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Popular Mechanics



PLANS: Build PM's work & play CAMPER

PM TESTS CHRYSLER'S OMNI & HORIZON: First U.S. front-drive compacts

ICEBERGS—THE NEW FRESH WATER SOURCE? WE CAN MOVE 'EM!

10 master tricks for restoring furniture

Half-scale flying replica of Focke-Wulf FW-190, famed WWII fighter

ROAR OFF IN YOUR OWN HOMEBUILT

12 exciting sports planes you can make from kits and plans

CARS: What sparkplugs reveal about your engine ■ Install total-surround stereo ■ How to survive if you're snowbound



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Popular Mechanics

On the cover
That mean-looking Focke-Wulf FW-190 is just one of many exciting half-scale warplane replicas you'll be able to build yourself from plans and kits. See page 54 for more on this famous German World War II fighter and other homebuilt sports planes.
—Painting by Ed Valigursky



JANUARY 1978

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Yes sir, that old GMC was some truck—still is, for that matter. Dad'll probably keep it till it's a hundred. Come to think of it, at the rate he's been borrowing the keys to your truck, his might just last forever.



Nothin' goes truckin' like a GMC.

This One



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LETTERS TO THE EDITOR

New mining education program

May I take this opportunity to compliment you on *Giant Miners for a New Coal Age* (page 77, Oct. '77) by Bill Kilpatrick. It should be well received by your readers as it very dramatically tells the story of an old industry now pulsating with a fresh heartbeat.

I am a professional mining engineer recently elected to be Director of Mining Management at this college, located in the coal-producing state of West Virginia. This new program, organized with the cooperation of the coal industry, is designed to educate young men for supervisory positions directing the operation of the "giant miners" so well described in your article.

C. W. STICKLER
ALDERSON-BROADDUS COLLEGE
PHILIPPI, W. VA.

In the article you say that last year a single longwall face in West Virginia set a world record by mining 12,395 tons in a 24-hour period. But you do not mention the name of our mine—the Robinson Run mine. I think that setting a world record should rate a mention of the mine that did it.

ROGER B. CONANT
CLARKSBURG, W. VA.

We do, too. The men in Robinson Run have reason to be proud.

PM readers are safer drivers

Congratulations to PM on winning, for the second year in a row, first place in the General Magazine category of the Uniroyal Highway Safety Journalism Awards. Your story, *How to Beat the Odds When You Drive at Night* (page 75, Mar. '77) by Bill Hampton, was a service to your readers. At author Bill Hampton's request, Uniroyal's \$1000 scholarship will go to the Journalism Dept. of the Williamsport (Pa.) Area Community College.

W. HERBERT SCHMALZ
PRESIDENT
UNIROYAL TIRE CO.

Promoting fire safety

I wish to commend you on the article, *Bold Tactics for Fighting High-Rise Fires* (page 67, Sept. '77). It was informative and well written. I hope stories such as this go far in providing a needed dis-

cussion of the issue of fire safety.

BILL GUNTER
STATE FIRE MARSHAL
TALLAHASSEE, FLA.

Checking out a thermostat

As one who is concerned with the design and testing of automobile thermostats and other cooling system components, I thoroughly enjoyed *Your Cooling System: All You Need to Know About It* (page 106, Sept. '77) by Mort Schultz.

There was one point, however, which should be clarified. The article states that "the valve should be fully open within 10°F., plus or minus, of its rating." Thermostats should be fully open at a temperature approximately 22°F. above the rating. If the opening temperature is within 10°F. of the rating, it probably will not cause damage.

It might be of interest to note that one method that can be used to measure the opening temperature of a thermostat is to heat the thermostat in a pan of boiling water (as the article suggests), remove the thermostat and, while it is cooling, let it close against a .002 thick feeler gauge blade between the valve and seat. With the thermostat suspended by the feeler gauge in a pot of slowly heated water (stirring the water with the thermostat), the thermostat should fall off the feeler gauge near the opening temperature. As the article points out, a reliable thermometer is a necessity.

B. PAUL SLIGER
ROBERTSHAW CONTROLS CO.
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A really hot topic

After seeing your guide on energy saving measures for the consumer (*101 Ways to Cut Home Energy Costs—Right Now*, page 117, Sept. '77), we feel obliged to inform you that we are manufacturers of a heat reclaimer, the Heizen Aire Heat Saver. Our unit can recapture 70 percent of the heat escaping through the chimney and bring it back into the home on a free-flow basis or it can be ducted directly to any specified area in the home. This means that approximate savings of 30 percent in fuel and dollars are possible.

We have had pilot units going for three years that support our claim

of 30 percent savings. All data is available on request. For additional information, readers should write to Heizen Aire Industries, Ltd., 1100 Altamont Ave., Schenectady, N.Y. 12303.

TERRI GARAFALO
SCHENECTADY, N.Y.

I have just started reading the Home Energy Guide and want to thank you for saying that many of the new breakthroughs in energy usage are only going to help the people who have always had what they needed anyway—the folks with plenty of money.

I'm afraid that new inventions in solar energy products and other modes of energy usage will do nothing for the huddling masses of the world until enough concerned persons really try to give something instead of just trying to make it big in the energy game.

KENNETH E. HOLMES
CLARKSVILLE, TENN.

The PM Guide pointed out "that the news is full of grandiose plans for the year 2000, and entrepreneurs keep devising systems for homeowners that would cost nearly as much as the house itself—with little hope of amortizing such expense in a normal lifetime. So far, there's been little useful information about how the average homeowner can beat soaring utility and heating bills."

Check your state's laws

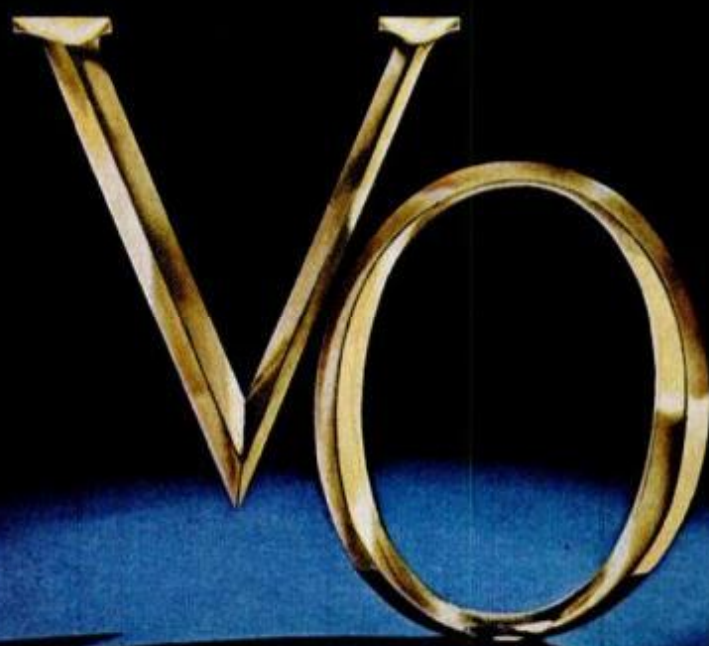
Many PM readers may be vacillating over the decision to install a solar or wind energy system because of anticipated property tax reassessment costs. They should be aware that some states have taken measures to alleviate this burden.

New York, for example, recently passed a law providing that real property on which a solar or wind energy system has been constructed is entitled to a 15-year property tax exemption to the extent of the value of the system, provided it's approved by the state.

Readers might do well to make inquiries into this possible source of tax savings. This kind of provision might be particularly beneficial to those contemplating new construction.

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Archery targets, 15 inches in diameter, 2½ inches thick and weighing three ounces, are designed for easy throw-launch. They fly in a vertical plane, with a prolonged hang-time in the air. The flying bull's-eye will take hundreds of hits from special Flu-Flu arrows, says maker. Targets are \$5.95; arrows six for \$8.50. Aerial Archery, Box 81, Lenox Dale, Mass. 01242.



Rustic board wall panels

New 4x8 panels look like vertical rough-sawn barnwood for dens, family or rec rooms. Ranchwood—light or dark—runs \$12 to \$14 per panel. It's Masonite's, at lumber suppliers.



Super safety goggles

Splash drains, baffled vents and seals make flexible chemical goggles more secure from splashes and fumes. Fits most hardhats. \$2 to \$3. Cadillac Plastic, Box 810, Detroit, Mich. 48252.

Electric-drive shark

For anyone who would like to have the beach to himself, a young British inventor has put together just the thing—a scaled-down model of a shark made of fiberglass and powered with an electric drive. The ballasted critter sails submerged just to the base of its highly realistic dorsal fin. Use of this unique model fish is reported to have cleared the waters of bathers off southern British beaches in short order.



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Insulation shortage

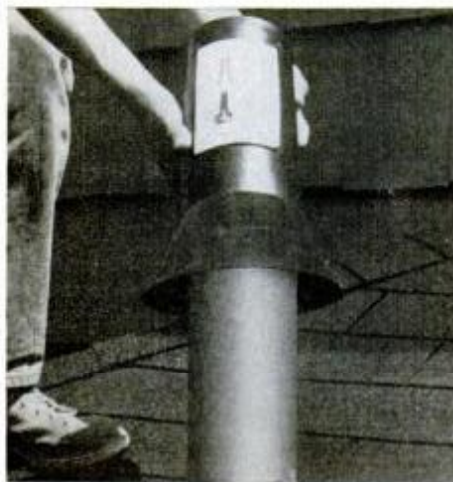
The shortage of home insulation material, expected to last at least another 16 months, could upset new-housing production and increase the price of new homes for buyers. Experts claim the shortage is being caused by the huge demand in the existing-housing market. Homeowners want to add insulation now to take advantage of anticipated tax credits. Robert Arquilla, president of the National Assn. of Home Builders, said "there appears to be no short-term solution to the problem because manufacturers claim they are already operating at full capacity."

Vent stack shield

Plastic stack shields are claimed to prevent leakage at the expansion joint of vent-pipe flashing. The shields are designed to overcome problems that are caused when a roof "planes" (rises and falls during high winds.) They are made of plastic and are available in two sizes: small (1½ and 2½-in. inside dia.) and large (3 and 4 in.



Inner ring enters stack for positive hold.



Unit slips over pipe, telescopes.



Base can be trimmed to suit roof's pitch.

inside dia.). The shields are telescopic and have an inner flange for a positive hold on the vent pipe.

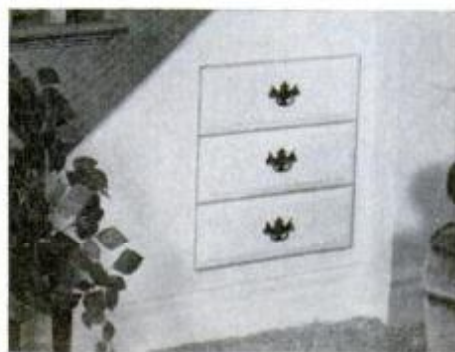
These FHA-approved shields are priced at \$4.99 for the small version and \$4.69 for the larger one, plus postage. Nevco 904 East 11 Mile Rd., Royal Oak, Mich. 48067.

Drawer in kit form

The precut drawer shown below can be assembled with a hammer and screwdriver because it installs in a metal mounting frame. Kit includes a frame with roller assembly, drawer box parts, stops and installation hardware; but pulls are not included. Drawers, which are available in 6 and 8-in. depths, come



Kit is easy to assemble in metal frame.



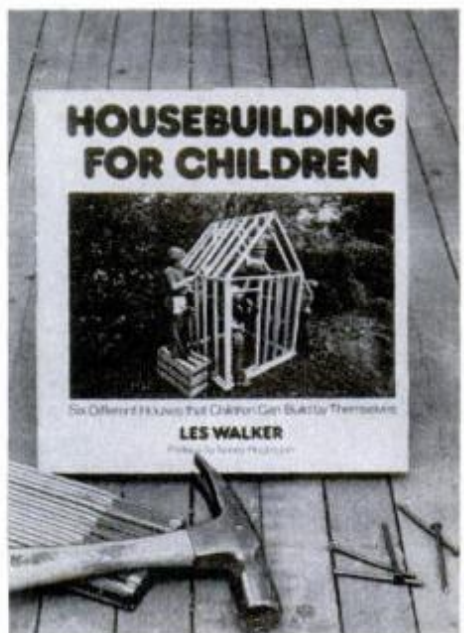
Drawers utilize otherwise waste space.

in three styles sized to fit between conventionally framed studs (16 in. on center).

The kits are sold in pairs with a money-back guarantee; prices are \$30 to \$42 postpaid. From Drawer-kit Sales, Box 36, Alden, Mich. 49612.

For pint-sized builders

Les Walker, PM's Pickup-Camper designer (page 76), recently built six houses with the aid of a crew of 10 kids. The adventure is record-



Youngsters on cover built homes shown.



Book has over 200 photos, drawings.

ed in *Housebuilding for Children*, \$10, published by Overlook, c/o Viking Press, 625 Madison Ave., New York, N.Y. 10022.—Harry Wicks, *Home and Shop Editor*

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HOMEOWNERS' CLINIC

QUESTIONS ANSWERED

Bubbly varnish

When I apply any type of varnish I get bubbles all over the surface and they dry to a roughness. I don't shake the container and I work with a clean brush. What am I doing wrong and what can I do to correct it?—E.M. Frost, Jacksonville, Fla.

It may be the brush and the way you handle it. You should use a pure animal bristle brush with varnish.

I suggest that you reclean the brush. Rinse it thoroughly in turpentine, then wash with soap and water and rinse well in clear water.

Work in a dust-free area when you apply the varnish. Use a tack rag, Q-tips, vacuum cleaner, or whatever you can to get off all traces of dust before applying the first coat.

Thin the first coat of varnish with turpentine. Apply varnish by first brushing it on the surface, then working the brush at a right angle to the original direction.

Finally, "tip off" with an almost-dry brush held at a 30° angle to the work surface. Ordinarily one thin coat and two full-strength coats should do the trick.

Cove base of sheet flooring

I plan to install vinyl sheet flooring in my kitchen and bath and carry the material up the wall to form the cove base or baseboard, rather than use the separate base or cove as in the conventional installation. I've seen flooring coved this way but don't know how it's done. Can you advise?—Henry Zielinski, Hoffman Estates, Ill.

It's rather tricky and I hesitate to suggest you do it yourself without experienced help. The covering is carried up the wall over a cove strip of wood or other material that gives approximately a 3/4-in. radius. The edge is protected with a cap strip.

Enamel on house siding

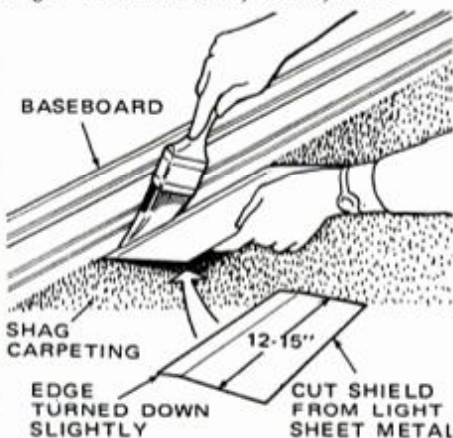
I'm tired of washing dirt off painted siding and repairing paint defects on the same siding. Why can't I use an enamel, with its hard, bright, smooth-finish surface when I paint? Wouldn't the enamel shed water and dirt better than house paint?—Phillip Stokes, Princeton, N.J.

I'm afraid you would be inviting

double trouble, especially if your siding is of a soft wood such as redwood or cedar. The enamels dry to a hard-surfaced, rigid film and any appreciable change in dimension of the boards due to contraction or expansion from temperature changes would be almost sure to form hairline cracks in the enamel, admitting dampness and water. Eventually the enamel would come off.

No-smear painting technique

I had shag carpeting installed and unfortunately the job was done before I got baseboards and quarter-round painted. Now, how can I do this without smearing the carpeting?—E. Harrison, Alma, Ark.



Patience is one "tool" and a metal shield the other. The illustration shows one way you can do this job fairly easily. Cut a shield from any light sheet metal and bend one edge over slightly. Press the curved edge down along the quarter round and paint along the edge with a small brush. Dip the brush lightly in paint and tap off excess on the inside of the container. Slide the shield along as you go. Have paper toweling handy to wipe its edge.

Extra lock for extra security

My back door has three glass panels and is sheltered under a breeze-way. The door has only one lock.

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

Break the glass and anyone can get in. I'd like your opinion of an auxiliary lock—one that locks with a key from both sides.—M. Daley, Burbank, Calif.

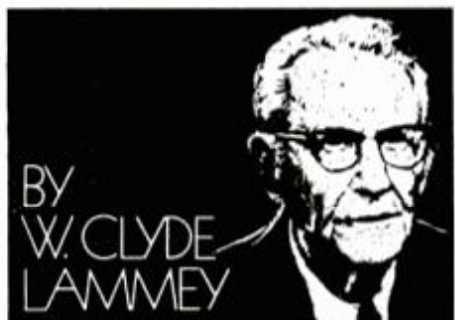
I assume the "one lock" you have is the spring-latch type that has the unlocking key inserted in the outside knob. This type offers the minimum security against break-ins through a glass-paneled door. If you can put up with the extra key required to unlock from inside, then an auxiliary double-cylinder deadbolt lock is a good one. It's recessed into the edge of the door and is relatively easy to install. Keep in mind, though, that if you have to make a hurried exit, as in a fire, those inside the house will need a key and will need to know where it is located.

Replacing kitchen countertop

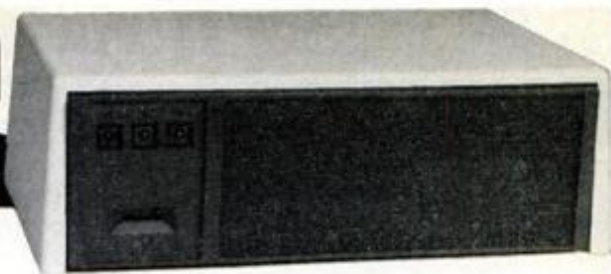
My kitchen countertop is covered with linoleum and I'd like to replace it with Formica. Can you advise how to proceed, how to prepare the top, which adhesive to use and how to apply the new Formica?—A.F. Miller, Dauphin Island, Ala.

You can do this by removing the old linoleum and replacing it with Formica on the existing plywood top. This involves time and considerable labor as all of the old residue must be removed down to the plywood surface. It's better to replace the old plywood top with a fully preformed counter, coved backsplash and no-drip front edge topped with Formica. Such do-it-yourself tops are available.

To remove the old countertop, first shut off the water at the meter, then disconnect the sink from the faucets and water lines. Retain the top or all parts of it for use when fitting the replacement. Your local hardware dealer can help with tools and materials.



Burglar Alarm Breakthrough



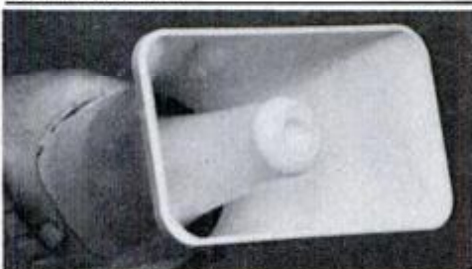
The Midex security computer looks like a handsome stereo system component and measures only 4" x 10½" x 7".

A new computerized burglar alarm requires no installation and protects your home or business like a thousand dollar professional system.

It's a security system computer. You can now protect everything—windows, doors, walls, ceilings and floors with a near fail-safe system so advanced that it doesn't require installation.

The Midex 55 is a new motion-sensing computer. Switch it on and you place a harmless invisible energy beam through more than 5,000 cubic feet in your home. Whenever this beam detects motion it sends a signal to the computer which interprets the cause of the motion and triggers an extremely loud alarm.

The system's alarm is so loud that it can cause pain—loud enough to drive an intruder out of your home before anything is stolen or destroyed and loud enough to alert neighbors to call the police.



The powerful optional blast horns can also be placed outside your home or office to warn your neighbors.

Unlike the complex and expensive commercial alarms that require sensors wired into every door or window, the Midex requires no sensors nor any other additional equipment other than your stereo speakers or an optional pair of blast horns. Its beam actually penetrates walls to set up an electronic barrier against intrusion.

NO MORE FALSE ALARMS

The Midex is not triggered by noise or sound, temperature or humidity—just motion, and since a computer interprets the nature of the motion, the chances of a false alarm are very remote.

An experienced burglar can disarm an expensive security system or break into a home or office through a wall. Using a Midex system there is no way a burglar can penetrate the protection beam without triggering the loud alarm. Even if the burglar cuts off your power, the four-hour rechargeable battery pack will keep your unit triggered, ready to sense motion and sound an alarm.

DEFENSE AGAINST PEEPING TOMS

By pointing your unit towards the outdoors from your bedroom and installing an outside speaker, light, or alarm, your unit can sense a peeping tom, and frighten him off. Pets are no problem for the Midex. Simply put them in one section of the house and concentrate the beam in another.

When the Midex senses an intruder, it remains silent for 20 seconds. It then sounds the alarm until the burglar leaves. One minute after the burglar leaves, the alarm shuts off and resets, once again ready to do its job. This

shut-off feature, not found on many expensive systems, means that your alarm won't go wailing all night long while you're away. When your neighbors hear it, they'll know positively that there's trouble.

PROFESSIONAL SYSTEM

Midex is portable so it can be placed anywhere in your home. You simply connect it to your stereo speakers or attach the two optional blast horns.

Operating the Midex is as easy as its installation. To arm the unit, you remove a specially coded key. You now have 30 seconds to leave your premises. When you return, you enter and insert your key to disarm the unit. You have 20 seconds to do that. Each key is registered with Midex and that number is kept in their vault should you ever need a duplicate. Three keys are supplied with each unit.

As an extra security measure, you can leave your unit on at night and place an optional panic button by your bed. But with all its optional features, the Midex system is complete, designed to protect you, your home and property just as it arrives in its well-protected carton.

The Midex 55 system is the latest electronic breakthrough by Solfan Systems, Inc.—a company that specializes in sophisticated professional security systems for banks and high security areas. JS&A first became acquainted with Midex after we were burglarized. At the time we owned an excellent security system but the burglars went through a wall that could not have been protected by sensors. We then installed over \$5,000 worth of the Midex commercial equipment in our warehouse. When Solfan Systems announced their intentions to market their units to consumers, we immediately offered our services.

COMPARED AGAINST OTHERS

In a recent issue of the leading consumer publication there was a complete article written on the tests given security devices which were purchased in New York. The Midex 55 is not available in New York stores but had it been compared it would have been rated tops in space protection and protection against false alarms—two of the top criteria used to evaluate these systems. Don't be confused. There is no system under \$1,000 that provides you with the same protection.

YOU JUDGE THE QUALITY

Will the Midex system ever fail? No product is perfect but judge for yourself. All components used in the Midex system are of aerospace quality and of such high reliability that they pass the military standard 883 for thermal shock and burn-in. In short, they go through the same rugged tests and controls used on components in manned spaceships.

Each component is first tested at extreme tolerances and then retested after assembly. The entire system is then put under full electrical loads at 150 degrees Fahrenheit for a full week. If there is a defect, these tests will cause it to surface.

PEOPLE LIKE THE SYSTEM

Wally Schirra, a former astronaut and scientist, says this about the Midex 55, "I know of no system that is as easy to use and provides such solid protection to the home owner as the Midex. I would strongly recommend it to anyone. I am more than pleased with my unit."

Many more people can attest to the quality of this system but the true test is how it performs in your home or office. That is why we provide a one month trial period. We give you the opportunity to personally see how fail-safe and easy the Midex system is to operate and how thoroughly it protects you and your loved ones.

Use the Midex for protection while you sleep, to protect your home while you're away or on vacation. Then after 30 days, if you're not convinced that the Midex is nearly fail-safe, easy to use, and can provide you with a security system that you can trust, return your unit and we'll be happy to send you a prompt and courteous refund. There is absolutely no obligation. JS&A has been serving the consumer for over a decade—further assurance that your investment is well protected.

To order your system, simply send your check in the amount of \$199.95 (Illinois residents add 5% sales tax) to the address shown below. Credit card buyers may call our toll-free number below. There are no postage and handling charges. By return mail you will receive your system complete with all connections, easy to understand instructions and one year limited warranty. If you do not have stereo speakers, you may order the optional blast horns at \$39.95 each and we recommend the purchase of two.

With the Midex 55, JS&A brings you: 1) A system built with such high quality that it complies with the same strict government standards used in the space program, 2) A system so advanced that it uses a computer to determine unauthorized entry, and 3) A way to buy the system, in complete confidence, without even being penalized for postage and handling charges if it's not exactly what you want. We couldn't provide you with a better opportunity to own a security system than right now.

Space-age technology has produced the ultimate personal security system. Order your Midex 55 security computer at no obligation, today.

JS&A NATIONAL SALES GROUP

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Northbrook, Ill. 60062 (312) 564-9000

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In Illinois call (312) 498-6900

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'78 FORD PICKUPS. TOUGH ALL OVER.

A new Ford Pickup is built tough from the ground up. Ford's exclusive forged steel Twin-I-Beam, extensive corrosion protection, big-cube V-8 options, all-welded cab, and double-wall box are just a few of the reasons.

But what makes a new Ford even tougher to beat are this year's new options like • Synchromesh 4-speed overdrive transmission for highway driving (not available on F-350 models) • Good-looking, comfortable new Lariat interior • 40-channel CB with concealed transceiver, single AM/FM/CB antenna, and all controls in the removable mike • New tilt steering wheel for your most comfortable position.

Take a look at all the new Fords. You'll find them tough all over. And *more* than just tough.



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

FORD
FORD DIVISION



THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS BY THE EDITORS

More-mpg carb

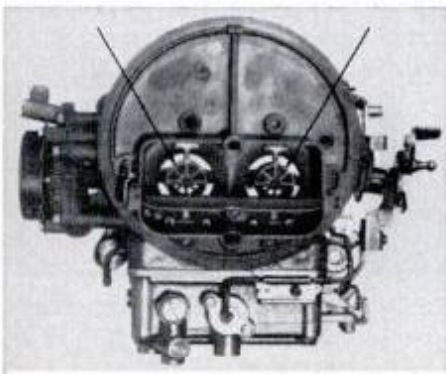
Automobile enthusiasts have always speculated about secret carburetor designs, supposedly suppressed by the oil companies, that would bolt onto a manifold and boost gas mileage phenomenally. There's no such animal despite what you've heard and read. But



Holley has new Economaster carb line.

the people at Holley Carburetor Div. of Colt Industries in Warren, Mich., feel there's enough potential fuel economy gain through refinements of existing carburetor models to introduce Economaster replacement carbs.

They're not making any wild claims. Tests show average gains of 5 to 10 percent—which would translate into 1 or 2 mpg for most cars in normal driving. The carburetors retail in the \$40 to \$80 range. With the soaring prices of gas, you can see that it wouldn't take long to pay for it with the



Fuel is vaporized quickly and effectively in Economaster's booster venturi by special nozzle and fins (shown by arrows).

usual 1000 to 1200 miles of driving per month. And if you have an older car, and need a new carburetor anyway, the Economaster costs very little more than a rebuilt replacement.

Holley engineers followed a very simple principle in most of their design modifications: Meter the fuel into the air to mix with the air in a fine spray. This helps the fuel vaporize instantly, which, in turn, gives more even distribution of the fuel-air mixture to the various cylinders through the manifold passages. Even-mixture distribution is the secret of fuel economy. When you don't have some cylinders running rich and others lean, you can lean the carburetor without having some cylinders stumble and buck. Each cylinder shares equally in the work, so less total fuel is needed. It works.—*B.H.*

Tire-valve tool

Tight valve cores can be finger-busters, so here's how to apply more torque. Model No. 444, 5 inches overall, has a fluted handle, standard and large-bore ends. \$1.40. Milton Industries, Inc., 4500 West Cortland St., Chicago, Ill. 60639.—*B.H.*



Handle on valve-core tool has good grip.

V-belt tool



V-belt tool gets belts on and off easily.

You're ready for this good-buddy of a tool if you've wrestled with too many belts and pulleys and lost. You rail and derail belts by using the tool's ingenious set of "ears." When they're in position you just crank the starter and watch the device do the trick. It's \$4. Thexton Manufacturing Co., 7685 Parklawn Ave., Minneapolis, Minn. 55435.—*B.H.*



Electronic antennas of Hans Kolbe design include Beta 33 (rear) with elastic rod and Beta 34 with telescoping rod.

Slick sticks

Car antennas have always posed a problem of one sort or another (that's why we've all seen the old coat-hanger antenna used in a pinch). The type sandwiched in the windshield was a fair compromise to the telescoping type, but it didn't work out. The latest twist is the electronic car antenna. A solid-state amplifier is part of the design and it serves to AM/FM reception. The Beta models shown here are from the German company of Hans Kolbe and are imported by Didacta, Inc., Box 8822, Charlotte, N.C. 28214. Price is \$36.—*B.H.*

Receipt organizer

If you don't have your own technique of keeping track of car expenses and find yourself behind the eight ball for lack of receipts for gasoline charged during the month, perhaps this cleverly simple, spring-loaded little Receipt-Trap box will get you organized. It's priced at \$3.49. Warren Marketing, 7707 Southeast Dolinda St., Milwaukie, Ore. 97222.—*B.H.*



Receipt-Trap is an efficient organizer.

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Your free booklet will also include information on employment opportunities for the career field of your choice, as reported by the U.S. Bureau of Labor Statistics in the Occupational Outlook Handbook for 1976-1977.

In addition, you will receive a free "Demonstration Lesson" that also lets you see for yourself why getting the career training you need most may now be easier than you think.

When students enroll in these programs, their lessons and career training materials are delivered to their homes— and each lesson includes an "Open Book" exam. As the students complete their lessons, they mail back each exam for review. Correct answers are checked off, and students are told how to correct their wrong answers. Then the graded papers are returned to the students by mail. This kind of "Open Book" testing— which allows you to concentrate on learning instead of worrying about grades— has proven so successful for adults it is now used in many colleges.

In short, your free "Demonstration Lesson" will allow you to see for yourself why graduates report that they enjoyed independent study for these three reasons: the freedom to learn at your own pace, in the privacy of your own home; the convenience of choosing your own study hours; and the opportunity to move ahead a step at a time, lesson after lesson, until you have earned the College Degree, Career Diploma, or Career Certificate that you may need at this time to help you qualify for the job you want.

If postpaid card is missing, send your name and address to:

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ICS is an Accredited Member of the National Home Study Council, and authorized to provide career training leading to Career Diplomas and Career Certificates. Thus, while it's not possible for ICS or any other reputable college or school to guarantee jobs to its graduates— and employment opportunities differ from company to company and city to city— you will get the same high quality of training that ICS has been noted for since 1890. So students can enroll with confidence in ICS, secure in the knowledge that ICS is here to help them prepare for the career field of their choice— no matter which Career Program they select . . . regardless of past experience.

When you receive your free career booklet and free "Demonstration Lesson" in the mail, you may want to show them to your employer. Please feel free to do so. You may also want to advise your employer that the ICS Industrial Training Division has special training programs and relationships with more than 3,000 companies, unions, and government agencies across the country— including corporations like Union Carbide, International Paper, 3M, Bethlehem Steel, U.S. Steel, etc. And note that if you decide to enroll in the Career Program of your choice— if you wish, your employer will be kept informed of your progress— so that your employer can better evaluate your effort and ambition should you be in line for a better job, or an increase in salary, etc.

In short, the attached postpaid card offers 36 Career Programs designed to help you qualify for the job you want. And you can find out what the Career Program of your choice can do for you— with no obligation to buy anything now or ever.

So just take a moment to check your Career Program. Fill in your name and address. And mail the card today.

Your Free Career Booklet and Free "Demonstration Lesson" will be mailed to you promptly.

MAIL THE ATTACHED CARD • NO SALESMAN WILL CALL

IMPORTS & MOTORSPORTS



Ford's Fiesta Fantasy is a show car that's coupe (here), pickup or station wagon.

Fiesta Fantasy

If the simple sedan is going to compete with fancy vans, pickups, hatchbacks and other more versatile, increasingly popular vehicles, it must offer its own pizzazz. This three-way Fiesta does just that. Right now the Fantasy is going into sheet metal for auto shows around the country this year. These final styling sketches preview the



Fantasy, a short-bed pickup, is practical.

car that Ford will spotlight in its exhibit areas.

The coupe/pickup/wagon, if it sees production, would be U.S.-made for a governmental reason: To achieve the fleet average mpg mandated by Washington, a manufacturer cannot include its imported cars. So the Fantasy would be a variation of the Fiesta to be built here.

In its coupe, the Fantasy has a panel covering a cargo area behind the cab. For the pickup, this panel is removed. A drop-on enclosure aft



As station wagon, Fantasy looks its best.

transforms the Fantasy into what could be one of the prettiest little wagons on the road.

Banjo's Camaros

"Hey, didja see Holbert go on his head?" That query was most asked by those who missed the opener of the International Race of Champions (IROC, pronounced I-rock). In Z-28 Camaros prepared alike by Banjo Matthews, drivers who normally compete in one sanction (NASCAR, USAC, IMSA and so on) compete in a three-race championship series.

With identical cars, a driver's racing skill is paramount here. In the first race at Michigan International Speedway, Sept. 17, Al Holbert kissed another car, hit the guardrail and flipped. His subsequent slide with the Camaro on its roof was like nothing you'll ever see in baseball: After several hundred feet, the car came to rest and Holbert spit out some mud and



Camaro Z-28s start IROC series at MIS.

grass that collected in the passenger compartment. The NASCAR-type roll cage and harness cradled him to a safe stop. Al Unser (USAC) took the opener by sling-shotting Cale Yarborough-NASCAR-style in the last turn. Chalk up one for Al, but he's not top banana yet: The overall winner will be decided Feb. 17 at Daytona after everyone's points are added up.

Bikes before books?

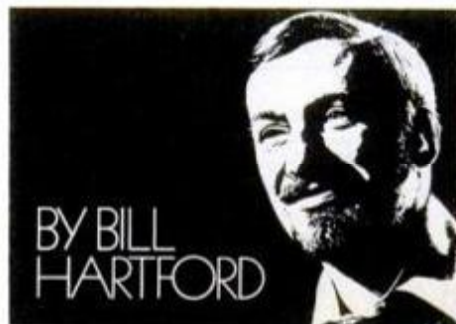
Every car nut or motorcycle freak who has children worries that his kids might go bananas over wheels and turn into a worse vroom-zoom weirdo than himself. We imagine we'll have a Hell's Angel in the house before high school! Should you encourage kids to learn about a car's controls at an early age? Should you test them for tight figure eights and hand signals before turning them loose on their banana-seat bikes? Or (and here's the heavy one) should you put your child on a mini motorcycle before he or she may know how to spell S-u-z-u-k-i?

Well, I think it's never too early to teach responsible habits at the handlebars, so I'll opt for the early-age instruction and hope for the best. One machine designed for kids of tender, early school age is Suzuki's new JR-50 Mini. The 19-inch-high motorcycle has safe, rounded-off levers, kill button, well-shielded chain and muffler and simple neutral and one-speed forward

Suzuki JR-50 mini motorcycle is only 19 inches high.



shifting. Top speed can be governed to match rider skills. If Mighty Young Rider saves a special allowance of \$6 per week for 50 weeks, he or she will have the purchase price. **PM**



BY BILL HARTFORD

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

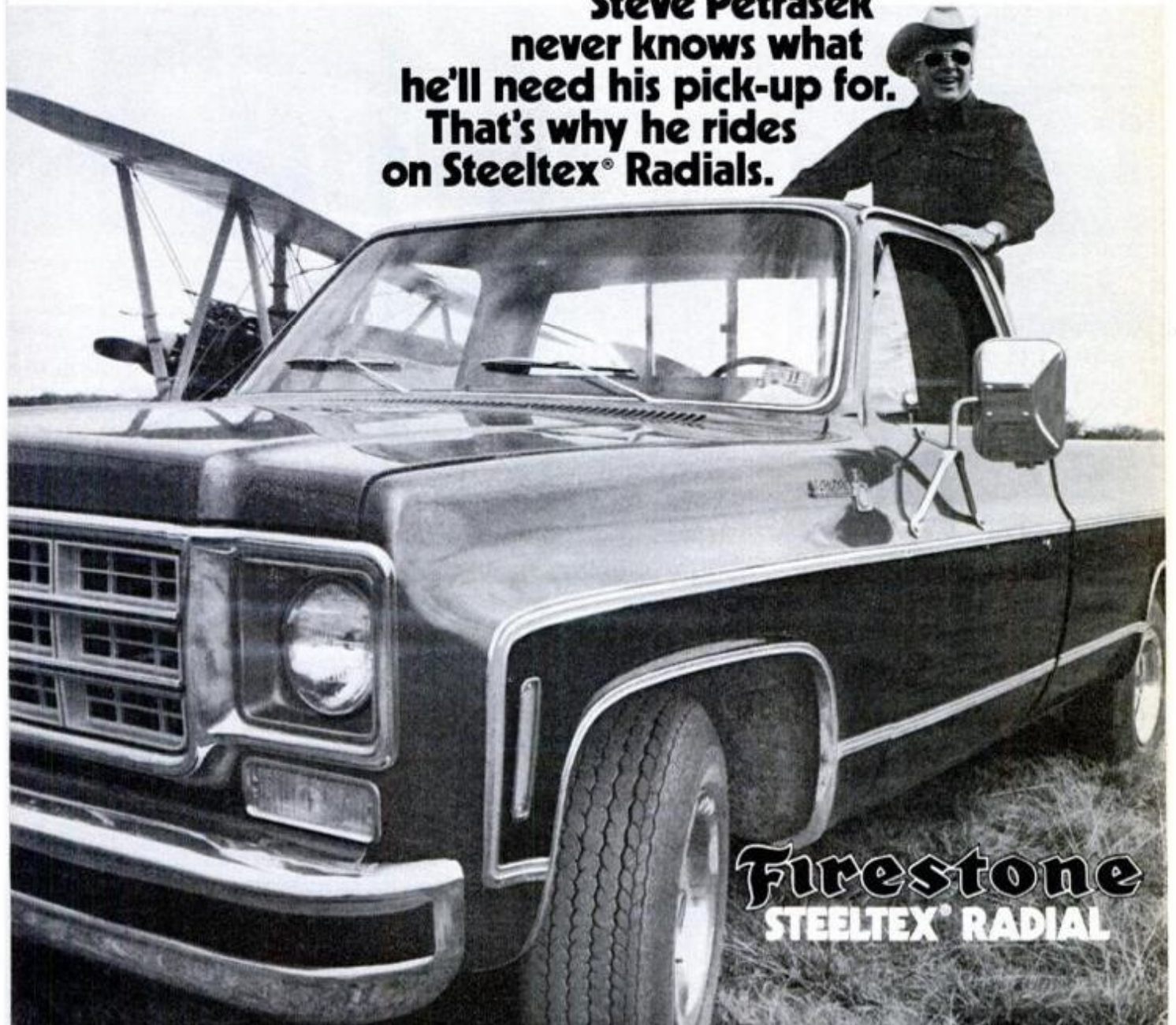
Steeltex for you.

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

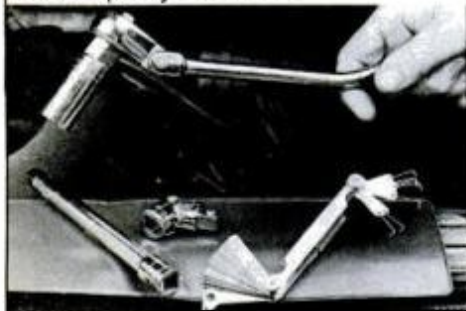
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ESPECIALLY FOR YOUR LIGHT TRUCK.**

NASCAR CHAMPS



**Driver Cale Yarborough,
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5 pc. 3/8 in. dr. Tune-Up Set. No. 4505-77. Handy set changes car plugs etc. Special tight spot ratchet. Total value **\$2159** if purchased separately **Suggested User Price** \$32.88.

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Suggested User Price

SAVE \$13.06 OVER 43%*

13 pc. 1/4 in. dr. Socket Set. No. 4913-77. For cars, wash. machines, small nuts & bolts. Total value if purchased separately **\$1698**

Suggested User Price.

SAVE \$8.69 OVER 47%*

5 pc. Combination Wrench Set. No. 1705-77. Takes on jobs from motorcycles to power mowers. Total value if purchased separately **\$959**

Suggested User Price.

*All savings based on piece by piece purchase at suggested user prices.

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S-K DRESSER

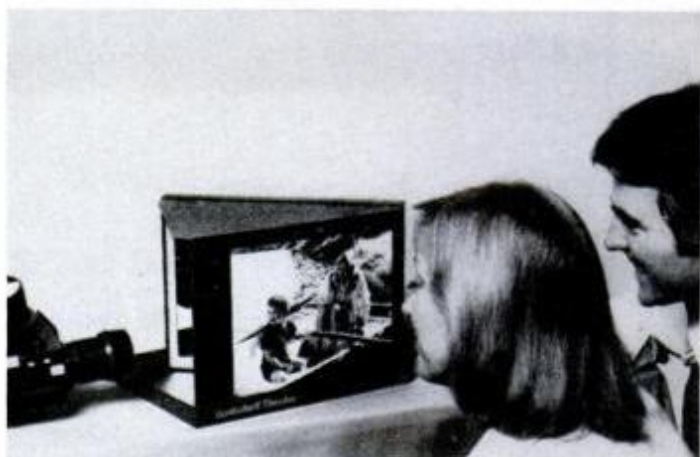
HAND TOOL DIVISION
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3201 N. Wolf Rd. Franklin Park, IL 60131



IT'S NEW
NOW

Bookshelf screen

Use your own projector with a compact rear-screen viewer that folds up and slips onto a bookshelf. Unit has an 8x10-inch viewing area, measures 10½ x14x1½ inches folded. It accommodates slides or movies, costs about \$30 from 3M Co. Sold at most photographic supply shops and department stores.



Shower with a throb

Bathtub shower head—either hand-held (\$13.50), or fixed \$(5.85)—offers steady spray or, at push of a button, pulsates to produce massage action. Peerless Faucet, Box 31, Greensburg, Ind. 47240.

Anyone for bounce tests?

Now you can quit guessing the bounce in tennis balls. A new ball tester provides an instant pressure reading on a scale pointer dial, making it simple to match balls for tournament play or separate bouncers from duds. About \$11. Welpro, Box 1837, South Bend, Ind. 46634.



Game pops up for losers

Matching blocks to holes in a tray within a minute timed by built-in clock is the latest in British family games. If time runs out, tray pops blocks skyward to kids' delight. About \$10. Home Stores, 129/137 Marylebone, London NW1, England.

Материал защищенный авторским правом

What this country needs is a good 1¢ router.

The router. 1/2 hp, 28,000 rpm — power and speed enough for extra-smooth, ready-to-finish cuts. Twin-knob handles for easy, sure cutting, freehand or otherwise. A dial-type depth control to insure accuracy.

And double-insulated construction to protect against shock without grounding. U. L. Listed. Complete with 1/4" collet and wrenches.

Regularly \$49.99*

Now you can get this \$50 1/2-hp router for only a penny when you buy our 10" Homecraft® Table Saw for just \$279.99*



The saw. The rip fence is self-aligning. The table is big, 22" x 32" with 11 3/4 inches in front of the blade.

The stand it sits on is all steel and heavy enough to stay put. The motor is a workhorse. Heavy-duty, high-torque, and overload-protected.

The capacity is considerable. Enough to cut the hardest hardwoods easy, or cut to the center of a 4' x 8' sheet, or cut as deep as 3 1/4 inches at 90° and 2 1/8 inches at 45.

And the price is worth every penny. Particularly when you consider that for just \$279.99, we'll also give you a great \$49.99 router for only a penny more.

What could be more patriotic than that?



Rockwell International

*Manufacturer's suggested retail price at participating dealers.

See the Yellow Pages under "Tools-Electric" for your nearest Rockwell dealer. Or write Power Tool Division, Rockwell International, 6263 Poplar Ave. Memphis, TN 38138.

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End tune-up problems forever. Replaces points & condenser, never needs adjustment.

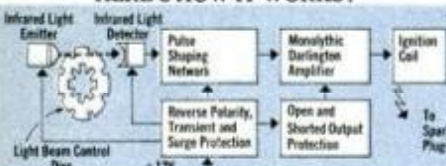
Save money on gas—more efficient combustion at all speeds & under all conditions. Longer spark plug life.

Install it yourself with our easy, detailed instructions. Fits 4s, 6s, 8s, domestics, imports, rotaries. Converts CDs to breakerless, too!

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make & cylinders:

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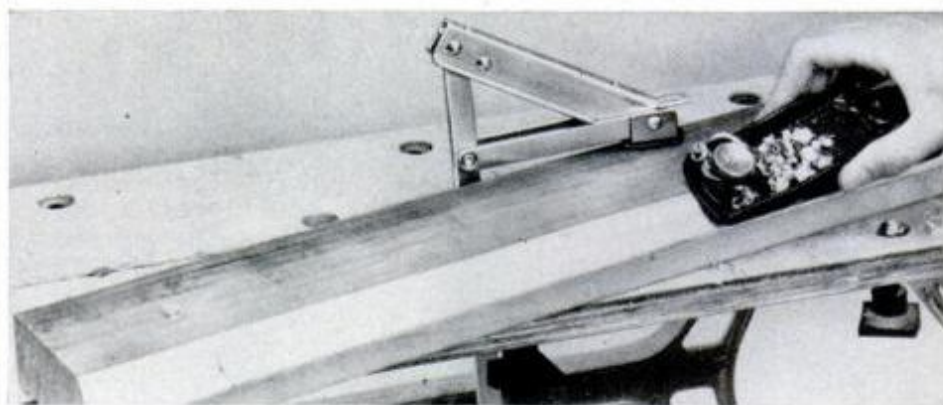
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SEND FREE ILLUSTRATED BROCHURE

PM LOOKS AT HOLD-DOWN FOR THE WORKMATE



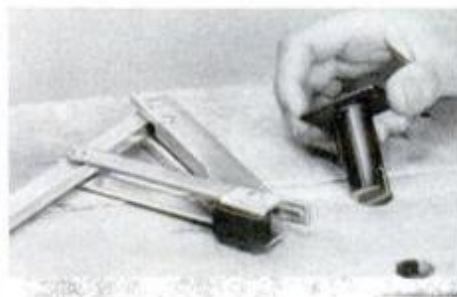
Versatile hold-down installs quickly on Workmate, holds work securely.

Black & Decker has just made a handy tool—the Workmate—even handier by announcing several accessories for use with it. I've tried out two—the Gripmate Clamp and the Routermate Shaping Guide.

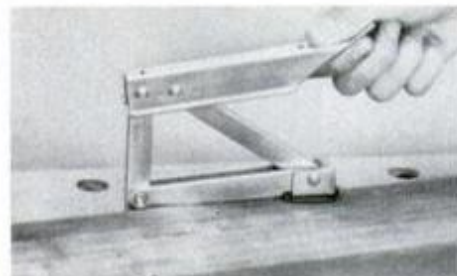
The former lets you securely hold almost any shape for sawing, sanding, drilling and routing of horizontal surfaces. It mounts quickly in the Workmate's top surface and functions as shown below.

The Routermate Shaping Guide can be used with most routers for edge shaping. To use the jig the router is rigidly held while the work is moved against the fence.

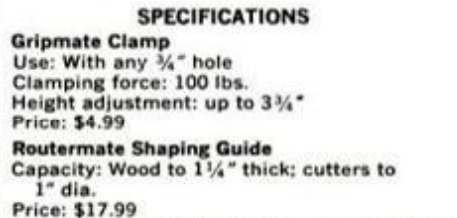
The problem here, as with many accessory products, is the lack of space for keeping the accessories organized. Perhaps a Workmate accessory holder should be next on B&D's production agenda.—Harry Wicks, Home and Shop Editor



1. To use the Gripmate Clamp, plastic insert is installed in the Workmate top.



2. Next, Gripmate is slipped into the plastic fitting until it's securely seated.

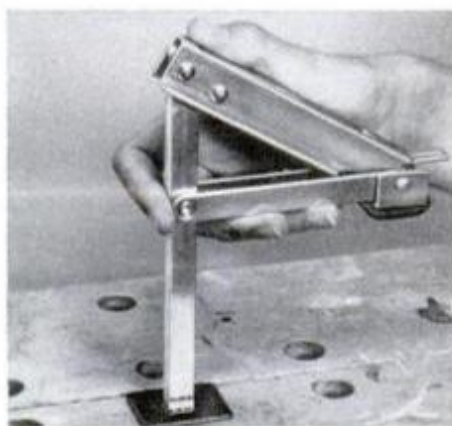


3. Gripmate lever is then pressed down to clamp the workpiece securely.

SPECIFICATIONS

- Gripmate Clamp**
Use: With any 3/4" hole
Clamping force: 100 lbs.
Height adjustment: up to 3 1/4"
Price: \$4.99
- Routermate Shaping Guide**
Capacity: Wood to 1 1/4" thick; cutters to 1" dia.
Price: \$17.99

Manufacturer: Black & Decker Manufacturing Co., Towson, Md. 21204. Accessories at hardware stores, building supply centers.

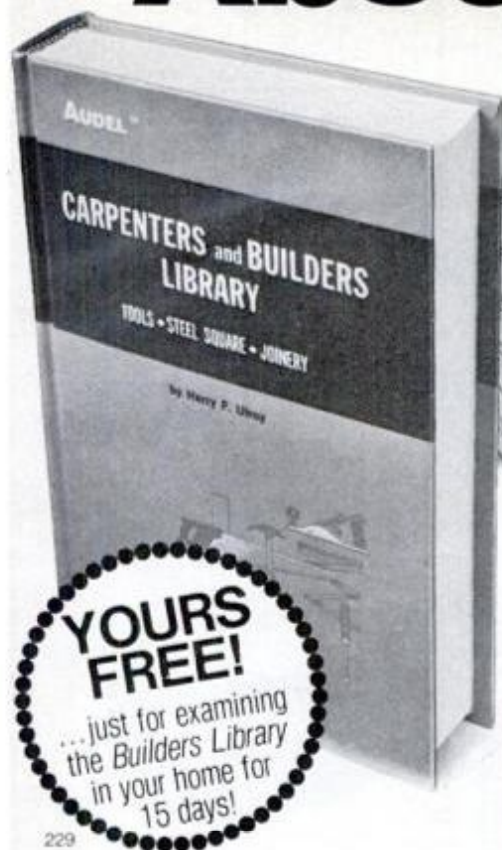


Routermate accessory can be used with most routers for accurate edging.



Routermate accessory can be used with most routers for accurate edging.

Absolutely Free!

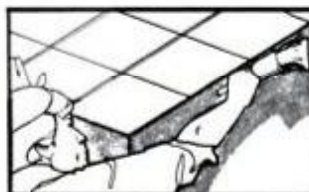


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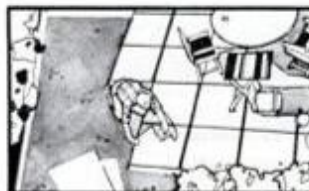
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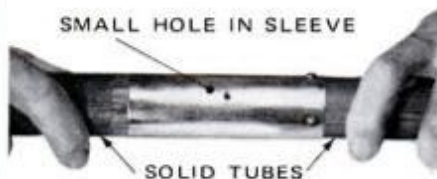
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PM

HINTS FROM READERS

Fasten poles together easily



Ease assembly and disassembly of solid rounds held together by a sleeve. Bore a small hole through the sleeve where the parts meet. This will let air in and out as the joint is fastened and unfastened.—Percy W. Blanford

Can the radio



Give a pocket radio a deeper voice by placing it, speaker side down, over a fruit-juice or other large can.—Walter E. Burton

Drill-bit holder



Keep the drill bits you use most often in a holder made of scrap wood hung conveniently on a wall.—Parry C. Yob

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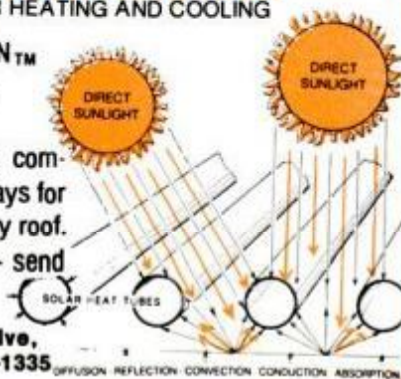
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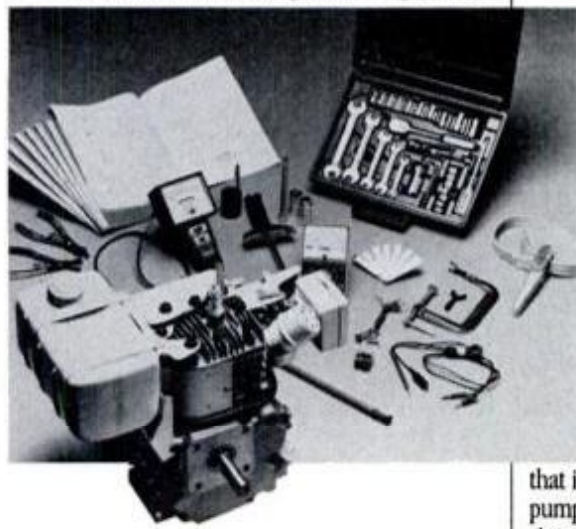
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CAR CLINIC

SOLUTIONS FOR MECHANICAL HEADACHES

BY MORT SCHULTZ



Changing baby's formula

If they phase out premium gasoline, what is going to happen to those of us who drive old but still good cars that require higher octane? I drive a 1969 Buick Electra with 70,000 miles, and I would like to keep it forever. However, it runs well only on premium. Will a consistent knock cause damage?—Robert E. Kennedy, Goodland, Fla.

A consistent, heavy spark knock (detonation, ping—call it what you will) can cause sparkplug and piston damage. If and when they phase out premium gasoline, you will have to modify your engine. This was discussed in the December 1975 issue of PM. Briefly, modifications call for the following:

- Retarding ignition timing by up to 10°.
- Installing centrifugal advance-retard springs (if available for your distributor) that limit distributor advance under load.
- Removing carbon by chemical means, and if that doesn't work by physically scraping it from the head and cylinders.
- Installing a thicker head gasket, if one is available for your engine, that decreases the compression ratio and reduces the tendency of gasoline to detonate.

Granada's Achilles' heel

My 1976 Ford Granada with 351-cu.-in engine is probably the best-performing car I've ever owned, but a ping on accelerating is driving me up the wall. My dealer seems unable to do anything about it. Is there anything he is missing?—Don Secor, Livingston, Tenn.

If your dealer is not applying the provisions of four Ford/Mercury/Lincoln service bulletins, that's what he is missing. The four are:

1. 99 (10/24/75)—retarding ignition timing 2° at a time until the ping subsides. A total of 6° from the specified setting is allowed.
2. 102 (12/5/75)—adjusting the vacuum diaphragm.

3. 108 (3/24/76)—correction to data in bulletin 102.

4. 116 (7/19/76)—readjusting engines equipped with an EGR exhaust, back-pressure control system.

Choice to make

After 2000 miles, the radial tires on my 1977 Pontiac LeMans have developed cracks in the sidewalls. The Uniroyal tire dealer is willing to give me a new set of radials. My mechanic tells me to take conventional, bias-belted tires instead as he's had other customers with the same complaint. What should I do about this?—Irwin Steinhart, Ottawa, Ont.

I think you'll be sorry in the long run if you switch. I have radials on both my cars. One set is Goodrich, has run 36,000 miles and looks good for another 20,000. The other set is Uniroyal with 20,000 miles and looks brand-new. I've had no sidewall cracking problem with these radials and yours is the first letter sent to *Car Clinic* that's complained of the condition, which I think is a fluke.

Undertaking his Plymouth

I'm about to give up, dig a hole and bury this bomb they call a 1977 Plymouth with 225-cu.-in. engine and two-barrel carburetor. It was running okay until I took it for service. Now it's hard-starting and stalls when cold. Once warmed up, it runs fine. My "friends" at the dealer's can't figure what's wrong. Can you help?—Peter ("Desperate") Sheppard, Athens, Ga.

I have a hunch, "Desp," but I have to assume that the mechanics checked all the obvious causes for this condition. Your car has a tricky air cleaner. Although this cleaner has locating tabs to try to assure its correct placement, someone servicing the car may have deformed the locators by twisting the air cleaner or may have forced the air cleaner down over the carburetor improperly. This would cause the aspirator hose, which passes close to the choke rod, to make contact with that rod, keeping the choke from closing. One way to tell if this has happened is by looking at the air cleaner and inlet duct. They must not be in a straight line. The duct should be curved. If the air cleaner isn't seated properly, reposition it to resurrect your Plymouth.

The tax man goeth

I think I have solved a problem with my 1974 AMC Ambassador Brougham (360-cu.-in. engine) that may benefit others. When I bought this car in '74, it averaged 21.7 miles per gallon although the air conditioner was being used daily. Beautiful—but then, like the tax collector, it began taking more

(Please turn to page 32)

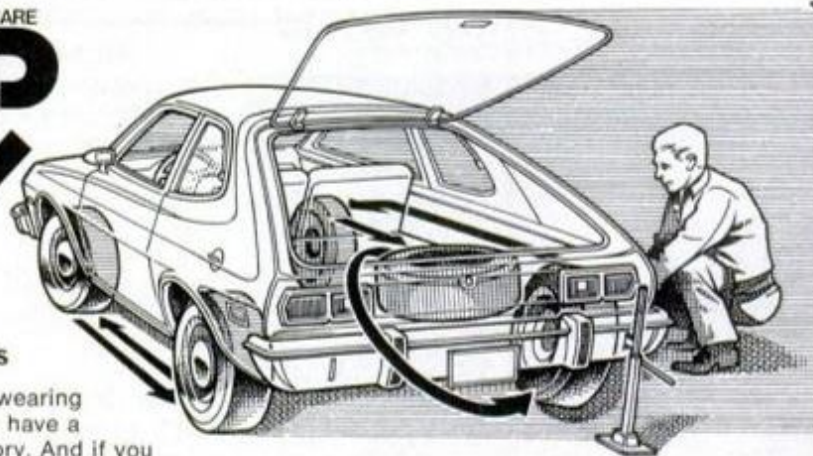
PM CAR CARE

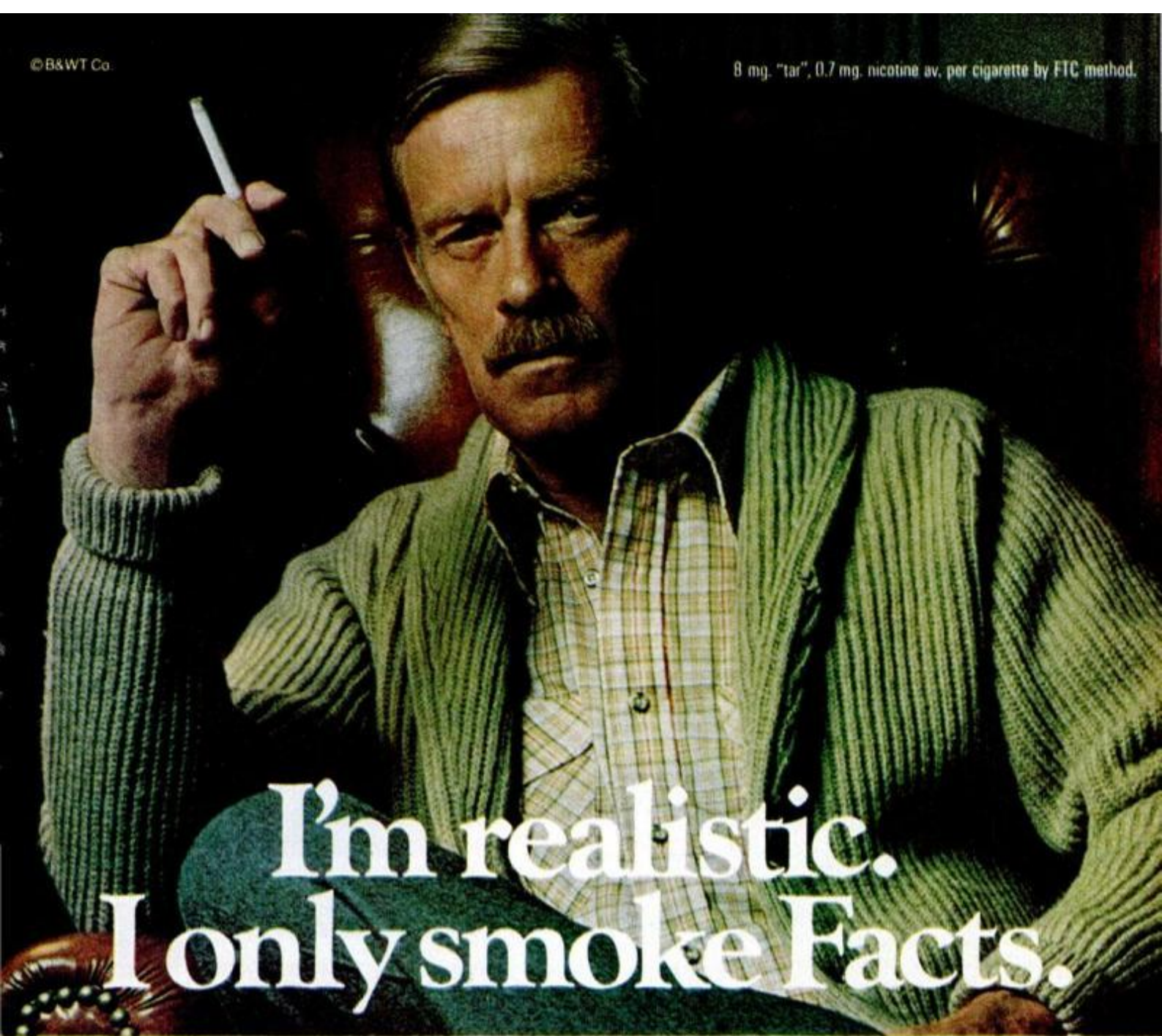


Radials have memories

Your long-wearing radial tires have a long memory. And if you "cross" them, they can give you rough treatment.

Radials, says The Goodyear Tire & Rubber Co., "remember" which side of the car they were on. That makes it important for you to remember that rotating radials is not the same as "crisscrossing" bias or bias-belted tires. Crossing them from one side of the car to another could result in unnecessary roughness or vibration and deprive you of some radial tire benefits. If you use the spare in a rotation pattern, put it on the right side of the car. Right-side tires usually take more abuse from edge-of-the-road chuckholes, curbs and roadside debris.





I'm realistic. I only smoke Facts.

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

FACT reduces the aldehyde* gases that we believe muddy the flavor of fine tobaccos so you can enjoy wide-awake taste.

FACT 2: We have smoke scrubbers in our filter.

These Purite® scrubbers work like magnets to reduce these same aldehydes and let the fine flavor come through.

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This '78 Winnebago gives you two extra feet of comfort. At no extra cost.

Last year, our lowest-priced full size motor home measured 21 feet in length. This year's Brave 23RG is actually two feet longer, several inches wider—but still at the same low price!

This thrifty new Winnebago isn't just bigger, it's better. We put that extra space to very good use. To give you a bathroom with separate shower compartment. Larger galley with double sink and backsplash plus more cupboard space. A choice of three forward seating arrangements: standard dinette, lounge chairs and table, or couch with pedestal tables.

Other added values include a rear fold-down bunk, AM radio, window screens for driver and passenger, and more. All wrapped up in a sleek new streamlined exterior. And all of it, remember, for no more than last year's list price.

This year, value is the word for every Winnebago from the compact Minnie Winnie to the long, luxurious Elándan II. Look up your nearest Winnebago dealer in the Yellow Pages and go see him now.

You can drive a bargain with us.

There are a lot of reasons why you'll sleep better in a Winnebago.



CAR CLINIC

(Continued from page 30)

and more gas. Gradually, mileage dropped to between 10 and 12 mpg. In desperation, I decided to do another complete, meticulous tune-up.

In raising the hood, I spotted water on the block near the water pump. Lucky I did, because as I was bent over investigating I noticed a drop of gasoline dripping from the carburetor-pump lever plate. This is the square plate through which the pump lever passes. It is held by four bolts which had come loose. The loose plate was letting gas spurt out every time I hit the accelerator pedal. Now that the plate is tight again, do you think my 21.7 mpg will return?—Roland Wisehart, Palmdale, Calif.

I wouldn't be surprised if it did, Roland. Thanks for sharing.

Rattling Cutlass

My 1976 Oldsmobile Cutlass 350-cu.-in. engine makes a slight clatter when starting from a dead stop. When the engine is warmed up, the noise disappears. Is this hydraulic lifter noise?—Charles S. McDowell, East Lansing, Mich.

I doubt it. Hydraulic lifter noise couldn't be described as "slight," nor would it normally last for an entire warm-up period. A weak lifter would stop clattering as soon as it filled with oil, which would take a few seconds. But if for some reason it didn't fill with oil, clatter would be loud.

I can't say for sure what's causing the clatter without listening to the engine, but I'll take an educated guess that it's the manifold heat-control valve. Try lubricating its shaft with manifold head control valve lubricant and see if the noise disappears. However, don't expect miracles. The noise may go, but it has a habit of returning, in which case I advise more lube.

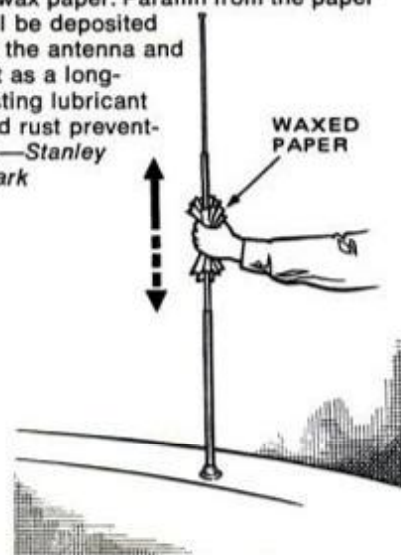
Buick's 'diesel' engine

My 1977 V6 Buick Century diesels occasionally. Is this harmful? The Buick garage suggests that I depress the gas pedal just before turn-off.—L. Kramer, Sarasota, Fla.

Occasional dieseling—even frequent dieseling—is not harmful. For those not familiar with it, dieseling is what happens when an engine continues chugging for a few seconds after the ignition is

Stuck radio antenna

In time, whiplike radio antennas get difficult to raise and lower, due to rust or corrosion. An effective cure is to raise the antenna to its highest point, then clean it thoroughly with a wad of fine steel wool moistened in kerosene. Wipe it dry with a clean cloth, then rub it down with a piece of wax paper. Paraffin from the paper will be deposited on the antenna and act as a long-lasting lubricant and rust preventer.—Stanley Clark





Want to try before you buy? Call Rent-A-Way Winnebago, 800-447-4700 for information (In Ill. call 800-322-440)

turned off. It can often be eliminated, or its frequency lessened, by adjusting the carburetor and ignition timing. If you want to make sure it won't happen, shut off the engine with the automatic transmission in Drive, or let out the clutch of a car with manual transmission to stall the engine. Racing the engine slightly as your garage suggests may also work.

Shocking thoughts

I have a 1976 Buick Regal with a V6 engine. At speeds over 20 mph there is a distinct thud or thump in the automatic transmission upon deceleration and acceleration. The Buick dealer refuses to do anything about it. Will this apparent play in the transmission cause harm?—Leo A. Batliner, Kansas City, Mo.

The "thud or thump" is not in the transmission; it's in the driveline. The Buick dealer "refuses to do anything about it" because he can't. It's there to stay, it won't cause any harm, so stop worrying.

Driveline clunk is normal under sharp deceleration and acceleration, because the dashpot previously installed on this engine had to be removed in 1975 to comply with emission requirements. Instead of re-

sponding gradually as it would if a dashpot were present, the engine responds sharply, which causes a "shock" in the driveline and clunk. Don't take that word "shock" literally. It isn't severe enough to cause a problem. If you accelerate and decelerate gradually (by easing the gas pedal), the noise will be reduced substantially or stop.

The stripper

Our 1975 Pontiac Catalina station wagon has simulated wood grain panels on the sides which have discolored. The dealer tells me I can do nothing but replace the panel—a horrible job of around \$400. Suggestions?—Bill Flannery, Holliston, Mass.

You have a few other options. Hopefully, discoloration has been caused by a buildup of wax. On this chance, buy an auto-body liquid cleaner at an auto supply outlet; use as directed. If discoloration goes away, use auto body wax.

If discoloration doesn't clear up, you can live with the panels, replace them or remove them and have a "straight" body.

If you decide on the last choice, strip off the panels to reveal the painted finish below. 3M Co. mar-

kets an excellent stripper. You can get it from your auto supply dealer. Apply it as directed.

Now, starting at an edge, strip the panel off carefully. Clean off glue residue with a product recommended by the manufacturer or your auto supply dealer. Wash and wax. *Voila!* Your car will have a new look.

SERVICE TIPS

■ Chevrolet advises that you don't need a new starter motor in your car or truck if the one you have experiences lockup because of salt used on roads during winter. Salt may form corrosion between the shaft spline and over-running clutch assembly. The starter should be disassembled, cleaned and lubricated with silicone and molydisulfide greases. The complete procedure is outlined for your dealer in Chevrolet Service News 2, Spring-Summer 1977.

■ Timing the ignition of the 1978 Ford Fiesta is a bit tricky. It's tough seeing the timing mark if you use the conventional method of sighting down the timing light. To time the Fiesta, first outline the 12° mark and the "V" notch on the crankshaft pulley with white paint or chalk. Hold the timing light in your left hand, aiming it straight down on the mark. Move your head to the right of the timing light so your eyes can focus on the marks. **PM**

SCIENCE WORLDWIDE

Now: a sun-capturing chemical

A compound that can convert solar energy directly into a chemical fuel has been discovered by scientists at the California Institute of Technology. The development raises the possibility of converting sunlight into a fuel with a greater efficiency than that of systems designed to convert solar-produced electricity or plant material into fuels, according to the researchers.

The chemical is a complex molecule containing the metal rhodium. When a solution of the rhodium compound is irradiated with light, it reacts with hydrogen atoms to produce hydrogen gas—a rich fuel. The system is still under development, and Caltech scientists caution that considerable work must be done before the compound can be put to work harnessing sunpower.

Small but sophisticated

A portable desktop flight simulator, designed for general aviation pilots and students, was recently demonstrated. Though it weighs less than 50 pounds, it's a sophisticated device with an analog computer.

Panel instruments are realistically functional, responding to control inputs, turbulence levels, wind direction and velocity, and other



A simulator for general aviation pilot.

conditions. The pilot's moves result in the same panel indications that would appear in an actual flight.

Made by Analog Training Computers, Inc., West Long Branch, N.J., the simulator is said to meet FAA requirements for instrument training. Top model in the line costs \$5900.

Wood borers come with drought

In addition to damaging crops and turning forests into tinderboxes, the West Coast drought has brought seawater and wood-destroying borers much farther up-



Music never heard before comes from synthesizer developed by Bell Labs research.

stream than normal, posing a threat to docks, bridges and boats. Lack of rainfall means less runoff, say Oregon University scientists, and when the flow of fresh water into rivers slackens, ocean water moves in.

Increased salinity permits wood borers like the gribble and shipworm to migrate. The collapse of a bridge at Coos Bay, Ore., is attributed to an infestation of gribbles in the bridge's pilings. Treatment with creosote offers some protection. But the best protection will come with a winter of normal rainfall, explain the OSU scientists, for then river conditions will return to normal.

It's good to be 39

Jack Benny was smart to remain 39 for much of his adult life, for it appears that the aging process really gains momentum at 40. Deterioration of bone is the telltale sign, reports Stanley M. Garn, University of Michigan professor of nutrition and anthropology.

"Bone loss is a problem simply because it diminishes the mechanical integrity of the skeletal units, reducing their capacity to withstand compressive forces and bending stresses," says Prof. Garn.

There is no known way of halting the aging process or deterioration of bone. Prof. Garn advises people to keep the body as flexible as possible through exercise.

Machine really sounds off

Though its looks are not very impressive, Bell Labs' new telecommunications signal processor is a one-man gang in the sound department. This electronic whiz—also known as a sound synthesizer—can simulate and play up to 30 musical instruments at a time, orchestrate and perform musical scores as fast as they are composed, make musical sounds never heard before, and instantly change the pitch of a human voice or instrument.

"The device," says Bell Labs researcher Dr. H. G. Alles (sitting at keyboard), "is also a powerful tool for analyzing sound, and we will be using it to model transmission systems and to process human speech for the purpose of improving the quality of transmissions."

When functioning as an analyzer, the computer-controlled processor divides sound into its frequencies and amplitudes. It processes the sound as received—up to 200 million times per second. **PM**



BY
JOHN F.
PEARSON

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FOR THE READERS OF THIS PUBLICATION

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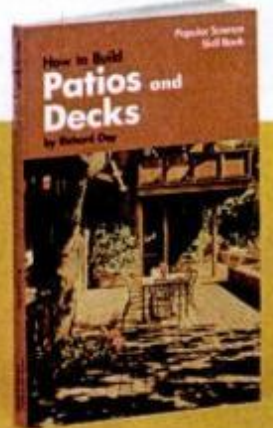
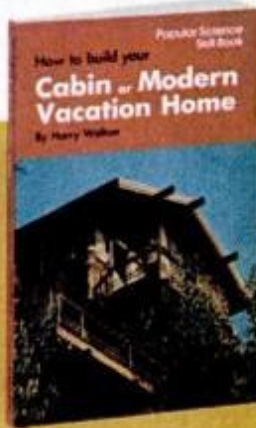
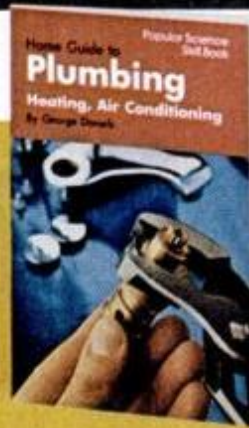
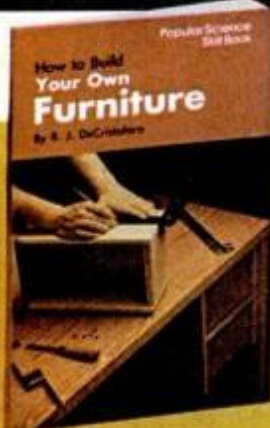
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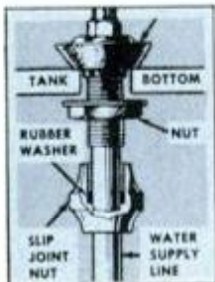
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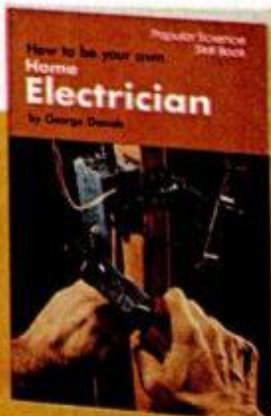
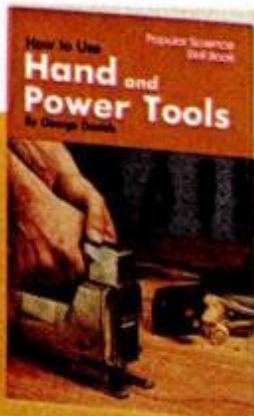
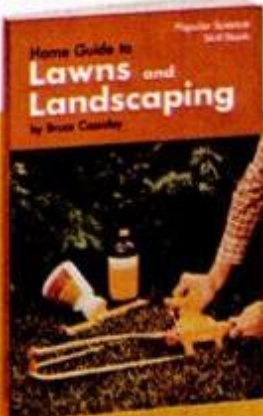
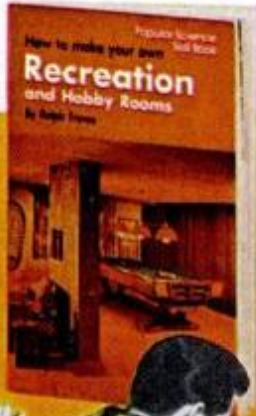
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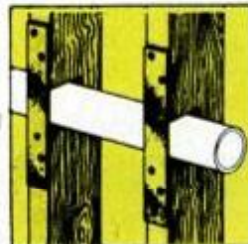
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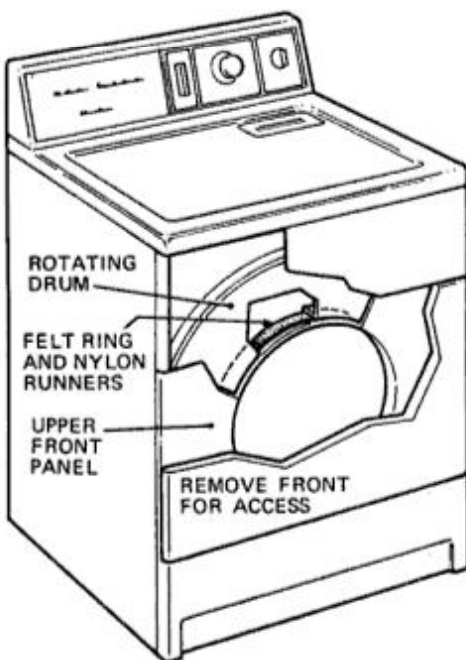
APPLIANCE CLINIC

QUESTIONS ANSWERED

Ring tale

As I have a clothes dryer (Hot-point) that "chatters," I couldn't wait to take the top off and oil the pads as mentioned for the Kenmore dryer in "Off-Beat Drum" (Appliance Clinic, Aug. '77). Alas, there are no "pads," but I did notice a felt ring that serves as a bearing surface for the drum. I couldn't get to the bottom but I oiled the felt at the top (see sketch). Lo and behold, no more chatter.—Bob Newbanks, Chamblee, Ga.

Sorry, Bob, we have to argue with success. Your cure will probably be short lived, and the problem will return as soon as the oil dries out. The felt is actually an assembly that consists of a felt ring to which two nylon runners are attached. Runners are equal in dimension. When one wears more



Replace felt ring-nylon runner assembly.

than the other, it throws the drum out of alignment and "chatter" begins. Replace the assembly with a new one.

The replacement kit can be ordered from GE as part No. WE-1X5157, which is a felt and nylon assembly. Cement it in place with Goodyear Pliobond, then lubricate the entire felt surface with silicone oil, GE part No. WE25X94.

Eventually the assembly (front bearing felt and/or Delrin ring) on Kenmore dryers will have to be replaced. Parts can be obtained at Sears appliance service centers.

Standing firm

I have a perplexing problem with a washing machine. As water is draining out of the unit during the spin cycle, it backs up and overflows out the standpipe onto the floor. The standpipe checks out clear when a garden hose is run full stream through it. What's clogged?—David Moine, San Luis Obispo, Calif.

Probably nothing. This is a common condition that occurs if the drain hose fits too tightly in the standpipe. Lack of air causes the water to back up. Somehow or other you have to get some breathing room between the hose and pipe. You can try wedging a couple of thin shims between the two, or you may simply want to replace the hose with one that has a slightly smaller diameter.

Pilot light predicament

One question that has puzzled me for years is whether to turn off the pilot on a gas range. It would certainly save gas. What about retrofit igniter sources?—Glenn Lawler, Carbondale, Ill.

You're not the only one who's puzzled. All of what follows is what the American Gas Assn. wrote to us:

"The gas consumed by the pilot light in residential appliances in the U.S. is approximately 11.6 percent of the total gas consumed by these appliances.

"The question arises as to whether this is entirely wasted. The American Gas Assn. does not think so. In fact, it estimates that in most installations about 74 percent of pilot consumption provides directly useful energy.

"The energy consumed by the range pilot, for a substantial part of the time, is utilized as an internal heat gain. During this time, if the pilot were eliminated the main furnace burner would have to operate longer each day.

"The use of a gas pilot light which is reliable and serviceable has other advantages:

- It ignites gas automatically when burner valves open;
- It affords reasonable initial cost and operating cost;
- It operates safety devices that prevent gas flow to the pilot itself or the main burner when the pilot is extinguished.

"In addition, the National Safety Council has said the extinguishing of pilot lights could increase the number of home accidents involving burns and fires. The Council stresses that consumer tampering with pilot lights be avoided.

"The Gas Appliance Manufacturers Assn. has said the shutting off of pilot lights 'would create a safety hazard without making a significant contribution toward fuel conservation.' It also notes that since many local building and safety codes require that gas appliances being installed comply with safety standards, it is possible that capping pilot lights could be a violation of law as well as a safety hazard.

"The following is a list of some manufacturers of retrofit igniters:

"White-Rodgers Co., 9797 Reavis Rd., St. Louis, Mo. 63123; Carborundum Co., P.O. 3399, Niagara Falls, N.Y. 14302; Honeywell, Inc., Residential Div., Honeywell Plaza, Minneapolis, Minn. 55408; Robertshaw Controls Co., P.O. 26544, Richmond, Va. 23261."

Body work

I have an eight-year-old GE portable dishwasher that's in very good shape except for one thing: On the inside surface of the door there's a rusted area about 2½ in. in diameter. It seems to be almost rusted through. Any suggestions?—Michael J. D'Amore, Cranbury, N.J.

Yes—go slowly. It just may be that your dishwasher is still covered by a warranty for this problem. The interiors of some models are covered for as many as 10 years, so ask an authorized dealer. Or you may wish to write the company. If the interior is warranted against rust, the problem will be disposed of at no cost to you.

If you don't strike it lucky, there are several alternatives. One is to scrape and sand the rust away and cover the area with an epoxy paint. The other is to replace the door panel, which would cost you about \$40.

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.

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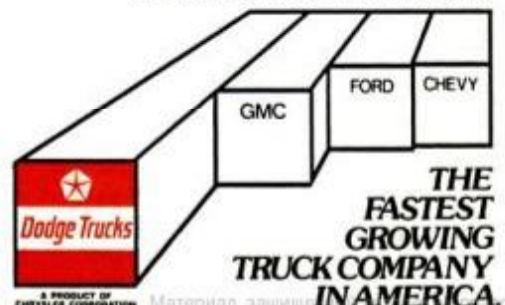


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DETROIT LISTENING POST

How soon the no-service car?

How close are we to a car that won't require any service beyond an oil change during the first year of operation? I've been asking that question around Detroit and here's how the guys in the know reply:

■ **American Motors**, via George Brown, executive director vehicle emissions and safety: "Probably three to five years. We're trying to eliminate or minimize adjustments, such as idle mixture and idle rpm. And we're trying to lengthen the oil change interval. But I don't think we'll ever eliminate the need for common sense in checking engine oil level, coolant and other fluid levels. We'd like to be able to seal the hood, but we're not quite there."

■ **Chrysler**, via Alan Turner, manager advance service planning: "Our target is a little more than a one year maintenance-free schedule. We're working toward a vehicle that will be maintenance-free for the first 30,000 miles. Next year we'll introduce tamperproof carburetors and we're working on a streamlined maintenance schedule for our '79 cars. But a word of caution. Cars can develop 'ailments' just like people get sick between regular checkups. We'll always advise car owners to do the common sense thing when a symptom appears and take the car in for a professional checkup if something happens between scheduled maintenance intervals."

■ **Ford**, via Chester Barion, general manager Parts & Service Div.: "We're very close to that right now. This year we have several engines that require only an oil and filter change and a few simple checks at 10,000 miles. We're working to improve this schedule and we may achieve your hypothetical situation within the next few years."

■ **General Motors**, via Robert Pansa, director of GM's service section: "We can't predict how far in the future we'll have a maintenance-free engine, but that certainly is the industry's goal. We've made significant progress in this area in the past few years and you'll see powerplant performance changes in the future that will require less maintenance. For example, we are going to an automatically-con-

trolled carburetor that will be set at the factory. Technology is changing very rapidly and will continue to change, but we can't predict the rate of change."

New breed of luxury cars

The most innovative, exciting automobiles out of Detroit during the 1980s will come from firms now building big luxury cars. The same divisions that have a reputation for turning out don't-rock-the-boat cars. Not necessarily dull machines, but cars that seldom blaze new trails. These makes will cease to exist in 1984-85, falling victim to various government regulations. But the automakers are not going to kill off cars that have taken 50 to 60 years to make names for themselves and have loyal followings of well-heeled buyers.

GM, Ford and Chrysler are now beginning work on after-1985 versions of Cadillac, Lincoln, Chrysler and the big Buicks, Oldsmobiles, Mercs and Dodges. These cars will undergo revolutionary changes and emerge in new shapes with features and mechanicals unlike anything available today.

Life of parts sparks battle

The auto companies and the government are at it again in the back room—neither side will talk for attribution—and it could cost you when they get through haranguing each other. The government wants Detroit to take the "maybe" out of owner's manuals and warranties.

Maybe language is where it says "inspect and correct, if necessary." This applies to many things on cars—belts, hoses, wires, plugs, shocks, various fluids. The reason manufacturers don't make specific recommendations on repairing or replacing those items is because the life of certain parts varies widely, depending on how you drive and treat your car, where you live, weather and many other variables.

Take sparkplugs, for instance. One driver can burn up plugs in 10,000 miles; another can stretch them for 70,000 or 80,000 miles. Most of us would fall somewhere between those extremes. The government wants the companies to make flat-out statements on the life of parts, no exceptions. "It's good for X miles or months, period."

Carmakers say this would be a dumb ruling because the only way they could protect themselves would be to write the recommendations to favor the guy who gets the least use out of a part. "That," says a source who participated in the discussions between Detroit and Washington, "means millions of car owners would be pitching out good parts with years of use and billions of miles of wear still left on them."

AMC to get torque lock-up

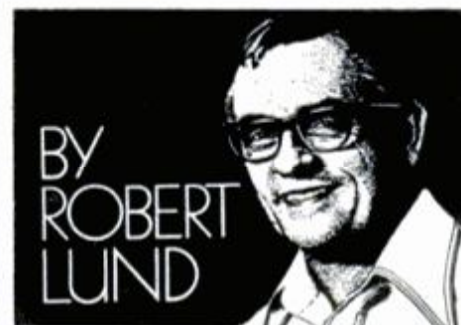
American Motors and Chrysler are wrapping up a deal whereby Chrysler will supply AMC with its lock-up torque converter later this year. The lock-up improves fuel economy in automatic-transmission cars.


Air bags versus passive belts

Carmakers still hope they can convince the government there's a better, cheaper way than air bags to protect people against injury in accidents. The companies aren't as optimistic about staving off air bags as they were a few months ago, but they haven't given up on the idea. Arguing against bags didn't win Detroit any points in Washington, so the companies will now do a show-and-tell on alternates to air bags.

Sometime during this model year GM will offer a passive lap belt/shoulder strap in three different cars. The point GM hopes to make is that the passive belt/strap is superior to the air bag in saving lives and that it can be installed at a much lower cost. Like \$200 less than a bag. American Motors, Chrysler and Ford will do likewise, but they will be at least a year behind GM in offering passive belts. They are still experimenting with various automatic belts and haven't decided which to use.

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1.3 mg. nicotine av. per cigarette, FTC Report, Aug. '77

ALL OUTDOORS

Breaks for boatmen

"Breaker nine" may soon be a new way to get help on the water. It has always been possible to call for help from a pleasure boat by citizens band radio, but was anyone listening? The Coast Guard monitors weren't. They rightly explained that with all the other emergency channels they were required to guard, they shouldn't have to listen to short-range calls that sometimes didn't reach across a lake.

But now they've changed their mind. Since safeguarding boatmen afloat is one of their missions, and since most small-craft owners don't have expensive marine-band VHF transceivers but many do have CB sets, it's hard to ignore the possibility that boatmen just offshore (where most stay) are calling for help.

Capt. James Fear, chief of the Coast Guard's Telecommunications Div. in Washington, tells us that PM reader-boatmen may be able to reach CG Search and Rescue stations by CB after Memorial Day this spring. The emergency channel hasn't yet been selected; there's a good chance it will also be Channel 9, as it is ashore. VHF-FM Channel 16 and 2182 kHz will continue to be the primary frequencies for calling for aid, Captain Fear notes, because of their long range-capabilities. VHF and single-sideband are strongly recommended for serious boatmen.

Citizens band is already being used of course, in some areas, to get in touch with the Coast Guard. By calling for help on Channel 9, a skipper may reach a CB base station ashore that can then relay by land line telephone a message to a Search and Rescue base. Owners of VHF and SSB transceivers can call a marine operator ashore in the same way and have their call to the Coast Guard completed by telephone. As long as emergency radio calls are limited by signal strength and by interference from overused channels and needless chatter, a relay call to someone else afloat or ashore to help pass along an urgent message is worth remembering as one worthwhile extra way of calling for help.

Buys for boatmen

This month a new little paperback called the *1978 National Boat Book*

at the hardly bargain price of \$30 is being published by National Market Reports, 900 South Wabash Ave., Chicago, Ill. 60605. It could be worth the investment, however, if you're boat shopping because, unlike similar guides, it gives both used boat prices and those for the newest 1978 unused boats as well. A little comparison shopping and reading could indicate whether a brand-new or older model is the better buy. A new electronics section covering such expensive items as radar, loran and radiotelephones will be added this year, since they also can do a lot to boost the final price on a dreamboat.

The best boating bargains around are undoubtedly government-produced navigation charts. One of the best safe-and-sane boating resolutions for the new year is to promise to throw away all outdated charts and get a set of up-to-date ones. It's a small price for safety and peace of mind.

Warm when it's cold

This chilly time of year makes it timely to review some of the latest ways for keeping warm. Snow-country clothing has left the winter resorts and can now be seen in cities, suburbs and afield. Some of it makes sense but much is overpriced and more stylish than practical. The demand for down is so great as a clothing insulator that costs have rocketed. Down is still lightest for the amount of lofting it provides, but loses this quality when it gets soggy in wet weather and is not as versatile as less expensive Fortrel Polar-Guard and DuPont Dacron Hollofil II. Both are excellent synthetics available in clothing and sleeping bags. And for energy-saving at home, consider turning down the thermostat and crawling under a quilt or comforter that our pioneer great grandparents used to call a "featherbed," filled today with down or one of the superior synthetics.

Waterproof clothing usually is made of heavy fabric that keeps rain out and sweat in. A new laminate called Gor-Tex, however, seems to provide a "breathable" breakthrough that lets perspiration out, but doesn't let moisture in. Several outdoor equipment and clothing manufacturers are now using it, and early reports indicate it can resist wind-driven rain in

tests of up to 55 p.s.i. while maintaining its high moisture vapor transmission ability.

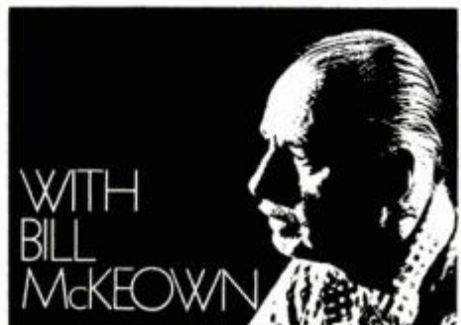
We have tested electric gloves, socks, boot soles and back pads in the past, as well as ones warmed by combustion and chemical mixes. The latest are electric ski goggles, only \$39 from Bromley, Manchester Center, Vt. Turn them on and the thermal lenses heat up to make all fogging disappear. The ski shop at the well-known New England resort also mail-orders out such items as automatic brakes for runaway skis, a tape deck to listen to and wear while skiing, presumably programmed with hot jazz, electric boot dryers, and assorted fitted bags to carry skis, boots and gear.

For warm-up practice before the first snowfall, a \$100 Street Ski that looks like a skateboard is reported to simulate downhill slaloms, or if that seems like work, a motorized skateboard with speeds to 25 mph is \$300. All are described in a new Bromley catalog.

Indoor projects

When winter weather makes it more pleasant to think about outdoors than to be there, it's a good time to catch up on workshop projects. A customized gun cabinet, available in PM plans, can hold up to five rifles or shotguns securely and has locked drawers below to store handguns or ammo safely out of reach. Carefully built from instructions supplied, it can become a handsome piece of furniture.

One of the most useful outdoor furniture items is probably a folding picnic table, also available in a PM plan. Constructed of redwood with seats attached, it accords flat for easy storage and opens in seconds. Stowaway Picnic Table, Plan 1716, is \$3.95; Gun Cabinet, Plan 1720, is \$4.95. Both are available from Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10019. **PM**



The difference between good and great.



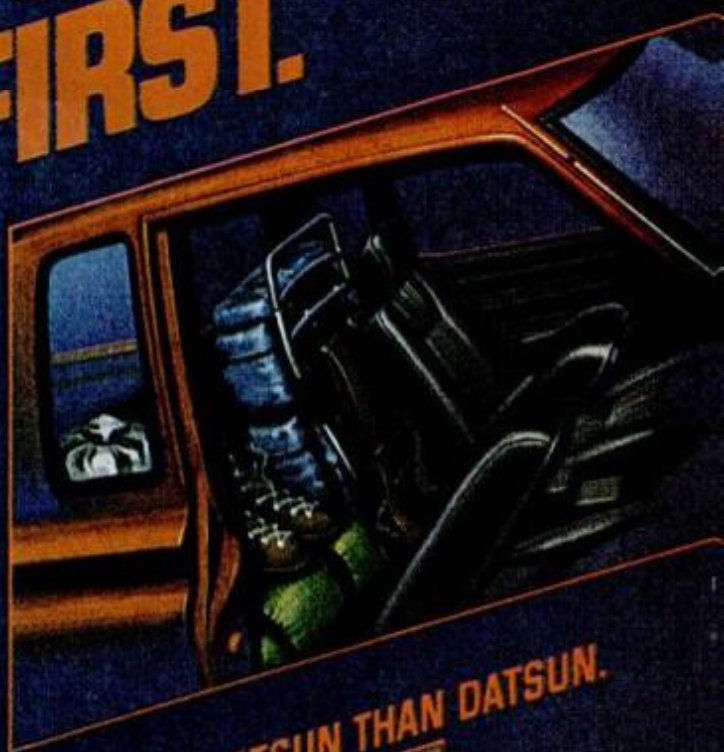
Taste the difference Seagram's 7 Crown makes. Add one part sweet vermouth and a dash of bitters to three parts Seagram's 7. Stir with ice and strain into cocktail glass. Garnish with a maraschino cherry. Or pour over ice in a rocks glass. Either way, you've got a great Manhattan.

Seagram's 7 Crown
Where quality drinks begin.



**IT'S A CAR. IT'S A TRUCK.
IT'S A FIRST.**

KING CAB.™ The most unique personality in small pickups. Only from Datsun. Inside the cab, all the features of a car — carpeting, console, more leg room than any other small truck and the only reclining bucket seats in any size pickup. But Datsun didn't stop there. Behind those bucket seats — up to 11.3 cubic feet of lockable storage space. Try finding that in any other small pickup. Not available. Yet the King Cab is pure truck tough. Even a 1400 pound payload of passengers and cargo can't hurt its performance. It's built to very demanding specifications: Datsun's! Come see the complete line of America's No. 1 small pickups and test drive the King Cab. It's Datsun — dedicated to the different — driven to the exclusive.



**NOBODY DEMANDS MORE FROM A DATSUN THAN DATSUN.
DATSUN.
WE ARE DRIVEN.**



"Keep thinking big, Datsun."

World's biggest moving job— icebergs!



Tugs are towing giant bergs away from endangered oil rigs—and may haul them up from Antarctica to supply fresh water. It's tricky, tough, treacherous work.

by E.D. Fales Jr.

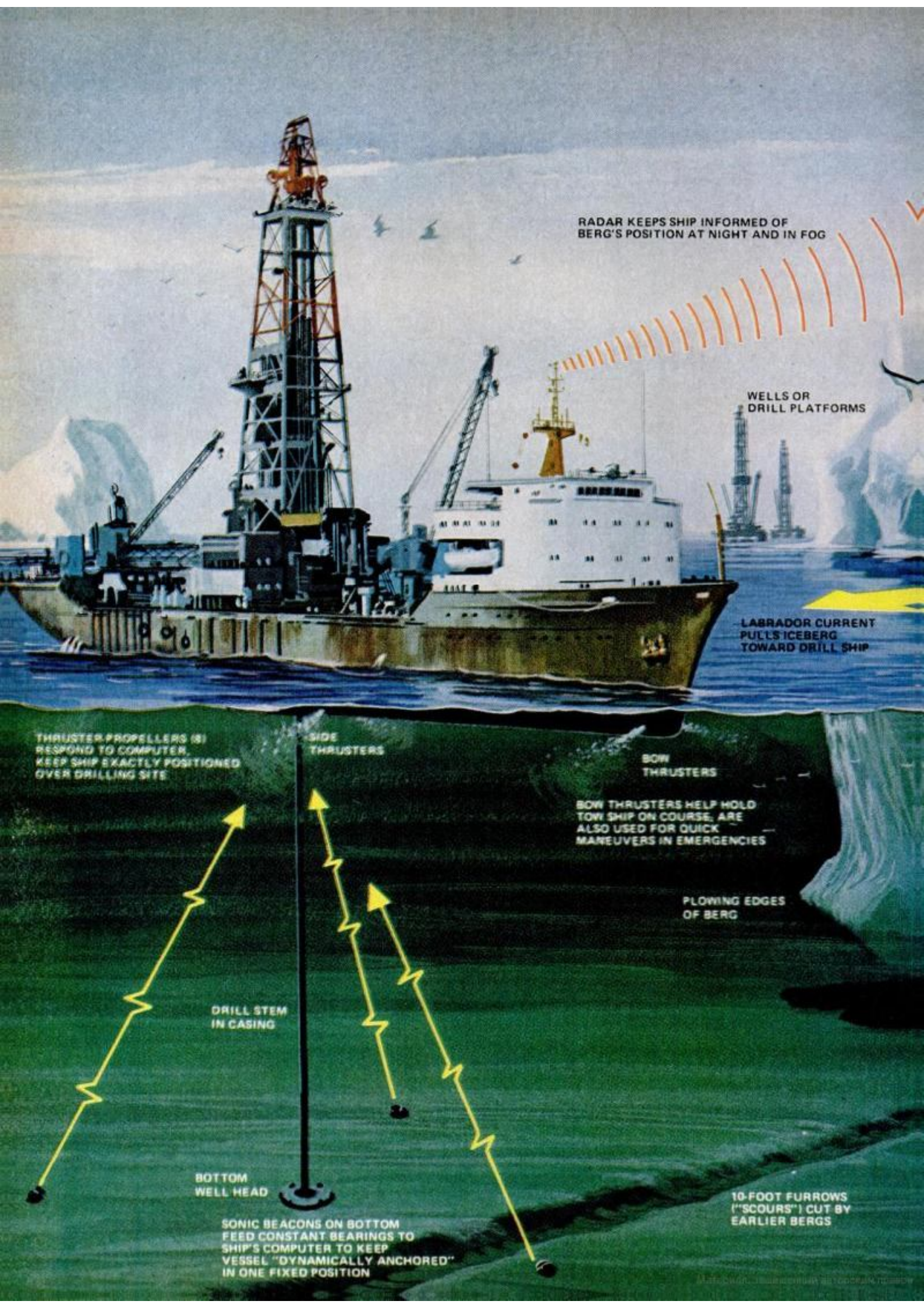
Will we soon be drinking icebergs? Don't laugh. The idea of using icebergs as water supplies to quench the thirst of an increasingly overcrowded world has long been under speculation; now it is under serious study. The drought-parched regions of the West and the arid, untillable lands of many other nations no longer make the prospect a laughing matter.

Last October, a 4785-pound iceberg was partly airlifted and partly trucked 4000 miles from Anchorage, Alaska, to Ames Iowa. Why Ames, one of the least likely spots in the world you'd expect to find an iceberg? Well, there was this meeting of iceberg experts, officially known as the International Conference on Iceberg Utilization, held at Iowa State University in Ames. That's why they needed the iceberg—you can't study one without one.

The convention drew more than 200 scientists from 18 nations, in-



Mammoth 4-million-ton iceberg (photo at top) is safely towed away from precious oil rigs along Newfoundland-Labrador coast. In hair-raising scene depicted above, ice splitting off from a berg almost crashes down onto tow-ship, a near-disaster actually reported by several ships.



RADAR KEEPS SHIP INFORMED OF BERG'S POSITION AT NIGHT AND IN FOG

WELLS OR DRILL PLATFORMS

LABRADOR CURRENT PULLS ICEBERG TOWARD DRILL SHIP

THRUSTER PROPELLERS (8) RESPOND TO COMPUTER, KEEP SHIP EXACTLY POSITIONED OVER DRILLING SITE

SIDE THRUSTERS

BOW THRUSTERS

BOW THRUSTERS HELP HOLD TOW SHIP ON COURSE, ARE ALSO USED FOR QUICK MANEUVERS IN EMERGENCIES

PLOWING EDGES OF BERG

DRILL STEM IN CASING

BOTTOM WELL HEAD

SONIC BEACONS ON BOTTOM FEED CONSTANT BEARINGS TO SHIP'S COMPUTER TO KEEP VESSEL "DYNAMICALLY ANCHORED" IN ONE FIXED POSITION

10-FOOT FURROWS ("SCOURS") CUT BY EARLIER BERGS

2 MILLION-TON BERG
HAS INCREDIBLE MOMENTUM
CALCULATED TO REPRESENT
MILLIONS OF HORSEPOWER

MILE-LONG LOOP OF
NYLON-HEMP ROPE
SURROUNDS BERG LIKE
A LASSO FOR PULL

LASSO HOOKS INTO
"BEACH" CAVITIES
TO KEEP IT FROM
SLIPPING OFF BERG

ONE OR MORE TOW SHIPS
MAY BE USED DEPENDING
ON SIZE OF BERG AND
STRENGTH OF CURRENTS

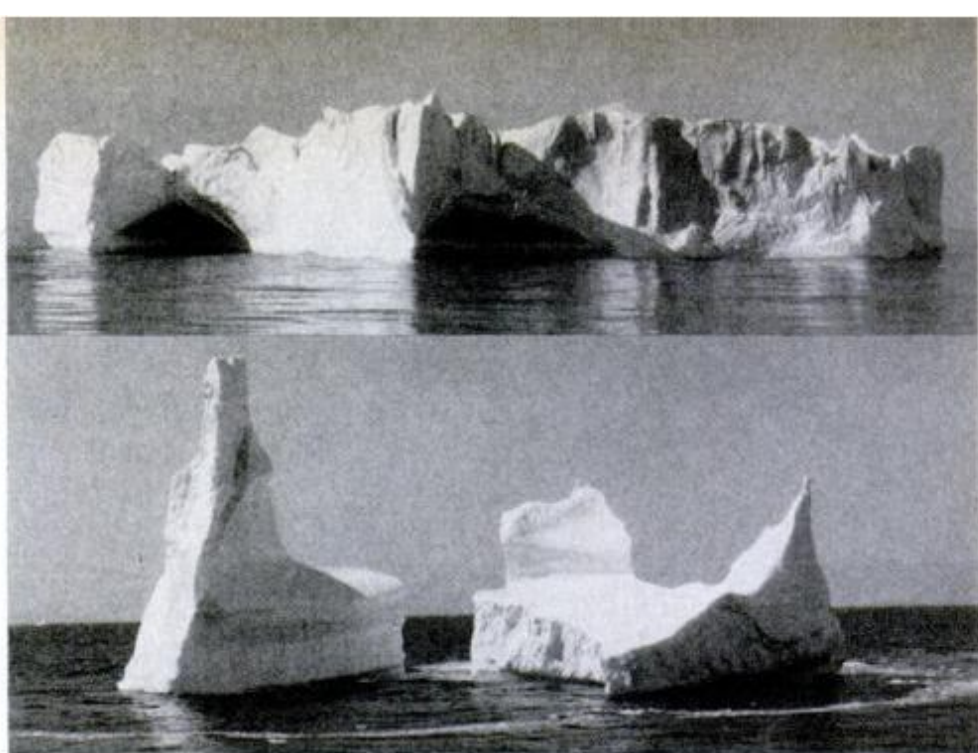
TRIANGULAR STEEL YOKE
TO SPREAD PULL STRAIN

1200 FOOT-LONG
TOWING CABLE

CORIOLIS FORCE
(FROM EARTH'S SPIN)
KEEPS TURNING BERG
TO THE RIGHT
TOWARD DRILL SHIP

TOW SHIPS PULL
EAST, BUT BERG
DRIFTS SOUTHEAST

DEEP-BURIED PIPES
CARRY OIL TO SHORE
FROM WORKING WELLS



Two basic types of iceberg formations are shown above. At top is flat "tabular" (or table-like) berg typical of those found in Antarctic waters. This one is estimated at

14 million tons. Tabular bergs are stable, don't roll, may prove reasonably safe. At bottom is "pinnacle" berg typical of Arctic waters—highly unstable, treacherous.



Typical tow-ship used in Newfoundland is M.V. (Motor Vessel) Orkney Shore. Note four-sided pilothouse for viewing in all directions. There are even dual controls

at rear for use when towing bergs astern. Tall structure amidships is tow derrick. Map shows route of bergs "chuting" down "Iceberg Alley" in Labrador Current.

cluding the forward-looking Prince Mohammed Faisal of Saudi Arabia who has a grandiose dream of hauling icebergs up from Antarctica to irrigate the dusty deserts of the Middle East. The purpose of the convention was to examine the feasibility of moving mammoth ice mountains across thousands of miles of savage polar seas. The purpose of flying an iceberg to Iowa—however puny it was as icebergs go—was to prove that sizable chunks of frozen water *can* be moved from one place in the world to another—even to a college town in a Midwestern cornbelt.

Bold new plans

The results of conferences like this and others held recently around the world are that things are beginning

to happen—things so bold and new that many scientists believe them as technologically exciting in concept as the first space flight.

Already, plans are underway to tow mile-long ice slabs—called "tabular" or "flattop" bergs—all the way from the frozen wastes of Antarctica to the sunny shores of California, where their slowly melting contents could provide billions of gallons of fresh, pure water in a continuous flow for years.

Icebergs offer some curious, useful features. Contrary to some belief, they do not consist of frozen seawater but are huge, drifting chunks of frozen fresh water that "calve" or break off from northern glaciers or South Polar ice masses. They thus produce clean, salt-free

(Please turn to page 106)



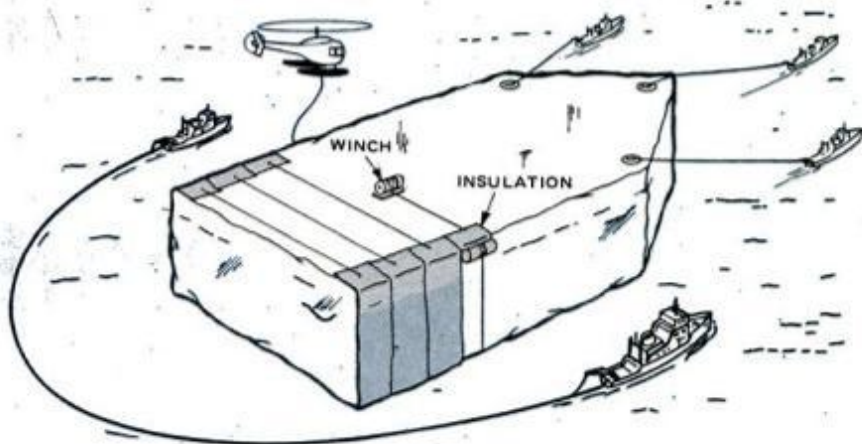
Oil-drilling ships are more often used in northern iceberg-infested waters than fixed platforms since they can be moved in an emergency. Tower amidships is a drill derrick. Note helicopter pad astern.

How do you move an iceberg from Antarctica to California? Carefully

They've got it all figured out—mostly. Million-ton icebergs, say planners, will soon be moving up from icy Antarctica to such sunny spots as California and Saudi Arabia where new supplies of fresh water are desperately needed. Fortunately, Antarctic bergs are of the flat, stable "tabular" type (see photo, facing page) and thus lend themselves well to this kind of operation. They are, in effect, giant floating ice cubes—lasso one, tow it home and you have an awful lot of ice to cool your evening cocktails—or cultivate millions of acres of arid desert land.

The sketch at right shows some of the steps involved in preparing a berg for travel. It would first be sliced into manageable slabs, each with a pointed, prow-like shape to lessen drag and make it "steer" properly. Then each slab would be wrapped in plastic—like food for a freezer. By using tugs to pull underwater lines and helicopters overhead, it would gradually be trussed up in plastic rolls.

Now comes the tricky part. Melting ice forms a thin film of water between the berg and the plastic and actually be-

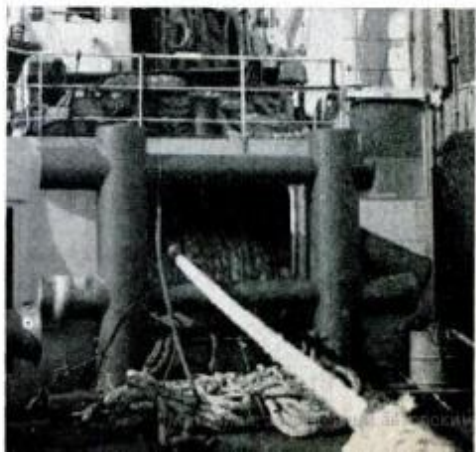


comes a layer of insulation. The principle is similar to that of a scuba diver's "wet" suit. In a wet suit, water between diver and suit warms to body temperature and acts as insulation against colder outside water because water—a slow heat-exchange medium—gives up heat less rapidly than would a dry body. In a plastic-

wrapped berg, the same thing happens—but in reverse. Icy water inside the plastic is chilled to nearly the same temperature as the berg itself and becomes an insulation barrier to reduce melting of the berg as it's towed into warmer waters. Experts say this is how they'll bring icebergs up from Antarctica—carefully.



Torpedolike side-scanning sonar device is retrieved (left) after being used to determine draft of iceberg looming up dead ahead. Above, a crew change takes place between *Orkney Shore* and her supply ship by way of modern-style breeches buoy. Note rough seas. Below, mile-long tow hawser holds berg on massive winch.



If it's not too late ... Hang on to that balloon-tire bike!

Collecting and restoring vintage bicycles is a new hobby—and, for some enthusiasts, a business.

by Leon Dixon

Monarch model 4409 with stylized carrier and rear reflector is 1949 vintage from Standard Cycle Co. The mud flap is an accessory you added yourself!

Neat seat from '35 Sears catalog has "new" horizontal-action springs.

Remember those Safetylites and bullet lamps?

Mercury F-29 from Murray-Ohio Co. has "Ohio Gothic" fender design, twin front-fork springs and horn in tank. Rear carrier was advertised as "new airplane design with jet-like blister."

If you've still got a fat-tire bike in your garage or attic, hang onto it, because balloonies are staging a comeback.

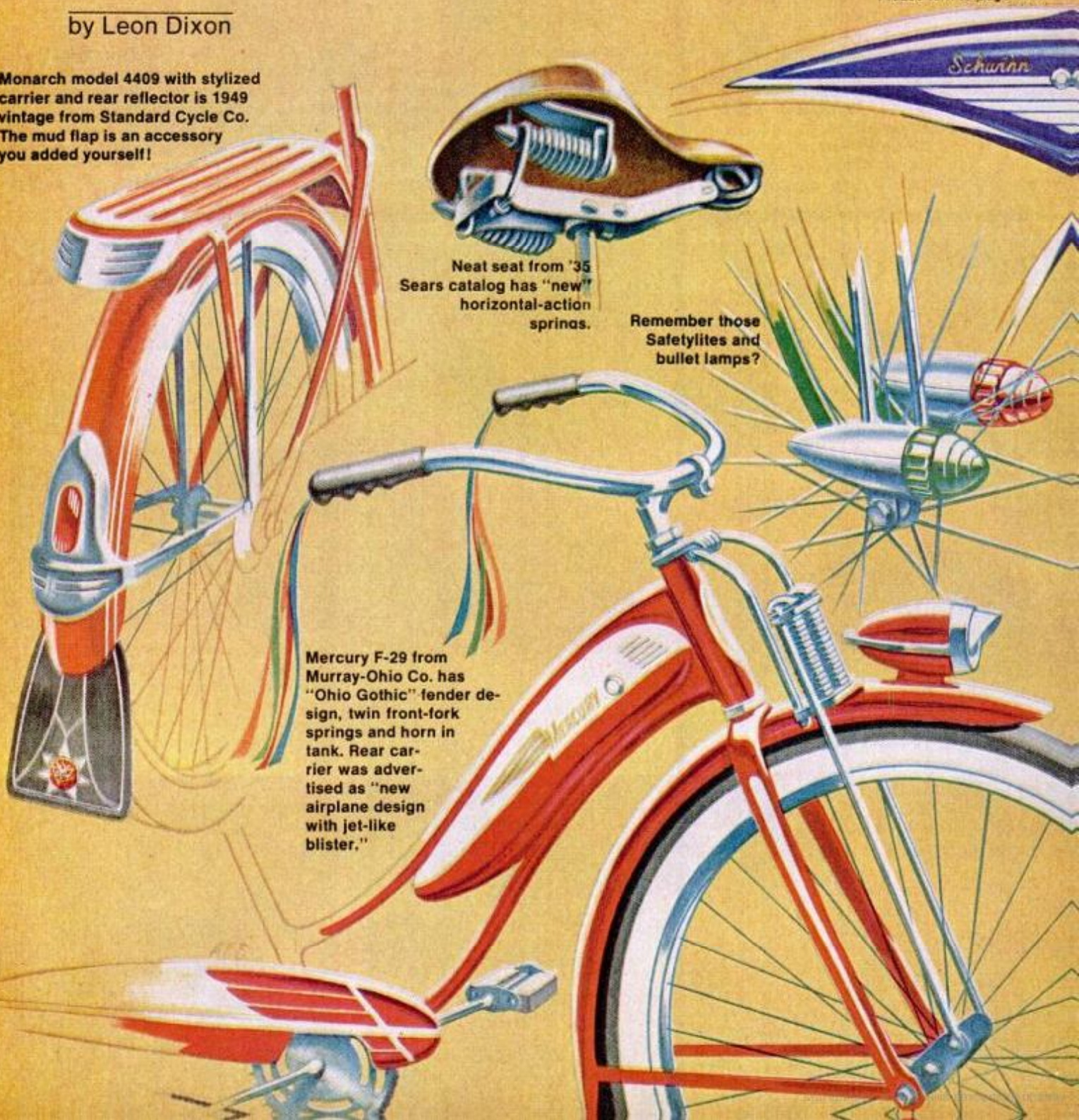
In the autumn of 1976, at a vintage-bike swap meet in Newport Beach, Calif., a fully restored Schwinn Whizzer sold for a cool \$1000.

Another California meet recently saw a 1950 Schwinn Black Phantom go for \$650. This beauty was in original, unrestored condition and looked fresh from the crate. Everything worked on it, including the tail and stoplights.

If you stroll down the beach sidewalks of Newport, Huntington Beach, Venice, Laguna, Balboa and even inland around Disneyland, you'll notice a tremendous number of bikers on shiny balloon-tired veterans. These "obsolete" bicycles might easily outnumber the 10-speeds by two to one.

And most balloonies look new—or at least nearly

Please turn to page 114





In 1951 Schwinn boasted "lavish use of chrome and color in an inspired design." Horn's in tank, of course.

Sears Elgin Skylark of 1936 has distinctive, gridded, pressed-steel skirt guard.

In mid-50s bikes had to have spring forks and "forward thrust" styling.

Whizzer bicycle motors were \$125 during W.W.II, but were available only to those "engaged in or doing defense work."

Were oo-gah horns or sirens popular in your neighborhood?

"Balanced to a gnat's hair," the Sears Elgin Bluebird of 1936 borrowed Chrysler Airflow design elements, had built-in tool compartment and "dashboard" with illuminated speedometer!

These home-grown aircraft combine easy construction and moderate cost with the thrill of flying your own sport plane. You can build many yourself from plans or kits.



NEW HOMEBUILTS: Classy looks with a dash of the old days

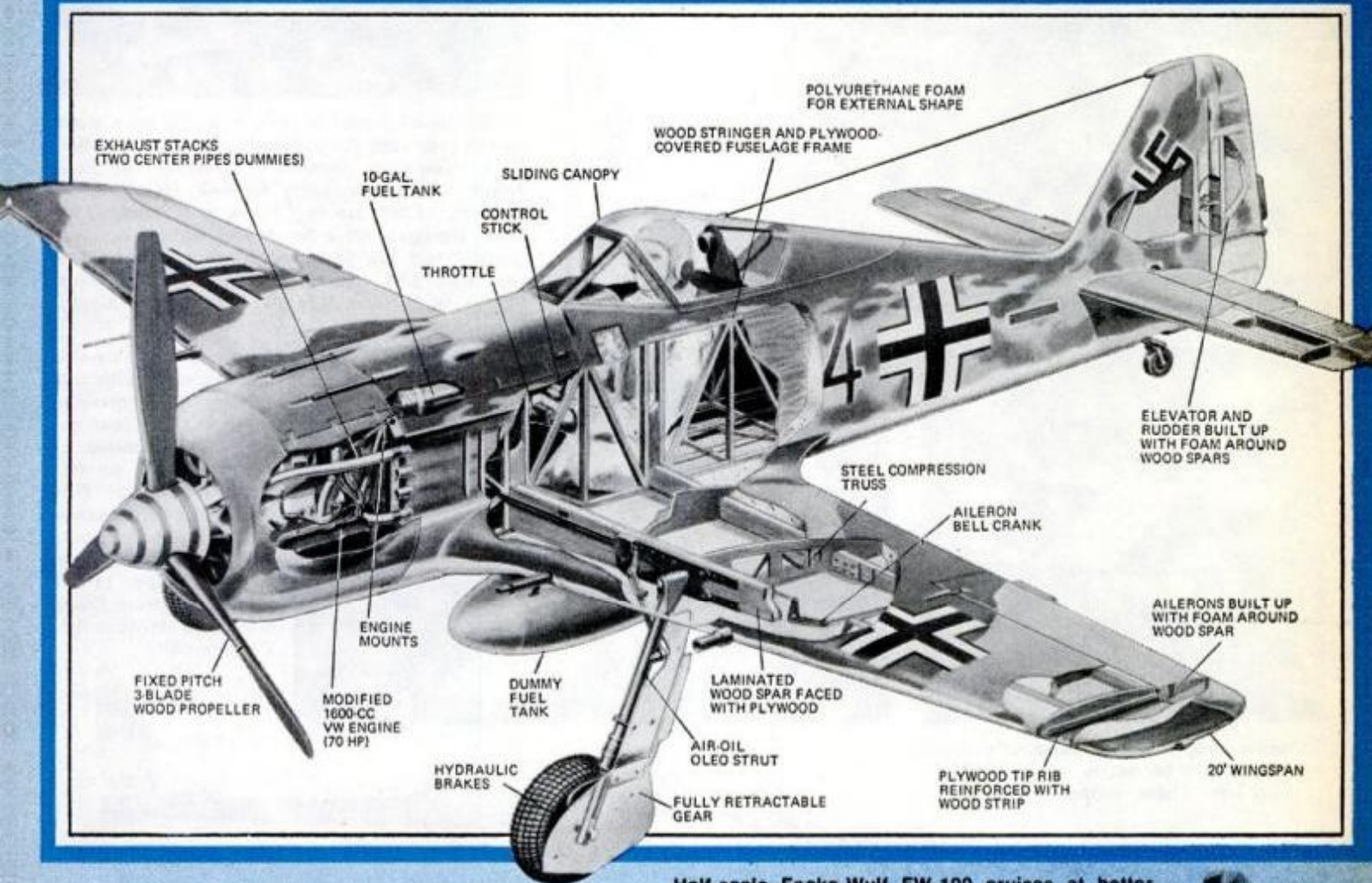
by Sheldon M. Gallagher and Howard Levy
PM photos: Howard Levy



Minimal in appearance, maybe, but not performance, is new Raz-Mut above, an inexpensive single-seater that takes 60 to 80-hp VW engines, climbs 650 f.p.m., hits 85 mph and—if you dare—can reach a ceiling of 12,000 feet. It even offers three-position flaps, snow skis, water floats. Plans are \$75, brochure \$8, kits up to \$2500. Jean St-Germain, Inc., 924 Rue St. Pierre, Drummondville, Que., Canada. For details on the two sporty bipes at right, see text.



Brandishing a fearsome shark's mouth, reminiscent of Flying Tiger P-40s, is colorful Acroduster Too shown on facing page. It's a two-place version of original Acroduster I, built by Jim Osborne of Riverside, Calif., and first flown by—appropriately—ex-Flying Tiger pilot Eric Shilling. Craft is semi-aerobatic, has top speed of 200 mph, boasts a 260-hp Lycoming. Length is 19 feet; wingspan, about 21½ feet. Plans are \$75, brochure \$2, from Stolp Starduster Corp., 4301 Twining, Riverside, Calif. 92509. Below is famous German Focke-Wulf FW-190 fighter of World War II, first of more than two dozen half-scale warplanes to be offered in kit form by War Aircraft Replicas (see text for details).



Half-scale Focke-Wulf FW-190 cruises at better than 135 mph, is stressed for combat maneuvers.



Homebuilt airplanes are getting more sophisticated every year—to the point that it's often hard to tell whether they're homebuilts at all. One reason, of course, is that more and more companies are offering sportplanes in kit form—a big aid in turning out professional-looking, well-performing results.

Biwingers are still the sentimental favorites of many homebuilders, as evidenced by the three colorful beauties on the facing page. For oldtime charm and good performance, they're hard to beat. The menacing shark-mouthed creature (top left) is Stolp's latest two-place Acroduster Too. Like many others, Stolp offers plans, materials and many ready-made parts.

Negative-stagger biplane (center left), reminiscent of classic Staggerwing Beechcraft, is newest Sorrell Hiperbiplane, first reported in PM in 1974 (page 85, Nov.). A side-by-side two-seater, it's fully aerobatic, tops 170 mph with a 180-hp Lycoming and includes such modifications

as larger doors and adjustable seats. Plans and kits are supplied by Sorrell Aviation, Route 1, Box 660, Tenino, Wash. 98589. Brochure is about \$5.

That eagle's beak on the small biwinger at bottom left gives the ship a mean appearance—and mean it is, too. A new entry into Unlimited Class aerobatic competition, the Eagle II is stressed for 9 Gs positive and 6 Gs negative, gets to 184 mph from a 200-hp Lycoming. It's a tandem two-seater—somewhat unusual for an aerobatic contender (note long bubble canopy to cover both cockpits)—but it might just give the

famous Pitts aerobatic champion a run for its money. A hotter single-seater Eagle I with a 260-hp Lycoming is on the way—just in case. Kits for Eagle II will be about \$14,750 from Christen Industries, 1048 Santa Ana Valley Rd., Hollister, Calif. 95023.

By now, you've probably noticed two significant trends in homebuilts: a desire for more exciting aerobatic performance and a desire for companionship aloft—two-seater accommodation. Nearly every aircraft on these pages is aerobatic or semiaerobatic and nearly every one is a two-seater. Side-by-side seating seems to



Tri-Z (above) makes it three in a row for Canadian kit-producer Chris Heintz. As name implies, it is three-place version of original two-place Zenith and single-seater Mono-Z (see text for source). At left are two Fikes in formation, the latest (foreground) a two-seater with 85-hp Continental and low-aspect-ratio wing said to prevent stall and spin. Cost: about \$3500. Plans: \$37.50, W. J. Fike, Box 683, Anchorage, Alaska.



Shoulder-wing design gives superb visibility above and below, is work of airline captain Bert Sisler, Bloomington, Minn.



Two-place, side-by-side seating, most with dual control, is a growing trend in sportplane design as evidenced by all homebuilts on this page except for F-80 jet below. Good example is PGK-1 Hironelle (left) with 115-hp Lycoming, speeds to 140 mph. Plans from Glenn Gibb, 119 Hartford Rd., Calgary, Alta.

be the popular choice since it offers greater communication between pilot and passenger and the chance for instruction.

Chris Heintz, who started with his two-place Zenith and went to a single-place Mono-Z, has come full circle to a three-place Tri-Z. Both Tri-Z and Zenith provide side-by-side seating with dual control, the Tri-Z having a third passenger seat in back. All three come in kit form from Zenair, Ltd., 236 Richmond St., Richmond Hill, Ontario, Canada L4C 3Y8. Brochure: \$5.

Breezy fans will note a newcomer, the flashy Raz-Mut, another up-in-the-air-with-nothing-around-you affair. If you have your courage screwed on tight, it will take you to such scary heights as 12,000 feet. Plans and kits are available.

War Aircraft Replicas—whose initials by no accident spell WAR—

(Please turn to page 116)

T-tailed, two-seat Polliwagen is high-altitude speedster able to cruise 230-plus mph at 19,000 feet. Plans are \$45. Polliwagen, 15175 Oakwood Lane, Chino, Calif. 91710.



First military jet fighter to turn up among homebuilts is this half-scale Lockheed YF-80 (above), later to become famous USAF F-80 Shooting Star. Kits to come from Windstar. At left: Two-seater Emerald with 125-hp Lycoming and 1000-f.p.m. climb rate.



IT'S NEW NOW



Robot does home chores

Bubble-headed robot now in production can be programmed (via the computer on his right hand) to serve dinner, vacuum, baby-sit, or insult your enemies. Klatu is five-feet-two, 180 pounds and runs on batteries. He also answers the door, announces visitors, and sounds alarms. He has a 250-word vocabulary, and he's yours for under \$4000. Quasar Industries, Rutherford, N.J. 07070.

Fingertip microwaving

Computerized microwave oven tells temperature and time in LEDs; has memory, too. Fingertips program it to memorize cooking orders or trigger "hold/warm." Kenmore unit is about \$500 from Sears.



Invisible screen

Here's a window screen with a see-through view (far right) that eliminates glare and lasts longer in salty coastal areas. The process, developed by New York Wire Co., York, Pa., deposits alkyd paint electrolytically on wire. Priced to compare with aluminum screening.



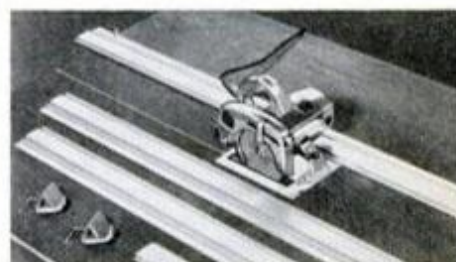
Large-screen stowaway TV

The "big eye" won't stare at you from a new Media Wall with 60-inch center section. It hides a six or seven-foot projection TV screen when not in use. Magna-Vision Network 2000 starts at \$1995.



Hydro-drive for bikes

No more trigger-shifting on multispeed bikes. A new automatic transmission developed by G. Ripley of Arlington, Tex., uses a hydraulic pump to control a planetary drive gear set for smooth shifting.



Fence for long saw cuts

Insure accurate straight cuts, bevels and dados with new cutting guide stretching 8½ feet for power handsaws or sabre saws. With clamps, pads, \$20. R.A.K. Co., Box 23426, Milwaukee, Wis. 53223.

How to survive being buried alive

by E.D. Fales Jr.



Five men died in this car last winter. They were less than 100 feet from a house they couldn't see because of a blinding snowstorm. When the men were found it was first thought that they died of exposure but it was actually carbon monoxide that killed them. This tragedy happened in Ohio but the scene was repeated throughout the northern, central and western states last winter when thousands of motorists became snowbound. The "Help!" sign on the snowbound Beetle, put there for a laugh, loses its humor when you realize how vulnerable you are in snow.

Like you, perhaps, I don't scare too easily. But one night in a snowstorm I drove into a whirling white madness in Buffalo, N.Y., and I was plain scared.

Not until it's happened to you will you ever really know how bad it can be. I didn't. A lifelong snow-driver, I've bucked many storms. But I'd never seen anything like this.

I knew I was somewhere in Buffalo's great Niagara Square. But a whole city was gone. I couldn't see my own headlights.

How do *you* react when a blizzard

screams at you, shakes your car by the scruff, then drowns you in a rolling river of snow flowing over your hood at 60 mph?

In my case I was lucky. The storm stopped as suddenly as it began. Stars came out. All around, the skyscrapers rose again, but suddenly they were snow-plastered.

It wasn't that easy for thousands of drivers who have been stalled in blizzards in the past few winters—from Virginia to California's Sierras, and from Texas to Illinois—and, of course, in *Buffalo*.

Oh, sure. We've all heard the old rule: Never drive when blizzards are forecast. But suppose you're caught in one that *wasn't* forecast?

And we've been told, too, what to do when we finally get stuck: (1) Turn so the exhaust pipe blows downwind (but suppose you can't?); (2) crack a window open (but suppose it's 10 below zero and you'll be



there all night?), and (3) seek shelter in the nearest house (but suppose there's no house or you can't find one?)

What to expect

Buffalo's great blizzard last January was world news. Stranded drivers died in their cars, while others who left their automobiles to get home perished.

Out of experiences of those who survived came some priceless tips for the rest of us.

You'd think being stuck in a bliz-

zard is just a case of going slower and slower until you stop—then walking for help.

It doesn't work out that way at all. It becomes a *fight*, a struggle (some died from heart attacks without ever leaving their cars), and—if you're not careful—a nightmare.

Take the case of reporter Ray Dearlove of Buffalo's *Courier-Express*. As the roads closed, he found he could drive his Impala only 15 feet ahead; then he'd have to back up and charge forward another 15 feet. Sometimes, he needed shovel help. He used an old Army shovel he had, "just enough to get a little rolling motion."

Next, he told me, "You get *lost*—even on familiar roads. All the landmarks you know vanish. Drifts change everything."

So he would leave his car, walk ahead to find a street sign, then resume that yard-by-yard battle.

He knew it was dangerous to leave a car even for a moment "because when you look again it may be gone. You grope everywhere and can't find it because you're lost in that terrible river of snow and wind. As you walk, you *turn* with the wind. You simply can't face it. You're dizzy."

But he had to risk it. And he made another discovery: "The snowblast goes right through you. You get wringing wet. Now if you're lost you get a chill and a freeze."

Next, your headlights black out. "I was surprised," he says. "I kept having to get out and brush snow and ice off."

Your windshield is in trouble, too. Most cars today have miserable defrosters—something the industry safety people ought to look into. Lukewarm windshields build enormous loads of ice. Wipers stall. If yours does, don't try to use the dash switch to start it. Turn it off—until you can get out to break it free.

But you may find that even getting out now is impossible. In a blizzard snow falls so fast it actually *locks* some drivers in their cars. The doors are blocked.

Dearlove's salvation was two telephone trucks that came along—with all wheels in chains. "I fell in behind," he says. "And a good thing, because just then two plows in tandem came rushing toward us. They saw the trucks but they would never have seen me."

So all this is what happens *before* you stall.

The super-experts of Buffalo blizzard-driving are the tow-truck drivers of Buffalo's superb AAA chapter.

Consider Bob Kowarko, heroic rescue truck driver who got a police call to rush blood to a hospital. A

boy was dying after being hurt in one of those snow-buried cars. Police couldn't get through.

The only reason they thought Kowarko might make it was his four-wheel-drive (Chevy K-5) pickup, wonderful in snow.

"You can't see even 10 feet at times. Sometimes you can't see *anything*," he says. But between the worst whiteouts he kept backing and going ahead (in low). Once he turned up on a sidewalk. Once he found himself crossing a parking lot. Lumps everywhere were buried cars. Once he was pushing through trees and shrubs. An hour later he had taken the blood halfway.

He checked his engine. Radiator was clogging, engine compartment filling to the brim and *inside* with snow. (This stalled many other cars whose radiators boiled and ignitions shorted out.)

Luckily, his engine kept running. "All you see is bumpers and half-hidden lights," he says. "You hit

**'You get lost—
even on familiar
roads. All the
landmarks you know
vanish. Drifts
change everything.'**

something and keep going because you have to." The urge *not to stop* becomes desperate. You get nervous. Where's the road? If you stop, you feel your car settling ominously.

You look at your hands. The knuckles are white. "You find you're gripping the wheel awfully tight," Kowarko says.

Your wipers may blow off. You see other drivers, just as desperate, doing foolish things. They come at you through red lights. "In a blizzard, *most* of them do," Kowarko says. "Your car starts bouncing around in snow." In the final struggle, there's lots of *violence*.

Then comes the fear. What's that ahead? A person? A fence? A *building*? Kowarko was amazed to see his wheels, on the hard storm-packed snow, going by the door handles of buried cars.

"You see people abandoning cars, stumbling, wrapped in seat covers torn from seats, huddling in rows. You hear babies crying." This is the panic time and you've got to stay calm.

But when at last the snow is up to your headlights and coming over

'Your face turns numb. Then you turn numb.'

your hood—even in a four-wheel-drive pickup—you're through.

And so it was for Bob Kowarko. He was up on a bridge, still crawling, when he saw cars strewn ahead. "I'd had it," he says. "I knew there was a car on my left and I got out to see who was in it, but suddenly I couldn't find it." He spent a day and a half there.

He radioed police: "I'm surrounded and blocked." The police sent a snowmobiler with a special trailer sled. The snowmobile came right over the tops of buried cars. When they reached him, Bob couldn't open his door; his pickup was going un-

der. He cranked down a window and passed the blood out. Later he heard it had reached the hospital in time.

It may be the worst thing you can do.

It's nearly impossible to walk in a blizzard. One 185-pound man was blown off his feet. But the worst danger is fatigue—pulling your own feet up out of deep snow-holes and trying to push them ahead. It sounds easy but it's killing. It killed some who tried it. Heart attacks.

One man reached safety by *crawling* a half mile. He was lucky. Others crawled and got lost.

It's the terrible blinding effect that can't be believed. You're like a mouse wrapped in cotton. Worse, even when you open your window to

To avoid panic, tell everyone that police, Red Cross, National Guard already are on alert to help. In Buffalo, within two hours, AAA had 20 operators at a long desk taking distress calls.

Besides all this, it's the CBers and *snowmobilers* who swing immediately into action today. "They saved the day here," one official told the *Buffalo Evening News*. So this winter Buffalo's snowmobilers may even have CB.

Advice from Iowa

Here are some good tips, too, from Midwest blizzard country. Two years ago the Iowa State Patrol, which has rescued many, and the *Des Moines Register & Tribune* polled 100 people who had been trapped. They were asked how *they* survived.

Here from Lt. Robert Glenn of the patrol are some suggestions that came from Minnesota to Colorado.

You'll get thirsty after a while, but *never eat snow*. Melt it first. One motorist did eat snow. Blood rushed in to melt it, chilling the outside of her body. She died.

Do *not* take an alcoholic drink: It opens blood vessels near the skin and speeds loss of heat. (This from a physician who was stranded.)

The patrol checked other physicians and now advises: "In a blizzard emergency, *abstain completely*."

Don't leave your car.

Two wool blankets will help. Wrap feet in papers. (In Buffalo, motor-

'It's the terrible blinding effect that can't be believed. You're like a mouse wrapped in cotton. Worse, even when you open your window to look, a million glassy beads of ice and snow chop your eyes shut. Your face stings. On your eyes it feels like a rain of glass.'

der. He cranked down a window and passed the blood out. Later he heard it had reached the hospital in time.

Not all the CB talk was tragic. One stranded woman called: "I'd do the craziest things for anybody who would get me out of here."

"We passed the call along," one CBer grins. "But nobody could get through to her."

What about those engine fumes?

Smart drivers run their engines intermittently for heat. But with the danger of snow-melt on the ignition system, Bob Kowarko ran his all night (at a cost of seven or eight gallons of gas, he says).

What about the danger of fumes, including carbon monoxide, when your engine is running? Suppose you can't turn your car so the tailpipe blows downwind? Or what if the wind changes?

In other situations fumes are a very deadly danger, sometimes even with windows open. They have killed many people.

But so great is the force of wind in a blizzard, Buffalo drivers said fumes were quickly blown away. This is good to know. But just don't count on it!

Should you get out and walk?

This is what drivers try, especially those with passengers left behind.

look, a million glassy beads of ice and snow chop your eyes shut. Your face stings. On your eyes it feels like a rain of glass. "Your face turns numb," says AAA's Gerald Ryan. "Then *you* turn numb. You may be blown backward."

So what do you do?

"Stay in your car," AAA advises.



Dig we must when howling winds drive drifting snow high enough to cover a car. This storm, which occurred last November in Ohio near Lake Erie, turned out to be Nature's practice for what she was to cover us with last winter.

ists filled their boots with seat stuffing.)

For heat, some found a candle in a can between your feet will help. To help circulation, swing arms, move about in car. Canned heat is useful (but watch ventilation).

Some suggestions were foolish, others dangerous. One of the latter, made by a tow-driver in Buffalo, was for thawing a frozen doorlock—if you get locked out of your car. “I hold a can of ether a foot away in one hand, and spray it across a cigaret lighter toward the lock,” he says. It could be instant suicide: the can could blow up. *No one should ever try it.* But it opened several cars for him, he said.

Iowa Patrol recommends tying a bright scarf to your antenna to help rescuers find you—and to protect you from plows. As a rescue beacon, some Air Force survival experts have even tried setting fire to the spare tire. A tire fire is hot, long and stubborn. The spare was removed a safe

‘Snowshoes in a car are priceless if the storm abates and you decide to risk a trip for help. If you have none, they can be cut from door fiberboards.’

distance. Then the fuel line was disconnected at the carburetor and the starter pumped.

This also is highly dangerous, and a last-resort life or death measure. (In a blizzard, wind *should* help dissipate fumes—but may not.) Gas collected in a hubcap then was lighted (another danger) to start the tire burning.

Snowshoes in a car are priceless if the storm abates and you decide to risk a trip for help. If you have none, they can be cut from door fiberboards. Leggings and snowboots can be made from seat covers.

If you do have to leave your car (if it is wrecked or should burn), here are Iowa Patrol tips on what to do if you don't find immediate shelter: Don't wait too long; build your own shelter before cold makes you numb. (Drivers on foot get terribly tired in snow and may actually fall asleep.) Hunt for a natural barrier to hide behind. (Deer know that the hollow under a thick evergreen tree makes a good cave.) Weave a wind-break wall of boughs and put a carpet of boughs under your feet for warmth. (Cut a hole for your head.)

A motorist's defense arsenal against blizzards

Keep this checklist handy, and keep your car prepared for an emergency

- Red flares (for protection against plows and to help guide rescuers).
- Two fresh, powerful flashlights.
- Blankets.
- Heavy sweaters, parkas, double mittens and strong lacing for parka hoods.
- Skiers' face masks with very small eye slits.
- One knife for slitting seat cushions or other emergency use.
- Several cans of canned heat; or several thick candles and tin cans to put them in.
- Full gas tank. Buffalo drivers who ran their engines without stop burned 8 gallons overnight. (Run your engine intermittently to prevent carbon monoxide poisoning.)
- CB radio.
- Snowshoes and ski poles.
- Heavy boots and warm socks.
- A change of clothing and socks.
- Sandwiches and coffee. (Not necessary for survival, perhaps, but they will help to keep you warm and your strength up.)
- An ax you can use to chop branches to provide shelter (especially if you may be caught out in wild country).
- A good storage battery in your car.
- A winter-tuned engine (important).
- Blanket or tarp to seal off engine against snow. Once a car stops snow quickly fills the engine compartment.
- Insulin or other medicine needed by a passenger.
- Plastic garbage bags sometimes help. (They are windbreaks and keep in body heat.
- Long-handled shovel (shorties are hard to use) or a hoe.
- De-icing fluid for windshield.
- Even a couple hundred yards of dacron cord could help you find your car again, if you decide to look for a nearby house or landmark.
- And if you have a snowmobile trailer and know you might encounter storms, taking your snowmobile along might be the best thing you ever did. (Note: it could also get you in trouble. So use it *after* the storm starts to subside.) And be sure to take along:
- One army (or outdoorsman's) compass in a tough case!

A snug cave in the snow is much warmer than the wind.

The whiteout trick

To these suggestions, I'll add my own.

What traps you, when a blizzard is moving in, is the *snowbursts*—the blinding whiteouts—that precede it.

Near Ripley, Pa., one night we were caught in a whiteout that came roaring in off Lake Erie. Snow suddenly deepened. All trace of the road was gone. Soon we couldn't even see reflectors to steer by.

I knew we were heading toward the Buffalo blizzard zone and instant action was needed or we would quickly bog down. What we did was amazingly simple: *we simply turned around and went the other way!*

The results were incredible. Now the blinding snow no longer roared at us. *We had the wind with us.* Now the storm lost all its fury.

It was an illusion, of course. The

storm still raged with the same intensity.

But running *with* the wind, the flakes opened out. They appeared to be coming straight down, far apart, as in a gentle April snow flurry. And once more we could see the road. We could even see objects 200 feet ahead! By simply turning around and running away from the storm we had pulled its teeth.

A simple way to escape a blizzard. I recommend it to you!

Less danger today

Buffalo's respect for the work of its CBers is shared by Iowa's Lt. Glenn.

The combination of CB radio and snowmobile rescue, he says, “is changing the whole rescue complex.”

Today, if you just wait in your car, he says, you're usually “a whole lot safer” than you would have been in a killer-blizzard—even two years ago!



New mini flattop 'flies' like a plane

Photos: Official U.S. Navy

So stable a cup of coffee won't spill in heavy seas, this fast, twin-hulled ship launches helicopters, fires missiles, may ferry people.

by Larry Wood

Famous racing-boat builder Gar Wood had the idea back in the early days of World War II: Slice a hull in two, stretch a platform across the two halves, and you have a very stable craft capable of high speeds in rough seas. The principle was simple: It's easier standing on two legs than one.

While nothing came of Wood's dream ship in time for use during the war, it did help spur development of a whole new breed of multihulled designs that went on to be the rugged catamarans and trihulls so widely used today in pleasure boats.

Now, some 3½ decades later, the U.S. Navy is applying basically the same principle to a twin-hulled mini aircraft carrier called an SSP for Semi-Submerged Platform. It gets its name from the fact that it is literally semisubmerged—half above the water and half below. The objectives are essentially the same as Gar Wood's: lots of deck space for a given hull length, high speed because of low water drag and uncanny stability in rough seas.

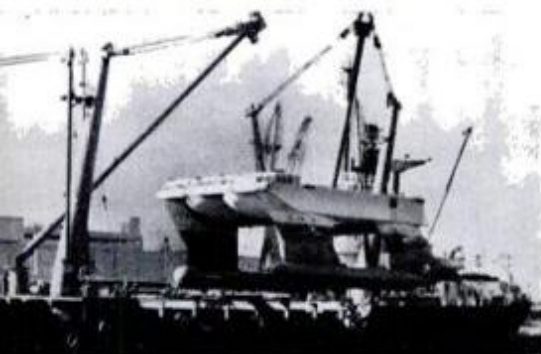
The first SSP to undergo tests is the *Kaimalino*, designed by Dr. Thomas C. Lang, head of the Advanced Concepts Div. Naval Ocean Systems Center in San Diego, Calif. The unique 190-ton vessel, admittedly boxy-looking, is 89 feet long, 46 feet wide at midsection and 32 feet high. Its range is 400 nautical miles at speeds up to 25 knots, while carrying 30-ton payloads and 18.8 tons of fuel. She's a performing beauty.

There has long been a need for small, fast, seagoing naval vessels,

but the problem has always been one of simple physics: The smaller you make a hull, the more sensitive it is to wave motion. While a large ship will plow through heavy seas, a small one wallows in the waves, pitching and rolling to the point where it is useless and dangerous.

A hybrid design

The SSP is aimed at overcoming these drawbacks to small ships. Actually, it is not a true catamaran but more like a cross between a catamaran and hydrofoil craft—with the best features of both. Hydrofoils offer high speed, low drag and good stability in calm waters, but have difficulty operating in heavy seas because of the danger of a foil breaking up through the surface in a wave trough and suddenly losing lift. By contrast, the SSP has four surface-piercing struts, two on each side, that support the above-water superstructure on two long, torpedo-like underwater hulls. The struts are



streamlined to offer minimum resistance. The submerged hulls are carefully ballasted with fuel and water compartments to gain controllable buoyancy, yet keep the craft heavily bottom-weighted for stability. Unlike hydrofoil craft, there is no chance the submerged hulls could accidentally lose lift.

'Flies' like a plane

What makes the SSP even more unusual is its elaborate system of control surfaces that enable it to "fly" through the water much like an airplane in air. Controllable bow planes—called "canard" wings—can be operated either collectively (in the same direction together) or differentially (in opposite directions) to provide delicate trim control at the bow. A horizontal cross-stabilizer connecting the hulls at the stern contains two movable flaps that can also operate collectively or differentially. Used together, they work like an airplane's elevator to control up and down movements. Used differentially—one up, the other down—they act like "ailerons" to help the ship make smooth, banking turns.

Twin rudders provide directional control at high speed and differential

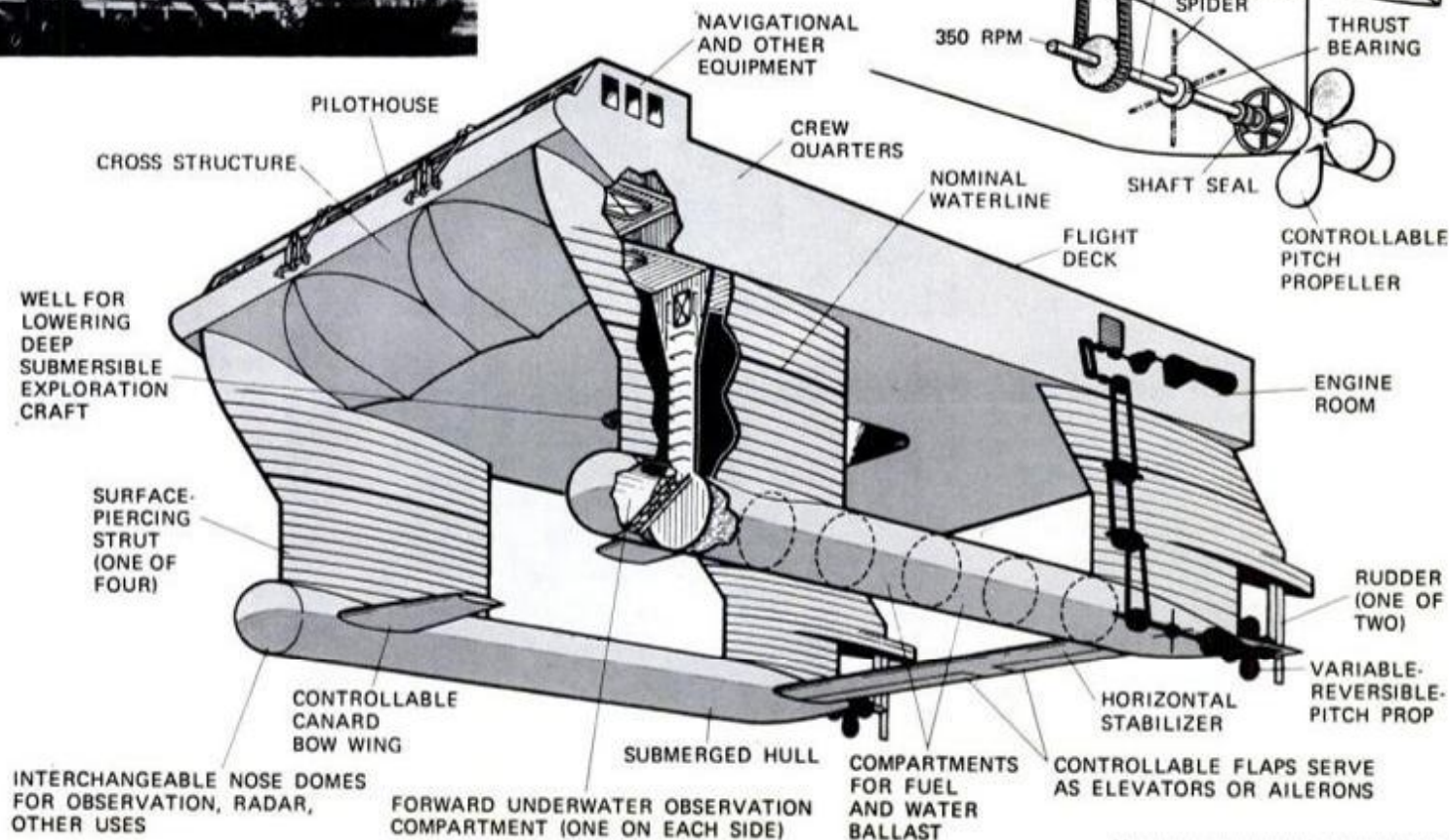
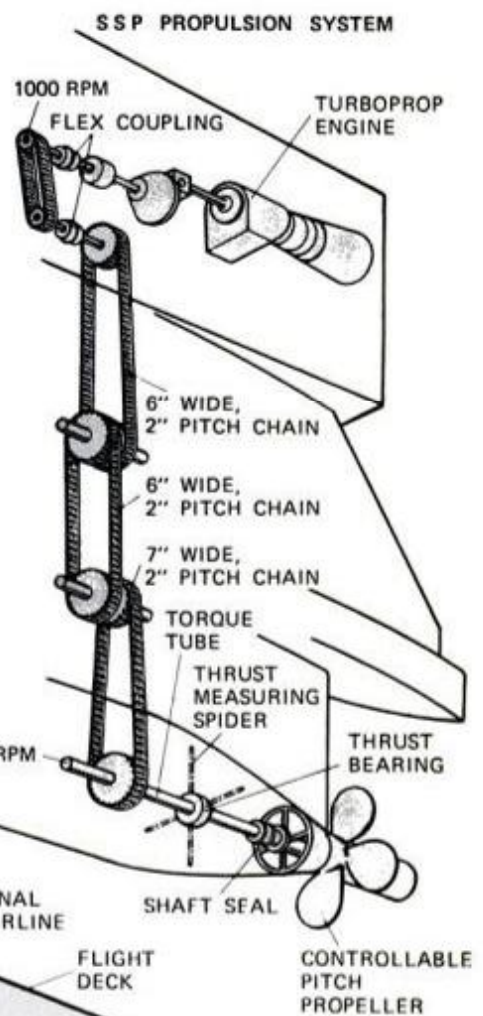
Chasing fast-moving 25-knot SSP platform ship, a Navy SH-2F helicopter (top left) makes a perfect bull's-eye touchdown on flight deck (center), proving SSP's stability even at high speed. At lower left, SSP is small enough to be hoisted aboard a mother ship for overhaul or transport.

thrust at low speed, the latter to help in delicate close-in maneuvers. The twin screws can be controlled independently and have variable-pitch and reversible-pitch prop blades. A DC-10 or 747 couldn't ask for better.

The result is that all of these intricate and ingenious navigational aids give the SSP complete control over pitch, heave, roll and yaw, even in the roughest seas. They can be

(Please turn to page 130)

Unusual four-step reduction drive carries power from turbine engines (one in each hull) to controllable-pitch propellers.



FIRSTHAND REPORT

by Robert Lund
DETROIT AUTO EDITOR



Driving the Dodge Omni and Plymouth Horizon



Chrysler's new sub-sized cars, Dodge Omni and Plymouth Horizon, are a couple years behind the pack or a couple years ahead, depending how you rate the cars vis-a-vis the competition.

Omni and Horizon are Chrysler's first subcompacts. The other companies have been making minis for two to three years. In fact, GM and Ford are now working on the follow-up cars to their first small jobs. From that standpoint, Chrysler is playing catch-up.

Chrysler admits "we learned a lot from our competitors," but the company doesn't see the new cars as late-starters. To the contrary, Chrysler says Omni/Horizon is "the American small car of the future" and GM and Ford are the late runners. GM won't have a small, American made, front-wheel-drive car until 1979 and Ford will follow a year later. Ford has a small front-wheel drive, of course—Fiesta. The qualifier is that Fiesta is not made in this country. Chrysler's claim is that it is first with a front-wheel-drive subcompact made in the United States.

What's it like?

What kind of machine is "the small car of the future," Chrysler version? I drove five copies of the car—Omni and Horizons—each with different axle ratios, different equipment—at Chrysler's Chelsea, Mich., proving grounds. Five versions of the same basic car. The two nameplates are virtually identical except for grilles, taillights and trim. You get an extra 22 pounds of metal on the Dodge than on the Plymouth. Omni weighs 2121 pounds, the Plymouth 2099. (Save yourself a trip to the dictionary to check Dodge name. I looked it up and Omni means all or totally, as in omnipotent.)

The shape is what designers call a two-box design. A cube in front for the engine, a box in back for pas-

sengers and luggage. From a side-on view, the car looks like the VW Rabbit, especially in treatment of the rear pillar. Chrysler doesn't care much for the comparison with Rabbit. "If you have to make a comparison with an existing car," a Chrysler

engineer suggested, "we think it looks more like a BMW than a VW."

VW does get credit for the engine, however. It's a 1.7-liter (104.7 cu.-in. displacement), four-cylinder, overhead cam supplied by VW with modifications by Chrysler. The en-



Comfort, roominess and visibility are excellent for subcompacts. Front-wheel drive always means steering effort is somewhat higher than with conventional layout, so you should consider a power-steering option.



Hatchback is the fifth door in the Dodge Omni pictured here. The five-door configuration of Omni and Horizon opens up the cars for a tremendous degree of practicality and for easy entry and exiting for passengers. Taillights are large, simply styled.

PM photos: Dick Fosdick

Материал, защищенный авторским правом

Plymouth Horizon profile probably will be compared with VW Rabbit's and the front end with all the cars that sport a "cow-catcher" grille, first used by Volvo, but interior will feel familiar to those used to domestically built automobiles.



engine is mounted transversely—east to west, instead of north to south, and is carbureted rather than injected like the VW's. It has a cast-iron block and an aluminum head and intake manifold. Chrysler has added its electronic lean-burn com-

puter spark advance to the VW package. This is the only engine available. No options.

Short-throw shift

The standard transmission is a four-speed manual with overdrive. The shift has a shorter throw than other sticks I've handled—a plus to my way of thinking, but it might take a day or two to get the hang of it if you are used to a stick where you have to search for the slot to put it in. A three-speed automatic transmission will be offered later in the model run.

Although the car has front-wheel drive, there is still a fair-size hump on the front floor. This is to allow clearance for the exhaust pipe, parking brake cables and transmission linkage. The hump isn't all bad. It provides a place to rest or press your right foot against while operating the accelerator.

One of the mechanical options Chrysler will make available is power steering. I think this is a smart move. It has been my experience that front-wheel-drive cars take a lot of muscle to steer and Omni/Horizon is no exception. You don't need power steering if you do most of your driving in the countryside or on freeways. But if you are going to use the car in the city, maneuvering in

and out of tight places, I'd pay extra for the power.

While we're in the fault-finding department, I have one other criticism. The cars I drove were noisy, a combination of engine noise and road noise. This is a common complaint with small cars. Chrysler has packed 40 pounds of sound-deadening material in the car and has used rubber hangers, mounts and seals to reduce the noise. But you still get mutters and murmurs and engine noise is particularly noticeable at 3000 to 4000 rpm. Chrysler will offer a sound insulation package and factory undercoating as an option. I'd definitely include these on the order if I were buying the car.

Roomy, convenient

On the Chrysler-did-it-better side: ■ Interior dimensions are excellent. Four adults can ride in the car without feeling crunched up and you can enter/exit without corkscrewing yourself into a pretzel. The doors are wide for a small car. The front door swings 65° and the rear opens 70°. I took a turn sitting in the back seat while photographer Dick Fosdick did the driving and my knees still cleared the back of the front seat, although it was shoved back all the way. The Chrysler engineer who ac-

(Please turn to page 136)

Servicing the Omni/Horizon: A dream job for the do-it-yourselfer

The Omni and Horizon are so serviceable you almost won't be able to wait until something needs doing. They're easy to service, but are different from what you're used to and a mistake could be expensive.

First, the cars must be jacked only where the factory has reinforced the unit body. A scissors jack supplied with

the car, or a hydraulic floor jack can be used. There are jack pads at the sides and center front. Don't jack or use stands on the cross member near the front or under a control arm, or you could bend them. In the rear, the torsion beam that connects the stub axles is unsuitable for jacking, so use one of the rear side pads.

The car has aluminum bumpers, so don't try to raise the car with a bumper jack; you'll crush an expensive part.

Second, cheap gear oil is better than an expensive grade when you drain a manual transaxle (VW supplied). Refill only with GL-4 lubricant, not the premium GL-5, which can damage bronze parts in this component. GL-4 is, unfortunately, not as widely available.

On automatic-transmission models (the Chrysler TorqueFlite), the differential should only be filled with Dexron.

Third, the lean-burn computer is next to the battery. Chrysler says the computer is well waterproofed, but take care not to spill battery acid on it.

Now for the good news:

■ Arrow on air cleaner points to location of the idle solenoid adjuster, so you can set idle speed easily by feel with air cleaner in place.

■ Dash cluster is super-quick pull. Yank the two plastic pins at the bottom with pliers and bezel comes off, exposing bulbs and gauges.

■ Clutch free play is set without tools. Pull up to unlock adjuster and turn it on its threaded rod.

■ Diagnostic socket is installed. It's designed to be plugged into a Chrysler tester, but you'll also be able to probe it with meters.

■ Like Ford with Fiesta, Chrysler thinks strut ball joints will last indefinitely, so they're lubed for life. The car has just two fittings, easily accessible on steering linkage. "It'd be a shame to pay for a grease job," said a Chrysler engineer. "We hope everyone gets a gun and does it himself." Maximum interval is three years or 30,000 miles, but annually is a better bet.

■ Almost everything on the transverse engine is wide open, including spark-plugs, distributor lock and timing marks (on flywheel and bell-housing). Fan-belt adjustment, however, easy from the top without airconditioning, becomes a get-underneath proposition when the air compressor is above the alternator. Remove splash shield (three screws, two clips) and reach up.

■ Suspect an engine problem and want to look inside? Oil pan unbolts in minutes. No jacking of the engine.

Chrysler is so high on Omni-Horizon serviceability, it will be putting a do-it-yourself manual in each glovebox. Your Dodge or Plymouth dealer's shop may not be happy about that.



Ohc, 1.7-liter Four, VW-designed and supplied, is laid out transversely.

Home-movie sound that sounds good



Pro techniques can get great results from your new Super-8.

by Dave Sagarin

Your new Super-8 sound movie camera offers tremendous opportunities, letting you capture both sight and sound when a child learns to speak, an old-timer reminisces or you travel to exotic places.

Super-8 sound also presents some challenges. We're accustomed to a quality of sound recording on TV and in theatrical movies not generally attainable with Super-8 equipment. But by understanding limitations and working with the world of sound as it is, you can learn to make good sound tracks.

There are just two sound problems to watch out for during filming:

- *Extraneous noise*, such as a passing airplane, wind or off-camera coughing, and
- *Filming-related noise*, such as echoes, resonance, popping P's and wire movement. After the film is made, you can get sound distortion from speed variations and editing difficulties.

Microphone types

Cameramakers offer three general types of microphones: cable-connect-

ed, built-in and wireless. The handheld, cable-connected mike will give the best sound under most conditions. The mouth of the speaker can be very close to the mike, so volume level can be set low, excluding much background noise. The mike can be correctly aimed for clearest pronunciation, and if the speaker moves, the mike moves with him. On the other hand, the mike remains visible. Holding a mike makes some people self-conscious (and makes others think they're superstars, but that's a different problem). Dragging the wire, kinking it or stepping on it can make noise on the sound track.

If you work outdoors in a free-flowing situation like a ballgame or a beach party, the camera-mounted directional mike shown above is fine. It hears what the camera sees, yet can be unclipped and aimed elsewhere. (Highly directional "shot-gun" mikes require an assistant.)

Built-in mikes have the same no-hands convenience, but are not directional, and usually have automatic level adjustment. This means they don't know or care where sound

comes from, and they produce an annoying surge of background noise when the speaker pauses. They're better suited to use with groups or for environmental sound than for recording one or two speakers.

Wireless-mike sets usually consist of a small, concealable transmitter pack and a receiver connected to the camera. They give great freedom of movement, but they're not cheap (\$100 or more), and may pick up CB or other radio transmissions.

Outdoors

With any mike outdoors, you've got to be sensitive to extraneous noise. The brain filters sounds so we hear what we're listening for. A microphone can't do that. It can be startling to film on location, hearing each word, only to project the result and find the track full of trucks on a road half a mile away, or hear a mumbled off-camera conversation come through loud and clear. By learning to open your ears to *all* sound, you'll spot these noise sources. If your camera has a monitor, by all means use it to test "am-

bience" (existing sounds and quality of silences) as well as the desired sound *before* you film. If you can, use hi-fi-style headphones instead of a little earplug. What do you do about that truck crawling up a grade half a mile away? Do what the pros do: call a break.

For wind noise, that little sponge ball works only part time. A really big sock stuffed with sponge rubber cuts it better. But there are times when nothing will work.

Indoors

Indoor problems are tougher. All rooms have ambience, the quality they give to sound. Walls, floors, ceilings, windows and rugs absorb some sound frequencies and reflect others—making echoes, "pinging," booming or high-frequency sizzling sounds, and driving listeners crazy every time a chair scrapes or a shoe squeaks. Fluorescent-light starters buzz, the camera whirs, and that truck half a mile away is still audible through closed windows.

I remember with a shudder filming two men in conversation in an office. We had tested the room beforehand with one of them talking for the mike. The fluorescents were turned off, a ventilator outlet was covered, a guard was posted in the corridor outside to warn passersby, and mikes were placed on pads.

Everything went well. But on the resulting sound track a tiny resonance bounced the voice of the second man—it was higher-pitched than the other's—on certain words. It became maddeningly distracting.

In any room, there are better and worse places for recording sound. *Always* test and monitor before filming. Illustrations below show some well-known trouble spots. A corner, walls and ceiling, can focus sound coming from the subject and from other parts of the room. If the mike is along the line of focus, you'll get a blurring echo, corrupting sound until it's unintelligible. The room center, equidistant between two long, bare walls, is a point of sound reinforcement; other points like these can be found that will interfere with perfect clarity.

Speed

The standard sound filming speed is 24 frames per second (f.p.s.) Many of the newer cameras permit filming at 18 f.p.s., but quality won't be as good, and you'll have a real problem if you ever want to edit the material together with professional footage. Also, slight variations in filming speed will be magnified at the slower rate. Filming-speed accuracy wasn't much of a problem with silent film, but if you shoot sound with fresh batteries and splice

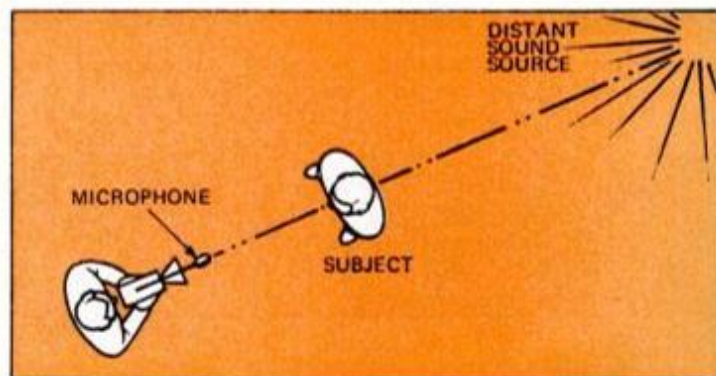
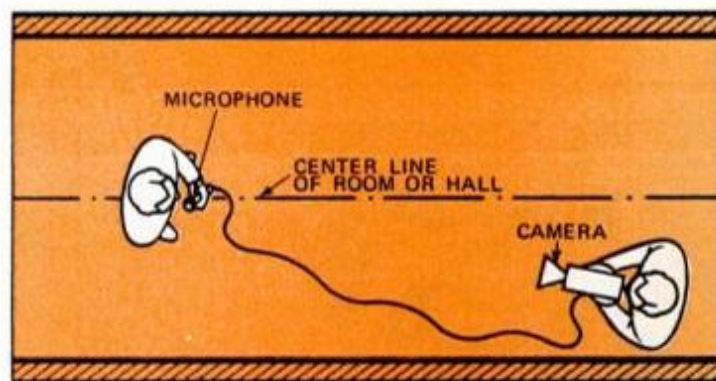
in footage of the same speaker made with low batteries, you'll get noticeable changes in the voice on projection. The answer is to replace batteries frequently, using rechargeables and carrying several power packs.

Tricky special effects like slow motion and fast motion are available on the new cameras—but you can't record sound while doing them.

Projectors

Some new sound projectors offer mixing, overdubbing and re-recording features—you can add sound to your track, or erase and lay a new track. This is fine for simple work, substituting spoken narration or music for synchronous sound. Anything more ambitious will be difficult. For serious sound manipulation the practical way is to originate the work in "double system" sound—recording sound separately from pictures on a synchronized tape recorder. The alternative, for dedicated experimenters, is to create a tape of the desired mix of music and narration and then lay it in from a tape deck while shooting the visuals.

Either approach requires knowledge of equipment and careful planning. But the object, to enhance your film with an interesting and supportive soundtrack, is well worth while. **PM**



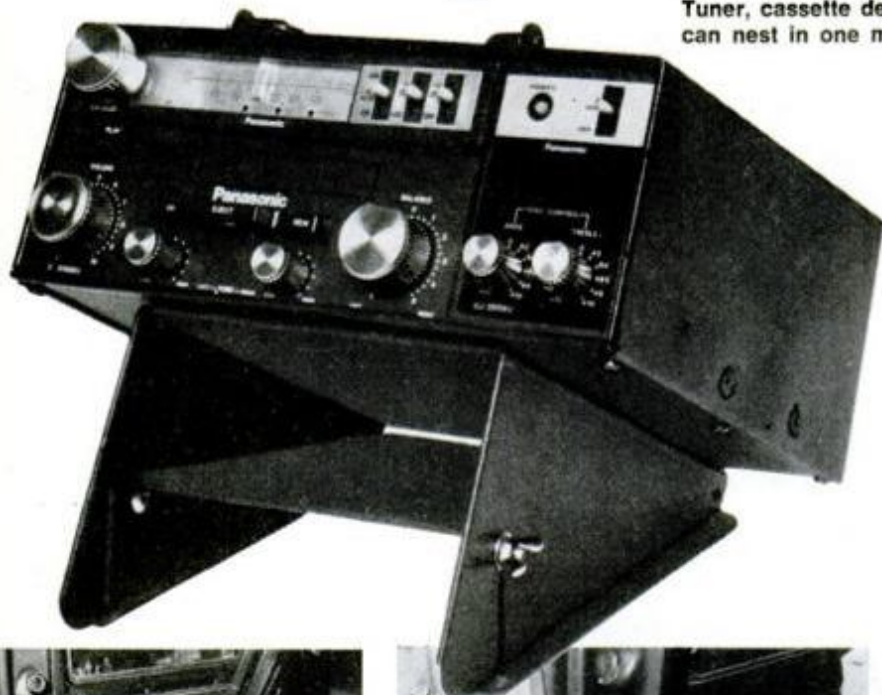
Microphone and sound source at midpoint between parallel walls can produce resonant echoes (top). Move both to one side.

Your attention's on the subject (above), but a distant sound, if in line with the mike, can dominate the sound track.

The corner of a room (left) can act as a focusing reflector, blurring sound. Put your subject somewhere else.

Component stereo

Tuner, cassette deck and booster amp can nest in one mounting bracket.



If your van or car has become a living room on wheels, sooner or later you'll want audio for it with living-room quality. Manufacturers are meeting that demand by upgrading their automotive sound products. And Panasonic has taken the step of introducing quality components for vehicle use. You can pick the pieces to build the system you want. Whatever system you select, the sounds it makes are very good.

To show what's involved in putting in rolling components, and to find out what they're like to live with, PM Outdoor Editor Bill McKeown volunteered his Ford Econo-



With old under-dash radio removed, space and power lines are available for system. Handbrake is pulled up to test clearance.



After mounting bracket is used as template, screw holes are drilled into dash bottom. Be sure not to hit any wires.



Mounting bracket is fitted and secured with self-tapping sheet-metal screws. The power cables are located beforehand.



With power cables connected and line fuses checked, AM/FM tuner and tape deck are fitted in bracket for securing.



Installation of new antenna for system is easy as it also replaces old unit. Leads are snaked through the old route.



Installation expert Peter Blumenfeld checks speaker placement to prevent interference with window mechanism.



Door-speaker wires can be snaked through a hole drilled between door hinges. Removable side panel speeds hookup.



Door panel is first marked for screw holes and cutting outline. The cover plate will hide any rough edges left on the opening.



Removable door panel is not screwed back permanently until entire system has been turned on and speakers checked.

on wheels

Here's how to put
real hi-fi
into your van.

PM photos: Jim Curry



Where panel removal is difficult, a hole saw and hacksaw can be used—but take care not to cut any hidden wires.



Pair of Sound Pumps speakers was positioned at rear of van in cabinet over stove and above closet door by sink.



Power Booster amplifier is located at right. Speaker selection control is placed on steering column bracket.



Check system from driver's seat before finally securing speakers and wires; locate and correct buzzes and rattles now.

line van conversion camper. Professionals at Dalis Marketing, a Panasonic distributor, did the installation.

Components selected were the CA-9500 AM/FM/Multiplex tuner (which can drive speakers with 4.8 watts per channel by itself), CX-1100 8-track tape player and CJ-3510 "power booster," an amplifier that ups power output to speakers to 10 watts per channel. Speakers are "Concert Sound" coaxials (actually two-way systems with separate woofer and tweeter) mounted in the front doors and "Sound Pumps" mounted in cabinets in the rear of the van. Also available are two stereo cassette players. Component prices (suggested retail) range from \$60 to \$110, speaker prices from \$19 to \$35 each, the coaxials naturally being the more expensive models.

The sound produced compares favorably with many home rigs. McKeown points out that strong, clear treble cuts through road noise. He also notes it seems less tiring to drive when you don't have to strain to hear music.—Stephen Walton



An engine-cover or transmission-hump mounting gives best access to controls. Airconditioner made it impossible here.



Mounting in front storage compartment in raised-roof van would make concealment easy, driver access underway difficult.



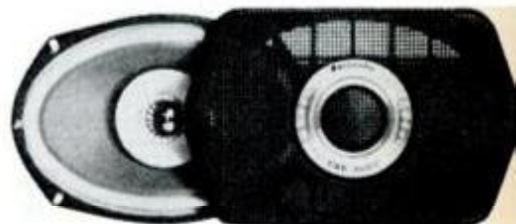
Shelf on top of refrigerator is another alternate location, convenient for tape storage but also out of driver's reach.

HOW GOOD DOES IT HAVE TO BE?

Published technical specifications are virtually unheard of in the car stereo field, but Panasonic has taken the step of issuing them for the Component Systems. They can't compare with those for the same maker's home-use audiophile products, but they are better than the—unpublished—specs of a lot of compact home systems.

Size and weight limitations do cut into the performance of automotive equipment, but it should also be

noted that super performance would largely go to waste—at least while you're driving. Road and wind noise mask the lowest and highest audio frequencies and the softest musical passages; noise also increases tolerance of distortion. Manufacturers can thus concentrate on efficiency in usable frequency and dynamic ranges, and not have to pass along extra cost of minimizing distortion to a buyer who listens mostly while on the road.



High-performance speakers like this 6 by 9-in., dual-cone Sound Pump and the Concert Sound coaxials make the component approach to automotive stereo worthwhile. Each can handle up to 20 w. input power.

They're like van conversions, but taken to the ultimate extreme. Instead of turning vans into rolling boudoirs, the owners of these big highway cruisers transform their buses into veritable land yachts. They've got all the comforts of home and then some.

Recently I attended a Family Motor Coaching Assn. "rally"—a get-together of motor-home owners. They had converged at the county fairgrounds in Los Banos, Calif. As I watched, here came a half dozen stately, shining, brightly painted buses (called coaches) purring through the fairground gates. The FMCA tells me that some 300 owners of converted buses now grace its roster.

A most unusual hobby

My host for the day was Lew Irwin, the FMCA's genial 72-year-old national vice president. He sat me down in his beautifully finished 40-foot Prevost coach and filled me in on the details of this most unusual hobby.

It's not just anyone's cup of tea. Used "shells" (buses) cost anywhere from \$15,000 to \$25,000, and that's just the beginning. Full conversion and incidentals bring the average coach into the \$35,000-to-\$50,000 range. Owners usually do most of their own work, although custom conversion shops now dot the country and can rebuild a bus to its owner's specifications.

The typical shell would be a retired GMC 4104 or 4106 of 1952-63 vintage. By the time it's put out to pasture, the average bus will have about 3.5 million miles on it—that being the normal service life of most intercity buses. However Greyhound typically racks up as many as six million miles before it retires one of its MCI buses (MCIs are built and owned by Greyhound).

A few smaller charter bus companies like LTR Stage Lines in Las Vegas and a similar outfit in Texas retire their buses at just under one million miles, so these coaches are much in demand by FMCA members.

GMC conversions most popular

The 4104s and 4106s make up about 90 percent of the FMCA's conversions. The GMC 4104 uses an inline, six-cylinder Detroit Diesel 6-71 engine mounted crosswise in the rear, with angled drive through a four-speed manual transaxle. The newer 4106 GMC buses have V8 Detroit Diesels (8-71) with Roots-type blowers. All come with airconditioning, air suspension and lavatories.

One of the country's more sumptuous bus conversions belongs to El-



Converted buses usually cost \$70,000 and up, but owners consider them to be worth it. This 40-foot Trailways weighs 37,000 pounds, gets 9 mpg.

Outgrown your motor home? Take the bus!

It's like putting a ranch house on wheels
and leaving the property taxes behind.

by Michael Lamm
WEST COAST EDITOR

vin and Jeanette Bale, who live and travel in their \$70,000 Trailways motorcoach 10½ months of the year. They're performers with the Ringling Brothers and Barnum & Bailey circus. Like other entertainer families whose work keeps them on the road, the Bales prefer the bus.

The ultimate in luxury

Elvin and Jeanette bought their coach directly from Continental Trailways in Dallas for approximately \$25,000, then had Angola Coach in Indiana handle the conversion for an additional \$45,000.

The result: two bedrooms (one for their 8-year-old daughter, Pinky), entry hall, living room, complete kitchen and full bath—all luxuriously outfitted.

The automatic airconditioning/heating unit uses three marine cooling and three heating systems: Electric power is propane and engine-generated. There's a built-in CB plus AM/FM 8-track stereo, intercom and master panel for switches, gauges, fuses and function controls.

You enter the Bales' Trailways via an 8x4-foot entry hall into the 8x12-foot living room. Floors are



Circus performer Jeanette Bale (left) designed her own 8x8-foot kitchen. Most appliances are full-scale and include trash compactor, microwave oven, dishwasher, pantries, and 8-foot counter. Below, guests enter large living room, which seats 10, has pop-up bar, color TV.



Full bath includes tub and shower. The Bales' coach is unusual in having two bedrooms.



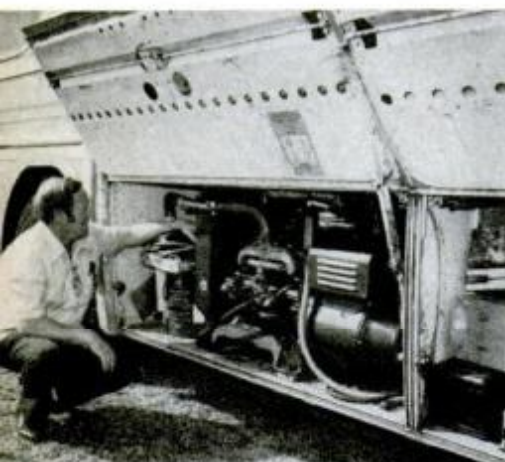
The Bales specified a doghouse for Sheba, their daughter's pet.



Sandy Hancock of Hayward, Calif., prepares lunch in her family's 35-foot FliXible.



Most converted buses, like this GMC, put bedroom aft, galley and bath amidships.



Dave Simpson checks large generator on his airconditioned 1958 ex-Santa Fe GMC.



Most conversions include CB, 8-track stereo, intercoms and custom instruments.

all carpeted, with walls covered in Formica and the ceiling in padded white vinyl.

The living room seats 10 in movable swivel chairs and a 6½-foot sofa/bed. There's color TV, a pop-up bar, and a 5-foot dining table.

In the 8x8-foot kitchen, Jeanette Bale specified all appliances full-size except for the clothes washer and dryer. In addition to the usual, there's a microwave oven, built-in dishwasher, 8-foot Formica counter, and several pantries.

The bathroom contains a full-sized shower and tub, a built-in pull-down scale and gold-plated fixtures.

The Bales' daughter, Pinky, sleeps in her 6x6-foot bedroom and has one conventional closet plus a special cabinet for her toys. The master bedroom, 7x6 feet, boasts a platform double bed, built-in digital clock, three full closets, two overhead cabinets, and reading lamps in addition to the fluorescent lighting used throughout the bus.

Do it yourself and save

The Bales' bus is somewhat atypical in being converted professionally. Many FMCA members rework

their buses themselves, thus saving considerable cash.

As FMCA president Irwin mentions, GMC buses make the most popular conversions, but his own coach happens to be a Canadian-built Prevost. Then, too, there are ex-Continental Trailways two-level FliXibles like the Bales' plus Greyhound's MCI buses and Silver Eagles, all of which make fine homes-on-wheels.

Many conveniences possible

Once he has a bus, the first thing a hobbyist does when he starts a conversion is to take out all the seats and overhead racks. Then he's ready to choose his floor plan and get to work. Irwin points out that FMCA headquarters in Cincinnati has a complete library to help the hobbyist/converter. "We've got all the bus shop and service manuals in our library; also catalogs, suggested floor plans, sources of materials, furniture, built-ins and so on. Also, I strongly urge anyone who's thinking about buying a shell or who's just bought one to come to our rallies and pick up ideas. That's the purpose of these rallies—so members can learn from each other."

The typical coach follows a fairly set format: bedroom aft, galley and bath amidships, and a large living area up front. Owners rarely stint on luxuries, so most have dual (and sometimes triple) airconditioners, built-in 8-track stereo, CB radio, color TV, complete kitchen with microwave oven, dishwasher, trash compactor, icemaker and wet bar, plus full bath with tub and shower. There's usually plenty of closet space, and most coaches have single or double doors to close off the bedroom from the forward compartment. The living area usually converts to sleep two or three guests.

Underneath the floor, where buses commonly have simple storage bins, the "basement" has been converted to hold such items as a 75-gallon butane tank for the water heater, kitchen range, and sometimes the refrigerator/freezer. There's also a power generator down below, and several buses at Los Banos carried four-cylinder Perkins reefer diesels and up to 12.5-kw. alternators for both 110- and 220-volt current.

The basement also contains compressors and evaporators for the air-conditioning system, twin diesel-fuel-fired heaters for cold weather, the 140-gallon fuel tank, a 75-gallon water tank plus its purifying equipment and pumps, a 100-gallon holding tank and additional storage area. All this makes for a full load, and it's not unusual for these behemoths to weigh 35,000 pounds wet.

The engine in Irwin's Prevost is twin-supercharged. Its Detroit Diesel V8 carries the standard Roots-type blower, but he's also adapted a turbocharger on top of that. Result: He gets about 9 mpg on the highway; also excellent performance regardless of altitude.

Customizing

While many custom converters will redo older intercity buses, a few accept only new ones. Here, the investment for the new shell alone runs to an average of \$90,000. The conversion might cost another \$35,000. These very expensive "rolling executive suites" are like company jets, and they're almost always ordered by corporations, not by private individuals.

Next time you see one of these private coaches swooshing down the freeway, figure that the owner has probably put several years of his time and a good deal of thought and money into the project.

And if you're thinking of converting a bus yourself, be sure to get in touch with the Family Motor Coach Assn., Box 44144, Cincinnati, Ohio 45244. **FM**

PM tests a new kit-built hovercraft

Performance is the plus for this speedy amphibian that actually goes where it's aimed.



by Bill McKeown BOATING EDITOR

PM photos: Lorraine McKeown

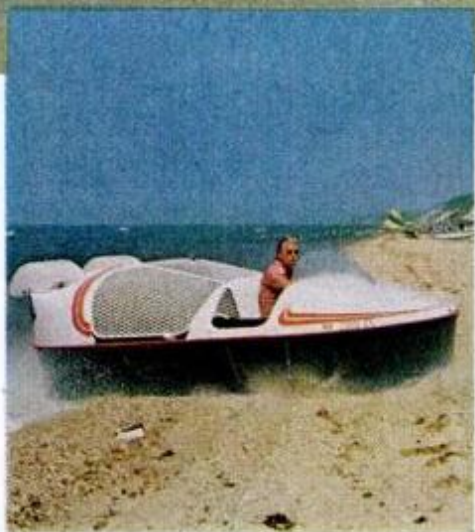
It's a machine that rides on a thin pillow of air. It has been called a hovercraft, an air-cushion vehicle, a ground-effect machine, or a surface-effect skimmer. In the past, it has also been termed an unmanageable gadget looking for a market. But now I have found and flown a second-generation model that turns out to have two admirable new qual-



Fire up and drive right off or on a tilt-bed trailer; it's easy with the Neova II.

ities—the Neova II is maneuverable, and it's fun.

The test machine came from Neoteric USA, Fort Harrison Industrial Park, Terre Haute, Ind. 47804, where complete machines, kits and plans are produced, although the original development engineering was done in Australia. John Talmage, noted Long Island collector



Speeding up and across a sloping beach proved no problem for maneuverable rig.



Parked in the marshes with front cowl off, Neova foredeck is a shooting platform.



With controls back (top) and rear buckets aimed forward, hovercraft backs up rapidly. Removal of the front cowl (above) reveals battery box and controls.

of antique aircraft who has built other hovercraft, allowed *Popular Mechanics* to check out and wring out his new Neova II. After a short check-ride with Chris Fitzgerald, Neoteric president, I was set.

The Neova II is 14 feet long, has

[\(Please turn to page 116\)](#)

A bigger selection of sizes, designs, accommodations and features are ready to go.

by Bill McKeown

BOATING EDITOR

Previewing the latest look in pleasure boats reveals that builders are giving boatmen what they need as well as what they want.

The sport is a daytime pastime most pleasant during warm and sunny weather. While there will always be sailors who find romance in the challenge of long nights of cruising and howling gales at sea, the average skipper who goes afloat for fun would just as soon stay safely ashore when skies are dark or the weather inclement. So cabin boats, with all those compact accommodations below decks that look so appealing at a boat show, often are not the most

Chubby, speedy little floating saucer, the Meteor from Astron Future Development does 33 mph with a 70-hp Mercury motor pushing its 9-foot hull.



New for '78—more

practical design. Now there's a healthy trend to layouts providing the most fun for the most time afloat.

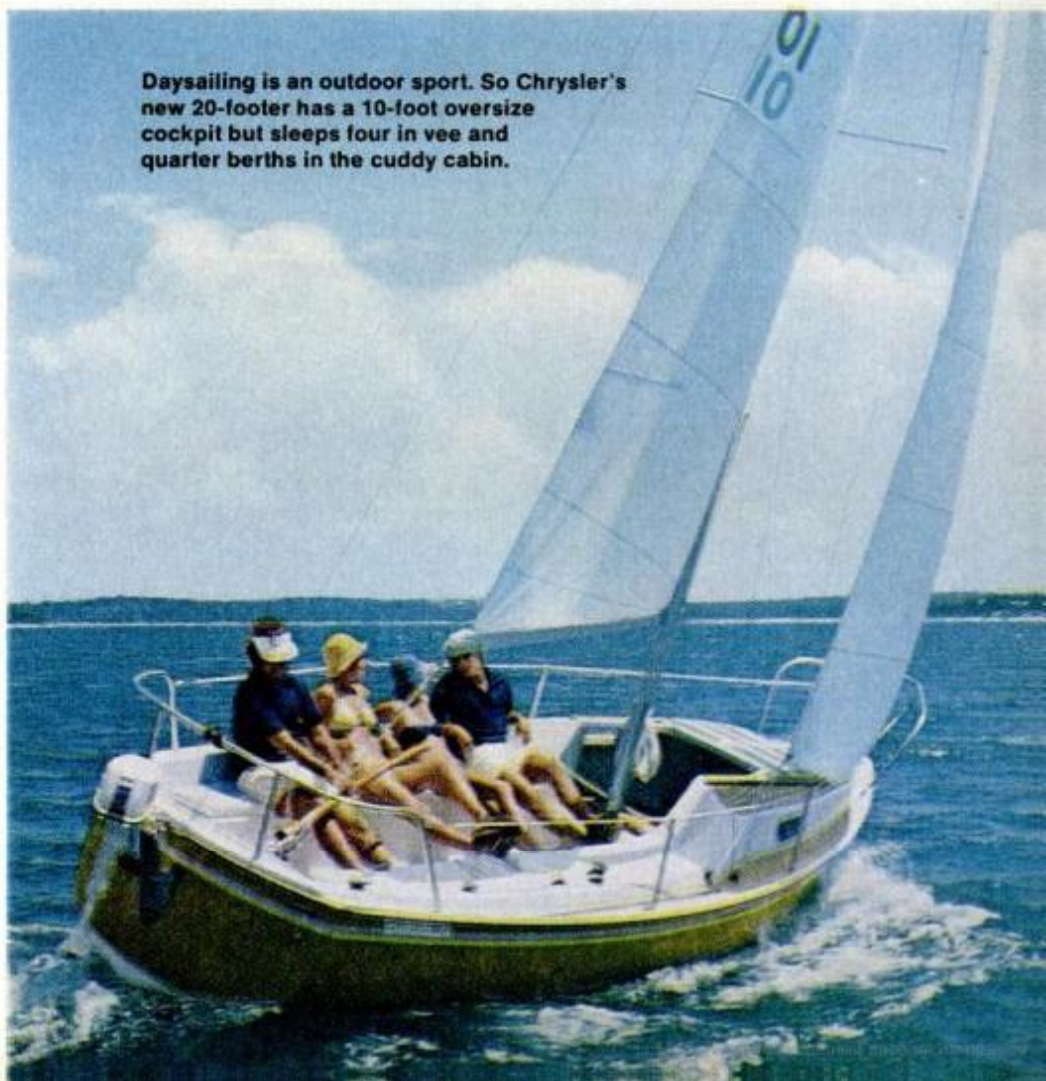
On deck for action

Pontoon and sun-deck boats are increasing in popularity. From simple rafts holding a small outboard and a couple deck chairs, the trend extends up through beamy floating platforms with railings, awnings, central control console and twin motors on to big tri-hull barge-type craft with sterndrive power. Their shoal draft and low freeboard restrict them to sheltered water, but they can easily edge into the shallows where the hungry fish often are. Fish boats, in fact, are adopting some of the pontoon types' open uncluttered decks for casting. The bonefish boats of the Southeast, offshore skiffs with elevated forward platforms, and even slim bass boats and open-foredeck runabouts are making good use of added sitting and casting deck space.

That bass boat boom

Want to chase the fish with style as well as speed? The last several years have seen more and more muscle clamped behind the bass hull or tucked into sterndrives down inside. Now these hot little two and three-

Daysailing is an outdoor sport. So Chrysler's new 20-footer has a 10-foot oversize cockpit but sleeps four in vee and quarter berths in the cuddy cabin.



From Glasstrom is this water-ski bass boat. The Family Fish and Ski HYP-175 is a dual-purpose speedster.



New from Starcraft, the 19-foot Stardeck with tri-hull is rated for 180 outboard horsepower or a 190 OMC sterndrive engine.



Designed with Jim Wynne deep-V hull for open water running with outboard or I/O power, AMF Crestliner Crusader models run from 19-footer, below, with 85-hp Johnson to 24 feet.



performance, more fun

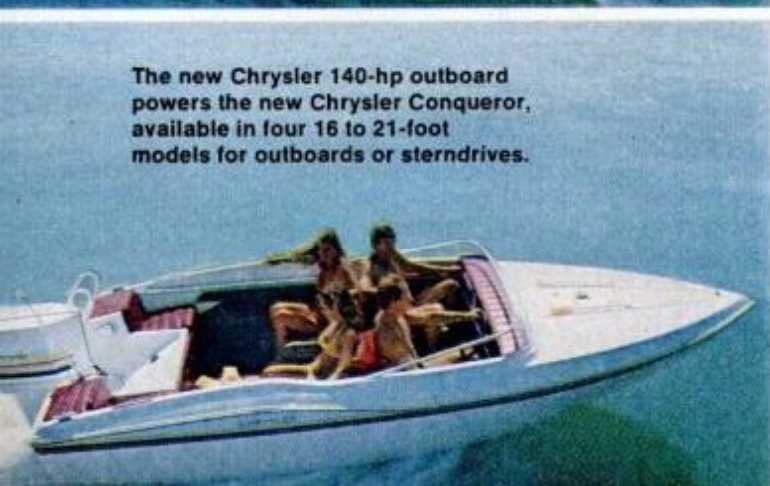
Bass-boat seats and speedboat speeds are features of newest Hydro Stream 17-foot Varmint from Pipkorn Industries. With a Merc-150, hot hull tops 57 mph.



Upholstered for extra comfort, the 17-foot Pace 717 from C & K Fiberglass hits 48 mph with a 170-hp Mercruiser.



The new Chrysler 140-hp outboard powers the new Chrysler Conqueror, available in four 16 to 21-foot models for outboards or sterndrives.



seater hulls are getting sleeker as well as faster. Metal-flake finish for the fiberglass is featured on many models for this year. With the forward pedestal seat removed or folded down (as it should be while underway), some new bass chasers look like mini-skiboats and can go nearly as fast. For a family that enjoys speedy day cruising and water skiing as well as fishing, the flashy new models are a good multipurpose choice.

Fortunately the price pendulum, while swinging high for the fancy rigs, is dropping for more spartan models. Simple bass-catching craft, often of marine aluminum and offering only basics in seats, fish wells and remote control consoles, are also earning favor with less-than-professional fishermen. Similar to johnboats in looks,

(Please turn to page 119)

Build PM's work-and-play camper

Use one side for work all week—the other for weekend camping, fishing and hunting trips.



Take along the conveniences of home when you travel in this compact camper with mini-kitchen. There's no need to unpack after the fun. A second storage area can hold tools and supplies for work, so your camping gear is always ready to go.

PM photo: Harry Hartman

Design: Lester Walker

Add PM's work-and-play camper to your pickup truck, and you'll have the most versatile vehicle you've ever owned! You can store everyday tools and supplies on one side and keep camping gear on the other. You'll still have the truck bed free for plywood and supplies.

As a camper, the converted pickup provides privacy and the comfort of off-the-ground sleeping for two. The sturdy canvas "cabin" may be left

up while you drive, but we've designed it for quick disassembly and compact storage. Though built on a Datsun Li'l Hustler pickup, it can be sized to suit other models.

For complete plans, send \$5.95 to Popular Mechanics, Dept. WP, Box 1014, Radio City Station, New York, N.Y. 10019. Please allow four weeks for delivery. For first-class mailing, include an additional 75 cents.

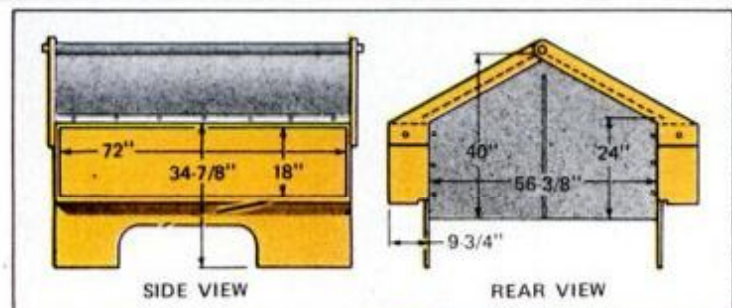
PM

Материал, защищенный авторскими правами

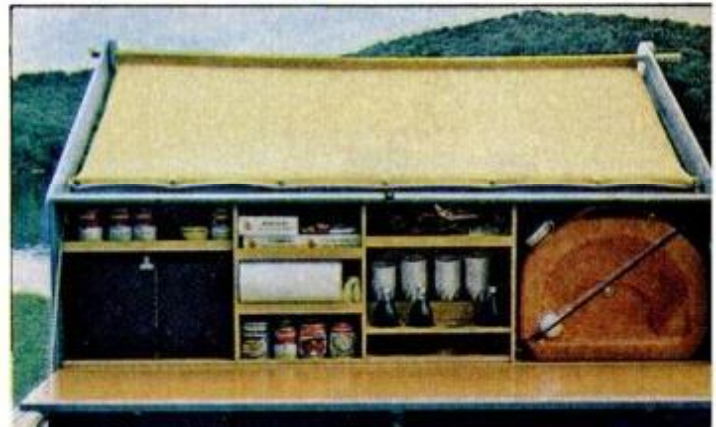
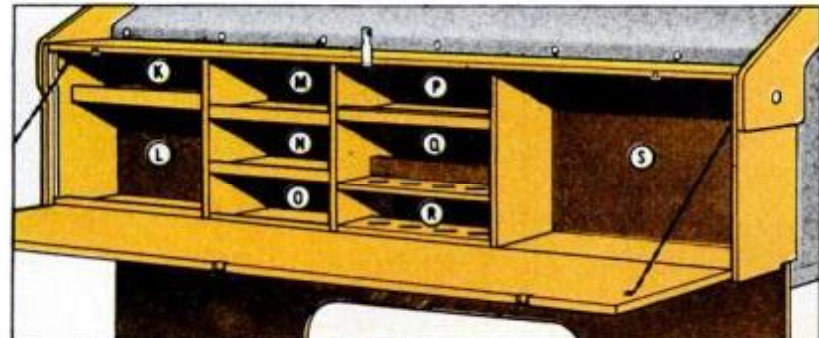
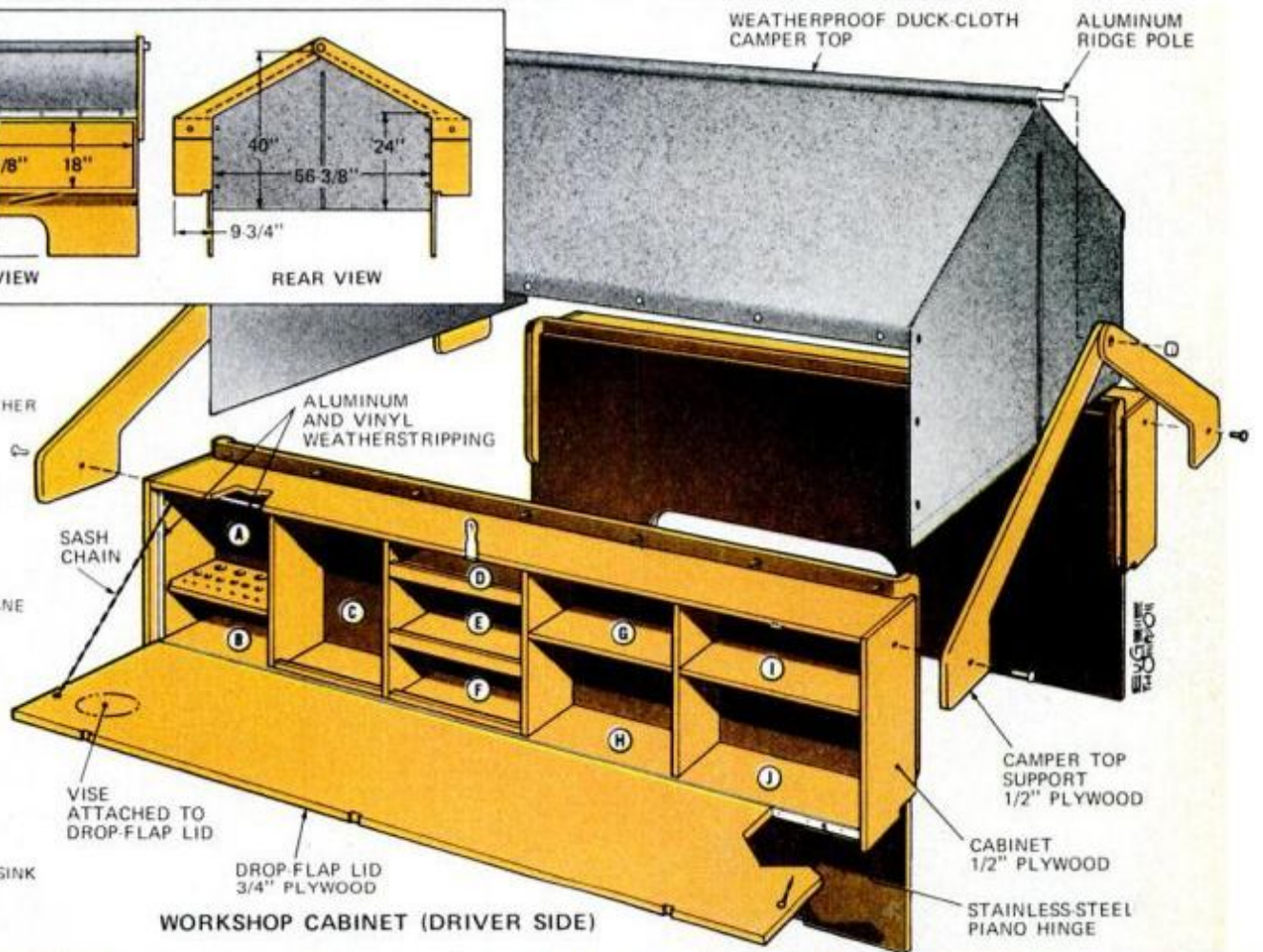




Fold-down work surfaces are handy on a job (left) or at your favorite campsite (below). MDO (medium density overlaid) plywood from Champion Building Products was used for construction due to its resistance to weather. Countertop is finished with several coats of urethane varnish, box is painted with PPG Industries' cornflower blue exterior latex paint. There's space in boxes for almost everything—from belt sander to the portable kitchen sink.



- LEGEND**
- A-VISE AREA
 - B-SCREWDRIVERS, FILES, CHISELS, OTHER SMALL TOOLS
 - C-SMALL PARTS CABINET
 - D-PAINTS, BRUSHES
 - E-PAINTS, BRUSHES
 - F-HAMMER, MISC. TOOLS
 - G-DRILL
 - H-BELT SANDER
 - I-POWER BLOCK PLANE
 - J-JIGSAW, ROUTER
 - K-MISC. STORAGE
 - L-COLEMAN STOVE
 - M-BOX AND CAN FOODS
 - N-BOX AND CAN FOODS
 - O-COOK POTS
 - P-PAPER DISHES, NAPKINS
 - Q-PAPER CUPS
 - R-BOTTLES
 - S-5 GALLON PORT A SINK



KITCHEN CABINET (PASSENGER SIDE)

SPARKPLUGS THAT INDICATE NORMAL ENGINE OPERATION



SPARKPLUGS THAT INDICATE THE NEED FOR TUNE-UP OR REPAIR



How to 'read' your sparkplugs

SATURDAY MECHANIC

They're sensitive indicators to conditions inside your engine, so begin by learning to recognize what they're trying to tell you.

by Mort Schultz

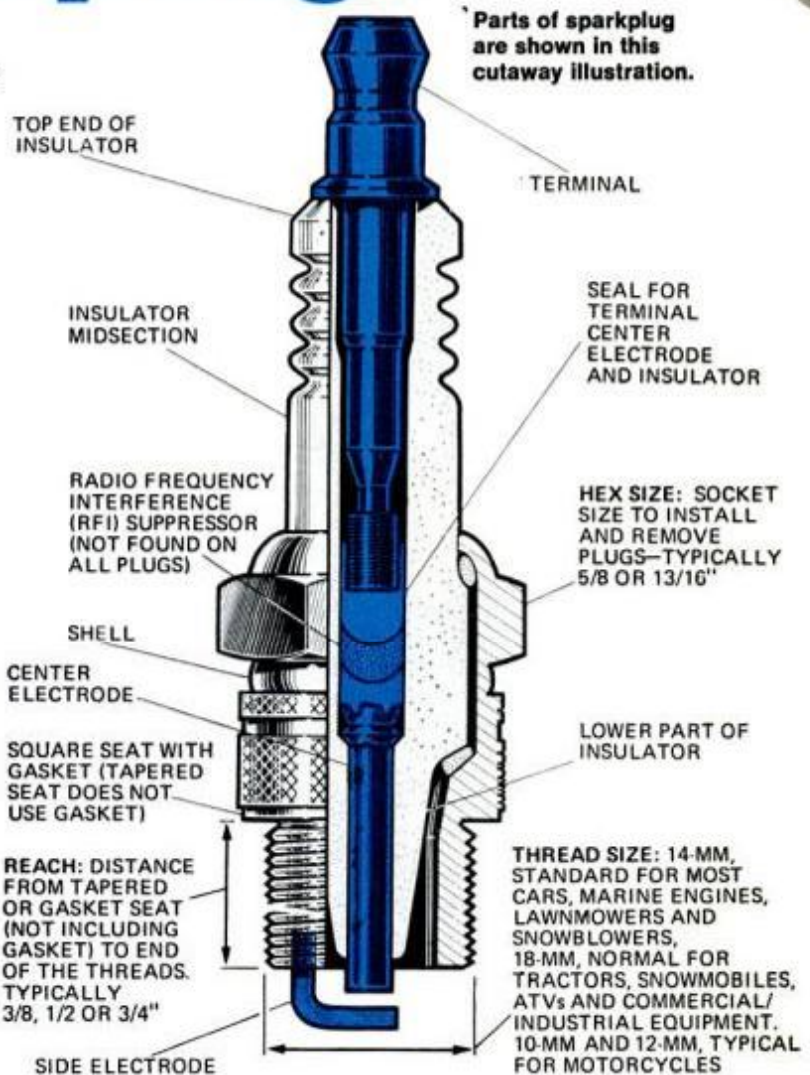
Are you sparkplug smart? Anyone who thinks he knows everything about sparkplugs ought to see if he can answer these questions:

- What has gone wrong when the top part of a sparkplug insulator shows vertical black streaks?
- What's the problem when a sparkplug's center electrode shows burning and extreme wear?
- What is corona, when is it most likely to occur and what should be done about it?
- How would you go about removing sparkplugs from a late model Chevrolet Monza with a V8 engine?

■ Back in 1908, a fellow who was to give his name to two present-day sparkplug companies started his own outfit. Who was he and what are the two companies that took his name?

Here are the answers:

1. The plug was improperly installed. In all likelihood, it was overtightened or an open-end wrench was used that distorted the shell, which led to the blowby that caused the streaks.
2. This condition is usually caused by improperly compressed or corroded gaskets which had been tightened down onto dirty seats. The normal flow of heat away from the sparkplug was prevented, resulting in overheating.
3. Corona is a high-voltage electric phenomenon that makes sparkplugs and sparkplug cables glow. It most often occurs in damp weather and is espe-



In living color at left are sparkplugs taken from 15 different engines. Here's how to "read" them.

1. Almost white, fluffy gray deposit on insulator tip and side electrode is normal for emission-controlled engines using lean mixtures and no-lead fuels. This plug has high mileage and should be replaced.
2. White with light tan tint: The soft deposits on center electrode and darker deposit on side electrode indicate proper heat range for the way this engine is being used—at moderate speeds and loads.
3. Light tan deposits on a well-used plug. The yellow deposit on the side electrode is normal and comes from metallic additives.
4. Yellowish, soft white deposits on the center electrode and insulator are normal for an engine using fuel containing certain metallic additives. Deposits on the shell are normal and show no signs of over-rich or over-lean fuel mixtures.
5. Classic example of a normal plug with fluffy, chocolate brown deposit on the insulator. Note slightly lighter color on side electrode showing that it's running a bit hotter. Sooty black deposit on shell suggests rich mixture, perhaps, need for new air filter.
6. Fluffy red deposits are normal in engines

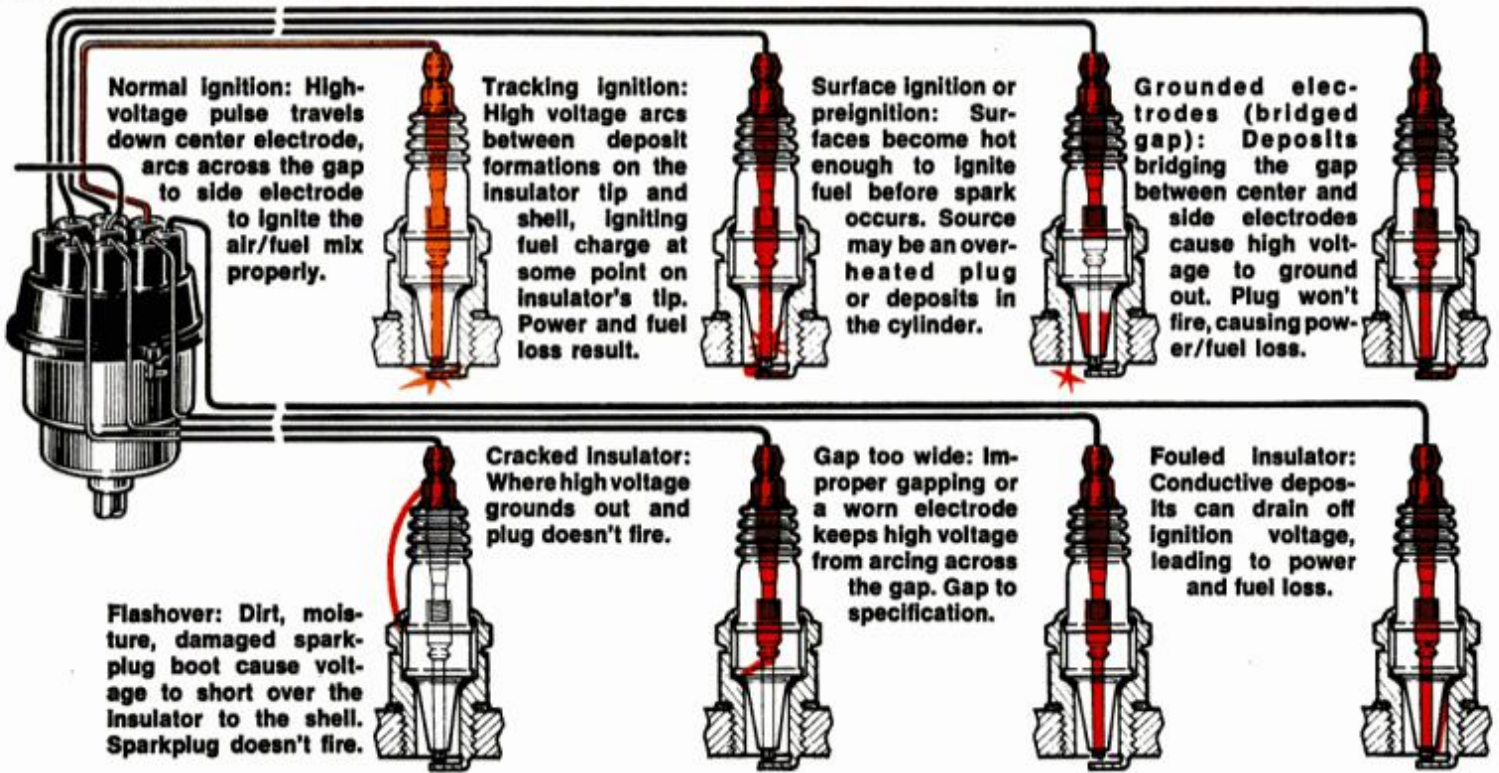
using fuels with MMT additives. Slightly oily deposit on the shell may be due to an engine not yet fully broken in. In an older engine it might indicate the beginning of wear on piston rings, valve guides/seals.

Problem sparkplugs 7 through 15:

7. Detonation damage: The firing end of the insulator is broken and metal transferred from center electrode to the side electrode. Possible causes: a. Overadvanced ignition timing. b. Fuel too low in octane. c. EGR system malfunctioning.
8. Preignition damage. White deposits on a blistered insulator, along with burned electrodes, reveal extreme heat condition. Possible causes: a. Sparkplug too hot. b. Overadvanced ignition timing. c. Glowing deposits in combustion chamber. d. Cooling system clogged. e. Exhaust system blocked.
9. Soot fouling. Fluffy, black soot deposits on insulator and electrodes. Possible causes: a. Excessively rich mixture due to sticking choke or defective carburetor. b. Faulty ignition primary circuit or defective sparkplug wires. c. Excessively cold starting without engine warm-up.
10. Oil fouled. Oily, usually black deposit covering insulator and electrodes. Possible causes: a. Excessive passage of engine oil

into combustion chamber due to piston ring or valve guide seal leakage. b. Defective PCV system.

11. Carbon fouled. Hard, black carbon deposits on insulator and electrodes. Possible causes: a. Moderate amount of oil passing rings or valves. b. Defective PCV system. c. Sparkplug too cold. d. Sparkplug not correct type for engine.
12. Dirt fouling. Carbonized and sometimes granular deposits on and around the insulator and electrodes. Possible causes: a. Air cleaner missing. b. Defective air-cleaner mountings.
13. Bridged gap. Carbon particles are lodged in the sparkplug gap. Possible cause: Combustion chamber deposits accumulated during low-speed, light-load use break loose during demand for full power.
14. Glazed insulator. Glassy surface on the insulator as a result of deposits melting on plug. Possible causes: a. Sparkplug too hot. b. Local overheating due to cooling system blockage or similar defect.
15. Splashed insulator. Splotches of black, almost paint-like deposits on the insulator. Possible causes: Delayed correction of an engine miss allows soft, oily deposits to accumulate in cylinder. After tune-up these deposits break loose and foul plug.



cially visible in the dark. Nothing has to be done about it.

4. Certainly not in the conventional manner. You will never get the No. 3 plug out of the engine. The entire procedure is outlined later under the heading, *Removing Monza plugs*.

5. The fellow was Albert Champion. The companies are Champion and AC.

These questions barely tap the information available about sparkplugs. However, this article has all you have to know about sparkplugs for the well-being of your car.

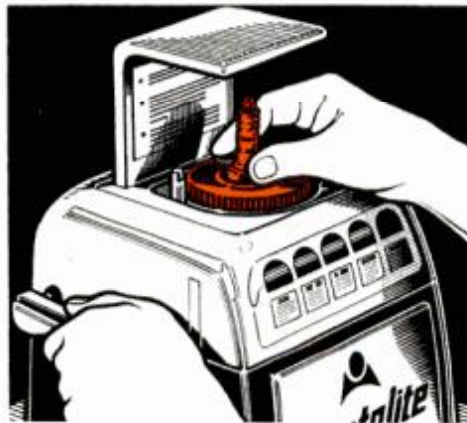
Sparkplug—that's an electrical component used in a gasoline engine's ignition system to provide a high-tension-voltage spark for igniting the fuel mixture.

How to tell when new plugs are needed

No one can argue with the fact that worn sparkplugs are a chief cause of hard starting, poor engine performance and increased fuel use.

"Sparkplug performance is the most important single factor in maintaining your gasoline mileage and engine efficiency," the AC Spark Plug Div. of General Motors contends. "AC tests show that if only one sparkplug out of eight is misfiring, gasoline mileage may fall off as much as 15.2 percent."

However, sparkplugs are frequently blamed for poor engine performance which they don't cause. Many letters received by me at *Car Clinic* relate the story of a car owner who installs a set of new spark-



Sparkplugs are cleaned by inserting the tip into a sandblasting machine.

plugs to cure engine misfiring and power loss.

The remedy works, but only for a few hundred miles. What's happened is that the new plugs temporarily improve engine performance, because new plugs make less of a demand on the ignition system.

But new sparkplugs cannot permanently rectify poor engine per-



Filing electrodes may be necessary to remove stubborn deposits.

formance that is being caused by worn distributor contact points, cracked distributor cap, unspecified ignition timing or a weak coil. Or for that matter, by worn rings or cylinders, or faulty carburetion.

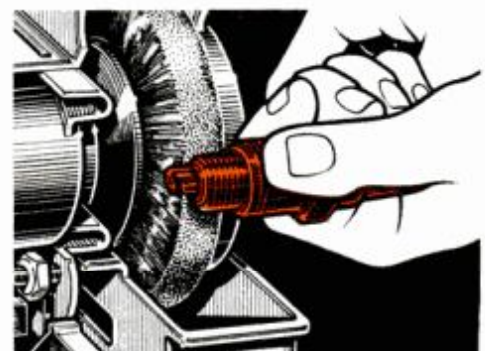
The best way to tell if sparkplugs are to blame for your problem is to examine them carefully when you take them from the engine. Look for conditions shown on page 78. If one exists, then a sparkplug or sparkplugs are causing trouble.

You should also analyze the tips of used sparkplugs carefully. They can provide clues to what's happening in the engine and to the plugs themselves, assisting you in diagnosing a condition that is interfering with efficient engine operation.

Removing plugs correctly

In most cases, the tools you need are a 13/16-in. hex or 5/8-in. hex sparkplug socket, a ratchet wrench and an extension.

You can find out the hex size you need by checking service data in a



Cleaning threads is important to insure proper seating of the sparkplug in block.

HOW TO TIGHTEN SPARKPLUGS

PLUG SIZE	WITH TORQUE WRENCH (ft.-lbs.)		WITHOUT TORQUE WRENCH Cast Iron or Aluminum Head
	Cast Iron Head	Aluminum Head	
10 mm	8-12	8-12	3/8 to 1/2 turn
12 mm	10-18	10-18	1/4 turn
14 mm, gasket seat	25-30	18-22	1/2 to 3/4 turn
14 mm, tapered seat	7-15	7-15	*
18 mm, gasket seat	32-38	28-34	1/2 to 3/4 turn
18 mm, tapered seat	15-20	15-20	*

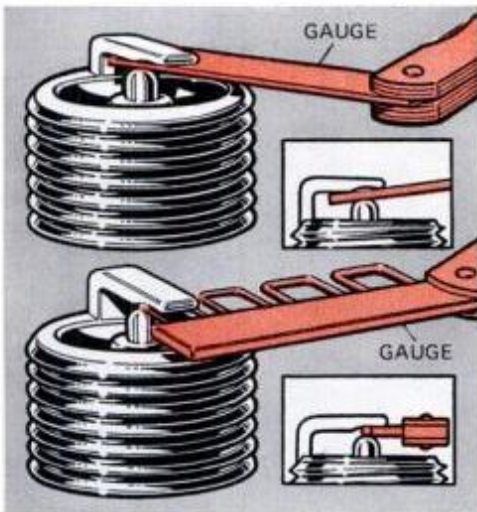
*Champion suggests that tapered-seat sparkplugs be turned 1/32 to 1/16 turn beyond finger tight.

manual or asking a dealer selling your make of car.

Don't confuse hex size with two other sparkplug dimensions—thread size and reach. The lead illustration has an explanation of all three.

In some cases, "conventional" tools won't do. Where quarters are too close to get a wrench and extension onto a plug, use a flexible sparkplug wrench. It consists of a socket on the end of a flexible hose-type extension with a T-bar handle, sold where auto tools are sold.

The following procedure is the



Flat feeler gauge won't give an accurate reading; use the round wire type.



Gasket on plug at left should be seated tightly; tapered seat needs no gasket.

conventional, correct way to remove sparkplugs from an engine:

1. *Mark each sparkplug wire* with some identifying symbol so it can be reinstalled in its correct cylinder. Accidentally switching wires leads to plugs firing out of sequence which can cause serious engine damage.

One method you can use to mark wires is to attach a clip-type clothespin or masking tape marked with a number to each wire as you remove it. The numbering system you use in the case of a V8 engine may be R-1, R-2, R-3 and R-4 for plug wires on the right (passenger) side of the car, and L-1, L-2, L-3 and L-4 for plug wires on the left (driver) side.

2. *Rotate the sparkplug boot* about one-quarter turn while pulling it off.

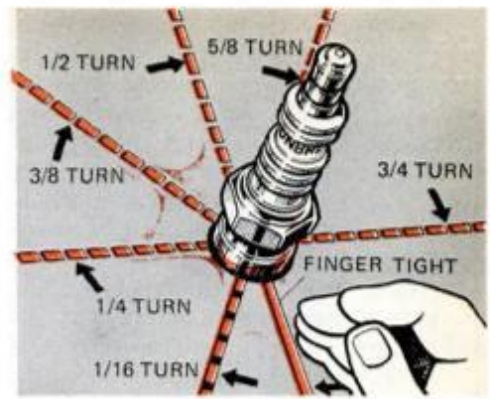
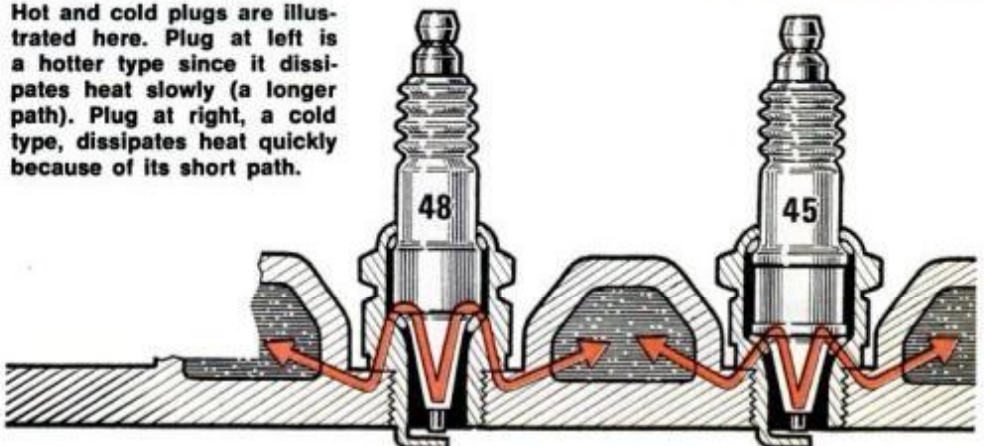
Caution: Never pull on the sparkplug wire itself. Rough handling will cause separation of the conductive strands, which will lead to an open circuit, poor conductivity, excessive resistance and sparkplug misfire. Pull only on the boot.

3. *Loosen each sparkplug* one turn only after cables have been removed.

Caution: Aluminum-head engines must be cool before removing plugs since plugs in a warm engine will seize and be difficult to unscrew.

4. *Blow away carbon and dirt* from around each sparkplug. Compressed air is best to use, but if an

Hot and cold plugs are illustrated here. Plug at left is a hotter type since it dissipates heat slowly (a longer path). Plug at right, a cold type, dissipates heat quickly because of its short path.



Your art of tightening plugs without a torque wrench is aided by this diagram.



Plugs for rotary engines use two outer electrodes. The plug shown at right is that currently used by Mazda.

air hose isn't available use a length of vacuum hose. Aim one end at the area and blow through the other.

5. *Remove each plug* and place it in its appropriate hole in a sparkplug tray that is numbered to coincide with the number of cylinders in your car. Proper identification is important so you can relate the particular plug with the cylinder to make a proper diagnosis of sparkplug condition.

Service tip: If a sparkplug is difficult to remove, unscrew it slightly to expose a few threads. Drip some light oil on the threads and screw the plug back into place. Let oil soak the threads before you try removing the plug again.

Removing Monza plugs (V8 engine)

1. Raise the car.
2. Loosen the two engine mount-to-cross-member attaching bolts on

(Please turn to page 132)

The new Dodge Diplomat turns out to be a better car, according to our owner survey, than its twin, the Chrysler LeBaron—this despite the Diplomat's slightly lower price tag (\$123 average).

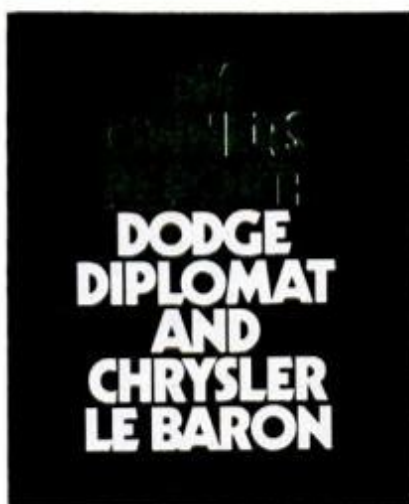
The cars are identical mechanically, with only minor differences in grilles, taillamp treatments and interior trim. The Diplomat, though, gets higher overall marks from its owners, perhaps because buyers of Chrysler's LeBaron expect more than purchasers of Dodges.

Slightly fewer Diplomat owners reported mechanical problems, and they also gave their dealers higher scores on service.



Diplomat's running lights are below headlamps; LeBaron's stand above.

Diplomat owners rate comfort a shade better than LeBaron owners; likewise gas mileage, and more say they'll buy another the next time around.



As with most American cars, styling came up as the No. 1 reason for the purchase. LeBaron owners seem more influenced by their cars' lines than Diplomat owners. Size and economy also entered the purchase picture, as you can see from our data panel on page 121.

We began our survey by asking why owners of both nameplates chose these cars over the competition, and here are some representative responses.

"Sharp-looking, smaller exterior, beautiful velour inside, and I wanted to see how the Lean Burn 318

V8 would perform," says a New York design engineer about his Diplomat.

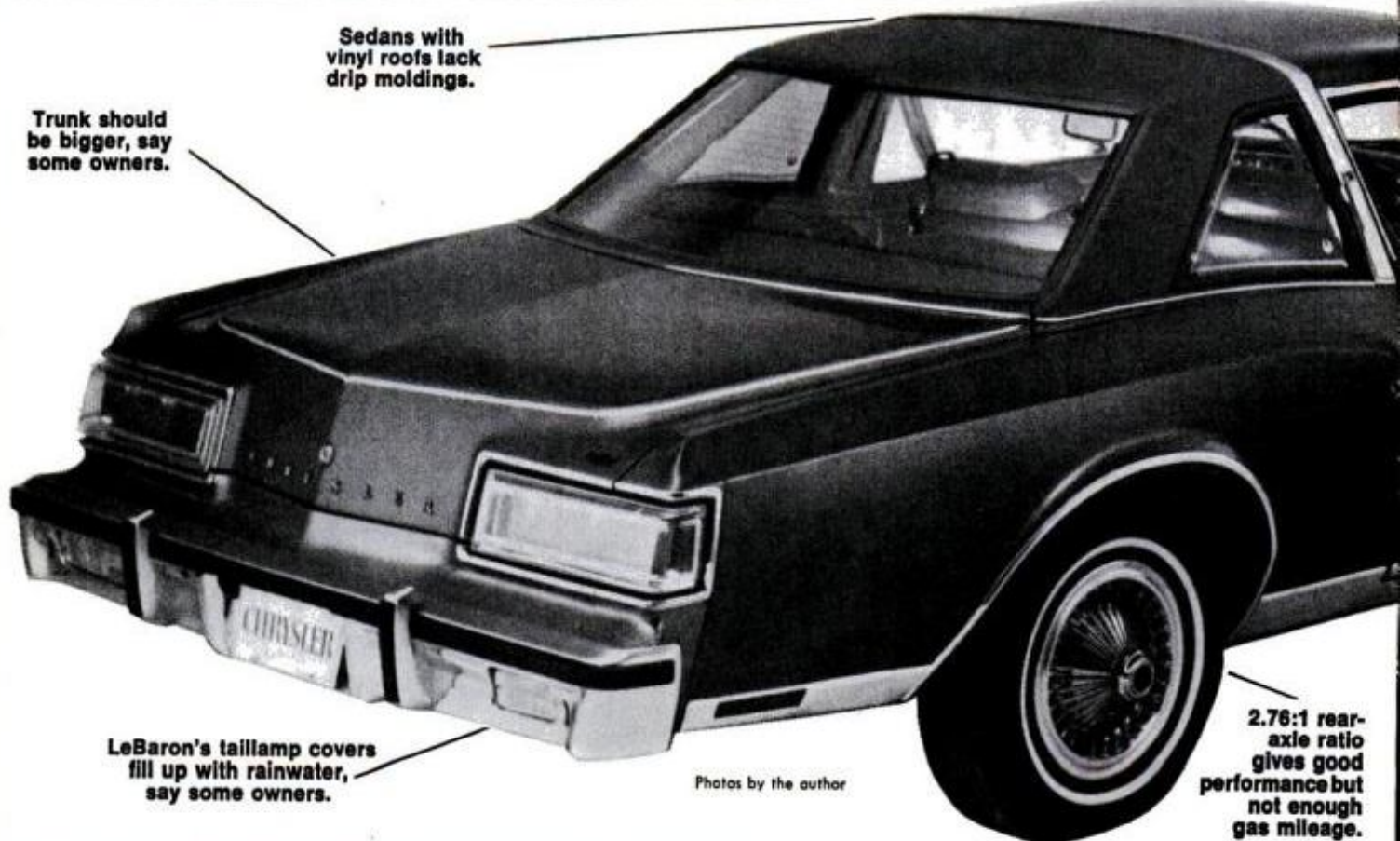
"I bought my LeBaron," says an Illinois insurance man, "because it combines economy with riding comfort and excellent styling."

An Indiana warehouseman: "Dodge just puts more pride into workmanship. The car is basically good." An Arizona sheet-metal mechanic: "The price of my LeBaron was lower than any comparable car—considering the luxury, comfort, size and fuel economy."

A remarkable number of owners selected Diplomats and LeBarons on the basis of brand loyalty. A Kentucky program analyst told about his 1966 Chrysler Newport with 350,000 troublefree miles. An Iowa chemist listed three MoPars in the family with a combined mileage of 222,000, also troublefree, and one Imperial with 286,000 miles on its clock.

The greatest disappointment voiced by both Diplomat and LeBaron owners was gas mileage. They expect more than they get. An Illinois sales manager grumbled: "I wish they'd be more truthful about fuel economy. I'm averaging 11.5 mpg at 55 to 60 on the highway, and I'm no cowboy. My

by Michael Lamm WEST COAST EDITOR



Sedans with vinyl roofs lack drip moldings.

Trunk should be bigger, say some owners.

LeBaron's taillamp covers fill up with rainwater, say some owners.

Photos by the author

2.76:1 rear-axle ratio gives good performance but not enough gas mileage.



Medallion series have 60/40 split reclining bench in leather or velour.

previous 400-cu.-in. Plymouth Gran Fury used to get 14 mpg!"

And a Chicago engineer echoes: "All the positive aspects of my LeBaron—the interior roominess, luxury, sensible exterior size, excellent finish and good engineering—are negated by the ridiculously poor gas mileage: 11.48 mpg combined city and highway."

A few more LeBaron owners voiced this complaint than drivers of Diplomats, but the figures are very close: 24.2 and 22.1 percent respectively.

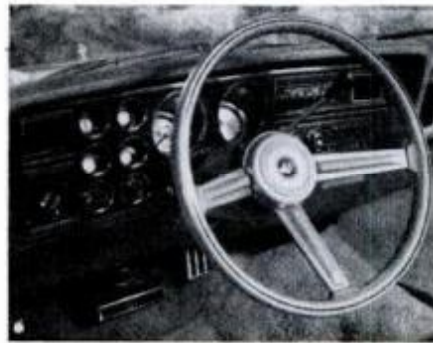
When we asked them to enumerate their praises of these cars, we received the following examples:

"I especially like the LeBaron's appearance," affirms an Indiana nuclear engineer. "On a recent trip to the West Coast, many people thought the car was a Cadillac Seville and would always comment on its looks. It attracted attention at every stop."

An Alabama teacher: "The Diplomat handles extremely well on the road, and I find the reclining passenger's seat great for long trips. I predict a long, dependable life in comparison with other cars, and the Diplomat is certainly beautifully designed."

And an Indiana housewife whose husband works for GM limns: "Our LeBaron's looks are out of this

Attractive instrumentation has LEDs for low fuel or oil, washer fluid, overheat, and insufficient charging.



world; comfort feels like riding on a cloud; moves with the grace and smoothness of an eagle; luxury at an affordable price; and we've never been treated better by a dealer. Yes—we prefer Chrysler cars; feel they're better built and better looking than GM cars."

In the area of dealer service, only 50.7 percent of LeBaron owners rated it good to excellent (lower than any car we surveyed in 1977), while the figure for Diplomat service came to a respectable 62.4 percent. "Car has to be left too long for service," observes a Minnesota electrician.

A West Virginia postal worker: "I took my Diplomat back with a list of 10 things to be corrected. They fixed two."

On the other hand, plenty of owners do have nice things to say about their dealers' service departments. A New Hampshire secretary: "My Chrysler service people have treated me with courtesy and concern. I have no complaints."

A Michigan retiree: "My 1500-mile checkup was scheduled and done on time; minor defects all taken care of."

A Colorado security officer: "They treat me and my car as if it

(Please turn to page 120)

A NATIONWIDE SURVEY BASED ON 1,112,603 OWNER-DRIVEN MILES



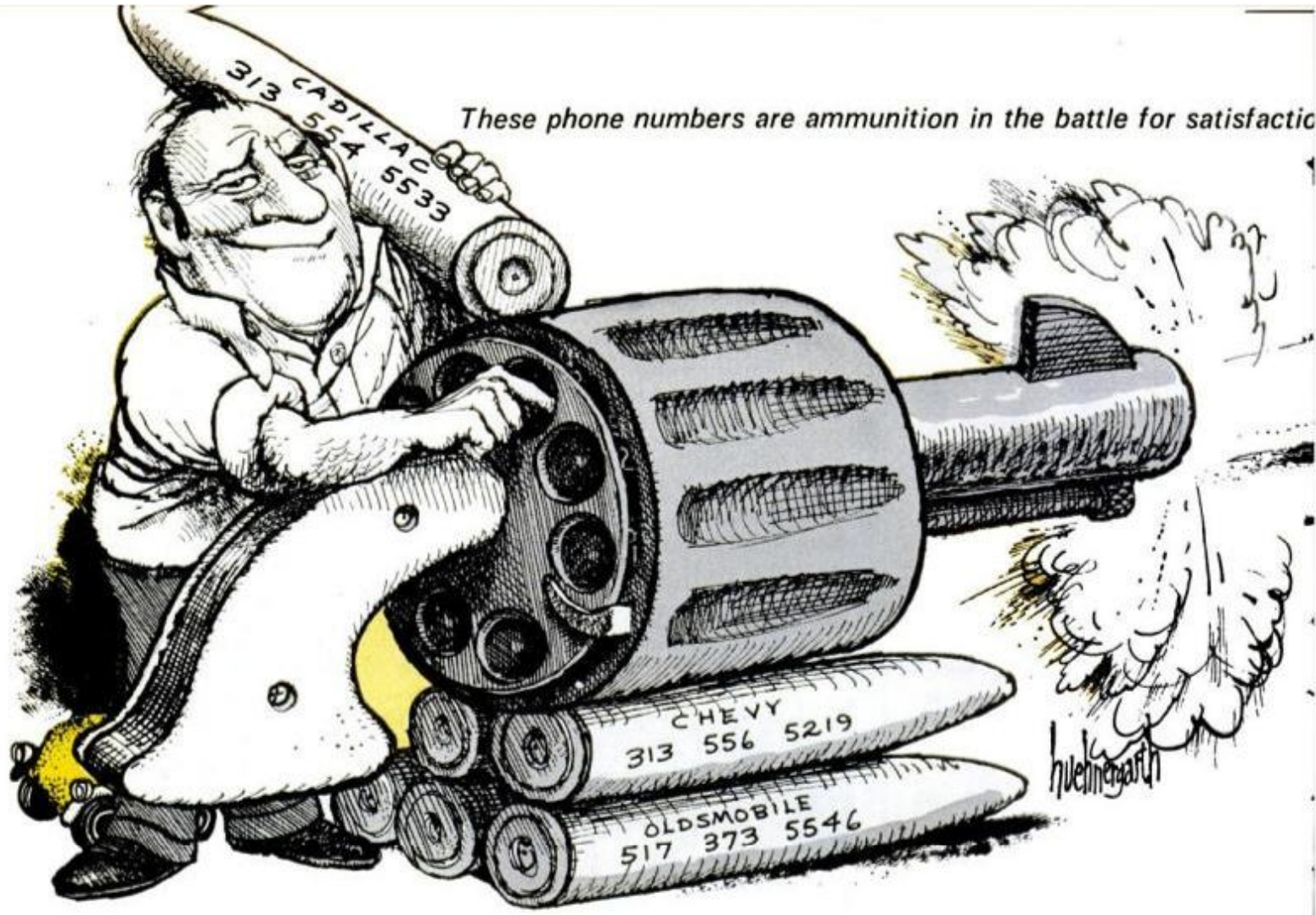
Out-in-the-open wipers don't get "ice-caved" in wintertime; optional delay can be varied from 2 to 15 seconds.

MoPar's M-cars rate high in looks, luxury, size and comfort. But owners want better gas mileage

Except for grilles and taillights, LeBarons and Diplomats are twins. LeBaron integrates sidemarkers and turn lamps in front ensemble.

New LeBaron stands more than two feet shorter than 1975 Imperial LeBaron, weighs 1340 pounds less.

Basic body pan and wheelbases are the same as Aspen/Volare.



These phone numbers are ammunition in the battle for satisfaction

GOT A LEMON?

Here's how to get the drop on Detroit

by Robert Lund DETROIT AUTO EDITOR

You say you have a problem with your car and nobody will listen to you? You've gone the route from polite reasoning to swearing to shaking your fist trying to get the thing fixed and the answer always comes up, "Sorry, buddy, your tough luck." No action, no satisfaction, you lose.

It doesn't have to be that way. If you have a legitimate gripe about your automobile—virtually anything from the way the pieces were put together to some flimflam the finance

company is working on you—you stand a good chance of winning the argument.

The trick is knowing how to proceed, the channels to follow, whom to call, where to write.

Rule No. 1 in settling a beef about your wheels is to start with the lowest rung of the ladder—the mechanic who repaired the car, the salesman who sold it, the clerk in the parts store. The powers-that-be in the auto biz are sticklers for going through

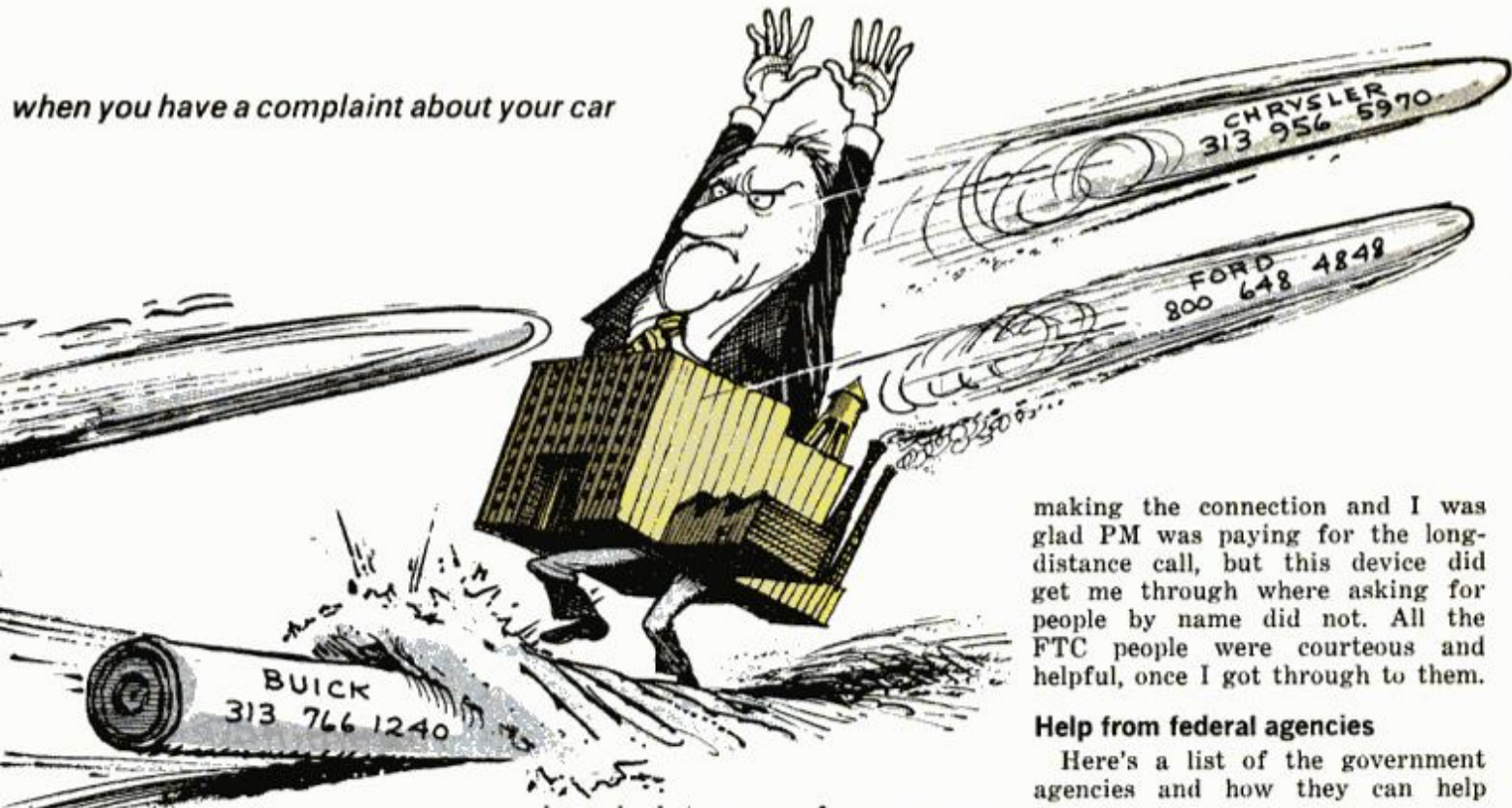
channels. If you ignore this rule, you'll run into a brick wall known as the refer-'em-back technique. The top guy will refer you back to the next in line, who will pass you down to the next and then to the next, until you eventually reach the end of the line.

Rule No. 2: Keep records. Nothing fancy or long-winded, just facts: whom you talked to, who worked on the car, when you took it in, what you were charged, when you made the phone call, when the trouble began. Don't embellish or exaggerate and steer clear of matters of opinion.

Check the owner's manual

If the car is under warranty or if you are the original owner of an older car, the first place to look for help with a mechanical problem, or a dealer's dispute is the owner's manual. Somewhere in the manual you'll find a step-by-step procedure to follow if you can't work things out with a dealer. The manuals list addresses and phone numbers of factory field

when you have a complaint about your car



offices you can contact for assistance. But don't contact a field office until you have exhausted all possibilities of settling the matter through the dealer.

If the field office can't settle the problem, the next step is to appeal to the factory. Ford, Chrysler and American Motors have central office phone numbers you can call. The Ford number is 800-648-4848. (Exception: In Nevada, call 800-992-5777.) No charge for the call.

If you call Chrysler or American Motors, the call is on you. Chrysler's number is 313-956-5970, American Motors' is 313-493-2341.

General Motors has no central office number. GM uses different numbers for its divisions. The number for Buick is 313-766-1240; Cadillac, 313-554-5533; Chevrolet, 313-556-5219; Oldsmobile, 517-373-5546; Pontiac, 313-857-1315. If you live in Canada, GM uses one number for all divisions: 416-644-6624.

Lemons are bad news

If you have a bona fide complaint and follow it through channels, you will usually find a sympathetic listener when you have worked your way up to the guy at the factory. He'll try to settle things to your satisfaction. You may not get everything you want, but you'll get a fair shake.

The exception to that is if your car is a total lemon. Total lemons are bad news. If you have a problem that isn't your fault, the companies will do just about anything to make it right—anything short of exchanging

ing a basket-case car for a new one. It may be dumb arithmetic, but they would rather spend \$10,000 trying to patch up a hopeless horror that sold for \$5000 when it was new than to admit building a clunker beyond repair. The only thing to do in this situation is hire a lawyer.

Detroit isn't the only place you can turn to if you have a problem, a dealer disagreement or just a question for which you'd like an answer. There are a number of government agencies, consumer groups and trade associations you can contact for information or assistance.

PM has compiled a list of these agencies and organizations, what they do and how they can help you. The only difficulty you may run into in contacting the groups if you do it by phone, rather than mail, is getting past the phone operator.

Trick gets results

The private organizations pose no problem, but the government outfits are a pain to reach by phone. Even if you have the right number and name of an individual at the number, the operator may tell you no such person exists.

I got so exasperated trying to reach people at the Federal Trade Commission that I finally resorted to a trick to get them on the phone. Instead of asking for Mr. So-and-So, I told the operator I was returning So-and-So's call. The operator still fumbled around

making the connection and I was glad PM was paying for the long-distance call, but this device did get me through where asking for people by name did not. All the FTC people were courteous and helpful, once I got through to them.

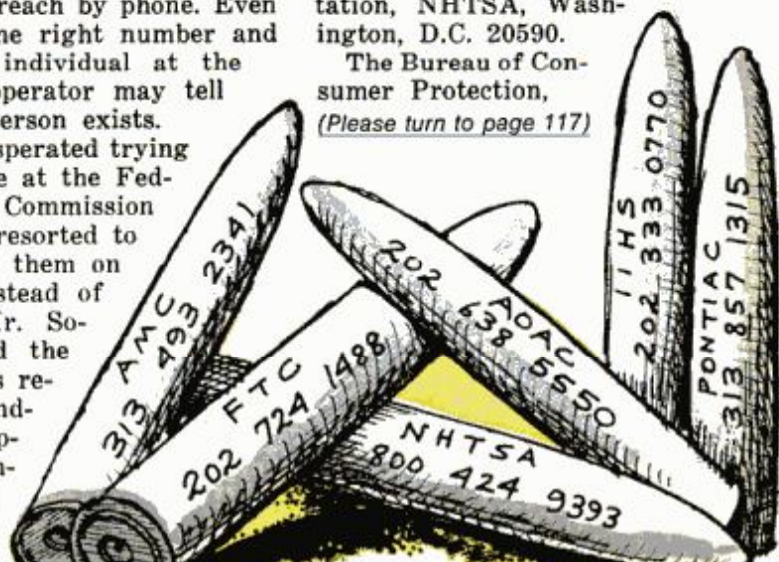
Help from federal agencies

Here's a list of the government agencies and how they can help you:

National Highway Traffic Safety Administration: Call NHTSA any time between 8:30 a.m. and 5:00 p.m. EST to find out if a car—new or used—has a safety defect or has been recalled to correct a defect. The agency can also supply information on vehicle performance and about anything relating to safety. But only on safety. Don't call if you have a problem regarding the warranty, crooked mechanic or bad paint job.

In addition to giving out information, NHTSA would like to hear from you if you have a safety-related problem. Call 800-424-9393, except in Washington, D.C., where the number is 426-0123. If you call when the office is closed or lines are busy, you can leave a message on a recorder and NHTSA will return the call or contact you by mail. The only states you can't call from are Hawaii and Alaska. If you live there, you'll have to use the mail. The address is Department of Transportation, NHTSA, Washington, D.C. 20590.

The Bureau of Consumer Protection,
(Please turn to page 117)



IT'S NEW NOW

Rollsey Rover

Deciding to "doll up" his Rover 3500S, an English doorman shortened a Rolls-Royce grille and installed it over the original Rover grille. Next came Mercedes headlights, a hood air scoop and racing wheels to complete the unusual hybrid auto. The job took more than four months to finish and cost about \$1750. The owner has already been offered almost \$9000 for his Rollsey Rover from a customer of the restaurant where he works.



Hole in bat improves your swing

You won't break any windows with this bat. Joe Martino of Brooklyn, N.Y., developed the bat with a hole to sharpen a batter's eye. If the ball goes cleanly through, it indicates a perfect swing.



Cigarette case rations your smokes

Smokers open this cigarette case only at specific times—a timer/lock can be set at 15-minute intervals for periods up to 90 minutes. Buzzer sounds when waiting time is over. About \$16. Hammacher Schlemmer, 147 East 57th St., New York, N.Y. 10022.

Eyeglass protector

Protect glasses from damage or loss with impact-resistant plastic case from Odyssey. Attaches to dashboard and floats if dropped in water. About \$6; in chrome, \$13. Available at department stores.



Boat cover snap opener

Slide fork of this tool under the most corroded boat-cover snap and tilt handle to pry the fastener open easily. It closes snaps, too. \$4.98 postpaid. Snap-Ease, 765 Eagle Ave., Bronx, N.Y. 10456.



Mickey Mouse telephone

Still a secret Mickey Mouse fan? Now you can get a Mickey Mouse pushbutton phone from Bell for about \$100. Mickey, in familiar red shorts and yellow shoes, stands 15 inches high on an 8-inch base.

FIRSTHAND REPORT

by Michael Lamm
WEST COAST EDITOR



The late, great Datsun 510 of a decade ago had a devoted following. Whether this new Datsun with a 510 nameplate will attract enthusiastic owners remains to be seen.

Every once in a while a car comes along that's totally neutral. There's nothing really bad about it, and nothing really outstanding.

One such neutral car is the 1978 Datsun 510. This new 510 replaces the 710 series, which replaced the 610 of 1973, which replaced the original and very good 510 of 1968-72.

The original 510

The first 510 was the best of the lot—Datsun's bread-and-butter Beetle battler that gave the buyer more than he expected in a \$2000 car. That 510 had four-wheel independent suspension, front disc brakes, heater, whitewalls, carpeting, two-speed wipers, locking gas cap, undercoating and several more touches that made owners smile. Besides, it maximized interior space and had a refreshing, straightforward approach to purpose and styling.

In 1973, the 510 was replaced by the larger 610, its twin mechanically but with the ohc Four expanded from 1595 cc to 1770 cc. It had the 510's independent rear suspension, a more sumptuous interior, flashier styling, and also cost more—\$2600.

Datsun dealers missed the low-priced 510 and said so, so the factory replaced the 610 in 1974 with the 710. Despite its higher designation, the 710 was smaller than the 610. It again carried over the 510 basics, with its engine later bored and stroked to 1952 cc. The 710, though, traded the independent rear

Driving the Datsun 510



Hatchback with a five-speed box has the most personality of the four body styles in the 510 series. Interior looks good, but the horn buttons on the steering wheel spokes can be tricky to use.

suspension for a one-piece axle on leaf springs. It was slightly noisier, too, and by now cost nearly \$3000.

The new 510

Well, for 1978, Datsun got the message and introduced another 510. As you've guessed, it's a replacement for the 710 but no genuine replacement for the old 510. The new base prices are: \$4093 for the two-door; \$4566 for the two-door hatchback; \$4347 for the four-door sedan and \$4683 for the five-door wagon. In California, add \$74 on top of those figures for the special emissions package.

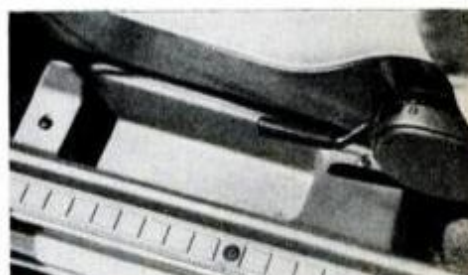
The new 510 weighs about 150 pounds more than last year's 710, has slightly less wheelbase but 7.7 inches more overall length (attributable mostly to the bumpers), and again there's no sign of an independent rear suspension.

The engine is carried over and shared with the 200-SX. A fine, durable powerplant, it's handicapped to some extent by the same disease that plagued the 610 and 710: a nagging cough when you step on the gas. I found this stumble in three different 510s I drove at the Datsun preview in San Diego, and it's a problem hot and cold.

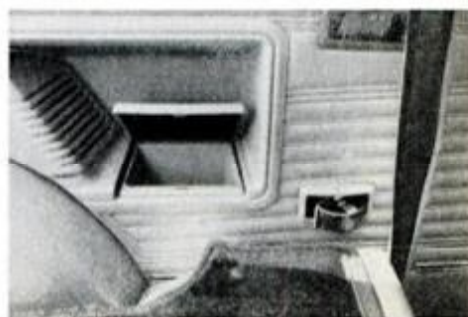
The gear ratios

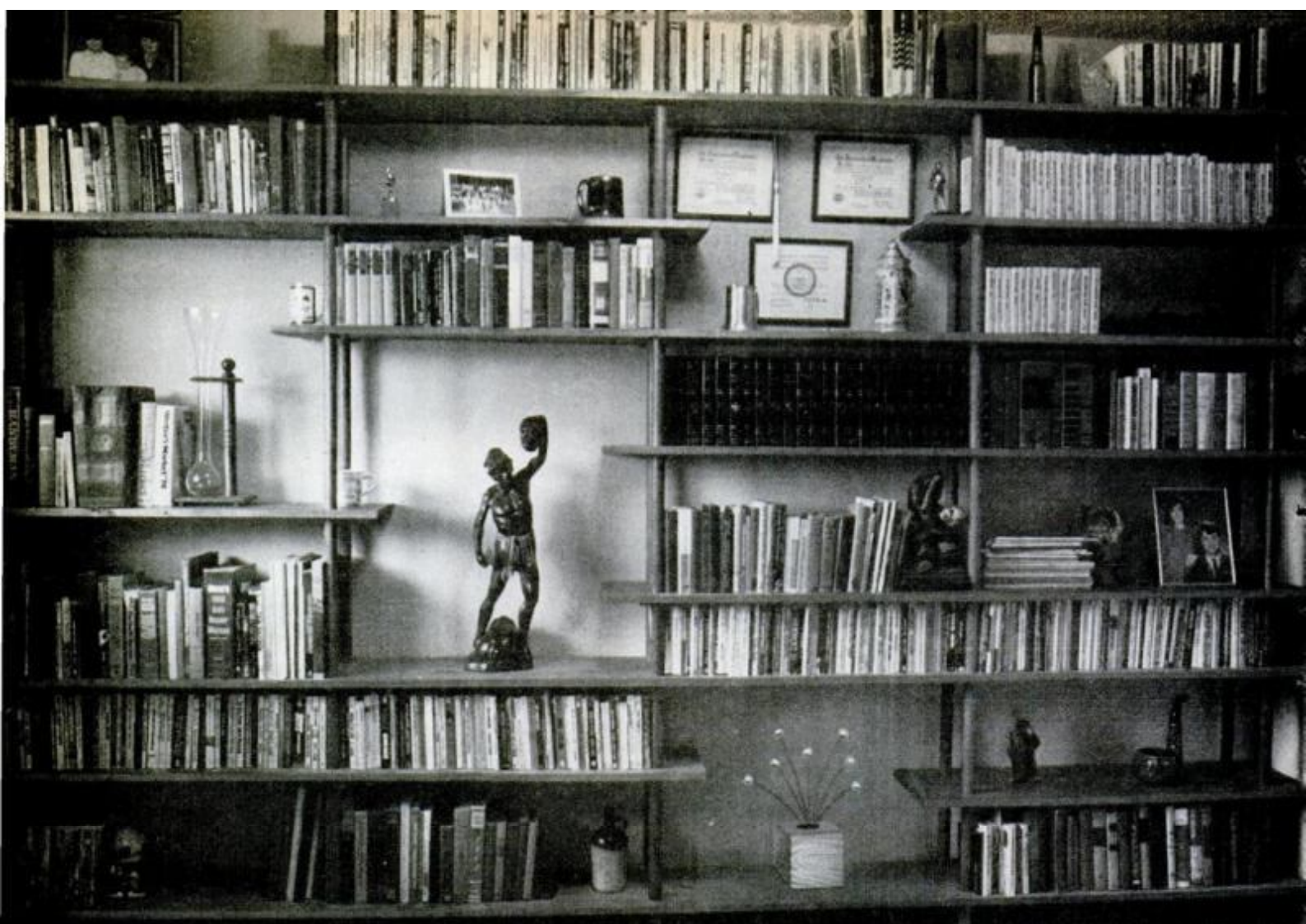
The new 510 comes in four body styles: four-door sedan and wagon plus two-door sedan and hatchback. The four-speed manual gearbox, with

(Please turn to page 124)



Good space utilization is evident in the design of these catchall storage areas: next to front seat (top) and rear (below).





Floor-to-ceiling shelving can be sized for any wall to display craftwork or organize your home library. Building technique uses closet-pole uprights and pine shelving.

Low-cost bookshelves you can build in a hurry

It's stable, versatile, good-looking—and can be used as a room divider, too.

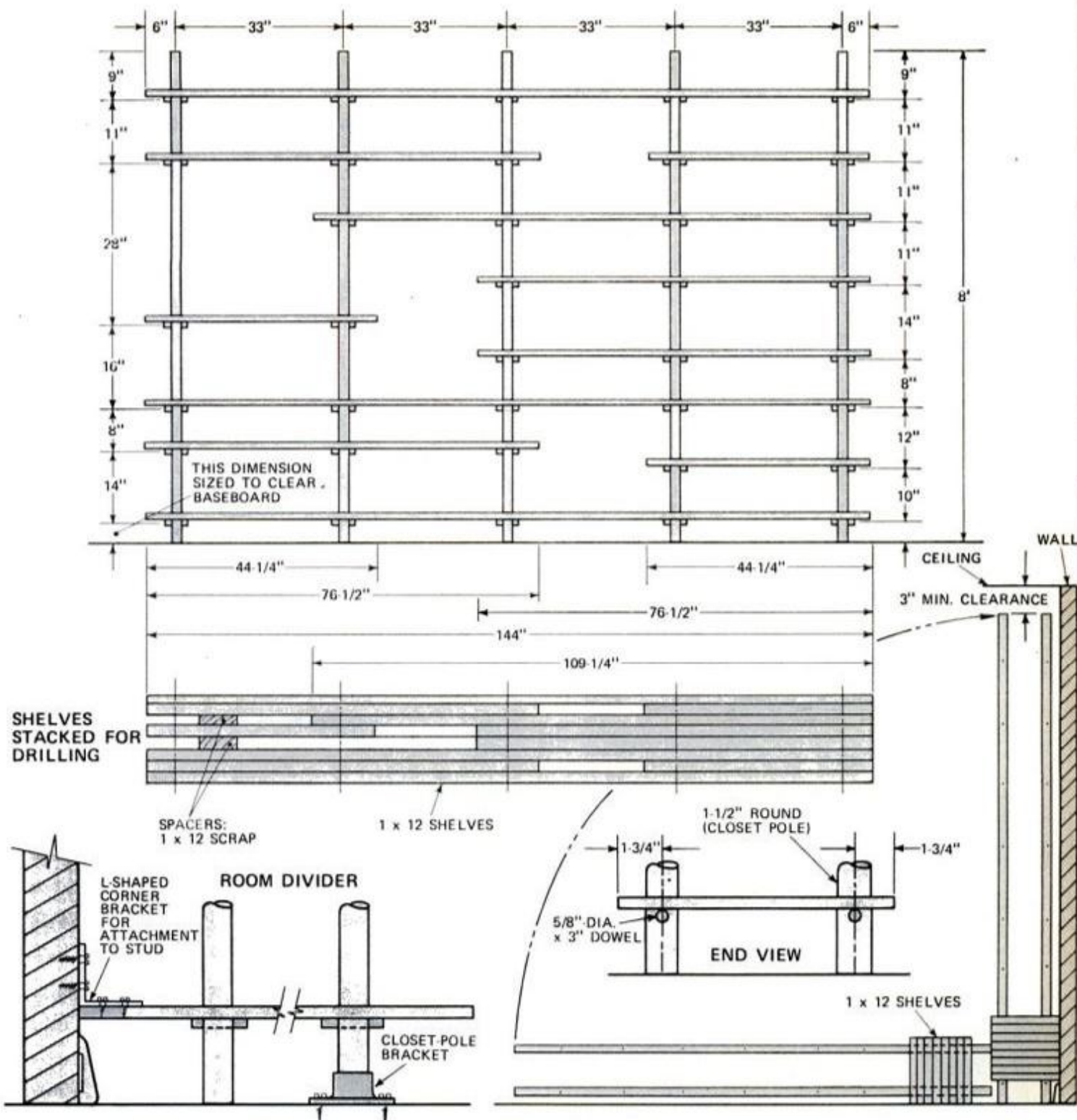
by W. Thomas Almli

In a few hours you can create a bookshelf unit to cover an entire wall for under \$60. It's easy to construct from readily available lumberyard stock and it doesn't need screws, nails or glue. Since tricky joinery is eliminated, the only tools you need are a drill and handsaw. In place, the unit is almost as rigid as the wall it's against.

To build the 8x12-ft. version shown, you will need 7 12-ft. pieces of 1x12 pine shelving, 10 8-ft. lengths of 1½-in.-dia. closet pole and 7 ft. of 5/8-in.-dia. dowel.

Cut the shelves to lengths given in the drawing (or to suit). Arrange them on sawhorses; carefully stack the boards according to eventual positions. Be sure to align all edges and then clamp the boards together firmly. Bore holes for the closet poles through all shelves at one time. This assures true holes and easy pole assembly. For speed and ease, use an electric drill and wood-boring bits. A brace and bit, how-





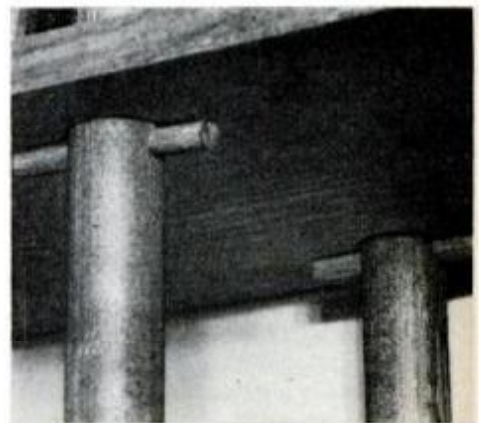
ever, boring at a slower rate, may lessen the possibility of rough edges and save sanding time. Next, cut closet poles 93 in. long for an 8-ft. ceiling and cut 74 3-in. dowels for shelf supports. Sand and finish all components before assembly.

Putting it together

Stack shelves a foot away from the wall base. Turn them on edge so their bottoms face the wall and push poles through. Insert dowel supports below the bottom shelf and stand the assembly upright. Slide the shelves up in position and secure each with dowel supports below.

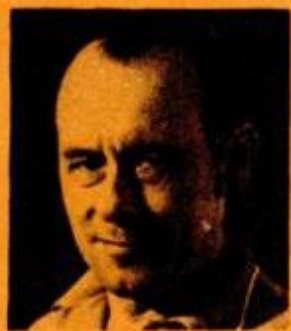
Anchor the top and bottom shelves to the wall with four 2-in. inside corner braces. If fastening to studs, you use 2-in., No. 8 fh screws in the wall and 5/8-in., No. 8 fh screws in the shelves. Where the wall is hollow, use toggle bolts. When the unit is used as a room divider, fasten one end to a wall in the same manner. Steady the outboard end by inserting the two end poles into closet-pole brackets attached to the floor. (Shorten bottoms of end uprights to compensate for the thickness of the bracket base.)

This system disassembles quickly for easy moving and stowage. **PM**



Dowels inserted through poles support the shelves and allow for quick dismantling.

10 great shop tricks from a master craftsman



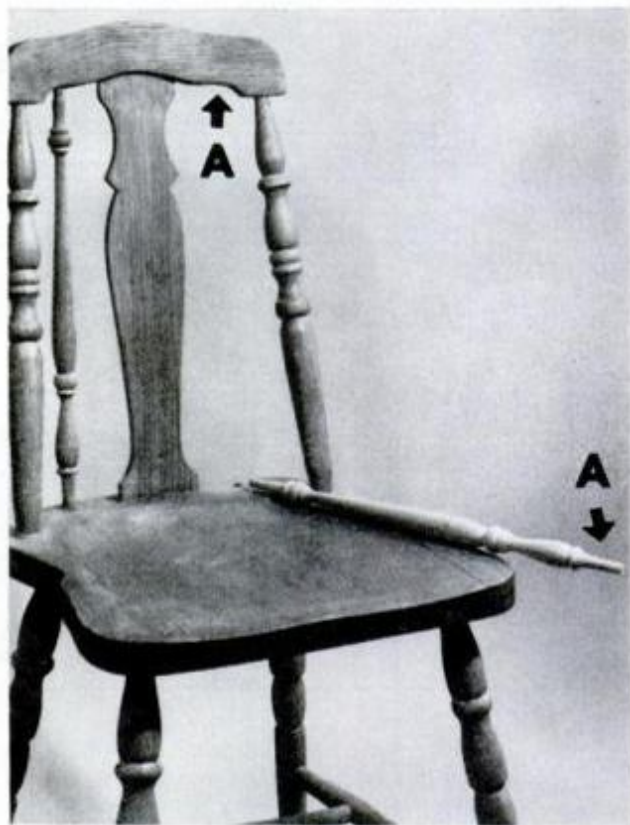
This is the second in a series of PM articles revealing solid workshop ideas used by well-known craftsmen. This month's expert, Dave Warren, is a Popular Mechanics regular who has written numerous woodworking articles. He has recently been retained by the Illinois State Historical Society to restore a barber chair that was originally commissioned by President Andrew Jackson, circa 1800.

Applying shellac filler



You can use a shellac stick on finished work to fill minor dents and crevices. Select the shade (or you can mix and melt two shades) to match the finish color near the defect to be corrected. Prepare the area by spreading petroleum jelly around the void to prevent shellac from sticking to the finish. Next use a torch to heat a blunt spatula, an old chisel or a burn-in knife made especially for this purpose. Make it hot enough to melt the shellac, but not enough to burn the finish. Hold the heated knife against the stick and drip shellac into the void. Wipe off excess shellac on the knife with a rag and reheat as required. Practice using very light strokes with a hot knife to remove any overflow of shellac.

A simple way to replace broken spindles or stretchers without spreading sound joints



Clean all waste out of the top and bottom holes. Then rebores the top hole somewhat deeper, taking special care not to pierce through the top rail. This operation may require that you use a flat bottom profile bit such as a Forstner or multispur bit.

Turn the spindle to match, but shorten the taper at the top tenon enough to enable it to slide sufficiently deep so that the other end can be lined up with its hole. Assemble by filling the holes with glue, inserting the top tenon into the deepened hole, then sliding the lower tenon into its hole. Be sure that you wipe off any excess glue immediately.



Steam away unwanted dents in raw wood

Dents that are caused by an unshielded jaw of a clamp or by a dropped tool can be corrected by driving steam into the compressed wood cells.

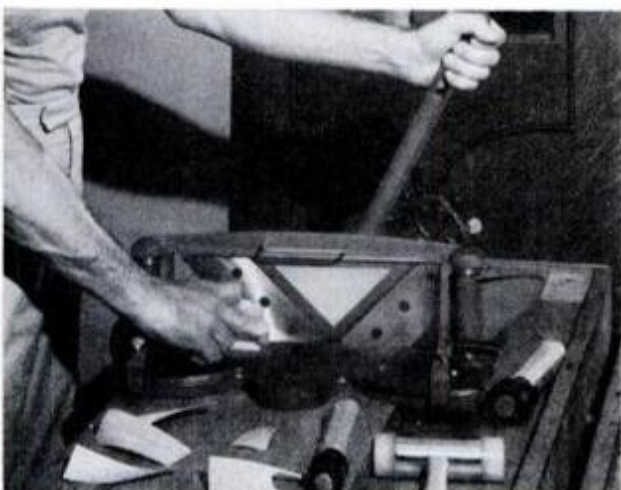
First apply a wet rag or sponge over the damaged area. Then press a hot soldering iron on this compress until the wood cells have expanded to their original shape. Let dry overnight before sanding with 150-grit paper.



Plugging big holes

If the damaged spot is too big for a shellac-stick repair, counterbore it with a Forstner or multispur bit. Then cut or turn a plug from wood of the same species and grain pattern. Glue plug in place so grain matches; when glue is dry, cut off excess and sand the plug flush.

Making veneer patches and shims



Small pieces of veneer will come in handy when you need to shim loose mortise-and-tenon joints, as well as for the repair of defects that show up in veneered surfaces. Rather than sawing off the shims and patches, my preference is for slicing them with a molding trimmer. It's best if you can work with scrap wood of the exact species, shade, grain and thickness needed for these repairs.

After you have sheared off a veneer blank, use a veneer punch to cut an irregular-shaped piece. Then use the same punch to cut out and remove an identically irregular shape around the defect in the veneer. In its place, glue in the new piece to make an invisible patch.

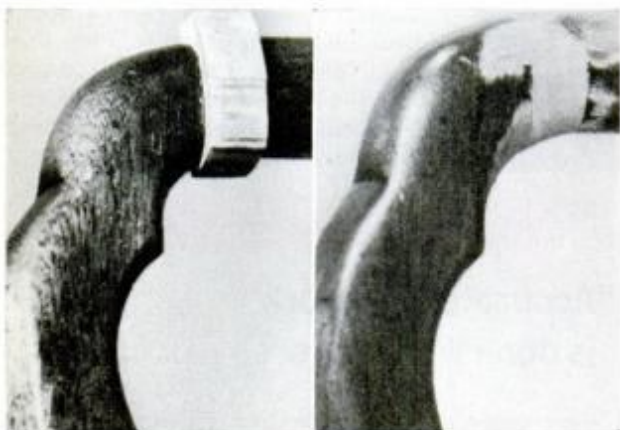
Accurate shopwork is done with mirrors



When an unwieldy operation forces you to resort to drilling or sawing with hand or portable electric tools, you can get the necessary two-point perspective on your work by mounting a mirror on the shop wall. For still closer control, mount two mirrors at 90° to one another and use two squares (or sliding bevels set at the desired angle) as guides for sighting in either direction.

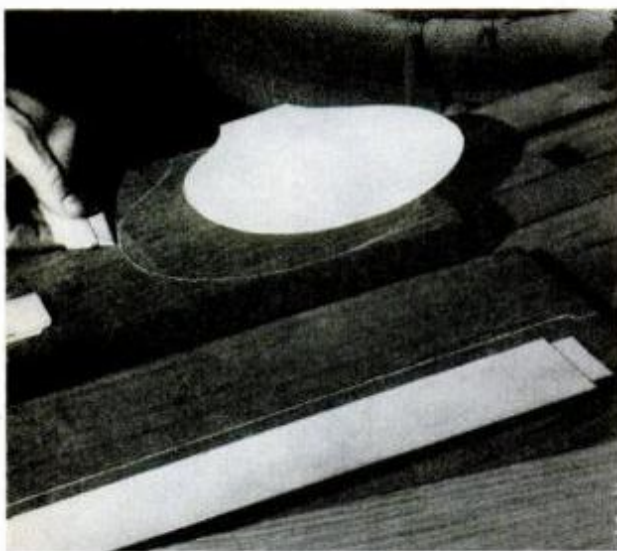
10 great shop tricks

Filling gaps with plugs



Missing wood may be replaced by sawing and chiseling out the irregular cavity so that it becomes straight and flat-bottomed. Cut a plug of matching wood and grain so that it will fit the slot snugly. Glue plug in place; when it's dry, use a rasp or chisel until it's almost flush. Then sand flush.

Marking out fine joinery



You may make a fine incised line with a knife or a scratch awl, but often a line that is somewhat less precise and easier to see is more appropriate. I prefer to use a 9H mason's pencil for such a job because the lead in it is so hard that the point cuts and doesn't blunt quickly—plus it leaves a fairly dark line on the work.

On dark woods, such as walnut or rosewood, even an incised pencil line can be difficult to see. If the work doesn't have to be too precise, I find that it's better to use tailor's chalk, which is available at most sewing supply stores.

The ideal stencil



Stencil paper and stencil board, which is available at your local paint and art supply stores, is a perfect material for cutting full-size patterns. Unlike cardboard, it has the proper weight, texture, and finish, as well as durability. Compared to an ordinary file-folder stock, stencil paper is somewhat lighter—while stencil board is slightly heavier. The stencil paper, however, has the extra advantage of being translucent so that you will be able to trace a design beneath it without straining your eyes.

Staining with dyes



You often need only a small amount of color to stain a replacement part to match. But to get the precise shade, sometimes it will be necessary to search around and buy a larger quantity than you need or to buy more than one can of stain to custom-mix a shade. With Rit Dyes, however, there is a rainbow of 35 colors. These dyes are cheap, readily available and easy to use. You get a bonus in their long shelf life.

Dissolve one or more of the dye shades in hot water. Then all you have to do is dip the piece or apply stain with a brush or rag. Dyes can shade small pieces of wood, tint spackle-filled nail holes. **PM**

WORKSHOP MINI-COURSE

WOOD CHISELS

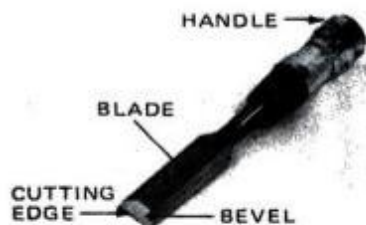
Most beginning woodworkers are understandably confused by the plethora of woodcarving tools available. That's because there are probably more tools designed for carving wood than for per-

forming any other workshop task. Experienced carpenters are aware, however, that a good set of chisels plus a quality knife lets you do almost all the woodcarving chores you're likely to encounter. The secret for getting maximum use from a good chisel is in knowing how to use it properly—and in keeping it sharp.

It is important to know that actually there should be two bevels on a cared-for chisel. The larger, more visible one is ground to a 30° angle (from the flat side) while the cutting edge is whetted at 30° to 35°. This is accomplished by lifting the back edge slightly as shown

below. When the cutting edge is honed smooth, turn the chisel over and remove the wire formed by whetting with a couple of strokes on the flat side. Don't grind a chisel every time it feels a *bit* dull. Whetting with a couple of figure-8 strokes will usually restore the cutting edge. A chisel should be ground only when its cutting edge has been nicked or damaged by striking a nail or the like.

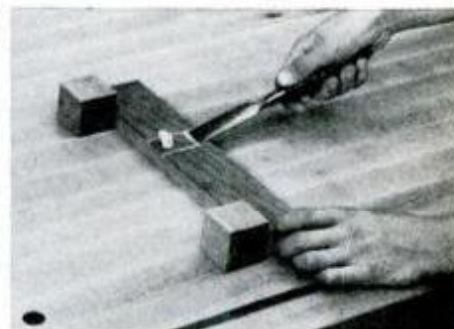
For best results, hold the chisel at a slight angle as shown. As you push the tool in this position you will get a paring cut and smoother results.—Harry Wicks, *Home and Shop Editor*



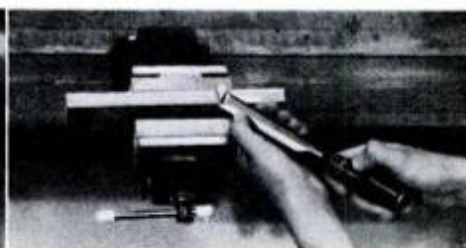
Butt chisel is designed for use with a hammer or wooden mallet (as below).



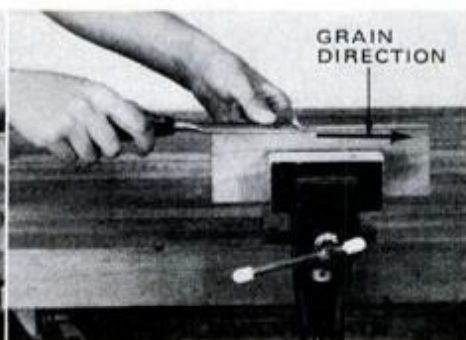
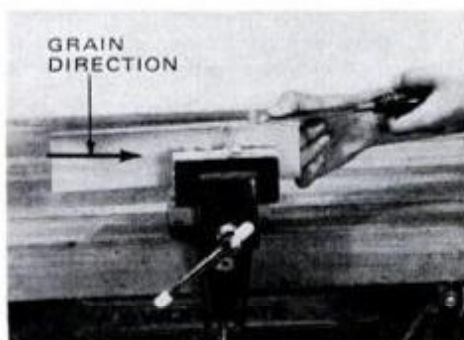
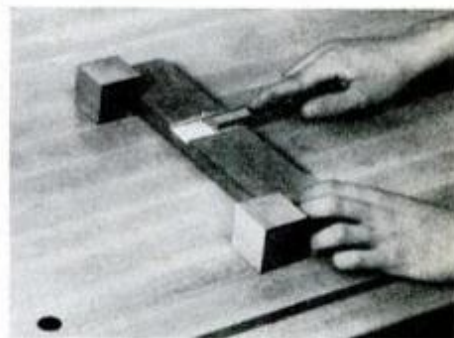
To whet a chisel, hold the bevel flat against the stone and raise the back edge slightly. Using both hands, rub the iron in a figure-8 motion. Next, to remove "wire" formed, hold the flat edge against the same stone and take a few strokes.



To chisel a dado, alternately work from both edges, start with bevel side down. Rotate chisel and use paring cuts to assure accurate depth throughout groove.



Don't steer the chisel straight into the workpiece because it increases cutting edge. The right way is to slant the cutting edge slightly in the direction of the cut.



Cutting against the grain leaves a rough surface and, in many cases, severe tears. When chisel cuts with the grain, wood fibers are neatly severed and finish smooth.



Six-chisel set from Stanley Tools comes with case that protects cutting edges.

An expert's secrets for carving lifelike birds

You have to learn as much about birds as you do about carving.

by Penelope Angell ASSISTANT HOME AND SHOP EDITOR

One woman was positive the bird was stuffed. Another viewer thought real feathers had been glued to a wood body. Phillip Zeller's lifelike bird carvings have been fooling people across the country.

Zeller devotes his time to carving the birds from basswood, a light wood that he sometimes hollows to make even lighter. Spring and summer he works in a lovely 150-year-old home in Dennysville, Me. There he and his wife Jean are surrounded by birds in the wild. The workshop and kitchen windows look out on a small pond and an old apple orchard that's a bird haven, complete with

(Please turn to page 122)



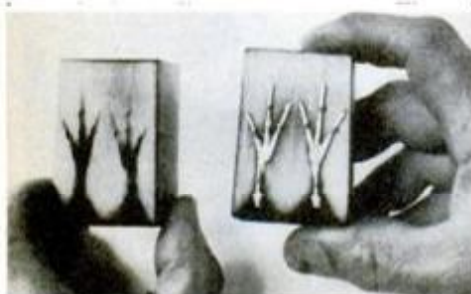
1 Zeller begins by outlining a pattern on basswood; beak runs with the grain.



2 Cut out the rough shape with a band-saw; begin to round areas as needed.



3 Carve out areas to shape the bird and draw in each individual feather.



6 To make feet, pour molten metal in wood mold held in vise. Legs are wire.



Phillip Zeller carves a 22-in.-high great horned owl. Later the bird will be mounted on a section of hollow tree trunk. The owl is now at Owens Gallery, Oklahoma City.



4 Outline feathers with a modeler's knife. Begin carving with skew chisel at tail.



5 Burn central feather shaft and barbs on both sides with an electric pencil.



7 Bird is completely burned and ready to paint. Front leg wires attach to base.



8 Real or not? It's hard to determine as this robin perches in tall grass.

Displayed in their natural environment, Zeller's birds look even more realistic. Here two bluebirds make their home on the bough of a blossoming apple tree.



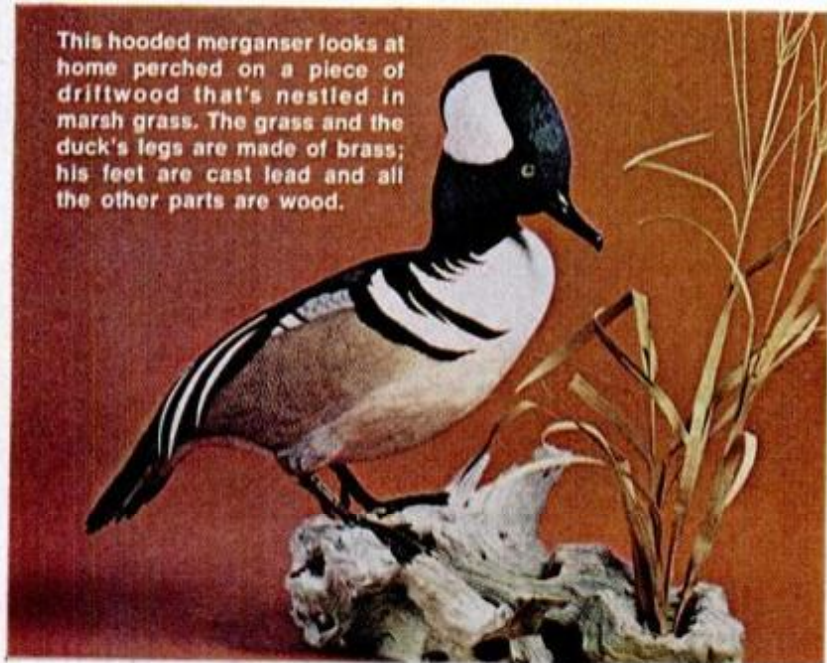
Although most of Zeller's birds are life-size, these flying widgeons are one-third actual size. The water is made of plastic resin and the grass that bends in the wind is of wood.



The wings of the colorful yellow-shafted flicker alighting on a dogwood branch are separate wood pieces joined to the body.



This hooded merganser looks at home perched on a piece of driftwood that's nestled in marsh grass. The grass and the duck's legs are made of brass; his feet are cast lead and all the other parts are wood.



There are 450 individual feathers on this purple gallinule. He feeds in a plastic-resin pond with lilies carved of wood. His feet are metal.

Nothing can beat new wall covering for changing the appearance of a room. You can have this for a fraction of the cost of new furniture—still less if you hang it yourself.

You can give a dynamic lift to a tired room with a bold-patterned or colorful covering. Try using it on one wall or in a corner to section off the area visually for a conversation or work nook.

Choosing a covering from near-infinite designs can be a pleasure, if you're aware of the types available and what each can do for you. A look at the five types of coverings shown here can help you.

When you do shop for the perfect covering, take along a swatch of carpet, upholstery or drapery if possible to make sure you get the shade you want. If this isn't possible, find the shade in a magazine color photo and take the page with you as well as your computations for the amount of wall covering you'll need.

Figuring the amount you need

Wall covering is usually sold in two or three-roll bolts that are priced by the single roll. To find the number of rolls you'll need, figure the square feet of each wall by multiplying the wall height by wall width. Then add these amounts.

Next figure the square footage of openings that won't be covered, such as doors, windows and built-in book shelves. Simply multiply their lengths by their widths and add the answers. Subtract this total from the first one to find the net wall area to be covered.

There are usually 36 sq. ft. in a

Tools to hang wall covering are, clockwise from top left: smoothing brush, water tray for prepasted covering (paste bucket for nonprepasted types), chalkline and plumb bob, seam roller, razor-knife, putty knife and paste brush if needed. Household needs are: shears, pencil, yardstick, ladder, sponge, dropcloth and work surface.



How to choose and use wall coverings

Wall coverings can hide all sorts of problems if you pick the right one and install it correctly.

by Penelope Angell ASSISTANT HOME AND SHOP EDITOR

single roll, but divide the wall area by 30 to allow for errors and pattern-matching in arriving at the number of rolls you need.

Handling old wall covering

If your walls already have wall covering on them (particularly vinyl), you should remove it, rather than risk its working loose to spoil the new covering. Strippable and fabric-backed coverings can simply be removed by loosening a corner and peeling.

To remove other types, buy a liquid wallpaper remover from a wall-covering store, add it to water according to directions, then paint the solution on the wall with a wide brush, roller or sponge. The wall-

paper remover makes the water penetrate faster to the glue to soften it. Let the water sink in, then lift the paper at a seam with a putty knife and begin to remove it. If dry spots appear, rewet immediately.

You can also remove paper with a steam rig rented at a paint store.

After the covering is removed, wash the bare walls to remove all remaining paste. When surfaces are dry, apply glue size to seal the wall pores so you can adjust the new covering easily and for better adhesion. The next day you can begin hanging.

If you don't remove the existing covering, cut the paper at corners from floor to ceiling and reglue it with white glue.

Preparing other walls

If the walls are of plaster painted with gloss or semigloss paint, wash

1 Paper wall covering often has a vinyl coat, is washable and least costly. Decro-Wall's Wallpaper in Squares makes hanging in tight places easy.





2 Foil covering brightens a room and makes it appear larger. This is washable and dry-strippable. The cost starts at \$10 a roll. Apply

foils to smooth walls—any bumps will show through—and don't use a seam roller. Both coverings in this foil duo are by Wall-Tex.

3 Cork and fabric coverings are the most expensive, but can be the most distinctive. They begin at \$25 a roll. Manufacturers suggest a

professional installation. This cork covering by Armstrong is made of tissue-thin sheets of cork on a lacquered paper backing.



4 Self-adhesive coverings must be applied patiently, but there's no mess involved. Most, such as this Con-Contact covering, are washable. From 70 cents to \$3 a yard.

5 Vinyl sheet laminated to backing is super stain and tear-resistant, good for high-traffic areas. This one from Imperial is pre-pasted; all are dry-strippable.





1 Remove plant hangers, switch plates, hardware. Turn off electricity at fuse box and pull fixtures away from the wall.



2 Measure for first strip at a door or window; the edge overlaps $\frac{1}{2}$ in. Snap a chalkline where the other edge falls.



3 Measure ceiling height. Allow 3 in. extra at the top and bottom. Cut a strip. Match the pattern and cut two more strips.



4 Hold the bottom edge; roll the strip, paste side out, in the filled water tray. Weight it down with a table knife inside.



5 Fold over top and bottom quarters of strip to center, paste to paste. Let the strip soak five minutes, then hang it.



6 Unfold top part only, position it near the ceiling with 3 in. overhang. Line the edge with a plumb line and smooth it.



7 Unfold and align bottom. Smooth with a brush. Use putty and razor knives to trim the paper at ceiling and baseboard.



8 Trim around window with putty and razor knives. Wipe off paste with a clean wet sponge and smooth completely.



9 Dip and hang the next strip. Match the pattern carefully while you work. Butt the edges and sponge off the paste.



10 A seam roller is used to secure the edges. However, on both flock and foil coverings tap seams with a sponge.



11 Wallpaper brush smooths large air bubbles. Work from center outward. Small bubbles will disappear with drying.



12 At a corner measure from last strip to corner at the top, middle and baseboard; add $\frac{1}{2}$ -in. to widest measure. Cut a vertical strip to this width; apply it overlapping corner. Measure width of remaining strip, add $\frac{1}{2}$ -in. and drop plumb this distance from corner to guide hanging first strip on remaining corner wall.

them with all-purpose cleaner and rinse thoroughly. Remove peeling or chipped paint with a putty knife and sand smooth. Fill cracks or holes with spackling compound, sand the entire wall with medium-grit sandpaper or paint on a liquid sandpaper. Then apply the size.

Clean and scrape unpainted plaster, fill loose cracks with spackling, sand smooth, apply glue size.

On badly damaged plaster walls or other rough walls you may want to apply a liner such as Imperial Wall Cover before hanging the covering. Liners are particularly helpful under foil paper which otherwise might show wall imperfections.

Cover newly plastered walls with a flat primer-sealer. When that has dried apply glue size.

If your walls are of plasterboard,

tape and spackle the joints. Hammer in protruding nails, cover with spackle and sand smooth. Prime the wall with a primer-sealer and apply glue size later.

The photos above show how to apply Imperial's prepasted wall covering. The finished room is on page 97. If you hang the nonprepasted type, use the adhesive recommended by the wall-covering maker. **PM**

Here are a pair of extra-useful shop tools—a tap wrench and multi-use saw—that you can make for pennies. Construction is easy.

Tap wrench

Adapt the measurements of this tap wrench to fit your needs. Using a hacksaw, cut a $\frac{5}{8}$ -in. steel bar into two 4-in. lengths, then drill and thread one end of each piece with a $\frac{3}{8}$ x 1-in.-deep tap for handles. *Shortcut:* Cut the bars 8 in. long for use without handles.

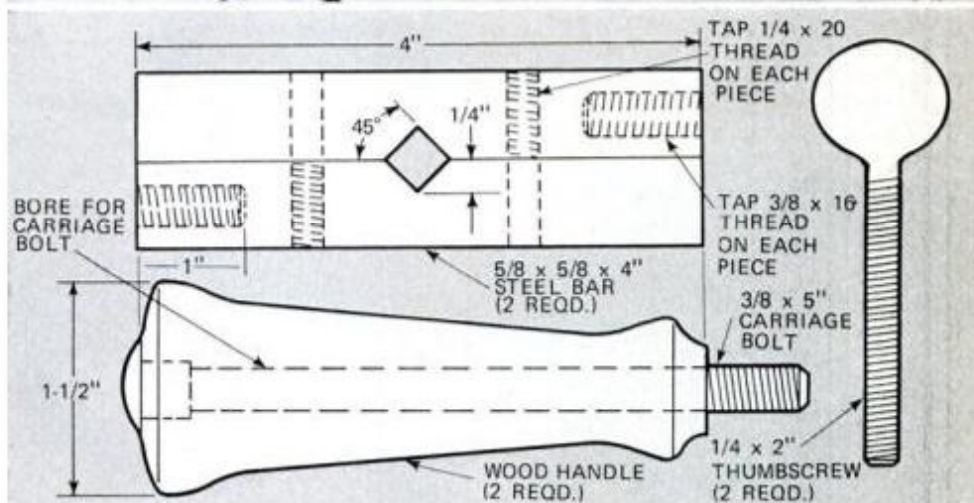
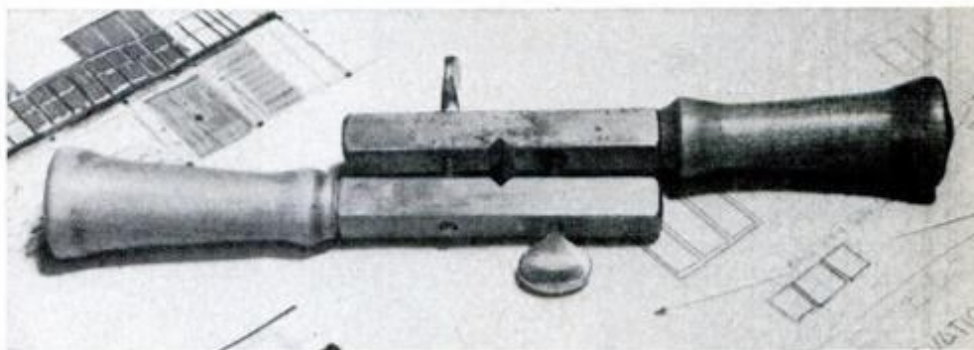
Two maple lathe-turned handles make the holder a pleasure to use and give it an old-world look. Their tapered shapes allow your hands to slide inward toward the steel to avoid bending the $\frac{3}{8}$ x 5-in.-long carriage bolts that run the length of the handles.

V-jaws hold the tap when it is in use. Make the V-notches by cutting $\frac{1}{4}$ in. into the steel, then filing them smooth. Use a combination square to scribe the lines at a 45° angle. The V-jaws need not be hardened if the tools are only for occasional light use.

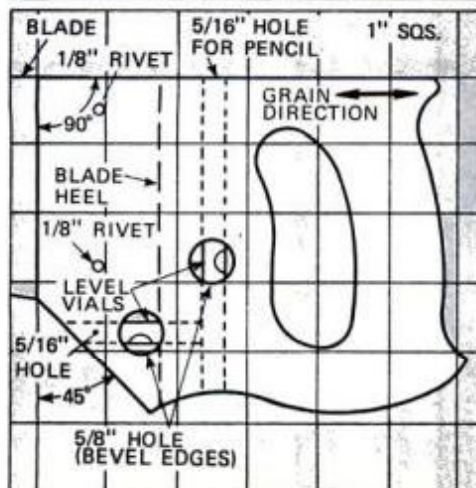
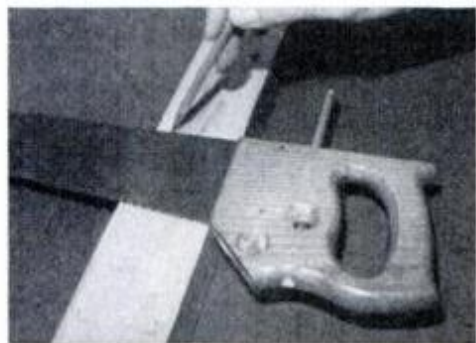
Use a pair of $\frac{1}{4}$ x 2-in. thumbscrews to clamp the bars together. Bore and thread the holes to receive the thumbscrews.

Apply several coats of a transparent sealer (such as Waterlox by Waterlox Chemical and Coating Corp., Cleveland, Ohio 44105) to the handle and steel. This will enhance the wood and prevent the steel from rusting.

Two tools you can make from scrap materials



Low-cost tap wrench holds a 1-in. wood tap with $\frac{5}{8}$ -in. square shank.



Handsaw stands double duty as a rule.

Wood threading taps and dies may be purchased from Woodcraft Supply Corp., 313 Montvale Ave., Woburn, Mass. 01801; and Conover Woodcraft Specialties, Inc., 18124 Madison Rd., Parkman, Ohio 44080. —Robert F. Bessmer

Multi-use handsaw

This tool is an especially handy one to tote in your toolbox, and for homeowners with limited workshop space.

The blade for the saw shown is from a nest of blades that came with a keyhole saw set. You could also use an old handsaw by cutting it to suit.

Trace the enlarged handle pattern on a table saw or bandsaw, slot the saw handle to receive the blade. Carefully bore the $\frac{5}{8}$ -in.-diameter vial viewing holes and the $\frac{5}{16}$ -in.-diameter vial entrance holes (of which one is the pencil hole).

Cut out the handle and chamfer all edges, except at the 90° square and 45° bevel edges, and sand smooth.

File or grind the back edge of the saw blade to assure a true straight-edge. Grind the tip and heel 90° to this edge, then scribe inch marks on the straightedge starting from the tip. Also scribe a mark at $14\frac{3}{8}$ in. for spacing between studs. Next, sharpen the blade.

After checking the fit, apply epoxy to the blade heel and handle slot. Insert blade into the handle, and make sure it is seated in the slot. Also check that the straightedge and flat of the handle are in line, and the 90° square is accurate. Make necessary corrections. Let the epoxy set, then bore holes for and install two $\frac{1}{8}$ -in. Pop rivets. Vials used in this saw are $\frac{1}{4}$ -in. dia. by $\frac{3}{4}$ -in. long. Slide them in place and seat them with plaster of paris. Adjust accurately before the plaster sets.

Apply polyurethane varnish to the handle and the tool will be ready to join or replace your other saws.

You can get vials from Constantine, 2050 Eastchester Rd., Bronx, N.Y. 10461.—Emery J. Loiselle

THESE TOYBOXES PLEASE EVERYBODY

From one basic plan you can create four different styles.

ALPHABET BOX

A personalized trunk may give your child incentive to keep his room in shape. It's a good way to show a toddler that neatness counts.

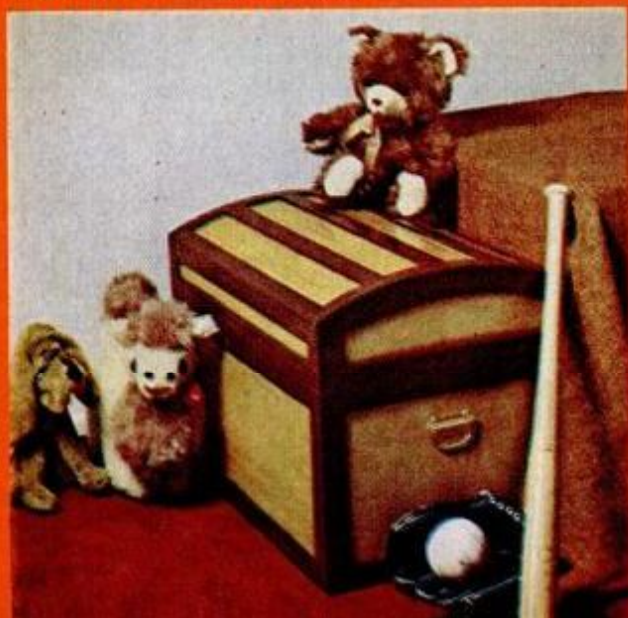
PIRATE'S CHEST

A boy's delight, this chest warns intruders to beware. It's a perfect place for him to stow away teddies and other booty.



STAGECOACH TRUNK

Here's a rugged-looking trunk that is handsome enough to grace your family room, offer handy storage for games and outdoor equipment.



PENNSYLVANIA DUTCH BLANKET CHEST

A touch of decoration turns our basic box into a dainty storage place for fabric and yarn in the sewing room.

For chest builders who would prefer putting their children's own initials on the chest, we have included the complete alphabet—in the style shown—in our patterns package. See text for how-to-order alphabet and full-size art patterns.



handles to make heaving the trunk on the coach a little easier.

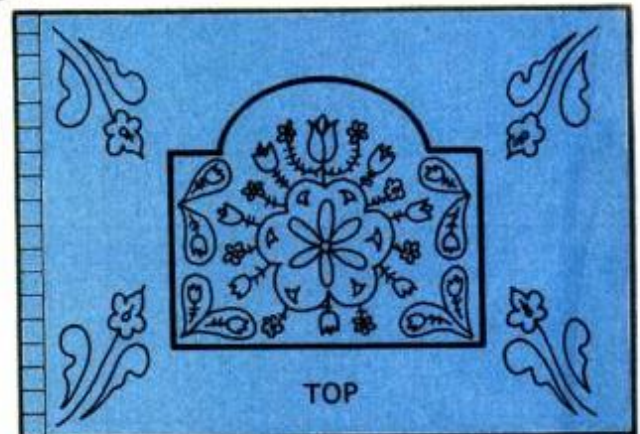
To make the Pennsylvania Dutch design, draw the pattern shown and cut a stencil on heavy paper.

Or, trace the design on the box in soft pencil; then paint it freehand. The alphabet toybox is easy to paint by using masking tape to mask off the letters.

To get a complete alphabet in the style shown, plus full-size patterns of the skull and crossbones and the Pennsylvania Dutch designs, send check or money order for \$5.95 to: Toyboxes, Popular Mechanics Plans Library, Box 1014, Radio City Station, New York, N.Y. 10019. Allow two to four weeks delivery for third-class mailing. For first-class mailing, include 75 cents extra. **PM**



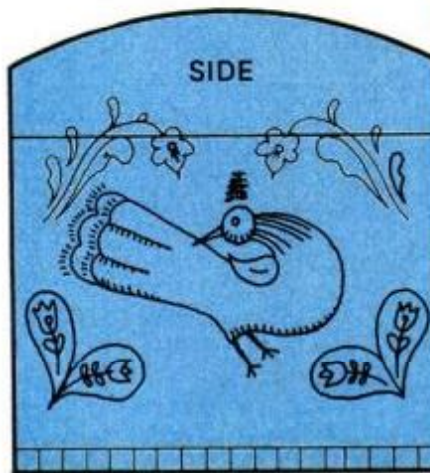
INITIALED CHEST



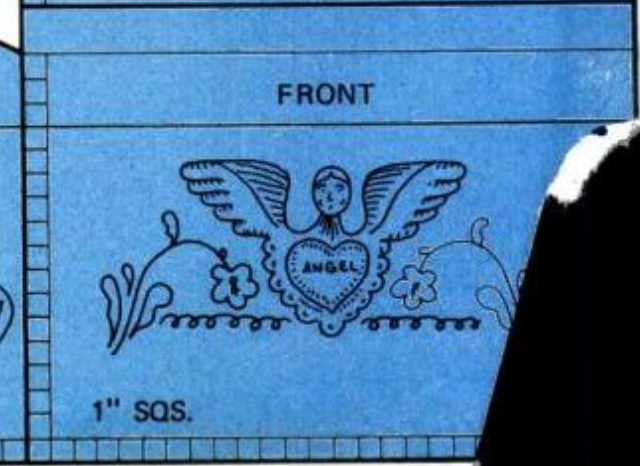
TOP



PIRATE'S CHEST



SIDE



FRONT

PENNSYLVANIA DUTCH CHEST

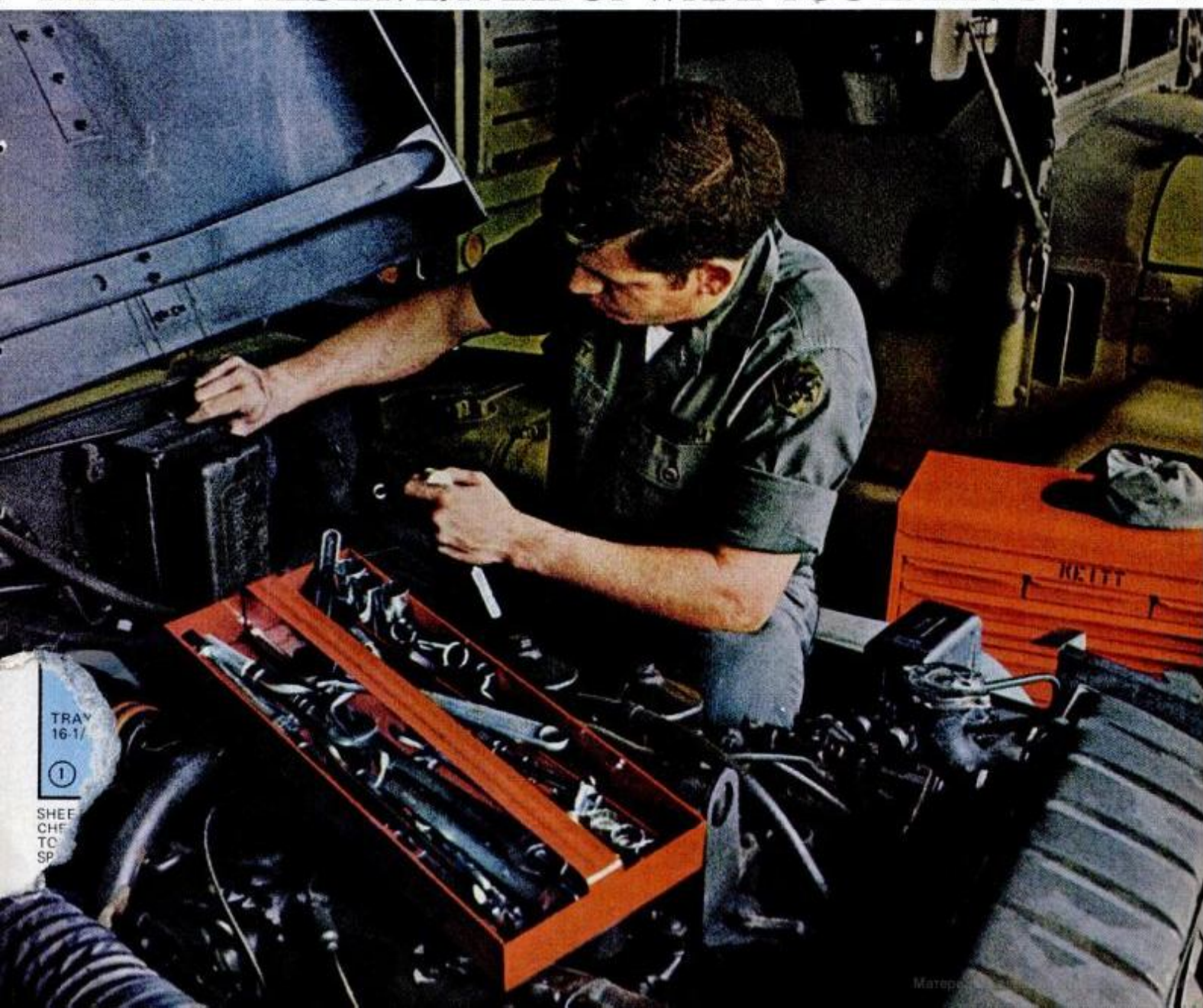
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BIGGEST MOVING JOB—ICEBERGS!

(Continued from page 50)

water suitable for drinking, agricultural irrigation and other fresh-water uses.

Icebergs are also much colder and denser than other forms of ice, meaning they melt more slowly even when brought up into warm temperate or tropical regions. Prince Faisal is so convinced of the physical and economic practicality of the "drinkable iceberg" he is already predicting that the first towed berg from Antarctica will reach Saudi Arabia waters by 1980—a scant two years away.

Faisal's plan envisions an ambitious two-stage operation. The first berg or bergs will be brought to islands in the Indian Ocean and allowed to melt rapidly in the hot sun there. Surging streams of rushing water from the melting bergs will generate hydroelectric power in the course of runoff, then the water will be pumped into tankers for shipment to the Middle East.

Eventually, billion-ton bergs will be towed directly to Saudi Arabia, moored offshore and covered with giant plastic tarpaulins to slow the melting process. This way, it is estimated it would take as much as three years for a berg of such a size to melt away. During that time, hundreds of thousands of gallons of fresh water could be drawn off daily to pour new life-giving fertility into once barren, waterless wastelands.

Floating 'refrigerators'

And there would be an important bonus, too—such a "captive" berg could also serve as a massive floating freezer to preserve perishable foods. According to Faisal, this natural "refrigerator" could store his entire country's food supplies for most of its three-year life, then another berg would be brought along to take its place.

"Mohammed's mountain" may yet come to Mohammed—to Mohammed Faisal.

There is even talk that properly placed "weatherbergs" might ultimately help to control our weather patterns—specifically in hot, storm-prone tropical areas where the icy chill of a berg could literally "cool down" a raging hurricane or typhoon by reducing the heat of the surrounding atmosphere.

All this might sound a bit fanciful if it were not for the fact that some of it has already started. Tugboats are actually towing icebergs like giant barges—"barges" that may weigh two to four million tons or more. In northern waters, they're

pulling mighty mountains of ice out of the way of endangered offshore oil rigs that otherwise would be demolished if struck by such drifting monsters.

Bergs are tricky, treacherous

What they're learning is helping to tell a lot about what can—and can't—be done with icebergs. Bergs can be cantankerous, beastly, tricky, treacherous. Like unruly dogs and children, they frequently don't want to go where you want them to go. They can flip over on top of you without warning. Often it's a question of which is being pulled by which—the berg by the ship, or the ship by the berg. There are many strange problems to be solved in the art of iceberg towing. To quote Army glaciologist Dr. W. F. Weeks, there are "some real bears."

To get a firsthand idea, I flew to Newfoundland to hunt up a hardy little band of men who have actually tried towing icebergs. In a secret experiment begun six years ago, they steamed out of St. John's one day with orders to try to grab hold of a berg and pull it—if they could.

In their official report, now released, the days that followed are described as thrilling but "harrowing." When conservative men of science use a word like harrowing, you can believe things were really rough.

Like the time a berg 20 stories high kicked up its heels right before their eyes and rolled upside down as they were ready to lasso it. When *that* happens, you feel a scare that never quite goes away.

Or the time a crew trying to tie a rope to a berg nearly got washed off the ship. For a tow-ship in heavy weather is a little like a submarine. It's a semisubmersible.

But despite the dangers involved, the need for towing icebergs away from oil-company drill-ships is becoming increasingly critical. Drillers have been probing deep under-seas off the Newfoundland-Labrador coast. At least one platform has been built, gas has been found, and Newfoundland expects oil soon.

'Iceberg Alley'

But the trouble is: All the drilling—and eventual pumping—lie smack in the middle of the world's famous ice chute—a 1000-mile stretch known as "Iceberg Alley" where the big bergs drift south from Greenland glaciers. Four years ago, 3000 bergs plowed down the Labrador Current in a hair-raising parade. Three years ago there were 2000. There will be bergs again this spring, and if even a little 50,000-ton "growler"

(Please turn to page 108)

BE YOUR OWN BOSS Earn \$8 an Hour

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Sharpening Saws & Tools



**Averages \$1500
a month!**

Retired carpenter
started spare time earning
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Foley Helps You

Start Your Own Business

First you'll receive a free booklet telling you all about the opportunities in your own saw and tool sharpening business. You can start with minimum equipment and add other equipment at some later date when your business has grown. Foley is not just interested in selling you a few pieces of equipment; it wants to help you succeed—then *You and Foley* will benefit.

Start Earning Money Now!

No lengthy correspondence courses; no volumes of instruction books to read. When your equipment arrives, a simplified Operators Manual is included showing you how to set it up; how to start sharpening saws. Within hours you're ready to start making money because the machines have been designed to do a professional job for you! It's an ideal spare time business.

Move Up to Full Time Business

Many started saw sharpening as a spare time hobby to earn a few extra dollars for some of the luxuries in life they've always wanted. Then they discovered that they could make more money per hour and per week than they did on their regular job, so they quit their job and became full time sharpening experts. They've become their own boss, but equally important, they have established security for their family—No one can fire them!

No Franchise Fee!

You are starting your own business. You don't have to pay a Foley franchise fee for the privilege of going into business for yourself. Foley has developed the right equipment for a variety of sharpening needs and as you build your business, you make the decision as to what you need to satisfy *YOUR* customers. And, Foley is always no further away than your telephone. You can call Foley any time you have a question on the Free Long Distance telephone—It's another reason you can be assured of success when Foley helps you get started.



Father and two sons discover saw sharpening business ideal because of low investment and almost no operating cost.



L.A. of Virginia works 2 or 3 hours a day and averages \$255 a month. "Don't need to advertise because regular customers keep me plenty busy."

Sharpen All These

You can sharpen combination (rip and crosscut) circular saws, band saws, hand saws, crosscut circular saws—and do a perfect job every time without experience or special training on Foley equipment.

**Almost
Everyone Can Be
A Customer**

Almost every home owner has saws and tools that need sharpening; all kinds of industries use saws and need to keep them sharp. Look around your community. Here are typical customers other Foley Associates tell us about:

- Contractors and Carpenters
- Cabinet Shops; Furniture Makers
- Mobile Home Manufacturers
- Lumber Yards, Loggers and Mills
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BIGGEST MOVING JOB—ICEBERGS!

(Continued from page 106)

should hit a drill-ship on station, the results could be disastrous. For drill-ships have 65-man crews and cost \$50,000,000 each.

With a new oil field in sight, it suddenly dawned on two top oceanographic engineers that science knew little about iceberg dynamics. Yet the world is moving into the Arctic. Drs. Angus Bruneau and Robert Dempster both worked for Newfoundland's great "Iceberg University." What worried them was the thought of all those drillers out there: sitting ducks. They were concerned about protecting Newfoundland's promising new oil industry and the riches it could bring.

"Iceberg University," site of another recent world ocean conference, is becoming a center for ice research. Its real name is Memorial University and from its campus on the windy hills at St. John's scientists can actually see icebergs streaming down the "alley."

Their respect for the toughness of bergs rose one day not long ago when an enormous Greenland monster blocked St. John's harbor. A howitzer was set up to blow it apart. "Boom," went the cannon. "Splat!" went the shells, bouncing off the ice. "All they produced was a little black splatter," says president Jan Furst of Nordco, a remarkable Newfoundland ice science "think-tank" group.

Oil men back plan

Drs. Bruneau and Dempster took their worries to the university, then to the government, then to oil companies licensed to explore the offshore field. All agreed something should be done—and fast. The oil men happily agreed to pick up half the tab—\$500,000—needed to mount a quick expedition. To do the job, Nordco was formed, headed by engineers and oceanographers. Credit for backing the tests goes to several oil-company members of the Eastern Petroleum Operators Assn. Meanwhile, another ice research group, C-Core, was formed.

Many questions needed answers. Everyone had heard rumors that sailing ships once towed icebergs up to Peru—a report that leaves most modern sailors skeptical. They'd heard suggestions, too, that nuclear submarines might try to push bergs—an idea that raises the horrifying question of what would happen to a submarine if a big berg suddenly turned on it—literally—rolling over on top of it.

And out in California, engineers were proposing to use helicopters to

"wrap" icebergs in sheets of plastic to reduce melting during the 8000-mile tow up from Antarctica. This, too, raises doubts. "Have you ever," asks the Army's Antarctic expert Dr. Weeks, "tried to handle plastic at 10 below zero?" And more puzzling questions: What happens if a hurricane should come up? Suppose a berg tips over: Will it pull the tow-ship under? For that matter, how do you grab hold of a slippery berg, anyway?

The first berg encounter

With drilling about to start, the first expedition was readied June 1, 1971. The Nordco think-tank group quickly chartered the husky Arctic supply ship *Percy M. Crosbie* of London. Others would sail later. But to the *Crosbie* went the first honors of doing battle with the shimmering green and pink dragons from Greenland.

Aboard when the *Crosbie* sailed were Bruneau, Dempster, a university crew, and a tall, husky oceanographer named Colin Langford, former ship master. He was project boss—a job that would prove, within hours, to be a headache.

Sailing north from St. John's, the scientists looked over the strange mass of ropes and wire designed to lasso the first berg. The pulling would be done by a monster braided polypropylene hawser, 8 inches thick. But to snare the berg, there was a steel net 600 feet long to go around its backsides.

The idea was to move up dangerously close to a berg, drop the steel net overboard with buoys to hold it up, and gradually pay it out while the ship steamed around the berg. The net was made of two-inch-thick steel cables that were linked together with chain crosspieces every few yards.

Once the net was around the berg, the *Crosbie* would snatch up the floating end of the chain and tie both ends to a rope bridle. This, in turn, would be tied to the 1000-foot tow-hawser.

Tipped off by the International Ice Patrol where bergs were, the *Crosbie* poked cautiously through fog and the next day, on radar, spotted her first big game, an 80,000-tonner about 400 feet long and 200 high. It was drifting south.

Two dangers

The *Crosbie* is a tough little ship of 2800 hp. Now she cut to dead slow. When the crew felt the sudden chill of ice, the engines were stopped. In eerie silence, she drifted until a cry came down from the

(Please turn to page 110)

(the BUCKLE CONNECTION)

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BIGGEST MOVING JOB—ICEBERGS!

(Continued from page 108)

crow's nest: "Ice ahead!" Slowly, the ominous shape emerged.

There were now, the crew knew, two dangers. Unlike Antarctica's flattop bergs, Arctic bergs are "rollers": They keep tipping upside down. A berg that tips toward a ship can smash it. But seven-eighths of the ice is underwater, so if the berg tips the other way, great reefs of ice come up to spear a ship or even lift it out of the sea (this has actually happened).

The other danger was "calving"—splitting off of towering ice pinacles that could crash down to become smaller bergs (calves). To test for calves, the ship, at close range, cut loose with long whistle blasts that might loosen cracked masses. Then she moved back a mile to wait for the weather to clear. No ice fell.

When the *Crosbie* moved in again, all eyes were on the ice above. Some watched for the sudden flight of sea birds—a sure signal of trouble. All ears were alert for the booming roar—like cannonfire—that would mean icefall.

Close up, there were weird sounds: the constant small popping and cracking of strains, occasional echoing bursts like rifle fire—more strains—and the curious effervescent sizzling of the water. For melting bergs release billions of age-old cells of compressed gases. Always there was the crash and boom of waves breaking on the berg's own ice-beaches. The ship danced in the backwash chop.

There was one worry: a huge tower of ice, estimated to weigh 7000 tons, that could split off and smash down on the helpless *Crosbie* at any moment. Cautiously, the *Crosbie* ventured into the very shadow of the berg and circled it, slowly streaming out the ropes and net. This took an hour. Nothing happened. The tow-hawser was attached and the engine went slow-ahead to pick up the strain.

Tense moments

Facing aft, all hands watched the cable tighten. (Some tow-ships actually have rear-facing wheelhouses so bergs can be watched). The rope and net could be seen adjusting themselves evenly around the berg's waist, near the waterline.

A snapping tow-hawser is a terrible thing. Its backlash has killed and maimed many men at sea. And so a careful watch was kept. Periodically, a few inches more were paid out to change the wear point where the hawser came in over the

stern through a steel guide. Attached to the hawser was a digital strain meter which now held all eyes. Slowly, the strain rose to 10,000 pounds, then 20,000. When it topped off at 30,000, the engines were full ahead.

Surging high on the seas, the *Crosbie* fought to move her load. This first berg was not large; even so, 80,000 tons is a monster weight to be pitted against a little 2000-ton ship. To tell if she were making headway, the *Crosbie* relied on radar impulses hurled back from transponders (echo-bouncers) installed on the coast a dozen miles west.

By constantly reading the radar echoes, the crew could fix position and see how fast they were moving the berg. They weren't moving it at all. Then, without warning, came the icefall. The ship surged. The captain ran for the bridge. His ship had been jerked backward.

High on the berg, that 7000-ton tower had toppled, falling on the net and cable. Incredibly, they held. But this in itself was a danger. The ice had fallen on the far side of the berg. Suddenly relieved of its weight, the berg now rocked toward the ship. A berg capsizing forward could pull the tow-hawser under and possibly sink a ship by the stern.

Moving but not moving

Two men with axes made ready to chop the hawser. Then the berg stabilized and fortunately the emergency release was not needed. But a radar bearing showed the berg still had not moved. It became apparent what was happening. While the berg appeared to remain stationary, it was actually being pulled south on the Labrador Current at one-third-knot speed, while the tug was pulling north at the same speed. "So we knew that even though the berg stayed there," Langford says, "we were holding it against the current. In effect we were towing it at one-third knot."

The berg was cut adrift and thus ended the first towing test—not dramatic but still significant. It had shown that men in little ships really can tow an iceberg—if they keep everlastingly at it.

But the real trick would be to learn to tow across the current or go with it: in short, to use it to help nudge bergs away from drill-ships, then turn them loose to melt in the Atlantic.

The upside-down berg

June 6 brought a bigger berg, nicknamed "St. Anthony." In a scary moment just as the ship moved in,

(Please turn to page 112)

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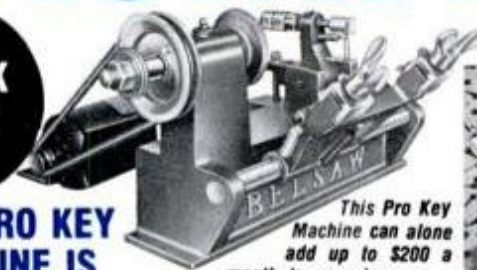
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BIGGEST MOVING JOB—ICEBERGS!

(Continued from page 110)

this one rolled upside down. Eventually, it, too, was taken in tow.

But now came another unsettling discovery. Try as they might, the *Crosbie* crew couldn't get it to go where they wanted. The trouble was caused by three strange forces: 1. Deep crosscurrents which pulled at the berg's underbody. 2. "Ruddering" (or steering) by curves in the berg's underwater ice. 3. The odd thing called the Coriolis effect.

When a tug tows a berg, the turning earth keeps slipping out from under them. As a result, bergs in the north keep turning forever to their right. This is what is known as the Coriolis effect.

Pull as she might toward the east, the *Crosbie* found her berg kept going south. Nothing was going to change it.

And the crewmen were learning that all these forces sometimes cause bergs to cavort outlandishly around a tug in circles. "They waltz right around you," Langford says.

When a berg actually overtakes its own tug, the latter is in great danger. Stretched on a taut towline over the side, tugs tend to go "in irons"—just as in the old familiar sailing term. They can't steer, can't turn, can't back up or go forward. What happens? Before they can escape, they may be tipped over sidewise—and sunk. It takes skilled handling to control a tug when a berg overtakes it, passes ahead, then crosses over to the other side.

Hours later this berg, too, was released. It never went where it was wanted. But it had been towed.

Ship bounces like a yo-yo

June 8 brought "Annette," a real son-of-a-gun. Before 300,000-ton Annette got through with the ship, she had yo-yoed it back and forth, letting it advance, then drawing it backward. A strange back-and-forth wave developed, with 15-minute periods: The tow-hawser was acting like a rubber band, or a yo-yo string.

Adding insult, Annette now towed the ship backward for hours at .6 knot. Then she began calving—filling the sea with baby bergs which—baby or not—can be deadly if you hit one. In real danger now, the ship cut Annette loose.

"We were glad to get rid of her," Langford says. But even so, Annette had taught the crew they could direct a berg around an oil rig even when being towed backward—by at least nudging it away from its collision course.

After this, the crew found they could forget the cumbersome steel net. On another tow, they simply tied a rope-lasso around a berg and pulled. Suddenly a chunk fell off. The berg rolled dangerously away. Under the ship, the water turned a weird, bright green: As the berg rotated, its vast underwater ice reefs were coming up to smash the ship. Just then the berg rolled back. The bright light in the sea went out: The ice reefs were sinking out of sight again.

All this time the single rope held.

In three weary weeks, the *Crosbie* towed and released seven bergs, the largest weighing 400,000 tons. Her crew sailed home exhausted and awed—but triumphant. Their report told the oil companies they could, indeed, protect their wells.

Cut and run?

Thanks to Nordco, nearly a dozen oil companies now are using "ice-berg tugs"—and simple one-rope tows—to protect their rigs. These companies include the big Eastcan Group: Gulf, Amerada, Aquitaine, Agip, Sun, Topna and Eastcan itself. The photos in this article, showing some of the oil-company tows in progress, were taken for the Eastcan Group by Nordco's research photographer Dougall Dunbar. (Other companies now using tow-ships are Mobil and British Petroleum.)

Adding their experience to Nordco's, here is what is now known about berg-towing:

Bergs are formidable, crazy, unpredictable, rebellious. "You never know," says photographer Dunbar, "whether you are towing the berg or it is towing you."

Special "thruster" propellers help ships escape disaster. Some hurl powerful water jets through nozzles in the ship's bow, stern and sides. Others are suspended under the hulls. On one tow recently (see sketch at bottom of page 47), thousands of tons of ice collapsed above a tow-ship. On the bridge, the captain threw his engines full ahead. Twin screws responded. But it was the portside bow-thruster that spun the ship on its heel—to escape.

When bergs are on the move, the crew of a drill-ship or oil well should spot them by radar 20 miles away. "This gives you several hours to decide," says Dr. Bruneau, "whether to cut and run, or bend the drill stem, or call a tow-ship for help."

It's a critical decision. Drill-ships are not easily moved. Some anchor on chains, with sonic quick-release links for emergencies. But getting free of that drill, which may be 300 feet deep in earth under 300 feet of

sea, takes hours. Some drill-ships are "dynamically anchored" by a remarkable computer system—no chain anchors needed. Acoustic transponders on the bottom feed continuous signals to the ship's computer. It, in turn, starts or stops from 8 to 12 "thrusters." These, churning the water in different directions, keep the ship exactly over its drill, even in high seas.

Dodging icebergs

Such a ship can cut and run sooner than one with anchor chains. And in a close brush with a small berg, it can even dodge to one side, *bending* the drill-stem until the berg goes by.

In a recent case, a 4,000,000-ton berg came south on the current within three miles of a big drill-ship. First, a tug pulled it *west*. But the berg grounded near the Labrador coast.

To leave it there would endanger the drillers if a storm should break it loose. "So the next day we tried pulling it *east*. We were astounded when it came free off the bottom," say the crewmen.

But now it was a race against time. The tow-ship had to pull the huge berg several miles across the

Labrador Current before the current could sweep it down on the drillers. First, the tow-ship had to overcome the berg's own inertia to start it moving. Next it had to fight the current pulling the berg southward. And finally it had to offset that fiendish earth-spin Coriolis force which actually kept trying to turn the berg toward the drill-ship.

Unbelievably, the whole operation took three days. But it saved a costly drill-ship, and it also saved nearly \$250,000 in working time—for it costs \$80,000 a day just to run a drill-ship.

How can a relatively tiny tow-ship cope with a berg weighing up to 100,000,000 tons? Finding and using the right underwater currents helps, *for currents have a lot more effect on bergs than wind*. And in the case of a hurricane, big bergs offer shelter to tow-ships—for they remain almost as unmoved by wind as an island.

But even so, how can a 2000-hp ship like the *Crosbie*, or even the proposed 100,000-hp Antarctic super-tugs, cope with the kinetic energy of enormous bergs?

The answer is surprising. The university's Dr. Ross Peters figures the kinetic energy of a 4,000,000-ton

berg moving at 1/2 knot as 88,000,000 foot-pounds or about the equivalent of a 160-car freight train rushing at a mile a minute.

It doesn't take much effort to turn such a train on a curve, and since a berg floats freely, it takes surprisingly little horsepower to move it. To move such a berg in calm water, without wind or current, can call for as little as 225 hp.

Close calls but no crashes

Such is the curious new world of iceberg science. More than 100 icebergs have been towed so far. Have there been any collisions? If so, no serious ones. There have been close calls, but thanks to Nordco and the men of "Iceberg U." a way has been found to protect what may soon be one of the world's big oil fields. The year 1977 was mysteriously "quiet": Only 100 icebergs came down for reasons no one yet understands.

But 1978 may see them coming by the thousands again—including many that *should* have come in '77. It may be the first big test for iceberg movers of the north. And it just also might be the first big test for iceberg movers of the south—a mountain could be finally on the way to Mohammed. **PM**

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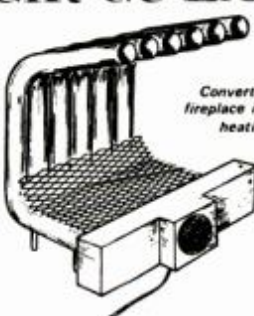
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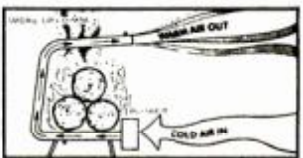
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HANG ON TO THAT BALLOON-TIRE BIKE! (Continued from page 52)

new. There's now a devoted clique of restorers who spare no expense in putting their mounts back in shape. They've been holding concours and swap meets for almost two years now, and there's even a newsletter devoted to the hobby. Called *California Balloon Bike & Whizzer News*, it's available for 50 cents a copy from Box 765, Huntington Beach, Calif. 92648.

Ironically, too, several dealers are back into big-tired bikes and accessories. Gertrude Vorgang, owner of the Pedal Pusher shop in Newport Beach, says, "I won't touch a 10-speed anymore." Gertrude specializes in vintage bike accessories and often finds her shop crammed with customers.

Another dealer, Larry McNeely, owns Recycled Cycles in Huntington Beach, Calif., the largest and oldest of vintage bike shops. Larry's inventory includes nearly every sort of vintage bike, and he also specializes in Whizzers. The old Whizzer Co. used to make little one-lung gasoline motorizing kits for big-tired bicycles. Most wound up mounted on the heavy Schwinn.

Whizzer kits enjoyed their hey-

day in the 1940s and '50s, but they haven't been made for years. Now, with mopeds in vogue, Whizzers are being snapped up at great rates. Not only do collectors search them out, but since Whizzerized bikes get up to 120 mpg, they're practical for street use.

Balloon-tired bikes have a ruggedness that their skinny-tired successors never could match. Then, too, the larger, low-pressure tires offer a smooth, well-controlled ride.

Balloonies introduced in 1933

Balloon-tired bikes were introduced and popularized by the Arnold Schwinn Co. in 1933. Schwinn adapted the idea from motorcars, which were then going through the "donut" fad—accessory tires with extremely wide profiles and very low pressures. The donut idea didn't catch on with auto drivers, but balloons made a big hit with bikers, and it wasn't long before all American bike manufacturers were copying Schwinn's lead.

Balloonies enjoyed tremendous popularity throughout the late 1930s and up until almost 1960. Paper boys loved them, as did kids of all ages.

Deluxe models were usually fairly expensive, and some came with novel accessories and bizarre styling features.

Names like Black Phantom, Silver King, Super Airflow and X-53 Rocket led the parade. Top-line models incorporated engineering from cars and motorcycles, such as "knee action" front forks (called "springers" in California), pushbutton electric horns, battery-powered headlamps and taillights, and some even had stoplights and turn signals built in!

Accessory-laden deluxe balloonies kept getting heavier and heavier, but not many of the kids complained until the British "racers" started to become popular with, first, college students and then high-schoolers. By the end of the 1950s, Raleighs and similar lightweight, narrow-tired, multispeed, imported bicycles spelled doom for the overweight balloonies. And with the 10-speed revolution, fat-tired bikes went the way of the raccoon coat.

Nostalgia plays an important role in the resurgence of balloon-tired bicycles. Anyone who remembers owning the classic Schwinn, the marvelous J.C. Higgins, the high-

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styled Sears Elgins, and dozens of other such names can feel the tugs at his heartstrings. But you don't have to be over 30 to appreciate the ruggedness, the smooth ride, the effortless ability of these bicycles to almost steer themselves.

'Cruisers' in California

A number of California youngsters—not purists but with an appreciation of balloons nonetheless—have settled on what's generally referred to as "cruisers." These are older fat-tired bikes, usually without fenders. Cruisers sometimes have elaborate paint jobs and pinstriping, but they're mostly made up of non-original parts. They're to bikes what hot rods are to cars.

Balloon-bike dealers have helped tremendously in finding and selling obsolete parts. They'll sometimes go around to long-established bicycle dealers and buy up all their out-of-date stock. This way it's become much easier for the hobbyist to get parts, literature and accurate information for his restoration.

Restoring a balloon-tired bike isn't necessarily cheap, though. Parts, rechroming and specialized labor such as pinstriping and painting, can run restoration costs into the hundreds of dollars.

Southern California collectors now hold big bike swap meets several times a year. One of the larger events takes place in Pasadena's Rose Bowl and recently attracted over 600 participants, many bringing more than one bicycle. There's always a brisk trade in the buying and selling of complete bikes; also in the exchange of manuals, catalogues, ads, decals and parts.

Not only are old balloons returning to the road, but at least one major bicycle manufacturer has re-introduced a fat-tired, "old-fashioned" model. It was originally called the California Cruiser, but the name has since been changed to avoid a conflict with a smaller bikemaker.

The balloon-bike hobby is still in its infancy, but everyone in it feels it's bound to grow. The strength of the cantilever and diamond straight-bar frame design, the easy ride and long-wear characteristics of the low-pressure tires, and the general knock-about capacity of these big cruisers give them some forgotten advantages over the frail 10-speeds that became so popular of late.

And when California goes nuts for something as fun and nostalgic as the fat-tired bike, can the rest of the nation be far behind? **PM**

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MENNEN AFTER SHAVE AND SKIN CONDITIONER

NEW HOMEBUILTS (Continued from page 56)

has come up with a clever idea: Most World War II fighters, especially the radial-engine type, had somewhat similar configurations. Famous warplanes like the F4U Corsair, P-47 Thunderbolt, Sea Fury, F8F Bearcat, F6F Hellcat—even enemy fighters like the German Focke-Wulf FW-190 and Japanese Zero—all had a chunky, blunt-nosed look.

What War Aircraft Replicas has done is develop a whole series of half-scale World War II warplanes built around a basically common slab-sided wood-frame box construction. You build the box, then add foam-plastic panels and template guides to produce the final configuration—Corsair, Bearcat, Zero, whatever. First is the half-scale Focke-Wulf FW-190 shown here, powered by a 100-hp Continental and fully aerobatic. Plans for the FW-190 are \$125, with kits also available. You can also get plans for the P-47, Sea Fury, Corsair, P-40 and P-51, with kits to come soon. Later will come plans and kits for the Zero, Lightning, Bearcat, Spitfire, Tempest II, Macchi C-200, ME-109 Messerschmitt, Hellcat, JU-87 Stuka, Fokker DXXI. In all, the company ex-

pects to offer more than two dozen half-scale historic warplane replicas. For information, write War Aircraft Replicas, 348 South Eighth St., Santa Paula, Calif. 93060.

Also coming is a half-scale version of one of the USAF's first jet fighters, the famous Lockheed F-80 Shooting Star. Fully aerobatic, it is powered by a real jet engine, the Davis Cold-Jet said to produce 300 pounds' thrust. Wingtip fuel tanks are detachable for aerobatics. No price is set yet, but Windstar expects kits soon. Contact Windstar, Box 3196, Boise, Idaho 83703.

Two-seater Emeraude (shown below the F-80 Shooting Star) is a brisk monoplane sportster that gets 165 mph from a 125-hp Lycoming and climbs 1000 f.p.m. Plans are from E. Littner, CP 272, St. Laurent, Montreal, Quebec, Canada H4L 4V6. Airline Captain Bert Sisler's sporty shoulder-wing side-by-side two-seater is designed especially for lightweight VW engines for craft that might not handle the heavier Continental, Franklin or Lycoming. He expects to offer plans soon from Sisler Aircraft, 9220 Chicago Ave., Bloomington, Minn. 55420. **PM**

PM TESTS NEW KIT-BUILT HOVERCRAFT

(Continued from page 73)

a beam of 7 feet that fits easily and legally aboard a flatbed trailer, and weighs about 750 pounds. Power is supplied by a Volkswagen 1600-cc engine, and payload is two passengers totaling 350 pounds with the body shroud on, 400 with it off. Speeds are conservatively rated at 35 mph over mudflats, 32 on the water, 30 ashore and 45 over ice. Sea conditions of a foot of chop can be easily handled, and fuel consumption is usually about 3.6 gallons per hour while running at the recommended 3000 rpm. One-third of the air output is used for lift and two-thirds for propulsion, with vent fans rather than propellers providing the push.

But what impressed me most was



Owner Talmage examines fans and engine with protective grille swung up and back.

the steering system. Two aircraft-type control sticks aim the machine. After revving up with them in neutral and feeling liftoff from the beach, I pulled back on them and backed neatly off into the water—a maneuver no other machine I know of can do. Pushing one stick forward and the other back, I spun around in place and headed offshore by holding both controls forward. Running right over floating buoys and logs, plus racing full speed up onto the beach and back into the water proved scary at first, but exhilarating after I got the feel of the machine.

For \$5, Neoteric offers an information pack on the machine; with the \$50 plan pack, a good scrounger and handyman should be able to build a Neova II for \$1500. A complete build-it-yourself kit is \$3000 plus engine and body cowl. Completed, ready to fly, it's \$8000. **PM**

GOT A LEMON?

(Continued from page 85)

under the direction of the Federal Trade Commission, can give you advice and assistance in a number of areas. The Bureau does not have legal authority to intervene in disputes between buyer and seller. But the agency will tell you what your rights are in a particular situation and is interested in tracking down false or misleading practices. The Bureau will make a record of your complaint and investigate to determine if your experience was an isolated incident—a one-time ripoff by one company or individual—or if there is a wide pattern of deception requiring remedial legislation.

Although the Bureau doesn't have a crew of cops it can send out to put the pinch on a swindler, the agency is not without teeth. If it finds a pattern of deceptive practice in an area, it will refer the matter to the attorney general of that state, or to a local office of consumer affairs for action.

There are two ways of contacting the Bureau of Consumer Protection. The Federal Trade Commission has offices in 12 U.S. cities—Atlanta, Boston, Chicago, Cleveland, Dallas, Denver, Honolulu, Los Angeles, New York, San Francisco, Seattle and Washington, D.C. The phone numbers are listed in the white pages for those cities under the listing for United States Government.

Names to call

You can phone or write the field offices in the 12 cities or you can contact Bureau department heads in Washington. Here are the names of the department heads and their fields of expertise:

■ The ad says the car will give 40 miles to the gallon, but you can't get more than 20. Contact Paul Foldes, Bureau of Consumer Protection, Federal Trade Commission, Washington, D.C. 20580. Phone: 202-724-1488.

■ The ad says the shop will do a brake job for \$14.95, but when you get there the price turns out to be \$49.95. Contact Joseph Riotto, same address as Foldes. Phone: 202-523-3461.

■ The ad offers a discount on replacement parts, but the parts are never available or the price is always higher than stated in the ad. Contact Paul Sailor, same address as Foldes. Phone: 202-523-3555.

■ The car, replacement part or accessory carries a warranty, but the thing breaks down before the warranty expires. You try to collect from the seller, but he gives you the

"Sorry, buddy" routine. Contact Steven Leach, Div. of Special Statutes, Federal Trade Commission, Washington, D.C. 20580. Phone: 202-724-1100.

■ You buy a car (or anything else, for that matter) that carries a warranty and it doesn't live up to the promise made in the warranty. You go back to the dealer and ask him to make it right. He gives you the horse laugh and says it's not his problem because he sold the contract you took out to purchase the car to the Flim-Flam Finance Co. "Take your troubles to Flim-Flam," he snarls. This is illegal. A federal law says the seller retains all valid claims and defenses if a second party buys an installment contract. Contact Ms. Rachel Shao, Div. of Compliance, FTC, Washington, D.C. 20580. Phone: 202-254-8302.

The Bureau of Consumer Protection is working on a bill of rights for buyers of used cars. This is not yet ready and, assuming its approval by Congress, it will likely be the middle of 1978 before the legislation becomes effective.

Private organizations to contact

In addition to the government agencies, there are a number of pri-

ate organizations you can contact for help on problems with your car.

The National Automobile Dealers Assn. has set up groups called AUTOCAP (for Automotive Consumer Action Program) in 38 states. NADA organized AUTOCAP to arbitrate disputes between dealers and car owners. You tell your side of the story and the dealer tells his. A panel that's made up of local dealers and representatives from the general public considers the case and recommends a solution. The recommendation is not binding on either party if one side or the other wants to seek legal recourse. But AUTOCAP has been successful in resolving many problems to the satisfaction of car owners.

You can find out if there's an AUTOCAP in your area by calling the local dealer association listed in the phone book or by writing Consumer Affairs Office, NADA, 84 Westpark Drive, McLean, Va. 22101.

Another private group is the Automobile Owners Action Council at 1411 K St., N.W., Suite 800, Washington, D.C. 20005. Phone: 202-638-5550. This is a nonprofit, member-financed organization—dues are \$25 a year—working largely in the

(Please turn to page 118)

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MENNEN
LATHER AND BRUSHLESS SHAVES

GOT A LEMON?
(Continued from page 117)

Washington, D.C. area. But AOAC will help nonmembers outside of Washington to the extent of outlining a course of action if you have a problem with your car that the dealer can't or won't take care of.

Insurance people seek safety

The Insurance Institute for Highway Safety is interested in hearing from you if you have a problem relating to safety. The Institute won't give you any immediate help in solving the problem, but they will check it out and if they consider it a serious hazard, they will report it to the NHTSA for action. The address is 600 Watergate, Suite 300, Washington, D.C. 20037. Phone: 202-333-0770.

The Center for Auto Safety is another group that you can contact if you have a problem pertaining to safety. Like the Insurance Institute, the Center doesn't promise immediate relief for the problem, but will look into it and follow up on it. The Center doesn't encourage phone calls from individuals, but you can write to it at 1346 Connecticut Ave. N.W., Suite 1223, Washington, D.C. 20036.

The Center for Auto Safety is currently pushing an idea to provide car owners with an impartial ear to tell their troubles to in Detroit. The Center wants the auto firms to set up a phone-in service where car owners can call and receive personal attention. The answering service would be operated by the carmakers or "an outside group with no ax to grind." The car owner would pay a one-time fee of \$10 for the right to use the number.

Clarence M. Ditlow III, director of the Center, says the phone-in setup "would guarantee to customers that their complaints would be personally handled, either through routine company channels or, when that fails, through arbitration by some independent, outside authority." If the car owner still wasn't satisfied, Ditlow adds, he could take his complaint to a consumer protection agency or small claims court.

Carmakers have own program

Carmakers say the machinery already exists for dealing with problems, but they recognize that communications could be improved to provide more personalized attention. One company, Ford, has set up a two-year test program in North Car-

olina to establish a give-and-take board for resolving differences between car buyers and dealers.

The board is made up of five members—a Ford dealer, a Lincoln-Mercury dealer, a representative from a consumer protection agency, a consumer activist and an instructor from a high school or community college that trains mechanics. The board's decisions are binding on Ford and the dealers but not on the car owner if he wants to seek redress elsewhere. This project is just underway and Ford will be monitoring it for the next two years.

If it works out, the company will expand the program nationwide over the next several years.

Triple-A can help, too

Triple-A is a good outfit to tell your troubles to if you should get fleeced by a crooked mechanic. You are not likely to get your money back unless the garage or gas station has a contract with AAA, but you can give the fleecer some trouble and you may well save the next guy from being ripped off. Turn your evidence over to the local Triple A office or send it to American Automobile Assn., 8111 Gatehouse Road, Falls Church, Va. 22042. **PM**



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NEW FOR '78—MORE PERFORMANCE, MORE FUN

(Continued from page 75)

weight and utility, these less-expensive stripped-down models may well catch lots of customers and fish without making such a dent in a boating budget. The smaller motors they can handle should also cut \$1000 or more from the cost of landing lunkers.

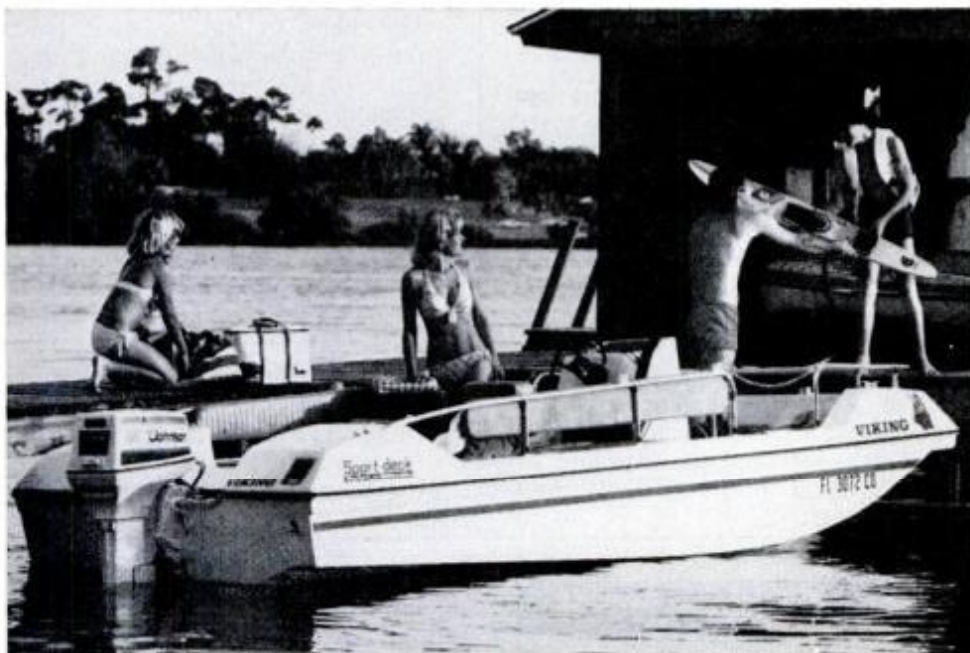
Offshore influence

Ever since the strange game of

and more models now offer optional canvas tops and side curtains to turn most boats into sleep-aboard cruisers without the expense and lost deck space of a fixed cabin.

How big is big?

Once a hull size moves up toward 30 feet overall, several smaller boat builders are now making the big move and increasing beam measure-



Runabout performance, water-ski speeds are deck-boat extras with Viking's 160 SI Sport Deck 16-footer using up to 115 hp.

Cee Bee's new Avenger 220 Day Cruiser, with a hull like some of its speed-record holders, comes with jet or sterndrive hp.

slamming into open ocean seas at full speed has become a powerboat sport, surviving hulls have had an impact on pleasure-boat designs as well. Once the softer ride of deep-V hulls was proved by offshore marathons, open-water fishing utilities, smaller cruisers and even some runabouts have been adopting it to provide rougher water capabilities without the bouncing and bone-jarring bumps of flatter bottoms. Many of this year's cabin models and open-decked fishing machines feature a deep-V below the water-line. Lessons in strong fiberglass layup and secure installation of fittings and accessories have also been passed along to the rest of the fun-boat fleet.

Dousing spray is a clammy companion aboard any boat, and the canvas covers and dodgers of open ocean cruisers are being adapted for almost any hull. A boat with deck room to lie down aboard is big enough for no-frills overnighting,



ment beyond the trailerable 8-foot width. Special permits are necessary once a trailered load exceeds the magic 96 inches, but if you have a big family and a place to moor where continual hauling out is not necessary, some of this year's broader models may be for you. Bunks for eight are crowded into some new 28-footers, and trailerable models that long are also available.

More size and powering options are available this year, in fact, than ever before. They just cost a little more. **PM**

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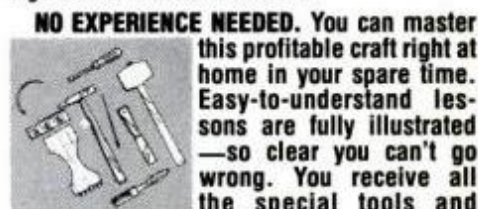
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were their own." And a New Orleans antique dealer summarizes: "My Dodge dealership has been instrumental in our selection of the Diplomat. I rent Chevrolets at airports and swear each time that my next car will be a Chevy. But we always go back to Dodge because they've been so good to us."

In the workmanship department, both cars get good marks, again with the Diplomat faring slightly better. "My Diplomat's general quality is the best I've had in any car since 1965," declares a New York IBM executive. A California pilot: "My LeBaron had a few new-car bugs, but workmanship is fine otherwise." "None better," interjects a Michigan radio announcer, and an M.D. from Illinois testifies, "Considering the multitude of components in and on my LeBaron, they've done a fantastic job!"

One nagging complaint about LeBarons, though, is that their clear outer Lucite taillamp covers trap rainwater. A West Virginia miner speaks for 11.7 percent of LeBaron owners who mentioned the problem



Covered inflatable spare intrudes into coupe's 16.3-cu.-ft. trunk.

when he writes, "Whenever it rains, these outer lenses fill up with water. I've had the car back to the dealer seven times, but they don't know how to fix it."

Comfort was judged good to excellent by a majority of owners, with particular praise going to interior appointments, the leather or velour upholstery, relining seats, and the smooth ride. Owners of coupes said they could do with

more rear legroom, and owners of sedans wish for more trunk capacity. The inflatable spare, they say, still takes up too much space.

When we asked owners to list suggested changes and improvements, 22.3 percent (Diplomat) and 20.2 percent (LeBaron) said, "No changes."

Among the rest, here are typical recommendations: "Drip moldings above the doors," urges an Indiana physician. A Michigan teacher: "Seat belts in the two-door tend to trip anyone who's getting into or out of the rear seat." A Texas computer operator: "I'd like to see a quieter airconditioner compressor and a sharper turning radius." And a number of owners suggested upping gas mileage and increasing trunk space.

Viewed *in toto*, however, Diplomat and LeBaron owners are well pleased with their cars. A California bureaucrat sums it up by saying, "I'm 5-4 and female; used to own a Renault, which I bought because it let me sit up high to see out. I went to my Chrysler dealer to try

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out the Plymouth Arrow, got in, and there was that old high hood. Well, there in the showroom sat my Le-

Baron. I climbed in and, wow! I could see out and the upholstery was so luxurious, and the car itself

was roomy enough to let me carry anything I wanted. It cost only \$900 more so I bought it!" **PM**

SUMMARY OF 1977 DODGE DIPLOMAT AND CHRYSLER LE BARON OWNERS REPORTS*

	Dodge Diplomat	Chrysler LeBaron		Dodge Diplomat	Chrysler LeBaron		Dodge Diplomat	Chrysler LeBaron
Total miles driven	527,207	585,396	Sloppy workmanship	11.5	12.5	What type of trouble?		
Average miles per gallon:			Taillights fill with water	0.0	11.7	Carburetor	14.8%	7.2%
318-cu.-in. V8			Not enough trunk space	9.7	0.0	Transmission	13.1	10.1
In town (EPA 15)	14.0	13.5	Poor dealer Service	0.0	10.2	Airconditioner	11.5	8.7
Long trips (EPA 25)	18.0	17.6	Rattles	7.1	0.0	Electrical	11.5	13.0
Engine choices			What changes would you like?			Brakes	0.0	7.2
225-cu.-in. Six (made available after PM survey was conducted)	0.0%	0.0%	More trunk space	16.1%	12.1%	Did you repair it yourself?		
318-cu.-in. V8	99.2	97.7	Better gas mileage	8.0	12.9	No	95.3%	98.6%
360-in.-in. V8	0.8	2.3	Waterproof taillights	0.0	8.9	Yes	4.7	1.4
Transmission choices			Better workmanship	0.0	8.9	Dealer repairs satisfactory?		
Automatic	100.0%	97.8%	Workmanship opinion:			Yes	59.6%	51.7%
Four-speed manual	0.0	2.2	Excellent	30.1%	22.8%	No	40.4	48.3
Body style choices			Good	37.4	41.2	Dealer service opinion:		
Two-door coupe	60.7%	55.1%	Average	15.4	16.2	Excellent	24.8%	24.2%
Four-door sedan	39.3	44.9	Fair	10.6	10.3	Good	37.6	26.5
Why did you choose this car?			Poor	6.5	9.6	Average	14.5	14.4
Styling	41.9%	53.0%	Comfort opinion (front seat):			Fair	6.8	13.6
Past experience	22.2	12.7	Excellent	55.6%	64.7%	Poor	16.2	21.2
Size	22.2	23.9	Very good	32.3	23.7	Number of vehicles owned:		
Economy	12.0	15.7%	Good	8.9	8.6	This car only	52.0%	41.3%
Specific likes:			Fair	1.6	2.9	Two cars	37.4	43.5
Styling	50.0%	53.2%	Poor	1.6	0.0	Three cars	8.9	9.4
Handling	40.8	40.5	Comfort opinion (rear seat):			Four cars	0.8	4.3
Comfort	38.3	39.7	Excellent	33.9%	36.9%	Five or more cars	0.8	0.7
Ride	30.0	36.5	Very good	38.5	35.4	Makes of other cars owned:		
Performance	13.3	0.0	Good	15.6	13.8	Chevrolet	22.0%	19.8%
Economy	0.0	16.7	Fair	10.1	9.2	Dodge	18.6	16.0
Specific dislikes:			Poor	1.8	4.6	Plymouth	16.9	21.0
Poor gas mileage	22.1%	24.2%	Had any mechanical trouble?			Ford	11.9	0.0
			Yes	52.9%	50.7%	Chrysler	0.0	16.0
			No	47.1	49.3	Would you buy another Diplomat/LeBaron?		
						Yes	80.2%	71.8%
						No	19.8	28.2

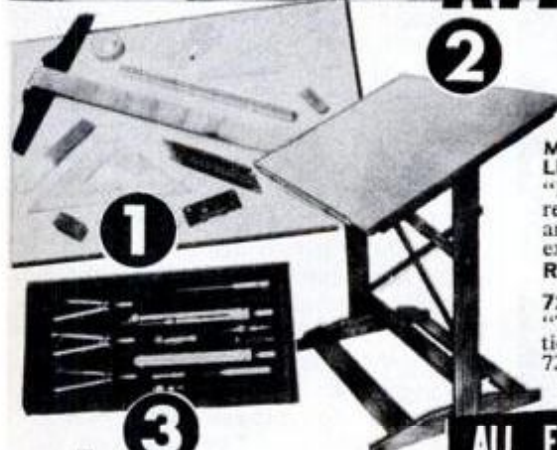
*Percentages might not equal 100% due to rounding or insufficient data.

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CARVING LIFELIKE BIRDS

(Continued from page 94)

feeders and birdhouses. Fall and winter he moves south to work.

Bird carving is a uniquely American art owing its origin to the straw decoys the Indians used. It has evolved slowly to today's high level of skill, exemplified by Zeller and a few other top professionals.

Steps in creating a bird

As Zeller explains it, there is more to creating a bird than carving. He spends much time in research, studying pictures and actual birds. A knowledge of metalwork is also needed as most carvings have metal feet and legs, and metal is used to make parts of the birds' environment. Assembling the bird—gluing individually carved feathers, attaching the feet and balancing the bird in its setting—is part of each project. Treating the bird with oil paint in natural colors means careful mixing of paints to get the right hues.

Zeller's most popular birds are the familiar ones—cardinals, chickadees and wrens. Game birds appeal to male customers, and songbirds are often women's favorites.

The time it takes to make a bird ranges from a week (about 80 hours) for a robin, to two or three months (300 to 400 hours) for an owl, pheasant or other large bird. This includes painstaking attention to detail. Sometimes he chooses the bird's environment, perhaps a particular piece of driftwood, before he decides the bird's position. He finally sells the pieces for \$500 to \$10,000.

Advice to beginning carvers

The advice Zeller considers most important for novice wood carvers is: Study birds as much as possible. Get pictures of birds, watch them and note how they move and hold themselves. Serious carvers would benefit by borrowing study skins—birds that are stuffed but not mounted—from schools or museums. He suggests carving a bird from a composite of pictures and information.

The mistake most often made by carvers, according to Zeller, is in shaping a bird's head and bill. Often the back part of the bill isn't narrowed enough. He suggests following photos closely and gradually tapering the bill from back to front. A common error is misshaping feet. Usually, Zeller uses metal feet.

To carve a lifelike bird, you must, like Zeller, really know the bird. As a friend said of him, "People can take a piece of wood and make a bird, but Phil takes the wood and it is a bird."

PM

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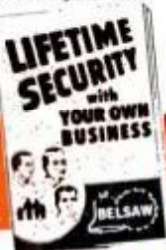
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DRIVING THE DATSUN 510

(Continued from page 87)

the same ratios as in the old 510, is standard in all but the hatchback, which gets a five-speed. A three-speed automatic can be ordered optionally, as can the five-speed in all but the wagon.

The automatic robs some engine power, but except for that initial stumble, there's plenty of oomph on tap for all normal traffic situations.

The five-speed box

The hatchback's five-speed makes for lively acceleration but has miserable linkage and a weird (for me)



Two-door sedan, four-door sedan and the station wagon (top to bottom) present bland profiles, but provide good, basic transportation for car owners who don't demand pizzazz in their automobiles.

shift pattern. Reverse in this five-speed is where I'm used to low, and I never did get used to Datsun's arrangement. High gear here is an overdrive, the other four ratios being the same as in the four-speed.

The engine feels as smooth as a V8 at idle and runs quietly up and down the rpm range. Steeper hills will bring you down to third gear, but that ratio is good for a comfortable 70 mph, so you'll be finding yourself in third not only on hills but also for passing.

The new 510 rides well on smooth pavement but gets unexpectedly choppy on rough dirt roads. The rear axle, with coils on all but the wagon, tends to float on washboard roads and sometimes shudders as it breaks loose when you push too hard in fast, power-on turns on pavement.

Overall springing seems to be soft on smooth surfaces, becoming



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firmer as it reaches the limits of suspension travel. I ran the 510 hatchback across some rough erosion ditches on a fire road, trying to bottom it out, but I never did—a testimonial to the shocks. Front springing comes via MacPherson struts, as in most modern small cars.

The new 510 corners well enough, but less sure-footedly than the old 510. Steering feels a bit slower; the turn circle is two feet wider. Brakes are good, with front discs having a 9.65-inch diameter.

Inside the car

The 1978 510's front seats recline and adjust to full upright position, the way I like them. Large glass areas allow good vision everywhere, but the ventilation system can't hold a candle to the original 510's, which really excelled. With any window opened a crack, wind noise becomes objectionable about 50 mph.

Of minor annoyance, the gas pedal stands too upright. I found my foot getting tired after about 45 miles of driving. And I kept accidentally hitting the spoke-mounted horn buttons while parking and maneuvering in tight quarters.

Datsun's been bringing in a lot of new models—the FWD F-10, the very pleasant and well-put-together 810, the updated and everpopular Z-cars, the fastback 200-SX, and now this second-generation 510. We've come to expect something unexpected from Datsun, and maybe that's not fair. The surprise this time is that there are no surprises. It's just another ordinary, good-enough, no-personality, neutral car. **PM**

DATSUN 510 SPECIFICATIONS

Engine—Type: Sohc 4, water-cooled
Displacement: 1952 cc (119.1 c.i.d.)
Horsepower: 97 @ 5600 rpm
Torque: 102 @ 3200 rpm

Transmission—
4-speed manual: standard sedans and wagon
5-speed: standard hatchback
3-speed automatic: optional
Ratios: 1st, 3.382:1
2nd, 2.013:1
3rd, 1.312:1
4th, 1.000:1
5th, 0.854:1

Brakes—Type: Power disc/drum
Disc diameter: 9.56 in.
Drum diameter: 9.00 in.

Steering—Type: Recirculating ball and gear
Ratio: 16.5:1
Turning diameter: 33.4 ft.

Suspension—
Type, front: MacPherson strut, independent
Type, rear: Solid axle, 4-link, coil springs, tubular shock absorbers
Tires and wheels: 4.5J-13 wheels with 165SR-13 steel-belted radials (6.45-13 bias-ply on 2-door sedans)

Dimensions—Wheelbase: 94.5 in.
Overall length: 169.9 in.
Overall height: 54.7 in.
Overall width: 63.0 in.
Average curb weight: 2277 lbs.

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.

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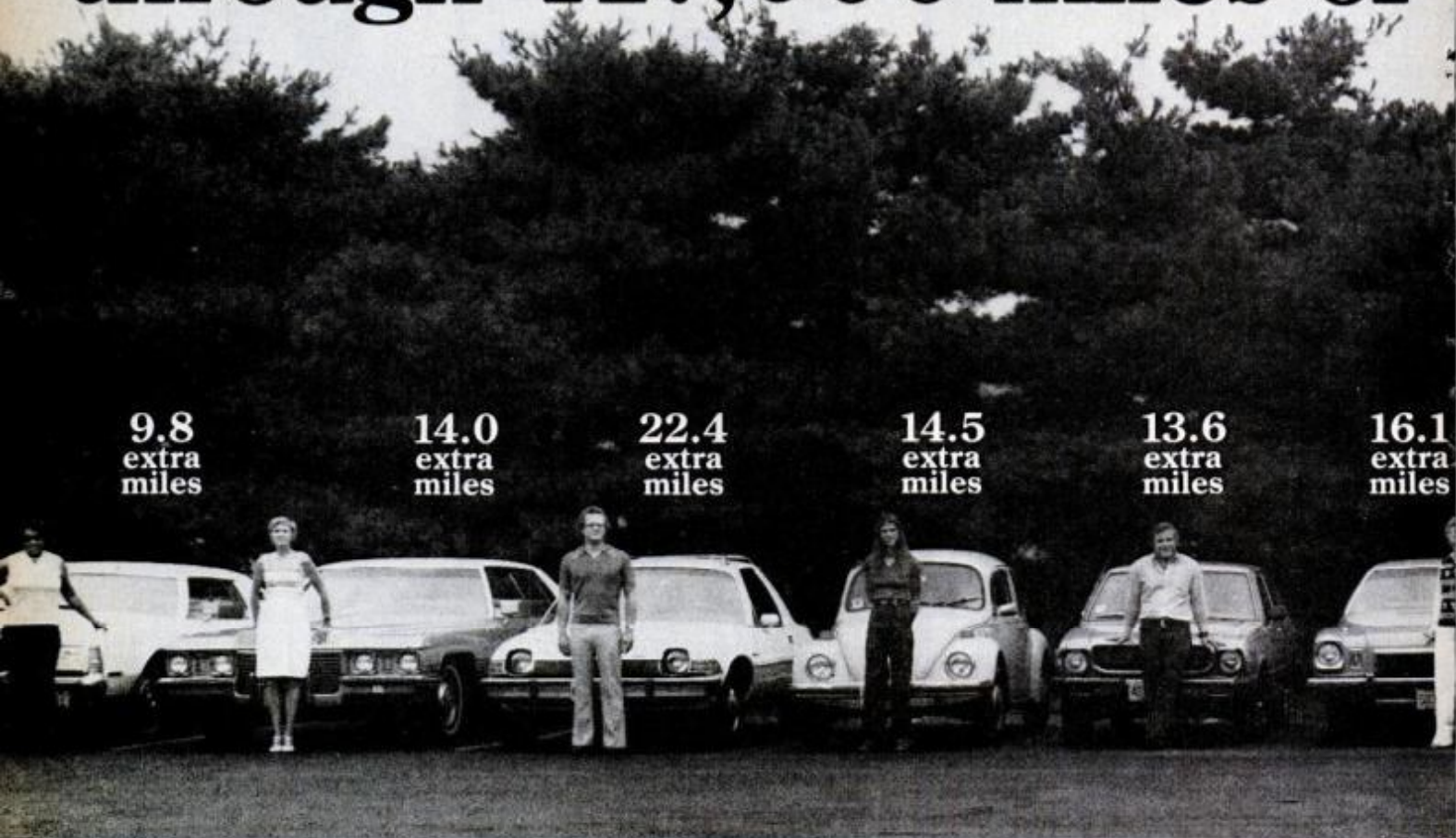
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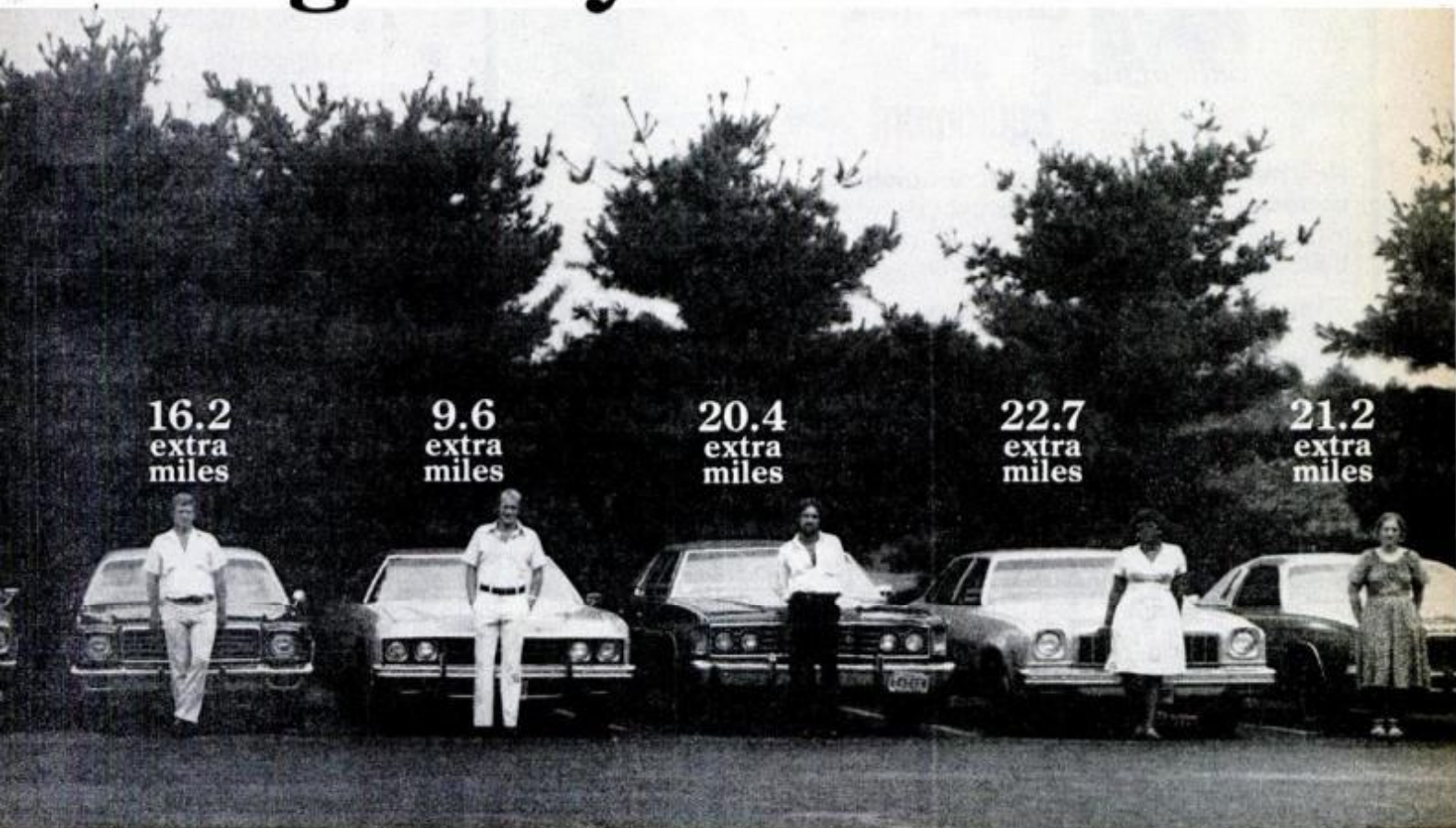
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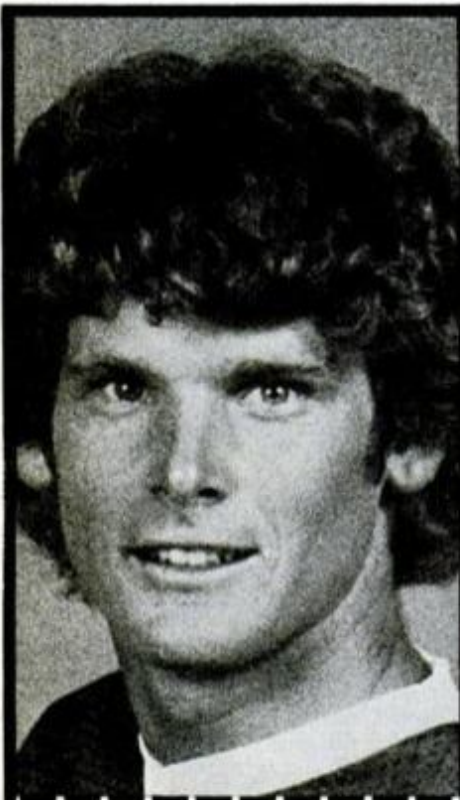
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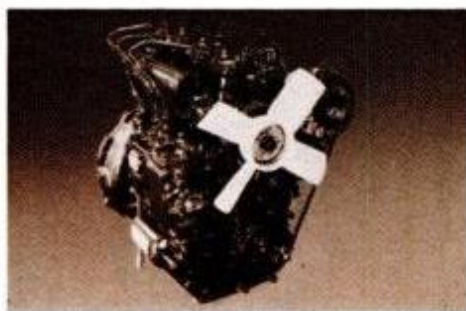


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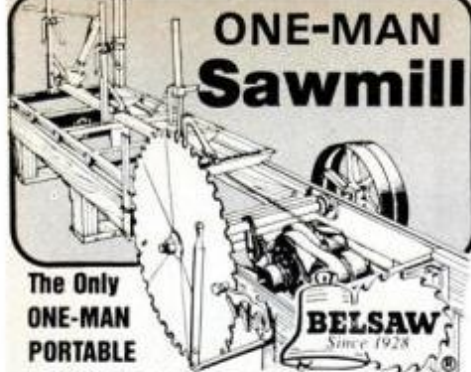
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NEW MINI FLATTOP 'FLIES' LIKE A PLANE (Continued from page 63)

operated manually or automatically, depending on conditions. For automatic operation, highly sensitive motion detectors feed data on the ship's movements to a complex computerized master control system that can fly the craft "hands off"—just like an airliner put on autopilot. There's even provision for using portable, "walk-around" remote-control hand units to "con" the ship from any point—fore, aft, on the flight deck during a helicopter landing.

Won't spill a drop of coffee

So stable is the SSP platform it's seen as an ideal seagoing base for launching and retrieving helicopters that otherwise could not operate in open ocean. It may also act as a floating gun platform for precision firing of ballistic missiles.

The prototype SSP *Kaimalino*—which means "calm waters" in Hawaiian—has been operating in anything but calm waters. Currently based at Oahu's Kaneohe Bay in Hawaii, she has already proven she can easily navigate the stormy seas of the Molokai Channel—in one trial run without even spilling a drop of coffee from a cup resting on a pilot-house windowsill, with seas running to heights of 12 feet. At another time, she made a complete 360° tight turn in 10-foot seas with an unslashed, free-rolling helicopter perched on her flight deck. So smooth and coordinated was the banked turn that the copter didn't budge.

Uses other than military are also foreseen for the "flying platform." For oceanographic research work, there's a well opening in the superstructure deck through which deep-submergence vehicles can be lowered and retrieved for underwater exploration. A removable plate exposes the well for use or covers it when the deck becomes a landing pad or cargo carrier. Hinged side railings can be retracted to clear the deck or raised in heavy seas.

Another clever trick: The fore and aft sections of the underwater hulls are accessible from above through companionways that lead down through the supporting struts. Manned compartments in the after sections or "tailcones" are used for checking and servicing propulsion equipment. The forward "nose-cone" sections have a variety of uses.

For underwater observation, nose domes on the torpedo-like hulls can be replaced with clear-plastic viewing ports. Other domes with sonar tracking instruments, scientific equipment or other special gear can be interchanged at will to make the

SSP a versatile workhorse for military and scientific missions.

Unusual propulsion system

Two powerful aircraft-type GE gas turbine engines drive the SSP through an unusual, clever arrangement. The turbines are located topsides, one on each side of the superstructure. To transfer their thrust to the props below, a narrow four-tiered chain-and-pulley linkage runs down through the thin stern strut on each side, making it possible to mount the engines above water, necessary for space, ventilation and access needs.

In the process, the four-step downgearing drive reduces a turbine speed of 1000 rpm to a prop-shaft speed of 350 rpm for a reduction of about three to one. An intriguing thrust-sensing "spider" on each propeller shaft measures power output and feeds readings to the control room to help determine input-to-output efficiency of engine to prop.

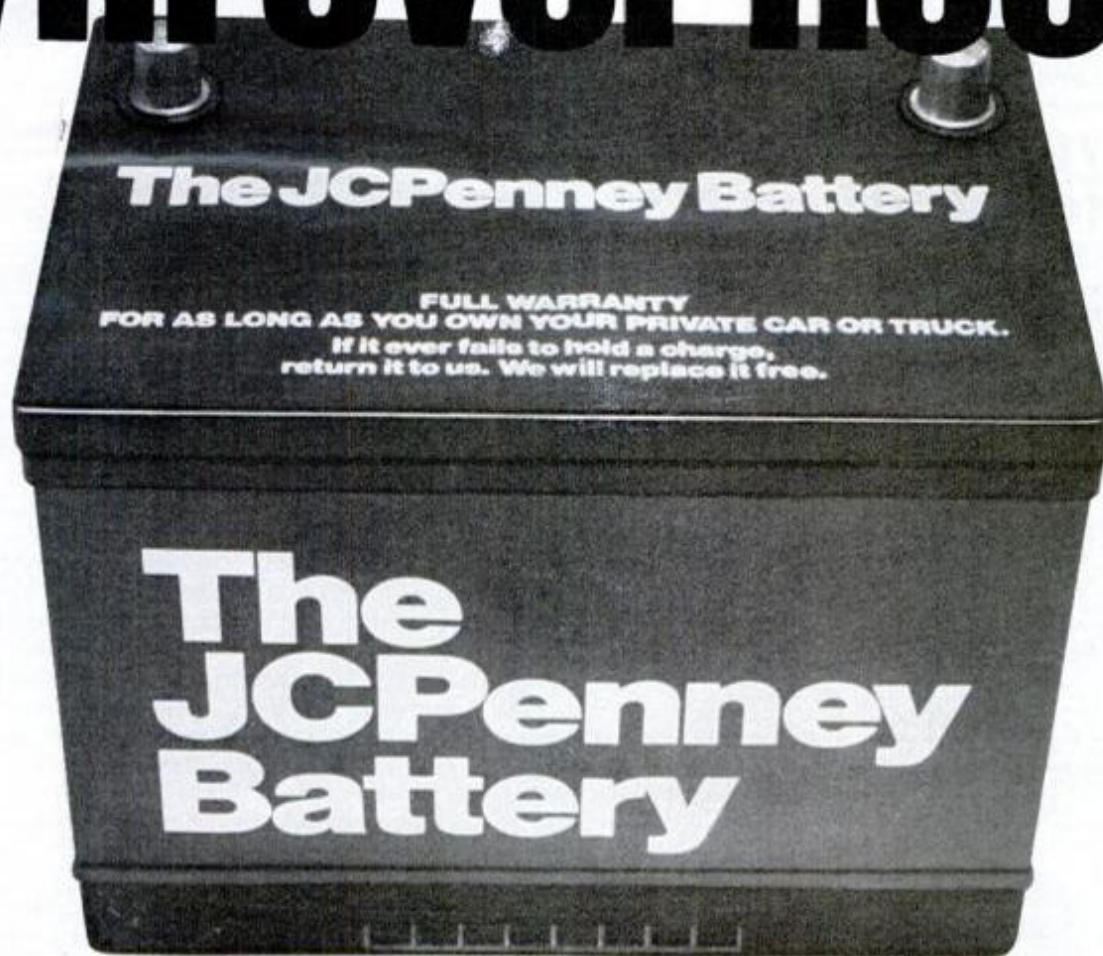
Each submerged hull is divided into six 2000-gallon cells in addition to fore and aft manned compartments. Three cells are fuel-storage tanks; the others contain water ballast. By increasing water ballast as fuel is used, the SSP can be made to ride at the same level regardless of fuel consumption, or the height of the platform can be varied to suit sea conditions.

Bigger jobs for bigger SSPs

The little *Kaimalino* presently skimming peacefully over the treacherous waters around the Hawaiian Islands may be a baby compared to bigger SSPs to come. Convinced of the practicality of these two-legged flattops, the Navy, along with private scientific institutions, is looking toward larger SSPs with increased capacity. Already under consideration is a 3000-ton version—roughly 15 times bigger than the *Kaimalino*. Such a ship, according to Dr. Lang, "would be large enough to support a sizable number of aircraft, weapons, missiles, sensor units or mixes thereof."

Offshore oil rigs may find stable SSPs ideal for crew boats or supply ships. The fishing industry may find them adaptable to its needs for crew transport or other uses. But for you and me—the general public—the best idea yet may be the little roll-on, roll-off SSP car ferry. One day, we may drive up onto the flight deck of a mini flattop, park and watch the scenery flow by just as if there were a smooth highway—instead of raging waters—under our wheels. **PM**

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HOW TO 'READ' YOUR SPARKPLUGS (Continued from page 81)

left side approximately four turns.

3. Lower the car.
4. Place a block of wood between the crankcase and a jack, and lift the engine about 1/2 inch.
5. Remove the No. 3 sparkplug by attaching the wrench set and breaking the plug loose. Remove the ratchet from the extension and turn the extension by hand until the plug is removed. Reverse this procedure to install the plug.
6. Lower the engine.
7. Raise the car and tighten the engine mount-to-cross-member attaching bolts.
8. Lower the car.

Plugs other than the No. 3 plug can be removed conventionally.

Servicing plugs

It is extravagant to throw away a set of plugs that can be cleaned, adjusted and put back in service. However, to do a thorough job of cleaning use a sparkplug cleaner.

Where do you get a sparkplug cleaner? You can buy one made for home garage use for about \$20. If you don't care to do this, take the plugs to a local service station and pay the man to do the job for you.

To service plugs correctly, proceed as follows:

1. *Wipe the plug clean* to remove moisture, oil and dirt.
2. *If the firing end* of a plug is oily or coated with wet deposits, wash the plug in a cleaning solvent, such as kerosene. Use a brush to work solvent into the lower insulator cavity. Dry the plug with compressed air—even if you have to beg an air hose. If the tip of a freshly washed plug isn't dried thoroughly, the cleaning solvent can cake deep within the plug and hinder plug performance.
3. *Clean plugs* in the cleaning machine.
- Caution:** Don't blast a plug for more than five seconds. Longer application could wear down the insulator and electrodes.

4. *Open the outside electrode* enough to slip a sparkplug file between electrodes. Use the gap adjusting tool of a sparkplug feeler gauge tool. Do not use pliers or any tool except a sparkplug tool to spread the electrode. If you do, irreparable damage may be done to the plug.

5. *File the center* and outside electrodes clean. Only one or two passes are necessary. Filing is important since the cleaning machine doesn't always remove electrode scale.

6. *Examine threads* closely for

carbon and scale that could keep a sparkplug from seating itself properly. Clean threads with a small hand or machine-powered wire brush.

Important: Be careful that you don't touch electrodes with the brush. You may damage them.

7. *Use a sparkplug wire-type feeler gauge* to gap plugs. A flat feeler gauge of the type used to adjust distributor breaker points will give an erroneous adjustment. Use the gap adjusting tool to set gap by bending the side electrode.

Caution: Do not bend the center electrode. If you do, you will have to discard the sparkplug.

Set gap to the exact specification in your manual or to that shown on the servicing decal in the engine compartment of your car. Gap is set properly when you feel a slight amount of friction as you move the feeler gauge back and forth between electrodes.

Important: Whether you are installing reconditioned or new sparkplugs, the gap of each one you put into your car's engine must be set before installation.

Installing plugs

If your engine has an aluminum head, apply a *thin* coat of graphite grease to the first two or three threads of each sparkplug. This helps prevent seizing.

Clean the cylinder head threads with a thread chaser, which you can buy in an auto-parts store, or with a small brush. If plugs use gaskets and are being put back in service, replace the old gaskets with new ones. Seat the gasket fully by threading it on so it fits flush against the base of the shell.

Tapered seat sparkplugs do not use gaskets.

If your engine uses tapered seat sparkplugs, it cannot use sparkplugs with gaskets. If your engine uses sparkplugs with gaskets, it cannot use tapered seat sparkplugs.

Screw the sparkplugs finger tight into the cylinder head and stop. Here is where we come to an impasse.

AC Spark Plug Co. and Prestolite are two leading companies that recommend the use of a torque wrench to tighten sparkplugs. Champion, on the other hand, contends that "practically no one uses a torque wrench on sparkplugs, and it is not really required."

What do you do? I suggest that if you have a torque wrench, use it. If you don't, use the "feel" method.

In either event, sparkplugs must

(Please turn to page 134)

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HOW TO 'READ' YOUR SPARKPLUGS (Continued from page 132)

be tightened *exactly* to the specifications given here which have been devised by the International Standards Organization and Society of Automotive Engineers. Although plugs won't seem to be tight, they will be tight enough. If you take liberties with these specifications, you will overtighten the plugs and probably experience engine operating troubles or seized sparkplugs.

Caution: Be very careful that you don't cross-thread plugs when putting them into the cylinder head. You could ruin the threads of sparkplug ports. Although inserts are available to fit ports and rectify the damage, it's a hassle you don't need, so take your time and work carefully.

Selecting sparkplugs

This should cause you no problem. You start by choosing the sparkplug recommended for your engine by the car's manufacturer. This recommendation is in the owner's manual and on the service decal in the engine compartment.

We aren't going to discuss the numbering systems of sparkplugs here. It's interesting, but irrelevant since each sparkplug manufacturer

has devised his own. All we want to do is emphasize that you start with the number that your car's manufacturer says to use.

Now, if this plug doesn't operate satisfactorily for the driving conditions you encounter, a plug that is colder or hotter in the heat range may be substituted. The heat range of a sparkplug is determined primarily by the length of the lower insulator. The longer the insulator is, the hotter the plug will operate. The shorter the insulator is, the colder the plug will operate.

There are three rules to follow in selecting the exact heat range plug that will operate best in your engine:

1. Select sparkplugs having the heat range specified by the car's manufacturer.
2. If plugs overheat (lower insulator blisters or turns ghostly white, and/or electrodes wear prematurely), switch to sparkplugs of the *same* make of the next lower (colder) heat range.
3. If plugs foul (firing tips get oily or sooty), switch to sparkplugs of the *same* make of the next higher (hotter) heat range.

Service tip: In case you haven't

heard, a new sparkplug design has been approved by Mazda for use in the R-100, RX-2, RX-3 and RX-4 passenger cars with rotary engines. It provides better antifouling protection and longer gap life.

Suppression vs. non-suppression




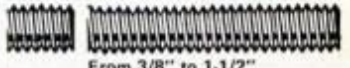

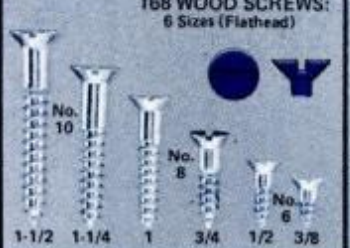

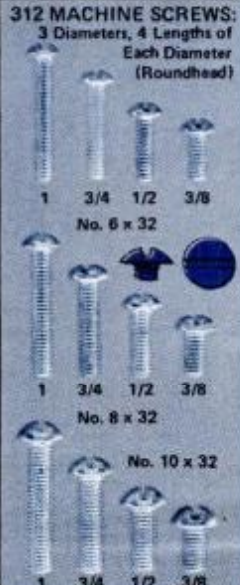

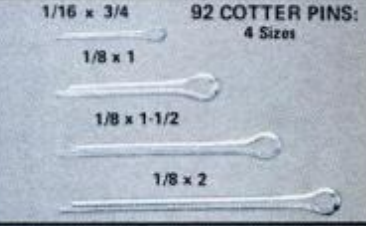

Automotive electrical systems have long been recognized as a major source of radio frequency interference (RFI). With almost 150 million cars, trucks and buses on the road, there's a lot of radio and TV interference. To keep it in harness, all vehicles are equipped with suppression devices at the factory.


As far as cars are concerned, these suppression devices take the form of so-called resistor sparkplugs, suppressor-type secondary cables or external suppressors. Frequently, resistor sparkplugs are combined with suppressor cables or external suppressors. Suppressor cables and external suppressors are not recommended for combined use.

Regarding the selection of sparkplugs, if the manufacturer's original equipment calls for resistor-type sparkplugs, then it is suggested that you use them.

LOOK AT ALL YOU GET!

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DRIVING THE OMNI/HORIZON

(Continued from page 65)

compared us volunteered that the car has more rear hip room—1.3 inches more than a Cadillac Seville.

■ Visibility via the windshield was as good as, or better than, any car, any size, I can remember.

■ Instruments, gauges, knobs, handles are clean, simple, easy to find, easy to read, easy to operate.

■ Chrysler hasn't confused small with cheap. The quality of the workmanship—at least on items visible to the eye—is first class. This applies to the paint job, upholstery, moldings, carpeting—all the detail stuff. The company says the same attention has been paid to concealed components. For instance, body panels are treated with more anti-rust materials than any previous Chrysler car.

■ Most small cars now come with a book explaining simple service jobs the owner can handle himself. The Omni/Horizon book has a new twist. Running to 104 pages, the book breaks the work down into four categories: 1. jobs you can do without

OMNI/HORIZON DIMENSIONS

Wheelbase: 99.2
Overall length: 164.8
Width: 66.2
Height: 53.4
Front track: 55.5
Rear track: 55.1

tools; 2. jobs you can do with common household tools; 3. jobs you can do with a few mechanic's tools; 4. repairs requiring special-purpose tools used by professional mechanics, in which case Chrysler recommends taking the car to a dealer.

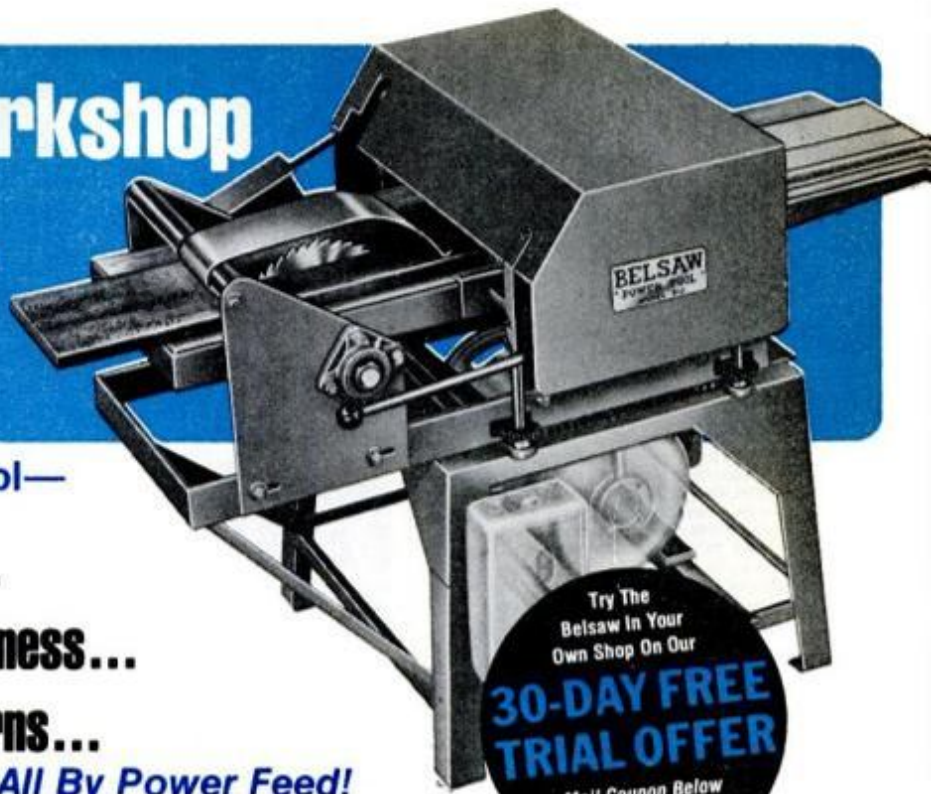
Mileage and price to come

Two important details were not available at the time I drove the cars. Chrysler was still running its mileage tests and wouldn't say what the results will be. The figure for combined city/highway driving should be around 35 to 40 mpg. The official figures will be released when the cars go on sale this month.

Missing detail No. 2: What will the cars sell for? My guess is that the cars will be stickered between \$3700 and \$3800, but if you add a few options—the list includes air, automatic transmission, power steering, power brakes with front discs, rear-window washer/wiper, rear-window defroster, three different radios, tinted glass, heavy duty suspension and various trim and paint options—the retail sticker will easily top \$4000 and could go over \$4500.

One option you won't be able to get this year is a flip-out sunroof. That's coming in '79. **PM**

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Pays For Itself • R. S. Clark, Springfield, Ohio: "I bought a batch of walnut in the rough, and after planing it on the Belsaw I figured up the money I had saved. It was enough to pay for two-thirds the cost of the Planer. It really does a good job."

More Than Expected • Stephen Schultz, Orangeville, Penna.: "This machine pays for itself by making money out of scrap boards. It is a very well built machine and I confess it is more than I expected for the price. It does everything you say it will."

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JAY HEDDEN—Editor of WORKBENCH Magazine

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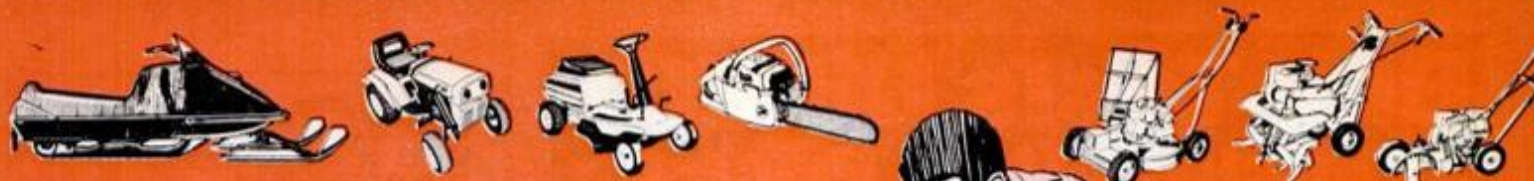
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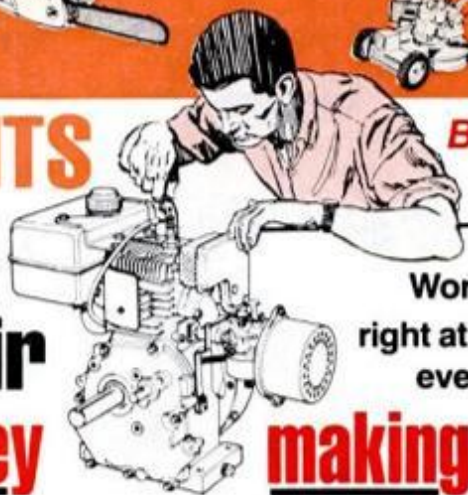
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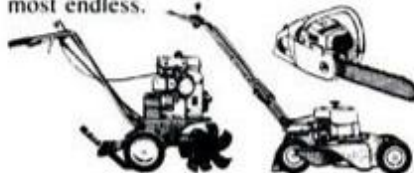
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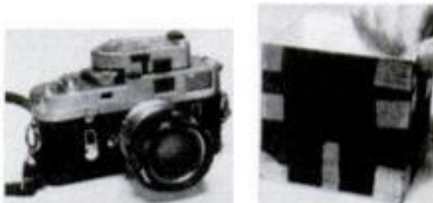
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PHOTO HINTS

Gadget-bag organizer



Without dividers of some kind, a gadget bag quickly becomes a tangle of photographic equipment. Smaller items will be much easier to find and remove if the camera itself is isolated in its own container; placing this in the center of the bag automatically creates two more independent compartments, one on each side. Using my camera as a form, I made a box out of pieces of mounting board, held together by strips of strapping tape. Surprisingly durable, the box has survived countless miles of domestic and foreign travel.—Robert Hertzberg

Simple tong stops



Print tongs that slip into full trays are a nuisance. A large rubber faucet washer pushed onto the end of the tongs will keep them out of the wet, and keep you from contaminating your fingers. Lacking the washer, wrap a small rubber band around the tongs several times.—Ken Patterson



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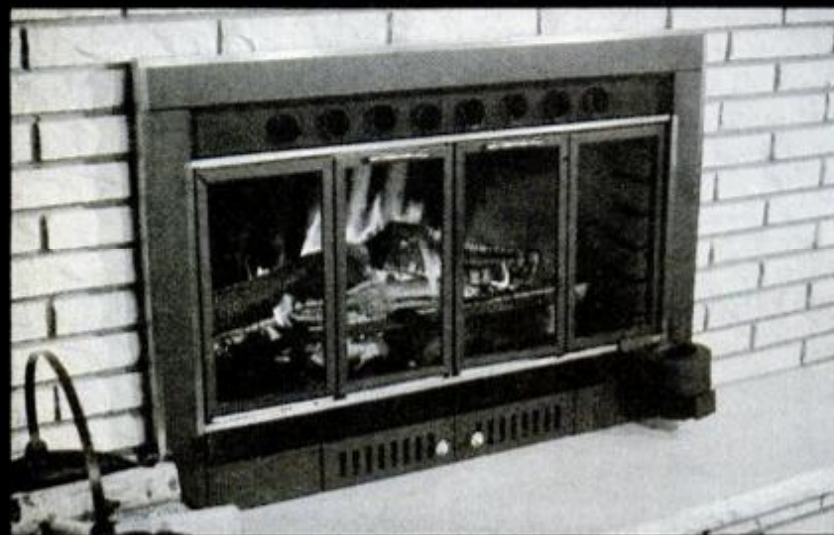
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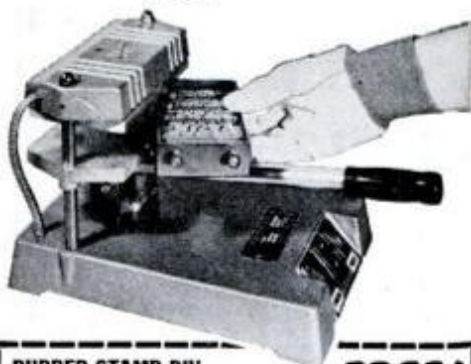
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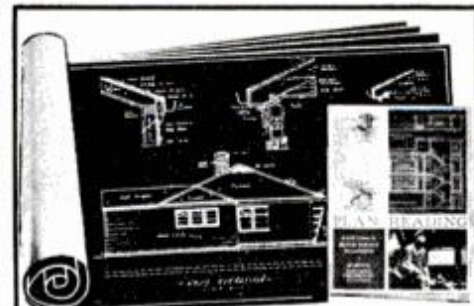


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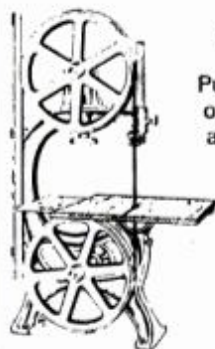
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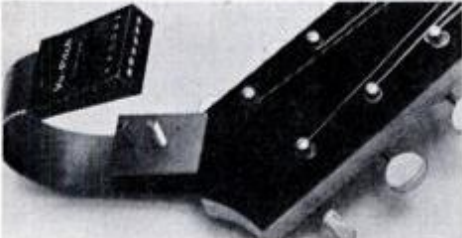
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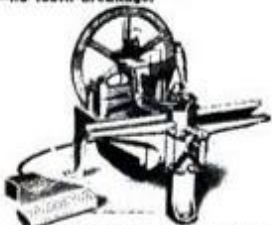
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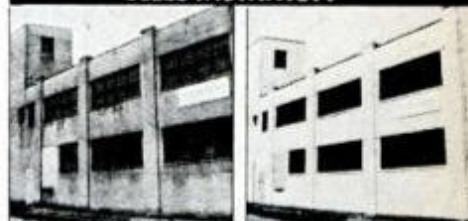
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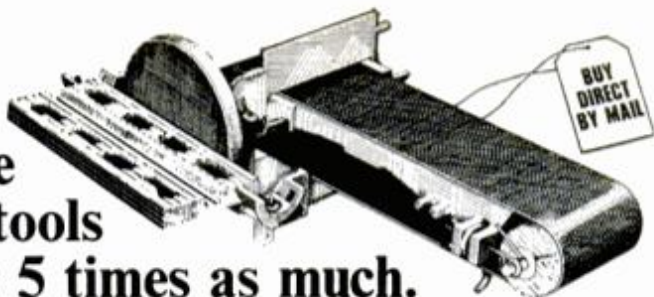


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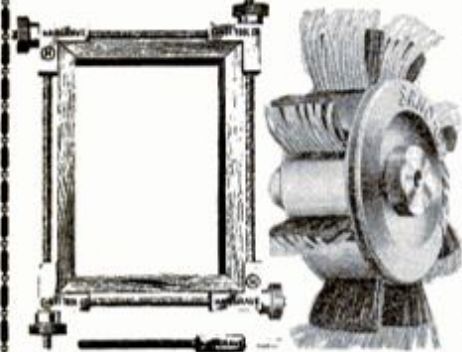
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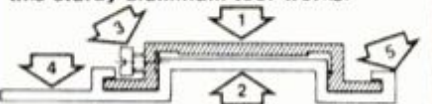
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<input type="checkbox"/> 746	<input type="checkbox"/> 750	<input type="checkbox"/> 754 35¢	<input type="checkbox"/> 758	<input type="checkbox"/> 762		Service Charge \$ _____
<input type="checkbox"/> 747 \$2.00	<input type="checkbox"/> 751	<input type="checkbox"/> 755	<input type="checkbox"/> 759	<input type="checkbox"/> 763 10¢		Total money enclosed \$ _____
<input type="checkbox"/> 748	<input type="checkbox"/> 752	<input type="checkbox"/> 756	<input type="checkbox"/> 760			

Total items requested _____

Name (Please Print) _____

Address _____

Town _____

State _____

Zip Code _____

(Please send cash, check or money order made out to POPULAR MECHANICS. No stamps, please.)

Note: Popular Mechanics processes your requests for the above information and forwards these inquiries to the organization making the offer. Each company mails the material directly. Your order will be on its way to you within 90 days.

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