

OCTOBER 1978 \$1.00

Popular Mechanics

15 ways to get more heat from your furnace

Best stereo systems for under \$500

New-car options that put zest back in driving

15 tiny electronic marvels you can have today

'79 CARS IN COLOR:



OLDS TORONADO

GM, AMC, CHRYSLER

Year of diesels & front-wheel drive

PLUS: The new pickups

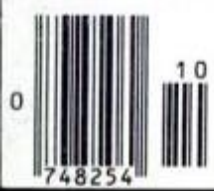
Triple-deck bunk you can build in any bedroom

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Complete plans inside

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WOOD

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On the cover

The cutting, splitting and storage of firewood will be a major occupation across the country this month in preparation for the winter to come. With PM's woodshed and log splitter, the homeowner has a real leg up on cold weather.

Photo by George Ancona



OCTOBER 1978

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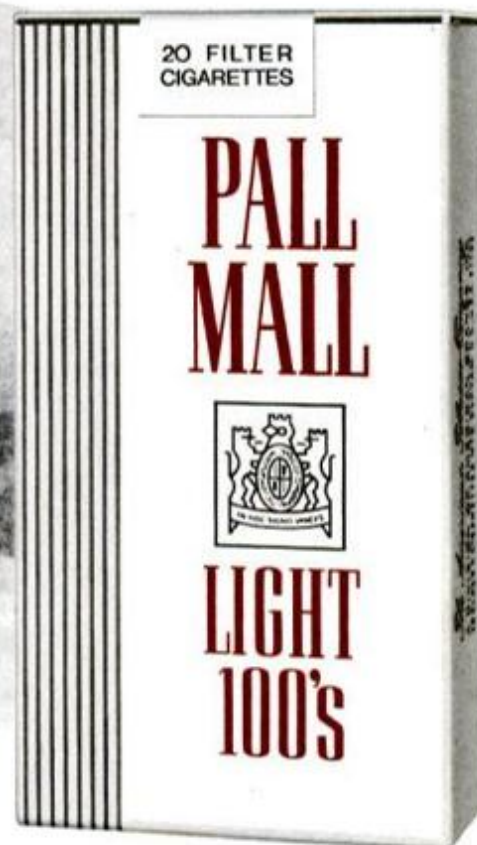
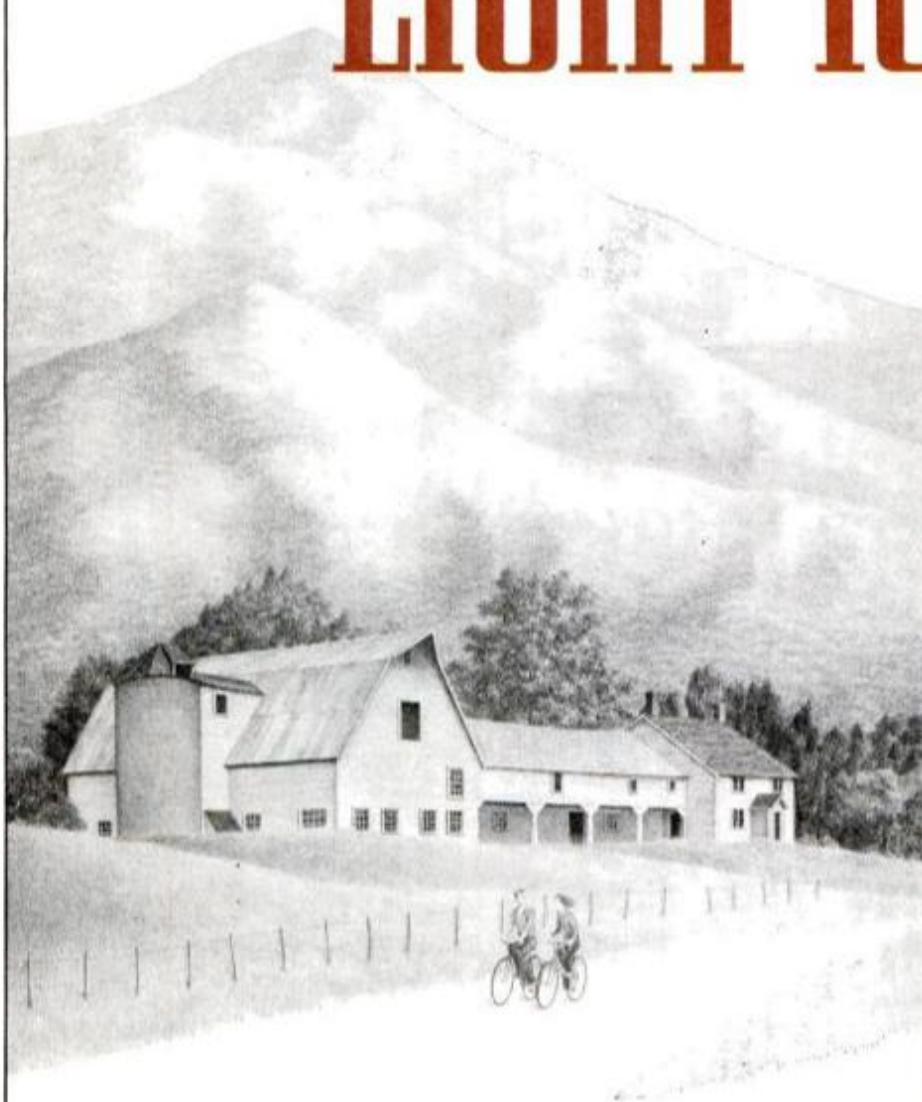
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HANDY IDEAS FROM BIG RED

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LETTERS TO THE EDITOR

Push comes to shove

The *Car Care Tip* in the Aug. '78 issue (page 52) shows a car being pushed out of the garage the hard way, in order to reduce the number of cold starts and short running periods.

I use the mechanical advantage of 2:1 offered by the wheels of the car by pushing on the top of the tire itself. It is much less awkward than it sounds. I balance by placing a hand on the garage wall and push with one foot against the top of a rear wheel. The rear wheel works best. It can also be done outside by holding balance against the car.

I began doing it this way when I had a 1961 Buick Electra, to overcome the rolling resistance of cold nylon tires. Since I am past 60, I much prefer this easier way. This is not a "dubious tip" if brains are used to assist muscle.

GERALD L. SHORT
SEATTLE, WASH.

The answer is blowin' in the wind

I disagree strongly with a statement in the motorcycling story in June (*Air Turbulence—How to Cope With the Invisible Threat*, page 78H). You say to keep to the right side of the lane in traffic. On the contrary, one should ride on the left third of the lane because:

1. You are more visible to both oncoming traffic and traffic in your lane.
2. You establish your position such that cars will not attempt to squeeze past you when it is unsafe to pass.
3. You have a better escape path for any unforeseen events.
4. There is less likelihood of loose gravel.
5. The rider's view of the road is best from this position.

JAMES HEITMAN
MADISON, WIS.

Author Bill Hampton replies: Actually, there are no rigid rules for lane position. Which side of the road you ride on depends on surface and traffic conditions, not to mention air turbulence. Perhaps air turbulence seems insignificant. I once thought so too. But one day a local cyclist took a bad spill when a truck whizzed past him. He was riding on the left side. If my article could save but one cyclist from

a bad spill, it has accomplished its purpose.

Pressure tactics

Re: *Install a Filter and Clean Up Your Home Water Supply* (May '78, page 136): the article makes several references to gate valves for isolating the filter from the water supply lines. The photo illustrations, however, show globe valves in place of the gate valves. This could lead to several difficulties:

1. Most globe valves used in domestic plumbing—even fully opened—reduce the water pressure by about a third. Gate valves, however, allow virtually unimpeded flow.

2. Many plumbing codes require the use of valves that do not effectively reduce the pipe size, so the globe valves may be illegal.

3. Globe valves can be noisy under high pressure.

Also, it is important to install the valve with the stem upright so that rust and sediment do not impair the operation of the gate-lifting mechanism.

FRANK R. GERETY, P.E.
NEW YORK, N.Y.

Practical electric car?

I must take exception to a statement by Victor Chase in the July issue (*Test Yourself: How Much Do You Really Know About Energy?*, page 80). Item number 15—"Are electric vehicles practical?" His answer is "no." I disagree with him.

We have used an electric vehicle for almost three years and about 14,000 miles. We had a used Datsun converted by Electric Engineering of East Lansing, Mich. We found actual operating costs average only 1.33 cents per mile. The car handles like a regular car, with a top speed of 70 and 0-30 in about 8 seconds.

Actual average speed is about 38 to 40 and it's easy to keep up with traffic.

Our daily use is about 25 miles with a high of 41; we have never been stranded for lack of power.

We have just ordered replacement batteries for the first time. They cost 3.8 cents per mile.

In its proper place around town, the car is as practical as other specialty cars from a cost-of-opera-

tion standpoint. Used as it should be, it's a very practical car.

AMOS D. BRIDGE
HAZARDVILLE, CONN.

He's high on this elevator

I strongly recommend the elevator for wheelchair persons which was pictured in *It's New Now* in May (page 276). I have had one of these for over a year now, and as an M.D. and a paraplegic, I can recommend it on both a professional and a practical level, for the following reasons:

1. Safety. Though the picture in PM makes the apparatus look "airy," it is quite safe.

2. Expense. My elevator (which covers three floors) cost less than \$2000, including installation. This is compared to about \$10,000 for electric elevators.

3. Strength. I can operate mine with three fingers.

4. Ease of installation. Any contractor should have no problem.

LARRY R. KIRKLAND, M.D.
ATLANTA, GA.

Saving face

Concerning *Basics of the Lost Art of Blacksmithing* (June '78, page 130), I take issue with the picture of Mr. Kayne cutting steel on the hardened top of the anvil.

The face of the anvil is hardened and should never be used as shown.

Also, with the current price of coal, it behooves one to save as much as possible. After using a forge, break the fire apart or much of the coal will burn to ash.

E.A. KALLAL
CHESTERFIELD, ILL.

As noted in the caption under the photo of Mr. Kayne, he cuts the steel from both sides. It should further note that he doesn't cut through the steel. It is snapped apart by hand or with the help of a vise. In working on projects where the steel must be severed, place a soft metal plate on the anvil to protect the anvil face.

Correction

In the July, '78 PM Workbench, there is an error in the Magnetic Toolholders item. The correct spelling of the manufacturer's name is Ten Gam Corp.

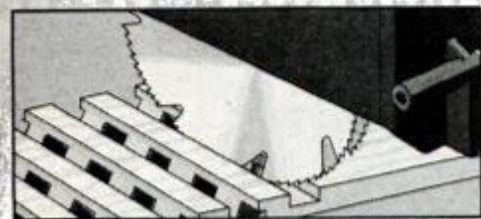
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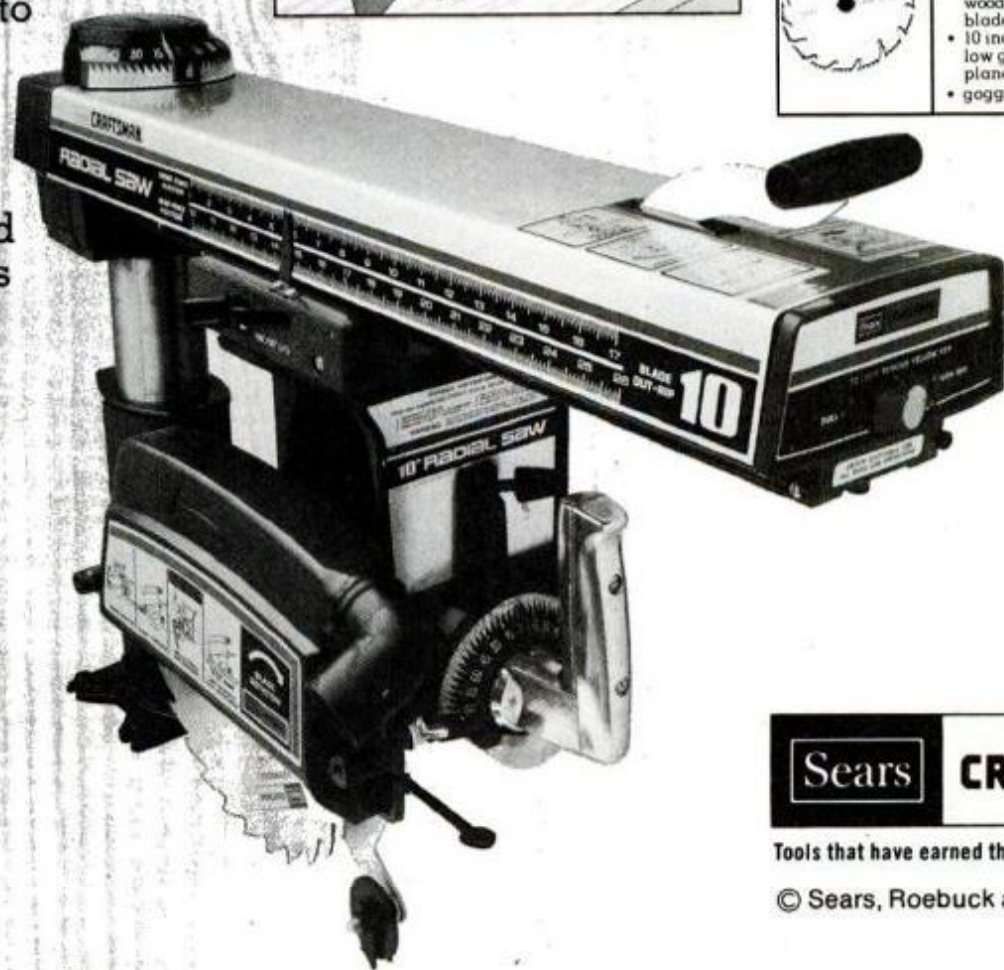


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Tools that have earned the right to wear the name.

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This One



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Renault-Alpine V6 Turbo—winner of the 1978 LeMans 24 Hours.

The legend of LeMans

They were motor racing on the roads around LeMans, France, as early as 1896. After 10 years of fooling around, the racers got organized and the first Grand Prix was held at LeMans in June, 1906 (the first 24-hour race was not held until May, 1923). The 1906 GP was won by a 90-hp Renault. Driver Ferenc Szisz averaged 63 mph for the 769.3 miles. Last June Renault was in its glory again—this time with a 500-hp V6 turbo that averaged just over 130 mph for 24 long hours and set a lap record of 142.45 mph). It was a long-sought victory for Renault in this second most popular race in the world (next to Indy), and gave French fans special satisfaction; both car and co-drivers Jaussaud and Pironi being French. If you want to know about Americans at LeMans, there's a book of the same title by Al Bochroch. It's \$25. Haessner Publishing, Inc., Drawer B, Newfoundland, N.J. 07435.

New Datsuns

The long-awaited, new Z car will be in the Datsun showrooms this fall, and next month we'll have a complete '79 model lineup. Not here yet is Datsun's replacement for the F-10 coupe and wagon. It should hit these shores later in the 1979 model year.

The car slated to give the F-10s



Pulsar uses 1400-cc transverse Four.

the boot is already to be seen on the streets in Japan where it goes by the name Pulsar. It's a front-wheel-drive machine on a 94.3-in. wheelbase and about 155 in. overall. It was introduced as a four-door model only, but a two-door hatchback will likely follow.

Mazda GLC wagon

Mazda's Great Little Car made its debut here as a three-door hatchback (*Driving Mazda's New Piston-Packin' GLC*, page 197, Mar.



Mazda GLC station wagon will be added to the three- and five-door sedans to represent the 1979 model year.

'77), a five-door model was added this year and now a station wagon is on its way. The four-door wagon is built on the same wheelbase as the sedans (91.1 in.) and will measure 157.3 in. overall.

In addition to the new wagon, the three-model GLC lineup will also sport larger, 1400-cc four-cylinder engines under the hood for '79. Further down the pike is the possibility of a diesel model, which would give Mazda the distinction of being the only manufacturer here selling piston, rotary and diesel-engine cars.

Two new TVRs

TVR sports cars from England first came ashore here in 1962 and the TVR cult was born. Latest models to evolve from the early cars are the Roadster and the hatchback Taimar shown here. Designed around a Ford 3-liter Six, the car is on a 90-in. wheelbase. Performance is 0 to 60 in 7.5



Roadster (top) and Taimar from TVR.

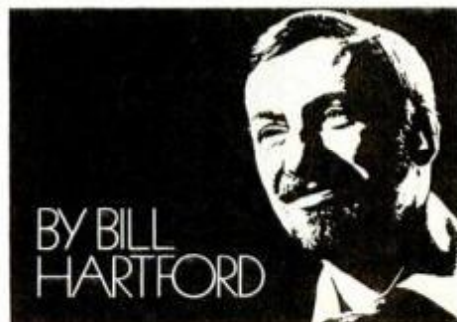
seconds, top end is 125 mph plus and price is \$16,000. Total sales for the '79 model year are expected to hit 300 cars.

How to read a plate

License plates come in lots of colors and designs, each bearing a secret message. To decipher the code, you'll need *The License Plate Book* by Tom Murray (Ventura Associates, 101 Park Ave., New York, N.Y. 10017; \$3.95 plus 55 cents postage). You can tell the county of origin, owner occupation and other coded information.

Decoding book.

Did you know about the Automobile License Plate Collectors Assn.? It's at 207 Springdale Ave., Beckley, W. Va. 25801. **PM**



SCIENCE WORLDWIDE

Focus on water power

Most of us know the old trick of focusing the sun's rays with a lens onto a leaf and burning a hole with the focused energy. Now a group of Norwegian scientists is trying to use the same principle to concentrate the energy of ocean waves, according to a recent issue of *European Scientific Notes*.

The "water lens" under development is the work of Even Mehlum and others at the Central Institute for Industrial Research in Oslo. While the concept involved differs from most schemes for capturing ocean-wave energy, it is not totally new. As the scientists point out, hydroelectric plants which extract energy from water that has been dammed or concentrated in one place operate on a similar principle.

The proposed lens takes advantage of the fact that the speed—and hence the wavelength—of sea waves increases with increasing depth. A structure consisting of horizontal plates at varying depths parallel to the shore should be able to curve a wavefront so it comes to a focus. Mathematical calculations indicate that with a nominal plate depth of 30 meters, the waves along a stretch of several kilometers of coastline could be focused into a section less than 500 meters wide.

One proposal would position a funnel-shaped chute along the Norwegian coast at the focus of the lens. The resultant wave would "pump" itself up the chute, perhaps as high as 100 meters above sea level, to a reservoir. Estimates based on experiments performed recently indicate that 70 to 80 percent of the kinetic energy of the concentrated wave would be captured as potential energy in the reservoir for hydroelectric power.

Drug degradation

A bathroom medicine cabinet may be the worst place to store medicine. Heat and especially moisture from bathing, washing and other bathroom activities may degrade drugs left in a cabinet. Aspirin, for example, may undergo hydrolytic cleavage and lose potency. Some antibiotics, like tetracycline, can even become toxic if they are degraded.

Most medicines should be kept in a cool, dry place away from chil-

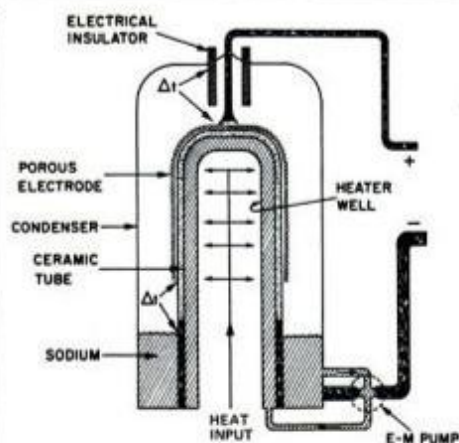
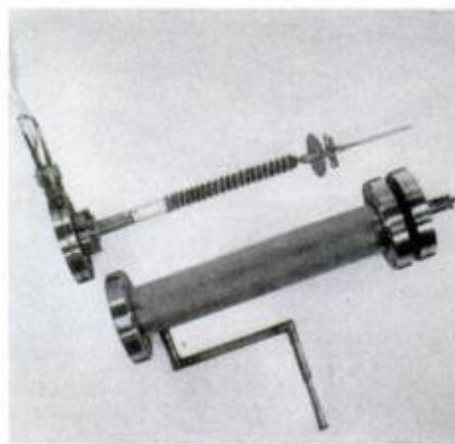


Diagram shows sodium heat engine operation. Right, disassembled working model.



dren (that rules out the refrigerator), says Arthur Lipman, chairman of the department of Pharmacy Practice at the University of Utah. Adds Lipman: Always discard your leftover prescription drugs, preferably down the toilet and away from trouble.

Heat into electricity

No, not with thermocouples, which are woefully inefficient (maybe five to six percent), but with a sodium heat engine.

Derived from work done on the sodium-sulfur battery at Ford Motor Co., the device uses a material called beta-alumina, a ceramic mixture of aluminum and sodium oxides.

In operation, pure sodium is heated to anywhere from 600° to 1000° C. inside a beta-alumina container, which is itself inside a metal container (see diagram above). Between the beta-alumina and metal container is a partial vacuum and sodium at about 200° C. Ions of the hotter sodium are forced through the beta-alumina to a porous electrode by the pressure differential and leave their electrons behind. A conductor connected to the sodium allows the electrons to flow out in the form of electricity.

Incoming electrons rejoin the ions on the porous electrode, whereupon the sodium condenses in the vacuum container and is pumped back to the heater well to start the cycle again. According to Terry Cole, a Ford scientist working on the sodium engine, the sodium is the only "moving part" if an electromagnetic pump is used.

Overall efficiencies of 10 percent have been achieved in the lab so far,

but Cole says the device has a potential efficiency of 20 to 35 percent.

Cole claims efficiency is independent of the engine's size, so there should be no scaling-up problems. He envisions it being used in conjunction with concentrating solar collectors or perhaps in a system where waste heat dissipated by the condenser would be tapped to drive another type of electrical generator.

Cancer-altitude correlation

A city's altitude and water hardness may affect the cancer mortality rate there, according to a recent study of the 99 largest cities in the U.S.

The study, by J. Frederick Cornhill of Ohio State University and Alan C. Burton of the University of Western Ontario, showed that the higher the city, the lower the death rate. And, the more dissolved solids in a city water supply, the lower the cancer rate.

Does that mean we should all move to high cities with hard water? Not necessarily. "We can't assume a direct cause-and-effect relationship," Cornhill says. Besides, some types of cancer may require up to 30 years' exposure to a given carcinogen. "Maybe the quality of a city's water supply many years ago is more relevant than the current quality," he explains.

The two plan to study other minerals found in drinking water to see if any can be shown to have a definite positive or negative effect. "We may find that adding certain minerals to the water will help combat cancer," Cornhill says.—Tom Sahagian.

25000

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Because it's synthetic (man-made), the molecules in Mobil 1 are all similar—long-chain molecules fortified with special additives. Ordinary oil is made up of all kinds of molecules—small ones and large ones connected in rings and chains.

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to work as hard, the average car can get up to ten extra miles per tankful (some test cars even got up to 27 extra miles) without any conditioning period at all.

Less oil breakdown

At high engine temperatures, the molecules in ordinary oil undergo a chemical and physical change. When they do, it changes the composition of the oil and, with other contaminants, forms sludge.

Because the molecules in Mobil 1 are bonded to withstand high temperatures, they don't undergo chemical change the way ordinary oil does. And they don't burn off as easily. The composition doesn't change nearly as much and the sludge isn't formed as rapidly.

Better suspension

Water that gets into oil from engine condensation and from the atmosphere can

cause other contaminants to form sludge.

Mobil 1 goes ordinary oil one better here too. Because of its specially-designed additive system of detergents and dispersants, it can do a better job of harmlessly suspending those contaminants rather than allowing them to deposit in your engine.

To make an oil that goes farther than ordinary oil, we had to make a better one. Mobil 1. Adding oil as needed, it protects your engine for 25,000 miles or one year, whichever comes first. Of course, if your car is under warranty, you should change your oil according to warranty instructions to keep your warranty valid.

After that, 25,000 miles or one year is the limit. For people who don't like to change their oil, that's reason enough to use Mobil 1. For people who do, protecting their engines might be a better one.



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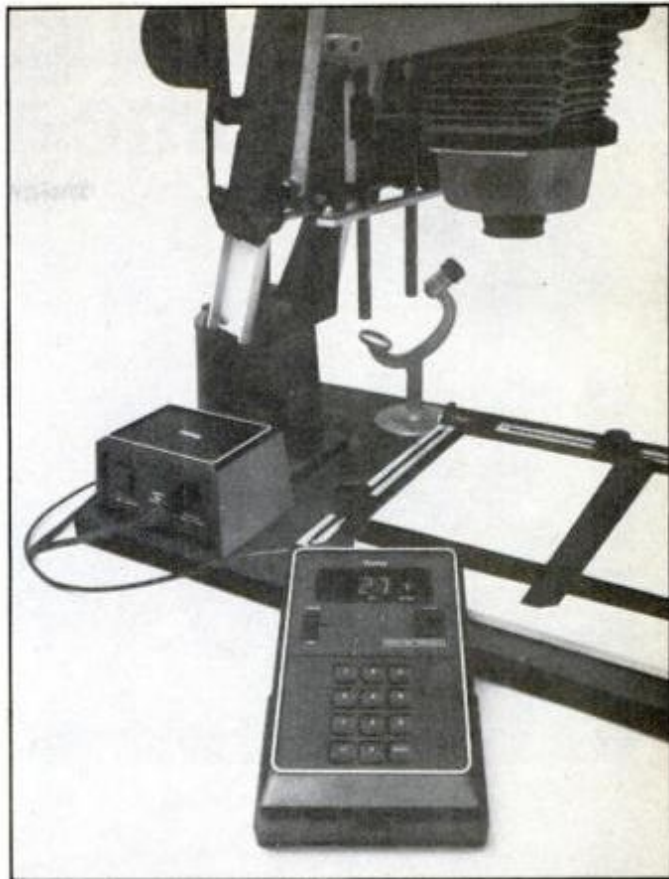
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OLYMPUS



Process Time Commander is ready to control an E-6 run for Ektachrome transparencies. The timer's display has been set for program 2, step 3: 4 minutes and 30 seconds. Since the E-6 process requires that steps be of widely varying times, the PTC greatly simplifies the job when you're doing it at home.



Simpler Digital Time Commander is set up here as an enlarging timer; display shows a setting of 27½ seconds. The enlarger is plugged into the right side of power supply; a safelight could hook into the left. DTC is shown set in a supplied bracket, which can easily be wall-mounted.

Two new digital timers for your darkroom

by Dave Sagarin

The first microelectronic products to reach us consumers did the same things as the products they replaced, only a little better. Calculators and watches, for example, became more accurate, smaller, less costly. But the new microelectronic products, just arriving, aren't mere stand-ins—they do *new* things.

Take Vivitar's Process Time Commander for the darkroom, for example. With beeps and LED digits, it leads you through practically any sequence of processing or printing intervals you may need—and

will even warn you that you're nearing the end of each step. You can enter three separate programs of six steps each, or link them for a maximum of 18 steps. Each step can last from one second to one hour.

In its "Auto" mode, the device times each step and moves right on to the next. In "Manual" it pauses and waits for you to restart; if you run over the preset time while in "Manual" the PTC will count up from zero until you stop it. In other words, it records how much you ran over—very useful in test printing.

The device's power supply has "Enlarger" and "Safelight" sockets for enlarging-timer use. It's a little awkward for this, but very good for controlling semiautomatic equipment, such as a drum processor. It could also control a food processor, or other household gadgets.

An optional thermometer for \$40 should be out by the time you read this; a socket is already provided.

The Process Time Commander takes a little getting used to, though the manual is thorough. My main use is in color film processing, and I already find it indispensable. I'd like to see them come out with a big brother PTC that alters developing time according to temperature, or even regulates temperature directly.

I'd also like a way to store programs—magnetic cards or plug-in memory modules—so you wouldn't have to reprogram each time it's been unplugged.

At \$123 the PTC isn't cheap, but it will save your life from time to time, if you do much color.

Vivitar's Digital Time Commander is simply an enlarging timer. Set the exposure time, from ½ to 99½ seconds. Push the button and the enlarger goes on for the preset time. No clicking or whirring. Plug the safelight into its socket on the power supply, and it goes off when the enlarger goes on. There's a "Focus" setting, and a reset button. The device is little different from several others: it's nice looking, at \$85 it's well priced, and it works. I wish it timed to tenths of a second rather than half-second increments. One good reason for having a very accurate timer is using very short exposure times (for saving time in contact printing, doing multiple prints or precise burning-in), and very short times require tenths for proper exposure.

Both timers are surprisingly light in weight—they can slide around the countertop, so I use the wall bracket that comes with each as a stabilizing tabletop accessory. **PM**

4 new products for your home and shop



Cheese it

You can make Yo-Cheese, a creamy, low-calorie yogurt cheese, with Salton's new Family Size Yogurt Maker. The unit also makes about twice as much yogurt as its smaller cousin. The Yo-Cheese can be used as a substitute for cream cheese or with appetizers and desserts. Yogurt Maker has glass containers, Yo-Cheese maker and Thermometer Spoon. About \$20 from Salton, 1260 Zerega Ave., Bronx, N.Y. 10462.



Putting the tweeze on

This nickel-plated tweezer set, C-422, includes five different types. One is 4 in. long with blunt points; one is 4¼ in. with sharp, bent points; one is 4¼ in. with sharp points; one is 4¼ in. with narrow-sharp points; the fifth is 4½ in. and has spade points. The variety of types makes the set useful for hobbyists, craftsmen and technicians. Packed in a clear vinyl pouch, they're \$6.28 from General Hardware Mfg. Co., 80 White St., New York, N.Y. 10013. Available at hardware stores.

Filling the gaps

Wilhold butyl rubber caulk is claimed to provide watertight protection when used on wood, metal, masonry, brick, marble, stucco, glass and concrete. Good for use in expansion joints, it protects five to six times longer than oil-based compounds and can withstand climatic changes from minus 40° F. to 210° F., the maker says. An 11-ounce tube sells for \$2.05 and comes in four colors. Wilhold Glues, Inc., 8707 Millergrove Dr., Santa Fe Springs, Calif. 90670.



Save Hot Water

Save Money

Water Pincher Home Pack

by ZIN-PLAS
for the Shower — Sink — Toilet



Save water

Saving water is becoming increasingly important these days, especially when you've used energy to heat it up for washing, bathing or shaving. The Water Pincher Home Pack is a kit containing items to help cut down on water usage. A luxury shower head limits water flow to 3 gal. per minute, and a faucet aerator reduces flow to 2 gal. per minute. The kit also contains a pushbutton shower shutoff valve, Teflon installation tape and toilet-tank dams. About \$18; made by Zin-Plas Corp., Box Q, Grand Rapids, Mich. 49501.

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The **World Traveler** keeps track of any two domestic or world time zones, concurrently. It is a timepiece for that singular man whose office may be in any city, but who measures bottom line profit by the activities of his factory abroad. A glance at his watch tells him that it is 10:48 PM, Tuesday, the 7th, when he boards a plane for his overseas flight. Touching just one button instantly shifts the watch from its local time mode to the preselected second city time. A flag appears beneath the alternate time zone symbol II. The display now shows that it is 5:48 AM, Wednesday, the 8th. The customary confusion associated with the International Date Line is a thing of the past. The watch will remain in the alternate time zone until, at the touch of a button, he returns it to his home time. And, when he does so, the exact hour, minute, day of the week, and date or second will reappear.



Peace Of Mind Accuracy... Anywhere In The World

The inherent oscillation of a gem cut quartz crystal assures the **World Traveler's** precision to within ± 5 seconds each month. Its powerful performance logic is equally guaranteed by the miracle of a tiny solid state microprocessor brain.

2-Zone Automatic Calendar

Liquid crystal readout, apart from assuring thousands of hours of battery life, delivers "always on" readability. Bold figures continuously show **hours, minutes and day of the week**. Touch a button and the **World Traveler** enables you to also read either running seconds or date. If it's Tuesday in Chicago, and Wednesday in your alternate time zone, your watch will maintain the respective days, dates and times, concurrently, with uncanny precision. A backlight enhances visibility for evening wear.

A Personal Alarm In Both Time Zones

It's easy to consider your **World Traveler** as two distinctive timepieces in one because each set of data is independent, yet simultaneously controlled. If you have set an alarm for 7 AM local time, the watch will automatically sound, for one full minute, at this time every day while in this zone, unless changed or shut off. If you switch to the alternate time zone, you can preset the 24-hour alarm just as easily. In either case, it emits a clear, electronic beep precisely at the preset moment, to remind you to make that call, or attend that meeting. With your personal alarm **World Traveler**, you will never have to rely upon a wake-up call again.

A Powerful Chronograph

The **World Traveler** is not two timepieces in one...it's three. And, in its chronograph mode it exhibits an entirely different personality. It's a recreational or business tool. With it, sailing enthusiasts can be at the starting line within a fraction of a second of the final gun. TV quarterbacks and season ticket holders can enjoy clocking ball release plays and punt "hangtimes" with professional precision. At swim meets, track events, races, you can keep tabs on your team or your youngster, with tenth of a second accuracy. You can measure piecemeal and production time with equal exactness.

Stopwatch. This mode counts action time only. Time any activity, from a track event to a telephone call, from start to finish. Begin an exercise and start the

timer. Take a break and freeze the clock. When you resume, push the button and the clock begins at the precise moment you left off. You measure total exercise time exclusive of non-action time.

Split Time. In this mode, you can stop the watch face to record interim time while the internal clock keeps running. After several seconds, the watch face automatically resumes its count, without having skipped a beat.

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From its world timetable face you can instantly determine the time for any one of the 24 international cities displayed.



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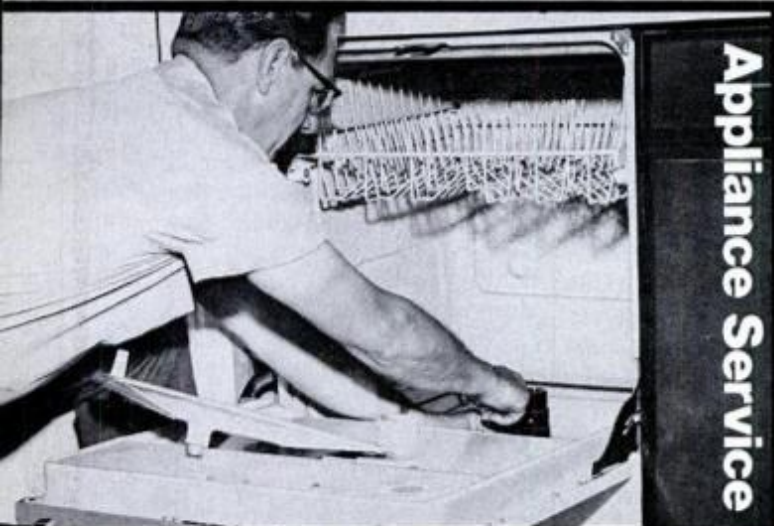
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varactor diode tuning and digital read-out. Computer courses now include the NTS/HEATH computer with 4K memory, Interface, and Video Terminal.

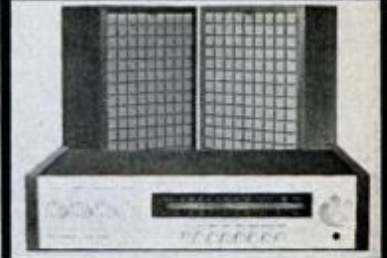
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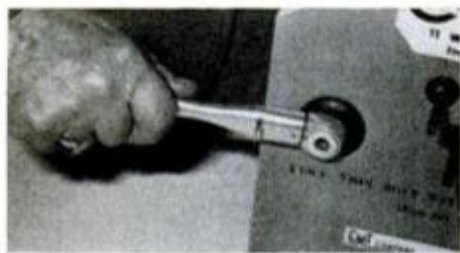
THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS BY THE EDITORS

Tight-quarters ratchet set

Struggling with a box or open-end wrench in tight quarters, because there's no way to fit in a ratchet and socket, is a constant problem. This slimline ratchet and socket set, however, is different. We tried it over and over to be sure it works.

The ratchet head is hollow and internally-splined. Into it will fit any of a complete assortment of externally-splined socket drivers or spline sockets themselves. If you leave out the square driver, you have a ratchet that is much trimmer than, but functions the same as, a ratcheting box wrench. And it will work with just a tiny fraction of an inch of handle movement, because of the principle of ratcheting used: The splines on

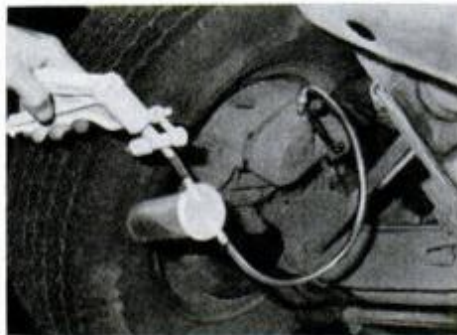


New ratchet wrench fits in tight places.

the socket or driver slip against the splines in the ratchet handle movement. A lever in the ratchet handle determines which way the socket or driver splines will slip, and which way the tool will lock. You might expect the splines to wear out rather early, but the tool is made of durable chrome molybdenum steel and the manufacturer claims it has passed extended use tests. Price for a complete set (ratchet plus $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ -inch socket drivers, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{9}{16}$ -inch and 10-14-mm sockets, plus metal case is \$58 list (actual price could be in the \$40s). From CMT Co., 5078 Clark Rd., Paradise, Calif. 95969.—B.H.

Brake bleeding

Bleeding brakes normally is a two-man operation, one to pump the pedal, a second to open and close the bleeder valve at the wheel. Professionals have pressure bleeders that attach to the master cylinder, for one-man bleeding, but



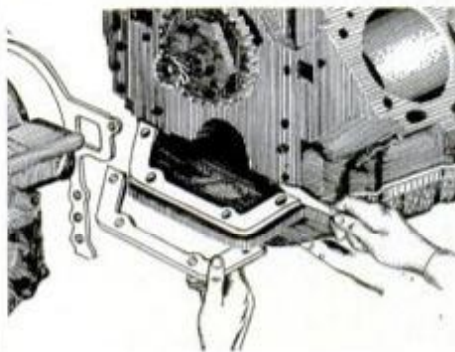
Trigger pump makes brake bleed easy.

they're expensive and require adapters for each car. A simple answer is a variation of a trigger-type vacuum pump with a gauge for checking vacuum and vacuum-operated devices. The tool consists of pump, tubing, plastic reservoir and tapered hose tip for insertion into the bleeder-valve hole. There is no gauge, so at about \$22 the tool is \$8 cheaper than the pump gauge.

Just set up the tool as shown in the photo, pump it to create a vacuum (which will hold the tapered tip in place), then loosen the valve. Draw off fluid until there's an inch or so in the plastic reservoir, then close the valve. Pour the fluid into the master cylinder and head for the next wheel. It's simple and it works. From Neward Enterprises, Inc., 9251 Archibald Ave., Box 725, Cucamonga, Calif. 91730.—B.H.

Gasket problems

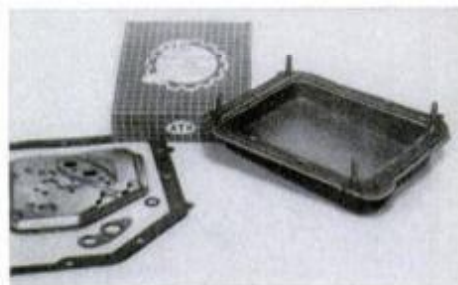
If you've ever changed a timing cover gasket, you know what happens the instant you lift off the timing cover. The bottom surface, which seals against a protrusion of the oil pan, tears the oil pan gasket. This can make grown men cry, even if they're ingenious



Oil pan gasket segment now comes in kit.

enough to handle the problem this way: Scrape away the exposed torn section, cut the same segment from a new oil pan gasket, give it a smooth coat of pliable sealer and install the timing cover with its new gasket. This is a lot easier than dropping the oil pan and changing its entire gasket. Of course, you had the expense of an oil pan gasket when you only needed a little piece, but what could you do? It was better than dropping the pan.

Now, a creative gasket manufacturer has the money-saving answer to this problem: it's a complete line of timing cover gaskets that has the needed segment of oil pan gasket packed into the carton. You



New gasket stays put as you want it.

don't have to spend extra for a pan gasket set and you've got the segment you need ready to install. From Fel-Pro Inc., 7450 North McCormick Blvd., Skokie, Ill. 60076.

A solution to a second gasket headache is now available. Ever try to change an automatic transmission pan gasket when you're doing a fluid and filter change? There you are, car up on stands and you underneath, trying to start the bolts while the gasket shifts out of position. You could use gasket shellac to hold the gasket, but if you do, you're in for a struggle the next time you have to change the gasket. The answer: a gasket with the four corner bolt holes slightly undersize, so if you push or thread the bolts through, they hold the gasket in position. You then have the four bolts ready to thread in when you put the pan up against the bottom of the transmission. From Automatic Transmission Parts Inc., 5940 Oakton St., Morton Grove, Ill. 60053.—B.H.



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APPLIANCE CLINIC

QUESTIONS ANSWERED

Rx for refrigerator hole

Can I repair a hole in the freezer compartment of my refrigerator using plastic aluminum? I have an auto-airconditioner recharge kit if I need it.—Donald Bohmann, Valley Cottage, N.Y.

This is not as easy as filling a hole with putty, Mr. Bohmann. The freezer compartment is the low-pressure side of your refrigeration system. Wherever there's a low-side leak, moisture is usually sucked inside. The moisture must be removed and the freezer hole repaired. If this is not done, an ice blockage will form and the compressor will run continuously without the refrigerator getting cold.

You should do the following: Discharge the freon cooling system. Remove the compressor and discard the oil. Vacuum the system to purge it of moisture. Replenish the oil. Repair the hole using an epoxy, and recharge the system.

Plastic aluminum and an auto-airconditioner recharge kit don't really qualify as the proper tools for this job.

Tip from a pro

I've been in the sewing machine business for 21 years, and although some dealers will refute what I'm about to say, I know from experience that it's true.

About 95 percent of all sewing machine problems are minor and can be repaired by the owner. Of these repairs, about 40 percent of them are the result of a needle that has been installed backward. This causes the thread to break whenever someone tries to sew.

My advice: If you have any trouble after changing a needle, be sure to double check that the needle has been installed properly.—No Name Please, St. Louis.

Thank you for a valuable tip, whoever you are.

Perpetual motion halted

In the May '78 Appliance Clinic (page 14, Cutoff Point) Otis Hedgpeth wrote that his Maytag dryer wouldn't shut off when clothes had dried. We had the same problem with our unit two years ago. A serviceman advised us to stop using a particular fabric softener because it was coating the sensors. He also told us to dry a

load of wet towels to clean the sensors. We did, and the machine has worked like a charm ever since. Incidentally, the fabric softener company sent us a check to pay for the service call.—Melvin J. Nutt, Ames, Iowa.

Above is one of several letters we received describing a similar experience. We thank you all.

Time marches on

The Whirlpool no-frost refrigerator-freezer (model EAT 17 GK) in our beach cottage is three years old. Lately, we've been hearing a noise in the kitchen. At first we thought it was a sea gull, but we've now traced it to the refrigerator. You can hear the noise when the refrigerator isn't running. What causes it, and how do we get rid of it?—John Reuben Jones, Huntsville, Ala.

It's hard to diagnose the cause of a noise without hearing it, but let me try. Your particular model uses a defrost clock that runs continuously, even when the compressor shuts off. When the refrigerator is off, everything that can make noise (e.g. the evaporator fan motor) also shuts off—everything, that is, except the defrost clock. Defrost clocks have been known to make noises after they have been in use for a number of years. The only thing you can do is replace the clock, but there's no guarantee that a new clock won't start making noise eventually.

There's one other possible cause of the noise. Your model is also equipped to accept an icemaker. If you have one, and the noise is intermittent, the sound may be coming from this accessory. The ice maker motor runs independently of the refrigerator.

Change dryer gasket

The seal around the door opening of our Maytag clothes dryer (model DG 606) is worn out. How do I replace it?—Frank G. Torpila, Trenton, N.J.

Disconnect the power cord and turn off the gas shutoff valve. Move the dryer from position until you can take off the back panel. Remove the three screws on the lower right side that hold the cabinet to the frame. Remove the four Phillips screws in the door open-

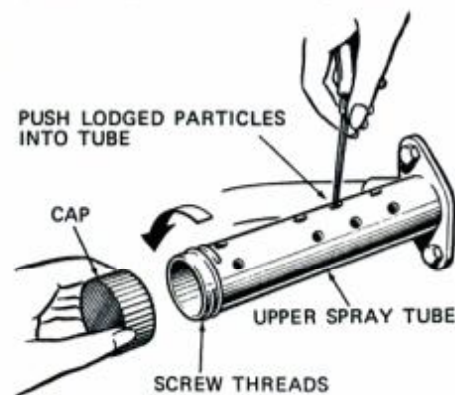
ing. Now you can move the right side of the unit. Move the cabinet forward 3 or 4 inches.

Take out the old gasket, but observe how it's tucked into its groove. Install the new seal in exactly the same way. Apply a soap solution to make the new seal more flexible. Button up the unit.

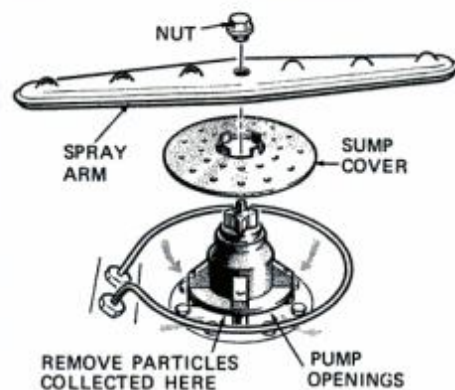
This job should take you from 30 to 60 minutes.

SERVICE TIP

Trapped food particles can hinder the spraying and draining functions of a dishwasher. Openings should be cleaned periodically. These drawings illustrate



Clean the spray tube periodically.



Brush particles from the drain area.

how to clean a Sears model. Use them as a guide in cleaning your unit.

To clean the upper spray tube, remove the cap and push particles from holes with care so the tool doesn't enlarge the holes. Then run the machine to wash particles from the tube. To clean the drain area, remove the spray arm and sump cover. Use a brush to sweep particles out into the tub where they can be gathered with a damp sponge. **PM**

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

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4 KING, 16 mg. "tar", 1.1 mg. nicotine, 100's: 19 mg. "tar", 1.3 mg. nicotine, av. per cigarette, FTC Report MAY '78.



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HIGH GAS MILEAGE RATINGS



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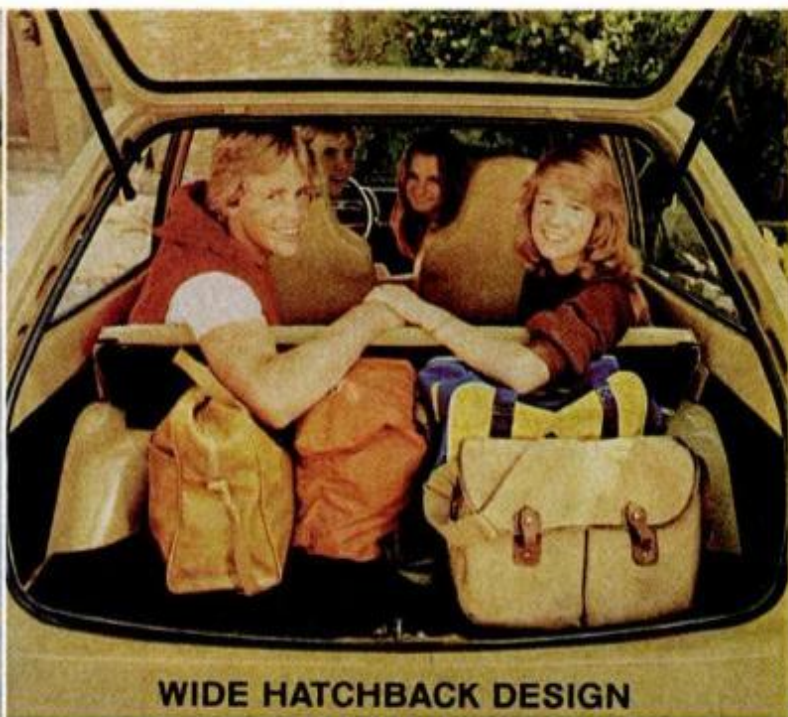
absolutely move you. In Ford tests, 1978 Fiestas accelerated from 0 to 50 MPH in an average of about 9 seconds.

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Fiesta not only gives you great performance, but also high fuel economy ratings. 1979 EPA gas mileage estimates were un-



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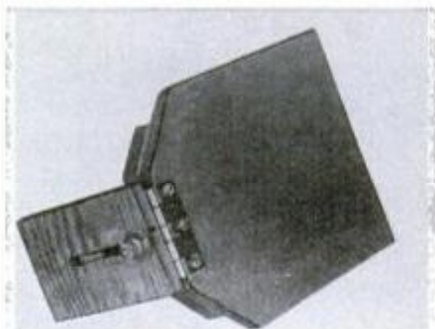
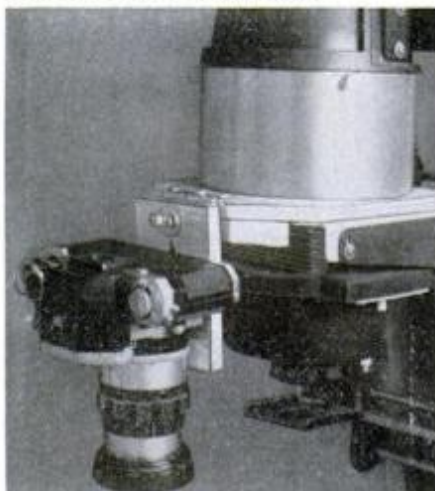
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PHOTO HINTS

Enlarger as copy stand



A hinged adapter that takes the place of the negative holder will turn almost any enlarger into a copy stand. Dimensions of the plywood plates are to suit the enlarger and the camera, held by a 1/4-20 bolt—not too long. With condenser-type enlargers, the upper plates should be faced with chamois, velvet or felt.—Fred Haitz

Tiny but mighty



For close-up work indoors, a high-intensity lamp placed just outside the field of view is a convenient means of adding high-lights or filling in shadows in your photographs.—Bob Berger

Just add water



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DETROIT LISTENING POST

Chrysler waits in line for turbo

While Chrysler would like to jump on the turbo bandwagon and could technically do so in 1979, reports indicate that there won't be a "blown" Chrysler product on the market for at least another year. Reason: Turbocharger suppliers—mainly Garrett AiResearch—will be hard-pressed to fill existing orders during the '79 model year and will have none to spare.

Diesel news

Diesel-powered car sales are growing like dandelions. A recent study by J.D. Power & Associates, a Los Angeles-based consulting firm, indicates that prospective small-car buyers prefer the diesel VW Rabbit to the gasoline version by over three to one in spite of the diesel's inherent noise, vibration and some difficulty in locating diesel fuel. All this is good news to U.S. and some import carmakers who are counting on the fuel-efficient diesel to help them meet the fast-accelerating federal fleet fuel economy standards.

But there are still some big flies in the diesel soup. For one, the federal emission standards for 1981 and beyond contain a one-gram-per-mile NOx requirement that may be difficult for diesels to attain; and California has set its own NOx standards at much lower levels, which will rule out diesels entirely in that state.

Also there is the big question of whether and how much diesel particulate emissions (fine airborne solid particles) should be controlled. Fortunately, EPA's initial research into the health effects of diesel particulate emissions has shown "no significant health effects" in laboratory animals subjected to high concentrations of light-duty diesel-engine exhaust.

If it gets a clean bill of health on particulates and meets NOx and other emissions requirements, the diesel is expected to be in as many as 25 percent of the new cars sold here by 1985.

Light trucks to get lighter

It's inevitable that light trucks, vans and recreational vehicles will get lighter and eventually smaller as a result of federal fuel economy

regulations. Which is why Ford, for one, has expressed concern that these rules must be reasonable enough that the affected vehicles don't lose their load-carrying capabilities.

For '79, Ford will meet the law with powertrain changes (smaller engines, lower axle ratios) to existing vehicles. But the company says its redesigned '80-model pickups will be some 250 pounds lighter than the models they replace and will get a new four-speed overdrive automatic transmission, possibly the 255-cu.-in. small V8 being developed for the company's cars—maybe even a "dual-displacement" 302 V8 that deactivates some of its cylinders for idle and light-load conditions.

A joint development with supplier Eaton Corp., the dual-displacement system was considered for six-cylinder truck engines as well, but was scrubbed due to engine roughness and lower-than-expected fuel savings. Other Ford truck engine plans include a 232-cu.-in. aluminum block V6 and a dual displacement 351 V8—provided the Eaton system works out on the 302, of course.

Since both Ford and Chevy report their trucks have been outselling their cars in recent months in certain areas of the country, such future plans are extremely important to both companies.

Eaton looks at future engines

Another area of research at Eaton Corp. reportedly involves high-efficiency engines that may have little or no water cooling and exhaust-driven turbines that will provide extra driving power.

According to a *Ward's Engine Update Report*, Eaton researchers are looking at ways of reducing power losses through the cooling and exhaust systems, which commonly account for about two-thirds of the energy produced in the average passenger car engine. The one-third that normally is wasted as heat absorbed by the cooling system can be reduced by shrinking and eventually eliminating water cooling altogether, provided engine materials (such as ceramics) can be developed that can take the resulting extreme temperatures. Some of the other

one-third that escapes with exhaust gases can be recovered through exhaust-driven turbochargers such as those already available on some U.S. and imported cars, but more of it could be harnessed with a technique Eaton calls "turbocompounding." This involves an exhaust turbine tied to the engine output shaft to add power to the drive wheels.

Eaton estimates that a non-cooled and turbocompounded engine could convert as much as 50 percent of the fuel energy into useful work vs. the 30 percent or so that comes out of current internal combustion engines. But such advanced technology is five to ten years away for long-haul trucks and much farther in the future for passenger car applications, even if the company's current work proves successful.

GM and Ford "World Cars"—'81

GM is planning a front-drive "J-car" that will be a true "World Car." It'll be produced in Japan, Europe, South America and Australia as well as in the United States.

The J-car is slated to bow in 1981 as a 100-in.-wheelbase replacement for the sporty Chevy Monza and Pontiac Sunbird, with longer-wheelbase "J-special" versions to follow soon after for Oldsmobile and Buick Divs. As the current Camaro and Firebird are based on the more mundane GM compact sedans, the all-new "Js" are expected to be shortened variations of GM's coming '80-model front drive Nova/Phoenix/Omega/Skylark—but with much sexier styling and sportier character.

Concurrently, Ford is developing its new front-drive econo car project, codenamed "Erika," also for production in various parts of the world. As a replacement for Pinto/Bobcat in 1981, the 94-in.-wheel-base subcompact will get unique styling for the U.S. market, while a sister car will debut in England as an Escort model. Front-drive manual-shift transaxles for the U.S. version will come from Toyo Kogyo in Japan (maker of Mazda cars and trucks and Ford's Courier minipickup), but automatic transaxles will be U.S.-built.—Gary Witzenburg

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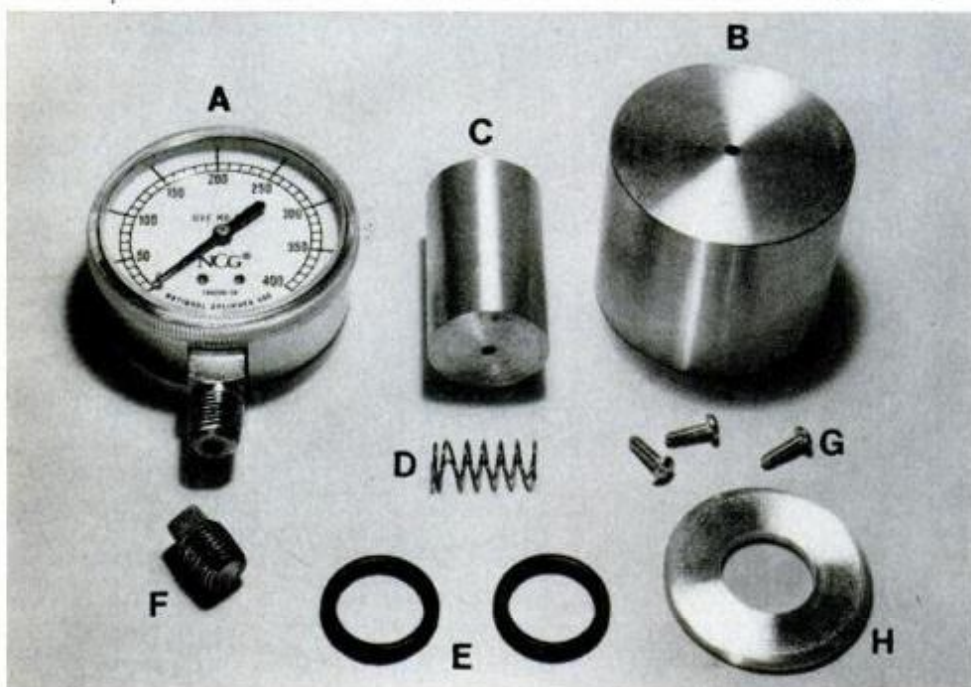
MG69



Make this compact scale to check your hitch weight

Hauling an improperly balanced load can cause you to lose control of your towing vehicle—and endanger the lives of you and your family. This simple load scale, built from inexpensive materials (below, left), takes guesswork out of achieving the proper weight ratio between the trailer tongue and loaded trailer. It's light enough to carry on trips—and can accurately weigh many other objects.

Use convenient scale to check for safe ratio between trailer and tongue weight.



Gather parts to build the scale from hardware, plumbing and metal supply outlets: A, pressure gauge; B, C, aluminum rod; D, spring; E, O-rings; F, pipe plug; G, machine screws; H, retaining ring (turned from aluminum rod). See materials list on page 34.

How to trail safely

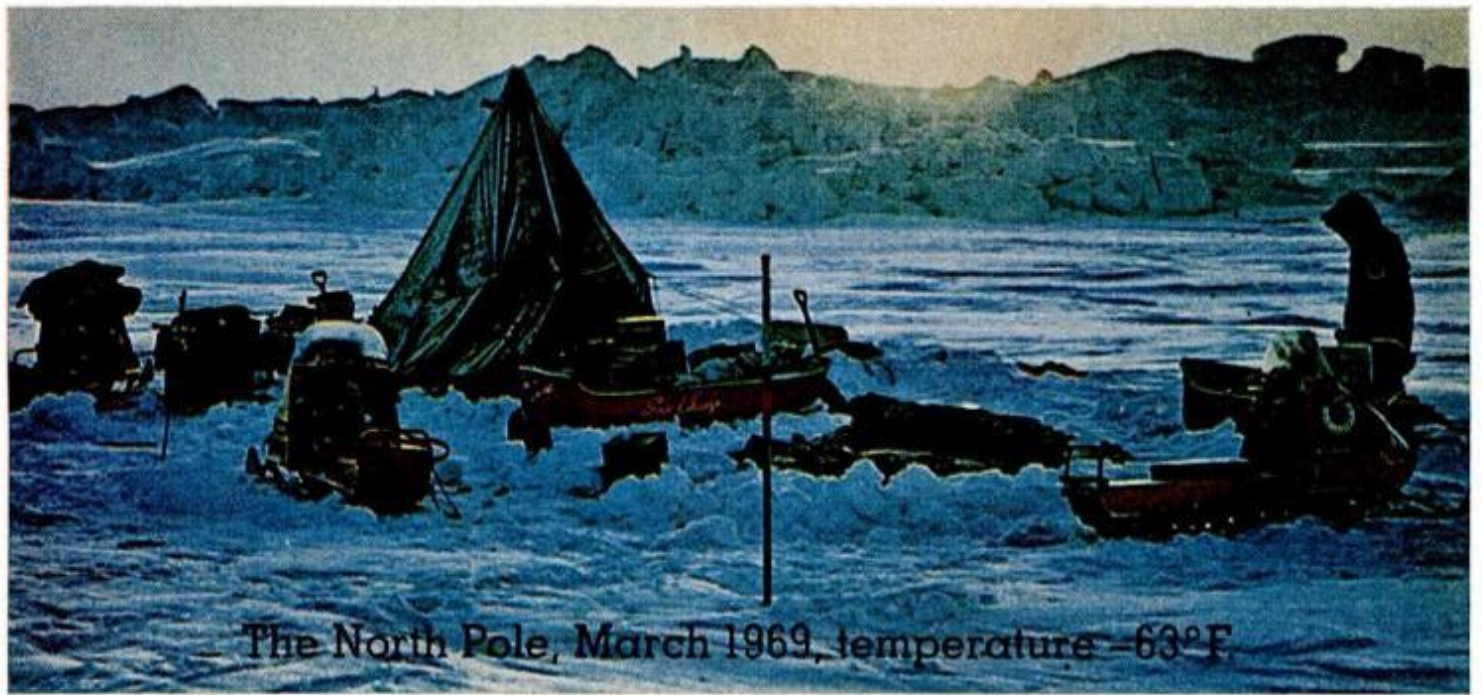
Trailer tongue load should be about 10 percent of the gross trailer weight for deadweight hitches, and 12 percent for weight-distributing type hitches.

Gross trailer weight can be determined in two ways. You can get the manufacturer's dry trailer weight rating plus all trailer options from your manual, dealer or rental agency—and add to it the weight of each item in your payload. Or, locate a scale at a local trucking company and ask to weigh trailer and payload all at once.

For correct balance, weigh the trailer tongue at hitch-ball height. Use a jack or other stable base to support the scale. If the tongue weight exceeds 15 percent of the gross trailer weight, shift the load to the rear and resecure. If the tongue weight is less than 10 percent, shift forward.

You can build this simple scale on

[\(Please turn to page 34\)](#)



The North Pole, March 1969, temperature -63°F

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HITCH-WEIGHT SCALE

(Continued from page 32)

any lathe from a Unimat on up. Start by making the piston-retaining ring from the larger aluminum rod. Then form the cylinder base from the same rod by boring a 1.128-in.-dia. hole and polishing with crocus cloth. Bore three 5/32-in. holes in the ring, then use a No. 35 drill to bore corresponding 3/8-in.-deep holes in the cylinder base. Tap holes in the base for No. 6-32 machine screws. The cross holes are drilled with a 27/64-in. bit and tapped for a 1/4-in. pipe thread to accommodate the gauge and plug.

Turn the piston to 1.124 in., and polish for a close slide-fit. A 3/8 x 1-in. piston-return spring fits in a 3/8-in. hole, 1/4 in. deep, in the piston end—and rests in a shallow 1/2-in.-dia. depression in the bottom of the cylinder base.

Cut the O-ring grooves with the specially shaped groove-forming tool detailed in the plans. Cut the grooves a bit shallow at first, then deepen if necessary after test-fitting the piston assembly. O-rings should be perfectly clean of dust and grit and shouldn't pass over any sharp-edged shoulders during installation. Taper the outer end of the cylinder bore about 15° for a distance of 3/32 in. to ease insertion of the piston with O-rings.

Assembly procedure

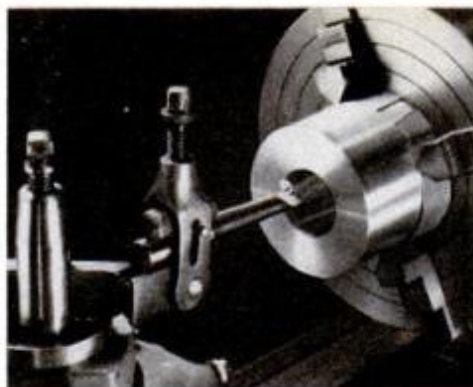
To assemble, insert the piston with O-rings and spring into the cylinder. Screw on the piston retaining ring. Next, put Teflon thread tape on the gauge threads and screw into the cylinder base. An oxygen or gas type gauge with a 400-lb. capacity was used on our scale, but other types of pressure gauges may be used. If you need a scale for heavier loads, substitute a gauge with a greater capacity. Now fill the cylinder with mineral oil, bleed out all air and insert the pipe plug, also using Teflon tape.

Caution: Never reuse a gauge on an oxygen tank. **PM**

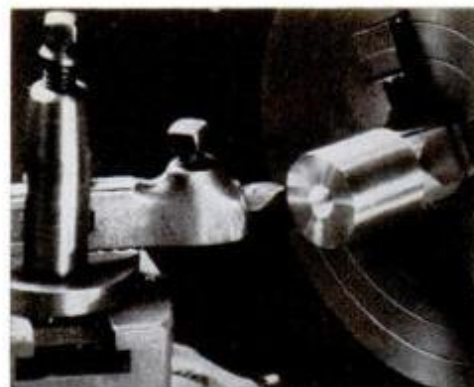
MATERIALS LIST—SCALE

Part No. Size and description (use)

A	1	Pressure gauge to suit. An oxygen or gas-cylinder type with 400-lb. pressure capacity was used on our scale, but other types can be used.
B	1	2 1/4 to 2 1/2"-dia. x 2 1/4" aluminum rod (cylinder base)
C	1	1 1/8"-dia. x 23/32" aluminum rod (piston)
D	1	3/8 x 1" spring (piston return)
E	2	3/8" I.D. National AS-212 O-rings
F	1	1/2" pipe plug
G	3	1/2" 6-32 machine screws
H	1	1/8" thick x 2"-dia. aluminum ring (Machine from large aluminum rod, part B, above)



Bore hole to accommodate piston and form reservoir for oil. Aluminum strip between rod, chuck jaws prevents marring.



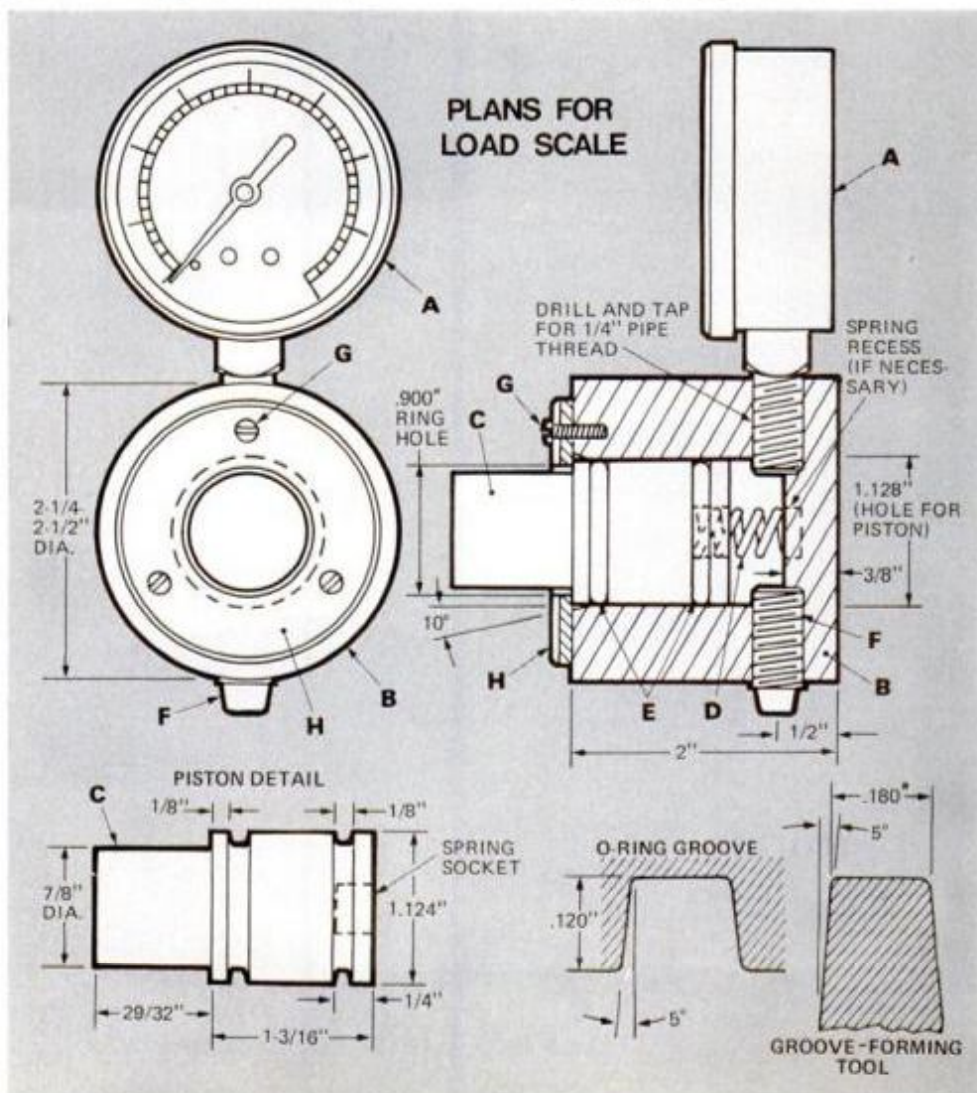
Predrill recess for spring and set up lathe as shown for machining critical piston diameter on smaller aluminum rod.



Cut grooves in the piston with a 1/4-in. tool bit ground to groove contour. See the groove-forming tool detail below.



Complete assembly of scale by inserting piston; secure with retaining ring. Add oil through pipe plug and seal.



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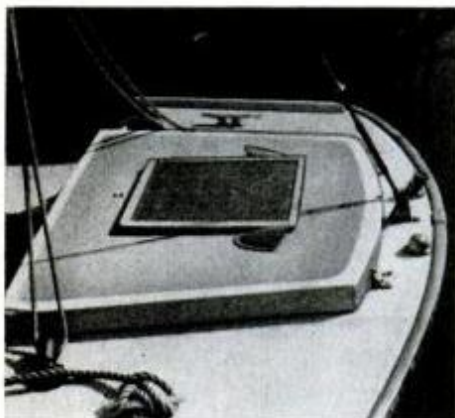
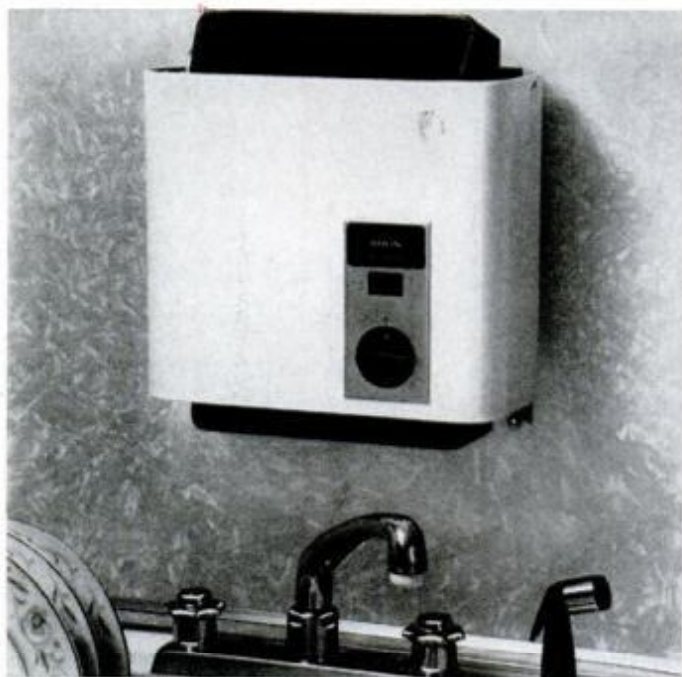
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Solar charge plate

The 7-watt Solar Energizer is an array of silicon solar cells designed to keep your boat's 12-volt battery at full charge to run its electrical system. About \$350 from Solarex Corp., 1335 Piccard Dr., Rockville, Md. 20850.

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Flush your outboard while it's still attached to your boat, in or out of water, with the Multipur Flushing bag. It also can be used as a live bait bag. Two sizes are \$50 and \$60. M.P.F. Mfg., Box 123, La Puente, Calif. 91747.



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HOMEOWNERS' CLINIC

QUESTIONS ANSWERED

Old-timer

I recently bought an old Sears Dunlop metal lathe with a 6-in. swing and 24-in. bed. My model (109-0702) was built about 1948 and parts are no longer available. Do you know where I could find them?—James Bewley, Tinton Falls, N.J.

Sears products enjoy an excellent reputation, but 30 years is a long time. The Sears Chicago office confirmed what you already know: It normally stocks parts for about 10 years. You could ask a local machine shop to fashion replacement parts, or you could place want ads in the local newspapers.

Leaky tar roof

My building has a flat roof made with tar paper and tar but no gravel. The roof expands and contracts, causing breaks and leaks. I need something soft and pliable to "give" with the structure. I've tried most types of roof coatings, but they always end up as temporary patches. The building has a history of leaking.—Glen L. Zabel, Cleveland, Minn.

It sounds as if you need a new roof. If your substrate (wooden decking) is in good condition, you may want to try a product by Water Guidance Systems Inc., Branford, Conn. 06405. Send for their brochure. The product is a polyvinylchloride membrane laminated to each side of a nylon reinforcing cloth or scrim for added strength. Applied with adhesive, it "gives" with the roof's movement. (It's available in 54-in.-wide strips, 32 mils thick.)

To prepare your roof for application, scrape it clean of all curled edges, pierce and nail flat all bubbles. Brush the roof clean. No ballast (stone) is used in the application. Use the special tape to seal the joints, followed by a top coating (with color choice) to protect the roof from ultraviolet rays. You don't have to rip off your old roofing, but for energy conservation, consider adding 1-in. rigid insulation to the roof.

Tape for gutters

The severe winter created ice backup 8 to 10 in. high in our gutters, causing roof leaks and gutter damage. Can I use heat

tapes like those that thaw pipes or heat seed beds to keep our gutters clear? — Delbert Smith, Huntington, W. Va.

I'm afraid not. "Seed tapes" are designed to heat to 74°. So unless you want to waste heat, don't use them. Since they'll rub on the gutters, install only those tapes designed for such use. Two manu-



Tapes melt roof snow, prevent ice dams.

facturers are: Easy Heat Engineered Heating Products, New Carlisle, Ind. 46552 (see sketch), and Wrap On Co. Inc., 341 West Superior St., Chicago, Ill. 60610. When writing for information, specify gutter and roof tapes.

Sticky predicament

I'm attempting to remove a pressure-sensitive foam-rubber-backed carpet from a hardwood floor. Most of the backing remains stuck to the floor. How do I remove the mess?—Raphael Bostic, Delran N.J.

I assume you want the wood floor exposed. Otherwise, I would suggest you carpet right over it. Armstrong, a leading carpeting manufacturer, suggests you apply warm water with a small amount of detergent (about 1 tablespoon per gallon). Use a sponge to moisten the backing for 30 to 60 minutes, but don't drench the rubber or you'll saturate the hardwood floor below. As the bonding agent appears to be "cut" by the water and heat, carefully remove the rubber backing. Although I haven't tried it, I think a steam iron would also be effective—much

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.

like it is in removing wallpaper. Since you already have a "mess," if the warm water and steam don't work, I'm afraid you'll have to call a professional floor refinisher for a scraping and sanding job.

Meter gone awry

My water consumption averaged 9500 gallons per month for four years. Recently I was hit with a bill for more than 100,000 gallons for two months. I haven't changed my lifestyle, and I suspect my water meter is malfunctioning. Can compressed air register on the meter after a break in the main? My water company claims that a malfunctioning meter will always register in the homeowner's favor. Who can check this out further?—Ken Green, Indianapolis.

You can. I checked with my water company and with the Neptune Water Meter Co., a leading manufacturer of meters, and I learned that: (1) It's possible for compressed air to register on a meter, but compressed air in a water line is impossible; (2) A malfunctioning meter does work in the consumer's favor, allowing more water to pass through without registering.

You probably have a leak. Have you checked all faucets and toilets? If you have, then carefully read the meter one morning and don't use any water for about eight hours. If the reading changes, you have a hidden leak on the house side of the meter. If the meter is outside (e.g., by the curb), the leak could be between the meter and the house. Run the same test, but shut off the water supply at the house. If the meter still shows usage, the leak is in the supply line to the house.

If your meter is in the basement or alongside the house, you should be able to spot the leak. **PM**



INTRODUCING A REVOLUTIONARY BIG PICTURE COLOR TELEVISION.



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GE "Command Performance"
VHS video cassette recorder optional.

You're looking at the new General Electric Widescreen 1000. A super size color TV with a picture three times the size of a 25" diagonal console. A picture that makes you feel like you're at the movies. A set with the advanced performance features you expect from General Electric.

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chairside convenience of random access remote control. So you can go from channel 2 to 83 instantly.

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GENERAL  ELECTRIC

PM WORKBENCH

PM EXAMINES PRODUCTS & SERVICES

Teenage craftsmanship

When the folks at The Stanley Works asked me to help judge their annual woodworking competition for high school students, I quickly said yes. The contest is open to students in grades 9 through 12 and is divided into two divisions—grades 9 and 10 and grades 11 and 12. Each student must submit plans, materials lists (materials for a project can't go over \$100) and a photo of the project. Twenty finalists are se-



Grand prize is examined by judges.



Trestle table won 15-year-old David Cloutier, Bolton High School, Conn., \$1000 in 9th and 10th grade division.



J. T. Turner, 18, at G.R. Clark High School, Winchester, Ky., took 11th and 12th grade division with a writing table.

lected and their projects are shipped to Stanley for final judging by a panel consisting of educators, designers and PM's Home and Shop Editor. Winning projects

are shown above. For more contest information, write Robert W. Campbell, Education Marketing Manager, Stanley Tools Div., New Britain, Conn. 06050.—H.W.

A quicker and easier way to split logs

This ax splits green logs as easily as seasoned ones because rotating levers in its head deliver extra splitting force. In the tests that I did, the Chopper split every log on one swing—even a couple with heavy knots. The levers also help keep the ax from sticking. It costs \$32.95 ppd. The ax is manufactured by Chopper Industries, Box 87, Dept. 1078, Easton, Pa. 18042.—H.W.



Unwieldy-looking ax head does the job.



Levers in head give tool an edge.



Levers rotate, increase splitting force.

Plumb's apron offer

Plumb's current offer prompted me to pick up a Plumb hammer—which turned out to have great heft—and send for a \$2.99 ny-



Apron is available through the mail.

lon/vinyl flame-resistant apron shown. Ames Apron Offer, c/o Plus Ltd., 2037 Wales Rd. N.E., Massillon, Ohio 44646. Allow six weeks.—H.W.

Industrial-use wrenches

Wright's line of quality flat wrenches features a V-notch design that gives a solid, slipfree grip on nuts. Also the new-style stem is dished to keep your thumb from

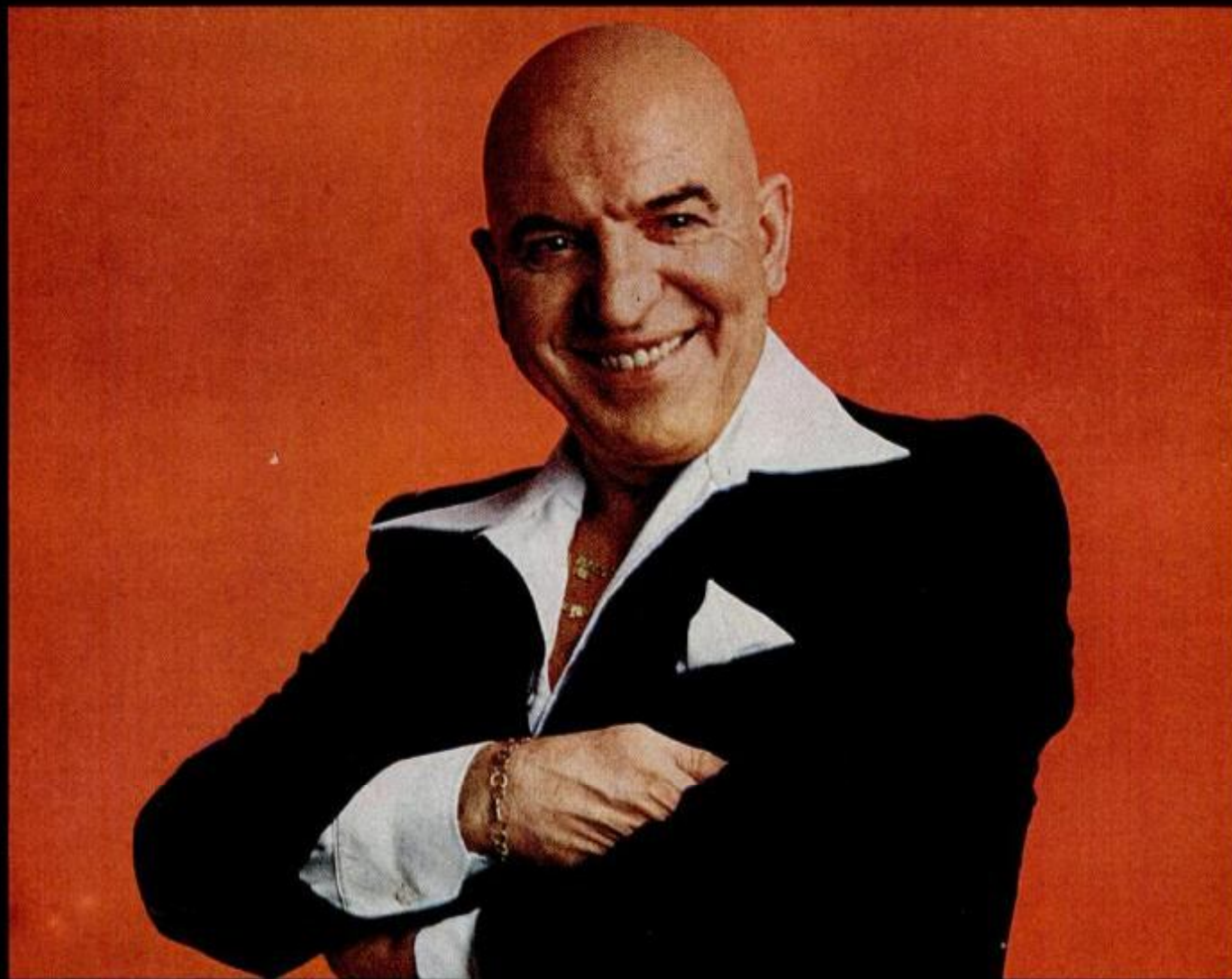


The wrenches come in a handy pouch. The V-notch design (inset) assures that you will have a good grip.

slipping. Set No. 707, consisting of seven wrenches, is priced at \$34.38 from Wright Tool & Forge Co., 42 East State St., Barberton, Ohio 44203.—H.W.

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

Telly Savalas is now appearing in "Mati."



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Tough Fords: America's Best-Selling Pickups.*

Ford pickups are the most popular trucks ever built. And the way they're built is—tough.

'79 Ford pickups have tough Twin-I-Beam suspension up front. Strong all-welded box in back. Solid toughness in between. Extensive rust protection on Ford Stylesides includes tough anti-corrosion coatings like galvanizing, plus no-rust inner front fender liners. And Ford pickups have the choice of standard 4.9L (300 CID) Six or optional V-8's. Ford pickups. They're tough all over.

Ford Motor Company offers an Extended Service Plan. Ask your dealer for details.

*Based on R. L. Polk & Co. registrations for 1978 models through May, 1978.



Tough F-150 SuperCab. America's roomiest 2-door pickup, can seat a family of six. Optional full-width back seat folds down.



GENERAL STORE



4-speed
overdrive for
easy cruising
on the highway.
(Optional on 2WD
pickups except
F-350.)

Ranger Lariat cab interior with
added options: tilt wheel, sliding
rear window, air conditioning, auto-
matic transmission, AM/FM
stereo, and convenience group.

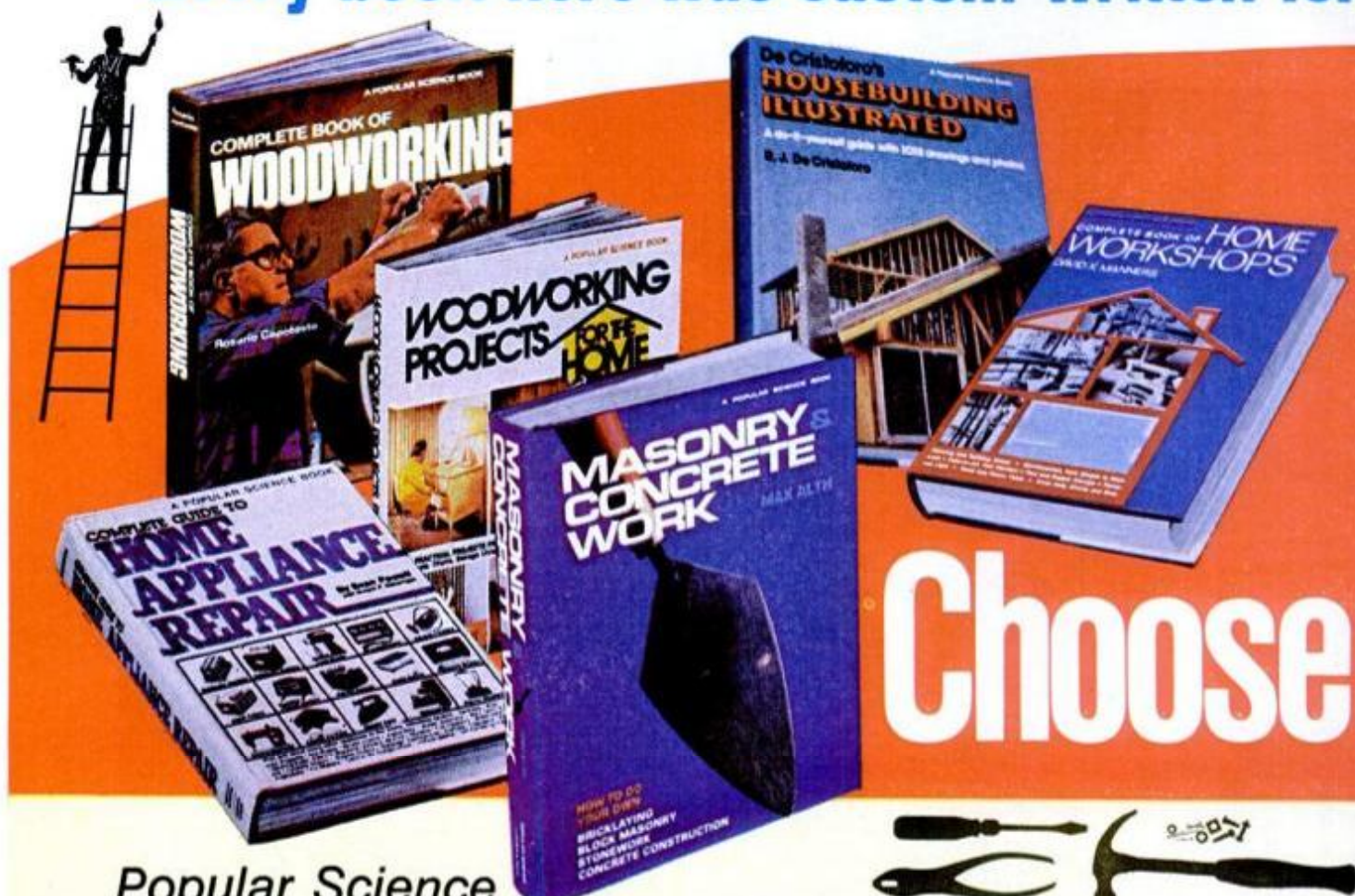
Tough Ford tests at the Arizona
Proving Ground totaled more than
a million pickup miles last year.
Bruising miles of steel-reinforced
chuckholes, frame twists, salt
baths, high-speed durability runs.

FORD

FORD DIVISION



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CAR CLINIC

SOLUTIONS FOR MECHANICAL HEADACHES

BY MORT SCHULTZ



Ignominious igwire

My 1975 AMC Matador, 304-cu.-in. V8 engine, has had the same problem almost from birth. While driving, the engine comes to an abrupt stop as if the ignition were turned off. The trouble is intermittent. Sometimes it won't happen for several weeks; other times it occurs several times in a couple of miles. When the engine stalls, turning off the ignition for a short period usually allows re-starting. The dealer has tried to find the trouble. For example, he has replaced the wiring harness. Any suggestions would be appreciated.—S.E. Eisenhard Jr., Lansdale, Pa.

Ironically, your letter and an "inside" tip that AMC is about to announce a recall relative to this problem arrived simultaneously. The trouble lies in the electronic ignition system, specifically with the siamese connector that connects the distributor to the electronic control unit. This connector builds up resistance. As it does, the connection is affected, which causes intermittent stalling. The condition is erratic; temperature and movement are involved.

Dealers are receiving instructions and a repair kit from AMC that allows them to fix the problem. Basically, the repair calls for cutting out the connector, soldering leads together with rosin core solder, and sealing the cut ends with a waterproof material. The repair is made free of charge. AMC calls it the Igwire Campaign.

Old story

I understand that the problem I have is widespread, so by helping me you will help others. The trouble is a buildup of carbon in a high-compression engine. In my case, the car is a 1976 Ford LTD, 400-cu.-in. V8 engine, that has been driven 79,000 miles. The engine runs well and burns no oil, but even with a new starter and battery, it is hard to start when

warm only. If left to cool a little or when cold, the engine starts right off. My options, I'm told, are to live with the trouble or install a new engine. What a choice! Any others?—Irv Culver, Cannon Falls, Minn.

Since 1963 when we started *Car Clinic*, I've discussed this engine carbon problem at least once a year. Here's the 1978 version:

An abundance of carbon increases an engine's compression when the engine is warm, making it difficult for the starter motor to crank the engine. You have two other options open to you, both more palatable than the ones you mentioned. I would first try using GM Carbon Solvent, available from a GM dealer. Follow instructions and have patience. Try several cans. Solvent breaks up carbon so it can be expelled out the exhaust.

If this doesn't work, disassemble the engine and physically remove carbon. This is a less expensive method than buying a new engine.

What's my line?

I paid \$40 for a transmission cooler when I ordered my 1978

Chevrolet Blazer K-5, and now no one can find it. I can't find it. The service manager at the dealership is puzzled. Even the company representative was confused until he found the letters "XT" stamped on the radiator. This, he says, indicates that the cooler is located inside the heavy-duty radiator. But now I'm dubious. Is the factory representative giving me a line?—Nick Vocino, Sterling Heights, Mich.

Not unless the transmission cooler was accidentally omitted from inside the radiator, which is unlikely. To satisfy yourself, find the two lines extending to the transmission from the radiator. Disconnect them. An outpouring of fluid confirms the presence of the "missing" transmission cooler.

A matter of choice

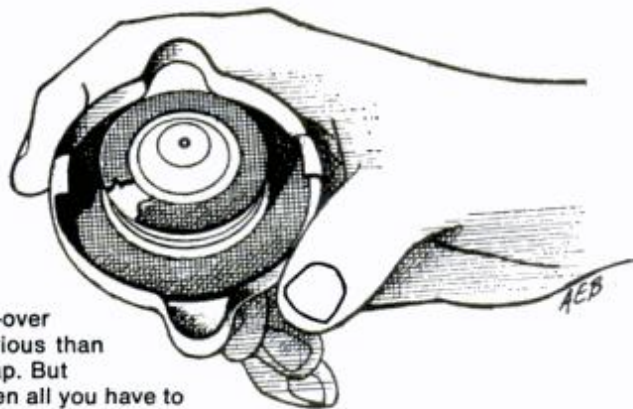
In the May 1978 Car Clinic, you advised L.W. Gilpin that he would have to drop the driveshaft of his Dodge Ramcharger to lubricate the constant velocity (CV) joint. I have devised a method that allows me to avoid this hassle.

Mr. Gilpin will need three things for his grease gun:

- A needle-type greasing adapter. I had to grind down the outside diameter of mine to get it to fit. Check fit by trial-and-error.
- A 90° pipe elbow.
- A flexible hose (the longer, the better) to replace the gun's original tube. A long hose lets you lay the grease gun on the ground and pump it with one hand while holding the greasing adapter in place with your other hand.

After replacing the gun's steel tube with the flexible hose, attach

(Please turn to page 160)



Cap kaput?

The cause of radiator boil-over could be nothing more serious than a shot radiator pressure cap. But why be inconvenienced when all you have to do is check the cap every six months? That cap has to seal the radiator to keep the coolant, under high pressure, from blowing out the radiator filler neck. Check the cap by removing it with the engine cold. If you have a pressure tester, use it. If not, a close inspection can frequently avert a budding gusher. Make sure that the gasket in the cap is not dry or cracked. If you find that it is, get yourself a new radiator pressure cap.



Come to where the flavor is.

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

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

Kings: 17 mg "tar," 1.0 mg nicotine—
100's: 18 mg "tar," 1.1 mg nicotine av. per cigarette, FTC Report May '78



PM PLAN OF THE MONTH

ENERGY-EFFICIENT SECOND HOME

The desire to get away from it all has started more and more families thinking about building a second home. Such homes are usually designed with an eye toward recreation and relaxation on weekends or during holiday seasons. However, these dwellings are also being used for more than just leisure living. Many are being built with an eye to future retirement and year-round living.

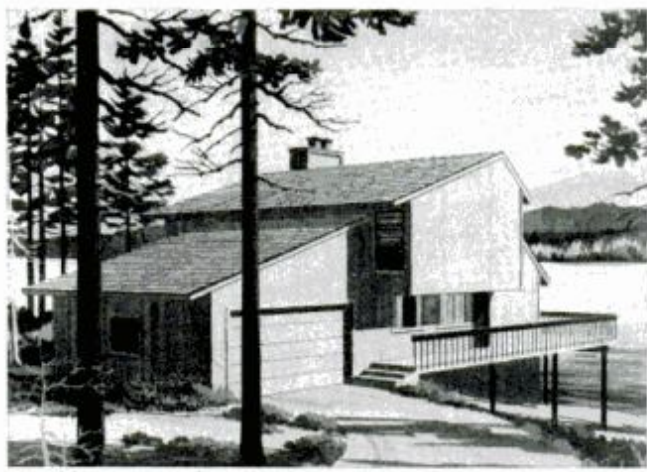
PM's plan, illustrated here, represents one of the most popular new versions of this multiple-use type of housing.

In our era of zoning restrictions and enforced building codes (even in remote areas) this design provides a good springboard toward your second home. It is particularly sensitive to today's demand for energy conservation and employs novel methods of construction and use of new materials to that end. Extra-deep 2x6 exterior wall studs allow space for insulation up to an R-19 value. Similarly, deep rafters and floor joists accommodate plenty of insulation (R-30 and R-19, respectively). Multiglazed windows are specified and the carefully planned window-to-wall-area ratio also helps to minimize heat loss.

Traditional heating systems are not ignored. A large-sized fireplace is located in the living room. The basement plan provides for a service area to house the furnace and water heater. There is also room in this space for a heat storage tank in case you wish to use the alternate plan for solar heating that accompanies this design. **PM**



Plans for this contemporary second home include details for the solar collectors on the roof and a solar heat schematic diagram in case you opt for this feature.

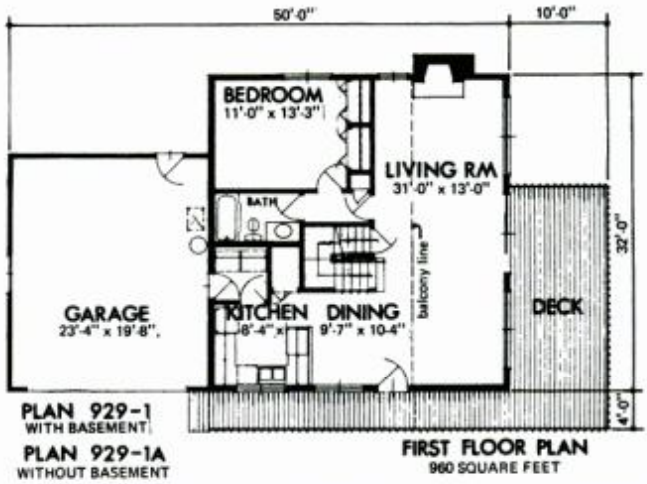


Compact first-floor plan (below) eliminates wasted hall and floor space. A central stairway connects all three levels including daylight basement. The L-shaped arrangement of the kitchen, dining area and living room does away with partitions, thus enhancing the feeling of spaciousness that prevails throughout the house.

This energy-conserving house is easy to maintain and flexible enough for people of any age, in any season. Spacious decks and terraces with plenty of access from inside allow you maximum outdoor living. Optional daylight basement gives space for expansion or under-house garage.

HOW TO ORDER PLANS

Complete plans are available for \$150. You will receive four copies for use in construction, financing, obtaining building permits and for your own study. Plans will be reversed side-for-side for an additional charge of \$20 and a list of building materials is \$10 extra. A single set of blueprints costs \$100. Address all orders or inquiries to Home Building Plan Service, Inc., 2235 Northeast Sandy Blvd., Portland, Ore. 97232 or telephone 503-234-9337. Specify plan No. 929-1 (with basement) or No. 929-1A (without basement).



The second floor boasts a second and third bedroom, two more baths, plus a naturally-lit balcony/loft that overlooks the living room.

"Solid feeling car..."
"Impressively quiet..."
**"Most significant
U.S. small car yet."**

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"Quiet... smooth ride."

Detroit News

**"The ride is firm
without being harsh."**

Car Biz

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RELAX. HORIZON CAN HANDLE IT.**



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Three different cars,
three different styles of driving,
one shock absorber: Gabriel Striders.

Most shocks give you one kind of ride Gabriel Striders® give you a choice of three

The typical shock absorber is a compromise. It has to be, because it's valved to suit the average driver going over average roads.

That means most shocks aren't firm enough for drivers who prefer crisp handling, or comfortable enough for those who spend long hours at highway speeds.

It means most shocks will not provide enough control for comfort on rough country roads or carrying heavy loads.

Most shocks compromise— Gabriel Striders adjust

Gabriel Striders are different. They can be *adjusted* for the firmness that you want. You can actually change the shocks' internal valving before you put them on your car.

When you install a set of Striders, all you need to do is twist the barrel of each shock to set it for a "Regular,"



A simple twist of the Striders barrel adjusts it for the ride you want.

"Firm," or "Extra Firm" ride.

Regular gives you quick, sure handling and the softest highway ride.

Firm provides a stiffer ride for even more responsive handling and for comfort on rough roads.

Extra Firm gives maximum control, for heavy loads, for rugged roads and for extra quick maneuvering.

A bigger cylinder, extra coil springs, more valve stages

The Striders' adjustability is only one of the things that make it a premium

quality shock absorber.

Striders use a heavy-duty 1 3/16" bore which reduces the heat build-up that's responsible for shock absorber fade.

Striders use more coil springs than you'll find on many other premium shocks—for more consistent operation even after thousands of miles of use.

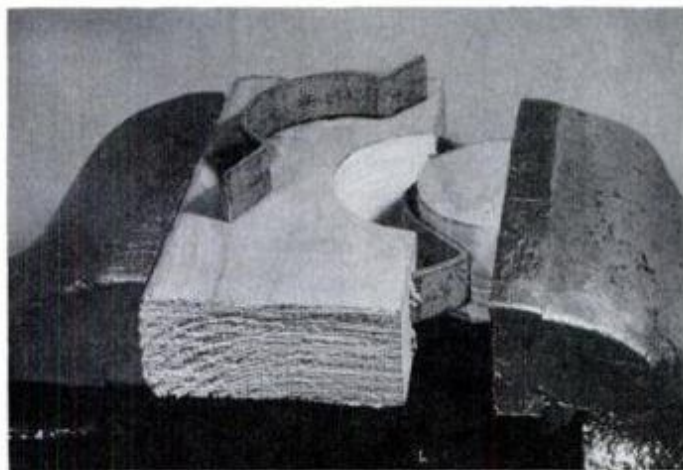
Striders incorporate a nine-stage valving system—three more than are used in ordinary shocks—for even more protection against excessive pressure, heat and fade.

Most important, Striders are adjustable—they don't just fit your car, they fit the way you drive it.



Gabriel[®]
SHOCK ABSORBERS

Make this drill-press table lifter to save your back



Bend your own column clamp for drill press lifter by using a form made from 2x4 scrap and applying pressure with a vise (above). Unassembled parts for lifter are at right.



by Harold T. Kennedy

Adjusting the table height on your drill press can be a real test of strength—and the awkward movement often required to lift it can cause serious back strain or hernia. Inertia, friction and the sheer weight of the steel table (with everything that might be resting on it) can require a lifting force of well over 55 lbs. Change those pounds to a mere 10 by making this simple lifting device for a fraction of the cost of a doctor visit.

The lifter basically consists of a lever, collar clamp and a link that connects the two. Make the clamp

yourself or order it from Sears. It's a 2- $\frac{3}{4}$ -in.-dia. clamp that fits most drill presses. To order, specify part No. 9-2438, model No. 2450. It costs about \$2.

To make your own clamp for a 2- $\frac{3}{4}$ -in. column, bend the ends of two 6-in. long blanks 90° to form 1-in.-long "ears." Next, use a compass to draw an arc with a 1 $\frac{1}{2}$ -in. radius on a 6-in. length of 2x4. The centerpoint for the arc should be $\frac{5}{16}$ -in. beyond the edge of the 2x4. Cut out the waste block with a jigsaw.

In a second piece of 2x4, cut out a semicircular block with a 1 $\frac{3}{8}$ -in. radius to produce a curved tool for forcing the iron strips into the first

notch. Keep the centerpoint of this arc at least $\frac{1}{8}$ in. in from the 2x4's edge. A hefty bench vise provides the bending force. (A column with a diameter more than a 2 $\frac{3}{4}$ -in. diameter calls for proportionately longer blanks and a larger jig for forming clamps. Cut the notch with a radius equal to the column radius plus $\frac{1}{8}$ in. Make the radius of the corresponding block equal to the column's. Maintain a $\frac{3}{8}$ -in. gap between ears of assembled clamp to allow for tightening.

Now, in the center of each clamp segment ear (except one), drill $\frac{5}{16}$ -in. holes to accept two 2-in.

(Please turn to page 56)

DRILL PRESS TABLE LIFTER

NOTE: ALL CAP SCREWS AND NUTS ARE 5/16 - 18

LEVER, FORM FROM 1/8 x 1 x 16" IRON

5/16" - DIA. DRILL (2 PLACES)

5/16" FLAT WASHER (2 REQ'D.)

NUT (5 REQ'D.)

FRONT SEGMENT*

REAR SEGMENT*

2" LONG CAP SCREW (2 REQ'D.)

NUT BRAZED TO EAR OF CLAMP

1/4" - DIA. TAP DRILL 5/16 - 18 TAP

5/16" - DIA. DRILL (3 PLACES)

NUT JAMMED HARD AGAINST NON-THREADED PORTION OF SHANK

"WING BOLT" MADE BY DRIVING HEAD OF BOLT BETWEEN "EARS" OF FORGED WING NUT.

1/4" - DIA. TAP DRILL 5/16-18 TAP, 9/16" DEEP (SCREW BOTTOMS HARD, BUT LINK REMAINS LOOSE)

NUT (2 REQ'D.)

1" - LONG CAP SCREW

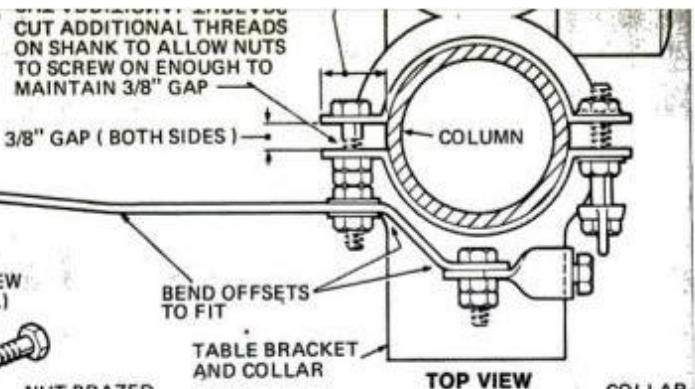
90° TWIST

LINK, FORM FROM 1/8 x 3/4 x 5-3/4" IRON

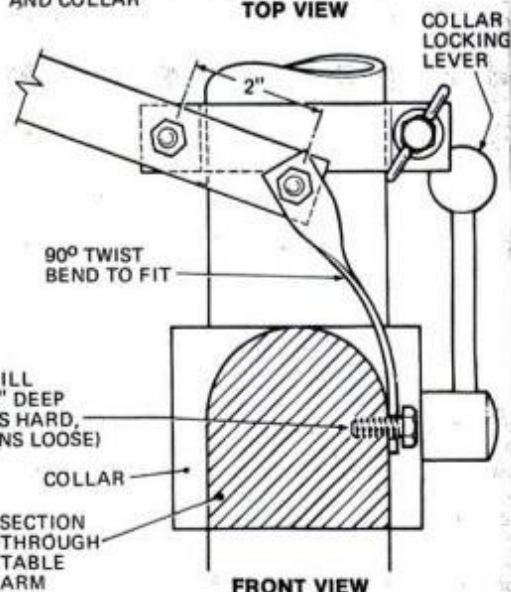
5/16" - DIA. DRILL (2 PLACES)

3/4" - LONG CAP SCREW

*CLAMP SEGMENTS FORMED FROM 1/8 x 1" IRON



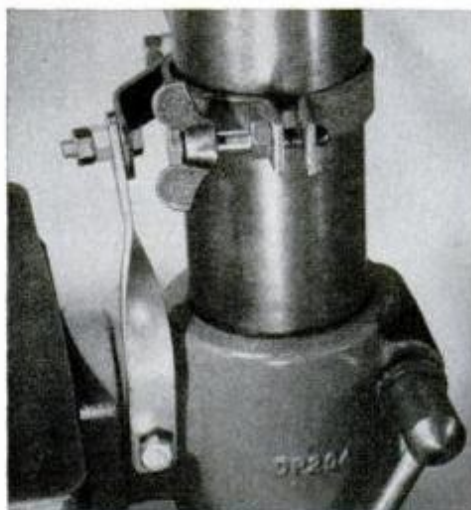
TOP VIEW



FRONT VIEW



Locked nuts (two nuts jammed together) prevent loosening at pivotal connections.



Wingbolt draws clamp segments together to keep table from dropping when collar locking lever is loosened. Link piece connects lever to arm of drill-press table.

DRILL-PRESS TABLE LIFTER

(Continued from page 55)

long cap screws. In the remaining ear, drill and tap for a 5/16-18 hole. This threaded hole goes to the right rear when the clamp is in position (see plans) and accommodates the right-hand, clamp-tightening bolt. A nut, brazed to the right-rear clamp ear may be used to reinforce or supplant the threaded hole.

In order to make hand-tightening possible, slip a forged wingnut for a 3/8-in. bolt up to the head of the right-hand bolt, and drive the head

tightly between the wings. Run a hex nut hard against the end of the threading to provide clearance for adjusting the wingbolt.

Locate fulcrum hole on lever about 3 in. from the end and 2 1/2 in. (center to center) from the connecting-link bolt hole. Form an offset bend in the lever for column clearance.

Make link from scrap 1/8 x 1-in. iron or from the 1/8 x 3/4-in. iron specified in the plans. Twist it 90° and bend as needed to secure it to the side of the table arm. To attach the link to the table, first find the

"balance point" (where effort to lift the table seems least) on the table arm. Drill and tap for a 5/16-18 x 9/16-in. hole to receive the 3/4-in. long capscrew. Be sure the link will fit loosely on the tightened bolt.

You may need a few extra washers during assembly to obtain specified gaps and eliminate wobble at connections. We had to place one under the head of the left-hand clamp bolt as a spacer to help produce the required 3/8-in. gap between the segment ears. Oil movable joints and wingbolt to reduce friction.

To operate the lifter, tighten table clamp and release the collar by loosening the wingbolt. Slide collar up the column as far as it will go, then retighten wingbolt. Release table clamp screw and press down on the main lever to lift the table. For a lift over 3 in., repeat the procedure. The reverse operation will lower the table. For a comfortable grip, slip a short segment of rubber or plastic hose over the handle.

A second column clamp, similar to the one described, installed below the drill press table, will prevent it from dropping accidentally to the floor or bench. The second clamp limits the table's fall if both lifter clamp and collar lock are loosened at the same time. Even if you do not install the lifter, this backup safety clamp is a smart precaution. **PM**

True Value

HARDWARE STORES

Master
MECHANIC™
**MEANS TRUE
VALUE IN
HAND
TOOLS**



Master **MECHANIC**™ professional-quality hand tools and accessories feature precision workmanship in every detail, superior strength in finest tool steel, maximum working ease in their well-balanced designs. Made in the U.S.A. exclusively for True Value Hardware Stores, to our own high standards of quality, Master **MECHANIC**™ promises professional performance at a value price for the homeowner and tradesman alike.

68-pc. multi-drive
tool set

99.99


Sold separately
at \$221.79



68 essential mechanic's tools and accessories at less than half their individual prices!

Master MECHANIC basic tool set: 1/4", 3/8" and 1/2" drive sockets, standard and metric sizes. Each piece is drop forged of tough American alloy steel, heat hardened and tempered, nickel chrome-plated. You get nine 6-pt. 1/4" drive sockets with ratchet, spinner, 3" and 6" extensions in carry case. Four 6-pt. and five 12-pt. 3/8" drive

sockets with 8" ratchet; 10" flex handle; universal joint; 3", 6" and 10" extensions; 5/8" and 13/16" spark plug sockets. Thirteen 12-pt. 1/2" drive sockets with ratchet, 6" and 10" extensions, flex handle, universal joint. Six 6-pt. and three 12-pt. 3/8" metric sockets in metal tray. 8 combination wrenches and feeler gauge. #T3769

TEAR OUT and SAVE this 8 page section 

There are over 5,000 True Value Hardware Stores in 50 states. For one near you, look under "Hardware" in the Yellow Pages.

Master MECHANIC

Master MECHANIC Customer Satisfaction Policy: If any Master MECHANIC hand tool or accessory fails to perform as you would reasonably expect it to, return it to the True Value Hardware Store where it was purchased for immediate replacement.



Fully knurled handle provides a sure, comfortable grip.

Drop forged from first quality American alloy steel for maximum strength.

1-piece knurled "speeder" lets you work in tight spots without moving the handle.

Ball holds socket firmly, releases easily.

Heat treated and tempered, nickel chrome plated to assure lasting durability and good looks.

82-tooth, double pawl action allows ratcheting with a minimum 4.4° work arc.

Mechanic's tools made to work a lifetime.



Chamfered for smooth lead-in of nut or bolt head.

Ball detents on 4 sides assure positive lock to drive tools in any position.

Deep broach gives full nut run capability.

Thin wall gives maximum clearance and light weight.

Deep nickel chrome plating locks out rust.

27.50



21-pc. 3/8" standard and deep socket set includes the 8" ratchet shown above with standard 6-pt. sockets: 3/8", 7/16", 1/2", 9/16" and 12-pt. sockets: 5/8", 11/16", 3/4", 13/16", 7/8". 6-pt. deep sockets: 7/16", 1/2", 9/16", 5/8", 11/16", 3/4", 13/16". Plus 13/16" spark plug socket, 3" and 6" socket extensions and double-wall fitted case. #T3821

Complete selections of Master MECHANIC American-made steel sockets and drive tools in standard and metric sizes are available individually or in sets at True Value Hardware Stores.



Master MECHANIC T.M.

6-pc. Combination Wrench Sets in standard, metric sizes



Heads offset and tips chamfered for easy use in tight areas.

Sizes clearly marked on both ends, both sides.

11.95
Each set

6-pc. combination wrenches, standard sizes: 3/8", 7/16", 1/2", 9/16", 5/8" and 3/4" in convenient pouch. #T5656

6-pc. combination wrenches in metric sizes: 8, 9, 10, 12, 13 and 14mm in convenient pouch. #T5656M

As America's conversion to the International System of Measurement progresses, more major manufacturers are using metric parts in motor vehicles, bikes and appliances. Your True Value Hardware Store offers Master MECHANIC tools in metric sizes to help you service these units.

American-made forged alloy steel with deep nickel chrome plating.

Precision broached and countersunk on box end for easy fit in minimum clearance.

Master MECHANIC is the exclusive trademark of True Value Hardware Stores where you'll find a complete selection of American-made hand tools. Just say "charge it" at participating stores.



There are over 5,000 True Value Hardware Stores in 50 states. Look under "Hardware" in the Yellow Pages.



True Value

HARDWARE STORES

Master MECHANIC™

Big 8-gal. Shop-Vac power-cleans wet and dry, indoors and out.

A powerful appetite for everything from wood chips and nails to flooded basements. Gobbles up wet leaves, sawdust, ashes, sand and grit. Sucks up standing water to vacuum-scrub floors and clean up spills. The unique master nozzle takes slide-on attachments for every clean-up need. In the shop, patio, home, car or garage Master MECHANIC makes light work of heavy cleaning. Shop a complete line of Master MECHANIC wet 'n dry vacuum cleaners at True Value Hardware Stores. #650-1



Rugged 1-hp motor above the tank, protected from water and dirt.

Use exhaust port for efficient blower action.

44.50

Float valve prevents liquid overflow.

Big 8-gal. steel drum takes in 7 1/4-gal. dry debris, 6 1/2 gal. liquid.

Tank design allows free airflow, maximum efficiency even when near-filled.

Easy-rolling 4-wheel dolly.

1 1/4" tool kit handles most big cleaning jobs, optional 2 1/2" kit takes bulky trash.

UL listed for use indoors or out.

Master MECHANIC™ Propane Torch, energy for dozens of jobs.

Instant, infinite flame control means efficient fuel use on every job.

Disposable cylinder contains 26.7 fl. ozs. top-quality, clean-burning propane.

Positive safety seal between cylinder and valve prevents propane leaks.

Long burner shaft puts distance between you and flame, gets at hard-to-reach work.

Clag-proof, corrosion-resistant burner tip.

9.95

Complete 6-pc. Set gives you instant, adjustable heat to lay tile, thaw frozen pipes, for soldering and light brazing. It's the easy, economical solution to many problems around the home, farm or industrial shop. Master MECHANIC propane burns clean, heats efficiently; all brass burner assembly offers a lifetime of reliable use. Includes fuel cylinder, pencil point burner, brush tip, chisel tip, flame spreader and spark lighter. #6565



Master MECHANICTM PROFESSIONAL

Master MECHANICTM Professional Screwdrivers

You'll feel the difference professional-quality makes in Master MECHANIC screwdrivers. Jumbo comfort grips on high-torque steel blades help you overpower tough screw-driving and removing jobs faster and easier. Professional-quality materials make them shockproof, flameproof and unbreakable. When you get a Master MECHANIC screwdriver, you've got a tool you can count on for a lifetime of hard work. There's professional variety in Master MECHANIC screwdrivers, too, for all home and industrial needs. Styles shown at right are sold individually and in sets.

Round crown design protects your hand from blisters.

Jumbo handles fit your grip to give greater turning power.

100% virgin resins make handles positively unbreakable.

Super-strength chrome-vanadium steel blades have professional mechanic's finish.

Tips are hardened and precision-ground to assure lasting perfect fit.

17.95

8-pc. Square-Blade Screwdriver Set. More steel in the shaft puts more strength on the job. Tips are ground diagonal to the square, for maximum turning power; turn these blades with a wrench, if necessary, without fear of snapping or twisting the shank. 8 sizes range from the 1/4" x 1 1/4" stubby to the long-reaching 3/8" x 12". With convenient pouch. #TS8SQ

Master MECHANIC square-blade screwdrivers are also sold individually, 1/4" to 12" long to fit 3/16" to 3/8" slotted screws.

There's a Master MECHANIC screwdriver right for every job.



Slotted-tip screwdrivers come with round or square blades 1/4" to 12" long to fit screws 3/32" to 3/8" in diameter.



Phillips-tip screwdrivers come 1/4" to 8" long with precision-machined cross-slot flutes to fit #0 to #4 phillips screws.



Robertson-tip screwdrivers come in assorted lengths to fit #5 to #14 plus 1/4" recessed Robertson and Scrulox fasteners used in mobile homes, marine and RV construction.



Clutch-head screwdrivers in assorted lengths fit recessed "butterfly" or "figure 8" screws, 5/32" to 5/16".



Nut drivers have hollow-forged shafts in assorted lengths with case-hardened hex sockets 3/16" to 1/2" in diameter.



Screwdrivers with screwholders with medium and long shafts, slotted and phillips tips, end fumbling in tight spots. Flanges hold screws in place until threads engage.

QUALITY



Master **MECHANIC**TM

Your choice of handles in quality Carpenters' Hammers.

Each packs 16 ounces of power to drive nails home with a few quick blows; professional balance puts the weight on your work, not on your arm. All give you these fine features:

- Heads forged of fine-grained American-made steel, precision machined and highly polished.
- Professional deep-throat design puts more driving power into every strike.
- Contour crown resists chipping, sets head flush without marring surfaces.
- Inner-beveled curved claw grips nails firmly for easy removal.

Your choice
7.50
each

A Chrome-plated tubular steel handle is stronger than hickory, absorbs more shock than solid steel. Tough vinyl grip resists grease and oil. #MM16S

B Solid 1-pc. steel head and handle is the strongest hammer construction available. Leather cushion provides a no-slip grip, reduces vibration. #MM16C

C Solid hickory handle, triple wedged and epoxy-sealed to head, is the best shock absorber. Sculpted, fire-hardened and smooth-finished to a naturally-comfortable grip. #F16TT



Master **MECHANIC**TM Test the response of our finest cross-cut saw.

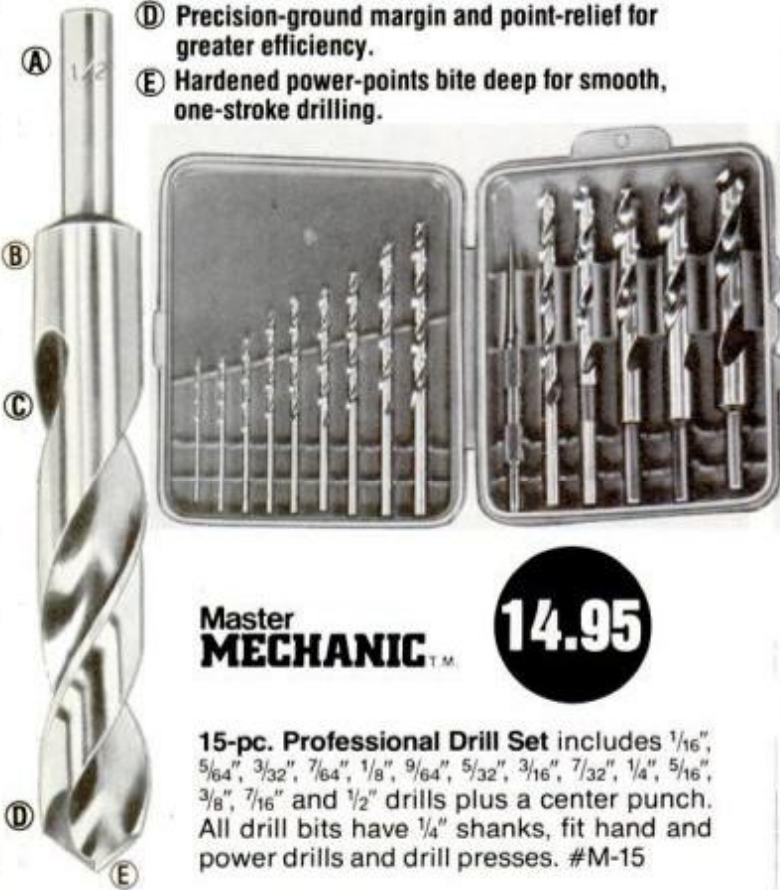
Bend it nearly to a U-shape and see it snap back straight as an arrow. That "zing" is the sound of strength-tempered chrome-nickel-molybdenum steel absorbing stress, bouncing back for more. It'll sing like that through

hardwood, plywood, even knots, without kinking or binding. Blade is fully taper-ground to prevent buckling. Protective coating resists rust and stain. Teeth are precision set and filed to stay sharp. 26" 10-pt. saw. #TT110.



High Speed Steel Drill Bits

- (A) Sizes clearly stamped for easy identification.
- (B) American-made of finest tool steel, heat-hardened to exceed federal specifications for strength.
- (C) Precision-ground flutes assure consistent, accurate hole sizes.
- (D) Precision-ground margin and point-relief for greater efficiency.
- (E) Hardened power-points bite deep for smooth, one-stroke drilling.



Master
MECHANIC T.M.

14.95

15-pc. Professional Drill Set includes 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", 5/16", 3/8", 7/16" and 1/2" drills plus a center punch. All drill bits have 1/4" shanks, fit hand and power drills and drill presses. #M-15

American-made chrome-nickel-molybdenum steel saw blades outlast, out-perform ordinary blades.

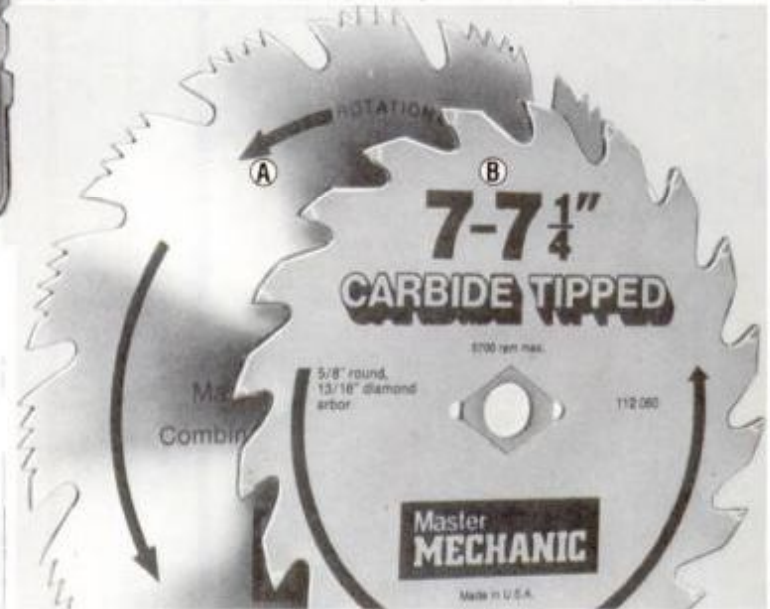
High chrome content of Master MECHANIC blades give clean cuts with less friction, less drag on power saw motors. Polished finish resists rust and corrosion, stays sharp longer for greater efficiency and safety on the job.

(A) **10" Master Combination Blade** rips, mitres, cross-cuts hard and soft woods. Impact-set teeth cut fast, deep expansion slots assure a warp-resistant blade. For 10" stationary saws. #S10000

4.95

(B) **Carbide-Tipped Blade** gives you both high speed and satin-smooth cutting. Cuts splinter-free in hard and soft wood, plastic, particle board, Masonite®, roofing, fiberglass. Most work needs little or no sanding. Stays sharp up to 5 times longer than noncarbide blades. 7-7 1/4" for hand-held saws. #M44

5.95



24-pc. set comes in fitted carry case.

Master MECHANIC 24-pc. Tap & Die Set

No workshop is complete without proper tools to rethread damaged nuts and bolts, or clean up those supplied with unassembled equipment, gym sets, etc. Here's everything you need to cut or repair threads to both National Fine and National Coarse specifications: 11 taps, 11 dies, tap wrench and die stock. #TD-24

21.95



Cutting edges hardened and tempered to wear better and stay sharp longer.

Extra-tough American-made tool steel.

PRICED



An outstanding offer by Master MECHANIC... any way you measure it!

Buy this 25-ft. automatic tape rule at the special price of \$4.75 and get a handy little 6-ft./ 2-meter pocket tape



FREE

Cyclac® case goes easily in pocket or purse. #PC6-2

2-color printing reads standard and metric measurements.

Both only **4.75**



Reverse side of blade gives direct inside reading, with no need to calculate length of case.

Master MECHANIC professional tape features a wide, deep concave blade for maximum extension and rigidity, easy accuracy in short or long measures. Automatic blade locks in place, controlled power return prevents snap-back. Self-adjusting end-hook provides true zero for consistent inside and outside measurement. #CB325TT



Master MECHANIC... **Electric Glue Gun**

Makes secure, professional bond in 1 minute. Hot, melted glue needs no clamping or waiting to dry. With glue & sealer. #MM203 **4.99**



Master MECHANIC... **Wood Chisel Set**

Wood Chisel Set

Bevel-ground, austempered carbon steel blades 1/2", 3/4" and 1" wide for easy shaping of wood and composition. #300TT **6.99**



Fire-hardened hickory handle gives a comfortable grip, easy-working balance.

Master MECHANIC... **Energy-Saving Woodcutter**

If you're cutting wood to cut fuel costs, save some of your own energy with this well-balanced axe. At 3 1/2 lbs. it's heavy enough to bite deep, light enough for tireless use. Steel head is drop forged and hand ground to stay sharp. #35SBTT **8.95**



Master MECHANIC... **Professional Aluminum Level**

Built to maintain rigid strength and perfect accuracy. 24" heavy-duty die-cast frame can't warp, has man-sized hand holds. 4 plumb vials and 2 level vials are set in moisture-sealed acrylic windows, fully weatherproofed. Superior quality. #10121 **9.99**

Master MECHANIC^{T.M.}

Exclusive "Strongbox" Construction



- (A) Extra heavy-gauge solid steel throughout.
- (B) Reinforced tops on full-length piano-type hinges.
- (C) Nickel-plated side handles and drawer pulls.
- (D) Tough silicone-based baked-on enamel finishes.
- (E) Chest drawers lock automatically when lid closes.
- (F) Cabinet drawers lock when front panel is in place.
- (G) Drawers glide smoothly supported on compound slides.
- (H) Sturdy 4" casters roll easily, brakes on 2 prevent creeping.
- (I) All chests and cabinets have maximum-security cylinder locks with 2 keys.

Tough as Master MECHANIC Tools . .

Master MECHANIC professional tool chests and heavy-duty roller cabinets. Powerfully built of heavy-gauge American-made steel with room enough for a workshop full of tools, and strength enough to carry them around. They're designed for rugged durability, reinforced at critical points, to maintain alignment under tremendous stress. Stack or use separately.

6-Drawer Chest, shown, measures 15" high, 26" wide, 13½" deep and weighs 67 lbs. Drawers are 12¾" deep in varying heights for easy organization. 4-section top till has lift-out tray. #1806

3-Drawer Roller Cabinet, shown, measures 33½" high, 26½" wide, 18" deep and weighs a hefty 88 lbs. Full-width drawers are 4" high, lower compartment is 13½" high. #1903

Master MECHANIC offers a wide selection of tool boxes, from small utility totes to massive 150-lb. cabinets.



\$71.95
Chest



\$89.95
Cabinet



Master MECHANIC^{..} 19" Flat Top Box

Many features of our heavy-duty tool boxes: strong steel construction, protected hinge, nickel-plated hardware, divided tote tray, padlock eye. 19x6x7" deep. #429 **7.50**



Heavy-Duty 19" Hip Roof Box

Popular for its big-capacity hip roof design and rugged steel strength. Has divided tote tray, locks with single drawbolt, padlock eye. 19x8½x7" deep. #819 **9.95**



Deluxe 2-Drawer Tool Chest

All-steel, electric-weld construction, full-length hinge. Drawers supported on compound slides, lift out for separate use, lock when lid closes. 22x10x9½" #902 **23.95**

COTTER & COMPANY, 100% Member-Owned warehouse distributor serving over 5000 True Value Hardware Members who own their own stores, set their prices and reserve the right to limit quantities. Because participating True Value Hardware Stores vary in size and merchandising policies, some may not stock all items shown. Prices may vary and are subject to change without notice. Prices expire Oct. 28, 1978.

8-PAGE PULL-OUT SECTION

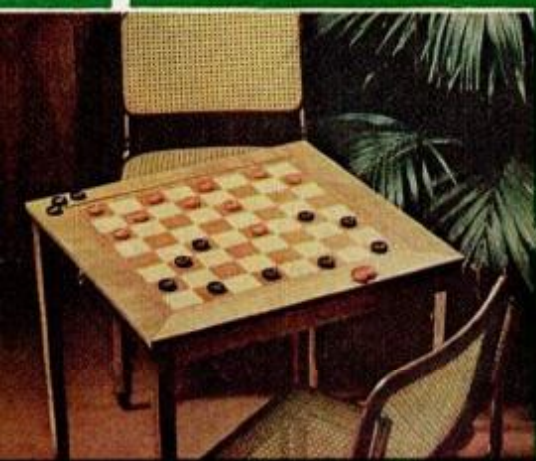
Build this flip-flop table for chess and backgammon

Its center panel flips so you can switch games in a jiffy

by Harry Hobbs



Ready-made veneer faces of standard game-playing boards assure perfect overlays.

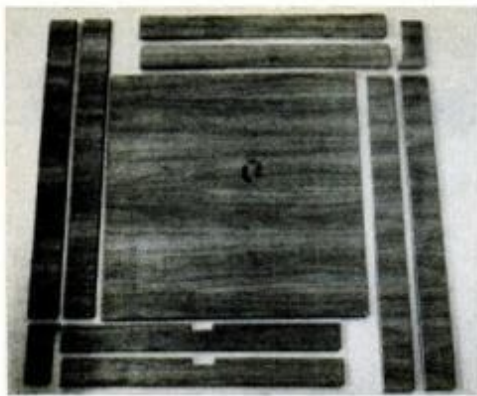


Pivoting gameboard is locked into position with two wooden slide inserts.

This multiuse, walnut game table will look great in your den or favorite game-playing nook. The table surface is a ready-made walnut and maple veneer face with a walnut border glued to walnut plywood. The apron is also of walnut plywood (good one side), while the legs are solid

walnut. The completed table measures 25 in. square and stands 27½ in. high.

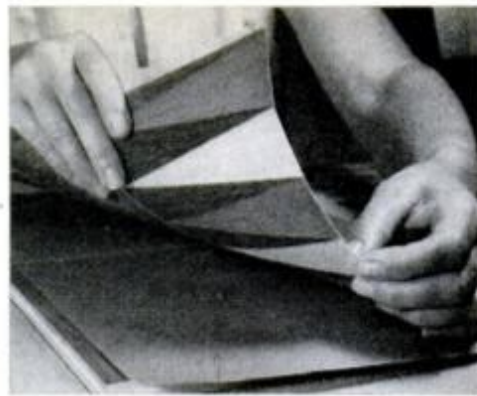
To allow leg space for players, the table is built without stretchers. Glue blocks are used at the corners to help reinforce doweled joints. A storage drawer is also omitted to permit the gameboard to pivot. Store your gear



Follow cutting diagram to get all parts except legs from walnut plywood panel.



Spread veneer glue on back of veneer and on plywood; recoat one hour later.



Use slip-sheet between coated game face and panel to assure alignment.

in a nearby cabinet and enjoy this slim, elegant game table.

Due to the pre-assembled veneer faces, construction of the gametable is easier than you might guess. All other parts (except the legs) are cut from a 1/2 x 30 x 30-in. piece of walnut plywood (good one side).

Start by cutting the plywood panel for the table top with a power saw fitted with a veneer blade. Study the cutting diagram until you're sure how to proceed—there is no extra wood for correcting mistakes. Make cuts in the order numbered on drawings. Some pieces will be exact size.

Mr. Hobbs is the author of *Veneering Simplified*, \$5.95, available from Albert Constantine & Son, Inc.

Others, such as the gameboard, will be oversize, to be resized later. Next, cut the gameboard panel 1/8 in. smaller than the veneer face to allow

for veneer overhang at the edges.

Use veneer glue for laying the veneer faces. It creates the tightest bond, thus reducing the risk of blisters. The backgammon and chess faces are composed of many small pieces of veneer which are held together with gum tape on the "right" side, to be peeled off later. Apply contact glue to the tape-free side, quickly and fairly heavily. Also spread glue on one side of the panel. Work with only one veneer face at a time.

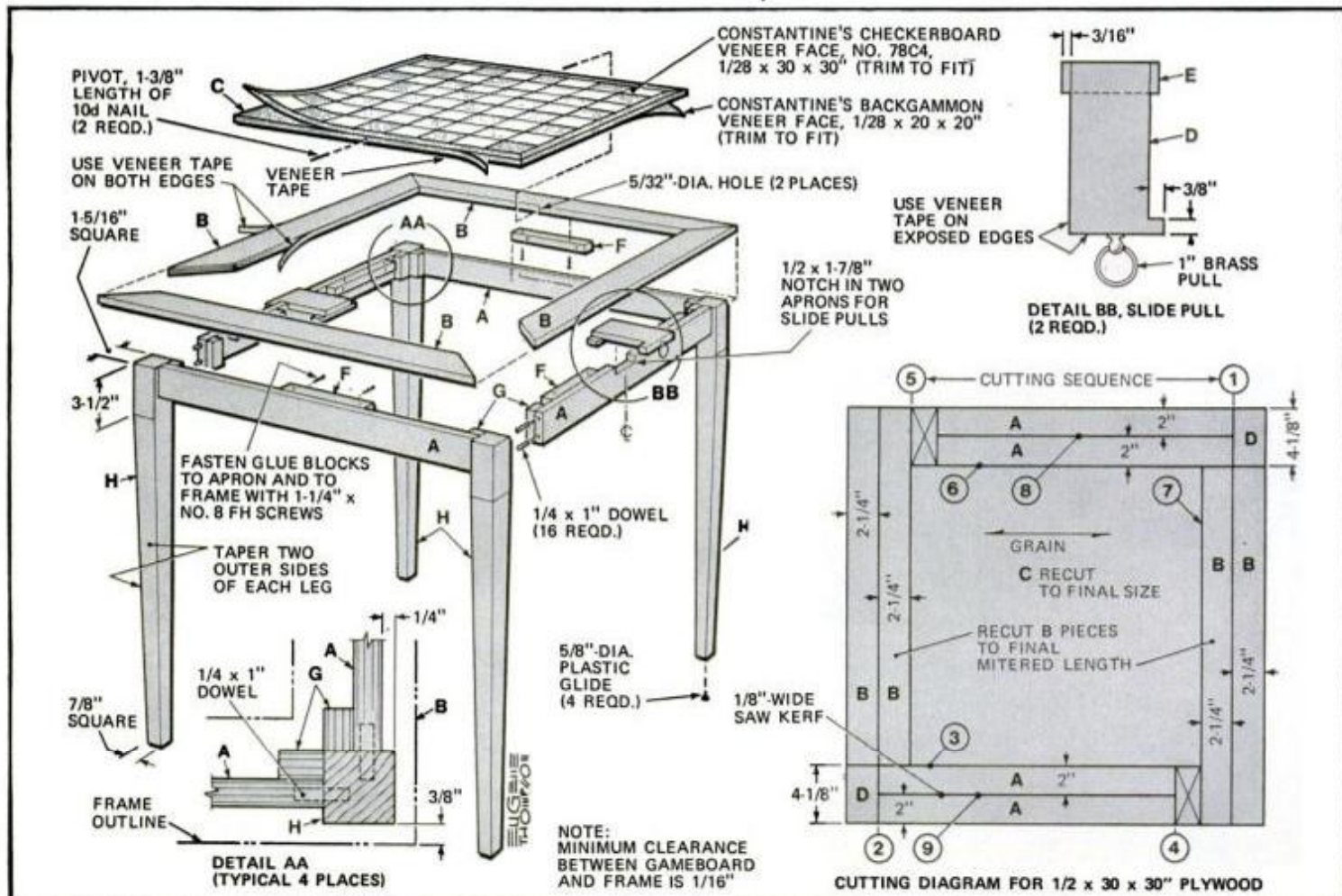
Allow one hour and then apply a second coat to each surface. Wait another hour before laying the veneer face on the board with a slip-sheet of brown paper between to prevent premature contact. Expose

MATERIALS LIST—GAME TABLE

Key	Pcs.	Size and description (use)
A	4	1/2 x 2 x 21 1/4" walnut plywood (apron)
B	4	1/2 x 2 1/4 x 24 3/4" walnut plywood (frame)
C	1	1/2 x 19 3/4 x 19 3/8" walnut plywood (gameboard)
D	2	1/2 x 2 1/4 x 4 1/8" walnut plywood (slide)
E	2	1/4 x 3/4 x 2 1/4" walnut plywood (stop block)
F	6	3/4 x 3/4 x 6" pine (glue blocks)
G	8	1/2 x 3/4 x 2" walnut plywood (glue blocks)
H	4	1-5/16 x 1-5/16 x 27" walnut (legs)

Misc.—30 x 30" checkerboard face (No. 78C4)*, 20 x 20" backgammon veneer face*, 1/4" doweling, 2 1"-dia. brass ring pulls, 4 3/8"-dia. furniture glides, 1 1/4" No. 8 fh screws, veneer glue, carpenter's glue.

*Game table veneer faces are available from Albert Constantine and Sons, Inc., 2050 Eastchester Rd., Bronx, N.Y. 10461. Complete game table kits are also available.



The end of the hand sandwich and the holy tearer.



Now there's Press 'n Sand® from 3M. Each sheet has a strong, pressure-sensitive adhesive backing. Just press it onto your sander and you're ready to sand. No clips, screws or ties to fumble with.

What's more, Press 'n Sand lasts longer than ordinary power sanding sheets because the adhesive holds Press 'n Sand firmly in place over the entire surface. No wrinkles or loose, uneven edges means no ripping or tearing.

Any power sander quickly converts to Press 'n Sand with a pad that holds each sheet 'til you're ready



to change it. Which may be quite some time because Press 'n Sand reduces heat build-up and residue loading, too.

Press 'n Sand is available in discs and cut sheets in a wide range of sizes to fit most

types of power or hand sanding tools.

And you can get Press 'n Sand in your choice of abrasive grades, too. In fact, it's

the most complete line of adhesive-backed abrasives made. And all at sandpaper prices.



Whatever the job, you'll find a complete line of 3M sanding and fix-up products, like Sand-Pak® with its new-look packaging, to help you do it faster and easier.

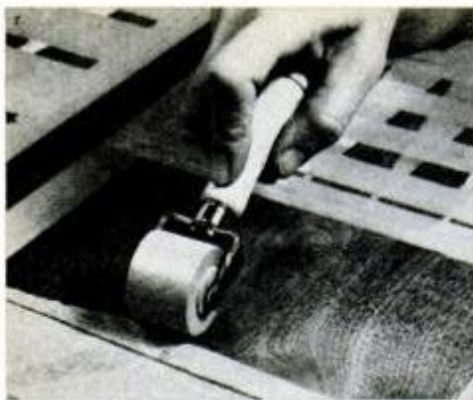
Press 'n Sand

takes the grind out of sanding

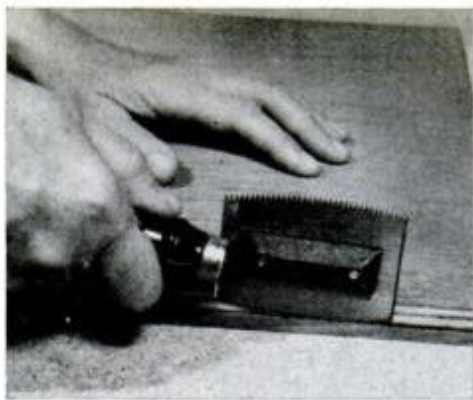
Press 'n Sand® and Sand-Pak® are registered TM's of the 3M Company.



3M



Press the game face with a roller for a good bond and to prevent blistering.



Use a veneer saw or X-acto knife (blade No. 11) to trim the veneer overhang.



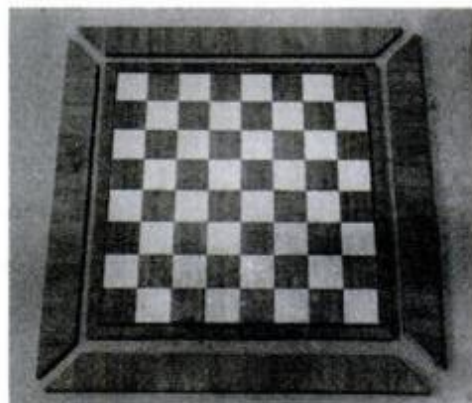
To remove gum paper on veneer, moisten small area with water; scrape with chisel.



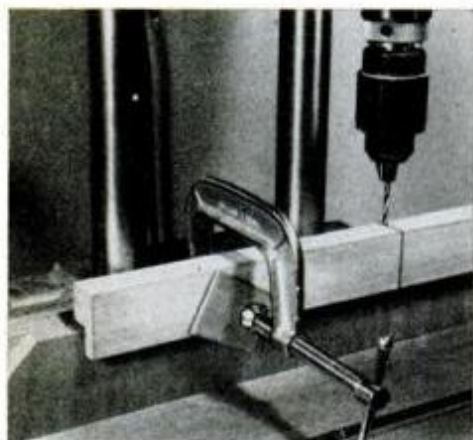
Bond veneer trim to gameboard edges with veneer glue, slipsheet. Trim overhang.



Miter frame members after measuring gameboard and providing for clearance.



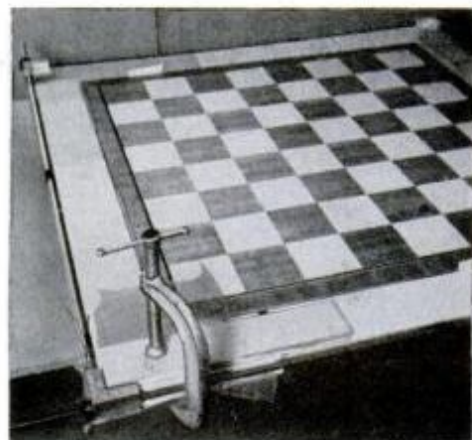
Position frame members around gameboard, lay out and mark for pivot points.



Simple wood jig aids in boring off-center pivot holes in the frames.



Insert nail pivots in gameboard (without glue) before assembling the frame.



When clamping, assure swing clearance with 1/16-in. shims between board, frame.

1/4 in. of glued board at one edge only. When you're sure of good alignment, finger-press veneer along the exposed edge. Withdraw slipsheet gradually, about 2 in. at a time. Apply pressure with a roller, but don't roll where slipsheet is underneath. When the slipsheet has been completely removed, roll hard over entire surface in the direction of veneer grain where possible. Turn the panel over on a hard, smooth, clean surface (such as particle board) and trim off veneer overhang before gluing the second face to the panel. Sand the edge gently. Do not sand outward across the veneer face.

To remove the gum tape backing from the veneer face, moisten a 3-

sq.-in. area using water and a soap-free sponge. Wait a minute for it to soften, then scrape with a chisel. Peel off anything that shreds. Continue this way, *resisting the temptation to soak the surface, until the board is clean.* Don't try to sand off the tape and don't use solvents. Follow the same procedure in laying the second veneer face.

Cover the edges of the gameboard with 1-in.-wide veneer that comes in a roll. Again, use veneer glue and the slipsheet method. Trim off the overhang.

When mitering the four pieces that frame the gameboard, allow for the thickness of the veneer edging on both the gameboard edges and on

the inside edges of the frame pieces—plus a minimum 1/16-in. clearance to permit the gameboard to pivot. Apply veneer edging to edges of frame *after* mitering.

To locate the pivot holes in two frame members and matching holes in the gameboard, lay the board on a flat surface and dry assemble four frame members around it. Measure the center point and mark it on the gameboard and frame. Drill 5/32-in.-dia. holes at center of edges at marked locations in two opposite edges of the gameboard.

Because the gameboard, veneered on both sides, is now thicker than the 1/2-in. frame, you have to lower

(Please turn to page 188)

The test results are in!

Jeep Pickup proved superior!



Jeep proved superior to Ford, Chevy and Dodge in a test of automatic 4-wheel drive systems.

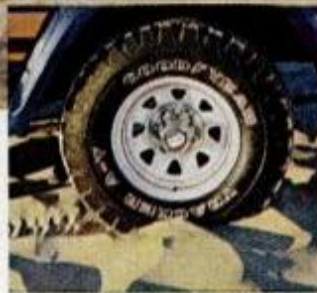
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Candlelight pictures



Built-in flash pictures



Sunset pictures



Stage-light pictures

What to do now... for a better lawn next summer

Now is the ideal time to get your lawn in shape. It will last longer into winter and green up earlier next spring.



Before seeding, rake debris; scratch soil $\frac{1}{4}$ in. deep to make seed lodging places.

While you're trimming and getting your shrubs ready for winter, why not do the same for your lawn? Fall is the best time to revitalize it. The time is right for three things:

1. **Seeding:** Those warm days and cool nights provide the best growing conditions. As long as the days stay warm, there's time.

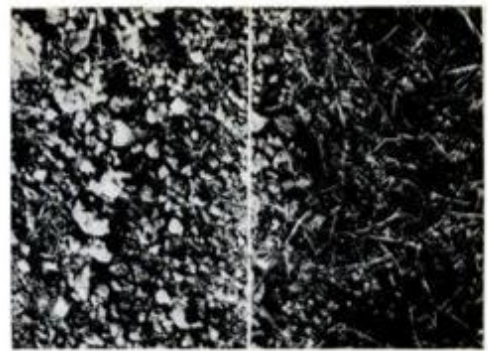
2. **Fertilizing:** Feeding the lawn with a slow-release fertilizer will help it stay green later and turn green sooner in the spring.

3. **Controlling weeds:** Now, while weeds are still growing, is the time to spread a weed control (if you're not seeding this fall), or a product that will fertilize *and* weed.

Seeding

Seeds need protective grooves in which to lodge. So slice the soil $\frac{1}{4}$ in. deep with a sharp-tined rake or a rented power rake.

(Please turn to page 72)



Fertilizer can make a difference. Area at right was fertilized; other area wasn't.



A newly seeded area is patchy with weeds, many will die when mowed.



Compare untreated lawn and one treated with a weed control and grass fertilizer.

Fall lawn care tips

1. **When the weather cools** and your grass is slowing its growth, mow the lawn about $\frac{1}{2}$ in. lower than its usual height. Letting it go into winter short cuts down on the possibility of its becoming diseased.

2. **Both your shrubs and lawn** need plenty of moisture to help them survive the winter. If nature doesn't cooperate, give your grass 1 to $1\frac{1}{2}$ in. of water a week. You can tell how long you need to leave the sprinkler on by setting out three or four tin cans at varying distances from it. After a set period of time—say, a half hour—find the average of the water depths in the cans. If it's $\frac{1}{4}$ -in., for example, one hour's sprinkling will give the lawn $\frac{1}{2}$ in. of water.

3. **Rake up the fall leaves** and

debris so they don't mat the grass. But it *is* wise to pile leaves around shrubs. It gives them added winter protection.

4. **Sprinkle a little fertilizer** on the compost pile between layers of grass clippings and garden debris. You'll get quicker, richer compost in the spring to use for your early garden.

5. **Don't bother trying** to rake up the late-season crabgrass. The frost will kill it permanently. Crabgrass comes up new each year from seed. You can stop it from cropping up next spring by putting down a crabgrass preventer, which you can buy combined with fertilizer. Even if you need to re-seed this fall, you can leave the dead crabgrass in the ground. The new grass will sprout up through it.

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A BETTER LAWN NEXT SUMMER

(Continued from page 71)

Next, put down seed and fertilizer separately. Use of a spreader will assure even and economical results. Both can be put down the same day. Buy top quality seed—it will determine the kind of lawn you have for years. The fertilizer should be one specially made for new seeding.

If you seed on bare ground, lightly mix the seed into the soil with the back of a lawn rake. Light mulching with straw so you can still see the ground helps hold moisture.

Once the seed has germinated, keep the top inch of ground moist until the seedlings are established.

For an even healthier lawn feed it again after about six weeks with a slow-release type of fertilizer that's high in nitrogen—the first number of three listed on the bag.

Fertilizing

Grass needs help to replenish itself after the hot, often dry summer. In the fall more than at any other time of year, grass plants will multiply themselves when fertilized, producing new leaves and new offshoot plants (called rhizomes) to thicken and strengthen the lawn. Fall-fed grass plants also produce and store carbohydrates over the winter, which the plants use in the spring. This late fall feeding speeds green-up in spring.

Select a long-acting fertilizer that nourishes for six to eight weeks. You can cover a 5000-sq.-ft. lawn in an easy half-hour walk with a lawn spreader. Start by fertilizing a strip at each end of a lawn section. To prevent fertilizer oversaturation, shut off the spreader as you reach each strip and turn around.

Controlling broadleaf weeds

To be an instant expert on controlling dandelions and other broad-



Using a fertilizer spreader assures an even application that yields top results.

leaf weeds, you need to know two things:

- The control should be put on the weeds during their active growing season, since its effectiveness depends on being absorbed by the plant;

- The control particles need to stick to the leaves for at least 24 hours, so the leaves should be moist when the control is spread. Water the lawn before spreading on weed control or do it when the grass is moist from early morning dew.

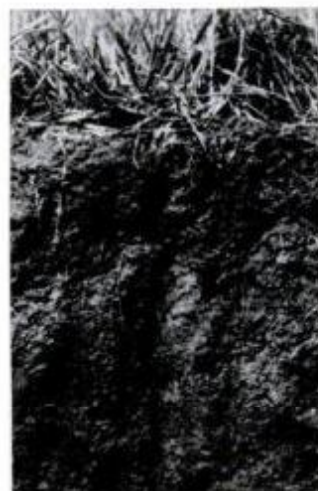
You can get additional help from a magazine like *Lawn Care*. It's available free on request to Scotts, Marysville, Ohio 43040. Regional editions contain seasonal tips and instructions. **PM**



Cutaway (left) shows dandelion with long taproot before weed control treatment.



Two weeks later dandelion (center) is failing; a month later (right) it's absorbed.



"I wish I'd known about NRI when I was learning auto mechanics."

Says Richard Petty, America's Winningest Stock Car Driver and NRI Automotive Consultant

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NRI training includes professional instruments and tools.

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Putting the brakes on auto insurance costs

by Tom Sahagian



Insurance commissioner James M. Stone of Massachusetts.

Late last year, the auto insurance industry howled—and many consumers cheered—when long-held conventions were overturned by sweeping changes in its auto insurance rate structure introduced by the state of Massachusetts.

At the forefront of the controversy was 30-year-old James M. Stone, the state's insurance commissioner. Termed "revolutionary" by critics and supporters alike, Stone's new formula has: eliminated the traditional rate classifications by age, sex and marital status; sharply

reduced the difference between the rates urban and rural drivers pay; and used an already-existing merit rating plan to create new incentives for safe drivers to further reduce their insurance costs.

Other states have expressed considerable interest in the Massachusetts system, and it may well become in time a model for the entire country.

One of the few states to have both compulsory coverage and state-fixed insurance rates, Massachusetts had been under growing pressure from automobile insurance companies the last few years to open the rates up to competition. Some well-known companies (including Allstate) will not write auto policies there. Many of those that do threatened to pull out of the state in 1975 when Stone decided to take the companies' investment income into account when setting the '76 rates (a move also termed revolutionary at the time). So the state legislature decided to allow open competition among insurance companies to determine the basic rates, subject to final regulation by the state.

The competitive market opened in January, 1977. To some consumers, at least, the result was disaster. Some companies' rates climbed as much as 70 to 100 percent, especially those for urban males under 25 (see example below). Some rates

were lowered slightly, but nonetheless consumer protest was vocal to the point of actual organized demonstrations in Boston. The legislature responded by mid-year and ordered rebates to all drivers whose rates had jumped more than 25 percent—a total refund of about \$42 million. It also rescinded open competition and went back to fixing its own auto insurance rates.

In view of the chaos and confusion surrounding the auto insurance issue, Stone held a month-long series of hearings in October to set the '78 rates and to restructure the auto insurance system. A parade of expert witnesses from industry, academia, government and consumer groups testified during the sometimes acrimonious proceedings. When it was all over, Stone wrote a 275-page document outlining his decisions on rates and rate structures.

New classifications

Under the old Massachusetts system, there were 11 driver classifications (some states have as many as 161) based on age, sex, marital status and other factors. Drivers living in urban areas had to pay much higher rates than their suburban and rural counterparts, sometimes as much as 10 times higher. A merit rating plan, where surcharges are added to premiums for at-fault

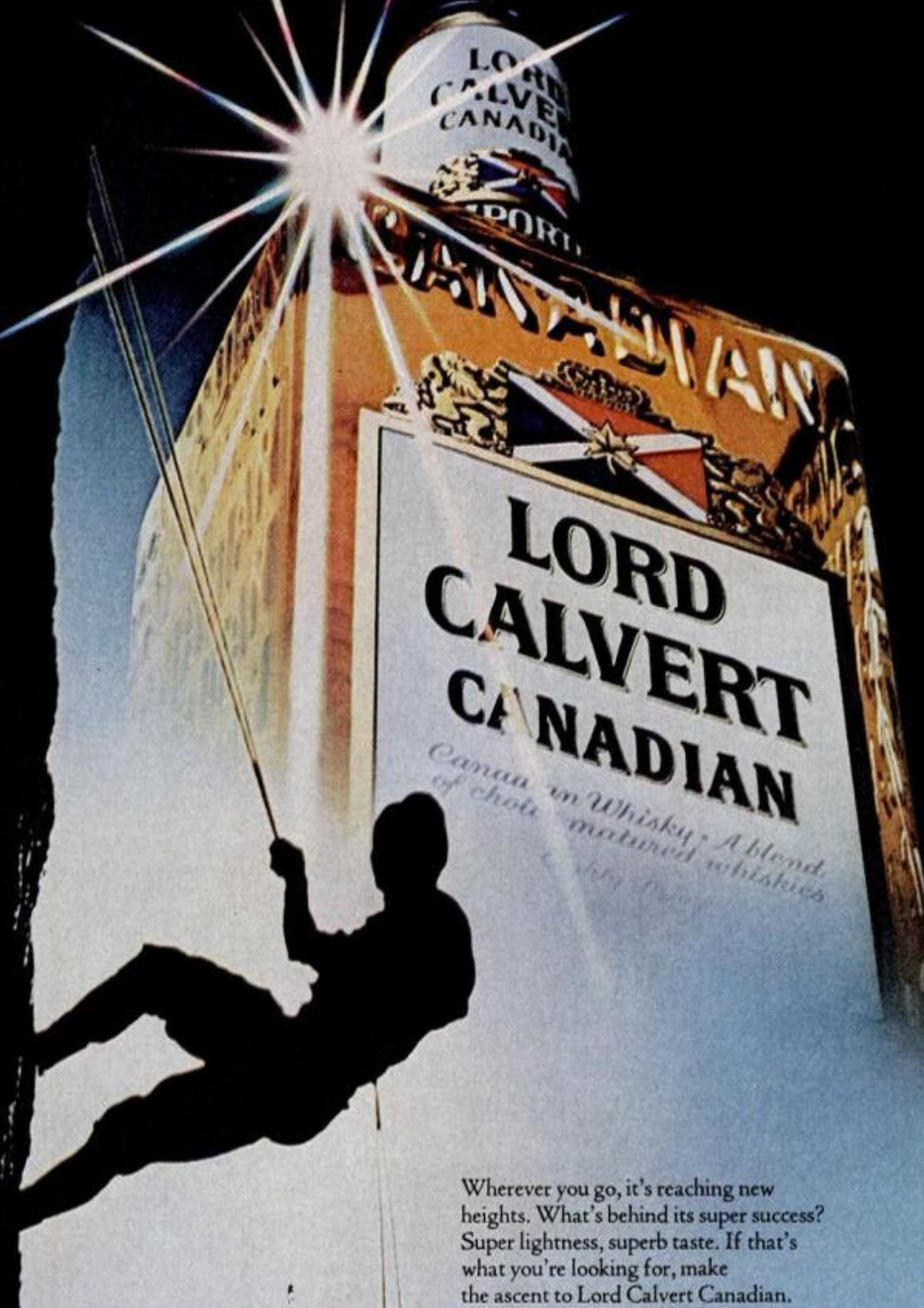
(Please turn to page 78)



New insurance system saved 21-year-old Joe Ciampa more than \$2000 this year.

The ups and downs of one man's auto insurance rates

Three years ago, then 18-year-old Joe Ciampa of East Boston, Mass., bought himself a '75 Oldsmobile Cutlass Salon with a 350 V8 engine, four-barrel carburetor and power everything. A brand new car like that needed full insurance coverage, and when Joe received his bill for 1976, it was \$1400. A year later, when the insurance companies were allowed to set rates competitively, he shopped around but returned to his previous insurer. Their quote for the same coverage as the year before was \$2800—this for a driver with a clean record and a car that was a year older. Joe had to reduce his coverage drastically to slice his bill to \$800. But this year, under the new Massachusetts reforms, Joe is back to full coverage, and the cost of his insurance has dropped to \$600.



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AUTO INSURANCE COSTS

(Continued from page 76)

accidents and moving violations, had been instituted in November, 1976.

Under Stone's new plan, however, there are only five classifications:

1. Standard (more than three years' driving experience).
2. Inexperienced (less than three years' experience).
3. Inexperienced with driver training.
4. Over age 65.
5. Business use.

Commissioner Stone recently explained the logic behind the new system to PM.

"It's designed to de-emphasize age, sex and territorial characteristics," he told us, "because they can't be controlled on an individual basis. On the other hand, at-fault accidents and moving violations are within the control of the driver. Thus we are replacing a system in which drivers had no control over the factors affecting rates with one in which they have quite a bit of control."

Stone uses a simple example to illustrate his point. "Suppose that all drivers can be represented by just three drivers—an irresponsible young male, a responsible young male with a clean record, and a responsible driver who is not a young male. Suppose the irresponsible driver has enough accidents so that he costs the system more than he pays in premiums. Who should make up the difference? Before, it would have been just the responsible young male. Now, it would be both of the other drivers."

Where the savings are

Rates for urban males under 25 plummeted dramatically under the new system (see page 76), but as a result, a lot of other Massachusetts drivers' rates rose slightly to take up the slack. Costs across the board fell, however, because Stone said reduced claims in '76 and '77 lowered the net cost by \$100 million, about 12 percent. Massachusetts insurance officials seem to feel that this claims reduction can be attributed largely to the incentives of the merit rating plan.

Merit surcharges for moving violations and at-fault accidents are stiff: a first drunken driving conviction within a three-year period, for example, is good for a \$200 surcharge. In addition, monies so collected are not kept by the insurance companies but are redistributed among all the uncharged drivers after the end of the year. The

amount returned to each driver is small, but it does show good drivers that they have not been ignored.

Crucial to the workings of the new system is the state's reinsurance facility, which has been in operation since early 1974. With such a facility, drivers who are considered bad risks by the insurance companies are placed there; claims made by these drivers are paid out of premiums paid to the facility. It differs from traditional "assigned risk" pools in several ways.

First, drivers don't know they've been placed in the facility. They buy their insurance where they choose, and at regular rates. If their company thinks they're a bad risk, the company cedes about 60 cents of each premium dollar to the facility. If the driver turns out not to be an accident producer, the company loses 60 cents on the dollar—thus there is little incentive to assign someone to reinsurance who is not a bona fide bad risk.

There are exceptions to this arrangement. If a driver has two or more at-fault accidents within two years, his or her company may charge a higher "facility rate" and must inform the driver he or she has been placed in the facility. This is not always the case with conventional assigned risk plans in other states, where companies sometimes can put people with spotless driving records there at much higher rates. (In some states, companies are currently placing all new drivers into assigned risk).

While merit rating created incentive to reduce accidents, other measures were brought in to reduce the incentive for fraud. One scam that will no longer work used to go something like this: A driver would buy, say, a beat-up Eldorado for much less than its book value. After registering it and putting it on the road, the driver would arrange to have it "stolen" and collect the book value of the car.

That ploy has been useless since 1976 because the driver and the insurance company must agree on the value of the car before it is insured. Disagreements are arbitrated by the commissioner's office.

New this year are tighter regulations concerning damage appraisals for repairs. They include requirements for "intensified appraisals" and reinspection in large claim cases and for repeat claimants. Says Stone: "The reduction of waste and overpayments in the repair of vehicles must go hand in hand with merit rating and classification reform if we are to develop a system

which rewards responsible policyholders and punishes the abusers."

In 1977 guidelines were set down for the purchase of anti-theft devices. Approved devices could yield savings of 5 to 15 percent of theft premiums.

With less incentive to cheat and more to drive well, Massachusetts motorists could theoretically safe-drive themselves into lower rates, despite ever-increasing medical and repair costs.

Other states

The reforms adopted by Massachusetts have sparked widespread interest. The insurance commissioner in North Carolina tried to initiate a similar program as early as 1975, but it was challenged in court by the insurance companies and did not take effect until December, 1977.

Although North Carolina thus became the first state to abolish age, sex and marital status as classification factors, their reforms are not nearly as comprehensive as those in Massachusetts. It does not apply to collision insurance; their new reinsurance facility involves a 10-percent surcharge; and where Massachusetts has reduced the gap between urban and rural rates, North Carolina has gone from uniform rates to about a 10-percent surcharge for urban drivers.

John Ingram, North Carolina Insurance Commissioner, wants these differences changed.

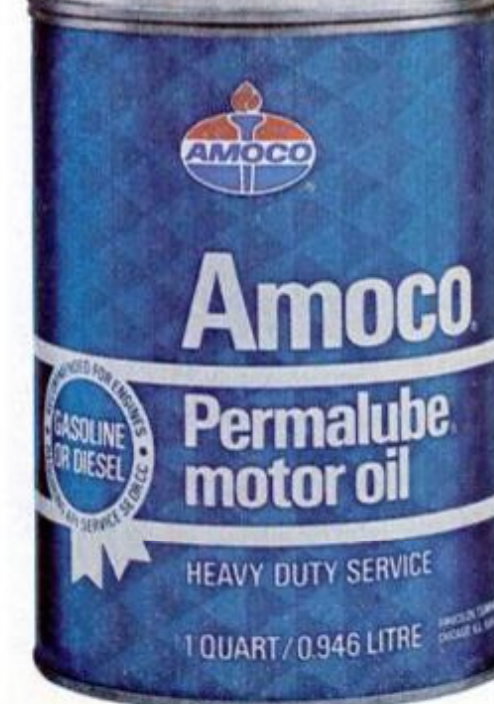
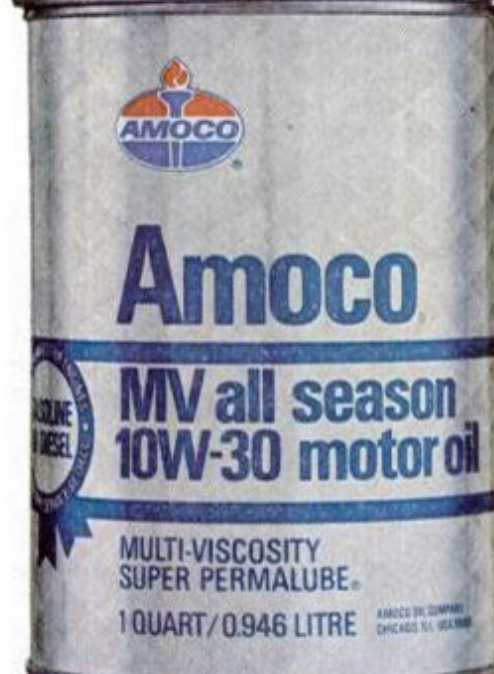
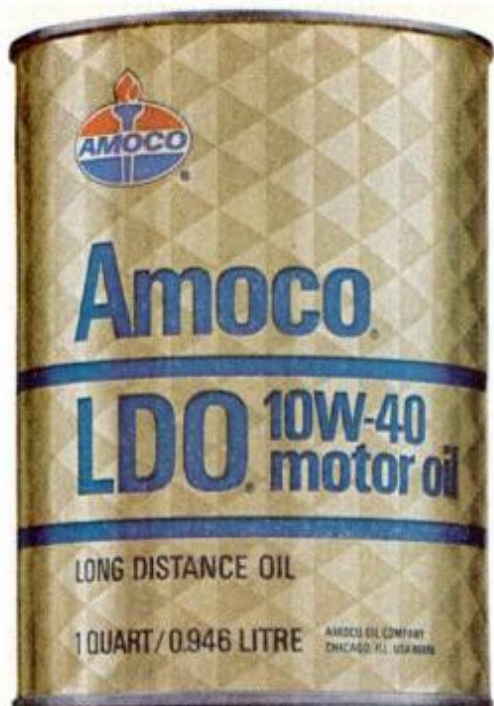
"Do you realize that in most states a driver over 25 who has been convicted of drunken driving can drive cheaper than one under 25 with a clean record?" he notes. "We need a Massachusetts-type law for us down here, but so far we've been unable to get it because of industry opposition."

New Jersey may be the next state to make the change. According to commissioner James Sheeran, he will institute a system much like that in Massachusetts if reinsurance facility and merit rating bills pass the legislature this fall. "It's the only way to go," Sheeran says.

Among other states, North Carolina has received inquiries from Texas, Oregon and California. Kenneth Hahn, supervisor of the Second District of Los Angeles County, has filed a class action suit against two of the larger local insurers there to reduce territorial rate differences. His office is also attempting to have age, sex and marital status eliminated as classification factors.

Walter Dartland, consumer advocate of metropolitan Dade County in

(Please turn to page 80)



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AUTO INSURANCE COSTS

(Continued from page 78)

Florida has filed a petition with the state insurance commissioner to bring in similar changes in that state. Says Dartland: "We would like to have the rates based on factors within the driver's control."

In Louisiana, commissioner Sherman Bernard recently tried to eliminate age and sex as rating factors, but the insurance industry has taken the matter to court and it is still under litigation.

Controversial "three horsemen"

The changes wrought by Stone, Ingram and others have not been without controversy. The two and Sheeran have been dubbed the "three horsemen" by insurance company spokesmen for their efforts. And not all state commissioners agree with their reforms. Says assistant commissioner Bob Mackin of California: "We would question such sweeping changes that, by forgetting traditional classification factors, may cause grave injustices to the majority of drivers."

The "injustices" Mackin refers to are outlined in an industry response to Stone's actions. They say Stone's idea is "hidden behind an elaborate theoretical facade, but what it amounts to is yet another proposal to flatten rates and to subsidize high-risk drivers." They went on to say that Stone had "disregarded rating classifications based on actual loss statistics and substituted in place of it an untested classification system he views as more desirable."

Critics also argue that with a special rate for drivers over 65, Massachusetts has not really abolished age as a rating factor. Stone replies that the age-65 criterion "is entirely an income question. That's the age when most people's incomes drop sharply. The classification does not relate to accident experience at all."

Wait and see

In Massachusetts, the industry had until January 20 of this year to appeal Stone's decision, but did not. The entire industry position at this point seems to be best summed up by Ron Krauss, vice president of communications for the American Insurance Assn. "Just because the Massachusetts decision wasn't appealed doesn't mean the industry agrees with what was done. We're taking a wait-and-see attitude to see how things will work out. We're willing to see how things develop."

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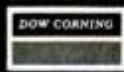
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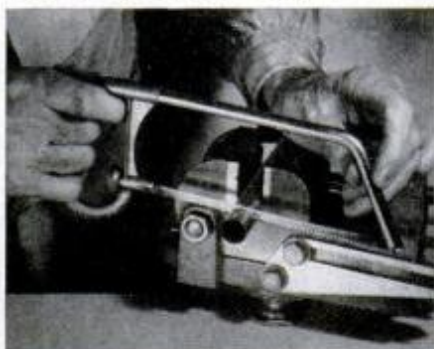
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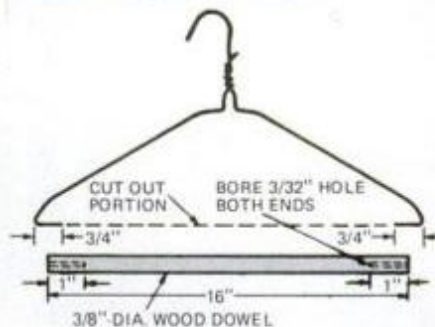
HINTS FROM READERS

Hacksawing the easy way



When you cut thin-wall tubing such as that used for drain or muffler pipes, insert the hacksaw blade backward in the frame so that the teeth point toward the handle. The teeth won't snag during cutting, and your chances of breaking the blade thus are lessened.—*Harvey Muller*

Improved pants hanger



To avoid creases when hanging pants, replace part of a wire hanger with a $\frac{3}{8}$ -in. dowel as shown. Use quick-set epoxy to keep the dowel from spinning and pants from falling off.—*Vern A. Pate*

Handy matchbox



To protect wooden kitchen matches on picnics and other outings, carry them in a plastic box like those used to package fish-hooks and other small items. Attach a strip of fine sandpaper with two-faced tape to the outside of the box for a striking surface.—*Grace B. Weinstein*

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Duty.

"Nobody who comes into the peacetime Army has any guarantee it's going to stay that way. As a military policeman in Berlin, you can see the other side only yards away — like at Checkpoint Charlie. It's odd, because sometimes you'll wave at their guards, and they'll wave right back. It's a human act, but it gives a soldier a very clear sense of his duty — which in my opinion is to protect certain beliefs and a way of life. On just a personal level, duty is doing the best you can. I'm in this job to help people. And I can't walk away."

SP4 Paul Sefcik, Berlin, Germany

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who've joined the Army.**

ALL OUTDOORS

Getting around

A few years ago, we drove a mini motorhome from Maine to Mexico without getting out. We were testing it to see just how "self-contained" it really was. The little rig rolled along without any problems—no flat tires, no motor trouble, no running out of water or food—and the only things we really missed were hot showers. Actually the compact little RV had a shower-head hose, but you had to stand outside to use it.

During the cross-country drive, however, it occurred to us that a lot of people could be doing almost the same thing. With a motorhome type of recreational vehicle, they might visit areas they had always longed to see, and if they were handicapped, or senior citizens who had trouble getting around on foot they would rarely need to get out of the camper. Even small minihomes now have bathrooms complete with showers and tubs, plus kitchens that make eating aboard easy.

It's estimated that there are 35 million people in this country who are considered handicapped, but with a little planning many of them can enjoy travel and outdoor activities. Consumer Information Travel Service, U.S. Department of Commerce, Washington, D.C. 20230, has prepared booklets giving hints for the handicapped and other travel tips. And from the Consumer Information Center, Pueblo, Colo. 81009, there is an *Access Travel: Airports* directory that tells which terminals all over the world have ramps, elevators, toilets, phones and other facilities that can handle wheel chairs and the rest. A skier with a broken leg or hiker with hearing ear dog may also want *Access National Parks: A Guide for Handicapped Visitors*, which is \$3.50 from Consumer Information Center, Pueblo, Col.

RV aids

For campers who would like to camp full time but need some extra income, the answers may be in a new volume, *31 Successful Ways to Make Money While Traveling with Your RV*, which is \$8.95 postpaid from Halmar Productions, Box 86, Homestead, Fla. 33030. It covers a variety of ingenious ways to make a buck including RV servicing,

arts and crafts, commercial and sport fishing, campground management, even running Bingo games.

Useful and almost essential for the driver of a diesel rig is a new guide by *PM* contributor Bob Behme. Called the *1978 Diesel Directory*, it is \$6.95 postpaid from Calcom Publications, Box 348, Magalia, Calif. 95954. Over 9000 U.S. and Canadian diesel service stations are listed by location and region, and a report is supplied on current passenger cars, RVs, pickups and 4wds that burn diesel oil. Though over a dozen types of diesel cars and pickups are now on the market, there is still a shortage of service stations for them, and a good directory can keep you from sweating out the pit stops.

Good gunning

For hunters this fall, and trap and skeet shooters all year around, there are several new shotguns.

Smith & Wesson is now offering a magnum autoloader in 20-gauge for its Model 1000 shotgun line. Like the S&W 12-gauge auto, this new gun can use interchangeable barrels in 26-inch skeet or improved, or 28-inch modified or full choke. It weighs about seven pounds with a 28-inch barrel, and the 12 or 20-gauge costs \$330.

Winchester has brought a side-by-side double back to its shotgun line after about 18 years with a handsome Model 23 Pigeon Grade XTR in silver gray satin finish and engraved scrollwork decoration. It will be available this fall in a choice of standard barrel lengths and choke combinations in 12-gauge at \$830, and a 20-gauge model may be offered in early 1979.

Winchester is also introducing a Big Bore 94 XTR carbine, chambered for a new 375 Winchester cartridge, in time for the deer season in brush country. The lever-action center fire rifle will look like the firm's venerable Model 94 30-30 carbine, but has been strengthened to handle the punch of the more powerful cartridge. Price is expected to be under \$200.

Stronger than graphite

Just when fishermen were getting used to the superior sensitivi-

ty and high prices of graphite rods, along comes boron, an element that has been used to reduce weight and increase strength in supersonic aircraft.

Now Browning Silaflex, the sporting goods and gunmakers in Morgan, Utah, are introducing a fishing rod that combines boron and graphite filaments with claims of more strength and sensitivity. Available in casting, spinning and fly models from five to eight feet long, the five rods already introduced range from \$108 to \$140. According to Browning, an angler should feel a fish sooner, thus be able to set the hook faster, and have less chance of breaking the rod while fighting a big one.

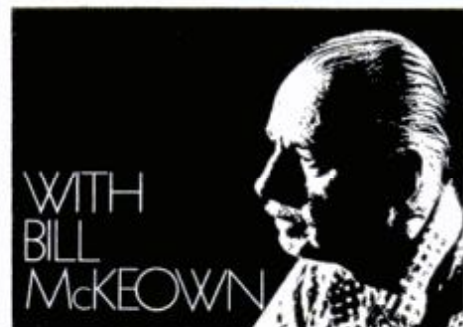
Not made of space-age exotics but "built to survive in the real world," new ice chests from Igloo have recently been tested successfully with cars balanced on top of them. Fishermen and campers particularly should welcome the new models that can be bounced while handled, or sat on in a boat or a station wagon without crumbling or cracking as the cheapie foam chests seem to enjoy doing. A three-year warranty goes with the latest models from Igloo in Houston.

Worthwhile warnings

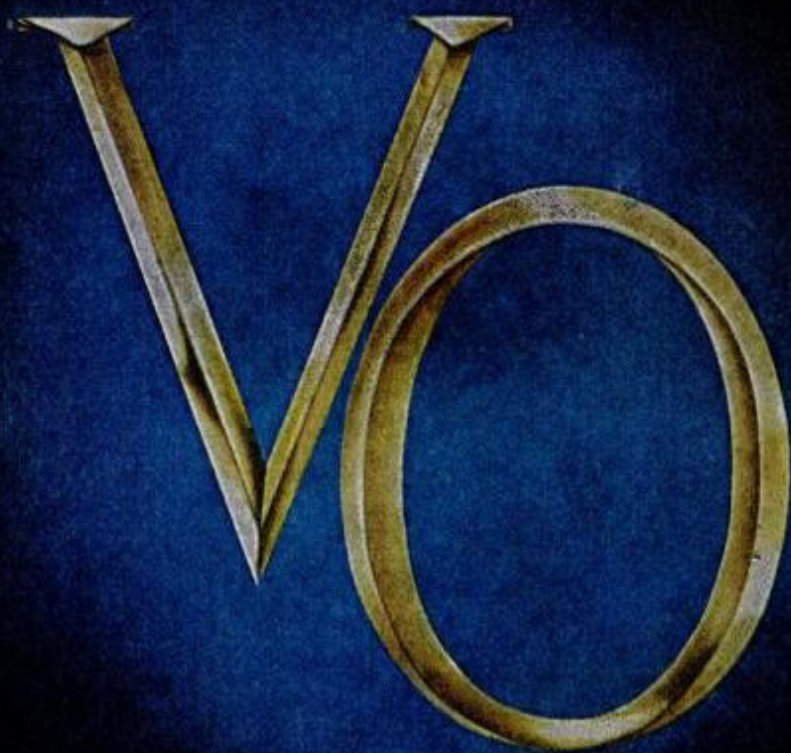
Because outdoorsmen with limited experience sometimes under-rate such hazards as wild animals and the sudden weather changes this time of year, government agencies have recently issued advisories.

Aside from the hazards just mentioned, the advisories warn that boatmen trailering their craft south, or with craft on inland waterways, may encounter overhead power lines that a mast or antenna could contact. Residents in coastal hurricane zones sometimes think

(Please turn to page 88)



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ALL OUTDOORS

(Continued from page 86)

they can outlast strong winds, but forget the hydraulic potentials of high tides carrying uprooted trees as battering rams. Skippers storing their powerboats for the winter know it is almost impossible to drain all gasoline from fuel tanks, and corrosive moisture and explosive fumes may remain. If local ordinances permit, topping tanks and adding a gasoline stabilizer chemical is often recommended.

To keep chipped or worn painted or galvanized metal from rusting, Rule Industries, Gloucester, Mass., has zinc spray in an aerosol can.

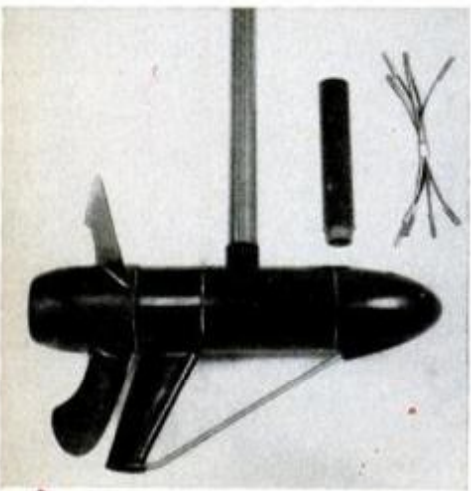
Model 400-D digital depth indicator, from Shakespeare Marine Electronics, Miami, can be set to warn



Spray-on Marine Galvanizing halts rust.



Shakespeare depth finder has two alarms.



Bay's kit lowers Thruster six inches.



Cavalry 1860 revolvers are Colt reissue.

of minimum depth, or for fluctuating soundings.

To mount Mercury's Thruster trolling motor on a boat with higher freeboard, Bay Pattern Works, Milan, Ohio, has an extension kit.



Can of worms is bait from Instant Worm.

A brace of U.S. Cavalry 1860 commemorative single-action revolvers come cased with a detachable walnut shoulder stock, powder flask, bullet mold and wrench.

Do-it-yourself plastic worms come from Chem-Source, Suffern, N.Y. The Instant Worm is an aerosol can available in red (shell-fish flavor), gold (bacon flavor), and worm color (cheese flavor) ready for a tackle-box buffet for the bass.

The EasyRider, a pickup truck cap cover by Brammall, Angola, Ind. (below), uses counter balancing



Lift-up EasyRider pickup cover from Brammall simplifies unloading cargo.



LP gas Charmglowette is portable.

springs to raise the fiberglass top for easy access to the cargo.

Charmglow Products Div. of Beatrice Foods, Bristol, Wis., has a small compact barbecue grill, the Charmglowette, fueled by a one-pound LP cylinder that stows inside it when not in use. Nonburning Charm-Rok briquets above the flames provide even heat and added flavor. Larger LP tanks can also be attached to the unit.

Two large screened, high-rise windows in rear of 9x12-foot Breezeway tent, plus window and door in front, give extra ventilation.



White Stag's tent features big windows. Monogram CampaCabana offers privacy.



The family-sized tent is from White Stag Camping, Portland, Ore.

The CampaCabana shelter by Monogram Industries, Redondo Beach, Calif., encloses new Pioneer portable toilet from Monogram, or serves as ice-fishing shelter. **PM**

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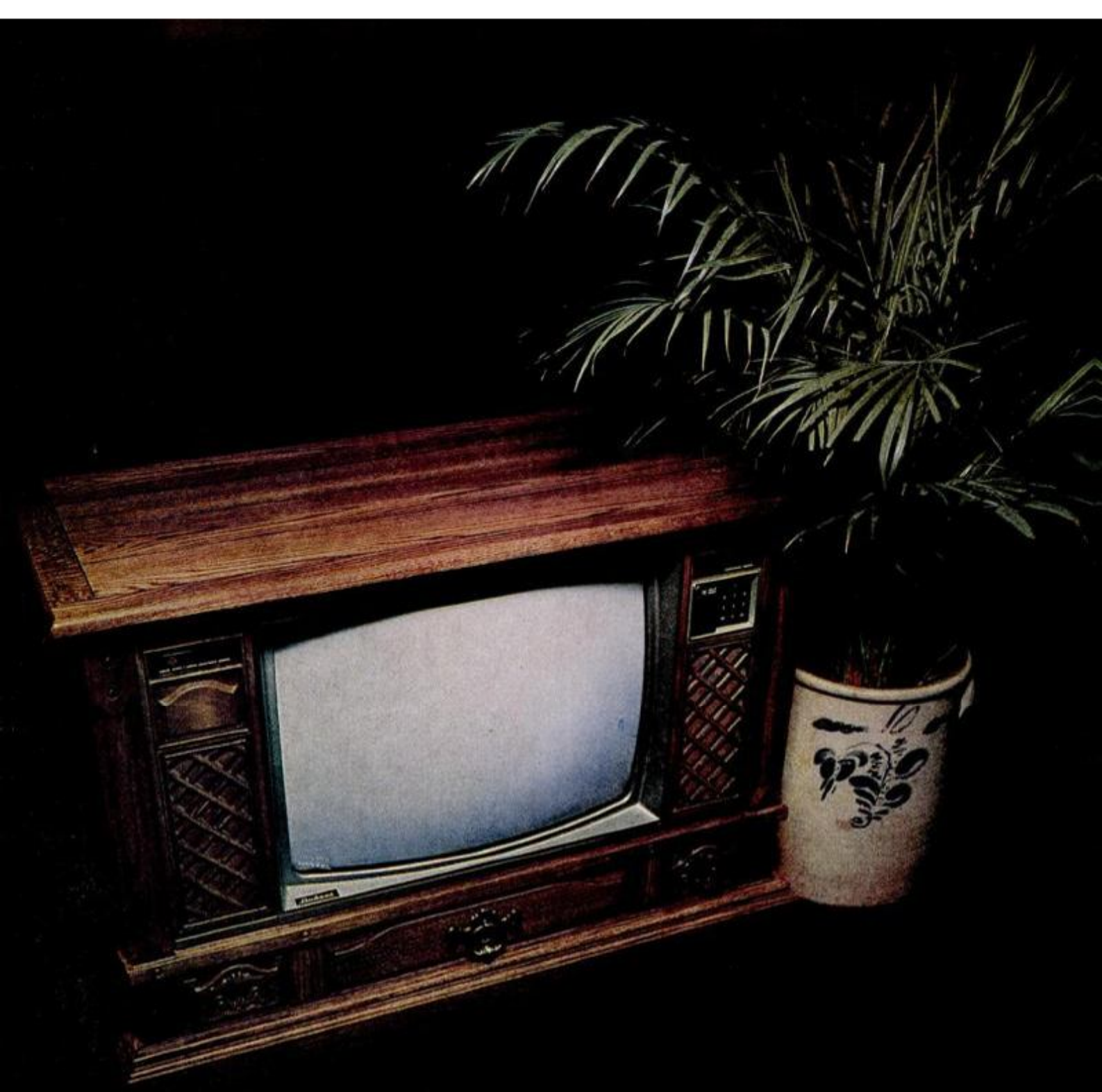
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Our family has more than 60 children. And it's still growing. Our family is the Quasar electronics family. A family of 60 fine products that utilize the latest developments in electronic, microwave and microcomputer technology to give you the ultimate in performance and reliability. As a result of our efforts, we can offer you a wide selection of fine television products in virtually every screen size.



We've got a whole new line of small AC/DC battery-powered black and white portables that let you take your favorite show wherever you go, whether it's the boat, the beach, the patio or out to the ballgame.



If you're in the market for a table model color set, we've got one to meet your needs. We've got 13" diagonal and 15" diagonal sets that are perfect for the bedroom, kitchen or den. And a broad range of 19" diagonal sets topped by a feature-filled model that even boasts an expanded-range three speaker sound system to make every show you watch more vivid and exciting. And all of this is in addition to a line that includes a broad range of 25" diagonal consoles boasting superb pictures as well as exquisite cabinetry in a wide variety of styles to match the

decor of virtually any room. Most manufacturers would have stopped right there. But our family is still growing.

Back in 1976, we introduced the first two-hour home video cassette system, the Quasar VR1000. Then, while many other companies were trying to build their first, we added a second system, the Quasar VH5000, boasting a full four-hour recording capacity. And that's not all.

Soon we'll be introducing an incredible new projection television system with a giant five-foot screen that fills your room with color and allows you to become even more involved with all your favorite shows. (And unlike other projection televisions you may have seen, ours has a unique lens system that allows you to watch with all the



normal room lights on!) Quasar has even moved into the kitchen. By introducing an amazing new microwave oven that lets you program a perfect meal with one incredible touch!

So Mom can get mouth-watering results without having to set cooking times, temperatures or power settings.

As you can see, our family in Franklin Park, Illinois is growing bigger and stronger by the day. With plenty of fresh new offspring growing on the drawing boards daily.

Why don't you introduce your family to our family? It could be the beginning of a lifelong friendship.



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Franklin Park, Illinois 60151

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Electronic mini-marvels: Big performance in tiny packages

Multifunction calculators, recorders, watches and radios keep shrinking.

by Stephen Walton

He keeps a wafer-thin calculator in his wallet. His wristwatch splits seconds into hundredths. When he's outside the house, he carries a cordless telephone on his belt. And watch what you say, because he may have a two-hour microcassette recorder in his pocket.

He's no James Bond. He's you or me, using the new microelectronic goodies, pocketable gadgets loaded with functions. They're becoming available through ordinary retail outlets, and their prices are within almost everyone's reach.

It's a far cry from the days—not so long ago—when a handheld calculator was really a handful, a clock-radio was the size of a shoebox and the smallest available tape recorders were nearly that large.

We've looked at more than a dozen of the new miniaturized electronic products and tried out most of them (all should be available by the time you read this). Our overall judgment: they're impressive in capabilities, they're fun to use and—with some minor reservations—they're practical.

Microelectronics—large-scale integration techniques that put the equivalent of thousands of transistors onto a sliver of silicon—is what makes these products possible. But the design of the packages that hold the electronics has a lot to do with the usefulness and appeal of these items.

Take the wallet-sized calculators. Casio brought out the first one with the approximate dimensions of a credit card (*It's New Now*, page 8, April '78). Now Sharp

New Sharp calculator fits into a credit card slot in your wallet, so it's always handy. Just don't keep the wallet in your hip pocket.

OLYMPUS PEARLCORDER TWO-SPEED
MICROCASSETTE RECORDER

TOSHIBA AM/FM CLOCK RADIO

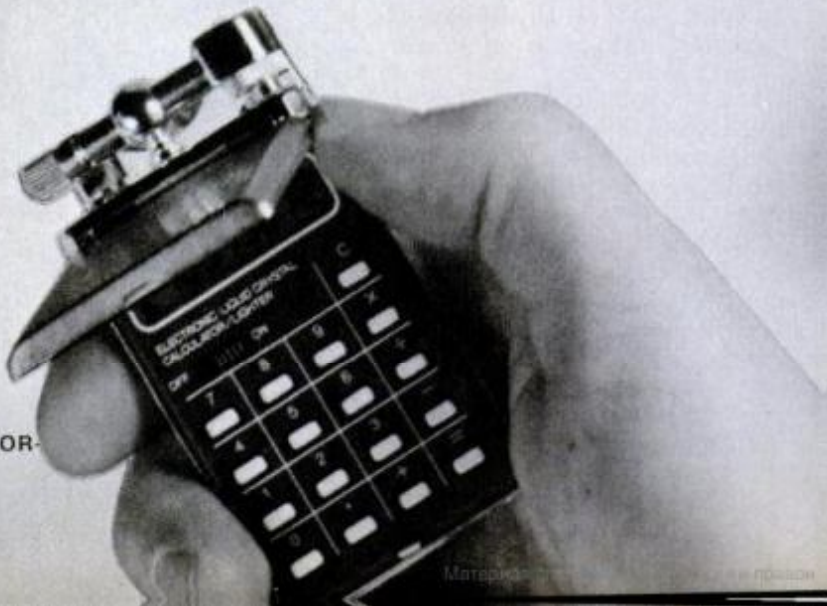


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TOSHIBA MEMO CALCULATOR



TEXAS INSTRUMENTS TRAVEL ALARM

HEWLETT-PACKARD INTERACTIVE CALCULATOR-WATCH-TIMER



SEIKO CALCULATOR-WATCH



CASIO CHRONOMETER

CASIO SCIENTIFIC CALCULATOR



has a slightly smaller one, shown on page 93. The EL-8145 has a flat keyboard and beeps at you to confirm entries in the absence of key-feel. It provides two kinds of continuous memory—that is, memory that's retained when the calculator is shut off. One of these is accessed via special "storage computer" keys and lets you do quick multiplication and division by a frequently used number, such as an exchange rate. Or you can store a telephone number in either memory. The calculator lists at \$40.

Not that Casio's been caught napping. Besides the original \$30 Mini-Card, they now have two more models in the same case, each selling for \$40. One's the calculator plus clock with timer and alarm. The other, shown below, is a 48-function scientific calculator with two levels of parentheses and a statistics mode.

These card-size calculators have just two drawbacks: First, the small keyboards take some getting used to. Second, the calculator had better not be kept in your wallet if the wallet is ever kept in your hip pocket—their liquid-crystal displays are glass, and will crack if sat upon.

But those are not the most mini of the minicalculators we've seen. Seiko and Hewlett-Packard now offer calculators built into wristwatches with keys that approach the human-engineering limit of practicality—they are so small they require a special stylus to press them.

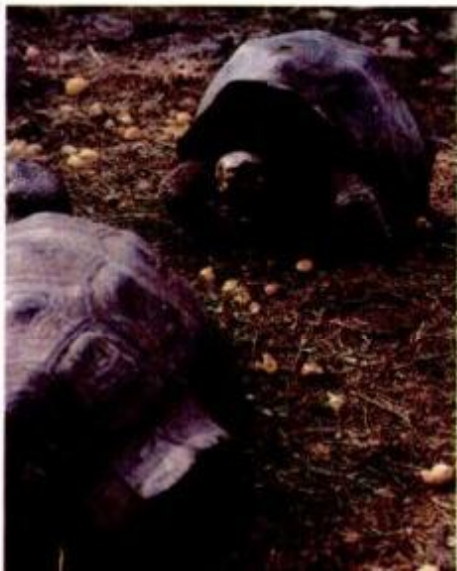
At \$350, the Seiko gives you full-time LCD display of time, month, date and day of the week. Press the center button on the side, and it's up and running as a calculator with all the basic functions, including memory, percent, square root and sign change.

The Hewlett-Packard HP-01 costs \$650 (or \$750 gold-filled), has the disadvantage of an LED display and is very bulky for a modern watch. But even though it's not a brand new product, it remains unique because it lets you use time and calculation functions interactively. Use the hundredths-of-a-second stopwatch and the toll rate to figure the cumulative cost of a long-distance call as you make it. Or get the number of days between any two

(Please turn to page 210)



Countless thousands of sea birds begin life as nestlings in the rookeries of the Galapagos Islands. Masked boobies (parent and young, above) are one of several species of that family inhabiting the rocky ledges. Animals introduced to the islands by man in the last several centuries, including feral dogs, cats, cattle and goats, threaten native birds either directly or by destroying their cover. Young of the unique Galapagos tortoise (below, left) are similarly threatened by introduced species, must now be reared in protection for later release.



Land iguana from South Plazas Island has coloration similar to vegetation he feeds on; at times he snaps at women tourists' painted toenails.

The



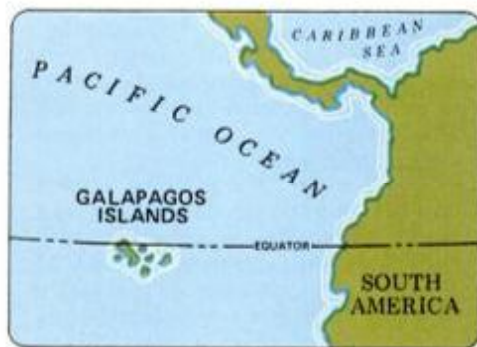
Blue-foot booby (above) awaits feeding by parents. Plight of flightless cormorant (left) is sad; found only in the Galapagos, its numbers are dwindling to point of possible extinction.



Galapagos: Ecology's prize dilemma

Only man's ingenuity can bring a second genesis to the rarest forms of life on Earth.

by Robin Nelson
EXECUTIVE EDITOR



Situated in the Pacific Ocean some 650 miles west of Ecuador, the Galapagos Islands have never been in the mainstream of commerce. And although they have in the past decade or so come onstream as a destination for a special kind of tourist, most visitors in prior centuries were seafarers. And naturalists.

The latter, of course, were first represented in 1835 by Charles Dar-

win, who in just five weeks had accumulated the evidence, through meticulous observation and collection of specimens, that would serve as a critical link in his argument for the existence of a natural process of evolution.

Many of the unique plants and animals that provided Darwin with an "Exhibit A" in the face of often fanatical Victorian opposition still thrive in the Galapagos. But some

PM's wild goat hunt on James Island



Since the Ecuadorian government is anxious to rid the Galapagos of the feral goats whose ancestors were brought as food stock by pirates and whalers, hunting them is permitted. I went ashore on James Island with Carlos Saavedra of the Galapagos Tourist Corp. (with rifle in photo above), along with two crewmen from the ship *Buccaneer* serving as beaters.

The terrain is dominated by a central volcanic cone; as we approached it the loose soil, sharp rocks and fresh-cut arroyos from the previous night's rain (already bone dry) didn't make for an easy stroll. It could have been Africa; the dense, vinous ground cover was relieved by scraggly trees every few yards—and from every tree limb, it seemed, a very fine spider's web extended to the ground. I took two paces into a couple of these and they held, so great was their tensile strength. Several Galapagos hawks, with the wingspread of a man's arms and a must-see on the birdwatcher's list, were spotted casually roosting. But, after a three-mile hike, no goats.

Finally, one beater cried, "Chivos!" and we caught sight of two of the nut-brown creatures zigzagging up the mountainside through the thickets. Carlos got off two rounds with his lever-



action Winchester, but it was too hard a shot—perhaps 150 yards.

It seemed our only trophy, had we chosen to take it, would be the goat skull (photo above) we'd come across. It reminded me that on this same island in 1835, Charles Darwin found the skull of a ship's captain said to have been done in by a mutinous crew.

But Hugo, our other beater, had run down a kid and killed it with his knife. He was skinning it when we met him at the beach. Done in a peppery stew that night, it was delicious—R.N.

Marine iguanas on Hood Island cluster on rocky ledges when not diving for the seaweed they feed on. They orient themselves to the sun to raise or lower their body temperature.



Feral animals in the United States—a growing problem

While the problem of feral animals has come to the fore in the Galapagos Islands, it has also assumed menacing proportions in the United States. Recently, police and ASPCA officials broke through a metal door in an abandoned New York City tenement building, fired tranquilizer guns and cleared it of 18 feral dogs that had terrorized the neighborhood for two years.

"We have dozens of calls every day reporting dog packs roaming the city," said an ASPCA spokeswoman. "There may be as many as 400,000 stray dogs in the five boroughs of New York."

Stray dogs are not necessarily feral—unapproachable, vicious, living in a completely wild state. "Dogs rarely make it on their own for more than six months," says Lee Bernstein, executive director of Associated Humane Societies, a national organization located in Newark, N.J., "but they probably have a better chance in big cities than in suburbs or rural areas. Cats have better odds—they're better hunters."

Bernstein estimates that about 16 million dogs and cats—abandoned pets or successive generations—are destroyed by humane organizations in the United States each year. Of these, 25 percent qualify as feral animals.

"This year is the worst in my 12 years here," he adds. "People are simply abandoning pets at a greater rate than I can remember. We have five Great Danes in our shelter in Newark. You never used to see that kind of animal deserted."

Those dogs who do survive in a feral state often make headlines.

Last December in Buena Vista Township, N.J., 11 deputized hunters with shotguns set out in search of three separate dog packs that had killed sheep, goats and pigs in the surrounding woodlands. The hunters—including farmers, mechanics, policemen, a carpenter and truck drivers—were led by a specially designated wild-dog warden, Gordon Smith, who had shot 12 of the dogs in the previous month.

"Wild dogs are scrawny and scroungy, with big heads and long, thin bodies, and they just stand and stare at you," said Smith. "Never turn your back on them or move quickly, or they'll attack." He estimated that 90 percent of the dogs in the pack were once domestic pets. (In some rural areas, feral dogs are said to interbreed with coyotes, producing "coydogs".)

Instances of "wild" dogs attacking humans are isolated, fatalities extremely rare, but they tend to get sensationalized in the press and on TV. This can obscure the larger problem of the damage that feral canines, felines, equines, bovines—and even pigs—are doing to our natural environment and its native wild animals.

A recent survey of 82 national parks by *National Parks and Conservation* magazine showed 46 parks reporting one or more types of feral animals competing with native species. In California's Golden Gate National Recreation Area dogs attack white-tailed deer and compete for food with owls, hawks, foxes and bobcats; in Texas' Gulf Islands National Seashore, feral hogs have eliminated most of the native snake population; in the Cumberland National Seashore off South Carolina hogs eat the eggs of the loggerhead sea turtle—a species headed for the endangered list; in Saguaro National Monument a herd of cattle estimated at 40 head is overgrazing a large section; and in Hawaii's national parks thousands of feral goats have caused extensive damage to native plants and 30 species of birds that depend on those flora for their survival.

Even in San Francisco's Golden Gate Park, feral animals are getting out of hand. Park officials say rabbits are rapidly devouring prized collections of native and foreign plants in the park's arboretum. The rabbit problem began last spring when local families, bored with caring for the Easter pets, freed them in the park. Attempts to trap the animals have been futile yet park officials are hesitant to kill them.

The most publicized feral animal problem, and the one that has stirred up the most public outrage is that of the burros in Grand Canyon and Death Valley Monument. Several thousand burros, descendants of North African asses first brought to the Southwest by Spanish conquistadors and later taken into the Grand Canyon and Death Valley areas by mineral prospectors, eat more than 10 tons of forage each day. By doing so they are gradually wiping out the native bighorn sheep, as well as unique species of rodents and plants in the fragile desert wilderness.

In Death Valley, before prospectors gave up their mining adventures and set their burros free, an estimated 5000 bighorn ranged over a 1400-square-

mile area. Today, says Peter G. Sanchez, National Parks Dept. resources management specialist, there are about 1600 burros and only 500 of the shy, elusive sheep—who won't drink at the same waterholes as the invaders. A similar situation exists in Grand Canyon.

"The fundamental problem is that burros have been introduced into an ecosystem operating since the Pleistocene Age under natural conditions characterized by a normally marginal water supply. The system is unable to absorb the addition of a new, large herbivore without large-scale adjustments."

In 1969 the National Park Service instituted a control program in Death Valley, and within three years reduced the burro population from 1500 to 700. The animals were shot and the meat sold to dog food companies. But in 1971 defenders of both burros and wild horses mounted a campaign for federal protection of these "symbols of the Old West," and Congress passed the Wild Horse and Burro Act, which called for a management plan for the animals.

Park Service people set about to develop one, but the ruggedness of the areas, particularly in Grand Canyon, made it impractical to drive the burros out roundup style. It is possible to live-trap them, but once trapped they have to be transported from canyon depths by helicopter. At \$250 per hour, per animal, this plan was rejected as expensive and ineffective. Reluctantly, the Park Service again decided to shoot the burros.

Once the word was out, outraged "conservation" groups filed suit in federal court, and Secretary of the Interior Cecil Andrus ordered the Park Service to hold its fire.

As of this writing, a concrete management plan has not been formulated, Sanchez says, and the burros continue to double their population every four years. However, there has been a favorable response to an adoption program allowing young jacks and jennies to journey back to domesticity—235 burros have been adopted from Death Valley Monument to date.

"Everybody we've talked to has been delighted with them. They tame down real well and make nice pets for children, as well as pack animals for hikers. The one big problem is zoning ordinances—if you live on the 16th floor of a city condominium, you can't very well keep a burro."—Christine Keller

are extinct—irretrievably lost—and many others are today in dire threat of being wiped out.

This situation is just now beginning to get widespread public notice, but it has been a matter of critical concern among biologists for some time. The reason is that the Galapageian ecosystem can never be replaced.

Emerging from the ocean some

three to four million years ago—a relatively short time in the overall evolutionary scale—in a series of volcanic upheavals, the islands were a pristine "receiving station" for already established forms of mainland life borne there randomly by wind and water currents: plant spores and seeds; birds; insects; marine; and even terrestrial vertebrates carried on rafts of mat-

ted vegetation (so the theory goes).

The relatively small "gene pool" of individual organisms surviving the journey was pitted against a hostile environment composed primarily of barren, arid lava rock, blistering under the equatorial sun but moderated in climate by the cold Humboldt Current. The only recourse: evolution of a rapid and unprecedented kind, with wholesale

creation of completely new species of plants and animals which could adapt and survive in the rugged, isolated Galapagos.

Today, more than a third of the different kinds of plants, one half of the resident birds, nearly all of the terrestrial animals and about 20 percent of the marine life in the Galapagos archipelago are *endemic species* found nowhere else in the world.

It is this great reserve of natural

wonders, and its potential for unlocking more secrets of life through further study, that the naturalists want to preserve. I recently visited the Charles Darwin Biological Research Station on the island of Santa Cruz, supported by UNESCO and worldwide voluntary contributions, to find out how scientists there regard the status of these unique islands.

"Our immediate problem is the threat posed by *introduced plants*

and animals," said a very serious Dr. Hendrick Hoeck, a Colombian recently appointed as director of the Darwin Station.

Hoeck was referring to the many varieties of life which have been brought to the islands—primarily as food stocks—by man. He was also referring to man himself.

Because of their limited exposure—four centuries at most—to a limited number of human beings,

(Please turn to page 206)

Technology vs. wild dogs on Chatham Island



1 As first step in our naturalist's proposal to eliminate wild dogs on Chatham Island, a number of animals are immobilized with tranquilizer darts and fitted with special radio tracking collars.



2 From camp on high ground, volunteers spend weeks or even months tracking locations and movements of wild dog packs.

3 From protective cages placed in habitat areas plotted by radio, marksmen attempt to shoot as many dogs as possible.



4 As dog packs are decimated, survivors become extremely wary of man, possibly more vicious; they take to burrows in dense cover.



5 Large male fighting dogs, specially bred, are surgically sterilized before introduction to the island; compete aggressively to mate with native females.



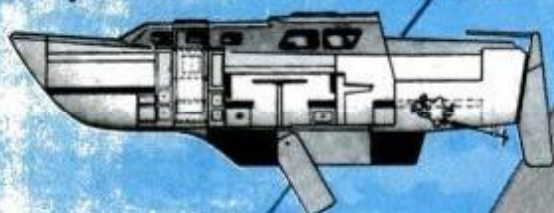
6 Even when mated to a sterile male, female dogs undergo a hysterical pregnancy that removes them from the mating pool for several months. Birth rate curtailed, wild dogs eventually die out.



New kits and plans that stretch your recreation budget

Bonus savings and satisfaction are payoffs when you build it yourself.

by Bill McKeown BOATING EDITOR



Want a \$40,000 around-the-world schooner for \$20,000, or a \$170 skiff built from scrap lumber for practically nothing? Want a \$15,000 cabin cruiser for \$10,000 spread over 10 years, a \$1200 pickup camper body for \$400 or a \$1000 sailboat for \$250?

Want to beat rising costs for all kinds of outdoor fun?

Building it yourself can be the answer today. Yachts and travel trailers, mopeds and airplanes are just a few of the many projects

available in kit form or from plans. You're likely to find you can afford twice the rig you'd first selected. The recent trend is toward bigger projects. ("Why not build the largest since it will take so much time and energy anyway?" you ask yourself.) Shown here are some of the more elaborate kits and plans you now can get started on.

The saving of so much money and the pleasures of creating with your own hands are obvious advantages. But are there any catches? Yes, and

the problems can come before you even begin construction, as well as after you're all finished. It's important to consider them all prior to getting underway.

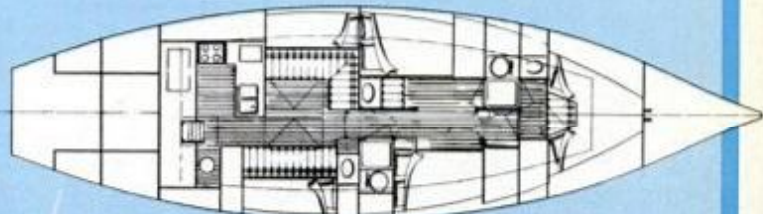
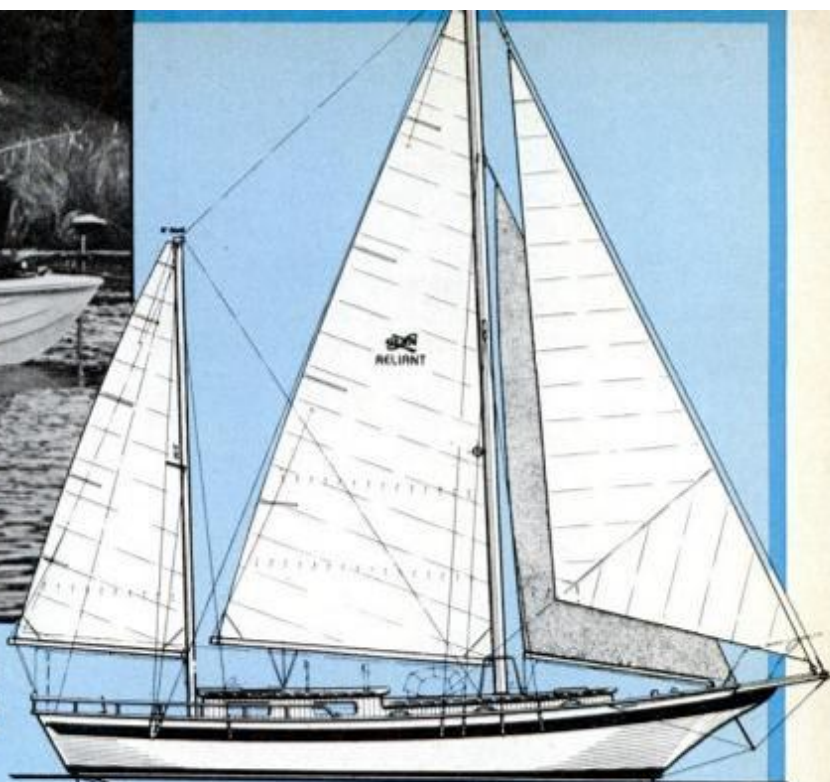
Before you start

Be honest with yourself and come up with answers to this checklist:

- **Time.** Do you have enough of it and will you really want to spend every evening and weekend on a project for a couple years?
- **Money.** Will you have enough for



A bass boat, providing compartments, live wells, pedestal seats and controls just where a fisherman wants them, can be custom built by a do-it-yourselfer using a kit with pre-molded hull and deck plus components, like this \$2895 Glassline model. Its Kevlar bass kit will soon be available as well.



Some craftsmen feel it's more efficient of time and energy to build large projects like Glen-L's ketch (top), cruiser (below). Construction proceeds as budget allows.



Pontoon deck boat uses Rotocast plastic units for flotation. The same floats can support a home-designed dock or swimming rafts of various dimensions.

Voyager 30-foot cruising sloop (left), from Luger Industries, is a swing-keel kit boat with only an eight-foot beam so that it trailers with ease to the water.



the extra hardware and tools that you will need, and will your bank lend money on a home-built if you need a loan?

■ **Skills.** Can you do a good, safe, professional job on a new kind of project? Do you have skilled friends who can help or provide instruction?

■ **Room.** Can you find a place to work under cover when the weather turns bad, and can you get your finished project out easily after you've finished?

■ **What you want.** Do you have a clear idea of the model that's best for you? No sense getting halfway through and finding you wish you were building the smaller or larger size.

■ **Quality.** Can you find other do-it-yourselfers who have completed projects from the same suppliers? Are they satisfied?

The reason your creation will cost less, of course, is because you are donating your time. Figure in a fair hourly wage and it's probably

cheaper to buy the item—because the manufacturer has skilled workers who can make it faster. But the satisfaction of building it yourself is important.

What you can get

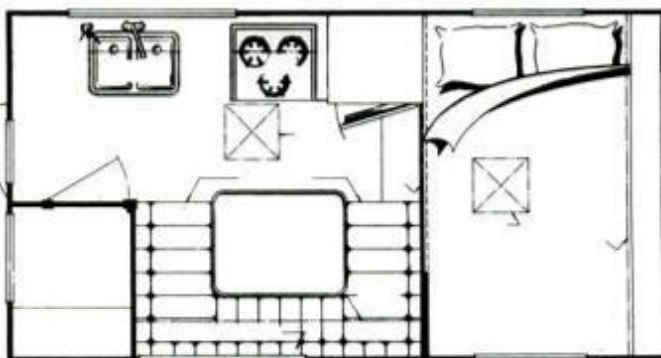
Figure that on small boats you save 25 to 50 percent on the cost of buying a finished product when you get a kit instead. Larger craft sell finished for \$1000 to \$2000 or more per foot so that building from kits or plans can be a real bargain. Shop

around locally so you can compare manufactured versus home-built prices.

For example, Glassline Products, 538 Grace St., Excelsior, Minn. 55331, has a 17-foot Basskit bass boat that can take a 90-hp outboard and is available in five colors: For \$2895 you get a pre-molded hull, deck, control console, two live wells, aerator, two fold-down fishing seats with power pedestals, carpet, lights, steering wheel, instruments, switches, bilge pump, and a number of other items of hardware and equipment as part of the basic price. The company also has plans to market a Kevlar boat kit soon, and a 21½-foot swing-keel sailboat is in the works. Included with the kit is a very detailed instruction manual of special help for beginners.

A similar bass boat at a similar price (\$2995) comes from Craft Master Boats, 6440 Flying Cloud Dr., Eden Prairie, Minn. 55344. It's 15 feet in length and is reported to take about 30 hours to assemble with no special tools required.

Largest, perhaps, of all plans suppliers is Glen Witt's 25-year-old Glen-L Marine Designs, 9152 Rosecrans, Bellflower, Calif. 90706. Plans and full-size patterns for the Glen-L 15-foot, 5-inch bass boat cost \$25, and a frame kit for it is \$150. Plywood planking can be purchased locally. A fiberglass covering kit is \$62.30, and hardware, flotation foam, C-Flex, equipment, accessories and books on boat and trailer building are also available, as well as plans for nearly 130 other craft from eight feet up to about 50. Another division, Glen-L Recreational Vehicles, at the same address, offers plans for regular and fifth-wheel travel trailers, and for pickup slide-in campers.



Kits are available for road as well as water use, and this pickup slide-in camper (above) and fifth-wheel travel trailer (bottom of page) from Glen-L are two rigs that can be custom finished inside to the user's needs.

Another long-time (26 years) kit supplier is Luger Industries, 3800 West Hwy. 13, Burnsville, Minn. 55337. Their four sailboats, at 16, 21, 26 and 30 feet, all have centerboards or swing keels and can be trailered. Premolded hull and deck of the Voyager 30 are under \$7000, and with pre-cut interior components it will cost you \$9000.

Simple deck boat of 17, 20 or 24 feet? Rotocast Flotation Products, Box 1059, Brownwood, Tex. 76801, claim their Dura Float models assemble from kits in 12 to 16 hours using their plastic pontoon

floats. Or use them to design your own docks or rafts.

For the largest selection of molded sailboat hulls in various stages of completion, Roberts and Matthews Associates, 106 65th Ave. W., Bradenton, Fla. 33507, has 21 models from 25 to 70 feet overall. Their most popular, the Adventure 25 sloop, for example, can be started from full-size plans and patterns for \$160, less than \$5000 for hull and deck and various components, on up to \$14,000 for the fully completed boat ready to sail. Her designer, at Bruce Rob-

(Please turn to page 144)



Sound strategy: 13 new components for great stereo at low cost

Assemble a system from these pieces and you'll get \$1000 worth of sound for a total investment of about \$500.

by Hans Fantel



High-efficiency speakers are the keystone in building a fine stereo system for minimum outlay. We chose pairs of speaker systems from B.I.C. (right), Radio Shack (above) and Electro-Voice (above right).

These days, a fine stereo rig may cost almost as much as a car. And since few of us have that kind of money, PM asked me and some consultants to snoop around and see if any "sound" bargains are left.

By picking, choosing and comparing—and taking advantage of the latest money-saving design innovations—we came up with some components that let you put together a truly fine-sounding system for about \$500—roughly one-third of what the average component buyer spends nowadays. (And since components are often sold at discount, you may wind up paying even less.)

The components we tested make a compatible system in any combination, and sound better than most systems costing twice as much just a few years back. That's really beating inflation.

The key to these unusual dollar values is a recent development in loudspeaker design that enables you to get more sound per watt. This allows you to use less expensive,

low-power amplifiers or receivers at no sacrifice in sound quality.

New design principles

Here's what's back of all this. Until recently, the only way to get clean, solid bass without false boom at the bottom was with so-called acoustic-suspension speakers. But they are by nature notoriously inefficient—they gobble up the watts to produce room-filling loudness.

It's easy to see why. Only half the sound energy produced by a speaker radiates from the front of the cone. The other half comes from the rear. If you put a speaker in an airtight sealed enclosure, as is done in acoustic suspension design, all the rear radiation is trapped. It never reaches the ears but gets converted into frictional heat. So you get a

housewarming instead of music—and you're wasting your watts.

Liberating the lost sound is the aim of several new kinds of speaker design. One of these is called the "passive radiator," or "drone-cone." This is a regular woofer cone stretched over an opening in the enclosure but without a magnet or coil to drive it. Instead, the drone cone flops back and forth in rhythm with the main woofer, being pushed by the back pressure that the motion of the woofer produces inside the box. The back pressure, instead of being lost as frictional heat, can thus contribute to the audible sound. What's more, the two cones (woofer plus drone) moving in tandem, make up a much bigger sound radiation surface than the woofer alone. This multiplies the air volume set in motion and creates a far more efficient sound transfer.

Other high-efficiency speakers do

PM photos: Stephen Fay Studios

not use a drone cone but let the back pressure out into the room through an open duct or vent. This idea, as old-timers may remember, dates back to the vented bass-reflex baffles, of the early days of high fidelity. But those old bass-reflex speakers sounded boomy—like someone talking into a barrel—because the box resonance was added bass. You couldn't tell, for example, the exact pitch of a plucked bass fiddle. All you got was a thud. The new designs have overcome this drawback and the music stays clear all the way to the bottom.

These innovations owe their success to two Australian engineers named A.N. Thiele and Richard H. Small. They analyzed the complex interactions between such factors as driver resonance, enclosure volume, drone mass, duct shape and vent area, to come up with a set of design formulas for having your cake and eating it—in this case, combining high efficiency with accurate sound.

Receivers

All three speakers recommended here employ one or the other of the new principles. Radio Shack's Realistic Optimus 10 sports a drone cone, the B.I.C. 11 relieves back pressure through a tapered duct and the Electro-Voice Interface 1 through a vent. As a result, all three produce ample loudness levels with less than eight watts.

The efficiency of these speakers lets us use relatively low-power receivers (ranging from 12 to 18 watts per channel) and still enjoy the power margin usually obtained only with far higher wattage. And

Top-Rated Budget Components

Speakers	Suggested price
B.I.C. Model 11	\$ 85
Electro-Voice Interface 1	\$100
Radio Shack Realistic Optimus 10	\$140
Receivers	
JVC JR-S61	\$200
Radio Shack Realistic STA-52B	\$200
Sanyo JCX 2100KR	\$180
Turntables	
B.I.C. Model 911	\$100
JVC JL-A-20	\$100
Pioneer PL-112D	\$100
Sanyo TP-1010	\$100
Cartridges	
Audio Technica AT-11	\$ 45
Pickering V-15 Micro IV AM	\$ 35
Shure M-70B	\$ 40

since power is the most expensive item in most sound systems, this is where you save money.

All three receivers tested (Radio Shack Realistic STA-52B, JVC JR-S61W, and Sanyo JCX 2100KR) list for about \$200 and deliver clear, well-balanced sound throughout the audible range at less than one percent distortion. But the STA-52B clearly has the most to offer: more sophisticated FM circuits, a provision for hooking up an extra pair of speakers for another room, and a unique option for four-channel sound.

About this last feature: A built-in matrix "synthesizes" a signal from the difference between the right and left stereo channels. This "difference" signal is fed to an extra set of terminals to which you may connect a pair of rear speakers for added spaciousness of sound. You don't need four-channel program sources to obtain this extra "space

effect." The matrix will process any standard stereo program—records, tape, or FM—for this kind of sound enhancement. Nor do you need fancy speakers to project rear-channel sound, since it mostly represents only echoes and reverberation. We used Radio Shack's ultracompact Minimus-7 speakers (\$100 per pair) for the rear channels and found that in combination with the front speakers they provided a sense of added spaciousness that made our listening room seem twice as big as it actually was. Of course, such elaborations are optional, and you can use the STA-52B strictly in standard stereo.

All three receivers are sensitive enough to pull in FM stations within a radius of about 50 miles, assuming you have an adequate antenna. But the Radio Shack STA-52B offers special advantages in this respect also. A highly sophisticated circuit, called a Phase-Lock Loop (PLL for short) helps hold FM stations firmly in tune even under difficult receiving conditions, thereby reducing noise and distortion and maintaining proper channel separation. For listeners in areas of high signal strength, the STA-52B offers a handy convenience. You can use a clip-on connection that lets the power cord act as an FM antenna, so you don't need any other antenna if you live near the transmitter.

Turntables

We stuck to the simplest type of turntable design—belt-driven single-play platters. Skipping the frills, we zeroed in on four excellent turntables in the \$100 price bracket



All three of the receivers we tested delivered clean sound with adequate power for use with our highly efficient loudspeakers. We found the Radio Shack STA-52 (left) superior to the JVC (top) and Sanyo (right) in FM performance, also liked its extra features.



Quartet of \$100 turntables: JVC (top); B.I.C. (bottom); Sanyo (left) and Pioneer (right). B.I.C. unit price also includes dust cover.

offering excellent basic performance—smooth rotation, low rumble, light-tracking arms, and good isolation from outside vibration caused by shaky floors or acoustic feedback.

Each comes with its own base and a floating-hinge dust-cover. All arms tracked flawlessly at the minimum stylus pressure recommended for the different cartridges (about 1.5 grams) thus assuring long life for stylus and records. No obtrusive rumble was audible even in the quiet musical passages, and the viscous-damped cue-control worked smoothly on all models, setting down the tone arm gently on the disc. There was no perceptible wow and flutter; even on long-held notes, the pitch remained rock-steady.

Yet for all these praiseworthy similarities, there were important differences. For one thing, JVC and Sanyo have automatic tone-arm return, so you don't have to jump up at the end of each record to lift the arm. Sanyo also features a vernier speed adjustment, which is useful if you want to "play along" with the record and want to get the turntable in tune with your own instrument. But when it comes to isolating the turntable from external shock and vibration, Pioneer and B.I.C. are clearly superior. They use a floating subframe that elastically supports both turntable and tone-arm pivot so that platter and arm move in tandem when jostled, i.e., they stay put in respect to each other. So even if you've got a herd of elephants doing the hustle in your living room, the stylus probably wouldn't skip a groove. B.I.C.'s turntable suspension even features variable

spring tension to let you adjust the suspension resonance and literally tune out unwanted vibration. This idea is comparable to the adjustable shock absorbers used in some of the fancier car suspensions.

The Pioneer PL-112D appears the most solidly built of the group. It is also the most compact, and we found its single-lever operating control (for start, stop, and cue) very convenient to use.

We found little to choose between the three cartridges, all of which sounded very good and quite similar. If you listened closely, you might notice that the Shure has particularly smooth highs, the Pickering an extra bit of brightness, and the Audio Technica a pleasantly warm overall tonal coloration. But these differences are slight, and we could live happily with any of the three. What surprised us is how close these budget cartridges come to the sound of top models. In fact, it takes some rather fancy equipment (and keen ears) to really show the difference. Keep in mind that if you buy a complete system from a single dealer, he will probably include the cartridge at a considerable discount.

Listening tests

We played these components in various combinations and put them through their paces with all kinds of music—jazz, rock, symphonies and vocals. Not a bad sound in the lot of them; despite the low wattage. And, thanks to the high speaker efficiency, even big orchestral

climaxes came through without blurring into distortion.

The main differences we noticed, as you might expect, were in the speakers. Both the B.I.C. and Electro-Voice had a nicely balanced tonal spectrum from top to bottom, though the B.I.C. benefited from a little bass boost. (We found it at its best with the bass control in the two-o'clock position.) Even at ample volume, their tweeters showed no sign of strain and the highs came out sweet and clean. The sound was a pleasure and needs no excuses. So, if price is a main consideration, either the Electro-Voice Interface I or the B.I.C. Model 11 are excellent buys.

But if you can swing the extra cash for the Realistic Optimus 10, you'll immediately hear what you get for the extra money. That 10-inch drone cone puts added wallop in the bass, pumping out the richest orchestral chords or the punchy thrust of the electric bass in a rock band with stunning conviction.

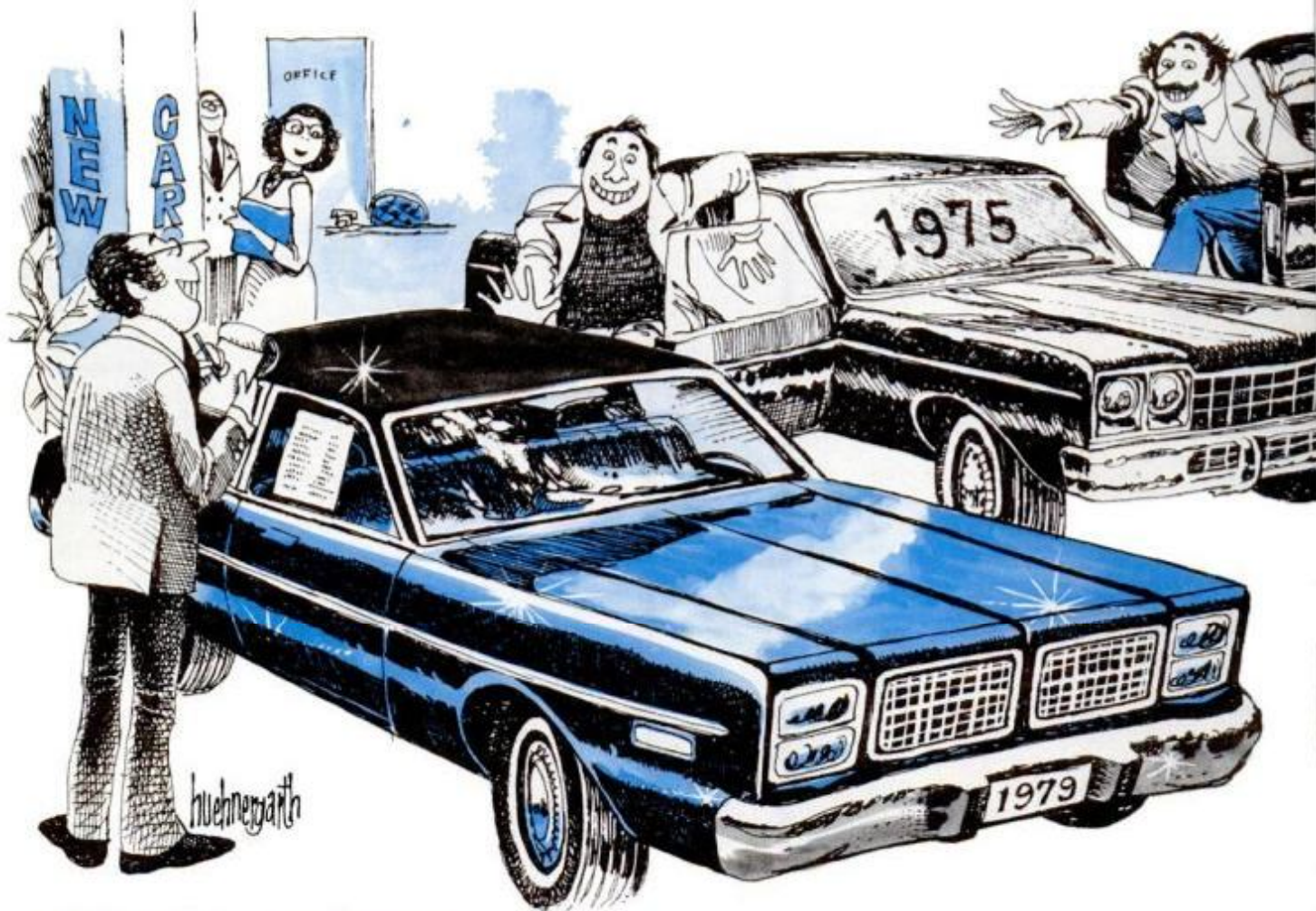
At the top, the Optimus 10 has a special sweetness that makes you sense the aged wood in a fiddle or the brass of a trumpet—rather than make you think either of them is made of tin. What's more, the treble is spread out so evenly that we could walk all across the room without noticing any change in tone color—an important factor in maintaining the stereo effect in all listening positions. If we have any gripes at all about this exceptional speaker, it is that in some rooms it sounds rather on the bright side. We liked it best with the tweeter control turned down to the -3 db position.

By the time we finished our listening sessions, we felt that we had proved our point: You can still get first-rate sound without going into hock.

FM

When it's time for another car...

SHOULD YOU BUY



“Would you buy a secondhand pair of shoes?”

—asks Bill Hartford, PM auto editor

Ah, factory fresh! A new car is a joy forever. Well, for 10 to 15 years anyway. When I spread the purchase price over a period like that, it doesn't hurt at all—and it beats buying a succession of clunkers and the proverbial “other guy's headache.”

Wheels are high on my list of priorities, of course, and I'd no sooner buy a used car than I would buy a secondhand pair of shoes. Wouldn't we all buy new cars if we could? As long as I manage my finances wisely my next new car, too, will be *brand, spanking new*—not “new” off a showroom floor or a dealer's back lot where it's been slowly rusting for six months, but ordered and built to my exact specifications!

There is, to be sure, a price to pay for this “luxury” of a new car every decade. But the cost of a new car today only *seems* astronomical. The average price of a new car is about \$6500. That's 36 percent of the national median income of \$18,000. In 1970 a new car was 38 percent of the median income, about 50 percent in 1960, and in 1950 you'd have to budget almost two-thirds of your annual salary for a new car. Using these figures, from the Automotive Information Council, a new car today is something of a bargain.

Insurance on a new car is a kick in the pants, you say? I couldn't agree more, and I'm surprised it hasn't had more of an inhibiting influence on new-car sales. But the big collision

coverage part of the tab is the price I have to pay to protect my long-term investment against an early wipeout.

And how about those double-digit financing percentages? Wicked. Another hassle. Dealing with the bank is almost as bad as coping with your local motor vehicle bureau. But having to shop around for the best rates is no reason to pick up a bomb with the cash you have on hand. When my payments stop after three (or four, ugh!) years, I'm home free. I own a car that's broken in, debugged and ready for many years of “free” driving.

Would I ever do it differently? Well, yes. I'd like to laugh all the way *past* the bank and buy my next new car with cash!

NEW OR USED?



“A new-car smell isn't worth a couple of thousand bucks!”

—says Mort Schultz, a convinced used car buyer

There's nothing crazier than buying a new car. And it's impractical, too.

Forget the fact that a new car costs 20 to 80 percent more than a car that's one to four years old. What does a new-car buyer get that a used-car buyer doesn't get, except a new-car smell?

Does he get a better running car? No, a used-car has been “debugged.” Just look through the scores of new-car service bulletins issued by manufacturers. A used car has been through this mill, and inherent bugs were probably squashed when the first owner had possession.

Does the new-car buyer get greater comfort? Maybe, psychologically, but that's in the head . . . not in the seat of the pants. Riding comfort depends on a sound suspension system. Unsound suspension components in a used car can be replaced.

Does he get greater safety? Hard to say. The fact that the number of recalls of new cars exceeds that of cars which are several years old seems to indicate not.

Are new-car ownership and operating costs lower? Not if you look at the total picture. Maintenance costs increase as a car gets older, but the rise doesn't offset the depreciation factor of new-car ownership and insurance.

Hertz Corp. did a study comparing the cost of buying and operating new and used intermediate-size au-

tomobiles for a three-year period and 10,000 miles a year of driving. The following chart summarizes the results. The moral: buy used.

Age of Car When Purchased (In Years)	Ownership & Operating Cost	
	Cents Per Mile	Percent Saved
New	28.1	—
One	25.3	10
Two	19.7	30
Three	14.6	48
Four	13.9	51
Five	13.5	52
Six	13.2	53
Seven	13.1	53

Approximately 13.5 million used cars are sold annually by new and used-car dealers, rental and leasing agencies and private parties at a dollar volume exceeding \$21.3 billion. Nearly three out of four U.S. passenger cars purchased for personal driving are secondhand. Most will provide good service for many years. According to the Motor Vehicle Manufacturers Assn., over 90 percent of the cars built five years ago, and 40 to 45 percent of those built 10 years ago, are still in use.

Obviously, however, a used car is a more practical purchase than a new car only if it isn't a candidate for Iron Mike, the junk dealer. Most used-car dealers are pros at covering up serious defects. But the time may soon be coming when the

advantage will be tipped toward used-car buyers.

A proposal before the Federal Trade Commission, if adopted, will force dealers to inspect cars for crucial safety and operating systems. They will have to disclose by an “OK—Not OK” sticker the status of these systems and will also have to reveal if the car was in a flood or major accident, and if it was privately owned, rented or leased.

Until the proposal is adopted, the way to determine whether a used car is sound is to make a careful inspection. You don't have to be a cracker-jack mechanic. Just use your eyes, ears, hands, nose and have patience.

Before discussing what and how to check, one point should be made. Let's say a used car you're looking at was in an accident, but your inspection doesn't uncover this fact. A test of the frame (see below) indicates that it is straight. So, a previous owner has paid a competent body shop to fix the damage. Does it matter that damage once existed?

Testing should involve a preliminary examination of the body, engine compartment and underside components, and a road test under all conceivable conditions—on the highway, in town, up and down hills, on back roads. Buying a used car involves more than kicking tires.

The difficulty in evaluating a car's

(Please turn to page 245)

Driving the '79 General Motors Cars

by Michael Lamm WEST COAST EDITOR

You're witnessing Phase Three of GM's \$15 billion downsizing program. This year, GM's E-bodied cars—Eldorado, Toronado and Riviera—return from the fat farm much slimmer, trimmer, and an average of 734 pounds lighter.

The 1979 Eldo, Toro and Riv now share an identical body/chassis configuration: 114-inch wheelbase, perimeter frame, front-wheel drive, four-wheel independent suspension system with torsion bars up front, and very similar dimensions inside and out.

These cars are totally new. I was greatly impressed with the way they drive, ride and handle. They're superquiet and smooth, and very stable on all surfaces at all speeds.

Front-wheel drive (fwd) makes a lot of sense in cars of this size—more than for the bigger Eldorados and Toronados of the past. Power-on cornering with fwd brings out much less understeer than on previous Eldorados, which had a distinct tendency to plow and be nose-heavy. Maneuverability benefits, too, from the 14:1 power steering and the fact that the car turns in a 5-foot-shorter radius than before. And revalved power steering gives more road feel.

In addition to the new 1979 E-Cars, other 1979 GM highlights include a restyled Firebird, more diesel engines, more turbochargers and a redesigned cast-iron 151-cu.-in. Four with crossflow head.

We'll examine all these in detail in a moment, but first a little background information.

GM's \$15 billion downsize

You'll recall that in late 1976, GM announced it would spend some \$15 billion by the end of this decade to downsize almost all its car lines. The only ones unaffected were those that were already small—like the Chevette.

Phase One of the downsizing program arrived for 1977 when GM's full-sized B- and C-bodied cars—the

big Cadillacs, Buicks, Oldsmobiles, Pontiacs and Chevrolets—all shrank by an average of 8.5 inches and 700 pounds.

In 1978, Phase Two went into effect and the intermediates shrank: GM's A- and A-Special-bodied cars. These included models we presently call Malibu, Le Mans, Century, Cutlass, Monte Carlo, Grand Prix and Regal.

Now for 1979, it's Phase Three and the resized E-Cars that make their debut. In May 1979, we'll see the arrival of a new crop of scaled-down, fwd X-bodied GM compacts: the 1980 Nova, Phoenix, Omega and Skylark. I've caught glimpses of them, and they look great!

The point is, though, that GM has committed itself to building smaller, lighter, more fuel-efficient cars. It's trying hard, and this is a big gamble, because there's no assurance even today—nearly five years after the Arabian oil embargo—that the American public will accept the

downsizing of *all* types of cars.

For example, will the traditional Eldorado buyer willingly step from his 5052-pound, 19-foot-long 1978 land yacht into a 1979 version weighing 1155 pounds less and measuring nearly two feet shorter? Is he willing to pay the same or more cash for this smaller, lighter car?

Another bit of background: When the downsizing program began, each GM division was assigned a specific area of research and development. Cadillac's project was fuel injection. Buick got into turbocharging and V6s, Oldsmobile's into diesels. Pontiac began work on closed-loop emissions systems. And Chevrolet's assignment lay in general engine and truck development.

That's why we're seeing diesels radiating outward from Oldsmobile to the other GM divisions, turbos emanating from Buick, fuel injection being pioneered by Cadillac, and so forth. Eventually, all divisions will share GM's new technologies equally, but in the beginning each division will be allowed to emphasize its own area of innovation. The day will come, though, when we'll see turbocharged, fuel-injected, dieselized V6s with closed-loop emissions systems. But for now they're being presented one at a time.

Let's turn now to the five GM car divisions and see what new specifics each one has to offer for 1979.

The 1979 Cadillac

The big news at Cadillac, of course, is the 1979 Eldorado. This luxury coupe has been totally redesigned for less weight and greater fuel efficiency. Its reduced size puts it in the sales category of such sports-luxury imports as the BMW, the new smaller Mercedes, Jaguar XJ coupe and even certain Porsches. To meet those competitors head-on, the new Eldorado goes "European" in its engineering.

Not only does it retain front-wheel drive but it adopts four-wheel

1979 SCORECARD

Model	Wheelbase (in.)
Chevrolet Chevette three-door	94.3
Chevrolet Chevette five-door	97.3
Chevrolet Monza/Pontiac Sunbird/Buick Skyhawk	
Oldsmobile Starfire	97.0
Chevrolet Corvette	98.0
Chevrolet Camaro/Pontiac Firebird	108.0
Chevrolet Malibu, Monte Carlo/Pontiac LeMans, Grand Prix/Buick Century, Regal/Oldsmobile Cutlass	108.1
Chevrolet Nova/Pontiac Phoenix/Buick Skylark/Oldsmobile Omega	111.0
Cadillac Eldorado/Buick Riviera/Oldsmobile Toronado	114.0
Cadillac Seville	114.3
Chevrolet/Pontiac/Buick/Oldsmobile full size	116.0
Buick Electra/Oldsmobile 98 full size	119.0
Cadillac DeVille, Fleetwood Brougham	121.5
Cadillac limousines	144.5

'E' IS FOR EFFICIENCY IN THE ALL-NEW FWD E-BODIES



Oldsmobile Toronado looks good inside and out, and mileage with its optional 350-cu.-in. diesel should easily top 20 mpg.



Buick Riviera gets the turbocharged V6 under the hood and a full complement of electronics with Trip Monitor in the dash.



Cadillac Eldorado, and the Olds and Buick E-bodies as well, provides supercomfort up front and in the rear seat, too.



PM photos: Irv Dolin

independent suspension with automatic load leveling, front torsion bars, four-wheel disc brakes, electronic fuel injection and an optional diesel V8.

Front-wheel drive makes not only for a virtually flat floor, but it simplifies the Eldo's new independent rear suspension system. "We've been working on independent rear axles for the Eldorado ever since the first generation," says Cadillac chief engineer Bob Templin. "Now we've finally been able to incorporate it for 1979."

This system uses semitrailing arms, coil springs and self-leveling air shocks. A mechanical height sensor and chassis-mounted electric pump regulate shock pressure to compensate for weight in the rear seat and trunk. This system keeps the headlights level and also gives adequate suspension travel under load.

The Eldorado's rear-axle centerline stands 10 inches forward of its 1978 location, putting rear-seat passengers just ahead of the axle. Yet the rear compartment gives a very comfortable ride, with more front and rear legroom than before plus added knee clearance and rear headroom. Usable trunk space is 75 percent greater than in 1978.

The standard four-wheel discs have 10.5-inch rotors made of a special damped-iron alloy that cuts brake squeal. And all four axles use integral spindle ball-bearing assemblies that never need readjustment or lubing.

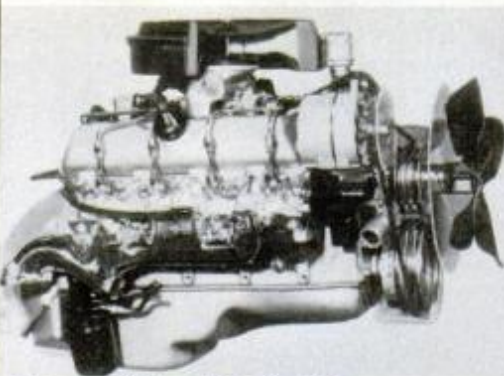
The Eldorado's standard engine is a fuel-injected 350-cu.-in. V8 that develops 170 bhp at 4200 rpm. That's only 10 fewer horses than in 1978, so the 1155-pound-lighter '79 Eldo's performance sparkles.

The Eldorado diesel delivers 120 bhp at 3600 rpm, and that's *still* more than adequate for decent acceleration. I'm amazed, too, at the insulating job Cadillac has done on the diesel. With all windows up, you can't hear the engine at all, and even with them down there's just the faintest clickety-click from under the hood.

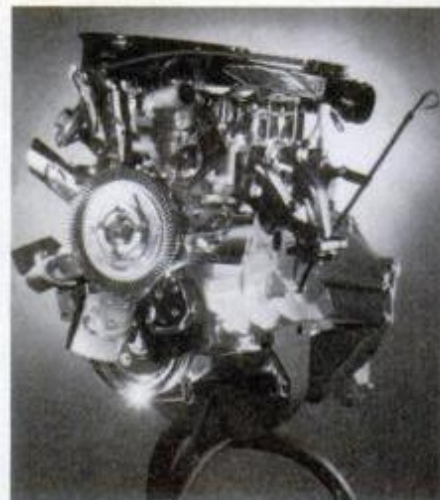
All GM diesel V8s now incorporate fast-start glowplugs in each cylinder. These make it possible to start the engine at zero-degree temperature in only six seconds, as opposed to the 60 seconds it used to take. The fast-start glowplugs, like the diesel V8s themselves, were developed at Oldsmobile.

While no official fuel-economy figures for the Eldo diesel have yet been released, it should get pretty impressive mileage—something like 24 mpg.

THE 1979 GENERAL MOTORS ENGINES TO WATCH



Olds small diesel: 4.3-liter V8.



Pontiac's 2.5-liter, in-line Four.



Buick's turbo: 3.8-liter V6.

Hot on the heels of last year's 350 diesel, introduced in the big Oldsmobiles, comes the 260, optional on all '79 intermediates. Buick's V6 turbo gets more hp when put in the Riviera: Placing the turbocharger nearer the engine gives 185 horses, 10 more than the engine provides in other Buicks. Production of Pontiac's cast-iron Four should double as other GM divisions want it, too.

Cadillac has again gone beyond most automakers in corrosion protection. The Eldorado uses one-sided Zincrometal for the front fenders. It also has gaskets or bimetal moldings at all bolted-together panels, plus plastic inner wheelhouses, a plastic battery tray (two for the diesel), lots of phosphate dipping and wax coating, and polyseal coatings for all visible underhood fasteners.

Cast aluminum wheels are optional, and they're 17.6 pounds lighter in toto than their steel counterparts. There's a Biarritz option in the Eldorado series that includes a brushed stainless-steel roof insert.

A redesigned Turbo Hydra-Matic 325 saves another 56 pounds. The new perimeter frame is nearly 100 pounds lighter than in 1978.

All 1979 Cadillacs come with rafts of standard equipment, this year including a standard AM/FM electronically tuned stereo radio. This radio incorporates automatic signal seeking, a scanner, and a digital display for the built-in clock and station selector. Also supplied is an antenna that goes up and down automatically either with a turn of the ignition key or the radio's on-off knob.

Another option for the Eldorado and Seville is a digital instrument cluster and trip computer. It's available only in gasoline-engined models. Digital readouts consist of

speedometer, gas gauge and trip-computer display. When you punch the 12-button computer panel, the display tells such things as your average mpg, estimated time of arrival, and elapsed time for the trip. It can also tell engine revs and coolant temperature.

Cadillac's larger 1979 offerings remain pretty much unchanged except for slightly revised grilles and rear treatments. All Cads except the Eldo and Seville use the 425-cu.-in. V8 at 180 bhp, same as last year. Tire pressures on the 1979 DeVilles and Broughams are up from 26 to 32 p.s.i., thanks to retuned shocks and body mounts. The higher tire pressure gives better gas mileage, greater load capacity, and longer tire life. You'll be seeing increased tire-inflation pressures in the future.

Cadillacs sold in California will have GM's closed-loop fuel-injection system with the Phase II catalytic converter. Developed by Pontiac, the closed-loop system incorporates an oxygen sensor in the exhaust manifold. This sensor sends an electrical signal to the fuel injector so it can time each squirt of fuel for optimum performance with lowest emissions. The sensor needs to be replaced every 15,000 miles. A little flag on the odometer reminds the driver at 15,000-mile intervals.

A new Cadillac body type this year is the pseudo convertible—the

De Ville Phaeton, with ragtop-like roof and smaller rear quarter windows.

The 1979 Buicks

The Eldorado's cousin and basically the same car, the 1979 Riviera comes in two versions: Luxury and Sport (L and S). The Riviera S has a turbocharged 3.8-liter V6 (231-cu.-in.) as standard equipment, with a special handling suspension package also standard. A 5.7-liter (350-cu.-in.) V8 can be ordered optionally.

On the Riviera L, the 350 comes standard, with the 231 turbo V6 optional. And the L's suspension package emphasizes a luxurious ride instead of sports handling.

The V6 turbocharger on the Riviera stands behind the engine, a configuration dictated by hood clearance. But in the process, the turbo was moved nearer the engine, which resulted in 10 more horses above other Buick 3.8-liter V6s: 185 instead of 175.

The Riv uses the same basic fwd, four-wheel independent suspension, self-leveling air shocks, four-wheel disc brakes, perimeter frame and body as the 1979 Eldorado. By midyear, the Riviera is expected to have a digital readout and trip computer much like the Eldo's.

You'll recall that last year's Riviera amounted to a special version of the Buick LeSabre coup and, to many, was indistinguishable from it. The 1978 Riviera weighed 3891 pounds, as opposed to 3762 for the 1979 model. Thus the weight decrease for this year's Riviera isn't nearly so dramatic as for the 1979 Eldorado—only 129 pounds as opposed to 1155 for the Eldo.

Revisions in this year's Buick 231 V6 result in 10 more horsepower and 14 pounds less engine weight. Reworked heads have bigger valves and ports for better breathing. A new cam gives higher lift and more duration. Intake and exhaust manifolds have also been improved, with a different two-barrel carburetor. The 3.8-liter V6 in the Riviera doesn't interchange with the 3.8 V6 used in other 1979 Buick lines.

Last year, only the Buick Regal sport coupe had the AiResearch turbocharger. For 1979, though, the turbo option has been extended to Century coupes and sedans as well as to the Riviera.

The Century Turbo coupe marks a new addition for 1979 and includes the 175-bhp turbocharged V6 along with a special firm suspension package, front air dam and rear spoiler, flat-black paint trim, seven-inch polycast sport wheels, high-perfor-

mance automatic trans, deep rear axle, fast-ratio power steering and fat tires. According to my stopwatch, this is the quickest of all 1979 Buicks, going from zero to 60 in just under 10 seconds.

Buick Skyhawks feature new faces with rectangular headlamps. A special Skyhawk package called the Road Hawk includes beefier suspension, bigger tires, fiberglass outer fender panels that incorporate the front air dam and rear spoiler, plus special paint.

Other Buicks stay pat for 1979, with only minor trim changes and mechanical improvements.

Oldsmobile for 1979

Oldsmobile makes two different diesel V8s optional in 19 models of its six lines, including the all-new Toronado. The Toro, of course, shares the new GM E-body with the Eldorado and Riviera.

You can order the 350-cu.-in., fast-start diesel V8 as an option in the Toronado. And Olds also offers a new smaller diesel—a 260-cu.-in. V8 that's optional in all 1979 Olds intermediates. It's available with a five-speed manual transmission or Turbo Hydra-Matic.

The 1979 Toro is about 900 pounds lighter than last year, yet it's bigger inside in nearly all dimensions. The rear seat gives more head- and legroom than before, and I found it amazingly spacious (as I did all 1979 E-Cars). The only dimension that's smaller is width, but there's still more than enough room for four adults.

Standard features inside the 1979 Toro—as in other E-Cars—include

Next month: *Saturday Mechanic* gives service tips on GM's '79 models. For service tips on '79 Fords, see September, page 12. For '79 Chryslers, see page 140 of this issue.

airconditioning, split front seat with six-way power for the driver, power steering, power brakes, power windows, automatic transmission, AM/FM stereo digital signal-seeking radio, power antenna, steel-belted whitewall radial tires, stowaway spare, digital clock and remote outside mirrors.

The Toronado offers four-wheel disc brakes only optionally, with 9.5-inch drums on the rear as standard.

To combat corrosion, Olds has developed a cationic elpo primer, used on the 1979 Toro body before

painting. Lower surfaces are also coated with a plasticized spray to minimize stone damage. Door outers, rockers, quarter panels and wheelhouses are galvanized on one side, with extensive use of Zincrometal and wax coatings on vulnerable areas.

Except for minor trim differences, other Oldses remain virtually the same as in 1978. The Starfire gets perhaps the most noticeable changes in its frontal appearance and large, horizontal tail lamps. On the muscle side, there's a retrimmed version of the 4-4-2 and Hurst Olds with W-30 option.

Pontiac for 1979

Pontiac's most remarkable changes for 1979 involve new front and rear ensembles for the Firebird. The Bird's soft front end now has a low horizontal nose and quad rectangular headlamps (see July PM, page 48).

Designer John Shinella told me that his Firebird studio considered eliminating the exposed headlights to give the hood a smooth, uninterrupted drop down to the grille scoops. But cost precluded use of electric or vacuum-operated headlight doors.

Around back, the Firebird sports blackout tail lamps and an Endura bumper treatment that repeats the front (see Detroit Listening Post, Sept. PM, page 62). New paint schemes, a revised Trans-Am "chicken," different honeycomb alloy wheels, and instrument panels round out the Firebird's major appearance groups.

The Trans-Am and Formula now make four-wheel disc brakes optional. A limited number of Special Edition all-black Trans-Ams with 400-cu.-in. V8s and four-speed transmissions will be available at the beginning of the model year. I drove one, and it really goes!

The Firebird engine lineup begins with the 105-bhp, 231-cu.-in. V6, standard in the base model this year. The Esprit's standard engine is a 140-bhp, 301 V8, with the Formula taking a four-barrel version of the same, with a rating of 150 bhp.

For the Trans-Am, there's a 403 V8 with automatic (185 bhp), with the 400 four-speed and 301 optional. In addition, Firebirds offer V8s of 305- and 350-cu.-in. capacity in various models.

The Firebird's four-speed shift mechanism has been improved for smoother action, and there's a new Rally cluster instrument panel with tach and quartz clock. All Firebirds

(Please turn to page 236)



Plymouth Champ and Dodge Colt hatchback (left) are all-new, front-wheel-drive fun cars designed to chase Rabbits and create discord at Honda.



Dodge Omni 2+2 (above) dressed up in its 024 package, and Plymouth Horizon TC3 (left) are fwd, two-door hatchback versions of the successful four-door models.

Chrysler Newport (below), New Yorker and Dodge St. Regis, are completely redesigned, six-passenger, four-door pillared hardtops that offer luxury with improved fuel economy.



Driving the '79 Chrysler, Plymouth and Dodge models

by Bill Hartford AUTO EDITOR

It's exactly like the 24 Hours of LeMans—right down to the old running start that made the drivers sprint across the track to their cars. The new models are lined up in the proving ground pits, the auto writers are given the "go" and the race is on. New Chryslers, Plymouths and Dodges are fought over and driven to the test track for a day of wringing out. Just like at LeMans, the winners are the cars that have logged the most laps.

It's a very simple rating system. Cars that are a pleasure to drive are in demand all day long and accumulate the highest number of miles on the odometer. So, without further ado, here are the cars that were hardest to get your hands on at

For an exclusive electronic fuel management story and Chrysler Corp. '79 service tips, see the Saturday Mechanic, page 140.

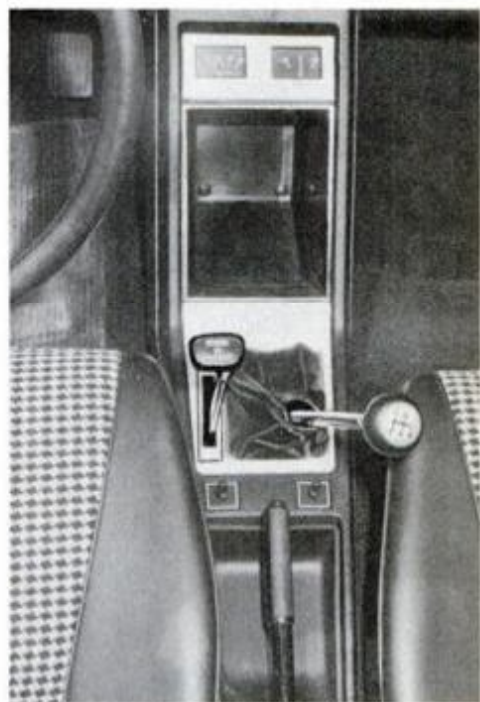
Chrysler's '79-model press showing.

Sapporo/Challenger. Sweet as can be. Most civilized cars in the lot. Introduced last year, these coupes offer tremendous driving pleasure (but I'd still like a little taller greenhouse). Plymouth Sapporo is the grown-ups' version, especially this year with the cleaned-up "Euro-coupe" model that's sans bright applique and doo-dads. Dodge Challenger's Sport setup is for drivers whose hair hasn't begun to thin.

Both cars are quick and smooth with the 2600-cc, Silent Shaft, MCA-Jet engine, and more economical than fast with the standard 1600-cc. Sapporo and Challenger, as most car buffs know by now, are manufactured by Mitsubishi Motors Corp. in Japan. Chrysler's share in MMC goes back to 1970, and since then cars that Mitsubishi sells in Japan have been sold here, too, with different nameplates, by Plymouth and Dodge dealers.

That brings us to the Mirage, as

(Please turn to page 178)



Twin stick option in Champ and Colt hatchback is set for "Power" or "Economy." Four-speed is shifted normally. Effect is a choice of eight forward speeds.



Fifth Avenue Edition of Chrysler New Yorker is limited option with enough chic tricks to set a sheik's heart a-beating. Two-tone champagne paint, pentastar hood ornament, gold stripe on tires, padded landau roof, etchings in edge-lighted, rear-quarter glass.

1979 SCORECARD

Model	Wheelbase (in.)
Plymouth Champ/Dodge Colt hatchback	90.6
Plymouth Arrow/Dodge Colt sedan and coupe	92.1
Colt station wagon	99.0
Plymouth Horizon/Dodge Omni two-door	96.7
four-door	99.2
Plymouth Sapporo/Dodge Challenger	99.0
Plymouth Volare/Dodge Aspen coupe	108.7
four-door and wagon	112.7
Chrysler LeBaron/Dodge Diplomat	112.7
Chrysler Cordoba/Dodge Magnum XE	114.9
Chrysler Newport, New Yorker, Fifth Ave./Dodge St. Regis	118.5



Spirit Limited liftback, with its neat and clean lines, is American Motors' new entry for the '79 model year.

Concord DL four-door sedan is AMC's luxury compact model; the quad headlights mark new front appearance.



AMX liftback is a Spirit sundae; it's got the works to go, including an air dam, spoilers, you name it.

Spirit Limited sedan is restyled Gremlin. Rear-quarter glass replaces ugly sheet metal; front end gets new look.



Pacer Limited offers leather seats and other luxury-car features. Base engine is now the 258-cu.-in. Six.



Driving the '79 American Motors models

by Gary Witzenburg DETROIT AUTO EDITOR

American Motors is in for a good year in '79. At least that's our opinion after seeing and driving the new AMC cars and Jeeps.

After years of stubbornly pursuing a philosophy of differentness—which often seemed synonymous with ugliness—in trying to carve out its own small niche of the U.S. market, company policymakers have finally decided to join the crowd and compete head to head with some downright attractive styling. Call it a "New Spirit," if you wish, which also happens to be the name of a new small car they have high hopes for.

Built on an updated version of the 96-inch wheelbase Gremlin chassis, Spirit comes in two body styles and three separate models—base, mid-range DL and superluxury Limited. There's also a sexy black-out treatment GT package available with DL and Limited liftback versions and with or without a GT handling suspension option, plus a race-car-style spinoff on the GT that serves to keep the AMX name alive and adds a touch of macho to the line.

Spirit styling

The Spirit sedan body is basically a nicely restyled Gremlin with a new front end and the ungainly rear-quarter sheet metal opened up to permit a large quarter window. This not only improves the car's appearance significantly, compared to the old Gremlin, and gives it a modern glassy look, but it also provides substantially better rear visibility from inside the car. Around back, the Gremlin's large, squarish taillamps and swing-up rear window have been retained.

The new liftback body, on the other hand, represents a complete styling departure from anything AMC has done in the past, except that it's similar to a handsome Gremlin-based fastback-concept car the company showed several years ago but decided at the time not to produce. The eggcrate-section rec-

tangular grille and quad-headlamp nose is shared with the sedan, but the similarity ends at the doors. Instead of the sedan's squared-off roofline, the liftback sports a fast-sloping roof with a large rear hatch and good-looking Plymouth-Arrow-like ribbed rectangular taillamps.

Bucket seats are standard even in the base cars, but a vinyl bench is available as a no-cost option in the low-priced sedan. Base cars also have a folding rear seatback for extra cargo space, and DL and Limited models feature a split folding rear seat similar to that in Toyota liftbacks. Full color-keyed, 12-ounce carpeting is also standard, but the Limited gets ankle-deep, 18-ounce living room stuff plus carpeted floor mats in front. The instrument panel is the same attractive and functional number found in the larger Concord, and there's a nice four-spoke "custom" steering wheel that puts the skinny plastic '79 Mustang/Capri wheel to shame.

Chassis and power train

Base Spirit engine is the 121-cu.-in. four-cylinder VW unit, while AMC's 232 one-barrel and 258 two-barrel Sixes and the 304 V8 are all optional choices. The 232 can be had with a three-speed manual transmission, but all other engines come attached to a four-speed floor-shift gearbox. Automatic transmission with either column or floor shift is optional with any of the four motors.

However, there are plenty of exceptions to the above, mainly due to regional emissions requirements.

For instance, you can't get the four-cylinder with four-speed in California, and you can't get it with automatic in designated high-altitude areas. The 232 Six is not available at all in California or at altitude, and the 258 comes with a one-barrel in California. (Check with your dealer to get the straight scoop.) Also, the 258 two-barrel is standard in the AMX with four-speed and in Limited models with automatic floor shift. The V8 is not offered in any Spirit sedan. Got that?

Spirit's suspension is carry-over Gremlin in concept, with coil springs over twin A-arms in front and leaf springs with a live axle in back, except that a lot of ride and handling work has been done to make it better. A front sway bar is standard on liftbacks, but you have to buy the GT handling package to get a rear bar. Brakes are front discs and rear drums.

Much attention also has been paid to sound-deadening and corrosion protection with special coatings in critical areas, extra insulation here and there and special soft-ride suspension mountings. DL and Limited models also get an "extra-quiet" insulation package as standard equipment. Other engineering features include new lightweight aluminum bumpers front and rear, a compact, high-pressure spare tire that saves weight and space, a fuel saving lock-up automatic transmission torque converter with the V8 engine, and revisions to the six-cylinder camshaft and pistons (higher compression) for better economy, performance and emissions, according to AMC.

DL and Limited models

In addition to the standard Spirit equipment, which includes an inside hood release, DL models get custom bucket seats in either corduroy fabric or "sport" vinyl, upgraded trim throughout, woodgrain-accented instrument panel and steering wheel,

(Please turn to page 164)

1979 SCORECARD

Model	Wheelbase (in.)
Spirit (two-door sedan and liftback)	96.0
AMX liftback	96.0
Pacer (hatchback and wagon)	100.0
Concord (two and four-door sedans, hatchback, wagon)	108.0

Trucking for the fun of it



Good looks, ride and performance are bonuses of '79 pickups. Dodge D150 Adventurer SE (top) has full cab trim, 15-color-choice, plus stacked rectangular headlamps, six-cylinder diesel option. International Scout Terra (left) compact model has gas or diesel engine, four-wheel-drive offroad capability. Styled striping, wheels add flair to Ford Courier mini-pickup. All new models under 6000 pounds now meet emission standards.

Who'd have picked the pickup as a combination sports car, RV and passenger car?

by Bill McKeown RV EDITOR

Pleasure car used to mean a two- or four-door sedan. Now it may be a truck.

Vans are transition vehicles that let you convert cargo delivery space into plush interiors. But the pickup keeps the capacity for both work and play. Statistics now indicate that a majority are used more than half the time for recreation, and that they are the fastest selling vehicle type.

So fast, in fact, that it is difficult to get an early look at some '79 models. This year's pickups have been selling so well and their production has been so tight that there has been little need for Detroit's truckmakers to show off next spring's new look six months in advance. Early entries show a continuing trend toward more comfortable interiors, more sporty exteriors. A number of pickups are now available with a choice of diesel power and/or four-wheel drive. Airconditioning, AM/FM/-stereo/CB combos, mag wheels, roll bars and stripe styling are no longer unusual options. Several of the trucks can actually become convertibles.

Smaller models under 6000 pounds gross vehicle weight all now conform to emission standards. Many imports—Toyota, Datsun, Mazda, VW—have little pickups, with the sleekest the Subaru Brat. Domestic pickup makers for next year will include Ford, Dodge, Jeep, International, and nearly identical Chevrolet and GMC lines.

Seating for four or six

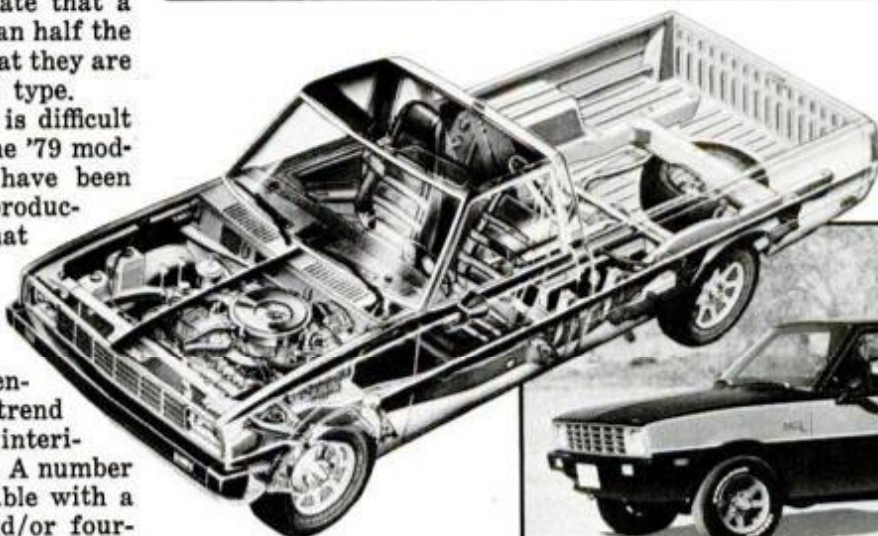
Even the limited three-in-a-row seating of the pickup is being stretched. Club car and crew cab arrangements add cargo or passenger space behind the driver; stretched-out four-door models provide room for a family of six. Customizing of these models to carry a matching camper body or tow a big travel or fifth-wheel trailer is under way by several recreational vehicle manufacturers.

Trucks may well be the answer for the larger tow-RVs as passenger cars become more compact. Pickups are no longer the stepchildren of the auto family.

FM



Soft top, no top or removable steel roof make the Dodge Macho Ramcharger a convertible. Dodge D50 Sport (left, below), is two-tone.



Classiest new cargo carriers are Ford's GT Ranchero (above); the GMC Caballero Diablo and its Laredo-styled models, and the El Camino by Chevy.

Jeep's new J-10 and J-20 pickups will have improved fuel-economy, catalytic converters, four-wheel drive and 14 color options.



HOW TO PICK AND CHOOSE YOUR NEW-CAR OPTIONS

Make sure you put your next new car together on paper before you set foot in the showroom

- | | |
|--------------------------|---------------------------|
| 1 Bigger/special engines | 7 Transmission oil cooler |
| 2 Airconditioning | 8 Antisway bars |
| 3 Sunroofs/T-roofs | 9 Power brakes |
| 4 Driving/fog lights | 10 Automatic transmission |
| 5 Heavy-duty battery | 11 Heavy-duty suspension |
| 6 Bumper guards | 12 Wider/whitewall tires |

by Wade Hoyt

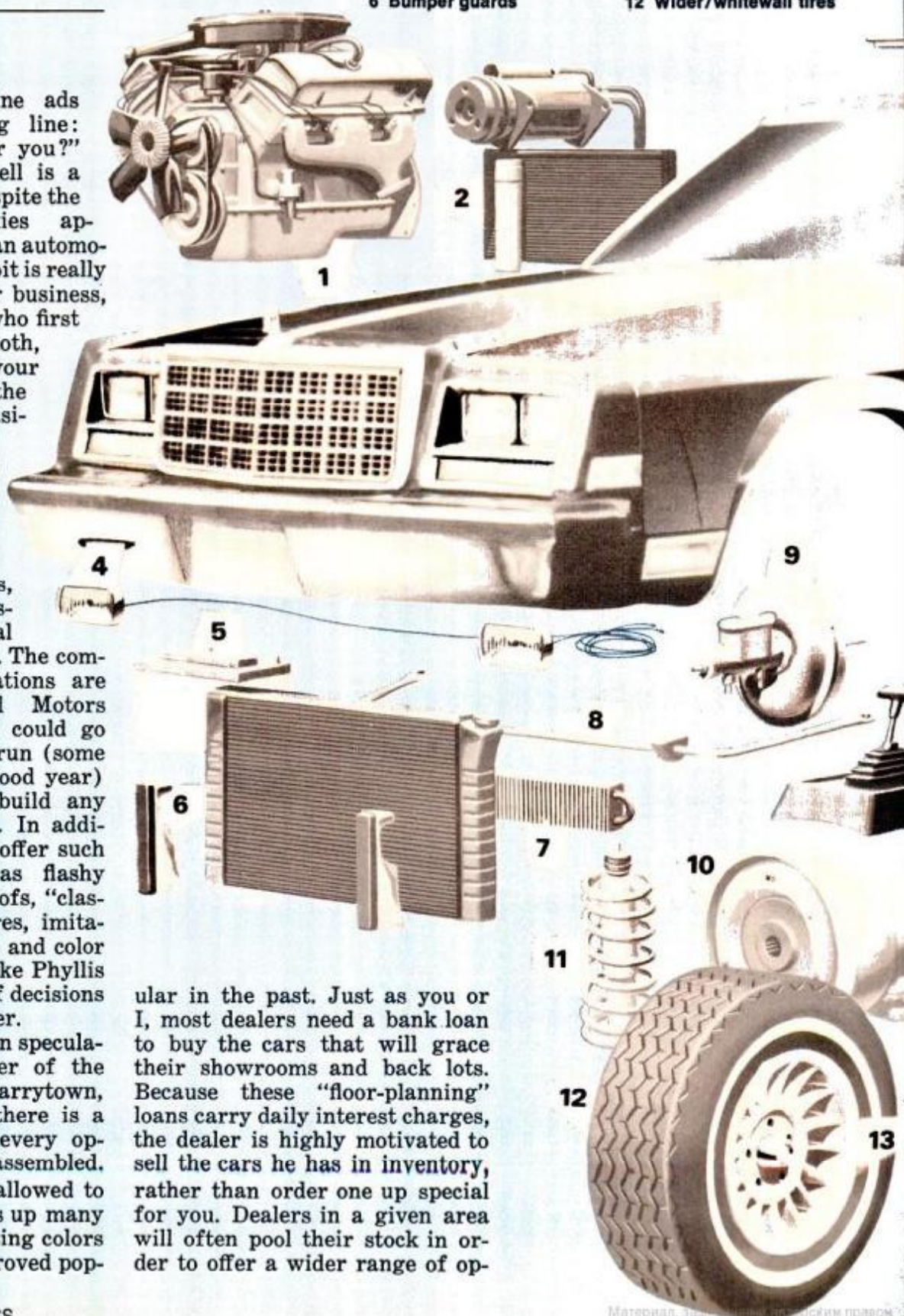
Oldsmobile's magazine ads end with the tag line: "Can we build one for you?" Along with the soft sell is a rare admission that, despite the stamp-'em-out-like-cookies appearance of the American automobile assembly line, Detroit is really in the custom-made car business, much as a good tailor who first shows you bolts of cloth, then makes up a suit to your specifications, is in the custom-made suit business.

There are nearly 300 car models being offered by domestic manufacturers for 1979 and almost as many choices of colors, fabrics, engines, transmissions and optional equipment for each one. The combinations and permutations are astronomical. General Motors once estimated that it could go through a whole model run (some 4½ million cars in a good year) and theoretically not build any two cars exactly alike. In addition, most dealers also offer such "aftermarket" items as flashy wheels, padded vinyl roofs, "classic" wide whitewall tires, imitation Rolls-Royce grilles, and color schemes that would make Phyllis Diller blanch. So a lot of decisions await the new-car buyer.

"We don't build cars in speculation," says the manager of the GM assembly plant in Tarrytown, N.Y., indicating that there is a firm order specifying every option before each car is assembled.

Your local dealer is allowed to speculate, and he orders up many cars for his stock, choosing colors and options that have proved pop-

ular in the past. Just as you or I, most dealers need a bank loan to buy the cars that will grace their showrooms and back lots. Because these "floor-planning" loans carry daily interest charges, the dealer is highly motivated to sell the cars he has in inventory, rather than order one up special for you. Dealers in a given area will often pool their stock in order to offer a wider range of op-



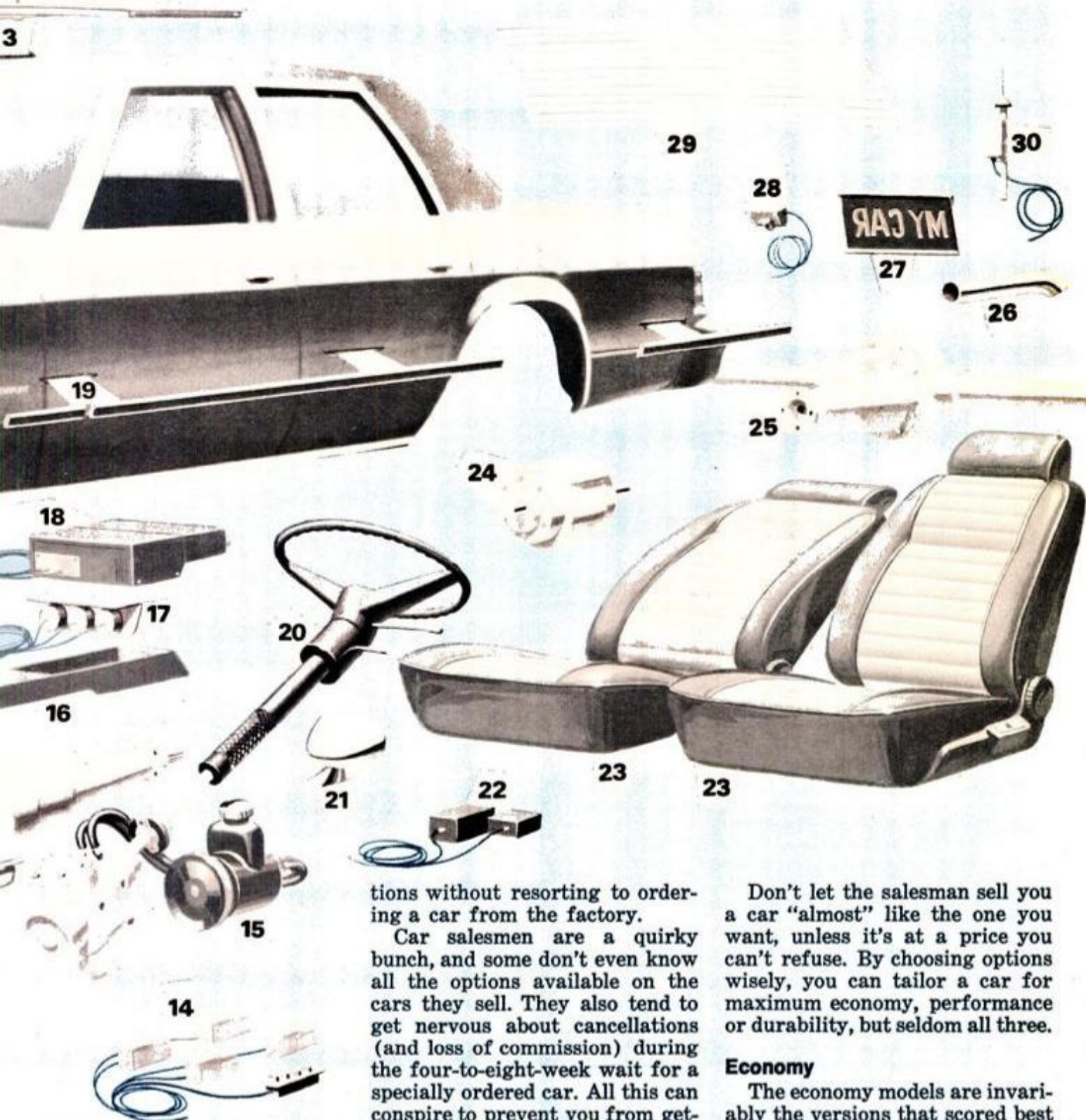
AND ACCESSORIES

- 13 Mag/cast-aluminum wheels
- 14 Power windows
- 15 Power steering
- 16 Consoles
- 17 Instruments and gauges

- 18 Sound systems
- 19 Body side moldings
- 20 Tilt/custom steering wheels
- 21 Racing/remote-control side mirrors

- 22 Automatic speed control
- 23 Reclining/power seats
- 24 Overdrive/five-speed transmission
- 25 Special rear axles
- 26 Special exhaust systems

- and extensions
- 27 Vanity plates/frames
- 28 Trunk/special light packages
- 29 Tinted glass/defogger
- 30 Power antenna/CB



tions without resorting to ordering a car from the factory.

Car salesmen are a quirky bunch, and some don't even know all the options available on the cars they sell. They also tend to get nervous about cancellations (and loss of commission) during the four-to-eight-week wait for a specially ordered car. All this can conspire to prevent you from getting exactly the car you want.

Don't let the salesman sell you a car "almost" like the one you want, unless it's at a price you can't refuse. By choosing options wisely, you can tailor a car for maximum economy, performance or durability, but seldom all three.

Economy

The economy models are invariably the versions that scored best

(Please turn to page 194)

15 simple steps to make your furnace produce more heat this winter

There are many ways you can increase a burner's efficiency. Some won't cost a dime—because you can do them yourself.

by Mort Schultz

There are ways to increase the efficiency of your home's heating system for free. They involve cleaning and lubricating, which you can do yourself.

Other methods cost about \$25 if the system is gas-fired—about \$50 if it's an oil burner. These are testing and adjusting services which require special equipment and training. They should be done by a professional, but find out specifically what he intends to do so his servicing doesn't duplicate yours.

Your heating system can work at maximum efficiency only by this dual approach. However, if only a little work is done, it will help the system's efficiency to some degree. The more quality servicing that is performed, the greater will become the unit's efficiency, and the more money you will save.

Efficient systems saves money

A recent study by the National Bureau of Standards tells how much money you can save with an efficient heat system. According to the study, an increase in efficiency of only 5 percent, which is achieved by performing simple cleaning and lubricating, will result in a saving of \$6.30 to \$9.10 for every \$100 of annual fuel cost. Thus, if last winter's fuel bill was \$500, an increase in efficiency of only 5 percent will amount to a saving this year of \$31.50 to \$45.50.

The table on this page shows the dollar saving per \$100 of annual fuel cost that can be attained, according to the National Bureau of Standards, by increasing the efficiency of an oil burner. Figures are based on last year's price of fuel oil. Savings for natural gas are comparable.

The saving is greater as a program to increase efficiency becomes more complex and expensive to in-

stitute. For instance, maximum savings are normally attained by replacing an old inefficient oil burner.

Replace an oil burner and save

According to the National Bureau of Standards' study, "... almost all the oil burners examined were oversized." An oversized oil burner burns oil at a faster rate than necessary to

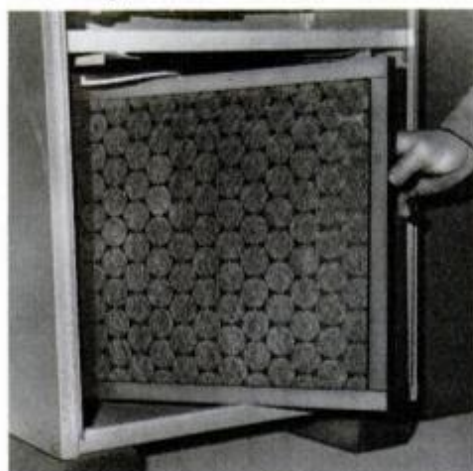
maintain a comfortable home temperature.

It is estimated that the cost of replacing an inefficient oil burner with a modern, highly efficient unit would be offset by an annual maximum saving of 30 percent. Assuming an annual fuel bill of \$500, this saving would, therefore, amount to as much as \$150 a year.

Dollar savings per \$100 of annual fuel cost

From original efficiency of	To an increased efficiency of					
	55%	60%	65%	70%	75%	80%
50%	\$9.10	\$16.70	\$23.10	\$28.60	\$33.00	\$37.50
55%		8.30	15.40	21.50	26.70	31.20
60%			7.70	14.30	20.00	25.00
65%				7.10	13.30	18.80
70%					6.70	12.50
75%						6.30

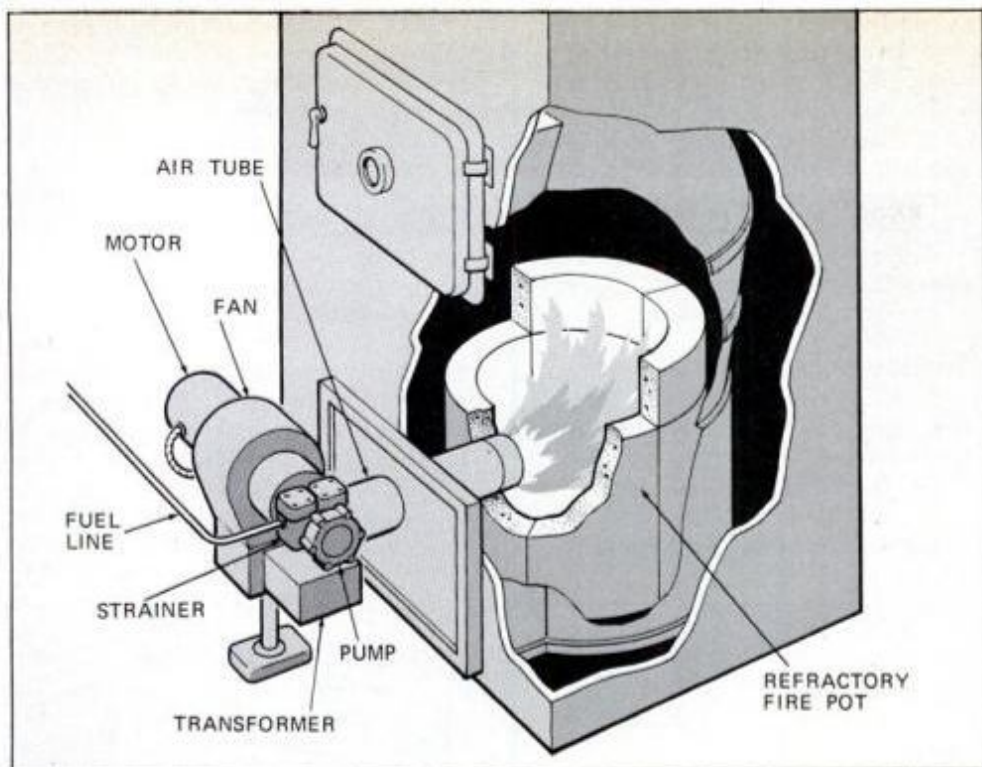
Do-it-yourself maintenance



1 Do a thorough cleaning job. Remove the filter from a forced-air system. It should be replaced or cleaned (if a permanent type) monthly during the heating season. Also remove the covers of forced-air system registers and clean out debris that may block airflow. Clean off radiators or hydronic baseboard units.



2 If you have a forced-air system, clean drive motor blower wheel as shown. Test tension of the blower wheel belt by pressing in on it midway between the drive motor and blower wheel pulleys. Belt should "give" 1/8 to 1/4 in.—no more, no less. If belt must be tightened, loosen and readjust the drive motor.



3 If you have an oil burner, replace oil strainer by shutting off valve on the oil line and removing the old strainer from the housing. By removing a bolt on top of housing, you can lower it to get at the strainer. Drawing shows the layout of a typical gun or pressure oil burner.

Lubricate oil burner motor (and blower motor of a forced-air unit, if it isn't pre-lubricated) with SAE 20 nondetergent oil. Use only two drops—don't flood the cup. It's important to check your owner's manual before oiling blower motor, which probably has pre-lubricated, sealed bearings



that can't be lubricated. Also clean the impeller of the oil burner's fan motor as shown in photo. Turn off the power and remove the screws holding the impeller housing to the motor. Canister in foreground provides a receptacle for the oil strainer.



4 With valve on the water line to the boiler open, flush boiler using low-water cutoff valve until clean. Insulate boiler, hot-water storage tank and hot-water pipes in unheated areas.

But there is another way to compensate for an oversized oil burner, and that is to modify air-handling parts and reduce fuel nozzle size. According to the National Bureau of Standards, this method can save 14 percent in the annual cost of fuel oil—or \$70 a year, assuming an annual fuel bill of \$500.

No matter what you do yourself and/or have done, making your heating system more efficient will



5 With forced-air system operating, run your hand over ducts to feel for heated-air leaks, felt as air puffs. Seal with duct tape. For good airflow, don't block registers or cold-air returns.

save the cost of service, if any, in a relatively short time. Thereafter, it will be money in the bank.

Following is a discussion of services and a summary of jobs to have done by a professional.

Note: Oil- and gas-fired furnaces are handled in much the same way. Differences in procedure, where they occur, are spelled out. Get familiar with your unit by reading the owner's manual. If you have



6 Bleed air from hot water radiators to eliminate air lock. To do this, open the air valve until all air trapped inside flows out and water begins to drain. Then close the valve quickly and tightly.

misplaced it, write the manufacturer for another. You have to know the parts of your furnace to be certain what to service and have serviced.

Do-it-yourself services

1. Do a thorough cleaning job. Remove the covers of forced-air system registers and clean out debris.

2. Clean the drive motor wheel of

forced-air systems and test the belt tension.

3. Replace the oil strainer of oil burners and lubricate oil burner motor (and blower motor of a forced-air unit, if possible). *Important:* Check your owner's manual. Blower motors in particular have pre-lubricated, sealed bearings that can't be lubricated. Furthermore, oil burner motors may have more than the one oil cup you can see. You may have to loosen the transformer and move it to get at a cup behind the motor skirt.

4. Flush the boiler until water runs clear.

5. Check ductwork for leaks. Insulate any ducts at points where

they run through unheated spaces.

6. Bleed air from radiators and open air valve until water drains.

7. Be sure your chimney and vents don't make more draft than needed. Don't continuously adjust dampers to compensate for wind changes or other variables.

8. Equip the system with a modern, efficient thermostat. They cut heat costs 5 to 15 percent.

Service technician jobs

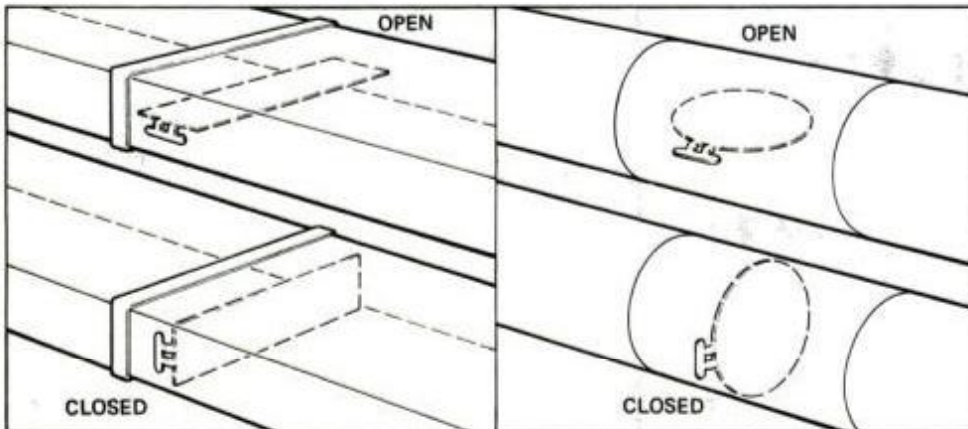
9. A serviceman should test carbon dioxide (CO₂) level to reveal combustion efficiency.

10. If 65 percent efficiency level isn't obtained, replace fuel nozzle and readjust electrode setting.

11. Caution: Don't poke inside an oil or gas burner if you don't know what you're doing. It can be dangerous and expensive.

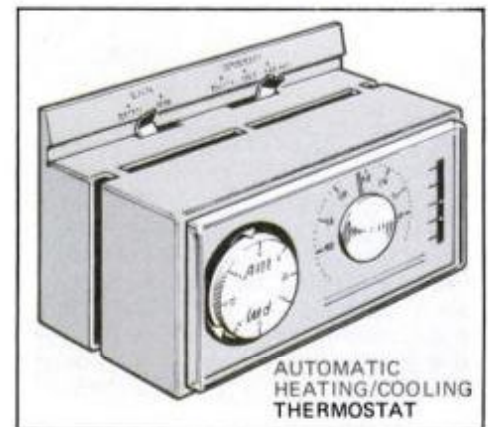
12. If a CO₂ efficiency level of 65 percent or more isn't attained for a gas burner, the gas valve should be tested with a U-tube manometer, an instrument that puts a column of water under pressure; replace valve if necessary.

CO₂ should be tested again after the adjustments and repairs just discussed are made. If efficiency is still below 65 percent, air may be leaking into the combustion chamber and the furnace might have to be sealed, or proper chimney draft may be lacking. Technician should



7 Chimneys and vents may produce more draft than necessary. Check that system is properly balanced after all other adjustments have been made. To do this, completely open all dampers. After several days, check to see if one room

is warmer than the others. Slightly close this damper. Experiment with one damper at a time until the temperature in all rooms is similar, then leave the dampers alone. Don't continuously adjust them to compensate for wind changes.

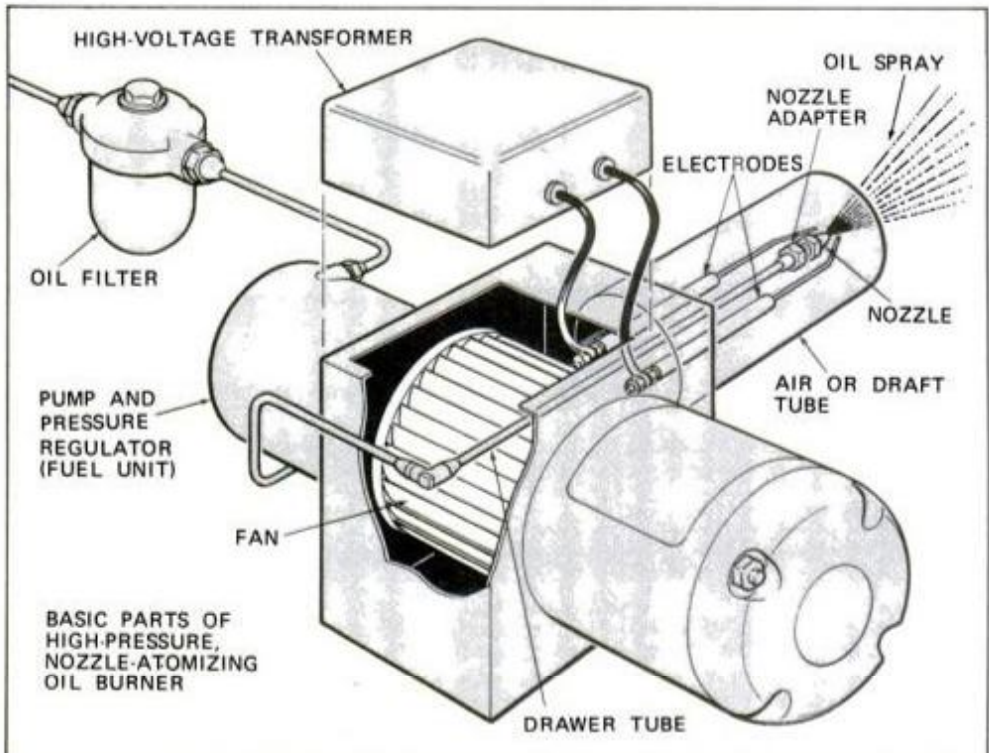


8 A modern, efficient thermostat is part of an effective heating system. This one operates automatically to raise temperature when the family is at home and active and to lower it when the family is away from the house or asleep.

Service technician tasks

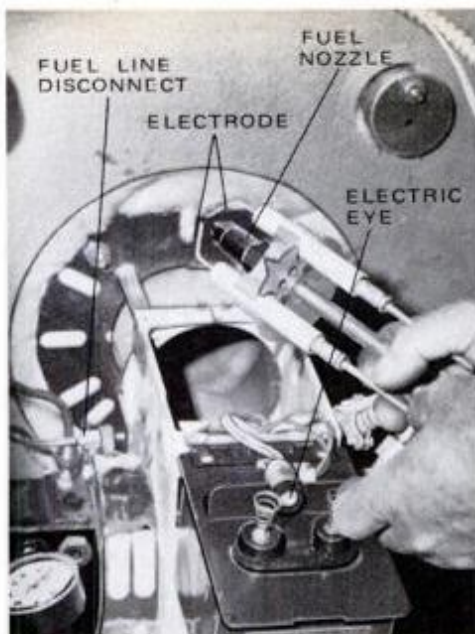


9 Have carbon dioxide (CO₂) level tested for combustion efficiency. Burner must mix air and fuel properly.

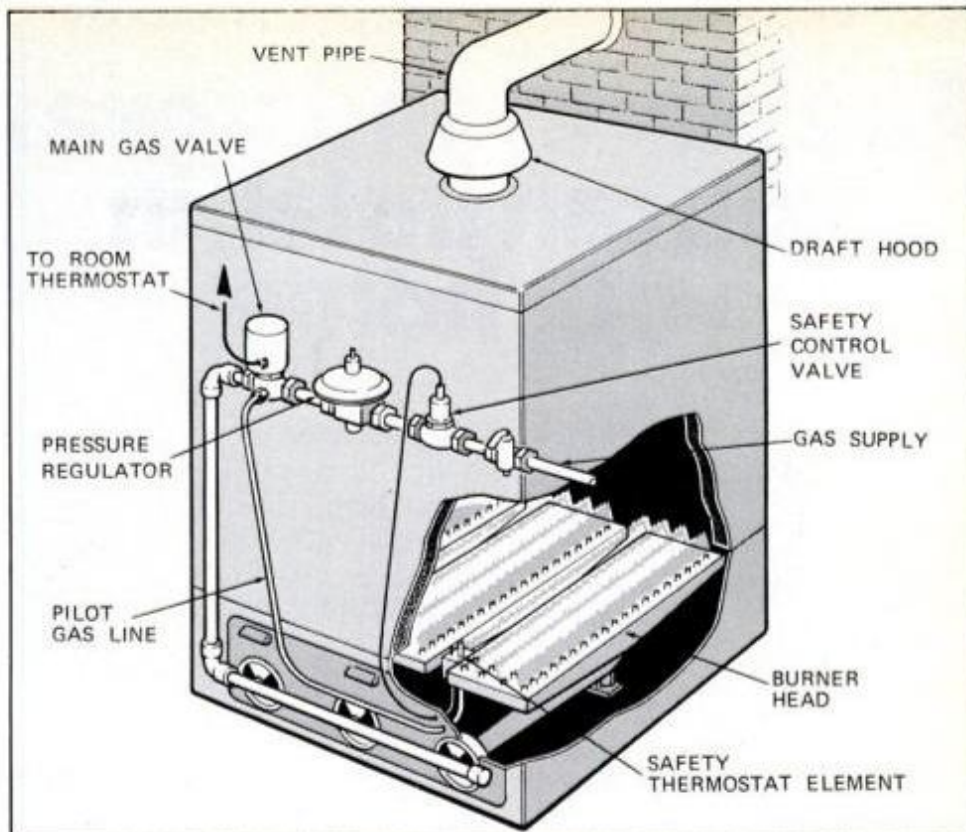


10 If efficiency level of 65 percent isn't obtained by oil burner, fuel nozzle

should be replaced and electrode setting readjusted, if necessary.



11 Another job for service technician is removing fuel nozzle-electrode assembly from an oil burner. This work done by a nonprofessional can result in damage to the electric eye. Primary reason for removing the assembly is to replace the fuel nozzle. To remove the assembly turn off power which deactivates the system including the electric eye; disconnect the fuel line.



12 Control mechanisms of typical gas burner are shown. If U-tube ma-

nometer test shows that gas valve gives improper gas pressure, replace valve.



13 The serviceman should follow CO₂ tests with a smoke density test to see if excessive fuel is consumed. This is done by placing special litmus paper near a sampling of flue gas, then comparing the paper with a gauge to determine if smoke is overly dense. Fuel mix is corrected by increasing air intake.

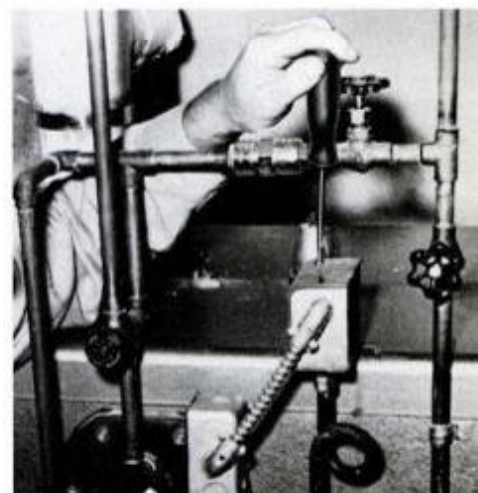
check draft with an incline manometer over the fire at the front door and in the smokepipe.

Insufficient draft means that the chimney or flue passage is blocked with soot. You can keep this from happening in an oil burner by shutting off electricity and closing oil valves. Then gain access to the flue box cover (see owner's manual), insert a household vacuum cleaner nozzle as far as possible and vacuum.

If, after all adjustments are



14 Pump pressure on oil burners should be tested to determine rate of fuel delivered to the combustion chamber. Adjusting pressure is done according to specifications in manual. Fuel adjustment screw is turned until specified pressure is recorded on gauge (top one in photo). At bottom is vacuum gauge.



15 Finally, depending on system you have, serviceman may perform other adjustments to assure maximum efficiency of the unit according to manufacturer's specifications. For example, if your system is hot water or steam, he may want to adjust the boiler limiting switch or pressure regulator respectively.

made, the CO₂ test still doesn't meet the 65 percent efficiency, consider purchasing a new burner.

13. A smoke density test should follow the CO₂ tests.

14. Pump pressure on oil burners should be checked. If manufacturer's standard isn't met, adjust or replace the pump.

Another test is the stack temperature test, done by inserting a thermometer in the smoke pipe. Temperature of a new furnace should be 600 to 700° F. Temperature of the

older units should be 400 to 600° F.

If the temperature is excessive and the fuel nozzle or gas valve has been replaced, it means the nozzle valve size is too large and more heat is being generated than can be utilized by the heat exchanger. (A possibility of an oversize gas valve is remote.) It may also mean that the surface of the heat exchanger is covered with soot.

15. Your serviceman may make other tests depending on your system.

PM

Fireplaces and stoves you can install in your home

Factory-built fireplaces, and their cousins, wood stoves, are helping millions to keep warm.

By Bernard Gladstone

The basic appeal of a crackling fire is being seen, felt and heard in about 26 million homes throughout the country—with that number growing steadily as more and more people add factory-built, real wood-burning fireplaces to homes that do not already have them. According to one industry estimate, this means that by 1980 about 60 percent of all homes in this country will have at least one fireplace.

Why all this upsurge of interest in fireplaces?

Aside from the fact that real estate brokers and builders have long agreed that a wood-burning fireplace is probably one of the most-wanted features in any home, there are a number of other factors that have contributed to the recent increase in the number of fireplaces being sold:

1. Frequent power failures in many areas have made homeowners

FACTORY-BUILT FIREPLACES



Lightweight, built-in fireplace only looks like an all-masonry unit. Temtex Products, Box 1184, Nashville, Tenn. 37202.



Model 3138 (\$850) draws in air, warms and returns it to the house through vents. Heatilator, Mount Pleasant, Iowa 52641.



Energy-saving glass bi-fold doors by Heatilator open easily, and insulated handles remain cool when a fire is burning.



Enclosed fireboxes such as in this Imperial Carousel (\$625) burn most efficiently. Malm, Santa Rosa, Calif. 95401.



Versatility of freestanding fireplaces such as this one permits imaginative placement in many areas of the home.



Moderne C38, an easily-installed, wood-burning unit, is priced from \$277. Preway, Wisconsin Rapids, Wis. 54494.

conscious of the fireplace as an alternate means of keeping warm in an emergency.

2. The energy crisis, which has caused conventional fuel prices to skyrocket, and has caused shortages in some cases, has made homeowners think of a wood-burning fireplace as a means of supplementing central heating, or even replacing it on chilly spring and autumn days when the central system is not really needed.

3. The widespread availability of factory-built, scientifically designed prefabricated fireplaces that can be installed by any carpenter—or a competent do-it-yourselfer who can use a heavy-duty sabre saw—in just a day or two in almost any room in the house.

Using a fireplace for heating

The traditional built-in masonry fireplace is actually a very ineffi-



To install this Heatilator easily, site the unit, fasten chimney starter section.



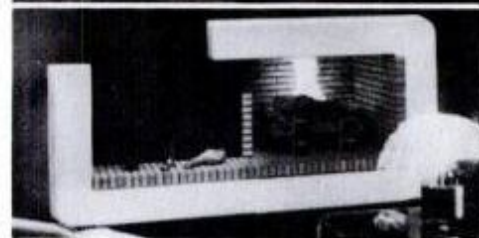
Run pipe through ceiling and roof and fasten firestop to top of ceiling header.



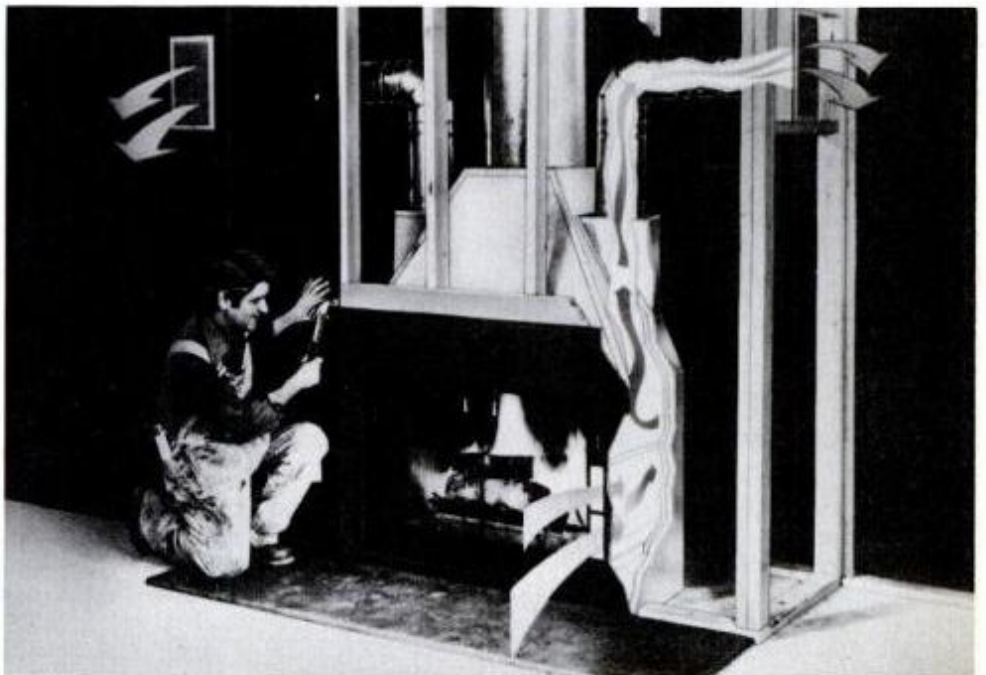
Position the warm air vents on the side. Next, frame out the fireplace with studs.



Apply exterior facings of paneling or imitation brick for a finished look.



Fireplace designs can be totally traditional (top), or curvaceously contemporary (above), to fit the decor of any room.



Front vents take in cool air. Warmed air leaves through the side vents.



Preway's free-standing, hexagonal fireplace is priced at \$522. It's available in black porcelain with a mesh fire screen.

cient heating unit—only about 10 percent of the B.T.U.s in the wood actually find their way out into the room. The rest is wasted up the chimney. (This compares with about 30 percent for a good wood-burning stove, and about 60 percent for an oil burner.)

Prefabricated free-standing fireplaces of good quality are more efficient in generating heat because they are not buried in the wall and

can radiate heat out from all sides. Also, they have smaller openings and fire chambers, so they do not waste as much heated air by sending it outside via the chimney.

All wood fires consume large amounts of combustion air which must be drawn from the room and since this air has already been heated by the furnace (if the fireplace is in use while the central heating system is on) some fuel is



This coal stove-fireplace (\$950) features relief artwork; Southport Stoves, 248 Toland St., East Hartford, Conn. 06108.



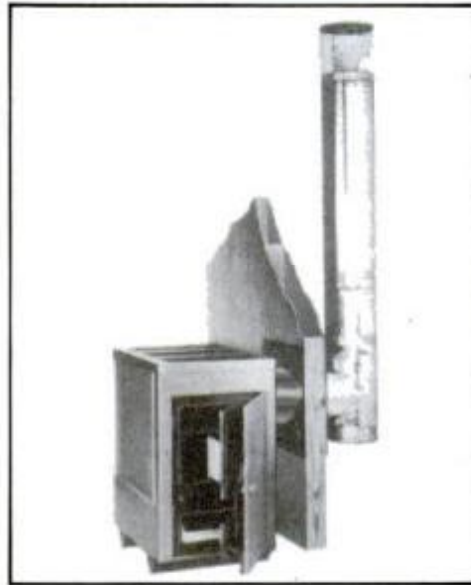
Fuel this cast-iron, wood-burning parlor stove (\$260) from front or side. Vogelzang Brothers, Inc., Holland, Mich. 49423.



The Viking Dual wood-burning stove is a screened fireplace; or close the door for efficient burning; \$500 from Vogelzang.



Enjoy the fire, burn wood efficiently with a glass-doored Franklin (\$261). U.S. Stove Co., South Pittsburgh, Tenn. 37380.



For mobile homes, this wood-burning heat system (\$565) is UL-approved. Suburban Manufacturing Co., Dayton, Tenn. 37321.



Combat high heating costs and fuel shortages with this heater that burns wood or coal. It's priced at \$362 from Suburban.

being wasted under these conditions. Instead of heat gain you may actually be having a heat loss in these cases—it all depends on the size and efficiency of the fireplace, and on how cold it is outside. The lower the outdoor temperature, the less likelihood there is of a heat gain if the furnace is operating while the fireplace is in use.

In tests recently conducted by one large fireplace manufacturer (Majestic) the "turn-around" point is when outside temperatures drop below 19° and the furnace is working. A fireplace will then waste more heat than it gains. When outdoor temperatures climb above this point you can expect a heat "gain" from the wood fire.

But what about using your fireplace as the only source of heat—when the central heating system is

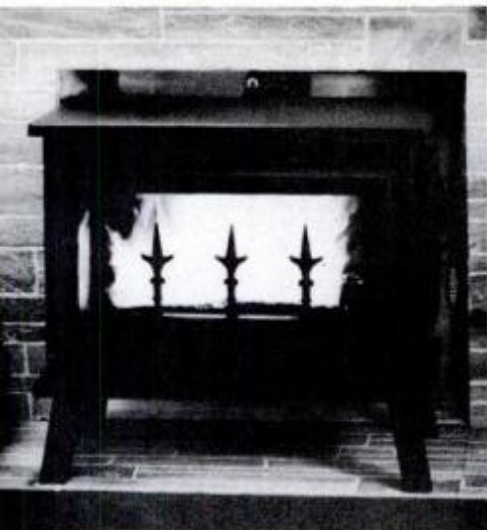
not in operation? Will you save money by burning wood? It all depends on fuel costs in your area, and on how easy it is to get hardwood suitable for fuel.

If you live in a rural area where you can cut your own wood, and are willing to put in the time and labor to cut and split the logs, then there is no doubt that wood will be your cheapest fuel. But if you live in an area where wood must be trucked in and you buy it already split and cut into fireplace lengths, then you may find that burning wood will be just as expensive, and sometimes more so than other fuels.

To help you compare costs, here are some pertinent facts: Firewood is traditionally sold by the cord, a stack of logs measuring 4x4x8 ft. This much wood contains about the same number of B.T.U.s (if air-

dried to the normal 20-percent water content) as one ton of coal, or about 200 gallons of fuel oil, so it should not be hard to figure the number of B.T.U.s you get for each dollar spent. However, when comparing prices, make sure your wood dealer is quoting the price of a true cord—not a so-called "face cord" or "pick-up cord" which are much smaller. Also, remember that the traditional masonry fireplace is only one-half to one-third as efficient as an airtight wood stove, and only about one-fifth as efficient as an oil burner.

But even if you find that burning wood is not cheaper than burning other fuels, a prefabricated fireplace still has a lot to offer. When a power failure or fuel shortage puts your central heating system out of commission, nothing can beat the



This glass-view wood stove of heavy-duty steel starts at \$385; from Russo Wood Stove, Holbrook, Mass. 02343.



Get radiant-circulatory heat from Nashua Fireplace Stove (\$595). Heathdelle Sales Assoc., Inc., Meredith, N.H. 03253.



Cast-iron Cookstove (\$1000) is a cooking/heating unit, uses wood or coal. Burning Log, Box 438, Lebanon, N.H. 03766.



Heat exchangers reclaim flue heat. Here a fan helps the process. Unit is \$120 from Magic Heat, Burton, Mich. 48529.

warmth of a blazing wood fire to take the chill out of your bones. And what is more cheerful than a crackling fire on a cold winter night—even when you don't really need it?

That is why for pure enjoyment, as well as for its practical value as a nonpolluting and an always-dependable heating source that uses our only renewable source of fuel, adding a fireplace is still one of the most popular and most worthwhile home improvement projects.

Plenty to choose from

The wonderful part about shopping for a factory-built fireplace is the great variety available. Sold in home centers and building supply outlets, as well as in specialty shops that sell only fireplaces and accessories, they come in many different shapes, sizes and styles. Most can be

classified as falling into one of three categories: Built-ins that consist of metal shells which are then covered with a masonry facing, zero-clearance models that can be mounted on or hung from a wall, and free-standing units that can be set up anywhere on their own legs or pedestal-type bases.

Made of heavy-gauge steel, the free-standing and wall-hung units have baked-on porcelain finishes that need no maintenance. Often there is a choice of colors available. Most models include a fire screen for the front, although on some this is an optional extra. A better-quality unit will also have a heat-resistant refractory hearth to support the fire, and the free-standing models will require some kind of heat-resistant base or floor covering on

(Please turn to page 208)

About stoves

The more nearly airtight a wood-burning stove, the better its efficiency, regardless of its appearance. Like some factory-built fireplaces, wood-burning stoves warm a room by convection, and by radiating heated air from burning fuel. The most efficient ones allow minimal escape of this air up a chimney or duct.

Whether you get a large stove weighing hundreds of pounds, or a lighter model of sheet steel, the basic components of any wood stove are the same: A firebox to hold the burning fuel, a draft opening to control airflow to the fire and a flue to permit smoke to escape.

Wood stoves are designed for one of two primary functions—heating or cooking. A cookstove is designed to hold a small, intense fire right underneath the cooking surface, with thicker walls around the rest of the fire compartment so the heat can't escape. A heat stove uses a larger fire compartment and thinner walls to let heat escape to the surrounding air. Sometimes the resulting convection is aided by a fan.

Wood smoke vs. air quality?

Many ecology-minded homeowners interested in purchasing wood stoves question the effect of wood smoke on air quality. But much of the organic matter in wood smoke is similar to material that normally enters the atmosphere as a result of the natural decomposition of matter. Burning simply speeds the process.

Wood fires produce only small quantities of unsaturated or unburned hydrocarbons, the most dangerous elements of air pollution or smog.

Underwriters Laboratories, Inc. (UL) recently released the fourth edition of its "Standard for Safety for Fireplace Stoves," UL-737. UL's new requirements cover all free-standing wood-burning stoves designed to be operated either open to a room or, if equipped with doors, operated with those doors either open or closed.

Copies are available for \$3. Or, for \$8 you can get the fourth edition and any future revisions issued while it is in effect. Send your check or money order to: Underwriters Laboratories, Inc., Attention Publications Stock Dept., 333 Pfingsten Rd., Northbrook, Ill. 60062.

17 accessories for chain saws

In recent years the use of chain saws as home and outdoor maintenance tools has grown dramatically. To a large degree new accessories that make chain saws easier to use and more versatile are responsible for the increasing popularity.

Some accessories allow you to use the saw safely and more easily under potentially hazardous conditions. For example, limbing bars that expose only part of the saw chain make pruning in tight spots safer for both the user and the nearby bark and limbs.

Other accessories add to the saw's range of uses, so that it isn't brought out of storage only once a year to cut the winter supply of firewood. Attachments help it perform such jobs as clearing weeds and brush.

Accessories also enable a homeowner to service his own saw. This makes it easier and less expensive to keep the tool in tiptop working condition. A regular maintenance schedule and proper use also prevent accidents.



Transport your load of firewood conveniently from the woodpile to the hearth with this heavy-duty canvas log carrier. It's available at McCulloch chain-saw dealers.

ACCESSORIES TO EXPAND CHAIN SAW USE



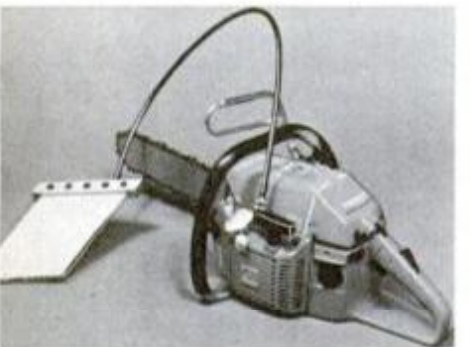
Stihl's limbing bar (\$33) exposes only the chain bottom. Stihl dealer can tell you if this will fit your saw-guide bar. Stihl Inc., Virginia Beach, Va. 23452.



Trimette fits many lightweight chain saws to turn a woodcutter into a weed cutter. It's \$70 from Hoffco, Inc., 358 Northwest F St., Richmond, Ind. 47374.



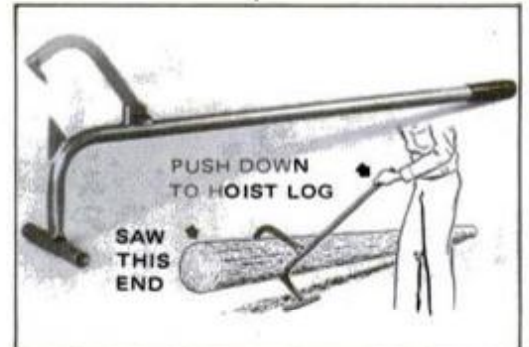
Felling handle extends a Husqvarna 340 or 162 saw to ankle height for low cuts on trees. About \$150 from Husqvarna, 224 Thorndale, Bensenville, Ill. 60106.



Felling cushion (left) slides into a saw cut, inflates to 4-in. thickness with 6600-lb. lift capacity to fell a tree. On Husqvarna 340 series SE saws, \$430 total.



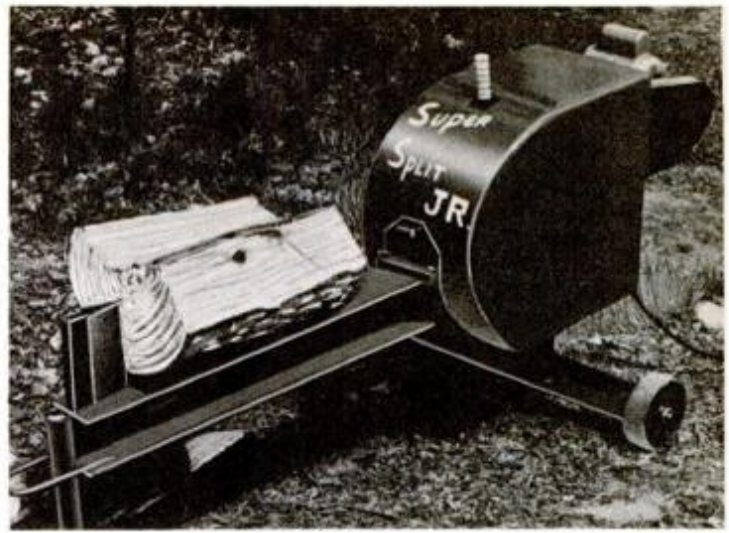
To protect your saw, carry or store it in lightweight case like this one (\$25) for McCulloch Pro Mac 10-10. McCulloch, 5400 Aila Rd., Los Angeles, Calif. 90066.



Hook, lift and cut up to 18-in.-dia. tree sections with this Jiffy Log Lifter. It's priced at \$38 postpaid from Oak Grove Enterprises, Foristell, Mo. 63348.



Wood splitter, model DB 19 priced at \$500, splits a 19-in.-long log using seven tons of pressure. It's from Didier Manufacturing, 8630 Industrial Dr., Franksville, Wis. 53126.

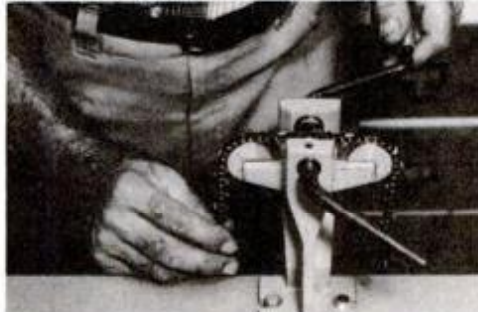


The FXG Super Split Jr. splits logs up to 26 in. long and a 30-in. diameter in less than two seconds. It sells for \$795 from FXG Corp., 2 Sullivan St., Woburn, Mass. 01801.

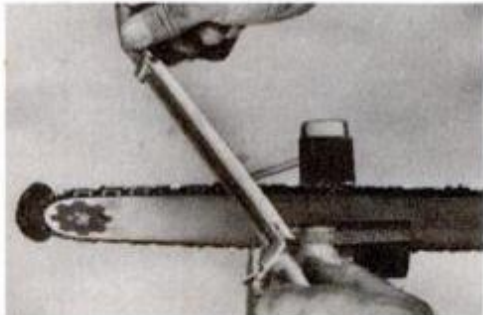
MAINTENANCE ACCESSORIES FOR TOP SAW PERFORMANCE



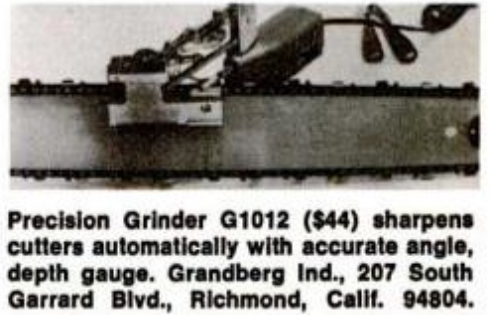
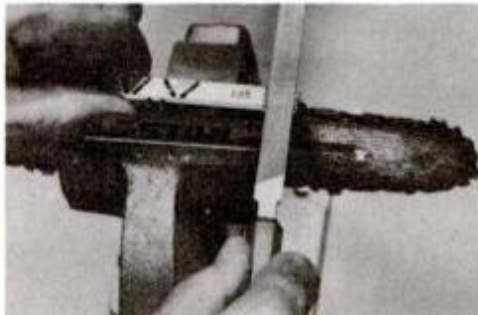
Two tools from Stihl that help repair saw chains are the pocket breaker (\$3) (above, left), and the bench rivet spinner (\$50). Breaker drives out rivets on chains from 1/4 through 1/2-in. Spinner makes easy work of replacing links. Adjustable guides hold the chain properly centered while you rotate the handle to form and seat rivets.



Apply 707 lubricant to a chain to minimize sawdust buildup, prevent binding. An 11-oz. can is \$5.20. 707 Co., Inc., 405 Lexington Ave., New York, N.Y. 10017.



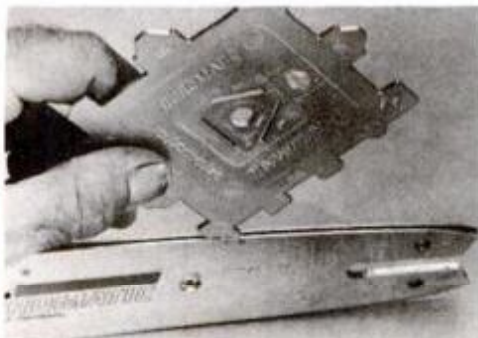
The \$5 file holder (above, left) insures properly filed saw teeth by guiding the file and keeping accurate sharpening angles. Slotted end of the \$1.60 filing gauge (above, right) fits over the chain's depth gauges. If they extend above the slot, file them level with the top of the gauge tool. Both are from Stihl.



Precision Grinder G1012 (\$44) sharpens cutters automatically with accurate angle, depth gauge. Grandberg Ind., 207 South Garrard Blvd., Richmond, Calif. 94804.



These tools from Stihl keep the bar in shape. The \$1.25 Hook-N-Adjust (above, left), scrapes out packed, oily sawdust from the bar groove which can otherwise cause chain wobble and premature wear. The 50-cent test gauge (above, right), checks groove width of guide bar, chain and sprocket pitch and chain's drive link thickness.



ACCESSORY SAFETY TIPS

Keeping a chain saw sharp and in top shape is an important safety measure. A little advice on proper accessory use can also go far to prevent accidents:

- Be sure the accessory you want to buy is designed for or can be adapted to your saw. Verify this through the maker's brochure or chain-saw dealer.
- Read directions for attaching the accessory to your saw and using it.
- Note particularly the special safety instructions or precautions mentioned.
- Most new accessories add weight and bulk to your chain saw. So begin working slowly until you are accustomed to handling the combination.
- Although many accessories increase the safety margin *cut only wood*. Cutting other material risks kickback.

How to keep your chain saw humming



The payoff is in efficient and safe performance when you take the time to familiarize yourself with the basic maintenance procedure for your chain saw.

Peak saw efficiency is possible only with a cared-for tool.

by Robert Townsend

Unlike the chain saws of 25 years ago, today's models are designed to keep occasional-user maintenance at a minimum. Nevertheless, the cardinal rule of chain-saw use is to first read—and then reread—the owner's manual. No one knows the saw better than its manufacturer, and should you “crank it up” and start cutting before you fully understand it, you could injure yourself and damage your equipment.

There are six basic systems with which you should familiarize yourself: 1) cooling, 2) fuel, 3) ignition, 4) control, 5) starting, 6) cutting. All six must be maintained properly to prevent loss of power and efficiency.

Keep the engine running cool

All lightweight, two-cycle chain saws made today are air-cooled. Air is blown across the cylinder fins to carry heat off the engine. Dirt or sawdust accumulations however, can interfere with cooling. So check all cylinder fins periodically and clean

them if necessary. Removing four or five screws exposes the fan (magneto rotor), the air shrouding and the cylinder fins. Spilled fuel or oil that finds its way into this area causes faster-than-normal dirt buildup, so clean the saw immediately after spills for safety and operational efficiency.

Maintaining your fuel system

Lightweight, two-cycle engines run on a mixture of gasoline and oil. In effect, this “changes” the oil with each intake stroke of the engine and allows the moving parts to be constantly lubricated with clean oil. The correct fuel mix is vital to your chain saw. Your manual will specify how much and what kind of gas to mix with specific types of oil. Don't experiment with mix ratios (see *How to Mix Fuel for Your Chain Saw*, page 190).

The fuel filter should be inspected at least once every 15 hours of operation, or once a year. If the filter is doing its job, it will block sawdust and dirt from reaching the carburetor. Be sure to clean or replace the filter, if dirty, to prevent blockage of fuel flow.

The same maintenance is required for the air filter since it will also plug up with dirt and sawdust. Most filters used today should be cleaned or replaced after each five

hours of use. A foam-type filter can be cleaned in detergent and water or in a cleaning solvent. Allow them to dry thoroughly before reusing.

The most important, and perhaps least understood, component of the fuel system is the carburetor. In today's lightweight saws, the carburetor is very small and has tiny passageways—a good reason to keep fuel clean and filters at maximum efficiency.

If you have a saw with a fixed main fuel jet, you're assured of the proper fuel-air mixture at all operating speeds (just like in an automobile). If you have an adjustable system, be certain you know how to make proper adjustments, or leave them to your dealer. If you set too lean a fuel/air mix, you'll increase engine speed and temperature, causing a seizure of engine components. If in doubt, don't attempt carburetor adjustments of any type. Just a few seconds of lean operation at 10,000 rpm could be very costly.

The fuel container or tank usually has a device for venting, either in the cap or tank itself. Be sure it is operational, or else a vacuum may form as the fuel is used, eventually stopping fuel flow. Fuel lines and the tank should be inspected periodically for cracks or pinholes. Make sure connections fit snugly.

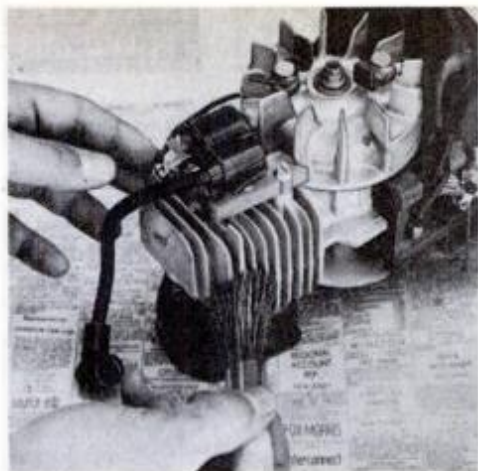
Ignition system checks

The ignition system is composed of the magneto rotor (fan), ignition points and condenser (or solid-state equivalent), sparkplug, ignition switch and various leads (wires). If your manual doesn't indicate how to remove the rotor and make point adjustment, don't try without instructions from your dealer. In some instances, a special remover is required.

The magneto rotor does triple duty. It acts as a cooling fan, as a flywheel and as a carrier of magnets. It must be kept clean and tight, and its air gap must be maintained for proper ignition voltage.

The breaker points and condenser function essentially the same as in automobiles. The point gap should be set as recommended by the manufacturer—or else the unit will lose power or operate at too high a temperature. When working with points, never touch contacts with your finger. Oil from your skin will cause premature failure. As long as they're kept clean, the points shouldn't cause problems.

The sparkplug is the component you should be most concerned with. Its efficiency determines how well the engine runs, but it's dependent on how well you mix your fuel and



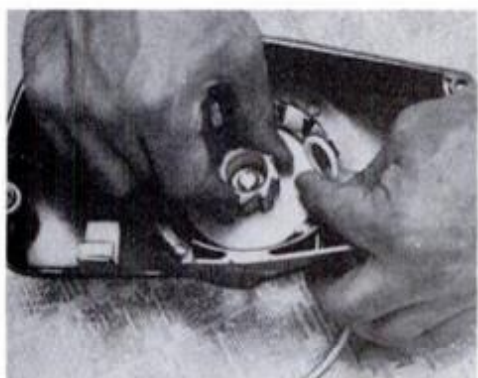
To avoid possible overheating of saw during use, occasionally clean dust and dirt from cylinder fins with a round brush.



Clean or replace foam-type air filters after every five hours of use. It's a good idea to have extra filters on hand.



Check the gap and condition of sparkplug electrodes. Typical gapping is .025 in., but check recommendations in your manual.

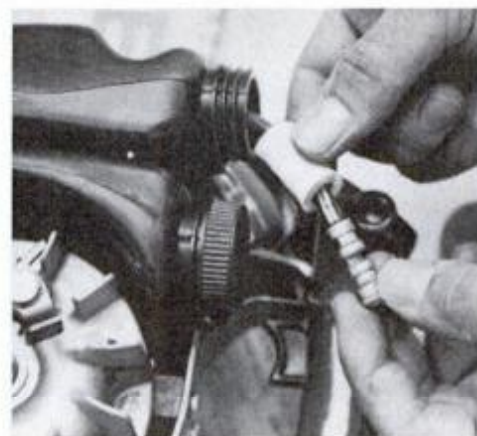


Check starter to be sure it rewinds all the way. If not, remove housing and tighten spring as prescribed by manual.

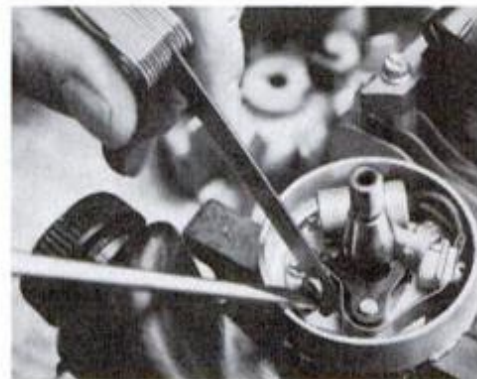
how clean you keep the filters and oiling system. The electrodes (firing points) of the sparkplug work in a very hot atmosphere. As the plug fires, the electrodes are subject not only to erosion, but to accumulation of oil and carbon.

Never substitute a sparkplug of a different heat range than the original plug unless the substitution is approved by the manufacturer. The original plug should last through 20 hours of operation without cleaning if the fuel mix is right, the carburetor is adjusted properly and the filters are kept clean.

When you service or replace the sparkplug, remember that it is threaded into soft metal, usually



Fish out in-tank-type filters with stiff, wire hook to inspect. Fuel filter (above) should be cleaned or replaced if clogged.



Check gap setting between breaker points with feeler gauge; reset to the specifications in your manual if necessary.



Carburetor may need adjustment to achieve proper idling settings. Clean air filter, read manual before beginning.

aluminum. If you overtighten the plug, you may strip the thread. The muffler should also be checked periodically to prevent power loss or excessive heat buildup.

Controls are easy to maintain

The control system requires little or no preventive maintenance. Occasionally examine the choke, throttle control rods, cables, and so forth, to make sure that they open and close fully and easily.

Check starting-system tension

The starting system includes a cord, pawls and pulley, but the component to be most concerned with is the starter spring. Too much



Also inspect the screen-type oil pickup filter which hangs inside the chain oil tank. Clean whenever it seems necessary.



Clean breaker box and area around points with oil-free brush. Cardboard may be run between points to polish them clean.

tension will shorten its life. Check your manual for proper spring tension. Improper starting techniques can lead to problems. Never let the cord snap back and don't pull to the very end or you may damage the starter. Inspect the cord periodically for frayed or worn spots and replace if necessary.

Good cutting is essential

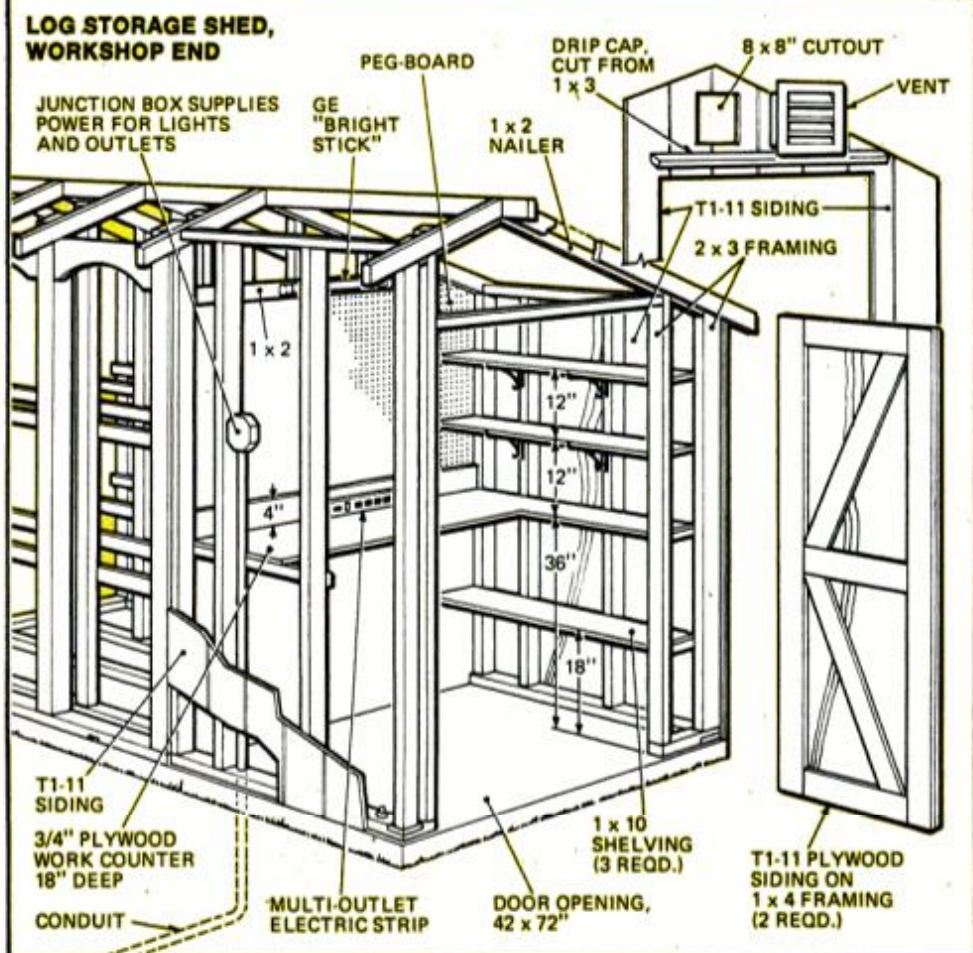
No matter how well the engine is maintained, all the care will be for naught if the cutting system isn't up to par. A dull chain can make the

(Please turn to page 173)

Here's an old-fashioned woodshed with a newfangled look

PM's woodshed boasts clever dividers so you can take old logs from the bottom of the heap.

by Dick Diener



Take a break from cutting and splitting firewood this fall and build PM's woodshed to keep your supply dry and accessible all winter. As a bonus, our shed provides tool storage and a place for sharpening and servicing tools.

The beauty of this shed is that it allows you to "rotate" your crop. Instead of always pulling wood from the top of the pile, the racks let you select wood that's been seasoned the longest. You can even mark individual cubicles with the date firewood was cut to help you know which batch has been dried longest. Not only does this assure better fires, but it discourages insects and other pests from getting a foothold in your wood.

The rack's dividers make it easy to tell how much wood you've used and how much you have left. They also separate the wood into 18 cubicles around which air can circulate freely, keeping contents dry and ready to use.

The project was a joint venture of PM, McCulloch Corp. and Western Wood Products Assn. The shed took three weekends to build, the first of which was spent measuring and pouring the foundation. The second was devoted to framing and sheathing the roof, and the third to roofing and finishing tasks such as hooking up electricity and building shelves and a workbench.

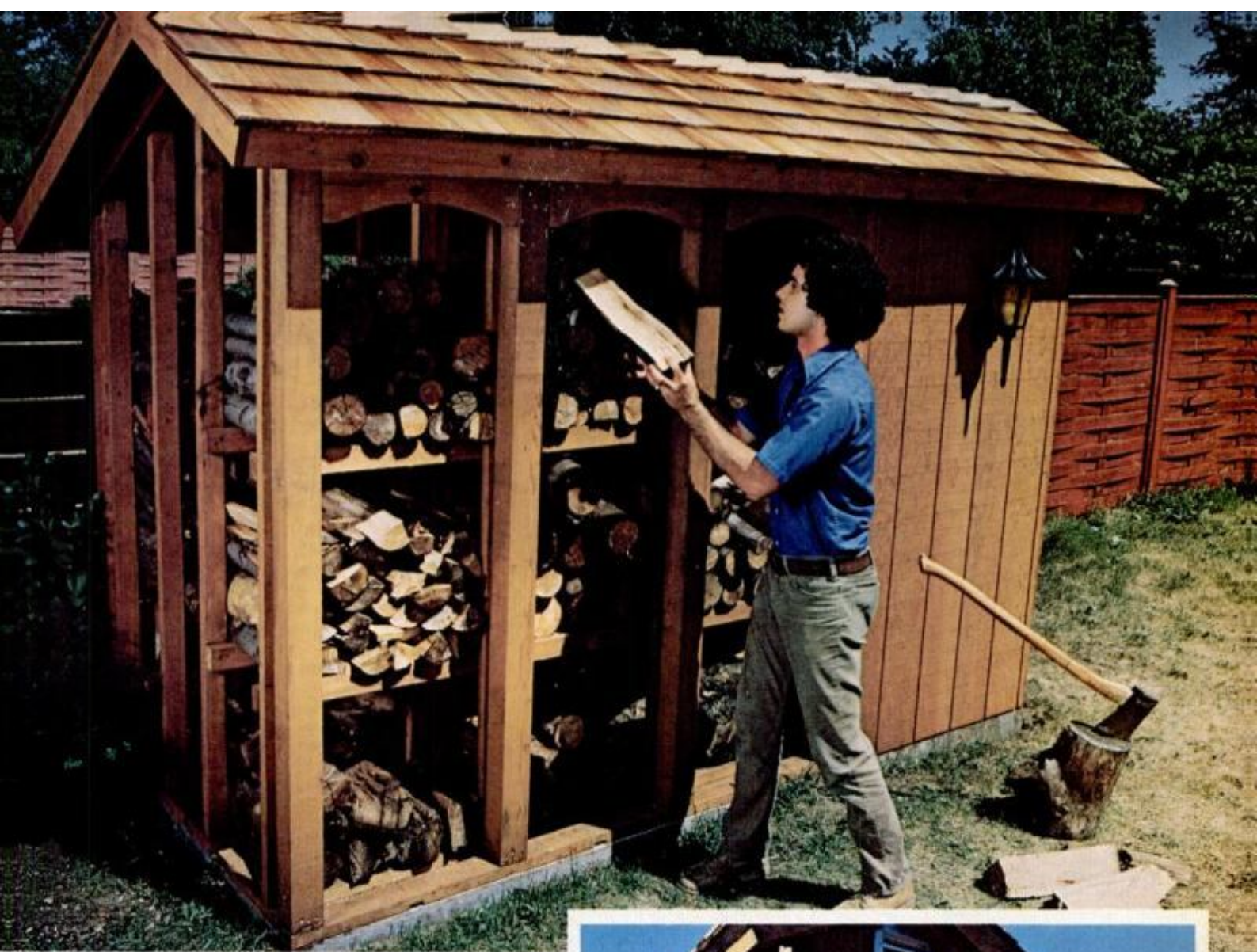
Pouring the foundation

Mark the 5x10-ft. perimeter with a mason's line staked at the corners. To check each corner of the rectangle for square, measure 3 ft. from the stake in one direction and 4 ft. in the second. Mark points on line and then measure the diagonal distance between them. If it's 5 ft., the corner is square—since any triangle with 3- and 4-ft. legs and a 5-ft. hypotenuse is a right triangle.

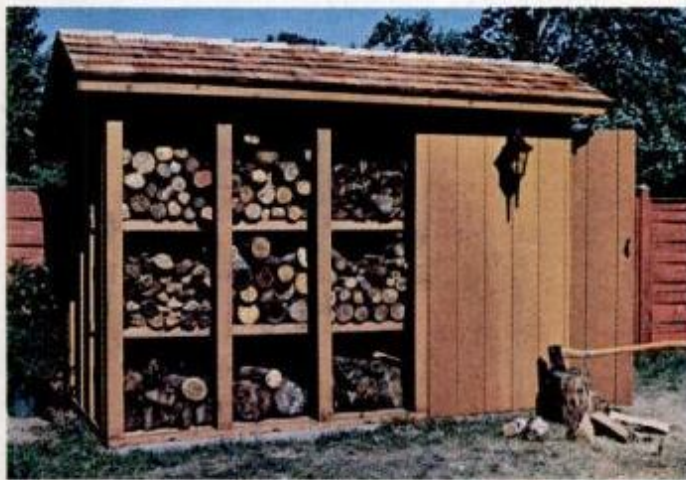
Next, excavate for the foundation. The footings are about 8x8 in. at each corner and are dug below the frost line. Around the perimeter, dig an 8-in.-wide by 4-in.-deep trench. Dig the remaining area about 4 in. deep. Forms are made with 2x6s reinforced with 2x2 stakes. Be sure the excavation is as level as possible, because concrete of uniform thickness is less susceptible to cracking.

One side of the form should be set slightly higher than the other to achieve a slight pitch in the finished surface. Check the form for square by measuring to see that diagonals are equally long from

Designer: Gary Gerber, IDSA
PM photos: Sing-Si Schwartz (color)
Irv Field (black and white)

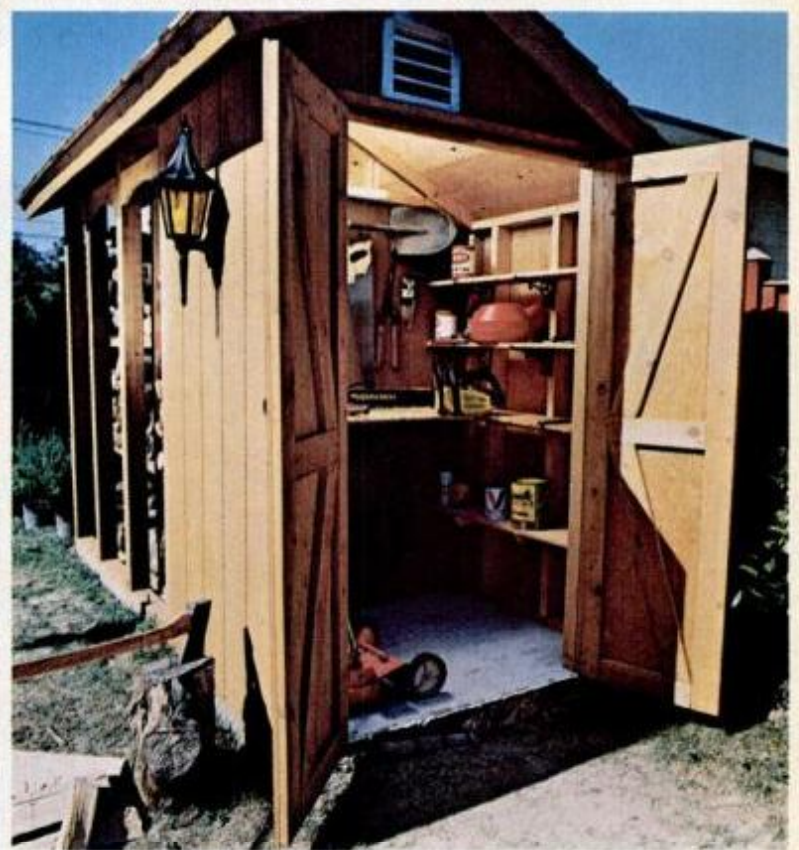
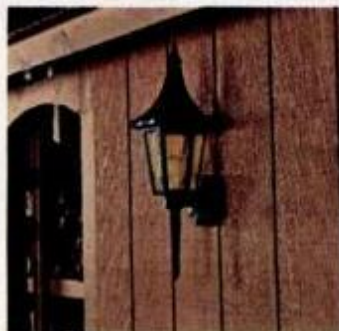


Rack storage system permits good air circulation and access to wood that's been seasoned longest.



Shed capacity is over one full cord—dividers tell user at a glance how much firewood is left.

Shed lamp provides light for runs to the wood pile on winter nights.



Tool and chain-saw storage area have an electrical strip outlet, fluorescent lamp, shelves and a worktable for servicing cutting equipment.

corner to corner. In areas of extreme temperature changes, lay wire mesh on bricks laid on the ground inside forms to reinforce the concrete and help prevent buckling.

To mix concrete, consider renting a gasoline-driven cement mixer for about \$25 a day. Mixing concrete in a wheelbarrow is time-consuming and back-breaking. Load the powered mixing barrel with half a bag (45 lbs.) of cement and nine shovels of sand per load. You'll need a little more than a cubic yard of concrete.

Within a half-hour after pouring, tamp the mixture with a rake to eliminate air pockets. Then use the edge of a straight 1x3 guided by the forms to level the wet concrete and remove the excess. A seesaw, back-and-forth motion called "screeding" does the job. After screeding, wait

another half-hour or until floating (smoothing) no longer brings water to the surface. Use a wood float (rectangular, trowel-like spreader) to give the surface its final finish, which will be slightly textured and skid-resistant.

For a week to 10 days, keep the concrete a bit damp, especially in hot weather. Cover the slab with straw, canvas or building paper and wet the cover occasionally.

Framing the shed

The lumber cost for the shed was under \$500. Western hem-fir and 4x4 cedar posts were used for framing. Wood for the sills was treated with Cuprinol wood preservative, but a pressure-treated lumber would be a sensible alternative.

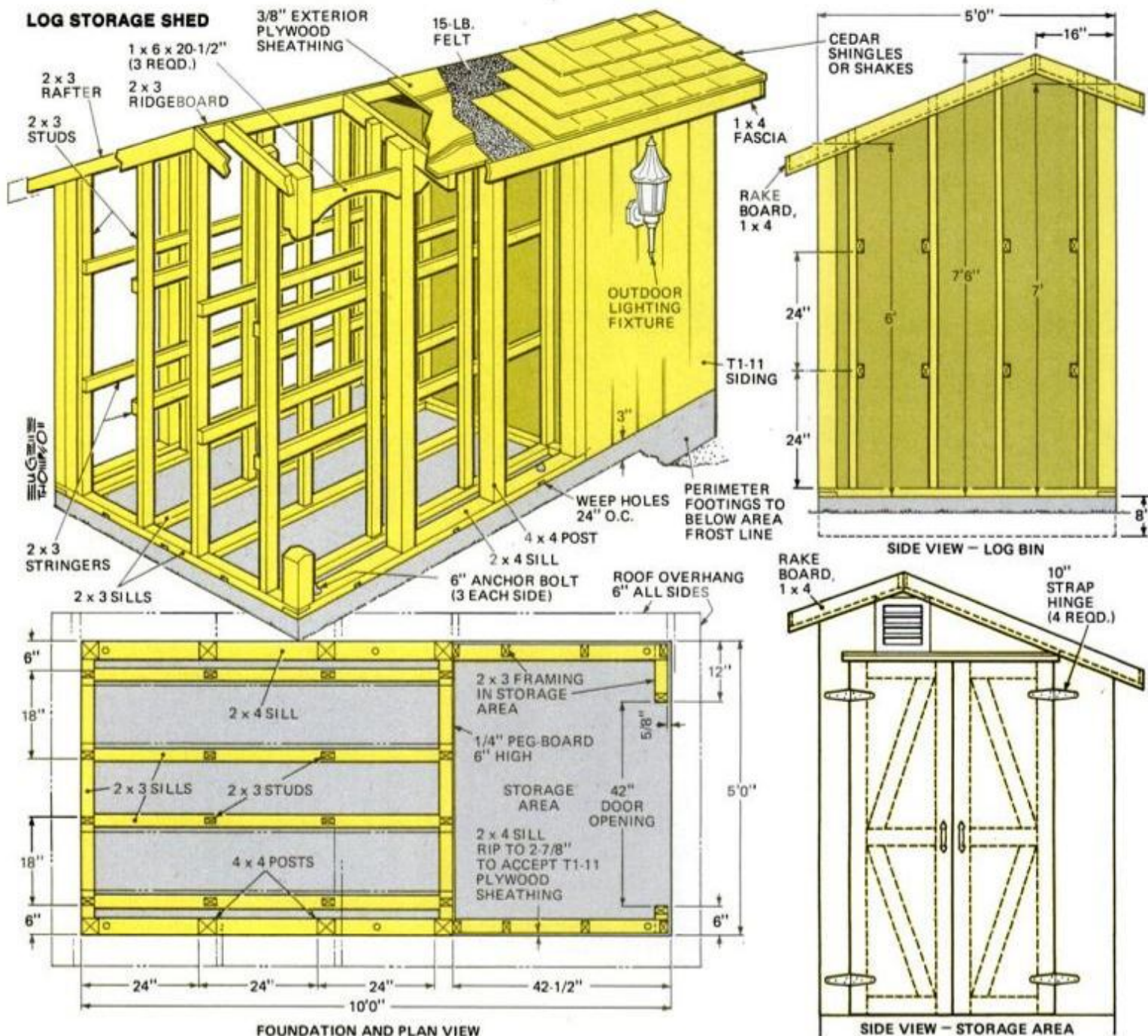
Start framing by securing the treated sills to the anchor bolts

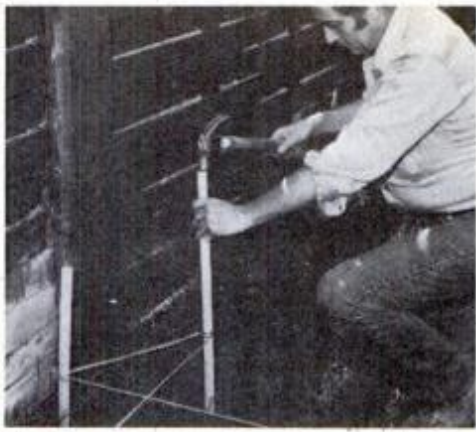
already set in concrete. After pre-assembling walls on the ground, raise them in place and toenail to the sill with 12d common nails. Use diagonal braces of 1x2 to hold walls in place until the ridgeboard is installed. Then nail on horizontal 2x3 stringers to form storage racks. Frame the workbench area last.

The shed was roofed with top quality cedar shake shingles. Almost three bundles of No. 1 perfect-

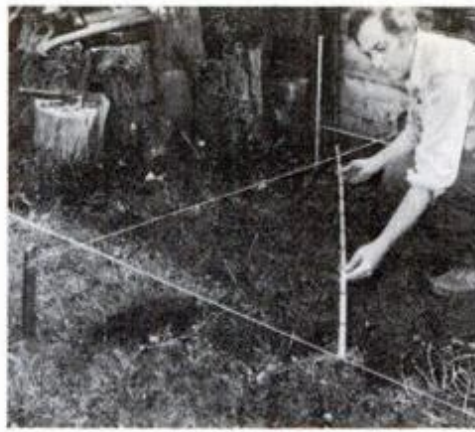
To learn an easier way to split logs, please turn to page 142.

tions were placed over 15-lb. felt. Finally, on two successive evenings, a coat of semitransparent Olympic Cedar Naturaltone stain (716) was applied to the shed. **FM**





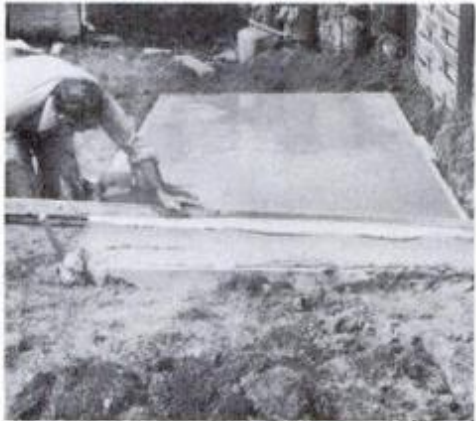
Lay out area for footings and slab using stakes and a mason's line.



Before building form for the slab, check corners for square with 3-4-5 triangle.



Small rented, gasoline-powered cement mixer saves time and back muscles.



After pouring concrete, level with 1x3 screed using back-and-forth motion.



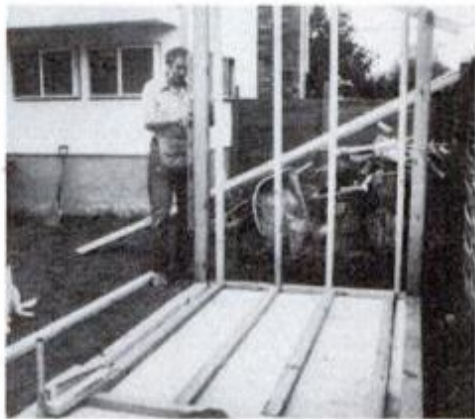
Set electrical conduit and anchor bolts in concrete; fasten sills with bolts.



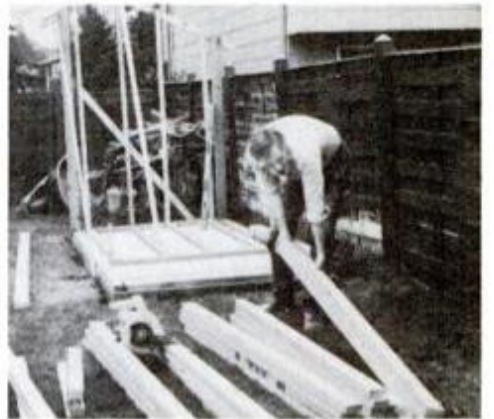
Two-by jig spaces rafters for ridgeboard when you lay out wall.



Cut waste from tops of studs and assemble with 16d common nails before raising.



Plumb each wall section in both planes with a spirit level, then brace into place.



Separate piles of pre-cut members for each wall or divider make framing step easier.



After ridgeboard is in place, frame the workbench/storage area with 2x3s.



Sheath roof with 3/4-in. exterior grade plywood, then add rake and fascia boards.



Use a 15-lb. felt under cedar shakes on the roof, T1-11 cedar boards for siding.



1 Ski-Trek room with its triple-deck bunks will please most youngsters.
2 The wall scene is a photo mural glued to foam-core board which, in turn, is affixed to wall with double-faced tapes.
3 Ladder to middle and upper bunks is permanently installed with wood screws.



Build PM's triple-decker bunk beds

This easy-build unit from PM's Vacation Home makes it easy to put up unexpected guests.

by Harry Wicks HOME AND SHOP EDITOR

PM photos: Richard Garland and the author

As the design of the PM Year-Round Vacation House (page 106, Sept. '78) evolved, it became obvious that it would be highly desirable if one of its three bedrooms were permanently fitted with the capacity for extra sleeping. This triple-decker bunk bed design by Nancy Gilbert, ASID, Armstrong Design Center, solved the challenge in handsome fashion. And the beauty of the design is that it can be copied for use in any home, including yours.

Designed for use with standard-size mattresses measuring 39 x 75 in., available at all bedding supply stores, our version also accepts two commercially built dressers measuring 31 x 18 x 30 in. (Armstrong furniture in the Georgetown pattern.)

As a bonus, we have also included plans for the handsome drop-leaf game table in the foreground photo (see facing page). The table is perfect for teen-age games and the like; building a copy is made easy by the plans on page 139.

Selecting materials

For economy, the prototype bed unit uses pine boards and fir plywood. For looks, select clear pine—even though it costs more than knotty common-pine. Since certain fastening is critical (for strength) at particular points, the wood in those areas should be free of knots;

Clean lines of this built-in make it an asset in any bedroom. Important design point is the strong horizontal (created by the middle bunk rail) which continues through the closet. Clothes pegs and the like in original room were mounted on board on adjacent wall which was placed at the same elevation.

an example would be where ladder-holding corner braces are fastened to side rails. To protect the furniture use a good quality stain to suit your room decor, and a durable finish such as varnish. We used Rez Latex Stain followed by McCloskey's Heirloom varnish, satin finish, on ours.

Building the bed unit

Start by measuring the spot which your unit will fill. If the wall won't accommodate our size unit, adjust its dimensions to suit your wall. The same holds true for the built-in dresser; check its sizes and adjust accordingly. With sizes determined you can lay out all wood parts and start construction.

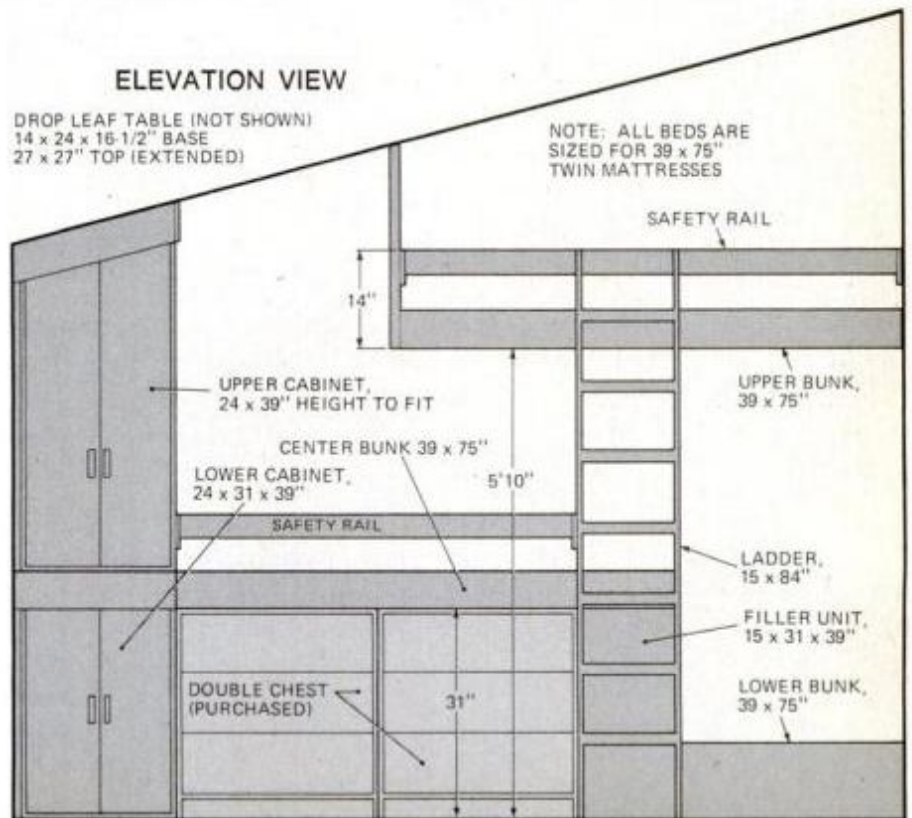
Build the cabinets at left first. As the drawing shows, these are built as two units which are joined during the installation. The box joints are simple butt joints and the plywood is permanently fastened using white glue and 8d finishing nails. For extra strength, also use a pair of 1½-in. No. 8 fh screws in countersunk holes along each joint. Hide exposed plywood edges with veneer tape or with ⅛-in.-thick strips of pine sliced from a ¾-in.-thick pine board. Fabricate the doors and fit them to respective openings using 1½ x 2-in. butt hinges.

Temporarily install the closet unit in the room and measure from its right side to the wall so that you can double check the dimensions for the beds.

Construction of the three bunks, basically, is similar but there are slight variations—so check the drawings on page 138. After setting the dresser alongside the wall closet, build and temporarily install the box at right of dresser. This is a basic box with a shelf fitted to provide convenience for the lower bunk-user (for radio, small TV, books and the like).

Do not build all three beds at the same time; the plethora of cut-and-marked parts will drive you up the wall. Instead, complete the lower bunk before starting on the center one, and so on.

The center bunk simply rests on the dresser below, but its head rail is fastened to the closet using hefty 1½-in. No. 12 fh wood screws. The



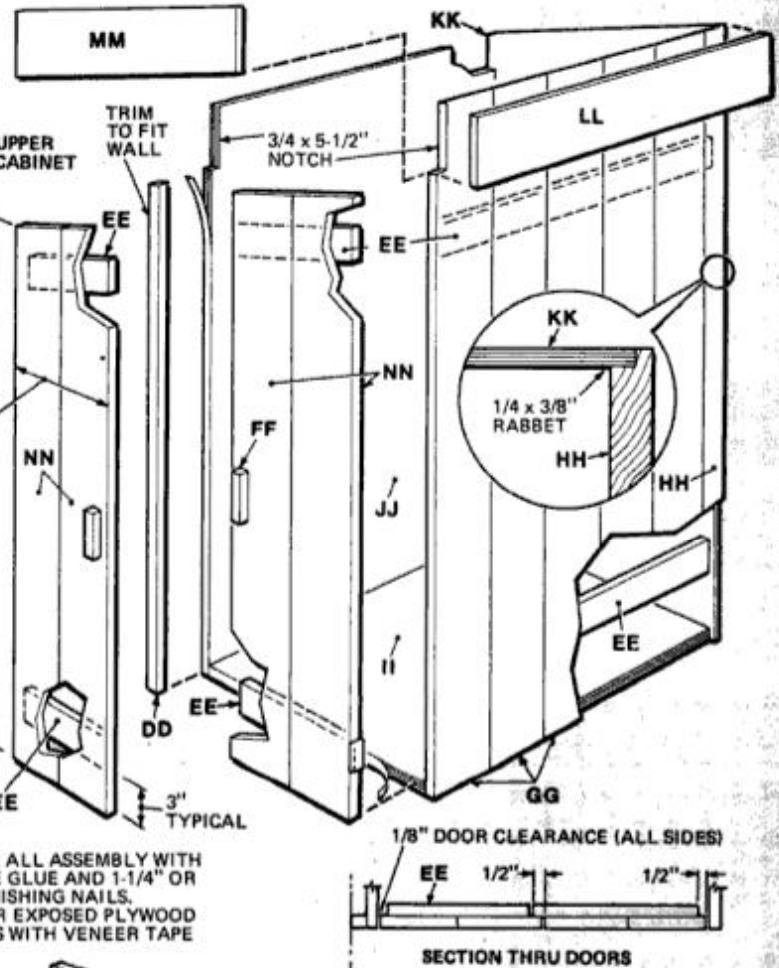
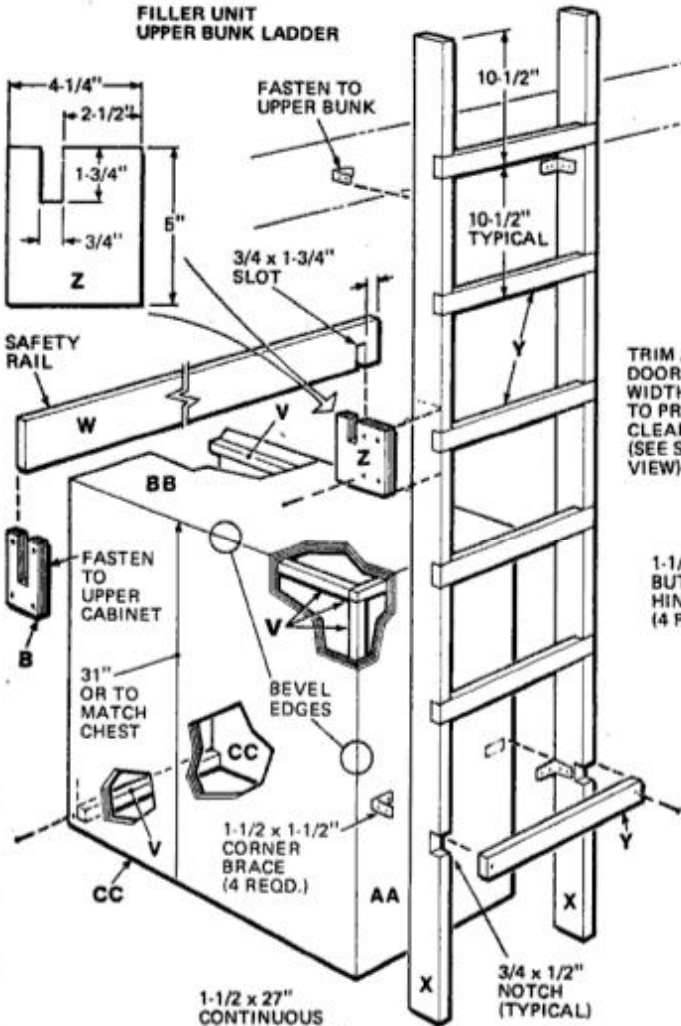
MATERIALS LIST BUNKS, LADDER AND SAFETY RAILS

Key	Pcs.	Size and description	Key	Pcs.	Size and description
A	1	2x4 fir, length to suit	N	1	3/4 x 5 1/2 x 75" pine
B	3	3/4 x 2 3/4 x 5" birch plywood	O	1	3/4 x 38 1/4 x 74 1/4" fir plywood
C	1	3/4 x 3 1/2 x 75" pine	P	2	3/4 x 3 1/2 x 73 1/2" pine
D	1	3/4 x 38 1/4 x 74 1/4" fir plywood	Q	1	3/4 x 9 3/4 x 74 1/4" fir plywood
E	2	3/4 x 4 x 74 1/4" fir plywood	R	1	3/4 x 9 3/4 x 37 1/2" fir plywood
F	5	3/4 x 4 x 36 3/4" fir plywood	S	5	3/4 x 3 1/2 x 36 3/4" pine
G	1	3/4 x 38 1/4 x 74 1/4" fir plywood	T	2	3/4 x 5 1/2 x 75" pine
H	1	3/4 x 5 1/2 x 39" pine	U	2	3/4 x 5 1/2 x 39" pine
I	1	3/4 x 5 1/2 x 75" pine	V	1	3/4 x 3/4" pine cleats to fit
J	1	3/4 x 38 1/4 x 74 1/4" fir plywood	W	1	3/4 x 3 1/2 x 60" pine
K	2	3/4 x 4 1/4 x 74 1/4" fir plywood	X	2	3/4 x 2 1/2 x 84" pine
L	5	3/4 x 4 1/4 x 36 3/4" fir plywood	Y	6	3/4 x 1 1/2 x 15" pine
M	1	3/4 x 5 1/2 x 39" pine	Z	1	3/4 x 4 1/4 x 5" birch plywood

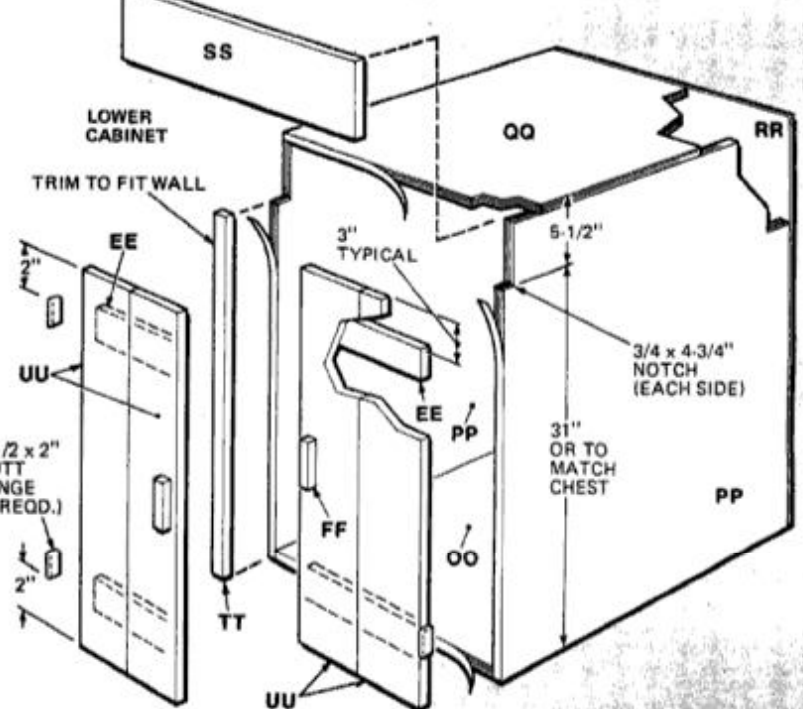
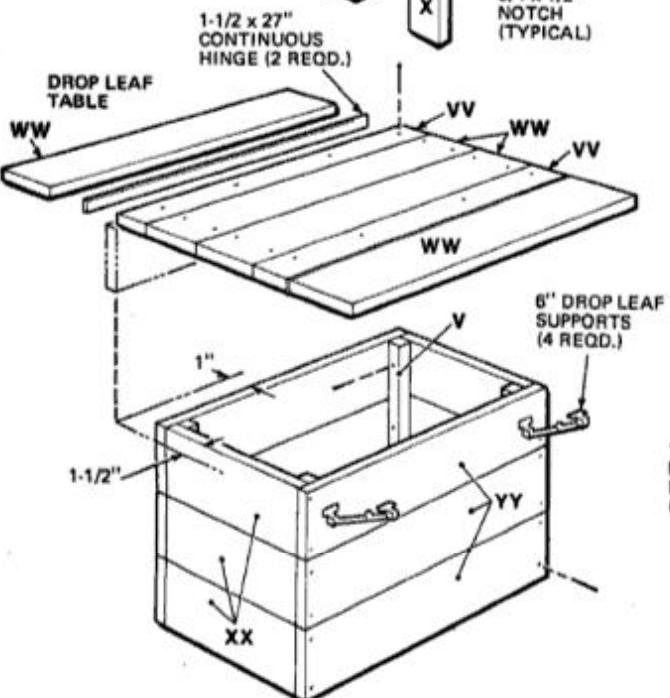
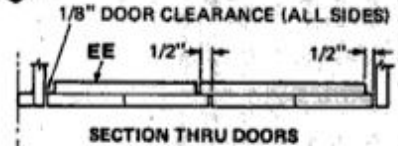
other end will be held rigid once the ladder is installed.

To get the upper bunk (assembled except for bottom, G) in place you will need a helper. After locating its exact elevation, nail temporary support cleats to the wall for the bed to rest upon. Make certain the cleats are level so that the bed will be too. Position the bed on the cleats and bore pilot holes through side (E) and head (F) rails and into wall

FILLER UNIT UPPER BUNK LADDER



NOTE: ALL ASSEMBLY WITH WHITE GLUE AND 1-1/4" OR 2" FINISHING NAILS. COVER EXPOSED PLYWOOD EDGES WITH VENEER TAPE

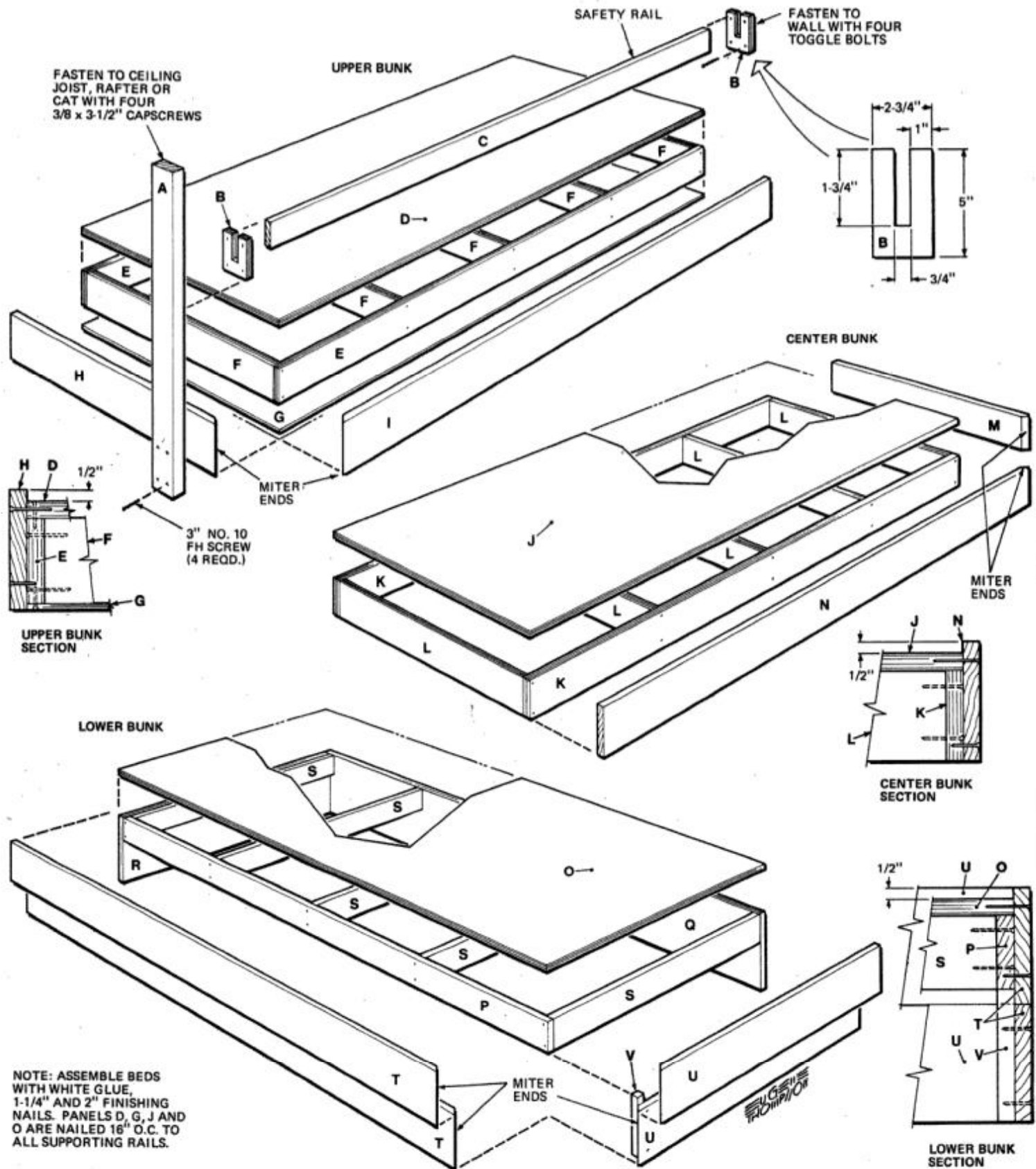


studs. Make certain that the hefty screws are securely in the studs or the bed could come down. Before removing the cleat, install the vertical hanger to the ceiling. For strength, this must be anchored securely to a structural member. If you're lucky, it will line up alongside a rafter or joist when it's plumb in both planes. If it doesn't you will have to open up the ceiling

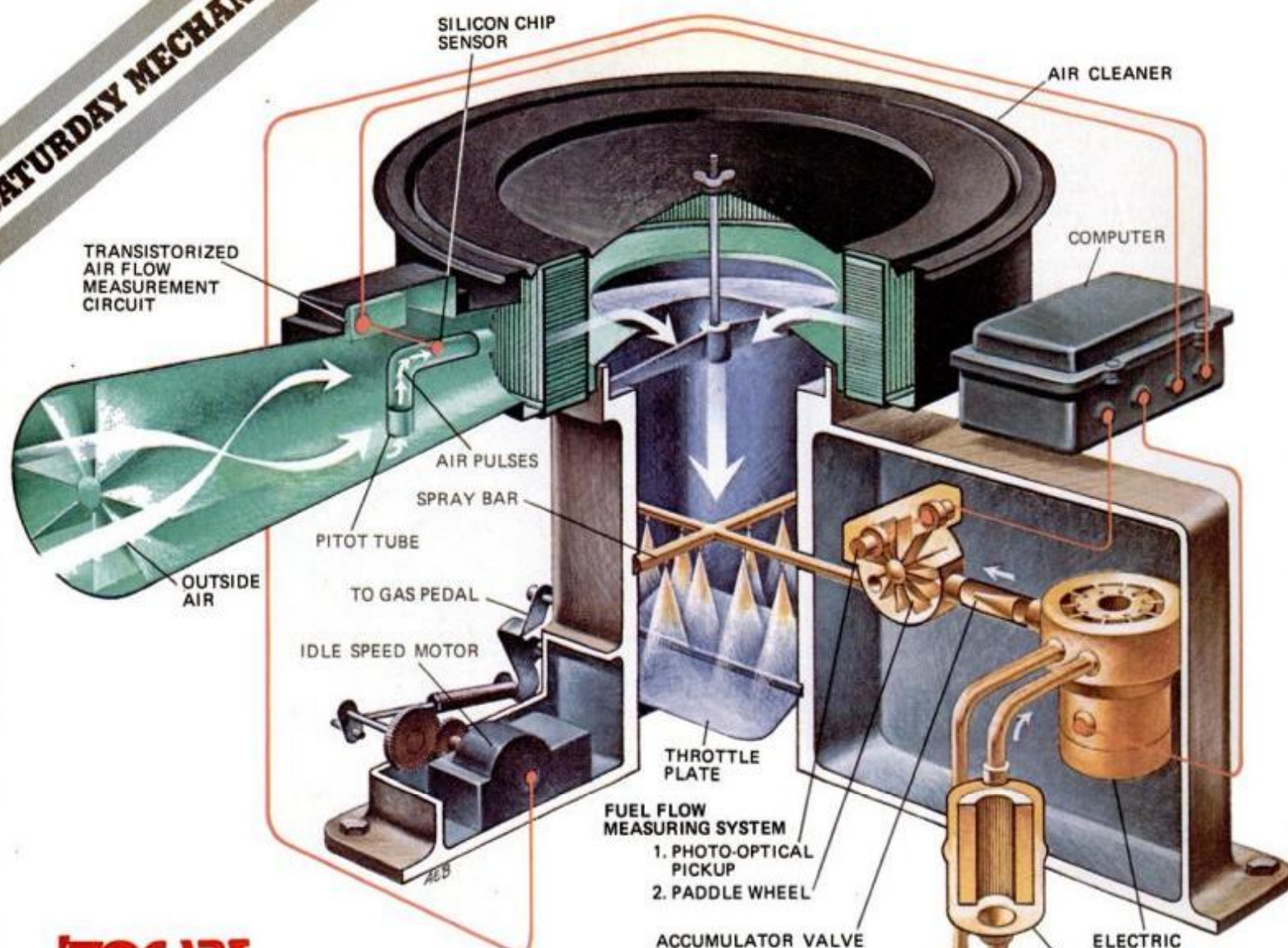
(Please turn to page 214)

MATERIALS LIST—CABINETS AND DROP-LEAF TABLE

Key	Pcs.	Size and description	OO	1	3/4 x 21 1/2 x 38 3/4" fir plywood
AA	1	3/4 x 15 x 31" birch plywood	PP	2	3/4 x 35 3/4 x 38 3/4" fir plywood
BB	1	3/4 x 15 x 39" birch plywood	QQ	1	3/4 x 23 x 38" fir plywood
CC	2	3/4 x 31 x 39" birch plywood	RR	1	1/4 x 23 x 36 1/2" fir plywood
DD	1	3/4 x 1" birch plywood, to fit	SS	1	3/4 x 5 1/2 x 24" pine
EE	10	3/4 x 2 1/2" cleats, to fit	TT	1	3/4 x 1 x 31" pine
FF	4	3/4 x 3/4 x 4" pine	UU	4	3/4 x 5 1/2 x 30" pine
GG	5	3/4 x 7 1/4" pine, to fit	VV	2	3/4 x 2 1/2 x 27" pine
HH	1	3/4 x 2 3/4" pine, to fit	WW	4	3/4 x 5 1/2 x 27" pine
II	1	3/4 x 21 1/2 x 38 3/4" fir plywood	XX	6	3/4 x 5 1/2 x 12 1/2" pine
JJ	1	3/4 x 38 3/4" fir plywood, to fit	YY	6	3/4 x 5 1/2 x 24" pine
KK	1	3/4 x 22 3/4" fir plywood, to fit	Misc.: 1 1/2 x 27" continuous hinge (2), table; 6" drop-leaf support (4), table; 1 1/2 x 1 1/2" corner brace (4), ladder; 1 1/2 x 2" butt hinges (4 pr.), closet units; leg-screws, wood screws, finishing nails.		
LL	1	3/4 x 5 1/2 x 39" pine			
MM	1	3/4 x 5 1/2 x 25" pine, trim to fit			
NN	4	3/4 x 5 1/2" pine, to fit			



NOTE: ASSEMBLE BEDS WITH WHITE GLUE, 1-1/4" AND 2" FINISHING NAILS. PANELS D, G, J AND O ARE NAILED 16" O.C. TO ALL SUPPORTING RAILS.



'79 CARS

Servicing the '79 Chrysler-Plymouth and Dodge models

by Paul Weissler

Electronic Fuel Management, the first new gasoline metering system since fuel injection, will be introduced on a small number of Chrysler cars in 1979.

EFM is a cross between a carburetor and fuel injection, with a computer, the same digital box used for electronic spark advance, running the show. The fuel is injected—actually sprayed, but at a single point—into the center of an intake manifold for a four-barrel

carburetor. Here's how it works.

An in-tank electric pump delivers the gasoline, first through a large in-line fuel filter, and then into an electric vane pump that operates at medium pressure—about 20 pounds per square inch (p.s.i.). The gasoline then passes through an accumulator, a spring-loaded valve that opens at very low pressure. It holds up the fuel flow just long enough to assure enough pressure for an effective spray.

Finally, the fuel enters the spray bar, a piece of tubing with carefully-sized holes (calibrated orifices), and it sprays through the holes into the airstream flowing into the intake manifold. The fuel spray is basically continuous when the engine is running, but the computer can reduce current flow to the vane pump to reduce the amount sprayed.

The vane pump, accumulator, spray bar, fuel-flow measuring

(Please turn to page 152)

6 YEARS OLD. IMPORTED IN BOTTLE FROM CANADA BY HIRSH WALKER IMPORTERS INC.
DETROIT, MICH. 86 & PROOF. BLENDED CANADIAN WHISKEY. © 1978

The "Lost Dutchman" gold mine. Legend says it's near the place where we hid a case of C.C.

We heard tales of hidden gold in the mountains east of Phoenix. They tell how miners who discovered it were mysteriously massacred. How an old prospector, "The Dutchman," rediscovered it. And how he, too, took its secret to the grave.

We searched the same canyons the Dutchman had followed.

These mountains seemed a natural place to hide a case of Canadian Club. So we found a wrangler, and with our C.C. tied on a surefooted mule, we set out. We would seek a hiding place among the sites of the Dutchman's legend...and perhaps his gold too. His last words were about a needle-like rock near his mine. So we kept such a rock in sight as we followed narrow canyons.



C.C. and mountain stream water.

With nightfall, we pitched camp

below the needle-rock, and toasted our saddle sores with C.C. Next day we rode northwest to a well-traveled "Indian trail" and soon buried the Canadian Club. To find it, seek a place on that trail where the needle-rock is in sight, then head for lakes that weren't here when the Dutchman was.

A strange rock, an abandoned camp.

Seek the rock pictured here (it won't look this way from the trail) and ride toward it. Follow a trail that's more stream bed in places, past a lone cactus that grows from a high rock outcropping, to the end. Near here we made camp again 'neath a small tree where the distant needle-rock can be seen. Within sight of our fire, we buried our case of Canadian Club.

We wish you better luck in your search for the buried case of Canadian Club than those who've sought the Dutchman's gold. But be warned: this rugged country is unforgiving. So if the trail seems too rigorous, you can strike it rich at any bar or package store. Just say, "C.C., please."



Beginning Sept. 4, get more clues
by calling 800-221-4686. In N.Y. call 800-522-7517.

Canadian Club
"The Best In The House"® in 87 lands.

PM's back-saving log splitter lets you split a cord of wood in 2 hours



Plans call for 3-hp or greater gasoline engine, plus readily obtained stock parts.

With PM's great log splitter, you can split a cord of logs in the morning and relax and watch a ball game in the afternoon.

This fall and winter, enjoy a well-stocked woodpile while avoiding the back-wearying chore of splitting logs by hand. Let PM's log splitter do the tough work for you. Wood is an increasingly popular, low-cost heat source that can help reduce your fuel bills. This hydraulic log splitter, which you can build with PM's detailed plans, will split cords of hardwood with ease. It saves you money and prevents backaches caused by hours of swinging an ax.

In operation, a powerful ram pushes the log against a fixed wedge and pop! The log is split—and it's all done by merely moving a lever. The carriage returns automatically to the starting position when the

control lever is released at any point during the power stroke. The log splitter exerts about 10,000 lbs. of pressure. That's enough to split ash or maple logs up to 2 ft. long and 12 to 14 in. in diameter.

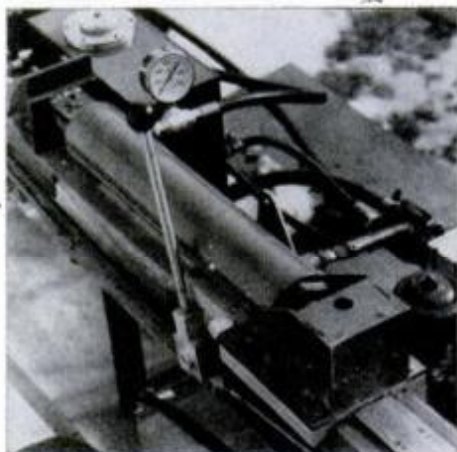
The backbone of the splitter is a 6-ft. I-beam on which the ram rides. Automatic transmission fluid under pressure drives the cylinder by way of a pump and control valve. A 3-hp or greater gas engine provides the power.

A flexible coupling is used to connect the hydraulic oil pump to the engine shaft. The pump is capable of being driven at 3600 rpm. In addition, the double-acting control valve has a built-in adjustable pressure-relief valve. This two-way control protects the pump and limits the pushing force to 10,000 lbs.

A two-wheel, rubber-tire trailer makes a good bed for mounting the splitter. It's convenient for towing the machine to the splitting site with a small yard tractor. The I-beam's



For best results, mount the log splitter on a two-wheel trailer and tow it to the cutting site with a garden tractor.



A lever controls the ram that forces the log against the splitting wedge. The cutting stroke can be halted at any point.

support brackets can be sized and positioned to bring the top of the beam about 6 in. below your waist—a convenient working height so there's no need to bend over except to pick up a log.

The hydraulic cylinder, control valve, hydraulic pump, oil filter and gas engine are easy to round up. You can make the parts not easily found by welding and bolting together steel plates. Information on obtaining the materials are supplied with PM's plans. **PM**

HOW TO ORDER PLANS

To get a complete set of plans and detailed instructions for building the log splitter, send a check or money order for \$8.95 to Log Splitter, Popular Mechanics Library, Box 1014, Radio City Station, New York, N.Y. 10019. Make check or money order payable to Popular Mechanics. Allow three to four weeks for delivery for third-class mailing. For faster first-class mailing, include 75 cents extra.



Radial-Matic® rides so good it's almost against the law.

Radial-Matics will make whatever you put them on ride so smooth, you'll hardly know she's moving. In fact, it's the best-riding shock Monroe's ever built. Y'see, Radial-Matics combine—for the first time—five proven ride improvement features all in one shock.

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



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



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Mail with 25 cents in stamps or coins to:
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P.O. Box 25188, Dept. M2
Oklahoma City, Oklahoma 73125

NEW RECREATION KITS AND PLANS

(Continued from page 102)

erts International, Box 1548, Newport Beach, Calif. 92663, also has a catalog of 100 cruiser and sailboat plans for building with fiberglass, steel, plywood or wood planking. Roberts and Matthews are unusual in that they offer a limited warranty on their components.

And additional kits and plans can be found every month in PM articles and ads. Especially popular plans—a work and play pop-up camper for your pickup, 14-foot speedy outboard runabout, houseboats, sailboats and cabin cruisers, air-cushion vehicle and many others—are listed in a 50-cent plans catalog. You can order the plans list from *Popular Mechanics*, Box 1014, Radio City Station, New York, N.Y. 10019.

Construction

Experienced kit builders advise it's smart to start with something simple. After first building a sailing pram, I found I could move on successfully to a 21-foot cabin cruiser. You're likely to learn, however, that you need to more than double the time you thought would be necessary to build the kit. You'll also need:

- **Directions.** Buying plans or a kit



Handsome enlarged version of Slocum's old around-the-world *Spray* is one of many Roberts and Matthews Assoc. kit boats.

doors or under cover is highly advisable.

After you've finished

There will still be problems to consider. Insurance on a home-built boat or vehicle, like original financing, can be difficult to arrange. The Coast Guard also has a booklet for back-yard boat builders that explains the need for a hull identification number and adherence to safety standards, especially if you should ever want to sell your home-built

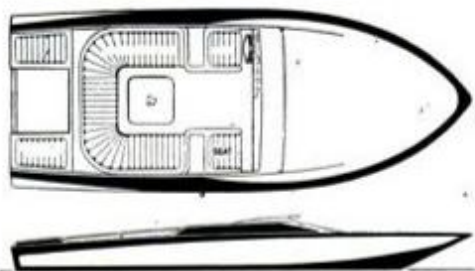


Another bass boat kit (left) for home assembly by bargain hunters, comes from Craft Master Boats, Eden Prairie, Minn. Rated for motors to 90 hp, it can be built in 30 hours or less, maker claims. Glen-L speedster ski boat (below) provides a chance for the home mechanic to convert an automotive engine for inboard power. Outboards can also be used. Many other runabouts are in the Glen-L Line.

does not enroll you in a carpentry correspondence course. You cannot phone a kit supplier at midnight to find the difference between a machine and a carriage bolt. Some suppliers and many libraries have good instruction books available for your use.

■ **Tools.** Power tools are essential. You should consider at least power drills that you equip with screwdriver attachments, table saw and sanders.

■ **Help.** Assistance from friends and neighbors can make a project appear to move more than twice as fast. You will find that working in-



pride and joy—as usually happens.

Rigs to carry you safely on land or water require much more careful construction and permit less inventive alteration of plans than when you build a kitchen table. But the satisfactions are much greater. **PM**

Introducing the new McCulloch 320 Vs. The Other Guys.



FEATURES	McCULLOCH PM 320	POULAN S25 CVA	STIHL O15LE	HOMELITE VI SUPER 2	SEARS 35235
PRICE (Manufacturer's suggested list)	\$169.95	\$189.95	\$174.95	\$189.95	\$207.95
DISPLACEMENT	35cc	38cc	32cc	31cc	38cc
BAR LENGTH	16"	16"	14"	14"	14"
CHAIN BRAKE					
HAND GUARD					
ANTI-VIBRATION					
AUTOMATIC SHARPENING					
ELECTRONIC IGNITION					
AUTOMATIC OILING					
MANUAL OILING					
MUFFLER SHIELD					
SAFETY TRIGGER					
THROTTLE LATCH					
RIGHT HAND GUARD					
CHAIN CATCHER					
SAFETY TIP					

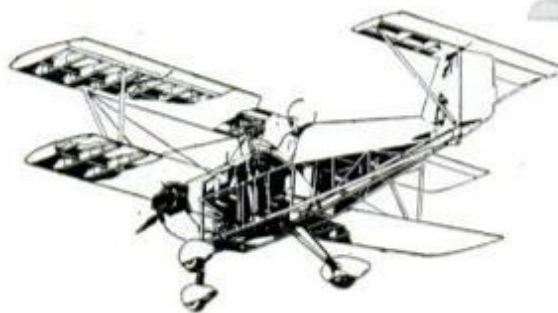
The above prices are the suggested list prices published by individual manufacturers, their distributors or their agents. Actual prices may vary by area and at the discretion of individual dealers. Data for the above models are on file at McCulloch Corporation and are available upon request.

You can't buy another chain saw with all these features at any price.



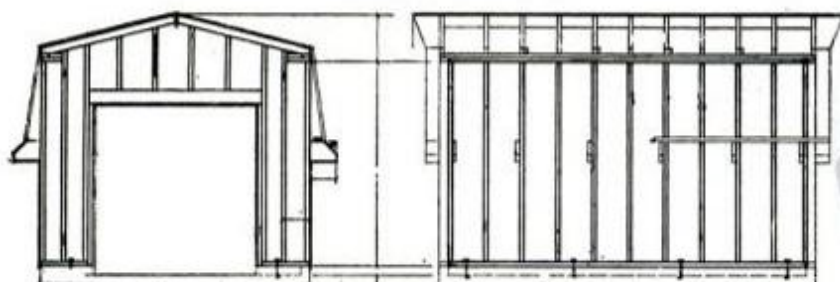
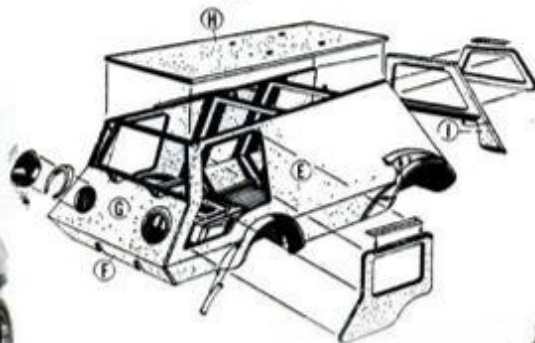
McCulloch Corporation, Los Angeles, California 90009

IN THE AIR, ON LAND



SCAMP

BOONIE BUG



DUTCH MINI-BARN

Popular Mechanics plans have been helping readers do the "impossible" for over 75 years. Here are just a few of the exciting PM plan projects.

SCAMP—A revolutionary all-metal, VW-powered acrobatic biplane that puts you in the air for less money than you'd think possible! With PM plans, man's dream of solo flight is easily attained.

\$49.98

(Featured in Dec., 1973 issue)

BOONIE BUG—A dynamic, new vehicle concept! Constructed from a VW bus chassis, the 'Boonie' offers the go-anywhere ruggedness

of an ATV, the sleeping and camping facilities of an enclosed van and the smooth-riding quality of a conventional station wagon at highway speeds—all rolled into the slickest looking vehicle ever! Do-it-yourself with PM plans. **\$14.95**

(Featured in March, 1974 issue)

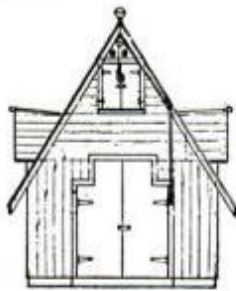
DUTCH MINI-BARN—You can erect our most popular backyard storage structure for under \$600. The roof design is somewhere between gambrel and mansard but it reminds us of Dutch colonial architecture. With 8 ft. of head-room inside and 10 ft. by 13½ ft. floor space it's fairly large although

it looks small. More than enough room for bicycles, lawn furniture, garden tools or use it as an office workshop or potting shed. Two sets of plans included, one for yourself and one for your building department. **\$5.95**

(Featured in August, 1972 issue)

STORYBOOK PLAYHOUSE—Put up a shed and the neighbors may hate you, but build this handsome little house and you'll be the hero of the neighborhood—especially among the small fry! This compact structure looks more like a storybook cottage than a tool-house—but you can readily use it for storage. In fact, wide barn-type

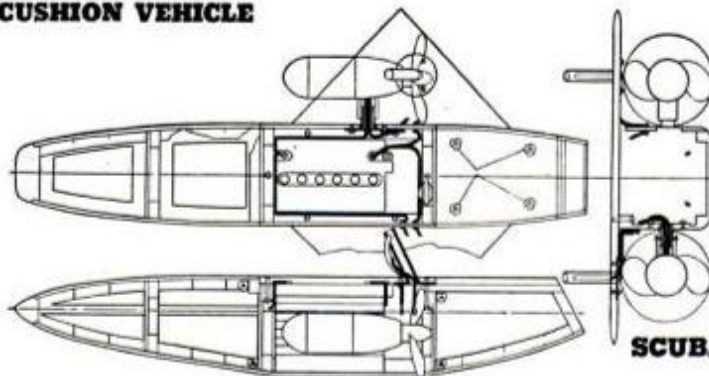
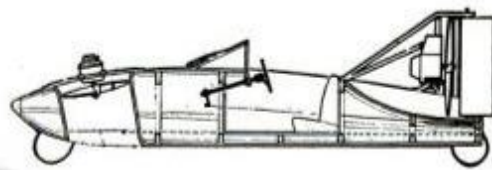
AND UNDER THE SEA



STORYBOOK PLAYHOUSE



LAND & WATER AIR CUSHION VEHICLE



SCUBA-TOW



doors in the back lead to a special tool-storage room walled off from the playrooms. You can hang a lot of garden tools inside and still provide plenty of play space. An extra set of plans is included for a building permit. **\$5.49**

(Featured in July, 1973 issue)

LAND AND WATER AIR CUSHION VEHICLE—A go-anywhere air-prop craft, the exciting Cobra ACV skims land or sea at speeds up to 60MPH. 14 ft. long, with room for two passengers this innovative vehicle will cost you less than \$800 to build. A unique project for the serious do-it-your-

selfer (caution must be paid in following all operating instructions). The joys of owning and operating this futuristic hover vehicle are truly inestimable. **\$12.95**

(Featured in Sept., 1975 issue)

SCUBA-TOW—The electric-powered sea scooter that performs like costly commercial models! Motorized Scuba-Tow will pull you on or under the water for hours of effortless snorkeling or scuba diving. Rugged, light weight and dependable—you can build Scuba-Tow in a weekend or two from PM plans. **\$7.95**

(Featured in July, 1974 issue)

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Please rush me the PM plans and/or catalogue

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| Boonie Bug | Storybook Playhouse |
| <input type="checkbox"/> \$14.95 | <input type="checkbox"/> \$5.49 |
| Land & Water Air Cushion Vehicle | <input type="checkbox"/> \$12.95 |
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Please clip and mail with check or money order



Plans, Projects Publications

PM LOOKS AT PRECISION SEWING WITH 'AIR ELECTRONICS'

Tap your foot and you'll appreciate the precision of the new "Air Electronics" sewing machine from Elna. The Swiss-made unit offers three unique features:

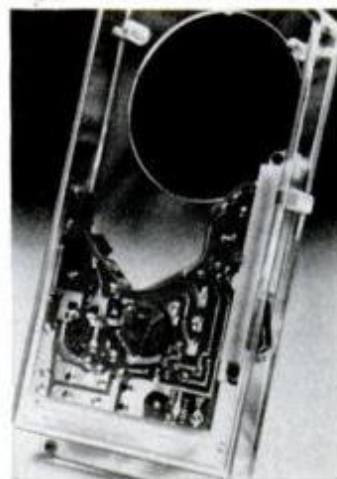
- A pneumatic foot control transmits your desired stitch speed precisely. With no moving parts, the pedal uses air pressure to signal the machine to open and close contacts operating the stitching motor.

- An electronic control center translates the signal, or exact pressure your foot applies, and responds with precise needle penetration at any speed—even over very coarse material.

- A new electromagnetic motor replaces conventionally wound coils for more power and durability. The suggested retail price for the top-of-the-line Elna model SU 68 (right) is \$989. For more information, contact White Sewing Machine Co., Dept. PM 978, 11750 Berea Rd., Cleveland, Ohio, 44111. **PM**



Just press the pneumatic foot pedal (far left), and an electronic control center (bottom left) will insure precise needle penetration, no matter how tough the material is. An electromagnetic motor (left) powers the unit.



ELECTRONIC CONTROL CENTER LOCATION

ELECTROMAGNETIC MOTOR LOCATION

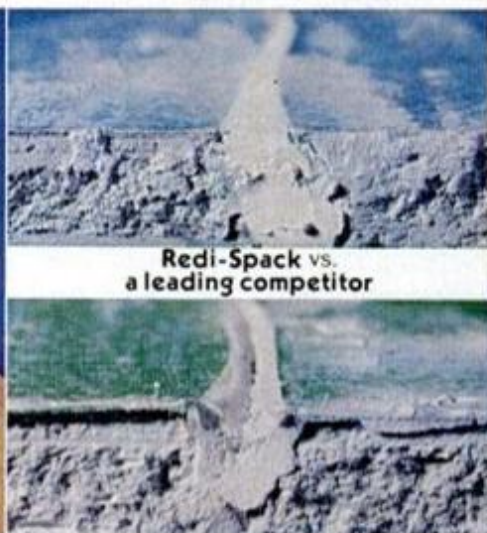
Elna SU 68 has a repertoire of 26 different stitches.



With Elmer's® Redi-Spack you don't need a pro's hands to give it the pro's touch.



Asbestos-free Redi-Spack™ acrylic latex spackling compound comes ready to use with no mixing or mess. No problems going on, either, because it's got just the right consistency.



In a first-time application test, the competitor shrinks and cracks when dry. Redi-Spack's acrylic latex formula resists shrinking, cracking and sagging.



After as little as fifteen minutes Redi-Spack is dry and ready to paint, with little or no sanding. No priming needed, because it won't wash out under paint or show through.

Elmer's. When results count.



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SATURDAY MECHANIC CAR CARE GUIDES are now available at these fine stores: Auto Parts & Equipment - Auto Shack - Cap's Auto - Clarks - Cook - Consumer Auto Parts - Klein Auto Parts - Kragen Auto Supply - Meltzer's Auto Supply - Mr. G's Auto - Murray's Discount Auto - Naylor Auto Parts - Osterio - Parts Plus (Michigan) - R & S Auto - Rickels - Robbin Arrow Auto - Sayer Brothers - Service Motor Parts - Sussex Automotive - Times Square Stores - Thrifty Auto Stores - Uncle Bills - Warshawsky - World Wide Auto -

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**WE'VE BEEN BUILDING
EVINRUDES FOR
70 YEARS.**

**IT TAKES THAT LONG
TO MAKE MOTORS
THIS GOOD.**





1909
 1½ hp. 13.52 cu. in.
 9.01 cu. in. per hp.

1979
 235 hp. 149.4 cu. in.
 .63 cu. in. per-hp.

Modern outboards, like 30 mpg automobiles and Mach 2 jet liners, didn't just "happen." They evolved, part by part, out of years of painstaking product development.

70 years ago, Ole Evinrude built the first commercially successful outboard. The motor succeeded and the company prospered because it was engineered right.

We've never forgotten that lesson.

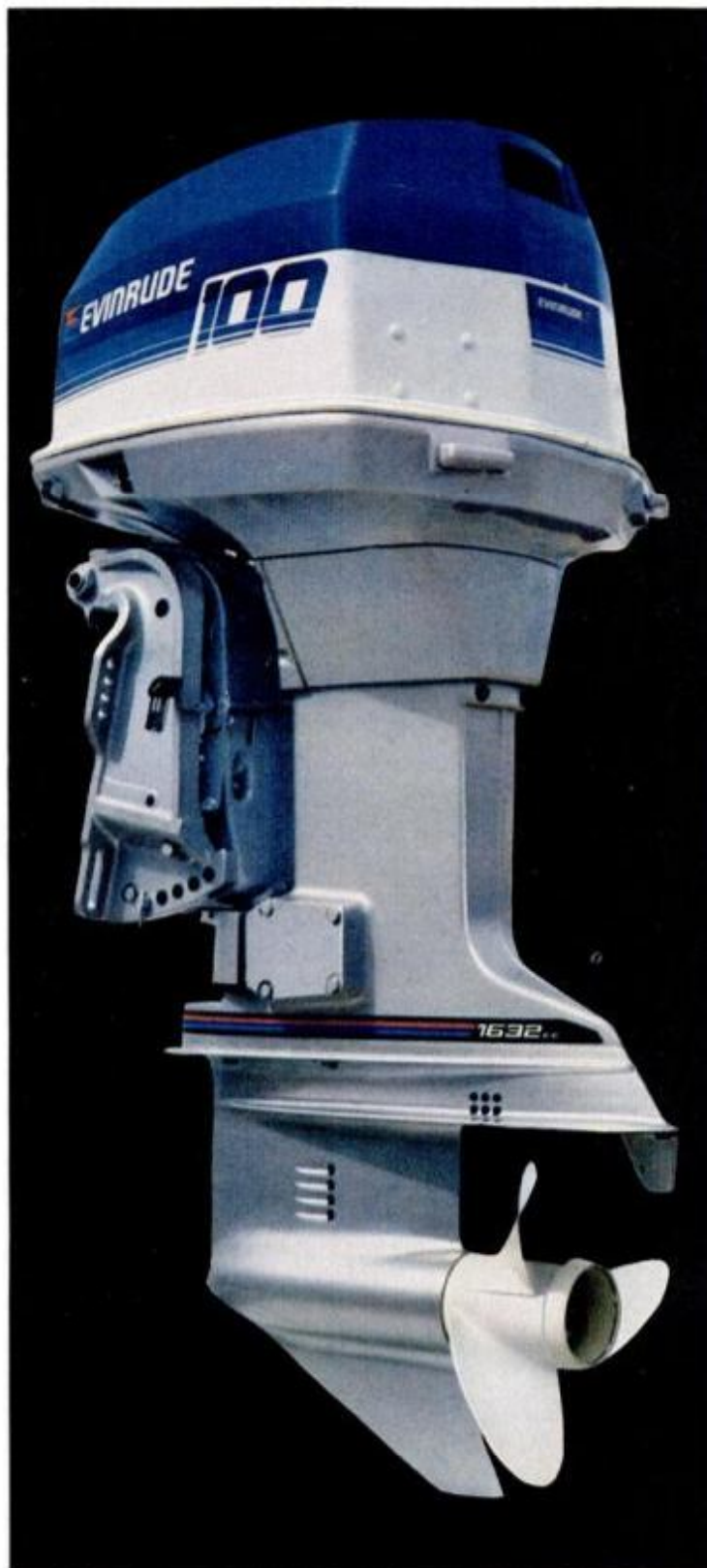
Today, Ole Evinrude's single-cylinder 1½ hp outboard has become a line of 22 outboards, from a tiny 2 hp single to a mighty 235 hp V-6.

As the need and uses of boating power have grown over the years, the technology has grown with it, from the early iron Evinrudes to the quiet, compact, lightweight, sophisticated electronically-timed, pulse-tuned Evinrude motors of 1979.

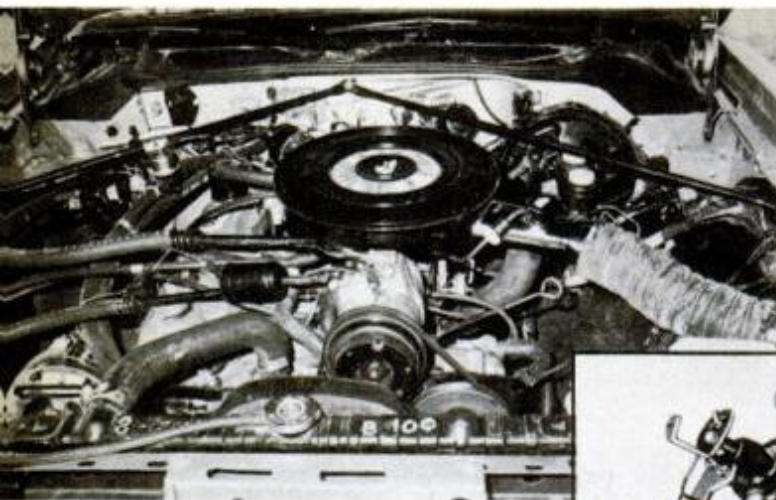
For 1979, we're adding still another Evinrude motor to the line — a compact, new high-torque "100".

We still build Evinrude motors the way Ole Evinrude taught us to build them — the best we know how.

After 70 years of pioneering, nobody knows how better.



EVINRUDE 
 PRODUCT OF OUTBOARD MARINE CORPORATION *first in outboards*



Slant Six engine installed in downsized Newport, New Yorker and St. Regis leaves good engine compartment room for do-it-yourself service. The two-barrel carburetor (below) does use mixture screws, but they are recessed and the bores are plugged.



SATURDAY MECHANIC

(Continued from page 140)

hardware and automatic idle-speed adjustment all are housed, with the throttle plate, in a module that sits on the intake manifold, under the air cleaner, much like a carburetor.

Airflow measurement

Measurement of airflow through the air cleaner is critical, for it is this information that the computer uses to decide how much current to provide for vane pump operation.

The measuring system is extremely sophisticated, adapted from aerospace technology.

The air cleaner snorkel has baffles that cause the entering air to swirl. A small portion of the swirling air flows into a pitot tube that projects down into the airstream.

As it enters this tube, the swirl breaks down into air pulsations that are proportional to the overall airflow.

At the top of the tube is a silicon chip heated by current from an adjoining transistorized circuit that is wired to the computer. Each air pulse has an instantaneous cooling effect on the silicon chip; after it passes, the silicon instantly heats up again. The brief cooling effect is translated into an electronic measurement of airflow by the transis-

torized circuit and fed to the computer.

Fuel measurement

The computer not only wants to know the precise airflow, it also wants an accurate measurement of fuel actually flowing so it can make instantaneous corrections if needed.

The fuel-flow measuring system is indeed intriguing. As the fuel flows to the spray bar, it goes through an enlarged section of fuel passage, containing a paddle wheel, a miniature version something like that used on the old riverboats. On one side of the passage is a photo-optical pickup, on the other is a light-emitting diode aimed right into it. As the wheel spins, the paddle blades interrupt the beam, triggering the photo-optical pickup. Each triggering of this pickup is a fuel-flow signal to the computer.

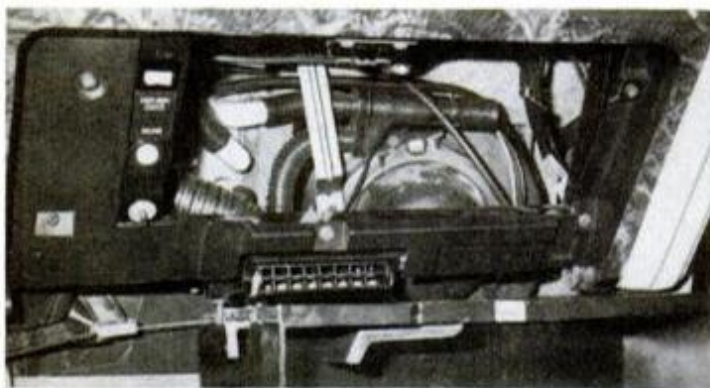
Automatic idle speed

The computer also controls the engine speed, by means of a motor and gear assembly in the EFM module. The motor can run forward or backward, depending on which terminals of the multifield motor receive current from the computer, and stop in any position as soon as the computer chops the current.

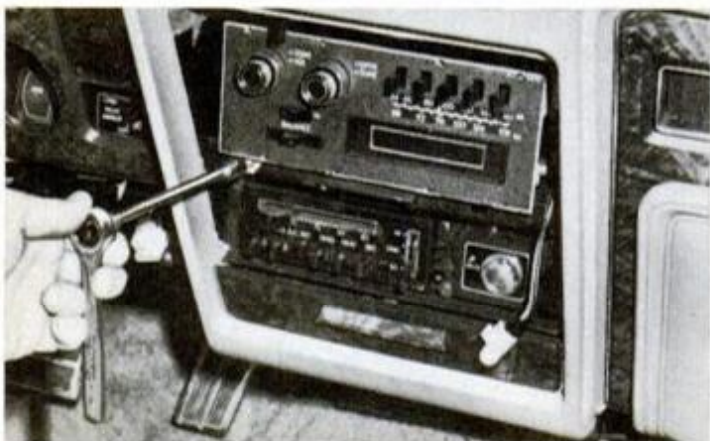
The output gear of this control operates a link connected to the throttle linkage. This gives the computer the ability to set idle speed for any situation. For example, the coolant temperature sensor tells the computer whether the engine is cold, warming up or warm, so the computer can set the geared motor for a precise fast-idle speed and gradually taper it to curb-idle during warmup.

The computer can set idle speed, if desired, to a very specific number, such as 839 rpm, simply by monitoring the electronic ignition pulses and making constant adjustments if required. As a practical matter, it will work within an rpm band, but a much narrower one than

(Please turn to page 154)



Bin-type glovebox is removable for access to behind-the-dash plumbing and wiring (left). It's easy to take out the radio. Just unscrew four retainers to remove the bezel, then remove two screws on radio (below, left) and pull it out. Disconnect the leads (below).



WHY MORE AND MORE PEOPLE ARE ASKING FOR A CHAIN SAW THEY CAN'T EVEN PRONOUNCE.

Poolen. Pullen. Polann.

With a name like Poulan, getting people to say the name right may be asking a lot.

On the other hand, people ask an awful lot of our saws. Quick starting. Extra cutting power. Quiet operation. Beautiful styling. Durability. Affordability.

And we deliver all that plus a lot of other standard features, no matter which Poulan saw they buy. From the Poulan Micro XXV right on up to our pro models.

At Poulan, we figure the more we put into our saws, the less people have to put into cutting.

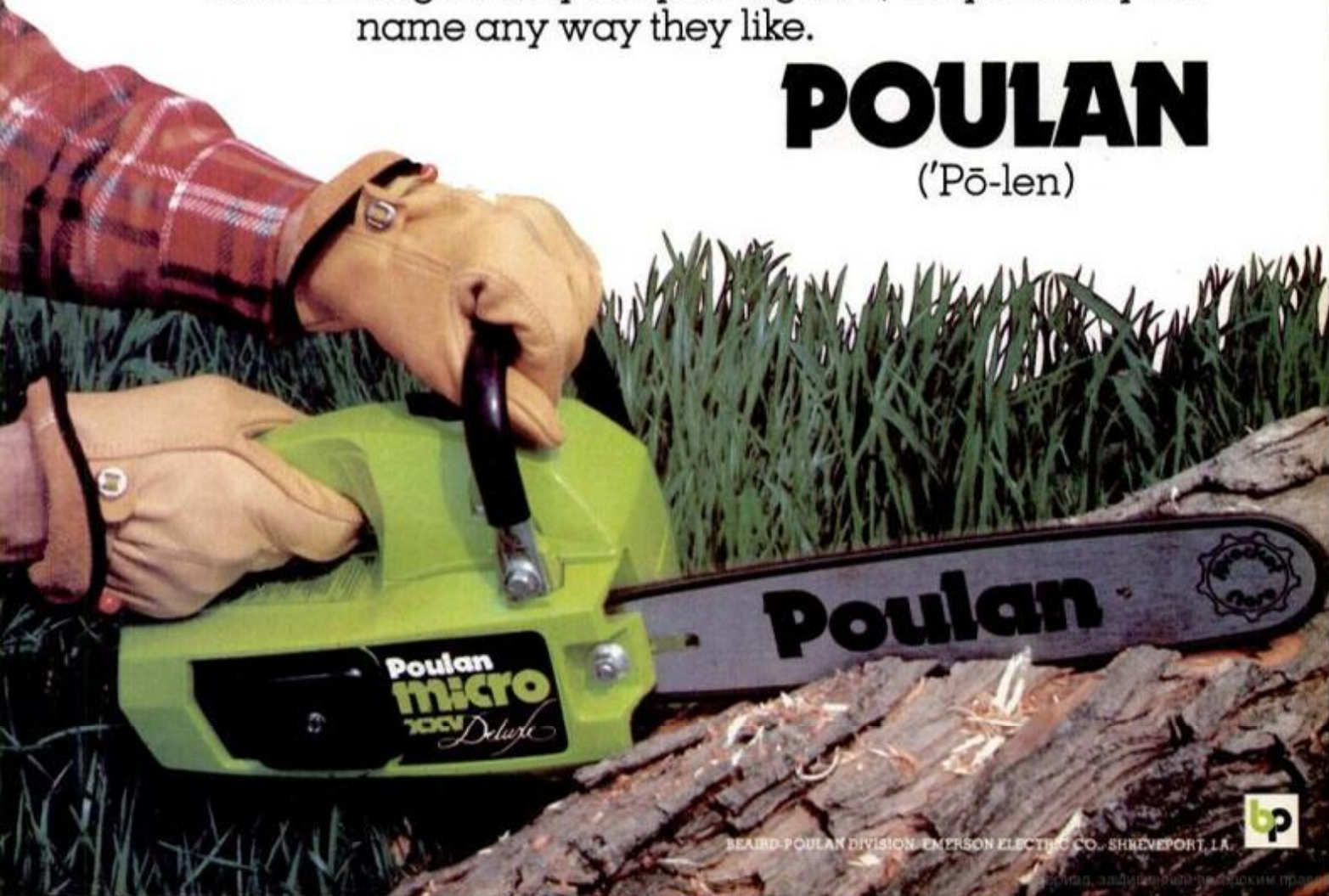
Maybe that's why more and more people keep asking for our saws.

And as long as they keep doing that, they can say the name any way they like.



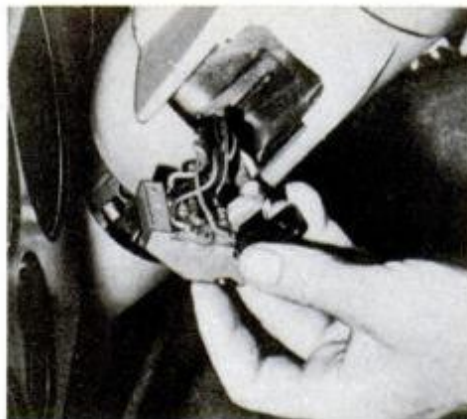
POULAN

('Pō-len)

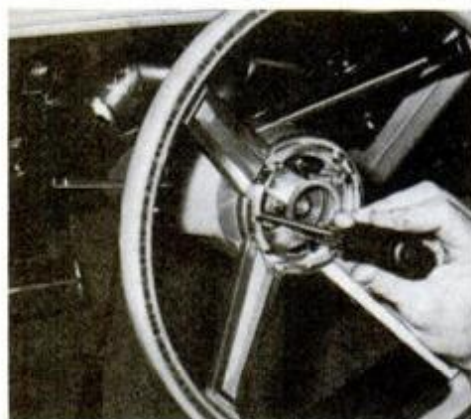




Stalk switch cover plate on steering column lifts off after removing single screw.



Stalk switch is removed from steering column after three screws are taken out.



Third screw for switch removal is located under the steering-wheel trim pad.



Dimmer switch, located lower on the steering column, is operated by linkage.

possible with conventional mechanical arrangements.

Development of EFM

EFM was supposed to be ready for 1978 mass production, but there were repeated delays. Earl Meyer, one of the system's developers at Chrysler, denied there were major problems: "Look, there were only two ways to meter fuel, the carburetor and fuel injection. When you're trying to come out with a third way, you've got to be sure it's ready before you put it out."

There are three bottom lines on EFM: emissions, driveability and fuel economy, as they compare with carburetion and fuel injection. Meyer says that EFM is now satisfactory on all three, and he hinted at a double-digit percent improvement in fuel economy.

How can a single-point fuel system equal, much less surpass, fuel injection which insures an equal quantity of gasoline for each cylinder? Meyer smiled, "I can't explain it, but it does."

Don't go running to a Chrysler dealer to place an order for an EFM-equipped car. Production may be as small as 500, and these may all go to zone offices for field-testing

by employees. Zone cars customarily are sold to dealers for resale to the public near the end of the model year. By then, it will be close to 1980-model introductions when you can expect large-scale installation.

Service tips

The downsized '79 Chrysler models—Newport, New Yorker and Dodge St. Regis—are a lot roomier where it really counts for the Saturday mechanic: in the engine compartment. The smaller size permits the cars to run with the two-barrel slant Six, compared with the tight fit on Volare-Aspen and the predecessor Valiant-Dart. This extra room is really meaningful too, for it's on the right side that you'll find the sparkplugs, distributor, coil, oil filter, fuel pump and alternator. Because the engine slants to the right, there is plenty of room on the left in any installation; with the new models, it's almost cavernous.

Chrysler will have a low-maintenance battery available on all models (standard on the 360 V8), and happily, it will have top posts for easier jump-starting, charging, testing and removal. The caps, through which water normally is added, are sealed, and a Delco-type prismatic

charge indicator is built in to show battery condition at a glance.

There's another service item eliminated under the hood, but this one you probably won't like: The mixture screws on the six-cylinder's two-barrel are tamper-resistant. All carburetor mixture adjustments will be sealed by 1980, and the two-barrel is Chrysler's head start.

Oil change

Chrysler has extended its 7500-mile engine oil change from six months maximum to one year, for those who drive very little. The filter change however, remains at every other oil change or 15,000 miles, but not to exceed one year. So if you go for the annual oil change, replace the filter at the same time.

Of course, Chrysler still has so much fine print in its oil and filter change recommendations, that unless you do nothing more than moderate-speed highway cruising in moderate temperatures, the oil change interval comes down to as little as 3000 miles or three months. That gives you an idea of when you really ought to be changing.

Air pump

The air pump, unfortunately, is back on 1979 Newport-New Yorker-St. Regis models with the six-cylinder, instead of the simpler Pulsair diaphragm valve still used on other models.

The slightly different emissions test for the bigger car demand more oxygen in the exhaust than Pulsair can provide. However, there's no major effect on serviceability.

Feedback carburetor

California buyers of '79 Chrysler compacts and intermediates can do some field-testing of a three-way catalyst and feedback carburetor, and pay extra for the privilege. Order a one-barrel Six with automatic transmission and you also can get the extra hardware, which is similar to what GM and Ford already offer on some California models.

The system isn't required for a while, but the time is coming. For a to-be-announced amount, you get a three-way catalyst, oxygen sensor in the exhaust, electronic control unit operating a vacuum solenoid to provide more or less vacuum to the diaphragm. The diaphragm flexes to increase or decrease fuel flow, so the engine operates with a 14.7:1 air-fuel ratio, necessary for the three-way catalyst to control hydrocarbons, CO and NOx.

The engine also comes with the

(Please turn to page 156)

FOR THOSE OF YOU WHO ARE HAVING SECOND THOUGHTS ABOUT YOUR FIRST CB.

Move up to the all-new Cobra 29GTL. It's the third generation of the trucker-proven Cobra 29. And like the 29 and the 29XLR before it, it advances the state of the art.

Transmitter circuitry has been refined and updated to improve performance.

Receiver circuits have been redesigned to include dual FET mixers, a monolithic crystal filter and a ceramic filter to reduce interference and improve reception.

By improving the transmitter circuitry the 29GTL keeps you punching through loud and clear. By incorporating new features for better reception everything you copy comes back loud and clear.

So if you're having second thoughts about your first CB, make your next CB the Cobra 29GTL.

We back it with a guaranteed warranty and a nationwide network of Authorized Service Centers where factory-trained technicians are available to help you with installation, service and advice.

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- **GARAGE FLOOR, BAR-B-Q AND MOWER CLEANER**—Removes the grease and oil from floors and machinery before it reaches the house!

RADIATOR SPECIALTY COMPANY
Charlotte, N.C. 28237

SATURDAY MECHANIC

(Continued from page 154)

Lean Burn computer in the same black box, but for this application the name Lean Burn is dropped; after all, the engine is no longer operating lean.

Chrysler will be claiming that the better performance and driveability will all be worth the cost.

Wiring harness

Chrysler will be using the same basic wiring harness for all Newport-New Yorker-St. Regis Sixes or all V8s, so if you see some unused wiring connectors dangling, that's the reason. Some are for airconditioning, others for speed control.

If you decide to retrofit speed control, Chrysler will supply a special kit that's a modified version of the original equipment type. It will plug into the wiring already there.

The wiring harness diagnostic socket introduced on Omni-Horizon is now on all models, but doesn't help a Saturday mechanic. It's strictly for the big show-business computer test that helps dealers sell service.

Heater/air system

Newport—New Yorker—St. Regis get a new heater duct design, but they still reflect the fact that the duct engineers haven't found out that most people order their cars with airconditioning. If the heater core fails, you still have to discharge the airconditioner to get it out.

Dash/steering column

News at the dashboard and steering column is almost all good.

The dash cluster and heater/air controls come out very easily, and the glovebox is a bin-type, much like on '78 GM intermediates. It unhooks and drops down, providing a wide opening to the heater blower resistor, antenna splitter, power decklid circuitry and some air components.

Perhaps the best news is the radio. Remove four screws and the bezel drops, then remove two more and you can pull the radio forward. Reach back and disconnect the antenna and electrical feed. That's it.

Putting the switches on the steering column jacket is a definite trend, and '79 Newport-New Yorker-St. Regis models will have a single stalk for the dimmer, directionals, washer/wiper and speed control. You can do all service on the switch without pulling the steering wheel if it is on a nontilt column.

Take off a little cover plate (held

by a single screw), then unscrew the switch itself. It looks as if it's held by just two screws at the side, but there's a third under the steering wheel trim pad. Just pull off the pad and insert a screwdriver through the steering wheel.

If the problem is with the directionals or washer/wiper, the stalk switch is the one you may be replacing. If it's speed control, you lift off the switch handle with no problem, but the electrical disconnect is far away and no picnic. You must push down a plastic steering jacket section, undo the tabs for the guide that holds all the wiring, then pull the guide down and out, make your disconnect and install the new part and wire, then reassemble. A simpler way is to cut and splice at the speed control switch. And even if the book says otherwise, that's what everyone will do.

The dimmer switch is not where it seems to be. You operate it by pivoting the stalk switch, but all you're doing is moving a rod through the column to the dimmer switch at the bottom. If all you want is the dimmer, just work at the bottom. If, however, you're changing the stalk switch, be careful to reengage the rod when you install the replacement, so the dimmer will work. If you have ignition switch trouble, you'll be happy to know it's similar. It's at the bottom of the column, where you can get to it, not at the key, which just moves an operating rod.

Dual exhaust

You can get dual exhaust on '79 Chrysler V8s, but you probably won't want to. The system has two catalytic converters, adding about \$250 to the price. To keep weight down, there is one tail-pipe and no clamps (it's an all-welded system). The single tailpipe does the job because the exhaust has cooled a lot by the time it gets to the rear.

Body

Bumpers on the '79 Newport-New Yorker-St. Regis four-door models are chrome-plated aluminum, so don't let the chrome plating fool you into thinking they're steel and can accept a bumper jack. A scissors jack is provided for use against jacking pads front and rear on each side.

The wheels on these cars are made of stamped aluminum, but they'll go on a standard tire changer or wheel-alignment rack.

The Newport-New Yorker-St. Regis are not really new cars, but are put on a reworked Cordoba chassis. The overall result is an improvement in serviceability. **PM**

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PM LOOKS AT

McCULLOCH'S POWER MAC 320 CHAIN SAW



Once you have used a chain saw to cut your first stack of firewood, it's a pretty safe bet that you will want to have your own. When you do make the decision to buy, a number of factors will influence your decision—the saw's bar length (capacity), power, ease of handling and, of course, price. One group of chain saws you should look over is the Power Mac 300 Series from McCulloch. The 320 shown here is \$169.95 and



Chain Guard/Brake handle is a comforting safety feature. Stops chain instantly.



In cold weather, the choke is pulled before yanking on the starter rope.



Next, your foot is braced against saw and the starter cord is pulled smartly.



In normal use, the brake handle tilts toward the rear; the chain runs freely.



If there is kickback, brake handle bumps hand, tilts forward, stops the chain.

SPECIFICATIONS—POWER MAC 320

Engine displacement: 2.1 cu. in. (35 cc)
Dry weight: 11.8 lbs.
Bar length: 16 in.
Ignition: Solid state electronic ignition
Fuel-tank capacity: 11.2 fl. ozs.
Oil-tank capacity: 3.4 fl. ozs.
Other features: Automatic and manual oiling; chain brake; antivibration system; muffler shield; auto chain sharpener.
Price: \$169.95
Manufacturer: McCulloch Corp., 5400 Alla Rd., Box 92180, Los Angeles, Calif. 90009.

offers some top quality features—electronic ignition, anti-vibration, automatic chain sharpening and a raft of safety improvements that include the wrap-around Chain Brake/Hand guard, a muffler shield, safety trigger and a chain catcher. A 14-in. model, with the same features except for the Auto Sharp, is \$149.95.—H.W.

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Available with 2-tone paint schemes, sport wheels, bucket seats. And an assortment of power assists (steering, brakes, door locks, even Cruise Control). Not to mention touches like air conditioning and AM-FM radio. GMC. It makes you appreciate Mother Nature. And Mother Nature makes you appreciate GMC.

Note: Camper top is dealer installed.

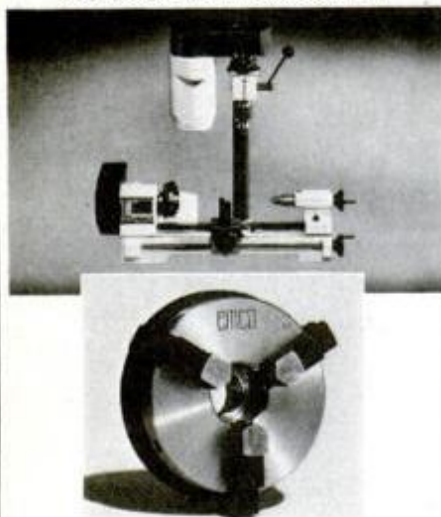


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Special Note to owners of the Unimat SL Series who have been looking for accessories. Emco-Lux has and will continue to have a complete line of all Unimat parts and accessories, manufactured by Maier and Company, builders of the Unimat line since the early 1950's.

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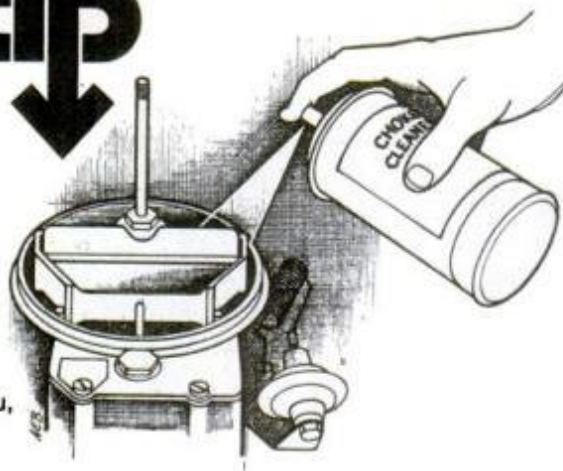
Be an unstickler

PM CAR CARE



With cold weather coming on, there will be the usual number of morning car-starting headaches. A lot of them will be caused by dirt that fouls the linkage of the automatic choke, preventing the choke plate from opening or closing.

Invest a couple of dollars in a can of carburetor and choke cleaner. Douse the choke plate and linkage generously with it. Then a snowstorm may deter you, but not something as silly as a sticking choke.



CAR CLINIC *(Continued from page 50)*

the 90° elbow and then the greasing adapter. With the CV joint's lubrication fitting (cup) positioned on top of the joint, work the adapter over the front end of the skid plate, stick one hand over the side of the skid plate behind the cross brace, and push the needle tip onto the fitting. Pump the grease gun until the grease shows between the centering ball and rear universal.

I block my truck when I do this job, put the transfer case in Neutral, and jack up the right front wheel so it just clears the ground. This makes it possible to turn the wheel to get the grease fitting in the right position.

Don't you think this is easier than removing the driveshaft?—Paul C. Hauschildt, Cedar Rapids, Iowa.

I'll let L.W. decide that since I don't have a Dodge truck. But thanks for the tip.

Painless cure

Has Chrysler ever found a cure for oil leaking out around the valve covers of its 400 and 440-cu.-in. engines? I'd sure like to know.—Gene Frazier, Jamestown, N.Y.

Yes, Gene, Chrysler has. You can get "the cure" from a Chrysler dealer. It's in the form of a newly designed gasket that's identifiable by its color (black) and its wedge-shaped tabs. To install this gasket, torque valve cover bolts from the center outward to 50 in.-lbs. Then, retorque them in the same pattern to 75 in.-lbs.

Polluting Hawaii's air

My 1977 Mercury Bobcat, 2800-cc V6 engine, is operating with an overly rich fuel mixture. Tailpipe

exhaust is dark black, and during fast acceleration/deceleration raw fuel explodes and backfires. The Lincoln/Mercury dealer has failed to resolve the problem. I'm told that the engine is correctly tuned, and that the model 2150-2V carburetor was preset at the factory and adjustments cannot be made. What can I do?—Ralph Mann, Ewa Beach, Hawaii.

The idle mixture should have been adjusted before the car was delivered to you according to article No. 1775-S in service bulletin 133 (4/26/77). Furthermore, make the dealer aware of the fact that a 1977 FoMoCo model having the 2150-2V carburetor that was built between Feb. 28, 1977, and Mar. 28, 1977, should have the carburetor checked for a choke that stays engaged too long. This is done by starting the engine and placing a finger over the choke clean-air opening in the carburetor air hole. If no vacuum is felt, the carburetor should be replaced. For your dealer's information, he should refer to service bulletin 140 (8/8/77), article No. 1942.

According to FoMoCo, you shouldn't have to pay for any of the repairs. If you get into a hassle with the dealer, consult a factory field office located in your area.

Stored up problem

I've got a 1940 Buick Roadmaster that has been in storage for nine years. Recently, I started it up. It smoked like a coke chimney. The longer it ran, the worse it smoked, and oil started to drip from the end of the tailpipe. Mechanics and service managers I asked tell me that rings have

(Please turn to page 162)

New National Smoker Study:

Merit Scores Important Victory!



High tar smokers report low tar MERIT delivers flavor of leading high tar brands

Are the toughest "critics" of low tar cigarettes satisfied with the taste of MERIT vs. leading high tar brands?

Read the results from a new nationwide research effort.

Results Confirm Breakthrough

Confirmed: Majority of high tar smokers rate MERIT taste equal to—or better than—leading high tar cigarettes tested! Cigarettes having up to twice the tar.

Confirmed: Majority of high tar smokers confirm taste satisfaction of low tar MERIT.

And in detailed interviews conducted among current MERIT smokers?

Confirmed: 85% of MERIT smokers say it was an

"easy switch" from high tar brands.

Confirmed: Overwhelming majority of MERIT smokers say their former high tar brands weren't missed!

Confirmed: 9 out of 10 MERIT smokers not considering other brands.

First Major Alternative To High Tar Smoking

MERIT has proven conclusively that it not only delivers the flavor of high tar brands—but continues to satisfy!

This ability to satisfy over long periods of time could be the most important evidence to date that MERIT is what it claims to be: The first major alternative for high tar smokers. © Philip Morris Inc. 1978

Kings: 8 mg "tar," 0.6 mg nicotine—
100's: 11 mg "tar," 0.7 mg nicotine av. per cigarette, FTC Report May '78

Warning: The Surgeon General Has Determined
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Kings & 100's

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It's time to put something hard on your car.**



THE HARD SHELL FINISH OF TURTLE WAX

Your car's finish gets a beading (not a beating), when you protect it from snow, slush, salt and sleet with Turtle Wax car wax. Ward off winter with the world's best seller.

CAR CLINIC

(Continued from page 160)

seized and should be replaced. My question is whether I should use chrome rings or ductile iron and steel rings. No one knows. Do you?—Andrew Powanda, Clairton, Pa.

Yep. Neither—not yet anyway. Over a period of nine years the valve stem seals may have hardened and cracked, which can account for the apparent excessive oil burning. This possibility is worth investigating before doing a ring job. New seals cost less than new rings and are easier to install.

Concerning which rings to use, if it comes to that, I suggest ductile iron and steel. They are better able to break in and seat against that Buick's old cast iron block than chrome rings.

SERVICE TIPS

■ 1978 Fords, Lincolns and Mercurys with 400-cu.-in. engines that idle rough or surge at steady road speeds can be fixed. FoMoCo uses almost two pages of service bulletin 158 (5/23/78) telling dealers how to do it. If your dealer hasn't gotten the word, tell him where to find it.

■ 1977-78 Cadillac Seville owners will be happy to learn that the source of a difficult-to-diagnose whistling noise that seems to come from the front of the car has been found. This very loud, high-pitched whistle, which is most noticeable at speeds of 25-40 mph, is being caused by air rushing through a gap in the front hood molding—the molding that bears the Cadillac name. Whistle-stop it by tightening up on the nuts on the underside of the hood while you are pushing the molding flush to the hood.

■ Chrysler reminds 1978 Omni and Horizon owners that only the three-inch-diameter high-pressure oil filter L-323 (part No. 5203217) should be used on the 1.7-liter engine. Using a larger filter will lead to oil leaks and possible rupture of the filter. If you do it yourself, be advised that this filter should be tightened three-fourths to one full turn after the gasket makes contact with the seat. Chrysler says, "A suitable oil filter wrench is required to obtain the three-fourths to one full turn." One such wrench is Miller Tool No. L-4551, which you can buy from a Chrysler parts department or by writing Miller Tool Co., 32615 Park Lane, Garden City, Mich. 48135.

GOT A PROBLEM WITH YOUR CAR?

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

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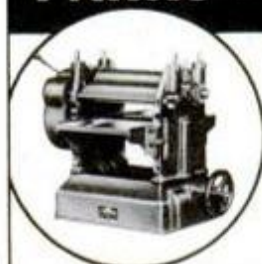
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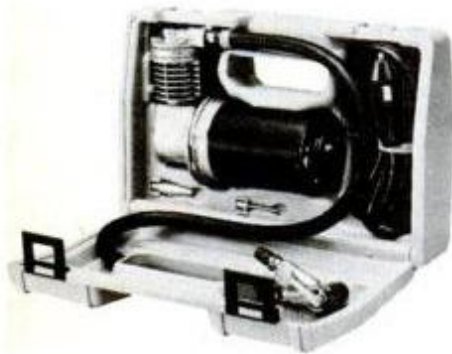


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DRIVING THE '79 AMC MODELS *(Continued from page 115)*

a fluorescent-display electronic digital clock, color-keyed styled wheel covers, whitewall bias ply tires and a bunch more.

But the height of little-car luxury has to be AMC's Spirit Limited, which comes with real leather seats and trim, power everything (except seats and windows), airconditioning, tilt wheel, tinted glass, AM/FM stereo, dual remote mirrors, larger glass-belted whitewall tires, a full-length center console with an armrest (but no handy storage compartment inside), and, on the liftback, a power liftgate release. Of course, most of these items, (except the leather interior) can be ordered as options on lower-priced models. Other new and interesting options include a pop-up, removable moon roof and AM/FM/stereo radio with CB.

GT and AMX

The fashionable thing for U.S. automakers these days is to black



Vacuum spark advance regulator is used on all Sixes and 304 V8 with automatic.

out all the chrome on a certain model and call it the "European Sport" or some such thing. AMC has done the blackout job on a special Spirit liftback version, but at least has resisted the temptation to dub it "European." Instead, it's simply called the "GT" and it's a nicely-done piece for those who like a bit of added sex in their small cars.

In addition to all the black trim, the GT package will get you steel-belted radials (blackwall, of course), spoke styled wheels, a console and armrest (black, of course),

leather-wrapped sport steering wheel (guess what color) dual remote mirrors (you guessed it), GT identification and even "deep-tone" exhaust sound with the V8 and manual-shift Sixes. This package is only available on DL and Limited liftbacks.

The GT "rally-tuned" suspension is a separate option applicable to the GT car only, so you have to buy the blackout job to get the trick chassis stuff. But for buffs who like their little cars really nimble as well as economical, it should be well worth it. Included are tuned front and rear sway bars, special strut rod bushings, "Hi-Control" rear leaf springs with "iso-clamp" pads, heavy-duty brakes, quicker steering and adjustable Gabriel "Strider" shocks all around.

The '79 AMX, which will be marketed as a separate model, is basically a liftback GT with good suspension and all the standard Trans-Am-style racy fiberglass pieces, plus its own special trim design instead of the GT's complete blackout treatment. There's a big front air dam, naturally, plus fender flares, a rear deck spoiler, ER60 x 14 white letter tires on 14x7 "Turbocast" aluminum wheels, accent stripping, and a wild (and removable) flame decal on the hood just so no one can miss the message. Inside, the AMX has a color-keyed console and leather-wrapped steering wheel, plus brushed aluminum instrument panel and door trim accents. There's also a power liftback release and a fully-instrumented gauge package.

Driving impressions

If you liked the Gremlin, you'll love the Spirit, and you might like it even if you were never a Gremlin fan. Base models drive much like the car they replace, but with better ride, quietness and comfort—even improved handling. There's little room in the sedan rear seat and even less in the liftback, but then the Japanese have proven that rear-seat room does not seem to be a major consideration for many buyers in this class.

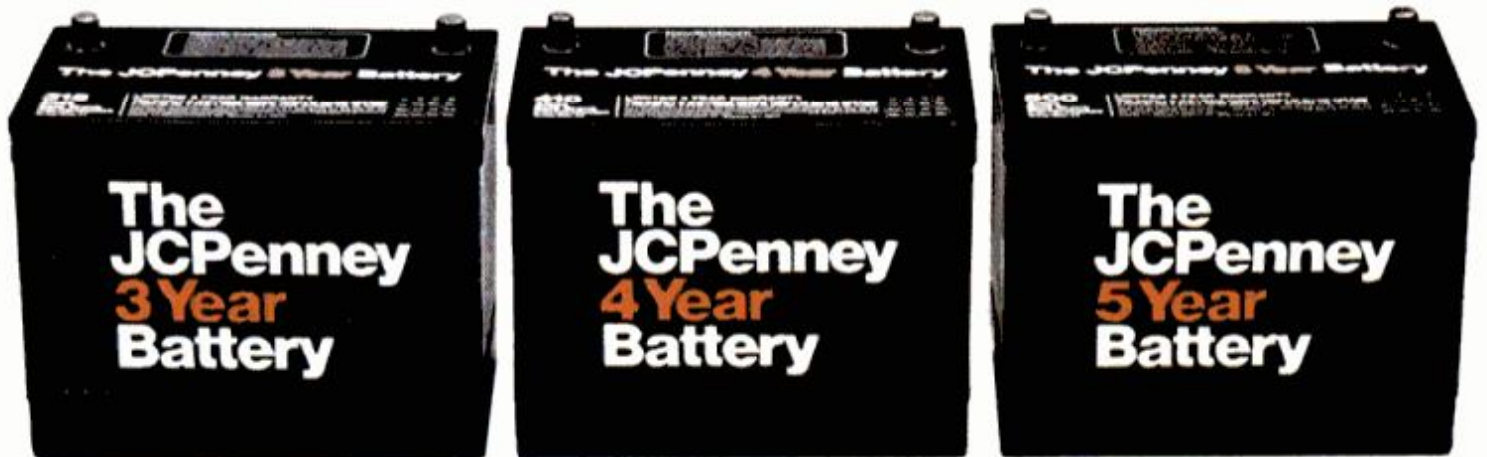
Front seats are a little cramped for those 6 feet tall and over, but no worse than most other cars in Spirit's class. DLs, of course, are still more quiet and comfortable, and Limiteds will knock you out for the amount of luxury feel AMC has built into such a basically inexpensive little car.

Everything in the new dash seems well laid out and easy to read

(Please turn to page 166)

When "the last battery your car will ever need" is more than you need.

The JCPenney Battery is the most powerful battery you can buy for your car. But it's not the only JCPenney Battery you can buy. There are alternatives. Three very powerful ones. The JCPenney 3, 4, and 5 Year Batteries. Each one has power to spare. Each one has an incredible warranty. So now you can choose the power you need and the price you want to pay. The JCPenney Family of Batteries. They're in a class by themselves.



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Cold Cranking Power

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THIS BATTERY IS WARRANTED AGAINST FAILURE TO ACCEPT AND HOLD A CHARGE FOR 3 YEARS WHEN USED IN YOUR PRIVATE CAR OR TRUCK.

- If it fails during the first year—we will replace it free.
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- If it fails during the 3rd year, we will allow \$10.00 towards the purchase of a new battery.

Just return it with proof of purchase to the nearest JCPenney store for service.

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- If it fails during the 3rd year, we will allow \$20.00 towards the purchase of a new battery.
- If it fails during the 4th year, we will allow \$10.00 towards the purchase of a new battery.

Just return it with proof of purchase to the nearest JCPenney store for service.

500 Amps (Group size 24)
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Limited 5 Year Warranty
THIS BATTERY IS WARRANTED AGAINST FAILURE TO ACCEPT AND HOLD A CHARGE FOR 5 YEARS WHEN USED IN YOUR PRIVATE CAR OR TRUCK.

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DRIVING THE '79 AMC MODELS *(Continued from page 164)*

and reach. The handy underdash parcel shelf is carried over from Gremlin (except on base cars), but you'll bump your knuckles on it when rolling down a window. The seats are comfortable, outside visibility is excellent, especially in the sedan, and the large usable glovebox makes those in most domestic cars look like letter boxes by comparison. On the negative side, the high center armrest (standard on GT, AMX and Limiteds) gets in the way of shifting when the car has a four-speed. The steering wheel seemed a bit too close, and there are no adjustable reclining seats available.

The four-cylinder may be cheap to run, but it's downright *slow*, and there's an annoying vibration around 4500 rpm. Six-cylinders are better if still somewhat anemic, but the V8 will do 0-60 in about 10 seconds—not bad these days. Handling is average but much improved with the GT suspension, especially in faster corners where the inherent understeer is less apparent. Unfortunately, however, the leaf-sprung rear axle gets badly upset by bumps

in midcorner, and the GT setup is a bit rough on tar strips and ripply pavement. The four-speed linkage on our test cars was much too loose and sloppy, but it did seem to find the right gears every time. Also we don't care for the notched console box with the automatic floor shift or the cheap-looking shift knob on the four-speed. Brakes were good except that the rear wheels locked in simulated panic stops, which can lead to control problems if you're not ready for it.

Lockup converter

The Chrysler TorqueFlite, which AMC installs with the Torque Command name, will have the Chrysler lockup converter on 1979 304 V8s. But unlike Chrysler products, it will lock at 40 mph, not 27-31 mph.

"There's a surge problem when you lock up at those lower speeds," said chief engine engineer Dan Hittler, "and if we tried to tune around it, we'd lose whatever fuel economy the lower lockup speed would give us."

(Please turn to page 168)

AMC SERVICE TIPS

A carefully-tailored increase in compression ratio, some camshaft realignment and a spark advance vacuum regulator will help American Motors meet '79 fuel-economy standards.

The compression ratio change, made on the bread-and-butter engine, the 258-cube Six, is only 0.3 (8:1 to 8.3:1), and it was done by changing the piston crown in the squish area.

■ The squish area is reduced, so as the piston rises, it pushes the fuel mixture, increasing turbulence. This results in better mixture distribution.

■ The smaller squish area is less prone to mixture self-ignition (from heat); thus, the octane requirement is about three numbers lower.

■ The higher compression ratio boosts engine efficiency.

AMC has retuned the 258 for better mileage, using up the octane advantage obtained from the combustion chamber modification.

Change manual trans 258 specs

The camshaft on manual transmission 258s is changed, but not new. The same as that on the 232 Six, it was selected because it has less overlap and provides better low-speed fuel economy.

Many tune-up specifications on the 258 for '79 are different from those in '78, so check before you adjust.

Vacuum regulator saves fuel

The vacuum spark-advance regulator is used on all Sixes and the 304 V8

automatic. It provides a regulated vacuum signal of 7 inches for idle and most off-idle operation. When carburetor port vacuum exceeds 7 inches, the regulator switches to the port signal, which will rise with increasing throttle opening up to 20 inches.

The regulator enables AMC engineers to put in all the spark advance that will benefit fuel economy at the low end. If an attempt were made to use just port vacuum for the high end and tailor the low end with centrifugal advance, there would be too much centrifugal at the high end, and the engine would knock. Electronic spark advance is the better answer, but for AMC the vacuum regulator does a satisfactory job at much lower cost.

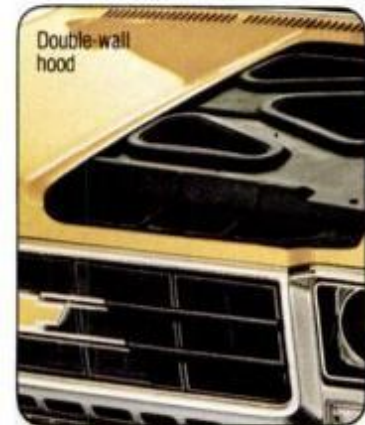
The valve is a sealed assembly with three vacuum hose connections: input from intake manifold and carburetor port, and output to distributor. Checking its operation is simple, and it can be done in either of two ways:

■ Connect a timing light and read the marks with the distributor vacuum hose disconnected and plugged. Then reconnect the hose and the timing should advance 8° to 9°.

■ Disconnect the vacuum hose from the distributor and hook up a vacuum gauge to the hose end. At idle and part throttle it should read 7 inches. Check switchover with a second vacuum gauge teed into the carburetor port hose and the port. Open the throttle. When the port signal exceeds 7 inches, the first vacuum gauge should read the same as the second.

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Two trucks for the price of one? Not quite. But every Chevy Fleet-side pickup has two walls of steel in areas where it's needed most. In the tailgate, pickup box sides, front fenders, hood and doors. And to help keep them tough, Chevy pickups for 1979 have extensive anti-corrosion protection, including a greater use of corrosion-resistant steels, more Zincrometal[®], more zinc alloy steel and more zinc-plated parts. For more good reasons to buy a tough Chevy pickup, see your Chevy dealer. Or if you'd rather lease a Chevy truck, many Chevy dealers can handle that, too.



Double-wall hood



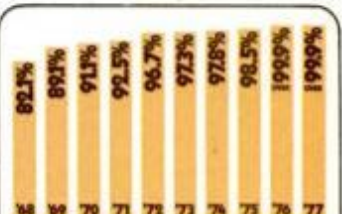
Double-wall fenders



Double-wall box & tailgate

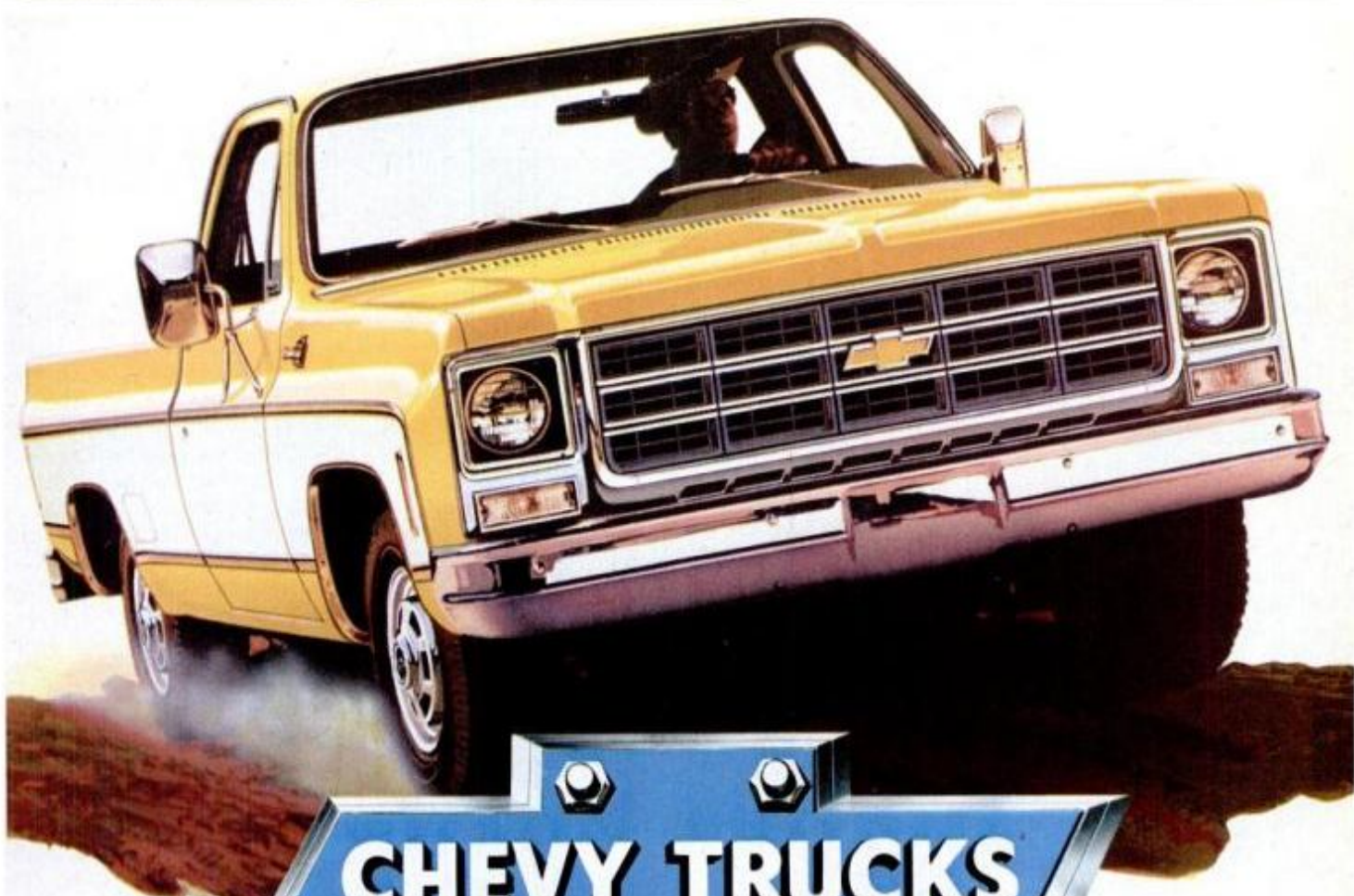


Double-wall door



A tough record to beat.

95.3% of all Chevy trucks, in the ten most recent years recorded, were still on the job. This is based on R. L. Polk & Co. model year registration statistics through July 1, 1977. 1978 statistics not available.



BUILT TO STAY TOUGH.

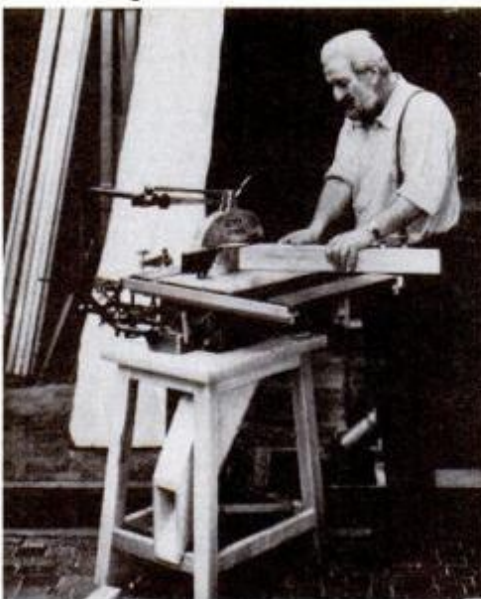
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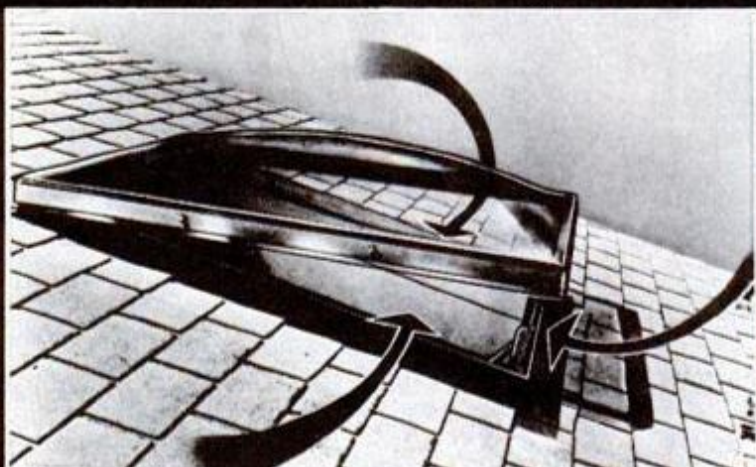
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DRIVING THE '79 AMC MODELS

(Continued from page 166)

AMC future

AMC still has some fuel economy margin in 1979, so the V8 continues. PM asked Hittler how long AMC can continue the present lineup.

"Assuming we can do what we think we can in the way of weight reduction, we start to run into real problems in 1981-82. If we tried to run with the Spirit-Concord lineup in 1985, we'd have to offer only the four-cylinder and practically all four-speed manual transmissions. Maybe we'd be able to sell 10 percent automatics."

Of course that wouldn't be a viable entry in the marketplace, so AMC would have to add a line of smaller cars. If the Renault deal jells, that would be one solution, Hittler said. "If it doesn't, we have to do a new car on our own."

How long would that take?

"It depends on what we have to do. If we have to do a front-wheel-drive from the beginning, it would be at least five years. If we can buy a front end, we might make it in 40 months."

Could AMC make it with just the hot-selling Jeep line?

"No. The engineering overhead has to be split, and if we sell one car for every Jeep, as we plan, it is. If all the cost goes on the Jeep, it won't work."

Other '79 AMCs

After considering dropping only the coupe model, AMC has finally decided to discontinue its whole long-neglected Matador line in deference to the federal fleet average fuel economy requirements. Concord, which sold surprisingly well in '78, gets a fully-equipped, leather-seat Limited model for '79, plus a more elegant-looking front end, aluminum bumpers and some new options such as the moon roof, power door locks, AM/FM stereo/CB and an air-shock leveling system. Ditto for Pacer, which now comes only as DL and Limited (no El Strippo "base" model), and has the more powerful two-barrel 258 Six as standard engine (one-barrel in California).

In sum, AMC for '79 has the best-looking and most competitive model lineup in many years. Since the future hookup with Renault of France should put front-drive Le-Car minis in AMC showrooms by winter, and the larger R-18 in the company's Kenosha, Wis., assembly plant in a year or so, things appear to be looking up for America's smallest automaker. **PM**

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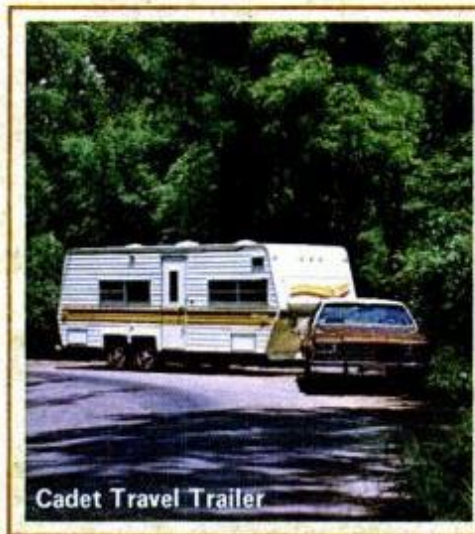
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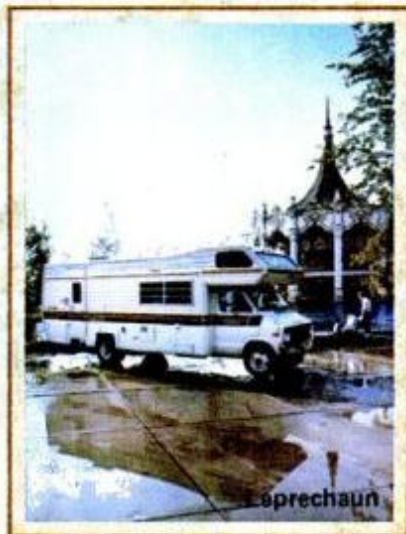
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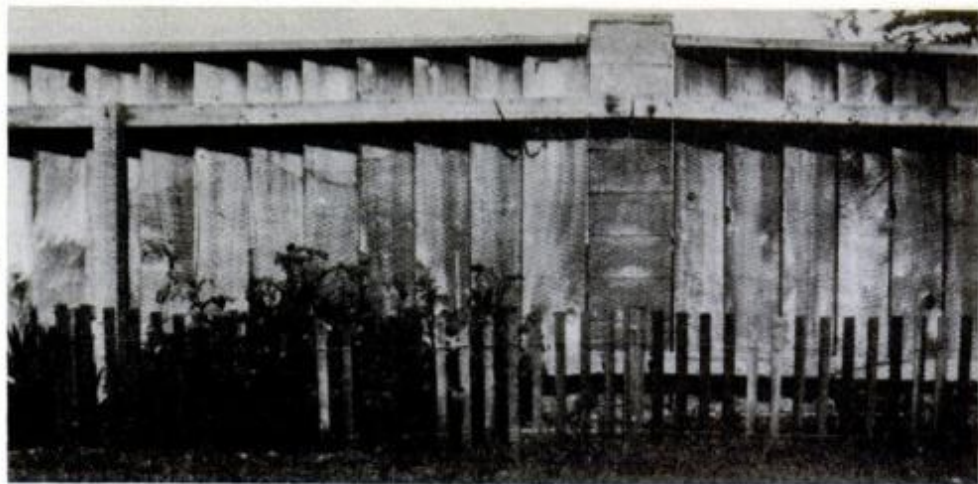
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Fence for a small garden

A strip of ground along your backyard fence is an ideal spot for growing flowers or vegetables. You can build a smaller garden fence that sections off the area to protect your plants.

This garden fence is 18-in.-high by 20-ft.-long utility fencing. It's made of redwood slats joined by wire. You can purchase it at lumberyards for about 35 cents per

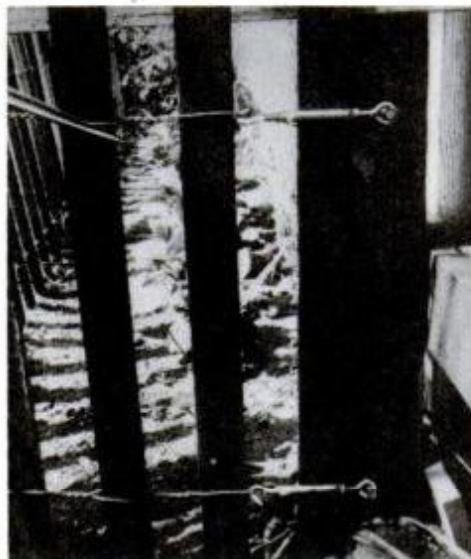
ft. Or write Tynan and Rogers, Box 540, Salinas, Calif. 93901, for the distributor nearest you. The slat fence is neat, stretches into place, releases easily and stores without squashing or bending.

Two end posts and a middle post are 2x4s cut 42 in. long and spaced about 8 ft. apart. Apply wood preservative and set them in holes about 23 in. deep. The two end posts connect to existing 4x4-in. yard fence posts by 1x4-in. rails. Bolt the utility fence through its middle slat to the middle post using 1/4-in. bolts and wingnuts (with washers under both head and wingnut).

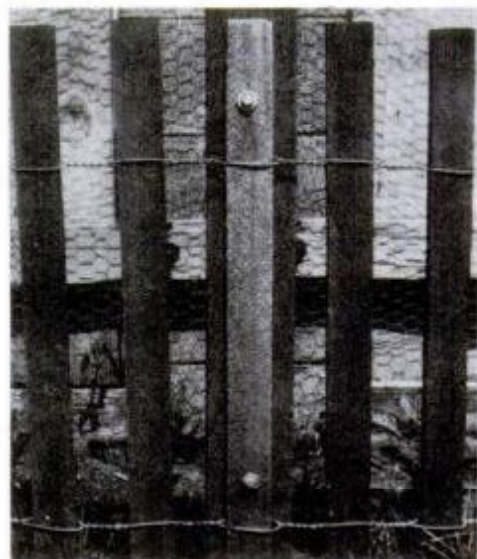
Four 3-in. turnbuckles, two at each end, hook into the wire that connects the slats. Their eyes slip over large nailheads in the yard fenceposts. Pull each end of the fence tight, hook the turnbuckle through the wire and tighten the turnbuckles. Later, you can remove the wingnuts and roll up the fence for winter storage.—*E.V. Reyner*



Top rails of 1x4 connect the garden fence posts to the existing yard fence.



Hook-type turnbuckles are fastened to yard fence and they tighten garden fence.



Bolt center slat to center post. Chicken wire (background) is for climbing plants.

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AIR FORCE 

KEEP YOUR CHAIN SAW HUMMING

(Continued from page 131)



Loosen mounting nut and turn tension adjusting screw to readjust the chain tension as shown in the photos below.



When chain and bar are cold, chain should look like this. You should not feel any binding as you pull the chain along bar.



A warm chain hangs down or sags as shown. This is correct as long as the chain tangs do not come out of the bar groove.



When tangs hang out of the bar groove, chain is too loose and needs retensioning. Never readjust chain until it cools.

best performing engine look very bad. The chain must be filed uniformly and accurately. Incorrectly filed cutters can cause the chain to chatter and bounce in the cut, causing shocks on chain components and reducing chain strength. If you find that sawdust from the cut turns from chips to powder, you're bearing down too hard to make the saw cut and the chain needs filing.

Sharpening the chain

Most dealers sell chain-sharpening equipment. It's important to maintain angles recommended by the manufacturer. If you don't feel you have the time to do the job right, bring the chain to a professional sharpener. But if you plan to do the job yourself, remember the following:

■ Hold file against cutter at 35° (marked on file holder).

■ Keep file level. Don't let it dip or rock.

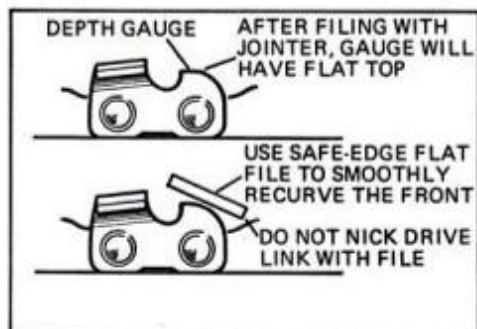
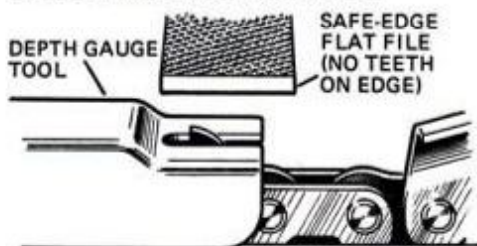
■ File in one direction only—toward the front corner of the tooth. Move file away from tooth face on return stroke.

■ Use light, but firm pressure. The holder will then position file to produce the 60° angle on cutting



To sharpen cutters, file toward the front corner of each tooth. Remove equal amounts of steel from each cutter.

HOW TO SET DEPTH GAUGE CLEARANCE



portion of tooth providing a hollow-ground underedge.

■ Use a few firm strokes on each tooth, filing all cutters on one side of the chain and then all cutters on the other. Rotate the file occasionally in the holder. If the cutters show abrasive wear on the top or sides, file the cutters back to a point where these worn areas disappear.

Depth of cut

The depth gauge determines the depth of the cut, as indicated by the thickness of the chips. The top plate surface of the chain tooth is angled

(Please turn to page 174)

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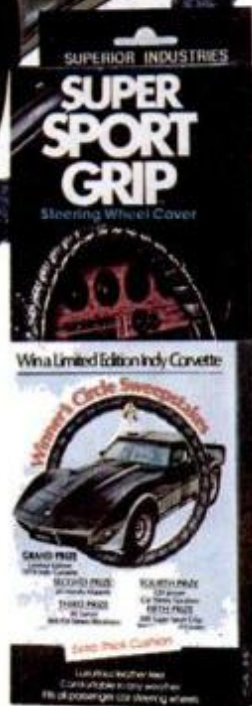
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SUPER SPORT GRIP from SUPERIOR™

KEEP YOUR CHAIN SAW HUMMING

(Continued from page 173)

and lower at the rear than at the front. As a tooth is filed back, the height of the cutting edge above the depth gauge is decreased, so it's necessary to file the depth gauges after three or four sharpenings on the cutters.

Depth gauges that aren't filed down will restrict the depth of the cut, indicated by powder sawdust. Gauges filed too much produce chips that are too thick, which can cause the chain to jerk and grab, thus overloading the engine. The proper depth setting for the chain used on most homeowner saws is .020 in. Check your owners manual. The original shape must be maintained after filing. Most dealers sell devices for controlling the correct filing depth.

Chain tension adjustment

Chain tension is also important. If the chain is too tight, it will burn up the lubricating oil and eventually overheat and tighten up. When set too loose, the chain will pound the guide bar at the entry and along the rails. With a new chain, you should check the tension often during the first few tankfuls of fuel. When checking chain tension, always see that the engine is shut off. A chain expands when it's warm, and contracts when cool. Allow a few minutes for cooling before adjusting chain tension.

Automatic chain oilers are common on today's saws, but they can malfunction. Check periodically for sufficient lubrication. Whether you have an automatic or pushbutton oiler, your chain should show evidence of oil. A slight oil film on the drive links and tie straps is desirable.

Test for lubrication

The drive sprocket, usually part of the clutch drum, has teeth in constant contact with the drive links of the chain. The sprocket rarely needs attention, but should be replaced whenever a new chain is installed. The clutch portion usually has a bearing which functions only when the engine is at idle. It rarely needs lubrication. Consult your owners manual for specific instructions, but remember that overlubrication can cause the clutch to slip if the lubricant gets onto the drive surface.

Use your manual in conjunction with the basic maintenance outlined here and you'll be sure to keep your chain saw humming as well as buzzing on the job.

FM

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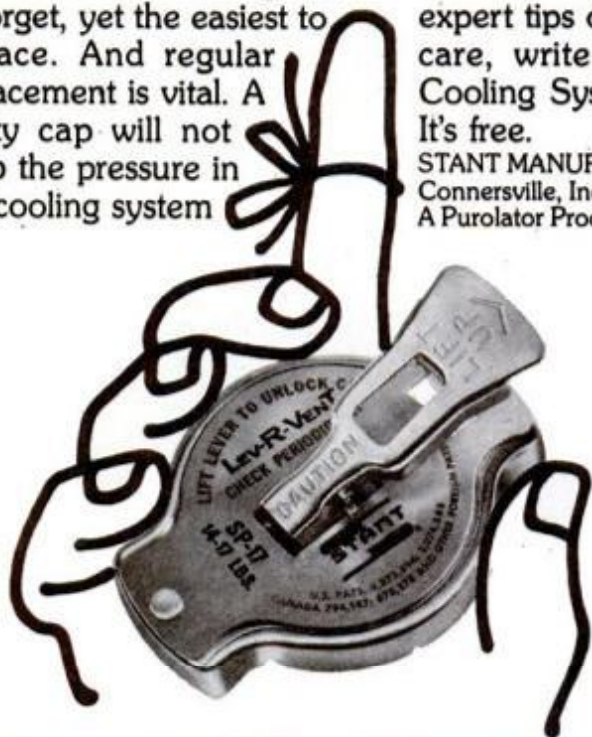


Remember!

Whether you work on your car yourself, or have your service station do it, remember to check the radiator cap. It's the easiest component to forget, yet the easiest to replace. And regular replacement is vital. A faulty cap will not keep the pressure in the cooling system

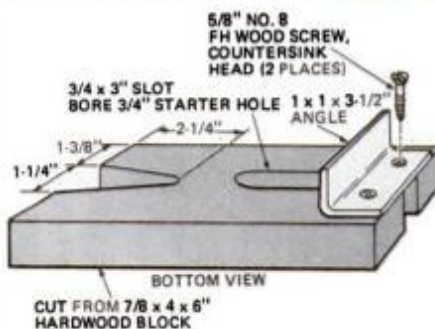
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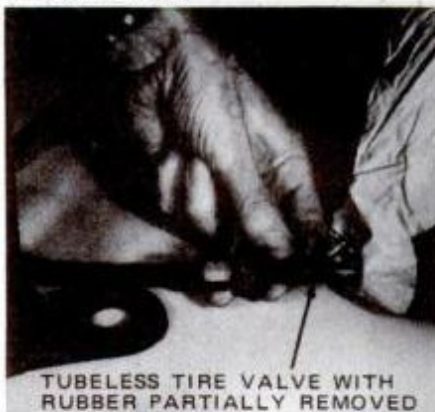
HINTS FROM READERS

Make a V-block



This easy-to-make V-block is almost a third hand when used with a coping saw. A C-clamp holds it to table or workbench. Saw cuts on pull stroke.—*Richard R. Busch*

Inflator's aid



Cut the metal valve from an old inner tube or tubeless tire and use it to inflate rubber toys. The threaded end will couple with most pumps. Pare away 3/4-in. rubber on cut end with moist knife blade, file clean to fit inflation valves.—*Jess Christul*

Camping tip

Plastic 35-mm film containers make great holders for small items when camping. Waterproof and durable, they hold matches, fishhooks, even an emergency sewing kit.—*E.V. Reyner*.

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CHRYSLER, PLYMOUTH & DODGE

(Continued from page 113)

the Japanese know the car, or as we'll know it, the...

Champ/Colt hatchback. This

new, front-wheel-drive mini, whether it's wearing a Plymouth Champ badge or sporting Dodge Colt hatchback stripes, is a tour de force. Mitsubishi set out to design and

(Please turn to page 180)

THRIFT OR SWIFT WITH TWIN STICK

You can have it both ways with the flick of a stick on the new Champ and Colt hatchback models. The additional gear-shift lever offers eight gear selection possibilities from what's basically a four-speed transmission.

No, it isn't overdrive, although the Rambler overdrive of the '60s also carried the Twin Stick name. The Mitsubishi setup adds an extra shaft in the transmission with two gears and shifting fork connected by cable to the power/economy lever next to the usual four-speed stick. Push the Twin Stick lever forward to power and you get high numerical gearing (1.526:1) for maximum performance. Pull it back into the economy position and the gear ratio drops 25 percent (to 1.181:1) for reduced engine speed and improved fuel economy.

What Mitsubishi did was simply move the conventional fwd transmission mainshaft down, from in line with the flywheel, and install in its position a new shaft with the choice of power or economy gears.

The power and economy gears mesh with gears on the mainshaft where the usual four forward-speed gears are located. The mainshaft meshes with the final drive shaft, the one with the pinion to drive the differential-ring gear.

Here are some of the advantages of the Mitsubishi design:

- It can be shifted from power to economy and back at any time (using the clutch) and at any speed within the rpm limits of the engine.

- It's compact. Everything is housed in the existing transmission instead of being appended to the rear. It adds just six pounds to the weight of the car.

- It's simple. The Rambler o.d. had a

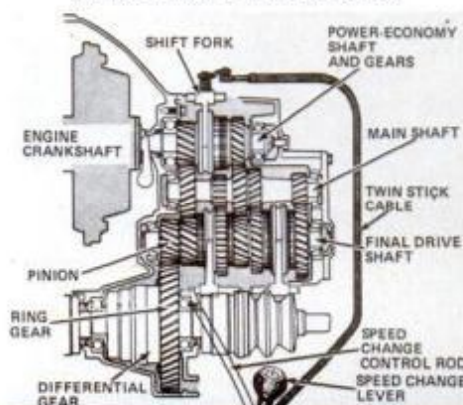
Dimensions (in.)

Wheelbase: 90.6
Length: 156.8
Width: 62.4
Height: 53.1
Weight (lbs.): 1850

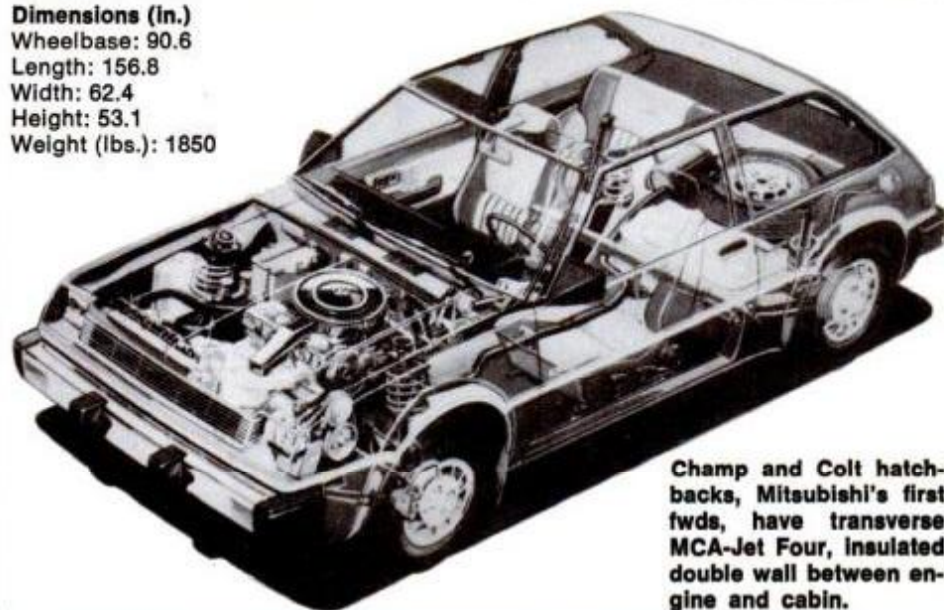
planetary gearbox, a governor, a solenoid and many switches.

The new hatchbacks also have well-laid-out engine compartments. Even with air conditioning, they're not crowded. That's quite a feat since models with air have radiator and condenser side-by-side with an electric fan for each. The air compressor is beneath the horizontally mounted ignition distributor. If it has to come out, taking the distributor out first only adds a few minutes to the job. All sparkplugs are at the front and easy to replace.

TWIN STICK TRANSMISSION



Power or economy range is selected using shift lever at left of four-speed stick.



Champ and Colt hatchbacks, Mitsubishi's first fws, have transverse MCA-Jet Four, insulated double wall between engine and cabin.

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(Continued from page 178)

manufacture an "internationally acceptable" small car, and did just that. It used to be easy to design cars for rigid size categories—compacts, intermediates, big—but it's a challenge to do a one-size-fits-all. Okay, you start by minimizing the mechanicals, stick the engine up front sideways and drive the front wheels. That's no secret, we all know what's up front these days—it's what comes after that counts.

This is one "econobox" that avoids the boxy edges: It's smooth and aerodynamic from front to back. You may have trouble distinguishing an Omni from a Rabbit, but there's no mistaking a Champ or Colt hatchback for any other car. The ease with which a 95-percentile American male makes himself at home in the car belies the effort that went into its design. The headroom's there and so are leg, elbow and stretching room. Tricks with thin pillars, door and rain-gutter design contribute to the excellent visibility and an-almost open-car feeling of roominess. Another neat trick is the space-saving elimination of steering wheel stalks and placement of the light and wiper switches on the sides of the dash instrument pod, where they're still at your fingertips while your hands are on the steering wheel. A very slick trick, indeed.

Even in its bare-bones configuration it's a very pleasant machine to live with. Four speed trans and 1400-cc MCA-Jet Four is standard drive train with Twin Stick optional. The Twin Stick (see page 178) promises a 10-percent increase in mpg in the economy mode. The Twin Stick is standard with the 1600-cc MCA-Jet in the Custom and Sport models. (The third-valve Mitsubishi Clean Air [MCA] approach to lean burn was fully described on pages 104 and 159, Oct., '77.) The extra 200 cc adds 10 hp: 80 SAE net



Light switch on instrument pod can be flicked while hands stay on steering wheel.

over the 70 at which the 1400 is rated. Axle ratio for both setups is 3.470:1.

Handling is predictable fwd under-steer, and reaction to steering inputs is quick and precise through the manual rack-and-pinion system. Front suspension is independent strut, rear, trailing links. The U-shape of the rear allows nestling of fuel tank and spare in safe, space-efficient positions.

In the design of the Mirage, their first fwd effort, Mitsubishi engineers had ample time to study similar cars already on the market, so it's not surprising that it's hard to fault any aspect of the car's design, performance or construction. As the saying goes, if you don't do it first, do it better.

New Yorker, Newport, St. Regis. More at home on I-95 than a twisty test track, the smaller and lighter, six-passenger Chrysler cars look better than ever and perform surprisingly well with their new standard engine. The 225-cu.-in. slant Six in these 3700-pounders provides enough kick, I found, so that you're



Dodge St. Regis is now lighter, 220.2 in. long, 77.1 in. wide and 54.4 in. high.

not sure you don't have the 318 V8 under the hood. The cars are up to 9 inches shorter and 800 pounds lighter than last year, yet offer every bit as much, if not more, luxury and creature comforts than previous years.

"Open Road" is a nice suspension package on the Dodge St. Regis that's a must for enthusiastic drivers. And for trailer towing, remember, you'll need one of the V8s: choice is 318, 360 or 360 high performance. The old 400 V8 has been deep-sixed.

Deep pile is the standard on the six-seaters, and leather seats, reminder chimes instead of warning buzzers, power this and that and electronic search sound systems are some of the things on Chrysler's list of features, some standard, some optional.

Omni/Horizon 2+2. If you were expecting a familiar four-door Omni/Horizon minus the back two



Dodge Aspen Sport Wagon puts racy car equipment on a station wagon body.

doors, you'll be surprised—they're completely different concepts. On a smaller wheelbase, but 8.5 inches longer than the four doors, the 2+2 models are hatchbacks whose styling will grab you right away or not at all. The relationship of pedals, seat and controls did not come together for this driver (brake pedal, for example, is higher by a mile than the accelerator), so I never really felt comfortable at the wheel.

The fwd 2+2s use the same drive train as the four-doors (1.7-liter overhead-cam Four placed transversely and working into a standard four-speed or optional automatic). Horsepower is 75 at 5600 rpm. Like their four-door counterparts, the 2+2s move out smartly, are extremely practical with their hatchback/rear folding-seat arrangement and are easy on gas.

Arrow. New in the quiver for '79 is a Fire Arrow model that was flogged unmercifully at its introduction. The splashy, striped and stiffly sprung fastback is heavy duty all the way: 2600-cc MCA-Jet Four, four-wheel disc brakes, cast aluminum wheels, clawing 185/70 tires, dual racing mirrors. All that sporty stuff is working for you on this one. A long day of hard driving revealed that this is another high-spirited Mitsubishi machine with mettle.

Still in the Arrow lineup are the base, GS and GT models (there's a new pickup now, too). New options are available on top of an already impressive list of standard equipment.

Volare/Aspen. These compacts are little changed since their debut in '76, but there's a real attention getter in the lineup for '79: The Dodge Aspen Sport Wagon is the family man's muscle car, and proof that you can have your cake and eat it too. Dodge gets credit here as the first and only automaker to offer one tough-looking machine that'll still be gentle on a load of urchins or eggs. On the outside the Sport Wagon growls with its aggressive road wheels, fender flares, air dam and race track trim, but inside it

(Please turn to page 184)

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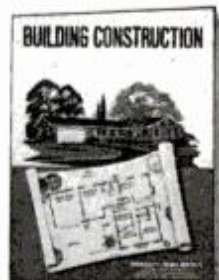
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PM LOG SPLITTER

CHRYSLER, PLYMOUTH & DODGE

(Continued from page 180)

purrs: the seats are superbly shaped and upholstered buckets; carpet covers everything; steering wheel, controls and console are a delight to hand and eye, and full instrumentation is available.

Sorting out the Aspen/Volare sedans and coupes will take a computer, the options, accessories and special packages are so numerous. Of course, it's those offerings that let you really personalize the cars. "Sunrise," R/T, Duster and Road Runner are some of the express-yourself packages.

The rest of the cars in the Chrysler Corp. lineup were pretty easy to get hold of, since they're largely carry-overs—a new grille here, new option there, revised this or that and some mechanical refinements. But nothing to warrant lots of driving to become familiar with. Here in no special order:

Omni/Horizon four-doors. They've got the price edge on the Rabbit (from which they're derived), and are decked out specifically to appeal to the U.S. driver who likes their economy and handling. That's why they're going like gangbusters—and why the *Consumer Reports* "not acceptable" tirade is not going to affect the ultimate acceptance of these cars one whit.

LeBaron/Diplomat. Last year's new ones come decked out as Sport, Salon, Medallion and Town & Country models, but this year there are new, lower-priced entries—base models—that'll provide solid, but no-frills, transportation in the mid-size category.

Cordoba/Magnum XE. Two-tone paint availability is one addition to the list of extras for these two-door specialty hardtops. Magnums with the 360-cu.-in. engine get a standard maintenance-free battery. Grids are strontium alloy instead of antimony. Service life is 38 to 40 months; it's got longer shelf life and is 11 pounds lighter than its weight of a year ago.

Colt coupe, sedan, wagon. With Mitsubishi's fwd Colt hatchback—a new car for the '80s—stealing the limelight, the "old" cars are easily overlooked. The front-engine, rear-wheel-drive colts may not possess the "in" drive train, but they all use an MCA-Jet Four—certainly a state-of-the-art engine (and one that some other respected automakers are interested in copying). Models range from the sporty coupe to the practical station wagon, with its longer wheelbase and 59.0 cu. ft. of cargo space. **PM**

1976-78 police Novas shown.



Portland, Me.



Fort Worth, Tex.



Portland, Oreg.



Windsor, Conn.



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There are a lot of reasons why you'll like the 1979 Chevy Nova for your own use. It's attractive, comfortable, dependable, and most of all, it's reasonably priced.

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Chevrolet

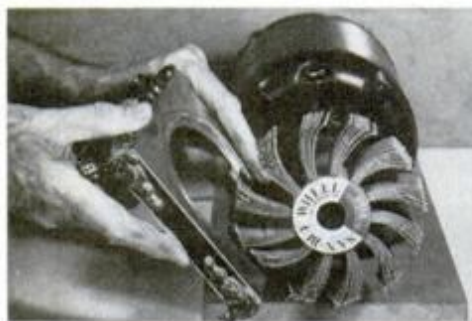


1979 CHEVY NOVA



HINTS FROM READERS

Refinishing brass



I wanted to remove the protective coating on a piece of brass so I could repolish it. My experiments with several methods of removing the coating weren't successful. Then I tried using an abrasive wheel. The fine-grit, flap-type wheel did a professional job. Although it left some fine lines on the brass, I easily removed them with a paste polish called Simichrome. Later, I coated the metal with a clear lacquer that would serve as a protective finish.—Walter E. Burton

Tap small holes easily



Avoid breaking small taps by tapping work still clamped in the drill press. Use a drill chuck as a support and bearing for the tap's upper end. Make a tap wrench from a large bolt head or $\frac{3}{8}$ -in. piece of $\frac{7}{8}$ -in. hex steel. A No. 27 drill makes a center hole for shanks of 6-32 and smaller taps; 5-40 setscrews on faces 120° apart hold tap. Turn wrench with fingers only; never with drill press.—Walter Olsen

Food for thought



Food-serving tongs available in supermarkets and houseware departments can handle hot objects in the shop. To get a secure grip on a small item, slip it through one of the loops on the pick-up end. Hang the tongs by a handle on a nail or hanger that is located within easy reach.—Parry C. Yob

Checkpoints for shade-tree mechanics.

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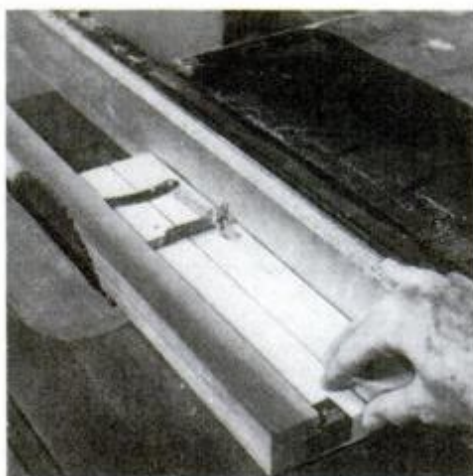
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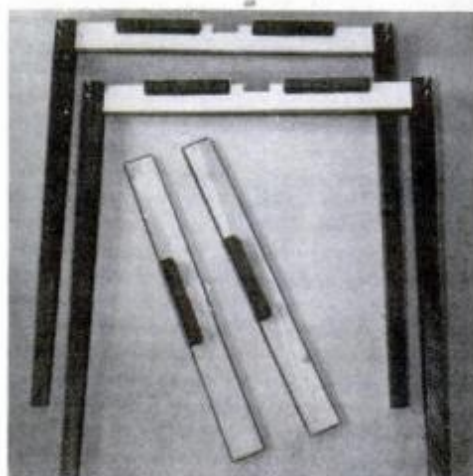
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TOOLS

FLIP-FLOP GAME TABLE

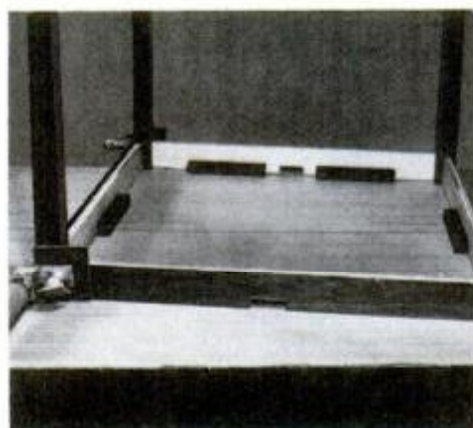
(Continued from page 68)



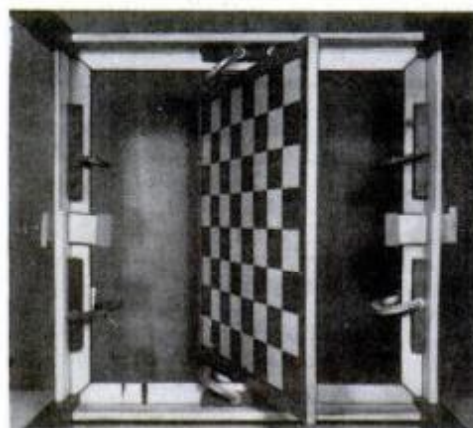
Dress walnut stock for legs on jointer, cut taper with table saw and tapering jig.



Notch two aprons for slides and fasten the glue blocks flush to the apron tops.



Use bar clamps and glue to assemble doweled understructure; check for square.



Place slides in notches. Glue and clamp gameboard frame to understructure.

the pivot hole in the frame so the gameboard top is flush with the top surface of the frame. Simply halve the thickness of the gameboard and use that dimension to locate the frame pivot hole by measuring offset from the good face. After drilling hole in one frame member, use it as a guide for marking second hole. A 16d nail, inserted in the hole, can be used to make a starter hole in the opposite frame member before drilling. Or use a jig to assure hole alignment (see photo, page 68).

Cut two segments of 10d nails for pivots. Working on a flat surface, insert pivots loose (no glue) in gameboard. Spread carpenter's glue on mitered ends of the frame. Lay members with walnut sides down so the frame and gameboard are flush on the side that becomes the table top. Apply a framing clamp around the frame and use one C clamp at each corner to hold wood scrap across miters, thereby keeping the joints flat. Before tightening the framing clamps, insert eight wood or plastic scraps 1/16 in. thick around the gameboard to obtain uniform clearance all around. After the glue

is dry, remove clamps and add veneer edging around the outside edges of the frame.

For the legs, run walnut over a jointer or dress with a hand plane and then cut to length. Use a tapering jig on a table saw to taper two inside faces of each leg.

Make slides as shown. Apply veneer trim to edges and install brass ring pulls. Cut notches in two aprons for slides.

To prepare for the final assembly, cut glue-blocks from scrap wood and fasten to aprons with glue and screws. Then drill matching dowel holes in aprons and legs and assemble the understructure with glue.

Insert slides in their notches and glue understructure to frame/gameboard assembly. When clamping, use hardboard scraps to protect walnut frame surface from clamp marks. Add small glue blocks in corners to reinforce legs to aprons.

The choice of finish—varnish or oil—is yours. The gameboard should be finished before assembly. Drive furniture glides in leg bottoms, after making starting holes to avoid chance of splitting.



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	Model 101-M Movement Complete with Tempus Fugit Dial, Westminster Chimes for Model 120-K	33	\$124.50		
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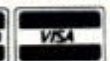
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Ever need a trailer, but not all the time? Or want to have one handy, but there's no place to park or stow it?

Bill Browning, in Denver, Colo., asked himself the same questions, and answered them with a multi-purpose rig that comes apart when it's not in use. His Port-a-Trailer assembles in 15 minutes, using link pins and snaplock rings so that no tools are necessary. The unit weighs 200 pounds and can carry 1000, but disassembles into parts that weigh no more than 35 pounds each. Partially folded, the trailer is only 24 inches wide and, with a handle attachment, can be used like a wheelbarrow or firewood cart and will fit through narrow doorways for easy storage.

Accessories also include a soft or hard cover, spare tire, bike rails and loading ramp. Basic 5-foot model is under \$450 f.o.b. Browning Manufacturing, 5133 East 38th Ave., Denver, Colo. 80207.

Not sure you'll need it on a trip? Take it apart and carry it in your car trunk.—*Bill McKeown*



Luggage and accessories can be enclosed and locked for safety while moving or traveling. Cargo cover is optional.



Loading ramp and mounting rails are trailer options that enable motorcycles, trail bikes to be securely transported.



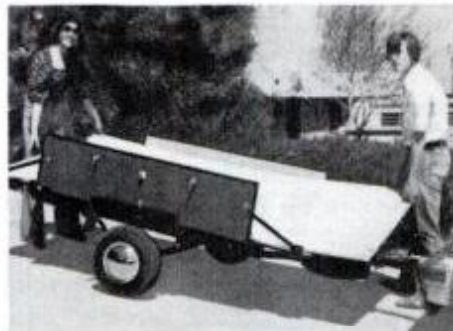
Contracted to narrow 24 inches and with hand-grip tongue added, unit becomes wheelbarrow to fit through doorways.



Hitched behind a garden tractor, the cargo box will carry bulk loads. Removable sides and ends make unloading easy.



Bicycles can be transported without drop ends lowered, as is required with larger snowmobile, motor bikes, mopeds.



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CHOOSING NEW CAR OPTIONS

(Continued from page 119)

in the EPA's fuel consumption tests. Many manufacturers have begun to design certain models especially for this test. For maximum economy, you'll want your car equipped in exactly the same way as the car that took the EPA test, with the following exceptions: If the test car had automatic transmission, an identical model with stick shift should do even better—provided the axle ratios are the same. The same is true for a car with an optional "economy" axle ratio or an overdrive transmission.

A fuel-saving option not found on

many EPA test cars is automatic cruise control, which can save gas on the open highway by eliminating erratic driving. It's available only with automatic transmission, however. Another gas saver is the economy meter still offered by some manufacturers. Follow the advice of this dash or hood-mounted vacuum gauge and you will become a regular featherfoot.

Airconditioning, when it's on, wastes gas. But some kinds waste much more than others. The "cycling" type of airconditioning turns itself off and on to maintain a given temperature, and therefore imposes only about half the fuel penalty of

(Please turn to page 196)

ONE MAN'S PONTIAC, OR HOW I CUSTOMIZED MY CAR

Theory is all well and good, but the acid test is trying to order up a car using the tips from the accompanying article. In the summer of '78 I bought a Pontiac Le Mans. It had an option list as long as an ape's arm, and I played it like a fine instrument, with the help of a cooperative dealer.

My basic choice was the four-door sedan with V6 engine. Then came the factory options, dealer options and aftermarket options that helped me build exactly the car I wanted.

For reasons of comfort, fuel economy or vanity, I ordered the following options: Four-speed transmission; limited-slip differential; airconditioning; power steering and brakes; heavy-duty battery, alternator and radiator; sound insulating package; courtesy and map lights; AM-FM radio; controlled-cycle windshield wipers, and dual racing mirrors. I like four-doors, but to keep our small kids in I was forced to go against my better judgment and order the \$125 power door locks. I just caught a mid-season special in which the factory would install the 60/40 split bench seats from the ritzy Grand Le Mans in my plain pipe-rack Le Mans.

Pontiac's dished steering wheels are a little too close to the driver for my taste. GM's tilt steering wheel is not available with manual transmission. The flat Formula wheel from the Firebird is about an inch further from the driver, and the dealer was happy to install one for \$46 (list price minus a \$19 trade-in on the standard wheel).

The big problem developed over the instruments. I wanted the Rally Cluster, which includes oil, water and voltage gauges, plus a tachometer. But it's only available with automatic transmission! I bought the car from the only dealer I could find willing to order these instruments as spare parts and install them in his service department. This cost more than twice the factory-installed price, but I'm glad I got them.

Pontiac offers fussy cast aluminum wheels that cost \$290 a set. While the Le Mans was on order, I caught my local speed shop's four-for-the-price-of-

three sale, and got four Western Superlite wheels for \$190. Not only do I like their European looks, but the Superlites are a snap to clean! Pontiac's body side molding (black only) is \$42. I got a do-it-yourself kit in tan, to match the interior, for \$28.

I ordered the widest tires Pontiac would sell me (195/75) for \$19.56, with the standard wheels and hubcaps. I sold the hubcaps to a salvage yard for \$20 and traded two of the wheels to a tire dealer in return for mounting and balancing the Sportlite wheels. I kept the other two wheels for snow-tire use.

For some reason, you can't get the Rally suspension with the V6 engine. It consists of heavy-duty shocks, front and rear antisway bars, wide 205/75 tires and a faster steering ratio. The dealer ordered and installed the sway



Sport mags and driving lights can put more fun into your time at the wheel.

bars. I bought Koni adjustable shocks on sale and installed them myself. In my experience, the Konis will last the life of the car, with periodic adjustments to compensate for wear.

I wanted to install Cibie's new rectangular quartz-iodine headlights, but they are now illegal in every state but Oregon and Washington. But, for some reason, Cibie's equally-bright bumper-mount driving lights—also quartz-iodine—are legal. I got them.

The final result is a sort of all-American GT car that I enjoy very much, especially when the FM radio croons *I Did It My Way!*—W.H.



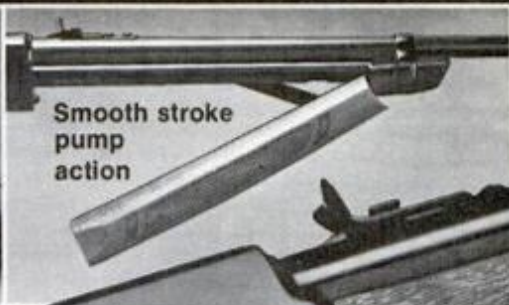
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CHOOSING NEW CAR OPTIONS

(Continued from page 194)

the noncycling "all season" units that keep the compressor running winter and summer, and adjust the temperature by blending in hot air from the heater.

Aftermarket air can save you (or the dealer) at least \$90 compared to "factory air." Here's a typical example: Factory air costs \$544 on the Pontiac Le Mans, and you must also order the \$152 power steering and \$69 power brakes, bringing the total price to \$765. You can have an aftermarket unit installed for \$400 to \$460, and skip the power steering and brakes if you want. But be sure to order the heavy-duty battery, alternator, radiator and suspension to begin with, and maybe tinted glass too.

Good aftermarket units are completely hidden from view, and so good that you can't tell them from factory air. Ford, Chrysler and AMC sometimes tell their dealers to install aftermarket air on special models with such small runs that it's impractical to install air at the factory! How can you be sure you'll get factory air if you pay for it? You can't, so never pay more than the cost of aftermarket air, no matter what the dealer says it is. Find the price of aftermarket air for your car by phoning firms listed under *Auto Air Conditioning* in the classified directory.

Performance

Performance comes in two varieties: straight line and around corners. Any salesman can order the big engine for you. You want to see the spec sheets that list car weights and engine horsepower. The biggest engine may not have the highest horsepower. And if it gives only 10 to 15 hp more than a small block engine, it may actually give you more pounds-per-horsepower than the small block option.

Also check the weight of the various car models: A 145-hp 305 V8 in a 2700-lb. subcompact gives you only 18.6 lb./hp to lug around, while a 185-hp 403 V8 in a 3700-lb. intermediate results in 20 lb./hp.

The aftermarket is glutted with more performance equipment than we could possibly cover here, but it's against the law for new-car dealers to install most of it. Even an unmodified car will accelerate faster with a low-geared axle ratio. What were called "performance" axles, are now known as "trailer-towing" or "high-altitude" axles. They have ratios of 2.7:1 to 3.5:1. (The days of the 4.11:1 axle ratio

are over except on trucks or from aftermarket suppliers.) Performance ratios will give you an edge in the stoplight grand prix, and shoot your gas mileage all to hell. "Economy" axles (numerically lower than 2.7:1) save gas but generally reduce a car's acceleration to glacial levels. Manual transmissions with overdrive gearing can give you the best of both worlds. If the salesman can't figure out which transmissions have overdrive, ask to see a spec sheet that lists the gear ratios. Any ratio lower than 1.0:1 (0.85:1, for instance) is an overdrive gear.

To improve cornering performance, there is a staggering selection of lightweight alloy wheels, wide tires, antisway bars and heavy-duty shock absorbers available from factory or aftermarket. The factory heavy-duty or "police" suspension package makes sense. But when it comes to rubber, you can often improve handling as much by changing the brand of your tires and shocks as you can by going to ridiculously wide tires that cause fender clearance problems.

Reliability

A trouble-free car is the goal of many buyers, though for most it is merely wishful thinking. The guy who has it figured out orders a car almost stripped of power, trim, comfort and convenience items, secure in the knowledge they are just trouble waiting for an inconvenient time to happen. He wants a basic transportation module and as little grief as possible. This buyer will order:

- Automatic transmission, because it has no clutch to wear out.
- Steel-belted radial tires, because they are good for at least 40,000 miles.
- A medium-sized engine, because it won't be overworked the way a small engine will, nor so heavy that it overburdens tires and springs.
- A heavy-duty suspension, battery, alternator and radiator, because they couldn't hurt.
- Vinyl upholstery, because it is easier to clean than cloth.

He will skip the vinyl roof, air-conditioning, fancy radio and power anything if he can possibly avoid it. He'll stay away from extra chrome trim (often a starting place for rust) and he'll invest in a proven rustproofing treatment such as Ziebart.

The real smartie will order up a police or taxi package. A typical one for the Ford Fairmont includes: extra reinforcements in the unitized

(Please turn to page 198)

Fun Insurance



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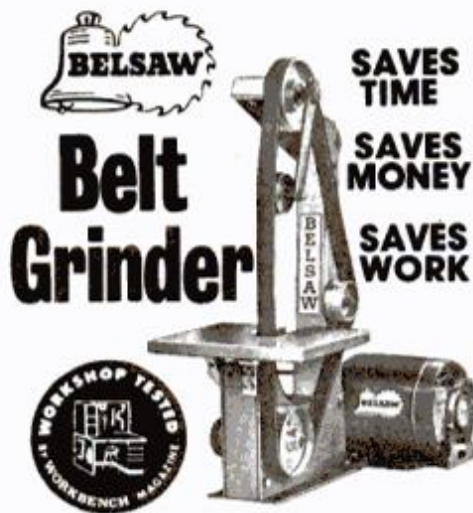


So send now for your copy of "Tune-Ups", then head for the automotive department of your favorite retail store where you will find all the quality RAC tune-up equipment you'll need to achieve perfect results. While you're there, don't overlook famous RAC tach and gauges so you may monitor your own tune-up work. You will also use them to drive with maximum economy.

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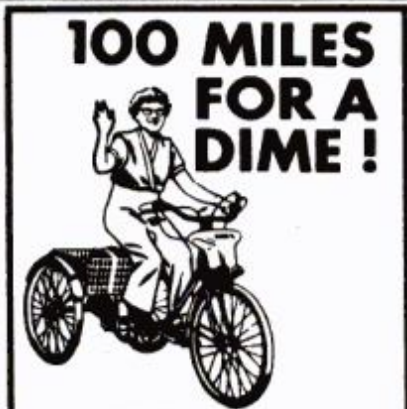
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CHOOSING NEW CAR OPTIONS

(Continued from page 196)

body; hardened axle spindles; heavy-duty alternator, battery and suspension; oil coolers for the transmission and power steering pump; a "maximum cooling" package; front and rear antisway bars; and radial tires rated for police use. Chevrolet, Pontiac, Dodge and Plymouth also offer police/taxi packages. Dealers are sometimes reluctant to order them, and they are built only in batches, so you will have at least a two-month wait, maybe more. But you will be able to get one, minus the lights and pursuit engine, and it's as bulletproof a car as America makes.

If you want to tow a trailer, by all means get the factory trailer-towing package. It contains modifications to the engine, transmission, frame, differential, cooling and electrical systems that would be expensive or impossible to add after the car is delivered.

General rules

Each salesman has a little pocket-size book that lists all of the factory options, their available combinations, and their list prices. There is nothing confidential about this book (it contains no dealer costs), so insist on seeing it. Don't believe that you can only get bucket seats on the Super Chromo model, which is \$450 extra, unless you see it in the price book. Even then, the factory has periodic specials when they will put slow-moving high line options into their low-line cars just to get rid of the stuff. Have the salesman check with his manager and with the factory zone manager for such specials. They could save you money. You may be able to get tan buckets in that low-line car, but not red, so be flexible on your color choices.

Some options do run out before the end of the model year. They're just gone, and the factory won't order more from their suppliers because they won't need them next year. This usually applies to trim and appearance items, not under-the-skin hardware.

Check for promotional packages such as free airconditioning or automatic transmission with certain engines or car models (a favorite AMC gambit). One recent package from Oldsmobile offered a free sport steering wheel, racing mirrors, mag wheels and pinstriping if you ordered any one of the five AM-FM radios. That's a bargain if you don't pay full list price for the radio. Other packages offer

a "special price" for certain combinations of options. These are bargains only if: (a) you want all of the package items to begin with, and (b) the package price is lower than the dealer's cost plus maybe as much as 8 percent. Don't compare this price to the list price of the package items.

Bring along your pocket calculator and do some homework. Use *Consumer Reports* "cost factors" (printed in April issues) to determine the dealer's cost for the car and options you want. Add license fees, dealer prep charges (if any) and transportation costs—you'll find them on the stickers of similar models in the showroom—and you'll have the dealer's bottom line. He should be happy with \$300 to \$400 profit over that. Consumers Union claims you will come within \$50 of the actual dealer cost by using its formulas. Since this markup stays pretty stable from year to year, it's a better system than the dealer-cost publications, which are often out of date by the time they hit the newsstands.

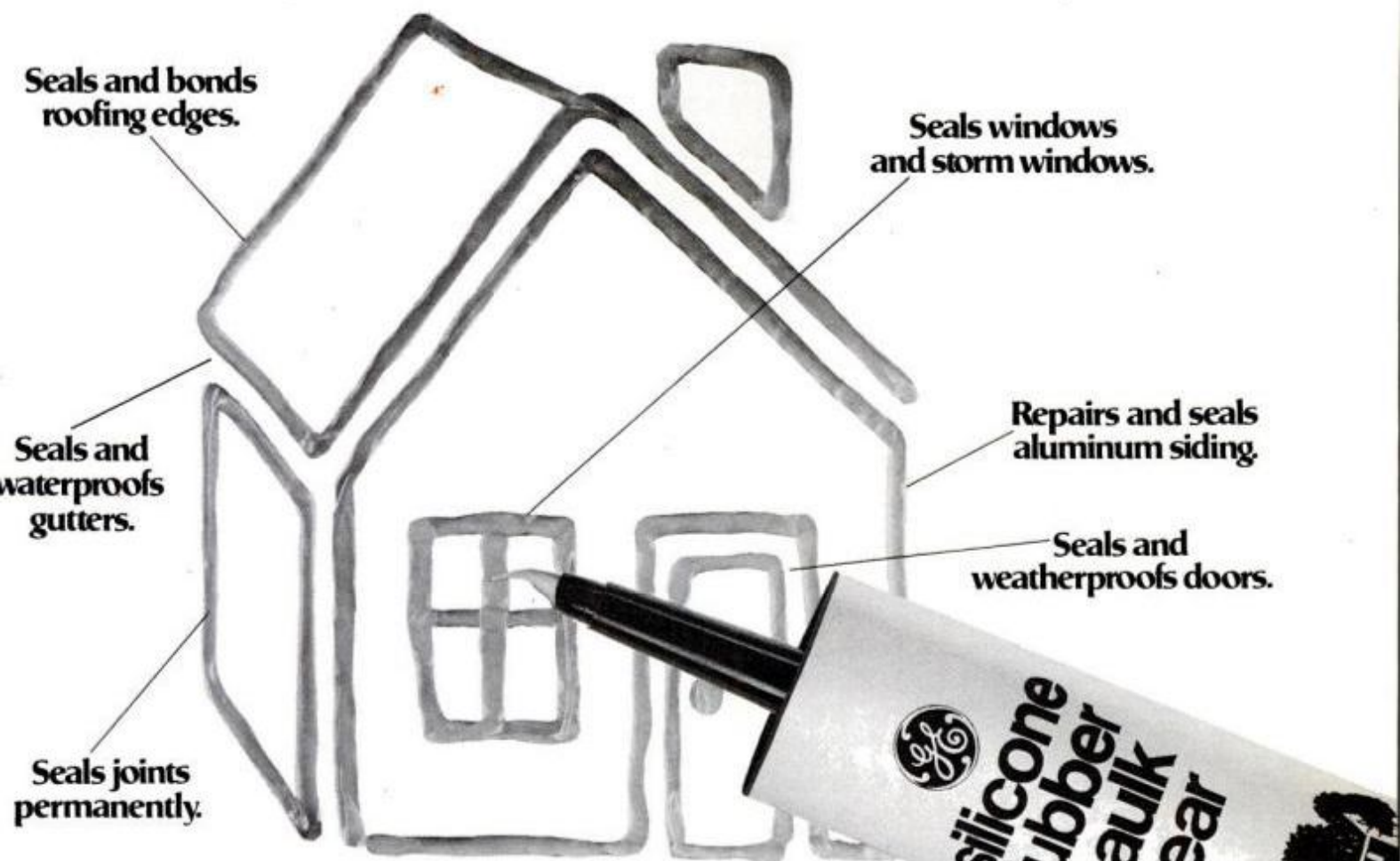
Beware of mandatory options that the salesman "forgets" to tell you about during your negotiations. For example, New York State requires an electric rear window defroster on all cars sold. That can be a \$95 surprise when you take delivery. The law is the law, but you don't have to pay list price for it. Offer dealer cost plus 8 percent. And don't fall for such salesman's lines as "all our cars are rust-proofed at the dock." Bull! Don't pay for anything you didn't agree to, or anything you didn't see on the order form.

Trade-ins

The way to get an honest quote on your trade-in is not to mention it until you have agreed to a firm price for the new car. Then ask: "How much could you give me for my old car?" It will be the official Blue Book wholesale price, or less, and it may sound depressingly low. But that's better than an inflated trade-in price coupled to a new car sale at close to list. Remember, there's no way the dealer is going to pay you more than wholesale for your old car. If he says he will he's beating you out of it somewhere else. If you're not happy with the real trade-in price for your car, sell it privately.

When salesmen play the options game, they play to win. You should be just as tough. Be polite, but don't try to be the salesman's buddy. You don't want to see him for another 5 to 10 years anyway!

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Flexible, waterproof General Electric Silicone Rubber Caulk. It's 100% silicone rubber compound. Silicone. Unlike any other kind of caulk and seal on the market today.

It seals completely and permanently — to almost any surface in and around your house.

It won't dry out. So it doesn't shrink. Or crack.

Or peel. Or fall out. And it resists temperature extremes as low as -65°F and as high as 500°F .

It comes in white, black, clear, and metallic.

It comes in a long-lasting plastic cartridge.

And now it comes with a new resealable cap. So you can use a little — and not have to waste the rest.

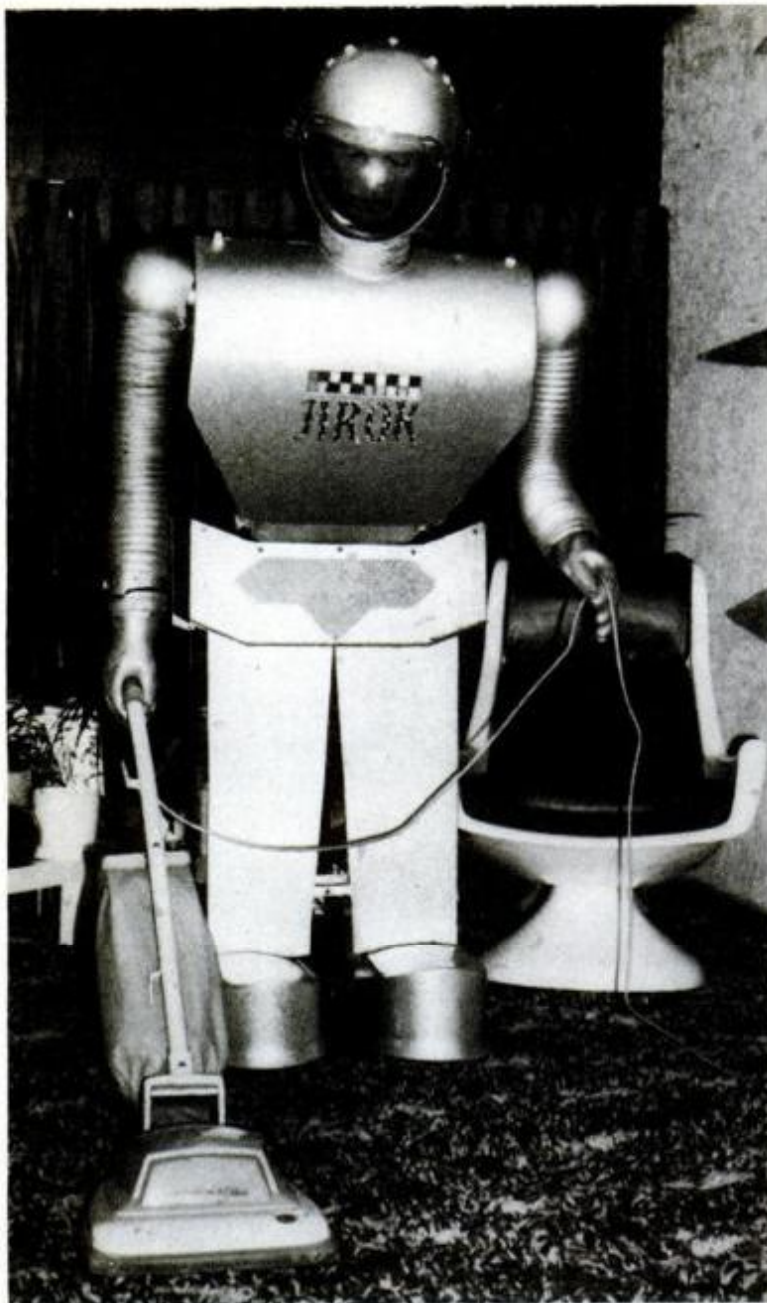
Whatever needs caulking, give it the GE Silicone Seal.

With GE Silicone Rubber Caulk. It goes better around windows.

It goes better around doors. It goes better all around the house.

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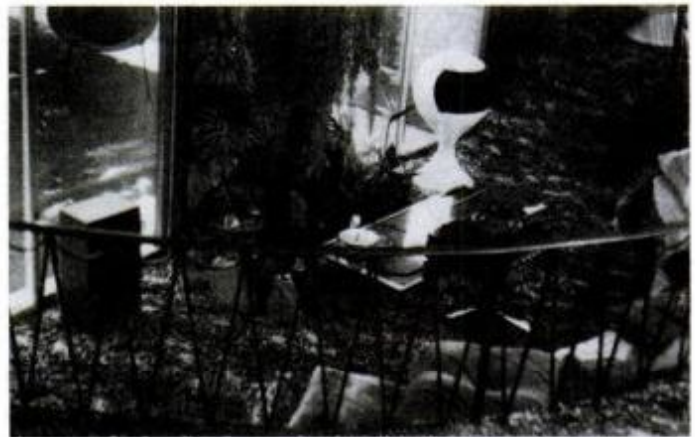


Ben Skora's homebuilt robot does household chores, earns keep by hiring out for local promotions. Living room, patio share huge turntable; at Skora's command, indoors is out.

Open house with a live-in robot

This inventor's home is the kind all button-pushers would like to live in!

by Victor D. Chase



Ben Skora has a thing for remote-controlled objects. It doesn't matter what it is, if it can be automated Skora will build it. His crowning success, to date, is Arok the robot. This 275-pound compilation of surplus and scrap parts will shake your hand, chat with you, walk the dog, take out the garbage, bring in the mail, and do at least some of the housework. It also brings its owner/inventor \$700 a day when it's employed at shopping center openings and similar promotions.

Perhaps the highlight of Arok's illustrious career was being one of the judges at the Miss Nude World Contest held last summer at the Naked City nudist camp in Rose-land, Ind.

Arok's home is in Palos Hills, Ill.,

some 35 miles southwest of Chicago, where he lives with his 51-year-old inventor. I went there recently to find out what kind of man spends some four years of his life building a robot. I found in short order that Arok is far from the only thing Skora has built. His home itself is nothing short of a collection of automatic devices, some of which truly stretch the imagination.

In Skora's own words, "I'm kind of a nut. I get an idea, and I do it. I never question if I can do it." The fact that Skora marches to a different drummer becomes obvious shortly after you enter his home. Besides the robot, he has built a disappearing toilet, a revolving living room, and reading lamps that swing from one chair to another on

the command of a pushbutton, to name a few.

And what does Sharon Skora, his wife of 14 years, have to say about all of this gadgetry? "It's kind of fun, except when things don't function exactly as they should. Another problem is when people come knocking at the door late at night asking to see the robot."

Skora's latest development is a motorized chair. If getting up and going to the refrigerator—or wherever else you might want to go during TV commercials—is just too much trouble, then this chair is for you. A switch on one arm controls forward and reverse, while a switch on the opposite side steers it right or left. Not content with this, Skora

(Please turn to page 202)

IF YOU OWN A TV AND A HI FI, YOU'D BE FOOLISH NOT TO OWN THIS COMPONENT.



Television has always been fun to look at.

But compared to your hi fi, it's an absolute disaster to listen to.

Where your hi fi provides you with rich, undistorted sound, the average TV sounds no better than a cheap kitchen radio.

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It's the first TV audio tuner. A high quality audio component that attaches to your receiver or amplifier like a cassette deck, and provides you with rich, clean, clear TV sound. Through your hi fi system, instead of the TV. (When you use the TVX-9500, you turn your TV sound off.)

But the TVX-9500 does more than just make TV sound better.

It makes TV an entirely different experience.

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snap. And almost wince at the tackle.

Movies begin to feel as if you're sitting in the theatre, instead of your living room. Characters like Brando's Godfather remain just as menacing in 19" as they were in Panavision. Musicals like "The Sound of Music" don't end up featuring "the sound of distortion." And for the first time, someone like King Kong will also sound larger than life.

Then there's TV music.

With the TVX-9500, live concerts will, at last, sound that way.

Symphonies will finally be as much fun to listen to as they are to watch. (Which is the whole idea of watching them in the first place.)

And when you view something like "Gone With The Wind," you'll actually be able to hear Atlanta burning.

Admittedly, even the great sound the TVX-9500 offers won't make up for bad TV programming.

But then our advice would be to do what you'd do to a bad TV show anyway:

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And enjoy your hi fi.

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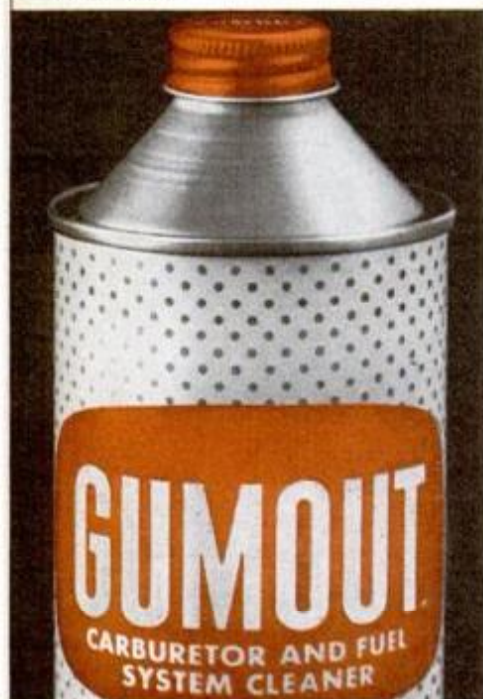


The between tune-ups, tune-up.™

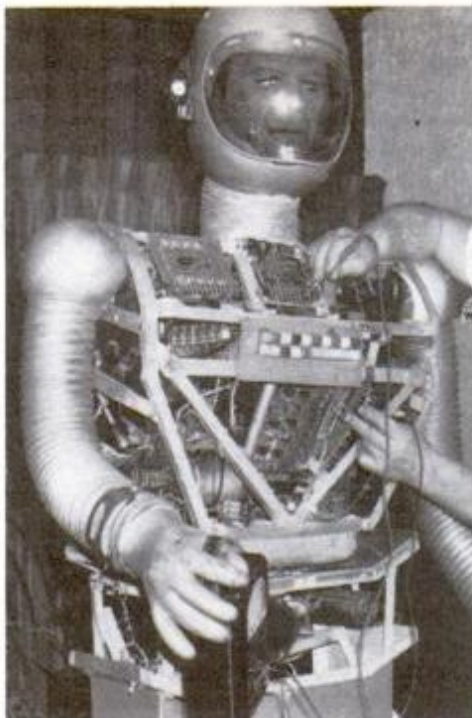
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Robot holds meter while inventor does a checkup. Construction took four years.

is planning a remote pocket control for the chair; if you don't want to walk over to sit down in it in the first place, it will come to you.

You might decide to relax on the couch in Skora's sunken living room, and listen to the mellow tones of his remote-controlled stereo system, while water trickles down the remote-controlled waterfall in front of you, and colored lights dance on the wall in time to the music.

But don't get too comfortable. At Skora's push of a you-know-what, the sunken living room starts revolving on a huge turntable and you find yourself out on the patio—the inside having been replaced by what a moment ago *was* the patio.

Skora likes surprises. There was the time, for example, when a crew came along to repair the blacktop in front of his house. Skora tuned in Arok, had him roll up alongside one of the busy workmen and casually ask, "Do you guys need any help?" The workman dropped his rake and nearly fainted.

One day just after Arok was completed, Skora sent him out with the garbage just as the garbage truck arrived. He also sent the robot to the door for the mail, and so on.

Sharon Skora is something of a jokester herself, and has more than once turned the tables on her husband—literally. If she wants to throw Ben out of the house all she has to do is wait until he is relaxing on the couch.

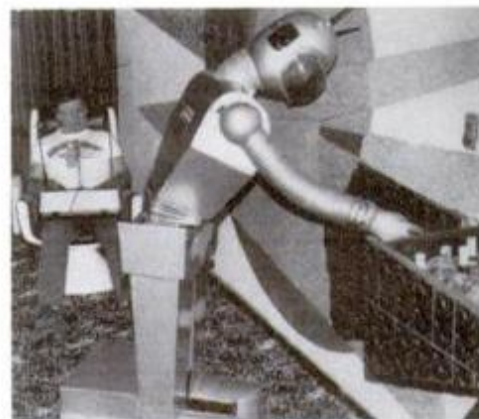
"I've revolved him and his friends out there a few times," she says,

"and sometimes I leave them out there until they pound on the door. You develop a great sense of power in this house."

Skora controls his robot with a relatively small transmitter box topped by three touch-tone telephone pads and a microphone. All of the other equipment in the inventor's home can be operated by pushing number combinations on a standard touch-tone telephone (which, incidentally, also serves as a telephone), or by pushing the combination on a remote transmitter that looks like a pocket calculator, or by individual switches. Most devices will respond to all three forms of actuation. When either the telephone or pocket transmitter is used, the signal is sent to a central processing unit in the garage to which each Skora gadget is tied. Individual switches are situated near the item to be controlled and operate it directly, bypassing the central processor.

What did Skora do for a living before he was able to clear \$700 per day with Arok? The answer is just about everything.

After a stint in the service he became involved in hypnosis, and started the Hypnosis Research Institute. He later owned several auto

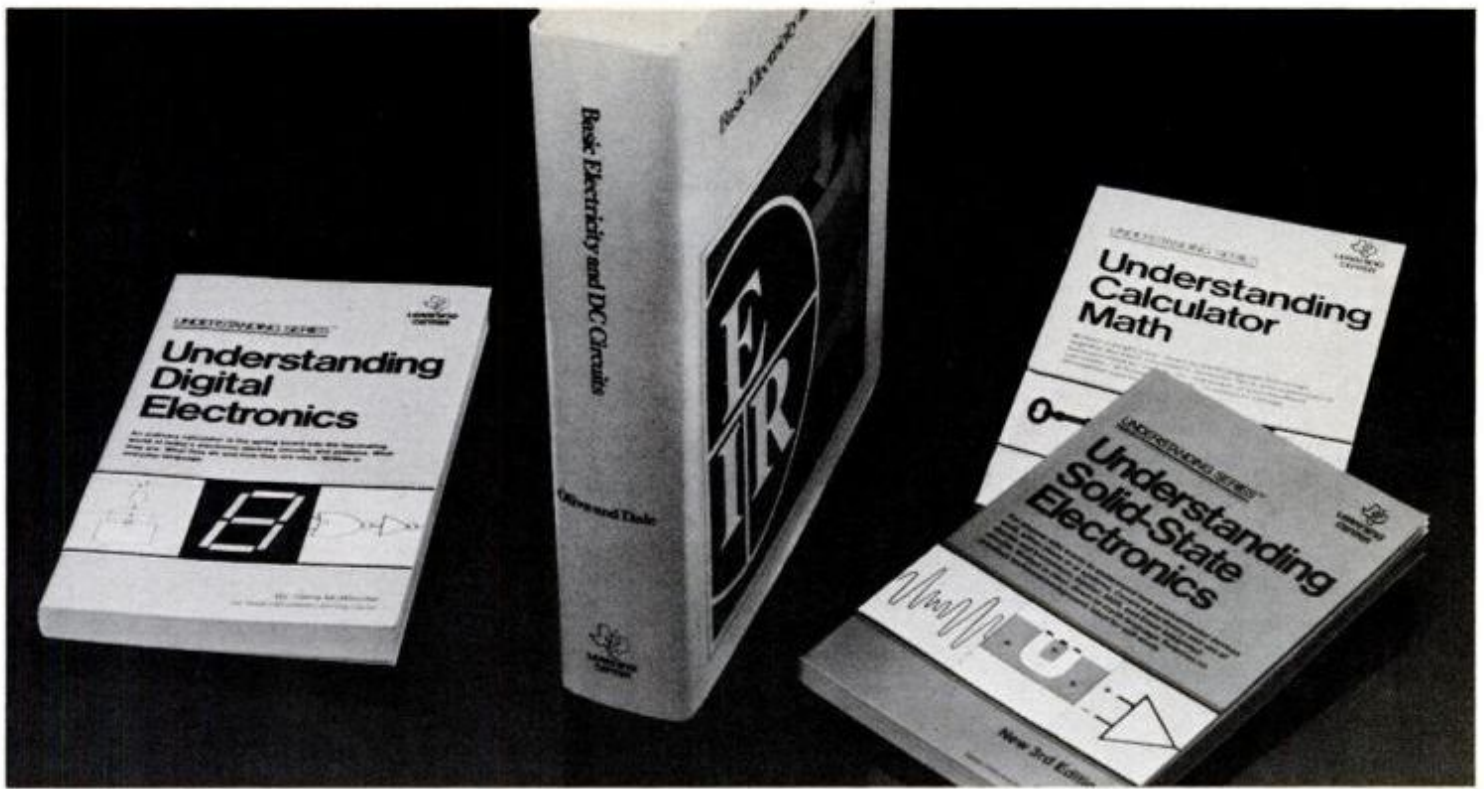


From his mobile chair, Skora controls the robot while it mixes him a tall, cool one.

body shops, became involved in a recording company, and is an accomplished magician. But, throughout, his true love has been tinkering.

"When I was a kid, I had to take everything apart and see how it worked," Skora says. His affair with remote control began at the tender age of 12 when, he claims, "I believe I was the first one to build a remote-control garage door."

And from here? "The next robot I build will operate on my brain waves. I will think, and he will do. Boy, are we going to get into trouble next year in Naked City." **PM**



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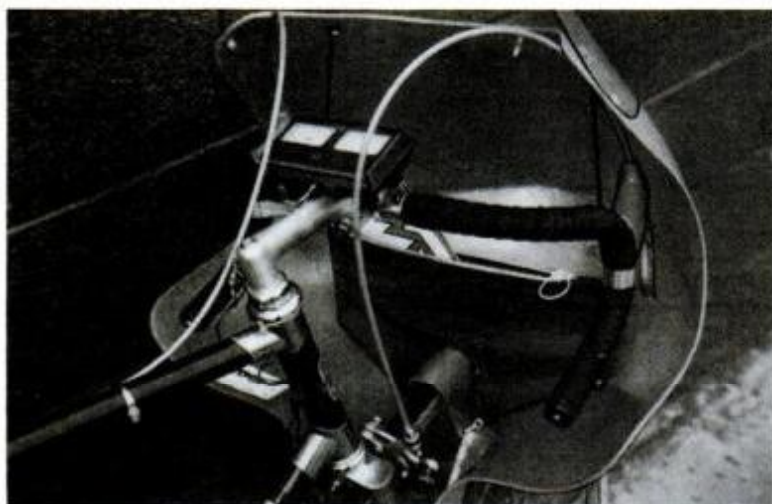
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Bike streamliner

Air resistance accounts for 80 percent of the force retarding a moving bicycle, says the maker of the Edge. The 30-ounce fairing is made of Marlex plastic and is claimed to mount easily to the fork of most 26- and 27-inch-wheel cycles having drop handlebars. The Edge is said to reduce air resistance significantly and can store up to five pounds of gear in its removable, zippered pouch. Guaranteed for five years; about \$70 with windscreen, pouch. Velocity Plus, 1101 West Washington Blvd., Venice, Calif. 90291.



Family hovercraft

Take the whole gang for a spin in the six-seater Phantom. A 138-hp Ford V6 drives twin fans for thrust and lift; skirt of 20-foot craft has replaceable segments. Phantom is said to be able to pull a skier and have a top speed over 40 mph. About \$15,500. Light Hovercraft Co., London Rd., East Grinstead, Sussex, England RH19 2BH.



Flash in the hand

The Colorburst 300 is a motorized instant camera with built-in electronic flash. The flash unit has a range of 3½ to 12 feet, recycles in 10 seconds and gives over more than 100 flashes per set of four AA alkaline batteries, the maker says. Other features include zooming circle focusing aid, electronic shutter, automatic exposure control and low-light indicator. The camera accepts Kodak's PR-10 instant film. Less than \$75, including batteries, from Kodak.



Steam shovel for sand castles

Junior construction workers can do their own digging with the Steamless Shovel. The oak and spruce toy swivels on a stationary base and has a three-foot reach. Two levers control digging, lifting and emptying of the chrome-plated bucket. Seven-piece, bolt-together kit is \$69 from GCM Industries, 17 Pezanko Court, Box 568, Putnam, Conn. 06260.

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THE GALAPAGOS

(Continued from page 99)

most animals and birds in the Galapagos show a complete lack of concern in the presence of humans. Even at a point today when Ecuador, against the urgent counsel of scientists, is considering doubling the present tourist quota of about 8000 per year, birds nest alongside hiking trails in natural park areas, and animals still raise their young without resorting to cover.

Man was an early predator

This pervasive tameness is even more remarkable in light of the past. It cost some species their very existence in the days when whaling fleets were provisioning in the Galapagos. Several varieties of the Galapagos giant tortoise, which made excellent live provender aboard sailing ships, are no more. Charles Darwin noted that many kinds of birds could be caught simply by grasping them from their perches—and commented with obvious distress on how sailors often killed them with sticks for amusement.

"It is surprising," Darwin wrote in his journal, "that they have not become wilder; for these islands during the last 150 years have been frequently visited by bucaniers [buccaneers] and whalers; and the sailors, wandering through the woods in search of tortoises, always take cruel delight in knocking down the little birds."

Though severe penalties now await anyone caught poaching protected wildlife in the Galapagos, the introduced animals—man's former livestock—now wreak more havoc on the archipelago's ecosystem than the bloodiest pirates imaginable.

Feral dogs and cats threaten birds, iguanas (both terrestrial and the unique marine variety) and young tortoises by direct predation. Feral pigs can sniff out and root up tortoise eggs buried two feet deep in sandy soil. Feral burros, horses and cattle compete with other herbivores for food and water, and their grazing also strips away vegetation used for cover—exposing, for instance, young tortoises to the always hovering local frigate birds. A chomping burro can destroy a giant cactus, which took a hundred years to mature, within a couple of hours.

The feral goat population of just one of the larger islands, Isabela, has been recently estimated at more than 140,000. They have overgrazed many endemic plants; they are uncontrollable and, unlike native animals, very wary of man. Attempts to curtail their spread by intensive

hunting have been only partially successful. On another island, James, goats have been observed drinking sea water, which suggests a supplement that could assure survival in periods of drought or freshwater contamination.

Extinction threatened

How introduced animals can mount a murderous threat to an endemic species is illustrated by the sad case of the Hawaiian petrel. This sea bird is now endemic to only one Hawaiian island and several in the Galapagos, where it makes burrows in moist, upland soil in which to deposit its eggs. The introduced black rat digs into the nests and eats the eggs. Feral pigs eat both eggs and hatchlings (in fact, years ago the free-roaming domestic pigs on Santa Cruz had such a heavy petrel diet that their meat was often tainted beyond use). Feral dogs and cats prey on adults and fledglings. Beyond that, burros eat the petrel's nesting material and goats often trample the eggs and hatchlings searching for forage.

In 1966, 38 Hawaiian petrel burrows were found on the island of Santa Cruz; more than 30 eggs were laid but only two young survived to become fledglings. In 1967, 26 eggs were counted but no chicks survived, and feral dogs killed seven of the adult birds.

The Hawaiian petrel is headed for extinction. So, probably, is the flightless cormorant, one of the world's rarest birds (photo on page 96). But that situation is different; the flightless cormorant has come to an evolutionary dead end. Its wings atrophied beyond use as airfoils, it must swim and dive for food. Which means it must nest near the water in order to feed its young. In competition for fish with countless other species, the cormorant has been moving its nests closer to the sea. Unusually high tides can easily sweep the nests and young to destruction.

Perhaps by the turn of the century, the flightless cormorant will be gone. Naturalists—the same who want to eradicate feral animals from the Galapagos—have to accept this natural extinction, unless some significant human-related factor is revealed in the study of its ecology in what little time there is left for the bird. (Feral cats and dogs do prey upon it on some islands.)

The complications that surround the simplest, most isolated ecosystem can drive a genius up the wall, as demonstrated by the guava, an introduced plant that now threatens to turn three of the major Galapagos islands into vast forests of

itself. Mystified as to the spread of guava many years after its initial introduction, scientists have concluded that feral cattle, ironically, kept it cropped down to shoots in the early stages. When these cattle were hunted by settlers, the plant matured into a woody growth no longer palatable to other domestic animals—and it really took off.

"Eradication" has a bad ring

Among the naturalists who come to Darwin Station from around the world, many are researching methods of eradicating introduced plants and animals and returning the islands to a state more nearly like that which Darwin found.

They are hampered in the execution of these programs by lack of public support—and the necessary funding and technical assistance.

The phrase "eradication program" is, unfortunately, a malevolent one in the minds of people who do not understand the necessity for it. Naturalist David Kiehn, a guide aboard the Galapagos cruise ship, *Buccaneer*, stressed that the wild dog eradication scheme he proposed for one island (see illustration, page 99) could be the most humane among several alternatives. But not

everyone will see it that way.

And there may be no "humane" way of dealing, for instance, with feral cats who live deep in lava tubes and emerge at night to hunt sea birds. "In some of these cases," says Dr. Hoeck, "we would need highly specialized, sophisticated equipment—like radio tracking collars—to run a pilot study on the animals and determine their patterns and habitat before we could decide how best to eradicate them."

Feral animals often have a "streetwise" intelligence surpassing pure instinct. They would attempt to remove tracking collars by any means possible—even cooperating to chew them off of each other. The equipment would have to be rugged and durable, operable in extreme conditions over a sustained period of time. It could not significantly alter the mobility or appearance of the animal wearing it or others in the pack or herd might drive it away or kill it, negating the study.

Challenge for technologists

If this is the kind of problem that can pique the interest of engineers in a high-technology company looking for ways to dramatically demonstrate its expertise, or a philan-

thropic body of any kind, there may be some hope for the Galapagos.

If not, it is very likely that the Darwin Station may lose the fight. As the exotic/endemic ecosystems complicate one another the mere identification of cause and effect, without introducing further complications, may approach the dimensions of a space program.

The Ecuadorian government is vocally sympathetic but, even though reaping the benefits of the country's current petroleum boom, not particularly farsighted when it comes to the problems of the Galapagos that require speculative funding. If increased tourism can bring more attention to the islands, without accelerating the destruction of native species, it may be the only chance left.

At Darwin Station, that is a risk they would rather not take. **FM**

WANT TO HELP?

Contributions to help studies that assist and document the value of the natural wildlife of the Galapagos should not be sent to Ecuador or the Darwin Station on Santa Cruz. They are administered through the Secretary General, Fondation Charles Darwin, Palais des Academies, 1 Rue Ducale, Brussels, Belgium.

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HOME FIREPLACES AND STOVES

(Continued from page 127)

which to stand—patio blocks or bricks, for example. (This is also true of wood-burning stoves.)

For the free-standing units prices range from as little as \$190 to as much as \$600 (without installation) while those intended for built-in installations cost even more (especially when you add in the cost of delivery and professional installation). Even the smaller free-standing units will weigh at least 100 pounds, so when you are getting a price make sure it includes home delivery.

Most of these prefabricated fireplaces come with enough insulated chimney pipe (finished to match the fireplace) to reach a normal-height ceiling, but unless you have an unused chimney flue which you can hook up to, you will need additional lengths to go from that point up through the roof. The simplest is straight up, but if this is not practical there is a wide assortment of offset and angled sections you can buy to fit almost any type of installation, as well as the needed hangers, collards, caps, flashing materials and supporting brackets.

Except for those that are designed to be wall-hung or built-in, and thus are designed for so-called zero clearance (they can go right up against the wall, but make sure they bear the UL label that indicates they are listed for this kind of installation), most of the free-standing units come with instructions telling you how far they must be located from the nearest wall. This can vary from as little as a few inches to as much as 3 ft., so be absolutely certain that you follow both the manufacturer's instructions and your local building code on this.

Professional installations

Although detailed instructions furnished with each fireplace will enable any carpenter or experienced home mechanic to install one of these units, if you lack the skills and tools, then make sure the dealer from whom you buy offers quality installation. Here are a few points that should be considered before you sign any contract or put down a deposit:

- Does the retailer offer immediate installation? Ask for a firm starting and finishing date.
- Does he use reliable subcontractors or his own trained installation crews? Ask for references from previous customers.
- Get the installation and delivery

fee in writing before you buy. Also make sure all hardware is included in this price. If not, you may conceivably end up with a bigger-than-expected charge.

■ Is the retailer familiar with local codes? Can he help guide you in checking them out?

From a quality standpoint, don't sweat the well-known brand names. They're all UL listed. Some manufacturers offer a 20-year guarantee on materials and workmanship. However, one word of caution: Manufacturers and retailers stress the fact that installers must follow directions exactly as listed in company literature.

Fireplace terms you should know before you buy

Here's a brief glossary of fireplace terms that have been provided by the Fireplace Institute, Chicago. The definitions represent the most wide-spread, agreed-upon industry usage.

Circulating fireplace: A double-walled unit with a metal fire chamber around which a second masonry enclosure is built. Air is taken in through vents near the bottom, heated as it passes over the interior heated metal frame and returned to the room through outlets at the top. The fireplace is sometimes equipped with forced-air fans.

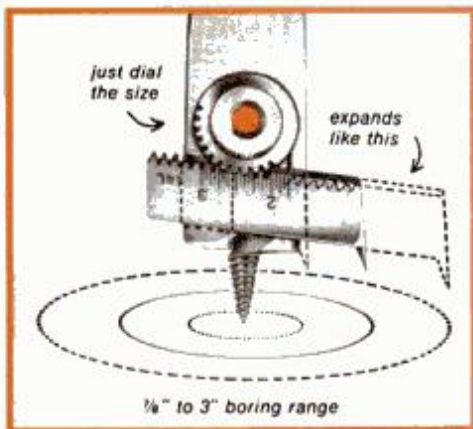
Factory-built fireplace: An integral fire chamber and chimney assembly, usually listed or approved by a recognized testing laboratory, and consisting entirely of factory-made parts.

Fireplace opening: The frontal dimension of the opening of a fireplace. A 36x24-in. fireplace opening is 36 in. wide by 24 in. high at the extreme front. Other common sizes are 28, 36, and 42 in. wide.

Free-standing, wood-burning fireplace: A fireplace-stove assembly standing clear of walls. It's for use with solid fuels commonly used in fireplaces.

Underwriters Laboratories, Inc. (UL): A nonprofit organization chartered to establish, maintain and operate laboratories for the examination and testing of devices, systems and materials.

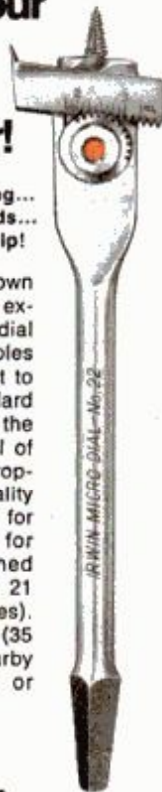
Zero clearance: A key phrase in understanding one advantage of factory-built fireplaces. The term applies when a fireplace is installed on or against combustible surfaces like walls and floors. The exterior of the heavy metal, insulated fire chamber and chimney remains cool and safe. Knocking out walls and other remodeling isn't necessary, nor is it necessary to build a foundation. **FM**



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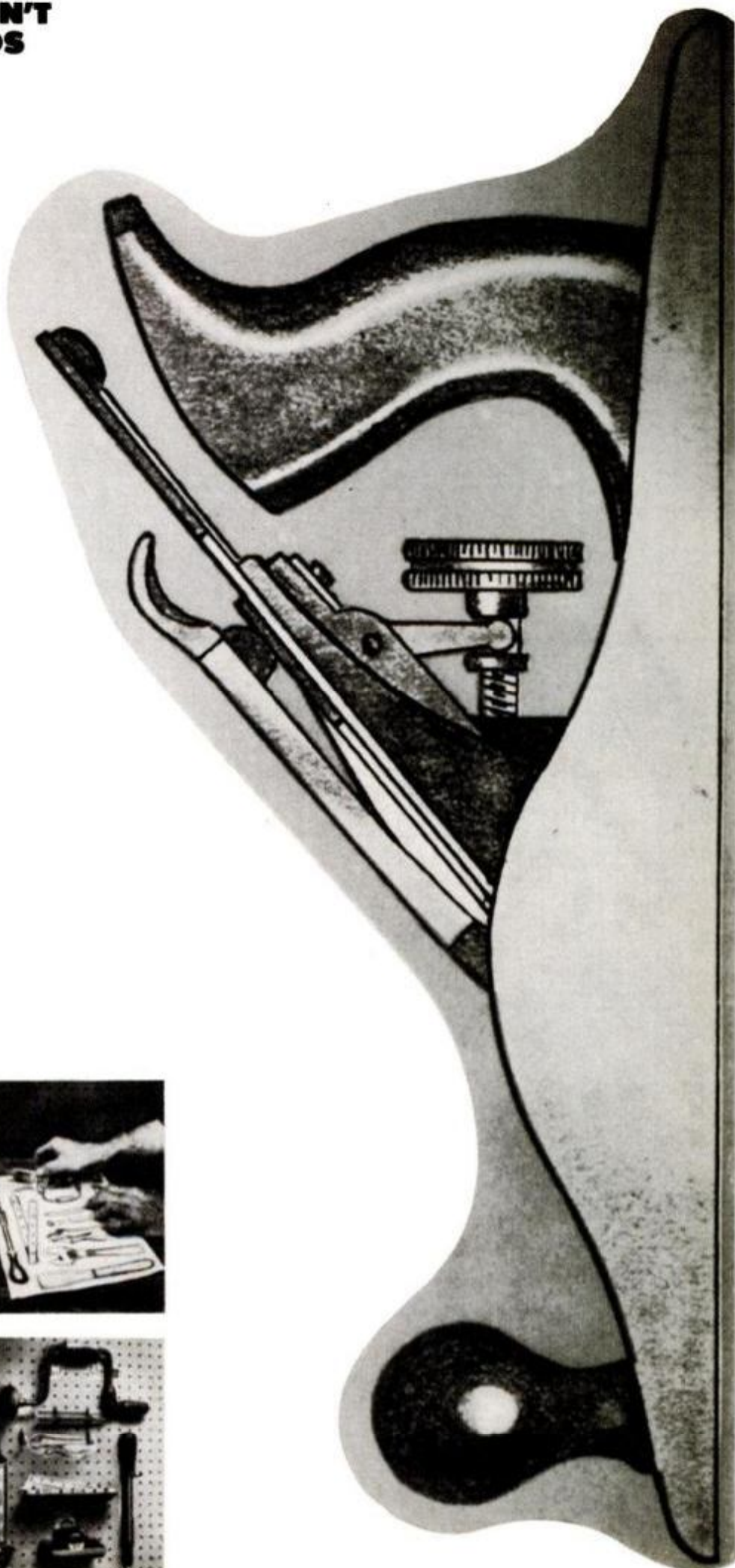
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ELECTRONIC MINI-MARVELS

(Continued from page 95)

dates in this century or the next. Or work out the time remaining to your destination—and have the watch's alarm sound when you should be there.

Another small-package calculator, from Teal (that may appeal to smokers) is built into a butane lighter. It sells for \$70.

Toshiba's Memo Note 30 looks like



Sampo 8703 combines TV set, cassette recorder, four radio bands: \$249.



JVC 3070 also has 3-in. diagonal TV, AM/FM radio and cassette deck; \$260.

These aren't pocket-size gadgets by any means—you'll feel it if you carry one for a while. But we wanted to show them because they do so much for their size. Both give crisp black-and-white TV reception, both include AM/FM radio and cassette recorders, with mixing control for recording off-air and from microphone at the same time, and both have speakers large enough to give better sound than most portable TV sets. The less-well-known Sampo adds CB and public service radio bands, and a picture-inversion switch for viewing from any carrying position.

an ordinary-size pocket calculator, but it's also an electronic scratchpad and address book. You can store 30 pairs of names and phone numbers in it for quick recall. It's available for \$80.

Back to timekeeping, Casio's F-100 weighs less than an ounce, yet shows time with seconds continuously; displays month, date and day of week; has a night light, and, as a stopwatch, resolves hundredths of a second and takes lap times and one-two splits. Price? Only \$40 for the plastic-case version. For people on the move, Texas Instruments and Seiko have neat little digital travel alarms



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at \$30 and \$95 respectively. Both sound off with electronic chirps. The Seiko keeps up with two time zones at once.

TI and Seiko have just announced innovations in watches that advance the state of the art, though in different directions. The new entry from Texas, at \$275 to \$325, provides hands you can glance at for an approximation of the time—but these hands are part of an LCD face, and the watch is all-electronic.

The Japanese watch is understood to be the thinnest to date. It's quartz electronic for accuracy but it uses a motor to drive the hands. Provided in a case of 18-carat gold, it'll cost \$5000 or more.

For pocket-size personal entertainment plus time and alarm, see the new breed of miniature digital AM/FM clock-radios. Toshiba (\$100) and Panasonic (\$115) models on pages 94 and 95 will wake you with a chirp or the radio or both, and each has a nightlight. The Toshiba version is somewhat easier to operate, but the Panasonic is slimmer because it uses AAA instead of AA batteries.

Sanyo offers a similar unit, model RPM 6800, for \$70, that provides a chirp alarm only rather than turning on the radio.

Another way to load your pockets



Royce Freedom Phone's "base station" connects to phone line with modular plug. Portable handset snaps in for recharging of nickel-cadmium batteries.

with versatility is with the Olympus Pearlcorde microcassette recorder and its clever accessory modules. The SD2 is the newest Pearlcorde model; it's a two-speed job that records for two hours on a matchbox-sized cassette. Even at a tape speed of just 1.2 cm per second, it provides excellent voice fidelity. The \$280 SD2 accepts one or more of the
(Please turn to page 212)

defy the COLD!

It's 10° outside . . . Even getting colder. So you bundle up in layers and layers of heavy clothes. First with long underwear . . . then bulky, restrictive thermalwear on top.

Oh, you were warm, all right. Like in a Turkish bath. Because you began to perspire from all your activity. And perspiring in that mountain of clothes is like perspiring in a plastic bag! The perspiration is locked in. So there you are. Wet and miserable.

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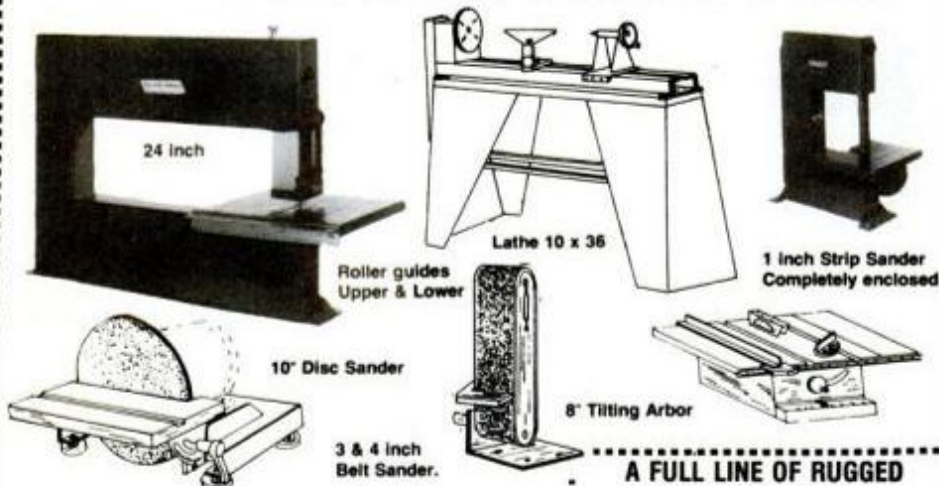
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ELECTRONIC MINI-MARVELS

(Continued from page 211)

tiny modules that screw into its base—the \$45 FM tuner, \$36 AM tuner and the voice actuator that's included with the recorder. The tuners permit direct recording off-the-air, and the voice actuator has three sensitivity settings.

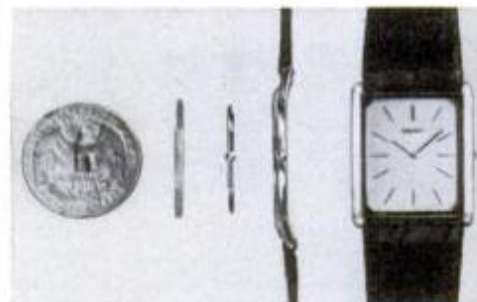
By now you've got something in every pocket, even if you're wearing a fisherman's vest. Fortunately, the Royce Freedom Phone IV has a belt clip. A step forward in size for cordless phones, it's a \$450 wireless



Skinny calculators from Casio (left) and Sharp (right) are made possible by tiny silver-oxide batteries, at upper left in each unit. A set's good for 1000 hours.



Newest Texas Instruments watch has LCD hands. Lower watch shows seconds, tenths elapsed in chronograph mode.

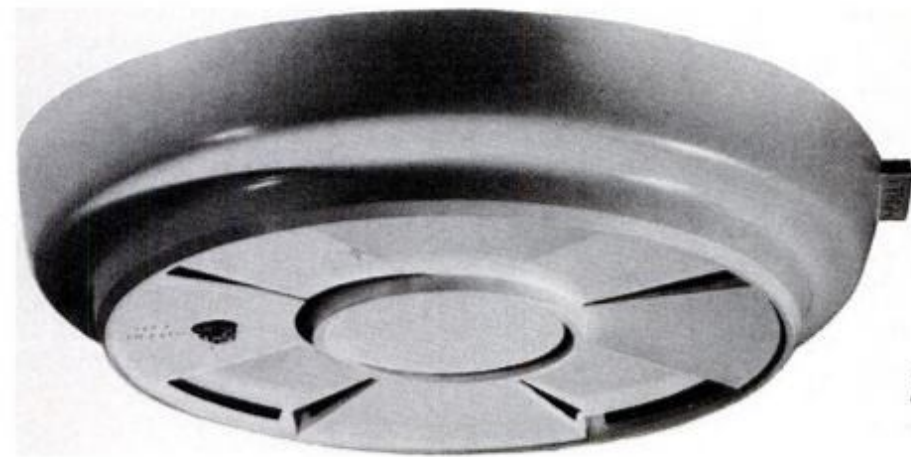


Seiko's latest quartz analog watch has movement less than 1 mm thick, with battery. Watch is less than 2 mm thick.

extension—the base unit connects to your phone line—with a 500-foot range. Just imagine. You could drop in on a neighbor's barbecue and still not miss your mother-in-law's call from the airport. Models are available for both pulse-dial and Touch-tone exchanges.

PM

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HOW DOES IT WORK?

The PDM Lifesaver Plus smoke alarm works on the "ionization" principle of fire detection. Inside the detector is a unique balanced stainless steel dual ionization chamber design with a superior teflon insulator for long life and reliability. The "reference chamber" is designed to keep the sensitivity level constant during normal atmospheric changes in your home. The "sensing chamber" continually monitors the air 24 hours a day and initiates an alarm when smoke and particles of combustion are present. An automatic reset shuts off the alarm when smoke or particles of combustion clear the chamber.

AUTOMATIC ELECTRONIC CHECKING

The PDM Lifesaver Plus smoke alarm has a testing system that does more than just check the battery to see if it's low. Pressing the test button electronically checks the entire alarm circuitry including the calibrated sensitivity, horn and battery. If the unit is functioning properly, the alarm will sound. Also perfect for fire drills.

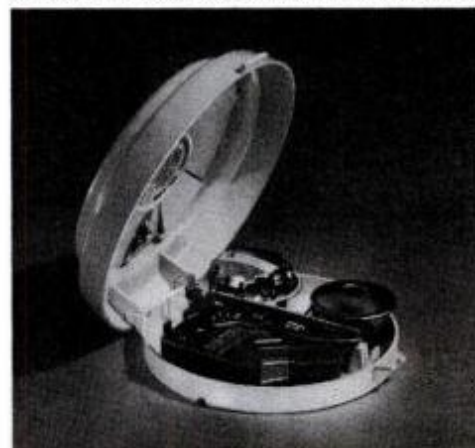
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5. Solid state circuitry for reliability, long life and stability.
6. Impact resistant case with open cover tab for easy access to battery.
7. Easy installation with 2 small screws provided—no wiring required.

The PDM Lifesaver Plus smoke alarm gives you more than just a smoke alarm. It gives you all the latest developments and technological advances, proven performance, plus 10 years of service before battery replacement is necessary. Don't be confused—you can't buy a better smoke alarm—plus a 10 year warranty on top of it! The PDM Lifesaver Plus smoke alarm is designed to give you quality, dependability, efficiency and long life.

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TRIPLE-DECKER BUNK BEDS

(Continued from page 139)

at this point and install a solid piece (cat) of 2x6 between the rafters/joists above. This cat, for strength, should be spiked in place with 16d nails at both ends.

Once the hole is made in the ceiling have your helper hold the vertical in position—make certain it is plumb by holding a spirit level against it—while you mark for cat location. Attach the vertical hanger to the cat using lagscrews and fasten its bottom end to the bed rail with heavy screws. When hanger is permanently affixed, saw off all excess board protruding below the bed bottom. Remove temporary support cleats and fasten plywood bottom (G) to rails, using glue and 1¼-in. finishing nails.

Building the ladder

To build the ladder, lay out and carefully cut the notches in rails to receive the 1x2 pine rungs. Round top edges of rungs to make them easier on bare feet. Use white glue and 6d finishing nails to assemble ladder. Hold the ladder in position against the unit and check both planes with a spirit level before installing the two pairs of corner braces as shown in the drawing.

The safety rails for the middle and upper bunks consist of 1x4 stock cut to exact bed length so rails can rest in U-notched holders at both ends. For each rail, install the first support, then insert the rail; use a level and a square to position the rail so the second support can be located. Permanently install supports with white glue and countersunk flathead screws.

The bed can be finished in place. Apply the stain of your choice following instructions on the can and let it dry overnight.

Next day, apply a coat of varnish and let it dry for at least 24 hours. Sand lightly with 180 (or finer) grit abrasive paper; dust, wipe with tack cloth, and apply a second coat.

Bedroom game table

This is a very easy project because it really consists of building a box with a hinged leaf top. Buy the 1x6 pine (see materials list) and you're in business. The project consists of simply putting together cut-to-size boards. No fancy joinery is called for. The table top is fastened to the box below using white glue and finishing nails, and the drop leaves are fastened to top with continuous (piano) hinges. Finish with the same stain and varnish as used on the bunk beds.

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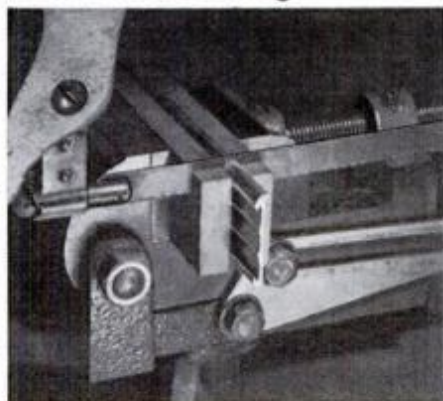
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HINTS FROM READERS

Better metal cutting

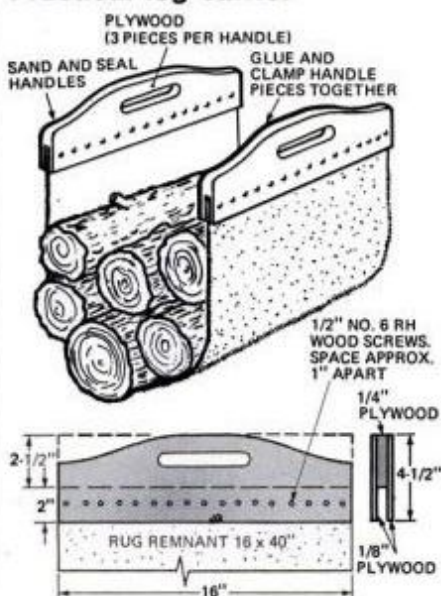


To hold a metal molding rigid for a hacksaw cut, I sandwich the strip between two pieces of wood and then mount the setup in my vise. To cut, I saw through wood and molding at the same time. Stunt saves blades.—*H.E. Moody*

Pull the right cord

Tired of pulling the wrong cord when you reach to open or close your drapes? Tie a knot at eye level in the opening cord when the drapes are closed. Open the drapes to their normal open position and tie a second knot at eye level in the other cord. Next time you want to open or close the drapes, you can't miss. Just pull on the cord that's knotted at eye level.—*L.A. Streufert*

Practical log carrier



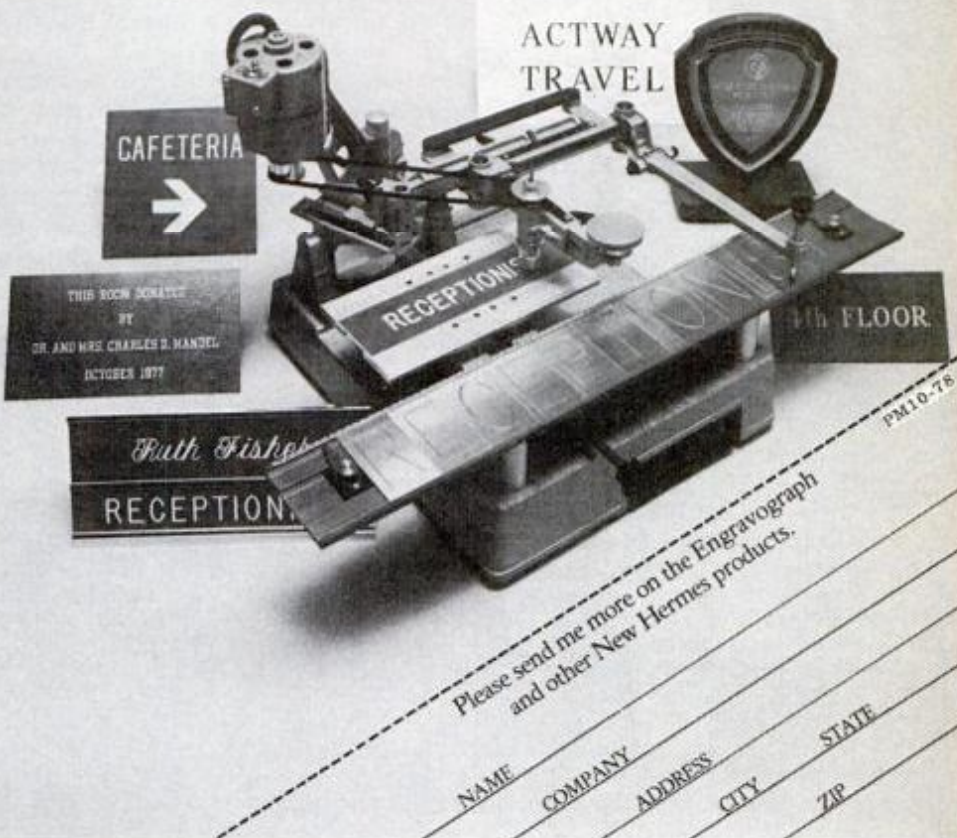
Make this log carrier for your fireplace using a rug remnant, scrap plywood, glue and wood screws as shown.—*August Freda*

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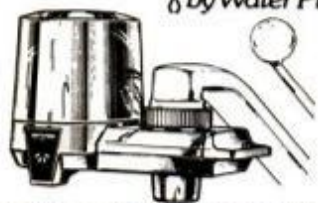


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How to buy and use brick for outdoor projects



Whether you plan to edge your garden, design a planter or build a patio, constructing your project with brick will give it stability and style.

Brick comes in a range of colors from off-white to near black. It's priced from five to 18 cents per brick. Although it is made in many different sizes and shapes, most outdoor projects can be built with a standard 3 3/4 x 2 1/4 x 8-in. size. Laid flat on sand, each brick this size covers 30 sq. in. A pallet of brick (500 units—the most economical way to buy them) on sand will cover about 120 sq. ft., which is enough for a 10x12-ft. patio. Always buy about five percent extra, however, to allow for breakage, especially if bricks will be cut to fit.

Patios and walks needn't be mor-

tared, as long as they are retained by boards, firm soil or well-rooted grass. Level the soil, lay 2 in. of sand. If heaving occurs during winter, lift out buckled bricks, smooth the sand, replace bricks.

If you decide to mortar the bricks in place, you can buy a sack of dry-mix mortar and simply add water; or make your own mortar using Portland cement, sand and hydrated lime.

You'll need few tools for simple projects—a mason's trowel for spreading mortar, a brick set or chisel to cut brick, a hammer, a level and a carpenter's square.

For the pamphlet *How to Buy Brick for Outdoor Projects* send 25 cents to: Brick Institute of America, 1750 Old Meadow Rd., Dept. 1078, McLean, Va. 22101. **PM**



To cut brick, score it on two surfaces of desired cut with broad-blade chisel . . .



. . . then point chisel inward and strike a sharp hammer blow for a clean break.



To assure good contact with the mortar, gently tap brick with a hammer handle.



A level will guide you in checking that the top surface is a true horizontal.

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money
...do it
yourself!**



shop at the store with the Sentry on the door!

September and October are Home Value Days at the 4,500 neighborhood Sentry Hardware Stores. This means you can select the "do-it-yourself" tools and materials you need to modernize, repair and improve your home - at real bargain prices.



SKILSAW® 12-INCH ELECTRIC CHAIN SAW

Easily handles cutting and pruning jobs. Burn-out protected motor. Push-button chain oiler. Double insulated. U.L. listed. (1601)



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Bostik® "POP" RIVETOOL KIT

Fastens materials securely without screws or bolts. Easy to use. Fast. Two nosepieces accommodate various sized rivets. Kit includes Rivetool and assorted rivets in handy plastic pouch. (K110)



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All-steel construction. Chrome finish. Jam-proof mechanism. Visual refill window. Includes wiring attachment. (T-50FS)



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\$1244

STANLEY® UTILITY KNIFE

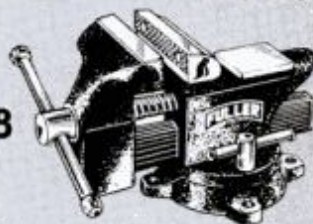
Dozens of uses. Lightweight aluminum handle comes apart to provide storage for extra blades. (299)



\$133

FULLER® 3-INCH SWIVEL BASE HOMEOWNER'S VISE

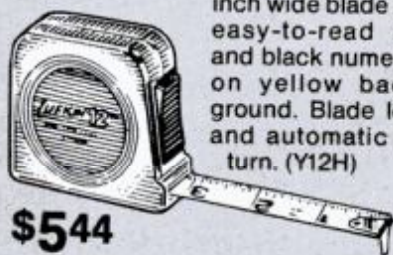
Unbreakable ductile steel. Replaceable hardened-face jaws. Permanent pipe jaws. Large anvil and horn. (1773)



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Lufkin® 12-FT. MEZURLOK® POWER TAPE

Professional quality. Rugged, lightweight case. 3/4-inch wide blade has easy-to-read red and black numerals on yellow background. Blade lock and automatic return. (Y12H)



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Electronic news gathering: The technology that's changing your TV news

Thanks to lightweight equipment, videotape is replacing film at more and more local stations; the result is livelier news.

by Michael Parker

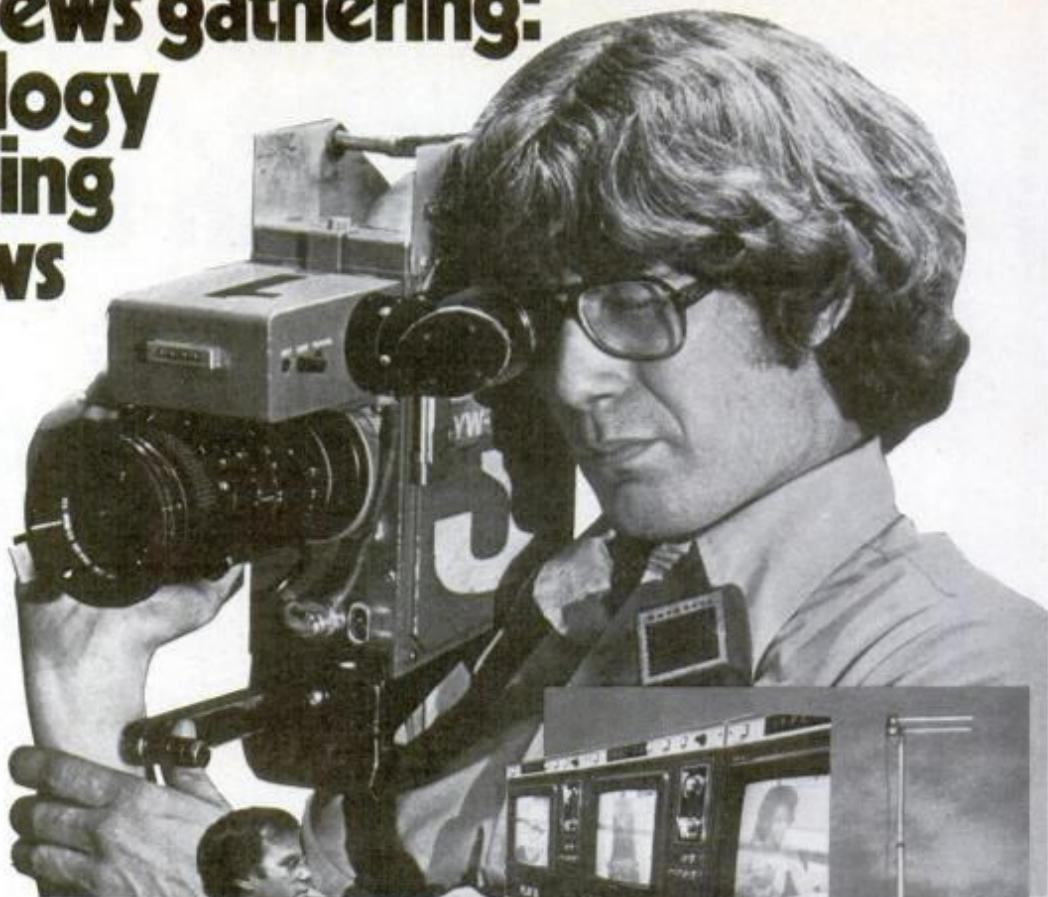
The assemblyman from Philadelphia was sweating under bright television lights. Pennsylvania was in a financial snarl—until the legislature agreed upon a budget, the state was technically out of money and unable to pay its bills or employees' salaries. TV viewers watched the man perspire as he was cross-examined by a tough questioner.

Routine TV fare? Not in this case. While the assemblyman was in the state capitol, Harrisburg, the questioner was in Philadelphia, more than 100 miles away—and wasn't a veteran reporter, but a distraught mother who had much to lose if certain programs were cut.

The statehouse and the woman's home were electronically linked with lightweight "minicams"—hand-held color video cameras—and a web of microwave relays that let the viewing audience watch the drama unfold.

A few years ago, this kind of live, person-to-person news coverage would have been impossible for local stations. It was for major networks only, and only for the most important national events. Today it's possible, and becoming common, at the local level because television is going through a revolution.

This revolution is called electronic news gathering—ENG—and it is profoundly changing the way news



Elements in an up-to-date electronic news operation: minicam (top) a hand-held color TV camera producing broadcast-quality pictures—this one's an Ikegami—editing console (above) that is far superior to film-editing in speed and flexibility, and mobile-unit van with antenna mast like a periscope for microwave relay back to studio—essential for live-remote coverage of breaking news.



PM photos by the author

is covered and presented—and can even determine which stories reach the air in some cases.

The essence of the ENG revolution is the replacement of 16-mm sound-on-film cameras—long the standard in TV news—with hand-held color TV cameras whose images are either recorded on videotape or relayed immediately to the station for broadcast.

There are good reasons for the change: First, film has become

increasingly expensive—a major local news operation could easily spend \$250,000 a year for film and processing alone—while videotape eliminates processing time and expense and can be rewound and used on a new story (not indefinitely—but maybe 20 times before it may jam equipment).

Second, and more important, ENG lets the news go live, with video and audio transmitted in-

(Please turn to page 222)

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William Wescott Willoughby, Ohio 44094



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"I'm a construction foreman, and my wife is a nurse's aide. Our Foley shop fits in nicely with our regular jobs, and we earn extra money. Our sons help out too, so ours is a real family business."

"I'm still too young to retire, but when I do I'll have a very good business built up. Foley equipment helps us to do good work and brings customers back with more jobs on a regular basis... we have a lot of repeat business the year around."

Victor Kosloski Sturgis, Michigan 49091



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Victor Johnson Lincoln, Nebraska 68507

This can be one of the most important decisions you ever make. Going into business for yourself can be the most exciting and rewarding decision you're likely to make in your lifetime.

Owning your own business brings you a sense of independence. You're the boss, setting your own work hours. Your own effort builds the business for yourself and your family. You can achieve great satisfaction and profits, if you choose and manage your business wisely. That's why so many men, just like you, are cashing in on the big profits to be made in this fast-growing service field.

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As original equipment continues to climb in cost, owners are becoming more concerned that the equipment be maintained so that it performs like new. This means more companies, contractors, carpenters and home owners are having their old saw blades and tools resharpened many times, where in the past, they would have replaced them with new blades or tools. This is where you

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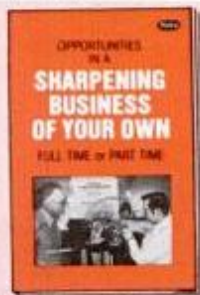
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ELECTRONIC NEWS GATHERING

(Continued from page 220)

stantly from the scene of events to the audience at home. News directors feel that live shots, as they're called, add immediacy and excitement to news programs, improve coverage of fast-breaking events and ultimately result in higher ratings. For the home viewer, live or tape coverage looks more real and immediate than film.

Risky spontaneity

Not that live shots don't have their hazards. Aircraft can fly overhead and drown out the reporter, power can fail (or you can transmit a great picture but no sound, or vice versa), people standing in the background can suddenly be seized with the desire to be "on camera," reporters can blow their lines, and drunks can stumble in from any direction.

While doing a live shot in front of a fire-stricken restaurant in Atlanta, reporter Jim Hickey of WSB-TV was accosted by one of the kitchen workers who had been drowning his sorrows. Hickey was in the middle of



Cameraman Ken Johnson of KYW television, Philadelphia, confers with technicians and director back at station while setting up live shot from remote location.

his report when the man lurched over and began screaming into his ear. Hickey did the only thing a good reporter under the gun could do—he tried to interview the man. That calmed the upset employee, but only briefly. He soon resumed his rantings. Hickey tossed the story back to anchorman John Pruitt, who by this point was doubled over with laughter.

Last holiday season, one live report made staffers on KPIX-TV in San Francisco yearn for the days of film. A reporter was live at a shopping center and the anchorman, watching his monitor, remarked that the crowd seemed sparse.

"Quite the contrary," the reporter replied as the camera zoomed back to reveal a throng of shoppers the lights had attracted. Feeling smug,



Author Michael Parker, a staff member of KYW Television News, shoots a story with an RCA TK-76 ENG video camera. Today's minicams are rugged all-weather units.

he turned to the crowd and chirped, "May I be the first to wish you all a Merry Christmas!" In the ensuing silent pause, a teen-ager in the crowd made an obscene remark that came through loud and clear. The director immediately switched back to the studio, where the anchorman grinned sheepishly and said, "We'll be back in a moment." Cut to commercial. That's how news directors get ulcers.

Conventions spur progress

Hand-held minicams are not in themselves new. The first one was developed by CBS Laboratories, now Thomson-CSF Laboratories, for the 1968 national political conventions. Since it weighed more

than 45 pounds, it wasn't all that mini; it required a sturdy brace and a cameraman with a *cum laude* degree from Charles Atlas. Its battery life was just an hour, but it did work. CBS licensed North American Philips to make the production version, the PCP-90.

For several years, the PCP-90 was the TV industry's standard hand-held (using the word loosely) camera for sports events and remote telecasts, and many of these original minicams are still in use.

The next major ENG breakthrough appeared at the 1972 political conventions in Miami Beach. A



WCAU-TV, Philadelphia, crew videotapes a reporter's "standup" on location with one of its Ikegami HL-35 minicams.

Japanese firm, Ikegami, made a 34-pound experimental version of its HL-35 ("HL" for "handy looky") camera available to ABC News. It was teamed with a 3/4-inch video cassette recorder made by Teac. It was this mating of a lightweight color video camera with a lightweight video recorder that really stimulated the spread of the ENG idea.

But something more was needed:

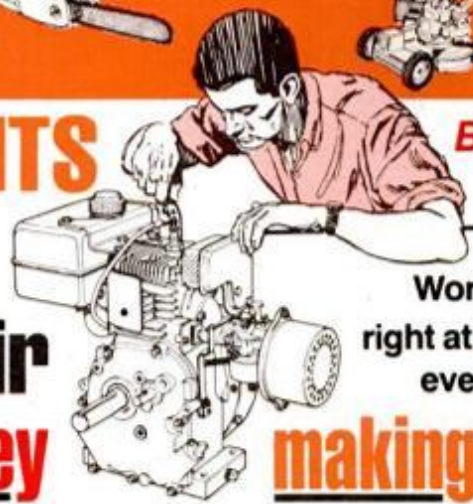
(Please turn to page 224)



At KYW Television News, technician John McCurdy (left) and news director Ken Tiven, working in nerve center of ENG operation, bring in live shot from remote unit.



Get in on the PROFITS in SMALL ENGINE service and repair Start your own money



BEAT INFLATION!

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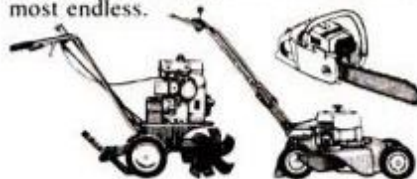
In just a short time, you can be ready to join one of the fastest growing industries in America...an industry where qualified men are making from \$10.00 to \$15.00 per hour...and that's just for labor. Parts, engines and accessories add even more to the profits.



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46-million small engines are in service today!

That's right—there are over forty-six million 2-cycle and 4-cycle small engines in service across the U.S.A. That's the official count from the Engine Service Assn., and new engines are being built at a rate of one-million per month! With fully accredited and approved Belsaw training, you can soon have the skill and knowledge to make top money servicing these engines. Homeowners and businessmen will seek you out and pay you well to service and repair their lawnmowers, tillers, edgers, power rakes, garden tractors, chain saws, mini-bikes, go-carts, snowmobiles, generators, snowblowers, paint sprayers...the list is almost endless.



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Datatron Editor console helps videotape editor Dave West at KYW combine video and audio sources to make final product viewers will see on home screens.

ELECTRONIC NEWS GATHERING

(Continued from page 222)

the digital time-base corrector. The problem with the $\frac{3}{4}$ -inch video cassette format was, and is, that the stability of image it provides doesn't quite meet FCC broadcast standards—it will occasionally roll or break up during broadcasting. The digital time base corrector electronically doctors the signal from a $\frac{3}{4}$ -inch cassette to stabilize scanning-line timing and meet FCC standards.

A behind-the-scenes innovation, the digital time-base corrector freed the cameraman once and for all from bulky—and noisy—2-inch videotape equipment, and made him

Minicam operation

Light from the subject is focused by a lens and then hits a prism that splits it by color in three directions—red, green and blue each going to its own pickup tube; each is like a layer of a color film. The images these tubes receive are enhanced before they enter the broadcast system that leads to the home TV set.

Modern ENG video cameras have an edge over film in their ease of balance to light sources of different color temperatures without filters.

The cameraman just aims at a white object (usually a piece of paper), presses his "white balance" button and watches for a signal light in the viewfinder that means his camera has been electronically adjusted to the ambient lighting. Established white balance assures accurate rendition of other colors, including flesh tones.

Most ENG cameras also have a provision for dim-light shooting—something like pushing film. By flipping a switch, the cameraman gains one or two more f/stops of sensitivity—but at the cost of "noise" in the image (the equivalent of graininess in a photographic negative). This option can provide broadcast-quality images at light levels equivalent to bright streetlights.

truly mobile. If he was not quite as mobile as his film-camera predecessor, he was at least agile enough for most news purposes.

Portable microwave equipment was the missing link for ENG. The ability to beam live stories to the TV station, and immediately to viewers, made station owners willing to put capital into electronic news equipment.

Microwave Associates of Burlington, Mass., entered the growing ENG field with a portable 2-gigahertz microwave transmitter and receiver with a 30-mile range. The transmitter is usually mounted in a van and used to transmit pictures and sound back to the station from a remote location.

Early installations used a 4-foot-

(Please turn to page 226)

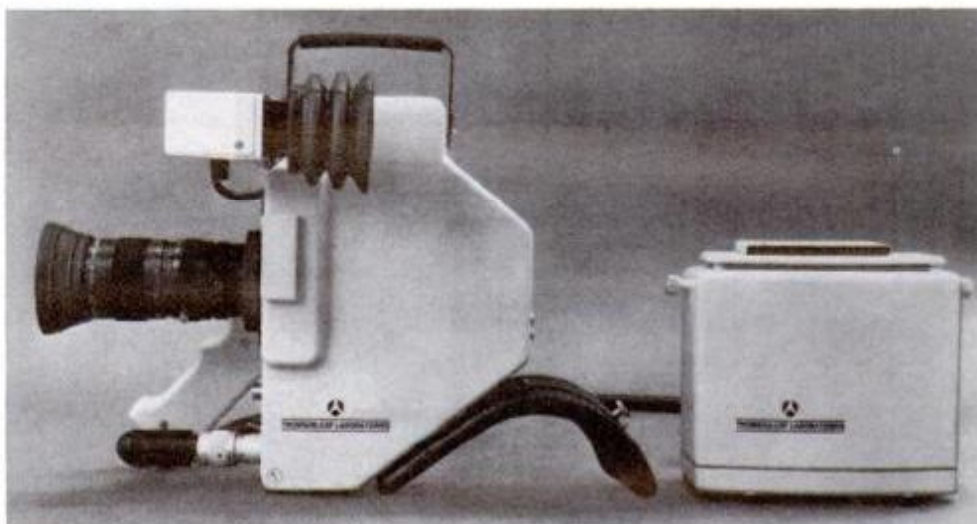
ELECTRONIC EDITING OF VIDEOTAPE

If a remote shot is to be used later, it must be edited. The editing process is now entirely electronic; no one actually snips the video tape.

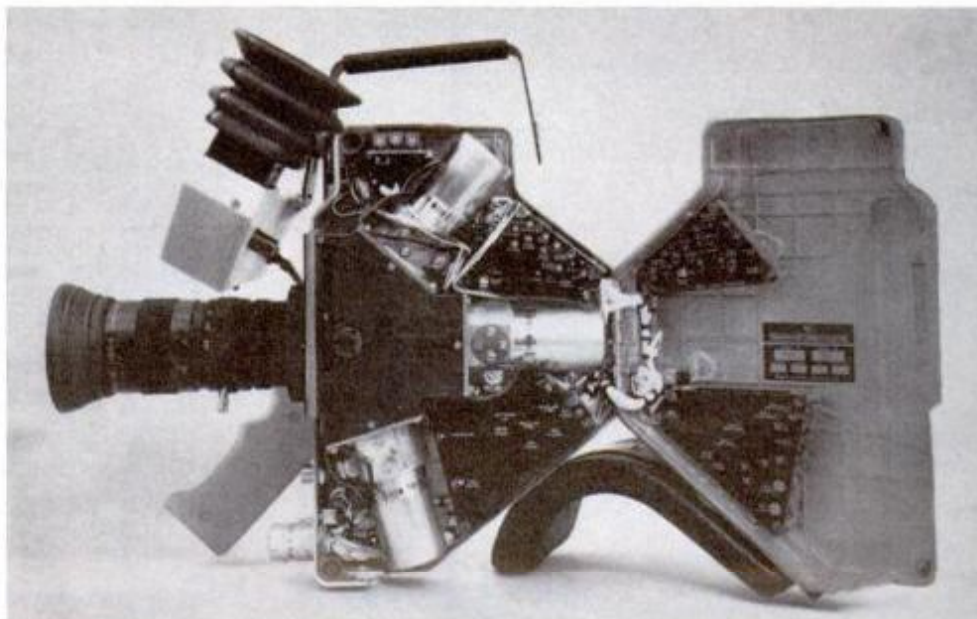
A $\frac{3}{4}$ -inch videotape from the field consists of a half-dozen tracks, only one of them for video. The others include two audio tracks, an audio guard band to reduce crossover, a control track and an address track. The control track takes the place of film sprockets—counting pulses on

this track allows the editing machine to make accurate frame-by-frame transfers to another video recorder.

Another, newer, editing method relies on a time code recorded simultaneously with the video and audio tracks. This SMPTE (Society of Motion Picture and Television Engineers) code gives each $\frac{1}{30}$ second frame its own identifying number. It's a more accurate but more time-consuming way of editing for broadcast.



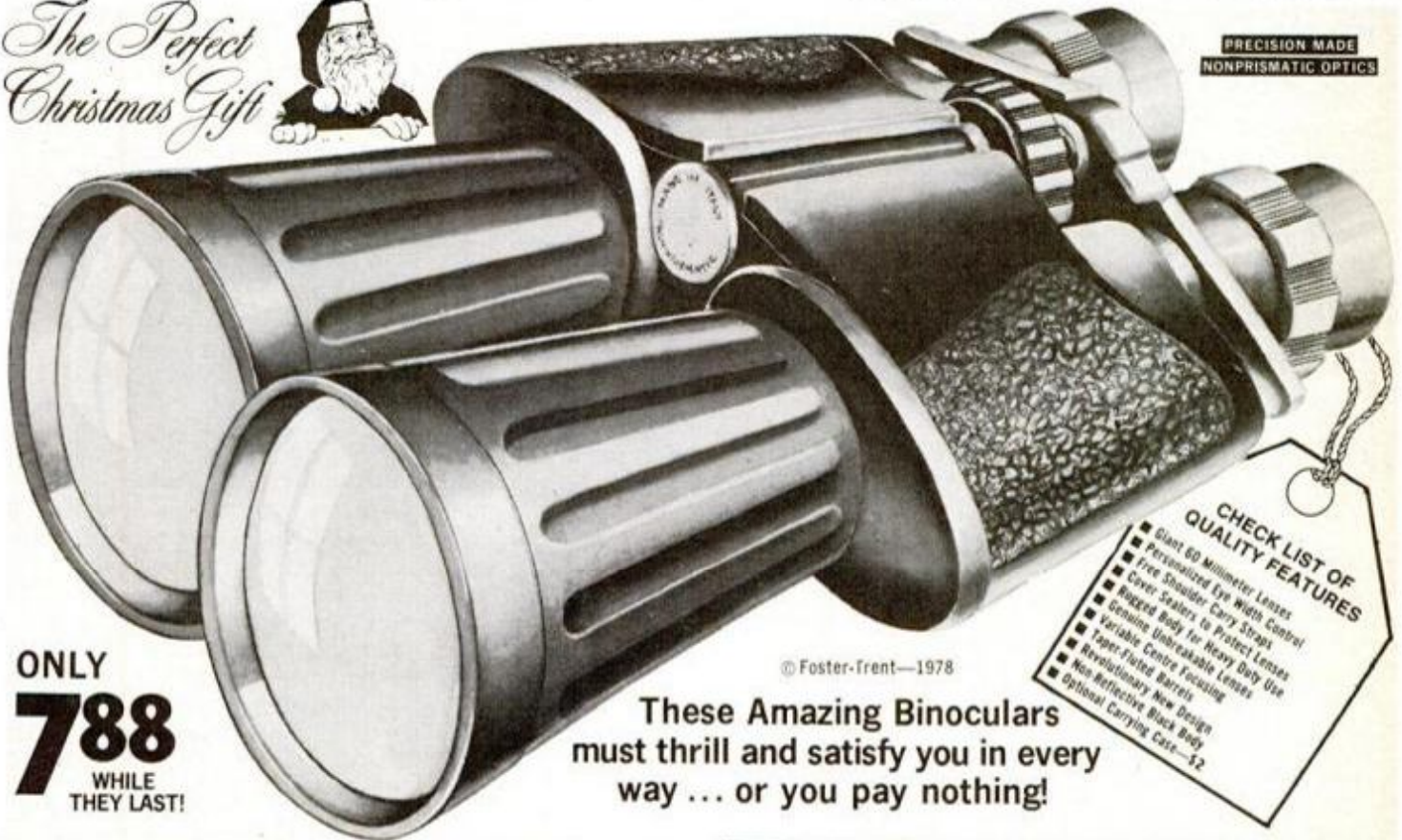
New Thomson-CSF Laboratories Microcam weighs just eight pounds. Combination control unit and battery pack adds just eight more pounds, allows five hours of operation.



Microcam with side cover open shows $\frac{3}{8}$ -inch-diameter Plumbicon image tubes for red, blue and green components of picture. Lens is an f/1.7, 12-1 zoom.

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PM LOG SPLITTER

ELECTRONIC NEWS GATHERING

(Continued from page 224)

diameter dish antenna on the van's roof. But there was no way to raise the dish to shoot over trees or high buildings (it was heavy and its large area made it vulnerable to wind). The dish is now being supplanted by a new transmitting antenna made of two lightweight rods (see page 220). Mounted on a telescoping mast, it can be raised as high as 40 feet like a submarine periscope. The telescoping mast and antenna add range and flexibility in getting live shots out of difficult locations such as areas with trees or tall buildings, or those far from the station's studios or repeater site.

Another boon to live shots is the hand-holdable 13-gigahertz microwave transceiver from Microwave Associates. The size of a shoebox, it has a range of about a mile. It can be a convenient—or indispensable—alternative to running a cable from a camera location to the ENG van.

The more powerful 2-GHz transmitter in the van then beams the signal to the station's repeater site. Since microwave transmission works only on a line-of-sight, the repeater is usually mounted on top of a tall building or the station's main transmitting tower, and, as its name suggests, then passes the signal on to the studio.

The line-of-sight rule may be violated when a signal is intentionally bounced off an object like a tall building, to make an otherwise-impossible shot. When this is done, the quality of the final picture often suffers, and viewers may be able to spot the deficiency.

If a story is happening close enough to the station's newsroom, the 13-GHz transceiver can be used to shoot a signal straight back without the 2-GHz link.

With the hand-held 13-GHz microwave unit, it's now possible for a local station to get a live story from a helicopter or a boat—where it would be impossible to lay out coaxial cable.

More stations switching

The first television station to switch to extensive use of the new technology for daily news coverage was KMOX, the CBS-owned station in St. Louis. They've been all-electronic since 1974, when their last newsfilm camera was phased out.

Another ENG frontrunner is KYW-TV, Westinghouse Broadcasting's station in Philadelphia. The news director there, Ken Tiven, first brought the new gear and methods to WSB-TV in Atlanta, and

in the past three years has spent almost a million dollars converting KYW from film to videotape and microwave. With five minicams and as many vans, he runs one of the most aggressive local-news operations in the country.

On the occasion of the canonization of Bishop John Neumann, a Philadelphian who died in 1860, Tiven put his operation into high gear. It was a major story for the city, and the station's principal competitors said they were sending reporters and film crews to Italy for the Vatican ceremonies. Tiven sent two ENG crews and an "Instant Eye" van to Rome. He also bought 90 minutes of satellite time. Although he didn't go live on the canonization—it was at 4 a.m. Philadelphia time—he beat his film competitors with a one-hour special program that won acclaim. It was immediate coverage of a transoceanic "local" story that would have taken many more hours—if not days—on film.

Improvement expected

Although advances have been remarkable, camera weight continues to be a problem—with lens, viewfinder and battery, an ENG minicam can weigh close to 30 pounds. Thomson-CSF Labs has a temporary answer—its new Microcam weighing but 14 pounds including lens, finder and an hour's worth of batteries. It's \$30,000 if you want one—but there's a waiting list.

Many companies are working on still smaller cameras. These will eliminate vacuum-tube technology from cameras by using CCDs—charge-coupled devices, solid-state light sensors—to pick up images. Broadcast-quality CCD cameras may be in use within two to four years.

Today's TV-news technology, despite its high prices and limited availability, points the way for tomorrow's consumer video products. The live-shot reporters who run afoul of loud drunks are preparing the ground for the home video enthusiast who demands superb quality in tapes of Junior's birthday party—even if candles are the only illumination.

Color video cameras for home use are now down to about \$800 in price—and they'll fall sharply when ENG use has validated CCD technology. When your local station's reporter brings you a live shot from around the corner—or around the globe—remember he's not just keeping you informed, he's also shaping the way you'll record your family's most important moments. **PM**

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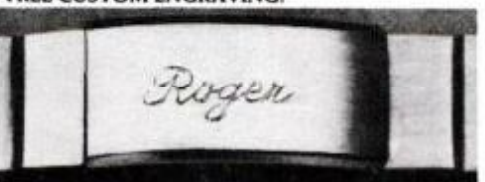
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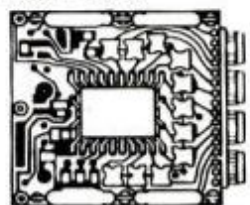
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You're approaching an intersection on your motorcycle. Waiting at the side-road stop sign is a car, its driver looking directly at you.

"Does he really see me?" you wonder.

Taking no chances, you slow down and prepare for a possible "pullout" by the other driver. Sure enough, at the last instant, he does pull out—*directly in front of you!* But you're ready for this situation and hit the brake before you center punch his car. You've narrowly missed becoming involved in the deadly intersection T crash—a classic hazard for unwary motorcyclists.

What makes intersections so hazardous anyway? Carelessness on someone's part. Quite often it's the fault of the motorist who simply doesn't notice an approaching motorcycle. The cyclist is careless, too, if he assumes other drivers see him. Street-wise bikers know better. They know that a lot of drivers aren't aware of any other vehicles smaller than their own cars.

In fact, psychologists have a term that applies to this kind of inattentiveness—*mental set*. Because a motorist is accustomed to seeing only cars around him, he can look right at a motorcycle and not really "see" it. This phenomenon isn't hard to understand when you realize that while the eyes may pick up sensory impressions of an object, the brain must interpret them to form a meaningful image. That's why if you're a sharp biker, you'll



Classic confrontation of bike and car at intersection may often result in injury or death to the motorcyclist.

YOUR MOTORCYCLE

How to get through killer intersections safely

by Bill Hampton

consider yourself invisible to other drivers. This attitude will place you properly on the defensive when negotiating intersections.

With a defensive attitude firmly established in mind, you're ready to tackle intersections. First, let's take the approach where you have the right of way. Here's where you have to get the other guy's attention. And one of the most effective means for doing it is to have your headlight on. Flipping your high/low beams will further make your light noticeable.

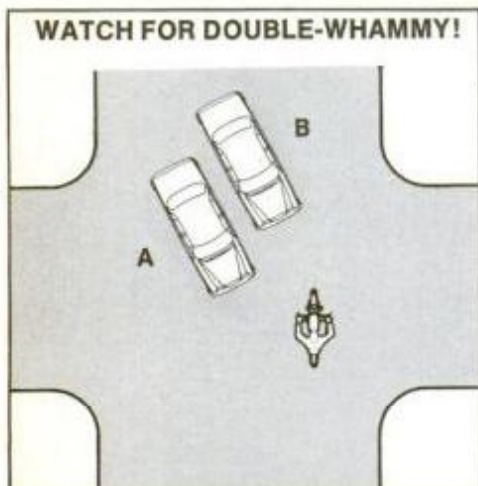
Bright riding attire helps, too. A reflective white or fluorescent helmet is one of the more noticeable things about a motorcyclist. So is a bright jacket or riding suit. You may even want to sport an old radio antenna with a bright orange pennant hanging from it. This item is especially outstanding in dense city traffic. And if your bike has a horn that can put out the decibels, don't be afraid to use it.

Now, as you near the intersection, hopefully you've gotten the attention of any other drivers present. But taking no chances, you get your speed down to where you can either stop safely or maneuver quickly to avoid an accident.

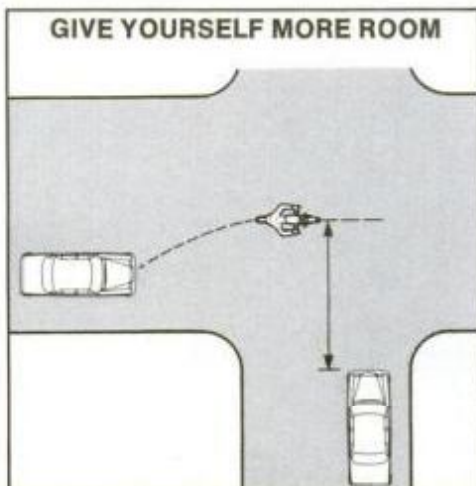
If you slow down too much, however, you may mislead other drivers into thinking you're going to stop or turn.

Take into consideration, too, that some drivers have difficulty in judging the speed of an approaching motorcycle. And should you al-

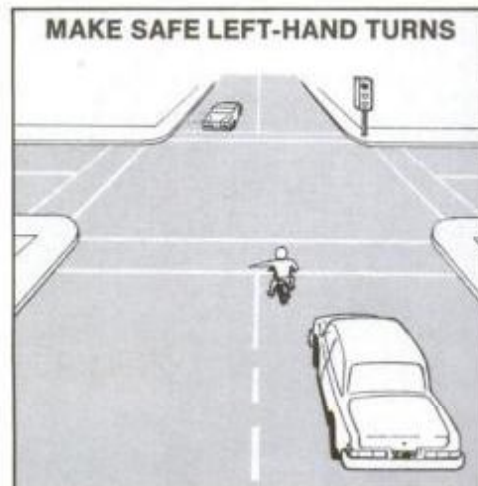
(Please turn to page 230)



Impatient driver in Car B doesn't see the cyclist and starts left turn behind car A.



Allow yourself more escape space in case car stopped at intersection pulls out.



Turn left from center of road so the traffic behind you has room to go around.

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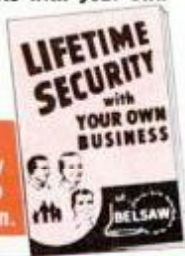
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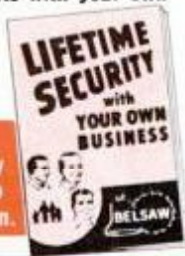
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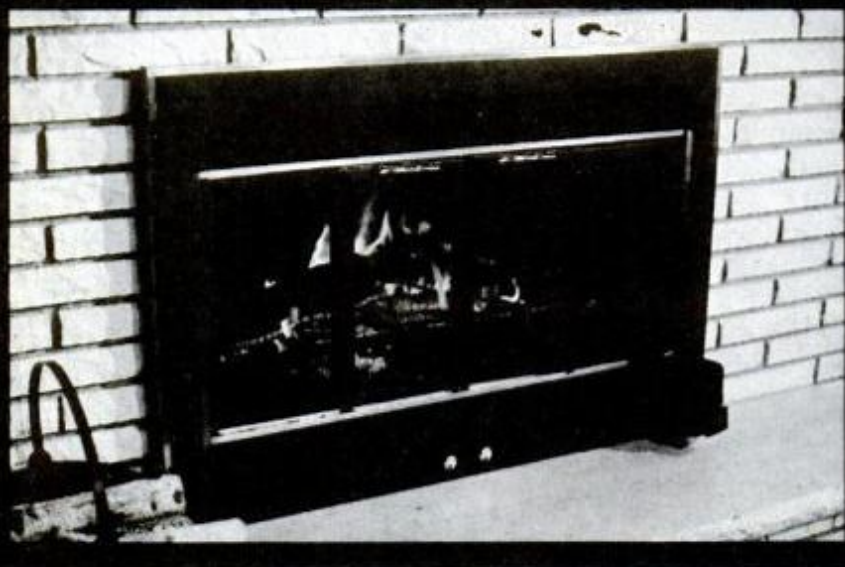
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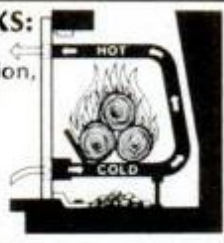
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YOUR MOTORCYCLE

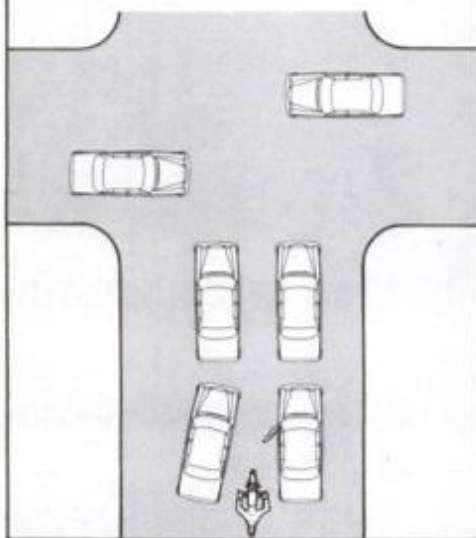
(Continued from page 228)

ternately speed up and slow down, you can upset another driver's judgment. He'll become indecisive. Then, at the last instant, he may feel that he can pull out or turn safely—much to your peril.

It's a fact that a lot of drivers feel uncomfortable when a motorcycle is nearby. So they may even do something reckless in an attempt to get away from you.

Since you never know when you'll have to make a quick stop, keep your hand and foot poised on the

DON'T RIDE BETWEEN LANES



Sneaking between traffic lanes can get you "sandwiched" or plastered against car.

brake levers. The idea is to cut down on reaction time and minimize stopping distance.

Another good idea is to keep an eye out for "escape space." In other words, if someone does cross your path or come at you, how would you avoid him? The more space you are able to maintain between you and other vehicles, the better opportunity you have for avoiding a collision.

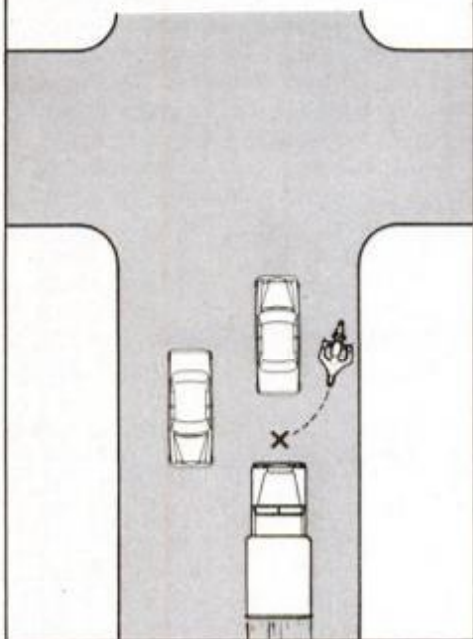
For instance, if there's a vehicle waiting for you at a right-side stop sign or yield sign, keep to the far left of your side of the road. But if there's an oncoming car or one waiting on the left side of the road, you'll have to divvy up the distance between the vehicles. Go up the middle. The extra few feet you provide for yourself could make the difference between a close call and a collision.

Train yourself to assess an intersection quickly, so you can spot a dangerous situation in time to cope with it. Keep your eyes moving constantly. And get into the habit of analyzing the behavior or actions

of other drivers for clues as to what they might do.

For example, let's say you're approaching an intersection where a car in front of you is signaling for a left turn. How can you be sure the driver will turn left? First, don't trust his turn signal. Because if you pass him on the right, he just may turn that way. Slow down and study the situation. Which way are his front wheels pointing? Is the vehicle stopped or still moving? If possible, observe the driver through his rear window. Note how he grips or turns the steering wheel. And if he's looking around, watch it! He

LEAVE ENOUGH ESCAPE SPACE



Watch rear-view mirror while stopped. You may be able to escape crash from behind.

may not be sure which way he does want to go. Unless that other driver gives a definite indication which way he's turning, play it safe and stay behind him until you can be sure.

If you can't see around another vehicle, try standing on the foot-rests. You'll not only see better, but other drivers will see you better, too.

Now, how about where you approach an intersection and have to stop while cross-traffic has the right of way? And as with approaching any other intersection, you keep to one side of your lane's center area. Because at any intersection, you'll find a concentration of oil drippings from vehicles that have stopped there before. And watch out for crosswalk markings. They can be very slippery, especially when you're banked for a turn.

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(Please turn to page 232)

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YOUR MOTORCYCLE

(Continued from page 231)

ing for the right of way, you'll have the bike idling in neutral and the clutch lever out. Right? If you sit there in low gear, idly blipping the throttle, what would happen if the clutch cable lets go? That's right, you would end up as an unwanted fender ornament on someone's car.

Keep your hand resting on the clutch lever and your foot poised on the gearshifter, ready to kick it into low if you have to move in a hurry.

You never know when some motorist might bear down on you from behind. So keep some maneuvering room between you and any vehicle you may be sitting behind. Also keep a watchful eye on your mirror, and always have in mind an escape route you might take to get out of the way of a vehicle that barrels up behind you and can't stop in time.

If you're first in line waiting at a red light, hesitate a second or two when the light changes to green. Check cross-traffic both ways before you pull out. It seems there's always a last-instant light crasher.

Use proper hand signals

Okay, now let's say you're making a turn at an intersection. Hopefully, your bike has turn signals and they're all working. If you must rely on hand signals, use them properly. For instance, for a right turn, extend your left arm up over your head. For a left turn extend your arm straight out to the side. To signal that you're slowing for an intersection, extend the left arm down.

Indicating that you're slowing down is a good idea, because you never know when the brake light may not be working.

For making hand signals noticeable at night, put reflective tape or fluorescent paint on your glove.

As you make your signal, rotate your wrist. This action will make the glove glisten when some vehicle's headlights play on it.

When making a left turn, allow room for other vehicles to pass on your right side. Don't tie up traffic. If you must wait for oncoming traffic to pass before you can turn, apply either the front or rear brake (in case the clutch cable lets go), when the bike is in gear.

After completing the turn, immediately cancel the bike's turn signals. Forgetting to turn them off may mislead some driver to think that you're about to turn again.

If you approach all intersections with caution and alertness, they'll never be the hazards to you that they have been to some cyclists. **PM**

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Slicker kickers for next year's boats



Right out of the plant and into the water (left and above) without extensive dealer assembly in between, new 15-foot Chrysler Striper with 45-hp motor is packaged ready to perform.

235-hp outboards are tops, but racers hint more to come.

by Bill McKeown
BOATING EDITOR

Take a first look at next year's new outboard motors. You see slicked up, styled up machines with more performance, fuel economy and horsepower options packed into familiar powerheads.

Sneak a look under some hoods, however, and you find a forecast of things to come. The horsepower race isn't over. A number of the engines in boat-racing stables are raring to get out.

Like car companies, the big outboard makers now preview next year ahead of time. Models for spring '79 are announced with a flourish this fall, though added starters may show up at late-winter boat-show time or be slipped in during the coming year. Next spring we'll survey all engines with special attention to small ones that are introduced later.

Don't ever overlook the little motors as a lot of buyers seem to have been doing lately. The big mills

are the show horses, but the little fishing rigs burn lots less gas, take only a little more time to get you where you're going, and pay off with a low price tag. The dollar spread can be just over \$100 versus just under \$5000.

Where the muscle is

Officially, next year's biggest machines are named Evinrude and Johnson. Each tops out with a V6

bolt-on that can crank out an amazing 235 horses of push. Close behind comes Mercury's Black Max, also again at 200 hp. Merc's stable-mate line of Mariner imports now has a big one at 175. Chrysler's largest is a color-striped 140.

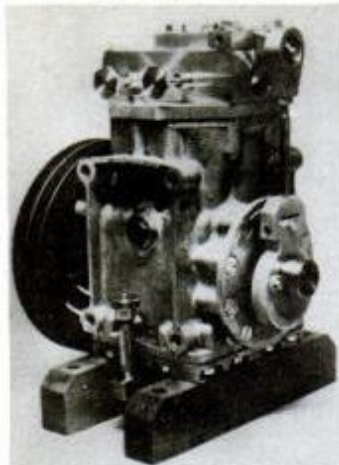
For '79, the biggest stories are not the biggest engines. Evinrude has added a V4 100 especially for hulls rated for up to that horse-

(Please turn to page 234)

New from Evinrude, a 100-horse model has been created for '79 to match the many boat hulls that carry a rating for outboard motors up to that figure.



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Tournament bass fishermen are among the skippers who'll check out a new Merc 150-hp Black Max V6, designed for speed but with improved non-stall idling electronics.

power. It will be in 20- and 25-inch shaft lengths with manual or power tilt and trim. Full line will include the 235, 200, 175 and 150 V6s, 140, 115, the 100, and 85, 75, 70, 55, 50, 35, 25, 15, 9.9, 6, 4, and 2 for horsepower ranges to match almost any hull.

Johnson will also start with 235 and provide similar power selections in 21 categories and 50 models. Special styling is available for the Johnson Javelin 100 and Stinger 75. Added thrust is provided in both forward and reverse for special 9.9 and 15-hp sailboat long-shaft models to make maneuvering easier when the wind goes down. The little 4 Sea Horse will have an integral

fuel tank or optional remote one.

Mercury tops at 200 and has V6s of 175 and 150 hp as well. Other Mercs rate at 140, 115, 90, 80, 70, 50, 40, 20, 9.8, 7.5, 4.5, and 4 hp. In addition to providing high speeds, Merc plans to take one more scare out of the sport by adding a new "idle stabilizer" to the V6s, an electronic sensor that notes drop-off of rpms when maneuvering around a dock and advances the spark to prevent engine stall when you chop throttle or shift to reverse in order to brake, and need power urgently. The smaller 7.5 and 9.8 fishing Mercs also have had their idling improved with the addition of a thermostat.

Mariner has joined the big leagues in the last couple years, and next season's lineup will see 17 horsepower ranges offered, (18 if you count their new electrics). The V6 175 is the biggest, or you can pick 140, 115, 90, 80, 60, 48, a 40 in six different models, 28, 20, 15, 9.9, 8, 5, 3.5 and 2. "Dependable work-horse" is the reputation Mariner seems to be earning.



High-style new Sea Horse 100-hp Javelin (above, left) and 75-hp Stinger with checkered-flag cowl decoration, are '79 Johnson models that are part of a line that includes 50 models, 21 horsepower classes, four electrics. Mariner 175-hp (left) tops a line of 17 ranges of power down to the smallest, a 2 hp.

Prepackaged power

Chrysler makes cars as well as marine motors, and it's also the only outboard manufacturer that still makes boats in addition to powerplants. You don't buy a car and then buy and install an engine; so why not pre-assemble the boat and motor package ahead of time? This coming year Chrysler will be doing it aboard a neat little 15-foot Striper bowrider planned to cost under \$3100. That will include boat, 45-hp outboard motor with electric start and alternator, controls and cables installed, dash-mounted keyswitch, tachometer and speedometer, running lights, battery in a battery box, tinted windshield, carpeting,

cushioned forward seats and sun-lounger seats in the cockpit. The prototype model that we tested averaged just a shade under 30 mph and appeared to be lots of sport for the money. It's an easy way to get started.

Other motors in the new Chrysler outboard line will include the 140, 115 and 85 Chargers, 100, 75, 70, 55, 45, 35, 30, 20, 12, 7.5, 6 and 4. Sailor models of 12 and 7.5 horses are popular with the windjammer crowd as auxiliaries with dependable thrust.

More to come

Other motor makers who will be updating their spring lines include firms such as Eska, Clinton, Honda, Volvo, Spirit, Sears Suzuki and others. And then there are racing motors running right now. To compete in most sanctioned class events, drivers must use mills that are actually in production and have been publicly advertised to prove it. The announcement may be a simple one-page flyer, however, giving cubic-inch displacement but not necessarily horsepower. Mercury has a Formula 2.4 Litre Black Max of



The Black Max racing Mercls, like this pair Pepe Nunez prepared for a Miami-to-New York run, have been judged by drivers to have 240 hp.



Johnson racers so far are secretive about total horsepower from their top-performance rigs. But guesses and race results indicate 250-plus—and rising.

142.2-cubic-inch displacement that drivers have referred to in print as "Mercury's 240-horsepower model." Outboard Marine has been racing high performance Johnsons and Evinrudes that have, on occasion, outrun it and have been guessed to

have well over 250 horses. End of the horsepower race? On race courses and in development labs, it seems to be still going at full speed. In the long run we'll be the winners with better, more efficient motors. **PM**

GOING FOR WATERFOWL?

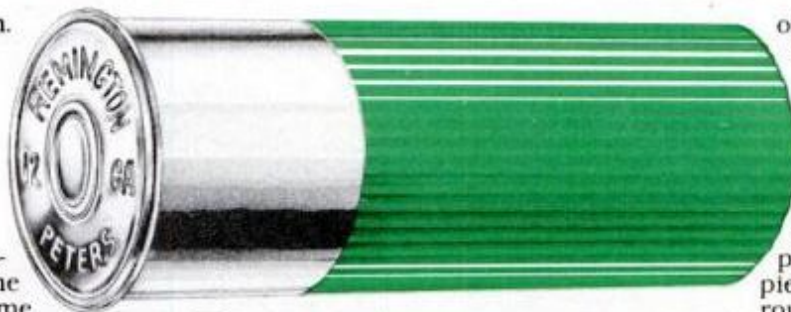


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(Continued from page 111)

now have column-mounted dimmer switches.

Pontiac's other car lines haven't changed appreciably for 1979. But the division's newsworthy item is its cast-iron, 151-cu.-in. four-cylinder engine. This powerplant has been re-engineered for 1979, with a lighter, freer-breathing crossflow head. Only the connecting rods interchange with the previous 151.

Separate intake and exhaust systems aid volumetric efficiency, with revised combustion chambers and pistons also helping. The aluminum intake manifold is heated by cooling water plus a special, separate thermostat. The new engine is 35 pounds lighter than before, yet horsepower is now 90 instead of 82 at 4400 rpm. Pontiac hopes to double production of this reliable Four and will supply it to other divisions as well as itself. The carburetor, called a Varajet, is essentially the venerable Quadrajets sliced down the middle lengthwise.

The 1979 Grand Am's suspension has been changed by incorporating higher-rate front and rear springs, a new rear stabilizer bar, new

urethane front roll-bar grommets, recalibrated shocks, and raised tire pressures. Pontiac also makes automatic airconditioning available for the first time.

Chevrolet for 1979

Chevrolet's 1979 changes come mostly by way of detail improvements, although there is a 4x4 option for the Luv pickup and a new small-block 4.4-liter V8 (267 cu. in.) for the Malibu and Monte Carlo.

The Camaro type LT is superseded by the Berlinetta, a trim package for the luxury GT market.

New bucket seats, console and sport steering wheel are now standard in most Monzas.

The Corvette's seatbacks fold flat for better access to the rear compartment, and seat adjustment is greater for both passenger and driver. The Corvette also lists an AM/FM stereo radio as standard equipment for '79.

Cold-air induction draws outside air into all Chevrolet engine compartments this year except for the 3.8-liter V6. And some Chevy carburetors actually come *without* idle adjustment screws.

Front discs are now standard on all Chevy cars except Corvette,

which continues with four-wheel discs.

An improved antitheft ignition lock for all Chevys uses a different cylinder arrangement that makes the cars harder to steal. It now takes 3.5 times the force to "ram pull" a Chevrolet cylinder lock than it did for 1978.

Chevrolet also offers an automatic shoulder belt system like the VW Rabbit's. It's a two-point harness that anchors to the upper door pillar and retracts between the front bucket seats. Lap belts are standard, as is a protective knee pad for the lower instrument panel.

Current Novas will end production by Dec. 1, after which Chevrolet will convert its assembly plants to build the new, fwd Nova to be introduced next May. This downsized Nova will share its X-body, as mentioned, with the Phoenix, Omega and Skylark. And police departments that previously used the larger 1978-style Novas will be encouraged to trade for special Malibus next time. These police-duty Malibus with the 9C1 option will include a reinforced frame, more durable engine and drive train, bigger wheels, larger radiator and heavy-duty suspension and interior. **PM**

Bob didn't do anything wrong. He was just listening to his new scanner, the Touch K100. When suddenly the scanning stopped, and the whole department came on the air. Seems they had just cracked a big underground ring.

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Minolta vs. Canon: Automation duel

Only two cameras offer you a choice of automatic-exposure modes; we tried them out side by side.

by Bob Berger



A-1 is slightly longer and heavier than XD 11, but both qualify as compacts.

Two new additions to the ranks of 35-mm single-lens-reflex cameras, the Minolta XD 11 and Canon A-1, are really tomorrow's cameras today. Not since the Olympus OM-1 and OM-2 has camera technology changed so dramatically.

The day it was unveiled, the XD 11 made history—as the first production 35-mm SLR to offer two auto-exposure modes, both aperture priority (you pick the lens opening, the camera sets the right shutter speed) and shutter priority (you pick the shutter speed, the camera sets the right lens opening), plus provision for manual operation. You set a three-position switch alongside the shutter-speed dial to the kind of operation you want.

Suppose you're photographing a tennis player and want a stop-action shot of his swing. You set the mode switch to "S" for shutter priority, and turn the shutter dial to 1/1000. The XD 11's computer will automatically set the appropriate aperture for that shutter speed.

Then you decide to include the net in front of your tennis player in the photo. Depth of field becomes important, so you turn the mode switch to "A" (aperture priority) and set the lens at a small enough F/stop to bring all subjects of interest into focus. Then the com-



XD 11's aperture-priority was used here to assure adequate depth of field.

puter selects the correct shutter speed, steplessly providing, for example, a shutter speed of 1/382 second.

Pretty good tricks. But there's more. When the XD 11 is set on "S," if the lens's greatest opening will produce underexposure at the chosen shutter speed, or if its smallest opening will produce overexposure, a light-emitting diode goes on in the viewfinder. It's your cue to reset the shutter speed. If you ignore the



Shutter-priority setting was chosen here to stop motion of the players and ball.

cue, the computer will readjust the shutter speed for you. You can always set the mode switch on "M" and use your own judgment or a hand-held meter to determine exposure.

Monitoring the XD 11's electronic activities is a pleasure. The viewfinder displays apertures or speeds, depending on mode setting, vertically on a scale to the right of the frame. An LED marks the stop or

(Please turn to page 238)

Typical available-light shot made with Canon A-1 set in a programmed-exposure mode.



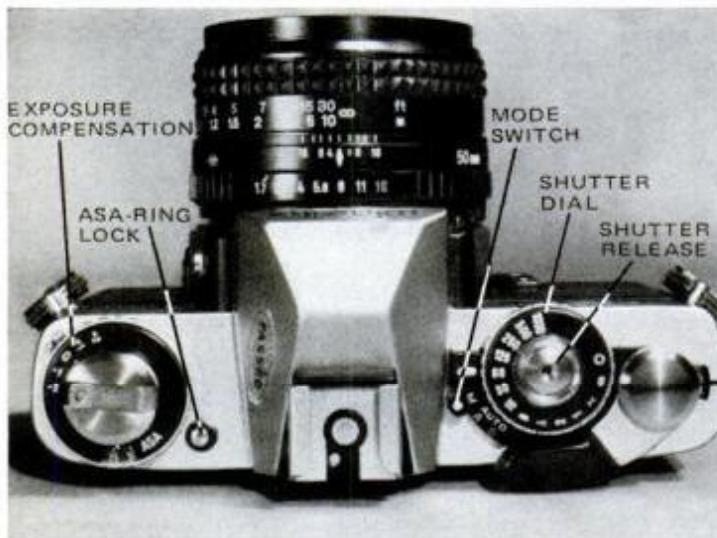
MINOLTA-CANON

(Continued from page 237)

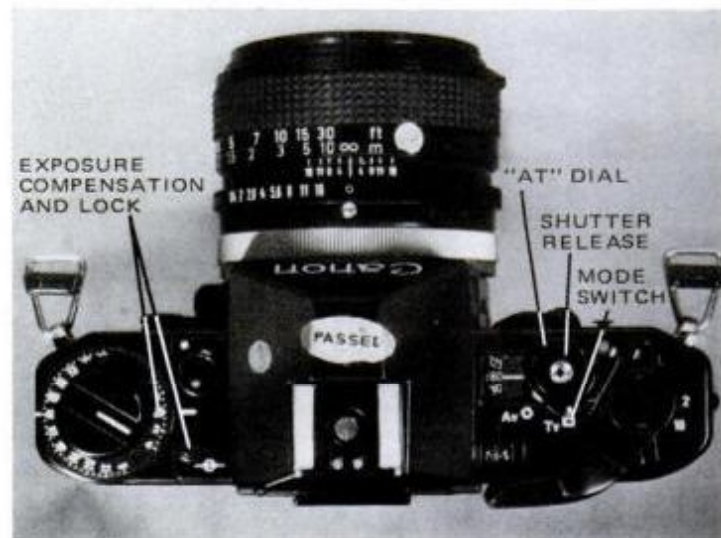
speed chosen by the camera. In "A," the F/stop shows at the bottom edge of the finder screen; switch to "S" and the speed comes into view beside the F/stop.

If the electronic goodies don't tempt you, a look through the finder might. It's so bright, and its contrast so generous, that focusing is a snap. The reason is a screen that incorporates more than two million conical prisms for increased light transmission.

Though the XD 11 is a small package—it weighs only 20 ounces minus lens—the controls are meaty



Top plate of the Minolta shows large, easy-to-use controls in a configuration that's convenient and readily understood.



Top plate of Canon shows mode switch set for Tv (shutter priority) with shutter at 1/60 second. Camera sets right aperture.



Flash and winder team with the Minolta to make a beautifully tailored unit.



Canon owners can avail themselves of fast motor drive, auto strobe with tilt head.

and operate easily. And everything works smoothly. The electromagnetic shutter release, in particular, is a gem. Lightly touching the large release button switches on the metering system; a slight increase in pressure trips the shutter. It takes some getting used to, but once you've got the knack it makes handheld shots at slow shutter speeds a cinch.

My own picture-taking with the XD 11 confirmed the accuracy of its silicon-cell, center-weighted meter. For bracketing and unusual lighting, there's an exposure-compensation dial surrounding the rewind knob, with a range of plus or minus two stops. A flip-up eyepiece shutter keeps stray light from striking the finder screen and inflating the meter reading for self-timer shots.

Some other things I like about the XD 11: the nonslip waffle-pattern grip on the Rokkor lenses' focusing mounts; the way the camera handles—it feels "right"; and the great accessories, particularly the film winder. With it you can shoot up to two frames per second—fast enough

for sequence coverage of nearly any subject. Add Minolta's Auto Electroflash and you can make flash photos in sync with the winder.

A few minor gripes: The XD 11, like many other SLRs, has an unthreaded PC socket that makes it all too easy for a flash cord to come undone at a critical moment. Another problem is the lack of a memory lock to hold meter readings in tricky lighting situations. In poor light, incidentally, the vertical scale of stops or speeds may be impossible to read, though the LED remains visible. Last but far from least, the owner's manual needs reworking; some if it is murky. A camera this good deserves better.

In designing the A-1, Canon was faced with the monumental challenge of following a very good act—its own AE-1, presently one of the most popular SLRs and itself an advanced design. Camera makers don't introduce new models just to hype sales. Enormous costs of research, development and tooling, plus genuine pride in his products are good reasons for a manufacturer not to bring out a new model unless it offers real advantages.

Six exposure modes

The Canon A-1 is so sophisticated that it may be a long while before the competition can match its technology. If that seems an overstatement, consider the A-1's six exposure modes.

Besides shutter priority, aperture priority and manual, the A-1 has a "P" (programmed) setting in which it chooses the most workable combination of speed and stop for the situation, stopped-down automatic exposure with Canon FL (old model) lenses, and fully automatic flash operation with Canon's 155A and 199A electronic flash units.

To keep track of lens opening and shutter speed, Canon has the best idea yet—a digital readout along the bottom of the viewfinder screen, marvelously visible in any lighting and thoughtfully placed outside the actual picture area. Also thoughtful is a switch on the top plate that lets you turn off the digital display.

As with the XD 11, a slight touch on the shutter button brings the A-1's metering data into view. The silicon-cell meter puts greatest emphasis on the center of the subject. An exposure override ring provides for compensation over a plus-or-minus-two-stops range; the ring is graduated in 1/3 stops—a boon for fussy photographers bracketing color shots.

Another example of the thought

(Please turn to page 240)

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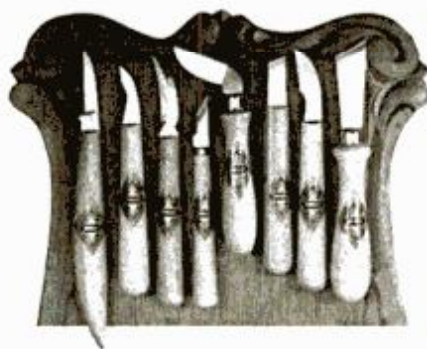
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that went into the A-1 is the circuitry that controls the viewfinder readouts. Instead of maintaining a constant brightness, like most calculator and watch displays, these digits automatically brighten for easy reading when the camera points at a brilliantly lighted subject, and automatically go dim in low-light conditions.

Different control markings

Everything about the A-1 makes it markedly different from any other SLR. Lens openings and shutter speeds are set by turning the same dial; a window in the top plate lets you read the settings. Markings are unfamiliar: setting the camera for aperture priority requires turning a pointer to "Av"; for shutter priority, the setting is "Tv." ASA settings go all the way to 12,800. A blinking LED comes on when the self-timer is actuated; just before the shutter trips, it flashes madly to let you know when to smile.

For all its sophistication, the A-1 has shortcomings. It doesn't wind smoothly and lightly, as a high-quality camera should; manual winding with the motor drive attached is accompanied by gear noise. I would have preferred that the "AT" dial, which sets aperture or shutter speed, be larger for easier operation. The control that may be hardest to use is the tiny lock on the ASA dial; it works fine in my living room, with fingers warm and dry, but on a cold, rainy day I don't think I could manage it. Like the XD 11's, the A-1's back unlatches with a simple pull on the rewind knob; I'd like an additional lock button. Like the Minolta, the Canon lacks a threaded PC socket.

On the positive side, the A-1 has the sturdy feel of its big brother, the F-1, and lets you use the same time-proven breech-lock mount lenses. You've no problem seeing the digital exposure display, no matter what the lighting. The exposure override control is easy to operate and has a positive-lock button. There's an eyepiece curtain, as on the XD 11. The Canon motor drive is superb and quite compact, especially with the nickel-cadmium power pack. If a winder is all that's needed, the same one that fits the AE-1 works fine on the A-1, and Canon's 199A Speedlite teamed with the A-1 takes all the work and worry out of flash photography.

List prices for the cameras are \$700 for XD 11 and \$680 for A-1 both with 50-mm f1.4 lens.



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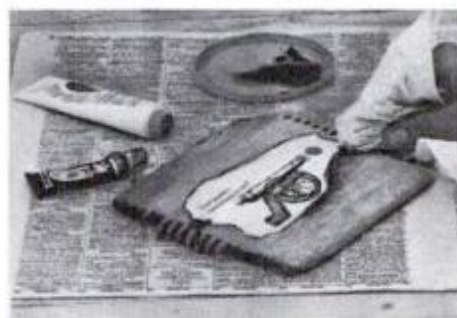
Start by selecting a print from a magazine or newspaper to serve as the art on your plaque. For rough (deckle) edges, simply tear art out; for smooth edges, use scissors or a blade.



Spray the back of the print with fast-drying black paint to prevent printing on back from showing through.



After applying glue to entire back, position the print using outline drawn earlier. Put wax paper over print and roll firmly to assure good overall contact and to remove any air bubbles.



Next day, you can "antique" print by rubbing in burnt umber or other pigment. Color should be darkest at print edges, and feathered into surrounding wood.

With an abundance of materials offered at artist's and crafts supplies stores, decoupage is an easy and pleasurable hobby to get started in. Basically, the idea is to affix a print to a surface and then coat it to make it appear as though it is a part of that surface. Though most do-it-yourself decoupage is on wood, you can apply printed matter, from any source, to either wood or metal—as long as the glue is compatible.

Many of the commercial products let you perform the craft in relatively quick time, but I still



Hold print in place on board to which it will be glued. With a sharp pencil, lightly trace print's outline to serve as an aid in final positioning.



After rolling, remove wax paper and wipe off glue squeeze-out with a water dampened cloth. Set aside to dry.



This plaque had many coats of varnish with lots of sanding between coats.

prefer the time-tested (and sometimes laborious) method—lots of coats of varnish with arm-wearying sanding between coats.

But the fact that I prefer the old-fashioned, hand-rubbed look over the commercial "plastic" finishes doesn't stop me from taking a shortcut that won't alter the looks of the finished product.

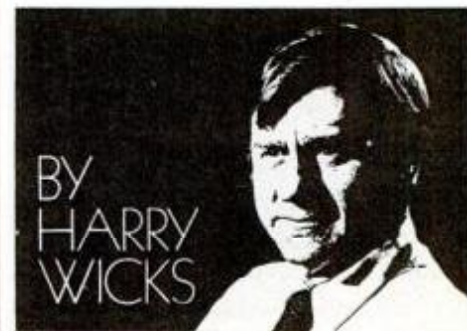
For example, because of the quality of many of today's varnishes, I generally stop after six to eight coats. Advanced decoupeurs who create very fine pieces of decoupage will go on to 30 and more coats. I have seen work on wood so finely rubbed and finished that it appears to be porcelain.

The plaque shown is a more typical decoupage project. The drawing was torn from the newspaper and the wood backing was used just as it was found on the beach—sand and sea textured, and weathered to a silver-grey patina.

Start by spraying the back of the print with a fast-drying black paint. If you skip this step, the printing on the back will show through after the varnish is applied. When paint is thoroughly dry, line the print up on material to which it will be affixed and draw a light pencil outline which will guide you later when permanently affixing print. Apply white glue to print back. Position print over the board using outlines and press it into place.

Next, place wax paper over the print and work out all air bubbles with a roller or straight-edge. Remove wax paper and set plaque aside to dry overnight.

Next day you can start the finishing process—applying coats of varnish with lots of sanding and tack-clothing between all coats. Start with 220-grit paper and work progressively toward finer grits after each couple of coats. **PM**



Coat rack for youngsters

If your kids need a little help keeping their coats off the floor and their boots in one spot, this quick project is for you. Besides providing coat hooks at a height accessible to a child, it also incorporates a place to stow wet or muddy boots. The boot box uses a grocery carton as a disposable liner so it never needs cleaning no matter how much dirt gets tracked in.

Cut members to length from 1 x 4 clear pine or fir. Eliminate sharp corners from head-level by rounding off upright members with a sabre saw (see drawing). Cut the stub tenons on the base's side pieces with a backsaw. Then use a coping saw to remove the bulk of the waste from the two sockets in the front piece to match the tenons, finishing with a sharp chisel. Assemble unit with

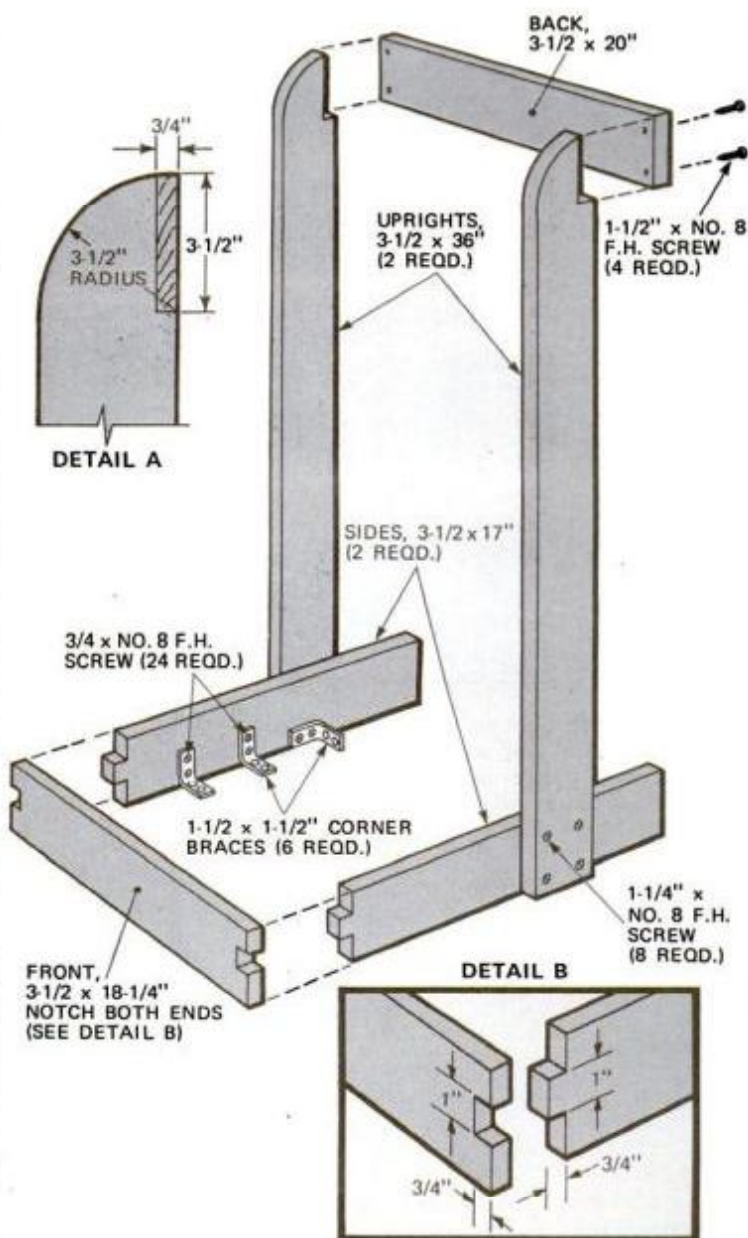
glue and flat head screws, countersinking them to prevent snags and tears. Sand well, especially all end grain, and finish with stain and polyurethane, or enamel paint. Add coat hooks and cut the boot box from a corrugated cardboard carton using a utility knife. Corner braces keep the boot box from being knocked out of position.—Max Farrell

MATERIALS LIST—COAT RACK	
Pcs.	Size and description
1	3/4 x 3 1/2 x 20" pine or fir
2	3/4 x 3 1/2 x 36" pine or fir
2	3/4 x 3 1/2 x 17" pine or fir
1	3/4 x 3 1/2 x 18 1/4" pine or fir
6	1 1/2 x 1 1/2" angle irons
24	No. 8 x 3/4" fh wood screws
8	No. 8 x 1 1/4" fh wood screws
4	No. 8 x 1 1/2" fh wood screws

Misc.: White or yellow glue, enamel paint or polyurethane and stain, corrugated cardboard box to fit coat rack base.



PINT-SIZED COAT RACK



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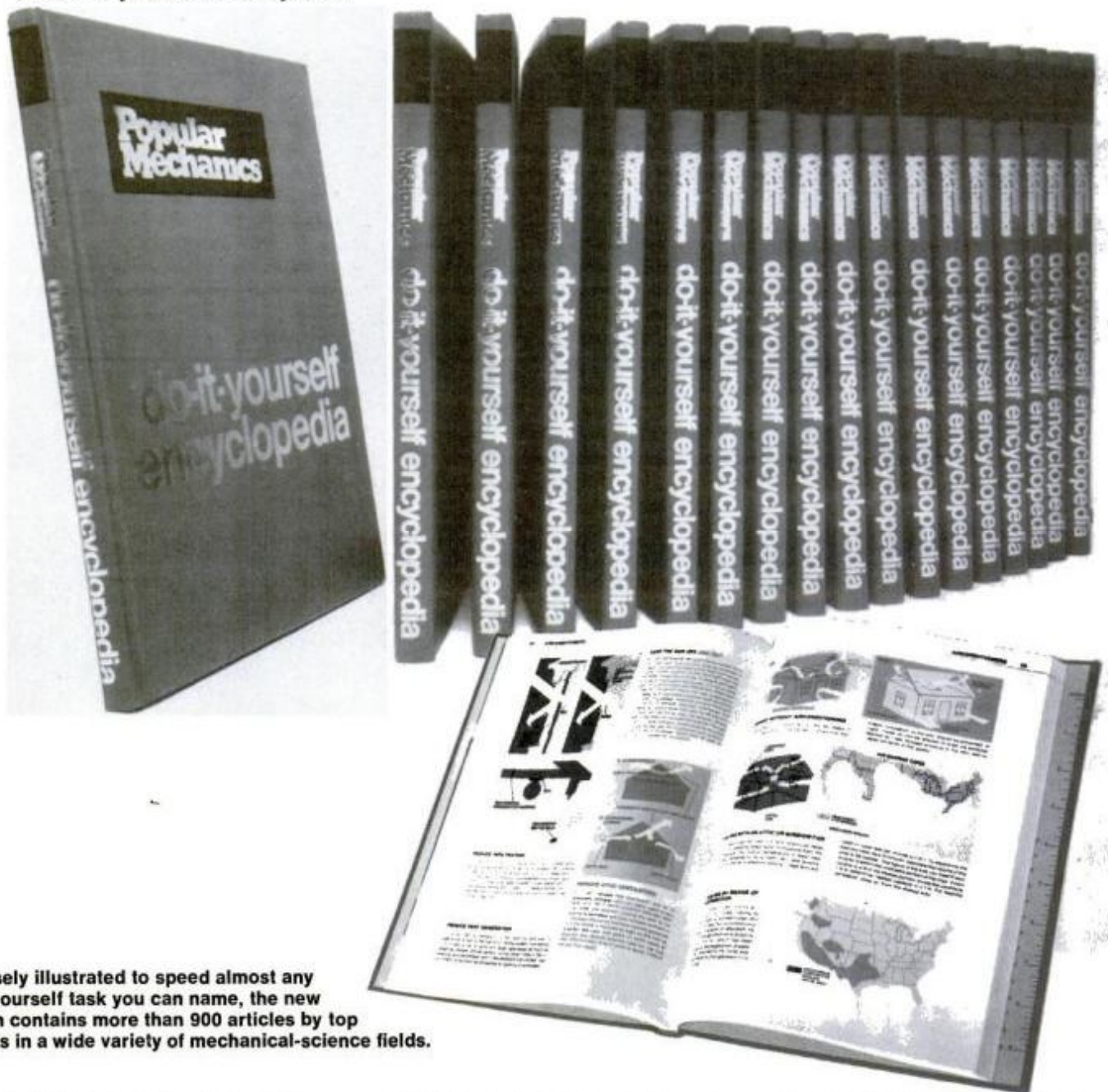
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WHEN IT'S TIME FOR ANOTHER CAR, SHOULD YOU BUY NEW OR USED?

(Continued from page 107)

worth is making sure that you inspect everything of consequence. I use a check-chart like the one that follows. Try it for the next used car you look at. Notice the "evaluation" column and symbols 1, 2 and 3. Here's what they mean:

1—The system or unit, if faulty, will cost a lot to repair or replace. Keep hands off unless the car offers exceptional value or dealer will perform and warranty the repair.

2—The system or unit, if faulty, can be repaired at moderate cost. The defect does not put the car in the same "hands-off" category as a transmission problem would, for example. The repair or an allowance for them should be made by the dealer.

3—The component, if defective, represents a relatively minor expense, but the dealer should pay for the repair.

CHECKLIST FOR USED-CAR SHOPPERS

Area, Component or System	Test	Evaluation Symbol
Body, moldings, bumpers, grille—overall condition	Look for damage and waves in metal.	2 or 3
Body—rust	Look and feel beneath fenders, doors and rocker panels; also along rain gutters and window moldings.	2
Doors, trunk lid	Open and close. Look for sprung or sagging units.	2
Glass	Look for windshield, backlight and side window cracks and scratches.	2
Paint	Look for scratches, pitting.	2 or 3
Tires	Worn, cracked bulges, other damage. Uneven wear points to front end alignment condition.	2
Springs	Park car on level ground; use tape to measure distance from fender wells to ground. Distance should be the same for each well.	2
Wiper blades	Brittle, worn.	3
Vinyl roof	Torn, faded.	2
Lights, signals	Not working.	3
Trunk interior	Water stains indicate a leak, or that the car was caught in a flood; new welds indicate a major repair was made.	1 or 2
Upholstery (seat, head and floor)	Look for wear, tears, dirt. Be careful of seat covers—upholstery beneath may be shoddy.	2
Engine	Check for ease of starting when engine is cold; also when it's warmed up. Race—see if visible smoke leaves exhaust.	1, 2 or 3
Airconditioning	Start engine and check operation.	2
Heater, defroster	Warm up engine and check operation.	2
Dash	Look for overall condition. Start engine—check gauge operation.	3
Radio, tape player	Inoperative.	2 or 3
Windshield wiper, washer	Check operation.	2 or 3
Brakes	Apply pressure. Pedal should be "high"; hold firm.	2
Clutch	Start engine, set parking brake, put transmission in first gear and let out clutch as you feed gas. Engine should stall when pedal is one-half to three quarters of the way up.	2
Odometer	Mileage important if car is '75 or later model and mileage is near or exceeds 50,000. Catalytic converter probably needs service.	2

(Please turn to page 246)

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CHECKLIST FOR USED-CAR SHOPPERS (Continued from page 245)

Area, Component or System	Test	Evaluation Symbol
Interior overall condition	Throw back carpets. Look for water marks indicating leaks or car that was in flood.	1 or 2
Hardware	Look for missing door handles, control knobs, etc.	3
Horn	Not working.	3
Engine-off checks:		
■ Belts, wires	Damage.	3
■ Radiator, coolant	Look for corrosion or rust on radiator signifying leaks; rusty coolant means cooling-system abuse.	2
■ Battery	Low electrolyte level, cracked case. Corroded terminals signify abuse.	3
■ Automatic transmission	Pull dipstick. Inspect and smell fluid. A dark fluid or varnish odor signifies trouble.	1
■ Internal condition	Pull dipstick. Inspect and feel oil for signs of coolant. Possible cracked block—be careful.	1
Engine-on checks:		
■ Starter motor	Disconnect coil-to-distributor cable. Crank engine 10 to 15 seconds. Operation of starter motor should be quiet and smooth.	2
■ Flywheel	With coil-to-distributor cable off, listen for clanking noise. It may signify damaged flywheel.	1
■ Compression	If you get a chance, test with gauge. If not, crank engine with coil-to-distributor wire off. Uneven cranking may mean damaged valve train area.	2
■ Noise	Let engine idle, then race. Listen for knock, grind, click, etc. Test with engine cold, warm.	1 or 2
■ Exhaust manifold(s)	With engine idling, check exhaust manifold(s) for "puffing" that may indicate a crack.	2
■ Oil system	If possible, check oil pressure with cold and warm-running engine. Low pressure means trouble.	2
■ Internal condition	When engine is warm, pull oil dipstick and let oil drop on hot exhaust manifold. If oil "sizzles," watch it—block may be cracked.	1
■ Radiator, hoses, water pump, fuel pump, carburetor	After letting engine run, turn it off and check for leakage around each of these.	2
Exhaust system	Let engine run and check under car for "puffing" exhaust-system parts.	2
Road test:		
■ Engine performance	Should be peppy when cold and warm—plenty of power, good pickup, no noise.	1 or 2
■ Brakes	Should provide quick, firm stops without signs of noise, pulling, fading pedal. Also test ability of parking brake to stop car at 5 mph.	2
■ Steering	Should provide solid control—no binding, hardness or looseness; no shimmy in wheel.	1 or 2
■ Clutch, manual transmission	Should provide quick, clatter-free response; easy shifting; lack of noise.	1 or 2
■ Automatic transmission	Should provide rapid, smooth response in all ranges without noise.	1
■ Differential	No noise. Press and depress accelerator to jerk car. Listen for thumps indicating excessive play. If possible, remove differential filler plug for sample of lubricant, which shouldn't feel gritty.	1 or 2
■ Propeller shaft, universal joints	Vibration and shimmy may mean prop shaft defect, wheel unbalance, loose steering, worn wheel bearings, loose motor mount, worn shocks, bad ball joints. Clicking at low speed means worn U-joints.	2
■ Suspension	Hit bumps going slow and fast. A car that bounces has weak shocks. A car that shimmies may be due to a condition listed above under "propeller shaft."	2
■ Frame	Wet tires; drive in straight line on concrete. Tracks should show two straight lines—not four	1
Other equipment, e.g. door lock, power window, speed control, antenna	Test for performance.	2 or 3
Car can also be checked for emissions control and safety at state inspection stations.		

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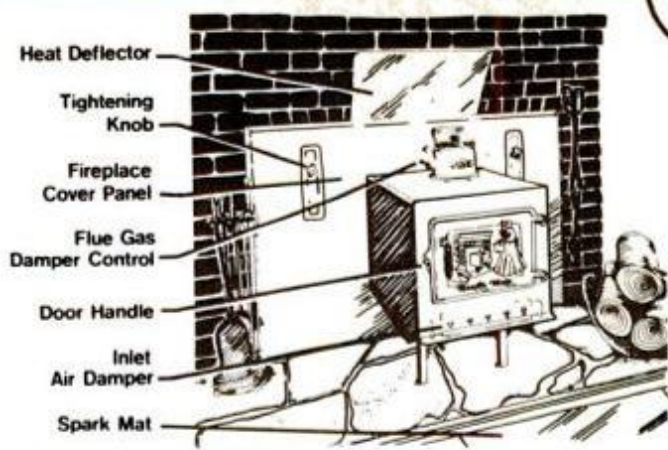


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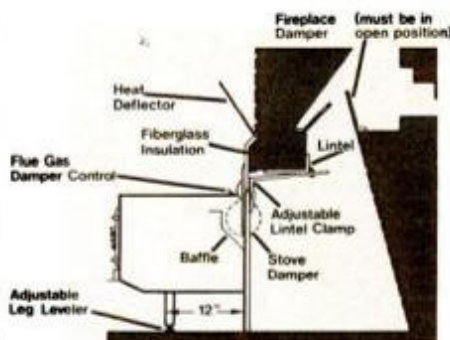
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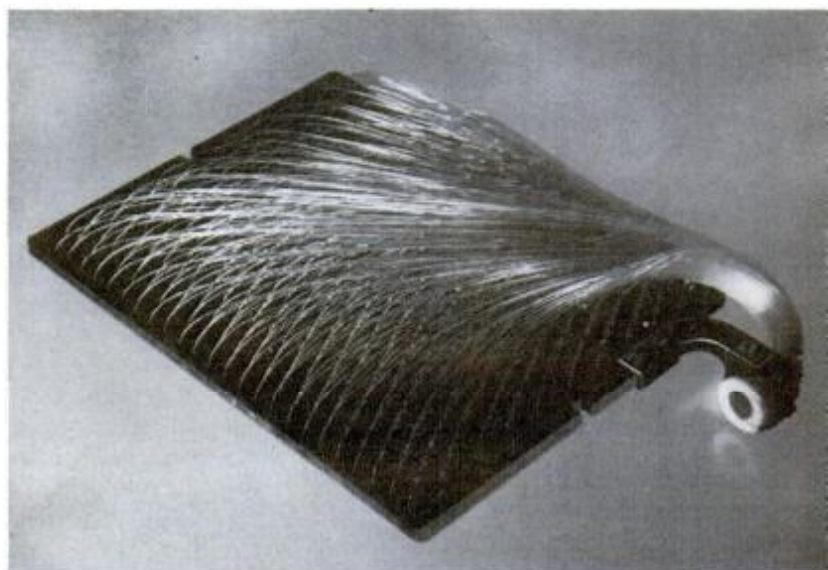
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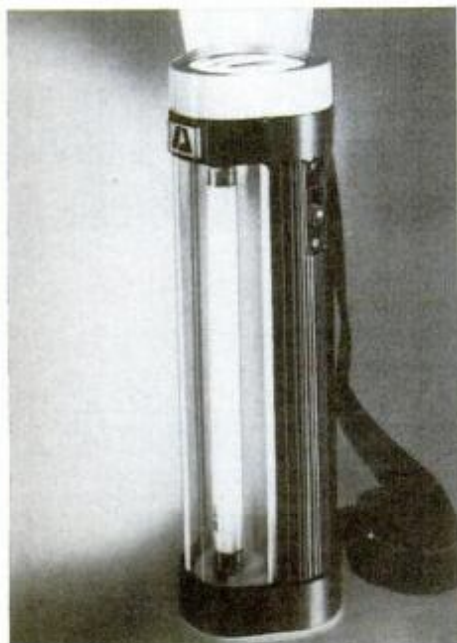
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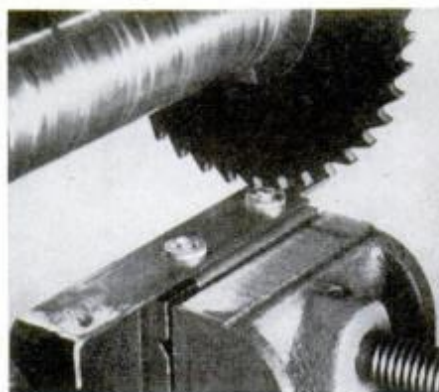
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HINTS FROM READERS

Removing rivets



When riveting an arrangement you may dismantle later without marring the parts, install a washer under each rivet head. To remove a rivet, cut, file or grind its head flush with washer and punch out.—*Walter E. Burton*

Lemon of a vaporizer

There's a remedy for vaporizers that gurgle water through the steam hole or don't work at all because the electrodes are corroded. If commercial cleansing tablets aren't at hand, apply several drops of concentrated lemon juice or vinegar on the opening at the top. This will dissolve the mineral deposits on the electrodes and let the unit run efficiently.—*Jerry D. Meece, R.Ph.*

Cutting glass safely



To keep a straightedge from slipping when cutting glass, place a strip of gasket rubber underneath it. The rubber keeps the straightedge in place and raises it above the wheel, preventing interference with the cutting action.—*David W. Roberts*

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Better than new, 8-year-old, 19-foot Sea Ray runabout shows improved operation with 240-hp OMC V8, upgraded outdrive.

Repower—save gas and money

A little hard and heavy work, and a clever transom modification, can pay off in more performance for less cost.

by Ted Harvey

Upgrading a boat engine can give you more power, performance and fuel economy. You can save installation costs as well if you do it yourself. Hooking up a bigger outboard motor is common practice,

but what about switching inboards or sterndrives—is it too much of a project for an amateur? Ray Lind of Waukegan, Ill. decided to find out.

His advice: Don't try it if you're a rank novice and have never used tools before. But if you've tinkered with engines, it's worthwhile.



For a good job—and this is a job for a good mechanic—first assemble all parts and have an assistant inventory them by size and number on an installation checklist.



Fiberglassed engine mounts were discarded before stringers were widened with 2x6s bolted and fiberglassed in place.



To alter the transom cutout, owner Ray Lind used a 3/16 x 20 x 24-inch aluminum plate. After marking the plate with a template supplied with the sterndrive, he cut the required opening with a sabre saw, then checked it against the old cutout.



His result: Just great. Smooth performance and extra miles per hour.

Ray liked his 8-year-old Sea Ray *Pachanga*, a 19-footer in good condition and with satisfactory basic performance. He would rather replace its engine, particularly if he could do it himself, instead of buying a new boat or going to the expense of pulling out the old powerplant for a complete overhaul.

Original power was a high-performance 235-hp V8 OMC sterndrive of 307-cc displacement. For replacement he picked a 240-hp OMC with a jump to 351-cc and a newly designed outdrive. Requirements for the job included adequate

bilge space and mounting stringers, regular power tools and rental of a chain hoist to handle the 700-pound engine.

Cost of the new engine, drive unit, side-mount controls and new instrument panel assembly—minus the trade-in allowance obtained for the old engine and drive—was \$3258.

Dealers react differently when you want to do the repowering installation yourself. Ray's dealer figured he was losing about \$1250 for the job of removing the old engine, cleaning the engine compartment, rebuilding engine supports, installing, connecting and testing the new equipment and test-

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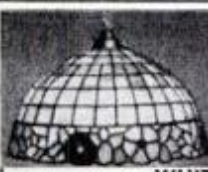
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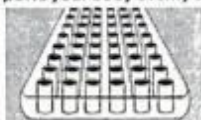


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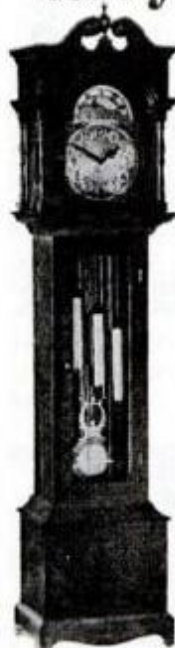
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running the new boat. On the other hand, he was making a full retail sale less trade-in allowance, and would have the used engine and drive unit to overhaul and probably sell for a profit as well. He also knew Ray could do a good job, and was willing to advise him.

After pulling the old outdrive, disconnecting throttle and electrical controls and removing mount lagscrews, Ray and a friend were ready for the hoist. Since cooling was integral, there were no hose connections to uncouple or plug; engine oil did not need to be removed. From

the dealer's stringer measurements, Ray knew he had to lower the support members and bring them closer together. With engine out and bilge cleaned, bed stringers were chiseled and sanded down, and 2x6-inch sections of building-grade pine were fitted, then bolted and fiberglassed in place inside the stringers.

Next the transom cutout for the outboard drive was trimmed lower and one side shaved since the new engine, unlike the old one, would be mounted dead center. Because the OMC outboard unit bolts to the engine but not the transom, only a seal fits around the drive and it was not necessary to fill in the old transom hole.

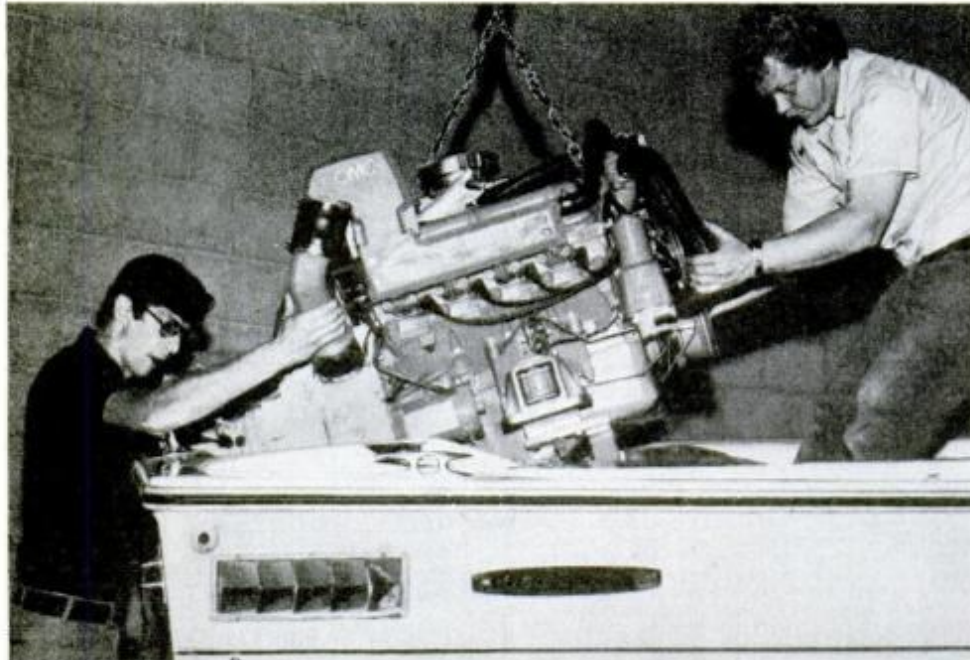
Exact placement of the new engine on its bed was essential. Rather than having to shoehorn in the engine, Ray marked bolt holes for the mounting pads, then removed the engine to drill the holes. He was able to borrow the necessary mounting jig from his dealer. With it he drilled the holes for the mounting pad lagscrews, installed them, and then eased in the engine with the help of friend Roy Smith.

The transom modification and repair method Ray used is one which other do-it-yourselfers could employ. After studying the irregular hole of the old sterndrive (or it might have been an outboard motor well cutout) that he had to cover, Ray determined that a 20x24-inch piece of aluminum plate would allow the new drive unit hole and still provide sufficient overlap for good purchase by holding screws. With a template pattern supplied with his new engine, he outlined and then cut the required opening with a sabre saw. Then, bedding the aluminum plate in silastic sealant, he screwed and bolted it into place on the outside of the transom, and fitted the transom seal around the engine stub housing.

Inside the boat, Ray hooked up steering cable and a new hydraulic power-assisted shift system and throttle cables before mounting the drive unit. Dashboard controls were installed, but connecting and attaching the instrument panel required only a simple plug-in. Final engine lineup adjustment was easier with the OMC SelecTrim feature that can tilt power thrust to the optimum angle.

The installation took two weekends, resulting in improved fuel economy at cruise and an increase of nearly 10 mph to a top speed of 60. Ray Lind decided the results certainly justified the cost and effort.

PM



To position the new OMC engine, Ray rented a chain hoist, the only extra tool he needed, to jockey the 700-pound power package into place over predrilled mount holes.



The watertight bond for the new aluminum transom plate was provided by bedding it in place in a silicone sealant.



Measurements of new plate were determined so outer edge would have space for screws beyond original drive hole.



Attachment of outdrive seal, drive unit and finally the exhaust-hub propeller were finishing steps. Transom was then painted.



Full instrument panel is available with the new engine. Wiring connections are simplified with plug-in harness hookup.

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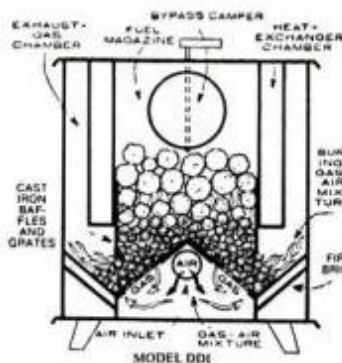
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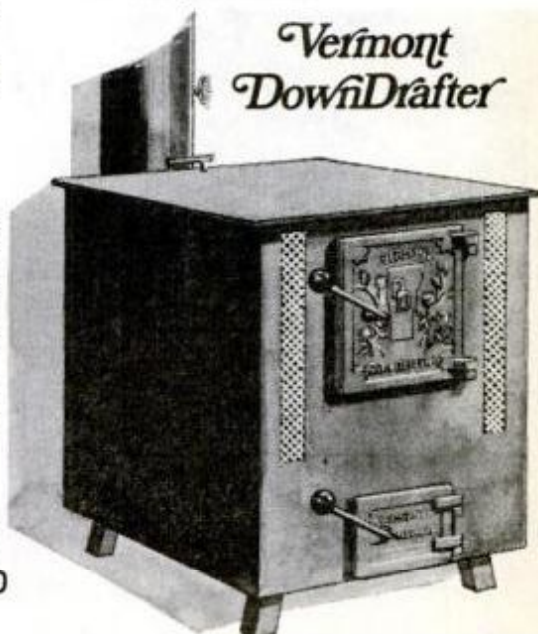
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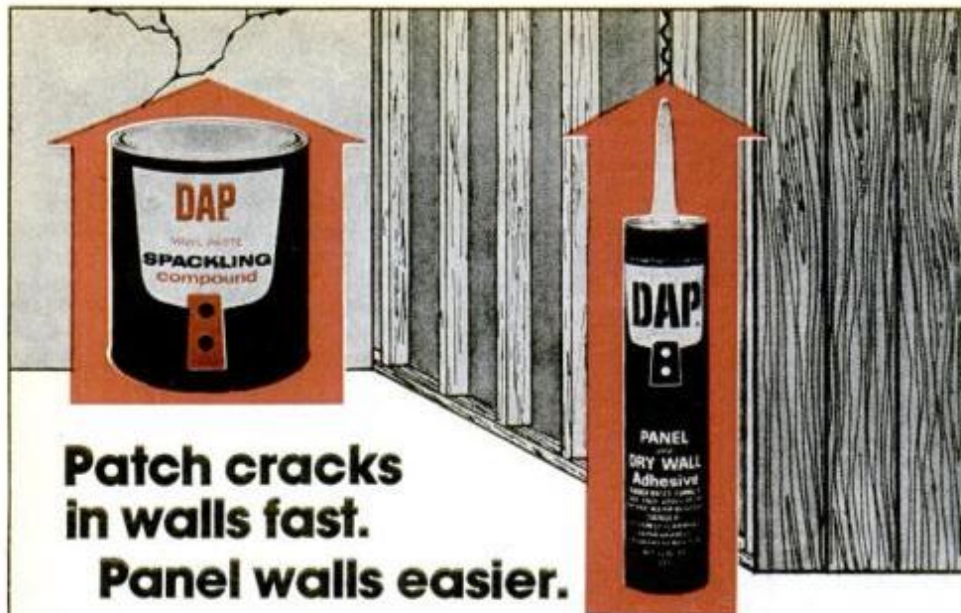
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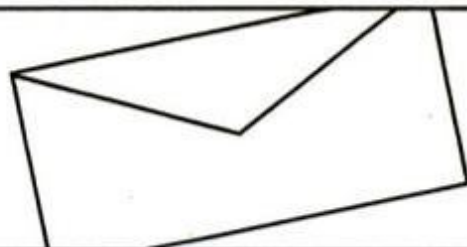
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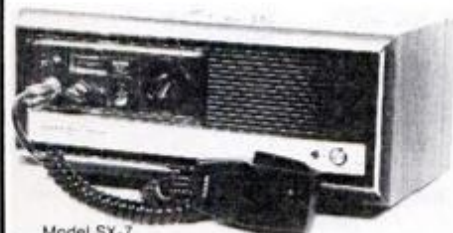
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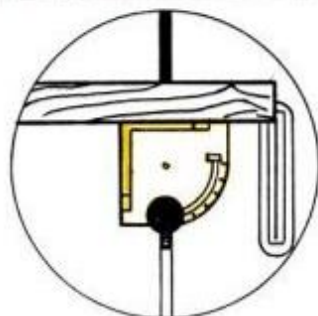
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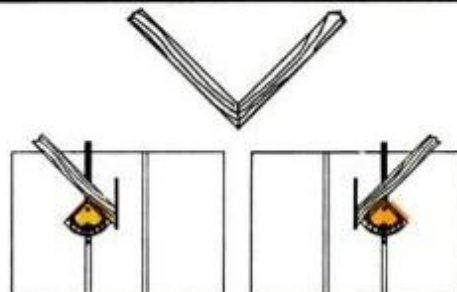
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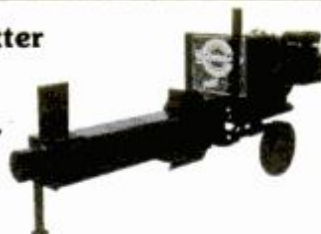
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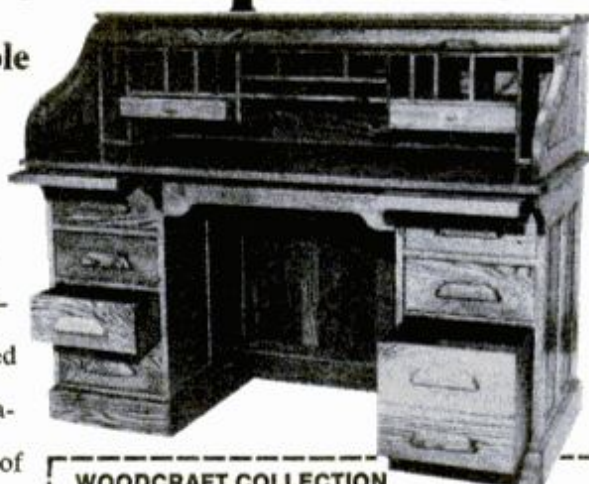
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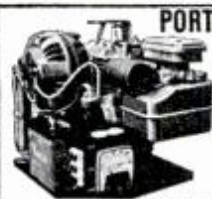
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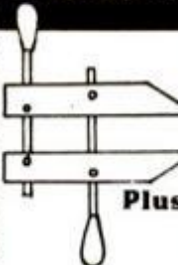


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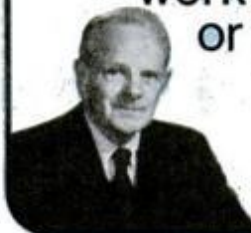
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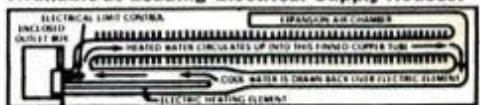
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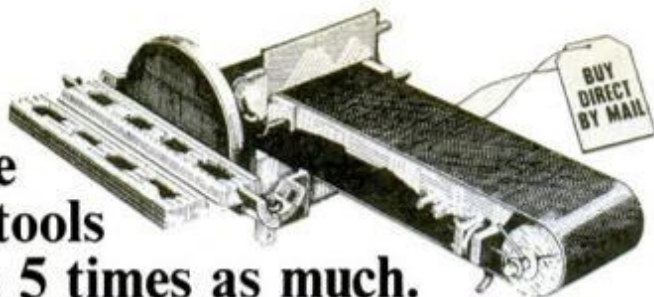


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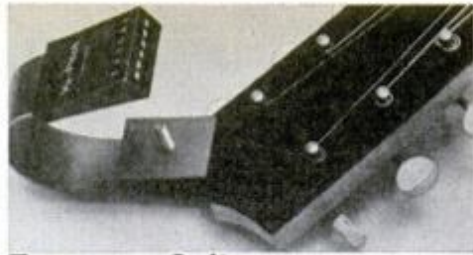
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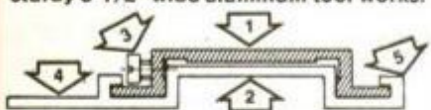


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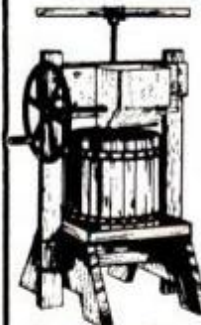
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