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OCTOBER 1975 • Vol. 144 No. 4

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SPECIAL FEATURES:

A good look at Detroit's '76 Cars. Pages 70-81. Plus how to repaint an oldie whether you plan to buy the job or do it yourself. Pages 56 and 58.

How to cut firewood and use a fireplace. Know the secrets that will assure you of good firewood, proper storage and fine fire-building. Page 60.

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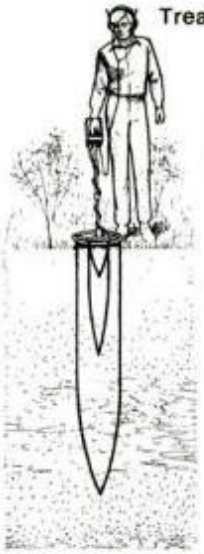
You can make your hardwood floors look like new again. Even if they are so bad they need sanding, you can do a fine job in a weekend. Page 92.

Turn on your family's creativity by making a potter's wheel. Seeing a shape emerge from a mere clay blob will seem like sheer magic. Page 96.



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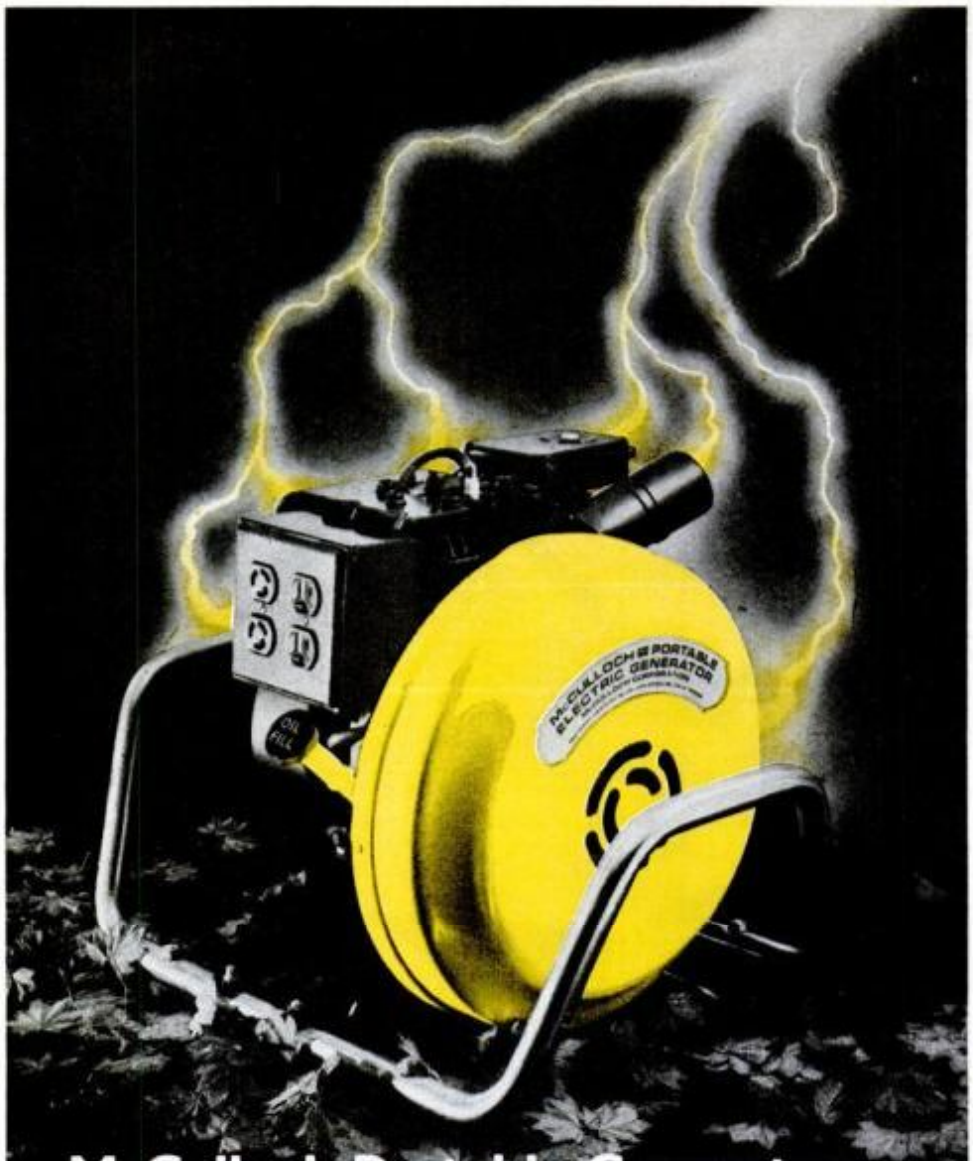

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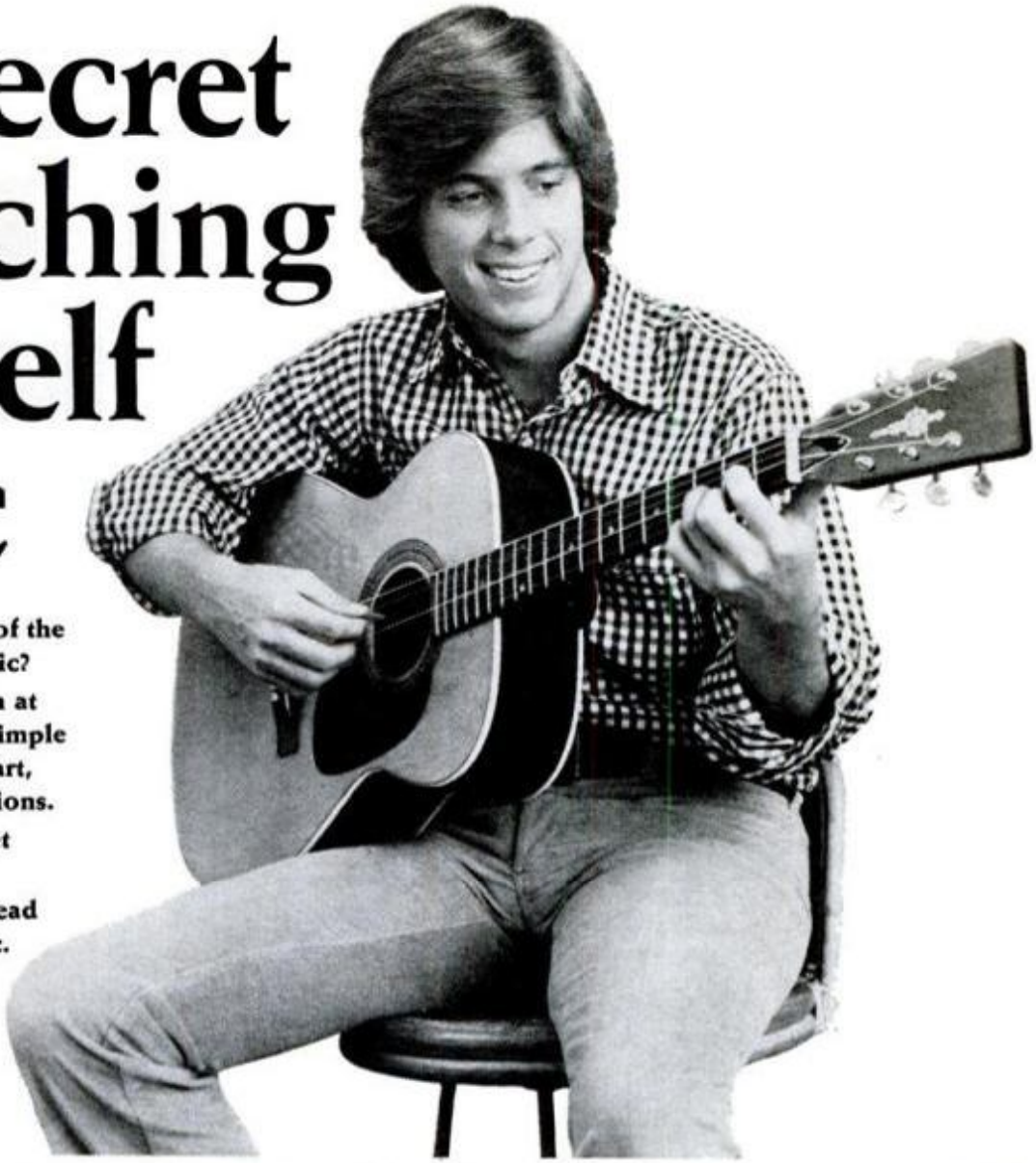
The secret of teaching yourself music



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It may seem odd at first – the idea of teaching yourself music. You might think you need a private teacher at $4 to $10 per hour to stand beside you and explain everything you should do – and to tell you when you've made a mistake.

But surprising as it seems, you need no such thing. Thousands of people just like you have taught themselves to play by using the lessons we give by mail. And you can too.

With our lessons, you learn to play the right way – by note from regular sheet music. Without any gadgetry or gimmickry. And all it costs you is just pennies a day.

You don't need any previous musical training. Our lessons start you off "from scratch" with clear word-and-picture instructions. A lot of the songs you practice first are simple tunes you've heard many times. And since you already know how these tunes are supposed to sound, you can tell immediately when you've "got them right."

Then you go on to more advanced pieces. By this time you can tell if your notes and timing are right, even without ever having heard the songs before. Sooner than you might think possible, you'll be able to play whatever kind of music you like. Folk. Popular. Classical. Show and dance tunes. Hymns.

You learn in your spare time, in the privacy and comfort of your own home. There's no one standing over you to make you nervous. And because you teach yourself, you can set your own pace. You're free to spend as much time mastering any lesson as you wish.

It's really a marvelous way to learn. In fact, graduate Mrs. Norman Johanson wrote us, "My daughter has taken lessons for 8 years from a private teacher, and now she asks *me* questions about some of her lessons. How very proud I feel when she says to friends, 'You've just got to hear my Mom play!' "

Others also enjoy her playing, Mrs. Johanson reports. She plays for herself to relax after a trying day, and for her husband when he's tired. She also plays for friends when she goes to parties. "In a sentence," she says, "it's the most soul-satisfying thing that has ever happened to me."

If you've ever dreamed of being able to play the piano, the guitar, or the spinet organ, why not learn more about our convenient, economical way to learn? Send for our free booklet *Be Your Own Music Teacher*. With it we'll include a free "Note-Finder." There's no obligation. Just mail the coupon to the U.S. SCHOOL OF MUSIC, A Home Study School Since 1898, 417 South Dearborn Street, Chicago, Illinois 60605.

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LETTERS

TO THE EDITOR

Small cars, big reaction

My commendations to Auto Editor Bill Hartford on his excellent August article (*How to Stay Alive in a Small Car*, page 39). I think it is the best thing on auto safety I have seen in a long time. And not just for drivers of small cars, either.

VAUGHN MANNERS
ESCALON, CALIF.

While I have been driving for over 35 years, I continue to become incensed over those kooks who are not content to serve me their bright lights at night, but have to blast me with them in daylight as well. So perhaps you can understand my shock that bright lights in daylight were recommended.

H.C. DOENNECKE
TULSA, OKLA.

May I compliment you on having the article in your magazine. It's the finest piece of work I have ever seen in my 30 years of driving. If this article could get the publicity of the movie *Jaws*, it would save thousands of lives and untold injuries. Please offer it to the school systems of our country.

CHARLES SEDLACEK
BRONX, N.Y.

A short story

Just a note to say your article, *A Jewelry Box for Your Queen* (page 124, July '71) is still a sensation.

There is a short story concerning this jewel box that I made which has a happy ending. In 1966, an eight-year-old Mexican girl living in Ensenada, Baja California, needed medical help which I arranged for her through The Flying Samaritans, a volunteer medical group to help Mexicans. The girl's father had died earlier and she "adopted" me as her godfather. Two years ago she was a "C" student and due to financial problems she was having a difficult time completing her education.

Subsequently, I underwrote her education costs and made her a bargain that if if she got her grades up to a "B," I would make her this jewel box. I'm happy to say that the youngster has just graduated from high school as a straight "A" student. In addition, she now intends to go on to college and become a math teacher. All she needed was the motivation and someone who cared about her.

So, my thanks to Popular Mechanics for publishing a design which has had far-reaching effect upon the future of one lovely youngster.

WILLIAM E. SARGENT
SAN DIEGO, CALIF.

Fireplace draws . . .

I built this fireplace-bar (*Fireplace Opens for Party Fun*, page 76, Jan. '75) and made a few alterations for

my convenience. I received many compliments. It was just what we were looking for to add to our newly built recreation room.

RICHARD W. SANDMAIER
LAKE VIEW, N.Y.

Clairvoyant

I was wondering if you could help me locate plans for a solid kitchen block table. I have been searching local sources, but have thus far drawn a blank.

BRIAN GAHRAN
ABERDEEN, MD.

Your letter and our planning coincided. *Please turn to page 102.* *There you'll find detailed drawings and patterns for building a unique butcher block table.*

Slick oil idea

I just finished your article *All About Oil*, (page 70, July '75). What caught my attention was the section on how to get rid of oil you don't want. I have seen people park over the neighborhood storm sewer and drain the oil into the inlet. There *are* people who do not care!

My best method is to collect plastic jugs originally used for laundry bleach, windshield washer fluid and antifreeze. These I hang fishstringer style in the garage for the future. Then, when needed, I pour the old oil into the jug, cap it and drop it in the trash can.

It's simple, easy and clean.

ROBERT WIDHELM
FREMONT, NEB.

Who picks whom, revisited

Is Leo Patterson kidding? (*Who goes into space? Letters*, page 5, Aug. '75). If they sold raffle tickets for a chance to be a colonist in one of those *Cities in the Sky* (page 95, May '75), they'd collect enough money to build one of them.

One of my few regrets after an interesting 60-odd years is that I was born too late for the opening of the American West, and too early to go into space.

CLIVE W. HASWELL
HONOR, MICH.

Now he'll get the point

I'd like to buy the twist drill sharpener that is shown in *Look What You Can Do With Your Portable Drill*, (page 79, July '75). It's the one shown at the top of the page with the caption: "Carbon and high speed twist bits can be sharpened with this tool. It accepts 11 sizes." Who makes it?

DAN CARVER
NEW YORK, N.Y.

Black & Decker Mfg. Co., Towson, Md. 21204. It's model 7980, and is available at most hardware stores.

A change of face

I have read with a good deal of interest the article by Nils Nelson (*The Miles Per Gallon Game*, page 62, June '75). It is evident that Nils is onto something good. Like a lot of other people, I suppose I have known about the accessories that he describes, but have always thought of them as speed equipment. Nils has put a different face on them.

FRANK BOSWORTH
SWAN LAKE, MONT.

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But if you think you've got lots of time to get around to it, you're only kidding yourself.

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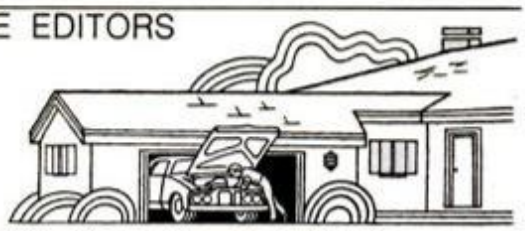


THE PM GARAGE

New sound for an old car

After you install it, a quality sound system is one of those things you wonder how you did without. My '68 set-of-wheels had an old AM radio that spattered and spit and never could be heard over the road noise when I drove at speed. I replaced it with a Lear Jet Stereo 8 Model A-71, and opened up a whole new world of listening. The AM/FM/FM stereo, 8-track stereo tape player fits into my

dash as if it were original equipment. The installation took the better part of a Saturday, because I had to enlarge my dash opening, custom-mount two speakers, run to the store for more solder, and so on. I picked up 12 volts at the accessories terminal of my ignition switch, plugged in my existing antenna and turned on the music.

The FM band was my first concern—that's where I'll have the 10-watt receiver tuned most of the time. Reception of stereo broadcasts was flawless at my location 40 miles from the New York transmitters (sensitivity is 5 microvolts on FM), and reception of the strong signals from nearby stations was beautifully controlled by setting the signal input level switch to local. After checking out the FM and AM, I left the unit to the kids: They already knew that you just push the tape cartridge into the hinged radio dial/dust door and turn up the volume to set your tympana pounding. I retreated. (Lear Jet Stereo, Inc., 6868 South Plumer Ave., Tucson, Ariz. 85706.) —*B.H.*

Super solvent

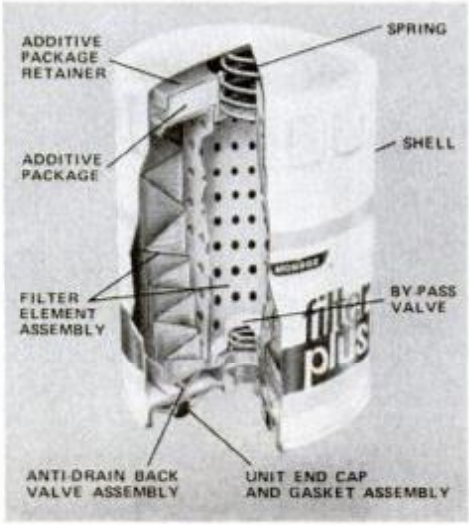
If you've tried to remove or repair the weatherstripping or carpeting on a car, or attempted to plug a patch in a vinyl roof, you know the goo used to seal those parts in is power-

ful stuff. How do you get it off? 3M Co. says it has the answer. It's called 3M Brand Release Agent 8962. It comes in a spray can and will cut just about any adhesive or sealant—oil base, butyl or polysulfide—used on cars. It can also be used to clean up those gobs of excess adhesive you sometimes find on a new car. (3M, 3M Center, St. Paul, Minn.)—*R.L.*

New filter adds additives

There's a new oil filter coming on the market that will give you more miles between oil changes. If you change oil every 6000 miles, as most carmakers recommend, you can go 9000 miles with the new filter. It figures out to a free oil change every 18,000 miles. Made by Monroe Auto Equipment Co., the filter is called Monroe Filter Plus. It has a chemical disc built in the top of the filter. The chemical disc dissolves as oil flows over it and the chemicals replace additives in the oil as they are used up, extending the life of the oil.

I've had the filter installed on my car, but I've used it for only a few hundred miles, so I don't know first-



hand that it's good for 9000 miles. But the people at Monroe, a pretty conservative outfit, say they have tested it for 750,000 miles. The auto companies are interested in using it on the '77 cars, which indicates that Detroit thinks the idea does have merit.

The filter is now available only in Indianapolis, but it will be sold nationally starting next year. It will sell for about 50 cents more than a regular filter. (Monroe Auto Equipment Co, International Drive, Monroe, Mich. 48161.)—*R.L.*

Set your speed

The instructions told me the Pacesetter electronic cruise control ought to take an hour to install. I say more like three or four. Anyone with a greasy thumb can do it, though, and the instructions are clearly written.

Simple tools are all you need, and basically what you do is mount a servo under the hood, place the control head under or into the dash, and connect the wiring between. It's for automatic transmissions only.

I find the Pacesetter works quite

well, holding the set speed uphill or down. Calibrations on the control knob don't quite jibe with my speedometer, but they're close, and I soon got used to translating.

The Pacesetter is fully warranted, and its manufacturer, Annuncionics, has a service consultant who's available by phone and who'll call you back if you need tech help. I did, and although he didn't know I was with a magazine, he returned my call promptly at his own expense (long distance). The Pacesetter costs $59.95 from most parts houses, or when ordered from Annuncionics, Inc., 2205 Stoner Ave., Los Angeles, Calif. 90064.—*M.L.* ★★★

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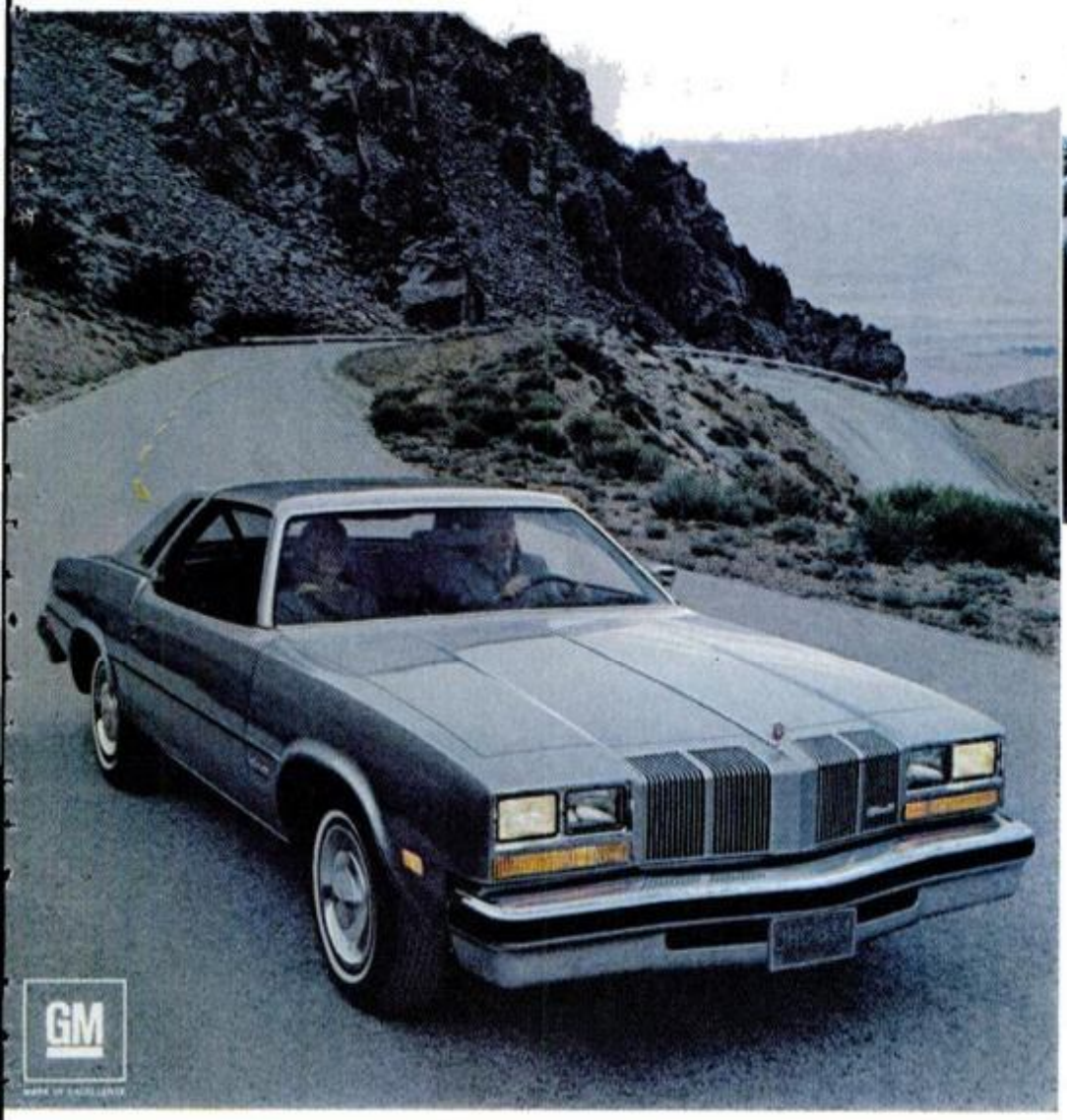
We built this Cutlass Supreme Brougham for Tom Rickey, a practical guy who likes to pamper his wife, Donna.



Cutlass Supreme Brougham is new this year, and it's the most luxurious version ever built of our most popular car. It's probably the only car that could satisfy people like Tom and Donna.

Tom has always liked the Cutlass Supreme's looks, its mid-size maneuverability, and the solid way it's built. The Brougham has all that and a lot more, a lot that Donna likes. The interior, for example, has velour seats with the loose-cushion look, like the ones in the famous Olds 98 Regency. And there's a landau roof that Donna ordered, too.

Cutlass Supreme Brougham, a practical mid-sized car with the look of a big, expensive car. And the good feeling of having an Olds around you. Built for hard-to-please people like Tom and Donna.

1976 CUTLASS SUPREME BROUGHAM

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CAR CLINIC

BY MORT SCHULTZ

Bright way to do it

I own a 1970 Buick LeSabre Custom and need to replace a taillamp bulb. I was informed it would cost me $25, because the bumper has to be removed. Surely, there must be a better way.—Edward E. Anton, Memphis, Tenn.

There is—do it yourself. Open the trunk lid and simply lift the rubber baffle which rests against the bumper. Either lamp socket can usually be reached through the scalloped opening in the bumper. Usually you don't ever have to loosen the bumper.

Even if conditions are tighter than normal and bumper-to-body clearance is limited, making it impossible to get your hand in behind the bumper, you should need only to remove the bumper-to-frame brace bracket bolts on the side of the burned-out bulb so that you can push the bumper down just enough to reach the socket.

More on brake squeak

In the May column, you advised Audi Fox owners with squealing brakes to tell dealers to order new brake pads using part No. 823698151A. My dealer knows nothing about this. What about it?—Charles Potwora, Toledo, Ohio.

My friends at Volkswagen threw me a curve on this one, swearing to the bitter end that the new brake pads were being issued. Now I find that a service circular, No. T-31/75, was mailed on May 9, 1975, to district and regional quality-control managers advising that "eliminating front-wheel brake noise on the abovementioned vehicles can be achieved by installing four silencer shims (part No. 171615121) in combination with Plastilube." The vehicles referred to are Audi, Dasher, Rabbit and Scirocco. Well, I really won't stay teed off if this is not just another put-on and if the repair finally gets the noise out of owners' ears.

Persistent shimmy

I have been unable to find a mechanic who can get the shimmy out of the front end of my 1968 Comet V8. This occurs only when brakes are applied. I have had the front end aligned twice, tires balanced three times, drums turned twice, drums replaced once and new brake linings installed three times. Can you help? —A. L. Owens, Winona, Tex.

Apparently you have investigated everything that can cause braking-induced front end shimmy, but I question how the repairs were done. Let's assume that front-end alignment was made to proper specification and wheels were balanced correctly. There is no guarantee that new brake drums are true, so before new drums are installed (and old drums, too) they should be turned with the tire-and-wheel assembly attached. Furthermore, new brake linings should be ground to remove high spots and to make them conform to the brake drum. Grinding assures *total* contact. Uneven contact may create shimmy. Front-strut bushings also should be replaced to reduce sensitivity in the front end.

There is also a chance that a brake backing plate (or plates) is not tightened to specification.

Playing it by ear

My 1972 Javelin AMX with 360-cu.-in. engine and automatic transmission is making a metal rattling noise, as if something were loose, in the area of the transmission. It happens only when the car is in gear. What is it?—Jerome P. Maillet, Mechanic Falls, Me.

Could be a cracked converter plate. It's tough to say without actually hearing the noise, but the converter is a good place to start looking.

Ring around a rosy

My 1970 Chevelle station wagon (307-cu.-in. engine) with 50,000 miles has suddenly started using oil, going from negligible to one quart every 500 miles. Consumption seems to be more pronounced with highway driving. I can't find any leaks, and a compression check shows all cylinders within plus or minus 10 p.s.i. of the manufacturer's 150-p.s.i. specification. What's wrong?—Ron Brase, San Jose, Calif.

Rings—although chance of trouble from another source is more likely. Don't let compression-test results fool you. Pistons have two rings—oil-retaining and compression-retaining. It's possible for oil rings to be worn, causing oil loss into cylinders, while compression rings have retained their integrity, accounting for good compression.

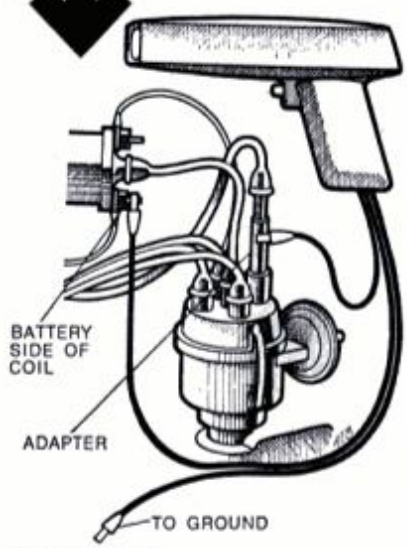
But there's a greater likelihood of (1) worn valve guides or (2) worn valve guide seals. You will have to pull the head to study the situation. If valve guides or valve guide seals are worn, oil is pushing past into the cylinders where it is being burned with fuel.

Short Sport

I own a 1973 Dodge Royal Sportsman. I was told it has a 25-gallon fuel tank, but I haven't been able to get more than 18½ gallons into it. After more than a year of letters to Detroit and wasting time going to various dealers trying to find the reason for my problem. Dodge came up with a solution designed by a

(Please turn to page 22)

PM CAR CARE **tip**



Use adapter

One sure way of destroying engine performance is to "cut into" ignition wiring with a probe or ice pick to attach a timing light and then continue the damaged wire in use. Save your wires—use an adapter. Detach the No. 1 cylinder lead from the distributor cap. Insert one end of the adapter into the lead so it contacts the terminal and seat the other end firmly into the distributor cap. Attach the timing light as shown in the illustration.

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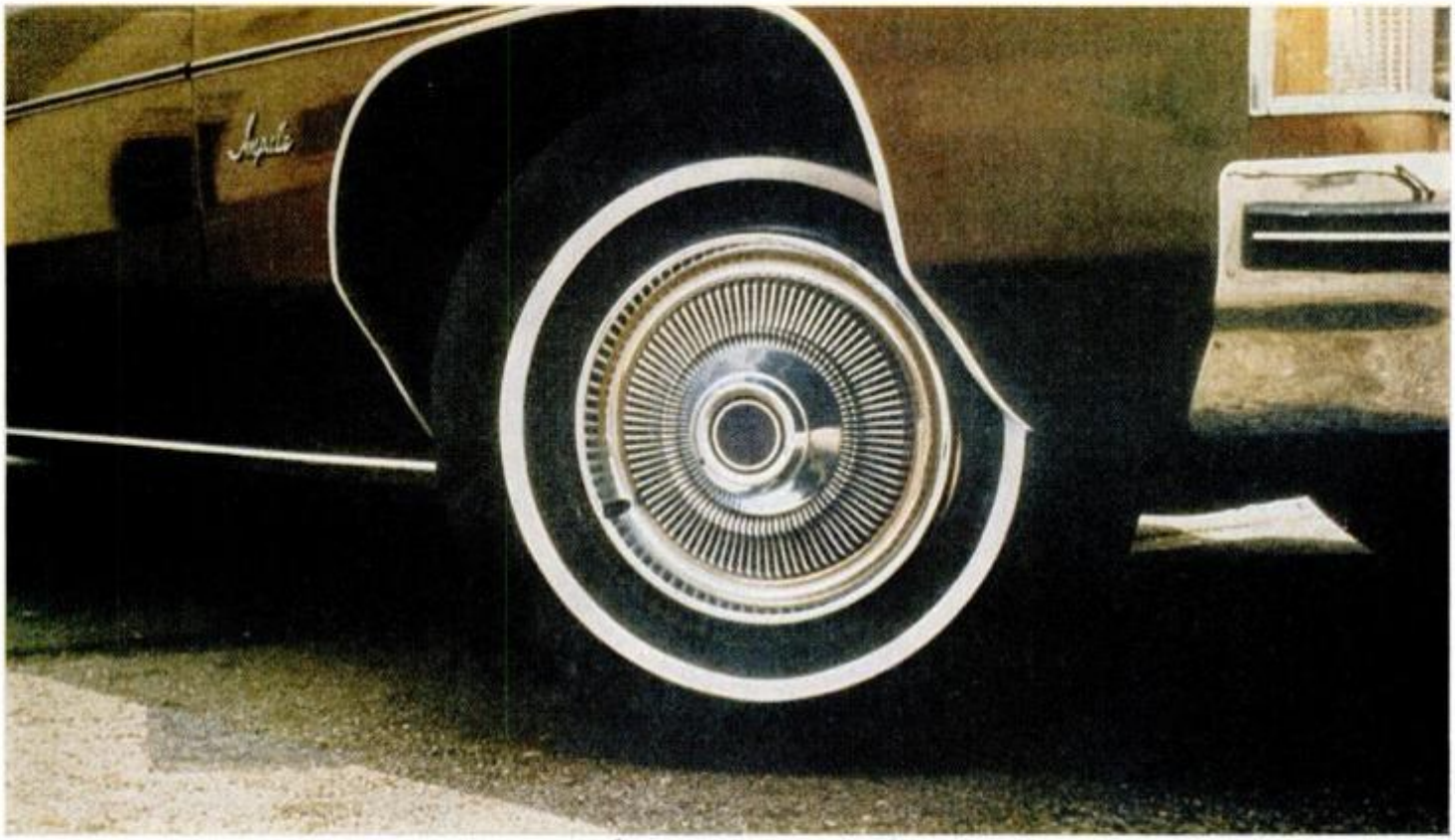

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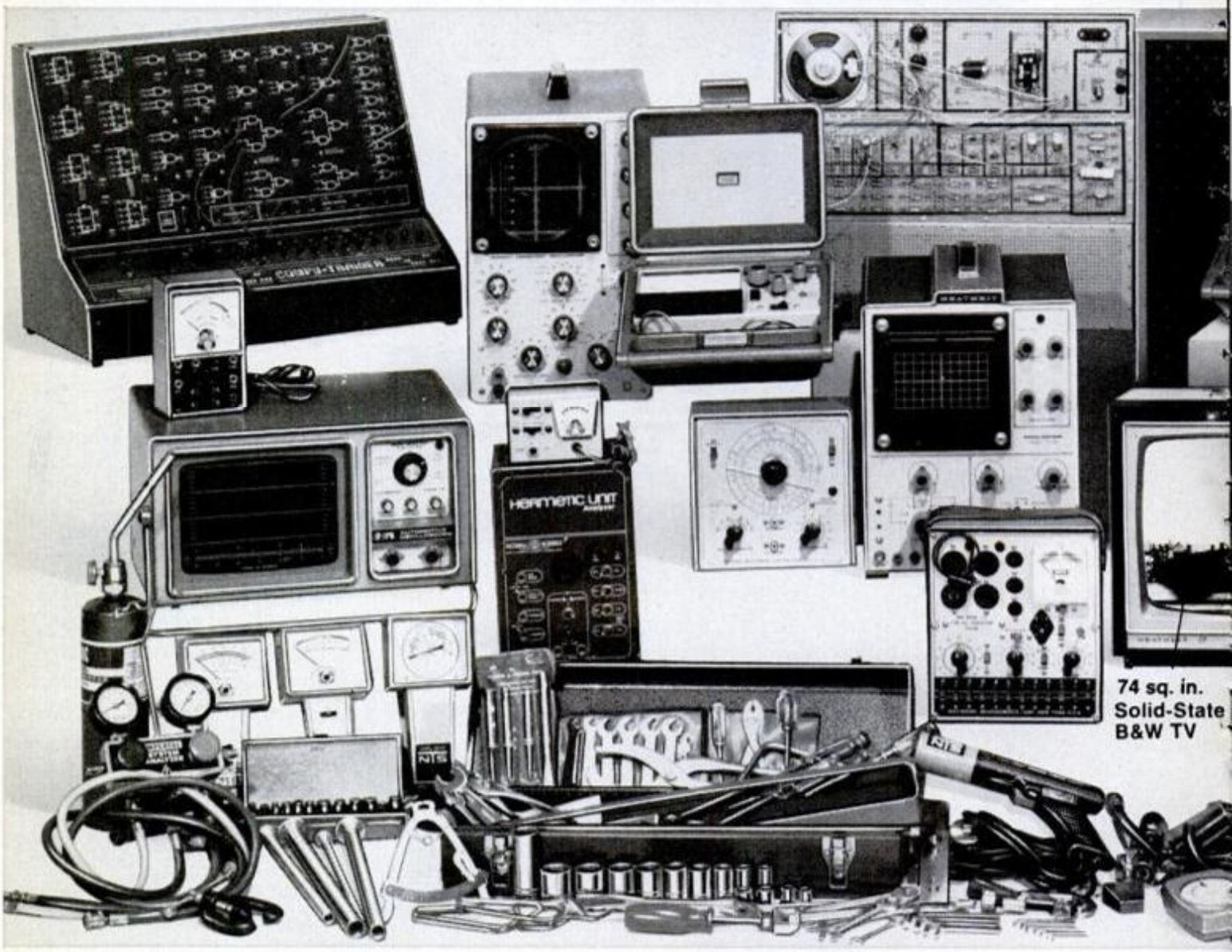

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(Continued from page 16)

mental giant. A change was made which allows my gas gauge to read FULL *when the tank has 18½ gallons. Please, is there anyway I can get 25 gallons of gas into my 25-gallon tank or is this asking too much?—Robert E. Mangieri, Richardson, Tex.*

If your situation is typical, the answer is not as mysterious as it sounds. You may be assuming that you only have 18½ gallons in the tank when, in fact, you may have it filled with 25 gallons. The original gauge on many of these models read EMPTY when six gallons of gasoline were actually still in the tank. The only way to determine if this is true in your case is to run the tank dry and fill it up.

Incidentally, making the change in the gas gauge was recommended by Chrysler for 1972, '73 and '74 Sportsmans exhibiting this trouble.

Let's assume that after you run the tank dry you find that it really can only take 18½ gallons. Then, there is damage. There's a tube which extends from the gas gauge of your vehicle into the fuel tank. Fuel is pumped through this tube to the fuel pump and on to the carburetor. If this tube is bent out of shape, it could be positioned off the floor of the fuel tank. In other words, it might be drawing out only 18½ gallons, leaving the remainder lying dormant in the tank. You may have 25 gallons of gas in the tank, but only 18½ gallons of it is usable.

If this is the case and you want to make a repair, the fuel gauge and fuel-feed system will have to be removed and examined for damage.

Staying trim

The simulated chrome-plastic trim around the dash of my 1971 Dodge Coronet Custom has worn in spots. The chrome-look has turned black—yecch! Who makes a paint or something that can be used to restore it? —Mike Holchuck, Elmira, N.Y.

No one that I know of makes such a paint, Mike. Want to get a laugh? One Chrysler Corp. dealer told me that you can't even replace the trim strips with new ones—they aren't made—and if you want to restore the look you would have to replace the entire dash assembly. It all seems kind of ridiculous.

But there's hope. There are chrome-toned fast-sticking tapes made that can be used to cover what you have. 3M is one company that makes them. I suggest that you visit some auto-parts and accessory dealers and look over the selection. But I've got to warn you: Trimming the tape to fit the dash pieces is not the easiest job. It takes patience and a really sharp etching knife or razor.

South Dakota blues

My problem with a 1970 Ford ½-ton pickup (360-cu.-in. engine) since new has been condensation that develops in the vent caps and runs back into the engine. What can I do?—Henry Kaiser, Yankton, S.D.

I'm assuming you're right and condensation is being caused by the wide swing in South Dakota temperature. If it's being caused by a cracked block or head—well, I don't have to draw pictures.

You can't do anything about the climate, but you can do something every so often to purge condensation from the engine. Change the oil and oil filter. Run the engine for a half hour and change oil again. Remove the valve covers and clean out the upper area thoroughly with kerosene. Be sure the PCV valve is working.

Impertinent Imperial

I have a 1975 Chrysler LeBaron Imperial (4000 miles). As I was going down a steep hill, the brake pedal kept creeping to the floorboard. Both of them hit bottom at about the same time—hill and brake pedal. A quick pump of the pedal gave me half-pedal. The Chrysler service manager assures me that this is the way four-wheel disc brakes act, but I'm worried.—Alexander M. Kordick, Sr., Seymour, Conn.

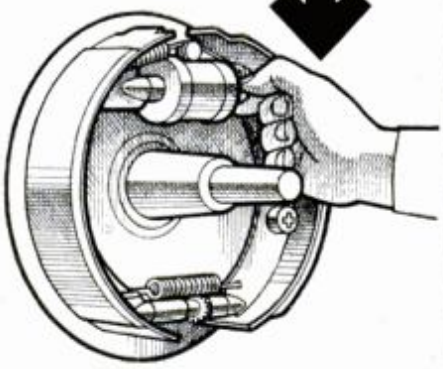
The service manager is not putting you on if he has, as I'm sure he has, examined the brake system for fluid leaks and found nothing. Under certain conditions, such as going down a steep hill, applying constant heavy pressure to the pedal of your brake system can induce brake fade. If you manually downshift the transmission on the crest of the hill, the engine helps to brake the car. Also, fan the pedal rather than pressing it constantly.

Moan over Monza

How do I get the No. 3 sparkplug out of the V8 in my 1975 Monza 2+2? The other plugs are easy, but there is no clearance for a wrench when it comes to No. 3. What gives?—Steve Reeves, Roanoke, Va.

A hassle gives, Steve. You have to raise the car, loosen the two engine mount-to-crossmember attaching bolts on the left side about four turns, lower the car and raise the engine up about ½ inch. You can remove the plug with a standard ⅝-inch sparkplug socket, 3-inch extension and ⅜-inch-drive, flexible-head ratchet. After you have the new or serviced plug in place, you have to do the same things in reverse.

PM CAR CARE **tip**



Safety first

A leaking wheel cylinder can lead to complete brake-pedal loss in time, but it may kill you before reaching that stage. Brake fluid leaking past the end caps may get on the brake linings. This causes a pull, which may become severe enough to throw the vehicle out of control. For this reason, any pulling condition that occurs when brakes are applied should be investigated and corrected immediately. To determine if wheel cylinders are leaking, pull back end caps. If any fluid drips out, the cylinder is defective and should be replaced.

SERVICE TIPS

■ Delco Electronics Div. of General Motors warns that spray cleaners should not be used on automobile tape-player motor commutators in an effort to eliminate unwanted noise. These cleaners destroy the motor brush holders. If a tape player doesn't work properly, take it to a qualified radio technician. The cost won't approach that of a new tape player.

■ Phew—if you get an odor that won't dissipate when operating the airconditioner of a 1972-75 Torino, T-Bird, Montego, Cougar or Mark IV, check to make sure that the drains in the evaporator cover and distribution plenum are clear. Any long pointed object may be inserted to see if drains are clear and to ream them out if they aren't.

■ Champion has a new service booklet and it's free. The 16-pager is titled *Troubleshooting the AMC, Chrysler, Ford, GM and IHC Electronic Ignition Systems.* It's available from Champion marketers.

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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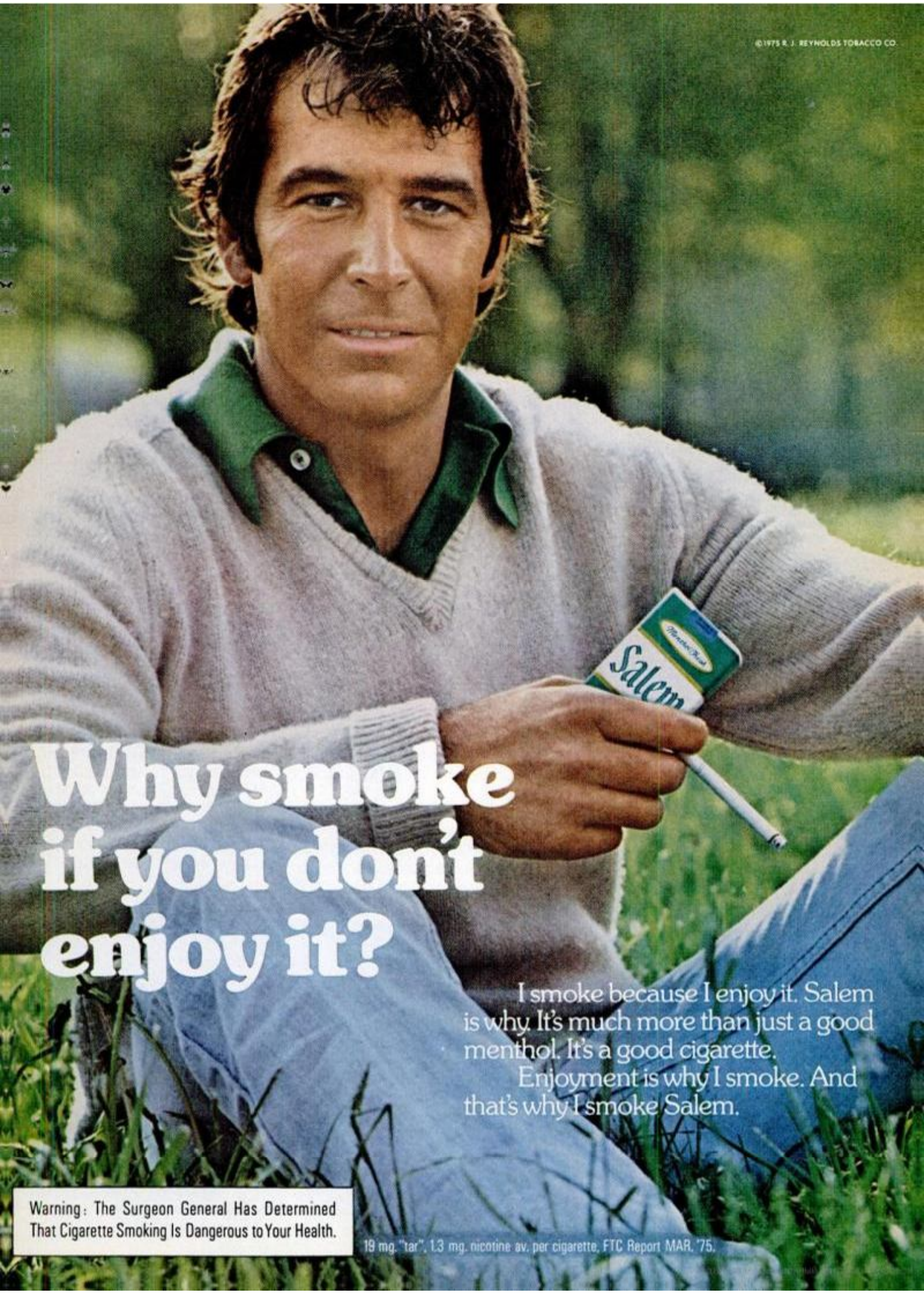
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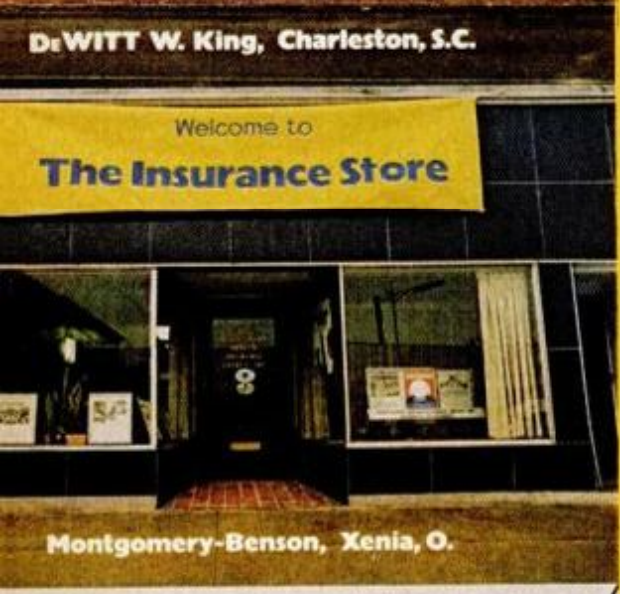

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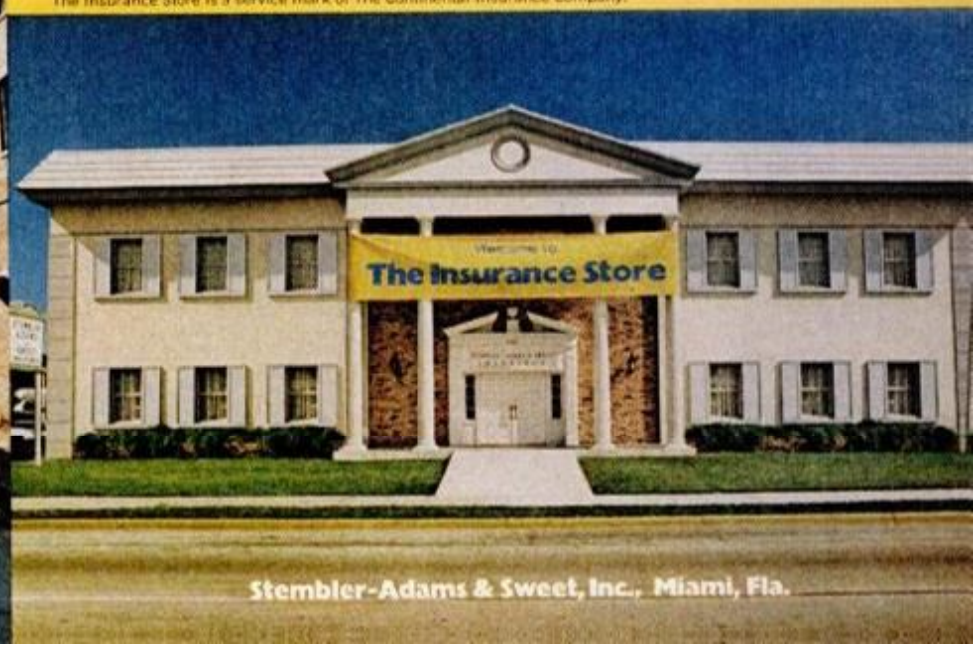

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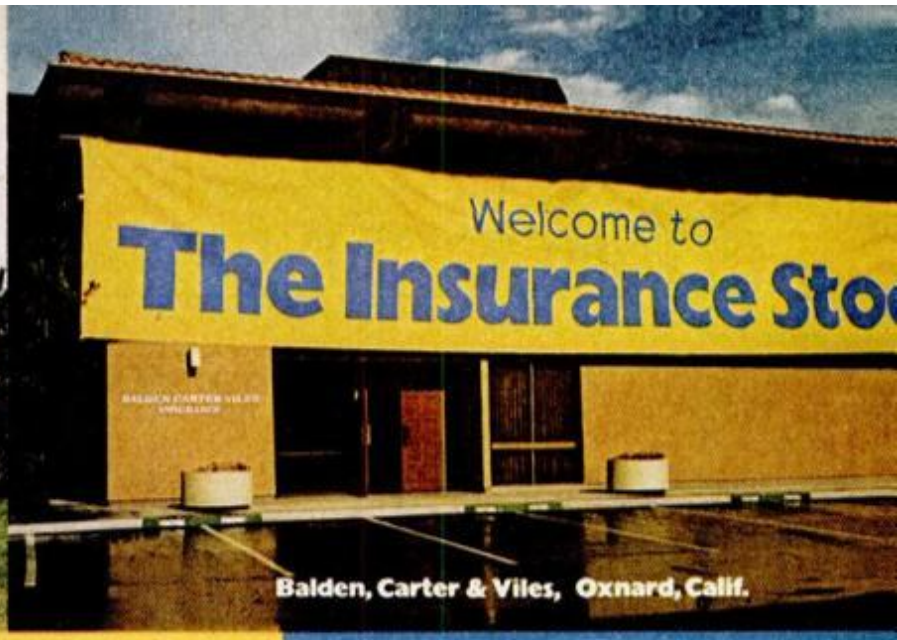

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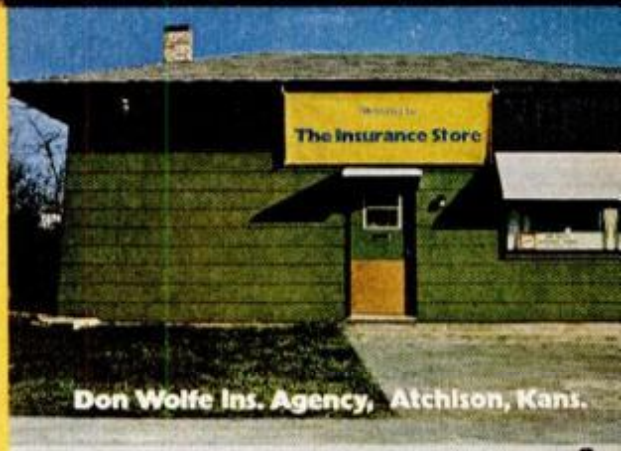

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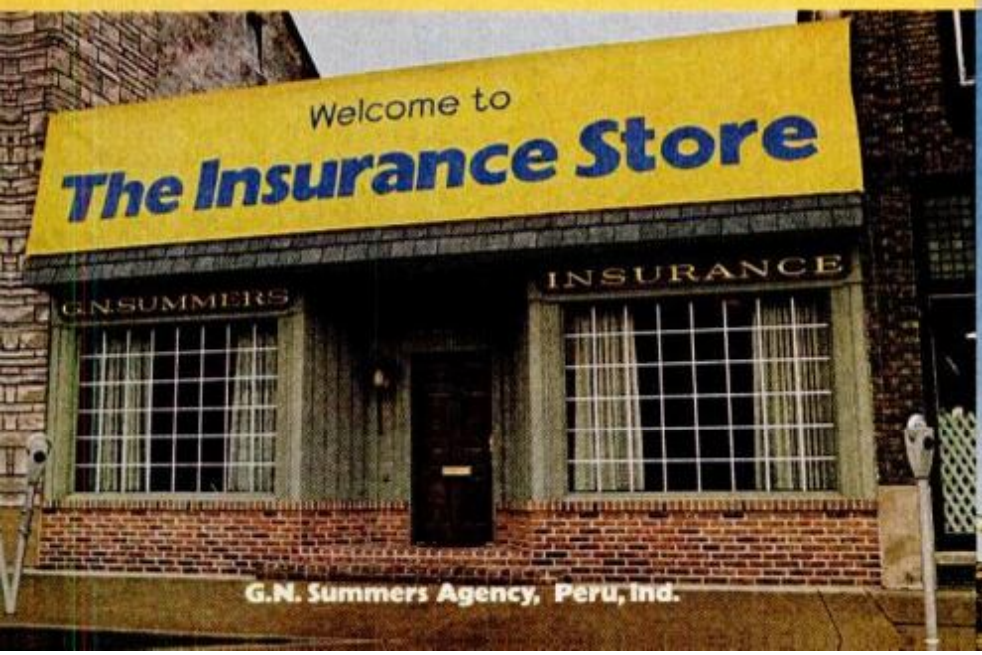

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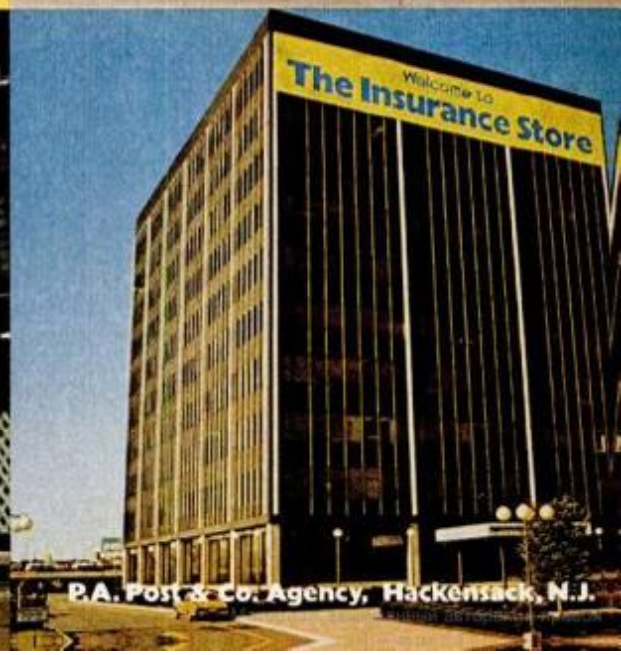

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APPLIANCE CLINIC

BY PAUL MANN

More on grounding

In the June '75, Appliance Clinic, *your advice to Peter Louglas to install a grounding adapter on his ungrounded circular saw is on the money, but it will work only if his home is wired in conduit or BX cable. If he lives in an older house that has type NM wire without ground, the boxes aren't grounded and the adapter won't offer any protection.*

He could replace the wiring from the fuse box to the outlets he uses to feed the saw with conduit, BX or new type NM with ground. Then, installing the grounding adapter as you suggested will solve his problem. If this is too much work, he can run a separate ground wire back from each outlet box to the fuse box and use the grounding adapter you described. Hope this advice helps.—Robert D. Smith, Swisher, Iowa.

You bet it does. Thanks for bringing my oversight to light.

Closing the door

Our General Electric refrigerator-freezer is about 18 years old. It's the one with the freezer drawer below the refrigerator. Our problem is that frost develops around the drawer, making it difficult to keep the door shut. I haven't been able to figure out what, if anything, is supposed to keep the door closed. There don't seem to be any catches or magnets. —Albert L. Stanley, Garfield Heights, Ohio.

For want of a better term, let's call this a spring-loaded door. There are small spring-type levers or arms built into the rails on both sides. The door is kept closed by its own weight and the pressure exerted by these arms. But when frost upsets the equilibrium, the result is difficulty in getting the door to stay shut. In fact, the door may keep bouncing open as you try to close it.

The best thing to do is simply defrost the unit frequently. This should work even if the arms have lost their oomph or are missing. Getting replacement parts for this model may be a problem because of its age. You can try calling a GE service center in your area if replacements seem called for. But if parts aren't available, keeping the unit free of frost should let you keep the door closed.

Heavy-duty headaches

We've been having big headaches with our heavy-duty Hotpoint washing machine since moving into our new apartment. It worked perfectly in our old apartment, but now it blows the fuse every time it goes into the spin cycle. The machine is about three years old, and the washing-machine mechanic can't find what's causing the trouble. Help.—Chester Trzeskowski, Bronx, N.Y.

I think what's causing the trouble is obvious. This heavy-duty machine draws a great surge of electricity when it shifts into spin. The fuse simply can't handle it. Replace the fuse with a 15 or 20-amp. time-delay fuse (you can buy these at a hardware store). Time-delay fuses can take more of a surge than ordinary fuses but still provide protection, because they will blow before a dangerous situation arises. If the time-delay fuse also blows out, I would have to conclude that the wiring in your new apartment just isn't able to take the load. In that case, you should not use the washing machine.

Dripping icemaker

What would cause the icemaker in my RCA Whirlpool refrigerator to drip water at both ends, so that water drips down into the ice-cube holding pan and forms a large glob of ice?—J. O. Snider, Corpus Christi, Tex.

You could have a faulty adjustment, a malfunctioning water switch, or there may be sediment in your water supply.

Let's start with the faulty adjustment, since it's the least difficult to correct and costs nothing. Remove the cover from the icemaker. You will see a cam that controls the water switch and an adjustment screw that controls the cam. If the screw is improperly set, too much water will be supplied and overflow will result. Readjust the screw for less water and see what happens.

The water switch, if it's malfunctioning (this is not common), will stay closed too long, letting too much water run. If the switch is bad, it has to be replaced.

More likely than a bad switch is the possibility that sediment from the water has been deposited in the water-inlet valve. This can keep the rubber seat from blocking off the flow of water, so that it keeps dripping and dripping. If this is the case, the valve should be taken apart and cleaned. If sediment in your water is a continuing problem, you can buy a filter. Installation requires that the tubing to the icemaker be cut square ahead of the water-valve screen and spread about 3 or 4 in. The filter is then attached by means of compression nuts and sleeves.

There are two filters made for this purpose. One is a refillable charcoal-type that filters out bad taste and odor as well as sediment; the kit is part No. 833565, and replaceable charcoal elements are part No. 833564. The other filter eliminates only sediment; its mesh-type element can be removed and flushed out periodically.

Overrunning can opener

My Sunbeam electric can opener does not shut itself off automatically any longer. On some occasions, in fact, it won't turn off when the handle is raised, and the plug has to be pulled from the wall outlet to stop the motor. I have cleaned the cutting and drive wheels perfectly and have inspected the interior for shorts in the wiring. Please advise.—Monroe Mayer, Columbia, S.C.

That leaves one other possibility—a faulty contact-type on-off switch. Maybe foreign matter is impeding the shutoff, in which case the area should be cleaned out carefully. Pay particular attention to the button on which the handle presses. If this should have dirt around it, the button can bind and remain down, keeping the switch on, even though the handle springs up after a can has been opened. Another possibility, although rather remote, is that switch blades have lost their tension and the contacts are staying closed, in which case the switch should be replaced. ★★★

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.

Материал, защищенный авторским правом

In chain saws, the greater the vibration, the greater the fatigue.

That's exactly why Poulan came up with the Super XXV CounterVibe Automatic, a new lightweight with 4 shock absorbers and a specially counterbalanced crankshaft that reduce cutting vibration dramatically.

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The New Poulan CounterVibe.

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Beaird-Poulan Division, Emerson Electric Co., Shreveport, Louisiana. See the Yellow Pages under "Saws" for your nearest Poulan Dealer.

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Bell & Howell Schools announces two ways to learn new skills in electronics without ever going to class or giving up your job!

Pick the one

Here are two fascinating home-learning adventures that say, "Don't envy the man with skills in electronics... become one!"

If you had to drop everything and go off to school to learn new skills in electronics, there's a chance you might not do it. But Bell & Howell Schools' excellent home training has already proved to tens of thousands that you don't have to drop anything... except the idea that classrooms are the only place you can learn!

You can keep your job, your paycheck and your way of life *while* you're learning. Because these programs allow you to pick the training schedule that best fits in with your other activities. It's *that* convenient.

I. AUDIO/ELECTRONICS

The first learn-at-home program including 4-channel technology. Explore this totally unique sound of the 70's as you experiment with testing equipment and build a sound center featuring Bell & Howell's superb quadraphonic equipment!†

Learn about 4-channel sound—without a doubt the most impressive technical advancement in sound realism in years. A development by which separately-recorded channels literally wrap a room in sound.

And now, for the first time, you can also discover this latest achievement in audio electronics with a fascinating learn-at-home program that explores the whole area of audio technology including 4-channel sound reproduction. A program that could lead you in exciting new directions with professional skills and technical know-how.

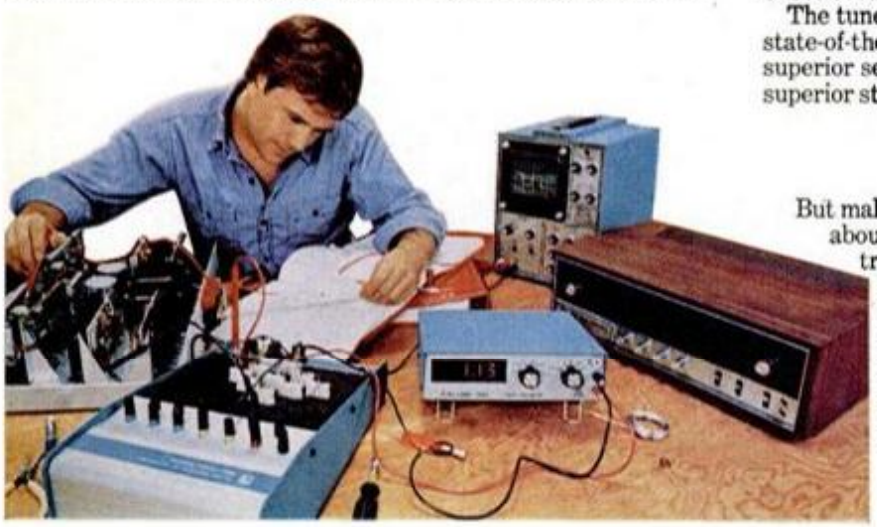
You actually build and experiment with Bell & Howell's high-performance 4-channel audio center ...including amplifier and FM, FM-Stereo tuner.

Understanding today's audio technology requires practical experience with high caliber equipment. And with the Bell & Howell amplifier and tuner, you've got the technological tools you need to gain the knowledge and skills that could open up opportunities for you in the audio field. Of course, we cannot offer assurance of income opportunities.

The sophisticated amplifier gives you the circuitry you need to conduct the comprehensive experiments necessary to master audio technology. Like signal tracing low level circuits, troubleshooting high power amplifier stages, and checking the operation of tone control circuits.

You'll investigate the technology behind this amplifier's full logic, 4-channel decoder and learn how full logic decoding produces outstanding front to back separation.

The tuner you build has both superior performance specs and state-of-the-art features such as: all solid state, FET front end for superior sensitivity, crystal IF filters for wide bandwidth, and a superior stereo multiplex circuit for excellent stereo separation.



You cover the full range of electronic fundamentals.

But make no mistake. This learn-at-home program is not just about 4-channel sound. It covers the full range of electronic fundamentals leading to understanding audio technology. So when you finish, you'll have the occupational skills to become a full-service technician, with the ability to work on the full range of audio equipment such as tape recorders, cassette players, FM antennas, and commercial sound systems. Get complete information on this unique program by checking the appropriate box on the card—mail it today!

†Cabinets and speakers available at extra cost.

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II. HOME ENTERTAINMENT ELECTRONICS

Gain new skills in Home Entertainment Electronics in an unusual learn-at-home program that includes the new generation color TV you build yourself!

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You'll probe into the digital technology behind all electronic tuning and channel numbers that appear on the screen. An on-screen digital clock that shows the time to the second. You'll also gain a better understanding of the exceptional color clarity of the Black Matrix picture tube, as well as a working knowledge of "state-of-the-art" integrated circuitry and the 100% solid-state chassis.

As you build this remarkable, new generation color TV, you'll not only learn how advanced integrated circuitry works, but how to detect and troubleshoot problems in any area.

Sound good? Then mail the postage-paid card today for more details.

Whichever program you choose, you'll get to build and experiment with your own electronics laboratory.

"Hands on" working experience with the latest equipment is the key to Bell & Howell Schools' home training. That's why in both programs we start you off with a set of equipment called the Lab Starter Kit, including a fully-assembled volt-ohm meter designed to help you experiment with and better understand basic electronic principles. So you don't just read about electronic principles, you actually make them work!

Next, in step-by-step fashion, you'll assemble Bell & Howell's exclusive Electro-Lab® electronics training system. It includes a special design console that enables you to assemble test circuits. A digital multimeter for accurately measuring voltage, current and resistance. And a solid-state "triggered sweep" oscilloscope which will allow you to analyze the functioning of tiny integrated circuits. Putting these instruments together will give you experience in wiring, soldering and assembling. Then, further on, you'll use the lab equipment for experience in electronic testing, troubleshooting and circuit analyzing.

We try to give more personal attention than other learn-at-home programs.

Both of these programs are designed so that you can proceed through them smoothly, step by step. However, should you ever run into a rough spot, we'll be there to help. While many schools make you mail in your questions, we have a Toll-Free Phone-In Assistance Service for questions that can't wait. Bell & Howell Schools also holds In-Person "Help Sessions" in 50 major cities at

various times throughout the year. There you can talk shop with fellow students and receive additional help from instructors. These personalized programs cannot guarantee you a job in electronics, but do equip you with important occupational skills. The knowledge you pick up will help you look for a job—or advance in the one you already have.

Mail the postpaid card today for full details!

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Kings, 15 mg. "tar," 1.0 mg. nicotine; Longs, 17 mg. "tar," 1.2 mg. nicotine, av. per cigarette, FTC Report Apr. '75

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DETROIT LISTENING POST

BY ROBERT LUND

Next GM mini in '79

GM is fixing on 1979 as the year it will bring out a one-seat, two-person car. The company has confirmed it is working on a one-seater, but declines to say when it will be ready. PM's sources say a 1980 label has been pinned on the car, indicating it will be out in fall of '79.

GM is also looking at the idea of an Americanized version of the Opel diesel. The company has put together three or four versions for testing. But take that with a grain of salt. Automakers are always looking at alternate engines. On the other hand, the people I talk with at GM are more optimistic about the diesel and/or turbine making it as a replacement for the piston engine than they are about all the other possibilities that have been kicked around.

New crew, same game at Chrysler

What are the chances of Chrysler revving up on a mini car now that the company has a new group of guys —a new chairman and new president as of Oct. 1—running the store? In two words, no change. As PM has been saying for more than a year, Chrysler's small car will be a remake of the French Simca. It will be ready by 1978 (see below). Chrysler is locked in on the cars it will build for three years. It would be difficult for the new command to change things even if it was so inclined.

Chevette follow-up car coming

I asked one of the top guys at Pontiac how long it will be before Pontiac brings out a remake of GM's new mini, the Chevette. I didn't expect a straight-out answer, but I didn't expect the answer I got. "Pontiac dealers are going to have to show they know how to sell a small car before they get a crack at another one," he replied. "They haven't set any track records with Astre (Pontiac's derivative of Chevrolet's Vega) and if they don't do better with Astre in '76, they may not get a Chevette-type car."

But that's probably just a whip to worry dealers into selling more Astres. There's already a Pontiac Chevette on the way. But not for the United States, not immediately, anyway. It will be sold in Canada. The car is in production and is expected to be on sale in the land of the Maple Leaf before the end of the year. This is the same course GM followed with Vega-Astre. Astre was on sale in Canada 18 months before the same car was put in production in the United States. It's only a matter of time until Pontiac or Oldsmobile puts a Chevette derivative on sale in this country. I'd guess it will be sooner than the 18 months it took for Astre to cross the border.

Nose job for Mustang II

Here's a twist—a car that will get longer instead of shorter. Ford is working on a limited-edition version of Mustang II for '77 that will sport a stretched-out hood. This will give Ford four different takeoffs of the same car—the standard two-door, the Ghia, Mach 1 and the long-nose job.

Other news from Ford is that the smaller—114-inch wheelbase—Mark IV which the company is readying for next year will get an aluminum hood and it may also get a new number in the name, becoming Mark V instead of IV.

Horse trading to get tougher

Automobile dealers are going to become tougher to bargain with on prices. Don't blame the dealer. He doesn't have the trading dollars he used to have. Dealer markup on a car used to be 22 to 25 percent; now the discount on most cars runs 17 to 20 percent and factories are pushing for another cut. One car line is already down to 14 percent.

The buyer isn't really concerned about markup. The only thing that counts is the price he has to pay. But the lower the markup, the more the dealer is going to balk at cutting the sticker price. That spells higher prices when you buy a car.

Mileage claims need debunking

About a year ago the Federal Trade Commission indicated it was going to crack down on mileage claims being made by car manufacturers. The FTC hasn't done a lick and the claims grow more and more extravagant. The claims aren't totally false, but they are about as straight as a pretzel.

You can thank another government agency, the Environmental Protection Administration, for most of the hocus-pocus. EPA sets the rules for measuring mileage. The rules aren't very realistic. For one thing, mileage tests are conducted under extremely favorable conditions—in a lab. There's none of the give-and-take, win-and-lose encountered in real-world traffic. The highway mileage figure—the number the auto companies headline in their ads—is arrived at by running the car at 48 mph. Who drives on the highway at a constant 48? EPA also specifies the equipment test cars must carry. Nothing wrong with that except it is almost impossible to buy certain cars with the same gear the test cars carry.

One of the duties of the FTC is to police advertising; keep it honest. So why hasn't the agency acted against the auto companies? I don't have the answer to that, but I can suggest an answer. It's like trying to get a doctor or lawyer to testify against another doctor or lawyer in court. One government agency is reluctant to stick it to another government agency.

There's no question Detroit is doing better on mileage all the time and that it will improve even more. But if you buy a car with the expectation of getting the same mpg hooted about in the ads, better plan to limit your driving to the down side of steep hills on days when there's a strong wind at your back. ★★★

Chrysler's small car will be a version of the new French Simca being unveiled in Europe this month. The five-door hatchback has a front transverse engine, plus front-wheel drive and all-independent suspension.

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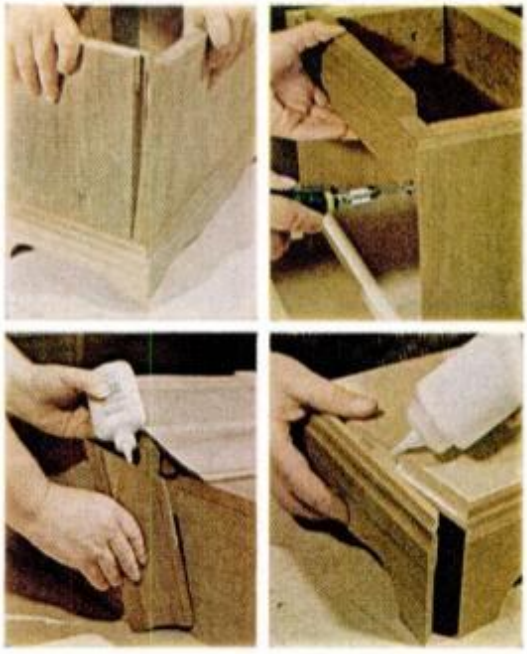

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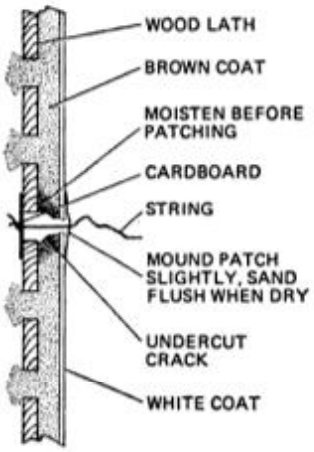
HOMEOWNERS' CLINIC

Cracked plaster

How can I patch a crack in old plaster over wood lath? I've tried, but the patch doesn't hold. The crack is straight, between two strips of lath and extends about 2 ft.—Myron Bates, Trenton, N.J.

Usually it can be done successfully as shown in the drawing below. First



undercut the crack slightly as indicated with a wood chisel (resharpen it afterward). Then cut a strip of cardboard, puncture it at intervals of about 6 in. and knot pieces of string through the holes. Force the cardboard strip through the crack and hold it with the strings as you first moisten the crack then fill it with spackling compound, keeping the strings held taut. Mound the compound slightly as you go. Allow the patch time to dry thoroughly, then cut off the free ends of the strings and sand flush with fine sandpaper. Prime the area with shellac before repainting.

Self-destructing chimney

I've recently noticed that the chimney above the attic floor in my home looks as if it is falling apart. The outside looks good, but on the inside the bricks and mortar seem to be soft and chalking away. I've thought of applying a wire mesh and coating it with a cement plaster. Or is there a better way?—Charles P. Silas, Haslett, Mich.

Before applying the plaster as you suggest, I would remove all the loose material, using a wire brush, and then coat the bricks and mortar with a masonry sealer. Usually this proves a good remedy for the condition you describe. If it is not permanent, it will at least put off any major repair or replacement. In making this suggestion, I'm assuming your attic is adequately ventilated.

Cracked brickwork

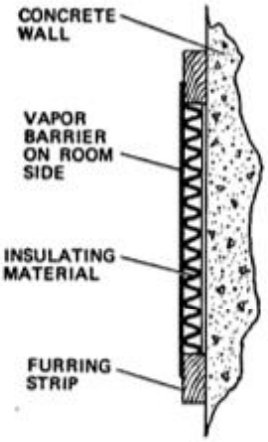
I have a crack in the seven courses of brick above the opening in my fireplace. The crack, which runs vertically through both bricks and joints, is hardly noticeable when the masonry is cold but it opens somewhat when the bricks are warmed by the fire. What can you suggest?—Dale Hurd, Springfield, Mo.

This defect has no simple solution. I'd hesitate to suggest any type of caulking or filler; because of the opening and closing of the crack, the filling is almost certain to break away. You or a mason could repoint the joints with mortar, but you would face the same objectionable possibilities. Opening and closing of the crack is most likely caused by a condition of stress built in at the time of construction.

I hesitate to say this because of cost, but I feel that the only permanent repair is to have the brickwork broken out and replaced by a mason. It's not a do-it-yourself job unless you have had plenty of experience with this kind of work.

Facing vapor barrier

I plan to install wood paneling in a room in my basement; it will go over furring strips attached to a poured concrete wall. There will be insulation between the furring strips, but I have conflicting information on which way to face the vapor barrier—toward the wall or the room?—Dale Edmonson, Des Moines, Iowa.



The vapor barrier should always be on the room side, as it will then tend to prevent formation of condensate on the concrete wall, especially on the lower third of the wall, which is usually at a lower temperature than room air during warmer months. When installing the furring strips, make sure they are correctly spaced and firmly attached to the wall; the best method, I think, is to attach the strips with screws turned into expansive lead anchors.

Condensation again

In the outside entrance to my basement drops of water are on the concrete-block wall from the floor to 2 feet or more up. Water is also on the entry floor. How do I locate this leak? There seems to be no crack.—Eldred Ames, Terre Haute, Ind.

What you see is condensate forming on the surfaces of the blocks because those near the floor are at a lower temperature than the air that contacts them. If you leave the entryway door open, the condition may correct itself. Otherwise, there is little you can do to prevent it. Actually, it does little harm.

Let them age

I've just had new galvanized gutters and downspouts installed and I'm wondering what paint, or paints, I should use. Can you suggest proper paints and procedures?—John Clement, Tulsa, Okla.

I wouldn't paint those new gutters, either inside or out, for at least six months, preferably a year. It's better to let them "season" for this length of time, letting the weather remove all fingerprints and the acids at soldered joints, and roughen the galvanizing slightly to provide a "tooth" for paint. Then use a metal primer as a first coat; follow with one or two coats of paint matching the house color. ★★★

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, *$4.49 postpaid. Send orders to PM, Dept. HJ5, Box 1014, New York, N.Y. 10019.*

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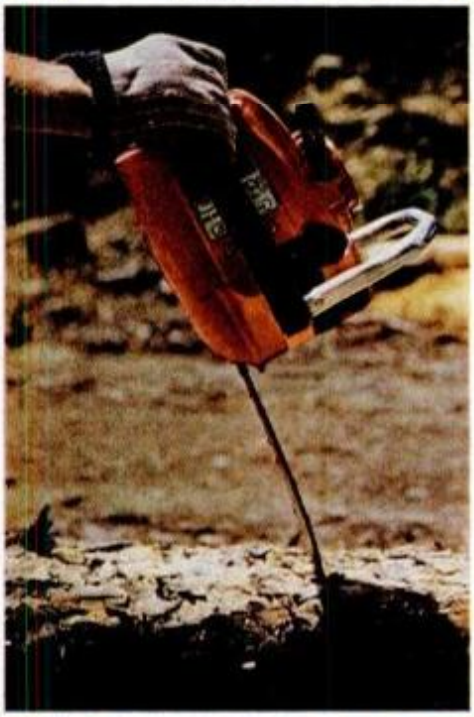

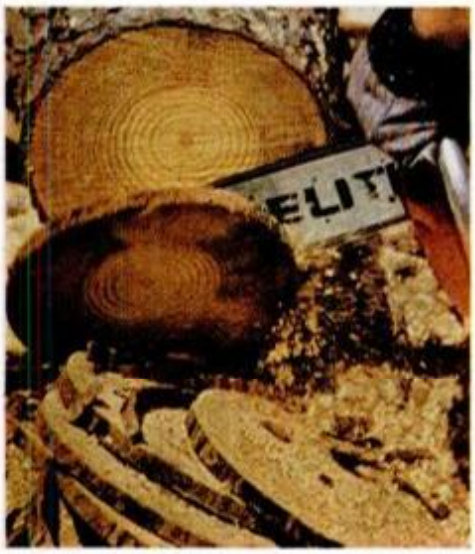

Homelite's $99.99* chain saw may be inexpensive, but it's not cheap.

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*Suggested Retail Price: $109.95. Available at participating dealers until Dec. 28, 1975 for $99.99. Check the Yellow Pages under Saw. ™Trademark of Homelite, a textron Division, Charlotte, N.C. 28217.

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BY BILL HARTFORD

IMPORTS AND MOTORSPORTS

BMW 316, 318, 320, 320i

Just when you thought you had the Bavarian Motor Works models sorted out, along comes a new series. The BMW 3-Series, just introduced in Europe, will eventually replace the 2002—but not just yet. The 2002 is the most popular model here (see *PM Owners Report*, July '75), and, even though it's been in production for years, it is a perfectly sensible car for the times: that's why it'll still be in the lineup next month when the '76 BMWs are introduced in the United States.

In Europe, though, the two-door 3-Series will become the backbone of the company's production. BMW must be confident it is improved in every way over the 1602, 1802 and 2002 models it replaces: the German car buyer is a demanding one.

As you would expect from a European automaker, the model numbers tell a story: the 316 is 1.6 liters (BMW's traditional, ohc, four-cylinder engine), the 318 is 1.8 liters and the 320, two liters. The "i" designation is for fuel injection.

The body of the 3-Series (photo above) is the same for all models, and its shape is what most distinguishes the new car. It's longer than the 2002 (to provide improved crash worthiness, mostly) and slightly roomier. Wheelbase is 100.9 in. and overall length is 171.4 in. This new series demands more attention from us, but we'll wait until BMW decides to bring it here.

New VW warranty

"Satisfaction or your money refunded" is something that would have been unheard of in the auto business a few years ago. Now, all VW, Porsche and Audi owners are promised just that. Under the terms of Volkswagen of America's new warranty, a dissatisfied customer who has not had a defect corrected after a reasonable number of attempts can elect to take a replacement vehicle without charge, or a refund based on the purchase price (less reasonable depreciation for actual use in accordance with Federal Trade Commission rules). This provision is on top of the basic 12-month, 20,000-mile warranty.

Chrome yellow

The latest among "limited edition" versions of standard models is Datsun's Honey Bee. It's a B-210, of course, but it's got special yellow paint, stripes and interior trim. With a sticker under $3000 and an EPA mpg of 41, it's hard to resist.

Big Renault

We've already mentioned that the new Renault 30TS will use the new V6 engine developed jointly by Peugeot, Renault and Volvo (*Imports and Motorsports*, Aug. '75), but we didn't show a picture of the car. The sedan is a hatchback, has front engine and front-wheel drive and disc brakes on all four wheels. No plans yet for importing it.

Electric motocross

The kids are guaranteed to get a charge out of this one—all without even pedaling. An electric motor, called Pedalpower, drives the front wheel and is powerful enough to carry a rider over roughest terrain, says the maker. The motor is $100 less battery and charger. The bike has a 25-mile range before recharging. Pedalpower, which installs on any motocross bike, is made by General Engines, Co., Inc., Electric Products Div., 591 Mantua Blvd., Sewell, N.J. 08080.

Racewatchers' guide

All eyes will be on the Formula 5000 race through the streets of Long Beach, Calif. on Sept. 28. That'll be a first, but it'll just be a warmup for the big one: a Formula 1 Grand Prix on March 28, 1976. The Grand Prix West will be in addition to the traditional U.S. Grand Prix at Watkins Glen in October, and will give the U.S. two F1 races in '76.

Meanwhile, at Watkins Glen on Oct. 5, this year's Formula 1 World Championship will wrap up with the 1975 Grand Prix of the United States. I'll be there, and I'll be driving—in one of the prerace events, that is. The "32-Ounces of Watkins Glen" is an economy run sponsored by World-Wide Volkswagen Corp. This year, invited sports editors and writers will be driving identically prepared VW Rabbits and featherfooting around the Glen for as many laps as possible before the 32 ounces of gasoline runs out. Not exactly death-defying, but it'll be fun. See you there. ★★★

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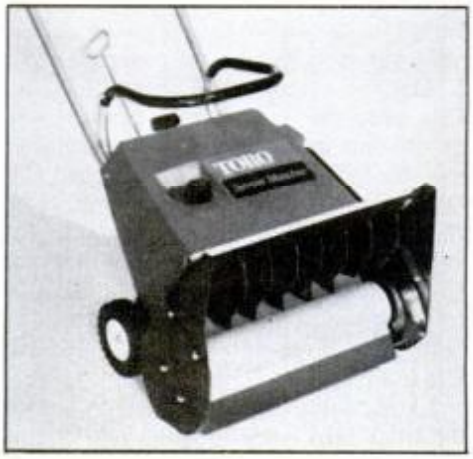
Little snowblower with a big bite



When Toro lent me their new Snow Master snowblower for testing, they cautioned me: "Don't expect big-machine performance." It's a small, light, economy model for average needs, designed as much to fight inflation as snow, they explained. They were overly modest.

Light it is—only 33 pounds—but weak it isn't. Though a moderately powered 2¼-hp push type, it eagerly chews 20-inch swaths through foot-deep drifts, spewing rooster-tail plumes 20 feet away (top photo, with wife at the helm). A simple single-stage design, it uses rubber paddle blades to swirl snow up through pivoted vanes that let you direct the discharge to either side. A gleaming red housing encloses the engine for low noise and a trim appearance. Twin handles give you a two-handed grip for easy lifting—you can even wield it like a broom for clearing steps and other small, tight areas. For its size and power, the little Toro Snow Master, to be introduced this fall, is a sweet performer. It will sell for about $200.—*Sheldon M. Gallager, Executive Editor*

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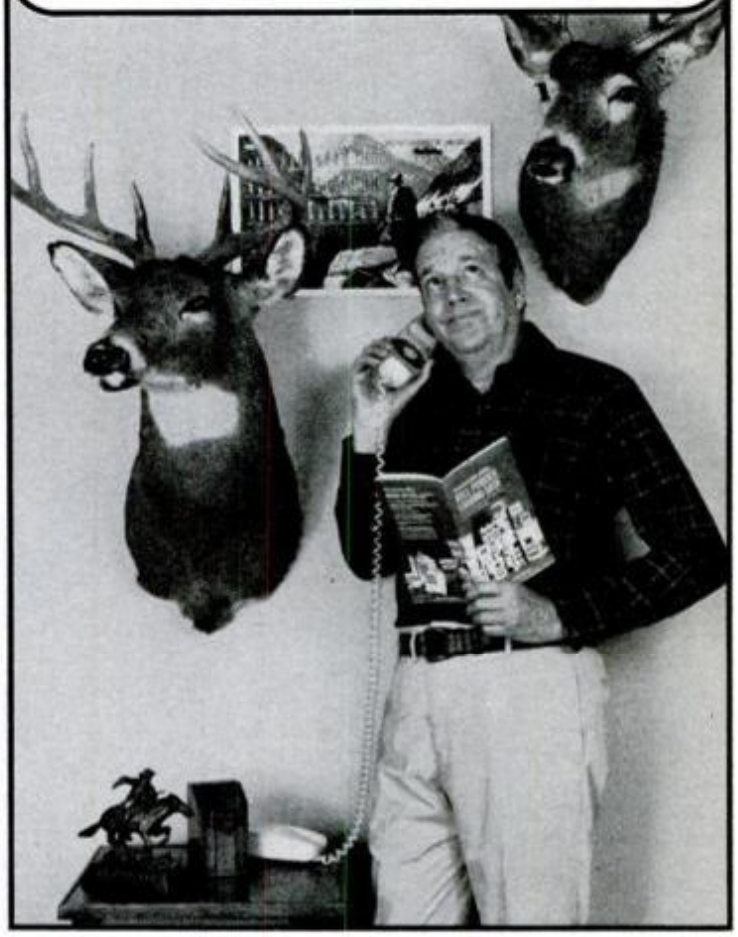
"Did you know that Winchester-Western has a complete line of hunting bullets in all rifle calibers plus a wide variety of handgun bullets including wad cutter, semi-wad cutter, jacketed hollow point and full metal case, all manufactured to the industry's most exacting standards?"

"I know."



Here is what *you* should know about Winchester-Western bullets

You should know that Winchester-Western jacketed and lead bullets are made to the most exacting standards of contour and structure for maximum accuracy and total dependability. There is a wide selection of calibers and types including new Winchester-Western Accuracy Match Bullets that offer bench rest and varmint shooters pinpoint accuracy for only pennies more and are now available in 22, 6mm and 30 caliber.

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ALL OUTDOORS

WITH BILL McKEOWN

Future fisherman

You may be able to recognize next spring's well-outfitted angler by his black fishing rod, orange mono line, multicolored lures and electronic aids. New trend tipped off at the recent American Fishing Tackle Manufacturers Assn. show was a boom in expensive but very strong and flexible fishing rods of graphite. Pioneered by Fenwick and Shakespeare, these limber lunker tamers in basic black are new additions to numerous other lines. A graphite rod can cost as much as $200, but look for a lot of them along the fishing holes.

Two companies, Wesmar in Seattle and Stembridge Products of East Point, Ga., are developing sonar scanners that not only show fish below a boat but also out at the side, and how far in which direction. Already successful for commercial fishermen, they may become the latest word in fish finders for amateurs as well.

Its no surprise that more lures in more shapes and colors than ever will be available, and DuPont is introducing for '76 a colorful new monofilament to tie them to. Called "Orange Stren," the fluorescent line is said to be more visible to the angler and less to the fish underwater. It is hoped that no fish will be color blind next season.

Assorted action

North of Houston at Lake Livingston, Tex., the TOG Pro-Am Bass Fishing Tournament, Oct. 10 through 13 with prizes worth $100,000, should be the richest contest of its kind ever staged. It is open to any fisherman or woman, boy or girl over 16 (except those who have served as professional guides on the lake), with information available from Texas Outdoor Guide, 5400 Memorial Drive, Houson, Tex.

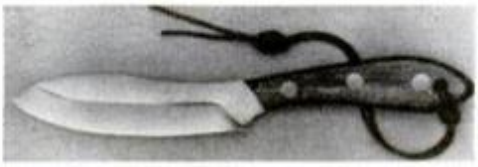
For adventure trips, check with airlines serving areas you want to see. TWA has been arranging jeep junkets, river runs and treks through the Tetons that include air travel plus all ground arrangements and backpacking or camping equipment needed. Their Flying Camper Holidays meet the plane in Los Angeles, San Francisco, Denver or Phoenix with an Open Road motor home you use for a week, sleeping six. Airline offices and travel agents now have many similar outdoor tours.

Cutlery collecting

Most outdoorsmen who have graduated from the boyhood pocket knife through boy scout models to, perhaps, a Victorinox Swiss Army model they still carry, know the special pleasures and values of really fine cutting steel. The quality old-time dollar knife is no longer around, but many new models are so superior it's not unusual when a sportsman spends $100 or more for a fine knife and then hates to use it. Names like Schrade, Buck, Gerber, Camillus, Russell, Smith & Wesson, Herter and Randall are a few becoming better known to new collectors. Limited-issue commemoratives frequently show a steady rise in value. One information source for the knife fancier is the Knife Collectors Club, 1705 Highway 71 North, Springdale, Ark. 72764. Membership is $5.

Schrade-Loveless Hunter, handsome model by custom designer for limited issue. Suggested retail is about $100.

Sun River, Ithaca Gun's folding knife, is from Track Knives, to be numbered. $70.



Canadian Belt Knife is one of four new issues from A.G. Russell; camp model, $35.

Best bets for better boating

Though accidents on the water are not increasing in proportion to the rapid growth of boating, there are many ways to make the sport safer, and the Coast Guard is looking for answers. A big problem, it finds, is that only about 10 percent of all nonfatal accidents involving injury or damage of over $100 are reported, although the reports are required by law. Without good statistics on the cause of accidents, the USCG Office of Boating Safety can't come up with good answers.

The Coast Guard suspects many boatmen think accident reports can be used in court against them. Actually it's against the law for the Coast Guard to use the reports for legal action, and 30 states also have legislation preventing their use in litigation or as admissible evidence.

Water skiers should note that some states, like Pennsylvania, now require a Coast Guard-approved life jacket or vest for skiing. A ski belt doesn't count. Purchasers of Approved Personal Flotation Devices, as the CG calls officially okayed life preservers, should be very careful not to buy "reconditioned" preservers or "factory seconds." Some makers slash production-lined rejects to keep them off the market, but it's been reported that some have then been sold. A defective PFD is no bargain (you may drown), and selling them is a federal offense.

One final warning. Boats with cabins often have galley sinks that simply drain overboard through a fitting through the topside. In a couple cases it has been found that a generator exhausting forward of the drain hole has been releasing a lethal amount of carbon monoxide that found its way back through the drain into the cabin. Any boat, recreational vehicle or cabin should be checked for this danger. ★★★

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FREE SOCIAL SECURITY 'CHECK'

Have you ever wondered how much money Uncle Sam is holding in your name, in the Social Security account into which you've been making payments for so many years? Wouldn't you like to know its balance? We'll check it for you—*absolutely free.* All you have to do is follow the instructions below.

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Is Cancer Contagious? Startling New Findings
Longevity Linked to Light Eating

In short, **Moneysworth** is a live wire sparking off hot information on the current money scene. It galvanizes readers all over the country into sending us ardent fan letters like these:

• "Thanks to **Moneysworth**, I am $5,417 richer. I battled the Social Security Administration unsuccessfully for 18 months, then finally won out by following your advice 'By All Means, Appeal'."—*S. Dominguez; Waterbury, Conn.*

• "Your article on the 15% interest paid by Mexican banks has made it possible for me to retire in style."—*Eric T. Svenson; Fallbrook, Calif.*

• "Your article on air-fare 'triangular' routes was an astonisher. My wife and I saved $100 *each* on a trip to New York by stopping off at Las Vegas as you suggested."—*H. Kessel; Los Angeles.*

• "You're not going to believe this, but I have parlayed $146 into *$90,000* thanks to your informative article on breaking into real estate."—*Horace T. Pinrose; Montgomery, Iowa.*

• "Your write-up on income averaging for tax purposes saved us $1,100 this year. We didn't realize retirees could do this."—*Mr. & Mrs. J.W. Long; Morro Bay, Calif.*

• "We salute **Moneysworth** for its excellent report on our free sex-counseling-by-telephone service. As a result of it, we've received calls from all 50 of the United States—including Hawaii and Alaska—and even a few from Europe and Africa."—*Community Sex Information Foundation; Boston; (617) 232-2335.*

• "Your recommendation that readers reduce orthodontic bills by having the work done at a university dental school saved me $1,350 on my daughter's teeth."—*Bob Walters; Oxon Hills, Md.*

• "Your advice on Social Security resulted in a $3,135 lump-sum cash payment to my wife, and $171 monthly pension. The best investment I ever made was a subscription to **Moneysworth**."—*Dr. Herman W. Hortop; La Grange, Ill.*

• "As a result of your article on nonprofit, low-cost memorial associations, we have been receiving 400 inquiries *per day*. You'll get an inkling of the immense amount of money your subscribers have saved when you realize that *each* of our members saves well over $1,000 on a funeral."—*R.J. Stevens, President, Continental Association of Funeral and Memorial Societies; Chicago.*

• "Your tip about deducting the cost of transportation between my two teaching jobs saved me in taxes at least the cost of a ten-year subscription. Not only that, but your publication is lively, off-beat, a delight to read."—*Professor Reuben Garner; State University College; Brockport, N.Y.*

• "Thanks to your article 'How to Buy a New Car for $125 Over *Dealer's* Cost,' I just bought a Chevy at a saving that I conservatively estimate at $350."—*Ron Bromert; Anita, Iowa.*

• "Your article 'Inaccurate Billing by the Phone Company' led me to discover four years of overcharges. I got a $1,593 refund."—*Armand DiRienzo; Bristol, Pa.*

• "Moneysworth's product ratings sure stretch the dollar. I bought the Canonet 35MM rangefinder camera which you recommended, and saved 30%."—*Robert D. Goodrich; Tucson, Ariz.*

• "Your article 'How to Fight a Traffic Ticket' saved me a $200 lawyer's fee *and* a ticket."—*W.R. Wendel; Hicksville, N.Y.*

• "Your tip on flying to Europe via Afghanistan saved me $450. You've made me a subscriber for life."—*Charles B. Fager, M.D.; Harrisburg, Pa.*

• "Your expose of charity rackets was a shocker. I've crossed several well-known organizations off my list, saving hundreds of dollars."—*Freida M. McMullin; Steilacoom, Wash.*

• "Your article on how to save $100 on a color TV worked. **Moneysworth** sure knows how to hold onto the green."—*P. Allen; Dir. Student Union; Henderson College; Arkadelphia, Ark.*

• "Your article on 'coupon refunding' got my husband and me hooked on the hobby. It saves us enough each year to pay for our vacation."—*Grace Ellen Feingold; Brooklyn, N.Y.*

• "Your suggestion that readers buy $200-deductible car insurance instead of the usual $50-deductible saved me *hundreds* of dollars. Insurance salesmen hate like hell to sell it because there's little profit in it for them, but it sure saves me money."—*Gary W. Goodwin; Sunland, Calif.*

• "You sure did us a good turn recommending Mayflower for our move from California to Minnesota. The bill was a hundred bucks *under* the estimate?"—*Donald J. Ganser; Owatonna, Minn.*

• "Upon **Moneysworth**'s advice, I asked the phone company for an itemized bill. As a result, I discovered that for years I had been paying for a nonexistent extra line. Result: A $550 refund. My trial subscription has paid for itself 110 times over!"—*George T. Petsche; Washington, D.C.*

• "**Moneysworth**'s investment news dispatches enabled me to make over $2,200 in less than a year. Yours is one of the most intelligent, down-to-earth, to-the-point periodicals I've ever read."—*Ruth Pantell; Yonkers, N.Y.*

• "Your article on TV game shows gave me confidence to try for 'The $10,000 Pyramid.' I won $850!"—*Ted Zammit; Franklin Square, N.Y.*

• "Your suggestion that I use a fake name in the phone directory, instead of paying $1 per month for an unlisted number, alone pays for my **Moneysworth** subscription several times over."—*Carlyle B. Russell; New York.*

• "Your report that dentures cost only $40 at the Sexton-Shealy Dental Clinic of Florence, South Carolina, saved me *hundreds* of dollars. They fitted me up in 24 hours and I completed the entire procedure during a vacation to Florida."—*Mrs. H. Petruccio; Frackville, Pa.*

• "**Moneysworth** is aptly named. To paraphrase Churchill, 'Never have so many paid so little for so much'."—*D. Alpern; Pittsburgh, Pa.*

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BY EUGENE A. SLOANE

THE BICYCLE SHOP

GENE ANSWERS QUESTIONS THIS MONTH

They do that

My bike has wired-on tires I keep at 70 lbs. pressure. Recently when I put in 47 lbs. and removed the pump, the tube blew. I saw no signs of a pinched tube. Why did it blow? Also, my center-pull Weinmann brake shoes are ⅛ in. from the rim but don't work well.—Bob Graham, Gaylord, Minn.

Could be a defective tube. Check the rubber around the blowout for thin or cracked spots. Or you may have hit a bump or a sharp rock and partially punctured the tube so it was just waiting to blow even at low pressure. Tires do that.

Re the brakes, check cables for bent spots, broken strands. Better yet, install the great new Wescon Ultra-Glide cables that work as smooth as silk (see last month's *Bicycle Shop*). Your bike shop should have them.

Missing teeth

Your bike book (The New Complete Book of Bicycling, *Simon & Schuster, $12.50) mentions "alternate-tooth" Shimano rear gear freewheels. I do not understand what this term*

means. Also, can you save money by buying a bike in Europe?—Steve Norman, Soldotna, Alaska.

The alternate-tooth freewheel has every other tooth missing on two higher gears (as shown in the photo above) to make it easier to shift to these extreme gears; the ratios provided are unchanged.

Yes, you save freight and import duty if you buy and ride a bike overseas, but I still don't advise it. Your new bike needs to be broken in and debugged, and a vacation trip is no time to fuss with problems.

Pump picks

What is the best bicycle pump on the market? All pumps I've used have let air out before I could disconnect them.—Richard H. Knights, Boston.

For European Presta valve stems (the skinny ones) I like the Campagnolo Silca pump. For U.S. Schraeder valve stems (fat ones) use the new Zefal HP pump with locking lever to hold the pump head on the stem.

Thornproof tires?

Where I live I have a lot of flat tires from punctures caused by Texas sand burrs and thorns. Are there any tires that resist this type of puncture?—Lawrence Keogh, Emmet, Neb.

Out West these burrs and three-pronged thorns are a real pain. No bike tire will resist them, but you can use a heavier, thorn-resistant tube available from any Schwinn dealer to fit most any wired-on tire. Tubular-tire users who travel west through cactus country should take many spare tires and tube-patch kits.

Pathfinding

Where can I find information about the many bicycle trails that have been built in this country?—Greg Wood, South Plainfield, N.J.

Write the League of American Wheelmen, 19 South Bothwell, Palatine, Ill. 60067. Tell them where you want to go. Also send $1.10 for *Outdoor Recreation Action* containing data on bike trails to Superintendent of Documents, Washington, D.C. 20402. Ask for Report No. 34.

Exotic small-bike parts

Why don't bike makers make moly-steel tube frames with aluminum-alloy rims and other parts for 20-in. wheel bikes?—Joe Giberson, Sewall, N.J.

They do, but these are costly and parents can't always afford them. Look for a Motobecane, but remember you can't bang it around like a heavier, less expensive bike. ★★★

If you have any questions about bicycling send them to The Bicycle Shop, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.

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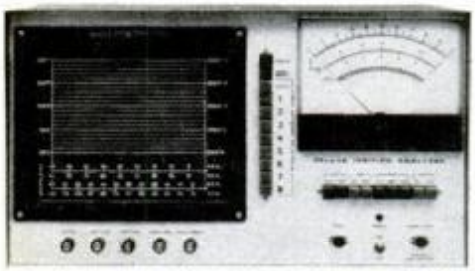

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For time calibration, it generates a 0.5 second to 1 μsec square wave in 1-2-5 sequence accurate to 0.01% with 200 mV peak (≤3% overshoot) and ≤4 ns rise time. Voltage calibration ranges are 1 mV to 100 v. in decade sequence, accuracy within 2%, DC plus variable 2 Hz to 10 kHz in 1-2-5 sequence (internal stnd. accuracy within 1%). Use it to calibrate scopes up to 35 MHz and voltmeters; it's also a fast rise time squarewave generator and good bench freq. standard. Kit IG-4505 $44.95

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The scope everyone can afford, and it has the performance you need. DC-5 MHz band width, 100 mV vertical sensitivity with X1, X10 & X100 attenuation, AC or DC. Automatic, positive locking horizontal sweep continuously adjustable from 20 ms to 200 ns/cm. Stable displays due to zener regulated amplifiers and sweep. 5" round flat-face CRT with 8 x 10 cm graticle. Simplified controls and switches make it easy to use. Lightweight, durable blue plastic cabinet; white panel. It's the best instrument buy in years. Kit IO-4560 $119.95

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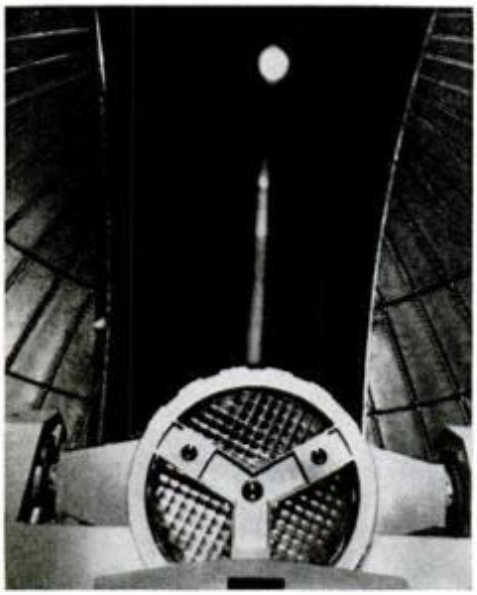
SCIENCE WORLDWIDE



Moon beam from laser

A 1.5-billion-watt laser bouncing light pulses off the moon is helping to measure the precise distance between the Earth and its natural satellite. Developed by GTE Sylvania, Inc., for NASA, the laser went into operation recently at the University of Hawaii's observatory following a year of field tests.

In operation (as shown above) the laser's beam is transmitted through a telescope atop 10,000-foot Mount Haleakala on the island of Maui and aimed by computers at reflectors placed by astronauts on the moon. Computers use the reflected signals to calculate transit time and to determine distance.

"Beam pulses are 16 inches in diameter and 2 inches long or thick as they leave the observatory," a Sylvania engineer explains. "They are one mile in diameter, but still only two inches thick when they reach the moon." Only a small part of the beam is reflected—much of it is absorbed or scattered when it strikes the moon.

Go underground, save energy

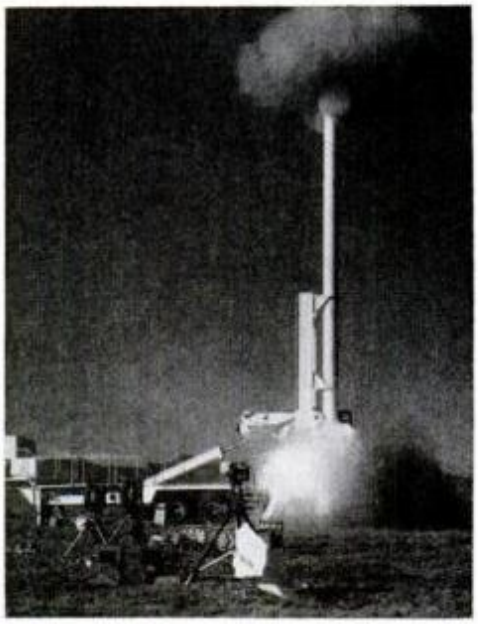
An underground bookstore under construction on the Minneapolis campus of the University of Minnesota will be equipped with instruments to provide data on energy conservation and heat loss in building materials and surrounding soil. The National Science Foundation is funding the research to learn more about the functioning of buildings constructed directly below ground level. Calculations have shown that subsurface structures may save up to 75 percent more energy than surface-level buildings.

To allow occupants exposure to daylight and to moderate the feeling of being underground this type building usually has a subgrade court open to the sky.

Big gun for probing earth

A cannon capable of blasting a projectile some 300 feet below the Earth's surface is under test at Sandia Laboratories, Albuquerque, in a research program involving terradynamics—the science of earth penetration. Unlike that of an artillery piece, the 35-foot-long barrel is open at both ends. Powder is sandwiched between the projectile and a reaction mass, a heavy steel slug that's blown out the top of the barrel as the projectile is fired into the ground.

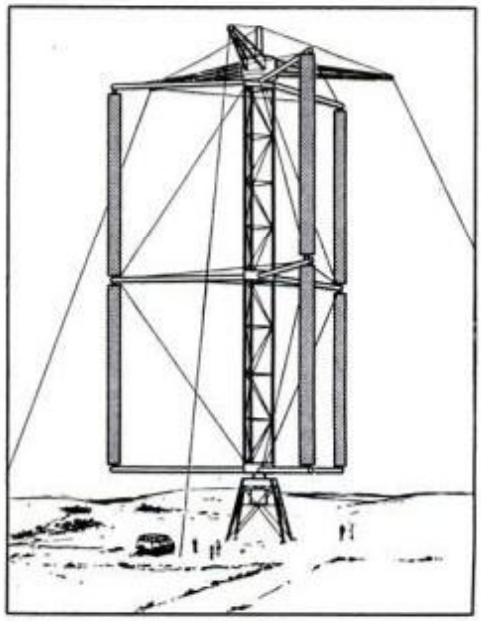
During the initial tests, a 355-pound projectile and a 1241-pound mass were used. "Smart" projectiles sense how various layers of rock and soil affect deceleration and this information is radioed to a receiver so that a soil profile can be formulated.



The same technique has been used to measure ice thickness and the hardness of ocean sediments, as well to emplace seismic and acoustic sensors in sites under investigation.

Now: paddlewheel windmill

The energy crunch has brought forth a rash of new windmill designs, among them a "paddlewheel" concept now under study by McDonnell Douglas Corp. engineers. Three 130-foot-long blades would be driven around a vertical shaft attached to a generator. The design calls for blades that actually are lifting surfaces similar to aircraft wings. The Giromill, as it's called, could be driven by winds from any direction and would not have to be rotated, as is the case with a mill of conventional design.



A typical Giromill system, say engineers, could generate 100 kilowatts of power in a 15-mph wind, enough electricity to service 40 modern homes.

Watch on Washington volcano

Following recent reports of unusually large amounts of steam and ash clouds over 10,778-foot Mount Baker—a "quiescent" volcano in northwest Washington—aerial and ground monitoring of the volcanic activity has been intensified, according to the U.S. Geological Survey. The program, including remote sensing techniques, is aimed at determining the significance of Mount Baker's new "restlessness," particularly a spectacular increase in steam emission. This increase is by far the greatest change reported since the volcano last erupted in the 19th Century, according to Survey scientists. ★★★

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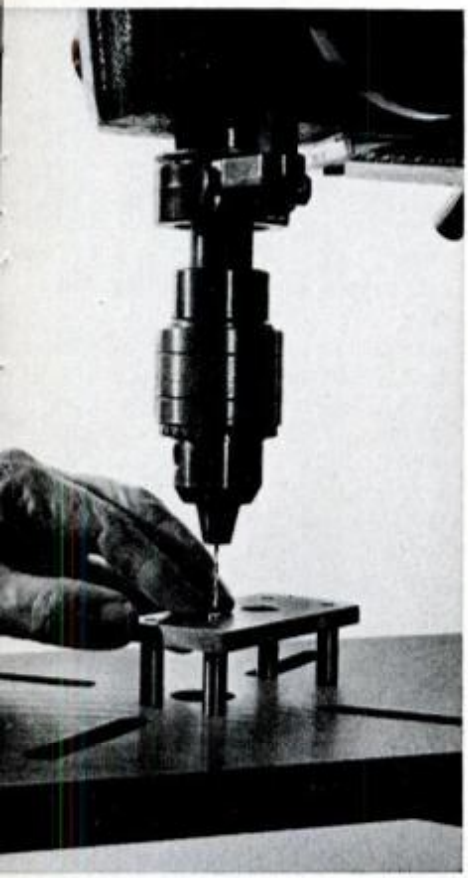
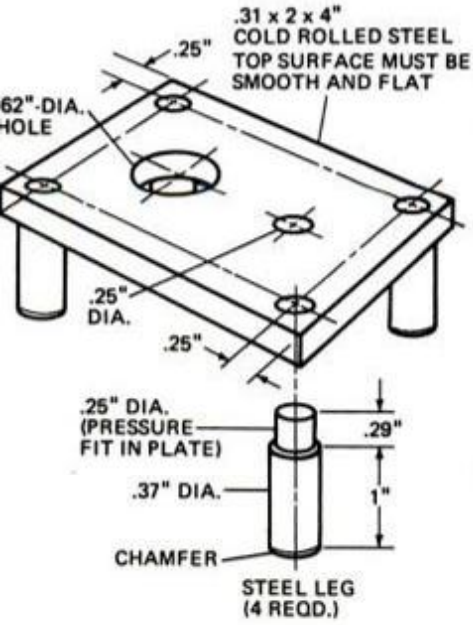
Tiny table for small-part drilling



This little table is a dandy aid for drilling small parts accurately. Two holes in its top permit drilling through, and because it's on legs, parts can be clamped to the table if desired. Dimensions can be varied to suit requirements and available materials. Do make certain that the legs are equal in length or you'll have a disconcerting wobble.—*R.S. Hedin*



New compact gear for outdoor action

by Bill McKeown OUTDOORS EDITOR

Cypress Gardens photo: Jerry Imber

Pick your pastime—and you are likely to find improved equipment available for it this year. Small in size, the accessories for almost any outdoor sport today can be packed away in a station wagon or hatchback, recreation vehicle or rooftop carrier. Many now can be strapped on a knapsack.

For best buys, here are the trends to check:

■ *Weight*—it's going down. Backpacking has led the way with frames of lighter metals, bags and tents of stronger synthetics and compact stoves with small LP-gas containers that give quick heat and make packing in and scrounging up firewood unnecessary. Even gear like larger tents, picnic chests and inflatable boats normally carried by car can now be found in lighter models that have strength and durability, as shown in our selections here. And for the perfectionist willing to spend the money, there are flyweight bicycles with frames of graphite (for over $1000), fishing rods, tennis rackets and golf clubs of the same expensive material with remarkable strength-to-weight ratios.

■ *Durability*—will not cost less, but

(Please turn to page 46)

Maurice Petty doesn't take chances with Richard's engine.

It takes a good engine to win a NASCAR race. Richard Petty, five times NASCAR Grand National champion, has the best.

He gets them from his brother, Maurice Petty, who has been building engines for the family racing cars for the last 14 years. Maurice knows that it takes more than horsepower. You can't win unless you finish. That means good parts and careful assembly.

"We do a lot more inspecting and fitting than most people," Maurice says. "If parts don't look right, we don't use them. That is where we gain an advantage."

Nothing escapes his scrutiny. New blocks are heat treated to remove stresses, checked for cracks, then remachined for accuracy. Crankshafts are magnafluxed and checked for straightness before the journals are ground to size. The same goes for the rods. Everything must fit properly. Main and rod bearing clearances have to be between 0.0025 and 0.0030 inches. Too much clearance reduces oil pressure. Too little will allow metal-

to-metal contact. Either way, the engine blows.

But even when the clearances are right, lubrication is critical. "When we build an engine, it may be a day or so before we get it on the dyno. The oil can run off all of the rubbing parts. So we use STP. We put it right on the bearings. That's so, when you first crank an engine, it's not dry."

Each Petty engine gets twenty to thirty minutes of break-in on the dyno. Then the heads are retorqued and the valve lash is set before it makes the final power run. If the engine passes this test, it's ready for the track.

But before it runs again, the oil is changed. And two cans of STP go in with the fresh oil. Maurice says, "STP gives the engine extra protection."

Still, it takes more than oil. Every single part has to be perfect. Occasionally, a new batch of bearings won't be as good as the old ones. Or the latest rod bolts may have flaws. "That's why I don't like to build three or four engines in advance," he says. "We're liable to run one, find trouble, and have three more with the same problem. In this business, you put all of your experience and all of your workmanship into your suppliers' hands."

One supplier that goes into every Petty engine is STP.

STP Oil Treatment: It helps your oil do a better job.

Материал, защищенный авторским правом

(Continued from page 44)

you'll get more for the money. Much of the old Army and Navy surplus gear was too heavily made, though certainly long-wearing, for today's outdoorsman. Look instead for modern camping and sports gear and clothing that may include synthetic compounds for added washability and wear. Consider the possibilities of rust, mildew and abrasion; then pick the products that will offer the best resistance, if given reasonable care.

Sleeping bags are an example of a product that has not changed radically in design but is now offered with a variety of improvements. Quality bags are now available in various weights for differing temperature ranges. Fabrics are longer wearing; insulation is water-resistant; zippers are less likely to rust, jam or leak cold air on the sleeper, and often they extend down the side and across the bottom to allow opening the bag into a comforter or doubling it up with another bag. Frequently linings can be zipped, tied or snapped in. Mummy-shaped bags have more foot room in some models and are also offered in shortie sizes for even more compact portage. Some synthetic-fill bags can go in a washing machine; expensive down-filled models use sewing designs that prevent shift of the fill and cold spots. Shopping is now more difficult with so many choices, but careful selection will result in a bag with a long and useful life.

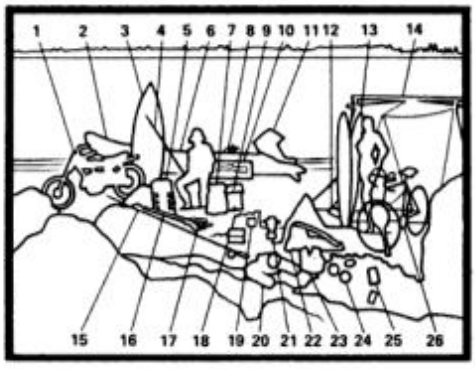
Tents, cooking gear, tackle, packs, clothes, foul-weather gear, shoes, safety equipment—all these are also available now in greatly improved variety. Quality items, in addition to improved design, weight, compactness and durability, showed adaptability to a number of activities as well in the wide cross section of items we selected recently for testing. The results showed an additional trend in both outdoor equipment and activities.

■ *Versatility*—this is a bonus quality that can save money and add action to outdoor activities.

You plan to buy a tent. Perhaps it is only for a weekend outing to see if your family enjoys camping. Study all the types available, and if you are new to the sport, rent one first to try it out. Shop, read, talk to experienced campers. Then pick a model that is light enough to handle easily, simple enough to set up in the rain or the dark, large enough for campers to get dressed and gear to be stored.

Two smaller tents may be better than one large one. But note that modern models don't need a tent pole down the middle, do have a floor, mosquito netting and fire resistance. Pick carefully and you will have a model the youngsters can use in the back yard, a cabana for the seashore, a tent to take along on trips by car, trail bike or boat.

Other new gear can be equally multipurpose in design. Fishing tackle can now be selected that is suitable for both salt and freshwater use. A shotgun can double on the skeet range or afield. Life preservers have recently been redesigned for action sports and are flexible enough either for paddling a canoe or speeding along on water skis. Variations of skin-diver wet suits will take the chill out of windy sailing or offseason skiing on the water. Takedown bows come apart like a fishing rod and make traveling with archery gear more simple than ever.



KEY TO COLOR PHOTO ON PAGE 44

1. Hodaka Dirt Squirt trail bike; **2.** Bell Helmet; **3.** Superior surfboard; **4.** Lew's Speed Stick rod; **5.** Cypress Gardens Action life preserver vests and belts; **6.** Bonair III Inflatable boat; **7.** Camp Trails day pack and stuff bag; **8.** Saunders Falcon II hunting slingshot; **9.** Coleman 10-qt. Roundabout cooler; **10.** Zebco Classic crossbow; **11.** Johnson 25-hp outboard motor; **12.** Coleman washable sleeping bag; **13.** Cypress Gardens Dick Pope Jr. water skis; **14.** Coleman Compact-4 tent; **15.** Scientific Anglers System 7 flyrod and reel; **16.** Winchester Model 101 shotgun, Sears hunting jacket, Herter's fishing shirt, **17.** Winchester-Western hand trap launcher; **18.** Zebco Traveler Trio broiler-grill campstove, **19.** Zebco Pot-Lucker backpack stove; **20.** Shakespeare Scuba-Drive, **21.** Coleman Twin Mantle floodlight lantern; **22.** Zebco Ben Pearson Silencer bow, Zebco One spinning reel; **23.** Turbo wet suit; **24.** Scientific Anglers Air Cel and Wet Cel Hi-D fly line; **25.** Jim Bagley bait lures; **26.** Schwinn Super Sport bicycle.

Boating no longer requires a boatyard and a budget-breaking investment. The inflatables, unfoldables, canoes, kayaks and cartop skiffs available, plus small outboards that fit in a car trunk, make the sport possible wherever you happen to live. Combine it with camping, hunting, fishing, water skiing, photography, bird watching, you name it.

Backpacking to suit your area

And the small items that make up the food and cooking gear of the hiker can be picked to travel just as well in a bicycle pannier, climber's rucksack, recreational vehicle snack shelf or in the pockets of a beachcomber. To stretch an afternoon walk into a week along a wilderness trail, switch to a properly fitted backpack with rigid frame that balances the load on hips and shoulders. Select your poncho and other protective gear to match the section of the country where it will be used. Packers accustomed to the dry Southwest will find their equipment not at all suitable for cold wet areas of the Northwest and Northeast, or humid heat of the Southeast. Good gear, however, can form a useful basis for outdoor sport anywhere.

During a recent photography and testing session at Cypress Gardens, Fla., an informal survey of visitors from all parts of the country showed that most of their interest was in new models of trail bikes, outboard motors, archery equipment, skin-diving accessories, touring bicycles, and new fishing gear. Questions on how to use it and where to buy came in first and second. Price was No. 3.

Check with magnet and magnifier

When checking equipment or shopping, it does no harm to fit out, as we do, with a pocket magnet and magnifying glass. Test rivets, screws, zippers, grommets, tie rings, hinges with the magnet to see if they are really iron under the plating and, therefore, likely to rust. Use the magnifying glass on seams, stitching, fabric flaws, and the small print of instructions and warranties.

If you're in doubt, take along an experienced friend and catalog from a good mail-order house to compare prices. Look for well-known brand names of companies that have earned their good reputation.

Still in doubt? Find some dealer who will rent equipment. Try it out. A good test is to see how successfully it works for you.

Our tests showed lightness must not mean cheap construction, or low price equal low quality. But gear shown here that passed our in-use exams should add satisfaction to days you spend outdoors. ★★★

Материал, защищенный авторским правом

'76 Pickup news from Ford

Newest Ford 4x4

Ford's new 4-wheel-drive F-150 runs on any gas . . . through just about anything! Great for doing a job or for getting away from the mob. Called a heavy duty half-tonner, the F-150 can actually haul over a ton. Heavy duty features like 4-speed shift and power disc/drum brakes are standard equipment. Options include full-time 4-wheel drive, Cruise-O-Matic.

Extra Durability

Roomy regular-cab pickups have over 200 sq. ft. of galvanizing to protect sheetmetal . . . Twin-I-Beam up front for strength plus smooth ride . . . all-welded Styleside box with smooth coved corners. Ford builds 'em to last!

Roomiest 2-Door

Ford SuperCab is the only 2-door cab roomy enough for a full-width, fold-down rear seat (optional, as are folding jumps). Seats a family of six! See your Ford Dealer.

93 out of 100 of all Ford trucks built in the last 12 years are still on the job (R. L. Polk & Co. figures).

FORD

FORD DIVISION

Материал, защищенный авторским правом.

Shown below:
All the beers in America that are still Beechwood Aged.

"Somebody still cares about quality."

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New trains are reviving America's romance with the rails

by Tom Kizzia

They're hearing some discouraging words out where the deer and antelope play, at the federal railroad test center on the high plains of Pueblo, Colo.

There was a time, not long ago, when U.S. Department of Transportation (DOT) officials didn't think they could get funding for their $80-million facility unless they called it the "High Speed Ground Transportation Center." Congressmen were excited at the time by researchers' predictions of 300-mph vehicles racing between cities, relieving clogged highways and backed-up airports of impatient travelers. The vehicles, levitated above a fixed guideway by magnetism or air cushions, would be able to "fly" under the power of electromagnetic induction motors.

But there was uneasiness beneath all the enthusiasm. People in the railroad business and the Federal Railroad Administration learned to refer politely to the high-speed systems as "advanced technologies" in public, but privately many people never got over calling them "Buck Rogers stuff." Nobody thought the research could pay off until the 1990s at the earliest.

In the past year, Congress too has grown impatient. Shying away from expensive test programs, it directed DOT to devote the taxpayers' dollars to more practical short-term improvement of the existing rail system. The rail traveler was to be gotten the 227 miles from New York to Washington in two hours, and not 40 minutes. DOT, ever sensitive to the winds of change, last December renamed its Pueblo test site the "Transportation Test Center."

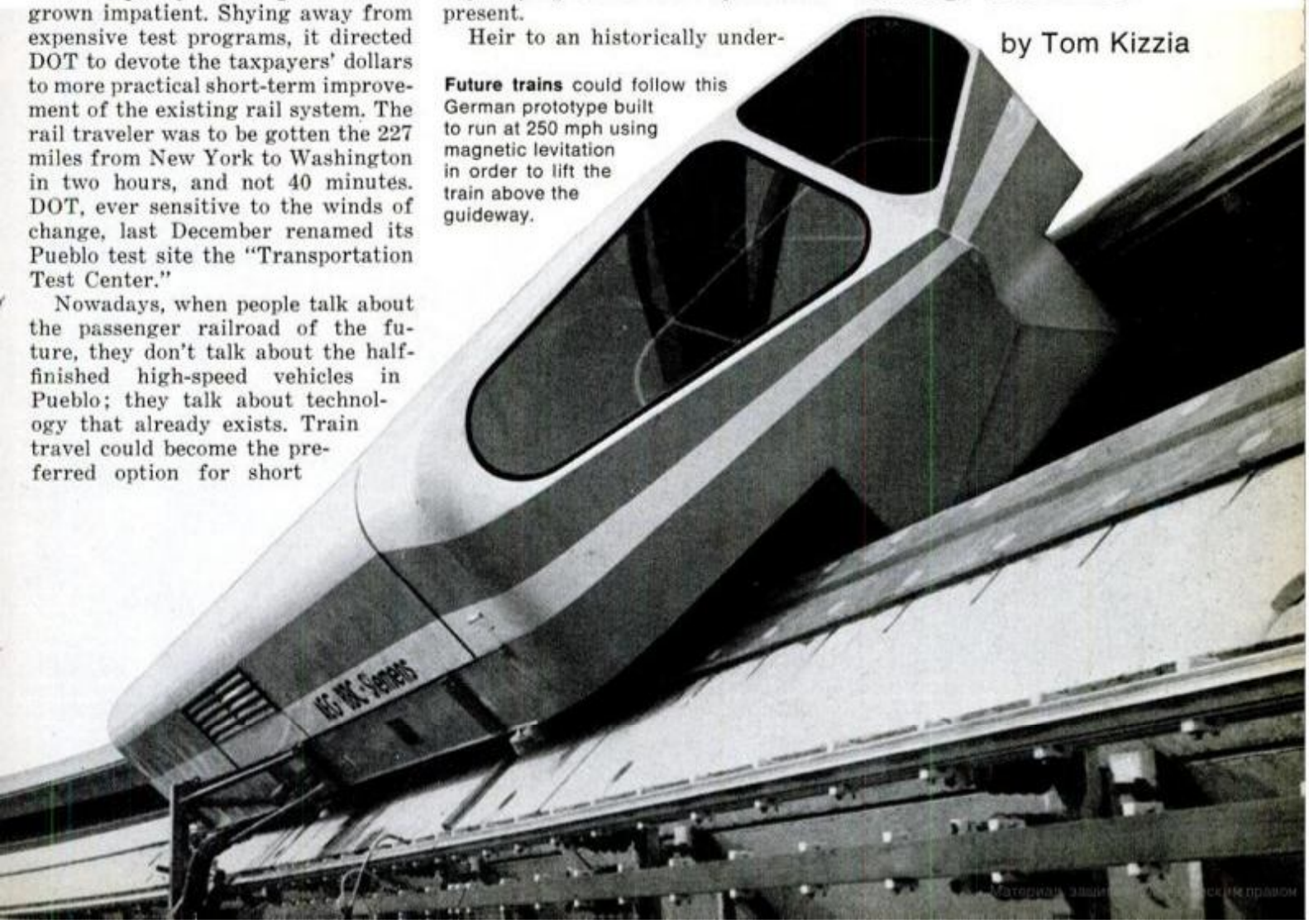
Nowadays, when people talk about the passenger railroad of the future, they don't talk about the half-finished high-speed vehicles in Pueblo; they talk about technology that already exists. Train travel could become the preferred option for short and medium distances here, as it has in other countries, using the same technology those other countries have used.

Europe is working on a 2000-mile system of high-speed lines to increase the railroads' hold on passenger travel there, and it is upgrading another 8700 miles. Already, West Germany alone has four times as many rail passengers as the United States, with less than a third of the population. The USSR's new "Russian Troika" makes the 400-mile run between Moscow and Leningrad in four hours. In Japan, the New Tokaido Line "Bullet" trains run every 15 minutes in each direction, *averaging* 102 mph over their 320-mile distance.

By contrast, America's showcase train, the New York-Washington Metroliner, sneaks up to 105 mph over one short section of track, and slow orders elsewhere cut its average to 75 mph. To travel 400 miles in the northeast corridor would take you over six hours.

Amtrak, the quasi-public corporation created four years ago by Congress to take over the nation's dilapidated passenger trains, is busy these days trying to claw its way into the present.

Heir to an historically under-



Future trains could follow this German prototype built to run at 250 mph using magnetic levitation in order to lift the train above the guideway.

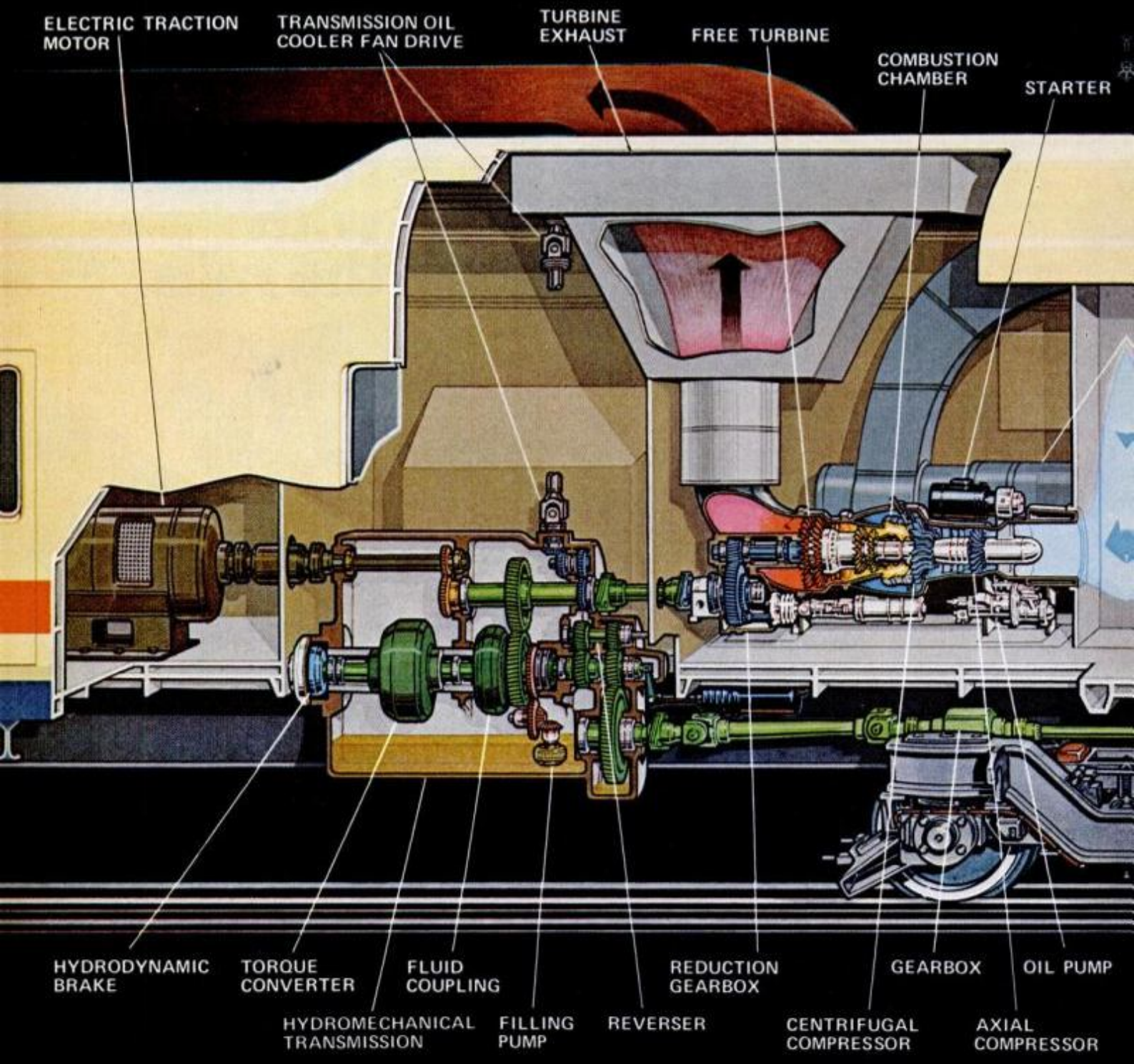
nourished business, Amtrak has gone on a new equipment buying spree this year with Congressional help. At the top of its shopping list is the 120-mph turbine-powered train.

During October, 1973, Amtrak shipped from France two RTG turbotrains and put them into service between Chicago and St. Louis. The high-speed turbos ran up a 92-percent reliability record. Amtrak was impressed enough to order four more from France and an additional seven, to be built in California, from Rohr Corp., the U.S. licensee.

Each five-car turbotrain set includes a power car at each end, so it's never necessary to turn the train around. There are two turbines in each power car: an 1140-hp two-shaft turbine that provides traction for the train through a massive, 7500-pound hydraulic transmission (see diagram), and an auxiliary 430-hp single-shaft turbine for the train's internal electrical requirements, such as airconditioning in the cars. The big turbines at each end are used to accelerate the train, but one of them can be idled when the train reaches cruising speed. Only one of the auxiliary turbines is needed at a time, thus guaranteeing back-up power to the train.

The advantage of a turbine-powered train is that it has the

Power-car cutaway showing turbine, transmission and internal generator



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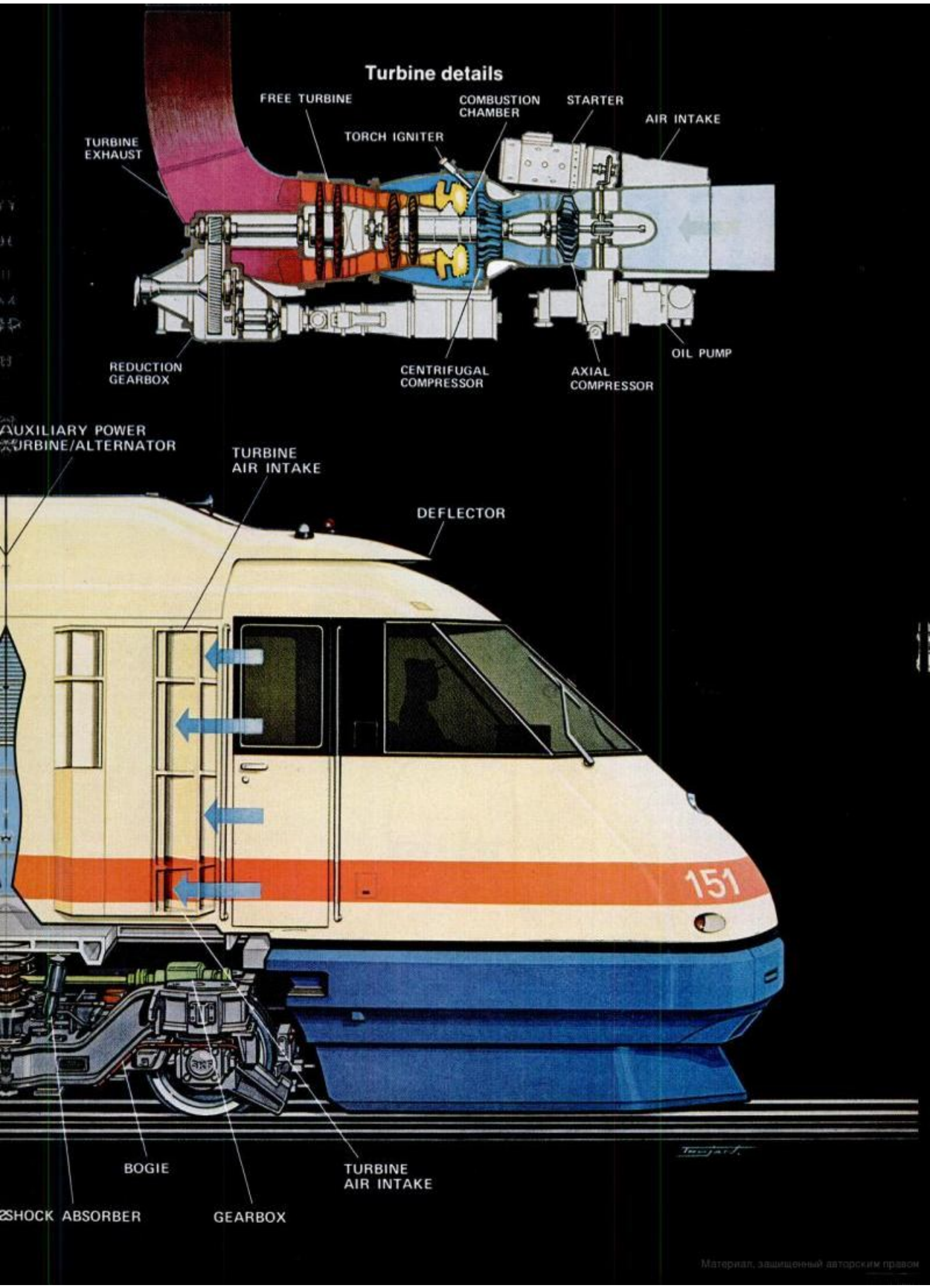

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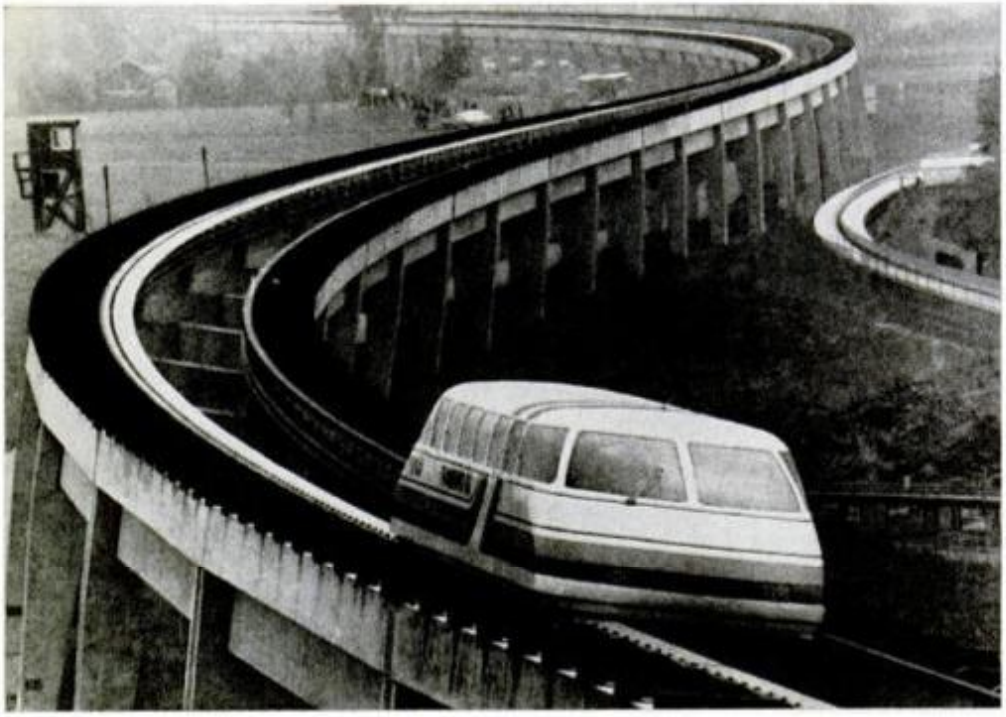
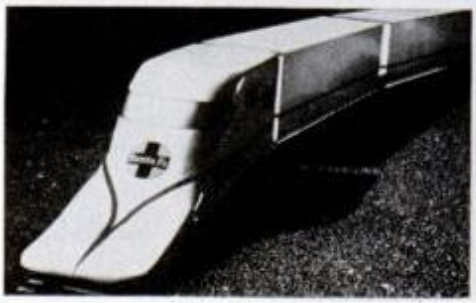


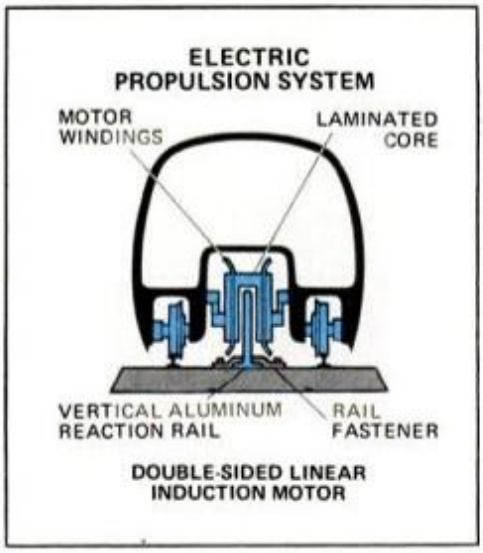


World's most advanced train (top right) is the British experimental Advanced Passenger Train especially designed to run 155 mph over unimproved track. LIM train (top left) may be America's answer to high-speed propulsion without rails. A German magnetic attraction vehicle (left) called Transrapid can go 120 mph with double speed planned. Tomorrow's freight may be transported by the multiwheeled Coaxial Train (above).

highest power-to-weight ratio available, making acceleration and braking easier. A complete five-car RTG train set weighs about 250 tons; a diesel-engine train, with four coaches to carry the same 300 passengers, weighs around 470 tons—almost twice as much. One disadvantage is the turbine's higher fuel consumption—but its lighter weight helps make up for that.

The seven Rohr-built turbos, first of which is due in April of next year, will be Americanized. For one thing, they will be seven inches higher and five inches wider. There will be more room for passengers, with capacity cut to 276 per train. Third-rail capability will be added, so that the train can switch over to electrical power when it enters New York—a sign that Amtrak is serious about its plan to use turbotrains between there and Boston.

Another change is being made partly at the request of the operators: a longer nose will be put on each end. The reasons aren't all aerodynamic. "Not only are there more grade crossings in America than in Europe," explains Fred Houser, railroad specialist for the Transportation Research Board in Washington, "but American drivers seem to have considerably more confidence crossing them. The operators didn't like being right up front under those circumstances; this should keep the autos out of their laps."



Turbotrains may make a dent in a couple of heavily traveled corridors, but they are no panacea for the nation's rail ills. The RTG has been clocked in France at speeds as high as those achieved on the New Tokaido Line, over 130 mph—but in the Midwest it is held to 80-mph top speed by track conditions. The problem in the United States has been maintaining high speeds, not achieving them.

When Japan built the New Tokaido Line, it built a whole new railroad. Today in America a generation of locomotives is being introduced that takes into account less-than-perfect track structure. Originally designed for 150-mph runs, the famous Metroliner has been retooled to 130 mph maximum speed. Amtrak is now testing a 10,000-hp GE electric locomotive, capable of 120 mph for short acceleration. The GE locomotive would be used on electrified track in the northeast. Garrett and GE have built prototypes of a combination gas-turbine/electric locomotive.

In general, not much more than 120 mph is the speed railroad people mention when asked about the Train of the Future. The locomotives, whether turbine or electric, are available. There are even high-speed diesel trains being developed—in Britain, the HST (High Speed Train), in

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Today's innovative freight cars, like this monstrous compact-car carrier, help keep railroads competitive with trucks.

Canada, the LRC (Light, Rapid, Comfortable). An HST prototype—which holds the diesel train speed record of 143 mph—is actually in service now between London and Bristol, and 27 more are expected to go into operation beginning next fall.

British Rail's Advanced Passenger Train (APT), now being tested, is probably just that—the most advanced train in the world. The idea is to build a train, with either gas turbine or electric motive power, that can reach high speeds on existing track. The secret is a new suspension system and a special car-tilting mechanism. Together they will permit the APT to speed around curves 50 percent faster than conventional trains.

Passenger trains would often be capable of going faster around curves if it weren't for passenger discomfort—there would be no danger of derailing, but passengers pitching into the aisles might justifiably jump to such a conclusion. As long as passenger trains share the track with slower-moving freight trains, some compromise must be reached in the banking of the curves. Several years ago an Erie freight was forced to stop in the twisty Delaware Water Gap, and several cars on a sharply banked curve slid off. A derailment, standing still.

One way to keep passengers off the edge of their seats—and thereby speed up the train—is being experimented with in the APT and the Canadian LRC: a hydraulic banking mechanism which would automatically tilt the car more than the curve tilts the train, up to 9° extra in the case of the APT.

New cars are also being developed that will make riding America's rough railbed easier.

The first of 492 Metroliner-type coaches will be appearing late this summer in the United States—at long last, the first standard Amtrak coach. Until now Amtrak has had to make do with whatever cars it could find, and it scouted every railroad yard in the continent to scrape together its fleet of 2000.

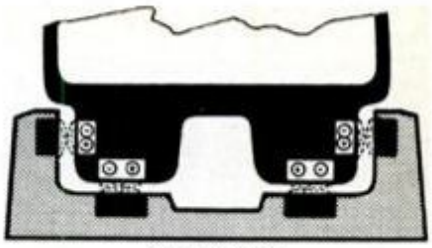
The new "Amcoach" will resemble the rounded Metroliner car, except that it will not carry its own electric motive power. Instead, it will be hauled by locomotive, thus allowing it to range outside the Northeast on other short-distance routes. Floor tracks in the new coaches will permit variable seat spacing.

Most of Amtrak's attention is going these days to the short-haul routes in corridors with high population density—routes where an improved system could give the airlines a run for their money—but it is not letting the long-haul passenger train go the way of the stagecoach, as some jet-setters have predicted. Amtrak has ordered 235 bilevel cars from Pullman-Standard, for delivery beginning in 1977. The cars will provide coach seats, sleeping compartments, and dining facilities; diners upstairs should get the benefit of a much smoother ride. Seats will be spaced as far apart as first-class airline seats, with folding tray tables mounted behind each seat.

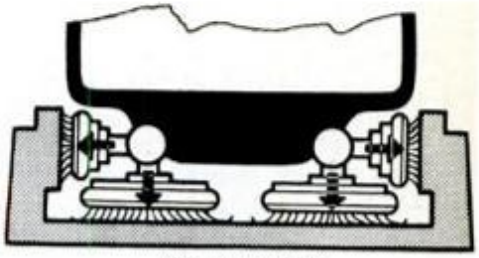
One reason why passenger service is more advanced in other industrialized nations where the railroads have been nationalized—the United States is virtually alone in preserving the private carrier—is its high public visibility. Passenger trains are good politics. America has, however, remained the leader in the profitable side of railroad-

(Please turn to page 112)

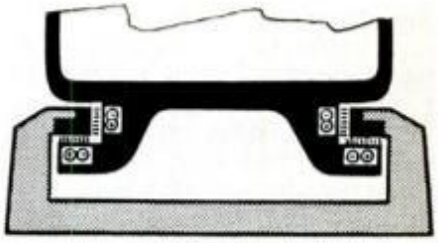
Guided Suspension Systems



MAGNETIC EDDY CURRENT REPULSION



AIR CUSHION CHANNEL OR U GUIDEWAY



MAGNETIC FERRO-MAGNETIC ATTRACTION

In service, high-speed British Rail prototype is holder of the diesel-engine speed record at 143 mph.

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Treasure hunting for fun (and possibly riches)

by Jean Lovetang

Since the 2nd century, a life-size bronze statue of the infamous Roman Emperor Hadrian lay buried in the sands near the Jordan River. It took an American vacationer swinging a metal detector costing "less than $200" to discover this treasure.

Morton Leventhal, a coin collector and amateur archeologist, started five years ago to investigate ancient sites looking for old coins. But little did he realize what he would uncover when his Metroteck signaled metal in the Israeli sands below his feet one day last summer. With a boy scout knife he dug down a foot and a half and discovered the ancient statue reportedly worth millions.

Like Leventhal, today's treasure hunters aren't rum-swilling, cutlass-armed swashbucklers. They're more likely to be average American hobbyists equipped with picnic hampers and electronic gadgets.

As a hobby, treasure-hunting with electronic metal detectors is not only fun, but a source of potential profit, too. At flea markets from coast to coast you'll find electronically recovered guns, buttons, keys, cook pots, branding irons, cartridge shells, cannonballs, Civil War medals, muskets, gold and silver coins—and old square nails. But coins are the most popular targets. Even the most common are worth at least face value—older ones can be worth much more.

You needn't travel far for treasure, either. Digging up the history in your own back yard can be as interesting (and perhaps even as profitable) as searching for lost nuggets in some faraway ghost town—where it's likely numerous other electronic hunters have already looked.

And the whole family can participate: Metal detectors are so simple that any child big enough to carry one is probably old enough to use it.

Your home, especially if it's an older house, makes a good hunting ground. Searching around your walls, foundations and even inside banister railings or stairs may show up hidden caches. Garages, steps, under trees, and any other place where people are likely to be will yield treasures ranging from old coins to that screwdriver you lost 10 years ago.

Parks and beaches are another favorite ground, especially for "coin-shooting." But unless you muffle your detector's beep with headphones, everyone around can tell exactly where you find something. Still your beeping is more likely to annoy than to intrigue onlookers. That's one probable reason why many public parks and beaches ban treasure-hunters.

Metal—on the surface or underground, whether treasure or trash—makes electronic detectors like this $250 Garrett Master Hunter sound off.

The holes left by enthusiastic but inconsiderate seekers are another.

The biggest finds are made by those who spend a little time in research before hunting. As one weather-beaten treasure-trekker told me, "Every summer I go scouting for gold coins. And I always get them. I know they're there, waiting for me, like money in the bank, because I've spent the winter researching from old deeds, stagecoach routes, county and state records, and sometimes through hot tips from someone who knows. In two and a half months this summer, I located $17,000."

What do you research for? Old battle sites and army camps, trading posts, ghost towns, crooks' hideouts—any place where people have been, or have spent or hidden money.

And secret caches can yield big finds. Back before farmers could drive into town with ease and before banks were insured, they might hide their savings in "post-hole banks" many of whose locations were never passed on before they died. Still other caches have been buried under bushes whose looks changed unidentifiably when the seasons did. Such private banks are not rare, either;

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Bill Mason, an avid Minnesota treasure hunter says, "I know personally of $217,000 that's been found in Minnesota in the past five years. An average of 1.6 caches per section (640 acres) of land isn't out of line."

Even today, money—especially criminal loot or undeclared income—is being hidden in clandestine caches. One federal authority says that if he had all the money wrapped and hidden in aluminum foil, he could buy himself the state of Illinois.

Though greenbacks aren't metal, you may find them as well as the usual small change and occasional gold hoard. Paper money is most frequently buried in metal cans for pro-

(Please turn to page 109)

Coil size affects search patterns: Small coils easily detect small objects in range from A to B. Big coils can detect large objects farther down (C), but miss small ones, Switchable dual-coil systems let you compare large and small coil responses to tell size and depth of object.

I tried it

by Dan Fales MANAGING EDITOR

Right off, I was successful while trying out a new treasure detector. I managed to locate the car in the driveway. This feat produced howls from the dog, amazement from my wife, but only skepticism from my friend, Dick Bennett.

"See if you can find my water main shutoff valve," he challenged pointing to the front yard.

Armed with what looks like a miniature mine detector from World War II, I started the search. The detector comes from Lowrance, has the title of Ferret Treasure Lo-K-Tor, and retails for $94.95. To help the novice, this unit also has the more formal name LML 500, and the words Metal Lo-K-Tor neatly stamped on the visual meter, which is one of two ways to determine if you've found something. The other is an audible indicator that sounds a lot like a Geiger counter. By tuning the visual meter to zero and the audible to inaudible, you have reached the null. By slightly moving the tuner clockwise or counterclockwise, you can tune the machine to detect non-ferrous or ferrous metals. Because buried metal money is non-ferrous, I doubt if the ferrous side is often used.

Photo: M.D. Bennett

Tuning an electronic device to detect metal in your back yard (above) instead of finding treasure on the beach (opposite page) is very easy although the varying pitch from the audio will not only arouse the curiosity of the family dog, but it may also set him to howling. Details of a typical metal detector, such as this Ferret Treasure Lo-K-Tor, are shown below.

So now with the audible established at a steady pitch, and the meter at the 6½ level, I started the search. I slowly moved the ring-shaped business end of the Ferret over the ground at grass-top level. Swinging the machine like a scythe-wielding harvester, I covered the better part of my friend's front yard. Nothing, absolutely nothing.

"Maybe the battery's down or the pipe's below the six-inch range," I remarked defensively as the tone remained unshaken in its preset pitch.

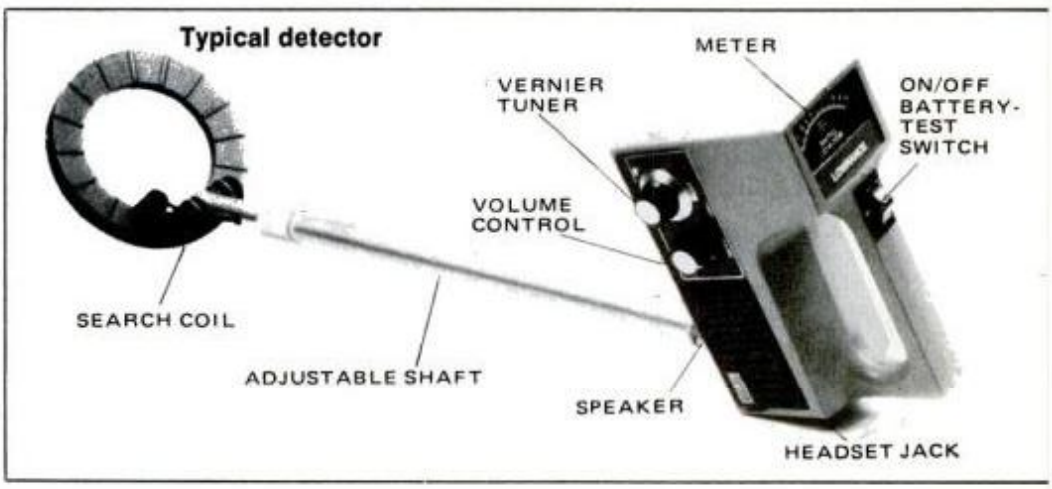
"Let me try it," said Dick. With the determination that accompanies a new idea, he moved the Ferret toward a large overgrown forsythia bush. Shoving the ring underneath the ground-hiding branches produced the most astonishing pitch change in the audible, while the meter needle quickly pegged to the right.

Pushing dirt aside revealed the evasive pipe inches below the surface.

Once assured the machine would in fact perform, we headed for a back-yard party to impress other friends and neighbors. Again we wanted to show off the machine.

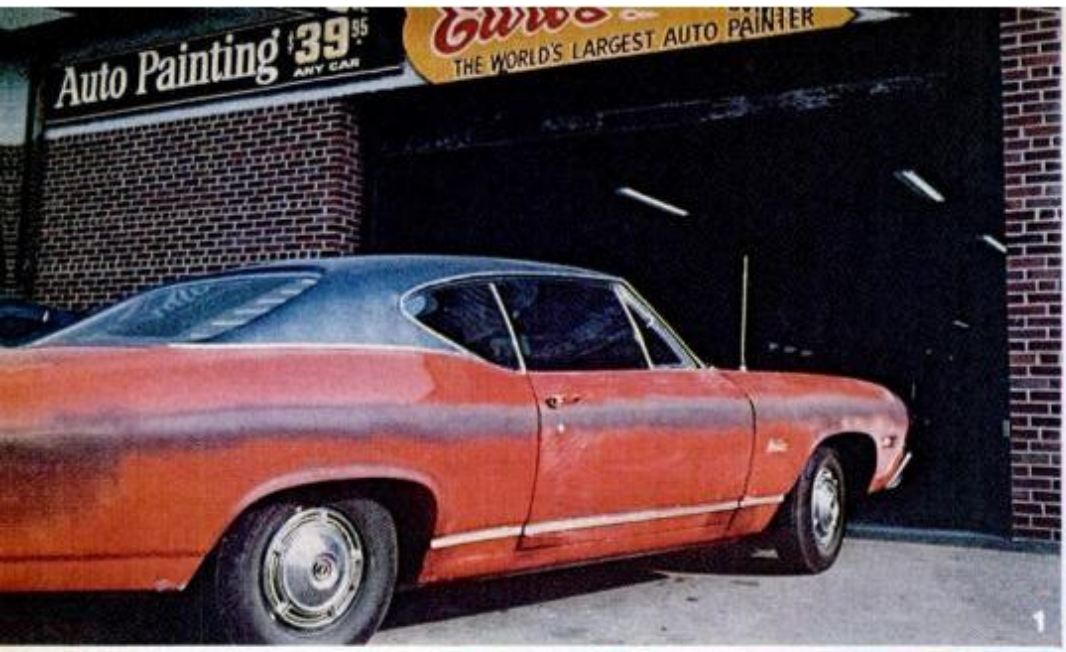
Upon arrival, everyone gathered

(Please turn to page 109)



How to buy

Photos: Richard Fosdick



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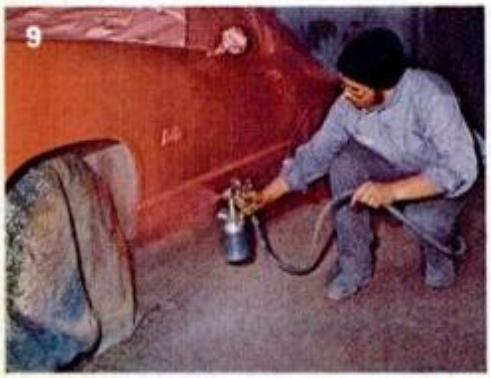

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a paint job for your car — without taking a shellacking

by Robert Lund DETROIT AUTO EDITOR

If your old car looks beat up and you've got the fever to buy a '76 or a late-model used car, you can cool the fever fast by checking out prices. The more prices you check, the better the old car begins to look. But, how do you make the old heap look as good physically as it looks in your mind when you consider the bucks you would have to shell out for a newer car?

Have it painted. Of all the ways you can spend money to spruce up an old set of wheels, a new paint job will get more of your money back when you go to sell the car than anything else you can do to it or hang on it.

A professional paint job will cost you anywhere from $40 on up. Mostly up.

The price depends to some extent on what the car cost when it was new. Repainters don't like to admit this, but it's true. Repainting a Cadillac generally commands a Cadillac price, while repainting a Gremlin generally brings a Gremlin price. The difference may have something to do with the amount of surface that has to be worked over and covered by paint. But there's also an element of high price car/high price for repainting, low price car/low price for repainting.

The price is also contingent on how much preliminary work has to be done before the car can be painted. Bumping, blasting and sanding, filling in low spots in the metal, grinding, deburring, feather-edging, caulking, filing, masking—these are some of the preliminary steps that have to be done to insure a quality job.

Because of the make-ready that has to be done before the paint goes on, refinishers are reluctant to quote prices over the phone. They want to see the car.

I called 10 shops in the Detroit area in gathering the information for this story and didn't get a straight "We'll do it for X dollars" answer from any of them. One shop quoted a price of $49.95 plus materials and labor. That didn't tell me much —because the entire job is materials and labor. What else is there?

Good shops give a guarantee

The reason repainters don't like to quote prices sight unseen is that the reputable shops give a guarantee. But they won't guarantee the job unless the surface has been prepared correctly to accept the paint.

If you want the car painted without preparation, there are shops happy to oblige with a once-over, slap-and-dash. But don't try to get a refund or have the work done over if the paint flecks off. Make that *when* the paint flecks off. No guarantee, no comeback if you have a beef.

There's another reason why shops want to see the car before quoting a price. All repainters are in the body business, more or less. They make money removing the lumps and the bumps.

Most refinishers remove small imperfections in the metal—nicks and scrapes—without charge. But everything else is extra. Any car that has been on the road a few years is likely to have a rust spot or two, dents, banged-in areas or some sort of body scars. So they like to get you in to see what body work they can sell you before they quote a price.

After striking out on the phone, I took my car—a '73 Mustang—around to several shops. Actually, the car is in pretty good shape and doesn't look like it needs repainting. Nevertheless, I got bids ranging from $102 to $146—despite the fact that little or no body work would be required. Then I decided to try the Earl Scheib chain, which has five outlets in the Detroit area.

Earl Scheib is the undisputed king of automobile repainters in the United States. The company has 220 shops across the country and Don Scheib, a vice president of the firm and Earl's son, told me the company turns out between 600,000 and 700,000 paint jobs a year.

Best way: Compare estimates

The Scheib name is a dirty word among other repainters. Earl undercuts everybody else on price and it bugs the heck out of the competition. But Scheib's detractors are hard-pressed to accuse him of anything very reprehensible. The worst bad-mouthing I could turn up on him is that he allegedly charges customers more for body work than non-Scheib shops.

This may be true or may be sour grapes. You can find out easily enough by taking your car to a Scheib outlet and a non-Scheib painter and asking for written estimates at both places. (Funny thing, but some automobile dealer shops that knock the Scheib operation have their own used cars painted by Scheib.)

If you want to paint your car yourself, turn the page and find out how you go about it.

Don Scheib says everybody pays the same for body work at Scheib shops. No ups or downs based on what the car cost when it was new. The company uses a Scheib-invented gizmo, the "Estometer," to measure the exact width, length and depth of body damage, "so everybody pays the same price" if bodywork is necessary preliminary to repainting.

The "Estometer" is about the size of a pocket watch. The estimator runs it along damaged section of the sheet metal. He takes a reading vertically and horizontally and then tells you what it will cost to have that specific area repaired.

Scheib's charge for a paint job anywhere in the United States is $39.95. The price covers washing the car, hand sanding, removing nicks and chips, priming any bare metal and repainting, including

(Please turn to page 120)

Repainting a car, this one a 1968 Chevy Chevelle, starts at 1 when you roll into the paint shop for an estimate. The gauge in 2 is an "Estometer," used to estimate body damage. In 3, manager Mark Buehler, at this Earl Scheib paint shop in Detroit, is shown explaining to author Robert Lund the work that has to be done before painting. For this car, $66.76 in body work was necessary, and that, added to the $39.95 paint job, resulted in a total of $106.71. Rough sanding is shown in 4, and hand sanding in 5. The car is then masked as shown in 6. A final sanding, 7, is done with a machine called a "jitterbug." Last step before painting is shown in 8: The car is cleaned of all dust and dirt with an air hose. In 9, the car is sprayed. The masking is ready to be removed soon after spraying as shown in 10. In 11, the car is wheeled out with its fresh paint.

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Yes, you can paint your car yourself and come out many dollars ahead—even if you don't own a compressor and spray gun. The equipment can be rented.

I called two companies in my town that rent tools. One wanted $17.50 a day for compressor and gun, and the other wanted $14 (plus $5 if equipment was returned uncleaned).

Unless you intend doing extensive spray painting, it doesn't pay to buy equipment. I got an "on sale" price of $200 for a unit suitable for auto painting from Sears. The regular price is $300.

"Even if a man doesn't want to get involved with spray painting, he can still save himself much money by preparing the car and bringing it to a professional shop ready-for-painting," says Russ Wolfe, owner of Autocraft Collision Service in Union, N.J. Russ paints cars for a living and he willingly shared his knowledge with me. What he has to say can save you time and money.

For example, Russ charges about $150 to completely prepare and repaint a car the size of a Mustang. He charges only $60 if the car is brought to him ready for painting. The charge includes the price of primer, paint, masking and repainting.

By "prepare" we're speaking about a car which doesn't need any body work. If your car has dents or rotted areas which you want to get rid of before repainting, I suggest that you refer to the article *"Your Summer Dents: How to Get Them Out* (page 130, Sept. '74).

Whether you rent or purchase a compressor spray unit, make certain that compressor and gun are matched. The compressor should supply the amount of air the gun requires. A 1 or 1½-hp compressor which delivers 3 to 5 cu. ft. of air per minute and a gun to match are suitable.

Two types of spray guns

There are two general types of spray guns: The external-mix (siphon) gun mixes paint and air outside the gun at the nozzle. An internal-mix gun mixes air and paint inside the gun.

You will probably be renting an external-mix gun. You can tell it by the air hole in the cap. This hole must be kept clear while spraying.

Other materials you will need to repaint a car (or prepare it for repainting) include sheets of 100D sandpaper and 320A or 400A wet-or-dry sandpaper; a sanding block; rolls of ¾-inch and 1½ or 2-inch-wide masking tape; tack cloth; spray mask you *must* wear when painting; and masking paper.

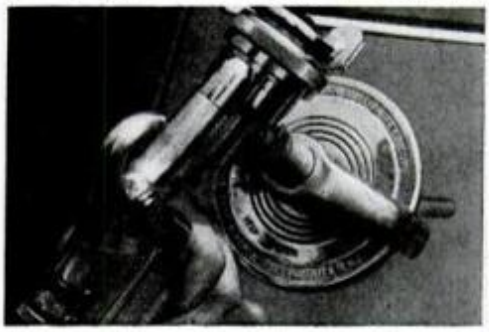
Masking paper should be as heavy as kraft paper or heavy wrapping paper. Don't use newspaper. Overspray can penetrate newsprint.

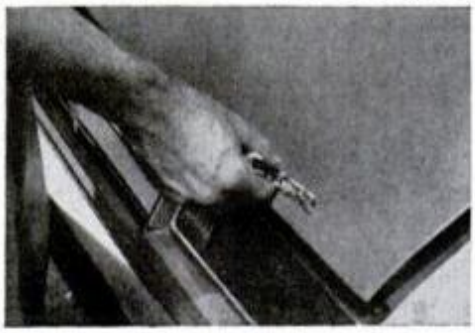
As for primer and paint, it's important to do business with a reputable auto paint supplier who sells a name brand, such as DuPont, Ditzler, Martin-Senour, Borden Krylon or Sherwin-Williams. Dealers are listed in the local directories under a heading such as "Automobile Painting and Supplies."

The counterman at a supply company which has a good reputation can be an invaluable source of information and helpful to call on if you get in a jam. He probably attended a training school run by one of the major paint companies.

The painting supplies you will need are: a half gallon of wax and grease remover; metal conditioner; body putty; a gallon of lacquer thinner; a half gallon of primer (lacquer base), and a gallon of acrylic enamel finish paint. You can figure out exact quantities for your car with the help

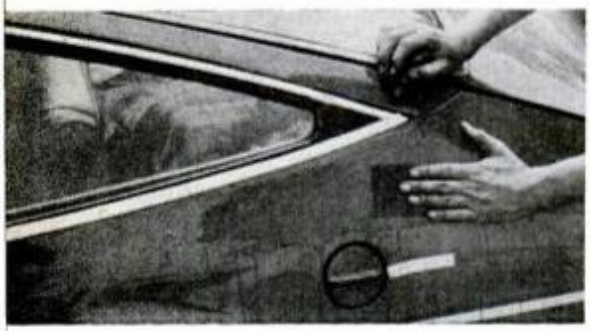
Spray gun of the external-mix type can be rented to do a repaint job yourself. Start by removing any trim that will come off easily. Then wash the car to remove all dust and dirt and, if necessary, clean the car with a wax and grease remover.





SATURDAY MECHANIC

How to repaint



Wet-sand the entire car. Keep both the car and the sandpaper wet and do a slow, careful job. Look at the surface from many angles so that you won't miss any spots. Get into the crevices where a wax buildup would repel the paint.

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of your supplier—the amounts suggested here are for an average-size car in the Mustang class.

Acrylic enamel is easiest

The reason acrylic enamel is recommended is that, for one thing, it's the easiest to work with. Furthermore, it can be sprayed over finishes of cars not originally painted with acrylic enamel. Conversely, you should not spray an acrylic lacquer on a car that's been painted with enamel. The new paint may crack.

When you spray on acrylic enamel, you will notice that it dries with a gloss and dust-free in about 20 minutes. There is no significant overspray problem, because the spray won't stick to any surface it hits if it travels more than about three feet.

Practically all models have original finishes of acrylic enamel with the exception of General Motors cars, which receive a coating of acrylic lacquer.

Incidentally, if you are painting a car that has already been repainted, be sure the old paint job is at least six months old.

Now, before we really get down to brass tacks and discuss exactly how to repaint a car, let's outline the conditions under which the job should be done. First of all, allow yourself at least one complete weekend—more if body work is needed.

But however long it takes you, *take your time*. There are no shortcuts. A quality repainting job requires meticulous and patient workmanship.

It's best to work indoors

Ideally, it's best to work indoors, free from dust and bugs that can stick to wet paint and ruin the finish. But few people have access to an inside area large enough to make this possible. This means you'll probably have to work outdoors. Pick a location as free as possible from flying insects and wind-blown dirt. Work in the shade, but not under trees that may drop leaves, sap, berries or bird droppings. Wait for a weather forecast of clear, warm (70° to 80°), low humidity and no wind! And don't smoke while painting or bring any flame or equipment that may spark near paint and other flammable liquids.

If you do work indoors, be sure the area is well ventilated and set up an exhaust fan to carry paint fumes away. A mask is a must indoors and is recommended even when working outdoors. Inhaling paint fumes can be lethal.

One last tip: It's not a good idea to do preparatory work on a car and then postpone painting unless you lay the car up in a garage where it won't be affected by weather. Leaving it outdoors or, worse yet, driving it, subjects sanded metal to dirt and elements that may cause rust. All the work you did in preparing the surface will be wasted.

The best way to describe how to repaint a car so you get a top-quality job is to "walk" through the steps in 1-2-3 order:

1. Remove all brightwork that is removable, including windshield wipers, mirrors, nameplates and moldings. If you can remove the bumpers, it would be helpful.

If it isn't apparent how a piece of trim comes off, look or feel behind the piece for a clue. The brightwork in most cars is not difficult to get off, which is good, because rust usually starts behind these pieces. Unless you can get them off, you can't treat the rust.

Pieces of brightwork you can't remove will have to be masked.

2. Wash the car thoroughly to re-

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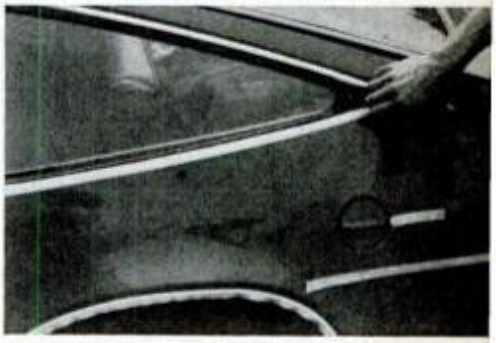
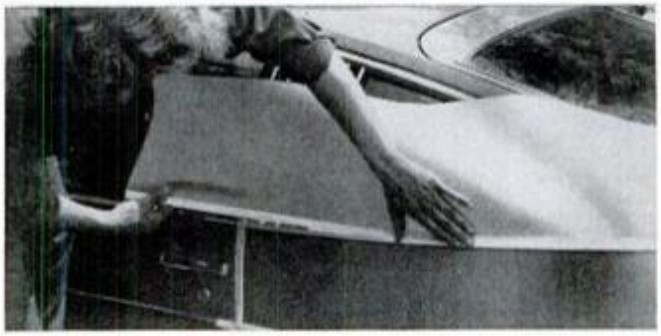
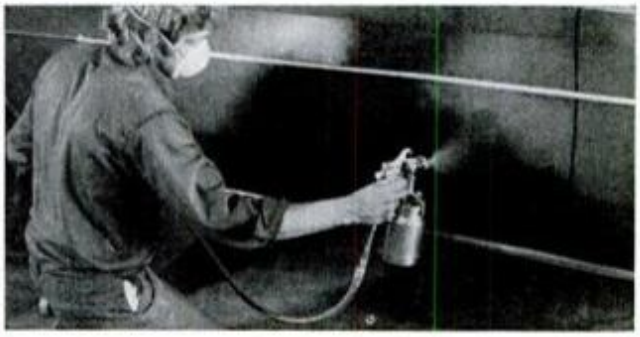
Masking tape should be applied carefully. Take your time and do a thorough job, covering only those parts to be protected from the spray. The tape is easily worked around molding contours. Next, wet down the car for wet sandpapering process.



your car yourself

by Mort Schultz





Mask glass with heavy paper—paint will soak through newsprint. Pick a warm, dry, windless day to spray the car if you'll be working outside. If working inside, wear a mask and provide for good ventilation of the area.

How to cut firewood and use a fireplace

With wood and hearth this winter, you can pocket many saved fuel dollars.

by Harry Wicks
WORKSHOP EDITOR

The well planned use of your fireplace this winter can be a practical complement to your home's heating system. A small fire can provide enough warmth to take the chill out of an early morning or damp evening. When it does, your furnace will work less, saving expensive fuel.

Most of us enjoy the look and sound of a roaring fire and the mood it creates. But the energy crunch has changed the thinking these days even for those who were less inclined to use their fireplaces. Now many tend to look toward the fireplace as our forefathers did—as a source of inexpensive heat.

Though there are occasions when you may use charcoal, coal or commercial pressed "logs," it's a pretty safe bet that you, like most, actually prefer to use real wood. Thus, with the cost of firewood being what it is today, it's just about a must to know how to select, cut and stack logs as well as how to use them properly in the fireplace.

Using a fireplace for supplementary heat makes good sense. For one thing, when you use wood you are burning a renewable resource. Unlike petroleum, new trees can be planted to assure a plentiful supply of wood for coming generations. In many instances, you will actually be helping your local environment because you will be reducing the accumulation of dead trees and limbs.

Photos: Abe Dulberg

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Where to get wood

There are a number of ready sources for good fireplace wood: For example, you can always cut branches and trees on your own property, judiciously selected so that healthier trees can thrive. And it makes sense to cut down and utilize dead and diseased trees which otherwise occupy valuable space without contributing toward a better environment.

Often, fireplace wood can be obtained from dumps and landfills because many areas have now prohibited open burning. You can often get firewood from industrial sources, too. Sawmills frequently sell off slabs and other waste wood products at very low cost. Many power companies sell trees and branches accumulated from powerline maintenance programs, also at low cost. In the final analysis, though, you may have to buy some firewood commercially.

Which wood is best?

Softwoods like pine, fir and spruce are easy to ignite and burn very fast with a hot flame. The very speed with which softwoods burn makes them less desirable, though. Such a fire needs constant attention and replenishing. But softwood can be the perfect answer when you want a fast warmup fire simply to remove a slight chill, then quickly burn out so you can retire for the evening.

You should avoid using scrap lumber and refuse. These materials, especially when excessively dry, produce sparks which escape up the flue and are a fire hazard.

The best fire—one that burns long and gives plenty of heat—is produced by combining softwoods with hardwoods such as maple, oak, birch and ash. The hardwood species burn less vigorously and with a shorter flame; thus, they burn more slowly. For aroma, add woods from fruit and nut trees: Apple, cherry, hickory and pecan, for instance, all give pleasant scents. Generally, wood smoke's scent resembles the fragrance of the tree's fruit.

Most wood species burn badly when wet (green). Some (such as swamp maple) are literally impossible to ignite until they have been seasoned (air-dried). For this reason, you should cut and stack this winter's supply of wood right now.

If you buy firewood, be aware that it is sold by the cord, a stack that measures 4x4x8 ft. Today you can expect to pay from $35 to $85 for a cord, depending on species ordered and your locale. The price of firewood is a good reason for doing your own cutting. For many homeowners, burning a cord of wood they have cut themselves will just about amortize the cost of a quality chain saw. Given reasonable care, that same saw will be cutting firewood for many years. But if you must buy logs, try to order from a dealer who can supply a mixture of wood species and log diameters.

Cutting firewood

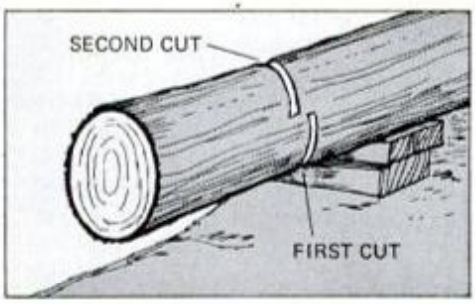
Try to select and work with logs of a length that you can handle easily. Then simply slice the logs up into fireplace lengths; for most fireplaces this is 24-in. The diameter of logs you buy should be governed by your chain saw's capacity. Using a saw with a 14-in. guidebar, for example, you can comfortably cut logs that are up to 20 in. in diameter.

When selecting wood, try to pick out straight-grained, knot-free logs, because they're easier to split than lengths with crooked grain. Keep in mind that wet or green wood is more easily split than seasoned wood. In general, softwoods can be split with less effort than hardwoods. Split logs after you have cut them to length—short logs are easier to split than long ones.

Setting the fire

Andirons should be spaced about 12 in. apart and equidistant from the hearth's centerline. Lay a generous

Fuel saw over ground that offers no fire hazards; keep mix in a clearly marked can.



As you cut a log, keep in mind that it weakens and bends at the cutting point. To avoid pinching the saw's bar and chain, support the logs as shown here.

To slice small-diameter log, open throttle fully before touching saw to log. For safety, cut with saw's bumper snugged against log. Release throttle as soon as cut is completed.

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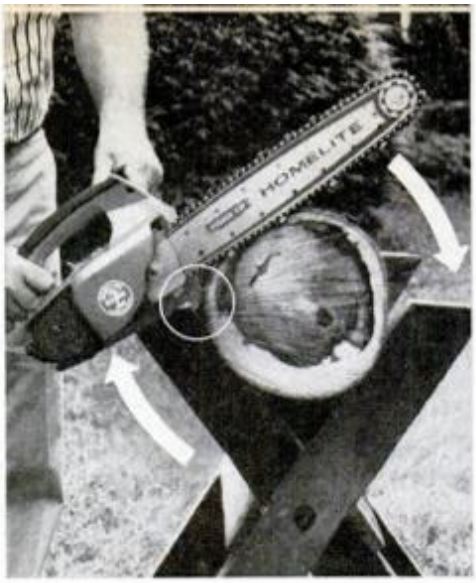
To saw larger-diameter logs—but still less than the length of the saw's bar—use this technique: Start with the saw's bumper (circle) pressed against a log with the blade held at a slight angle. Open the throttle to full speed and slowly lower the traveling chain into the log by pivoting the saw with its bumper kept against the log. Keep the throttle fully open throughout the cut; release the throttle as the log starts its drop.



You can split logs—preferably when they are green—using either a splitting ax, as at left, or a steel splitting wedge and a sledgehammer, as above. For larger logs, the latter method is recommended.

Good circulation through and around pile makes this a good way to stack logs for seasoning. When the logs are split into similarly dimensioned pieces, you can pile from 12 to 16 pieces in such stacks.

amount of crumpled newspaper on the hearth between the andirons. Next, arrange a crisscross pile of kindling—pine and cedar work fine —on the newspaper.

(You might consider buying a gas, electric, or Cape Cod lighter if your kindling supply is limited.)

Position the longest and thickest log across the andirons toward the rear of the fireplace. *Do not* let the logs butt tightly against the back wall. Leave about ½ in. of air space between them. Place a second piece, preferably a split log, in front and a third split log on top to form a triangular pile.

If you use a fire basket instead of andirons, the fire-laying procedure is the same—just place crumpled newspaper below the basket.

Light the fire with the fireplace damper open all the way. When the fire has started, close the damper until the fireplace starts to smoke, then open it just enough to stop the smoking.

Give your fire air

For your fire to burn brightly, it must have a supply of fresh air. If your house is tightly weatherstripped and storm-windowed, it may even be necessary to open a window several inches. Ideally, that window will be located on the wall opposite the fireplace rather than to one side where it may create a cross-draft and smoking.

Also keep in mind that any exhaust fans going full blast in the kitchen and bathroom can create a smoking fireplace by pulling air down the chimney. Try to keep such fans off while your fire is going or close the door between fan and fire.

Putting out a fire safely

If your fire hasn't burned out and you're ready to retire or must leave, use the fireplace tongs to stand all unburned logs on end in the back corners of the fireplace. Standing this way, the logs will burn out quickly.

Do not close the damper if there is any smoking wood in the fireplace. The fireplace screen should be fully closed before you retire to keep sparks off rugs and floors.

Some common-sense rules

Don't clean out your fireplace after each fire: Ashes about 1-in. thick should be left and spread evenly over the entire hearth. These will insulate the cold hearth and make the next fire easier to start.

Don't build too big a fire. Three or four logs will usually provide all the heat and flames you will want. As top and front logs burn up, turn them with tongs and, if necessary, place another split log on top.

Do keep the fireplace screen closed because of sparks which can pop out and smolder on rugs. (Moisture in the wood can become steam that drives out showers of sparks.)

Do open the damper before starting a fire and close it when the fire is completely out. ★ ★ ★

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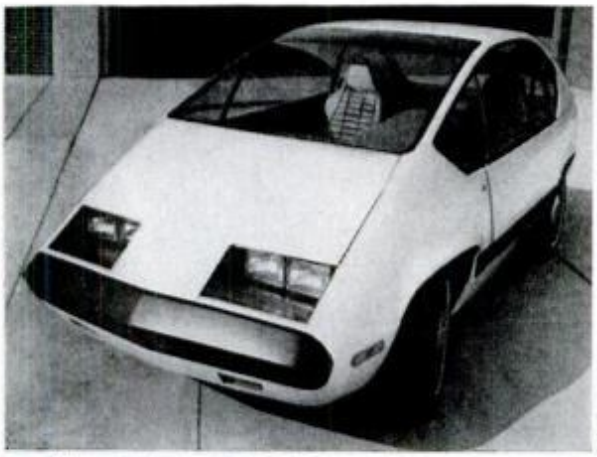
IT'S NEW NOW

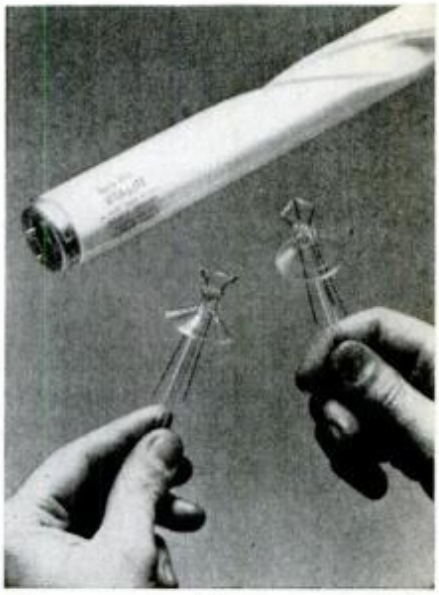


Two new electric cars that go in style

Electric cars are not only being taken seriously; they're now being designed to go in style. As proof, here are two battery-powered beauties—one a sporty, streamlined, two-seater hatchback by the Copper Development Assn. of New York City (top) and one a luxury-loaded, six-passenger sedan with classic big-car lines by Electric Fuel Propulsion Corp. of Troy, Mich. (bottom). The CDA hatchback has a range of 120 miles on a single charge and a top speed of about 55 mph. A key feature: sideways sliding doors (top right) for getting in and out easily in tight parking spots. The EFP sedan, more conventional in style, offers power steering, power brakes, power windows, power seats, power door locks, electric sun roof and stereo radio and tape system. It gets about 37 miles on a charge, hits up to 60 mph. Price: around $15,000.

Handy dimmer

Just turn a knob on this lamp dimmer and you can vary bulb brightness all the way from off to full intensity. Dimmer screws into any standard lamp socket; takes bulbs up to 150 watts. It provides dimmer control where unswitched outlets do not permit use of wall dimmer, also makes possible individual control of a number of different lamps. $5.95 at Radio Shack stores.



Fluorescent with a new twist

If the next fluorescent lamp you buy looks twisted, don't take it back—it's not defective. It's Duro-Lite's new Power-Twist, deliberately formed into a spiral shape to increase surface area for greater light output. Also incorporating new double cathodes, it's said to extend bulb life 30 percent. $7.35 for 40-watt size.

Man from Mars?

The mechanical humanoid above is not a man from Mars but a robot from Hackensack, N.J., home of its maker, Quasar Industries. One of 32 similar robots, it moves and talks, has a 4800-word vocabulary and can be programmed to respond to a variety of instructions. The lifelike "androids" are used for amusement and promotional purposes at fairs, conventions.

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Home-movie sound gets easier– and more professional

By Don Sutherland

Photo: Lou Jawitz

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The revolution happened so quickly that hardly anyone knew it was on until it was complete—Super 8, the movie medium deliberately designed for the rankest amateurs, has become a satisfactory medium for professional sound film production, too.

Skim the camera ads, and you'll see more and more sound film equipment for the home moviemaker who wants impressive results with the least effort, knowledge and expense.

But the big news is that you needn't settle for "home-movie" results. This new equipment lets you go on into journalistic reportage or personal artistic expression. The trick is to find the right equipment.

Sound for home movies isn't all that new—it's long been possible to have a laboratory add magnetic striping (like the magnetic oxide on recording tape) to your film, so you can add a sound track with a sound projector. What's new is that now you can record sound while you shoot and have the sound and picture synchronize perfectly.

Two ways to synchronize sound

There are two routes to synchronized sound: single-system (page 47, Oct. '73) is the newer, the simpler and better-known one, with camera recording sound on magnetically striped film at the same time it records the picture. But double-system, with its sound recorded on a separate tape, is the more flexible medium, offering you a wider range of more professional results.

The all-single-system rigs are the simplest to use: drop in one of the new sound-striped film cartridges, plug a microphone into the camera and shoot. These cameras are mostly limited in features but easy to use, even by the amateur. They have electric eyes that automatically set the lens for proper exposure (often with "XL" capabilities that allow shooting under normal living-room illumination without extra movie lights) and automatic gain controls (called AGC or ALC) that maintain proper recording level, too.

Most have zoom lenses that can make "wide-angle" (actually about the same angle as a still camera's normal lens) or telephoto shots. Several, but not all, have earphone monitor circuits that let you hear just what the microphone is picking up. These cameras are priced in the $300 to $500 range.

A bit more professional

If you want something a bit more professional, the Beaulieu 5008S is available for $3000 with an ultrafast, f/1.2 6-to-80-mm zoom lens that focuses to about 2 feet, in an interchangeable mount so you can use other lenses.

Like Super-8 films, Super-8 single-system sound films are packaged in 50-foot lengths that run 3 minutes, 20 seconds at the standard, amateur speed of 18 frames per second (f.p.s.) or 2 minutes, 30 seconds at the "professional" 24 f.p.s. speed, which few single-system cameras offer as yet. The sound cartridges are bigger than the silent ones, so they won't fit silent cameras (though silent cartridges fit sound cameras) and they cost about $1.75 more than their silent equivalents. For professional applications, Kodak also plans a 200-foot cartridge that will fit through a trap-door in the top of one of its Ektasound cameras; other cameras for this cartridge will soon be available.

Single-system film carries a thin, magnetic-oxide sound stripe with sound quality about as good as your television set's.

Single-system projectors let you watch and hear your film as soon as you thread and run it. You can also rerecord some sound on the projector, though it's tricky if you don't want to erase the sound originally there.

Single-system is hard to edit

Single-system is so convenient, economical and technically successful that one might wonder why alternatives exist. But single-system sound is hard to edit and discourages the addition of voice-over narration, sound effects or background music.

The editing problem is due to "sound advance"—the sound and picture aren't at the same point on the film. That's because the film must move intermittently, frame-by-frame, at the picture gate, but must roll smoothly past the sound head; it takes a space of 18 frames (and some stabilizing gadgetry) for the film to settle down after hopping through the gate. Since the film travels at 18 frames per second in most Super-8 equipment, that means the film and picture are one second apart. Cut the film at one point in the picture, and you're either cutting off one second of its sound or including a second of sound from another sequence.

The problem isn't too bad in simple editing—tightening overly long shots, eliminating bad ones and rearranging sequences. But if you do elaborate editing with tight cutting of inserts and cut-away—techniques that heighten the drama of your film and make editing an art—you'll be in trouble. If, for example, you want a quick, two-second shot of somebody reacting to something, at least half of that sequence will have to remain silent.

Adding music, sound effects and narration to a synchronized single-system film is risky, too. Most projectors let you add sound without erasing the original—but if you goof the additions (if your dog barks, for instance), you can't erase the error without erasing the original sound, too.

Double-system's advantage is that its sound and picture are recorded separately, so they can be edited separately, too. That's also its disadvantage: You have to juggle (and pay for) separate pieces of equipment for sound and picture, while shooting, while editing, and sometimes while showing your film.

Double-system recording

Most double-system Super-8 outfits record the sound on compact, high-quality cassette recorders that also record a synchronizing signal from the camera on a separate track of the tape. The synch signal is needed because neither the camera nor recorder runs at a perfectly accurate or even

Cameras for single-system and double-system sound: Single-system Kodak Supermatic 200 (near right) is shown with 200-foot cartridge that fits through top of camera; normal 50-foot cartridge fits inside. Elmo double-system camera (far right) tapes sound and camera synchronization pulse on matching cassette recorder; microphone boom on top lets you keep hands on camera while shooting. Several other new cameras also have this feature.

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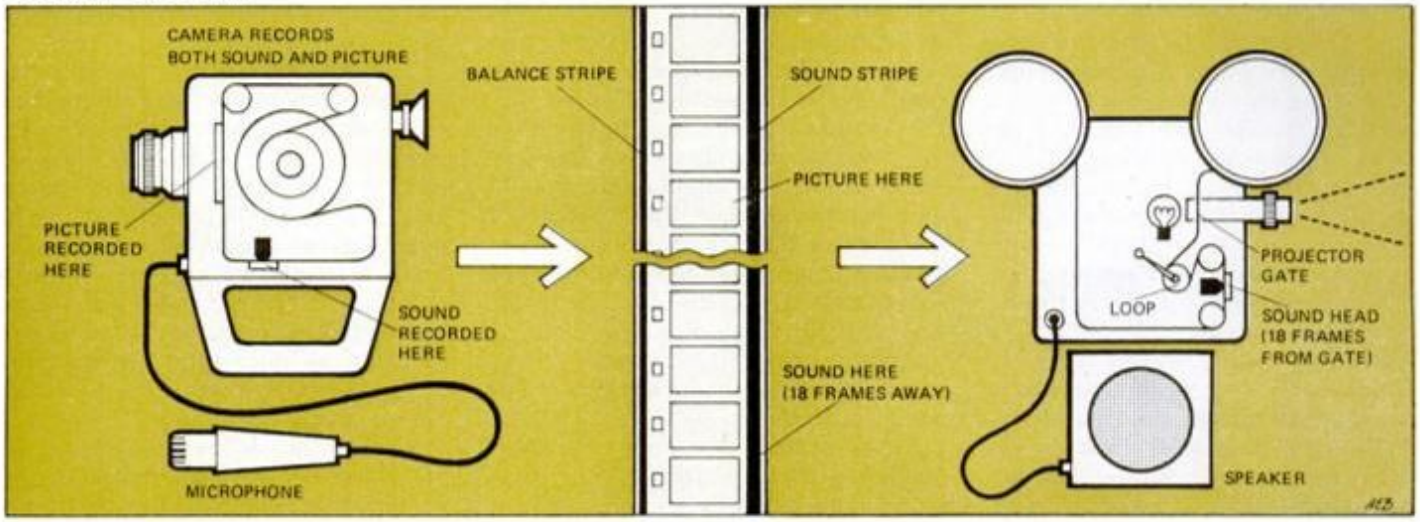
How the systems work

SINGLE SYSTEM

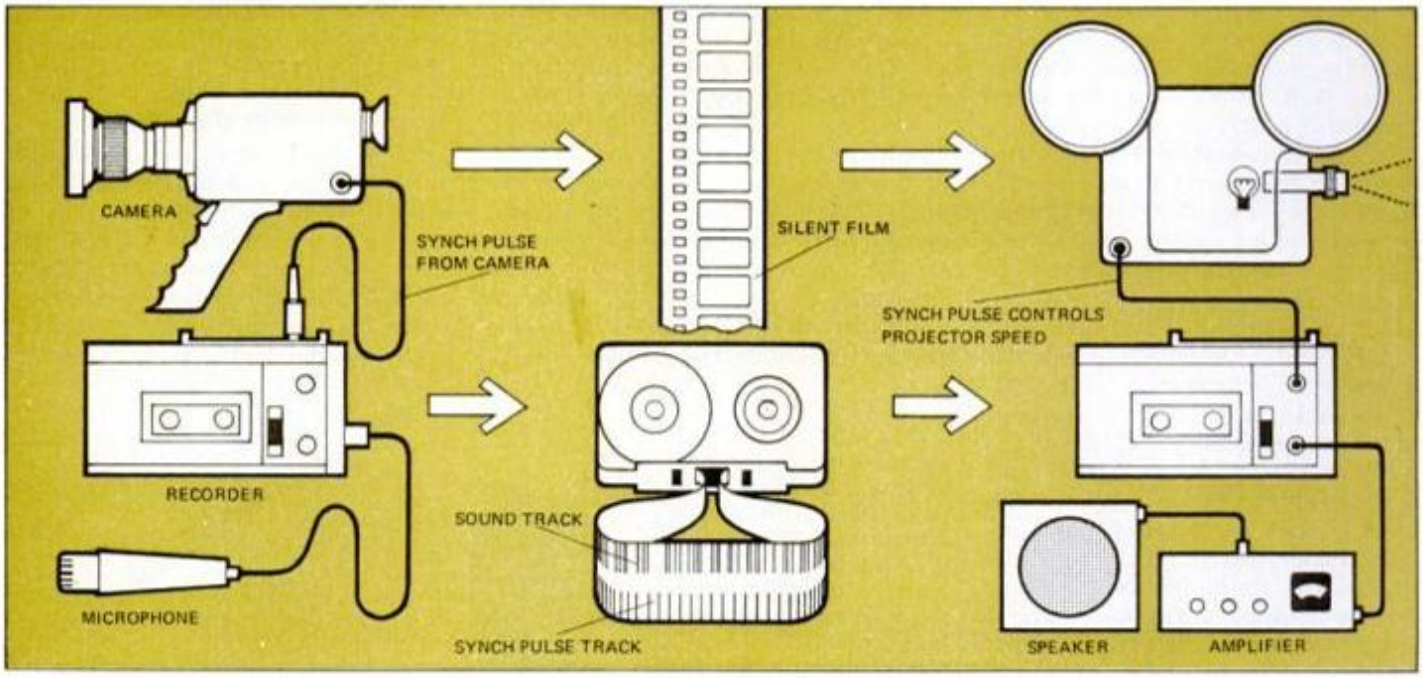


Single-system is simplest: Camera (left above) records image photographically, records sound magnetically. But sound and picture are 18 frames apart on film (above center), because film must move intermittently past shutter, standing still as each frame is taken, then moving swiftly to the next frame—but it must move smoothly, not jerkily, over the sound head, or you'll hear flutter.

Returned film (above center) has picture, sound stripe, plus extra stripe to balance sound stripe's thickness, keep film moving evenly and smoothly through camera and projector. Editing is hard because film must be cut in one place for the picture, in another, 18 frames away, for its matching sound.

In projection (above right), film passes with intermittent motion again through projection gate, then smoothly over playback head which feeds amplifier and speaker; loop and rollers shown smooth film motion between the gate and the sound head.

DOUBLE SYSTEM



Double-system is most versatile: Camera (above left) records only image, feeds electrical pulse for each frame to separate recorder, which tapes synch pulses on one track of a cassette and sound on the other track.

Returned film (above center) has no sound stripe; sound track and synch pulses are on separate tape (shown here pulled out of cassette to show track locations). For editing, sound track is transferred to magnetically coated "fullcoat" film which can be cut frame-for-frame along with film for perfect matching

In projection (above right), recorder feeds sound to amplifier and speaker, simultaneously feeds synch pulses to projector. Projector regulates its speed to match frame rate of camera as recorded on pulse track. Double-system sound track can also be transferred onto film for single-system projection.

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speed; with (usually) one pulse recorded on the tape each time the camera shoots a frame, the tape carries a record of the variations between the film's running speed and the tape's. Directly or indirectly, that signal will control the projector's speed to keep it synchronized with the tape.

Shooting is just about as simple with double-system as with single-system—you just start the camera, and it signals the recorder to start, too. The only extra consideration is juggling the separate camera and recorder and making sure the synch cable doesn't come loose.

Sound quality is usually better than single-system's. And the cameras are usually more advanced than their single-system counterparts. The Elmo 110R camera, for example, has a lens with a 10:1 zooming ratio (far more than the 2:1 and 3:1 of most single-system cameras or even 6:1 or 8:1 of some newer models) and macrofocusing to within an inch of the lens barrel itself.

The more sophisticated of Fujica's double-system cameras, the Z800, has an 8:1 zoom and a variable shutter that gives the cameraman greater control over sharpness in action shots and depth of field. The Fuji, though, takes its film in Single-8 rather than conventional Super-8 cartridges; the two films can be interchanged in projection, but not in the camera, so you're restricted to Fuji's films—which are excellent and a bit faster than their Kodak equivalents, but they are a bit harder to find.

Project as single-system

The Fuji and Elmo systems are basically designed for double-system playback, too, with the tape's synch signal regulating the projector's running speed. But you can project them as single-system films by having your edited film sound-striped by a lab (about 2 to 4 cents per foot); then you need to use accessory equipment to synchronize your taped sound track with the film on a single-system projector.

Fuji and Elmo are the leading makers of double-system camera/recorder systems. But there are recorders for use with other cameras, too. Both Optasound and Super-8 Sound have, or soon will have, similar cassette recorders that work with modern movie cameras having flash synch contacts (usually for time-lapse work). Most other movie cameras can be adapted to work with these recorders, too—so almost any movie camera can be used.

This opens some exciting possibilities. The cream of the Super-8 camera crop includes equipment that is more capable, more sophisticated, more versatile and more fun than any other movie equipment ever made, bar none. In addition to ultrahigh zoom ratios, macrofocusing lenses, slow-motion and fast-motion shooting speeds (usable for shots not synchronized to the sound track) and other creative features, many cameras can make dissolves for attractive, artistic, professional-looking transitions between sequences. Several have built-in intervalometers—timers that fire single frames, even long-time exposures—at predetermined intervals for time-lapse shots.

Real advantage is in editing

But the real advantage of double-system comes in the editing—which is why professional feature films are made that way. Most such editing starts with a transfer of the sound track from the cassette to "fullcoat"—Super-8 film coated with magnetic oxide instead of a photographic emulsion. Now the sound track and picture are an exact physical match: Cut the film at, say, its 117th frame; cut the fullcoat at the same place, and the film and track are still in synch. To insert a cutaway shot (such as a shot of someone reacting to what the main character's saying), just substitute your cutaway for an equal number of frames of the main shot, leave your sound track intact, and synch is unimpaired.

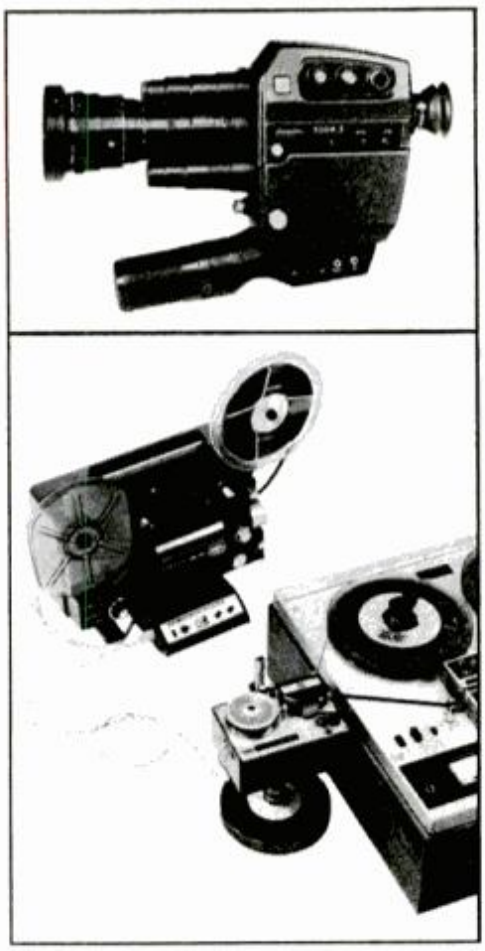
You can also build additional sound tracks for music, narration and special effects, keep them synchronized on fullcoat, then mix all the tracks together when you're done.

Simplest editing equipment

The simplest such editing equipment consists of an editing viewer for the film, with a synchronizer—a shaft with sprocket wheels for your film and track or tracks and a sound reader head and amplifier. As you advance or rewind the film, the sound is advanced or rewound accordingly. Such a setup can cost as little as $500, from Specialties Design and Manufacture, or can be rented in most cities.

Film studio consoles

More sophisticated are editing consoles like those used in film studios. The film and fullcoat rolls lie horizontally on circular plates with vertical hubs: Four-plate versions handle one picture and one fullcoat sound track at a time; six-plate and eight-plate versions enable additional sound tracks (or sometimes additional picture films) to be worked on simultaneously. Consoles by MKM Industries and Super-8 Research Associates are in the $2500 to $5000 range. Even more versatile is Optasound's ESTEC (Electronic Sound Transfer and Editing Console), a six-plate editing unit that can also make synch transfers from cassette or single-system to fullcoat, simultaneous mixing of several tracks and high-quality transfer from double-system to single-system, all for a complete system cost of about $3000.



Most professional, most expensive single-system camera is Beaulieu 5008S (top), up to $3000 according to lens. Fujica Puls-Sync Box (above) allows stereo sound movies using two tracks of 4-track stereo recorder for sound, one for synch.

Double-system editing rigs like these are what ultimately make Super-8 capable of matching 16-mm and 35-mm in most of their technical potential, while far surpassing them in operating convenience and economy (film, the greatest single expense, in the long run, costs only about 25 percent as much in Super-8 as in 16-mm). That's why there's been an explosion of Super-8 use in television, in educational, scientific and industrial films, and in many other professional or quasiprofessional applications.

It also gives the individual, for the first time, a way to afford making personal films—to support a cause, state his views, or pursue art for its own sake—with a technical flair and polish equal to anything ever done in cinema. ★★★

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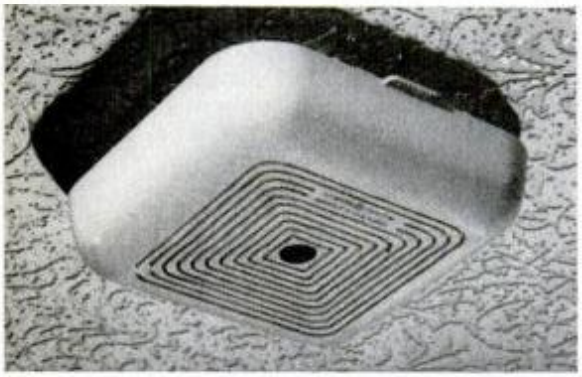
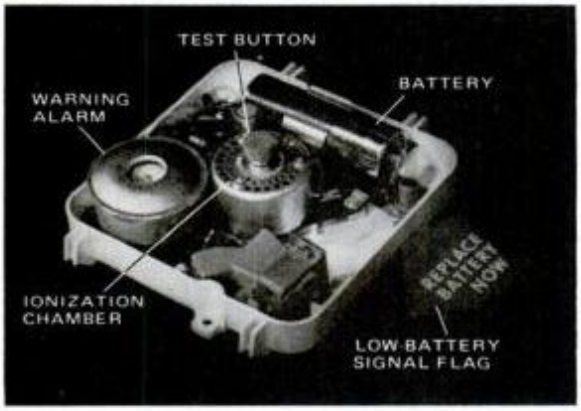
IT'S NEW NOW

Bigger twin-trigger chain saw

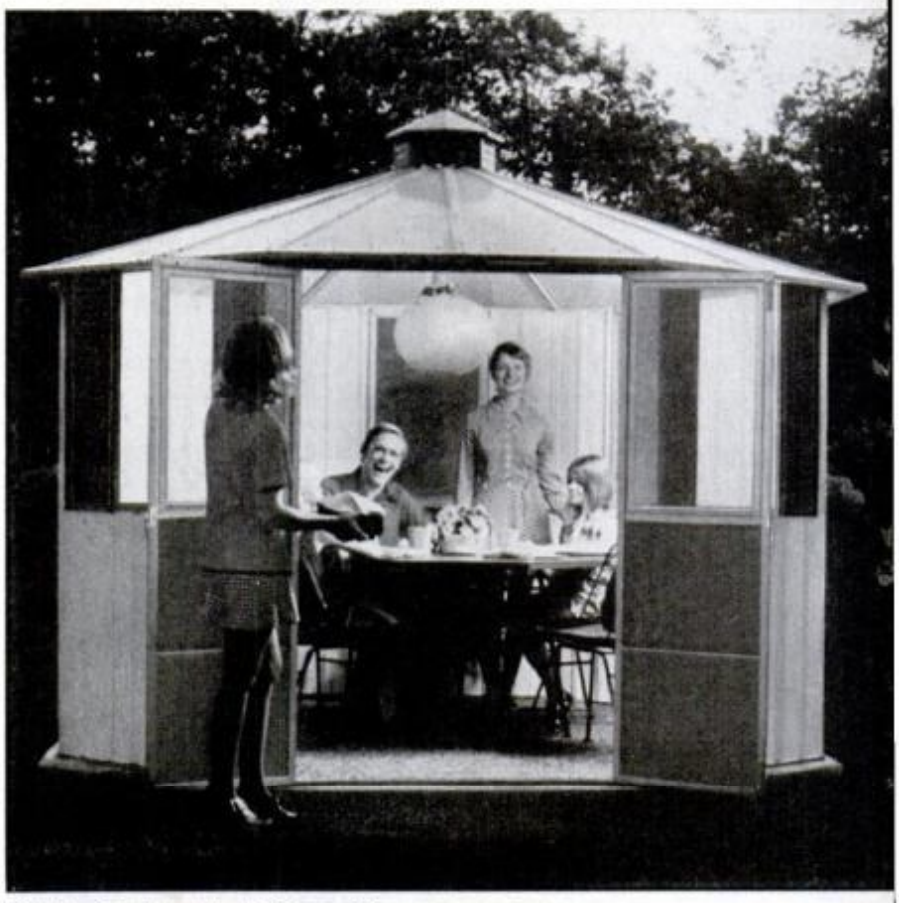
Like the XL-2 (*New Chain Saw: Two Triggers Are Better Than One,* page 162, Nov. '74), Homelite's new Super 2 has twin triggers for easy handling—but also has 20 percent more power and a 14-in. bar. Features include automatic chain oiling, cushioned handlebar, all-weather ignition and all-position carburetor. $149.95 retail. Homelite, 70 Riverdale Ave., Port Chester, N.Y. 10573.





Early-warning fire alarm

This GE Home Sentry smoke alarm detects fire in its earliest stage, when there is no noticeable smoke or flame, giving a loud warning in time for escape. A dual ionization chamber prevents false alarms from atmospheric changes. Test button checks entire unit, not just horn; d.c. model shown, $54.95, has both flag indicator (can't be reset until battery is replaced) and beep to warn of low battery; a.c. model, $39.95, can be wired by homeowner. General Electric, 600 3rd Ave., New York, N.Y. 10016.

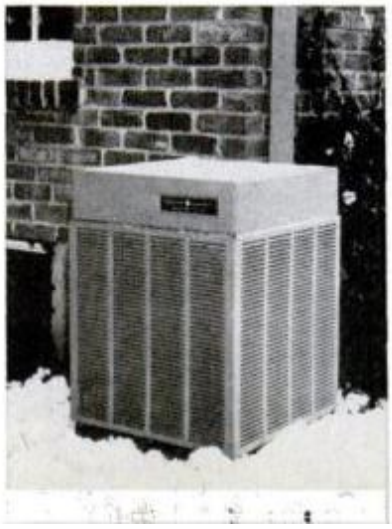


Eight-sided outbuilding with many uses

For outdoor storage or for fun, this Wheeling Gazebo comes in a variety of styles. The octagonal steel structure can be erected by two people in about eight hours, according to the manfacturer. Interior space is 77 square feet, equivalent to nearly half a garage. Standard unit has two windows and combination doors. Gazebo shown, with four windows and screen doors, is priced at about $399. Maker suggests use as an outdoor dining room, cabana, playhouse or workshop. Made by Wheeling Corrugating Co., Four Gateway Center, Pittsburgh, Pa. 15222.

Heat pumps warming up

Already common in the South, the heat pump is becoming more popular farther north because it's the most economical electric-heating method and reversible, too—it's an airconditioner in summer. GE Weathertron unit shown is part of a full line for residential use.

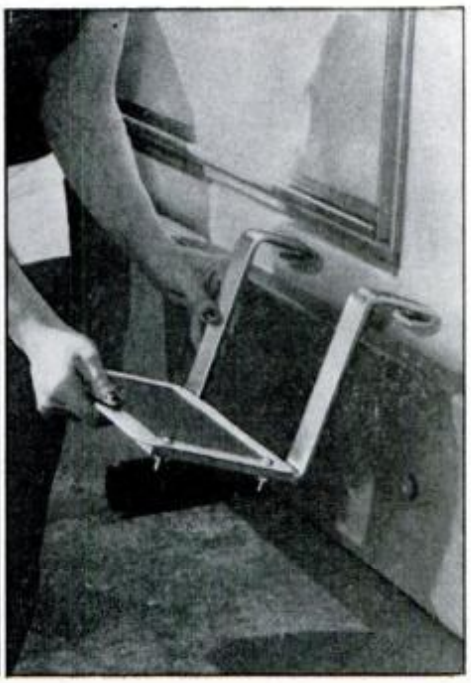


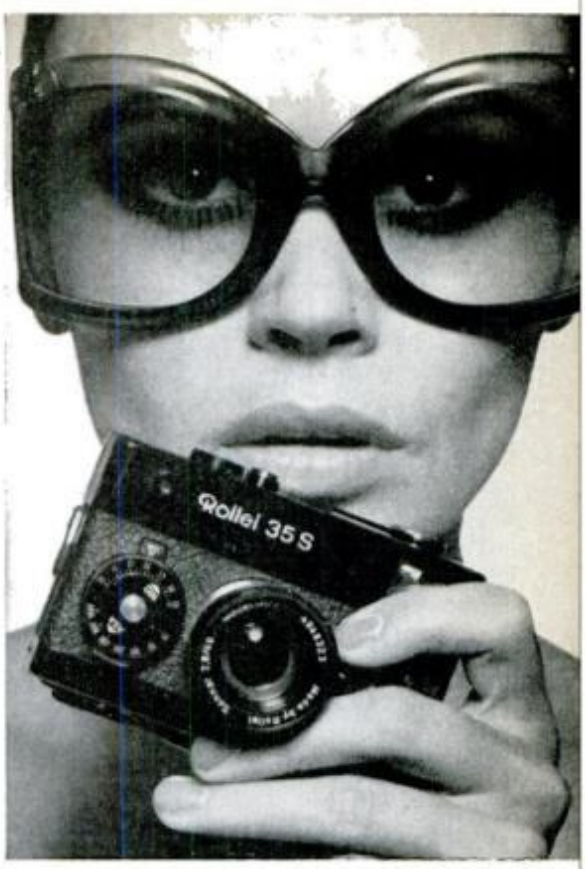
Rain gauge for the hobbyist

Amateur meteorologists can have a precision rain gauge at moderate cost. An upper catch funnel feeds into a small sight tube that magnifies readings for measurements to 5/100ths of an inch. Government approved; $5.95. Taylor Instrument, Arden, N.C. 28704.

Slip-on bumper step gives motor-home owners a lift

Hook this portable step on the bumper of a motor home and you can reach those hard-to-get-at areas inaccessible from the ground. The step fits either front or rear bumper and is handy for cleaning windows, servicing the engine, installing rooftop accessories or performing other high-up maintenance chores. It can also be used on truck bumpers for easier reaching of engine parts or cargo areas. $9.95, Valley Tow-Rite, Inc., 27 East Vine St., Lodi, Calif. 95240.





Rollei's mini-35 updated

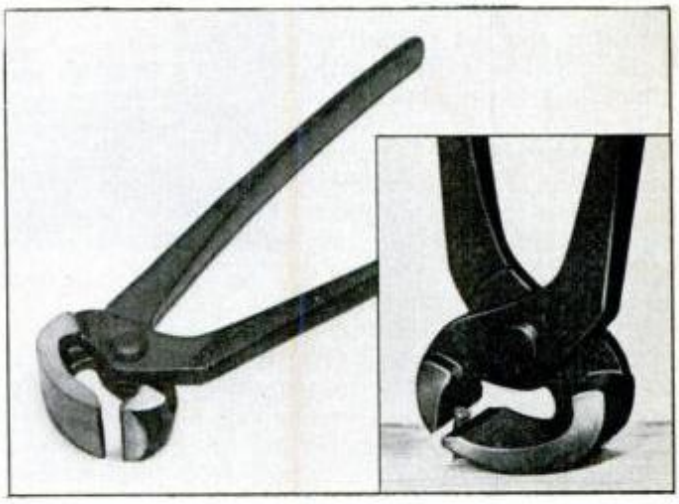
The Rollei 35, which helped to kick off the ultraminiature 35-mm race, now sports a faster f/2.8 Sonnar lens that tucks inside the camera for compact carrying. Instead of a rangefinder, it has two-zone focusing with click stops at 6½ and 20 ft. With built-in light meter, $240 in chrome, $255 in black.

Two-in-one digital watch

This new Heuer Chronosplit is both a conventional wristwatch and precision stopwatch in one. It has two separate digital readouts—one for time of day in hours, minutes, seconds and date, and one for fast-action timing in 10ths of a second. Time-of-day readout uses a low-power-drain LCD (liquid crystal display) and is permanently on. Timer readout uses brighter but high-drain LEDs (light-emitting diodes) and is on only on demand to conserve power. About $500 at watch stores.

Versatile nail puller is cutter, too

This "nail outener" not only yanks nails, but cuts nails and wire up to 3/32 inch in diameter. Multipurpose tool has flat area on head for pounding brads, tacks, small nails. Made of forged tool steel, the nail puller has a black-oxide finish, hardened, tempered jaws for clean cutting. Overall length is 8½ inches. Jaws are 1-inch wide and open ⅝ inch. $10.75 postpaid, Brookstone Co., 120 Vose Farm Rd., Peterborough, N.H. 03485.



Buddy biking two at a time

You can pair two bikes together and ride side by side with this simple connecting frame. The rig joins any two 24 or 26-inch bicycles, provides comfort and safety of four-wheel stability, is handy for older or inexperienced cyclists who enjoy riding together. It swivels to prevent strain and damage on rough terrain, can be quickly disconnected for separate use of bikes. Buddy-Bike-Frame is $39.95 postpaid from Meade Mfg., Box 710, Meade, Kan. 67864.

'76 Cars

GM's story in a word: Chevette

by Robert Lund DETROIT AUTO EDITOR

No two ways about it. The honors for cock-of-the-walk car for 1976 go to Chevrolet. The car is the Chevette. There's not another car like it produced in the United States, although there are several imports—including two foreign jobs made by GM—that are close kin.

It would be easy to nitpick the car because it doesn't differ enough from imports that have been around a long time. But give GM credit. It's the first U.S. company to come up with a home-grown mini. And a pretty slick car at that.

Many details won't be news to you because bits of information about Chevette have been leaking out for two years. But here are the basics if you missed them: 158.7 inches overall (just a nick over 13 feet), 94.3-inch wheelbase, 52.3 inches high, 61.8 inches wide and a slim 1998 pounds in weight. The standard engine is a 1.4-liter (85-cu.-in.) Four with a four-speed manual shift. You can pay extra and get a 1.6-liter version of the engine with automatic transmission.

Photos: Irv Dolin

Chevy claims several firsts for the car: It's 17 inches shorter than any earlier Chevrolet; it has the best antirust protection of any U.S. car (including big-ticket Cadillacs and Lincolns); you can almost turn it on a dime—the turning circle diameter is 30.2 feet; it's the first American-made car with all-metric measurements; and it marks the first time GM has used on-vehicle plug-ins for tracing service problems. The plug-ins will give a mechanic readings on the battery and how front brake linings are wearing. But so you're not at the mercy of the mechanic, a do-it-yourself book is included with the car.

There's only one body style, a two-door hatchback, but you can doll it up or strip it down to suit your predilections and price. Sometime this fall, Chevrolet will put a bargain-basement version of the car in production. It will be called the Scooter. The Scooter will be GM's answer to people who say they buy foreign cars because they can't afford U.S. cars. The company had not disclosed prices of any '76 cars when this issue of PM went to press.

Chevrolet was still working on the gas-mileage figures for the car when it held its press preview for magazines. These are the figures that have to be cleared by the Environmental Protection Agency. The preliminary figures for Chevette indicate the car will give 28 miles to the gallon in city driving, 37 mpg on the highway. But those numbers are expected to go up to 29 to 30 miles in the city and 39 to 40 miles on the highway when final testing is completed. Chevy's goal on mileage is to equal or top the Datsun B-210.

The optional automatic transmission is an entirely new unit. A three-speed, it's called the Turbo Hydra-Matic 200. It's smaller, simpler and lighter—35 pounds lighter—than any automatic GM has offered before.

Lenses for the turn signals on the back of the car are amber, instead of the usual red. This is probably a tip-off that GM will eventually go to amber lenses for turn indicators on all cars.

One idea Chevette borrowed from GM's more expensive cars is a lever on the steering column combining the controls for turn signals, headlight flasher, windshield wipers and washers in a single unit.

Some personal observations:

Chevette may be a cheap car—or what passes for cheap in an era of high prices—but it's not chintzy. For the price, it's a well-made, carefully engineered automobile.

The lowest-price version of the car has only a single bench seat (two people) up front. No rear seat. There's a metal floor panel where the rear seat would go. You can have a back seat if you want it, but it costs extra. Save your money. The rear seat isn't worth a hoot unless you have small children or want it to carry grocery bags. Legroom in the back is zilch.

In bringing out all-new cars like Chevette, auto companies live in fear they may have overlooked something, a monumental goof forcing a recall to correct the mistake. Assuming Chevette doesn't fall in that pit, it should give the economy imports a real dogfight for the dollar.

The car also spells trouble for another Chevrolet product, Vega. If the imports take it on the chin from Chevette, Vega is also in line for a drubbing.

Chevrolet has made only minor changes in its other cars. Five cars have been discontinued: the Impala sport coupe, the Caprice and Corvette convertibles and the sedan and wagons in the Bel Air line. One new car has been added: a notchback coupe in the Monza line.

Here are the highlights on the other Chevmobiles:

Camaro: The 350 V8 engine standard on this car in the past has been replaced with a small block 305-c.i.d. Eight. You can still get a 350 V8 as an option, but it's

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a four-barrel instead of the former two-barrel.

Chevelle/Monte Carlo: The same small-block engine used in Camaro has been made standard on these cars.

Chevrolet: Except for rectangular headlights on the Caprice Classic and Estate wagons, there's not much new on the full-size cars.

Corvette: There's been a rumor for years that the Corvette body is going to be changed from fiberglass to steel. Well, they finally got a start on it. The front section of the underbody has been changed to steel. Reason: to improve the body structure—make it more rigid, reduce road noise and provide a better heat shield from exhaust temperatures.

Monza: There's a new performance and handling package called the Monza Spyder.

Vega: A new option is a four-speed manual shift housed in an aluminum case. The lighter housing should help gas mileage.

Taking all of its '76 cars as a group, Chevy says they give better gas mileage than last year by an

Chevette's fingertip switches show the European influence: directional signals, headlight flashers and windshield wipers and washer are all on the same stalk.

average of nine precent. That doesn't tell you much. To come up with a plus nine, you can bet there are some losers in with the winners.

Here's a rundown on what's new on the other GM cars:

Buick: Most changed cars at Buick are the mid-size Centurys—Coupe, Custom and Regal. They have new grilles, new treatment of taillights and new sheet metal on the lower half of the sides. The other cars have new grilles and ornamentation changes. Buick has gone to rectangular headlights for all cars except Skylark.

With the exception of two Skylarks, Buick says its '76 cars will give better gas mileage than the counterpart '75s. The increases range from a gain of two percent on the Estate Wagon to an improvement of 20 percent on Riviera. The gains were achieved by increasing the spark ad-

'76 SERVICE TIPS FOR THE DO-IT-YOURSELFER

The Chevette, General Motors' newest car, has, as you might expect, the lion's share of '76 GM service innovations.

Foremost, this is America's first all-metric car (except for bumper mountings) and so requires metric tools to service. Most routine work, happily, is relatively uncomplicated and the four-cylinder overhead-camshaft engine is in a compartment of adequate size for accessibility.

The Chevette comes with a unique twin diagnostic socket arrangement (mounted on the firewall) that looks something like the VW setup but actually is simpler and requires no computer hookup. You can use it with a tachometer and voltmeter.

One socket for ignition and general electrical-system checkouts, has terminals for engine rpm (connect your tach to this one) and voltage checks of charging circuit, electronic ignition and starting system. On cars with airconditioning, a second socket has terminals for blower motor, switch and high-speed relay, and airconditioning-selector, engine-temperature and discharge-pressure switches.

The ignition system is the GM High Energy Ignition, but it differs from other GM cars in two respects:

- The coil, separately mounted, is not bolted to the distributor cap as on other GM cars, because the airconditioning compressor is mounted just above the cap.
- The timing-mark setup includes the regular pulley mark and degree dial, plus a hole in the dial and slot in the pulley. This should be ignored by the Saturday Mechanic; it's designed for a special oscilloscope with magnetic timing probe.

The Chevette has a multipurpose switch built into the directional signal lever. The switch also controls wipers and windshield washer, and flashes headlamps. As on European cars that have had this design for years, the switch is not cheap, so if it fails, you can save real money by getting a replacement from a discounting car dealer and installing it yourself. Remove steering wheel for access to the switch.

GM brakes

New federal brake standards are in effect Jan. 1. Like other carmarkers, GM has revised its brake systems to meet them.

GM cars will use a new organic (asbestos-base) disc-brake shoe, and one combining organic material and metallic particles, on the front wheels. Some cars will have only the new organic linings, others only semimetallics and still others one organic and one semimetallic at each front wheel.

The semimetallic lining has been designed to approximate the organic in wear characteristics, but it depends on your braking. The effect of the regulations, regardless of your lining, is an estimated 10 percent reduction in lining life, compared with '75 shoes, so be ready to reline a bit more often. Still, the new linings shorten stopping distances and reduce fade.

GM expects the new organic lining to wear faster than the semimetallic, so on cars with one of each, the metal wear tab (causing a loud squeal when the lining is worn) is on the organic shoe. Rear drum brakes are larger on most models to meet the standards, but the only cars with significant changes are Cadillac Eldorado, Vega, and Vega-based Olds Starfire, Pontiac Astre and Buick Skyhawk.

The Cadillac Eldorado will be offered with a new Delco rear-wheel disc brake (to go along with the front discs). The rear disc caliper, incorporating a parking brake, vaguely resembles the Kelsey-Hayes rear disc used on some Ford products since '75, in that a giant screw in the piston bore pushes the piston out to compensate for brake lining wear and also contributes to actuation of the parking brake. As with the Ford setup, the piston screw must be threaded back when installing new shoes.

The Vega-and-variations rear brake no longer adjusts when you pull the parking-brake lever. Instead, there is a standard star wheel with self-adjusting lever, as on other American cars with rear drums.

Chevrolet plug gap

Because of plug-fouling associated with very-short-trip driving, Chevrolet has reduced the sparkplug gap on '76 cars: from .060 to .045 inch on the Vega Four, plus all Chevy V8s except the 454, and to .035 inch on Sixes. Chevette's plugs also get the .035 gap. The problem occurred primarily in dealerships, which because of sluggish sales, shuffled the same cars around the lot day after day. The Saturday Mechanic who drives very short distances or has alternate-side-street parking also could have this problem.

Airconditioning

Most Saturday Mechanics are familiar with the antidieseling solenoid on many late models. You'll still find it on many manual transmission GM cars in '76; also on '76 automatics with air for another reason: to raise idle speed when the airconditioning is turned on.

On GM V8s, the solenoid is wired in the magnetic clutch; on Fours and Sixes (which have a cycling clutch), into the dash airconditioning switch. Either way, with engine idling, turn on the airconditioning and crack open the throttle, then release. The solenoid rod should extend and raise idle speed.

Another '76 airconditioning innovation is a moisture indicator on '76 Oldsmobiles. If moisture is present the cylinder changes color, from a deep blue to violet, then to pink. When color changes, evacuate the system, replace the desiccant bag in the receiver-dryer, remove expansion valve assembly, install a new indicating cylinder.

Switching valve

Recalibration of engines for better fuel economy left Oldsmobile with a dilemma on the 260 V8: To have adequate advance for part throttle meant too much advance at idle, causing some detonation and loss of acceleration from a stop. Cure: a switching valve that bleeds off vacuum only at idle. The valve is a sealed assembly spliced into vacuum lines, but you check it with a vacuum gauge. First, tee the gauge into the supply port from the intake manifold, and with the engine idling you should get a reading of about 14 inches. Tee gauge into output port (with hose to distributor) and reading should be about 7 inches. Crack open throttle and vacuum should rise to 14. If the valve doesn't perform this way, replace it.

Sealed battery

Many GM cars will have a new sealed battery, called the "Freedom." You can't add water, but if specific gravity is low (calling for a recharge), an indicator on top gives a visual signal. ★★★

Материал, защищенный авторским правом

GM's '76 Cars

vance on two big engines, the 350 and 455 c.i.d.s, using a different camshaft for the 350, lowering axle ratios and by making changes in the carburetor.

The company is building more cars with six-cylinder engines as standard equipment. At the start of production a year ago, a V6 was standard on 10 models; the same engine will be standard on 15 cars for '76.

A new option on Skyhawk is a five-speed overdrive manual transmission. Rear brake-drum size on Skyhawk has been increased slightly, from 9 x 1.2 inches to 9.5 x 2 to improve braking capacity. The solid-front rotor used last year has been replaced by a vented rotor with a larger brake-apply piston. The design change, according to Buick engineers, increases braking capacity and improves dissipation of heat.

A special ride and handling package is available for the Riviera, Regal, Century and Skylark coupes. Contents of the package differ from car to car.

Buick has cut back on the number of models—28 cars this year versus 34 last year.

Cadillac: Caddy hasn't made any major changes for '76. There are some new grilles and ornamentation changes, but that's about it. The mileage figures on Seville, the "small" car introduced last spring, have been improved to 15 miles to the gallon in city driving, 21 to the gallon on the highway.

Oldsmobile: Two new cars this year, three oldies discontinued, for a total of 34 models. The new numbers are Omega Brougham and Cutlass Supreme Brougham. The retirees are Omega Salon, the base Cutlass and the Delta 88 Royale convertible.

Omega Brougham, which replaces the Salon, is the new top-of-the-top in the Omega series. All Omegas have a smaller, lighter (26 pounds) rear axle than last year, 7.5 inches in '76 versus 8.5 inches in '75, for better gas mileage. Olds says most of its cars will give better mileage than in '75, but specific figures were not available at press time.

The Cutlass series has some new sheet metal—front-end panels, hoods and fenders. The full-size cars—Delta 88, Royale and Custom Cruiser—have the new rectangular headlights.

New options include GM's manual five-speed overdrive transmission for Starfire, Omega and Cutlass and a load-leveling system for the intermediate and full-size cars. The load-leveler is activated by a control knob on the instrument panel. It can be set for a normal load, medium or heavy. Mechanics of the system include a vacuum pump with tubing linked to special shocks with integral air cylinders.

A neat gadget Olds has added to cars equipped with airconditioning is a "moisture minder." PM had a piece on this in *Detroit Listening Post* last June. The refrigeration system has a ceramic cylinder with a peek-a-boo glass in it. A small disc is visible through the glass. If the system is dry, meaning it's okay, the disc shows blue. If there's moisture in the system, the disc shows pink. So what? So the mechanic doesn't have to sock you with a bill for labor to tear down the system to find out if there's moisture in it.

Pontiac: Like other divisions of GM, Pontiac is cleaning house this year, cutting out overlapping models. There are 34 cars for '76, down from 52 at the start of the '75 run.

Chevelle Malibu Classic has revamped the front with vertically stacked headlights.

Pontiac has a new car for the new year. New to Pontiac. A two-door coupe, it's Pontiac's remake of Chevrolet's Monza Towne Coupe. Pontiac calls the car Sunbird. A more dressed-up car than its Chevrolet cousin, it has a different grille, different treatment in the back and square headlights. Later in the year, Sunbird will get a sunroof, an option Chevy doesn't offer on the Towne Coupe.

Pontiac says most of its '76 cars will give an extra one to three miles to the gallon matched against comparable '75 cars.

The manual five-speed gearbox offered on other GM makes can be special-ordered on Sunbird, Astre, Ventura and the LeMans Sport Coupe.

First U.S. automaker to tune its cars for radial tires, Pontiac has made a change in its RTS (for Radial Tune Suspension) package for '76. The rear stabilizer bar has been dropped. But the company says it has made modifications in suspension to provide the same handling characteristics obtained with the stabilizer bar. You can still get a rear bar, but it costs extra.

Next year will be Pontiac's 50th anniversary, so naturally there's a golden anniversary car—a spiffed-up Grand Prix with a special paint job and trim.

Pontiac has one of the best crews of engine engineers in GM and they have done some interesting but non-obvious things to improve mileage. For instance:

Idle speeds on most V8 have been lowered to 550 rpm to reduce idle fuel consumption. A throttle actuator has been added to the carburetor to increase the throttle setting when the airconditioner is turned on and a cycling clutch has been added to some models to reduce the power requirement for airconditioning. Instead of trying to make one compressor do for all airconditioners, a smaller compressor is used on smaller cars. Pontiac has also done the obvious things—made more small engines available for cars that used to come equipped with big gas guzzlers and extended availability of manual shifts for cars that formerly took automatic transmissions.

All of which ties in with GM's claim that a lot of little things can still be done to the piston engine to coax more go out of a gallon of gas.

A new option common on several GM makes is a removable roof called the Hurst Hatch. (Hurst for the company that makes the item.) The roof consists of two sections of smoked glass over the front seat, one panel on the driver's side, another on the passenger side. The panels can be removed to give the car the appearance of a semiconvertible. The option is available on Buick Century Custom and Regal coupes, Oldsmobile's Cutlass Supreme, Salon and Brougham coupes and the anniversary edition of Pontiac's Grand Prix.

Another item common to many of GM's '76 cars is a new battery called the "Freedom Battery." The electrolyte is permanently sealed in the battery, obviating the need for periodic service checks of the fluid level. A charge indicator is built in the battery so a mechanic can check it by looking at it.

The five-speed manual shift with overdrive offered as an option by all GM divisions except Cadillac won't be available on some cars until later in the model year. Dealers will have the item in the catalog, but they won't be able to supply it. GM is just beginning to roll on the new gearbox and it will take a few months to get enough jobs to supply everybody. So if you want the five-speed stick, you might have to wait a while to get your car. ★★★

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Chevrolet Chevette (photos 1-2) is small outside and big inside. The 2000-pound, two-door hatchback is 158.7 inches long, turns in 30 feet and sips gasoline like a kid who squeezes his straw to make the soda last longer. America's first minicar comes with either 1.4 or 1.6-liter overhead-cam Four and either four-speed manual or automatic transmission. It's GM's answer to Honda Civic and VW Rabbit.

Pontiac Sunbird two-door coupe (photo 3) is a "new" car: The subcompact is Pontiac's version of Chevy's Monza Towne Coupe.

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Oldsmobile Cutlass Supreme Brougham (photo 4) is top-of-the-line addition to Olds intermediates.

Buick models have a choice of roofs that let passersby know where your head's at: Skylark S/R (photo 5) offers a Landau roof option. Skyhawk V6 (photo 6) has a see-through roof that's translucent from the windshield back to the "headband." And Century Custom (photo 7) has two removable tinted-glass panels.

Photos by the author

Mercury Monarch starts its 10-mile economy run simulating EPA Highway Cycle at the Ford proving grounds.

'76 Cars

Ford's fix for more mpg

by Bill Hartford AUTO EDITOR

There's not a car on these pages that you won't recognize. But they are different from last year: The 1976 Ford and Lincoln-Mercury models are good for more miles per gallon.

I found out about the '76 models during an extraordinary preview day at Ford's proving grounds—a day when I heard, with my own two ears, a Detroit automaker actually say that the only difference between this year's models and last year's is that this year's gets more mpg. Hallelujah! That a refreshingly honest product description from the old sheet-metal benders.

The '76 models have had some doctoring up, of course. The plastic surgeons had lots of black and silver paint, horse-headed stickers and stuff to work with. Some of their efforts look good, some just plain tacky.

It was the engineering internists who saved the patients. They were given the go-ahead to make the necessary transplants under the hood and in the driveline to get more miles per gallon from the cars. They had to work with existing hardware and within the unchanged emissions standards for '76. There was no breakthrough involved, just the plodding application of well-known principles of internal combustion.

Ford's decision to install catalytic converters across the board (and in some cases, two converters per car) is what made the gains in mpg possible. If you recall, Ford limited its use of the "cataclysmic perverters," as one cartoonist refers to them, in its '75 model cars because of doubts about durability, performance and customer acceptance. They've found that the converters are working out well and now feel confident in putting them on all models.

Here's what's involved: Tuning an engine for fuel economy results in increased emissions, hydrocarbons specifically. But since enough of the emissions can be "cleaned" in the converters to meet federal standards, the economy tuning is possible.

So, here's what's been done to the engines: Spark has been advanced, increasing combustion efficiency; compression ratios have been increased, improving thermal efficiency.

In addition, the exhaust gas recirculation (EGR) system on the V8s has been improved. And, finally, more reduced rear-axle ratios are being used. Most knowledgeable car owners know that reducing axle ratio, from 3.40 to 3.18, for example, results in better fuel economy because for a given car speed the engine rpm is decreased. They also know that there's a trade-off: a loss in performance, or, in other words, race fans, your 0-to-60s, or elapsed times in the quarter mile, start to look bad. But Ford's beat that rap, too—with the engine retuning that's been done. Ergo, no drop in performance.

All the changes above started to come "on line" as "running changes" for some of the late '75 models—the "MPG" Pinto, Mustang II and Bobcat models specifically. But here's one that is new: Computer Controlled Timing. CCT goes only on Mark IVs this year, so it won't affect too many buyers. And even Mark IV owners will see only up to a half a mile per gallon more with CCT. The system senses transmission gear in use, coolant temperature, manifold vacuum and engine speed. An electronic logic circuit digests the information from the sensors and then advances or retards the spark to suit engine requirements.

As you can see, there's no magic involved in what's been done to increase fuel economy. All the things are just a "fix" for more mpg, but there's no arguing with the approach that, so long as we're dependent on reciprocating pistons, if whatever you do works, do it! The boost for Ford and Lincoln-Mercury mileage is three mpg in the sales-weighted corporate average as measured by the Environmental Protection Agency (EPA). In real numbers, here's the range for the cars that were on the simulated EPA Highway Cycle at the Ford proving grounds on preview day. The cars were run over the course both ways by over a dozen drivers and all the cars had the base engine and manual transmission: Pinto/Bobcat: 30 to 35 mpg; Maverick/Comet: 28 to 32 mpg; Granada/Monarch; 27 to 30 mpg; Mustang II: 30 to 33 mpg; Capri II: 30 to 33 mpg.

Improved fuel economy is the most significant part of the Ford's new model story, but it's not the whole story. Here are more highlights on the line. (We'll skip

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Capri II "S" (photos 1-3) is Lincoln-Mercury's sporty, 1976½ version of the Capri—restyled as a hatchback and introduced earlier this year as a '76 model. The Capri IIs come either standard, Decor Group, Ghia or "S," with the "S" available in black and gold or white and gold. It's sporty but sensible.

Mercury Bobcat (photos 4-5) is one FoMoCo car to get late '75 running changes of catalytic converter and lower-ratio rear axle for more fuel economy.

Ford Granada (photo 6) is shown in new Luxury Decor Option, which includes two-tone paint, four-wheel disc brakes and new interior appointments.

"Stallion" package (paint, tape and decals) is an appearance option on Pinto (photo 7), Mustang (photo 8) and Maverick. It includes blackout areas instead of bright work.

Ford's '76 Cars

such things as Pinto's new option of "half vinyl roof with dual monochromatic over-the-roof tape stripe." That's the kind of thing any dealer will be all too happy to tell you about.)

Granada and Monarch have big changes under the skin—some standard and some optional. Improved ride and reduced sound levels are standard—the result of re-engineering the suspension with particular attention to sound-deadening techniques. Steering effort is reduced and the airconditioning compressor is improved. Among options introduced at

Ford Pinto Stallion: Standard setup is 2.3-liter Four, four-speed, 3.18 rear axle.

1975½ were four-wheel disc brakes and Sure Track. Added for '76 are speed control, tilt steering wheel, power door locks, lots of warning lights and various other forms of pampering.

Maverick and Comet get a nice standard-equipment addition: front disc brakes. Airconditioning system improvement boosts airflow, fuse panel is easier to reach and fuel tank capacity is up to 19.2 gallons from 16 ('75½ change).

Ford and Mercury, the standard or full-size cars that is, now have four-wheel power disc brakes as an option.

Thunderbird, Continental and Continental Mark IV, traditionally loaded with every convenience from power lumbar-support seats to jet-aircraft-type, quick-defrost windshield/backlite, have a new option: quadrasonic sound. Four individually adjustable speakers. Count 'em, four!

The Gran Torino nameplate is missing from the lineup this year, but that still leaves nine Torino models.

There are other things that distinguish the '76s from the '75s in the rest of the line. Any dealer will be all too happy to tell you about them, too! ★★★

'76 SERVICE TIPS FOR THE DO-IT-YOURSELFER

Ford has cleaned up some of the underhood confusion of hoses and wires in its '76 by substituting catalytic converters for much of the underhood plumbing. This should improve serviceability on most 1976 Ford products. A few changes also will make things a bit more difficult and expensive for Saturday Mechanics.

First, the good news—if you think of catalysts in that vein: The extension of converters to virtually all 1976 Ford products has made it a lot less likely you'll accidentally disconnect an underhood hose, because there are fewer of them on the most popular engines (2.3-liter Four, 250 Six and both 351 V8s). Ford also saves 3000 miles of hoses from '76 production, but don't expect a price cut because platinum-coated catalysts cost more than rubber hose.

Air pumps

The air-pump injection manifold on the 2.3 Four and 250 Six, which always got in the way during underhood service because there was a tube to each exhaust manifold branch, now has a single connection, on the end of the manifold near the exhaust pipe joint. Reason: The air pump is no longer supplying air to burn off hydrocarbons near the exhaust port. Instead it feeds air through the exhaust pipe to the converter to assist in a chemical reaction that eliminates them.

Exhaust gas recirculation

The complicated vacuum amplifier system used to control the exhaust-gas recirculation system on Fours and Sixes also is gone. With the old air injection near each exhaust port, temperatures rose and oxides of nitrogen were increased, forcing the use of recirculated exhaust gas to reduce temperatures. Now the air-pump manifold revamping has reduced oxides of nitrogen, so the amount of exhaust gas recirculation can be reduced, and the requirements for precise control of large amounts of exhaust gas is gone. So goodby amplifier; the simple carburetor port vacuum-controlled EGR valve is adequate for the small amounts of exhaust gas currently needed for Sixes. Actually, the amplifier never was necessary on the four-cylinder engine, but Ford didn't find that out for sure until the 1975 model was too far gone to make a change.

The Ford alterations that add servicing problems for the Saturday Mechanic are greater use of clutch fans, a new computer-controlled ignition system and a new EGR control on V8s. But, in all cases, there's a performance improvement, so the rest of the story isn't all bad.

Computer ignition

Just as you're starting to learn electronic-ignition service, the automobile industry throws a curve by adding computer controls. Ford's new system, to be introduced first on Continental Mark IV, is primitive compared with what Chrysler has in store with its "Lean Burn" computer, to be introduced in November, but it still takes some new techniques to check out the Ford setup.

The Ford computer advances ignition timing 6° ahead of the standard setting whenever coolant temperature is below 125°, or above 225°—or between those temperatures when there is more than 5° of engine vacuum and engine speed is above 800 rpm. If the car is in third gear, engine temperature is in the 125° to 225° range, speed is above 2600 rpm and vacuum is under six inches, the computer decides that engine load and speed are high and knock is imminent. As a result, it retards the spark 4° to lower octane requirements.

The hardware includes a transmission switch to sense high gear, high and low vacuum switches, coolant temperatures sensors, two electronic pickups in the distributor and a black "logic" box.

To check out the system you need a timing light, tachometer and vacuum gauge, and you must put the computer through as many paces as you can (checking the retard signal would be about impossible without a dynamometer, but other modes present no major problem). Some quick checks can be made by pinching vacuum hoses and listening for a change in engine speed, indicating timing changes by computer.

Clutch fans

To save horsepower and fuel, the thermostatically controlled fluid clutch fan has clear-cut advantages, and it has been successfully used for many years on cars with airconditioning. Ford will be installing it on all 1976 2.3-liter four-cylinder engines and before the model year is out, on as many other non-air cars as it can.

If you haven't had an airconditioned car, the clutch fan will be a new experience. It can leak and never lock up (causing overheating) or can seize and be no better than a conventional fan. Checking it is easy—it should freewheel when the engine is cold and suddenly cut in after about 10 minutes of engine operation. Don't let a slipping fan clutch go, for today's engines overheat easily and they're a lot more expensive than a replacement clutch.

Back-pressure EGR

The elimination of the vacuum amplifier on Fours and Sixes was a design simplification, but unfortunately it's almost cancelled out by the addition of a sensor that is controlled by exhaust-system back pressure. The sensor used on '76 V8s (and some late '75s as a running change) permits more precise metering of the larger flows of recirculated exhaust gas for better performance and fuel economy. So it isn't all bad.

The sensor is a diaphragm device with a valve. When exhaust back pressure is high, the diaphragm moves the valve to permit full vacuum flow to the EGR valve, which opens all the way and exhaust gas recirculation is at its maximum. With back pressure low, the diaphragm springs back, pulling the valve to restrict the vacuum flow. Reducing vacuum to the EGR valve moves it to the closed or nearly closed position, cutting the exhaust gas recirculation and improving engine performance.

The amount of exhaust back pressure closely corresponds to actual needs for emission control, far more closely than carburetor port vacuum alone. GM used the sensor on V8s in 1975 and reportedly had good results.

Checking out of the back-pressure sensor requires no special tools. ★★★

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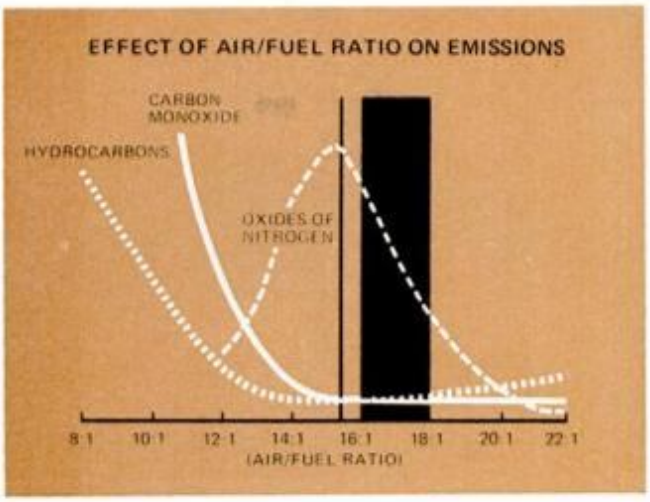


'76 Cars

Chrysler's hot on lean burn

by Michael Lamm WEST COAST EDITOR

Chrysler's biggest news for 1976 is that lean burn equals clean burn, as shown in the graph here. As I see it, lean burn is Chrysler's most significant engineering breakthrough since the 1934 Airflow.

Why so important? Because Chrysler's lean-burn (LB) system lets a car engine meet and beat 1976-77 federal emission standards *without* a catalytic converter, *without* exhaust gas recirculation (EGR), *without* an air pump, and *without* myriad other hang-on hardware; and it also means that you don't need unleaded fuel.

So frankly, LB makes the whole 1975 cat-converter/unleaded-gas stop gap look like a big mistake. Lean burn will soon obsolete that catalytic converter and will make us look back at the whole "cat" era as a wasteful, terribly expensive mistake.

How does LB work? First, a little background.

In presmog days, car engines used to run on air/fuel ratios of about 12:1. That's 12 pounds of air to one pound of gasoline. Running at 12:1 meant lots of pollutants, especially carbon monoxide (CO) and hydrocarbons (HC).

So one of the things emissions engineers did was to "lean out" the carburetor to about 15:1. That brought CO and HC way down but upped oxides of nitrogen (NOx). Engineers could see, though, that leaning out the air/fuel ratio even more—say to 18:1—would bring NOx back down without upping HO and CO (see graph).

But at that time, a normal engine carbureted that lean (18:1) simply wouldn't run. Honda was the only mass producer of cars to solve the lean mixture problem, and they did it with the CVCC-adding extra valves and precombustion chambers in the cylinder head.

Meanwhile U.S. desmogged engines weren't running too super, even at 15:1 and some NOx, CO, and HC, plus blowby from the crankcase and evaporative fumes still had to be burned at very high temperatures in the exhaust manifolds and cat converters. Sadly, none of this afterburner equipment added to performance or fuel economy-in fact, just the opposite. Unleaded gas, with its lower octane, reduced efficiency—and smog pumps, EGR and the rest robbed power and fuel.

Okay—so what lean burn means is this. You *can* run an 18:1 air/fuel ratio very efficiently *if* you can advance ignition timing to about 52° before top dead center (BTDC)! An 18:1 engine runs fine at 52° BTDC, so long as you're cruising, which is most of the time. If you want to accelerate, though, or start the engine, you have to retard the spark and enrich the air/fuel ratio to what we now consider normal.

What LB does, then, is to give you a *carburetor* that'll provide air/fuel ratios from about 12:1 to 20:1, plus a computerized electronic spark advance (ESA) that automatically and instantaneously can vary ignition timing from, say, +10° to +52° BTDC.

In this system, six sensors feed information into a brick-sized computer that's hung on one side of the engine air cleaner. These six sensors monitor start conditions, engine and air temperatures, throttle position and its rate of change, engine rpm and manifold vacuum. It makes a difference, for instance, whether you're restarting a warm engine or whether it's stone cold; also whether it's a summer day in Houston or winter in Anchorage. The sensors can tell all that plus a lot more.

All this information is fed into the computer, which sorts the data and chooses the best spark timing for an ideal balance of power, fuel economy and emissions. It can give thousands of different spark settings per minute if necessary.

With LB, the "normal" spark setting is 52° advance, and variations come in degrees of retard. Incidentally, ESA gets rid of all vacuum and centrifugal spark controls, and it wouldn't work without the use of electronic ignition.

What about cost? Since the LB system eliminates so much previous hardware and plumbing (the catalytic converter, 26 feet of hose, air pump, EGR, and a host of sensors and relays), Chrysler estimates that the lean burn engine will eventually cost less than a 1975 counterpart. So LB is better and cheaper, and you don't have to pay for unleaded gas.

What about maintenance and repairs? There's really not much that can fail in the LB system, but Chrysler is sending dealers plug-in diagnostic equipment that's very quick and simple to use. Anything found defective is easy to replace. Computer replacements are sold on an exchange basis and are rebuilt in Chrysler's Huntsville electronics facility. Huntsville's experience in Saturn and Apollo missile electronics helped to make

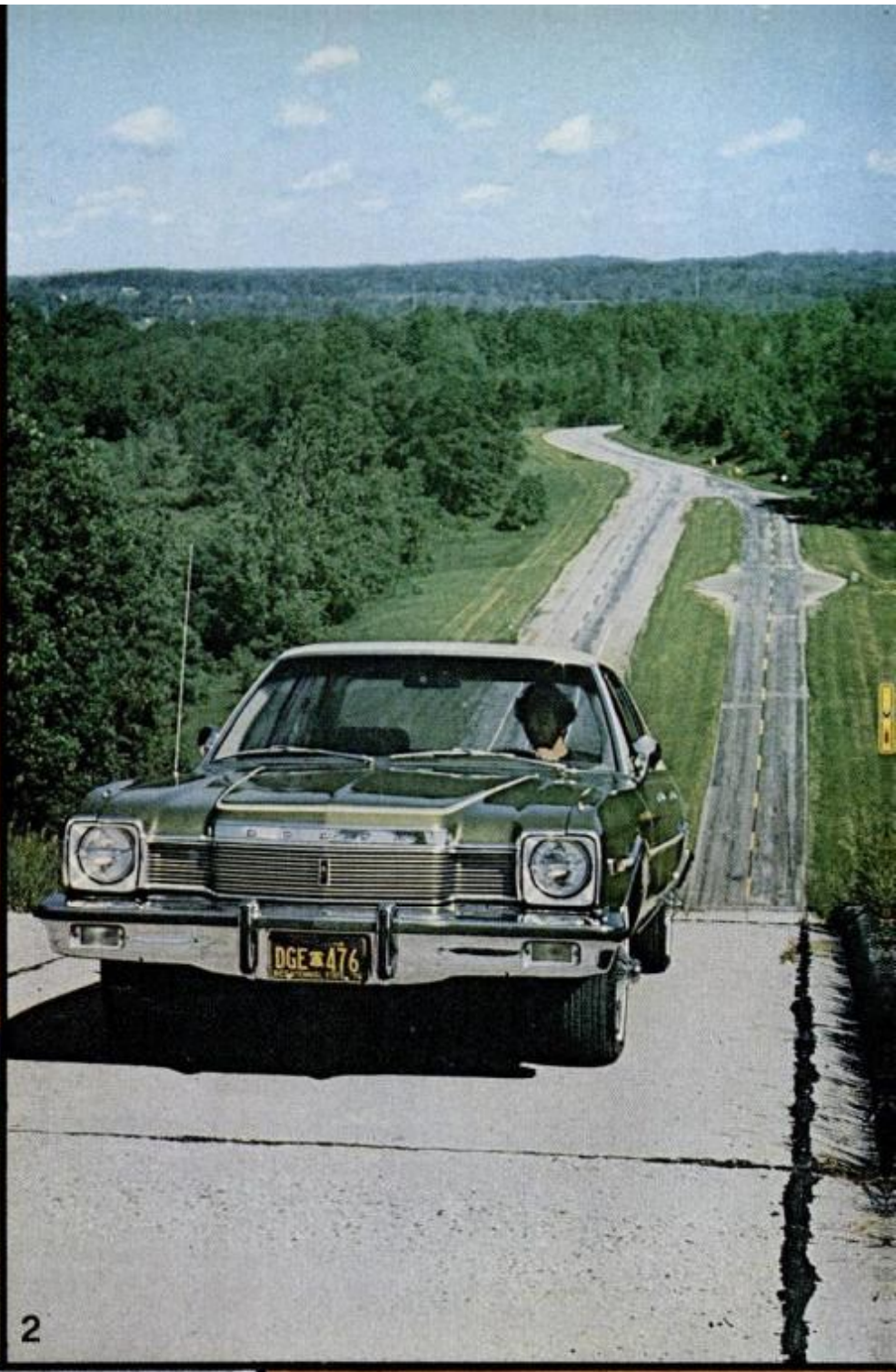
Chrysler's '76 Cars

lean burn possible in the first place.

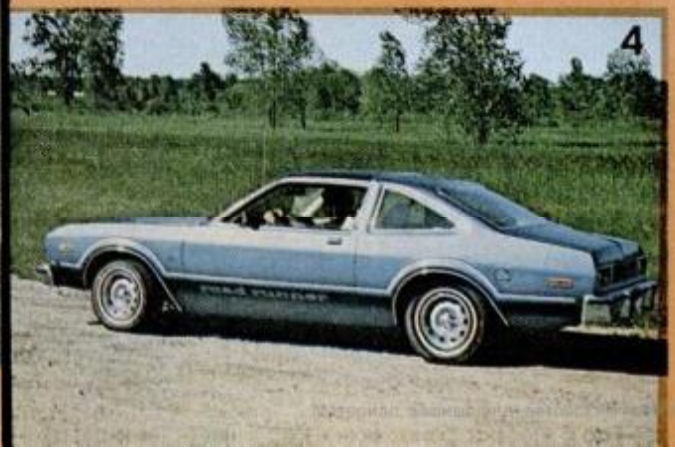
There's one more question, of course. Does lean burn work? I drove a 1976 Chrysler equipped with an LB 440-c.i.d. V8. It felt just like a pre-smog car—smooth, peppy, strong and unfoolable. From cold starts, you can jackrabbit to top speed without any hesitation. It doesn't even have the fast idle of conventional choking. Cruising is surge-free at any speed, and I hear that lean burn gets appreciably better gas mileage than "cat"-equipped cars. In other words, this LB Chrysler ran like the best of the 1966s.

Chrysler Corp. will begin equipping its 400 and 440-c.i.d. V8s with LB early in 1976 and will have LB across the board by 1977 if emissions standards are not changed. I predict that the other carmakers will have to go to something similar soon. And the best news of all is what one Chrysler engineer told me—an engineer with major responsibility for the lean-burn system. He believes the industry *can* help meet much tougher future emissions standards, thanks to LB, and

Photos by the author



Dodge Aspen and Plymouth Volare are Chrysler Corp.'s new cars for '76. Both nameplates will be available in coupe, sedan and station wagon models. Shown here are the Dodge Aspen Special Edition coupe (photo 1), the Dodge Aspen Special Edition sedan (photo 2), the Dodge Aspen station wagon (photo 3) and the Plymouth Volare Road Runner (photo 4).



that the future of the atmosphere looks a lot less cloudy now than it did even six months ago.

Two new luxury compacts

In the model lineup, say hello to two new Chrysler Corp. compacts—the Plymouth Volare and Dodge Aspen—then bid a fond adieu to an old friend, the venerable Imperial by Chrysler. The last Imperial rolled off the line on Thursday, June 12, 1975. Chrysler will likely discontinue all its C-bodied (full-sized) cars with the 1978 model year.

The Volare and Aspen were originally meant to replace Plymouth's and Dodge's A-bodied compacts, the Valiant and Dart, now nine years old. But Chrysler noted Ford's success in keeping the Maverick and Comet after introducing the Granada and Monarch, so it said—why not? Valiants and Darts are still very much with us, thanks to a loyal following. Thus Chrysler Corp. will sell four compacts in 1976—the Volare and Aspen being slightly more expensive than Valiant and Dart, which rumor has it will be phased out for 1977.

Volares and Aspens are built on what's called the F-body. All new, this shares no components with the Valiant/Dart A-body. Like the A, it's unitized, but uses fewer stampings. It's also lighter than the A-body, has an altogether different suspension setup, boasts more room inside, better vision, and better insulation against noise.

The F-body's suspension, again by torsion bar, is totally unlike Chrysler's previous torsion system. Instead of two longitudinal bars, it uses one bar across the front, like the VW Beetle's with trailing arms coming back to unequal length A-arms. The entire Volare/Aspen front suspension is isolated from the main body by heavy rubber bushings, and uses differently calibrated torsion bars, depending on engine weight and accessories. There's also a good deal of compliance in the system (fore and aft wheel movement), to screen out road roughness and soften the harshness of radial-ply tires.

F-bodied cars come in three body styles: a coupe on a 108.5-inch wheelbase plus a four-door sedan and wagon on a 112.5-inch span. The Volare and Aspen offer more luxury and comfort options than any compact in corporate history. You can get every expected power accessory from steering and brakes to power seats and windows, electric door locks, sunroof, four-speed overdrive transmission, cruise control, insulation package and several levels of trim.

The Dodge Aspen's top model, the

(Please turn to page 118)

'76 SERVICE TIPS FOR THE DO-IT-YOURSELFER

Serviceability of today's cars can be improved as much by subtraction of emission-control gadgetry as by new designs and engineering features, as Chrysler Corp. has proved with its 1976 cars.

One of the most successful efforts results from subtraction and addition, namely the addition of the computer-controlled spark advance system called lean burn and subtraction of a host of items.

Lean burn, which permits an engine to run on very lean fuel mixtures and produce minimum emissions, is in itself a very compact design. Aside from the black box computer and an inlet air-temperature sensor built into the air-cleaner housing, plus two switches on the carburetor, there are no new components strewn throughout the engine compartment (with connecting wires and hoses).

Eliminated are the catalytic converter, air pump, exhaust-gas recirculation system (with electronic timer, coolant-control valve, a solenoid-vacuum valve, vacuum amplifier and the EGR valve itself). Also gone is the orifice spark-advance control, a spark-advance delay system that includes two valves and connecting hoses. In all, lean burn has eliminated 25 feet of vacuum hose and once more you can see the engine.

Although the computer is a new part, it substitutes for the simpler (but little smaller) electronic-ignition control unit, so on a part-for-part basis, the engine compartment is a lot cleaner. Although lean burn will only appear on 400 and 440 V8s in 1976 because of limited production facilities, it's only a matter of time before it's across the board.

Lean burn has been designed with service in mind, and even the Saturday Mechanic has not been forgotten. There's a piece of computerized test equipment Chrysler will be selling to check out the lean-burn black box in dealerships, but the Saturday Mechanic will be able to do a satisfactory testing job with no more than a power timing light, vacuum gauge, tachometer and ohmmeter. The checkout procedure will consist of running the engine at different temperatures, throttle openings and engine speeds, and making sure timing is at certain specifications. This will tell if the control computer is properly digesting the information obtained from all sources.

If the computer is defective, you unplug it and install a replacement unit. Eventually, the computer will be serviced by changing either or both of two internal modules, but now there's some special soldering technique necessary to avoid damage to a good module.

It's important to remember that all the lean burn computer does is precisely control vacuum advance and trigger the ignition coil. The centrifugal advance weights still are at the bottom of the distributor (although eventually they'll be replaced by electronics) and all other ignition-system components, such as coil, distributor cap, rotor, wires and sparkplugs need normal attention.

OSAC out

The orifice spark-advance control system (OSAC) also has been eliminated on a number of engines without lean burn, including non-California versions of the 225 Six with automatic and 318 V8 with catalyst, plus the California version of the 360 V8 four barrel (with catalyst).

Catalyst overheat system

Another underhood gadgetry elimination is the catalytic converter overheat protection system, which also was made on the basis of they-found-they-didn't-need-it. The system included an electronic speed switch wired between the electronic ignition-control unit and a carburetor solenoid, a setup that slowed throttle closing on rapid deceleration when a rich mixture would be dumped into the converter.

Transmission fluid level

Checking automatic-transmission fluid level on such vehicles as the Plymouth Voyager and Trail Duster has always been a nuisance because of a less-than-wide-open location under the engine cover. A '76 option that may be offered on passenger cars in '77 is an electronic fluid-level indicator built into the dipstick and wired to a dashboard light. On the tip area of the dipstick is a thermistor, a temperature-sensitive solid-state device. When the transmission fluid is at operating temperature, the shift lever is in neutral and fluid level is correct, the thermistor circuit remains open and the dashboard light is out. If the fluid level is low or if the fluid overheats, the thermistor closes the circuit and lights the dashboard bulb.

Aspen and Volare

The Dodge Aspen and Plymouth Volare, although they share drive trains with the Valiant and Dart, are otherwise very different cars.

The Aspen-Volare transverse torsion bar front suspension is completely isolated from the chassis, which means that top ends of the shock absorbers are mounted on a rubber-insulated subframe, not through the sheet metal into the engine compartment. You could reach up from the bottom and struggle with the front shock top mountings, but you don't have to, because there's a convenient access plate on each side of the engine compartment. Just unscrew it to reveal the shock mountings, wide open. Removing the plates also provides easy access to the upper control arm for camber adjustments.

Unlike other Chrysler products, the Aspen and Volare rear shocks have a single-bolt ("spike-type") lower mounting (upper mount is the conventional eye-type with a through bolt). Shock replacement is somewhat easier with this setup—you just bolt the part in at the top and you've got a simple aim of the stud into the hole at the bottom to finish the job.

The Aspen-Volare dashboard may be the most serviceable in the industry or perhaps tied with the AMC Pacer. Everything is held in place with a minimum number of easily accessible screws, including the cover-bezel that surrounds the gauge cluster. Once the screws are off, you just pull the gauge cluster forward, reach behind and undo the master electrical connector, and it comes right out. There's no need to reach up underneath and disconnect the speedometer cable—it's retained in the cluster holder.

All bulbs are in the holder behind the cluster and all fuses are behind a small cover in the dash to left of the steering column. If you remove the panel in which that cover fits, you have access to turn

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Jeep CJ-7 (photos 1, 2, 4, 5) has a wheelbase 10 inches longer than CJ-5 (photo 3). CJ-5 will stay in the lineup, but the CJ-7 will offer more advantages: there's more room in the back for the bench seat and now it's possible to fit an automatic transmission and Quadra-Trac, AMC's full-time four-wheel-drive option. On CJ-5, the driveline is too short for these refinements.

Gremlin (photo 6) has a new grille and the Matador gets a new luxury package called the Barcelona (photo 7) which includes reclining front seats, unique upholstery.

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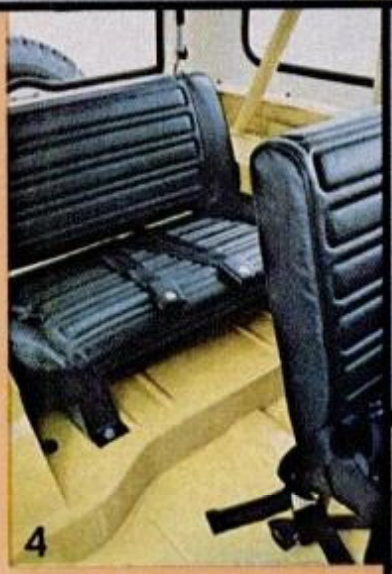
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Photos by the author

'76 Cars

AMC stretches its Jee-e-p

By Michael Lamm WEST COAST EDITOR

AMC's delivery of the Pacer in mid-1975 means there's not much truly new in the company's 1976 passenger-car lineup. But there is a new Jeep worth talking about.

Designated the CJ-7, it's more than just a bigger CJ-5. The CJ-5, which will be continued, has always been too short. Its driveline, for instance, is too short to put in an automatic transmission. Its 83.5-inch wheelbase is also too short for much of a back seat.

So the Jeep people designed a new frame, added 10 inches of wheelbase and dubbed it the CJ-7. Now there's plenty of room for GM's Turbo Hydra-Matic, and with the new automatic transmission it's also possible to include AMC's Quadra-Trac (full-time four-wheel drive) option. Too, there's plenty of room for a small rear bench.

Jeep vehicles now make up 25 percent of AMC's car volume. And in 1975, half of all Jeeps sold were CJ-5s. So AMC isn't about to scrap the successful CJ-5, yet Jeep does want a contender in the Scout/Bronco/Blazer market. (Last year's CJ-6 never really caught on, so it's being dropped except for export.)

The CJ-5 and CJ-7 share sheet metal back to the cowl. They likewise share engine choices. The 232-c.i.d. in-line Six is standard, with the 258 Six and 304 V8 optional. Completely redesigned instrument panels, new antitheft steering columns, all-synchro three and four-speed manual transmissions with or without regular all-wheel drive, and fold-down windshields are also shared.

The meatier new Jeep CJ frame is wider at the rear than up front, placing the rear springs farther outboard for greater lateral stability. This frame is fully boxed back to the gas tank, and uses a skidplate under the engine, trans and transfer case.

The CJ-7's metal doors have roll-up windows, yet you can easily lift these doors off their hinges for hunting and duning (like the VW Thing's doors). There's also a new removable, optional plastic hardtop that unbolts in about five minutes.

Other options include an extra-duty suspension system that uses seven-leaf, two-stage springs instead of the normal four-leaf units; tach and rally clock; indoor/outdoor carpeting, and the Levi's interior.

The CJ Renegade package has aluminum wheels, rollbar, the 304 V8 with heavy-duty cooling, wheel-lip extensions, special tires, a rear seat and sporty trim.

Jeep's Wagoneer and Cherokee wagons remain almost unchanged, as does the Jeep pickup.

Turning now to AMC's passenger-car lines, you'll find new grilles in the Gremlin and Matador coupe, a re-engineered two-barrel carb for the Pacer's 258-c.i.d. in-line Six, plus minor refinements and trim changes. The Matador coupe, for instance, gets a luxury package called the Barcelona with plush velvety upholstery that looks permanently crumpled (very nice, actually), reclining front seats, plus distinctive medallions and wheelcovers.

AMC speedometers have been recalibrated to top out at 90 mph, and there's a new lockable, padded console in some models. AMC cars produced after Jan. 1 will have bigger brakes to help meet federal stopping standards. These brakes also add about 75 pounds to the weight of each car.

A development that will result in better fuel economy for AMC models, possibly in the '77 model year, is the recently concluded arrangement with VW for the two-liter Audi engine. ★★★

'76 SERVICE TIPS FOR THE DO-IT-YOURSELFER

There's always something new under the hood and, despite a lack of styling changes, American Motors has some new wrinkles of interest to Saturday Mechanics on its 1976 cars.

Rocker-cover gaskets

Following an auto-industry trend, most '76 AMC rocker covers will have squeezed-from-a-tube gaskets made of silicone rubber. Unlike a conventional preformed gasket, the squeezed bead can be repaired safely if it tears when you remove the cover. Just fill in the gap with a fresh squeeze. You can get tubes of silicone rubber at most auto supply stores.

To virtually eliminate future gasket sticking, AMC suggests you apply a film of engine oil to the cylinder-head contact surface of the rubber bead before you reinstall the cover.

Drive belts

Drive belts on most accessory-leden cars are usually perfect examples of afterthought. Normally you must remove a few noncritical accessory belts to reach something important.

Recognizing that many V8s are bought with airconditioning and power steering, AMC has rationalized its belt layout for 1976 to offer servicing conveniences in an emergency and give backup protection.

In 1975, the four belts that drove the water pump, power steering, alternator, airconditioning and emission-control air pump were typical industrial layouts. The outermost belt was wrapped around power-steering and air pumps only, but its failure would have no effect of safe car operation. A second belt was for the airconditioner, a third for the alternator, power-steering pump and water pump, and the innermost belt for the water pump alone.

In 1976, the outermost belt drives power-steering and water pumps, the second belt is wrapped around the power-steering and air pumps alone, while the third and fourth belts are wrapped around the airconditioning, water pump and alternator.

This means you can lose any two belts (and as many as three) and the cooling-system water pump will still function. Additionally, the alternator and aircon-

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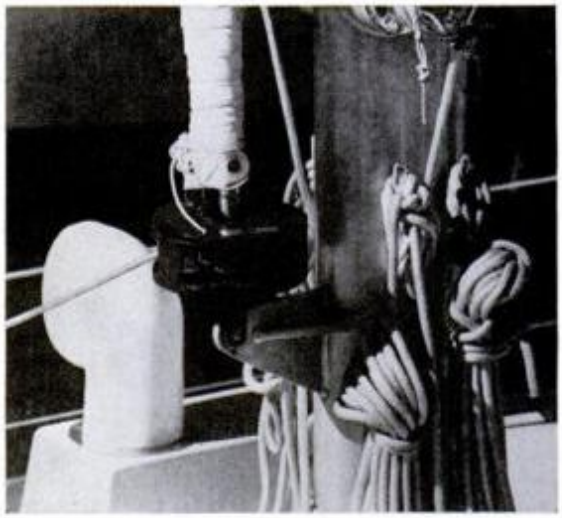


Sail-handling simplified

Now they've lowered the boom—and even removed it—in a new roller-shade system for setting all sails.

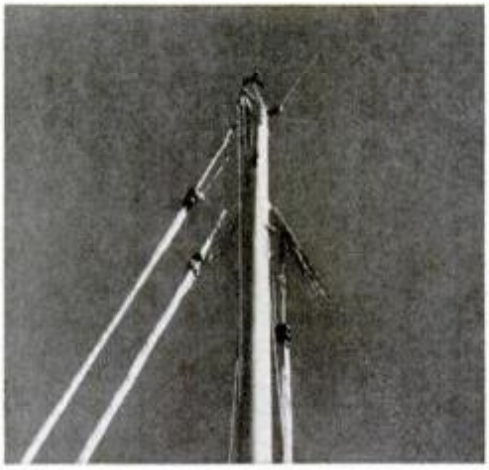
by Bill McKeown

Crew members will never be clubbed overboard by a jibing boom aboard Chris-Craft's 35-foot Caribbean motor sailer with a new MacLear rig. All sails can be roller-reefed like a window shade, but vertically, and the result may be a breakthrough to easier sailing.

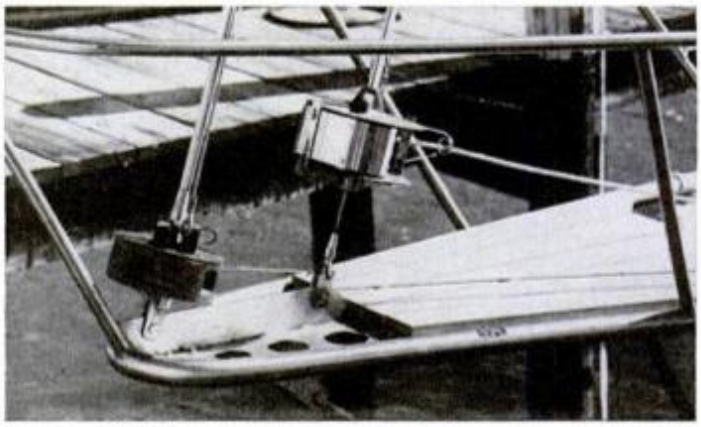
Instead of a boom along the bottom of the mainsail, the loosefooted sail is sheeted to the backstay. Instead of fitting a slot or track up the mast, it furls around a rod jackstay just behind the mast. Vic Oristano, owner of the first experimental model, discovered that sails can be shortened and balanced to fit the exact amount of wind right from the cockpit, and the skipper can leave the helm and move about without the threat of an accidental jibe. The boat proved a delight to handle and provided speeds to 7½ knots under sail or diesel power.

Production models with noted designer Frank MacLear's rig have only a single jibstay, and should show how easy sail handling on a cruising boat can be. ★★★

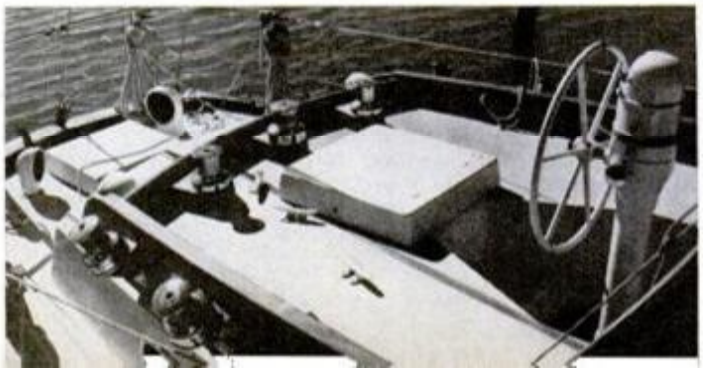
Chris-Craft's Caribbean 35 motor sailer has roller-reefing for reacher and genoa jibs forward, plus a rod jackstay, shown above, that runs up parallel to the mast from a special aluminum fitting 18 inches above deck. Drum at bottom winds up reefing line as mainsail is unfurled off jackstay; winds up sail as line is pulled.



Forward of masthead are reacher rod headstay and, below it, genoa on this new experimental craft. Mainsail parallels mast. Triple backstay is secured below masthead radio antenna, anemometer and wind-direction indicator, flag hoist.



Double headstays are secured to stem plate which is part of the bowsprit. Forward rod stay carries reacher, and aft stay, the genoa jib. Jibing reacher is easier than tacking it between two stays, but it can also be roll-furled in and taken out other side.



Seven winches surround cockpit, and make possible all sail handling right in cockpit. Port and starboard reacher and genoa sheets are handled by side winches, furling lines and mainsheet are adjusted with aft ones. Mainsheet runs to snatchblock on adjustable backstay slider, deck block.

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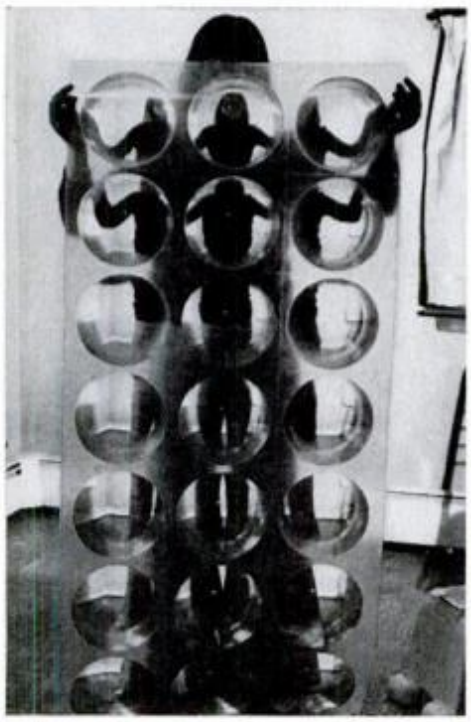
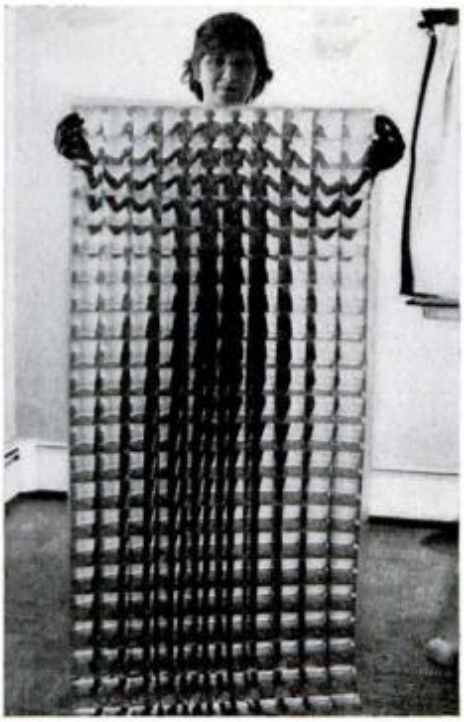
IT'S NEW NOW



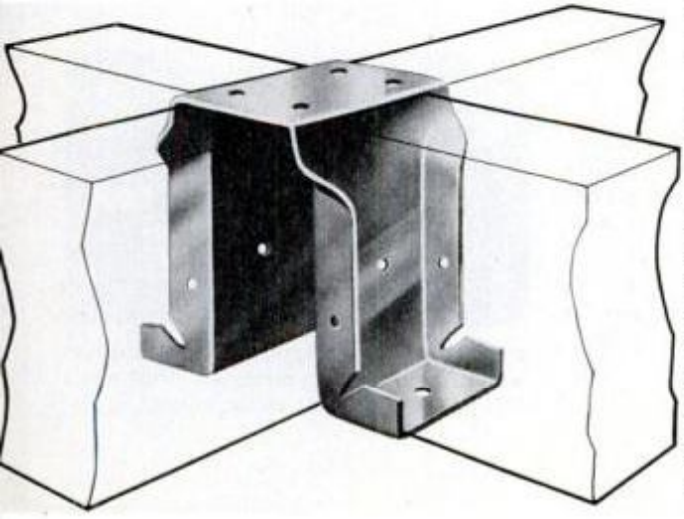


New way to decorate—with plastic 'lenses' by the dozens

Mount one or more of these unusual plastic sheets in a wood frame and you have a decorative, eye-catching room divider or privacy screen. The sheets, approximately 2 by 4½ feet, have lens-like circles and squares molded in, creating interesting patterns of multiple images. They're available in a variety of styles and colors for about $10 each. Universal Specialties Co., 15 East 40th St., New York, N.Y. 10016.

New camera system from Yashica

Yashica's new FX-1 auto-exposure 35-mm reflex camera takes a wide range of 19 Yashica and 17 Zeiss lenses in a new bayonet mount. Same mount is used in the new Contax RTS camera, sleekly designed by Porsche. Compatible mount and lens system enables the two cameras to share other accessories as well. Both have fully automatic exposure setting; viewfinder readouts show settings in use. System was jointly developed by Zeiss of Germany and Yashica of Japan.

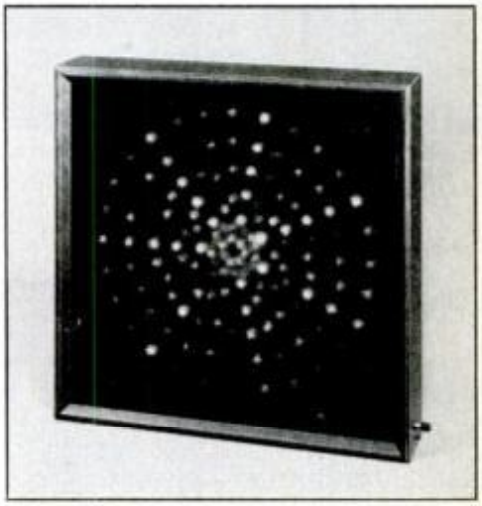


Saddle clips for intersecting beams

For joining intersecting beams—as for a patio or carport roof—this purlin clip-saddle gives a strong, flush joint in minimum time. Beams are put in clips and nailed in place. The clips are 18-gauge galvanized steel and come in 2x4, 2x6 and 2x8 sizes. Prices start from 67 cents each. A single-purlin (T-joint) style is available. Panel Clip Co., Box 423, Farmington, Mich. 48024, is maker.

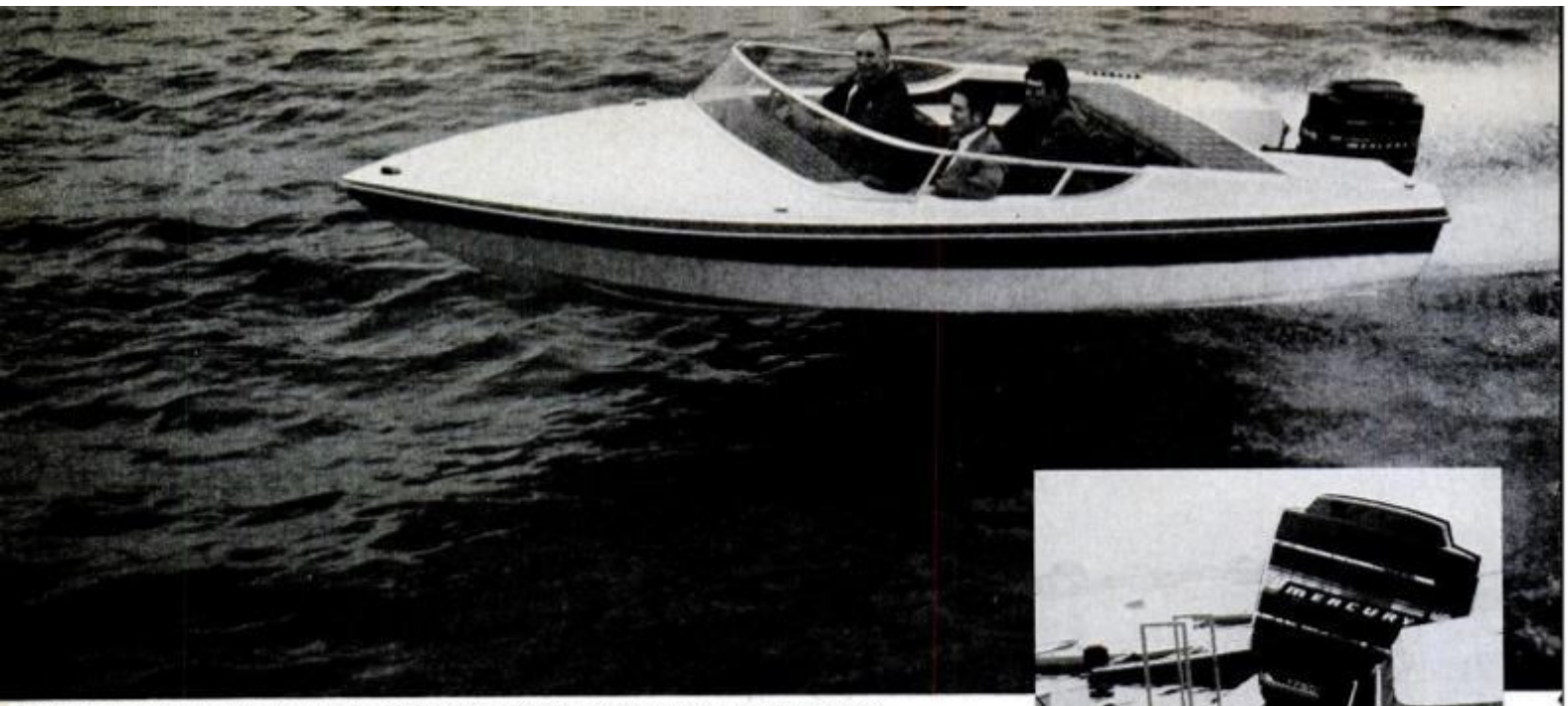
Kit-built 4-channel color organ

Slim enough to hang on a wall, Heath's new 4-channel color organ has 140 colored lights that blink in time with music from your hi-fi system. Built from a kit, the 4½-inch-deep display connects to your speaker and lights up red bulbs for bass frequencies, blue for low midrange, green for upper midrange, amber for treble, depending on music's energy content in each band. TD-1006 kit is $79.95. Heath Co., Benton Harbor, Mich. 49022.



New low-cost folding Polaroid

Polaroid's original SX-70 took a lot of bows for being the first single-lens reflex camera that folded flat. Now there's also a nonreflex version, the SX-70 Model 3. At less than $100, it's about half the original's price, but uses the same revolutionary film and Flashbars. It also has the same lens, which still focuses to 10 inches, but now by guess, not by groundglass. It still spits out the pictures, too—only now you don't cough up as much.



With less bulk, noise than some mills half as big, Merc's 175-hp Black Max gets grins from test driver McKeown, engineers Alexander and Hale.

Merc's new max-muscle machine

Our tests show they've turned a racing prototype into a high-powered production performer.

by Bill McKeown BOATING EDITOR

More power from less space, less noise and less gas consumption is a good trick, but Mercury's new 175-hp Black Max V6 manages it.

They've done it by biting the bullet and breaking with tradition. A Merc has been easily recognizable because of its black paint and its stacked-cylinder design, giving it a tower-of-power look. Make the pistons even bigger or add more and mount a skyscraper motor on the back of a boat? No way. Instead, chief engineer Charles Alexander's performance technicians took their in-line Six and split it in half into two banks of three each in a V configuration. They came up with higher displacement and horsepower, and with four inches less height.

Racer watchers have known something was up for years as special tunnel hulls driven by Merc's factory team started taking checkered flags after sustained runs of over 100 mph. We knew the brains at Fond du Lac and Oshkosh weren't getting that kind of torque just by changing props, doctoring fuel or whistling Dixie. Twister was the name for the high-performance racing mill and the latest, Twister T-3, is the father of this new Black Max Merc 1750.

Jerry Hale, project engineer for Max, spent five and a half years on development and testing.

Once production models were available, I went to Wisconsin for a sneak preview.

Black Max actually is four inches shorter than this year's Merc 150-horse 1500, and an inch wider, but there's no way to tell where those extra 25 horses are coming from. The V of the cylinders is only 60°, however, instead of the 90° V of the OMC competition, and reduced width is the result. With 122-cu.-in. (two-liter) displacement and a weight of 355 pounds, it's not a mill you pick off the transom and put in the trunk. For that you can go to Merc's new smaller-than-ever four-horse 33-pounder. But aside from portability, the other outboard and stern-drive advantages are all here.

Max not only tilts in thin water or

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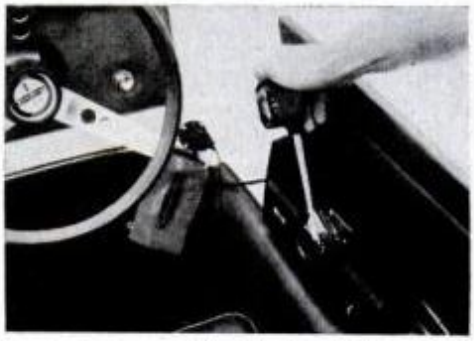

Lower in top profile, higher in lower unit output, Max makes potent package for large runabout or cruiser. Controls above show kill switch and newly designed throttle lever combining shift and thumb buttons to trim outboard in or out without your releasing steering wheel or throttle. Tests showed trimming could cancel torque in steering.

Natural for big horsepower is big cruiser where one Max can equal a pair of minis and use less fuel for wider range.

Photos: Joe Snyder

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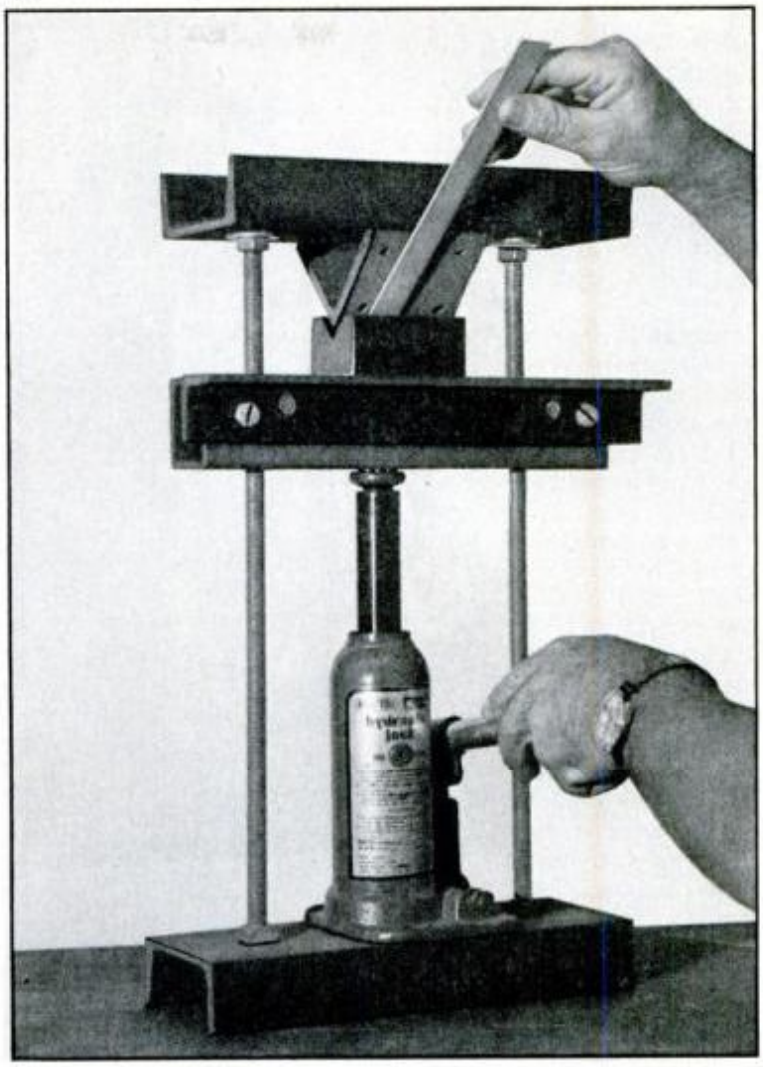
A simple frame and hydraulic auto jack make a powerful press for bending jobs.

Hydraulic press you can build

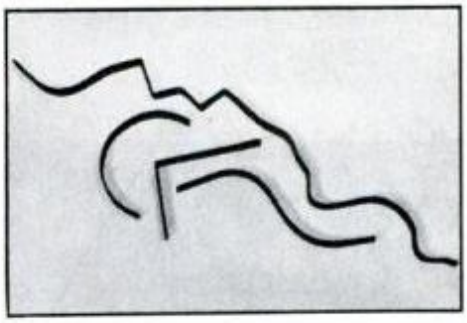


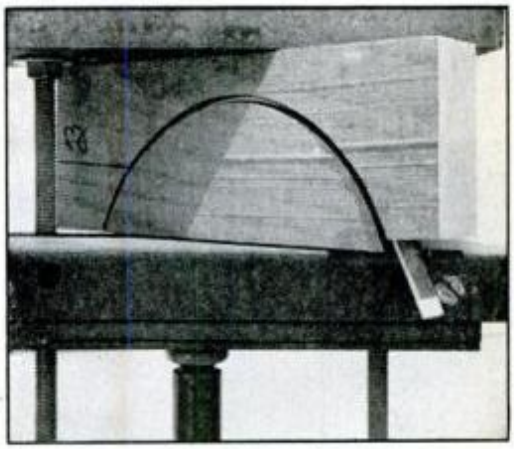
by Morton E. Milliken

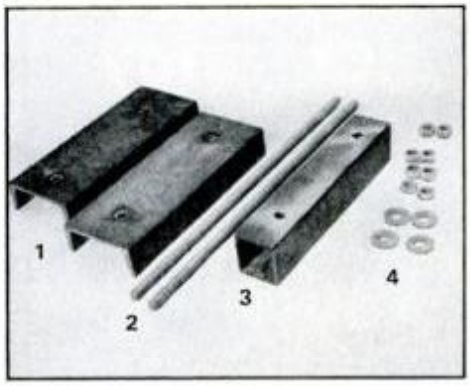
Trying to bend a piece of strap iron cold with only a hammer and vise or force a tight press fit between metal parts makes you want a hydraulic press that will do the work for you. They're expensive ready-made, but you can make one from a few dollars' worth of structural iron and a $20 hydraulic auto jack. My press uses a 3-ton jack; do not use a larger one. A 1½-ton jack would do.

Base and top parts (1) below are 10-in. lengths of 4-in. channel; the movable jaw is made of two 10-in. lengths of 2-in. angle. If you have a welding shop cut the iron and weld or braze the movable jaw together, the only tools you'll require to complete the frame are a hacksaw (to cut threaded rod) and a drill press with ½-in. bit. The two rods parts (2) are the result of cutting a 3-ft. length of ½-in.-dia. threaded rod (standard hardware item) in half. Parts (4) include 8 nuts and 4 washers.

The only potential problem in construction is the alignment of ½-in. holes through base, top and jaw. Make a cardboard template to help locate these holes 7 in. apart, center to center; 7 in. allows sufficient working area, yet keeps holes far enough from ends of iron parts. If necessary, a tight fit can be widened with a round file. When frame parts are assembled with nuts and washers (one on each side of each hole in channels), the jaw should drop to the base without binding. Put the jack in place (it is not attached, so remains available for other uses) and the press is complete. In use, you'll notice that both jack and work must be centered to keep the jaw from sagging. You can widen the jaw's work surface as I did by bolting an extra length of angle to it. ★★★







Neat right-angle bends in mild steel are easy (top) with V-block, angle iron as form. Two-part form (above) bandsawed in 2-in. oak block produced curved work. Variety of angles, curves (above, left) can be formed in ⅛ x ¾-in. mild steel; press also handles ½-in.-dia., mild-steel rod. A welding shop can cut the frame parts (left) for you and weld or braze the angle sections (3) to make the box for the moving jaw.

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New radios cover more and newer bands

Now that most radios cover both FM and AM, radio manufacturers are offering additional bands. For short-wave listeners, Panasonic now offers the 24-band Model RF-8000, probably the world's biggest, most expensive "portable" (right): at least it must be a portable, there's a handle on top. It has three antennas, a motorized tuning dial, a built-in clock that shows time around the world, a beat-frequency oscillator for single-sideband (SSB) signals, and crystal-calibrated tuning accuracy on 12 shortwave bands, 8 VHF bands, 3 marine bands and AM broadcasts—all for just $2500.

General Electric's portable "Searcher" has a programmable scanner (no crystals needed) that monitors any four channels on the Public Service high band (150-174 MHz), and can be dial-tuned on that band as well as FM and AM. It's $150.

You can pick up the sound of television channels 2-13 on GE's new $70 digital clock radio and the Boman Astrosonix Teleplex 8 AM/FM/8-track unit for the car. Or you can convert your present car radio to pick up TV sound, FM and the weather band with Audiovox's $80 converter.

A newer wrinkle in weather-band reception is a circuit that automatically howls an alarm whenever the National Weather Service transmits a special, weather-hazard signal. Two similarly-named radios, the $40 Weatheralert and Regency's $50, crystal-controlled Weather Alert Monitor Radio have it. ★★★

Cassette portables get fancy

Yesterday, the cassette was just a toy; so was the portable cassette recorder. But today cassette portables are sophisticated and professional. JVC's $300 CD-1635 (left), Sony's $370 TC-153SD (top right) and Yamaha's $390 TC-800GL (far right) all record stereo on regular or chromium-dioxide tapes from a.c. or batteries. The JVC gets 62 db of signal-to-noise ratio with its ANRS noise-reduction system. Sony and Yahama, both with Dolby, get 65 and 58 db respectively. The Yamaha's unique wedge shape makes controls easy to see from eye or waist-level. And Panasonic's new, more conventional-looking $100 RQ-323S has cue-and-review to let you hear what's on the tape as you rewind or fast-forward it, to find sounds you're looking for. Optional foot-pedal remote has a cue-and-review control. ★★★

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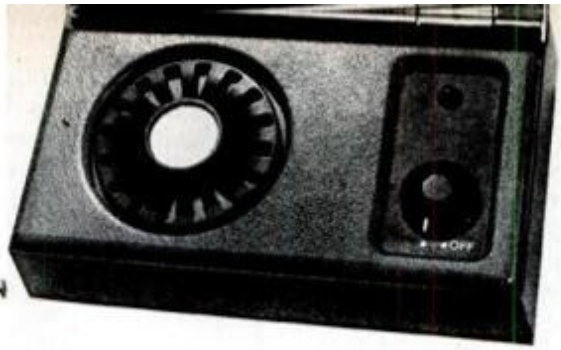

Weather warners: Weatheralert (left), Regency Weather Alert Monitor (below)

GE "Searcher" scanner with FM and AM

Radios with TV sound: GE clock radio (left), Boman 8-track car stereo with FM and AM (below left), Audiovox car radio converter with FM (below).

Sony TC153SD

Yamaha TC-800GL

Panasonic RQ-323S

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The skills of shooting can be learned at any age, and shotgunning ace Gary Randall of Orlando, Fla., has been refining the methods that helped him as a boy. Now, with sons aged 5 and 7 of his own who are eager to "shoot like dad," Randall, 34, is starting them carefully in the techniques that made him a skeet champion.

Since the days of the Pilgrims, American youngsters have been instructed in the safe and proper handling of sporting firearms. Gary learned from his father, William D. "Bo" Randall, who produces in his Orlando knife plant the blades that many sportsmen consider among the world's best.

BB gun practice shooting at wooden discs tossed by his dad, Gary Randall, gives young Michel a shotgunning headstart.

This grandfather, father and son have worked out a system, combining safety and instinctive skill, for fun together learning—

How to start with a shotgun

by George X. Sand

The elder Randall, a perfectionist, started young Gary by teaching him to shoot instinctively. First came a BB gun and a couple dozen small round wooden discs, about three inches in diameter, cut from a thin panel. Both teacher and pupil wore glasses (for eye protection from possible ricocheting pellets). Standing out of the line of fire about 10 feet to one side and slightly in back of Gary, Bo Randall scaled the little targets, spinning broadside in a slow arc, in front of his son. He tossed the discs one at a time so that they sailed by only about eight feet in front of the shooter.

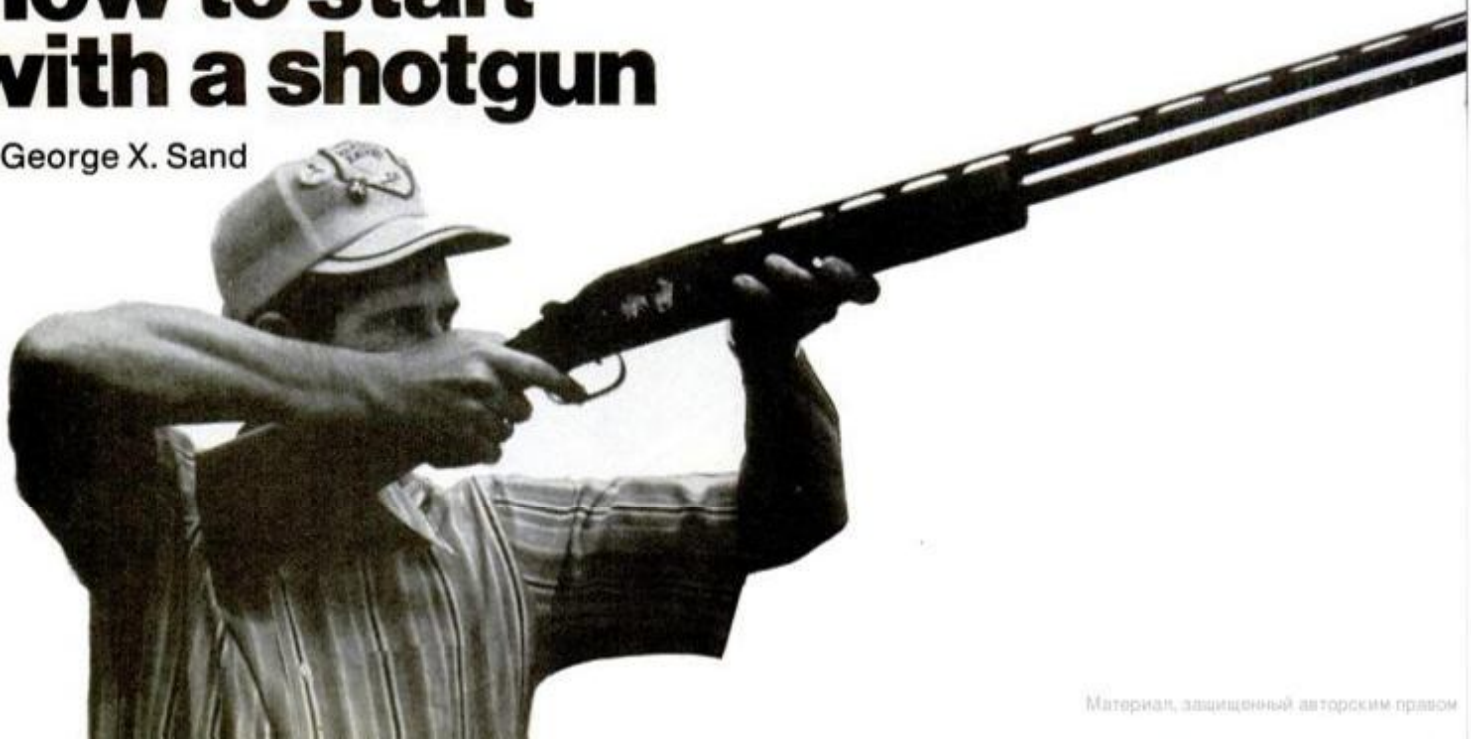
Gary was instructed to hold his head up, keep both eyes open, and to concentrate on the target, *not* the gun. Holding his air rifle ready at his shoulder, Gary did not aim but just pointed instinctively at the moving disc and then fired when the time seemed right—usually at or near the top of the arc. The gun was pointed as though it were merely an extension of the boy's outstretched arms.

After only a few hours of such father-and-son practice, the pleased boy could hit the seemingly impossible little targets with amazing regularity. "I must have shot many thousands of BBs with my Crossman," Gary recalls. "I would walk through the woods plinking at leaves, twigs and trees practicing when I could."

Before Bo Randall's son was allowed to fire live ammunition at moving targets he was given a thorough course in gun handling with strong emphasis on safety. The firearm he would be using was no toy weapon, one to be aimed carelessly at other humans as is sometimes done in movies and on television. Henceforth, Gary would *never* point a gun—loaded or unloaded—toward another person. The safety would *always* be left on until just before he was ready to pull the trigger.

During short, easily understood lessons, Bo Randall explained to his son how a shotgun shell is made, how it is exploded when the trigger is pulled and the gun's firing pin strikes the shell's primer. The shotgun barrel, and the degree of its possible constriction (choke) to control shot patterns at various distances was discussed. Parts of a shotgun—stock, receiver, trigger, barrel and safety button—were also inspected and their

Taking aim at a hand-launched clay bird, Gary Randall shows son Michel how he perfected his moving-target technique.



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operation analyzed. After each lesson, Gary's father asked questions and kept a record of the boy's progress. Not until he knew all the answers and could demonstrate every phase of proper handling was the boy allowed to have a gun of his own.

That first gun was a 20-gauge pump shotgun with a shortened stock: "I was eight at the time," Gary recalls, and we had a summer home on a lake in Michigan. Each fall my parents would put me in school up there temporarily so we could stay through October and Dad could hunt grouse. He was a very good shot and wanted me to be one, too, so every weekend we would find a field or some open woods and he would teach me how to hit a moving target.

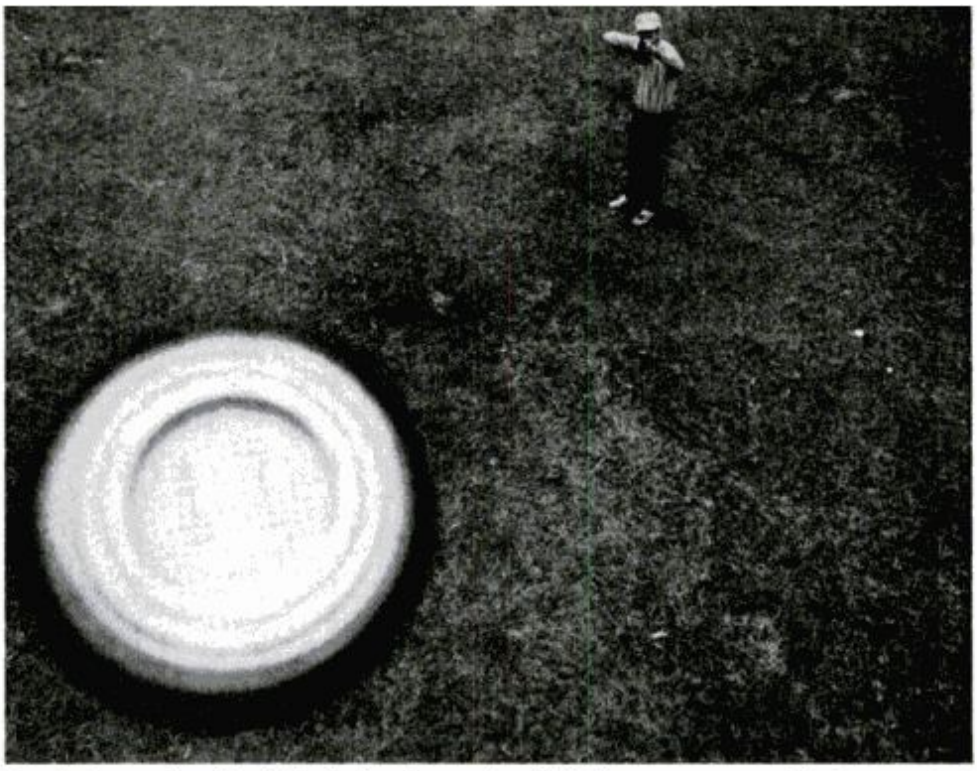
"Father would walk close behind me. He carried a handtrap loaded with a single clay bird. When I least expected it, he would send that clay pigeon sailing outward—sometimes high, sometimes low—and then tell me which direction to look." Gary began to learn the concentration, control and confidence needed for successful game bird shooting.

Today the boy who began with an air rifle has graduated to a $5000 Krieghoff shotgun with interchangeable 12, 20, 28, and 410-gauge barrels. (The 16 gauge is not shot in skeet competition; its size is too close to that of the 20.) For the past three years, Gary Randall has defeated all Florida competitors to become "High Over All" skeet marksman in his state. His HOA score last year was 391 out of 400. (One hundred clay targets are shot in each of the four gauge categories.) Competing only in skeet but not trap, Gary Randall shoots 30,000 flying clay targets a year, about 8000 of these in competition. Like many tournament shooters, he reloads his own shells for economy. Number 9 loads are normally used for skeet shooting.

But Florida's expert is quick to point out that a costly gun is not necessary to becoming a good shot. His choice for a beginning skeet or trap shooter is the Remington Model 1100 autoloader in 20 or 28-gauge size. Popular for light recoil, it is available for right and left-hand shooters and has interchangeable barrels in all four gauges. Winchester, Ithaca and Browning are among other favored makes.

"If a person, young or old, has been taught to properly handle a shotgun and will shoot two or three times a week for one month, he should be able to break 20 or more birds out of every 25 thrown for him," says Randall.

Today, Gary's older son, Michel, is learning from his father the fundamentals of shooting. Concentration is the key to success in skeet, says Gary. Each station presents its own unique problems as its released target flies at a new angle. The required lead—the distance one must aim ahead of the moving target—varies. So does the speed and timing needed to track the target, move ahead of it, then follow through with the swing after firing. Randall advises beginners to face the center stake squarely. Stand comfortably with feet at shoulder width, one foot a little ahead of the other. Lean forward slightly, until about 60 percent of your weight is on the forward foot. Keep your head up with both eyes open, looking at the spot where you judge the clay bird will be emerging. Bring up your gun with a single smooth movement so that the butt rests firmly against your shoulder and the comb of the stock lightly touches your cheek.



Developing automatic skills for leading a clay bird the proper amount takes constant practice for "high-overall" scores. Gary Randall has broken 100 straight.

Expensive shotgun is not essential, but Randall now uses $5000 four-barrel model.

Do not sight down the barrel as you would a rifle. Rather, keep your eye on the target so you can view the bird and gunsight at the same time. Never hunch your head down, but form an even sight line along the barrel or rib. Bring your gun up to your eye, not your eye down to the gun. When you swing to shoot, move your whole body, not just from the waist up.

"It will help a beginner to understand lead better if he can picture the shot coming from his gun as though it were a strong stream of water being squirted from a hose. In order to hit an object passing quickly before him, he would have to catch up with the target, then keep the hose stream just in front of the object," Randall advises. Two of the most common mistakes, Gary notes, are raising the head during shooting and stopping the swing of the gun as the trigger is pulled. Allowing the gun barrel to cant in a tilt to one side also causes misses.

Randall does not recommend that shooting be done in one's back yard. Instead, he urges beginners to join an organized gun club. The Boy Scouts, American Legion, 4-H Clubs, Future Farmers of America, high schools, colleges and other organizations sponsor instructions for young people in cooperation with the National Rifle Assn. ★★★

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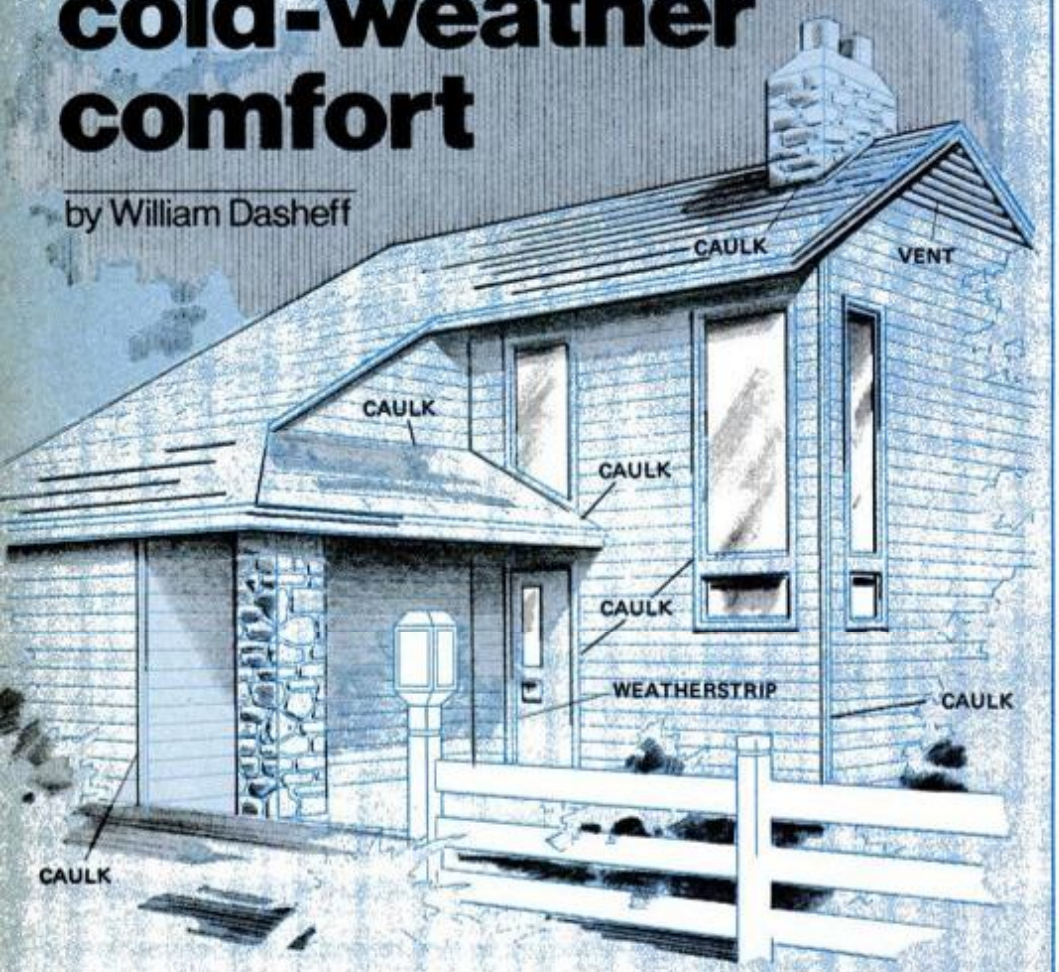
SAVE YOUR HEATING DOLLARS

Button up now for greater cold-weather comfort

by William Dasheff



These days, with the steadily increasing cost of home heating and the ever-present fuel shortages, the average householder can no longer afford to ignore any opportunity to economize in heating his home.

Don't be lulled into thinking that a warm, cozy house automatically indicates that heating energy is being efficiently utilized. On the contrary, a comfortable temperature level is often maintained while expensive heat loss goes unnoticed because the furnace furiously works overtime to push up the heat that the thermostat demands.

The point is, if you want to obtain the full benefit of economy of fuel consumption, you must take steps to be sure your home is fully protected against undue heat loss.

When winterproofing your house, don't be fooled by the size of an air leak; bear in mind that a lot of small leaks over a winter can add up to costly, unnecessary waste of energy. For example, an opening of just 1 sq. in. can represent a heat flow of about 55 B.T.U.s per hour. Thus, a ¼-in. crack under a 3-ft.-wide door provides 9 sq. in. of flow space, which translates into a cost per winter of at least $6.75 in wasted heat (based on oil heat and Cincinnati climate). Multiply this figure by the number of cracks and openings you can find in your home and you will have a pretty accurate idea of just how many fuel dollars you have thrown away.

Obvious energy-saving moves include avoidance of wasteful fuel consumption due to an inefficient furnace. To prevent this, you can engage a professional to inspect your heating plant prior to the heating season.

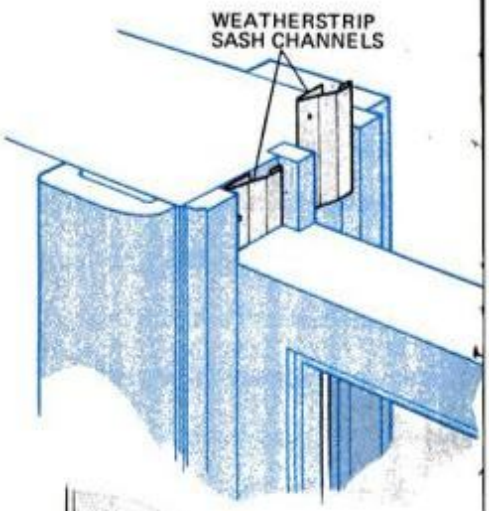
You can also greatly reduce heat loss by adding floor, ceiling and wall insulation and by installing storm windows. But, even with such major improvements, it still pays you to eliminate as many small heat leaks in your home as possible.

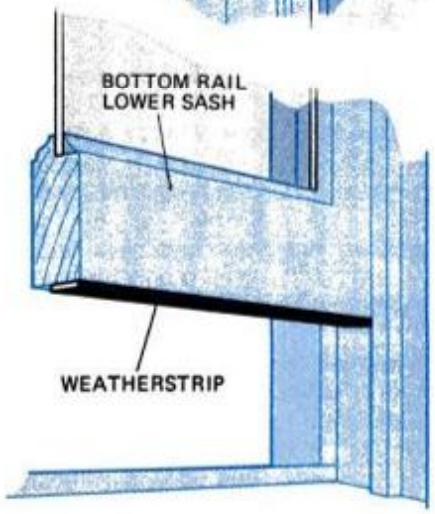
Here are eight ideas for buttoning up your home this winter. ★★★

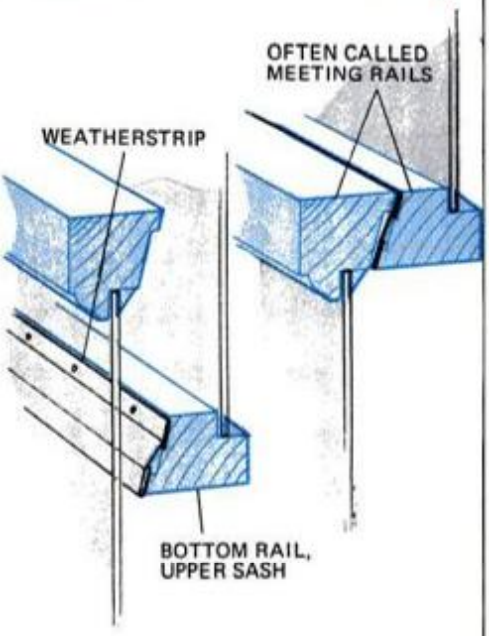
Weatherstripping

WINDOWS

Be sure that any unweatherstripped window (or door) in your home is fixed. On double-hung windows, fasten weatherstripping down full length of all sash channels, making sure that window operation remains unimpeded. Apply weatherstripping to horizontal members shown.



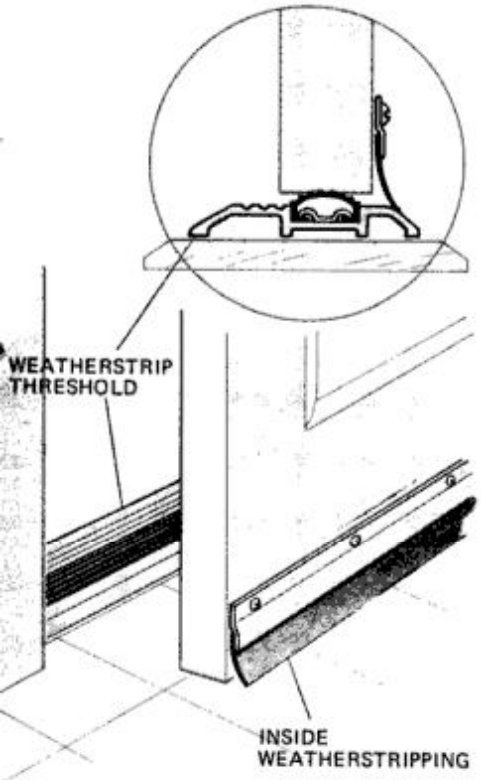


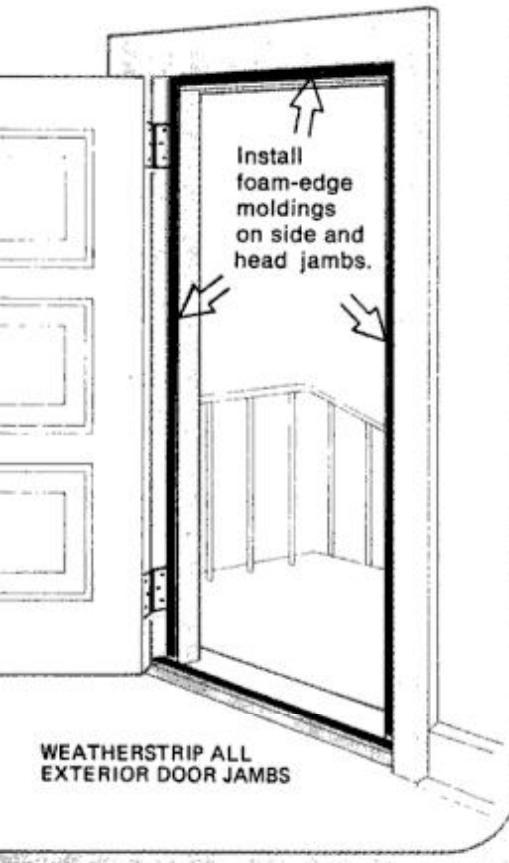


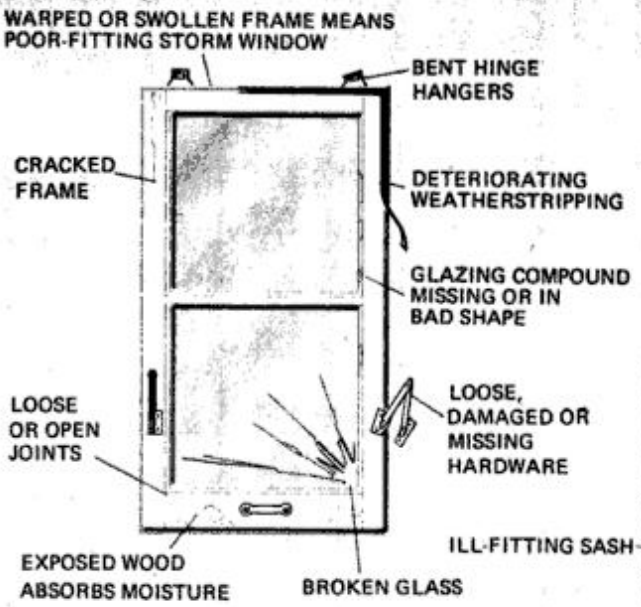
Art: Fred L. Wolff

DOORS

You should weatherstrip doors, too, for maximum draftproofing. At the door bottom, install an interlocking threshold or spring-loaded weatherstrip device, or both. Apply weatherstrip-stop (foam glued to molding) to door jambs as shown below to eliminate any drafts.







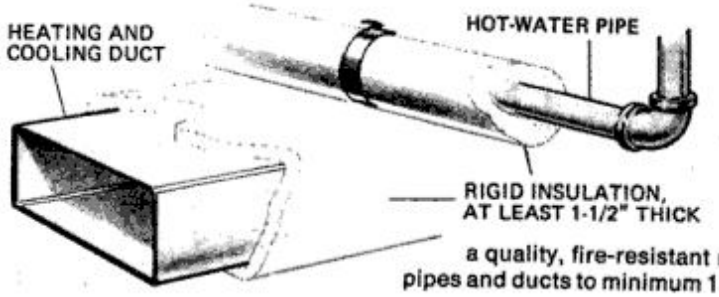
Storm windows

Valuable energy savers, storm windows reduce up to half the heat loss through windows. To be effective a storm sash must be snug in its frame; thus, ill-fitting ones should be replaced. Often, the fit can be improved by installing weatherstripping around the edge of the frame.

Window maintenance

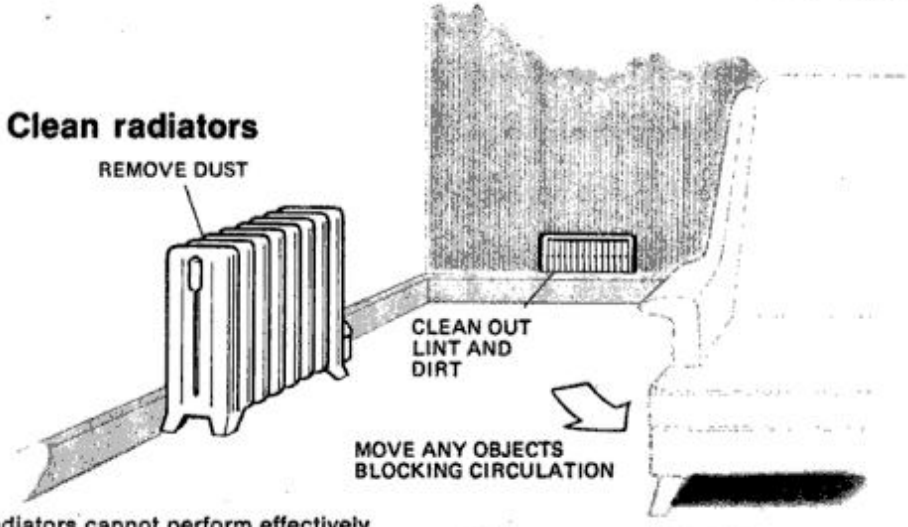
If left in a state of disrepair, damaged or loose-fitting windows can be costly sources of heat loss. Replace any cracked or broken panes, sealing with a quality glazing compound; also inspect for crumbling or missing compound; make sure windows shut properly.

Insulation



Whether heat is distributed throughout your home by pipe or warm-air duct, it makes sense to contain heat by insulating. Pick a quality, fire-resistant material and wrap pipes and ducts to minimum 1½-inch thickness.

Clean radiators



Radiators cannot perform effectively when covered with an insulating layer of dust. Similarly, dust and lint-clogging hot-air registers (cold air too) wastefully restrict the flow of heated air. Make it a practice to clean these areas regularly. Heating waste can be reduced by making sure there's adequate circulation.

Other sensible hints

Always close the damper when not using the fireplace. Also, check for and seal any draft-permitting tracks in hearth, fireplace or chimney—especially where the chimney and roof join. Remember that snug-fitting drapes offer an extra margin of heat conservation by reducing convection drafts created as warmed room air contacts cold windows.

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You can make your hardwood floors look like new again

It's a weekend job you can do yourself
even if the floors are so bad they need sanding.

by Wayne C. Leckey HOME AND SHOP EDITOR

Photos: Pierce & Stevens Chemical Corp.

The smoother the surface, the greater the reflection; the greater the reflection, the greater the gloss regardless of the finishing material used. Careful sanding makes the difference in producing a beautiful floor like this.

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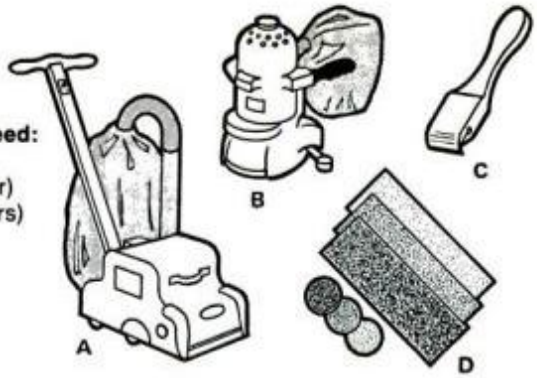
There's hidden beauty only a weekend away in those shabby wood floors in your home. Come Monday morning you'll be proud of the way they shine and equally proud of your handy self, not to mention the money you saved by doing the job yourself.

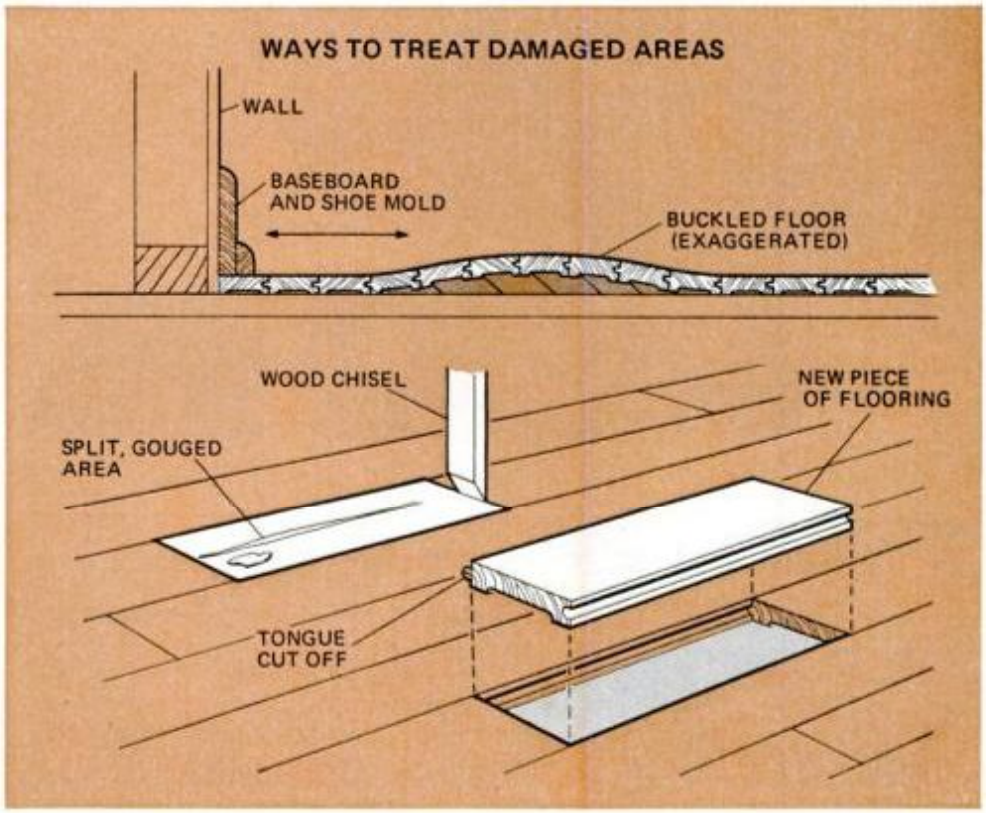
Putting beauty back into dingy, dull-looking hardwood floors is not beyond the ability of the average homeowner. Thanks to quick-drying, "mop-on" finishes and sanding equipment you can rent, making old floors look new again is not the chore it used to be. The new polyurethanes have done away with the conventional messy job of applying paste wood filler to oak floors. Now you simply flow on two coats of finish an hour or so apart and you are ready to move back in on a tough surface coating that never needs waxing.

Proper preparation of the surface is the most important part of refinishing hardwood floors. If your floors have simply lost their shine, but are in good condition otherwise, all it takes to prepare them prior to refinishing is a good cleaning to remove all traces of wax and other residue. However, if your floors have been neglected, the finish cracked, badly discolored and worn down to the bare wood in places, proper preparation requires more than just cleaning —the old finish must be completely removed.

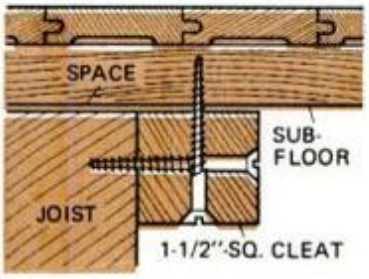
Power sanding is by far the most widely used method of removing old varnish from hardwood floors although paint and varnish removers

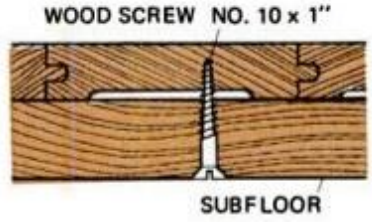
Sanding equipment you'll need:
- **A** Drum sander
- **B** Disc edge sander (edger)
- **C** Hand scraper (for corners)
- **D** Abrasive paper (discs and sheets)
  - 3½ (20)—coarse
  - 1½ (40)—medium
  - 2/0 (100)—fine

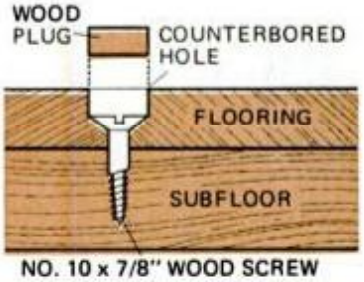




Two things to remember when using a power sander for the first time: 1. Always keep the machine moving once the drum is in contact with the floor; 2. When you want to stop sanding, first always lift the drum off the floor. This way, you won't sand gouges in the floor. Sand lengthwise to the boards, never across, and at a slow to medium walk, lapping each previous pass two to three inches. Accepted practice: start at one wall and move straight across to opposite wall, stopping at a safe distance from the baseboard.







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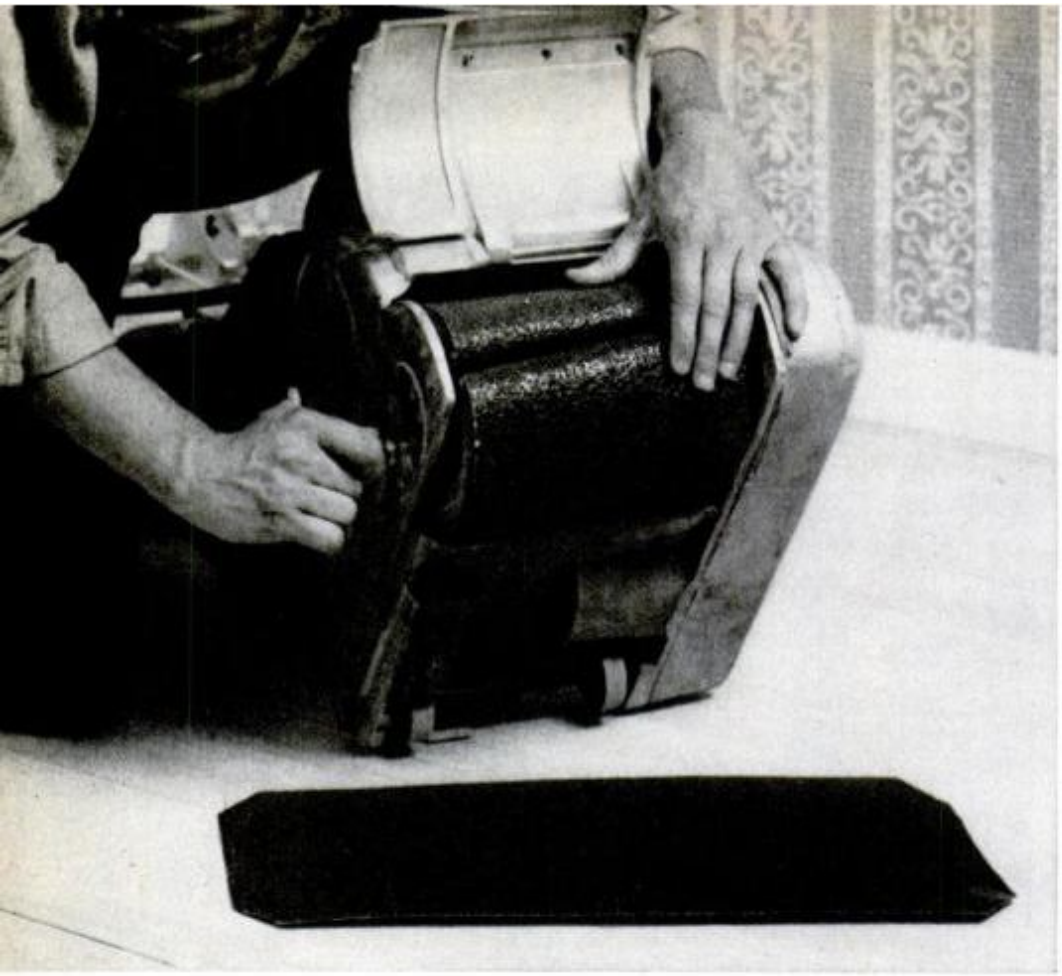
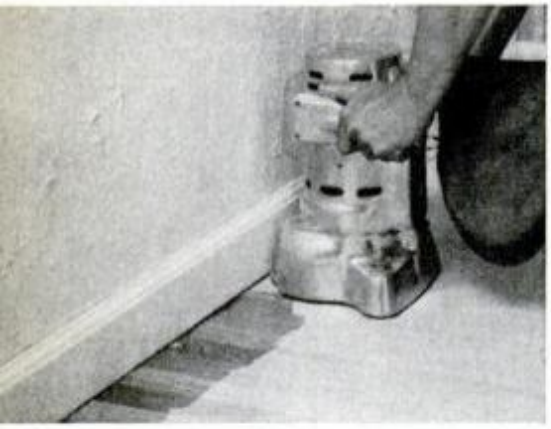


Changing abrasive papers is easy enough. Ends of paper are inserted in slanting slot in drum and clamped tightly by tightening with wrench.

BASIC SANDING OPERATIONS FOR OLD FLOORS			
FLOOR	OPERATION	TYPE OF PAPER	
Covered with varnish, shellac, paint	First cut	Coarse	3½ (20)
	Second cut	Medium	1½ (40)
	Finish Sanding	Fine	2/0 (100)



are sometimes used. However, there's more to surface preparation than sanding; there's the floor itself.

Go over the entire floor, renail any loose boards and sink and fill any protruding nailheads which would tear the sanding paper. Look for gouges and cracked boards, deep dents, as well as buckled areas in the floor. Where a board is gouged so deeply sanding will not remove the gouge or dent, you are faced with replacing the bad section with a new piece of flooring. This is done by literally chopping out the bad section with a sharp chisel, being careful not to cut into adjacent boards, and squaring off ends of the cavity so the fill-in piece will fit perfectly. The tongue on the new piece is planed off and glue and finishing nails are used to hold it in place. Nailheads are set below the surface and puttied.

Disc sander called an edger takes over along baseboard where drum sander can't reach. Coarse, medium and fine abrasive papers are used in same sequence as drum.

Dust bags on sanding machines catch a lot of dust but not all of it. Use your vacuum sweeper to thoroughly clean the floor, baseboards and windowsills.

This is the time, too, to take care of squeaks in the floor. When you can get at the floor from the basement, screws driven through the subfloor and up into the hardwood flooring will often silence a squeak. When the floor is inaccessible from below, screws can still be used in counterbored holes drilled in the top surface and capped with wood plugs. Buckled boards in a floor, often caused by inadequate nailing or insufficient space under the baseboard for normal sideward expansion, present more of a repair problem. There's little you can do but pull them up and re-lay them.

Paint and varnish removers are used only when the floor area involved is small, such as a closet or when refinishing is limited to the border surrounding a rug, or when circumstances make it impractical to remove the old finish with a power-sanding machine.

The purpose of a liquid remover is to soften the old finish (paint, varnish, shellac) so that it can be easily scraped, wire-brushed, or otherwise removed from the surface of the wood. To retard evaporation (and keep the remover "wet" longer so that more time is allowed for softening the old finish), most liquid removers contain a "bodying agent" such as wax, paraffin or oil. Traces of this "bodying agent" remain on the floor—especially in cracks between boards after the finish itself is completely removed, and even though the surface appears to be perfectly bare.

Very often this residue will cause slow drying or other serious, unfavorable results when the new floor finish is applied. Therefore, it is important that all traces of this "bodying agent" residue be thoroughly removed, using a water-soluble wax-removing powder (such as Wax-Off or the equivalent). After this cleansing operation, the floor should be allowed to dry completely before the new finish is applied.

Before you start sanding, carefully pry up the quarter-round molding along the baseboards, open all windows and close doors to adjoining rooms. Sanding is a three-step procedure in which you use coarse,

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medium and fine abrasive papers in the order given.

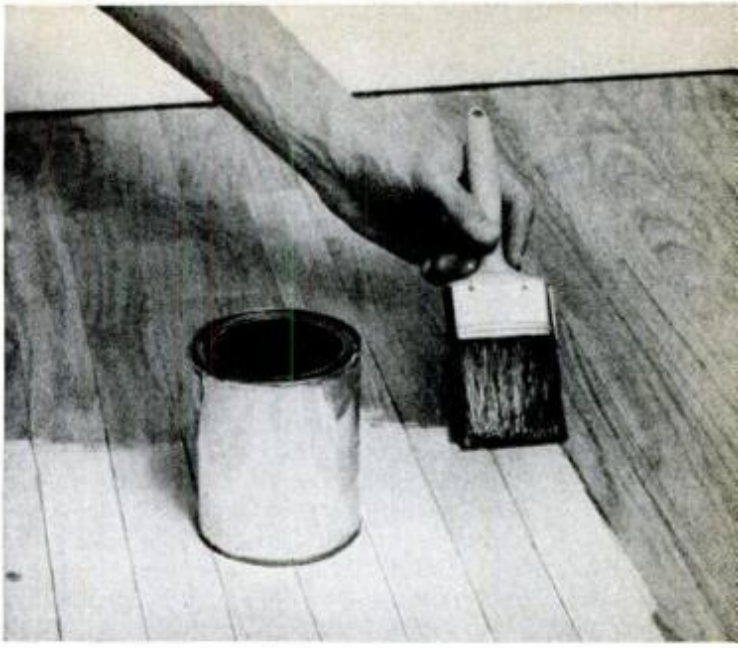
The initial cut is made with No. 3½ (20 grit) paper, the second cut with No. 1½ (40 grit) paper and the finish cut with 2/0 (100 grit) paper. The coarse open-coat paper is used solely to cut through the old thick finish down to the bare wood, the medium paper is used to remove the roughness made by the coarse paper and the fine paper is used to produce a perfectly smooth surface. You should not skip the third sanding step just because the floor feels smooth enough. A final sanding with fine paper is most important and makes the difference in the quality look of the finished job.

Sanding is done with the grain, never across, and with straight passes. Start at one wall and slowly walk the sander forward toward the far wall. Then retrace the same path walking backward. Each forward pass should lap the previous pass two inches or so. To sand as close as possible to the starting wall after the floor is sanded from end wall to end wall, turn the machine around and head in the opposite direction. The one thing to remember when using a drum sander is to keep it moving forward as soon as the revolving drum contacts the floor. If you don't, you'll sand deep depressions in the wood. Before you stop sanding, always lift the spinning drum off the floor for the same reason. You can rent floor sanders from tool-rental stores, sometimes from paint dealers. They also have the three kinds of abrasive paper you'll need.

A second sander called an edger is required to sand the floor along the baseboards where the drum sander can't reach. It uses sandpaper discs and the same three-step sanding sequence—coarse, medium, then fine—is followed. In corners where even an edger cannot reach, you'll have to use a hand scraper to remove the old finish.

When the sanding job is complete, go over the floor and windowsills with a vacuum cleaner. It's important that the floor is thoroughly clean of sanding dust before the finish is applied.

The finish you pick should be applied to your newly sanded floor as soon as possible to prevent the penetration of moisture from the air into the bare wood. Be sure to open windows to provide adequate ventilation and promote drying. Tough synthetic resin finishes, such as Fabulon, dry tack-free in about 15 minutes, ready for the second coat in one hour. Flow on the finish as it comes from the can with little brushing or rolling, letting it seek its own level.



Applying the finish with a roller makes job go a lot faster when there is a lot of floor to cover. Application by brush is recommended when room is small and closets are to be done. Roller application still requires use of brush to get into corners and close to baseboard. Flow on the finish, letting it seek its level. To keep from marking up the floor, it's best to work in your stocking feet.

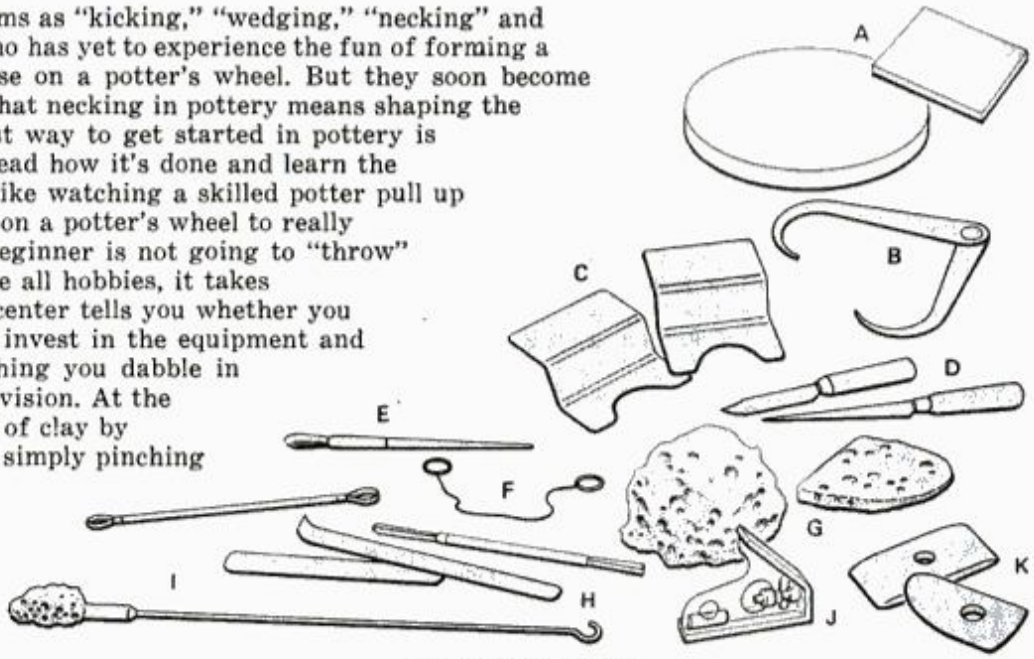
The first coat should be hand-sanded lightly with fine abrasive paper before the second coat is applied to remove the slightly raised wood fibers which feel rough to the touch. Two coats of finish will produce a radiant satin sheen. A thinned third coat (four parts resin, one part reducer) applied at least four hours after the second coat, will give a brilliant high gloss. Let the third coat dry overnight. Finally, replace the baseboard molding and you're ready to move in. If you wish to darken the floor, use pigmented wiping stain in desired color, following manufacturer's directions. Stain must dry overnight and be wiped thoroughly with clean, dry cloths before applying the finish. ★★★

Материал предоставлен Московским домом

Turn on your family's by making a

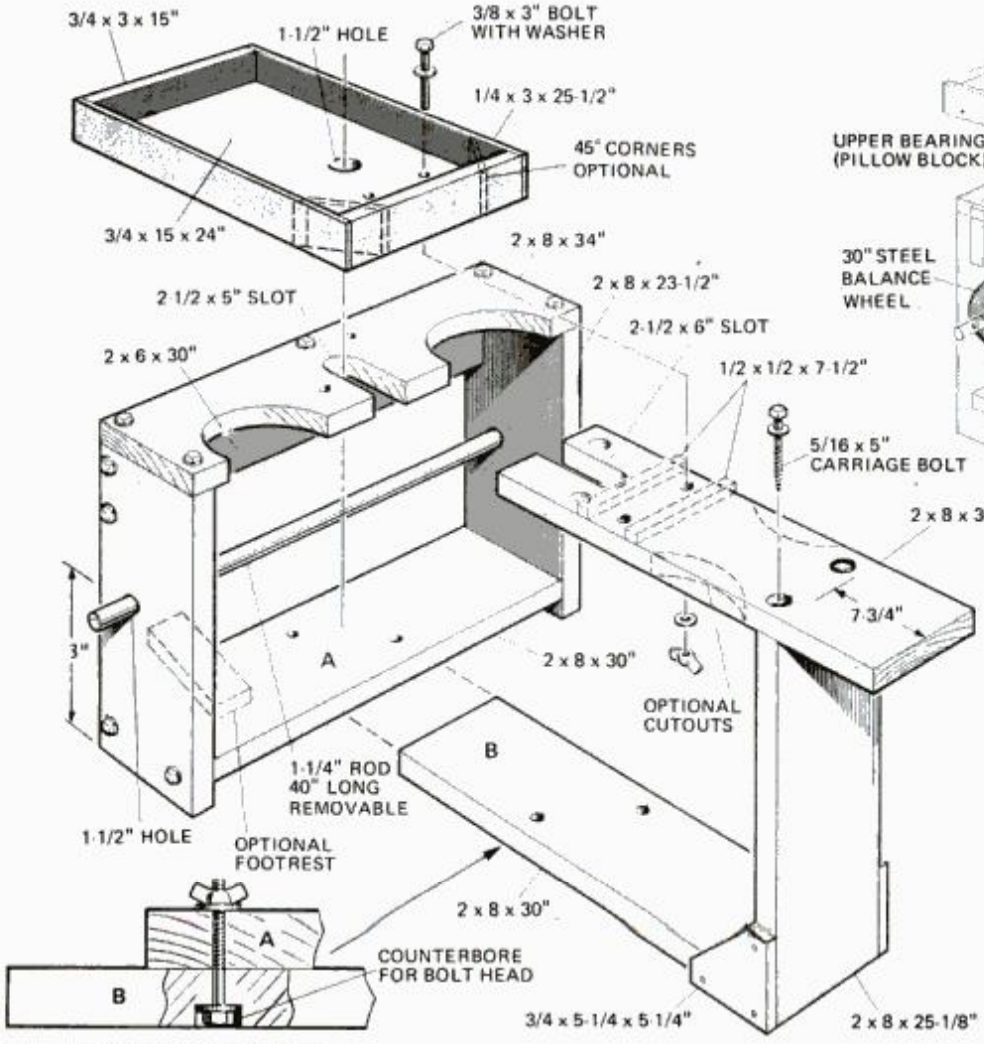
by Susan Lancaster

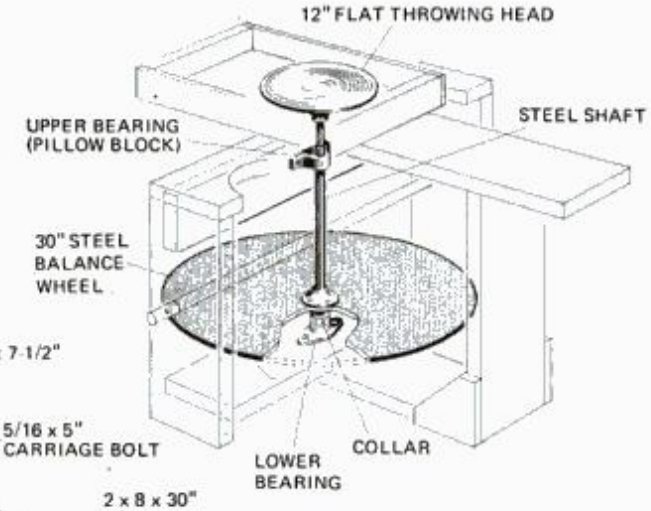
Like a foreign language, such terms as "kicking," "wedging," "necking" and "throwing" are Greek to one who has yet to experience the fun of forming a hunk of clay into an attractive vase on a potter's wheel. But they soon become common parlance, and you'll know that necking in pottery means shaping the neck of a pot. I found that the best way to get started in pottery is to take lessons. The beginner can read how it's done and learn the fundamentals, but there's nothing like watching a skilled potter pull up a pot from a mass of spinning clay on a potter's wheel to really see how it's done. Even then, the beginner is not going to "throw" a perfect pot the very first try. Like all hobbies, it takes practice. Taking lessons at a craft center tells you whether you really want to take up pottery and invest in the equipment and tools required. Pottery isn't something you dabble in like needlepoint while watching television. At the start, you'll form simple shapes out of clay by hand, using coils or slabs of clay or simply pinching a ball of clay into a pot with your thumbs and forefingers in much the same way that kids do in kindergarten. But most useful



TOOLS YOU'LL NEED

A Plaster bats
B Calipers
C Lifters
D Paring/potter's knife
E Pointer
F Cutting wire
G Natural and elephant-ear sponges
H Foot rimmers
I Sponge on stick
J Level
K Wooden ribs





You can save money by making your own potter's wheel from a kit such as this one which includes a 12-in. aluminum throwing head, shaft and bearings, and a 30-in., 100-lb. balance wheel faced with rubber for foot traction. You provide the wood. Coordinated foot movements on the balance wheel control starting, stopping and speeds for throwing. The kit sells for $144 f.o.b. from American Art Clay Co., Inc., 4717 West 16th St., Indianapolis, Ind. 46222. Details at left show how to build bench. Note optionals in making tray and seat.

Art: Fred L. Wolff

creativity potter's wheel

Kick wheels depend on foot power for their motion. The potter sits astride a bench and turns a heavy flywheel by foot. The flywheel, in turn, spins a wheel head on which the clay is formed.

Color photo: Stephen Fay

1 "Wedge" clay to remove air bubbles and form two or three lumps softball size. Then slam one lump on center of wheel head, or on a moistened bat, to make it stick. Bat is 1-in.-thick plaster cast stuck to head with clay.

2 Set wheel in motion by kicking it forward with the right foot. When spinning, remove foot and begin working clay ball with hands to center of wheel. Keep clay and hands wet; and do not kick and shape at the same time.

3 When clay is centered, open it with thumbs, working them down slowly to about ¼ in. from base. A steady hand control is important; brace right elbow against your side to help hold hand and arm in a fixed position.

7 As it becomes necessary the uneven top is trimmed with a pin tool. This is done to maintain the clay balance so the cylinder will remain centered. Trim the top just enough to level the top rim of the turning clay.

8 Continued upward pulls will produce larger cylinder with thinner wall. As wall thins, kick-wheel speed should be slowed down. If at this point work collapses, remove clay and start fresh with another ball of clay.

pottery—mugs, plates, bowls, planters—come from the potter's wheel. Seeing a shape emerge from a blob of clay seems like sheer magic. It's what hooked me on pottery and made me decide I must have a wheel of my own. Even if the studio where you take lessons has plenty of wheels, you need your own to practice on if you want to make much progress. Taking lessons without working between times is like studying piano without practicing.

After the pot has been shaped, trimmed and dried, finishing it requires materials and equipment difficult for the beginning potter to assemble on his own. This is another good reason for the novice to link up with a studio. The place where you take lessons will usually let you glaze and fire your pieces for a fee even after the course is over. First the dried piece, known as green ware, is fired in a kiln, either gas or electric, until the clay takes on the characteristics of an ordinary flowerpot. It is now known as bisque and is ready for glazing. Some studios use ready-mixed glazes and some mix their own and store them in big crocks in which the pots can be dipped. After the piece is glazed, it is fired again at a very high temperature. At the studio where I work, stoneware pottery is fired to 2350°F. in a gas kiln. This final firing produces a glasslike surface and makes the pot extremely durable.

The main costs of starting in pottery are the purchase of a wheel or a kit to build one and the initial lessons. Typically, lessons cost $5 to $7 for a three-hour session and are given once a week for 10 to 14 weeks. A separate charge for clay, glazes and firing is made on top of this. However, clay is cheap—about 12 cents a pound for stoneware clay—and the tools needed by a beginner are simple and often can be found in your own home.

I started with a knife and fork from my kitchen, and a sponge (used to wet the clay while throwing) from the cosmetics section of a drugstore. I cut off the corner of an old chamois to smooth the rim of the pot after throwing it, and I found a thin but strong piece of wire in the toolbox to cut the pot off the wheel head. You do have to buy trimming tools to

HOW TO WEDGE CLAY

Your clay is made workable by a process called wedging. Similar to kneading dough, wedging is done before the clay is placed on the potter's wheel, a necessary step to remove air bubbles and pockets from the clay.

First your clay lump is cut in half. Then one half of it is slammed down on top of the other, with cut side out. This step is repeated many times until the pockets of air are forced from the clay, and finally the well-wedged lump is shaped into a four-sided loaf by patting the ends with the hands.

Wedging the clay is a most important step, not only in removing air bubbles but in producing uniformity of texture in the clay.

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4 Start forming clay into cylinder by pulling clay upward with thumbs. Use little pressure with hands. Each upward pull will gradually thin the clay wall and make it taller. It will take two or three pulls.

5 For better control, join hands whenever possible by locking thumbs together or resting left thumb on right hand. When placing or removing hands, do it slowly to prevent clay from moving off center.

6 Since cylinders tend to flare out at top, they must be closed in by necking. This is done by cupping the hands around the center of the cylinder which makes the clay wall thicken and rise straight.

9 Use taut wire to cut work free of wheel head after trimming excess clay from base with wooden tool. Place wire under base; pull toward you. If work was thrown on bat, lift from wheel head, set work aside to dry.

10 If a bat was not used and the work was thrown on the wheel head itself, slide the work gently, after cutting free, onto a board or plaster bat and allow to dry. It will then be ready to be glazed and fired.

Photos: Golden Press

finish the bottoms of your pieces after they become partially dry—"leather-hard" is the term potters use. These tools are available at most art supply stores.

Later on I made some plaster bats—solid, dish-shaped slabs that you attach to the wheel head when throwing a pot and remove to let the pot dry. The plaster for making bats can be purchased from a hardware store, and pieplates make good molds.

Firing charges can be rather high, especially if you make big pieces. The rate might be $1 a pound at a commercial art center, somewhat less at an adult education center. This fee covers the cost of both firings and the use of the glazes. When you are more experienced, you can cut these costs by purchasing your own kiln and mixing or buying your own glazes. Although some people feel the gas kiln produces a more beautiful and subtle glaze, many find the electric kiln, with its more evenly distributed heat, provides more predictable results. Electric kilns range in price from $250 to $500 and portable gas kilns from $200 to $600.

For the beginner, however, developing skill on the wheel will be the primary concern. The accompanying pictures demonstrate the steps in forming the basic cylinder from which most shapes are made. It is useful to have such pictures to refer back to again and again as you work. But pictures and books can only go so far and a complete beginner will find it hard to learn without some instruction from a teacher.

For instance, the very first step in making a pot—kneading, cutting and pounding the clay to eliminate air bubbles and produce a uniform texture—is hard to pick up on your own. "Wedging," as the process is called, is most easily understood by watching a demonstration. Later, when your pot disintegrates in a soggy pile on the wheel head for the fifth time in a row, perhaps the teacher can tell you the one small thing you were doing wrong so that it won't happen again. It will be a while before the pot you see in your mind will be the one you end up with. But in time it will come and you will get great satisfaction from turning out handsome and useful things on your potter's wheel. ★★★

RECOMMENDED BOOKS

There are many books that are helpful to the beginning potter. Here are two suggestions:

The Complete Book of Pottery Making by John B. Kenny, Chilton Book Co., Philadelphia, publisher; $4.95

Throwing on the Potter's Wheel by Thomas Sellers. Professional Publications, Columbus, Ohio, publisher; $4.

For the more advanced potter:

Pottery, the Technique of Throwing by John Colbeck. Watson-Guptill, Inc., New York, N.Y., publisher; $10.

Clay and Glazes for the Potter by Daniel Rhodes. Chilton Book Co., Philadelphia, Pa., publisher; $12.50.

Step by Step Ceramics by Jolyon Hofsted. Golden Press, Inc., New York, N.Y.: $2.95.

Материал предоставлен горскинформом

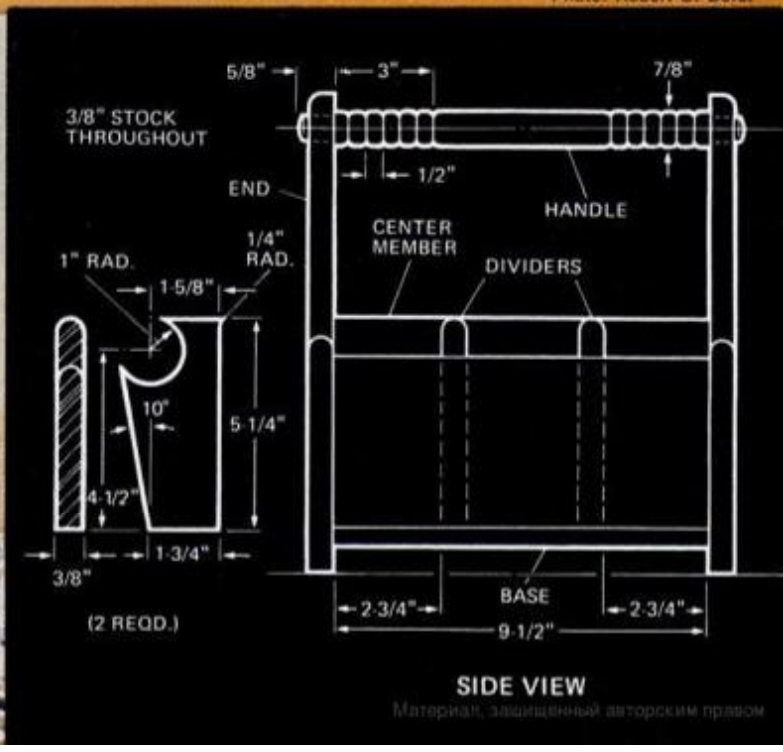
OLD-TIME GROCERY-BIN CANISTER

Photo: Frank Lusk

Two easy projects that add spice to your kitchen

SILVERWARE-AND-NAPKIN CADDY

Photo: Robert D. Borst



SIDE VIEW

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This miniature version of an old-time grocery-store bin will add a charming accent to your kitchen in the form of a five-in-one canister. It's made to hold half-gallon plastic food containers you can buy in housewares departments. You have the option of making five separate lids or a one-piecer that looks like five. The window openings are made in one strip, then cut apart if desired.

Windows are cut out by drilling 3/8-in. holes at corners of the openings, then jigsawing from hole to hole. Rabbets for 1/10-in. Plexiglas are formed with 1/8-in. thick strips. I used dabs of quick-setting epoxy to hold the plastic in place and 5/8 x 3/4-in. brass butts from Brainerd Mfg. Co., East Rochester, N.Y., to hinge the lids. You'll need 10 for 5 lids, 3 for one lid.—*Rosario Capotosto*

You'll find lots of use for this silverware and napkin caddy—it's extra-handy when serving a buffet meal. Except for the turned handle, the caddy is made of 1/2-in. walnut throughout. Both ends are identical and cut out at one time, the holes bored for the handle and the edges rounded. With the turned handle in place, the ends are fastened squarely to the center member with small screws in counterbored holes, later filled. Then the bottom is added.

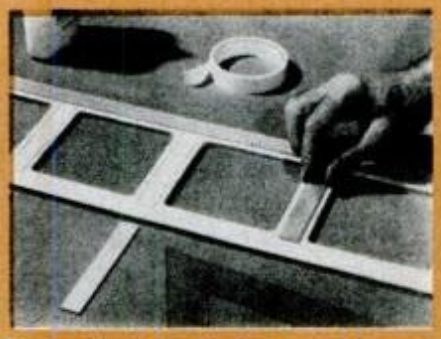
The two dividers are made to fit the round edge of the center piece by forming a 1/4-in.-radius lip at the top with a round file. They're screwed in place from the back. The two slanting sides are added last. I finished the caddy with Danish-walnut stain, followed by two coats of clear satin polyurethane.—*Martin Higgins*

Art: Peter Trojan

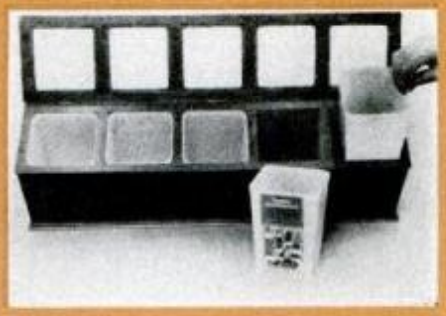
Butt-join, glue and nail 1/4-in. bottom to the six compartment dividers.

Double-up thickness of top with second 1/4-in. layer beveled at front.

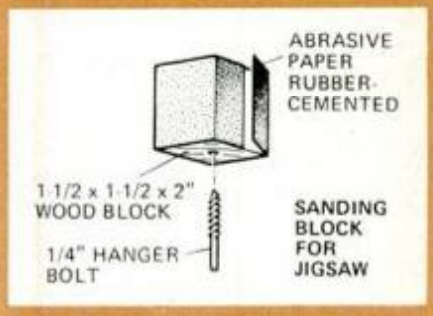
Use homemade sander in jigsaw to smooth edges of five window openings.



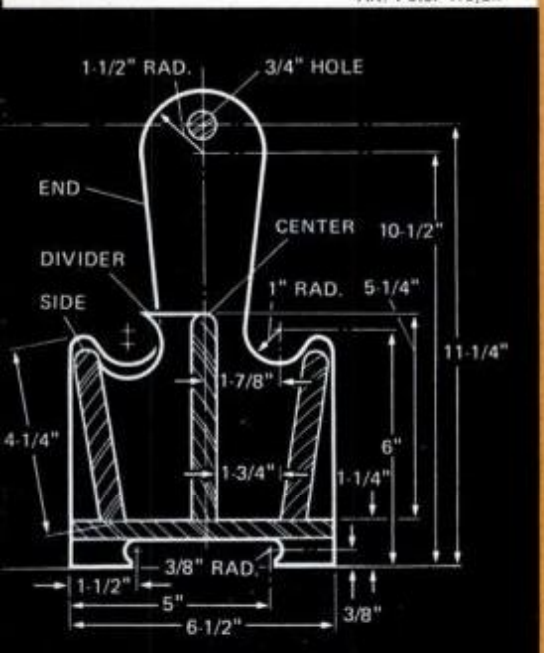
Form rabbets for window panes by adding 1/8-in. strips around openings.



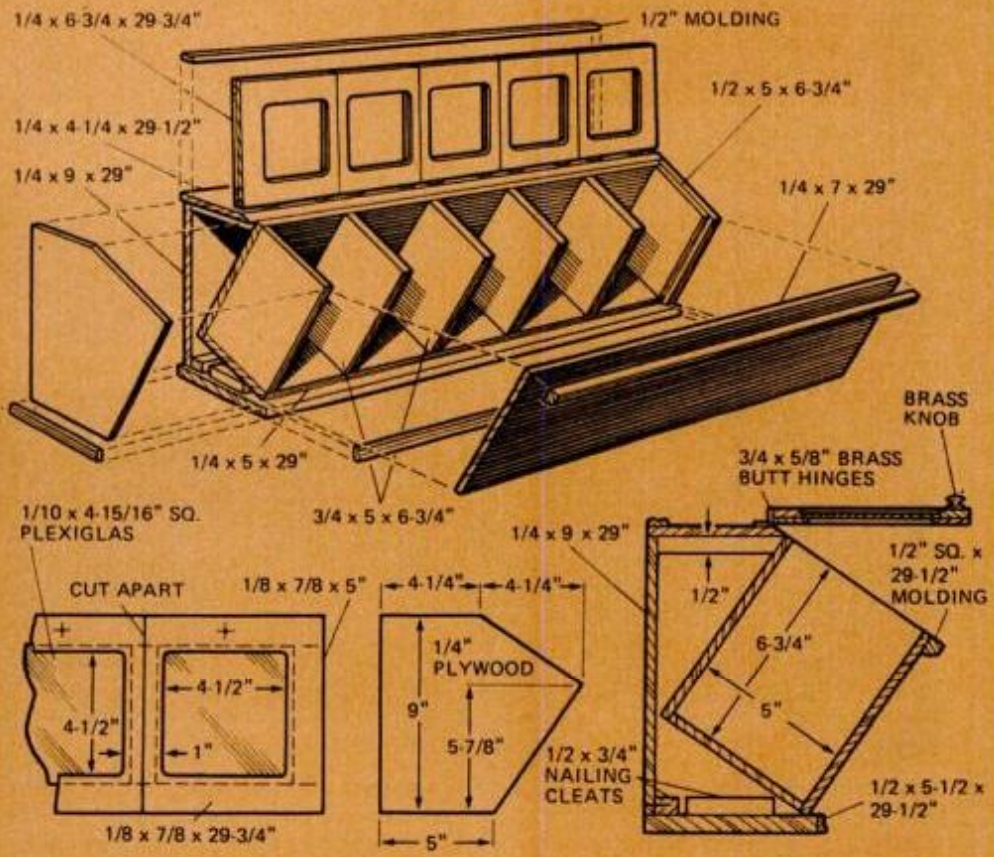
Standard 1/2-gal. plastic food containers are placed in compartments.



Hanger bolt in abrasive-covered block is chucked in jigsaw for sanding.



END VIEW, END REMOVED



UNDERSIDE OF LID

END PATTERN

END VIEW, END REMOVED

Build this handy butcher block

The old-time chopping block is finding great popularity in the modern kitchen. You can save up to $100 by making your own.

by Rosario Capotosto

Regular butcher blocks are true heavyweights with solid maple tops from 12 to 18 in. thick. Those sold for home use average about 10 in. thick. Some have solid tops; many are simply thin shells as little as 1¼ in. thick. I made mine 2⅝ in. thick and used poplar throughout instead of the traditional maple in the interest of economy and ease of fabrication. While poplar is considered a soft hardwood, it is none the less sufficiently hard as end grain.

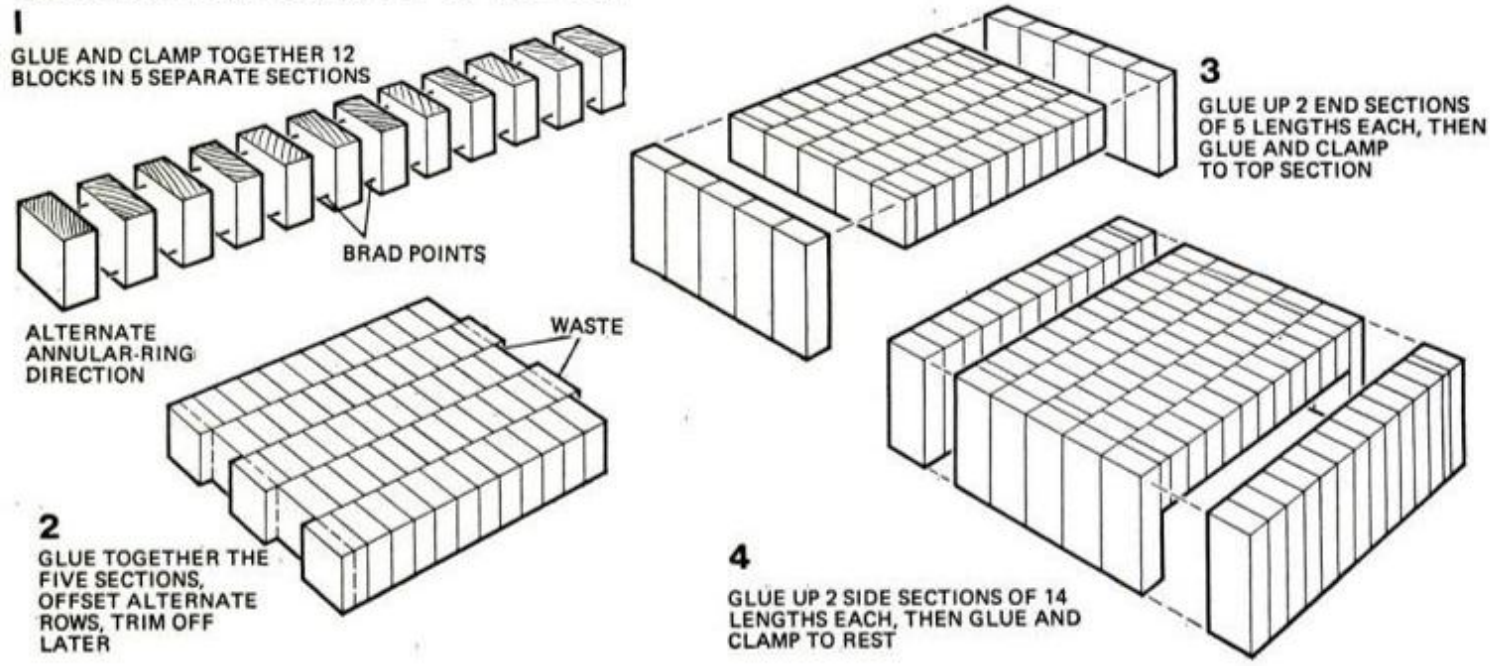
How to select the lumber

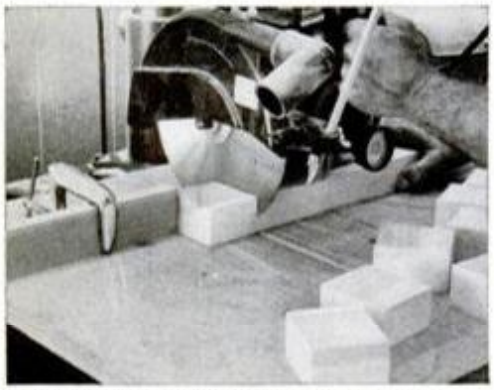
Start by selecting kiln-dry lumber which is sound and absolutely warp-free. You'll need 50 ft. of ¾ by 4 in. for the top and 18 ft. of 1¾ x 4¼ in. for gluing up the turning blocks for the legs. The dressed ¾ stock will normally measure 1 13/16 in. thick so that's the reason for the odd dimension of the blocks. The 1¾ stock is necessary for the legs in order to permit dressing to a full 4-in. square after gluing. The lumber should cost between $45 and $50. With $10 more for glue, abrasive paper, lagscrews and finish, you have a total of $60. A store-bought table of equal size and quality will run somewhere between $140 and $185.

Make 60 blocks for the top

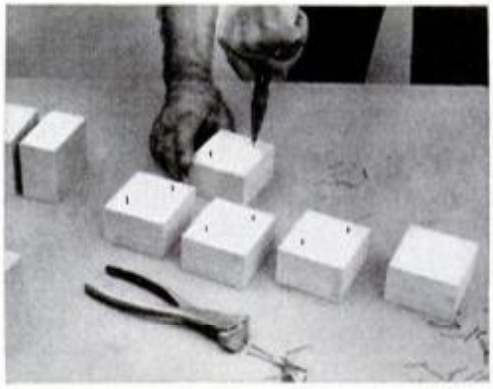
You'll find it best to work with easy-to-handle short lengths of about two feet. Rip and joint each piece exactly alike, then make the cross cuts to come up with 60 small blocks 3 in.

SEQUENCE FOR ASSEMBLY OF THE TOP

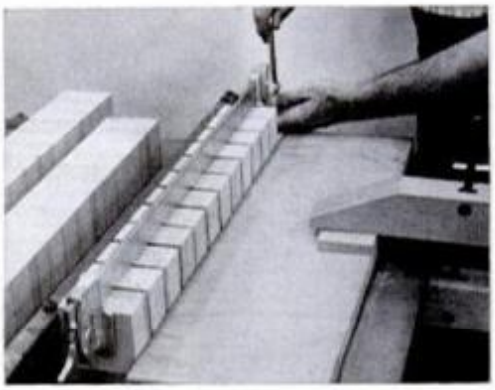




Use stop block clamped to saw's fence, plus smooth-cutting blade, for uniform blocks with nonsplintered edges.



Alternate annular rings of blocks, number blocks and insert headless brads in one side only to prevent shifting when gluing.



Use saw table and rip fence, plus board, as alignment setup for imbedding brads with bar clamp. No glue is used here.

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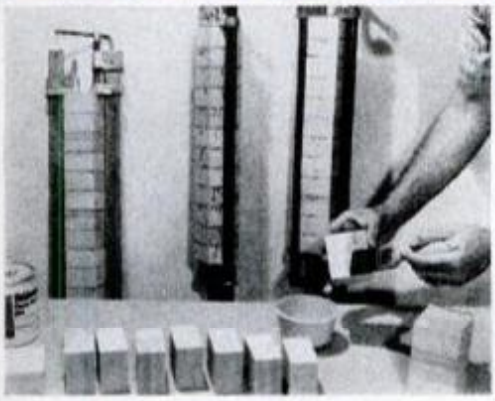
long. All rip and jointing cuts must be perfectly square.

Gluing the block is done in stages. Five rows of 12 blocks each are made up to start the top. Pairs of headless nails are used in all phases of gluing line-up to insure the necessary accuracy. Use 1-in. No. 17-ga. nails with the heads clipped off. Drill pilot holes in all alternate faces to a depth that will allow about ¼ in. of the points to protrude. Line up a dozen of the short blocks on the saw table and up against the rip fence, then clamp a straight piece of wood onto the table and up against the blocks to keep them in perfect alignment. Apply a bar clamp over the stack, then slowly tighten it to drive the nail points into each mating piece. Number the blocks, then separate them for gluing.

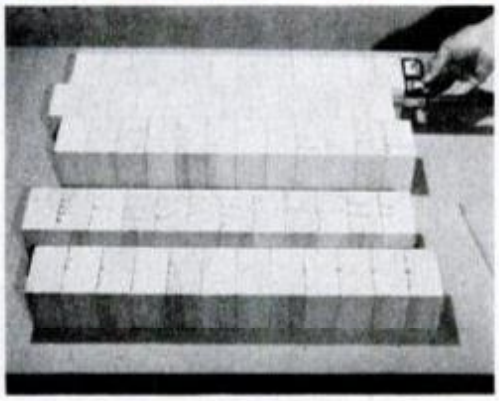
Use water-resistant, plastic resin glue and a postage scale for accurate proportioning of powder and water. This is important: If too thin, a mix will be weak: too heavy, it may begin to set before you get all the pieces together. Work with vertical stacks; brush a coat of glue on both surfaces, then insert the nailpoints into the holes of the stacked pieces. Apply pressure to the stack with two bar clamps. If you wait about an hour before scraping off the excess glue, it will come off much easier and with less mess. When the glue has dried, joint the surfaces of each block slightly to remove all traces of excess glue before proceeding to the next gluing step.

Line up the five stacks so an offset joint pattern results. This will necessitate cutting off a bit of waste on alternate ends. The offset pattern does two things: It makes a stronger top and adds visual interest. Follow the same procedure with a pair of headless nail-positioning pins to align the five stacks for gluing. When the basic top is glued, it will measure ap-

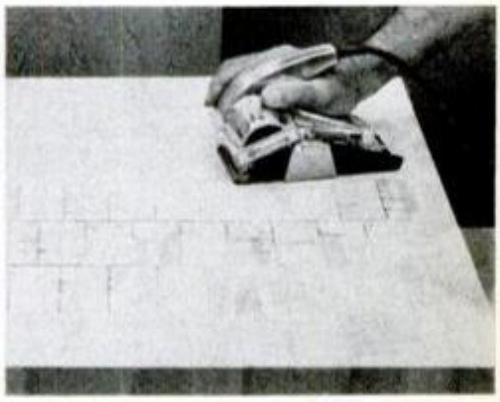
Color photo: Frank Lusk
Art: Fred L. Wolff
Styling: Gabe Herrick



Work fast when gluing blocks. Coat both surfaces, stack blocks vertically, use two bar clamps on each stack.

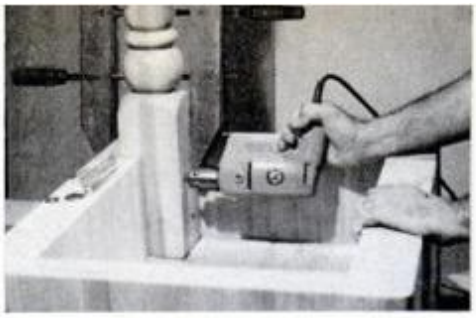


Line up five glued-up stacks so joints are offset, then mark projections for cutting off the waste at alternate ends.

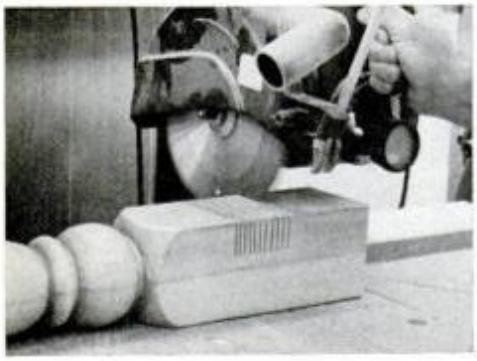


Use power block plane for fast surfacing of top, hand plane otherwise. Follow planing with belt and finishing sanders.

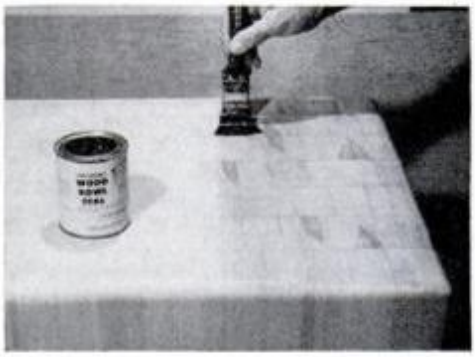
Rough-round leg blanks with gouge and run lathe at medium speed. Parting-tool depth cuts simplify turning four duplicate legs.



Clamp legs in place for drilling the pilot holes for ⅜ x 4½-in. lagscrews. Tighten lagscrews before removing the clamp.



Run series of kerf cuts to form notch at top of each leg. Hold work securely against fence with hand (not shown in photo for clarity).



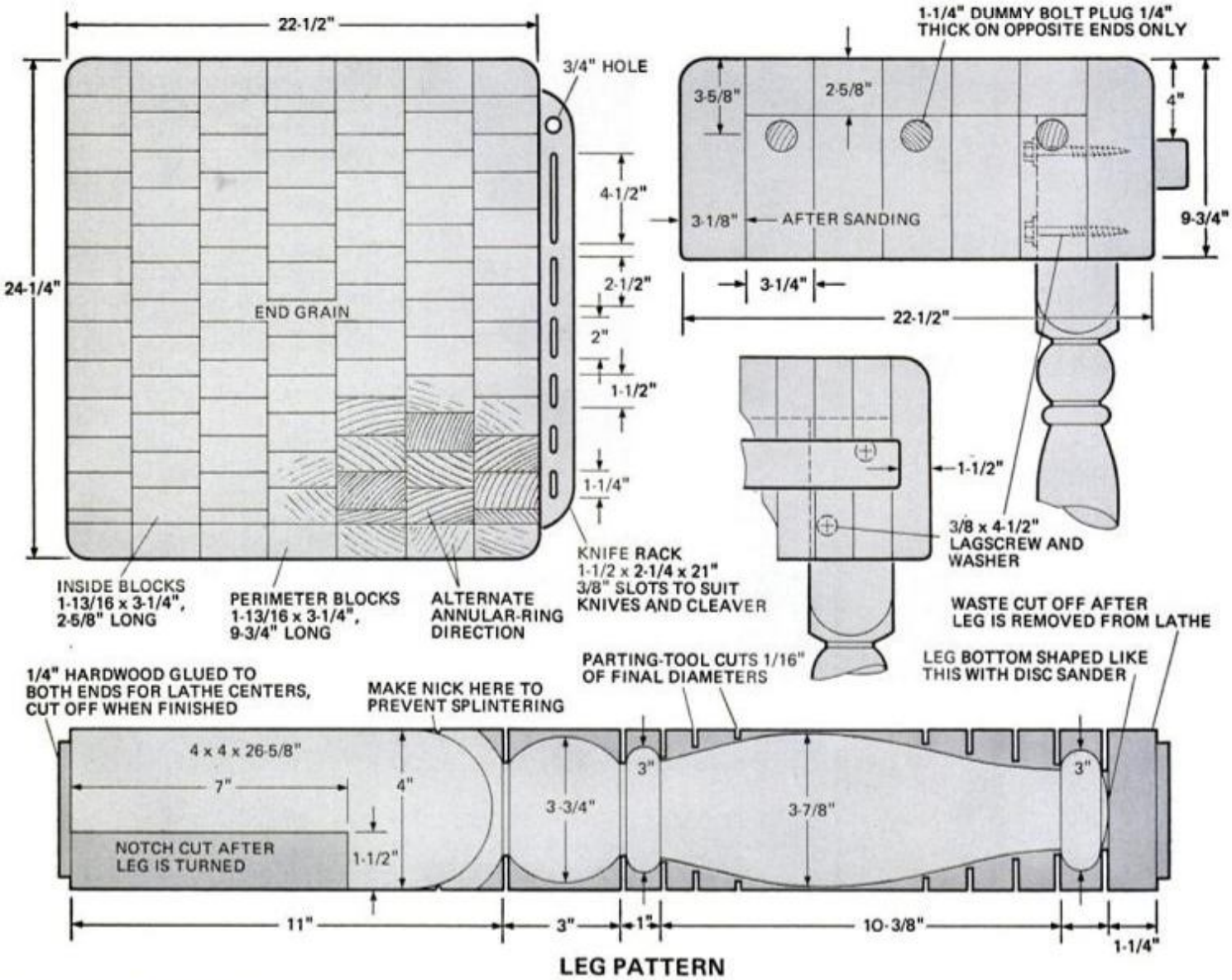
Apply single coat of special wood-bowl finish which produces excellent hard topping. Wood-glo was used to finish legs while each was still in lathe.

proximately 3 x 16 x 20¾ in. Joint the four sides, then put the piece aside while you work on the end blocks. The drawing shows the top thickness as 2⅝ in.; this reflects the removal of stock in the final planing and sanding.

Make up two ends consisting of five 10-in. pieces glued edge to edge and two side pieces composed of 14 lengths glued face to face. Note that one block of half-thickness is required in each of the two side assemblies. Use temporary clamped-on cleats during the gluing to insure that the surfaces glue up perfectly true. Kitchen wax paper will prevent the cleats from sticking to the work.

Dummy bolt plugs are used for effect on the end blocks. Drill shallow holes, about ¼ in. deep by 1½ in. in

(Please turn to page 124)



LEG PATTERN

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 (Continued from page 55)

tection. Not all finds will be money, of course, or even of valuable antiques. Often the real value is in the fun. Bob Barnes of Oklahoma City, for example, used detectors to "find" his family again: "I used to play golf three or four times a week, which made my wife and children unhappy. Now, we go bottle-hunting together.

"I work during the day, so my wife Marie researches leads in her spare time. But it's a family project. Each of us, including our three children, owns and operates a metal detector. Somewhere along the line we've contracted the bottle-hunting disease: if there's an air space surrounded by glass, we have it." Bottles, like greenbacks, must be located indirectly, usually through metal trash thrown out with them.

And even bottles have their value to collectors. Amber-colored fruit jars, for instance, sell for $25 to $100, depending on condition. A rare, cobalt blue Mason jar sold recently for $1000.

There's a less fanciful side to metal-detection, too—more down-to-earth, if that's possible. Detectors are in daily use to find buried pipes (installers of plastic pipes frequently leave detectible metal pieces at each joint in case the pipes should need to be located later), car keys lost in tall grass, even small metal parts tangled in shag rugs.

Metal detectors vary in price from about $40 to $600. For that, you get a noticeable variation in features and performance, but no specific performance guarantees. That's not a cop-out by the manufacturers, though: Because ground conditions vary so widely, no manufacturer can guarantee how large an object can be found at any given depth. In general, the bigger the object, the farther down you can find it; and objects that have been buried a long time are often easier to find, because their metal has corroded into the surrounding earth, presenting a bigger target.

The size of the search coil makes a difference, too: Bigger coils penetrate farther, but smaller ones can detect small surface objects, such as coins, that the big coils miss. Many detectors have interchangeable coils of several sizes, either supplied or as optional accessories including waterproof coils for underwater searches.

Most detectors, save for the very cheapest, have three ways of indicating when they're onto something: a speaker, a headphone jack (to disconnect the speaker), and a meter (to give you a better indication of the size and depth of your find).

Speakers may be more comfortable to use than headphones, but you'll prefer the latter when there are others around: Not only do they help you keep your finds a secret (wise treasure-hunters tell you everything about their finds but where they found them), but they also shut out noises that could keep you from hearing faint signals. What you hear depends on the instrument you own: Beat-Frequency Oscillator (BFO) or Transmitter-Receiver (TR), also known as Induction Balance (IB).

BFO metal detectors have two oscillators that beat against each other. What you hear are two frequencies: a slow "putt-putt" sound or a low tone in the absence of detectible material. But when you bring the detector's loop near metal, its influence unbalances one of the two oscillators, shifting its frequency and the audible difference tone.

With a TR detector, you hear nothing till it has picked up something—then you hear a tone that gets louder as the signal strengthens. The tone comes from a tiny, low-frequency radio transmitter, and is heard on a built-in receiver. But the receiver is balanced to pick up no signal till metal nearby unbalances the pattern. When it does, you hear the tone.

TR detectors cost more than BFO types, but many beginners find them easier to use: The difference between silence and signal is more pronounced than the difference between a low tone and a slightly higher one. TR types also are more sensitive, are easier to tune and tune more stably and respond faster, making it less likely that you'll miss a signal.

But BFO types, once you learn to use them, have advantages, too: Small changes in signal pitch are easier for most people to hear than equally small changes in signal volume. The full width of a BFO's loop is sensitive, too, while a TR's loop usually has a narrower sensitive area; that means a BFO can cover an area with fewer sweeps.

Some new BFO machines even discriminate for you between valuable objects such as coins, and less valuable junk such as bottle tops, flip-top can rings, and foil-wrapped chewing-gum packs. These BFO discriminator machines do have three disadvantages: They're not as sensitive as the best TR or BFO machines, cost more, and miss about five percent of the valuables a nondiscriminating instrument might find. Still, the time saved in not digging up useless metal junk seems more than worth the loss of an occasional plated ring or wire-mesh bracelet. ★★★

I TRIED IT (Continued from page 55)

around. "What's that?" "Oh, a treasure finder." "Does it work?"

"Sure," I said, flushed with the shutoff valve victory. "What treasure shall we find?"

Suddenly, there was a disconcerting pause. What treasure *was there* to find?

So with the quickness of a performer who sees his audience about to unload fresh fruits and vegetables on his stage, I dug deeply in my pocket, pulled out a handful of coins and threw them upon the troubled seas of mystery—in this case the side lawn.

"Let's make up a game." I quickly challenged, noticing that the natives were noting the exact position of each fallen coin. "If you find the coin with the locator, you can keep the money." This seemed to pique their interest. But I had a problem. How do you make the game honest? I mean every contestant could *see* the money.

"Blindfolds," I announced, grabbing my wife's scarf from around her neck.

And blindfolds it was. Though the game was only moderately successful, I have a feeling you could develop a fun hide-and-seek event using a metal detector for more than the occasional shutoff-valve hunt in the neighborhood. Now if only the makers would come up with a mini detector to find lost contact lenses, too. ★★★

AMC: '76 SERVICE TIPS

(Continued from page 81)

ditioner, driven by the innermost belts, have two-belt protection. Power steering is the only key system run off a single belt from the crankshaft—that belt is outermost, therefore easiest to change. The air pump is on a single belt driven by the power-steering pump, but its failure would not mean a road emergency.

Electric-assist choke

Many cars have electric heaters to speed the choke's opening at warm temperatures, for lower emissions, but only AMC's runs on alternating current. The a.c. heating system, tried on V8s last year, will see wide use in 1976 for the first time, as AMC extends it to most six-cylinder cars, accounting for over 80 percent of AMC production.

An a.c. tap is built into the alternator, and a wire connects it to a bimetallic switch with a heating coil in the choke housing. When the choke temperature reaches 80°F. after a cold start, or cools to no lower than 60° after engine shutdown, the switch is closed, letting current flow from the alternator. A metal plate attached to the heating coil and the choke's thermostatic coil transfers the heat to speed choke opening. At low temperatures with the bimetallic switch open, the choke reacts to engine heat only, so that it opens more slowly.

To check current flow to the choke, begin with a cold engine, disconnect the wire from the choke and connect a 6-v. (or 12-v.) test lamp in series (one lead to wire, other to choke housing terminal). The lamp should not light. If it does, the choke will open too quickly, resulting in cold-engine stumble. Cause: faulty bimetallic disc switch; replace.

Warm up the engine and again hook up test lamp. It now should light, perhaps very faintly. Note: a.c. voltage is only 6 or 7, so if you use a 12-v.-only test lamp, it may not light at all. *Warning*: Do not disconnect wire from choke terminal and scratch it on an electrical ground, to confirm current flow. This could damage the alternator. ★★★

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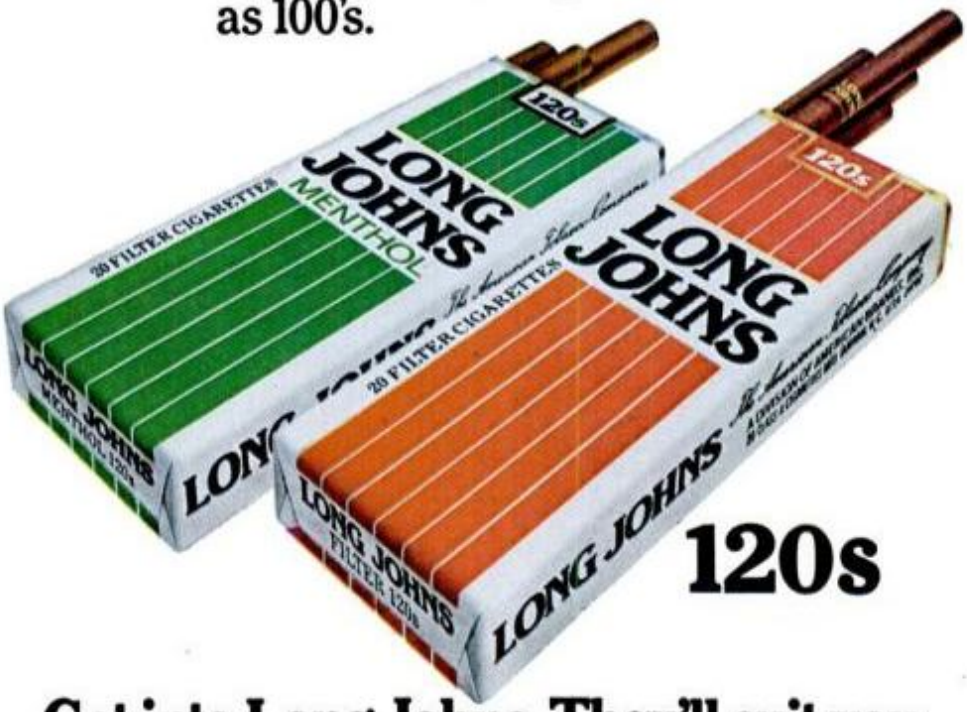

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1976 Vega wagon. Built to take it.

A tough body.

Corrosion is going to find the 1976 Vega wagon tough to get at.

The reason being a new extensive protection program for 1976.

It makes use of special corrosion-resistant metals and coatings . . . at the fenders, windshield, doors and other vital areas.

A tough 60,000-mile 5-year engine guarantee.

Chevrolet guarantees the 1976 Vega's 140-cubic-inch 4-cylinder engine for 60,000 miles or 5 years . . . whichever comes first. Any authorized Chevrolet dealer will make repairs, without charge to the owner, during the term of the guarantee, to the cylinder block, cylinder heads, all internal engine parts, the intake and exhaust manifolds and water pump, made necessary because of defects in material or workmanship.

Of course, this guarantee does not apply to repairs required because of misuse, negligence, alteration, accident or lack of reasonable or proper maintenance.

See your Chevy dealer for full details of the guarantee. This 5-year/60,000-mile engine guarantee is an added value feature included in your 1976 Vega wagon.

And talk about practicality.

The Vega wagon and Vega Estate (a neat "woody" version) seat four adults with storage room behind the second seat.

Flip down the second seat though, and you can take up to 50 cubic feet of cargo through the rear liftgate.

1976 Vega wagon. It's built to take it.

Part of Chevy's full line of 1976 wagons.

Being *America's Family Station Wagon Builder* means offering wagons for all kinds of American families.

And we do.

Chevelle. Mid-size, that's a good size.

For many families, Chevelle is just the wagon.

Not too large, not too small. Just right.

It's available as a 2-seat or 3-seat wagon. The tailgate lifts up and out of the way.

On 3-seat models, the third seat faces to the rear. And swing-out rear quarter windows give added ventilation.

Standard equipment includes Turbo Hydra-matic transmission, power steering, power brakes, steel-belted radial ply tires and the Chevrolet Efficiency System.

Choices: Malibu, Malibu Classic or Malibu Classic Estate.

Chevrolet. Full-size, comfortable, practical.

For families with larger needs, we offer two choices:

Impala and Caprice Estate. 2- or 3-seat. On the 3-seat, the third seat faces forward.

Standard features on both include Glide-Away tailgate, power steering and power brakes, Turbo Hydra-matic transmission, steel-belted radials, a 400-cu.-in. V8, the Chevrolet Efficiency System, and lots of elbowroom.

Suburban. Some call it Superwagon.

It's built on a tough truck frame, yet Suburban has a comfortable wagon interior.

It seats up to nine with available seats, carries about half again as much as many wagons, and can move about seven tons including trailer, passengers, luggage and Suburban.

Sportvan. The family space vehicle.

It can seat up to 12 with available seats.

There are wide-opening double doors in the rear, and a sliding side door that needs only 4½ inches clearance.

And rounding out Chevy's wagon lineup . . . Blazer, a go-almost-anywhere fun vehicle.

Chevrolet

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NEW TRAINS (Continued from page 53)

ing, that of the freight business.

New cars, like a monstrous boxcar able to carry 30 new compact autos strung up like sides of beef, have kept the freight business competitive with trucking.

There is even an idea for a futuristic freight train able to run on existing track. Looking something like a multilegged caterpillar with the bill of a platypus, the Coaxial Train would have no cars: Instead, the long train would snake around curves as a single flexible unit, with a wheel every four feet on each side. Each wheel would have its own small motor, powered by electricity from onboard diesel generators—sort of the four-wheel-drive principle, multiplied hundreds of times. The Santa Fe Railroad, which developed the concept several years ago, claimed it would make possible higher speeds, longer trains and heavier loads. But the idea has been sitting in the file cabinet of somebody at DOT the last few years, and there are no plans to pursue development right now.

Some private American railroads are working to upgrade track. Main lines are slowly being relaid with continuous welded rail. Normal rails are 39 feet long, and are held together by joint bars that must be tightened constantly. Wheels wear out, track bends at the joints, ballast is pounded down. Welded rail, on the other hand, has no joints: It is laid in 1440-foot lengths, and these are welded together in the field. Where welded rail appears, the only loss will be felt by romantic passengers who miss the clackety-clack of jointed track.

With diesel fuel costs up nearly 200 percent in two years, railroads have been looking at the possibility of large-scale electrification. At present only 1100 route-miles out of 200,000 in America are electrified, practically all of that between Washington and New Haven, Conn. One study showed that using electric locomotives could reduce energy costs by 34 percent; Another study found that 22,000 miles of track had sufficient traffic to warrant electrification. GM is interested in the possibilities for extensive electrification: It recently rolled out a prototype 6000-hp all-electric locomotive for freight, and is at work on a 10,000-hp locomotive. So why don't you read about electrification projects? Because the cost of electrifying can run anywhere from $55,000 to $100,000 a mile. It seems unlikely any large-scale electrification will take place without massive government support.

Right now the object of the game being played in Washington is to find a way to improve track so that 120-mph trains can go 120 mph, without upsetting competitive railroads, trucking firms, banks with claims against bankrupted roads, or the taxpayers, whose money must eventually be spent in huge amounts.

One proposal in Washington is to put a WPA-like labor force to work improving roadbed with federal money, thus providing needed employment in a sensible place. An old proposal that is getting a fresh look is to have the federal government take over all track in the country and maintain it like the highway system, with private carriers paying rent and no longer worrying about upkeep.

To get speed up to 120 mph, some places would require, in addition to track work, expensive tunneling and straightening of curves, which just may not be possible. "Obviously you can't tear down all the houses along the way to avoid a curve," Houser observes, adding, "Only highways can do that." At any rate, the price tag for necessary right-of-way improvements could run over a billion dollars for the Northeast alone.

"If we're going to build a whole

I rode a track checker

The EC-1 is a 42-ft., diesel computer car that gets track data from the center wheels.

It's the only one in the United States. It's called a track Evaluation Car (EC), and it's used to check the 9500-mile road of the Union Pacific.

Riding in this modern-day handcar, I watched an 11-channel computer analyze the steel tracks below. The EC-1 is a sophisticated checker that gets electronic data on the vertical and lateral forces produced by a moving railroad car. It checks rail alignment; track surface for high and low spots; track elevation on curves so trains can maintain scheduled speeds and detects track twist which affects lateral stability of the trains.

If any problems are found, a section gang is sent to make corrections. This $350,000 car is part of an annual $50 million track maintenance program aimed at providing more dependable and *faster* transportation.—*Roy Grinnell*

new rail line, then I'd like to talk the government into getting more for its money than the Japanese did," says Bob Parsons, the FRA's Research and Development man. He points out that, despite nightly track work, the Japanese have found that the welded rail they laid in 1964 for the New Tokaido Line has worn faster than expected, and they may have to close the line temporarily to rebuild it. "If we're going to build a whole new right-of-way, then it's time to go for the quantum leap."

When America gets ready to make that quantum leap—and it's a matter of when, not if—it seems likely that, as with the turbine train, the technology will come from overseas. While DOT has pretty much suspended its research in the "Buck Rogers stuff," other countries, notably West Germany, are pressing on—though they, too, have grown more cautious as money grows tight.

In West Germany, two consortiums are developing, with government financing, two separate magnetic levitation vehicles, one operating under the attraction principle and one by repulsion (see diagram). By "floating" vehicles above the guideway, the Germans hope to overcome the speed limitations of friction, and thereby fill the transportation niche existing between conventional rail and air travel. There is a long-range plan to bisect the country with such a super-speed system, and feed it from the sides with high-speed conventional rail. Presently, there are plans to come up with a 300-passenger prototype train set by 1979, capable of running at 250 mph.

Meanwhile, out at Pueblo, it appears the prairie dogs who share the semidesert with DOT may be getting ing a reprieve. DOT got a Tracked Air Cushion Vehicle up to 100 mph, and is adding another 2.7 miles to its 3-mile concrete U-shaped guideway in order to reach 150 mph. But the project will be dropped at that point, unless some state or local transportation authority can be persuaded to pick it up. A second ACV, with a larger induction motor, is never going to get more than 1500 feet of track to run on; its 300-mph motor will be tested at 30 mph.

DOT had some success at Pueblo with its Linear Induction Motor Research Vehicle (LIMRV), which operates with wheels on standard rail. Its purpose was to test the motor used in levitated vehicles. It is, however, outfitted with a jet engine. Once the car has been accelerated, the induction motor takes over. On Aug. 14, 1974, LIMRV established

(Please turn to page 118)

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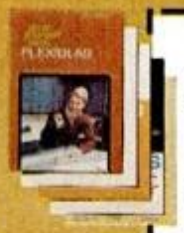

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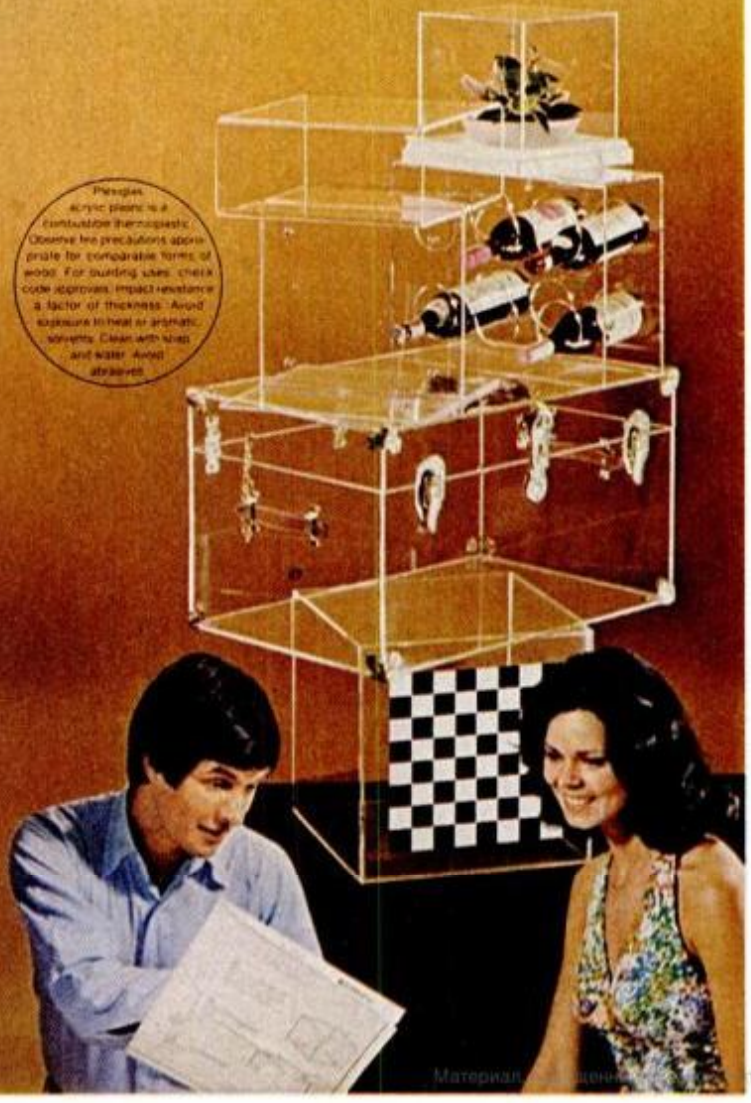

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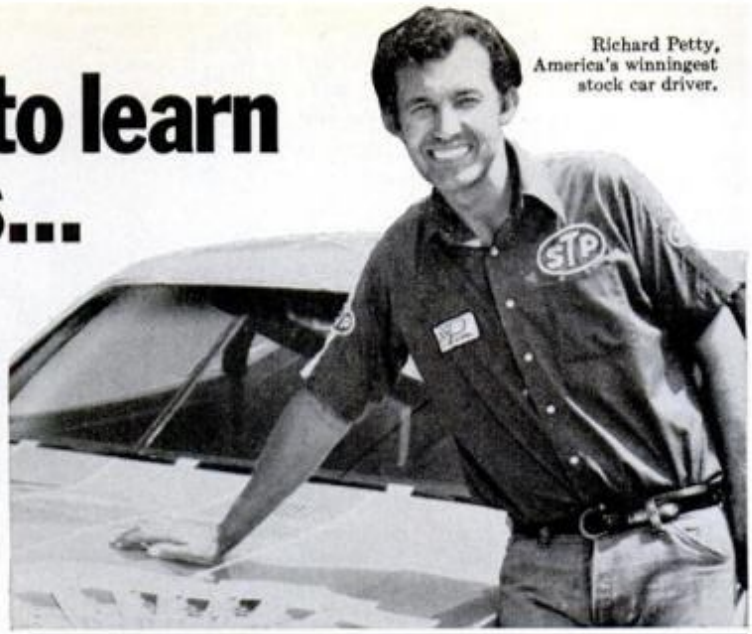

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 (Continued from page 79)

Special Edition, leans to luxury and silence, while Plymouth's top-ranked Volare Road Runner goes in more for performance and sporty handling.

Engine choices are the same as for Valiant/Dart: the 225-c.i.d. Slant Six plus 318 and 360-c.i.d. V8s.

Driving the new compacts

I got a chance to drive three of the new, preproduction, F-bodied compacts at Chrysler's Chelsea, Mich., proving grounds: an Aspen Special Edition sedan, a Plymouth Volare Road Runner coupe and a Volare station wagon. All had the 360-c.i.d. V8 with automatic.

These are quiet cars, but the SE sedan, with extra body insulation and thicker carpets, is noticeably quieter than the others. The three-speed automatic transmission, for instance, growls a bit in its lower ranges, yet this is barely audible in the SE. The SE, in fact feels and sounds like a full-sized car.

The Volare Road Runner coupe has a relatively stiff suspension and handles extremely well, yet its ride isn't so stiff as to be uncomfortable. In addition to driving the Road Runner, I rode in its rear seat; while there's not much legroom, the ride still feels good. Road Runner really has precise steering and almost no lean through hard turns.

There's ample power with a 360 V8—more than enough, actually. Even the Six should be adequate unless teamed with too many accessories. I drove a '75 Dart Six, for instance, with air, and its acceleration depressed me.

Visibility from the F-body's driver's seat is great—25 to 33 percent more glass area than Valiant's and Dart's. There's a 60/40 bench seat available in these new cars. The 60-percent side is for the driver and includes a central armrest. The bench is also reclinable. Or you can order buckets with or without console. Aspens and Volares come in three stages of fanciness, with the wagons in only high and low trim.

I noticed some front-end shake on the proving ground's pitch-and-roll course, and the wagon had some seat squeaks that might be preproduction quirks. There's no third seat for the F-bodied wagons, but there are lockable rear (side) storage compartments. These wagons' cargo decks are about two-thirds the size of those in Chrysler's intermediate wagons. Load ratings for Volare/Aspen wagons are but 100 pounds less than for Coronet and Fury.

Small cars made up 55 percent of Chrysler sales in '75; the Aspen and Volare are expected to make that about 65 percent in '76. The corporation naturally doesn't want to compare these new F-bodied compacts against the older A-bodied Valiant and Dart, but comparisons are unavoidable. I'd say they have it all over the Darts and Valiants, even though the A-bodied cars were—and still are—excellent values.

Going up the line, Chrysler continues its confusing name switches. The intermediate Plymouth is called Fury; it started life as Satellite. The big Plymouth is the Gran Fury. Not much new except subtle appearance changes.

Nor are Dodge Coronet and Monaco much different. That includes the Charger and Chrysler Cordoba, which share the Coronet basic body.

A Chrysler New Yorker Brougham has been added to take the place of the Imperial, but it's hard to see the difference. Chrysler's big Town and Country wagon remains.

Engines and power teams have been standardized throughout the company range. The Gran Fury, Monaco, and Chrysler offer V8s of 360, 400 and 440 cu.-in. displacement. Charger and Cordoba list a 318 V8 as well. The Fury/Coronet B-body can be ordered with 225-c.i.d. Six or 318, 360 or 400 c.i.d. V8.

The Dodge Colt gets what's called a Silent Shaft Four. It's a page from the 1932 Pontiac Oakland V8, which had a similar arrangement, namely reciprocating countershafts to help cancel out inherent vibrations. In the Oakland case, it was a cam-driven weight that counter-rocked the 180° crankshaft. In the Colt engine, it's two shafts that turn at twice crankshaft speed and compensate for reciprocating couples. Gears that drive the countershafts also act as the oil pump.

The Colt continues with a broad range of models, trim, and options (including five-speed overdrive transmission). I understand it will be joined in 1977 by a U.S.-assembled Chrysler subcompact code-named "Hare." Styling closely resembles the VW Rabbit, although slightly bigger. Like the Rabbit, it'll use front-wheel drive and a four-cylinder engine—lifted whole from a contemporary Simca. My source told me Chrysler eventually hopes to build the fwd power ensemble in the United States, but early versions will import the drive train from France. ★★★

CHRYSLER: '76 SERVICE TIPS

(Continued from page 79)

that cover fits, you have access to turn signal and hazard flashers, key-warning buzzer, ignition-key light timer, horn relay, and the electrically heated back window relay and timer. They're all plug-in type components.

More room

There's more room in '76 Chrysler, Aspens and Volares.

The Chrysler radiator has been moved forward slightly, providing more clearance for drive belt and lower radiator hose service, and better access to front-of-engine accessory mounting bolts.

The Aspen and Volare engine compartment holds the same powerplants as the sister compacts Valiant and Dart, but it's a couple of inches wider, making right side service in particular less of a snake-your-hand-in proposition.

Dodge Colt

Although the four-cylinder Japanese-built Dodge Colt always has been an easy car to service, it has some serviceability improvements to go along with the Silent Shaft vibration-reducing feature in 1976. The oil filter, always accessible, is even more conveniently located, and as before, the Colt is probably the only car in which the engine oil and filter can be changed without getting underneath (yes, the oil drain plug is accessible from the top of the engine compartment).

Air injection remains (the car has no converter), but the air pump supplying the system has been replaced by a tiny housing with a reed valve (spring-metal flap valve) pushed open by air flow through the engine compartment. Air supplied with this system is less than with a pump, but adequate for the Colt.

Finally, the rear-mounted electric fuel pump used in 1975 is gone, and the Colt is back to a mechanical pump at top left front of the engine. The wide-open location, used on Colts through 1974, is from a service standpoint, a step back for the better. ★★★

NEW TRAINS

(Continued from page 113)

a world's speed record for steel-wheel-on-steel-rail vehicles: 255.4 mph. That's pretty fast to be going on a six-mile track, and five braking systems are used to stop it.

Don't wait for the LIMRV to come to your neighborhood. A special 22-inch-high fin called the Reaction Rail runs down the center of its track, and presents all sorts of problems for practical use. How, for example, do you switch tracks if you must constantly straddle a Reaction Rail? Some researchers think they may find the solution in a "single-sided" LIM, which would not need a vertical rail.

But they won't find the solution at Pueblo, where researchers are turning their attention to problems of wheel wear and train/automobile collision impact studies. For now, improved rail transportation in the U.S. will depend not on a great technological leap, but on a series of small steps. And it may still take a small political miracle—finding a way to improve track—before even the small technological miracles get a chance to show their stuff. ★★★

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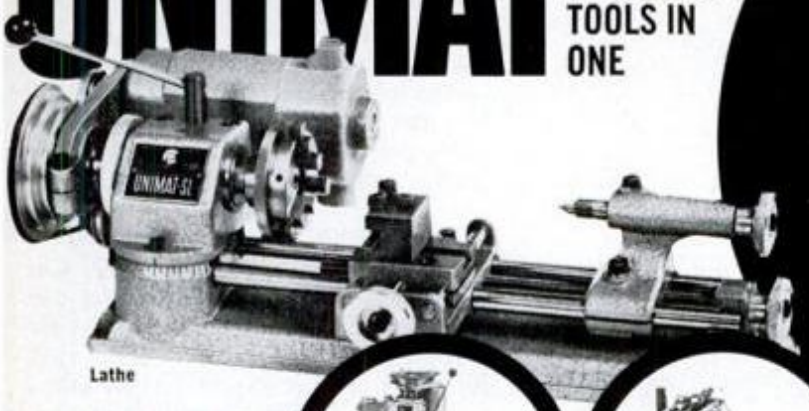

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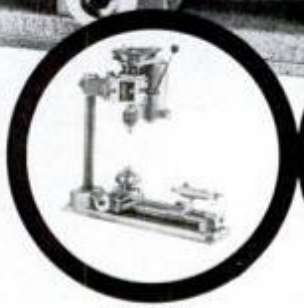

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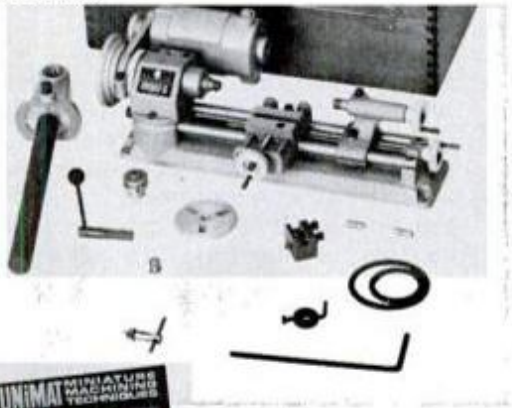

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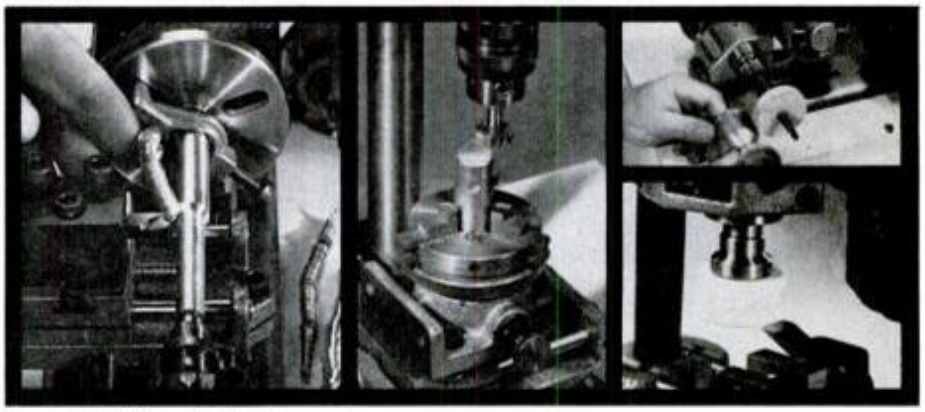

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HOW TO BUY A CAR PAINT JOB

(Continued from page 57)

wheels and door jambs. The price does not include major body repairs. That's extra. From time to time the company offers a special deal where it throws in $10 worth of body or fender work at no charge.

The $39.95 price is limited to 27 colors. If you want a color that isn't on the basic chart, the price is $59.95. For the higher price, you can have any color you want. Two-toning and trick combinations are extra.

One-day service—and he means it

Scheib gives one-day service. Get the car in by 7:30 a.m. and you can drive it home by 6:00 p.m. People don't like to give up use of their cars for more than a day at a time and I was under the impression the one-day deal might be a gimmick to get the car in and then stall the customer until the shop could get around to painting it.

Charles Moninger, a division manager for Scheib, corrected me on this. Moninger works out of Detroit and directs the activities of 16 shops in Michigan, Ohio and Kentucky. "We handle so many units a day," Moninger explained, "that we run into a parking problem if we don't keep the cars moving." Moninger has a rule that his shop managers call each customer as soon as his car comes out of the painting booth to let him know the car is ready. Scheib really does give one-day service.

Scheib also gives a guarantee good for five years on a pro rata basis. It's the same type of guarantee you get on tires. You don't get all your money back, but you get an adjustment or a credit toward a new paint job, depending on how much time has elapsed since the car was painted.

How can Scheib do it? One explanation is that the company is running a volume operation. Just as Sears or Wards can undercut the locally-owned, one-outlet department store, Scheib can beat the repainter who has only a single shop. Scheib owns all the shops carrying his name. They are not franchises. Another reason the company can shave the price is it manufactures its own paint. Scheib owns a paint factory in Cleveland. There's no markup in cost between the paint factory and the repainting shop.

If Scheib is the king of the repainters, MAACO is the crown prince. MAACO is a new company formed in 1972 and the full name of the firm is MAACO Auto Painting and Body Works. One of the two founders of the firm is Anthony A. Martino, who put together the

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AAMCO Transmission chain. Martino has sold his interest in the transmission company.

MAACO has 52 shops in the United States. Daniel I. Rhode, vice president of the firm and a co-founder of the company with Martino, told me the company expects to open another 25 shops this year and "at least" 70 more outlets in 1976. The goal is to put together a chain of 500 shops over the next six to seven years. The MAACO shops are franchises. They are not owned by the company.

MAACO has three prices $54.95, $89.95 and $119.95. For $54.95 you get two coats of paint. Scheib uses one coat. On the $89.95 and $119.95 jobs you get three coats of paint. Most of the difference between the $89.95 package and the $119.95 deal is in the preparation of the surface. The highest-priced job includes hand and machine sanding of the finish and a special coat of primer and sealer. MAACO advertises a choice of 7000 different colors.

The company expects to paint between 85,000 and 90,000 cars this year.

I asked Dan Rhode to explain how a MAACO job differs from an Earl Scheib job.

"We see a market for a quality paint job between Scheib's price and independent shops that charge anywhere from $150 to $300. After spraying the car, we move it directly into a gas-fired bake oven to dry for 35 minutes at a temperature of 180° to 185°. The car is never exposed to the outside air, so you get a cleaner job."

To bake or not to bake

There's a small dispute among repainters over the merits of baking the paint on versus nonbaking. At one time, a bake oven was the only way to get a hard, smooth finish. Some shops will use ovens, others don't. Scheib used to use ovens, but phased them out last year.

Nonbake painters say the synthetic enamels and lacquers used today dry so fast that baking isn't necessary. Pro-oven painters agree that the new paints dry rapidly, but are quick to say you still get a superior finish by baking.

How about doing the job yourself? It isn't the easiest task, but it *can* be done (see the accompanying article on page 58). And if you don't want to tackle the whole job yourself, you can at least do some of the preliminary clean-up and make-ready work part of the cost. ★★★

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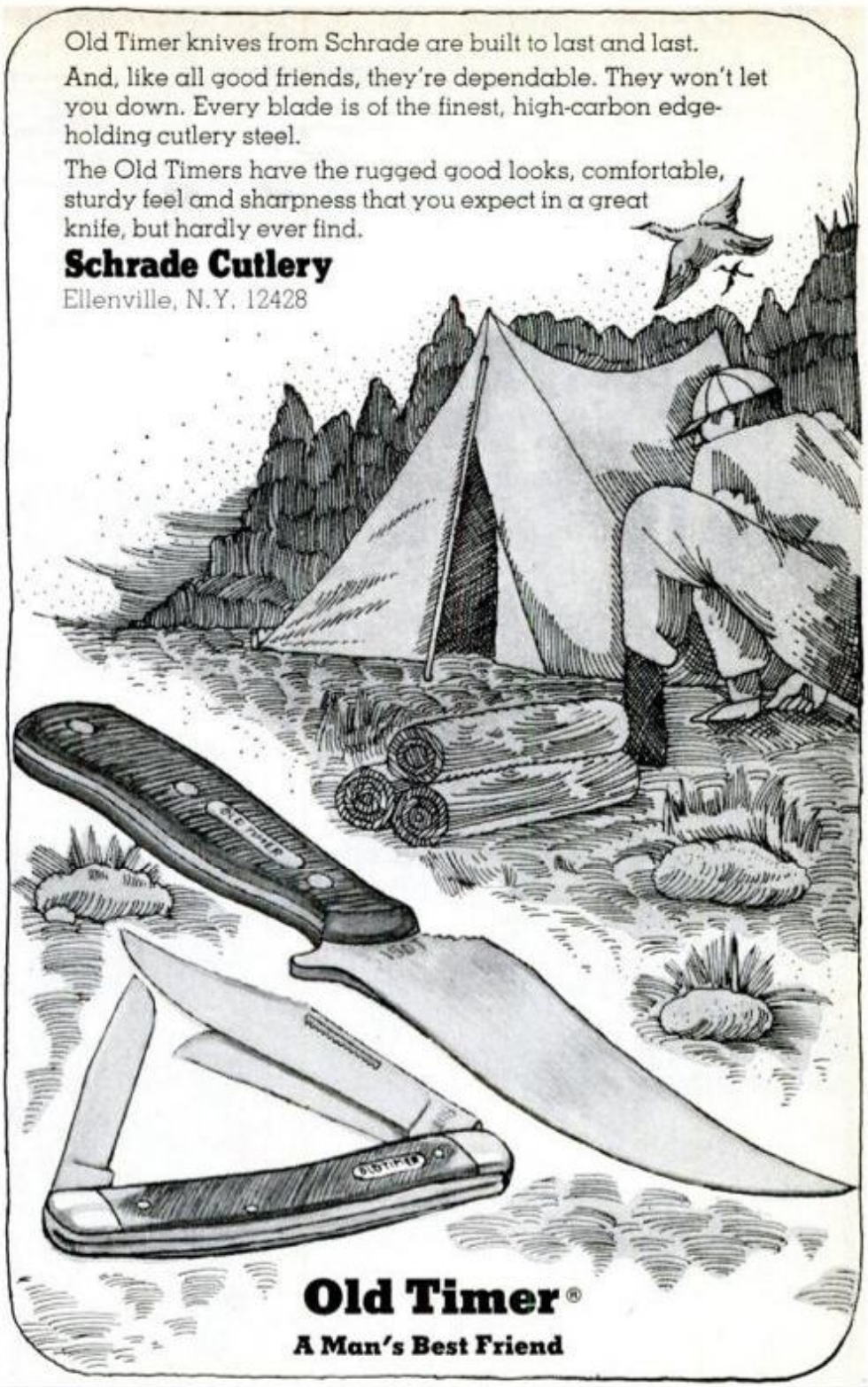

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Easy removal of hinged cowl is shown by Max project engineer Hale, for chief engineer Alexander, PM's McKeown.

MERC'S NEW MUSCLE MACHINE

(Continued from page 84)

when striking a log, but it tilts an extra 10° total for easier launching, hauling, trailering. Instead of a tilt pin, there is a rotating tilt stop that you don't need to do a handstand to adjust. The stop doubles as a convenient trailering tip-up lock.

The hinged cowl comes off easily for access to the innards. Jerry Hale swore to me that it's no extra problem in a pinch to rope-start Max, though I didn't try it. Electric start and power trim are standard features, and the trim doubles as shock absorber as well. Hydraulic lines are inside and protected from damage or corrosion. The Thunderbolt ignition has no distributor and is supplemented by short ignition leads, Perma Gap plugs. And, particularly unusual, a warning horn honks in case of engine overheating. Trim indicator and tach are also standard, but my favorite innovation is the trim control built into the handle of the throttle-shift, with buttons that reminded me of the gun trigger on the control stick of my fighter plane. No need to let go of wheel or throttle to trim out for perfect planing angle at any speed.

For performance, we first tested Max on a sporty Starcraft runabout and then on a Cruisers cabin model —typical of hulls particularly suitable for this added power.

Who needs 175 horses? Any bigger boat that can handle them, and tests showed that by throttling back slightly, Max burns less fuel at over 30 mph than the smaller mills.

In both hulls, the low-end torque designed in for water skiers got us immediately up on plane. Steering was beautiful as the trim adjustments canceled out prop-torque wheel resistance. Max is no loudmouth. The tuned exhausts are there, but buried so there seemed to be less noise from all that power than with smaller engines. I could only tell as the speedometer flickered past 50 that the wind made more noise. ★★★

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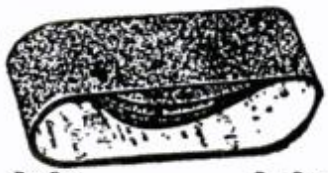

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HANDY BUTCHER BLOCK

(Continued from page 104)

diameter, then plug them with slices of thick dowel of the same size which you turn on the lathe. Position them so the grain runs crosswise.

If you have a power block plane, you can surface the top with little effort. Otherwise you'll need a jack plane and muscle power. Round off all corners with a plane, then sand all surfaces with a belt sander followed with a finishing sander. Apply a coat of sealer only to the inside surfaces to protect the wood against dampness. A special nontoxic salad bowl sealer, used for top and side surfaces, is available from A. Constantine & Son, 2050 Eastchester Rd., Bronx, N.Y. Apply one coat of the salad-bowl seal using a full brush and letting it soak in.

Glue up blocks for the legs

The lathe work is next. Glue up the stock for the turning blocks and joint them to 4 in. square. Glue a scrap of extra-hard wood, such as maple or oak, to each end to provide durable temporary centers which will not readily wear during the rough turning. Use the gouge to rough-round the cylindrical section, but first make a shallow nick cut at the shoulder using the heel of the skew held vertically. This will prevent accidental splintering of square corners. After rounding carefully, make parting cuts to the required depths as indicated on the drawing. Shape contours with skew and diamond-point chisels, working to limits set by parting-tool grooves. Sand smooth.

To obtain a top-rate finish, apply several coats of Wood-glo or other finish of your liking while the work is still in the lathe. If you plan to use the salad-bowl finish for the entire job, it will take a full pint. When the finish coats are dry, saw off the waste. If you sand a slight convex curve on the bottoms of the legs, you'll be able to get by without casters, which would somewhat spoil the appearance. Shallow rounded ends will permit easy sliding on practically any floor.

Most dado cutters haven't the capacity to make the deep cuts required for notching the legs so a series of kerf cuts is made to clear out waste. You can use a table saw or radial saw, but the latter is preferred since repeated pushing of the leg on a table saw may mar the finish. The legs are secured with a pair of ⅜ x 4½-in. hex-head lagscrews. Glue is optional.

Finally the knife rack. Make it by boring a series of ⅜-in. holes, then clear out the waste with a chisel to form slots. Glue the rack in place before applying the finish. ★★★

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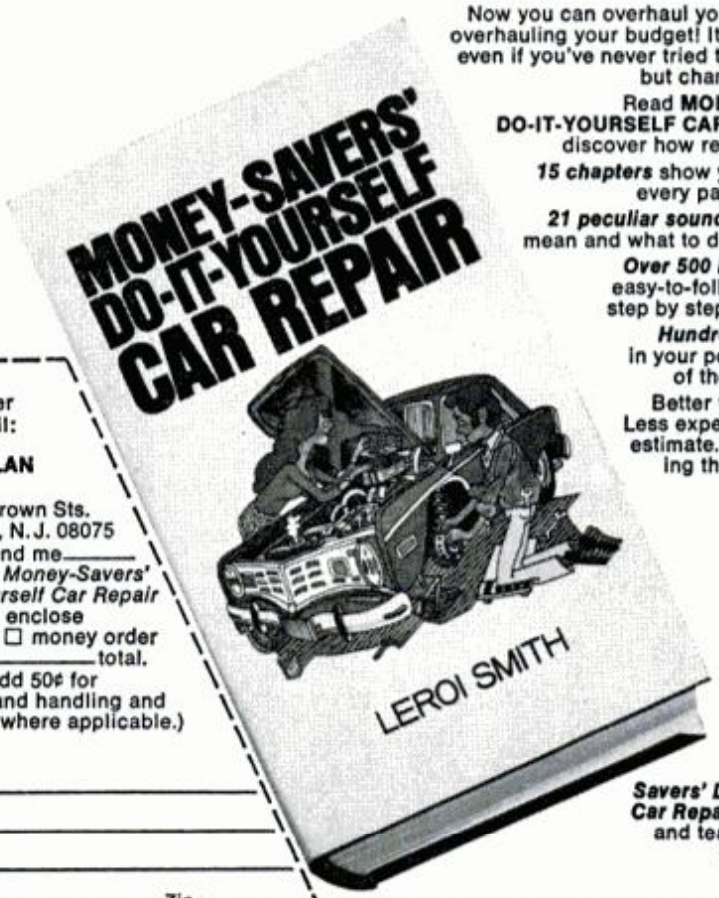

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REPAINT YOUR CAR YOURSELF

(Continued from page 59)

move all dirt and dust. Dry it, and then wash the surface down with wax and grease remover, changing rags frequently.

Caution: The products you employ all have very clear, detailed and important instructions for use on their cans. Read and follow them!

3. To prepare for initial sanding, examine the areas around chrome pieces which have remained on the car. If there is rust butting them, mask the chrome with masking tape to protect it against the heavy sanding that's necessary.

Now, sand the entire car with wet-or-dry sandpaper, using water as a lubricant. Keep the surface and sandpaper wet. A good technique is to have a pail of water at your feet. Keep dipping a rag or sponge in the water and squeeze it over the surface. Dip the sandpaper into water often, too.

The purpose of sanding in places other than rusted areas is to get a surface to which paint will adhere. There is no need to get down to bare metal, but make sure you remove all oxidation and gloss.

Take pains to sand in all corners and crevices. Wax has a tendency to build up in these spots. Unless removed, it will prevent good adhesion, and paint may start to peel.

You can use a sanding block where possible. Otherwise, hand-sand. It's not advisable to use a power sander. Gouging is likely to result.

Use 100-grit *dry* sandpaper to remove rust, or use a wire brush driven by an electric drill. Go to bare metal in rusted areas. The surface must be left absolutely bright and rust-free, or rust will form and ruin the job.

4. Wash the car with wax and grease remover again, and allow the surface to dry. As it's doing this, mask areas that may receive overspray, including glasswork, headlights and taillights, grille and moldings.

5. Treat bare metal areas with metal conditioner, which etches the metal so that the primer will adhere. Metal conditioner also helps prevent rust.

6. Mix primer and thinner to the proportions spelled out on the can. Spray one coat of primer over the entire car. Then go back and give it another coat.

As you go along, you will get a "feel" for spraying and for knowing when the surface has received an ample coating—not too little or too much. If the primer coating is too light, it will look dry and gritty. If it's too wet, it will run and start

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splitting when it dries. In the latter case, the preparatory steps should be repeated.

7. Let the primer dry for one hour. Then examine the surface for "low" spots. Treat these imperfections with body putty.

Sand the entire car once more with wet-or-dry sandpaper. Keep the sandpaper wet. See to it that all scratches and other imperfections are removed. Sand puttied areas smooth and even with the surface.

8. Remove old masking. By this time, it's gotten messy.

Sponge-wash the car to remove sanding residue, and give it another treatment with wax and grease remover. Blow dust out from behind molding with the air hose.

9. Remask areas that require masking. If you have trouble getting the masking tape to adhere to rubber seals around glass, wipe the rubber lightly with lacquer thinner. Tape will adhere better.

Make sure all areas that have to be masked are masked, but also be certain that a surface to be painted is not masked. Take your time and do a neat job. Careful masking is important.

10. See that the surface is perfectly dry and wipe it down with a tack cloth to remove dust.

Mix paint and thinner according to the instructions on the can and paint the car.

Begin by spraying on a light coat. Coverage is not important. You simply want to lay down a tack coat which will provide a base for subsequent coats.

Do not overlap paint. Don't hit a spot more than once.

By the time you've done the whole car, paint will have set up sufficiently so the surface is ready for a second coat. Make this one medium-heavy. You should barely be able to see the primer coat beneath the paint when this second coat has been applied.

The third coat should be the final coat and provide complete coverage. The finish should look smooth and glossy as this coat is applied.

As you spray, hold the gun about 6 inches from the car. Keep the gun straight and perpendicular to the surface at all times. Do not arc the gun. Sweep it across the surface smoothly.

Let the paint set up overnight. Then, very carefully, strip off all the masking, pulling the tape slowly so you don't peel the new paint. Then replace all the brightwork—and the job is finished. ★★★

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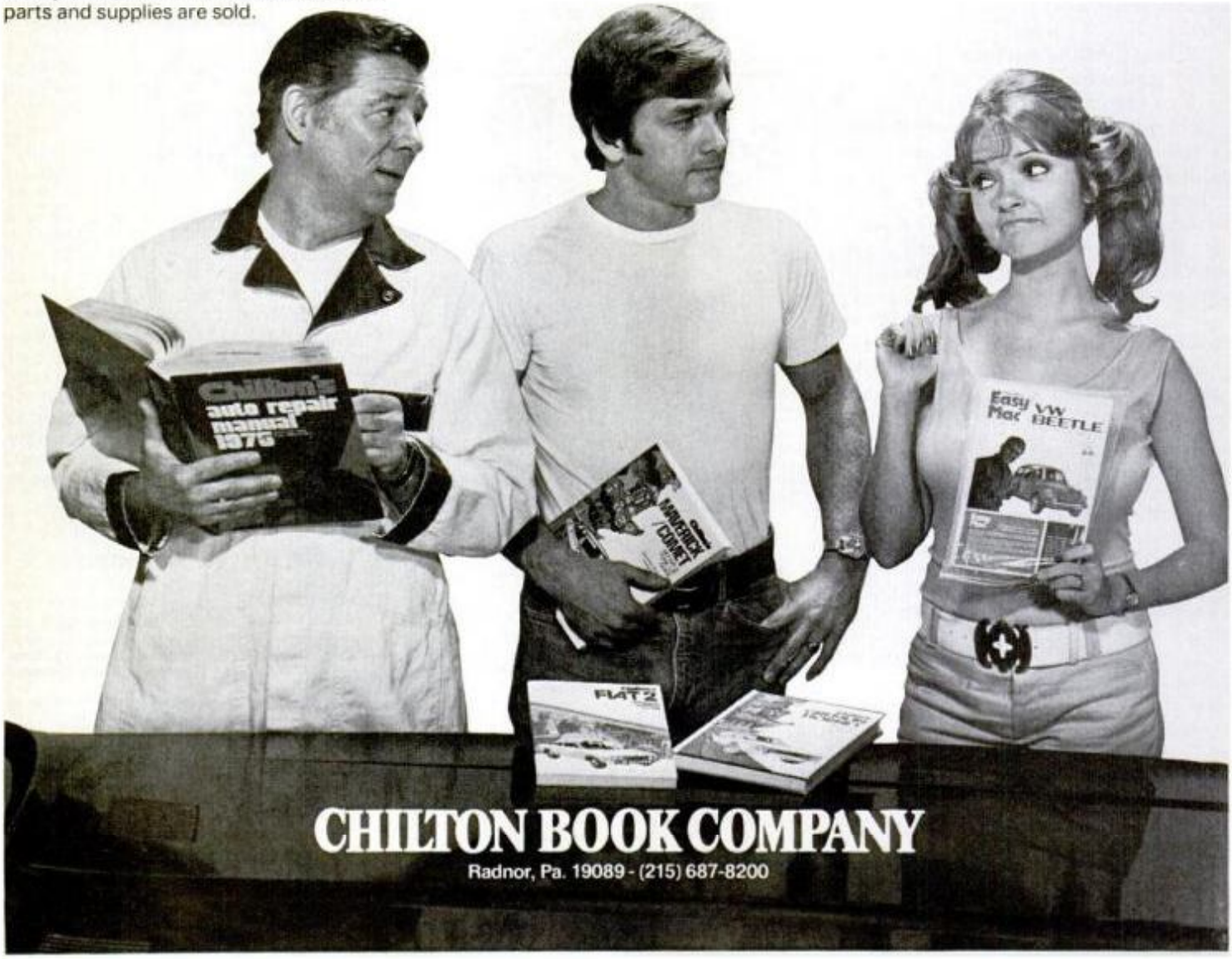

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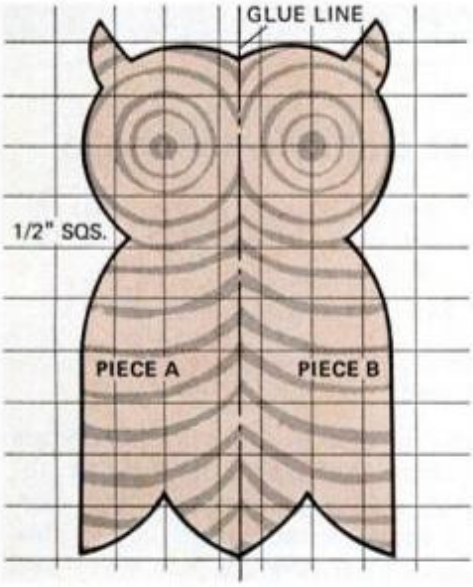
WORKSHOP QUICKIE

Owl pinup

Knot forms eyes and annual rings form feathers when right and left slices from a 2x6 are glued together edgewise



Using ¼-in.-thick pieces sliced from the end of a 2x6, you can create these decorative little owls. The board must be quarter sawn; the annual rings should run from 45° to 90° across the end grain. Simply keep your eye peeled for a board with a knot such as the one shown. Using white glue, join two reversed slices edgewise and clamp overnight. Next day, sand the piece and cut the outline with a coping saw or jigsaw. To protect the wood, spray it with several coats of Krylon 1301 clear acrylic finish, sanding between coats. To hang the owl, attach a thread to a short pin or tack glued into a predrilled hole in back.—*John Gaynor*

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This brings me to my point. If you want to make money in a field that's begging for trained technicians, there's a fine, low-cost home-study plan available that teaches you how to handle every type of Appliance repair in detail—including refrigeration, air conditioners, and even small gas engines. The course was prepared by the instructors at National Radio Institute. This is the oldest and largest home-study school in the Electronics/Electrical fields with more than sixty years' experience training men like yourself for new careers or spare-time or full-time businesses of their own.

A few years ago, NRI recognized the increasing demand for trained Appliance Repairmen. They set about preparing well-illustrated, easy-to-understand lessons that teach you how to repair home, commercial and farm Appliances. NRI even added a professional Appliance Tester that's included in their low tuition. With the Tester and a few basic tools you probably already have, you're equipped to service most Electrical Appliances. If you aren't making $5 to $7 an hour in spare time fixing Appliances for friends and neighbors within a few months after enrolling, my name isn't McCahill.

The reason I'm no doubting Thomas, is because the staff at NRI is composed of experienced instructors who guide you through the course with more personal attention than you'd get in many classrooms. With the kind of help they give a student and the kind of course they have, you can be the man in demand in this field—even if you've never rewired a plug, or got fed up with school at the 9th grade.

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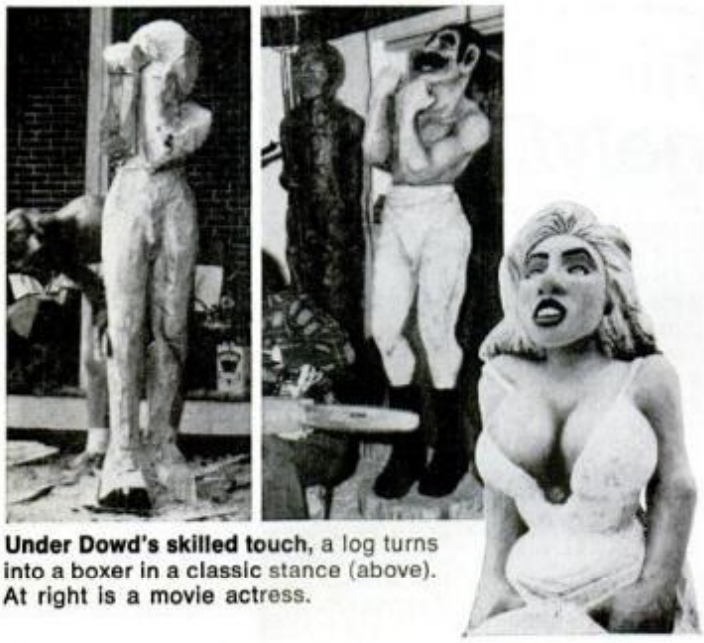
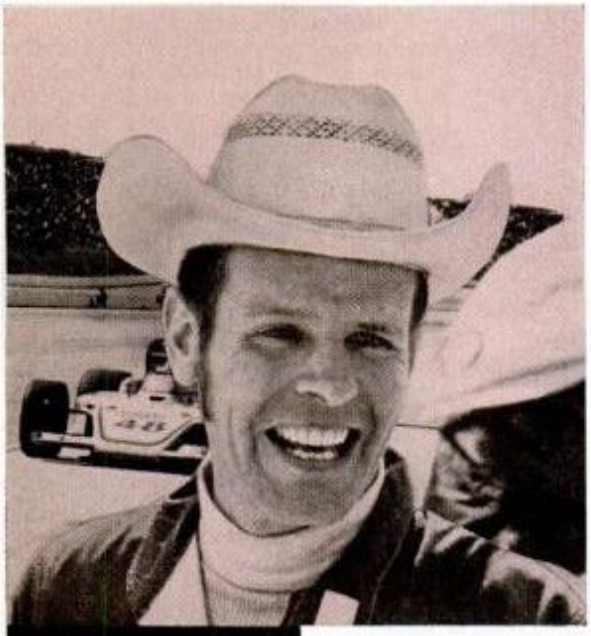
Artist with a chain saw

Attacking a hefty chunk of wood (preferably native pine) with a chain saw, Vermont artist Jack Dowd can turn it into a remarkably lifelike caricature of a person in a matter of 25 to 50 hours. Dowd does most of the sculpting with his selection of Stihl chain saws, which includes a new electric model. After finishing the fine details on the figures, he paints them in bright colors.

Chain-saw artist Dowd always sculpts "from the head down." Below, he stands surrounded by a group of life-size figures.



Under Dowd's skilled touch, a log turns into a boxer in a classic stance (above). At right is a movie actress.



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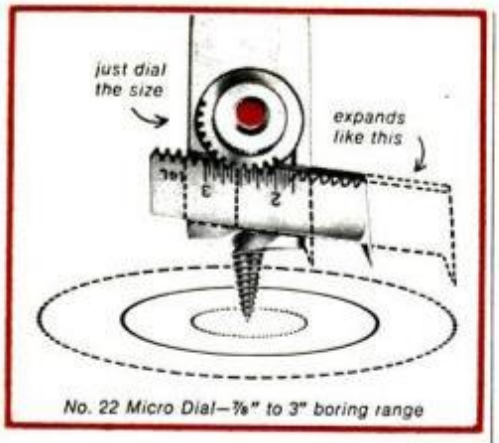

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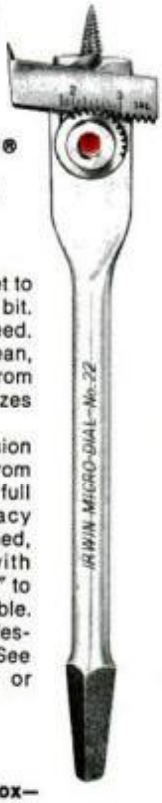

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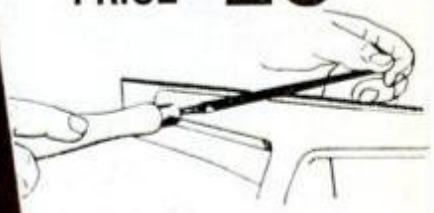

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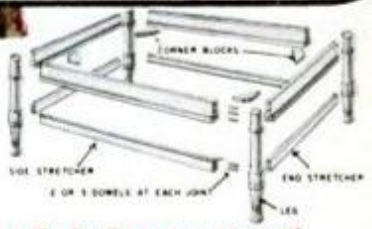

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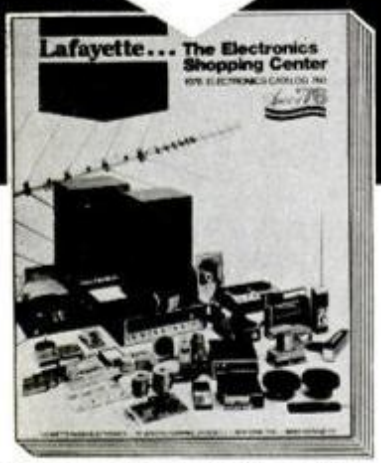

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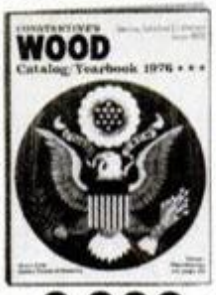

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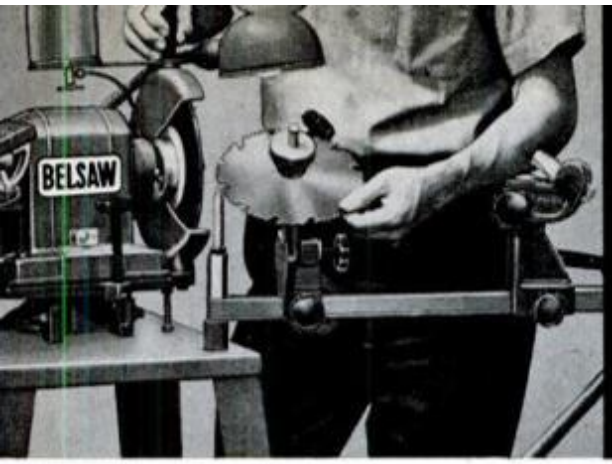

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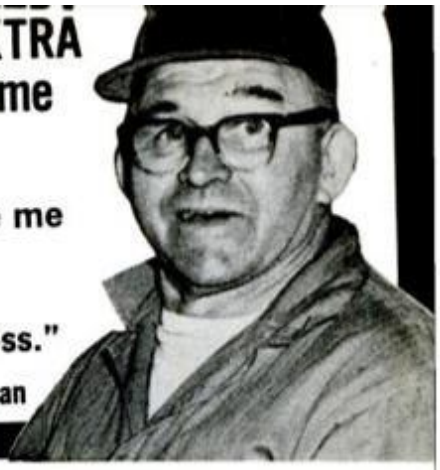

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Now: Garden tractor with liquid-cooled engine

New star in the Wheel Horse stable is the D-250 garden tractor, a German-made unit sporting a 19.9-hp, liquid-cooled engine. Built by Renault, the four-cylinder plant (below) has a big muffler to insure quiet operation. The tractor has three power takeoffs for operating a variety of attachments.

Wheel Horse calls it the "Mercedes of garden tractors," and their new D-250 does qualify in terms of silence, ruggedness, engineering—and price. It's relatively expensive.

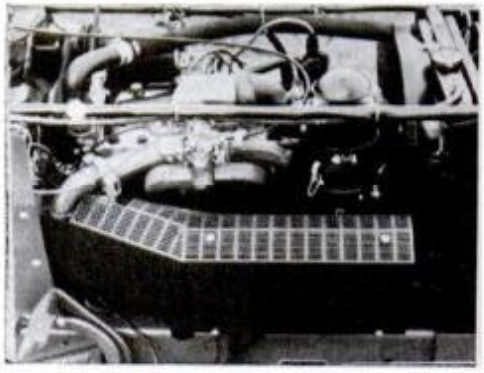
Manufactured in Germany by Gutbrod (a maker of minicars from 1949 to 1954), the D-250 has been marketed in Europe for seven years. So while it's new here, it's been proven in the field. The Wheel Horse Co. of South Bend, Ind., has "Americanized" the Gutbrod product by making it conform to federal consumer standards.

A Renault R5 auto engine—a four-cylinder, 19.9-hp plant—provides the power. It uses water cooling instead of the traditional air cooling. The advantage: The gasoline engine runs much quieter than its air-cooled rivals.

A short driveshaft feeds to a dual-range four-speed transaxle with twin reverse. This gearbox includes an integral rear PTO (power takeoff) plus a manual differential lock for equalized rear-wheel traction. There are three splined PTOs in all—rear, front, and center—along with a hydraulic system to raise and lower attachments fore and aft.

The D-250's major attachments include a midmounted, shaft-driven rotary mower that goes up and down on the tractor's hydraulic system and cuts a 60-inch swath. There's also an enclosed 40-inch tiller that mounts on the rear PTO.

A reversible plow lets you make furrows going forward or backward. By simply flipping a lever, you can plow in tight spaces (such as along fences) without turning the tractor around.



For snow, there's a 59-inch dozer blade. A single joy stick controls a hydraulic ram up front to raise, lower and index the blade. With the repositioning of one pin, the blade automatically indexes 30° right or left.

Other attachments include a spring-tooth cultivator, a harrow and a moldboard plow. A 48-inch snowthrower and a tractor cab are expected to be available in 1976.

Among the D-250's subtler engineering innovations are a hydraulic seat with a twist adjustment to compensate for the driver's weight; a removable bug screen ahead of the radiator; foot and hand throttles; central fuse panel; complete tool kit, with grease gun and dust cloth.

The unit also boasts an oil-bath aircleaner; an hour meter; complete lighting system, including telltales for engine and handbrake functions; lift-off hood for easy engine access; and an ABS plastic, one-piece rear skirt that also lifts off.

Base price for the D-250 is in the low $4000 range, with attachments extra.—*Michael Lamm* ★★★

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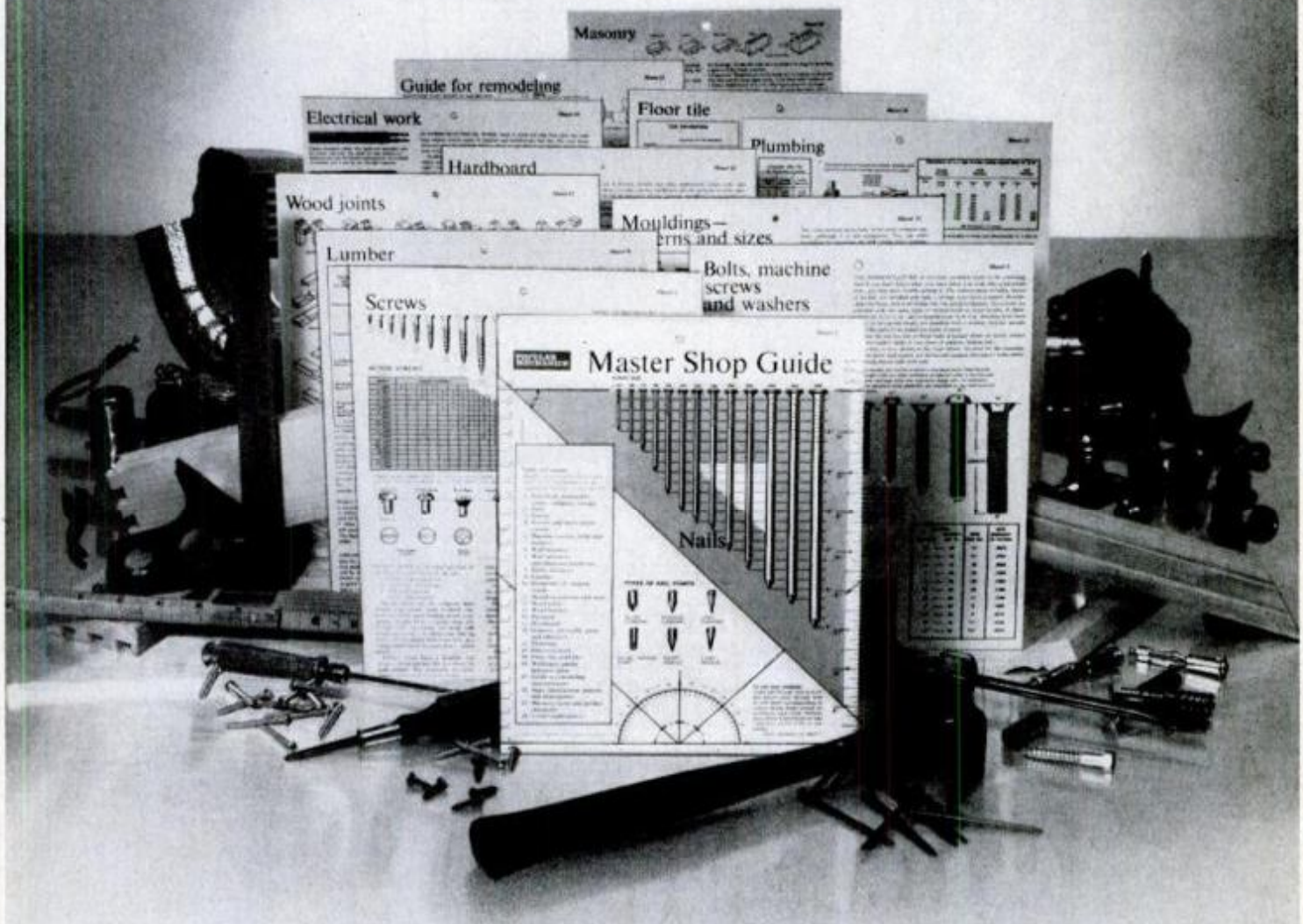

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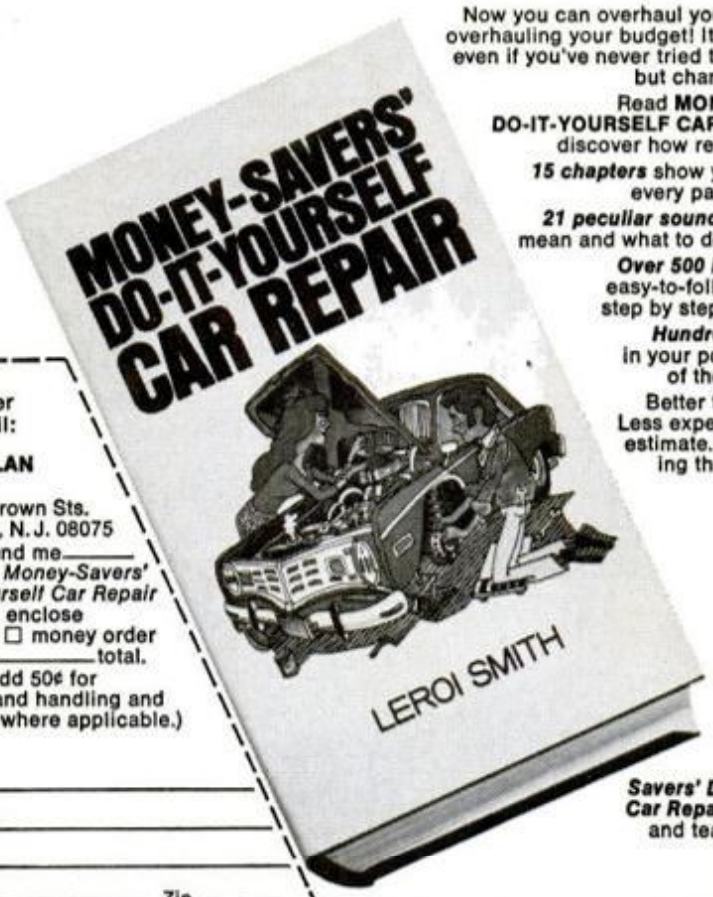

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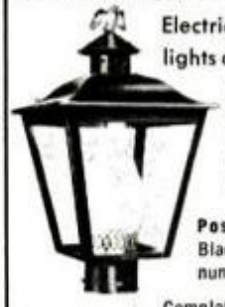

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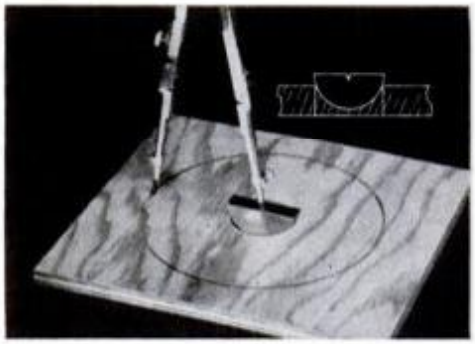
HINTS

FROM READERS

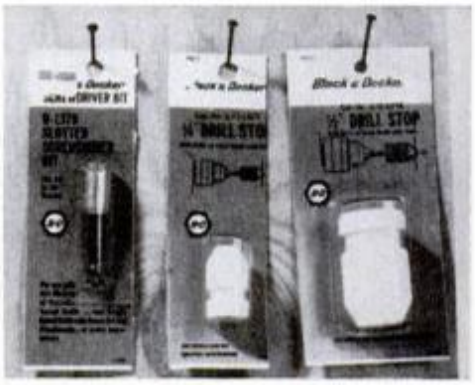
Quick pill case

To make a handy container for small tablets such as saccharin, remove the tip and wick from a felt-tip pen. Wash out ink residue. Use the pocket clip to carry it like a pen.—*Harry Radzinsky, Charlotte, N.C.*



When center is missing

When you need to draw a circle around a hole, dimple the center of the flat side of a suitably sized Woodruff key and locate the compass point there.—*Mike McMullen, Santa Margarita, Calif.*



Storage in packages

Don't discard plastic bubble packages—they're visible storage containers for tools that come in them and usually are marked with tool size. Cut away bubble tops with a sharp knife and hang packages on nails or hooks like a hardware-store display—*Parry C. Yob, Fair Oaks, Calif.*

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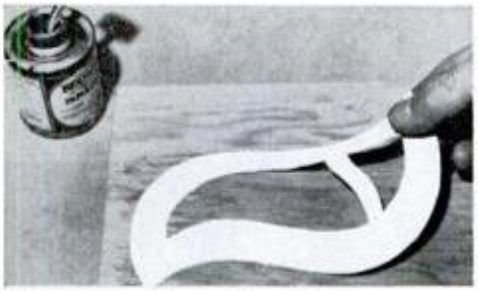
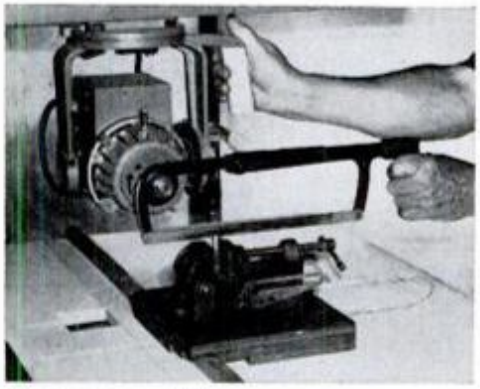


For accurate cutting

When exacting scroll sawing is to be done, it's helpful to cement the pattern directly to the wood. With rubber cement on just one surface, pattern will peel off easily.—*Rosario Capotosto, Greenlawn, N.Y.*

Phone protection

If small children leave a phone's receiver off the hook, it can go unnoticed for hours. A large rubber band will hold buttons down, but can be slipped aside for use of phone.—*Ken Patterson, Regina, Sask.*



Hacksaw guide

A radial-arm saw is also a fine guide for precision slotting, grooving and angle cutoff work. Remove guard and blade, fasten hacksaw frame between the two washers as shown. Multiple blades in hacksaw frame will give a variety of slot widths.—*William G. Waggoner, Sacramento, Calif.*

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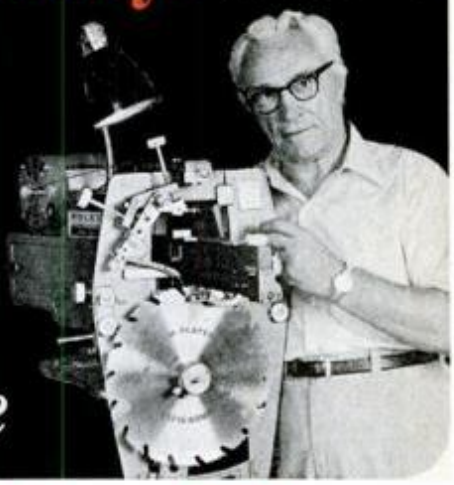

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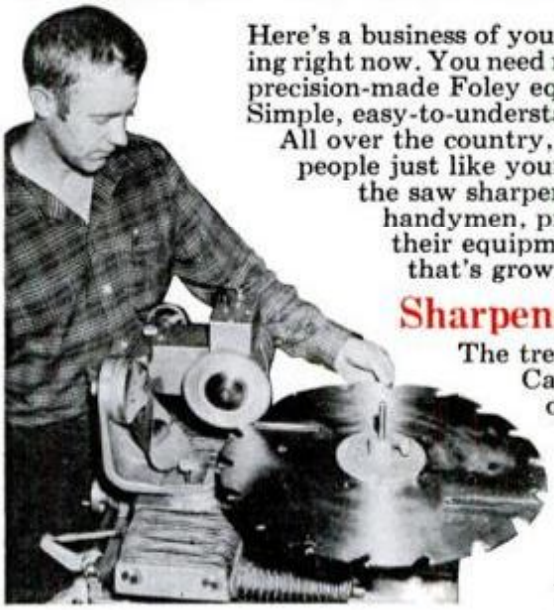

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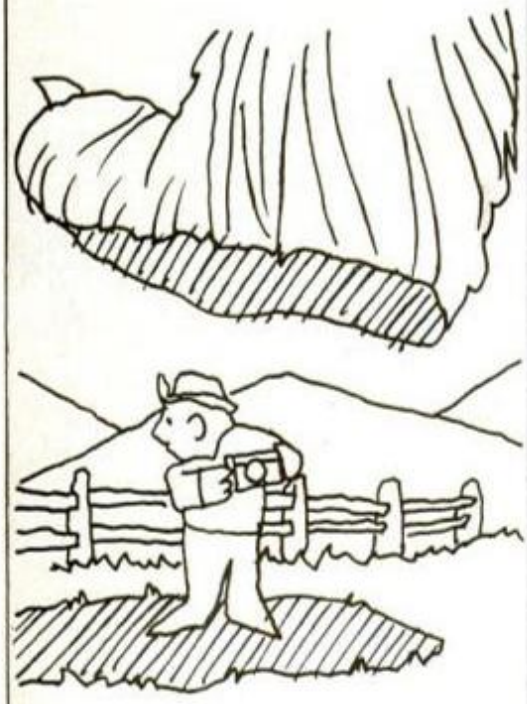

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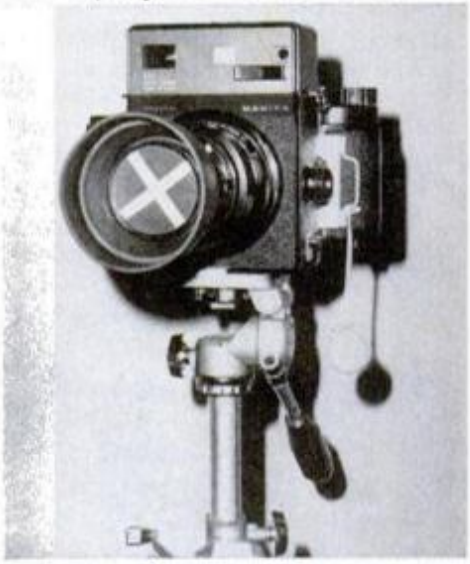
PHOTO HINTS

FROM READERS

Fishing vest ends photo fumbling

A fishing vest is ideal for carrying everything you need when you're out in the field shooting pictures. Mine holds film, lenses, filters and accessories without concentrating weight on one shoulder as a gadget-bag would. An extra-large size can be worn over your jacket.—*Ralph L. Emerson, Van Nuys, Calif.*

Red tape prevents red faces



Red reflective tape across your lens cap will make the embarrassment of shooting with the cap on much less likely; you're more likely to see the cap that way, and even if you don't, your subjects or passersby are sure to spot and mention it. Tape the inside, too, to reduce the chance of losing or forgetting the cap when you lay it down.—*Major J. P. Greeves, Alexandria, Calif.*

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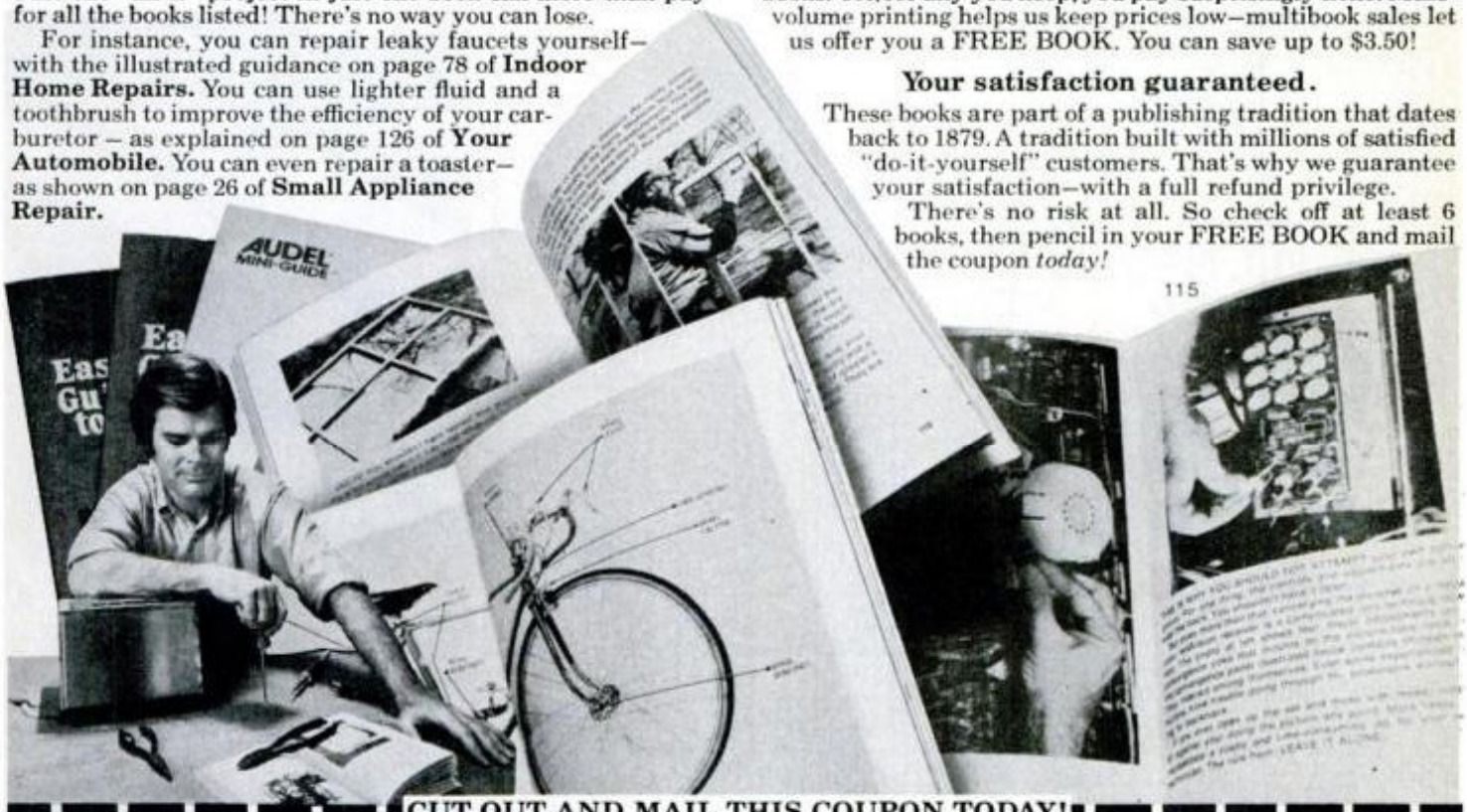

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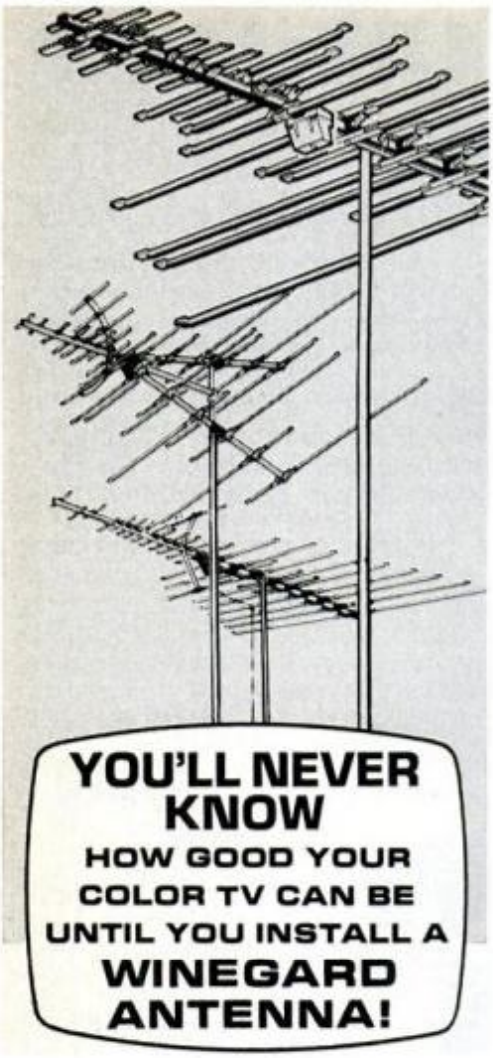

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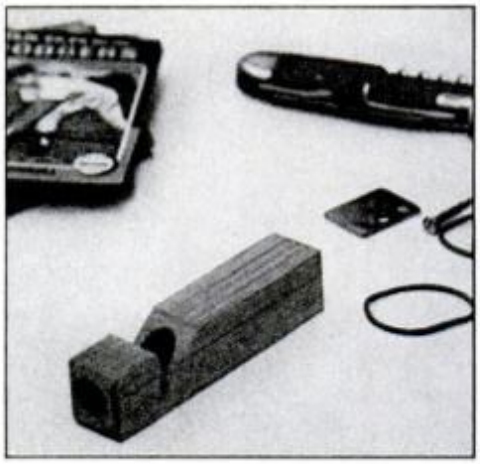

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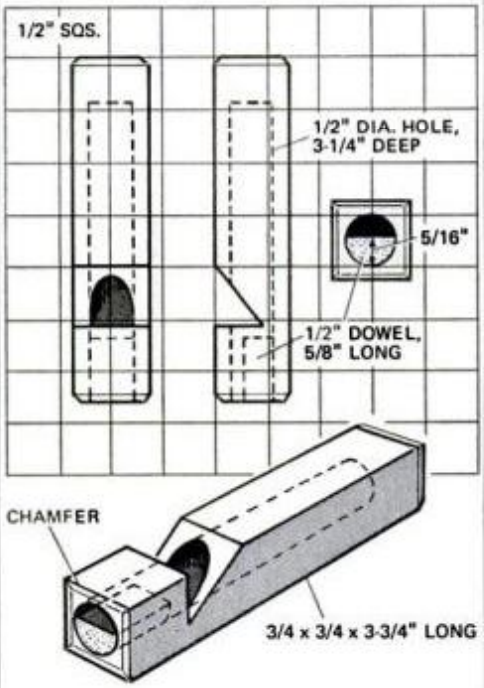

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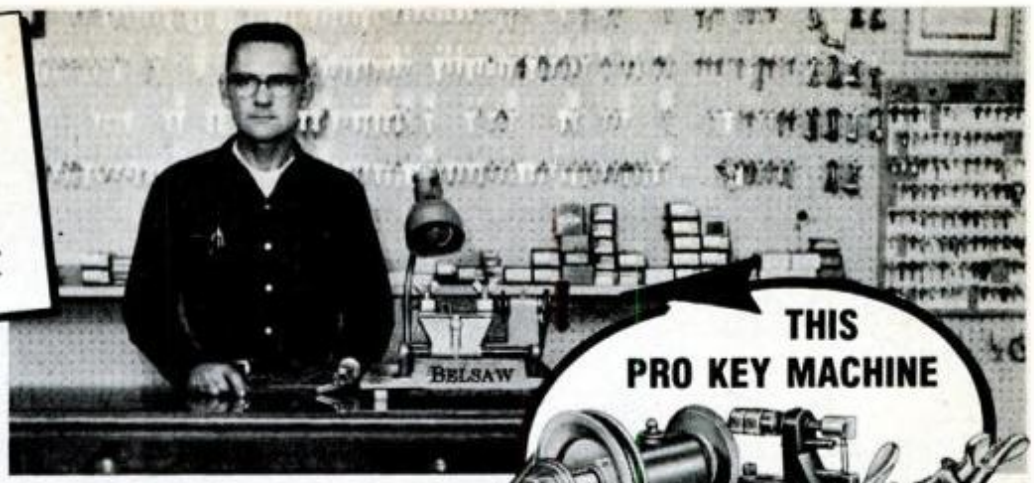

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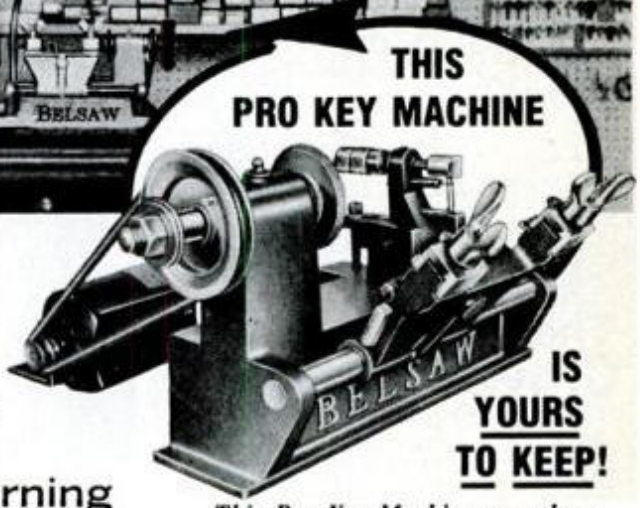

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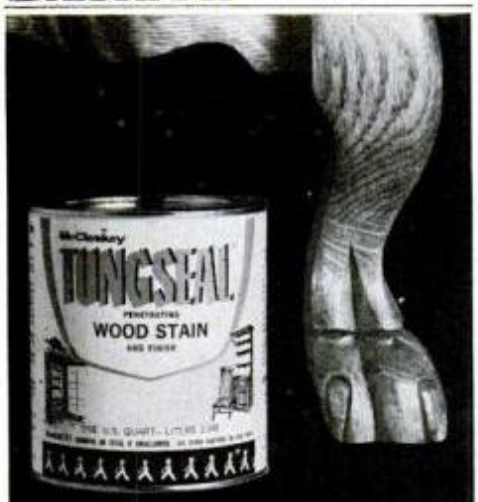

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All of us have a favorite piece of furniture. One that has been in the family for years or something special that we've found in an out-of-the-way place. To us, it's a bit of Americana. McCloskey's Tungseal Wood Stain can restore it to its original beauty and keep it that way. Simply apply it straight from the can, it'll penetrate deep into the wood and bind the fibers together producing a soft satin sheen. Choose from a variety of stains or one of our special Bi-Centennial colors. Preserving one's heritage is something Tungseal Wood Stains and Polyurethanes do best.

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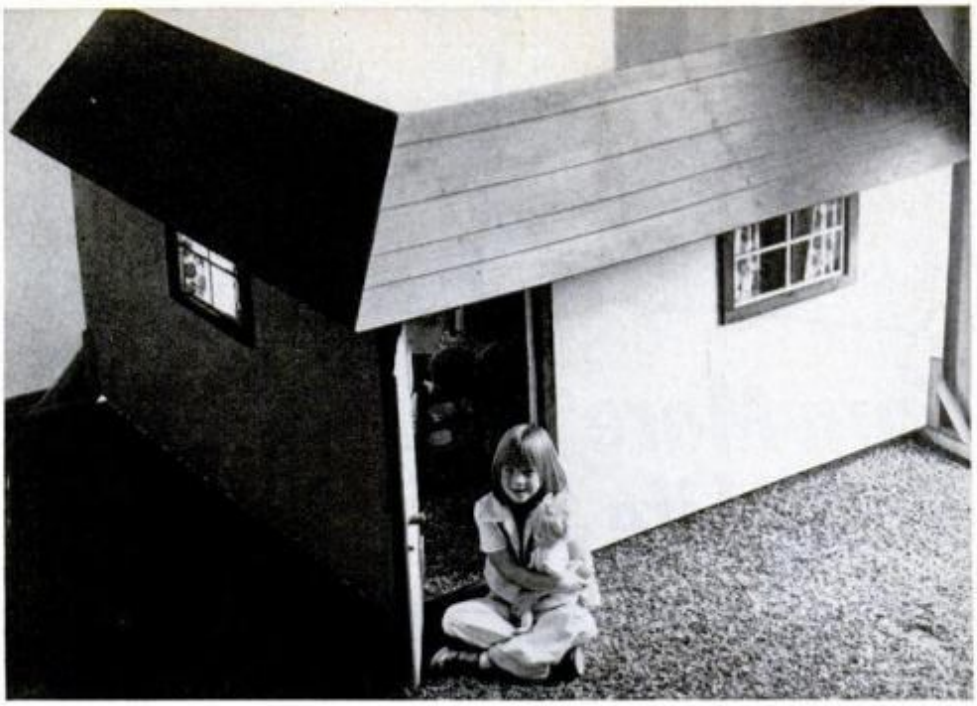
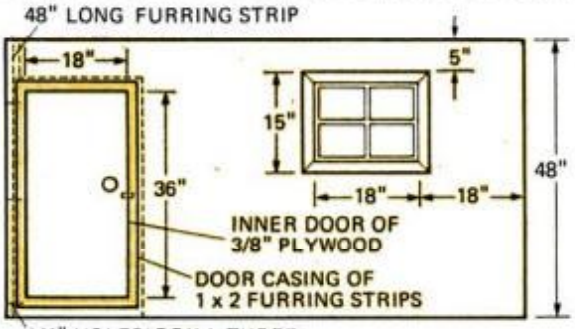
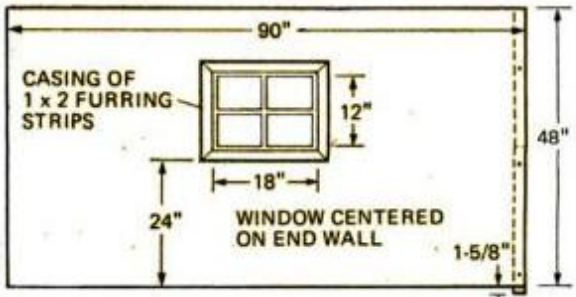
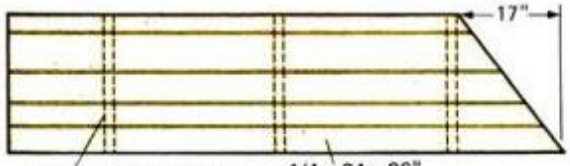


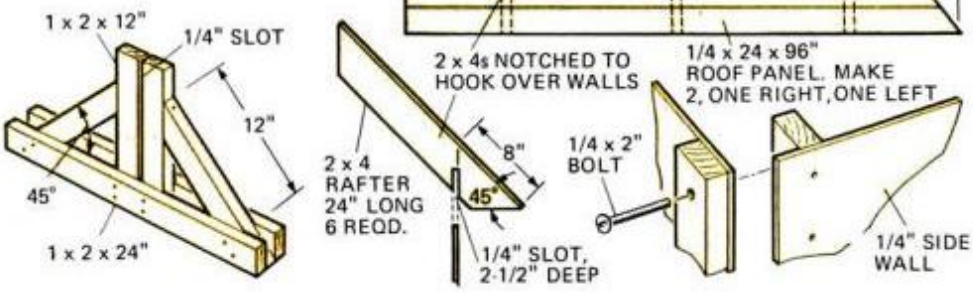
Indoor playhouse for your doll

Materials for playhouse are ¼-in. plywood for walls, a sheet of paneling for roof, furring strips and 2x4 scraps, beveled and slotted for roof supports. Corner is held together with three ¼-in. bolts through furring strips on both walls.









This quick-to-set-up playhouse will delight your youngster. Walls can be ¼-in. plywood painted to suit or prefinished ¼-in. paneling. If the door opening is cut carefully, the cutout can become the door; window panes are also cut out, leaving muntins and bars. Furring strips for corner assembly and casing are glued and nailed; note that one longer corner strip serves to level walls held in end stands. Plywood strips lining door opening inside protrude ½ in. inward in order to keep the door from swinging in. Finishing touches are curtains and doorknobs, the latter made from thread spools.

—John L. Kuik

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I'd like to give this to my fellow men...

while I am still able to help!

I was young once, as you may be — today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

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

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

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

I Have All The Money I Need

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

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

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

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

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

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

Does Happiness Hang on Your Decision?

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

VICTOR B. MASON
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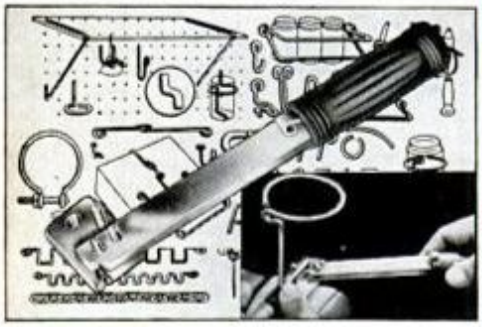

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Easy kit for photo backgrounds

Ever wonder how professional photographers get those nice, plain, undistracting backgrounds in their shots? The answer usually is seamless background paper. You'll find rolls and rolls of it in different colors on wall brackets in most studios.

But if your living room is your studio, you can't leave rolls of paper on your walls. That's where this take-apart BD A-Dapt-O stand comes in. It holds rolls up to 115 inches long (or shrinks to fit in spaces less than 6 feet wide, with narrower paper rolls), and adjusts from 64 to 120 inches in height, all without tools.

No tools needed

Assembling the stand takes no tools either (unless, as in our sample, the screws provided are a bit too thick for the holes in the stand legs). But though the legs all look identical, some have their holes drilled differently to match different hole heights in the upright poles. Match them correctly (instructions don't cover this), and the poles won't wobble. Mismatch the holes and the poles will be wobbly—but still secure.

The stand lists for $49.95, but it's available by mail for $38.05 (plus shipping) from Porter's, Box 628, Cedar Falls, Iowa. Porter's carries only 36-foot rolls of 50-inch paper (the width shown above) for about $12, but large camera stores carry other sizes from 50 inches by 36 feet (about $8.50) to 140 inches by 100 feet (about $50).

BD, at Box 3057, Erie, Pa. 16512, carries about 47 shades of paper in a wide size range. But you're better off writing for the name of your nearest dealer than ordering direct—freight is expensive on individual-roll shipments.—*Ivan Berger.*

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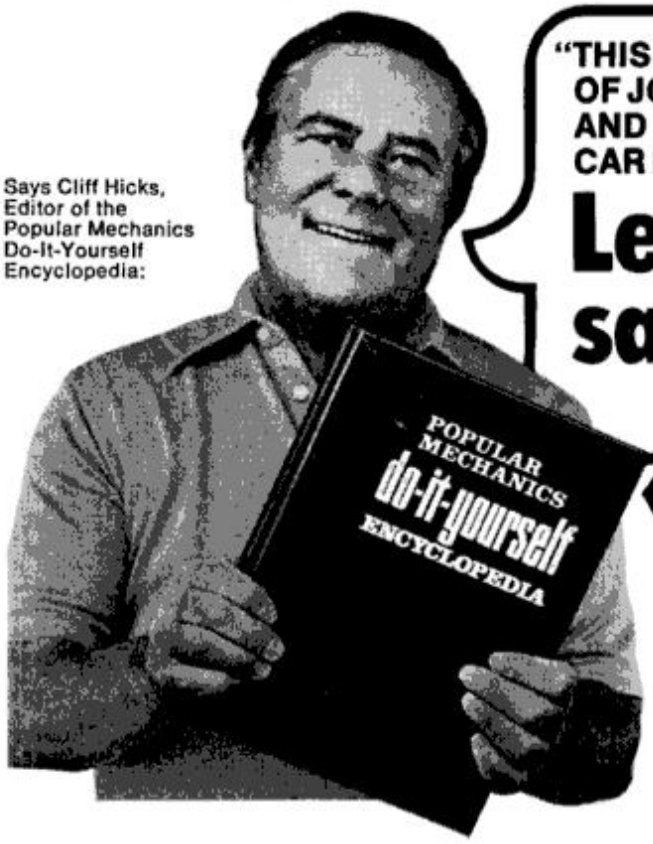
Says Cliff Hicks, Editor of the Popular Mechanics Do-It-Yourself Encyclopedia:



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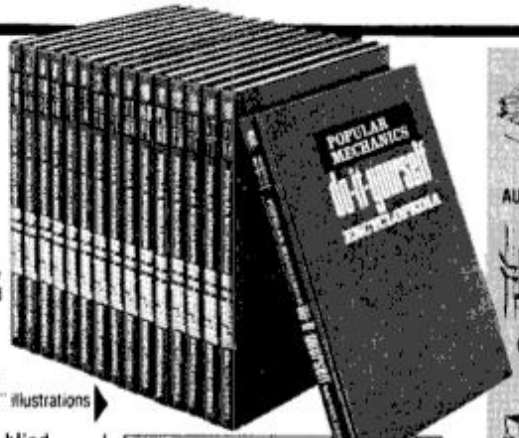

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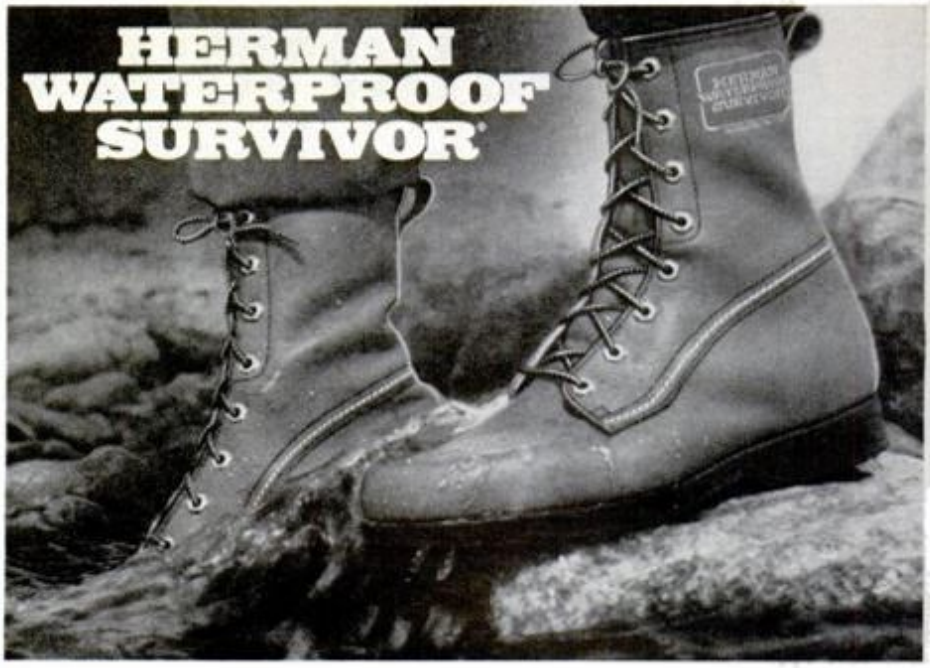

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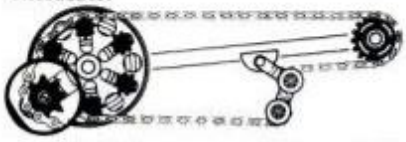

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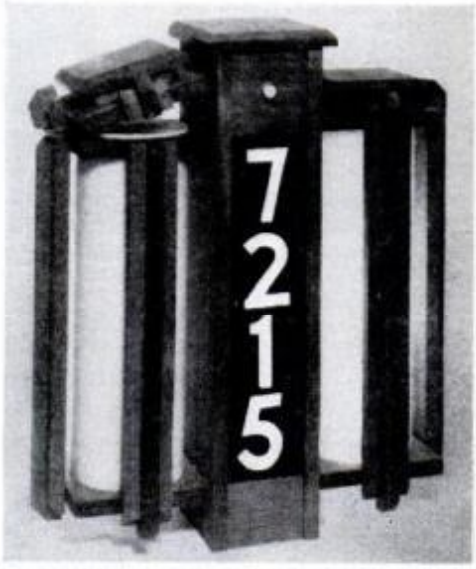

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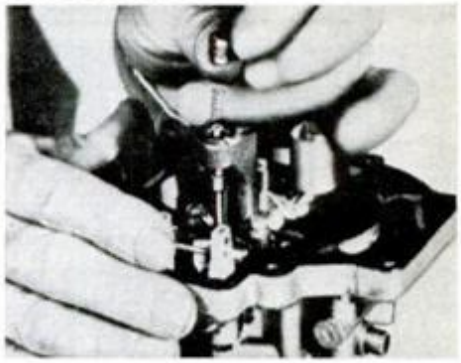

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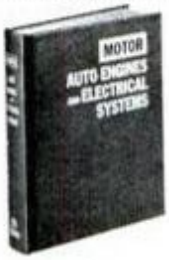

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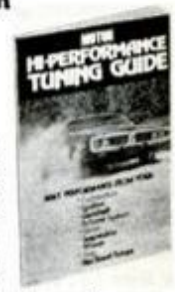

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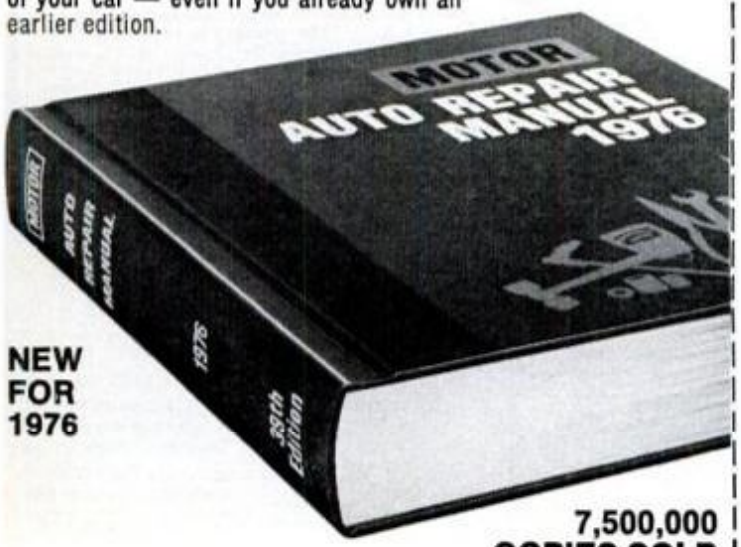

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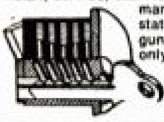

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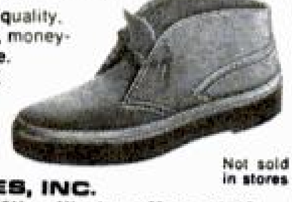

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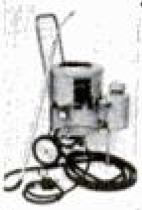

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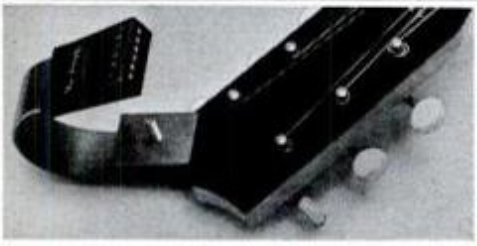

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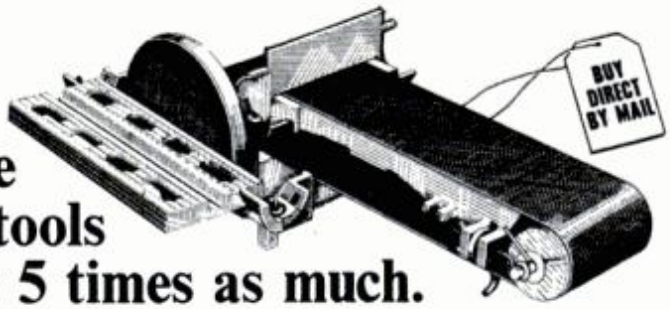

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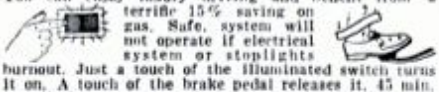

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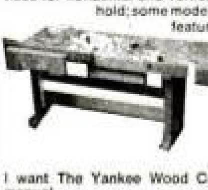

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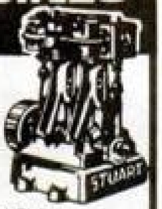

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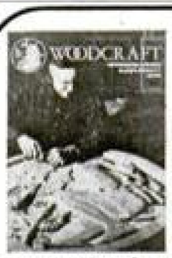

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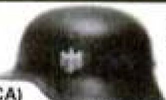

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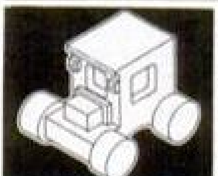

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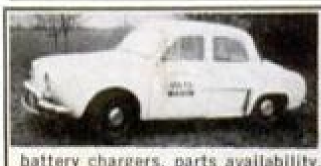

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