

Popular Mechanics

MEMORY BOXES:

How to create keepsake collections that make perfect gifts

Page 98

...Plus 7 other original gifts from your workbench

Page 96

America's longest, meanest car rally

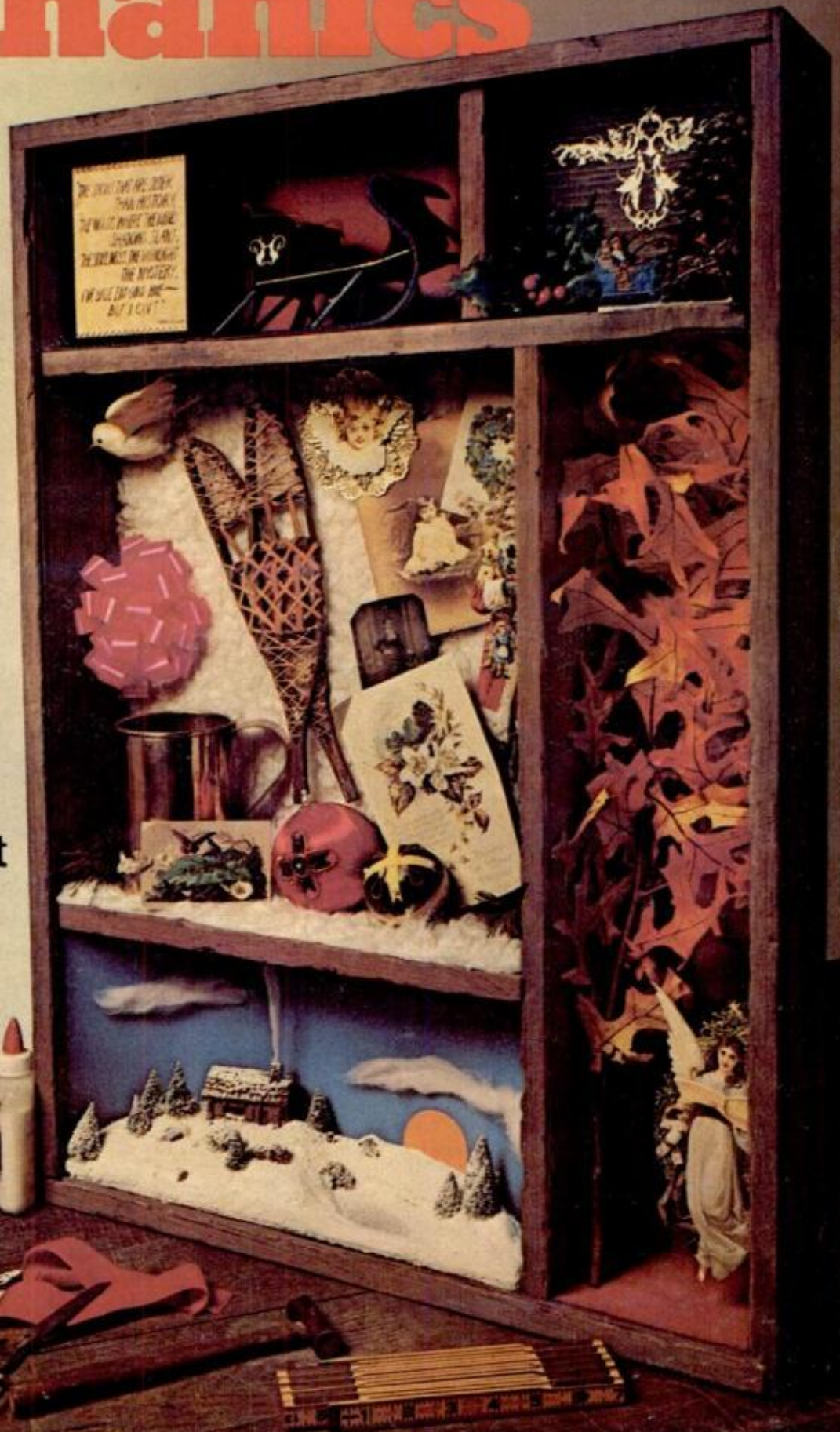
Page 73

Safer football helmets

Page 78

Energy: We might just make it with windmills

Page 80



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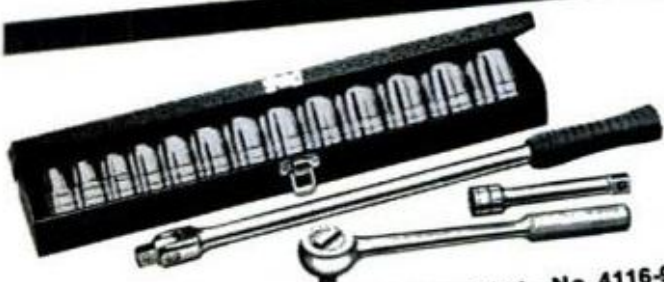
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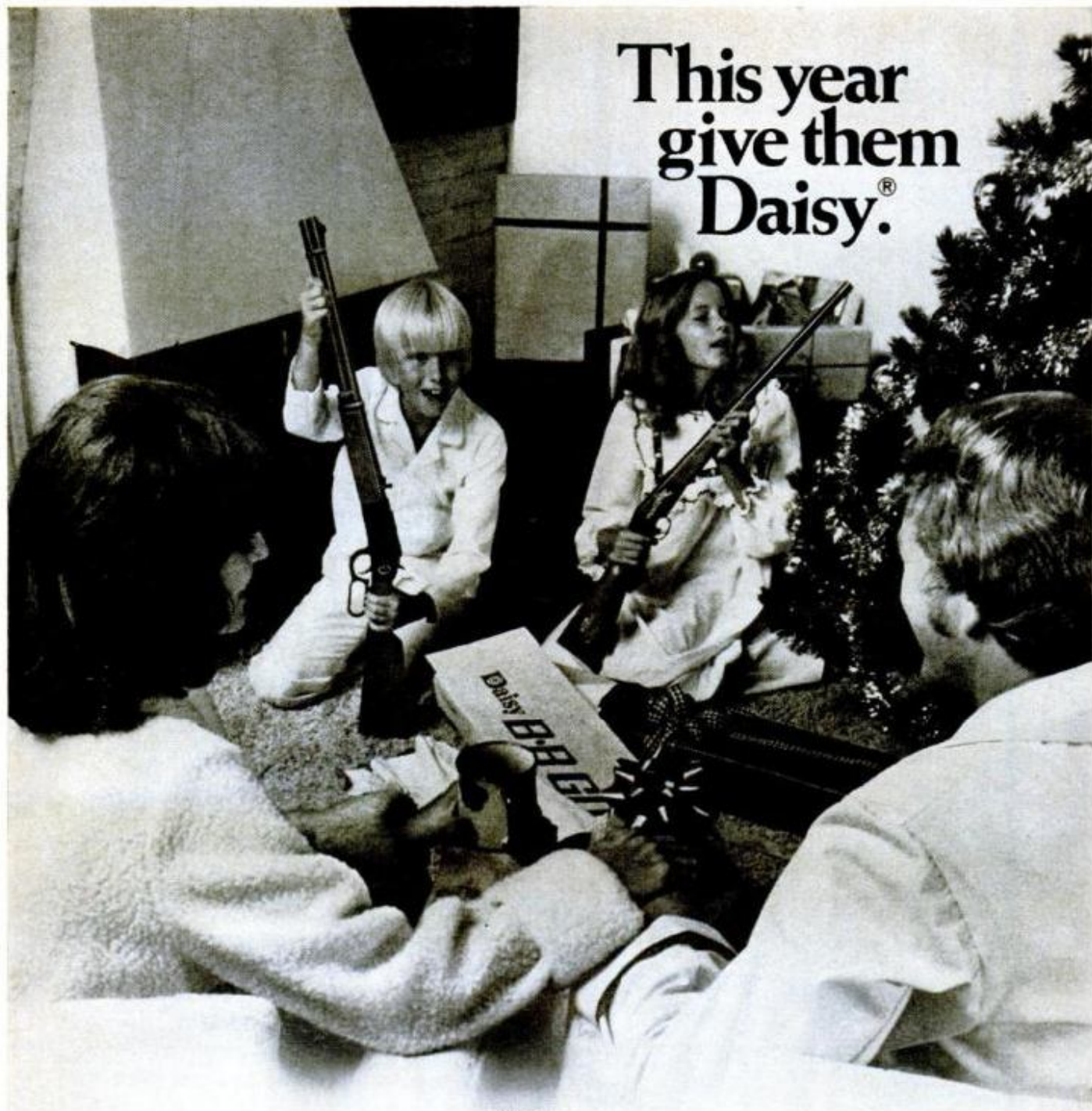
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AUTOMOBILES, DRIVING

- [20](#) [Detroit Listening Post](#)
- [36](#) [Imports and Motorsports](#)
- [73](#) [Drive it into the ground! What it's like to drive in the Press On Regardless road rally](#)
- [134](#) [Saturday Mechanic: Retreads—safe at half the price](#)

CHRISTMAS GIFTS YOU CAN MAKE

- [96, 102](#) [Chamberstick and bud vase you turn on your lathe](#)
- [96, 104](#) [Pipe-smoker's king-size display case](#)
- [96, 112](#) [Assemblages—a way to keep memories fresh](#)
- [97, 107](#) [Surprise her with a nail-polish dryer](#)
- [97, 108](#) [Hatching chick keeps coming alive](#)
- [97, 110](#) [Performing seal makes balancing trick look easy](#)
- [98](#) [Display boxes for keepsakes](#)
- [100](#) [Handsome candle sconce adds beauty to any wall](#)

SCIENCE, INVENTIONS

- [78](#) [Science 'knocks heads' in the search for a safer football helmet](#)
- [80](#) [The wind shifts to windmills for added power](#)
- [124](#) [Superflywheel: The 'battery' that spins](#)
- [140](#) [Danger: Noise at work! What its harmful effects are and how you can guard against them](#)

PHOTOGRAPHY

- [40](#) [Photo hints](#)
- [88](#) [New flash units make any photographer look brighter](#)
- [138](#) [Turn your lens into a telescope](#)
- [180](#) [New little Konica makes even daylight flash easy](#)
- [182](#) [New-camera meters don't give you the needle](#)

SHOP AND CRAFTS

- [14, 16, 46, 48D, 48H](#) [Hints from readers](#)
- [42](#) [Die-stock attachment makes threading easy](#)
- [146](#) [Toy truck for the boy in every man](#)
- [150](#) [Portable saw pinch-hits as cutoff machine](#)
- [158](#) [PM Test Report: Velvetizing lets you add a colorful soft touch](#)
- [162](#) [PM Test Report: Homelite's new chain saw—two triggers are better than one](#)

HOME AND YARD

- [132](#) [How and what to caulk](#)
- [154](#) [How to install a fast-set door lock](#)

BOATING, OUTDOORS

- [92](#) [Snowgoers for '75—more speed, less noise](#)
- [128](#) [The old art of muzzleloading: Shooters' new smoky hobby](#)
- [178](#) [Travel tote for rod and gun](#)

AVIATION

- [85](#) [Homebuilt planes: Breezy biwing beauty you can build or buy](#)

EVERY MONTH

- | | |
|---|---|
| 8 Letters | 50 The Bicycle Shop |
| 26 Homeowners' Clinic | 58 All Outdoors |
| 28 Appliance Clinic | 68 Car Clinic |
| 33 Science Worldwide | 114 It's New Now |

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NOVEMBER 1974 • Vol. 142 No. 5

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Australia, Caribbean,
Mexico, Southern Hemisphere



Eight unusual gifts you can make . . . [96](#)



Snowgoers for 1975 . . . [92](#)



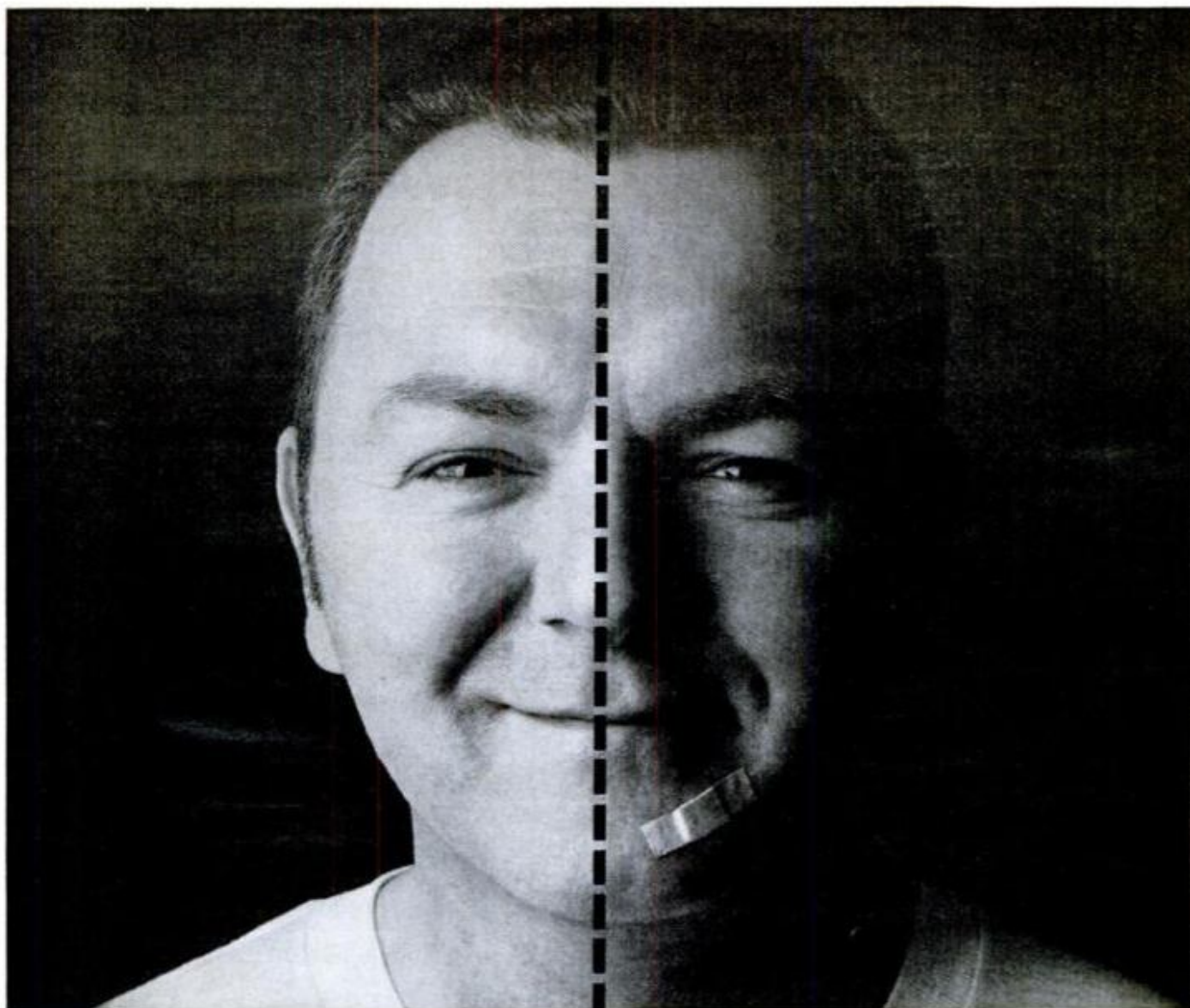
Turn your lens into a telescope . . . [138](#)



Build a high-performance biplane . . . [85](#)

ON THE COVER: The memory box—a great way to display your special interest, hobby or collection of keepsakes. *Photo: Cosimo Scianna. Designer: Jerry McConnell*

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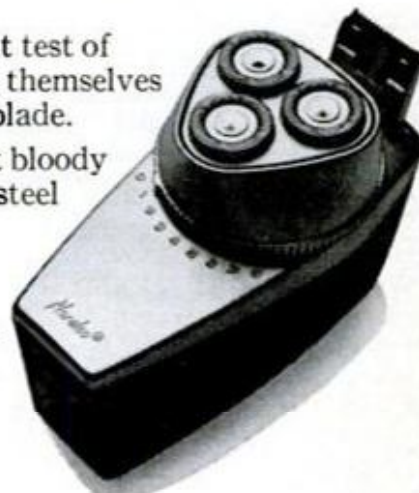
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Poor color TV reception may be only your antenna showing its age

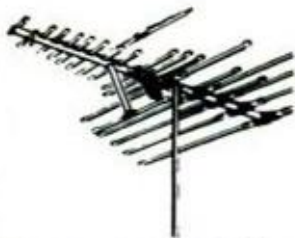
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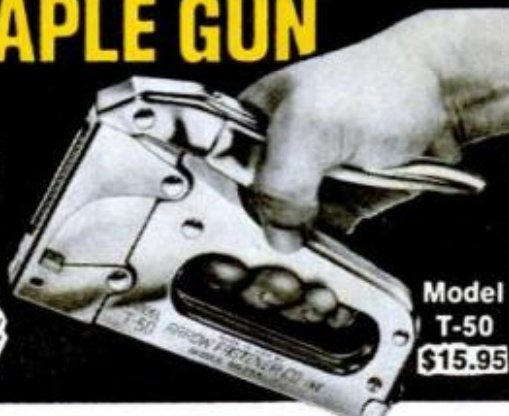
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LETTERS

TO THE EDITOR

Airships on the waterfront?

While circling Manhattan by boat, I was struck by the lack of shipping at the piers. Many of the piers are in the process of repair and some are in bad shape.

I'd like to suggest that such airships as are shown in *Don't Sell the Airship Short* (page 112, Sept. PM) could be moored between two piers over the water and the cargo and passenger service could continue as per ocean liner service.

JAVA VILLAGE, N.Y. ERNEST L. DAWSON

Shameless shaver

I, too, was *Shamed by a Shaver* (page 26, Sept. *Appliance Clinic*). I pride myself at being able to take apart anything, but a year ago, after an hour of trying to get that thing apart, I gave up rather than break it. Your September issue solved my problem. But please tell your readers that the spring wire that must be lifted is *not* readily visible.

The one that is visible belongs to the trimmer itself. Hold the shaver head toward you, trimmer end up. Look between the trimmer and plastic case diagonally down toward the bottom corner (switch end). There that little devil is!

BETTERTON, MD. HENRY GERNHARDT JR.

More railing for the tree house

The skull and crossbones is appropriately flying over the flattop building on page 147 of *Clever Disguises for Storage Buildings* (Sept. PM).

The top rail must be 42 inches high. There must be an intermediate rail. There must be a kickboard at least 4 inches high around the edge of the roof. These are OSHA requirements for safety in industrial plants. Don't you feel that as much

(Please turn to page 10)

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LETTERS

(Continued from page 8)

care should be exercised to prevent accidents to children as is used, by law, to protect employes in industry?

BEMIDJI, MINN.

F. RUSSELL EGGERS

That platform is a substitute for a tree house for kids, and, being low, is much safer than most tree houses we've seen. Your point is well taken, though; the design should perhaps have had more than just a top rail—enough barrier that if the child goes through, he does it on purpose and not accidentally.

Tip for drying wood

I enjoyed *A Modern Workshop in the Old West* (page 154, Aug. PM) by Harry Wicks. Charles Kastl has a great looking shop.

I would like to add one thing to his good idea of salvaging fallen and dying trees. Green wood as it *air dries* has a tendency to check or crack. This can be minimized by sealing the ends of the log with enamel paint (several coats) or with a liberal coat-

ing of paraffin. The amount of wood lost when it's ready for use is only a short piece on each end. I have done this with a lot of success on cherry, cedar and osage orange.
FREEPORT, ILL.
W. DEGRAW

Tamron's price

It was very nice to see the reference to the Tamron 200-500-mm f 6.9 lens on page 105 of your August *New Now*. Unfortunately, however, you indicated the price at about \$500. Actually, the current list price is \$800.

SCOPUS DIV. OF BERKEY
WOODSIDE, N.Y.

BRUCE LANDAU
PRODUCT MGR.

Lines and safety belts for boaters?

May I suggest an additional safety device to use in conjunction with the kill switch for boats (*This Kill Switch Can Save Your Life*, page 50, Aug. 1974 PM). Simply tie one end of a 25-foot line around your waist and the other end to the boat. Then if you fall out, the boat can't drift away, and you

have a much shorter swim back. Or you can pull on the line and be back to the boat in a few seconds. If you have a fast boat, make the line longer.

SWISHER, IOWA R.D. SMITH

Sailors often tie lines to themselves in heavy weather, especially if they're alone. But most powerboaters—aside from not wanting the tangle of line—feel that the line tied to a boat under way (it'll still be moving even if the engine is killed) will tend to drag them under the surface.

Why can't the driver use a seat belt?

SAN FRANCISCO E.C. WON

Even drivers of unlimited hydroplanes don't wear belts. They prefer to be loose in the water rather than tied to a sinking boat.



Did you miss a button this morning?

Mennen Pushbutton Deodorant provides lasting protection against perspiration odor. And Pushbutton's fine mist dries instantly on contact.

Button up your underarm.



Underwater clean machine

In response to 'Clean' Machine Runs on Propane (page 118, Aug. PM), here's a photo of the homebuilt propane-powered motorcycle I use in the Detroit Metro Water Dept. 6-mile-long, 16-foot-diameter raw wa-



ter intake beneath Lake Huron. This cycle has been driven over 1000 miles in very wet and undesirable conditions. The 8-pound tank lasts approximately 125 miles, and top speed of the machine is 35 mph.

MARINE CITY, MICH. SHERMAN LANGELL
SENIOR CONSTRUCTION INSPECTOR

Meters by the bushel

I enjoyed Ivan Berger's article on *Exposure Meters: Aim Them Right, and They Won't Steer You Wrong* (page 108, Sept. PM). However, on page 111, he shows the Gossen Super Pilot as selling for \$9.

Request that he 1) tell readers he goofed or 2) tell me where I can pick up a bushel or two at that price.

HUNTSVILLE, ALA.

LLOYD DUNN

"Oops," says Ivan. "At \$9 I'd have bought a bushel myself." Correct price is \$75.

We still have 'em

I recently received a copy of the *PM Master Home Care Guide* and found it very helpful. However, I noticed it was the second in a series of Master Guides. Is the first in the series still available?

WEST CARROLLTON, OHIO BRUCE BERGSTRESSER

Glad you asked that question! Sure we have the first—it's the *Master Shop Guide*. Price is \$3.95 plus 50 cents shipping. Order

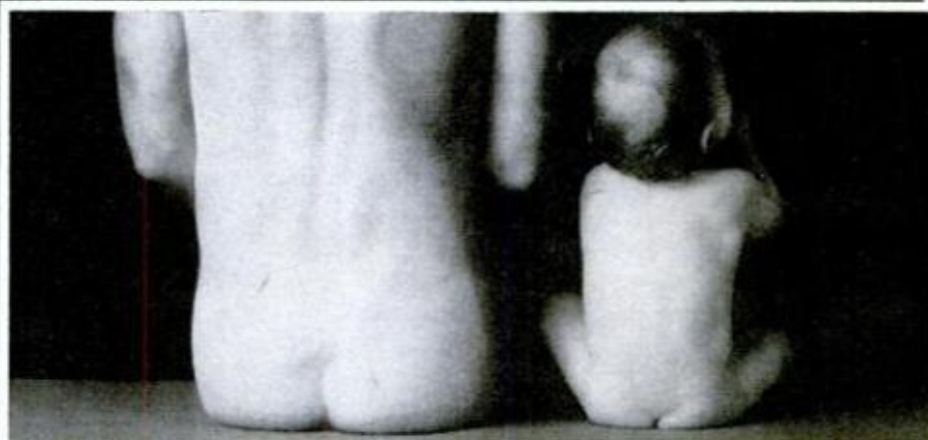
[\(Please turn to page 13\)](#)

Alive and well

The first paragraph of the *Renault 12 Owners Report* (page 78, Aug. PM) hit a tender spot. You say that in the 1950s "parts for Hupmobiles were easier to get" than parts for Renaults. This infers that Hupmobile parts are hard to get, which is not true.

The Hupmobile is alive and well. The Hupmobile Club (of which I am parts coordinator) has members in more than a dozen countries around the world and has a very efficient parts locator service. We also have as a source the remaining factory surplus and all factory drawings as well as the stock from dealers who for some reason did not see fit to stay in business.

DAYTON, OHIO DON ROETMAN



You changed. Did your powder?

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Don't kid yourself. Get Mennen.



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LETTERS

(Continued from page 11)

from *Popular Mechanics*, Dept. JL, Box 1014 Radio City, New York, N.Y. 10019.

Not a pendulum

What your writer calls a horizontal pendulum on page 144 of your August issue (1450 A.D. Clock in a Kit) is not a pendulum at all. It is a foliot balance. I notice that the manufacturer, Caldwell Industries, refers to the mechanism as a foliot; hence, the error must lie with your writer.

GROVE CITY, FLA.

HAROLD J. READ

More pay dirt

In *Pan for Gold This Summer* (page 82, July PM) author Bob Behme left out one old gold field in Buckingham County, Va., and neighboring counties. Before gold was discovered in California, most gold mining in the country was done in this area.

NEW CANTON, VA.

D.T. WRIGHT

TV implants for the blind

I read with interest the article, *TV Implants May Help the Blind 'See'* (page 94, July PM). Inasmuch as the original research work on which this article was based was done in the College of Engineering and the College of Medicine at the University of Utah, I was disappointed that you did not give proper credit to those doing this important work.

COLLEGE OF
ENGINEERING
UNIVERSITY OF UTAH

ROBERT E. STEPHENSON
ASSOCIATE DEAN

Unfortunately, space limitations squeezed out mentions of the roles of the Universities of Utah and Western Ontario and of earlier work at the University of London and Addenbrooke's Hospital, Cambridge.

New size for PM

Beginning in January, Popular Mechanics will be published in a new, larger format. Our page size—now 6½ by 9⅛ inches—will be increased to 8 by 11 inches. With it, we hope to have an even more exciting magazine than we've had for the past 73 years. ★★

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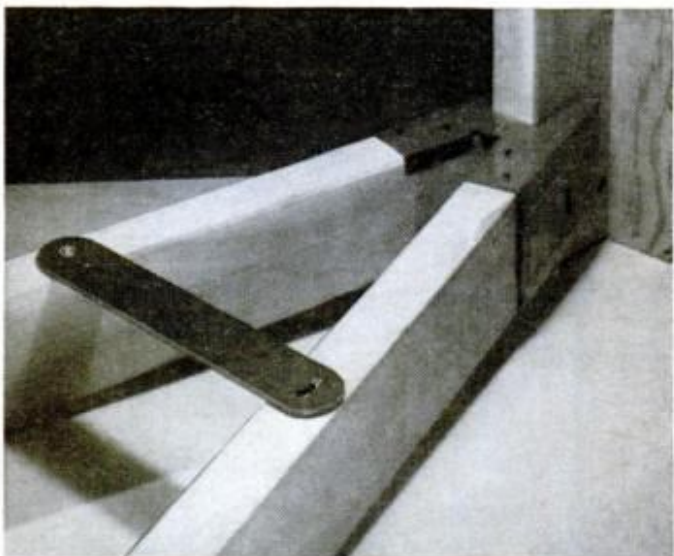
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HINTS

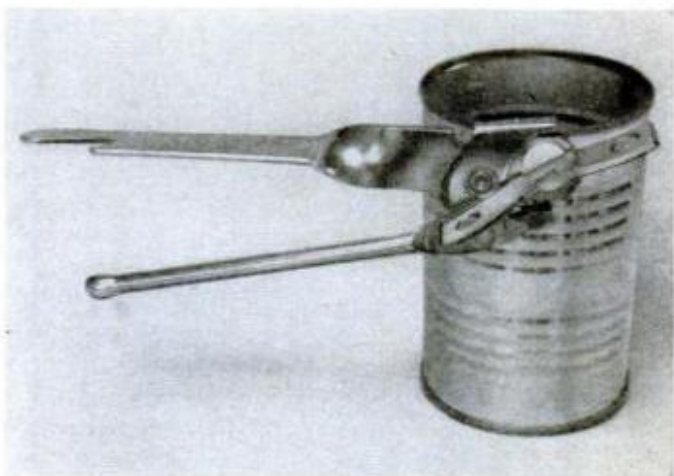
FROM READERS



Sawhorse brace

One way to keep sawhorse leg brackets from folding at the wrong time is to use a hook-type brace pivoted on a woodscrew. One shown was made from tempered hardboard, 1½ x 9½ in. Slotted hole in brace fits over shank of second screw.

—Walter E. Burton, Akron, Ohio



Can opener makes pot handle

A can opener of the type shown, when used as a detachable handle, makes a tin can of any size a disposable pot—handy for shop use, camping, candlemaking.

—Philip Genatempo, La Crescenta, Calif.

TOM McCAHILL SAYS:

“You can pocket \$5 to \$7 an hour if you're good enough to fix these things.”

The coming of the automobile built a multimillion dollar service industry in a few, short gas-eating years. The same thing has happened in the electrical appliance field. Manpower is desperately needed now to repair appliances.

But there is one big difference. Anybody with a few simple tools can get started in appliance repair. No expensive equipment is needed.

What is needed is the right kind of training. You can't strike it rich in today's job market with nothing more than muscle. Nor can you hang onto an old-time job skill while an electronic monster with buttons replaces men around you. It's like driving a buckboard down the Jersey Turnpike. The fuzz would locate you fast and send you out to pasture.

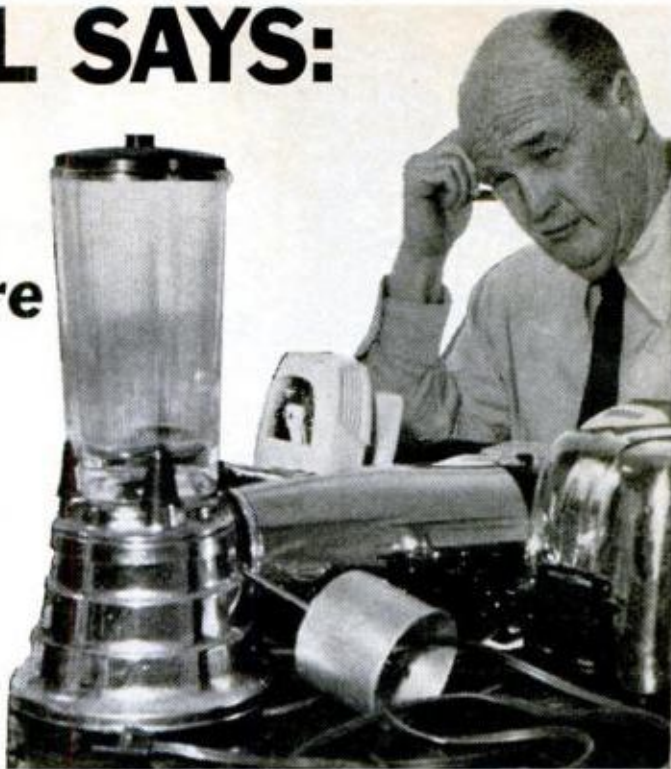
If you want an up-to-date job skill with good opportunity—why not take a look at the Electrical Appliance Repair field?

This field is loaded with opportunity because every house in our high speed land is loaded with appliances. There are about four times as many appliances as we have men, women, children and babies in the good old U.S.A. There are over a billion of these electrical gadgets being used, abused and broken. If you know how to do fast repair jobs on them, how much you can earn can well depend on how much you want to earn.

The opportunities in this field are all the better because you can prepare for them fast. There's one short, sweet course you can take right in your own home and it covers everything. I'm referring to a home-training course offered by the Appliance Division of National Radio Institute—one of the biggest and oldest home study schools of its kind.

NRI gives you the whole works. Their training covers basic electricity and how to use test instruments. They cover the electrical and mechanical operation of every type of appliance from toasters and coffee-makers to dishwashers; from vacuum cleaners and automatic laundry equipment to air conditioners and refrigerators. They even show you how to fix farm and commercial appliances and small one-lung engines.

The training is designed to be interesting, practical and fast. You can make \$5 to \$7 an hour extra fixing



appliances in spare time starting soon after you enroll. They give you all you need to know to do fast, profitable repair service. They even include equipment without charging you extra. And the full cost of the training is surprisingly low.

If you are driving a buckboard in today's job market, at least find out what the Appliance field can do for you. NRI sends you a fancy, illustrated book about their training so you can judge for yourself. There's no obligation and they don't send a salesman to pressure you. All I say is get the facts and see for yourself. Send the coupon today while you are thinking about it.

Tom McCahill

AVAILABLE UNDER NEW GI BILL

If you served since January 31, 1955 or are in service, check GI line below.

APPLIANCE DIVISION, NATIONAL RADIO INSTITUTE 600-114
3939 Wisconsin Avenue, Washington, D.C. 20016

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- Check for facts on new GI Bill.
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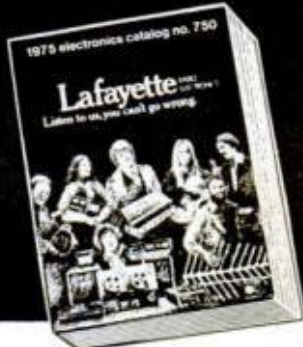
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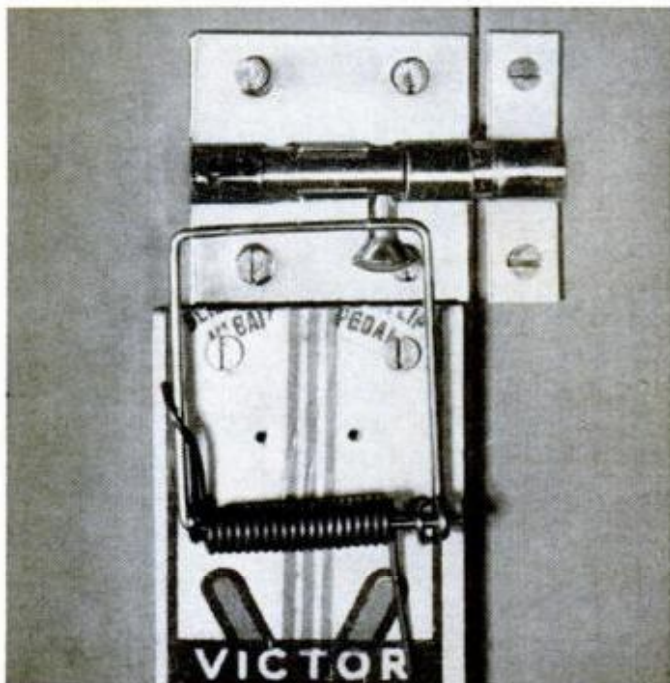
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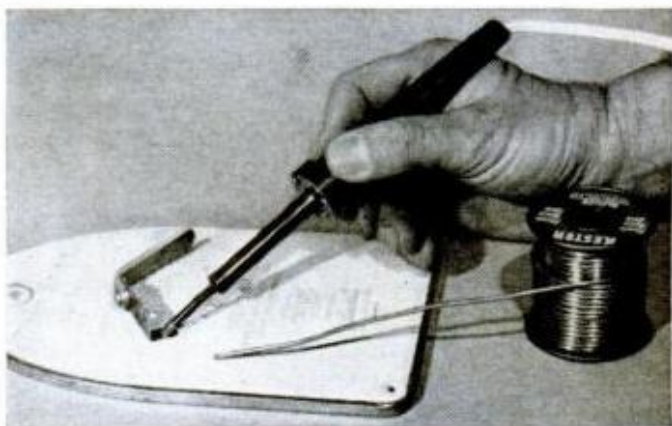
HINTS

FROM READERS



Securing bolt latches

Where vibration makes it difficult to keep a latch or bolt closed, as on cabinets on a truck, a mousetrap can help. With about 1 in. of its wood base cut off, the trap will hold the bolt throw closed with its spring bar.—*Ralph Leeds, Lander, Wyo.*

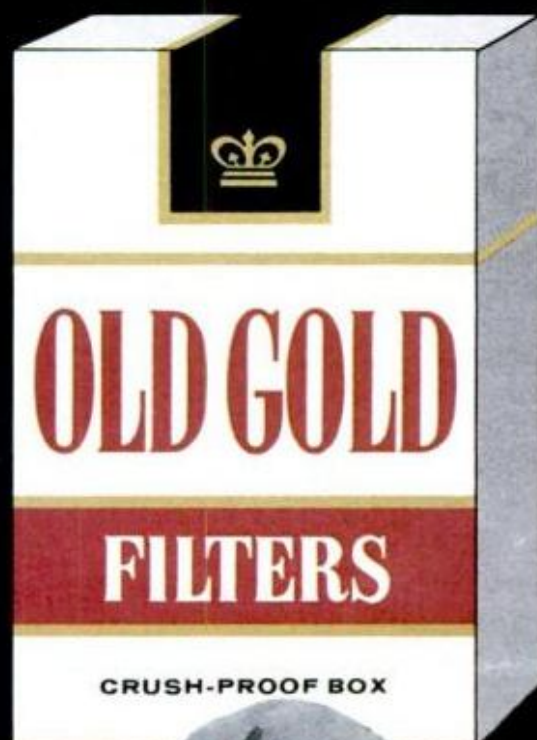


Heatproof soldering stand

Asbestos-surfaced rest made for a household iron makes a handy soldering table. Feet can be attached to raise it off bench surface, allowing use of a clothespin to hold work.—*Ken Patterson, Regina, Sask.*



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Almost half of successful TV servicemen have home study training and among them, it's NRI 2 to 1! A national survey*, performed by an Independent research organization, also showed that the pros named NRI most often as a recommended school and as the first choice by far among those who had taken home study courses from *any* school.

Why? Perhaps NRI's 60-year record with over a million students...the solid training and value built into every NRI course...and the designed-for-learning equipment originated by NRI are part of the answer. But send for your free NRI catalog and decide for yourself.

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DETROIT LISTENING POST

Major makeover for GM compacts

GM will make extensive changes in three of its derivative cars for 1976. Buick's Skyhawk and Olds's Starfire, both offshoots of Chevrolet's new Monza, will be reworked to disguise the kinship to Monza. Pontiac will do the same with its Astre, a makeover of Chevy's Vega.

Chrysler mini not dead yet

Although Chrysler now says it won't have a U.S.-made mini car until sometime after the 1977 model year, if then, the company still has a skeleton crew of product planners assigned to development of a Vega-Pinto-size automobile. Actually a little smaller than Vega and Pinto.

Chrysler is also continuing development work on a four-cylinder aluminum engine, that is obviously intended for a smaller, lighter car than anything the company makes now.

DeLorean working on kit car

One of the projects John DeLorean's working on these days is a kit car. A build-it-yourselfer. DeLorean's the former head of car and truck production at GM who quit his \$600,000 a year job in 1973 to go it alone. One of the kit cars he likes the look of is the Autokit Invader pictured on the cover of the October '73 issue of *PM*.

Speaking of kit cars, the government is considering legislation requiring build-it-in-the-back-yarders to meet the same regulations on safety and emission controls that the car companies have to follow.

Push on plastics at GM

GM has assembled a special study group to explore all potential uses of plastics in cars.

The company obviously has something in mind other than the Chevrolet Corvette, which has a fiberglass body. Corvette is a short-run job, limited to fewer than 30,000 units a year, and GM would not organize a special project crew unless it was thinking in bigger numbers than Corvette.

Service by pictures

There are a lot of good books on the market with instructions for repairing your own car. They cover just about any make produced in the past 15 years and just about any job you want to tackle. But the instructions can be difficult to follow if you don't know the technical lingo. So even after buying the book, you may wind up taking the car to a dealer or gas station because the terminology is too technical. GM is working on an idea to correct that.

John Bates, who heads up all service activities at GM, tells us he is going to put more of GM's instruction material in picture form, rather than text. Some text will still be used, of course. But Bates says where possible, GM will try to explain service and repair procedures in step-by-step drawings. Drawings, not photographs. GM is doing this for the benefit of mechanics employed by GM dealers, not fix-it-yourselfers.

But *PM* readers have been getting step-by-step drawings for years.

Save those gas receipts

The catalytic converters on the '75 cars will supposedly last the life of the vehicle. That's what the car companies claim. By law, the smog scrubbers are required to last 50,000 miles. But carmakers say they will do better than that—providing you don't use leaded gas and poison the catalytic element and providing you don't drive over

(Please turn to page 24)

A winner never stops proving it. Presenting the Poulan SUPER XXV.

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TIME FOR CHRISTMAS **SAVE HUNDREDS OF DOLLARS!**



100-M Movement with Moving Moon dial \$114.50



100-M Movement with Tempus Fugit dial \$99.50

EMPEROR MOVEMENT FOR MODEL 120

Eight Day • Weight Driven • Westminster Chimes

Emperor's 100-M Grandfather Clock Movement is produced in West Germany by proud clocksmiths who, for over a century, have been manufacturing the world's finest movements. Their painstaking craftsmanship is evidenced by the thousands of satisfied Emperor Clock owners from coast to coast. The solid brass dial is framed by intricately embossed overlays. Serpentine hands sweep across the gleaming dial face.

Select from two dial versions. One has the classic Moving Moon Dial with lunar calendar, in color. This dial rotates each 29½ days showing the phases of the moon. The other has the words "Tempus Fugit" (Time Flies) inscribed in black enamel spanning the world.

The completely weight driven movement strikes the famous, melodious Westminster chimes on four musically tuned rods; four notes on the quarter-hour, eight on the half-hour, twelve on the three-quarter hour and sixteen on the hour. Four additional tuned rods sound the hour with a Big Ben tone.

The Emperor movement includes weights, solid brass weight shells, brass bob, pendulum and chimes. All plates are solid brass, and pinions hardened steel. Installation and adjustment of the movement is simple, following step-by-step instructions.

MOVEMENT CARRIES A FULL 1-YEAR WARRANTY

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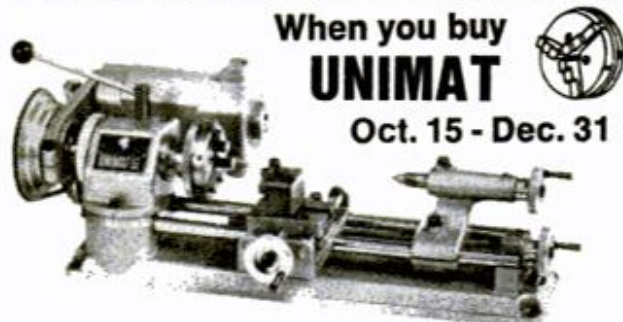
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DETROIT LISTENING POST

(Continued from page 20)

a rock and puncture the canister. If you should ding up the canister or bash in the tailpipe, you will have to pay the cost of replacing it. That could run \$100 to \$200.

But suppose something goes wrong that you feel isn't your fault? The auto companies are so positive the air purifier is near perfect—within the definition of the law—that they indicate they are going to be hard-nosed about footing the bill to replace the equipment. So the Environmental Protection Agency offers this suggestion for you:

Every time you get gas, ask the attendant for a signed receipt certifying that you bought unleaded fuel. Save the receipts. Then if anything goes wrong, the car manufacturer or the gas station will have to pay the bill to repair or replace the catalytic converter.

Comeback for concealed antenna

The auto companies may have another go at concealing the antenna for car radios. But not in the windshield. The antenna sandwiched in the windshield didn't work out because the glass insulated the antenna, interfering with radio reception. The "pull" wasn't as good as that obtained with a conventional pole antenna mounted outside the car.

The new idea is to imprint the antenna in the roof of the car, along the outer edges in the area of the drip molding. Reception is supposed to be as clear as with a pole aerial.

Car prices: Read 'em and cringe!

How long is it since you bought a new car? Ford kept tabs on the age of trades taken in on '74 models and the average age figured out to be 4.1 years. Ten years ago the average age of a trade was 3.8 years. Now people are keeping their cars longer than they used to.

If it's been three or four years since you shopped for a new car, you're in for a jolt when you price a '75. Just about any car you can name will cost you \$1000 to \$1500 more than the price that same car bought four years ago.

★★★

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So when the time comes to buy your favorite mini motor home, insist that it's built with the kind of support that Dodge is famous for. The Dodge van chassis. The largest selling van chassis in America.



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Extra care in engineering makes a difference.



HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Squeaky stair

I live in an older home with an oak stair to the second floor. In the fall when the wood dries it squeaks annoyingly here and there. It's open underneath, as the basement stair is directly below. How can I stop the squeaks—Randy Howard, Denver.

You're fortunate that the stair can be reached readily from below. The stair from a first to second floor is usually the "housed" type—with treads and risers let into dadoed stringers and held with wedges. You should see these small hardwood wedges from underneath. Have a helper walk the stair to locate the squeaky treads, then lightly tap in the wedges under these treads.

Occasionally, the squeaks originate between riser and tread. If this is the case, screw a small metal shelf bracket to riser and tread at the center of the step, with your helper standing on the tread while you tighten the screws.

Now, after the heating season has begun and while the wood is relatively dry, is a good time to do the job—otherwise you might have to repeat it.

Quick cuckoo

How do I prevent a cuckoo clock from running too fast? It gains 10 minutes in a few hours.—E. Harris, Madison, Wis.

Slow it down by lowering the pendulum bob, usually carved in the shape of a maple or oak leaf, which should slide on the pendulum rod. Lower the bob gradually, a fraction of an inch at a time, until the clock keeps accurate time.

Doing without filler

I've never had any luck finishing open-grain woods with the fillers I buy in the paint store. How do I go about finishing a mahogany tabletop without using the stuff?—R. Wilson, Greensboro, N. C.

Several coats of bartop varnish, such as

Fabulon, over stain and sealer is one way. Sand between the coats of varnish.

Another method, which I've used with fair success, is using the sealer as a filler. This is done by applying successive coats of sealer (preferably that known as a "sanding sealer") and sanding down each coat just to the stain, no deeper. This is a bit tricky, and it's unorthodox, but if you are especially careful it will work quite well.

If you wish to finish the mahogany top in the natural color without stain, use the varnish as a filler, sanding down each coat to the wood until the open grain is filled flush. Allow ample time for complete drying between sandings. Finish with a final top coat and rub this to a satin gloss with rottenstone and oil or with a prepared rubbing compound.

Chimney brick flaking

I have a woodburning fireplace and chimney of brick construction. The outside faces of the brick seem to be flaking off. I've tried masonry sealers, but these don't seem to be the solution. What can be the cause and what can I do about it?—Ralph Andalaro, West Islip, N. Y.

Usually this condition is caused by water getting inside the chimney through a faulty cap. Once inside, the moisture dries very slowly, if at all, and tends to activate salts in the masonry that cause the damage you describe. Sealers are then of no avail.

Sometimes this condition can be remedied, at least temporarily, by replacing the cap, but the only sure, permanent cure is to have the top portion of the chimney rebuilt and capped properly. ★★★

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. For more home repair and maintenance help, get PM's Home Care Guide, \$4.45 postpaid. Send orders to PM, Dept. HK4, Box 1014, New York, N.Y. 10019.



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NOVEMBER 1974 27

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APPLIANCE CLINIC

BY PAUL MANN

Intermittent annoyance

We have a GE model P7 electric stove and oven. The problem, which does not appear at every use, is that the oven is not reliable. A temperature setting is made and the oven is turned on. It heats up to the specified temperature, cuts off, but never comes back on again. Other times, it cycles normally. Can you tell me what the trouble is?—Charles W. Dodson, Berwyn, Pa.

Not very specifically. The problem can be in any number of places. Complicating your situation even more is the fact that you can't find the failure unless you catch the oven in the act of "misfiring." When you do, you'll need to jump each circuit until the oven comes on, indicating the faulty area.

If you try this yourself, you will need a wiring diagram to show you just what circuits are involved in oven cycling. I can't tell you, because P7 is not a model number—it simply means that the oven is self-cleaning. GE has been making self-cleaning ovens since 1961, and their circuitry has been redesigned many times. If you're leery about making jump tests with the oven live—and caution is a must for these—you'll have to try to make the problem show up when a serviceman is present.

Out of orbit

My Craftsman orbital sander has burned out three armatures in rapid succession. I replaced the brushes. What is wrong?—A. Iacuzio, Stamford, Conn.

Rarely is the trouble mechanical. Burned out orbital-sander armatures are primarily caused by misuse. An orbital sander is intended as a finishing machine. You can do some cutting with it by changing to a heavier sandpaper, but if you extend the tool beyond its limits, using too coarse a sandpaper and bearing down too hard on the machine—in short, attempting to use it for jobs that require a belt sander—you will burn the armature.

Although it's not likely, the sander may

have a mechanical malfunction, a stripped gear or a dry bearing. If so, the sander would be making a screeching noise.

Flapper or installation?

I agree with you that a faulty pump flapper valve may be causing Harvey G. Hall's Lady Kenmore washing machine to drain prematurely (Appliance Clinic, page 49, May '74 PM). However, during my eight years' experience servicing washers and dryers for Sears, I have found that improper installation of this machine is a more common reason for the problem.

See to it that the open end of the drain hose is not lower than the water level in the washer. If it is, water will siphon out. Proper drainage is obtained into a tub or standpipe at a minimum height (from the base of the washer) of 34 in. and a maximum height of 72 in. If a floor drain is being used, a siphon break must be installed. This can be purchased from a Sears appliance service center using part No. 76660. Thanks for listening.—Marvin F. Fritz, Ackley, Iowa

And thank you for writing.

Burning blender

I own a Hamilton Beach model 610 blender that emits a burning odor which is getting worse with time. The machine now seems to be lagging as well. What is the trouble?—Rodney Miller, Chicago.

Odor can result when sugary substances are mixed in the blender and the cutting assembly is not cleaned properly. The sugar runs down and solidifies on the bearing. This strains the bearing, causing the motor to labor, which in turn makes the armature field burn, producing the odor. As a check, fill the blender with water and turn the machine on. The cutter must spin freely. If it doesn't, replace the entire assembly.

The problem with the cutter assembly

(Please turn to page 30)



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Due to physical size and merchandising policies some stores may not have on hand all items illustrated in this advertisement. Sale prices effective at participating stores through November 30, 1974. Check your Yellow Pages for your nearest Ace Hardware Store.



The Helpful Hardware Man

APPLIANCE CLINIC

(Continued from page 28)

can be avoided by cleaning it properly, especially after blending sugary mixtures. Fill the jar with hot soapy water and run the unit; then run it with the jar filled with clear cold water. Finally, remove the cutter, turn it upside down and shake it to dislodge any remaining substance, and let the unit air dry.

Another cause of odor is a burning clutch assembly, which will give off the smell of burning rubber. There are two such assemblies, one in the cutter unit and one in the motor base. A cause of clutch burning is failure to seat the jar all the way down on the base; this makes the clutch slip. Clutches should be inspected for wear.

Whether your trouble lies with cutter or clutch, it is less expensive to make the repair than to buy a new machine.

Efficiency tips

With the price of electricity going up in many parts of the country, this is a good

time to review some ideas for getting the most economical use out of major energy-consuming appliances in the home: range, water heater, washer, dryer and refrigerator. This month's tips will help you save money in using your range and oven; other appliances will be covered in coming months.

1. Match the pot size to the size of the surface unit.

2. To retain heat, use lids on pots.

3. Use high heat only to bring liquids to a boil—then reduce heat to finish cooking.

4. Whenever possible, thaw frozen foods before cooking.

5. Don't open the oven door to check foods; use an accurate timer instead.

6. Use a steamer or pressure-cooker to cook several foods at the same time.

7. Use portable cooking appliances (electric grills, roasters, fry pans) when possible—they do the same job for less. ★★★

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



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If you, too, have been thinking these thoughts lately, you'll find one of our free Career Guidance Booklets very helpful at this time. We invite you to send for one.

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—Bill Alfring, Anderson, Cal.



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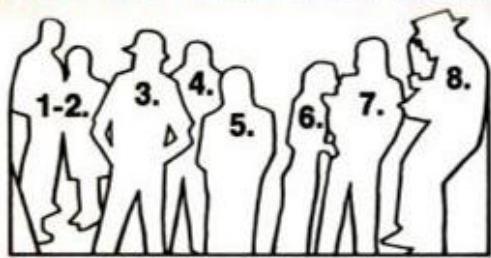
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Can you spot the Camel Filters smoker?



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9.

Night at the Carnival. And almost everybody has a gimmick. Pick the one who doesn't. **1-2.** No and no. It's the former tattooed man and his wife, "The Rubber Woman." Gimmick: They've embraced so much, she's erased him. **3.** Nope. He's Moe M. Downe. Gimmick: Pitching show-off. His curve never breaks... only his extra-long cigarette. Not too bright. Thinks a manila folder is the Filipino contortionist. **4.** Nope. He's Jack Knife. Gimmick: Dives 185 feet into a full-color photograph of Lake Erie. **5.** No, he's Hugh Mann Kanonbawl, recently fired. (They wanted a man of higher caliber.) Either still has black powder on his face... or his charcoal filter cigarette is attacking his nose. **6.** No, but it's a pretty good ms. **7.** Right. He thinks there's enough fun here without extra gimmicks and fancy frills. Likes his smoking pleasure honest, too. Camel Filters. Great tobacco taste without the nonsense. **8.** Not Noah Refund, the barker. Gimmick: Fast sales pitch. He could talk the Wolf Man into wearing a flea collar. **9.** "The Bird Man" (not shown). He's away nesting.

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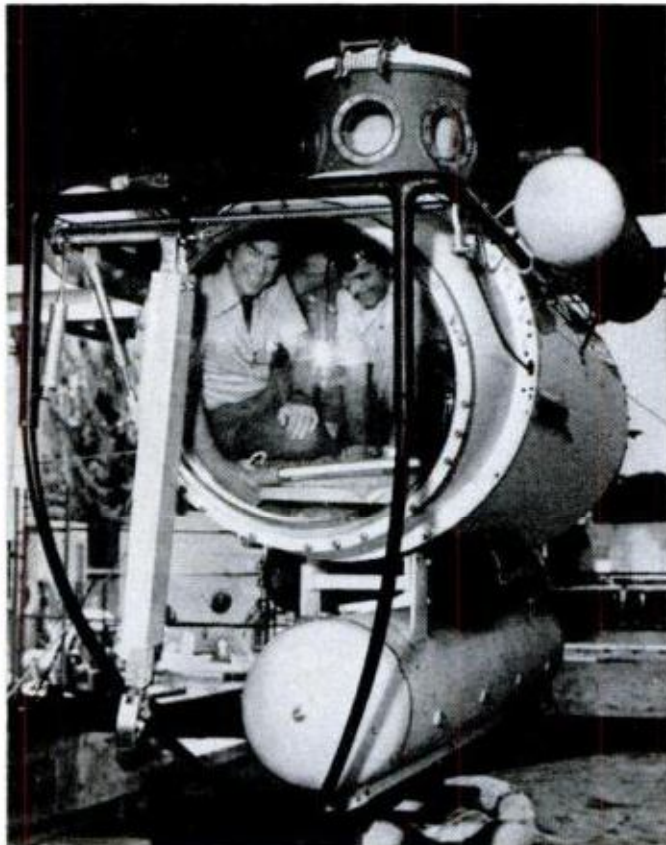


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SCIENCE WORLDWIDE



Tiny sub for research in Gulf

A two-man sub with an operational depth of 1200 feet has become part of the "fleet" of Texas A&M University, and is based at the university's Galveston campus. The sub will be used primarily to investigate natural oil seeps and for advanced environmental studies in the Gulf of Mexico. The miniature vessel has been named *Diaphus* after a lantern fish found only at extreme depths in the world's oceans. The sub was built by Perry Oceanographics, Inc., Riviera Beach, Fla. John H. Perry Jr. (left), inventor of undersea equipment, and Dr. Thomas J. Bright, a member of the faculty, peer out through vessel's transparent acrylic nose.

Carbon monoxide found in blood

Nearly half of all nonsmoking Americans have a concentration of carbon monoxide in their systems that is higher than the level

considered permissible under federal safety standards. This finding is contained in a research report appearing in a recent issue of the *Journal of the American Medical Association*. The report is based on the results of blood tests of 29,000 Americans living in city and country. The researchers identify the auto as a major source of carbon-monoxide pollution and report that the highest bloodstream levels were found to exist in Denver and Los Angeles. Rural dwellers had the lowest levels. Smokers in all geographical areas showed higher concentrations of the poison than nonsmokers. Healthy adults may not suffer serious harm from the condition, according to the report, but it can do damage to infants, the elderly and heart patients.



Body maps: new medical tool

Contour maps of the human body are helping scientists at the Baylor College of Medicine, Houston, to study spinal deformities in children and as an aid in reconstructive

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

The famous Lincoln AC 225-amp welder is your best buy



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SCIENCE WORLDWIDE

(Continued from page 33)

surgery and in fitting artificial limbs. Researchers use dual cameras to take two overlapping photos of each side of a subject's body. As in aerial mapping, a plotting device identifies reference points common to each photo to create a 3-D image. The reference points, which may range from about 100 to over 40,000, are fed to a computer along with other data to produce precise measurements of the entire body.



Miniature orange grove in lab

A greenhouse lab is used at the University of California's Berkeley School of Public Health to reproduce the environment of a commercial orange grove. The researcher shown in photo is taking air samples in an effort to determine how soon farmworkers can safely enter fields and orchards after plants have been treated with pesticides. Monitoring equipment records humidity, temperatures and light intensity.

New way to brand crabs

Tagging crabs in order to study population trends and movements is a problem that may be solved by the laser, say researchers at Oregon State University. Plastic tags or painted marks are lost when a crab sheds its shell in molting. Laser branding, now under test at OSU, alters pigmentation cells. When a new shell forms, it, too, carries the laser-produced brand. ★★★

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IMPORTS AND MOTORSPORTS



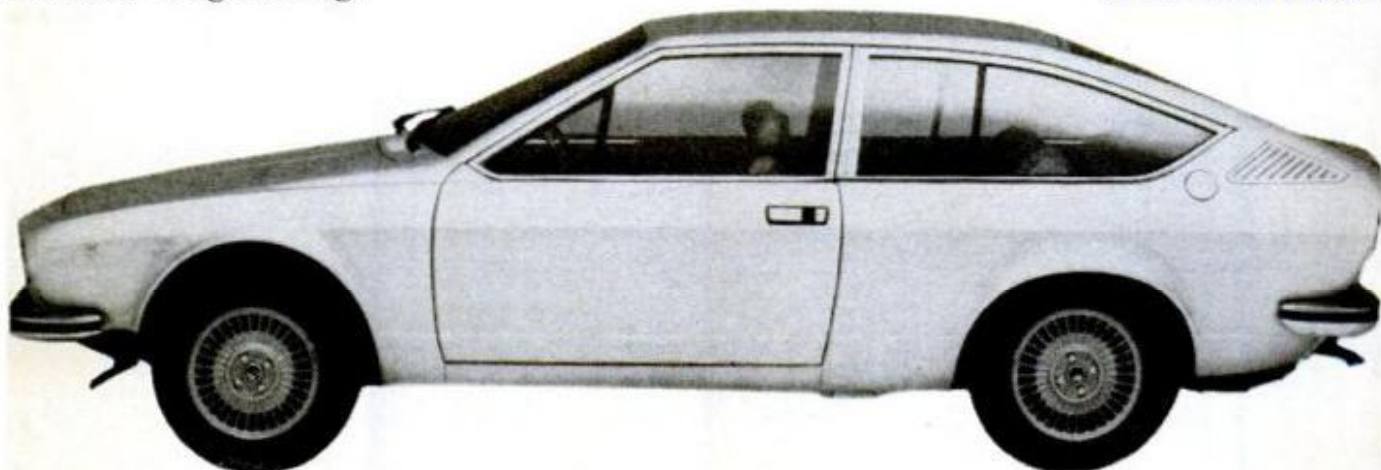
The cat is back

Production of the Jaguar marque goes back to only 1945. In the fifties Jaguars wiped up the competition in the 24-hours of Le-Mans five times, won at Sebring and took several national championships in SCCA racing. In the mid-sixties the six-cylinder E-type Jaguars scored an impressive string of victories—39 of 42 starts—in SCCA events. But, until this year, the E-type V12 has never run in U.S. races. The 12-cylinder engine (see *Are Eight Cylinders Enough?* page 84, Jan. '72 *PM*) displaces 326 cu. in. In the racing convertibles, the smooth and sophisticated overhead-cam powerplant generates 425 hp. Now with the backing of British Leyland Motors a team of V12s will be driving hard for the B Production title which in recent years has belonged to the Chevy Corvette. Bob Tullius (above) and Lee Mueller will be campaigning the cars which have been prepared and are being fielded by Group 44 Racing and Huffaker Engineering.

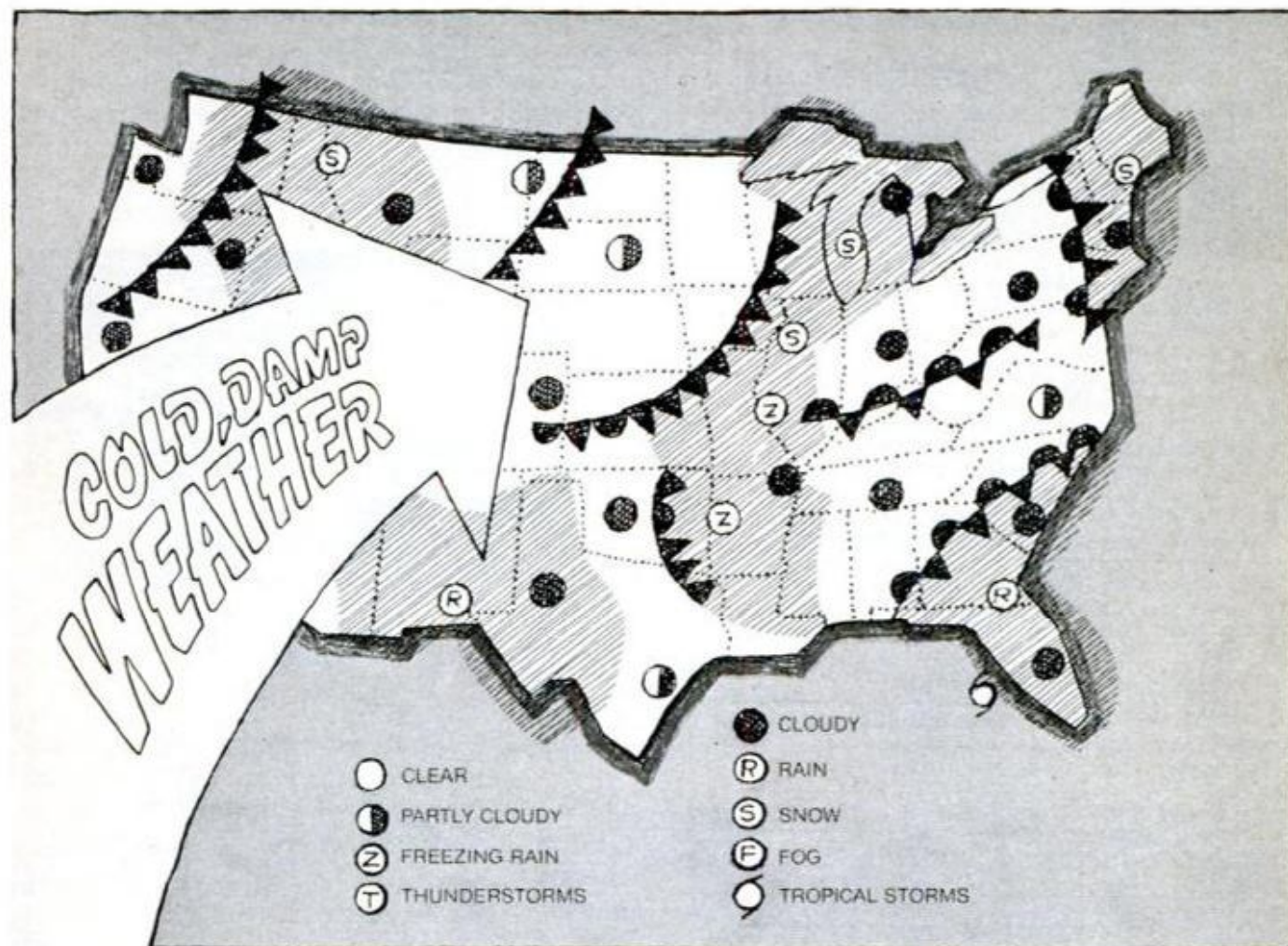
Alfa a la mode

You can tell the lineage is the same, but the lines are all new. The Alfetta GT shown below is Alfa Romeo's replacement for the GT Veloce which has been in production since 1968. Both cars are from the design genius of Giorgetto Giugiaro. The sporty coupe will have a 1975 debut here, preceded by the introduction of the Alfetta sedan from which the GT was derived. Like the current GTV and Spyder, the Alfetta will use the two-liter, dohc, fuel-injected in-line Four for the U.S. version. The 2300-pound hatchback has a wheelbase of 94.4 in., is 164.9 inches long, 65.5 inches wide and 51.2 inches high. Transmission is five-speed, steering is rack and pinion, brakes are disc front and rear. The price, I'd say, may be anywhere between \$7000 and \$8000.

(Please turn to page 38)



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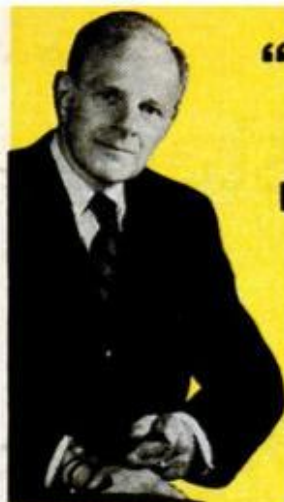
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IMPORTS AND MOTORSPORTS

(Continued from page 36)

Welcome wagon

There's a growing demand for station-wagon versions of sensibly sized economy cars. As predicted last February in *Dockside Guide to Imported Cars*, there's now a wagon in Datsun's 710 series. It's powered by the same 1770-cc overhead-cam used in the sedans and, like them, has a long list of desirable features that are standard equipment. That's what makes the \$3500 price so attractive!



Camshafts über alles

The 2.8-liter, double-overhead-cam Six that Mercedes introduced here in 1972 in the 280 series is a jewel of an engine. Installed in a 450SE it would give you a very smooth, economical, luxury car indeed. The 450 chassis has, in fact, been available in Europe with the Six, and now will be marketed here. The 280S, as the car is called, is good for about 20 mpg, or roughly 5 mpg more than the 450SE gets with its 4.5-liter V8.

Mercedes-Benz will have still another engine for '75. It's a five-cylinder diesel. By adding another cylinder to the ohc 2.4-liter diesel used in the 240D, the engineers brought the displacement up to three liters. Mercedes knows that the 240D 3.0, with its improved performance, will overcome some of the resistance to the diesel because of its slow acceleration. ★★★



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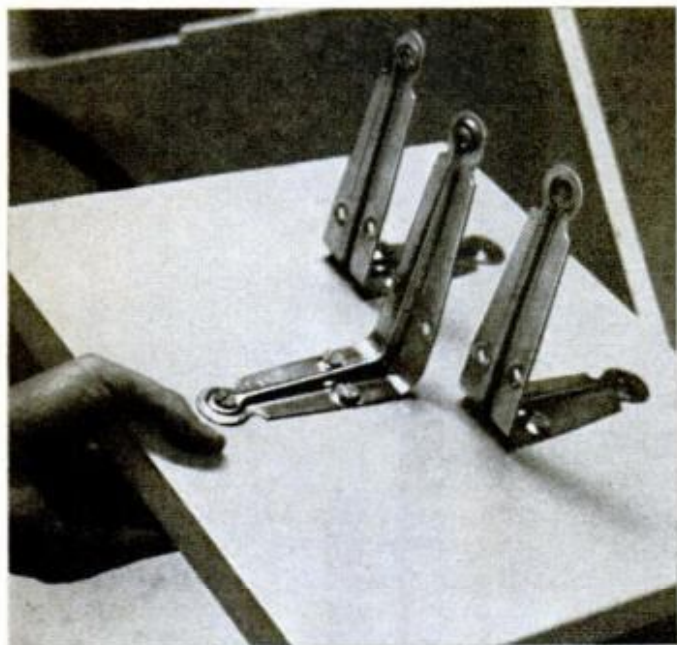
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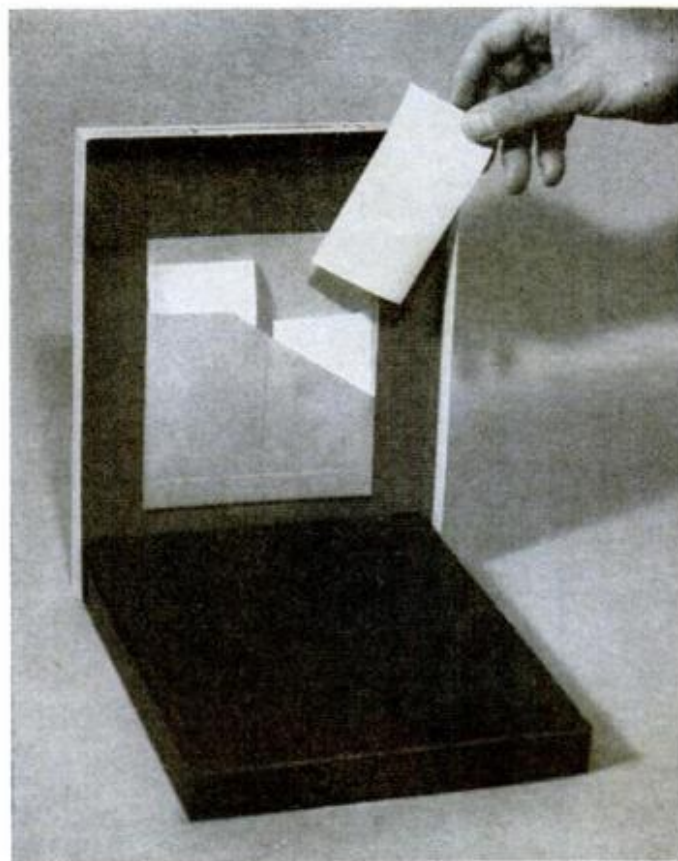


Darkroom shelf fits on laundry tub

If you're using a laundry tub, either single or double, for a darkroom sink, here's a shelf that will stretch your effective counter area—and will drain off easily into the tub.

Attach three 5-inch shelf brackets to a suitable piece of scrap lumber, as shown, so the brackets will fit snugly over the side or divider of the tub. A coat of epoxy paint will make it waterproof and stain-resistant. It's handy for holding trays or developing tanks, and for mixing chemicals.

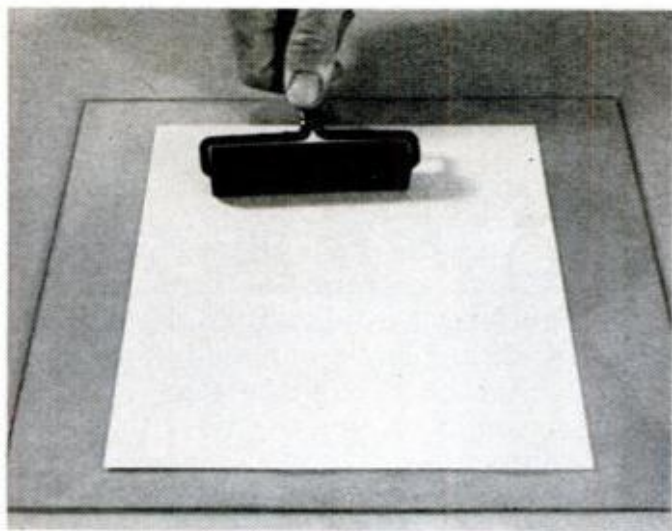
—William M. Phillips, Tallahassee, Fla.



Envelope keeps test strips handy

Photographic test strips left lying loose in your enlarging paper box can be hard to find in the dark. So I keep mine slipped in a manilla envelope, cut open as shown above, and glued to the inside of the enlarging paper box lid.

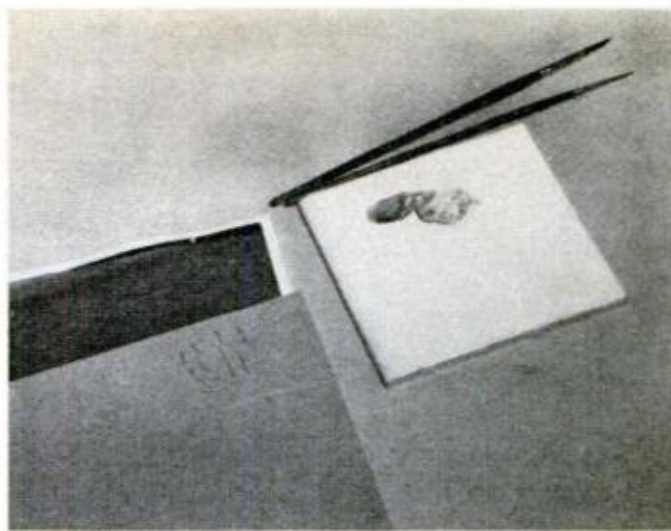
—Ken Patterson, Regina, Sask.



Plastic 'ferrotypé' for color prints

Do your ferrotyped color prints have measles? Those stains are due to pits and scratches in the ferrotyping plate's surface. For foolproof color ferrotyping, cut a new plate from clear plastic "window glass," sold by builders' supply stores. In hot or dry weather, cover the prints with old newspapers once they're on the plate, so drying will be slow and even.

—Philip Duclos, Mira Loma, Calif.



Aids to easier print-spotting

Print-spotting gets a lot less tedious if you work on only one section of a print at a time, blocking off the rest of the area with a sheet of white or yellow construction paper. This paper also doubles as a blotter for removing excess spotting fluid from your brush. And a plain, white, 4-inch-square tile from the hardware store is great for mixing the spotting dyes.

—Grace B. Weinstein, Los Angeles, Calif.

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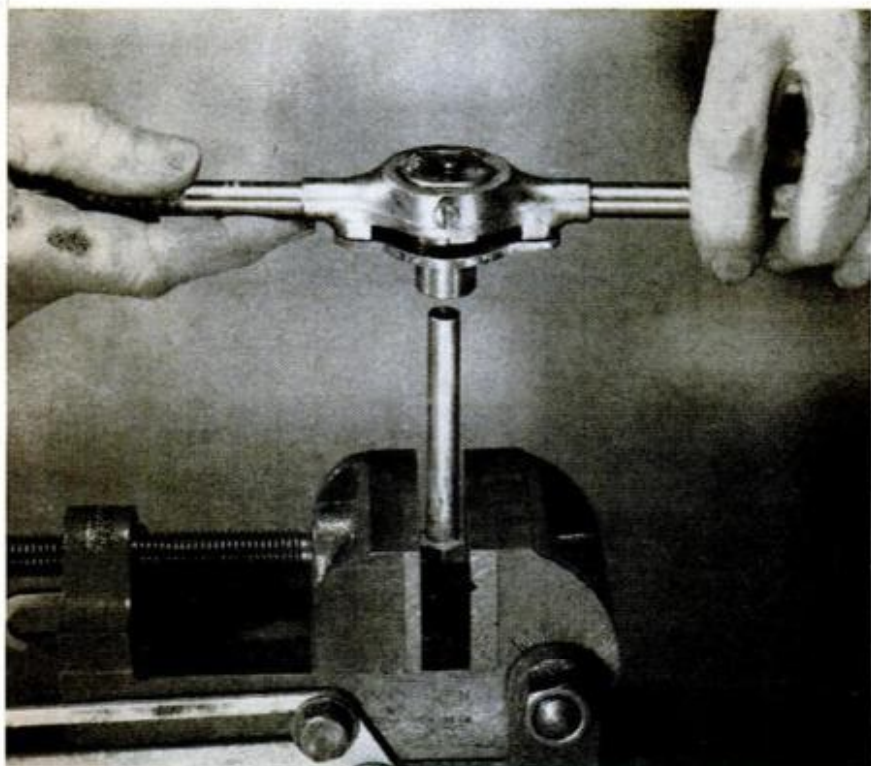
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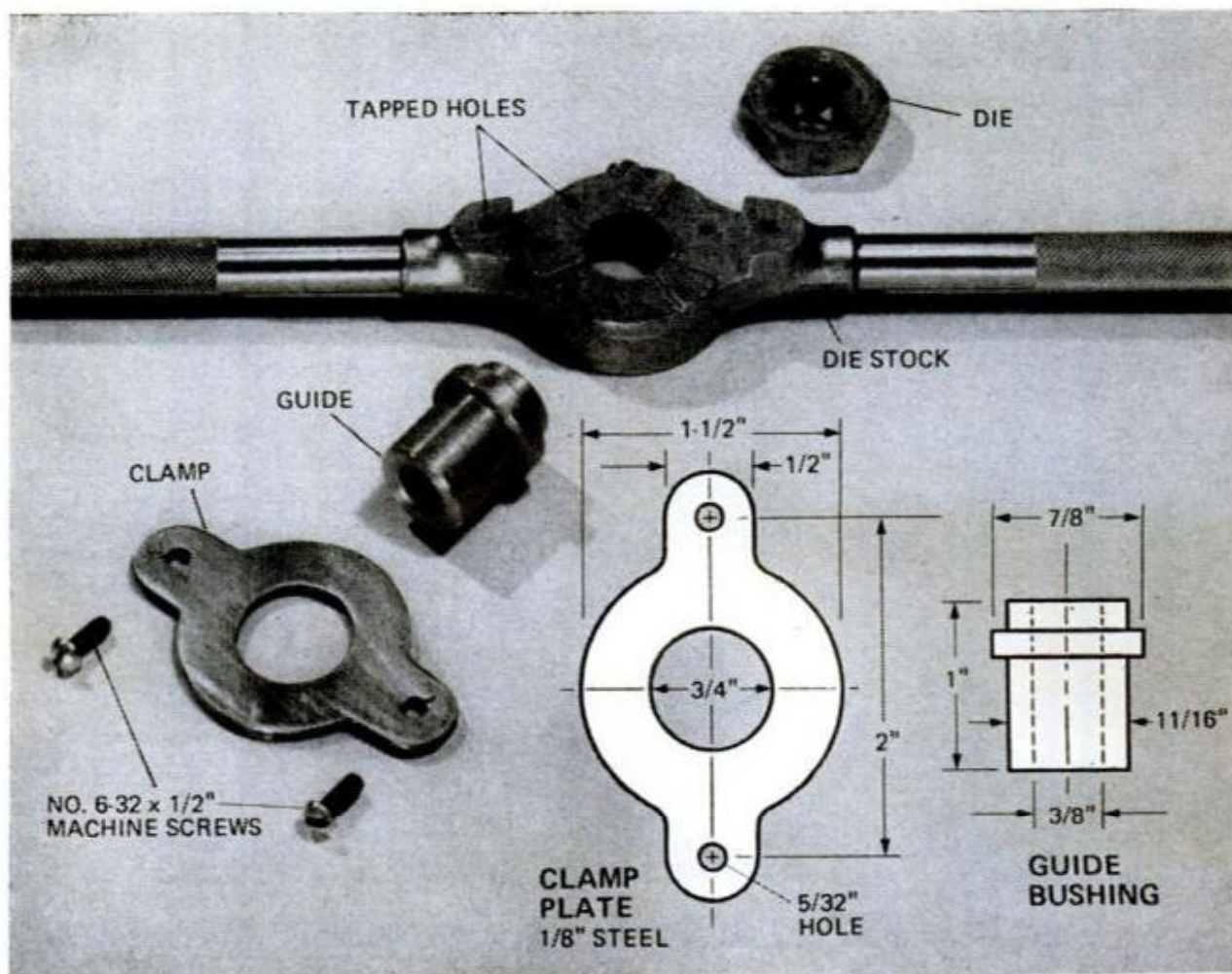
Die-stock attachment makes threading easy

by John Mallak



Once the die is started straight and true, there's no trick to cutting uniform threads with a die stock, but I always had trouble aligning the die properly. If only the stock had a long bushing to align the die with the work automatically when slipped over the end. I solved my problem by making the attachment you see here to fit my Craftsman die stock. It has a clamp plate used to hold separate interchangeable guide bushings made to suit different diameters. Overall size of each bushing is identical; the hole through it is bored .010 in. oversize for an easy slip-on fit. The shoulder is made to fit the recess in the stock.

In use, back the die stock off often to clear chips. When threading very short rod, if the bushing interferes with and restricts the travel of the die, the bushing is easy to remove. ★★★



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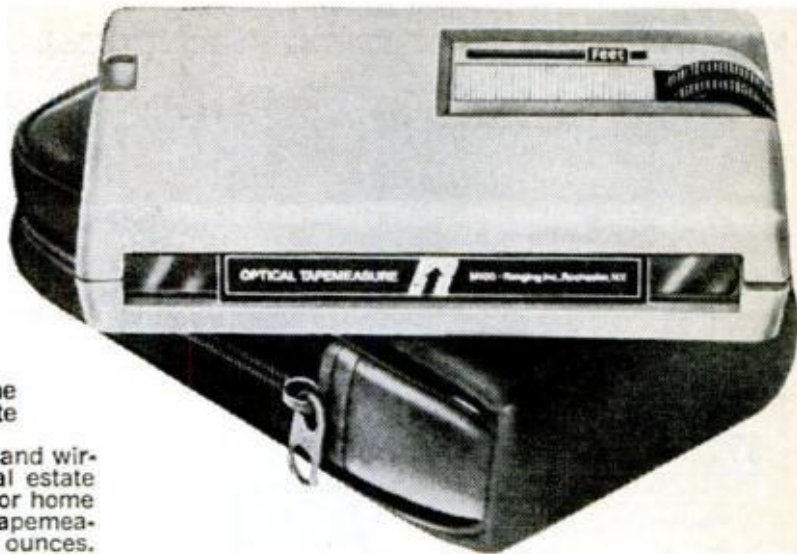
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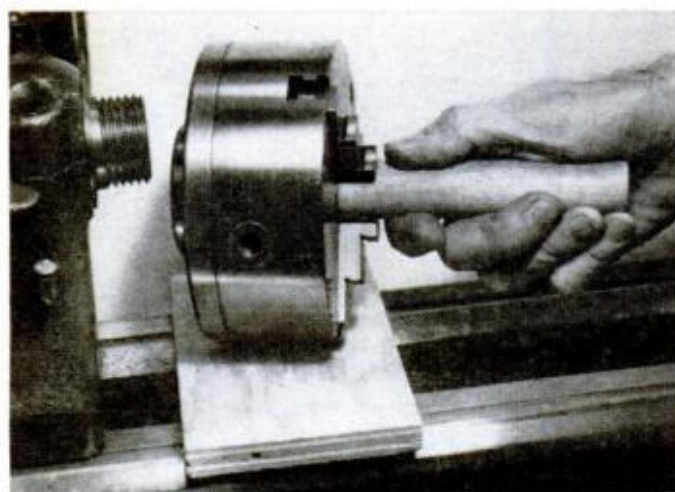
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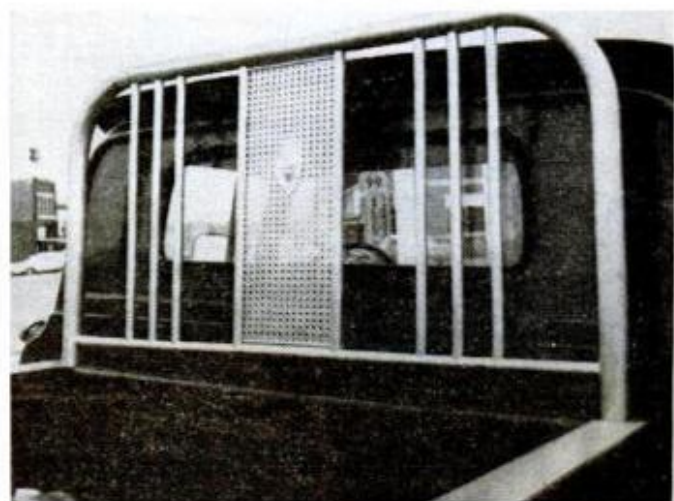
FROM READERS



Handle for lathe chuck

A heavy lathe chuck can be difficult to mount or remove, thus easy to drop. You can put a convenient handle on it by clamping a short length of dowel (of largest possible diameter) with the jaws.

—Federico Strasser, Santiago, Chile



Cab window guard

Pickup owners soon learn that loads can shift forward, endangering the cab's rear window. An easy way to make a guard—truckers call them "headache posts"—is from an old bedstead, cut and welded into place.—Lee H. Schrimpf, Tulsa, Okla.

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Best wishes,
Tom McCahill

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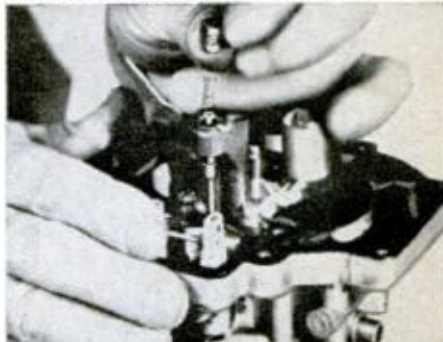
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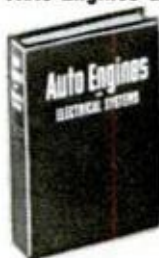
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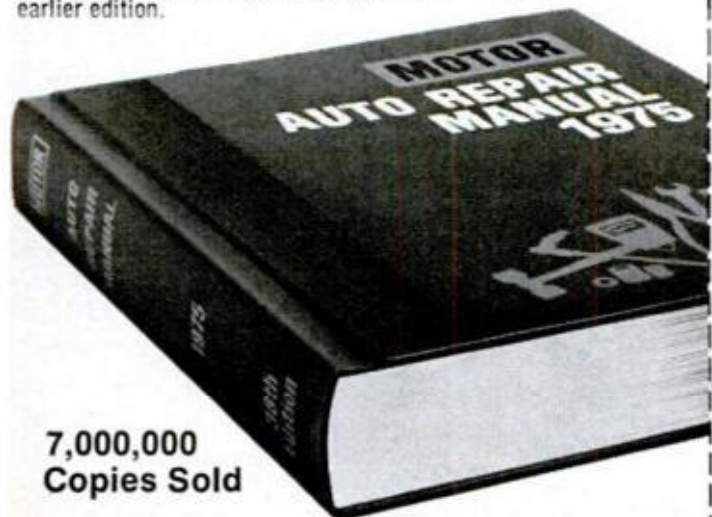
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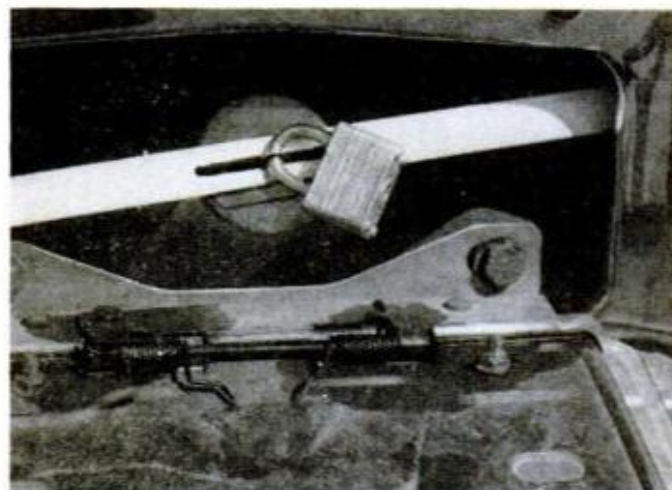
HINTS

FROM READERS



Pizza pan for saw-blade cleaning

To clear circular saw blades in a minimum of gum remover, submerge them in the fluid in an aluminum pizza pan. Get the permanent kind—not the disposable type—sold in hardware stores and housewares departments.—Ken Brooks, Vashon, Wash.



Gas-cap lock

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—George T. Elton, Johnstown, N.Y.

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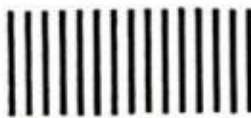
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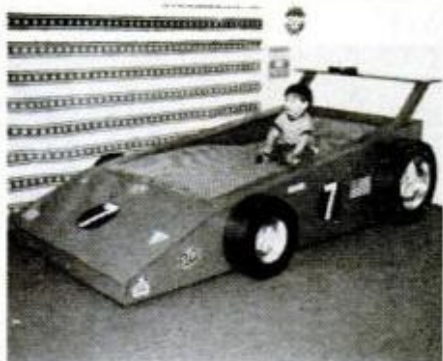


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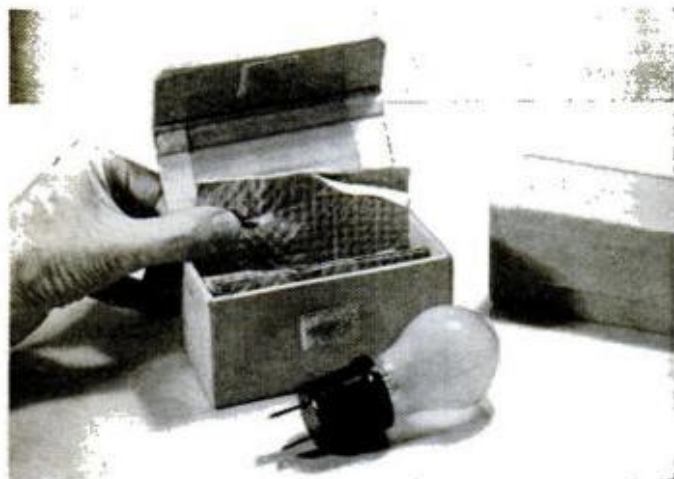
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HINTS

FROM READERS



Traveler's night light

For those who like a night light, especially when traveling and sleeping in unfamiliar rooms, a 15-w. bulb and two-prong socket will fill the bill. If that's too bright, use a smaller, dimmer 7½-w. bulb. Carrying cases for the lights are easily made of cardboard, with Velcro closure.

—W. B. May, Oak Park, Ill.



Drying children's boots

Children's boots are constantly getting wet during the winter and can take a long time to dry. They'll dry faster if 2-lb. coffee cans, open at ends, are inserted in boots and placed over hot-air registers. Continual passage of hot air dries boots. For toddlers' boots, use 1-lb. cans.

—J. D. Maxwell, Vancouver, Wash.



Homemade tack puller

A tack puller is quickly improvised from a 10-cent bottle opener by hacksawing a slot in the pointed end and beveling the resulting prong tips. Wrap hook at other end with tape to improve grip, but leave the tip untaped so you can tap it with a hammer.

—Walter E. Burton, Akron, Ohio



Reusing masking tape

When masking tape is removed after a paint job, its adhesive surface may still be tacky. If so, it can be used to pick up filings, grinding grit and dirt from tools and workpieces. Stickiness can be preserved for some time by storing tape scraps on the side of a tin can.—E. B. Walters, Chicago

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THE BICYCLE SHOP

BY EUGENE A. SLOANE

A tank with pedals?

I would like to contact the firm or person who made a bike with a metal housing around it to keep out rain. It supposedly had a gear system so you go uphill effortlessly.—James Lauria, Brooklyn, N. Y.

What you're looking for sounds like a tank to me. Anything with that much metal around it sure would need a big gear system to go on the flats, let alone uphill. And there's no such thing as "effortless" cycling; sweaty effort is good for you. I can't say I'm really sorry I never heard of such a bike, but I never have.

Can you carry luggage in the frame?

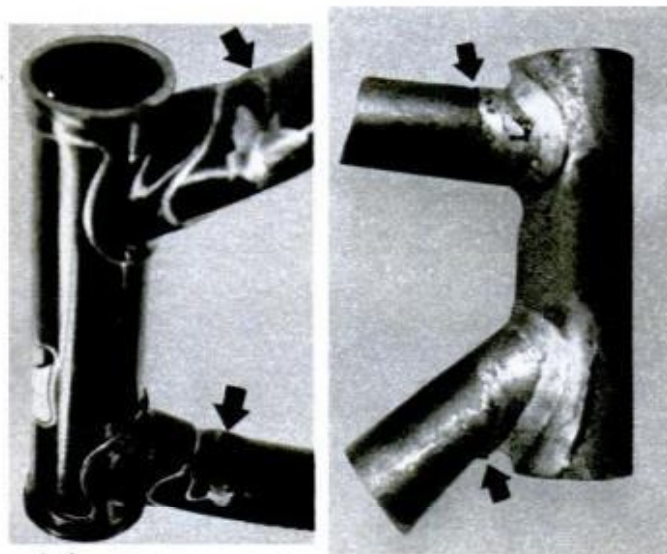
In your article on best bikes for various uses (Best Bicycles and Gear for Commuting, Shopping and Touring, page 90, June PM) you mentioned various bicycle packs. Would it not also be possible to put a bicycle luggage carrier between the frame, under the top tube?—Douglas Reynolds, New York.

It sure would be possible, and, in fact, you can buy them. For myself, I don't like this location because the inside area of my thigh rubs on bags in this spot, a solid mass there gives wind resistance which can unbalance you in a high wind and bags in that location can't hold much.

Better brazed or lugged?

Is a hand-brazed frame as good as a lugged frame?—Gene Kaplan, Buena Park, Calif.

I assume you're asking if a hand-brazed lugless frame is as good as a hand-brazed lugged frame, and by "good" you mean stiffness, strength and resistance to road shock. Yes, a good lugless frame, with accurately mitered tubes and professionally hand brazed is just as strong as a lugged



LUGGED

LUGLESS

frame. Lugs can hide poor mitering, for example. I witnessed a test last year in England in which a hand-brazed lugless frame outperformed a brand-new hand-brazed frame of "531" double-buttet tubing. The lugged frame (left) in a drop test, failed well before the lugless frame (right). The lugged frame shown is a sawed section of the main frame head, top and down tubes. Arrows point to the places that the frames cracked and crumpled.

New bike that creaks

Soon after I bought a new bike I noticed the rear wheel was making creaking noises with each turn of the wheel. Is this due to the wobble of the freewheel? The wheel does not make a noise unless somebody is riding it.—Frank Breen, Latham, N. Y.

Some bikes under \$150 have spokes tightened and wheels trued by machine, with possible touch-up at the factory or bike shop. Nothing is perfect, however, and you may have a wheel with spokes never tightened enough. I am sure that's what causing the creaking noise, because as you ride on

(Please turn to page 52)

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Pickups shown are equipped with optional whitewall tires, rear bumper, radio: SuperCab has two-tone paint.



THE BICYCLE SHOP

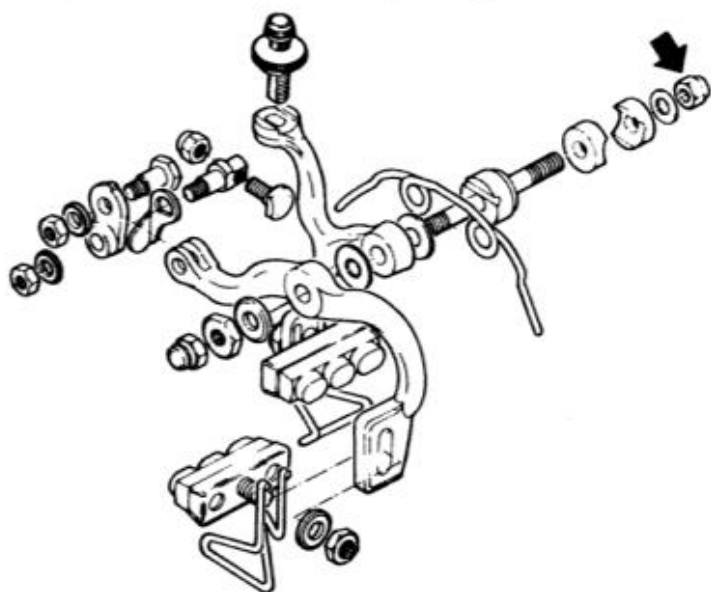
(Continued from page 50)

the bike the spokes are being pulled back and forth as the wheel turns, and part of the creak is also from the wheel rim bending under stress when it should be held in place by the spokes. Spokes should "twang" and feel tight when plucked and all spokes should have about the same tension. Please refer to the April 1973 *Bicycle Shop* for wheel-truing instructions. The freewheel wobble is normal, has nothing to do with wheel creak.

Tightening those center-pulls

I have a new bike with center-pull brakes which are always dragging on one side on the rim. I reset the brakes by loosening the brake bolt on the rear of the fork, but the brake always seems to come back dragging in a short time. How can I fix this?—Barry Fischer, Troy, N. Y.

Side-pull and center-pull brakes have this problem, but it is worse on side-pulls. You should hold the left brake shoe tightly against the rim while you tighten the brake



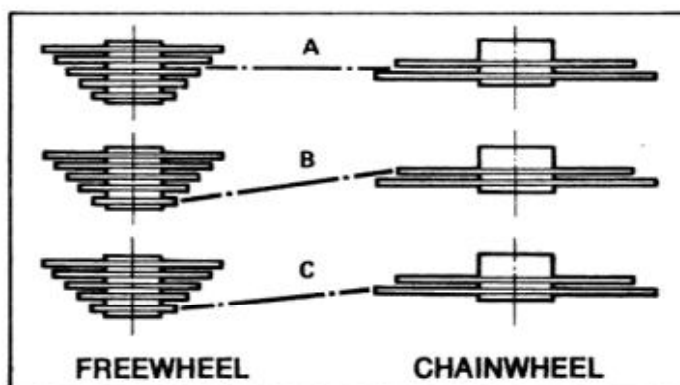
bolt (arrow in drawing) firmly with a 10-mm (usually) wrench. If the brake still drags, you haven't tightened the brake bolt enough (but don't break or strip it by bearing down too hard).

That's the rub

A week after I bought a new 10-speed bicycle I noticed that when my chain was on

the smaller chainwheel and the smallest rear sprocket, the chain rubbed against the larger chainwheel. I took it to the shop where I bought it and they said I wasn't supposed to ride in that gear. Is that true? Then I noticed that when the chain was on the larger chainwheel and on the smaller back sprocket the chain rubbed against the front derailleur, even when it was all the way over. I also noticed that the two chainwheels were slightly lopsided. Can you tell me what I should do?—T. J. Tenafly, N. J.

Sounds to me as though you have at least three things wrong here. I have made a few simple pencil sketches to illustrate. Sketch A shows correct chainline, with the middle



or third rear sprocket in line exactly midway between the two front chainwheels. Check with a piece of angle iron for a straightedge or eyeball it. This should be your first step. Correct any out-of-line problem by moving the rear wheel left or right by removing or adding spacing washers on the rear axle right side. You may also have to "redish" the rear wheel to keep the rim centered between axle locknuts as shown in the April, '73 *Bicycle Shop*.

Sketch B shows chainline (exaggerated a bit) when the chain is on the smallest two gears. Note that the chain can rub on the front chainwheel if this latter wheel is bent out of line. To correct, straighten the chainwheel by moving it (carefully) in the right direction when held between the jaws of a monkey wrench.

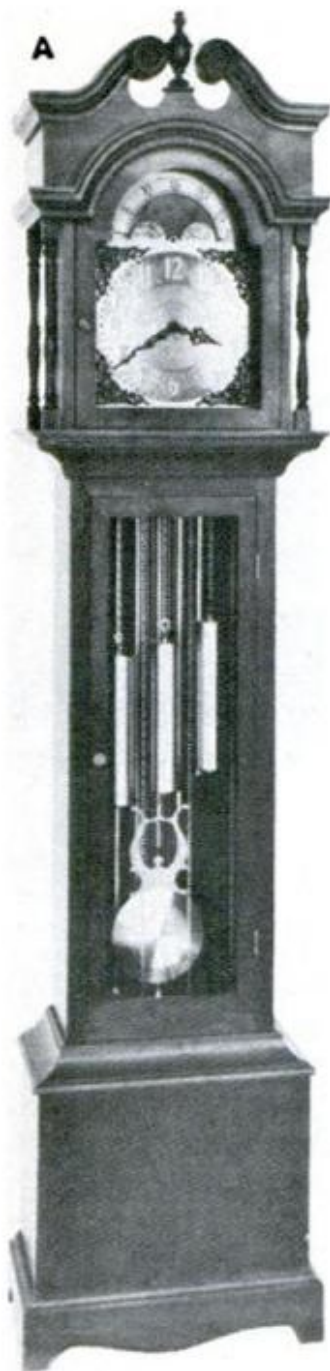
Sketch C shows the chain on the larger chainwheel and smallest sprocket. It is possible, if your front derailleur is not adjusted so it will move over far enough to the right, it will not clear the chainwheel so the chain won't rub on the inside of the derailleur cage. However this should be even more of a problem when the chain is at an extreme angle as in Sketch B.

One thing few cyclists seem to realize

(Please turn to page 55)

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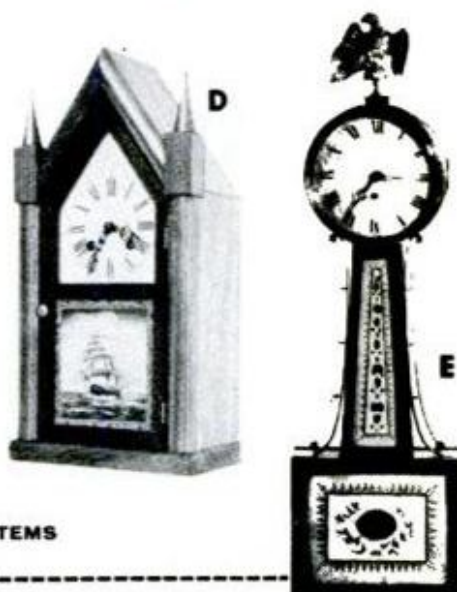
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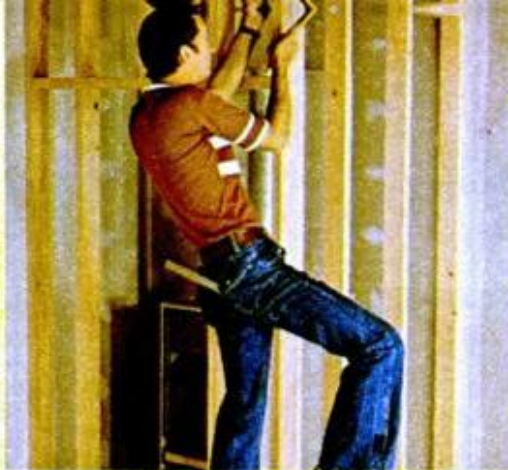
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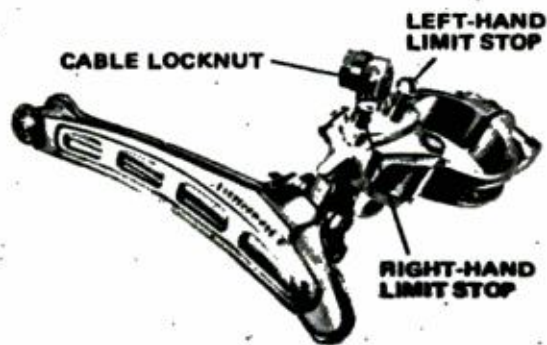
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THE BICYCLE SHOP

(Continued from page 52)

is that when you shift through the rear gears the chain assumes increasingly steep angles, and you must continually move the front derailleur slightly as you shift the rear gears to keep the chain from rubbing on the inside of the front derailleur cage. Get into the habit of pushing the left hand or front derailleur lever a bit forward when you shift to a larger rear gear and a bit backward when you shift to a smaller rear gear, and check chain clearance between the front derailleur cage sides visually (but make sure the road ahead is clear and look up quickly!). Also the front derailleur may not be adjusted so it can be moved far enough to the right so you can shift it to clear the chain. In this case simply unscrew the stop bolt on the front derailleur so it can move to the right. A bent chainwheel will of course exaggerate any of these problems. And if the shift cable is stretched so you can't move the lever far enough to pull the derailleur to the right for this clearance, you will have to loosen the cable locknut, pull excess cable slack through (while the shift lever is all the way forward) and retighten cable locknut on the derailleur. Here's a photo of a typical front derailleur:



Where can I find bicycle decals?

I want to paint my bike. Where can I get new decals for it?—Joe Wolfe, Los Angeles.

I know of no normal channel of supply that will get these decals to you. Best bet is to see your local bike dealer and ask him to go back to the wholesaler and/or importer. Raleigh and Schwinn aside, I don't think you will have much luck. But it's worth a try, and if enough people ask for them, manufacturers may make them more readily available. ★★★

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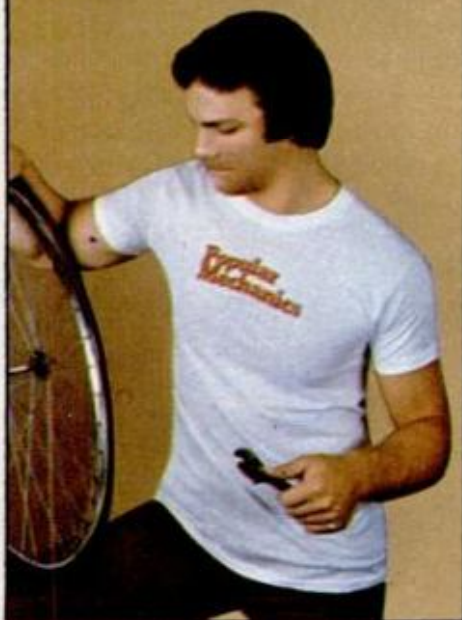
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ALL OUTDOORS

Marine muscle

More power for pleasure boats has been developed this year in spite of the early pinch in fuel supplies. Outboards have been setting new world records. Little gasoline and electric kickers for fishing are multiplying like guppies. Stern-drives, considered so experimental just 15 years ago, set a new record this summer for the famous Miami to New York offshore run when Dr. Bob Magoon averaged 55 mph for 1257 ocean miles with his big 40-foot Cigarette powered by a pair of 482-cu.-in. MerCruiser outdrives.

Even diesels are now getting lighter and more compact so they can go into smaller hulls. And the West Coast ski boats, particularly, have been turning to water-jet power, now being made available by a number of companies. For shallow water and the safety of swimmers, they do offer advantages.

Judging jets

Water jet jobs we have tested recently have been surprisingly good—or very bad. We would recommend the following check-outs before buying one:

On land, examine the exterior nozzle unit to see if it has any rudder fin that swings as the jet is steered. In the water, this could conceivably strike a swimmer or an obstruction, but it seems to help greatly in steering control.

Next, during demonstration trials, at-

tempt slow maneuvers as you ease alongside a dock. See if you have any control in reverse. Do you need to spin the wheel and oversteer to get control? Must the throttle be stabbed on for steering response? Good models don't require this but the bad ones certainly do.

Sure, you can learn to get used to this bad handling and compensate for it, but why should you?

One last test: Run at speed over choppy water and see if it feels like you're trying to steer a squirrel. Then, as if you spotted a log or swimmer dead ahead, chop throttle and spin the wheel to turn out of the way. If you coast dead ahead on your way to a potential collision, cross off that make of jet and shop instead for a better performer.

Fisherman's luck

The recent American Fishing Tackle Manufacturers Assn. Show of all the new tackle *(Please turn to page 60)*



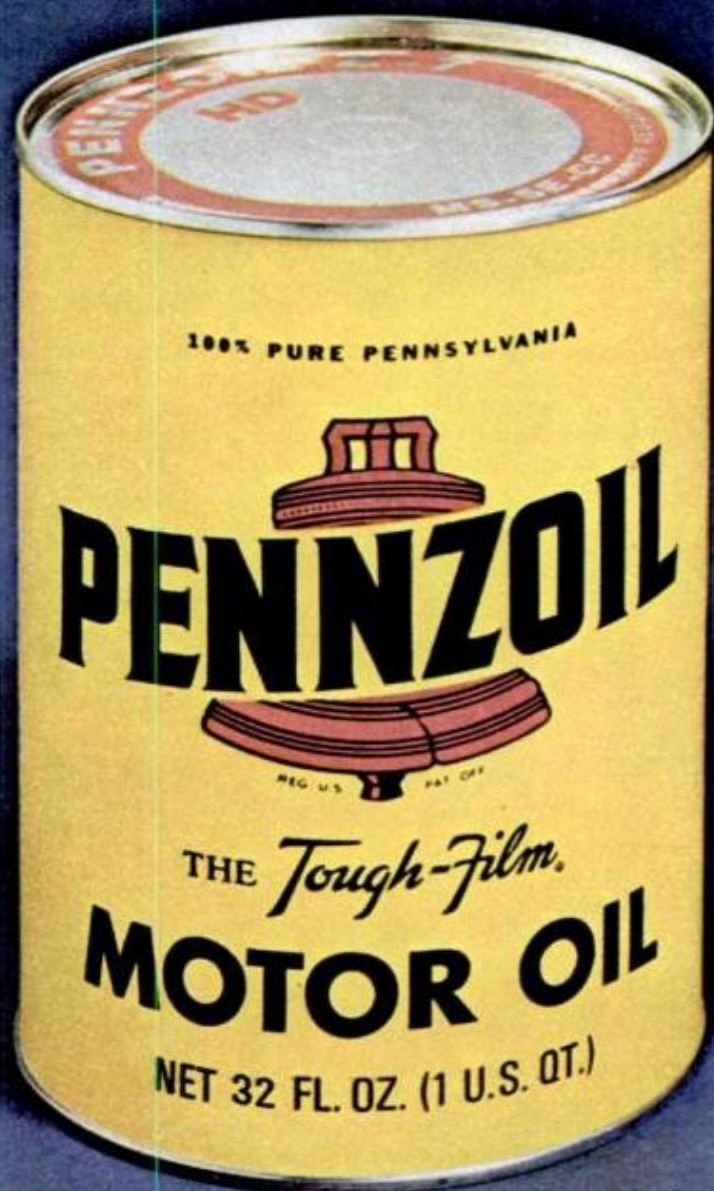
New Chevy Blazer models for next year have a hardtop as base equipment along with roll bar. Open two and four-wheel-drive have optional hardtop and quick-release tailgate for complete removal. High-energy ignition system and catalytic converter for exhaust control improve mileage.



For 1975, the full-time four-wheel-drive first available on the Dodge Ramcharger (left) will now be standard equipment on W100, 200 and 300 Power Wagons like model at right. Trailer towing packages with heavy-duty alternator, battery, radiator and wiring harness are also offered.

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ALL OUTDOORS

(Continued from page 58)

for next year seems to indicate a lot of luck in finding fish will no longer be necessary—if all the new gadgets really work.

One outfit has introduced an underwater radar set that practically shows you a lunker's size, depth, distance and picture on a screen.



Smaller travel trailers have a bigger appeal now for the owners of compact cars. Shasta's 19½-foot model 1950 sleeps eight, and comes equipped with a shower with a tub, a four-burner gas stove and a refrigerator that runs on gas or electric power.

For trailer campers who would like to park their rigs and stay awhile, a new 34-foot fifth-wheel park-model has just been introduced by the Monitor Div. of Wickes Homes. This unit boasts a 4x6-foot tip-out living room.



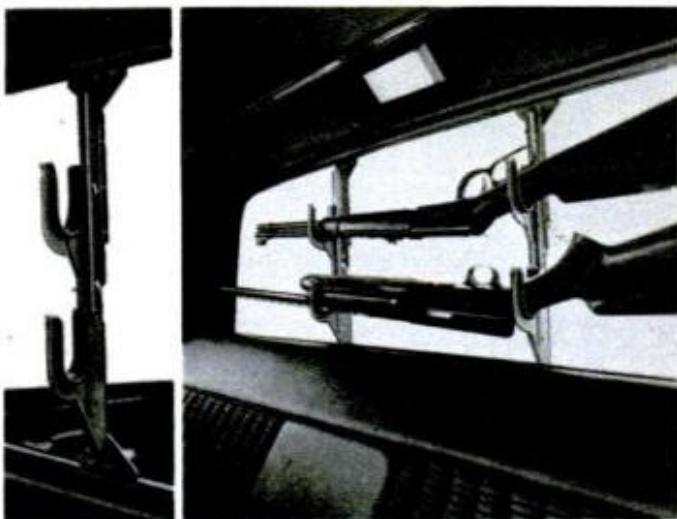
A new lure is transparent so you can load inside any bait that might attract him, including a picture of his favorite food.

Even rods have come a long way from a stick with a string. Space-age graphite fibers are the latest refinement. They are

(Please turn to page 63)



Truck campers and cap covers for standard size down to subcompacts like Luv truck shown above with Deluxe Sport Cap are available from Hop'Cap Inc., Bremen, Ind. Models come in wood, aluminum or fiberglass. For El Camino and Ranchero, styled caps are also offered.



Fitted into a vehicle without drilling holes, the E-Z Mount Gun Rack installs quickly by inserting rack blades under rubber window seals of trucks, RVs and station wagons. Cushioned to hold guns, fishing rods and archery gear, it's \$6.95 from Futura Products.

Cruising in style for '75, the new Nova Weekender 250 from Wellcraft is 24 feet 8 inches overall with an 8-foot trailerable beam, engine options up to twin 245s. Folding soft top encloses cabin with dinette and galley. From Wellcraft Marine, Sarasota, Fla.



I'd like to give this to my fellow men... while I am still able to help!

I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things, of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to

gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own." It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and

ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

VICTOR B. MASON
1512 Jarvis Ave., Suite M-2-DM
CHICAGO, ILLINOIS 60626

Why you should buy a chain saw from a company that cuts it with lumberjacks.

Homelite is the largest maker of professional chain saws in America.

Which is a great reason to buy their new homeowner's saw.

Because it just makes sense that the company that can satisfy the demands of the professional logger can make a saw to meet the needs of the average homeowner.

And a perfect example of that is the new Homelite XL which sells for under \$100.

The XL has a tough, lightweight engine which allows you to feel like a lumberjack without requiring that you be built like one. It also features an all-weather ignition system which

makes for fast starts. And automatic chain oiling. For \$99.95, the new XL is really a great chain saw.

But then again, so is the Homelite XL 2, which sells for \$119.95. The big thing about the XL 2 is that it has two triggers.

A trigger up front which lets you get right up on top of your work, where you need control.

And a second trigger in the rear to give you leverage for the big jobs.

The XL 2 also tips the scales at a light 7¼ pounds.* It comes with a 12" guide bar. And the same Power Tip® sprocket nose that professional loggers use to boost their cutting power.

And right now, to really make a case for buying the XL 2, we throw in a case, free.

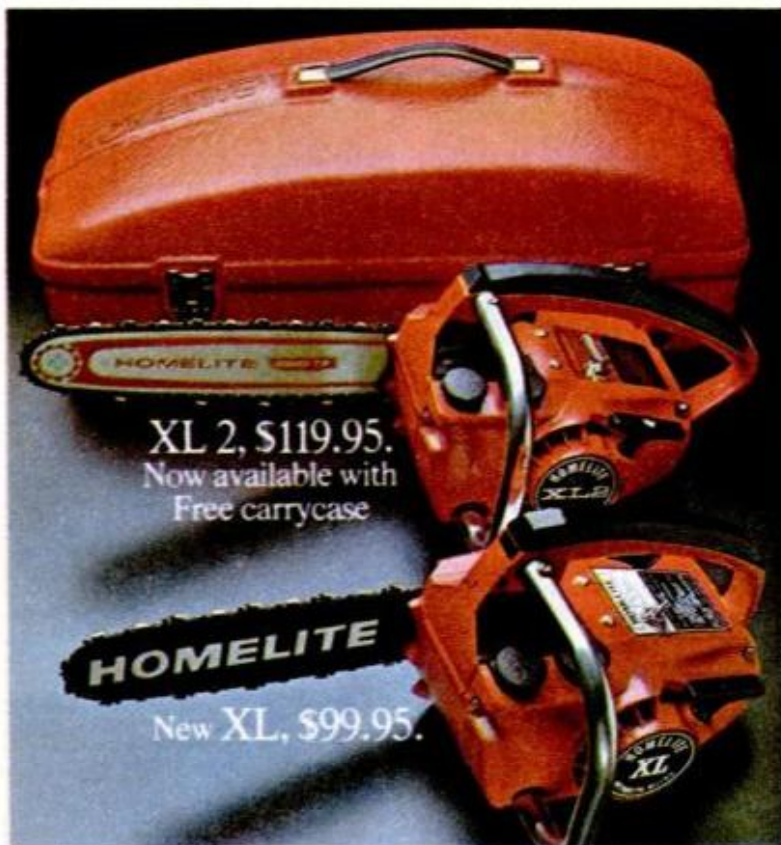
This carrycase regularly sells for \$10.95 and can accommodate the chain saw plus all its accessories.

Of course, another benefit in buying a Homelite chain saw is that we have more dealers to serve you if something should go wrong. More than 7,500 of them in the U.S.

Homelite's XL and XL 2. Considering everything they come with, it's hard to believe what they go for.

HOMELITE®

For the Homelite dealer nearest you, check the Yellow Pages under Saws. Homelite, a **textron** Division, Port Chester, N.Y. 10573.



XL 2, \$119.95.
Now available with
Free carrycase

New XL, \$99.95.

*Less bar and chain. Free carrycase offer good at participating dealers only while supply lasts. Expires December 31, 1974. Suggested Retail Prices: XL, \$99.95; XL 2, \$119.95.

ALL OUTDOORS

(Continued from page 60)

made into a particularly responsive, strong, light and startlingly expensive rod.

Aids afield

New from Remington Arms, Box 432M, Bridgeport, Conn., is a big \$3 color poster displaying 17 popular hunting dogs. Duck, big game and upland bird posters are also available.

Winchester dealers can now supply five new super-accuracy bullets for handloaders in .22 to .30 cal. The U.S. Fish and Wildlife Service has recommended that steel shot be mandatory for some flyways in 1976. All major shot-shell manufacturers are expected to have steel loads available shortly. ★★

New for steelhead and trout fishermen, the Uni-Spin 638 eight-footer below comes prespooled with 17-lb. XL mono, offers the True Temper Uni-Spin built-in reel feature with casting pushbutton on top of the rod.

Classic Crossbow (shown below rod) from Ben Pearson Archery/Brunswick has 36-inch bow with 75-pound draw weight, front and rear sights adjustable for windage, trigger safety lock. Set with three arrows is \$80.



Most elaborate model of the Waller Fishhawk 550, (above), now measures depth with a digital counter, oxygen content of water, temperature, light intensity and proper lure color selection, to 100 feet.

Pot-Lucker (below) from Zebco, a new backpacking stove, folds up inside its fry pan and stew pan for compact carrying. Fuel cylinder of butane provides adjustable heat up to 6200 BTUs. Price will be about \$15.



Muzzleloading accuracy is claimed for the new Texas Carbine from the Trail Guns Armory of Houston. The .58-cal. muzzleloader takes .575 Mini balls or patched balls and No. 11 percussion caps. Sights are adjustable front and rear; Henry-style butt stock and 24-inch barrel give it 39-inch length. Price: \$190.

Build these posing accessories for your portrait shots

by Ed Johnsey

Photos by the author

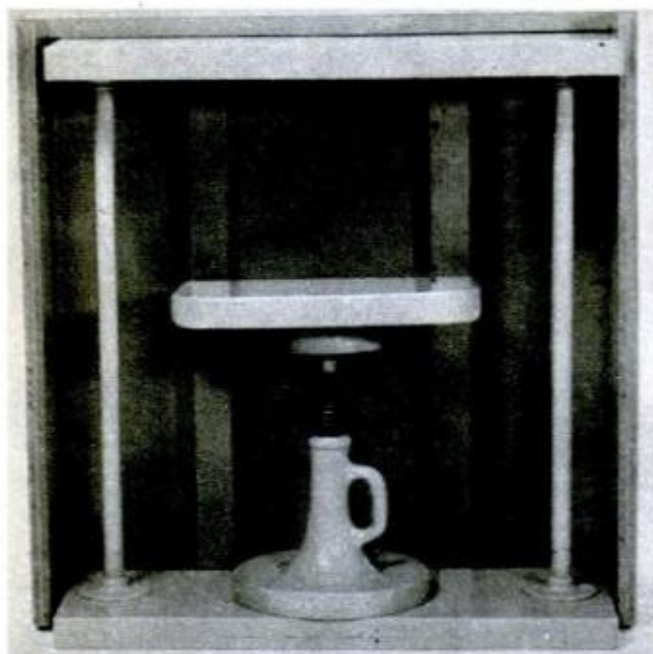
Three accessories that every portrait photographer can use are a posing stool that swivels and adjusts for height; a narrow table for a hand and armrest; and a small platform to raise your subjects for low-angle shots. They're hard to buy, but easy to build. And since they'll be either out of the picture or covered with a rug, cloth, or paper when photographed, no great furniture-finishing or cabinetmaking skills are needed.

The stool is basically a five-ton jackscrew (Ward's 84C5520M or Sears' 9H7773C) topped by a seat made from two 8x12-in. pieces and two smaller (say 5x5-in.) pieces

of $\frac{3}{4}$ -in. plywood. These are joined with the two smaller pieces under the center of the seat. Drill a hole through the four layers of plywood to accept the jackscrew head, and permanently secure with epoxy cement. The stool's base is another sandwich consisting of two $\frac{3}{4}$ x 8-in.-dia. plywood discs with a 4 $\frac{1}{2}$ -in. hole cut in one disc to accept the base of the jack. A thin bed of epoxy adhesive holds the jack in place. The finished stool adjusts from 10 to 15 in. in height; the platform can add another 8 in. when needed. The table consists of two 20-in. lengths of $\frac{1}{2}$ -in. galvanized pipe, fastened by flanges between 1 $\frac{1}{2}$ -in. "planks" made by laminating two pieces of $\frac{3}{4}$ -in. plywood measuring 8 x 21 $\frac{1}{2}$ in.

The platform is a $\frac{3}{4}$ x 24 x 24-in. piece of plywood glued and nailed to two $\frac{3}{4}$ x $\frac{1}{4}$

(Please turn to page 66)



Posing stool and armrest table nest inside platform (above), take less than two square feet of floor space. For tabletop photography (right), platform is supported by armrest table; loop for background (no-seam) paper is stiff wire.



Some facts to consider about economy and value.

Here's good news on how you can get *improved* economy and value in 1975 Chevy trucks. Important news about the economies of less frequent routine maintenance. News on how you benefit from lasting Chevy value.

An efficient new economy Six.

This engine features a new intake manifold to distribute fuel more evenly to cylinders. And newly designed combustion chambers concentrate the fuel charge around the spark plugs for efficient burning and fast ignition. This engine even uses its own exhaust gases to warm up quicker. You get all this efficiency *and* increased horsepower and torque.

High Energy Ignition system.

Standard on Fleetside and Stepside pickups, this new system can deliver up to 35,000 volts to each plug to improve starting and it provides all-weather protection from moisture, dirt and road splash. The result is a system that extends time between tune-ups and helps improve engine performance.

New extended maintenance intervals.

For trucks 6,000 lbs. GVW and under, equipped with catalytic converters and using unleaded gas, the chart below tells the story.

1975*		1974	
22,500 miles	SPARK PLUGS	6,000 miles	
6 mo. or 7,500 miles	ENGINE OIL	4 mo. or 6,000 miles	
First 7,500 miles Every 15,000 miles thereafter	OIL FILTER	First 6,000 miles Every 12,000 miles thereafter	
30,000 miles	AIR CLEANER ELEMENT	Sixes: 12,000 miles V8s: 24,000 miles	
6 mo. or 7,500 miles	CHASSIS LUBRICATION	4 mo. or 6,000 miles	

Chevy trucks over 6,000 lbs. GVW, using leaded or unleaded gas, can also go further between recommended spark plug changes than was the case last year. See your Owner's Manual for full details on recommended service intervals.
*Chevy-recommended service intervals for trucks 6,000 lbs. GVW and under.



LASTING CHEVY VALUE



'75 CHEVY

CHEYENNE

Help!

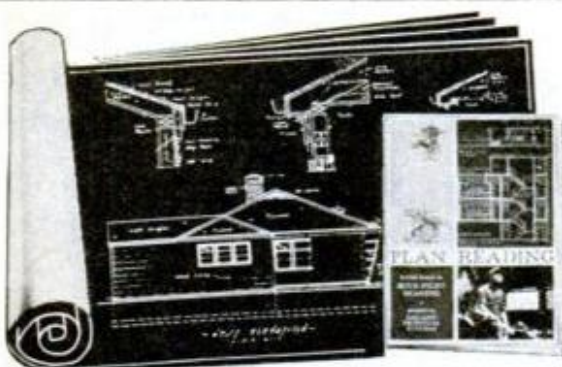
Flat tire! Here's emergency help. Just plug in 12-volt Auto-Flator in your car's lighter. In minutes tire is inflated. Also pumps boats, rafts, mattresses, pools, toys, etc. Only 6½" long. Delivers up to 60 lbs. pressure! Every vehicle should carry one. Only **\$32.95** complete (plus \$1.00 shipping). Guaranteed. Send check or M.O.



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NAME _____ AGE _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

Veterans
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Here

POSING ACCESSORIES

(Continued from page 64)

of plywood glued and nailed to two ¾ x ¼ x 24-in. uprights. Notice the additional brace on one end made from a 22½-in. piece of 1x4 lumber. (Dimensions needn't be exact, but these allow the table and stool to be stored inside the platform.) Two 1x2s under the platform serve as centering tracks so you can mount the platform on the armrest table to make a 24-in. square tabletop for small-object photography. Heavy bolts through the platform let you secure it to the table with wingnuts. Attaching four 1 x 2 x 23¼-in. legs with carriage bolts converts the platform to a sturdy table for photographing children. The whole combination of posing aids nests and stores in less than two square feet of storage space. ★★★



Setup is designed to keep portrait subjects comfortable and in position while you shoot pictures. Carpets or towels on the armrest add interesting texture.

BLACK & DECKER INTRODUCES AN INCREDIBLE PAINT-SPRAYING SYSTEM.

It's easy to use. It sprays latex as well as oil. It needs virtually no cleaning. It does a multitude of other jobs. And it costs under \$55.

In the past, you had a lot of reasons *not* to own a paint sprayer.

They were expensive. Heavy. And mostly, they sprayed only *oil* paint.

No more.

Black & Decker's come up with an incredible new home paint-spraying system.

It's powerful enough for the bigger jobs.

Compact enough for those small, hard-to-paint jobs, like shutters or wicker furniture.

It'll spray *latex* as well as oil-based paint.

And it costs under \$55.

It's powered by an efficient, *piston-*

driven air compressor—not a diaphragm—for greater reliability.

It comes with inexpensive, throwaway nozzles for easy cleanup. You can start with a fresh nozzle for each job, with no clogging or spattering. It'll give you that "professionally sprayed" look that a paint sprayer should give you.

But one of the *best* things about

it is that the compressor itself can be a wonderful new source of power around your house. For those annoying jobs you never seem to have the right equipment for.

It can inflate just about anything from bicycle tires to basketballs.

With optional garden nozzle, it can spray shrubs and trees. It can even drive our optional caulking gun. It's the new home air system, from Black & Decker. It paints. It sprays. It inflates.

All for under \$55.

Now you've got a *lot* of good reasons to own a paint sprayer.



Universal
Spray/Inflator Kit
#7761

54⁹⁹

Expect the best from Black & Decker, for less than you'd expect. **Black & Decker**
For your nearest Black & Decker Dealer, call 800-243-6000 FREE, day or night. In Connecticut, call 1-800-882-6500.

CAR CLINIC

BY MORT SCHULTZ

Shifting the shifter

I own a 1973 Chevrolet Blazer that has a three-speed shift on the steering column. I would prefer having it on the floor. I have heard about conversion kits, but am dubious about buying one, because my Blazer is one fine vehicle and I would not want to cut its performance or make shifting awkward. How reliable are conversion kits?—Mike Craft, Lexington, Va.

The good ones, if installed according to instructions in the kit, are very reliable. They cost about \$45, and it takes a mechanic about two hours to install one (it may take you longer if you do the job yourself).

No longer rattled

The front disc brakes of my 1972 Torino emit an annoying rattle except when I apply pressure to the brake pedal. Is something wrong?—D. D. Benshoof, Glen Rock, Pa.

Nothing that can't be fixed. Ford has instructed dealer service departments to install antirattle clips which place tension on the ends of the inboard shoes. This takes up the shoe-to-caliper clearance that causes rattling. The repair applies to the 1972-74 Torino, Montego, Thunderbird, Ford, Mercury and Mark IV, and the 1973-74 Lincoln. There are two different clips to accommodate different clearances. If the shoe-to-caliper clearance is less than 0.032 in., order antirattle clip D20Z—2B164-A. If shoe-to-caliper clearance is more than 0.032 in., order antirattle clip D4FZ—2B164-A.

Lagging lubrication

I have a 1973 Dodge Dart Sport equipped with a 225-cu.-in. slant Six. The car has 18,000 miles. My problem is oil filter drainage. If the car sits idle for more than two hours, oil drains from the filter. When the engine is started, no oil pressure develops until the filter fills with oil. The problem is alleviated for 500 to 1000 miles after a new filter is installed. I have tried every kind of

filter on the market, but none shows any better results than the others. Please help before the bearings are scored, or I go broke buying new filters.—William J. Benzick, New Castle, Pa.

Indeed, this is one of the oddest problems I have encountered in some time. I can only guess the cause. Perhaps the standpipe was inadvertently left off the engine during production. The filter is installed so the standpipe runs right up through its center. The standpipe allows oil to fill the filter immediately. The pipe is bolted to the engine and may be ordered using part No. 3577848.

Why does a new filter alleviate the problem for a few hundred miles? Probably because it is clear and there is nothing to block the flow of oil into the depths of the filter.

Locked out

I read Car Clinic every month and file many items for reference, but my file won't be complete until I can get service bulletins. How can a customer get on a mailing list for the service bulletins that apply to his car?—Charles E. Banks, Stratford, Conn.

He can't. Service bulletins are considered confidential information and are sent by manufacturers to their dealers and to certain lucky people like me. My job is to pass important information on to you through *Car Clinic*.

Chatterbox

I bought a used 1972 Chevrolet Nova with 350-cu.-in. engine and three-speed manual transmission. Clutch chatter has been a problem although I have replaced the clutch, pressure plate, flywheel and throw-out bearing. Can you give me an idea what else to look for?—Dean J. Nebuder, Ankeny, Iowa

Check the clutch linkage for binding. There should be a grease fitting on the

(Please turn to page 70)



Start fresh with Belair.

And have a picnic with these two refreshing Belair ideas.

MAGNAVOX PORTABLE RADIO—yours for free B&W coupons, the valuable extra on every pack of Belair. For your free Gift Catalog, write: Box 12, Louisville, Ky. 40201.



FOLDING PICNIC TABLE—only \$29.00. For smoking pleasure, nothing is fresher tasting than Belair. For outdoor enjoyment, another fresh idea is the Belair folding picnic table. Opens out from its luggage-type carrying case to seat four. Delivered to you for only \$29.00 and one Belair end-flap. Enjoy Belair, with the right touch of menthol, and your Belair picnic table, too. Offer limited. Order yours now!



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

MAIL:
\$29.00 plus one Belair carton end-flap, to:
**Folding Picnic Table Offer, P.O. Box 3000 FPT,
Louisville, Ky. 40201.**

(Check color preference Red Light Blue)
Make payable to **FOLDING PICNIC TABLE OFFER:**
 Certified Check Money Order

NAME _____

(I am 21 years of age or older)

ADDRESS _____

(No P.O. Boxes, please)

CITY _____ STATE _____ ZIP _____

Note: Offer limited to U.S.A. and expires 7/1/75. Order now while supply lasts. Please allow 6 to 9 weeks for delivery. 38

Kings, 15 mg. "tar," 1.1 mg. nicotine; Longs, 17 mg. "tar," 1.2 mg. nicotine, av. per cigarette, FTC Report Mar. '74

cross shaft. Fill it with grease. If grease is applied and the linkage is operating smoothly, then suspect a worn pilot bushing, which is in the center of the flywheel and serves to connect the crankshaft to the front input shaft of the transmission. If your examination reveals that the pilot bushing is worn, it should be replaced.

There are other things that should be checked in your attempt to clear up the chatter. Be sure that there is no free play between the clutch hub splines and the splines on the transmission clutch gear; see to it that the clutch release bearing is sliding freely on the transmission retainer, and that internal and external grooves of the release bearing are packed with grease.

Bottoms up

My 1964 Pontiac Tempest with V8 engine started bottoming so badly that the drive-shaft was rubbing on the body. I installed a set of heavy-duty shocks on the rear that didn't help, so I installed a new set of coil springs on the rear which did help, but the car still bottoms with roughly 475 pounds in the rear seat. What else can I do?—Thomas J. Davis, Belle Fourche, S.D.

You seem to have a fetish with the rear. What about the front? If the front springs are weak, the car could be nosing, which would cause bottoming. The same thing would be true if front shocks are worn—the car would bottom when going over bumps. Really, though, 475 pounds in the rear is a goodly amount of weight for your Tempest. If you want to increase that capacity, I would replace the front springs and/or install a new set of air shocks in the rear that will allow you to raise the car according to the weight in the rear. I would also make sure the front shocks are okay.

Hot stuff

My 1971 Plymouth Duster has had to have the front brake shoes replaced five times in the last 10,000 miles. All four wheels have

been relined with high-quality linings, all drums have been cut, and all hold-down springs and return springs have been replaced. Front linings make noise and crack after a few thousand miles. I don't ride the brake pedal. What's wrong?—Richard Levy, Bronx, N. Y.

Excessive heat causes brake linings to crack. If all brake work has been done properly, then check for binding wheel cylinders. The wheel cylinders may not be releasing, which keeps linings in contact with drums, producing noise and heat. If this is the problem, replace the cylinders.

I'm assuming that when you had brake work done the brake pedal linkage was examined for a binding condition, and brake pedal free play was adjusted. Linkage that is binding and lack of play can force linings into continuous contact with drums, resulting in excessive heat and cracking. Also, the compensator port in the master cylinder could be plugged, which will keep hydraulic pressure on linings and push them against the drums.

SERVICE TIPS

■ **Don't use airconditioner additives.** That's the word from a number of carmakers. These commercial dehydrants are supposed to stop moisture contamination, but they contain methyl alcohol which can severely corrode aluminum parts of airconditioning system.

■ **Stop stalling.** This is what Chrysler Corp. has in mind for every one of its 1974 models, except the light truck with 360-cu.-in., two-barrel engine. If your engine stalls or has a very rough idle when it returns to idling after the first acceleration following a cold start, hose connections to the coolant-controlled EGR valve in the radiator top tank may be reversed, keeping the EGR valve open during the warm-up period. That's like having the thermostat open all of the time. The correct connection is spelled out for your Chrysler-Plymouth dealer in service bulletin 25-09-74C and your Dodge dealer in service bulletin 25-11-74D.

■ **Annoying noise in the rear.** Are you being bothered by a squeak, cracking, grating or rattling sound coming from the rear of your 1974 Maverick or Comet? The nut of the parking brake cable attaching clamp bolt may be projecting too far and hitting against the body rail when the car bounces. See if bolt head faces outward toward wheel. If so, turn it so the nut faces outboard. ★★

GOT A PROBLEM WITH YOUR CAR? Ask Mort about it. Send your question to Car 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.

ARE AUTOMOTIVE ADDITIVES JUST ANOTHER 'PUT-ON'?

Perhaps you just can't get yourself to believe that an additive in the fuel system can possibly solve what seems to be a mechanical problem: getting an engine to start easier, idle smoother or stall less.

The next time you're in an automotive department, stop in front of that big rack of additives. Remind yourself that every year, car owners buy over 500 million dollars worth of these various chemicals. Maybe they know something you don't.

Here at GUMOUT, we produce an additive that cleans the inside of a carburetor. Every carburetor needs cleaning because the gasoline passing through gradually builds up deposits of gum and varnish. This prevents the carburetor from feeding the proper mixture of fuel and air into the engine. As a result, the car becomes hard to start, idles roughly, loses pep and pick-up and stalls easily. Carburetor gum also increases the emission of dangerous fumes, and wastes gasoline. Newer cars are even more prone to these problems because of the anti-pollution devices which are now part of the fuel system.

If you are experiencing any of these problems, we suggest you put aside your skepticism toward automotive chemicals long enough to add a can of GUMOUT carburetor cleaner to your gas tank. See for yourself how much difference a clean carburetor can make!

GUMOUT will clean your carburetor on the inside while you drive, removing gum and varnish deposits from all the jets and passages. Try GUMOUT and see for yourself how much better your car performs. Easier starting, smoother idling, more lively acceleration, improved gas mileage, and a decrease in dangerous exhaust fumes.

GUMOUT is also available in a Jet-Spray can that's used by professional mechanics for quick cleaning of carburetor linkage, automatic chokes, and PCV valves.

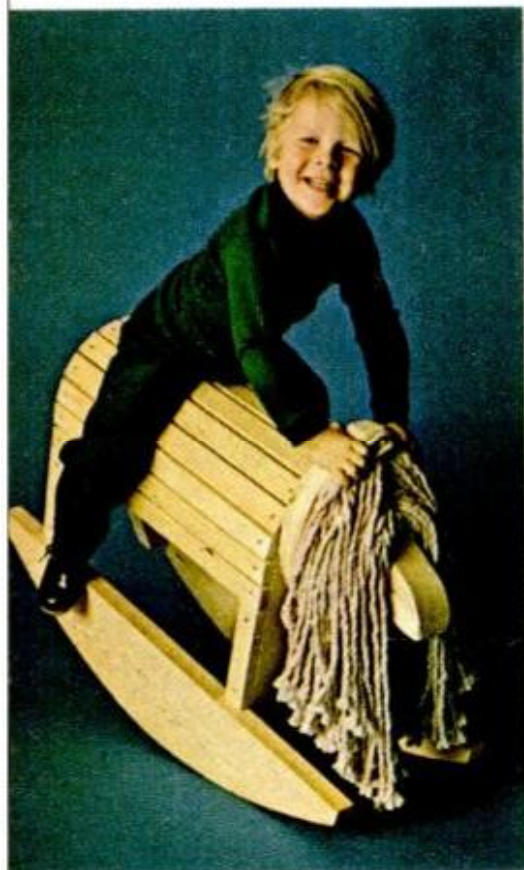
Get GUMOUT wherever automotive products are sold.

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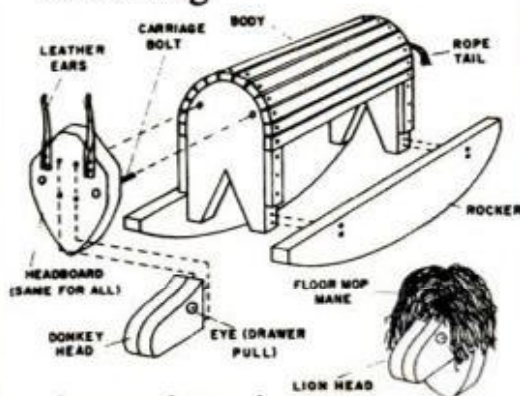
Surform tool shaves, planes easier. Free plans prove it.

Now and then a woodworking project can turn you off. Especially if it calls for a lot of planing, filing and smoothing



grater" blade can't clog either; shavings pass right through.

All of this you can prove for yourself. Our free plan set to make these animal rocking toys calls for a good amount of planing, forming and smoothing



down edges. A Stanley Surform plane or file or even pocket-size model makes it a pleasure. And — by the way — Surform tools aren't just for woodworking; they also take on soft metals, plastics, material like autobody filler. Another thing — if a Surform blade wears out, you just snap on a new one.

So go take a look at

Stanley Surform tools. Any store with a good tool department sells Stanley Surform tools and replacement blades.

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— which sometimes can be tricky work.

It's no problem with Stanley Surform tools. They let you trim away material fast, easy, without goofing. Really make you look like a pro. Surform's "cheese-



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helps you do
things
right





Drive it into the ground!

At the Press On Regardless International Rally in Michigan, the world's best rally drivers will literally run their cars into the ground—after spending lots of time and money to put them in perfect condition.

By Don O'Reilly

Riding shotgun in the Press On Regardless world championship road rally is like "riding in a runaway locomotive being driven by a drunken engineer," said one rally navigator.

From a veteran driver's point of view: "You look down the road and visualize the best speed you can do, then drive 20 to 25 mph faster."

Gene Henderson, a burly 48-year-old Dearborn, Mich., police sergeant, should qualify as an expert. He has won the P.O.R. three times, finished second three times and, in the second half of the 1974 rally season, was leading in points toward the 1974 Sports Car Club of America (SCCA) Professional Rally national championship, an 11-rally series.

"You have to psych yourself," he says, "to get accel-

Photos: Joe Farkas



Rallying is a test of driving ability and car preparation, and provides competition for normal, everyday passenger cars. In "Special Stages" of the course that are laid out, usually over back roads, the driving is flat out, and it's not unusual to get airborne like the Dodge Colt (top) coming over a bridge at Belle Isle in Detroit. If you go into the soup like the Datsun above, you set up the winch to get back in the running. You always . . . press on regardless!

You have to keep going . . .

erated at the right level before it starts to happen. It's a matter of self-preservation. You hurtle yourself into this thing at such a velocity the only way you're going to survive is . . . it's like you are running and leaning forward constantly at a 45° attitude. You have to keep going or you will fall on your face.

"You approach the rally, driving in a head-over-heels fashion, knowing that the skills will come, again, hopefully, to save your life, because that's what you're doing, going into blind corners where you have never been, cresting unfamiliar hills.

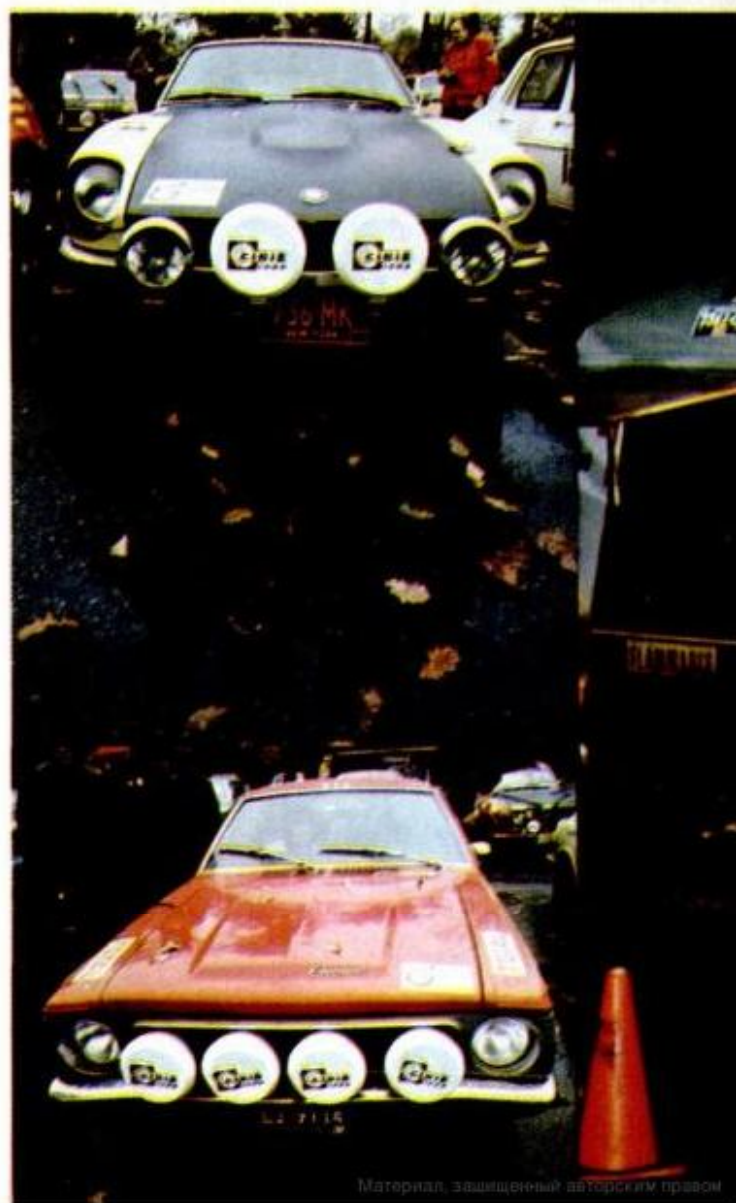
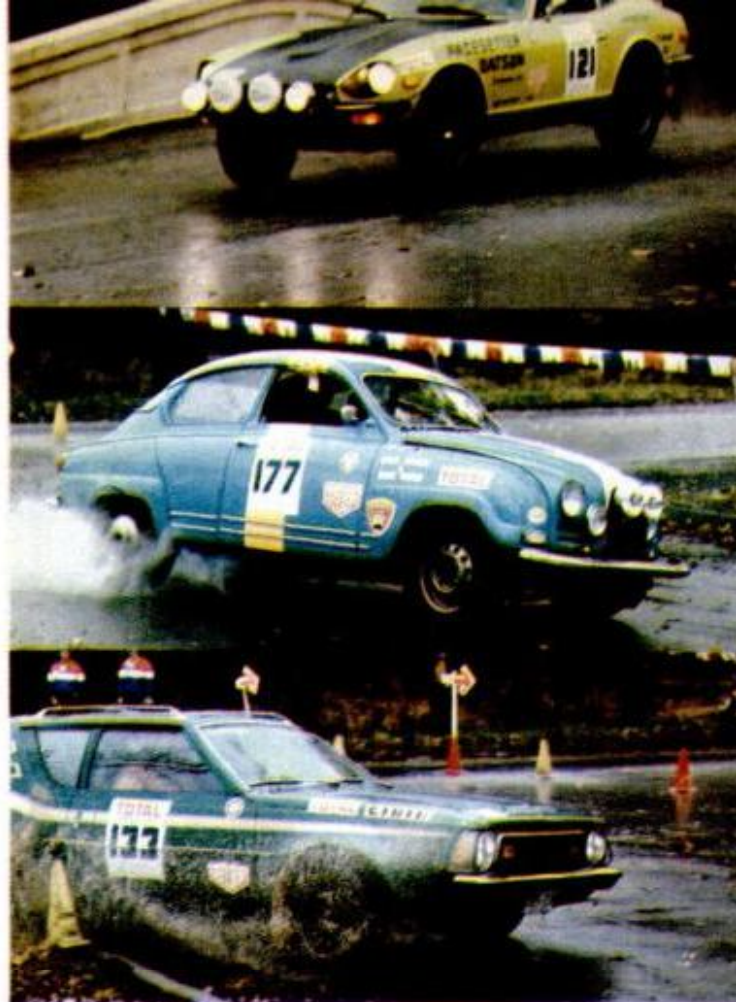
"Visually, you have to do things which on the face of it look absolutely idiotic. Eighty percent of what you do is instinctive."

The tortuous 1500-mile, three-night P.O.R., through the wintry wilds of Michigan's Upper Peninsula, is rated one of the toughest of the FIA-sanctioned (Federation Internationale de l'Automobile) world championship series. This year it is scheduled Oct. 30 through Nov. 2, each all-night race going out of Marquette, Mich.

The Detroit Region of the Sports Car Club of America proudly calls it "America's oldest, richest, longest, meanest car rally."

But rich it isn't. Without a large spectator gate, there is little source of revenue for any rally organizers.

It is, however, one of the longest obstacle



Adjusting lights before a rally is of utmost importance: there's no sense in having the fastest car if you can't see where you're going! And you need more than just the stock headlights: Long-range lights and twin fog lights are a must. The twin fogs are set to angle outward for good visibility in hairpin turns. Some drivers set the long-range lights one pointing up and one down—to be able to see up and down hills! At far right a Lancia refuels under the floodlights.

P.O.R.
TOTAL '72 PRESS ON REGARDLESS
INTERNATIONAL
AUTO RALLY **FINISH**



"Half the time you're airborne and the other half you're sideways," is the way some drivers describe rallying. At far left you see cars in both attitudes. Driving technique is all-important here, but the car has to be strong enough to take the punishment, too. Rally drivers must be "one with their car" and often make adjustments on controls and seating, usually replacing stock seat with one that offers superior lateral support.



Reaching the finish line first, or reaching it at all, takes more than just skill and luck; it takes a navigator! At left, Ken Pogue, navigator of Moby Dick 1, the winning Jeep Wagoneer in the 1972 P.O.R., describes the basic equipment any competing vehicle needs. It includes very accurate mileage-measuring gear, a calculator or computer, chronometer or clock to synchronize with official time and a compass. A navigator also needs an FIA International Driver's License, applied for through the SCCA Rally Dept., since he must be eligible as a co-driver.



Meanest stretches of tree-lined, boulder-strewn nonroads

courses. Many cars start, but few finish.

On the normal state, county and municipal roads which the rallyists must share with the sparse nighttime traffic, drivers run at reasonable speed, albeit a bit faster than the posted limit, especially if a team is running behind schedule because of flat tires or mechanical breakdowns.

This will be the first running under the fuel emergency-imposed 55-mph limit.

It is during the 450 miles of torture-chamber special stages that the rally becomes a flat-out no-holds-barred off-road series of obstacle-course sprint races.

The 50 specially selected stages range from two miles to 50 miles long, and are vicious stretches of logging trails, mountain goat-type trails and other nonroads.

The people who plan the rally route and select the stages are chosen from the best and most experienced rallyists in the sport. There are no tricks, however. When the P.O.R. first went full international in 1972, three-time winner Scott Harvey sat out the event to work on the committee to be certain the European contestants would have no disadvantage because of their lack of knowledge of the Michigan terrain.

"I made sure the route instructions [which are withheld from contestants until a few minutes before each night's start] were easily understood by everybody." In brief, the rally route is selected to avoid traffic and public as much as possible. The "transit" sections on county roads provide little challenge to professional drivers, except when snow-covered or icy slick, and high speeds would endanger the public.

The 50 special stages are selected because they are the meanest stretches of tree-lined, boulder-strewn nonroads in the areas. Also, they can be closed to the public for

the three hours or so each will be in use.

The dates for the annual P.O.R. are carefully selected. The FIA in Paris, which handles worldwide motor sports scheduling, wanted this event to take a September date span next year.

Michigan officials thundered, "No way!" First, there would be too many late-summer tourists in the area, and the weather would be too nice. They want to go after the hunting season, and when there will probably be snow and ice on the ground, but before the snowmobile season.

Officials run and rerun each stage until they know every twist and turn and every boulder, then the fastest run by the experts becomes the optimum time for that stage.

"Beat that if you can!" Few do.

Penalty points are issued at the rate of 100 for every minute late at a stage, 50 points for every minute late on a public-road transit section. The team with the fewest penalty points wins.

Press On Regardless came into being in 1949 when the young Detroit Region decided sports cars were there to stay and something should be done about it.

The first P.O.R. was run from Greenfield Village in Dearborn to Flint and return, and included a 1930 MG sports car, a 1939 BMW 327, an SS100 Jaguar and a 6.9-liter 1936 Duesenberg, with the entries coming from as far away as Chicago; Dayton, Ohio; South Bend, Ind., and Cuyahoga Falls, Ohio.

The rally was given its prophetic name by Bill Wood, nephew of the late powerboat champion/industrialist Gar Wood.

"The phrase 'press on regardless' was in a quote from Winston Churchill," Wood explained. Why Churchill? "Because we all drove British sports cars then."

Charlie Davison, another of the original



organizers, recalled: "We always tried to avoid causing any problems for the public, but once in a while we missed.

"We raced a lot on country dirt roads, both for the challenge and to avoid traffic. There was one farmer's wife who had her fresh, white, clean laundry drying on the clotheslines. As our first cars went by, they stirred up a cloud of dust.

"By the time the fourth car appeared, the irate farmer was out in the yard with a shotgun, blasting away. The fellows knew he meant business, so they managed to send some one back up the road to flag down the other competitors and slow them down past that farmhouse.

"In those days, sports cars were observed

with disfavor by some, especially police. Going through a town, even if everyone obeyed all the traffic laws, just because it was a group of sports cars, the police would rush out just in time to ticket the last car at least, usually me, old 'tail end Charlie.'

"Heck, in those days, if a policeman saw an MG parked at a curb, he'd write a ticket for something."

The P.O.R. was the first rally ever sanctioned by SCCA. In the 1950s it was on the first SCCA National Rally Championship calendar, was the "best National rally of the year" in 1968, the first American rally to carry FIA international recognition in 1970, and in 1972, the first Western Hemisphere rally to be given full world championship listing.

The first overseas entry for 1974—both events—came from veteran Britons Brian Culcheth and Johnstone Syer, driving a British Leyland factory-prepared Rally Marina 1.8. Some of the world's great rally teams are expected, opposed by the best from the United States and Canada.

About 1000 man-hours are required to prepare a car for the P.O.R., according to Gene Henderson, whose Jeep Wagoneer victory in 1972 surprised him as well as other experts.

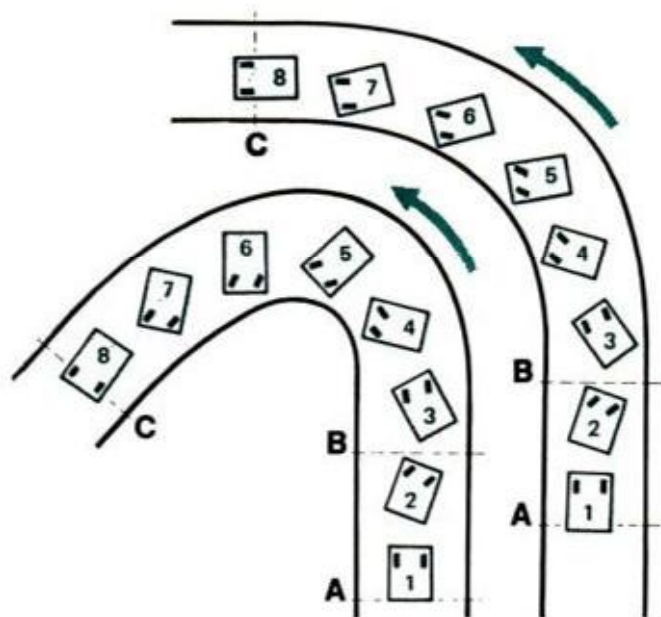
Because his rallying friends and competitors kidded his heavier car and called it a "big white whale," Henderson nicknamed his Jeep "Moby Dick I" and called the teammate "Moby Dick II."

They may have laughed when he first picked up the socket wrench, but they cheered when the 1557½-mile road race rally ended, because the Moby Dicks had finished first and third among 21 finishers from a field of 78 starters.

"An ideal rally car weighs about 2000 pounds and develops 130 to 200 hp, and can accelerate to 100 mph in 20 seconds.

"Our Jeeps weighed 4800, put out about

(Please turn to page 172)



High-speed cornering on dirt and gravel roads must be accomplished with skill and balance—and a dash of bravado! Sometimes a driver does not even touch his brakes, relying on the dirt buildup against the tires to slow the car the right amount after he puts it in a sideways attitude. He sets up for a turn, whether it's 90° or tighter, by flicking the steering wheel first quickly in the opposite direction of the turn as shown in position 2 of the sequence above; then it's right on through using opposite lock (front wheels pointing in the direction the rear end is sliding) as seen dramatically in the pictures below.

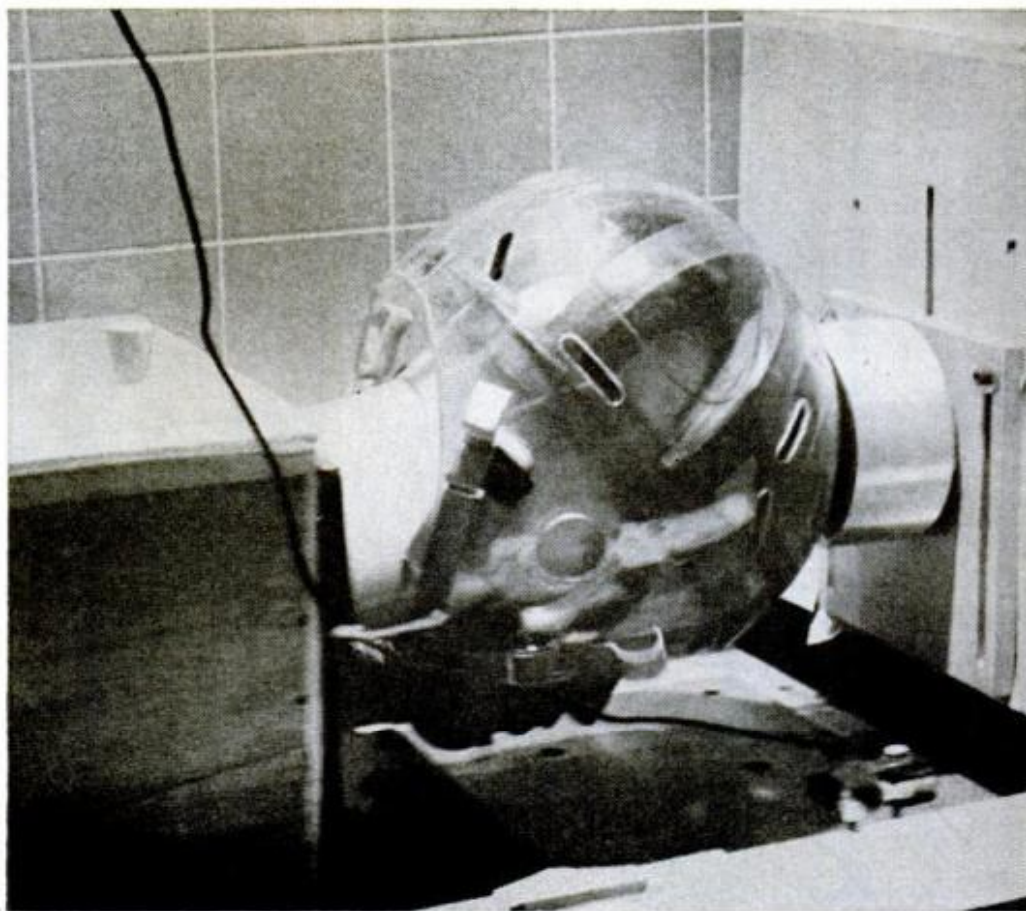


Science 'knocks heads'



Mass of cinder block simulates blow from a falling object, as might be received by a fireman wearing helmet model shown. Snap-off visor and rear shield have been added to the helmet.

Wham! Test helmet slams into anvil equipped with load cell to measure the impact. Boxy sled carries 70 pounds of sand to approximate weight of player's upper torso and arms.



A dummy's head, encased in a football helmet, slams into 600 pounds of concrete and aluminum. Lights flash, recording gear whirs, and blue-green lines of light skitter across the face of a cathode tube.

This is a test of a prototype football helmet in the neurosurgery lab at the University of Michigan Medical Center, Ann Arbor. The helmet is the result of more than 10 years' study of the causes and prevention of brain injuries in football players.

The heart of the new helmet is its inner liner, comprised of two spoked, plastic skullcaps that fit one inside the other. They are inflated with air or inert gas. The hard outer shell has firm areas covering especially vulnerable parts of the brain, and resilient areas to provide "give."

Patented by Dr. Richard C. Schneider, chief of the neurosurgery section, and research assistant Elwyn Gooding, the design reportedly proves more effective than any helmet now on the market.

Prior to the Michigan study, which was started in 1961, helmets had been tested

by placing them on dummy headforms and dropping them from a predetermined height. Despite sophisticated monitoring gear, differences in helmet design and weight caused variations in angle and force of impact, making comparisons difficult.

Gooding constructed an impact sled to run on a small track equipped with timing switches. The headform hits an anvil of aluminum and concrete that has a sensor in it to measure impact. Another sensor in the sled responds to the forces transmitted to the headform. When set up vertically, the epoxy head is mounted on a metal rod that bends on impact to simulate the resistance of the human neck.

Better protection for football players is only one aspect of the research. Head injuries are the leading cause of accidental death in this country, according to the Michigan scientists. "We focused on football," says Dr. Schneider, "because the football field is one of the few places where the actual mechanisms of trauma to the central nervous system may be witnessed

in the search for a safer helmet



Lab setup (top photo) includes monitoring and recording gear at left, test sled and track, and control panel at right. Tape unit records data, plays it back to provide printout. Shown above are spoked, inflatable inner liners and assembled helmet (top). The clear plastic shell shows how some areas of the helmet are made thicker to offer added protection while other areas are made lighter to provide resiliency.

and later studied on TV recordings or movie film."

"Most often, the cause of death in football is acute subdural hemorrhage," explains Dr. Glenn W. Kindt, another neurosurgeon involved in the project. "This is the type of injury you might receive in falling straight backwards and striking your bare head on the pavement. It's due to the rupture of a vein that drains the brain, causing blood to accumulate between the brain and its dural covering. Death occurs because of increased pressure within the head."

The Michigan helmet has proved superior at absorbing the initial impact and dampening or spreading out the remaining force. Using the same basic design, Gooding has also developed a prototype fireman's helmet and is ready to start on industrial hard hats, motorcycle helmets and other protective headgear.

Though a manufacturer has acquired patent rights to the football helmet, it's not known when it will hit the market. ★★★

The wind shifts to windmills

by William and Ellen Hartley

When Henry and Retta Clews built their home in the Maine woods a few years ago, they found the cost of running in power lines too high for their budget. Not content to settle for kerosene lamps and the inconvenience of doing without electrical appliances, the 29-year-old former high-school science teacher decided to install a generating system—a decision that ultimately put him in the windmill business.

For \$2800 he bought an Australian Dunlite windmill system and 40-foot steel tower. His wife and brother-in-law helped him with the installation.

"The tower comes in all these little pieces and must be bolted together," he explains. "It's the biggest Erector Set you ever saw. We chose to set the base first and build the tower up from the ground, which is not too hard if you're not scared of heights. The top is as high as a five-story building."

The system proved capable of lighting eight 75-watt bulbs every evening and of running a TV, stereo, electric typewriter, blender, toaster, vacuum cleaner, portable saw, electric drill and a 1/2-hp water pump.

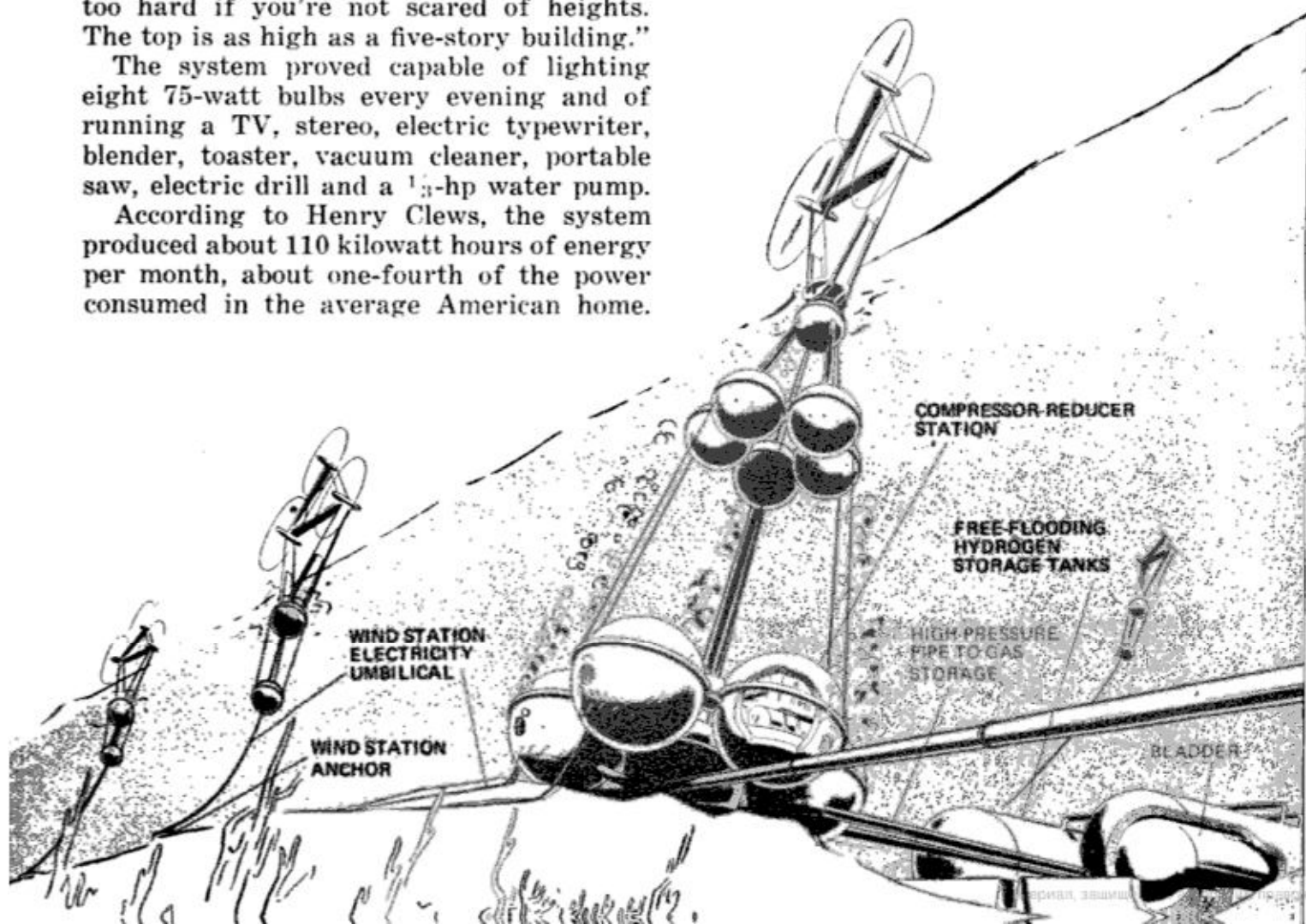
According to Henry Clews, the system produced about 110 kilowatt hours of energy per month, about one-fourth of the power consumed in the average American home.

Later, he added a Swiss-built Elektro windmill to provide further capacity.

Henry Clews did more than solve his power problems when he turned to the windmill. He also found himself a livelihood as the American representative of the Australian and Swiss windmill makers. During his first year in business, he sold 15 complete systems—one small indication of the current interest in wind-generated power.

In contrast to Henry Clews's focus on the problem of providing power for the individual home, men like William E. Heronemus are thinking in terms of how the wind can be used to provide energy for large sections of the nation. Professor of civil engineering at the University of Massachusetts, Heronemus and his colleagues have produced studies of windmill systems for the New England and Lake Ontario regions as well as other areas.

Heronemus foresees, for example, a vast network of windmills floating off the coast of New England, each of the hundreds of



WIND TURBINE GENERATORS

200' DIA.

160' FROM OCEAN SURFACE

A vast network of floating wind generators would be strung out off the New England coast if a concept developed by Prof. William Heronemus becomes reality. System would produce hydrogen through electrolysis of seawater. Hydrogen would be stored in deep-water tanks, from which it would be pipelined ashore to produce electricity in fuel cells. Electrolyzer units and compressor stations would be manned.

GIMBAL

BUOYANT AND ACCESS LEGS

WORK AREA

LIVING QUARTERS

ELECTROLYZER UNIT

PURE WATER TANK

ELECTRICITY UMBILICAL

PURE WATER TANK

HYDROGEN GAS COLLECTION AND DISTRIBUTION PIPELINE

ELECTRICITY UMBILICAL PENETRATIONS

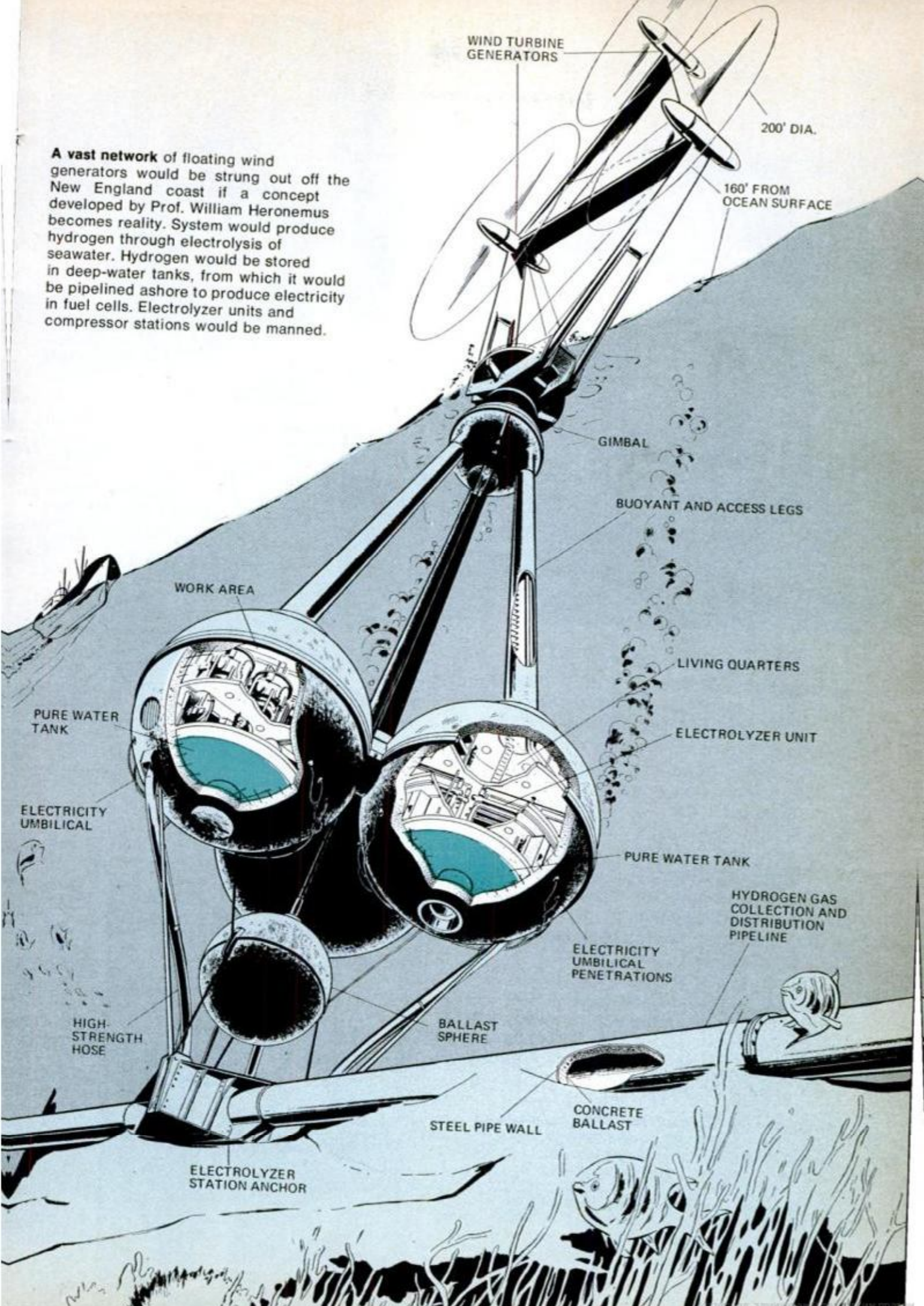
HIGH-STRENGTH HOSE

BALLAST SPHERE

STEEL PIPE WALL

CONCRETE BALLAST

ELECTROLYZER STATION ANCHOR





Biggest wind-power experiment to date was the 110-foot-high Smith-Putnam Wind Turbine. Located atop 2000-foot Grandpa's Knob in Vermont, the rig was in operation in the '40s. Streaks at left are star tracks caused by time exposure.

wind generators rising more than 300 feet above the sea. The electricity would be used to electrolyze seawater into oxygen and hydrogen. The oxygen would be allowed to escape but the hydrogen would be stored in huge seabottom tanks from which the gas would be piped ashore on demand. The bulk of it would be used in fuel cells for conversion into electricity but some—in the form of liquid hydrogen—might be used to fuel advanced aircraft or land vehicles.

Prof. Heronemus maintains that the proposed windmill system could take over the entire job of providing electricity for the six New England states.

In an aerogenerator system, there is always the problem of how to store the energy so that it's available on demand. Using electricity to electrolyze hydrogen gets around the problem very nicely. In a sys-



A vertical axis aerogenerator (right, top), designed for light winds, is under development at NASA's Langley Research Center. The 14-foot airfoil-shaped blades are made of balsa and fiberglass.

A lightweight sail-wing concept developed at Princeton University is being tested by the Grumman Aerospace Corp. Figure of man at the base of the model indicates relative height of actual device.



tem such as that of Henry Clews, banks of storage batteries must be used to store the electricity for use on windless days. (Clews estimates that his batteries could provide electricity for a week, if need be.)

The use of windmills for generating electrical power is far from new. From about 1920 to the early 1930s, literally thousands of American farms used windmills to provide at least some of the power they needed. A supply of cheap rural electricity eventually made the wind generators obsolete.

Today, however, energy-conscious scientists like William Heronemus and rural homeowners like Henry Clews see the wind as an untapped, inexhaustible and non-polluting source of energy.

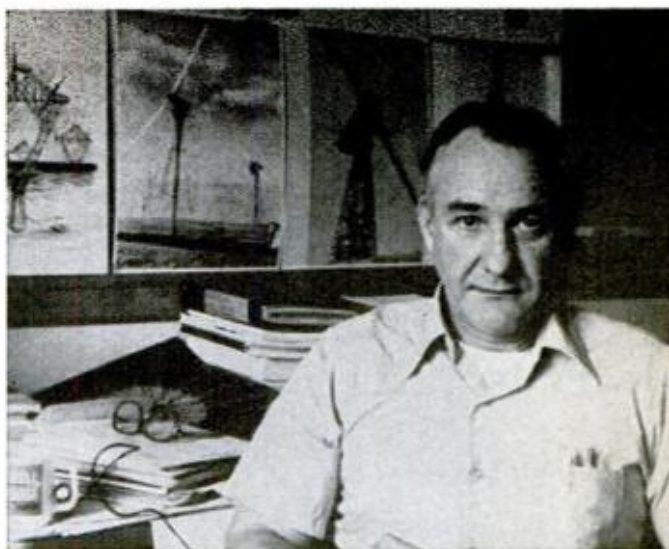
A wind generator, wind turbine or aerogenerator—the terms are interchangeable—has already been used to deliver commercial power. The pioneer effort and experiment lasted from 1941 to 1945, when World War II made huge energy demands. The Central Vermont Public Service Corp. intermittently augmented its regular power supply with current created by a huge wind generator, the Smith-Putnam Wind Turbine, situated on 2000-foot-high Grandpa's Knob near Rutland, Vt.

The turbine sat atop a 110-foot steel tower and had stainless steel blades over 11 feet wide and nearly 70 feet long. The rotor drove a synchronous generator that converted the wind's energy into electricity. The installation withstood gales as high as 115 mph without apparent damage. One test run of 143 hours and 25 minutes generated 61,780 kilowatt-hours at an average level of 431 kilowatts.

But by March of 1945, one of the giant blades had become overstressed. It broke off and sailed through the Vermont night sky. This ended the Grandpa's Knob experiment, which was judged a technical success but a financial failure.

Soon American wind-power development came to a halt. It took a growing awareness of an energy shortage to get things moving again. In June, 1973, a Wind Energy Systems Workshop was held in Washington, D.C.—the first concrete step in a five-year program set up under the leadership of the National Science Foundation and NASA. Dr. Joseph Savino, technical director of NASA's Lewis Research Center, Cleveland, summed up his view of the situation:

"There's enough energy in the winds to supply all our electrical needs. None of the



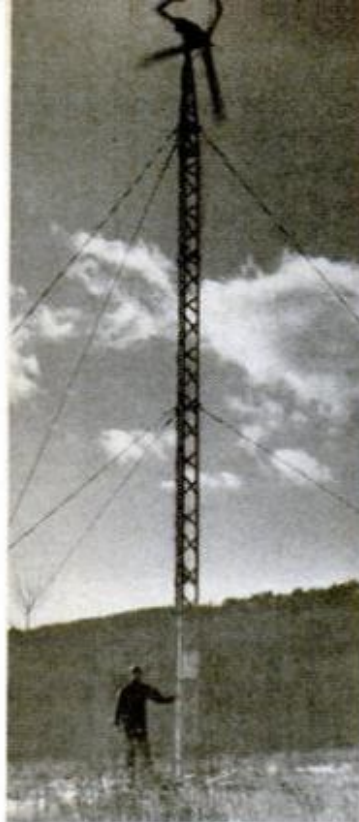
Professor of civil engineering at the University of Massachusetts. William E. Heronemus has done considerable work on systems for harnessing solar energy. Here, in his own words, are some of his views on the current energy situation:

We must slow down rather than increase the rate at which we consume energy if we continue to use combustion and fission energy processes. There are fundamental reasons behind that requirement. They involve resource depletion, pollution, economics and some very basic moral considerations . . . Any slowdown, unless executed wisely, will trigger direct and side effects that would be unpleasant at least, crippling at worst. We can muddle on for a few more years without slowing down, but we hazard intensified undesirable effects the longer we wait . . . Solar energy alternatives could impact our energy market in from 4 to 10 years, depending upon the commitment we make to them.

You might say, as others have, that wind power could do the whole job of providing electricity for this country. But I don't say that. I think that if by the year 2000 we were providing 10 to 15 percent of our power needs, we would probably be doing quite well. We must regard wind power as just one of the solar energy processes. If we put them all together, we'll be doing very nicely.

The total (wind power) resource available to the United States is difficult to estimate. I have made one estimate that suggests that at least two trillion kilowatt hours of electricity, per year, could be harvested economically.

Our country might be better off if one or more of our automobile companies were changed over to building wind generators. I get quite disturbed at the large numbers of automobiles we build each year, though I don't know what we'd do with the economy if we didn't build them. Somebody ought to figure that out one day. One thing we could do, though, is to have (displaced) auto workers building wind generators, which we probably could use to greater advantage than all those automobiles.



Every light in Henry Clews's home in Maine is turned on to demonstrate that his system really works. Appliances and power tools also run on electricity generated by windmills on his rural property.



One of two wind generators in Clews's system is a 6-kilowatt Elektro, a Swiss-made machine with a 16½-foot prop. Fifty-foot steel tower dwarfs Clews, a do-it-yourselfer who's become an expert in home-site windmills.

A windmill kit has been developed by James Sencenbaugh (right) of Mountain View, Calif. Of limited capacity, the rig is designed for budget market. Most windmill systems are relatively costly.



new technology of the '60s or '70s has been applied to wind turbines . . . Energy demands of the future are of such magnitude that every source of supplying a significant fraction will probably be used in the not too distant future—within 20 or 30 years."

NASA researchers are currently working to put up a 100-kilowatt windmill at the Plum Brook Laboratory near Sandusky, Ohio. It will reach a height of over 100 feet and have two blades, joined at a hub, that will span 125 feet. A prototype plant is expected to go into operation during 1975. It will serve as a low-cost model for aero-

generators that can be mass produced for use by power companies.

At NASA's Langley Research Center in Hampton, Va., engineers are working on a relatively small aerogenerator for home use. It's a vertical windmill adapted from a design produced in Canada a few years ago. The Canadians, in turn, had based their project on a curved-blade design patented by a French inventor in 1927.

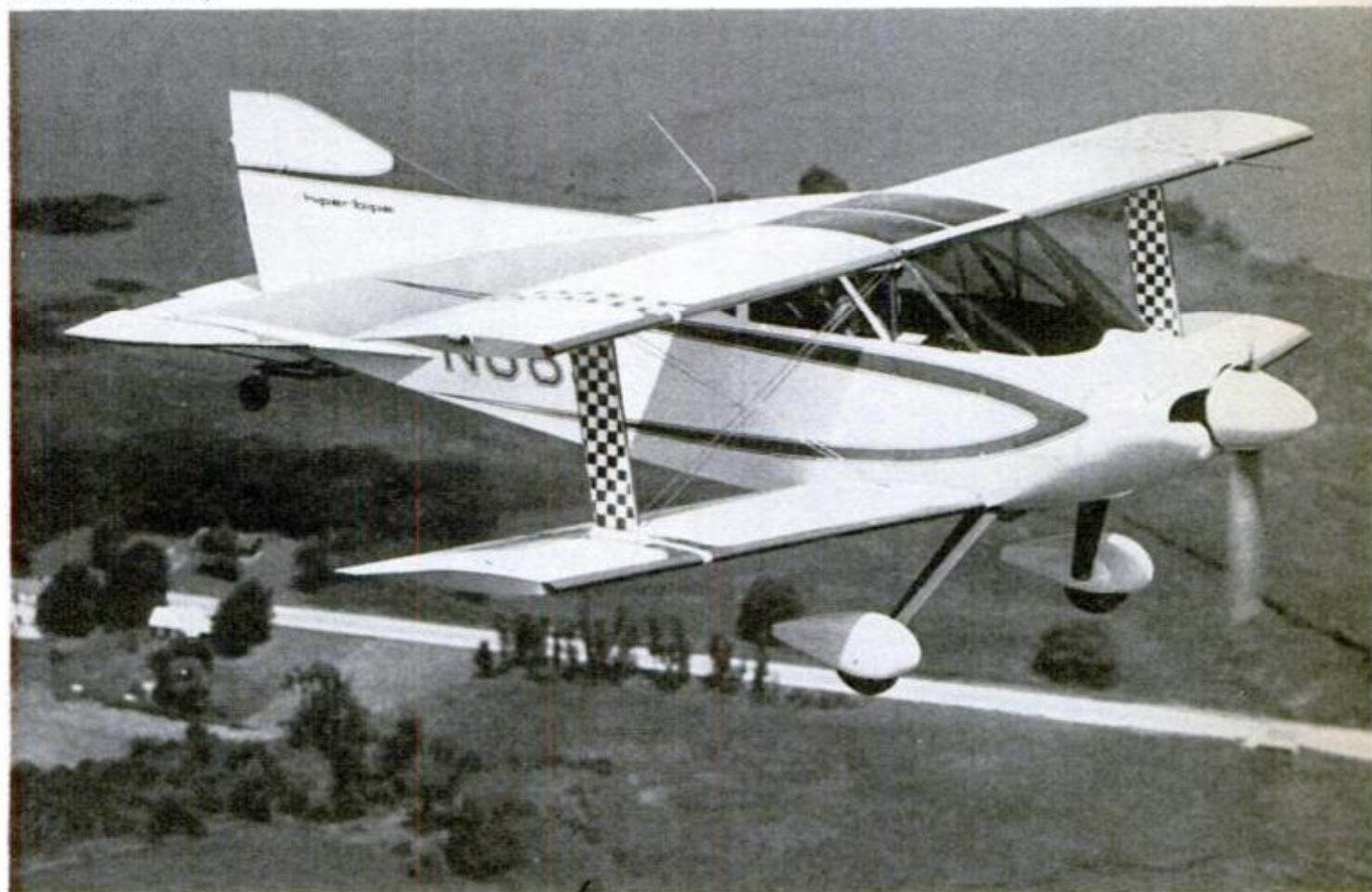
With its airfoil blades, the Langley prototype resembles a giant egg beater. Specs on energy output have not been published,

(Please turn to page 168).

Breezy biwing beauty you can build or buy

This unusual two-seater sport plane combines enclosed-cockpit comfort with the thrills of aerobatic flying.

Photos: Howard Levy



by Sheldon M. Gallager
and Howard Levy

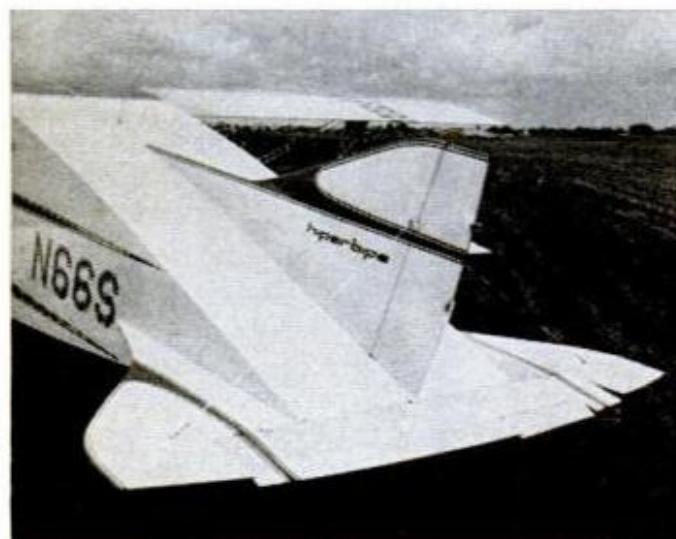
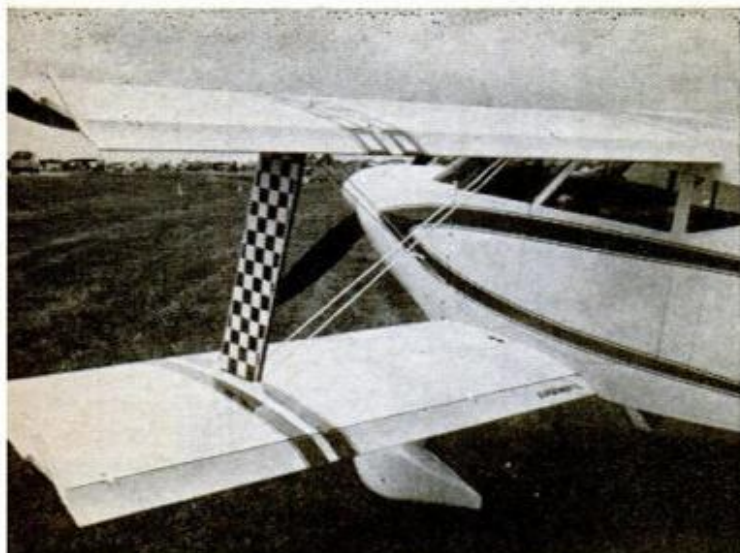
After undergoing five transformations and nine years of testing, the Sorrell Hiperbipe has finally "arrived." According to all who have flown it, the wait was well worth it. The SNS-6—the latest in a series of six versions—has evolved from a primitive little low-powered single-place puddle-jumper into a sleek, fast, two-place sportster capable of full aerobatic performance. The name Hiperbipe is short for "high perfor-

mance biplane," and the SNS designation stands for "Sorrell Negative Stagger."

Negative stagger indicates the unusual biwing configuration that puts the lower wing ahead of the upper one—the reverse of conventional biplane practice. The arrangement—necessitated by the enclosed cabin—not only gives the ship a classy appearance, but provides good visibility ahead and above the upper wing—especially important when performing aerobatics.

The Hiperbipe has been a family project for nearly a decade. C. H. "Hobie" Sorrell and his three sons, John, Mark and Tim—

From ugly duckling to beautiful bird



Dual ailerons (top photo, above) run full span of wings, can be lowered collectively to 12° and 25° positions to double as flaps while still providing aileron control. Unlike most dual-aileron designs, there are no external "slave" rods connecting the upper and lower control surfaces—all linkages are hidden neatly inside wings, reducing drag. Bottom photo shows how slab-sided fuselage sweeps smoothly back from cabin roof to tail—an easy shape to fabricate.

all aviation experts—fix other people's planes as a business and design their own as a hobby. Their dream of a high-performance, enclosed-cabin biplane began to take shape in 1965 with the first prototype, SNS-1. With all of 18 horses, the tiny single-seater managed a top speed of 80 mph—hardly high performance, but a beginning. Succeeding models gradually grew bigger, more powerful, slicker-looking and more highly sophisticated.

The current SNS-6 is the ultimate in advanced design, with convenient side-by-side seating, dual controls and a 180-hp Lycoming engine giving a top speed of 170 mph and a cruising speed of 160. Refinements include inverted fuel and oil systems for aerobatic maneuvers, a constant-speed prop to prevent dangerous overspeeding in dives and a vastly beefed-up structural system capable of withstanding sustained stress loads of six Gs positive and four Gs negative with ultimate loads for brief periods of up to nine Gs positive and six Gs negative.

The ailerons are especially clever in design. They're of the dual type—two on each side—but you have to look close to tell. The usual tipoff—a "slave" rod interconnecting the upper and lower ailerons—is missing. All ailerons are independently controlled through internal linkages hidden in the wings. This eliminates the need for external linkages, helping to reduce drag. The full-span, strip ailerons can also be lowered collectively to serve as flaps for low-speed landings. Stall speed with flaps down is 49 mph; with flaps up, 58 mph. Aerobatic roll rate is 150° per second. Takeoff run is 390 feet; landing roll, 595 feet. Rate of climb is 1600 feet per minute.

Cabin width inside the Hiperbipe is a roomy 42½ inches—spacious by comparison to most side-by-side two-seat homebuilts. Overall length is 20 feet, with a wingspan of 22 feet, 10 inches. Wing chord is 39 inches. The square-cornered, slab-sided fuselage might be considered boxy if it weren't so well designed. Its lines, despite a minimum of compound curves, are sweeping and graceful. In fact, the lack of tricky contours is an advantage, helping to make the Hiperbipe a relatively easy construction job. The wings are wood with fabric-covered plywood skins, and the fuselage and tail are of fabric-covered tubular steel. Empty weight

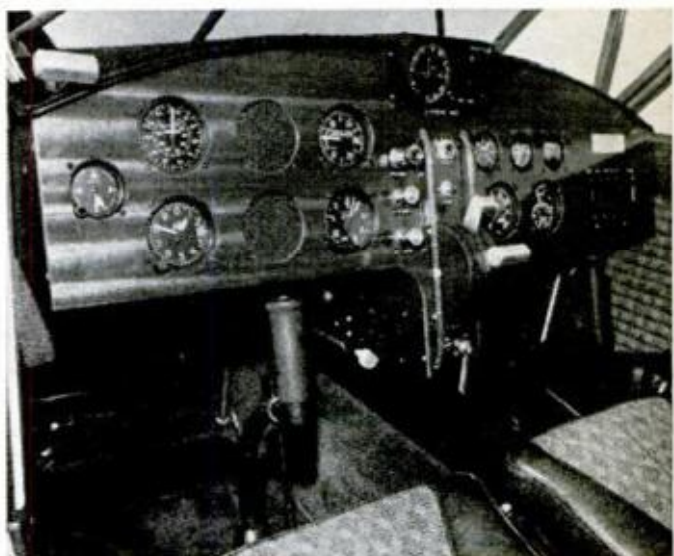


Negative-stagger design with top wing set behind bottom one produces graceful, sweeping lines with unobstructed vision above and ahead of upper wing. Fully aerobatic, the ship is stressed for 6 Gs positive, 4 Gs negative. Overall length is 20 feet; wingspan, 22 feet, 10 inches. Cockpit (below) is wide and roomy with side-by-side seating and dual controls. Throttle and flap levers are on a center console within easy reach of either pilot.

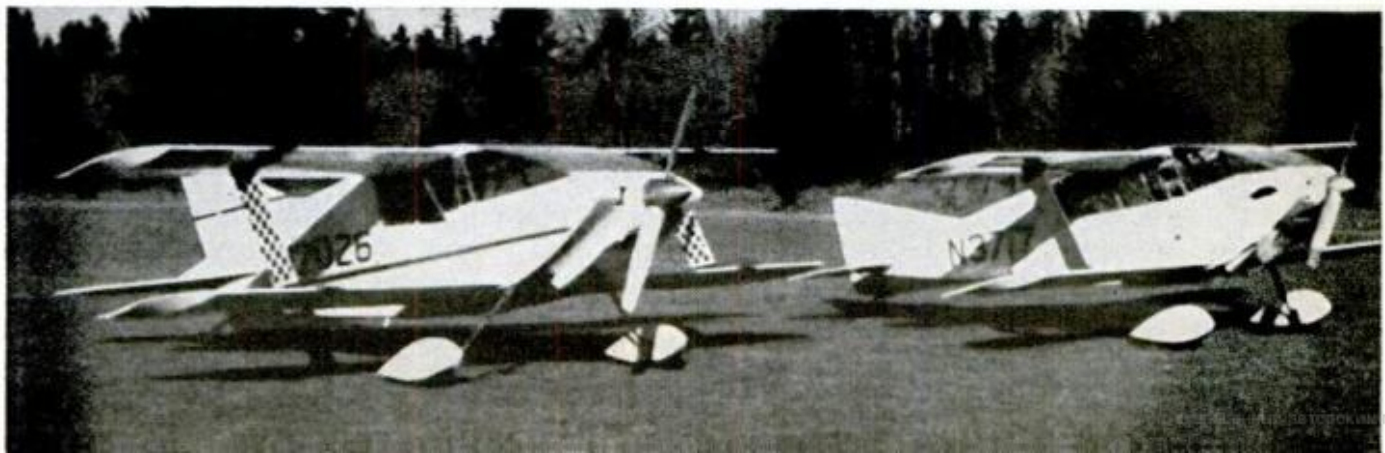
is 1150 pounds. Normal gross is 1800 pounds; aerobatic gross, 1600. Range is 480 miles on 37 gallons of fuel.

The Sorrells plan to offer the Hiperbipe in two forms. For those who wish to build it, a plans-plus-partial-kit package will be available for about \$2500. The kit will include two fuselage halves, four ready-to-install wing panels and drawings for completing the rest of the construction. Other prefabricated parts will also be available separately. Total building cost is estimated at about \$8000 with engine and radio.

For those who prefer to buy the plane preassembled, the Sorrells expect to have a fully certificated, ready to fly production version for about \$8500. Further details can be obtained from Sorrell Aviation, Route 1, Box 660, Tenino, Wash. 98589. A basic information packet is about \$5. ★ ★ ★



Early versions of the Hiperbipe show how the ship has progressed in sophistication from the stubby little SNS-1 at right, an 18-hp single-seater built in 1965, to the current 180-hp two-seater beauty at top of the page. Shown below are the SNS-3 and SNS-4 models, each bigger and more powerful than its predecessor. SNS-4 (foreground) was first of the wide-bodied, two-place, dual-control designs.



New flash units make any photographer look brighter

by Ivan Berger
PHOTOGRAPHY EDITOR

Photos: Stephen Fay Studio



Capro 533 flash outfit has just about everything you need for the three-light portrait setup shown (except the camera, tripods and furniture to double as light stands). The outfit includes three flashguns, a nine-foot extension cable and an electric-eye slave tripper, plus gadgets that may be needed for mounting the flash units to tripods, furniture or tabletops.

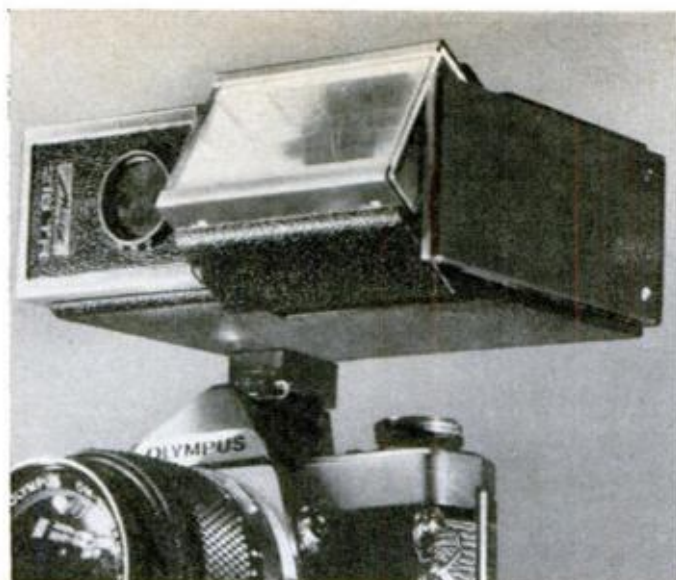
Electronic-flash designs are brighter every year—smaller, more automatic, less expensive, with higher light output, faster recycling and more flashes per charge.

But if the average flash photographer is any brighter than he used to be, you'd never know it from his pictures: flat and featureless, because the easiest flash technique—direct flash with the gun mounted right on the camera—is still the only one he uses. And auto flash, by making direct flashing easier, has, if anything, discouraged the bounce-light and multiple-light techniques that can add interest, form and flattery—

if you're willing to shoot photos manually.

But the latest auto-flash units from Honeywell, Braun, Vivitar (page 90) and most notably Metz (facing page) make bounce-flash easy. Some, like the Vivitar and Honeywell, permit use of umbrella or similar reflectors, for a spread of directional light as soft and flattering as window light.

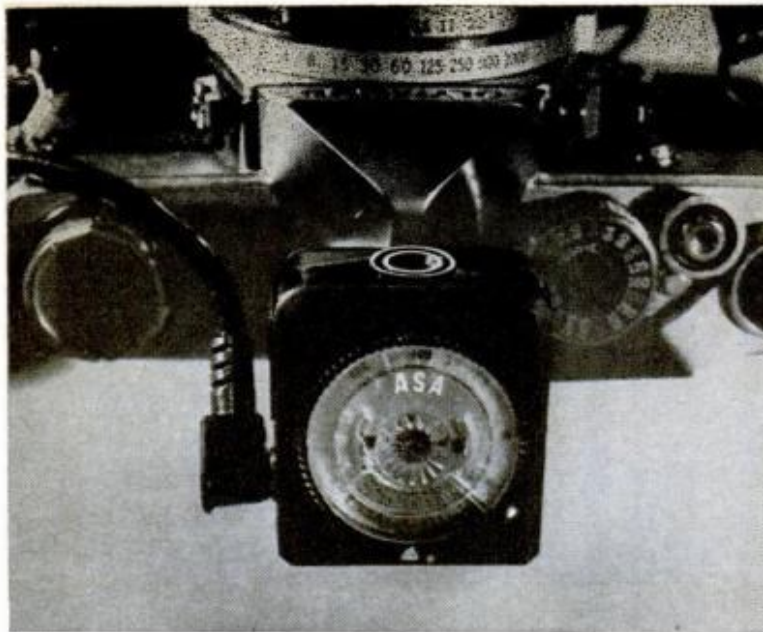
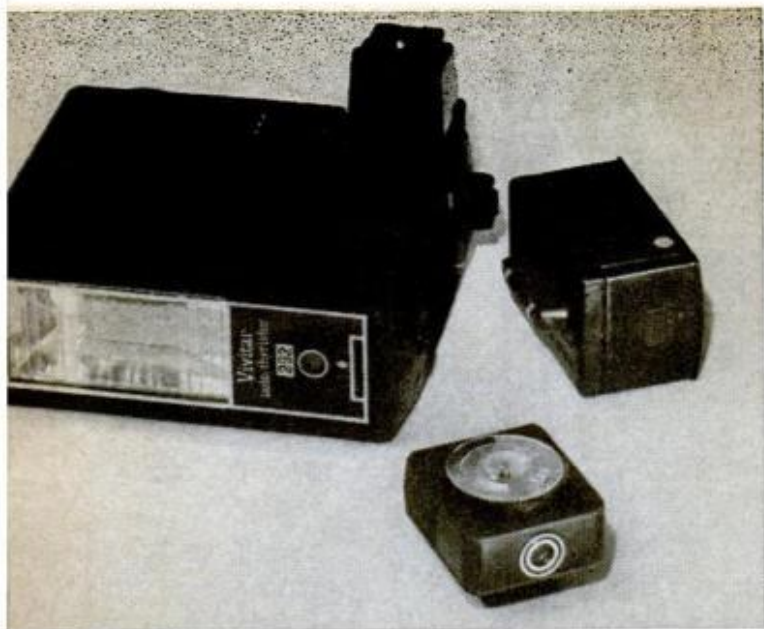
Multiple flash is easy and inexpensive with Capro's outfit (above), that includes three manual flashes for main, highlight and background (or key-light) use, plus every accessory you need to mount and trigger them—except instructions on multiple-



Metz 218TR Quadrolight, \$160, swivels reflector up and down or (turned 90° on its shoe), left and right, while auto-flash eye still faces subject. Auto range is up to 30 feet, with choice of three f-stops.



Sample lighting effects (shot by light of Quadrolight alone) include (clockwise from upper left) direct, side bounce, bounce from below and more familiar ceiling bounce. Total bounce distance from flash to reflector to subject must be within auto-eye's distance range.



Vivitar 292 has built-in auto-flash sensor for direct flash, takes \$25 accessory remote sensor (top right) for bounce. Since flash angle is independent of sensor, 292 can be used as auto flash even with umbrella reflectors like \$19 Spiratone outfit shown, as long as sensor is within three feet of flash. Nickel-cadmium battery packs (top left) are interchangeable, so you can carry charged spares. Snap-on attachment (above right) broadens light spread for use with wide-angle lenses. Auto-flash range is 33 feet with choice of three f-stops; price, including case, wide-angle attachment and charger, is \$160.

light setups (for those, you'll need a book on photography). You'll also find multiple-light setups in the Vivitar 292's instructions—ironically, since the 292 should usually be used manually for multi-flash.

Bell & Howell's Focusmatic is basically a poor-man's auto flash. But beside telling exposure, it tells distance—which should make photographers whose cameras focus by guesswork look brighter by letting them take sharper pictures. ★★★



Bell & Howell Focusmatic 855 flash works on same principle as Focusmatic movie cameras, to ensure quick, accurate distance measurement for proper f-stop setting. You aim sight (above scale in upper right photo) at subject's feet, then press red button at side to light front peep sight and unlock pendulum weight whose edge shows as an indicator in the distance f-stop scale. Release button to relock weight, and you can read both f-stop and distance settings (handy, for scale-focusing cameras) when you straighten up again. With replaceable nickel-cadmium batteries and chargers, \$60. Lower-power unit without recharger is \$35.





Snowgoers for '75

This winter — more speed, less noise.

by Bill McKeown
OUTDOORS EDITOR

This winter should be a big season for snowmobiles—if there are gas and snow. Last November when the sudden energy crunch came, followed by December and January when snow didn't fall in the heavily populated sections of the snow belt, machines stacked up in dealer lots, and many may be left for sale this year.

Last year's slump was unfortunate because the sport appears to be coming of age. All machines now produced are reported to be down to the required sound level of 82 decibels at 50 feet, about the noise of a car accelerating, and will reach 78 dBA by mid-1975. That is a 94½ percent reduction in 10 years—a remarkable improvement.

The industry and snowmobile clubs have



Speeding into the first turn at close to 100 mph, a Polaris 650-cc Sno-Pro racer holds the lead at Eagle River (top). A dozen additional models will be available. Evinrude has new 40 and 35-hp Skimmer 440 and 400 (above) plus 646-cc Skimmer 650s and RC Trailblazer 35 and 45 with quiet rotary power.



Newest John Deere addition is Model 800 Green Machine with 440-cc reed-valve engine. Its standard equipment includes speedometer, tachometer, skis with carbide wear rods, shocks.

Hustlers with 644-cc engines rated at 50 hp, the Mercury Hurricane Mark II models are joined by new Sno-Twister and Trail-Twister free air machines; seven in all.

Wide track and engine options of 244-cc, 336-cc and 439-cc for the new Polaris Electra series provide horsepowers of 20, 30 and 42. An 18-inch track rides on slide rail suspension.





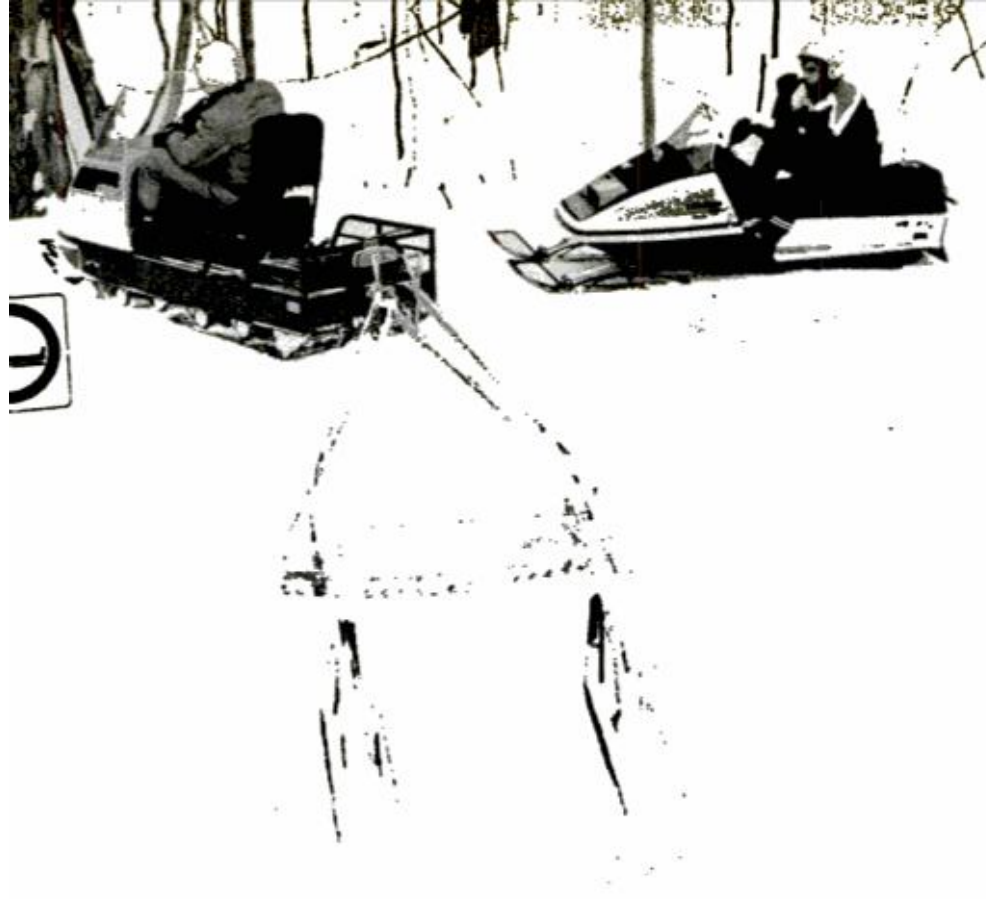
New colors and styling mark the addition of the Pantera this winter to the black and purple Arctic Cat line. New model has 440-cc twin-cylinder engine, 120-watt alternator, lengthened seat for two riders.



Seven Moto-Ski models will be offered for '75 with the introduction of Nuvik manual or electric start (left). Machine displacements range from 247-cc for child's Cadet to 436-cc Futura and Grand Sports.

Speedster Ski-Doo from Bombardier, the T'NT (for track 'n trail) comes in six models with 340-cc or 440-cc, manual or electric start, and free-air versions as well for owners who like class racing.





Hot Ski-Doo for cold racing, Blizzard F/A is free-air Pro-Am machine available only on special order for experienced racers.



Trail bumps are smoothed with a groomer behind a twin-track Ski-Doo Alpine while F/A 440 waits.

Lineup of new Ski-Doos shows multicolored Elans at left, two Olympiques and two T'NTs (center), Elite (upper right,) F/A T'NT, but no Everest, Alpine, Blizzard.



High performance for both cross country and track racing is offered by John Deere's new limited-production fan-cooled wide-stance JD340/S machine.

also swung heavily behind the development of trails. Hundreds of miles have been created and are being groomed and maintained. No longer does a driver have to cross private land, endanger cars and homes and annoy animals. Particularly scenic trails are available, and trailering to them has become part of the sport.

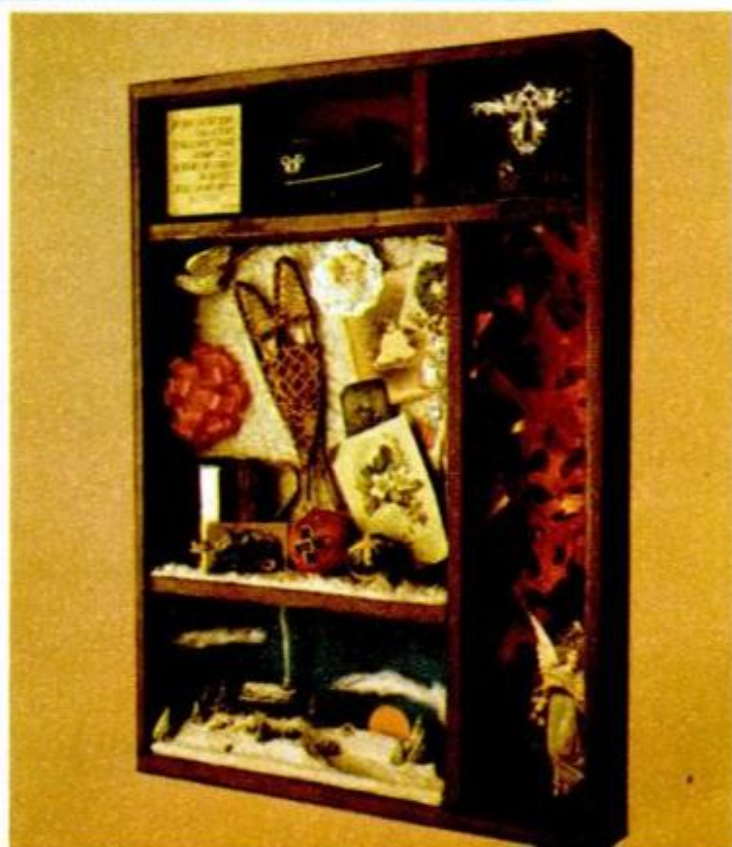
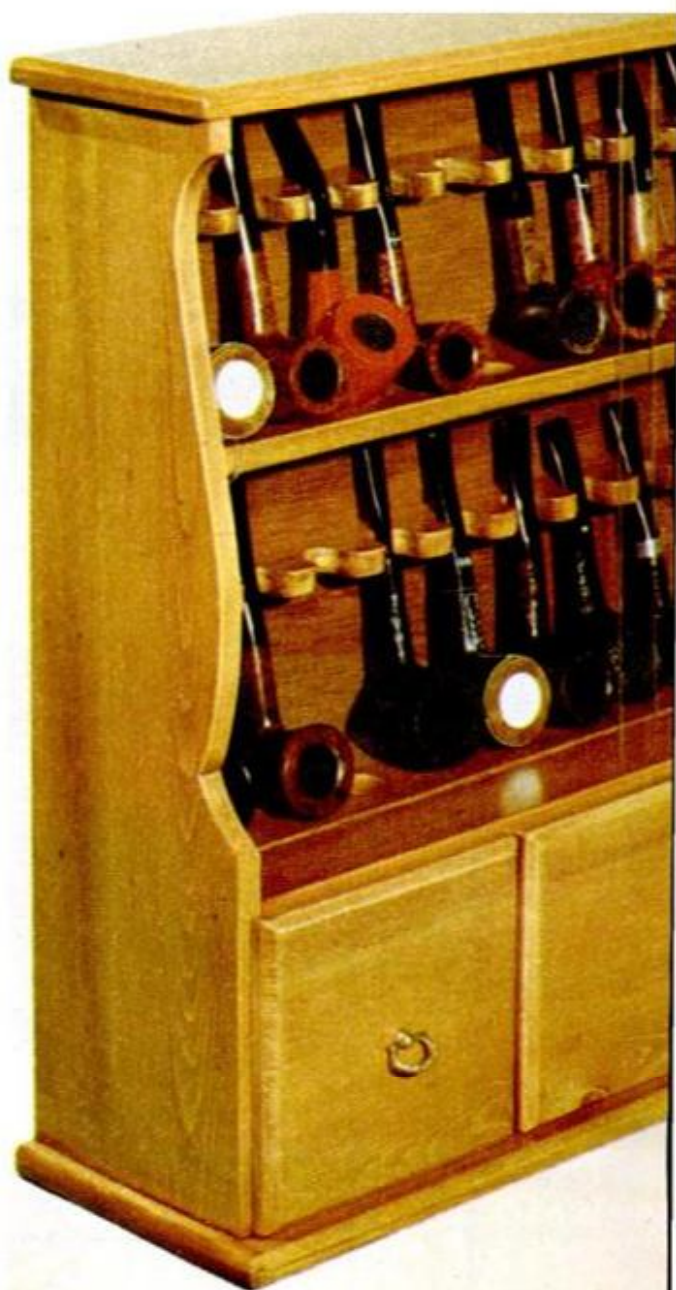
Racing has settled into its segment of the sport. New free-air machines are faster, while using less gas, but safer driving techniques are lowering accident statistics.

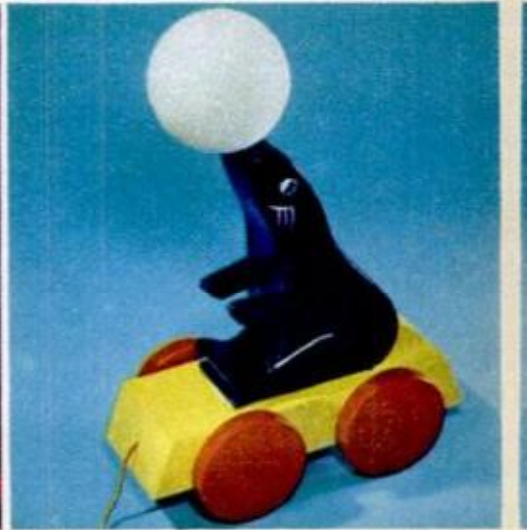
Fewer manufacturers are around, but the survivors are solid names like Arctic Cat, Boa-Ski, John Deere, Evinrude, Harley-Davidson, Johnson, Massey-Ferguson, Mercury, Moto-Ski, Polaris, Scorpion, Ski-Doo, Sno-Jet, Suzuki and Yamaha. The snowscape of the future looks bright. ★★★

Gifts with a personal touch

Nothing conveys the spirit of Christmas better than a gift made with your own hands. It will be cherished for years.

Pictured here are eight unusual gifts you can make. You will find complete instructions for making each on the indicated pages. Counterclockwise from the left, they are: wall sconce, page 100; assemblages, page 98; wall pipe cabinet, page 104; pull toys, pages 108 and 110; fingernail-polish dryer, page 107; bud vase, page 103; and colonial chamberstick, page 102.



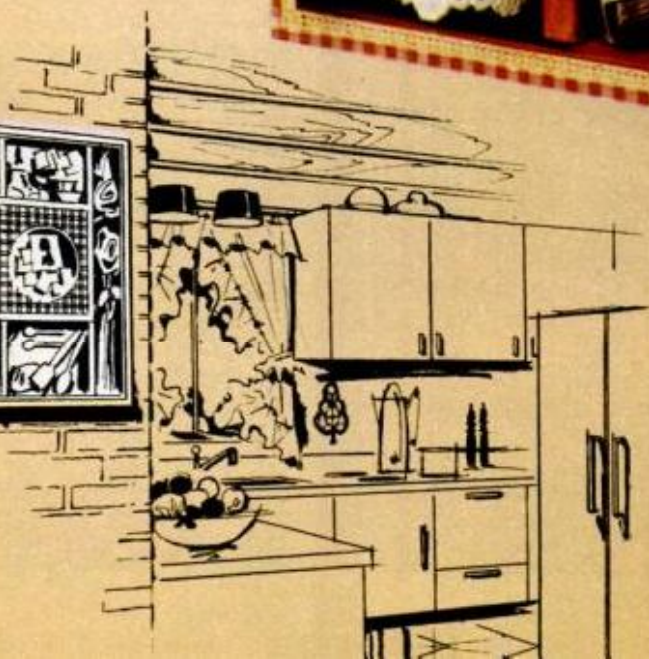


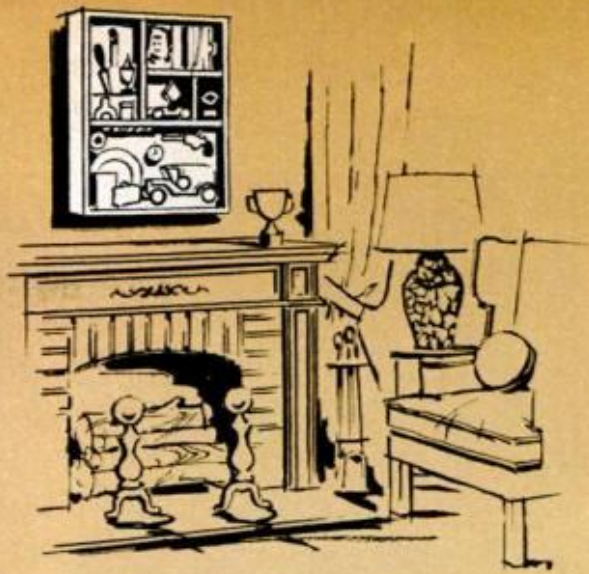
Display boxes for keepsakes

Mother's mementos:

A fitting wall hanging for a kitchen. Assemblies like those shown here can be unique portraits of your own life or of members of your family. At right is a collection of a mother's treasured mementos.

Materials used here include such items as top ornament from wedding cake, bridal veil, Grandma as a young woman, baby picture, miniature bowl and jug, roses from yesteryear.





A man's interests:

A collection that typifies your interests and hobbies. The more meaningful the items, the better your display will be.

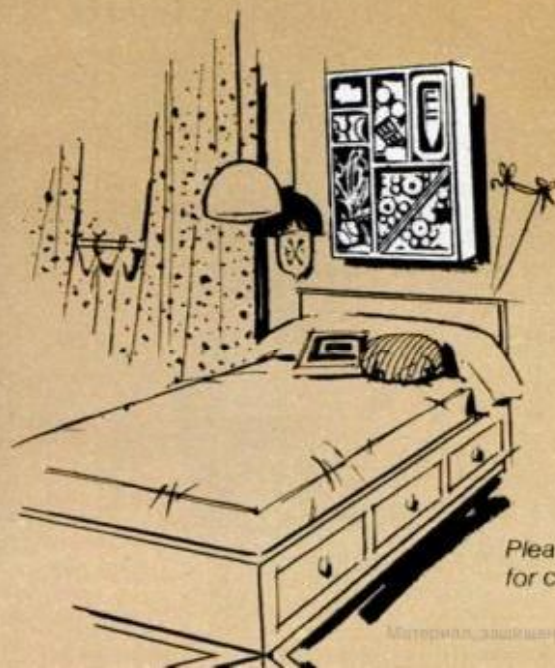
From Dad's odds and ends: antique molding plane, film holder from an early camera, toy race car, fish jaw (labeled 356-lb. shark), sergeant's stripes, toy from Dad's youth. Round object at bottom is old stove lid.



Vacation memories:

A summer at camp will yield lots of souvenirs for a teen-ager's room. And a family tour could make an interesting living-room display.

From distant places: dried beach grass, oarlock, toy ship-in-a-bottle, rowboat made of balsa, assortment of cork floats, and sea urchins. Boxes are completed with items having sentimental meaning.



Please see page 112 for construction details

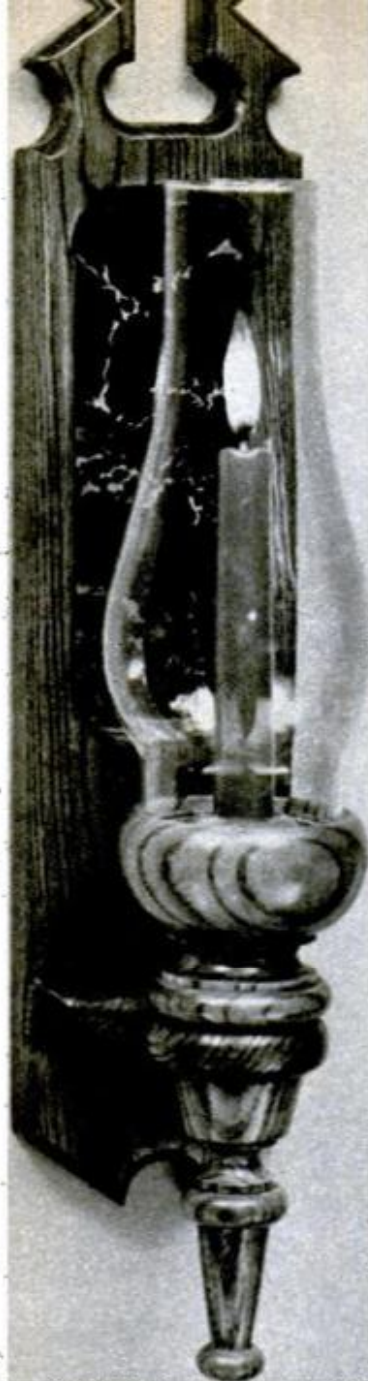
Handsome candle sconce adds beauty to any wall

Your wood lathe is called upon to help make this handsome candle wall sconce. A piece of oak, cherry or walnut $\frac{3}{4}$ x 4 x 60 in. will make one complete sconce including the two-part turning. The turned candle cup, which also holds a lamp chimney, requires a glued-up block measuring 4x4x5 in. It is turned attached to the lathe faceplate. The dimensions given will accommodate a standard $2\frac{5}{8}$ x $8\frac{1}{2}$ -in. hurricane lamp chimney obtainable at lamp-parts stores. The second part of the turning requires a 2x2x6-in. block and is turned to the shape shown between lathe centers.

The antique black and gold mirror is optional. If a pair of sconces is being made, you can get two mirrors from a standard 12x12-in. mirror tile. The opening for the mirror is cut with a sabre saw, sanded and then rabbeted on the back to receive the mirror flush.

Both parts of the turning are held by a bracket which fits between the two and is housed in a groove cut in the scroll-cut mirror board. As a final step prior to finishing, the front edges of the mirror board, as well as both top and bottom edges of the bracket, are shaped with a $\frac{1}{4}$ -in. corner-rounding bit in a portable router.

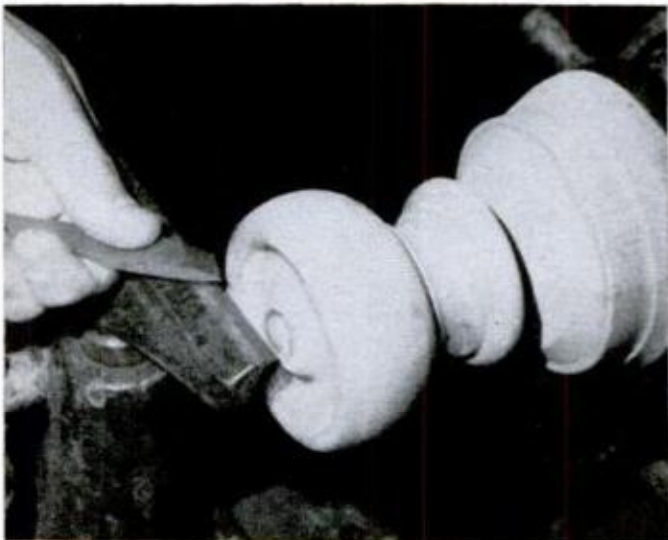
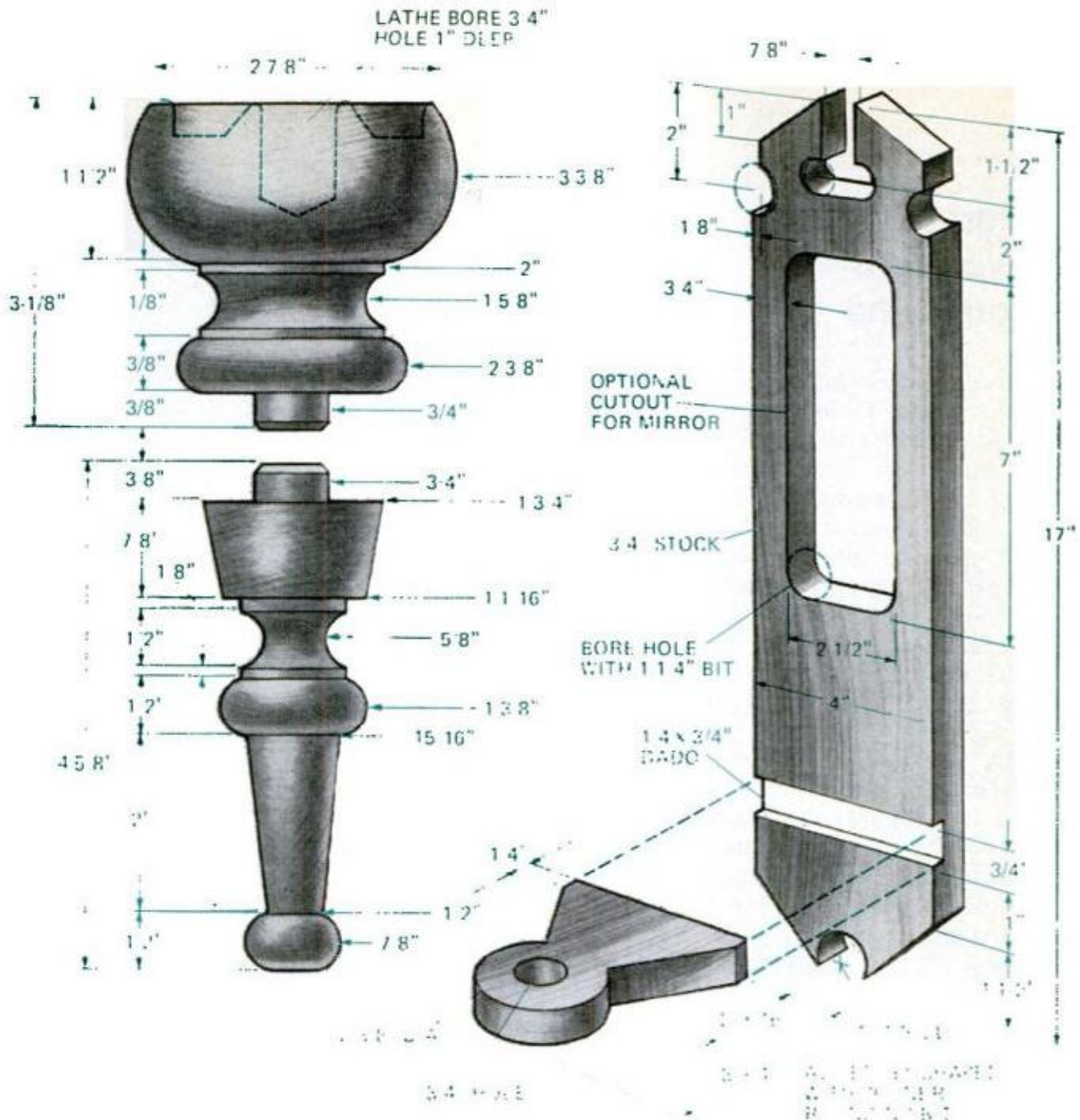
—Robert R. Henderson.



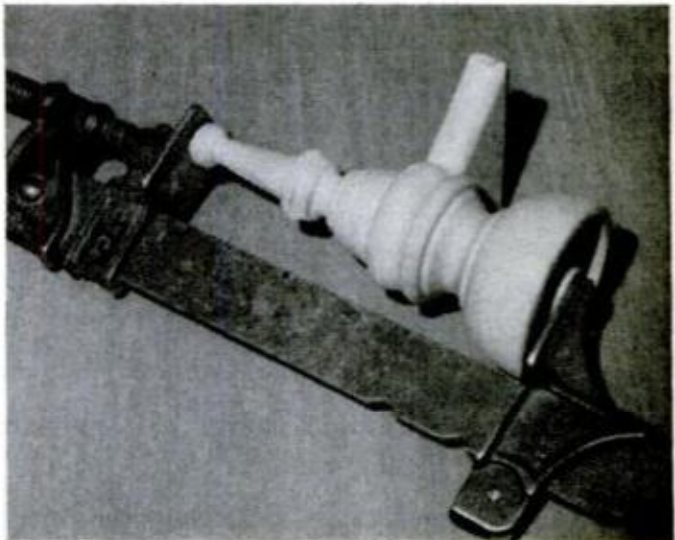
Pair of sconces, used at each side of a beveled mirror, makes a truly smart wall ensemble.

Black mirror tile streaked with gold reflects dancing candle flame to get extra decorative effect.





Upper half of turning is shaped with work mounted on lathe faceplate, then cut free at end of 3/4-in. tenon.



With supporting bracket placed between, tenons on turnings are coated with glue and clamped.

Two graceful gifts that you turn on your lathe

The chamberstick here and the bud vase on the facing page are two graceful gifts that will give you a chance to show off lathe skills on fine hardwood.

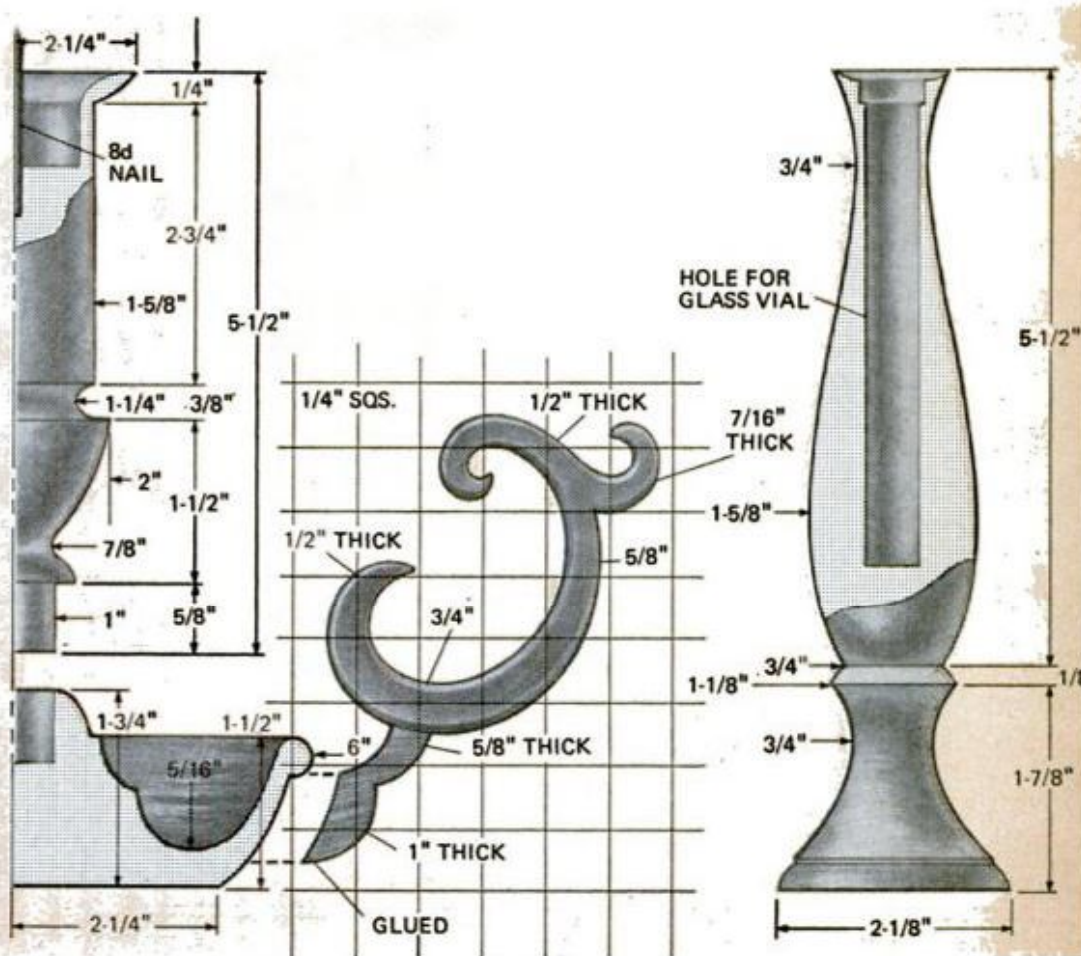
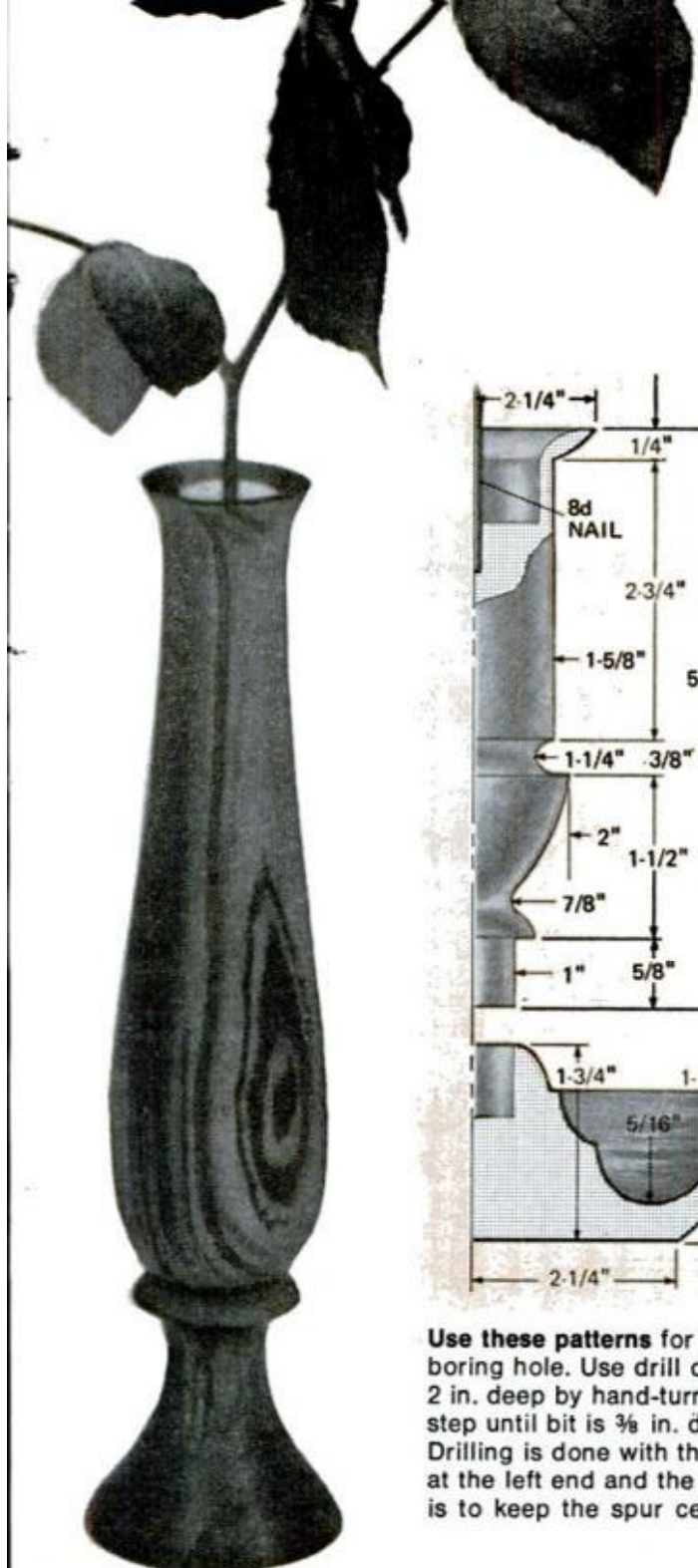
The chamberstick, made of walnut, consists of two lathe-turned parts plus a separate, hand-shaped handle. The base, or cup, is faceplate-turned, while the stick is shaped between lathe centers. Smooth the turned parts while they're in the lathe with 80, 100, 120 and then 220-grit sandpaper. For a lustrous finish, apply a 50/50 solution of linseed oil and shellac with a cloth as the work is spinning (then dispose of the cloth). Before gluing the turned parts together, bore a 1-in. hole $\frac{3}{4}$ in. deep for the upper tenon. A protruding 10d nail forced into a $\frac{1}{8}$ -in. hole helps hold the $1\frac{1}{4}$ -in.-dia. candle.

The bud vase is made of one block of choice rosewood, turned between lathe centers. Apply a shellac-and-linseed-oil mixture, then bore a hole for a florist's glass vial.—*Dave Warren*

Fine hardwoods used in these projects not only look beautiful, but allow delicate turnings. Walnut of the chamberstick allows you to achieve a thin wall in the base, clean-cut corners and slim look to carved one-piece handle.



The handle of the chamberstick is glued to the rim of the base, or it could be doweled also. Bottom of the base is covered with a $3\frac{1}{2}$ -in. disc of green felt so it doesn't scratch.



Use these patterns for turning both items. Trickiest part of bud vase is boring hole. Use drill chuck in lathe tailstock and drill a $\frac{1}{8}$ -in. hole 2 in. deep by hand-turning lathe. Then change to $\frac{5}{8}$ -in. bit, repeat the step until bit is $\frac{3}{8}$ in. deep—and finish hole with lathe at low speed. Drilling is done with the turning supported by the lathe dog (spur) at the left end and the drill bit at the right. The tricky part here is to keep the spur center engaged in the turning as the work rotates.



Disc blank for chamberstick is mounted to faceplate for turning with short, stubby screws that won't pierce bottom of base (photo, far left). After handle is jigsawed, it's shaped and rounded with burr cutter in hand grinder (photo, near left).

Pipe-smoker's dream holds 24 of his favorites, tobacco and all

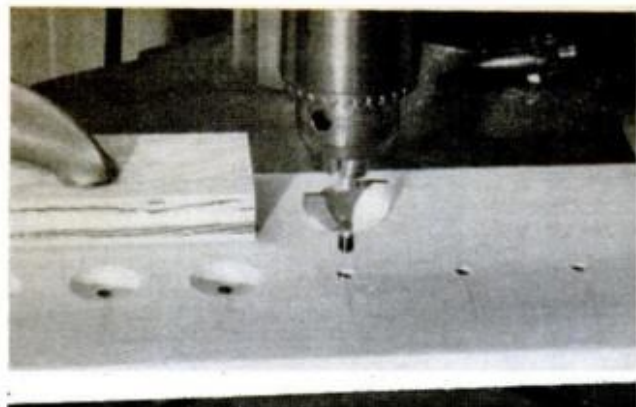


Pipes: Peterson's Ltd., Inc., and S&M Frank Co., New York

For the man who loves a pipe, this king-size display case will make the greatest gift ever. It holds up to 24 pipes, has clear plastic sliding doors to keep the collection dust-free and has two drawers for humidor tobacco jars, plus a large center drawer for smoking accessories.

Half-inch stock is used for the main parts, $\frac{3}{8}$ -in. material for the drawers and $\frac{1}{8}$ -in. plywood for the back and the drawer bottoms. Butt joints, glued and nailed, are used in attaching the cross members to the scroll-cut ends. The back panel is set in a rabbeted recess, and the sliding doors ride in a single groove made in cross members A and E. The rabbets for the back in the top and bottom members (parts A and F) are run completely through and then made blind by inserting and gluing $\frac{3}{4}$ -in.-long wood plugs at each end of the rabbet.

The four photos at right show and explain



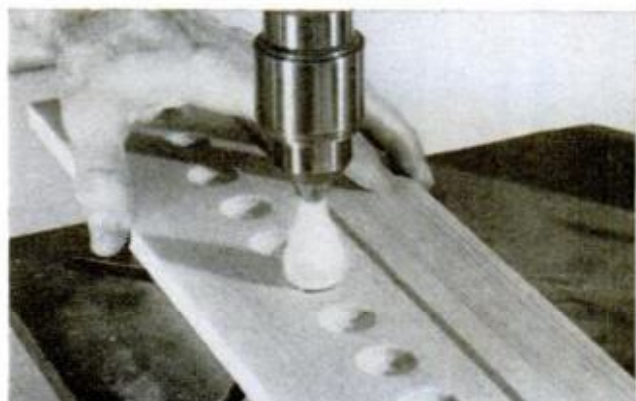
A $\frac{1}{2}$ -in.-radius cove router bit is used to make depressions for pipe bowls. Drill pilot holes first.



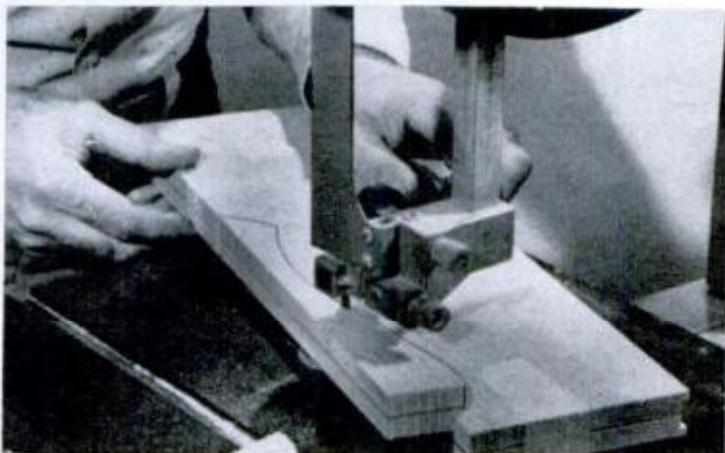
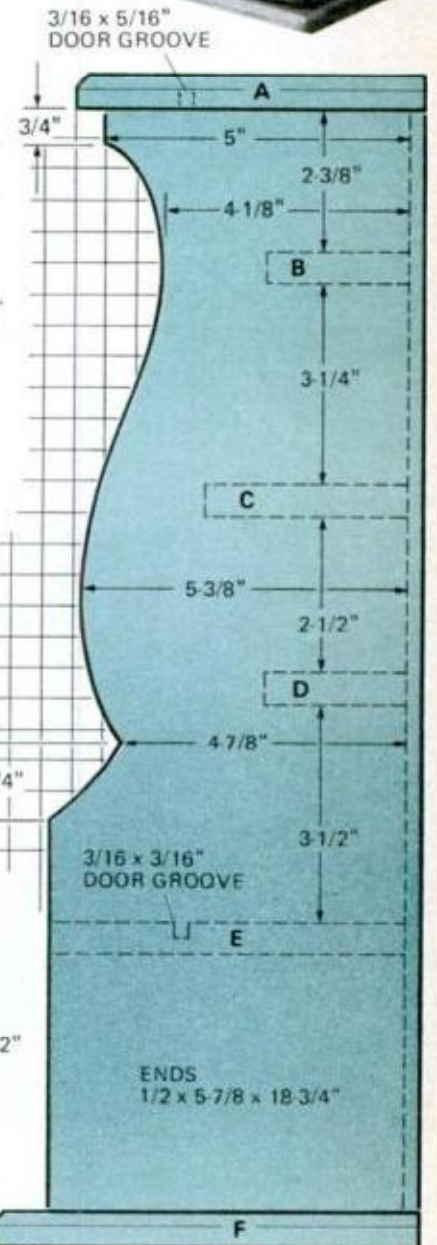
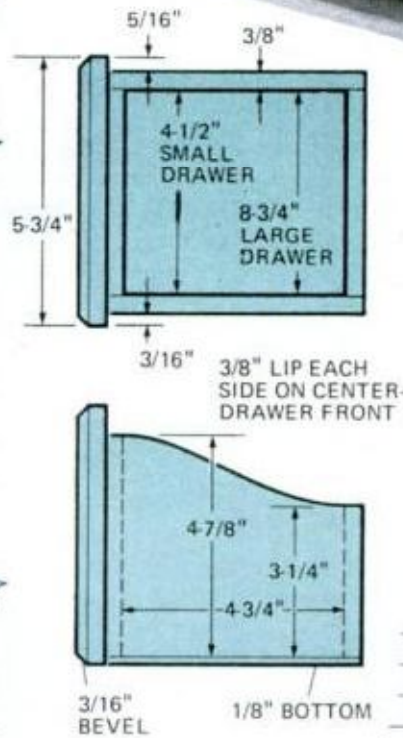
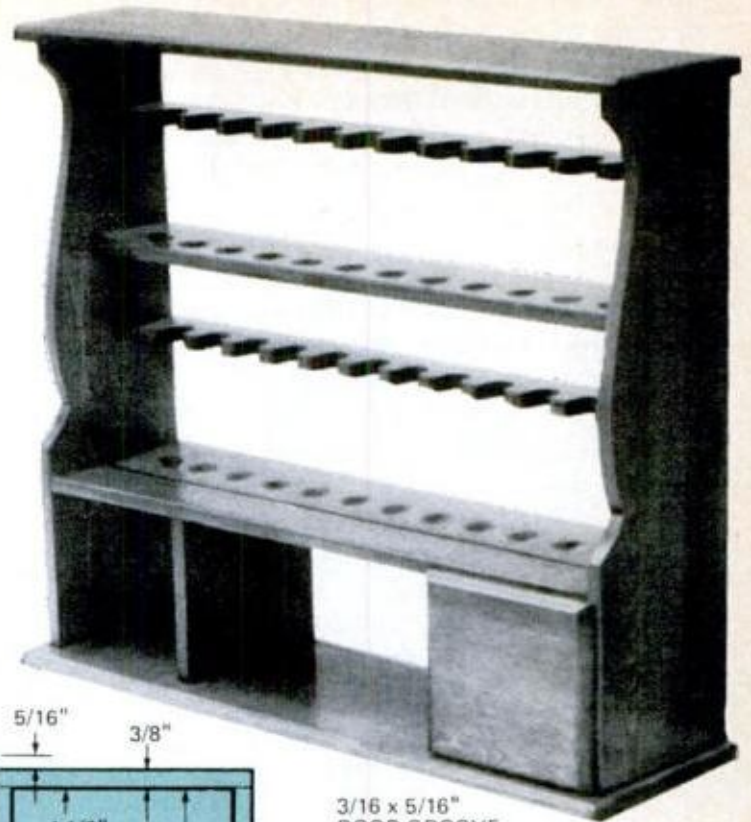
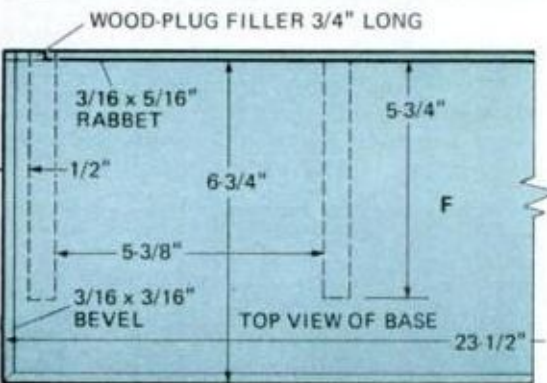
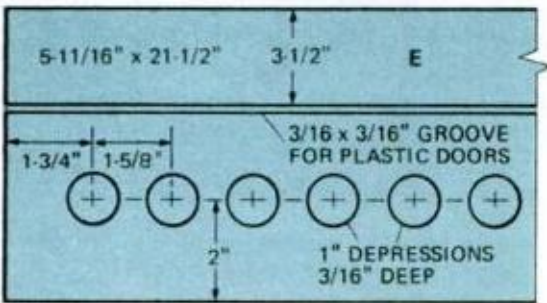
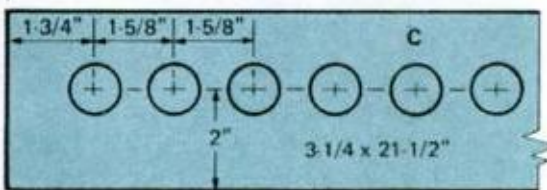
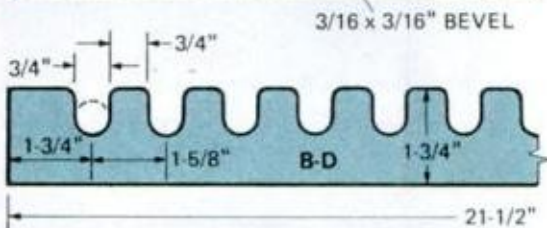
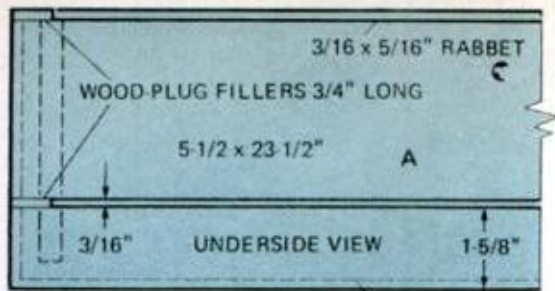
Fill pilot holes with vinyl spackling compound and let dry. Overfill holes a bit to avoid shrinking.



To sand compound in holes wrap abrasive paper on rotary file, tape to shank, chuck in drill press.



Sanding recesses should be done with press running at high speed, but the feed should be light.

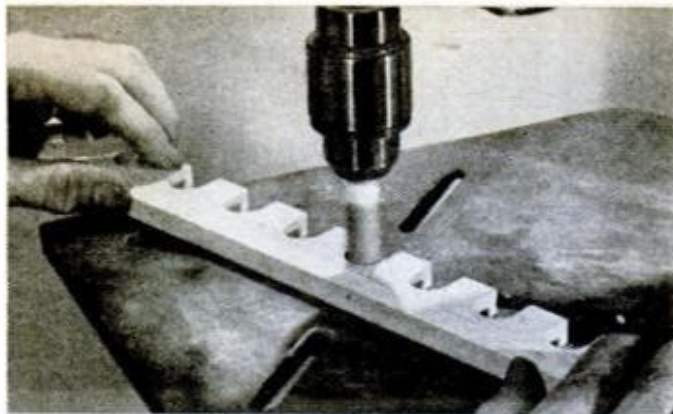


Saw the side panels both at one time to assure identical units and to save time. Use masking tape to hold them.

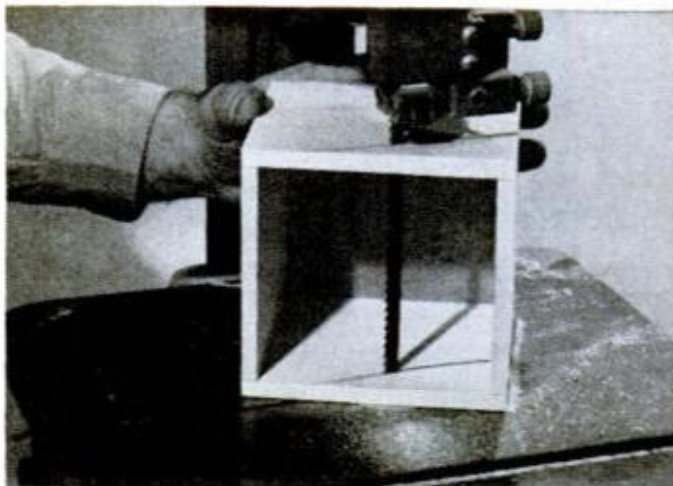
how the depressions for the pipe bowls are cleverly made with a cove router bit guided by a row of equally spaced pilot holes and chucked in a drill press. The press is run at high speed, set for a $\frac{1}{4}$ -in. depth of cut, and the workpiece is clamped in place as each depression is made.

Notched members B and D are neatly cut by first drilling $\frac{3}{4}$ -in. holes $1\frac{3}{4}$ in. on centers and then sawing into each hole from the edge. A short piece of $\frac{1}{2}$ -in. dowel wrapped with a strip of abrasive paper and chucked in a drill press will make quick work of sanding the notches. Wrap the paper on the dowel counterclockwise and secure it with masking tape at top and bottom. As the paper wears you can unwind it a bit and tear off to expose fresh grit. Outer edges of the notches can be rounded quickly with a band sander, a sanding attachment inserted in a jigsaw, or by hand.

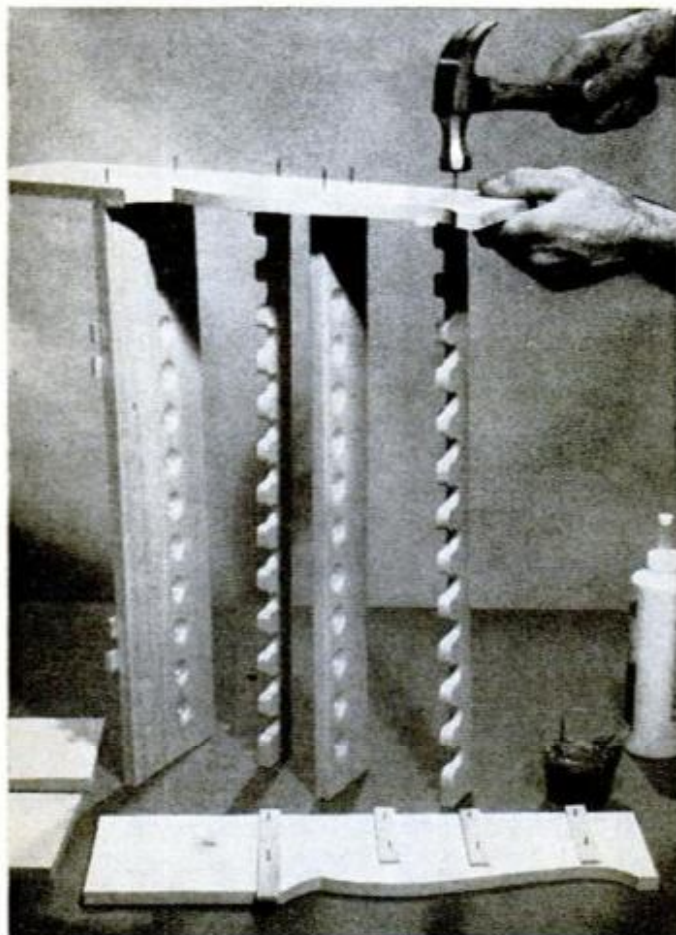
When assembling the case, the simple trick of using temporary cleats for lining up the parts will insure precise assembly. Be sure to remove the cleats before the glue sets. The $\frac{1}{16}$ -in.-thick plastic doors install like any sliding doors; the upper groove is twice the depth of the lower groove. The doors are inserted in the top grooves first, then dropped into the lower grooves.—*Rosario Capotosto*



A length of $\frac{1}{2}$ -in. dowel wrapped with abrasive paper custom-made drum sander for stem notches.

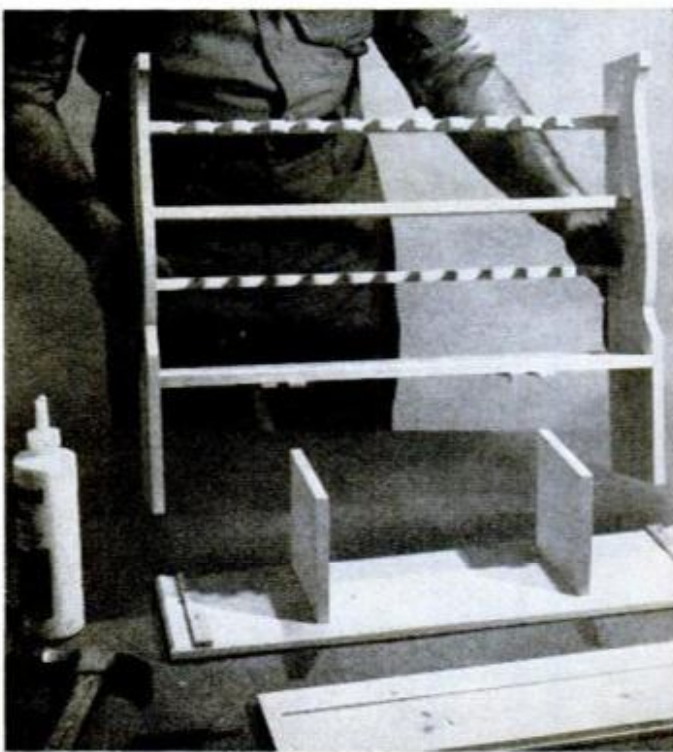


Bandsawing drawers after they are assembled is quick way of cutting curved sides of two end drawers.



Start assembly by gluing and nailing side to cross members first. Temporary cleats assure good lineup.

Drawer dividers and bottom are added next, followed by top. Back goes on, finally sliding plastic doors.

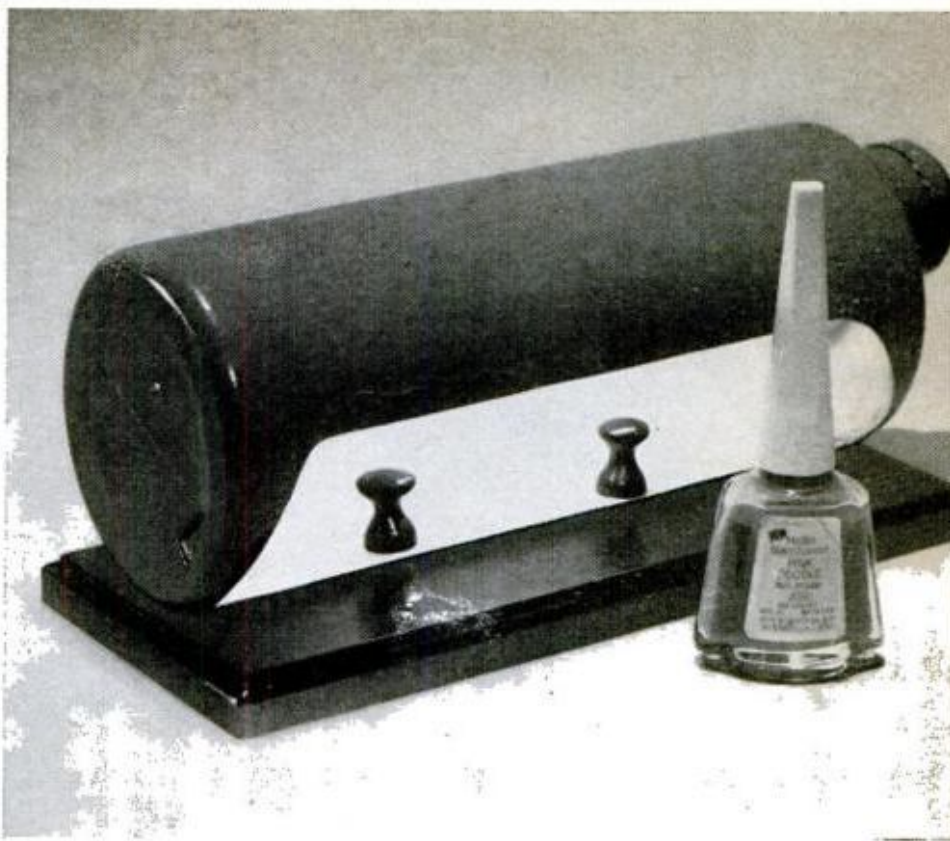


Surprise her with a nail-polish dryer

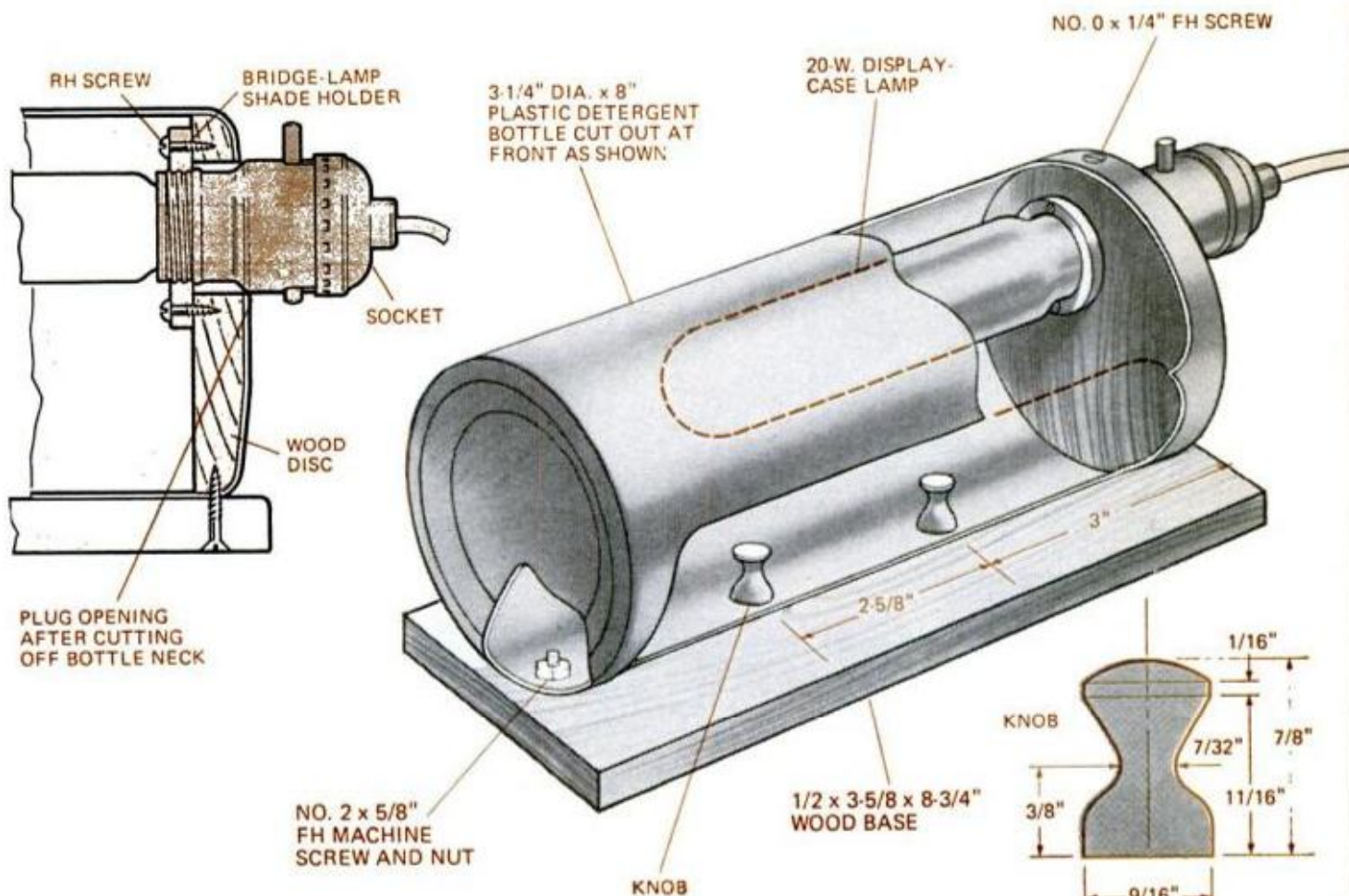
After watching my wife and daughter sit with fingers spread waiting for nail polish to dry, I made them this little dryer. You can copy it for about the price of a display-case lamp, bridge-lamp shade holder, socket and some lamp cord. The rest of the material can be found in a scrap box.

You make it from an empty plastic detergent bottle measuring 3½ x 8 in. The neck is cut off and an opening is made in the side, as shown. Then the bridge-lamp shade holder is screwed to a wood disc bored to fit over the socket and cemented to the one end of the bottle. Finally, the bottle and two posts are attached to a wood base.

—Frank Schubert



To dry her nails, the user switches on the bulb, applies the polish, then rests her hand with fingers apart on the two posts provided. The heat from the bulb dries the polish in seconds without discomfort for the user and without smearing the polish.



are glued together as shown after $\frac{1}{4} \times \frac{3}{4}$ -in. grooves are made in parts B. Full-size patterns for the egg and nest are made from the grid drawing below, the nest pattern being traced on $\frac{1}{4}$ -in. plywood and cut in duplicate.

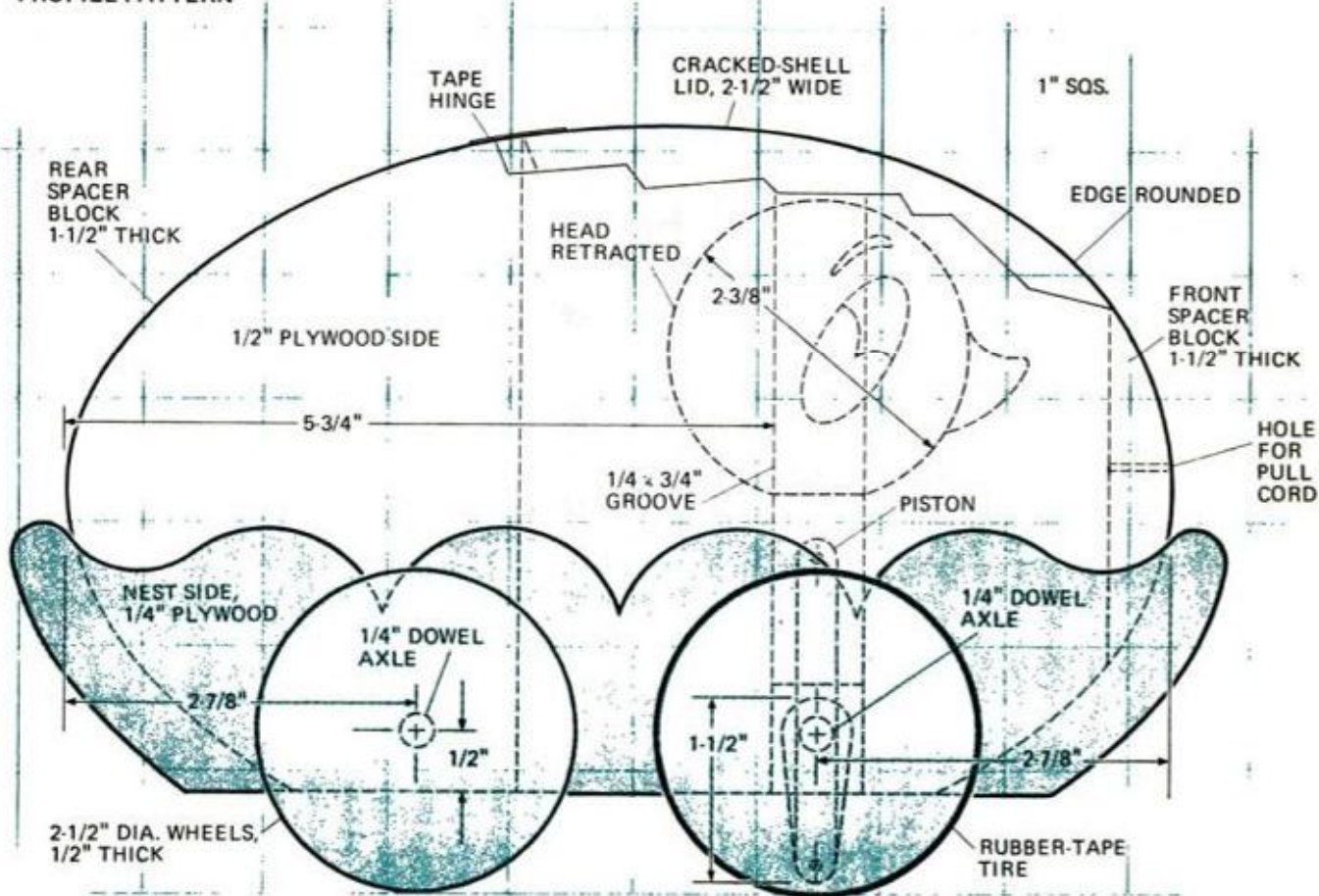
The egg pattern is traced on your built-up block, then bandsawed. The hinged part of the cracked shell is cut to fit from a separate piece of pine.

The rubber-tired front wheels move the crank-and-piston linkage, which in turn moves the chick's head up and down in the

grooves provided. Wax applied to the grooves will make the head move smoothly as the chick is pulled.

Holes for the wheel axles are drilled completely through at the points indicated after the scroll-cut nest pieces are glued and nailed to the sides of the egg. The holes should be reamed a bit oversize so the wheel-and-axle units turn freely. The $2\frac{1}{2}$ -in. wheels can be cut with a drill-press hole cutter, lathe-turned or jigsawed, then drilled $\frac{3}{8}$ in. deep from the back and glued to the ends of the axles.—*Merton H. Slutz.*

PROFILE PATTERN





Performing seal makes balancing trick look easy

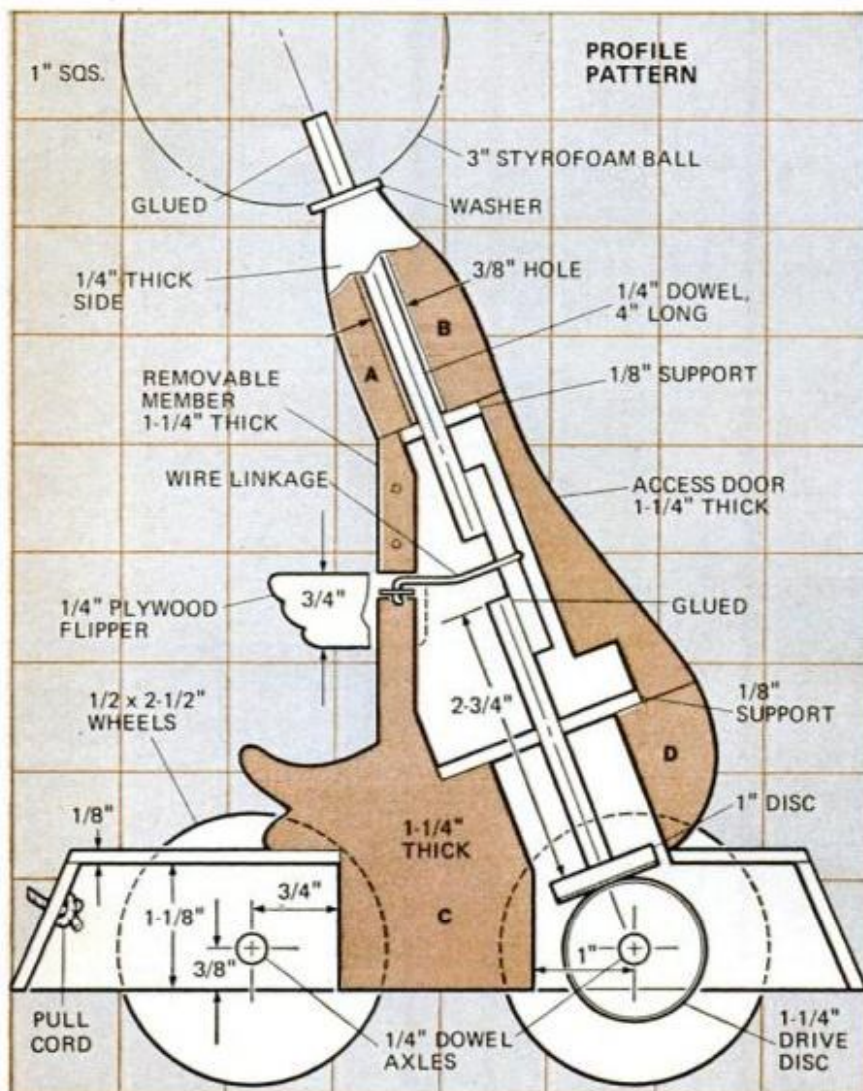
When Flappy the seal is pulled along, he flaps his flippers most realistically while he balances and twirls a ball on his nose.

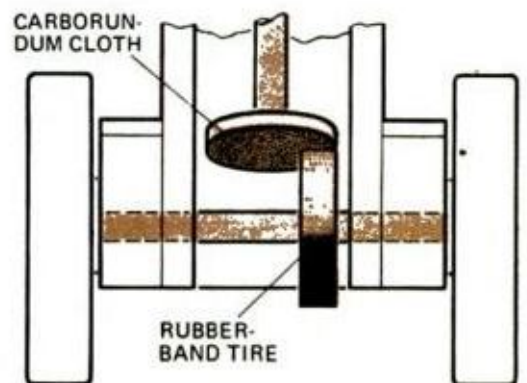
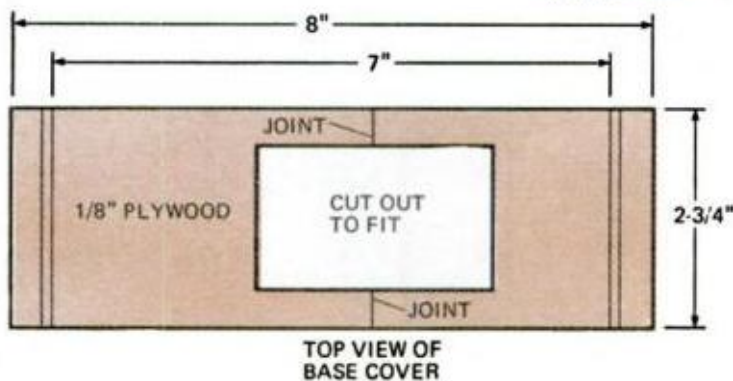
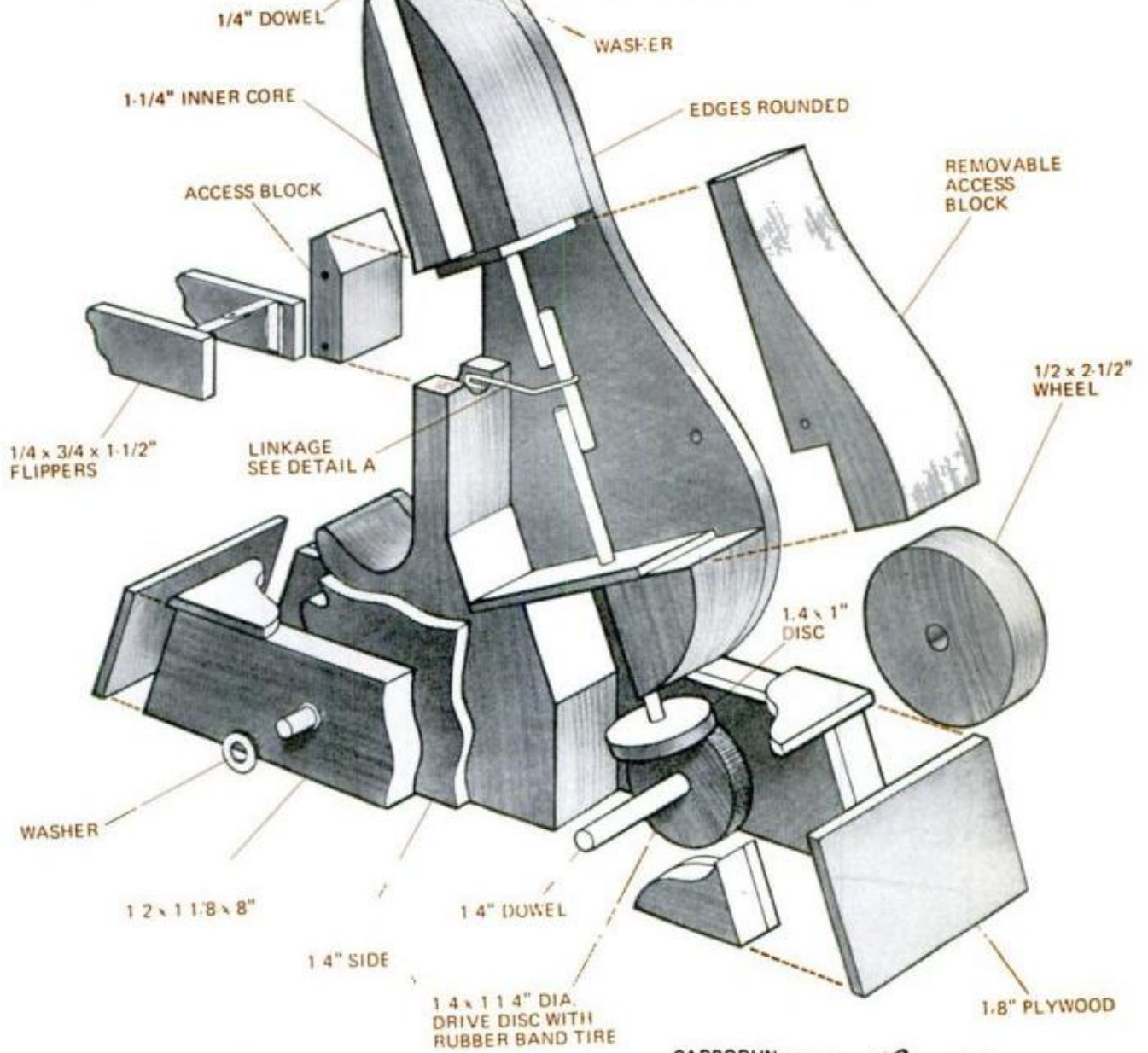
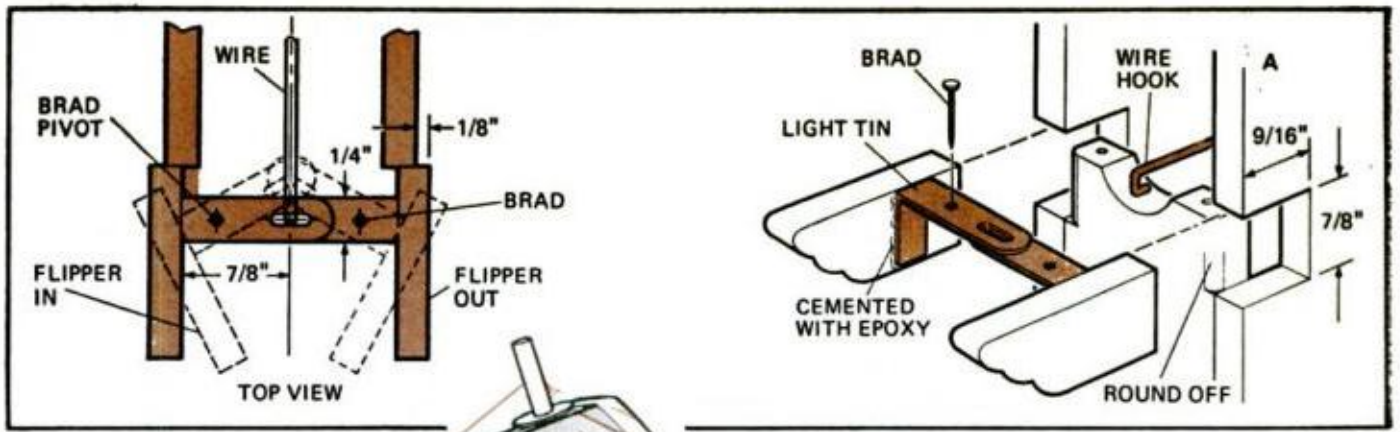
To make the toy, you begin with a paper pattern of Flappy's body, which consists of a sandwich of three pieces—a center piece that's $1\frac{1}{4}$ in. thick and two outer pieces which are $\frac{1}{4}$ in. thick. The center part (shown in color in the grid drawing) consists of six parts, two of which serve as removable sections (held by tiny screws) to gain access to the cavity formed by the other four.

The body assembly is begun by gluing the four fixed parts to one $\frac{1}{4}$ -in. side piece. Then parts A and B and C and D are bridged with $\frac{1}{8}$ -in. pieces which support the offset dowel that twirls the ball and moves the flippers. Obviously the dowel and its friction-drive disc, as well as the flippers and wire linkage, have to be installed before the second side piece can be glued to the rest.

The $\frac{1}{2}$ -in.-thick side members of the cart on which Flappy sits are bored for $\frac{1}{4}$ -in.-dowel wheel axles, then glued in place, after which the ends and top are covered with $\frac{1}{8}$ -in. plywood. You'll notice in the top-view detail of the base that the top piece consists of two pieces and is cut out to fit around Flappy.

—Merton H. Slutz.





Nostalgia, humor and a touch of whimsy in a frame

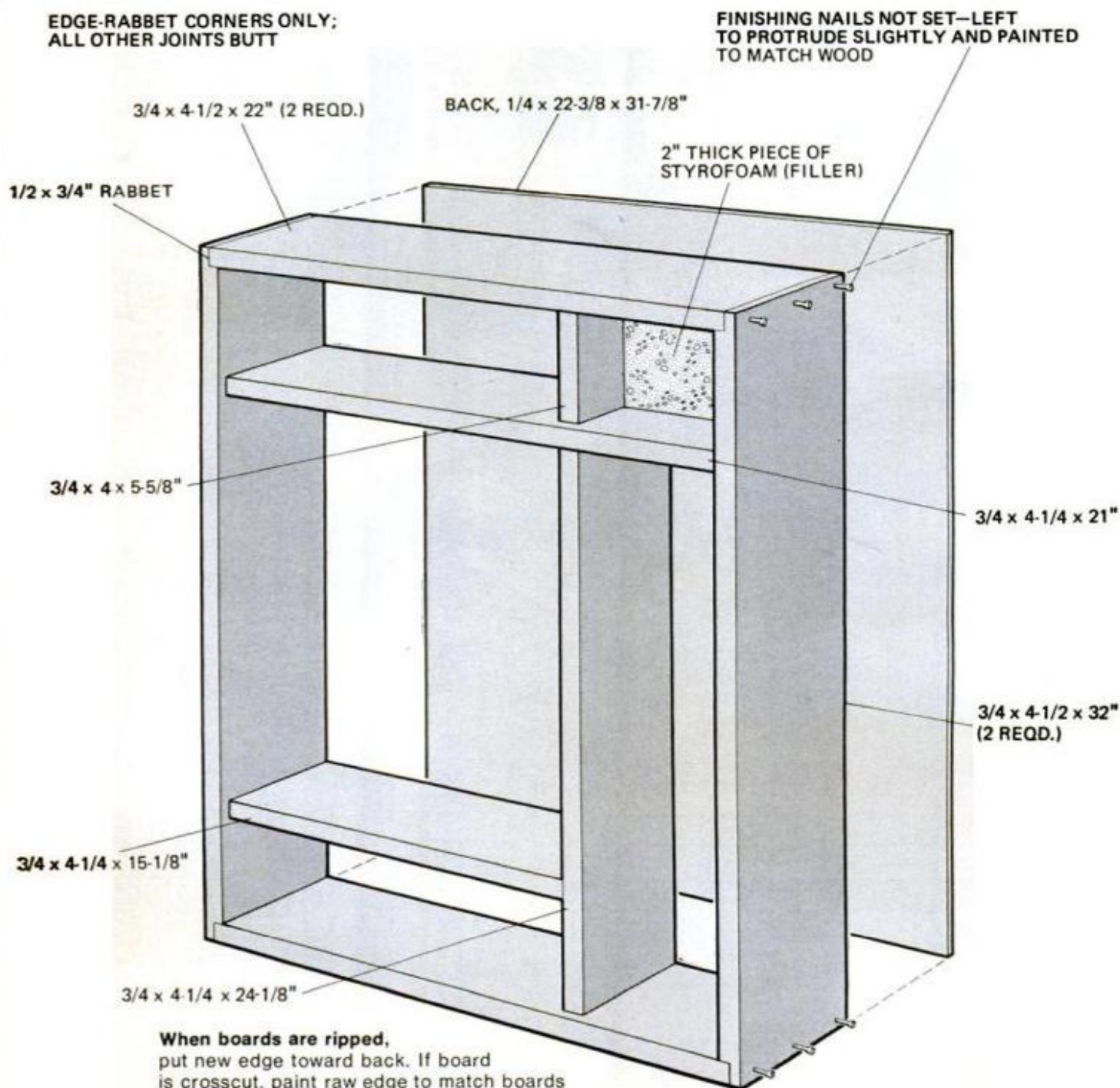
Assemblages are designed to evoke memories of things past. Because each box has a "personality" all its own, it is an ideal gift for someone who shares those memories with you.

To stir your imagination, *PM* commissioned artist Gerald McConnell—a leader in

the collage/montage art field—to create four assemblages, each with a different theme. The handsome results are shown on the cover and on pages 98 and 99.

Of course, you are not restricted to duplicating the boxes shown. In fact, you can turn your imagination loose to create a box with a theme of its own for each member of the family. You are limited only by the type (and amount) of memorabilia you can find in your attic, basement or garage.

Construction is very simple. Except for the four corners, butt joints are used throughout in making the box. (If desired, even the corners can be simply butted.) The



back is not let into edge rabbets; rather, it is simply cut $\frac{1}{8}$ in. less in width and length and glued and nailed to the box. Though (for photo purposes) the boxes shown were left uncovered, you may want to protect your assemblage with a sheet of clear plastic such as Plexiglas. To do so, simply cut the plastic to size, drill holes at the four corners, and affix with four brass roundhead screws.

The fun—or nuisance—part of the job (depending upon your point of view) is the rounding up of items to consider for inclusion in the box. A search through an old desk, junk boxes, shoe boxes in the closet, photo albums and the like will usually turn up more than enough appropriate items to use.

Start by deciding just what the box's theme will be. Then compose a list of all those things that best illustrate that theme. Finally, select those items from the junk you've collected.

The boxes shown were constructed from lumber found in a junkyard. Thus it was not necessary to do any distressing or antiquing. Boards were simply left in the state that they were found. The only "finish" applied to the boards is tempera paint used on any ends that had to be crosscut.

McConnell stresses the need for varying shelf widths. "It is important," he says, "to emphasize the three-dimensional effect." To do it, glue a block of Styrofoam to any shelf you wish to have shallower.

After cutting the pieces for the box, temporarily assemble it so you can measure for the $\frac{1}{4}$ -in. plywood back. Finally, permanently assemble the box using 6d finishing nails and white glue. Start by putting together the interior shelves and verticals and then enclose these with the sides, top and bottom. Notice that the finishing nails on the outside are left to protrude about $\frac{1}{4}$ in.; these are painted with tempera paint mixed to match the box's wood tones.

Immediately fasten the back to the box so the latter will be perfectly square and true when the glue has dried. Check all joints for glue ooze-out and wipe away any excess with a dampened cloth.

Mounting props in box. All items are permanently fixed in the box. In fact, the boxes shown can be turned, tilted, even inverted, and all items will stay precisely where they were put.

Most items can be held securely with a

dab or two of white glue. Nonporous items can be permanently fixed with a small amount of epoxy adhesive. Items suspended in air (for example the pistol in the Man's Box on page 99), are supported from the back with heavy wire. Simply drill a pair of $\frac{1}{16}$ -in. holes through the back, loop around a thin-diameter copper wire and twist the wire behind the back to secure the item.

Large items can be supported by drilling through the box back and inserting a small-diameter dowel through the back and into the item. Fastening is mostly a matter of common sense; the object will dictate which method you should use.

For instance, a heavy item (such as the old stove lid), is placed so that it makes contact with two or more surfaces. At these points, glue is carefully applied.

Tips for making assemblages. To make miniatures such as the rowboat and sleigh, first find a suitable photo or piece of artwork to copy. Build the models of balsa-wood. Here you'll find yourself doing things that you haven't thought of since your boyhood. For instance, to make bends such as for the boat's prow, soak the strips of balsa-wood in hot water. When thoroughly soaked, they are bendable without breaking. Bend the strips into position and hold them there using pushpins through the balsa. Allow these pieces to dry overnight while in this position.

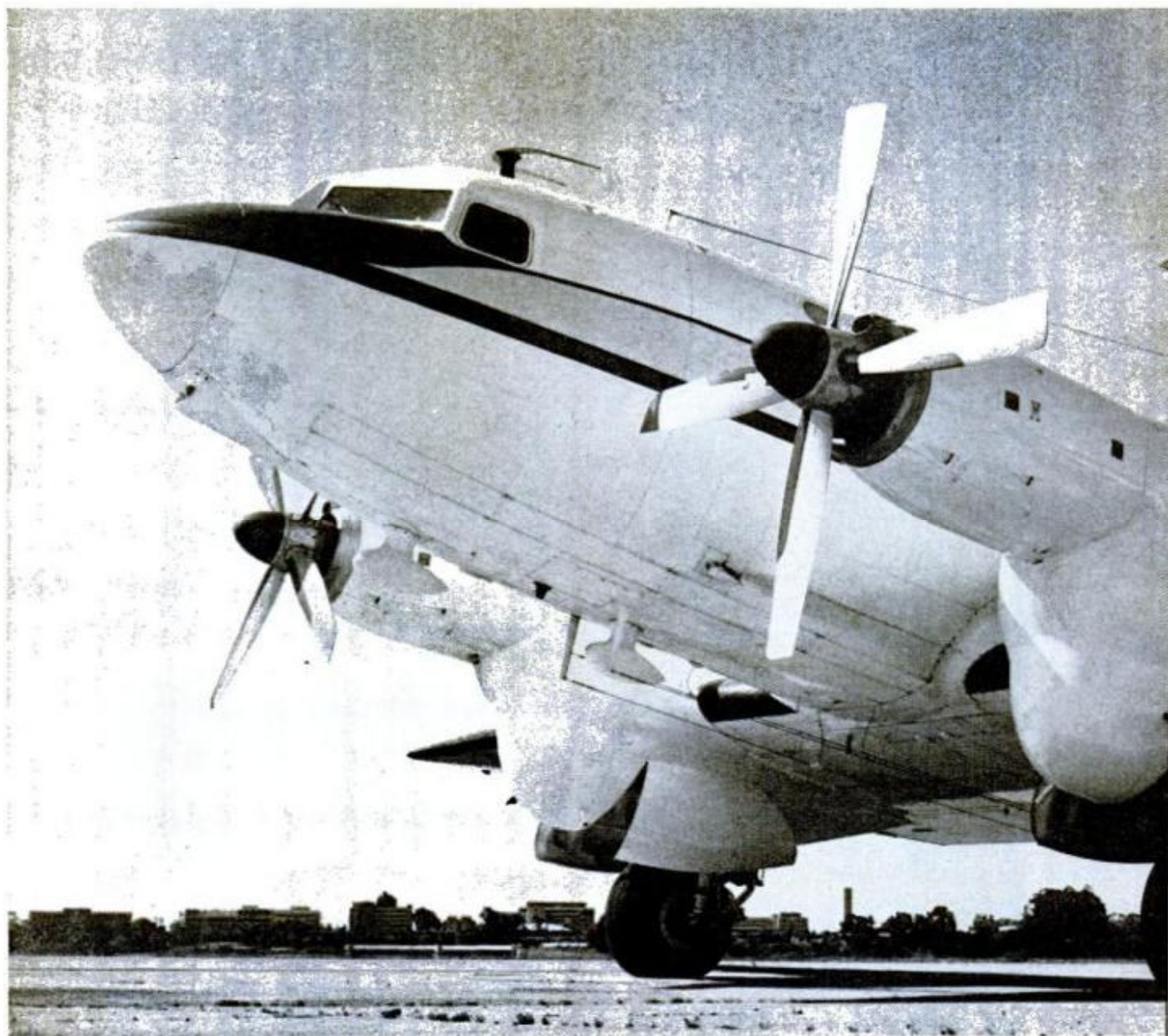
Next day, assemble the parts, holding each one in place with pushpins. When all parts are assembled, apply a dab of white glue to each joint. Remove the pins after the glue has dried.

The "paddle" part of the oars is also carved from balsa-wood. The shaft is simply a length of $\frac{1}{8}$ -in. dowel glued to the paddle blade.

About those leaves and dried flowers. After selecting dried plants to use in an arrangement, handle them carefully to make the arrangement. Secure the stems by tying with fine thread or wire. Next, spray the leaves with Krylon's Fixing Spray; this fixative will prevent them from flaking later (when handled). When spray is dry, flowers can be glued in place.

Snow. When the look of snow is desired, spray the area to be covered with a spray contact adhesive. While still wet, sprinkle on white soap flakes (Ivory Snow) and allow to dry. ★★★

IT'S NEW
NOW



**Electric air freshener sprays
automatic whiffs—like clockwork**

First automatic air freshener (right) sprays scented aerosol deodorant into a room every 15 minutes to keep bedrooms, bathrooms, kitchens and other household areas clean-smelling all day long. Operated by a battery-powered timer, the Schick Fresh Air Machine is \$19.95 at drug and department stores. Refills, in three fragrances, are \$1.25.

POPULAR MECHANICS



The famous old DC-3 flies again—30 years later

The beloved old DC-3 transport—workhorse of the airlines 30 years ago—is back again in a modernized form designed for short-run commuter flights and use in the newly opened Alaskan North Slope oil operations. Called Super Turbo-Three (STT), it's shown below (at bottom) flying alongside an

original DC-3 (at top). Changes include a longer fuselage, modified wings and tail and four-bladed turboprop engines (facing page) in place of earlier piston engines. Designed by Turbo-Three Corp., Santa Barbara, Calif., the STT will carry passengers or cargo and be extremely economical to operate.



Shirt-pocket chess and backgammon

Tiny enough to slip in a shirt pocket, these miniature playing boards for chess and backgammon are handy for use when traveling or at other times away from home. Self-stick plastic playing pieces stay in place until moved so a game can be stopped at any point and put away without the pieces shifting. Chess pieces are reversible for playing checkers. \$2.50 each, Shirt Pocket Games, Inc., 200 Fifth Ave., New York, N.Y. 10010.



NOW

Safe bow for children shoots no arrows, still hits target

With this archery set for children, the arrow never leaves the bow. All that's propelled toward the target is a soft, plastic, suction-cupped shuttlecock. Lawnplay Indoor-Outdoor Archery Set by South Bend Toy Mfg. Co. includes four-foot fiberglass bow, arrow, four shuttlecocks and target. At toy and sporting goods stores for about \$11.95.



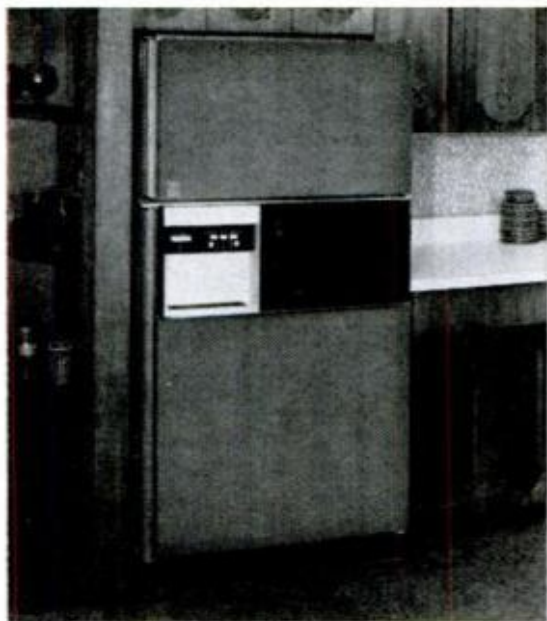
High-speed finishing sander is also power polisher

For fast, general-purpose sanding of wood, metal and plastic, Black & Decker has introduced a new high-speed finishing sander with 10,000 orbits per minute. Designed for one or two-hand control, this double-insulated model will flush-sand on three sides. With a special attachment that connects to most tank-type vacuum cleaners, it will operate dust-free (near left). Used with synthetic lambswool polishing pads, it becomes a polisher (far left). The Black & Decker finishing sander (Model No. 7404), available at hardware and building supply stores, is \$14.99; dustless sanding attachment, \$10.95; polishing pads under \$1.60.

Rack helps clean up clutter by storing guitar on wall

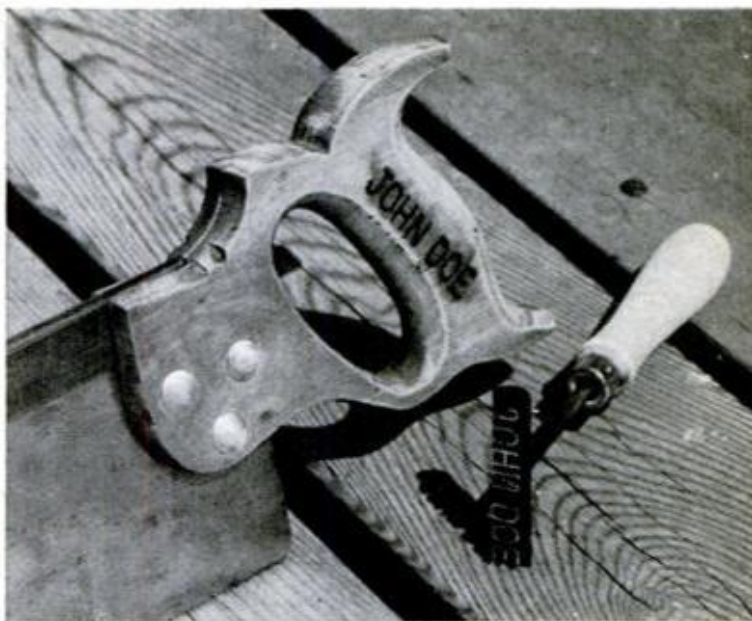
This small, decorative wall rack allows you to neatly and securely hang your guitar on the wall (far right). Made of clear pine and finished in walnut, Strings Up Wall Rack has an owl design in brown and buff on the front (near right). According to the manufacturer, the wall unit offers a unique metal mounting system that provides a simple and stable installation. Price is \$6.50 postpaid from The Macmillans, Box 810, La Canada, Calif. 91011. The company also offers wall racks for other stringed instruments, ready to mount or in kit form.





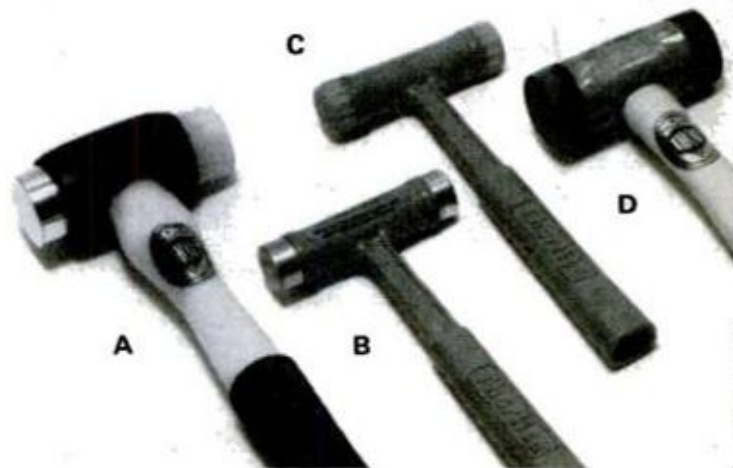
Cold drinks from refrigerator without opening door

A new 20-cubic-foot refrigerator from Frigidaire lets you dispense beverages without opening the refrigerator door (photos above). A front panel slides to one side for access to four push-bar selectors for ice, chilled water and two beverages. In unit's dispenser compartment are two containers, each holding 24 ounces of liquid concentrate. A dial for each beverage dispenser can be set so concentrate is automatically mixed with right amount of water to produce a mild, medium or strong beverage.



Branding iron marks tools, valuables

This old-fashioned branding iron, about 7 inches long, will place a permanent mark of ownership in wood, leather, canvas, cardboard and plastic. The tool, with up to eight $\frac{3}{8}$ -inch copper letters and/or numerals, is \$5. Other prices dependent on number of letters ordered. I. Miller Enterprises, Box 772, Manchester, Mo. 63011.



Soft-faced hammers protect user and work

Soft-faced hammers above include aluminum and plastic hammer (A) for \$4.95, a hammer (B) that comes with four interchangeable rubber-like faces for \$5.95, a safety hammer (C), \$2.75, and rubber-faced hammer (D), \$2.95. Hammer World, Box 663, West Caldwell, N.J. 07006.



Heavy-duty wrench with locking lever

All-steel locking-lever wrench has serrated jaws with 4-inch capacity. Drop-forged jaws release by simple flip of lever; 11½-inch-long, 3½-pound wrench works on pipes, bolts, nuts, sheet metal, bar stock. It's nickel-plated to resist rust. \$16.75. Brookstone Co., 16 Brookstone Bldg., Peterborough, N.H. 03458.

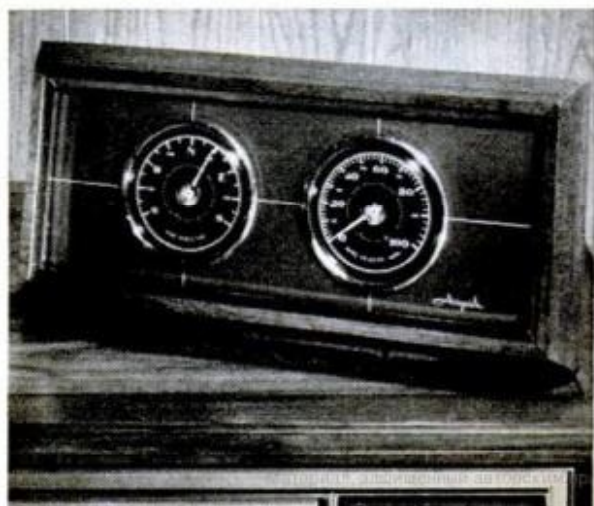
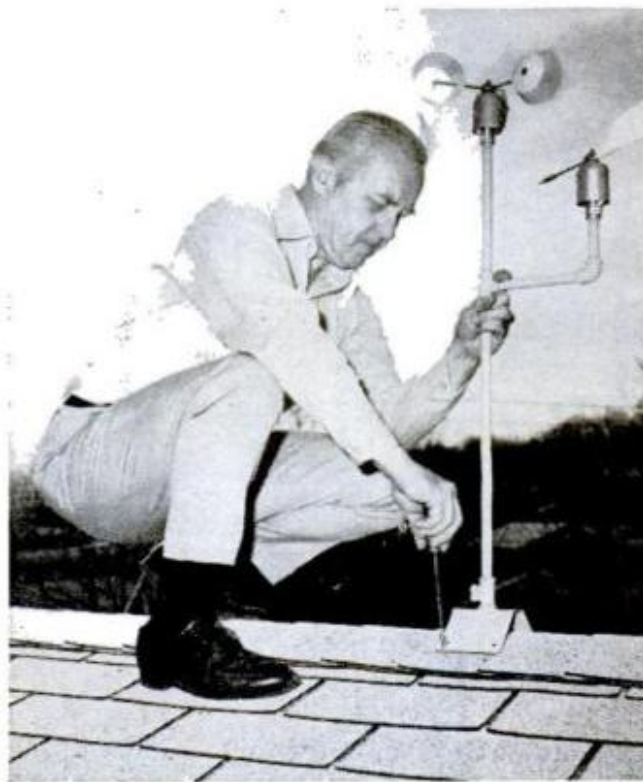
Electric indicator clocks wind speed and direction

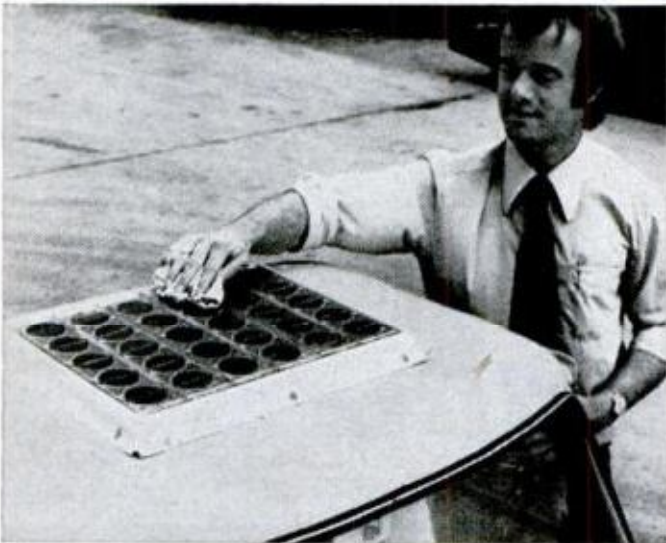
Same type of weather instrument used by professional weather stations and many television weather forecasters gives continuous readings of wind speed and wind direction by means of two wide-sweep, 250° dials mounted in a walnut console (bottom photo below). Console can be built into wall or placed on a table. Remote 36-inch-high pick-up unit installs on peaked or flat roof as easily as a TV antenna with just four screws (top photo). Includes 50 feet of three-conductor flat ¼-inch-wide cable. Plugs into regular 110-volt outlet and draws only 4 watts. Model 915 retails for \$159.50 from Airguide Instrument Co., 2210 Wabansia Ave., Chicago, Ill. 60647.



Quiz game for all members of the family

Lexidata is a Swiss-invented quiz game which uses a mini computer to program questions geared to beginner, junior and senior levels. According to the manufacturer, repetition can't occur with the 43,200 possible combinations from the 260 questions in the test booklets until after years of constant replay. Price is under \$10. The Ohio Art Co., Bryan, Ohio.





Solar cells help power electric car

To increase limited range of batteries for electric car above, solar panel was fitted to its roof. In daylight, silicon solar cells charge storage batteries which power car's motor and lights. Regular cleaning increases cells' efficiency (lower photo). Solar unit was developed by the Joseph Lucas Group, Ltd., Great King St., Birmingham, England.

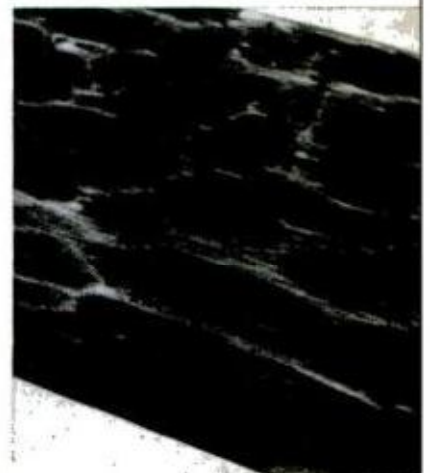
Convertible dishwasher: From portable to built-in

For those who haven't settled permanently, the Maytag dishwasher (below) offers portability with permanent installation possible later by means of a conversion kit. New model has casters and is hooked to sink faucet for water source. High-velocity water action eliminates prerinsing. Convertible unit has a single timer control for selecting one of four cycles—heavy, regular, rinse-and-dry, and dish-warmer. Comes in white, avocado, gold or coppertone with textured zinc-coated steel top. The Maytag Co., Newton, Iowa 50208.



Plane accessory gives hand-hewn look

With this accessory designed for conventional 8 to 14-inch bench planes, you can produce the look of hand-hewn beams (far right) without the skill or dangers involved in using an adze. Called Hew-Do-It, the accessory consists of an eccentric wheel assembly (near right) that produces dips in the plane's motion and a curved blade to scoop out cuts in the wood surface. Price is \$7.50 postpaid from Ironworks Hill, Box 191, Brookfield, Conn. 06804.



Skyjackers beware: New 'safe' bullet will get you without hurting others

Stopping skyjackers may be easier if law officers adopt a new plastic bullet developed by Australian marksman Robert Eyles of Sydney (right). The .38-cal. nylon bullet expends 90 percent of its energy on impact, thus killing or disabling a potential skyjacker without passing through his body to endanger the lives of innocent passengers. It also won't penetrate cabin walls so it can be safely used on high-altitude flights without risking damage to a pressurized airliner.



Bicyclists' and backpackers' lightweight tent even has its own 'front porch'

New two-man conical tent offers several novel features. Designed to be erected with its narrow tail end into the wind, it provides controllable flow-through ventilation, has double-wall air-barrier insulation to keep occupants comfortable in

their sleeping bags in cold down to 0°F. Enclosed "porch" ahead of main sleeping pod serves as a mud room for changing out of wet clothes and stowing gear. The 7½-lb. T-91 is \$160, Cannondale Corp., 35 Pulaski St., Stamford, Conn. 06902.



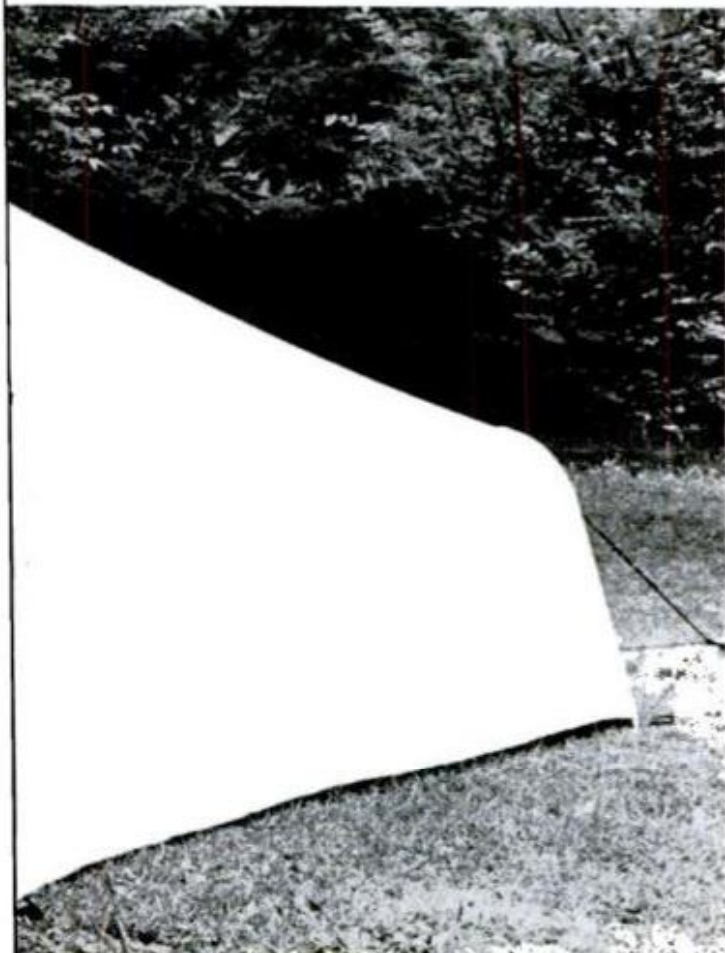
Instant patio—indoors or out

It looks like patio paving, but it's really carpeting—the latest pattern in Ozite's indoor-outdoor Sunscape series. Available in two colors—orange-brown and mottled green—it's \$7.95 a square yard in 6 and 12-foot widths. Ozite Corp., 1755 Butterfield Rd., Libertyville, Ill. 60048.



Fishing game for ages three to seven

Children "go fishing" with this Learning Well game. With tiny magnetic poles, they pull out metal numbers and alphabet letters, which must then be fitted into playing boards in proper order. The game, by Dynamic Innovations, Richardson, Tex., teaches number and letter recognition as well as manual dexterity. About \$4.



Electronic shopping reminder

Japanese restaurants will never run out of food or drink with this computerized inventory-control system. As pen-size electronic scanner is simply passed over each customer's check, it automatically records the items sold, totals them up at the end of each day and indicates what supplies need to be reordered. Developed by Toshiba, it's under test at Tokyo hotels.



Wild bikes for a wild new sport

If the bicycles above look strangely like motorcycles without engines, that's exactly what they're supposed to be. Designed for use in the popular new sport of motocross bike racing, they're specially beefed up to withstand the pounding punishment of flying jumps, grueling hill climbs and tortuous turns on rugged dirt-course rally runs—just as the bigger powered machines do. Yamaha's Moto-Bike (upper right) sports a telescoping front fork, fat tires, heavy-duty frame, motorcycle-type handlebars and a floating swing-arm rear suspension complete with shock absorbers. Price is expected to be around \$130. At lower left is Mossberg's entry in the field, the Motocross MX. It features large knobby tires, double-walled rims, padded handlebars, heavy-duty coaster brake and extra-sturdy tube frame. Its price has not yet been announced.



Heavy-duty router comes in kit

This new heavy-duty router is available in a handy kit along with straight and circular guides, router bit, two wrenches and a sturdy plastic carrying case. A router manual with full operating instructions is also included. The 1-hp router (No. 7620) is UL-approved. Suggested price, \$69.95, from Black & Decker Mfg. Co., Towson, Md. 21204.



'Shower of light' to top your Christmas tree

For the holiday season just around the corner, here's a new type of eye-catching decorative ornament for the top of your tree. Called "Lighted Tree Topper," it's simply a ball, half translucent, with 140 sparkling polyoptic fibers sprouting from the top. The fibers are lighted by a 7-watt bulb inside the ball. This novel decoration is made by GE and is available at hardware stores and electrical supply outlets.



Raised light on police car warns traffic of accident ahead

In England, police have found that a motor vehicle accident is often the cause of a secondary collision when oncoming traffic is not warned of the original crash. The same situation can also exist even if a police vehicle is on the scene after the first collision, because the police are usually too busy aiding crash victims to warn approaching traffic. To help solve this problem, some British police cars are now being fitted with a tall, pop-up telescopic pole with the traditional flashing blue light on top. At the flick of a switch, a spring mechanism raises the light well over the crash scene.



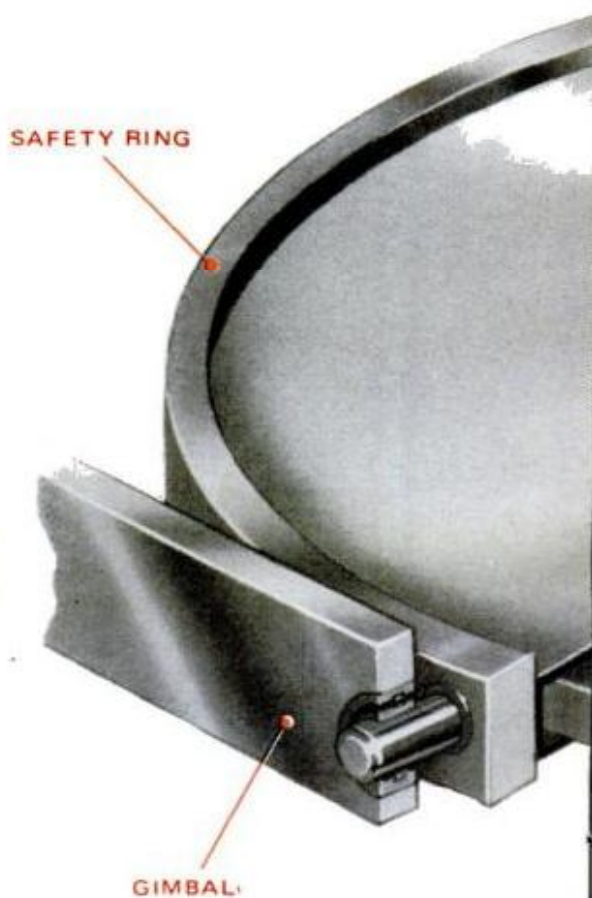
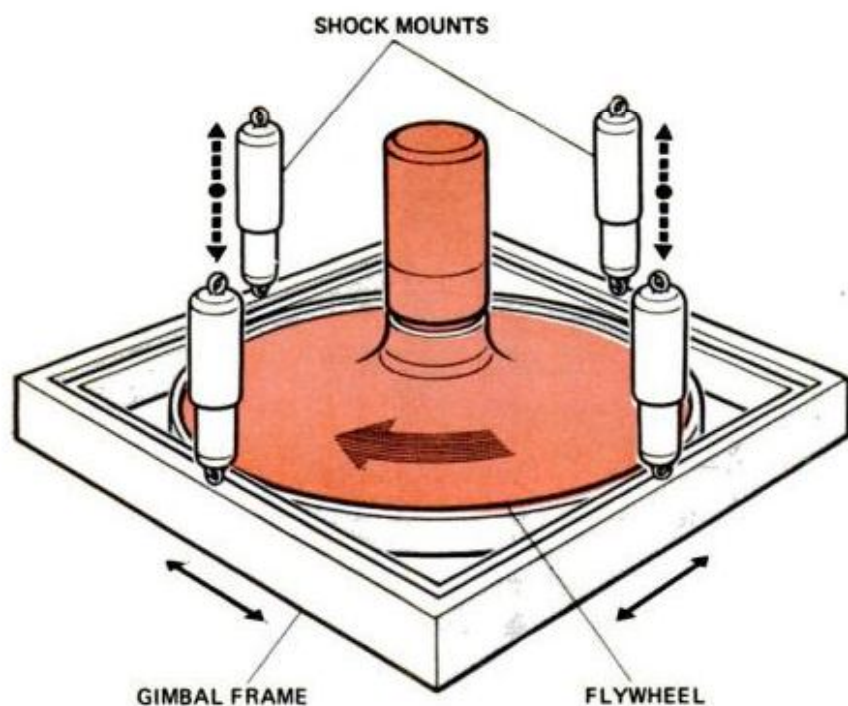
Superflywheel: The 'battery' that spins

A 6000-year-old device—the flywheel—has been brought up-to-date. It promises to power everything from small commuter cars to hand tools.



Models of two of the superflywheel configurations that David Rabenhorst (shown) has developed in his lab.

by David Lampe



In 1969, a Johns Hopkins University aeronautical engineer named David Rabenhorst boldly suggested in a memo that an ancient device could help solve mankind's energy problems. The device: the flywheel.

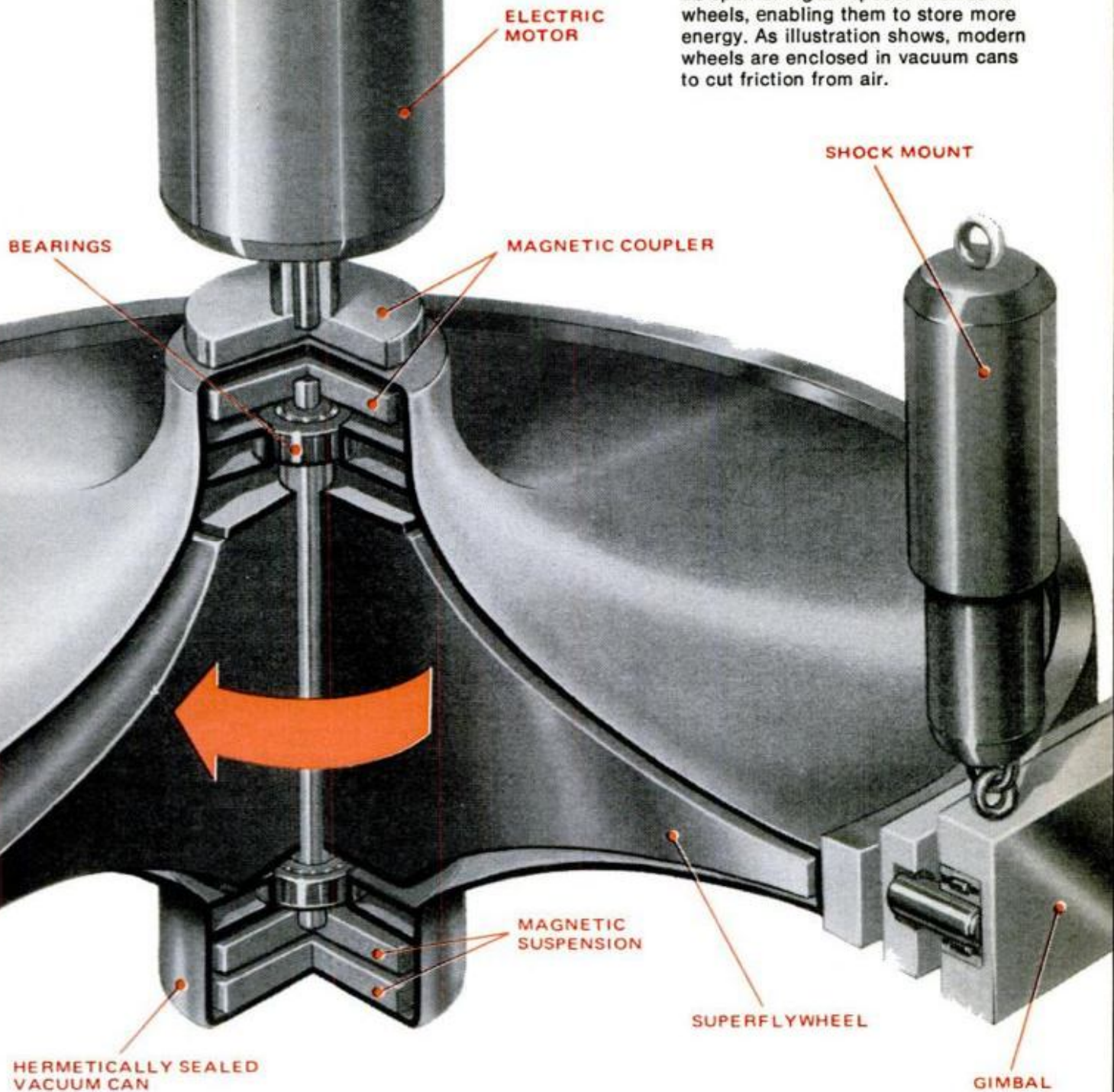
Sent to a number of government agencies, the 60-page memo stated that the "superflywheel"—space-age version of the old device—could power everything from zero-emission commuter autos to cordless hand tools. And it could do this more efficiently and

cheaply than even next-generation batteries.

Engineers have always classified flywheels as energy-storing devices, but of very limited capacity. For centuries, it was thought that, to be efficient, the flywheel had to be thickest and heaviest at the rim—like the flywheel in your auto engine.

But as Rabenhorst's '69 memo noted, a flat metal-disc flywheel of equal overall thickness stores 50 percent more energy than the traditional thick-rimmed, spoked

Flywheel system of the type that Rabenhorst described in his 1969 memo. The wheel itself is made of solid metal instead of individual filaments, a later refinement. Filaments with high tensile strength can be spun at higher speeds than solid wheels, enabling them to store more energy. As illustration shows, modern wheels are enclosed in vacuum cans to cut friction from air.



type. Efficiency is further improved—to twice that of the standard flywheel—if the wheel is thickest at its axis and tapers to the rim. The superflywheel that Rabenhorst proposed in '69 was said to have an energy capacity five times that of the traditional type.

Though Rabenhorst's memo evidently started few wheels spinning in government circles, he continued with his research. He's still at it. Though the superflywheel is still

confined to the laboratory, work has progressed so far, according to Rabenhorst, that a properly funded project could put an advanced prototype flywheel-propelled auto on the road in 18 months.

In '69, Rabenhorst described a lightweight automobile (1300 pounds, including driver and a passenger) powered solely by a superflywheel. According to the car's specs, a single charging of its flywheel would permit it to cruise for 110 miles at a steady 55

How the superflywheel works

"When you put electricity into a storage battery with a charger," David Rabenhorst explains, "you cause a chemical change within the battery. This permits storing the energy for subsequent use.

"If an electric motor were substituted for the battery, the same energy that previously charged the battery would now cause the motor to run and to spin—to 'charge'—the flywheel. Instead of causing a chemical reaction, as in the battery, the energy in the flywheel is transformed into energy of motion, commonly called kinetic energy.

"The more electrical energy that's put into the motor, the faster the flywheel will spin and the more energy it can store. To make use of this kinetic energy, you need only to connect the flywheel to a load, say to a small car, through an

appropriate variable transmission. As the car moves, energy is removed from the flywheel, causing it to slow down gradually—that is, to 'discharge.' A slightly more complex system is required for an electric bus (see diagram).

"With modern materials and configurations, superflywheels can store many times more energy and more acceleration power for less money and have a much longer life than the best available batteries."

Rabenhorst explains that the best materials for superflywheels are those that resist pulling forces. They have a high tensile strength rather than uniform overall strength. These materials can be spun three times faster than the speed at which the best steel wheels fracture.

Not all the materials that show promise in superflywheel applications are recently developed man-made ones. Laminated bamboo or wood

mph. Its operating cost was pegged at one-tenth of a cent per mile.

Just as exciting, the Johns Hopkins engineer proposes flywheel-propelled boats, submarines and airplanes; flywheel-assisted, gasoline-driven vehicles in which energy generated in braking would be stored in a superflywheel instead of dissipated as unwanted heat; superflywheel lunar vehicles, lawnmowers, hand-tool power packs, and a host of other applications.

The flywheel is an old idea. Flywheels have been used for thousands of years to power potters' wheels. Flywheels kept the power flow constant in early steam engines—just as they still do in gasoline engines. A flywheel-powered naval torpedo was patented in the United States back in 1884, and a flywheel-driven rail car is said to have been used in Indiana in 1902.

A more modern application was in the 70-passenger Oerlikon Electrogyro bus produced in Switzerland in the early 1950s. At every other stop along its route, three power arms reached up from the bus's roof to touch a crossbeam on a telegraph pole, drawing current to spin a motor-generator under the floor of the bus. The motor wound up a 3300-pound, 64-inch-diameter flywheel.

Propulsion was gained when the flywheel turned the motor-generator, which sent current to other motors at the bus's wheels.

The Oerlikon buses were made in several models and remained in service in Switzerland and in South Africa for 17 years. What

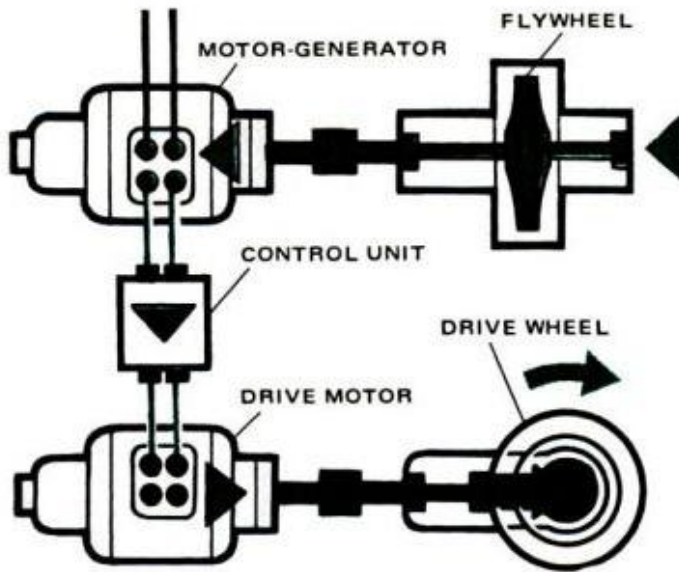
limited the bus was the inefficiency of its flywheel, which took as much as two minutes to be brought up to maximum speed—3000 rpm—and then ran down too quickly (even though it was encased in a hydrogen-filled container to minimize drag). Left to spin when the bus stood still, the wheel would go on turning for 24 hours.

Swiss engineers aren't the only 20th century flywheel pioneers. The Russians have built a whole catalog of flywheel-driven

Flywheel rigged on a bicycle is used at the University of Wisconsin to further research into flywheel-propelled, zero-emission automobiles.



FLYWHEEL PROPULSION



could prove best for some types of flywheels. Wheels designed for some purposes may have the individual energy-retaining strands bonded together, while in other superflywheels the energy-storing filaments may be joined only at the hub, which would give the wheels a brushlike appearance.

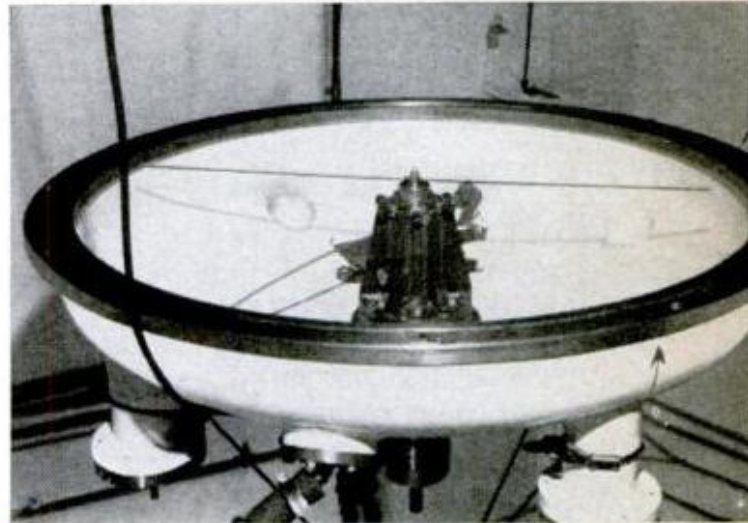
The efficiency of all wheels—not only superflywheels—is cut by friction against bearings and by aerodynamic drag, so superflywheels rotate suspended between magnetic bearings and inside vacuum containers.

The containers' vacuum seals will be absolute because the superflywheels will be coupled to driveshafts by magnetic devices rather than direct contact through a vacuum seal. Electric tachometers, which themselves impose no drag on the superflywheels, will indicate rotating speed and when the wheels must be recharged.

railway engines, as well as a flywheel-powered earth scraper, a bus and even a flywheel-powered arc-welding apparatus.

The superflywheel Rabenhorst described in his 1969 memo was composed of numerous strands of high-tensile material, experiments having shown that the higher the tensile strength, the faster a wheel would be able to spin and the more energy it would store. Top flywheel speed in the Oerlikon bus had been 800 feet per second (about 550 mph) while that of a superflywheel would be supersonic. Rabenhorst points out this isn't an unheard-of speed; it's the same

(Please turn to page 169)



One of the test rigs used in the Johns Hopkins lab. Device is set up to spin a single rod of solid glass—not fiberglass—until it disintegrates.



San Francisco trolley-bus similar to this one will be equipped with flywheel system located in front of rear wheels. The system will permit the trolleys to operate up to six miles "off wire," extending their normal routes.



The old art of muzzleloading: Shooters' new smoky hobby

Spittin' image replicas now let anyone shoot like frontiersmen

by Joe Kelleher

In the 100 years after the founding of the United States, the black powder muzzleloading rifle was the principal weapon of the military and an essential tool for settlers moving west. These rifles put meat on the table for generations of Americans, held off the Indians and knocked down marauding grizzlies. The old charcoal burners finally got pushed aside by the introduction of the metallic cartridge, but recently they've been making a smoky comeback to the shooting scene.

Until a few years ago, shooters had to rely on a dwindling supply of original models if they got bit by the muzzleloading bug. These original guns have not only become increasingly expensive, but neglect

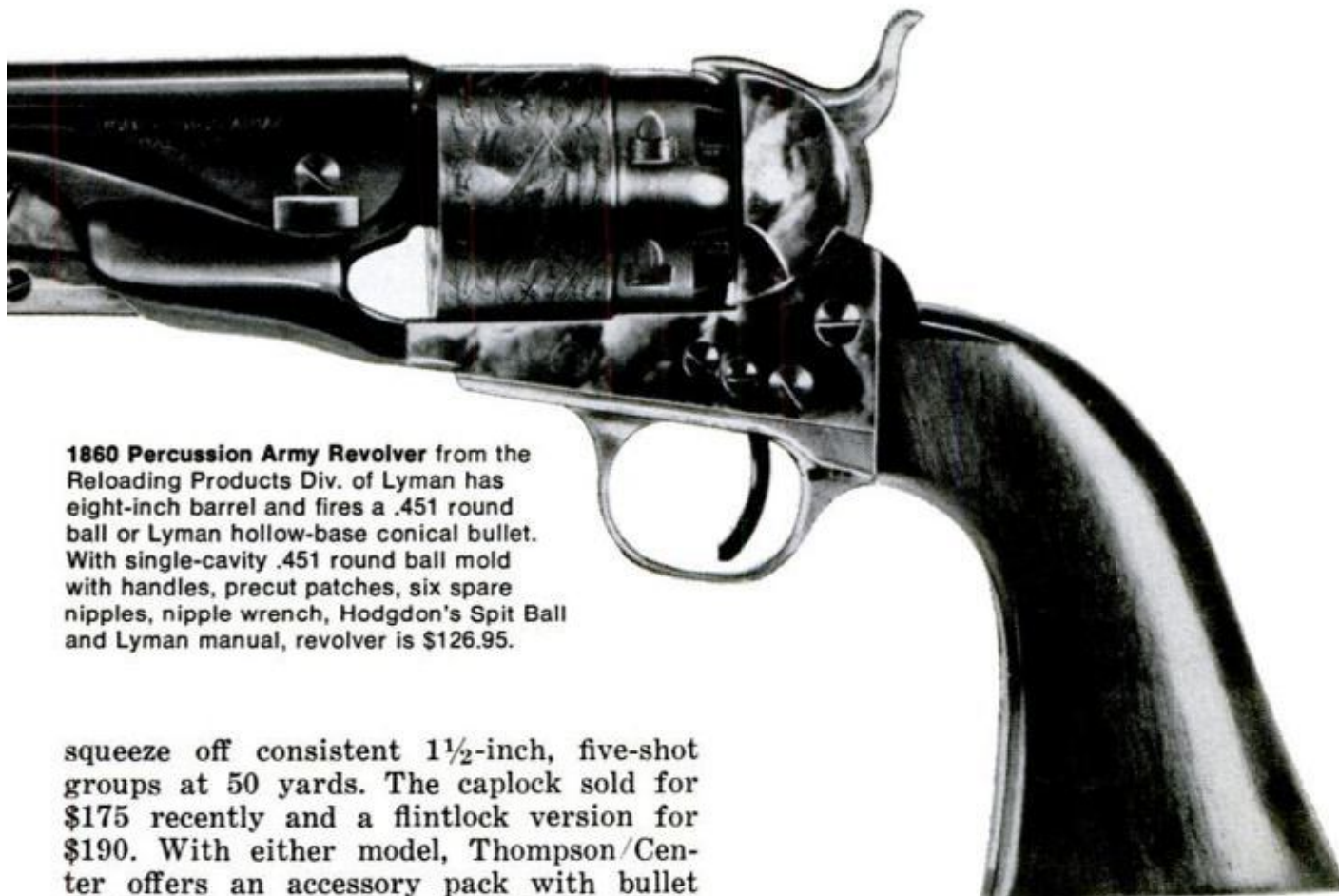
and lack of replacement parts have made many of them much less than reliable. Today, however, some of the finest flintlock and percussion rifles ever made—plus a full line of accessories—are being produced again. You can have your pick from a range of target models, with adjustable sights, to authentic copies of famous military and hunting rifles.

One of the most popular muzzleloaders sold today is a Hawken, produced by Thompson/Center Arms Co. The original of this rifle was made, starting in 1822, by the Hawken brothers in Saint Louis for fur traders and explorers pushing westward. This half-stocked rifle, weighing 8½ pounds, has a 28-inch octagon barrel with 12 lands and grooves.

Available in .45 or .50 cal., the model has polished brass trim on the butt plate, fore-end cap, ramrod fittings, patch box and trigger guard. Open hunting sights are micrometer-adjustable to simplify sighting in. Double-set triggers enable the shooter to



Hawken Hurricane, in .45 or .50 cal., and the **Hawken Hunter** in .58 cal. with a magnum ignition system, both modeled after the Hawken brothers' fur-trader rifles of the 1820s, are now made by Navy Arms. Four-inch groups at 100 yards from benchrest are claimed. Both are \$175.



1860 Percussion Army Revolver from the Reloading Products Div. of Lyman has eight-inch barrel and fires a .451 round ball or Lyman hollow-base conical bullet. With single-cavity .451 round ball mold with handles, precut patches, six spare nipples, nipple wrench, Hodgdon's Spit Ball and Lyman manual, revolver is \$126.95.

squeeze off consistent 1½-inch, five-shot groups at 50 yards. The caplock sold for \$175 recently and a flintlock version for \$190. With either model, Thompson/Center offers an accessory pack with bullet mold, package of patches, powder measure, short bullet starter, powder solvent, extra nipple and nipple wrench—all for \$20 and well worth it for the beginner.

Hawken rifles are also produced by the Navy Arms Co. whose **Hawken Hurricane** comes in .45 and .50 cal., while their new **Hawken Hunter** is an elephant gun magnum in .58 cal. that has been tested on African safari. Both models are priced at \$175.

For the military buff, Lyman offers the .58-cal. 1863 **Zouave** of Civil War fame. A



Revolutionary Land Pattern "Brown Bess" musket is a ready-to-shoot 42-inch 10½-pound replica from Lyman Products for Shooters. The .75-cal. gun is \$275. Graduated Powder Measure of solid brass (at right) adjusts to hold up to 120 grains of black powder in 10-grain increments. From Michaels of Oregon: \$8.95.



natural for those interested in the War Between the States, the Zouave was claimed to be the most accurate military rifle of its day. With careful loading and practice, it can produce surprisingly tight groups or knock down the heaviest U.S. game. Alone, it's \$145 from Lyman, and \$15 more for a kit with .58 Minié-ball mold, spare nipple, nipple wrench, bullet lube and Lyman's Black Powder Manual.

The Kentucky long rifle, often called a squirrel gun, was a favorite of famous frontiersmen. Hopkins & Allen has reproduced a fine model called the Minuteman. Available in flintlock or percussion, the full-stocked 55-inch rifle has a 39-inch octagonal barrel bored for .36 or .45-cal. balls. The 9½-pound Minuteman is \$180 ready to fire, or as a kit for about \$100. All metal parts in the Hopkins & Allen kits are ready to be fitted. Only a rasp and sandpaper are needed to finish the stock, which is machine inletted, drilled and fully formed.

Building your muzzleloader is fun, but the real challenge is shooting. Each shot fired from a charcoal burner is a test of your skill as a loader as well as marksman. Accuracy with either flint or percussion rifles depends on careful fitting of the patched ball to the bore, and then carefully

ramming the ball down onto the measured charge of black powder in one smooth stroke. For smaller bore rifles of .45 cal. and under, the patched ball is best. But the big-bore weapons, .50 cal. and up, can produce accurate results with hollow base bullets called Minié balls. Loaded without a patch, the lubricated Minié has a cavity in the base that expands to engage the rifling in the bore.

Loading technique starts with drying the bore with a clean patch and snapping off a percussion cap or two to clear the nipple. Set the butt on the ground with the muzzle pointed away from you and pour a measured amount of powder down the barrel. Lubricate a precut patch with saliva and lay it over the muzzle. Place the lead ball in the bore with the sprue pointing up. Using a short ramrod called a ball starter, push the ball into the bore until it is flush with the muzzle. Trim off any excess patch with a sharp knife and push the ball into the bore using the starter. Then switch to your ramrod and seat the ball on the powder



A .22-cal. model for boys and beginning shooters, the RMAC breech loader makes a single-shot first rifle that can fire up to 250 shots for about \$1. Breech turret holds ball, only the correct safe load of powder and cap. Sear safety blocks hammer until turret locks close. Traditional black powder rifle, by Rocky Mountain Arms, is \$50. Old English muskets, arranged for antique auction at right, are valuable but more dangerous to fire than modern replicas.



with one smooth, uninterrupted stroke. Banging or tamping the ball can result in a deformed ball, a compressed powder charge or an air space between the ball and the charge. Deformed balls are inaccurate, compressed powder often misfires and an airspace can cause a bulged or split barrel.

Now with the charge and ball seated, put the hammer on full-cock and press a cap on the nipple. You're set to take aim and fire.

If a Minié ball is used, the procedure is simplified. After the charge is poured down the barrel, the Minié is pushed into the barrel by hand and seated with the ramrod. Add a cap and fire. After firing, leave the cap on the nipple to smother any sparks from the preceding shot. Whether you use a patched ball or a Minié, accuracy depends on perfecting your loading technique. Don't hurry, stick to a set routine, and you'll find that speed comes with practice.

Black powder shooting is not for the white-suited fastidious marksman, however. After a dozen or more shots, the shooter and his gun will be liberally covered with

soot. While the soot scrubs off the shooter's skin easily, his gun is a lot harder to clean. Black powder soot is very hygroscopic—which means it tends to soak up moisture from the air. Within hours, depending on humidity, an uncleaned black powder gun can start to rust, so precautions must be taken as soon as a shooting session is over.

Several good black powder solvents are available to soften up the soot and speed cleaning, but to really clean a black-powder muzzleloader there is no substitute for hot water, soap and lots of elbow grease. Start by putting a piece of rubber over the nipple and letting the hammer down to hold it in place. This seals the barrel which can then be filled with really hot, soapy water. A plastic or aluminum funnel in the muzzle will help get the hot water into the barrel rather than on the shooter. Let the hot water soak for about 15 minutes to soften up the powder fouling.

Then dump the water and run soapy patches through the bore until they come out clean. Next fill the barrel with clean hot water to flush out the soap. After flushing several times with hot water, the barrel should be quite hot. Run patches through the hot barrel until they come out absolutely clean and dry.

Next step is to clean the breech area with a damp cloth. A toothbrush is ideal to get into those crevices and crannies around the nipple and tang. If you intend not to shoot the gun for some time, remove the nipple and clean it thoroughly. While the gun is still warm from the hot water, apply oil to all metal parts and reassemble. Check your gun for the next few days to make sure you have removed all the fouling and no rust is commencing. The bore should be swabbed with a clean patch and reoiled. Your muzzleloader will last for generations if cleaned thoroughly after firing and kept well oiled and cared for as outlined here.

For a beginner thinking about getting started and the experienced shooter as well, Lyman's 26-page booklet, *Black Powder Basics*, is one of the best guides for accurate muzzleload-shooting sport. The booklet provides clear and simple how-to information on loading flint and caplock rifles, bullet casting, patched and Minié balls, accuracy tips, loads and cleaning. And with nearly 75 models of rifles, shotguns and pistols now produced for the sport, a muzzleloader can look forward to endless collecting and shooting fun. ★★★



Black powder ready-to-fire replicas, from top to bottom, are an 1855 Buffalo Hunter, \$150; 1841 Mississippi Rifle, \$145; 1864 Remington Zouave Rifle, \$140; 1797 Kentucky Percussion, \$165; 1797 Kentucky Flintlock Carbine, \$165. All are available from Navy Arms Co. of Ridgefield, N.J.



How and what to caulk

The high price of fuel is reason enough to seal your house tightly with caulk to keep out costly—and chilly—blasts of winter air. But there are other reasons for maintaining a good, periodic caulking program. A properly sealed home is protected from unnecessary damage—inside and out—due to the effects of weather extremes, wind, dirt and moisture. And caulking will do much to eliminate unsightly paint failures such as mildew and peeling.

A common mistake is to think that all caulk materials are alike. Believing that, many homeowners will buy a tube of caulking that sells for \$1 or less—after spending \$10 or more per gallon to repaint their homes.

A homeowner should be familiar with three types of caulk. Oil base is the cheapest. But, more often than not, the other types will do the job better. Here's the rule to follow when choosing caulk: Always pick the one best suited to the job at hand. The chart below will help you do just that.

What kind of caulk should you use?

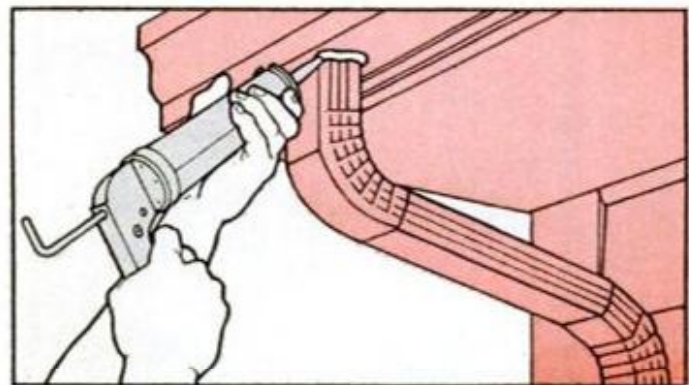
Type	Advantages	Disadvantages
Oil base	Low cost.	Short use-life. Requires recaulking each year. Can't be painted for 24 hours. Flexibility is limited. Has minimal allowance for movement. Has poor adhesion to many surfaces.
Butyl	Long life. Good to excellent adhesion to most surfaces. Good flexibility at most temperatures.	Solvent required for cleanup. Composition tends to be stringy. Also tends to pick up dirt.
Acrylic latex	Long life. Good to excellent adhesion to most surfaces. Requires only 30 minutes setup time before painting. Easy to handle. Good weathering characteristics. Water and soap used for cleanup.	Should not be subjected to rain immediately after application.



Stop costly drafts by caulking joints where siding meets door casings. Clean out old caulk, and make certain surfaces are clean and free of dust. Apply bead, holding caulk gun at a 45° angle to the surface. Your best bet: *acrylic-latex caulk*.



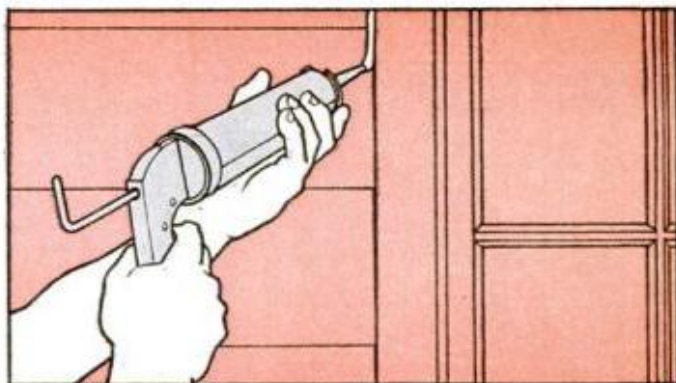
Seal open joints between house siding and foundation. If crack is more than 1/2 in. deep, push in urethane filler before caulking. Squeeze caulk from the tube and force it into crack with a putty knife. Use *butyl or acrylic-latex caulk*.



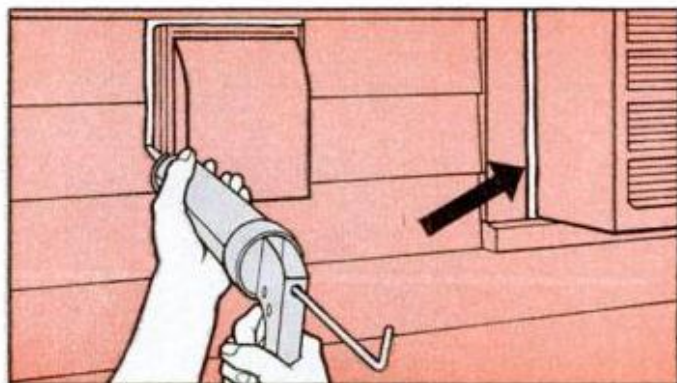
Leaks appearing at rusted drop outlets where downspouts join gutters can be stopped by caulking. For good adhesion, be sure surface is completely dry and free of rust. After applying caulk, tool bead flat with a putty knife. Use *butyl caulk*.



Caulking material makes quick work of reglazing chores. Remove all loose chips, dust off and apply caulk to glass/wood joint. Spread caulk with putty knife; periodically dip knife in water for easy spreading. Use acrylic latex.



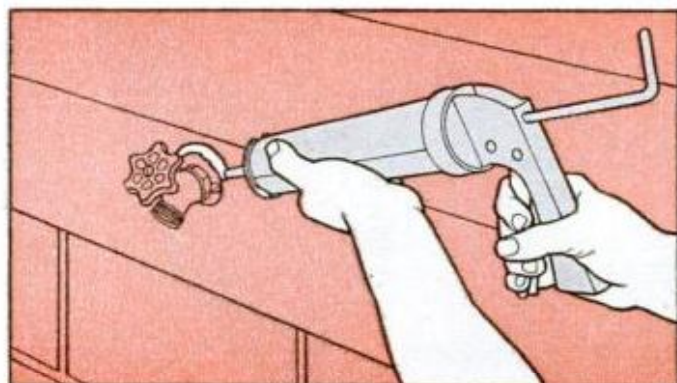
Paint failures are usually due to moisture entering siding material at end grain; thus, joints at siding/window-casings should be caulked. Other spots to caulk: Where two lengths of siding butt each other and at corners. Use acrylic latex.



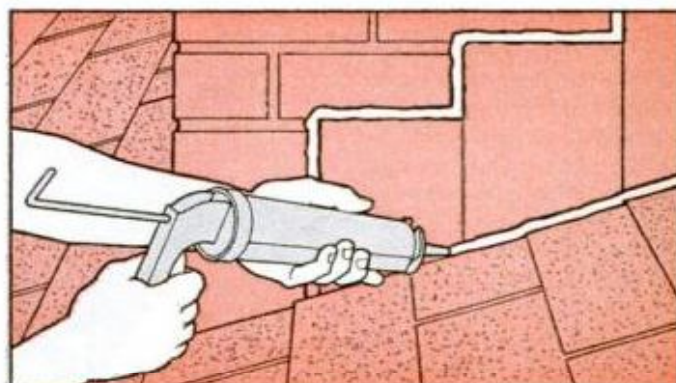
Cracks around wall caps (for ventilators) and air-conditioners should be sealed with a bead of caulking between siding and fixture. If desired, cap can be loosened and then reset in bed of caulk. Use acrylic latex or butyl caulk.



Unightly cracks or nailholes in siding can be filled by forcing caulk into the crevice, then feathering the edges smooth. After removing any excess caulk, the material can be painted to match the siding. Use acrylic-latex caulk.



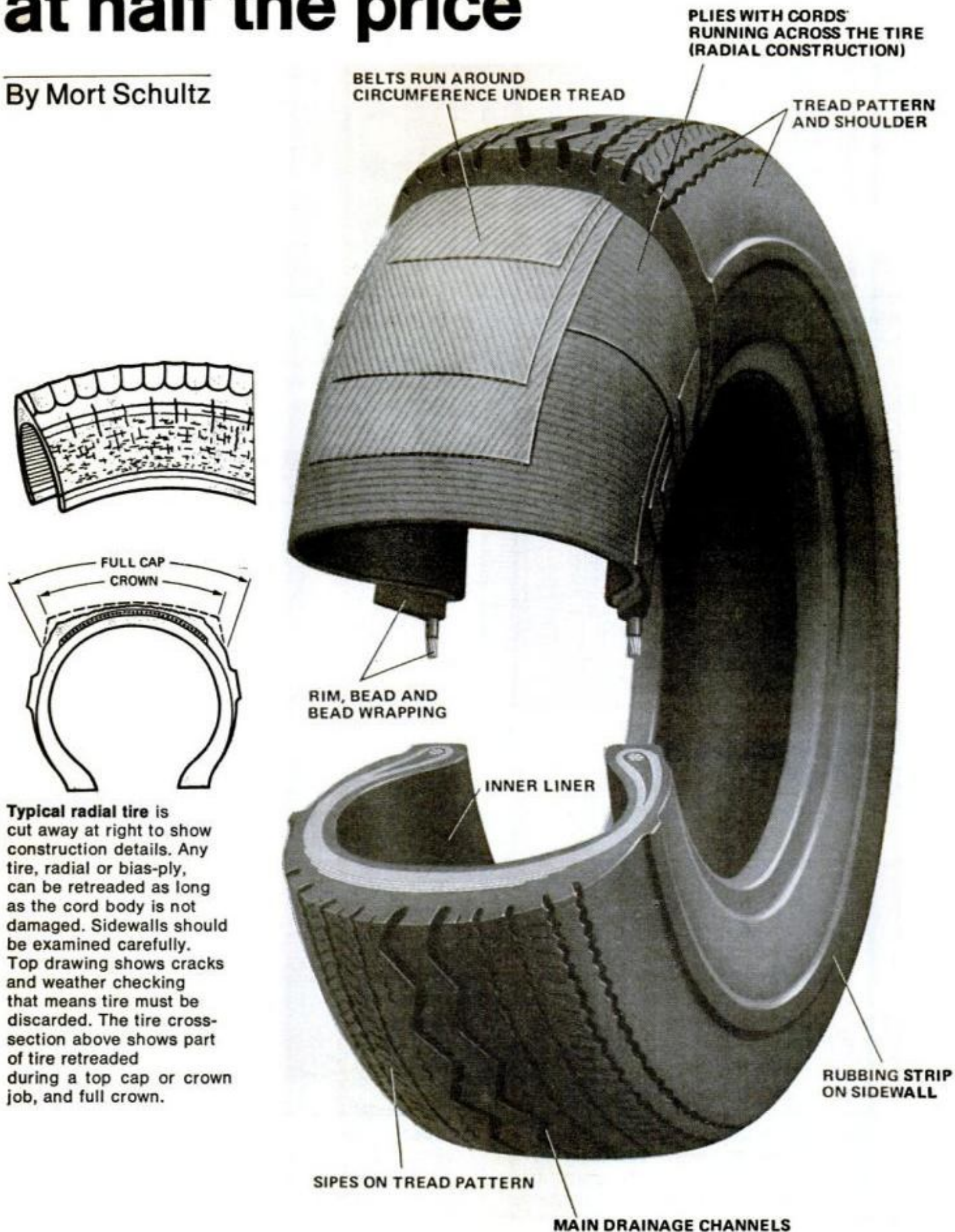
To prevent water from seeping into your home, seal around plumbing (hose bibb shown) and electrical outlets. Force caulk into joint around fixture; if necessary, first stuff in urethane or other nonstaining filler. Use butyl or acrylic-latex.



Loose flashing around chimneys can be a source of continual water leakage into the house. To close gap, run a bead of caulking into seam between flashing and shingles. If necessary, also caulk between flashing and chimney. Use butyl.

Retreads: Safe at half the price

By Mort Schultz



Typical radial tire is cut away at right to show construction details. Any tire, radial or bias-ply, can be retreaded as long as the cord body is not damaged. Sidewalls should be examined carefully. Top drawing shows cracks and weather checking that means tire must be discarded. The tire cross-section above shows part of tire retreaded during a top cap or crown job, and full crown.

I remember my father telling me thirty years ago that retreaded tires are unsafe and wear out quickly.

"Retreads are made so used car dealers don't have to pay to put new tires on cars they sell," he said.

I don't know whether Dad was right, but if he was, things certainly have changed. Today, you can buy safe retreads that wear as well as comparable new tires for one-half the cost of new tires.

Retreading involves buffing a used tire's worn tread area, and vulcanizing (bonding) new tread rubber to the cord body. The process was invented before World War I.

Retreaded tire sales enjoyed their greatest popularity during World War II when natural rubber for new tires was in short supply. Today's inflation and emphasis on recycling could spur another boom if motorists learn the facts that refute the myths.

For example, retreads are as structurally sound as comparably graded new tires. This is supported by the fact that tires used on commercial aircraft, trucks and off-the-highway vehicles represent a significant portion of the retread industry.

"These tires are retreaded over and over again as long as casings are in good condition," Frank E. Timmons of the Rubber Manufacturers Assn. points out.

However, passenger-car tires cannot be retreaded more than once, according to Federal Motor Vehicle Safety Standard 117, which governs such performance requirements. This assures that retreads pass tests comparable to new tires for cord body strength, bead strength, load-carrying capacity, and sidewall consumer information labeling.

There is no arguing the fact that retreads cost less than new tires. Less material and man-hours go into their manufacture.

As I was preparing this article, two ads side-by-side in a local newspaper caught my eye. One was for new G78x15 bias-ply belted tires costing \$29 each. The other was for retreaded G78x15 bias-ply belted tires costing \$26.95 for two.

But will retreads roll the same number of miles as new tires before wearing out? According to the Tire Retreading Institute, there is no doubt about it. Assuming similar driving conditions and individual driving habits, retreaded tires provide mileage that equals comparable new tires.

This means if the tread width and depth of a retread equals that of a similar-type

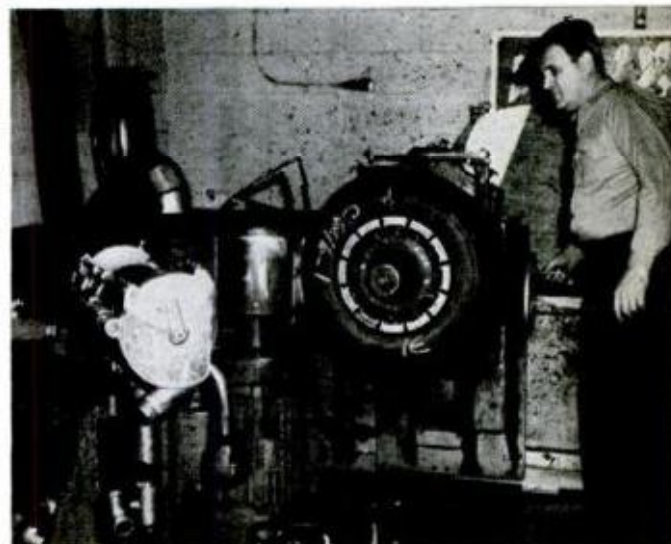
new tire, mileage that both get will be about the same. Tread depth of a new tire generally is $1\frac{1}{32}$ or $1\frac{2}{32}$ of an inch.

"You can take a casing which was an inexpensive new tire and put the best grade of rubber on it as a retread, and you can end up with far more mileage," claims Phillip H. Taft, director of the Tire Retreading Institute (TRI).

Reputable retreaders back up claims of good mileage by writing guarantees equal to those given buyers of new tires. For instance, Goodyear's guarantee stipulates that every automobile tire it retreads is guaranteed during the life of the tread against normal road-hazard damage, except repairable punctures. As with new tire guarantees, there are no time and mileage limits.

"If retreaded tires are so all-fired good,

BUFFING



Tire to be retreaded is buffed to remove old tread and shoulder rubber and leave a clean, rough surface.

TREADING



Buffed tire carcass receives new tread rubber using the modern orbitreading process shown here.

why aren't more being sold?" you may ask.

Part of the reason, I'm sure, is persuasion exerted on motorists by retail tire dealers who don't sell retreads.

"Not all new-tire dealers handle retreads, and in some cases such dealers attempt to persuade the motorists against putting retreads on his car," J.H. Hynds of Firestone says.

Several dealers, in fact, told me that I shouldn't buy retreads if I do any type of sustained highway driving (the rubber is "too soft," one said). The facts don't support the statement. There is no limitation on the type of driving you can do.

Hynds, incidentally, is quite emphatic about the service that retreads offer.

"If the motorist purchases a retread with the same tread pattern as original equipment new tires, with the same dimension of tread width and depth as original equipment new tires, and with the same quality level of tread compound as original equipment new tires, then he should expect to get the same mileage as he would had he purchased a replacement set of original equipment quality new tires," he says.

Since there are good and inferior retreaded tires sold just as there are good and inferior new tires, how can you tell one from the other? This is a problem, because it's hit-or-miss.

There is no grading system (but there is none for new tires either). However, there are two rules-of-thumb you can apply. One concerns price, and the other is the reputation of the retreader.

Top quality retreads cost more. Hynds and Taft agree that a retread which cost half the price of comparable type of new tire should give comparable service. This means that a belted bias-ply retreaded tire, for example, costing \$15 should give practically the same wear as the same size belted bias-ply new tire costing \$30, assuming similar driving conditions. If it doesn't the tire is probably defective and covered by guarantee. On the other hand, be wary of the belted bias-ply retreaded tire costing \$10 that is palmed off as giving the same service as a new belted bias-ply tire costing \$30. It may, but chances are it won't.

The expertise and reputation of the retreader is another criterion you can use when judging a retread. Local dealers in business for a long time are generally reliable, and usually have straight answers to questions.

Taft of TRI admits to being biased, but suggests that you patronize retreaders who are members of his organization.

"There are, of course, other good retreaders in the country, but I'm afraid there are also quite a few whose work is somewhat suspect," he says.

The TRI polices its members. It sends crews into the field to drop in on shops unannounced to observe their work and make recommendations for improvement.

"If in time a shop fails to comply with our standards, it is kicked out of the Institute," Taft says.

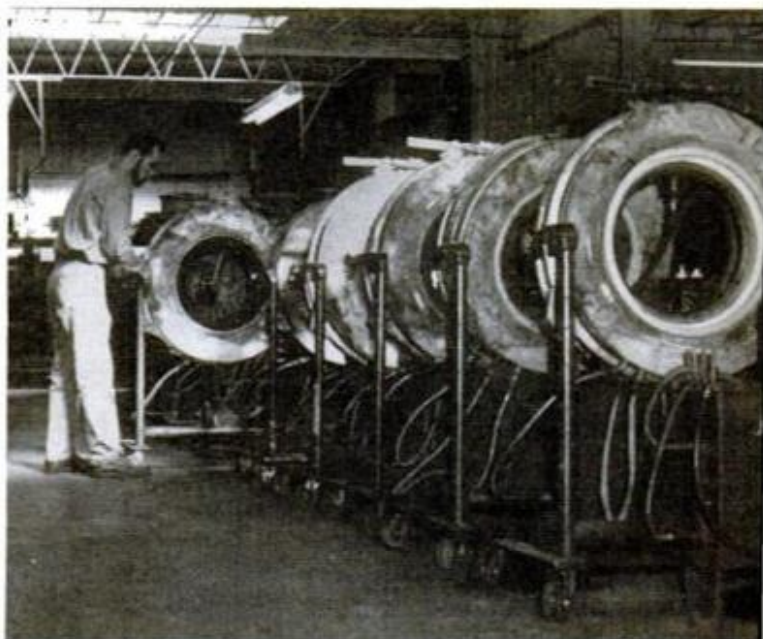
One assurance of getting good retreads, then, would be to patronize a dealer who complies with the standards set by TRI or the American Retreaders Assn., a similar trade group, or to buy retreads bearing the name of a leading tire manufacturer, such as Firestone, Goodrich or Goodyear.

The key to manufacturing a good retreaded tire is the old casing. It must be sound if the retread is to be sound.

A casing should be rejected if the old tread is worn to a point where the cord body fabric is visible, if there is excessive radial cracking in the shoulder, if the bead is damaged or if there is severe weather checking in the sidewalls.

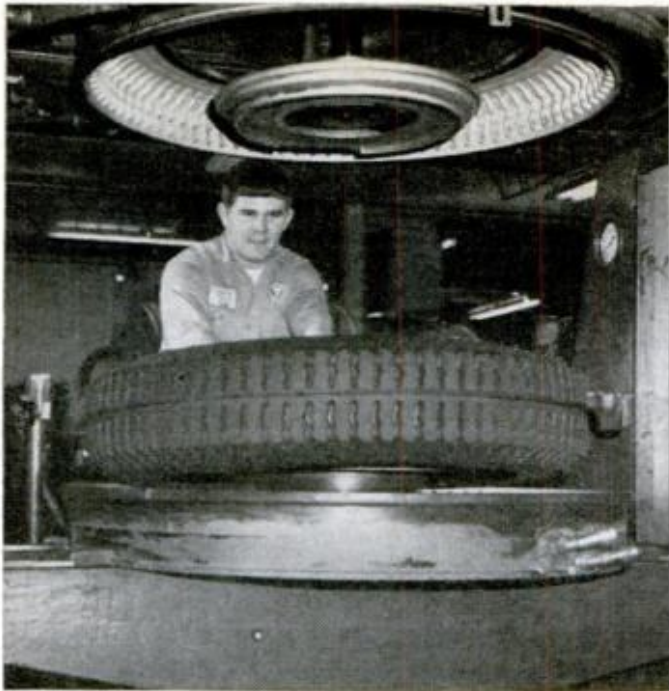
To get as much service from a retread as from a comparable new tire, the casing must be able to deliver another tread life. Interestingly, only 23 percent of all old tires removed from service are retreadable.

CURING



Retreaded tires in molds are attached to steam pipe and cured at controlled temperature. When cured correctly, new tread will never separate from casing.

PATTERNING



During the curing process, the pattern is put into tread rubber. Tread pattern shown is on truck tire.

After an old tire passes inspection, the casing is mounted on a wheel, inflated and buffed with a rasp to remove remaining tread pattern. This operation continues until enough tread rubber is removed to present a surface of proper contour, texture and dimension for a new tread.

Following another inspection, the cord body is sprayed with vulcanizing rubber cement. When the cement dries, the new tread is added. There are two ways of doing this. The oldest method is to apply a single strip of uncured rubber to the width of the tire. The ends are spliced together, and the tire is cured in a mold.

The other method, called orbitreading, builds up the tread rubber on the cord body to desired thickness by winding a thin, narrow strip of rubber (1-inch wide by $\frac{1}{8}$ -inch thick) around the casing in overlapping layers. The rubber is fed from an electronically controlled machine at a temperature of more than 200°F. and pressed into place on the tire casing by spring-loaded rollers that assure proper placement and adhesion.

The orbitread system doesn't produce a tread splice, which allows a better balanced tire to be created. About 95 percent of retreads made now are made by orbitreading.

Following the application of rubber, the tire is placed in a curing mold to complete vulcanization of the new tread to the cord body and impress the tread pattern. The

INSPECTING



Inspection of retreading operation is done during all stages, plus a final inspection of completed tire.

final step in making a retread includes another inspection, trimming and painting.

Any type of tire can be retreaded, including steel-belted radials, but not every retreader can retread every type of tire.

The radial tire is comparatively new on the American scene, and only 25 percent of the 6000 retreaders in the country are equipped to handle it. It's not that radials present a more complicated problem than conventional tires. They don't. But radial-tread patterns are different than those of conventional tires and need a different curing mold (matrice). Seven or eight different molds are used to accommodate the different radial sizes and tread patterns. Each costs about \$1500.

It doesn't matter whether you bring your old casings in for retreading or not. You used to be able to save \$1 or \$2 per tire, but, as one dealer told me, "Casings are so plentiful to meet demand that we don't want customers to bring us their old ones. Many times their casings are no good and we have to get rid of them. That costs me money."

Knowing all these facts, you may decide retreads are worth a try. But if you want more information first, send a self-addressed envelope to the Tire Retreading Institute, 1343 L St. N.W., Washington, D.C. 20005. Ask questions or just ask for general printed information about the advantages of retreaded tires. ★★★

Turn your lens into a telescope

by Walter Gottlieb

Photographers use nonphotographic gadgets all the time (*PM's Photo Hints* pages are full of examples). But you can also use your photo gear for nonphotographic purposes. Your camera's interchangeable lenses, for example, can be turned into compact, highly corrected telescopes at hardly any cost, with no more labor than drilling two holes—and no impairment of their photographic usefulness.

A telescope is merely a comparatively long focal length lens (the objective) that aims at the object to be viewed and a shorter focal length lens (the eyepiece) that magnifies the image formed by the objective lens and presents it to the viewer's eye. The longer the focal length of the objective and the shorter that of the eyepiece, the greater the magnification of the telescope. So if you couple a short-focus lens from your movie camera to a telephoto from a 35-mm or larger camera, you can assemble a telescope that's powerful indeed. (The actual power of the telescope can be found by dividing the objective's focal length by the eyepiece's.)

If you don't shoot movies or if your movie camera, like most current models, does not have a removable lens, you can pick up a lens for your eyepiece dirt-cheap at a used camera counter. The least expensive way is to buy an obsolete, inoperative regular-eight camera, unscrew the lens and throw the camera away.

Now drill a well-centered hole in the larger lens's rear cap, just wide enough to clear the movie lens's threads ($\frac{5}{8}$ inch for lenses from 8-mm cameras, one inch for 16-mm-camera lenses). Then drill out the movie lens's rear cap as wide as you can without damaging its screw threads, or grind the cap's bottom off just below the threads. (This cap must be metal, though the larger lens's cap can be either metal or plastic.)

Centering the hole in the larger lens cap is important for good optical performance. One way to center it precisely is to coat

Photos by the author.



A little work and an old movie camera lens made this powerful telescope from a telephoto lens.



Interchangeable movie lens, mounted through a hole in telephoto's rear lens cap, serves as an eyepiece.

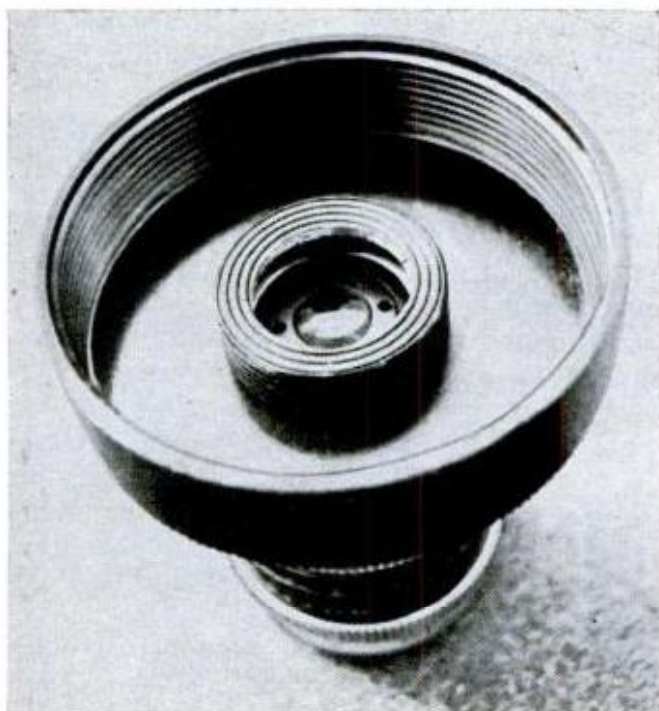
the cap with white tempera paint, then scribe a series of straight lines in the paint with a marking gauge set at approximately the lens cap's radius, turning the cap slightly for each line. The intersections of the scribed lines will form a polygon small enough for you to judge its center with as much accuracy as you need to center-punch the hole before drilling it.

To assemble, insert the threaded end of the movie lens into the hole in the larger lens cap and fasten it in place by screwing on the drilled-out movie lens cap. Screw the telephoto cap onto the back of its lens, and there it is—a high-power telescope! If you can't bring a distant object into focus using the telephoto's focusing ring, insert one or two extension tubes between the

lenses to bring the eyepiece to the proper focal point. You can estimate the amount of extension necessary by looking through the two lenses, both hand-held, and varying the separation between them until a distant object looks sharp.

With a 300-mm telephoto and the 5.5-mm wide angle from my 8-mm camera, I get over 50-power magnification. For less power and wider viewing angle I use the 12.5-mm normal lens or the 25-mm movie tele as eyepiece. If you have a telephoto lens converter, its use will increase the power of the 'scope by its usual conversion factor. Naturally no matter how many lenses you use in your combinations, you need make only one coupler.

While these telescope combinations are powerful, they have a disadvantage common to all celestial telescopes: The view is reversed, upside-down and backwards. For looking at things down here on earth, you'll find it convenient to have a negative-focus eyepiece (one that makes things look smaller to the eye) that keeps things right-side up. For this I use the negative front element of an inexpensive lens salvaged from an old 8-mm camera (practically all normal focal length lenses use a negative first element). Unscrewing and discarding the rear element, I mounted the remainder of the lens in the eyepiece coupler as before. This eyepiece needs less extension behind the objective lens than the other eyepieces;



Movie lens's own rear cap, drilled out (see text), serves as its retaining ring.

it may even have to be mounted on the *inside* of the telephoto's cap to obtain the proper focus.

In use, mount your telescope on your tripod by means of the socket built into your long lenses for clearer, less tiring viewing. Telephotos without built-in tripod sockets will usually yield low enough magnification so that they can be used hand-held.

The telephoto lens cap which has been converted into the eyepiece coupler can still be used for lens protection when not being used in telescopes by plugging the hole with a movie camera body cap or turret plug, held in place by the drilled-out movie lens cap.

Now, just by reaching into your gadget bag for a combination of lenses that you're not using on your cameras at the moment, you're ready for a close-up look at anything on land, sea, sky or beach. ★ ★ ★

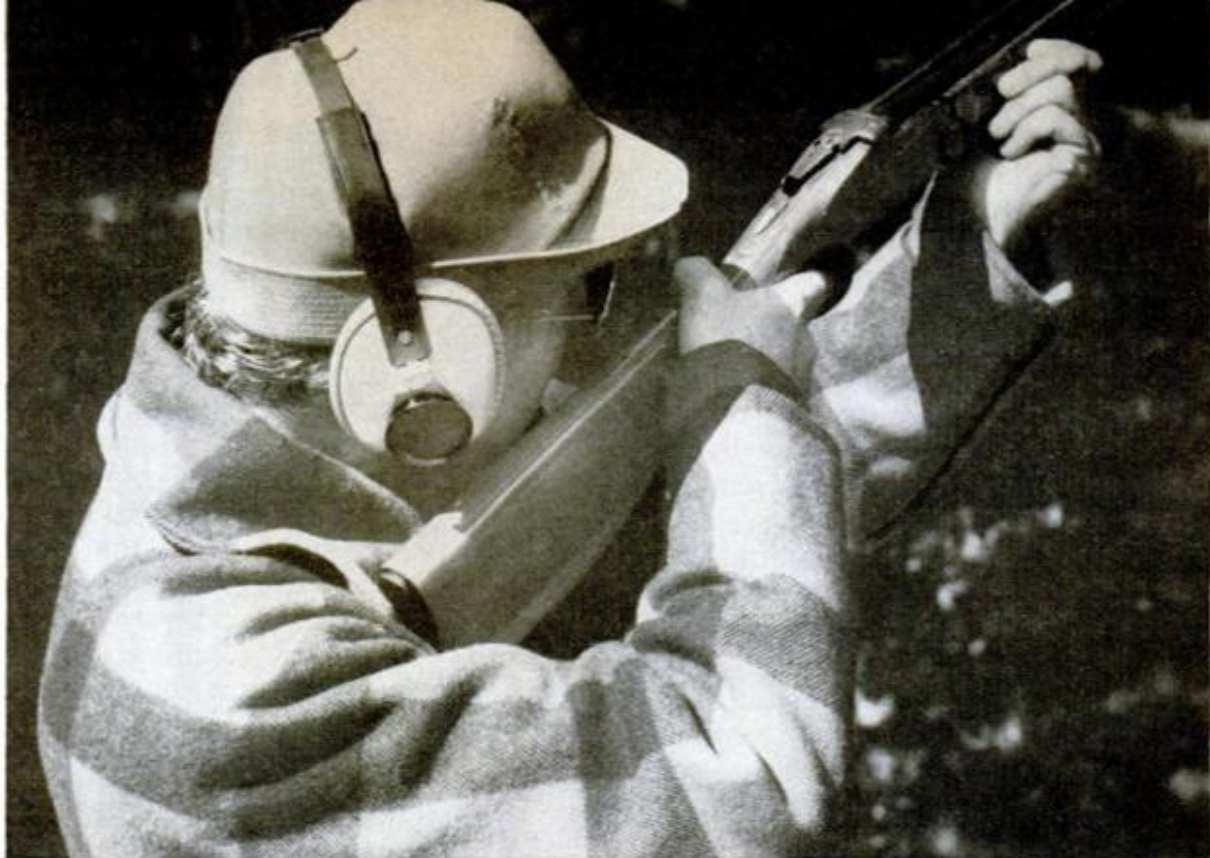


Hole in larger lens cap must be centered carefully and be wide enough to clear movie lens's threads.



For a right-side-up image, use just the negative front element from a junked 8-mm camera's lens. Unscrew the rear element using a needle-nose pliers as a spanner, then discard.

Shotgun blasts can produce sound-level impacts of well over 100 decibels—enough to cause ear damage if you're exposed to prolonged periods of continuous shooting, such as in trap and skeet contests. For such activities, ear protectors of type shown at right are recommended. They're also good insurance when operating noisy power equipment like chain saws, tractors.



Danger: Noise at work!

The mounting din of modern life is bringing with it problems of deafness and other disorders never before realized. Here's what you should know about the harmful effects of noise and how you can guard against them.

by Arthur S. Freese

A young homeowner recently got the shock of his life. After several hours' work felling trees around his yard with a chain saw, he shut off the tool and turned to greet his approaching wife. To his amazement, her lips were moving, but no sound was coming out. Dulled by the roar of the saw, his hearing was totally gone. It took an hour for it to return.

A doctor picking up his teen-age daughter after an evening's rock concert was astonished to find she couldn't hear what he was saying. An air-show pilot, after giving a dazzling exhibition of aerobatic flying, stepped from the cockpit of his plane to the thunderous cheers of the

crowd. He could see their arms waving wildly, but could hear nothing.

All these are common cases of temporary deafness caused by prolonged exposure to loud noise levels. The problem is, if such exposure is repeated too often, the deafness no longer remains temporary. That noise can cause ear damage has been known for more than a century, back when premature deafness was a well-recognized occupational hazard of blacksmiths. Only recently, however, has the seriousness of the problem been truly realized. The reasons are twofold: First, what used to be shrugged off as merely brief or minor hearing losses are now known to be far more devastating—actually, slow, progressive steps toward ultimate permanent deafness. Second, the mounting din of our modern mechanized way of life is causing noise levels to rise at an alarming pace. According to experts, noise levels have doubled in the past 15 years and are continuing to increase at the ominous rate of one decibel a year. At this rate, we may all be deaf by the year 2000, some predict.

This doesn't mean you have to give up your hi-fi and power tools, quit your job and head for the hills. What it does mean is that you should be aware of the dangers

Young rock fan (right) may be having a ball, but may also be endangering his hearing. Listening to loud music with headphones is a bad trip because enclosed phones channel sound-pressure shocks directly against eardrums, concentrating impact. There's nothing wrong with headphone listening, but be sure to keep volume to reasonable level.



Hi-fi system played excessively loud is a major source of noise pollution in home. Tests with sound-level meter (left) show volume can hit 100 to 120 db near speaker, 80 to 100 db a few feet away—too much for prolonged listening. If it seems "deafening," it likely is—literally.

of noise and what can be done to help avoid them. Too often, people claim they "get used" to noise—they may, but their ears can't. What frequently happens is that they experience a gradual loss of hearing so slight it may not be noticeable until it becomes severe. Their hearing is fine, they keep insisting—it's just that everybody else "mumbles." Often it takes the constant urgings of friends and relatives to finally convince such a person he really does have a hearing problem and needs help. By then it may be too late for help. This has led hearing specialists to exclaim: "There's no such thing as getting used to noise; you can only get used to deafness."

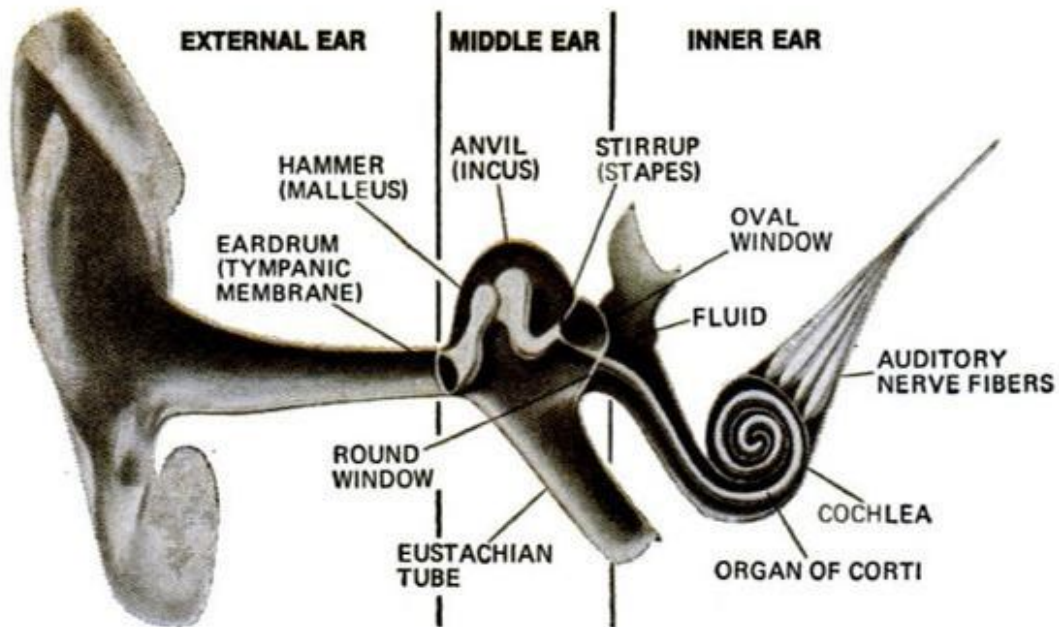
To appreciate the importance of protecting your hearing, it's essential to understand how the ear works. Sound waves striking the eardrum are transmitted through the middle ear to thousands of tiny, delicate hair cells in the Organ of Corti in the inner ear. These hair cells pick up the vibrations and translate them into electrical impulses that are sent along nerve fibers to the brain. Loud sustained or repeated sounds literally blast the fragile hair cells so hard they destroy them. Only a few cells may be damaged at a time, but over a period more and more gradually dis-

appear until your hearing ability is seriously affected. As the cells are destroyed, no new ones grow in their place, so the deterioration is progressive, cumulative, irreversible and permanent. Eventually, it can lead to total deafness.

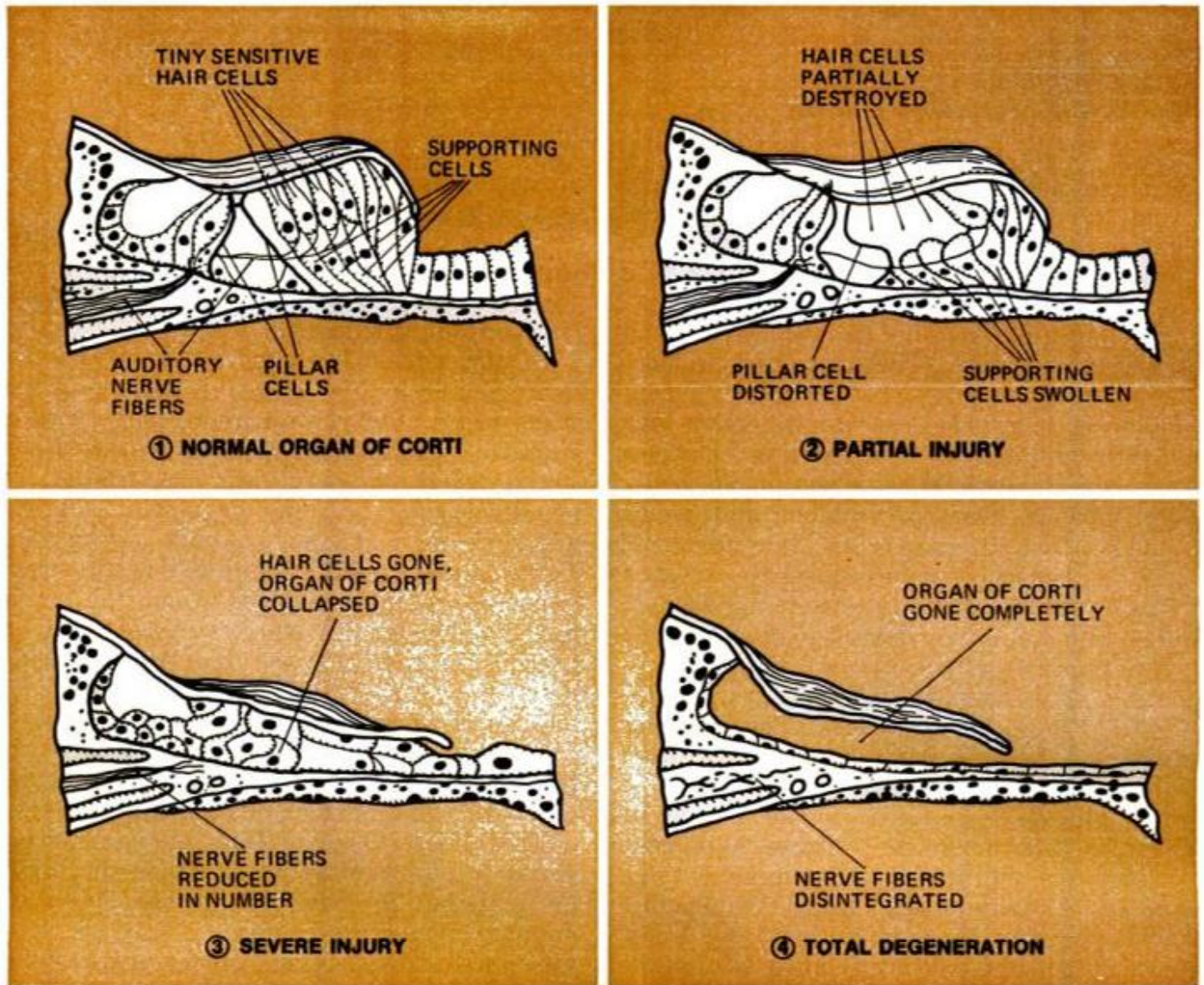
In the normal person not subjected to loud sounds, this deterioration process takes years, and your hearing may remain good well into old age. But where excessive sound levels are present, the process is rapidly accelerated, and hearing losses begin to show up at a surprisingly young age. Tests on snowmobile racing drivers in their twenties recently showed them to have hearing deficiencies equivalent to those of persons in their fifties. Dr. Aran Glorig, noted director of Dallas's Callier Hearing and Speech Center has been quoted as saying that nearly every man who goes through the Army's basic training program comes out with some permanent hearing damage.

This doesn't mean that everyone who drives a snowmobile or shoots a gun will go deaf, but it does indicate the potential dangers of excessive noise. The U. S. Environmental Protection Agency reports the shocking fact that some 40 million Americans are regularly exposed to hazardous levels of noise. And the U.S. Public Health

HOW YOUR HEARING IS GRADUALLY DESTROYED



CLOSE-UP VIEWS OF ORGAN OF CORTI SHOWING PROGRESSIVE DETERIORATION



Why hearing loss is irreversible is shown in drawings above. Sound waves are transmitted by eardrum through middle ear to tiny hair cells in Organ of Corti in inner ear. Hair cells pick up vibrations and

send corresponding impulses to brain through nerve fibers. Loud, sustained noises slowly destroy these delicate cells until they disappear completely. Once gone, they do not regenerate and damage is permanent.

Service estimates that more than 8 million already have sustained some degree of hearing impairment resulting from noise.

In addition to ear damage, excessive noise has been linked to a variety of other ailments, including heart disorders, ulcers, gastrointestinal spasms and emotional upsets. It is not uncommon for NASA space technicians working near a rocket launch to experience dizziness, nausea and fainting spells after a blast. Medical experts now believe some unexplained auto accidents may be attributed to certain low-frequency engine sounds that can produce a state of euphoria in a driver similar to drunkenness. So the list mounts as researchers discover more and more harmful effects of noise.

How loud is too loud? This depends on several factors—the type of sound, its intensity and its duration. The screech of chalk scraping on a blackboard makes you cringe, but is not intense enough to cause actual damage. On the other hand, many sounds that aren't particularly disturbing—that may even be pleasing—could become harmful if allowed to persist overly long. Loud rock music has taken a lot of blame for impairing teen-agers' hearing, but it's not the only culprit. A full symphony orchestra listened to at or near the same volume could be just as damaging, yet seem quite pleasant and enjoyable. Many common sounds around the home—vacuum cleaner, garbage disposer, dishwasher, food blender, power mower and shop tools—could also be potentially harmful, but generally these are heard for only brief periods at a time. Loud sustained or frequently repeated sounds are the worst for your ears.

Sound intensity is measured in decibels (db). For medical purposes, measurements are usually made on the so-called "A-scale" (dbA), a scale weighted to take into account the higher frequencies to which the human ear is most sensitive. The important thing to remember about the decibel scale is that it's logarithmic, not arithmetic—what may seem like a small increase in db is actually a large increase in sound intensity. Technically, a rise of 10 db on the scale represents a tenfold increase in loudness. For practical purposes, in terms of apparent impact on the ear, each rise of 10 db amounts to a doubling of the sound level. Thus 50 dbA is twice as loud as 40 dbA, 60 dbA is four times as loud, and 70 dbA is *eight times* louder. Keep this in mind as you study the noise-level table on



Punch-press operator wears muff-type ear protectors, which reduce sound intensity by up to 40 db. Most industrial plants now require workers to wear such protectors where noise levels approach or exceed 90 db.

Chart recorder registers hearing acuity at various frequencies with moving pen on graph paper. It's useful for determining type and extent of hearing loss, compares left and right ears on side-by-side graphs.

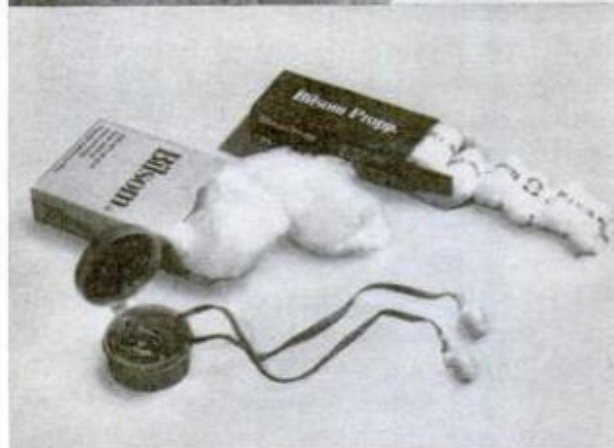
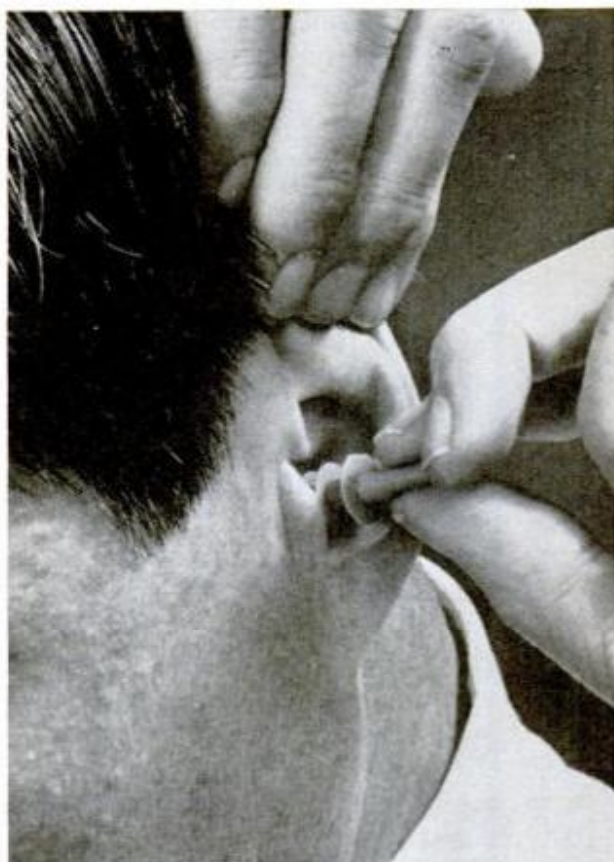


HOW TYPICAL NOISES COMPARE IN INTENSITY

SOUND LEVEL IN DECIBELS (dbA scale)



NOTE: Sound levels given above were compiled from a number of sources and are necessarily arbitrary. They may vary considerably under actual conditions and in differing situations.



Protective ear plugs come in a variety of types. One shown in top photo has circular baffles that work much like those in an auto muffler to reduce sound intensity. Lower photo shows cotton-like ear down in two forms: in prerolled plugs ready for insertion (top) and loose (center) for rolling your own plugs, both made by Bilsom. At bottom are molded-plastic plugs with tie string to prevent their loss, made by Southern First Aid Supply, Box 669, Lexington, N.C.

the facing page. Note, for instance, that a typical suburban living room has a noise level of 45 dbA, while the same room in an urban area rates 55 dbA—10 dbA higher. Thus the city dweller is subjected to *twice* as much noise as his country cousin. And a jetliner (150 dbA) is *128 times* louder than a bus or train (80 dbA).

In an effort to establish safe, acceptable levels of sound, the Occupational Safety and Health Act (OSHA) was passed in 1970. Under OSHA regulations, aimed primarily at protecting industrial workers from excessive noise, a limit of 90 dbA is the maximum allowable for a normal eight-hour workday. Above 90 dbA, the periods of permissible exposure shorten rapidly—

six hours at 92 dbA, four hours at 95 dbA, two hours at 100 dbA, one hour at 105 dbA and only 15 minutes at 115 dbA.

You can see immediately what this means in terms of potential danger to your ears from ordinary daily sounds usually taken for granted. A rock band often plays at levels up to 120 dbA all night long. Chain saws and snowmobiles can hit 115 dbA, an outboard motor 102 dbA, a table saw 100 dbA. Even a home hi-fi system is frequently played at 95 to 110 decibels. If you spend several hours a day in a subway (100 dbA), you may be endangering your hearing just riding to and from work.

And even OSHA standards are not considered safe by all. Already, there is pressure in Congress to reduce the 90-dbA eight-hour limit to 85 dbA, and some would like to see it lowered still further to 80 dbA. The Air Force requires ear protectors to be worn at any levels above 85 dbA, regardless of exposure time. Most authorities agree that 80 dbA is the beginning of the unsafe range. Prolonged exposure to sounds above this level will definitely result in permanent hearing loss.

Unfortunately, many noise-acceptance measurements are made at a specified distance from the sound source—often as much as 50 feet. This is because, up until now, concern has been more for the broad-scale impact of noise pollution on the environment in general than for the particular individual involved in the noise-making activity. Many states, for example, have adopted 82 dbA as the maximum allowable noise limit for snowmobiles—but as measured at a distance of 50 feet. It does not take into account the fact that noise levels in the driver's seat can reach 115 dbA—more than eight times louder. Heavy trucks register about 85 dbA at 50 feet, but can produce 90 dbA or more within the cab. Passenger cars are a relatively quiet 72 dbA at 20 feet, but can subject their occupants to as much as 90 dbA at turnpike speeds. There's a big difference between listening to sounds at a distance and being battered by them at close range.

While the picture may seem discouraging, you *can* protect your hearing. One way is to use simple common sense. Avoid loud noises whenever possible, especially for long periods. When operating power tools, noisy vehicles or other motorized equipment, do so for only brief stretches at a

(Please turn to page 171)



Muff-type protectors, like those worn by airport personnel, simply slip over head, are easy to use. Those at top are made by Willson (left) and David Clark (right), cost around \$10 to \$20 at sports shops.



Toy truck for the boy

Steam-powered pickup truck, only 4¼ in. long, is complete with engine, boiler and gear drive. Materials come in a handy kit.

by John Burroughs

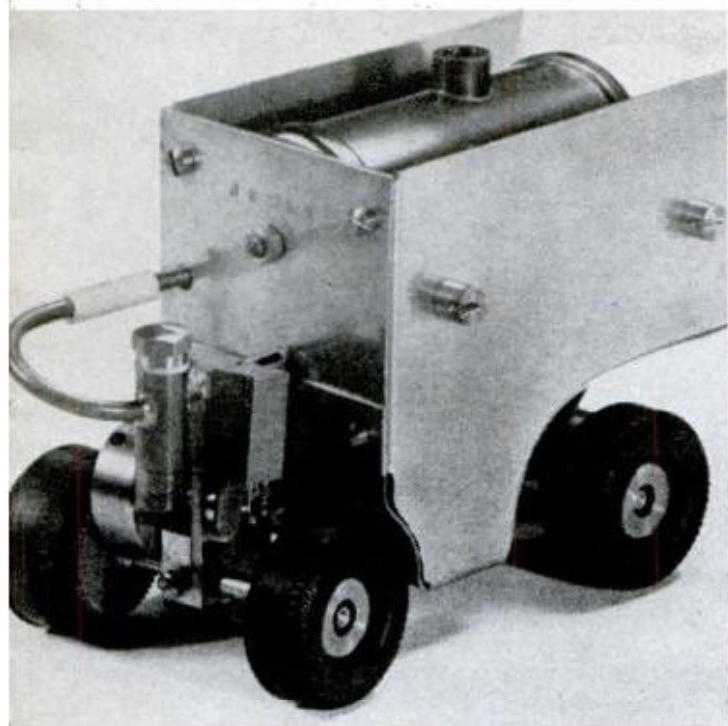
Dr. J.R. Senft, a mathematics professor at a small North Dakota college, eyed the toy pickup his young son had received as a Christmas gift, and thought: What a pity the little truck didn't run.

He made drawings. Taking the 4¼-in.-long toy pickup apart, he discarded all plastic parts and salvaged the pressed-steel body shell and rubber tires. Then he rebuilt the truck on his small Unimat lathe.

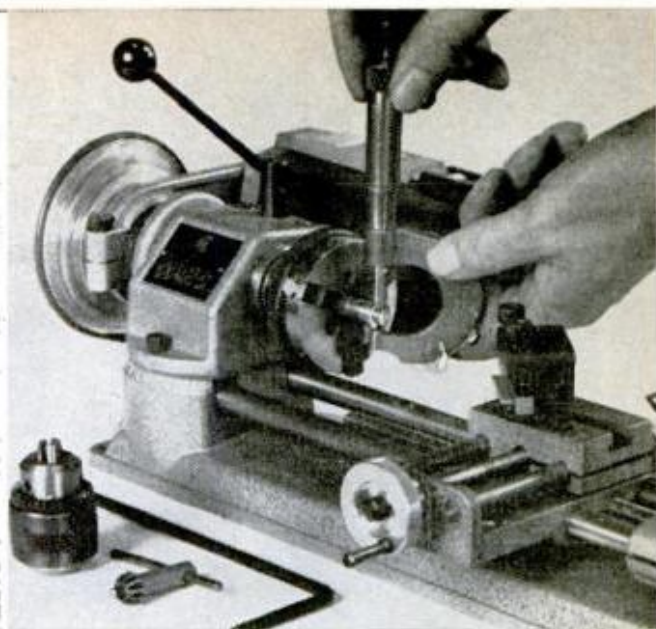
First he machined new wheel hubs from bearing bronze and fitted the wheels on stainless-steel axles. Next he built a tiny ⅜-in.-bore by ⅜-in.-stroke oscillating-cylinder steam engine not much larger than your thumbnail and mounted the engine to drive one of the truck's front wheels through 5:1 reduction gears from an old clock. Then he assembled a sheet stainless-steel firebox and built in a 2-in.-long, alcohol-fired brass boiler to supply steam at 15 to 20 p.s.i. working pressure. The firebox serves as the truck's chassis and has slotted studs that mount the body shell.

The finished precision-built pickup runs six minutes in a five-foot circle on ½ teaspoon alcohol and 1½ teaspoons distilled water at a scale speed of 50 mph.

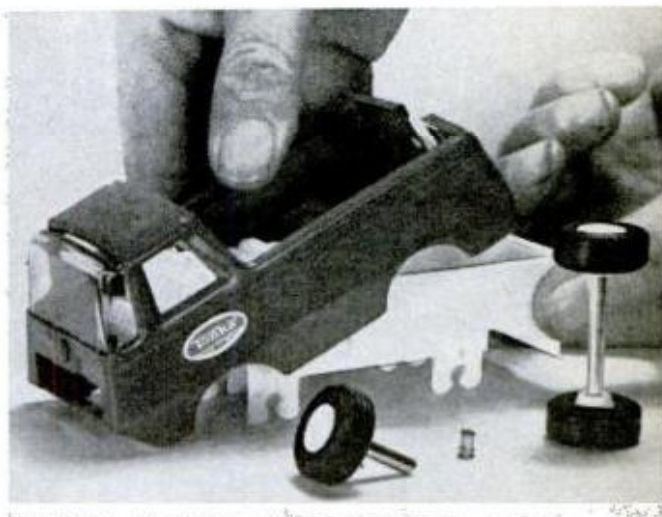
The firm that markets Unimats, American Edelstaal, Inc., has designed a kit of



Assembled chassis ready for body shell. Body mounts in slotted studs riveted to sides of firebox.



With a modelmaker's lathe, the truck's parts can be machined to exact size and checked with a micrometer, or machined to fit its mating part.



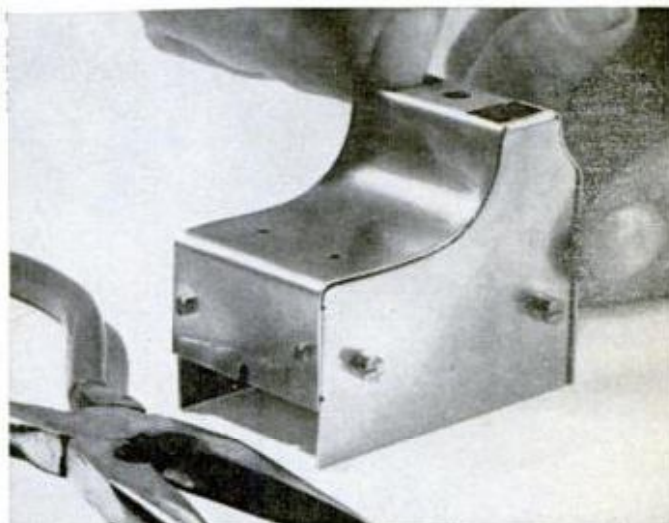
Steel body shell and the rubber-tired wheels are salvaged from a Mini-Tonka toy pickup truck. The truck's plastic chassis is discarded, new wheel hubs are made.

in every man

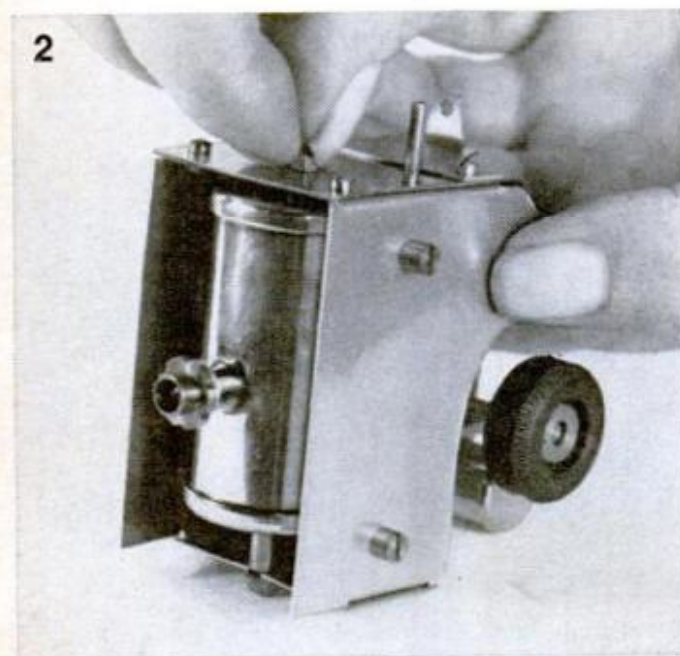
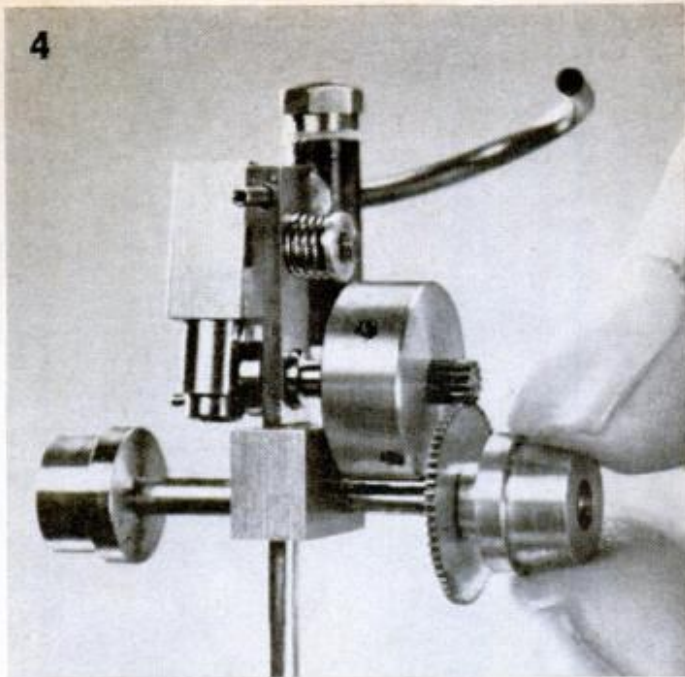
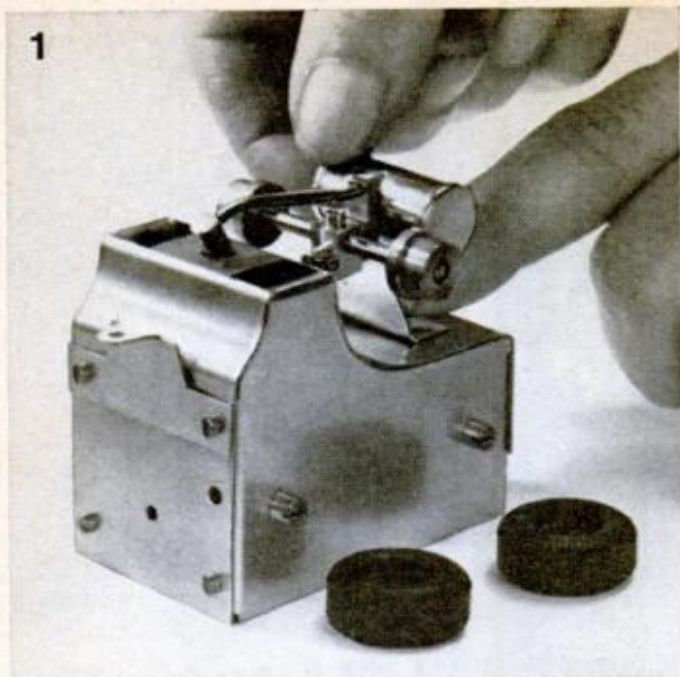
materials that contains a Mini-Tonka toy truck, rough-cut bronze and stainless steel for all parts, and all fastenings, plus complete drawings and illustrated how-to instruction booklet.

To simplify the job, the drawings are arranged in four sections that show the engine, boiler and burner, running gear and the firebox. With the parts machined as shown, construction is simply a matter of assembly. The machinework can be performed on any small metal lathe. The silver-soldering required can be accomplished with an ordinary propane torch. The 10 photos on the next two pages take you through the steps of making and operating the little truck.

You can order a kit directly from American Edelstaal, Inc., 1 Atwood Ave., Tenafly, N.J. 06770, for \$19.95 postpaid. ★★★



Firebox which serves as truck's chassis is formed from sheet stainless steel and assembled with machine screws. Bottom openings supply air to burner.



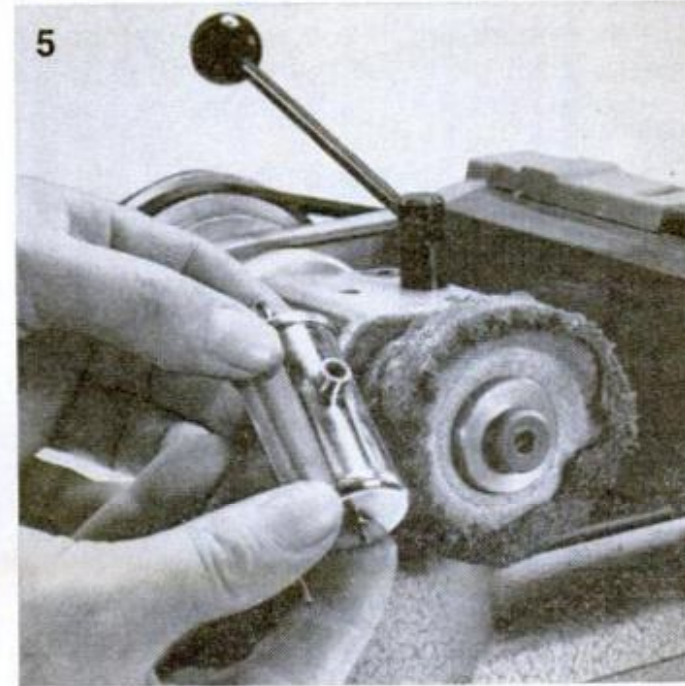
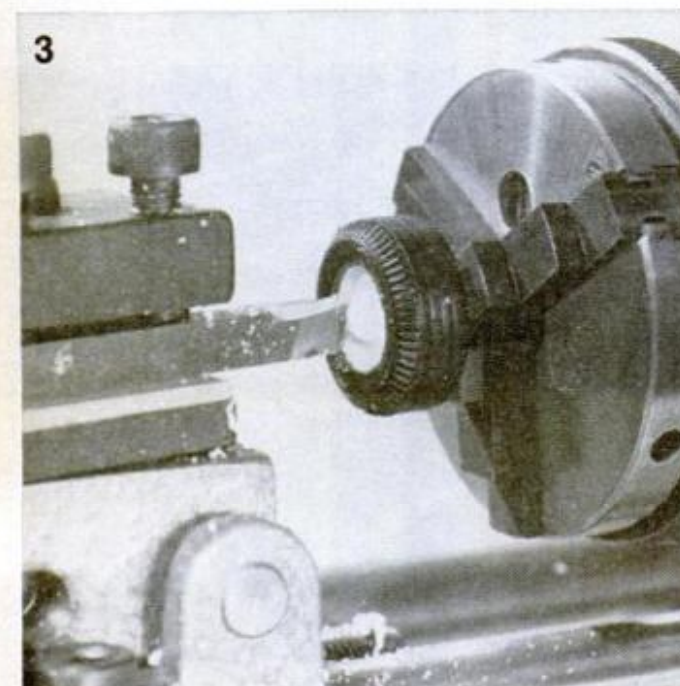
1. **Rear-axle assembly** and the fuel tank mount on a bracket that is bolted to the firebox. Alcohol fuel flows to burner's wick through a brass tube.

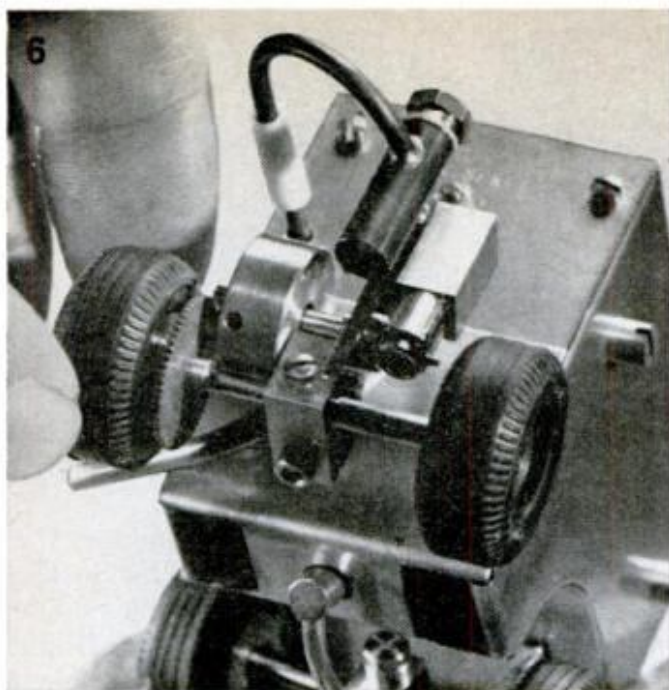
2. **The boiler mounts** inside the firebox with studs silver-brazed to the boiler's end caps. Firebox is lined with asbestos paper to conserve heat.

3. **Tires are slipped off** original plastic hubs by turning out hubs a bit. Plastic hubs are replaced with bronze ones and then fitted with new axles.

4. **Tiny single-acting steam engine**, machined from brass and stainless steel, gear-drives truck's right front wheel. Gears are from old clock works.

5. **Completed truck** has look of a precision instrument when brass, bronze and steel parts are polished with cloth buffing wheel charged with rouge.





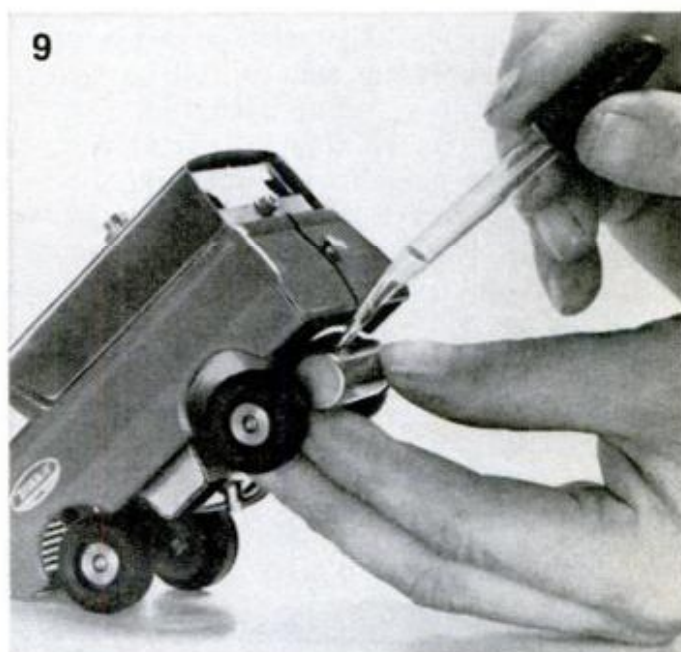
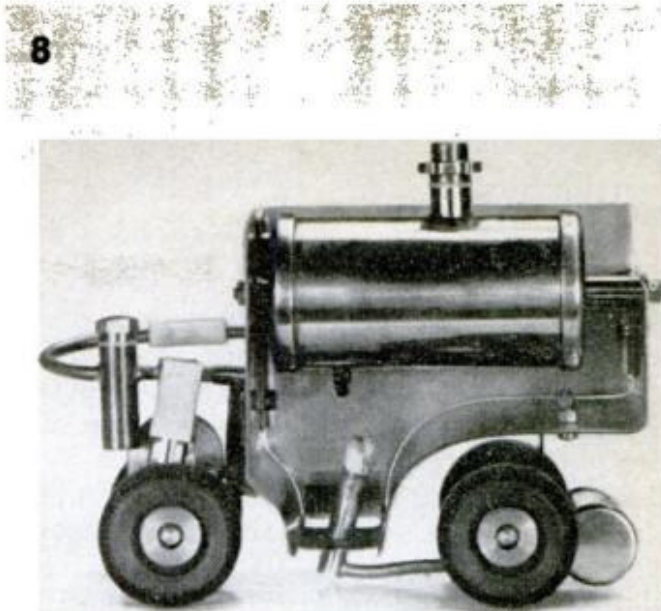
6. Front-axle assembly is set at a slight angle to make the truck run in a 5-ft. circle. Steam engine powers truck at a scale speed of 50 mph.

7. Boiler's safety valve in top has an adjustable spring-loaded core that maintains the steam pressure at 15 to 20 pounds per square inch.

8. The 2-in.-long brass boiler mounts in stainless-steel firebox which also serves as truck's chassis. Here, side of firebox is removed to show boiler.

9. Eyedropper is used to fill fuel tank with one-half teaspoon of alcohol, powering truck for about six minutes. Burner's wick is lighted with match.

10. Distilled water prevents formation of mineral deposits in steam system, is added through safety-valve hole. Displacement lubricator lubes engine.



Portable saw pinch-hits

by Walter E. Burton

A portable circular saw is the heart of this cutoff machine. Its abrasive blade slices through metal rods, pipes, angle iron and bars of various shapes with ease, even through hardened steel that a hacksaw won't touch.

The machine consists essentially of a metal framework that supports the saw vertically and nose-down, with a swinging unit to which the material to be cut is clamped. Swinging this "workholder" through a short arc by a handle projecting upward from it feeds the work against the edge of the abrasive blade. Shields help provide safety and protect the user from sparks and particles generated by the grinding action.

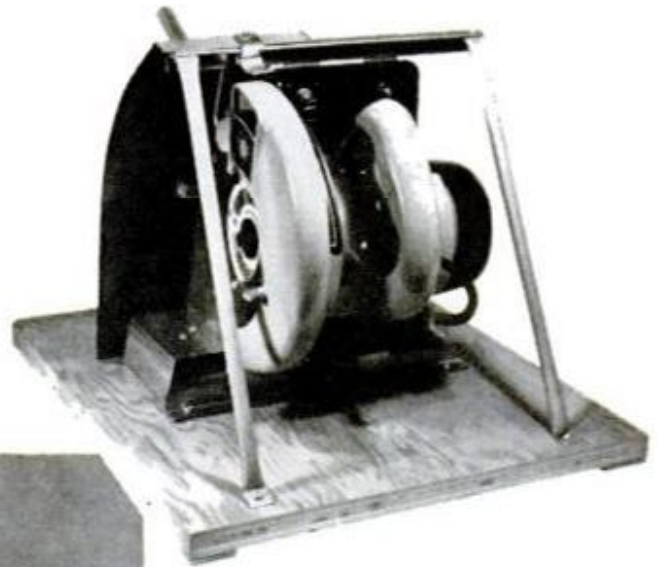
A Rockwell No. 75, 7½-in. portable circular saw was used in the machine illustrated. The abrasive disc normally used is an aluminum-oxide type designed for cutting steel and other metals. Dimensions given are for this particular saw but they can be altered easily to accommodate a saw of a different make.

The saw-supporting frame is made by

riveting together two ½ x 1¼ x 11¾-in. steel bars and two ¾ x ¾ x 11¼-in. pieces of angle iron. The frame is mounted on a plywood base with three bolts, and braced by two lengths of ½-in.-o.d. tubing flattened at the ends. The bars are positioned on the angle pieces so that two holes drilled in each to receive 10-24 bolts will align with similar holes already in the base plate of the circular saw.

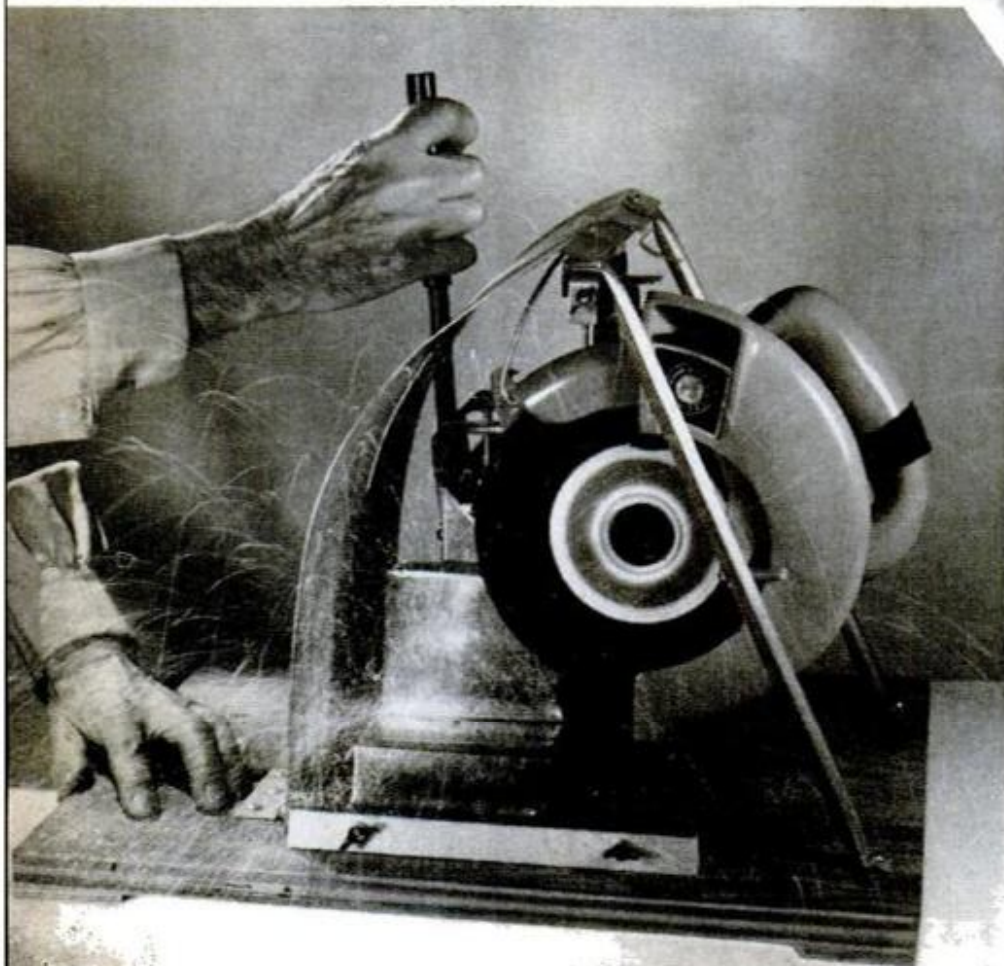
The bottom angle strip is fastened to the plywood baseboard with 10-24 bolts. So the lower ends of the bolts would clear the bench top, five blocks about ⅜-in. thick were glued to the baseboard (one at each corner and one near the center) to serve

Photos by the author

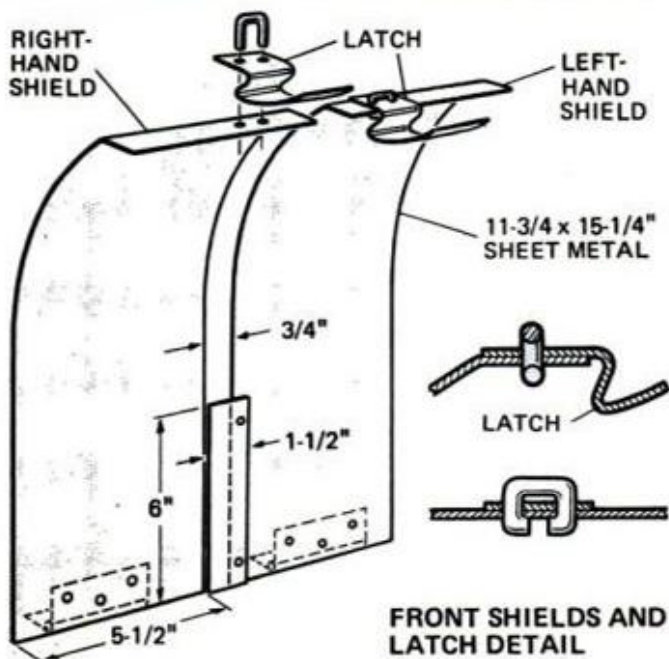
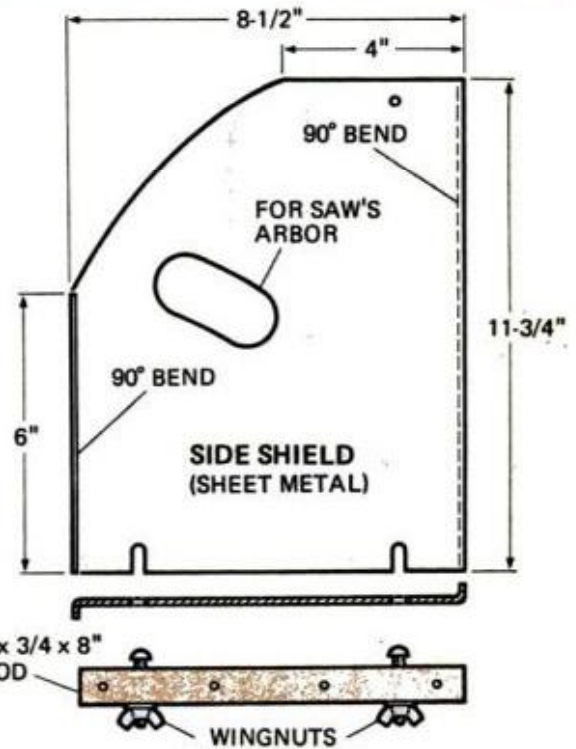
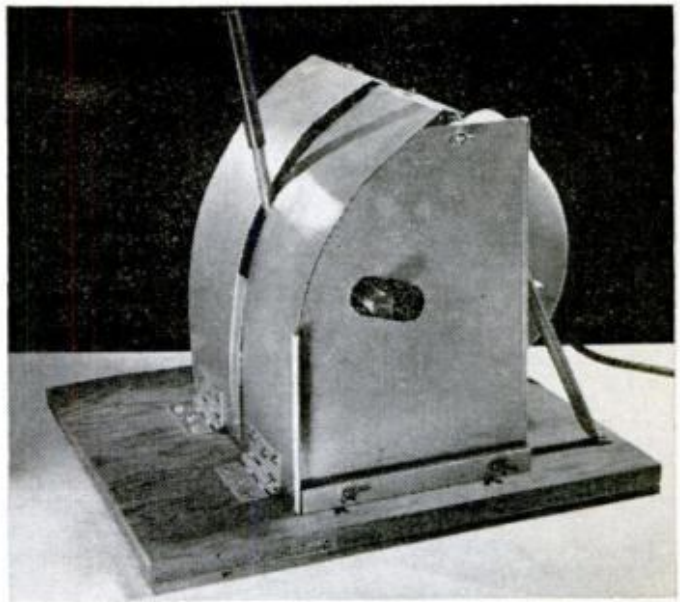
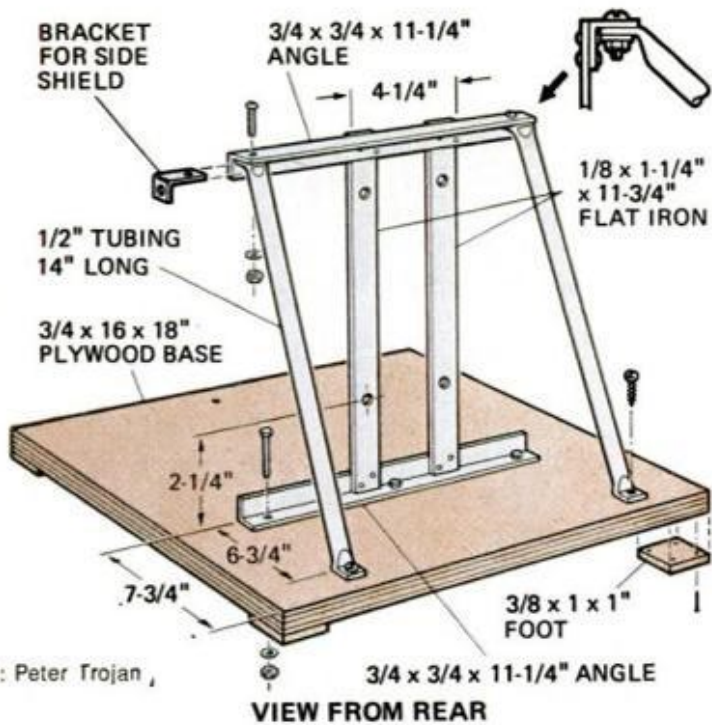


Rear view of cutoff machine (above) shows how portable circular saw is attached to vertical supports. Since it isn't convenient to control saw with its own in-handle switch, switch is taped in "on" position and saw is controlled by foot switch.

Saw being used (left) to cut ½-in. steel rod. Side shield has been removed to show cutting operation. It should always be in place when machine is used.



as cutoff machine



Elongated opening in sheet-metal side shield (photo, top) accommodates long workpieces, lets them move freely during cutoff operation. Control handle has plastic grip over end.

Frame which holds circular saw vertically is bolted to baseboard and held rigid by two diagonal braces of 1/2-in. tubing flattened at the ends as shown in drawing at upper left.

Simple latch holds each curved shield closed. Latch is easily flipped open, but it will lock automatically whenever the shields are swung to their closed position.

as "feet." In mounting the frame, the two tubular braces are positioned so the bars remain perpendicular to the baseboard.

The saw is attached to the frame with short 10-24 bolts, lock washers and nuts. It is positioned so its lower tip clears the metal angle by approximately $\frac{1}{8}$ in.

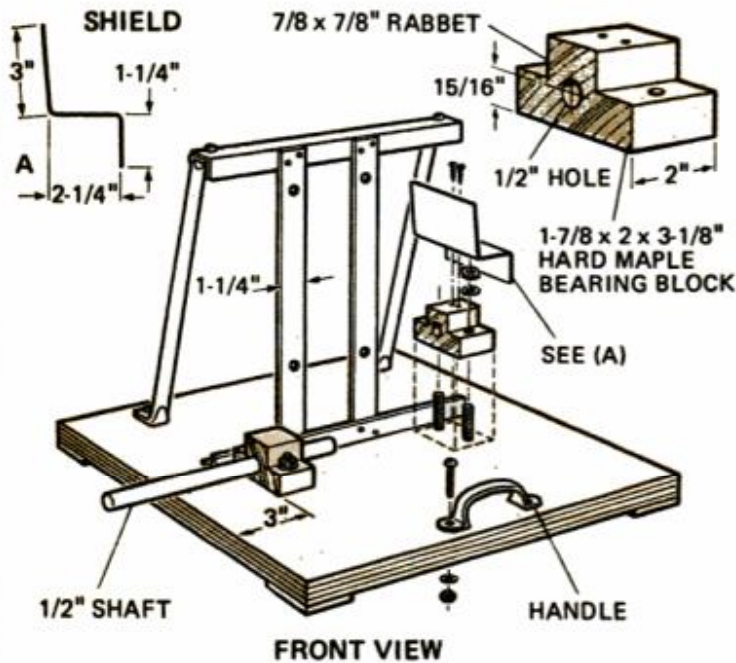
The swinging workholder is made by bolting together two thicknesses of $\frac{3}{4}$ -in. plywood. Dimensions are not particularly critical so long as the assembly can be swung without binding against the baseboard, and

the V-groove for holding workpieces is at approximately the same height above the baseboard as the center of the abrasive blade.

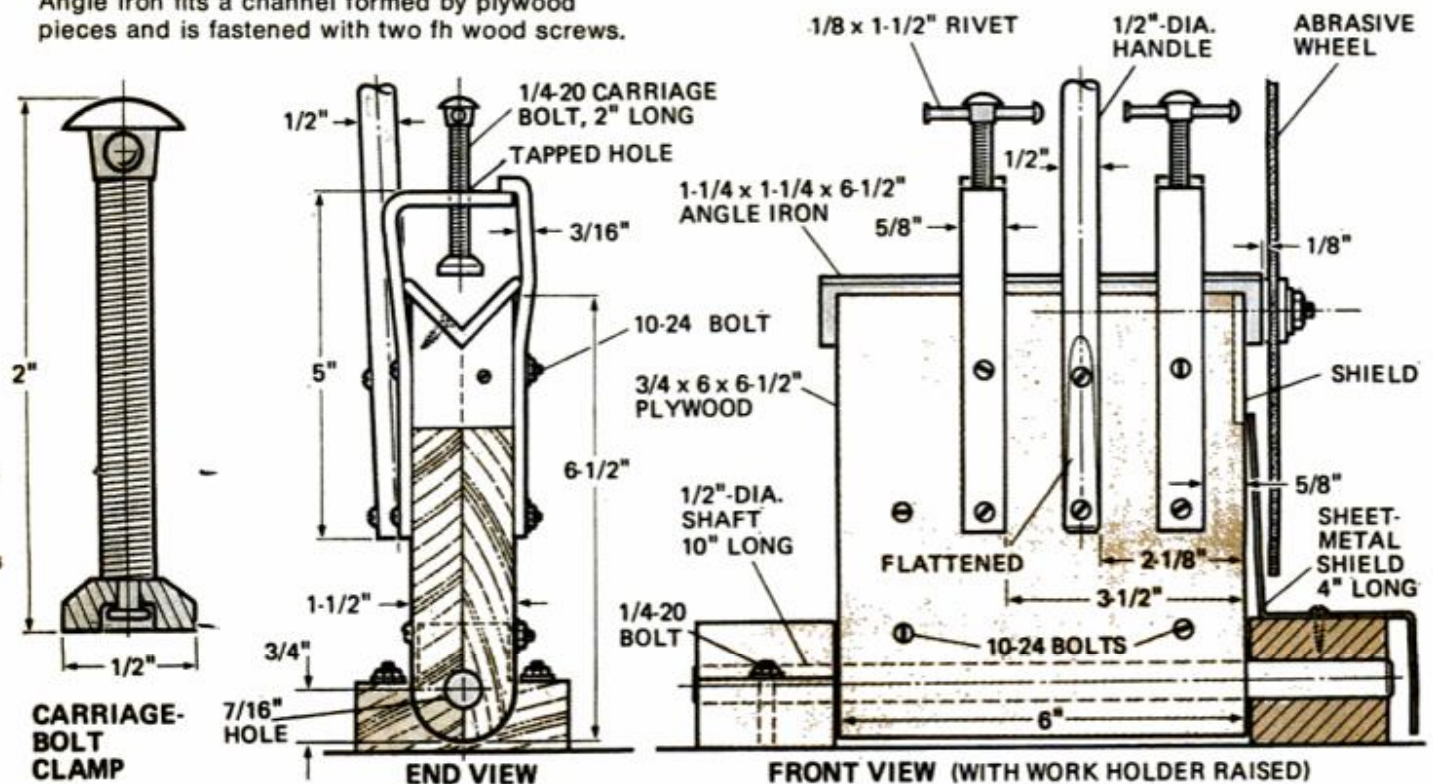
The workholder pivots on a $\frac{1}{2}$ x 10-in. steel shaft extending between two identical pillow blocks. A V-shaped channel, in which a piece of angle iron measuring $1\frac{1}{4}$ x $1\frac{1}{4}$ x $6\frac{1}{2}$ in. is secured, is formed by the two 45° plywood edges. Centered $\frac{3}{4}$ in. up from the bottom edge is a $\frac{1}{2}$ -in. hole for the shaft. This hole can be formed by roughing a near-semicircular groove in each plywood half on a circular saw and finishing it with a gouge and rasp. The finished groove is a little less than $\frac{1}{4}$ in. deep.

Shaft ends rest in holes bored in the pillow blocks and should be a rather tight fit. If you adjust the two lower bolts that pass through the plywood halves, friction can be maintained and all play eliminated. The shaft grooves are coated lightly with grease. In mounting the pillow blocks, holes were made oversize so the blocks could be shifted to eliminate end play of the workholder and to align the angle-iron channel with the saw blade.

Two screw clamps, made and installed as shown, secure work in the channel of the swinging workholder. Both clamps are bent to an L-shape from $\frac{3}{16}$ x $\frac{5}{8}$ -in. steel bar stock; and the clamp nearest the wheel is further stiffened by a "hook" made from



Holddown clamps (below) are made from steel strips and attached with $\frac{1}{4}$ -20 x 2-in. carriage bolts. Angle iron fits a channel formed by plywood pieces and is fastened with two fh wood screws.



similar material. This hook prevents the clamp screw from springing upward when tightened. Ideally, both clamps should completely encircle the V-channel as shown.

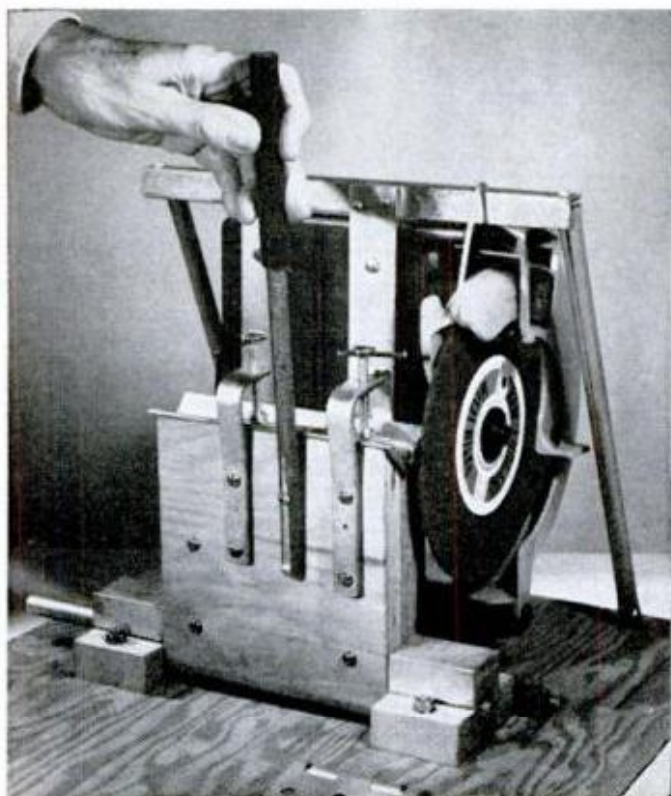
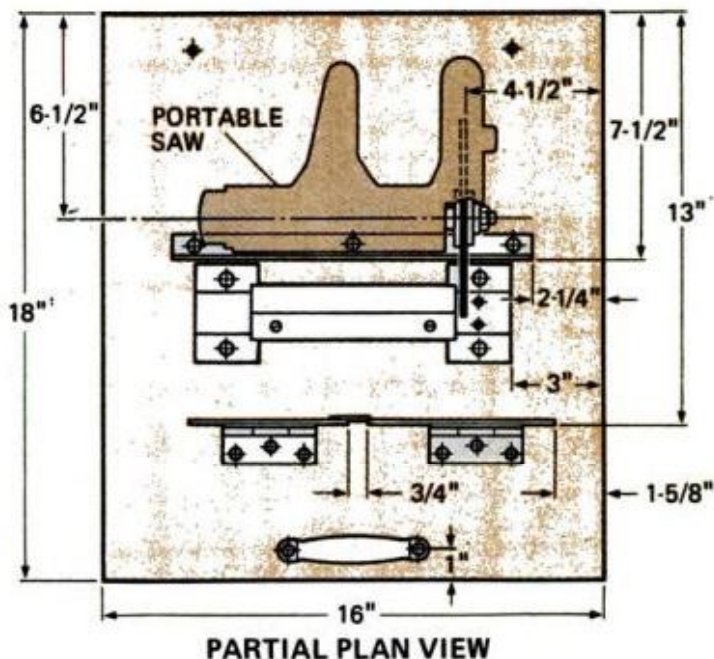
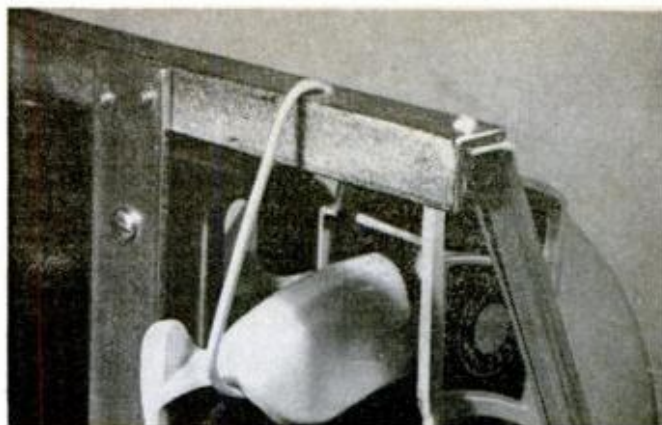
The clamp screws are made from $\frac{1}{4}$ -20 x 2-in. carriage bolts. The bolt tips are fitted with loose collars like those on conventional C-clamps. The collars are lathe-turned and the bolt ends turned down to fit loosely in the collar holes, after which the ends are peened over with the aid of a punch. The cross handles, extending through holes drilled just below the bolt heads, are $\frac{1}{8}$ x $1\frac{1}{2}$ -in. rivets.

The handle, which is attached near the middle of the workholder, is a 12-in. length of $\frac{1}{2}$ -in. steel rod, somewhat flattened at the lower end where two bolts are used to fasten it to the wood workholder. I added a length of plastic tubing to the end to provide a grip.

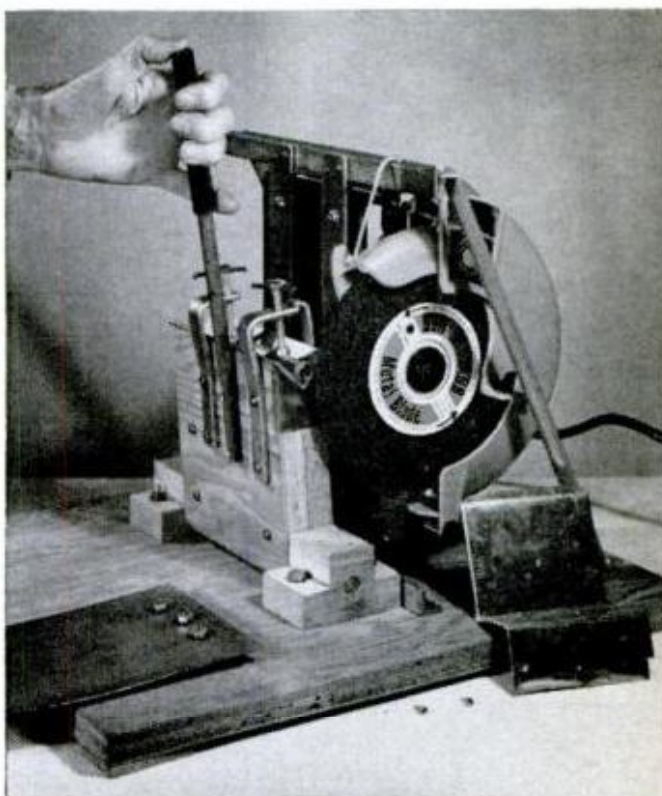
Shields made from heavy-gauge sheet steel help to protect against possible breakage, and against flying sparks and particles produced by the grinding operation. The curved front shield is 5 in. wide and positioned to be approximately centered with

(Please turn to page 169)

Bent wire holds spring-fitted guard of the circular saw partially open (see photo above, right) to expose the saw blade to the work being cut.

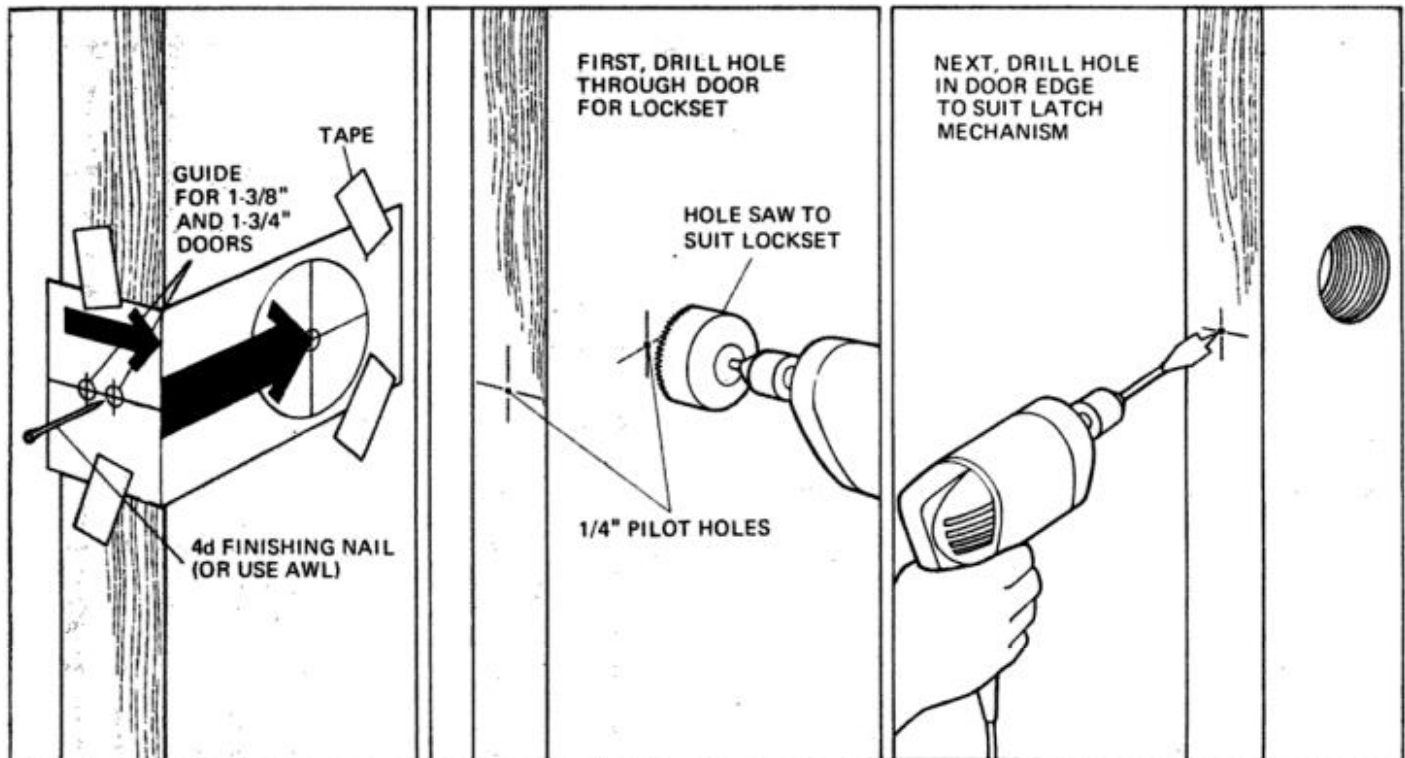


Pillow blocks are mounted to position the shaft so that the work-holding assembly will clear the blade. Hinge is for one of the curved front shields.



Swinging workholder must position the workpiece perpendicular to the side of the abrasive blade if you are to be sure of obtaining a square cut.

How to install a fast-set door lock

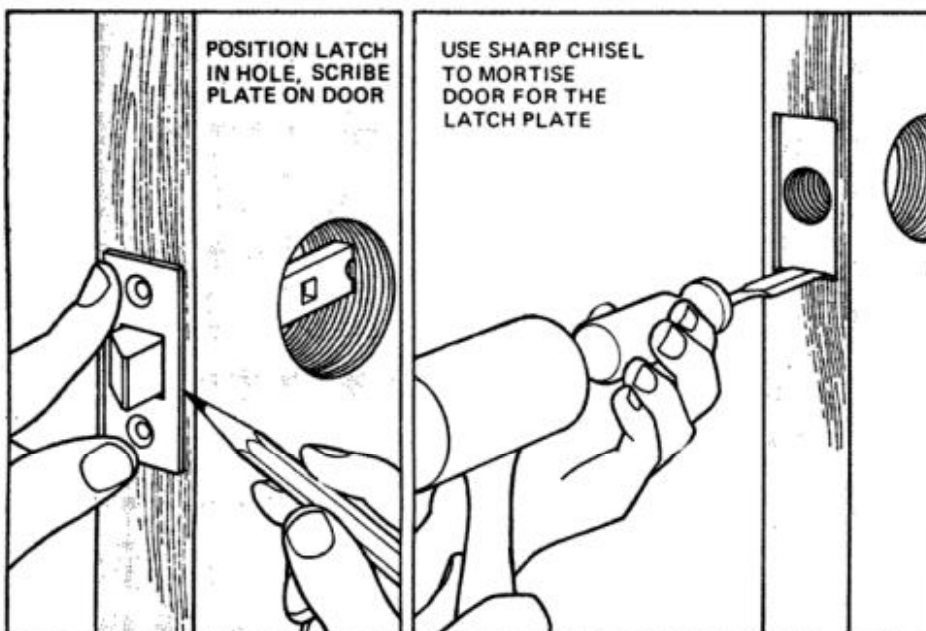


Locate the holes for the lockset

The job starts by lining up the template (packed with the lockset or on inside of the box) with the door edge as in the drawing at left. Standard door-knob distance from floor is 36 to 38 in. Tape the template so it cannot shift, then drill $\frac{1}{4}$ -in. pilot holes in door face and edge. Remove template and, using a hole saw to suit diameter of the lock you've bought, bore the large hole through door. The best

hole-saw technique is to drill halfway through from each side; while holding the drill at right angles—in both planes—to the door surface. Then, using a spade bit of a diameter to suit the latch mechanism, drill a hole in the edge for the latch.

To keep the door from moving while drilling, you simply wedge a pair of undercourse shingles under the door.



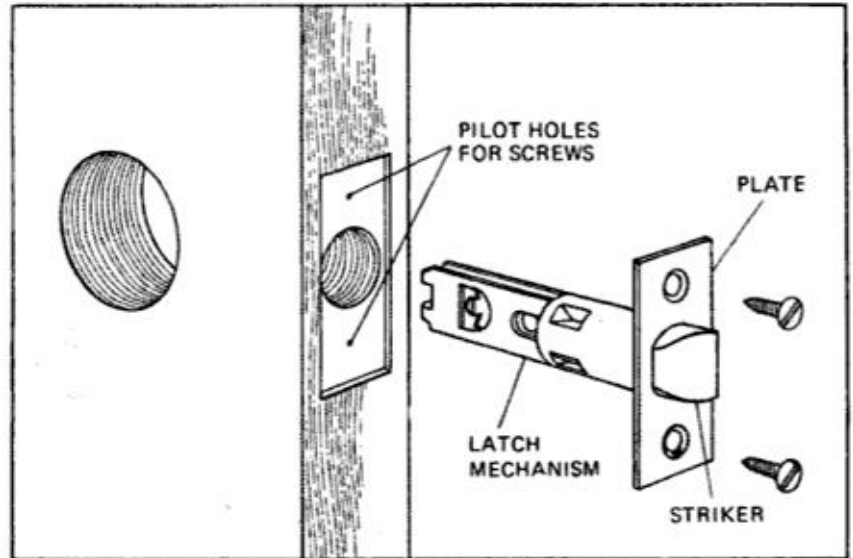
Mortise for latch

Test-fit the latch mechanism in the hole you have just bored in the door edge; it should slide in and out freely without binding. Insert the latch in the door, firmly hold the plate against door edge and draw a pencil line around the plate. With a utility knife, score this pencil line. (This acts as a safety guide when mortising with a chisel.) Finally, using a $\frac{3}{4}$ -in. chisel, remove the waste inside the mortise. *Caution:* When approaching the correct depth, avoid a too-deep mortise by stopping occasionally to check the mortise depth by inserting the latch.

Install latch mechanism

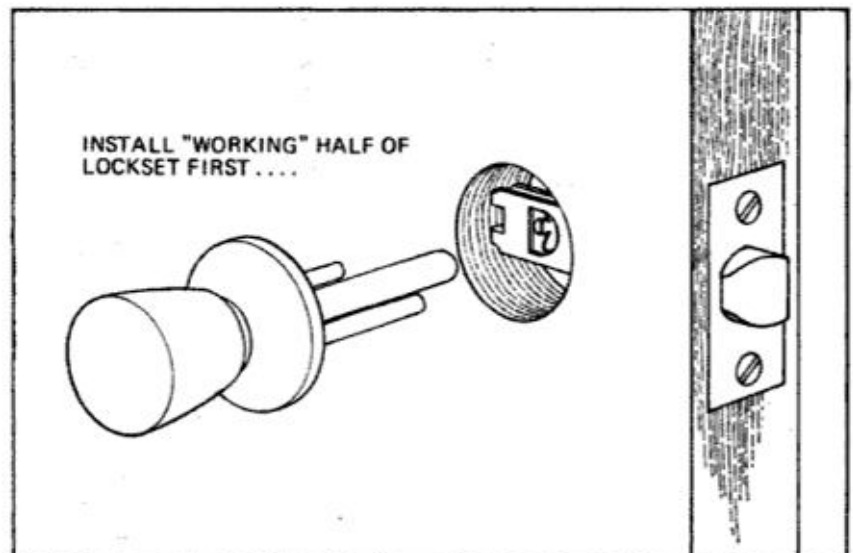
Latch plate must be absolutely flush with the door edge: If it's too deep the door may not stay closed; if not deep enough the plate or screwheads may keep the door from closing. When plate is flush with the edge, permanently install it with screws provided.

Push plate fully into mortise and, with an awl, make pilot holes for the screws. Install the flathead screws, turning them fully home. If the latch plate has a sloped surface, the slope should be toward direction of door closing. For smooth lockset operation, bar extending into the door must be at right angle to door edge.



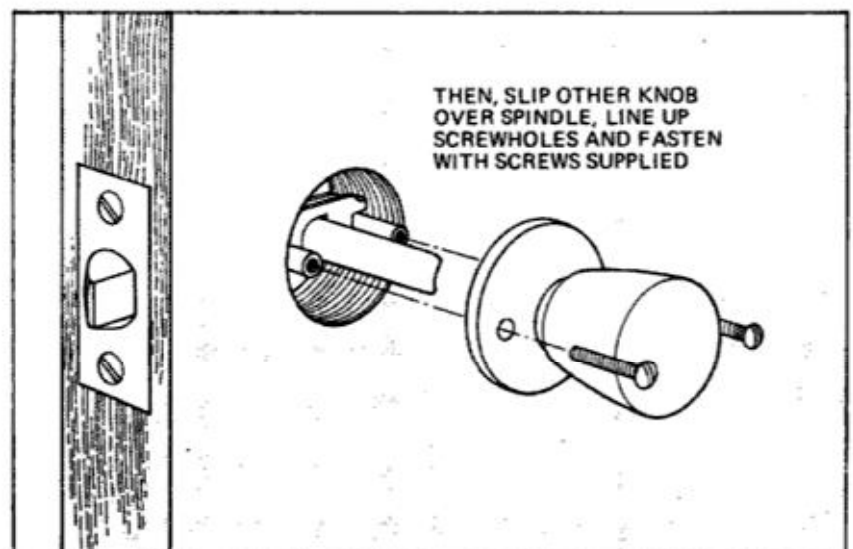
Exterior trim goes in next

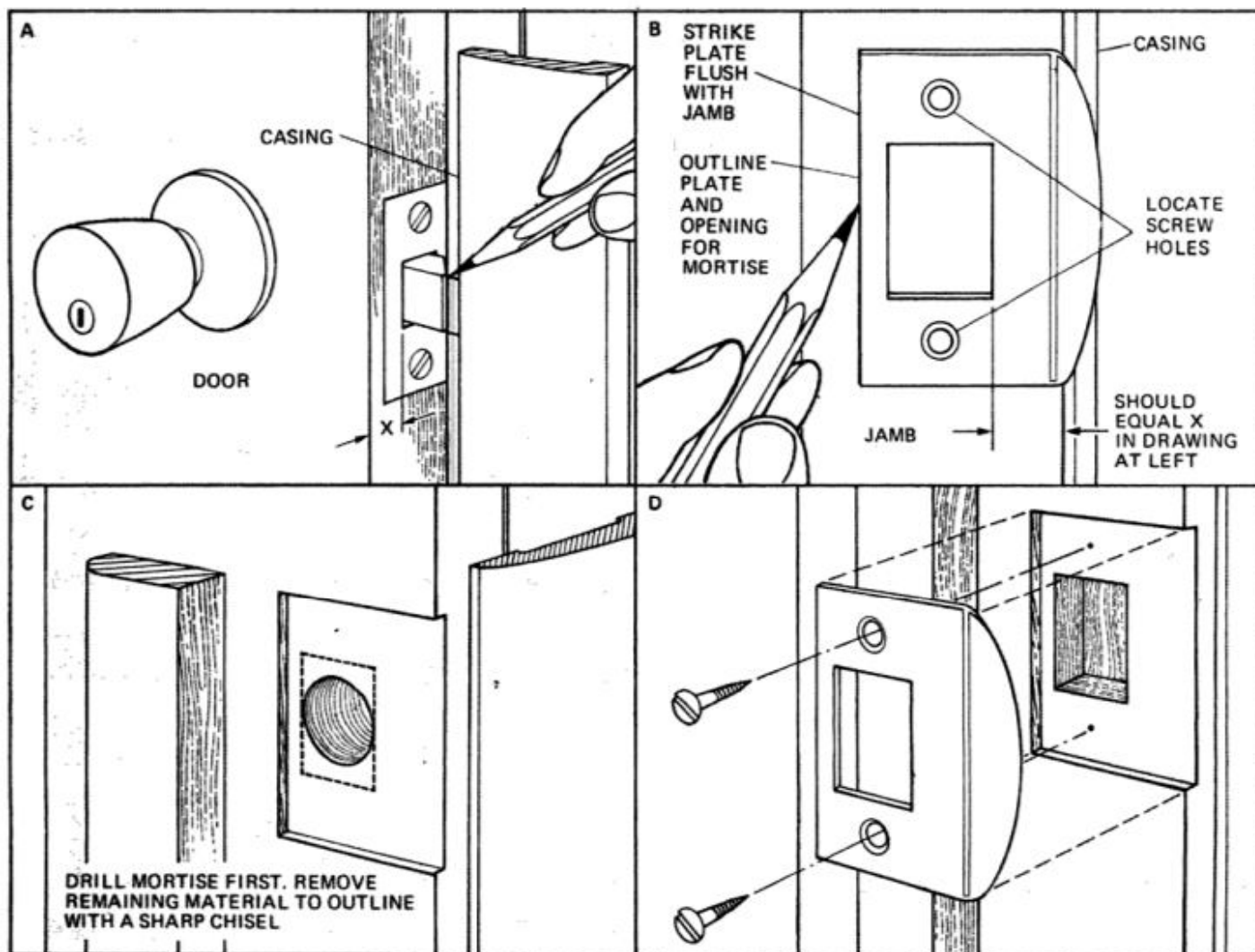
Next, install the exterior trim (knob with the tie rods) through appropriate holes in the latch. Tie rods should slide freely, not bind against latch or door. Important: If installing a lockset with a key, place lock so the keyhole is at bottom of the knob (in 6:00 o'clock position). This is particularly important in installations where the lock is exposed to the weather. Correct installation allows moisture to escape, instead of trapping it and damaging the lockset. Never insert the key into the lockset before the installation is complete; you could disturb the tumblers.



Finish lockset installation

Install interior mounting trim plate (rosette) over spindle and tie rods. On the lockset shown (there are several types of fast-set locks), the rosette is then rotated until holes in the rosette are centered over the tie rods. Hold both plates with one hand, insert lockset holding screws and catch the threads in the tie rods. Here, because the doorknob is usually partly in the way, it is best to use a slender-shank screwdriver to turn home the screws. Screws should be tightened until snug; not tightened with brute force, nor should they be so loose that the lock operates sloppily.





Locate striker plate on door jamb

To locate the exact position of the striker plate on the door jamb, close the door until the striker barely touches the jamb (drawing A above). Mark top and bottom of the striker on the jamb and open the door. Using a combination or try square, transfer these marks to face of the jamb—these are the horizontal marks that the opening in the striker plate must be located on.

Next, measure the distance from face of the door to the flat side of the striker in latch mechanism (dimension X in drawing A). The striker plate can then be precisely located as shown in drawing B. Horizontal edges of striker-plate opening are positioned on marks scribed on jamb earlier; vertical edge (of opening) nearest door is set back from edge of jamb to equal dimension X.

When satisfied that the striker-plate position is accurate, use a pencil to scribe lines for the plate mortise cut. Score the outline with a utility knife and chisel the mortise. After mortising the jamb so the striker-plate face is flush with the jamb, hold

the plate in position in the mortise and mark for the striker mortise (dotted rectangle in drawing C) and screw pilot holes. Using an appropriate-size spade bit (usually $\frac{3}{4}$ in. dia), bore a hole in center of the mortise area (indicated by circle in drawing C). It is not necessary to drill completely through the jamb; just drill deep enough to fully accept striker. In most cases the bored hole will give satisfactory results, but for looks it is best to clean out this rectangle to the necessary depth using a chisel.

On many locksets, the edge of the striker plate toward the door is curved to such a degree that it will be necessary to remove additional material from the edge of the jamb near the door and, in some cases, the edge of the casing. You can do this with a chisel or pocketknife. Finally, position the plate and permanently install it using flathead screws provided. Open and close the door several times to check installation—be sure to stand on the hinge-pin side of the door in case the lock malfunctions. ★★★

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Velvetizing lets you add a colorful soft touch

The application of velvet by electrostatic action gives a new dimension to decorating.

by **Wayne C. Leckey**
HOME AND SHOP EDITOR

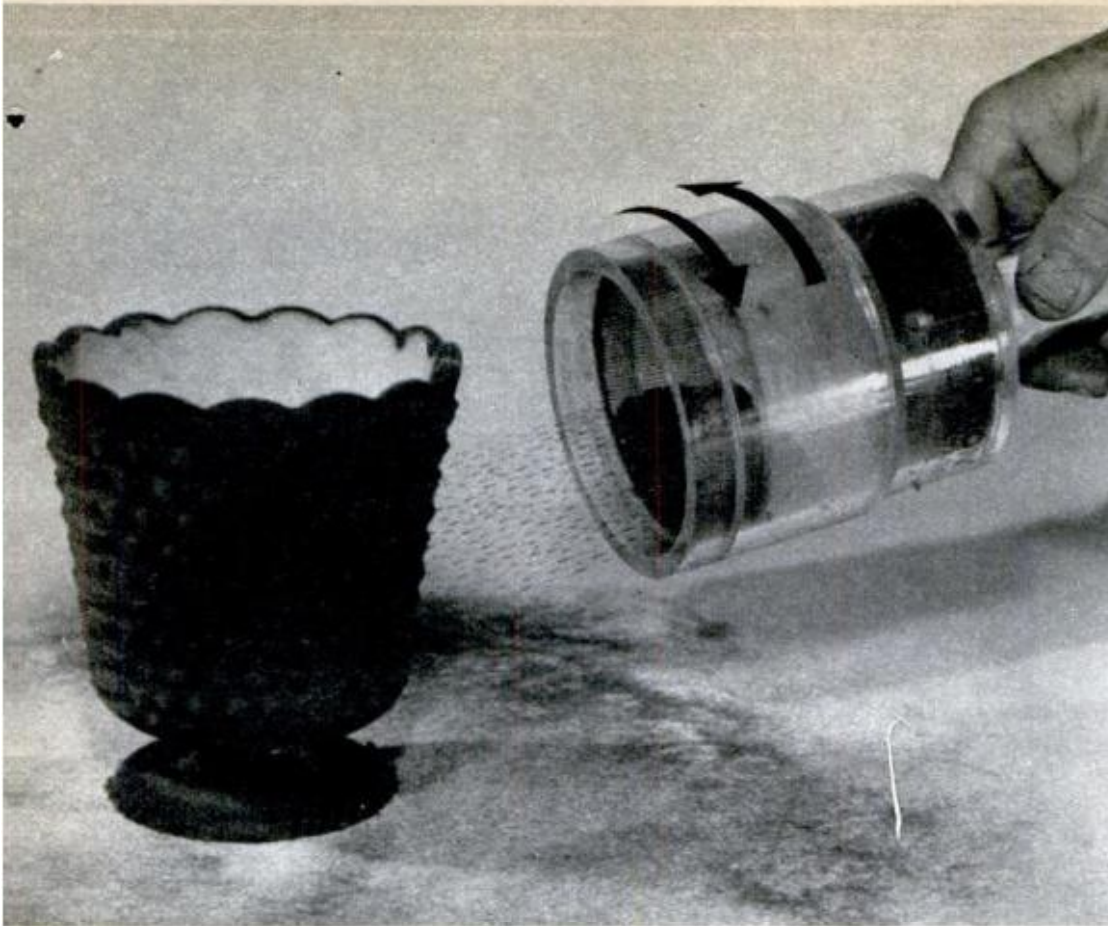
If you can picture a deep-pile coating of velvet being sprayed from a gun, you can begin to understand how a unique new decorating system called VelveTouch works. However, you don't use a regular spray gun, and the velvet fibers are not really sprayed—they're applied by a special gun called a

wand and the fibers are actually pulled from the wand, not blown.

The velvet fibers transform commonplace items into unusual ones, and you can velvetize practically anything whether it's made of wood, metal, plastic, glass, leather or fabric. A partial list of objects you can velvetize includes decoupage boxes, ceramic items, picture frames, bottles, lamp bases and shades, wall switch plates, glasses, T-shirts, plaques, lunch boxes, trinket-chest drawers, old toys, toilet seats, trays, Easter eggs, Christmas gifts—and countless others. You have a choice of 16 colors and three different kinds of fibers called velvet, glow and sparkle.

Application is unique, child-safe and mag-

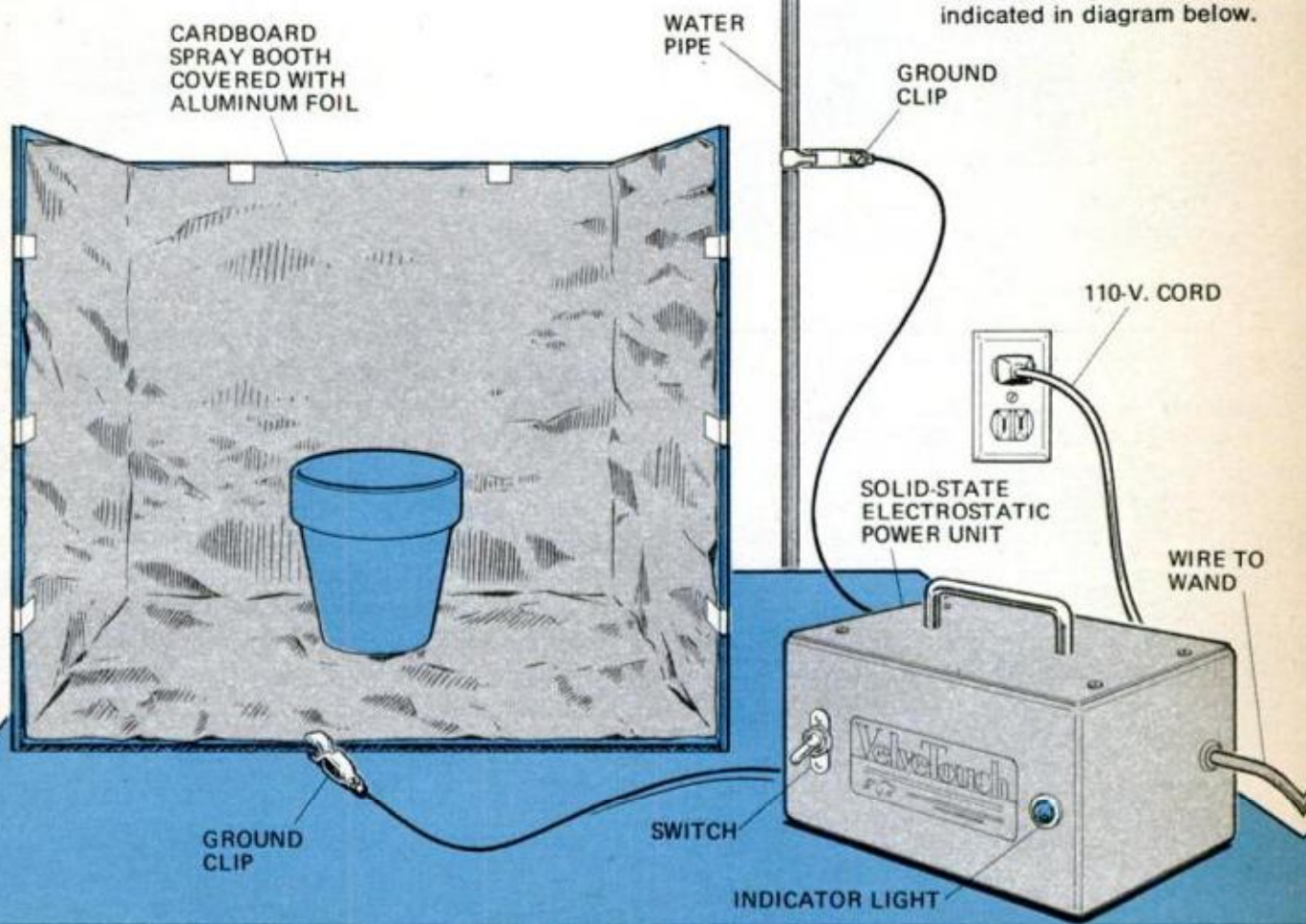




Grounded wand applicator is hand-held about 3 in. from object and rotated back and forth as it's aimed at adhesive-coated surface. Electrostatic action causes fibers to bombard surface and stand erect in adhesive, producing deep-pile texture which feels like velvet. It does not matter what position the wand is in; it velvetizes whether you hold it up, down or sideways.

To work properly, the system must be well grounded: Plug power unit into a grounded receptacle and also attach grounding clips to a water pipe and to adhesive coating. The latter is done by lining cardboard booth with aluminum foil and attaching clip to it as indicated in diagram below.

TYPICAL SPRAY SETUP





Basic hobby model (\$250) includes a solid-state power unit (7) and wand applicator (4). Materials (not part of basic unit) include solvents (1, 2) for adhesives (5, 6), and fibers (3) available in 16 different colors. Colorant, enough to color a 7-fl.-oz. jar of adhesive, is bagged with fibers. Unit is ideal for school use and as way to earn extra income at home. Power unit and applicator wand can be rented from some hobby stores.



A 1-oz. jar of colorant, packed with each 3½-oz. bag of fibers, is used to color the clear adhesive.

Adhesive is applied liberally to object with brush to create a deep bed for fibers. Avoid thin spots.

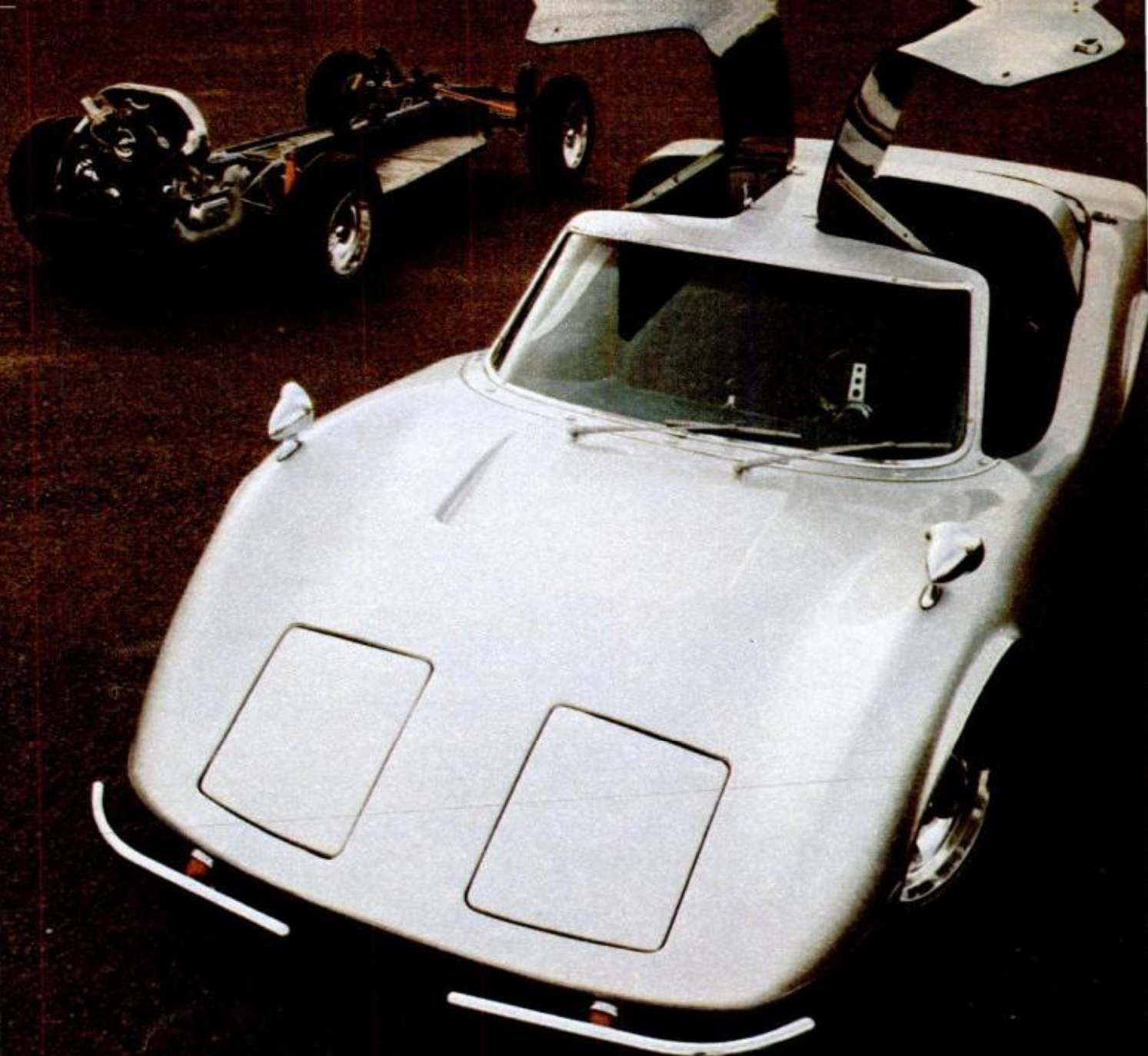


ically done by static electricity. The electrically charged, adhesive-coated surface attracts the velvet fibers like a magnet attracts steel filings, bedding and packing them perfectly erect in the adhesive to produce a thick-pile texture which looks and feels just like velvet.

When I first tried velvetizing I was fascinated watching the fibers sail mysteriously from the wand and bombard the adhesive-coated surface, and I was also surprised to find the technique so easy. As the instructions explain, the trick is to learn to spend two minutes or so more in wand work than your eye tells you since the electrostatic action can build an astonishingly dense nap as long as the adhesive remains "wet."

Basically, the technique is simple: You

(Please turn to page 170)



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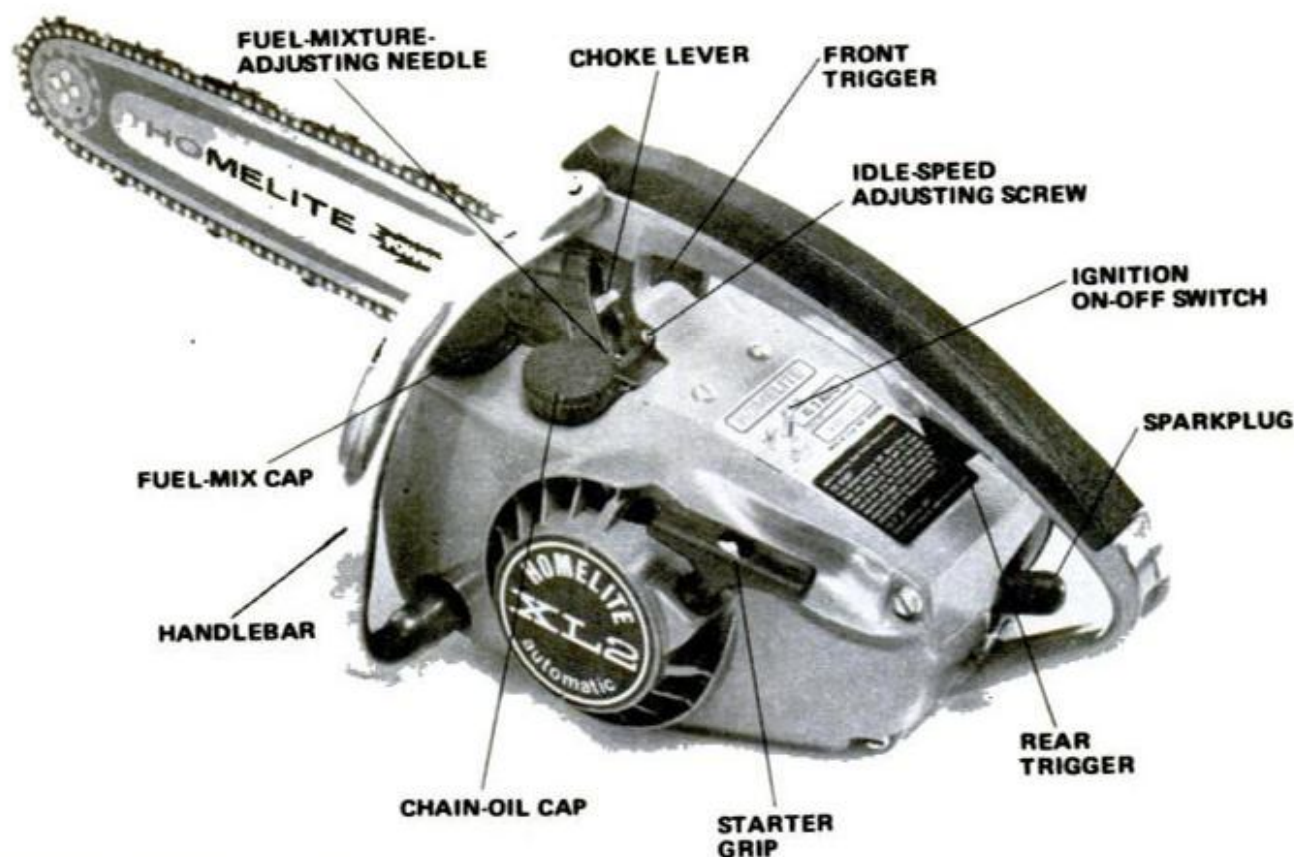
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New chain saw: Two triggers are better than one

PM tests Homelite's latest lightweight model and finds it rugged and reasonably priced. Two triggers simplify handling.



by Harry Wicks
WORKSHOP EDITOR

It makes my job easier when I test a new tool and find it not wanting in any of the areas in which the tool is supposed to deliver. That was my experience recently when putting the Homelite XL2 chain saw through its paces in my yard and workshop: It started quickly after each refueling, cut well and was easy on my arms and back.

Priced at \$120, the XL2 is compactly designed. Its 7-lb. weight (normal for saws of this price) is so distributed that it feels comfortable, even on first use.

Though you expect a high noise level in

a gas-operated tool (compared to an electric type), this one was reasonable for a chain saw. I had hoped to find an easier-to-fill oil-chain reservoir and gas tank but, apparently, those features still avoid the chain-saw scene. (Even though I use a funnel, I inevitably spill some of each liquid when filling the tool.)

I was curious about the new twin triggers, wondering if they were really useful or simply a gimmick to hypo sales. After 20 minutes of my initial work session (about six hours of log cutting), I had my answer: They did, indeed, serve a purpose.

The rear trigger is great when reaching up to limb a high branch, or when rocking

(Text continues on page 171; photos on page 164)

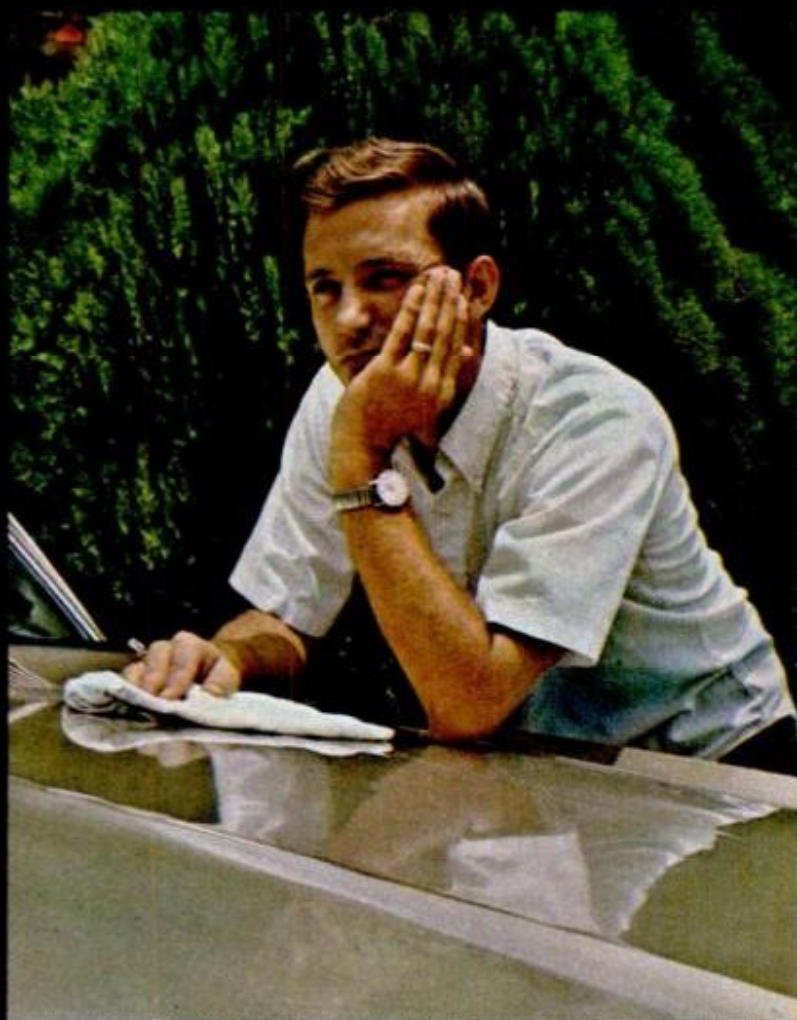
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1



1. The twin triggers on the throttle-control handle are located so user is comfortable regardless of stance when cutting.

2. Size makes XL2 particularly easy to handle during starting. Model shown started within two pulls every time.

3. Correct chain tension is obtained conventionally; nose bar is raised to support weight, then mounting nut is tightened.

4. Size of this tool makes it handy for cutting construction lumber (boards). Here it's used to make a diagonal cut on a 2x6.

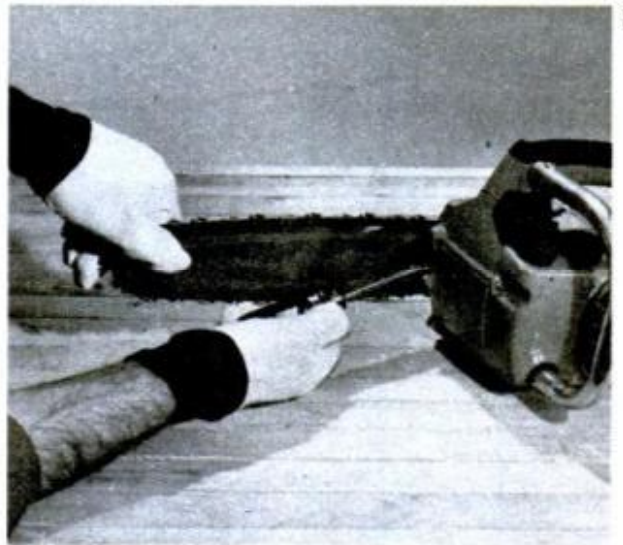
5. Power is good. Small-diameter limbs were cut quickly with very little effort. Tool's bite lets you handle bigger logs, too.

Author also used saw to cut 8 to 10-in.-diameter fireplace logs and found that its light weight made the tool a pleasure to handle over a long work session.

2



3



5

4



Photos: Robert D. Borst

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THE WIND SHIFTS TO WINDMILLS

(Continued from page 84)

but it's known that the Canadian forerunner delivered 1.3 hp in winds of 15 mph.

Two big problems face today's wind-power researchers. First, as mentioned earlier, there's the problem of storing the energy produced. Electrolyzing water is one proposed solution; another, to use the energy to pump water into an elevated lake, which then provides power to spin turbines for generating electricity when needed.

The second obstacle is the unpredictability of wind velocity. It can change by as much as 50 percent in a mere second. Commercial power flows in "waves" of 60 cycles per second, and all of our appliances are designed accordingly. An aerogenerator's rotor and blades have to spin at a constant speed in order to provide 60-cycle current. This is impossible because of changing windspeeds. The answer is to install a governor to maintain constant blade speed regardless of wind velocity. Several such devices have been designed and work well, but they're too expensive.

Here's how Henry Clews got around this problem: His windmills spin alternators—more efficient and longer lasting than generators—to produce a.c. This current is passed through a rectifier that converts it to d.c., which is stored in batteries. Battery current is then used to turn a d.c. motor, which in turn spins another alternator (at a constant rpm) to produce 60-cycle current.

Much research in wind generator development is being done at universities. At Oklahoma State University engineers are experimenting with a type of generator that reportedly doesn't require the rotor to move at a constant speed in order to produce 60-cycle a.c. power.

At the Brace Research Institute of McGill University, Montreal, researchers have developed small-scale wind energy systems that are being used in many parts of the world. A prototype installation, for example, is being used in Barbados to pump water. But the unit can also be used to generate electricity.

One man who thinks both small and big in relation to wind power is Philip Coulter, associate professor of mechanical engineering at Florida International University in Miami. He has designed a 3-kilowatt aerogenerator for use at a home site.

"Peak draw for homes today is 12 kilowatts," says Prof. Coulter. "If you want to go whole hog and run the entire system at 12 kilowatts, you'd simply put four 3-kilowatt windmills on the same tower." The only trouble with that is cost: Prof. Coulter estimates that one of his units would sell for \$10,000.

The professor also has drawn up plans for a network of windmills around the state of Florida for the production of electric power.

Private corporations are slowly beginning to lean toward the wind. Four utilities in Oregon are studying the feasibility of using aerogenerators for supplementary power. Boeing Vertol Co., a builder of helicopters, is studying windmill designs, and the Grumman Aerospace Corp. is testing a prototype that it hopes to sell to companies needing power at remote sites.

All in all, it looks as though the windmill is proving to be something more than a decoration on a box of Dutch chocolates.

If you want more information on wind power and small wind generators—or even want to buy a complete system—here are some sources:

- Solar Wind Co., Box 7, East Holden, Me. 04429. This is Henry Clews's company, and he sells everything from an information booklet (\$2) to complete systems costing over \$10,000. Lowest cost rig (\$565) is a 200-watt, 12-volt d.c. system, including storage batteries and a 10-foot tower.
- Brace Research Institute, McDonald College of McGill University, Ste. Anne de Bellevue 800, Quebec, Canada H9X 3M1. For a small fee, the Institute will send you a publications list (order number M. 17). One booklet, for example, contains specs for the Brace 1-hp airscrew windmill plus 15 assembly and 70 detail drawings. Order number T. 43.
- Sencenbaugh Wind Electric, Box 11174, Palo Alto, Calif., 94306.
- Real Gas and Electric Co., Main and Armstrong Sts., Guerneville, Calif. 54859.
- Mother Earth News, Box 70, Hendersonville, N.C. 28739.
- National Weather Records Center, U.S. Weather Bureau, Federal Building, Asheville, N.C. 28801. The Center supplies weather data for all parts of the country.
- Aircraft Components, Inc., North Shore Drive, Benton Harbor, Mich. 49022. This company sells wind-measuring equipment. A hand-held meter sells for \$5.95. ★★

SUPERFLYWHEEL

(Continued from page 127)

as that of a small flywheel in the control system of a B-70 bomber.

Having launched the superflywheel idea on the world, Rabenhorst continued studying materials suitable for the wheel, spinning them fast enough on a laboratory rig to make them fly apart. An ordinary flywheel shattering under such conditions would have exploded like a bomb, but, as Rabenhorst hoped, when filaments in his superflywheel fatigued and shattered, they were reduced to dust before reaching the simulated wall of a vacuum container. At worst, they scratched the wall but did not greatly distort it.

Failures were accompanied by sudden flashes of heat of several hundred degrees. But the heat was of such short duration it was clear that no special shielding would be needed, for example, to protect the occupants of a superflywheel-propelled vehicle.

Tests indicated that the stronger the material used in a superflywheel, the more completely and rapidly it would disintegrate on failure. But even if all fibers in a superflywheel were to fail at the same time, there would be no explosion. And if a superflywheel were made of fibers of varying lengths, the failure of one strand might not even upset the wheel's balance.

Chief characteristic of Rabenhorst's superflywheel is that it is made up of many filaments of material. In early experiments he tested violin strings and steel music wire as potential flywheel materials.

"One of the most exciting things about this project," Rabenhorst told *Popular Mechanics*, "is that it gets better as it goes along. A lot of materials that looked right for superflywheels back in '69 were then too expensive. Carbon fiber, for example, then cost about \$350 a pound. The price is way down now. The same is true of glass fibers and nylon variants."

Experiments with fibrous materials indicate some "old-fashioned" ones might prove useful. Tests show, for example, that many efficient flywheels could be made of wood or of that most versatile of the wood-like grasses—bamboo.

Though the superflywheel is still a laboratory phenomenon, high-speed flywheels made of new, stronger alloys are being used in practical applications. The New York subway system is running experimental trains with flywheel braking systems. In

braking, the system stores energy that would have been wasted in the form of heat. This energy is used as an assist in acceleration, thus cutting electrical consumption.

In San Francisco, experimental trolley-buses will be able to run miles beyond the trolley-line area by using flywheel-stored energy. The flywheel propulsion system, now being built by the Lockheed Missiles & Space Co., is equipped with a 1000-pound, 40-inch-diameter wheel. Made of high-strength steel, the wheel will spin at about 12,000 rpm, enabling it to store 10 times more energy than that of the Oerlikon bus. Like the wheel in the subway braking system, the flywheel of the trolley-bus will spin in a vacuum can to minimize air drag.

Another interesting application can be found in David Rabenhorst's laboratory.

"We have a flywheel in our computer set-up to keep the current flowing for a little over three seconds in the event we lose our main power," he explains. "It takes about three seconds for our emergency generator to cut in.

"I've calculated that if we were to replace that flywheel with a superflywheel storage system that would enable us to stop drawing main electricity during a few peak hours every day, we'd cut our annual electricity bill by \$350,000 a year—a lot more than it would cost for the installation." The idea, Rabenhorst says, is being considered. ★ ★ ★

PORTABLE SAW A CUTOFF MACHINE

(Continued from page 153)

the blade. Its lower end is attached to the baseboard with a butt hinge so the shield can be swung out of the way when mounting or removing work.

While the swinging workholder fills the space fairly well on the motor side of the blade, I added a second curved shield in front of the machine and mounted it alongside the first with a space of almost 1 in. in between for the workholder lever. The lower 6-in. portion of this gap is blocked by a sheet-metal strip riveted to the right-hand shield.

At the upper end of each shield is a self-locking latch which engages metal angle to hold it in closed position. The latches are so shaped so they cannot be disengaged by outward pressure against the shield. They must be lifted by a finger.

Another sheet-metal shield is bent to fit

(Please turn to page 170)

PORTABLE SAW A CUTOFF MACHINE

(Continued from page 169)

over the pillow block beneath the abrasive blade to fend off sparks and grit. It extends upward between blade and workholder and overlaps a small metal shield nailed to the end of the workholder. Two wood screws fasten the pillow-block shield in place.

The side shield is at right angles to the curved shield and covers much of the side of the machine to intercept flying sparks and particles. Two notches in its lower edge engage 6-32 bolts that clamp it against a wooden strip fastened to the baseboard. The upper corner of the side shield is attached to the saw-supporting frame with an L-shaped bracket and bolt. An elongated opening permits long workpieces to pass through.

The machine is turned on and off by a foot switch. The switch in the saw handle is taped in the "on" position and all starting and stopping is controlled by the foot.

The portable saw I used has a pivoted guard that, if not restrained, covers too much of the blade in cutoff work. Hence I locked it partly open with a C-shaped wire hooked through a hole in the top metal angle.

A cutoff machine of this type is essentially a grinder, and grinders can throw out a lot of gritty dirt and voluminous sparks. So such a tool should not be used where it might cause trouble with other equipment or with personnel, or near easily ignitable material. No one should stand where, in the event of wheel breakage, flying pieces might cause injury. Children, especially, should be kept away. The machine should be checked frequently to determine whether all shields are in position and secured, and that other parts are functioning properly. The operator should wear approved safety goggles or a face mask, and a breathing mask (respirator) is recommended.

The saw speed in revolutions per minute should not exceed the recommended maximum rpm for the abrasive wheel used. Manufacturers of portable circular saws often include abrasive blades among the accessories. Abrasive blades thicker than regular saw blades may require a thinner inside washer.

During cutting, especially of sizable stock, it is a good idea to stop and examine the clamps frequently to make certain the workpiece remains held firmly. ★★★

VELVETIZING

(Continued from page 160)

first brush a colored adhesive on the object to be velvetized, fill the wand with fibers of the desired color, flip a switch and gently rotate the wand back and forth as you aim it at the surface. As a final step, the surface is "combed" with the wand by bringing it very close to the surface without touching. Any loose fibers which have not penetrated and adhered to the adhesive will return to the wand's cup.

When the velvetized object is left untouched and the adhesive has been allowed to dry thoroughly (usually overnight), the velvet coating is exceptionally durable, even scrubbable.

There are three kinds of adhesive—multi-purpose, super and fabric—and the one you want is dictated by the size of the object and fibers being used. Fabric adhesive creates a soft glue bed without stiffness. Multi-purpose provides a relatively short working period of 20 minutes, a period in which the adhesive effectively accepts the fibers and assures good coverage. The slower-drying super (epoxy) adhesive provides 90 minutes of working time and is used where the area to be covered is extensive and thus requires more time to velvetize before the adhesive dries.

All adhesives are clear and, except for the fabric adhesive, require the addition of a colorant in order to tone them to the approximate shade of the fibers to assure good hiding.

There are several ways to establish a ground for the electrostatic process. A metal-top table makes a good surface to work on. If you are working with a cardboard booth, you can make a good grounding surface by lining the walls and floor of it with aluminum foil.

If the object should be made of a material that resists grounding such as unfinished wood or some plastics, you may ground directly into the wet adhesive by inserting a needle or hat pin and attaching the ground-wire clip to it. The pin is moved around during application.

Some small objects may be grounded for velvetizing simply by holding them in your hand and lightly touching a thumb or a fingertip to the wet adhesive.

For additional information about Velvet-Touch, write American Art Clav Co., Inc., Box 68163, Indianapolis, Ind. 46268. ★★★

DANGER: NOISE AT WORK

(Continued from page 145)

time, giving your ears a chance to rest in between. Keep your hi-fi volume down to a reasonable level. Despite what some buffs think, it is possible to enjoy music without its shaking the house. Studies show that one hour's listening at 95 dbA is about the maximum safe limit. And if you want to know how loud 95 dbA is, use this simple rule of thumb: If you have to raise your voice to be heard at normal conversational range, the sound around you is at least 95 decibels. If you shout and can't be heard, the level is considerably higher—well up into the danger zone.

The other thing you can do is wear ear protectors. Except in a few cases where such devices would not be practical or legal—such as when driving a car—ear protectors offer a safe, easy, inexpensive way to safeguard your hearing. These come in two basic types—plugs that fit into your ears and muffs that go over your ears. The muff type—which look like headphones without wires—go on and off quickly, can be passed around among various members of the family, and are highly effective, reducing noise impact by up to 40 decibels. Their only disadvantage is that they may be a bit bulky and conspicuous. You might not want to wear them walking down the street, but around the yard, on the shooting range and out on the trail they're fine.

Ear plugs are tiny and inconspicuous, but take longer to insert and remove and are more personal, like a toothbrush or hair comb—you can't share them with others. If you choose plugs, be sure to get the type designed specifically for protection against noise—not the simple drugstore kind sold to keep water out of your ears when swimming. Also, some types of plugs must be specially fitted and worn only when prescribed by a hearing specialist.

Ear protectors are available at sporting goods stores, medical supply houses and hearing-aid outlets. Prices range from a few dollars for plugs up to about \$20 for muffs. If you're exposed to a particular type of noise regularly, such as on your job, it's wise to consult an ear specialist. Whatever the type, ear protectors are your best insurance against a hearing loss you can't even hear coming. Remember, any noise that sounds "deafening," probably is—literally. ★★★

HOMELITE'S NEW CHAIN SAW

(Continued from page 164)

the saw over toward the far side of a log cradled in a sawbuck. The front trigger earns its spot on the handle when you have to position yourself close to the workpiece, or want maximum control (such as when carving logs with the nose).

On all chain saws it is necessary to oil the chain periodically to keep it from dulling too fast. Model XL2 does this task automatically and saves your thumb. You must, of course, stop every so often to refill the chain-oil reservoir. ★★★



Either trigger can be used, depending upon stance. Use of rear trigger here is easier on right arm.

Model XL2 chain saw specifications

Engine: 2-cycle type with twin trigger-control system
Weight (dry): 7 lbs., 3 oz.
Operating speed: 7000-8000 rpm
Idle-speed range: 2900-3200 rpm
Bearings: roller bearings throughout
Starter: Rewind, nylon rope, one-piece pulley
Clutch: one-piece ductile iron, centrifugal
Ignition system: breaker point, magneto
Chain-oil capacity: 6.1 U.S. fl. oz.
Fuel-tank capacity: 8.45 U.S. fl. oz.
Recommended gas: regular or low lead, 85-100 octane
Continuous operating per filling: 15 minutes
Guide bar, 12-in. hard nose
Chain speed (per 1000) rpm engine speed: 375 rpm
Price: \$119.95
Manufacturer: Homelite, Dept. PM, 70 Riverdale Ave., Port Chester, N.Y. 10573.

DRIVE IT INTO THE GROUND

(Continued from page 77)

260 hp, but needed half a day to get up to 100 mph. We didn't have acceleration, but we had everything else.

"There are two parts to every rally, the rough part with sand, mud, water, rocks and trees blocking your way. Then, there are the frightening sections with the same obstacles, but where the faster, car-breaking speeds are possible, and that's where we won. The Jeeps could go through faster than the usually fast, but more fragile, sports cars."

Durability is the reason for the Jeep success, Henderson explains. Most any good sports car can beat the Jeep on any given short period, but when the rally is long, especially three nights as is the P.O.R., the durability pays off "and we're usually around at the finish, when a lot of others have broken."

Four-wheel drive offers an advantage in the obvious ways, "but Quadra-Trac full-time four-wheel drive is what really puts it all together," Henderson explained. "It's a type of four-wheel drive so much superior to other makes."

Quadra-Trac is made up of three locking differentials, between the front and rear, with a transfer case in the middle. The power goes to the wheels which have the most adhesion at that moment, the most holding power, and which will be most effective.

"You can't even tell it to drive it," Gene said. "You can't make any mistakes. It does all the thinking for you."

Like the famed Granatelli turbine at Indianapolis, no one voiced any concern about four-wheel-drive advantage before the 1972 P.O.R., but after the commanding victory by Gene Henderson and his aviator navigator Ken Pogue, plus the third-place finish of teammates Erhardt Dahm and Jim Callon, the wails of anguish were heard across the ocean in the hallowed halls of the FIA in Paris.

"Ban the four-wheel drive!" was the cry from afar.

European rulemakers couldn't quite understand the problem. Four-wheel drive is not prevalent in their rally vehicles.

"The Americans make four-wheel drive, they want to ban them. So what? Okay." was the thinking. But the rulemakers left

a loophole big enough to drive a Jeep through—local option.

Last year, the P.O.R. officials decided not to avail themselves of the option to ban four-wheel drive, so Henderson/Pogue and Erhardt Dahm, now with navigator Tom Grimshaw, were back with their new Quadra-Trac Jeep Cherokees.

Four-wheel drive was not a factor, however, as both cars were out early the first day with problems in their newly-installed and untested engines.

This year, Henderson/Pogue and company are assembling a brand-new Jeep Cherokee. In 1973, they finished a close second for the inaugural SCCA Professional Rally Championship, close behind veteran Scott Harvey and Wayne Zitkus in a Dodge Colt.

In 1974, of the first six SCCA Pro Rallies, the Jeep won three and finished second in the others.

This year there is much sentiment to retain four-wheel drive as a permissible P.O.R. rally item, but it is not unanimous.

Scott Harvey, one-time outspoken opponent of four-wheel drive, is ready to go either way, preparing his Dodge Colt plus a new four-wheel-drive Dodge Ramcharger for the P.O.R. In fact, he has been racing a Ramcharger with four-wheel drive in the SCCA Pro Rallies and feels he is working out the bugs.

First it was "If you can't beat them, ban them"; now it seems to be "If you can't beat them, join them."

The 1973 rules specified local option, but the 1974 FIA rules don't mention four-wheel drive, yes, no or maybe.

So, P.O.R. officials, SCCA officials, ACCUS-FIA officials and contestants were waiting for a decision from Paris, as time was rapidly growing short, pointing out that FIA has already approved homologation of the Quadra-Trac Jeep Cherokee, and Chrysler had requested homologation of its four-wheel-drive Dodge Ramcharger. The Plymouth version is the Trail Duster.

In preparation for the P.O.R., weight is a problem with the Jeep Cherokee. Required minimum weight is 4300 pounds. The addition of roll bars, fire extinguishers, auxiliary fuel tanks and extra shock absorbers boosted the total to 5000 pounds.

Henderson did not want to increase the horsepower output dramatically for fear of overstressing the driveline.

Because the Cherokee is basically an off-

road vehicle, in the sports utility market, ground clearance is good.

"We have to beef up the suspension," Henderson said, "because these 5000-pound vehicles were never meant to fly three and four feet off the ground. Brake assemblies are beefed up, metallic linings installed, with metallic disc brakes on front. Silicone brake fluid is used, because of its high boiling point."

Brakes are from Lakewood Industries in Ohio. Henderson helped Dow develop the silicone fluid. "We had a high heat situation. Extreme heat. The brakes were so hot we were annealing the return springs. They were stretched out like bailing wire."

Special shock absorbers were developed by Monroe engineers. Goodyear tires and Champion sparkplugs are also sponsored items.

"When running a 1500-mile race, you can't have an engine in a high state of tune, because it won't stay that way," Henderson explained. "We run the AMC 360-cu.-in. engine and I imagine we're getting in the neighborhood of 300 hp.

"We find that beyond that you start losing torque characteristics. We need an engine with a large amount of flexibility because we run from 2000 rpm up to 6000. We have a camshaft that was designed for us."

Some 180 miles north of Detroit the second phase of the first day of Press On Regardless was 45 minutes underway. The rally had started shortly before noon on Belle Isle in Detroit, a municipal park out in the Detroit River. (Scott Harvey and others were campaigning, this year, to retain the traditional Detroit beginning, rather than move the entire event to the Upper Peninsula as planned for 1974. The proponents claim the Belle Isle start will insure the continued interest of the important Detroit newspapers, radio and television.)

At the rugged Sterling truck trail stage, the deep-throated roar of a well-tuned racing rally car could be heard in the distance, the roar ascending and descending as the driver gearshifted around the sharp turns, the switchbacks, through the deep ruts, deftly avoiding tree stumps and boulders, while scraping the branches and sometimes bark from the trees lining the narrow forest logging trail.

The leading car jounced into view on the

back road across the field. The Sterling truck trail was the fifth special competitive stage of the still-young rally, only 45 minutes into the first serious all-night grind through wind, rain, fog, snow, sleet, ice, mud and sand—not necessarily in that order.

The imported Ford Escort of John Buffum and William Potvin had been the leader at the first stage on Belle Isle and was still out in front 182 miles later.

Buffum snapped the steering wheel back and forth, tossed the rear end into a controlled slide around the sharp right turn, roared smoothly through the next speeding right, then the rear wheels threw mud at a cameraman as the car skidded sharp left and down the hill to an almost hairpin left, on to the hard-packed gravel of narrow Lucas Road, past the waiting checkers and scorers huddled in their parked cars, the heaters running to balance against the cold wind through the open windows.

Navigator Potvin leaped out, dashed back to the scorers, snatched the proffered timing slip, leaped back in the car, and away they went toward Chandra in Crawford County and the Thayer Creek special stage 57 miles and one hour and 12 minutes away.

This act was to be repeated here 77 more times (or take a few as cars dropped out) before the scorers moved on to their next assigned location.

Little did Buffum and Potvin imagine the thrills and crashes they were to experience within the next 36 hours. They continued to lead the 78-car starting field at the 7:20 p.m. meal stop at Mio and built their advantage to three minutes when they reached the Hayes Tower stage 381 miles from the start.

On that winding road, the steering locked, the Escort did a somersault and landed on its roof, wheels spinning. Before Buffum and Potvin had their safety harnesses unlatched, observers were rolling the little car back on its wheels and they were off and running again.

Soon, the steering failed a second time, off the road they shot and, as the sports-car people say, they "collected a tree," bashing in the right rear.

Dan LaGrow, a key member of the Henderson/Pogue Jeep team, was nearby, so he provided a socket wrench so the Escort's

(Please turn to page 174)

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DRIVE IT INTO THE GROUND

(Continued from page 173)

steering wheel could be rebolted in place.

In spite of their setbacks, the Buffum/Potvin team was running sixth at St. Ignace, the end of the first night's contest.

They had improved their standing to fifth at the second night's meal stop at Newberry, but a few miles later it was all over when the Escort rolled and crashed a third time at the Germfax truck trail stage.

A favored Canadian team of Pierre Cayer and Robin Edwardes took the hairpin turn at Sterling truck trail too fast and too wide, their little Datsun stopping abruptly with the right rear wheel deep in a drainage ditch. They winched out, and while still playing catch-up the second night, they bashed a right rear fender against a tree stump, then clobbered some trees with the left front, smashing one important headlight. By Saturday morning, end of the second night, they had rattled their way up to 17th position and were still running. So were 26 others.

The third and final night was almost a crusher for No. 13 Datsun. Cayer was running too fast, admittedly born of desperation, when the front wheels hit soft sand. The car skidded off the road, rocketed up a dirt embankment and then it crashed upside down.

The two men managed to right the car, get it back on the road, but they were so stunned they couldn't figure out which direction was forward.

The roof was crushed down to the roll bars, the rear window was gone, the frame bent and the rear axle so relocated the rear wheels were at least 12 inches out of line from the front pair. Regardless, they waited until the next car came by, then dropped in behind.

At every checkpoint, tired officials suddenly came awake as they blinked in amazement at this rolling wreck, held together with yards and yards of racers' silver tape, bailing wire and solid faith. The Cayer/Edwardes duo pressed on, regardless, scored 14th out of 21 finishers, just an hour and 40 minutes behind the winners.

Rallyists can't explain why they do it. There is little prize money involved. They talk about the challenge, their feeling for good automobiles—all clichés—and they sum it up with the biggest cliché of them all "Press On Regardless!"

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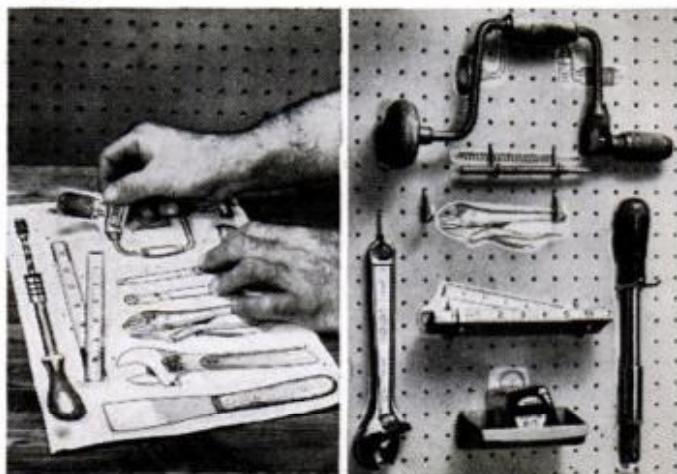
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Travel tote for rod and gun

Make this take-along from PVC pipe and safeguard your gear for under \$25.

by Bob Stearns

Custom case of PVC can protect one rod in two-inch diameter size or nearly 20 in a six-inch width. One end cap is cemented on permanently and the other secures with cable and padlock. Handle balances case.



What could spoil a trip faster than to arrive at some remote hunting or fishing hot spot and find your favorite rod or gun has been damaged along the way? A usable replacement might be impossible to locate.

Yet you can make your own custom-fitted lockable case for about \$25 or less. It's a small price to protect the valuable equipment you'll be carrying inside it.

Basic material of this easy-to-build tote is PVC pipe, an amazingly tough product used by the plumbing trade. It is readily available in many diameters and in lengths up to 20 feet. It also comes in a variety of wall thicknesses but the lightest, called "schedule 40," is more than sufficient. It's almost 1/4-inch thick, and you can stand on it without hurting it. The length you choose will depend on the longest item you plan to transport, but keep in mind that some

airlines may balk at containers over eight feet long as baggage.

PVC is sold by its inside diameter. If you plan to take a small rifle or shotgun, you might get by with five-inch diameter. Larger guns will need six-inch pipe. If only rods are carried, a size down to two inches will work well. To help you select, here is a schedule 40 chart with approximate costs and weights:

Diameter (in.)	Approximate Weight (lbs. per ft.)	Approximate Price (per ft.)	End Cap Price (each)
2	0.83	\$.67	\$.78
3	1.50	1.40	1.79
4	2.17	2.00	4.28
5	3.00	2.70	5.68
6	3.67	3.50	6.62

Most retail plumbing supply houses carry PVC. Use slip-on caps, not threaded ones. Prices may have risen since this writing.

Besides the pipe and two caps, you need a small container of PVC cement, rubber cement, one foot of $\frac{1}{8}$ to $\frac{3}{16}$ -inch steel cable, two brass sleeves to fit the cable, two adjustable stainless-steel hose clamps to fit around the pipe, a sturdy handle, heavy-duty eye strap and small padlock.

Assembly is easy. Try caps on both ends of PVC for the loosest fit. Rubber cement a circle of $\frac{1}{2}$ -inch or thicker foam plastic padding inside the tighter fitting cap and follow instructions on the PVC cement can to glue cap permanently on pipe.

With a small knife and very fine sandpaper, bevel the outside edge of the other end of the pipe and smooth inside the cap for an easy slip-fit. Make a small loop in one end of the steel cable, and secure it by slipping on a sleeve and hammering flat. Drill a hole slightly larger than the cable in the center of the removable cap. Feed free end of the cable through this hole and secure it inside with the other sleeve. With padlock hooked through the loop end of the cable and eye strap, the position to bolt the eye strap is determined.

Once the eye strap is bolted so the tight cable holds the cap in place, file down slots

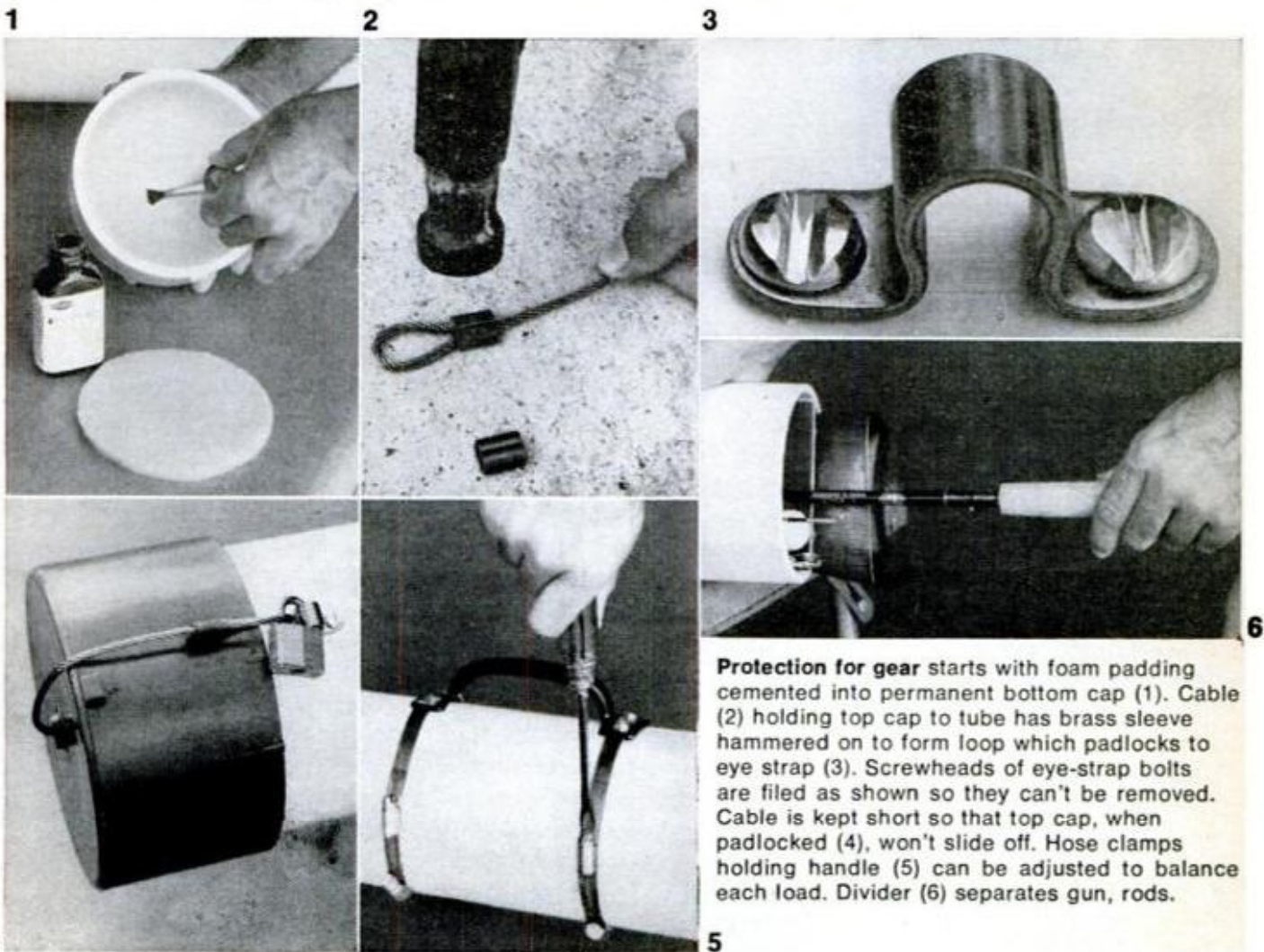
in bolts so a screwdriver can no longer get a bite to remove them.

Next, bolt an inexpensive but sturdy handle to the inside of the hose clamps, as shown in the photo. This provides a grip that can be loosened for moving along the length of the pipe to a place that is at the center of balance for every load.

When both gun and fishing rods are to be carried in the case, a piece of $\frac{1}{4}$ -inch plywood can be cut to fit the full length of the tube as a divider. Guns and rods should be kept in protective bags or wrapped with old towels and bundled tightly with masking tape, if necessary, to prevent rattling, movement or chafing.

The number of rods that can be carried is surprising. Unless you have spinning rods with very large guides, you can get up to four rods in a two-inch pipe case, a dozen in a four-inch tube, and eight or ten plus a shotgun in the six-incher.

And does the system work? My five-inch case has hauled 18 rods all over Africa and Central America, plus a lot of other places. I have yet to have a single guide get bent. That's over 35,000 miles without damage to a single rod! ★★★



Protection for gear starts with foam padding cemented into permanent bottom cap (1). Cable (2) holding top cap to tube has brass sleeve hammered on to form loop which padlocks to eye strap (3). Screwheads of eye-strap bolts are filed as shown so they can't be removed. Cable is kept short so that top cap, when padlocked (4), won't slide off. Hose clamps holding handle (5) can be adjusted to balance each load. Divider (6) separates gun, rods.

New little Konica makes even daylight flash easy



Backlighting (top) ends sun-in-the-eye squint, puts a glow on hair, but throws the face into shadow. Fill-in flash can balance the face with the background (above). This ordinarily complex job is easy with the little Konica Auto S3 outfit (top right), which also features automatic daylight and flash exposure, rangefinder focusing. In the black finish shown, the outfit is \$152; a chrome version is \$5 less expensive.



Konica's new \$110 Auto S3 compact rangefinder 35 not only gives you auto exposure with natural light or flash, but lets you use both at once for "fill-in flash" outdoors.

Pose your outdoor subjects with their backs to the sun, and you avoid sun-in-the-eye squint, while putting highlights in their hair—but now their shadowed faces and the sunlit background require two widely different exposures.

Fill in the shadowed face with flash, though, and both subject and background will be properly exposed—if you juggle your flash-to-subject distance and your shutter speed so that both the flash-lit and sunlit areas require the same f-stop. That can get a little tricky.

Konica's solution is a pair of needles in the finder: When the flashgun's plugged in, a meter needle shows what daylight exposure should be, and a bar linked to the flash system tells the flash exposure setting. Change shutter speeds or distance to bring needles together (or let the meter's needle rise a hair above the flash indicator, for more natural contrast), and you're ready to shoot. Shutter speeds are 1 to 1/500 second; apertures run from f/1.8 to f/16. A black finish is \$5 extra; the flash is \$37. ★★★

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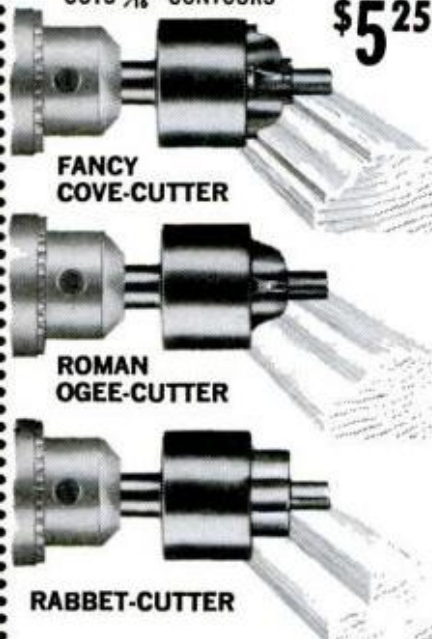
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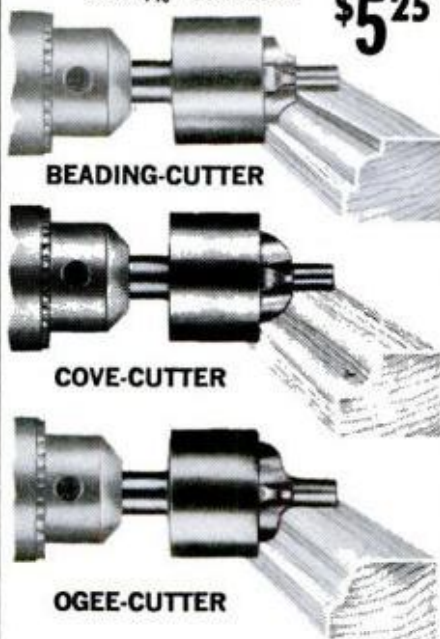
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NOVEMBER 1974

181



Cameras with light-signal readouts include (left to right) Fujica ST-801, \$430; automatic Fujica ST-901,

\$595; Nikon F2S, \$828; Alpha 11E1, \$999. Not shown are Yashica TL Electro-X, \$380, and Electro-AX, \$510.

New-camera meters don't give you the needle

by Ivan Berger
PHOTOGRAPHY EDITOR

Look into the viewfinder of any reflex camera above, and you won't see an exposure-meter needle, even though they all have meters. What you will see is pictured on page 184: Light-Emitting Diode indicators that tell whether your exposure's on or off the button. (The two Yashicas not shown do the same with ordinary bulbs.)

Light indicators are more rugged than needles, are easier to see in dim light, and give the same readings whether the camera's held vertically or horizontally (which unbalanced needles sometimes don't). And the readings they give are so precise that

they may shift if a subject changes his or her angle to the light just a few degrees.

At first, that seems too sensitive. Exposure changes of a fraction of a stop, that you might not notice or bother with as needle motions, stand out as alarmingly as indications of more exaggerated exposure errors do, especially on cameras with only under and overexposure arrows (exposure is correct when both arrows light). Soon, though, you realize that exposure's okay if one light glows and the other flickers.

The Fujica ST-901's meter is easiest to read: In automatic mode it shows in lighted numbers what shutter speed the meter has automatically selected. Since exposure will be automatically correct, whatever the meter reads, you need only follow it enough to be sure the shutter speed is appropriate for the shot's action. (If you control the shutter-speed manually, though, the meter gives no reading.)

The nonautomatic Fujica ST-801's meter, our second choice, shows how far you are from correct exposure, with a series of LED dots. The Nikon F2S showed shutter speed and f-stops, too, and seemed a bit easier to read than the Alpha's.

Cost is one drawback; it should come down as LEDs become commoner. ★★ ★

(Please turn to page 184)



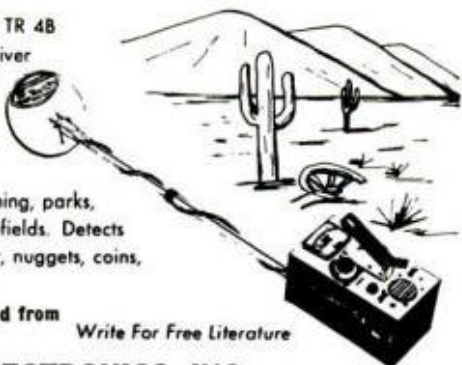
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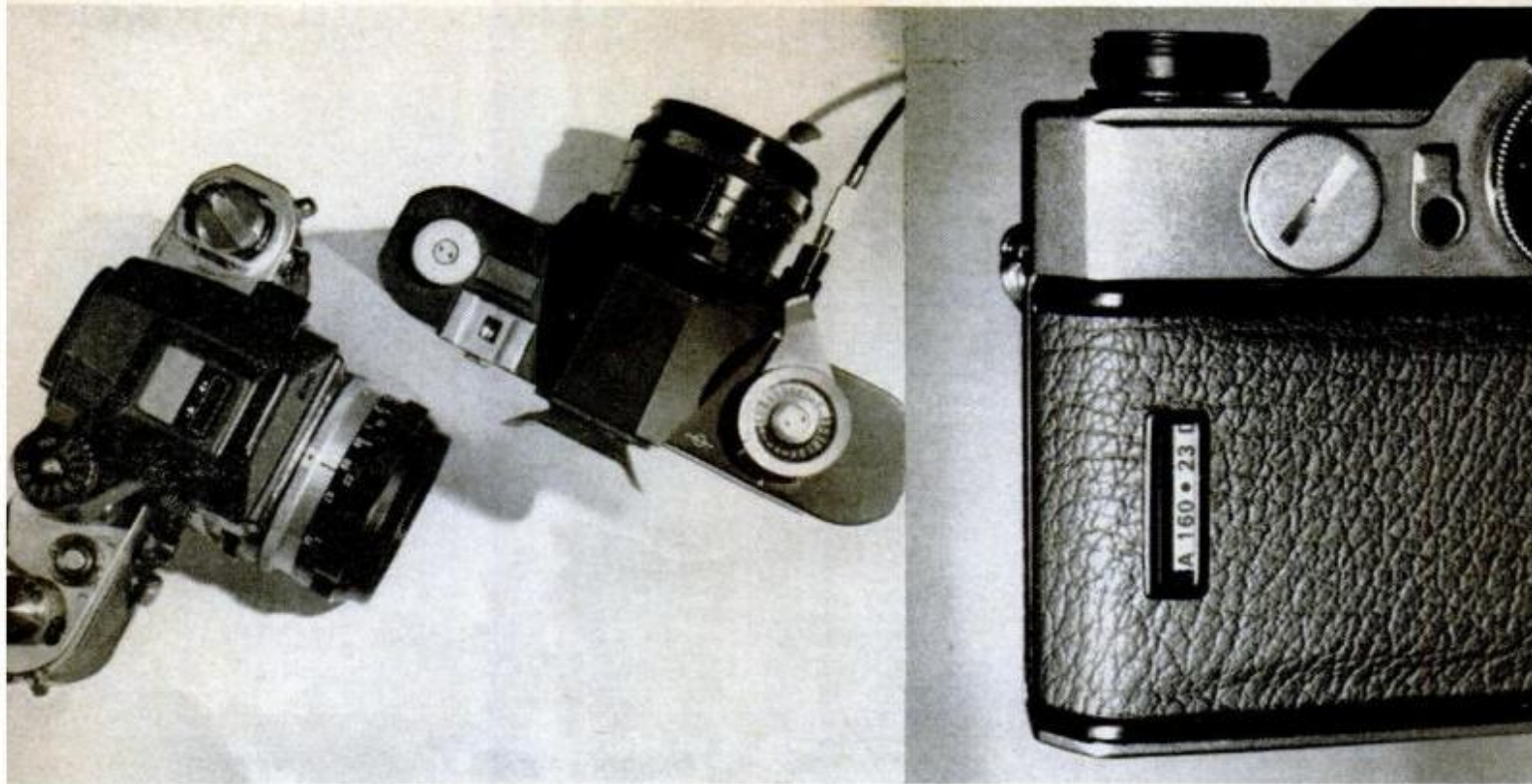


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Topside readouts on Nikon (left), Alpa (right) let you check exposure before raising camera to your eye.

Film-viewing window on Fujica 901 helps you check which film you've loaded; baffles prevent light leaks.



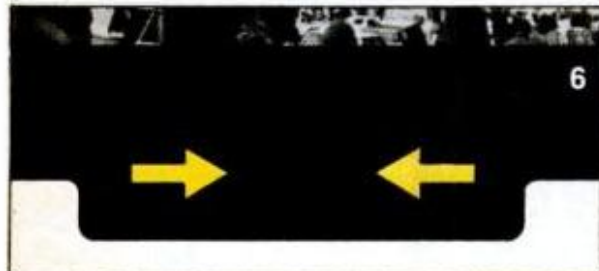
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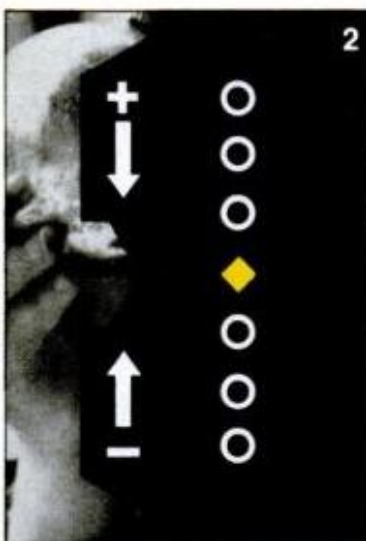
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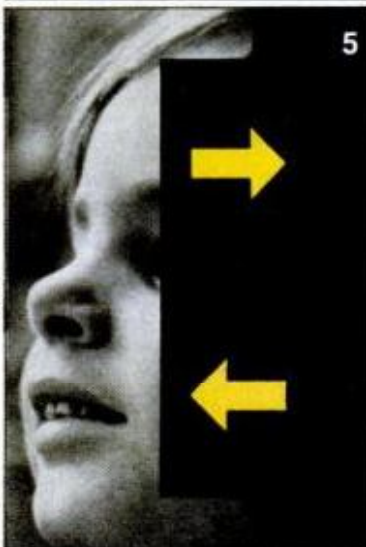
4



6



2



5

1. Fuji ST-901 automatically selects shutter speed and tells you what it is digitally.
2. Fujica ST-801 shows how far you're off, not just which way.
3. Nikon F23 has f-stop and shutter readings in addition to LED exposure arrows.
4. Alpa has red LED for overexposure, an overbright yellow one for underexposure.
5. Yashica TL Electro-X has dual arrows at right of screen.
6. Yashica Electro-AX has similar arrows below finder.

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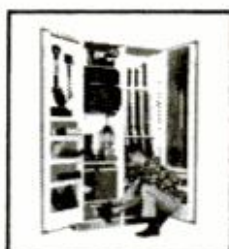
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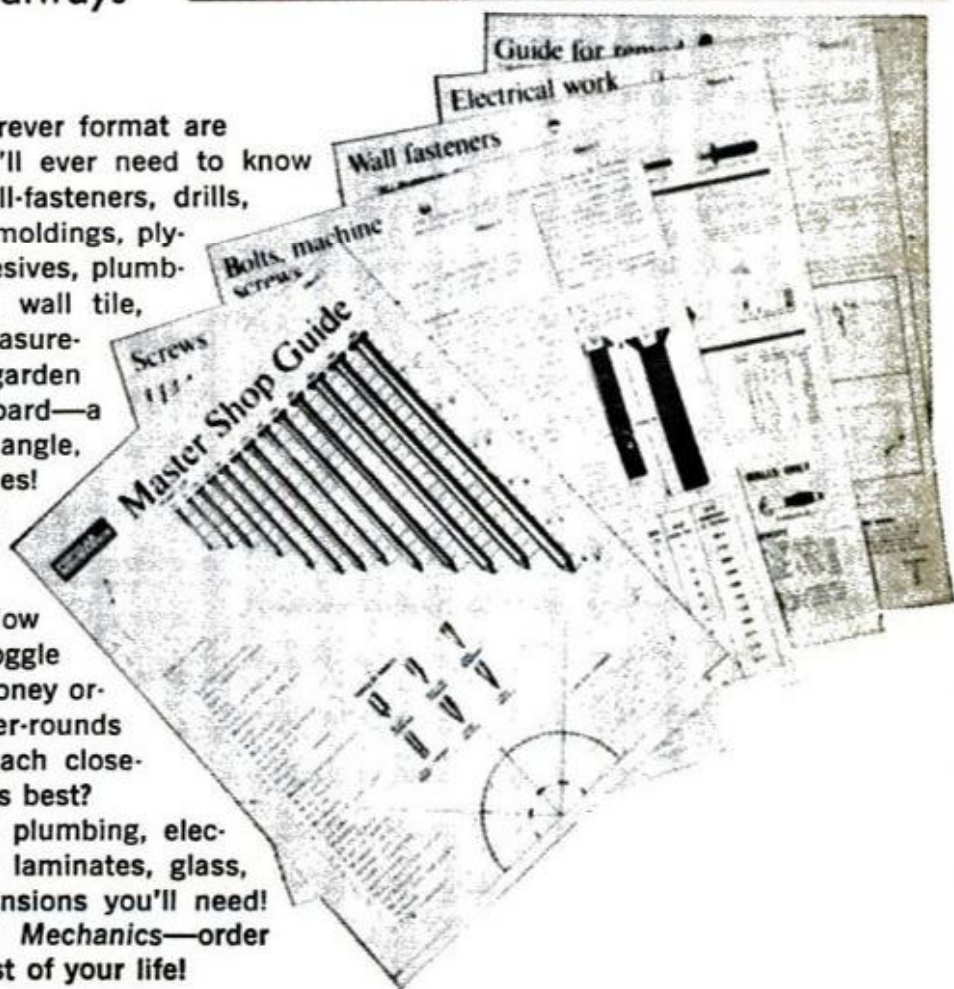
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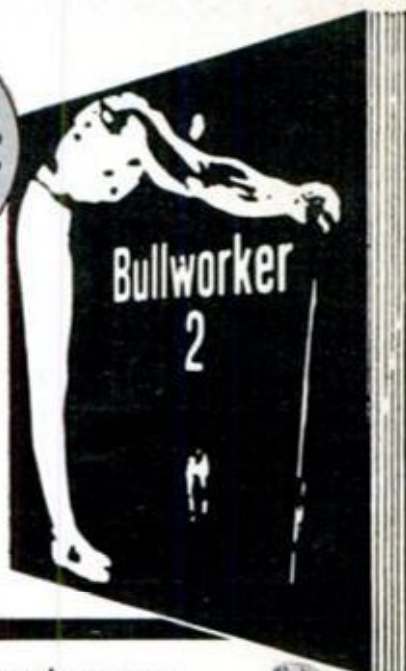


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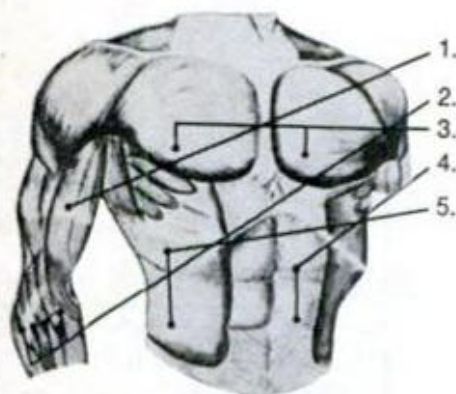
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(Continued on next page)

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197

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NEW SUPERSIGN SAVES LIVES. Giant 4' High Sign "**DANGER-STOPPED VEHICLE.**" Highly Visible. Printed Black and Red on Bright Yellow Heavy Gauge Plastic. Attaches instantly to all Cars, Trucks, Campers Station Wagons, etc. even in rain or brisk winds. Convenient Storage Pouch. Only \$3.98 plus .50¢ postage and handling, 2 for \$8.25 Ppd. Money Back Guarantee. Clairmont Sales, Box 314P, Uncasville, Conn. 06382.

BACKGAMMON! Well Known Authority reveals Secrets of Successful Play. Beginners and Advanced Players. \$1.50. Clairmont Sales, Box 314P, Uncasville, Conn. 06382.

MAGNETS. All Types. Specials-20 Disc, or 10 Bar, or Stick, or 8 assorted Magnets, \$1.00. Magnets, Box 192-A, Randallstown, Maryland 21133.

DON'T Die without a will! Blank Will form protects your family. Only \$2—guaranteed! Order today!! Sunriseco, 65 Ferry Street, Dept. B11, Hudson, NH 03051.

EMBLEMATIC Jewelry For Boating, Tennis, Cycling, Gliding, Sports, etc. Catalog \$1.00, Credited. Customcraft, 493 Main, Ventura CA 93001.

EMERGENCY Highway Kit Boldly says you need Help. Four Giant 16x23 inch Self-Sticking Pliable Posters. Guaranteed. \$2.95. New Products International, R.F.D. 3, Box 691, Anniston, Ala. 36201. Dept. C-10.

HOW TO PROTECT YOUR ESTATE! Make sure your family gets the **FULL 100%** and pay no inheritance taxes . . . all within 24 hours. Free details. Turner, 3425 S. 176th, Suite 125M, Seattle, Wash. 98188.

BURGLAR ALARMS & HOME PROTECTION

LOCKSMITHING Supplies—Buyers Guide \$1.00. Despubs, Box 22005H, Phoenix, Arizona 85028.

FREE Catalog on Burglar-fire Alarm Equipment. Protecto Alarm Sales, Box 357-D, Birch Run, Michigan 48415.

BURGLAR ALARM Easily mounted on Door or Window. Strong chain link discourages intruders . . . but if they persist, there is a loud piercing Alarm instantly. \$4.95. Alarm, P.O. Box 1948, Odessa, Texas 76760.

SECURITY! Home, Business. Illustrations, Methods, Details. \$2.00. Ernest, Box 6075, Albany, New York 12201.

LOCKSMITH—Materials Purchasing Information—\$1.00. Jem, 630 Lyle Ave., Haines City, Fla. 33844.

BUILD and Install your own Burglar alarms, easy step by step instructions \$2.50. B.B.A. 4738 W. Byron, Chicago, Ill. 60641.

DEPENDABLE Home Fire Alarm System Easily and inexpensively made. Plans, \$2.00. Empire Industries, Box 2153, Niagara Falls, NY 14301.

Unadorned power tools.



4' Wood Lathe at \$39.10

They do the same job as tools costing up to 5 times as much.

We skipped the chrome to save you money . . . but we did not skip anything on performance. Actually, we skipped more than just chrome, we cut out every costly frill that wasn't absolutely needed.

The lathe shown above isn't exactly flashy. We admit it. But in a recent article, Popular Science used it to demonstrate wood lathe technique and said: "You won't go wrong with this economical introduction to wood turning." It is typical of our tools which in spite of low prices, are full scale and offer full performance and precision.

HERE'S HOW WE DO IT . . . First, we don't claim our tools should sell for five times the price! Just that our tools do the same job . . . with the same accuracy, ease and speed . . . and will last at least as long. AMT tools cost less to make and are sold direct. They are bona fide quality power tools used by serious amateurs and professionals alike and if sold in retail stores would be much higher in price. We use no magic, let's be specific: **SIMPLICITY . . .** AMT tools are soundly engineered to eliminate every frill and gimmick—to minimize material and production costs. Machined parts are used only where they're needed. Unadorned cast iron and aluminum save you a fortune.

DIRECT-FROM-FACTORY SAVINGS . . . You save a bundle, yet, we offer a double guarantee backed by a 38-year-old company with millions of satisfied customers . . . and hundreds of orders pour in daily.

LARGE VOLUME . . . Our own foundry and large mass production facilities plus large buying power all work to keep costs down.

STANDARD PARTS . . . Our designs use standard hardware items wherever possible. By avoiding custom-made parts we pass on tremendous savings to you.

If you are looking for power tools that perform like units costing many times our low prices, order today and you'll be one step closer to many hours of woodworking satisfaction.

Bill Monte

POWER SAW 8" tilt arbor saw

...crosscuts, rips, mitres, cuts compound angles, dadoes, coves, moldings. Completely assembled with ground cast iron table, safety guard, splitter, mitre gauge. Less blade, motor. Rip fence for easier work alignment, \$4.50 add'l. Ball bearing model, \$7.50 add'l. Takes 1/3 h.p. motor or larger, standard blades, attachments. Wt. 26 lbs., f.o.b. factory



\$29.95



FREE OFFER, cabinet base plans, . . . with one piece of 3/4" plywood, convert your \$29.95 saw into a floor model with a huge 27" x 24" top. Takes cabinet rip fence, \$5.50 add'l.

TWO GUARANTEES

10-DAY MONEY BACK GUARANTEE
Try any of these power tools and compare it with any similar machine at any price. If not satisfied, return it for prompt, no questions asked refund. We pay the return shipping charges.

10-YR. FULL SERVICE GUARANTEE
Any part or parts of these AMT power tools (except motor which carries a one year guarantee) which become inoperative for any reason within ten years after purchase date will be repaired or replaced by the factory with no cost to the purchaser other than postage.

AMERICAN MACHINE & TOOL CO.
4th & Spring St., Royersford, Pa. 19468



Brand new electric motor developing full 1 h.p. 17 lbs. (Purchased separately, \$29.85). With any AMT machine here. **\$24.90**

BUY DIRECT
...USE THIS HANDY ORDER COUPON NOW

AMERICAN MACHINE & TOOL CO., Dept. PMN4 Royersford, Pa. 19468
Please send me the units checked. Payment in full enclosed \$_____ or \$5 deposit each item enclosed, balance C.O.D. I must be fully satisfied or will return unit within 10 days for full refund. No questions asked.

- | | |
|---|--|
| <input type="checkbox"/> 8" Power Saw at \$29.95 | <input type="checkbox"/> Jointer Planer at \$37.80 |
| <input type="checkbox"/> Standard Rip Fence at \$4.50 | <input type="checkbox"/> Ball Bearing Spindle at \$10.00 |
| <input type="checkbox"/> Long Cabinet Rip Fence at \$5.50 | <input type="checkbox"/> Wood Shaper Kit at \$25.95 |
| <input type="checkbox"/> Ball Bearing Spindle at \$7.50 | <input type="checkbox"/> Opt. Hold Down Assembly at \$3.95 |
| <input type="checkbox"/> Belt Sander at \$28.00 | <input type="checkbox"/> 6" Swing 3' Lathe at \$19.80 |
| <input type="checkbox"/> Disc Sander Attachment at \$7.95 | <input type="checkbox"/> 12" Swing 4' Lathe at \$39.10 |
| <input type="checkbox"/> Mitre Gauge for Sander at \$1.95 | <input type="checkbox"/> Face Plate \$2.50 (either Lathe) |
| <input type="checkbox"/> Drill Press at \$48.80 | <input type="checkbox"/> Turning Chisels \$6.95 (either Lathe) |
| G.E. Motor <input type="checkbox"/> \$24.90 (with other item) | <input type="checkbox"/> \$29.85 (purchased separately) |

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3' WOOD LATHE . . . 6" swing.

Same precision and speed as \$40 units. Sturdy cast iron with tubular steel bed. Lever action tail stock, two-speed pulley, fits any motor. Set of 3 high speed turning chisels, \$6.95 add'l. 4" face plate, \$2.50 add'l. 15 lbs., f.o.b. factory



\$19.80

4' WOOD LATHE . . . 12" swing.

Industrial size, does the same job as \$75 units. Tubular steel bed rails, screw action tail stock, three-speed pulley. Use any motor. 3 high speed turning chisels, \$6.95 add'l. 4" face plate, \$2.50 add'l. 30 lbs., f.o.b. factory



\$39.10

JOINTER-PLANER 4 1/8" x 22".

Cast iron and steel, precision ground adjustable tables. For planing, joints, bevells, Rabbits to 3/8" depth. Fence adjustable 0° to 50°. Steel knives, dual guards. Use any motor. Precision ball bearing industrial model, \$10.00 add'l. Wt. 19 lbs., f.o.b. factory



\$37.80

BELT SANDER A precision unit.

It changes from horizontal to vertical in seconds. Heavy, sander includes 4" x 36" sanding belt. Uses 1/2 h.p. or larger motor. V-pulley drive and multi-purpose drive spindle. Disc sander accessory, \$7.95 add'l. Mitre gauge, \$1.95 add'l. 15 lbs., f.o.b. factory



\$28.00

DRILL PRESS Precision 32" radial unit has standard features and many extras.

Depth of throat up to 16". Head tilts and table stays level. Drills to center of a 32" circle. All cast iron and steel. Takes standard motor. 32 lbs., f.o.b. factory.



\$48.80

WOOD SHAPER KIT Makes beads, coves, moldings, tongue-and-groove joints, etc. Accurate cuts at high speeds. Sealed greased-for-life ball bearings. Less wood. Takes 1/4 h.p. motor or larger, standard cutters. Optional hold down assembly, \$3.95 add'l. 15 lbs., f.o.b. factory



\$25.95

THE 1975 OLDSMOBILES: IF YOU LIKE WHAT YOU SEE YOU'LL LOVE WHAT YOU CAN'T SEE.



Introducing Starfire (center), our new Supercoupe; 98 Regency (left); Cutlass Supreme (right).

We've engineered better mileage into every 1975 Olds model.

It took a new approach to our emission controls. A new lineup of engines. Improvements in the power train. And other things you don't see—but they add up to a new Maximum Mileage System that helps make every Olds a better car than last year.

Step I: A catalytic converter

This "pod" full of platinum-palladium coated beads is a new way to reduce most emissions—after combustion, in the exhaust. They do a more effective job—and they eliminate some of the gas-robbing, combustion-stage controls of the past.



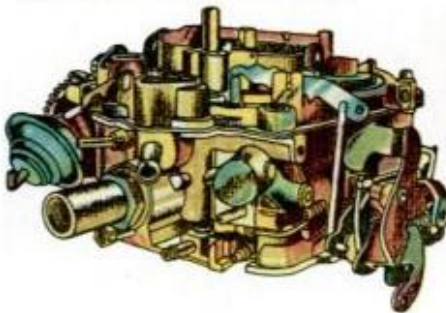
Step II: High-energy ignition

Olds engineers didn't stop with the catalytic converter; they designed in a high-energy ignition system. It means a hotter spark, more thorough combustion—and it eliminates the maintenance of distributor points and condenser.



Step III: Redesigned carburetors

They had a field day here. They improved "cold starts" in any weather one way—and improved "hot starts" another. And they even found a way to modulate the fuel more precisely for improved driveability.



Step IV: Resetting the spark

Now Olds engineers could reset spark timing for better performance, instead of lower emissions. And they added a temperature-compensation feature on some engines to help you get better economy in a wider range of outside temperatures.



Step V: Keep on improving

Which means improving the gas mileage by adjusting gears and shift points in transmissions. Using economy axles. And by making GM-specification steel-belted radial tires standard.



How much better MPG?

The mileage you can expect in a 1975 Oldsmobile will depend on the model you choose, how you drive, and other factors. But as you can see, we have significantly improved the capability of our new cars to get more miles per gallon of gas than a year ago.

Now, about what you can see

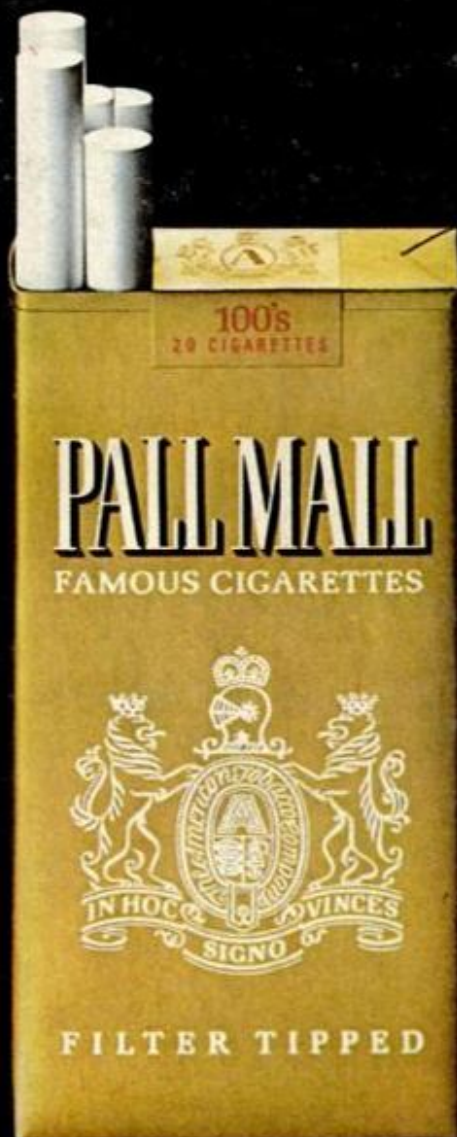
There's a lot of news there, too. And the place to get it all, first hand, is your Oldsmobile dealer's. Why not visit him today?



IT'S A GOOD FEELING TO HAVE AN OLDS AROUND YOU.

PALL MALL

GOLD 100's



Longer...
yet milder.

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

21 mg. "tar", 1.5 mg. nicotine av. per cigarette, FTC Report March '74.