

Workshop that paid for itself Page 63

**The truth about
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Popular Mechanics

JUNE 1972
50 CENTS

AIR SURFING: A new sport
takes off in kites
and gliders

Page 98



**OUR GREAT
VIETNAM GOOF** Page 70

**'Gadgets and exotic weapons—untested military hardware—
fouled us up.'**—Col. David H. Hackworth, U.S. Army (Ret.)

\$\$ SAVING and FUN TO BUILD:

Combination bunk bed/desk for a boy's room Page 156

Trash compactor from a kit Page 118

Durable furniture—from cardboard Page 132

Cartridge player from a kit Page 113

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Filter Kings, 17 mg. "tar," 1.2 mg. nicotine; Longs, 18 mg. "tar," 1.3 mg. nicotine, av. per cigarette, FTC Report Aug. '71

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Shave close.

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Or closer.
Or closer.
Or closer.
Or closer.
Or closer.
Or closer.
Or closer.

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The



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STANLEY
helps you do things right



They Bugged out of Milwaukee.

Once, there were three girls in Milwaukee. And one by one, they went to Hollywood. In Volkswagens.

Georgia (on the right) drove out two years ago.

Marianne (on the left) was next. She rode in somebody else's VW.

And the beautiful Chris (in the middle) had just arrived two weeks ago in the Volkswagen on the left.

We'd love to say that of the 20 million people who've switched to Champion, this has been three of them.

But we can't.

Because lots of Volkswagens have Champions installed at the factory.

And the girls had no idea how or when their cars had been given Champion Spark Plugs. ("Spark Plug? What's a spark plug?" said Marianne.)

But still, the girls did help prove our point. Champions are a great spark plug for Volkswagens.

From Milwaukee to Hollywood.

Or from wherever your Bug is, to wherever you'd like to be.



Toledo, Ohio 43601

20 million people have switched to Champion Spark Plugs.

HOW TO . . .

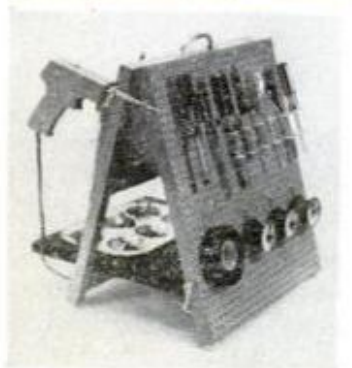
Ship your car
by Auto-Train 110



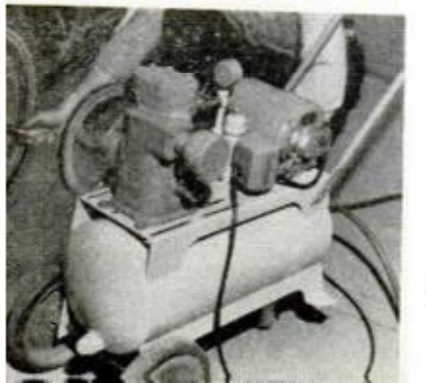
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Cover photo by Mario Romo

Air surfing: A new sport takes off in kites and gliders in man's latest—and dizziest—attempt to fly like a bird

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JUNE 1972

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LETTERS

TO THE EDITOR

Why the 'tests' on pets?

I was shocked to read about Medical College of Georgia's so-called tests, made by presumably skilled "researchers" on 16 defenseless dogs (*Science Worldwide*, page 40, April PM).

Anyone using an aerosol and who can read instructions immediately understands the contents are for external use only. There have been numerous fatalities among humans who voluntarily exposed themselves to aerosol propellants in their quest to get "high." Consequently, is there any reason for medical laboratories to torture and bring grief into the lives of our pets for inane and sick experiments such as these?

CRANFORD, N.J.

RICHARD K. BEYER

It is a guaranteed car!

I bought a 1970 Hornet, and as far as I am concerned their guarantee is as good as, if not better than, any of the others (*American Motors' 'guaranteed car.' Is it?* page 94, May PM). Their service department here in Vegas is tops. Any and all trouble I have had has been taken care of to my satisfaction. I have plans to buy a '73.

LAS VEGAS, NEV.

JAMES L. SMITH

Encore!

Especially enjoyed your *There is no 'impossible' house* (page 134, April PM). Encore!

HAWTHORNE, N.J.

DAVE VANDERZEE

'72 road racing preview

Congratulations on *One for the money! Two for the show!* (page 75, April PM). Your article is most assuredly a service to the reader and certainly to the Sports Car Club of America.

SPORTS CAR CLUB OF AMERICA DEL OWENS
DENVER

My father, Eddie Pullen, had the distinction of driving the first American car to win the International Grand Prix. The race was held at Santa Monica in 1914. He

(Please turn to page 8)

POPULAR MECHANICS



There are times
when you want
more than
a good pair of lungs.

You
want to
be sure you're heard.

You're suddenly alone. Lost. Swallowed up in the great outdoors.

That's why SuperSound is as important as your knife, flashlight and first-aid kit.

Because this air horn's sonic blast can be heard up to a mile away, it's your constant protector. Whether for defense or signaling, it's always ready.

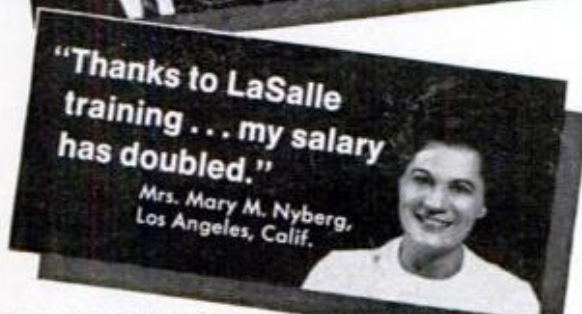
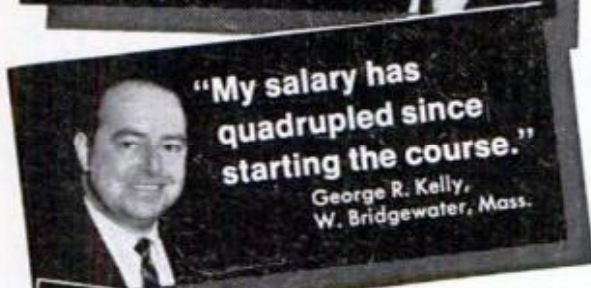
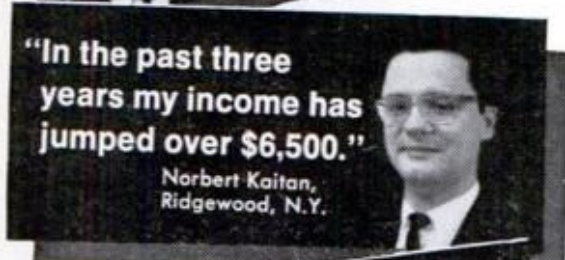
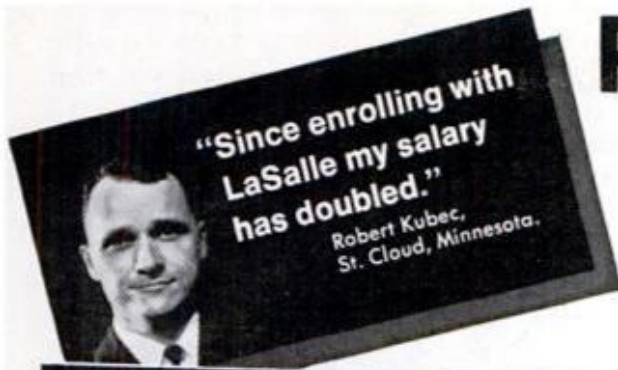
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Address..... Apt. No.....

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2

LETTERS

(Continued from page 6)

was driving a Mercer made in Trenton, N.J. He also broke the world speed record in 1914 at Corona with a speed of 100 mph.

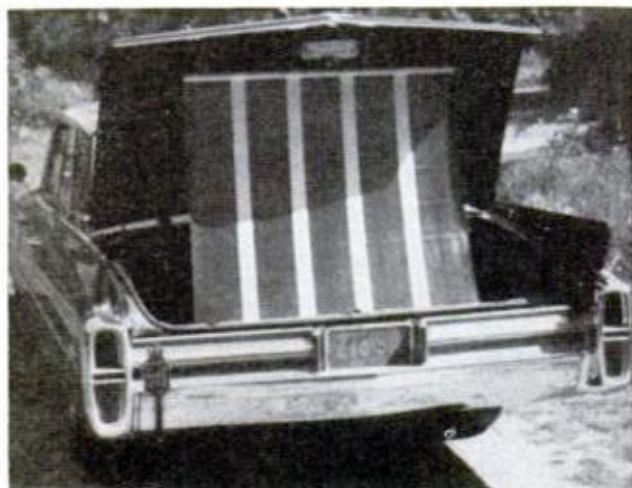
SOUTH EL MONTE, CALIF. DON PULLEN

Your article is well written and informative. However, your closing comments are disturbing. I am referring to your exclusion of "auto crossing" (also known as gymkhana). The latter term does not apply because this auto sport is fast becoming a true driving event, putting skill and speed against the clock. Many clubs that put on these events have had to form larger associations to handle the increased attendance. Several of these organizations have paid memberships that number in the thousands—such as Western New York Auto Cross Trail Assn. and Southern California Council of Sports Car Clubs.

RED JACKET MOTOR CLUB PETER MISNER
WEST SENECA, N.Y.

Homemade warning sign

New for Your Car (page 16, March PM) included a warning sign for a disabled auto. I assembled a red and white cloth safety curtain several years ago after investigating a fatal rear-end accident. This curtain is on a retractable spring curtain



roller attached to the car's trunk lid. It can be easily pulled down when needed. It costs \$10 to \$15 to make, depending on width and length of the material required.
RIVERHEAD, N.Y. CEYLON ANDERSON

Loudmouth

I think it is disgusting to headline your April cover *The spy plane we don't talk*

about . . . page 80. Why, then, did you reveal it? It seems strange to me when this country has a good piece of equipment, we have to loudmouth it to the rest of the world.

Don't you feel the Russians can't do the same thing, and possibly are, but you can bet your old bippy they aren't going to tell us about it.

SOUTH EUCLID, OHIO

LEONARD WARMINGTON

The Russians and Chinese have known about the SR-71 for quite some time. We just thought you'd like to know about it too.

Cabana as utility shed

Here's a photo of a utility shed I built



from the plans in *Build this cabana now—use it later* (page 154, April '71 PM). I used all the materials that were called for in the instructions, in-

cluding Homosote as the exterior covering.
YORK, PA.

JAMES H. KEHOE

But if you want to know more . . .

There's a lot more to know about tires than was included in *Everything you wanted to know about tires* (page 60, March PM). Our comprehensive 130-page 1972 *Tire Guide*, which has just been published, includes complete tire specifications, size conversion charts, load and inflation charts and much more. It's \$3. Other publications include a *Tread Design Guide* and *Who Makes It and Where*.
FARMINGDALE, N.Y. BENNETT GARFIELD

Mr. Garfield is right; there is more to know if you still have questions. You can write to Tire Guide at 2119 Route 110, Farmingdale, N.Y. 11735.

Inspired by PM's motor home

Inspired by *You can build this motor home for under \$3900* (page 137, Jan. '71 PM), I set to work building a small motor home from my '64 Econoline which my

(Please turn to page 10)

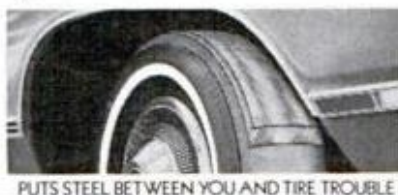


The more places you take your car the more you need The People Tire.

Maybe you can do enough of the wrong things to this tire to tear it up. But it's tough.

Maybe you can find enough back roads to plow through, or enough fields to pull off into, or stop in enough muddy, rocky camp grounds to do it in. But it's tough. Really tough.

Firestone builds this tire with a strong polyester body. And right under the tread, where a tire really gets it, we put two armor belts of steel — made of steel cords so strong a single cord will pull a



PUTS STEEL BETWEEN YOU AND TIRE TROUBLE



car, cords set so close together it takes 805 feet to make just one tire.

Our engineers call this tire the Firestone 500 Steel Belt. We call it The People Tire.

We're not saying it's a tire you *shouldn't* take care of. We're saying that, with a little care, it will really take care of you. Wherever you take your car.

Go to your Firestone Dealer, Store or service station and let them tell you all about it.

Firestone
500 Steel Belt

the people tire

The quality performer handloaders prefer.



Famous Winchester- Western Wads

The same quality Double A Wad that's in the Winchester and Western Double A Trap and Skeet shot shells. Now you can roll your own Double A shot shell. These wads seal gas away from pellets at ignition, keep them round through the barrel, and give denser patterns. They hold the shot away from the barrel and protect it until it leaves the muzzle. Look for Double A Wads and the new Double A Handicap Wad for long yardage shooting. Winchester-Western makes top quality fiber and cardboard wads, and plastic cup wads, too. All part of Winchester-Western matched components for a total reloading system for today's handloader. **WINCHESTER-Western**, 275 Winchester Ave., New Haven, Conn. 06504.

1972 | winchester
the way you
want it

LETTERS

(Continued from page 8)



son had wrecked. I lengthened it by about nine inches and increased the width by only the thickness of the walls, giving it overall dimensions of 15 feet by six feet, three inches. It could sleep four, though I have need for only a single bed that lowers over the front seats, leaving the rest of the unit completely usable.

NORTH VANCOUVER, B.C. JOHN L. WATT

Not just in Amsterdam

In your March issue, there was a *News Brief* on page 73 about trolley-car mail service in Amsterdam. I thought your readers would be interested in knowing that Chicago had just such a mail service from 1894 to 1914.

CHICAGO

KEN GREENBERG

Fifty years ago we had them in England. I was just a youngster, but I remember it well.

MIAMI, FLA.

VERNON WALTON

Readers helped by PM articles

When I read "New joints for old" in *Mechanics of Medicine* (page 92, Jan. '71 PM), I was confined to a wheelchair with an arthritic right knee. The article described an experimental knee-replacement operation by a Swedish doctor; it also stated that Dr. Frank Wilson of the University of North Carolina was experimenting with the same device.

My family doctor got in touch with Dr. Wilson, who referred me to Dr. Harlan Amstutz, chief of orthopedic surgery at the UCLA school of medicine. I entered the UCLA medical center on Dec. 5, 1971, and emerged 44 days later with a brand-

(Please turn to page 12)



Maybe your second car should be your first truck.

Chances are you've never thought of yourself as a truck driver. After all, you're in the market for a second car and that's that.

But a truck doesn't have to be the lumbering monster you've always thought it would be. It could be a Toyota Half-Ton. Small, maneuverable and just plain fun to drive.

If you can handle a car, you can handle a Half-Ton. But more important, the Toyota Half-Ton can handle things that a car can't. 1000 pounds worth. And you can tie tall, cumbersome items to the tie hooks all around the edges of the box.

If you're looking for a low-cost way

to get to work during the week, you've got another good reason to buy a Toyota Half-Ton. Our economy truck can give even an economy car a run for its money.

On weekends the Toyota Half-Ton can haul motorcycles, barbecues and camping equipment all over creation. Not to mention a camper built to fit in the back.

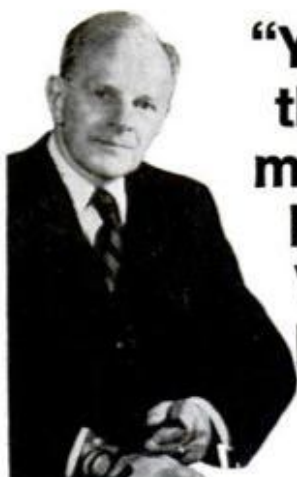
But here's the best part. The Toyota Half-Ton costs about the same as an economy car. That's cheaper than almost all station wagons. And that puts the whole thing in a new light.

Now seriously, aren't you beginning to think of yourself as a truck driver?

Toyota Half-Ton. \$2223*

For your nearest Toyota dealer, call 800-243-6000 toll-free. (In Connecticut 1-800-882-6500.)

*Mfrs. suggested retail price for the Half-Ton pickup. Freight, local taxes, dealer prep and options extra.



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Perfect because with Von Schrader Detergers you provide a service everybody needs: on-location cleaning of carpeting, upholstery and walls. Perfect because every home and building are potential customers—your business keeps growing.

Perfect because the equipment you use is the finest; proven to clean quickly, completely, professionally. And so easy to operate you need no special skills. (1) Von Schrader Carpet Deterger gives deep-level cleaning to carpeting; (2) Von Schrader Upholstery Deterger cleans fabrics and synthetics beautifully; (3) Von Schrader Wall Deterger cleans walls (and ceilings) five times faster than by hand.

Perfect because you can start with one Deterger. Then, as your business grows, add the other two and thus offer a complete cleaning service. Perfect because you are the boss, own your equipment, work your own hours. Perfect because there are no fees, royalties or contracts.

Perfect because your investment is so small you'll find it hard to believe. And perfect because we help you every step of the way, just as we've helped thousands of other men to financial independence for almost 40 years.

For details (without obligation) send coupon.



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Free booklet gives you full information

Get the facts about your future in on-location cleaning. See how well Von Schrader Detergers are built, how easy they operate. Read how other Associates became financially independent, how we help you every step of the way.

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Address _____

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State _____ Zip _____

LETTERS

(Continued from page 10)

new knee replacement. I now can walk normally and have almost full deflection of my leg. The prosthesis used in my knee is not the one shown in your article, but a much improved one.

It goes to show you what can happen from a small article in your magazine. Thanks to you and your magazine article, I am walking normally now.

LOS ANGELES

RALPH B. MOORHEAD

Last summer my husband came home with a copy of PM and showed me the article, *Now: an electronic pain killer* (page 68, July '71 PM). You see, I'm one of the "flunkouts from disc surgery" that Dr. Norman Shealy describes so well, and I had had four back operations, the last one in January 1971. By September, I was in agony at times, so in desperation I wrote to Dr. Shealy asking if he would see me.

In October we drove to LaCrosse, Wis., had a long talk with Dr. Shealy, and I was admitted to St. Francis Hospital the following day (he is no longer associated with the Gunderson Clinic). He insists that out-of-state patients stay in the hospital two weeks before he will consider surgery so he can get to know them and evaluate their emotional status, for emotions play a big part in back pain. At the end of the two weeks, on Nov. 9, I had the dorsal column stimulator implanted.

I am happy to report that the results have been excellent, and I'd say that I am getting 75 to 90 percent relief, depending upon what activities I've indulged in.

I strongly feel that it was the hand of God that led my husband to buy that particular magazine, and there are no words to express my gratitude to Him, to Dr. Shealy and to *Popular Mechanics*.

COLUMBUS, OHIO MRS. HAROLD R. HAYDEN

Bum steer—it's brakes

There's a picture caption on page 120 of *How and where to look for leaks* (page 118, March PM) that states: "Brake-fluid leak from master cylinder may go into power-steering unit." That's impossible.

ROSEDALE, N.Y.

SOL MACKLER

Right—and the error is not that of author Mort Schultz. The last three words should be "power-brake unit." ★★★

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The Tough One has all the built-in quality and features you'd expect in a Rockford mini-cycle. The only surprise is the low, low price. Folding handlebars, 3-speed 60cc rotary valve engine, primary kick starter and full suspension head the list of standard features. See it. You'll agree it's about the biggest value anywhere.



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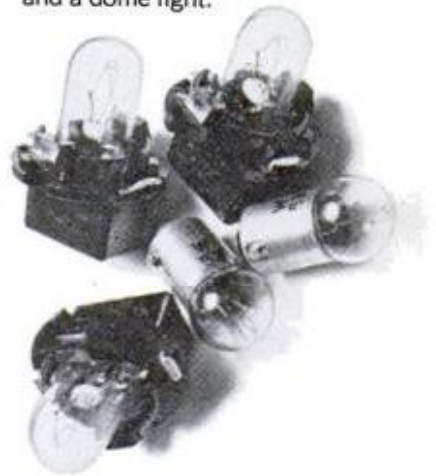


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• If you're a salesman, office worker, or production foreman—or if you're just plain good at working with people—all you may need to start moving up the executive ladder is some specialized training in (7) Business or Production Management; or (8) Hotel/Motel Management. (Other alternatives, for both men and women—(9) Secretarial training...or (10) a career in Interior Decorating.)

• Or if you're already working with numbers—maybe as a Biller or Traffic Manager—all you may need is some professional training to become an (11) Accountant or (12) Computer Programmer.

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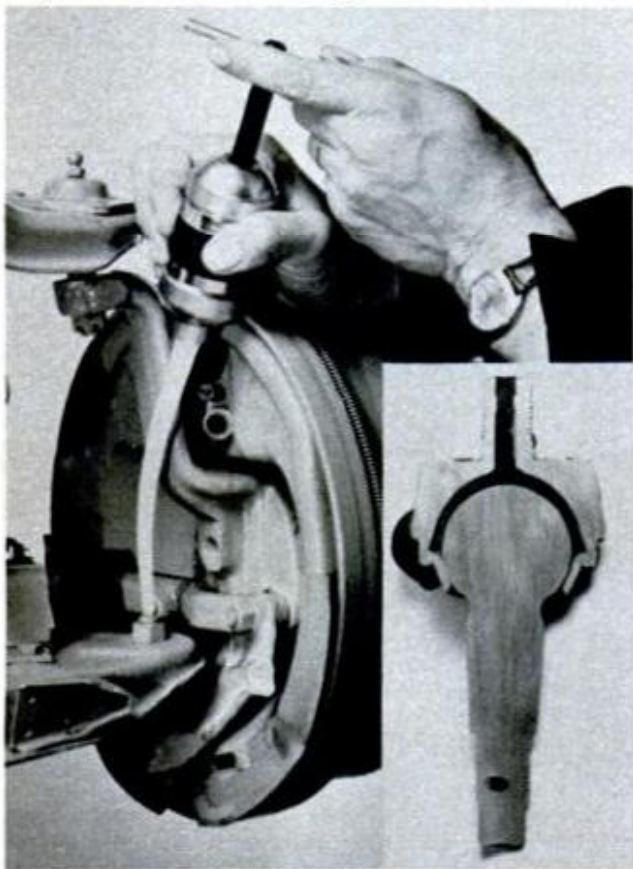
AUTOMOBILE CLINIC

BY MORT SCHULTZ

Ball joint first aid

I'm told I need new ball joints on my '59 T-bird, but I'd rather spend the money bringing the body back to mint condition. Is there an inexpensive way to repair ball joints instead of having to replace them?
—Dennis Golon, Euclid, Ohio.

There is a new product, called Lubri-Cast, from 3M, that can be injected into the ball-joint chamber to give you another 30,000 miles of driving. As shown in the



photos, you put the compound in with a handgun and it hardens in place. Such use of this product is suggested only if your ball joints are loose, not if they are worn beyond the manufacturer's replacement tolerances.

Too much maintenance

The manifold heat-control valve of my 1967 Plymouth Barracuda has to be freed every four days. A mechanic told me the only thing I can do is to keep freeing it with solvents. But every four days? What's the alternative?—Jack Allen, St. Johnsbury, Vt.

The alternative is to install a brand-new manifold heat-control valve assembly. The shaft of the old one is probably loaded with corrosion. Once the new assembly has been installed, lubricate it with manifold heat-control valve solvent every time you change engine oil. Be sure the area is cold before applying lubricant.

Another cure for hesitation

Your answer to Lois Smith's hesitation problem in last November's Automobile Clinic is a good one, but there may be another solution. I am a mechanic for a Dodge dealer and not too many people realize that this trouble is caused by overtightening the wingnut that holds the breather in place. This warps the top of the carburetor and causes venturi action to draw in excessive air, leading to a too-lean condition. Dealers now stock an extra thick gasket and bridge to force the warp-age back to its original position.—Russell Beck, Macomb, Ill.

Thanks for the help, Russ.

Stalls after a fine start

I own a 1971 Pontiac Grand Prix and a 1972 Pontiac GTO, have the same carburetor in both—a Rochester four-barrel—and the same problem. When I start the engine cold, it starts fine, but as soon as I put it in gear and give it gas, it stalls. It restarts without trouble and is okay from then on. What's the story?—J. W. Hill, High Point, N.C.

Many '71 and '72 owners of GM cars are having the same problem. The engine just isn't getting sufficient "raw" gas on the initial start to keep running because of the leanness of the fuel mixture to help combat emissions. As this article was being written, Pontiac informed me that a lengthy modification was being tested in Detroit and that a service bulletin probably will be hitting the shops of GM dealers soon. I suggest you keep inquiring at your dealer's about it.

Meanwhile, make sure that the fast idle is set on the first cam—just to be certain

(Please turn to page 22)



A special offer for the guy who knows what the underside of a car looks like.

If you've been under a car, you know what's connected to what and why, and you've probably got more than a little Missouri in you. So when someone starts up about his shock absorbers, stop him with a "Show me." We will.

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The more you know,
the more you'll want Delco.



AUTOMOBILE CLINIC

(Continued from page 20)

that the problem isn't mechanical. Now, when you start the engine cold, slowly press the accelerator pedal to the floor twice—even three times is okay—hold it halfway down and turn on the ignition key. In most cases I have seen, this procedure has provided the engine with sufficient gas.

Up in smoke

On several occasions in my 1970 Ford Fairlane with 302-cu.-in. V8 engine, the whole instrument panel has gone balmy. The "idiot" lights come on, the gas gauge registers "full" (although the tank isn't), the temperature gauge shoots up to "hot" and I get a cloud of smoke. I turn the engine off and restart it. The instruments usually return to normal and the smoke clears. Your advice, please—John Weeks, Satsuma, Ala.

Look at the constant voltage (CVR) contacts at the rear of the instrument printed-circuit board. The CVR reduces voltage from 12 to 8. I think there's a poor connection between the contacts and the printed-circuit board. Clean the contacts and make sure they make a tight connection. If this fails to solve the problem, the CVR is probably defective.

Operating in a vacuum

I have a 1971 Buick Skylark with 350-cu.-in. engine and power disc brakes. The power-brake assist unit often fails, mainly on cold mornings before the engine reaches normal operating temperature. My dealer says the problem is a loss of vacuum and nothing can be done about it, but adds that it will eventually cure itself. The car has run 10,000 miles and the problem still exists. Do you know of something that my dealer doesn't?—Ronald Strege, Watertown, S.D.

I don't think so. We both know there is a vacuum leak that apparently seals itself as the engine heats up, and metal parts expand. The first thing to do is determine whether the vacuum line is leaking where it connects to the manifold.

And I'm sure that your dealer is aware that if he can't find and fix the leak that the power assist unit should be replaced under the terms of the warranty since it was reported before the warranty expired.

Right to the end

I have a 1971 Impala with a 350-cu.-in. engine. When going 30, 40 or 50 mph, I can lift my foot from the accelerator only to have the car continue at the same speed. The engine doesn't decelerate, and relying only on the brakes to stop can be dangerous. My Chevrolet dealer's service manager claims that there is nothing he can do about the problem. Is he right?—C.F. Mount, Linwood, N.J.

I wouldn't trust him to fill my gas tank. Ask him if he's ever heard of the throttle-stop solenoid. Give him a clue. Tell him it's on the carburetor. Then ask him if he knows what happens if the plunger of the throttle-stop solenoid isn't properly adjusted or binds. Then tell him to fix the problem before you end up being right—around a telephone pole.

Service tips

● **1972 Plymouth Satellite owners:** The recommended sparkplug for your car as stated in the 1972 Owner's Manual (1st edition) is not correct. If your car has an 8-cylinder 400-cu.-in. engine with 2-barrel carburetor, the correct plug to use is a J-13Y or 35P. If the car is equipped with an 8-cylinder 400-cu.-in. engine and 4-barrel carburetor, the right plug is a J-11Y or 34P.

● **1971-72 Vega owners:** If you have a noise coming from the front end of your engine, don't be too fast to condemn the water pump. The trouble may be an improperly tensioned timing belt. Before you toss away a good pump, have the timing belt tensioned to 11-12 ft.-lb. with the engine at room temperature, using a foot-pound torque wrench and belt tension adapter J-23564. If the noise continues—maybe it is the pump.

● **1971 Ford Pinto owners:** If your 2000-cc engine is leaking oil from the filler tube, there's a cure: a new valve cover that incorporates a baffle under the filler tube to keep the oil where it belongs. Its part number is D1FZ-6582-A. ★ ★ ★

GOT A PROBLEM WITH YOUR CAR? Ask Mort about it. Send your question to Auto Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of general interest will be published in the column.

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Drivin' with Dan

Are rear-view mirrors of any help to a race driver? What would you stress in high-school driver training? Are superchargers worthwhile for street cars? Dan Gurney answers these and other automotive questions

Q. How much use are rear-view mirrors in a race car? With all the vibration, I wouldn't think they're worth very much. And the ones on an Indy car are too small, aren't they?—Benjamin Smithson, Providence, R.I.

A. They are a big help; indispensable, in fact! There's not a single driver who would race at Indy without one, even if the rules did not require them. The vibration is certainly a problem, but it can be overcome. Our Eagle rear-view mirrors are about 4 inches in diameter.

Q. Are emission restrictions hurting automobile engine performance or improving it?—Roger Goss, Elmira, N.Y.

A. Practically speaking, they are hurting performance. On the other hand, it is becoming apparent that careful tuning for performance will also reduce emissions. In other words, keep your car in tune: it'll perform better and keep down emissions.

Q. Have you ever ridden the water-cooled Suzuki 750 that was in PM in Feb.?—Henry Saamundsen, Babylon, N.Y.

A. No, not yet, but I would certainly like to! Team Suzuki will be campaigning the ma-

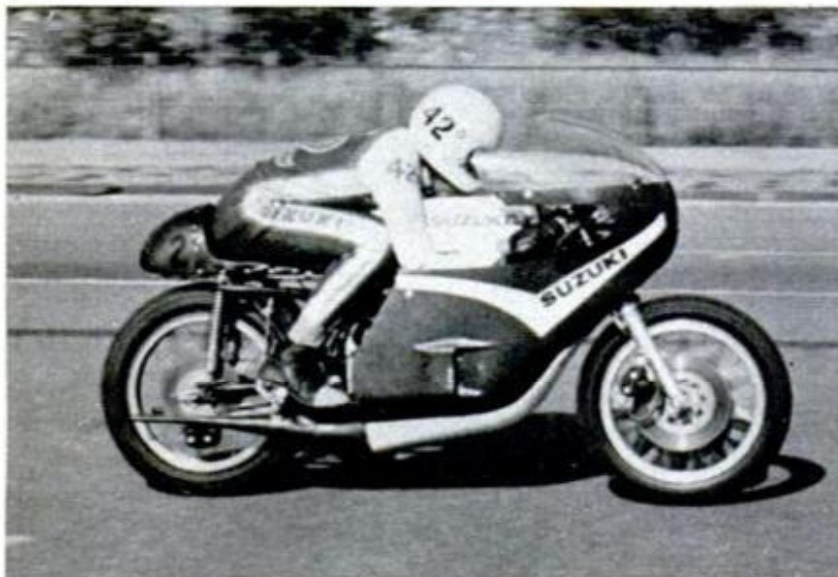
chine in national championship events this year. Riders are Ron Grant, Art Baumann and Jody Nichols. Events coming up are the Loudon 100 (N.H.), June 11; Indianapolis 125 (Ind.), June 18; Laguna Seca 125 (Calif.), July 23; Talladega 200 (Ala.), Sept. 3; and the Ontario 125 x 2 (Calif.) on Oct. 1.

Q. If you were laying out a curriculum for high school driving instruction, what areas of instruction would you emphasize?—Carol McTier, Tallahassee, Fla.

A. Driver judgment. Learning to analyze situations to avoid the need for reaction: anticipate! Also learning to recognize flaws in your own driving and that of others, which do not always cause accidents but certainly increase the probability of one. Practice on skid pads and driving in the wet are also very important.

Q. What are the advantages and disadvantages of superchargers for street cars? Does anybody still make them?—O.E. Holloway, Mount Morris, Mich.

A. Turbochargers, or exhaust-driven superchargers are gaining in popularity for the street. They are relatively troublefree. (Most



RACING VERSION of the Suzuki GT-750J water-cooled motorcycle that was featured on the cover of the February PM has a fairing to give it the aerodynamics for high-speed road racing. The bike is competing in American Motorcycle Assn. (AMA) events. The racing 750 has a dry-type clutch which is cooled by air that's forced to it from a scoop on the fairing. Water cooling keeps power from falling off when the engine temperature goes up, as happens with air-cooled two-strokes

big diesel trucks use them.) They double horsepower without much difficulty. Three or four manufacturers are making them and others are making conversion kits. They are also being researched for their low-emission potential. See your local speed shop for details.

Q. Do manufacturers build in many real qualities which make a NASCAR stock car or Trans-Am sedan a winner, or is it more a question of who spends the most money and gets the best racing teams?—Ed Barton, Houston.

A. A certain minimum amount of money is necessary for a factory to go racing, even by a small dedicated team that cuts it close to the bone. The Camaro probably has the most stuff available to anyone at a reasonably low cost in Trans-Am. Stock-car racing is the domain of established teams, very competitive, and it requires a lot more background experience. The racing team is still the most important ingredient. All items are important, however, and hard work and intelligent engineering can make up for a lot of money.

Q. Is there much chance of an explosion from smoking a cigaret around an operating pump at a gas station?—Clyde Rothman, Arlington, Tex.

A. The chances are certainly increased by smoking. Don't smoke at an operating gasoline pump, and remember to turn off your engine as well. Boatmen who know the dangers of trapped fumes in a bilge, for example, will go further than that and avoid all potential spark-producing actions in the presence of gasoline fumes.

Q. Whatever happened to Graham Hill after his crash at Watkins Glen in 1969?—Russ Braen, New Hartford, N.J.

A. Graham was treated at a hospital in London that has built up an excellent reputation for rehabilitating people with broken limbs. I understand that it avoids the use of casts whenever possible. Despite rather grim early forecasts, Graham's determination and good physical shape have helped him to recover from his injuries. He is back driving again for the Brabham Grand Prix team and, although there's some lingering stiffness in his leg, he appears just as fit as ever. ★★

If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 20).

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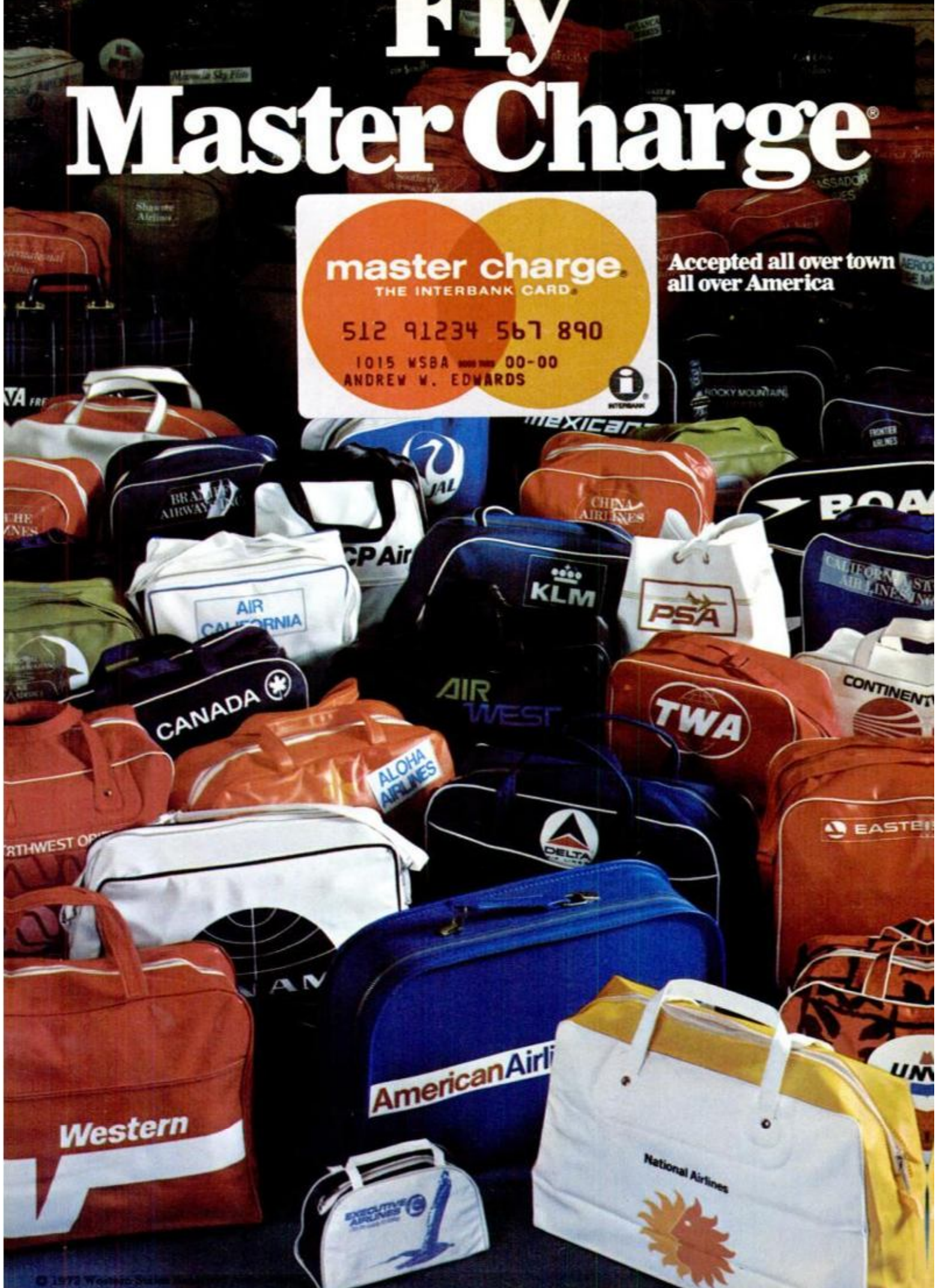
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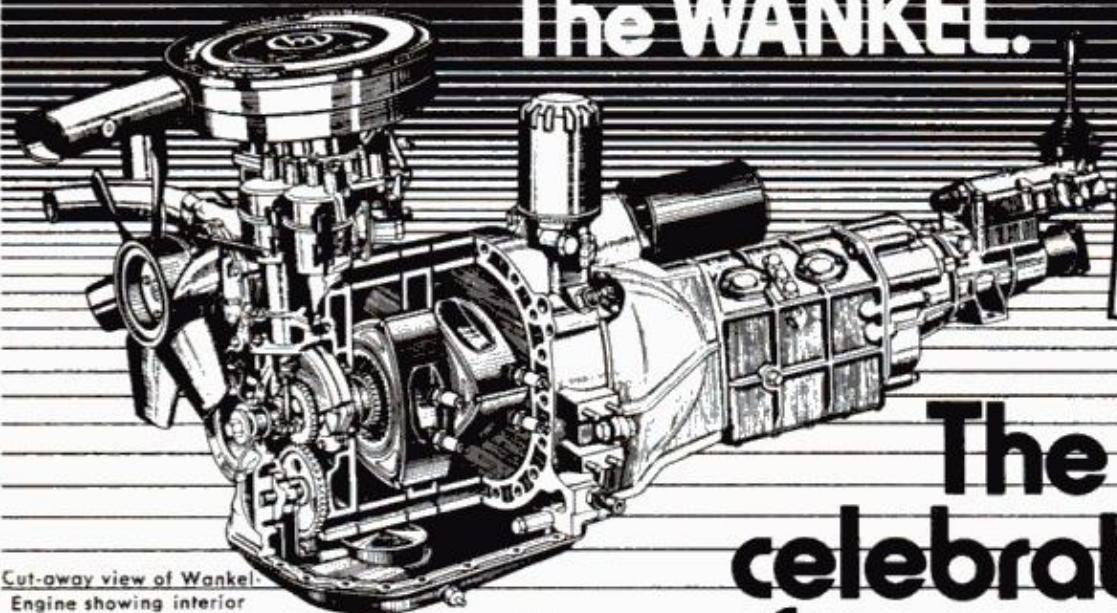
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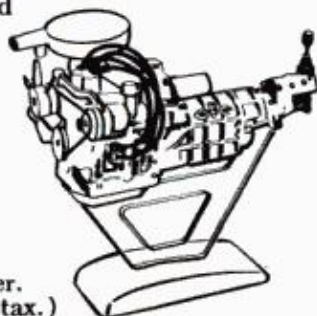
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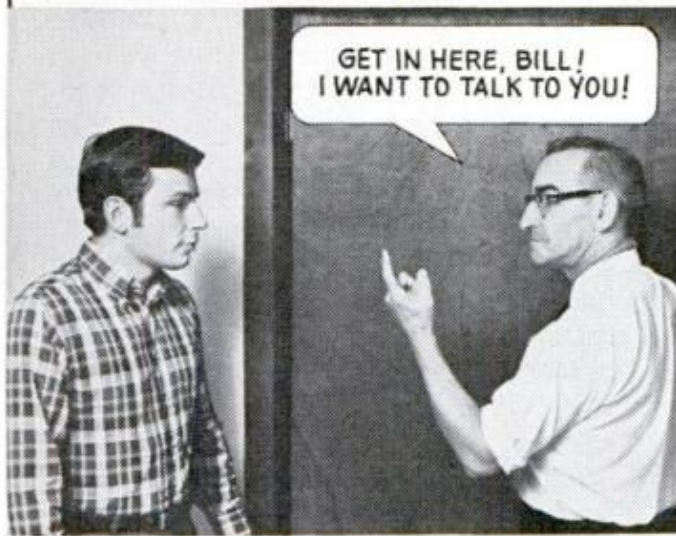


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I'VE GOT A NEW JOB
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THE MONEY!



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TO PAY YOU
THAT MUCH!

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YOU THINK!
I'VE BEEN
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PM-67

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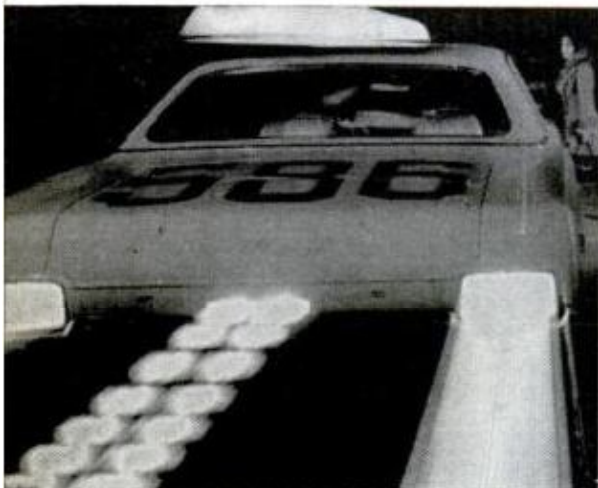
By JOHN PEARSON



Plastic helmets take breath away



"Robot" tests manipulating device



Pulsed beam means car is slowing

TO HELP LOWER THE RISK OF INFECTION in certain operations, physicians at St. Luke's Hospital, Denver, operate inside a portable "clean room" while wearing plastic helmets equipped with a communications headset and a hose to carry away expelled breath. The clean room has a controlled environment. Air is forced in a gentle breeze from the rear of the room to the front, which is open. Surgical team members "upwind" of the patient wear helmets, but personnel stationed "downwind" do not require special gear. Air they may contaminate wafts out of the room. The system was developed by the Martin Marietta Corp. under a NASA contract.

A 40 PERCENT BOOST IN GROWTH can be obtained by illuminating greenhouse plants with mercury halide lamps instead of the fluorescent and incandescent lamps normally used. This has been established by Cornell University researchers who worked with crops such as corn, soybeans and alfalfa. Even greater growth was obtained from quackgrass, wild mustard and other weeds. The researchers explain that, unlike the standard types, mercury lamps have a spectrum similar to that of sunlight. They are regularly used to light football fields, hockey rinks and warehouses.

IN SOME FUTURE TIME, all housework, including vacuuming and the making of beds, will be done by remote-control devices. This is more than a housewife's daydream. It is the view of the future of engineers at London University, England, who are developing a variety of robots for use around the house. They range from table-clearing devices to stair-climbing machines.

JOGGING MAY BE BAD for your health if you do much of it alongside busy highways, where you breathe deeply of polluted air. That warning comes from Asher J. Finkel, M.D., writing in the *Journal of the American Medical Assn.* He points out that concentrations of carbon monoxide may reach dangerous levels during rush hours, especially at intersections where cars are halted by stop signals. In one study cited by Dr. Finkel, it was found that the zone of heaviest pollution extended 65 feet to either side of a highway.

A NEW SAFETY SYSTEM FOR CARS incorporates a device that senses rate of deceleration and activates an amber light on the rear of an auto. As the car slows, the light emits a pulsing beam. The faster the stop, the brighter the pulses. Thus, a following driver is instantly warned of an unexpected braking situation, allowing him to slow down or take evasive action. The

(Please turn to page 32)

Jeep Truck. When you work it over, you don't overwork it.



With Jeep guts, this husky 4-wheel drive truck is no stick-in-the-mud.

The Jeep Truck is built for hard and unusual punishment. It comes through, come mud, water, snow, or sand. With a load that'd bog down most others. The reason: Jeep guts.

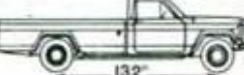
That means go-anywhere Jeep 4-wheel drive. A rugged suspension, with strong multi-leaf springs all around for greater stability. And a rugged frame with 5 cross-members.

The Jeep Truck gives you a choice of powerful straight-6 or V-8 engines. Plus your choice of transmissions geared to your field of work—



3-speed, heavy-duty 4-speed, or automatic.

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 **Jeep**

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Go treasure hunting on the bottom! Fascinating fun & sometimes profitable! Tie a line to our 5 1/2-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along bottom—your "treasure" haul can be outboard motors, anchors, other metal valuables. 5 1/2-lb. Magnet is war surplus—Alnico V Type—Gov't cost \$50. Lifts over 150 lbs. on land.

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 lbs. \$ 5.75 Ppd.
 lbs. (lifts 40 lbs.) \$ 8.75 Ppd.
 lbs. (lifts 350 lbs.) \$33.95 FOB

Stock No. 60.215H 1 1/2
 Stock No. 70.570H 3 1/2
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"Balls of fun" for kids, traffic stoppers for stores, terrific for amateur meteorologists. Create a neighborhood sensation. Great backyard fun. Exciting beach attraction. Amateur meteorologists use to measure cloud heights, wind speed and temp. Made of heavy-duty neoprene. Inflate with vacuum cleaner or auto air hose; or locally available helium for high rise.

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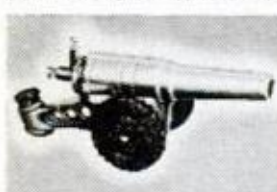
AMERICAN MADE OPAQUE PROJECTOR



Projects illustrations up to 3" x 3 1/2" —enlarges them to 35" x 30" if screen is 6 1/2 ft. from projector, larger pictures if screen is farther away. No film or negatives needed. Primarily intended for children. Projects charts, diagrams, color or black-and-white in darkened room. 115 v. A.C. . . . 6 ft. cord and plug included. Size 12" x 8" x 4 1/2" wide. Weight 1 lb. 2 ozs. Plastic case.

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SCIENCE WORLDWIDE

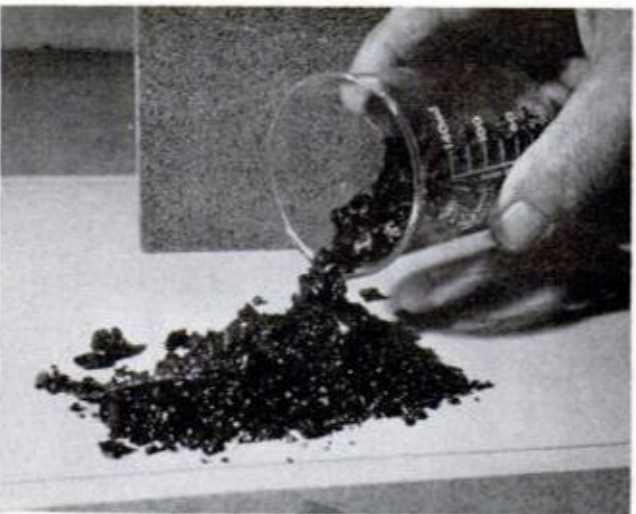
(Continued from page 30)

system, called Cyberlite, is being tested in California.

The Environment

A YEAR-LONG STUDY of Lake Ontario by United States and Canadian scientists will start this spring. The object: to improve the scientific basis for the management of Great Lakes water resources. Universities and government agencies of both nations will cooperate in setting up a network of towers and buoys in the lakes. They also will use ships, aircraft, weather stations and satellites to gather information about the 30,000-square-mile drainage basin of Lake Ontario.

REFUSE IS TURNED INTO BRICKS by a process developed by scientists at a New Jersey company. The refuse—garbage, tin cans, bottles, old bikes—is heated at high temperatures in a furnace. The resulting slag is quickly cooled in water to produce



a granular frit (the dark stuff being poured from the beaker). The frit is mixed with Portland cement and water, and the mixture is poured into molds and pressurized. After 24 hours of curing in the air, the bricks are ready for use. Their mechanical strength continues to increase for some time, according to researchers.

THOUGH NEARLY 120,000 TONS of fluoride are emitted each year into the air of the United States—from natural and industrial sources—airborne fluoride does not currently present a hazard to man. So says a scientific report recently issued by the Environmental Protection Agency. ★ ★ ★

Winchester and Western extra-power 22s have all the flat-shooting, power-packed, high-velocity performance you'd expect from any ammunition marked Super-X.

Each offers the utmost you can get from a 22 Short, Long, or Long Rifle, in the original brand of long-range power that's never been topped.



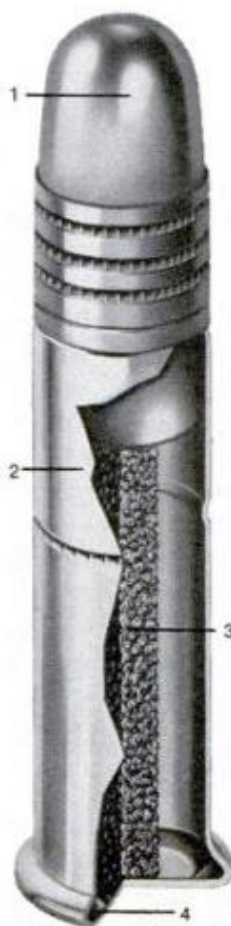
Super-X . . . the name that means "extra power" now in both Winchester and

Western brands. For years hunters who require the most powerful ammunition have relied on Super-X to bring down big game, or high flying waterfowl. This same kind of reliable Super-X extra power goes into our high velocity Super-X 22s too, to give you a cartridge that hits with impressive power for a 22 rim fire . . . perfect for small game, pests or varmint hunting.

1. Exacting bullet weight and contour. To ensure all the long-range, wind-bucking accuracy you need, to go along with extra power, Super-X bullets are made to exacting standards of weight and contour, so they'll hit where you're holding for elusive rabbits or wary squirrels. Bullets are available in Short, Long, Long Rifle, Lubaloy or Kopperklad coated for better performance. Hollow points, too, in Short and Long Rifle.



2. Precision-formed brass case. There's only one brass good enough for Super-X ammunition . . . the brass we make ourselves in our own brass mill. It's a special cartridge brass that's drawn and shaped to perfection. You get the same kind of precision in a Super-X 22 case that goes into our largest center fire ammunition.



3. Clean, progressive-burning Ball Powder. A superior smokeless propellant, Ball Powder is the result of an exclusive Olin manufacturing process, and has been proven by sportsmen around the world for more than 30 years. Ball Powder provides highly uniform ballistics that are especially important for 22 accuracy . . . and gives clean-burning, controlled ignition for progressive burning and fast barrel times. Each Super-X Short, Long, or Long Rifle bullet is powered by a custom-formulated load of Ball Powder, that's custom-measured for optimum velocity, accuracy, and performance.



4. Non-corrosive priming. Consistency is the name of the game in compounding the priming that's carefully spun into the rim of every Super-X 22 rim fire cartridge. Consistency means exactly the same primer ignition impulse every time you pull the trigger on Super-X . . . and that spells tight groups at all 22 rim fire ranges. Consistency also means non-corrosive performance you can count on in any weather, for hunting, plinking, or target shooting. Super-X is available now in both Western and Winchester brands. New plastic, all-weather 100-pack also available. **WINCHESTER:Western.** 275 Winchester Avenue, New Haven, Connecticut 06504.



Ask for the new High Strength Plastic 100 pack

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the way you
want it

DETROIT LISTENING POST

BY ROBERT LUND

ELECTRONIC FUEL INJECTION is such a hot item that Ford has apparently decided to develop its own unit, instead of buying an e.f.i. system from a supplier. Ford had indicated to a supplier it might take as many as 100,000 units in 1974, but that's been cancelled, although Ford may still use the supplier version on a few '73 cars.

GM AND THE WANKEL. Why does GM continue to play it so coy and close-to-the-vest on its Wankel? Why all the secrecy and pussyfooting around? GM's reply is that it still has reservations about the engine, so it doesn't want to come flat-out in favor of the rotary until all problems have been resolved. There may be more to it than that. The feeling you get talking to people at GM is that (1) the company's confident the problems can be solved, but (2) GM sees the Wankel as a short-term proposition as engines go. Not as a throwaway, an engine you use up and pitch out, but as a relatively short-lived form of power, good for something like 8 to 10 years, until the turbine can be perfected. Nobody at GM's said this in so many words, but it's an impression you get talking with people on the inside.

WANKEL IN A VEGA? *Would you want the Wankel installed in something larger than a Vega, or smaller? You can have it either way, depending on which auto-industry trade paper you read.*

Paper A confides, "The car will be larger than the Vega."



SERIES III LAND ROVER was among new-car introductions at New York's International Auto Show this spring. Transmission, clutch, brakes and heater have been improved; on the outside, this legendary vehicle is marked by a new, corrosionproof grille

Paper B reveals, "GM plans to inject the engine in a new small car six to eight inches shorter than Chevrolet's Vega."

Confused? You're not alone.

TROUBLE AHEAD FOR CAR THIEVES. Since Chrysler announced it will offer an antitheft locking system for its '73 cars, everybody else is trying to counter with a we've-got-something-just-as-good.

Ford's said to be looking at the idea of doing away with the lock and key for trunks of all cars except bottom-of-the-line specials. The only way of opening the trunk would be via a release inside the car. Security engineers at all the auto companies say it's practically impossible to burglarproof a trunk using lock and key.

Another idea being checked out involves the use of an extra key. It activates and deactivates an alarm system—lights flash and the horn blows—inside the vehicle. You turn it on when you leave the car. Thieves could still force entry and get a car started, but any attempt to move it without using the key to kill the alarm causes it to sound off. The alarm continues until the car is brought to a stop.

CADILLAC COMPACT? GM has yet to place tooling orders to produce a junior edition Cadillac, but dimensions of the car and the engineering package are virtually wrapped up. The bijou version will carry a strong Cadillac identification up front but not in the rear. Wheelbase will be something under 120 inches.

WHAT'S THE STEAM CAR'S FUTURE? GM says it doesn't have a future, Bill Lear's claims to the contrary. GM's the one auto company that's assisted Lear in his efforts to develop a steam car, as the inventor himself has acknowledged. GM's not antisteam engine, if you want to use it in something other than an automobile. But for automotive use, GM says steam can't cut it. Chrysler's not accepting the GM-signed death certificate just yet and wants to explore the idea further before giving a verdict. Chrysler has agreed to do a conversion of a standard six-passenger car to carry a reciprocating steam engine, being developed by a non-auto company, when the engine's
(Please turn to page 36)

ASK THE AC ENGINEERS

“Is there really a difference in spark plugs?”

Yes, there is a difference in spark plugs. There are a number of features that make a significant difference in AC Spark Plugs.

The two newest features are . . . the improved Alumina insulator material and the Iron-Glass seal. Both are standard in all AC Spark Plugs.

1. AC's Alumina insulator provides added strength, added protection against corrosion, and improved insulation under high temperatures.



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These new features are built into the AC ACniter Spark Plugs that go into your car.

Whether you tune your own car or have it done, next time ask for ACs.

Remember, there is a difference in spark plugs.



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**STOPS ENGINE NOISES
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DETROIT LISTENING POST

(Continued from page 34)

ready for testing. Chrysler will also cost out what it would run to put a steamer in production.

DELUXE PINTO worked up by Ford is said to be a grabber in both looks and action. But Dearborn's in no hurry to put the car in production. Ford envisions the remake as a shot in the arm for Lincoln-Mercury, if and when that division needs a booster. But L-M's riding high, so the car's on ice for the time being.

CHRYSLER CONTINUES TO DENY an interest in building a small car in the U.S. Big C says it has that market covered with its Japanese and British imports, Colt and Cricket, but the company's feeling the pressure to get going on a U.S.-made mini. The pressure's coming from the other auto firms and Chrysler's own dealers. But the money men in charge at Chrysler don't pressure easily. While they may not bow to the pressure, they might bend a little. Say to the point of chopping down one of the company's current cars and putting it out as a star-spangled answer to Vega and Pinto.

HOW TO TELL THE NEW VW. If you have trouble distinguishing a '72 Volkswagen from a '71 or a '70, climb in the back seat and try to lift up the parcel shelf under the rear window. If the shelf is hinged and lifts up, it's a '72. If the shelf won't budge, you can date it as a car made sometime between 1949 and 1971. What if it's not your car and you can't get in the back seat to give it the shelf test? In that case, write to VW of America, Englewood Cliffs, N.J. 07632, and tell 'em you want a copy of the new edition of the Beetle-watchers guide, What Year Is It? Free.

SAFETY BEGETS WEIGHT, GM and Ford have found while working on experimental safety cars for the government. They've had it tough meeting the 4200-pound weight limit set by the Department of Transportation. Even after extensive use of lightweight materials, the cars still weigh 750 to 1000 pounds over the DOT maximum. If you want the extra safety gear, say the engineers, you have to take the extra weight.

"WORLD CARS 1972" from Herald Book Publishers, Bronxville, N.Y., is once again the definitive encyclopedia of cars—800 in all—being made the world over. This handsome volume, formally called the World Car Catalog, also includes sections on motor sports, prototypes and automotive research and developments. The 9½ by 11-in., four-pound reference costs \$17.50. ★ ★ ★

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MORE OF A JOB, MORE TRAINING: The Navy can guarantee you your job (there's over 70 to choose from) or the Navy can guarantee you get to a school where you'll learn one.

MORE CHOICE—NEW 3 YEAR ENLISTMENT: You can come in for 6 years or 4 years or now, 3 years.

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2. OR SEE YOUR NAVY MAN.

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3. OR SEND IN THIS COUPON.

Send To: Captain Donald E. Oglevee⁹
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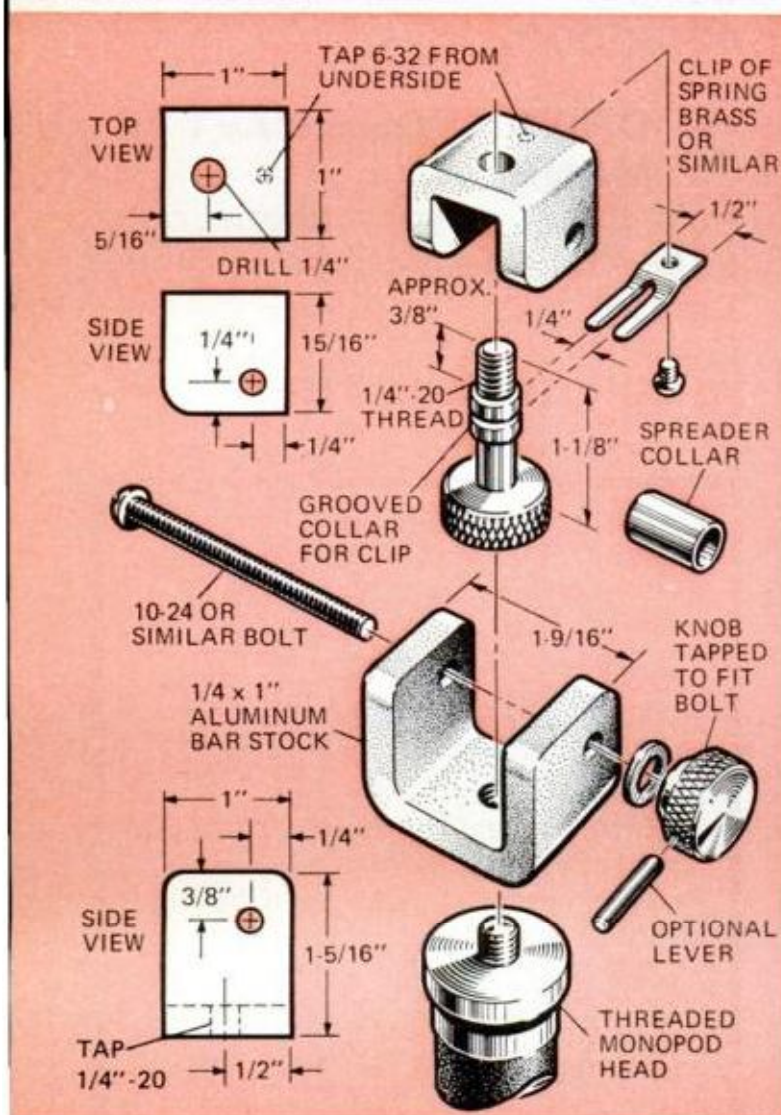
Photo Hints

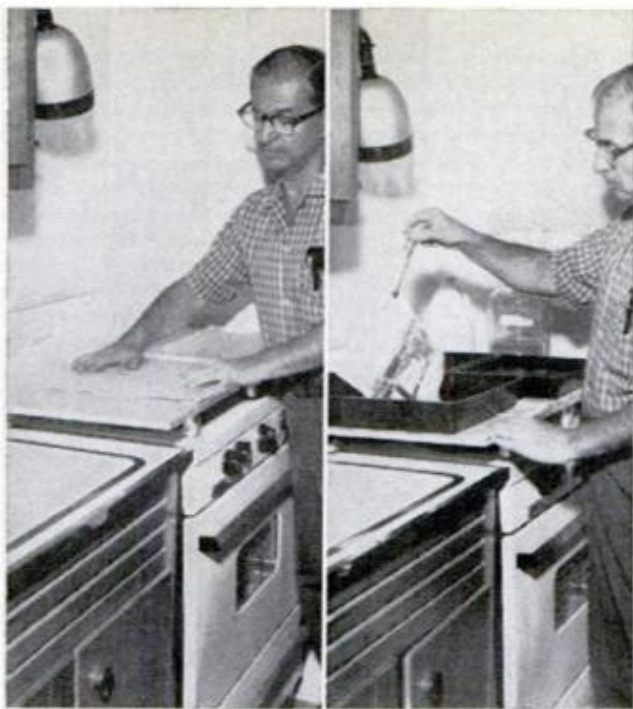


Tilt-top for monopod shooting

One-legged monopods may not be as steady as tripods, but they're a lot more portable—and still a lot steadier than nothing. The lack of a tilt head is no problem when you shoot objects near eye level, or distant scenes—just lean the camera and unipod together for whatever slight tilts you may need. But when shooting up or down at steeper angles, you have to tilt the unipod so far that it can't support the camera. Here, a tilt-head is needed—but tilt-heads made for tripods are so bulky that they eliminate the unipod's main advantage: compactness. Ball-and-socket heads, though compact, tend to tilt in too many directions at once.

Hence this ultracompact tilt-head, designed specifically for monopod use. It's basically a hinge made of two pieces of aluminum bent into U-shapes (I used a hammer and bench vise), then drilled. I also filed flat the surfaces that bear against camera and monopod. The camera-holding screw and the hole tapped in the bottom piece are standard 1/4"-20 thread. If you have no lathe, solder or weld a washer to a regular tripod screw. If it's hard to loosen, a coin slot cut in the screw-head will help. You can use a wingnut on the horizontal clamping screw, but I find a knurled nut with 3/16-inch brass lever rod, cut to protrude 5/8 inch, neater. This tilt-head weighs little more than 4 ounces. —Walter E. Burton, Akron, Ohio, and Irl Gordon, Daytona Beach, Fla.





Stovetop darkroom counter

Need more counter space for your kitchen darkroom? Add a plywood platform over the range. Short corner posts will raise it over the burners—spools are ideal. Use newspaper to absorb any spills.—Robert Hertzberg, Flushing, N.Y.



Color-code your darkroom gear

Using the same funnels, trays or tongs for developer and fixer will contaminate your chemicals and reduce their life. Color-coded tray sets are widely available, but it pays to use different-color tongs and funnels, too: one for developer and water, one for stop bath and fixer. Make sure you can tell the colors apart under your darkroom safelight; different-shaped funnels help. If you code with paint, color only the *outside* surfaces. Labeling tape is a good reminder, too.—David E. Anderson, Sunnyvale, Calif.

When it's bath time, Spot hurries under the porch. Should your camera be set for flash, or shouldn't it?

If you guessed no, chances are you guessed wrong. At times even outdoor subjects need flash. Or else you might lose your picture in shadow.

But why guess at all? The Minolta Hi-matic E 35mm camera decides whether to flash or not, automatically, indoors or out.

Just leave the electronic flash on the Hi-matic E at all times. You get a flash when you need it. No flash when you don't.

And flash or no flash, you never have to worry about shutter speeds and lens openings. The camera adjusts itself automatically for a perfect picture every time. In any light. Even time exposures are automatic.

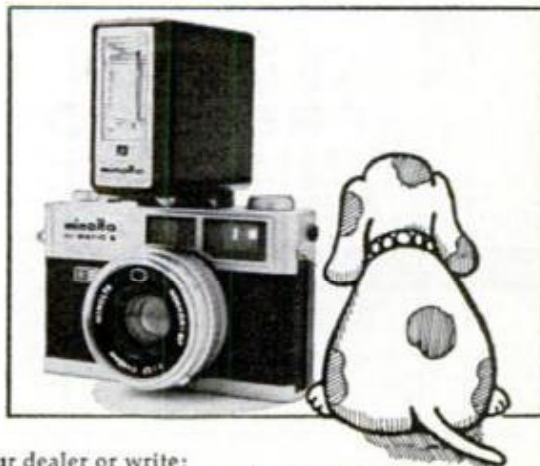
Minolta Hi-matic E

The automatic everything camera.

For information, see your dealer or write:

Minolta Corp., 200 Park Avenue South, New York, N.Y. 10003; In Canada, Anglophoto Ltd., P. Q.

Think not, before you shoot. The electronic Minolta Hi-matic E, about \$180 with flash and case (camera and case only, about \$160).



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The engine is incredibly smooth at all speeds, with no vibration. The reason is simple: it's a street version of the 350cc engine that powered Kel Carruthers to victory in last year's AMA 125-mile National at Road Atlanta. And, it's the same proven Yamaha dependability that has dominated Daytona road racing for the last 7 years straight. Put that performance together with no-mix/no-mess Autolube oil injection, excellent suspension front and rear, a care-free positive 5-speed transmission – and it's easy to see why the experts have made our 350 Twin their choice. But, why not read what they have to say for yourself?

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NEWS BRIEFS



Roadside emergency box

Roadside aid for a motorist is just seconds away with a new batteryless call box from ADT. The self-contained box has buttons for summoning fire, police, medical or auto-service assistance. Action of opening door lever produces electrical charge to power an FM radio transmitter. The coded signal is received by a console in a central location, such as a police post.



New Kodak microfilm readers

Two new Kodak Ektalite readers make microfilm viewing "an economical reality" for business, libraries and schools, reports Eastman. The Ektalite 120 reader (shown), priced at \$95, is designed for reading a 4x6-inch microfiche containing up to 98 images; the Ektalite 140 reader, priced at \$110, reads a standard microfiche carrying up to 325 images.



Light tread for painters

A custom-designed truck, with ATV-type fat tires that are deflated so they don't damage lawns, is the heart of a new painting-contractor franchise operation. Carrying a 32-foot hydraulic aerial ladder plus two hydraulic pumps (one for pumping water and cleaner at 1500 p.s.i. to remove loose paint; the other for pumping paint at 3000 p.s.i.), the truck was developed by Paul R. Adams Jr., president, Paint-a-House of America, 426 Pennsylvania Ave., Fort Washington, Pa.



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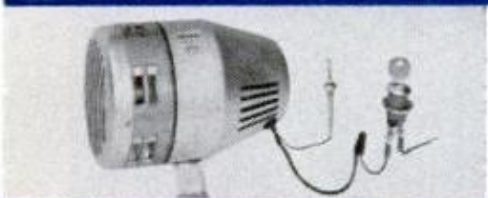
ARMSTRONG TIRES

JULY **Preview** OF POPULAR MECHANICS



SPECTACULAR SKI TRICKS YOU CAN DO

World champion trick and slalom skier Christie Freeman shows how to do some basic tricks that look difficult but are easily learned.



THIEFPROOF YOUR CAR: 17 WAYS

This roundup of some of the best commercially available and homebuilt anti-theft devices offers you a lot to choose from.



NOW: A 20-FOOT TRAVEL TRAILER YOU CAN BUILD YOURSELF

With plans, full-size patterns and a construction manual, PM readers can build this professional-looking trailer.



BENCH-SAW KNOW-HOW

Part I of a series on how to get the most from your bench saw stresses safety tips to remember.



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Bicycle hostels, new lightweight all-weather gear and new cycling paths make for a growing family sport.

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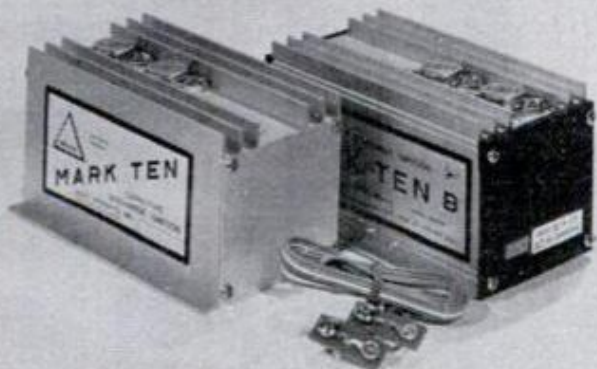
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JUNE 1972

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PHOTOGRAPHY



POLAROID SQUARE SHOOTER 2, lowest-priced color Polaroid yet, makes $3\frac{1}{4} \times 3\frac{3}{8}$ -inch color prints for about the price of developed color. The electric-eye shutter has electronically controlled speeds of 1 to $1/500$ second for indoor or outdoor shots on color or black-and-white film packs. Viewfinder shows the



focus scale (with best flashcube distances in red) and a red square to tell you when you're five feet from your subject. Spring-wound flashcube gun and a lock to prevent accidental shots are built in. Camera, \$24.95; Type 88 Polacolor film, \$3.99 for eight shots. Polaroid Corp., Cambridge, Mass. 02139.



STROBE ADAPTER for Instamatic-X cameras allows use of any electronic flash unit in place of batteryless Magicubes. The adapter, which fits over the camera's flashcube socket, synchronizes the flash unit through its "hot" accessory shoe or a standard PC contact. Heavy flash users can save over flashcube costs; occasional users may find it more convenient. K-477 adapter, \$9.95. Kalimar, Inc. 2644 Michigan Ave., St. Louis, Mo. 63118.

CASSETTE-LOADING Super-8 sound projector shows sound or silent Super-8 and 8-mm films on reels or in instant-loading Auto-8 cassettes. For sound films, speed is controlled by sync pulses from an optional Filmosound-8 cassette recorder. Another accessory lets you add sound to existing silent movies. The projector threads automatically from either reels or cassettes up to 400 feet, and rewinds auto-

matically at the end of the show. You can also speed up or slow down silent films, "freeze" a frame, or project in reverse. Model 478Z, \$249.95. Bell & Howell, 7325 North Linder Ave., Skokie, Ill. 60076.



ALL By BILL McKEOWN OUTDOORS

"I WANT IT RIGHT OUTDOORS," outdoorsman Ted Williams told me. I knew he was talking about hunting, camping and fishing, although there are spectator sportsmen who seem to think Ted is only the manager of the new Texas Rangers and the best baseball player alive.

We were examining boats, outboard motors, fishing rods, reels and lures, hunting clothes and assorted gear for the sportsman that might one day carry Ted Williams' name. He tends to be a perfectionist, and there are rumors that years ago the mild-mannered Mr. Williams took a bunch of fishing rods, broke them up barehanded, and tossed them at an audience of equipment executives to complain about the quality.

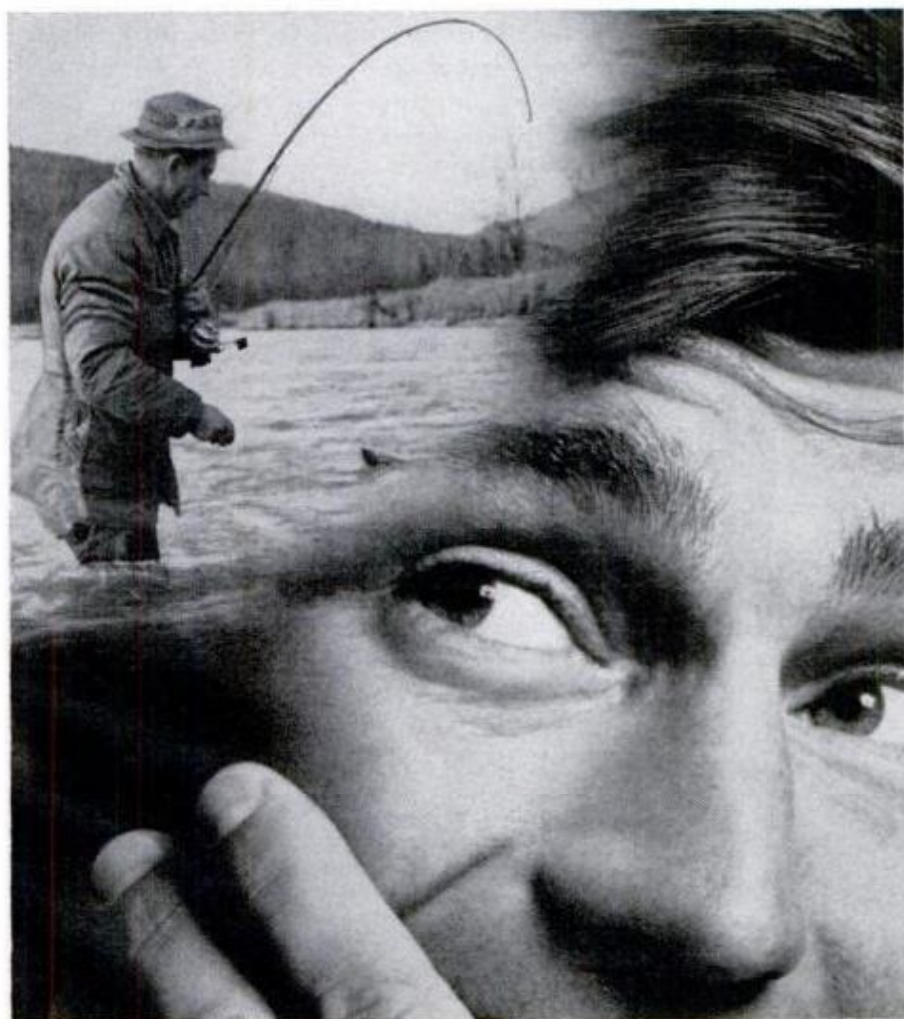
That must have been long ago. Now Ted is on the Sears, Roebuck sports advisory staff, and gear wearing his familiar signature is first tested to destruction, I found, at a little-known research and development base that Sears maintains year-round on the Gulf of Mexico in southern



Florida. Blazing tropic sun, corrosive salt spray and barnacle-infested waters are encouraged to do their worst to equipment before it is considered strong enough to be sold.

Called the Sears Fort Myers Beach Merchandise Development and Testing Laboratory, the facility is a branch of the 200-man test headquarters in Chicago. The combined operation is the world's largest private testing lab, second in size only to the Bureau of Standards in Washington, D.C. The staff of 19 includes product

(Please turn to page 48)



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Charlotte, N. C.

ALL OUTDOORS

(Continued from page 47)

engineers specializing in outboard motors, mini-bikes, lawn-care equipment, firearms, power and sailboats, and even a full-time naval architect.

Williams pointed out an early development model of the new Sears 12-foot Super Gamefisher boat that had already been photographed in color for TV commercials when the engineers decided they wanted to further improve the deck of the sturdy craft (made of ABS vacuum-formed plastic—the same material used for telephones and crash helmets). So production stopped until the engineers got the design they wanted and Ted got the performance he insists on.

Another recent project was strictly for comfort. Many fishermen, it was felt, don't bother with life jackets because they are uncomfortable. The result of research and testing was a series of vests approved by the Coast Guard and flexible enough for an okay from George O'Day for sailing Sears' new Jetwind sailboat, or from Ted Williams for fly casting. Testing sporting gear for pay must be a most pleasant job, but many outdoorsmen are likely to benefit as well.

FIREARMS should be handled with care, but the idea they are an important cause of accidental deaths is false, according to a recent study by Metropolitan Life Insurance. Fire, drowning, motor vehicles, even falls cause many more fatalities. The fatality rate per 100,000 for car accidents was reported at 47; falls, 9.5, and firearms, 2.1.

CAMPERS planning where to go this summer have a lot of help already available if they do a little homework now. An extensive assortment of publications is available. Some are free.

From Safari Camps, Eastgate Plaza, Columbia, Mo. 65201 and Jellystone Campgrounds, 236 Michigan St., Sturgeon Bay, Wis. 54235, free booklets list their growing number of camps across the country, also give free numbers to call for reservations. And Rand McNally now has a start on a library of handsome books covering national parks, tours, road atlases, and campground and trailer park guides listing facilities and prices for each campsite.

FEW FISHERMEN will reveal their favorite spots, but Chrysler boat and motor dealers have a booklet, *Where to Find the Big Ones*, listing 20 hot spots from Kickapoo Creek on Lake Livingston, Tex., to trout hideouts in Canada. A companion booklet tells *How to Get the Most Out of Boating*.

(All Outdoors continues on page 50)



Seagram's 7 Crown. It's America's whiskey.

In America, 7 Crown outsells the leading Canadian and Scotch combined. And for a very good reason: the taste. It's uniquely and consistently smooth.

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This 27 piece set contains:

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 - 3/16", 1/4", 9/32", 5/16", 11/32", 3/8", 7/16" hex head screws and nuts.
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ALL OUTDOORS

(Continued from page 48)



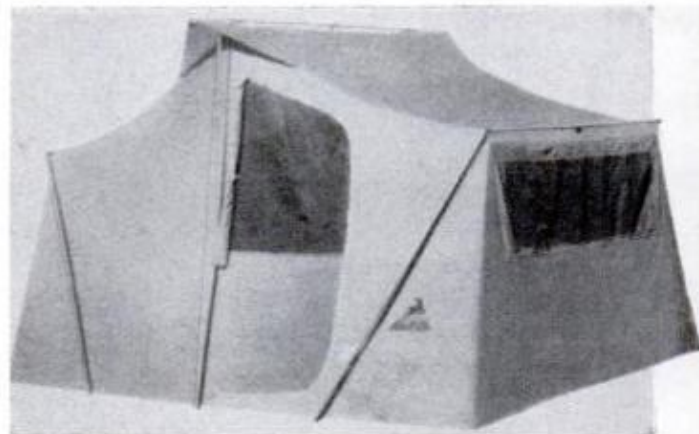
CAMPECUE is the catchy name of a new camp barbecue reported to "charcoal broil" food without the charcoal. Permanent ceramic coals are heated by a built-in propane burner that warms up instantly and adjusts for desired cooking temperature. Flame-ups from liquid starter fuel, plus soot and ashes, are eliminated with the \$40 unit from Primus-Sievert, but barbecue flavor is said to be retained. Small backpacker stoves, lights and heaters are also new to the Primus line.



COLEMAN LANTERNS, long standard equipment for outdoorsmen, have now been upgraded to hook up with disposable or refillable LP tanks and bottles, and tamed down so that single or double-mantle lamps can be adjusted from full glare to warm glow. Adjustable catalytic heaters, assorted sleeping bags with varying thicknesses of Dacron II filling, and Charger 3000—a fluorescent camp lamp that runs off batteries, car or 110 volts for recharging—are among newest items.

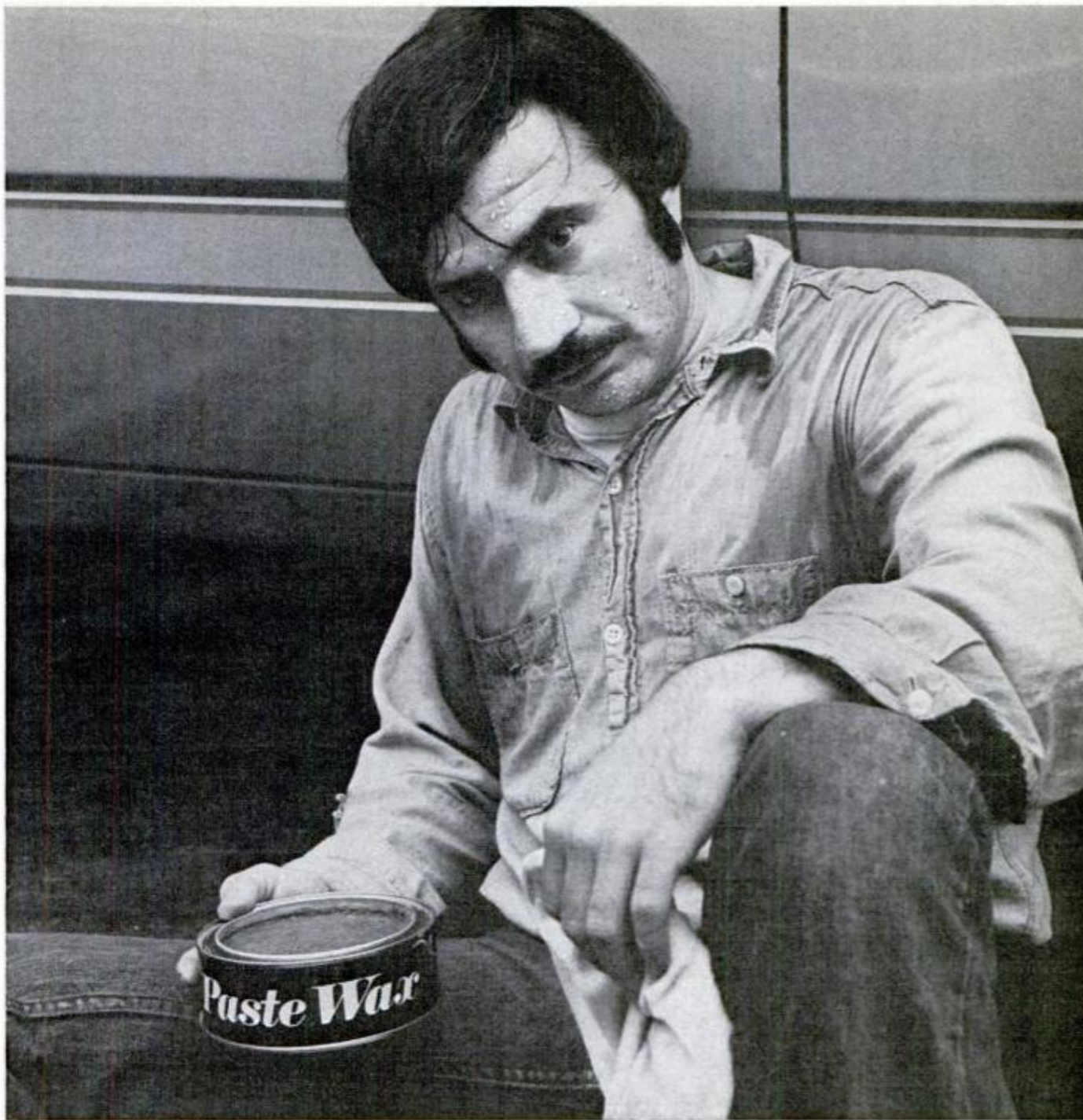


CAMPERS COMPANION Model 24-C from Savage Arms features a .22 rifle over a 20-gauge shotgun; it weighs 5 $\frac{3}{4}$ lbs. and disassembles neatly into a 5x20-inch carrying case. Four 20-gauge shells and 10 .22 cartridges stow in a flip-open compartment in the butt plate. This \$75 over/under rifle/shotgun can mount a scope, and for plinking, varminting or even signaling if you're lost, the new gun should be good company.



RUGGED ENOUGH to be recommended for the tent rental market by the maker, this new Model 21007 chalet-style tent from the Hirsch-Weis Div. of White Stag, 5203 S.E. Johnson Creek Blvd., Portland, Ore. 97206, can sleep five. The 9x12-foot unit has a waterproof nylon floor, bugproof full-zip Dutch doors and windows and heavy-duty zippers. A 10x10 umbrella model available has the same tough construction.

(All Outdoors continues on page 52)



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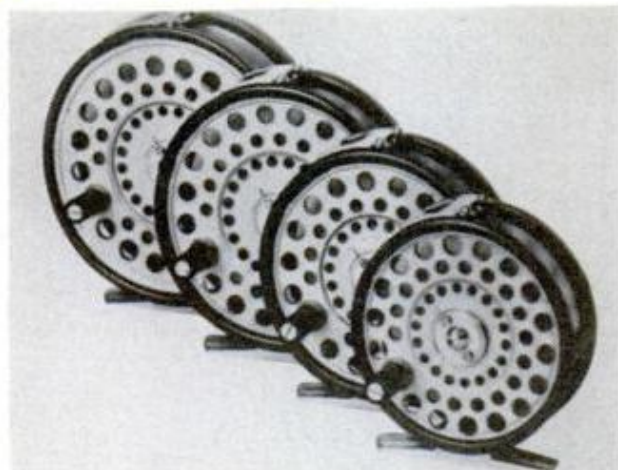
Simoniz Vista Soft and Easy



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ALL OUTDOORS

(Continued from page 50)



DAIWA FLY REELS in a new 700 single-action series feature one-piece frames of noncorrosive aluminum, with no screws or small parts to vibrate loose. Large-spool models are reported to handle almost any weight of fly line. Chrome-plated line guards protect line, and guard and pawls reverse for right or left-hand reeling. Large-capacity Model 740 handles up to AFTMA 10 line, 720 for 8 line, 710 for 7, 700 for 6. From Daiwa Corp., 14011 Normandie, Gardena, Calif. 90247.

ONE FUEL SOURCE for the works is the new camping trend, and the Bernzomatic Deluxe Camp Kitchen offers a model that converts from carrying case to a two-burner cooking table in seconds. Double-mantle lantern and distribution post attach to top of bulk tank to complete neat \$90 set.



AN OLD FAVORITE, the Winchester Model 12 pump gun is being brought back after nearly 10 years of semiretirement. The 12-gauge slide-action shotgun from Winchester-Western Div. of Olin Corp. will be available in field, trap and skeet versions. First introduced 60 years ago, the gun has gone through production of nearly 2 million units. The 1972 Model 12 will have a six-shell magazine, be available in barrel lengths of 26, 28 and 30 inches at \$350 to \$385.



A BIG-GAME RIFLE in 7-mm Rem. Magnum, the Model 810B from O. F. Mossberg and Sons adds a new bolt-action gun to Mossberg's extensive line. American walnut stock has high-gloss waterproofed finish. Detachable three-shot magazine fits into a solid one-piece trigger guard-magazine assembly. Standard 5½-pound trigger pull is internally adjustable. Barrel is 24 inches, overall length 44 inches, and weight 7½ lbs.



BIG-BORE SPECIAL first built in 1895, Marlin's new Model 1895 is chambered for the old favorite .45/70 big game caliber. Combining the fine traditional lever action and Western frontier look, this five-shot repeater uses modern alloys to make it lighter and stronger while delivering a punch that can push through swamps and thickets of white-tail country. Side cartridge ejection allows low center scope mount on \$185 rifle.



A machine famous for not breaking down.



1972 Maverick 2-door Sedan shown with optional Accent and Protection Groups, white sidewall tires and tinted glass.

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THE BICYCLE SHOP

By EUGENE A. SLOANE

The author of The Complete Book of Bicycling continues to discuss bottom-bracket assemblies—Caring for the three-piece cotterless types

BETTER BICYCLES use three-piece cranksets, made of strong aluminum alloy. As we noted last month, bottom-bracket cranksets need be lubricated only once or twice a year. To do this job you'll need the right tools.

The Japanese Sugino three and five-piece cranksets use Campagnolo tools. The other two major suppliers, Stronglight and T. A., use their own sets of tools. To remove and reinstall aluminum alloy cranksets, you will need:

- Dust cap remover (a large screwdriver will do for Campagnolo, Stronglight and Sugino);
- Eight-inch adjustable crescent wrench;
- Spanner to fit crankbolt or metal punch and hammer;
- Wrench to fit the cone.

Things will go a lot more smoothly if you follow these step-by-step instructions—they are the result of a lot of trial and error experience.

1. Remove crank dust caps with special tool or screwdriver.



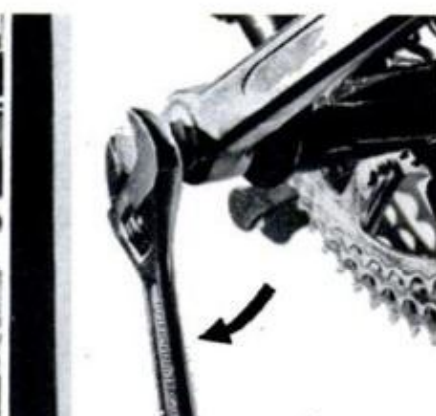
REMOVING DUST CAP with special tool is the first step in taking off this cotterless aluminum crankset

2. Remove crank lockbolt and washer, using special tool to remove the bolt.

3. Note that the crank-pulling tool has an outer section that is threaded at one end and that has a place where a wrench can grip it at the other end. Into that end is threaded the second piece of this tool, the part that is used to force the crank off the crank axle.

To use this tool, first make sure that the inside or second section is threaded counterclockwise all the way back so no part of this inner section protrudes beyond the outer section. Unless the inner section is all the way back, you may not be able to screw the outer section into the crank. Thread the outer section of this tool into the crank, and onto the same threads that hold the dust cap. Make sure that this section is threaded *all* the way in, since all the force required to pull the crank off

(Please turn to page 52D)



CRANK LOCKBOLT is removed with appropriate removal tool (left). The crank-pulling tool (center) is inserted on threads that hold the dust cap, then turned clockwise (right) to force crank off axle shaft

10W-50

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THE BICYCLE SHOP

(Continued from page 52B)

the axle is taken by these threads. Since they are of aluminum they aren't as strong as steel. If you strip these threads you will have to buy a new crank, and you would be lucky to find a dealer willing to split a set to do this.

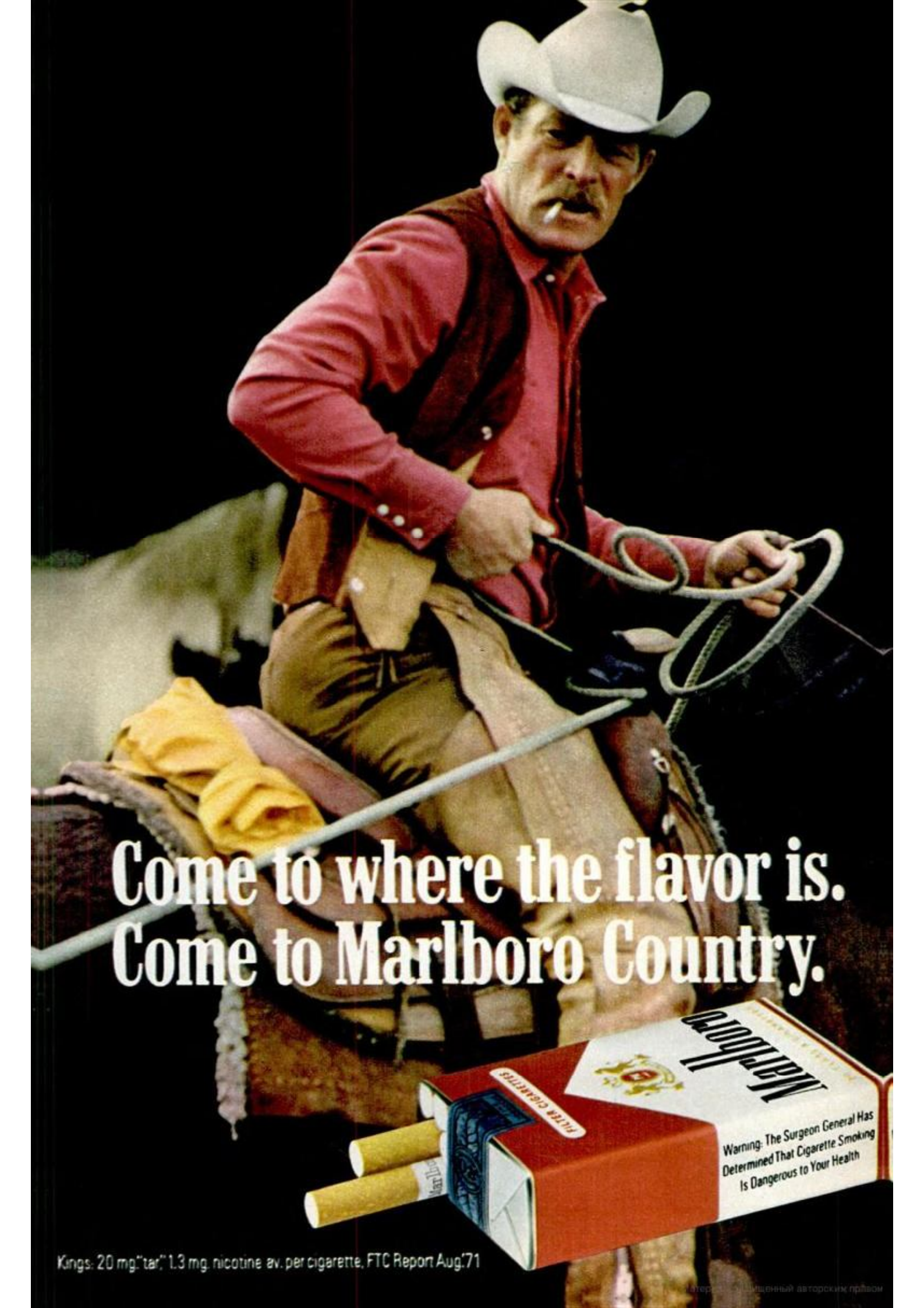
4. When the outer section of the crank-pulling tool is threaded all the way into the dust-cap threads, you are ready to use the inner section to pull the crank off the axle. With the adjustable crescent wrench, turn the inner section of this tool clockwise, about one-quarter turn at a time. *Do not force it!* If the crank won't pull off, tighten the tool and then tap the crank with a wood or plastic mallet and try tightening again. Repeat until crank is loose. Remove crank tool and apply to other crank.

5. When both cranks are removed, use a spanner, or center punch and hammer, to remove locknut or lockring from the left side of the bottom bracket. With a cone wrench or monkey wrench, remove left-hand cone. *Be ready to catch loose ball bearings as axle is removed. Bearings will fall out of both sides of bottom bracket.* Newer cranksets have ball bearings in a nylon race, so they won't fall out all over the place. If you lose any ball bearings, take one of the old ones to the bike shop so you can be sure to get an exact replacement. The newer Campagnolo bottom-bracket crank sets also come with a plastic sleeve or liner to keep dust out of the bearings. Remove all parts of this liner. With kerosene, clean out bottom bracket, all bearings and cups.

Examine loose bearings for cracks. Examine cups for "galled" spots showing undue wear. These are shiny places. Any part that is cracked, galled or rusted should be replaced. Check bearings in race. Check race for cracks.

6. To reassemble a loose bearing crankset, first roll loose bearings around in a dab of grease till they are lightly coated. Then put a thin layer of grease inside both cups and insert bearings in cups. The grease should hold bearings in place until axle is inserted. If your bearings are in a race, force lubricant into the race until all bearings are covered. When reassembling cranksets with bearings in a race, make sure that the curved part of the

(Please turn to page 52F)

A classic Marlboro advertisement featuring a cowboy on a horse. The cowboy is wearing a white cowboy hat, a red long-sleeved shirt, and a brown vest. He is holding a lasso and looking towards the camera with a cigarette in his mouth. The background is dark, making the cowboy stand out. In the foreground, a pack of Marlboro cigarettes is shown, with two cigarettes protruding. The pack is red and white, with the Marlboro logo and the words 'Marlboro' and '11 CIGARETTES' visible. A warning label is also present on the pack.

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Warning: The Surgeon General Has
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Is Dangerous to Your Health

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THE BICYCLE SHOP

(Continued from page 52D)

race is toward outer-side sides of the bottom bracket.

7. Insert axle back into bottom bracket, making sure that the long side of the axle is on the right side of the bottom bracket—this is the side the chainwheel and crank section goes on.

8. Now that axle and bearings are in place, screw in the left bearing cup, taking it up snug (gently) and then backing it off counterclockwise about one-quarter turn.

9. Then thread on the lockring and tighten it. Check for axle side and end play, and for axle binding. Check sideplay by moving axle up and down, check end play by moving axle in and out. Check for binding by twisting and rotating the axle.

10. Reinstall cranks by pushing them

by hand back on axle. Insert lockbolt washer and lockbolt on each end of axle and tighten lockbolt with special tool you used to remove this nut. The crank must be on the axle tight and snug.

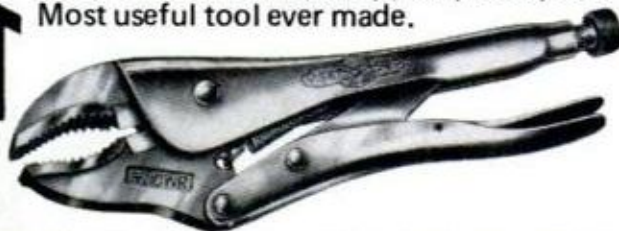
You should retighten the crank lockbolts at 50-mile intervals for the next 150 miles to guard against the crank coming loose. If this is allowed to happen, the softer aluminum crank will wear quickly against the steel axle to the point where it will need to be replaced.

As a final check for bearing-cup adjustment after the cranks are on tight, grasp and twist them from side to side to check for sideplay, and spin the crankset to make sure the cup is not binding. To take out side play, loosen lockring and tighten bearing cup about $\frac{1}{8}$ th turn; repeat if necessary. If crank turns stiffly or is binding, loosen lockring and back off bearing cup about $\frac{1}{8}$ th turn; repeat if necessary. ★★★

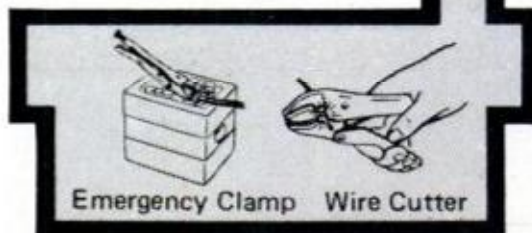
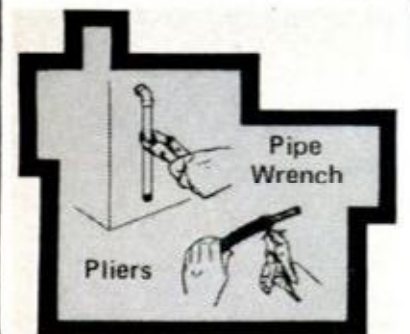
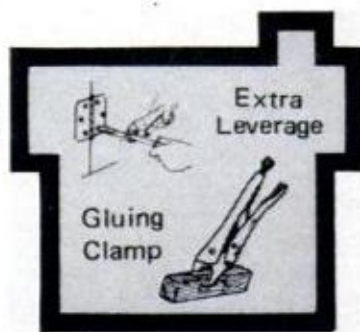
GOT A PROBLEM WITH YOUR BIKE? Ask Gene about it. Send your question to Bicycle Shop, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of general interest will be published in this column.

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HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Moss on the roof

How can I get rid of moss above the eaves on the asphalt-shingle roof of my garage?—Lee Handy, Louisville.

The first thing is to remove, if possible, the conditions that favor growth of moss on a roof: near 100-percent shade, overhanging trees or shrubs that promote damp conditions, and the lack of adequate ventilation. Trim the overhang of trees or shrubs to let air circulate.

To get rid of existing moss, apply a solution of 1½ ounces of copper sulfate in a gallon of water, scrubbing the moss loose with a stiff-bristle brush as you go. Wear rubber gloves and protect your eyes from spatters.

Mustard cleans bottles

Several old bottles I recently acquired have both an odor and a coating inside that seem impossible to remove. There must be some way; what is it?—Ronald Kendall, Philadelphia.

I've cleaned old bottles with dry mustard powder—about one level tablespoonful to the quart of water. Fill a bottle halfway and swish the solution vigorously. Then rinse in the same fashion with two or more waters and just as vigorously. In my experience, this treatment always removed any latent odor and any discoloration. Once I added a handful of clean, fine sand to the mustard solution; it helped in the removal of an especially stubborn coating.

Pantry pest

Recently, I discovered a brownish, beetle-like insect not more than 1/8 in. long in a package of cereal. Some of the cereal (a cooked variety) had been used! What is this insect and how do I get rid of it?—R. Kelton, Knoxville, Tenn.

You've already had a portion of your daily protein requirement provided by the well-cooked insects! I'd guess that they are saw-toothed grain beetles. They are more or less retiring and the strictest

sanitation and use of the vacuum cleaner in all kitchen storage cabinets is the first step in getting rid of them. Then go over all cracks and crannies in the cabinets with 0.5 percent Diazinon, which comes in spray cans. A light, mist coating of this insecticide will be sufficient, but be sure—repeat—be sure to follow instructions. Do not get the spray on food.

Discolored rush chair seats

I have two chairs with artificial rush seats and after long use these seats have become soiled and discolored. After I washed them with detergent they turned grayish white. What happened? How do I restore the original color?—Earl Edwards, Dayton, Ohio.

It's likely that these seats were coated with shellac, the four-pound cut—which used to be a common treatment. Use a stiff-bristle brush on the seats to remove dust and any loose material; then try to stain them back to their original color. Apply an oil stain that matches the finish on the wood parts of the chairs; wipe it on the rush lightly and then let it dry thoroughly.

Raising nap of rug

How do I raise the nap of carpet after the legs of furniture have depressed it deeply?—A. R. Cuchmann, Dayton, Ohio.

On some carpeting a light brushing with a metal-bristled brush, such as that used on suede leather, will do an effective job. Should this fail, wet the depressed nap, brush it lightly as before but in different directions, and let dry. Repeat if necessary.

Tree choice for parkway

I'm thinking of planting a silver maple on my parkway as a shade ornamental. Is this my best choice?—D.H., Illinois.

Of the maples I'd choose a sugar maple. While its growth is relatively slow, its resistance to wind damage is very nearly equal to that of the elm and it is near the top choice as a shade tree. However, its surface roots may create a problem for your 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. While letters cannot be answered individually, problems of wide interest will be discussed in this column.

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APPLIANCE CLINIC

By PAUL MANN

Open and shut case

We have a two-door lengthwise Amana refrigerator-freezer. When we open the left freezer door, the right refrigerator door pops open. We can't understand why this happens. Can it be fixed?—Michael J. Stevens, Trenton, N.J.

Some 1966 and 1967 Amana models that had this problem were equipped with magnetic gaskets to hold the doors closed. If a unit was not level and leaned forward at the top, the weight of the food stored in the door, plus air compression that developed when the door was slammed, caused the other door to open. The condition was aggravated by poorly adjusted gaskets and/or hinge-pin bind in the bearing of the outer door shell because of misalignment. To correct it, hinge pins had to be aligned, gaskets readjusted and the unit leveled in favor of a slight tilt backward. These steps might work for you.

Drought in Chicago

My Hamilton washing machine won't hold water. The drum fills okay, the motor works, but soon there isn't a drop left in the drum. I see no water around the unit, so apparently there are no drain-hose leaks. Where is the water going?—C. Talentowski, Chicago.

This problem usually signifies a drain valve stuck in the open position. Often a piece of lint or dirt may keep the valve from closing fully. The valve should come out of the machine and be cleaned, including the valve seat. In addition, check that the valve spring has sufficient tension to close the valve. Make sure the linkage from the valve to the solenoid that controls valve operation is not binding. Clean and apply a light household oil.

Thermostat search

The oven thermostat on my stove suddenly stopped working and I have not been able to get a replacement. A serviceman told me the American Stove Co. went out of business and that my stove is about

30 years old. It's a beautiful old stove in perfect condition. Can you help?—Mrs. Eleanor Offentier, Teaneck, N.J.

The American Stove Co. is alive and kicking, but under another name: Magic Chef of Cleveland, Tenn. 37311. Stove companies get their thermostats from manufacturers of thermostats; I'm sure you can get a replacement. Your best procedure is to remove the old thermostat from the stove and take it to a store listed in your local classified directory under the heading "Ranges and Stoves—Supplies and Parts." One large stove supply store I'm familiar with in your area is Jacoby Appliance Parts, Inc., of Hackensack, N.J. If you strike out here, send the old thermostat and your story to the customer service department of Magic Chef. The company will probably be able to get you a thermostat from its supplier.

Full of cold air

When my Kenmore 600 gas clothes dryer is turned on, the tumbler will turn, air will blow, but the burner won't ignite. What's wrong?—Ehrman H. Eldridge, Denver.

This machine has an igniter coil that heats up when the machine is turned on. When the coil gets hot enough, it ignites the pilot (gas) which, in turn ignites the main gas burner. It's doubtful that anything is wrong with the main burner, but it's most likely that the igniter coil, also called glow coil, is too weak to ignite the pilot and should be replaced. If not, the pilot may be clogged with dirt or the glow-coil solenoid may have gone bad.

Hot tips about a cool subject

I have a central three-ton heating and cooling system in my house, which has 1700 sq. ft. of living area. The unit doesn't cool the distant rooms adequately. Two servicemen recharged it four times, suggesting a leak somewhere but they couldn't find it. A third serviceman found a leak in the coil. Before I have a new coil put in, I want to know if this unit is large enough to cool the extremes of my house properly or if I should replace it with a larger unit. If so, how big?—W.E.L. Fischer, McAllen, Tex.

You can answer these questions better from your end than I can from mine. Did the unit perform to your satisfaction after

(Please turn to page 58D)

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APPLIANCE CLINIC

(Continued from page 58B)

it was recharged? If so, then it'll be more to your economic advantage to replace or repair the coil than to install a new conditioner. If you finally decide you need a new unit, I strongly urge you to consult a qualified airconditioner contractor and not arbitrarily select a size you think may do. There are many other factors to consider, including layout of space, size and number of doorways and archways, relation of window areas to walls, thickness and composition of insulation, intensity of sun exposure, number of appliances and lights (they give off heat), and the number of persons who occupy the house.

Finally, be advised that the Air Conditioning and Refrigeration Institute suggests that cooling capacity be expressed in British thermal units (B.T.U.), not in "tons." Cooling capacity of an air conditioner is the amount of heat it can remove from a predetermined area in one hour. One B.T.U. is the amount of heat required to raise the temperature of one pound of water 1° F. Thus, an air conditioner with

a cooling capacity of 10,000 B.T.U. can remove that much heat in one hour.

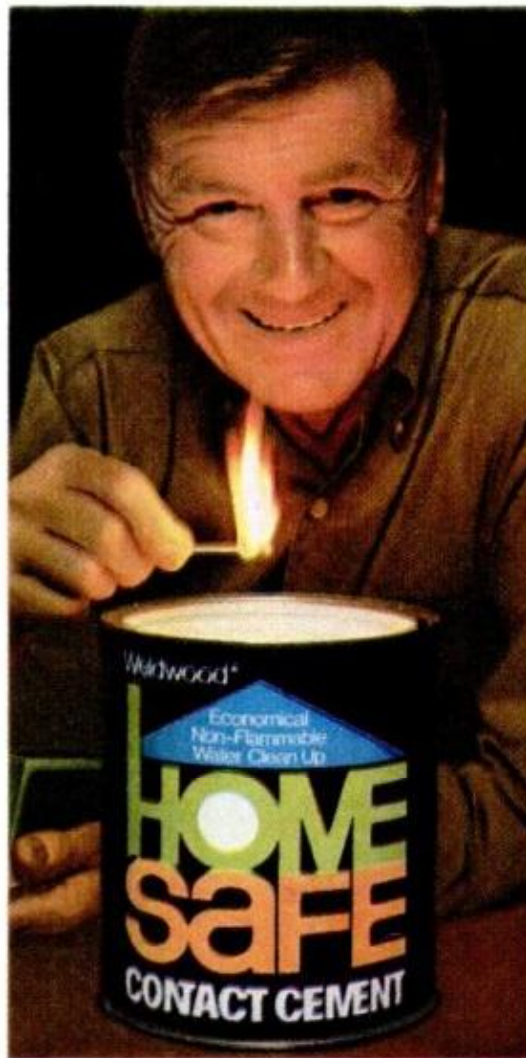
Warming up to the facts

Charles W. Stott and Fred A. Sellade, service training engineers at Southern States Cooperative, Inc., Roanoke, Va., raise a good point concerning an electric water heater that did not provide enough hot water for Jack Whitney (Appliance Clinic, page 20, Dec. '71 PM).

They say that nearly all water heaters are made with a top inlet using a dip tube to put incoming cold water near the bottom of the tank. We illustrated a bottom-inlet type which may not be the kind of unit Whitney has. Stott and Sallade point out that if the dip tube has broken off, you'll get a gallon or so of hot water, but cold water, instead of heading for the tank bottom, will go directly across to the outlet. Therefore, faucet water will be lukewarm. ★★★

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. However, problems of widest interest will be answered in this column.

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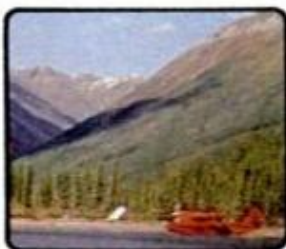
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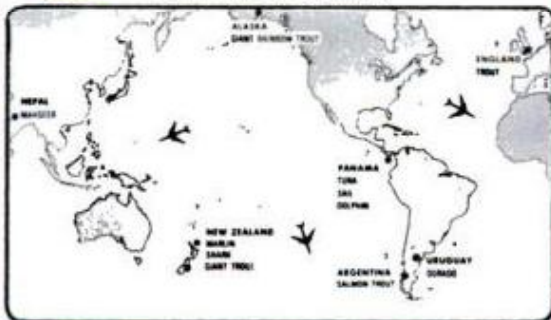


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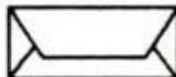
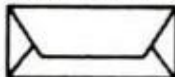
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Here's my entry in the Seven Wonders of the Fishing World Sweepstakes. Enclosed are two bottom flaps from KENT, TRUE or OLD GOLD (or a 3 x 5 inch piece of paper with the name "KENT", "TRUE" or "OLD GOLD" hand printed in plain block letters).



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All entries received by June 30, 1972 are eligible. All winners will be notified by mail. Enter as often as you like, but each entry must be mailed separately, use the entry blank provided here or a plain piece of paper the same size. Sweepstakes limited to entrants 21 years of age or older. Employees and their families of Lorillard, their media, advertising and sweepstakes agencies are not eligible. One prize to a family. No purchase required. If you are one of the 7 trip prize winners, and you list your dealer's name and address, he will receive a one-week fishing trip for two to Panama. Drawings will be conducted by D. L. Blair Corp., an independent judging organization whose decisions are final. No substitution for prizes. Payment of taxes on prizes is the responsibility of the winners and not Lorillard. Open to residents of the United States. Void in Idaho, Missouri, Washington, Georgia and wherever else prohibited by law. All federal, state and local regulations apply. For a list of major prize winners, send a separate, stamped, self-addressed envelope to: Fishing Winner's List, Box 963, Blair, Nebraska 68009. Entry in the sweepstakes constitutes full permission to publish names, addresses and photographs of winners without further compensation.

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What Ham did for Virginia, Old Crow did for Bourbon.



Even before Virginia's George Washington became President, Virginia was famous for the good taste of her country hams. Not long after, the good taste of Old Crow made Bourbon famous.

Before 1835, Bourbon was made every which way. That year, Dr. James Crow took it out of the hit-or-miss league and created the process that gave Bourbon its mellow taste—and good name: Old Crow.



KENTUCKY STRAIGHT BOURBON WHISKEY. 86 PROOF. DISTILLED AND BOTTLED BY THE FAMOUS OLD CROW DISTILLERY CO., FRANKFORT, KY.

This shop paid for itself... and grew and grew

Popular
Mechanics

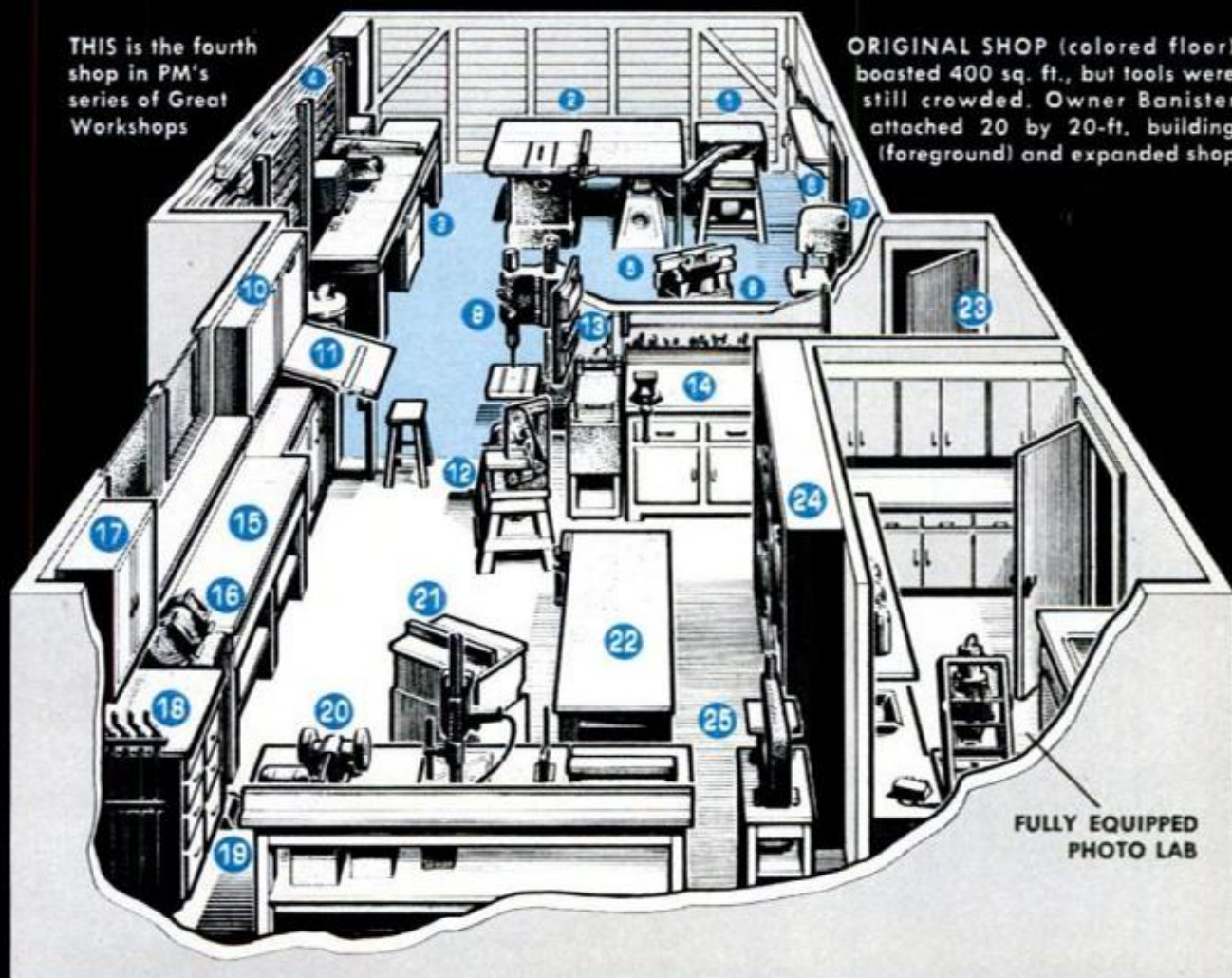
By HARRY WICKS, Workshop Editor

YOU CAN GET LOTS OF GOOD IDEAS for shop layout from the Californian who owns this 800-square-foot beauty. Equally important, he has a couple of good suggestions for ways to pay for it all. When I asked him how he assembled such an impressive setup, he said: "Making furniture for friends and acquaintances paid the bill. And," he continued, "I badgered my wife and relatives to give me tools—instead of ties and pajamas—on gift-giving days."

The owner of this fourth in PM's Great Workshop series is Clarence "Doc" Banister. Since he works in the photo department of a nearby missile plant, Doc's shop time is confined to evenings, weekends and vacations. He does not make

THIS is the fourth shop in PM's series of Great Workshops

ORIGINAL SHOP (colored floor) boasted 400 sq. ft., but tools were still crowded. Owner Banister attached 20 by 20-ft. building (foreground) and expanded shop



FLOOR PLAN INDEX: (1) Belsaw planer; (2) Delta 10-in. Unisaw; (3) DeWalt 10-in. radial saw; (4) Lumber storage; (5) Delta spindle-shaper; (6) Shelf and telephone; (7) Craftsman 12-in. bandsaw; (8) Craftsman 6-in. jointer (not visible); (9) Shopsmith (drill press); (10) Storage cabinet; (11) Drawing board; (12) Delta sander-grinder; (13) Hinged toolboard; (14) Metalworking bench; (15) Workbench; (16) Craftsman pedestal-grinder; (17) Tool cabinet; (18) Clamp rack; (19) Hardware cabinet; (20) Grinder; (21) Shaper table; (22) Assembly bench; (23) Lawn-tool storage; (24) Plywood storage; (25) Sprunger 24-in. jigsaw.

'Making furniture for friends and acquaintances paid the bill'

standard items, such as those found in an unpainted-furniture store. He prefers challenging, custom-type work.

Banister has had a varied career. Upon graduating from the American School of Photography, Chicago, in 1955, Doc set up his own photographic studio (with a framing shop next door). Six years later, "an accident caused me to fold up my tent." Undaunted, he simply went to work as a lab technician in General Dynamics photo lab. After several years he decided to try the real estate business (using his photography knowledge and experience as a sales aid). But ups and downs of the home mortgage market proved too much, so he returned to the missile-plant lab.

Besides building almost all his own furniture, Banister does nearly all his own

home renovation and improvement. The room his wife, Bette, calls her "pantry" is a former service porch he enclosed to create a laundry. The walls are lined with cabinets. By providing his wife a "Great Shop" of her own, Doc wisely maintained family harmony while adding to his setup.

Banister started with basic hand tools and a "rather simple" workbench in the garage. As with most workshoppers, his love of woodworking grew deeper with time and experience. He added power tools as budget and projects allowed. He never succumbed to the urge to buy a low-quality tool, preferring to do without a particular tool until he could buy one of high quality.

Now that his shop is complete, he de-

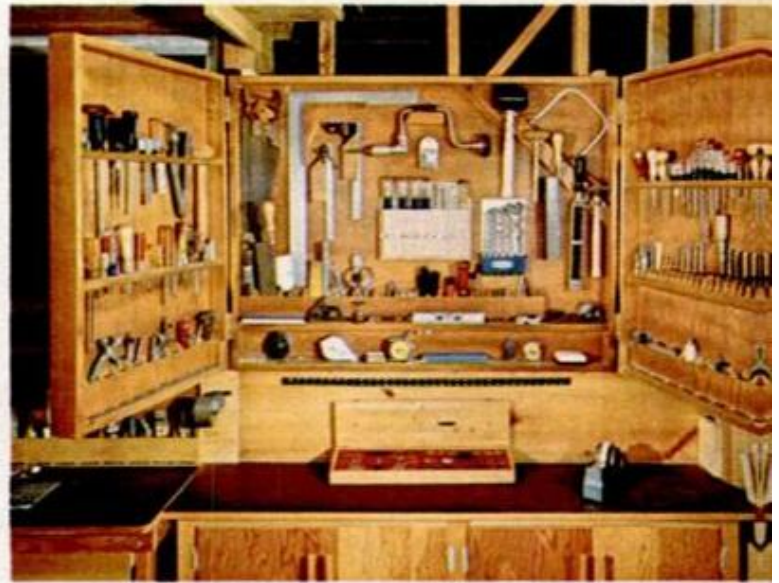
(Please turn to page 188)

OVERALL VIEW OF SHOP. Worktable in foreground has a roomy shelf below to hold several shop-made jigs



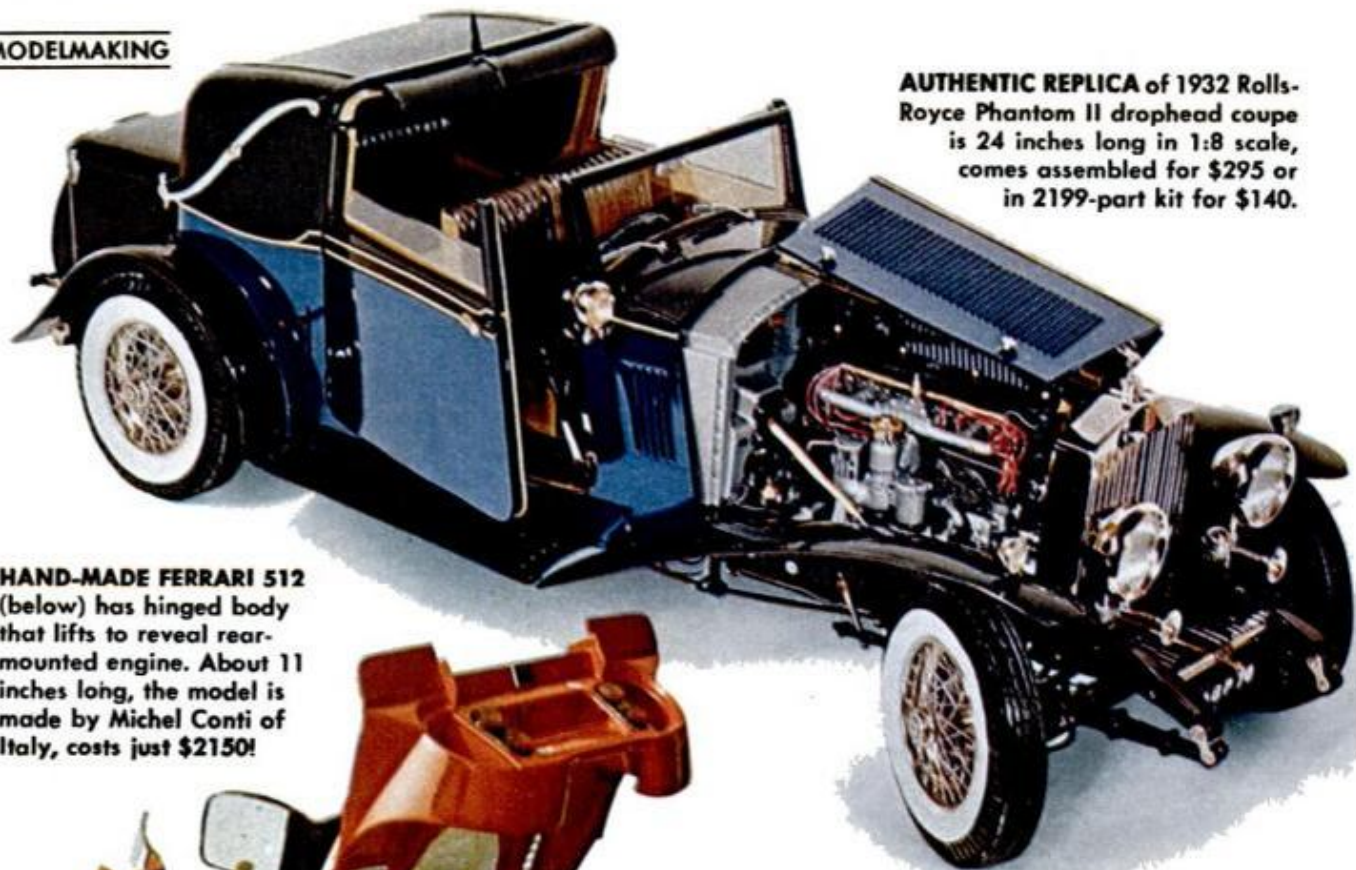


RADIAL SAW is parked along a wall and features generous-sized work surface with ample storage below



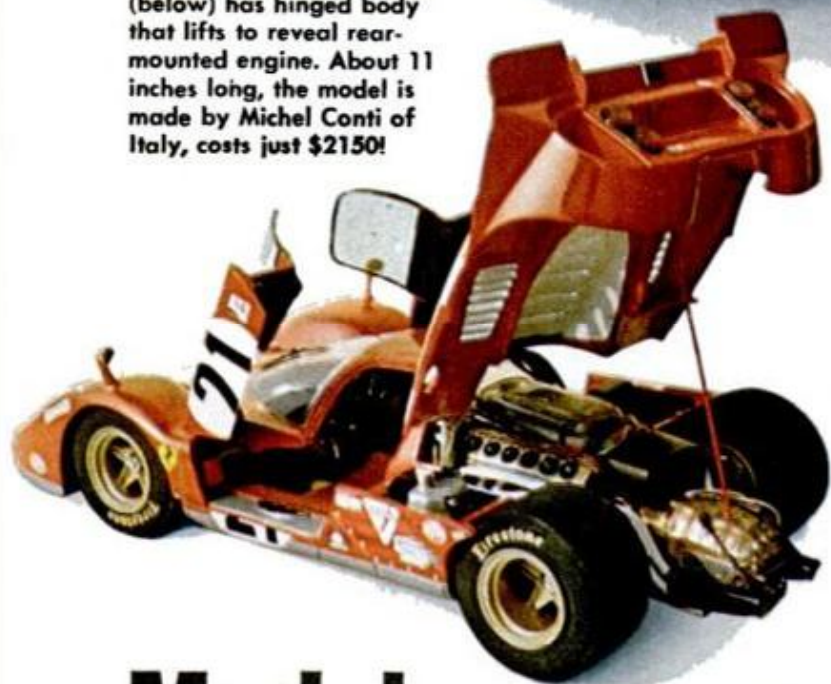
WALL TOOLCASE (above) has an attached drawing board. Blade cabinets flanking the radial saw (left) will be featured in the July PM. Below is an almost-finished bath-vanity Banister's making for his home





AUTHENTIC REPLICA of 1932 Rolls-Royce Phantom II drophead coupe is 24 inches long in 1:8 scale, comes assembled for \$295 or in 2199-part kit for \$140.

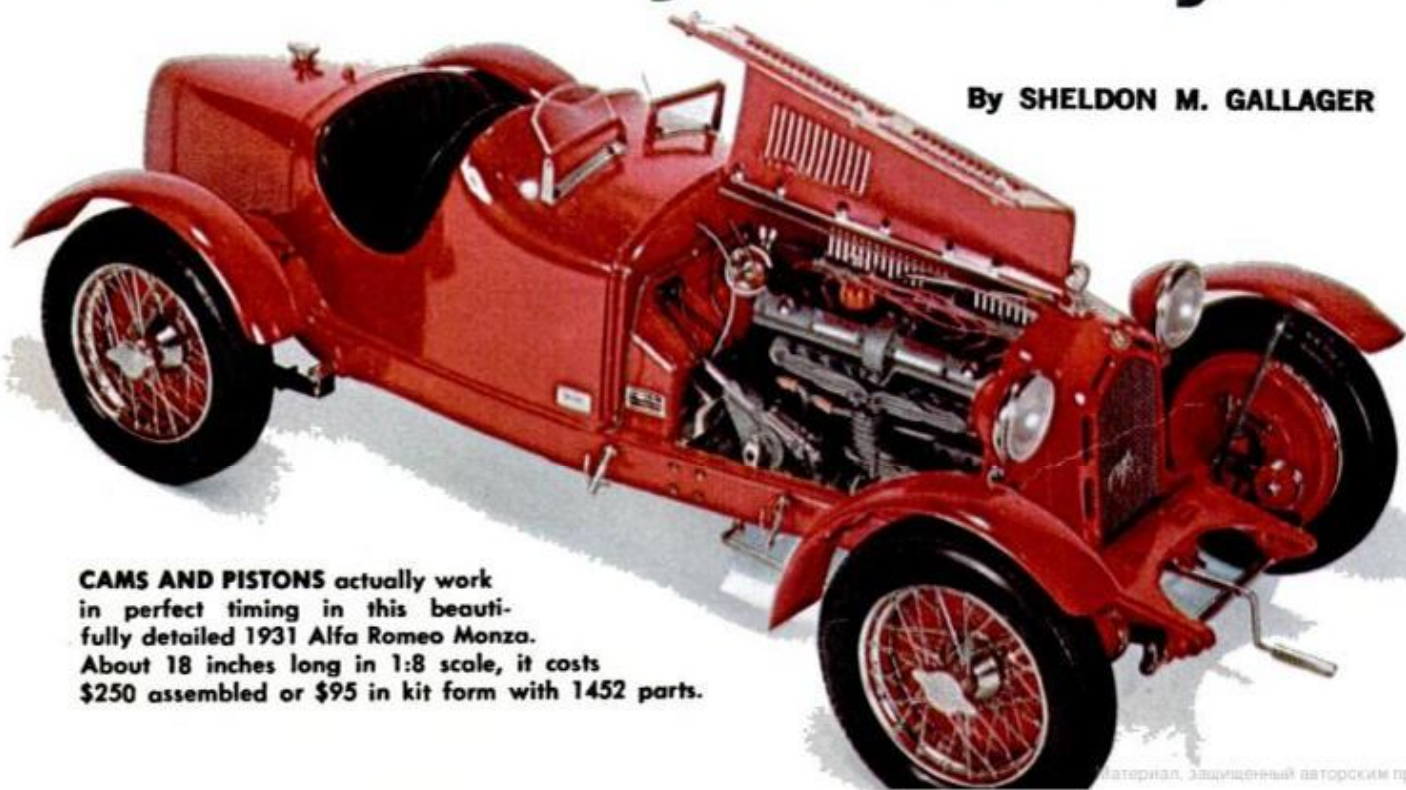
HAND-MADE FERRARI 512 (below) has hinged body that lifts to reveal rear-mounted engine. About 11 inches long, the model is made by Michel Conti of Italy, costs just \$2150!



Super-detailed and finely hand-crafted, these fantastic miniatures range from \$2 to more than \$2000

Model cars you can buy for

By **SHELDON M. GALLAGER**



CAMS AND PISTONS actually work in perfect timing in this beautifully detailed 1931 Alfa Romeo Monza. About 18 inches long in 1:8 scale, it costs \$250 assembled or \$95 in kit form with 1452 parts.

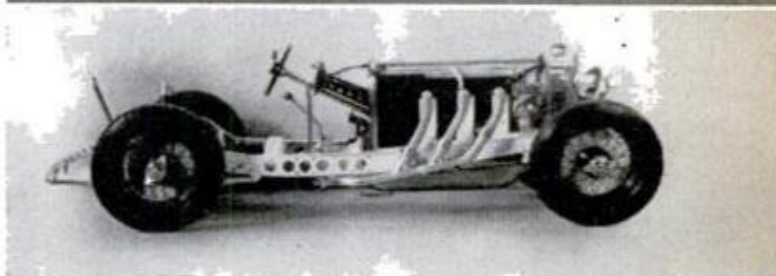
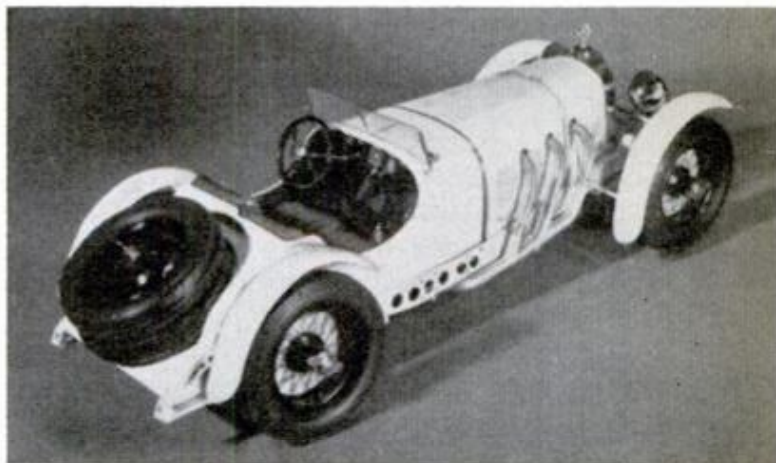
IF YOU HAVE \$2150 you're not doing anything with, you can pick up that flashy Ferrari racer on the opposite page. You won't be able to drive it around town because it's only 11 inches long, but it's guaranteed to be one of the most eye-catching display models you've ever seen. If the price seems a bit steep, there's a 24-inch elegant blue Rolls-Royce you can have for a measly \$295 or an 18-inch flaming-red Alfa Romeo for just \$250. If you like kit-building, you can buy the parts for even less—\$95 to about \$140.

These spectacular scaled-down replicas are sold by Sinclair's Auto Miniatures in Erie, Pa., a firm that specializes in importing finished models and kits from famous makers all over the world. They're not toys. Superaccurate and superbly crafted, these authentic beauties are designed for the modelmaker who appreciates fine detail, flawless workmanship and unbelievable realism. On many models, the wheels steer, hoods open and close on miniature strap hinges, gears mesh with delicate precision, the handbrakes really brake and even the pistons and cams work in perfect timing. Kits contain literally hundreds of parts—2199 for the Rolls-

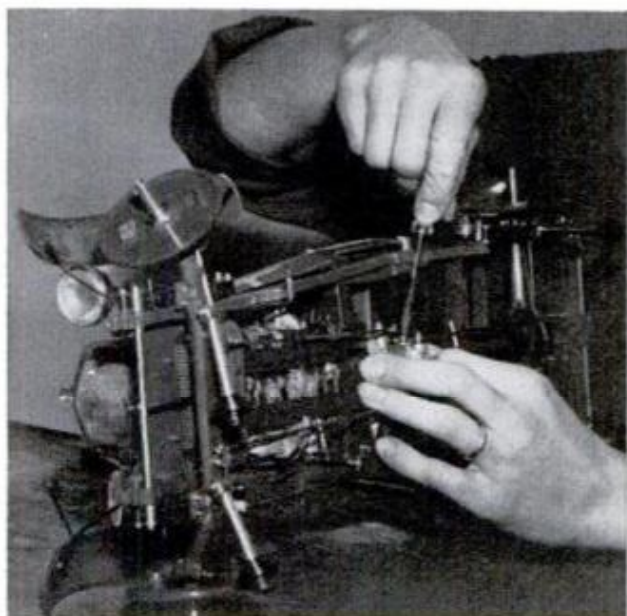
JAUNTY 1928 MERCEDES SSKL RUNABOUT at right, handmade of brass in 1:12 scale, is about 14 inches long, costs \$500. It has authentic suspension and steering, plus operating gearshift and brake

Royce, for instance, and 1452 for the Alfa Romeo. Each tiny piece is individually installed—right down to pinlike spokes on wire wheels. Available models range all the way from historic antique classics to sleek, modern Grand Prix speedsters.

The Sinclair company was started by Dave Sinclair, an advertising executive who took up modelmaking as a hobby. Friends and business associates soon admired his collection and began asking him



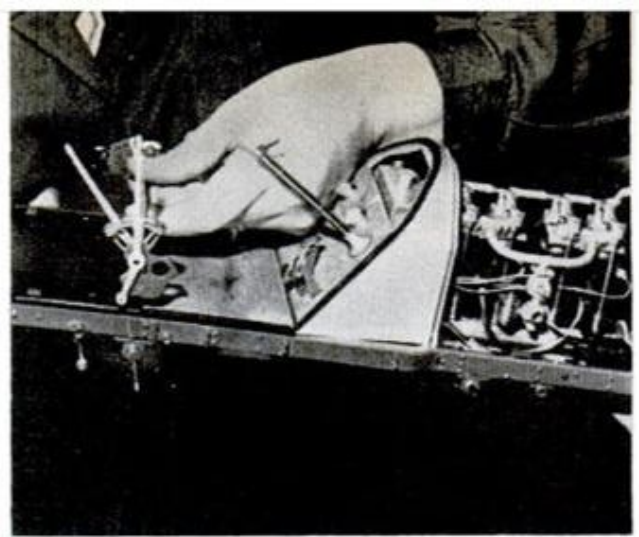
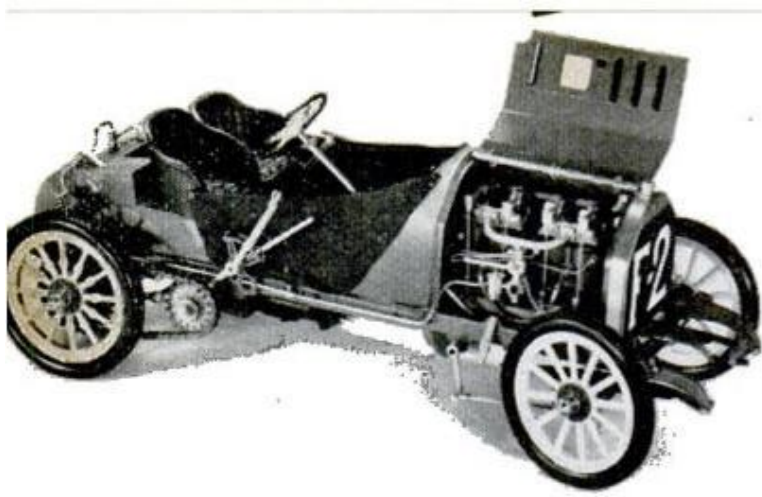
the price of a real one!



to order similar models for their own use. The hobby quickly grew into a full-time business, and now Dave imports thousands of models a year from such well-known master craftsmen as Pocher, Rio and Conti of Italy and Solido and Norev of France.

Some models are handmade and so expensive they're available only on special order, making them rare collector's items. Some cost as much as \$5000—more than most families spend on a real car. However, not all of Sinclair's collection are as elaborate and expensive as the few shown

INDIVIDUALLY INSTALLED WHEEL SPOKES on Alfa Romeo, shown at left and on facing page, give idea of model's precise detailing and fantastic complexity. Car is 18 inches long, comes as a kit for \$95



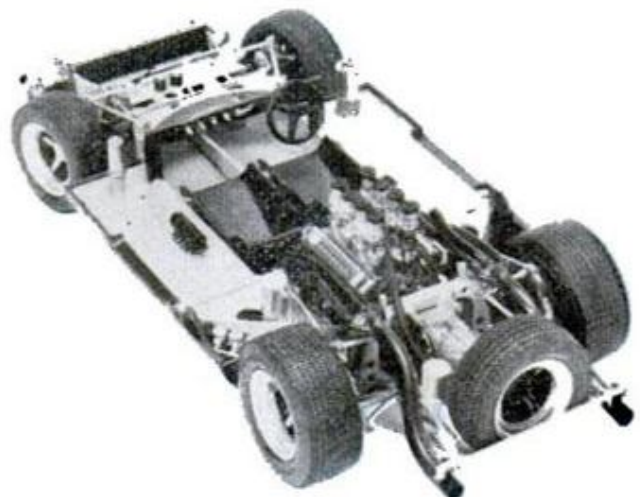
CHAIN DRIVE ACTUALLY WORKS on this replica of famous Fiat-2 racer that won 1907 Grand Prix in France. Hand in photo at right shows large size of model, about 17 inches long. Kit is priced at \$65

here. Dave also carries a full line of "matchbox" miniatures—tiny two to three-inch-long models you can buy for about \$2 to \$10. These are made to a scale of 1:43—the smallest generally used in modelmaking. They include luxurious old-time open Mercedes touring cars, jazzy Porsche, Ferrari and Alfa Romeo racers, sporty Rolls-Royce, Bugatti and Jaguar coupes, and America's dream classic, the Lincoln Continental.

Larger scales run from 1:25 and 1:16 to 1:12 and 1:8. Models in 1:25 scale average 6 inches in length; those in 1:16 scale, about 8½ inches; and those in 1:12 scale, up to 14 inches. Most are made of metal,

although a few come in plastic or a combination of plastic and metal parts. Many are available as kits as well as prefinished. Prices range from under \$10 to more than \$100.

The largest scale used—1:8—produces models 17 to 24 inches long. These are the most finely detailed, the most elaborately finished and the most costly. Kits containing 2000 or more parts are not uncommon. Prices run from \$100 to \$200 unassembled, up to \$300 or more assembled. For more information, a detailed catalog is available for \$1 from Sinclair's Auto Miniatures, Inc., Box 8068, 3416 West Lake Rd., Erie, Pa. 16505. ★★★

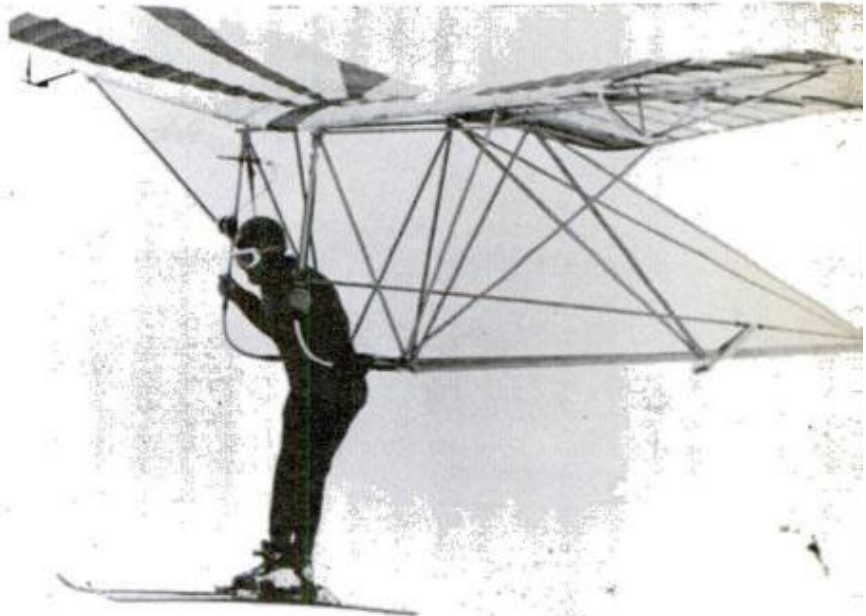


MADE ENTIRELY OF PLASTIC, except for rubber tires, this sleek Lola T-70 Mark III is one of a few moderate-priced Sinclair models not using metal parts. The accurately detailed reproduction in 1:12 scale is patterned after real-life prototype that won Daytona race in 1969, piloted by Mark Donohue and Chuck Parsons. Car is 14 inches long and comes in a kit, shown at lower left, containing hundreds of tiny parts. Assembly time runs 10 to 15 hours



Trouble spotter

Monitoring everything that's picked up by the radarscope (lower right), a new navigation instrument, the Digi-plot (center), displays the 40 most threatening potential collision targets on its cathode-ray tube. Computerized system shows present and future position of targets, helps captain plan collision-avoidance maneuvers. It's made by Iotron Corp., New Bedford, Mass.



They're doing it in Europe, too

Just like his American counterparts who have taken to unpowered flight in a big way (see cover and page 98), Swiss acrobatic skier Art Furrer soars on his hang glider. He gains flying speed by skiing down a slope; controls glider by body motion.



Europa makes its maiden flight in England

Shown on its first flight this spring is the first airship to be built in Britain in 20 years, the *Europa*. The 192-foot-long craft was assembled in four months from parts shipped

from America. During the test flight, the helium-filled *Europa* hit a top speed of 55 mph. (For more on blimps, see *Up, up and away!* Very slowly, page 76, Feb. PM.)



Our great Vietnam

goof!

By COL. DAVID H. HACKWORTH, U.S. Army (Ret.)

MORE THAN A MILLION ex-infantrymen who trudged the hills and paddies of Vietnam are back "in the world" now and many of them are asking questions.

They want to know why they were sent into battle without the best tools of war.

They want to know who goofed.

All types of gimmick weapons and equipment were supposed to make the difference between victory and defeat, according to our strategists. For nearly a decade now, our men in Vietnam have been forced to use American-made equipment which not only is obsolete, but which from the start was never worth the tens of billions of dollars spent on its development and manufacture.

Let's look at some of the so-called wonder weapons and other gear that served to embitter our Vietnam combat veterans.

- The 5.56-mm M-16 rifle is as light as

a BB gun and about as effective in the jungles of Southeast Asia. This rifle never could take the abuse of combat. It requires perfect maintenance and a near-sterile battlefield to keep it clean enough to prevent jamming.

- The M-60 machine gun is a totally unsatisfactory infantry weapon. It is cumbersome and prone to stoppages.

- The M-72 Light Antitank Weapon was designed for use against armored vehicles which the enemy never really deployed until last April, after the majority of American troops had departed. In Vietnam the Army found itself without a lightweight, shoulder-fired weapon similar to the enemy's effective rocket-propelled grenade (RPG). The M-72 was issued to our troops to counter the enemy's

RPG fire and to bust Vietcong bunkers. It was ineffective in both roles and discarded by the savvy American soldier who quickly discovered that it was awkward to carry and easily damaged in the bush.

● The jungle uniform that was specifically designed for Southeast Asia is made of material that doesn't breathe adequately. Nor can it take the clawing of the thorny "wait a minute" bush that tears a uniform to shreds after only days in the boonocks.

It doesn't take a military wizard to see the uselessness of the baseball cap headwear that is part of the jungle uniform. This would flunk the course if one were to apply Frank Lloyd Wright's maxim of form following function. Ironically, the excellent GI-issue Australian bush hat, designed to replace the baseball cap in the Southeast Asia environment, has been outlawed by several major units in Vietnam. The commanding general of the Army's 1st Signal Brigade claimed that "it doesn't look military enough."

● It took the Army years to develop the ruggedly excellent PRC-25 field radio but

somebody goofed in the design of the all-important handset. It's as delicate as a fine piece of porcelain. A good jar causes it to malfunction, and moisture, of which there's a surplus in the tropics, shorts it out.

● In one episode that was both comic and near-tragic, a field hospital composed of a system of inflatable shelters was deflated by Vietcong gunners. In July, 1967, the 3rd Surgical Hospital at Dong Tam was mortared by the enemy. Fortunately, none of the wounded patients was killed. But somebody's ego should have been deflated along with the hospital's shelters. The military goods salesmen and the Army procurement people who bought the inflatable shelters must have believed no enemy would shoot up a hospital. Incredible!

I've often asked myself what happened to the rugged weapons and equipment that the Army used in World War II and years later in Korea. I can recall a fire-fight during the Korean war in which I found myself behind a .30-cal. Browning machine gun after its crew had been knocked out. Shrapnel had caved in the side of the weapon near the bolt-operat-

We failed in Southeast Asia because of poorly informed top officers who gave our men gadgets and exotic weapons to fight with. So says the author, whose medals lend weight to his opinions



SOLDIER AND MAN OF CONVICTION

After 25 years in the U.S. Army, Col. David H. Hackworth voluntarily retired last year because of deep differences with senior officers and a conviction that the Army had failed the American public and the men who wear its uniform. He spent five years in Southeast Asia—as infantry brigade officer, battalion commander and advisor to Vietnamese units. A courageous and innovative soldier, he's been described as the Army's most highly decorated officer. A partial list of his decorations: 2 Distinguished Service Crosses, 10 Silver Stars, 8 Bronze Stars (with Valor), 45 Air Medals (with Valor), 8 Purple Hearts. A self-made man who grew up in foster homes, he says the GI will always produce if given proper training and leadership. "But I've seen colonels and generals pour into Vietnam merely to get the needed 'credentials' for that next promotion, spending only six months in the field and another six behind a desk in Saigon before their next assignment. They never learned what the conflict was about—or how to fight it."



M-16 RIFLE, charges the author, requires constant maintenance. It can't take the abuse of combat

ing assembly. The weapon was clogged with mud and the link ammunition belt was coated with ice and dirt. The temperature must have been 10 below. But even so, that old .30 cal. chattered away when I pulled the trigger.

The equipment that I grew up with in the Army of a quarter of a century ago was what I call "GI proof"; it could take the abuse and beating that rough, careless American kids can sometimes dish out.

Unfortunately, equipment that we have developed in recent years has a lot in common with modern appliances—they're all part of our obsolescent, instantly disposable plastic civilization.

It has been suggested by some brash young officers that the Army bureaucracy is the root cause of the problem of poor weapons and equipment. I agree. For one thing, the octopus of "red tape" has choked the Army's research and development process. But underlying this problem is the almost complete preoccupation of Army leaders with the development of hardware that will automate warfare and replace the man who carries the rifle.

"It seems to me that we are always looking for exotic weapons or gimmicks like the Davy Crockett," explains one of these candid young officers, referring to the infantry weapon of the early '60s that cost millions of dollars to develop and was publicized as the ultimate weapon. It supposedly could even fire a small nuclear

war-head. But there was one catch. It didn't work—and was junked.

As I see it, in Vietnam our country has tried to kill a fly with a sledgehammer—a sledgehammer made of gimmicks and gadgets. We have tried to wear down the enemy by a massive outpouring of bombs, bullets and materiel from the nation's great assembly lines.

Unfortunately, the "sledgehammer" concept is a part of American military tradition upon which our generals and admirals have cut their eyeteeth in their advanced studies at the War College or the Industrial College of the Armed Forces. The strategic theories to which they have been exposed derive from Gen. Grant's tactics of attrition in the Civil War. Since then our military leaders have accepted the doctrine that the United States will always be able to outproduce an enemy in the materiel needed to wage war. The result: victory—as was the case in both world wars.

Another reason for our overdependence on hardware is that since the end of World War II scientists have taken over the development of weapons and gear. Many of these young PhDs never have worn a uniform nor heard a shot fired in anger.

A good example of scientific "think tank" planning was the attachment of the M-79 40-mm grenade launcher to the M-16 rifle. The idea was to give the infantryman a double punch and do away with the man who carried only the grenade launcher. This study, probably costing millions of dollars in the production of combination rifle-grenade launchers, lasted a year and added a lot of heartache to the troops forced to use the weapon against their better instincts and often to their detriment. The combination weapon was not a good one—as any infantry platoon sergeant could have pointed out after a five-minute examination.

On one occasion a colonel and I got into a violent argument with a group of social scientists who insisted on dictating to the Army where the infantry unit of the future would locate the machine gun within its proposed combat organization. These well-educated men knew nothing about machine guns or combat, but refused to acknowledge these lacks. Between us, the colonel and I had more than 10 years of active combat experience. But our experience carried no weight—and the



"A **TOTALLY** unsatisfactory infantry weapon" is the way Col. Hackworth describes the M-60 machine gun, shown being carried by a Marine in Vietnam. He says gun is cumbersome, prone to jamming, not nearly as rugged as old .30-cal. Browning. On the other hand, the colonel has nothing but praise for young soldiers who must use equipment issued by Army

scientists won the fight. Their recommendations for the Army of the future will prevail.

Our conventional approach simply has not worked in Vietnam. There we are pitted against a fanatically dedicated opponent who would take on tanks, if necessary, armed only with bow and arrow. We have flattened jungles and mountains only to discover this is far easier than destroying a courageous, determined enemy.

The so-called wars of national liberation—guerrilla warfare—call for changed tactics and strategy. The British learned this in the mid-'50s when they came up against Communist Chinese guerrillas in the jungles of Malaya. The British developed special jungle equipment, weapons, tactics and a force designed to fight without the support of massive air and artillery strikes and huge numbers of helicopters. Great Britain simply could not afford the \$160 billion that America has poured into Vietnam.

The United States went the opposite route. In the early 1960s, we saddled the South Vietnamese Army (ARVN) with a blueprint for a military force structured in part after the U.S. Army. First, this new ARVN force had to look like soldiers and we provided our steel "pots" and uniforms patterned after those worn by American soldiers in the field. Later, our own troops would stumble and hack their way through the bush wearing the ungainly pot which had been initially issued in 1942.

For years prior to the Vietnam conflict many of our professional soldiers in infantry units had pleaded for a lightweight helmet with a built-in radio receiver so that squad leaders could communicate with their men on the battlefield without needless exposure to themselves. But the same orders were *shouted* in Vietnam that were shouted in combat in World Wars I and II, and Korea: "Jack, move that machine gun 30 meters to the right!"

A small nine-ounce radio that clipped onto the steel pot was developed by the Army as a squad radio along with a 15-ounce hand-held transmitter that slipped into the pocket of the jungle uniform. There was one problem: The system didn't work. And when something doesn't work, it's quickly discarded by the troops.

In the early '60s the M-113 Armored Personnel Carrier was an item of "wonder gear" shipped to Vietnam and given directly to the ARVN. "This is the new miracle vehicle, the answer to crossing the

(Please turn to page 184)

SHERIDAN TANK, which revealed many bugs in combat, is said to be inferior to Japanese-made tank





New from Kodak:

World's smallest pocket camera for under \$30!

By IVAN BERGER

It loads like an Instamatic, takes pictures like an Instamatic, is handy like an Instamatic—but looks like no Instamatic you've ever seen before.

I DROPPED a Kodacolor cartridge into my new Instamatic, then slipped it into the breast pocket of my suit. It barely made a bulge—it's only one inch thick.

It's the Instamatic 20, first and (at \$29.95 with film and Magicube) least expensive of Kodak's five new pocket Instamatic cameras—and the beginning of a whole new system of photography.

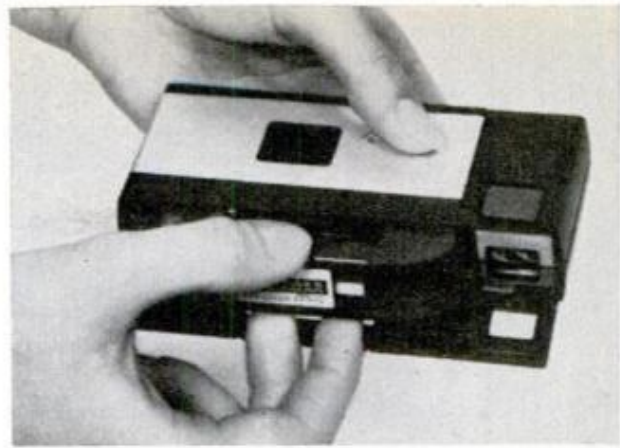
Besides the cameras (which range in price up to \$129.95), the system includes four kinds of film (two of them new), a new slide mount system, and three new, small Carousel projectors with 120-slide trays.

The cameras are all Instamatic-easy to use. The cartridge looks and loads like a standard Instamatic 126, but is reduced in size to take 12 or 20 13x17-mm exposures on 16-mm film; you can't put it in the

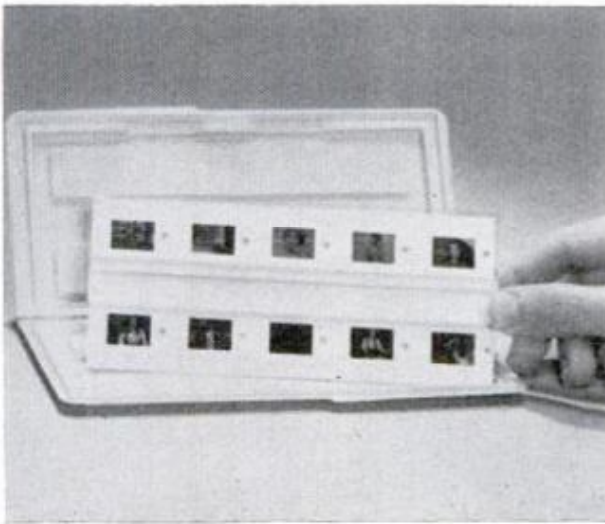




FLASHCUBE SOCKET on each pocket Instamatic camera takes a standard, batteryless Magicube, and rotates automatically as you wind film. A viewfinder signal warns when you're trying to fire a used cube



NEW INSTAMATIC 110 FILM DROPS IN, gives you 20 slides from Kodachrome-X or Ektachrome-X, 20 or 12 prints from new Kodacolor II, 12 prints from Verichrome Pan. Window in camera tells you film type



POCKET INSTAMATIC SLIDES are plastic-bound, come back on "slide sticks" for easier handling and editing. Negatives come in plastic protective strips with labels for easier identification and ordering



THREE NEW POCKET CAROUSEL PROJECTORS—so small you could lay one on this story and have half a page left over—take the new 30-mm slides, 120 at a time. Adapters for regular projectors are available

camera wrong. The film winds with two zips of your thumb on a slide recessed into the camera bottom. You can't double-expose or wind past the next frame.

You don't have to worry about exposure settings, either. On all but the under-\$30 pocket Instamatic 20 (with fixed aperture and shutter), exposure is automatically controlled by a CdS electric eye and an electronically-timed shutter. On the top-of-the-line pocket Instamatic 50 and 60 models, the eye controls apertures, too, from f/2.7 to f/17.

All five cameras have batteryless Magicube flash sockets that rotate as you wind the film. The pocket Instamatic 40, 50 and 60 also cut down the light that reaches the film when you flash close-up, to prevent overexposure.

In low light, all models from the 30

(\$50) up automatically shoot time exposures up to 10 seconds; below 1/30 second, a light in the finder tells you to use a tripod and cable release to prevent shake. Outdoors, the 50 (\$110) and its range-finder-focusing twin the 60 (\$130) shoot at a shake-stopping 1/250 second whenever possible.

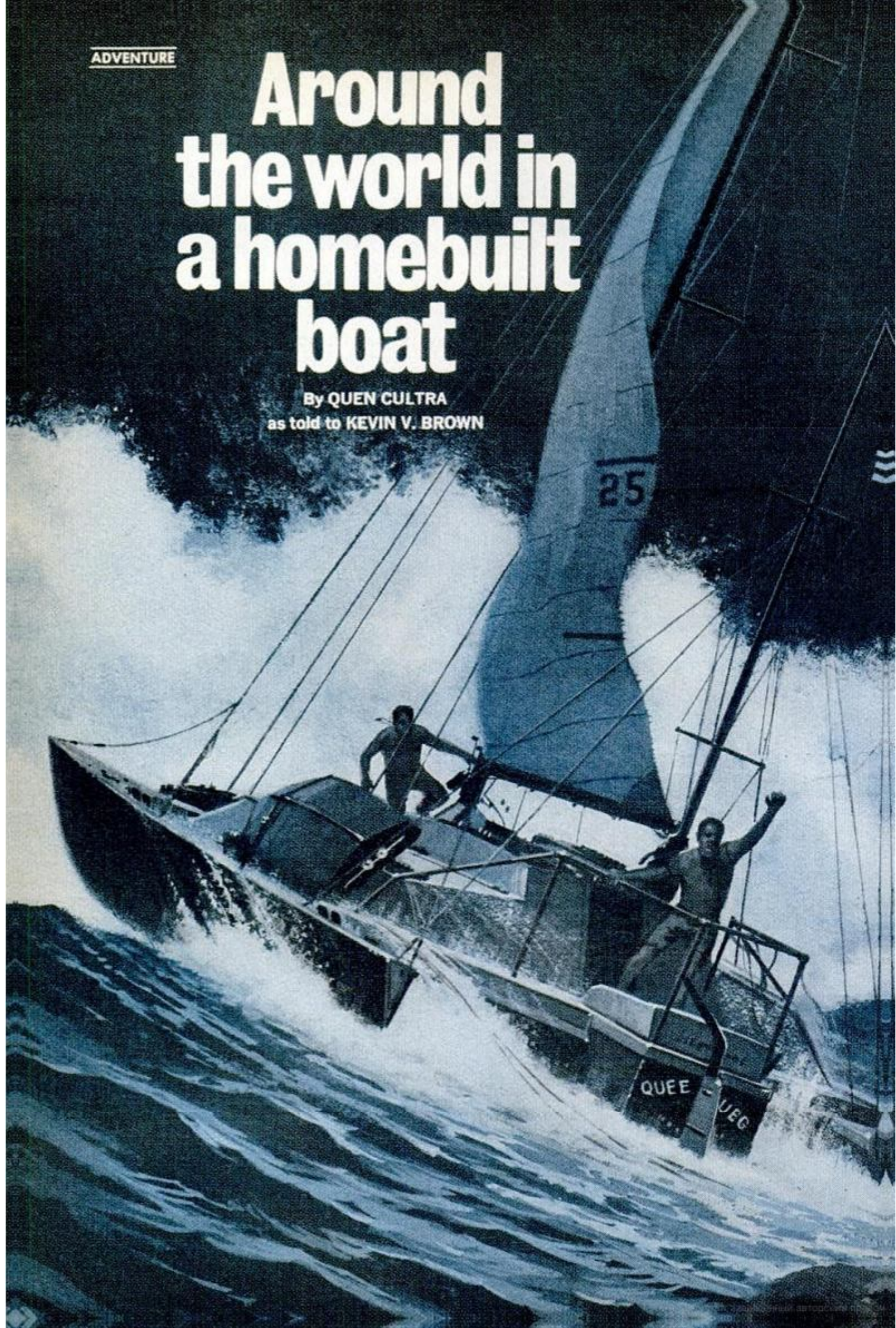
With the new, sharper Kodacolor II print film (available only in the new 110 size this year), 3¼x4¼ and 5x7-inch prints were about as sharp as those from regular Instamatics. Slides (on Kodachrome II and Ektachrome) were crisp and brilliant in the new projectors. For black and white, an improved Verichrome Pan is coming soon.

It's not the first or smallest camera system. But it's the first you can buy anywhere you normally buy film. ★★★

ADVENTURE

Around the world in a homebuilt boat

By QUEN CULTRA
as told to KEVIN V. BROWN

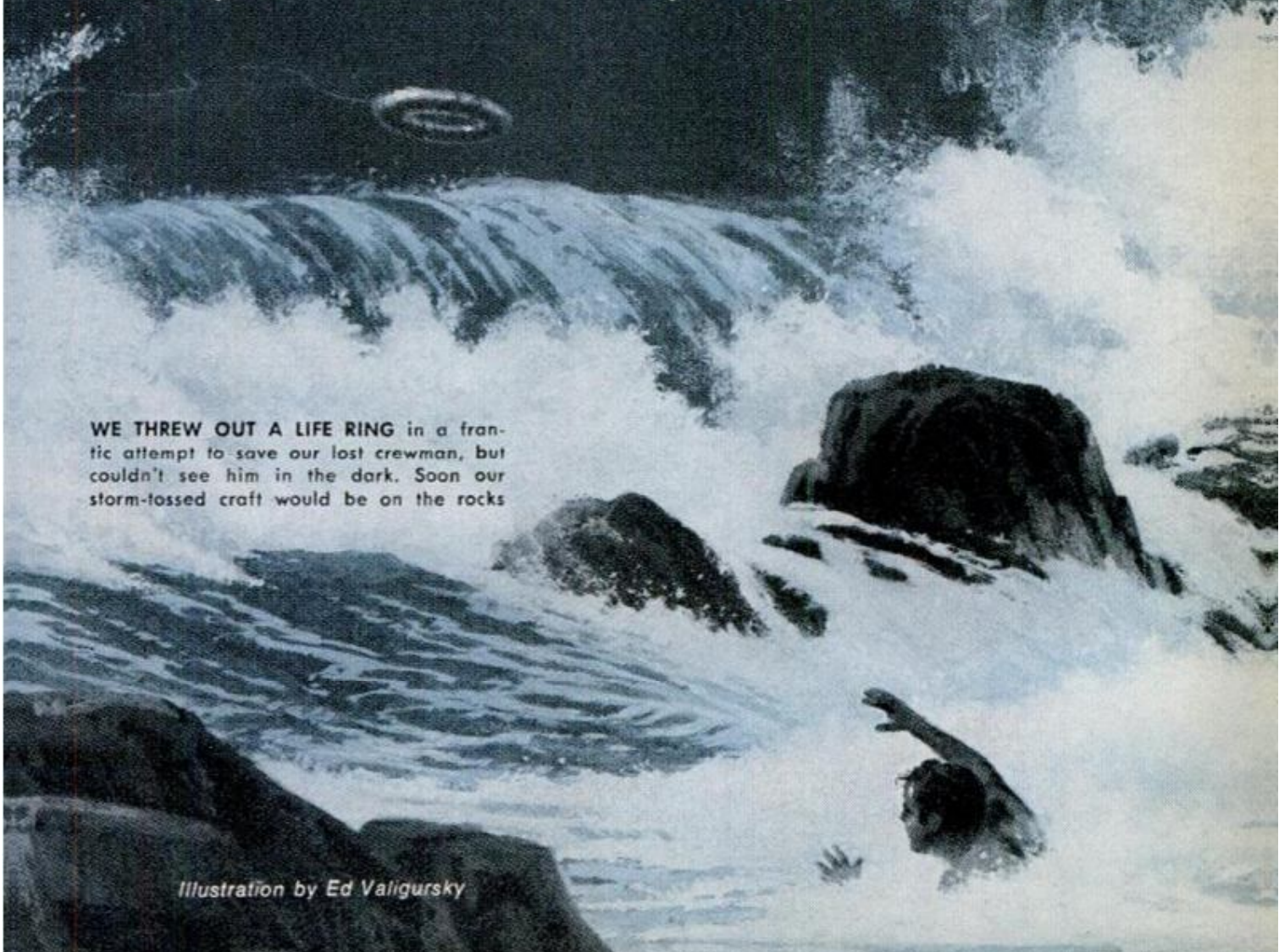


A midwestern landlubber knowing nothing of boats sets out in a two-masted trimaran on a hair-raising 2½-year sailing adventure—and miraculously lives to tell about it!

THE FIRST SIGN OF TROUBLE was the ominous sound of crashing surf. It was a pitch-black moonless night and we were being driven rapidly toward an unknown shore, caught in the teeth of a roaring wind. Then we saw them—the rocks—big, dark, craggy shapes looming angrily out of the boiling sea. Just as we desperately tried to bring the boat around, a huge wave thundered down on our decks, flooding the cockpit and nearly capsizing our craft. When it had gone, so had Jack Downs, one of our three-man crew, swept into the churning blackness. Although we couldn't see him, we frantically hurled a life ring in the direction of his cries. I attempted to launch a dinghy to pick him up and was immediately swamped and swept into the sea myself.

We were in the worst kind of trouble a boat can get into. We were on the rocks in a raging storm, with two men overboard and a treacherous surf pounding us closer and closer to destruction. It was the tensest moment in a 2½-year, 40,000-mile voyage that had started out with the hilarity of a Laurel and Hardy comedy and now seemed destined to end in grim disaster.

I'm a farm boy from downstate Illinois and there aren't many sailors in that part of the country. Ever since childhood, however, I had dreamed of sailing around the world. And I would do it the hard way—I would build and sail my own boat! The fact that I had never even been on a boat, never seen an ocean and never sailed anything more complicated than a plastic toy in a rain barrel didn't bother



WE THREW OUT A LIFE RING in a frantic attempt to save our lost crewman, but couldn't see him in the dark. Soon our storm-tossed craft would be on the rocks

Illustration by Ed Valigursky

me at all. I was determined. So about five years ago I started out on an adventure that was to be alternately comic, frustrating, thrilling and deadly dangerous, bringing me and my crew near death on several occasions. The only mistake I *didn't* make along the way was to build my boat in a basement and not be able to get it out. Everything else that could possibly go wrong did.

I decided on a 35-foot trimaran patterned after the famous Indonesian outrigger design, with one main center hull and two smaller ones outboard. It would, I figured, ride the waves with surefooted stability and be easy to build of fir spars, a plywood skin and fiberglass exterior coating.

The first problem I ran into was that a 35-foot boat may sound small, but tends to get rather large as it takes shape, especially a trimaran which is almost as broad as it is long. As construction proceeded, it became harder and harder to handle the assembly by myself. This was the beginning of the Laurel and Hardy part. Whenever I needed extra muscles, I'd go into town, stick my head into one of the local bars and shout: "Free beer at the Cultra farm!" Everyone would come running out, including the tavern owner himself, and I'd have 20 or 30 instant helpers. They'd come out to the farm and heave the boat into whatever new position I needed it for the next construction step. I spent a lot of money on beer that summer.

The fiberglass used for waterproofing the hulls gave me trouble, too. It needed high temperatures to apply, above 70° but my timing was off. It was going on winter when I was applying the final

HUGE MAIN HULL of fir spars became so heavy as it took shape that author couldn't handle it alone



'I had never even



UNDER FULL SAIL, *Queequeg* carries a large jib, mainsail and smaller after sail on the mizzenmast

coats. So I had space heaters, strung on long extension cords, placed around the boat, and I was doing a lot of breathing on the skin during the finishing touches.

But I finally finished the job, and when I did, it was Laurel and Hardy time again. What do you do with a 35-by-20-foot boat in Illinois farm country when the nearest waterway is 90 miles away?

I called the state capital to get a permit, but they didn't have much experience in issuing permits for sailboats on state highways, so they brushed me off as some kind of nut. I called a housemover to see if he could help, but he cut me off in mid-sentence. I even called a helicopter company to see if they could airlift the boat to a river. They were sympathetic, but their machines could handle only 3000 pounds, and my boat was up to 4500.

So when you're going to do something yourself, you do it yourself. I wrapped the boat in a black tarpaulin, got it up on a trailer, and started out at dawn, down side roads. I had prepared the route, measuring bridges and tunnels, but because we took up most of the road, we were stopped a few times.

I'd just explain, "It's an experimental asparagus picker." They'd nod knowingly and let us pass. Experimental machinery is quite common in downstate Illinois.

We got to the Illinois River—which would take us to the Mississippi—on New Year's Eve, 1967, for some more Laurel and Hardy. My girl friend, Judy, came

unfurled a sail.'

down from Chicago and broke a bottle of champagne on the bow, christening the boat *Queequeg*, after the character in *Moby Dick*. The champagne promptly froze before it hit the ground. I should have been warned.

That night, with the boat in the water, the temperature dropped to minus 18°. I slept on board, with a hot-water bottle at my feet, and next morning the hot water was ice and *Queequeg* was frozen solid in the river. I hired a crane, lifted the boat onto the bank, and it stayed there until spring. A great beginning.

In March, we finally started out. My crew included Jack Downs, a social worker I met while teaching school in Chicago. Neither of us had ever been to sea. My seamanship at the point consisted of a course in celestial navigation at the Adler Planetarium in Chicago—I had never even unfurled a sail.

We putt-putted down the Mississippi, using a 25-hp outboard motor. At Port Isabel, at the southern tip of Texas, we made friends with the Confederate Navy, a fun organization of Texans who offered to teach us to sail in exchange for rides on our unusual craft.

For anyone who hasn't done it, I can say this: You can learn to sail in half a day. It's something called seamanship that takes longer. So we spent all that summer learning seamanship and navigation. By October 1968 we were ready. After we set out for Cozumel, at the tip of the Yucatan Peninsula in southeast Mexico, we ran into our first bit of bad weather—the fringes of Hurricane Gladys. We hauled down the sails and rode it out, eventually making it through the Panama Canal to Costa Rica. From there we headed south to the Galapagos Islands off Ecuador, famous for huge turtles that live for hundreds of years.

Once we left the Galapagos, it was one island hop after another, stretching westward across the Pacific with a lot of water and very little civilization in between. The sail from Galapagos to the Marquesas Islands was the longest leg of our journey—3100 miles and 26 days. But once in the trade winds, it was literally a breeze. We had rigged a self-steering system, working the rudder off the jib,



MAKING A SIGHTING, author preferred \$13 plastic sextant to elaborate \$200 model also kept on board

so we almost cruised the entire distance hands off.

Tahiti was a disappointment. It has become too famous, too commercialized and too crowded. But we were stuck there four months, waiting out the hurricane season in the South Pacific. It was a profitable stop, however, as we picked up an additional crewman, Don Travers, a former Navy lieutenant who wanted a lift home and didn't mind going the long way round to get there.

After leaving Tahiti, we made stops at Western Samoa, Tonga and the New Hebrides—all delightfully unspoiled civilizations off the heavily beaten tourist routes. Some of the natives, had never seen a white man, and we were real curiosities to them.

On Malekula, one of the islands in the New Hebrides, we heard of an inland tribe, the Small Nambas, that even in this century practiced cannibalism. Through sign language and a little money, we persuaded one of its members to take us to his tribal home deep in the jungle—we didn't know then just how deep. At dawn the next day we started out. After walking for hours through thick, almost impenetrable forest, I asked how much farther. Our guide held up five fingers. Great, only five more miles, I thought. One hour and several miles later, I again asked how much farther. He held up four fingers. Then I caught on—he was talking in hours, not miles. It was late after-

noon before we finally stumbled into a clearing and ancient history.

The natives wore only banana leaves and had bones in their noses. But even here I could see how similar human beings are the world over. The old men of the village resented us—one of them actually threatened me with his machete—considering our visit a breach of privacy, but the young men were fascinated by us, our clothes and our equipment. So even in the jungle there's a generation gap.

From the Hebrides, we sailed to Australia, through the barrier reef, then westward to Indonesia, stopping several times, once at Komodo to see the famous 12-foot Komodo dragons (which are really quite timid creatures), and again at Bali to see the beautiful women (they are!), then on to Mauritius in the Indian Ocean.

It was after we left Mauritius, en route to South Africa, that our longest night began. It had been overcast for three

CURIOUS NATIVES pile aboard *Queequeg* in south seas, fascinated by strange craft (top photo below). In lower photo, natives treat *Queequeg's* crew to an island meal of fish wrapped in leaves and baked

days, making sightings impossible, so we unknowingly drifted off course, close to Madagascar. At the sound of crashing breakers, we knew we were in trouble. Moments later, we found ourselves on the rocks with *Queequeg* pitching wildly and Jack Downs and myself in the water. Only Don Travers was left on board.

Stunned and almost unconscious, I lost sight of Downs, but he had somehow managed to catch the life ring we had tossed him when he first fell overboard. I don't remember much of what happened during the next few minutes. When I opened my eyes, Jack was standing over me and we were on the beach. By some chance miracle, Jack and I had washed in through the rocks and raging surf and were now safely on shore. We could hear Travers shouting to us from the boat that he would stay aboard as long as he could. We had thrown out anchors as soon as we saw we were nearing the rocks, but had no idea how long they would hold in the savage wind and waves.

It was impossible to try to swim back

MAP SHOWS ROUTE author took down *Mississippi*,



to the boat in the dark, so we buried ourselves in the sand for warmth and waited until dawn. Neither of us could sleep. At the first light, with *Queequeg* still tossing in the water, we dove into the waves, hoping to reach ropes that Travers had let out with empty plastic water jugs floating on the ends. We tried for two hours, but only got cuts and bruises for our efforts.

Finally, it became obvious that one of us had better go for help, and Downs volunteered. But right in the middle of our troubles, we burst out laughing. More Laurel and Hardy. When he was washed overboard, Downs lost most of his clothes. He was now wearing only a T-shirt. I gave him my swimming trunks and he started down the shore.

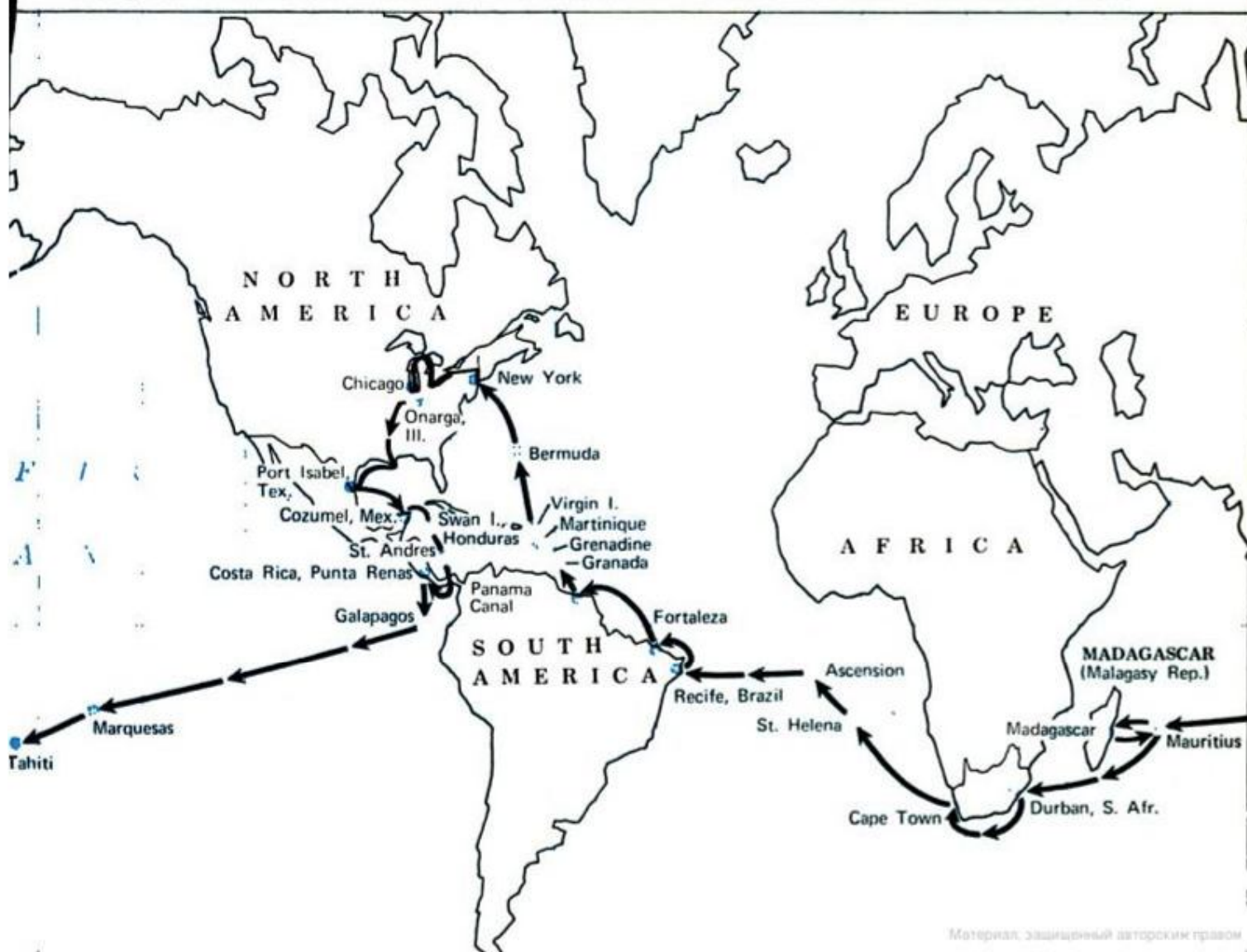
If we had only waited a little longer, we could have saved ourselves a lot of trouble. No sooner had Jack disappeared from sight than some friendly natives came along and helped to push me out over the rocks to one of the floating tow

(Please turn to page 182)

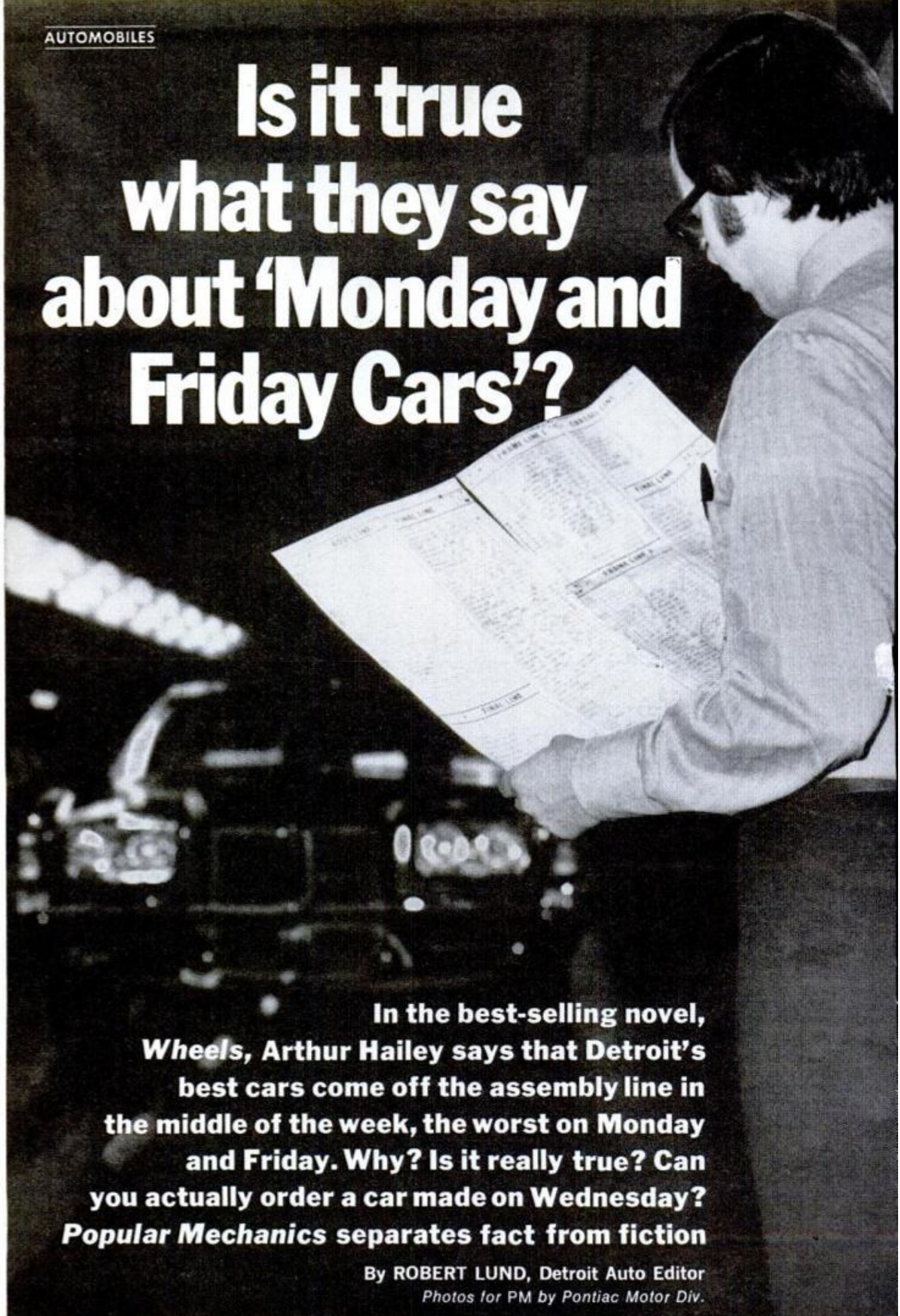


HOME AT LAST, *Queequeg* puts triumphantly into Chicago harbor after 2½-year, 40,000-mile journey

through Panama Canal across Pacific to Australia, then around Africa, up the Atlantic and home to Chicago



Is it true what they say about 'Monday and Friday Cars'?



In the best-selling novel, *Wheels*, Arthur Hailey says that Detroit's best cars come off the assembly line in the middle of the week, the worst on Monday and Friday. Why? Is it really true? Can you actually order a car made on Wednesday? *Popular Mechanics* separates fact from fiction

By ROBERT LUND, Detroit Auto Editor
Photos for PM by Pontiac Motor Div.

YOU'VE DECIDED to buy a new car. What happens between the time you sign the order and the day the dealer calls to tell you the car is ready?

Once you've put your name on the contract, something like 15,000 pieces must be pulled together to build the car. The same 15,000 pieces will never be assembled exactly the same way again—even if you order two identical cars the same day.

According to the Detroit version, your order is fed into the most sophisticated, computerized, nothing-can-go-wrong machine conceived by the mind of man. Presto, a perfect car pops out the other end. Never a foul-up, never a lemon.

The other version is the anti-Detroit horror story. Cars coming through with orange upholstery when you ordered blue; a six-cylinder engine when you ordered an eight; cars with defective brakes, motor mounts and leaky gas tanks.

Both versions are more folklore than fact. Not out-and-out fabrications, because you can always come up with the exceptions—the perfect car or the perfect botch, depending on the ax you want to grind.

Your chances of getting a perfect car, or let's say a near-perfect car, are vastly greater than your chances of getting a jinx. It's tough to figure the odds in numbers. Every company produces its share of lemons. Every company occasionally stops the line to correct quality problems. Every company runs periodic tests (usually daily) on quality and the finest cars made turn up a couple of defects or reject items. (The faults are supposed to be fixed before the cars are shipped.)

Your chances of getting a car with a passing mark as opposed to a lemon, figure out to something like 1000 to 1. But that doesn't mean you'll have no problems with a car that gets a passing grade.

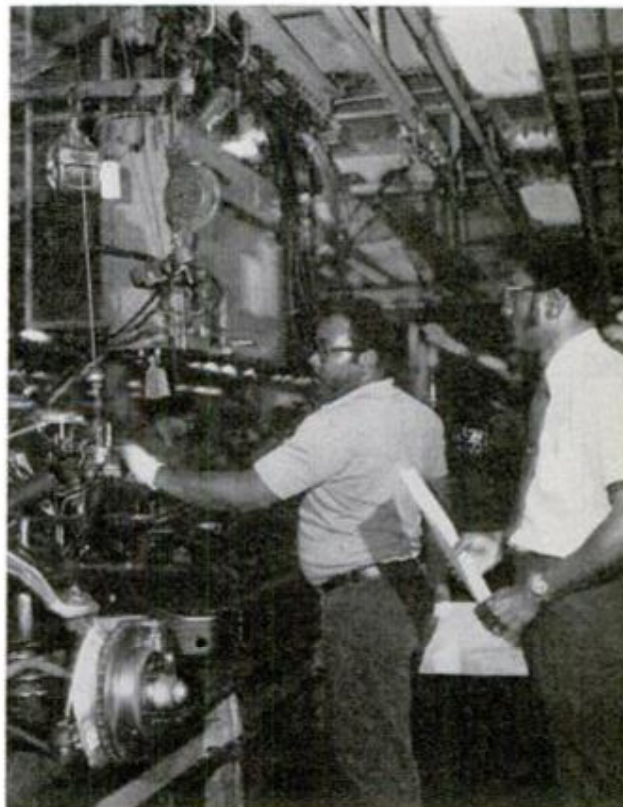
Considering the number of people and parts involved, the number of cars produced per year (9 million to 10 million in an average year) and the intricate chain the order follows from dealer to delivery to the customer, one clunker out of a thousand is a pretty fair record.

There's a popular fiction that bad cars are built on Monday and Friday. As if Detroit reserved a couple of days of the week just for turning out junkers. One

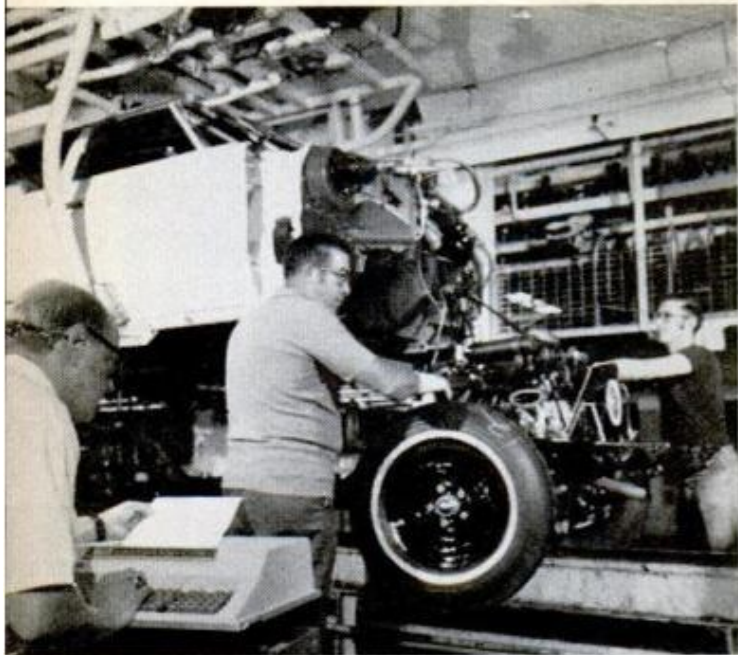
JUNE 1972



CAR-BUILDING ORDER is received by a teletype machine in scheduling booth at Pontiac Motor Div.



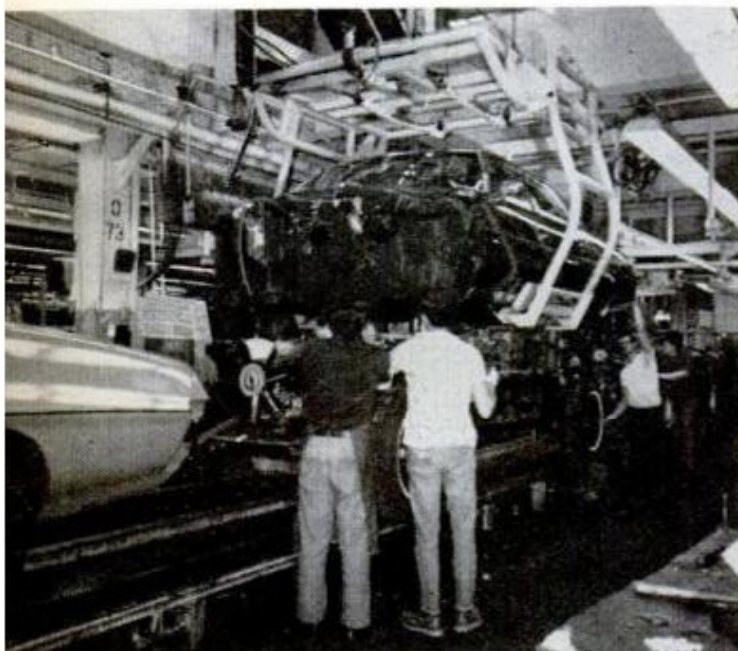
ASSEMBLY-LINE CHECK for fluid leaks is made on hydraulic brakes as chassis moves through the plant



NEW COMPUTER SYSTEM keeps track of cars in production on Pontiac assembly line. Status of buyer's car is available to dealer at push of button

of the recent novels about the auto industry, Arthur Hailey's *Wheels*, repeats the Monday/Friday car myth, warning against buying a car made the first or last day of the week. That's misleading on two counts: (1) Monday/Friday cars are not inferior to cars produced Tuesday-through-Thursday, and (2) even if the premise was true, there's no way a buyer can avoid getting a car made on a Monday or Friday.

The background on this myth is that Monday and Friday are the days the drifters on the production line fail to report for work. Assembly-line workers are paid by the hour. If they don't show up



for work, they don't get fired. They just don't get paid.

It's true that absenteeism in the auto plants runs higher Mondays and Fridays than on other days. There's some absenteeism every day. It averages about 6 percent and can go as high as 10 percent. On Mondays and Fridays it can jump to as much as 15 to 20 percent.

But that doesn't mean cars completed Monday and Friday are turned out by incompetents or that they're strung together with string and hairpins. On days when absenteeism is higher than normal:

1. The line is slowed down. Fewer cars are produced. Or,
2. A swing man fills in for the absent worker. The relief man is frequently more experienced and conscientious than the man he replaces and, presumably, should turn out a better car.

That's not to deny a certain number of inferior cars come off the line Monday and Friday. But the number is no greater than the number of lemons produced Tuesday through Thursday.

Cars completed Monday/Friday go through the same inspections as those built on other days. If they don't pass, they're sent back through a fix line.

The story about Monday/Friday cars being half-best half-breeds may have been true in some ancient yesterday. But there are good reasons why it isn't true today. The auto companies are doing the best job ever in inspecting for quality, reliability and durability every day of the week; no slackening off Monday and Friday.

The reason the auto firms are doing a uniformly good job on quality is because they're afraid to turn out bum cars. There are too many nippers-at-the-heels waiting for them to make a mistake. They want to avoid recalls and lawsuits and they aren't eager to tangle with Ralph Nader and other critics in government and the insurance industry.

But maybe you're still skeptical about Monday/Friday cars. How do you avoid buying one?

By dumb luck. That's the only way. You can't avoid Monday and Friday cars by design, by planning it out. If you buy a car off the showroom floor, there's no way of telling the day it was made. The

BODY DROP is spot on the line where the right body meets the right chassis for your built-to-order car

patent plate will give you the month and year, but not the day or date.

If you special-order, the dealer has no way of controlling the production date. You can bug him to find out the day the car will be produced. But if he tells you it's Monday or Friday, there's nothing you can do. Dealers won't accept special orders without a signed contract and a deposit. If you refuse to accept the car after signing the contract, you lose your deposit.

What about intentional damaging or sabotaging of cars by production workers? Stashing a Coke bottle or a slab of Limburger in the door panel? The "union slob" job.

It happens. GM had a run of badly botched Vegas at its Lordstown, Ohio, plant early this year. Rejects ran so high that the company stopped the line and virtually rebuilt the cars from the frame up. In the end, the rejects were better than Vegas that come off the line without a check mark on the fix sheet.

The United Auto Workers union doesn't like to talk about sloppy workmanship or sabotage. "Our members do the best job they can considering the conditions they work under, the tools they have to work with and within the time limits prescribed by management," a spokesman says.

Another source in the UAW allows that there may be occasional derelictions by disgruntled production workers wanting to "get back" at management. "You might even run across a rare sorehead who'll resort to malicious damage," he adds. "But if the companies can't sell the cars because they've got a reputation for being lax on quality, our guys lose their jobs. The man on the line knows this and puts the best he's got into his work."

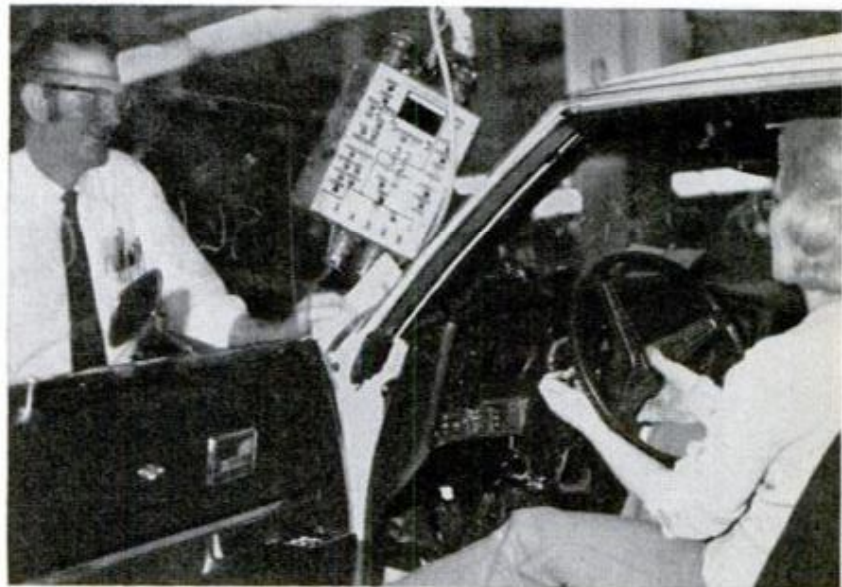
Union officials say much of the vandalism charged to workers happens after the vehicle leaves the plant—while in transit. Cars frequently arrive at dealers with gouges in the paint, broken glass and parts missing. Auto manufacturers agree that in-transit vandalism is serious—to the tune of millions of dollars a year. But

they scoff at the idea they can't differentiate between damage done on the line and vandalism in transit.

Let's follow an order from the time you sign it until the dealer receives the car. On the average, this takes 8 to 14 days. But you can hit it lucky or unlucky and run under or over that time.

If your order is for a wagon or a car calling for special (low volume) equipment and it arrives when dealers are clamoring for two-doors, it may get sidetracked until the factory gets caught up on two-doors.

The first obstacle the paperwork has to get by is Hometown Motors. Cars aren't



ELECTRICAL TESTS of all components such as lights, horn and power options are performed as car nears end of the final assembly line

made in one day, despite what salesmen might tell you, and Hometown doesn't send the order direct to the factory.

Anyone who's bought a few cars has had the experience of a salesman promising delivery in X days and then waiting days or even months after the date for the car to come through. Why the delay?

Hometown will tell you the tie-up is at the factory. Maybe—and maybe not. The order may be hanging on a spike at Hometown. Detroit can't start construction until Hometown submits the order.

Why would Hometown stall on sending it? The villain could be the factory contest. Auto companies are always running contests. Not for the public, but for salesmen, dealers, factory field offices and regional offices.

If there's a contest coming up or a ru-

mor one's in the offing, the salesman, dealer or zone manager may put your order on hold until the effective date of the contest, thereby accumulating a point to qualify for the payoff on the contest. A contest can also work to your advantage, although it seldom seems to happen that way. If one is about to terminate, the dealer may try to expedite the order to get in under the wire.

Once the order clears the dealer, it goes to the local field office. In some cases the dealer sends the order in on a coded form. In others, the code card is punched out at the field office. (Your car could get hung up here just as it was delayed at the dealer.)



The field office passes the order on to a computer at the processing center. There a master order card determines where the car will be built—and makes certain the particular parts required to produce it are available at that plant.

The order doesn't necessarily go to the nearest assembly plant. All plants don't build all cars. The order is channeled to the nearest one that builds the particular car you ordered. If it's a Chevy Camaro, for example, it will be built at Norwood, Ohio—the only place Chevy builds Camaros. If you order a standard-size Chevy, it might be built at Janesville, Wis., St. Louis or several other sites.

At the processing center or the assembly plant, the order undergoes a final check. It's impossible, the auto companies say, to order the wrong engine, color combination, wrong anything else. If the specs

(Please turn to page 176)

FRONT BUMPER is installed as an inspector checks the car-build record against the customer's order

COMPLETED CAR gets various road-simulation tests—this one is for possible rattles and squeaks

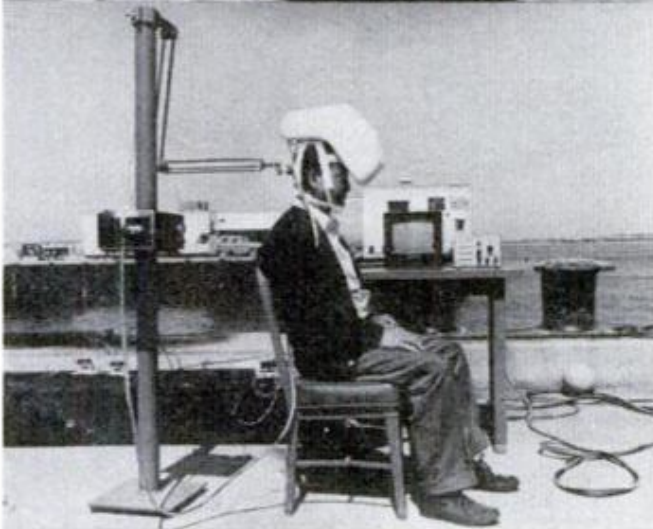
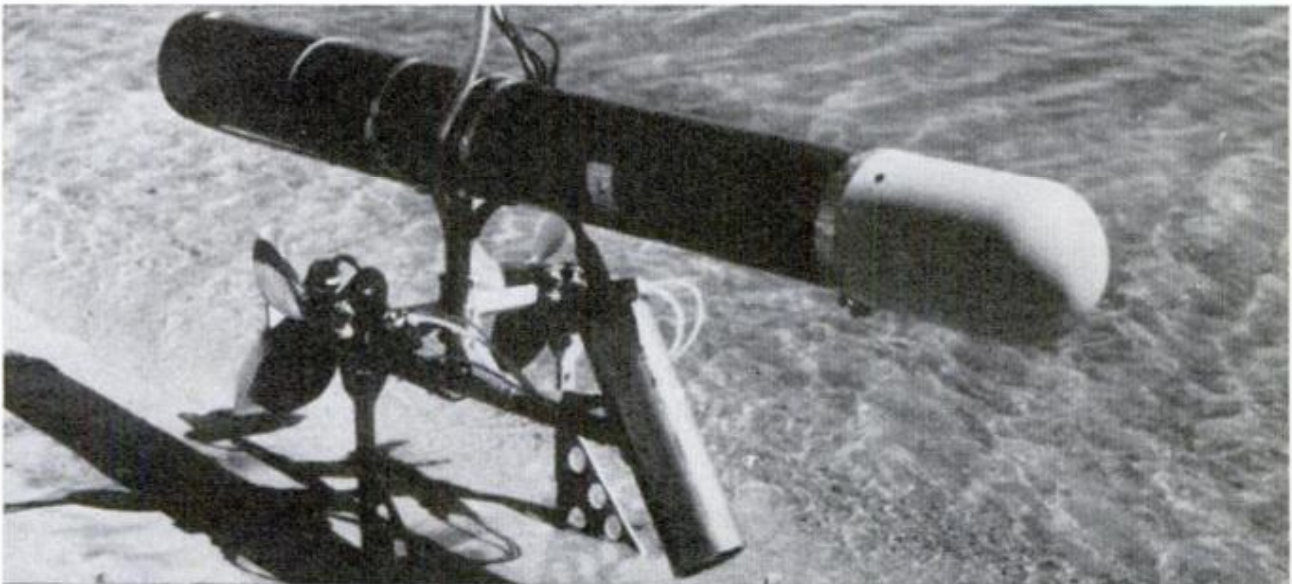




Squareback (and front) Danish beach buggy is rustproof

This beach buggy is made in Denmark and has a body of galvanized iron and plastic that can't rust, says Ole Sommer, its designer.

The vehicle will be manufactured in lots of 10 and will sell for \$6000 in Denmark or \$2000 in Sweden where tax and duty aren't so great.



Deep-diving Snoopys is an underwater 'spy'

Snoopys is the U. S. Naval Research and Development Center's TV-equipped submersible that can operate 20,000 feet under the sea. Controlled by head motions of an operator on shore, Snoopys turns and tilts to transmit back

accurate pictures to the screen in the operator's mask. Driven by hydraulic power so it doesn't stir up vision-obscuring silt, the 4½-foot-long vehicle will give scientists a look at areas they've not been able to see before.

IT'S A SUNNY spring morning, ideal for a bit of fishing at that lake 200 miles from your home. You hitch your car to the trailered amphibian in your garage and drive to the local airport. After parking car and trailer, you take to the skies. In an hour and a half you touch down on a sparkling lake—and minutes later you're fishing, right from the plane's cockpit.

For most of us, this is only a nice daydream. But for the owner of a Taylor Coot—a sporty, two-seat amphibian—weekend sky-jaunts would be as easily accomplished as a drive in the country.

The Coot is the brainchild of M.B. (Molt) Taylor, an ingenious designer who specializes in planes that can be built by the home craftsman. A pre-

vious creation—The Aerocar—is an auto that converts into a plane (*This Car Really Flies*, page 87, Aug. '71 PM).

The Coot, according to Molt, can be built by anyone with basic “manual training” skills and with standard tools. He estimates that the average hobbyist can build the plane in 1500 hours and at an approximate cost in materials of \$3500. That includes the price of a used engine. Taylor's prototype Coot-A is powered with a 125-hp Franklin Sport 4-R engine, which is available in kit form. This engine provides enough power to enable the plane to take off at a gross weight of 1850 pounds, including a “payload” of about 600 pounds. A takeoff from water requires 300 feet; from a runway on land, 400 feet.

A dreamboat you can build... and fly!



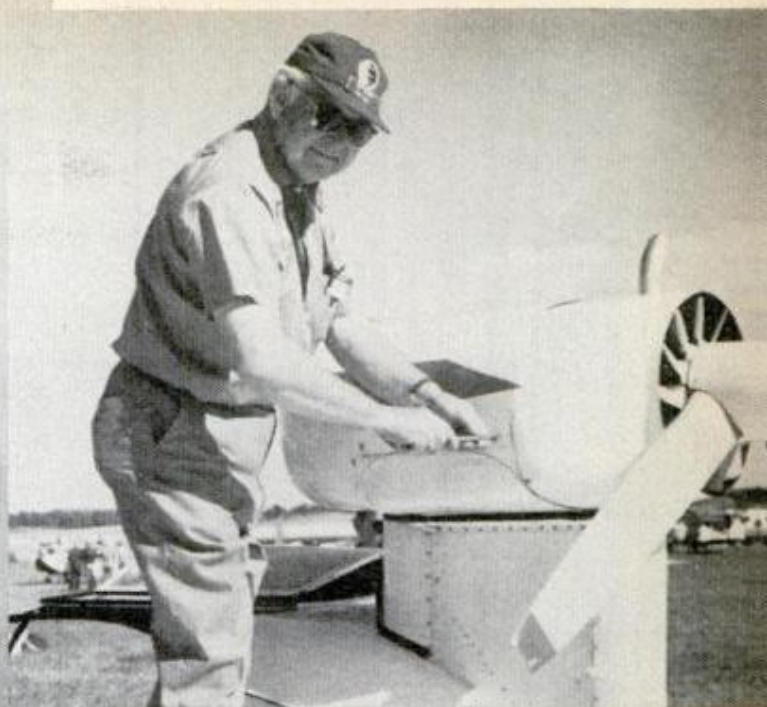
The sporty, two-seat Coot operates from land or water and has a range of 450 miles. You can build it, using standard tools, in about 1500 hours, says the designer. The cost: \$3500.

By JOHN F. PEARSON and HOWARD LEVY / Photos by Howard Levy

Water takeoffs develop an extra boost from a "ground effect" that enables the craft, according to Molt, "to jump out of the water." What happens, as he explains it, is that a layer of air is trapped between the surface of the water and the inboard wing panels. (The panels ride on the water and act like sponsons.) As a result, the plane tends to "climb up" on the compressed layer of air.

Molt designed the plane for the sportsman-flyer. It's ideal for the fisherman, scuba enthusiast and even the water-skier. Ski lines can easily be hitched to the tail boom. The wings fold for storage or for towing on a boat trailer.

Last summer Molt trailered the Coot from his home in Longview, Wash., to



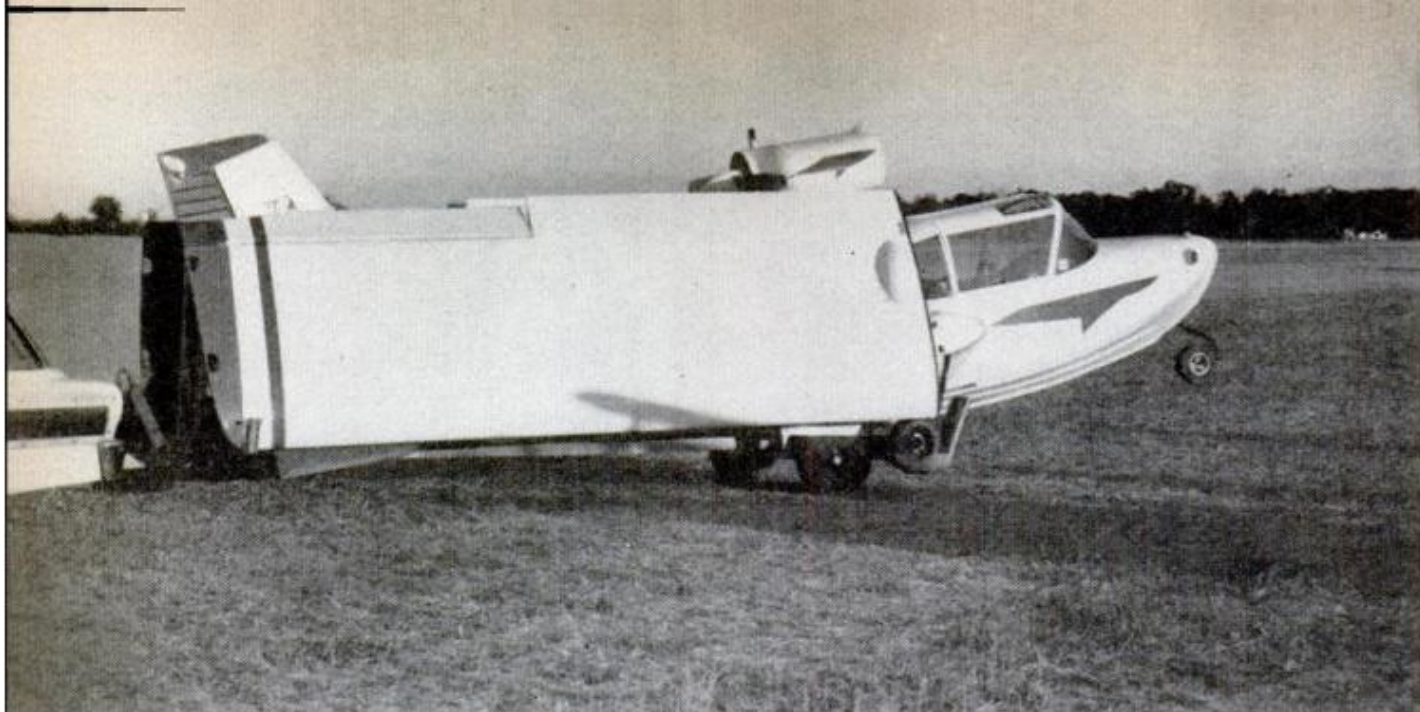
MOLT TAYLOR tightens screw to button down engine cowling. Engine can be built from kit

PANEL contains neat arrangement of gauges. Cockpit is roomy enough to permit fishing from plane

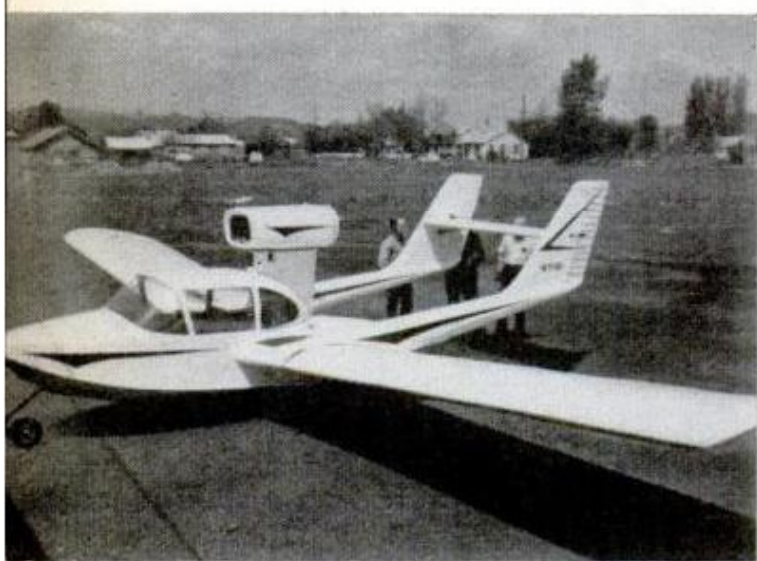


DISTANCES AS SHORT as 300 feet are adequate for water takeoffs with the amphibian

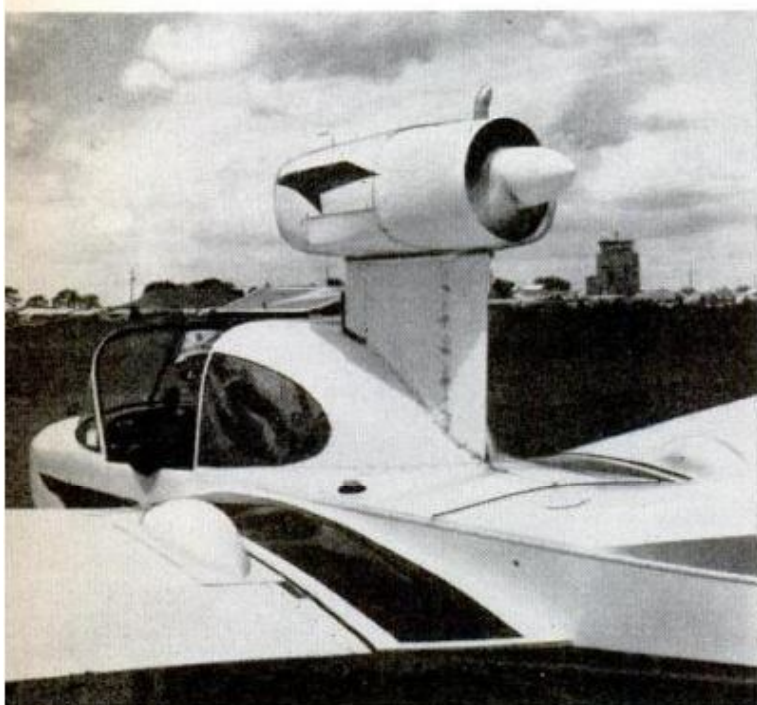




WINGS FOLD ALONGSIDE fuselage, reducing plane's width to eight feet, which makes for easier towing



THE COOT comes in twin-tail configuration, but Taylor claims that the single-tail version is superior



a homebuilt aircraft convention in Oshkosh, Wis., a distance of approximately 2100 miles.

"We made it each way in three days," he recalls, "driving the legal limit on all roads. That's pretty good going."

The Coot comes in A and B configurations. "The B has a twin-boom tail," explains Molt, "which may help its looks, but it lessens air stability and makes the plane harder to fold up for trailering." The B version was created to suit a particular homebuilder.

The Coot-A has a wing span of 36 feet, is 20 feet long and 8 high. With wings folded its width is eight feet. The wing is built of wood and fabric, and has a fiberglass leading edge. The hull is covered with fiberglass and the tail has a metal frame that's covered with fabric.

With the Franklin Sport engine the plane has a maximum speed of 135 mph and a cruising speed of 110 mph. It has a range of 450 miles and its ceiling is 14,000 feet.

If interested, you can get an information packet for \$3. Write to Molt Taylor, Box 1171, Longview, Wash. 98632. He also sells a complete set of plans for \$150. ★★

Next month: PM will feature a highly successful homebuilt, the Pazmany Laminar.

A 'PUSHER' ENGINE and standard prop power the Coot. A controllable-pitch prop can also be used

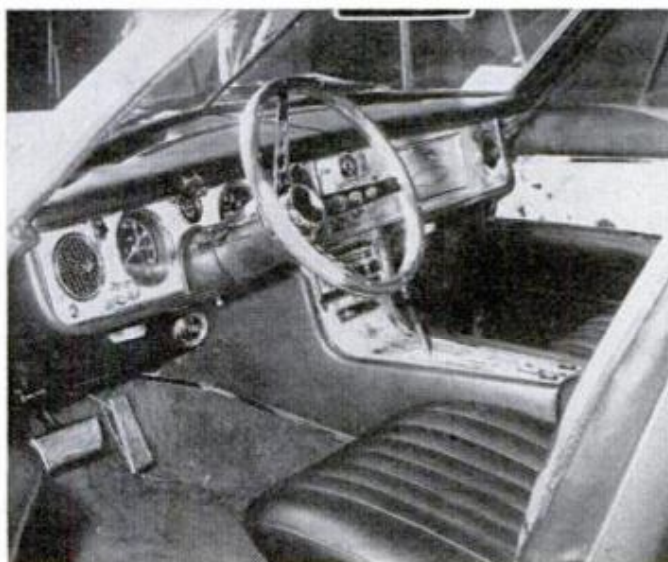
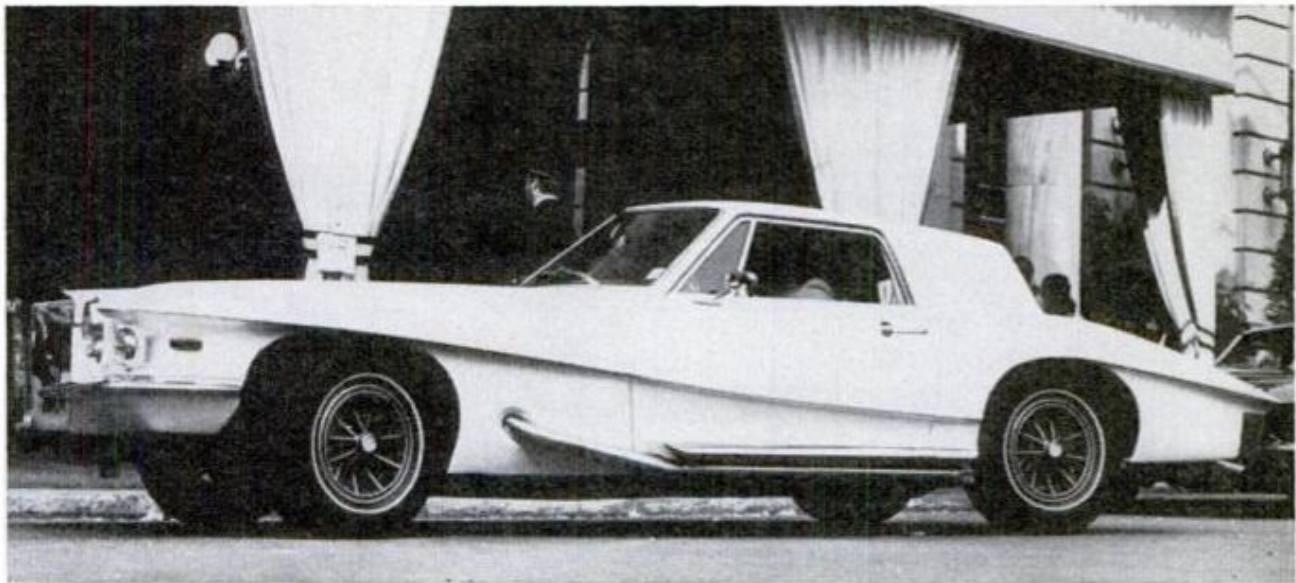
POPULAR MECHANICS



Special car takes handicapped youth hunting

Because of his love for hunting and fishing, Hugh Peacock has given hope to other paralyzed sportsmen. A special car, the Wildcat, was built for Hugh by the National Engineering Laboratory of East Kilbride after the 19-year-old was paralyzed from the waist down in an auto accident. Now he can travel over his

father's farm in Southern England at 12 mph in search of game and trout streams. The Wildcat can negotiate nearly 40° slopes, is hand-operated and the cab flings back to give a clear shot. The car, which is the first of its kind, may be produced on a limited basis for other paraplegics.



The Stutz is back in town

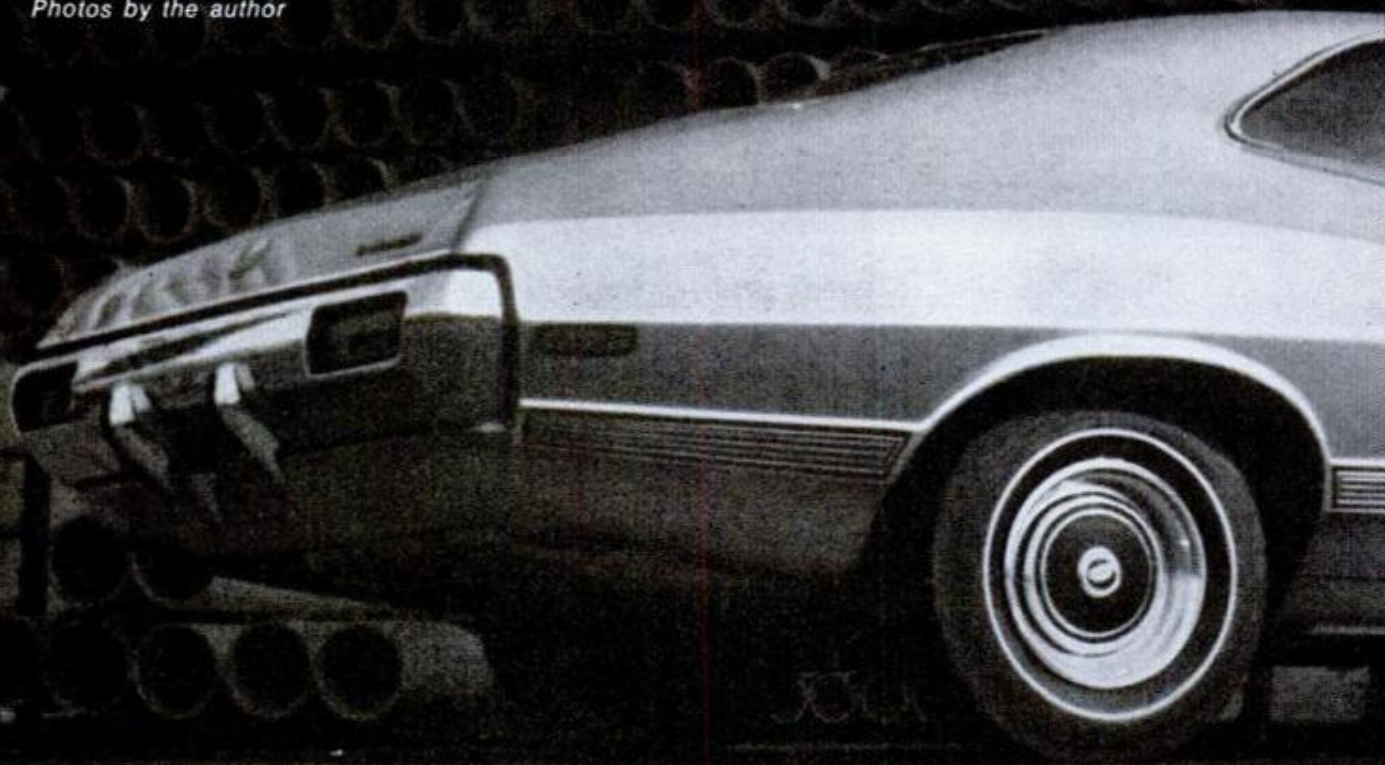
The Stutz, which disappeared from the American scene with prohibition and flappers, has returned—more exciting than ever. Stutz Motor Car of America, New York City, is now selling this hand-crafted prestigious automobile which ranges from \$24,500 for the two-door hardtop to \$75,000 for the VIP model. A convertible and four-door are also offered. The body is made in Italy, the engine is built around a 455-cu.-in. GM block and a modified Grand Prix chassis is used. Sorry—you'll have to wait in line to get yours. At press time, 450 orders had been received, and production is limited to only 500 units per year.

PM **FORD TORINO**
OWNERS REPORT...

A nationwide survey based on
1,250,000 owner-driven miles

Head-turning styling—but neck-snapping visibility!

By **MICHAEL LAMM**, West Coast Editor
Photos by the author



"SARCOPHAGUS SEATS," and the big, blind C-pillars hide everything behind the 1972 Torino, complain the people who drive them. Not only that, the high seat backs mummify rear riders, especially kids, so everyone in the car is unhappy about riding in it.

But it sure looks great, say owners. The Torino was one of the few cars completely restyled for 1972—Ford makes lots of hay about that. Almost 60 percent of owners bought the car

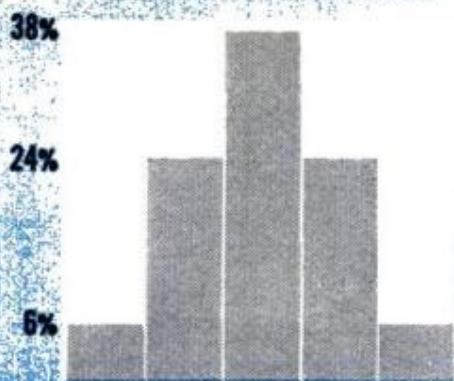
just because they like its new style.

Gas mileage is something else: Overall average mileage for all engine options and all sorts of driving stands about midway between 12 and 13 mpg, and that's on the low side for an intermediate.

Almost all Torino owners in our survey have either the 302 or the 351-cu.-in. V8 (a total of 89.6 percent, very evenly divided). Difference in gas mileage between the two engines was almost nil. A few owners complained of

TORINO FUEL-MILEAGE CHART

PERCENT OF OWNERS



302-V8	Local	6.9	9.7	12.5	15.3	18.1
	Trips	9.4	12.4	15.4	18.4	21.4
351-V8	Local	7.8	10.1	12.4	14.7	17.0
	Trips	10.4	12.7	15.0	17.3	19.6

MPG

park and drive in congested areas." "Maneuverability is beautiful." And a number of owners have good things to say about the Torino's quiet ride.

It appears that several owners are under the impression that disc brakes are standard equipment on the Torino, while in fact they're not. Front discs are mandatory options with certain engines and models, notably on all 429-cu.-in. V8s and on wagons having the 400-cu.-in. V8 engine with or without airconditioning.

What do the owners think of Torino workmanship? "By far the best-built car I've ever driven," says a Minnesota sales manager. In all, 32.6 percent rate workmanship as "very good/excellent," 31.4 percent describe it as "good," 16.7 percent give it "average/fair" and 29.3 percent call it "fair/poor."

We asked Torino owners what they

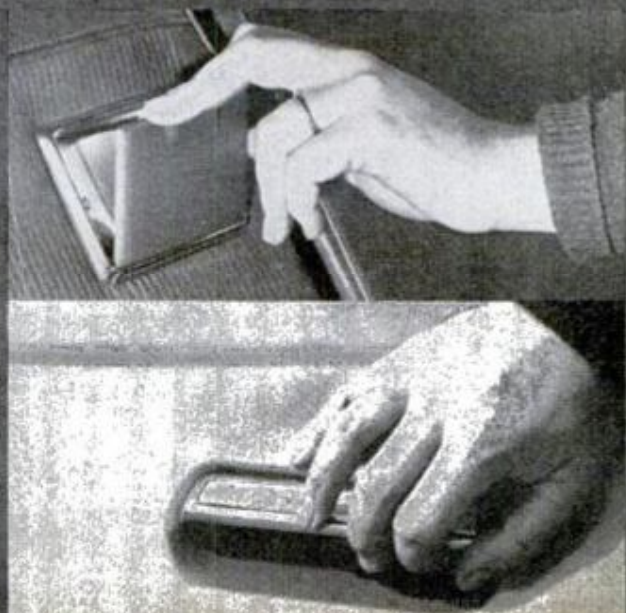
lack of power, but they meant this in relation to more powerful cars they'd owned before.

Except for the two big beefs of visibility and mileage, Torino owners swear by their cars rather than at them.

Handling was high on the list of likes, with oft-repeated comments like: "Easy to handle." "Comfortable to

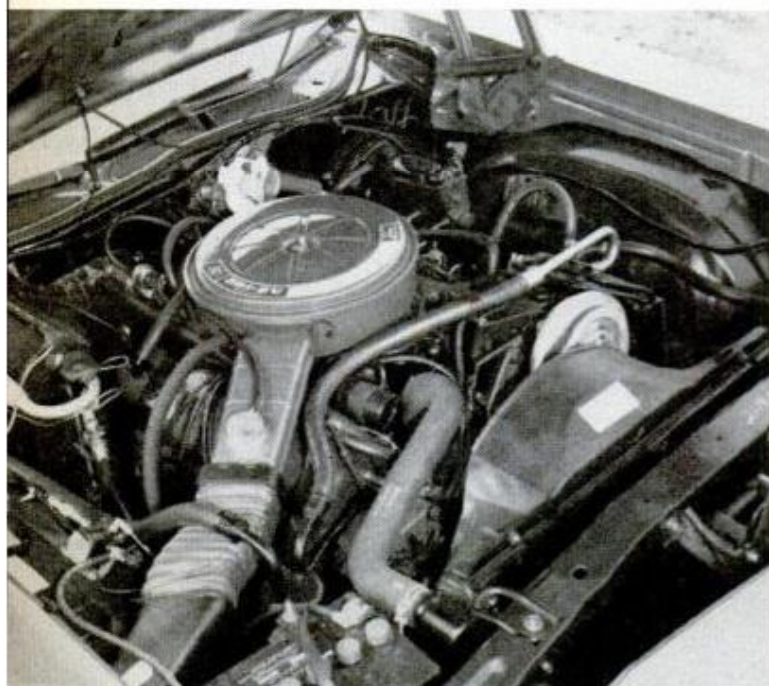
REAR ASHTRAYS, set in back of the front seats, are convenient but smokers sometimes burn the upholstery

DOOR HANDLES follow the fashion for flush mounting. The doors are easily opened with one finger





NEATLY GROUPED DIALS please most owners; some claim speedometer and gas gauge should swap places



POOR GAS MILEAGE (13.6 mpg average) brought groans. Most owners chose 302 and 351-cu.-in. V8s



TORINO'S STYLING sold most of the owners. It's one of the few "new" cars built for 1972—a major restyling job. A number of owners complained that the plastic grille tends to break easily; others said they would really appreciate a stronger front bumper. The high seatbacks make it hard to see the view behind

think of their dealers. We broke the question down into two parts, one to rate their dealers generally and the other to rate their service departments specifically.

In general, 72.1 percent consider their dealers "good/excellent." But in the service area, precisely 50 percent rated Ford dealer service "poor," with only 24.9 percent giving it "good/excellent." And 17.8 percent went so far as to say it was "very poor/terrible." (Definitions vary a great deal, we're sure, from respondent to respondent.)

What changes would Torino owners like to see put into effect? "Lights in ashtrays should be standard." "Side vent panes." "Lower front seatbacks." "The shoulder harness assembly could be neater." "Improve emission control so system doesn't cut performance and let engine idle slowly." "Better gas mileage." "More snap from the 400 V8." "Better paint job." "I wish the deck-lid lock didn't have that cover—it makes unlocking it a two-hand affair."

In the odd problems department, a retired school teacher from Lawrenceville, Va., writes, "My radiator grille broke when a six-pound rooster flew into it from the side of the road. I thought these grilles were made of metal and shouldn't break, but I find they're plastic." A Delaware supervisor recalls that whenever he used to honk his horn, the headlights would flash instead. "A typical new-car bug," he says. And an Oklahoma serviceman reports, "The fuses are mislabeled on the fuse block of my Torino. It took me a while to figure out the problem until I checked all the fuses. Makes me wonder if they're wrong on all Torinos."

What about comfort? A Nebraska travel-

ing salesman who racks up 60,000 miles a year on his car, says, "Passengers comment on the big-car ride of my Torino." "Very smooth and quiet," echoes a North Carolina research technician. "Our new Torino rides as smoothly and silently as our 1972 Ford LTD," notes a New York office worker. "Rear passengers can't see ahead," says a retired Coloradan. And a practical nurse from Kentucky feels "very comfortable except for the limited legroom in the rear seat." She owns the two-door hardtop.

Good looks, size and price sold the Torino initially; good handling, ride and comfort keep the owners happy. Still, there's nothing that the owners can do about the seats short of chopping and reupholstering them. The overwhelmingly negative reaction of owners to the shape and style of the seats has already gotten



AMPLE TRUNK gets chewed up by horizontal spare. Deck-lid lock cover makes opening it a two-hand job

back to Dearborn, and there is every indication that Ford does listen and that the seats on the 1973 models will be improved. Maybe the owners will even be able to fit them to their '72 Torinos. ★ ★ ★

Summary of Ford Torino Owners Reports*

Total miles driven1,250,663

Average miles per gallon

302-cu.-in. V8
Local driving12.5
Long trips15.4
351-cu.-in. V8
Local driving12.4
Long trips15.0

Engines:

250-cu.-in. Six 3.9%
302-cu.-in. V843.7
351-cu.-in. V845.9
400-cu.-in. V8 5.2
429-cu.-in. V8 1.3

Body styles:

2-door hardtop45.2%
2-door Sportroof20.4
4-door sedan20.9
4-door wagon13.5

Transmissions:

Automatic96.2%
3-speed manual 3.0
4-speed manual 0.9

Why the Torino?

Styling59.3%
Size18.3
Past experience14.5
Price11.2
Handling 7.9
Economy 7.1

Specific likes:

Handling54.5%
Style51.5
Ride42.1
Comfort30.6
Silence10.6
Fuel economy10.2

Specific dislikes:

Poor gas mileage23.2%
Poor rear view16.3
Seat shape 8.2
Rattles 7.3
Lack of power 6.4

What changes would you like?

Improve rear vision19.7%
Change seat shape12.3
Better gas mileage 7.4
More legroom 6.9
Change styling 6.4

Had any mechanical trouble?

No60.1%
Yes39.9

What kind of trouble?

Carburetor20.8%
Transmission17.7
Wheel bearings 6.3
Valves 5.2

Did you repair it yourself?

No96.9%
Yes 3.1

Dealer repairs satisfactory?

Yes57.3%
No42.7

Is the Torino your only car?

No50.4%
Yes49.6

Other cars owned:

Ford35.6%
Mustang15.4
Chevrolet13.0
Volkswagen10.6
Pontiac 5.7

Accessories/power options:

Automatic transmission96.2%
Power steering72.7
Radio57.7
Power brakes50.2
Airconditioning48.5
Vinyl top22.0
Tinted glass19.8
Whitewall tires17.6

Age distribution of owners:

15-29 years27.4%
30-49 years44.4
50-plus28.2

Would you buy another Torino?

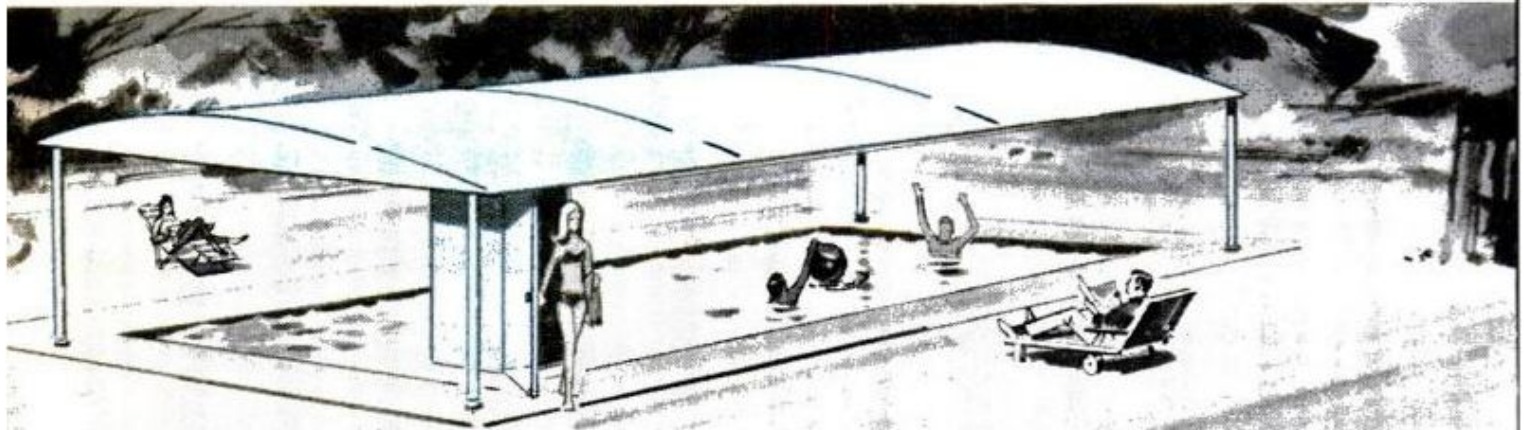
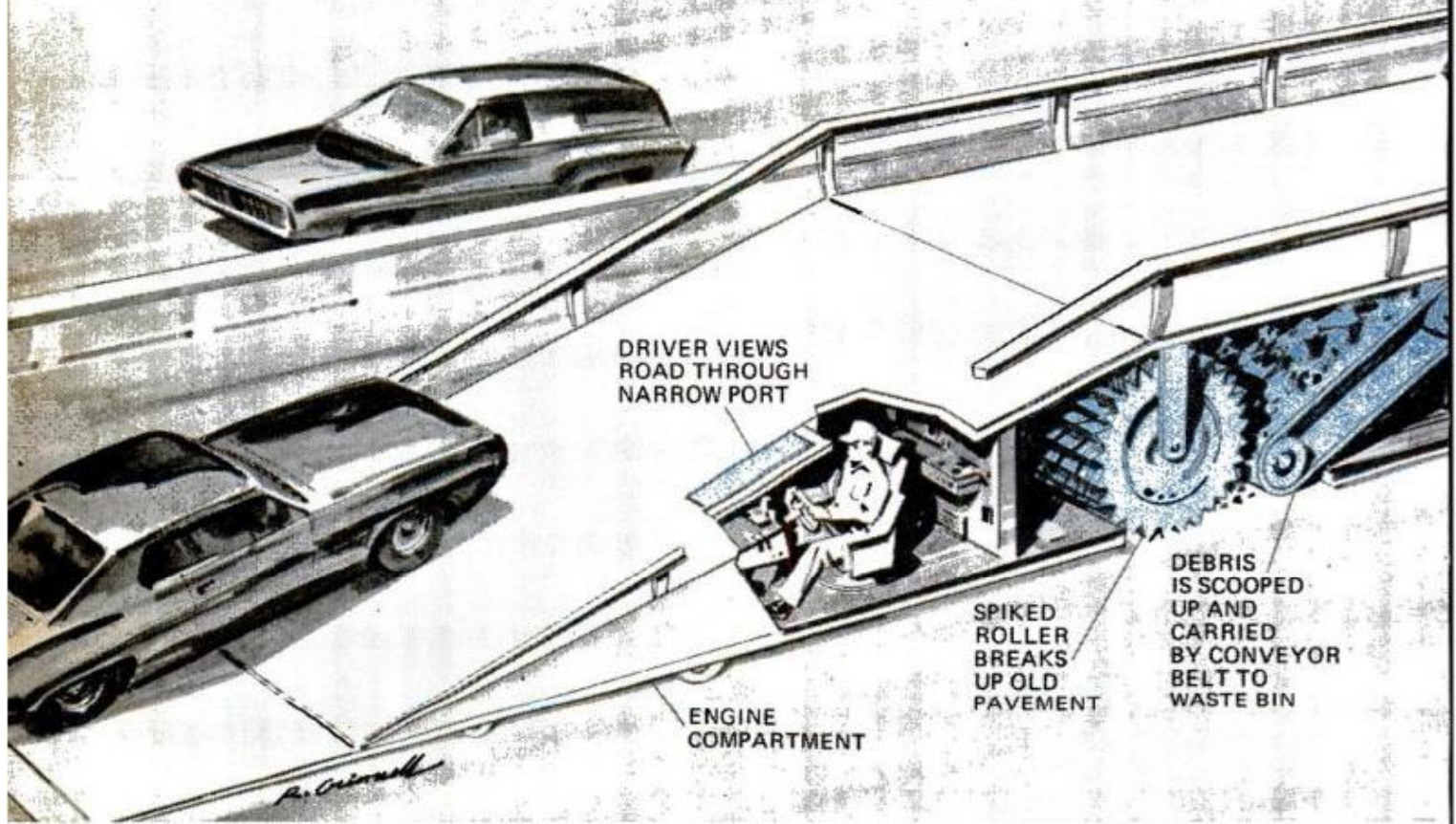
Yes77.0%
No23.0

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

RAKISH PROFILE and strong design of front end most impressed owners who bought Torino for looks alone

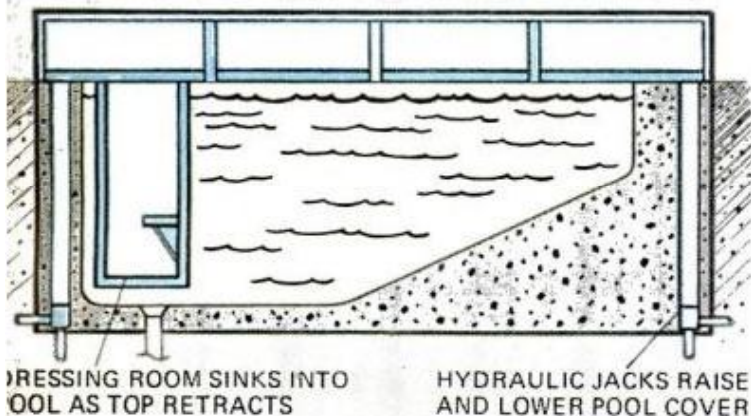


Rolling machine repairs

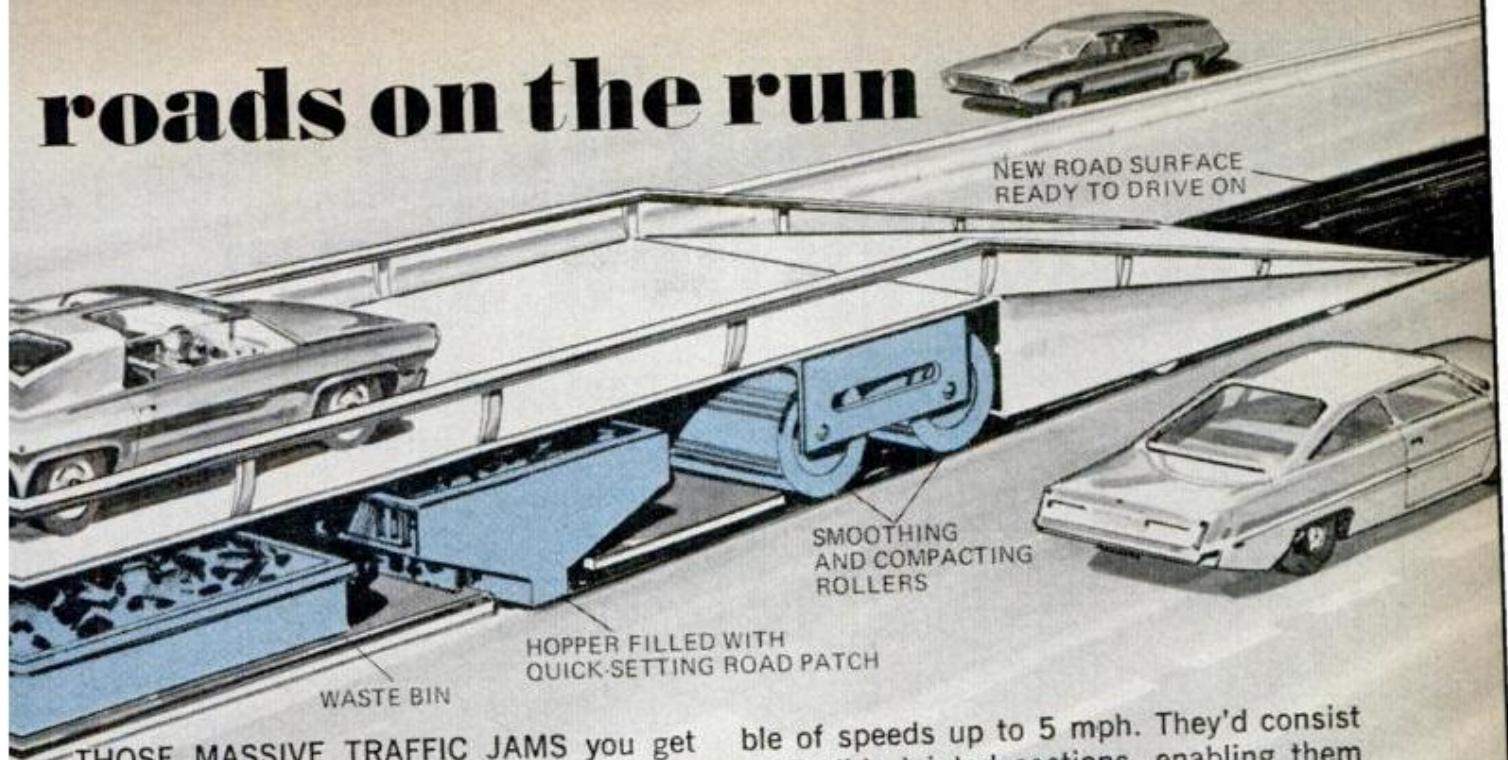


Pop-up pool cover

You don't have to worry about children and pets accidentally falling into your swimming pool with this hydraulically operated pop-up roof. Retracted, the roof safely seals the pool when not in use. It also provides shade on hot days, helps to keep debris out of the water and serves as a permanent winter cover. A built-in dressing room retracts into the water along with the roof. Inventors are Ro Mell Peterson and Le Roy Peterson of Salt Lake City, Utah.



roads on the run

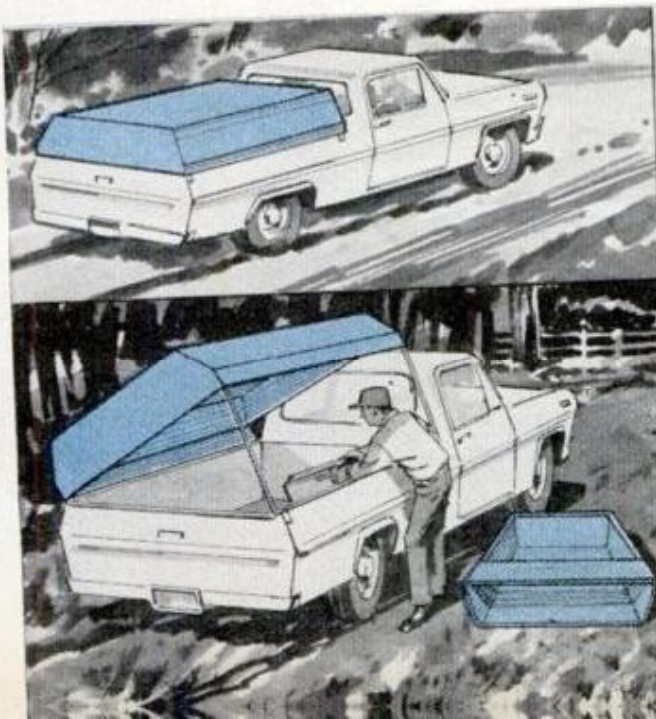


THOSE MASSIVE TRAFFIC JAMS you get into whenever road crews are at work may be a thing of the past if this ingenious plan is adopted. Conceived by students and instructors at the Illinois Institute of Technology in Chicago, it calls for mobile highway-maintenance machines with ramped roadways built over the top like a bridge. Instead of having to block off a busy lane while repairs are made, road crews would simply work inside as cars continue to roll along overhead. The snakelike, self-powered machines would be 190 feet long and capa-

ble of speeds up to 5 mph. They'd consist of flexibly jointed sections, enabling them to negotiate curves, guided by a driver peering out a narrow window slot in front. Inside, there would be equipment for breaking up and removing old worn pavement and replacing it with fresh surfacing material dispensed from hoppers. In addition to avoiding traffic tie-ups, the rolling giants would protect crewmen inside from the possibility of injuries from passing cars and provide for more comfortable working conditions in any kind of weather.

Pickup top turns into a handy rowboat

This clever enclosure for the bed of a pickup truck does double duty. While you're on the road, the hinged cover provides weatherproof cargo space for stowing camping, fishing and other supplies. At the campsite, it can be removed completely from the bed and fitted to a separate bow section, forming a watertight craft for rowing and fishing. The convertible top was invented by Ricks and Paul Strong of Dallas, Tex.



Air surfing: A nervy new sport

Human gliders soar off steep cliffs slung precariously beneath homemade bamboo kites in man's latest—and dizziest—attempt to fly like a bird

By PENNY NICOLAI / Photos by Mario Romo

FROM THE DIZZYING HEIGHTS of a coastal cliff along a California shore, sunbathers on the beach below look like tiny ants. A brisk breeze blows across the top of the sandy bluff as a young man straps on a strange contraption of poles and fabric, then suddenly leaps over the edge, soaring gracefully out toward the gleaming ocean far beyond.

Relaxed and nonchalant, these human gliders are a daring new breed of airmen fulfilling man's ancient dream to fly like a bird. Clinging precariously to huge kites called "hang gliders," they sail off steep hillsides, covering 300 to 800 feet in a single flight. They call themselves kite-men, sky surfers or, more preferably, self-soarers. They say it isn't really dangerous, and their calm courage makes you almost

believe it until you remember the sight of those tiny ants on the distant beach below—it's a long way down.

Men have sought the freedom of unpowered flight for centuries, but few have succeeded. Until the recent appearance of the California kitemen, the only form of free flight has been the conventional glider—simply an airplane without engines.

"But in a conventional glider it is impossible to experience the feeling of total freedom that is available with a hang glider," explains Dick Eipper, president of the Southern California Hang Glider Assn. "In a hang glider, there is nothing surrounding you—all you do is hang on. I can't explain it—you have to try it to see what I mean."

While air surfing got its start on the

SWINGING WILDLY, a sky surfer maneuvers his fragile kite high above antlike sunbathers on beach below





LAUNCHING HIMSELF FROM A CLIFF, California kiteman gets a helpful push from assistant above. Below, another surfer skirts mountain ridge, riding updraft. Both kites are Rogallo types. At right is a bi-winger reminiscent of Wright brothers' design



Air surfing *Continued*

blustery shores of California, it is by no means limited to that area. This exciting new sport is spreading fast, and hang glider clubs are popping up all over—wherever there are hills to jump off from and adventurous young men to try them.

A hang glider is a kitelike wing consisting of a lightweight frame of aluminum or bamboo poles covered with polyethylene plastic or dacron for a skin. It is pilot-carriable and pilot-launchable. If it requires any type of towing device, it is not a true hang glider. There are a number of different models, some relatively simple and others extremely complicated. Thus far, the most popular type is the Rogallo Wing, developed by Francis Rogallo of NASA for possible use as a means of carrying parachuting fighter pilots safely away from enemy territory. Also known as a delta wing because of its roughly triangular shape, the Rogallo design has rigid nose poles flaring out at an angle of between 80° and 90°. Wingspan varies from 12 to 25 feet. Weight ranges from 16 to 40 pounds.

Slung below the wing is a simple framework from which the pilot hangs. In some versions, this consists of a single crossbar resembling a circus trapeze. In others, there are two parallel rails that pass under the pilot's armpits. Some surfers simply hang on—literally. Others are supported in harnesses similar to those used in parachutes. A few have even rigged up a sling that serves as a sort of seat, something like a child's swing. In any case, the pilot's body does all the work. In most hang gliders, there are no controls. Moving the body forward or backward changes pitch of the wing, tilting it up or down to gain maximum lift. Swinging the body sideways controls lateral direction, banking the wing for turns.

The Rogallo Wing is popular because of its simplicity and stability. The Sail Wing is similar to the Rogallo, but flares out to a broader angle at the nose—all the way from 90° to as much as 180°. This design provides more lift, but makes pitch control more difficult. It also results in wider wingspans, ranging from 28 to 40 feet, and increases structural weight to as much as 70 pounds.

The Swing Wing, also known as a VJ-
(Please turn to page 102)

And a daring young man gets a smooth lift-off from a ski slope



By ED CHRISTOPHERSON / Photos by the author

WHILE CALIFORNIA KITEMEN soar off cliffs into the sunny, blue Pacific, a 20-year-old ski instructor is trying his own brand of air surfing in the chill mountain air at Snowbird, Utah — he sails off a ski slope. The first to attempt this daring feat, tall, lanky Jeff Jobe launches himself into the air from a steep downhill run, using conventional snow skis and a colorful red, white and blue delta-wing glider. Making as many as nine flights a day to thrill spectators at Snowbird's lavish new ski resort, Jobe has reached heights of 3000 feet or more and remains aloft eight minutes during the long glide from the precipitous mountain summit to the valley floor
(Please turn to page 172)



SAILING HIGH OFF A SKI SLOPE in the snow-covered Utah mountains, young kiteman Jeff Jobe has hit altitudes of more than 3000 feet in his daring flights. In row of photos at left, he begins downhill run at mountain's summit (top), lifts off as speed increases to 27 mph (center), then glides in for a gentle landing after eight-minute, 3000-foot sail. His delta-wing kite, made of aluminum poles and dacron, can be folded and rolled for easy carrying (facing page)



Air surfing

(Continued from page 100)

23, was invented by Volmer Jensen, a well known California aerodynamics engineer. This design comes closest to resembling a conventional glider, having a cantilevered wing with a separate tail assembly on the end of a boom. It sports a three-axis control stick that determines pitch, roll and yaw. One of the most sophisticated of the hang glider fleet, the VJ-23 has a wingspan of nearly 33 feet and weighs a hefty 90 pounds.

There's even a Bi-Wing hang glider built along the lines of the early Wright brothers' experiments. It has two wings, one directly over the other, and the pilot hangs from rails below the lower wing. Wingspan averages 30 feet and weight ranges from 50 to 100 pounds. The most common method of control is known as

"tip drag." This consists of a pair of air brakes, one on each wingtip, that can be used to slow one wing at a time for turning or both wings together to reduce overall speed. Some bi-wing gliders incorporate "wing warp" to increase stability. The tips of the wings are warped slightly downward at the leading edges so they still provide some lift even after the main portions of the wings reach a stalling attitude. This helps to prevent a sudden loss of lift as the craft starts to stall.

Sky surfing isn't necessarily limited to jumping off steep cliffs—although this is the quickest way to become airborne. Safer, if less dramatic, takeoffs are possible by running down a slope into a slight headwind until the glider begins to lift off by itself. It takes a wind of 5 to 12 mph to become airborne and an average airspeed of 20 mph to remain aloft. How long a sky surfer can stay in



POISED FOR TAKEOFF, kiteman above begins run down slope that will lift him into air. Below are two harness arrangements. At left, pilot hangs vertically in parachute-like straps; at right, rider sits in a sling

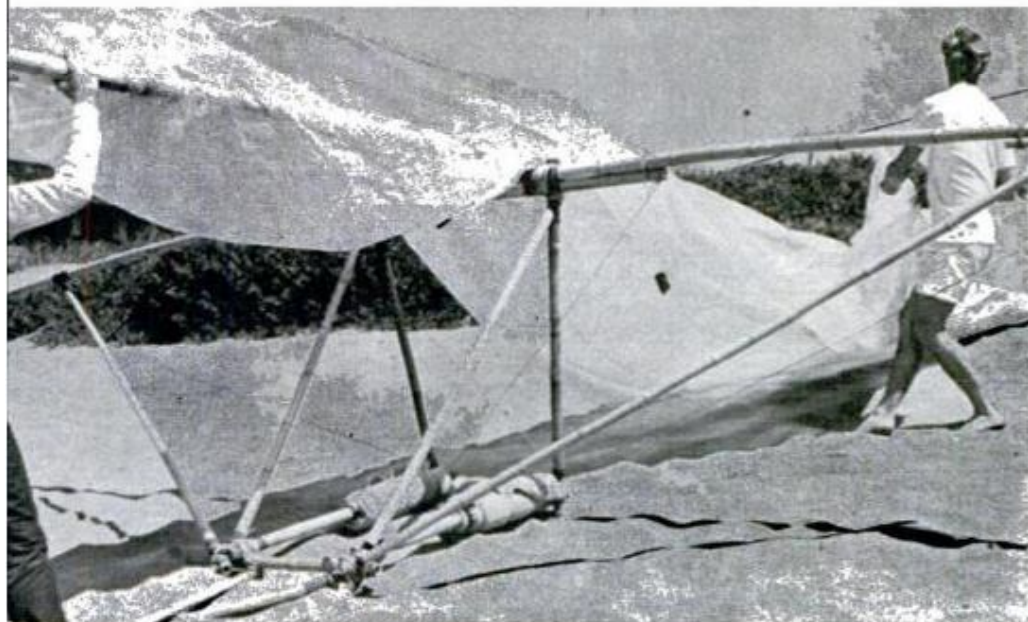


the air depends on wind strength and skill. The record is one hour and four minutes, a flight of six miles. Typical flights range from 30 to 60 seconds, with pilots reaching altitudes of 60 feet or more.

For safety's sake, kitemen have a pet saying: "Never fly higher than you're willing to fall." Many disregard this warning, however, and soar to heights that would mean instant death if a pilot were forced to let go or his kite went into a sudden spin or stall. Landing is relatively simple and safe. As the flight nears its end, the technique is to pull down the nose to pick up extra airspeed. This increased speed assures good stability and control during the final approach and avoids the danger of premature stalling. As the glider nears the ground, the pilot levels off to reduce speed, then pulls the nose up into a stall for a gentle touchdown.

Constructing a hang glider is inexpensive, especially for the simpler shapes, and plans are readily available. For those interested in obtaining more information about the sport, there is the Self Soar Assn. located at 59 Dudley Ave., Venice, Calif. 90291. This organization offers free membership to anyone wishing to get into the sport and also has a news publication, available at a nominal subscription rate, that keeps hang-glider enthusiasts up to date on the latest developments in kite designs, construction methods and flying techniques.

At present, no license is required to fly a hang glider, and the Self Soar Assn. is working with the FAA to have foot-launched free flight established as a special recreational sport not using commercial air lanes and not subject to government aviation regulations. ★★★



BAMBOO POLES, tied with thongs, form framework for many simple hang gliders. Covering is thin polyethylene plastic, often patched with tape when tears occur. At right below, kitemen work on bi-wing model, one of sport's more unusual designs. At upper right is Rogallo wing with stiffening ribs






Now squirt jobs have finally learned to steer and back up, accelerate enough for skiers and still skim over thin dew



FIRST CAME new small-craft water-jet power from down-under New Zealand 15 years ago. The unit was supposed to do everything except blow bubble gum for the boatman. Then a reverse was added to the second-generation models, plus a funny rake to reach under your boat and claw some of the seaweed out of the water intakes. Owners learned you couldn't climb waterfalls or shortcut across dry land just because you had no propeller underneath.

Now it looks like a market for this sea-

NEW JX-245 OMC JET DRIVE has the punch to push the Thunderbird Formula up to nearly 50 mph
 104 **POPULAR MECHANICS**



Third generation water jet— new from OMC

By **BILL McKEOWN**
Boating Editor



PHOTOS BY TRAM PICKETT

going firehouse fixture has settled down and opened up. Skippers tired of replacing banged-up propellers and running with tilted-up lower units when the going gets thin should like the latest models. If you've got stumps and snags, reefs and rapids, rocks, sand bars, mud flats and oyster beds around just under the surface, or you don't like the danger of chopping nearby swimmers, skiers and divers with a prop blade, the jets could be for you.

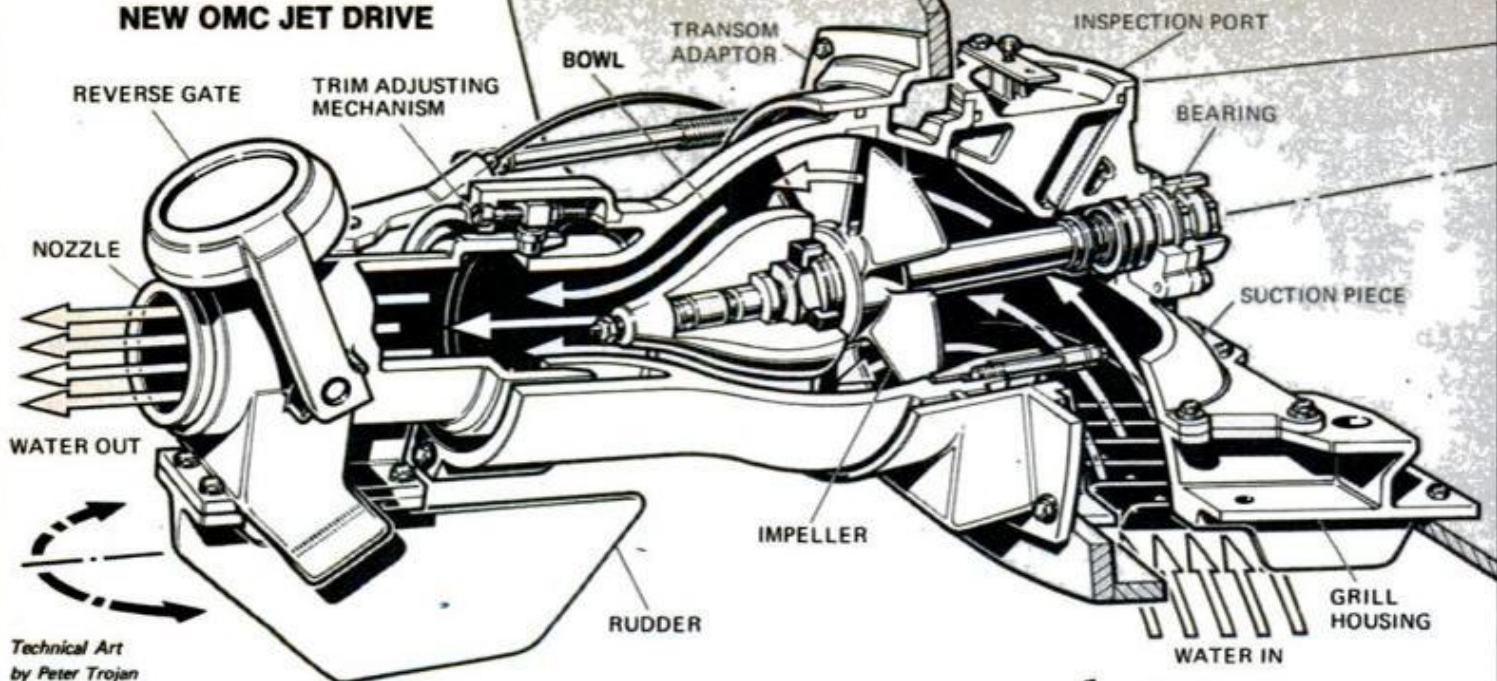
Working with Jacuzzi pumps, Outboard Marine Corp., producer of OMC stern drives and inboards, is adding this new squirt job to its extensive line. Our pre-view tests indicate this third-generation

WATER IMPELLER SYSTEM uses a 245-hp 307-cu.-in. V8 engine with a hot Corvette cam-to-power pump

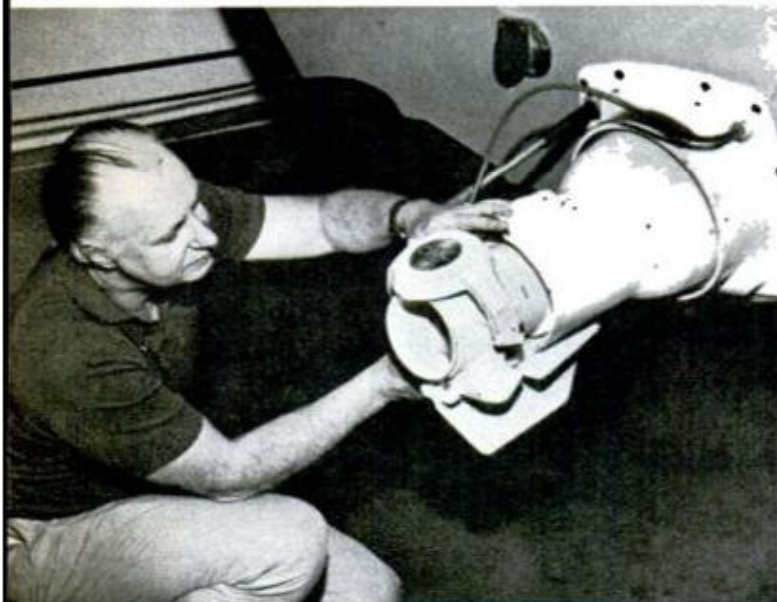
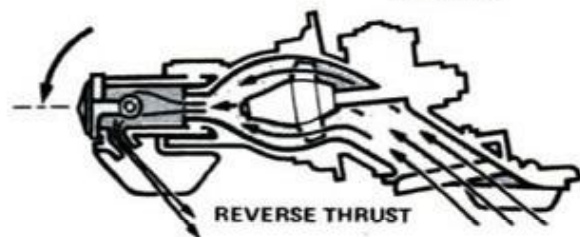
development is going to correct the powerplant's remaining major problems.

Jet rigs used to be terrible to drive. I remember skidding around Lake Michigan near Chicago's Navy Pier while I tried to control some unheard-of make a few years ago. Turn the wheel and the craft would slide sideways without changing direction. Slow down and you had no control at all. I decided that it felt somewhat like a defective dodge-em car, skating around on big swivel casters but with the steering wheel missing. "It takes a little

NEW OMC JET DRIVE



Technical Art
by Peter Trojan



REVERSE THRUST GATE that swings down for backing up, plus the rudder fin, simplifies maneuvering

getting used to," the manufacturer told me.

Or the matter of running over sandbars. "Everyone wants a demonstration ride with a grind across a reef," well-known Lauderdale Marina operator Bob Cox complained about an early model. "The engine holds up but no boat bottom this side of a battleship could take that abuse. It's a novelty nobody buys."

But times may have changed. Instead of the old underpowered, inefficient hose jobs I watched falling off plane as we bombed by them in the steep seas of the open Gulf Stream during a Miami-Nassau race years ago, the new OMC hooks up OMC's pump to a plenty husky 245-hp 307-cu.-in. V8 marine conversion that mounts a hot Corvette cam to help

crank out the torque. The result is a package with mid-range torque on the way up to as much as 50 miles an hour, the kind of thrust that can get a loaded boat up on plane or a gang of water skiers up and sliding from a deep-water start. It's frankly rated about 25 percent less efficient than a conventional prop job at some speeds, but its thin-water capabilities more than make up for this.

It handles well but differently, I found.

When maneuvering around a dock, healthy blasts of throttle swung the stern in and out neatly in both forward and reverse. The fin rudder sticking below the nozzle must deserve much credit for steering improvement. Bombing along at full throttle across shoals, plenty of muscle was necessary to crank in tight turns, but that will probably be corrected in future models. Adjustable trim allows balancing out the boat for level ride, and the 19-foot Thunderbird Formula I wrung out with *Motor Boating Magazine's* Ray Marunas riding shotgun showed the same seakindly deep-V performance I remembered from its racing prototypes. Chrysler, Mercury and Waukesha have also announced water jets. Berkeley, Hamilton and Jacuzzi, among others, are already producing. It looks like these jet jobs are back to stay. ★★★

New for boating

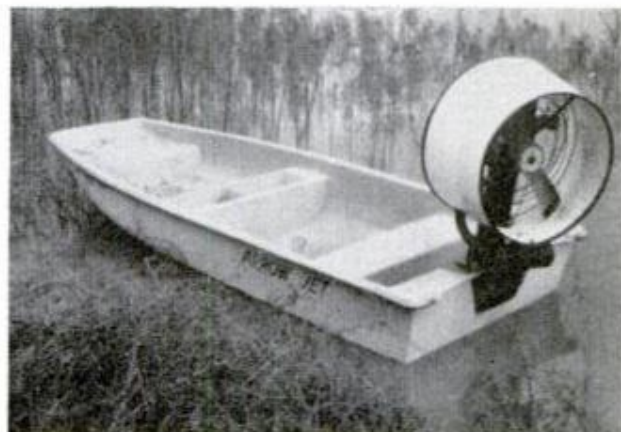


HYDROPHILIC, the chemists describe it. New Hydron Speed Coat paint from Hydron Marine Labs, 375 Park Ave., New York, N.Y. 10022, acts as an antifouling wetting agent for faster power-sail performance.

BEATING WITH WATER is Glastron test for hull strength and durability of new Ferro and Reichhold Chemical gel-coat. Most fading, chalking and blistering are reported overcome, even though Galveston Bay gives Glastrons impacts up to 25 Gs.



IF INFORMALITY will save lives, the Coast Guard is willing to try it, too, and offers this booklet through Auxiliary and district offices for boatmen having no basic classes available. Cartoons and bright instructions remind skipper how to handle his craft safely.

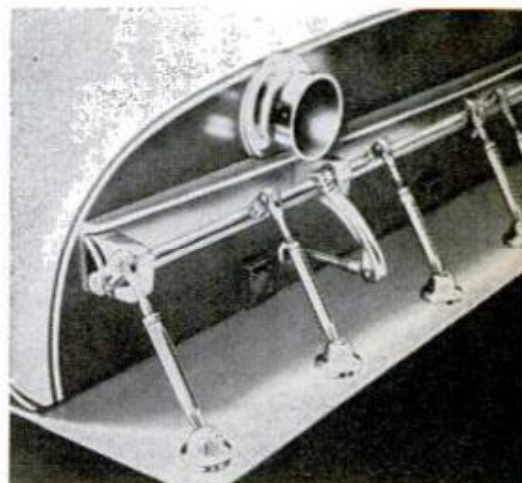


HEAVY DEW is reported deep enough to float an airboat; to power it, new \$449 Arrow Drive 1400 from Arrowcraft, Pearland, Tex. 77581, is 14-hp stern-drive outboard airdrive. Said to be okay to clamp on aluminum, fiberglass and inflatable craft up to 16 feet.



BATTERY-CHARGE INDICATOR is among special features of Sears electric fishing outboard motor. Variable speeds, night light and a reverse toggle switch are included in this new \$115 trolling model.

CAVITATION PLATES for deep-V hulls are offered with stainless ball-joint turnbuckles from Nicson Marine Equipment, 11850 Burke St., Santa Fe Springs, Calif. 90670. Firm's \$2 catalog describes its speed equipment conversions.



New 'flat-top' movie projector: A neat trick with mirrors

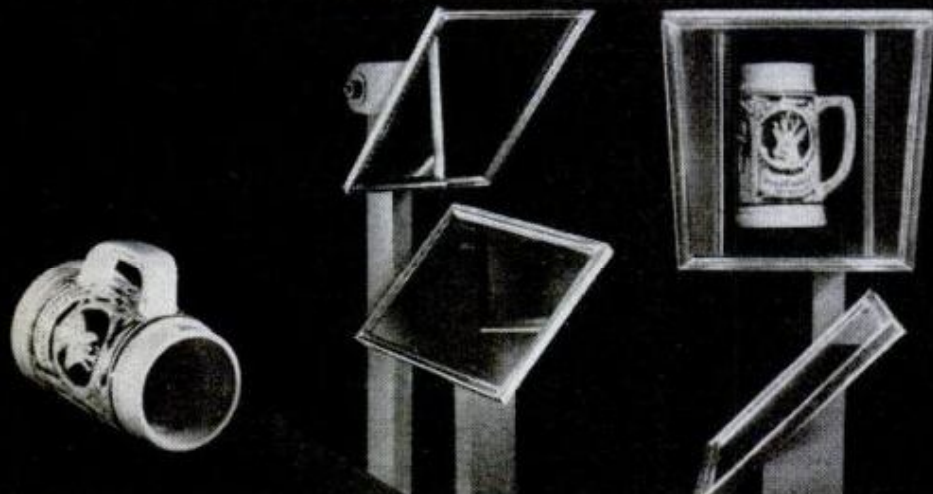


You load the film in sideways, but the pictures come out upright in this ingenious Kodak system.

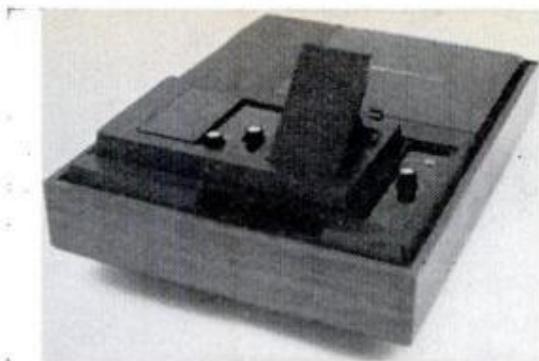
By **SHELDON M. GALLAGER**

Technical photos by Robert D. Borst

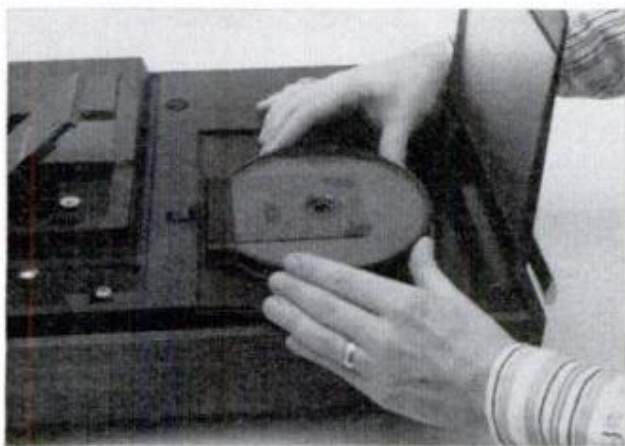
YOU HAVE TO SEE IT to believe it. When you first slip a reel of film sideways into this flat movie projector, you wonder how the pictures are ever going to come out right side up. The secret is a clever system of mirrors that turns the horizontal image on the film into a vertical image on the screen. How this works is shown in the photos and drawing at the bottom of this and the facing page. You can have some



TO PROVE A POINT, the homemade mirror setup shown here duplicates same optical system used in Kodak's new horizontal-style Supermatic 60 projector. Note that beer mug photographed on its side in picture at far left actually appears upright when viewed through mirror arrangement at near left. The combination of two angled mirrors at right angles to each other produces a vertical image on the screen from the horizontal image on the film. How this system works is shown in diagram on facing page



POP-UP SCREEN, shown in photo on facing page, makes it possible to view movies right in the projector itself without setting up a separate screen. With the screen folded flat (above), the machine functions as a conventional projector. Flip-up mirror throws image onto the screen, then retracts when not in use. Photo below shows how the cartridge is slipped in sideways, dropping onto a spindle that automatically feeds film through the projector, then rewinds it back into the cartridge

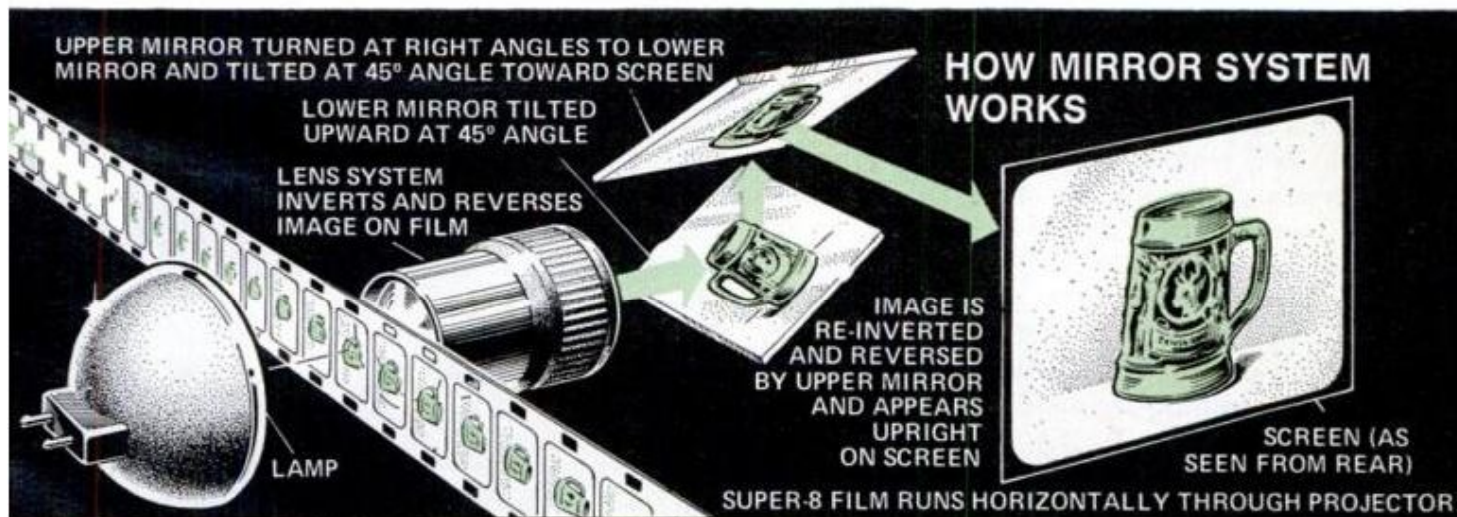


fun trying out the system yourself with a couple of small hand mirrors. Hold both mirrors at a 45° angle, one above the other, with the upper mirror turned at right angles to the lower one. Aim the lower mirror at some object lying on its side on a shelf or table and look into the upper mirror. The object will magically

appear upright—just as the film image does on the screen.

Called the Supermatic 60, the new Kodak projector takes standard Super-8 movie film in handy instant-loading cartridges and also provides sound from a self-contained amplifier and speaker system. The smart-looking shallow-style shape is designed to store easily on a shelf and eliminate the height and bulkiness of conventional upright projectors. For quick previewing of films, a small built-in screen flips up so you can see your movies instantly without bothering to get out a separate screen. For group viewing, the small screen folds out of the way, and the image is projected onto a large screen in the usual way. The upper mirror is also pivoted and swings up when the projector is in use. For storage, it folds down flat, sealing out dust and dirt.

The projector takes the same self-threading, drop-in plastic cartridges that are used in Kodak's regular cartridge-loading upright models. The cartridges are available in 50, 100, 220 and 400-foot sizes. For showing sound movies, the film is first magnetically striped along one edge to provide a sound track, then inserted into a cartridge. You just drop the cartridge flat into the top of the projector and from there on the entire operation is automatic. The film feeds through the projector, then rewinds itself back into the cartridge. Controls provide stop motion, reverse and a choice of two projection speeds—18 and 24 frames per second. The sound system has a power output of five watts and, in addition to the built-in speaker, provides connections for external speakers or headphones. First of its kind, the novel projector is priced at \$460. ★★★



Your car goes with you on this train

You watch the towns go by from the comfort of a reclining chair. Your car is on board, too, ready for use at your destination, 37 miles from Disney World

By E.D. FALES Jr.

THEY SAY YOU can't have your cake and eat it too. But I'm not so sure about that—not after my recent experience aboard the Auto-Train.

This is a new service that saves you the wear and tear of long-distance driving but lets you take your car along for touring at the end of the train ride. So far, the service operates only between Lorton, Va., near Washington, D.C., and Sanford, Fla., which is located about one-third the way down that elongated state and is an excellent jumping-off spot for vacation tour-

UNLIKE MUCH of today's rolling stock, Auto-Train cars are clean. They are washed before every trip



AUTO-TRAIN STEWARDESSES handle various jobs. This one checks in boarding passengers in Virginia



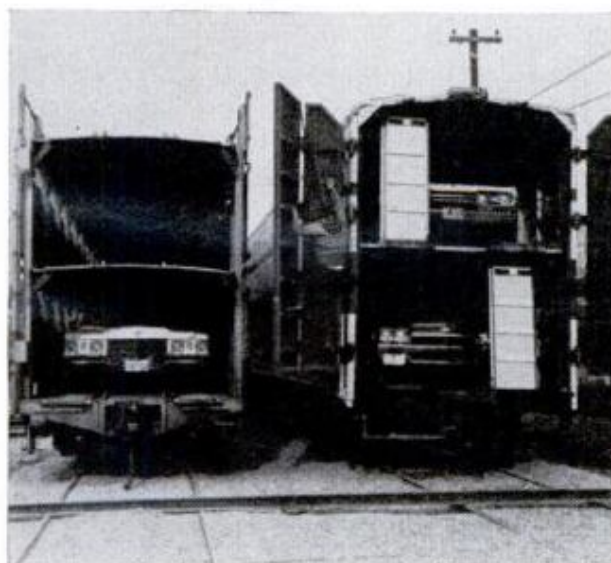
POPULAR MECHANICS



AT TERMINAL, attendants drive cars up ramp for loading. Here author's wagon heads for lower deck



A SNUG FIT. There are only inches of clearance above station wagon's roof as it enters auto carrier. Luggage can be left in car during the trip



HIGH-TOP CARRIERS from Canadian National can carry eight autos each. Standing better than 16 feet high, they're the biggest cars on rails today

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ing. Sanford is about a 30-minute drive from the new Walt Disney World and 40 minutes from Daytona Beach.

If the operation proves a success, there is the possibility that the service will be started in other sections of the country. One route reportedly under consideration: Ohio to Florida.

Auto-Train service was only a few weeks old when my wife and I tried it out last winter. We pulled into Lorton in a station wagon loaded down with luggage, fishing gear and a 4-hp Johnson outboard. We left practically all of the stuff in the car, taking only a small overnight bag with us into the passenger section of the train.

Attendants drove the autos aboard double-deckers of the type that Canadian National uses to haul new cars. The autos were parked in gear and with brakes on. For added stability, each car's right wheels rode in a steel channel and were blocked, front and rear, by heavy steel chocks.

Gasoline was not drained from tanks. Since the cars ride perfectly level, there is no danger of fuel leakage.

On our train there were eight auto carriers, each containing eight autos. These carriers are monsters—16.5 feet high. Their size reportedly accounts for the fact that Auto-Train service was not extended to New York. The double-deckers are too big for many of the tunnels between Washington and New York.

The rest of the train was made up of three domed lounge cars, several sleepers, a diner and a crew car. The muscle needed to pull all this heavy equipment was supplied by a two-unit, 7200-hp engine fresh out of the Erie, Pa., shops of American Locomotive.

We pulled out of Lorton at 8 p.m., right on schedule. Before settling down for the night in a sleeper, where we had reserved a room, my wife and I toured the passenger cars.

There were about 300 passengers aboard. (Maximum capacity is 400 passengers and 100 cars.) Many of them would make the entire trip in the lounge cars, which have specially designed reclining chairs that are said to be comfortable for sleeping. That's the standard mode of travel; sleeper berths cost extra.

If a passenger is more in the mood for diversion than an early snooze, he has a



DOMED LOUNGE CARS do double duty. At night, many passengers use reclining chairs for sleeping



UNLOADING OPERATION in Florida moves smoothly. A car is rolled off ramp about every three minutes

choice of ways of pleasantly killing time. He can sit in a cocktail lounge and catch a bit of live entertainment. Or he can see a movie or watch TV. There's a supervised playroom for youngsters, and after breakfast they can watch cartoon shows.

The fare includes dinner and breakfast. My wife and I agreed that the food was superior to the airline variety and far better than most highway restaurant meals we'd had on other trips from Connecticut, where we live, to Florida.

Service was good. The Auto-Train staff—especially the 10 pretty stewardesses—was young, enthusiastic and helpful. The

five-man operating crew, I learned, was from the Richmond, Fredericksburg & Potomac Railroad. During the night they would be replaced by other crews from the Seaboard Coast Line.

The trip was smooth and restful, and ended a few minutes ahead of schedule. We arrived at Sanford at 10:45 a.m. The 900-mile run from Lorton to Sanford had taken 15 hours.

Minutes after the train's arrival at the terminal, unloading began. One after the other, cars were driven down ramps and delivered to passengers. I noted that it was exactly 10:53 when our wagon was delivered to us. The speedy service was attributable to the fact that our car was one of the first on. Cars are unloaded in the same order as they are taken aboard.

That night the train would return north. There is daily service in both directions.

As I got behind the wheel, I savored the thought that we had saved at least two solid days of driving. Had we spent the night in a motel near Washington, as we have in the past, we would have been somewhere south of Washington at this moment—with the better part of 900 miles to cover to reach Sanford.

And I don't think you save any money by driving all the way—not if you figure the wear on your car and what you have to pay for gas, tolls, motels and meals.

On Auto-Train, one-way fare for a car and four passengers is \$190. Additional riders can come along for \$15 apiece. Meals, lounge chairs, movies and other entertainment are all part of the package. Sleeping compartments cost an additional \$40 per couple.

These prices compare very favorably with competing rates. The usual train fare for the 900 miles to Sanford is \$37 per person, \$148 for four. Day coach air fare comes to \$66 per person, \$264 for four. And in both cases, the family car would still be in the garage at home.

You need reservations. You can get them by mail or by a free call to this number: 800-424-8520.

It's wise to show up early. If departure is scheduled for 8:00 p.m., be in the Lorton terminal by 7 at the latest. On our trip I heard about two cars that got hung up in traffic and missed the train.

That's a heck of a way to start a vacation—especially if you've been dreaming about hooking a few tarpon or snook. ★★

A cartridge player you can build from a kit

By SHELDON M. GALLAGER

IF YOU'VE BEEN LOOKING for an inexpensive way to play cartridge tapes, here's a kit-built eight-track deck that's both a breeze to assemble and a real bargain in good listening. The trim-looking Heathkit player is designed around the famous Motorola transport mechanism, which comes as a preassembled unit. This not only saves construction time, but gives you a ready-made tape drive of proven performance.

The kit is so simple that you can put it together in an evening. There's only one small circuit board to wire and a few chassis connections to make. The walnut-finish cabinet comes preassembled with the front panel and a nicely molded-in tape-loading slot installed. All you do is slide the finished chassis in from the back and lock it in place with four screws through rubber feet. The kit even includes a trial cartridge of popular hits so you can start listening right away if you don't have any tapes of your own.

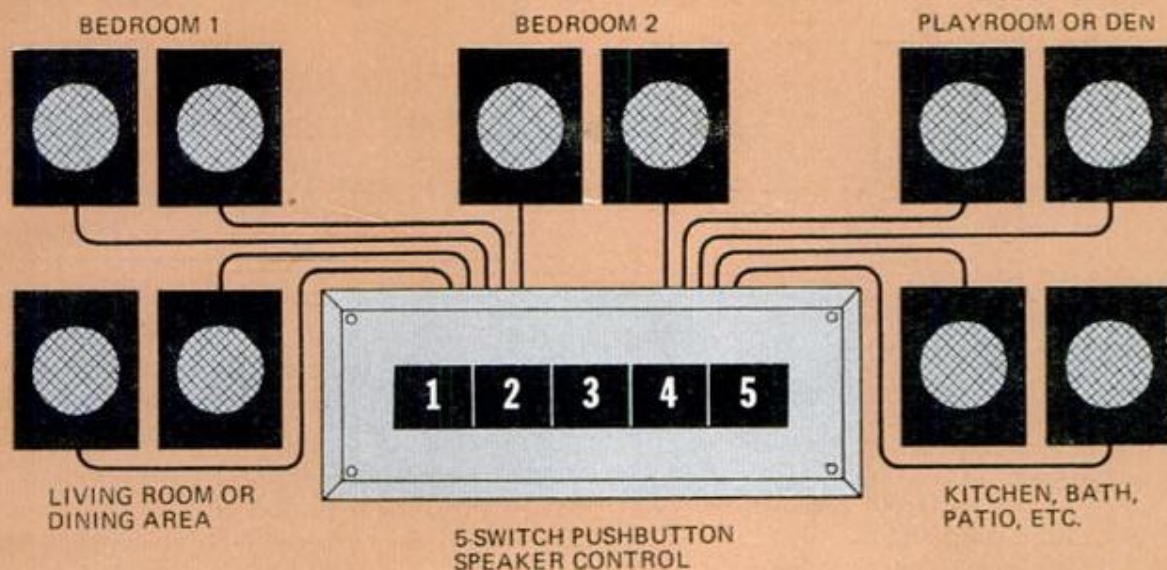
Priced at \$59.95, the Model GD-28 deck has a built-in preamplifier and can be played through any stereo amplifier or receiver. A track-selector switch lets you choose any of four programs, and numbered pilot lamps light up to indicate the program playing. Cost is kept down by omitting an automatic-eject feature—you remove the cartridge manually to shut off the deck. Heath Co., Benton Harbor, Mich. 49022. ★★★

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BASIC PARTS OF KIT are shown in the upper photo above. On the left side is the Motorola tape-transport unit, completely assembled and ready for installation. Also note the prefinished cabinet, which simplifies construction. The lower photo shows the slide-in chassis that slips into the cabinet to complete the job. Connections to the amplifier are made by cables that have been provided to plug into the rear of the chassis

UP TO 5 STEREO PAIRS AT THE TOUCH OF A BUTTON



for your stereo speakers

First of its kind, this handy pushbutton selector lets you turn on up to five pairs of speakers in any combination without harming your hi-fi system

By **SHELDON M. GALLAGER**/Photos by Robert D. Borst

EVER SINCE hi-fi sets went solid-state, speaker switching has been a problem. If you turn on too many speakers at one time, you burn out delicate transistors in the amplifier or blow their protective fuses. Now a trim little pushbutton selector lets you switch on up to *five pairs* of stereo speakers in any combination, anywhere in the house, without endangering your amplifier.

The control's secret lies in built-in protective circuitry that automatically compensates for the changing load as different speakers are switched on and off. When speakers are wired in parallel, their combined resistance drops as more and more are turned on. If the total impedance load falls below about 4 ohms, excessive power flows through the amplifier's transistors and can damage them. In the new control, the speakers are wired in parallel, but also wired in series with a 3-ohm resistor added to provide just enough extra impedance so the

load never falls below the danger point.

How this works is shown in the diagram on the facing page. With one speaker on, the load starts out at 9.02 ohms—slightly above the normal 8 ohms, but not enough to cause a mismatch. As additional speakers are switched on, the load falls gradually to 6.14 ohms, 5.08 ohms, 4.54 ohms and finally, with all five playing, to 4.212 ohms—still well within the safe load limit. In addition, there's a 50-ohm resistor across the input terminals. Its resistance is so high that no current flows through it so long as one or more speakers are in operation. If all speakers are turned off, this resistor serves as a "dummy" load, again protecting your amplifier from harm.

The Audiotex control is made by GC Electronics, 400 South Wyman St., Rockford, Ill. 61101. It comes installed in a small walnut-finished cabinet for \$39.95 or without the enclosure for do-it-yourself mounting for \$29.95. ★★

Handy fold-up tool toter

By **SHELDON M. GALLAGER**

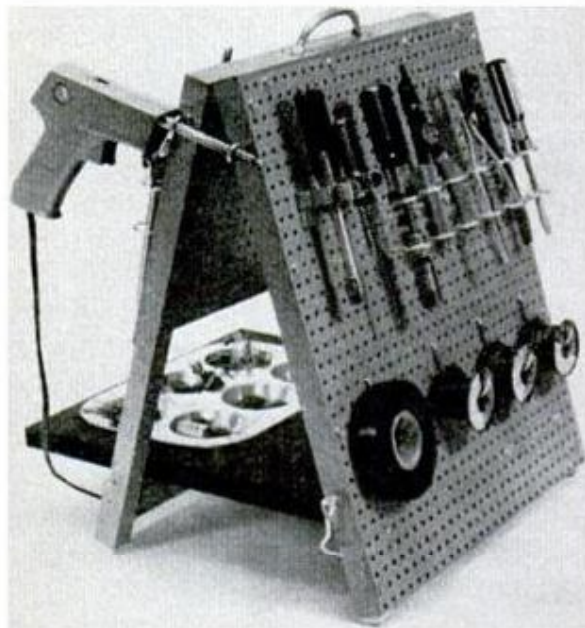
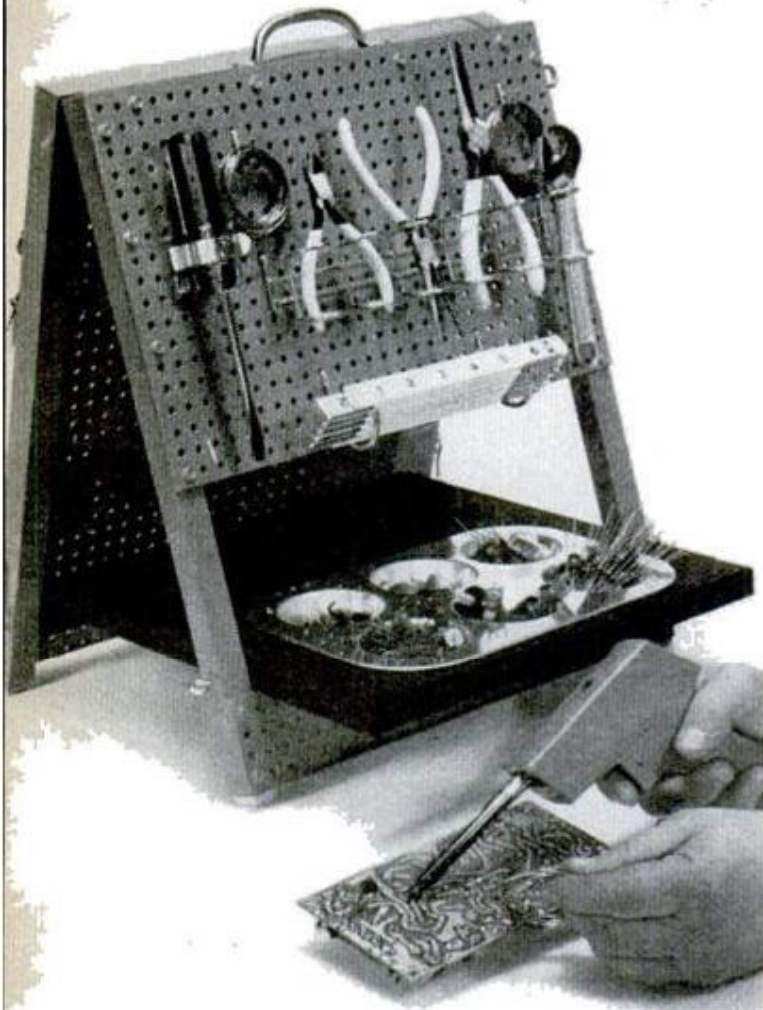
Photos by Robert D. Borst

IF YOU ENJOY kit-building and model-making but don't have a permanent place for such activities, here's a portable work center you can set up and put away quickly as needed. The tool-and-parts caddy can be placed on a desk, dining table or other surface for temporary use, then folded up for easy storage in a closet. Small parts are kept neatly sorted in lift-out muffin tins that can be switched to suit whatever project you're working on. One tin might hold parts for a hi-fi kit, another those for a model plane or car.

The toter consists of two hinged panels that open out to form a sturdy A-frame stand. The panels are made of perforated hardboard (Pegboard) screwed to $\frac{3}{4}$ -inch-square framing strips. Using standard Pegboard fixtures, you can arrange the panels to hold any assortment of tools you like. Put the most frequently used items on the front where they're readily accessible. The back panel can store special tools and extra supplies.

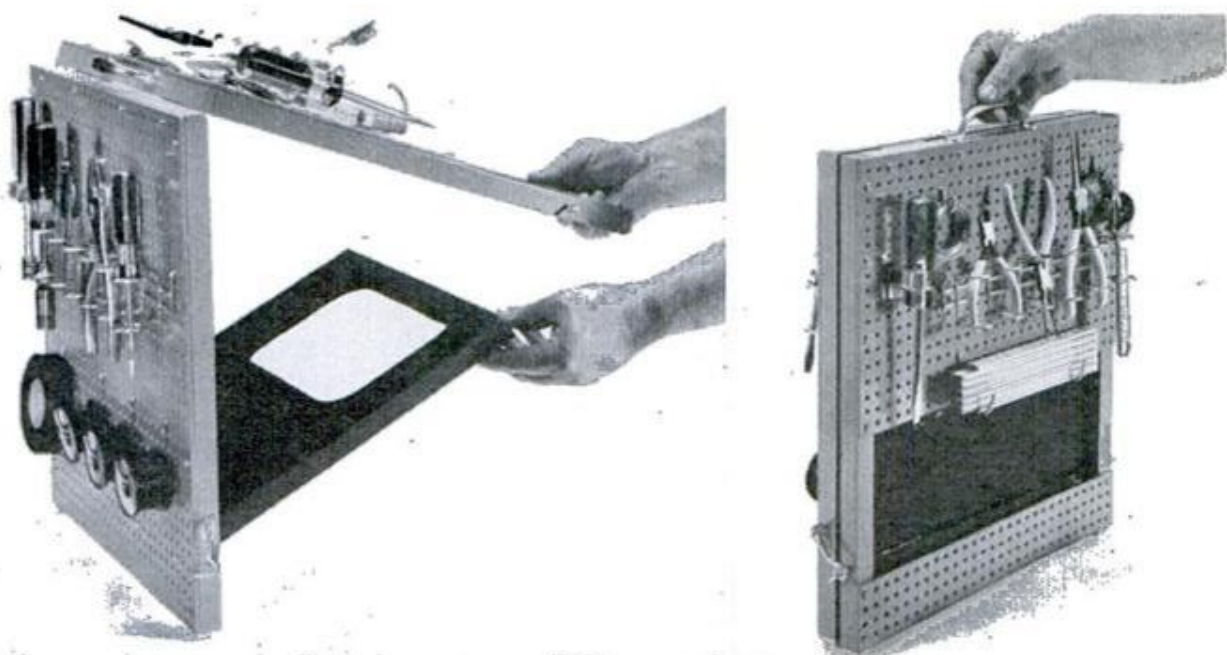
You can, of course, make the carrier any size you wish. The dimensions shown here are based on a six-compartment muffin tin that typically measures about 7 by 10 inches. The tin is held in a plywood shelf that protrudes through an opening in the front panel and is hinged to a cleat screwed to the back panel. To collapse the carrier, you simply remove the parts tray, swing the shelf up between the two panels, then fold the panels flat together. Rubber stick-on feet keep the panels from slipping when opened, and screen-door hooks hold them together when closed.

Note that the cleat supporting the rear edge of the hinged shelf is 1 inch wide, projecting slightly beyond the $\frac{3}{4}$ -inch thickness of the back-panel framing. This provides necessary clearance for the shelf to swing up between the panels without striking the fixture hooks that stick through on the inside of the back panel. It also allows space for two or three empty muffin tins to be left stacked in the shelf in the closed position. ★★★

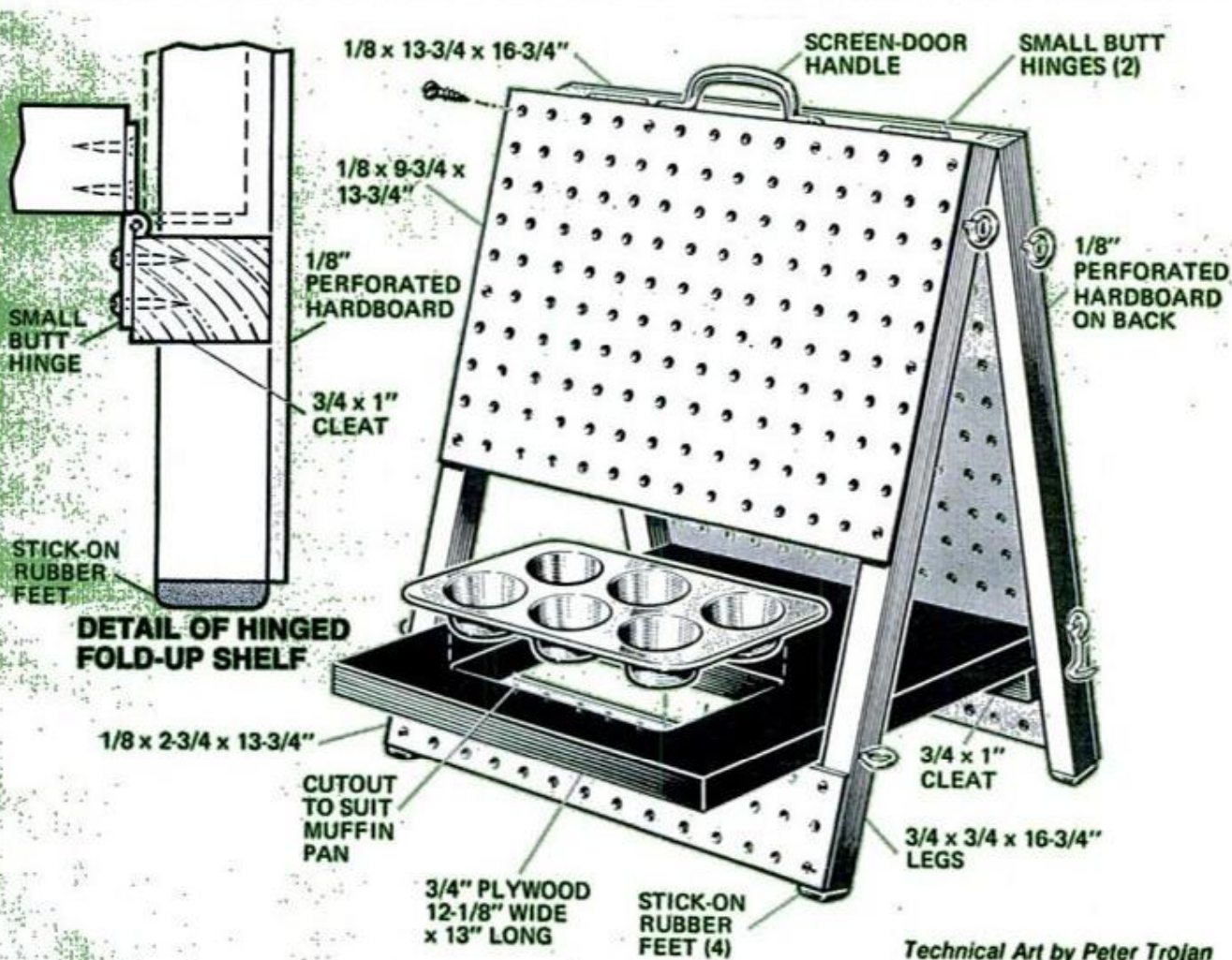


SIMPLE HOLDER for a hot soldering gun or pencil iron can be made from two screw eyes, one in each panel edge. Locate eyes so they hold tool at slight downward-tipped angle to keep it from sliding out

for hobby projects



COLLAPSING THE CADDY FOR STORAGE is simple. You just slip parts shelf out of opening in front panel (left, above) and swing it upward between framing strips in rear panel. Two panels then fold flat together and hook (right). Rule held in U-shaped hooks across front is handy for measuring wire lengths in electronic kit-building—you can hold the wire up to it without even removing the rule from the board



Pop, crackle and crunch: Handy new compactors put the squeeze on trash

By SHELDON M. GALLAGER

MODERN KITCHENS are making strange new noises these days. They start out as a soft whirring of gears and drive belts, then suddenly there's a curiously satisfying series of crackles and crunches as a one-ton ram crushes a pail-size load of trash and garbage into a neatly flattened pancake. These odd but not unpleasant sounds come from that clever new contraption—the trash compactor. The latest in labor-saving kitchen appliances, these mechanical garbage-eaters are catching on fast because of the clean, efficient way they put the whammy on the messy home problem of handling waste.

In case you're inclined to think a trash compactor is merely a housewife convenience, you have to live with one for a while to appreciate its usefulness for the whole family. For the man of the house, it eliminates the annoying daily trips out to the garbage pail and the horsing around of heavy trash cans. It encourages quick kitchen cleanup and puts an end to unsightly piles of trash in open containers. You simply slide out a drawer-like collector bin, toss in the refuse, then close the drawer and press a button. Down comes a powerful motor-driven ram, compressing the contents, then retracting automatically, ready for the next load. The whole cycle takes only about a minute.

The inside of the collector bin is lined with a tough, removable paper bag to keep the bin itself clean. In average use, it takes several days' worth of trash to fill the bag. During the compacting, the

trash is reduced in size to about one-fourth its original volume. In actual tests by *PM* editors, it was found that one bagful of compressed waste equals the contents of two large conventional-type garbage cans, as illustrated in the photo below and on the facing page. This means that, for the average-size family, you need to change bags only about twice a week. Some families go a whole week on a single bag.

What can you put in a compactor? Virtually anything—cans, bottles, bones, corncobs, cardboard cartons, even wet garbage with a few exceptions. Not recommended are food wastes that spoil quickly and produce strong odors, such as fish



POPULAR MECHANICS



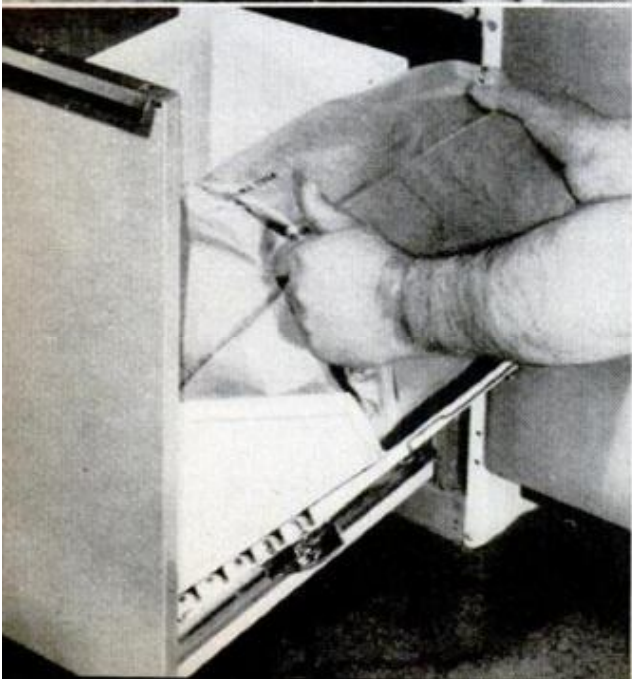
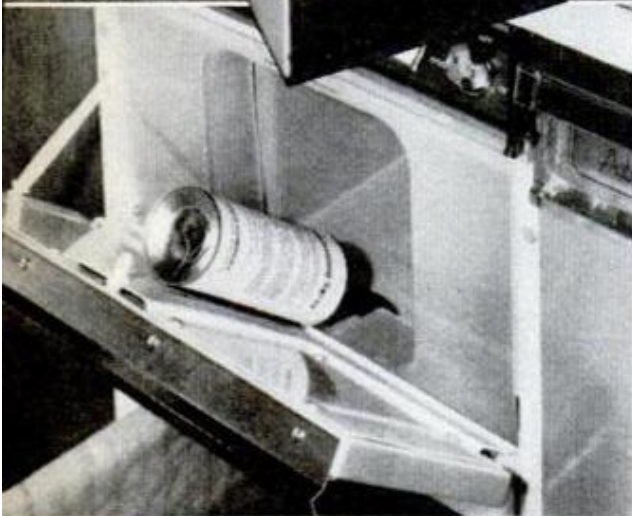
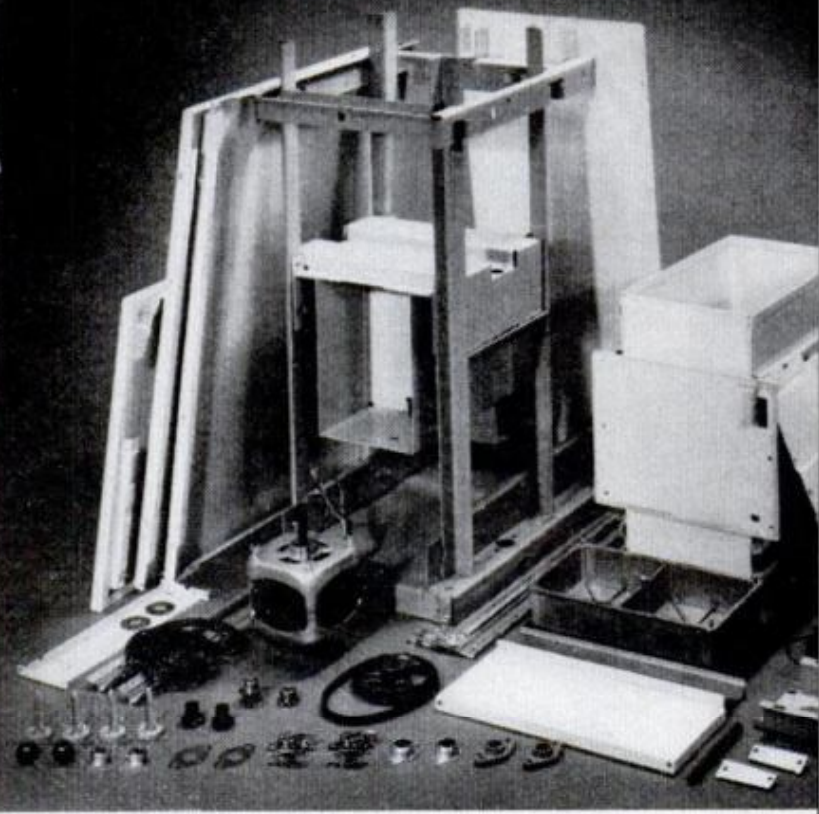
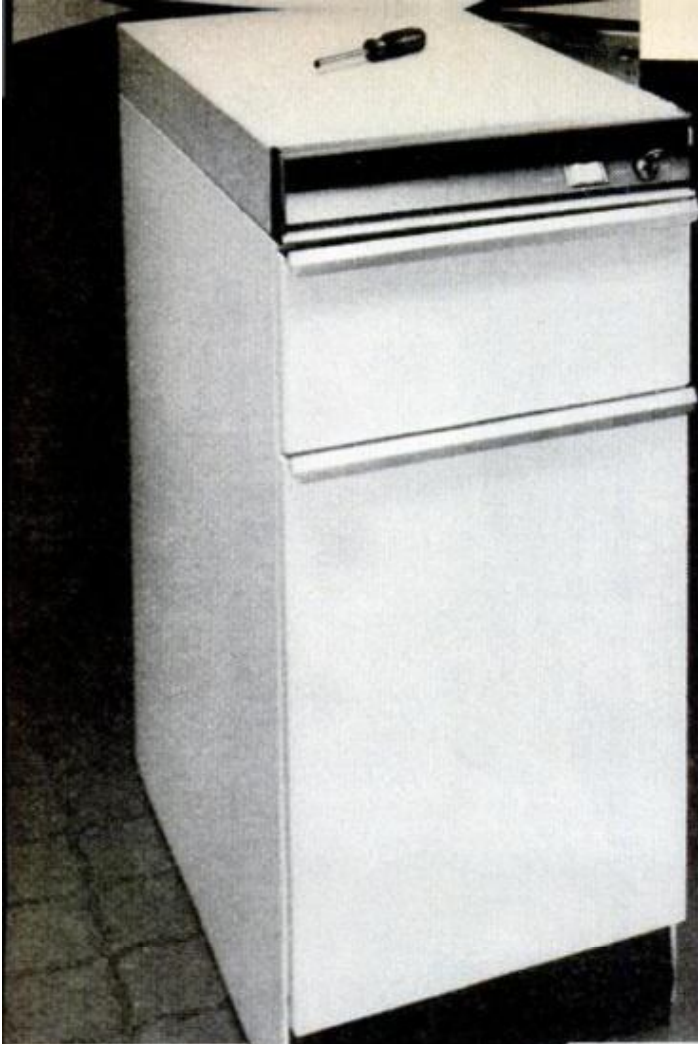
ONE SMALL BAGFUL of compacted waste contains the equivalent of two large trash cans, as shown above and on the facing page. At top left is Sears' Kenmore compactor priced at \$219.95. Lower photo on opposite page shows how bag of compressed waste is easily removed from compactor's slide-out drawer when filled. Self-sealing flaps fold over to close bag and at the same time provide convenient hand grips. At right above is GE model installed under a standard counter. Inset photo above shows how the same unit can be used freestanding with chopping-block top to give extra work space. Interchangeable front panels offer a choice of four colors to match other appliances. Price is about \$240

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and citrus-fruit rinds. Also to be avoided are empty aerosol cans that might pop with explosive force when crushed. Otherwise, anything that would normally go into a trash can or garbage pail can go into a compactor.

Made by a variety of manufacturers, trash compactors range in price from under \$200 to about \$260. The Sears Kenmore model sells for \$219.95. GE has a similar unit for about \$240. There's even

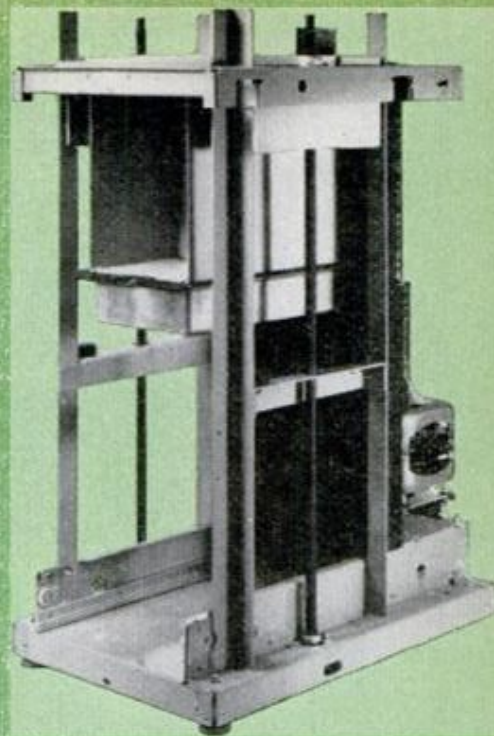
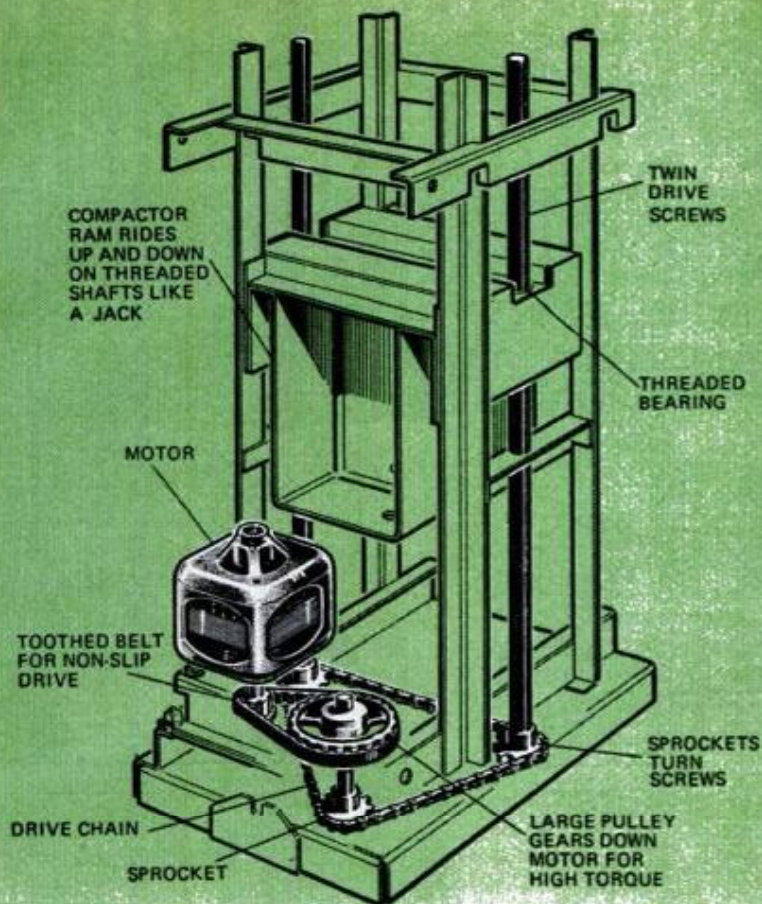
You can even assemble
one yourself from a kit



KIT-BUILT COMPACTOR, made by Heath, can be purchased for under \$200 and assembled in a weekend or two. Basic frame, shown in layout of parts, comes prewelded to assure absolute rigidity and smooth ram operation. Close-up at left shows aerosol spray can at top that automatically squirts deodorant into trash bin each time the ram is actuated. Side of the bin swings out on hinge for easy removal of filled bags

a compactor you can build from a kit. Made by Heath, it sells for \$199.95 and is a relatively easy construction job since it consists mainly of mechanical assembly.

Trash compactors are particularly useful in areas where sewer restrictions prevent the installation of sink-type garbage disposers. In fact, they'll take some things that can't be put down a sink disposer, such as bones, corncobs and other hard objects that might jam the mechanism. Tall and slim, compactors take up little kitchen space. About 15 inches wide, they can be slipped under an existing counter or used freestanding alongside a counter. They match standard counter depth of 24 inches and are about 34 inches high. Some makers offer an accessory wood chopping-block top so the unit can double as an extra work area. Most models come in a variety of colors to harmonize with existing kitchen appliances, including such currently popular finishes as coppertone brown, avocado green and harvest gold, as well as white. Some, like GE's, have an ingenious system of reversible, slip-in front panels with a different color on each

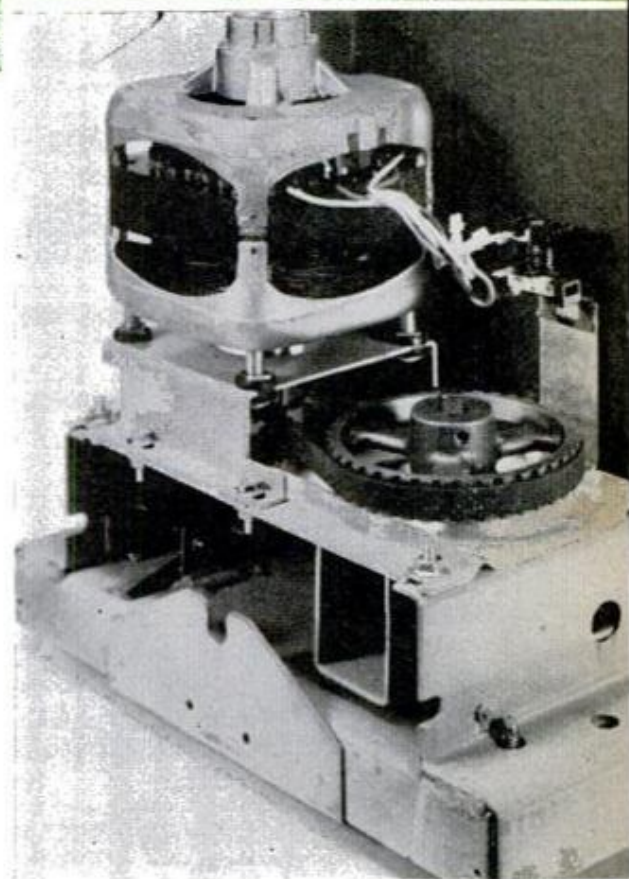


COMPACTOR RAM is shown in upper position in photo above. Threaded bearings guide ram on two jackscrews at the sides

side. You can change colors at will merely by sliding out a panel and turning it around.

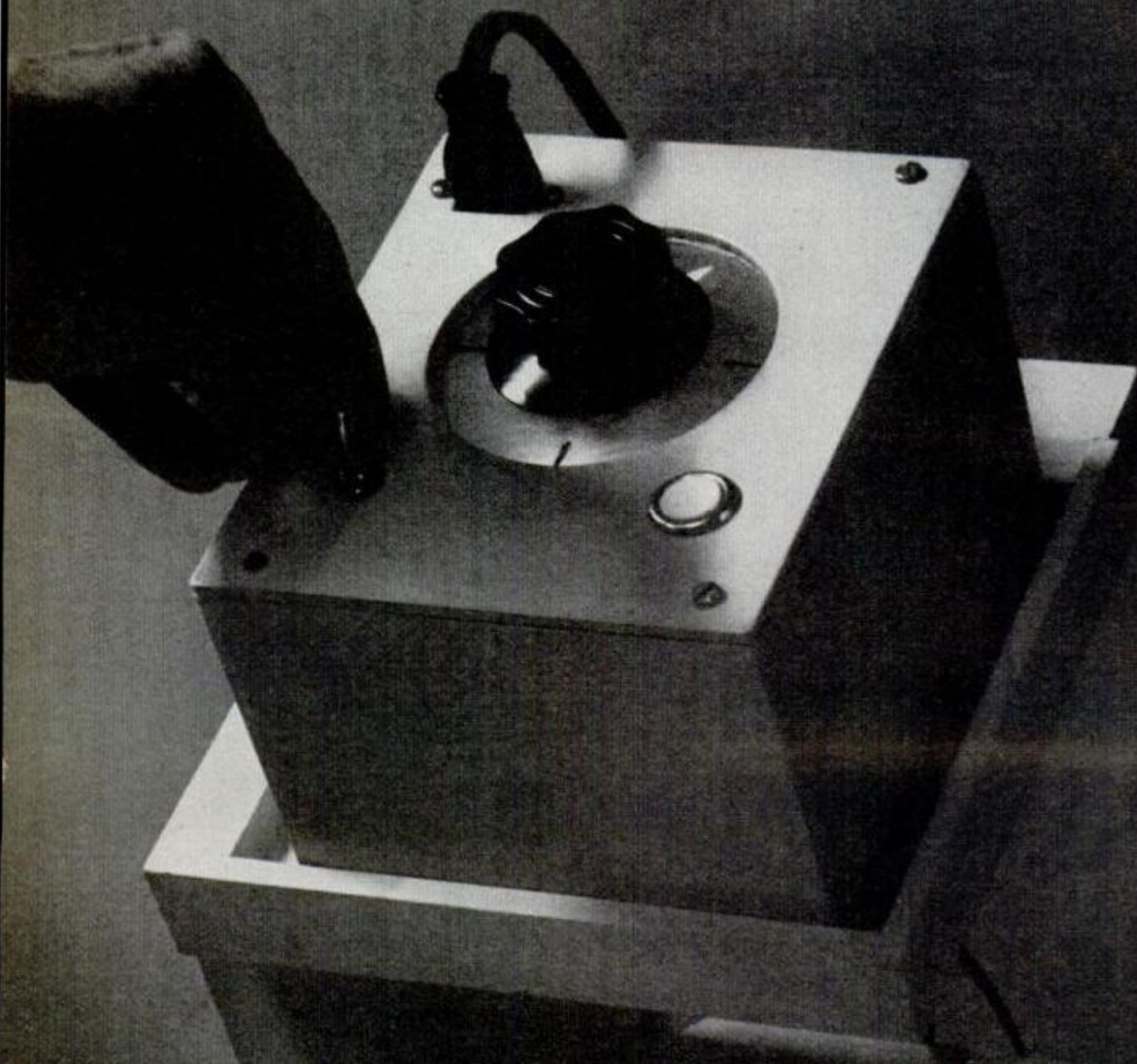
All compactors work basically in the same way. The compressing ram rides up and down on a pair of threaded rods rotating at high speed. The rods, electrically driven through a system of belts and chains, act like screw jacks, causing the ram to exert tremendous force on the downstroke—actually measured at 2000 pounds or a ton of pressure. As compacted waste builds up in the bin, pressure-activated limit switches sense the point at which further compression is not possible, and the ram automatically stops, reverses, then returns to the top and shuts off by itself. Thus each downstroke becomes a little shorter every time you throw in a new load of waste, until finally the ram stops altogether and you know the bag is full. You then slide out the filled bag and replace it with an empty one for the next series of loads. Interlocking flaps on the top of the bags fold over to provide a self-sealing closure that keeps odors in and makes the bags easy and clean to handle.

Built-in safety switches keep the ram from operating while the waste drawer is open and also prevent the drawer from being opened while the ram is moving. In addition, there's a key lock that deactivates the mechanism so children can't play with the machine when others aren't around. The compactors operate on ordinary 117-volt house current. ★★★



MOTOR AT REAR of Heathkit compactor drives ram screws through belt and chain arrangement shown in drawing at top of page. Ram rides up and down like an elevator inside angle-iron frame. Threaded jackscrews turn at high speed, providing 2000 pounds of pressure as ram descends to crush trash in bin at bottom

A darkroom timer you can see in the dark



An illuminated dial for easy dim-light readings is a feature of this electronic enlarger control you can build yourself

By R. S. HEDIN

TIMER CONTROL is held in a small, slanted wood bracket attached to rear edge of the enlarger base. This puts the control at a handy working height and angle for quick, easy setting of desired exposure intervals.

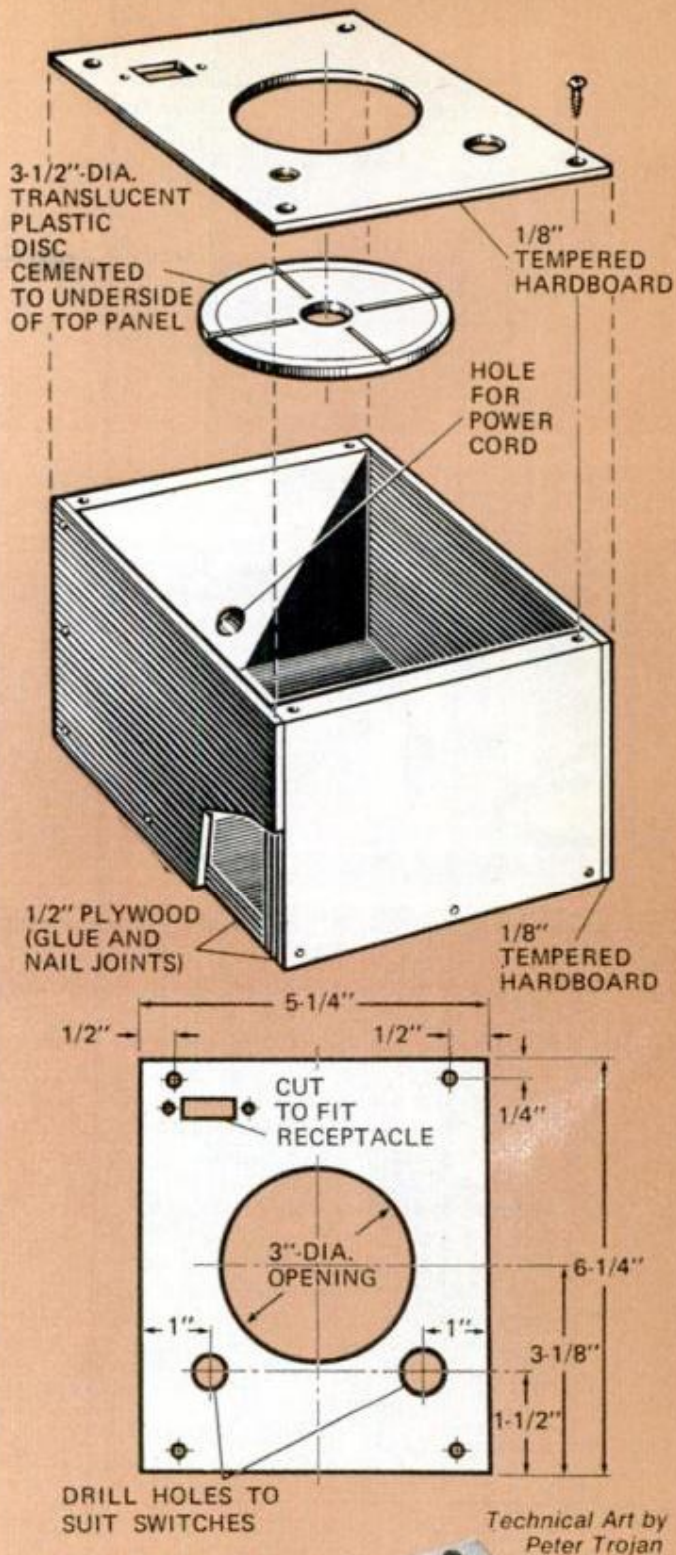
NOT EVEN EXPENSIVE commercial darkroom timers have the nifty feature that this homemade version has. A back-lighted dial lets you easily make exposure settings, even in total darkness. Exposure times are determined electronically by a simple transistorized circuit. To make a print, you just turn a knob to the desired setting and press a button. The enlarger goes on to start the exposure, then shuts off automatically at the end of the preset number of seconds.

The parts can be mounted in any small enclosure, such as the one shown here made of plywood and hardboard. The timing circuit is controlled by a potentiometer installed in the center of a plastic disc cemented on the underside of a circular cutout in the top panel. The plastic disc serves as the illuminated dial. It can be of translucent white material, or you can use clear and sand the underside to give it a frosted appearance. Illumination is provided by two tiny neon night lights of the type designed to plug into a wall outlet. These are available at hardware and electrical stores and are taped together back to back with their prongs wired in parallel. They give a soft glow with no problem of unwanted stray light.

Mounted in the top panel, along with the plastic dial and timer knob, are a receptacle for plugging in the enlarger, a pushbutton switch to start the timing cycle and a toggle switch that permits continuous operation of the enlarger for focusing. A main on-off switch is also attached to the potentiometer. Turning the potentiometer knob switches on the dial light and feeds power to the control circuit. Thereafter, the enlarger can be operated either by the pushbutton for timed use or by the toggle for nontimed use.

The timing circuit itself consists of one transistor, a diode rectifier, three capacitors and a resistor. These are all wired together on a small circuit board called the timing module in the diagram. This board can be mounted flat against one wall inside the enclosure so it takes up little space. The neon lights are centered on the bottom under the dial. Other parts needed are a transformer to provide low voltage for the timing module and a relay to turn on the enlarger during the timing cycle. The time the enlarger remains on is determined by where you set the potentiometer knob. You can calibrate the dial by

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NEW IN

ELECTRONICS



DELUXE TELEPHONE PICKUP is molded of soft plastic to fit the telephone earpiece like a glove. This minimizes extraneous noise pickup, and prevents accidental mounting in a "dead" pickup area. It won't slip off, as ordinary suction-cup pickups often do (and even



if it did, your ear would hold it in place). Tape the dangling cord out of the way, and you can leave it permanently in place—we could detect no change in tone when listening through it. Model 30-60002 is \$2.90. GC Electronics, 400 South Wyman St., Rockford, Ill. 61101.

DIGITAL DEPTH-SOUNDER KIT (below) can be read in direct sunlight, with brightness adjustable to prevent night blindness. It automatically reads depths from 20 to 200 feet in 1-foot increments, 2 to 19.9-foot depths in increments of $\frac{1}{10}$ foot. In shoal waters of 10 feet or less, a red warning lights. Assembly time is about eight hours. Available with through-hull or high-speed transom mount transducers, in weatherproof case with gimbal mount. Kit MI-101 is \$139.95 plus shipping from Heathkit, Benton Harbor, Mich. 49022.



SOLID-STATE HAM TRANSCEIVER (above) covers 80 through 10-meter bands, transmitting 250 watts PEP for single-side band, 180 watts for CW. Accepting 117/234 volts a.c. or 12 volts d.c., it's suitable for mobile or portable use; in "receive-only" mode, it uses a scant 8 watts. Integrated-circuit speech compressor raises average transmitted power level for extended coverage. Easy-to-service modular circuits have crystal calibrator and crystal lattice filter. Model FMP-300, \$595. Hallicrafters, 600 Hicks Rd., Rolling Meadows, Ill. 60008.



CLEANING BATTERY POSTS is quick and easy and most thorough with this inexpensive wire-brush tool

How to get all you pay for from your battery

Proper testing, care and maintenance will ensure you'll get the last ounce of life from your battery—you'll be sure it's really dead before you trade it for a fresh one

By MORT SCHULTZ

WHY CRANK YOUR ENGINE if you're parked on a hill and can roll down to start your car? I know someone who parks facing downhill and starts that way every morning. Conservation of energy can easily become a habit: It's as simple as flicking the light switch as you leave a room or automatically turning off your headlights when you restart a stalled engine.

Prolonging battery life is easy and is just a matter of developing good habits of testing and maintenance. Start by keeping the battery clean. A dirty one actually discharges itself; acid corrosion and dirt act as conductors. Corrosion accumula-

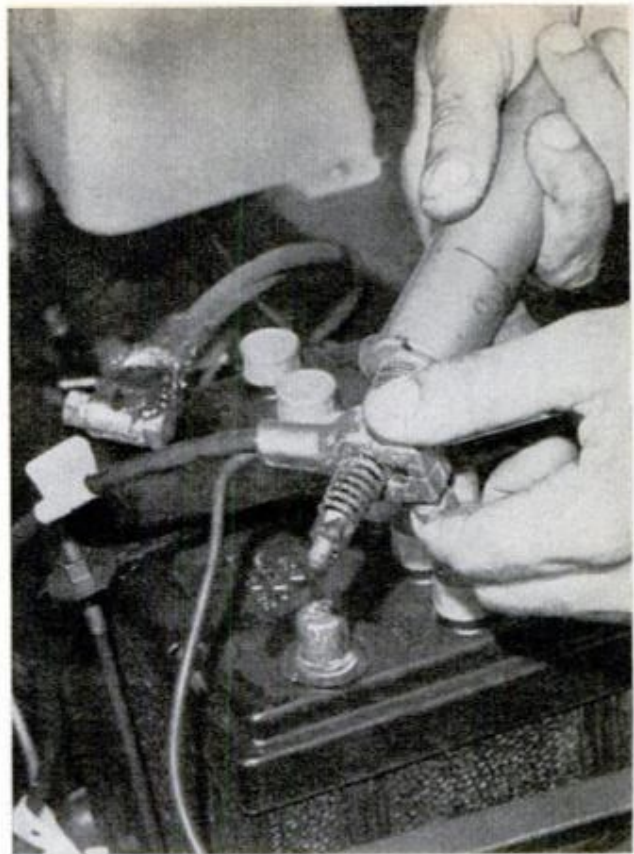
tion around battery posts also eats away copper cable terminals. That means more frequent replacement of cable terminals at best; if you don't catch corrosion in time, a cable will fall off the battery post.

Periodically remove your battery and scrub it down with a solution of baking soda and water or ammonia and water; then flush with clean water. Be sure that vent caps are tight so no solution gets into cells to neutralize the acid.

Also wash the battery carrier and hold-downs. Check that the carrier is solid enough to support the battery securely and keep it level. If it isn't, repair or replace it.



CABLE-TERMINAL PULLER applies leverage to lift up the terminal off of the battery post. It's a must



CLEANING BATTERY TERMINALS is quick, easy and thorough using other end of the wire-brush tool

Put the battery back on the carrier and run up hold-down bolts, but don't overtighten. Tight bolts will strain the battery. Check the battery case for cracks before putting it back. If it is cracked, repair or replace the battery.

A battery gives off hydrogen, which is explosive. Keep open flame away from the battery. Furthermore, guard against sparks by disconnecting the ground cable first when removing the battery from the car. When reconnecting cables, connect the ground cable *last*. And be careful not to let tools or other metal objects fall across the battery terminals.

The ground cable in most cars is attached to the *negative* post of the battery, but double check. There are still some positive-ground electrical systems in use. The ground cable is bolted to the engine or frame.

When removing battery terminals, always use a battery terminal puller. You can get one for between \$3.50 and \$5. It'll prevent damage to the battery and terminals that can be caused by prying off terminals with a screwdriver or pliers.

One thing that causes premature failure of batteries faster than anything else is lack of electrolyte. Plates exposed to air deteriorate rapidly. Check electrolyte lev-



TERMINAL LUBRICANT or petroleum jelly should be applied to connections to retard corrosion buildup

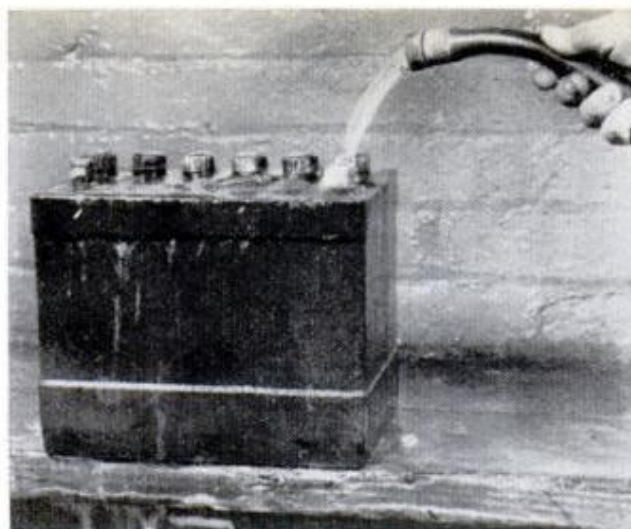
el frequently, especially in hot weather when evaporation is more likely.

Many car owners and some manufacturers advocate adding only distilled water to a battery. Others say that drinking water is okay, but it should be "colorless and odorless." Whichever advice you take is, of course, up to you, but keep in mind that battery life is extended by using the purest water available. However, any water is better than no water!

If you have to add water more often



BAKING SODA neutralizes acid on battery case. Be careful to avoid getting solution into the cells



RINSING BATTERY is last step in cleaning. Make sure it's dry before replacing in battery carrier

than once every 1000 miles or so, the battery may have a shorted cell or be overcharging. The battery tests described below will uncover a bad cell. Overcharging is usually caused by a voltage regulator that is set too high.

The color and odor of electrolyte will often reveal an overcharging condition. Sniff the fluid and draw some into an eyedropper or battery hydrometer. If the acid is discolored or smells like rotten eggs, the battery is overcharging.

Check battery charge with a hydrometer. It measures specific gravity, a measure of the percentage of sulphuric acid in the electrolyte. As a battery drops from charged to discharged condition, acid leaves the solution and enters the plates, which causes a decrease in the specific gravity.

Never take readings right after adding water. Water must be thoroughly mixed with electrolyte by charging the battery. Take electrolyte from each cell in turn and make a note of the specific gravity. Be sure to return the electrolyte to the cell from which it was taken.

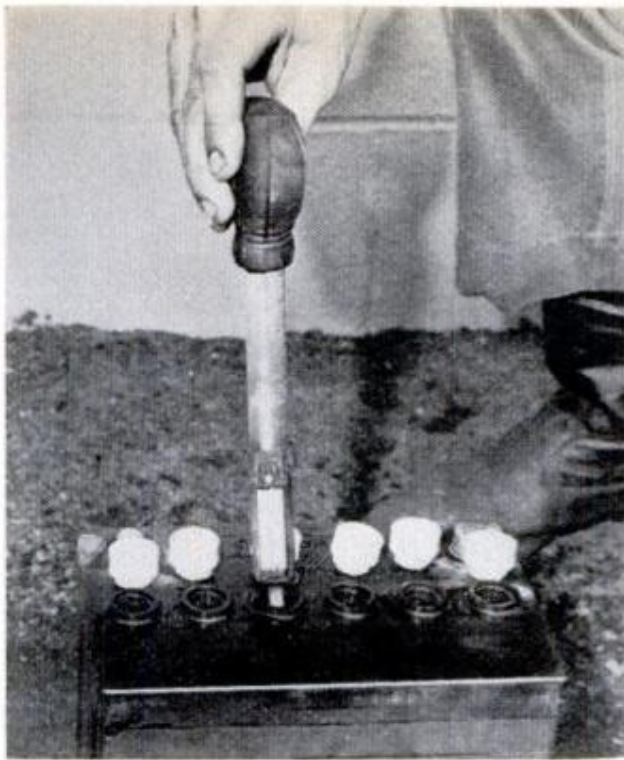
If your hydrometer doesn't have a built-in thermometer, and you want a very precise check of specific gravity, you need a separate thermometer, since specific gravity varies with the temperature of the electrolyte. A fully charged battery will have a specific gravity of 1.260 to 1.280 at 80°F. For every 10° that electrolyte temperature is above 80°, add four (.004) specific gravity points to the reading. For every 10° below 80°, subtract four (.004) specific gravity points.

Compare readings from each cell. If

one cell is .050 points or more lower than the other cells, its plates aren't holding a charge or it may be shorted. Just one shorted cell means the battery can't do its job and usually is discarded or traded in. Before spending money for a new battery, however, check your local classified pages under "Battery Repairing and Rebuilding"; it may be worthwhile to have a professional shop replace a shorted cell if the battery is otherwise in good shape. If the battery won't take a charge—specific gravity doesn't come up to 1.225 or about half charge—the plates are deteriorated and the battery is near failure and it will shortly have to be replaced—don't delay.

If the battery checks good by the specific gravity test, you should still make a battery capacity test, also referred to as a variable-load or high-rate-discharge test. This determines if the battery is capable of meeting the demand put on it by the starter motor. This demand is duplicated by a variable load tester, available in auto supply stores. The tester measures current and puts a load on the battery and voltage. To use one, connect it to your battery and adjust the load-control knob so that the ammeter reads the ampere-hour rating stamped on the battery case. If the rating isn't marked, it is safe to use a 60-ampere-hour rate for 12-volt batteries and a 100-ampere-hour rate for 6-volt batteries.

Read the voltmeter. If it is 9.6 volts or more for a 12-volt battery, or 4.8 volts or more for a 6-volt battery, the battery is in good shape. If voltage falls below these specs, recharge the battery and test



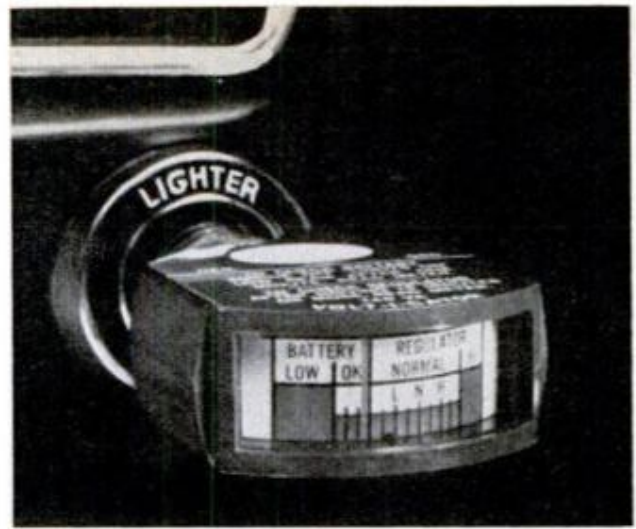
HYDROMETER measures specific gravity of electrolyte, the measure of the battery charge (see text)

it again. If it still fails to meet these requirements, the battery is weak. At any time you take a reading, don't maintain the load on the battery any longer than necessary.

There are "passenger compartment" test instruments that are convenient to use. They plug in your cigaret lighter socket. They can warn of an overcharging regulator as well as a low-battery condition. After 15 minutes of driving, an easy-to-read voltmeter indicates whether the regulator is allowing the battery to overcharge or not charge enough. One such tester is called the Volt-i-cator. It sells for \$12.95 from J.F. Ivan Co., 10918 Governor Ave., Cleveland, Ohio 44111.



TRICKLE CHARGER provides safe, slow recharge of battery, and it's the least expensive type available



VOLT-I-CATOR INSTRUMENT measures voltage at the cigaret-lighter socket to check battery, regulator

Voltage-regulator condition can also be checked by connecting a voltmeter across the battery. Set throttle on the high step of the carburetor fast-idle cam so that the alternator is providing a maximum charge and turn off all accessories. The voltmeter should read between 13 and 14.5 volts (steady), assuming a 12-volt charging system. If the voltmeter needle fluctuates, clean the wire connections at the battery, alternator and regulator, and make sure they are tight. If the voltage is too high, the regulator has to be adjusted or replaced.

If your car has a nontransistorized voltage regulator, you can try to adjust it by removing the cover and decreasing tension on the adjusting screw that controls the voltage control.

A transistorized voltage regulator cannot be adjusted. Some are built into the alternator, which means that the alternator has to be disassembled to remove the regulator. Others are externally mounted, such as on the firewall.

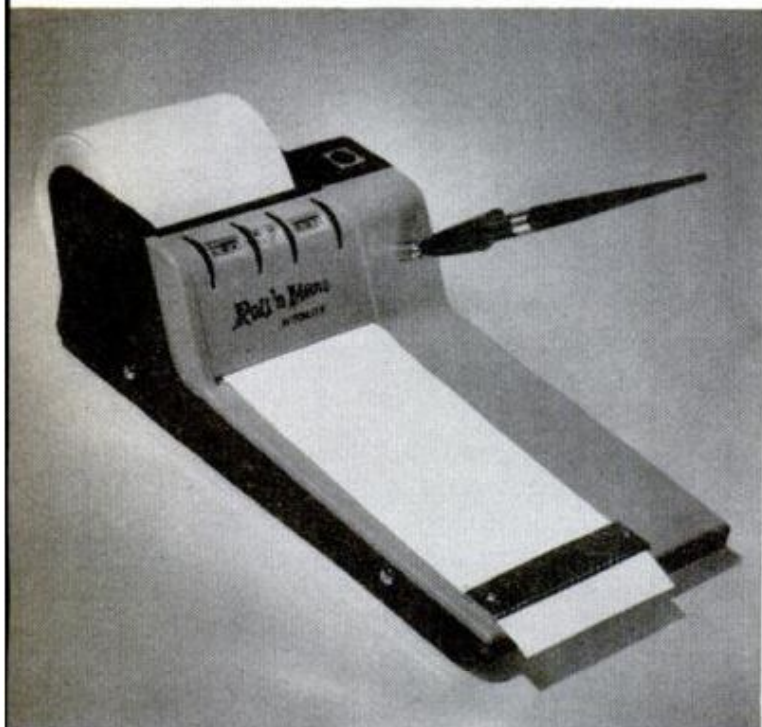
Finally, watch for conditions that will quickly run down your battery:

- Accidentally leaving on accessories or the headlights.
- A hung-up stoplight switch that causes lights to glow continually.
- A short that is draining the battery.
- Slow-speed driving of short duration that doesn't give the alternator (a.c. generator) a chance to recharge the battery.
- Bad battery cables.
- A slipping alternator drive belt.
- A malfunction in the alternator or voltage regulator.

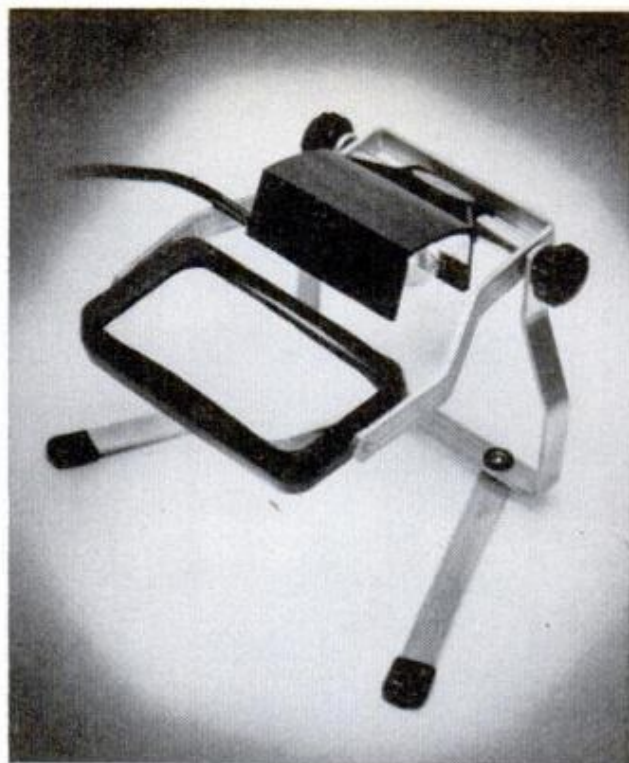
★★★

EXCITING NEW PRODUCTS

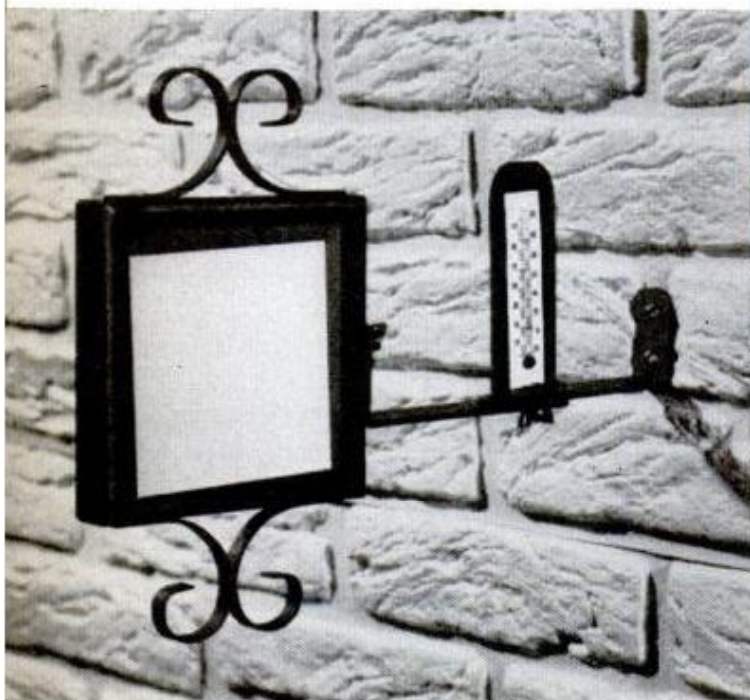
BY CATHERINE BILSKI



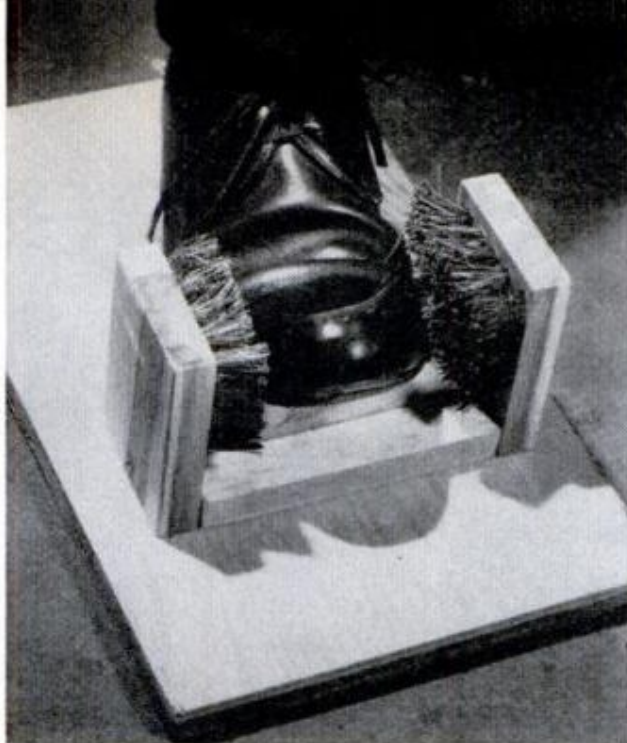
MEMO PAPER automatically at your disposal with the press of a button makes the Berkshire Roll 'N Memo an ideal item for home or office. It's handsomely designed with a perpetual calendar and comes complete with pen and one roll of paper (standard adding machine tape). Available in black/gray or avocado/brown, it sells for \$9.95 postpaid with batteries from National Marketing, Box 40584, San Francisco, Calif. 94140.



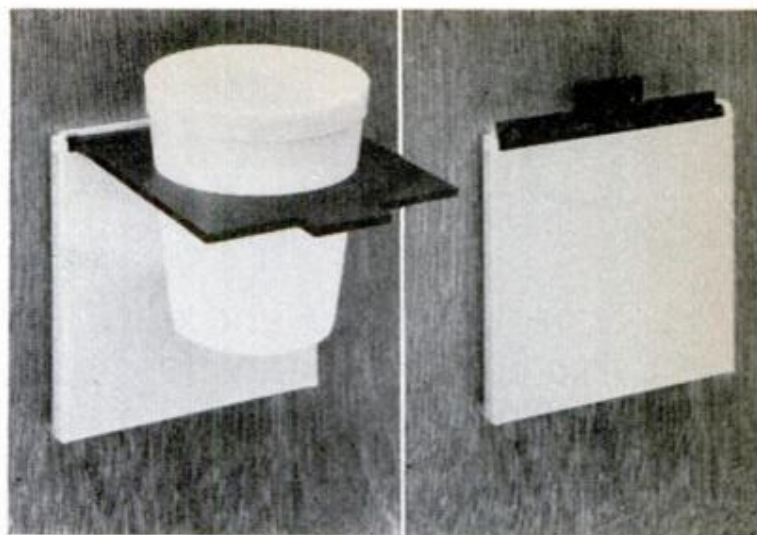
PREVENT EYESTRAIN and have both hands free when doing close work—such as soldering and engraving—with a 3-D Sight Booster, an illuminated magnifying stand. Both lens and light frame adjust separately. Unit includes a 7-watt, 115-volt lamp with 6-ft. cord and on/off switch. Folds for storage. Priced at \$5.95 from Better Vision Co., 23-26 143rd St., Whitestone, N.Y. 11357.



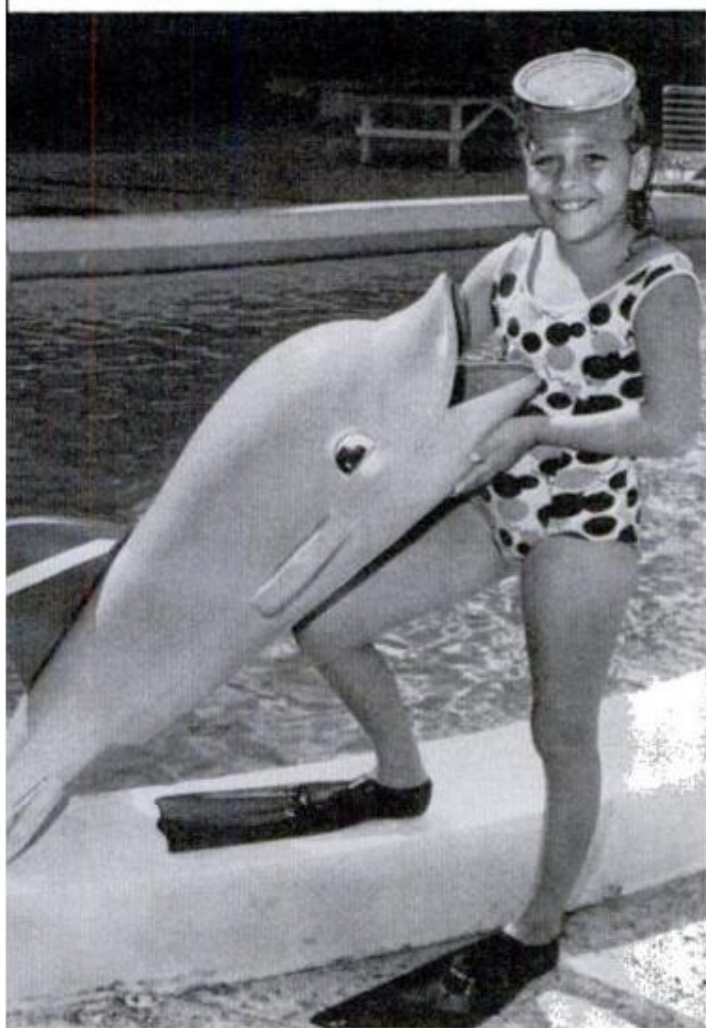
PEEK-A-VIEW Door Detective allows you to observe strange callers at your door while you remain out of sight. Adjustable mirror mounts on window frame or wall and is aimed for a full view of your door area. It solves the problem of windowless doors. Made of heavy-gauge metal with wrought-iron finish with an outdoor thermometer attached, it's \$4.98 postpaid from Oak Grove Enterprises, Dept. PM, Foristell, Mo. 63348.



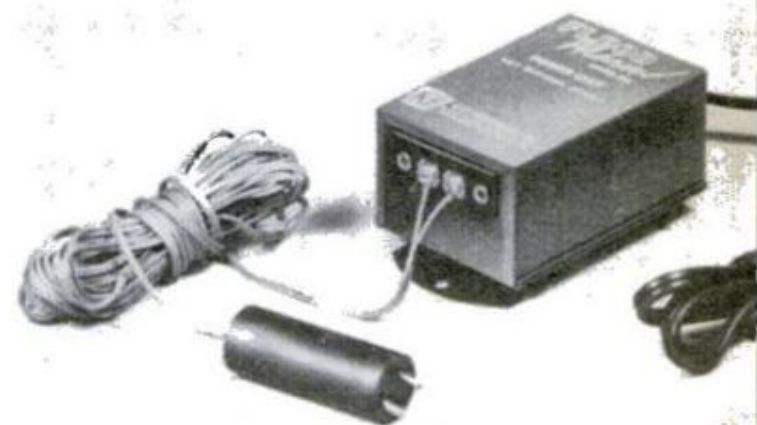
NO MATTER HOW MUDDY your shoes are, you will not dirty floors and carpets if you use this U-shaped Foot Scraper-Brush outside your door. Sturdy metal bar scrapes bottom of shoe, and stiff brushes clean the sides. Priced at \$4.65, it adjusts to any size shoe, needs no bolting to floor. It's made by Parlee Mfg. Co., 309 West Morris, Indianapolis, Ind. 46225.



SPACE-SAVING, convenient, easy to mount and use are features of this Folding Drinking Glass Holder. When not in use, the sturdy plastic holding ring folds flat against the mounting bracket, and an internal tension spring holds it rigid to prevent rattling. Ideal for boats, campers, trailers, it's \$7.50 post-paid from the Accurate Mfg. Co., 945 King Ave., Columbus, Ohio 43212.



JUNE 1972



WATER LEVEL ALARM, an ultrasensitive electronic device, can help prevent costly flood damage. The second it detects a trickle of unwanted water it sounds off with a loud buzzer alarm. An ideal alarm for basements, garages, washrooms, boiler rooms and other isolated areas, it plugs into any 110-120-volt a.c. outlet. Sells for \$14.95 from Edmund Scientific Co., 380 Edscorp Building, Barrington, N.J. 08007.

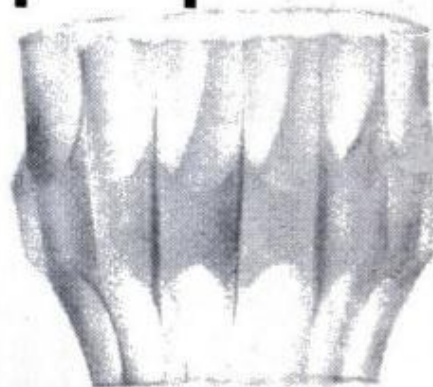
"SEAWEED" IS THE NAME of a lovable, unsinkable dolphin made of durable blue-gray plastic for pool and scuba-diving fun. He has a bright red fin that serves as a diver's safety flag. He's easily carried, weighs only 5 pounds, measures 42 in. long, has no mechanical parts and sells for \$49.95 postpaid from the Red-Fin Water Sports Corp., Dept. A-4, 1411 Pennsylvania Ave., N.W., Washington, D. C. 20004.

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WORKSHOP PROJECT

Do-it-yourself paper

Smartly styled and surprisingly strong, this furniture can be duplicated easily and inexpensively because it's made of—believe it or not—corrugated cardboard



furniture

By HARRY WICKS, Workshop Editor

Data: Annette Sukov
Photos by Les Turnau



CIRCULAR tabletop is constructed of two layers of cardboard, then painted with enamel. Designer Ted McLaren estimates that typical cost for the dining set would be about \$5. The stool-like chair at right can be made for a dollar or so

HERE'S A PROJECT the entire family can have fun working at. The paper furniture is easy to assemble and costs little. You might even be fortunate enough to get the material free in the way of a carton from a local appliance dealer or warehouse. But even if you have to buy the cardboard, the total cash outlay for the set is in the super-economy class.

Designer Ted McLaren of Saint Paul, Minn., built the prototype table-and-chair set for use in his dining area. The stool-like chair (below, with Ted comfortably seated) is unbelievably strong because of its design. These can be turned out production-style to provide extra seating galore in a family room or on the patio.

To locate the nearest source for corrugated cardboard, look in your local classified directories under *Boxes-Corrugated and Fibre*. The cardboard that was used in the *PM* shop to build a sample table and chair (to check strength) was labeled 225 Test, B Flute. It's very strong. But if you can obtain V-3 C board, we found that it is even stronger and is waterproof. To prevent warping, the tabletop is made up of two pieces



of cardboard glued together with their corrugations at a 90° angle. (See drawing on the facing page). The laminated top comes close to matching plywood's strength.

Construction consists of four basic steps: laying out, cutting, creasing and assembly.

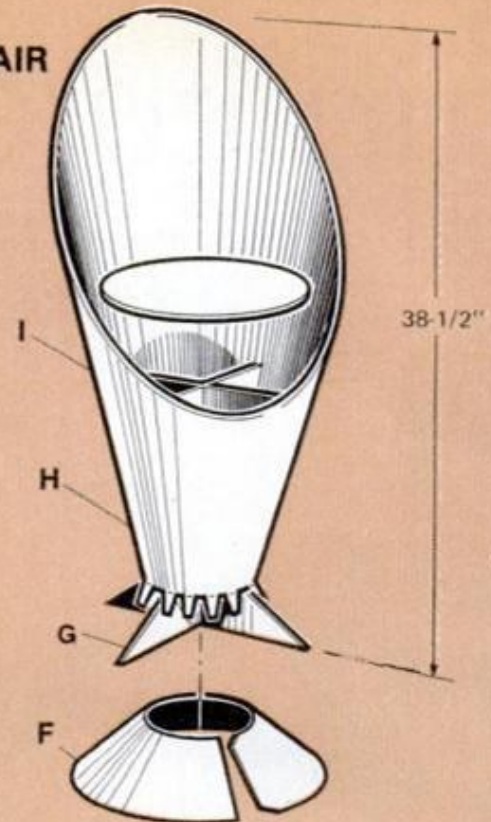
To lay out: On certain pieces such as the base supports, it is important that the "corrugation grain" run in the correct direction. Obviously, if the grain on these were horizontal instead of vertical, strength would be greatly reduced. Thus, where grain direction counts, it is indicated on the drawings.

Cutting the board: A utility knife used with a straightedge works best. And to keep the straightedge from slipping, apply a strip of masking tape to its underside.

Caution: When you are cutting close to the flutes, move the knife slowly and carefully because the blade has a tendency to follow the fluting.

Creasing: You can use the back of a
(Please turn to page 180)

CHAIR



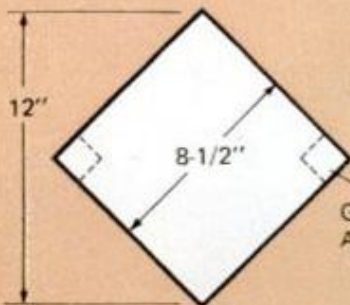
LAMP*

1



USE OLD LAMP SHADE OR MAKE OF WIRE OR 1/8" DOWELS

PIANO-WIRE LOOP TO HOLD BULB



GLUE AREA

3



ROLL AND SPOT-GLUE IN POSITION

4



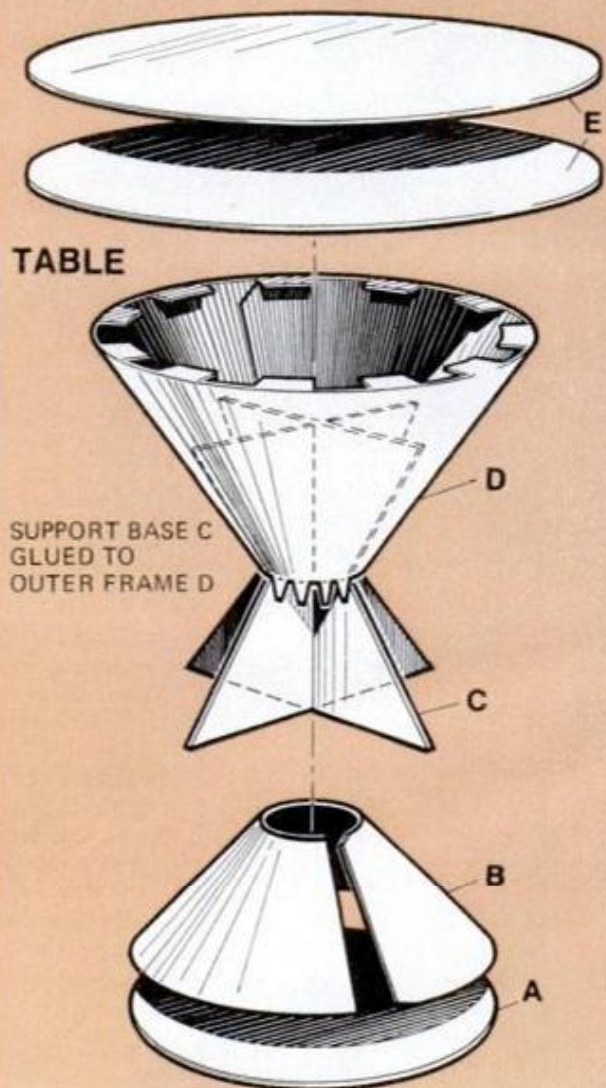
SPOT-GLUE UNITS TOGETHER

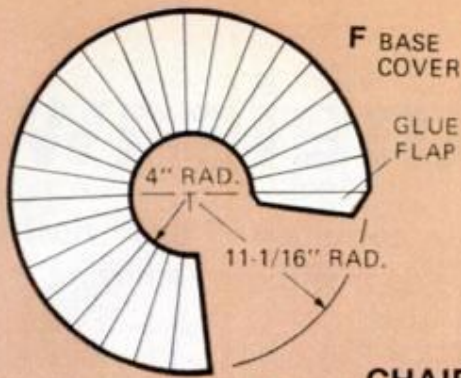
TRIM LINE

NOTE: 6" DIA. REQUIRES 10 UNITS

* USE TYPEWRITER OR BOND PAPER TO MAKE LAMP

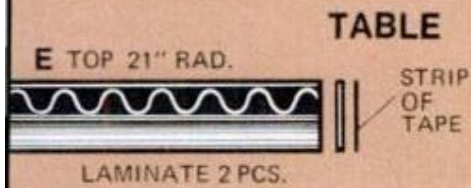
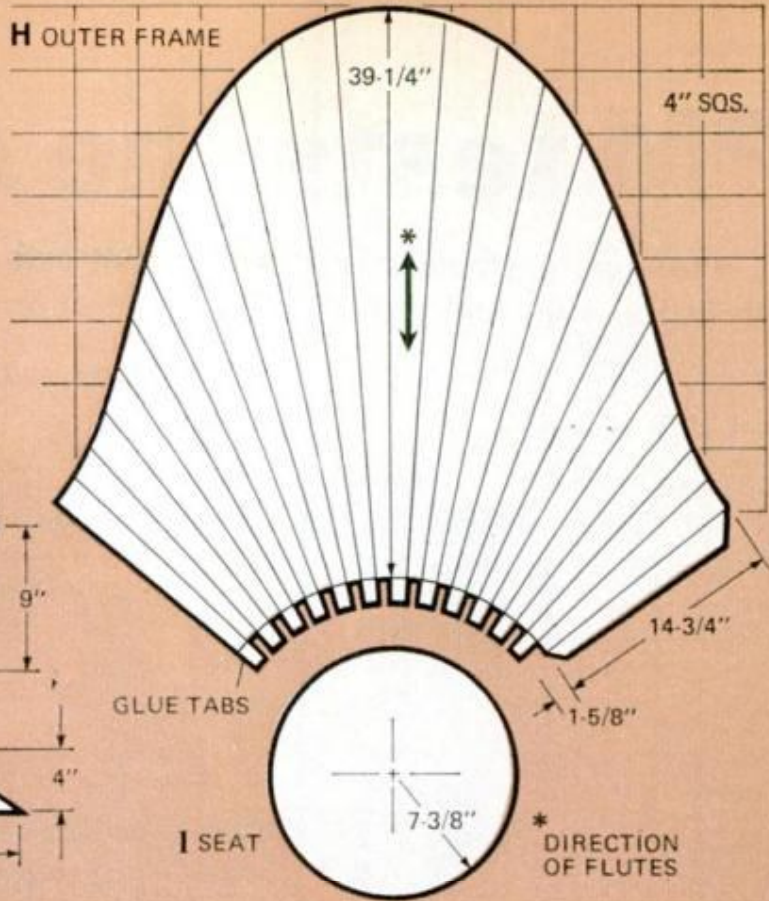
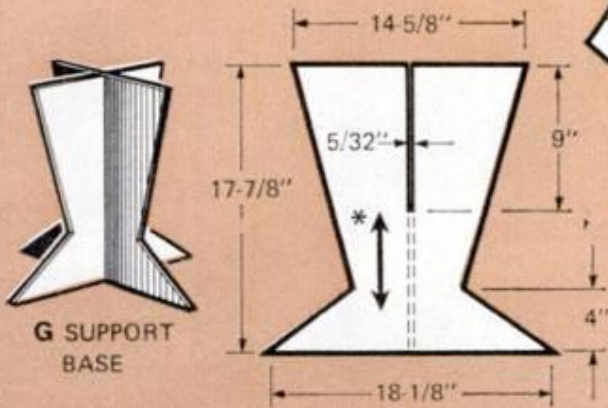
TABLE



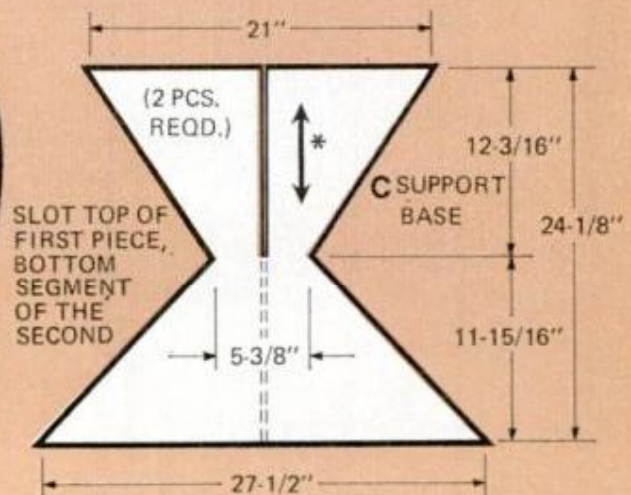
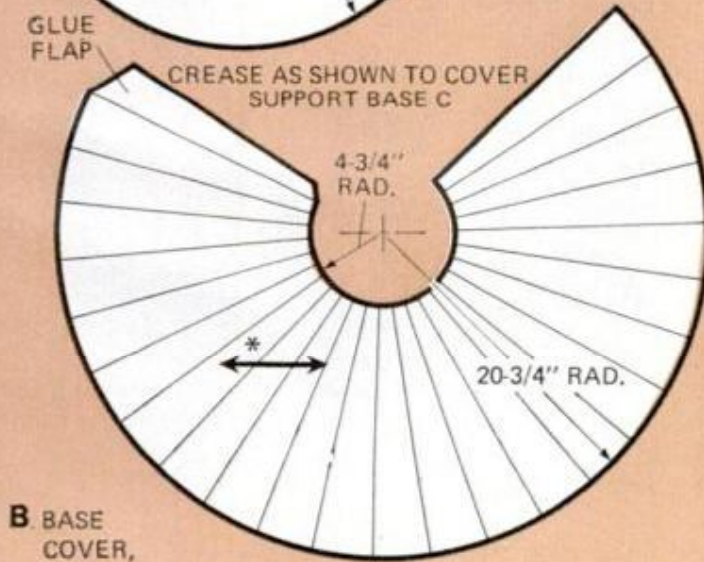
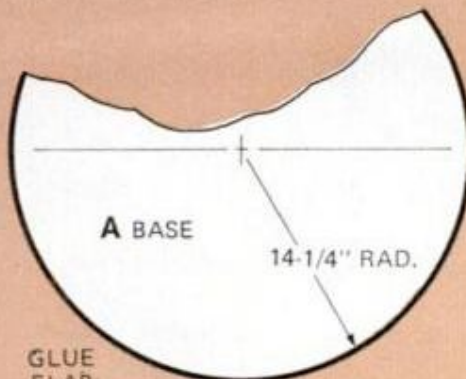
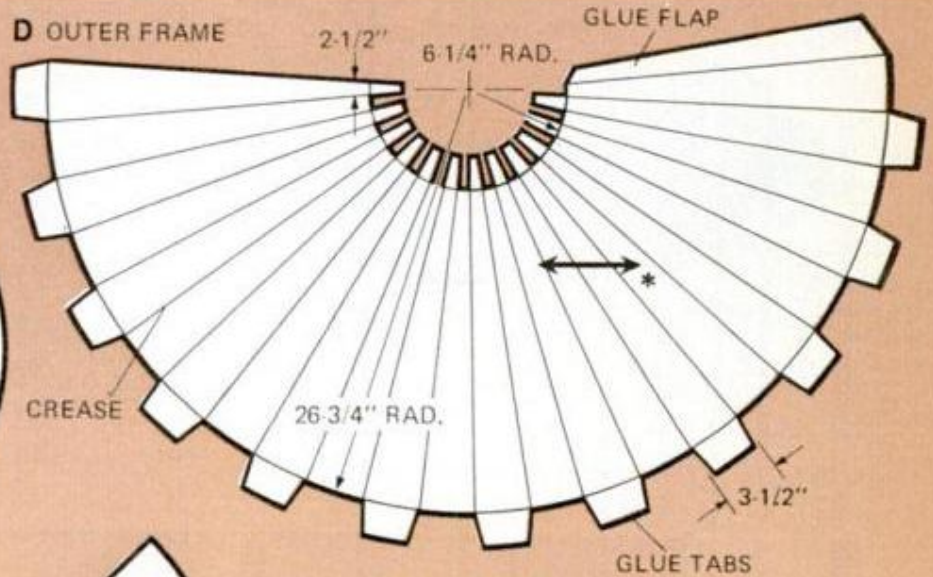


MAKE CREASES WITH SPOON

CHAIR



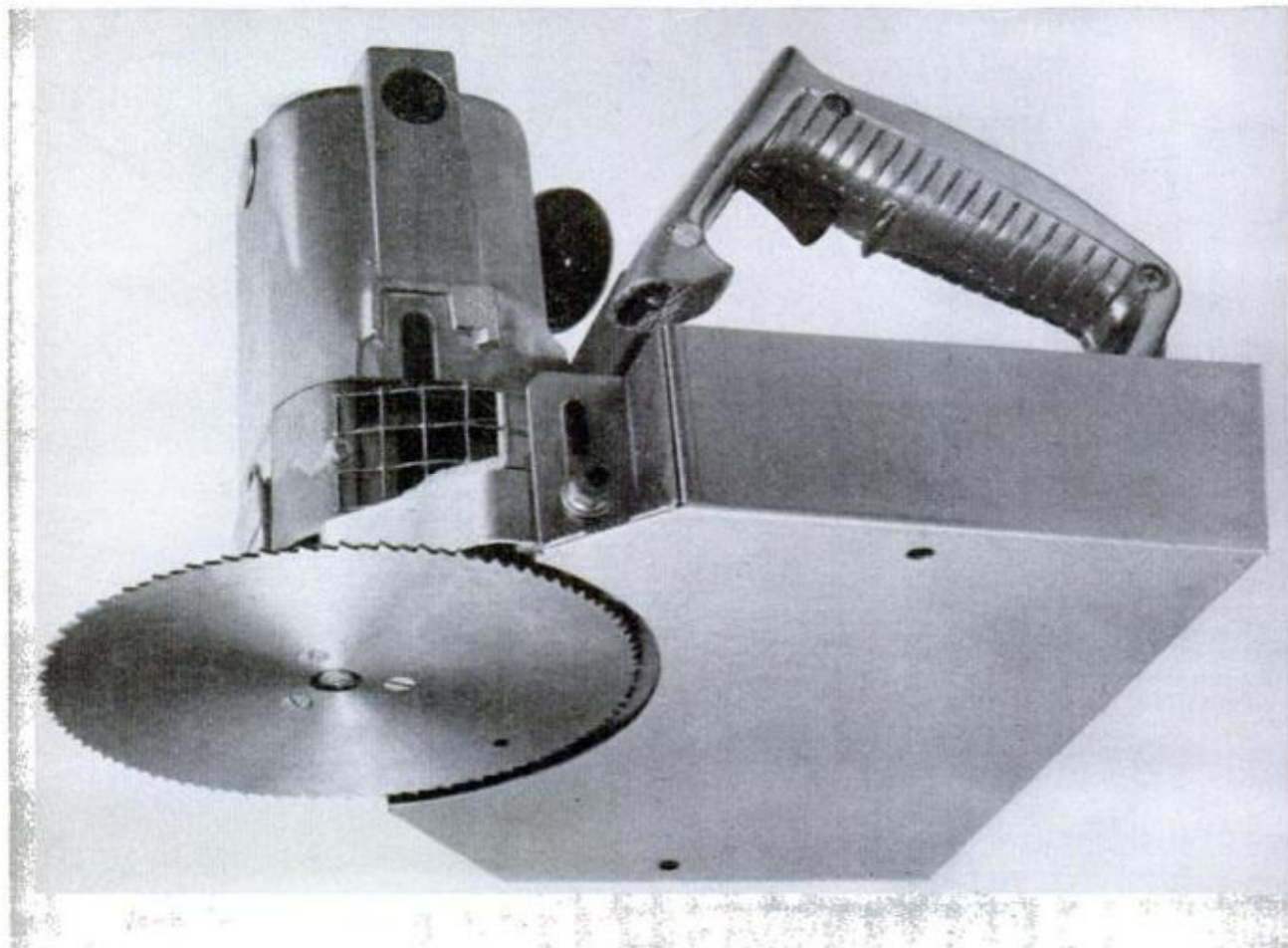
TABLE



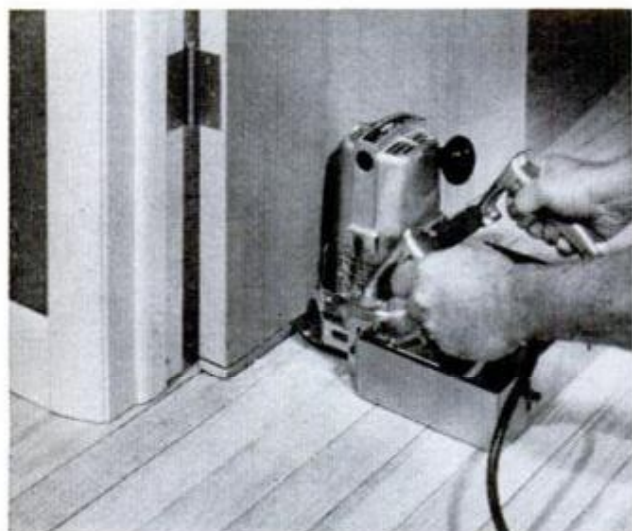
PM tests the Anglsaw

It's a unique, portable builder's saw that cuts into corners and dead flush with floors, walls and ceilings. You can even trim a door without removing it.

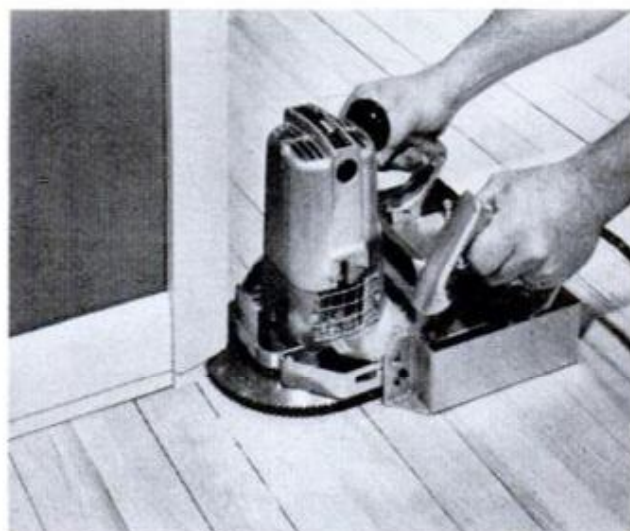
By WAYNE C. LECKEY, Home and Shop Editor



WORM'S-EYE VIEW shows blade flush with saw's broad 7½ x 10-in. base, which offers accurate guidance



DOORS ARE CUT without being removed and without splintering by merely guiding Anglsaw across floor



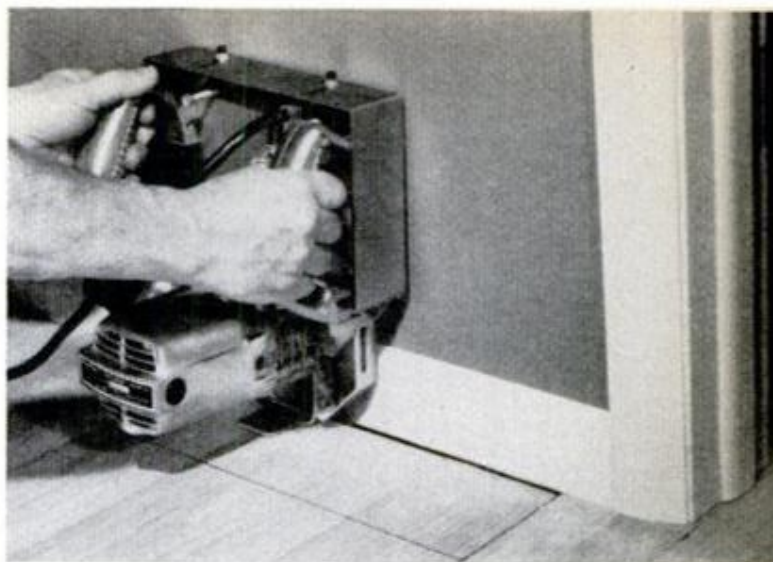
BOTH BASE AND DOOR JAMB are undercut quickly with saw to allow neat installation of carpet and tile

THE ANGLSAW—so named because the blade is at a right angle to the handles—is really a tool for the professional and does many “impossible” jobs you can’t do with a regular portable electric saw.

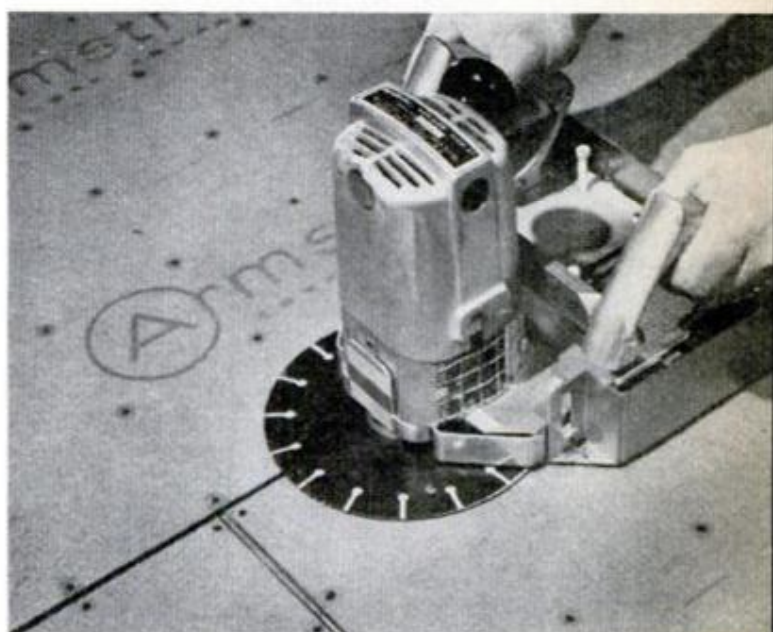
It’s a labor and time-saving tool designed to cut into corners and into material *already in place*. For example, carpet installers can cut off the bottom of a door without removing the door from its hinges. Likewise, the saw can undercut door jambs and base so that carpeting (or tile) can be installed neatly under them instead of against them. It can cut down flush along the base when you want to remove old hardwood flooring and replace it with tile or marble. It can quickly cut scuttle holes for access to attics and roofs flush with joists and rafters. You can cut out a 2x4 floor plate even with the door buck. Fitted with the right blade, or abrasive disc, this unique tool can cut steel, tile and stone. It can also sand down uneven underlayment joints and concrete surfaces and remove paint and rust from any flat surface.

Weighing 15 lbs. the tool is made extra safe to use since, unlike a conventional portable saw, it requires both hands. Each handle is fitted with a “dead-man” switch. Model A7 comes complete with blade, wrenches, instructions and steel carrying case for \$160. For additional information, write to BuzzMaster, 600 Hartrey Ave., Evanston, Ill. 60202. ★★ ★

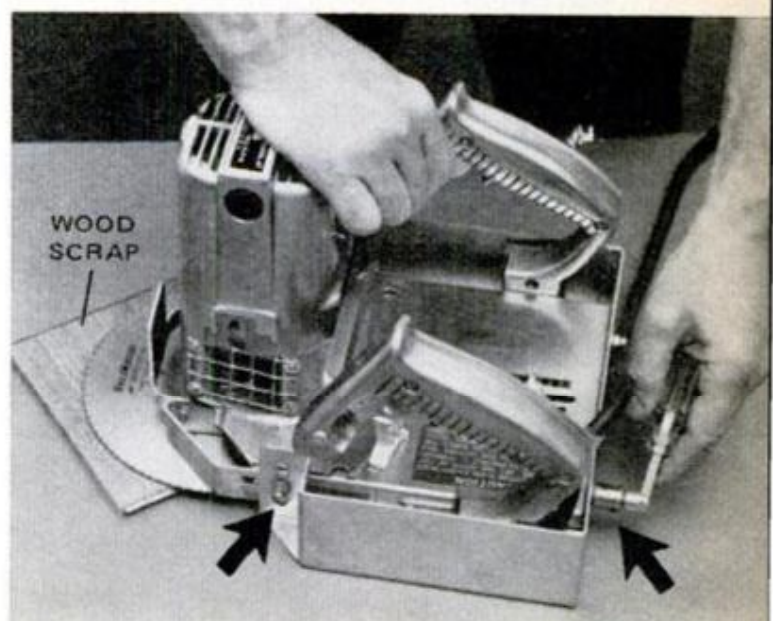
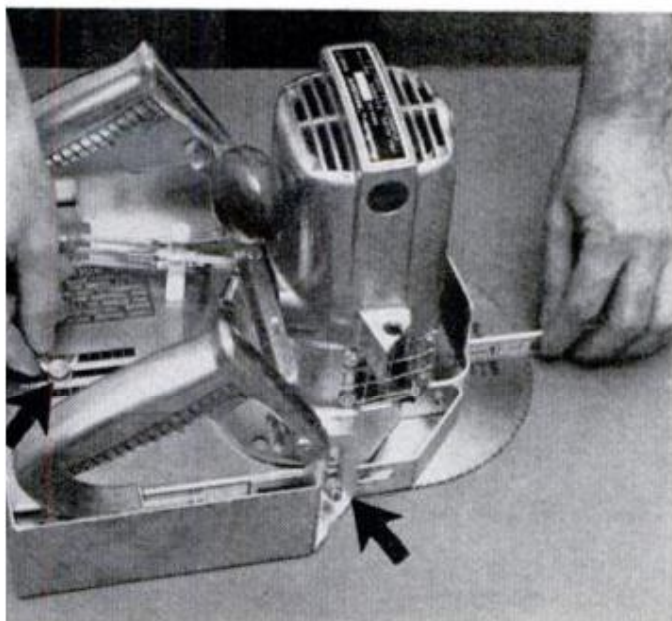
SPECIAL SANDING DISC mounts like a blade to sand down uneven underlayment seams and wood joints



WHEN GUIDED AGAINST WALL, saw can cut flush with base to sever old floor, cut new duct openings



DEPTH OF CUT IS SET by loosening wingnut and a screw on each side (below, left). Height adjustment is made by loosening four screws at side and rear and placing a scrap block under blade (below, right)



Twin-paddle your canoe

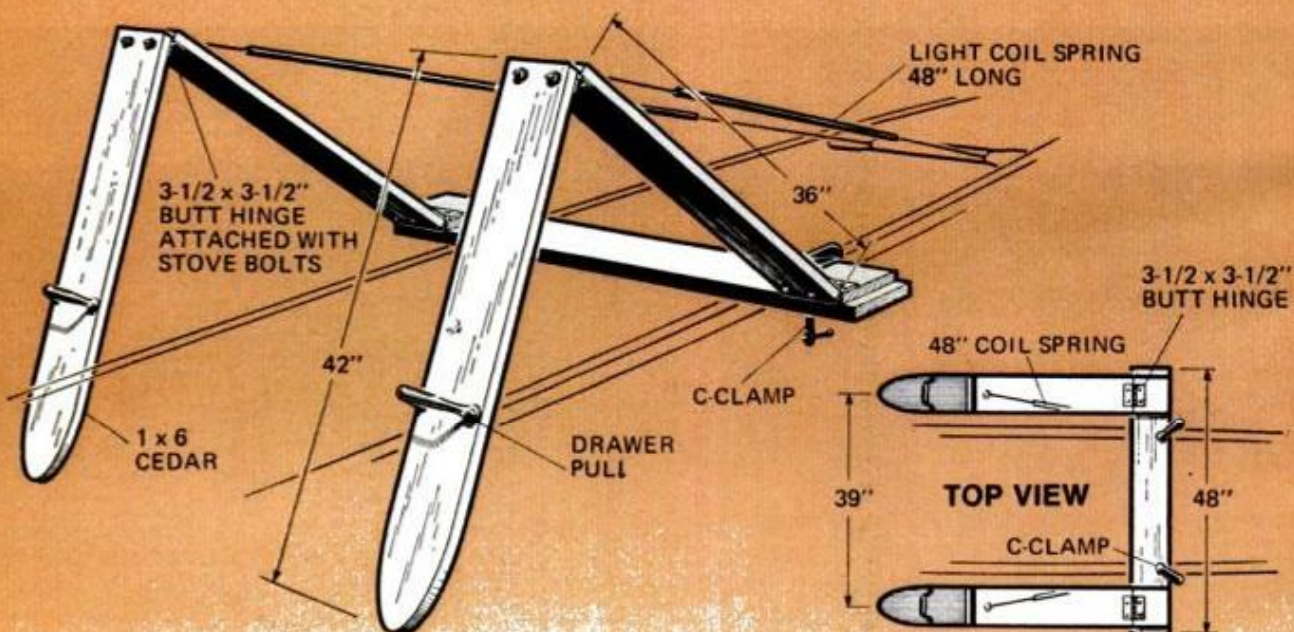


GENERALLY, a lone canoeist has to be satisfied with a single paddle to propel his craft. With this twin setup, he can have the advantages of two paddles.

A canoe with twin paddles offers all the advantages of a rowboat with oars—plus the additional benefit of your being able to face the direction you're going. You can make a swift turn by pulling harder on one paddle than the other, or backwater with one, just as with oars. You can also slow the canoe in a straight course by holding both paddles in a vertical position. Paddling, as with oars, is done partly with your back.

To make the rig, you need three pieces of 1x6 pine, two pieces 36 in. long and one 46 in. The two 42-in. paddles should be cut from a 1x6 cedar board. Two heavy pairs of butt hinges (about $3\frac{1}{2} \times 3\frac{1}{2}$ in.) should be fastened with $\frac{3}{8}$ -16 stove-bolts. Two light coil springs, 48 in. long, are used to return the stroke. Such springs are sometimes used to hang window drapes. Two drawer pulls, wide enough to fit your hand, should be tried in various positions on the paddles. Two C-clamps are used to attach the 46-in. board to the gunwales at a point found best for rowing when sitting in the bow seat and facing the rear of the canoe. Try the very center of the canoe. You will be surprised to discover how easy it is to canoe with twin paddles.

—Elbert M. Coe, Glenwood, Fla.



HINTS FROM READERS

Clamp guards sabre-saw blade

When you store a sabre saw with the blade in place, a spring-type paper clamp with padded jaws can be used as a blade cover. The padding can be leather, rubber, or other semihard material attached to the jaws with adhesive. The clamp shown is padded with rubber belting fastened with a double-faced cellulose tape.

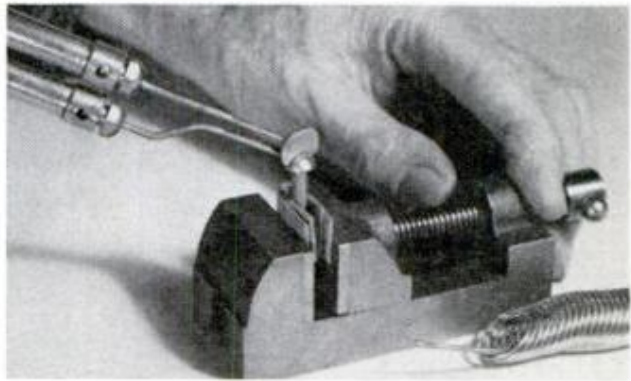
—Walter E. Burton, Akron, Ohio



Heat sink for soldering

You can solder metal parts while they are clamped in a vise without excessive heat loss if the vise jaws are thermally insulated by several thicknesses of cardboard (or another poor heat conductor). Photo at right shows flat piece of brass being soldered in slot of a 10-24 brass bolt insulated from jaws with cardboard.

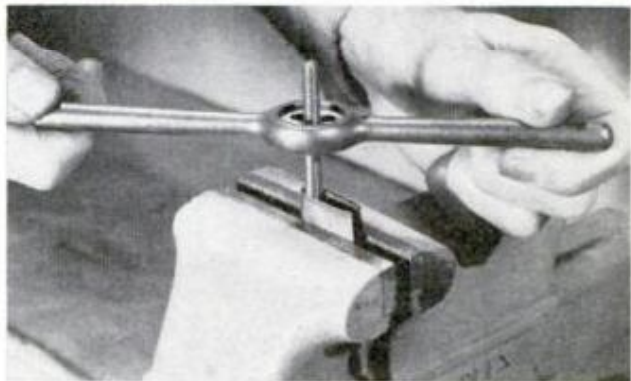
—W. B. May, Oak Park, Ill.



Holding slender rods firmly

Clamping a small-diameter rod (so it won't turn or be marred) in order to thread it with a die can be frustrating. I found that the vise jaws will hold the workpiece securely—without damage—if a piece of sheet aluminum or copper is bent in a C-shape and then sandwiched between the work and jaws.

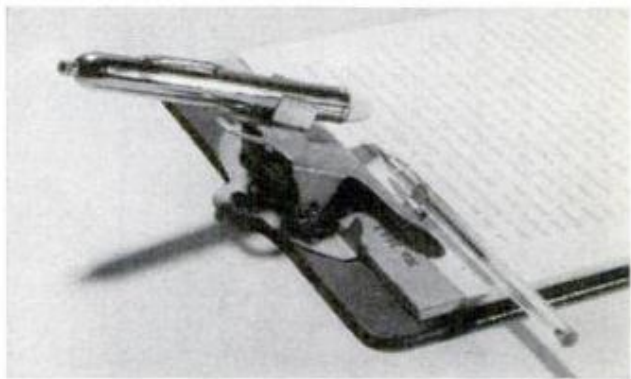
—B. W. Ervin, Kent, Ohio



Clipboard writing aids

When writing at night on a clipboard in the car, I've wished I had a light at hand. I solved my dilemma by attaching battery clips to the spring clamp to hold a penlight. And, by fastening a pencil clip as well, a pencil is always with the clipboard. Use a pair of small machine screws on each clip.

—Marshall Lincoln, Wickenburg, Ariz.

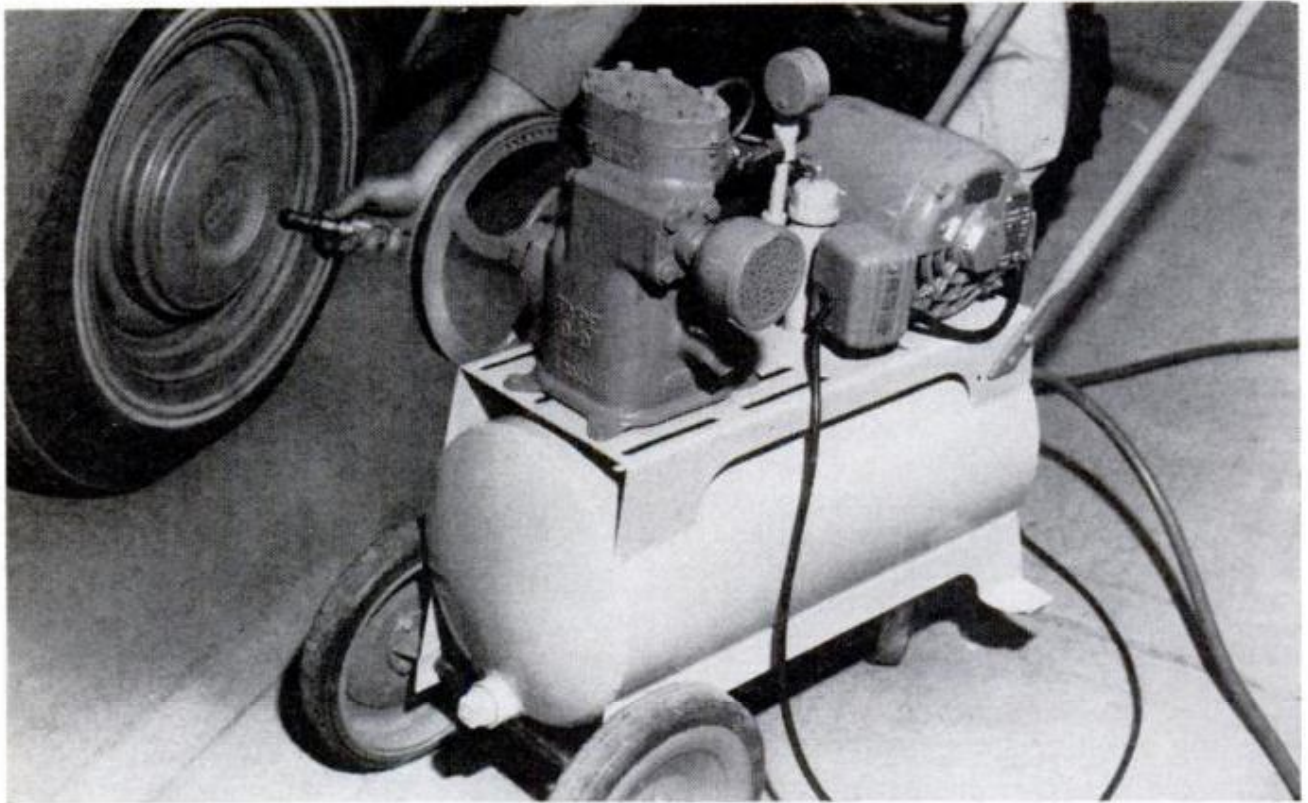


Cleaning chipped glass

Old glass pieces that we display started showing dark spots and lines where dirt accumulated in surface abrasions. To clean the glass, the spots were moistened with strong detergent solution and, 30 seconds later, gently rubbed with a stubby-bristle brush. Once cleaned, deep spots were filled with clear lacquer to stop dirt buildup.—Burt Wed, Skokie, Ill.



How to build an air



HOMEBUILT COMPRESSOR can be used in shop or, because it is portable, rolled outside for inflating jobs. The tank has a 10-in. diameter, 21-in. length; the pump is a two-piston, open-type refrigeration unit

By **GARRY SWERDFEGER**

AN AIR COMPRESSOR is a practical machine to have in your shop. You can use it often to blow dust off a project you're sanding, as a sprayer and even to speed up the drying time of a finish. Building one is both rewarding and economical.

The compressor shown has an automatic on-off switch set for specified limits, a pressure gauge graduated from 0-160 pounds per square inch (p.s.i.), a check valve to stop air leaking from the tank back through the pump and, for safety, a relief valve set for 100 p.s.i.

Start by heating and bending the tank's two front "feet." After drilling holes for the axle, cut axle and install front-wheel assembly as shown. Make and assemble the back caster section.

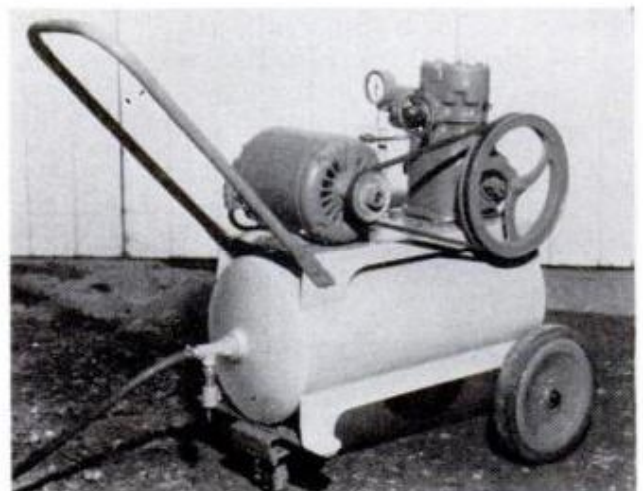
Bend the conduit for the handle and flatten each end as shown. After drilling the holes in each end, hold the handle at a 45° angle to the mounting stand atop the tank, mark hole locations, drill holes in stand and bolt handle in place.

Next, mount the pump on the stand

(with pulley on the right-hand side) using four $\frac{7}{16}$ x $\frac{3}{4}$ -in. bolts. The pulley should clear the side of the stand by about 1 in. and should be about $\frac{1}{4}$ in. from the front of the stand. Check the oil level; if necessary, add or change oil (SAE 10).

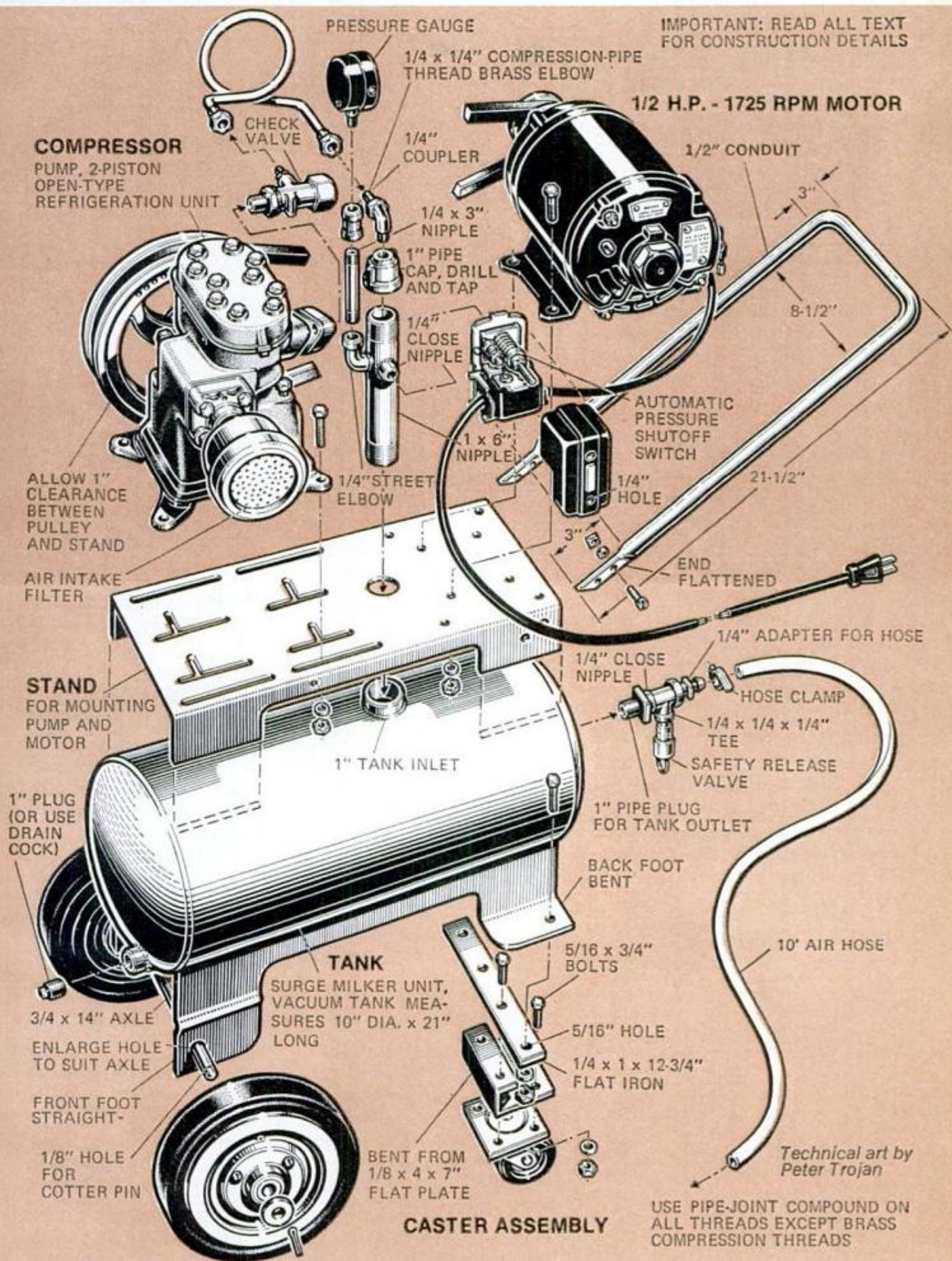
Remove the adapting flange from the pump inlet, being careful not to damage the gasket. Drill the inlet hole larger

POWERED by $\frac{1}{2}$ -hp, 1725-rpm motor, unit is shut off by automatic switch when pressure reaches 85 p.s.i.

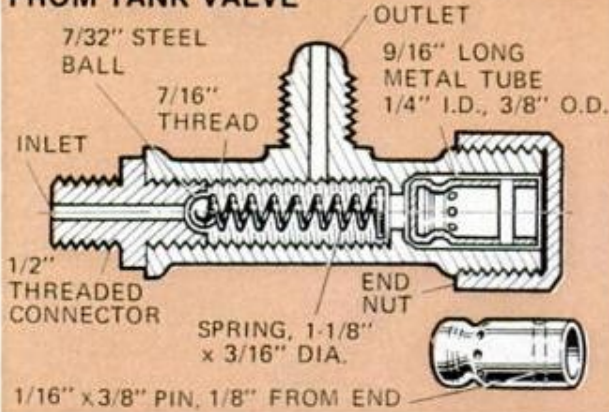


POPULAR MECHANICS

compressor—for \$70



CHECK VALVE, CONVERTED FROM TANK VALVE



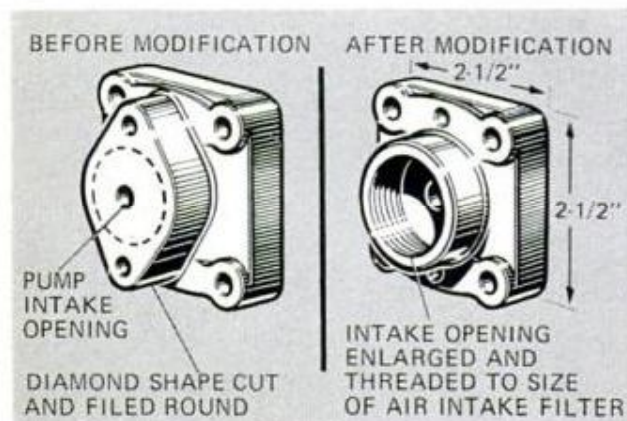
CHECK VALVE is made by converting tank valve from a refrigeration unit. Ball must be properly seated

and tap it so the air intake filter can be threaded into it as shown. If filtering material is not clean, replace it with coarse steel wool. Rebolt adapting flange to pump and thread the air intake filter in position.

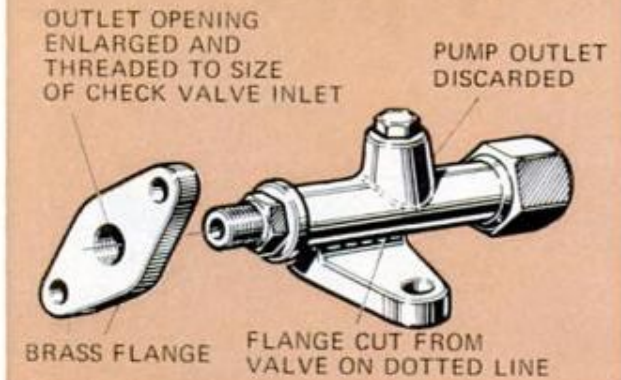
Taking care to avoid damaging its gasket, remove the brass valve from the pump outlet and cut the mounting flange from the valve. Drill the center hole larger and tap to the size of the connector threaded into the end of the tank valve. Rebolt the flange to the pump.

Now remove the threaded connector from the front of the tank valve, and the nut from the back. Take out the stem and packing. Solder the hole in the end of the nut (through which the stem extended) closed. Drill at least two $\frac{1}{8}$ -in. holes $\frac{3}{16}$ in. from one end of the $\frac{3}{8}$ -in. o.d. metal tube. Cut or file a groove around the tube at these holes to assure ample space for air to pass. Drill two holes, insert the pin from the other end of the tube and rivet the extended ends. This pin will prevent the spring from

ADAPTING FLANGE on pump inlet is modified and hole is drilled and tapped to receive air intake filter



VALVE FROM PUMP OUTLET



BRASS VALVE is removed from pump outlet; hole is enlarged and tapped to suit connector in end of tank

slipping through the back of the tube.

Using a $\frac{7}{32}$ -in. steel ball and fine grinding compound, reseal the end of the connector which threads into the valve. Once finished, thoroughly clean the parts to assure removal of the grinding compound. Assemble the valve using the second $\frac{7}{32}$ -in. steel ball.

To test the valve, blow into the inlet and then into the outlet. If air leaks back through the inlet, the ball is improperly seated or the spring is too weak. Check the seat first—the spring does not have to be strong—and thread the valve into the pump.

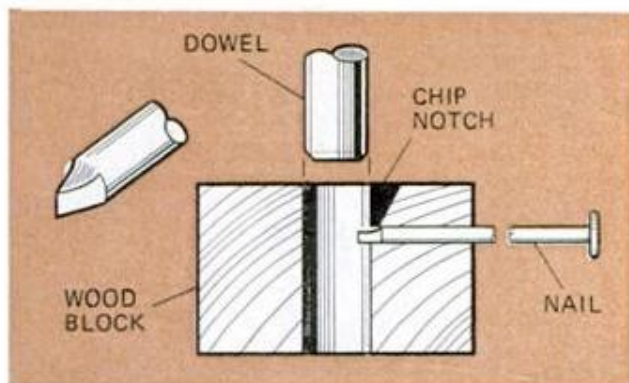
Install the 1x6-in. nipple into the threaded inlet on top of the tank. Although this will have to be removed, it is *important* to thread the nipple the same number of turns it will be when permanently installed. The pressure gauge and automatic shutoff switch will be connected to this nipple.

Mark the position of this switch on the left-hand side of the nipple, 4 in. from the bottom and with at least 1 in. clearance between switch and motor. Mark position of the gauge connection on front of the nipple, 4 in. from the bottom. Remove the nipple, then drill and tap it for $\frac{1}{4}$ -in. pipe thread. Also drill and tap a hole in the center of the 1-in. pipe cap the same size. Be sure to use pipe-joint compound on all threads except brass compression threads.

After wiping on joint compound, insert the 1x6-in. nipple in the tank inlet. Connect the pressure shutoff switch using a $\frac{1}{4}$ -in. close nipple. Then connect the gauge by threading the street elbow into

(Please turn to page 178)

HINTS FROM READERS



Improvised dowel-groover

Lengthwise grooves to release trapped air and glue can be cut rapidly in wood dowels by driving them through a hole in a hardwood block equipped with a "grooving bit." The bit is simply a nail with sharpened point driven through an under-size crosshole so its point projects $\frac{1}{16}$ in. into dowel hole. Chip-notch lets chips escape.—*Walter E. Burton, Akron, Ohio*

Map on clipboard is extra handy

If deliveries or calls require frequent checking of a road map, salesmen and others will find it a real convenience when a section of the map is rubber-cemented to the face of a clipboard. Here it's not only extra handy but the firm surface of the clipboard makes it easy to mark on the map.

—*Marshall Lincoln, Wickenburg, Ariz.*

Tangle-free way to store cords

If you are looking for a way to keep an extension cord tangle-free when not in use, coil it in a hank and insert it in a sleeve made by removing both ends from a tin can. If you have several cords of different lengths, you can mark the lengths on the cans for quick selection. Clothesline can be stored same way.

—*E.V. Reyner, Salinas, Calif.*

Nontip small-tool stand

Small hand tools such as pliers, drill bits and screwdrivers can be kept organized and neatly stored on your workbench using a jumbo-size face brick. Since each brick has 10 holes, 2 or 3 of them should easily hold all small tools used most often in the average workshop.

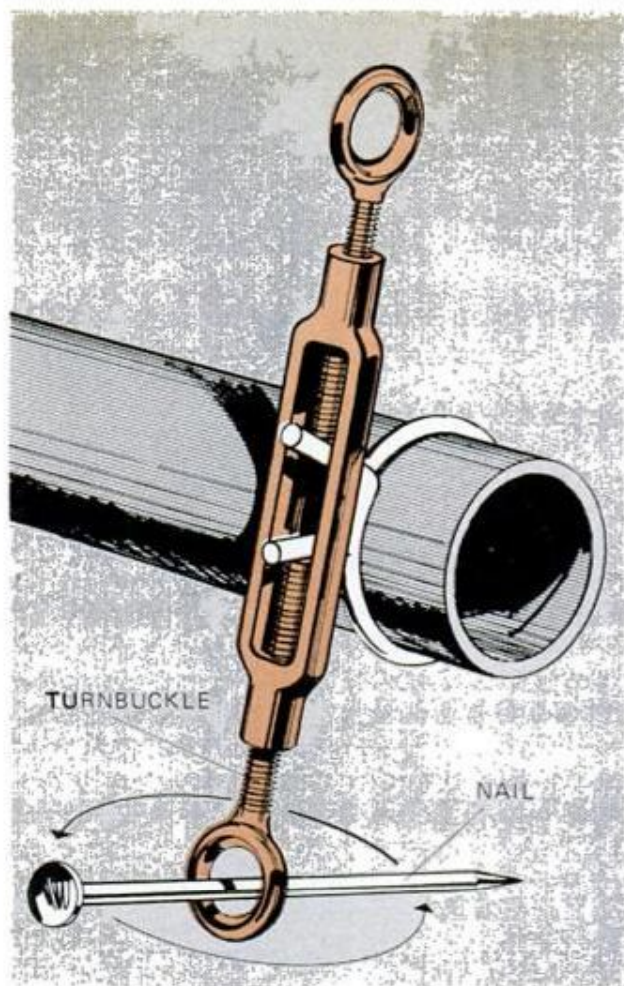
—*Ken Patterson, Regina, Sask.*



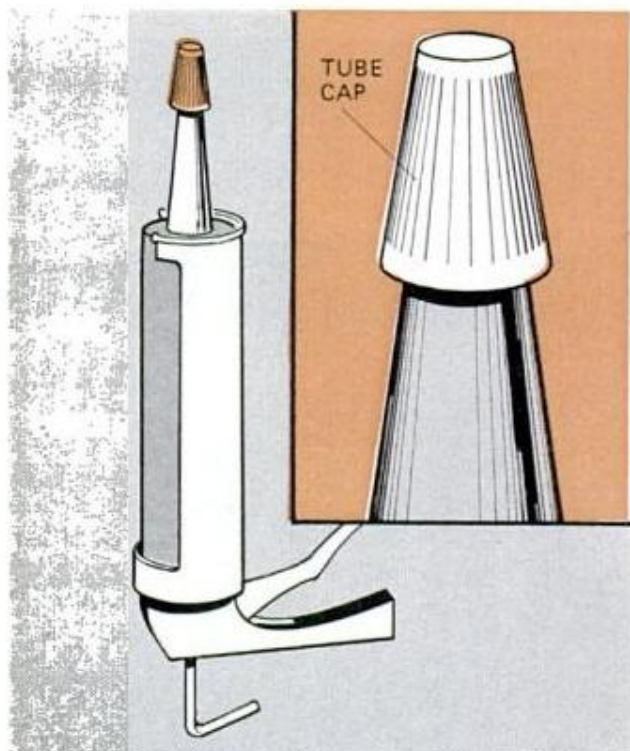
BETTER WAYS TO DO IT!



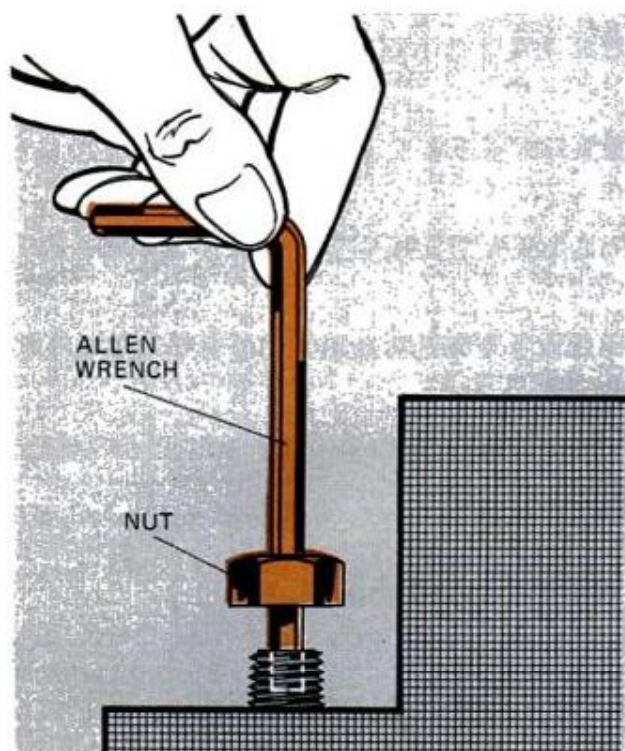
ATTACK ON MY MELONS by pests is prevented by placing each melon atop a glass jar. Perched above ground, the melons are beyond the reach of snails, slugs and the like.—*John Krill, North Lima, Ohio*



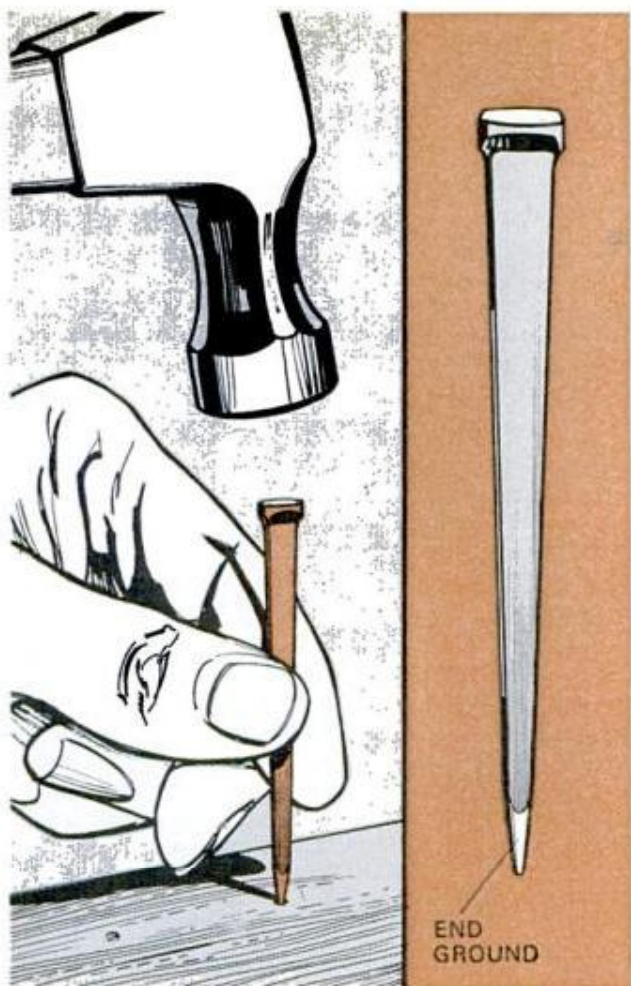
REINSTALLING HOSE CLAMPS, when servicing an appliance, is an easy one-hand operation if you use a turnbuckle as shown. When the clamp takes hold, remove turnbuckle.—*John Walker, Walnut Creek, Calif.*



CAULKING-CARTRIDGE CAP can be improvised from toothpaste or shaving-cream tube to keep remaining caulking usable. Simply twist on cap tightly to keep air out.—*Victor Lamoy, Saranac Lake, N.Y.*



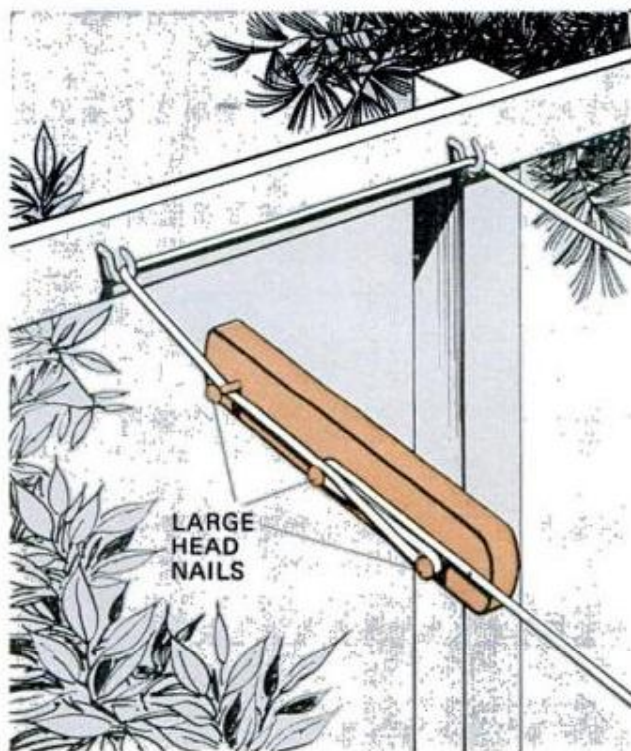
DROPPED NUTS, when you're working in tight quarters, can be avoided by using an Allen hex-wrench. Simply rest wrench on the bolt when you have to turn nut on or off.—*Marvin Duchoviner, Brockton, Mass.*



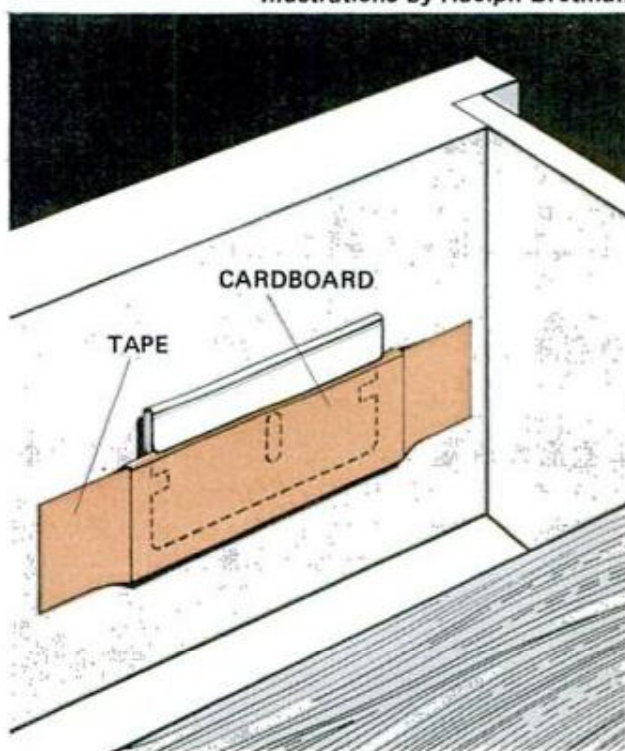
QUICKIE NAILSET that can be used safely for setting brads and small finishing nails is made by rounding tip of a masonry (cut) nail. Hardened-steel nail won't bend.—Alan R. Haberton, Ogden, Utah



SCREEN-DOOR-CLOSER SPRING can also be used to correct any minor sagging. Simply fasten outboard end at an angle until the frame is pulled into square.—Dennis G. Richardson, Perkinsville, Vt.
Illustrations by Adolph Brotman

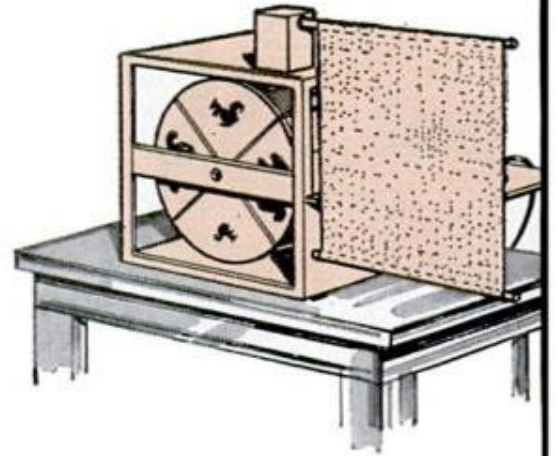


DROOPY CLOTHESLINES can be pulled taut with tightener stick and three nails. Hold stick vertical with rope between two nails, take up slack, secure with third nail.—W. H. McClay, Pasadena, Calif.

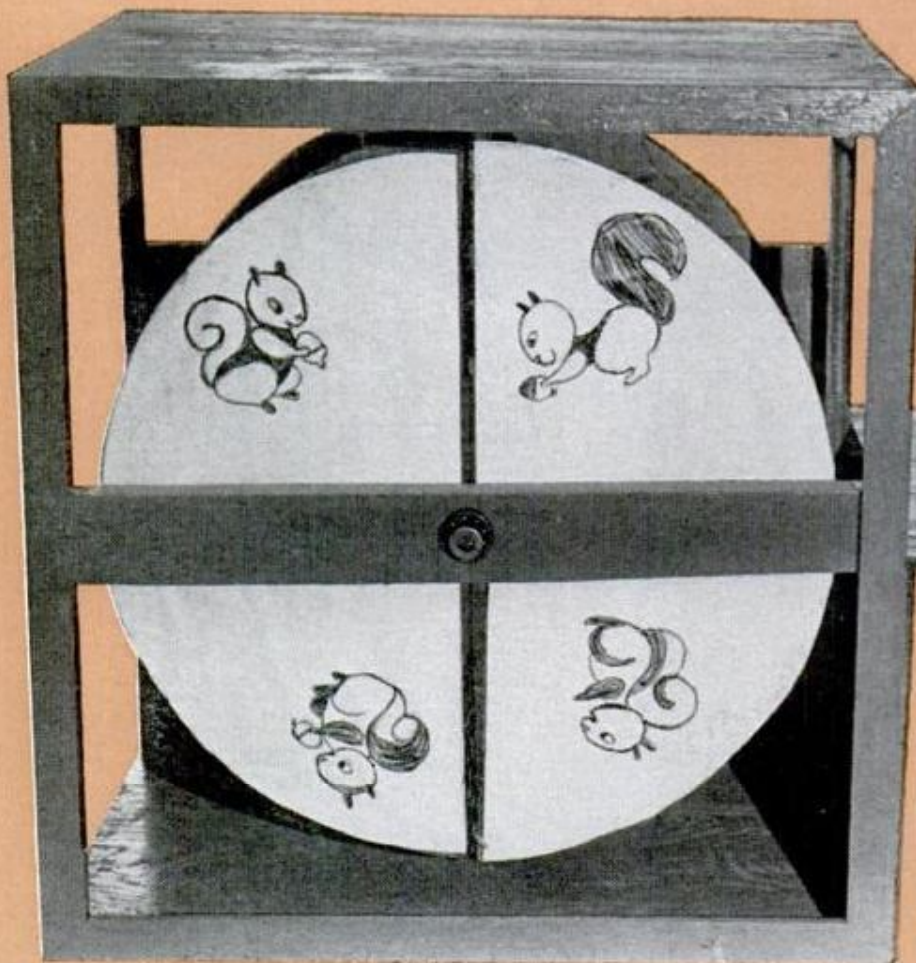


SINGLE-EDGE RAZOR BLADES can be stored safely inside a desk or bench drawer using this "holster." Simply tape piece of cardboard so that cutting edge will be covered.—J. David Lambert, Prospect Park, Pa.

Things to make



TO SAFEGUARD BYSTANDERS from injury should a stray pellet ricochet off the blades of the whirling fan, a shield of some kind should be placed in front of it. This can be a piece of cloth attached to a length of dowel and hung by a wood block glued to the top of target box. Cardboard would do also



CHAINS permit hinged fan shelf to be tilted up or down to control force of air hitting paddle wheel

in your workshop

Tabletop shooting gallery with moving targets

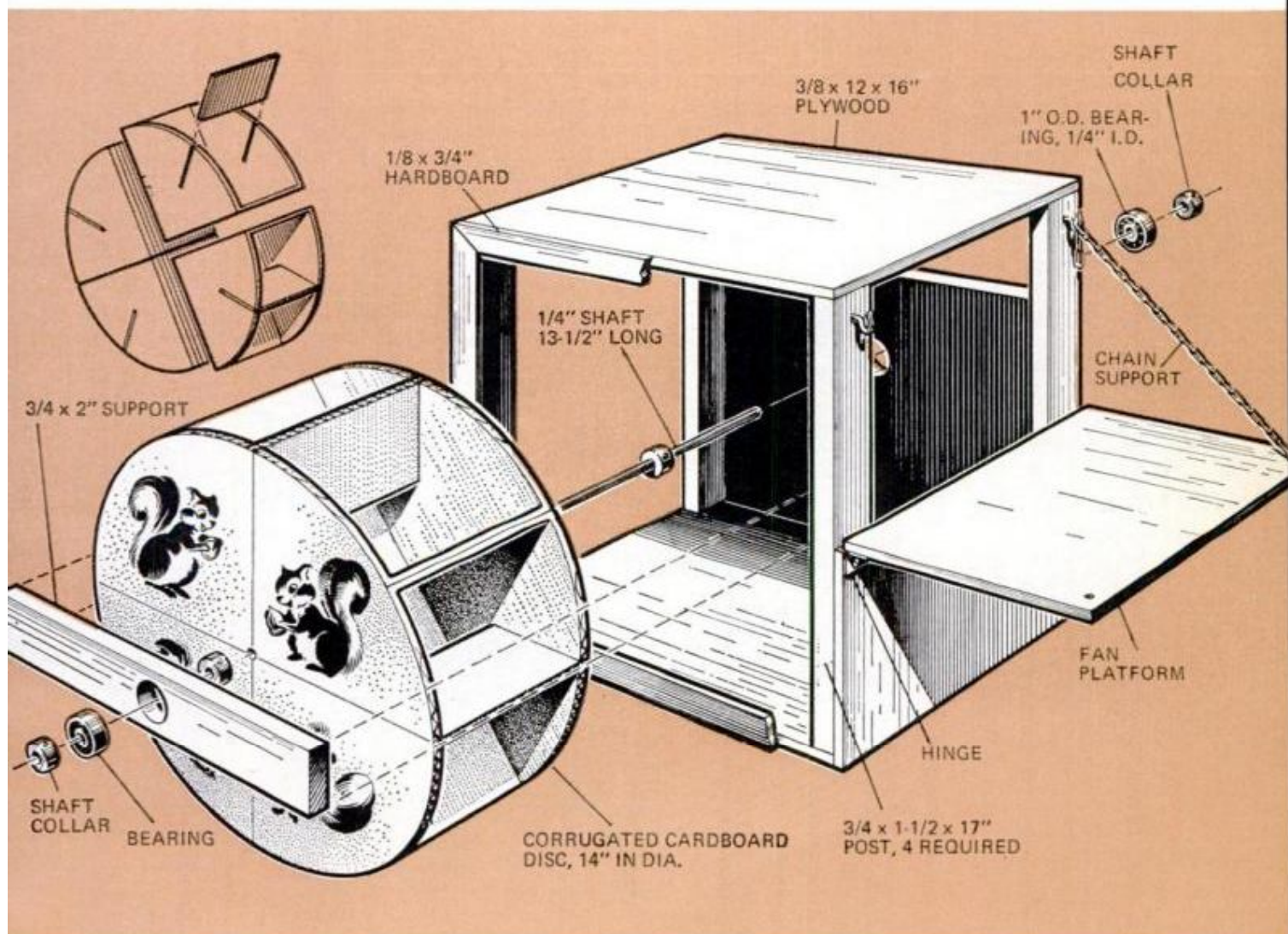
Here's a moving target that will make a sharpshooter out of any young rifleman. It turns at a fluctuating speed by the breeze from a small electric fan, and you can slow it down or speed it up by tilting the hinged shelf on which the fan sits up or down. If the fan pivots, you can tilt it, instead of the shelf, to direct the air toward or away from the paddles.

The paddle wheel, to which pictures of wildlife targets are pasted, is made from the corners of a corrugated cardboard box, glued together and covered at each end with a 14-in. cardboard disc. Slots 4 in. long are cut as shown in the box sections to receive four snug-fitting cardboard paddles. A 1/4-in. hole is centered in each disc for a 1/4-in. curtain-rod axle. The

axle turns in two 1-in. o.d. ball bearings pressed into holes drilled in the cross members of the box. Setscrew collars prevent the paddle wheel from rubbing and keep it turning freely. It might be wise to place a small rubber washer between the collar and wheel discs to provide friction and prevent slipping on the axle.

The paddle wheel must be installed in the box, of course, before the top is added, after which the axle is inserted.

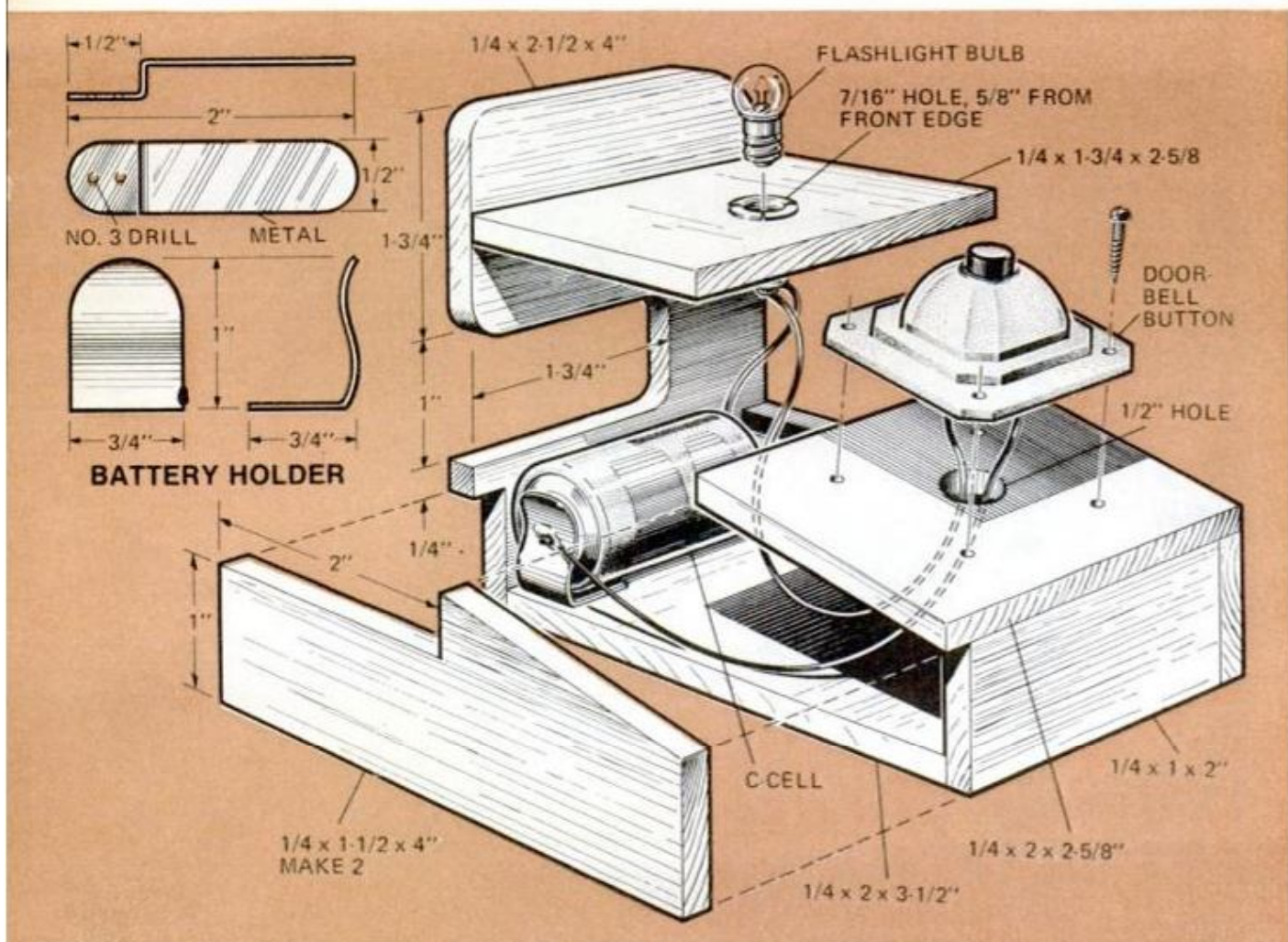
When used with an air rifle, the outer disc will eventually become peppered with holes and need to be replaced. When used with toy projectiles like rubber suction darts, the target wheel will stop after each hit so it's easy to check your accuracy. —*Frederick C. Lurz, Stony Brook, N.Y.*



Lighted watch stand

After finding it difficult to see the luminous dial on my wristwatch at night, I decided to make this little illuminated stand for it so I could see what time it is from my bed. Now I reach across to the night table, press the button and a small shielded Christmas-tree bulb lights the watch dial.

The drawing below shows how the stand is made from a few scraps of $\frac{1}{4}$ -in. plywood. All parts are nailed and glued together except the part that holds the bulb and socket. This is attached with small screws so it can be removed for battery replacement. For a socket I used one from a discarded string of Christmas-tree lights, cracked off the plastic shell and pressed the metal socket in a $\frac{7}{16}$ -in. hole. The C-cell battery is held by clips made from thin sheet metal, as is the clip that's attached to the back of the stand to hold the watch band as shown in the back view photo at the left.—Wallace H. McClay, Pasadena, Calif.



Flamed candle stand

This unique candle stand begins as a $3\frac{1}{2} \times 3\frac{1}{2} \times 4$ -in. redwood cube. Turn the wells for the three sizes of candles in the top plane of the cube, following the dimensions given. Trace the carving designs on the four sides of the cube so that like designs are on sides opposite each other. (Patterns will be found on page 177.)

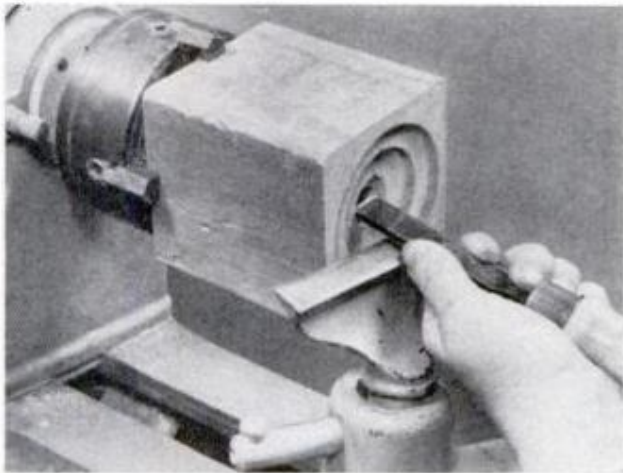
Before flaming the block, recess the background $\frac{1}{8}$ in. deep with carving burrs in a drill press. Clamp a piece of wood to the drill-press table to make the straight outer cuts, and clean out the rest of the wood freehand. With the cube clamped in a vise, use a propane torch at low flame and pass it back and forth over the work so the tip just touches the wood to char it lightly.

If the wood should catch fire, blow it out. If necessary, remove heavy charring

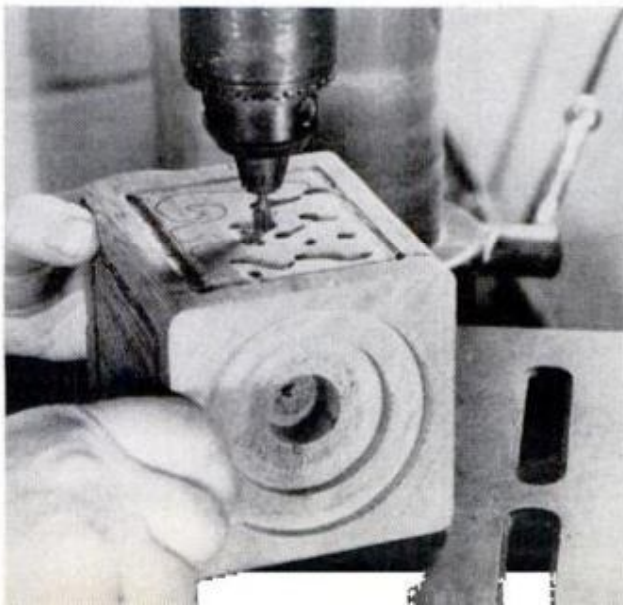
(Please turn to page 177)



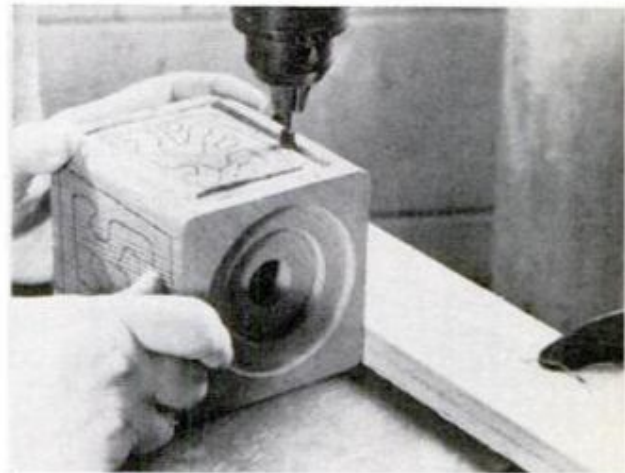
BLOCK IS MOUNTED in four-jaw lathe chuck and wells are turned in top for three sizes of candles



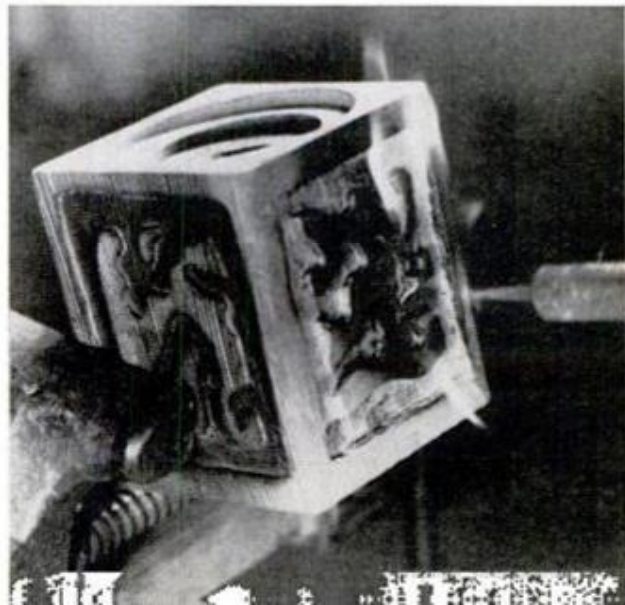
BACKGROUND OF DESIGN is carved freehand to a depth of $\frac{1}{8}$ in. with a burr cutter in the drill press

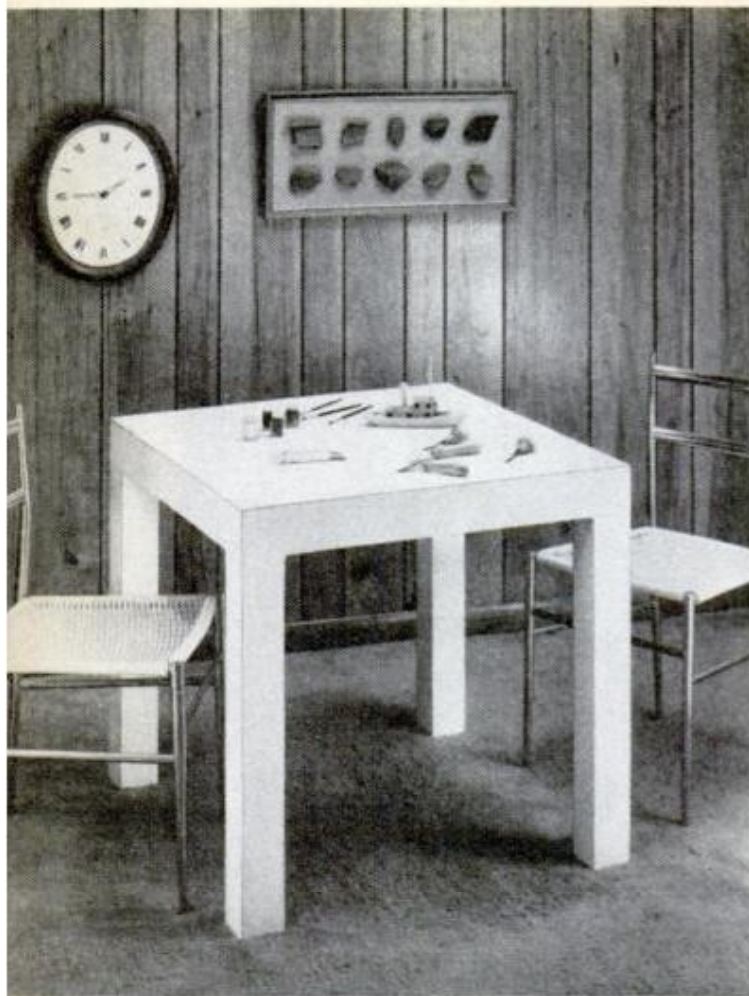


BOARD IS CLAMPED to drill-press table for a fence to guide block when you make straight burr cuts



WOOD IS CHARRED lightly with flame of torch. Keep the flame moving to keep wood from catching fire



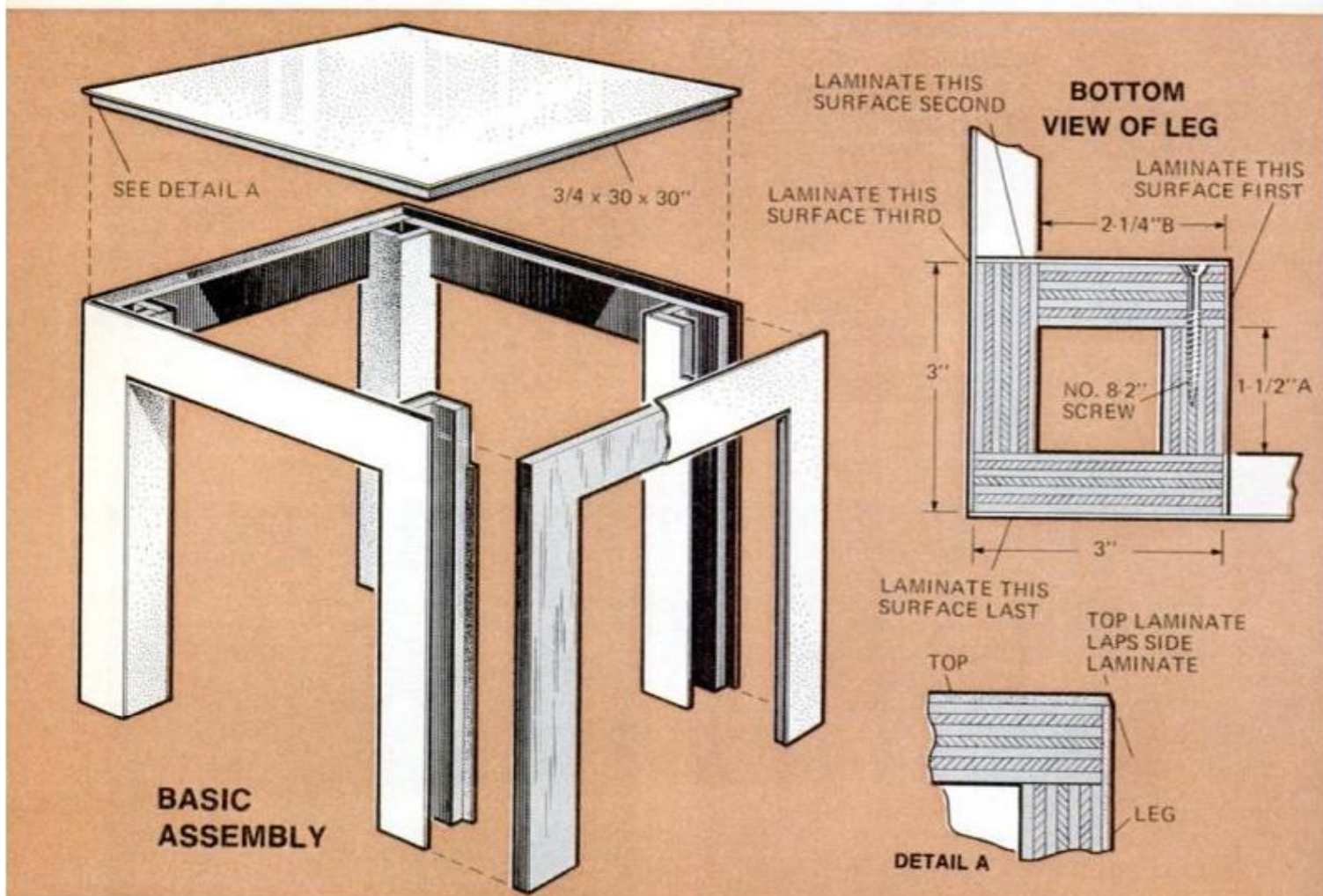


Parsons bridge table

The parsons table has nothing to do with a parson, contrary to popular belief. Some say it was named after Albert Parsons, founder of the famous Parsons School of Design, and credit him with designing it. Others say it was designed by a Frenchman on the Parsons faculty.

Because of its overall flush design, the Parsons table has always presented a problem to the do-it-yourselfer when it comes to attaching the legs rigidly. I solved this by making the legs hollow and as an integral part of the whole table. The result is a table with incredibly rigid legs. After I covered all of the exposed surfaces with a white Micarta (decorative laminate), the table appeared to be molded of plastic.

The cutting diagram shows how you can economically lay out all 13 parts of the 30x30x30-in. table on a sheet of 4x8 plywood $\frac{3}{4}$ -in. thick with a minimum of waste. The four U-shape sides are cut alike as are the pieces for the built-up hollow legs. Each side member laps the edge of the adjacent one, which accounts

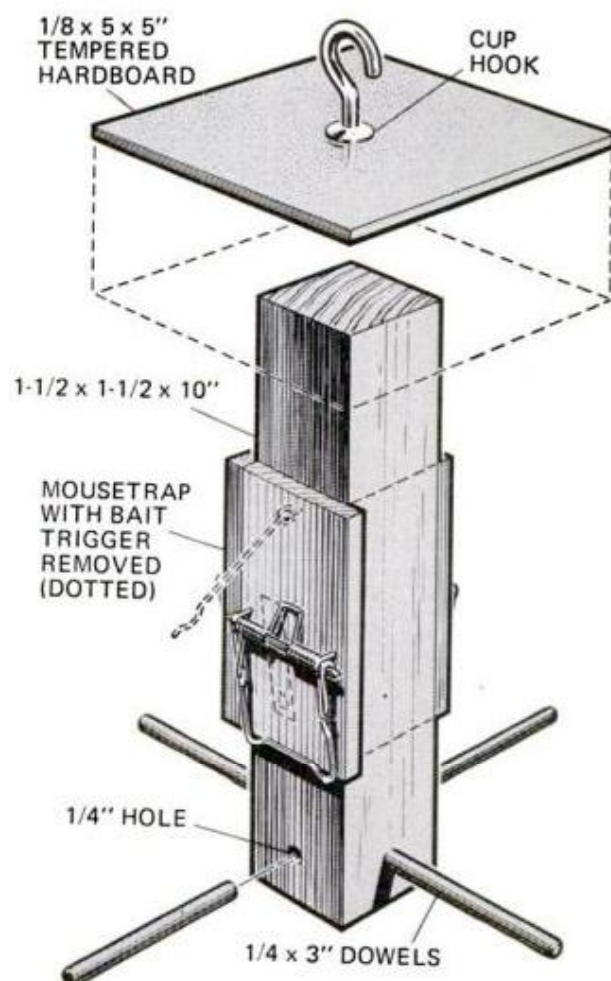
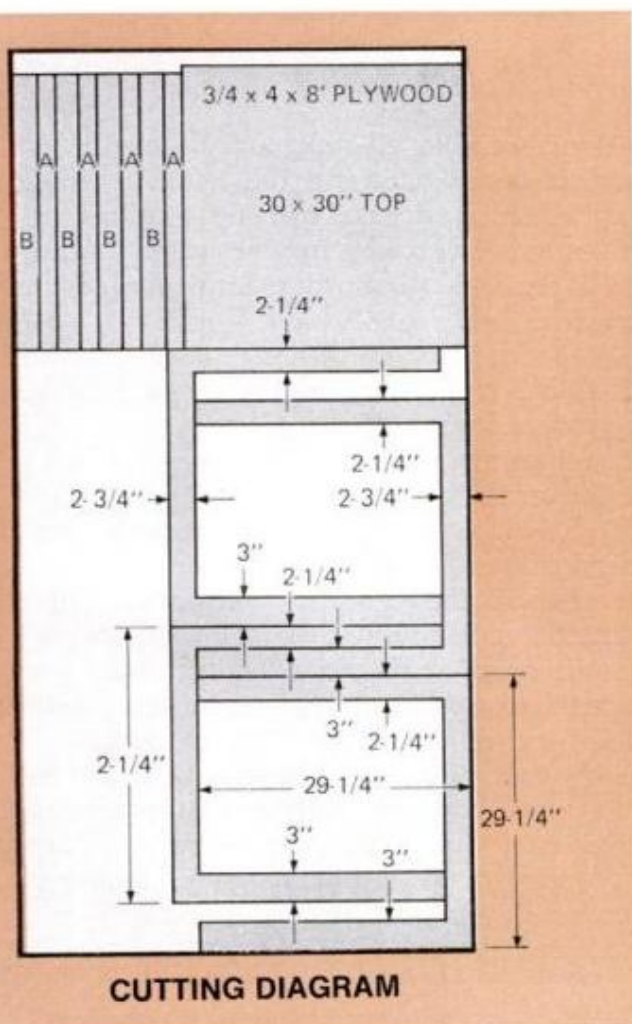
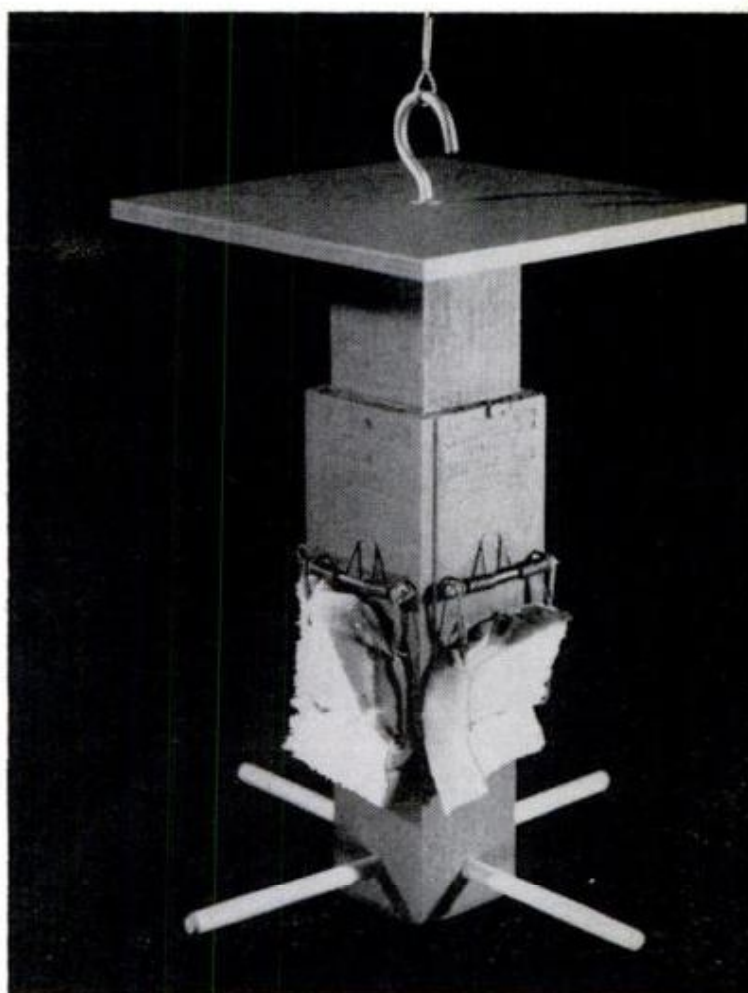


for one leg of each side being 3 in. wide and the other 2¼ in. All the joints are butted, glued and nailed (or screwed); the top is applied last.

The laminate is applied to the legs first, then to the U-shape sides and finally to the top. For instructions, see *How to Work with Plastic Laminates* (page 154, March '70 PM). Directions for applying contact cement to bond the laminate are on the can.—William Schremp, Huntington, N.Y.

Four-station bird feeder

Using four common mouse traps to hold suet, bread and other tidbits for your feathered friends, this hanging bird feeder can be quickly mass-produced in your home workshop and sold for a handsome profit. As you see, after the bait trigger and wire are removed from it, each trap is fastened to a side of a length of 1½-in.-sq. wood. Holes are drilled at the lower end for ¼-in. dowel perches, and a 5-in.-sq. roof of ⅛-in. Masonite is attached to the top with a brass cup hook. Paint the feeder a rustic brown.—H. D. Butts, Brownsville, N.Y.



Hard answers to concrete questions

There is no mystery about computing amounts, ordering, or working with concrete—if you have facts. Here are answers to eight most asked questions

By STEVEN J. HOWARD



FALSE 'EXPANSION' JOINT is made after slab is troweled

WHEN CONCRETE around your home starts to crack, crumble or flake, you may justifiably wonder why. Concrete should last as long as the house—failure can usually be blamed on an inferior mixture, improper handling, or both. To help you avoid common pitfalls, here are the answers to some basic questions.

● *How do I order ready-mix concrete?*

By the cubic yard (27 cu. ft.). To determine amount needed, use this formula:

$$\frac{\text{Width} \times \text{length} \times \text{thickness (in feet)}}{27} = \text{cu. yds.}$$

For example, a driveway 6 in. thick, 10 ft. wide and 60 ft. long would figure:

$$\frac{10 \times 60 \times \frac{1}{2}}{27} = \frac{300}{27} = 11.1 \text{ cu. yds.}$$

Here, 11½ cu. yds. would be ordered to allow for waste and low spots.

● *Is there a minimum (volume) order?*

Generally, you can order as little as you want, even one yard. But most tran-

sit-mix outfits will add a trucking fee to orders that do not fill the truck's barrel. If you can wait until the supplier has another small delivery in your area, he may well combine the orders and forget the trucking fee.

● *Will I save money if I buy and mix the aggregates myself?*

Assuming the job is as large as a sidewalk or patio, no. To make a cubic yard of driveway concrete, for example, you need about 6½ bags of cement, 16.3 cu. ft. of sand and 19.5 cu. ft. of gravel. Current rates, depending upon locale, are approximately \$1.90 per bag of cement and a total of \$28 for those amounts of sand and gravel. This adds up to \$40.35. A ready-mix outfit will charge about \$36 for the same volume and, more important, you save yourself the mixing chore. For small jobs requiring small amounts, you're better off using a dry ready-mix such as Sakrete.

● *When is the best time to pour concrete?*

POPULAR MECHANICS

When the temperature is between 40° and 85° F. If it rains on the pour day, call the supplier early in the morning to re-schedule the delivery.

● *What is curing?*

This means keeping fresh concrete damp so that moisture doesn't evaporate too rapidly during hydration. (*Editor's note:* Hydration is the forming of the compound—concrete—by the union of water with cement and aggregate.) To cure, cover the freshly poured surface with material such as burlap. Then, depending on temperature and humidity, use a garden hose to moisten burlap once or twice daily. Keep concrete covered and moist five to seven days.

● *My concrete steps are scaling. What causes this unsightly mess?*

As exposed concrete alternately freezes and thaws, thin chunks may break away. The best prevention is to use air-entrained cement to begin with. This agent, which consists of microscopic air bubbles, also protects concrete from ice-melting salts. Existing concrete can be treated with an oil solution—*before scaling begins*. To make a gallon of the solution, mix .03 lb. laundry-soap powder, .04 lb. trisodium phosphate and pour into ¾ gal.

of water, stirring well. Stir in ¼ gal. each of boiled linseed oil and kerosene. This mixture should be mopped on the concrete when temperature is above 70° F.

● *Can I place concrete in cold weather?*

For the average homeowner, working with concrete when the thermometer is around the freezing level is not a good idea. If it's a must when the temperature is below 30° F., the ready-mix operator should heat the aggregates before mixing. A masonry antifreeze should be used to accelerate set and reduce water content. Make sure no ice is formed on the subgrade, forms or steel reinforcing, and insulate the ground to keep it from freezing until concrete is placed. The poured work must then be covered to retain heat. Walls, foundations and the like should be covered with canvas and then kept warm and dry with salamanders (portable heaters) or other mechanical means for seven days. Considering this trouble, try to postpone the job until spring.

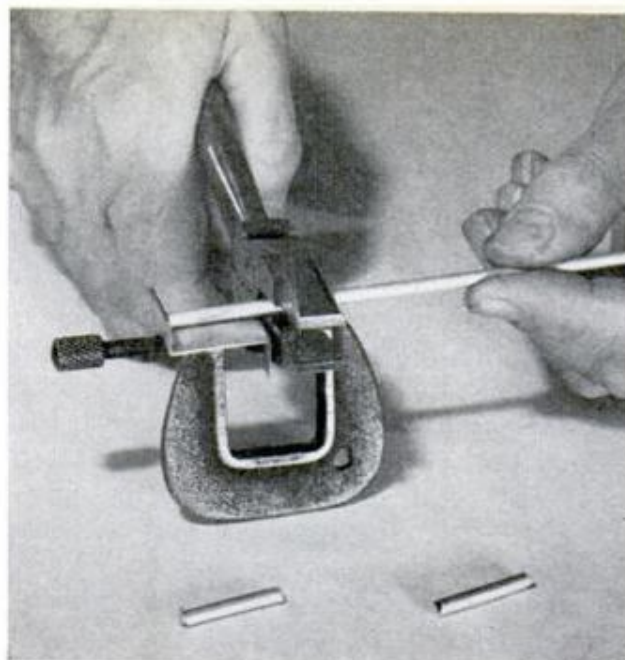
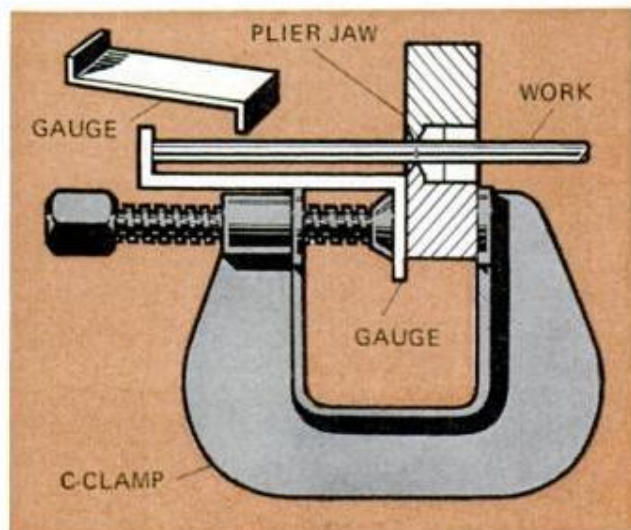
● *How about concrete in hot weather?*

During excessively hot, dry weather, dampen the subgrade and forms to slow absorption of moisture from concrete. Protective covering should be left on for at least a week. ★★★

SIMULATED FLAGSTONE LOOK is achieved on concrete walk by scoring heavy joints. When you're satisfied with appearance, give walk final smoothing with a steel trowel to erase trowel marks alongside joints



HINTS FROM READERS

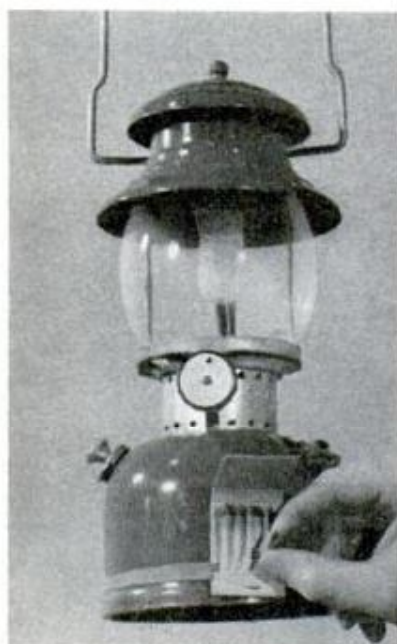


Simple jig for cutting wire to identical lengths

The next time you have to cut a number of wire pins to the same length, bend a "gauge" from sheet metal and C-clamp it to one of the jaws of your side-cutting pliers. Simply position the outer bend so that the distance from cutting jaws is equivalent to the pin length desired.—*Walter E. Burton, Akron, Ohio*

Matches at the ready

When returning to my cabin after dark, I've often had to grope for matches to light a kerosene lantern. To stop this annoyance, I keep a matchbook on the lantern base with a hefty rubber band. For safety, remove book before lighting match, then close cover and replace it.—*Ken Patterson, Regina, Sask.*



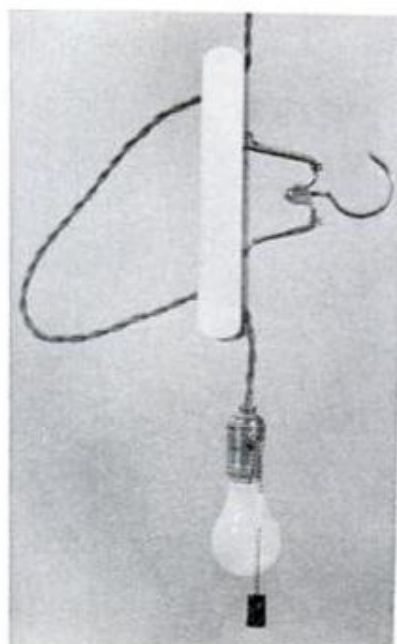
Improvised dust cover

A bowl-shaped plastic food container will make a handy lightweight cover for protecting delicate parts from dust and other shop hazards. Handle shown is a cap from a toothpaste tube. It was threaded for a 6-32 bolt that extends through two felt washers, one on each side of the plastic.—*B.W. Ervin, Kent, Ohio*



Shortening a drop cord

If it is desirable to shorten a drop-light cord for work on a particular job, just use a spring trouser hanger. You can take up the slack as needed to hang the light where you want it. If you have this problem very often, wind the cord around the hanger to store it.—*Ken Patterson, Regina, Sask.*





Today, a man needs a good reason to walk a mile.

Start walking.



25 mg. "tar," 1.5 mg. nicotine
av. per cigarette, FTC Report AUG. '71.

This kid studies

Combination bunk bed/desk solves space problem in a small bedroom



under his bed

Color photo by Robert D. Borst
Cabinetry by Everett Johnson

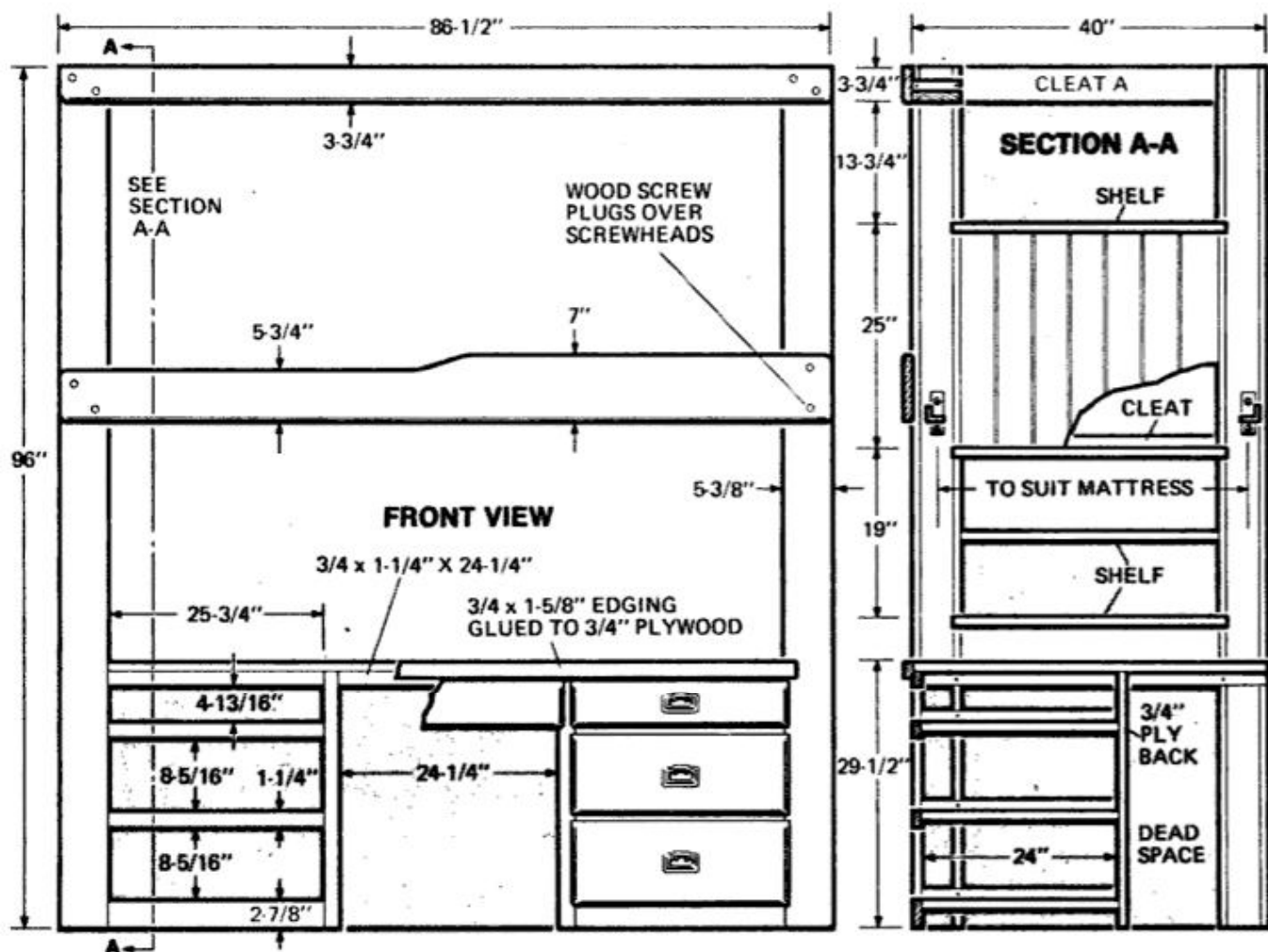
NOT ONLY DOES this kid study under his bed, he sleeps over his desk. Far from being a mixed-up kid, young John Linkletter, son of *PM*'s managing editor, thinks he has the grooviest bunk bed/desk ever, and feels he's solved the space problem (the combination unit is his own idea) in a small room.

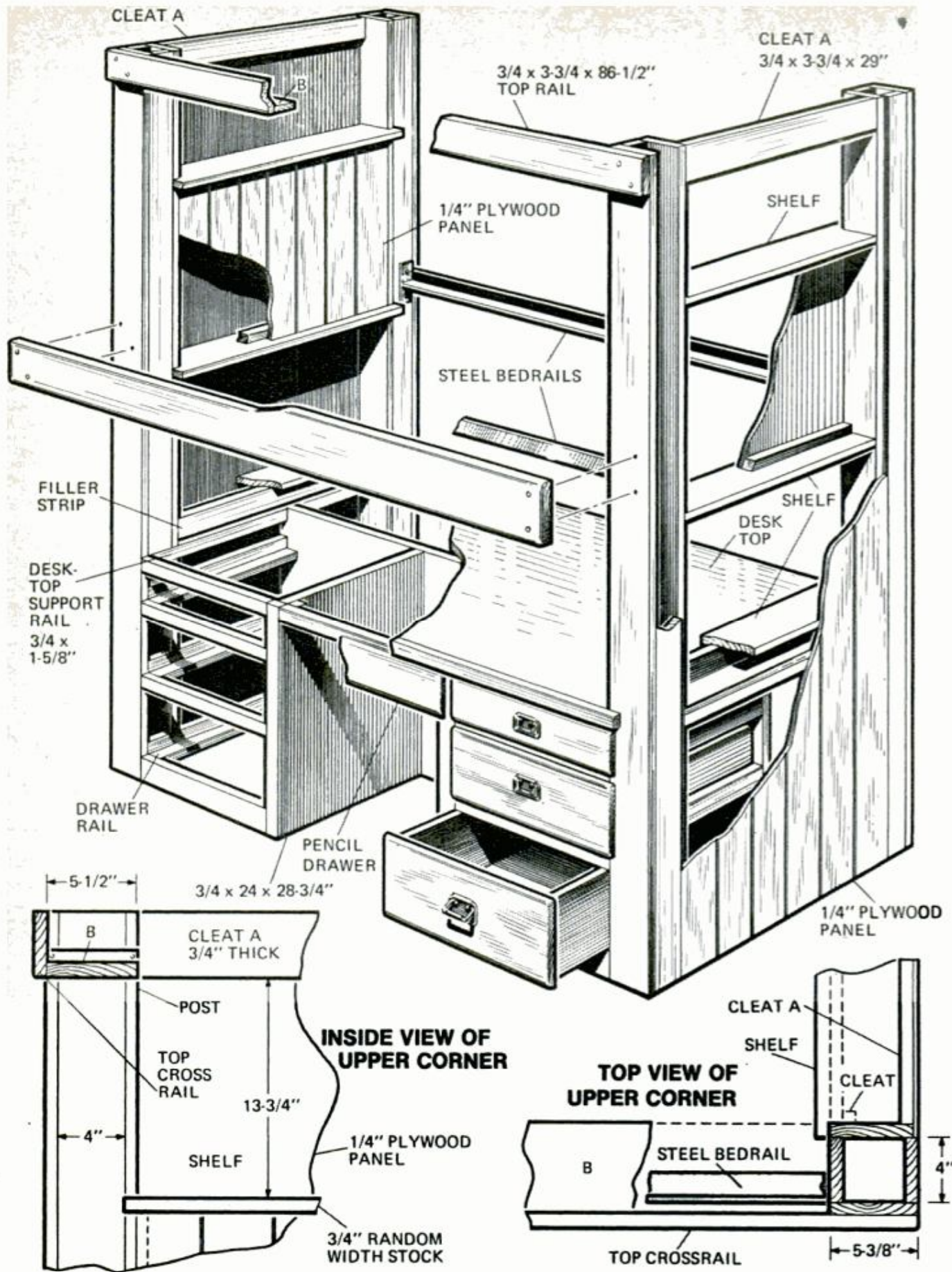
This two-in-one unit occupies a corner of the room from floor to ceiling to provide a regulation-size bunk bed and a kneehole desk with nearly a 4x7 ft. top. Ample in size for homework galore, the desk also presents a great hobby and play surface for model building, train and racing-car layouts—you name it. Three roomy drawers flank each side of the kneehole with a pencil drawer above.

Constructed of common white pine, it is pretty much a duplicate each side of a centerline. Like members are

made the same except for being assembled left and right hand. This is particularly true when making the four hollow posts and the two separate drawer compartments.

Since the posts butt against the ceiling they have to be built in place. You can't expect to tip them up into place if put together on the floor. Each pair of end posts is joined together with a panel of 1/4-in. plywood, which can be plain or fancy with random grooves. If the bed is built in a corner, only the exposed end would require fancy plywood. If centered on a wall, both ends would be exposed. The distance between posts is set by the length of the steel bedrails. The original rails (and mattress) are from Sears and measure 75 in. long. They are for bunk beds without springs, and a pair costs about \$6. After the rails are bolted to the posts of each end assembly, you can





proceed to add the connecting board across the top at the ceiling and the board that hides the bed rail. These are fastened with screws set in counter-bored holes and capped with plugs.

The rails of the drawer compart-

ments are attached to the front posts with dowels. Notice that a full-length plywood panel provides a back for each compartment and the kneehole. This panel also supports the outside drawer slides at the rear. ★★★

ONLY DODGE HAS A 3/4-TON PICKUP DESIGNED TO HANDLE THE LARGER CAMPERS.

BUY NOW AND GET A **FREE** AUTOMATIC TRANSMISSION.

The Trailblazer Special is a specially equipped D200 pickup with a Camper 9000 package to handle the larger slide-on campers. This unique camper has a GVW of 9000 pounds, the highest rating in the industry for a 3/4-ton pickup. It carries a total payload of up to 4645 pounds. To make it even more attractive for you to buy now, Dodge is not charging your Dealer for the automatic transmission.

So when you order a Dodge Trailblazer Special equipped with the following equipment, your

participating Dealer can offer you the automatic transmission free.

THE SPECIAL EQUIPMENT INCLUDES: Camper 9000 package • Heavy-duty chassis package, including heavy-duty frame, axles, springs, brakes, and jack • 9.50 x 16.5 (10 PR) tires • 60-amp alternator • Stabilizer bar • Two-tone paint • Full foam seat cushion and back • Undercoating • Bright hubcaps.

See your Dodge Dealer soon, because this offer is for a limited time only.

Check out his complete line of recreational vehicles.



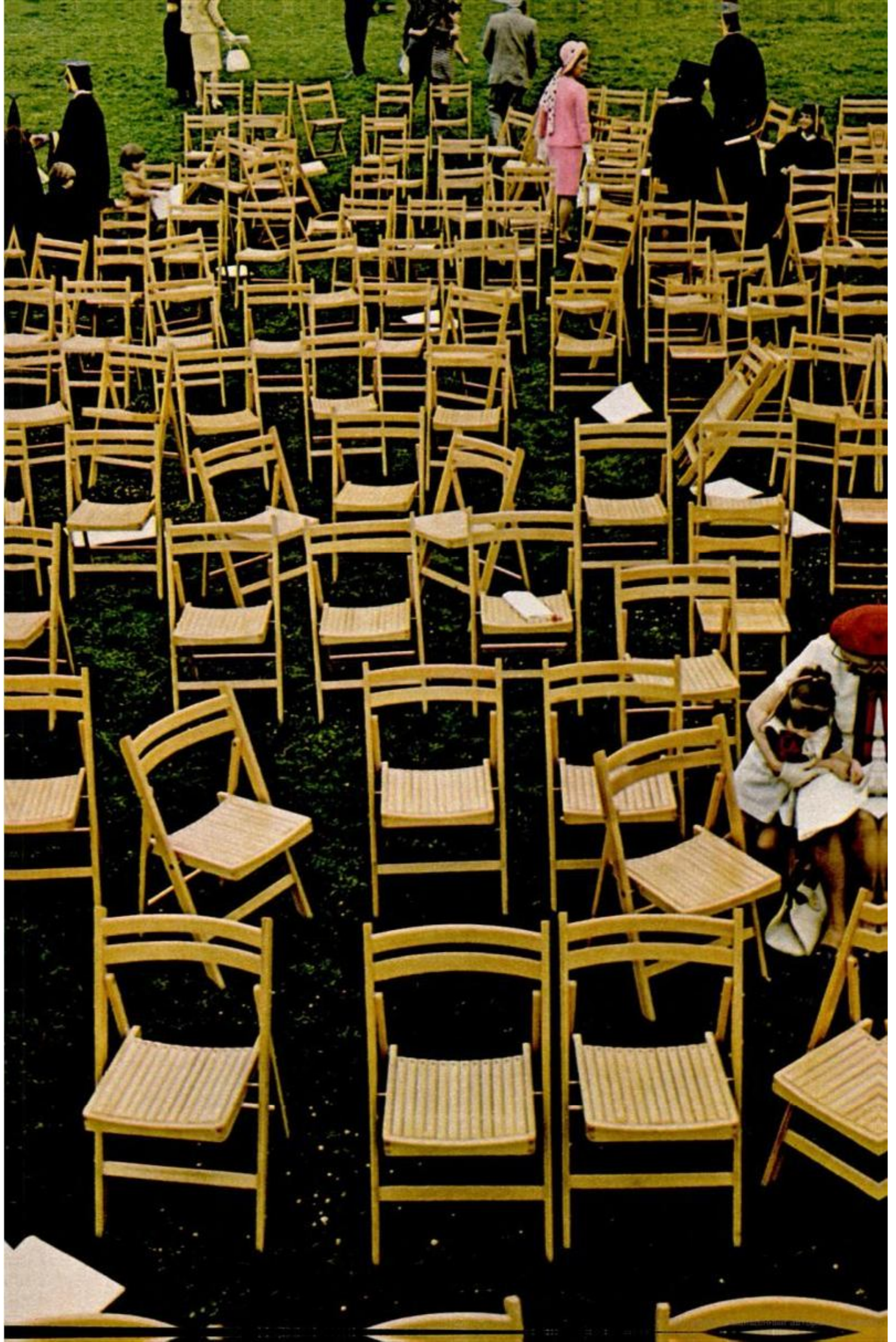
 **CHRYSLER**
MOTORS CORPORATION

**BONUS
OFFER**

Get a Good Guys Trailblazer Kit at your Dodge Dealer's.

A free packet of helpful literature, called the "Good Guys Trailblazer Kit," is available now at your Dodge Dealer's. It contains: Lyle Engle's new "Complete Book of Motor Camping" • KOA Kampground Directory • National Parks Guide • Carefree Campering Guide • Trailer-Towing Booklet. To get this FREE packet, simply bring this coupon to your nearest participating Dodge Truck Dealer. Supply is limited, so act fast. Going places? Let the Good Guys guide you.





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A job where you can learn a skill. We have over 200 job-training courses. Taught by excellent instructors, in good schools, with the finest equipment around.

A job that can become a career in the Army. Or in civilian life.

A job that gives you a chance to travel. Make new friends. Meet people. Grow.

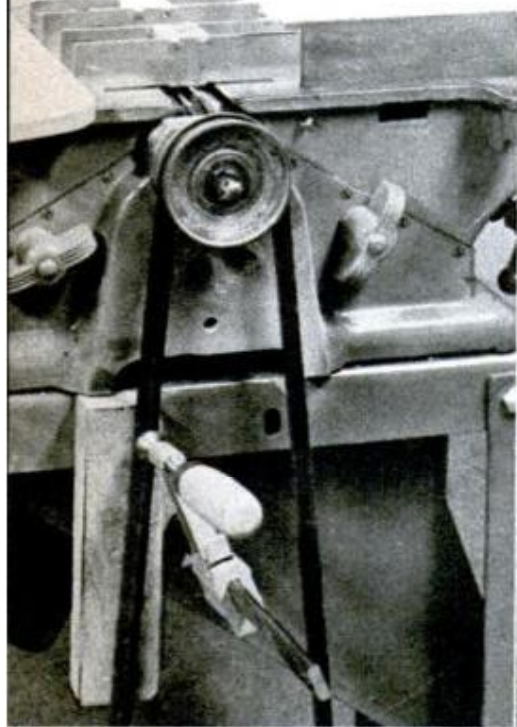
And with our Delayed Entry Option, you can sign up today for the job training you want and report any time within the next six months, depending on the course you choose.

Wouldn't you enjoy your summer more if you knew where you'd be in the fall? Your local Army Representative can arrange it.

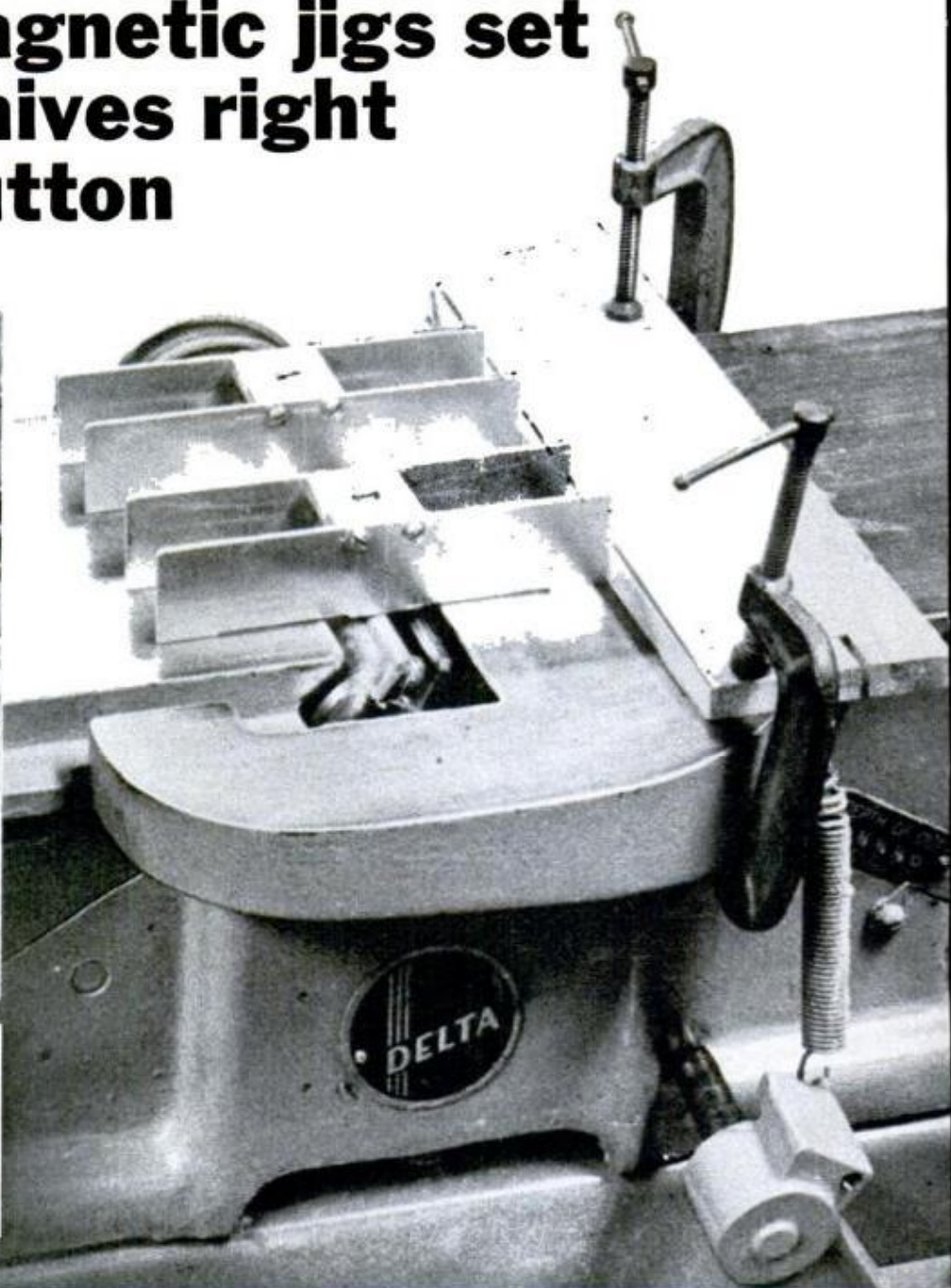
**Today's Army
wants to join you.**

Army Opportunities Dept. 200, Hampton, Va. 23369	Date _____
I'd like to know more about the job-training and promotion opportunities in today's Army.	2PM 6-72
Name _____	Date of birth _____
Address _____	
City _____	County _____
State _____	Zip _____ Phone _____
Education _____	

These magnetic jigs set jointer knives right on the button



DRIVE BELT, when clamped to leg of machine's stand (above) keeps cutterhead from turning. Block of wood is placed between belt and leg. A second block clamped to front table serves as a stop for the two magnetic jigs



ALIGNING JOINTER KNIVES properly is an operation that can take hours. Two of these jigs will enable you to set the knives perfectly in minutes.

The heart of each jig is a 2½-oz. magnet that will lift about 11 pounds. Available at most hardware stores, the magnet has a hole in it which accommodates the flathead screw.

Note in the drawing, page 179, that the screw holes in the side plates are slotted to permit perfect seating of the magnet when the jig has been assembled on a flat surface.

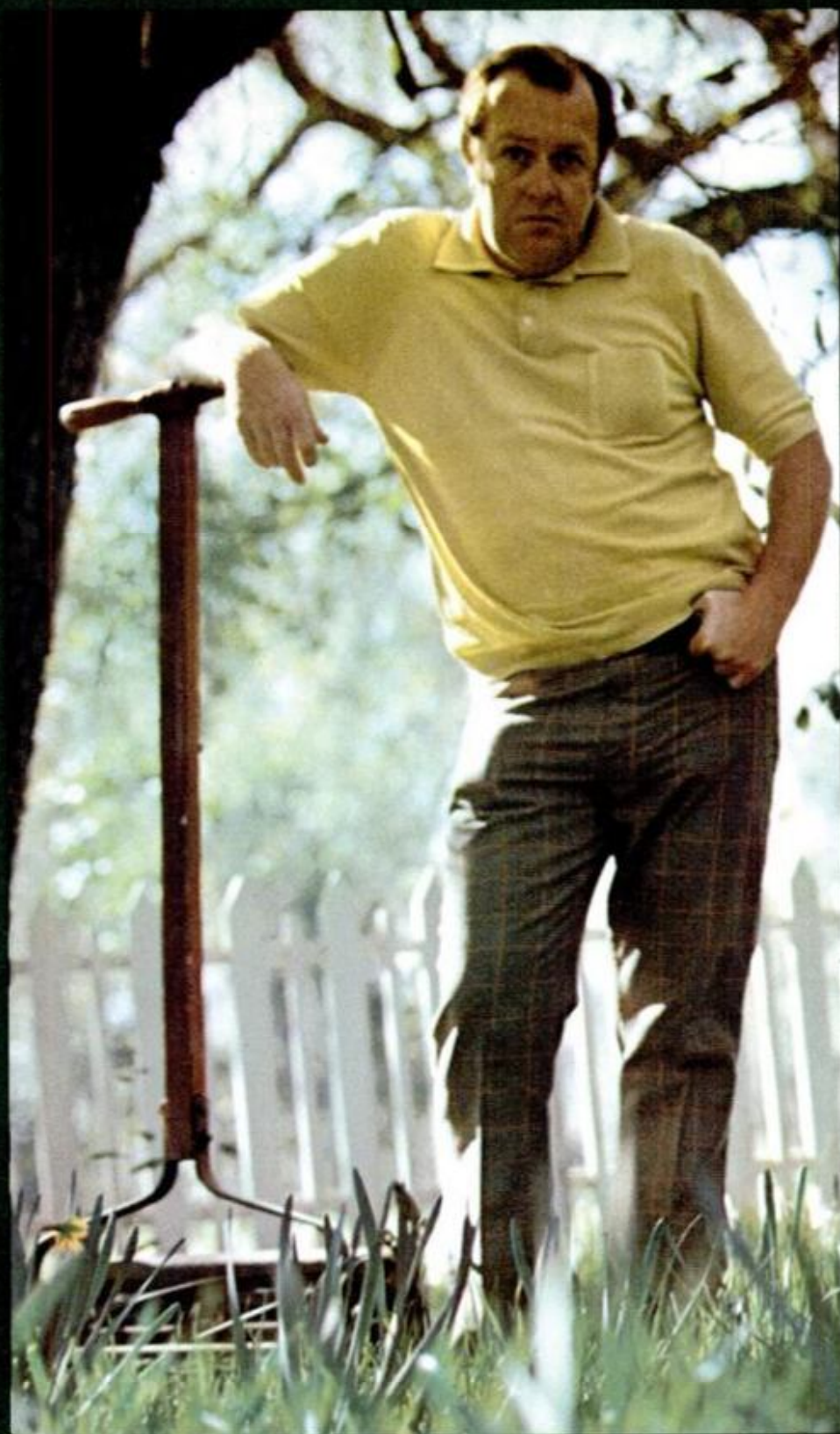
To use, loosen the locking screws in the cutterhead, and remove the fence and swinging guard from the machine. Bring

front and rear jointer tables into the same plane and check with a straightedge. Align the index marks on the jigs over the cutting edge of the knife when at its highest point. Clamp a stop block of scrap wood to the table to keep the jigs in position, and clamp the machine's belt to keep the cutterhead from turning. Place a block of wood between the belt and machine stand when clamping to prevent displacement of the cutterhead.

These jigs are designed for a 6 or 8-in. jointer. For a 4-in. jointer, reduce their size accordingly and substitute smaller magnets.

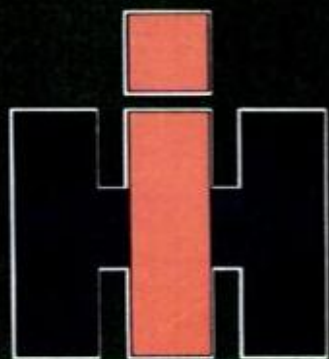
If your local hardware store does not
(Please turn to page 179)

Season's greetings.



Ah, summer. Isn't it beautiful? So nice and green and birdies singing, and here comes the grass again, growing like a wild plant from outer space, swallowing up your weekends.

This year, cut it down to size with power lawn mowing equipment from International Harvester. Choose from big, strong, reliable Cub Cadet[®] tractors, riding mowers, walk behind power mowers. There's a model with just the right power for you and your grass, from the wide open spaces to a city backyard.

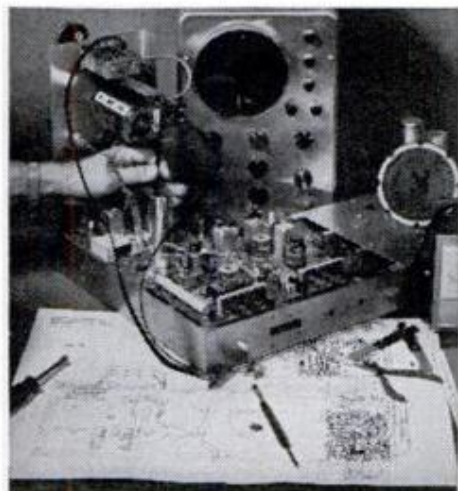


International Harvester

Any way you cut it.

3 needed skills NRI can teach you at home

NRI courses use "bite-size" texts to show you how to service TV-Radios, Repair Cars or Appliances



TV-Radio Servicing

The NRI TV-Radio Servicing course includes your choice of black and white or color TV training equipment. NRI courses cover FCC license preparation, complete communications electronics, aircraft electronics, mobile communications, marine electronics, amateur radio, industrial and business electronics.

Automotive Repair

Take your choice of Master Automotive Technician training or a shorter Automotive Tuneup and Electrical Systems course for the man seeking greater understanding of basic car repair. Both courses include professional equipment so that you get "hands-on" experience and the chance to earn spare-time money making repairs.

Appliance Repair

NRI trains you to fix all kinds of electrical appliances, plus air conditioners, refrigerators, house wiring, electric motors, even small gas engines. An appliance tester is included for fast trouble shooting, so you can begin earning money repairing appliances long before you finish the course.

"Hands-on" training pays off

NRI was the first to supply home study students with custom-designed training kits to give practical hands-on experience as you learn. You get more value from the exclusive Achievement Kit sent the day you enroll, to "bite-size" texts and training equipment. Learning TV-Radio, Automotive Servicing and Appliance Repair at home is easy, exciting, the simplified, dramatized NRI way.

Earn \$5 to \$7 an hour spare or full time

Tens of thousands of NRI graduates are proof it is practical to train at home in your spare time. Keep your present job while preparing for a better one and earn \$5 to \$7 an hour extra in your spare time.

Fix your own equipment, or earn money making repairs for friends and neighbors. NRI shows you how.

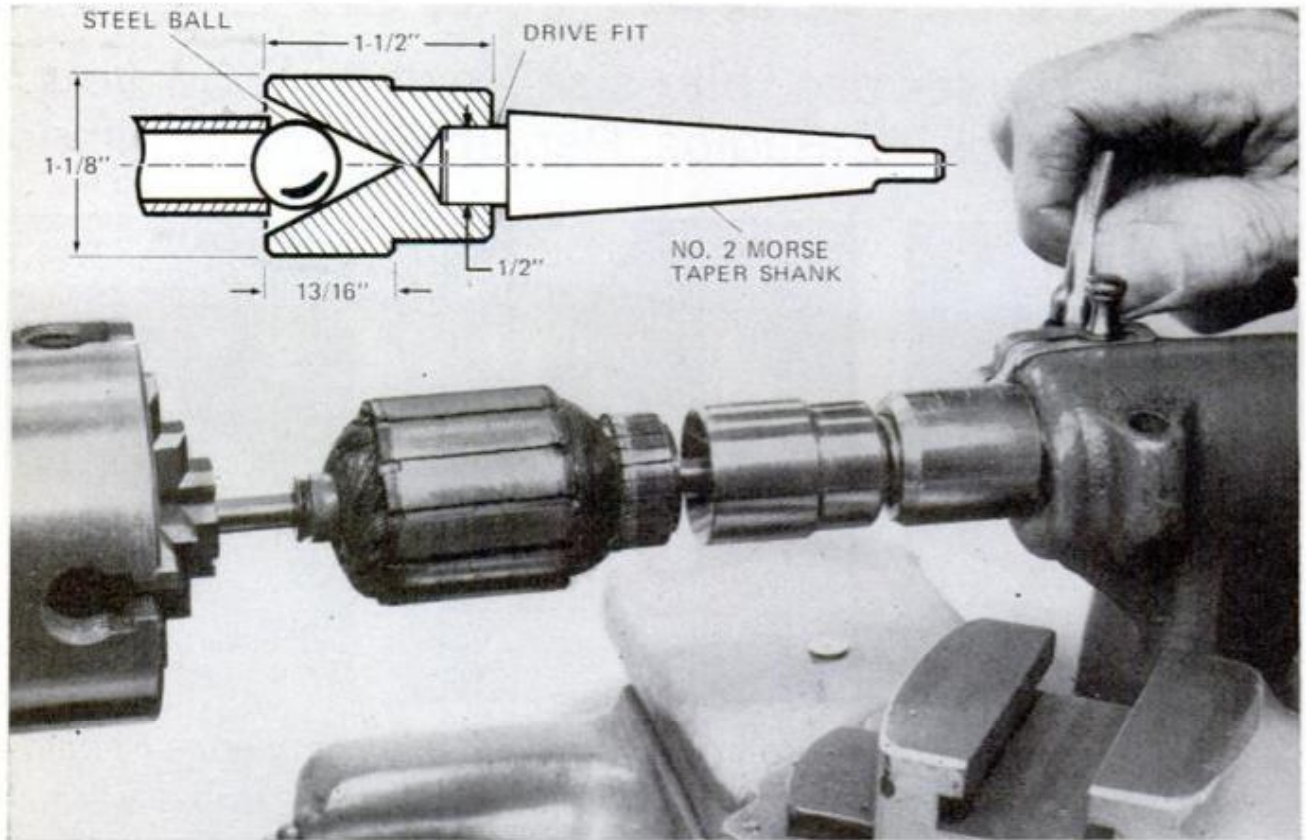
Train with the leader—NRI

The same training innovations which have made NRI the leader in career training at home is now available to you. Let NRI help you step up to better pay, a brighter future. Decide now to move ahead . . . the decision is yours to make. Mail the postage-free card today for a free full-color catalog in the field of your choice. No obligation. No salesman will call.



NRI TRAINING
3939 Wisconsin Avenue
Washington, D.C. 20016

Four practical



Hollow-cone lathe center

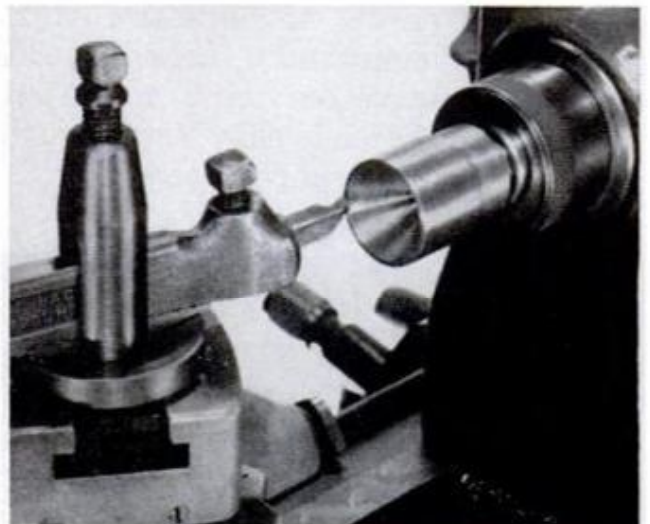
A hollow-cone lathe center is useful when a motor armature or other piece of work that has no center hole is to be mounted for turning, filing or polishing. The cone can also hold a steel bearing ball that serves as a center for tubing or other piece, especially one having an i.d. too large to rotate on a regular center.

Hollow centers other than cone-shaped can be used, but a cone will accommodate a range of diameters. A hollow center can be used in the tailstock, with a chuck grasping the other end of the workpiece; or both headstock and tailstock centers can be hollow, if you have a lathe dog to drive the work.

The cone center illustrated was made by machining a conical cup of approximately 1-in. maximum diameter and having an apex angle of slightly more than 60° , in a piece of $1\frac{1}{8}$ -in.-dia. steel rod fitted tightly over the end of a taper shank from a broken twist drill. The cone was machined with this assembly inserted into the headstock-spindle taper. Greater wear resistance would result if the cone surface were hardened, and finish-grind-

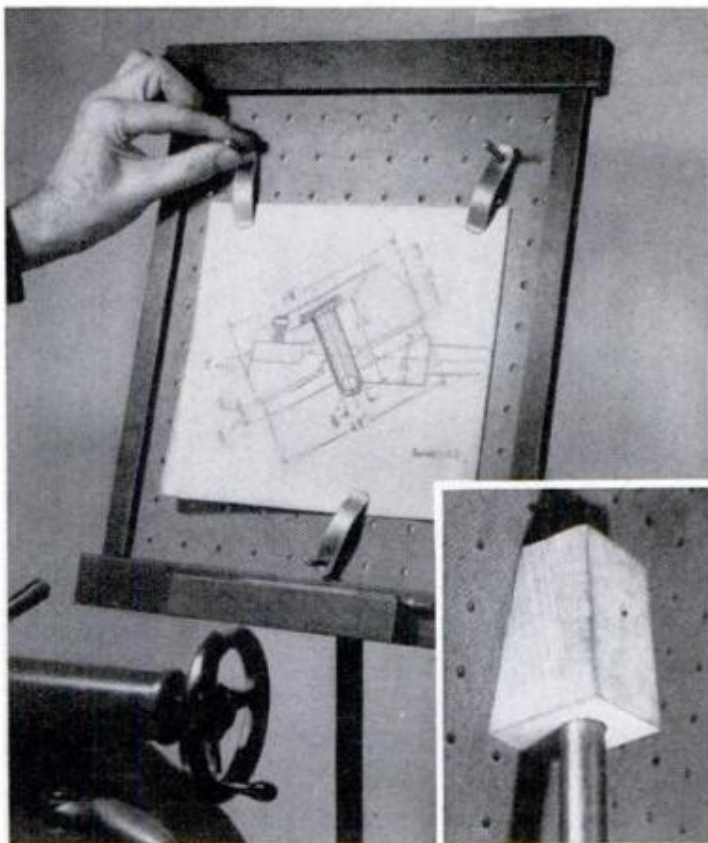
ing is desirable after hardening, for greatest accuracy.

If a steel ball is used in the cone, it is selected to suit the internal diameter of the tubing or other piece to be centered. Ball diameter is somewhat greater than tubing i.d. Of course, whether the workpiece is positioned against the conical surface or the ball, its end must be square and even. Sometimes the end can be trued with the help of a center rest. Also, the part contacting the cone or ball must be kept lubricated.



shop ideas

By WALTER E. BURTON



Work-drawing holder

A piece of perforated hardboard is the heart of this handy lathe "bulletin board" on which drawings and other material can be displayed conveniently for the operator. The panel is mounted in any suitable frame.

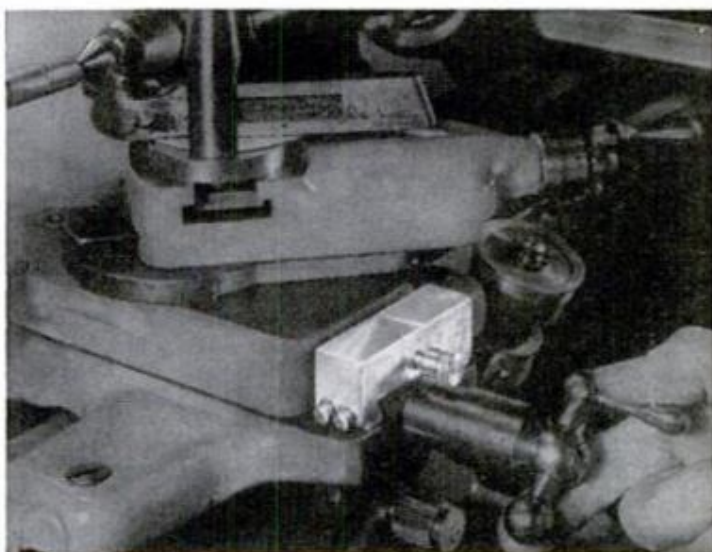
A mounting block, cut from 2x4 stock with the face at about a 15° slant from the vertical, is fastened to the back of the panel at the center with four screws. A vertical hole is bored in the block so it will fit over the end of a length of 3/8-in. pipe fitted with a floor flange and fastened to the benchtop at the tail-stock end of the lathe.

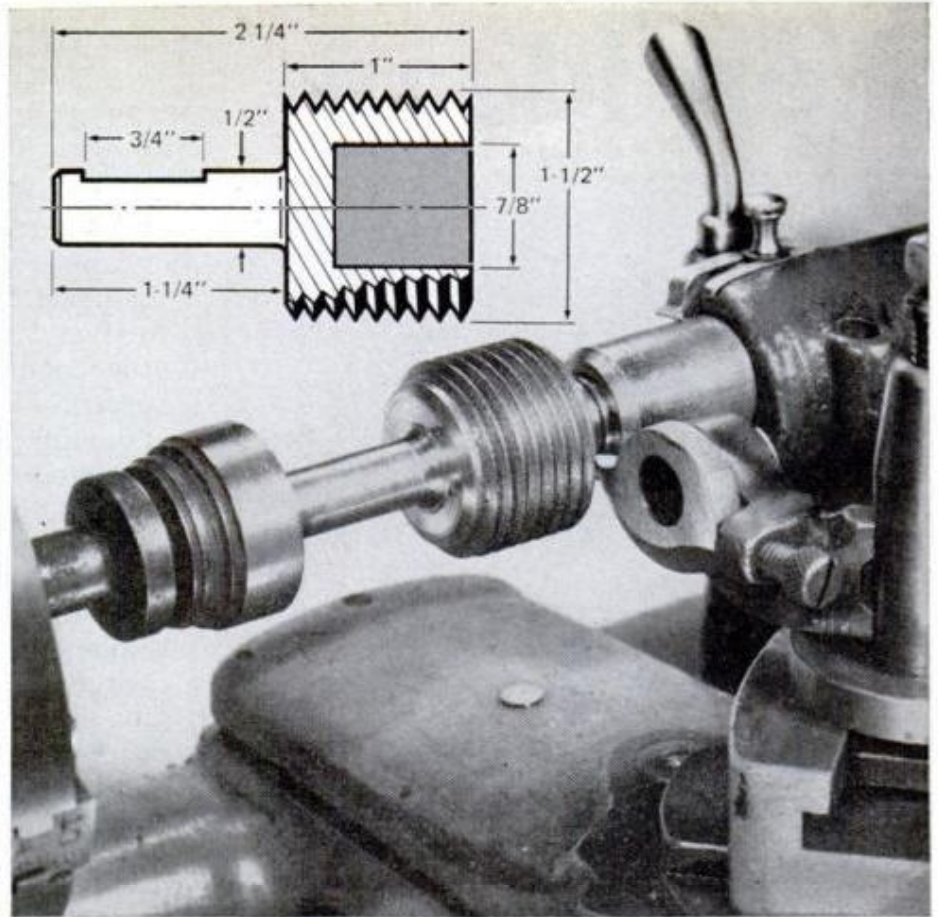
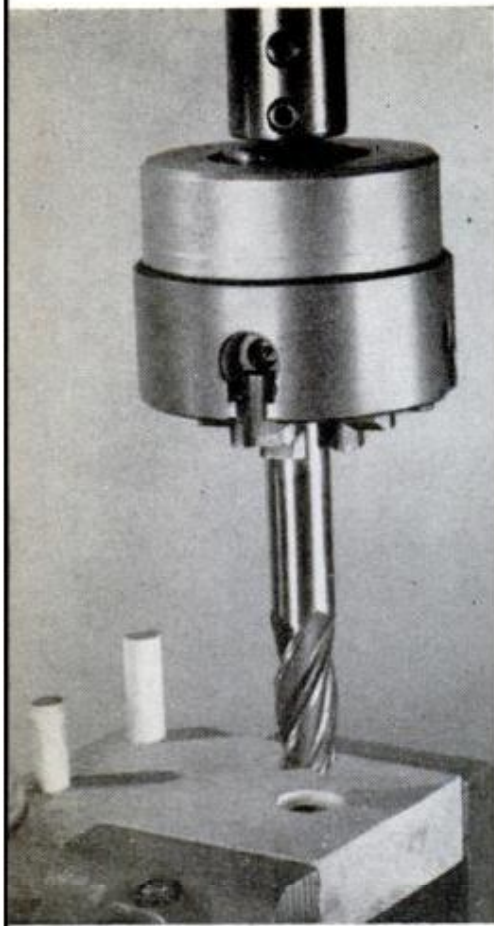
The holding clips shown were made from flat spring stock and fitted with knobs of 3/16-in. brass rod 1 in. long. Knurling the end knobs provides a better grip for moving them from hole to hole.

Cross-slide stop

A cross-slide stop is an attachment that prevents a lathe cross slide from traveling beyond a predetermined point. Because it is particularly useful in threading operations, this gadget is sometimes called a "threading stop," but it can serve in other ways, too.

In thread-cutting, the stop enables the tool to be reset quickly to cutting position after it has been backed away from the work and returned to the starting point. For the new cut, the cross-feed screw is turned to move the slide toward the work, until the stop prevents any farther movement. This brings the tool to the work without running the risk of jamming or of your forgetting where the micrometer scale on the cross-feed screw has been set for the preceding cut. Chip depth is adjusted either by turning the "sliding screw" of the stop or moving the compound slide—and the new cut can be taken. In machining a number of parts to a certain diameter, the stop can be set





to position the tool for the final cut—much as stops are used on turret lathes. Similarly, the stop can limit the depth of cut in forming slots, shoulders and the like.

Lacking a source from which to obtain a ready-made stop, you can whip together a workable one from a block of aluminum, case iron or steel, two small bolts for setscrews, and material (such as 1/2-in.-dia. rod) for a "sliding screw."

Lathe chuck on drill press

A small lathe chuck mounted on the spindle of a drill press that normally handled up to 1/2-in.-shank bits enabled me to use a 5/8-in. straight-shank end mill for counterboring holes in hardwood to a diameter of nearly 1-in.

Such a chuck can expand drill-press use in other ways. If it is an independent-jaw type like the 3-in. Craftsman chuck shown, it can handle unsymmetrical or odd-shaped cutters of various kinds. For instance, a cutter could be made from flat steel stock to turn decorative rosettes on wood, and the chuck jaws adjusted to grip it firmly.

To counterbore a hole to almost 1-in. dia. with the 5/8-in. end mill shown, the tool was set off-center as far as the chuck

opening permitted. The spindle was run at rather low speed, and feed was gradual and careful to prevent the tool from grabbing. A spindle with considerable play might have been a problem in this case.

The adapter for connecting the chuck shown to a 1/2-in. pot (setscrew) chuck on a Delta drill press consists of a steel plug having a 1 1/2-in.-8 thread about 1 in. long—the same thread as that on the headstock spindle of a lathe on which the chuck normally is used. Projecting from this plug is a 1/2 x 1 1/4-in. shank to fit in the pot chuck. It has a flat for two setscrews to bear against. The plug center was bored out to permit tool shanks to project farther into the chuck. Photo and drawing above show how adapter is made.

A chuck permitting a drill press to handle larger-than-normal bits and cutters should not give license for attempting to do work that will overstrain the machine. However, there are numerous little jobs such an arrangement can make possible. For example, an oversize drill bit can be expected to work satisfactorily in such "gentle" materials as wood without overloading the spindle or other parts—but it might not be advisable for drilling tough metal. Spindle speed should be regulated to match size of bit or cutter used. ★ ★ ★

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Electronics Specialist

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New tools you should know about



STAINLESS-STEEL WRENCH SET is designed especially for professionals and men who like the look and feel of high-quality tools. Of 100-percent stainless steel, tools have maximum resistance to chipping, peeling or rusting. The light wrenches— $\frac{1}{16}$, $\frac{1}{2}$, $\frac{9}{16}$, $\frac{5}{8}$, $\frac{11}{16}$, $\frac{3}{4}$, $\frac{7}{8}$ and $\frac{1}{2}$ -in.—feature tapered, torpedo-shaped styling for greater hand comfort, are packed in a heavy-gauge metal case with fitted red-velvet interior. At most Sears stores, or through their catalog, about \$45.



WOODCARVING KNIVES can be used for whittling, sculpting and pattern and modelmaking. The six knives feature blades of high carbon manganese alloy steel, heat-treated to Rockwell C57-58 hardness to take and hold a keen edge. The blade shapes are similar to those preferred by old-world craftsmen. Cherrywood handles are lacquered for durability, and designed for comfortable balance. Knives vary from $5\frac{1}{2}$ to $6\frac{3}{8}$ in. long overall. Set No. X-1581.8 is \$9.95 plus \$1.15 postage from Brookstone Co., 9 Brookstone Building, Dept. C-PM, Peterborough, N.H. 03458.



MINIATURE POCKET-CLIP DRIVERS come in seven sizes (four shown) with nut, Phillips and Allen drivers. At hardware stores, from 70 cents to \$1 each. Vaco Products Co., 510 North Dearborn Ave., Chicago, Ill. 60610.



GLUE GUN, claimed to be the fastest that exists, squirts glue that sets in 20 seconds, bonds in 30. Other advantages are worklight indicator and automatic glue-feed and control. 10.95. Weller, 100 Wellco Rd., Easton, Pa.



SUPERDRIVER called Mister Tork is said by Technology Development Corp., 176 Second Ave., Waltham, Mass. 02154, to run screws, nuts and bolts faster. Tool uses standard socket tools and adapters, is \$9.95. When job is done, spinner handle fits in plastic handle.



Fabulous *Folbot* Holidays

Pictures show our home assembled Super Folbot.

Now, we marvel at her beautiful shape, the slim and trim lines, the accurate symmetry of this perfectly harmonious design, further enhanced by its colorful and tastily textured hull and deck of ELASTIC FIBER-PLASTIC. Our good neighbors and friends all shared in admiration.

The assembly was easy indeed. Quite an assortment of pre-fabricated sections, parts and frames arrived in cartons with numerous containers, and a multitude of fasteners, fittings, metal shapes, special cement, compounds, undercoating and valuable resin varnish; in fact everything from the first brass screw to the name plate, as the last. We fastened the instruction sheet on our garage wall for easy follow-through. Every step is described and pictured, which made it a cinch to proceed. In spite of expected 'bugs', there were none. With eager helpers, my wife and her visiting little brother, we had the framework up in four hours. Then we allowed a break to extoll about shape and lines of our handiwork.

We installed the double hull fabrics and decking, and ended up with a smoothly fitting job. Of course, all outside surfaces are already supplied with a substantial and beautiful VINYL coating, which provides this excellent and elegant Folbot



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WALLY TABER of High Adventure

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Counting everybody's time, a most enjoyable and relaxing pastime it was, it took from the prefab cartons to the BEAUTY on the lawn some 53 hours. If we value our leisure time at two dollars per hour, we SAVED over a hundred dollars this way, and would not want to miss this fun even without a saving. It all started a few months ago, when I was tired of repairing and attending to our motor boat, which took most of my free time. We also desired a more rewarding and sensible recreation, rather than constant noise and vibration of a motorized boat. We love to explore new environments and learned that folbotting offers inexpensive, independent cruising on charming waterways at a reasonable pace. We have dozens of clean rivers for exploration, a moderate surf and sea, as well as lovely lakes and connecting canals. All of these we will cruise, explore and absorb over many years in our new Folbot. Only a few times out, we already realized the difference and many advantages. In the motorboat, we could never converse quietly and had to raise voices under strain; the motorboat hopped over waves and wakes, which hardly was restful. In our Folbot we relax in deepseated, cushion supported seats with swivel backs, equal to bucket seats or easy chairs. Alternating from gentle paddling to just floating and observing the scenery glide by, we are in love with our new-found way of boating. My wife and I can readily load this Folbot on our sport car with cartop rack. Every free day off, shows us a different surrounding. We bring home unusual photos, and capture nature's best

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AIR SURFING ON SKIS

(Continued from page 100)

mountain summit to the valley floor 3000 feet below.

Dangerous? Not according to modest, mild-mannered young Jobe. "I'm not taking any more risks than a bus driver," he insists. "My kite is safer than a helicopter because it has a lot fewer parts."

One advantage of the Jobe method is that he doesn't have to hurl himself over the edge of a cliff or run madly down a hillside to become airborne. Sailing down the ski slope, he makes a smooth, graceful lift-off that's virtually effortless. Maximum speed needed for takeoff is 27 mph—no task for an expert downhill skier. Landings are equally smooth and gentle, unlike the bone-crushing crashes that are sometimes experienced by the California kitemen.

Jobe simply levels off over a flat stretch of snow, pulls the nose of his kite slightly upward into a speed-killing stall, then settles neatly down on his skis and coasts to a stop. The only problem is the occasionally encountered turbulence of a sudden mountain updraft that can blast a kiteman upward for several hundred feet. "That," admits Jobe, "can spook you." Actually, Jeff's only injuries came once when an unexpected gust of wind blew him into the treetops, demolishing his kite and inflicting minor cuts and bruises.

Even at Jobe's youthful age, his ability to fly and ski comes from years of earlier experience in related sports. At 15, he was an accomplished water skier and became a demonstrator for the firm of O'Brien Water Skis, personally selling over 300 pairs in a single season. He tried air surfing from a kite pulled by a speeding boat, but didn't like the frustrating feeling of being tied to a tow cable. So he'd climb to heights of 900 feet, cut loose the cable and glide freely back down to the water, landing on his skis.

The transition from water skis to snow skis came easily, and soon Jeff was working as a ski instructor during the winter between summer jobs with O'Brien. It was then that Jobe got the idea of combining air surfing with snow skiing. He adopted the delta-wing Rogallo design and fashioned an 18 by 27-foot hang glider from light aluminum poles covered with dacron. He sits in a slinglike seat and steers by twisting a crossbar. The whole rig weighs only 36 pounds and can be collapsed and rolled up like a boat sail for easy carrying. The name O'Brien is emblazoned on the wing in bold letters—a tribute to the firm that gave Jobe his start. Already, Jeff has sold 40 of his kites for \$500 apiece and also gets \$500 a day for his daring exhibition flights at Snowbird—a nice way to make a living if you don't mind risking your neck. And Jobe doesn't mind at all. ★★★

NEXT MONTH IN SHOP AND CRAFTS

NOW, A 20-FOOT TRAILER YOU CAN BUILD YOURSELF. This well-designed camping vehicle has all the comforts—from cooking facilities to complete bath with shower. Its factory-made equal would cost much more, but you can build PM's Laguna-20 for less than \$2000. Pick up the July PM and learn how you can vacation in style.

MAKE A COLONIAL FOOTSTOOL to match the handsome chair of solid cherry presented with full construction details in the December '71 and January '72 issues of PM. Step-by-step construction procedures will appear next month in answer to many requests.

SHORT COURSE IN CRAFTSMANSHIP: THE BENCH SAW—PART 1. Power tools can provide you with the ability to achieve a high degree of craftsmanship in any project you try. The first installment of this series acquaints you with the "granddaddy" of power tools and starts you on the way to getting the most from what you own. Make sure not to miss this most informative article—packed with photos, sketches, helpful hints.

WEEKEND PROJECTS THE ENTIRE FAMILY WILL ENJOY. Quick projects next month include a rack for your pool balls and sticks, a "Cheese Mountain" game that will keep young and old fascinated for hours and a mail organizer for the home office. Complete plans for all three will be offered.

PLUS: A one-man dinghy dolly for \$8; butcher-block table and bench set and more.



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Sunoco Special takes all the worry and confusion out of buying the right oil for your car. You see, Sunoco Special 10W-40 is really four oils in one.

It does all the work of a 10W, 20, 30 and 40 motor oil. Sunoco Special is one oil you can use in both summer and winter—in fact, all year round. Sunoco Special meets or

exceeds the warranty standards of all car manufacturers.

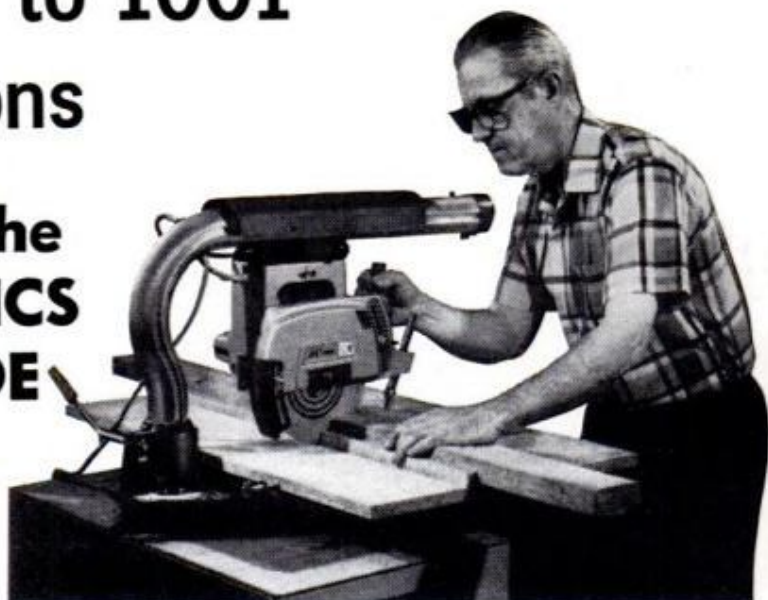
What's more, it gives you extra protection against thickening or breaking down under heavy-load, high-speed driving conditions. So change to Sunoco Special and know you're getting the right oil for your car...the right oil for all seasons, all driving conditions.

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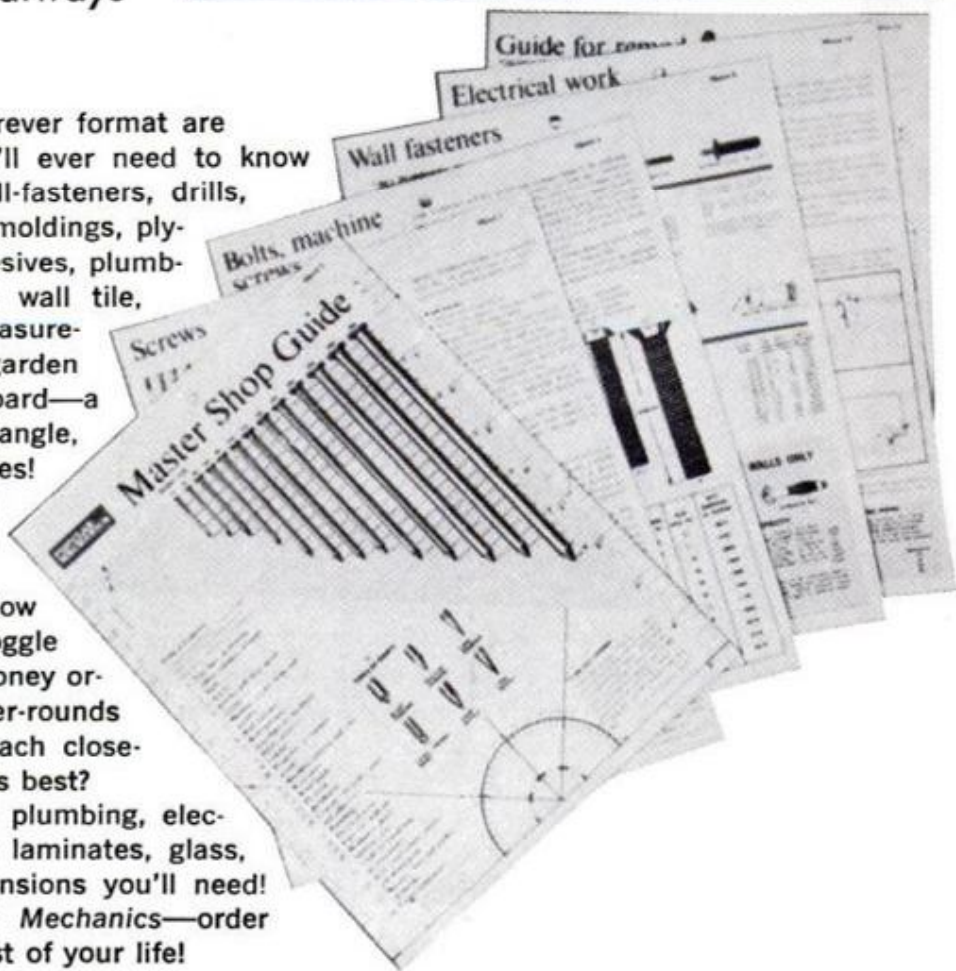


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recreational vehicle.

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Yes, reserve a 5-acre Lake Conchas Rancho for me. I understand the price is \$595 per acre
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A MESSAGE FROM THE PUBLISHER

The United States Postal Service, now a semi-independent governmental corporation, recently increased postal rates by 1.4 billion dollars.

This is just the beginning. In its new budget, the Postal Service is asking for an additional 414 million dollars.

Part of the new postal rate structure includes increasing magazine and newspaper postal rates by 142% during the course of the next five years—starting with a 30% increase this year—with no reasonable prospect of any improvement in your service.

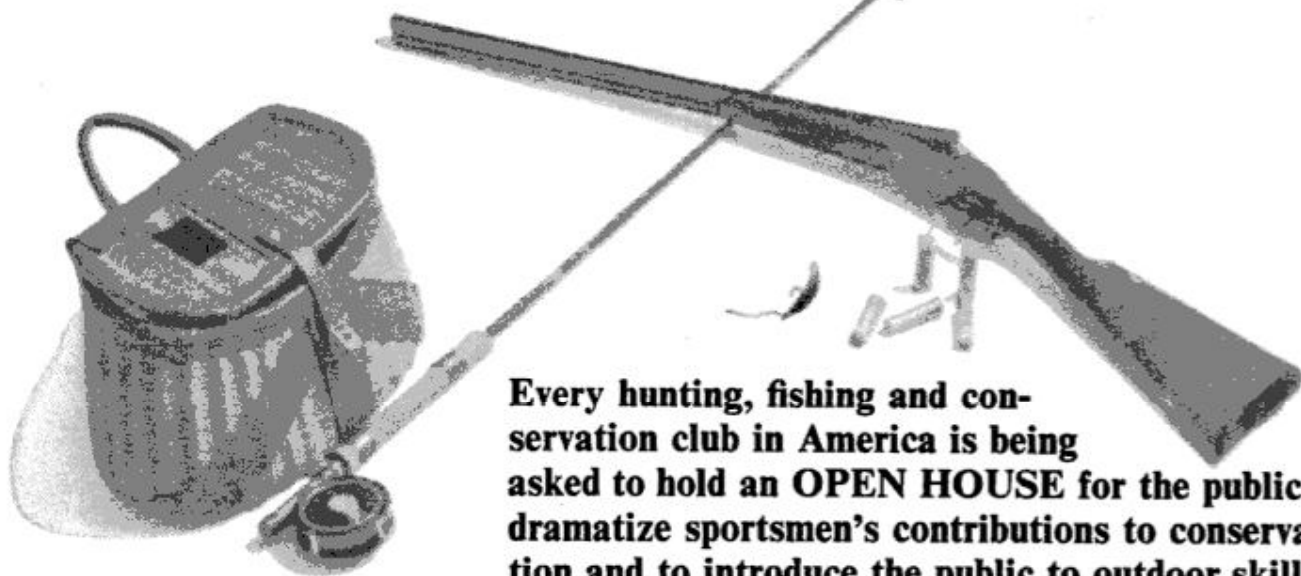
Despite the President's valiant efforts to curb inflation through his 5.5% price and wage stabilization program, the Postal Service offers no alternative to this irresponsible course of enormous rate in-

creases, both immediate and future! Where is the logic in achieving success on some fronts in the battle against inflation while at the same time permitting the Postal Service to encourage roaring inflation in other areas? Any postal increases, of course, will start an inevitable inflationary chain from publisher, to advertiser, to consumer.

We appeal to every citizen, to Congress and to the President to hold the line on postal increases for two reasons: not only to protect your right under the First Amendment for a free press, but also as a deterrent to inflation. We hope you agree and that you will write your congressman accordingly. We'd be very pleased to have a copy of your letter.

The Publisher
Popular Mechanics Magazine
224 West 57th Street
New York, New York 10019

National Hunting and Fishing Day, September 23, 1972, may be the most important day in the lives of 55 million hunters and fishermen.



Every hunting, fishing and conservation club in America is being asked to hold an **OPEN HOUSE** for the public, to dramatize sportsmen's contributions to conservation and to introduce the public to outdoor skills.

National Hunting and Fishing Day officially recognizes the role of America's sportsmen in conservation and outdoor recreation. Resolutions now in Congress not only establish NHF Day, but ask hunters and anglers to lead the public in a rededication to the conservation and respectful use of our wildlife and natural resources. Your sportsmen's club should take the leadership in your community by holding an **OPEN HOUSE** which shows your friends and neighbors what sportsmen are doing for conservation . . . and have done for the past 70 years.

Open House can win new friends for conservation and introduce youngsters to shooting and fishing. No one can do more for hunting and fishing than you, working in your own community on a friendly person-to-person level with your neighbors and business associates. By helping your sportsmen's club organize an **OPEN HOUSE**, you could show exhibits and movies about the sportsman's outstanding contributions to conservation to many new people. You and your club can set up skill centers for young people and their parents to participate in shooting, archery, casting and camping . . . really show them what goes on at a sportsman's club and how much fun it is. It's an ideal time to teach them that the American sportsman is the best friend fish and wildlife ever had. An **OPEN HOUSE** might also be used to raise funds for a conservation project with a turkey shoot or casting game. Civic leaders will be glad to provide valuable support, and you might well get a newspaper or broadcasting station to co-sponsor **OPEN HOUSE**. National Hunting and Fishing Day, along with state proclamations by all 50 governors, will help get publicity for your role as a sportsman in conservation. Imagine what will be done when clubs like yours hold successful **OPEN HOUSES** all over the country on National Hunting and Fishing Day!

You'll be supported by these important organizations:

- | | |
|-------------------------------|--------------------------------|
| National Wildlife Federation | American Fishing Tackle |
| Sport Fishing Institute | Manufacturers Association |
| Wildlife Management Institute | National Shooting Sports |
| Outdoor Writers Association | Foundation |
| of America | International Association of |
| The Wildlife Society | Game, Fish and Conservation |
| American Fisheries Society | Commissioners |
| National Conservation | Izaak Walton League of America |
| Committee of Boy Scouts | National Sporting Goods |
| of America | Association |
| National Rifle Association | Keep America Beautiful, Inc. |

Send for a complete Open House Action Manual, with everything planned for you in advance. Contents include complete, step-by-step plans for:

- What activities to present.
- How to get publicity.
- How to organize **OPEN HOUSE**.
- Where to obtain displays and literature.
- How to get VIP's.
- . . . and more.

Conservation needs more friends. Tell some of yours all about it on National Hunting and Fishing Day. Use the coupon below to obtain your copy of the **OPEN HOUSE Action Manual**.

Enclosed is \$1.00. Please send your Open House Action Manual that tells me how my club can tie in with National Hunting and Fishing Day, September 23, 1972.

Name _____

Club Name _____

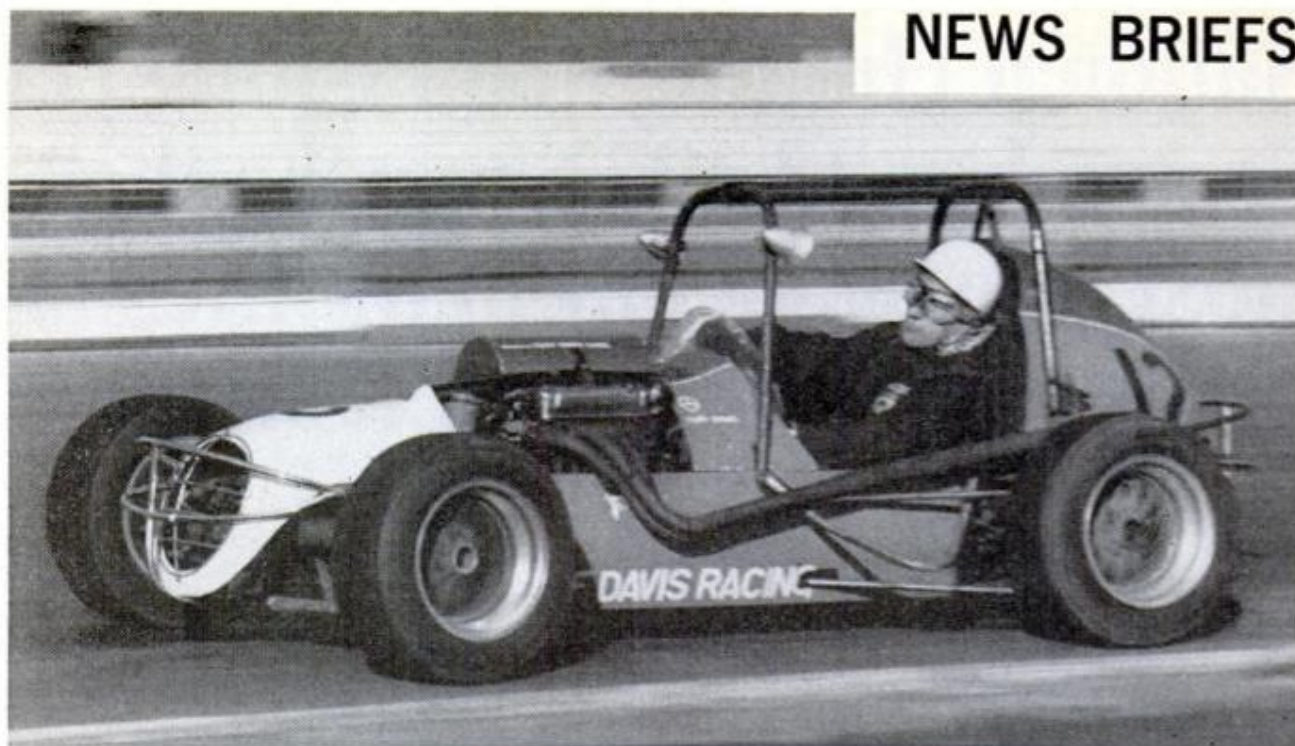
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Stirling Moss stages a one-day 'comeback'

Stirling Moss, legendary British driver who gave up racing after a near-fatal crash in 1962, couldn't resist the chance to try a Grand Prix midget recently. He's shown taking it around the London dog track during his one-day-long "comeback."

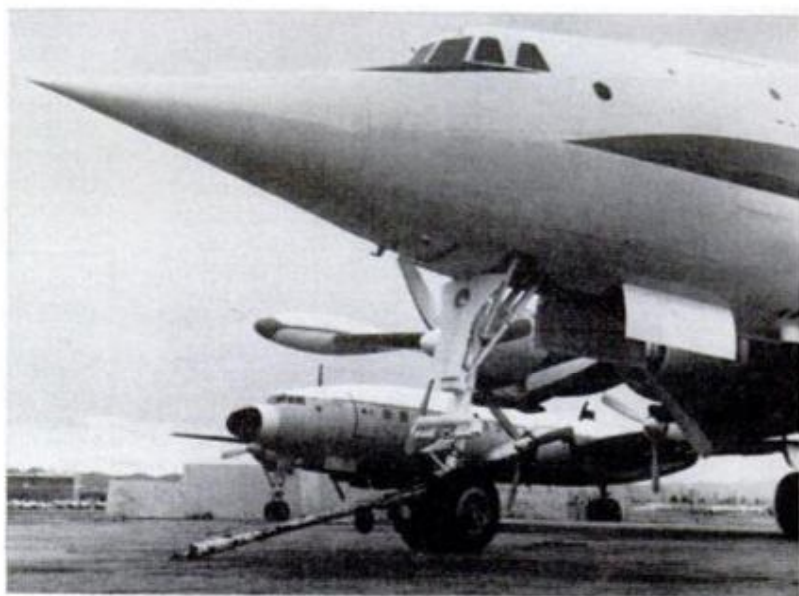


Winged ACV

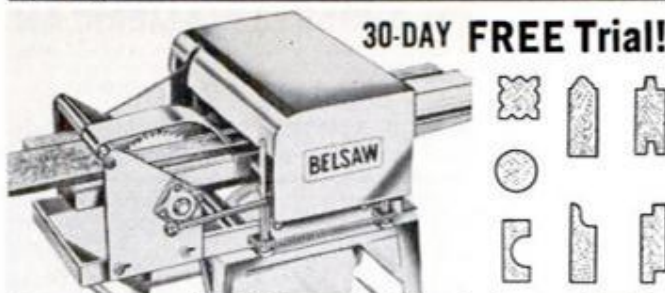
Skimming over Lake Constance on a cushion of air at a speed of about 62 mph, the "Aerofoil" is shown being put through a test flight. Powered by a 45-hp engine, the test model carries only a pilot. Later models will carry passengers. Air trapped between the downsloping wings and water surface furnishes the cushion on which it rides. The craft was developed by Prof. Alexander Lippisch.

Nose job

There weren't any spare Concorde's available, so an American movie company did the next best thing when a supersonic transport was needed. Workers added a needle nose to a Constellation (that's an unaltered Constellation in the background of the photo) for close-up photography. For overall and flying views, film clips of the real SST will be used.



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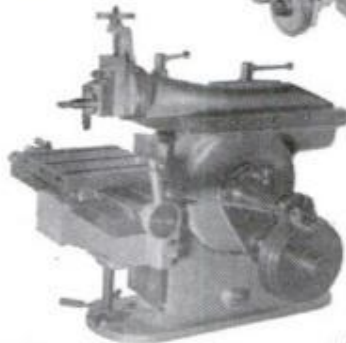
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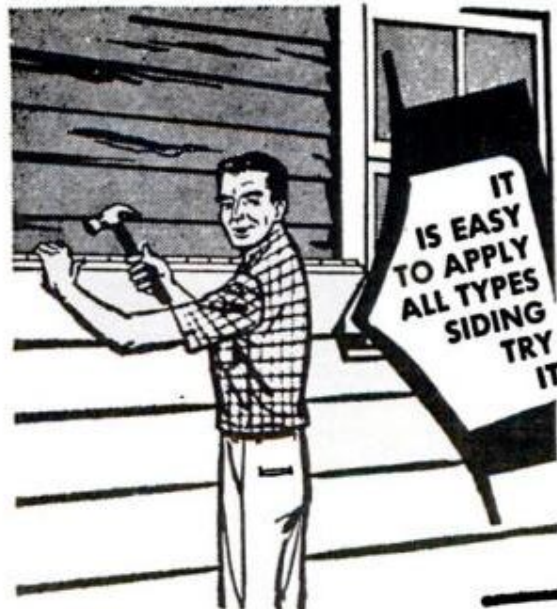
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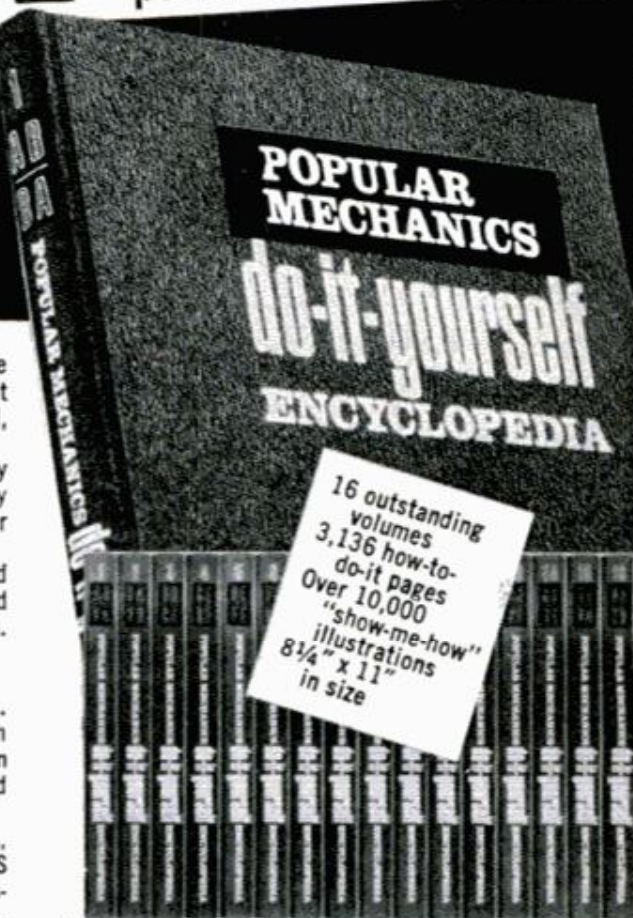
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MONDAY/FRIDAY CARS

(Continued from page 86)

aren't correct, the computer at the processing center or assembly plant will kick the order out for correction.

If that's true, how do you get orange upholstery when you ordered blue, or power windows when you asked for power brakes? For the answer, we have to go back to Hometown Motors.

Hometown may have made an honest mistake. The salesman checked orange, although you said blue. That's one explanation, but probably not the right one. More likely, the mistake was no mistake, but intentional.

Hometown may have a car in stock fitting all your specifications except the color of the upholstery. The salesman might tell you this and try to sell you the floor model with the orange seat covering. But if he figures you're going to balk at it, he won't mention it. He'll go through the motions of writing up a special order. But the order never goes in. The salesman waits a few days and then calls to announce your car is ready. He apolo-

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gizes for the mix-up in the color of the upholstery and offers to throw in an extra gadget or a grease job to make it right.

There's another explanation for cars coming through with deviations from the customer's order. The factory may have a batch of something it's trying to unload—which doesn't necessarily mean the item is inferior. A lot of reasons for discontinuing an item have nothing to do with quality.

To move out its stock of the part to be discontinued, the carmaker offers an incentive to dealers to order cars equipped with it. Let's say the dealer gets an extra \$100 discount when he takes a car with the item to be phased out. (In practice, the discount seldom runs this high.)

The dealer knows you don't want orange upholstery. But with an extra \$100 to play with, he figures he can throw in a \$30 radio at no charge and still come out \$70 ahead. When you object, he puts on his best humble-pie face, offers the familiar explanation: "That's the only way Detroit builds 'em," and counters with the free radio. Most people go for it.

Once the car starts down the line ac-

companied by the master order card, the machinery is supposed to be foolproof. The system of checks and double checks makes it impossible for a worker to make a mistake, to put an unwanted item on the car or to omit an item covered by the order.

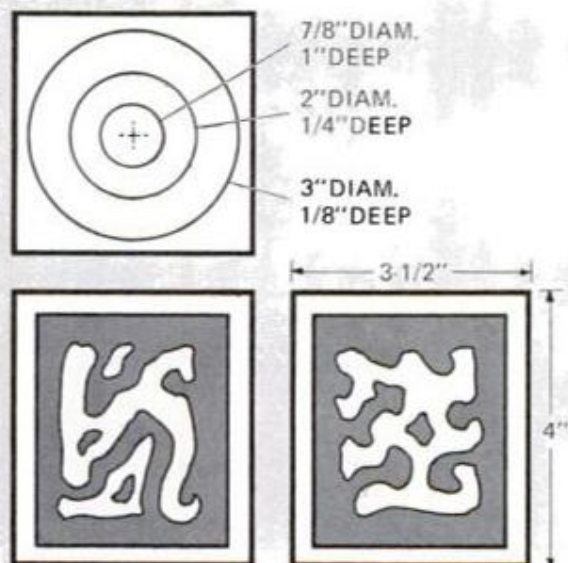
The system may be foolproof as to what goes on the car, but it isn't foolproof in terms of uniform quality of assembly. Detroit is trying in this respect to reduce the human factor in carmaking but it isn't always successful. The same bolt doing the same job may get two turns on one car, three turns on the next one and only one turn on the next—on any day of the week. ★★★

FLAMED CANDLE STAND

(Continued from page 149)

from the cube with a wire brush. Move the brush with the grain, then rub the block with a soft cloth and apply two coats of a satin-finish clear lacquer.—Willard and Elma Waltner, Ravenna, Neb.

CARVED PATTERNS



NEXT MONTH IN PM

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WEL-DEX MFG. CO., Dept. W-203, Box 10776, Houston, Texas 77018

AIR COMPRESSOR FOR \$70

(Continued from page 142)

the tapped hole, a 1/4 x 3-in. nipple into the elbow, followed by a 1/4-in. coupler and the gauge.

Now thread the 1-in. pipe cap on the top of the 1x6-in. nipple and install the 1/4-in. pipe thread x 1/4-in. tube compression elbow (compression end of this fitting points to the right-hand side of the tank).

Next, drill and tap a 1/4-in. hole centered in a 1-in. pipe plug and install plug in the outlet in the back of the tank. Into this, thread a 1/4-in. close nipple, then a 1/4 x 1/4 x 1/4-in. tee. Turn the safety-release valve into the tee outlet pointing downward and turn adapter for the air hose into the tee leg pointing up. Attach hose with a small hose clamp and connect the quick-change coupler to the other end.

The outlet in the front of the tank must be plugged—insert a 1-in. pipe plug or, if you prefer, a drain cock.

Put two 1/4-in. flared compression nuts on the 18-in. copper tube, flaring each end of the tube. Attach one end to the check-valve outlet and bend tube into a coil as shown in the photos. (The coil's purpose is to keep the pipe from breaking due to vibration.)

Bolt the motor to the stand about 1 in. behind the pipe in the tank inlet. Carefully align motor pulley with that on the pump. This should allow clearance between the motor and the handle on the compressor so that you can move the motor to tighten the V-belt if necessary.

Wire the switch to the motor and turn it on to see if the motor is turning in the right direction to drive the pump. If not, switch the polarity of the motor windings to reverse the rotation. Put on the V-belt and your compressor is ready for a trial run.

Switch it on and watch the pressure build up. Check all fittings and connections for air leaks. Since you don't know at what pressure the switch will turn off the unit, keep your eye on the gauge. If it does not shut off automatically before pressure reaches 83-85 p.s.i., turn the power off. The safety-relief valve is set for 100 p.s.i., but you should allow for a few pounds pressure between this point and that at which the compressor will stop automatically.

You can now set the switch, increasing or decreasing the pressure to the point where you want the compressor to stop. To increase the pressure, put more tension on the large spring by turning the adjusting nut to the right. To decrease pressure, just turn the nut to the left.

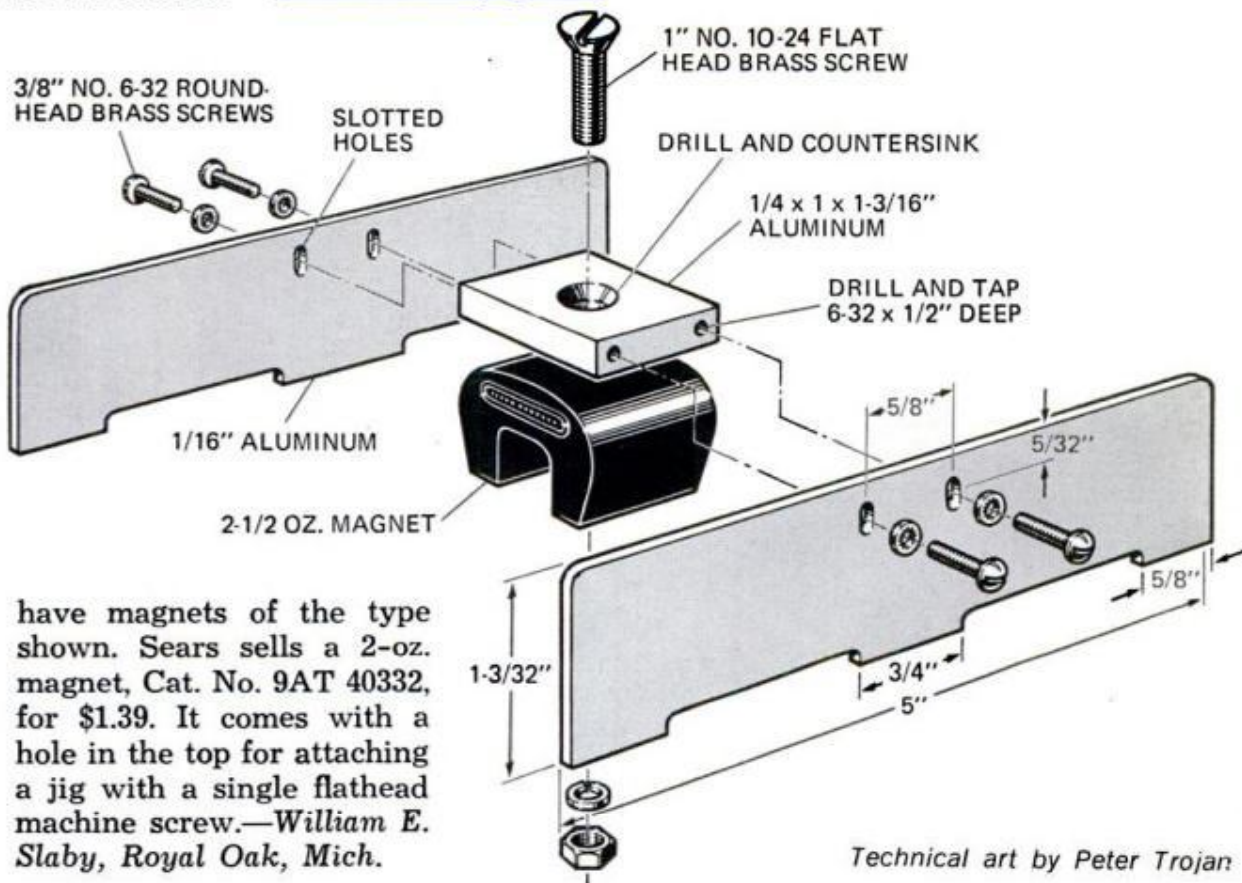
When the switch has been adjusted to stop the compressor automatically at the desired pressure, allow the compressor to build up pressure and stop by itself. Now, slowly let air out of the tank to see at what pressure the unit will restart. The starting mechanism for the switch is controlled by the smaller spring and works on a 1 p.s.i. differential. This, too, can be adjusted by changing tension on the small spring.

Select your accessories and thread them into quick-change adapters. They'll be ready to attach to the quick-change coupler on the air hose. ★★★

MATERIALS LIST—AIR COMPRESSOR

Purchased parts	
Amt.	Description
1	Refrigeration unit—two-piston, open-type pump (Sources: Canadian Tire, 837 Young St., Toronto, Ont.; Princess Auto & Machinery Ltd., 600 Panet Rd., Box 1005, Winnipeg 1, Man.)
1	Surge milker unit vacuum tank, air-intake filter
1	1 x 6" galvanized nipple
2	1" galvanized plugs
1	1" galvanized cap
2	1/4" galvanized close nipples
1	1/4 x 3" galvanized nipple
1	1/4" galvanized street elbow
1	1/4" galvanized tee
1	1/4" galvanized coupling
1	1/4 x 18" copper tubing
1	1/4" pipe thread x 1/4" compression elbow
1	1/4 x 1/4" adapter, pipe to air hose
10'	1/4" air hose
1	Hose clamp (small)
1	Quick-change coupler (for coupling accessories to air hose)
1	Air-line coupling (for connecting quick-change coupler to air hose)
2	Quick-change coupler adapters (accessories to quick-change coupler)
1	0-160 p.s.i. pressure gauge, 1/4" threaded
1	Safety relief valve, 1/4" threaded (factory set for 100 p.s.i.)
1	Automatic shutoff switch (adjustable type used on water-pressure systems, purchased used from pump-repair shop)
1	V-belt
1	3 x 5/8" bore V-pulley
1	1725 rpm, 1/2-hp electric motor, 5/8" shaft
Salvaged from refrigeration unit	
8	5/16 x 3/4" bolts
1	Brass valve from pump outlet
2	1/4" flared compression nuts (connect copper tubing)
1	Brass tank valve
Scrap parts needed to convert tank valve to check valve	
1	3/8" o.d. x 1/4" i.d. x 9/16" metal tube
1	1/16 x 7/16" pin-nail or welding rod
1	1 1/8 x 3/16" spring
2	7/32" steel balls from discarded bearing
Parts necessary for making compressor portable	
2	1.75 x 9 1/2" wheels
1	3" caster
1	3/4 x 14" cold-rolled steel (axle)
2	1/8 x 1 1/4" cotter pins
2	Flat washers to fit axle
1	1/8 x 4 x 7" flat iron
1	1/4 x 1 x 12 3/4" flat iron
1	1/2" conduit, length to suit
8	5/16 x 3/4" bolts, with nuts and lock washers
4	3/16 x 3/4" stovebolts

MAGNETIC JIGS (Continued from page 162)



have magnets of the type shown. Sears sells a 2-oz. magnet, Cat. No. 9AT 40332, for \$1.39. It comes with a hole in the top for attaching a jig with a single flathead machine screw.—William E. Slaby, Royal Oak, Mich.

Now it takes only seconds to sharpen drill bits

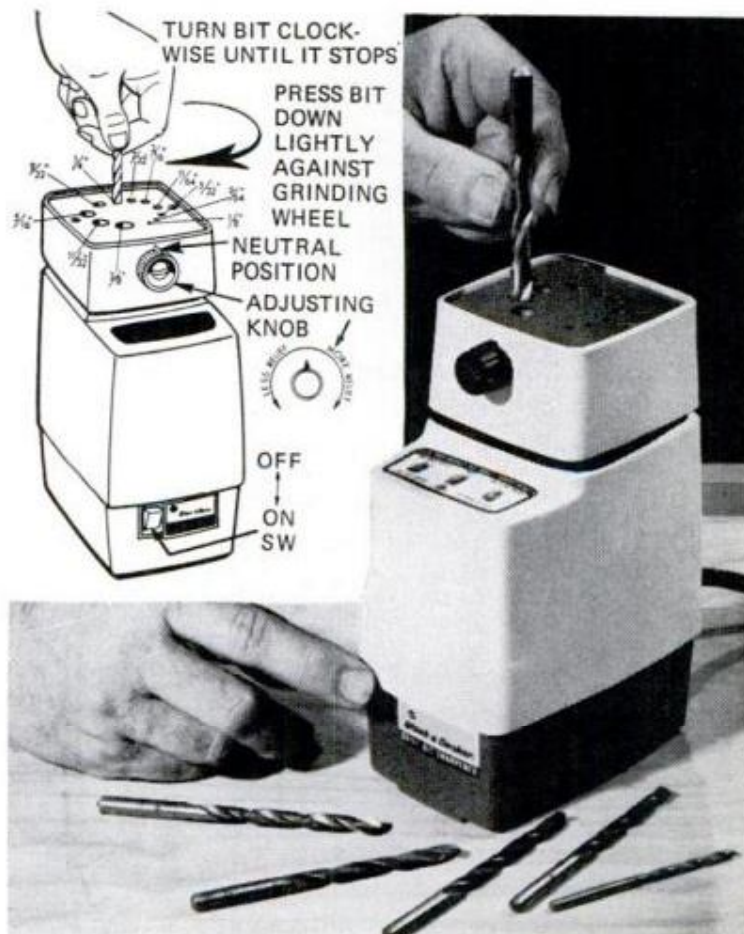
BLACK & DECKER's new electric drill grinder makes it almost as easy to sharpen a drill bit as it is to sharpen a pencil.

You simply insert the bit in the smallest hole in the index head into which it will fit and rotate the bit clockwise until it stops. Then, while holding the bit lightly against the grinding wheel, press down on the switch for one, two or three seconds. This hones one cutting lip.

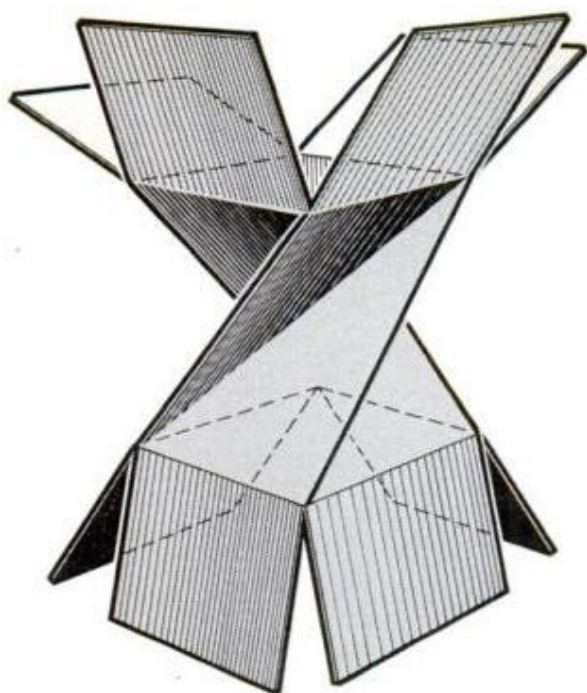
To grind the other lip, you withdraw the bit, rotate it one-half turn (180°) in the hole and repeat as before. Presto! You have a perfectly ground bit.

If the bit point is not exactly in the center, you control the angle of cutting relief with an adjusting knob on the sharpener.

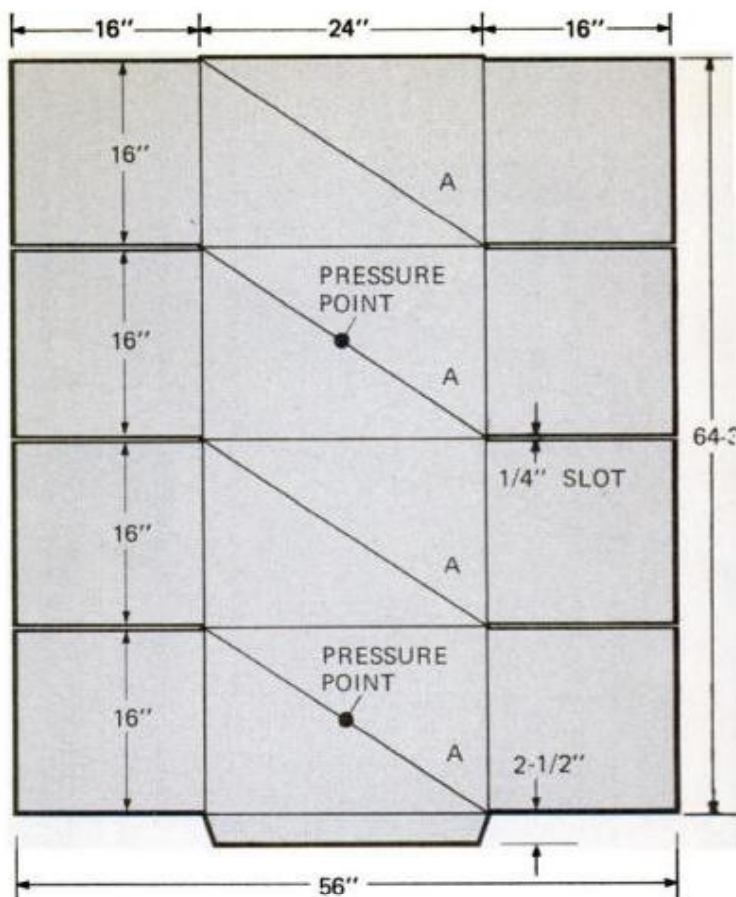
The grinder sharpens 11 sizes, 1/8 to 3/8 in. By Black & Decker Manufacturing Co., Towson, Md. 21204, it sells for \$15.99. ★★★



STOOL



A: DIAGONAL LINES INDICATE CREASE LINES. SCORE (INSIDE) WITH RAZOR BLADE



STOOL-LIKE CHAIR is cut from cardboard; large carton works fine. Contact cement glues flaps in place

PAPER FURNITURE

(Continued from page 134)

hefty spoon to make the crease, but a screen installation tool does a better job faster. You can buy one in most hardware stores for about a dollar. You cannot bend a curved crease, so make certain that all creases are straight. And all of the creases should be made on the "inside" of the cardboard. Notice that on one side of the board you can see the lines. This side is the inside.

Assembly: You can use white glue to laminate the tabletop and to make butt joints. However, the glue tabs and flaps will be under tension, so contact cement is recommended for these parts. (It is impossible to use clamps, which would be necessary if you were working with a slow-drying glue.) When working with contact cement, bear in mind that it is highly flammable.

Start assembly by interlocking the slotted supports and run a bead of white glue along all butted joints. Apply contact cement to the glue flaps and mating surfaces and allow the glue to set according to the maker's instructions. When the adhesive has set, wrap the frame around the

support. This refers to H around G on the chair, and D around C on the table. This step is somewhat tricky and you are well advised to have a helper standing by. The tabletop goes on next.

The base covers, parts B and F, go on last. The table base-cover goes on easily, but the cover for the chair is rather stubborn. You will have to keep twisting and bending the piece until it snaps into place. Don't despair, it can be done.

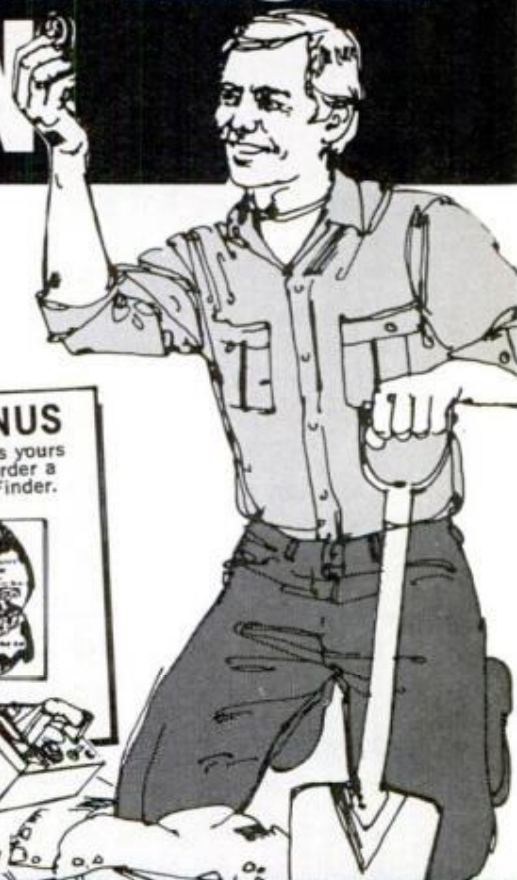
General information. Notice that the supports, parts C and G, have opposing slots. On one piece, the slot is cut in the upper portion and on the second piece, it is cut in the lower portion. Though some trial and error in the PM shop proved a $\frac{5}{16}$ -in.-wide slot acceptable, it's best to make a couple of trial pieces in order to assure a proper fit.

The stool-like chair. This is cut from one piece of cardboard. The trick lies in those key pressure points. After cutting and creasing, locate these points and simply twist the chair into shape. To familiarize yourself with the principle, make a scale model first.

To finish, apply fabric tape around the tabletop edge to conceal flutes, and paint the furniture with enamel. ★★★

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AROUND THE WORLD

(Continued from page 81)

lines. I grabbed the rope and hauled myself on board. Travers, who had been on the pitching boat all night, was exhausted. One of the two anchor lines had snapped and the other was vibrating like a rubber band, its anchor stuck fast to the bottom. Since we couldn't raise the anchor, we cut it loose and madly put up the sails to get away from the rocks. We made it by inches, but the worst was yet to come.

We tried to locate Downs by following the shoreline, but never did see him. So we headed for open sea, rigged the boat for self-steering and, for the first time in 36 hours, tried to sleep. That was our mistake. One of us should have stayed on watch. Because one hour later it happened.

We were both thrown violently from our bunks. Rushing to the deck, we were

... both masts had been torn from their moorings and were lying in the water.

just in time to see a huge cargo ship looming above us, obviously unaware that it had rammed us. One of our outboard hulls had been smashed and, worse, both masts had been torn from their moorings and were lying in the water. The main mast alone weighed more than 400 pounds. We'd never get it up again by ourselves.

We had to act fast. The freighter, in the dark, hadn't seen us and, over the roar of its engines, couldn't hear our shouts. It would soon disappear into the gloom and we'd be stranded in a crippled boat. We sent up a flare and flashed the SOS flashlight. After some anxious moments, we saw the lumbering freighter slow down, then make the long, laborious circle to pick us up. It took two hours.

The captain was apologetic and, while he solved our immediate problem, he created another one. He was en route to Mauritius and couldn't stop to pick up our missing crewman. For all we knew, Jack Downs was still walking along the beach in Madagascar, completely unaware of our predicament!

I sent a cablegram from the freighter to the American consul in Madagascar, explaining that he was stranded there with-

out clothes, money or passport. As we learned later, it saved him from an even more serious situation. He had already been picked up by local officials and jailed as a possible spy. When he was released, I sent him an airplane ticket to Mauritius, where the freighter had towed our disabled craft. We spent a month there making repairs.

We had other adventures the rest of the way home—including the most violent storms of all trying to round the Cape of Good Hope. We also made more stops—at Durban and Cape Town in South Africa and at St. Helena (Napoleon's prison) and the Ascension Islands in the South Atlantic. From there we made the long haul across to Brazil and up along the coast of South America, island-hopping again northward through Granada, Grenadine, Martinique, the Virgin Islands and Bermuda.

On the various legs of our journey, we had developed one important rule of survival—we always carried enough food and water to last twice as long as the estimated time between stops. If the distance was figured to take 10 days, we carried 20 days of food and water, based on two meals a day (you lose appetite on long voyages) and half a gallon of water per man per day. The system worked well. Only once did we run short of water—when becalmed for a week in open ocean. But we flagged down a passing freighter and it graciously replenished our supply—it's the law of the sea.

Our food consisted of fish caught from the boat, fresh vegetables wherever we could pick them up and an ample stock of staples like flour, rice, noodles and canned goods—things that wouldn't spoil in the tropical heat.

From Bermuda, we sailed into New York harbor, up the inland waterway and finally through the Great Lakes to a triumphant landing at the port of Chicago in my home state of Illinois—back again 2½ years and 40,000 miles later. We made mistakes—some of them serious—but we learned and saw things that few men have had the opportunity to experience. Judy and I were married when we returned and, in 10 years or so when our children are old enough to travel, we plan to do it all over again—this time as a family cruise. This is one farm boy who's sold on the sea. ★ ★ ★

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OUR GREAT VIETNAM GOOF!

(Continued from page 73)

rice paddies," declared the American project officers involved in the development of the APC. "The ARVN will have the mobility edge over the Vietcong."

But the APC just hasn't performed well—even after nearly 100 modifications. As long as we had committed APCs for use in Vietnam, we should have provided one of the best available, the Swedish Army Model 302. It is far superior to our M-113 in performance, has a lower silhouette, is easier to maintain—and has been on the market for many years. Unfortunately, the U.S. Army is locked in to purchasing the inferior M-113 because it is made in America, an important military-industrial complex qualification in contracting for equipment that costs hundreds of millions of dollars.

Another lemon in the armor category is

The Sheridan (tank) became one of the Army's greatest sources of embarrassment.

the M-551 Sheridan tank. The Sheridan was supposed to (1) drive silently, especially at night when quiet movement is a tactical must; (2) pack tremendous firepower with its 152-mm artillery and .50-cal. or 60-mm machine guns; (3) have good speed and range, and the capability of fording deep streams.

As it turned out, the Sheridan became one of the Army's greatest sources of embarrassment. The responsibility falls not only on the manufacturer but on the officers who accepted the Sheridan as combat-ready and approved its deployment to a combat zone. At the time that a number of these new tanks had been handed over to the Army, the Shillelagh missile, this tank's roundhouse punch, was still in the development stage along with the special shells for the 152-mm artillery piece mounted on the tank's turret. Despite such major drawbacks and many other defects, the Sheridan was rushed off to Vietnam to be tested under fire.

The tank proved to be disastrous for the men who had to use it. Two weeks after deployment to Vietnam, a Sheridan driver was killed when his tank struck a mine. The mine didn't kill him. Its blast

ignited ammunition stored in the tank.

Three tankers in another Sheridan were severely burned when an enemy round struck an exposed 152-mm cartridge case that the crew was desperately trying to extract from the breech after it had twice misfired. The casing was supposed to consume itself after each firing.

Three months after the Sheridans had been shipped to Vietnam, the U.S. Army Test and Evaluation Command at the Aberdeen (Md.) Proving Grounds issued a report which warned, in part: "Due to a problem with fuel-tank leaks, frequent checks for spilled fuel should be made to prevent fires. . . . When operating in jungle or heavy underbrush, vegetation will clog air intake grilles and radiator, requiring frequent clearing to avoid overheating. . . . The cartridge case of all 152-mm ammunition is highly flammable. . . . Very small pieces of smoldering residue left from firing conventional ammunition can ignite the case of a subsequently loaded self-consuming round developed for this weapon."

A Congressional hearing brought out that one company of Sheridan tanks had suffered, during a 30-day period, 16 major equipment failures, 123 electrical-circuit failures, 41 weapons misfires, 140 ammunition ruptures, 25 engine replacements (caused by overheating due to clogged exhausts and vents) and constant malfunctions of the recoil mechanism of the 152-mm turret gun. And all this happened in a combat area!

During World War II and Korea, the old reliable Sherman M4A3E8 tank never had the Sheridan's problems. The Sherman was a rugged, efficient piece of equipment.

Simplification is the name of the game but today in the U.S. Army complexity is the rule. For instance, the present complex electronic optical rangefinders on tank guns are worth tens of thousands of dollars each. They break down all too frequently. When I was a kid in the Army we didn't require fancy rangefinders. We relied on training and skill. When we were given a target to knock out 1200 yards away, you could bet a month's pay we got it on the second round. If we missed after two rounds it could cost a man his stripes.

Today, instead of keeping it simple, the scientists and the generals submit detailed

(Please turn to page 186)



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JUNE 1972

185

OUR GREAT VIETNAM GOOF!

(Continued from page 184)

descriptions of what they believe an armored vehicle should do. Then some clever project manager totals up the requirements and out of this jumbled mess comes the design for a combat vehicle such as the M-113 APC, the Sheridan or the Main Battle Tank of the '70s that was finally scrapped after six years and more than two billion dollars in development costs.

Other armies have produced better tanks. The Japanese, for example, have a new 38-ton tank that can turn tightly, zigzag and maintain accurate firing direction of its turreted 105-mm gun which, coupled to a small inexpensive computer, stays on target regardless of the vehicle's movements. In addition, this tank can raise or lower its profile as much as three feet.

Although the helicopter has added an important dimension to warfare and has

Some . . . allies arrived in Vietnam equipped for the rough road ahead.

proved of great value under certain conditions, it has its drawbacks. When helicopters were first introduced in Vietnam in the early '60s, they were used as strategic vehicles and rarely deployed to heavily contested areas. They were considered airborne trucks for the transportation of troops and supplies.

When the smaller, swifter Huey was developed, additional machine guns and rocket launchers were added and the chopper was deployed as a combat-support weapon. This worked for a while. The high command touted the chopper as yet another weapon that would provide Allied superiority. But the helicopter is a relatively fragile piece of equipment, as was devastatingly demonstrated during the South Vietnamese incursion in Laos early last year. So great were the helicopter losses that the final count has never been released for reasons of security.

There was much fumbling when the first American units were deployed to South Vietnam, costing several of our elite Army combat units valuable time in reaching peak performance. In 1965 at Fort Campbell, Ky., the 1st Brigade of what was then the 101st Airborne Div., re-

ceived alert orders for Vietnam. We were instructed to pack the brigade's entire TO&E (Table of Organization and Equipment).

As the brigade operations officer, I opposed this decision. My protests fell on deaf ears. We moved to Vietnam with the works, including green Class A dress uniforms—a winter uniform.

Our tentage was designed for arctic use, and our heavy trucks and our jeeps were hardly made for jungle travel. Of course, we also brought icemaking machines, refrigerators and other frills. Before the first year was over, our ill-suited equipment and weapons—like the cumbersome 4.2 mortar—had turned to rusting junk. It was a small example of the monumental waste that was to follow.

Some of our allies, however, arrived in Vietnam equipped for the rough road ahead. The Australians, with a wealth of experience in Malaya, Borneo and New Guinea, arrived in battalions especially configured for combat in Indochina and with rugged, appropriate gear and weapons. But no icemakers or post-exchange frivolities.

In many ways, the Vietnam conflict has cost this nation dearly because the men in the Pentagon focused on fighting a conventional war against an enemy equally equipped and armed with aircraft, tanks, artillery, missiles and the like. Out of the Vietnam conflict has come the Integrated Battlefield Control System or IBCS, described by Gen. William C. Westmoreland, Army chief of staff, as "the threshold of an entirely new battlefield concept." The IBCS, also called the "electronic battlefield," is a futuristic complex of vision-expanding devices, advanced automation, exotic sensors, electronic technology and complex computerization.

Over-reliance on electronics cost the lives of 33 American soldiers and wounds to 76 others in March, 1971, when Vietcong sappers infiltrated a firebase of the Americal Division. The small radars and sensors protecting the Americal firebase, a kind of mini-IBCS, were of no help.

If an unsophisticated enemy like the Vietcong can breach defenses protected by the latest that science and technology can offer, it stands to reason that a more sophisticated enemy can easily overcome any electronic battlefield it may encounter in the future. ★★★

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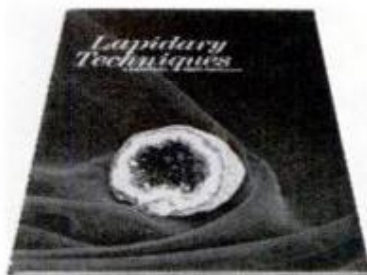


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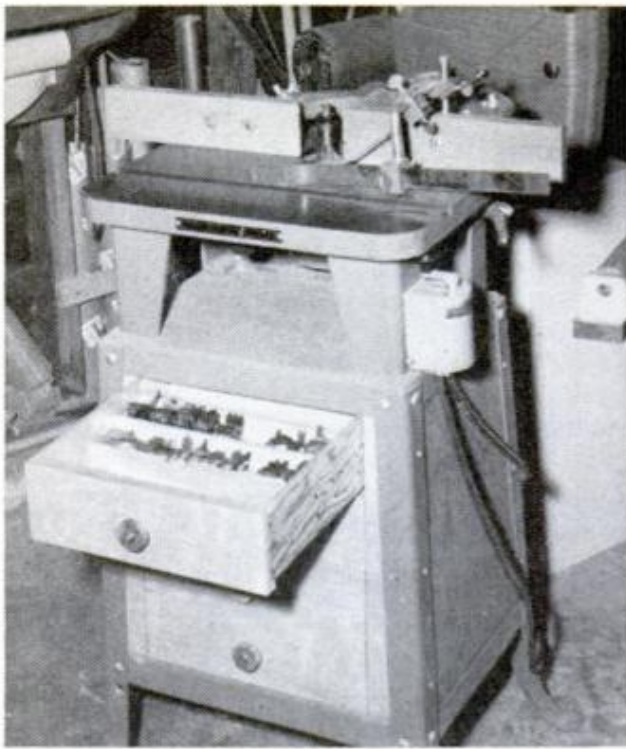
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SHAPER CUTTERS are stored in handy cabinet. Banister also has 30 sets of saw molding-head cutters

THIS SHOP PAID FOR ITSELF

(Continued from page 64)

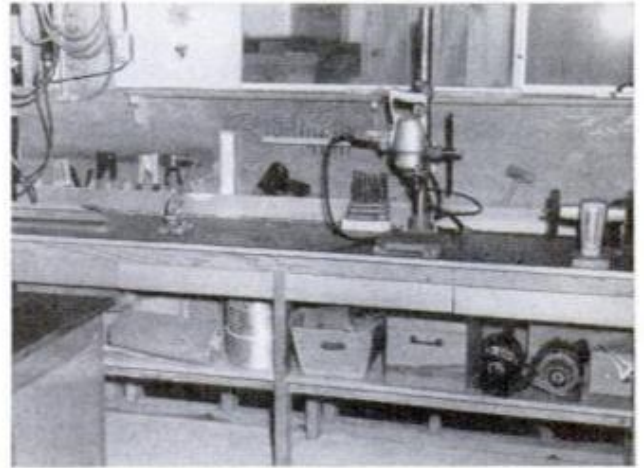
votes most of his shop-time to a particular love: custom-cabinet design and construction. It borders on understatement to say that he puts a great deal of effort into detail. Good examples of his dedication to perfection are shown in the photos. From bathroom vanity to the circular-saw-blade cabinets with tambour doors, it is obvious that each project is fully thought out at the drawing board. (*Editor's Note:* Instructions for building the latter will appear in the July *PM*.)

The shop is fully powered. Both sections are wired to separate 100-ampere, 220-volt electrical services. And each main panel is protected by circuit breakers; these, of course, eliminate fuse-hunting whenever a circuit becomes overloaded and "blows."

And, because his shop investment is considerable, Doc has safeguarded it with an



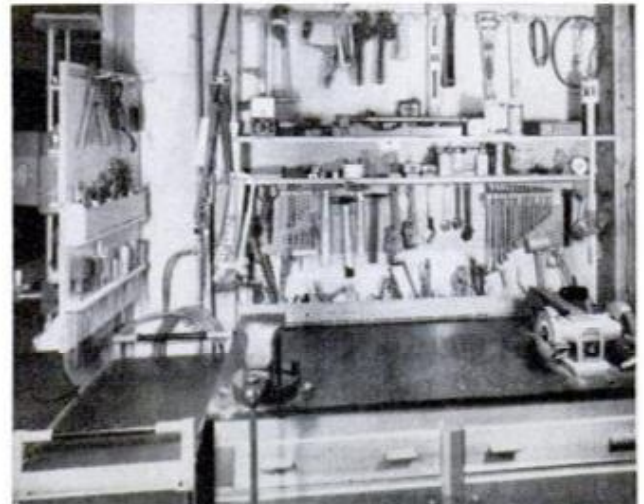
NEW SECTION OF SHOP features evaporative cooler and space heater, both suspended from the ceiling



DRILL-PRESS WORK, bench grinding, riveting and other fastening activities are done in this part of shop



HAND POWER TOOLS are handy to assembly bench. Drawers contain staplers, accessories and templates



METALWORKING BENCH has handy shop cart at left. Back of drill-press accessory board is also used



DUST-COLLECTING UNITS are on nearly all tools in shop. Dust they miss is inhaled by the shop vacuum



DOOR RACKS were added after cabinets had been in use for years. The jars are used for small hardware



DRAWING BOARD ready for action. When not needed, board flips up against cabinet and stays dustfree



DRILL-PRESS ACCESSORY BOARD is hinged for convenience; Stanley dowel machine converted to power

elaborate electronic, burglar-fire alarm system. The sophisticated system uses Edwards Heat Detectors (sensitive to maximum heat and the rate of temperature rise) with three sensors—one in each shop section and a third in the photo lab. In addition to the electronic burglar alarm, shop windows are fitted with a laced network of welded-steel rods. Even if the alarm should fail to sound, a forced entry would create a noise that could be heard for blocks.

Doc's parting shot is sound. He urges others to adopt this policy he says he has always followed: "Make certain that you are always on friendly terms with local

carpenters, electricians and plumbers." He feels that "you never know when you will need a word of advice on a knotty problem, or want to exchange work with these professionals. Besides, they are nice people to associate with." ★★★

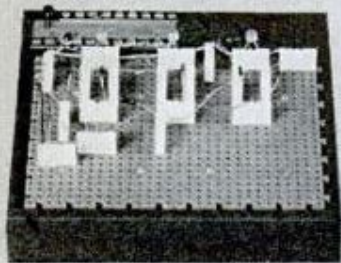
Two more of *PM's* Great Workshop articles are in preparation and you're sure to learn something from each. We're still interested in visiting good shops with a *different slant*. If you think yours qualifies for publication in *PM*, send snaps and a brief description to Workshop Editor, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. If your shop has it, we'll flaunt it.

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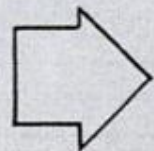


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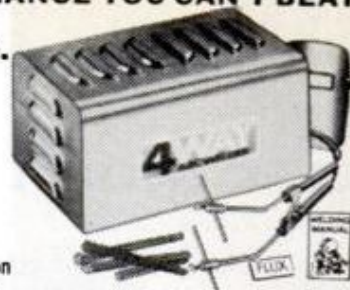
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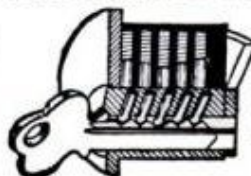
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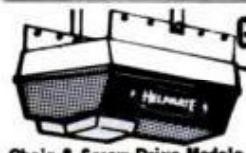
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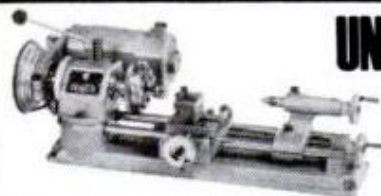
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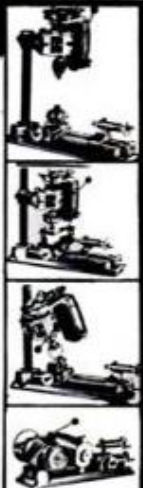
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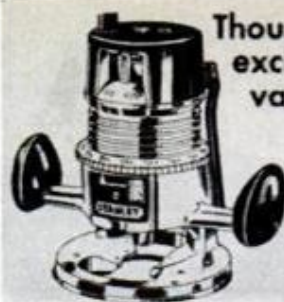
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(Continued from preceding page)

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(Continued on next page)

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(Continued from preceding page)

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(Continued on next page)

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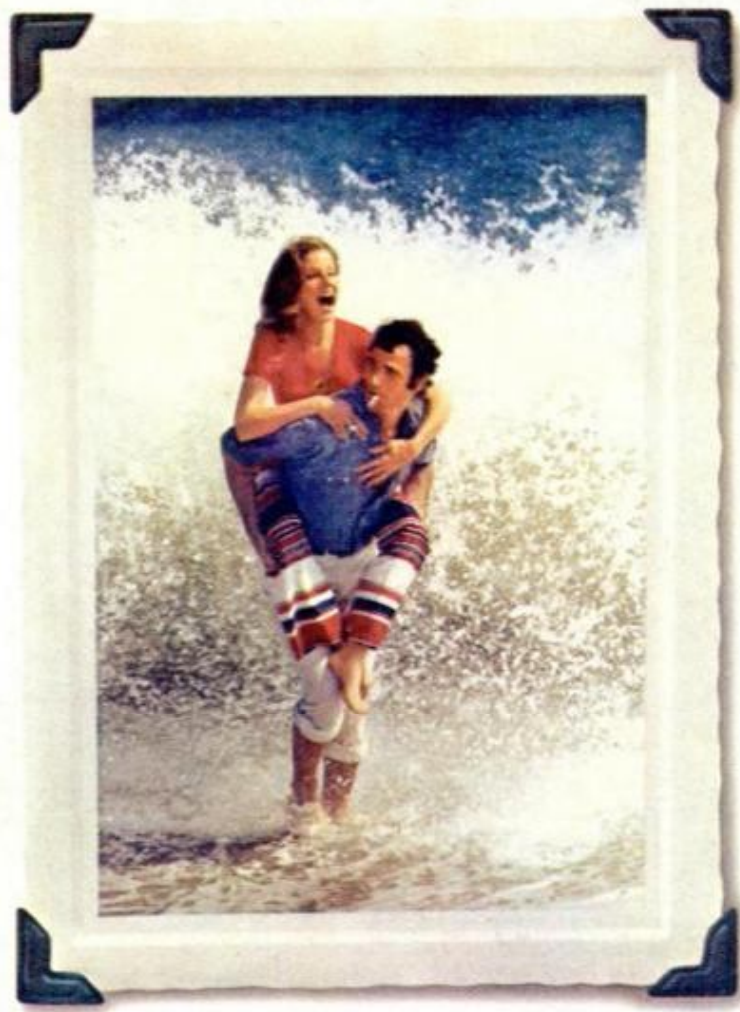


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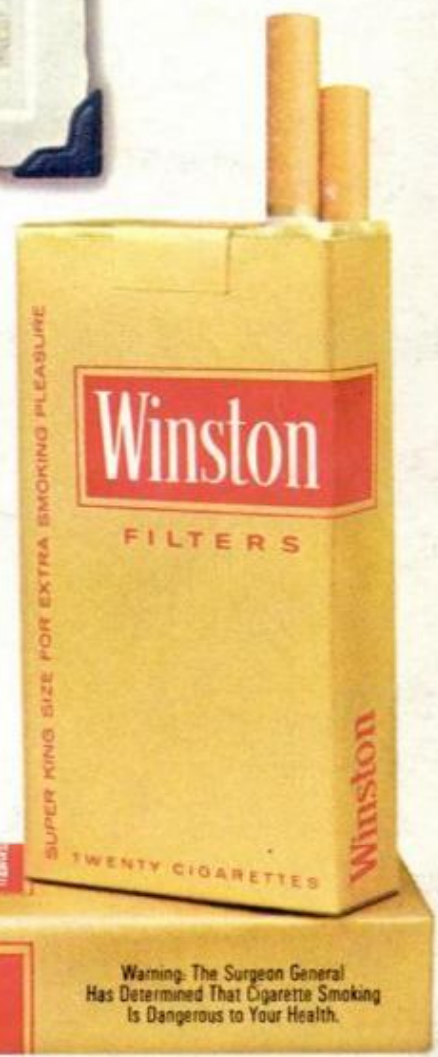
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