

SEPTEMBER 1976 75 CENTS

Popular Mechanics

**COUNTER-TOP
COMPUTERS**
The hot new
home
appliances!

**COMPLETE GUIDE TO
4 GREAT HOME IMPROVEMENTS**

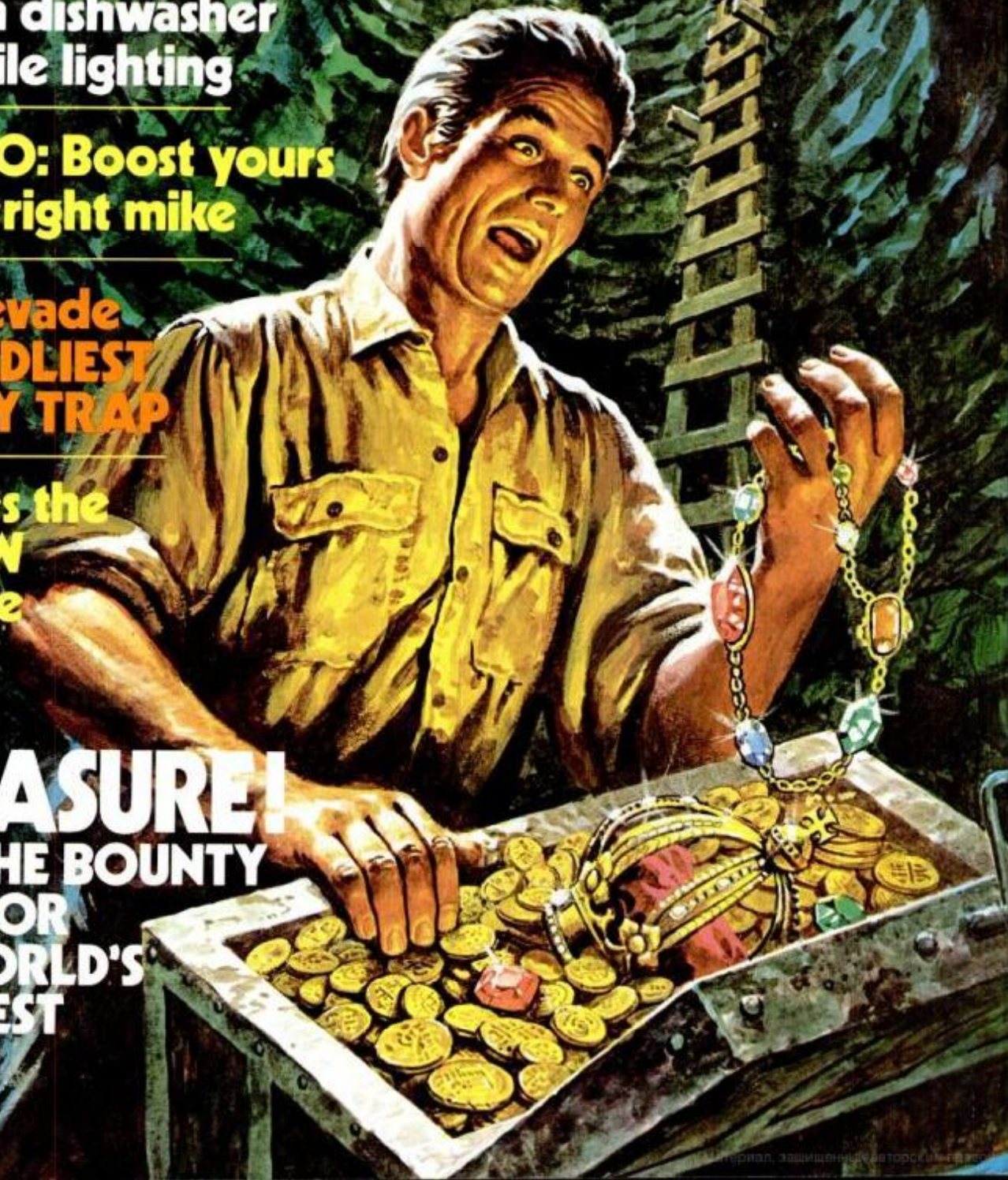
- Freestanding fireplace
- Informal dining set
- Built-in dishwasher
- Versatile lighting

**CB RADIO: Boost yours
with the right mike**

**How to evade
THE DEADLIEST
HIGHWAY TRAP**

**PM drives the
new BMW
& Porsche**

TREASURE!
JOIN THE BOUNTY
HUNT FOR
THE WORLD'S
GREATEST
PRIZES



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Filter Kings, 16 mg. "tar," 1.1 mg. nicotine; Longs, 17 mg. "tar," 1.2 mg. nicotine, av. per cigarette, FTC Report Apr. '76

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Why should you spend \$3.95 for a can of motor oil?



Introducing Mobil 1 synthesized engine lubricant. It's better than conventional oil, no matter how you drive.

It's a whole new lubrication generation: A unique multiviscosity fluid made with synthesized hydrocarbons from a patented Mobil process.

It can work magic for your engine. Here are seven reasons why.

Better engine protection.

Mobil 1 protects valve trains, gears, piston rings and cylinders better than ordinary oils. It's a performance reserve you can count on.

To prove it, we put Mobil 1 in a fleet of highway patrol cars for 12,000 miles. Then, we tested that "used" oil against conventional motor oil in a Pinto engine at 3000 rpm for 150 hours. Even after all its previous use, Mobil 1 protected like brand-new ordinary oil.

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Better high-temperature performance.

If you drive fast and hard, you'll find Mobil 1 won't thicken and form deposits to the extent ordinary oil does.

We proved it in the Olds IIC "SE" high-temperature-high-load test (3000 rpm, 100 HP, 300° F oil). Ordinary oils are tested for only 64 hours. But we had to double the test length to get even a significant viscosity increase with Mobil 1.

Faster cold starts.

Down where even antifreeze turns to mush, Mobil 1 helps your engine start quickly. Ordinary oils are so thick at -20° F we can't measure their viscosity. Mobil 1 still flows at -50° F.

Cleaner intake system.

Because it's so stable, Mobil 1 forms less deposits on intake area and valves. In a cyclic test on a 6-cylinder, 250-cu.-in. Chevy engine, Mobil 1 gave 78% less buildup on intake valves than conventional oil, after 200 hours of testing.

Less oil consumption.

Mobil 1 isn't used up as fast as ordinary oils. (Providing your engine is in good mechanical condition.) In city and highway fleet tests, Mobil 1 cut oil consumption by as much as 25%. This means a cleaner exhaust stream.

A cleaner engine.

A lot of people say it. We can prove it. Our exclusive detergent additive package is why. Even after 384 hours—double the standard length—in the Ford VC test, Mobil 1 came up better than ordinary oil standards in every way. Less sludge and varnish. No oil ring or screen clogging. No ring sticking.

Better mileage.

You can get more miles per gallon, too. Up to 10 miles per tankful for the average car. Sure, you know a million ways to boost your mileage; here's a way to get a little bit more.

That's the Mobil 1 story. And now you know why it's worth up to \$3.95. Or even more.

Mobil 1
The oil that saves you gas.

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Popular Mechanics®

SEPTEMBER 1976 • Vol. 146 No. 3

INTERNATIONAL EDITIONS: Australia, Caribbean, Mexico, Southern Hemisphere

SPECIAL FEATURES:

Complete guide to four great home improvements: Freestanding fireplace, informal dining set, built-in dishwasher, lighting. Begins on page 96.

CB radio: Boost yours with the right mike. Amplified, compressor and noise-canceling types will improve the clarity of your signal. Page 83.

How to evade the deadliest highway trap—the tailgating accident that strikes suddenly when neither you nor the guy in back can stop. Page 86.

PM drives the new BMW and Porsche. Firsthand reports on the 924, just now available, and the 320i, to go on sale in November. Page 90.

Counter-top computers: The hot new home appliances that are about the size of two breadboxes and are becoming more affordable. Page 112.

Air racing roars back. Souped-up ex-fighting planes and special-design speedsters are turning Reno into a new "Cleveland" of air racing. Page 67.

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WORTH WRITING FOR

Looking for more ideas and information?
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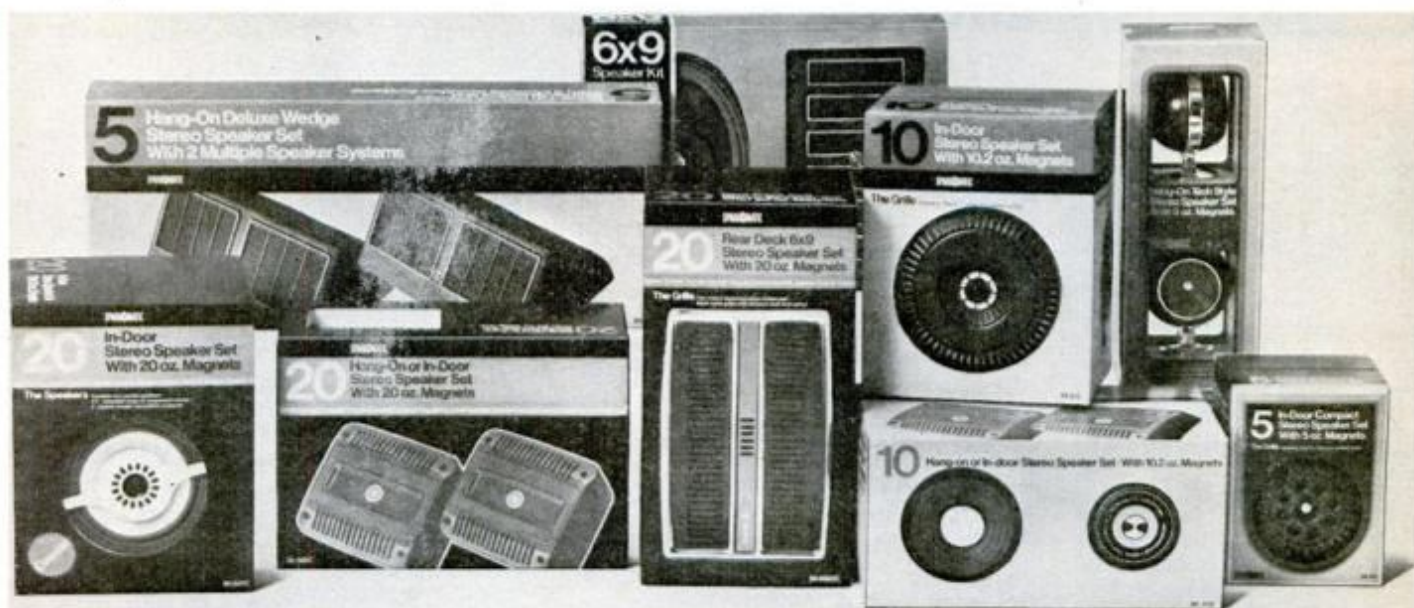
ON THE COVER

Treasure! That's the hoped-for prize at the end of one centuries-long search. Other men are searching elsewhere for other long-sought rewards. Page 92.
Illustration: Hector Garrido

POPULAR MECHANICS IS PUBLISHED MONTHLY by the Hearst Corporation, 224 West 57th Street, New York, N.Y. 10019, U.S.A. Single copy for the United States, 75 cents; for Canada, 95 cents. Subscription prices: United States and Possessions, \$7.00 for one year; \$13.00 for two years; \$18.00 for three years. Canada, add \$3.00 for each year. All other countries, add \$5.00 for each year. Second-class postage paid at New York, N.Y., and at additional mailing offices. Authorized as second-class mail by the Post Office Department, Ottawa, and for payment of postage in cash. Registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 20, 1950. © 1976 by The Hearst Corporation. All rights reserved. Printed in U.S.A.

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FOR THE BEST CAR SPEAKERS AROUND THIS IS WHAT YOU SHOULD LOOK FOR.



AND THIS IS WHY.

For the past eight years we've had more speakers on the road than anyone else. So even though you may not have heard of the Sparkomatic name, you've probably been listening to the Sparkomatic sound.

Our SK-250 stereo speaker set undoubtedly helped make us number one. When we first engineered this "dual" speaker concept eight years ago, it was the only car speaker that could produce anything close to the high fidelity sound of home speakers.

Since then everyone's been trying to imitate us.

After breaking that sound barrier for the car, we soon went even further and engineered our coaxial speakers.

We mounted the woofer and the tweeter on the same axis (to deliver more natural bass and treble reproduction) and connected a capacitor crossover network to allow each speaker to operate at its peak level. Now our coaxial stereo

speaker line-up includes the SK-620C which is a trim in-door model, the SK-520C, an easy-to-



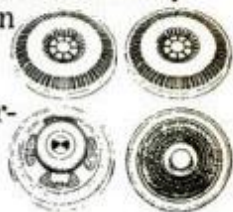
install hang-on and the SK-6920C, a rear deck mount designed to fit most existing rear deck cut-outs. All have twenty ounce magnets, well worth their weight to produce the best there is in car sound.

Our SK-355 stereo set is another example of Sparkomatic engineering know-how. We kept it small in size so it would be very much at home in compacts and mini imports. It has respectable five ounce magnets and air suspension cones so you can have big sound in small places. The SK-303 "tach" style speaker is also designed for small car application with the ease of hang-on installation.

No matter what size or price our speakers are, we put the same Sparkomatic expertise into everyone of them.

Like our SK-510 stereo speaker set. Moderately priced, yet, with

hard working ten ounce magnets and excellent range and delivery. It's an easy hang-on installation. Or, if you're looking for the same characteristics in an in-door application, our SK-610 is the one.



If you're still into monaural sound we have a wide range of individual high fidelity speakers. (We're perhaps the only company that does.) These rear deck speaker kits come complete with a dash mounted switch for adjusting the sound from front to rear or for a combination of both. They're available in two sizes, 6 x 9 and 5 x 7, and they fit the existing cutouts in the rear decks of most cars.

We make all of our speakers easy to install—most people do it themselves. All are quality engineered for every kind of car radio and tape deck there is.

With Sparkomatic speakers you can fill your car with a world of sound that is comparable to what you hear at home. And now you know why Sparkomatic makes the best car speakers around.



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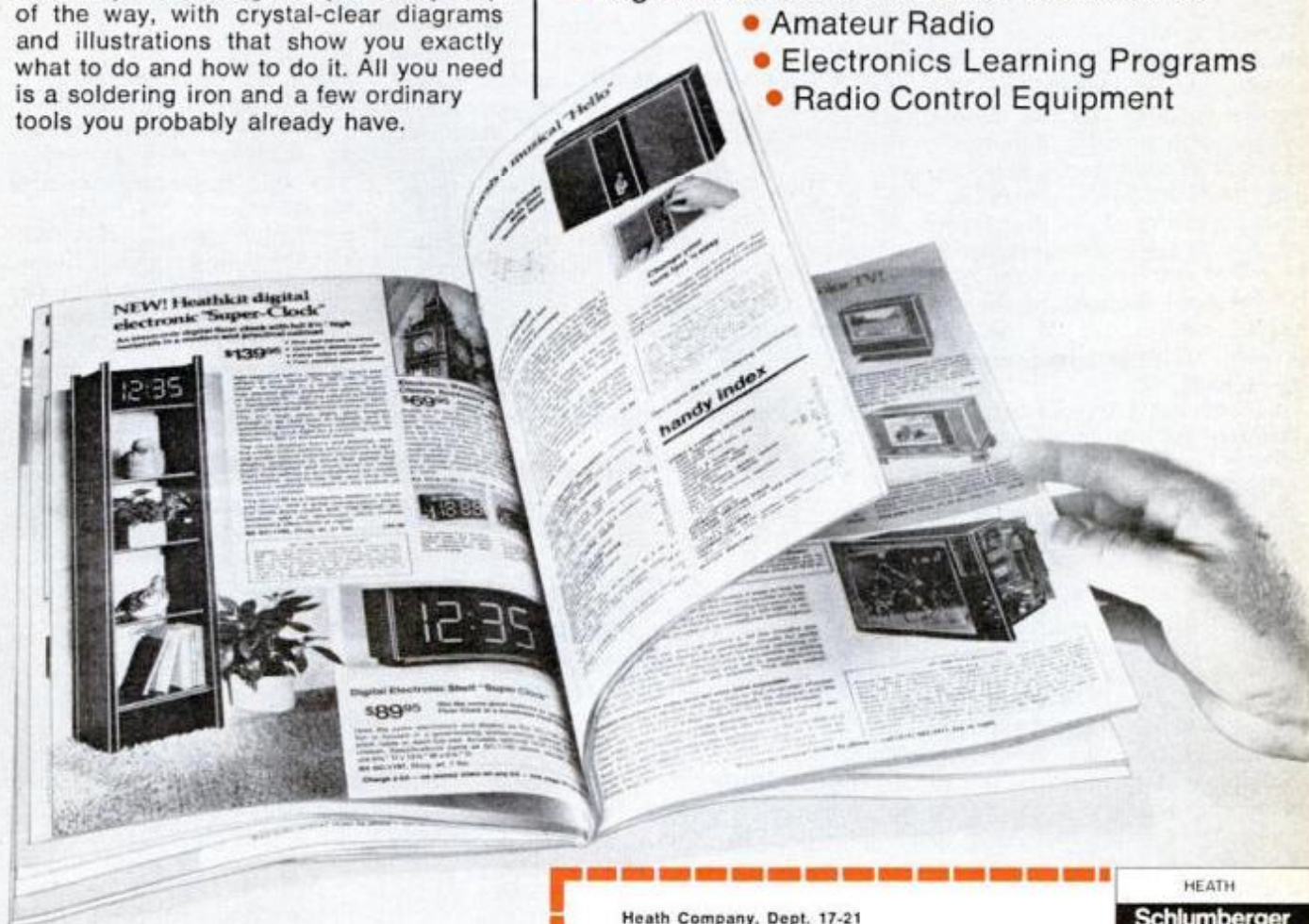
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LETTERS

TO THE EDITOR

Stained-glass artistry

Stained glass is an art form, not a do-it-yourself project. Your article *Flood Your Home With Color Through Stained-Glass Windows* (page 110, June '76) cheapens the art. There are too many people now who turn out poorly made, poorly designed, junk glass. Please do not add to these "craftsy" hordes by suggesting that everyone can do stained glass. The article made me shudder.

BONNIE MANSON
STAINED GLASS DESIGNS
MOBILE, ALA.

Writer Robert Wortham missed on only one point. Any stained-glass window over 24 inches should be reinforced to keep it from distorting, buckling and possibly slipping from the frame. To reinforce, place a piece of flat metal on edge across the window and solder it to each piece of lead it crosses, including the edge. The metal can be cut at the edge or extended and secured to the frame, creating a solid unit. If the window has long, unbroken lead pieces laid edge-to-edge, the reinforcing "rods" can be concealed behind them so the continuity of the window's design won't be broken up.

I thoroughly enjoyed your story.
JAMES H. BAER
GLENSHAW, PA.

No delivery

I read with interest the June article evaluating current model vans (*PM Owners Report: 1976 Ford, Chevy and Dodge Vans*, page 72). I got a terrific laugh from the Chevy owner's complaint that he waited over three months for delivery. I should be so lucky! After my van had been ordered for better than three months, my dealer learned that the work order was still sitting in someone's office and had not even been sent to the factory.

Three more months have passed, and the only van I have is the picture on a slick promotional piece I received when my van was ordered. GM sends me form letters, but no one seems to know for sure the status of my order. If my experience is fairly common, perhaps GM would do better to take orders for '77 models starting in December 1975.

That way the vehicles would be delivered while the model year is still current.

REV. WM. L. DEUTSCH
GIBSON, IOWA

Now hear this: Great story

Congratulations on your article covering the Navy's new USS *Spruance* (*Our Newest Destroyer: Swift and Sneaky*, page 82, May '76). John Pearson took a difficult subject and brought his experience to life for your readers. Your story was one of the finest I have ever read about a Navy ship.

If your readers have questions about the Navy and how they can join the team that runs the USS *Spruance* and ships like her, they should write to Capt. H.C. Atwood Jr., U.S. Navy, Box 2000, Pelham Manor, N.Y. 10803 or call toll-free (800) 841-8000.

TOM HALL
NAVY RECRUITING COMMAND
ARLINGTON, VA.

Not a percolator pump

The wiring diagram in *How to Repair Coffee Percolators* (page 102, June '76) which shows a "pump" in the circuit is wrong. It really is a warming or low element.

GEORGE HOFFMAN
CHARLOTTE, N.C.

The part is neither a "pump" nor a keep-warm heating element, but a connector, writer Mort Schultz says. The percolator we used for the drawing has no warming element, though some do.

For Saturday mechanics

Though I enjoyed your *Car Care Guide* (May '76), I think a couple of vital areas were overlooked.

In discussing clutch problems, you did not mention the clutch shaft pilot bearing as a potential trouble spot. The clutch release bearing and even the clutch assembly itself can be ruined due to a defective pilot bearing.

I believe you should have considered the oil-pressure sending unit in the section on oil leakage. I have replaced several leaking ones on my own and others' autos.

DAVID G. DRAPER
WAKE VILLAGE, TEX.

I was a subscriber to a competitor's magazine for over 50 years, but I've switched to *Popular Mechanics*. I think your magazine is terrific, especially the car care articles. Are these articles, particularly the *Car Care Guide*, to be published in bound book form?

HENRY MARTIN
WEST CALDWELL, N.J.

You'll find our Car Care Manual just what you're looking for. It's available for \$8.95 postpaid from PM Books, Box 1575, Radio City, N.Y. 10019.

Computerized tee game

When I first tried the tee game, I had nearly as much trouble as the chap in your May *Letters* column (page 6). However, working with computers gave me better recourse than simply asking my friends to try it, so I programmed the machine to play and keep track of the solutions.

I was rather astonished by the result, as there are not only "about five combinations" as the original article said. The machine churned out more than 32,000 completely unique solutions, and it stopped then only because I didn't want to waste any more paper. Figuring from the amount that the computer *did* complete, I'd say there are easily 300,000 solutions.

WILLIAM M. SLECHTA
STERLING PARK, VA.

A versatile project

It's sometimes hard to see the numbers when you use a calculator on a flat surface. But the *Message Minder* in your June issue (page 176) can serve as a calculator stand as well.

These stands sell for \$3 to \$6, and you can really save by making your own.

MURIEL SALOMON
E. HAVEN, CONN.

Byline blues

Our July project, *Novel Lighthouse Night Light* (page 102), carried an incorrect byline. The project was designed and described by Richard Cutler, not R.S. Hedin, whose byline was carried on the article. ★★

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Get your CB from a company you can depend on. Because someday you may have to depend on your CB.

Sure, CB is fun. But when you get a CB transceiver, make sure it won't break down when you need it most. Because helping you out of tight scrapes is really what CB is all about.

If your car gets stranded on a spooky mountain road. Or there's an emergency on the highway. Or when it's 1 AM and your tank reads "E." Or even when you're beginning to nod off and you need some conversation to

keep you awake. That's when you need a dependable CB transceiver as much as you need dependable brakes.

We've been making 2-way communications systems for years. Marine. Police. And HAM systems. And, like everything Panasonic, we build them as if our reputation depended on it.

And that's how we built our mobile transceiver, the RJ-3200. That, you can depend on.



CB/PA Switch. To turn your CB into a public address system (with optional external speaker).

Noise Blanker/ANL Switch. Silences background noise for clearer, quieter reception.

Delta Tuning. Pulls in off-center communications.

"LED" On-Air Indicator. Lights when the set is in the transmitting position.

Lighted Channel Indicator. To easily see any one of 23 channels.

4 Watts of Power. The legal maximum.

Squelch Control. For silencing interstation background noise.

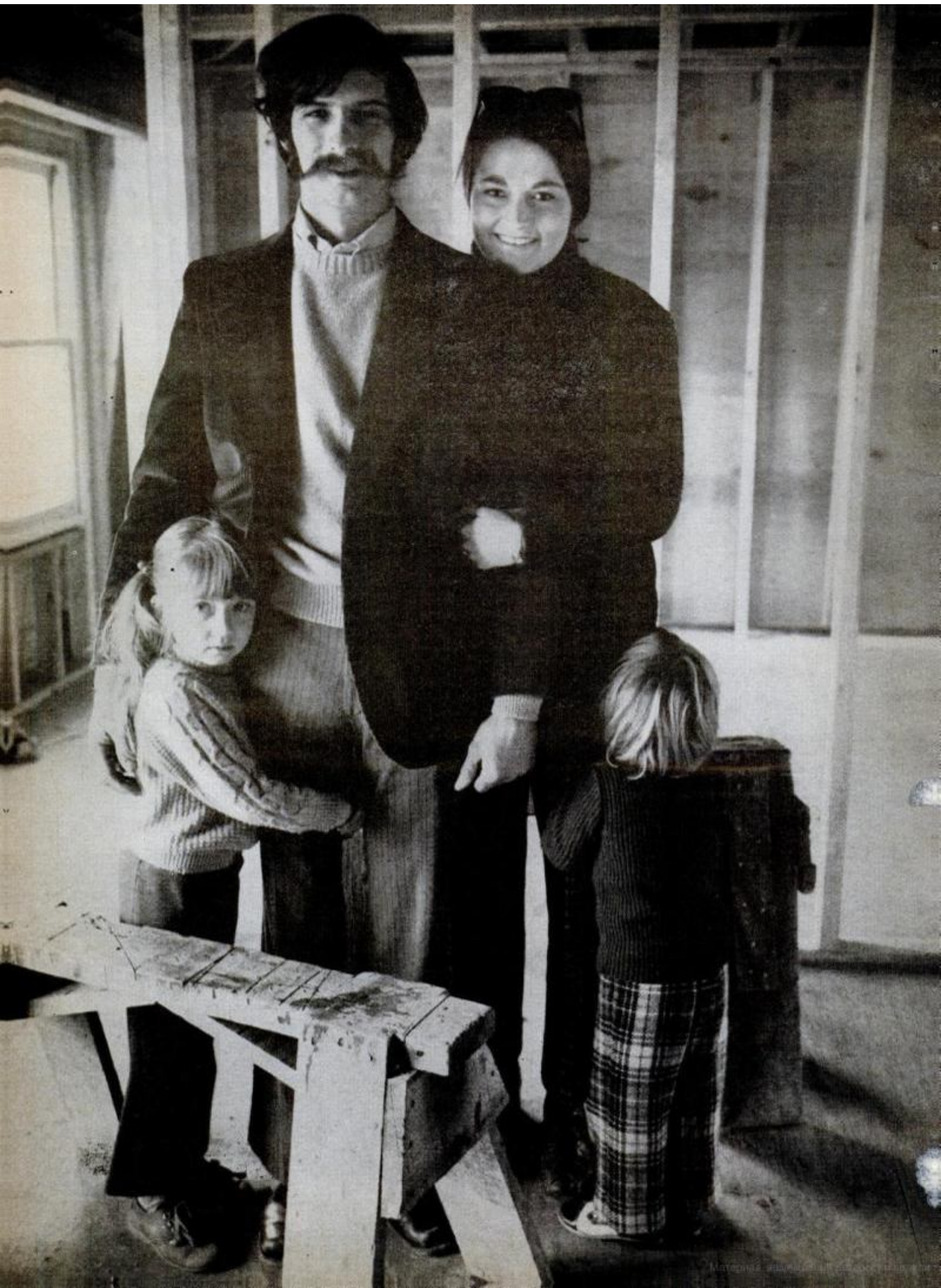
S/RF Power Meter. Measures both transmitting and receiving signals.

Quick-Release Bracket. Lets you remove your CB so a thief can't.

Modulation Indicator. Lights up to indicate strength of transmitting signal.

Detachable Mike. For ease of storage.

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just slightly ahead of our time.



How to start making it early in life.

(A TRUE STORY)

Since he got out of the Navy, John Muirhead of Gales Ferry, Conn., has provided well for his family.

Two cars. A new house going up alongside a wooded lake. Even a handsome Great Dane named Sherman. But John has bigger ambitions.

"I want my own air-conditioning business doing installations and repairs. For homes, office buildings, restaurants, small factories, motels.

"That's no dream. With the training I've gotten from ICS, I know I can do it.

"In fact, my ICS training helped me get the first job I ever applied for. I won out over two other guys, even though I had no experience.

"Naturally, I was nervous at first. So I took my lesson diagrams with me on the job. And I found I could lick any problem.

"Pretty soon, they asked me to head up the air-conditioning department. I also picked up some business of my own on the side. That's what's helping to pay for the new house."

John Muirhead is one of our outstanding graduates. He's hard working. He's in a growing field. And he has good training.

Of course, we can't promise you'll be as successful as John — no school can guarantee jobs for its graduates. But ICS can give you the first-rate training you need — especially if you're interested in one of the growing careers where ICS concentrates its training.

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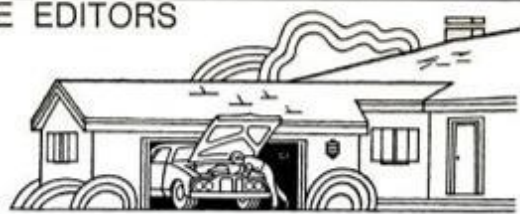
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THE PM GARAGE



Instant compressed air

How often have you tried to blow out clogged tubes, fuel lines or other tight, dirty spots and wound up with bulging eyeballs? How many times have you taken a deep breath, blown away dust, chips or other debris from the job you're doing and wound up with eyes full of the same?

If that's the story of your life, you know how difficult even easy do-it-yourself jobs can be without a source of compressed air. When you need a blast of air at the workbench, you'll get it from this Jet Gun, and you'll find out it's the greatest thing since the invention of the hand bellows. The cylinder is rated at 70 p.s.i. and a variable trigger lets you aim a little puff or a blast of air. It comes with a 2-foot extension nozzle for pinpointing the air. It's good for thousands of blasts and if you're going to use it a lot, it's worth \$16.50. Refills are \$2.75. Falcon Safety Products, 1137 Route 22, Mountainside, N.J. 07092.—*B.H.*

Greatest investment

Several years ago, while exploring an auto accessories department in a store in Geneva, Switzerland, I saw something I had never seen in a stateside shop: a huge display of sheepskins cut to size for bucket seats. I dropped about \$40 for one and it's been covering my vinyl driver's seat ever since (later, I got one for the passenger, too!). In the winter, it keeps the cold vinyl from pulling all the heat out of your back; in summer, you don't scald yourself.

Greatest investment I ever made.

They're becoming more popular here, and one source is Norm Thompson outfitters. I like their sheepskins because the securing straps are sewn in, which is a better arrangement than my clips. Thompson has one that fits a bench seat as well. They're \$34 each, two for \$65.50, and are shown in the latest catalog. Norm Thompson, 1805 N.W. Thurman, Portland, Ore. 97209.—*B.H.*



Mongrel plug wrench

For years, I've been trying to find the perfect sparkplug wrench. And, like the seekers of the Holy Grail, I have yet to find one.

I'm a sucker for mongrels, so I

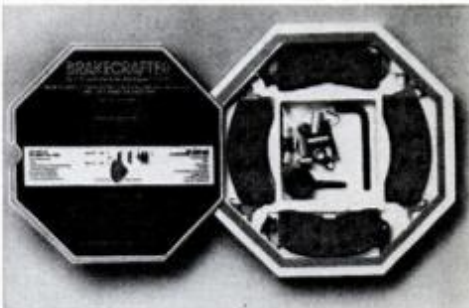


bought this great-looking wrench despite the fact that the package carried neither a manufacturer's name nor an address. There's apparently a growing number of brandless stepchild tools of this sort. They're usually in the 88-cents-to-\$1 bins, and they look good. But the trouble is they usually work about halfway.

This sparkplug wrench does that and no more. Its T-handle doesn't give enough leverage to untighten snugged-down plugs. That's my main complaint. Also, despite its universal joint, it won't reach those really

hard-to-get-at plugs in some MoPar and GM V8s. So save yourself \$2.69 and stick with your trusty ratchet or socket-on-a-stick.—*M.L.*

Ready to tackle brakes?



If you've never replaced disc brake pads before, it takes quite a bit of confidence just to get the replacement parts and then go to work without any real help. This is the first disc-brake pad-replacement kit designed for the do-it-yourselfer, and if you're afraid to tackle brakes with it, you'll never be ready. It's a complete package, with all the necessary parts (four pads plus hardware) and illustrated step-by-step instructions. The Brakecraft kit is \$19.95 and you can get one for any domestic model (no kits are available for imports yet). Hayes-Albion Corp., 1999 Wildwood Ave., Jackson, Mich. 49202.—*B.H.*

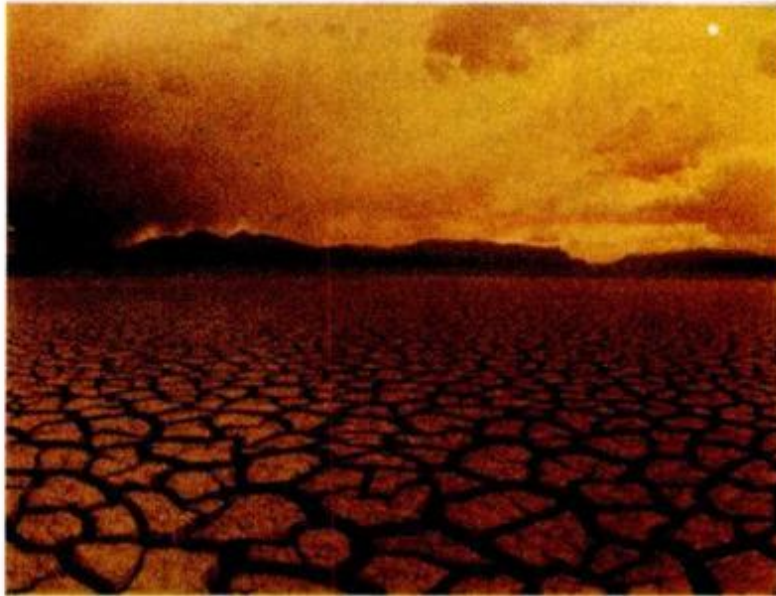
Amazing tape

Chewing gum and tape are ingredients in the old saw about how to keep things together. But that was before this fiberglass repair patch that cures in sunlight. Put it on like tape, let it harden, sand and



paint. It's that easy. The Auto-Pak Lay-It-On Body Patch is \$2.69. 3M Co., St. Paul, Minn. 55101.—*B.H.*

You're looking at all the water you will ever need for your Delco Freedom Battery.



There's little water in this arid, forsaken waste. Of course you may find a few drops in a discarded canteen.

But with a Delco Freedom Battery, you don't need water.

Delco changes the chemistry of batteries.

The Delco Freedom Battery has a revolutionary Lead-Calcium Grid system, rather than the conventional lead-antimony plates. And it's this system that allows for a sealed top.

Good news for everybody from Miami to Minneapolis and beyond.

That means Freedom has no filler caps. And nobody has to remember to check out the water supply.

The Delco Freedom Battery is an advanced technology for starting cars. It is more heat-resistant than even the finest conventional Delco Battery. It packs cold-weather cranking wallop, too.

And it should need no service. Once you buy it, you virtually shut the hood on battery worries.

The Lead-Calcium Grid... Freedom's secret weapon.



No matter where you live, a Delco Freedom Battery makes a lot of sense. Strong, powerful sense. And just plain common sense.

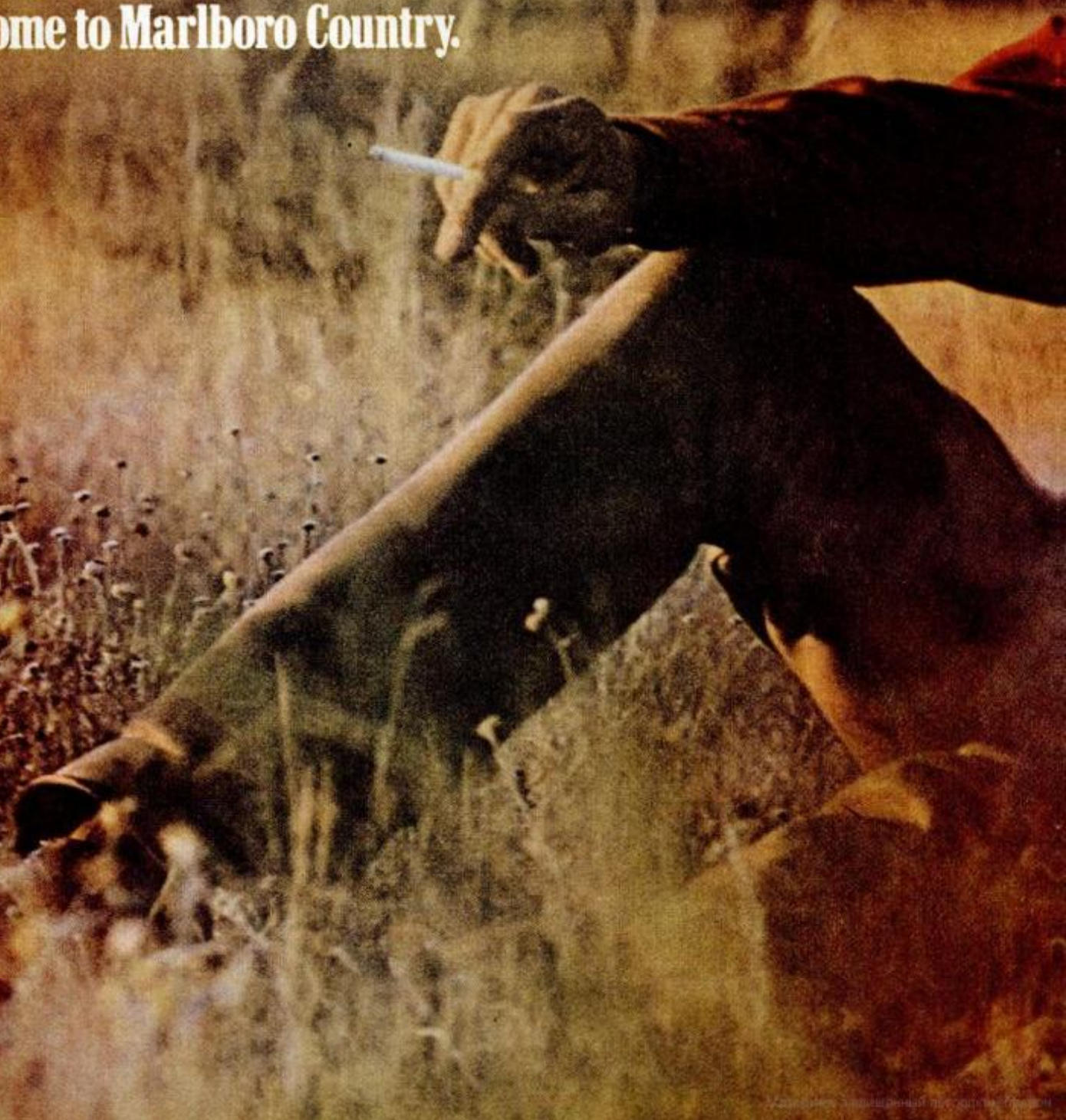


Go with the names you know.



AC-DELCO DIVISION OF GENERAL MOTORS CORPORATION

**It's a good smoke, at the end of a workin' day.
Come to Marlboro Country.**



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Lights: 13 mg. tar, 0.8 mg. nicotine—
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SCIENCE WORLDWIDE



Huge platform put in gulf

In the search for new oil and gas deposits, oil men are moving farther offshore. This calls for bigger and heavier equipment of all kinds as well as more sophisticated technical skills. Recently, the Mobil Oil Corp. towed a 1500-ton steel structure from Morgan City, La., where it was built, to a site 230 miles southwest. The pyramid-shaped structure is a "jacket" for a drilling and production platform. Its eight legs, each over 300 feet long, are hollow, permitting 400-foot steel pilings to be driven through them into the seabed. Photo shows the jacket after it was jettisoned from the barge. It is now held by cables that run to a powerful seagoing crane.

As the hollow legs fill with water, the jacket slowly drops into place, standing upright and level. After the pilings have been driven 300 feet into the seabed by a 70-ton steam hammer, a huge deck will be towed to the site and dropped on top of the structure. This will serve as the working and living quarters for the platform crew.

In the photo, the massive size of the jacket is indicated by the Lilliputian worker (circled) near the uppermost cable.



"Production is still one to two years away," according to a Mobil spokesman. "The drilling rig must be installed, development wells drilled and production equipment added. Then the platform should be ready for up to 25 years of operation."

Scientists spot distant pulsar

The first pulsar beyond our galaxy, the Milky Way, has been detected by scientists of the Naval Research

Laboratory, Washington, D.C. Located in the Small Magellanic Cloud, a million-trillion miles from Earth, it pulses X-rays 84 times a minute, according to NRL astronomers. The pulsar is a tiny neutron star coupled to a giant star to form what astronomers call a binary pair.

Gaseous matter is believed to flow from the giant to the neutron star, which is very dense and has an enormous gravitational pull. The gas

speeds up and its temperatures soar as it nears the neutron star. Intense X-rays from the superhot gas then flash outward into the universe.

Help for energy inventors

The National Bureau of Standards is evaluating energy-related inventions, particularly those submitted by individual inventors and small companies, according to an announcement by the Department of

Commerce. If the NBS evaluation shows that an invention has significant potential for saving or producing energy, it is sent to the Energy Research and Development Administration for additional study. Financial assistance for the further development of an invention is a possibility. For information, write the Office of Energy Related Inventions, National Bureau of Standards, Washington, D.C. 20234.

Windy City weather under study

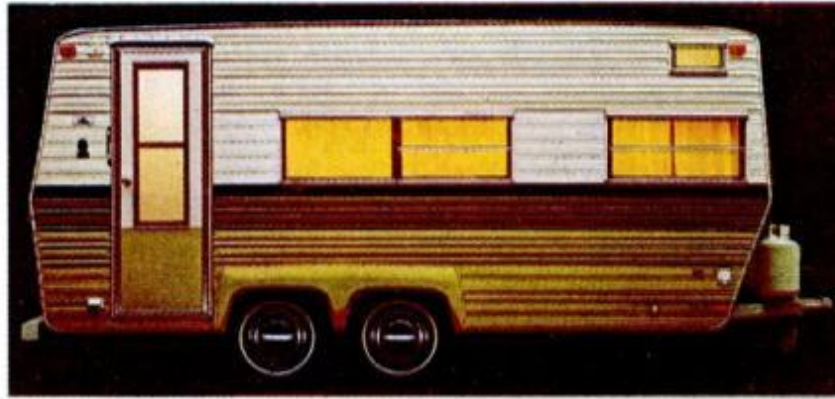
A three-year study of Chicago's unpredictable weather will be made by the Illinois State Water Survey, located at the University of Illinois at Urbana-Champaign. In the Chicago area, blizzards occur within a few miles of sunshine; underpasses may be flooded and sewers swamped only a few miles from dry areas. Lake Michigan is blamed for many of these effects. Smoke, dust, heat and buildings are also factors. The survey will use two weather-search and rain-measuring radars, and the world's largest rain-gauge network. Some 300 gauges are being placed in a 3500-square-mile area. Data will be compiled and analyzed by computer.

'Charmed' particle found?

A new subatomic particle has been found by a group of physicists at the University of California's Lawrence Berkeley Laboratory and the Stanford Linear Accelerator Center. Evidence for the existence of the new particle—thought to be the long-sought "charmed" particle—was obtained in an experiment performed over the past two years. The particle, not yet named by physicists, has a large mass (nearly twice that of the proton, the nucleus of the hydrogen atom) and lives for a relatively long time before decaying into lighter, more common particles. These properties, say the researchers, suggest that the particle is a member of an entirely new subatomic family.

Charmed particles have been predicted theoretically but, until now, none has been isolated. "Charm" is believed to be a new property of matter and is observed only in matter that has been excited to very high energies; it is somewhat analogous to electric charge. ★★★

We design the Prowler so you feel like you did.



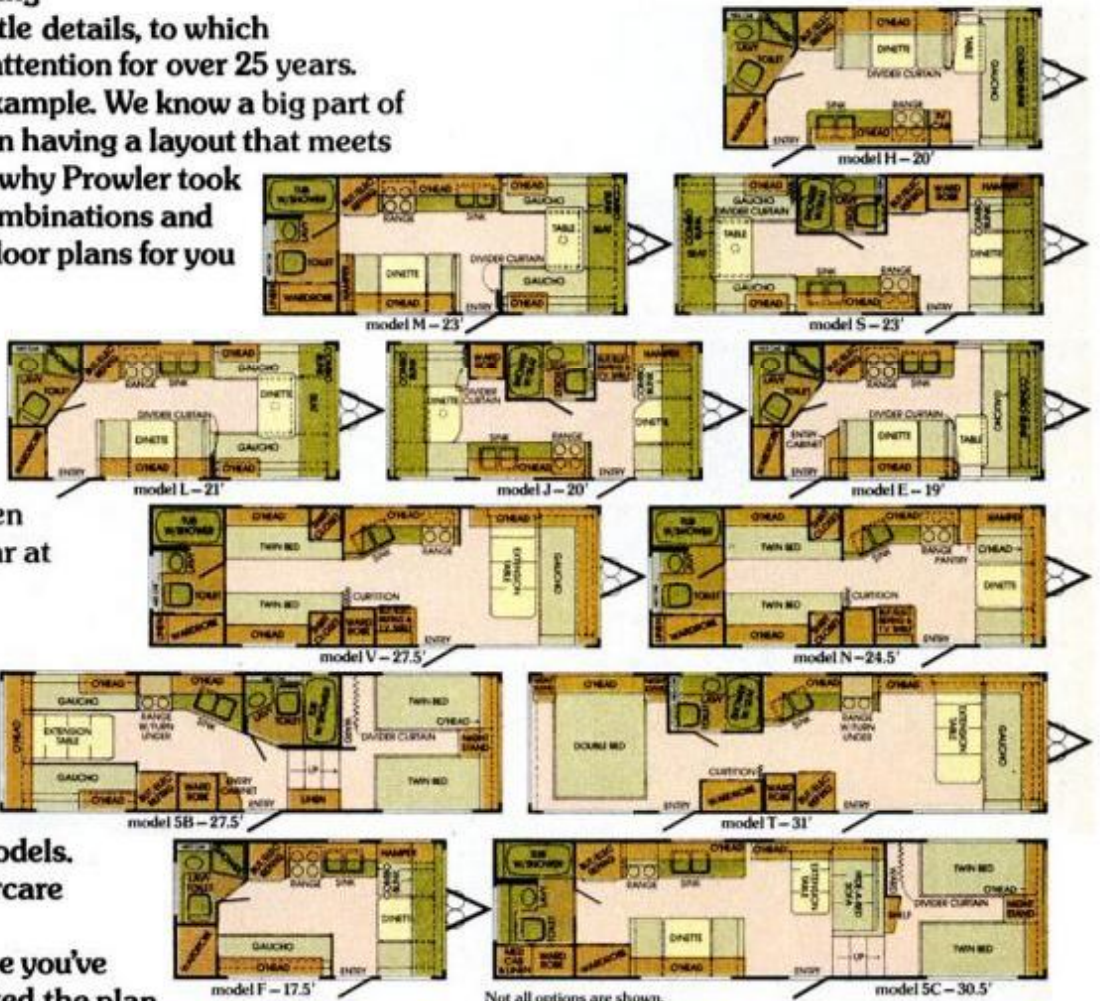
At Prowler, we don't build travel trailers so you can leave home. We build them so you can take home with you.

And that at-home feeling comes from a thousand little details, to which we've been paying careful attention for over 25 years.

Take floor plans, for example. We know a big part of feeling at-home depends on having a layout that meets your family's needs. That's why Prowler took the time to study all the combinations and come up with 18 different floor plans for you to choose from.

We know, in one instance you may want to keep the baby close when you're in the kitchen, and then again, you may have older children you want to bed-down as far at the other end as you can.

You'll find tasteful coordinations of furniture, colors and fabrics, as well. And a range of model sizes from 17½ to 31 feet, including two 5th wheel models. Plus a full, one-year Ownercare warranty.*



So, by the time you've selected the plan and model of your choice you almost feel your Prowler was designed personally by you. We figure that's how it should be.

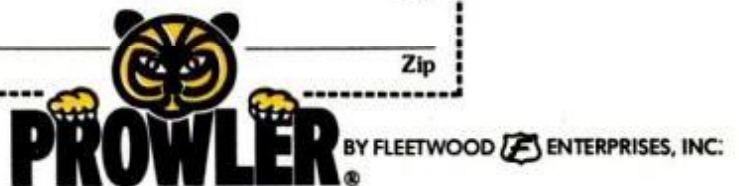


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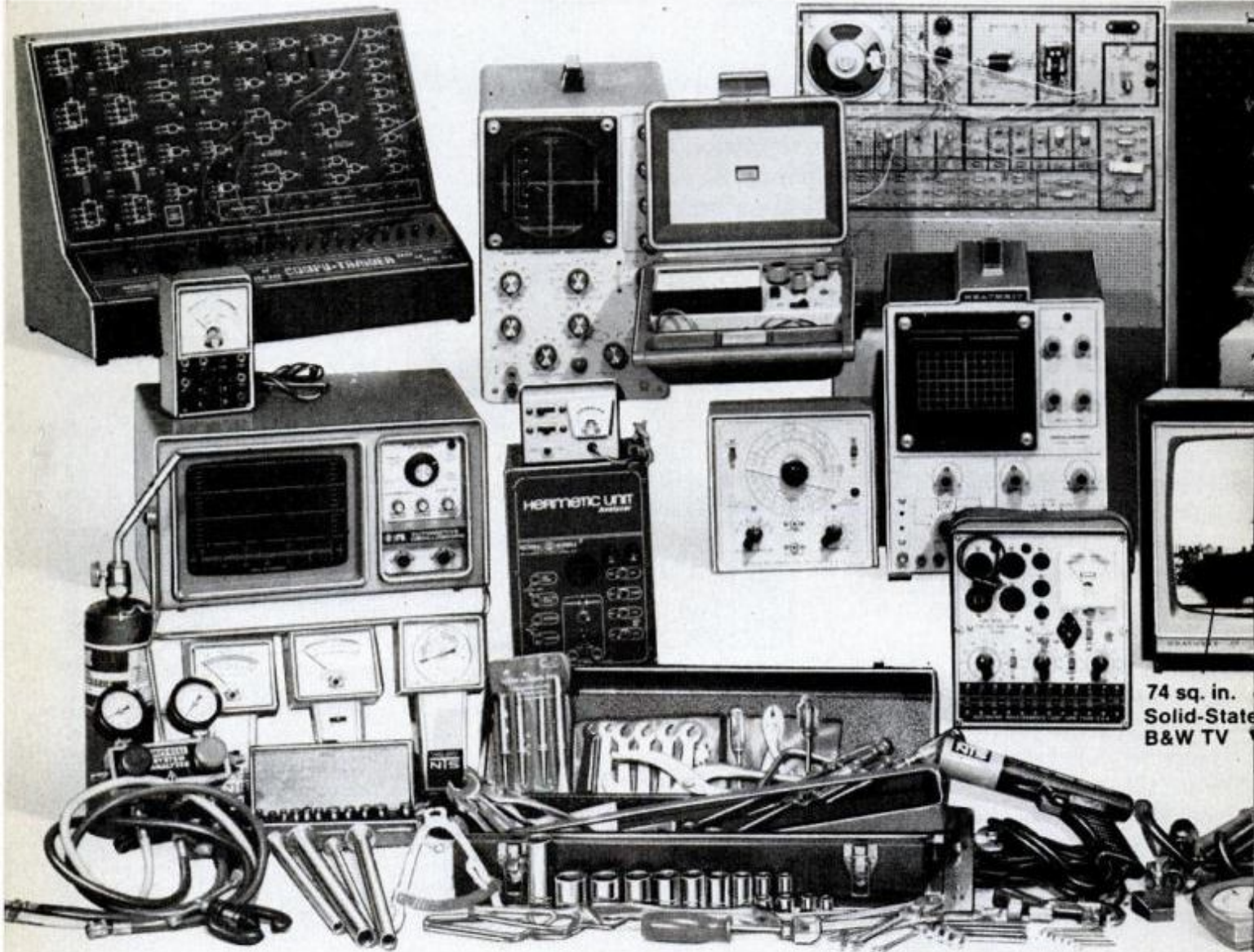
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ALL OUTDOORS

WITH BILL McKEOWN



Sportsman's day

Any day is a good time to explain the pleasures of the out-of-doors, but once a year the official date is the third Saturday in September. This month, National Hunting and Fishing Day is Sept. 25, and it will be an appropriate occasion for sportsmen's clubs to hold open house and demonstrate some of the attractions of hiking, camping, shooting, archery, fishing, hunting, boating and wildlife study. Suggestions, booklets, loan movies and various aids are available to clubs and organizations from the National Shooting Sports Foundation, 1075 Post Rd., Riverside, Conn. 06878.

Pointing the way

This year the National Oceanic and Atmospheric Administration's National Ocean Survey printed its billionth chart since the first one appeared in 1839. Originally the survey turned out less than 200 charts a year, but by 1900 about 75,000 were issued annually, 330,000 in 1917, and today the total is 43 million, in addition to Coast Pilots, tide tables, current tables and aeronautical chart supplements.

To mark the occasion, a special edition of the chart of Annapolis has been issued with an inset of the original chart of the harbor as printed 130 years ago. The commemorative chart (No. 12283, 16th Edition) is available from the National Ocean Survey Distribution Div., Riverdale, Md. 20840, for \$3.25, or from some local marine supply stores that carry charts.

The look of a bigger van will come in a compact package in October with Ford's introduction of its new Pinto Cruising Wagon. It's offered with a sports rally package.



Meanwhile, NOAA is developing methods to put chart data into computers, and by 1980 it hopes to have the system fully operational so computers can then turn out in four to six weeks the work that now takes six to nine months. Computers could



Four-wheel camping for under \$10,000 is feature of Chevy's new Blazer Chalet rig.

also be programmed to produce print-outs of the location of coastal wrecks or, possibly, a listing of all the good fishing spots.

Good gear

Many notable items have been announced recently in time for use this fall. European campers, for example, will remember Jet Gaz compact stoves and lanterns that worked so well abroad and were so hard to get fuel for here. Backpackers, cyclists and boatmen can dig them out again since the Coleman Co. is now distributing here both the units and non-refillable butane cartridges.

Have a good old outboard and a good new boat that require a longer lower-unit shaft? Bay Pattern

Works, Box 1250, Milan, Ohio 44846, now is supplying lower-unit extension kits for many models of Evinrudes, Johnsons and Mercurys. Lengthening your lower unit yourself can save several hundred dollars over going out and buying a new motor.

For campers who like compact cars, Coachmen Industries, Middlebury, Ind., is now producing the Sun Puppy, a little tent camper claimed to tow easily behind a small car. Hitch weight is only 80 pounds, and the low-profile unit is 14 feet long by 6 feet wide and only 40 inches high. It sleeps four adults and two children.

If you're fishing in strange water or close to home and catch something you can't quite identify, the new Fish



Swap tops of Merc's new Hi Performance 1750XS Black Max let driver unbolt and change powerhead of Twister T2X from 100 to 122 c.i.d. between racing events.

Ident-I-Cards at \$1 apiece are particularly useful. With six or seven color pictures on each and identifying features pointed out, the cards are plastic-laminated and will fit in a pocket or tackle box. They cover the pike, bass, trout, sunfish, catfish, crappie and white bass, Great Lakes salmon and trout, Pacific salmon and trout, and perch and walleye families, with 54 illustrations. The cards, also sold in a nine-card set for \$8 in many tackle shops, are made by Barcum House, 1919 Briarcliffe Blvd., Wheaton, Ill., 60187. ★★★

Let C.W. McCall tell you about one of his Midland Convoy Buddies.

The "Wizard of Ohms" Discovers Midland CB.



I've got this Good Buddy everyone calls "The Wizard



of Ohms" 'cause if it runs on electricity, he knows all about it. This is the kind of guy who could build a color TV out of an old radiator and three pop tops.

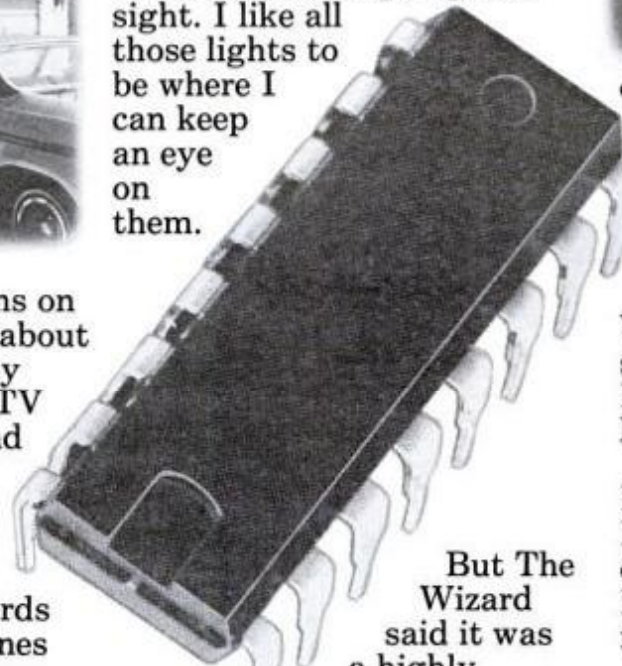
The Wizard kept putting off buying a CB radio because the ones that met his high standards cost too much and the ones he could afford weren't sophisticated enough. The



Wiz is a stickler for electronic perfection.

But, one day, The Wizard gave me a call and told me to come over because he'd finally discovered a CB good enough for him. I figured if it was good enough for The Wiz, it must be a honey.

When I got there, I found out he had a Midland 830 just like mine! I got it because it was the easiest to use. The lighted S/RFO meter, TX light and big, easy-to-read lighted channel selector are on top, right in sight. I like all those lights to be where I can keep an eye on them.



But The Wizard said it was a highly advanced piece of equipment.

Besides AGC, ANL, a tuned RF stage and all those other refinements to clarify reception, the 830 has a phase lock loop frequency synthesizer for greater stability and reliability.

Then there's features you usually find only



on more expensive units, like external CB and PA switches which let you switch CB reception to a speaker outside your car or use your CB as a public address system. The Wizard likes all these sophisticated components. But I still like the little lights on top.

And I like my Convoy Buddies. When you join the Midland Convoy, you get over a million Convoy Buddies 'cause that's how many good people have bought Midland CB's.

People like my buddy, "The Wizard of Ohms."



The Midland Model 13-830. Like all Midland 23-channel CB's, it's rugged, 100% solid state and FCC type accepted for full 4 watts of output power. Visit your Midland CB Convoy Buddy Headquarters and see the broadest total communications line around.

When you get a Midland CB, You get a Convoy Buddy.

MIDLAND CB^{T.M.}
Communications Division

Door Latch and Hinge Test.



Open.



Close.



Open.



Close.



Open. Etc.

It's boring.
Chickachock. Open.
Chickachock. Closed.
Chickachock. Open.
Chickachock. Closed.

Testing...is boring.

But it's important. Because you give doors a lot of tough punishment, we test them tough: 80 thousand times.

Ford, Mercury, and Lincoln cars are the result of one tough test after another.

Chickachock. Open.
Chickachock. Closed.

Testing door latches and hinges is boring.

But tough testing... makes for tough cars.

So, at Ford Motor Company, we do a lot of it.

Chickachock. Open.
Chickachock. Closed.
Etc.



It's simple. Ford wants to be your car company.





MIT breaks the sun barrier

Researchers say their new solar converter will be capable of producing 50 percent of the electricity and up to 85 percent of the hot water for an average home.

by Mike McClintock
ASSOCIATE HOME AND SHOP EDITOR

The most common demonstration of the power of the sun (and one that's impressed many schoolchildren) is to concentrate the sun's rays through a magnifying glass onto a dry leaf until it smolders and finally bursts into flame. This dramatic but simple piece of physics has been expanded by a research team at the Massachusetts Institute of Technology into a system that could make the dream of efficient, nonpolluting, and low-cost solar energy a reality as early as next year.

The solar conversion system uses a conventional photovoltaic cell which converts the sun's energy into electricity. The cell is fed with a beam of sunlight that's concentrated 500 to 1000 times. This means that the expensive silicon cell can be much smaller, and consequently much cheaper, than units that collect diffuse rays without focusing them.

This concentrating process starts as the sun's rays are collected in a 2-foot-diameter dish mirror. These collected beams then reflect up to a small convex mirror mounted above the dish. This thin but powerful beam is then focused down through a hole in the center of the dish onto the surface of the photovoltaic cell.

A balance of power

I took a close look at the model which was erected on the roof of MIT's science building. I had to wear screened goggles to look directly at the cell because it glowed with an intense white light. The magnified sunlight also produces tremendous heat. So to protect the cell (which

operates more efficiently at a lower temperature) coolant is run through the copper base plate of the silicon converter. This necessary but extra step seems like a disadvantage. But some of the energy that would be wasted as heat (the way it is with a lightbulb) is now absorbed in the coolant. This solar heat can then be used to make hot water.

Here are the projected figures. The total energy from the sun that falls into the dish mirror is magnified 500 to 1000 times onto the surface of the cell. It is capable of converting 15 percent of this energy directly into electricity. That leaves 85 percent of the energy in the form of heat. Researchers say the cooling system can capture at least 50 percent of this heat energy.

Dr. Roy Kaplow, who led the research at MIT, said: "There may be some areas of the country, like the Southwest, where the system would prove to be too efficient and the heat would have to be exhausted into the open air."

Officials of the company that has a license to market the converter say they will have a model ready for production by the end of '77. They expect it to cost between \$5000 and \$7000 and to provide roughly half the electricity used in an average home and more than half of the heat and hot water. The production of low-cost, epoxy-based mirrors is being studied now and a prototype of the commercial model will probably be installed early next year at an institution like a hospital that can use all the solar energy. ★★★



The first operational model uses two mirrors to concentrate the sun's rays (by 500 to 1000 times) onto a solar cell mounted in the center hole of the 2-foot-diameter dish mirror. Below are the tracking motor, which uses feedback from the cell to align the mirrors for maximum concentration; the diurnal drive, which tracks the sun across the sky each day, and Dr. Roy Kaplow, a professor at MIT's Department of Materials Science and Engineering, the inventor of the system.





IMPORTS AND MOTORSPORTS

Speedy diesel



There's nothing sluggish about this diesel-powered car—it has just set a world speed record by averaging 156 mph for 10,000 miles. You might recognize the bodywork: It's the Mercedes-Benz C-111, which was originally designed with a Wankel engine amidships.

For this record run, however, it mounted a five-cylinder diesel from the Mercedes 300D passenger car. No, you won't get 150-mph-plus from the 300D: This setup uses a turbo-charger to boost horsepower to a bit over 200 in the 4200 to 4700-rpm range. And the C-111 is a lot slipperier than the four-door 300D.

Four factory engineers did the driving, which was on a circular course in Nardo, Italy. See, a diesel doesn't have to be a dog.

Safety cell

While some carbuilders were declaring that "safety doesn't sell," Volvo was busy building crashworthiness into its cars. The Swedish automaker did the job well: The National Highway Traffic Safety Administration (NHTSA) selected Volvo as the base vehicle for advanced small-car passive restraint system tests. Crash tests performed at the Calspan Corp. for the NHTSA showed that the Volvo offered the best potential for occupant survivability.

An indication of the structural integrity of the passenger compartment is given in the crash photo of the 244 which had been run into a



fixed barrier at a brisk 45 mph.

In another development, the California Air Resources Board has released its data on several four-cylinder cars submitted to them by Volvo: The cars tested nearly pollution-free. A three-way catalyst and electronic fuel monitoring did the job. Cars were only experimental Fours, but Volvo's trying.

Homemade Manta



Most of the do-it-yourself kit cars are just *bodies*. The one pictured above, though, is a complete project—from tubular chassis to small-block V8. The Can-Am-styled Manta Mirage is the idea of Brad LoVette. Manta Cars, 3303 F6 Harbor Blvd., Costa Mesa, Calif. 92626.

A book on the kit-car phenomenon has just been published by Weigen Graphic Center, 8840 7th Ave. N., Golden Valley, Minn. 55427. The handsome volume, *Automotive Self Expression*, is available for \$5.95, plus 50 cents for postage and handling costs.

BMW 630CSI

We previewed the new BMW coupe in the April '76 *Imports and Motorsports* before seeing or driving it. Now that we've done both, we're even more enthusiastic about it. Its competition—cars like the Mercedes 450SLC and Jaguar XJS—will seem rather overstuffed and ostentatious next to this lean machine.

Now that you have surmised it's in the \$20,000 class, you know why we concentrated on the other new



BMW—the bread-and-butter 320i in our BMW-Porsche story that begins on page 90. For emissions reasons, the U.S. version of the coupe will be a three-liter Six and not the 3.3 liters available in Europe (hence 630CSi instead of 633CSi).

Both of the new BMWs will be in showrooms in November. You might pass the time until then with a new volume about the marque from Motorbooks International, 3501 Hennepin Ave. South, Minneapolis, Minn. 55408. You get lots of good pictures for the \$22.95, but the book is a little bit short on text.



Racing wallpaper



With enough stickers you can paper your den. This particular one is from Koni and features Bob Sharp's Datsun Z racer. You can get it free from Kensington Products (distributors of the Dutch-made Koni shock absorbers in the United States), 150-64 Green St., Hackensack, N. J. 07601. ★★★

Experience is the best teacher. You might settle for any CB first time around. Understandably. A lot of people think they're all pretty much alike. But you'll soon discover that, like everything else, there are exceptions.

Ask the pros. America's long distance truckers. These guys talk CB day in and day out. And they demand the best. That's why truckers refer to the Cobra 29 as "The Diesel Mobile."

Listen to Cobra. You'll hear a big difference. Because the Cobra 29 gives you features which assure crystal clear reception. Like switchable noise limiting and blanking, to cut out practically all pulse and ignition interference. Add squelch control and RF gain and you've got exceptional — adjustable — receiver clarity. Even in the heaviest CB traffic. You also get Delta Tuning which makes up for the other guy, because even off-frequency transmitters are pulled in. Perfectly.

Talk to Cobra. And you know you're punching through. One glance at the

29's over-sized illuminated meter tells you just how much power you're punching out and pulling in. For voice modulation the DynaMike delivers at 100%. Same way with power: The 29 transmits at maximum power levels.

Sooner or later you'll get a Cobra. And you'll get engineering and craftsmanship second to none. Performance that will make your first CB seem obsolete. Reliability and durability that have set standards for the industry. Above all, you'll get power. The power to punch through loud and clear like nothing else. Because when it comes to CB radio, nothing punches through loud and clear like a Cobra.



Cobra

Punches through loud and clear.

Cobra Communications, Products of Dynascan Corp.
1801 W. Belle Plaine, Chicago, Illinois 60613

**IF YOUR FIRST CB ISN'T A COBRA
YOUR SECOND ONE WILL BE.**



You can save \$6 to \$7 every time your car needs an oil change by doing the work yourself. It's an easy job, taking about 30 minutes.

But in saving a buck you could be doing your community and country an injury that will take a lifetime to correct and cost somebody—probably you in the long run—far more than you save by changing your oil.

What do you do with the old stuff after draining it out of the crankcase? How do you dispose of it?

If you're like most do-it-yourselfers, you dispose of it in one of three ways: 1. Drain it into a container and throw it out in the trash. 2. Pour it on the ground. 3. Dump it down the sewer.

If you're talking one or two cars, two or three oil changes a year, there's nothing wrong with those methods of old-oil disposal. The local landfill, sewage-treatment plant or mother nature can handle 15 to 20 quarts of oil a year without much more difficulty than a human would experience taking 15 to 20 doses of castor oil. It's not pleasant and you might choke getting it down, but it won't kill you.

Millions of gallons

But waste-oil disposal isn't that simple. It's not a case of pouring the sludge from two or three oil changes behind the garage to kill the dandelions and hold down the weeds.

Old oil from car A is added to the crud from car B and then the goop from car C, through the alphabet millions of times. As a result, 500 million gallons—gallons, not quarts—of dirty oil are dumped in sewers and back yards every year. The black gold that goes in the car emerges as black

WORLD'S BIGGEST OIL LEAK

... and what you can do to stop it.

by Robert Lund
DETROIT AUTO EDITOR

glop and America is drowning in it.

Most of the 500 million gallons—something like 400 million—come from the crankcases of cars owned by do-it-yourselfers. Another 100 million gallons or so come from other sources—farm equipment, lawnmowers, snowblowers, motorcycles, golf carts and the like. (These figures come from two sources—the Federal Energy Administration and an industry trade association, the American Petroleum Institute. The groups don't agree to the decimal point, but their respective numbers aren't far apart. They do agree the do-it-yourselfer is the major polluter.)

There's a lot of backup evidence supporting the charge that the do-it-yourselfer is the main culprit.

How many do it?

Do-it-yourselfers account for 40 percent of all automotive oil sold in the United States and the do-it-at-home oil change is the most popular self-service job done by car owners. The Automotive Parts & Accessories Assn., a group representing manu-

facturers selling to home mechanics, polled 972 d-i-y's earlier this year and found that 91 percent of them change their own oil.

So what do they do with the old oil? The Environmental Protection Administration wanted an answer and hired a research company to talk to car owners. The EPA study was done in Oakland, Calif., in 1973. Nothing has changed much during the past three years that would lead most dump-it-at-homers to mend their ways. Here's how Oakland oil-changers disposed of their old oil:

Method of disposal	Percentage
Dump in back yard	33
Take to service station	15
Take to public dump	11
Dump down sewer	11
Dump in garbage can	10
Dump in empty lot	3
Other means of disposal	17

The FEA says two-thirds of all back-yard dumpers realize it's wrong to dispose of used oil by pouring it down a drain or on the ground, and would be willing to collect it for recycling.

While people in government and in the oil business are fast to point a finger at the do-it-yourselfer and tell him he's a bad boy for dumping the goop on the ground, they are slow to come up with better ways of disposing of used oil. In gathering material for this story I contacted dozens of government agencies, oil companies, auto companies and trade associations. I got enough studies, reports, graphs, copies of speeches and news releases to fill the next 12 issues of PM.

But 99.99 percent of the stuff isn't worth the paper it's printed on in

(Please turn to page 32)



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WORLD'S BIGGEST OIL LEAK

(Continued from page 30)

terms of giving d-i-y's practical advice on getting rid of old oil in ways that won't pollute. One of the gems I received from the FEA, the government agency that's supposed to come up with ideas for solving the problem, is a design for a bumper sticker. That's a solution?

Oil has indefinite life

There's a lot of talk—but again not much action—in government and the oil industry about recycling old oil. Lubricating oil, used in cars, has an indefinite life. It gets dirty and a certain amount is lost (dissipated) through use. But short of burning it, oil never wears out and does not break down when dumped on the ground. Oil is oil almost forever.

Old oil has a reclamation value. It can be used in several ways: re-refined for use in cars and other machinery, for heating purposes, as a raw material for making asphalt, as a blend with diesel fuel, for firing kilns, lubricating railroad journal boxes and to suppress dust in coal mining. Old oil is also widely used in the United States to control dust on unpaved roads. Environmentalists oppose this on the grounds that oil eventually washes off the road and finds its way into the water table.

The problem with all approaches aimed at recycling is rounding up enough oil at one location to make it worthwhile for the recycler to pick it up and process it. Recyclers don't want your occasional five quarts. Not even as a gift. To make money from recycling, they need a constant supply of thousands of gallons.

Noble tries

General Motors made a noble try at solving the collection problem several years ago. In 1970, GM lined up 65 dealers in the Detroit area with a recycler. The dealers estimated they could supply the recycler with about 35,000 gallons of oil a month. In some instances the recycler charged the dealer a small fee for picking up the oil. In other instances the pickup was free. If the dealer was 50 or 60 miles away and a tanker had to spend most of a day getting there and back, there was a charge. If the dealer was nearby, the pickup was free.

The program was a failure. People in dealer service departments assigned to work with the recycler kissed the job off as a nuisance. There was pirating of the old oil. Pump-out pipes for waste oil are usually outside the building and pirates would drive up at night and help themselves,

so when the recycler showed up there wasn't enough oil left to make the stop worth his time. The reprocessor didn't want to invest in his own trucks until he tested the idea and he hired a subcontract trucker to make the pickups. The subcontractor wasn't too reliable. Good idea, but it didn't pan out.

But there may be a solution to the collection problem, a way of getting all the waste to drain into one barrel, thus encouraging recycling.

Bring-it-back legislation

The federal government and some state legislatures—California, Illinois, New York and Wisconsin—are pushing bills requiring firms selling oil to do-it-yourselfers to provide facilities for disposal of the old oil.

Most retailers aren't happy with the idea of keeping a slop barrel in the back room and over-the-counter stores may well put up a fight at having to accept the return of old oil as a condition of selling new oil. But maybe not. One major over-the-counter outlet, J.C. Penney Co., apparently sees some merit in the idea.

"We believe uncontrolled dumping of millions of gallons of used motor oil is highly undesirable environmentally and economically," Ted Boggio, head of Penney's automotive operations, told PM. "We are studying the proposed (bring-it-back) act with the hope it will provide a viable solution to the problem."

One oil company not waiting for the government to pass a bring-it-back law is Continental Oil—Conoco for short. Headquartered in Houston, it has gas stations in 28 states. In May, 1975, Conoco designated 26 Minneapolis stations as "Used Oil Recycle Stations." Anyone with used oil to dispose of was invited to bring it to a Conoco station. The company even supplied reusable containers and sold them at cost, 45 cents.

Conoco success

Conoco sells the oil to a re-refiner at no profit. The re-refiner pays two to five cents a gallon and proceeds from the sale are divided 50-50 between the American Cancer Society and Minnesota Heart Assn.

Conoco's had a few problems. Some slobs bring old oil in open cans and drop it off at night. Vandals follow them around and kick the cans over, making a mess for the operator to clean up next day.

But Conoco is determined the venture isn't going to fail because a few spoilers abuse it. Since pilot operation started, the company has expanded the program to other cities—Omaha; St. Louis, Springfield and

(Please turn to page 186)

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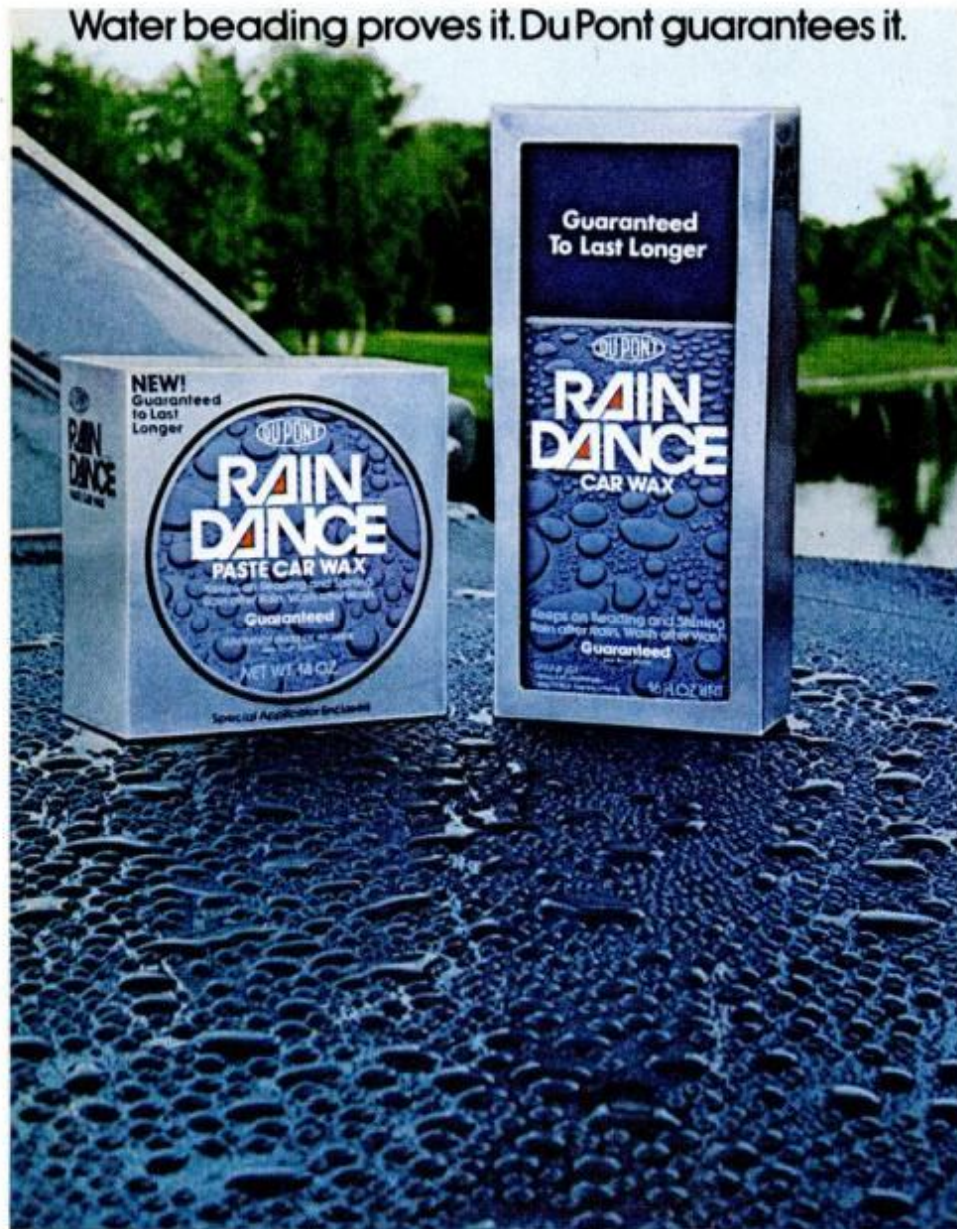
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PHOTO HINTS

FROM READERS

Vibration-free darkroom fan



If the fan you use for comfort during darkroom sessions passes print-fuzzing vibrations to your enlarger, substitute a model airplane propeller for the metal fan blades—its light weight and better balance minimize vibration. Make sure the propeller has the same pitch and direction as the fan blades it replaces. Drill out the prop's shaft hole to fit the fan shaft (but be careful to keep the hole centered). To secure the prop, file a flat on the fan shaft, then run a small wood screw through the prop hub's side to act as a setscrew.

—George Daniels

Give your bag a wax shine



Ordinary acrylic floor wax will protect your gadget bag's finish, even in hard-knock situations. Give the bag two coats to start with, and repeat as needed before and after vacation trips or camera outings. The wax adds a rich luster, but also darkens light leather or plastic, so test wax first on the bottom of the bag to see if you like the result.

—Grace B. Weinstein

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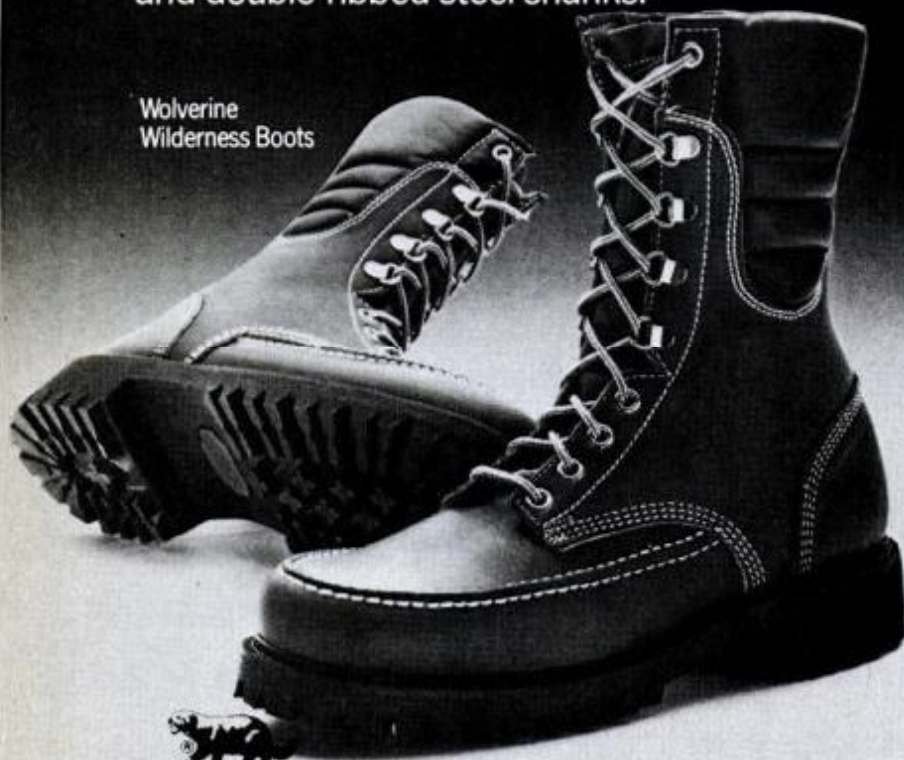
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HINTS

FROM READERS

Open wide!



When you're raking and bagging leaves, holding the plastic bag open is no problem if you borrow the folding stand of a TV tray. Four spring clothespins clip the bag to the frame, and the cross-legged stand spreads the bag open better than an extra pair of hands.—*Ken Patterson*

Epoxy mixing palette

When mixing small amounts of epoxy, I have found that the turned-up bottom of a can makes a dandy non-absorbent surface. The can's rim also retains the cement after it's mixed.—*Bill Koranda*

Spotting the problem



Checking over a printed circuit and marking a defect with a self-sticking notebook reinforcement ring makes it easy to spot for final repair. Paper rings can be pulled free without fear of damaging tiny components.—*Ken Patterson*

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DETROIT LISTENING POST



Sporty wagons from GM, Ford

GM and Ford are working on a new type of station wagon for 1978. They will be sporty, high-ticket cars, compact or subcompact in size, depending on your definition of those terms. You read it right—sporty wagons. The GM entry will be a Chevrolet Monza. Monza is a stretched version of GM's H body. If the company follows past practice, other GM makes sharing the stretched H—Buick Skyhawk, Oldsmobile Starfire and Pontiac Sunbird—will add the wagons a year later, in 1979.

Ford is working on sporty wagons for Maverick and Comet. These cars will get new bodies next year and may get new nameplates to go with the new metal. So the wagons may appear under names other than Maverick and Comet.

Olds has edge on diesel

Which GM division will get first crack at the passenger-car diesel engine GM has coming next year? Oldsmobile is doing the development work, but Chevrolet has wangled one of the early prototypes and is testing it in a Chevy truck. This has led to speculation that Chevy might be in line to introduce the diesel ahead of Olds. That would be very unlike GM, to give one division the dog work and a rival division the glory.

Another factor arguing against Chevrolet getting first dibs is that GM does not see the diesel as a big-volume item during the first few years. Chevy is a big-volume operation, Oldsmobile isn't. Olds is currently testing a new type of emission-control system for the diesel.

Owner's manual that 'talks'

How about an owner's manual that talks to you, that tells you when your car needs service? Honda has something like that on its new hatchback, Accord. Indicator lights on the dashboard flash yellow/red when it's time to change oil and rotate the tires. Accord also has a miniature television screen on the dash with an outline of the car and if one of the exterior lights isn't working, arrows flash on the screen pointing to the light that needs replacement.

While this isn't a new idea, Honda deserves credit for being first to put it on a car. The auto companies have been looking at different ideas for years to encourage people to take better care of their cars—reminders to have the car checked, serviced or parts replaced periodically. This information is printed in the owner's manual, but most people don't pay much attention to the manual. So the companies would like to put some sort of service-alert system on the car—on/off lights or a beeper/buzzer—to flag the driver when it's time to have the engine tuned, brakes checked, oil changed or whatever.

A British company, Joseph Lucas, put together a service monitoring system several years ago that keeps tabs on something like 40 components or functions of the car. But Lucas hasn't been able to sell the idea to Detroit. GM and Chrysler are keenly interested in this concept and it's only a matter of time until they build service warning devices in their cars.

Final fade-out for GM Wankel

GM has never put out an official obit on its Wankel engine, but if there was any lingering life left in GM's version of the engine, it has now expired. The company would like to sell some of the tooling it purchased to produce the rotary. If GM had plans to revive the engine in the next several years, it would not sell tools that cost hundreds of millions.

When GM was high on the rotary a few years ago, it set up a production line at Willow Run. Willow Run is in Ypsilanti, southwest of Detroit. The plant has a reputation for being jinxed and has changed hands almost as many times as Liz Taylor has changed consorts. Henry Ford (the First) built the place to produce planes during World War II. Ford couldn't figure out what to use it for after the war and sold it to Kaiser-Frazer. Kaiser folded and GM took it over.

GM uses part of the building to produce transmissions, but it's such a football field of a place there was plenty of room to set up a line for the Wankel. Now the Wankel has joined the list of losers.

Good time to buy a small car

If you're in the market for a small car, this is a good time to dicker for a leftover '76. Most dealers handling domestic makes have a surplus of '76-model small cars and there is an incentive to move them.

There's an arrangement whereby dealers pay less for cars at the end of a model run than earlier in the year. This is up to the manufacturer, but if it doesn't lower prices before the new models come out, dealers get a 5 percent rebate from the factory on any old models left after the new ones arrive.

Foreign imports ain't right

One thing that bugs me on this job is to see or hear the phrase "foreign imports" applied to automobiles made outside the United States. A foreign car sold here is obviously imported and an imported car obviously foreign. It makes as much sense to refer to U.S. makes as American domestics. You can use one word or the other. But not both. Radio and TV news guys are always rattling on about "foreign imports." Newspapers and magazines use the phrase too, including such classy publications as *The New York Times*.

What are they going to call cars made by Volkswagen and Volvo when they begin producing automobiles in this country next year? Foreign domestics? American foreigners? Non-foreign foreigners or nonimported foreigners? If that doesn't give you a headache, how about the small cars Chrysler and Ford will bring in from Europe next year? Cars made by American companies in overseas plants and imported into this country used to be called "captive imports." But if a VW or Volvo made here is a foreign domestic, then it's only fair to refer to a U.S. car made outside this country as a domestic foreign. Please pass the aspirin.

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APPLIANCE CLINIC

BY PAUL MANN



All about warranties

By last count, more than 200 kinds of electrical appliances were available to make life easier for the American public. All carry some sort of warranty to protect you against manufacturing defects. When you buy a new appliance, you should understand the provisions of its warranty. Failure to do so may cost you money.

Thanks to the Magnuson-Moss Warranty Federal Trade Commission Improvement Act, warranties have become more readable. They must be written in plain English. They must name the warrantor and customer, and specify the extent of coverage, length of time the warranty is in force, how the customer is to go about getting service and any conditions.

In this regard, when you buy a new appliance and read its warranty, ask yourself the following questions:

- Does the warranty cover the entire appliance? If it's limited, exactly what parts are covered? Is labor included?
- Who is responsible for repairing the appliance—dealer, recognized service agency, or manufacturer?
- Who pays for repairs, parts, labor and shipping, if any?
- How long does the warranty last?
- If the appliance has to be serviced, is provision made to provide a replacement until the appliance is returned?
- Who stands behind the warranty—the manufacturer or the dealer?

Warranties for a particular kind of appliance—a dishwasher, for example—vary from maker to maker. If you are undecided whose appliance to purchase, the warranty could be the deciding factor.

Read the use-and-care manual, and use the appliance according to instructions. In nearly every case, a warranty is voided if the appliance is not used as directed.

Set aside a safe spot where you can keep all appliance instruction booklets and warranties.

Now, if you need service under the provisions of a warranty agreement, keep these steps in mind:

1. Call the dealer who sold you the appliance or the service agency he

recommends. Most problems are solved on the local level.

2. If a problem cannot be taken care of locally, write or call the manufacturer, giving full details.

3. If you cannot get satisfaction from your dealer or manufacturer, outline your problem and send it to the Major Appliance Consumer Action Panel (MACAP), 20 North Wacker Dr., Chicago, Ill. 60606. The telephone number is (312) 236-3165.

MACAP is an eight-member board of consumer experts who discuss problems and make recommendations for solutions to appliance manufacturers. They act as a "last resort" agency which acts when you and your dealer or manufacturer can't resolve a problem.

Incidentally, correspondence to a maker or to MACAP should include:

- Your name, address and phone number.
- The kind of appliance, brand, model and serial number.
- Name and address of the dealer who sold you the appliance.
- The name of the service agency that is supposed to handle problems covered under the warranty.
- A clear, factual description of the problem.

Dry up

I have a portable KitchenAid dishwasher manufactured before the advent of energy-saving switches that cut off the heating coil during the drying period. When the machine reaches the dry cycle, I advance the timer by hand to skip it. Results are satisfactory. My problem is that it's inconvenient and sometimes not possible to be on the spot. Can I install a switch or disconnect the heater?—Thomas P. Freeman, Chapel Hill, N.C.

Install a switch? No way that I know of. Disconnect the heater? Sure, but be careful how you do it.

Find the wires going to the heater. I can't tell you how to get to them, because you didn't give the model number of your unit, but if you have a problem, consult the schematic wiring diagram glued to the appliance's chassis. Simply disconnect the two wires at the heater coil.

Here are a few precautions to

follow: First, disconnect the power cord. When wires have been disconnected, tape them well. Make absolutely certain that neither is grounded against a metal part.

One of our readers, Aaron G. Todd Jr. of Los Angeles had a similar desire. He wrote me that he handled the problem this way:

"I have found that opening the door at the beginning of the dry cycle saves energy and does just as good a job of drying."

Robin on the wing

Because a service center wanted to charge \$35 for the job, I replaced the seals in the icemaker of my General Electric model TBF-17A refrigerator myself. It cost me only \$5.50, and the job was done, I thought, to perfection. That's why I can't figure out why the icemaker still leaks. Any ideas?—Tony Franklin, Stamford, Conn.

Yes. You have to use a special tool to positively seat the seals in the mold. Otherwise, as the icemaker mechanism activates, the seals will pull out of the mold, allowing water to leak. Seals cannot be firmly seated by hand.

The tool you need is manufactured by Robinair and is known as No. 14173. It's available from a General Electric service center for about \$2.

At your service

Where can I get a service manual for a Sears Coldspot frostless refrigerator, Model 6694261?—Eldred E. Jones, Pompano Beach, Fla.

This manual is out of print, but you can probably get the information you need at the Sears service center nearest you. You'll find diagrams there giving complete breakdowns of every appliance, past and present, sold by Sears. They show every part, part number, and how units are arranged. The information is on microfilm and ready for public use. ★★

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



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Driving the new Rolls Camargue

Worth \$90,000?

by Michael Lamm
WEST COAST EDITOR



Elegant and sporty at the same time, the new Rolls-Royce Camargue is being put together at the rate of two per week. So if you're only getting around to placing an order now, you'll have to queue up. Grille is as stately as ever, but shorter to work with the lower profile of the car. Rear styling is simple; overall, car is remarkably clean. Complexity begins on the inside with the two-tier climate control, which is worthy of a multimillion-dollar space capsule. As shown below, double-R badge is correctly in place as is lovely lady, mistress to all Rolls owners.

The big question: Is the new Rolls-Royce Camargue worth \$90,000? In my opinion, no, it's not.

It's a good car, yes, but outstanding in no way except price. I'm not saying that the Rolls people have priced the Camargue capriciously, but if Ford built only 100 Mark IVs a year, I suppose it might similarly ask \$90,000 apiece and be justified doing it. Low volume has to mean high price, and Rolls plans to build only 100 Camargues this year.

Earlier this year, two dozen press people attended a U.S. introduction of the Camargue (pronounced Ka-MARG) in Scottsdale, Ariz. Each editor was allowed to drive one car about 15 miles at normal speeds down a smooth, bland stretch of highway—no sharp bends, modest hills, no pot-

holes, no wavy pavement. I managed, in addition, to put five more miles on another Camargue during picture-taking. That's not a fair test of the car, but it did show up some imperfections.

Maybe I expected too much, but I could hear the Camargue's engine idle; heard fan roar when revving;

noted a great amount of wind noise with the windows open and some leakage even with them shut (on both cars I drove). There *was* suspension noise over road irregularities. And the ride, while smooth, was no smoother than that of many other luxury cars I've driven and ridden in.

The dual-level automatic air conditioner does a fine job of controlling temperature, but again, it's noisy. I'd expected to hear no whoosh of air from the ducts. It does, though, allow different foot and face temperatures.

The Camargue steers precisely and with expected ease. I couldn't test cornering, but did note considerable body lean from the all-coil, all-inde-

(Please turn to page 46)



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NEWS RELEASE 1976

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DRIVING THE ROLLS CAMARGUE

(Continued from page 44)

dependent suspension. There's an automatic leveler in the system that compensates for heavy loads in the softly suspended trunk.

Horsepower, which Rolls traditionally rates as simply "adequate," is not adequate to take this 5175-pound coupe up even moderate grades without a noticeable drop in speed. Acceleration from standstill feels adequate but not neck-snapping, and with the throttle floored there's a fair amount of engine roar.

The Camargue has the external dimensions of a six-passenger car, but seats only four. Rear legroom isn't especially generous, either.

Rolls hopes to bring in 30 to 40 Camargues this year, all of them long sold. There's a two-year waiting list. Insurance on these cars will run \$2000 in some areas, I hear.

Rolls also imports the Silver Shadow sedan (base price \$38,750) and the Corniche coupe and convertible (\$64,000 to \$67,500). All these Rollsies, including the Camargue, use the same engine and running gear.

So what makes the Camargue so special? Certainly it's beautifully made; it has flawless workmanship and is built to last. But for \$90,000, the buyer has a right to demand a more nearly perfect car. ★ ★ ★

SPECIFICATIONS—ROLLS-ROYCE CAMARGUE

U.S. base price: \$90,000 port of entry
Standard equipment: Automatic bilevel air-conditioning, GM Turbo Hydra-Matic, power steering/brakes/windows/locks, automatic ride-level control, AM/FM stereo radio with quadraphonic tape deck, clock, leather upholstery, six-way power seats with recliners, stainless steel bumpers, aluminum hood/decklid/doors
Engine: Aluminum ohv V8
Bore and stroke: 4.1 x 3.9 in.
Displacement: 412 cu. in.
Horsepower and torque: "Adequate"
Carburetion: Twin sidedraft SUs
Transmission: GM Turbo Hydra-Matic 400
Rear Axle: deDion, hypoid bevel gears in an aluminum case
Axle ratio: 3.08:1
Suspension: All independent
Front: Lower wishbone, stabilized upper lever, coil spring, tube shock, antiroll bar
Rear: Trailing arms, coil springs, tube shocks, automatic ride control
Brakes: 11-in. Girling discs all around, dual hydraulic circuit with deceleration-conscious pressure-control valve for rear wheels
Body: Unitized, with front and rear subframes; extensive corrosion protection and insulation
Dimensions:
Wheelbase: 120.1 in.
Overall length: 206.2 in.
Overall width: 75.5 in.
Overall height: 58.0 in.
Curb weight: 5175 lbs.
Gas-tank capacity: 28 gal.

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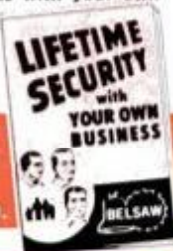
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HOMEOWNERS' CLINIC

Whistling water heater

Our water heater whistles, makes noises like marbles rolling around inside, and sometimes pops loudly when water is drawn. Will it blow up?—Mrs. M.H. Shannon, Hawthorne, Calif.

Water heaters equipped with pressure-relief valves rarely "blow up," but as described may spring a leak any time. Apparently the bottom has become coated with a hard deposit of lime or other chemicals which, when heated during "on" cycles, form tiny steam pockets. Their release accounts for the noises. If the heater has been drained and cleaned without alleviating the noises, it would be wise to replace the unit, as it is near a final breakdown.

Oak floors darken with age

Oak flooring in my home has darkened, some of the boards turning a brownish color with the grain showing more prominently. I'm sure the floors have been waxed many times during the years. Will removal of the wax give a more uniform color?—Mel Hopkins, Cincinnati

Oak flooring tends to darken with age. It's a natural process and removal of wax is not likely to make any appreciable improvement. You'll probably need to sand the floors to achieve the desired result. Remove the wax and sand first with coarse abrasive; follow with finer grades of abrasive to obtain a smooth surface. Then coat the bared wood with a floor finish made especially for the purpose.

Heater peels paint

My gas heater is about 3 ft. from the ceiling and the stipple-finish paint directly above it is peeling. How can I prevent this? Take off the old paint and substitute another? What kind of paint should I use?—David Hyatt, Lake Charles, La.

Is your heater vented to the outside? If not, it should be. I suggest you first scrape off all the old paint. Then you have a choice. You could cover the area with a noncombustible material such as fire-code plaster-board or asbestos board. Or you could paint a square or rectangular area—larger than the overall size of

the unit by a third or a half—above it using heat-resistant paint. Your local paint dealer should be able to recommend a suitable heat-resistant variety.

New roof over old

My home needs a new roof and I'm considering using 240-lb. shingles over the old. Rafters are 2x6, 16 in. on centers; every third pair is cross-braced with a 2x4. Will I have a safe margin if I reroof as described, considering shingle weight, snow load and high wind?—Tony B. Step, Pittsburgh

I assume that by "cross-braced" you refer to collar beams, that the original shingles are asphalt, and that roof framing and nailing are in accord with standard practice. Though snow load and exposure to high wind are impossible to evaluate with certainty, it would seem from your description that you can reroof as planned.

Fail-safe picture-hanging

Whenever I hang or take down a picture, I have trouble installing or removing the hanger—the type with a hook and brad you drive into the plaster at an angle. The plaster is old, and I usually break out a chunk when I work with the hanger. Do you have an answer?—Ray Price, Reno, Nev.

Placing a short piece of adhesive tape at the point where you'll drive the nail will prevent this. Drive nail at the proper angle to avoid "wedging" when it is driven home. To remove the hanger, grip it with pliers and pull it out at the same angle it was nailed in. Don't use a claw hammer, as it's almost sure to break out plaster.



Hidden leak in flashing

My chimney has two flues, one for the furnace, the other for the fireplace. Apparently a leak has developed in the flashing, but so far I've been unable to locate it. The chimney is outside the end wall of

the house and is flashed to the roof. The flashing seems good; it's not rusted. Do you have a suggestion?—Willis Harmon, Omaha

First inspect the bricks for crumbled or loose mortar and check the flashing for poor solder joints. Look for lifted shingle nails and actual cracks in the masonry. If it is the flashing, remove it and peel back the shingles. Reset the flashing in roof cement, nail the outer edges, and coat the margin of flashing. Finally, press the shingles back down in roofing cement.

Papering slide-past doors

I'm wallpapering a bedroom and the plain, homemade slide-past closet doors of 3/4-in. plywood are my problem. I can paint them to match the trim, but there must be a more attractive decor. What can you suggest?—Mrs. William Warner, Philadelphia

Why not carry the wallpaper right over the doors? This could be rather attractive if you retain the plywood doors. Remove finger pulls and bottom guides so you can swing one door outward, thus enabling you to paper the inner one.

Mowing wet grass

I'm told that lawns should never be mowed when the grass is wet, especially with a power mower. Why not?—Richard Long, Adrian, Mich.

Wet grass will clog the blades and driveshaft on your mower, making it less efficient. If you use a grass catcher, it, too, will clog frequently with wet clippings, making it necessary to stop the engine every few yards to clear the blockage. Without a catcher—especially when growth is heavy—clippings will "ball" like hay cocks in a meadow. They may damage the grass if not removed. Otherwise, "wet" mowing does little or no harm to the lawn. ★★

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. HCG, Box 1014, New York, N.Y. 10019.

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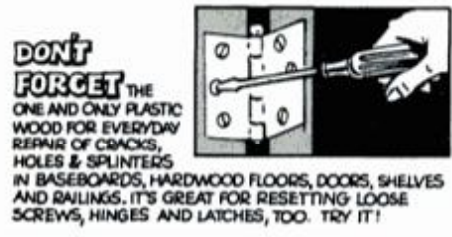


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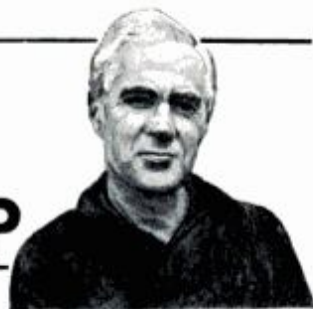
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BY EUGENE A. SLOANE

THE BICYCLE SHOP



Screeching brake cure

My center-pull brakes screech loudly every time I apply them. Is there a cure for this?—Dave Dougherty, Clarion, Iowa.

Sure there is a cure. You should "toe-in" brake shoes slightly so the front part of the shoe grabs first. But first check brake shoes for embedded material. Personally I like my own brakes to squeak loudly when I apply them; this makes pedestrians aware that I'm bearing down on them in city traffic, and I often use my brakes as a horn. A little noise can be a safe thing.

A bike for 'gunkholing'

I want to buy a bike for just riding in the neighborhood. I would like a 10-speed that requires very little maintenance and that would be durable. Can you help?—Lori Lemon, Ajlune, Wash.

Sorry, Lori, that's a contradiction in terms. Any 10-speed bike needs fairly continuous maintenance. The chain should be cleaned and oiled every few weeks; pedal, hub and bottom-bracket bearings need cleaning and regreasing two or three times a year, depending on mileage. Brakes need readjusting every month or two and wheels need truing two or three times a year.

As for durability, you get what you pay for. For your use, I would suggest a \$130 or so Schwinn, Raleigh or Peugeot bike.

A 700-centimeter headache

I bought a bike in Europe last year, and when I tried to replace one of the tires it would not go on the rim. The tires that came with the bike are marked: 28 x 1 5/8—700 x 32 C. The tire I bought was 27 inches x 1 1/4 inches. I can't find a tire to fit this rim size. Is there a source in the United States or do I have to fly back to Europe?—Clarence Higgins, Okeechobee, Fla.

I have an aspirin for your wheel headache: 700 C rims are a good idea if you want to change wheels from wired-on to tubular rims. You may want tubulars for local trips and wired-on tires for tours. With 27 x 1/4-inch rims, you have to readjust brake pads every time you change

from wired-on to tubular sets of wheels (these tires are not interchangeable on the same rim). But there is good news. You can buy 700 C tires and tubes in this country, from better bike stores, or from any of the better bike mail-order stores, such as Wares Cycles, 2656 North 76th St., Milwaukee, Wis. 53213.

Speedometer—yea or nay?

I saw your article on how to install handlebar and gearshift levers. You recommend taping bars from the levers to the top of the bars. How do you secure the tape at the top? Also, do you recommend a speedometer?—Dick Wong, Cutler, Calif.

I use self-sticking tape, such as made by Skid-Lid, but you could use electrician's tape or contact cement. About speedometers, I really hated these toys until a new electronic one came out. The old speedometers are heavy, give noticeable drag that wastes your energy, and are generally in the toy category.

Now for the good news! There is a brand-new electronic speedometer and cadence indicator on the market with zero drag that weighs only nine ounces and is very accurate. The cadence indicator is a real help because it tells you how fast the cranks are turning. When you know both mph and pedal rpm, you can see the effect of any improvement in pedaling technique and muscular effort instantly.

I consider this new unit a valuable aid to better cycling for both the racing and the touring cyclist. It's not cheap at \$78.85, but worth the investment if you're a serious cyclist. Get it from your bike shop or by mail from Erisman Industries, 521 South Maguire, Warrensburg, Mo. 64093. This unit uses tiny magnets on spokes and chainwheel, with separate sensor heads to pick up impulses as the magnets pass them. The indicator uses heavy-duty electric meters calibrated in mph and rpm. ★★★

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.

FOR MOTORCYCLES

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MARCA REGISTRADA

DIRECTIONS

CRANKCASE—First time you need oil and every time you change oil, add **STP** Oil Treatment to your engine when it is running and warmed up. New and low mileage cars use one can **STP** to 4 or 5 U.S. quarts of oil (or 10% **STP** when oil capacity is below 4 or exceeds 5 quarts.) Engines with excessive wear, use **STP** up to 20% of oil capacity. **MANUAL TRANSMISSIONS, GEAR**

BOXES AND DIFFERENTIALS—Add 10% **STP** Oil Treatment to regular lubricant. **POWER STEERING**—Use a maximum of 10% **STP** Oil Treatment. **GENERAL SHOP USE LUBRICATING OIL**—Add 7.5% **STP** Oil Treatment to all new or rebuilt **ENGINES AND MECHANICAL ASSEMBLIES**—Use 5% **STP** Oil Treatment to all new or rebuilt

50% motor oil, and 10% **STP** Oil Treatment to all new or rebuilt 50% motor oil, and 10% **STP** Oil Treatment to all new or rebuilt

SQUEEZE MOUTH OF CAN TO FORM POURING BEAK

— 15 OZ. LEVEL AT TOP OF CAN

NET 15 FL. OZ.

If you want to help reduce engine wear and oil consumption, follow the simple directions.

Use STP Oil Treatment at every oil change and the first time you need oil and you'll be taking a helpful step toward reducing engine wear and oil consumption in your car. STP's effectiveness was confirmed in a series of tests conducted by Automotive Research Associates, Inc. in 27 cars driven over half a million miles. In those tests it was clearly

shown that STP Oil Treatment helps reduce engine wear, and oil consumption, too. That's because STP fortifies and toughens oil... even a premium 10W-40 to help reduce the wear rate of lubricated parts in an automobile engine. And if you'd like to know what's in STP Oil Treatment and how it works you can read about it, plus detailed

test results, in a free booklet available from STP.[®] But while that takes four pages to explain, the directions are simple enough to fit on the side of the can. And if you want the security of knowing that you're helping your engine live a longer life, that's the next thing you really ought to read.

[®]For your free booklet, write to: STP Corp., 1400 W. Commercial Blvd., Ft. Lauderdale, Fla. 33310.

Tubedoring— bargain water sport

by L. A. Wilke



For maximum wet action at minimum cost, try a ride aboard an old truck inner tube behind a fast boat. For fast turns, wear full-size life jacket rather than ski belt.



Optional stomach surfing is provided by lying flat on tube and holding onto tow line. Towboat should carry observer and stay well away from shore during turns.



Original metal valve stem must be cut out and replaced with short rubber valve so rider will not be scratched. Webbing wrapping is also used to cover valve stem.



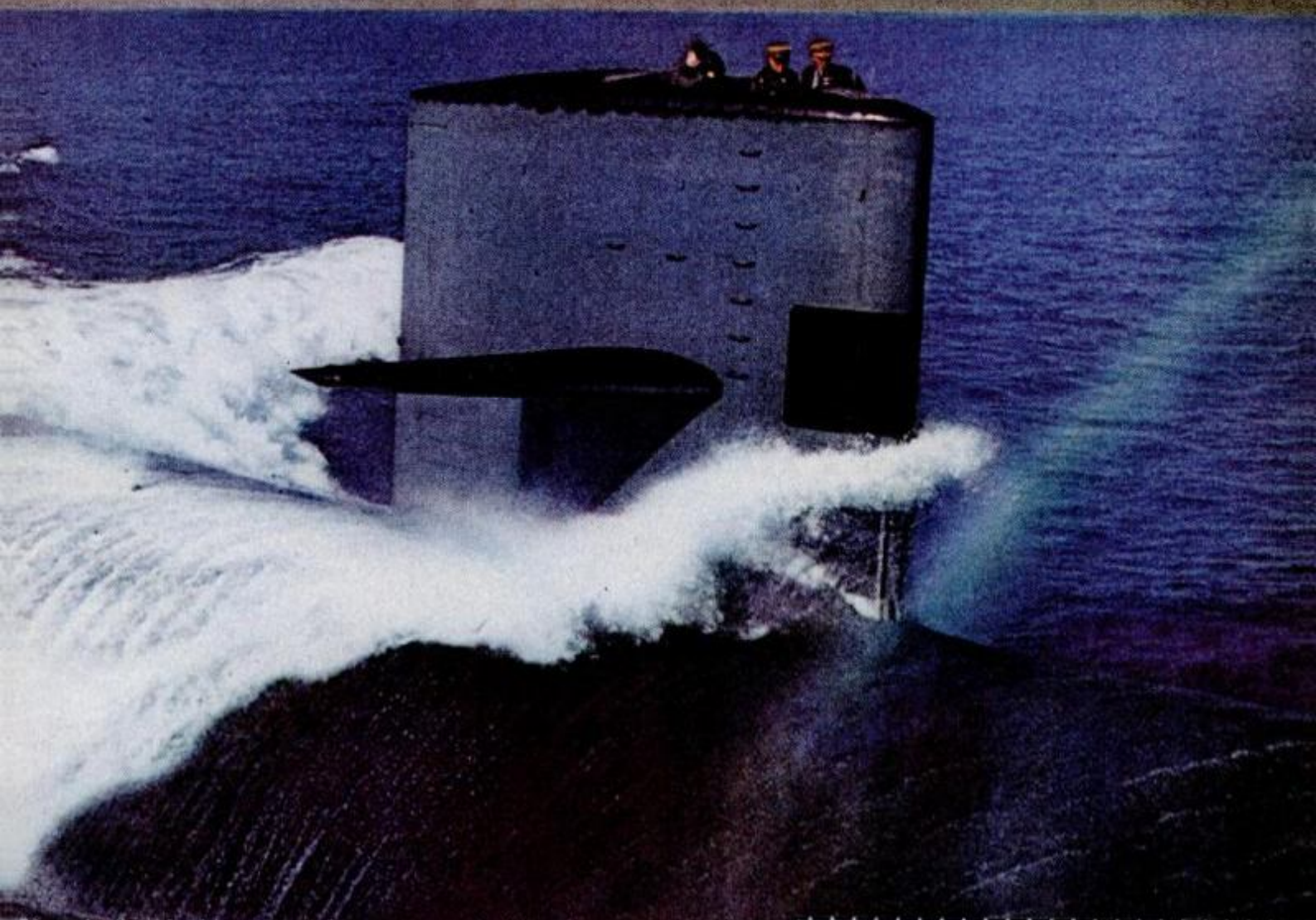
Tubedor sportsmen have not been invited to the Olympic games, but throwing out a tube and jumping in to ride it is simple enough to attract any overheated skipper.

All it takes is an old truck tire inner tube and a tow boat to get into the action with this new and wet activity. No one knows how it got started, but it's being developed across runabout wakes on many Texas lakes. It's been named tube skiing, also butt bustin'; a group of employees at the Glastron Boat Co. in Austin have formed a team, practice every weekend on nearby Lake Travis as the "Tubedors."

To get started, you remove the long metal valve stem from a large truck tube and replace it with a short rubber stem. This can be done by almost any tire repair shop or on your own workbench. Cut out the old stem with a sharp knife, buff down the rubber to nearly the same thickness as the rest of the tube, and cement in a short rubber stem.

After inflating, bind the stem section with heavy fabric or web belting so there's no chance of injury. Then, as for skiing, hook up a towline to a fast boat with driver and lookout. The swimmer, lying across the tube or sitting in it, should wear a good life jacket. Stay well away from shore during fast turns—and hold on for inexpensive entertainment. ★★★

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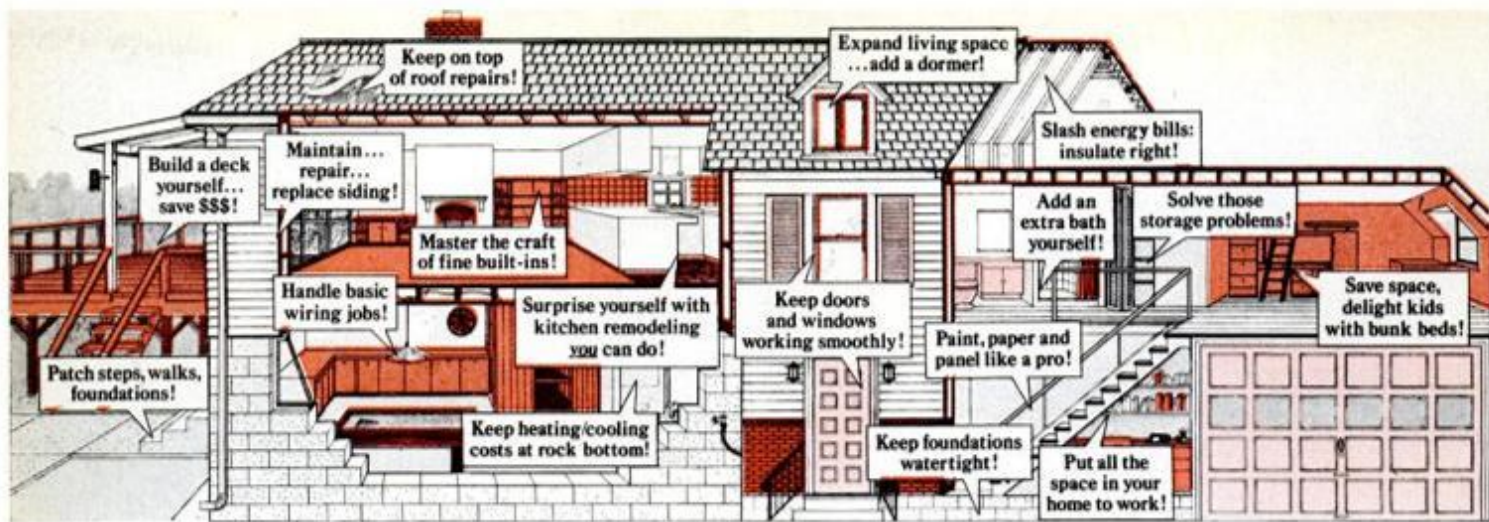
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Get the introductory volume for FREE 15-day trial

With money as tight as it is, who can afford to spend \$15 to replace a 15-cent washer . . . \$50 for installing a simple electrical outlet . . . \$400 for repairing a water-damaged ceiling! Yet these prices are typical of the outrageous costs of home repairs and improvements today.

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guide you point by point, from start to finish. And this guidance is really authoritative, relayed to you by the expert Editors of TIME-LIFE BOOKS from specialists in every area of home repair and improvement.

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tools required, and instructions you need to put them to use.

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Basic Wiring clearly explains your home electrical system. Detailed, easy-to-follow instructions show you how to make good, safe connections . . . how to run wiring through walls and ceilings . . . how to install new outlets, dimmer switches, doorbells, recessed lights . . . how to run outdoor cable underground . . . much more! You get the know-how you need to take the mystery out of home wiring. See for yourself — we'll send you *Basic Wiring* to examine and use for 15 days without cost. Details are in the order form. Mail it to TIME-LIFE BOOKS, Time & Life Building, Chicago, Illinois 60611.

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Yes, I would like to examine *Basic Wiring* and my free booklet, *The Home Tool Kit*. Please send them to me for 15 days' free examination and enter my subscription to the TIME-LIFE Home Repair and Improvement series. If I decide to keep *Basic Wiring*, I will pay \$6.95 plus shipping and handling and *The Home Tool Kit* is mine to keep at no extra cost. I then will receive future volumes in the TIME-LIFE Home Repair and Improvement series, shipped a volume at a time approximately every other month. Each volume is \$6.95 plus shipping and handling and comes on a 15-day free-examination basis. There is no minimum number of books that I must buy, and I may cancel my subscription at any time simply by notifying you. If I do not choose to keep *Basic Wiring*, I will return it and *The Home Tool Kit* within 15 days, my reservation for future volumes will be canceled, and I will not be under any further obligation. CDAMP9

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| Repair a water-damaged bedroom ceiling | SAVE \$400 |
| Install a simple electrical outlet | SAVE \$ 50 |
| Reshingle the garage roof
(Imagine how much you can save by doing the roof of your house!) | SAVE \$300 |
| Lay a new vinyl floor in the kitchen | SAVE \$200 |
| Build an 18' x 18' deck overlooking the back yard | SAVE \$580 |

(Figures are based on estimates in metropolitan area. Labor and material costs vary by area; but you can always save when you do it yourself.)



Among the volumes

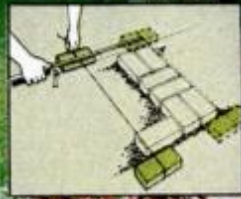
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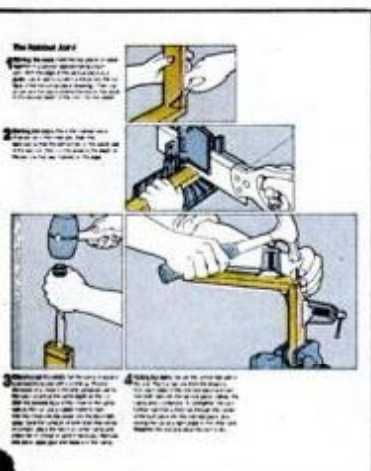


How to paint, paper and panel

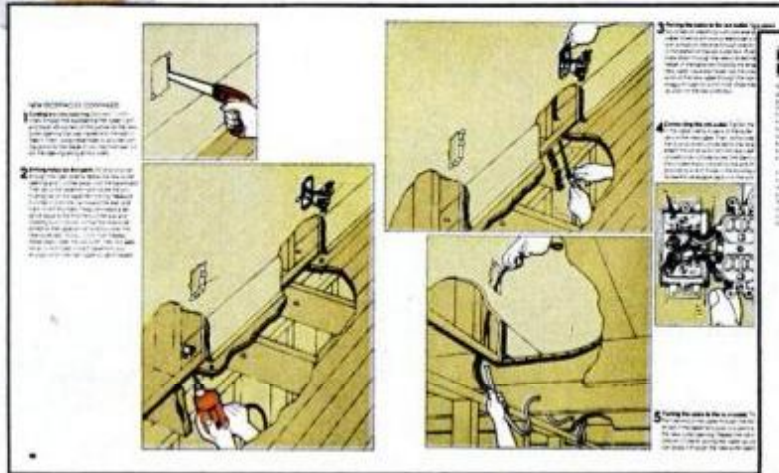


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CAR CLINIC

BY MORT SCHULTZ



Stuck's stuck

I've been a mechanic for 24 years and thought I knew engines until I encountered misfire with an air-conditioned 1973 Pontiac 350-cu.-in. V8 engine. The entire ignition system has new GM Delco parts installed per spec, and all tune-up settings are right on the money. I have checked every vacuum-operated accessory individually; all carburetor and manifold fittings are tight; and all joints have been checked and double-checked for leaks. The fuel pump delivers specified pressure, the accelerator pump operates at a mere touch and a cleaner has been run through the carburetor.

Yet this engine has a misfire at idle that worsens on acceleration. Vacuum falls to three inches on acceleration and comes back up very slowly. The misfire isn't continuous—I mean the engine may run five minutes at a smooth idle and then misfire for a minute. Help!—Lawrence A. Stuck, Marietta, Ga.

You should check the distributor shaft for too much play, distributor cam lobe for wear and carburetor jets for a fouling condition the carburetor cleaner couldn't handle. Also check EGR valve for carbon. These are things you haven't mentioned that can cause misfiring.

But being a betting man, I would take odds that the root of the problem is a sticking valve. Look at your vacuum test results.

Lame Colt

Seven hundred miles after taking delivery of a 1975 Dodge Colt (1600-cc engine), I replaced the original A78x13 bias-ply tires with steel-belted radials. I put two Sears (made by Michelin) tires from my previous car on the rear, and two brand-new Sears steel-belted radials (not made by Michelin) on the front. The rear tires were 175x13, and the front tires were AR78x13.

Almost at once I got a vibration in the front wheels, which was especially severe between 40 and 50 mph and when turning the wheels any amount from a straight course. Tires were statically and dynamically balanced, but this didn't help, so I consulted a tire specialist who told

me the front tires were out-of-round. Sears replaced them for me, and the car drove okay for 50 miles. Then the vibration returned as bad as ever. Again I was told the tires were out-of-round.

To make a long story short, I tried three sets of tires on four different rims. Now the dealer who sold me the car tells me that camber needs adjusting, but I will have to take the car to a frame shop, because to adjust camber the frame has to be bent. I'm really in a muddle. Can you help me?—Saul Zeichner, Califon, N.J.

I really don't know, but I sure can give you information that might help you in making some decisions:

■ Those 175x13 tires you took from your old car and put on your Colt's rear are oversize. The radial size recommended for Colt is 165x13. What you have are large tires on the rear or front (wherever the 175x13s are now) and small tires on the other wheels. Could it give you a vibration? You know it.

■ Those AR78x13 tires up front are not steel-belted radials. They are fabric-belted. Could steel and fabric-belted radials produce vibration when mixed? Some say "yes" and some say "no." Before you start bending a car's frame, I suggest you

take sides with those saying "yes," and get the same tires on the car (size and type) to see what happens.

■ The tires themselves may not be producing vibration. Vibration may result from an eccentric brake drum or rotor, or a bad rim. The entire tire-wheel-brake assembly should be spun on the car as a package to assure perfect assembly balance.

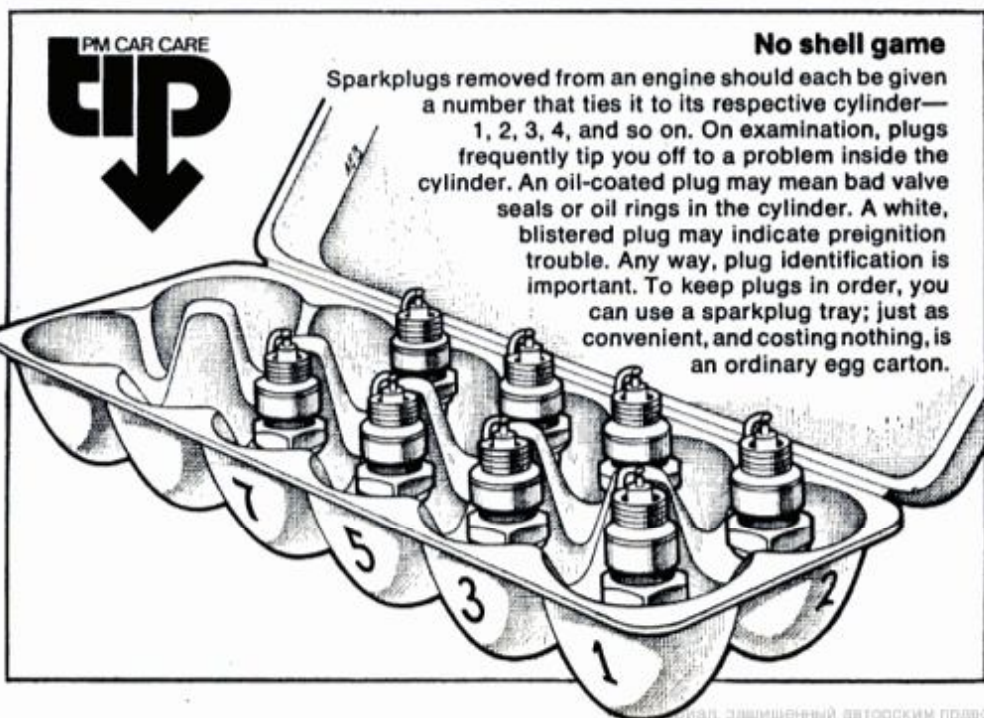
■ One of the tires may have a broken belt or a belt separated from the rubber. This can cause vibration.

■ Finally, the Colt's caster and camber are set at the factory and require no adjustment unless there is damage. Did you bang the front end? If not, then out-of-line camber exists for only one reason—a factory defect, which means that straightening the problem should be done at manufacturer expense.

But I doubt that a camber problem exists unless something happened to the car on the road. According to your letter, the car performed perfectly until you switched from bias to radial tires, and maybe your most reasonable course of action is to retire the radials.

Inside out

The outside mirrors of my 1971 Mustang Mach I are loose and rattling. I tried tightening the screws, but



**“Why Viceroy? Because I’d never
smoke a boring cigarette.”**



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

16 mg. "tar," 1.1 mg. nicotine,
av. per cigarette, FTC Report Apr. '76



Viceroy. Where excitement is now a taste.

CAR CLINIC

(Continued from page 60)

they rotate and won't tighten. I want to take the door panels off to bolt the mirrors from the inside, but I can't get the handles for the windows off, because I can't find a cotter pin anywhere. My father had the same problem, and it cost him \$50 for a mechanic. I can't afford that. Please advise.—Bruce Polsemer, Silver Spring, Md.

Your dad was duped. See that decal over the "fat" part of the handle? Pry it off with a small-tipped screwdriver or your fingernail. There it is—the screw that lets you remove the handle. If you mess up the decal, you can get a new one from Ford parts for a lot less than \$50.

Dad's day

I am 12 years old, and I want to help my father with a problem we are having with a 1975 Chevelle Malibu Classic (350-cu.-in. engine) Every two or three weeks, the power-steering fluid is gone. The problem started at 14,000 miles. Is this normal?—Gordon Webb, Boucherville, Que.

Normal it isn't, Gordon. The power-steering system is a sealed unit and shouldn't lose fluid. You have a

leak that has to be found and fixed. Unfortunately, the warranty on the car has run out, so your dad is going to have to stand still for the expense, but you can help matters by pinpointing the area of leakage. Here's how:

■ See that the fluid level in the reservoir is up to the full mark.

■ Raise the car. If you have a buddy at a gas station, ask to use his lift. If not, maybe you can place the front of the vehicle on jack stands, but make sure the car is going to stand firm—you have to get underneath with the engine running.

■ Spread some talcum or foot powder over the system so the area that is leaking will be easily spotted.

■ With the engine turned off, wipe down the entire power-steering system. Make sure the gear pump, hoses and connections are all clean and dry.

■ Have a friend start the engine and turn the steering wheel all the way to the left stop and then all the way to the right stop. Do this three or four times, but don't hold the steering wheel at either stop for any length of time. You could damage the power steering pump.

■ As this is being done, examine the system for leaks. If the problem is something you can't fix yourself (no reason that you can't tighten loose

connections), take the car to a mechanic.

On second thought, Gordon, instead of asking a friend to help you, maybe you ought to get your father in the act. Might be a lot safer with him supervising.

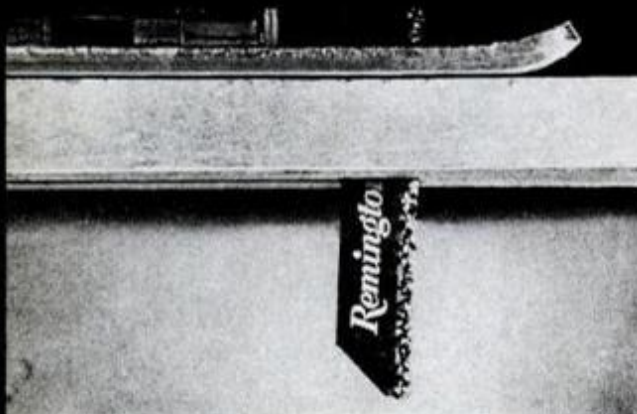
Mom's turn

The trouble Mrs. Railsback from Spokane was having with the brakes of her 1968 Ambassador (Car Clinic, April '75) struck a responsive chord, because I, too, had the same problem with my 1965 Ambassador. The condition started soon after I had a brake job done. Fortunately, I watched the mechanic perform the work and noticed that he removed the little rubber dust covers.

A couple of days afterward I picked up my mother to do the weekly shopping. It was raining, and suddenly every time I applied the brakes poor mom nearly went through the windshield.

The car was returned several times, and each time the brakes were adjusted. Finally, this really got on my nerves, so I stayed and watched how the adjustment was being made. I didn't see anything but holes, so I asked the mechanic where the little rubber dust covers went to.

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Remington "Grit-Edge" saber saw blades make contour cuts in asbestos-cement, fiberglass, synthetic marble and plenty of the other "unsawables".

Tungsten carbide particles permanently bonded to steel make "Grit-Edge" blades just the cutting tools to saw hard and brittle materials with a smooth-edge finish.

Economical, durable "Grit-Edge" blades. Tough enough to take on almost anything.

For more information, see your hardware dealer or write: Abrasive Products, Dept. 547, Remington Arms Company, Inc., Bridgeport, Conn. 06602.

Grit-Edge When ordinary blades can't cut it.

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"Grit-Edge" blades can cut it.

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Beryllium	X	X			X
Carbon	X	X		X	X
Cast Iron	X	X			X
Composites	X	X	X		X
Composition Board			X	X	X
Fiberglass	X	X	X	X	X
Foamed Glass	X	X			X
Friction Materials	X	X	X	X	X
Glass	X	X			X
Hardened Steel	X	X			X
Honeycomb Materials					X
Marble, Natural	X	X	X		X
Marble, Synthetic	X	X	X	X	X
Plaster			X	X	
Plastic Laminates	X	X	X	X	X
Plywood			X	X	X
Stainless Steel	X	X	X		X
Stranded Cable	X	X			X
Superalloys, Iron-base	X	X			X
Superalloys, Nickel-base	X	X			X
Tempered Hardboard			X	X	X
Tires, Steel-reinforced					X
Titanium	X	X			X
Tile, Ceramic	X	X	X		X

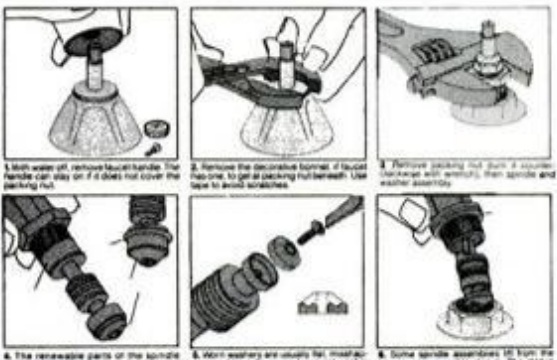
*Requires coolant and variable-speed machine

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SAVE \$12.25 FIXING A LEAKY FAUCET, ETC.

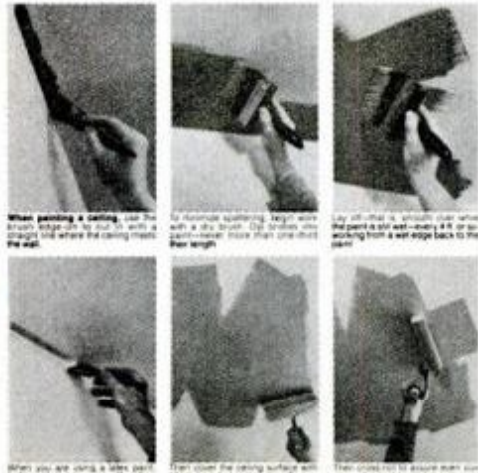


1. With water off, remove faucet handle. The handle can stay on if it does not cover the packing nut.
 2. Remove the decorative cap of faucet handle, to get at packing nut beneath. Use screw to avoid scratches.
 3. Remove packing nut. Turn it counter-clockwise with wrench; then spritz and wash assembly.
 4. The replaceable parts of the cartridge assembly vary with the manufacturer. At least washer, some packing, others O-ring.
 5. When washers are worn, file, install new, and hand. If you install new washer won't fit, reverse the file line. Always use a brass screw to install a washer.
 6. Some handle assemblies fit from the base on a replaceable sleeve. The sleeve contains the valve seat, and can easily be replaced if seat is badly worn.

(Reduced detail from p. 219.)
 Nothing is more satisfying than doing a job well with your own two hands. Except maybe saving money. That's why Reader's Digest put together the *Complete Do-it-yourself Manual*. "By far the best of the repair books," according to *Money Magazine*.

The secret is, Reader's Digest picked the experts' brains, then translated their jargon into plain English, with 2,255 step-by-step how-to photos, illustrations, and diagrams. (The ones you see on this page are reduced samples from the book.)

Follow the pictures, and you learn all the basics of materials and tools, from how to work in wood or concrete to how to use a soldering iron



When painting a ceiling, use the brush edge to get in with a straight line where the ceiling meets the wall.
 To minimize splattering, keep your brush at a 45-degree angle to the surface.
 Lay off paint in smooth, even strokes. The paint is still wet when a 10- or 12-inch brush is swept back to the pan.
 When you are using a wire paintbrush, cover the ceiling surface with alternating diagonal strokes. To prevent splattering, never let the brush touch the ceiling.
 Then, cross-roll to assure even coverage. It is best to start in a dry area and roll toward one that was just painted.

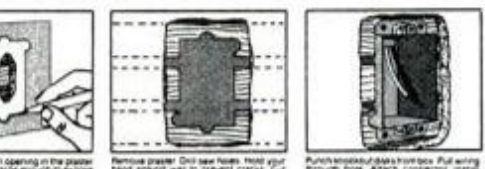
(Reduced details from p. 328 & 331.)

or choose the right nail. You can handle small jobs, like rewiring a lamp, installing a lock, or restringing the blinds. And big ones, like laying a brick driveway or adding a new room.

You can do special projects, like building a double bed or a barbecue pit. And cope with everyday emergencies, like re-

placing a fuse or fixing an overflowing toilet tank. Whether you're installing an air conditioner, hanging a mirror, or waterproofing your basement, it's

SAVE \$20.12 INSTALLING A NEW WALL OUTLET.

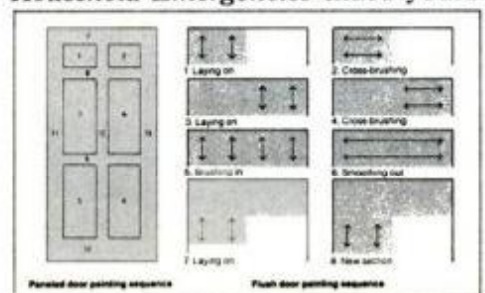


1. Locate stud. Cut an opening in the plaster 1/2 in. that fits snug, large enough to slip your wire. Use template as guide to outline hole to be made in the wall.
 2. Remove plaster. Drill saw holes. Hold your hand against wall to prevent plaster. Cut away center with compass. Cut sections from left, above and below.
 3. Punch knockout holes from top. Push through hole. Attach connector metal screws. Push into hole. Another hole to set with wood screws.

(Reduced detail from p. 265.)
 like having the experts at your side without having to pay them. What's more, you have the rare pleasure of knowing the job has been done right the first time.

Physically, the book is impressive. It has a rugged, wipe-clean, laminated cover. It weighs a hefty 4 1/4 lbs. It measures a big 21 3/4 x 8 3/8 inches when open. While its lie-flat binding lets you read as you work.

We urge you to send for it now, to use for seven days free trial. (It makes a thoughtful gift, too.) We'll also include our *Women's Guide to Household Emergencies* that's yours



Painted door painting sequence
 Flush door painting sequence

free, even if you return the *Manual*. But we think you'll want to keep it. According to the U.S. Depart-

SAVE \$151 TILING A 12'X15' KITCHEN FLOOR.



1. Measure the distance between the end of a tile or 1/4" less and the wall to get border on based the pattern of tiles. Begin from the wall (8 in. for 12-in. tiles).
 2. For a wider border, move the row of tiles 4/8" in based the pattern of tiles. Begin from the wall (8 in. for 12-in. tiles).
 3. Snapping a chalk line. Drawing lengths, joint the ends of the string on the floor and snap each of the lines in full.

(Reduced detail from p. 359.)
 ment of Commerce, homeowners in 1970 paid repairmen and contractors a whopping \$6,655,000,000. With this book, you'll save your share of those billions.



USE THIS 4 1/4-LB., 600-PAGE, 2,255-PICTURE-CRAMMED BOOK FOR 7 DAYS FREE TRIAL.

Send my *Complete Do-it-yourself Manual* to use for seven days free trial plus the free *Women's Guide*. I'll pay only \$13.95, payable in 3 monthly installments of \$4.65 each (plus 70¢ postage, which will be added to first installment) with no interest or charge for credit or handling. (Sold in bookstores for \$16.95.) Otherwise, I'll return it and owe nothing. (We'll reimburse you for postage.) Price subject to change without notice. Offer not valid in Canada.

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Handy light

Here's a neat tip from William A. Sample from Oklahoma. The exploded view says it all. The handy light should cost less than \$5.

haven't had a bit of trouble.—Mrs. Florian Hunkapiller, Andalusia, Pa.

These covers are supposed to be in place over the adjusting holes in brake drums or backing plates, depending on the adjustment setup. They keep dirt and moisture off braking parts.

Gasping for air

What causes the air conditioner in my 1975 Pinto with 2.3-liter engine to cut out when I accelerate in second gear? It's giving me fits.—M. S. Ladner, New Orleans.

The cause is a split in the selector that controls vacuum for air conditioner and heater functions, such as maximum cooling, defrost, heat and vent. A split vacuum selector, beneath the hood, leads to a loss of vacuum under load, which forces the recirculating door closed over the vacuum port, cutting off cold air. A damaged vacuum hose will also cause this. The solution? Replace the faulty vacuum selector or hose.

don't let it throw you; there were two different suppliers.

On one version, numbers actually are used to spell out some intervals—the pressed-steel pulley has a single deep groove at top dead center and shallower grooves at 2° intervals, with identifying numbers at 4° and 8° BTDC and 4° ATDC. The pulley without numbers—it's cast iron—has a deep groove for TDC and lesser grooves at 2° intervals. There are six BTDC marks and two ATDC marks.

■ Would you believe that an engine-dieseling (afterrunning) problem can be caused if you don't turn off the heater blower switch before you turn off the ignition switch? That's what Dodge says regarding the 1974-75 Colts. According to the company, "the blower motor acts as a generator when coasting to a stop, thus causing feedback through the fuel shutoff solenoid wire harness preventing an immediate fuel shutoff."

Dodge corrects the problem in service bulletin 14-08-76 (4/12/76); it calls for installing a jumper wire to transfer the heater blower motor from the "ignition wire" circuit to "accessory" circuit. ★ ★ ★

SERVICE TIPS

■ If you compare the crankshaft-pulley timing marks of your 1972-74 Capri having a 2.0-liter overhead-cam engine with those of a friend's similarly equipped Capri, you may find a different setup. But

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.

He said, "You don't need them." But I said I did. Since the covers were put back where they belong I

ATHLETE'S FOOT?

DON'T BLAME DESENEX



If you have athlete's foot, you're probably not using Desenex.® Desenex would have helped get rid of it fast.

And Desenex used every day will help keep athlete's foot away.

Trusted Desenex. The ointment, spray, solution and powder all contain the most widely used athlete's foot fungus killer.

So if you have athlete's foot, it's your fault, not ours.

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A PRODUCT OF **PARWAL** CORPORATION



“We never used a chain saw before today. Homelite put us in control.”

None of these seven people had ever handled a chain saw before. So we gave each person a different Homelite® and told them to start cutting. It proved our point: *anyone* can be in control with a Homelite.

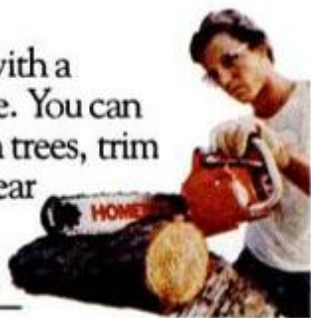
Homelite chain saws are designed with control in mind. They're lightweight, precision balanced. They all have solid, comfortable grips. And they're the only chain saws with the exclusive new SAFE-T-TIP™. With SAFE-T-TIP in place, a Homelite can't kick back—and you're protected against the most serious loss of control in a chain saw.

Kickback occurs when the nose of the saw hits a solid object. But the new SAFE-T-TIP shields the nose and chain. So kickback cannot occur. The SAFE-T-TIP also keeps the nose from hitting dirt, stones and obstructions that can dull or damage the chain. You get easier cutting with less

need to sharpen or replace the chain.

Whether you're a first timer or an old timer, you're in

control with a Homelite. You can cut down trees, trim limbs, clear brush and cut firewood—quickly, easily, efficiently. Your Homelite Dealer has the widest selection anywhere, from the economical XL®, to the SXL-Automatic. And with over 12,000 Homelite Dealers coast to coast, you're sure of fast, efficient service—and a wide range of parts and accessories—wherever you live.



HOMELITE **TEXTRON**

Homelite Division of Textron Inc.

You're in control with Homelite.



Allstate

**STATE FARM
INSURANCE CO.**

Welcome to
The Insurance Store

You'll never guess which one sells the most insurance.

You're looking at three of the best places where you can buy property and casualty insurance.

Which one do you think sells the most insurance?

Hint: It's not the one that promises to put you in "good hands."

Hint: It's not the one that promises to be there, like a "good neighbor."

Surprise: The one that sells the most insurance is The Insurance Store.

But then, that's really not so surprising once you know all about The Insurance Store.

More Kinds of Insurance for More People.

One reason The Insurance Store sells the most insurance today is because over the years it's been able to provide more different kinds of insurance for more people than Allstate and State Farm.

Your Choice of Insurance Companies, Policies, and Prices.

Allstate sells Allstate Insurance. And State Farm sells State Farm Insurance.

But The Insurance Store offers you a wide variety of leading insur-

ance companies—including ourselves, Continental Insurance.

Some of the companies specialize in automobile insurance. Others, in homeowners insurance. And still others, in business insurance.

At the same time, some of the companies specialize in low price. Others, in unusual coverages. And still others, in a combination of both.

By shopping at The Insurance Store, you can select the specific companies, policies, and prices that best match your needs. And budget.

Unique All-in-One Plan.

The Insurance Store offers you the unique Continental Insurance Personal Comprehensive Protection Plan: the all-in-one plan.*

It lets you combine separate policies on your home, your car, and yourself all into one neat package—with one premium and one expiration date.

What's Best for You.

Each Insurance Store is owned by an independent agent.

Independent means: While he represents many different compa-

nies, he's beholden to no one company.

And so if the company with which he places your business doesn't do what's best for you, he's free to switch to another company which will.

That gives him tremendous leverage to use on your behalf. And use it he does.

Locations Coast-to-Coast.

Wherever you live, there's an Insurance Store near you.

And it's easy to find: Just see an agent who is listed under Continental Insurance in the Yellow Pages.

Finally: Insurance Made Easy.

Now that you've read this far about three of the best places where you can buy property and casualty insurance, you know two very important things:

Which one sells the most.

And why.



Continental Insurance © CC
featured at
The Insurance Store

*The Insurance Store is a service mark of The Continental Insurance Company, a Subsidiary of The Continental Corporation.

†Not available in all states. Terms and conditions vary in certain states.

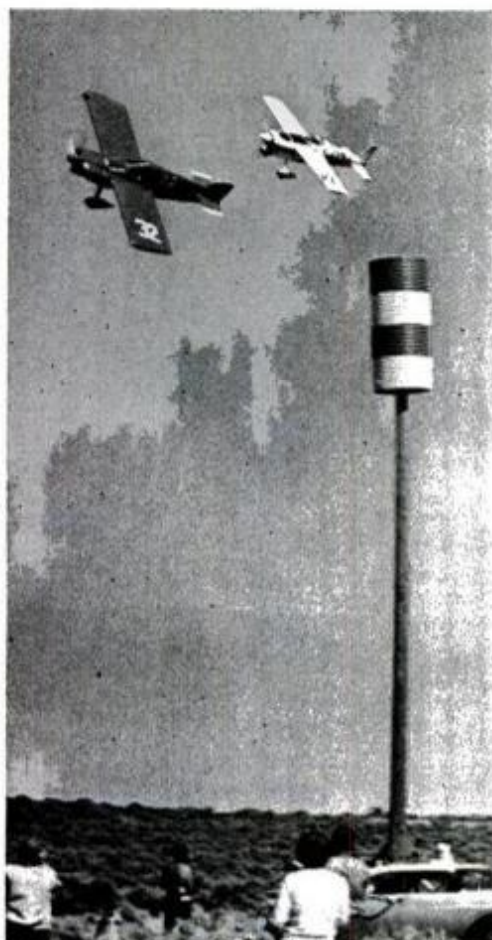
Two fastest Bearcats in the business are those of Lyle Shelton (near right) and Darryl Greenamyre (far right). Shelton set new record at last year's Reno races, averaging just under 430 mph. Greenamyre had fastest qualifying time of 435 mph, but was unable to enter main event because of mechanical failure at takeoff. Both hope to compete this year.

Air racing roars back



Powerful souped-up ex-fighters and new specially designed speedsters are bringing back the thrills and glamor of a sport that caught the world's fancy 50 years ago.

by Don Berliner

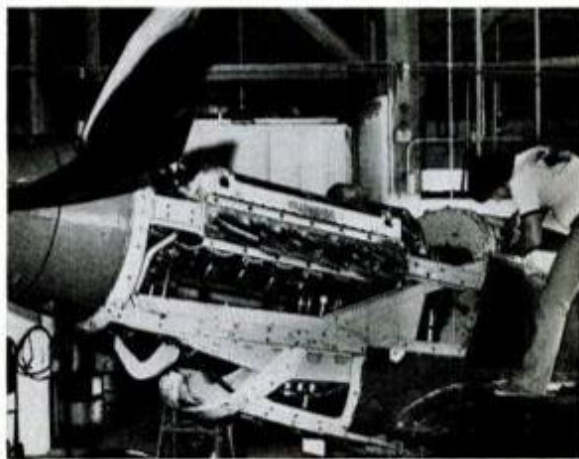


Photos (above and right): Ralph Emerson
Photo (left): Jim Larsen

Formula 1 racers, rounding pylon at Reno (left), are typical of new midgets that are becoming popular. While not as fast as the big Unlimiteds, they are much less costly and fly shorter, tighter courses, providing exciting action within the view of spectators.

The big red and white checkered pylon flashes toward you at a frightening rate. At better than 400 mph, you have only seconds to line up on it and decide your strategy. You're in traffic—there are two big Bearcats just off your right wingtip and a Corsair sneaking in under your left. Ahead, a P-51 Mustang threatens to catch you in the deadly turbulence of its prop wash. You resist the temptation to ease off. You skin the pylon as close as you dare, roll into a tight, steep bank and take the turn at full throttle, flat out, wide open. You're pulling three to four Gs—more if the air is rough—and you pray the wings stay on and the engine doesn't blow. Then it's on to the next pylon . . . and the next . . . and the next. You're in the world's fastest sport.

Early this month, the nation's top racing pilots will experience such tense moments as they thrill roaring crowds at the National Championship Air Races near Reno, Nev. Reno—the big event of the year—is rapidly becoming the new "Cleveland" of air racing, helping to



What may be world's fastest prop plane is Roy McClain's highly modified P-51 "Red Baron." Powered by 3000-hp, 12-cylinder Rolls-Royce engine (top), it has already exceeded 500 mph.



PM art: Roy Grinnell


Air racing roars back *(Continued)*

recreate the glory days of the 1930s when the sport was at the peak of its popularity and crowds exceeding 100,000 regularly turned out to watch the historic Cleveland National Air Races.

Air racing has had its setbacks—mostly due to a succession of wars—but now there are signs that interest in the sport is returning. Both the number of racing events and the size of spectator attendance have been growing over the past years. In addition to Reno, there are the California National Air Races at Mojave—another major competition—and a number of regional races held in various parts of the country. Also on the increase are wild and woolly air shows, breathtaking aerobatic exhibitions and homey “fly-in” air meets—all indicating that the nostalgia and excitement of the old barnstorming days are here again.

World's fastest prop planes

As many as 100 planes are expected to show up at Reno in five different classes. Of the five types of aircraft involved, the fastest and most spectacular are far and away the so-called Unlimiteds—big, souped-up ex-fighters from World War II—mostly Mustangs, Bearcats and



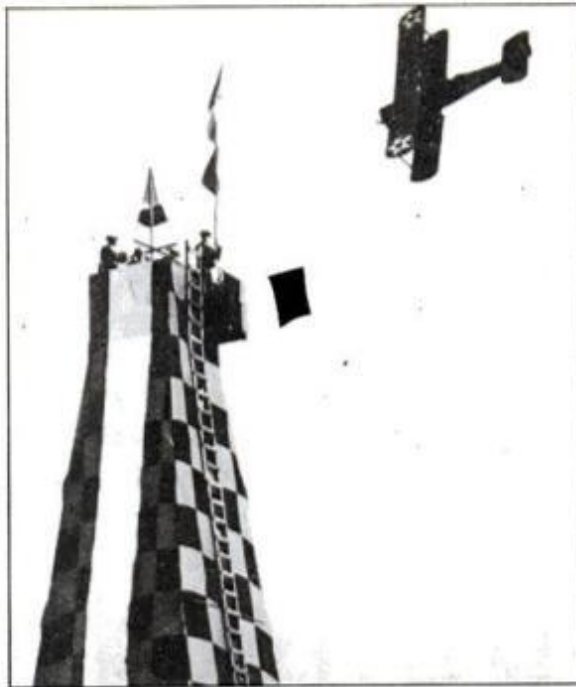
Mighty souped-up warbirds—here two P-51s followed by a Bearcat—roar around checkered pylons as air racing returns as a popular sport.

R. Crum

Photo: U. S. Air Force Museum



Photo: T. C. Weaver collection



Photos (above): Official U. S. Navy

Air racing goes a long way back. At top far left, a French Bleriot is readied for takeoff at the first official event held in 1909 at Reims, France. At near left, a U.S. Army DeHavilland biplane rounds a pylon in 1923. Floatplane below is typical of the sleek speedsters that set records in the 1920s in Schneider Trophy. At lower far left, famed Tony LeVier flew his Shoenfeldt "Firecracker" to several victories in late '30s.



Sign of things to come is unusual needle-nosed racer designed by Dave Garber for Unlimited-class events. Unlike modified warbirds, it is custom-built, will have two engines, one in nose, one in tail, but may not be ready for this year's Reno.

Photo (upper): Lyn Sullivan
Photo (lower): Don Berliner

Corsairs. These monstrously powered, meticulously modified warbirds develop more than 3000 hp and roar around the racecourse at speeds approaching 450 mph.

This year's Reno races will bring together some of the world's fastest prop planes in what is predicted to be one of the closest, fiercest battles in modern air racing. Pitted against each other will be such top contenders as Lyle Shelton and Darryl Greenamyer—owners of the two hottest F8F Bearcats flying—and Roy McClain in his highly modified P-51 Mustang "Red Baron."

Hard-fought rivalry

All three have experienced both fame and misfortune, and their quest for victory has developed into a hard-fought rivalry. At Reno last year, Greenamyer turned in the fastest qualifying time at a sizzling 435.556 mph, only to miss the main event because of a mechanical failure. Shelton came in first, setting a new course record at an average speed of 429.916 mph, with the Red Baron hot on his tail to take second at 427.313 mph.

The year before, both Shelton and McClain came to grief. Shelton actually roared in first and thought he had won, but was penalized for a rules

infraction that dropped him to fifth place. McClain was forced out of the race with engine trouble. (Greenamyer didn't enter that year.) This summer at Mojave in June, McClain coasted to an easy win with Shelton out of the race because of a blown oil line.

So the three are expected to go again this fall, with a hot and heavy contest likely. Shelton has power estimated at 3600 hp, but Greenamyer, with 3300 hp, is believed faster because his airframe is aerodynamically "cleaner." McClain's Red Baron may be faster still—in flat-out speed trials over a straight course, it has hit well over 500 mph.

Unlimited Unlimiteds

Unlimited-class racing is well-named because there are virtually no limits imposed on the type, size or power of entries. There are only four requirements: An Unlimited must be prop-driven, must not exceed 21,000 pounds takeoff weight, and must have working radio and oxygen systems. The last two are for safety: radio for communication in case of emergencies; oxygen to prevent asphyxiation from breathing carbon monoxide fumes, a hazard believed

(Please turn to page 130)

IT'S NEW NOW



Push up, shove back and away we go

Children's Center for the Physically Handicapped in Winston-Salem, N.C., was in trouble when the custom-made wheelchairs for their 3, 4 and 5-year-old tots wore out. New ones were too costly. So Center volunteer John Vickers got permission from his superiors at R. J. Reynolds instrument shop to use volunteer company technicians and facilities to do the job in spare time. Result: a new fleet of tiny-tot wheelchairs turned out in the pipe shop, using chrome-plated copper tubing, small bike wheels and casters. Design provides a padded footrest youngsters can boost themselves onto and, from there, hoist themselves to the seat. "It's hard to describe what it was like to see those kids when the chairs arrived," notes one volunteer. "They were thrilled."

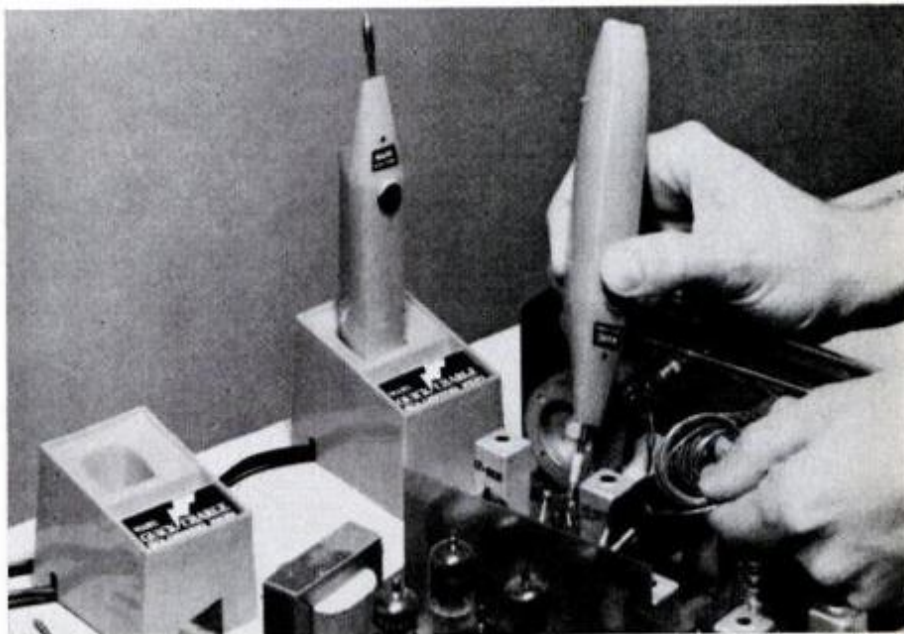


Three new pocket cameras

Three new automatic pocket mini-cameras using drop-in 110 film cartridges with side-by-side plug-in flash are designed to accommodate a wide range of snapshotter pocketbooks. Minolta threesome includes \$110 Auto-pak 270 with f/3.5 lens, speeds from 1/330 to 10 seconds, built-in close-up lens, exposure warning; \$90 Model 250 with f/8 lens, two-position zone focusing; \$65 Model 200 with two-speed (flash or daylight) shutter designed for "point-and-shoot" simplicity.

To go upstairs, turn on the tap

Tap-water hydraulics at only 30 pounds pressure works this lift. The cage rides steel guides with a hydraulic cylinder on each side. A three-way valve is hooked to the home water supply. "On" feeds water to the cylinders to lift the car; "hold" stops the car; "off" expels water for descent. It was built by students at Queensland Institute of Technology, Brisbane, Australia, for a handicapped person.



Fast-heating soldering iron—and it's cordless, too

Now it's a cordless soldering iron that goes from cold to soldering temperature in five seconds. The maker claims its "Iso-Tip" unit will solder up to 125 electrical contacts on a single charge. A "lock-off" switch prevents accidental tip heating. For dark corners, a built-in light shines on the work. Unit is available with recharging stand, plug-in recharger or an assembly that fits the cigarette-lighter socket in a car. Depleted battery recharges overnight. About \$20. Wahl Clipper Corp., 2902 Locust St., Sterling, Ill. 61081.

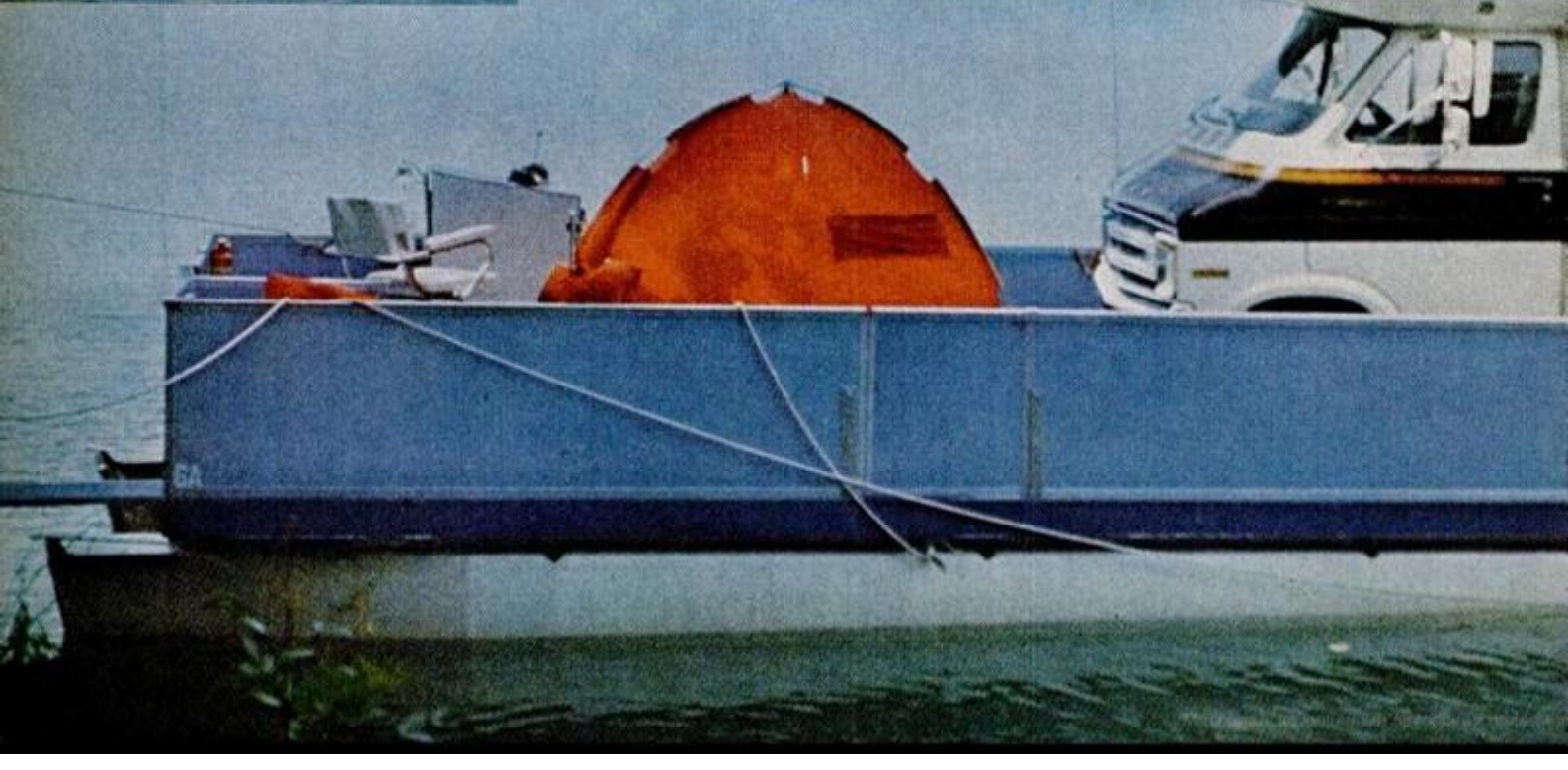


All the comforts of a motor home go amphibious on this clever drive-aboard houseboat to which you bring your own house. Nudging a quiet shore or tying up for the night can come minutes after you're lowered into the water (lower left) by a Marine Travelift. Foredeck tent can add accommodations or two families in two small trailers can share one boat.

Now: Turn your RV into a houseboat

Simply drive aboard this new pontoon craft—and you're off on a boating vacation!

by Bill McKeown OUTDOORS EDITOR



Deckboats aren't new, and assorted recreational vehicles have been around a long time. But stack one on top of the other, launch the rig, and the result is a very successful innovation—a bit of the best of both land and water worlds. In our test, we found it was like adding one-plus-one and coming up with half a dozen neat new kinds of fun.

Our deckboat was the Camp-A-Float pontoon craft, which can carry up to 9000 pounds of trailer, truck camper, motor home or tent—plus passengers and gear. Our RV was a new L'Espirit, the latest and sleekest from Travco Corp. of Brown City, Mich.

'Looks like a mini 747'

"Your rig looks like a mini 747," we were often told at our frequent stops at filling stations, and the streamlined shape of the "astro compartment" over the cab seemed to reduce wind resistance and wind buffeting noticeably. This medium-size motor home is built on a Dodge "chopped van" chassis and comes with a 360 or 440-cu.-in. engine. It's 22 feet long, 8 feet wide, has 6-foot, 5-inch headroom and sleeps two adults (or our three small children easily) in the cab-over double bed.

Two more adults can sleep on the sofa bed.

Accommodations are generous with nice extras like a four-burner stove, furnace heater with automatic thermostat control, and a compartment for an auxiliary 4-kilowatt generator that could power an additional rooftop airconditioner. But true luxury for a rig this size is the little bathtub plus shower in the bathroom. Roughing it is purely optional.

Camp-A-Float rental operations are now located at Lake Hartwell, Ga., Crystal Springs, Ark., and Havasu Springs, Ariz., with more spots under consideration. To reach the nearest one, on the Georgia-South Carolina border, we had a drive of nearly 1000 miles from Mount Kisco, N.Y., where Holiday-on-Wheels, the most extensive RV dealership in the New York metropolitan area, had a Travco ready and waiting.

Though the model was fitted with refinements such as a monitor panel that showed the amount of water in the 33-gallon tank, LP-gas level, condition of batteries, and levels in the separate wash water and toilet holding tanks, check-out briefing proved quick. And quite soon I was comfortable driving it. The 2000-mile round-trip, we felt, with a family of five

plus large dog, was the kind of test that can really rate the livability of an RV, and the type of outing a prospective purchaser should arrange with a rental dealer before buying.

How does it handle?

The first few hundred miles convinced us of the responsiveness of the rig, but how well would it take to the water? Heading south across Chesapeake Bay on the Annapolis Bridge, we looked down apprehensively at the boats below to see if we could spot a 40-footer that could hold our RV. (Plan to use bridge routes rather than tunnels; avoid towns like Baltimore where the Thruway Harbor Tunnel allows no vehicles with LP gas tanks.)

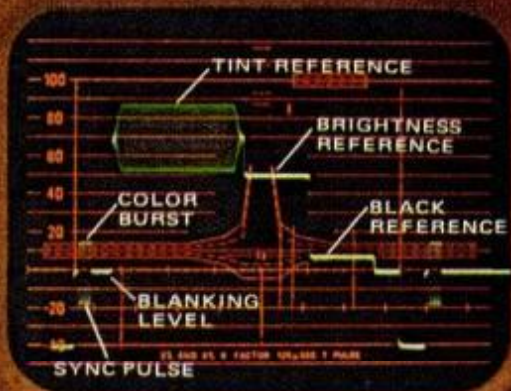
Distance driving in the well-cushioned chairs with the cruise-control adjusted for automatic speed left plenty of time to enjoy the scenery and consider our only worry—vehicle weight. The rig's basic weight is 8400 pounds. But with copious cabinets and closets to store gear, plus water, food, fuel and the rest, it could be easy to load one more ton that would bring it up to allowable gross vehicle weight but well above the 9000 pounds that the pontoon boat was rated for. Rather than drive in

(Please turn to page 142)





Automatic color correction makes the difference between images on screens of sets above: Right-hand set shows how poor reception, misadjusted set controls or errors at station can alter color; correct color on the left-hand, larger set shows it's locked onto the Vertical Interval Reference signal transmitted between frames of the TV picture (left), where you ordinarily don't see it. The VIR signal, here shown on oscilloscope at New York's Channel 9 (left, below), lets stations check the color signals they're transmitting—but not what may have happened to those signals en route to your set. GE's new circuit compensates for that, too.



Color TV: Brighter sets and better broadcasting this year

by David Lachenbruch

Television-set manufacturers are making up for lost time in their 1977 models, with a double dose of innovations: those already planned for this year, plus those planned for last year but postponed by the recession. The changes are biggest in four major areas:

- New picture tubes.
- Automatic and semiautomatic color adjustment.
- All-electronic varactor tuners—the beginning of the end for mechanical tuners—often linked to calculator-keyboard, random-access digital tuning, even on remote controls.
- New chassis, designed for more economical, highly automated production and lower power consumption, thanks to heavy use of integrated circuitry.

Picture tubes. The first member of a completely new generation of picture tubes, representing four years of design effort and an investment of millions of dollars, is featured in Zenith's high-end 19-inch sets. The new tube differs radically from its predecessors, its lighter-weight glass bulb having been designed by Corning Glass Works for high-precision, automated assembly. Its lightweight, frameless shadow mask is suspended at all four corners from studs in the faceplate for sta-

bility and better color registration.

The deflection angle of its electron beam is 100° (as compared with the conventional 90°) for more compact set design; and its in-line electron gun is of a new "tri-potential" type, which can yield greater sharpness, brightness or contrast, and lower cost for the same picture quality.

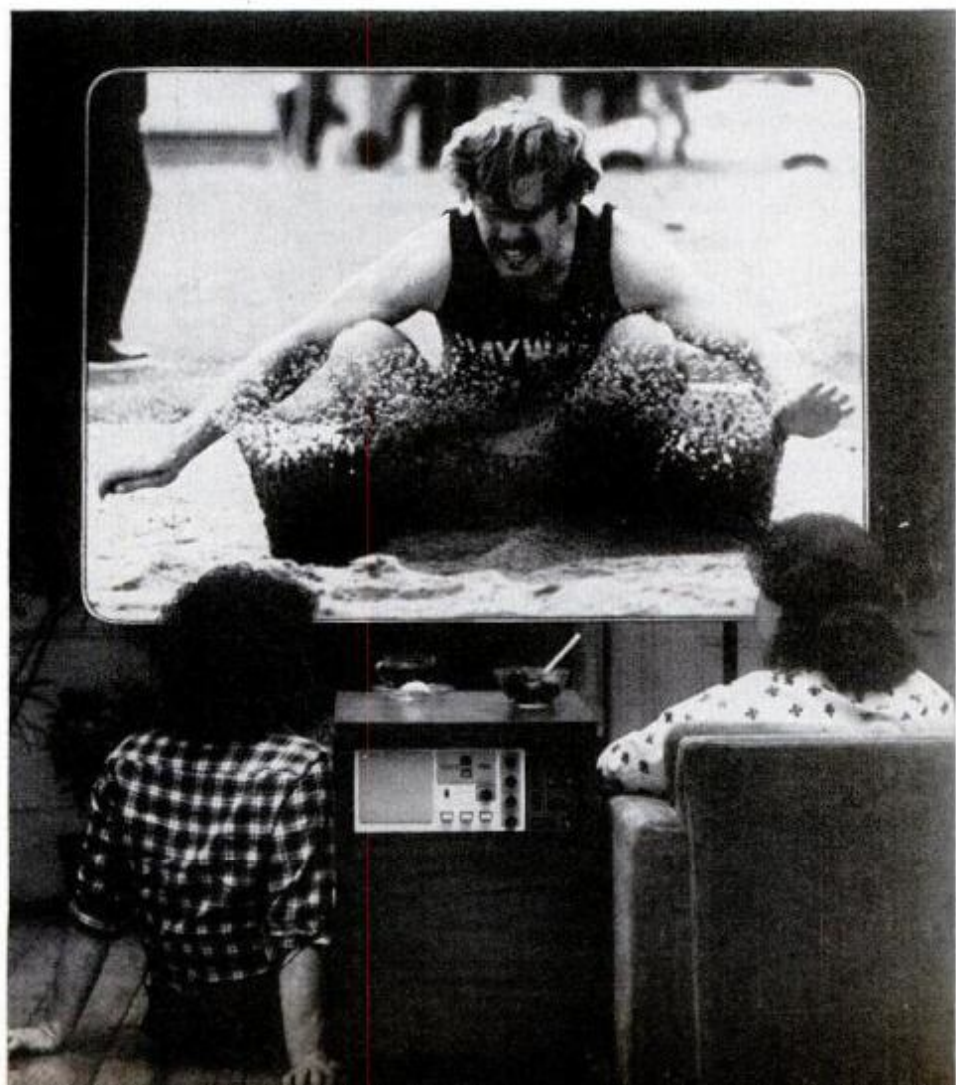
The combination of the new gun and 100° deflection, Zenith says, permits a finer spot size—and therefore higher resolution—in a self-converging slot-mask tube than is possible in the traditional dot-mask type, eliminating the problems of picture sharpness and detail which have plagued large-screen, slot-mask tube designs. Next year this design will be applied to a 25-inch tube.

General Electric, which pioneered the in-line gun with its 10-inch Porta-Color way back in 1965, has now gone all the way—each of its new color models has an in-line tube, including the first ever sold in the 25-inch size. GE's 25-inch tubes use standard dot masks as do the smaller in-line tubes. In-line design cuts receiver costs and, by eliminating most or all dynamic convergence adjustments, adds to reliability.

Sony started the trend to slot-mask tubes with its Trinitron (which more accurately should be called a



Digital keyboards and readouts zip you from one station to another as fast as you can push two keys. Some sets have on-screen readout, visible only when tuning.



Big-screen TV: Still a projection

While every laboratory in TV research is working feverishly on the ultimate picture tube—wide as a movie screen, as cheap as current tubes and thin enough to hang on the wall like a picture—the only way to get a picture bigger than 25 inches is to project it.

One way to build a large-screen projection TV is to hang a lens in front of a regular TV set's screen and turn the brightness up. That's simple enough that lots of little companies are moving into the projection TV field (more of them than make conventional sets, in fact). Even Sony uses a more sophisticated version of this approach.

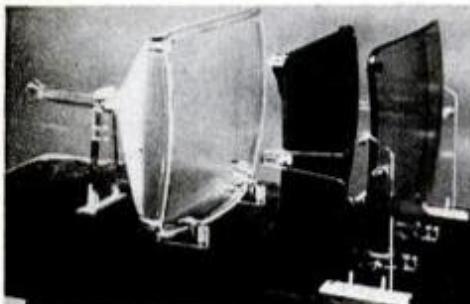
But there are other ways: Advent uses special tubes made specifically for projection use, and with each of three tubes handling a different color. It yields the sharpest, brightest projected images we've seen, but it's costly: Advent's big, 7-foot screen model costs nearly \$4000, and even its newer, "little" 6-foot model (left) costs \$2500.

No matter what the method, though, projection sets still have some problems: Their images are dimmer than those of conventional sets—even with the bright Advent, you'll want to keep your shades down when watching daytime programs. And whether the projectors are separate, like Advent's or share a cabinet with the screen, they're bulky. Nonetheless, more sets are coming—and from more of the major companies, too.

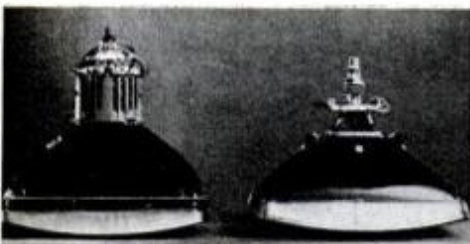
"slit-mask" because its vertical perforations are uninterrupted from top to bottom). For 1977, all Sony color sets from 12-inch up will have Trinitron Plus, with each phosphor stripe on the screen surrounded by black, light-absorbing material to reduce reflections and allow the electron beam to illuminate each stripe more fully. Thus, Sony has caught up with other tube makers, who have already adopted this "negative-matrix" approach to improve contrast, purity and screen brightness.

Sony's competitors once said Trinitron couldn't possibly be built in sizes larger than 12 inches. They had to eat their words when Sony brought out the 15, 17 and 19-inch Trinitrons. Now for dessert there's the new 21-inch Trinitron, and if they're still hungry there'll be a 25-incher next year.

Automatic color. The television station, not the viewer, adjusts color and tint in GE's "VIR" receivers—something of a long-distance record for remote control. These sets are the first to make use of the vertical interval reference (VIR) signal which is carried along with the pictures by networks and stations for



New Zenith Chromacolor picture tube (top) shows simple mask and faceplate compared to those of conventional tube (above).



Chromacolor tube (above, right), with 100° deflection angle, is 2½ inches shorter than conventional 90° tube (above, left) in same 19-inch size.

their own adjustment of color values during the transmission process. You can't see the signal because it's on line 19 of the picture, transmitted during the vertical blanking interval between frames. The VIR decoder in the GE sets, a five-inch-square, plug-in circuit board with five integrated circuits, employs this reference signal to adjust color and tint to levels specified at the broadcasting station. An indicator light shows whether the VIR signal is being transmitted. All four networks now use the VIR signal, as do more than half of all stations.

Sylvania and RCA are spreading their previously introduced automatic-color systems throughout their lines to lower price points. Nearly all Sylvania color sets now have GT-Matic or GT-Matic II. The newest version contains more automatic circuits, including flesh-tone correction which doesn't disturb green, both black and white-level correction, and automatic brightness, contrast and color-level circuits. Vertical and horizontal hold are controlled by ICs, virtually eliminating adjustments.

RCA's ColorTrak also is a name designed to cover a variety of automatic features. When introduced in August 1975, it was confined to a few models at the very top of RCA's line. For 1977, it is RCA's main line; the older XL-100 chassis is relegated to price-leader status.

ColorTrak's circuits keep contrast, color and tint at preselected levels regardless of changes in the incoming signal. Coupled to a light-dependent resistor, they coordinate the three functions with ambient room-light conditions. The "contrast" control is actually a master picture control, maintaining a preset ratio of brightness and color. Also part of the ColorTrak system is the Accu-Filter picture tube, a negative-matrix type with optically tinted red and blue phosphors that reduce reflected light and improve contrast and color rendition.

Tuning systems. The goal of absolutely equal tuning ease for both VHF and UHF channels is now being realized, thanks to all-electronic varactor tuners. Most brands for 1977 have at least some models with single-knob all-channel tuners, capable of tuning from 14 to 20 preselected V and U channels. Electronic digital channel-number displays using light-emitting diodes or gas-discharge devices are the fad this year for station identification. Panasonic's digital display system serves a double purpose: When it's not showing the channel number, it can give you the time of day, thanks to a built-in electronic clock chip.



Works in the drawer of the latest, large-screen Quasar sets are all on one, big "Super Module." Panasonic and JVC follow similar, modular-building approaches.

Random-access tuners

The ultraluxury in tuning systems is the calculator-keyboard random-access digital tuner, pioneered by Magnavox in its STAR system in 1974. Among the new models, four different random-access systems are available, and there will probably be more before the model year is over. STAR itself has been updated by adding on-screen time to channel display. The time feature was introduced last year by RCA in its Control Center models and still earlier in some Heathkit sets.

Magnavox STAR sets have two tuning keyboards—one at the set and one in the remote-control unit—while RCA Control Center sets are tuned from the remote keyboard only. The RCA Control Center has adjustment buttons for color and tint; the on-screen channel and time display changes from white to red or green as color or tint is adjusted.

Magnavox has introduced a second calculator-style keyboard tuner for lower-priced models. This nonremote system is tuned in the same manner as STAR or Control Center—the viewer presses "0" and "4" for channel 4 or "2" and "3" for channel 23. But instead of providing an infinite number of channels, the Touch-Tune is programmed for up to 20. An electronic digital indicator replaces the on-screen channel display of higher-priced STAR models.

Rockwell's Admiral Group has also gone the calculator-tuning route in its top-of-the-line "Era II Limited" series. The viewer uses an on-the-set keyboard to tune any channel by punching out the channel number and the button marked "select." The channel readout is electronic.

Optional remote. A completely

(Please turn to page 172)

IT'S NEW **NOW**



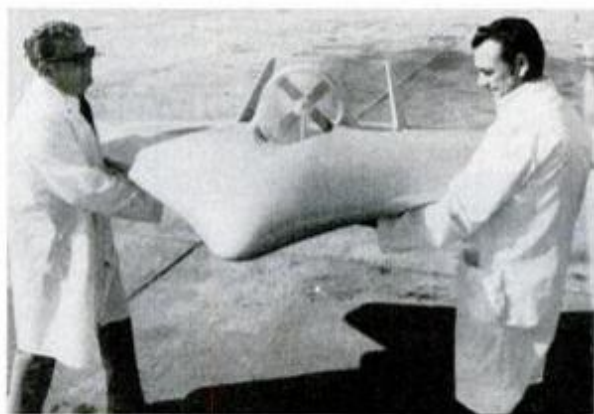
Shortcut telephones almost dial themselves

Special phones that shortcut normal circuits are finding more uses. Highway Emergency sets, in weatherproof housings with door handles that "pop" the ice in winter (top), may ring an aid station as soon as set is lifted; some provide numbers to dial for help. Other Alarm Reporting Telephones are activated by burglar, fire or other alarms, ring the proper number and play a "canned" message. User presets number, and automatic equipment (bottom) takes over. Western Electric makes them.



Record reviver

Brushes and vacuum work together to remove static electricity and dirt from your records. Any standard disc fits in the vertical slot and is held gently as it is rotated slowly by an electric drive. As the platter turns, the specially designed brushes clear particles of microdust from the grooves. The built-in vacuum action quickly sucks away the loosened dust, source of unwanted noise as well as damage to the record's sound-producing surfaces. A static-electricity elimination circuit reduces dust-attracting static from up to 20,000 volts to near-neutral levels. Since static attracts dust, and dust causes crackle and wear, removal of both is vital to record life. \$24.97 from Tele House Two, Box 714, Canal St. Station, New York, N.Y. 10013.



Mini 'plane' has no pilot

Delta-shaped and driven by a ducted propeller, the class 120-pound Remotely Piloted Vehicle (RPV) above is no model-plane toy. The Teledyne Ryan craft is for low-detection reconnaissance, surveillance, weapons delivery and intelligence missions.



Tiny calculator with paper printout

Small enough to slip in an attache case, a nine-digit mini-calculator not only performs the basic functions plus percentage, constants and floating decimal, but also produces a silent electronic printout in bold numbers on 2 1/4-inch paper. Texas Instruments, Box 5012, Dallas, Tex. 75222.

The INCREDIBLE FLIGHT of CAL RODGERS

THE FIRST TRANSCONTINENTAL TRIP BY AIR TOOK 49 DAYS — AND INCLUDED 16 CRASHES !



PM art: Milton Caniff



The great adventure begins. On the afternoon of Sept. 17, 1911, Cal Rodgers takes off from a Long Island, N.Y., racetrack on the first leg of the transcontinental

It was 65 years ago this month that a daring young man named Calbraith Perry Rodgers lifted his flying machine from a field on Long Island, N.Y. Forty-nine days later — after 68 separate hops, 16 major crashes, countless other mishaps and a variety of injuries — he landed at Pasadena, Calif., to become the first man ever to fly coast to coast.

Rodgers' meandering route (see map) covered 4231 miles. Though he is largely unknown to the American public today, his feat earned him a niche in aviation history and an honored place in the Aviation Hall of Fame in Dayton, Ohio.

Cal Rodgers caught the flying fever early, taking lessons at the Wright Brothers flying school in 1911, eight years after Orville and Wilbur had first achieved manned, powered flight. He bought the first Wright plane sold to an individual.

It wasn't long before Cal dreamed of making a transcon-



When Cal noted that his route would take him near the Illinois State Penitentiary at Joliet, he had his wife notify the warden. There was a yard filled with excited

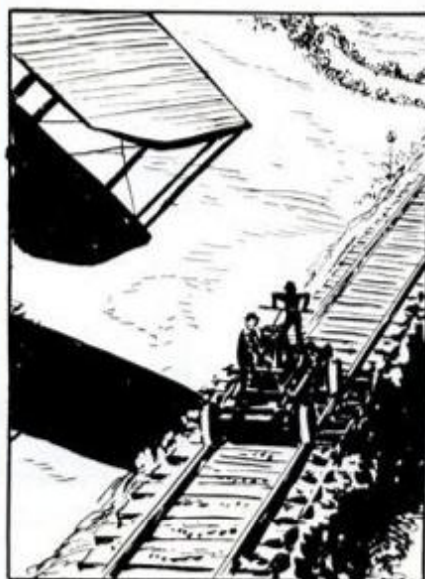
prisoners, most of whom had never seen a plane before, when Rodgers and his flying machine appeared. Cal put plane through a series of maneuvers before flying off.



tinental flight. He entertained some hope of winning the \$50,000 prize then being offered by publisher William Randolph Hearst to the first man to fly across the United States in 30 days. (The offer expired while he was still enroute.)

Cal had the enthusiastic support of his pretty wife, Mabel, when he bought a second Wright plane, a Model B, for the cross-country effort. But the Wrights were aghast

(Please turn to page 192)



Having no navigational aids, Cal followed railroad tracks. In Texas, he swooped down to warn men on a handcar the Vin Fiz special was bearing down on them.



Over California, an engine cylinder blew up, driving metal fragments into Rodgers' right arm and damaging the plane. Fearing another explosion, he landed quickly.



flight. The 32-year-old Rodgers—six four and 200 pounds—was as determined as he was rugged. Not even the Wright Brothers could talk h'im out of making the flight.



The 104-mile hop to Middletown, N.Y., was easy. But on the takeoff the next morning, the landing gear caught in a tree, causing the plane to crash into a chicken

coop. While Rodgers lay unconscious amid the wreckage, his head bleeding, an irate farm woman berated him, demanding payment for her hens. Repairs took three days.



Heading for Vinita, Okla., on Oct. 15, Cal ran into a wild electrical storm. The rain and wind battered the frail craft, but he managed to bring it down for safe landing.



Between Fort Worth and Dallas, an eagle raced the plane, then wheeled toward it as if to attack. Luckily, for plane and bird, the eagle veered off at last moment.



Time out for repairs in Texas. The special train (background), like the plane, carried the name *Vin Fiz* to promote a new soft drink made by sponsor of the flight.



On Nov. 5, a tired and battered Cal Rodgers landed in Pasadena as first man to fly coast to coast. He received a medal and was draped in flag.



To achieve a personal goal, Cal flew to Long Beach, Calif., to dip wheels of the *Vin Fiz* in the waters of the Pacific, just as he'd done in the Atlantic at the start

of the venture. Only five months later, on Apr. 3, 1912, he crashed in shallow water at Long Beach after a gull became entangled in his controls. He died in the crash.

**PM OWNERS REPORT:
CHEVROLET IMPALA**

Can size and comfort bring happiness in the shadow of the gas pump?

A nationwide survey based on 1,012,685 owner-driven miles

by Michael Lamm
WEST COAST EDITOR

Photos by the author

Nearly 80 percent gave Chevy service marks of good to excellent.

"All things considered," reads our questionnaire, "what are your specific praises of the Chevrolet?"

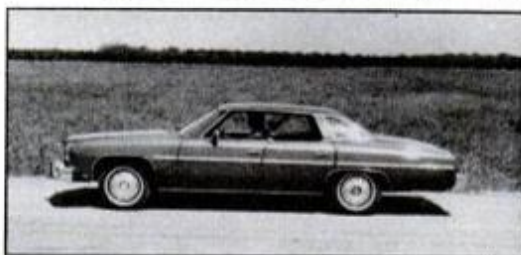
Right under that, we ask, "And what are your specific complaints—in order of severity?" Here are random and typical comments from owners of 1976 Chevrolet Impalas.

Says a 59-year-old North Carolina foreman: "It's good, dependable transportation, with excellent service in this area and better resale value than any other make a person can own. On the minus side, there's too much engine noise when it's cold, the car lacks directional stability in crosswinds, and the front seatback leans back too far. This is in the coupe."

From an Illinois musician, 44, who owns an



The 350-c.i.d. V8 proved most popular with Impala owners. In EPA tests, the four-barrel version got better mileage than the two-barrel. Styling rates high with owners, but many would like a return of ventipanes—instead of flow-through ventilation system.



Impala wagon: "Dependable, economical, functional; good value in my opinion. A larger car is far better than a small one in all aspects, even pound for pound. What bugs me is the yearly increase in price."

A New York packing supervisor, 49: "Good handling, comfortable ride, easy to service. Of the 14 Chevrolets I have owned, the only problem I've ever had was on the 1957, when the transmission shifting linkage disconnected. I have no complaints."

An Alabama clergyman, 63: "There are better cars than the Chevrolet if you have the money to pay for them. I do not intend to be negative, and yet I have no specific reasons to praise this car. My complaints are that with the antipollution equipment, the engine warms up slowly, and I feel this is unsafe when entering a fast-moving flow of traffic."

Now a Wisconsin heating and plumbing contractor, 35: "In comparison with our previous 1973 Olds wagon, this is a superior wagon—better ride, better gas mileage and no rattles. However, I feel the exterior finish chips and mars rather easily. I have several nicks in the paint all the way down to the metal. I envision rust problems even though I got a dealer undercoat."

A 44-year-old consultant to the handicapped for the State of Wisconsin: "I like the safety of a big car, the dependability of General Motors and the local dealer. Also, since my job covers 12 counties, I appreciate the comfort of this Impala sedan—the convenience in terms of fitting in groceries, laundry, etc., and the ease of taking long and short trips. On the other hand, I hate the triple bind of three years of high payments, high repairs on my older car, plus the uncertainty of the energy crisis. I feel like a pawn in a politico-economic chess game, and it angers me. Then, too, there's guilt. Some people at work (and my 26-year-old son) chide me for my 'conspicuous consumption.' My next car will probably be one size smaller than the Impala."

An Arkansas retiree: "Quality of materials and construction have a lot to do with economy, because you can pay a lot of money for things other than gasoline. I also like this car's handsome appearance, its comfort, and its anticipated service. What I object to are the low compression ratio, which makes for an inefficient and wasteful engine; the catalytic converter; and the fact that a lot of metal underneath the car is not painted or rustproofed."

Turning to the question of workmanship, we asked for a rating (see the data chart on the following page) plus comments. Here are some of those—again a representative cross section.

"Workmanship can always be improved," opines a South Texas shrimper, "but my experience has been that Chevrolet builds a very competitive automobile. It's usually a trouble-free car, with very few major problems. The 350-c.i.d. V8 with two-barrel carburetor is an especially fine engine."

"Seems well put together—no rattles," says an Iowa meat inspector.

"We've had Chevys many years and have always been satisfied, but on this 1976 model

► If only the quality—or disguising—of plastic parts were better, there'd be fewer complaints.

◀ Quite a bit of flack on pitting and areas that simply hadn't been painted at all.

► You usually get better service in small towns than in bigger cities

◀ About 30 percent of new-car buyers are going for four-year contracts. Individual payments are lower, but the car costs more.

◀ Betcha more people feel guilty about owning big cars than admit it. This guy's got guts!

► Dealers don't like to handle warranty work—they get less money for it.

► At least 60 percent of the buyers we surveyed were repeat customers.

workmanship isn't what it used to be. The trunk won't shut tight. There's a big rattle near the hood. The rear carpeting has a lump. And the entire glass rear light lens had to be replaced."—Wisconsin retiree.

"I rate workmanship average, mostly because they're putting too much plastic into these new cars today. Plastic parts don't fit right, and they squeak."—Colorado machinery repairman.

"Some years the workmanship is better than others. 1976 is a very good year."—Maine potato seed inspector.

"Best Chevy I ever had!"—Iowa retiree.

"Workmanship is average and getting poorer. Why not get the assembly workers to earn what they make? If an operation calls for four screws, I find three inserted, none tightened, and one under the seat."—Illinois retiree.

"My car was made in Canada, and workmanship is excellent."—Florida retiree.

"It isn't cheaply put together like some cars."—Texas supermarket manager.

How about Chevy dealers—their sales and service departments? We asked the owners we surveyed to rate their dealer service departments and also to tell us what they think of their dealers' sales policies, courtesy, fair dealing and the like.

A Nebraska farmer and cattleman writes, "Our dealer is far above average in the service department. His shop is always busy with cars of other makes from people in town who don't want to go back to their own dealers. The Chevy dealer is a very square shooter and has always treated me well."

An Iowa trucker: "Excellent service. They do what you want done and don't add items unless you need them. Great courtesy from the sales staff—they don't treat you like a dollar sign. No pressure, and I believe my deal was fair to both parties."

A Wisconsin store manager: "We've had excessive starting problems; have taken the car back six times. I feel they don't have enough experienced personnel to handle warranty repairs. I rate the dealer's service department fair."

An Illinois engineer: "Excellent service. Repaired my noisy speedometer cable in one day, no charge. I've purchased eight Chevrolets from this same dealer. His price and service have always been good."

A New York project manager: "The service being excellent and nearby are the reasons I presently own four Chevrolets: the '76 Impala, a '73 Impala, '73 Nova and '67 truck."

And a retired Michigan man writes that he bought his Chevrolet, ". . . because I sold them for many years and have great confidence in the product." But he rates his present dealer's service department as "dirty, understaffed and slow" and sees his dealer's sales organization in terms of "schlock dealing and broken promises."

What, then, prompted owners to buy their Impalas in the first place? Nearly 60 percent said they'd been steady Chevrolet customers for years, so why change? Other reasons included these:

"Chevrolet, especially the Impala, is a very

good, roomy car which you can really trust."—Second secretary of the Soviet Mission to the United Nations.

"Habit—I buy one every year."—Illinois salesman.

New Hampshire repairman: "A change from Chrysler products."

Alabama federal employee: "I've owned Fords, Plymouths and Chevrolets. The last three have been Chevys and have given outstanding service."

"I like the styling and performance."—Wisconsin postal worker.

"I owned a 1963 Nova and got 104,000 miles out of it without any trouble. Now I wanted a bigger car."—Arizona postmaster.

"I work for a company that can get Chevrolets at a discount."—Indiana analyst.

"Because the service is as good as the car."—Michigan shop owner and farmer.

And a Colorado postal carrier told us he bought his 1976 Impala "because my Plymouth dealer died."

While Chevrolet owners basically like their cars fine the way they are, many suggested improvements when we asked, "What would you like to see changed?" To wit:

"Nothing major, but I'd like to see a return to vent panes."—New York packer.

"Better gas mileage, even if it means less horsepower. I wouldn't mind a six-cylinder motor."—New Jersey clothier.

"I'd like to be able to burn the cheapest grades of gasoline."—North Dakota farmer.

"Shorten the overall body length, straighten out the body tuck so the fenders don't catch all that tar and dirt, improve fuel mileage, and provide more headroom. Other than that it's a super car."—Mississippi farmer.

"I miss those vent windows in the front doors. They used to be so much better to open for air. The so-called flow-through ventilation systems are to help the car companies sell airconditioners."—Illinois retiree.

"Lower pricetag."—Illinois engineer.

"The rear windows don't open on the coupe. It would be nice if they did."—Wisconsin carpenter.

"The front seat leans too far back for comfort. I placed a 1.25-inch piece of pipe under

the seat where it bolts to the floor."—Wisconsin retiree.

"Move the ashtray away from the blower. How could anyone be that stupid?"—Florida retiree.

"Hideaway wipers freeze in winter. Glovebox could be bigger and nearer driver. Ashtray location impossible."—Colorado maintenance technician.

"Make it easier to put on rear shocks—it's terrible the way it is!"—Wisconsin pastor.

The Impala has always been a great American standard—since it appeared in 1958. It'll apparently continue in that role as long as Chevrolet cares to call it *Impala*. No fewer than 90.3 percent of owners we surveyed said they'd buy another when they're ready to trade. That's as hearty an endorsement as an automaker can hope for. ★ ★ ★

You'd think this Detroit fad would go the way of wraparound windshields and tailfins.

This may be his last chance to get what we now call a full-sized Chevrolet. They'll shrink next year—on the outside, but not on the inside.

Fantastic interior roominess front and rear helps Impala rate high in comfort. One of owners' major gripes centers on ashtray, which stands so near blower outlet that it's practically useless. Another complaint is of a too severe rearward tilt in the front seatback. One owner solved this by blocking up rear bolts.



Summary of 1976 Chevrolet Impala Owners Reports*

Total miles driven 1,012,685	Dealer service	15.0	Workmanship opinion:	Ford	15.8
Average miles per gallon:	Performance	9.4	Excellent	Volkswagen	10.5
350-c.i.d. V8	Price	8.7	Good	Had any mechanical trouble?	
In town (EPA, 13 automatic) 12.7	Specific likes:		Average	No	53.1%
Long trips (EPA, 19 automatic) 16.2	Comfort	36.1%	Fair	Yes	46.9
400-c.i.d. V8	Styling	29.6	Poor	What type of trouble?	
In town (EPA, 13 automatic) 11.9	Performance	28.7	Comfort opinion (front seats):	Transmission	16.4%
Long trips (EPA, 18 automatic) 14.6	Handling	22.2	Excellent	Speedometer	11.5
Body styles:	Riding qualities	19.4	Very good	Airconditioner	9.8
Four-door sedan	Specific dislikes:		Good	Electrical	8.2
Coupe	Gas mileage	21.2%	Fair	Did you fix it yourself?	
Sport sedan	Poor workmanship	9.7	Poor	No	98.3%
Station wagon	Poor dealer service	5.3	Comfort opinion (rear seats):	Yes	1.7
Engines:	What changes would you like?		Excellent	Dealer repairs satisfactory?	
350-c.i.d. V8	Better gas mileage	15.3%	Very good	Yes	71.4%
400-c.i.d. V8	Relocate ashtray	5.9	Good	No	28.6
454-c.i.d. V8	Better ventilation system	5.9	Fair	Age distribution of owners:	
Carburetor choice:	Revamp seat shape	5.1	Poor	15-29 years	6.2%
Two-barrel	Dealer service opinion:		Number of vehicles owned:	30-49 years	31.8
Four-barrel	Excellent	35.7%	Impala only	50-plus	62.0
Why did you choose the Impala?	Good	37.2	Two cars	Would you buy another Impala?	
Past experience	Average	12.4	Three cars	Yes	90.3%
	Fair	7.0	Four cars	No	9.7
	Poor	7.8	Five or more cars	Makes of other cars owned:	
			Impala only	Chevrolet	
			Two cars	63.2%	
			Three cars		
			Four cars		
			Five or more cars		

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

Do you have the right CB microphone?

The proper mike makes your CB easier to hear. But the wrong one makes it harder.

By Ivan Berger
ELECTRONICS EDITOR

With the CB channels as crowded as a rush-hour highway, what's the best way to be heard above the roar? Not by increasing your transmitter power—that's not just unfriendly and unfair, it's also illegal. Try a better mike instead. It won't make your signal reach any farther, but you'll be more easily understood wherever that signal does reach.

Using an incorrect microphone—or even using the right one improperly—can make your signal *harder* to understand, turning your strong, clear rugged voice into a mumble or distorted mush.

Accessory mikes for CB come in four basic types: straight replacements that leave your set's original performance unchanged; amplified mikes; compressor mikes, and noise-canceling mikes. There are combinations, too. The proper mike for you depends upon your problem, and why you aren't being heard to best advantage now.

If you're transmitting from a noisy truck or tractor cab, you'll need a *noise-canceling* mike. Its design cancels out most sounds coming from more than an inch or so away. You can usually tell these by the bar that holds them just the right distance from your upper lip. But hold the mike away from your lip, and your voice is canceled too (the Telex

"double-header" has a switch that cancels the noise-canceling feature, for comfortable talking under quiet circumstances).

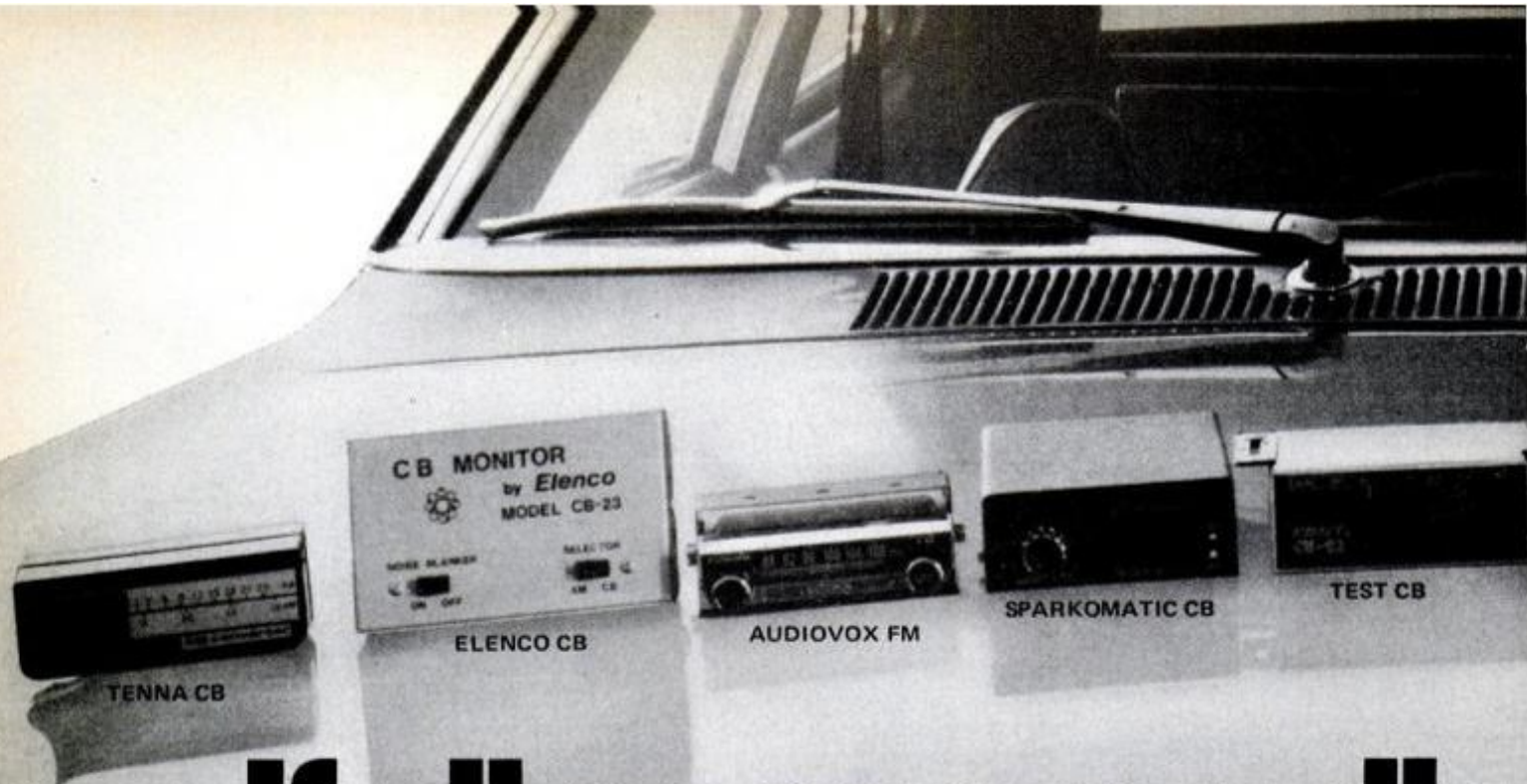
If your problem is too soft a voice, you need an *amplified* or "power" mike. All it does is boost your voice level as it goes into your transceiver. Amplifier mikes have volume controls, though, so you don't boost your voice too much. Too high a boost will cause distortion on some sets—and on older ones, without modulation limiters, it will make your signal splatter illegally into adjacent channels.

A more sophisticated "power" mike is the *compressor* type. Like the amplifier mike, it can make soft voices louder. But its main function is to

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All the above are amplified mikes. Superex CB10 and Telex CB-1200 are headset models, while Turner M+3 has compression. Turner 400NC and Telex CB-73 are noise-canceling. Turner M+2/U is a standard amplified mike.



If all your car radio

Wish your car radio could pick up FM? CB? TV? Weather? Well, it can.

by Ivan Berger
ELECTRONICS EDITOR

The air is full of fascinating things to listen to, but your car radio can't hear them all. Though more and more car radios pick up both AM and FM, surprisingly many still do without FM's clearer sound and greater freedom from fading under bridges. And even AM-FM sets miss CB chatter, government weather broadcasts and TV sound tracks.

But you needn't replace that radio now in the dash to get them. Just add a converter.

Plug in between radio and antenna

Converters plug in between your car's radio and antenna. That and attaching a power lead to a 12-volt source are all you do to install them.

Switched off, they have no effect on the signals reaching your radio. Switched on, they either shift the frequency of amplitude-modulated signals like CB onto the AM band, or tune in and demodulate a frequency-modulated signal from FM broadcasts, TV sound, government weather service forecasts or fire and police calls. That signal is then amplitude-modulated on a new frequency your AM radio can pick up.

Most frequency-shifting converters shift all frequencies equally on

the band they pick up. You tune in the individual stations with your car radio's regular tuning knob. Most FM-type converters have their own tuning knobs, so that all the stations they pick up will come in at the same point on your car radio's dial; you can set one pushbutton to that point.

■ **FM converters** tend to work well, possibly because of FM's inherent resistance to interference problems. There are dozens on the market. We tried Audiovox's FMC-1C (\$40). In the city, it brings in as many stations as the FM band of a good car radio, though with less high-frequency response, and not in stereo. In the country, where sensitivity is more important, it gets fewer stations than a top-notch FM car radio, but still more than many radios do.

The FM band of Audiovox's FMC-TV (\$85) worked just as well, but it also picked up TV and weather signals. Theoretically, you just click from channel to channel as you do on a TV set; in practice, some channels require adjustment of the fine-tuning ring surrounding the channel-selector knob. The "W" between channels 13 and 2 is for weather forecasts; this takes further fine-tuning (and with still further adjustment you can hear some marine telephone calls, too.)

■ **Other weather-service attachments** can sometimes be unorthodox. Audiovox's WB-70 (not shown) takes only about as much dash space as two commemorative stamps, uses a simple frequency converter to adapt FM weather broadcasts to FM car radios, and costs \$23.

Instalert EM-1W (\$124) from Electrosonics not only lets you listen to forecasts, but shrieks an alarm in response to weather-service severe storm warnings when you're not listening. Since converters are switched off when you're not listening to them, Instalert isn't a converter, but a radio you wire in along with your broadcast set.

■ **CB converters** are booming, but they suffer frequently from static. Most worked fairly well when our test car's ignition was turned off, but picked up lots of static with the motor running. The Tenna CBC-23 (\$30) suffered most from this, followed by the Test CB-23; both would be okay, though, on cars with more static-free electrical systems. Both sets had scales to help you locate CB channels on your radio's dial; Tenna's scale was a bit clearer.

The squelch control on Electronic Circuits and Devices' Bear Buster CBM-19S (\$45) helped reduce static as well as cut noise between CB



gets is AM, convert

signals. The Bear Buster also had a cigaret-lighter plug for easy power connection, a pilot light to let you know it was on, and an oscillator that broadcast a distinctive tone to help you find the spot on your radio's dial where Channel 19, the highway traffic channel, would come in.

Sparkomatic's CB-10 (\$20) also had a pilot light, plus a sensitivity control which acted somewhat like a squelch in controlling noise, and could also cure overloading from strong local signals. Elenco's CB-23 (\$35) had a noise-blanker switch, which reduced ignition noise greatly; the CB-23's broad, flat shape though, makes it more suitable for sticking to the dash, rather than hanging under it.

All these CB converters were fairly well matched in convenience and performance. But the Audiovox CBC-100 (\$74) was in a class of its own. It looks like a regular CB transceiver and has most of the features of one—except the ability to transmit, of course. Tuning is by a 23-click, illuminated dial; there's an illuminated "S" meter that's bigger and easier to read than those on most transceivers; there's a squelch control; and the CBC-100's sensitivity and noise rejection seem better than those of any of the other CB converters we tried. This is about as

first-class as you can get; and it looks that way, too (though the shiny chrome front panel could cause glare problems in a few cars).

Another click-tuned CB converter is coming soon from Sparkomatic. Its new CB-10 will have fine-tuning, noise-silencer and sensitivity controls, but will not have an "S" meter or a squelch.

■ **Other converters** are available for various purposes: Becker makes a shortwave converter, Electrosonics makes several that pick up public-service bands (handy for volunteer firemen, among others), and Boman has one that picks up roadside radar, as well as CB emergency Channel 9.

Then there are converters that don't pick up radio at all, but which play cassette or 8-track tapes through your car radio.

And there are the combinations: FM and weather, or FM, weather and cassette (Audiovox), TV and weather, Channel 9 and weather, or Channel 9 and TV (Boman/Astrosonix), FM and CB (MetroSound), and so on.

No matter what your present car radio lacks ears for, there's no reason not to hear it if you want to. Just plug in the appropriate converter, push its button, and listen. ★ ★ ★

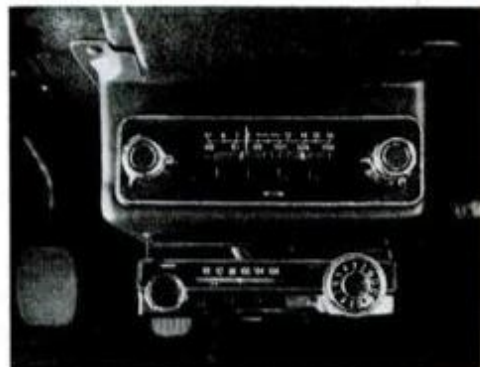
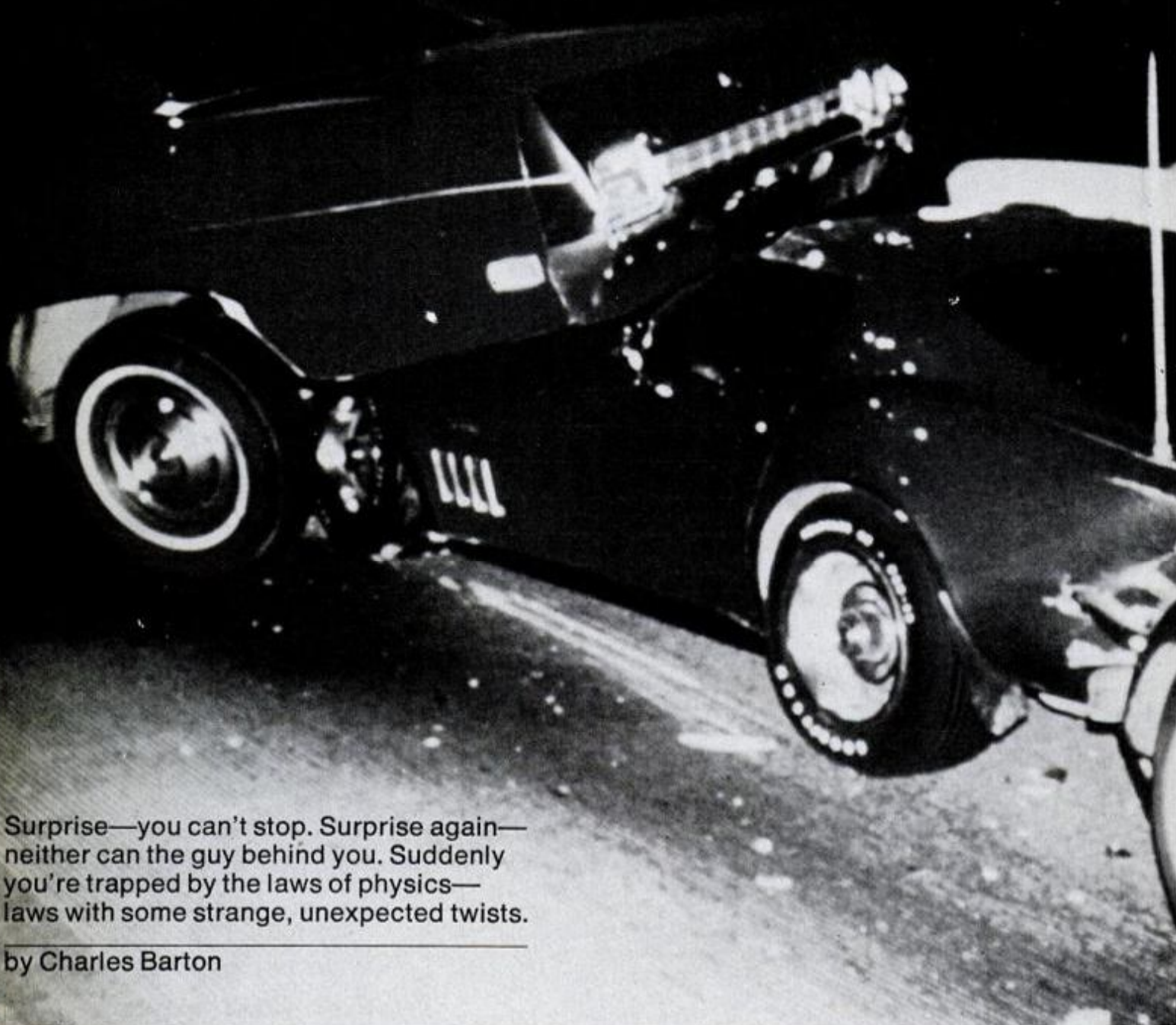


Photo: Madeline Silver

Two radios? No. Hanging under the Philco-Ford car radio (above) is a converter—Audiovox's \$85 FMC-TV that adds the sound from VHF TV channels and government weather forecasts, plus FM (if your radio doesn't have that already). Converters are easy to install between a car's radio and antenna. Shown on the hood of the car are (left to right): Tenna CBC-23 (\$30), Elenco CB-23 (\$35), Audiovox FMC-1C (\$40), Sparkomatic CB-10 (\$20), Test CB-23 (\$29), Audiovox CBC-100 (\$74), Electrosonics Instalert EM-1W (\$124) and Bear Buster CBM-19S (\$45). Units differ both in what they do and in how well and how conveniently they do it.

Tailgating: The accident waiting to happen



Surprise—you can't stop. Surprise again—neither can the guy behind you. Suddenly you're trapped by the laws of physics—laws with some strange, unexpected twists.

by Charles Barton

With the coming of darkness, fog drifted in and shrouded the highway in an ominous gloom. Martin Raymond peered intently through his windshield. Taillights of the cars ahead appeared as faint halos in the thickening mist. Suddenly brake lights flared brightly, and Raymond tromped on his own brakes. Tires screeched as they clawed at the road, but there was not enough time. Raymond's world exploded into violence as he slammed into the car ahead, then almost simultaneously felt the jolting impact of the car behind.

Martin Raymond had just been trapped by the iron laws of physics. Normally a careful and alert driver, he had simply misjudged the necessary stopping distance under the conditions—and so had the driver behind him, and the one behind him.

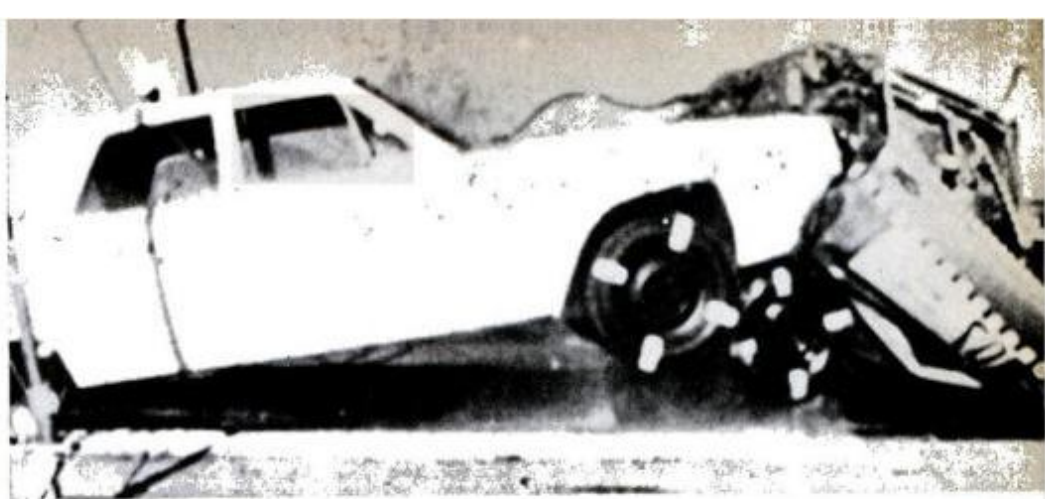
Different kinds of tailgating

The problem is that tailgating is frequently not what we assume it to be. We think of the tailgater as deliberately and maliciously riding the tail of a car ahead in an attempt to push it faster or make it move over. While this is the most vicious

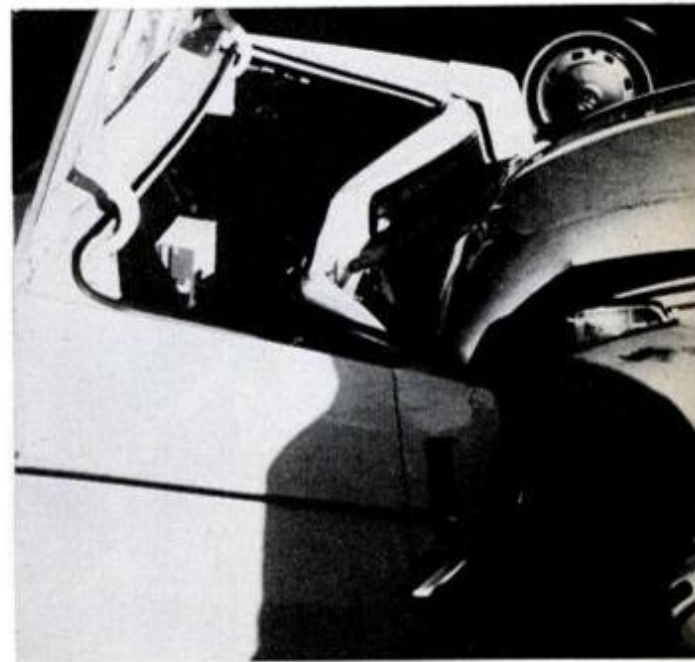
form of tailgating, it is by no means the only one or the most common. You can be a conscientious driver moving along with three or four car lengths between you and the vehicle ahead and still be "tailgating" if you can't stop when you have to. The trick is knowing how much distance is a safe distance—and the facts of physics can be surprising.

When visibility is limited and drivers are traveling at speeds where stopping distances exceed the distance they can see, a trap like

(Please turn to page 167)



Chain-reaction pileups like one at left are common result of leaving too little space between cars at high speed. As lead vehicles slow, braking time for following ones progressively lessens until there is insufficient distance to stop, resulting in series of rear-end collisions. Test crash above shows what happens when a small compact is rear-ended by a full-size car. At 60-mph impact, small car is almost completely demolished. Overturned car at center right doesn't look like result of tailgating but is. Driver, seeing he was about to hit car ahead, slammed on brakes and swerved in "successful" move to avoid collision. But he spun out of control, hit curb and rolled over. Unbelted, he was severely hurt. Crackup at lower right shows how much damage can occur at relatively low speed of 25 mph.



How fast can you stop?

SPEED

STOPPING DISTANCES

20 MPH  17 FEET

50 MPH  187 FEET

55 MPH  230 FEET

70 MPH  527 FEET

Stopping distances shown here are approximate and are based on an average car on dry pavement with brakes and tires in good condition.

Distances can vary considerably depending on type and condition of both road surface and vehicle. Note that stopping distance at 70 mph is more than double that at 55 mph, one reason tailgating is so deadly.

New cameras revive an old format

by Ivan Berger
PHOTOGRAPHY EDITOR

Many an old, folding camera took 16 rectangular shots on a roll of 120 or 620 film. But for years, most 120 cameras have taken 12 2¼-inch-square (60x60-mm) shots per roll. Now, the latest Mamiya and Bronica models are almost back to the old format, shooting 15 60x45-mm pictures per roll.

The switch is a practical answer to the coming shortage of silver used in film. Making 8x10 prints from square negatives wastes about 25 percent of the film's area. But making one from a 60x45 (actually 55x42-mm image area) wastes only about 3½ percent. Yet each negative size can make equally sharp, fine-grained enlargements, since both require the same enlargement (4.8X) to make an 8x10 print. This close match between negative and standard printing paper proportions is why 60x45-mm is an "ideal" format.

By contrast, 35-mm negatives, 24x36 mm, have to be enlarged 8.4X in order to make an 8x10-inch print, and 17 percent of the film area is wasted.

Since the 60x45 negative, though still made on 120 film, is smaller than the 60x60 square negative, the camera can be smaller, too—but not much. The Mamiya (top center) is nearly as big as a 2¼-square Hasselblad—but still small enough to nestle in a hand (right, above). The Bronica, smaller, nestles more cozily still.

Both cameras offer a raft of useful accessories: light-tight viewing hoods, eye-level prisms (some with meters to control shutter speed), and a wide range of lenses. The Bronica also takes interchangeable film backs, including a Polaroid back for test shots. But the Mamiya is easier to load, has an instant-return mirror (Bronica blocks out after each shot) and costs \$795 against \$899. ★★

New 60x45-mm format is intermediate size between 60x60-mm (2¼-inch-square) and 24x36-mm (35-mm) formats of cameras shown flanking it. Mamiya M645 is shown here.



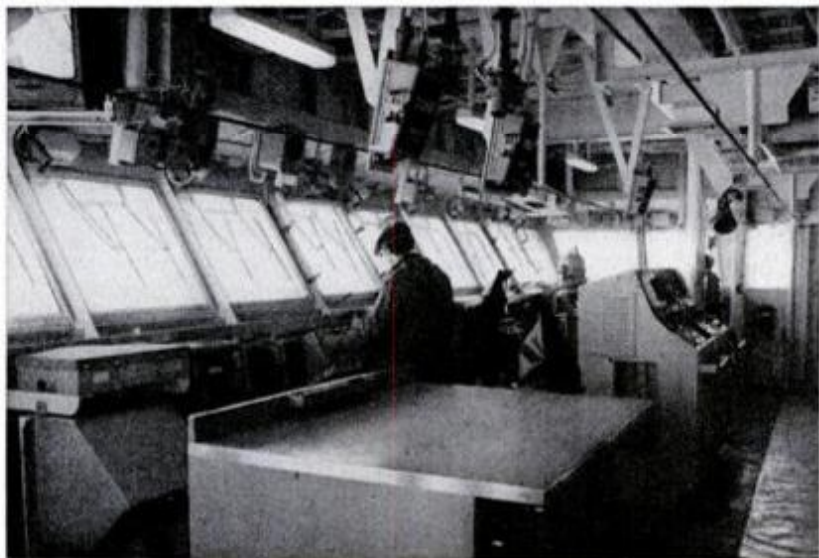
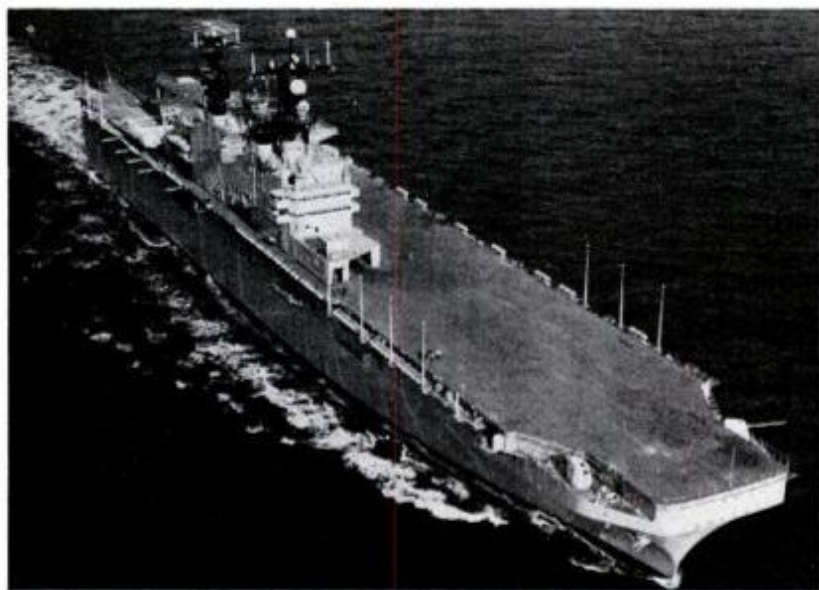
Vertical pictures are no problem on either camera when you use optional, eye-level prism finders. But with finder hoods like that shown on Bronica (below), a vertical image would be upside down.



Bronica vs. Mamiya: Bronica ETR (left) is more compact than Mamiya 645 (below), has leaf shutters in each lens instead of focal-plane shutter in Mamiya's body, and interchangeable backs. But it costs more.



IT'S NEW **NOW**



New breed of amphibious assault ship

Tarawa (LHA-1), the first of our Navy's new assault ship fleet, went into service this summer. She and her sister ships will be able to deliver a balanced assault force of Marines in landing craft and helicopters, with fire support. Flight deck is equal in size to about three football fields, and the ship's speed is better than 20 knots. Two horizontal conveyors and nine elevators handle the aircraft and vehicles.

Jig for accurate dowel holes

Six different size holes in a doweling jig enable you to drill precision holes for almost any kind of fussy doweling job you have. The revolving turret, mounted in a cast-aluminum frame, clamps on to any workpiece up to four inches wide. The turret slides on crossbars and locks in position to permit drilling either centered or off-set dowel holes. The jig turret will accept drill bits from $\frac{1}{16}$ to $\frac{1}{2}$ inch in increments of $\frac{1}{16}$ inch. The tool measures $2\frac{3}{4}$ x 3 x $6\frac{1}{4}$ inches and costs about \$10. From Sears Roebuck and Co.



Four speakers spread tweets and woofs

Its sound is aimed at you instead of floor or ceiling, according to the maker of a new four-way speaker system. Polymer diaphragm in the supertweeter uses a breathing motion for dispersal; carbon fiber cone woofer delivers deep tones; mid-ranges spread from a 4-inch cone; and a $1\frac{3}{4}$ -inch cone drives the ultra-high ranges. \$300 from Pioneer.

Bedside computer terminal for night work

Plug-in computer terminals that link up to home telephones and TV sets are providing bedtime contact with problem-solving executives of a British company. When things go awry at the computer center, the night staff calls the appropriate man and plugs in the telephone-computer link. The data flashes on the executives's home TV screen once he has placed his phone in the bedside mini-console receptacle. He then can "talk" to the computer via his keyboard feed-in typewriter. After consultation with the computer, he can correct program failure, job control language or wrong data right from his bed. BOC Ltd., Hammersmith House, London W6 9DX, England.



Firsthand report: Driving the new Porsche and BMW

Only those who love to drive need apply.

by Bill Hartford
AUTO EDITOR
and Michael Lamm
WEST COAST EDITOR

The whirling propeller emblem of BMW goes back to the days when the Bavarian Motor Works was *the* shop to build the powerplant for your wings—none less than the Red Baron staked his life on the engines. That was before BMW got into wheels—motorcycles in 1920; cars in 1928.

While BMW was putting its first four-wheeler into production, Ferdinand Porsche was watching another of his creations—the unbeatable Mercedes SSK racer—mop up all competition in Europe . . . and already a gleam in his eye was the VW Beetle. It would take until 1948, however, before the first sports car of his design carried his name.

These latest cars from BMW and Porsche share a heritage of German design and engineering, and are now out for a share of the U.S. auto market after their introduction in Europe. The 924 is just now becoming available in numbers, and the 320i will go on sale in November.

At the time the U.S. version of the 320i was previewed on BMW's home ground in Munich, the Porsche was shown at Laguna Seca Raceway in California (where more Porsches are sold than in any other place).

Bill Hartford's report on the BMW

■ Driving from Munich to Salzburg and back (with many shunts off the



autobahn onto Alpine roads), I knew that the bottom-of-the-line BMW is all the car that any American driver would ever need. I was convinced that at a trifling 55 mph the engine will run forever, that 55 mph is slow enough to take any curve or corner on any road, that—if it goes on sale for \$7500 or less—it's *the* best value around today (the all-time great value was the BMW 1600 of 1966).

Okay. But it's natural to exaggerate after caroming around the mountains in a car that you can really *drive*. The 320i is that kind of car.

The 320i (3-Series, 2.0 liters, fuel-injected) replaces the 2002 which is

now out of production. Enthusiasts may groan, "Another classic gone; this one'll just be more expensive" (as I did before seeing and driving it), but the 320i is everything the "02" was and more.

Body. The obvious change is the new body, which is closer to the lines of the 530i and maintains BMW's tradition for a strong family resemblance. The new body was not designed for style alone: It's stronger (in rollover and torsional rigidity), has improved crush zones (with fuel tank moved ahead of the rear axle line), has better soundproofing and much better ventilation. Visibility is superb, finish and quality of materials are excellent and the trunk is adequate (toolkit swivels down under the trunk lid, naturally).


Engine. There's no catalytic converter, and regular fuel is burned in the two-liter Four—which is basically the same as the 2002 powerplant with its ohc and inclined valves. Carburetion, however, is replaced with K-Jetronic fuel injection. The motor is strong, responsive and smooth (new engine-mounting system includes hydraulic vibration damper). Exhaust system has greater volume which reduces car noise. Lively performance remains a BMW priority and it's not compromised for better fuel mileage—even better, I

(Please turn to page 124)



Porsche 924, above and left, is a 2+2 hatchback sports coupe that departs from Porsche tradition by putting a water-cooled engine up front. The 2-liter, ohc Four is laid over 40° to allow fast-sloping hood. BMW 320i, below and right, is a two-door sports sedan firmly in the Bavarian Motor Works tradition: strong engine, independent rear suspension—overall, a good balance of performance, ride and comfort.





Many searchers for Atlantis believe an erupting volcano blew it into oblivion.

7 great quests of man

Be it a monster in a Scottish lake or intelligent life in space, man has been searching for the pot of gold at the end of several rainbows. Here's a progress report on how the questers are doing.

by Dan Cohen

A quest is a search and an adventure. It is the pursuit of a great but difficult, perhaps impossible, goal. History and mythology are full of tales of quests. There was Jason's quest for the Golden Fleece, Sir Galahad's quest for the Holy Grail, the conquistadors' quest for El Dorado and the quest of a generation of explorers for the source of the Nile.

Are such adventures dead in our humdrum and commonplace modern world? Of course not! Here are seven of the greatest quests of the 20th century. The list is a personal one. There could be others, but these seven would surely come near the top of anyone's list.

ATLANTIS

The quest for the lost continent of Atlantis started with the Greek philosopher Plato. About the year 355 B.C. Plato wrote about a great civilization on a continent called Atlantis. He said that it was ancient in his day, and had sunk into the sea as the result of a vast cataclysm. Plato is the only original source for the Atlantis story.

Plato wasn't very specific about the location. He said it was "beyond the Pillars of Hercules," an ancient name for the Strait of Gibraltar. That meant it would be somewhere out in the Atlantic Ocean. Over the centuries Atlantis has been "located" in lots of places from the coast of Spain to the North Sea. At one time



Photo: Wide World



Photo and drawing: Photo Trends

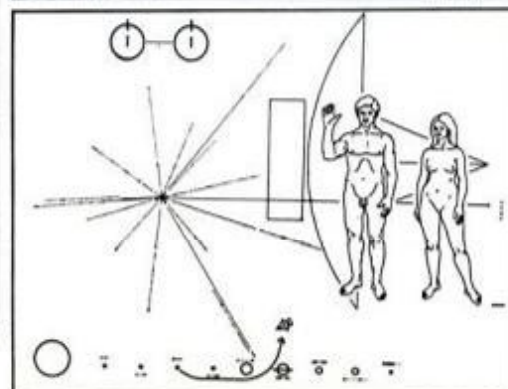
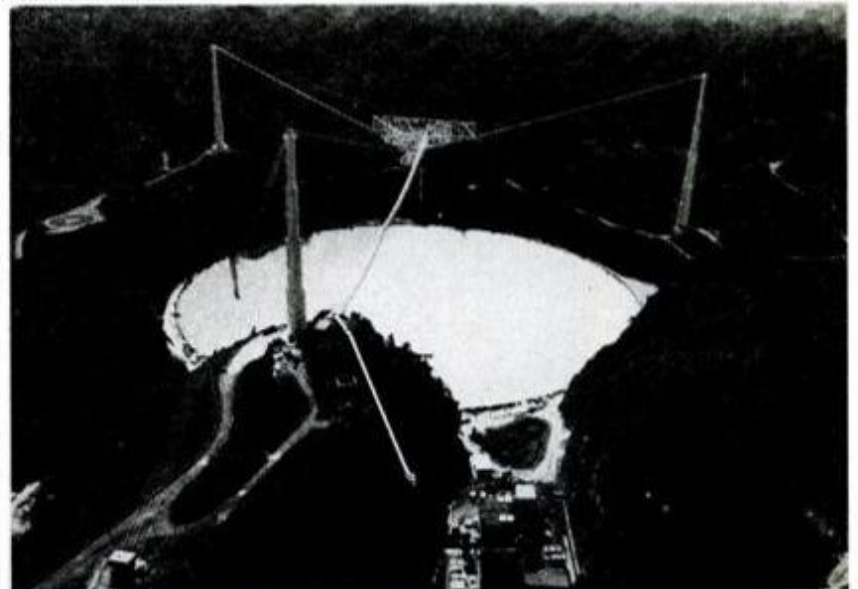


Loch Ness monster appeared to exist in 1961 photo (top) taken above water. In 1975, apparent head-with-horns photo (left) was taken underwater. Artist's concept of what's in photo (above).

Photo: Wide World



Photo and drawings: NASA



Quest for intelligent life in outer space takes two forms: 1. Listening for celestial signals with a 20-acre radio telescope (above) in Arecibo, P.R.; 2. Sending a scientifically designed plaque (left) into other solar systems aboard Pioneer 10 (far left). Plaque shows humans, solar system, hydrogen atom, and frequency of 14 pulsar stars at capsule launch time.

some people thought America was really Atlantis.

The American psychic Edgar Cayce said that Atlantis sank near the island of Bimini in the Bahamas. He also said the sunken continent would rise again. Some of Cayce's followers insist that they have been able to locate the ruins of Atlantis where the seer said they would be, and that a section of sea floor actually is rising! Professional archaeologists treat such claims with unconcealed disdain.

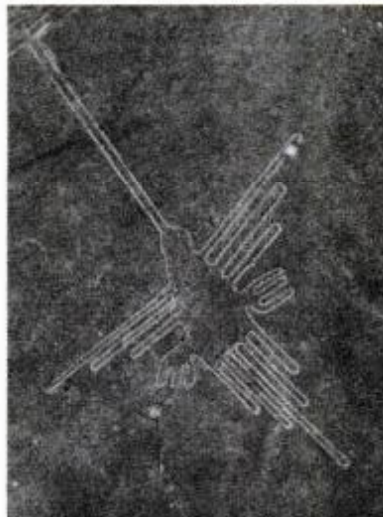
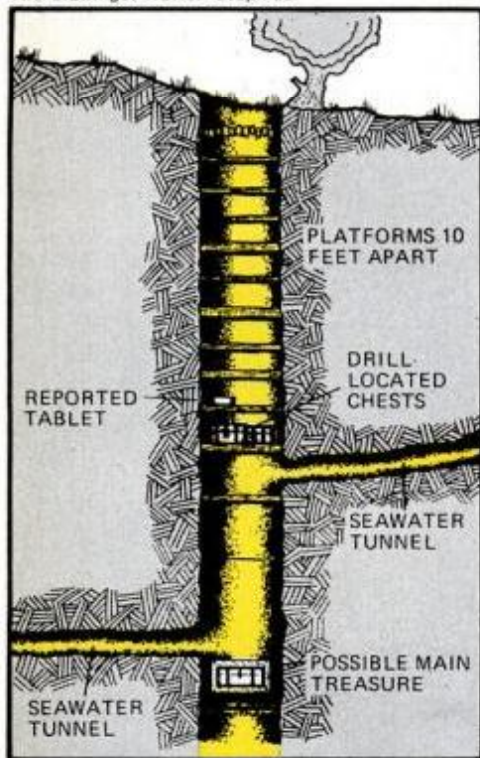
They are not at all disdainful of another claim—that Atlantis really was found in the 1960s. This Atlantis isn't in the Atlantic, but in the Aegean, not far from Plato's homeland of Greece. It wasn't a continent, but a volcanic island called Santorin.

The island had rested on an enormous subterranean chamber filled with lava. Sometime between 1480 and 1450 B.C. the volcano erupted. This chamber emptied out and a



Quest for evidence of ancient astronauts starts in Peru with this 840-foot-long carving in the side of a coastal mountain. It points to the Nazca Plain—60 miles inland where there are other giant drawings (below).

Two drawings: Walken Graphics



Visible only from the air, condor-like bird drawings (above) and a giant spider (right) are scribed near runway-like clearings in 200-square-mile Nazca Plain.

Photos: Peruvian Air Force



Quest for the Oak Island treasure centers around the money pit (left) where evidence of a tablet and decoy chests has been drilled up. Below are quest locales around the world.



large portion of the island collapsed into the sea. What remains are three smaller islands, of which Thera is the largest.

During the 1960s excavations of Thera revealed that it had once been the home of the Minoans. These were a highly civilized, seafaring people whose center was on the island of Crete about 70 miles from Santorin. The Minoans on Thera had been wiped out by the eruption. The well-preserved ruins now being uncovered are one of the major archaeological finds of this century.

The civilization of Santorin was neither as old, nor as large, nor as advanced as Plato said Atlantis had been. Many archaeologists are convinced Plato had just used a little poetic license with the facts.

That explanation has not satisfied everyone. Others will continue to search for Atlantis elsewhere, as they have for thousands of years.

NOAH'S ARK

"And the ark rested in the seventh month, on the seventh day of the month, upon the mountains of Ararat."

That is all the Bible has to say about the final resting place of Noah's Ark. In biblical times Ararat meant a large region including parts

(Please turn to page 144)

HOW YOU CAN GO QUESTING

You can easily visit the sites of some of the quests discussed in this article. Here's how:

ATLANTIS: The island of Thera, possible site of Atlantis, is reachable by ferry from the Greek seaport of Piraeus, near Athens.

NOAH'S ARK: The Turkish government does not encourage freelance expeditions to Mount Ararat.

LOCH NESS MONSTER: The most direct way is to fly to Prestwick Airport, near Glasgow, then take a train to Inverness. Bus tours of Loch Ness are available from Inverness. You can also rent a car in either Glasgow or Edinburgh and drive to Loch Ness.

BIGFOOT: Regular Bigfoot expeditions for the hardy are run by Beamer Expeditions, Box 285, Dept. PM1, Canoga Park, Calif., 91305. A detailed catalog costs \$3.

OAK ISLAND: A causeway from the mainland to Oak Island is 51 miles from Halifax, Nova Scotia.

ANCIENT ASTRONAUTS: Information on tours of the Nazca and other Peruvian sites is available from Braniff International, 135 East 42nd St., New York, N.Y. 10017 or call toll-free 800 527-4000.

INTELLIGENT LIFE IN SPACE: Unless you have your own spaceship, you had better leave this one to the experts.



Photo: UPI



Photo: Wide World

Bigfoot, is that you? (top) and is that the Abominable Snowman's scalp? (above) are questions often asked about these photos made in the Pacific northwest by professional creature hunters, and in a Himalayan monastery.



Photo: UPI



Bettman Archive

Many questers for the remains of Noah's Ark (artist's version of the landing, above) feel as does Dr. John Montgomery that a satellite photo (left) of Mount Ararat in eastern Turkey in 1974 disclosed a possible resting site.

Beat those cold winter nights with a handsome, low-cost fireplace

by Mike McClintock
ASSOCIATE HOME AND SHOP EDITOR

Most people nowadays are warmed by fires they never see. All across the country, blue-tipped flames burn away symmetrically inside furnaces and water heaters. It's pretty hard to get romantic about that. But when you put a match to logs in a fireplace, you can curl up in front of it with a friend and stare into the flames for hours. It's not hard to add a good-looking fireplace to your home. In fact, you can do it in a weekend. Freestanding and built-in prefabricated units come in a wide variety of colors, shapes and sizes, with fittings you can



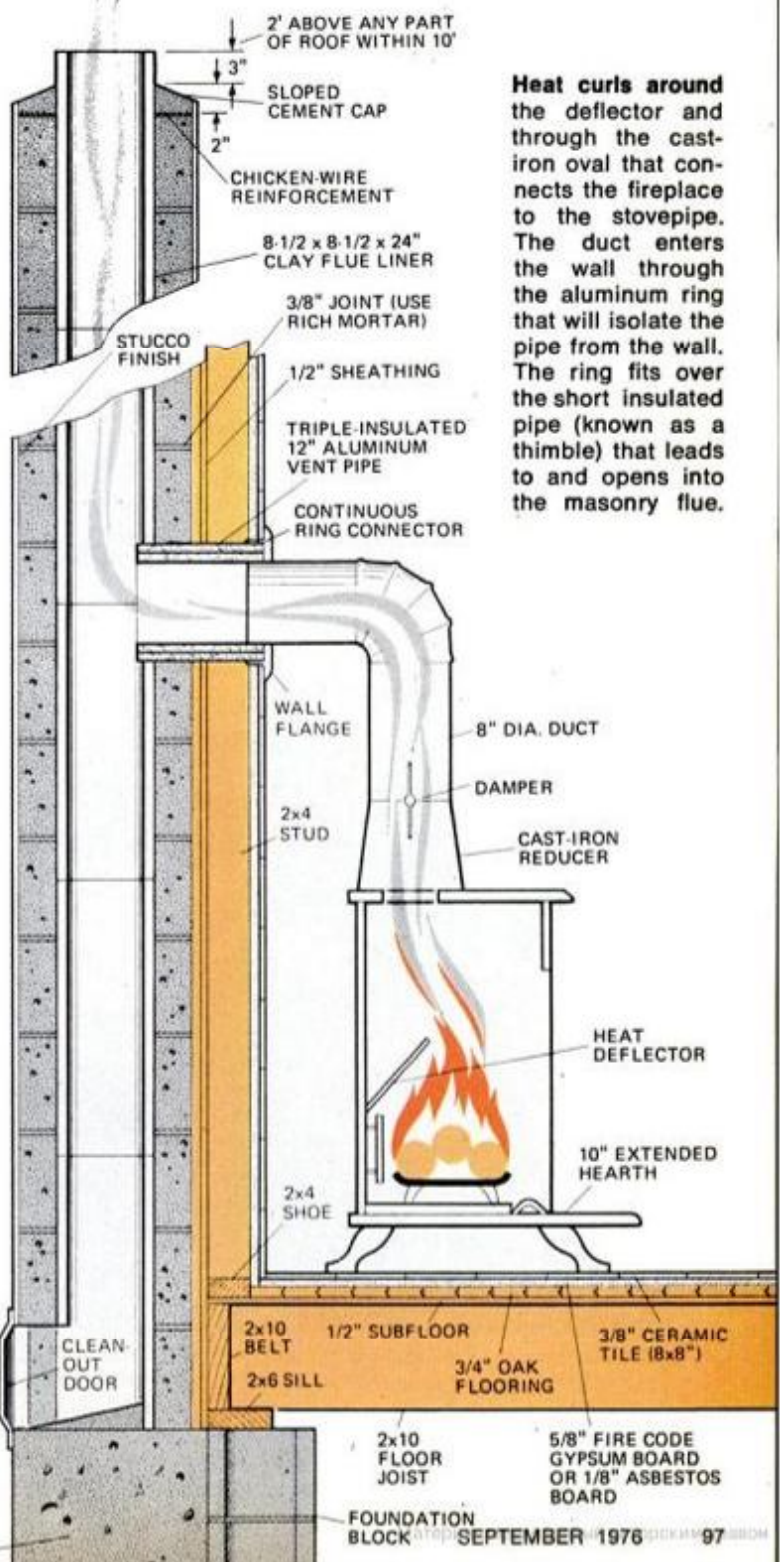
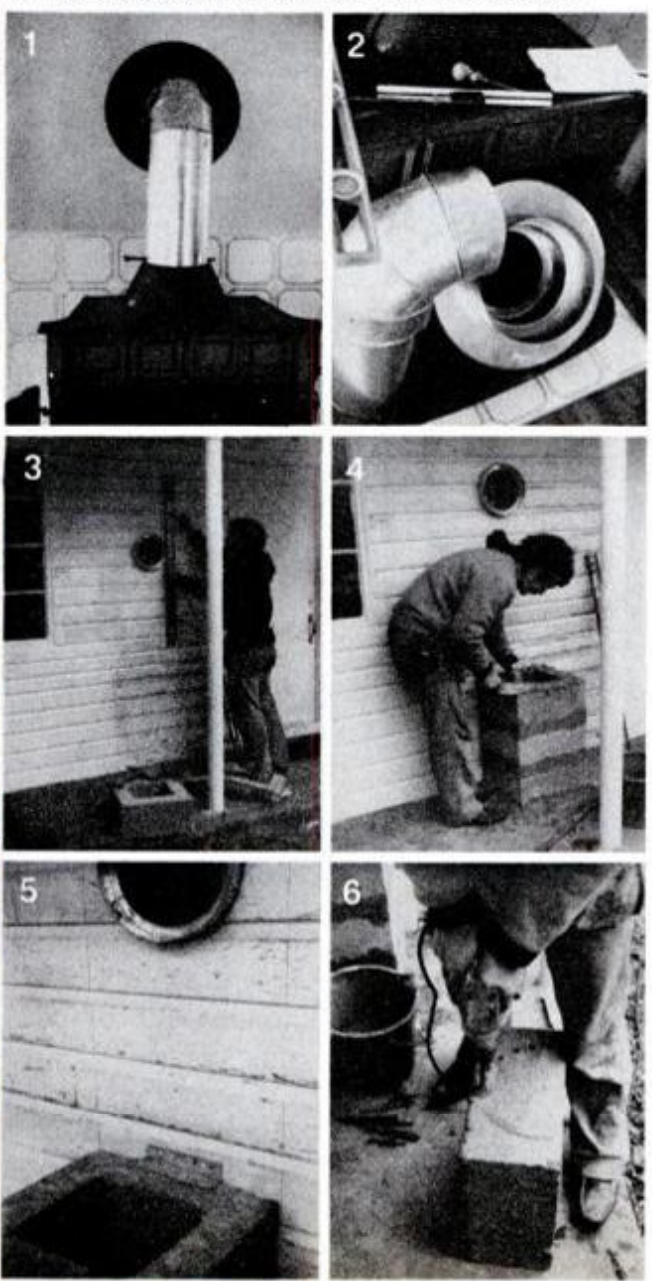
Franklin stove installations



Top and back vent outlets are provided on this heavy cast-iron Franklin stove. Three different sizes are available from Atlanta Stove Works, Box 5254, Atlanta, Ga. 30307. Shown above are alternatives to the installation that we made below.

Here are some tips on building a masonry flue:

1. Assemble the stovepipes to measure the wall cut.
2. A ring connector isolates the pipe from the wall.
3. The thimble must fall in the center of the block.
4. Provide a slab or footing for your chimney.
5. Metal clips anchor every third block to the house.
6. Holes help break the block to fit around the pipe.



Heat curls around the deflector and through the cast-iron oval that connects the fireplace to the stovepipe. The duct enters the wall through the aluminum ring that will isolate the pipe from the wall. The ring fits over the short insulated pipe (known as a thimble) that leads to and opens into the masonry flue.

adapt to any installation. When the energy crunch hit a few years ago, there was literally a stampede to get Franklin stoves, old log-burners, pot-bellied coal stoves—anything that would provide an extra (and inexpensive) heat source. Even now, fuel prices being what they are, an efficient fireplace is starting to be more of a necessity than a luxury. The Franklin stove I installed is in a 16x24-ft. living room heated by forced hot air. Last winter, with the stove in operation, our fuel-oil bill decreased about one third. Conventional masonry fireplaces are nice to look at, but can't save you that much fuel. Most of their heat goes straight up the chimney. But freestanding units act like giant radiators and throw off heat from every side, including the exposed stovepipe leading to the flue. Many built-in units capture some of this chimney heat with circulator chambers and blower fans. But whichever type you pick, you have to install it carefully.

Good flue is important

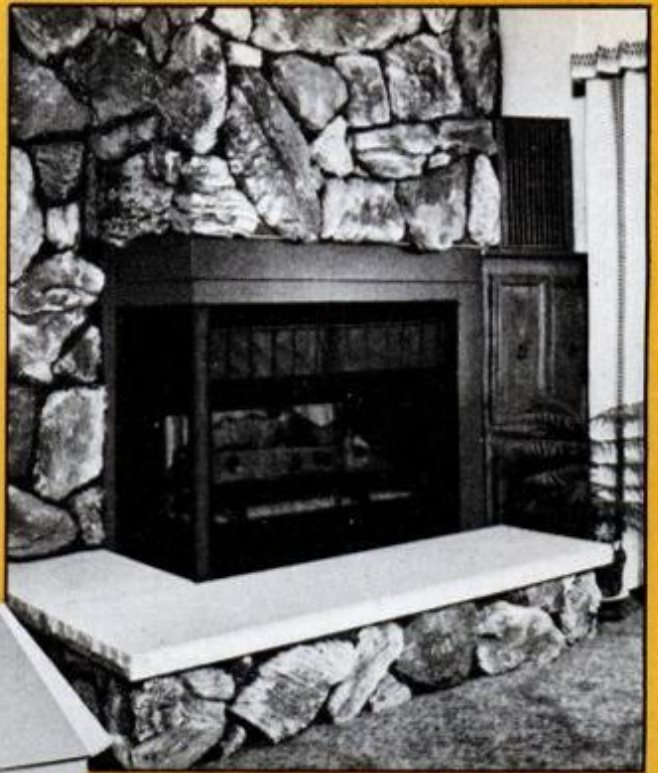
You should build the flue so that even if it filled with flames, fire could not escape into the walls. Think of this when you pick a fireplace location. Venting directly through an outside wall is easier than running a stack up through two stories and an attic.

If you have an existing flue,

Majestic fireplaces

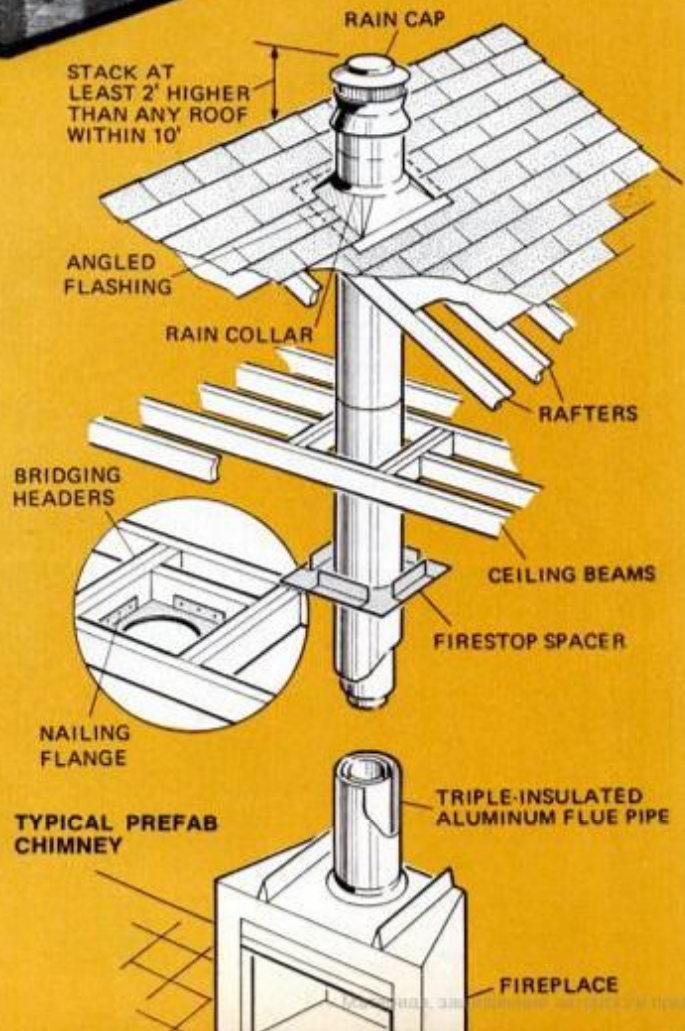


Clean, straight-line styling makes this double-wall steel hearth one of the best looking and most flexible. The Manchester-Pierce is like a modern Franklin stove with black matte finish and either top or back venting. The unit is 21x34 in. with a 16x28-in. screened opening. It costs \$300 from Majestic Co., Huntington, Ind. 46750.



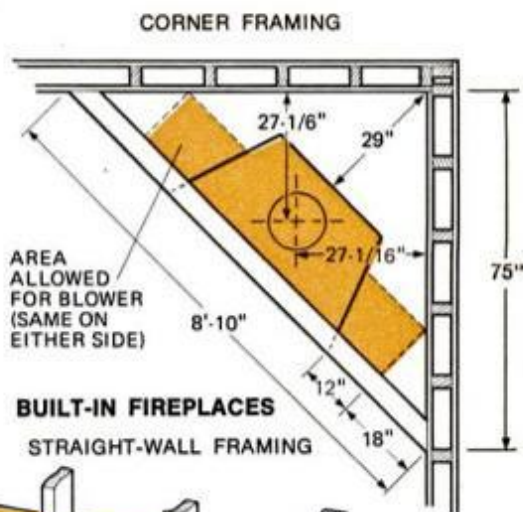
Preway fireplaces

Large Freestander (28x42 in.) has octagonal design in black, red or green. Built-in damper, ash guard and stainless-steel baffles keep down surface temperature. Preway Fireplaces, Wisconsin Rapids, Wis. 54494, also makes built-ins such as the open-end unit above. Shown below is a typical prefab chimney layout.

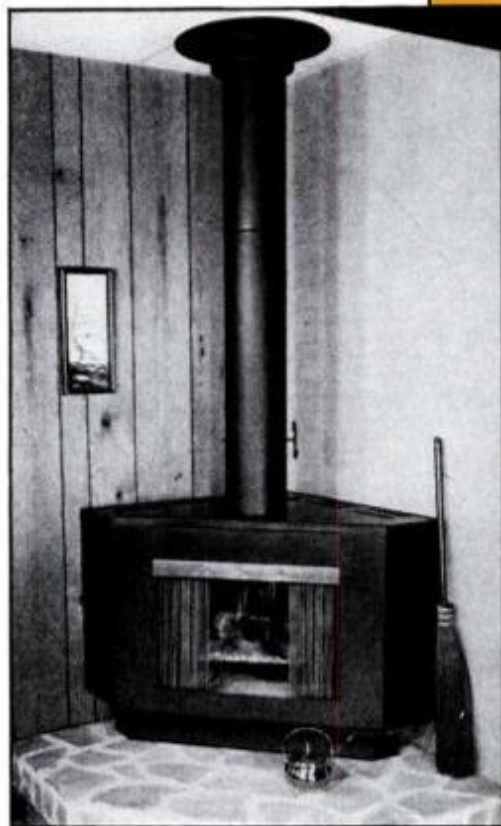
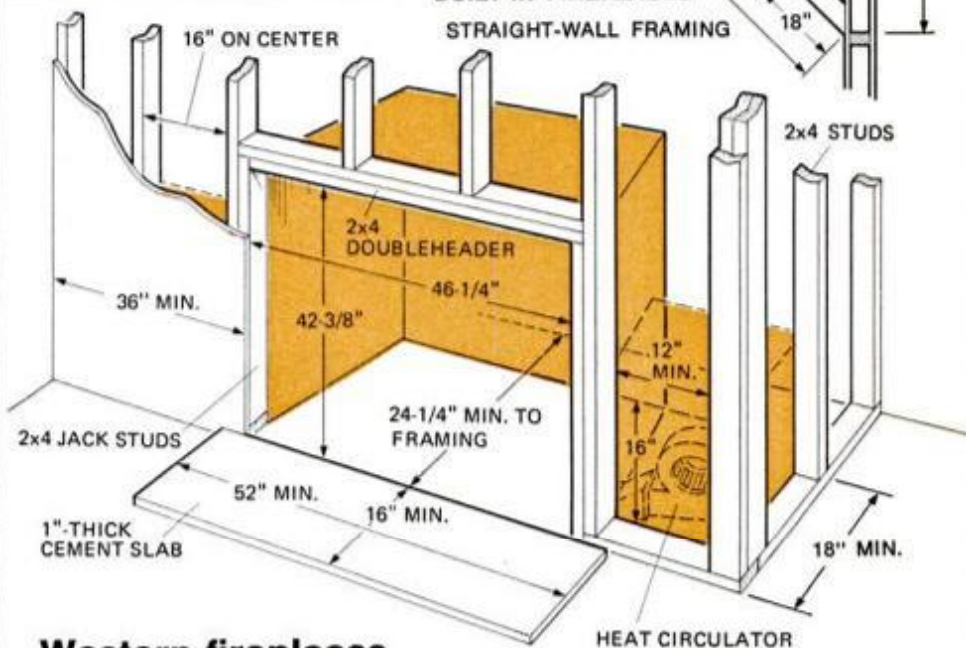


most of your work is already done. But it pays to check it carefully for cracked masonry (you can point it up with cement and a trowel) and for soot deposits. A heavy cloth bag, filled with sand and tied to a rope, can be hauled up and down the flue from the roof to break loose many deposits that could ignite from a large spark. The weakest link in most flues is the point where the

(Please turn to page 141)



BUILT-IN FIREPLACES
STRAIGHT-WALL FRAMING



Western fireplaces

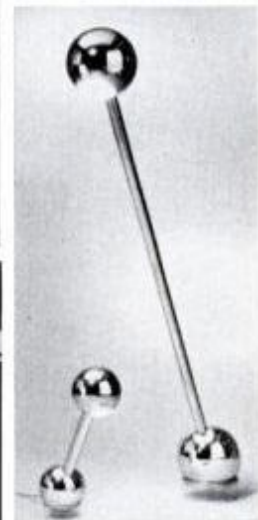
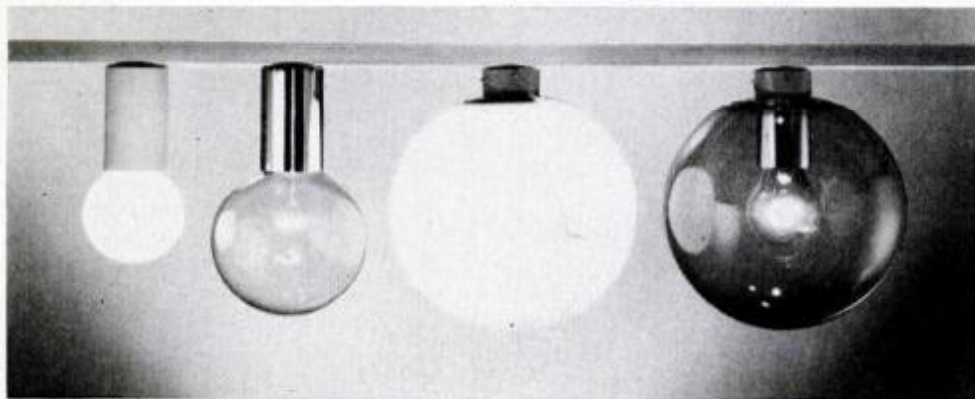
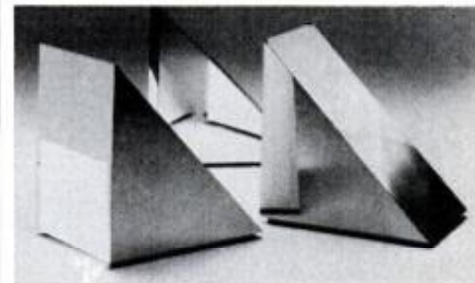
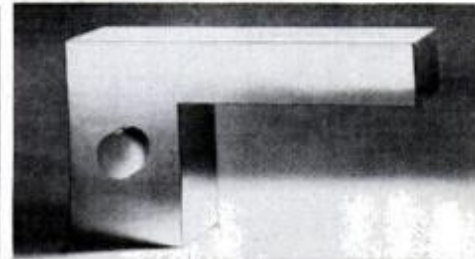
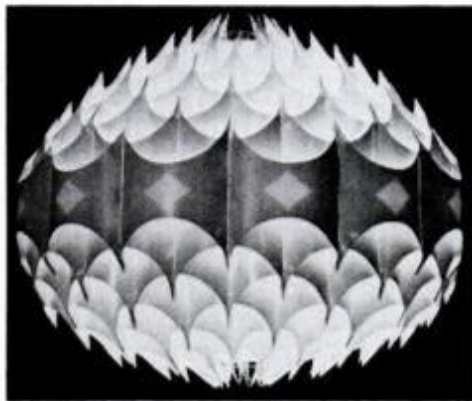
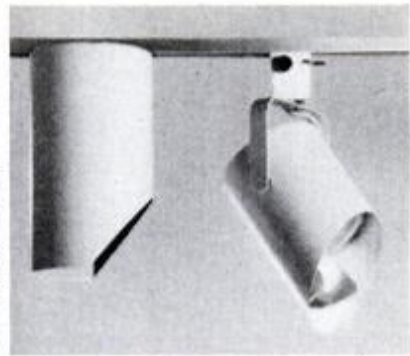
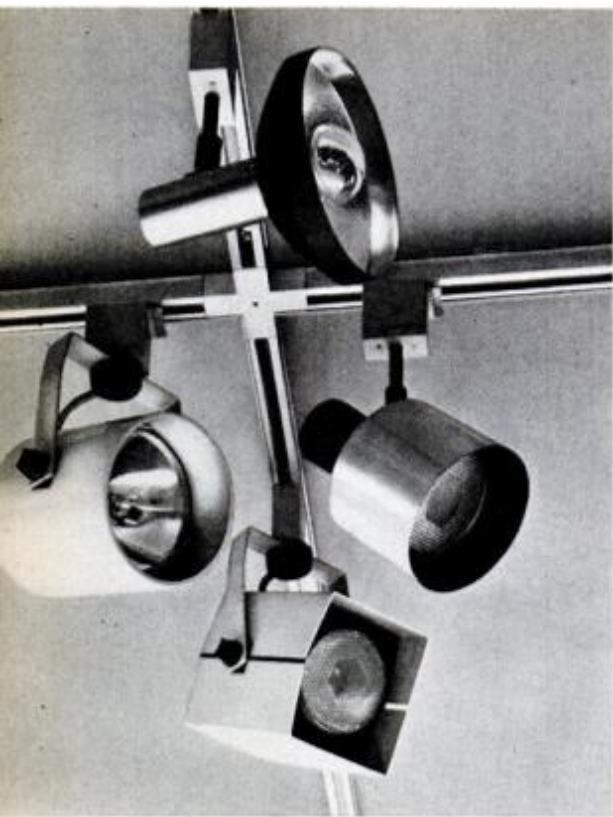
Zero clearance to combustible walls is a unique feature of the Woodsman (left) although all stoves must rest on a fireproof base. Above are two typical framing plans for built-in units.

Western's roof support kit is extremely secure and easily adjustable. Western fireplaces are made by A.R. Wood Mfg. Co., Box 760, Santa Cruz, Calif. 95061 and Luverne, Minn. 56156.

Portland stoves



Classic cast-iron designs include this ornate Atlantic wood-burning cooker and the incredibly efficient pot-bellied stove. This company makes its stoves from original manufacturing patterns. The cook stove at left is 24x38 in., has four 8-in.-diameter cooktop covers, an array of dampers and even a removable, copper hot-water reservoir. The pot-bellies range from 12 to 20-in. diameters, with the largest being 51 in. high and weighing 426 lbs. From the Portland Stove Foundry Co., 57 Kennebec St., Portland, Me. 04104.



Skillful lighting makes a good room look great

by Mike McClintock
ASSOCIATE HOME AND SHOP EDITOR

Yes, believe it or not, they're all lamps. Track lights (top left) can floodlight, pinpoint a spot on the wall, and reflect light from silver-coated bulbs gently over an entire area. You can get bulbs (in a variety of sizes) that are frosted, clear or darkened. The grow light (top center) is a unique fixture made by George Kovacs Lighting, 831 Madison Ave. New York, N.Y. 10021, in two different sizes. Kovacs's lamps range from conventional to geometric shapes and balancing silver barbells shown above. At right, Lightcraft's spheres will concentrate light where you need it, and simple G-lamps provide flexible, general lighting in the kitchen.

Lighting can make a good room look great and a great room look spectacular. It's the finishing touch that should combine beauty and efficiency, but it usually gets little attention because outlets may not be in the right place or there may not be enough of them. So you wind up putting lamps where you *have* to instead of where you'd *like* to. But more wiring (in the right place) is only part of the solution. The real trick lies in planning how you'll be using the room (including what you'll be doing and where) and picking the best kind of light or combination of lights for those situations.

An overall view

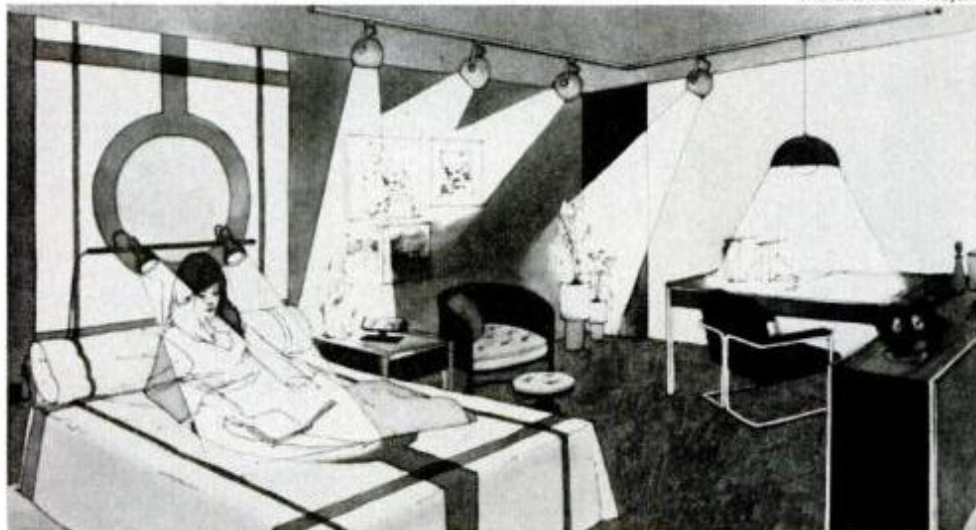
To begin with, most rooms need some kind of general lighting. This can be high-intensity light in a kitchen or bathroom or soft overall light in a living or dining room. The question is how to illuminate the whole room without putting a 200-watt bulb in the middle of the ceiling. Track lighting is one answer for two good reasons. Wiring one junction box in the ceiling can feed a whole series of tracks. You can hang fixtures from them that will throw exactly the light you want.

Track lighting frees you from the limitation of having one outlet box near every source of light. It also lets you make a mistake or change your mind. When you sink a lot of money into an elaborate center-ceiling fixture that's it. The light is going to stay there. But if you don't like the way your tracks look, just unplug them from the supply box and make a different arrangement. You can also slide fixtures along the track, bunch them at either end, or put different fixtures (throwing different kinds of light) on different tracks altogether. The possibilities are endless and they're all up to you.

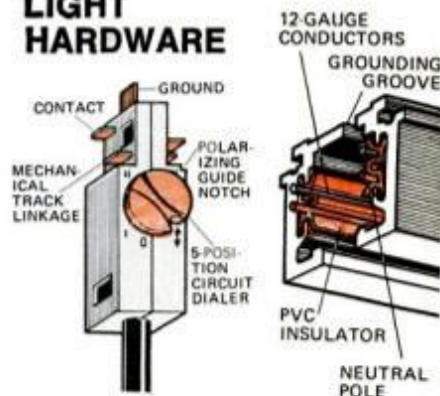
An easy installation

The system starts at the feed box. It's a small box, matching the contour and style of the track, that sits on the ceiling and connects to the junction box above it. Once this is installed, wiring the rest of the system is literally a snap. Since conductors run the full length of the track, power is available at each end. There are caps (made to close off one end if you're hanging only one track) and connectors (elbows and straights) that let you plug one track into another and continue the

PM art: Peter Trojan

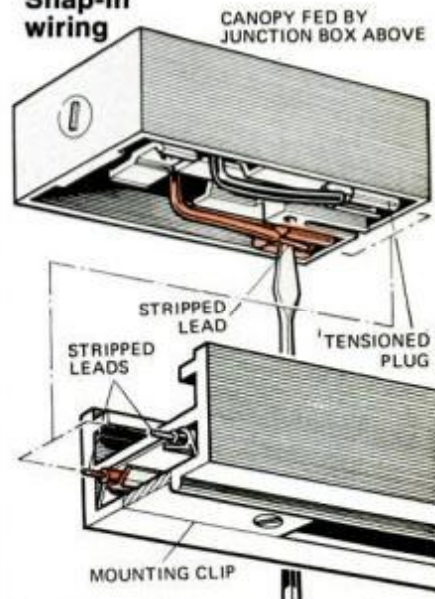


TRACK LIGHT HARDWARE



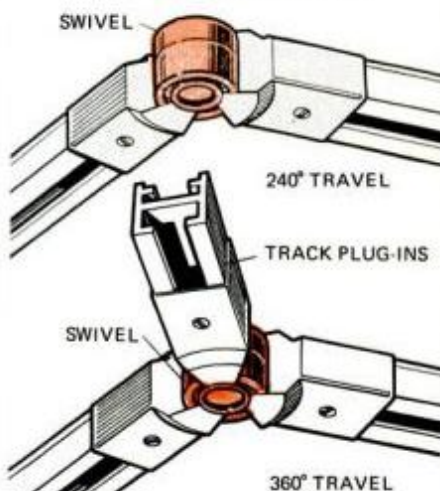
Swivelier, Nanuet, N.Y. 10954, makes single and triple-circuit track. Dial settings on a three-circuit system will activate any combination of lamps.

Snap-in wiring



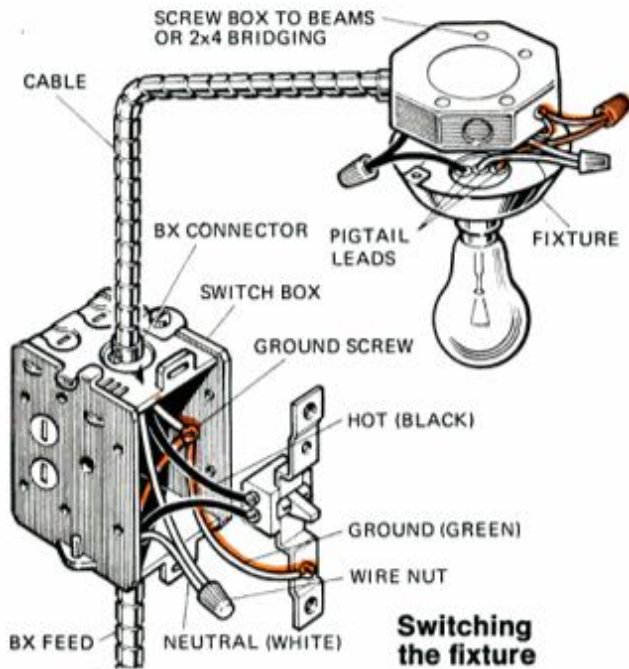
Lightolier, 346 Claremont Ave., Jersey City, N.J. 07305, makes over 35 lamps. Canopy boxes, wired at the ceiling, act as plugs for the track sections.

Rotating connectors

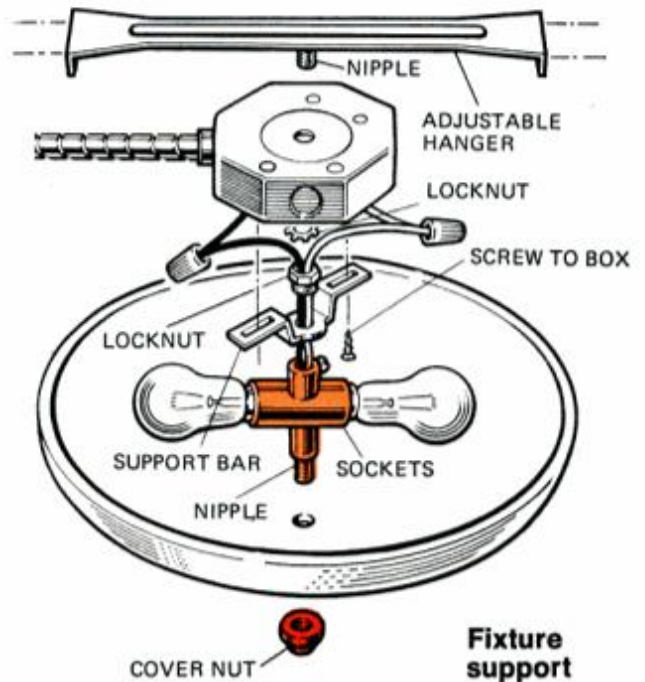


Lightcraft, 5691 Rising Sun Ave., Philadelphia, Pa. 19120, features these connectors (and a six-point swivel) to track in any direction.

WIRING MADE SIMPLE



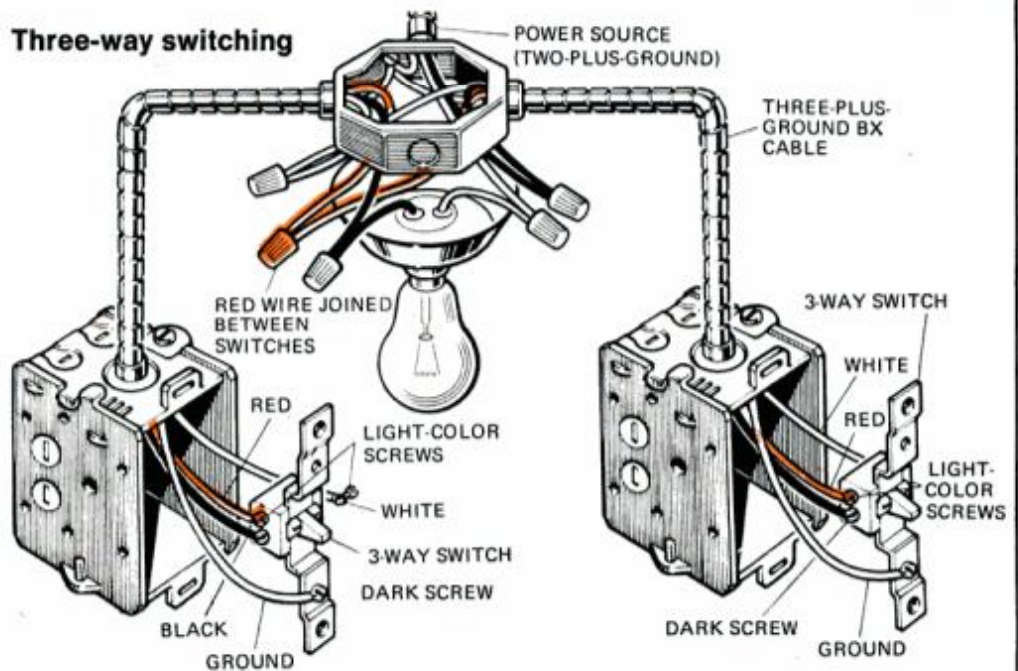
Switching the fixture



Fixture support

A full cellar or an open attic gives you easy access to string your wires and make electrical connections. It's harder if you have to work from inside the finished room. An electrician's fish tape (a spring-tempered length of flat steel ribbon) is inserted down through holes in the ceiling or floor framing and maneuvered until you get to the source of the cable. You may need to make an extra hole in the wall to clear the tape from an obstruction. To pull the cable up (Romex will come easier than BX), splice the exposed leads around the hook at the end of the ribbon. Then wrap the connection with tape and haul away. Here are wiring connections for single and dual-control switches and a typical ceiling box supported between the beams.

Three-way switching



system in any direction. It's a job you can do by yourself, too.

Measure from a side wall and snap a line where the track will be. Small mounting clips are screwed into the ceiling and tracks slip onto them. These clips make installation easy and space the track about 1/4 in. off the ceiling to absorb the margin of high or low spots that could make the track uneven.

More work, more rewards

Companies like Swivelier offer two kinds of track. Most basic and easiest to install is a single-circuit track

fed with a standard three-wire cable (hot, neutral and ground). You can control it with two or three-way switches. That means either a switch in one central location or switches at opposite ends of the room so you can turn on the light as you enter at one end and turn it off as you leave from the other. All lamps on this track will go off and on at the same time. But they also make three-circuit track with hardware to match (page 101). This system links three separately switched circuits with each length of track. It's ideal in a large room where you can install continu-

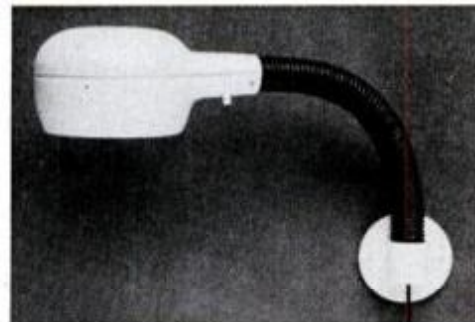
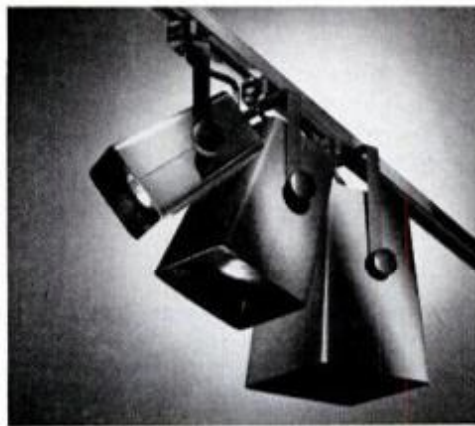
ous tracks to cover the entire area.

Say you have six lamps along a 30-ft. wall. You may have pictures hung at one end that need "wall-washing" fixtures; lamps that flood the wall—and only the wall—with light. A stereo cabinet at the other end needs a spotlight for high visibility. You might want softer light on a couch in the center of the wall. With three-circuit track you can control each area independently. And if you decide to move the couch to the other end of the room, you can move the fixtures with it as though the wiring were specially designed

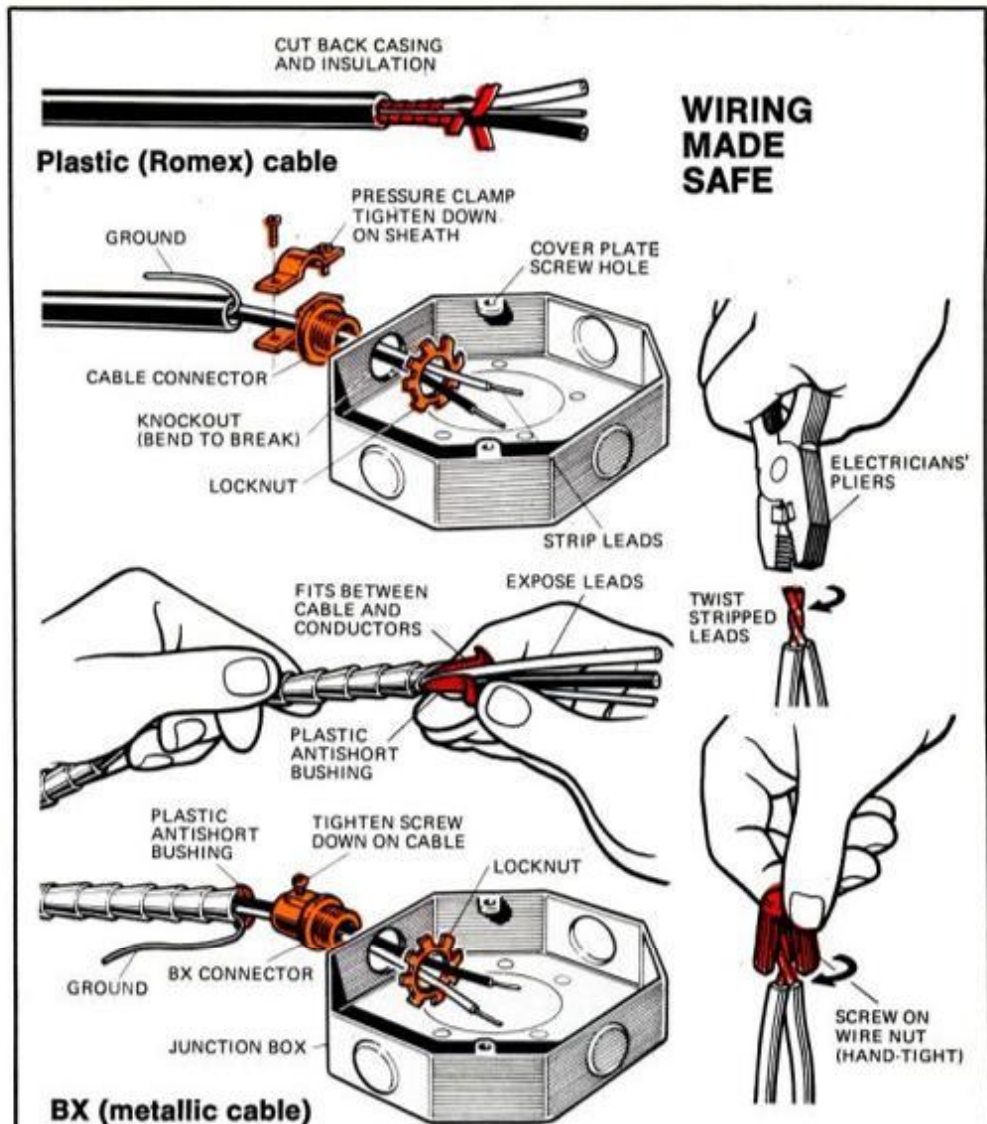
to accommodate the brand-new setup.

The light you can't see

This sounds impossible, but it's the special effect you get from a newly developed fixture. You can look directly into this light from six inches away without squinting. It throws a wide beam of clean white light, but you can't see where the beam is coming from. The effect is both dramatic and mystifying. Objects appear to be lighting themselves. The light source is a clear bulb with a silver bowl covering half its outer skin. Light bounces up into a mottled, high-purity, aluminum bowl and is diffused down onto the room. The fixture, generally referred to as "no-glare," is shown at the top left corner of page 100. Make sure you install all your lights correctly. ★★



The soft square (top) comes in three sizes and colors from Lightcraft. Kovacs carries an array of shapes and sizes plus unique imports like the Swedish gooseneck.



BX (metallic cable)

The safe way to install and wire lighting is defined in the National Electrical Code. It's no more complicated than haphazard, on-the-spot methods, so follow these code-approved methods for a better, safer job.

Choose copper conductors. Use UL-approved, sheathed, copper wiring. It can be packaged in armored metallic cable (type AC) or thermoplastic cable (type TW or THW). These symbols are embossed on the cable's outer surface. For 15-ampere circuits, use No. 14 gauge and heavier No. 12 gauge for 20-amp. circuits. Each should have a third grounding wire. Specifying "fourteen-two, with ground" is the right way to give your order to the electrical supply house or hardware store.

Watch your colors. When you're joining new conductors to existing ones, always connect black to black, white to white and the bare or green wire to its counterpart. This is important because in house wiring the white always acts as the grounded neutral conductor, the black as the hot, ungrounded conductor, and the bare or green as the safety grounding conductor that protects you from getting a shock.

Don't break the chain. If you have to install a new junction box or take a new line out of an existing one, be sure

to attach the grounding wire to the metal box. If two or more sets of conductors are spliced in the box, connect the two grounding wires together *in addition* to attaching them to the metal frame. One break in the line can cancel out the safety factor on the whole circuit.

Always switch the black. Always run the black (hot) conductor through the switch, never the white. If you switch the white instead, the fixture on the circuit will be a permanent, hot, shock hazard—even when the switch is off.

Attach the white to the shell. When you wire to a permanent lamp fixture, connect the white (neutral) to the screw on the metal shell of the light-bulb socket. If the lamp is already fitted with "pigtail" leads, join the white wires with a wire nut as shown above.

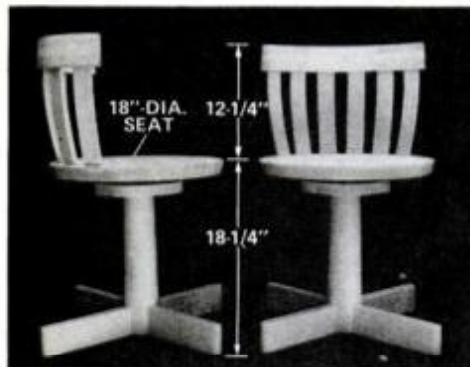
Try three-way switching. To control one light from two different locations, you'll need two three-way switches and special cable known as "fourteen-three, with ground." Our diagrams on page 102 will show you how to connect the wires.

No multiple choice. If you have any doubts about which wire goes where, don't guess. Turn over the job to a licensed electrician and you'll keep your peace of mind.

Make this graceful dining set for informal entertaining

Mini trestle table with chairs that swivel is a challenging two-weekend project.

by Rosario Capotosto



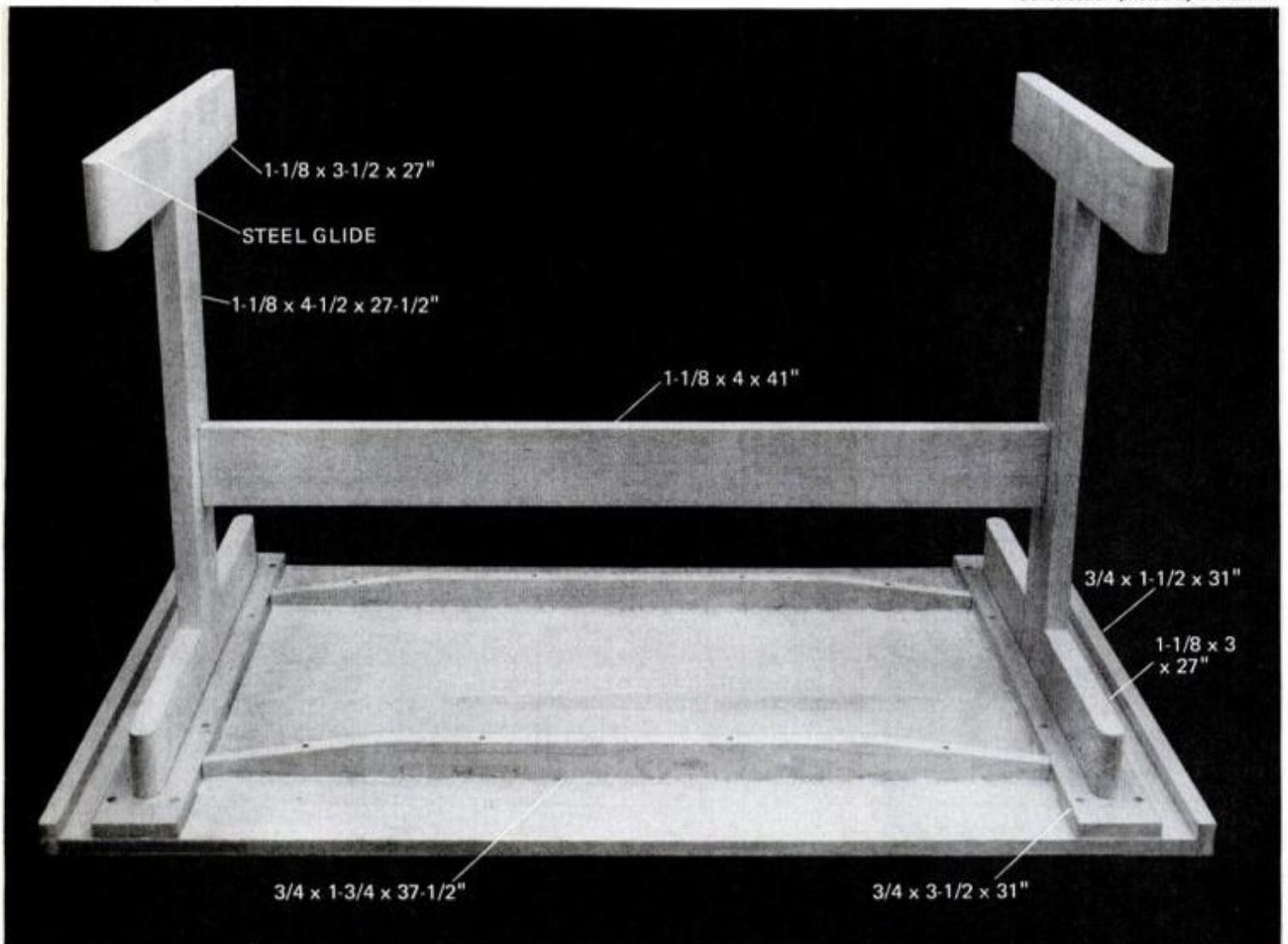
This charming dining set can be built for approximately \$75—about one-fifth the cost of a retail-store version of comparable quality.

Southern (soft) maple is used for all but the tabletop, which is made of $\frac{3}{4}$ -in. birch-veneer, lumber-core plywood and edged with solid maple to achieve a thick look. The coloring and grain patterns of these woods are look-alikes so they can be readily

intermixed. I used birch veneer for the top because you'll find that maple-veneer plywood is not commonly available at most lumber-supply houses.

If you haven't worked with southern maple, you're in for a treat. It tools nicely, and while it's known as a "soft" wood, it is more than hard enough for furniture-making. It is soft only in comparison with north-

Construction photos by the author



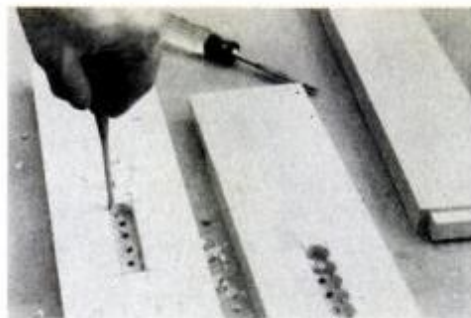


With its colorful cushions and natural mellow finish, this table-and-chair set will add an exciting fresh look to a limited dining area. The tabletop measures 32½ in. wide and 49 in. long. The curved-back chairs swivel freely for added comfort. The dining set is a beauty—and a project that is not nearly as difficult to build as it may look.

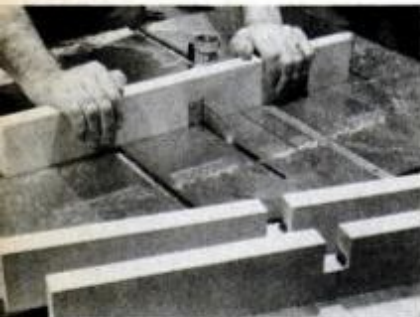
PM color photo: George Ratkai



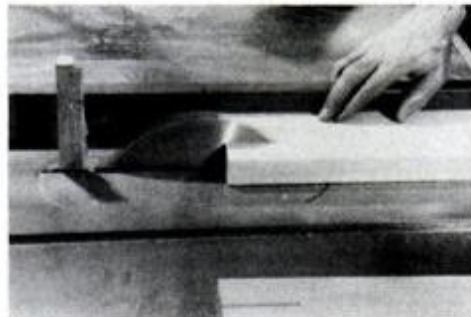
tion upright on base, and mark mating lap with knife blade for accuracy.



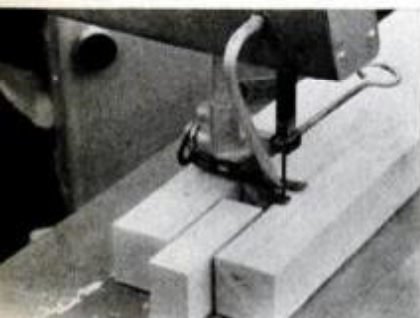
Make blind cross-rail mortises by boring series of holes and chiseling out waste.



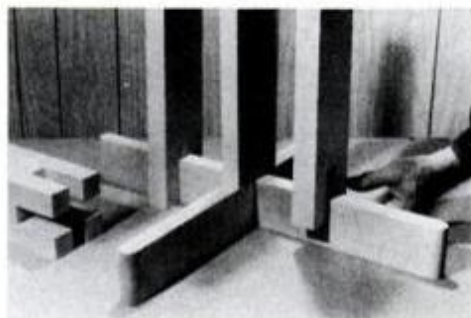
Use repeated passes to clear waste after making two outside cuts halfway through.



Cut four-way pedestal notch before gluing. Set blade high and make two cuts.



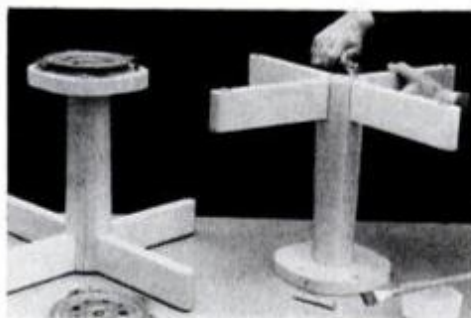
Remove waste from between two parallel cuts in two outside members of group.



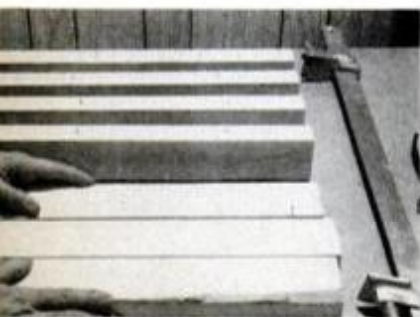
Test notches for fit over base before gluing and clamping three pieces together.



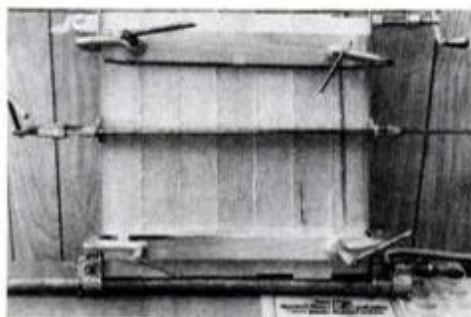
Mount glued-up pedestal between lathe centers for turning. Center it perfectly.



Apply glue and tighten lagscrews to secure base to pedestal. Add 8-in. swivel.



Use headless brads for slip-proof alignment when clamping parts of chair seats.



Clamped crosspieces keep all others flat. Wax paper prevents them from sticking.

ern maple, which is extremely dense and hard, and rough on tools.

The table, a modernized version of the trestle style, is not difficult to construct. The cross rail (stretcher) utilizes blind mortise-and-tenon joints and the leg members are put together with cross-lap joints held only with glue. If you exercise care and accuracy in making the relatively simple joints, you'll wind up with an exceptionally sturdy table.

You shouldn't have trouble making the comfortable swivel chairs. I "engineered" their construction so you can build them with minimal fuss and bother. Note how the turning blanks for the pedestals are made up with 2³/₈-in. preformed notches, which would be practically impossible to make with any degree of accuracy or safety after the pedestals are turned. Also, rather than call for a steam-bent curved chair back, I used a segmented glued block to obtain a strong parallel-grain structure throughout the curve.

Steps for making the table

1. Start with the understructure. Cut the 5/4 (1¹/₈-in.) stock for uprights and cross members to size and plane them smooth on the jointer before cutting the cross-lap joints. Removal of stock along the edges after the joints have been made would loosen them.

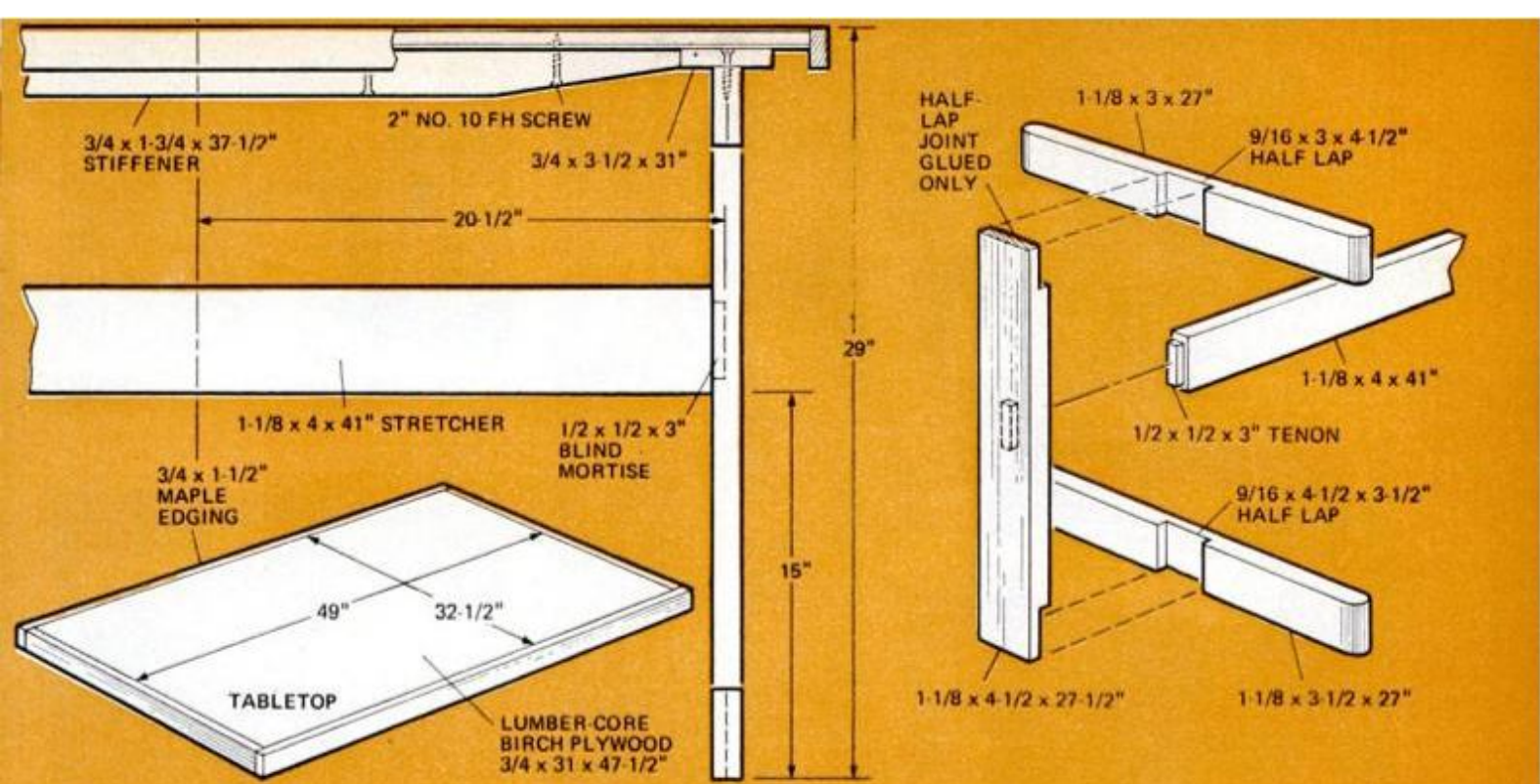
2. The blind mortise-and-tenon joints for the cross-rail stretcher are next. Form tenons in the rail by making a partial saw cut completely around each end, then remove the waste with a dado head. Then bore a series of holes part way into the leg members to rough-form the mortise—making sure the drill point does not go through the board—and clear out waste between the holes with a chisel.

3. Finish-sand the parts, then assemble the legs and cross members. When the glue has set, glue and screw the two 3/4 x 3 1/2 x 31-in. table-attaching cleats to the tops of both leg sections with 2-in. No. 10 fh screws.

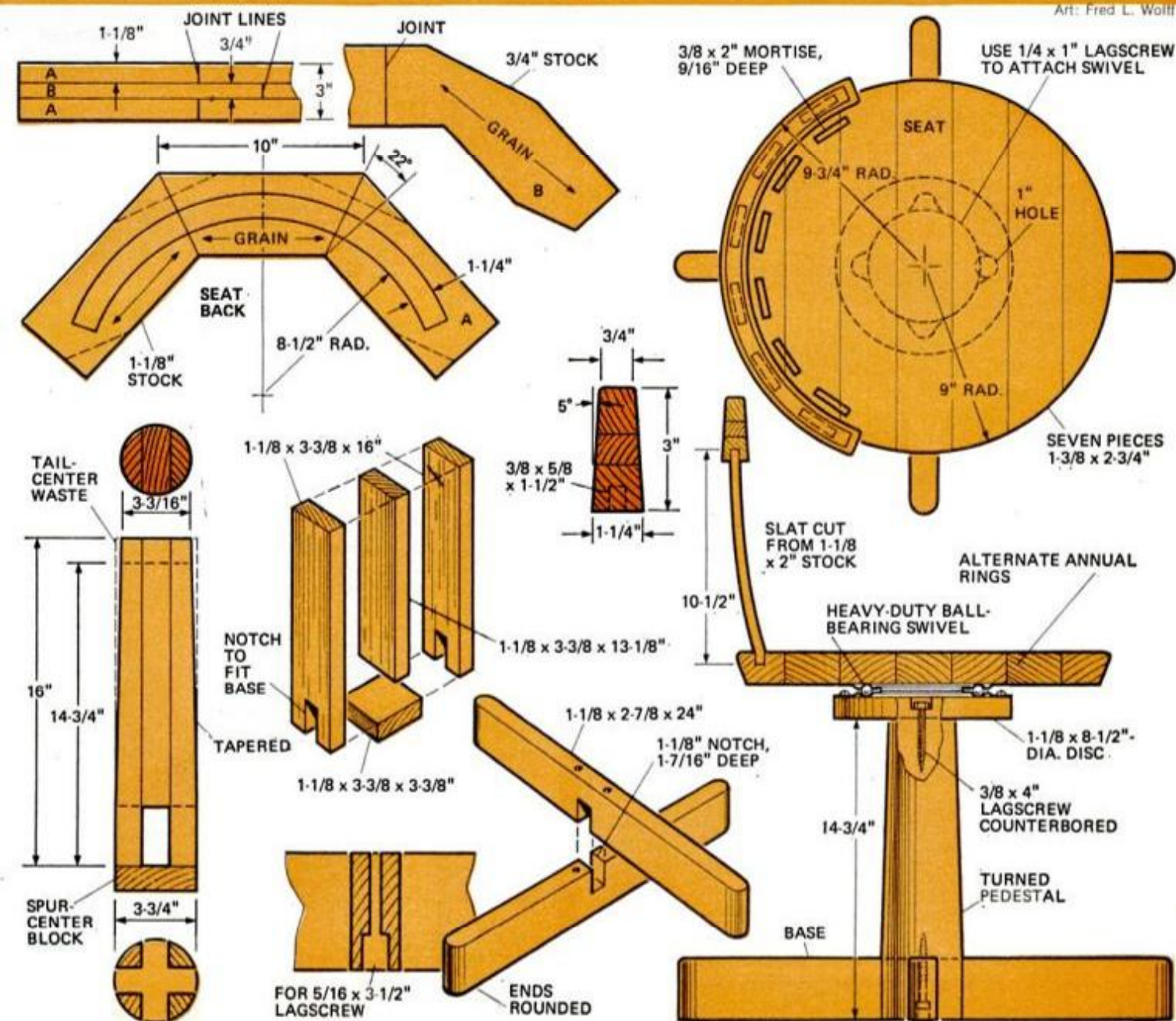
4. Set the tabletop upside down on a pair of horses or other supports and check the surface with a level in both directions. If necessary, shim up the horses to adjust until the top lies perfectly plane. This is important—if the table is glue-assembled while uneven, you may possibly build-in some unwanted twists.

5. Screw one of the assembled legs to the top with 1 1/2-in. No. 10 fh screws in predrilled countersunk holes. Insert the cross rail, secure it with a pair of bar clamps, then screw the other leg assembly to the table-

(Please turn to page 174)



Art: Fred L. Wolff





PA photo: Cosimo

Weekend update: An easy-living kitchen

A lot of the chores done on a daily basis in your home center around the kitchen. So it's a good place to start making things more efficient to give yourself more leisure time. You can cut the kitchen work load in half by building in a new dishwasher under a new countertop that holds a new sink and a new garbage disposer. It's a weekend job. Here's how you'll be able to do it.

A new counter

Modern laminate surfaces look good, install easily, clean quickly and last a long time. We picked a buff-finish white Formica. It looks bright, but the textured surface won't glare with reflected light. First, make sure the cutoff faucets are closed and then detach the sink fittings. Remove your old counter by prying along the edges of the cabinet, a little at a time.

Now check the instructions that come with your new dishwasher for minimum width and counter height allowances. The GE Potscrubber we used called for a 34½ in. height, so we had to add 1x2 strips along the edges of the cabinets to build

them up. Make your counter from ¾ in. A-C exterior-grade plywood, with 2-in.-wide strips on the flat to reinforce the perimeter. Glue the panels down with laminate adhesive (watch the vapors—keep the area well ventilated) and cover the 1½-in.-thick edges as well. Make all your cuts slowly (with a carbide-tipped blade if possible) to avoid chipping the edges.

The dishwasher opening

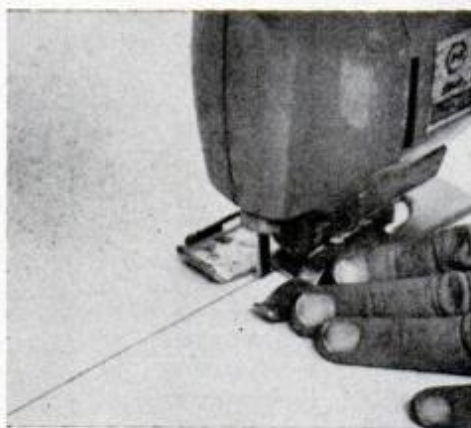
You do have to give something up to gain all these conveniences. It's cabinet space. We left ¼-in. clearance on each side of the dishwasher, cut away the cabinet base to expose the floor and added ¾ in. plywood partitions to box in the sides. Since most makers build kick-space into the base of their units and design the doors to cover the edges of the cabinet, this simple flush opening is all that's needed.

The supply lines

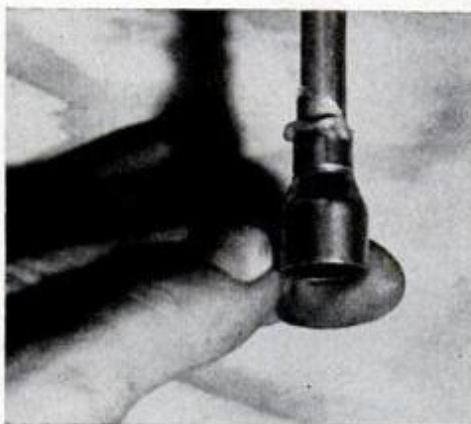
You'll need one BX cable (14-gauge 2-wire plus ground) to supply the electricity. Pick up the feed from the nearest junction box and make sure it's grounded. Don't for-



1. New counter rails. We screwed new 2x2 rails along the back wall (and predrilled them) to support the counter.



5. The cutout. Turn the sink upside down and mark the perimeter outline on the counter. Cut ⅜ in. inside this line.



9. Soldering. Clean the surfaces with steel wool, then wipe on a layer of flux. Heat the joint and apply solder.



13. Leveling. Slide the unit into the opening over the control box. Unload (lift up) to adjust the leg height.

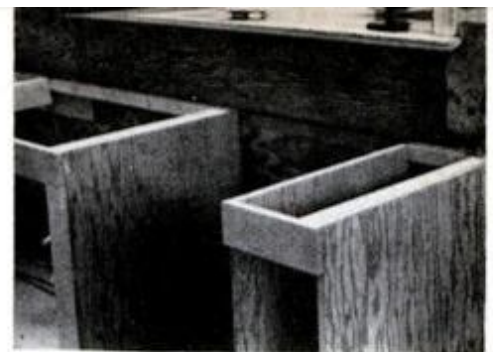
Photos by the author



2. Extra support. A 2x2 block added to the cross brace makes the counter stronger. Pre-drill it for 2-in. screws.



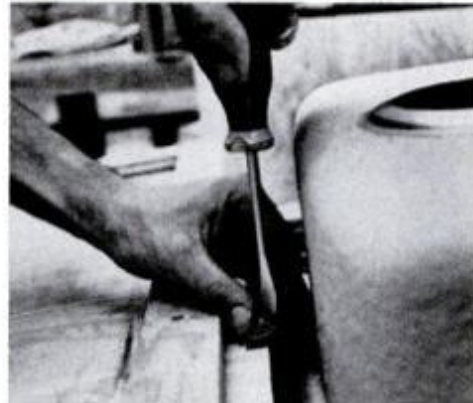
3. Reinforcing. Added 2-in.-wide plywood strips screwed to the 3/4-in. counter provide backing for the laminate edge.



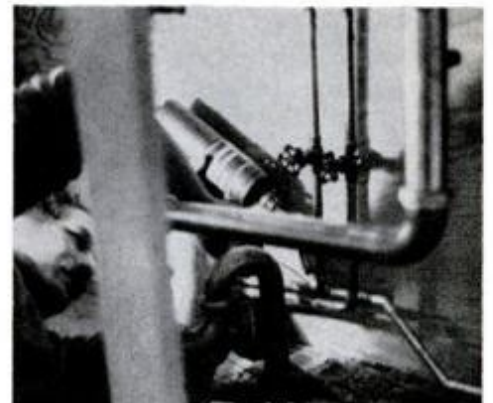
4. The opening. Leave 1/4-in. clearance on each side of the dishwasher. The plywood side panels are 3/8-in. thick.



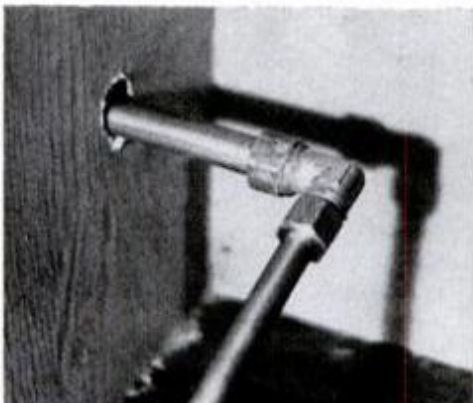
6. Watertight. Use a clear silicon or white butyl bead along the flange. These materials won't dry out or crack.



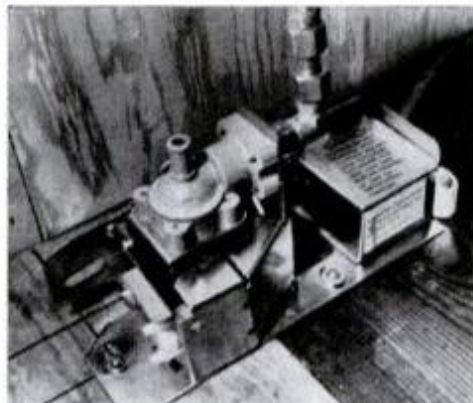
7. Fit the sink. L-shaped clips come with the sink. Extra caulk is forced out as you tighten them up, sealing rim.



8. Water supply. Install a cutoff in each sink line. Use a tee fitting to run the hot pipe to the dishwasher.



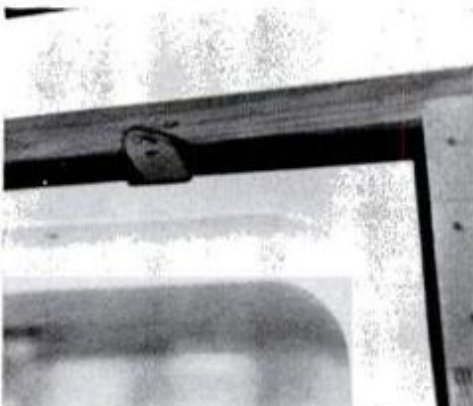
10. Compression fittings. These joints don't need soldering. They can also reduce between different pipe sizes.



11. The control box. The GE box mounts on the floor. You can attach the pipe, turn on the water and test for leaks.



12. Drainage. This 1 1/2-in. drain line has a presoldered tee for clamping on the end of the dishwasher drain hose.



14. Counter tabs. After all lines are attached and the unit is leveled, screw the tabs up into the counter.



15. Checkups. Read the instructions for the unit you buy. Plan the job so you'll have the fittings you need.

get to turn off the appropriate circuit breaker before you start working. Now check your instructions again. Most manufacturers specify an area toward the back of the opening where the utility lines must enter. About the best place to tap into your hot-water line is at the elbow where the line starts its vertical run to the sink fittings. Close off the supply to this line and replace the elbow with a tee fitting.

Although new copper fittings need only a quick steel-wooling to assure a good solder bond, old fittings must be carefully sanded and steel-wooled to remove all traces of dirt and corrosion. Extend a 1/2-

in. copper line from the free end of the tee about 4 in. into the dishwasher opening, as in photo No. 10. Now your utilities are roughed in—that is, ready for the fixture installations.

Attaching the new sink

Photos 5, 6 and 7 tell the story. Make your sink cutout with a saber saw, cutting very slowly. This way, it will be easy to follow your pencil line and you won't chip the laminate edge. We used a two-compartment, stainless-steel sink made by Elkay. Run either a silicon or butyl caulking bead around the perimeter of the flange and set the sink in the cutout. L-shaped clips attach to a channel on the flange and lap over the plywood counter base. As you tighten them, the flange clamps down on the counter, forcing out the extra caulking to make a permanent, watertight seal. Now you can attach the counter (including the sink) to the cabinets. We first attached Formica-covered splash-boards to the back edges of the counter with screws. To anchor the counter in place, run 2-in. flathead screws up through the 2x2 (nominal) rail supports.

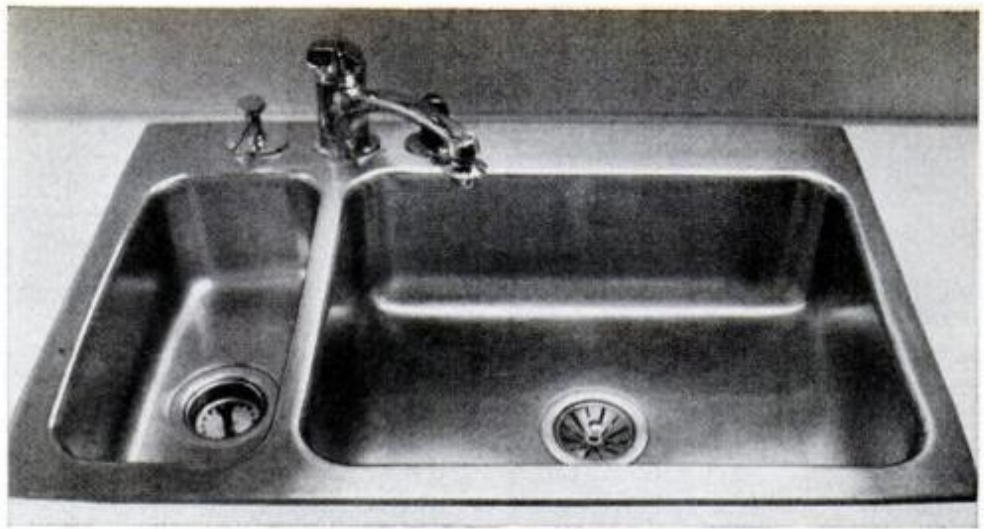
Attaching sink fittings

We used Elkay's single-control faucet (shown at top) with a soap dispenser fitting on the left and a rinsing spray on the right. The key to an easy installation here is the faucet wrench (far right). It's a vertical drive, cam-action pipe wrench that will save you a lot of time and a few scraped knuckles. It shouldn't cost more than \$5.

The single-control faucet has two $\frac{3}{8}$ -in.-diameter copper pipes already attached to it. In photo 9 you can see the reducer fitting we used to make the connection between these pipes and the $\frac{1}{2}$ -in. copper supply lines. The light-colored material just above the fitting is called flux. It's a paste you should wipe onto the end of the pipe before assembling the fitting. As you heat the joint with a propane torch, concentrate the blue tip of the flame on the fitting. It will heat up and cause the flux to sizzle. At this point the fitting should be hot enough to melt the solder. The flux will make the solder flow into the joint and bond more evenly and securely.

The drainage system

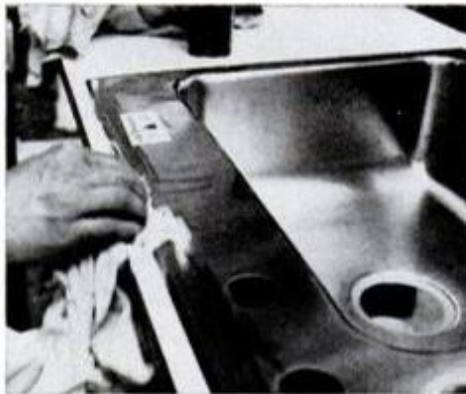
The top of the garbage disposer is attached to the small-compartment sink drain and fitted through its outlet to the $1\frac{1}{2}$ -in. drainage pipe. The large compartment is fitted with a standard drain basket. Below it is



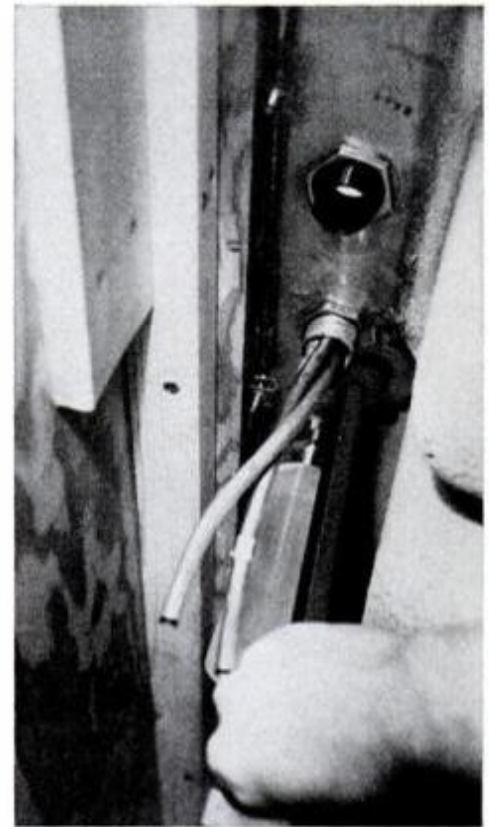
This two-compartment, stainless steel sink is made by Elkay, 2700 South 17th Ave., Broadview, Ill. 60153.



A thin silicon bead inside the flange on the drain basket will make a leakproof seal when flange is tightened down.



Use turpentine liberally on a clean cloth to wipe away excess caulking compound from the edges of the sink.



A faucet wrench is a specialized but inexpensive tool that fits neatly up into the small space behind the sink.

a special section of pipe with a pre-soldered dishwasher tee, as shown in photo 12. The drain hose from the dishwasher is clamped over it.

The final steps

The GE unit has a control box (photo 11) that should be screwed to the floor. It holds a junction box for the wiring and inlet for the water supply. The electrical splice is made with wire nuts. The final plumbing connection can be made with compression fittings (photos 10 and 11) to avoid soldering.

Now carefully slide the dishwash-

er into place. Your unit will be equipped with a short hose that connects the water pump on the control box and the spray jets in the washer. Complete the drain system by clamping the hose that runs from the tee fitting under the sink onto the outlet under the dishwasher. Photo 13 shows the automatic leg levelers. Adjust them up or down until the unit is dead level. Lastly, screw the unit to the counter through the two tabs shown in photo 14. I started the job Friday night and Sunday night's dinner dishes came out crystal clean.

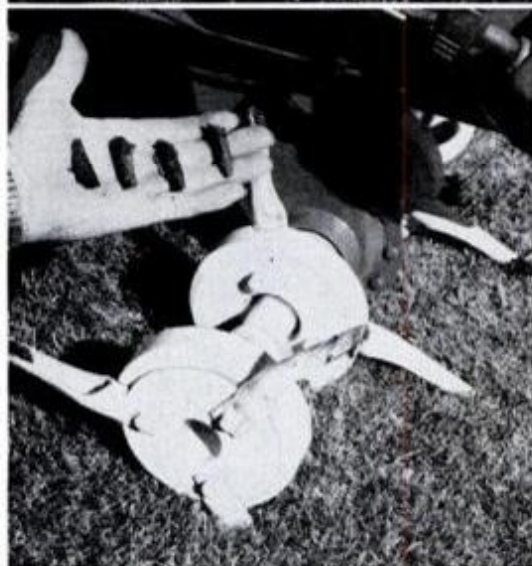
—Mike McClintock

IT'S NEW NOW



Tractor aerates, digs, tills, plows, carts

When you're through turning raw earth using the adjustable double mold-board plow (top right) with bar-lugged, snap-on wheels in place, just snap off the wheels and replace the plow with any one of six varieties of rotors (top left) for furrowing, harrowing, ditching or aerating. Blades can cut a swath one foot deep by four wide. The aerator extracts sod plugs (lower left) like the machines used on golf courses. A two-wheeled trailer with a 3-by-6-foot bed (lower right) hauls half a ton, tilts for dumping, has removable sides for bulky loads. Merry Tiller is sold by Solkover, Davidge & Jenkins, 500 Union St., Seattle, Wash. 98101.



Take the phone 'ring' with you

Relax in your workshop, patio or garden without missing phone calls. Take the bell with you. "Fone-A-Lert" has 40 feet of reeled wire (more can be added), hooks to your phone by suction. A pocket-radio-size box with 9-volt battery goes with you; howls when phone rings. \$15. Floyd Bell, 555 Marion Rd., Columbus, Ohio 43207.

Office in a parked car

Now you can do that office work on the road in your parked car. A 16-by-20-inch "Car Desk" of hardboard and wood mounts on the steering wheel, has a clip to hold paper and a shelf on the bottom for up to three binders, catalogs or books. Unit tilts to suit left or right-handed people. \$7.50. Bahaco, Box 1697, Huntington Beach, Calif. 92647.



TV facsimile in color or mono

In two minutes a message or image sent to you slides out from a slot at the base of your TV set. Using a low-cost "ink jet" system, Matsushita Electric is riding TV broadcast waves with a facsimile signal that prints out color or black-and-white. The system is aimed at eventual home use for facsimile service subscribers.

Everybody knows what a computer is: a roomful of multimillion-dollar boxes looking like refrigerators with a dazzle of flickering lights, all working swiftly and efficiently to screw up our charge-account bills.

But for an estimated 5000 to 15,000 Americans right now, a computer is a twinkly-eyed gadget about the size of two breadboxes that not only does a lot of figuring, but also acts as referee—and sometimes opponent—in games of wit, logic or dexterity. And it's affordable—more or less.

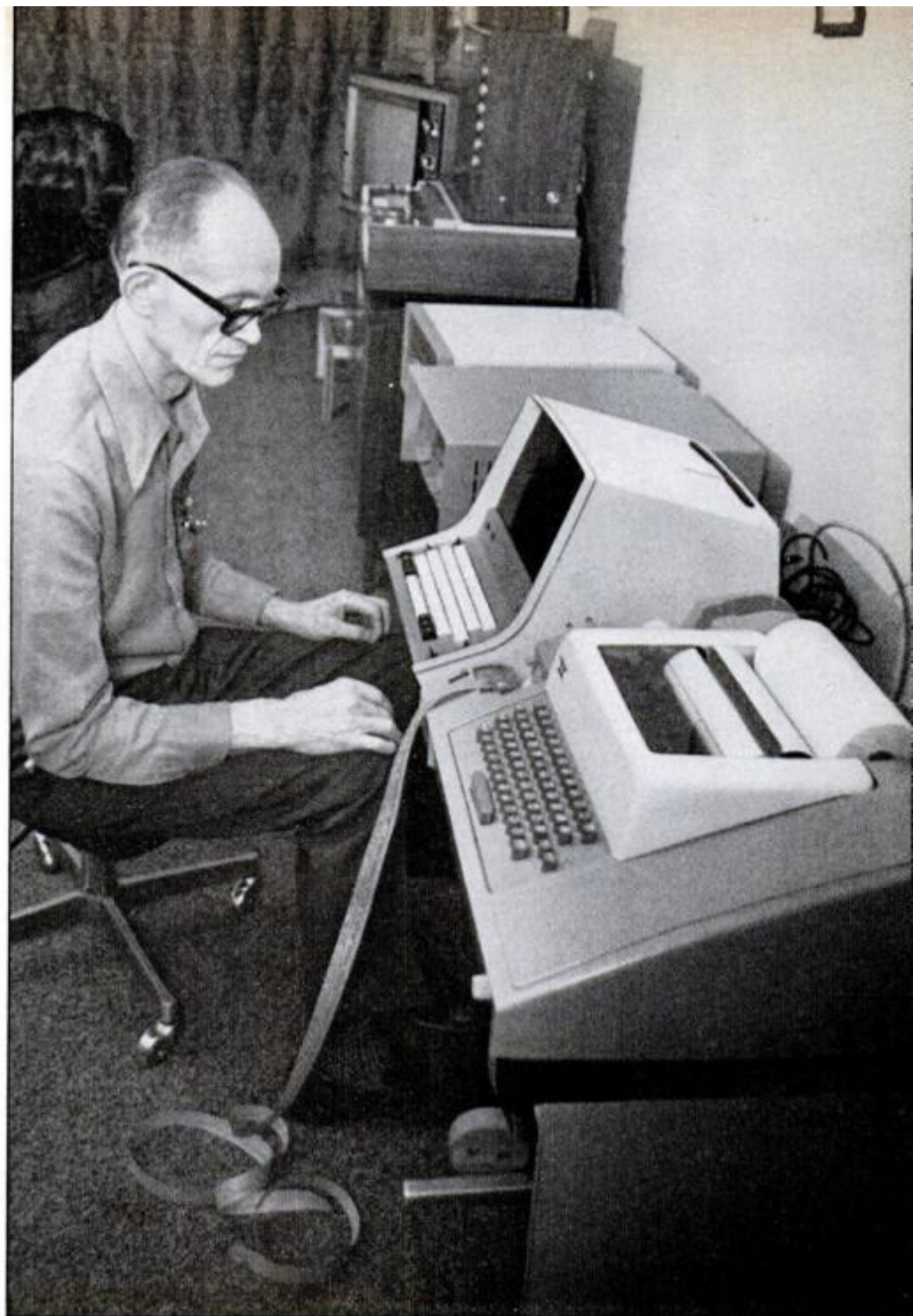
Today, you can buy a basic computer processing unit for \$400 or even less. The price includes the computer chip itself, some memory, means of getting data in (usually by front-panel switches or a calculator-type keyboard) and out (with blinking lights or a numerical display).

But a bare-bones computer like that will be tedious to use and limited in its uses. For a full operating system, you'd want a keyboard having both letters and numbers (under \$50, if you shop around), a video monitor to display the computer's input and output (readily made from any TV you're no longer using), and either a computer output printer or a teletype (about \$800 up—devices printing both capital and lower-case letters will cost more). Add another several hundred for additional memory and programs to run on the machine, and you can easily run your system up to a few thousand dollars.

Costs dropping

But the cost of home computers isn't rising—it's going down. The computer processing units that cost a few hundred dollars now have the power of computers that cost a hundred times that much or more a few years back. And the prices of the peripheral devices that turn those bare computers into operating systems—the printers, keyboard, memories and so on—are dropping like snowflakes in an avalanche ("Cheap" floppy-disc memories, for example, costing about \$1500 when I started this story, should be available for about \$400 soon).

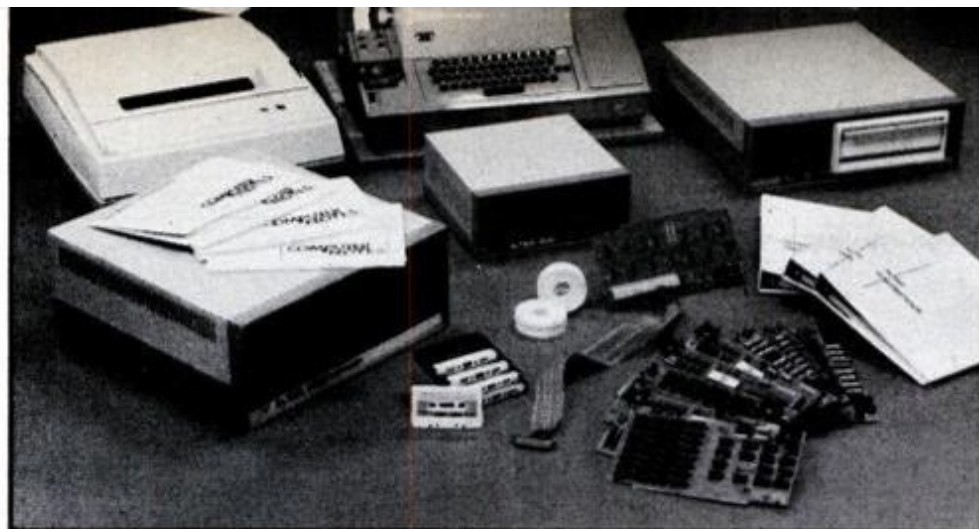
Even so, a computer is still costly compared to some hobbies. But it's cheaper than a sports car or a medium-size sailboat. And will a sports car or a sailboat do your income



Home sweet computerized home

How soon will your home have its own computer? Thousands have them now!

by Ivan Berger ELECTRONICS EDITOR



Typical system components (left) include (clockwise from left front) MITS Altair 8800 computer, printer, teletype, floppy-disc memory. Memory boards are in front, smaller Altair 6800 computer in center. Below, right: MITS 8800b.



tax? Help you design electronic circuits? Remind you to send birthday cards? Play—and compose—music? Draw pictures and diagrams? Plan nutritionally balanced menus?

A computer can do all that for you and still play all the games that thousands of happy hobbyists can dream up for it—if you can either write the programs that tell the computer what to do and how to do it, or wait till someone else writes such a program.

Talking its language

Writing programs in the computer's own, internal "machine language" is difficult, and such programs won't run on computers of a different type. But you can write many programs very easily in Basic, a language which uses English much the same way you do.

For example, tell the computer:

PRINT "4 + 2"

and it will print "4+2". But tell it simply:

4+2

and it will automatically perform the addition, and print "6." With a little practice, you can get into more complex programs that perform different actions according to the inputs the computer receives. For instance, the computer could print:

WHAT'S YOUR NAME?

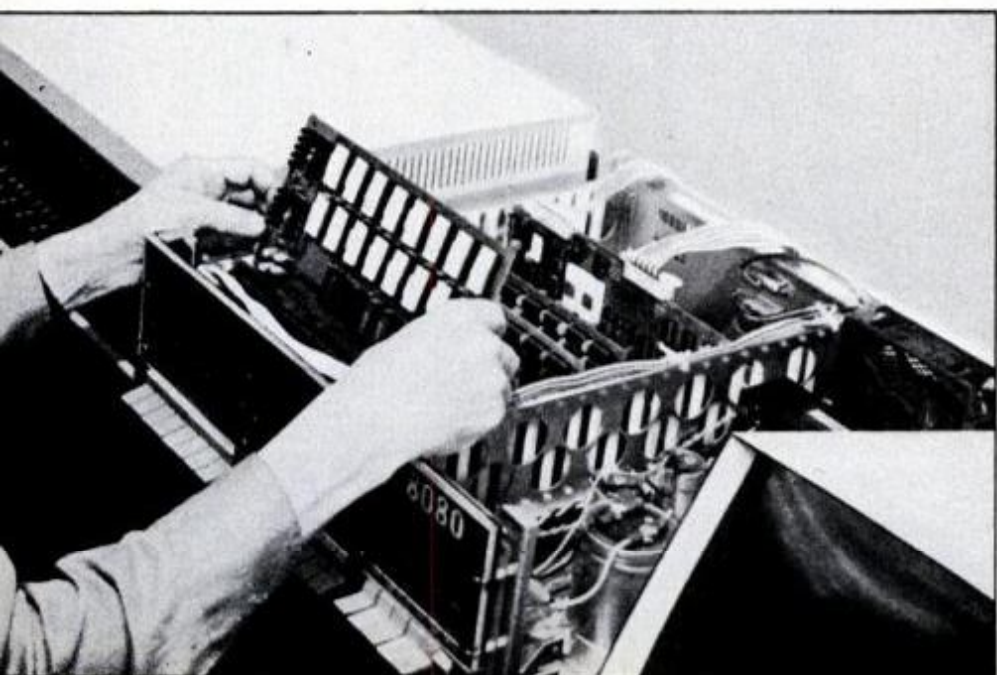
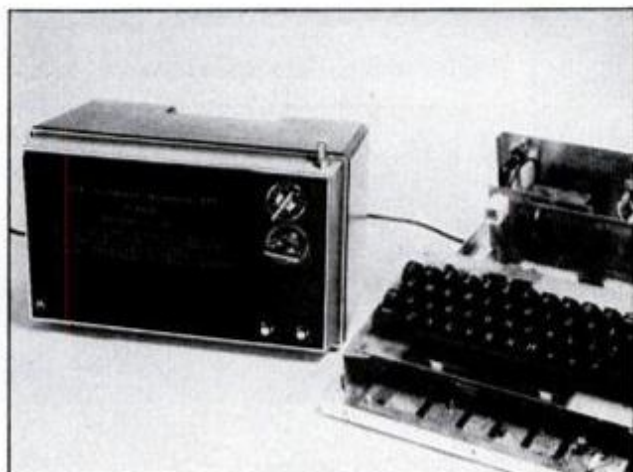
and respond with insults, flattery, or a request to borrow money, depending on the name given.

A home appliance

All this is still meat more for hobbyists than for the average man. But the time is coming—soon—when you'll buy a computer for your home about as naturally as you now buy a dishwasher—and more easily. Computer stores are springing up all over the country. In two to five years, you'll be able to go to one, say what you want a computer to do, and walk out with equipment that's as easy to use and plug together as hi-fi components, with programs as easy to load as phonograph records or cassettes.

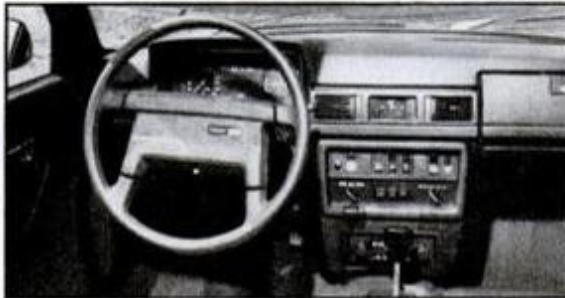
Chances are there's a home computer somewhere in your neighborhood already: we only had to make one phone call to find the computer setup shown here—just two blocks from our office. ★★★

Living-room computer system shown here (facing page) has two computers (small boxes to operator's left), plus video terminal and teletype printer. Most home systems are less elaborate, substituting devices like Southwest Technical's TV Typewriter (right) for commercial terminal shown. Below, replacing a memory board in a \$599 IMSAI computer; box at left is a \$539 MITS Altair 8800. Above, sample of computer-produced sketch on a TV screen.





Photos by the author



Volvo owners are especially high on handling and comfort. They view comfort as a safety adjunct, citing the firm, highly adjustable seats for leaving the driver rested and more alert on long trips. The new Volvo V6 uses aluminum extensively and has fuel injection, electronic ignition, overhead cam and hemi heads. Four-wheel power disc brakes, power steering, airconditioning, sun roof, electric front windows, overdrive or automatic trans, plus a host of other extras are all standard in GL models. Unitized body gives great space in boxy trunk, and most rear-seat riders feel there's plenty of legroom.



Beauty is only skin deep, so Volvo owners get out and look under

A nationwide survey based on 672,874 owner-driven miles

by Michael Lamm WEST COAST EDITOR

What do people think of *The Car For People Who Think*? We put that question to owners of the new V6 Volvo and found that they think highly of the car indeed. Yet a tiny minority had reservations.

Workmanship came in for high praise, with 92.3 percent of our respondents rating it *good to excellent*. Handling and comfort also received rave reviews. And for the first time in recent memory, *safety features* became a category under "Specific Likes." Safety is one of Volvo's aspects that owners genuinely appreciate.

Safety goes beyond Volvo's comfortable shoulder harness and impact-absorbing front end, owners tell us. It includes "... power and pickup, control on the road under all conditions, great visibility, and comfortable seats that hold you in place," according to a Florida housewife. And a retired mechanical engineer from Arizona says, "I've had two previous Volvos. Ride and safety impressed me as well as engineering. For example, the seats are hard by American standards. That means that after 500 miles of driving, one isn't at all tired out."

Volvo owners have discovered, then, that safety and comfort go together. It's a valid point that several Volvo owners noted.

One comfort item, however, that doesn't always do its job is the **airconditioner**. An Arizona real estate man sums it up for a number of owners: "Airconditioner does not put out enough cool air." Apparently both volume and temperature fall short. A few

The Swedes do a fantastic job. One owner wondered if American labor will do as well assembling Volvos (starting next year) in Chesapeake, Va.

This V6 was developed jointly by Volvo, Peugeot and Renault, has ohc on each hemi head, uses fuel injection.

Front sheet metal crushes and all doors have anti-intrusion bars.

Seats are firm, as is suspension, and a little jiggling is good for blood circulation, they say.

The airconditioner's output is weak, rarely reaches rear riders, sometimes can't cope with really hot days.

owners complained of leaky lines between compressor and evaporator. Just over 15 percent were unhappy with the airconditioner.

The 260 series constitutes Volvo's luxury range. To understand Volvo's numbering system note that the 2 stands for the series in general. The 6 denotes number of cylinders (there's also a 4), and the final figure tells number of doors. Thus the 264 is a four-door V6, while the 265DL is the five-door, six-cylinder wagon. DL stands for DeLuxe while GL means Gran Lux. GL Volvos are "above" DL models in that they include leather or velour seats, sun roof, electric front windows and airconditioning as standard equipment. (The 265DL wagon also comes with air.)

All 260-series Volvos boast an impressive standard equipment list too long to reproduce here. Highlights include power four-wheel disc brakes, power rack-and-pinion steering, automatic or four-speed manual overdrive transmission and steel-belted radial tires. Bodies are extensively anticorrosion-treated and engineered to withstand impact better than most. In short, as a physician from Illinois puts it, "I get the feeling that Volvo is honestly trying to put out a fine car." He's not alone in that sentiment.

A California farmer's wife comments, "Being the mother of two children under four, I like the safe, strong, solid feel of this Volvo. It's comfortable to travel in, with good trunk space, and the engine is powerful enough to handle most situations. I also like the see-through headrests—the kids can see

(Please turn to page 158)

Summary of 1976 Volvo 260 Owners Reports*

Total miles driven 672,874	Ride 17.1	Fair 2.3	Chevrolet 11.8
Average miles per gallon:	Safety features 17.1	Poor 0.8	Ford 10.8
In town (EPA, 15 manual) 14.8	Specific dislikes:	Comfort opinion (front seats):	Had any mechanical trouble?
Long trips (EPA, 27 manual) 19.3	Poor dealer service 12.8%	Excellent 70.2%	Yes 66.7%
Series and body styles:	Price too high 11.1	Very good 27.5	No 33.3
262GL two-door sedan 0.8%	Mileage below expectations 10.3	Good 2.3	What type of trouble?
264DL four-door sedan 2.5	Poor workmanship 9.4	Fair to poor 0.0	Electrical 17.4%
264GL four-door sedan 64.5	What changes would you like?	Comfort opinion (rear seats):	Airconditioning system 15.1
265DL five-door wagon 32.2	Better styling 11.2	Excellent 56.1%	Transmission 10.5
Why did you choose the Volvo?	Airconditioning that works 10.3	Very good 38.2	Did you fix it yourself?
Past experience 19.7%	Lower price tag 8.6	Good 4.9	No 100.0%
Reputation 15.0	Fewer rattles 7.8	Fair 0.8	Yes 0.0
Size 15.0	Dealer service opinion:	Poor 0.0	Dealer repairs satisfactory?
Quality 14.2	Excellent 32.3%	Number of vehicles owned:	Yes 73.4%
Comfort 14.2	Good 37.9	Volvo only 27.9%	No 26.6
Performance 13.4	Average 12.9	Two cars 54.3	Age distribution of owners:
Styling 13.4	Fair 3.9	Three cars 14.7	15-29 years 10.9%
Specific likes:	Poor 8.1	Four cars 2.3	30-49 years 52.9
Handling 47.2%	Workmanship opinion:	Five or more cars 0.8	50-plus 36.2
Comfort 46.3	Excellent 58.5%	Makes of other cars owned:	Would you buy another Volvo?
Performance 18.7	Good 33.8	Volvo 19.4%	Yes 79.2%
Styling 17.9	Average 4.6	Oldsmobile 12.9	No 20.8

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

How to overhaul drum brake systems

Last month in Part 1 brake drums were disassembled, cleaned, inspected and refinished. Part 2 tells how to overhaul cylinders, reassemble everything and get back on the road.

by Mort Schultz

Take a close look at your wheel cylinders while other brake parts are removed from the backing plate. Inspect boots for cuts, tears and cracks. Physical damage indicates a need for cylinder overhaul. ■ **If the cylinder has external (rubber) boots, as most do, carefully pull back the lower edge of the boot as shown in drawing 1.** If more than a drop of fluid spills out, the cylinder is damaged and should be overhauled or replaced. Each cylinder has two boots. Be sure to check both ends.

Some brake cylinders have metal caps. To check such cylinders for damage, you have to remove either the connecting link or cap on one end of the cylinder. If fluid runs out, overhaul or replace the cylinder.

A slight amount of brake fluid behind a boot or cap is normal. Fluid is a lubricant for pistons, but it's not normal for fluid to run or spill. Excessive leakage means trouble.

You might be able to service brake cylinders with the part in place on the backing plate. If not, remove the cylinder mounting bolts and work on the part in a clean area.

Cylinder overall

Here's how to service brake cylinders that need repair:

1. From behind the backing plate, clean away dirt around the connection and disconnect the brake line from the cylinder. Tape the open end of line to keep fluid from leaking and to keep dirt out.

2. If links are used between cylinder and brake shoes, remove them. Now, pull off external (rubber) boots with pliers and discard them. Remove metal caps used instead of boots.

3. Remove pistons, cups and spring assembly as shown in exploded view 1. (Note how they come out, so that, later, you can replace

them in the right way.) While removing the spring assembly, be careful not to scratch the bore of the cylinder. Also remove bleeder screw from the cylinder and make sure passages are clear.

4. Examine the cylinder bore. If it is just stained or discolored, the cylinder can be kept in use. If bore is scratched or corroded, replace cylinder with a new one.

Important: Don't confuse staining with corrosion. Pit marks or roughness in the bore indicate corrosion.

5. Remove stains and discoloration with crocus cloth wrapped around your finger. *Revolve the cylinder* on the crocus cloth. Do not slide the cloth lengthwise through the cylinder. You may scratch the bore.

6. Wash the cylinder in clean brake fluid, shake off excess, and allow the part to air dry. Do not use a rag to dry the cylinder. Lint can get on the bore surface.

7. A brake cylinder rebuild kit is needed at this point. All rubber parts are contained in such a kit. However, metal parts such as pistons may not be included in the kit. If not, clean used parts in clean brake fluid and let them dry before reuse. If pistons are damaged, and you can't get replacements, you will have to replace the whole cylinder.

8. Inspect the bleeder screw and bleeder screw inlet hole for stripped threads. Replace a damaged screw.

9. Lubricate the bore with clean brake fluid before putting parts in the cylinder (be sure your hands are clean). Insert the spring assembly and new cups. See that cups go in the right way. Recall how they came out. Usually, the flat surface goes to the outer end of the cylinder.

10. Insert pistons properly. They must go back in the same position they were when they came out of the bore. Normally, pistons are installed with their flat surfaces toward the center of the cylinder.

11. Press new boots into place and install links, if they are used. Boots must be seated firmly.

12. Place the cylinder back on the brake backing plate and tighten bolts. Hook up the brake line.

Backing plate

■ **Turn your attention to the backing plate.** If you have compressed air available, blow off loose dirt. Use a wire brush to loosen caked-on deposits and scale. If there is no compressed air, use a wire brush only.

Check backing plate for minor surface defects, such as corrosion. Fine emery cloth will remove this.

Examine the backing plate. If it's cracked or bent, it must be replaced.

Apply a thin film of brake lubricant to the raised pads on the backing plate. (drawing 2). On these pads the new shoes will rest.

Self-adjust mechanism

Disassemble the adjusting mechanism at your workbench and clean the parts (see exploded view 2). Make sure the adjusting screw threads fully in the pivot nut without binding, and that no adjusting teeth are damaged. Discard bad parts.

Lubricate the adjusting screw and reassemble adjusting mechanism.

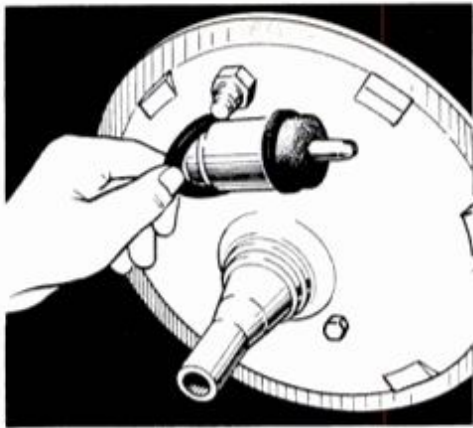
Reassembly

At this point you can install new shoes and replace all other parts, but first there are a couple of points that needed emphasis:

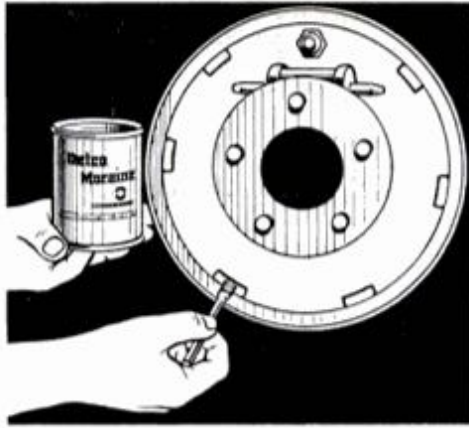
Important: Depending on the final diameter of brake drums (if they have been turned), you may have to use oversize replacement brake shoes and linings. Generally, if a drum is turned from .060-inch oversize to maximum discard dimension, .030-inch oversize linings are used, but check your parts man to see what's recommended for your particular brake.

Important: The instructions presented here apply to the individual

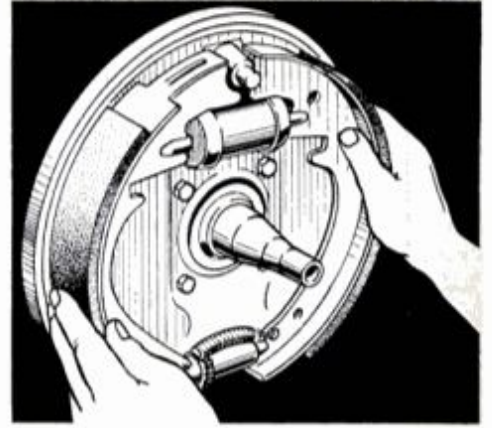
(Please turn to page 164)



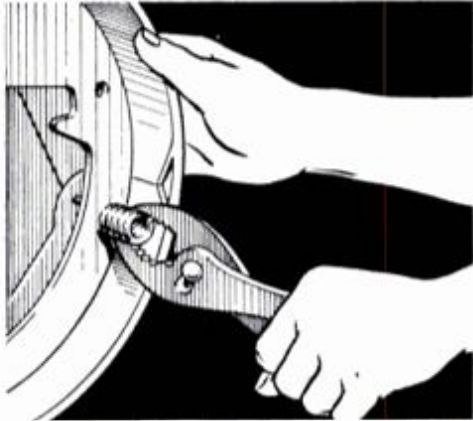
1. Brake cylinder at each wheel should be checked for leaks; pull back boot.



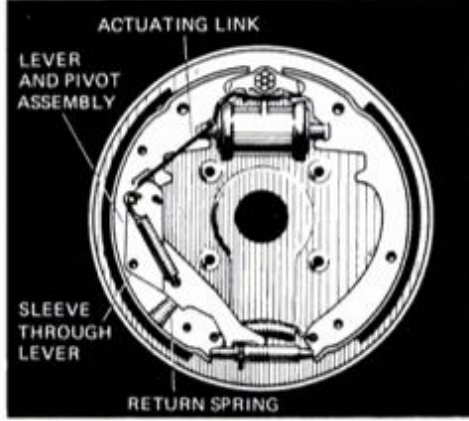
2. Raised pads on which shoes rest are lubricated to prevent noise and wear.



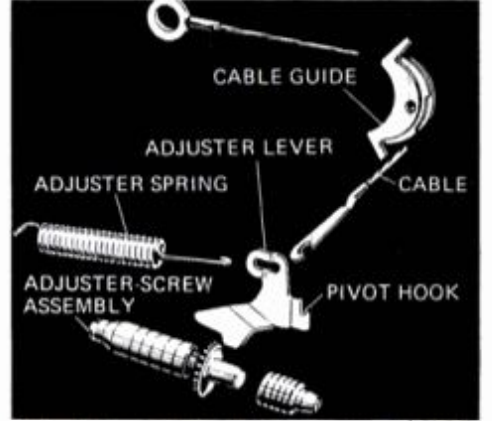
3. New shoes, with adjusting mechanism and spring, are installed on backing plate.



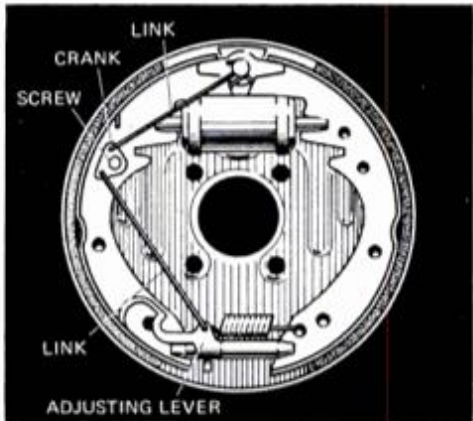
4. Hold-down pins that retain the brake shoe get a quarter turn to lock in place.



5. Delco-Moraine self-adjusting mechanism is shown here installed (see text).



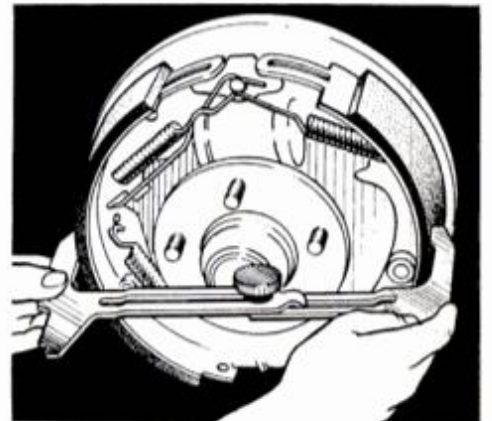
6. On Bendix unit, self-adjust mechanism uses components shown here.



7. On Wagner unit, reassemble self-adjust mechanism as shown in this drawing.



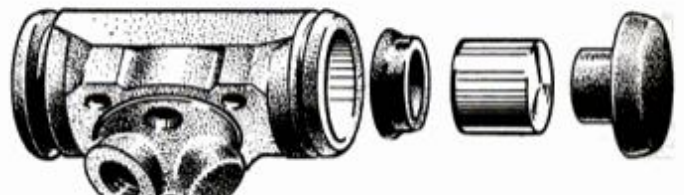
8. Drum-to-brake-shoe clearance gauge is set to measure inside diameter of drum.



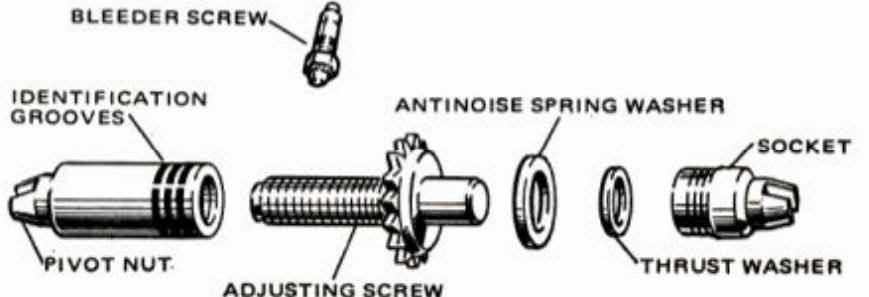
9. Gauge is turned over to fit over brake shoes. Expand linings to meet the gauge.



Exploded view 1: Typical brake cylinder (wheel cylinder) has two boots, pistons and cups, plus a common spring, cylinder housing and bleeder screw.



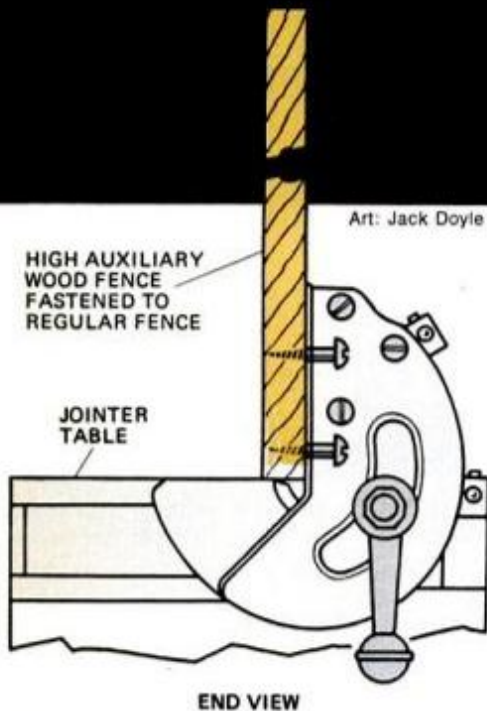
Exploded view 2: Typical adjusting mechanism (less levers and cables) should be disassembled, cleaned and inspected; adjusting screw should be lubricated.



13 bonus tricks for your jointer

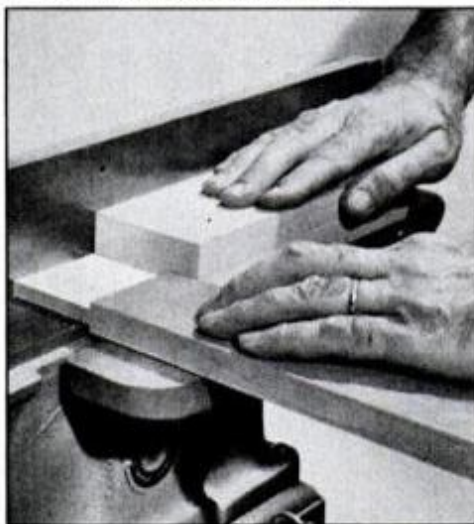
by Wayne C. Leckey
HOME AND SHOP EDITOR

Like most workshop tools, a wood jointer has a lot of hidden talent beyond jointing the edge of a board or dressing the surface. It's a machine that can perform a number of clever and tricky jobs if given the chance. These 13 tricks will show you how to get the most from this versatile tool.



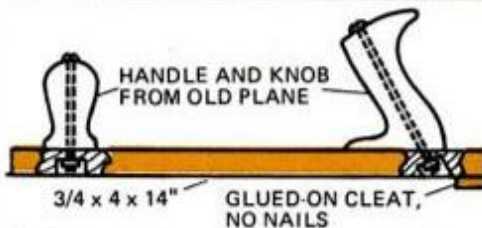
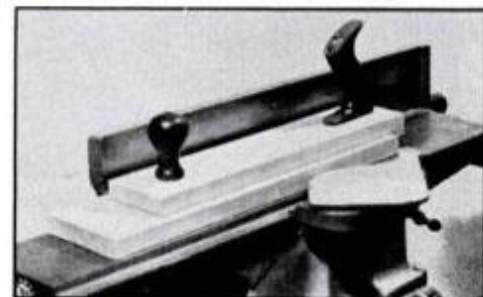
Art: Jack Doyle

2 Shouldered tenons



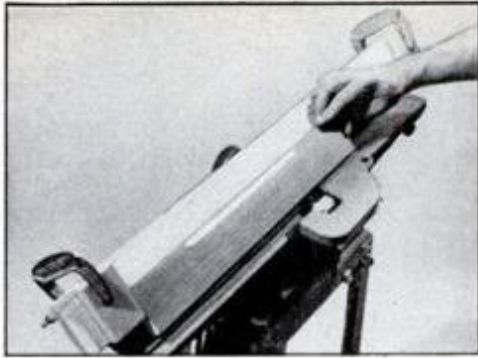
Shouldered tenons on narrow stock are easily handled with the aid of a backing block. This is simply a square block of 2x4 or the like, which is used to push the work squarely across the cutter head as you keep the end of the work firmly against the fence. If the shoulder cut is fairly deep, make the cut in two or more passes. Flop the work with each cut before lowering the front table to make the next.

3 Push block for safety



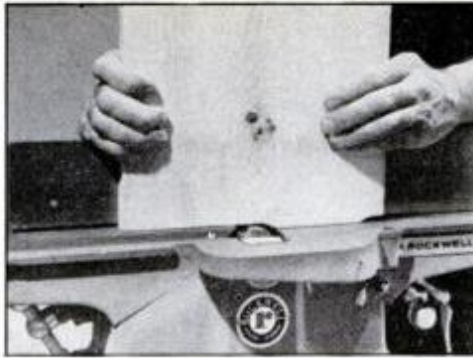
Surface planing should never be done without using a combination push block/hold-down to keep your hands clear of the cutter head. The push block shown makes use of parts from an old hand plane, but you could also use 1-in. dowels for handles. In use, the pusher is grasped by one hand on the knob, the other on the handle. A small cleat across the end on the underside hooks over the edge of the workpiece.

4 Stopped bevel chamfer



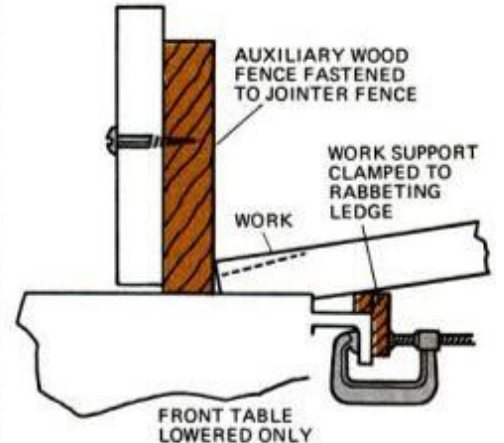
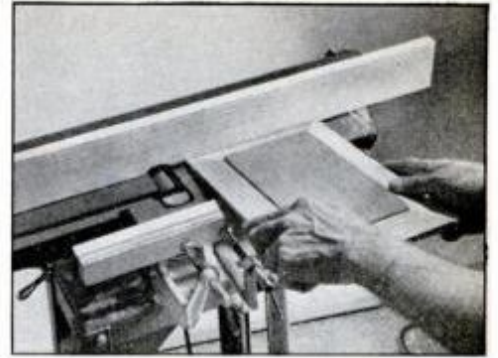
This handsome cut is widely used for table and chair legs, posts and general cabinetry. It is made in the same way as a common stopped chamfer with the exception that the jointer fence is tilted 45° to form a beveled cut. Use an auxiliary wood fence with stop blocks attached, and lower both tables an equal amount. Elevate the lead end of the work while resting the opposite end against the right-hand starting block. Start the machine, lower the work into the cutter, then advance it slowly until it reaches the forward stop block. Important: Use two hands for this operation. (One hand is shown in the photo for the sake of clarity.) The operation requires the removal of the blade guard so watch your fingers when making the cut.

5 How to plane end grain



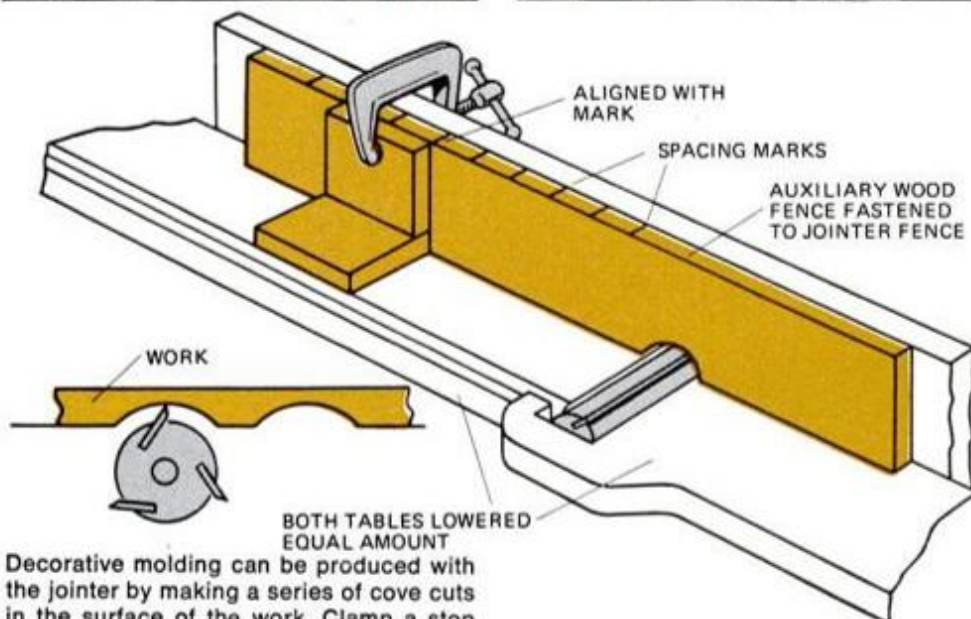
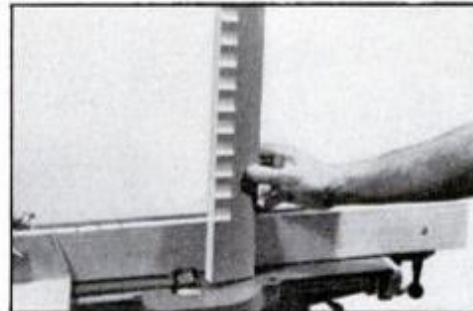
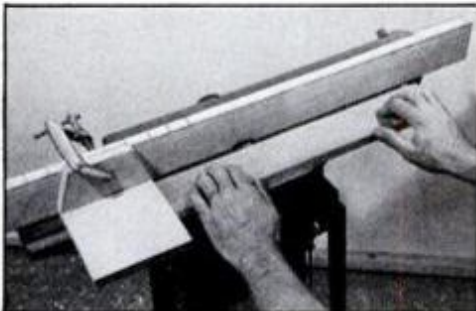
Planing end grain with a jointer will usually chip and splinter the wood at the end of the cut. But not if you first make a short cut with the jointer and then reverse the work to complete the cut. The knives of the cutter head merely pass over the initial cut without cutting, resulting in a chip-free corner. End grain of a board should always be planed first, then the side grain for best results.

6 Cutting raised panels



Raised door panels can be formed neatly with the jointer. First clamp an auxiliary wood fence to the jointer fence, letting it just clear the tables. Set the fence for the desired width of cut, then clamp a strip of wood to the rabbeting ledge of the rear table. This supports the work at an angle to produce the desired amount of bevel as the work is passed over the cutter. Take small bites, about 1/16 in. at a time, and make cross-grain passes first, then the straight grain, to avoid chipping at the corners.

7 How to make novelty molding



Decorative molding can be produced with the jointer by making a series of cove cuts in the surface of the work. Clamp a stop block to an auxiliary wood fence and mark the fence with equally spaced index lines. Butt the end of the work squarely against the stop, then lower it face down into the rotating cutter head. Shift and reclamp the

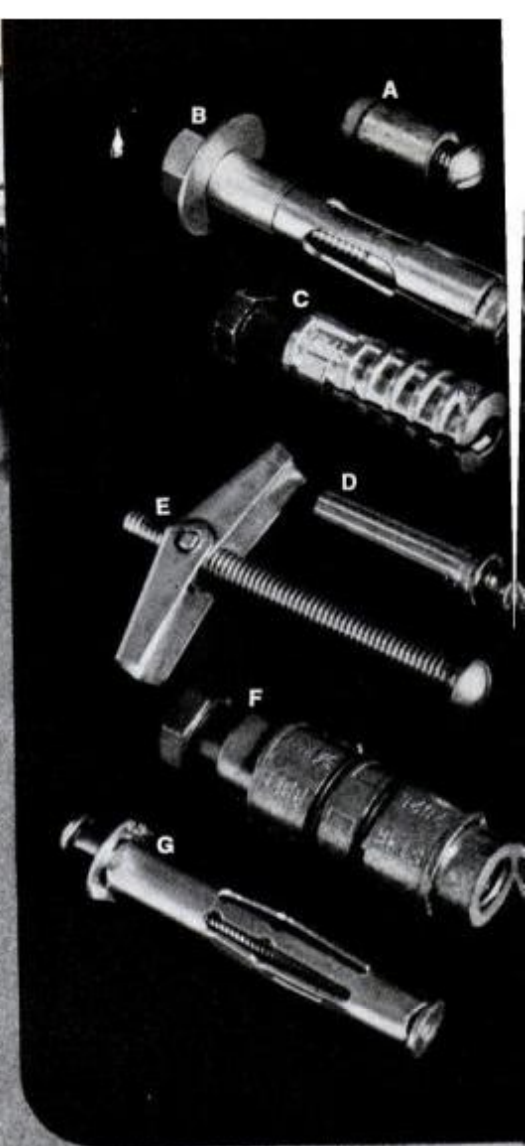
stop for each cut. Both the front and rear tables must be lowered an equal amount for this operation. The design can be altered by varying the spacing of the index marks.

8 Freehand rounding



Round shapes can be formed with a jointer by making repeated passes and changing the angle of incidence with each cut. The fence is adjusted to a single arbitrary angle to serve only as a guide to keep the work moving in a straight line. The procedure is basically a freehand operation so "eyeball" your progress carefully.

(Please turn to page 152)



Hold it!

Here are dozens of clever fasteners for holding up everything and anything.



(A) lead bolt anchor, (B) stud bolt anchor—sleeve type, (C) double expansion shield, (D) lead screw anchor, (E) toggle bolt, (F) machine-screw anchor, (G) hollow-wall anchor, (H) self-leveling picture hanger, (I) hardened drive stud, (J) hardened drive pin, (K) plastic screw anchor, (L) utility hook, (M) nail picture hanger, (N) mirror holder, (O) cup hook, (P) screw eye, (Q) L-hook

Whether you hang a heavy mirror on a bedroom wall or attach a shelf to a concrete wall in the basement, you don't want it to come crashing down. It won't if you pick a fastener recommended for the job.

There's a fastener made to fasten anything to any wall; some are shown at left. Two old standbys, the toggle bolt and the expansion bolt (better known as a Molly) are shown below. They're used in hollow walls. But what must you use when the wall is solid concrete or brick?

The first thing to consider in choosing a fastener is the type of wall it's going into. In most homes this will be a hollow wall above grade and a poured or block wall in the basement. In hollow walls you want a fastener that passes through the plaster or drywall face (or the wall of cinder block or hollow tile) and spreads out to anchor against the back. In solid walls, you want a fastener that holds by expanding against the sides of the hole you sink it into.

Two additional considerations determine your choice of fastener: the weight of the fixture you are hanging, and the type of load it presents. A light load is under 10 lbs. (picture frames, pinup lamps, metal soap dishes), while a load of 25 lbs. or more is heavy. A shear load is one which exerts a straight downward pull (such close-to-the-wall items as

mirrors or wall clocks), while combination loads exert an outward pull as well (shelves, cabinets) and require stronger anchorage. Dead loads, where the pull is constant, need less anchorage than shock loads which must withstand sudden impact or increased weight. Vibration loads (such as airconditioners) call for special treatment—usually a fastener that can be retightened.

Determining wall thickness

To select the right length hollow-wall fastener, you must know the thickness of the surface wall. You can determine this by drilling a small trial hole at the mounting location and inserting a wire with a tiny hook bent at one end. Catch the hook against the back of the wall, then remove it to tell the length of fastener needed. Allow for the thickness of the fixture mounting plate.

To attach shelf brackets to a concrete wall, you use a shield or anchor. Both work on the same general principle—a wedge nut or cone expands the outer sleeve. To install both types you need to drill a hole in the concrete, but this is no problem with a carbide-tipped drill bit. When you buy shields or anchors, bolts or machine screws are purchased separately to suit. The length of the screw is equal to the length of the anchor plus the thickness of the work or fixture. ★★★

FASTENERS FOR HOLLOW WALLS ONLY



EXPANSION BOLT (Molly)

Installation: (A) insert bolt in drilled hole, (B) tap to embed cap teeth in wall surface, (C) turn screw with screwdriver to draw split sleeve into "spider" against back of wall. Remove screw, align hole in fixture, then reinsert screw.

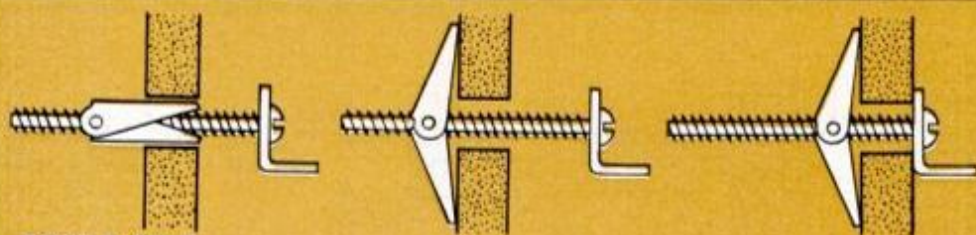
Advantages over toggle bolt: Requires smaller hole in wall, centers bolt precisely. Remains in place for reuse when fixture is removed. **Disadvantages:** Mounting holes must align exactly with fixture—a tricky job with several holes.

SIZE AND LOAD CAPACITY

Overall for wall

Size*	Bolt Length	Wall Thickness	Load (lbs.)
XS	¾ to 7/8"	Up to 1/4"	200
MS	1 to 1 1/2"	1/4 to 1/2"	to
S	1 1/2 to 2 1/4"	1/4 to 1/2"	500
L	2 to 2 3/4"	3/8 to 1 1/4"	(varies with make)
XL	2 1/2 to 3 1/2"	1 1/4 to 1 3/4"	

*There is no industry standard so these are compromise listings. Some brands have each length in several diameters.



TOGGLE BOLT

Installation: Drill hole in wall to accept toggle head. Remove toggle head from bolt and pass bolt through fixture hole. Spin toggle head back on bolt, fold spring-loaded wings and push through hole. Wings fly open and lock within wall. Tighten bolt with screwdriver to draw wings against wall. Fixture is anchored.

Disadvantages over expansion bolt: Requires large hole in wall for wings to pass, bolt "floats" in hole, does not position fixture precisely. Fixture mounting plate must be big enough to hide hole in wall. If fixture is ever removed, wings drop off, are lost in wall. Requires another toggle bolt to rehang fixture.

SIZE AND LOAD CAPACITY

Bolt length	Diameter	Load (lbs.)
2,3,4"	1/4"	200
2,3,4,5,6"	3/16"	450
3,4,5,6"	1/4"	925
3,4,5,6"	5/16"	1150
3,4,5,6"	3/8"	1500
4,5,6"	1/2"	1800

*Some brands come in 2 1/2, 3 1/2 and 4 1/2" lengths.

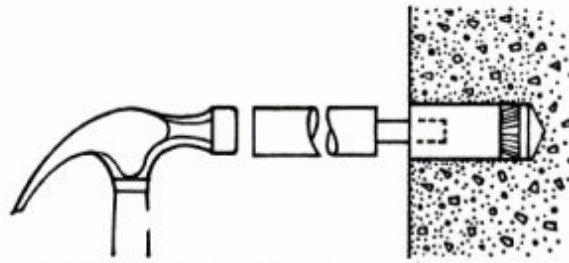
Recommended uses: Toggle head has great holding power. Use when hanging heavy objects like big mirrors, wall cabinets and large shelves. Expansion bolts are used to hang lighter objects like window cornices, clocks, adjustable shelf standards since metal in spider is thinner than toggle-bolt wings.

(Please turn to page 122)

Machine-screw anchor



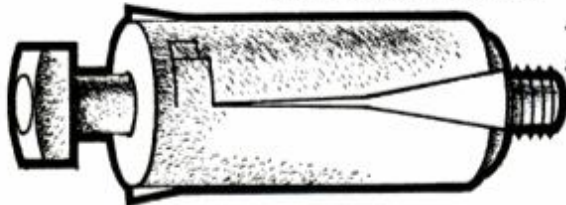
To install, drill hole. Go deep enough to set anchor just below surface. Push anchor into hole, nut end first, then "caulk" with special tool.



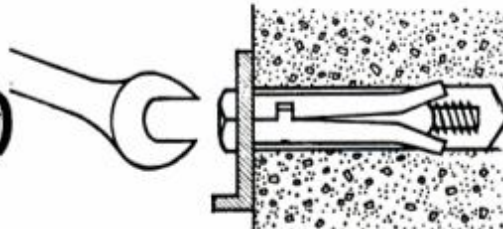
Pass screw through fixture hole into anchor and tighten. For heavy jobs, anchor has great holding power; cone-nut prevents thread stripping.

Screw Size (No.)	Hole Dia. (in.)	Load (lbs.)
6-32	1/4	625
8-32	5/16	950
10-24	3/8	1100
12-24	7/16	1750
1/4-20	1/2	2275
5/16-18	5/8	2850
3/8-16	3/4	3670
7/16-14	7/8	5500
1/2-13	7/8	7200
5/8-11	1 1/8	7800
3/4-10	1 1/4	8300
7/8-9	1 1/2	10,000
1-8	1 3/4	12,000

Machine-bolt shield



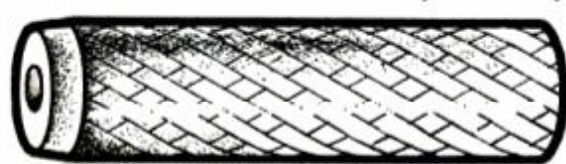
To install, insert shield in snug press-fit hole, its top flush with surface. Pass bolt through fixture mounting hole and turn into the shield. As bolt is tightened it draws wedge-



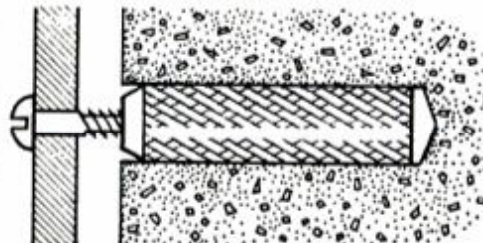
shaped nut forward, expanding split sleeve. Great for attaching heavy fixtures to solid masonry. Shields are tough, rustproof alloy casting. Available in wide choice of types.

Bolt Size (in.)	Shield Lengths (in.)	Hole Size (in.)	Load (lbs.)
1/4	1 1/2	1/2	500
5/16	1 1/2-2	5/8	800
3/8	1 1/2-2 3/8	3/4	1000
7/16	2-2 3/8	7/8	1000
1/2	2-2 1/2	7/8	1500
5/8	2-2 7/8	1-1 1/2	2000
3/4	2 1/2-3 1/4	1 1/4-1 3/8	2000
7/8	3-4 1/4	1 3/8-1 1/2	2300
1	4 1/4-4 1/2	1 3/8-1 3/4	2400
1 1/4	5 1/2-6	2 1/4	2500

Fiber anchor (lead core)



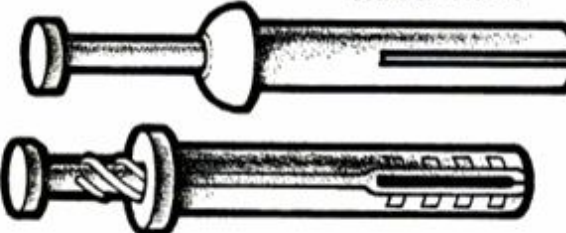
To install, use drill, plug and screw of same size. Insert plug just below surface, drive screw through fixture into lead core. Only threaded section should enter plug. It's



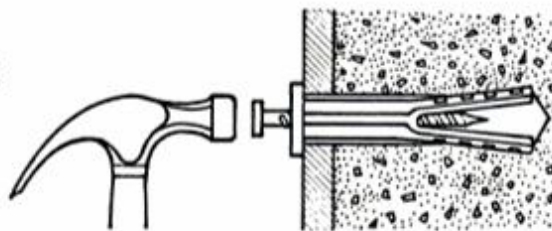
easy to install, inexpensive. Screw may be removed and replaced without affecting the anchorage. Once it's in, plug grips firmly.

Screw Size (No.)	Anchor Lengths (in.)	Load in Concrete (lbs.)
5-6	5/8, 3/4, 1	550
7-8	5/8, 3/4, 1, 1 1/4, 1 1/2, 2	885
9-10	3/4, 1, 1 1/4, 1 1/2, 2	1150
11-12	3/4, 1, 1 1/4, 1 1/2, 2	1525
14	1, 1 1/4, 1 1/2, 2	1590
16	1, 1 1/2, 2	2150
20	1, 1 1/2, 2	2830
22	2	3500

Nail anchors



To install, drill hole the same size as shield, insert anchor through the fixture's mounting hole and into wall. When the flange is seated firmly



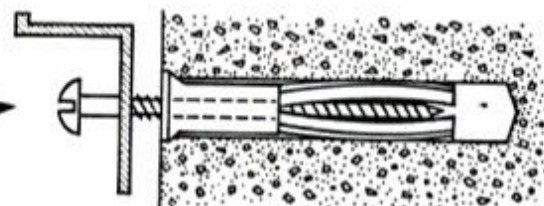
against the fixture, drive nail home with hammer. Recommended for light loads such as furring, pipe straps and outlet boxes to concrete block.

Shield Dia. (in.)	Shield Length (in.)	Load (lbs.)
3/16	3/8	375
	1/4	110
	1	200
1/4	1 1/4	240
	1 1/2	325
	1 3/4	300
5/16	1 3/4	350
	2 1/4	375
	2 3/4	375
3/8	2	450
	3 1/4	485
1/2	2 1/4	525
	3 1/2	625

Lead screw anchor



Screw length equals thickness of mounting plate plus length of anchor, plus 1/4 in. To install, drill hole 1/4 in. deeper than anchor length. Set it flush with wall surface and drive screw through fixture. Flared end of anchor prevents loss of the



anchor in hole drilled through to core of concrete block. Flared end also makes it easier to start screw. For mounting any item you'd normally attach with wood screws, sheet-metal screws or lagscrews.

Screw Size (No.)	Anchor Lengths (in.)	Load in Concrete (lbs.)
6-8	3/4, 1, 1 1/2	to 400
10-12-14	1, 1 1/2	to 900
16-18	1, 1 1/2	to 3000
20-22-24	1 3/4, 2	1600 up

(Please turn to page 184)

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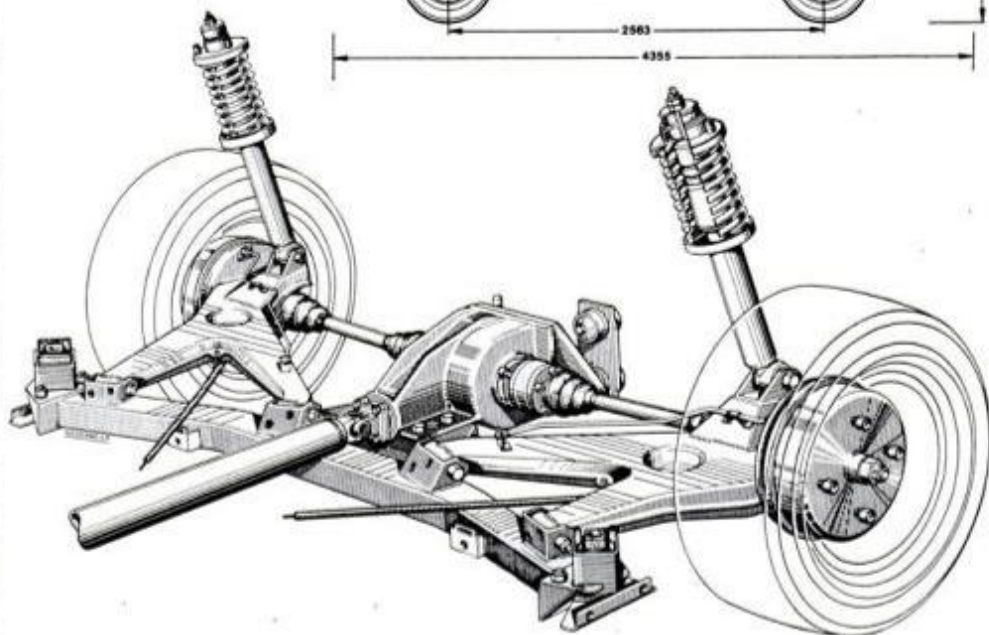
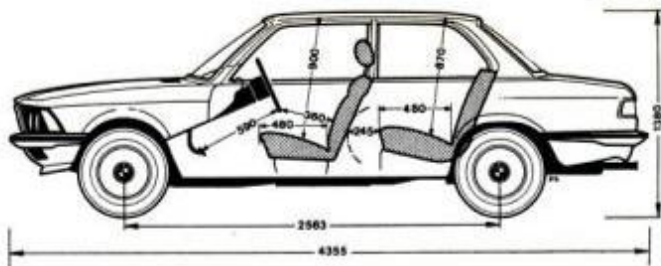
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FIRSTHAND REPORT: PORSCHE AND BMW

(Continued from page 90)



BMW 320i, like all BMWs, has independent rear suspension. Interior dimensions of the sporty sedan are given—get used to it—in millimeters above: 100 mm equals 3.937 in.

should say, since city/highway average should be more than 20 mpg.

Steering and suspension. Rack-and-pinion steering system is new, with the rack rubber-mounted. Road feel is as good as ever with better responsiveness as a result of lower gearing. Steering wheel is smaller, which is nice, but horn buttons are still on spokes and not on the hub, so you have to hunt to honk. Front spring rate is a bit softer, the rear harder, which is difficult to detect if you're not a Hans Stuck: The car gobbles up bumps and holds the road as superbly as its predecessor.

Brakes. Improvements in the brakes include larger discs and drums, with the front discs now ventilated.

So much for the major improvements of the 320i over the 2002—which I guarantee brought a sigh of relief from BMW fans, who should now be assured that the marque still stands for everything it always has. But the uninitiated will probably still wonder if it's all worth \$2000 to \$3000 more than a run-of-the-mill compact car. It's probably not . . . unless you love cars and love to drive.

Mike Lamm's report on the Porsche 924

■ The Porsche 924 began life as an engineering and styling study for Audi back in 1970. During part of its development, it was intended to become a top-of-the-line Audi sports model. But with shared dealers, it

seemed more reasonable to make it a Porsche instead of an Audi.

The 924's engine was originally developed by Volkswagen to power light trucks. Porsche modified it by adding a belt-driven overhead cam and Bosch K-Jetronic fuel injection. This four-cylinder, two-liter engine stands lengthwise and tilts 40° to the right.

Power flows through a rigid torque tube where the driveshaft is supported in four bearings. The shaft connects through a rear-mounted clutch to a transaxle.

The transaxle carries Audi gears, and the torsion-bar rear suspension comes from the VW Beetle. Of other

(Please turn to page 126)

SPECIFICATIONS—BMW 320i

Engine: Ohc in-line Four, water-cooled, cast-iron block, light-alloy head, five main bearings
Bore and stroke: 3.15 x 3.5 in.
Displacement: 1977 cc (120.6 cu. in.)
Horsepower: SAE net: 110 @ 5800 rpm
Torque: SAE net 112-ft.-lb. at 3750 rpm
Fuel injection: Bosch K-Jetronic
Compression ratio: 8.1:1 (regular fuel)
Transmission: Four-speed
Final drive ratio: 3.64:1
Suspension: all independent
Front: McPherson struts, coil springs
Rear: Semitrailing arms, spring struts
Brakes: Power-assisted front discs (ventilated) and rear drums, dual hydraulic system
Tires: 185/70 HR 13 radials
Dimensions (in.):
Wheelbase, 100.9 Overall width, 63.4
Overall length, 177.5 Overall height, 54.3
Curb weight (lbs.): 2535
Fuel-tank capacity (gal.): 15.9
Optional equipment: Automatic transmission, air-conditioning, sunroof, metallic paint, audio equipment, performance accessories.
U.S. base price: Not yet announced (we estimate \$7500)

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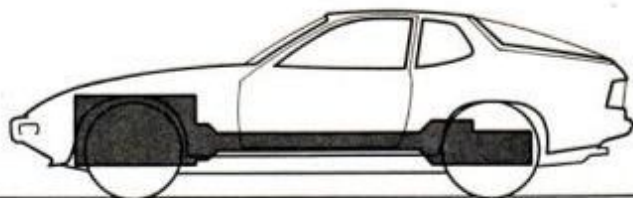
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FIRSTHAND REPORT: PORSCHE AND BMW

(Continued from page 124)



Porsche 924 interior has the neat, spacious feel traditional to Porsche. Layout above shows 924's transaxle arrangement with engine at front and transmission at rear axle.

shared parts, the lower front suspension members are VW Rabbit, with McPherson struts taken from the Audi 80. Steering, brakes, gauges, and electronics come mostly or wholly from Volkswagen.

In ordinary driving, the 924's performance feels perky but not what you'd call hot. Factory tests show 0-to-60-mph acceleration at 11.8 seconds, with 118 being the car's true top speed. On long, steep hills, it's necessary to shift down from fourth to third gear, high being an overdrive ratio (0.966:1). Fuel mileage averages 20 mpg around town and 30 mpg on the highway.

It's a very tight car in several ways. Handling feels unerring in its steadiness and precision, thanks partly to the car's 50/50 weight distribution. On a short, tight slalom course, the 924 easily outruns larger, more powerful sports cars.

Its tightness of suspension, though, leaves the car with a sharp, choppy ride, even on relatively smooth pavement. And true to its VW ancestry, it's fairly noisy, even for a sports job.

The 924's hatchback gives it 2+2 seating, with a pinched set of fold-down rear buckets for kids or dogs. The huge glass backlight (heated) opens on gas-filled struts and gives access to a carpeted cargo deck.

There's plenty of leg and headroom for tall drivers. The 924's front seats are very much like the 911's, and there's ample adjustment.

The view ahead is hoodless and

excellent. To the rear, there's some distortion through the big, curved glass, but no blind spots.

Porsche has gone to great lengths to rustproof the 924. Underbody sheet metal has galvanized zinc coating on both sides. Porsche engineers claim that if the coating gets scratched or nicked, it's "self-healing." An 0.3-volt difference in electromotive potential between the zinc and steel is said to cause "cathodic rust protection" as ions migrate from zinc to steel.

Porsche promises that an automatic transmission will be available later this year. ★★★

SPECIFICATIONS—PORSCHE 924

Engine: OHC in-line Four, water-cooled, cast-iron block, light-alloy head, aluminum pan, five main bearings
Bore and stroke: 3.41 x 3.32 in.
Displacement: 1984 cc (121.6 cu. in.)
Horsepower, SAE net: 95 at 5500 rpm
Torque, SAE net: 109.2 ft.-lb. at 3000 rpm
Fuel injection: Bosch K-Jetronic
Compression ratio: 8.0:1 (regular fuel)
Transmission: 4-speed transaxle (transmission located on rear axle)
Final drive ratio: 3.44:1
Suspension: All independent
Front: McPherson struts, coil springs
Rear: Semitrailing arms, transverse torsion bars, tubular hydraulic shocks
Brakes: Power-assisted front discs, rear drums, dual diagonal hydraulic system
Tires: 165 HR14 radials
Dimensions (in.):
Wheelbase, 94.48 Overall width, 66.33
Overall length, 170.10 Overall height, 49.99
Track f/r (in.): 55.88/54.01
Ground clearance, loaded (in.): 5.9
Curb weight (lbs.): 2447
Fuel-tank capacity (gal.): 16.4
Optional equipment: Airconditioning, removable top, front and rear stabilizers, alloy wheels, audio equipment, headlight washers, rear wiper
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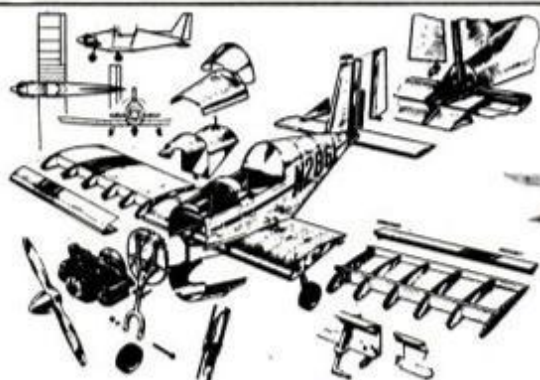
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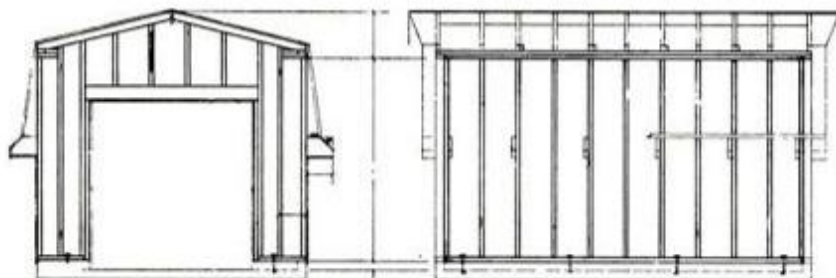
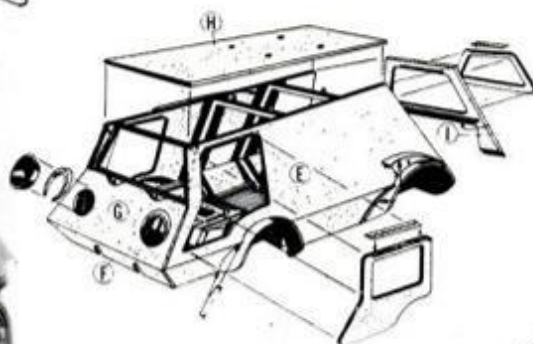
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(Featured in May, 1971 issue)

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(Featured in March, 1974 issue)

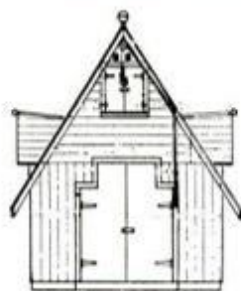
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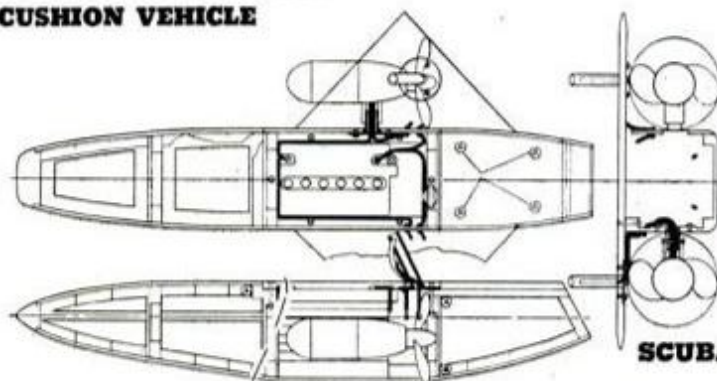
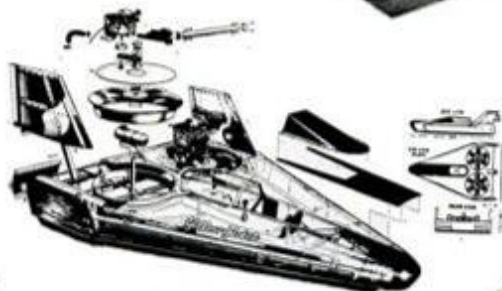
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AIR RACING ROARS BACK

(Continued from page 70)

to have caused several earlier fatal crashes. The prop requirement is essentially to keep pylon-type racing a practical, interesting spectator sport. While jets did fly in some special events in the past, they are generally considered unsuitable for sport racing because their tremendous speeds require such large racecourses that the planes are out of spectator view most of the time and barely more than blurred streaks when seen at all.

Beyond these few restrictions, there are no limits to what you can do to make a plane faster and more powerful. In modifying warplanes, wings are "clipped" (shortened)—often by several feet on each side—to reduce drag. Tail-fin area is enlarged to increase stability. Everything sticking out anywhere is either removed or streamlined as much as possible to lessen speed-reducing resistance. Canopies protrude just enough to let a pilot almost see out.

McClain has added an intriguing new wrinkle this year—his Red Baron has twin contrarotating props turning on concentric shafts. The object: to neutralize the heavy prop torque of the huge engine and eliminate the need for a bigger single prop. At high speeds, long-bladed props tend to go supersonic at the tips, reducing efficiency. Using two smaller props avoids this.

To win, pile in power

In the end, the guiding philosophy of building a fast raceplane has been to cram the biggest possible engine into the lightest, sleekest airframe and hope the combination holds together long enough to make it around an eight-lap, 10-mile racecourse. Often it doesn't. Blown engines, shattered props, ruptured fuel and oil lines, metal vibrating to bits—all these are common—and sometimes fatal—results of the tremendous stresses, temperatures and pressures that build up when you push a screaming, 3000-hp mass of complicated machinery around frightening pylon turns for some 80 miles at full throttle.

That's air racing. And curiously enough, as specialized a sport as it may seem to be, it's been around almost as long as aviation itself—and, in fact, has contributed much to the advancement of aviation technology. The first official air race was held at Reims, France, in 1909—just six years after the Wright Brothers had brought the airplane into existence. The event drew no fewer than three dozen flying machines. Many

of the crude, rickety craft wobbled and thrashed about on the ground—and occasionally got into the air. A couple even showed signs of promise. Eugene Lefebvre had a Wright biplane with cut-down wings, while Louis Bleriot—later to build one of the first World War I fighters—had a "huge" 60-hp V8 stuffed in the snub nose of his open-work monoplane. Neither won, but the idea was firmly implanted in many active imaginations that with more power and less airplane you ought to be able to go a lot faster.

King of speed: the seaplane

A few years later, Jacques Schneider offered a trophy to the winner of a speed contest for "hydro-aeroplanes"—planes on floats. Thus were born the famous Schneider Trophy Races that would eventually be a greater stimulant to speed in the air than any other peacetime event.

The races were interrupted by the war, but they really got rolling in the 1920s. A strange thing happened. Inspired by the Schneider challenge, the world began rushing to build seaplanes that, despite their huge, ungainly, dangling floats, managed to fly faster than any current landplanes. The Schneider Trophy carried so much international prestige that governments poured millions of dollars into magnificently sleek craft good for a few minutes of screaming speed.

The U.S. Navy in a valiant show of air prowess created the superslick Curtiss R-3 and R3C-2 seaplanes—then the fastest planes around. In 1925, a young military flier won the Schneider in an R3C-2 at the then incredible speed of 233 mph. The pilot's name was Jimmy Doolittle, who later was to lead the legendary bombing raid on Tokyo in World War II.

Not to be outdone, the British Vickers-Supermarine and Italian Macchi firms showed up with their equally impressive floatplanes. Supermarines won all the remaining Schneider events up through 1931, and later in 1934 a Macchi set a new seaplane speed record at 440 mph—a record that still stands today. For British designer R. J. Mitchell, it was a straight line from the spectacular Supermarine to his immortal Spitfire and the Battle of Britain in World War II.

Racing fever mounts

While the Schneider Trophy dominated the 1920s, other race events were being held, and still others were in the making. Racing fever was clearly mounting. The Pulitzer

(Please turn to page 137)

AIR FORCE. 1-2-3-4 WAYS TO START A GREAT WAY OF LIFE.

Air Force people are special. Trained. Talented. Devoted to service and nation. From Airmen to Generals, were a worldwide community working to make a great Air Force better—and there are at least four different ways you can become a part of that community.



1 If you become an Airman, there will be many opportunities for self-improvement through education and service. That's why we have a Community College of the Air Force, and some of the best technical training in the world. We know that the better you get, the better we all get.



2 If you prefer to serve part time, consider the Air Force Reserve. We'll train you, pay you, make you part of a proud and skillful team. A team of winners.



3 You can put it all together in Air Force ROTC if you're heading for college. There's a \$100 a month tax-free allowance in your last two years. You may also earn a 4-, 3- or 2-year Air Force ROTC scholarship that will pay your tuition including the \$100 monthly allowance.



4 Maybe you're Air Force Academy material. If you think so, try for it. It means a top quality education and an Air Force commission.

If you believe you can meet our high mental and physical standards, call toll free 800-447-4700 (in Illinois call 800-322-4400) for the location of your nearest Air Force representative. Or send in the attached card.

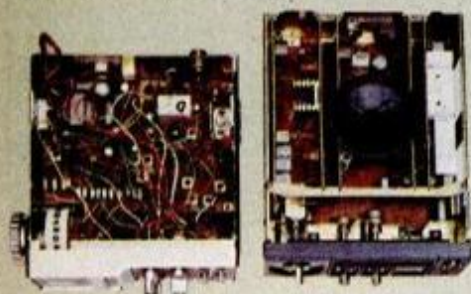
AIR FORCE A GREAT WAY OF LIFE



Royce introduces The Wireless

Now you have an easy way to decide which CB to buy.

Look inside and compare! Royce has brought computer technology to CB!



THE OLD WAY

THE ROYCE WIRELESS WAY

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This is no "add-on" feature on the same old transceiver.

This is no minor event in the world of CB.

Because only Royce has the Wireless Module concept. And, it is the

biggest CB technological breakthrough since the transistor!

You don't have to be an engineer to figure out why. Wireless modular construction promises trouble-free performance, uniform quality and reliability over the years — on rugged country roads or off them.

Precision assembly with higher quality components assures you of dependable communications with every Royce transceiver. The final touch — computer tuning and testing — makes doubly sure that you get what you have always wanted:

Reliability! Peak power! Maximum range! Longer CB life!

Other CB makers *might* have this Wireless Module concept by 1978. But, why wait?

See the 6 new Wireless models at your Royce dealer's soon. Royce Electronics Corp., 1746 Levee Road, North Kansas City, Mo. 64116.



Royce

THE RIGHT CB MICROPHONE

(Continued from page 83)

automatically compensate for volume variations caused by different mouth-to-mike distances, or by the natural rise and fall of normal speech inflections. To do this, it amplifies soft sounds more than it amplifies loud ones for even, nearly full modulation most of the time.

Mura makes a variation of this, which shifts some energy from vocal peaks (which your set clips off instead of transmitting) to points where your voice is soft and modulation is low; they claim it reduces distortion, too.



Noise-canceling mikes work best when held just a bit away from the mouth, as shown above. Most, like this Turner, have lip-touching projections to insure the proper distance. Volume controls (below) are signs of power and compressor mikes.



The myth is that power mikes increase your transmitter power. That's not so. What they really do is increase the signal-to-noise ratio in the signal your listeners receive by keeping the modulation level of your signal high. In other words, your signal will get out just as far as it did before and will look the same on an "S" meter—but (unless you turn your mike up too high and distort) your message will sound clearer and be easier to understand. ★ ★ ★

A CHAIN SAW IS ONLY AS GOOD AS ITS CHAIN.

If your chain saw is not cutting like it should, more often than not the problem is the chain.

Of all the things that can go wrong with a chain saw and affect its cutting ability, the actual cutting chain is probably the most important. And probably the most neglected.

A chain that's been mis-used, a poor quality chain or a chain that's not adjusted the way it should be, can turn your chain saw from a useful, handy tool into a real pain in the neck.

WE'VE BEEN MAKING SAW CHAINS FOR 20 YEARS.

You may well have one of the best chain saws on the market. But remember, it's the chain that does the cutting. If it's not up to scratch, then you're turning easy work into hard work.



YOU CAN'T BUY A BETTER CHAIN.

Every Sabre saw chain is of the highest possible quality, thanks to our obsession with quality control. Each step in a chain's construction is handled with the ultimate professional care.

Another thing that makes our chains so good is the super-tough nickel alloy we coat our cutting edges with. The end result is a longer-lasting chain with a sharper cutting edge.

IF YOU'VE GOT A CHAIN SAW, WE'VE GOT THE CHAIN.

We make saw chain for just about every kind of chain saw on the market. On the Sabre Chain Saw Accessory Center you'll find an easy-to-use selector guide, that tells you quickly and easily the size and type of chain your particular chain saw needs.

You'll also find all kinds of chain saw accessories—like

sharpening tools, repair kits, 2-cycle engine oil, lubricants, wedges, spark plugs. You name it. It's probably there. You'll also find a handy little book we called "How to Keep Your Chain Saw Working Like It Should". It's full of ideas, information and projects. And, best of all, it's free.

Get this great book, full of information, ideas and projects. Free wherever you find the Sabre Chain Saw Accessory Center.



If that pile of firewood that should be taking half an hour to cut, is taking half the day, then in all likelihood the problem is the chain.

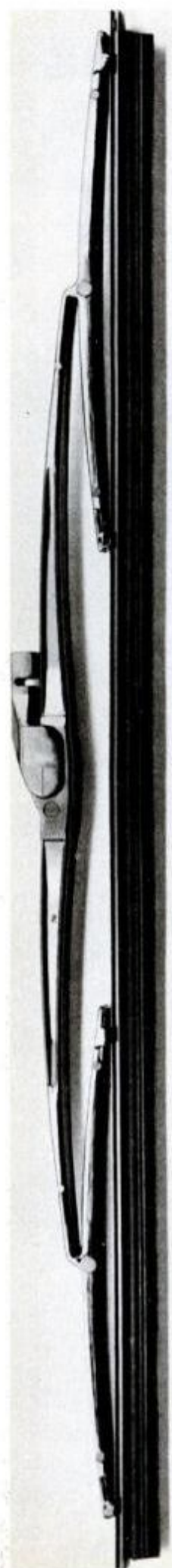
Over just a relatively short time your chain can lose 50% of its cutting ability. Then it's time for a new chain.



Or write Sabre Saw Chain Inc., P.O. Box 272, LaSalle Station, Niagara Falls, N.Y. 14304.

SABRE® MAKES YOUR CHAIN SAW WORK LIKE IT SHOULD.

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pliers, just a pair of hands.**

You can put on a pair of Fram wiper blades in a matter of minutes, without any tools and without any special talents.

They adapt easily to both bayonet and the hidden type arms found on domestic cars. And complete, illustrated instructions are on the back of every box.

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not affected by heat or cold, and stay flexible for cleaner wipes throughout their long service life.

Furthermore, Fram rubber *refills* are the only ones that are fully interchangeable with factory original equipment. So if your holders are still in good shape, all you need are rubber refills.

Priced generally less than regular replacements, Fram wiper blades and refills are available at most leading automotive parts and accessories outlets.

So all you really need is a few bucks, a couple of hands, and a couple of minutes.



Fram Corporation

A Bendix Company

Providence, R. I. 02916

AIR RACING ROARS BACK

(Continued from page 130)

Trophy Races of the early '20s, primarily contests between military planes and pilots, evolved into the soon-to-become-famous and eventually civilian National Air Races. The first of these was held in 1924 at Wright Field in Dayton, Ohio.

In 1929, a young pilot by the name of Doug Davis at a place called Cleveland accomplished a feat that was to change the course of air racing—at least for the next decade. Flying a privately built Travel Air Mystery racer, he whipped the best the military could offer and triggered an explosion of interest in small, fast, highly personalized racing planes. His Travel Air was, in fact, the first civilian plane to beat a military craft, posting an average speed of nearly 200 mph.

New races, new planes

New races and planes were quick to follow. In 1930, the first Thompson Trophy Race was established to become perhaps the best-known, most popular closed-course pylon event in air-racing history. This was followed a year later by the Bendix Trophy, a cross-country speed dash from California to Cleveland. Again, Jimmy Doolittle took the honors, winning the first Bendix and continuing to set a new west-to-east transcontinental speed record averaging 217.4 mph.

A whole new crop of custom-built, civilian-designed racers began to appear with colorful names like the Laird "Solution" and "Super Solution" biplanes that won in the early Thompson and Bendix races, then later racy little monoplanes like the Wedell-Williams, Kieth Rider "Suzy" and Wittman "Chief Oshkosh."

The 'flying coffin'

One of the most famous—or infamous—original designs to come out of the early '30s was a snarling little beast called the Gee Bee after its designers, the Granville Brothers. It was godawful fast, but had one bad habit—it kept crashing. Shaped like a pickle barrel and not much bigger, it was little more than a monstrous engine with a seat behind it for a pilot. Its pitifully small control surfaces fought to counter the torque of 800 horses, not always succeeding. Notoriously unstable and temperamental, it tended to pitch and yaw unexpectedly for no reason, often at critical moments during landings and takeoffs.

Still, despite its shortcomings, the Gee Bee did manage to win races. In 1931, it took three major events,

including the Thompson Trophy, then rewarded its courageous pilot, Lowell Bayles, by killing him in a spectacular fiery, cartwheeling crash. In 1932, it was none other than the great Doolittle to dare the Gee Bee's wrath. With perhaps understandable misgivings, he nevertheless flew the monster to a new speed record of nearly 300 mph and the same year won the Thompson in it.

The Gee Bee was—briefly—the world's fastest landplane and will forever epitomize the airplane meant for nothing but pure speed. But Doolittle's joking remark to a mechanic—"Just put six silver handles on it"—proved grimly prophetic: Every Gee Bee made ultimately crashed.

The more sensibly designed Wedell-Williams—a slender, manageable monoplane—was to have a much more durable and safer future. In 1932, it swept the Bendix Trophy and finished second, third and fourth in the Thompson. For the next two years, it was to win both the Thompson and Bendix and was still flying in 1939 just before World War II.

The glory years

The 1930s were the glory years of air racing. The time was right. A nation stunned by the financial crash of 1929 and desperate for glamor and escape zeroed in on the Cleveland Air Races for a new kind of thrill. Crowds by the thousands flocked out to watch years of work by hungry men become instant fame or rubble. The little homebuilts that tore around the red-and-white-checked pylons were the hand-built creations of a few inventive experimenters with far more ideas than dollars.

It was an era of individualism, ingenuity and do-or-die daring. Out of it came advances in aviation technology that were to prove critical to the success of Allied air supremacy in a brewing World War II. In addition to sheer speed and power, there were refinements like retractable landing gear, turbocharging, superstreamlining, variable-pitch propellers, low-drag bubble canopies, flaps for speed and lift control.

The triumphs of highly original designs like the Wedell-Williams also brought with them some of the most illustrious names in air racing—James Wedell himself, James Haizlip, Doug Davis, Earl Ortman, Frank Sinclair, Harold Neumann and, of course, the unforgettable Roscoe Turner. Turner, flying a Wedell-Williams, won the 1933 Bendix and the 1934 Thompson, placed high in numerous other races, set a new transcontinental record in 1934 and went on to win two more Thompsons in 1938 and

(Please turn to page 138)



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Name _____

Address _____

City _____

State _____ Zip _____

AIR RACING ROARS BACK

(Continued from page 137)

1939 in the speedy new Laird-Turner racer.

There is the story about how Turner accidentally got his prop into reverse rotation, was shocked by its tremendous braking action and reported the strange phenomenon to the Air Corps. The result: the first reversible-pitch propellers, later to be instrumental in permitting big B-29 bombers to land on short Pacific island runways in World War II. Roscoe Turner is still remembered as one of air racing's all-time greats.

Girls in goggles

Also emerging in the 1930s were famous feminine names—Jacqueline Cochran, Amelia Earhart, Louise Thaden, Blanche Noyes, Laura Ingalls, Arlene Davis—the first women race pilots. The gals didn't do too badly. In the 1936 Bendix, Louise Thaden and Blanche Noyes ran off with first place, Laura Ingalls came in second, and Amelia Earhart placed fifth. In the 1937 Bendix, Jackie Cochran came in a respectable third and a year later surprised everyone by roaring in first. In 1939, she set a new women's speed record and

was still racing years after the war—in P-51s!

In 1934, the Greve Trophy Races were added to the Thompson and Bendix. These events were limited to smaller, less powerful planes with engines of no more than 550-cubic-inch displacement. Their intent was to establish a less expensive, more competitive racing class with such notable innovators as Steve Wittman, Lee Miles, Art Chester, Rudy Kling, Ben Howard, Frank Haines, Harry Crosby and a youthful, spirited Tony LeVier, later to gain fame as chief test pilot for Lockheed.

War ends racing

Throughout the 1930s, civilian racing planes were as fast or faster than any operational combat craft, even though they had far less power. As late as 1938 and 1939, little home-designed speedsters were still beating the wings off the swiftest military fighters. It was the most exciting time aviation had ever seen, but it couldn't last. With the coming of World War II, sport racing was suspended—and with it the incentive and enthusiasm for original design.

After the war, the Cleveland Air Races were completely dominated by surplus fighters. After all, what little

home-brewed concoction could possibly hope to compete with even a stock P-51, Bearcat, Corsair or Cobra? The Thompson and Bendix were reinstated in 1946, but not the Greve Trophy—there was no place for a race in which warplanes couldn't compete. Other races sprang up—the Sohio, Kendall, Tinnerman and Allison—all for the mighty, readily available ex-warbirds.

Record speeds

Speed records jumped 100 mph in the postwar Cleveland races and continued to climb dramatically as engineers began to see how souped-up, cut-down, cleaned-up military planes could be turned into real racers. Speeds soared past 400 mph.

There was one exception. In 1947, a new racing class, the Goodyear, was established. This was limited to 500-pound, 85-hp strictly custom-built "midgets." More often than not, the designer, builder and man in the cockpit were one and the same.

Though not as thunderous as the big Unlimiteds, the little midgets, hurtling around a small two-mile oval at well over 150 mph only 50 feet off the ground, were exciting to watch. Their popularity grew fast, but not in time to save the Cleveland Air

JOE GARAGIOLA M.D.
(MOPAR DOCTOR)

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Races when still another war, the Korean, came along. The sport struggled along for a decade on the strength of one or two Goodyear races a year and threatened to die completely in the '60s.

Reno revives dying sport

Then the scene shifted to Reno, and air racing began to flourish again. Helping to broaden its appeal are a number of race categories that give spectators a chance to view all kinds of craft in action. In addition to the Unlimited class, there are special events for Sport Biplanes; Goodyear-type midgets, now called Formula 1s; the AT-6s (SNJs), the famous World War II advanced trainer; and a still newer Formula V class—small homebuilts powered by VW engines.

Sport Biplanes typically average close to 200 mph; AT-6s, 210 mph or so; Formula 1, to 235 or 240 mph; and Formula V, 150 to 160 mph. The smaller, slower planes generally fly short, tight three to five-mile oval courses, while the 400-mph Unlimiteds need longer 8 to 10-mile circuits with up to eight pylons to keep the turns less sharp. Spectators at last year's Reno races—30,000 or so—did not approach the 100,000-plus turnouts of the old Cleveland days,

but were a sign that air racing has regained a solid popularity.

New breed coming

While the Unlimited class will still be dominated by hopped-up warbirds, a new breed of racer seems on the way—the all-out, built-from-scratch, strictly-for-racing original design. Many feel that aging warplanes have about reached their limit of performance through modification and new approaches are needed. The extremely specialized, custom-built raceplane is being reborn, using advanced technology old-timers would find hard to comprehend.

Some designs coming off drawing boards are highly imaginative. A most exotic one is the creation of airline pilot Dave Garber of Hialeah, Fla. A small, slim, superbly streamlined craft, it will have two engines, one in the tail with a pusher prop and one in the nose with a tractor prop. Only 20 feet long—compared to the 37-foot typical P-51—it will have just enough wing area to hold it up, and its canopy will be faired into its sleek, needle-nosed fuselage so that there will be virtually no canopy at all to protrude and cause drag.

Other unusual concepts proposed for the new Unlimiteds include such

radical departures as tail-first canards, delta wings and ducted-fan props. Another airline pilot, Anson Johnson, who won the 1948 Thompson in a P-51, is coming out of retirement with a delta-wing Unlimited powered by an automotive V8 driving a shrouded prop. Texas-based Jim Wilson is building a more conventional-appearing racer having the nostalgic looks of a 1930s speedster but with modern refinements. It will have an inverted V12 Ranger engine, thin, razor-sharp wings and use spoilers for roll control.

A new era

Today's new Unlimiteds are much less powerful than the mighty warbirds, but their small size, light weight and ultrastreamlining make up for the difference. Any day now some cute little 800-hp homebuilt racer will slip gracefully past the 3000-hp Mustangs and Bearcats, leaving them panting in its prop wash—and a new era will begin. Will it happen this month at Reno? The glorious warbirds are still the planes to beat. Pilots like Shelton, Greenamyre and McClain have the skill, class and experience to be tough contenders. Their magnificent steeds won't quit easily. ★★★

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LOW-COST FIREPLACES

(Continued from page 99)

stovepipe passes through wall or ceiling. You must protect this area from fire and heat by using a masonry thimble or a short section of insulated aluminum pipe. One end fits over the thin stovepipe; the other opens into the flue.

Prefabricated chimneys are expensive—each section is made from triple-wall, insulated aluminum—but they're easy to install and safe. Ends of the sections are threaded and the seams covered by overlapping flanges. If your location means venting up through the center of the house,

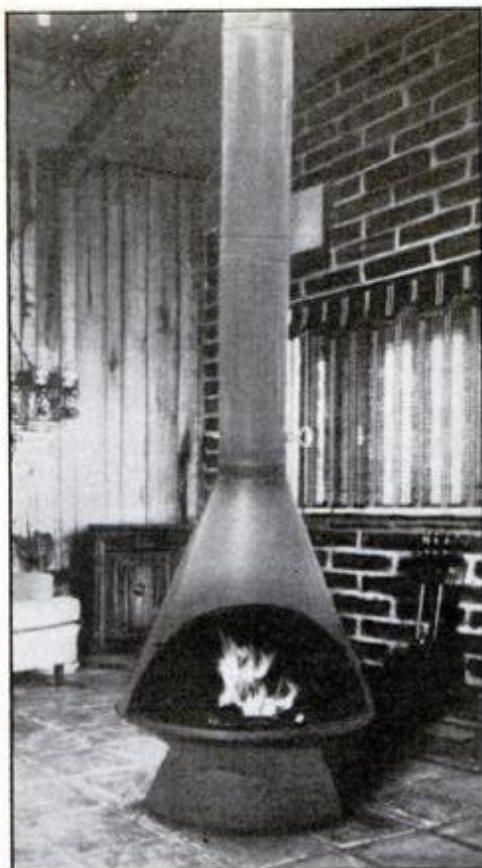


This French import is among 100 types of heaters carried by Preston Dist. Co., Whidden St., Lowell, Mass. 01852, plus spring aluminum stovepipe fins.

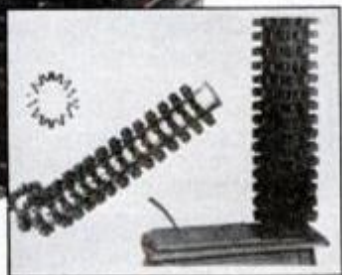
this is the way to go. Be sure your vent kit is complete, including a fire-stop spacer, angled flashing pan for the roof, storm collar and rain cap. A common accessory is a fake brick chimney cap that hides the aluminum pipe exposed above the roof.

Building your own flue

A masonry flue is good for an outside wall. You'll need a few bags of concrete (it comes premixed), four or five bags of mortar mix (also premixed) for joining the block, cement flue block and clay flue liners. Most lumberyards stock these. Just build one block on top of another with about a 3/8-in.-thick layer of mortar mix in between. Flue liners fit inside the block and are also joined with mortar. Make sure the seams of the stacks are staggered and check each

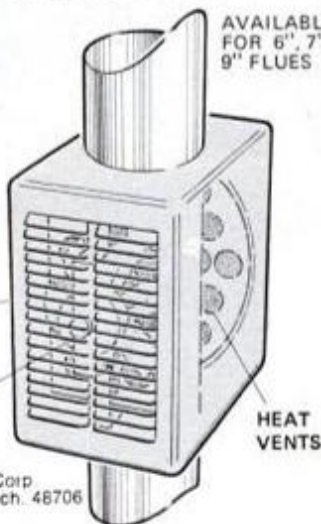


This modern cutaway cone fireplace comes in red, black and orange with a self-contained base; 12-gauge steel baffles protect the firebox interior. Superior Fireplace, 4325 Artesia Ave., Fullerton, Calif. 92633 and Baltimore, Md. 21237, also makes heat-circulating built-ins.



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AVAILABLE FOR 6", 7", 8", 9" FLUES



14-1/4" x
18-1/4" x
10-5/8"

FAN

HEAT
VENTS

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block with a level. String a plumb line from ground to roof; use it to lay the block neatly and evenly.

In all prefab units your first five or six fires should be small. It's hard to resist the temptation to fire them to the limit, but you should give the metal a little time to temper. Don't be surprised if you get some metallic odors at first. They will stop as your fireplace is broken in. Then you'll be ready for a winter of warm, cozy evenings, around the new heart of your home, the fireplace. ★★★

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Have you ever thought of operating a little mail order business of your own? Something you could start on a shoestring right from home in your spare time. It's a fabulous business!

Bob Carter of Newark, N.J. ran his first small mail order ad in House Beautiful magazine—offering an auto clothes rack. Business Week reported that his ad brought in \$5,000 in orders. By the end of his first year in Mail Order, he had grossed over \$100,000!

Another beginner—a lawyer from the mid-west, sold a mail order item to fishermen. Specialty Salesman magazine reveals, "he made \$70,000 the first three months!"

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ARROW FASTENER COMPANY INC.

271 Mayhill Street, Saddle Brook, N. J. 07662

TURN YOUR RV INTO A HOUSEBOAT (Continued from page 73)

suspense, we swung off through a truck-weighing station on our second day. The scale showed only a couple hundreds pounds over the float limit so we drained our water tank and ran the 36-gallon fuel tank low before pulling up to the launching Travelift at Harbor Light Marina, Lavonia, Ga.

Launching is easy

Launching proved as simple as driving aboard a ferry, and after chaining the vehicle to the deck and attaching fresh water and holding-tank lines, site manager Mark Callis

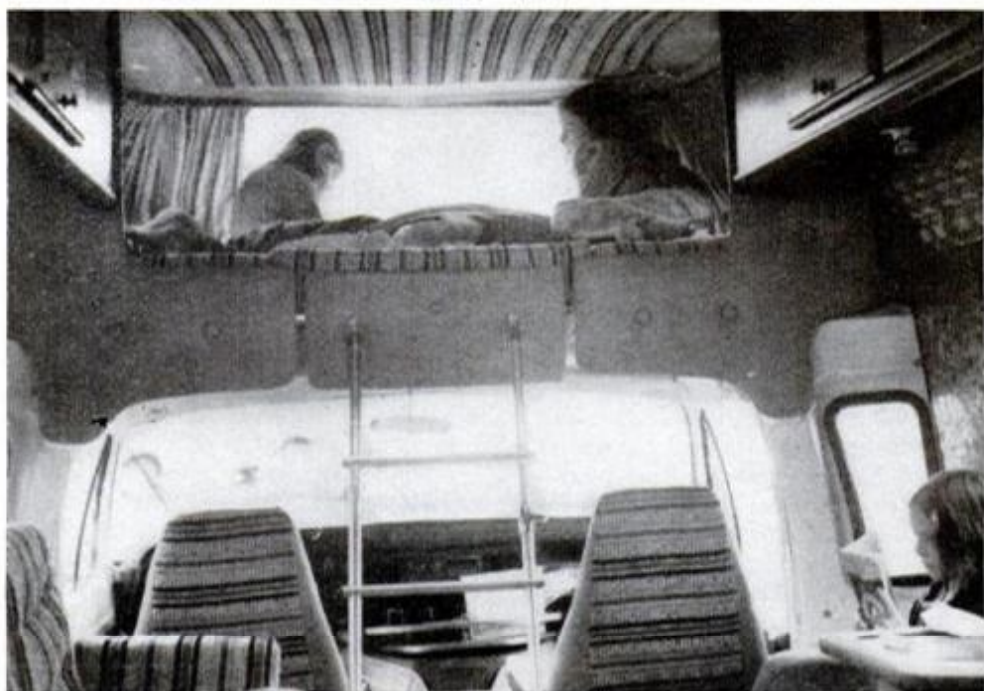
lowered us gently into the water. No problem! When Camp-A-Float creator Dick Reed designed this pontoon boat, he first studied *Popular Mechanics* several years to be sure there was nothing like it and then worked out a catamaran flotation system that meets all Corps of Engineers, Coast Guard and state health department requirements. Our full load floated with generous freeboard to spare, and Mark fired up the 65-hp Mercury outboard to back us out easily. Maneuvering the bulky rig proved quick to learn, and after fueling up we were on our own.

Charts of Lake Hartwell were supplied, along with life jackets for each passenger. The water was deep enough so that the bow of the shallow-draft boat could be nudged against the 962-mile shoreline almost anywhere and the anchor, we were told, was used only for an emergency. A boarding plank stowed in the bow is pulled out so that most places you step ashore without getting your feet wet. Mooring lines are run to trees to hold your "houseboat" in place.

Stopped in a snug harbor

Opening the throttle in open water, we found we were hardly a runabout, but didn't doubt the 12-mph speed claimed. But most renters, we were told, just like the great relaxation of easing along. Steering at the control console forward on the starboard side proved so easy that each child

Special luxury in new Travco 22x8-foot motor home is a bathroom behind kitchen (left) with a bathtub below the shower.



Cab-over compartment above driver's seat provides double bed for daytime relaxing and night comfort for two adults or three children. The ladder stows out of the way when not in use or can be rigged as a safety rail to keep small travelers in place.



Small control console at forward corner of deck gives excellent visibility while you steer 65-hp outboard mounted aft on transom. Speed is a respectable 12 mph.

got a turn. Then, well before sunset, we selected one of the many uninhabited and sheltered coves, eased in and tied up while the kids inflated the American Safety Pack Raft we had along, put on life jackets, and began exploring our little bay. The motor home's large gas refrigerator with freezer section provided ice cubes for drinks, cooking was simple on the stove, and the RV batteries provided plentiful light.

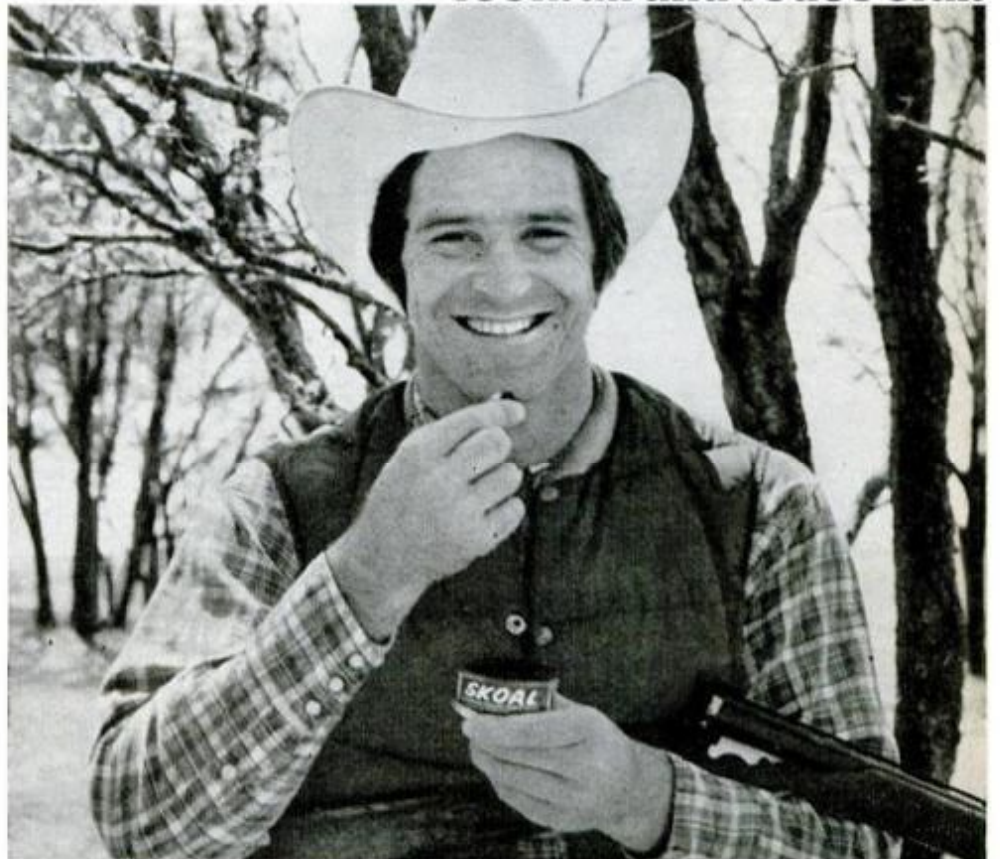
For a less complete RV rig, spare batteries can be rented, as well as the portable marine toilet required on these federal impoundments if your RV does not already have one or if you are tent-camping aboard. The Pop-Tent we had along provided a camping-out sleep shelter for the children at night and a cabana and playroom during the day. For extended cruises, a generator is available for rental, but its noise out on these unspoiled waters would be disturbing. The only nighttime sounds we noticed were splashing fish, hanging around to see if we'd offer them a line.

The Camp-A-Float boats so far are popular primarily for rental, although a basic craft could be bought for less than \$5000 or a fully fitted-out model with controls and ready for an outboard for under \$10,000. Lease-back sales are also arranged, but the primary appeal is for renters who reserve a boat months in advance as well as RV travelers who just arrive and want to give it a try. A toll-free call (800-435-2944) to the CAF Industries' Rockford, Ill., headquarters is all you need to make advance arrangements. Charges are about \$35 a day; \$225 a week.

"We just never knew boating could be so simple, living in our own camper," one returning couple told us. "Or so much fun." ★ ★ ★

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**Walt Garrison,
football and rodeo star.**



I'm a guy who loves tobacco, but I never take a puff. I use smokeless tobacco instead.

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**Smokeless tobacco.
A pinch is all it takes.**



For a free booklet that explains how to get the full enjoyment of "smokeless tobacco" — as well as a few free pinches that you can try for yourself — write to "Smokeless Tobacco," United States Tobacco Company, Dept. P99, Greenwich, Connecticut 06830.

of modern Turkey, Iran, Iraq and the Soviet Union. There are many mountains in the area.

But a special tradition attaches to Mount Ararat. This peak, rising majestically 16,946 feet from the plains of eastern Turkey is where the quest has been centered.

Most archaeologists believe that even if the story of Noah's Ark were literally true no remains of a wooden ship could possibly have survived. Yet Ark-hunting expeditions to Mount Ararat are launched regularly, primarily by American biblical fundamentalists. Skeptics have called the searchers Arkeologists, and they have cheerfully adopted the title.

The quest is filled with rumors and tantalizing hints.

A 1916 Russian expedition was supposed to have found the remains of the Ark, but the accounts are confused and have been impossible to confirm. A series of photographs of the Ark or something, taken by an American flying over Mount Ararat in a helicopter in 1953, have been the subject of much speculation. Many people said they had seen the pictures, but the man who took them died in 1962. No trace of the photos can be found.

An orbiting satellite is said, to have photographed an "anomaly"—that is, something odd—on Mount Ararat in 1974. Some thought this might be the Ark, but it never checked out.

The most controversial evidence is a piece of petrified wood found in 1955 by Fernand Navarra. Navarra was convinced it was a piece of the Ark. One laboratory radio-carbon dated the wood as 5000 years old, old enough to be from the Ark. Other laboratories found the wood to be only 1200 to 1400 years old.

Currently the Turkish government is discouraging foreign expeditions to Mount Ararat—it's in a politically sensitive area. As soon as restrictions are lifted, there is no doubt the Arkeologists will be back.

THE LOCH NESS MONSTER

The hottest quest going in 1976 is the quest for the Loch Ness monster. Tales that a large unknown beast dwells in Scotland's deep, dark Loch Ness have been around for centuries. The outside world didn't pay much attention until the 1930s. Then there were a series of spectacular sightings of an unknown "something" by a variety of reliable witnesses.

In 1933 a London surgeon vacationing in Scotland took a picture of what appeared to be the long neck

and small head of an unknown creature. It is still the best-known and clearest Loch Ness monster photograph.

Since then the search has had its ups and downs. Sightings continued, but there were no good pictures until 1960 when Tim Dinsdale took a brief film of what he thought was the monster. Five years later photographic experts in the Royal Air Force examined Dinsdale's film and concluded that it probably showed a living thing that might be as much as 90 feet long. That brought many monster watchers to Loch Ness. There were more pictures and sightings, but nothing conclusive.

If it exists, the Loch Ness monster rarely sticks its head above the surface. Attempts to photograph it underwater have been frustrated by the murkiness of the water. Attempts to use small submarines in the loch failed. Sonar produced some intriguing but ambiguous readings.

In 1972 an advanced underwater camera got a shot of what appeared to be a flipper-like object. In 1975 better underwater photographic equipment was used and two significant photos were taken. One shows a close-up of what may be the head of an unknown animal, the other what may be its head, neck and body.

In order to see much of anything, the 1975 photos had to be enhanced by computer processing. The same system is used with many space probe photos. These pictures have generated new interest in the Loch Ness monster. Respectable scientists like Harvard Biologist Dr. Alfred W. Crompton find the evidence "sufficiently suggestive of a large aquatic animal" to ask for more investigation. Biologist Dr. Roy P. Mackal is quite convinced there is an unknown animal in the loch, probably some sort of prehistoric reptile.

This year the loch is swarming with well-equipped investigators, and the long search may be nearing a conclusion.

BIGFOOT

There may exist an unknown creature, or creatures that we call Bigfoot, the Abominable Snowman, the Yeti, the Sasquatch or a dozen other names. We can identify this creature, whatever its name, by its characteristics. It is wild, hairy, very strong, lives in mountainous or at least deserted places, and is nearly but not quite human.

The modern quest for this creature can be dated from 1925. A photographer with the Royal Geo-

(Please turn to page 146)

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7 GREAT QUESTS OF MAN *(Continued from page 144)*

graphical Photographic expedition in the Himalayas sighted what he thought was one of them in the mountains of Sikkim. Twenty-six years later the British mountaineer Eric Shipton photographed what looked like large apelike footprints in the snow on the slopes of Menlungtse in the Himalayas. There were, in addition, many reported sightings.

In 1969 Sir Edmund Hillary, the conqueror of Everest, led a large expedition to the Himalayas in search of the Abominable Snowman. Hillary found nothing, and came back convinced that it did not exist.

But rumors of a similar creature in the mountains of Northern California, Washington and Western Canada were circulating more frequently. Here the creature was often called Bigfoot because of the enormous footprints that it left.

In October 1967 Roger Patterson and Bob Gimlin, a couple of freelance monster hunters, photographed what they said was a seven-foot, two-legged hairy creature striding through the woods in a wilderness area northwest of Eureka, Calif.

Scientists who examined the film were cautious. John Napier, a primate expert from the Smithsonian Institution, put it this way: "I could not see the zipper and I still can't."

Ambiguous or not, the Patterson-Gimlin film stirred up an enormous amount of interest in Bigfoot, and has made it more famous than its Asian cousin. Stories of similar creatures have now been reported from places like Florida and Wisconsin. Such stories must be taken with a grain of salt—many of them, at least.

The western Bigfoot, however, has been the object of intensive searches by monster buffs. A California company even packages Bigfoot expeditions. No spectacular new evidence has turned up recently, but the searchers are ever hopeful.

OAK ISLAND

Oak Island, a small island on Mahone Bay off the coast of Nova Scotia is the site of what has to be the most frustrating quest of modern times. There may be a treasure on the island. People have known where the treasure is buried for nearly 200 years. But it is so cleverly protected that all attempts to recover it have been foiled.

The quest began in 1795 when 16-year-old Daniel McGinnis found evidence that someone had buried something in a clearing on the island. His imagination fired with thoughts of buried treasure, the

boy induced two friends to come back to the island with him. They began digging. Ten feet down they hit a layer of oak logs. Twenty feet down was another layer. Thirty feet another layer. Clearly someone had buried something and then gone to a lot of trouble to protect it. Thirty feet was as far as the teenager and his companions could go with picks and shovels.

It was nine years before McGinnis could return with more helpers and better equipment. This time the excavation went down nearly 100 feet. Every 10 feet there was another log platform. Then the pit flooded. Later it was discovered the pit was connected to the beach by two underground tunnels. It had been designed so the shaft would flood if anyone dug below the 100-foot mark.

This was only the beginning in a long series of failures to discover the secret of what came to be called the Money Pit. Whether that name refers to the treasure or the several million dollars spent trying to get the treasure out is unclear. Expeditions always ran out of money before they could find much of anything.

In 1897 a drill brought up three small gold links, and a tiny piece of parchment. Some think the drill actually penetrated the treasure chest. Since then the chest, if there is one, has shifted position in the waterlogged soil. Later drillings were unable to locate it precisely. No one has the faintest notion of what is in the pit. Theories range from Captain Kidd's treasure to the crown jewels of France.

Currently the treasure hunting on Oak Island is in the hands of a syndicate of Canadian and American businessmen. You can't dig on Oak Island yourself, but you can visit it. The Nova Scotia Department of Tourism runs tours for \$1.50 each, lower rates for families and groups.

THE ANCIENT ASTRONAUTS

Did visitors from other planets come to earth in ancient times? Recently, yes has become a very popular answer to that question.

Some have seen certain ancient monuments and decided they couldn't or wouldn't have been built by people who had only primitive tools. They must have had help from extraterrestrials with superior technology.

The most suggestive of all the monuments are the lines and figures of the Nazca desert on the coast of Peru. There was nothing difficult about making these lines and figures. They were made simply by removing

(Please turn to page 148)

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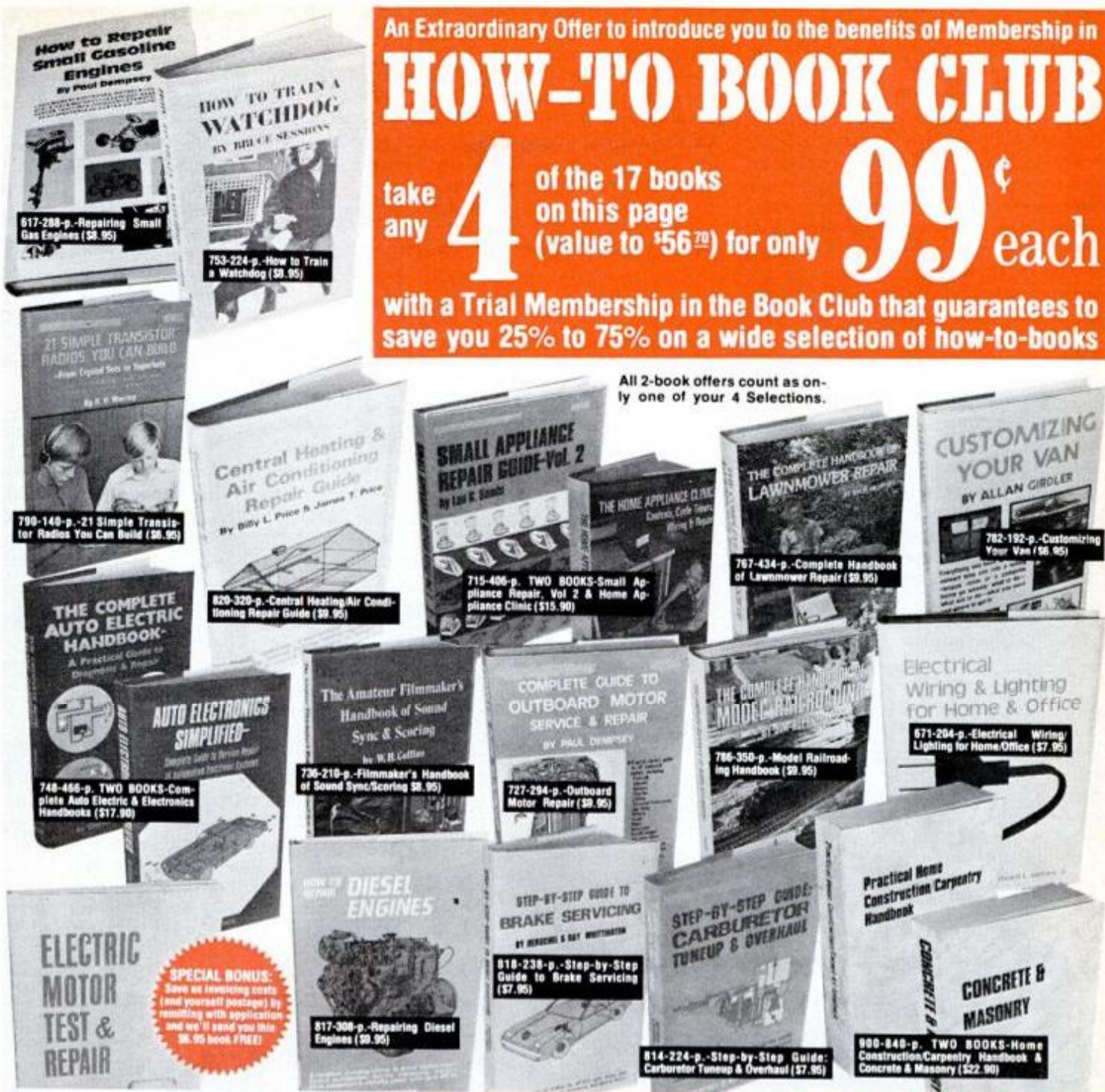
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7 GREAT QUESTS OF MAN

(Continued from page 146)

the surface rocks exposing the lighter gravel beneath.

Since it never rains in this desert, the lines and figures could last almost forever. Scientists estimate they were made some 1500 years ago. They are fascinating because no one can figure out why they were made. The lines start nowhere and end nowhere. The figures are huge, so large that they can only be appreciated from an airplane. Yet they were made in a time when there were no airplanes. Why would anyone take the time and trouble to make drawings they could never see?

Orthodox scientists contend that the drawings were made for the gods who lived in the sky. Supporters of the ancient-astronaut theory say the gods were spacemen, and the figures and lines may have been used as landmarks for incoming spaceships.

They point to such monuments as the Gate of the Sun at Tiahuanaco, also in Peru. This enormous structure, they say, could not possibly have been raised by people who had only ropes and levers.

Throughout South America and in other parts of the world, supporters of ancient-astronaut theories keep coming up with pictures, hundreds or thousands of years old, that look like people in space suits.

Practically every nation has legends of gods that came from the sky. These are no mere exercises of primitive imagination, say ancient astronaut theorists. Though now encrusted in fabulous detail, the legends were once factual accounts of the arrival of visitors from outer space. Supporters of this theory are scouring the earth for more, and they hope conclusive, evidence.

INTELLIGENT LIFE IN SPACE

Ask most scientists what they think of the ancient-astronaut theories, and they will just snort at you. But that doesn't mean that they don't take the subject of intelligent life in space seriously. They do. They are now trying to contact extraterrestrial civilizations. That is the last, and perhaps the most exciting, quest of all.

The first genuine scientific attempt to find intelligent life in outer space was Project Ozma in 1960. Dr. Frank Drake, director of the National Radio Astronomy Observatory at Green Bank, W. Va., turned his radio telescope on two likely looking stars in an attempt to pick up what might be intelligently controlled radio signals. The project lasted two weeks and the results were negative. Ten years later two somewhat more ambitious but similar projects were launched: one in the United States; the other in the Soviet Union. Once

again the results were negative. But the scientists are not discouraged.

On March 3, 1972, Pioneer 10 was launched from Cape Kennedy. It became the first man-made object ever to leave the solar system. Aboard the space probe is a gold-covered aluminum plate with drawings of a nude human male and female and a number of diagrams that scientists feel should be intelligible to any advanced civilization anywhere in the galaxy. Astronomer Carl Sagan, who conceived the project, acknowledges that the chance an intelligent extraterrestrial will find this tiny probe in the vastness of space is slight. It is very much the note-in-the-bottle approach.

Scientists believe that chances of radio contact are far better than a space-probe approach. Sagan has pointed out: "It is an astonishing fact that the great 1000-foot-diameter radio telescope of the National Astronomy and Ionosphere Center, run by Cornell University in Arecibo, Puerto Rico, would be able to communicate with an identical copy of itself anywhere in the Milky Way Galaxy . . . We can communicate over tens of thousands of light years, into a volume containing hundreds of billions of stars."

The message may be picked up as the result of a deliberate project like Ozma, or by accident. It may happen a thousand years from now, or tomorrow. But scientists are convinced that the quest for intelligent life in space will someday be concluded successfully. ★★★

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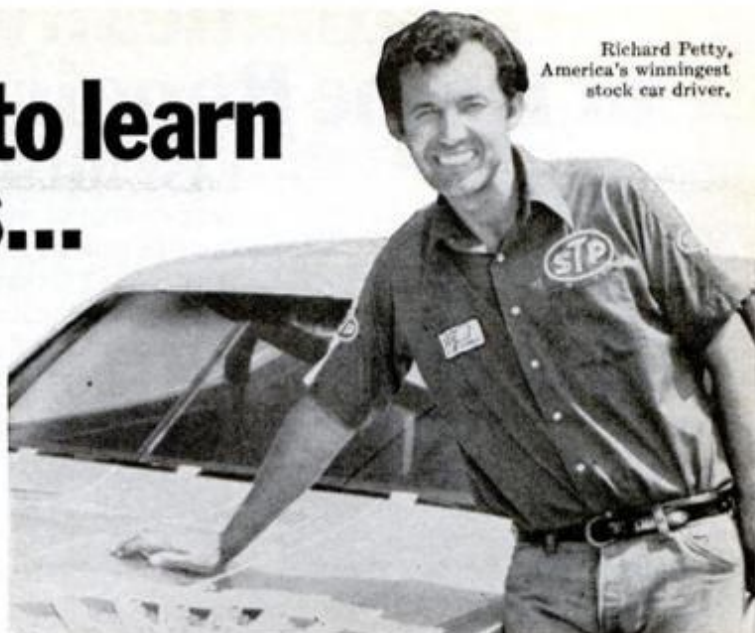
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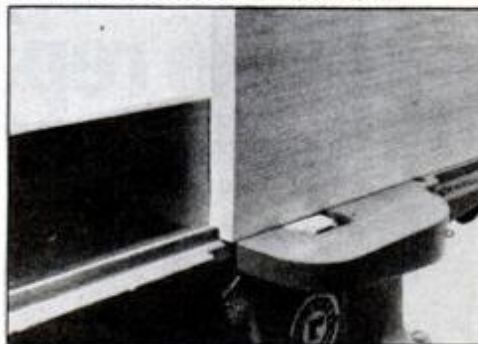
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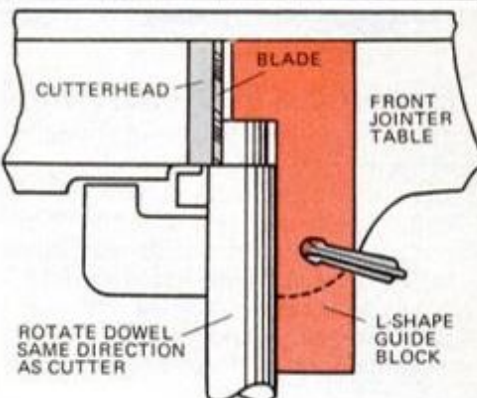
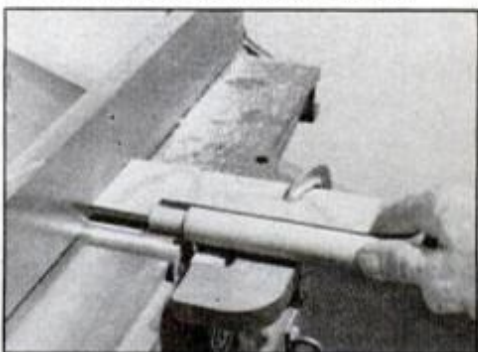
(Continued from page 119)

9 Big and little rabbets



When the job calls for a rabbet that must be made by planing, it's a simple operation for a jointer whether it be an edge rabbet or a surface one. You simply position the fence to set the rabbet's length (or width) and adjust the front table to set its depth. Rabbet depth is limited, of course, to the rabbet ledge on your particular machine, and when the depth required is greater, you will be forced to cut such rabbets on your table saw. An extra smooth rabbet can be cut with a hollow-ground planer blade. Certain dado cutters will produce a smooth rabbet too. In the case of a dado cutter, it's often necessary to add a wood facing to the saw's fence.

10 Shouldered tenons



A notched block clamped to the rabbeting ledge of a jointer permits cutting round tenons on round stock. The position of the clamped block sets the length of the tenon, while the front table adjustment determines the depth of cut. To turn a tenon, push the work into the spinning cutter from the side and then slowly rotate the work in the same direction of rotation as the cutterhead.

(Please turn to page 154)

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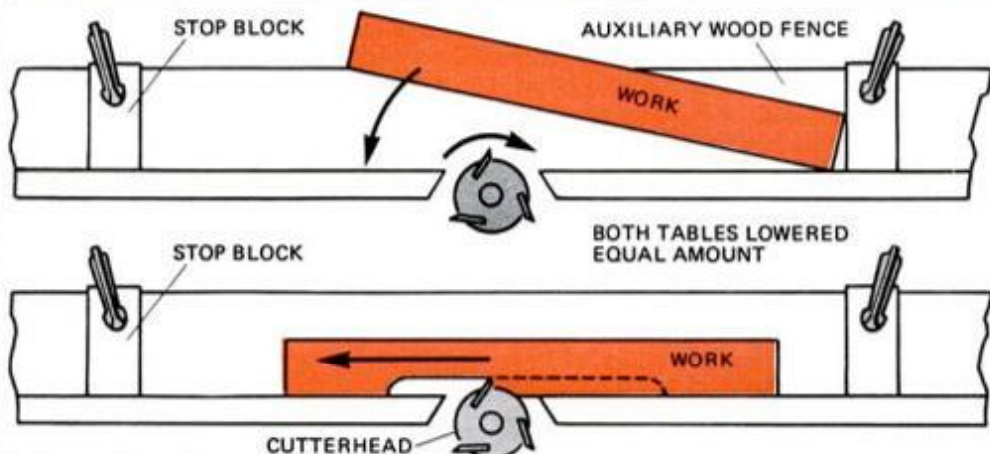
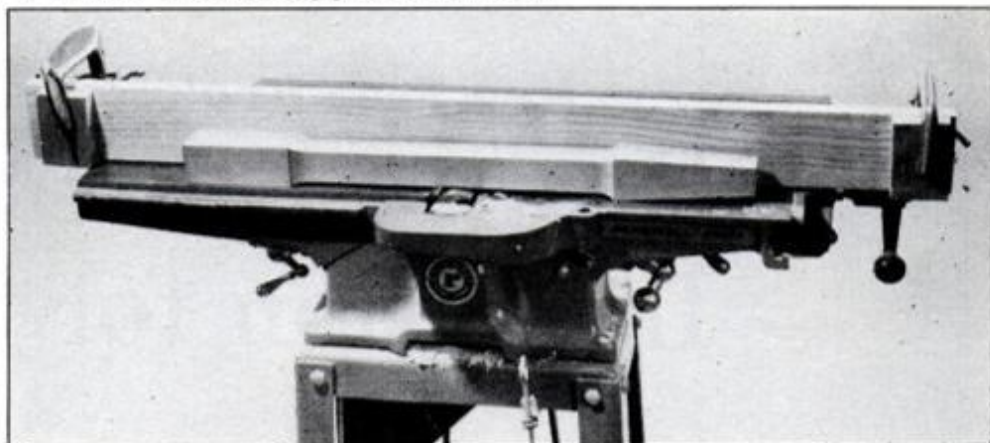
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13 BONUS JOINTER TRICKS (Continued from page 152)

11 How to cut stopped chamfers



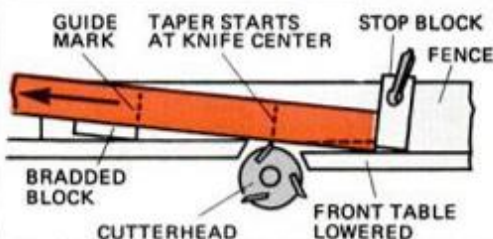
A stopped chamfer can add an interesting shape to a square chair leg. Here's how it's made on a jointer. Lower the front and rear tables equally. Then clamp start and stop blocks to an auxiliary wood fence to limit the length of cut. Place the end of the leg against the front-table stop block and start the machine. Lower the raised end of the work into the rotating cutter and advance the work until it touches the rear-table stop block. Be sure the front-table stop block is clamped securely in place because there is a forceful kick-back thrust to the work at the start of the cut.

12 How to make bevels



Bevels are cut by running work against a tilted fence in an "in" or "out" position. The outward tilt shown is safer because fingers are in full view. When working with wild grain, an inward tilt is needed for a smooth cut. Several passes with adequate downward and sideward pressure are usually required to plane a full shape.

13 Tapering square stock



To short-taper the four faces of square stock, you pull the work over the cutterhead. Lower the front table to suit the amount of taper. Then mark stock where the taper is to start and center mark directly over the cutter. Press down so the corner of work contacts the front table and slip a block under the raised end on rear table to hold work at an angle. Mark block location on each face with a try square, then lightly brad block to one face. To start cut, rest front end against a clamped block that prevents kickback and assures the same starting point for each pass. Rebrad block to the work for each of the four cuts.

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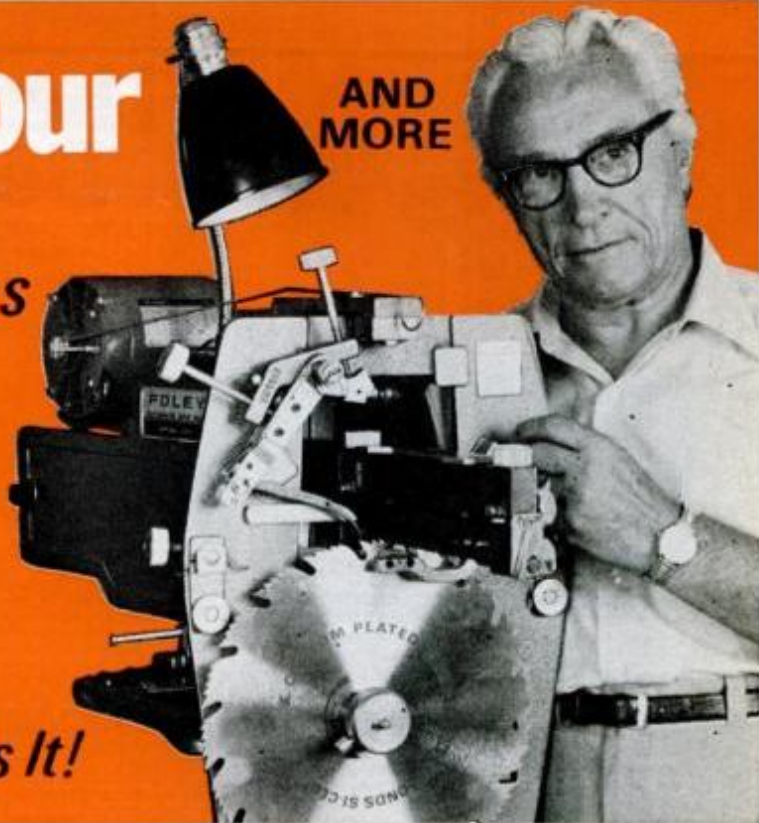
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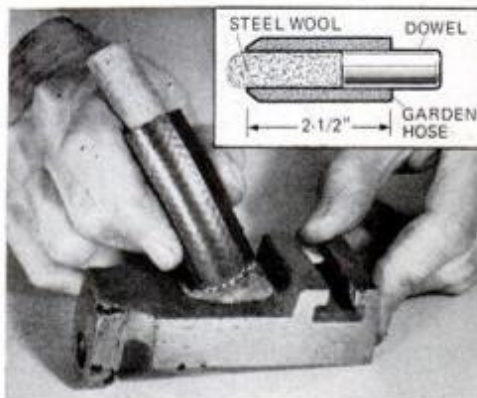
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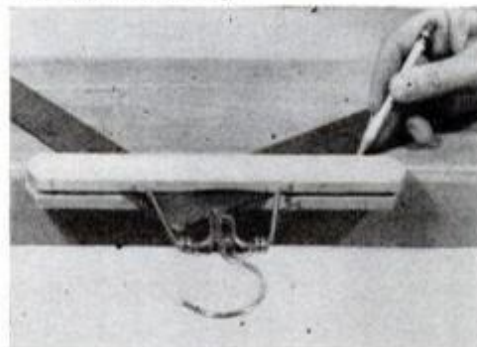
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Safe steel-wool holder



Holding steel wool for smoothing small areas without fear of getting bits in your fingers is no problem with this simple holder—a piece of garden hose and snug-fitting dowel plug. In use, the steel wool is packed tightly in the hose and fed from the end as needed by pushing the dowel forward.

Readymade stop



Used with a framing square when laying out stair stringers and similar work, a spring-type trouser hanger makes a dandy adjustable clamp-on depth stop.—Ken Patterson

Double-duty board



Attach a spring paper clamp with a short screw to a small wooden cutting board and the board will serve as a handy clipboard for your shop when not being used for cutting.



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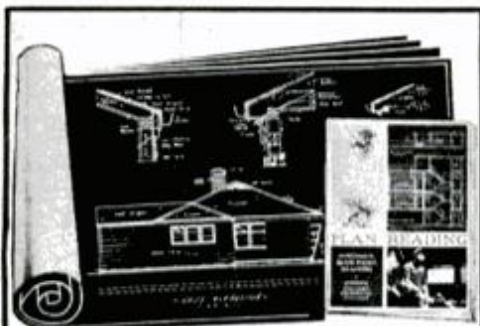
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You don't have to like or hate the looks, although some owners do both. Most are neutral, though.

This is one reason Volvo owners don't trade often.

Packed engine compartment adds to do-it-yourselfer frustration.

Repeat customers reached nearly 20 percent in our survey.

Forget luxury, say some owners, and get us back to the basic car Volvo used to be.

PM OWNERS REPORT: VOLVO 260

(Continued from page 115)

the road ahead from the back seat, and that's important."

Volvo's styling managed to stir up controversy. It ranked fairly low on the scale of "Specific Likes" (17.9 percent) but topped the list of items owners would like changed. Typical comments: "Shape of the station wagon is too boxy."—California photographer. "If BMW and Mercedes can make good-looking cars, why not Volvo?"—Oregon pharmacist. "I wish they'd give us a more stylish design and a greater selection of colors, inside and out. Right now, you can have any color of leather upholstery so long as it's tan or black."—Virginia telephone supervisor.

On the other side of the styling coin, "... the design won't be out of date in a hurry," observes a California printing foreman, and an Ohio school teacher notes, "Part of the reason there's so much space in the trunk is because it's a big box."

One recurring complaint: "The price is too high."—New Jersey retiree. Owners repeated that opinion again and again, adding such comments as, "I'd like a little more luxury from a car that lists for \$10,640."—Washington senatorial aide. And "Repairs and parts are too expensive."—New York dentist.

Volvo service took good marks overall, with 78.9 percent rating it *good to excellent*. None of our respondents repaired their cars themselves, though. A New York motion picture equipment salesman noted, "The new V6 engine is very difficult and costly to work on. Also, the manufacturer will not supply owners with a mechanic's manual, so it would be impossible for me to do my own maintenance."

Some 265DL wagon owners noted that the third seat lacked room. But, said a New York matron: "It's comfortable for a small wagon, has four doors (rare these days), and shows better quality than the competition."

Volvo advertises its cars as long-lasting, a point not lost on owners. An Illinois salesman writes, "My Volvos have proven out over the years. This is my sixth since 1965. They're the most comfortable and reliable cars I've ever owned. I trade because I put over 20,000 miles a year on my cars."

Gas mileage disappointed some drivers. Little wonder, really, because the EPA figure for over-the-highway mileage beat what our owners reported by a hefty 9 mpg. If Volvo salesmen quoted the EPA figure (and it's reasonable to assume some did), the disappointment is not surprising.

All in all, though, Volvo buyers appear well pleased with their purchases. The attributes Volvo takes pride in—quality, workmanship, longevity, safety, efficiency, size, easy handling and general economy—these are exactly what owners hold in highest esteem. Some quibble with what Volvo calls luxury, and a few buyers would prefer a less accessorized car than the DL, giving them a chance to buy a new Volvo at a lower price.

Most owners plan to keep their cars for a long time, and nearly 80 percent will make a Volvo their next car. ★ ★ ★

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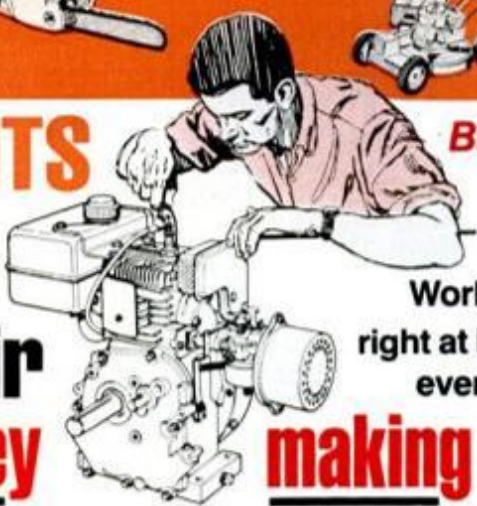
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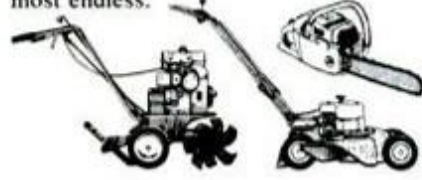
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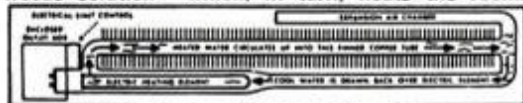
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HINTS

FROM READERS

From cartons to bins

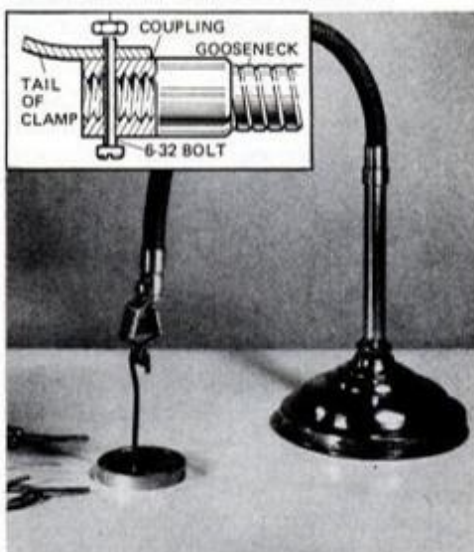


Cut as shown and ganged together on their sides, quart milk cartons make neat bins for storing anything and everything on a workshop shelf. Each is labeled for a quick check of contents.—R. P. VanGerpen

Wet stencil adheres better

A plain paper stencil will hug the surface and prevent under-spray if you dampen it before applying. Place it on the surface, then pat with a soft cloth to remove excess water and press in place. If the same stencil is used repeatedly, dampen it occasionally.—Rick O'Shea

Three hands better than two



A discarded gooseneck desk lamp can become a useful "third" hand for solder work and the like. Simply unscrew the shade, drill a hole through threaded end of the neck and bolt on a battery clip. —Mike McMullen



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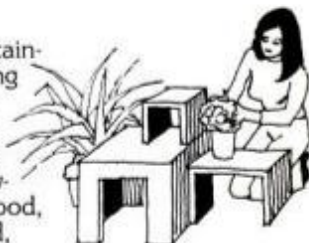
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OVERHAULING DRUM BRAKES

(Continued from page 116)

brake system mentioned. However, there are variations from year to year, so close observation during disassembly will pay off. Information here will guide you.

1. When you have drums miked and turned (see Part 1), have the brake shop match each new lining to its respective drum by grinding it to the drum's micrometer reading. This eliminates high spots and assures linings will make full contact with drums. However, as noted last month, high-quality brake linings are generally preground by the maker, so this may not be necessary.

2. In the case of Bendix brakes, hook the adjusting lever into the hole in the secondary shoe web. Wagner self-adjusting brakes should have the adjusting lever placed in the secondary shoe web with the slot in the lever engaging to the full depth with the slot in the shoe web.

3. Lay brake shoes on a clean surface in correct mounting position. Connect the lower spring between the shoes. On Bendix brakes, the spring is connected between the primary shoe and adjusting lever. Engage the adjusting mechanism.

4. Carry the assembly to the car and place it on the brake backing plate, engaging the brake cylinder (drawing 3). Position the shoes' webs on the anchoring unit.

5. On rear brakes, spread shoes slightly, reinstall parking-brake strut and springs and rejoin parking-brake lever to the secondary shoe.

6. On all brakes except Delco-Moraine, reinstall the shoe retaining parts. On Delco, do this after installing the rest of the self-adjusting mechanism.

On units with hold-down springs, push the hold-down pin through the backing plate and shoe, and hold pin in place. Grasp the hold-down spring and cup with pliers, place the spring on the pin, and give the pin a quarter turn to lock it in place (drawing 4). If spring clips are used, compress the clip and snap it in place on the pin.

If brake hold-down devices are tension-type retaining pins, fit the spring-retaining clip through the backing plate and use a small punch to extend the spring, hooking it on to the retaining clip.

7. Install the rest of the self-adjusting unit as follows:

On Delco-Moraine brakes (drawing 5), hook one end of the actuating link over the anchor pin or on the anchor plate if plate is bolted on.

(Please turn to page 166)

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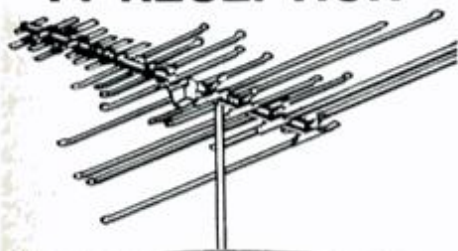
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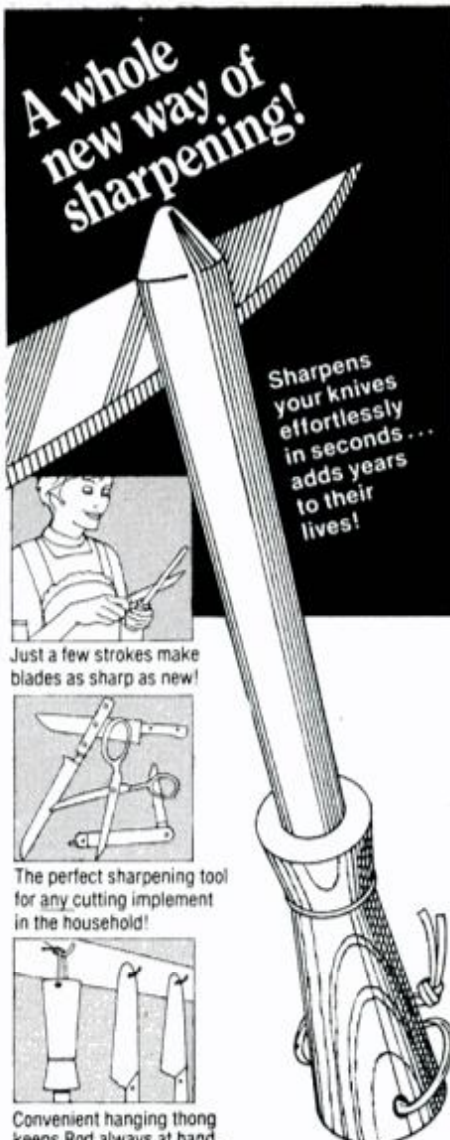


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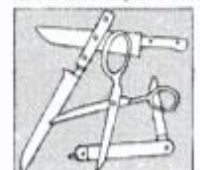
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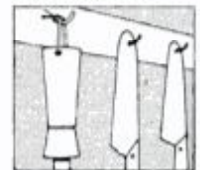
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OVERHAULING DRUM BRAKES

Continued from page 164

Hook the other end to the lever and pivot assembly. Position the lever on the secondary shoe, placing the lever return spring between the lever and shoe. Install the sleeve, then the hold-down parts.

On Bendix brakes (drawing 6), install the cable guide on the secondary shoe, hook one end of the cable on the actuating lever, run the cable around the guide, and slip the cable eye over the anchor pin.

On Wagner brakes (drawing 7), bolt the crank to the secondary shoe. Install offset ends of the links onto the crank holes. Hook upper link over the top groove in the anchor pin. Lift the adjusting lever slightly, and hook bottom link to the lever.

Important: Defer installation of the upper link until you install shoe return springs since it is installed on the anchor pin *over* the spring.

8. Install shoe return springs. Hook springs to shoes first and then attach them to the anchor assembly using a spring installation tool. Spring installation varies, so examine springs before removing them. On some cars, springs hook directly to anchor plates. On others, the secondary shoe return spring attaches to a hook on the actuating link rather than to the anchor pin or plate.

■ To finish your brake job, use a drum-to-brake shoe clearance gauge to check drum's inside diameter. Tighten the lock crew (drawing 8).

Turn the tool over and fit it over the brake shoes. You will probably have to expand the shoes manually by turning the star wheel to get the linings to extend to the gauge. The gauge should just slide over the linings. That's a proper fit (drawing 9).

Reinstall brake drums and tighten the parking-brake equalizer until there is tension on brake cables. Apply and release the parking brake to check its operation. Be sure there is no drag on the rear wheels when the lever is released.

Road test

Before moving the car, check for ample brake pedal. Now drive the car forward about 200 feet, stop, then back up 200 feet. Do this a few times, coming to a complete halt each time. Brake pedal reserve should come to a normal position. If not, something is fouled up with the automatic adjusting mechanism, so check it. On the road, give linings and drums a chance to mate with each other. ★★★

TAILGATING

(Continued from page 87)

the one that caught Martin Raymond is set. Any traffic condition that causes a sudden slowdown can trigger that most spectacular and massive of highway disasters—the chain-reaction pileup.

The world's record for such a disaster was "The Big One" of Feb. 28, 1975, on the Riverside Freeway near Corona, Calif. (For a full account of this accident, see *World's Biggest Highway Crash*, page 55, July '75.) On that fateful February morning it was still dark as heavy commuter and truck traffic roared along the Freeway in both directions. Fog suddenly thickened, and the leading drivers were forced to slow down. Following vehicles plowed into them, and then into each other, in a long series of rear-end collisions that seemed almost endless. When it finally was over, highway police estimated that 300 cars and trucks had crashed in the massive tangle.

Two days later on March 2, 1975, the Riverside Freeway was again turned into a mile-long junkyard as another dense fog caused the smash-up of 120 cars and trucks. These California spectaculars with their casts of thousands, however, are but especially grim examples of an all too common daily occurrence—the rear-end collision.

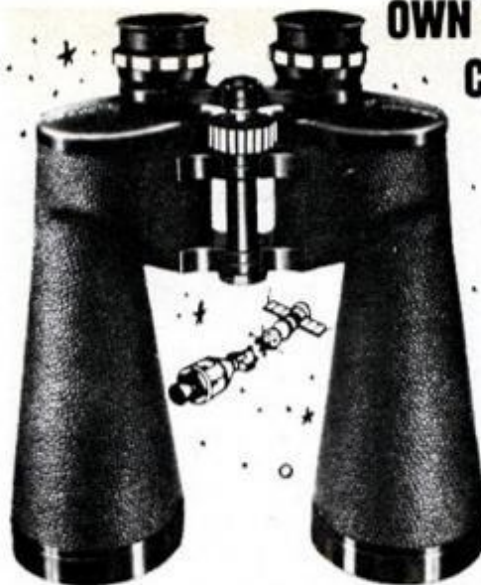
Moving danger zone

As you drive along, a danger zone moves with you. This zone includes the distance in front in which you can't stop and the distance in back in which a following driver can't stop. The important thing to remember is that multiple chain-reaction collisions almost invariably involve two separate and potentially devastating crashes—you pile into the car ahead and someone behind piles into you. If the first doesn't kill you, the second may.

At 55 mph with good brakes and tires on a dry, level, paved surface, it takes 230 feet—about 13 average 17-foot car lengths—to stop. And that's *after* you've applied the brakes. Reaction time—that critical period it takes your mind to react to danger and your foot to get on the brake—increases the distance. At 55 mph, a car covers about 80 feet every second! Add any adverse conditions—worn tires, poor brakes, slippery road surfaces—and you multiply your stopping problems.

Yet many drivers feel that two or three car lengths are an adequate space cushion and gamble their lives

(Please turn to page 168)



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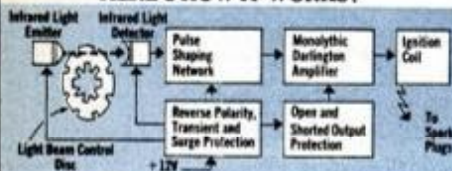
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TAILGATING: THE ACCIDENT WAITING TO HAPPEN

(Continued from page 167)

—and yours—on that assumption. Henry Baldwin, a "two-car length" driver, learned the folly of this the hard way. A vehicle he was closely following suddenly swerved to avoid a trailer truck stalled in the right-hand lane. The first vehicle missed the truck; Henry didn't. He slammed into the rear end and the car continued on under the truck body until stopped by the trailer's rear axle. Only the long hood on Baldwin's big Olds Ninety-Eight saved his life and his wife's life. In a smaller car, they would have been decapitated. (Note: In the incidents cited here, names have been changed to protect privacy, but the facts are authentic and come from actual police records.)

Those strange laws of physics

Stopping distances are governed by the physical laws of energy in motion, called kinetic energy. This energy is what brakes must cope with—and is what causes accidents when they can't. Kinetic energy varies with the square of the velocity. It increases *four* times when speed is doubled. Tests show that the stopping distance at 50 mph is about 11 car lengths. At 70 mph—only 20 mph faster—this distance jumps dramatically to about 31 car lengths—almost three times greater.

This dangerous increase in stopping distance and the cumulative effect of delayed reaction time are the critical factors that make it mathematically impossible to avoid a rear-end collision without proper precaution. One clear April evening in 1972 a cluster of four closely spaced cars sped northward on Los Angeles' Harbor Freeway. The first driver saw congestion ahead and braked to a stop. The second stopped closely behind him. The third, with screeching tires, just barely managed to stop, too—but this didn't save him or the rest. Car four, unable to stop, crashed into him and forced all the cars into one another.

Because each following driver had to wait for the car ahead to put on its brakes before he could in turn apply his, each had to brake harder and more abruptly, and the available time and distance for each progressively lessened. Finally, poor tail-end Charley just ran out of space, wrecking not only himself but everyone else. That's the terrible thing about chain-reaction pileups—everyone gets hurt, the innocent as well as the guilty.

Even a valiant and successful

attempt to avoid a rear-end collision can itself cause another type of accident. In one dramatic example, shown in an accompanying photo, a driver slammed on his brakes to keep from hitting a car ahead. He succeeded, but threw himself into a spin, struck a curb and rolled over, sustaining serious injuries.

Worse—speeding or tailgating?

While speeding and tailgating are obviously closely related, tailgating has been found to be a major cause of more accidents than pure speeding alone. According to statistics compiled by the Pennsylvania Bureau of Accident Analysis, following too closely resulted in 38,697 accidents during 1974 against 20,603 caused by speeding—almost double. And the majority of these accidents were caused, not by flagrant tailgaters, but by well-intentioned, competent drivers merely unaware of what they were getting into.

How not to be a statistic

How can you avoid contributing to such statistics? High-speed highway driving involves a question of relativity—the relationship of one moving vehicle to another. You need to be able to slow down in synchronization with the car ahead. He can't stop cold and neither can you. The problem is, when you see his brake lights come on, he is already in his braking phase, while you are just starting your reaction phase.

To allow for this, the generally accepted safety rule in the past has been to maintain at least one car length between following vehicles for every 10 mph of speed—or, say, about five car lengths at 50 mph. But this simple rule of thumb has proven to be woefully inadequate because stopping distances don't increase along a straight arithmetical line—they jump startlingly in a geometrical progression, as we have seen. Five car lengths at 50 mph would give you a stopping distance of about 85 feet, again assuming perfect conditions. But the actual stopping distance at 50 mph is over 185 feet—or 100 feet more.

Recognizing this, the National Safety Council has already recommended that the old rule of thumb be doubled, or two car lengths for every 10 mph of speed. But a separation of 10 car lengths at 50 mph in today's heavy highway traffic densities is not always possible, practical or even safe. You drop back to what is supposedly a "safe" distance and someone else cuts in

front to fill the gap. You drop back again and another car cuts in and so on. This increases the possibility of lane-changing mishaps as well as rear-end collisions.

A new rule to follow

Perhaps the best safety rule to follow is a newer system advocated by the National Safety Council. This is to allow at least two seconds of time between you and the car ahead at highway speeds. How do you do this? It's easy, says the Council. Use a road sign, tar strip, light post or any fixed object near the road as a reference point. As the rear end of the car ahead passes the check point, start counting "one thousand and one, one thousand and two . . ." Each count very closely approximates a one-second interval, so the front of your vehicle should not pass the same check point before you have finished counting "one thousand and two."

This will give you a two-second separation, which at 55 mph provides a reasonable stopping distance of about 160 feet. This procedure is not as complicated as it may sound and will soon become automatic, instinctive and easier than trying road ahead clearly, wait for a good, long straight stretch, then pass to estimate car lengths. Of course, under especially hazardous conditions involving rain, snow, ice or uneven pavement, you should increase your count, allowing more separation.

Little time is lost

The system does not eliminate the cutting-in problem, but does help to reduce it somewhat over the more impractical car-length method. In any case, as annoying as it is to have someone cut in front of you, remember one amazing fact: Figures show that at average highway speeds, even if you are cut in on once every 30 seconds, requiring you to momentarily slow down, your trip will not be lengthened by more than a minute for every hour of driving!

So it simply doesn't pay to tailgate or to get upset if someone steals your safety cushion. Avoid the temptation to compete with, or retaliate against, the driver who wants to get ahead of you. Let him go—you'll get there almost as fast, and more likely in one piece. On single-lane roads where passing is difficult, don't ride the tail of the guy ahead—he's just blocking your view. You're much better off to hang back where you can see the

(Please turn to page 170)



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TAILGATING: THE ACCIDENT WAITING TO HAPPEN

(Continued from page 169)

road ahead clearly, wait for a good, long and straight stretch, then pass in safety.

Earle P. Brown is a Certified Safety Professional with the United Services Automobile Assn., one of the world's largest insurers of cars. "An unmistakable mark of the defensive driver," he says, "is his skillful use of brakes. He has mastered the fine art of 'stream-flow' driving. While all around him brake lights are flashing and tailpipes spew acceleration exhaust, the stream-flow driver seems to glide along effortlessly, saving gas, tires, brakes and wear and tear on both his vehicle and his nerves. And surprisingly, he seems to make as good time as his brake-jabbing neighbors."

The experienced stream-flow driver maintains a steady speed and a space cushion both fore and aft of his vehicle. Another mark of a good driver is that he keeps watching as far ahead as possible, and is not just concentrating on the rear end of the car immediately in front. If he spots brake lights flashing 10 or 15 cars ahead, he can immediately start easing off on the gas and get ready to brake if necessary. Taking advantage of this advance warning greatly reduces the cumulative effect of delayed reaction time—such a deadly factor in multiple rear-end collisions.

In cars with manual transmissions, there's a tendency to downshift to reduce speed instead of using your brakes. While this is good driving practice, it does not let a following driver know that you are slowing down. He may be right on top of you before he realizes that you've decelerated. To avoid this possibility, it's best to tap your brakes lightly when downshifting just as a warning to cars behind you.

Significant findings

Accident investigations involving rear-end collisions have turned up some important—and occasionally strange—findings. Injuries are much more likely and more severe when seatbelts aren't used or are too loose.

The reason is that rear-end crashes almost always produce impacts in a straight fore and/or aft direction—the direction in which injuries can be the most serious and in which seat belts can be the most effective in preventing them.

And here's an unusual one you may never have thought of: Cars waiting to turn left in a left-hand lane with their front wheels already cocked are invariably knocked into opposing traffic if struck from behind, even lightly. When waiting to make a turn, always keep your wheels straight until you're actually ready to go. Better yet, try to avoid situations where you have to stop at all on a busy throughfare.

A common cause of rear-end collisions is the "rubbernecking" motorist who momentarily takes his eyes off the road to note some scenic attraction or roadside police activity. In the second he looks away, the car that was far ahead a moment ago has suddenly slowed or stopped and old rubbernecker is in trouble.

Avoiding a tailgater

What can you do if someone is tailgating you? There are several techniques. The first and most obvious one is to move over and let him pass if you can. If you can't, flash your brake lights briefly and repeatedly without actually slowing down. If he's a normally courteous driver who just isn't aware that he's following too closely, he'll get the message and drop back; if he's a persistent tailgater, he probably won't.

Don't speed up in an attempt to "lose" a tailgater—chances are, he'll stay on your tail anyway, and at the

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same time you're dangerously reducing the safety cushion between you and the car ahead. Instead, slow down. This will increase your safety cushion so that if you do suddenly have to slow down or stop, you can do so gradually to keep your tailgater from running up your rear. Remember, though, that traveling at lower than normal highway speeds can invite tailgating and be as hazardous as speeding. That's why many highways now post both minimum and maximum speed limits.

On multilane roads, keep moving into the slower inside lanes. It's doubtful that a tailgater will follow you there—he wants to get by. On single-lane roads, be patient. If he sees you won't be pushed, he will usually tire of the "game" in time and either drop back or pass.

What to do in fog

When you're caught in sudden fog or smoke where a chain-reaction pileup could occur, slow down quickly but not so abruptly as to become a hazard for following cars. Turn on your lights and put your entire vehicle on "alert"—with windows open, radio or tape player off, everyone listening intently for the sound of collision activity ahead.

Don't "key" on the taillights of a car ahead in order to follow the road. If you have to resort to that, the chances are you're too close.

As exasperating as the problem of tailgating is, scientists are beginning to do something about it. Among new highway automation methods being tested is the FTC Monitor, an electronic logic system that precisely measures the time lapse between vehicles and signals a warning if it is improper. It includes a detector in the highway that locates the front and rear of every car passing over it in its lane of surveillance. If spacing between vehicles is insufficient, a sign flashes the word "danger" to motorists, and a signal is sent to police cars indicating the exact location and severity of the situation. If there is flagrant tailgating, an additional signal notes "violation." A camera is included that automatically takes a picture of the violator.

While it will take time and money to install such systems, they will eventually do much to help reduce the number of lives lost each year to tailgaters. Meanwhile, we can do a lot ourselves to avoid being innocent, unintentional tailgaters—actually a bigger problem than the deliberate, uncaring menace. ★★

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COLOR TV (Continued from page 76)

new feature has been added to both Magnavox Touch-Tune and Admiral II Limited models—"remote-control optional" (and it's about time). Thanks to the motorless operation of varactor tuners, buyers of these sets can choose them with or without remote, or add remote control at any time during the life of the set.

With the Magnavox set, a cigaret-pack-size remote receiver module can be installed by a service technician in about five minutes. Unlike the control at the set, the remote unit is a non-keyboard, four-button unit which can tune up to 20 channels in sequence. The Admiral remote is a calculator-keyboard twin of the one on the set and can be installed by the consumer without tools. He just removes a one-inch-square plug from the front of the set and slides in a two-inch-deep module containing the remote receiver microphone and electronics.

New chassis. Just about every maker that didn't introduce a brand-new chassis last year is adding one in 1977. Some are trending to more modular design; others are going the opposite way toward unitized construction. The most unusual new chassis is the "Interconnect Frame" in Admiral's "Era II" sets. The frame contains only wiring, no active components. Seven modules are mounted vertically on the frame, five snapping onto spring-loaded sliding connectors. The chassis may be assembled or disassembled in one minute.

Greater automation

Automatic production is the name of the game in keeping costs down and reliability up, and almost every manufacturer has redesigned for greater automation. Japan's giant Matsushita Electric, has standardized many aspects of various chassis to realize mass production and procurement economies for its affiliates, including the three that sell TV sets in the United States.

Although the chassis aren't the same, Quasar, Panasonic and JVC will share many components and circuits. Quasar, which pioneered modular construction with an 11-module set in 1967 when it was a part of Motorola, has converted to a "Super Module," which packs most of the components (including five ICs) onto a single plug-in board to increase reliability by reducing the number of interconnections. Yes, the works are still in the drawer (in 25-inch models), but now the technician replaces almost all of the works in one fell swoop.

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Sony has redesigned its color chassis for easier service, making it more modular and providing for widespread interchangeability of parts among different models. Sharp has introduced a new chassis, used in Japan, claimed to contain the most extensive microcircuit content of any TV set sold in the United States, eliminating hundreds of individual parts and connections and cutting power consumption 12.5 percent.

The most unusual new television set is Advent's VideoBeam Model 750, an all-new home version of its giant-screen projector. It sells for \$2495, compared with the current price of \$3995 for the original model. Like the earlier VideoBeam 1000, it uses three projection tubes, but eliminates the complex reflective optics which had tube, mirror and lens in one glass envelope.

Washable 6-foot plastic screen

Advent 750's tubes are regular five-inch cathode-ray tubes—one with red phosphor, one green, one blue; each with a separate external plastic lens system. The screen size is 6 feet in diagonal measurement, as opposed to 7 feet for the VideoBeam 1000. Unlike the delicate screen used in the 1000, the screen in the new set is made of washable, reflective, embossed plastic not damaged by fingermarks or rough treatment. The walnut-veneer receiver-projector console, about the size of a small end table, may be rolled out of the way when not in use. Wireless remote control is included. Picture brightness is claimed to be 5 to 10 times that of smaller single-tube consumer projection sets and more than two-thirds the brightness of the bigger Advent.

Better TV sound

Even the sound side of sets is beginning to get some attention: JVC, at least, is calling justified attention to its larger sets' 1½-watt amplifier and 4x6-inch speaker—large by TV-set standards, if not by those used in high fidelity.

Broadcasters are beginning to work on improving picture quality, too. The VIR color signal—originally adopted to help stations control the color they were sending out—was just the beginning. Next may come "circular polarization"—a way of sending signals that will be easier to pick up with today's antennas (even rabbit ears), but which can be received ghost-free if you use a matching, circularly polarized antenna. ★★



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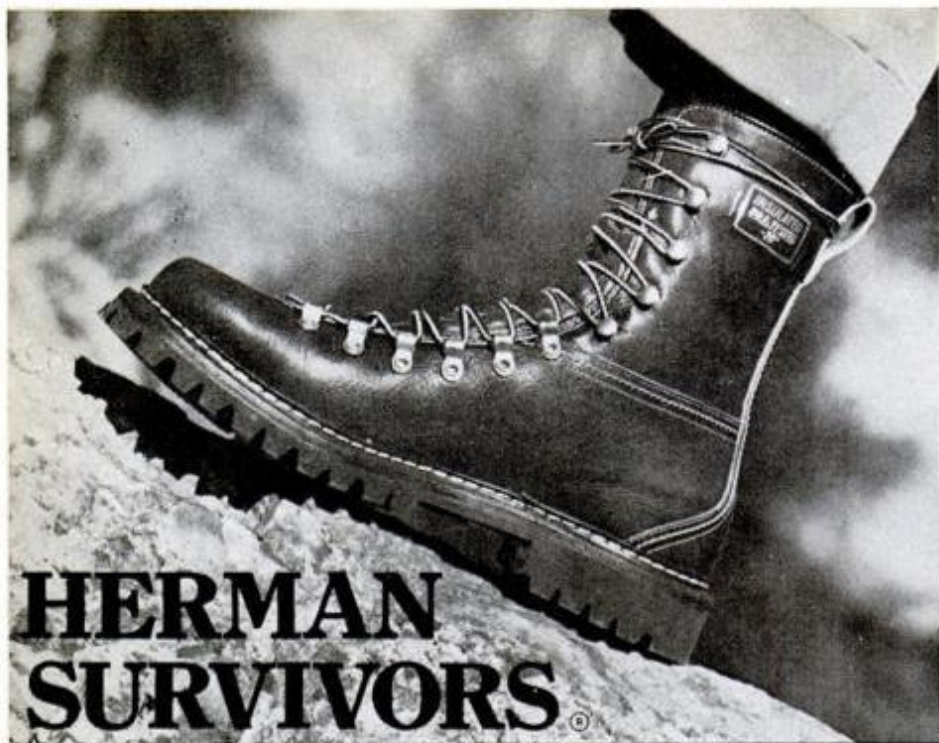
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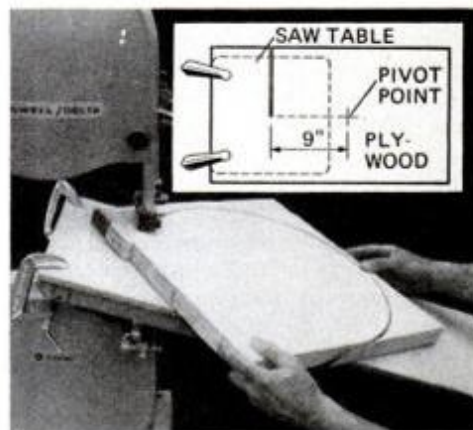
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GRACEFUL DINETTE SET

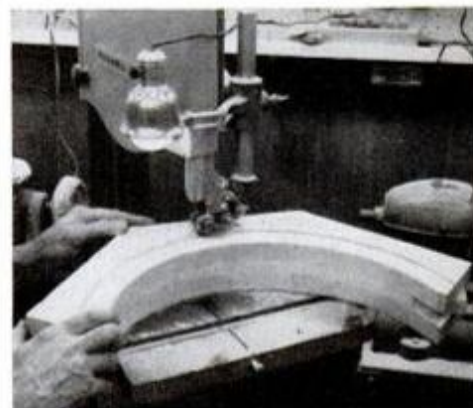
(Continued from page 106)



Screw pivot jig to seat bottom, tilt table 15° to bandsaw perfect 18-in.-dia. disc.



Form slat mortises by squaring up rows of holes in seat bottom with sharp chisel.



Set bandsaw table 5°, use sharp blade, saw chair rail slowly to give smooth cut.

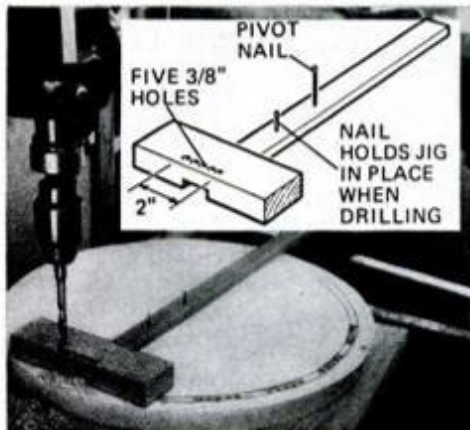
top. Screw and glue the pair of stiffeners in place.

6. Use concealed nails with heads cut off to help align the mitered edge-facing strips. Install the end strips, glue and clamp. Follow with sides. Round the corners with a block plane, then sand the top.

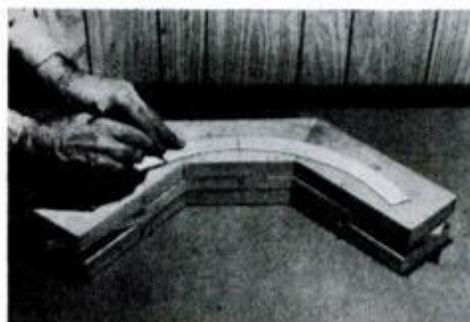
Steps for making chairs

1. Cut a deep notch halfway through each piece of the chair bases to form the cross-lap joints. Round the ends on a stationary disc sander, then glue the members to form the crossed base.

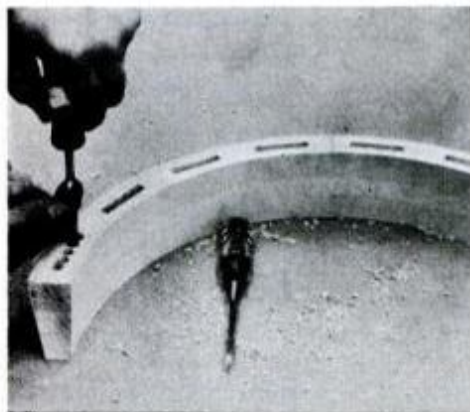
2. Select three lengths of stock to form the turning blanks for each



Line up slat mortises with pivoting jig and use it to drill a series of blind holes.



Place cardboard template on bottom of curved back rail; trace for bandsawing.



Cut mortises in chair-back rail same way as seat. Drill holes with brad-point bit.

pedestal. Notch the ends of the two outer pieces so they will slide freely over the $1\frac{1}{8}$ x $2\frac{7}{8}$ -in. base section. Insert a few concealed nails without heads for registration, then sandwich the three pieces together. Mark each blank for later match-up with its base. Remove excess glue inside the notches to insure a good fit later.

3. When both blanks have been made up, glue a scrap of hardwood to the notched ends for mounting in the lathe. Bandsaw the four waste corners from the blocks to save a lot of rough lathe work.

4. Use the gouge and skew to turn the slightly tapered cylinder to shape,

(Please turn to page 176)

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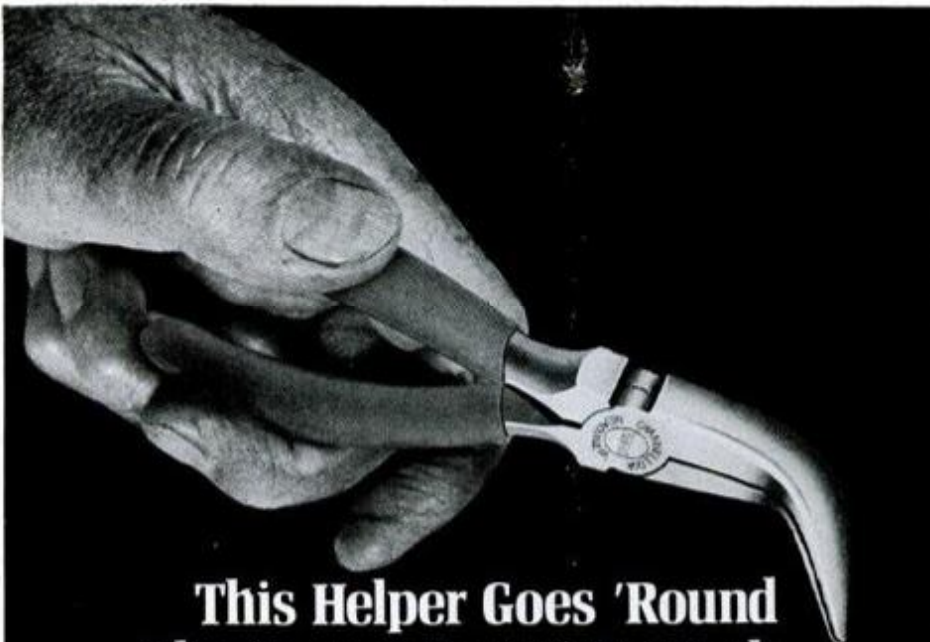
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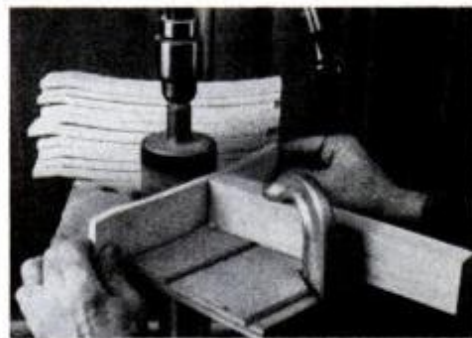
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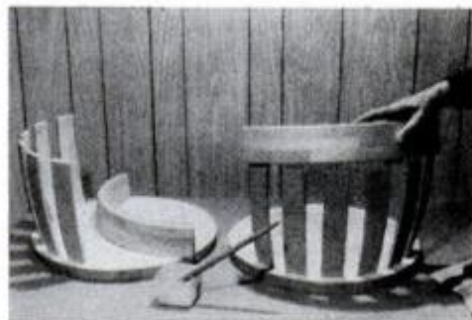
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GRACEFUL DINETTE SET

(Continued from page 175)



Bandsaw curved slats from solid stock, then sand smooth with drum in drill press.



Use top rail dry (no glue) to hold glued lower ends of slats in proper alignment.



To glue top rail to slats, apply level support, then glue and press it into place.

and use the parting tool at the top to cut the pedestal to proper length. The block at the bottom is cut off by bandsawing at the glue line.

5. The chair seat is next. Select seven lengths of 6/4 (1 3/8-in.) stock to make up the seat. Check your rip saw to be sure it is cutting perfectly square. Lay out the pieces so that the annual rings alternately curve up and down. This will counteract any warping tendency. Insert headless brads into predrilled holes so the points protrude about 1/4 in. Working on a flat surface, proceed to press the pieces together to form registration brad holes. Separate the pieces, apply glue, then clamp together in this manner: Tape kitchen wax paper to four scrap boards and clamp them to both sides of the bundle using moderate pressure. Apply bar clamps to pull the seven members

(Please turn to page 180)

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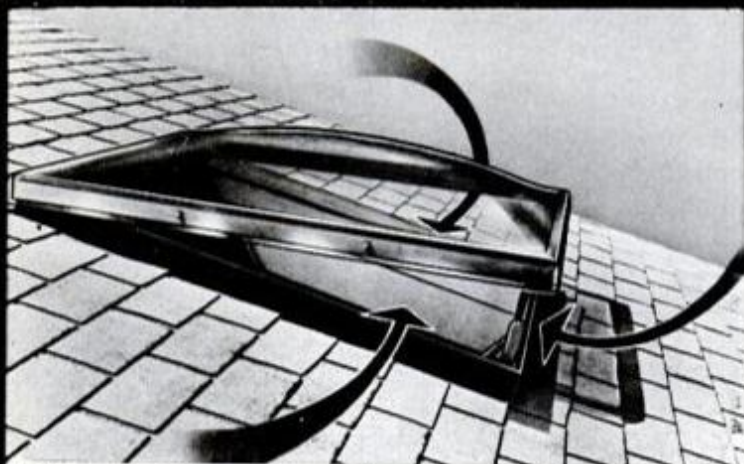
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GRACEFUL DINETTE SET

(Continued from page 176)

together. Check that the whole thing is perfectly flat. If necessary, apply more pressure to the clamps on the line-up blocks.

6. The beveled 18-in.-diameter seat is easily cut with a simple circle-cutting jig on the bandsaw. Clamp a board with a partial cut through it (for blade entry) to the saw table. Drive a screw through the bottom of the board so that it is exactly 9 in. from the blade and in perfect alignment with the front edge of the blade teeth. This is very important because if the pivot point is ahead of or behind the teeth, the cut will be eccentric and the work will be spoiled.

You can test the right-angle alignment by trying the cut on some scrap cardboard. When ready, tilt the saw table 15°, start the cut freehand to get the blade into the wood, then stop the saw, insert the screw into the bottom of the seat to provide a pivot.

7. The curved slats are cut from 5/4 (1 1/8-in.) stock, freehand on the bandsaw. Sanding out the saw marks is easy if you use a 3-in. sanding drum on the drill press. Clamp a scrap of wood on edge and aim it to the center of the drum with just enough space to allow the work to pass through with a snug fit. Keep the work continuously perpendicular to the guide as you push it through. When all the insides have been sanded, move the guide a fraction closer and repeat the operation on the opposite side of the slats. Note that the bottom ends of the slats have a straight portion—be careful not to round them off. Some hand sanding will be required near the flats.

8. The curved back is made up by gluing eight angled segments together. A sandwich is made by stacking three, two and then another set of three blocks, one atop the other. This allows the grain to run as closely as possible in the direction of the curve. The alternating vertical joint lines produce a strong block.

9. The back is tapered in cross section so that it is wider at the bottom. Trace the outline of the bottom curves in the block. Set bandsaw table for a 5° bevel and make both cuts.

10. A simple hole-locating jig is used to bore a series of five overlapping holes in a straight line to form the mortises for the slats. The jig is made to pivot by driving a nail through the stick into the seat center. When the block is positioned where required, a second nail is tacked into the stick to keep the

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block from moving. A 3/8-in. drill bit is driven through each hole in the block. Work with a spur bit for best results.

11. Use a chisel to clean out the waste and trim the mortises. Because of its shape, the curved back piece does not lend itself so readily to a jig for boring the holes for the mortises. Therefore these holes are lined up and drilled freehand. A slight error here can be tolerated—not so on the seat.

12. When all parts are sanded to completion, test the fit, then apply glue only to bottom ends of the slats and the seat mortises. The curved back is inserted, dry, only to help hold the parts in alignment. When the slats have been glued to the seat, you can proceed to apply glue to the backs. Work upside down, with the curved back resting on a table and the seat elevated and supported on a level plane. Gluing the back in two phases will prevent a messy glue runoff which could drip all over the slats.

13. Assembly of the chair: First use a hex-head lagscrew and glue to attach the ball-bearing support disc to the top of the pedestal. The hole must be counterbored so the screw-head doesn't project above the sur-

face. Before attaching the disc, bore a 1-in. screw access hole properly located in the block.

Turn the unit over, apply glue and insert the base into the notches in the pedestal. Secure with four hex-head lags. Be sure to counterbore a hole large enough to receive a socket wrench which is required to turn the screws. Attach the swivel mechanism to the disc with lagscrews, then screw the upper section of the swivel to the seat bottom.

The screws are inserted one at a time through the 1-in. access hole in the block which is alternately rotated to reveal each screw-mounting hole. The heavy-duty 8-in. swivel, No. 91 K8, is available from A. Constantine, 2050 Eastchester Rd., Bronx, N.Y. 10461, for \$3.50 plus postage.

14. Finish is optional. I thought it might be refreshing to depart from the usual routine of staining the piece so I applied a coat of sanding sealer followed with two coats of clear satin finish to obtain an interesting high-key effect.

15. Install four steel glides to both table and chair bases.

Seat covers are optional. Shown are oversize shag toilet-lid covers available from Sears. Cut cardboard and 1-in.-thick-foam pieces to fit



Close-up view of chair-back rail shows an interesting effect of laminated segments.



Optional seat cushions are made from toilet-seat covers, foam and cardboard.

each seat 1 in. shy all around. Insert foam and then cardboard to retain shape of the cushions. ★ ★ ★

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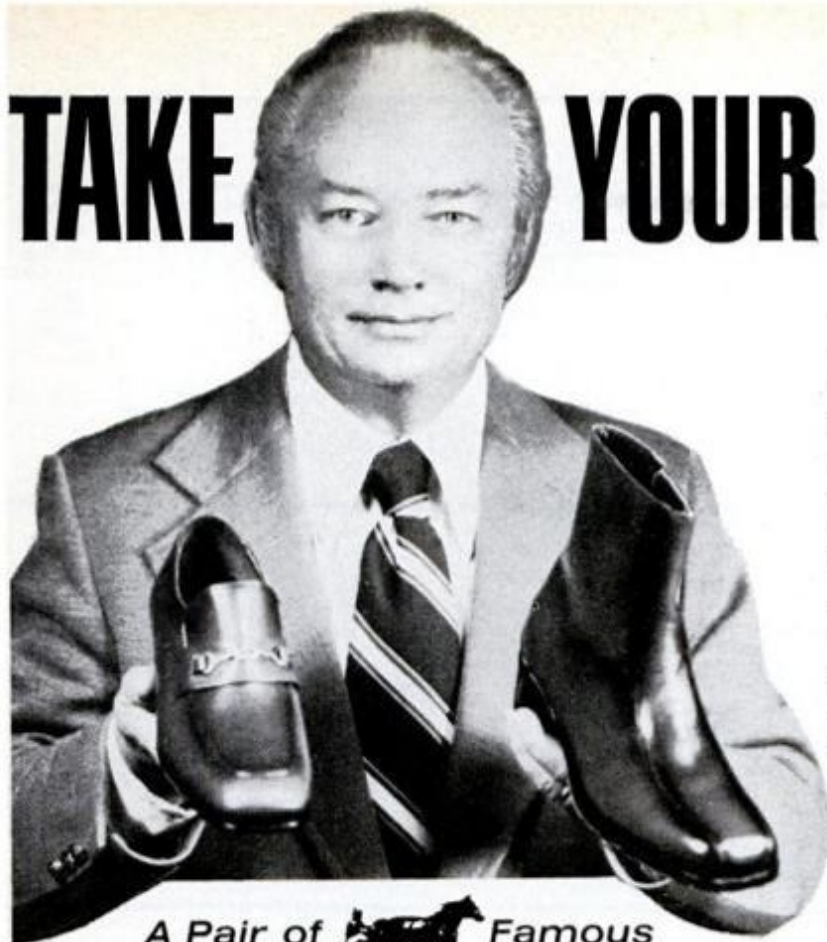
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Not at all. Right now I'm talking about a spare time business that will bring you extra income. But let me also tell you that the Hanover door is open to even more opportunities and more money. I'll show you how you can put yourself into the executive class at an executive's income. And I'll show you plenty of men who have followed this path with Hanover and are making more money than they ever made in their lives.

FREE SHOES

Free shoes? Sure. Send in the card and let me send you the selling kit. Take orders for just ten pairs of shoes in the first 30 days and you can have any shoe in the catalog selling up to \$29.95 free. Of course you'll also get \$40 or \$50 in cash in commission, too. And keep your eye on the BIG payoff—the fact that this can be the start of your own business and a new life for you.

Gordon King
President

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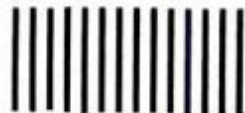
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Permit Number 54
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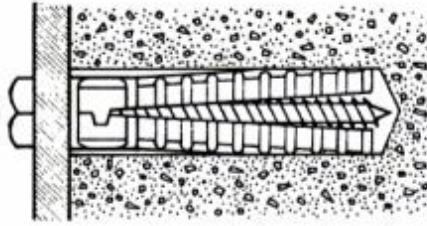
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Dept. 1761

Lagscrew shield



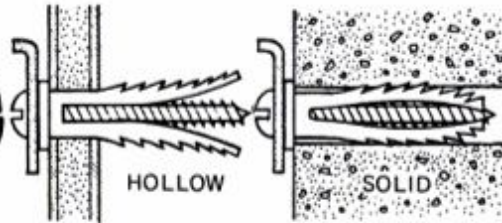
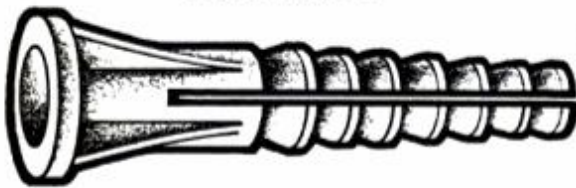
To install, drill hole same size as shield. Set shield flush with or slightly below surface. Insert lagscrew through fixture hole into shield, which expands as screw is drawn tight with wrench. Heavy ribs assure

powerful grip. For mounting items too heavy for plain screws, especially to brick where hole can be drilled in mortar joint without marring wall. Requires large masonry bit.

Screw Dia. (in.)	Shield Lengths (in.)	Load in Concrete (lbs.)
1/4	1, 1 1/2	450, 600
5/16	1 1/4, 1 3/4	800, 1200
3/8	1 3/4, 2 1/2	1200, 2000
7/16	2 1/4 only	1650
1/2	2, 3	2000, 3000
5/8	2 or 2 1/2 *	2500, 3500
3/4	3 1/2	
	2 or 2 1/2, 3 1/2 or 3 3/4 *	3000, 4000

*Long standard sizes differ with brands

Plastic anchor



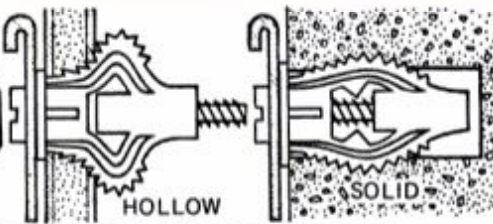
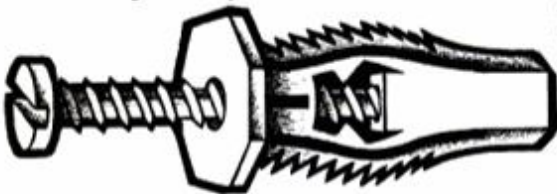
To install, drill hole size specified for anchor used, press anchor in hole flush with surface, insert screw through the fixture and drive into the anchor. In hollow walls, screw

spreads the anchor, locking it in place. In solid walls, screw causes anchor to bulge and tighten itself within the hole. Being plastic, anchors are good for bathroom and outdoor use.

Screw Size (No.)	Anchor No. and Length (in.)	Holding Power (lbs.)
4, 6, 8	No. 1, 3/8	650
10, 12	No. 2, 1	850
14, 16	No. 3, 1 1/2	1075

Although most brands come in three sizes, the recommended screw ranges differ. Where screws are not packaged with the anchors, use size recommended on the package.

Nylon expansion anchor



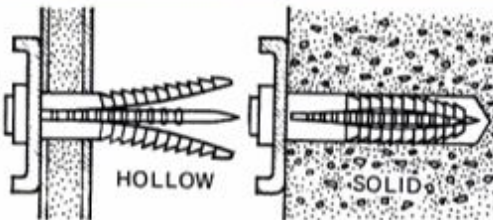
To install nylon expansion fastener, drill hole at least 1 1/2 in. deep, pinch anchor between fingers to fit the hole and tap in place with hammer. Insert screw through the fixture and

tighten. Recommended for mounting drapery hardware, brackets and the like to any type of wall: plaster, drywall, brick, concrete, cinder block, marble, stone and even wood.

One size (about 1 in. long, and requiring a 3/8-in. hole) serves all applications and comes with a 1 1/8-in. self-tapping screw.

Shear load tests:
250 lbs. in cement block
50 lbs. in plasterboard.

Nylon drive anchor



To install, insert fastener through fixture's mounting hole and push into wall hole. Tap the nail provided until its head seats against fastener's. Fixture cannot be removed without withdrawing the entire anchor. Mounting hole

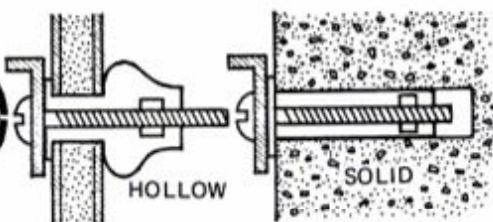
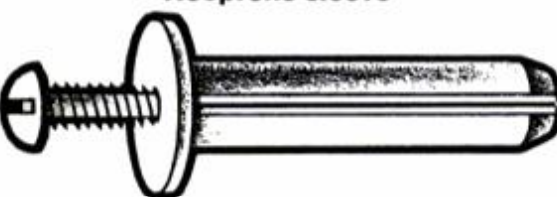
in the fixture must be at least 3/16 in. in diameter. Recommended for drapery hardware, shelf brackets, mirrors. Anchor comes with nail, costs more than plain plastic anchor.

Anchor Dia. (in.)	Anchor Length (in.)
1/4	3/4, 1, 1 1/2
3/16	1, 1 1/2

Both Tap-It (U.S. Expansion Bolt) and Jif-Eze (Jordon) come in choice of head style: round, flat, mushroom. Not all lengths available in all head styles.

Shear tests:
800 lbs. in solid wall
365 lbs. in hollow wall

Neoprene sleeve



To install, drill hole of same diameter as the neoprene shank (in solid wall drill just a bit deeper than length of the screw); push sleeve in hole, up to flange, hold fixture against

it while tightening the screw through mounting hole. Shank bulges as the nut draws up and forms a rivet head against back of hollow wall or a pressure fit in solid wall.

Sleeve comes in one standard size: shank diameter 1/4 in.; length 15/16 in. Load in concrete: 370 lbs.; in brick: 440 lbs.; in cinder block: 470 lbs. Recommended for mounting any item such as drapery hardware, brackets, bathroom fixtures to any wall: plaster, drywall, brick, concrete, cinder block, marble, stone, even wood.

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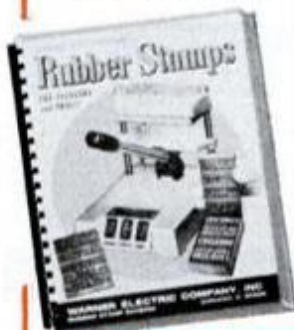
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WORLD'S BIGGEST OIL LEAK

(Continued from page 32)

Jefferson City, Mo.; Topeka, Kans.; Des Moines and Sioux City, Iowa, and Albuquerque, N.M. C. W. Mussler, Conoco exec in charge of the program, says more collect-and-recycle stations are planned.

"Conoco has the right idea," an executive of a competing oil company told me. "I think the rest of us are living on borrowed time and we better start addressing ourselves to the problem. We don't need any more 'White Papers' on the subject. We need action."

No thanks to the finger-twiddlers-cum-buck-passers at the other oil companies and agencies of government, a few individuals and groups are muddling their way out of the oil mess, going about it as Conoco does, by collecting old oil in sufficient quantities to interest recyclers.

Horn grabbers

While the FEA was designing its bumper sticker and oil companies were putting together another committee to write another White Paper, two women in Sunnyvale, Calif., grabbed the bull by the horns. Mary Cornwell and Mary Anna Eklund talked local service stations into making their underground collection tanks available to people wanting to dump old oil. When the two Marys started their crusade, Sunnyvale service stations were paying re-refiners to get rid of old oil. The re-refiners are now paying six cents a gallon for the reclaiming privilege.

Three communities outside Chicago—Glen Ellyn, Des Plaines and Naperville—have joined forces in a used oil recycling program. One participant is Belton R. Williams, owner of a re-refining company and president of the Association of Petroleum Re-Refiners.

"In our wasteful economy," Williams observes, "we've been taught that anything second hand is second class. Use it once and discard it. Lubrication oil doesn't wear out just because it's dirty. Properly refined, it can be reused much the same as the original."

This is fine if you live near a Conoco bring-it-back station in Sunnyvale or a Chicago suburb. But what do you do if you don't?

There is no single answer. No practical, universally acceptable disposal method will fit all situations. But there are ways to get rid of the stuff that will not pollute or that minimize the chances of polluting. ■ Find a gas station, car dealer, auto-parts store or farm equipment

(Please turn to page 188)

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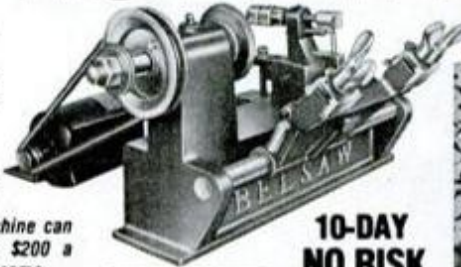
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WORLD'S BIGGEST OIL LEAK

(Continued from page 186)

dealer who will take the old oil off your hands. Gas stations don't like the idea of car owners changing their own oil because the station misses out on a profit. So some stations will turn you down if you ask permission to dump used oil in their disposal tanks. But if you buy gas regularly at the same station or give the station some of your service business, the station won't put up a big fuss over letting you dump a few quarts.

■ Get a barrel or container and save the oil. Conservationists, oil companies and various government branches are working on ways to salvage used oil. As the price of new oil has increased, re-refining has become more attractive. There's money to be made in old oil; eventually someone will be glad to get yours.

■ One of the best suggestions for disposing of waste oil comes from a do-it-yourselfer. Bruce Bidelman runs a family-owned construction business in a small town in Michigan. Bidelman operates two vehicles, a pick-up truck and an automobile. He changes oil fairly often and generates about 60 gallons of waste oil a year. Bidelman has a small workshop behind his home and the shop is heated by a cast-iron stove. He feeds the stove with a combination of scraps of wood salvaged from construction jobs mixed with waste oil. The oil drips directly into the firepot via a length of pipe with a shutoff valve. The workshop isn't heated every day, but Bidelman estimates he has reduced his consumption of wood by about 50 percent as a result of burning the oil. The combination of fuels burns extremely hot and there is no air pollution because the oil is fully consumed.

■ If you lack any other way of disposing of old oil, the least harmful way of dumping it is to collect it in a container—a bleach jug, for example—and put it out for the trash collection. If your community burns trash, this isn't a bad way of getting rid of the goop. Waste oil actually improves the incineration process if an air-atomizing burner system is used. If trash is used for landfill, burying castoff oil is not ideal, but it's better to dump it in one place, rather than spill it indiscriminately.

You can go right on dumping on the dandelions behind the garage. But that's a dumb solution. Someone has to pay to clean up the lakes, rivers and sewage treatment plant. The money will come out of your pocket in the form of higher taxes. And there goes the \$6 or \$7 you saved by changing your oil. ★★★



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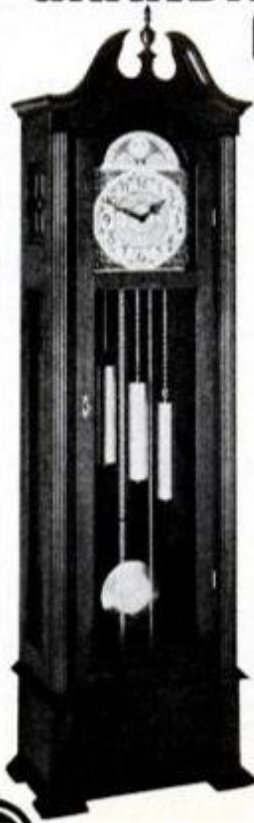
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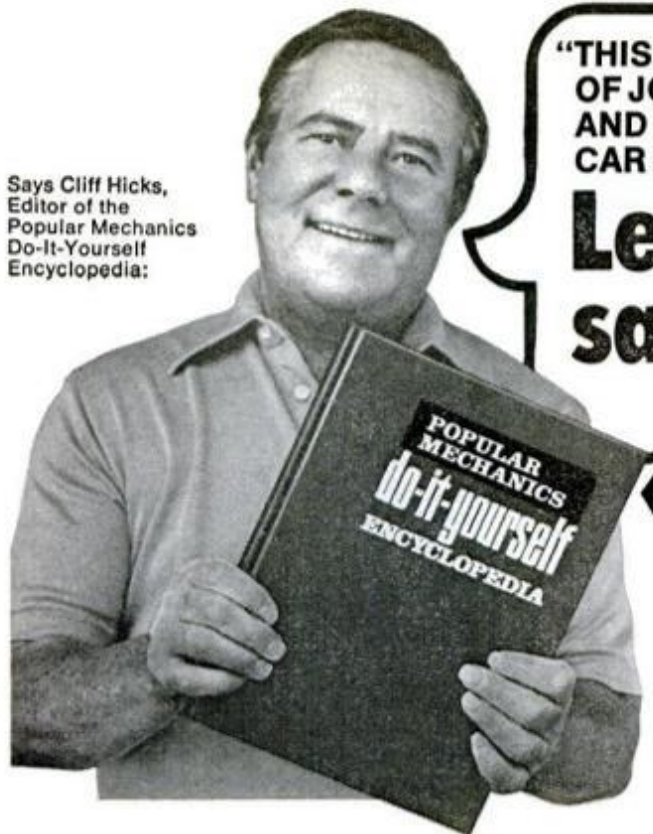
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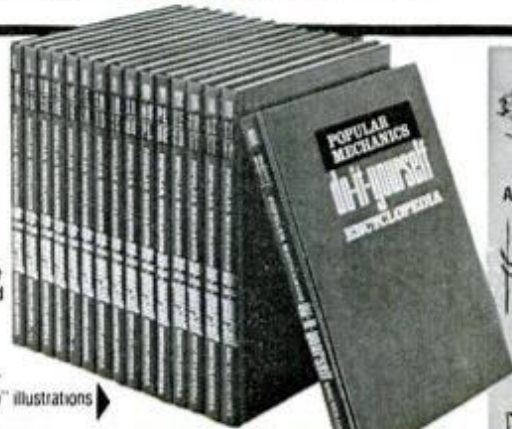
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CAL RODGERS

(Continued from page 78)

at the idea, saying their planes were unsuited for such long, difficult flights. However, when they saw that the intrepid Rodgers could not be dissuaded, they advised him to take along a lot of spare parts and lent him the services of their ace mechanic, Charlie Taylor. "Oh, God, how you will need him!" said Wilbur.

By today's standards, the Wright biplane seems about as robust as a motorized kite. Its 32-foot wings were covered with a rubberized fabric, and the fuselage, an open spruce framework, was held together with steel wire. The plane had a four-cylinder, 35-hp engine that could push it at a top speed of 55 mph in calm air. Two 8-foot, 4-inch props, made of laminated spruce covered with linen, were chain-driven. With a pilot and a full load of fuel on board, the plane weighed all of 900 pounds.

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In flight, Rodgers was followed by a special three-car train carrying a complete second plane, extra wings and propellers, a load of spare parts and a machine shop. Also aboard were a Palmer-Singer touring car, Cal's wife, mother, a young friend named Charles (Wiggie) Wiggin, two mechanics, two flight managers.

To pay for the expensive project, Cal lined up a sponsor, J. Ogden Armour, a wealthy meat packer who was anxious to plug his company's latest venture—a new soft drink called "Vin Fiz." Cal agreed to have Vin Fiz painted on his planes and on the sides of the railroad cars.

Another of Cal's money-making ideas was to carry airmail. When the Post Office Department turned him down, he did it on his own, carrying letters from city to city in a bag tied to his shoulder. The cost per letter was 25 cents.

Cal missed a bet in not lining up a cigar-company sponsor. It was rare that he did not have a stogie clenched in his teeth. He smoked while flying, reportedly burning up 19 cigars on one particularly windy flight. There was no windshield and he sat in front of the wings.

You can see Rodgers' plane at the Smithsonian Institution in Washington, D.C. His portrait, which hangs in Dayton's Aviation Hall of Fame, was done by Milton Caniff, who also drew the highlights of the flight for this issue of PM. Caniff based his drawings on a book—*The Transcontinental Flight* by Charles S. Wiggin—and on an account by James W. Jacobs, chairman emeritus, Aviation Hall of Fame. ★★★

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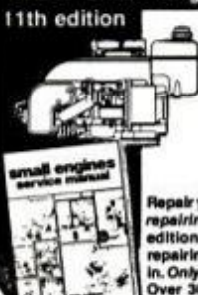


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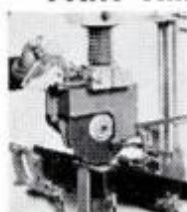
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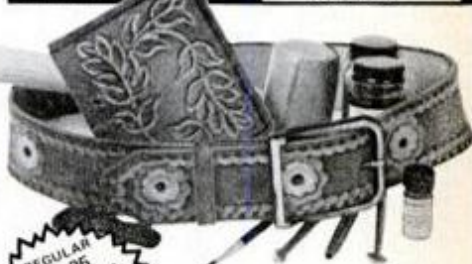
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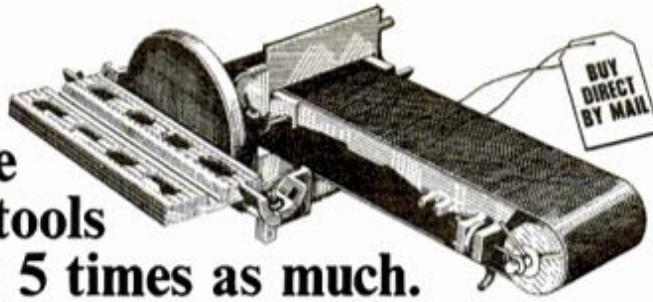


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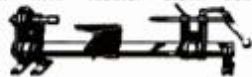


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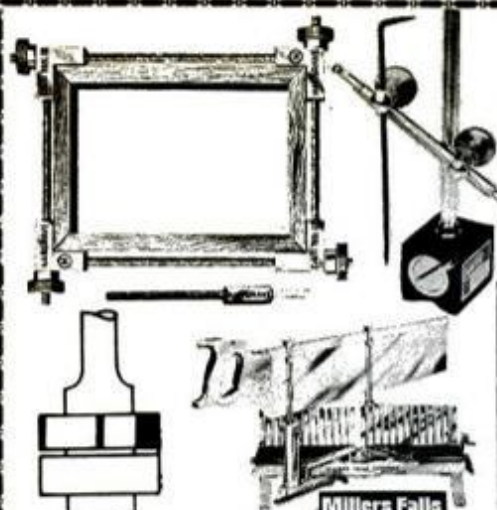


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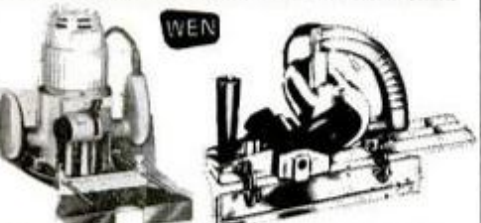
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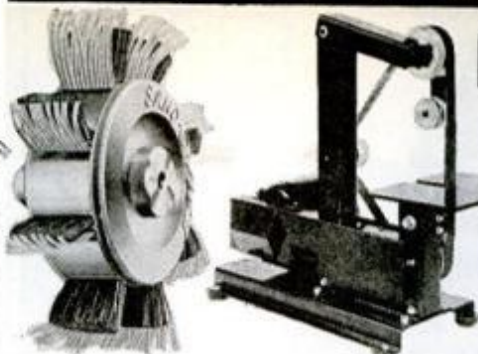


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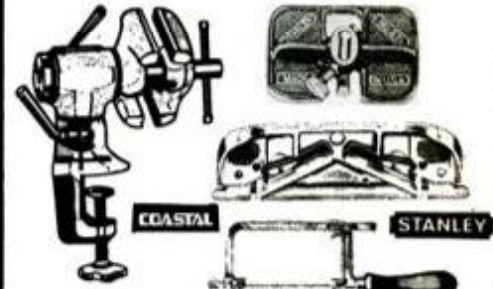
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