

# Popular Mechanics

In this issue—PM's best ever

## 40-PAGE HOME IDEAS GUIDE

full of the know-how you need to: Facelift your home

• Come up with a really different family room

• Make your own light fixtures • Install a prefab bath

• Get a new entry • Discover new products that

will give you ideas, ideas, ideas... Begins on page 137



## WHIRLYBIRDING:

A whole new idea in radio-controlled model flying

Page 69

## CLIP & SAVE KNOW-HOW:

- How to paint a room • How to install insulation
- How to add a garage-door opener
- How to put up ceiling beams • How to hang a door





## The motor that makes it here can make it anywhere.

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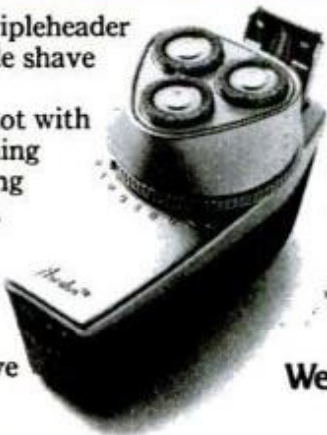
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*Available in cord or rechargeable models.*

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**Jeep**

Buckle up for safety...drive your Jeep vehicle with care and keep America the Beautiful.

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Three great brands of "smokeless tobacco" are taking hold all over the country.

There's Copenhagen, which has the rich flavor of pure tobacco.

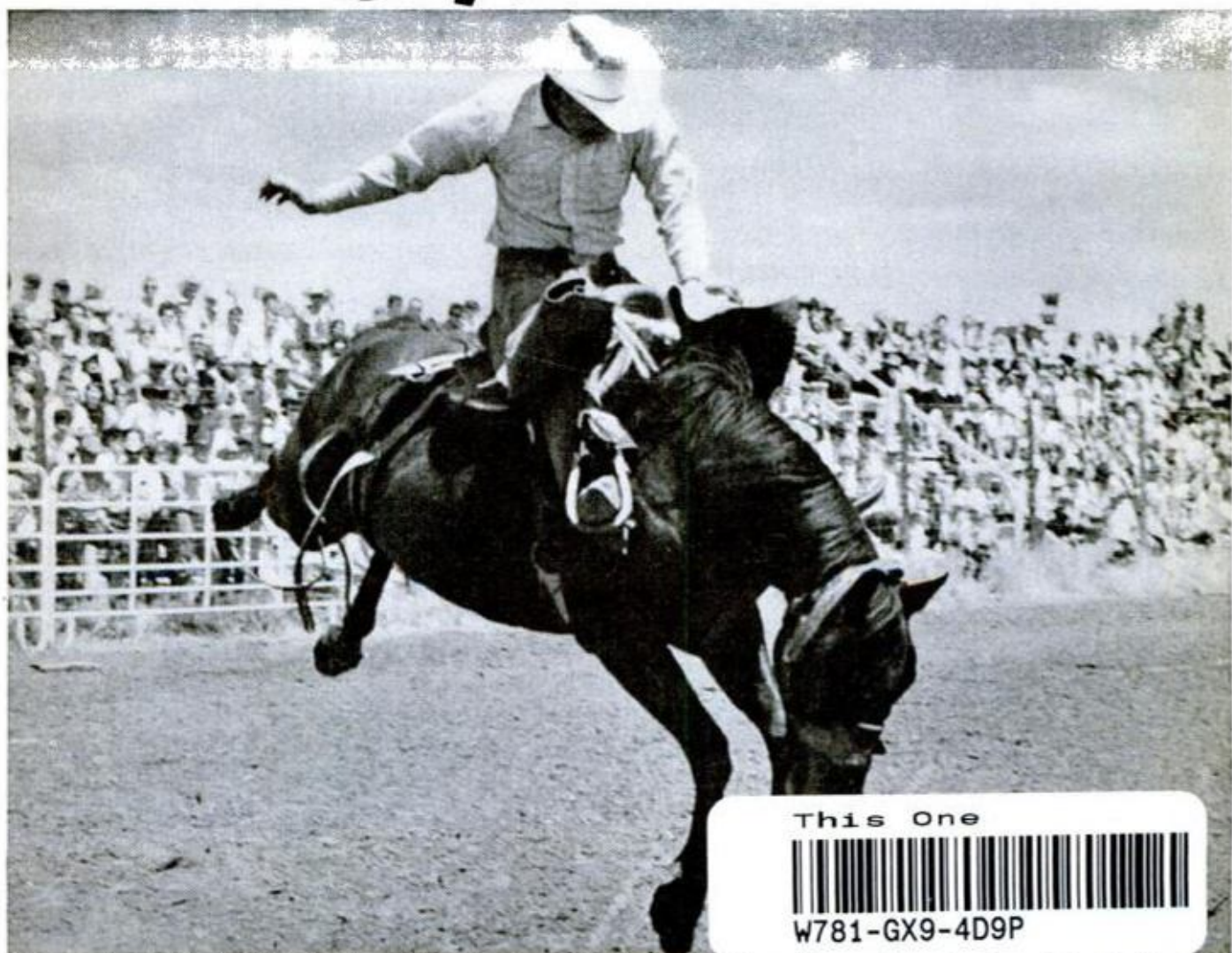
Skoal, laced with winter-green. And Happy Days Mint.

They all give you tobacco satisfaction without having to light up.



**Smokeless Tobacco.  
A pinch is all it takes.**

# There are times when a guy just can't smoke.



This One



W781-GX9-4D9P

For a free booklet that explains how to get the full enjoyment of "smokeless tobacco"— as well as a few free pinches that you can try for yourself— write to "Smokeless Tobacco," United States Tobacco Company, Dept. P-33, Greenwich, Connecticut 06830.

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*Photo by Joe Fletcher*

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AS A SERVICE TO READERS, Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Because of possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects that result from plans published in this magazine.

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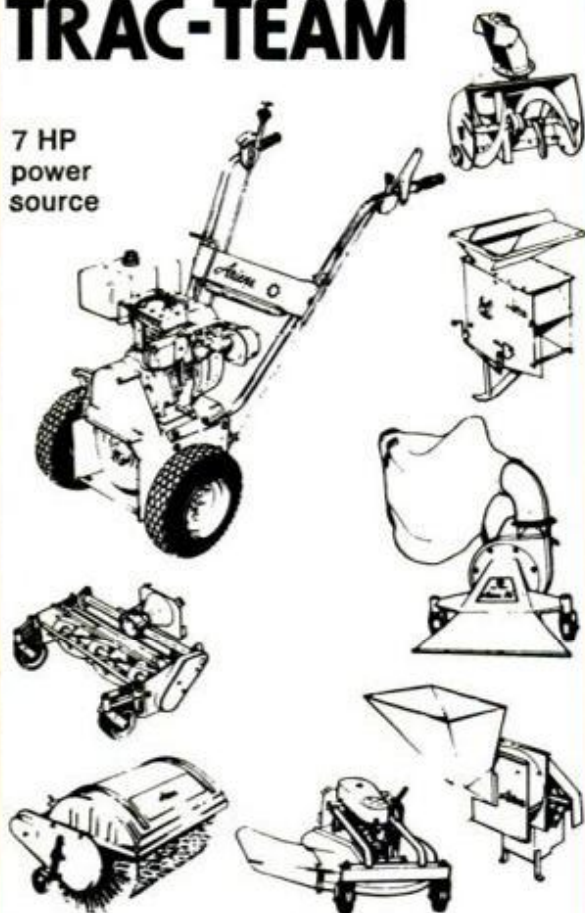
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POPULAR MECHANICS



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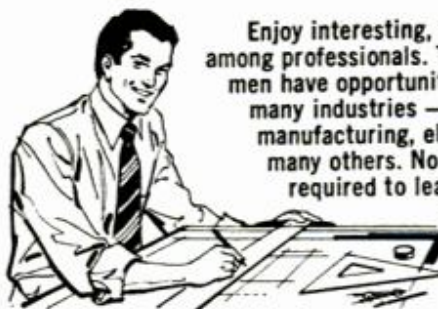
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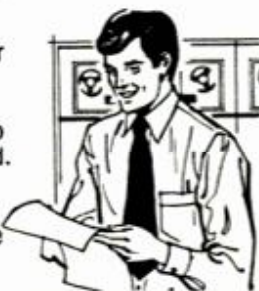
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# LETTERS

TO THE EDITOR

## Good frames for good art

Your article, *Good Art at a Price You Can Afford* (page 73, Feb. PM) is a great job, more detailed than any we have seen before on the subject.

NEW YORK

HILDEGARDE POPPER

I'll be taking PM home with me tonight and will have fun reading your article after supper—even though I can see already the sparks which Harry Wicks' story and Robert Borst's photos will kindle in the lovely eyes of Mrs. H.

CHICAGO

DAN HOLMAN

Your article on picture frames gave me a whole new bunch of ideas.

GREENVILLE, N.H.

LAURENCE M. JOHNSON

I've never been happy with the frames I've gotten from professional framers so I'm planning to try my hand at framing, following your very clear instructions.

NEW YORK

RUTH GALANOPLOS

Your magazine the past two years has exceeded all my expectations and certainly your Great Workshop series and the story on making frames are out of this world.

WILMINGTON, MASS.

C. F. CAHIFF

Yup, our Home Workshop Editor did a great job—built all those picture frames in his shop, set up the photos, wrote the story and instructions. The only thing he didn't do was paint the pictures.

## Aerosols and animals

*Don't Take Chances With Aerosols!* (page 83, Feb. PM) is interesting, but why give publicity to vivisection? By mentioning vivisection, you, I assume, are supporting it. If so, I would ask you to think whether it seems possible that God ever intended that animals be tortured in order that we might be cured of disease.

STREAMWOOD, ILL. MRS. RONALD E. HOLMES

## Not Kawasaki's first four-stroke

*Imports and Motorsports* (page 24, Jan.

*(Please turn to page 10)*

POPULAR MECHANICS



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UPHOLSTERY DETERGER



WALL DETERGER

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1<sup>5</sup>/<sub>16</sub>" turning radius

No. 104

1<sup>11</sup>/<sub>16</sub>" turning radius

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EMERSON

## LETTERS

(Continued from page 8)

PM) has one small error. On page 26, concerning the Kawasaki Z-1 900, you say: "You're right, the 900 stands for displacement of Kawasaki's first four stroke—903 cubic centimeters to be exact."

In the mid-1960s, Kawasaki manufactured (and sold in the United States) a four-stroke, twin-cylinder motorcycle of 624 cubic centimeters, designated the W1 and W2SS (depending upon carburetion).

Except for that error, I found the column most interesting and informative.

SALT LAKE CITY

ROBERT O. LINDSAY

*That earlier four-stroke was, indeed, sold in the United States from 1966 (when Kawasaki started bringing bikes here) until 1968. It is still sold, and is popular, in other parts of the world.*

Hooray for Bill Hartford's new column, *Imports and Motorsports*. As owner of a Valiant (Canada), a VW bus (Brazil) and a Yamaha motorcycle (Japan), I appreciate the emphasis on imports. PM is tops anyhow; now this makes it complete.

BIXBY, OKLA.

R. C. DAVIS

### This lamp is 'perfect'



Here is a photo of my husband's modified version of your lamp (*Build a Spanish-Style Lamp the Easy Way*, page 166, Oct. '71 PM).

He made it to match our semiformal living room (in Mediterranean style).

I hadn't been able to find a "store lamp" for less than \$100 that I liked.

This is perfect. Thanks!

HUNTSVILLE, ALA. MRS. PAUL MAKOWSKI

### 'Old farmer's way' to start a fire

In an otherwise good article on fireplaces, the instructions for getting a draft started violate a very fundamental safety rule (*How to Have a Smokeless Fireplace*, page 76, Jan. PM). The rule is never, never stuff paper in the chimney and light it! Burning paper has a habit of floating

(Please turn to page 12)

POPULAR MECHANICS

Материал, защищенный авторскими правами

# SIX REASONS WHY YOU SHOULD PUT FIRESTONE STEEL RADIAL 500 TIRES ON YOUR CAR VERY SOON.

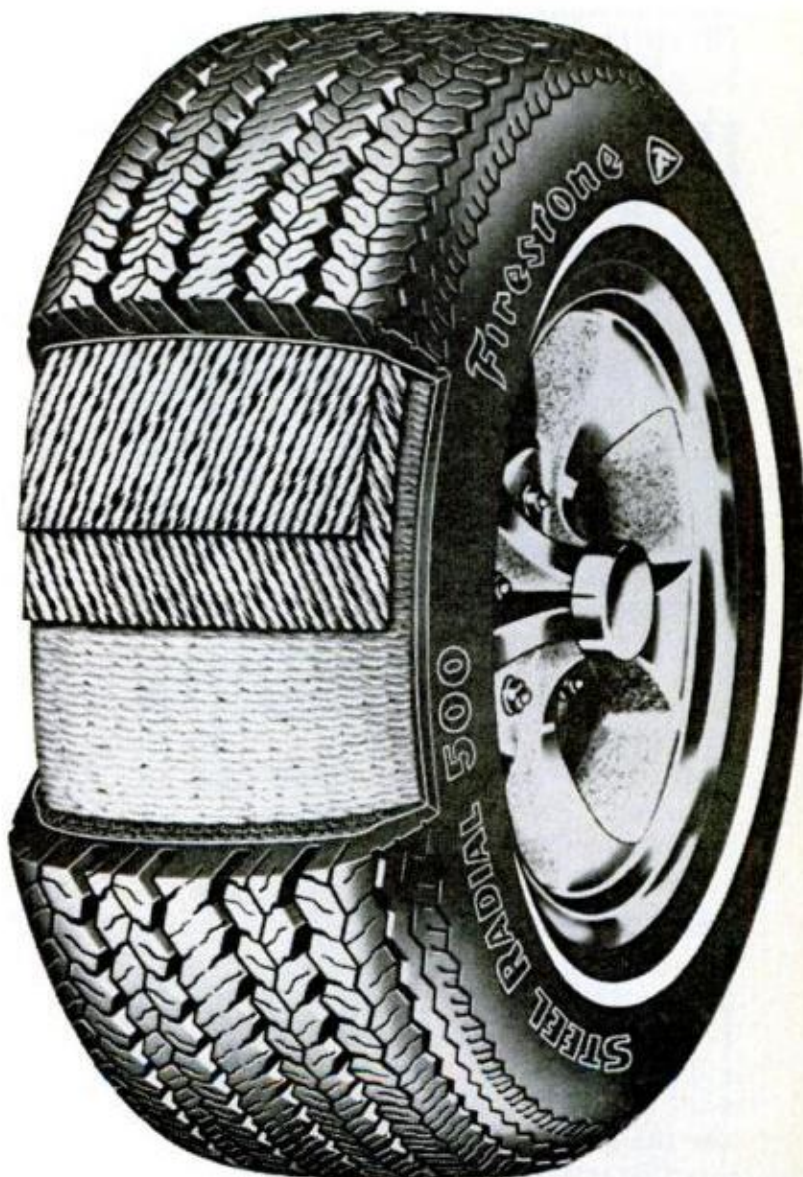
- 1 They will put steel between you and tire trouble.** Two strong belts of brass plated high tensile steel cord are under the tread to stand up to chuckholes, curbs and roadjunk.
- 2 They are guaranteed for 40,000 miles.** When you think most people drive about 12,000 miles a year, imagine how long these tires should last.
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#### OUR 7 DAY TEST RIDE

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## Firestone

The people tire people

## LETTERS

(Continued from page 10)

out of the chimney and setting the roof on fire. The proper way, as any old farmer will tell you, is to twist the paper into a candle, light one end and *hold* it just under the throat.

SYRACUSE, N.Y.

LIONEL NAUM

### Solid oak gossip bench

Many enjoyable hours were spent working on this gossip bench which now has a prominent spot in our living room (*Build This Early American Gossip Bench*, page 152, March '71 PM). The bench is



made of solid oak and the last coat of finish was hand-rubbed with pumice stone and rottenstone to give it an extra smooth finish. Keep coming with these beautiful plans for Early American furniture!

PELLA, IOWA

DALE VAN DONSELAAR

### Behind the eight ball

Regarding the color photograph illustrating *\$300 Pool Table for \$107* (page 63, Jan. PM), what game are the gentleman and lady playing? If the gentleman makes what appears to be the eight ball, he will lose the game.

LONG BEACH, CALIF.

RAY KOMPSI

*And the lady will win. That's why we all agree he's a gentleman, whether he knows how to shoot pool or not. (Matter of fact, he's the man who built the pool table for us and wrote the article.)*

### Aeroprinting

We received the January issue of *PM* and its story on Aeroprint (*Color Prints*

*From a Spray Can*, page 156) with delight as well as surprise. But there were some errors. The color kit retails for \$29.95, not \$24.95. You state that capacity per kit is 57 8x10 prints, but the figure is 40 (the exact amount will vary from user to user). And last, total processing time is 36 minutes including four five-minute washes, not 36 minutes plus wash.

You also mention the cost of an Aeroprint may approach the cost of custom printing. This is not so. Commercial labs charge \$12 and up for an 8x10 print, while Aeroprint costs only about \$1.

AEROPRINT PRODUCTS USA JERRY FRANK  
EMERSON, N.J. EXECUTIVE V-P

*The capacity of 57 8x10 prints was calculated from Aeroprint literature. But the price comparison we gave was not for custom-lab prints, but for "commercial" prints—the drugstore kind. Aeroprint's main advantage, as we said, is that it lets you try such custom operations as special cropping, dodging and burning in, at drugstore prices.*

### Lamp stand—a challenge

The octagon lamp table (*A Beauty—and So Simple to Make*, page 154, Aug. '72 PM) seemed very challenging, so I tried it and it



was. I added a bottom, a 2-inch base molding and two doors with magnetic latches. I love the variety of projects you offer in *PM*.

INGLEWOOD, CALIF.

ELMER HOHBOCH

### How do you get the slip out?

I hope one of your readers can help me solve a problem. I do ceramics but find it difficult to handle large molds as I get older. I wonder if anyone has come up

*(Please turn to page 14)*

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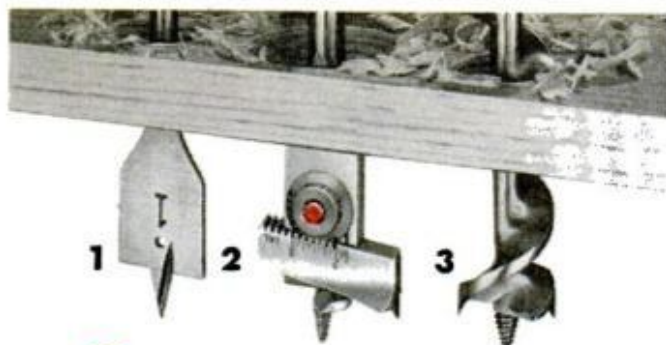
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## LETTERS

(Continued from page 12)

with some sort of pump for taking the slip (which weighs 15 to 18 pounds per gallon) out of molds. A commercial pump costs \$300, but such expense is out of the question.

JACKSONVILLE, FLA. MARGARET FRUMERIE

*Has any do-it-yourselfer solved the problem? We'll pass your ideas to Mrs. Frumerie.*

## \$50 lightbox for \$56.26

I just got through making *A Lightbox for Under \$50* (page 112, Dec. PM) except that mine cost \$56.26. I would like to know how your contributor constructed his for less than \$50.

ROSAMOND, CALIF. HAROLD M. CHASE

*We don't know, other than that maybe things are cheaper over in Pomona where he lives.*

## Turn off the fan if the light's off

In your very informative *Slide Projectors Get Smarter All the Time* (page 140, Feb. PM), I couldn't help noticing that you suggest cooling the lamp with the projector fan after turning off the lamp—to lengthen the lamp's life. All of us here at J.C. Penney used to do it until I came across a paragraph on "Lamp Life" in Kodak Publication S-53. Kodak seems to feel that the fan *shouldn't* be used to cool the lamp after it's turned off.

J.C. PENNEY Co.  
NEW YORK

JOEL MAXWELL  
PHOTO SUPERVISOR

*You're right. Kodak says: "The fan should normally not be operated after the projector lamp has been turned off, because the rapid flow of relatively cool air tends to set up stresses in the lamp, condensers and the heat-absorbing glass by cooling their surfaces rapidly."*

*So why is there a FAN-ONLY position on the switch? Kodak says it's for cooling burned-out projector lamps for quicker replacement.*

*It also allows use of a "programmer" (which fades in an image from one projector while fading out the image from another.)*

★★★



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*A man can take a lot of pride in a highway he's designed. Jack Terry of Lake City, Fla. knows that feeling. (Photo: Yale Joel)*

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# SOLUTIONS FOR MECHANICAL HEADACHES

# AUTOMOBILE CLINIC

BY MORT SCHULTZ

## Tight cap

*I have a problem with the oil filler cap of my 1971 Chevrolet Impala's 400-cu.-in. engine. The cap has been so stiff to get back on after adding oil that it has cracked and broken. Several pieces have dropped into the rocker-arm cavity. I would like to know if they can cause damage, and also if there is a different type of cap I can use that's easier to install.—K.E. Hart, San Jose, Calif.*

The pieces of cap that have fallen into the rocker arm cavity shouldn't cause damage unless they are 1/2-inch or more in diameter. Large pieces may plug one or both of the oil drain-back holes in the cylinder head, which could lead to spark-plug fouling and a leak at the valve cover gasket.

To get the pieces out, simply remove the valve cover. Otherwise, oil filler cap material is relatively soft and will cause no problem. Eventually the pieces will make their way to the oil sump and be drained from the engine when oil is changed.

There is no different type of cap you can use. However, if you find that a new cap is just as stiff as the old one, try spreading some lubricant, such as petroleum jelly, around the lip. This should allow the cap to slip into place easily.

## Mixing drinks

*If necessary, in an emergency, is it okay to mix two different brands of permanent ethylene glycol antifreeze, such as Zerex and Prestone, or will some incompatible-chemical reaction damage the cooling system?—Ken Greenberg, Chicago.*

Yes—it is okay; no—there will be no damaging chemical reaction.

## Removing sap

*Our driveway is under a poplar tree, and the sap has dripped on my car's finish. Is there a way of removing it?—Dom Paratore, Exeter, N.H.*

It's tough, especially if the sap has been allowed to harden over a period of time.

The ideal thing is to wash the car as soon as possible after tree sap falls on the finish. If the sap has time to take hold, it will work its way into the finish, much as egg would if splattered on the car.

You can try a couple of things. A finish conditioner sold by new-car dealers may help. But if the sap proves stubborn, dampen a rag with gasoline and "spot" the affected areas. Have someone follow behind and immediately wash the area with a household detergent solution. Flush with lots of water.

## Rear tire wear

*I've noticed a tire-wear condition I call "step-off" on the two rear tires only. The car is a 1970 Hornet with 232-cu.-in. engine. The outer ribs of the treads are wearing away faster than the rest. Why is this happening?—Andrew Duchay, Chicago.*

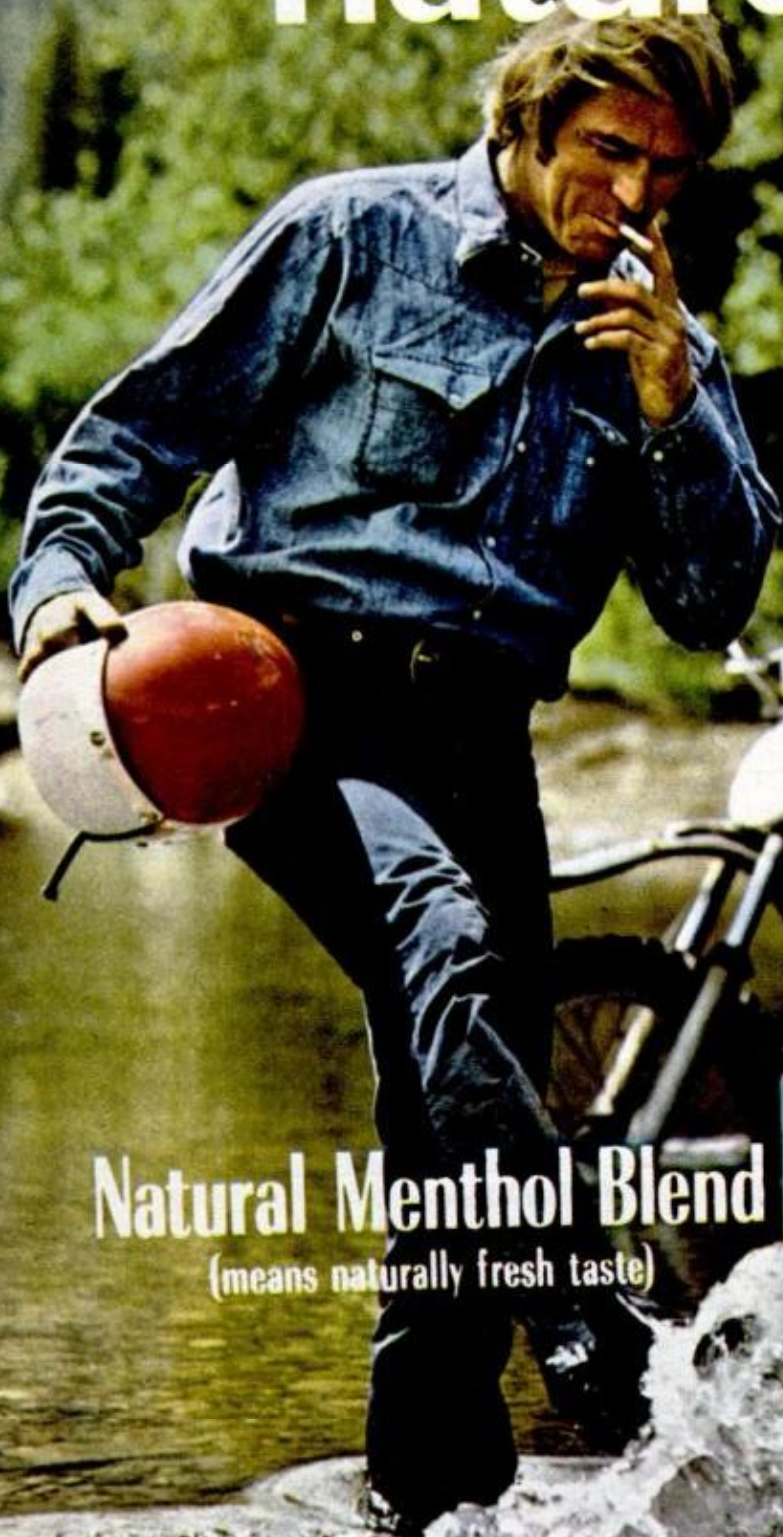
There are three primary causes of erratic tire wear in the rear. First, of course, is improper tire inflation. Then there is the chance that the rear wheels are out of balance. This, though, would cause the type of wear normally described as flat-spotting. Finally, erratic tire wear will result if the axle is bent, throwing rear-wheel alignment out of whack. Normally a vibration would be felt if this were the case.

## Fanning the fires

*While I was driving through South Carolina in August, the radiator and engine of my 1971 Oldsmobile overheated and literally blew apart. The mechanic who worked on the vehicle stated that the cause of the accident was that the fan clutch broke, causing the engine to overheat. It was further determined that the temperature-sending unit was defective. Since the red temperature warning light did not go on, I did not realize that the engine was overheating. What I would like to know is how an Oldsmobile owner can check the temperature-sending unit and*

*(Please turn to page 24)*

# Salem refreshes naturally!



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## AUTOMOBILE CLINIC

(Continued from page 22)

*fan clutch prior to a trip?—Col. Paul R. Kaufmann, Fort Meade, Md.*

The temperature-sending unit is part of the temperature indicator-light circuit. A shorted sending unit would cause the warning light to remain on constantly although the engine doesn't overheat. Most times the problem doesn't happen this way, but rather with a warning light that doesn't go on.

To check the warning light, turn the ignition key to START. The light should glow and continue to glow as you crank the engine. It should go out when the engine starts. If the light doesn't light in this way, the bulb has burned out, the fuse has gone bad, or there is an open circuit.

The fan clutch engages when it senses that air temperature has reached about 180° F. The most accurate way of checking its operation is to have a mechanic insert a special dial-type thermometer between the fan blades and radiator, and observe at what temperature the clutch engages. You know that the clutch has engaged when you notice a sharp increase in the fan noise.

You can find out if the fan clutch is operating by running a cold engine at slightly above fast idle (2000 rpm) for a minute or two. Stop the engine and turn the fan by hand. It should turn freely.

### Ruining contact points

*I have a 1972 Chrysler with a 400-cu.-in. engine. The car has only 10,000 miles and already I've had to replace the distributor contact points. What's wrong?—David Speth, Orchard Lake, Mich.*

You don't say whether the points were burned or pitted excessively. If burned, check for a high primary voltage condition resulting from an improperly adjusted or inoperative voltage regulator, or a faulty ballast resistor. A defective condenser or high resistance in the condenser circuit will cause points to burn, too, as will improper adjustment of the contacts themselves.

Finally, if a clogged engine breather is allowing crankcase pressure to force oil or vapors into the distributor, contacts can burn. Burning may also result if lubricant gets on points—lubricant that was placed in excess on the distributor cam.

If points were pitted excessively (a certain amount of pitting results from normal operation), make sure that condenser capacity, contact-spring tension and contact gap are to specification.

## Service Tips

● **Poor fuel economy** with a 1971 or 1972 Dodge car or truck having a 360 or 400-cu.-in. engine and Holley 2210 two-barrel carburetor may be caused by a sticking, sealed-bowl vent valve in the carburetor. If the valve is not closing, the engine will burn more gas. The problem can be solved and gas mileage improved by disassembling and cleaning the parts of the vent assembly in denatured alcohol, and by adjusting the clearance of the valve to allow insertion of a 0.015-inch gauge between the vent valve plunger stem and operating rod. The procedure is detailed in service bulletin 14-12-72D (9-27-72).

● **Two precautions** are needed to minimize the possibility of the tape of an 8-track radio/tape player from wrapping itself around the capstan. First, remove the tape cartridge before the unit is turned off. Secondly, clean the pickup head and capstan shaft every 100 hours of operation. Use isopropyl alcohol (rubbing alcohol) and a long cotton swab. It's not necessary to remove the unit from the car.

● **What's a worn ball joint?** This question should be resolved once and for all with the introduction of ball joints with wear indicator in new cars. On General Motors models, for instance, the lower joint uses a protrusion of a 1/2-inch-diameter nipple into which the grease fitting is threaded. The nipple projects 0.050 inch beyond the surface cover of the ball joint. As the joint wears, more room is left for the nipple to recess itself into the joint. To inspect units for wear, wipe the grease fitting and nipple free of dirt, and attach a grease gun as if you were going to lubricate the joint. If the grease gun forces the nipple flush with or recesses it beyond the surface of the cover, the ball joint is worn and should be replaced promptly. ★★★

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

---



# "The styling coup of '73"

When we introduced the Hornet Hatchback this fall, Car & Driver Magazine called it "The styling coup of '73."

And along with sportscar styling, you get room to travel in; 23 cubic feet of cargo space with the back seat folded down.

Now we've added something else. An optional Levi's interior. The look of jeans,

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Buckle up for safety.

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When you buy a new 1973 car from an American Motors dealer, American Motors Corporation guarantees to you that, except for tires, it will pay for the repair or replacement of any part it supplies that is defective in material or workmanship. This guarantee is good for 12 months from the date the car is first used or 12,000 miles, whichever comes first. All we require is that the car be properly maintained and cared for under normal use and service in the fifty United States or Canada, and that guaranteed repairs or replacement be made by an American Motors dealer.

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## AMC Hornet

We back them better because we build them better.



# 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-CD  
CHICAGO, ILLINOIS 60626

# You can't get a good job without experience. We'll give you both.

There are lots of jobs in the want ads. Unfortunately, almost all the really good ones ask for experienced help.

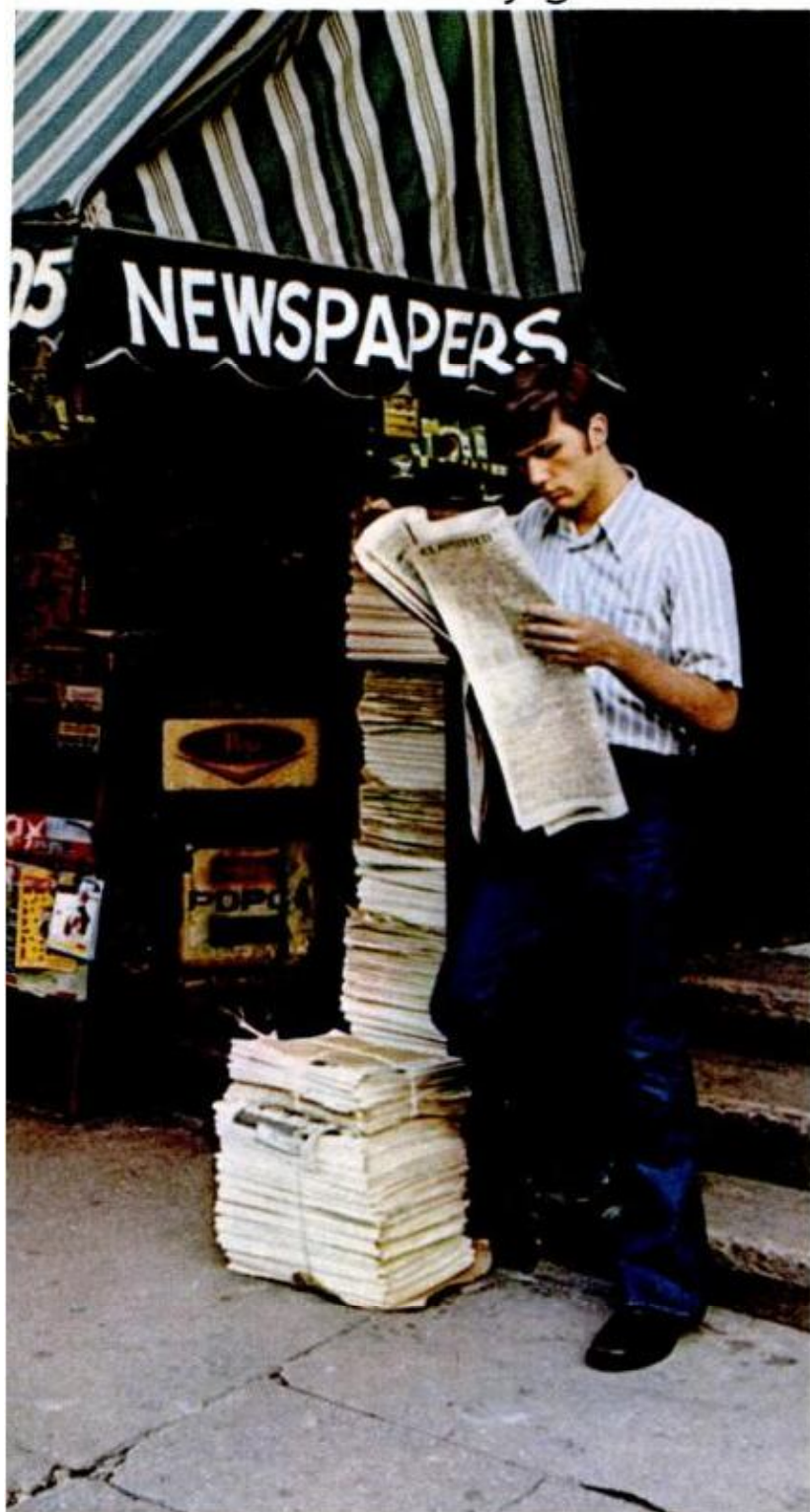
So you ask yourself, how can I get experience if no one will ever hire me? One answer lies in today's Army.

You'll start at \$307.20 per month (before deductions). No experience necessary.

In fact, we'll give you that experience. Along with the training you need to perform your choice of over 300 jobs. Jobs you can turn into a career. In the Army, or out.

For more information see an Army Representative, or write Army Opportunities, P.O. Box 5510J, Philadelphia, PA 19143.

**Today's Army  
wants to join you.**



# ALL By BILL McKEOWN OUTDOORS

**PLANNING AHEAD** for the coming season, campers and outdoorsmen should start by sending 75 cents to the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402, along with a note asking for the book *National Parks & Landmarks No. 2405-0287*. This handy paperback in a size that can fit in a backpack describes natural, historical, recreational and cultural areas plus national capital parks that are administered by the National Park Service, as well as a number that are not. Hundreds of "sites declared eligible for registration as national historic, natural and environmental education landmarks" but not administered by the National Park Service are also listed. The book is a bargain directory of places to see.

For outdoorsmen and others, the low-cost publications of the Government Printing Office can be as welcome as an income tax refund which, in fact, they are. Interested in a specific national park, camping or boating in general? Write to the Superintendent of Documents about your special interests; by return mail you're likely to get a check list of half-a-dozen or more pamphlets covering the subject. Individual parks are also a source for booklets covering their history and points of interest.

**EVERYONE TALKS** about the environment but it is encouraging to hear when something is done about it. In Utah, the Division of Wildlife Resources reports two men are serving 90-day jail terms for shooting a golden eagle. The men claimed they did not recognize the bird so they shot it for coyote bait.

**KEEPING COMFORTABLE** outdoors with the right clothing is getting a big boost from the recent introduction of a number of light but durable items. Gladding's Aqua-Float Coat is a jacket suitable for boating, fishing or snowmobiling but is said to have enough buoyant foam lining to keep the wearer afloat in case of a dunking. Several similar life-preserver windbreakers have recently come on the market from other sources as well, and while most are not Coast Guard approved as legal "personal flotation devices," any one of them might save a life.

John Deere dealers, the source of much outdoor equipment, have borrowed from the astronauts a metallic Therm-O-Liner to reflect body heat for wearers of their new jackets.

Clothes to match your boat were bound to come, just as they have for snowmobilers. Appropriately enough, Arctic Cat's companion company, Silverline Boats, now has sets of child-size and adult windbreakers, warm-up and flotation jackets and full storm suits color matched to Silverline runabouts and cruisers. Or to look the same as your Johnson Stinger outboard, you can get a Fish-N-Boat Johnson jump suit at the same time that you buy your motor.

Outboard Marine, parent company of Johnson and Evinrude outboards, has added Bo'suns boating shoes to its extensive accessory line. The white pebble-grain Duratex vinyl uppers can be easily cleaned with soap and water; squeegee soles can grip slippery decks. We have tested them and can recommend them. OMC parts and accessories have also been expanded to include useful items such as propeller guard kits that provide a protective shield around the prop, electronic corrosion protectors, combination bilge pump blowers, dash instruments, power tilt and trim, self-contained marine heads, freshwater systems for OMC stern drives, and stainless-steel Teflon propellers—so popular they're made for Evinrudes, Johnsons and their competition as well.

Hardly attractive to wear, but worthwhile just the same, are earmuff protectors like those used by jet-aircraft mechanics. More and more shooters are starting to bring them to the range as part of their regular equipment. Recently we tested some red, white and blue Whisper-Pak muffs that are about \$10 from Ithaca Gun dealers. It was discouraging to find how much they can improve a score—no one likes to believe he still flinches occasionally—but we find the muffs really work, and are equally useful, of course, to prevent ear damage that might lead to deafness.

**RECREATIONAL VEHICLE** owners often seem to have trouble tracking down all the accessories they like to load aboard. One new source is a 200-page *Camper's Catalog* that covers a good assortment of the tons of gear available. It's offered by many RV dealers, and to find the closest, check with Camper's Pride, Box 965M, Elkhart, Ind. 46514. Next time you're looking for a power converter or a heater replacement, roll-up awning or new LP-gas tank you can write them instead of me.

**WHAT THE FISHING BOAT** of the future is going to look like will be previewed shortly in a

*(Please turn to page 32)*

'73 Ford pickups  
start the better  
ideas coming  
all over again!



Behind seat is storage,  
not gas tank.



Ford box cover fits  
right, looks right.



Full-foam seat 5 in.  
deep is standard.



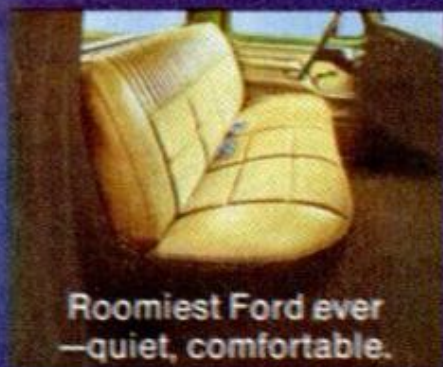
Optional "air" is all  
neatly built in.



Box sides are full  
depth double-wall.



Front disc brakes  
standard exc. 4x4.



Roomiest Ford ever  
—quiet, comfortable.



Twin-I-Beam, start  
of Ford's great ride.



A better idea for safety:  
Buckle up.

FORD PICKUPS

FORD DIVISION



Works like a truck/rides like a car.

## ALL OUTDOORS

*(Continued from page 30)*

forthcoming issue. Now in preparation are drawings of PM's predictions for the ideal fishing rig.

**GUN FANS** have a number of new selections available, including several collectors' items that are almost too good to shoot. This year is the 150th anniversary of the venerable Texas Rangers. In their honor Winchester-Western Div. of Olin has issued a limited edition of 5000 commemorative Model 94 lever-action 30-30 rifles patterned after the famed old Winchester 1894 frontier model. A special-edition set of 150 will be offered through the Texas Ranger Assn. at \$1000 each, with the remainder sold by Texas dealers at \$135 per firearm.

Smith & Wesson's Texas Ranger commemorative will be a .357 revolver of the type used by the Rangers. Mounted in a presentation box with a bowie knife, the handsome set is priced at \$250.

Updating of a popular modern classic has been performed by Sturm, Ruger on its Single-Six revolver. Now the Ruger Super Single-Six, it has been refined to carry all six chambers fully loaded since a transfer bar is necessary to deliver hammer stroke to the firing pin, and the bar only rises into position when the trigger is pulled completely back. This new single-action six-shooter is strong enough to be "fanned," although the practice is not recommended. The revolver is expected to sell at about \$88 supplied with two cylinders—one for standard .22 loadings plus a magnum cylinder for powerful .22WMR cartridges—and 5½ or 6½-inch barrels.

From Remington comes announcement of its new Model 3200 American-made over and under 12-gauge shotgun. Similar to the Model 32, introduced in 1932 and produced for 10 years, this latest model has been radically upgraded. Air space between barrels keeps heat in one from distorting the other's aim. Stronger metals are used throughout. Field, skeet and trap grades will be available, starting at \$450.

Ithaca Gun's new one is the Deerslayer Model 51. Equipped to shoot rifle slugs, it is reported to be the first gas-operated semiautomatic of its type on the market. While a scope can be easily mounted for usual deer ranges, an owner can switch to regular shot-shells for birds and small game. Price for the shotgun will be about \$205.

**BOAT BUILDING BUFFS** have been showing new interest in catamaran sailboats, according to our mail, and to answer a lot of them at once here are two sources: Taft Marine, Dept. PM, 6512 Shingle Creek Parkway, Minneapolis, Minn. 55430, offers an all-glass

16-footer in kit form. Price is under \$900 and a trailer that fits it is also available. For starters-from-scratch, plans are \$5 for El Gato, No. B1233, a sailing cat, and \$5 for Pop-Cat, an outboard powered runabout. Both can be ordered from Popular Mechanics, Dept. CO, Box 1014, Radio City, New York, N.Y. 10019.

**SOME PEOPLE** don't like the sour taste of lemon, no one likes to own a "lemon," but everyone likes the smell of lemons, according to Johnson Wax researchers. They've come out with a lemon-scented spray called Glade Sunny Lemon that is claimed to be effective in masking the fish and bilge smells that can build up in a boat. If the stuff could also detour the seasickness that boat smells can help bring on, Johnson should have a nautical winner.

**OUTDOOR-TYPE READERS** are continually coming up with more uses for plastic bags and monofilament fishing line. Backpackers, of course, can bag almost everything to keep moisture out, and even a small camera can shoot right through protective plastic on a rainy day if the material across the lens is held tight and unwrinkled with a rubber band. A bag secured over a gun muzzle or around a prize fishing reel can keep the weather out until the last moment.

Mono line is regularly recommended for emergency thread to sew up a pack or tent rip or double as emergency guy lines or shoe laces. The Newton Line Co., one of the mono fishing line manufacturers, also notes that you can use it for emergency snares (breaking strengths go up from 2 to about 200 pounds) and as a repair medium for leaky rubber waders by heating and dripping it into the hole. Stow spare mono in your emergency kit along with a Swiss army knife, those plastic bags, matches and strapping tape and you'll find yourself inventing your own quick cures for ailing equipment in the field.

**RECENT PAMPHLETS** that are good, free and of special interest to outdoorsmen include one on care of fiberglass boats that is offered by Owens-Corning Fiberglas, Industrial Materials Div., Fiberglas Tower, Toledo, Ohio 43659, or boat dealers. *Fire Retardancy and Fiberglass Boats* comes from Hooker Chemical Corp., 1515 Summer St., Stamford, Conn. 06905. Any Sears, Roebuck store should now have in stock the new *Boating & Fishing* equipment catalog for summer, 1973. And Laacke & Joys, 1432 North Water St., Milwaukee, Wis. 53202, has recently enlarged their camping and marine mail order catalog and tell me they'll send it free to PM readers. ★ ★ ★

# DELCO PAIR-PAK. BECAUSE THEY'RE RIGHT FOR EACH OTHER, THEY'RE RIGHT FOR YOUR CAR.



Delco's made it easier for you to get the exact tune-up parts you need. Instead of asking for a set of points, and a condenser to go with them, ask for Delco's new Pair-Pak. You'll get a set of matched points and condenser in one convenient package.

Because the Pair-Pak points and condenser are

designed to work together, you get a good, clean break in the current that helps keep the points working cleaner, longer. And that means your engine works efficiently that much longer. Good for your engine, good for your pocketbook.

Next time you get involved in a tune-up, pick up a Delco Pair-Pak for your car. And you'll know you've got the right parts.



**THE MORE YOU KNOW,  
THE MORE YOU'LL WANT DELCO.**

DETROIT

# LISTENING POST

BY ROBERT LUND

**THE MINI-MINI CAR** may be here a lot faster than anybody figured. GM's working on two ultrasmall cars right now. That indicates the minimum mini's a lot closer than "the late 1970s" estimate GM puts out when asked, "When?"

GM wants to get a feel of what the market might be for a pinch-of-salt-size car before putting up the chips to produce it. So the current strategy calls for GM to join with a Japanese company and foot part of the bill for a new mini, which will be produced in Japan and imported into the United States for sale by GM dealers. After two years, GM will have a fair feel of the market and then decide whether to put a domestic version of the vehicle in production.

Both cars are being worked up now. The Japanese job could be ready in 18 months, as a '75 model or as a mid-year entry early in calendar 1975. There's a development program on the American follow-up car, but GM isn't pushing the project because it expects to pick up pointers on what to put on or leave off the home-grown version as a result its experience with the Japanese trailblazer.

**CHRYSLER'S GOT ONE TOO.** Chrysler's on-again, off-again small car is reportedly on again. Big C's taking a different tack this time. Instead of sizing and pricing the car to sell against

*Pinto, Vega and Gremlin, Chrysler will leapfrog the subcompact field and bring out a bantam-size car. Smaller than the current crop of pony-cars but not necessarily smaller than what the rival minis may be trimmed down to by 1975-76. How small? Say about 150 inches overall. But that's just a guess.*

**THE NEW LITTLE CARS** are more significant than they seem on the surface. They signal a new dimensioning of all cars. Smaller everything, from Cadillac and Lincoln on down.

Detroit's been saying for years it wants to reduce the number of models, cut out the proliferation, duplication and overlapping. So why complicate things by bringing out a new breed of automobile, the ultimate mini? Why add if the goal is to subtract? Will Detroit kill off something else to make room for the new shavetails? That's the idea, sort of. The mini-minis won't actually kill off current cars. But they'll be the successor automobiles to today's small cars, just as the medium-size cars will move down a notch to become subcompacts and the standard-size cars will shrink to medium size by today's definition. Everybody take one step back. That's the chain reaction the new shorties will set off when they appear in a couple years.

**DISCS ON ALL MAKES.** The few remaining  
*(Please turn to page 36)*



**THE APOLLO** goes on sale Apr. 5. With three ports on the front fenders, what else could it be but a Buick? Now all GM divisions (except Cadillac) have a compact (spelled Nova, Omega, Ventura, Apollo).

The car is 10½ inches shorter than the Century and comes in three models: hatchback, two-door coupe and four-door sedan. Standard engine is the 250-cu.-in. in-line Six with the 350-cu.-in. V8 engine optional



# freshen up



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

18 mg. "tar," 1.5 mg. nicotine av. per cigarette, FTC Report Aug. 72.

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# ECONOMY TRACTOR



## Man-size to give you more than just a lawn mower.

Economy tractor mows big lawns fast... but that's not all! It handles nearly every task on your place with really worthwhile man-size tools.

How? It's a special breed, that's how. Economy's extra size, weight and traction, plus the greater power-delivery of *all-gear drive* converts nearly 100% of engine horsepower into work. No fluid drive loss. Gives you more pull-power to work faster, more tool-power to operate 60" rotary mower and 20 other attachments. Write today for free catalog.

### With an Economy Tractor you can:

- Plow, till, harrow, pull heavy loads.
- Bulldoze with 4-ft angling blade.
- Load gravel, dirt; ¼-ton bucket.
- Mow 2 to 3 acres an hour with rotary mower or sickle bar.
- Clear 16" snow in one pass.



# ECONOMY TRACTOR

1005 K-4 Anoka Avenue  
Waukesha, Wis. 53186

C-31A

## DETROIT LISTENING POST

(Continued from page 34)

cars without disc or power disc brakes as standard will get the item beginning with production of the first '75 model. No exceptions.

**NEW DOOR LOCK.** One of the supplier companies, TRW, has developed a door-to-speedometer hookup that looks like a sure winner. The device automatically locks the doors of a car when its speed reaches 30 miles an hour. The item is being tested and may be offered on some '75 cars.

**PRICING THE WANKEL.** Despite GM's all-out commitment to the Wankel, the company is far from the finish line on how it's going to handle cost and pricing of the rotary.

With all the advance buildup the engine has received, GM figures it can sell the first year's output of rotary-powered cars at just about any price it wants to ask. Something like \$400 to \$600 over a conventional V8 wouldn't be out of line. Not that GM's indicated that's what the premium will be.

GM's concerned about what it will have to charge for the engine after the first rush of buyers have been satisfied. The Wankel has to be priced competitively against the piston engine, or it isn't going to sell in the numbers GM needs to recoup its investment. GM's considered all this, but has yet to come up with the figures on how it's going to price the engine after the novelty wears off.

**SAFER, CLEANER CARS** coming in '74 and '75 may run a lot noisier than current cars. Engineers say automobiles can't continue to get heavier. But they're going to get heavier because of new safety and emission-control gear coming in '74-'75. Car producers are looking at new materials—plastics and aluminum—to reduce weight, but this takes time, because new materials have to be tested over a long period.

The quickest way to pull pounds off a car would be to remove sound deadeners used to reduce road noise. Some cars use as much as 250 pounds of sound dampeners. Engineers fear this is the route they may be forced to take. If so, your next car and the one you will buy after that are going to ride a lot noisier.

And speaking of cleaner cars, April is National Check Your Emissions Month. The point is that now is the time to get an emissions tune-up.

★★★



**Any one of these four oils  
is right for your car.**



Sunoco Special takes the worry and confusion out of buying the right oil for your car. You see, Sunoco Special 10W-40 is really four oils in one.

It does all the work of a 10W, 20, 30 and 40 motor oil. Sunoco Special is one oil you can use in both summer and winter—in fact, all year round. Sunoco Special meets or exceeds the warranty

standards of all car manufacturers.

What's more, it gives you extra protection against thickening or breaking down under heavy-load, high-speed driving conditions. So change to Sunoco Special and know you're getting the right oil for your car...the right oil for all seasons, all driving conditions.

**Sunoco Special. The long mileage motor oil.**



## Get a horse... Wheel Horse of course!

There are a lot of lawn and garden tractors around. But, we feel that Wheel Horse is the best! And a better buy! Our 25 years of experienced craftsmanship help us provide you with better quality and more trouble-free tractors. Wheel Horse offers a wide selection of tractor models and attachments. Thirteen lawn and garden tractors to choose from... 7 through 18 HP for 1973.

Wheel Horse offers six automatic and seven standard transmission models, all backed by a two-year warranty for your protection... serviced by a nationwide network of over 2000 dealers. Visit your local Wheel Horse dealer today. He's listed in the Yellow Pages under "lawn mowers."

Write for your free copy of our new 1973 Wheel Horse catalog.

**Ours come with a 2 year warranty.**



## WHEEL HORSE Lawn and Garden Tractors

Wheel-Horse Products, Inc., Dept. PM, 515 West Ireland Road, South Bend, Indiana 46614

**Two-year Warranty**—Wheel-Horse Products, Inc., guarantees its tractors and attaching tools against manufacturing defects for two years from date of purchase. Parts manufactured by Wheel Horse will be replaced free if found to be defective while in normal service during the two years following the date of purchase. Products used commercially are guaranteed for 90 days from date of purchase. Drive belts are also guaranteed for 90 days from date of purchase. Engines and batteries are guaranteed separately by their manufacturers.

All claims must be handled through an authorized Wheel Horse dealer. Transportation costs and dealer service call charges are the responsibility of the owner.

# THIS CAN BE YOUR "BIG BREAK"

if you're a man who doesn't want to be...

**"Ashamed  
to go to his  
class reunion!"**

REMEMBER, DEAR, OUR  
HIGH SCHOOL REUNION  
IS THIS WEEKEND.

DO WE HAVE TO GO,  
HONEY? SUPPOSE  
SOMEONE ASKS ME  
ABOUT THAT CRUMMY  
JOB OF MINE...?



PLEASE, JACK,  
I'M DYING TO SEE OUR  
OLD FRIENDS AGAIN.

OH,  
I GUESS SO  
— O.K.

LATER

JACK! WHERE  
HAVE YOU BEEN  
KEEPING YOURSELF?

OH, YOU KNOW—  
AROUND. LOOKS LIKE  
**YOU'VE DONE**  
ALL RIGHT, THOUGH.

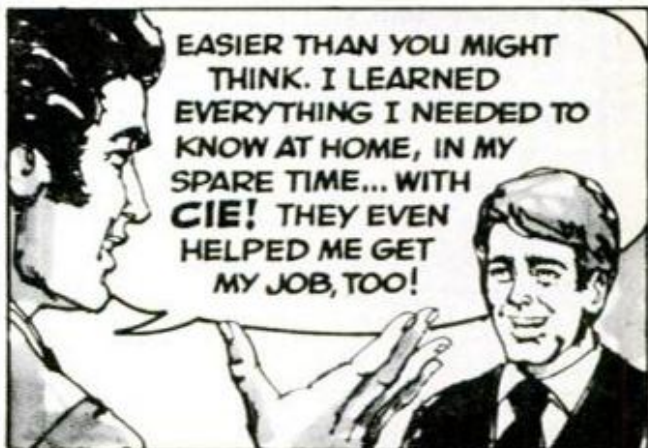


ONLY SINCE I GOT  
SMART AND GOT INTO  
**ELECTRONICS!** IT'S  
A BIG "GROWTH" FIELD  
TODAY.

SOUNDS GREAT.  
BUT HOW'D YOU  
BREAK IN?



EASIER THAN YOU MIGHT  
THINK. I LEARNED  
EVERYTHING I NEEDED TO  
KNOW AT HOME, IN MY  
SPARE TIME... WITH  
**CIE!** THEY EVEN  
HELPED ME GET  
MY JOB, TOO!



HOW ABOUT YOU? WANT A  
GREAT JOB IN ELECTRONICS?  
GET FULL FACTS IN  
**CIE'S 2 FREE  
SUCCESS BOOKS!**  
SEND REPLY CARD  
OR COUPON NOW!



Be sure to send for your 2 FREE books today. For your convenience, we will try to have a representative call. If coupon has been removed, write to Cleveland Institute of Electronics, Inc., 1776 East 17th Street, Cleveland, Ohio 44114.

FILL IN COUPON AND MAIL TODAY

**CIE** Cleveland Institute of Electronics, Inc.  
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Please send me your two FREE books:

1. Your school catalog, "Succeed in Electronics."
2. Your book on "How To Get A Commercial FCC License."

Name \_\_\_\_\_ Age \_\_\_\_\_  
(please print)

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

APPROVED FOR TRAINING UNDER G.I. BILL

Veterans & Servicemen: Check here for G.I. Bill information

PM-78

# THE BICYCLE SHOP

By EUGENE A. SLOANE

**YOU WERE LEFT** with a wheel wobbly and out of true at the end of last month's column on *How to Build and Lace a Bicycle Wheel*. The instructions here will show you how to make a bicycle wheel "true," both laterally (side to side) and concentrically (in its roundness).

Even if you haven't laced up a new rim, you should know how to keep your wheels straight and true because caliper brakes work better when they can grab a rim evenly on both sides, you can steer more accurately in traffic, and tires last longer.

Here's some basic vocabulary:

- **Concentric out of round** occurs when the wheel has high and low spots on the outside diameter of the rim, so you feel a thump, thump, thump as you ride.

- **Lateral out of round** is a wheel rim that is too much to one side or the other.

- **Dishing** refers to the rear wheel and means that the wheel is moved to the right so it's centered on total width between locknuts (not the hub or axle) to compensate for the freewheel (see drawing at right). Dishing keeps the wheel centered in the bike frame, which is critical to a properly aligned bicycle.

- **Centering** applies to the front wheel and means that the rim is centered between axle locknuts, but *not* moved to the right (see drawing at right).

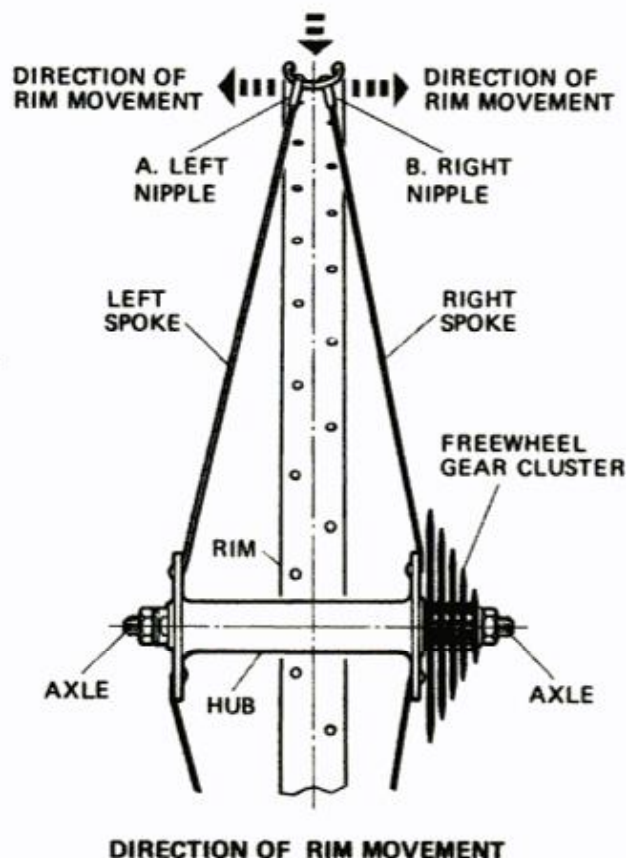
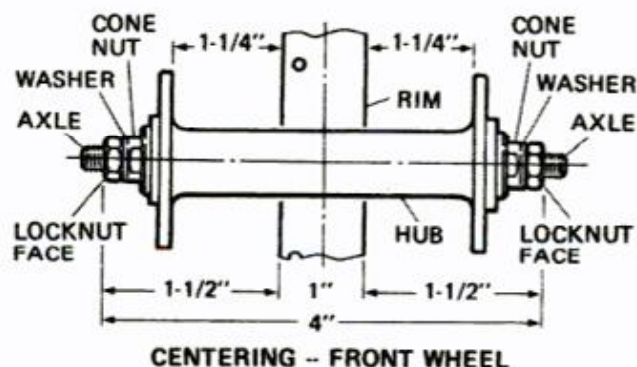
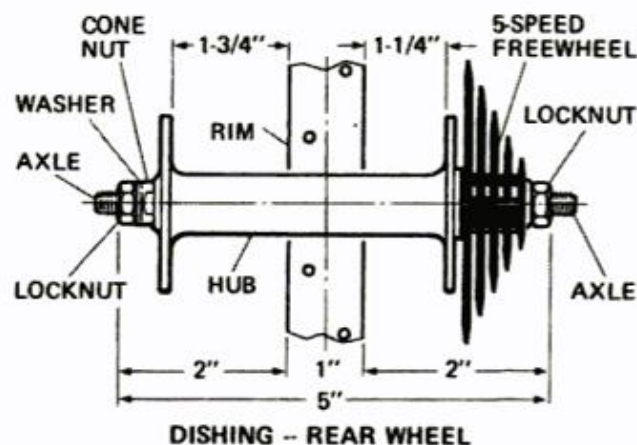
- **Tension** applies to the degree to which you tighten spoke nipples. Tension should be more or less even on all spokes, with perhaps the right spokes of the rear wheel having a little bit more tension than the left because you've concentrated on pulling (dishing) the wheel to the right.

- **Direction of rim movement** has to be understood before you can true a wheel. In the drawing, arrows show how the rim will move when you *tighten* a spoke. If all spokes are tight, the rim moves in the *opposite* direction when you *loosen* the same spoke. There's further explanation in the step-by-step instructions.

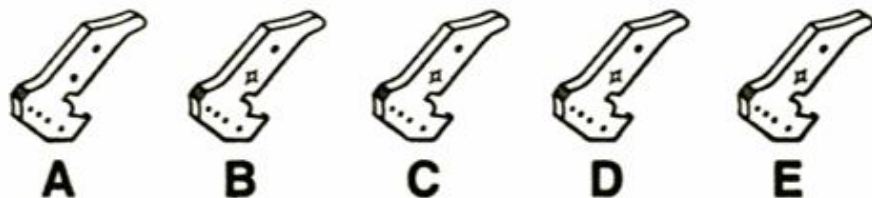
(Please turn to page 42)

## How to 'true' a wheel

For a safe, straight-riding bicycle, the art of 'truing' a wheel is vital



# If you've got the answers, we've got the job.



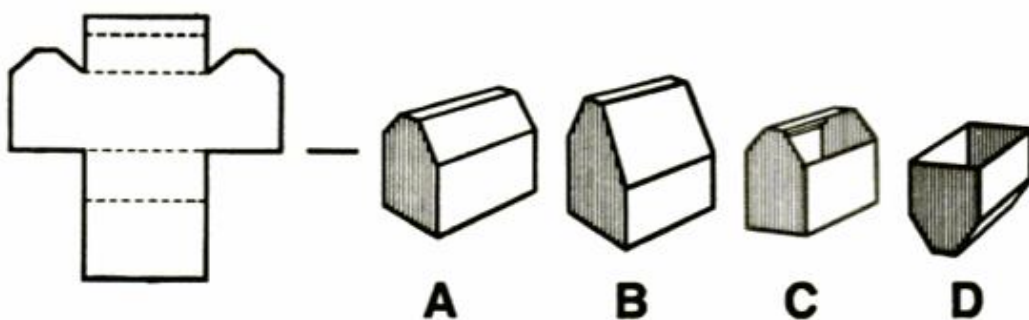
How accurate are you at spotting the difference between similar objects? If you have inborn mechanical ability, it's something you're good at. Some-

thing that should help take you fast and far in today's technically sophisticated Air Force. Quick, which of the five parts is the odd ball in the bunch? **Answer: A.**



Good technical specialists need to visualize. These "cubes" will give your visualizing talents a workout. Look at all five.

Which, if any, of the cubes on the right - A, B, C, or D - could be the cube on the left after being turned? **Answer: A.**



Here's one that helps show how good you'll be with blueprints. At left, you see the top, side and front views of a simple

object. Put them together in your mind's eye, and where do you wind up? With A, B, C, or D? **Answer: B.**

Illustrations Courtesy of Arco Publishing Co., Inc.

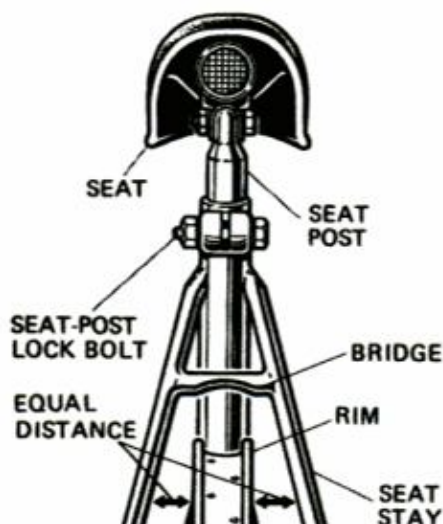
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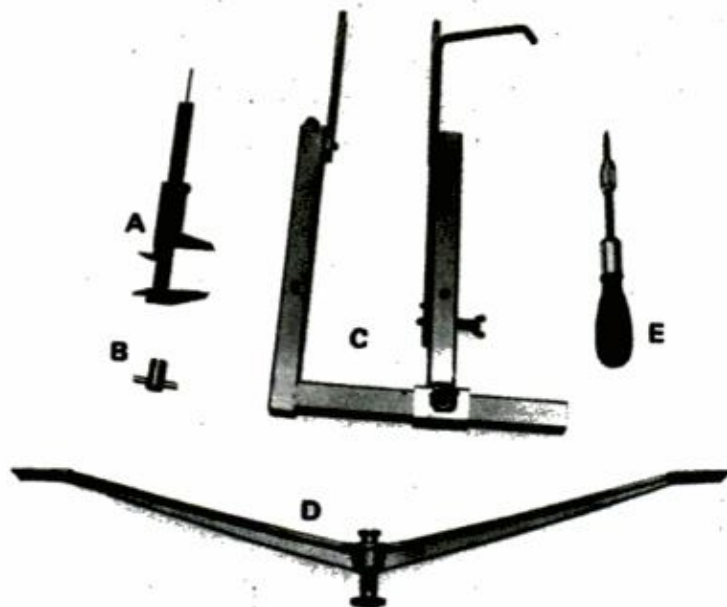
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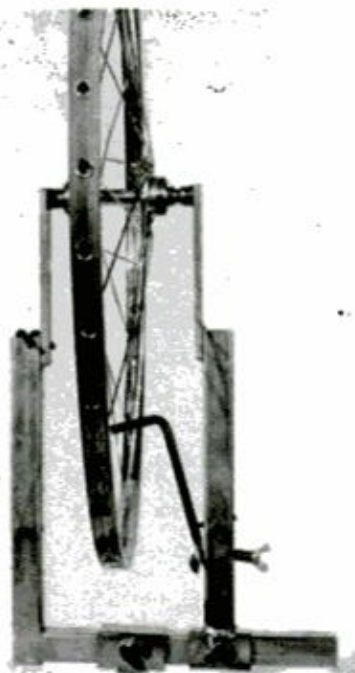
## Find yourself in the Air Force.



**TOOLS YOU NEED:** inch/metric vernier caliper-depth gauge (A); a spoke wrench (B); a wheel-truing stand (C); rim-centering gauge (D), and ratchet screwdriver (E) to speed nipple threading. The wheel-truing stand is about \$25 from a Raleigh dealer, or you can use an old bicycle fork. The rim-centering gauge is about



\$10, or you can make one from wood if you work carefully. (The gauge simply assures that edges of the rim are the same distance from the outer face of both axle locknuts.) You could also use the seat-stay bridge as a guide (as shown in the drawing). The rear wheel should be centered on the bridge



**Step 1:** These instructions will start with the rear wheel since it is more difficult to true than the front wheel because it has to be dished. (The drawings on page 40 illustrate that difference between front and rear wheels.) Put the rear wheel in the truing stand (or an old fork) with the free-wheel on the right side. From now on in instructions, the free-wheel side will be called the right side.

sides of the rim. Yet you will notice there are  $1\frac{1}{4}$  inches on the left and only  $1\frac{1}{4}$  inches on the right side of the rim so far as the hub alone is concerned. Thus you can see the rim is centered not on the hub but between the axle locknuts; the rim is dished to the right. The front wheel is centered both on the hub and between the axle locknuts (as shown in the "Centering" drawing) and is not dished. Now, adjust the movable stop on the rim gauge, following these steps. Measure distance between axle locknuts with vernier calipers. (I suggest you buy a combination inch/metric pocket inside-outside-depth vernier gauge for about \$3.50 from either Ametric Supply Co., 2309 W. Leland, Chicago, Ill. 60625, or Metric & Multi-standard Components Corp., 198 Saw Mill Rd., Elmsford, N.Y. 10523. And I suggest you use metric measurements to avoid complications.) Let's say distance between locknuts is 120.3 mm.

**Step 2:** Start at the valve hole and, using the ratchet screwdriver, turn right-side nipples till spoke threads are just out of sight. Then turn left-side nipples until the last four or five threads just show under the nipple. With spokes drawn up tighter on the right side than on the left, the rim is pulled to the right for correct dishing and centering between locknuts. (For front wheels, turn nipples on both sides to cover spoke threads.)

**Step 4:** Measure rim width with the vernier gauge. Let's say it's 19.4 mm.

**Step 5:** Subtract the Step 4 measurement from the Step 3 measurement and divide by 2. Example:

|                          |       | Inches<br>(Fraction) | Inches<br>(Decimal) |
|--------------------------|-------|----------------------|---------------------|
| Locknut-to-locknut width | 120.3 | $4\text{-}3/4$       | 4.750               |
| Hub width                | -19.4 | $-49/64$             | -.76242             |
| Remainder                | 100.9 | $3\text{-}63/64$     | 3.988               |
| Divided by 2             | 50.45 | $1\text{-}127/128$   | 1.994               |

**Step 3:** To learn the use of the rim-centering gauge, to center both rear and front rims, first study the "Dishing" drawing on page 40. Measurements given are for purposes of illustration only. Note that total distance from outer surface of both axle locknuts is 5 inches, that the 1-inch-wide rim is centered between axle locknuts because there are 2 inches on both

Obviously, the metric system makes it simpler. Good bikes are generally metric, so it makes sense to use the metric system. Remember these measurements are hypothetical; you must measure the hubs and rims you're using for accurate centering.

**Step 6:** Put the centering gauge on a table, and, with a vernier depth gauge, set the gauge's screw  
(Please turn to page 46)



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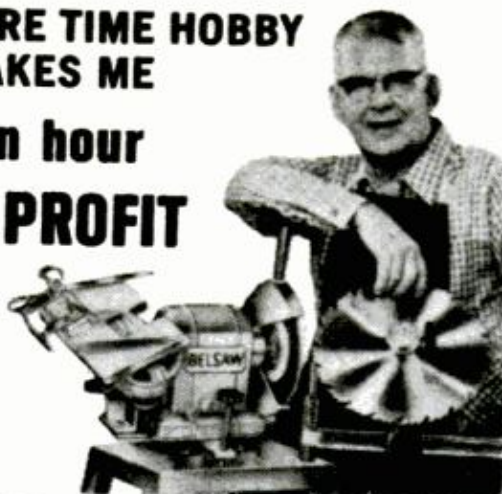
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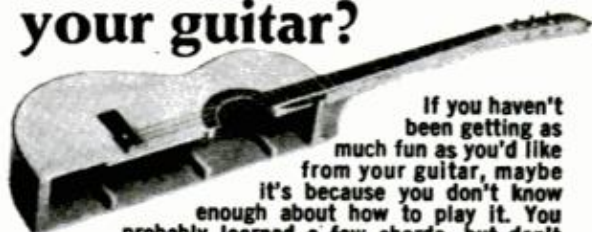
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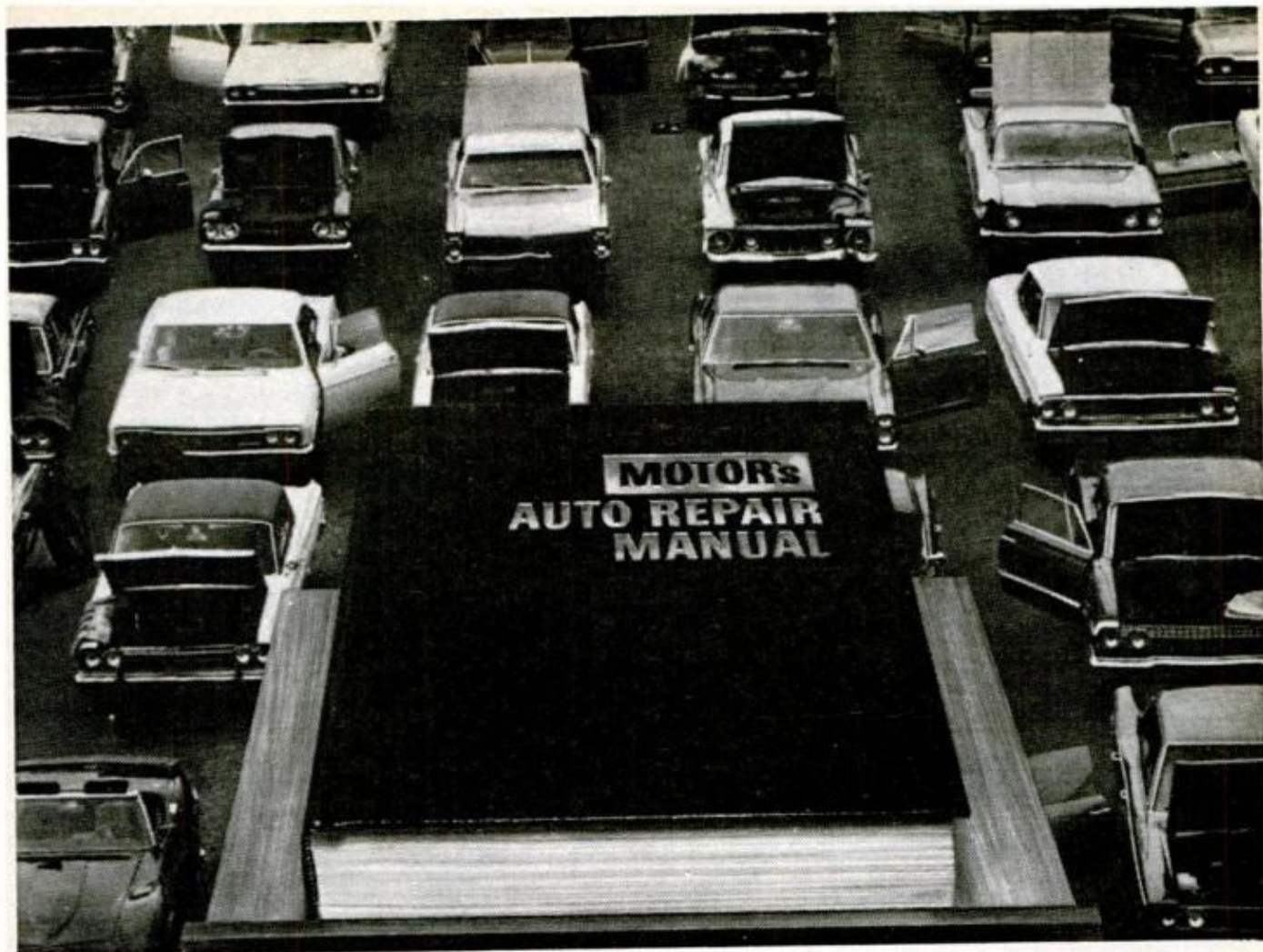
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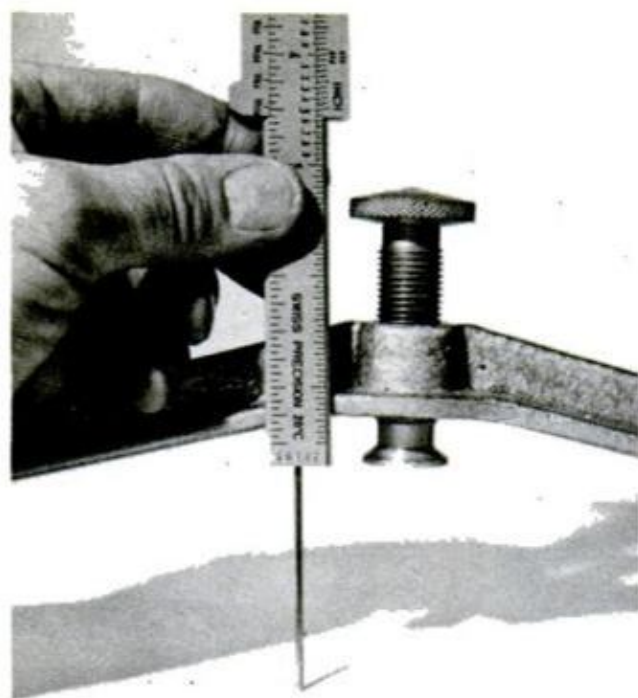
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## THE BICYCLE SHOP

(Continued from page 42)



so the head of the screw that rests on the axle locknut is 50.45 mm or 1-127/128 inches from the table. (You could say 2 inches, but you'd be off a bit.) The gauge screw is hollow, so the axle fits inside and permits the gauge screwhead to rest on the axle locknut. (Again, these are hypothetical measurements.)



**Step 7:** Remove wheel from truing stand and lay it on your bench. Put the centering gauge on the wheel and try both sides to get an idea of how far the wheel rim is off to one side or the other.

**Step 8:** Put the wheel back on the truing stand. Set lateral (side to side) movement indicator so it touches the first major bump (farthest rim spot) on the left side. (If you're using an old fork, a piece of pipe cleaner or anything that will stay in place will serve as an indicator.) Tighten spoke nipple of right side from the bump one turn to pull the rim right. Find the next worst bump on the left side and repeat. Keep going until major left-side bumps are more or less removed. Don't worry about fine truing at this point.

**Step 9:** Repeat step 8 (move indicator to right side) to remove major right lateral bumps, turning nipple on the left side across from the bump one turn and continue around the wheel until the major right-side bumps are out.

**Step 10:** Remove wheel from the truing stand and again check rim alignment with gauge, as in step 7. If the rim is too far to the left, tighten all spoke nipples on the right one-half turn; if too far to the right, tighten all nipples on the left one-half turn.

**Step 11:** Put the wheel back on the truing stand. Continue working on the wheel to remove lateral untrueness, except this time turn the nipples one-half turn the first time around, then one-quarter turn the succeeding times. Do not attempt to pull out a lateral bump all at once, but work gradually around the rim. Excessive nipple tightening may cause uneven spoke tension in the finished wheel, leading to spoke breakage.

**Step 12:** Check again with the rim-centering gauge, removing the wheel from the truing stand and adjusting nipples one-quarter turn at a time, as described in step 10.

**Step 13:** With the wheel in the truing stand, move the indicator to the outside diameter of the rim so concentric out-of-roundness will show. Spin the wheel to find where the rim rides highest. At this point, refer back to the "Direction of Movement" drawing (page 40) Note that the rim moves toward the hub when two spoke nipples—A and B—are tightened the same number of turns. The idea is to remove high spots by tightening both left and right spoke nipples at the high spot, thus drawing the rim down by compression as spoke tension is increased at that point. Work around the rim to pull down all concentric high spots, tightening left and right spoke nipples at the high spots one-half turn the first time, one-quarter turn the second time around and one-eighth turn the final times.

**Step 14:** Remove the wheel, check with the rim-centering gauge as in step 7 and turn nipples one-eighth turn to bring the rim to the right or left as necessary.

**Step 15:** With the wheel out of the truing stand and with one hand on the valve side of the rim and the other hand on the opposite side, rest the axle on a workbench and press the rim vigorously down on both sides. Rotate the rim one-quarter turn, repeat the pressing-down operation and continue rotating the rim two more turns. You may hear popping sounds as the spoke heads seat into the hub flange. Check the rim alignment once more with the gauge, as in step 7.

**Step 16:** With the wheel in the truing stand, touch up lateral and concentric untrueness and rim alignment with respect to hub axle locknuts, as in preceding steps, turning nipples very slightly each time (no more than one-eighth turn). If you've gone over the rim several times and find all spokes are tight—so you can't turn the nipples any more—you will have to loosen nipples slightly to take out untrueness. Example: You have a slight bump on the left side, but can't draw up the nipple on the right-side spoke across from the bump. Instead, loosen the left-side spoke one-quarter turn. For concentric highs, loosen the right and left nipples on the side of the rim opposite the high. Later, as you take a ride on your trued wheels, you may hear twanging sounds which indicate that spokes are still seating in. You will need a touch-up truing in 50 miles or so, and, as spokes continue to stretch and nipples and spoke heads to seat in, occasional touch-ups. ★★ ★

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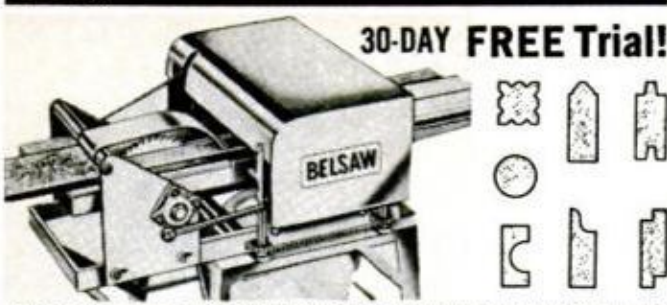
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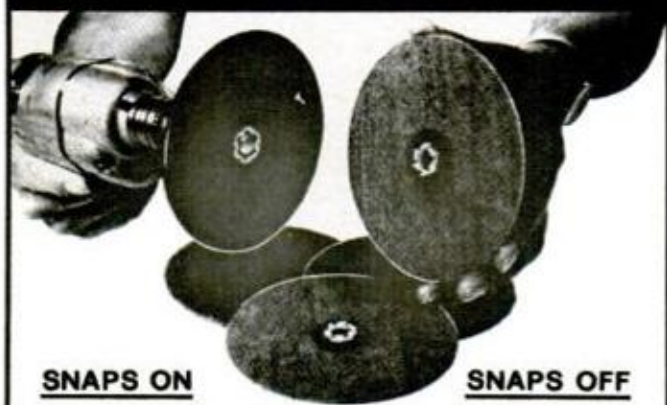
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# APPLIANCE CLINIC

By PAUL MANN

## Testing oven temperature

*Our Tappan gas range, recently purchased, has an automatic clock that we set to operate the oven for a desired period of cooking time. At the end of this period, oven temperature automatically tapers off to keep the food warm. I don't think the holding temperature is hot enough. Can it be raised?—Donald Cooke, Nashville, Tenn.*

Yes, but first I would make certain that the setting is actually off. The degree of temperature in the holding position depends upon the setting of the temperature for the cook position. For example, if the thermostat is set for a cooking temperature of 350°, the holding temperature should be around 180° to 200°.

Test temperature with an accurate oven thermometer. Set the thermostat at 350° and let the unit get good and warm. If the thermometer shows that temperature is off by 100° or more, the thermostat should be replaced. If the temperature is off by less than 100°, the thermostat can be recalibrated.

To reset most thermostats, remove the knob which is usually held by a small conventional screw or Allen screw. In the center of the stem, you'll see a setscrew. In most cases, you turn the setscrew counterclockwise to lower the temperature; clockwise to raise it.

Only a slight turn of the setscrew is needed to vary temperature many degrees. Since turning the screw to achieve a desired temperature is trial-and-error, you should test the unit with the oven thermometer as you go along. To get an accurate reading, allow the thermostat to cycle three times before reading the thermometer. The thermostat should give an audible click as it cycles.

## If the shoe fits . . .

*While making continuity checks of a washing machine with a new ohmmeter, the meter went blooey and refused to*

*function. What recourse do I have toward the manufacturer of the meter?—William Fisk, Council Bluffs, Iowa.*

The manufacturer of your meter is an old reliable firm, and if the fault lies with the instrument, I'm sure the company will honor the warranty. However, experience shows that ohmmeter failure is often caused by incorrect application on the part of the user.

One of the mistakes frequently made is to perform the continuity test with the appliance connected to a live electrical circuit. Another is to use an ohmmeter to check a 110-volt circuit, which will knock the guts out of the ohmmeter.

Another fact frequently overlooked is that appliances often have capacitors that are energized even if the plug is pulled from wall outlet. If you hook the meter into the capacitor circuit, you'll discharge the capacitor right through the meter, which will damage the instrument. To check a capacitor circuit with an ohmmeter, you should first disconnect the capacitor leads and bypass the capacitor by throwing a jumper across the leads. Or you can discharge the capacitor by shorting across its leads to ground.

Another serious mistake often made by home mechanics is not reading the manufacturer's instruction booklet that comes packaged with a test instrument.

## Diagnosing water-valve noise

We have received letters asking us to diagnose water-valve noises coming from under-the-counter dishwashers. This is difficult to do without hearing the noise. Thus we will try to define each type of common noise, leaving it to you to do your own diagnosis. Before you start, however, check the water-heater setting because high water temperature can cause noise. Generally, water-heater thermostats should be no higher than 150° in homes having dishwashers.

Four common noises are:

1. *Water hammer.* This is caused by the abrupt closing of a water valve. It is characterized by a single loud thud. This thud creates a shock wave that is transmitted back through the plumbing system, which may cause considerable movement of piping.

To offset water hammer, manufacturers of under-the-counter dishwashers usually

*(Please turn to page 52)*



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## APPLIANCE CLINIC

(Continued from page 50)

install "slow-moving" water valves in their units. If water hammer is a problem in a home, the cause is probably water pressure in excess of 160 lbs. per sq. in. In this case, a water-hammer eliminator or pressure reducer should be installed in the plumbing.

2. *Chatter.* This noise and water hammer frequently go hand in hand. As the shock of water hammer is transmitted back through piping, the piping can vibrate if it isn't supported, so secure long runs of pipe with pipe clamps.

Chatter can also be created when a water-valve diaphragm fails to close on the initial movement of the solenoid armature. This noise is characterized by low-frequency pulsing sounds which are created by the pulsing of the water-valve diaphragm as it tries seal off the valve port. The noise may occur for a brief second or go on indefinitely.

The cause of this kind of chatter is frequently inadvertent use of the wrong part. For example, installing a fast-closing diaphragm intended for use in portable dishwashers in a slow-closing water valve will cause chatter. Also use of an under-size inlet pipe when the dishwasher is first installed will cause chatter. Minimum size of an inlet pipe should be 1/2 in. outside diameter.

3. *Flutter.* This noise is a low-frequency rumble that usually occurs when the water valve opens, but it can occur any time that water is flowing through the valve. Flutter is produced by variations in pressure at the water-valve flow washer. The noise is actually produced by flexing of the flow washer. Flutter is normally caused by high water temperature.

4. *Whistle.* This is a steady high-pitched noise caused by water flowing through the flow washer orifice. The noise may be anything from a hissing to a shrill whistle, depending upon pressure and temperature. If the sound is objectionable, it may be corrected by installing a small hand valve in the inlet line so the size of the pressure band can be varied. ★★★

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

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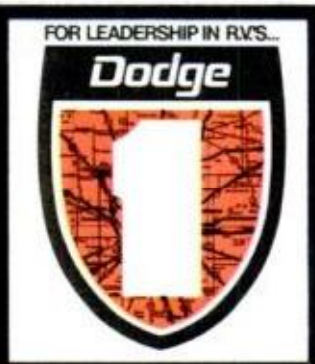


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**A "HOT" FLUORESCENT LAMP**—capable of operating at full power at temperatures up to 212° F. (boiling point of water)—has been developed for use in Skylab. The orbiting lab, scheduled to be launched later this year, requires heat-tolerant lamps because of the lack of cooling convection currents in its compartments. Conventional lamps are cooled by air currents. The new lamp was developed by Westinghouse engineers.

**A CHILD BORN TODAY IN THE UNITED STATES** can expect to live about 22 years longer than his grandparents, according to a report in *Update*, a publication of the American Medical Assn. This prediction is based on a comparison of 1971 life-expectancy data—the most recent available—with similar data for 1900. The increased longevity is ascribed to improved standards of living and advances in medicine. At the turn of the century, tuberculosis and diphtheria were among the chief causes of death. Now they're no longer listed as leading killers. Today, heart disease and cancer top the list.



Tuning in from Eifel Mountains

**WORLD'S BIGGEST MOVABLE CELESTIAL EAR** is now in full operation in the Eifel Mountains of West Germany. Its dish is 328 feet in diameter, some 80 feet bigger than Britain's famous Jodrell Bank radio telescope. The 3200-ton instrument rides on a track and can be moved as little as 1 mm. (.04 of an inch) at a time. Astronomers say the dish will open up new areas of study involving the formation of our galaxy.

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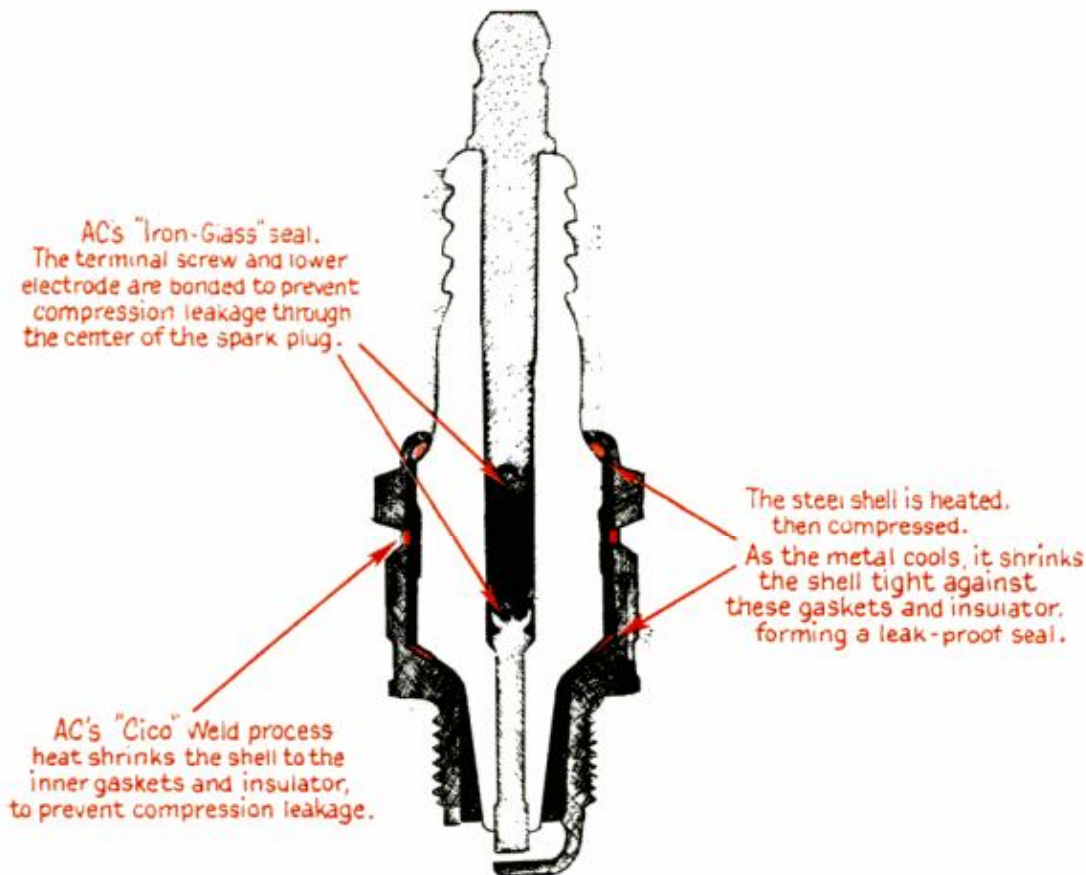


It's a cheap washing machine

**CHEAP BUT EFFECTIVE.** That's the evaluation of a medical appliance recently created at James Cook University, Australia, by scientists who used plastic tubing to hook up a five-gal'on plastic container, an aquarium pump and a cheap thermostat. Their creation is a "scrubber" that can be used to wash out part of the intestinal tract, a procedure used in treating patients suffering from kidney failure. The device,

*(Please turn to page 60)*

# TOUGH!



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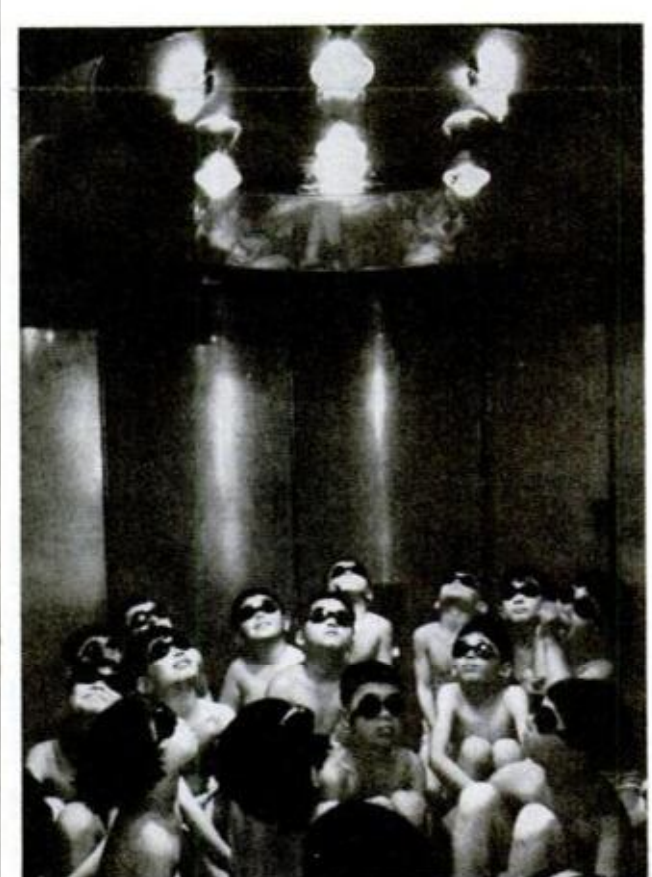
(Continued from page 58)

expected to cost less than \$200, can be used in the patient's home to supplement treatment with more sophisticated kidney machines.

## The environment

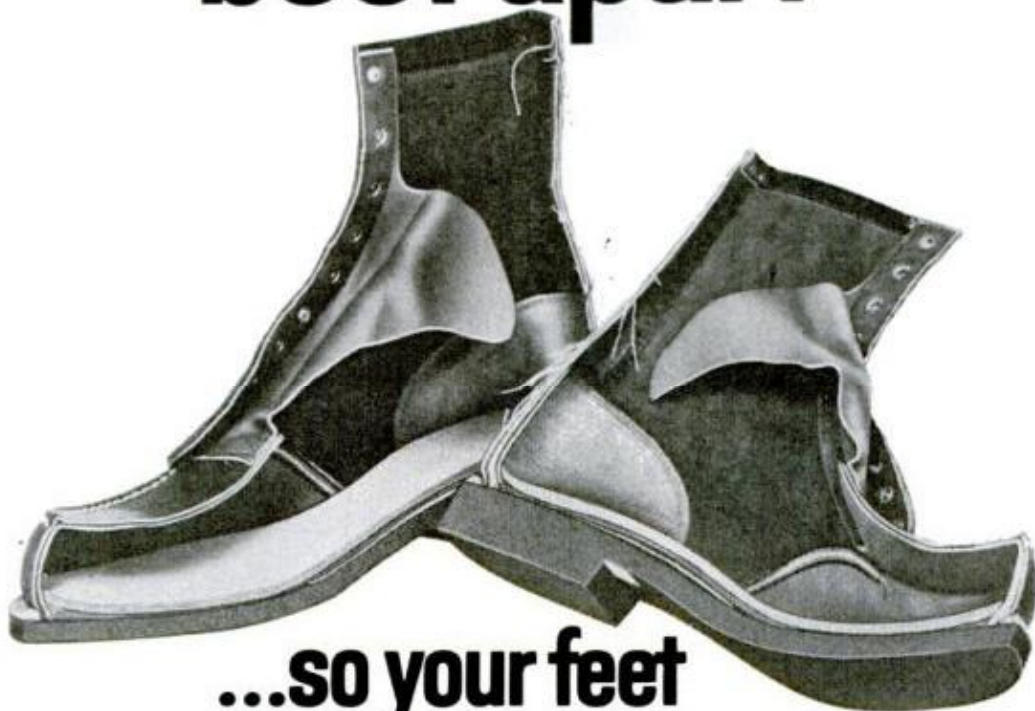
**NOISE POLLUTION** is not only an outdoor phenomenon—it occurs in homes, too. Electrical appliances are the chief sources. Noise levels produced by electric shavers, garbage disposers, shop tools and a host of other gadgets may cause actual hearing damage with frequent or continual use. This information comes from a new booklet, *Noise in the Home*, which can be ordered from Consumer Product Information, Washington, D.C. 20407. Cost: 15 cents. The booklet also contains suggestions on how to reduce indoor noise levels.

"**SUNLIGHT SHOWERS**" are part of the routine at a grammar school in Hokkaido, Japan. The program was started years ago in an attempt to improve the health of schoolchildren living in a congested part of the city. Today, the artificial sunlight showers are considered more important than ever because Hokkaido, like other big cities, has a smog problem. ★ ★ ★





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cure for  
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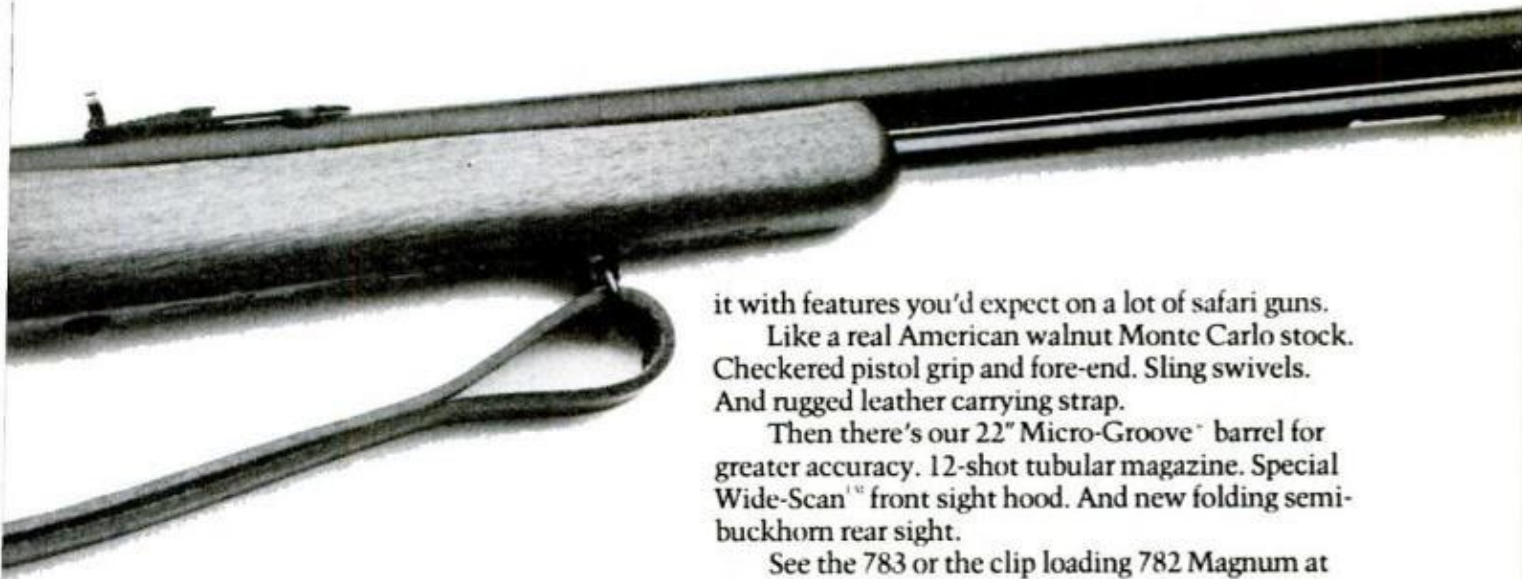


Marlin 783, suggested retail price about \$59.95  
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See the 783 or the clip loading 782 Magnum at your dealer's. And while you're there, ask to see the complete line of Marlin bolt-action .22's for Short, Long or Long Rifle cartridges from about \$37.95 to \$55.95. Ask your dealer for a free color catalog or write Marlin Firearms Co., North Haven, Conn. 06473.

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**ALL RIDING MOWERS  
ARE EASY ON YOU.**



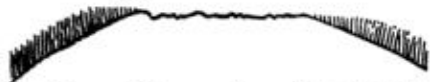
# HOMELITE RIDING MOWERS ARE EASY ON YOUR LAWN.

It's too bad you can't test drive riding mowers before you buy one.

Because if you could, you might discover that while you're up there in the seat having a grand old time, your lawn is taking something of a beating.

## HOMELITE DISCOVERS THAT THE LAWN ISN'T FLAT.

A lot of riding mowers have been designed as though the earth under them is flat. Their mower decks (where the cutting blade is) are fixed to the mower's chassis, which gives them absolutely no give. So when they run into a bump or incline, they really run into it. Turning grass into mincemeat.



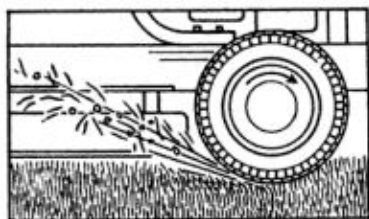
Homelite, on the other hand, attaches its mower deck to the front axle. When the wheels glide over a high spot, the deck



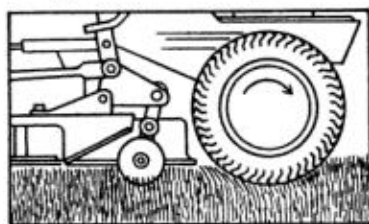
glides right along after them. Gently cutting your lawn instead of brutally scalping it.

## HOMELITE LETS YOU SHIFT WITHOUT SHIFTING YOUR LAWN.

To shift gears on most riding mowers, you have to clutch. And while clutching may be just



great on the drag strip, it's a drag on your lawn. Clutch into reverse, for example, and you may find your back wheels spinning out — spinning out some grass in the bargain.



That's why Homelite's RE-8E (rear engine, 8 horse power) riding mower has a no-clutch transmission similar to the automatic transmission of a car. It enables you to shift smoothly from forward to reverse with a single lever. Leaving your lawn unscathed.

## WE NOT ONLY PAMPER YOUR LAWN. WE GIVE IT AN EVEN CUT.

The cutting blades of our Homelite riding mowers are reinforced with rigid steel. And



when you have a 30-inch cutting swath, that can be very important.

Because the steel keeps the

blade from flexing on either end. Which means that every one of those 30 inches gets cut on the same level. And your lawn ends up looking even instead of odd.



## WE DIDN'T FORGET ABOUT YOU.

Now that we've told you how good our riding mowers are for your lawn (and we've only had room to tell you part of it), it's time we paid some attention to you.

Electric starting is standard on our 7 and 8 hp. models (optional on 5 hp.). And they all have full plush seats that are actually adjustable. Practically effortless steering (the RE-8E even has a steering wheel instead of just a bar). And all kinds of safety features and operating conveniences.

But to get the full story on how easy Homelite riding mowers are on you, we suggest you go to your nearest Homelite dealer (to find him, call toll free: 800-243-6000, in Conn., 1-800-882-6500).

To get the full story on how easy they are on your lawn, we suggest you take one home.

## HOMELITE® RIDING MOWERS.

They're as easy on your lawn as they are on you.

HOMELITE A  DIVISION • 504 RIVERDALE AVE. • FORT CHESTER, N.Y. 10373

# Photo Hints

## Sections of hose make handy floodlight holders

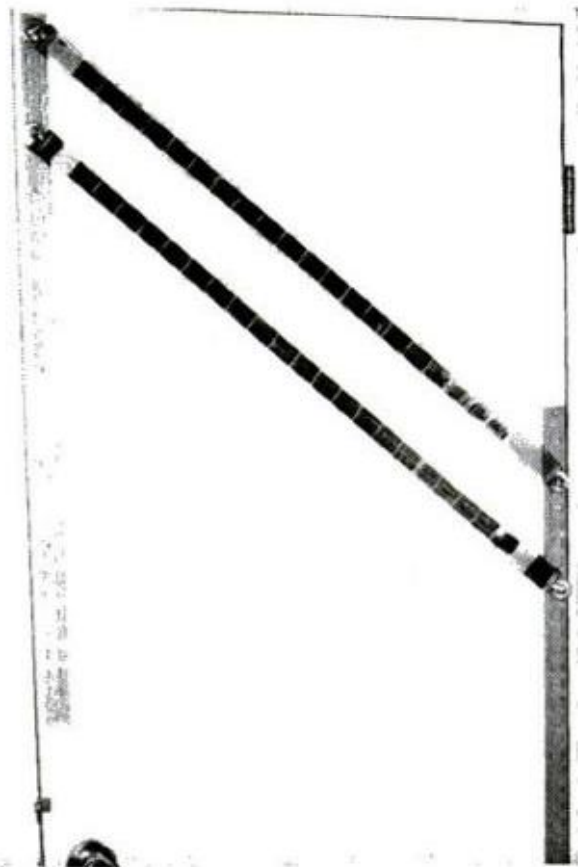
Need a place to store your photoflood reflectors? You can rack them neatly on your wall in these homemade holders. Just cut a piece of hose about one-half the reflector's circumference, curve it to fit the light, and nail it to the wall. Coil cords around the sockets. —E.V. Reyner, Salinas, Calif.



## Film dries quicker on the bias

I dry my film diagonally, to save space (it fits across my door that way) and find it dries better, too. Hung vertically, a film's top frames dry fast, but its bottom ones stay soggy from runoff. Horizontal film dries uniformly, but not quickly enough. My way, water runs quickly down the film and off its corner (collecting on the sprockets, if anywhere). Magnets hold the film clips to double-width shelf standards, staggered as shown on my darkroom door.

—Don Anderson, Sunnyvale, Calif.



## Labels as durable as tin cans

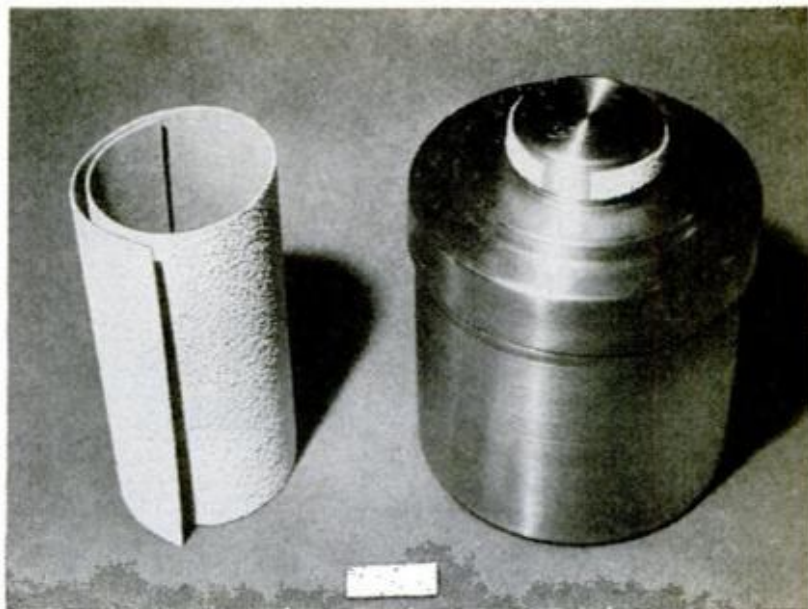
Need labels that won't fade or wear away? Next time you mix chemicals, cut labels from the cans the dry powders came in. Trim off the sharp corners, and drill the label for a wire or chain with which to hang it on the jug or bottle neck.

—Ken Patterson, Regina, Sask.



### Letters for reading in the dark

In the dark, how can you tell one grade or type of enlarging paper from another? Weller suggests you write on the paper boxes with a hot-melt glue gun. The raised letters will be easy to "read" in the dark. Here, "F" stands for the paper surface, while the two dots signify Contrast 2. You can use any suitable code.



### Nonskid grip for tank lids

When the filler cap on a stainless-steel developing tank sticks, it can hold you up long enough for the film to overdevelop, or pull the whole lid off. Strips of pressure-sensitive nonskid material (sold in boating and hardware shops) give you enough grip to remove even the stickiest cap.—Don Anderson, Sunnyvale, Calif.

# Freeze-a-Ferrari.

Not all 35mm reflexes let you keep up with the action. When you look away to adjust the camera, you lose the race.

With a Minolta SR-T 101, you never lose sight of your subject.

Because you set shutter speed and lens opening

by simply aligning two indicators in the viewfinder. So you can frame, focus, adjust exposure and (Varroom!) get the shot, fast and easy.

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When identified by a factory-sealed "M" tag, Minolta 35mm reflex cameras are warranted by Minolta Corporation against defects in workmanship and materials for two years from date of purchase, excluding user-inflicted damage. The camera will be serviced at no charge provided it is returned within the warranty period, postpaid, securely packaged and including \$2.00 for mailing, handling and insurance.

**Minolta**



# IMPORTS AND MOTORSPORTS

BY BILL HARTFORD



**THE VERTICAL GRILLE** is the tip-off that under the hood purrs Jaguar's V12 engine. More smooth and stealthy than savage, the 12-cylinder single-overhead-cam powerplant in the new XJ12 sedan is the same as that used in the XKE convertible and 2+2 coupe (see *Are Eight Cylinders Enough?*, page 84, Jan. PM). The XJ6 sedan with double-overhead-cam, in-line Six will continue to be sold for \$9250; the new car will go for \$10,500

**DROPPING A V12** into Jaguar's XJ sedan isn't the shoehorn task it may seem. The car was designed in 1968 to take the 12, then under development, but all the first V12s went to the E-type sports cars. Last year, for Jaguar's 50th anniversary, the XJ12 went on sale in England. Now the cars have reached the colonies, and, as was the case with the XJ6, the waiting list is long. Extraordinary as the XJ6 is in performance and comfort, the XJ12 is better. The smooth torque curve of the 12 is noticeable in acceleration and cruising and the antidive front suspension geometry minimizes nosediving under hard braking; and like the XKEs, the front discs are ventilated. With the aluminum block, the V12 weighs only slightly more than the Six so the car requires only slightly stiffer front coil springs. The great delight of the car is that it is luxurious in every way but can still be

thrown around as if it were a sports car.

**GETTING BACK TO BASICS** is the best way to describe the second new British Leyland car for the U.S. market: the Austin Marina. Most popular of the company's models in Britain, the Marina uses the MGB sports-car engine and is available here in four-door sedan and two-door GT models. Prices of \$2575 and \$2625, respectively, put them in a very competitive class of compact, sporty family sedans. The four-door won't turn any heads, but the GT is distinctive, especially with the "hot setup"—a special trim kit with side stripes, alloy wheels and backlight louvers.

**BIKERS' LIBERATION** is built into the Bird 100MX. You can concentrate on takeoffs and landings without worrying about being in the right gear at the right time: A torque converter  
(Please turn to page 62H)

**AUSTIN MARINA GT** and four-door sedan model went on sale in England in 1971 and quickly became the nation's third best-selling car line after the Ford Cortina and Escort. Now being manufactured in sufficient quantity for export, the Marina has a 96-in. wheelbase. The 1798-cc engine (same as in the MGB sports car) drives rear wheels through a four-speed box with automatic optional. Brakes are disc/drum and tires are radials





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PROTECTION**

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**Also gives Prompt, Temporary Relief in Many Cases from Pain, Itching in Such Tissues.**

Doctors have found a remarkably successful medication that actually helps shrink swelling of hemorrhoidal tissues when infected and inflamed. And it *does more*. In many cases it gives relief for hours from pain and itching in

these tissues. Tests by doctors proved this true in many cases.

The medication used in these tests was Preparation H. And no prescription is needed for Preparation H<sup>®</sup>. Ointment or suppositories.

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



Thousands of home handymen, farmers and shop fabricators buy the Lincoln AC-225 every year for these reasons.

**Hundreds of Uses.** Lincoln AC-225 welders give the ideal arc for fabrication and repair welding. Build your own tools and equipment. Fix cars, trailers, boats, farm machinery quickly. Rebuild or hardsurface worn parts. Heat metal for bending, straightening. Thaw frozen water pipes.

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**Long Life, Dependable Performance.** No controls to creep or wear out. Transformer is extra dipped for weather protection. Bottom screen makes the welder verminproof. Built by Lincoln Electric...world's foremost producer of arc welding equipment and supplies.

**Easy to Install.** Plug into standard 230-volt, single-phase current, just like an electric range. NEMA rated. UL approved at 230 volts, 60 hertz. Will also operate on 208 volts.

**Mobile, Lightweight.** Easy to move. Wheels optional.

**Ready to Use.** Price includes accessories, sample electrodes, power cable, instruction book.

(Suggested Zone 1 list price only \$95, subject to change without notice. Optional features, taxes, local delivery and Zone 2 freight charges may alter this price.)

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## IMPORTS AND MOTORSPORTS

(Continued from page 62F)



keeps the engine operating at the peak of its power curve, does the job of the usual five-speed transmission and automatically downshifts in response to changes in engine rpm. It's mated with a 99.3-cc McCulloch engine that Bird Engineering raced successfully at several Mini-Cycle Nationals and set a 100.888-mph record on the Bonneville salt flats.

**YOU NEED A LOT OF BREAD** to go racing. The secret to winning races, according to some competitors, is not cubic inches but cubic money! Wonder Bread, made by ITT-Continental Baking, is supplying the dough for a

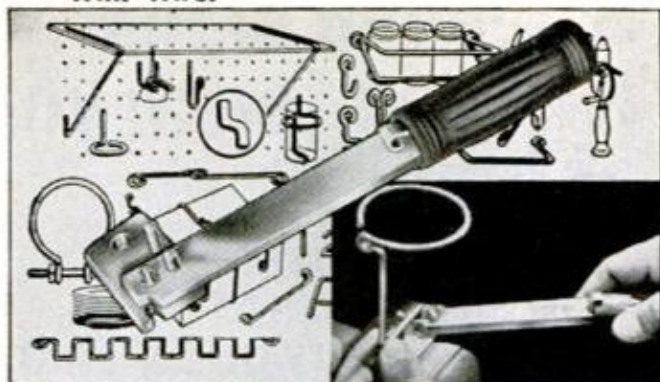


pair of Funny Cars that'll be running the drag strips this season. The "Wonderwagons," on Vega panel trucks, are powered by Ed Pink-prepared Chryslers displacing 494 cu. in. and churning up 1500 hp on 92 percent nitro fuel.

Quarter-mile speeds should be in the 220-mph range. Any way you slice it, that will be real competition for the Funny Car Eliminators. ★★★

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It measures 8 feet by 12 feet; has a second floor; and can be built by most any handyman.

Plans give detailed building instructions. You probably will want to order two sets of plans as you likely will have to submit one set to your local building department.

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Please send me plans for Popular Mechanics' back-yard storage building as indicated below. Enclosed is my payment in full.

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APRIL 1973

# May is a month to get excited about!



### 80 PAGES OF INFORMATION

And a month to start thinking about your vacation and how you'll get there. Most likely you'll take your car, but, if it's not in shape your vacation will be more headaches than fun.

To help you stay on the road, whether vacationing or not, POPULAR MECHANICS May Issue will feature a "Car Care Guide". This will be a special magazine-within-the-magazine that will include 80 pages of information and tips on engine tune-ups, body repair, cooling systems, waxes and polishes . . . in short, it will be a complete guide to car care. POPULAR MECHANICS "Car Care Guide" will be a treat for both you and your car.

Also, during the month of May, thousands of retail members of the Automotive Parts & Accessories Association (APAA) will be promoting Car Care Month to help you get your car ready for the summer months ahead. Look for their advertisements in your local newspapers.

## on sale April 26



1

# 3 needed skills NRI can teach you at home . . .

NRI courses use easy "bite-size" texts to show you how to service TV-Radio Repair Cars or Appliances

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But *you* must make the decision. Mail the card today for a free full-color catalog in the field of your choice. No obligation. No salesman will call. If the reply card is missing, write to NRI at the address below and ask for the catalog.



2



3

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runs  
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# HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

## Best time to transplant tree

*When is the best time to transplant a growing crabapple tree, spring or fall?—W. Leonard, Jefferson City, Mo.*

I favor spring as the best time for open-root transplanting. This gives the transplant time to develop an adequate new root system and attain some growth before winter comes. Balled specimens can usually be transplanted any time, but even then, spring is best.

## Locating furring strips

*I need to locate furring strips under soft-board paneling. But how? Tapping with a hammer doesn't indicate any change of sound, as it does on other types of walls.—Gene Tomey, Topeka, Kans.*

Use an ordinary pin. It can be pressed through the softboard without leaving a large, unsightly hole. Once you have located one or two strips the others should be easily found by measurement, assuming they are on 16 or 24-in. centers. If necessary, the pinholes can be filled with a spackling compound colored to match.

## Painting a stone wall

*A stone wall, laid in mortar, encloses a part of my back yard. I'd like to paint it in some attractive color to get rid of the moss and the dirt it collects. Should I use a house paint, or what?—Ted Beeman, Rochester, N.H.*

Don't use house paint. Use a water-soluble masonry paint made for the purpose. You should be able to select the color you want. But why paint a stone wall? It would be most attractive in its natural state. There's a certain natural beauty in stone work that paint hides and once paint has been applied there's no getting it off handily.

## Radiator doesn't radiate

*One radiator in my home requires bleeding frequently, but even with bleeding the air twice every week or more it doesn't heat consistently. The system is in its 15th winter. What can I do to get it*

*working for another heating season?—Wiley Short, Rochester, N.Y.*

Several factors may be involved, but I would suspect the malfunctioning radiator is nearest the boiler where it gets all, or most, of the air present in the system. If my guess is right, then installation of an automatic bleeder valve should alleviate the trouble. These valves allow air to escape but close when contacted by water.

## Removing spilled paint from bricks

*I spilled a small amount of house paint on my brick-and-concrete stoop and all my efforts at removal have failed. Can you help me?—B. Mills, Atlanta.*

Paint removers and vigorous scrubbing with a wire brush should get most of the paint, but if the bricks are rough-textured some may be difficult to remove. Make a paste by adding trisodium phosphate to water and stirring to a creamy consistency. Pour this over the splatter and keep it covered with a dampened cloth for several hours. Remove and again scrub with the wire brush. Repeat the process if necessary. This treatment may "brighten" the bricks temporarily, but weathering should return them to a matching color.

## Bringing out 'tiger-maple' graining

*On many old pieces of "tiger maple" I see the grain is strongly defined, a trick I've never been able to accomplish by staining. How did they do it?—Mrs. John Darlson, Wheeling, W. Va.*

Much of the maple you see in old pieces was cut from mature trees in which the so-called tiger grain was well defined in strong contrasting stripes of more or less uniformity. Material cut from younger trees does not always display this grain strength when finished. Early craftsmen often coated the wood with Van Dyke brown in oil to which a small amount of lampblack was added. This brings out the stripes strongly in contrast when rubbed in with the palm, with any excess immediately wiped off. A later practice is to sear the wood with a torch (a butane torch will do), charring it just enough to accent stripes without blackening lighter portions. This job must be done with care. ★★★

*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.*



## Spend a milder moment with Raleigh.

A special treatment softens the tobaccos for a milder taste.

Rough it in comfort. Get a water-repellent Sportline Sleeping Bag just like the one shown for free B&W Raleigh coupons, the valuable extra on every pack of Raleigh.

To see over 1000 gifts, write for your free Gift Catalog: Box 12, Louisville, Ky. 40201.



Filter Kings, 17 mg. "tar," 1.3 mg. nicotine; Longs, 19 mg. "tar," 1.5 mg. nicotine, av. per cigarette. FTC Report August '72

APRIL 1973



RALEIGH

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

# Presenting Datsun 610.

## Considering the luxury, its economy is all the more remarkable.

The new Datsun 610 is something altogether new... a luxury economy car. A Datsun original.

Whether you choose the new 2-Door Hardtop, the new 4-Door Sedan or the new 5-Door Wagon, you get more power, more room, more quiet, just plain more car than any economy car has a right to be. But it comes with a Datsun price tag. And the kind of design sophistication you've come to expect from Datsun.

There's a new 1800 overhead cam engine and new power-assist front disc brakes for the perfect per-

formance combination. The 4-Door Sedan and 2-Door Hardtop have a new independent rear suspension, too.

As for the luxury, well, you've really got to drive it to believe it. The luxury touches—whitewalls, fully reclining bucket seats, tinted glass, full carpeting and custom vinyl interior—are just a beginning.

It's the new Datsun 610 series. Sporting performance, luxury accommodations and an economy car price. You've got to drive one to believe it. Drive a Datsun... then decide.



### Own a Datsun Original.

From Nissan with Pride



# What it takes to build and fly a **RADIO-CONTROLLED MODEL COPTER**

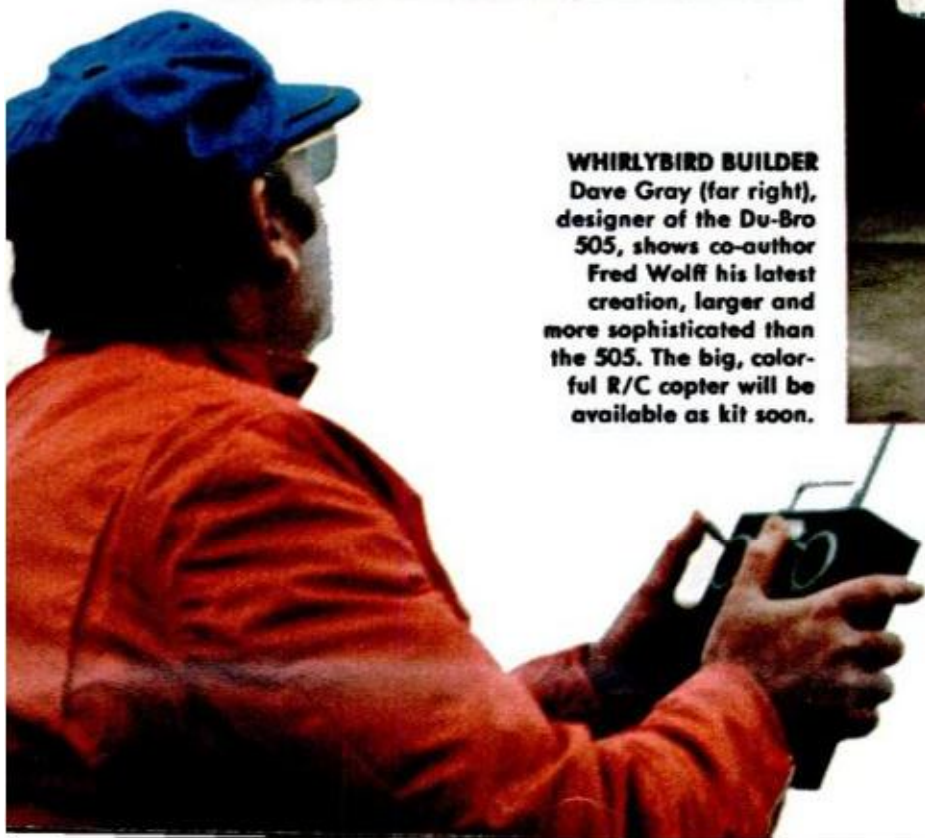
By **FRED L. WOLFF** and **JOHN F. PEARSON**

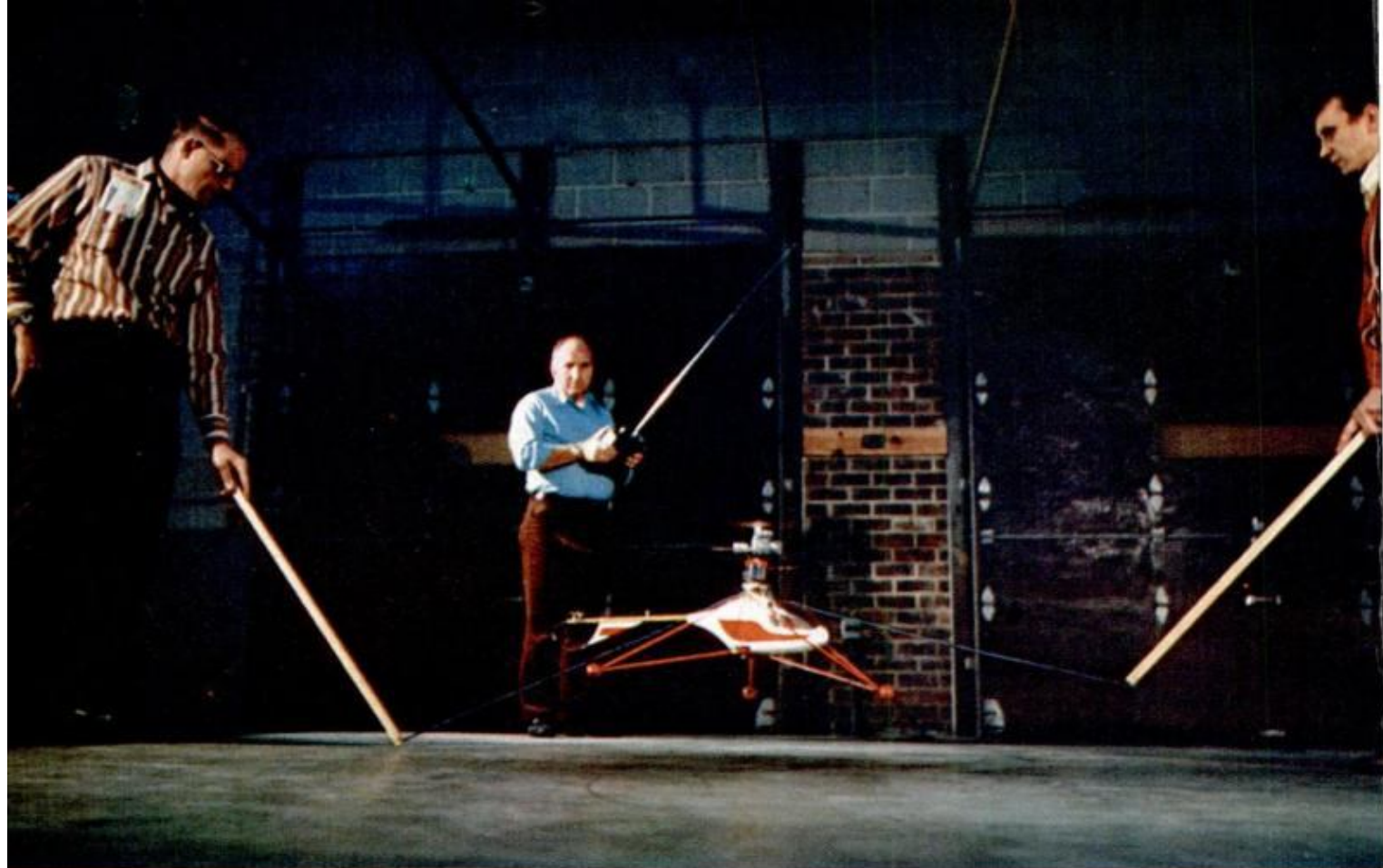
**I**T HOVERS DELICATELY for a moment, then sweeps into a smart banking turn, swoops low over the ground, comes to an abrupt halt in mid-air and finally settles gently to earth, its long, graceful rotor blades coasting slowly to a stop. It's a radio-controlled, kit-built model helicopter, one of the latest entries in the exciting new sport of R/C whirlybirding.

When R/C helicopters first came along, many fixed-wing enthusiasts considered them merely a passing novelty, too complex and costly for practical use. Now, with the introduction of precisely engineered, ready-to-assemble, relatively inexpensive kits, model whirlybirding is fast becoming a brand-new kind of hobby offering thrills, fun and challenges not possible



**WHIRLYBIRD BUILDER**  
Dave Gray (far right), designer of the Du-Bro 505, shows co-author Fred Wolff his latest creation, larger and more sophisticated than the 505. The big, colorful R/C copter will be available as kit soon.





with conventional radio-controlled model planes. The reason: Like their full-size big brothers, R/C model copters require a completely different flying technique from that of fixed-wing aircraft. A four-channel transmitter control is needed to handle the complex functions of fore-and-aft rotor tilt, side-to-side rotor tilt, tail rotor pitch, and throttle.

Maneuvers call for close coordination of two control sticks. They must be moved simultane-

**NOVICE PILOT WOLFF** handles controls while "ground crew" holds sticks attached to the tether lines. At least two hours of tethered flight are required before free flight can be attempted. Garage is a good place to train



**PARTS IN KIT** (left) come separated into groups and are clearly identified. Finished Whirlybird 505 (above) is 37½ inches long, has main rotor that spans 46½ inches and a 7-inch tail rotor. Kit does not include engine or radio-control system, sells for \$125

POPULAR MECHANICS

ously—tricky at first, but that's what makes whirlybirding so intriguing and challenging.

We built the Whirlybird 505 from a kit made by Du-Bro Products, Wauconda, Ill. The kit costs \$125 and does not include the radio-control unit or engine. We used the recommended O.S. Max .40 RC engine (about \$40) and the Blue Max Mark II radio-control system—both made by World Engines, Inc., Cincinnati. This type of unit costs from about \$250 and up.

Working carefully, it took most of a weekend to assemble the Whirlybird 505. The kit is not a collection of preformed components but is made up of many metal, wood, plastic and electronic parts. Their quality is good, identification excellent. The instruction booklet is complete.

If you haven't done much soldering recently, it would be wise to practice before assembling the kit. A lot of soldering is required, and neat, effective joints are a must. You'll need a soldering gun rated at 250 watts or better.

The delicately balanced, precision machine should have a flying weight of exactly 3 pounds, 14 ounces. Much under or over, and its flight characteristics will be noticeably affected. If it's too heavy, it won't get off the ground; too light, it won't

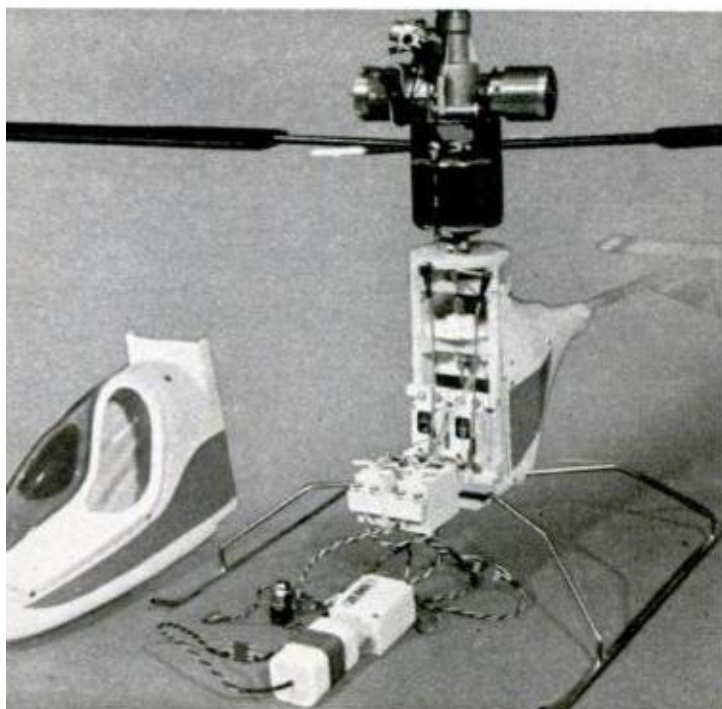
handle well. Sloppy soldering will add unwanted weight.

Construction of the Whirlybird breaks down into three main sections: main rotor, tail rotor, body. The body is heart of the bird. It holds the wood-frame mounting for the fiberglass tailboom, the main rotor shaft assembly and swash plates. It also houses servos for the throttle, tail and main rotors, receiver and battery pack.

The Whirlybird is a true helicopter and is powered by a "torque reaction" system. The rotor head is mounted on the engine so that they rotate together. A small propeller above the rotor turns on a drive-shaft. The engine spins the prop counterclockwise. The torque created by the prop—a reactive force—causes the engine and the rotor to spin in the opposite direction. This simplified system eliminates the need for a gearbox and makes handling easier.

The torque developed by a gear-driven rotor, as on a full-sized copter, tends to cause the fuselage to rotate in a direction opposite to the rotor's spin. This force must be countered by a small prop on the tail. On the Whirlybird 505, the rear prop functions merely as a rudder.

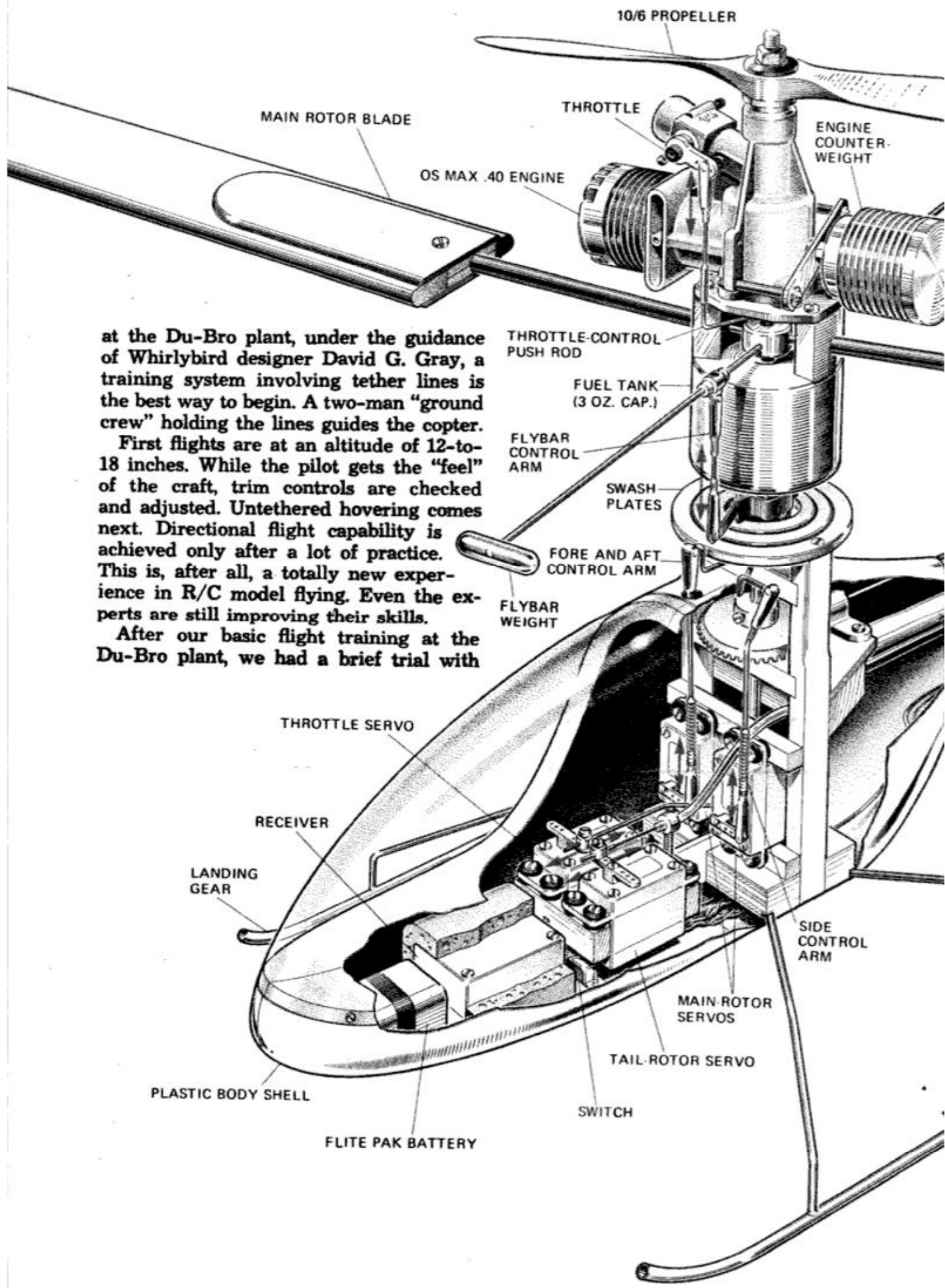
Still, learning to fly the Whirlybird takes practice and patience. As we learned



**WITH NOSE OF CRAFT REMOVED**, airborne electronic gear can be seen. The battery is up forward, ahead of the receiver and the four servos. Other radio-control systems may be used in the copter, provided the components are of the correct weight and size. Extra weight affects flight characteristics



**COMPONENTS** of the Blue Max Mark II radio-control system include the ground transmitter (at top), the flight battery package (at lower left corner of transmitter), four servos, and the receiver. On transmitter, left stick controls the throttle and tail rotor. Right stick controls the copter's main rotor



10/6 PROPELLER

MAIN ROTOR BLADE

THROTTLE

ENGINE COUNTER-WEIGHT

OS MAX .40 ENGINE

at the Du-Bro plant, under the guidance of Whirlybird designer David G. Gray, a training system involving tether lines is the best way to begin. A two-man "ground crew" holding the lines guides the copter.

First flights are at an altitude of 12-to-18 inches. While the pilot gets the "feel" of the craft, trim controls are checked and adjusted. Untethered hovering comes next. Directional flight capability is achieved only after a lot of practice. This is, after all, a totally new experience in R/C model flying. Even the experts are still improving their skills.

After our basic flight training at the Du-Bro plant, we had a brief trial with

THROTTLE-CONTROL PUSH ROD

FUEL TANK (3 OZ. CAP.)

FLYBAR CONTROL ARM

SWASH PLATES

FORE AND AFT CONTROL ARM

FLYBAR WEIGHT

THROTTLE SERVO

RECEIVER

LANDING GEAR

SIDE CONTROL ARM

MAIN ROTOR SERVOS

TAIL ROTOR SERVO

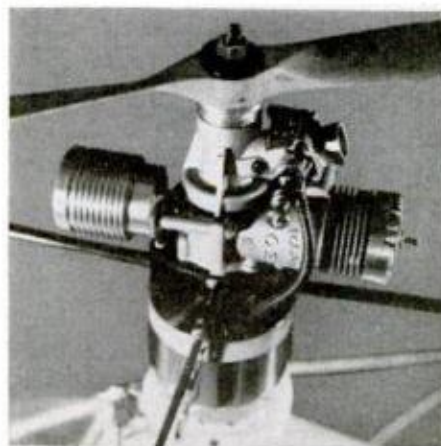
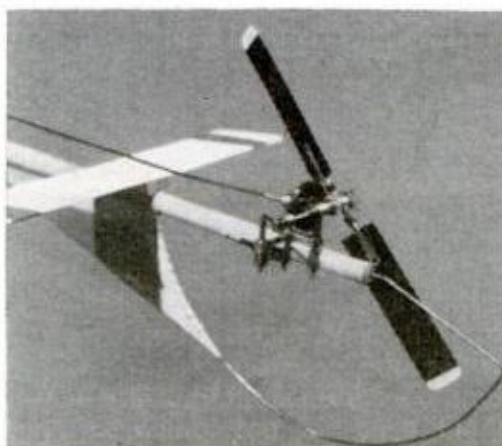
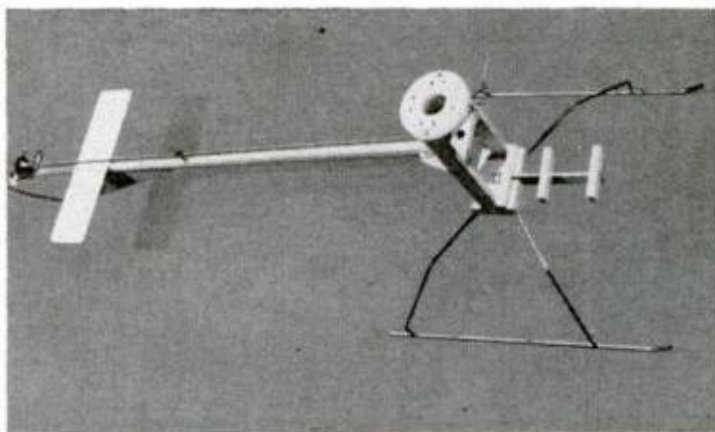
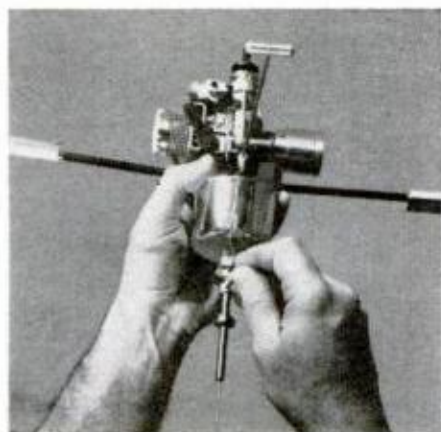
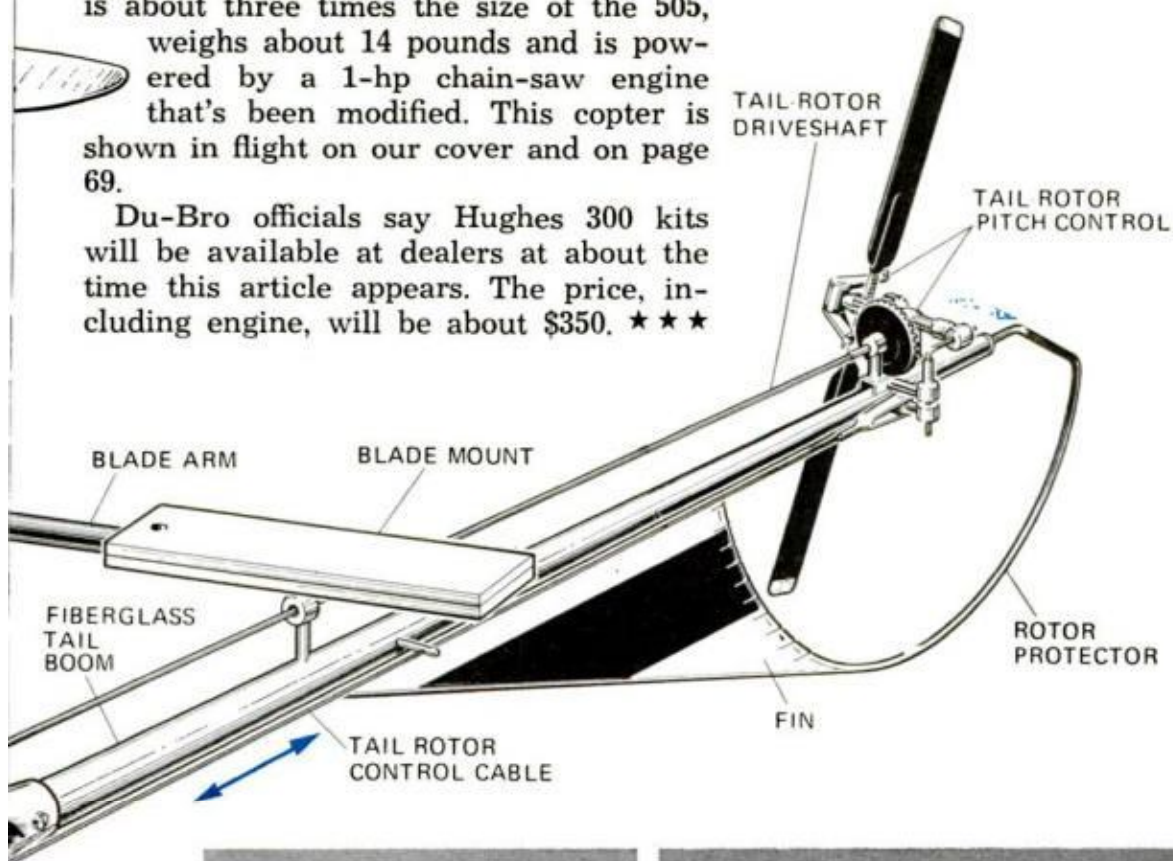
PLASTIC BODY SHELL

FLITE PAK BATTERY

SWITCH

Du-Bro's latest—a model of the Hughes 300. This bird has a gear-driven rotor, is about three times the size of the 505, weighs about 14 pounds and is powered by a 1-hp chain-saw engine that's been modified. This copter is shown in flight on our cover and on page 69.

Du-Bro officials say Hughes 300 kits will be available at dealers at about the time this article appears. The price, including engine, will be about \$350. ★ ★ ★



**BUILT SEPARATELY, POWER UNIT** (upper left) includes engine, shaft, tank. Precision balancing is a must in adding rotor blades. Stabilizer at end of frame (upper right) later was removed for better control in wind. Tail rotor unit (lower left) takes stress, requires effective soldering. Carburetor side of engine is seen in last photo. Tankful of fuel—mix of methanol, castor oil, nitromethane—can last up to 8 minutes.

## PM OWNERS REPORT: OLDSMOBILE OMEGA

A nationwide survey, based on 650,000 owner-driven miles



# Omega: An alpha for size,

By MICHAEL LAMM, West Coast Editor

Photos by the author

**O**MEGA SPELLS Oldsmobile's version of Chevrolet's Nova. Pontiac began offering this same basic car as the Ventura back in late 1971 (see *Owners Report: Pontiac Ventura*, page 84, March '72 PM). Now Oldsmobile has it, too.

They're three very alike cars—so

much so that an owner in Yonkers mentioned, "My Omega came through with NOVA on the dashboard." That's not surprising considering all three cars are built on the same assembly lines in Van Nuys, Calif. and Willow Run, Mich. and by the same workers. Oldsmobile *does* have its own inspectors supervising assembly. The Omega's front-end treatment, taillamps, steering wheels, and V8

**OMEGA SHARES** sheet metal and other basics with Chevrolet Nova and Pontiac Ventura. Grille marks greatest point of departure. About a third of owners had bought hatchbacks (right) and reported liking them, but shifting cargo sometimes makes for long reaches. Except for the steering wheel (below), dash is Nova's—utilitarian and clean but uninspired



engines are different from Nova's and Ventura's, but otherwise they're all carbon copies.

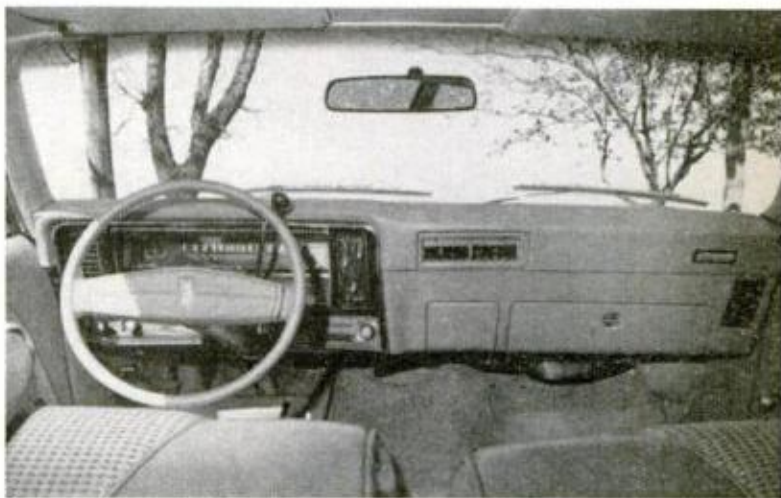
Base prices of Novas/Venturas/Omega range within \$230 of each other, meaning that the bare-bones Nova 6 lists for \$230 less than the least expensive Omega 6 coupe. What does an Omega owner get for those extra bucks?

The Oldsmobile name, for one thing, and it's important to a good many customers. Olds enjoys very high owner loyalty. Our survey shows that past experience with Oldsmobiles definitely influenced quite a few Omega sales.

This car also uses an Oldsmobile V8, although its displacement—at 350 cu. in.—is precisely that of Nova and Ventura V8s. Bore, stroke and outputs are different, though, for all three.

The Omega “looks Oldsmobile,” as an Ohio school teacher puts it. A New Jersey machinist: “I had a 1962 Olds F-85 for 10 years. It gave me good service. I could have bought a Nova for \$400 less, but I think Chevrolet puts them together cheaper, too.” An Alabama salesman states, “I bought the Omega because it's an Oldsmobile and because it's an economy car.”

How much of an economy car is it, though? Not everyone came away convinced. “Mileage?” wrote a retired California naval officer, “For a car that's sup-



## but economy rates a delta!

posed to be ‘economy,’ 10 mpg doesn't spell economy in my dictionary. I used to get better mileage from my Delta 88.” An Ohio secretary says, “Would have bought another Opel if I'd known what a gas-eater it is.” And a Mississippi dry cleaner: “I get far better gas mileage with my 1970 Chevy station wagon with the same size engine.”

Ironically, poor gas mileage was the

main complaint from 1972 Ventura owners, too, and they averaged 2-3 mpg more with both the Six and V8. Omega owners expected a lot better than the 12-16 mpg they're getting. An Oregon retiree wrote, “We wanted a small car that would give good gas mileage. The salesman said 22-28 mpg. We're getting 13-17.”

Quite a few people bought the Omega for its size. It's neither too big nor too



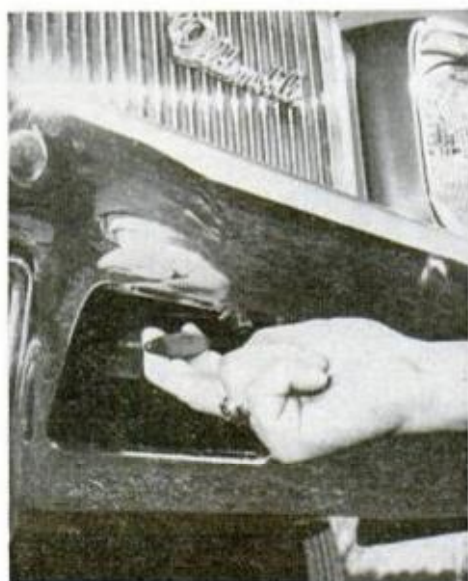
**SLOTTED BUMPER** accepts the jack at its strongest point and makes the lifting steadier



**SOME OWNERS** wanted more distinctive rear styling, objected to car's looking so much like Nova/Ventura



**ALTHOUGH** Nova/Ventura also have 350-cu.-in. V8s, the Omega's isn't shared. The six, though, is Chevy's



**HOOD RELEASE** in bumper slows both thieves and station attendants, should be inside car

small, they say. A North Carolina soldier opined, "Big-car ride from a small car." Many owners praised parking ease, maneuverability and handling in traffic.

On the minus side, we heard complaints (13.7 percent) that coupes lack rear legroom. A few sedan owners mentioned that both the front and rear floors were short of leg space.

Thirty percent bought Omega's hatchback coupe. Reactions: "I bought this car specifically to carry light loads, but it still looks like a car."—Nebraska cartographer. "I'd like easier access to get things in and out of the hatch. I have to climb in to get at stuff that's slid forward in braking."—Illinois accountant. "I like to be able to haul things I would in a station wagon without having to own one."—Michigan body layout man. "I do a lot of hauling, and for long trips and camping, the hatchback is hard to beat."—Missouri retiree. (Oldsmobile and several accessory manufacturers supply canvas flies and camp conversions for the hatchback.)

But then there's the seatbelt hassle. "Belt attachments are in the middle of the entryway to the back seat." This complaint was echoed by many owners of hatchbacks and standard coupes. Similar sore points: "The front inside lap belt is too short. I have to struggle to find it." And, "I have to yank retracted belt several times before I can fasten it." And, "Although I believe in seatbelts, the buzzer is quite annoying."

What do owners think of the quality of their Omegas? "Overall it's very good," reports a West Virginia insurance manager. Most buyers agree—59.4 percent gave it a better-than-good rating on





ON 111-INCH WHEELBASE, it's neither a giant nor a midget. Size ranks first as the main reason for buying

workmanship. "The car is very tightly put together," represents a typical comment. Another respondent wrote, "GM sends Omegas to Olds dealers with a few defects, and then it's up to the purchaser to ride herd on minor repairs." Lots of new-car owners feel this way: "Overall quality good, but it needs more attention in final inspection of paint and control knobs."

Ride was judged noisier than other Oldsmobiles but very acceptable nevertheless. The Omega got good marks on general comfort except for legroom plus a few gripes on rear-seat width.

Other minor annoyances included the Omega's lack of distinctive looks. "They ought to make it look less like a Nova,

especially from the rear." And we got the usual mentions of dieseling, stalling, and flat spots in acceleration. These plus much of the poor gas mileage was blamed on smog equipment. Whether that's the real trouble, though, remains a moot question. An awful lot of mechanical failings that couldn't possibly have anything to do with smog stuff also get blamed on emission-control components.

Omega stands as the last letter in the Greek alphabet, but according to 32.6 percent of Omega owners, it's not the last word in automobiles. That percentage said they wouldn't buy another Omega next time. It's a high figure compared with similar cars we've reported on in the recent past. ★ ★ ★

### Summary of 1973 Oldsmobile Omega Owners Reports\*

|                                  |         |                                     |       |                                     |       |
|----------------------------------|---------|-------------------------------------|-------|-------------------------------------|-------|
| <b>Total miles driven</b> .....  | 657,866 | <b>Size</b> .....                   | 20.4  | <b>Dealer repairs satisfactory?</b> |       |
| <b>Average miles per gallon</b>  |         | <b>Economy</b> .....                | 10.6  | <b>Yes</b> .....                    | 76.8% |
| 250-cu.-in. Six: local driving   | 13.9    | <b>Specific dislikes:</b>           |       | <b>No</b> .....                     | 23.2  |
| long trips                       | 16.7    | Poor gas mileage                    | 26.2% | <b>Is the Omega your only car?</b>  |       |
| 350-cu.-in. V8: local driving    | 12.2    | Rattles                             | 10.9  | <b>No</b> .....                     | 53.4% |
| long trips                       | 14.4    | Sloppy workmanship                  | 10.9  | <b>Yes</b> .....                    | 46.6  |
| <b>Body styles:</b>              |         | Seatbelts get in way                | 6.3   | <b>Other cars owned:</b>            |       |
| Two-door coupe                   | 51.2%   | Poor dealer service                 | 5.5   | Oldsmobile                          | 45.6% |
| Hatchback coupe                  | 30.0    | Lack of power                       | 4.7   | Chevrolet                           | 23.5  |
| Four-door sedan                  | 18.8    | <b>What changes would you like?</b> |       | Ford                                | 10.1  |
| <b>Engines:</b>                  |         | More legroom (esp. rear)            | 13.7% | Buick                               | 6.0   |
| 250-cu.-in. Six                  | 31.3%   | More distinct styling               | 13.2  | Volkswagen                          | 5.4   |
| 350-cu.-in. V8                   | 68.8    | Better fuel economy                 | 9.6   | <b>Workmanship opinion:</b>         |       |
| <b>Transmissions:</b>            |         | Seatbelts laid out better           | 6.4   | Good to excellent                   | 59.4% |
| Automatic                        | 85.0%   | <b>Had any mechanical trouble?</b>  |       | Average to poor                     | 40.6  |
| Three-speed manual               | 15.0    | <b>No</b> .....                     | 59.2% | <b>Dealer service opinion:</b>      |       |
| <b>Why did you buy an Omega?</b> |         | <b>Yes</b> .....                    | 40.8  | Good to excellent                   | 58.5% |
| Size                             | 41.9%   | <b>What type of trouble?</b>        |       | Average to poor                     | 41.5  |
| Styling                          | 26.5    | Carburetor                          | 18.4% | <b>Age distribution of owners:</b>  |       |
| Price                            | 20.0    | Electrical                          | 13.2  | 15-29 years                         | 32.5% |
| Past experience                  | 18.9    | Slipping transmission               | 13.2  | 30-49 years                         | 28.4  |
| Reputation                       | 15.8    | Windshield wipers                   | 8.8   | 50-plus                             | 39.0  |
| <b>Specific likes:</b>           |         | Alternator                          | 7.0   | <b>Would you buy another Omega?</b> |       |
| Handling                         | 62.0%   | <b>Did you repair it yourself?</b>  |       | <b>Yes</b> .....                    | 67.4% |
| Styling                          | 30.6    | <b>No</b> .....                     | 92.0% | <b>No</b> .....                     | 32.6  |
| Ride                             | 23.1    | <b>Yes</b> .....                    | 8.0   |                                     |       |
| Comfort                          | 21.2    |                                     |       |                                     |       |

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



**REAR-FOLDING WINGS** give aptly named Osprey 1 the look of a roosting bird, its wings tucked neatly along its body. The tricky arrangement, similar to that used on carrier-based World War II aircraft, makes the ship compact for easy towing and storing. Above, craft rests on a specially built trailer that permits it to be launched from any ordinary boat ramp. A single hinge pin locks each wing section in either an extended or retracted position

# Flyweight flying boat you can build yourself

By **SHELDON M. GALLAGER**  
and **HOWARD LEVY**

*Photos by Howard Levy*

**SIMPLE WOOD-FRAME CONSTRUCTION** is demonstrated by designer George Pereira, trying out the cockpit fit in his back-yard "proving ground." Swimming pool in background came in handy for flotation tests. Note planing step in hull just aft of the cockpit. Frame is shown before addition of a Styrofoam nose and a fiberglass skin

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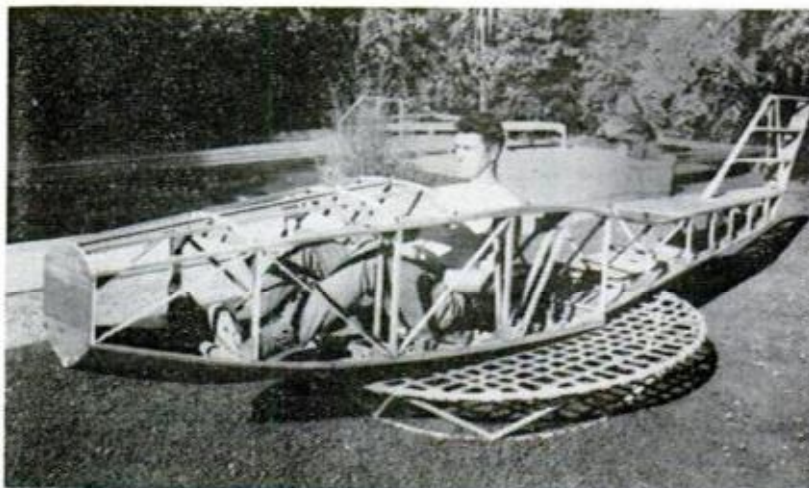
**M**OST HOME BUILT AIRPLANES are designed by aircraft experts. This one, however, was the brainchild of a boatbuilder so—quite naturally—it started out as a hull with wings and became a miniature flying boat. Dubbed the Osprey after the water-loving fish hawk, it's built around a center float that looks more like a step-type hydroplane racing hull than that of a conventional flying boat, being longer and flatter with a greater wetted area.

Oddly enough, the unusual design provides surprising advantages. The longer hull allows the step to be moved closer to the wing center of gravity. This helps to keep the ship stable while planing, and the flatter bottom pivots easily in the water, making possible tight-radius turns in cramped quarters. A retractable water rudder also improves maneuverability while afloat. Despite the greater wetted area, there's no problem getting the bird unstuck from the surface. It climbs up on the step fast, planes readily at low speeds and can take off in 250 feet—less than the length of a football field.

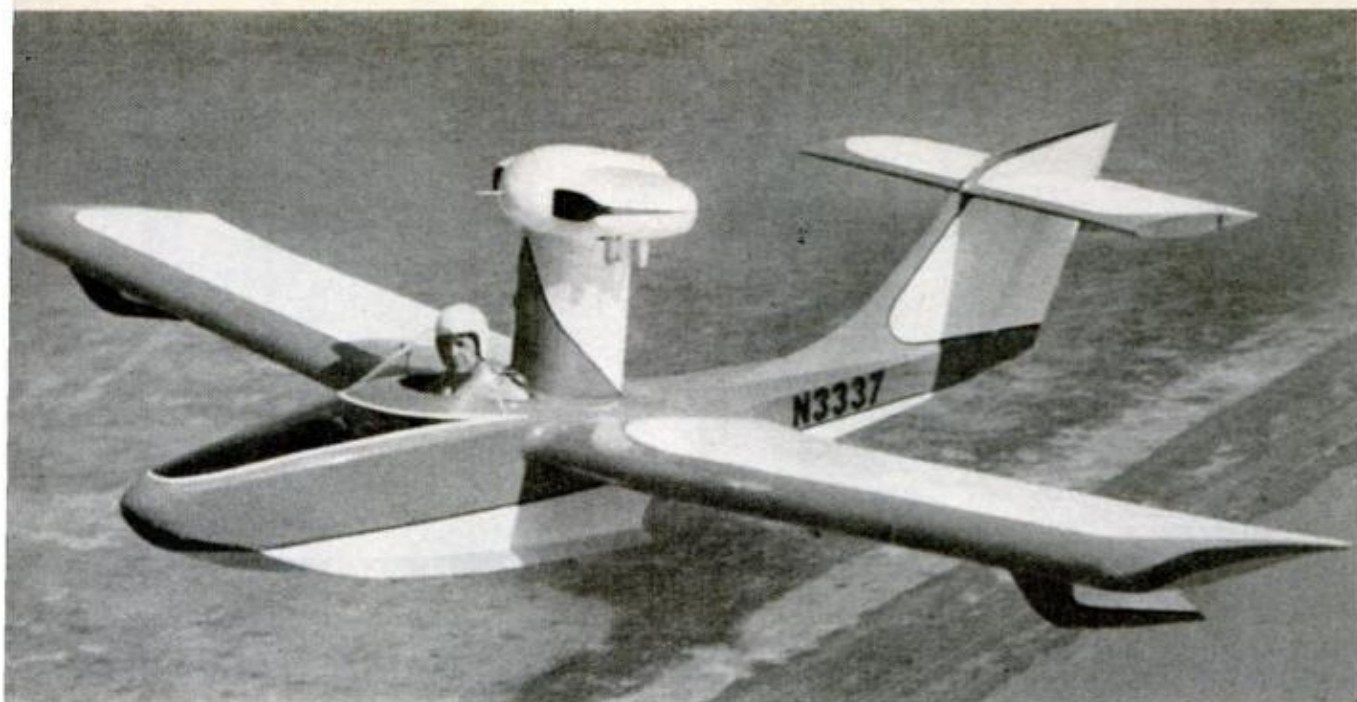
Developed by George Pereira of Sacramento, the mini single-seater flying boat is fun to build and fly because of its small size, easy handling and eye-catching appearance. Although it has no wheels and is not designed for amphibious use, its fold-back wings enable you to trailer it to any lakeside launching ramp and put it in the water just as you would a boat.

Overall length is 17 feet, 3 inches with a folded width of less than 8 feet—handily managed on any highway. Total height is a mere 5 feet, 3 inches, including the elevated pylon engine mount. Empty

*(Please turn to page 134)*



POPULAR MECHANICS



**PYLON-MOUNTED POWERPLANT**, a 90-hp Continental, spins a pusher prop—the only item that must be custom-made because of engine's reverse rotation. Pylon's shroud houses two eight-gallon fuel tanks. The U.S. insignia indicates that ship is under test for possible military use as small police patrol craft

**COCKPIT VIEW** shows single joy-stick control and simplified instrument panel. Ship is equipped only for VFR (Visual Flight Rules) instrumentation to keep the cost low. Foot pedals control the rudder directly through cable linkages without the use of hydraulic boosters—also to keep building cost to a minimum

APRIL 1973



**SITTING LOW IN WATER**, ship is protected from wind effects until it reaches planing speed. Water rudder improves surface maneuverability, then retracts into tail rudder as the craft becomes airborne





## Recorders by the pocketful

By IVAN BERGER, Electronics Editor/Photos by Robert D. Borst

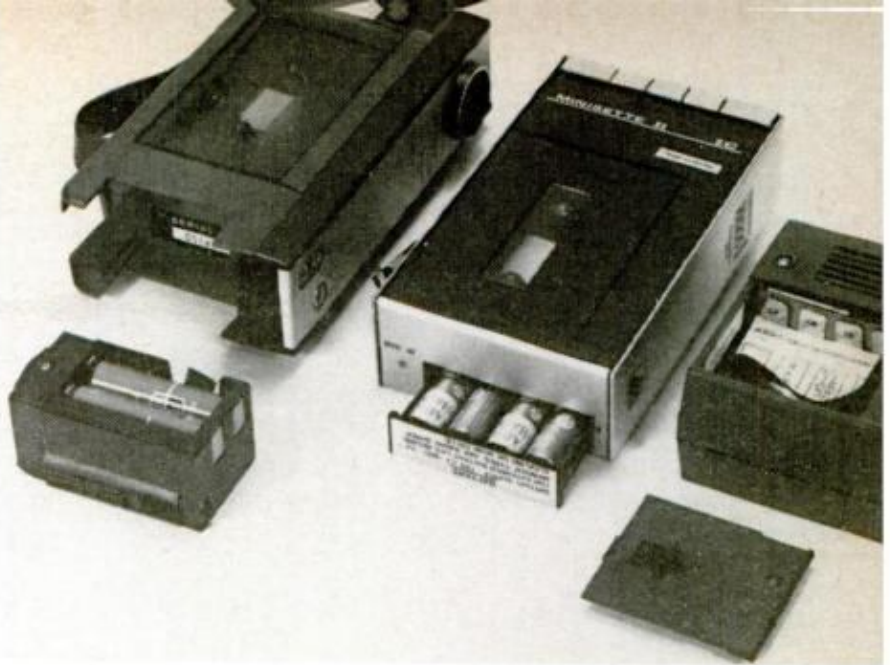
**MINI CASSETTE RECORDERS** cover wide size range, but conventional-sized cassette towers over them all. Left to right: Craig 2605, Hitachi TRQ-21, Sony TC-55, GE M8700, Admiral CTR590 and mike, Realistic Minisette II, Panasonic RQ-212S, Wollensak 401, Crown CTR-381, Sony TC-40, Sony TC-45, Concord F-26, with older Sony in background. For others, see table on page 82

**R**EMEMBER HOW SMALL the first cassette recorders looked? Now, those same book-sized portables tower over the latest in cassette machines—models so compact you can slip them in your pocket.

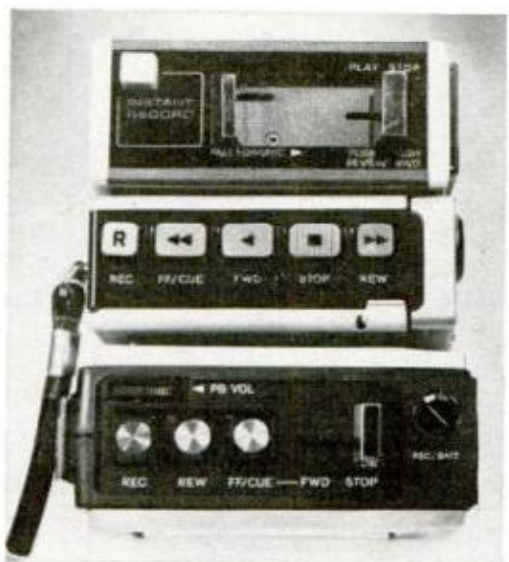
We managed to track down 18 mini recorders using standard cassettes (skipping those ultra minis that take the special, hard-to-find cassettes with limited recording time). They ranged in size from as little as 26.5 to as much as 73.4 cubic inches; but their weights ran a shorter gamut, from just over one pound to a hair more than two—apparently size differences are due less to what's inside a machine than to how it's packed). In price, they ranged from \$65 to \$229.

Most of them record far better than they can play back. Their compact designs leave room for only tiny speakers, two to two-and-a-fraction inches in diameter, and for amplifiers with one-quarter to one-half watt of output. So they're no match for larger cassette recorders when it comes to music. With a good, commercial cassette recording, the minis will play back about as well as similar-sized portable FM radios.

But the recordings that the minis make play back surprisingly well on larger machines, including cassette decks used with hi-fi systems. For crisp sound pickup, most of the minis have built-in condenser microphones, distant relatives of those used in recording studios. And they all have



**REMOVABLE BATTERY CASES** (above) in Sony and Realistic prevent leaky batteries from causing expensive damage; sealed-off battery compartment in Crown is next-best. Adjustable automatic recording level controls (left) improve music recording; Sony switch adjusts auto control response for speech or music while Concord switch gives choice of auto or manual control



**HOLD MINI LIKE A MIKE** (right) and you can record without trailing, dangling cords or cables. Built-in mike (arrow), small size and handy controls make minis easy to use. This is Sony TC-55, only fifth smallest unit; Craig 2605, GE M8700 and both Hitachi models (TRQ-21 and TRQ-30) are even smaller

**SPECIAL CONTROLS** (left) include "Review" on Wollensak, an instant rewind that lets you rewind words you've just missed in play or just taped in record mode; "Cue" on Sonys (TC-55, middle; TC-45, bottom) that lets you skip parts you don't want to hear while listening for the next words you do want



automatic recording level circuits that keep loud sounds from overloading the tape with distortion, yet keep soft ones from being lost amid the tape noise.

Unfortunately, those automatic circuits aren't too good for music recording: designed to iron out the rapid volume fluctuations that rob speech of its intelligibility, they also suppress the volume changes that give music much of its punch. For better music taping, the Concord F-26 has manual as well as automatic level control, and the Sony TC-55's automatic level control can be switched to work slowly and imperceptibly for music, as well as rapidly for speech.

Though you needn't watch a meter to

get good recordings, nearly all the minis have meters, nonetheless. The needle's wiggling is your assurance that the mike is picking up properly. And in playback, the meters double as battery checkers. (On the Craig and GE minis, which have no meters, lights signal when the battery is about to go.)

And how those batteries do go! Doing all the work of a standard-sized recorder on three or four pen-light batteries, the minis gobble ordinary carbon-zinc batteries like peanuts, especially if you use your fast-forward or rewind controls a lot. While we didn't make precise measurements on all machines, battery life seemed roughly proportional to the number of

## SIZE, WEIGHT AND SPECIAL FEATURES OF 18 NEW

| MAKE AND MODEL         | PRICE | SIZE (in.)  | VOLUME (cu. in.) | WEIGHT <sup>2</sup> (lbs.) | BATTERIES | BATTERY HOLDER | AC POWER SUPPLY             |
|------------------------|-------|---|------------------|----------------------------|-----------|----------------|-----------------------------|
| Admiral CTR590         | \$ 90 | 1 <sup>3</sup> / <sub>4</sub> x 6 x 3 <sup>7</sup> / <sub>8</sub>                             | 40.7             | NA                         | 4 AA      | Co             | Optional, \$7               |
| Concord F-26           | 75    | 2 <sup>1</sup> / <sub>4</sub> x 7 <sup>1</sup> / <sub>4</sub> x 4 <sup>1</sup> / <sub>2</sub> | 73.4             | 2.5                        | 3 C       | Co             | Supplied                    |
| Craig 2605             | 120   | 1 <sup>3</sup> / <sub>8</sub> x 5 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> | 26.5             | 1.7                        | 3 AA      | SCs            | Optional                    |
| Crown CTR381           | 90    | 1 <sup>3</sup> / <sub>4</sub> x 6 <sup>3</sup> / <sub>4</sub> x 3 <sup>3</sup> / <sub>4</sub> | 44.3             | 1.75                       | 4 AA      | Co             | Optional                    |
| GE M8700               | 70    | 1 <sup>1</sup> / <sub>2</sub> x 6 <sup>1</sup> / <sub>8</sub> x 3 <sup>1</sup> / <sub>2</sub> | 32.2             | 1.7                        | 5 AA      | Co             | Opt., \$8                   |
| Hitachi TRQ-30         | 100   | 1 <sup>1</sup> / <sub>8</sub> x 7 <sup>1</sup> / <sub>8</sub> x 4 <sup>1</sup> / <sub>8</sub> | 33.1             | 1.5                        | 4 AA      | Cs             | Supplied                    |
| Hitachi TRQ-21         | 110   | 1 <sup>3</sup> / <sub>8</sub> x 5 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> | 26.5             | 1.3                        | 4 AA      | Cs             | Supplied                    |
| Lanier 1100            | 139   | 1 <sup>3</sup> / <sub>4</sub> x 6 <sup>3</sup> / <sub>4</sub> x 4 <sup>1</sup> / <sub>4</sub> | 50.2             | 1.7                        | 4 AA      | Cs             | Supplied                    |
| Lanier 1300            | 229   | 1 <sup>3</sup> / <sub>4</sub> x 7 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> | 45.9             | 2.0                        | 4 AA      | SCs            | Optional, \$10              |
| Panasonic RQ-212S      | 70    | 1 <sup>3</sup> / <sub>4</sub> x 6 <sup>1</sup> / <sub>2</sub> x 4                             | 45.5             | 1.6                        | 4 AA      | Cs             | Supplied                    |
| RCA YZB387             | 65    | 1 <sup>7</sup> / <sub>8</sub> x 7 x 4 <sup>1</sup> / <sub>4</sub>                             | 55.8             | NA                         | 3 AA      | Cs             | Supplied                    |
| Realistic Minisette II | 80    | 1 <sup>5</sup> / <sub>8</sub> x 6 <sup>5</sup> / <sub>8</sub> x 3 <sup>3</sup> / <sub>4</sub> | 40.4             | 1.4                        | 4 AA      | Cs             | Optional, \$6               |
| Sharp RD-428U          | 80    | 1 <sup>5</sup> / <sub>8</sub> x 6 <sup>1</sup> / <sub>4</sub> x 4 <sup>3</sup> / <sub>8</sub> | 44.4             | 1.7                        | 4 AA      | Cs             | Supplied                    |
| Sony TC-40             | 100   | 2 x 7 x 4 <sup>3</sup> / <sub>8</sub>   | 61.3             | 1.7                        | 4 AA      | Cs             | Optional                    |
| Sony TC-45             | 125   | 2 x 7 <sup>1</sup> / <sub>4</sub> x 4 <sup>3</sup> / <sub>8</sub>                             | 63.4             | 2.1                        | 4 AA      | Cs             | Optional, \$30 <sup>4</sup> |
| Sony TC-55             | 140   | 1 <sup>1</sup> / <sub>2</sub> x 5 <sup>7</sup> / <sub>8</sub> x 3 <sup>7</sup> / <sub>8</sub> | 34.1             | 1.9                        | 4 AA      | Cs             | Optional, \$30 <sup>4</sup> |
| Unisonic 711           | 70    | 1 <sup>1</sup> / <sub>2</sub> x 6 <sup>3</sup> / <sub>4</sub> x 4                             | 40.5             | 1.6                        | 4 AA      | SCs            | Supplied                    |
| Wollensak 401          | 100   | 1 <sup>3</sup> / <sub>4</sub> x 6 <sup>3</sup> / <sub>4</sub> x 4                             | 47.3             | 1.6                        | 4 AA      | SCo            | Supplied                    |

Footnotes: 1. See text; 2. Weights not strictly comparable—not all units weighed with batteries.

batteries; we'd suspect the GE, using five AA batteries might get longer than usual battery life, and the Concord, which uses three large C cells, even more. In any case, it pays to use long-lived alkaline or mercury cells, use rechargeable batteries if possible, and run a mini from an external power supply whenever you can.

A.c. power adapters are supplied with about half the minis, and are available for all the rest. Unfortunately, these adapters can't be built into the machines without making them bulky (but the Hitachi TRQ-

*(Please turn to page 135)*

**EVER-READY CASES**, like that on Realistic (near right), make tape-changing and control operation easy. Pouches supplied with other minis, such as the Hitachi TRQ-21, are almost as handy. But Wollensak (not shown) had to be removed from its ever-ready case when cassettes had to be flipped or changed

### KEY TO CHART ABBREVIATIONS

|     |                                 |
|-----|---------------------------------|
| Acc | Accessory                       |
| AC  | AC power supply                 |
| ASO | Automatic shutoff (at tape end) |
| Car | Automobile adapter              |
| Co  | Built-in battery compartment    |
| Cs  | Case                            |
| FF  | Fast forward                    |
| L   | Locking                         |
| Mic | External microphone             |
| NA  | Not available                   |
| NL  | Nonlocking                      |
| PC  | Patch cord                      |
| RC  | Rechargeable batteries          |
| RS  | Remote switch                   |
| SCo | Sealed battery compartment      |
| SCs | Sealed, removable battery case  |
| SP  | Shorting plug                   |
| TPU | Telephone pickup                |



POPULAR MECHANICS

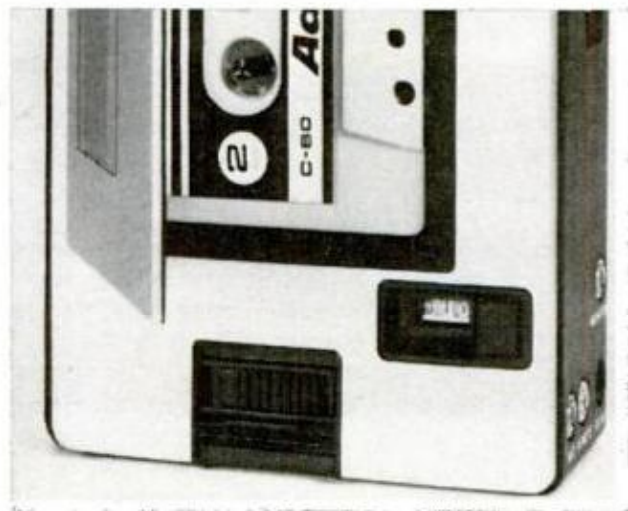
## MINI RECORDERS THAT TAKE STANDARD CASSETTES

| BATTERY CHECK | PAUSE CONTROL    | FF REWIND TIME (minutes) | SPECIAL FEATURES  | ACCESSORIES SUPPLIED <sup>1</sup> |
|---------------|------------------|--------------------------|---|-----------------------------------|
| Meter         | —                | 2½, NL                   | Mic only, shoulder strap  | Mic, Cs                           |
| Meter         | L                | 1¼, NL                   | Switchable automatic or manual recording level                            | AC                                |
| Light         | NL               | 2¾, L                    | Tape counter  | Mic, Cs                           |
| Meter         | —                | 2¾, NL                   | Tape counter  | Cs, SP                            |
| Light         | NL               | NA                       |   | Cs                                |
| Meter         | NL               | 1½, NL/L                 | AC fits on, handy controls, ASO, tape counter                             | Mic, AC, Cs, PC                   |
| —             | —                | 3½, NL                   |   | Mic, AC, Cs, PC                   |
| Meter         | L                | 2½, NL                   |   | AC, Rc, Cs                        |
| Meter         | Yes <sup>1</sup> | 3, NL                    | Single-button record-play-rewind; printed index; tape-end light           | Cs                                |
| Meter         | —                | 2½, NL/L                 | ASO   | AC, SP, Cs                        |
| Meter         | —                | 2½, NL                   | Mic only, shoulder strap  | Mic, AC, RC, Cs                   |
| Meter         | —                | 2, L                     |   | SP, Cs                            |
| Meter         | —                | 2, NL                    |   | RS, AC, RC<br>Service manual      |
| Meter         | Acc. suppl.      | 12/2, NL <sup>1</sup>    | Cue (no FF) <sup>1</sup> , shoulder strap, beeps at end of Sony cassettes | Cs, pause switch                  |
| Meter         | L                | 1½, NL/2, L              | Cue and FF, ASO, shoulder strap, tape counter                             | Cs, PC                            |
| Meter         | L                | 2¾, 1½, L                | Cue and FF, ASO, shoulder strap, speech/music switch, tape counter        | Cs, PC                            |
| —             | —                | NA                       | Cue (no FF)   | Mic, AC                           |
| Meter         | —                | 2¼, NL                   | Review, tape-end light, ASO "instant record"                              | AC, PC, Mic, Car, TPU, Cs         |

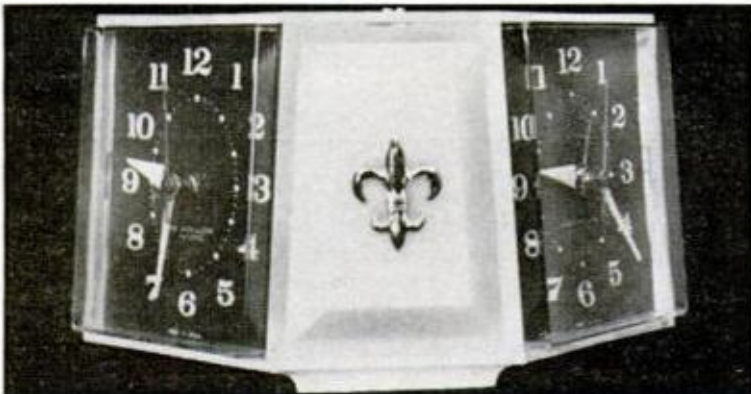
<sup>1</sup> Earphone, batteries and cassette supplied with most models; 4. Includes nickel cadmium batteries.

**DIGITAL COUNTERS** (this one is on Sony TC-45) are great help in finding your place on the tape—if you jot down the locations of taped items as you record or find them. But counter indications are not standardized, so tape locations logged on one recorder may be irrelevant when playing on another

**BATTERY INDICATORS** tell you when short-lived batteries are due for replacement. Meter on Panasonic (left) and most others doubles as recording indicator. Lights on Craig and GE (which have no meters) are battery signal that's harder to ignore. Wollensak's light (right) signals end of tape, not of battery



# IT'S NEW NOW



## And now a new craze: Kooky clocks

Reflecting a new interest in unusual clocks is this sampling of oddities from Hammacher Schlemmer, 147 East 57th St., New York, N.Y. At top, there's a hideaway "book clock" that folds neatly out of sight between two dummy volumes. At center left, a "satellite clock" revolves in orbit, telling times in different parts of the country. At center right, a mouse runs up the clock, indicating the hour on a scale, in a whimsical design patterned after the nursery rhyme *Hickory, Dickory, Dock*. The clever two-faced version at bottom is for twin-bed sleepers who want to see the same clock from opposite sides. Prices are \$15 for this up to \$295 for others.

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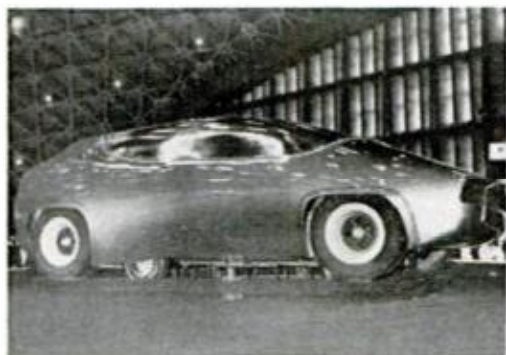


## My! What sharp teeth you have!

If you're wondering what those little blobs of plastic are doing on the chainsaw teeth above, they're there to keep the teeth factory-sharp until use. Cutting chains often become dulled during shipment or through handling by dealers and customers. The protective coatings are applied to Omark's Oregon-brand saw chains.

POPULAR MECHANICS





**Three for the road:  
Far-out cars  
from far-away Japan**

From Japan's recent Tokyo Motor Show comes a new crop of futuristic car designs that may eventually get to try their wheels on U.S. highways. At top is Daihatsu Kogyo's electric-powered, clear-plastic-bodied "see-through" runabout—great to show off pretty mini-skirted riders. At center, the sleek, bubble-topped bullet is Mitsubishi's entry into the powerful sports-car field. The Nissan family sport sedan at bottom has a novel rooftop periscope giving the driver a road-wide rear view.

APRIL 1973



**A plane you can crash and walk away from**

Crop dusters used to look like old biwing relics from World War I days, but not this trim little Piper designed especially for pilot safety at low altitudes. Features include extra-long impact-absorbing snout, wheel-mounted wire cutters should the craft tangle with a fence, nonflammable fuel tanks, crushproof rollover canopy.



**A 'primitive' tractor for primitive countries**

It looks crude, but it beats a team of oxen. Designed for easy, economical cultivation of backward lands in Africa, the simplified Tinkabi tractor—named after the Swazi word for "many oxen"—has only a 16-hp engine, steering wheel and one control for forward or reverse.

# NOW



## Wheelless wheelchair climbs stairs on spokes

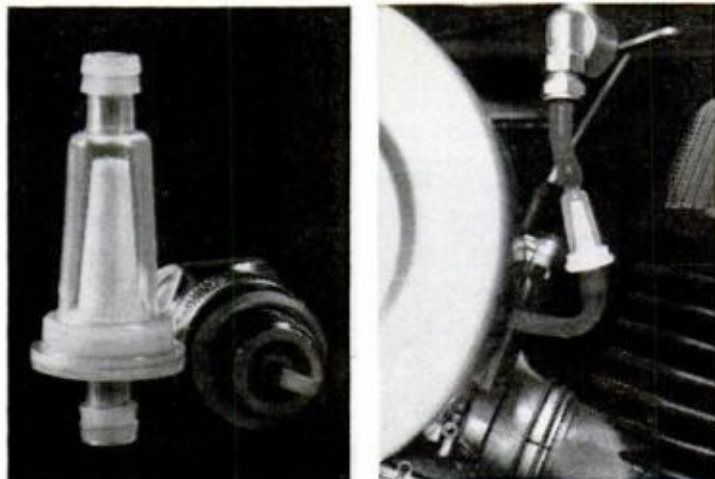
Climbing up stairs and over other obstacles is no problem for this electric-powered, spoke-wheeled wheelchair invented at Queen Mary College in London. Spokes are spring-loaded and rubber-tipped for a sure grip and smooth ride.



## Rebirth of the dirigible?

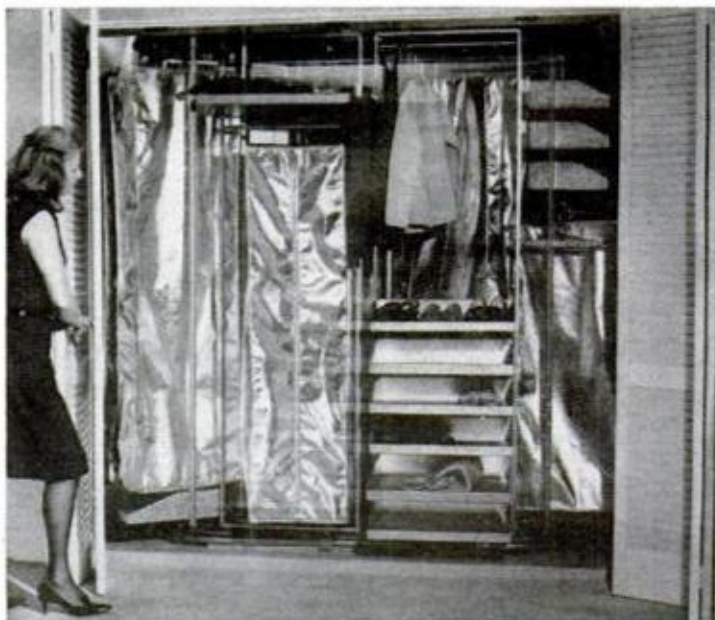
These two new German dirigibles, developed by the WDL Airship Works at Essen, are the first in a series designed to bring lighter-than-air aircraft back into practical use. Over 200 feet long, they can carry 66,000-pound payloads—passengers or cargo—at up to 87 mph.

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## See-through fuel filter for cars

This transparent plastic fuel filter tells you at a glance when it's dirty enough to need servicing. Its inner cone-shaped nylon-mesh strainer is said to funnel deposits to the tip, leaving the remaining area free from clogging for longer operation. Designed to fit 1/4-inch fuel lines, \$1.25. Technology Development Co., Box 66386, Houston, Tex. 77006.



## 'Merry-go-round' clothes closet

You don't have to hunt for anything in this mechanized closet—it comes to you. Press a button and storage racks revolve around an oval track until the item is at your fingertips. \$2500 at Hammacher Schlemmer, 145 East 57th St., New York, N.Y.

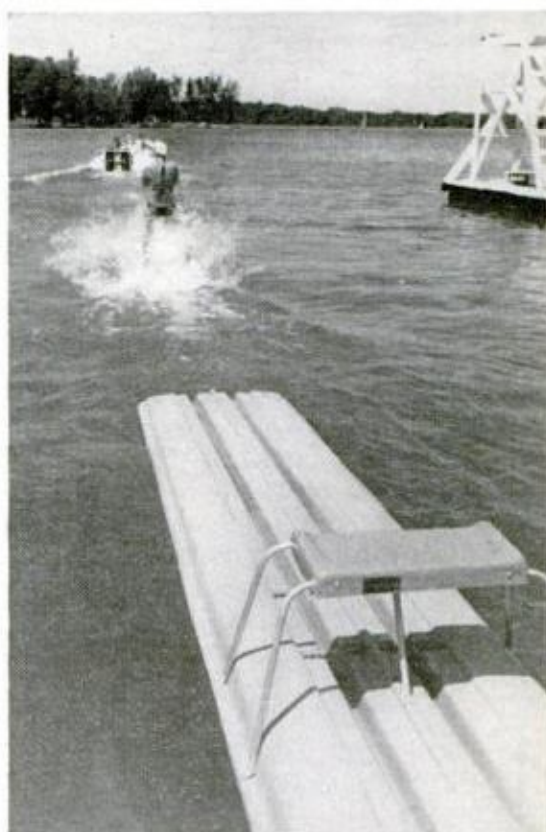
POPULAR MECHANICS



### 'Instant' snowmobile from your motorcycle

You can turn your motorcycle into a snowmobile with this handy conversion kit—a bit late for use this year, perhaps, but good to know about for future winters. The kit consists of twin crawler tracks that replace the rear wheel and a ski for the front. The drive linkage pivots to permit the cycle to tilt in relation to the tracks for making banked turns or riding upright across slopes. Priced at \$778, Snow Job kits fit most cycles. Advanced Recreation Equipment Corp., 645 National Ave., Mountain View, Calif.

APRIL 1973



### Quick launcher for water skiers

As everybody knows, getting up on water skis is the hardest part. This floating plastic launching slide lets you take off level without even getting wet. Aqua Slide is also said to reduce power requirements, enabling a small boat to pull skiers it might not otherwise be able to handle. Price not given. Aqua Ski Corp., Box 374, Sturbridge, Mass.

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# NOW

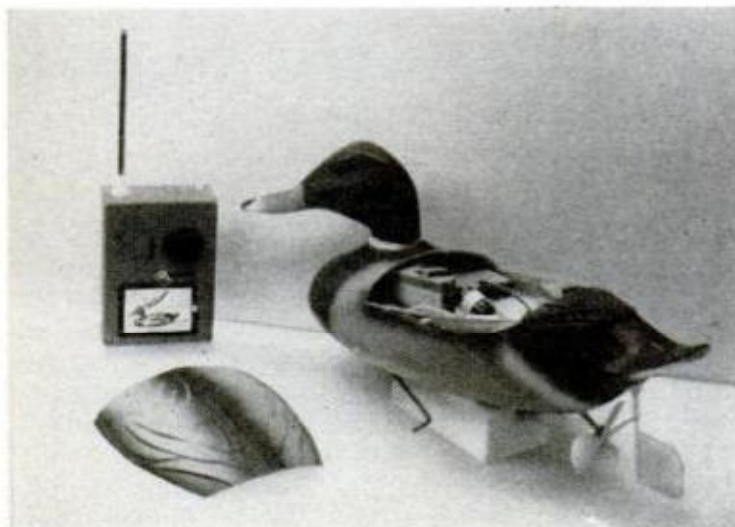


## Dial-a-file finds it for you —no matter where you put it

With this ingenious electronic filing system, a harried office secretary doesn't have to hunt through stacks of files to find the right one, doesn't have to put it back in the same place and doesn't have to worry about losing misfiled material. All she does is dial the number of the desired file and out it pops in clear view (far left). It can be refiled anywhere; an electro-optical scanner will still find it, making misfiling impossible. Supreme Equipment & Systems Corp., 170 53rd St., Brooklyn, N.Y. 11232, developed the automated system.

## Low-cost ham transceiver you can build from a kit

Designed especially for beginning ham operators is this low-cost, kit-built three-band CW transceiver priced at \$69.95. The HW-7 covers the 15, 20 and 40-meter amateur bands and has both VFO and crystal transmit capabilities. It can operate on 12-volt batteries or accessory a.c. power, making it ideal as a home or portable camping station. Heath Co., Benton Harbor, Mich. 49022.



## Would you believe— now it's a radio- controlled duck decoy

It had to come. Press a button and a hunter can send this radio-controlled duck decoy swimming along like a real one instead of anchoring it in one spot. The battery-powered duck will tow a string of other, nonpowered decoys, can retrieve a dead duck for you, even trails a trolling line for remote fishing from ashore. \$300 from RaCo Enterprises, Box 182, Pittsburg, Kans.

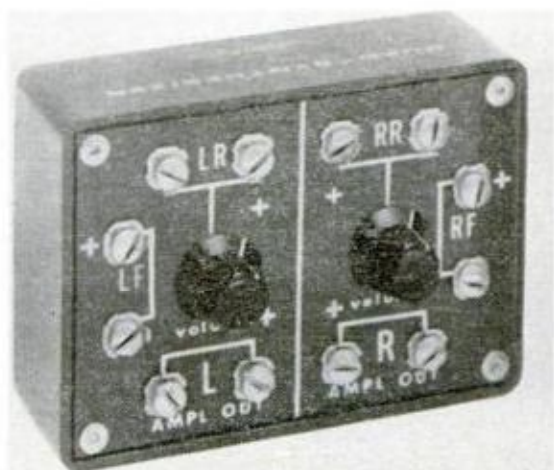


### Amphibious trike: Not too practical but a lot of fun

If you want a tricycle you can ride right off the road and into the water, this is it. The novel three-wheeler has large rubber-ball tires with paddles on the sides. On land, the balls give good support on soft ground and a soft ride on hard ground. In water, the paddles provide the propulsion. The amphibious trike is sold in Europe by Victoria-Werft GmbH in Munich, Germany. Price: 1280 marks—about \$390 in U.S. dollars.

### Mini drivers for small, hard-to-reach screws

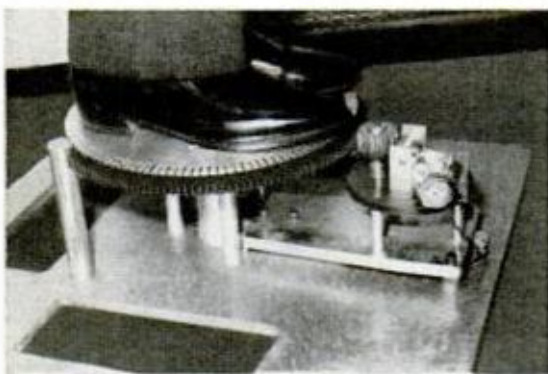
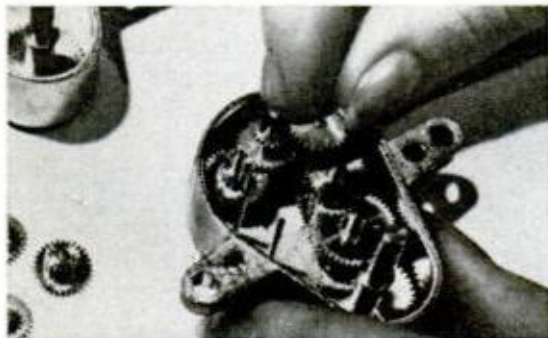
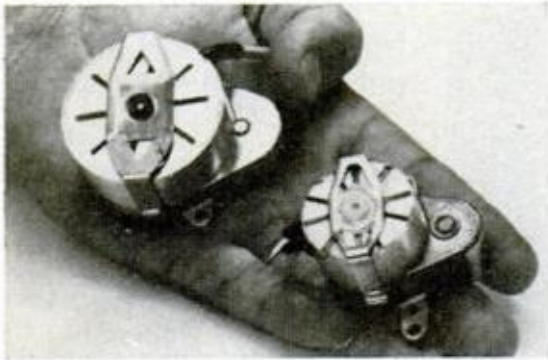
Two sets of tiny screwdrivers for delicate work on clocks, cameras and electronic equipment are now available from Xcelite. Set M-50 contains five drivers for slotted screws with tip widths from .040 to .100 inches. Set M-60 adds one Phillips driver and a slip-on handle for increasing torque. For prices and catalog, write Xcelite, Orchard Park, N. Y. 14127.



### Four-channel 'starter' attachment gives you quad sound at low cost

This simple adapter lets you try 4-channel sound at minimum cost. It requires only two additional speakers and your existing stereo system. Two added channels are "derived" through differential phase relationships of the original stereo signals. Basic model (left) \$6.95; with volume and balance controls, \$9.95. Robins Industries Corp., 75 Austin Blvd., Commack, N. Y. 11725.

# NOW



## New 'miracle' mini motor

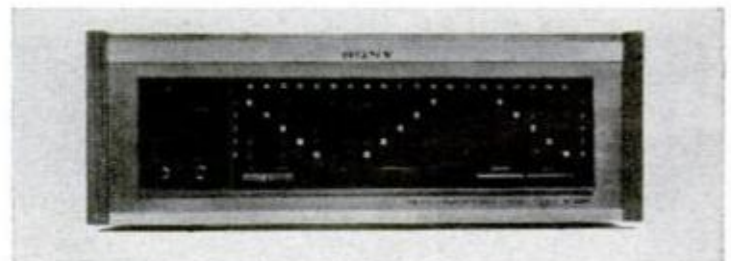
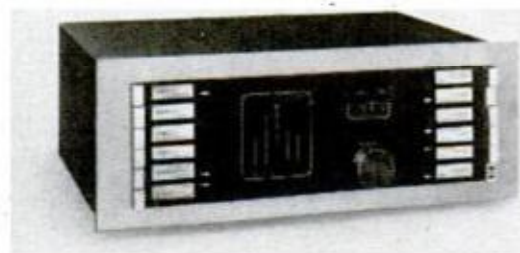
Synchronous motors are the tiny muscles that run countless mechanisms from electric clocks to automated factories. Because they start in either direction, mechanical devices such as ratchets have been needed to keep them operating in the desired direction. These are noisy, can cause drag and frequently fail (ever see an old clock suddenly start to run backward?). Now the British firm of Elremco of Harlow, England, has come up with an electronically controlled synchronous motor that can be started either way, stopped in a fraction of a second and reversed at will—all without mechanical devices. The new mini motor comes in two sizes—small enough to fit in the palm of your hand (top photo) and powerful enough to turn a man standing on a turntable (bottom).

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## A bit slow, but still racy-looking

Russian students at the Institute of Kharkov work on what is said to be the world's first electric-powered racing car. The flashy Khadi-5 won't set any records yet, though—top speed is a modest 80 mph.



## Fancy tuners with fancy price tags

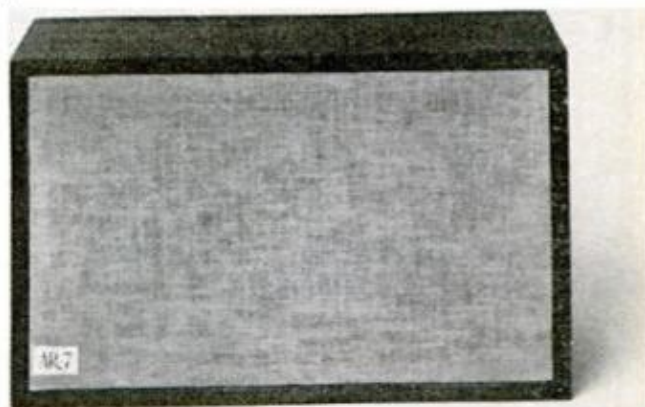
Today's most advanced and expensive tuners are the new Sequerra model (top) at \$1600 and Sony's new ST-5555 (bottom)—a mere \$1200 or so. The Sequerra tuner incorporates digital frequency read-out to show what station is tuned in, Dolby noise suppression and a built-in oscilloscope that displays tuning accuracy, signal strength, multipath, stereo separation and quadraphonic sound distribution. The Sony features computerized tuning with one pushbutton for each FM channel. Buttons corresponding to receivable stations light up, guiding your finger for one-touch channel selection. Or you can sweep automatically through all stations—except those you've specifically programmed the tuner to ignore. Sequerra Co., 71-07 Woodside Ave., Woodside, N.Y. 11377. Sony Corp. of America, 47-47 Van Dam St., Long Island City, N.Y. 11101.

POPULAR MECHANICS



### Foolproof burglar alarm

This new Panasonic burglar alarm fills a room with an invisible field of microwaves. Any movement in the room disturbs the field, setting off the alarm. Unlike previous UHF and ultrasonic alarm systems, the device will detect slow motion and can't be set off by wind.



### New AR speaker—smaller than ever

AR's newest and smallest speaker is this compact AR-7 measuring 15<sup>3</sup>/<sub>4</sub> by 9<sup>3</sup>/<sub>4</sub> by 6<sup>1</sup>/<sub>4</sub> inches. Said to offer the same high-quality reproduction as larger, costlier acoustic-suspension models, the walnut-finished enclosure has an 8-inch woofer and 1<sup>1</sup>/<sub>2</sub>-inch tweeter with adjustable crossover. \$60. Acoustic Research, 24 Thorndike St., Cambridge, Mass.



### Depth sounder really sounds off

This new kit-built depth sounder beeps an audible warning as you approach shallow waters or submerged objects at any preselected depth. Two switch-selected ranges read up to 60 or 240 feet. The MI-1031 kit is \$99.95. Heath Co., Benton Harbor, Mich. 49022.

APRIL 1973



### Flashy flash is full of tricks

First of a whole new wave of flashguns coming our way is this clever Braun 200 Vario Computer. It's an automatic strobe that saves unused flash energy instead of dumping it like conventional auto flashes so it recycles as fast as 0.3 second, gets up to 700 flashes per charge. Tilts for bounce flash. \$120 and \$140 models. Braun, Cambridge, Mass.

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# NOW



## Easy one-step wood finishes

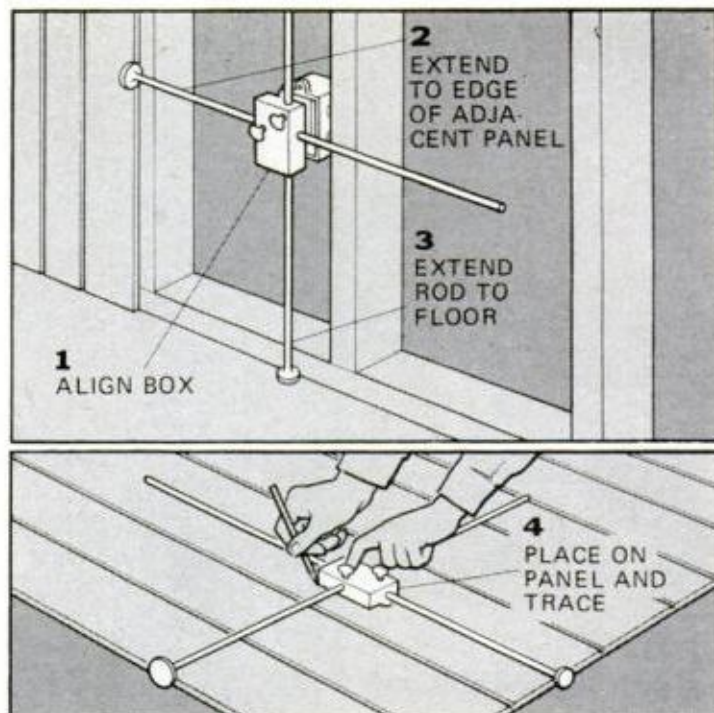
A wood finish that combines stain and wax works wonders with any porous wood surface. In six tones, it can be blended to match any wood and hide scratches (above). \$1.29 per half ounce. Rub 'n Buff, American Art Clay Co., Box 68163, Indianapolis, Ind. 46268.



## Versatile receiver—it's got rhythm

Plug one or two electric guitars into the front panel on this new KR-6170 Kenwood stereo receiver and you can play along with the music. If nothing on the air suits your mood, you can switch on a built-in rhythm section. \$550. Kenwood, 15777 S. Broadway, Gardena, Calif. 90248.

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## No-guesswork way to locate outlet boxes accurately when paneling

Take the guesswork out of locating cutouts for electrical receptacles on a paneling job by using a Fox Box. Step 1 (in sketch): Box is located at desired point between wall studs, then telescoping gauge arms are extended vertically and horizontally (steps 2 and 3) to the position panel will occupy when installed. Step 4: Fox Box is laid on workpiece, and outlet box location is pinpointed and traced onto paneling for cutting. Price: \$9.50 postpaid; The Dot Box Co., 1804 Whittier, Springfield, Ill. 62704.





### Bib overalls are 'in'

Bib overalls, used by professionals for more than 40 years, are the latest find for the "now" generation. Type shown above by Sears, Roebuck and Co. features adjustable shoulder straps, watch-fob buttonhole, two utility pockets, pencil slot, pliers pocket, hammer loop and other pockets. Price: about \$6.



### Low-cost digital watch

Most digital watches cost an arm and a leg, but you can have this modest version for \$19.95. Hour and minute readouts are mechanical rather than electronic. Sharon J. Williamson Co., RR No. 8, Saint John, N.B., Canada 11B12.

APRIL 1973



### Spruce up the family chariot the spray way

Unique valve produces a car-wash gun (top) featuring precise control, automatic shutoff, spray-rinse cycles and a reservoir. \$6.95. Silicone upholstery cleaner (above) comes in a 14-oz. aerosol can; cleans leather, plastics, vinyl, fabric and floor covering; gives a dirt-repelling coating that restores finish. \$1.35. Turtle Wax, Inc., 1800 Clybourn Ave., Chicago, Ill. 60614, makes both.



### Gardener's holster

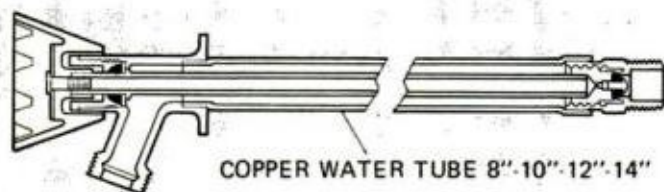
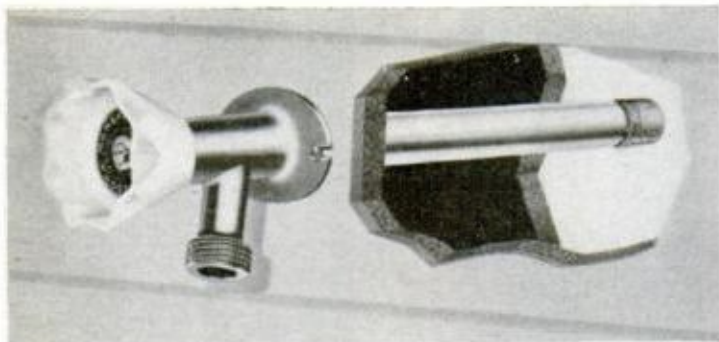
Styled like a western gun holster, this leather sheath has belt loops and brass clips for keeping your pruning shears handy on belt or pocket when you are green-thumbing it. Designed to hold Wiss shears, it's \$2.95 from J. Wiss & Sons Co., 400 W. Market St., Newark, N.J. 07107.



### Little, big 'arbor press'

Mini press incorporates principles of arbor-press design in miniature. Frame is 4 3/4 in. high, ram is 1/2 in. in diameter, travels 2 in. Leverage ratio is 15:1. \$10.95 ppd. Northwest Mfg. & Supply Co., 1285 Golf Rd. Des Plaines, Ill. 60016.

# NOW



## A frostproof outside faucet

Claimed not to freeze or burst in winter, this outside faucet eliminates need for shutting off water supply because—through an elongated stem—it turns off inside the building where it is warm. Available in 4- to 18-in. lengths, faucet is priced from \$6 to \$8 depending on size. Made by Mansfield Sanitary, Inc., Perrysville, Ohio 44864.



## Lowest-priced Mini-Mac chainsaw

This ultralight, gasoline-powered chainsaw is claimed to be the first to break the \$100 price barrier. Weighing under 8 pounds, Mini-Mac sells for \$99.95. Oil for gas mix (shown with saw) is extra. At McCulloch dealers throughout the country.

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## Angle-indicating table

Printed on sheet plastic, the accessory Angle Cutting Table Surface provides a handy protractor guide with divisions of  $\frac{1}{2}^\circ$  for cutting bevels, miters and tapers on a radial saw. The graph is cemented to plywood and placed on the saw table. Guide is priced at \$4.50 from Comparator Chart Engineering, Box 1250, Huntington Beach, Calif. 92647.



## Octagonal shelter you can customize yourself

This octagonal prefab can be a summer home, beach cabana, back-yard playroom—anything you want to make it. Interchangeable interior and exterior panels let you locate doors, windows and partitions to suit. Basic shells of 32 and 40 feet diameter are \$4950 and \$7950, panels extra. Game Time, 903 Anderson Rd., Litchfield, Mich. 49252.

POPULAR MECHANICS



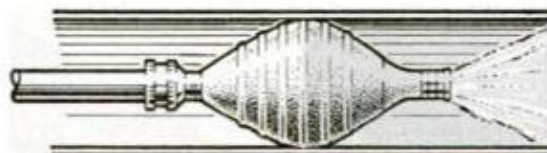
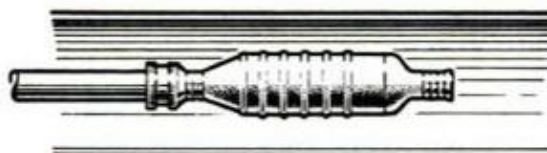
### Once a boxcar, now a bridge

What do you do with an old boxcar? You make a covered footbridge out of it—at least that's what Topanga, Calif., did with this Santa Fe relic headed for the boneyard after 29 years of service.



### Get an edge on your garden tools

A yard-tool sharpener from Stanley Tools, Div. of The Stanley Works, New Britain, Conn. 06050, features a tungsten-carbide sharpening bit (above) and a stone (top photo) for deburring and final honing of blades. At most hardware suppliers for \$1.79.



### Super-duper drain declogger

By simply connecting Drain King to your garden hose, the chore of unclogging downspouts, kitchen sinks and the like is made easy. When water is turned on, Drain King expands and locks itself in a pipe. Pressure forces strong jets of water through surge valve to dislodge blockage. \$1 ppd. G. T. Water Products, Inc., Van Nuys, Calif. 91412.

APRIL 1973



### Have wheels, will travel—anywhere

What has eight-wheel drive and can haul 15-ton loads equally well over paved roads or rugged back country? It's this giant all-terrain Dragon Wagon flat-bed trailer designed by Lockheed for go-anywhere use over wilderness trails.

95

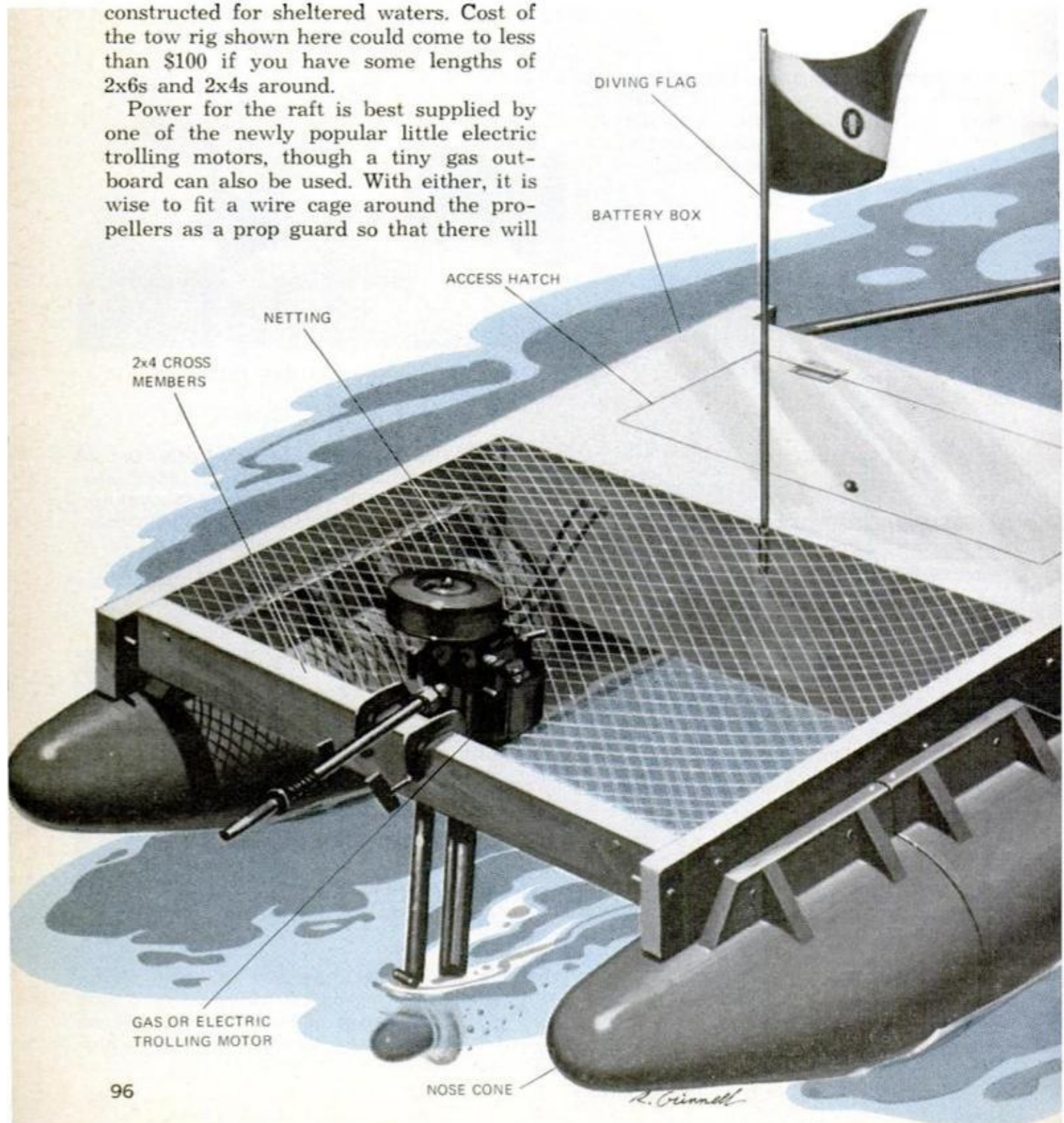
**A SIGHTSEEING RIG** for skin divers can be a simple project when you use the plastic pontoons available from several sources. Bolt this surface skimmer together and you have a safety raft for divers. Add a little motor and it can tow you on a tour of reefs and underwater sights.

The snorkel-scooter shown here was designed by diving instructor Phil Adams, of Key Colony Beach, Fla., and measurements can be easily altered to fit your special needs. Using more of the pontoons, a raft craft or even houseboat could be constructed for sheltered waters. Cost of the tow rig shown here could come to less than \$100 if you have some lengths of 2x6s and 2x4s around.

Power for the raft is best supplied by one of the newly popular little electric trolling motors, though a tiny gas outboard can also be used. With either, it is wise to fit a wire cage around the propellers as a prop guard so that there will

# Tow rig for

Fit four plastic pontoons under a deck for less than \$100, add pint-sized power, and it is a sightseeing skiff for skin divers



# snorkeling

By FREDERICK PHILCOX

Illustration by Roy Grinnell



be no chance of divers bumping into blades. All power is shut off, of course, when divers are below the surface. One or two divers can be towed at up to two mph for about two hours per battery charge. Steering is accomplished by the diver angling himself behind the rig. Higher speeds would make steering—and sightseeing through your face mask—difficult.

Flotation for the scooter comes from four rotationally molded polyethylene pontoon modules made by Rotocast Plastic Products, 67 N.W. 36th Ave., Miami, Fla. 33147. Two three-foot body sections and two nose sections are required. The

**STEERING** for this easily built, slow-motion raft is simply a shove or a foot-flipper kick by the swimmer. Motor is set for about 2 mph, and skin diver gets a leisurely view of the bottom with minimum effort. Pontoons have buoyancy to let swimmers rest on deck

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**EASY TO BEACH** and light enough to be cartopped, diver's scooter can also unbolt to fit a car trunk

**FLOTATION** for almost 800 pounds allows passengers aboard, or use as a rest raft for swimmers, divers



body sections are about \$21.45 each f.o.b. and the nose sections are \$20.79 apiece. Rotocast has dealers around the country and can give you the address of the nearest local outlet. Experience in Florida waters indicates the pontoons don't deteriorate and probably have a life of many years. Antifouling paint can be applied if they show signs of barnacle buildup in some coastal waters.

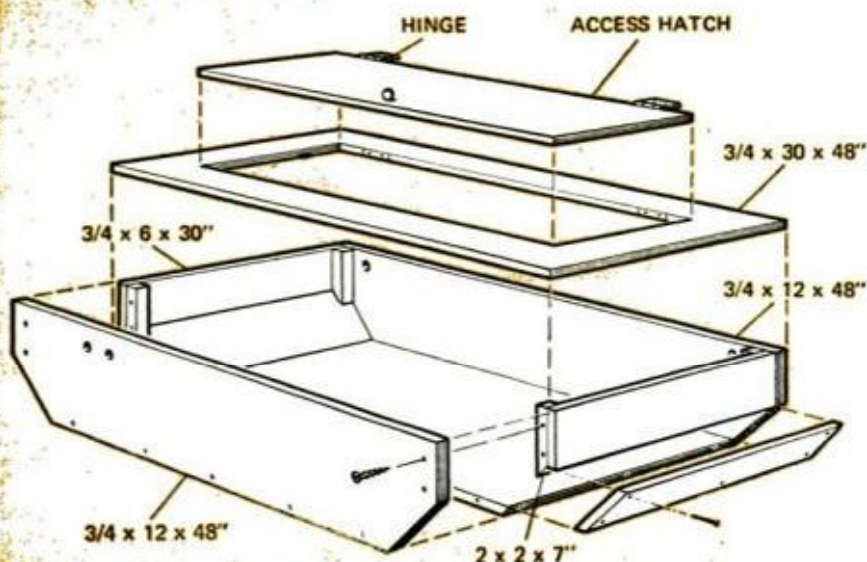
For the model shown, two 5-foot lengths of 2x6 were used for the side stringers. Cross members can be three 4-foot lengths of 2x4s. These can be screwed or lagbolted in place, secured with brackets, or special cross-member brackets are available at \$1.05 each from the pontoon

manufacturer. You'll need six. For small motors, the forward 2x4 cross member provides a clamping spot for your power supply. Bolt a section of 2x6 across the front as a motor mount if you need to support a larger outboard.

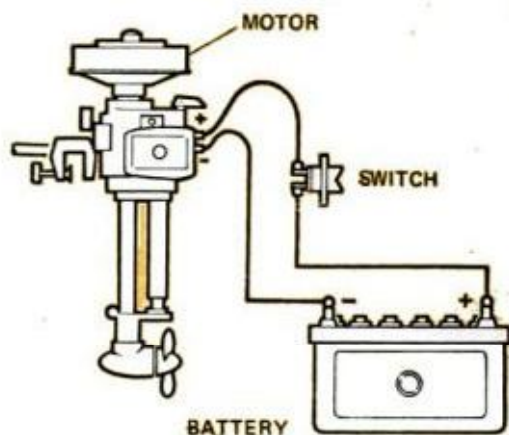
The size of the afterdeck is optional, depending on your needs. As shown, a battery and equipment storage compartment with top hatch, about 4x3 feet and 1 foot deep can be constructed of 1/2-inch plywood. Swim fins, masks, snorkels and even wet suits and scuba gear could be carried along in a larger size box.

Some divers prefer simply to rest their 6 or 12-volt battery in a simple securing frame on the deck since it is easier to

## BATTERY BOX



## WIRING DIAGRAM





**ADD MORE PONTOONS**, and a raft large enough for double-decker sunning or fishing can result. A houseboat could also be constructed, with snorkel rig in as "dinghy"

remove than lifting from the storage box for regular charging. Though the battery on deck will be well above water level, a fiberglass battery box, that secures to the deck with nylon tie-down straps, offers more protection from spray. These boxes cost about \$5 at marine supply stores. Two batteries can be carried, of course to increase your range.

Most electric outboards come with heavy-duty battery cables and clamp grips. Keep the grips on the cables since you will be disconnecting regularly to charge the battery. Cut into one cable, however, and attach the leads from your on-off switch. This switch is mounted in the middle of your tow-handle grip. The tow handle can be a 12-foot length of

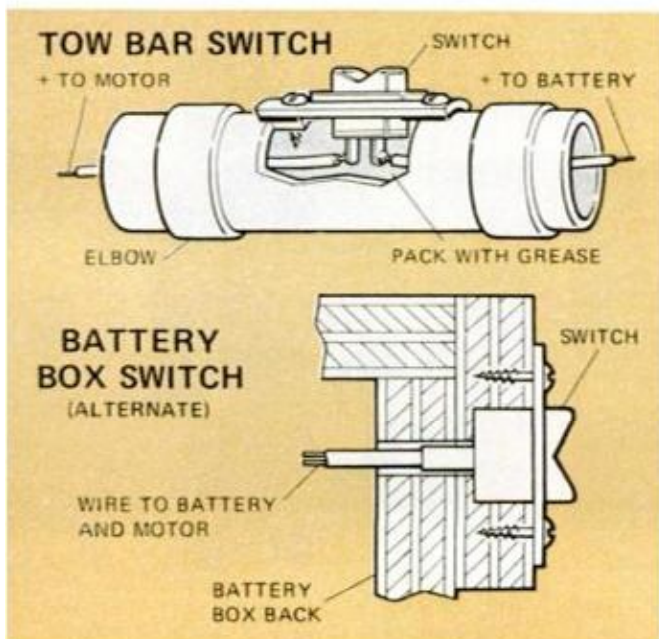
aluminum or galvanized  $\frac{3}{4}$  or 1-inch pipe bent into U shape, with wires to the kill switch run inside. We used a switch from a Crowell bilge pump but any waterproof switch should do. It can also be mounted on the back of the storage compartment.

Forward of the decking, a fish net strung between the stringers and cross members will provide a handy catchall for gear or shells and objects brought up from the bottom during a dive. Eyebolts, secured fore and aft, can secure an anchor line or tow lines if the rig is to be pulled along to the diving area behind a larger craft. The pontoons, which are sealed at each end and designed to lock together, provide nearly 800 pounds of flotation and easily support a tired diver who wants to climb up and ride on deck.

Before assembling the components, it is well to paint the wooden parts with colored fiberglass resin or marine paint for waterproofing. The pontoons come in an attractive blue. The rig is light enough for cartopping, but can also be constructed so it can be disassembled by unbolting to fit into a car trunk. ★★★

#### BILL OF MATERIALS

| No.     | Size and Description (Use)                                  |
|---------|---|
| 2       | 2x6 stock lumber 5' long (stringers)                        |
| 3       | 2x4 stock lumber approx. 4' long (cross members)            |
| 12'     | $\frac{3}{4}$ " or 1" aluminum or galvanized pipe (tow bar) |
| 1 sheet | $\frac{1}{2}$ " marine plywood (deck or storage box)        |
| 1 qt.   | 4-oz. colored fiberglass resin (waterproofing)              |
| 1       | waterproof on-off switch                                    |
| 4       | Pontoon sections  |
| 25'     | 2-wire electric cable (motor switch)                        |
| Misc.   | assorted screws and $\frac{5}{16}$ " lagbolts               |



# Underwater update

New and improved devices for diving are safer and more sophisticated

By WAYNE HARRIS

**F**OR SUBSURFACE BEGINNER and old expert alike, this year's diving gear and gadgets aren't radically different—but have been notably improved.

And even expert skin divers aren't so aged from years of experience. Self-contained underwater breathing apparatus (SCUBA) arrived during World War II and even such simple items as face masks and foot fins were hardly on the market until the late 1940s and '50s, although Leonardo da Vinci gets credit for working on a diving mask, among his many other projects, and Ben Franklin is supposed to have designed hand and foot flippers to make his swimming easier.

This year, however, a diver can select from a broad assortment of upgraded items to keep him warmer, safer, breathing with less effort, and photographing more easily what he sees underwater.

Starting from the top and working



**VENTED FINS** having slots to allow water to flow through are becoming popular. Dacor calls its new Quadra-Vent models Turbo II Fins, claims improved vertical and lateral stability. A TV-K pair costs \$20

down, a diver can now wear a wet suit hood constructed to take pressure off his ears and, if necessary, add equalizing air from his back tank. Experienced divers will also check the variety of ear drops that help guard against inflammation and infection. Better face masks, in even greater assortment, can be selected in goggle form or with side glass for wide-angle vision, outside nose-pinch provision to help equalize ear pressure, plus a purge valve to expel water. Masks can be ground to eyeglass prescription, or lenses can be fitted or cemented inside. Better snorkels are now frequently topped with a fluorescent color for better visibility, and a diver may wear both snorkel and tanks to conserve his air supply while on the surface.

Regulators to provide the proper amount of air from tank to diver are offered this season with claims for even easier breath flow, more durability, a sonic reserve



**WET SUITS** now come in an assortment of colors, textures, styles and thicknesses. U.S. Divers Co. models are shown above



**AIR TANKS** of aluminum or steel are now available with a lifetime warranty



alarm to warn when tank pressure is getting low, and models that shut off free flow of air in seconds if the regulator is dropped in the water.

Tanks are more corrosion-resistant, can safely hold higher pressures, and may be fitted with harness adapters for a hookah hookup so an alternate surface air source may be attached by hose for shallow dives. Scuba tanks, regulators, and in fact all underwater gear should be chosen with the advice of an experienced dive shop, and only, of course, after the diver has had full instructions. Classes provide a chance for a diver to compare gear and get help in selection and individual fitting.

Flotation compensation is receiving more attention, and a variety of new buoyancy vests of the "Mae West" type is offered this year. Better models use one or two CO<sub>2</sub> cartridges plus a mouth tube for inflation adjustment. The new hip weights are reported to be more comfortable than smaller waist leads.

Wet suits come in a greater variety of colors, sizes and custom fittings. One remarkable new model, called the Unisuit, is available to professionals and certified divers with the claim that it combines wet, dry and hard-hat suit advantages. It can take air from a diver's tanks to inflate and balance-out buoyancy compensation. Special fin-guards are required to keep foot fins from popping off if the suit is fully inflated. The \$300-plus model is said to keep you warm enough for diving under ice.

Swim fins now come in buoyant and

nonfloating models with new rib designs and optional slots claimed to give an added venturi jet thrust to the swimmer. New flexibility is reported for rubber diver gloves.

And to keep a diver's hands full underwater—as well as decorating arms, chest and legs—there are improved spearguns, searchlights, plastic slurp guns to suck in small fish specimens, underwater metal detectors, knives, submersible decompression charts, depth indicators and compasses with tiny built-in lights, marker floats, intercom systems, and electric-powered towing rigs.

For taking pictures of the fish that got away, the well-known Nikonos now has a wide variety of wide-angle and fish-eye accessories. Most other still and movie cameras can be bottled in custom plastic cases with exposure meters and flood, flash or strobe lights attached.

For fish that will not go away, a Shark Dart or hand-held Shark Dagger will dispatch one with an internal blast of compressed CO<sub>2</sub> that is claimed to be surer and quicker than the shot-shell bang-stick.

For stings from jellyfish, sea urchins and coral, a diver's first-aid kit is also being supplied.

Ashore, sprays and powders help the diver suit-up, new compact compressors fill his tanks. But once he's in the water, the appeal of the undersurface world remains exactly the same, unspoiled by all of the clever gadgetry that makes seeing it possible. ★★★



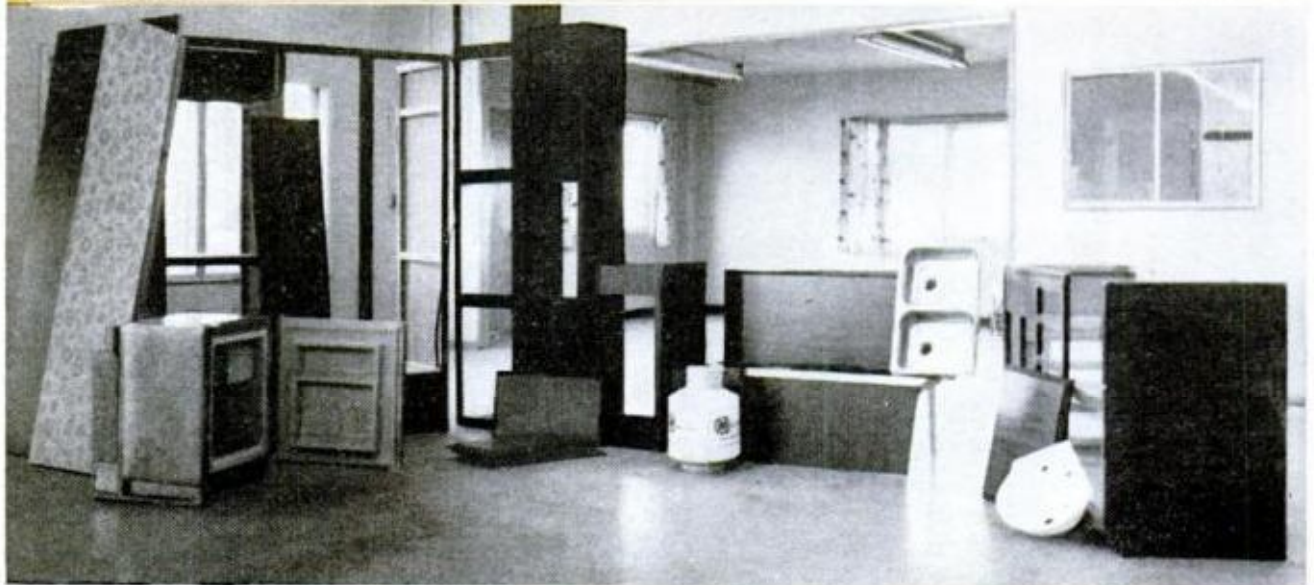
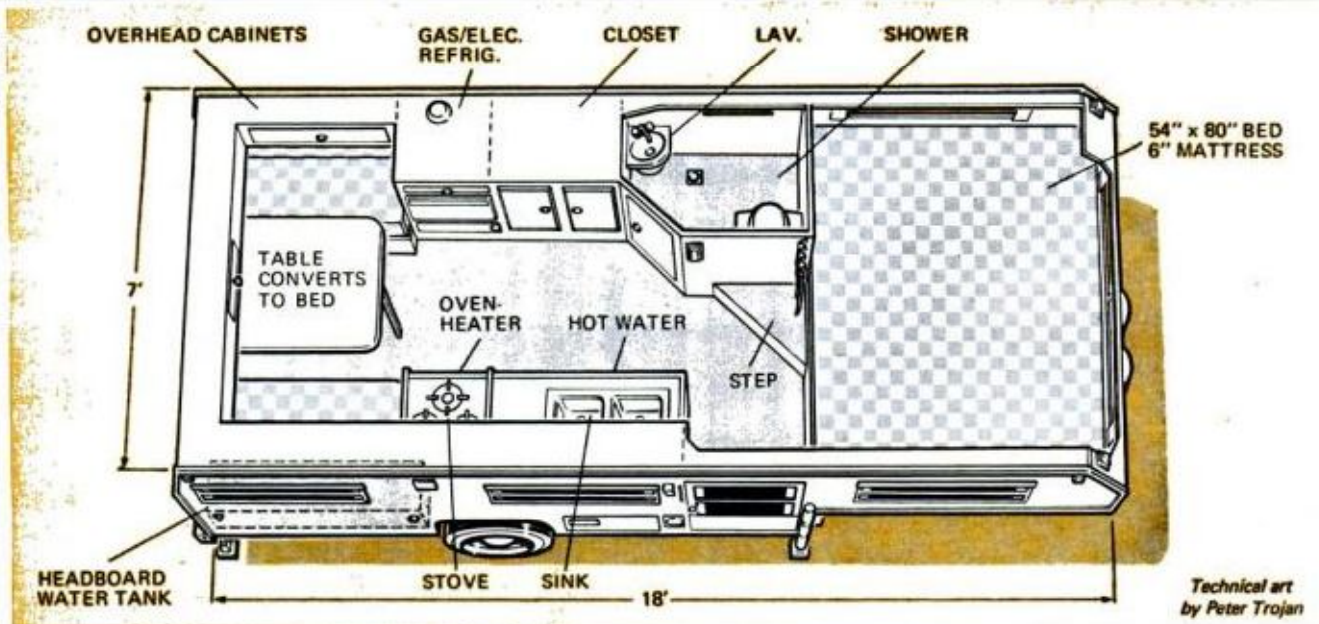
**CUSTOM HOUSINGS**, like Giddings Cine-Mar for 8-mm movie camera, are offered for most still, movie rigs

APRIL 1973



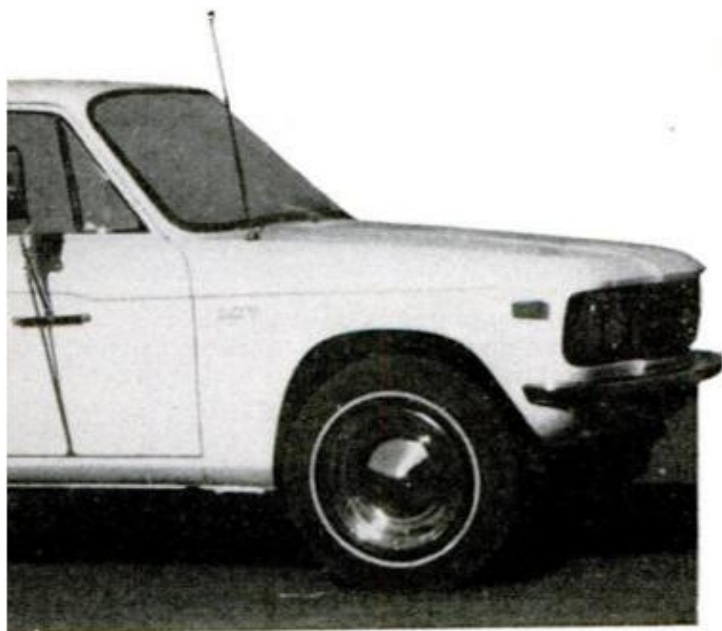
**SUBSURFACE SYSTEM** includes Nikonos II camera, bar bracket, strobe light, exposure meter, close-up tube

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Here's a homebuilt fifth-wheeler to hitch behind half-ton and imported pickups

# Big trailer for small trucks



**E**VEN A COMPACT imported pickup can pull this roomy 18-foot fifth-wheel trailer you can build yourself. Only about 370 pounds of hitch load on the cargo bed of a Toyota, Datsun, Mazda, Courier or LUV is necessary to tow this 2800-pounder down the road. Or you could use your Ford Ranchero, Chevrolet El Camino or any standard pickup truck.

The trailer is called the Small Fry Fifth Wheel, and speeds of 60 mph at 15 mpg are claimed with some economy rigs. Electric trailer brakes on the Small Fry's wheels provide dependable stopping, and some states classify the fifth-wheel as a semi-unit safe enough for passengers to ride inside.

The designer, Small Fry Enterprises, Inc., of 3094 S.E. Tualatin Valley Highway, Hillsboro, Ore. 97123, estimates that an amateur builder can construct the trailer in two months of part-time work. The completed rig is fully self-contained with 25-gallon water supply, automatic pump, water heater, shower, toilet with holding tank, 10,000-B.T.U. furnace, three-burner stove with oven, gas/electric refrigerator, double stainless sink and bunks for four.

Tools needed for construction are a 1/4-inch router, 3/8-inch variable-speed reversible drill and a portable electric saw. Also helpful would be a metal-cutting saw, table saw, air staple gun, air compressor and welding rig. Building can be done from the detail plans available and parts assembled locally, or a complete kit can be ordered from Small Fry. A list of necessary components and suppliers is provided with the plans. Hitch can be purchased with the plans. Wheels and axles are obtainable from trailer suppliers.



**MORE RIG** for less cost, offering maxi space and towing stability behind a mini pickup, are among advantages claimed for the Small Fry build-it-yourself fifth-wheel trailer shown at top. Secure hitch, similar to a semi's, is mounted in truck cargo bed

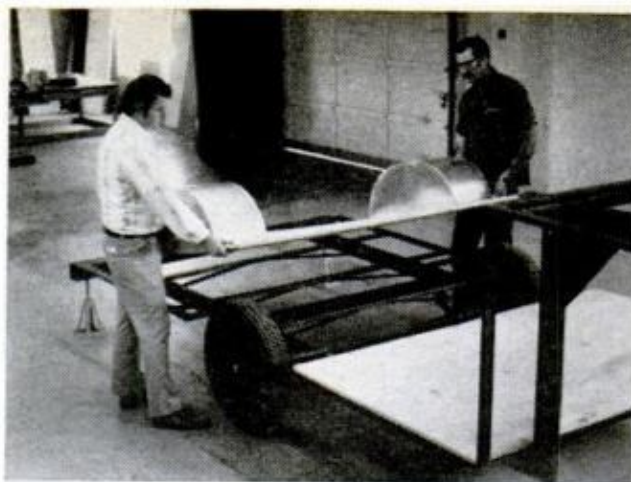
**STEEL FRAME**, using channel iron and steel tubing forms basic structure. Wheels and axles can be purchased from mobile-home or travel-trailer supplier. Interior arrangement (left) shows large double bed forward, dinette aft that can convert to sleep two more, full galley with furnace and water heater below, and enclosed bathroom. Rig carries holding tank, 25 gallons of fresh water, LP tanks at front

**UTILITIES AND CABINETS** in prefab form can also be bought in a kit from Small Fry Enterprises. Included are double stainless-steel sink, water heater, 4-cu.-ft. gas electric refrigerator, toilet

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**WHEEL WELLS** can be farmed out to local sheet-metal shop. When they're installed, flooring can commence

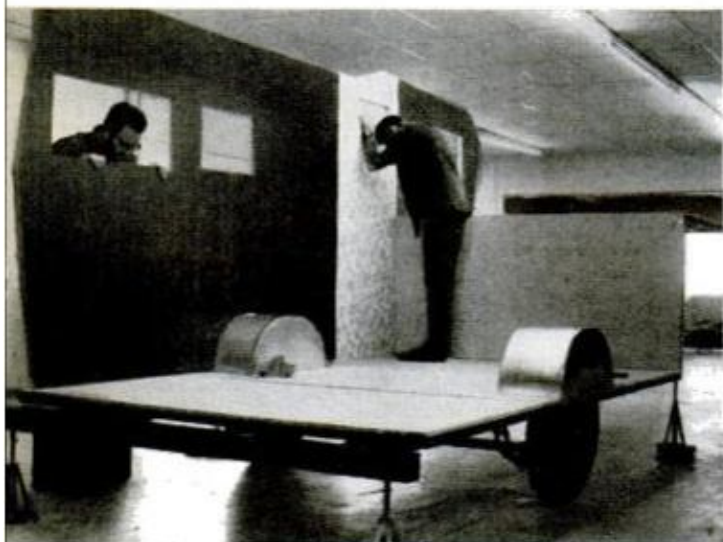


**FLOORING** is shaped from ½ to 1-in. insulation board and ¾-in. exterior plywood, fastened by screws

ers. Wheel wells can be fabricated by a local sheet-metal shop, using the detailed drawings provided.

Large-size fifth-wheelers are also available in plan form. The 18-foot and 21-foot plans are \$35 from Small Fry Enterprises. For \$40, complete plans for building a 25-foot rig or 35-footer can be purchased. Prefabricated kit parts include unassembled cabinets, plus construction materials, plumbing and electrical components and appliances. ★★★

**KITCHEN COUNTER** (below, looking forward) shows full-size cabinets and work areas, window above sink



**WALLS** are framed out with 2x2s, paneling is glued and stapled or nailed. Panel bit routs edges, windows



**CLOSET** with full-length space to hang clothes (left) has been called symbol of luxury trailering

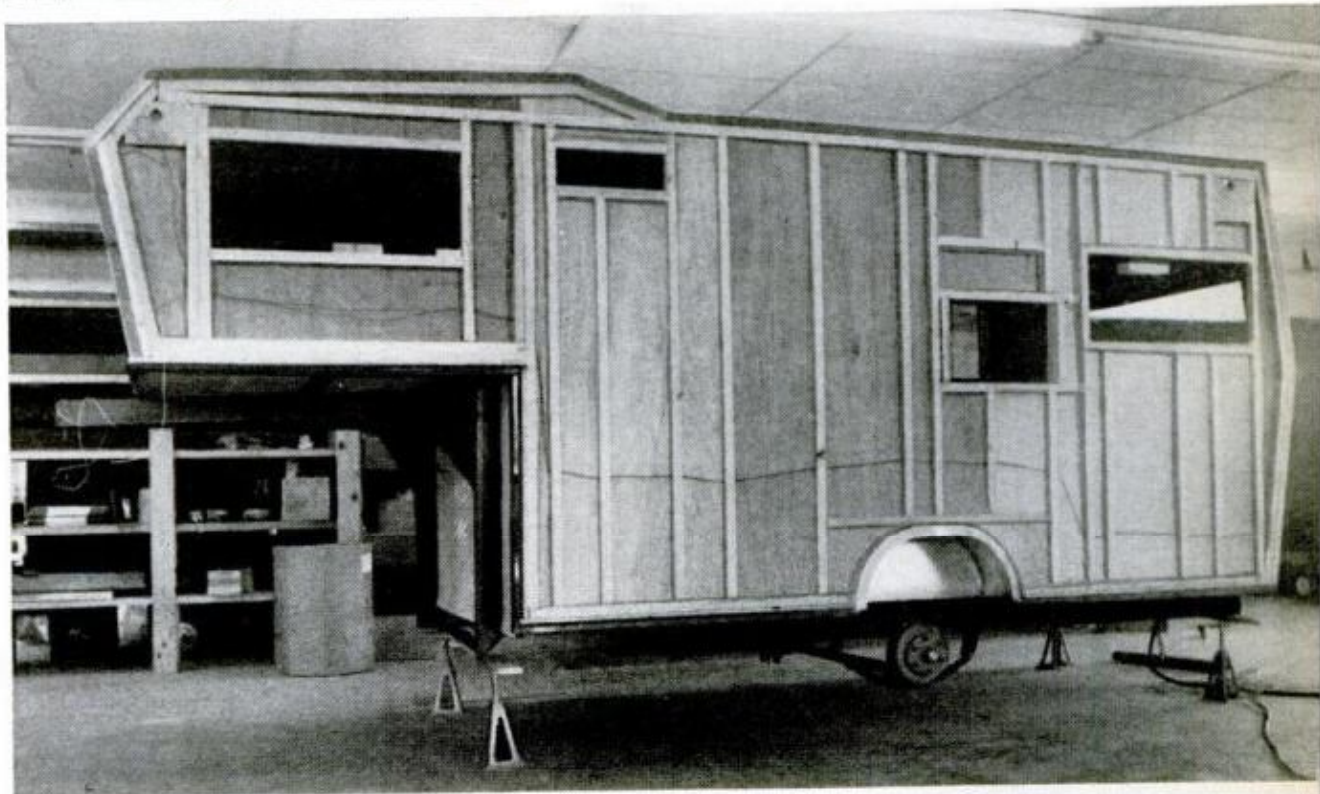


POPULAR MECHANICS



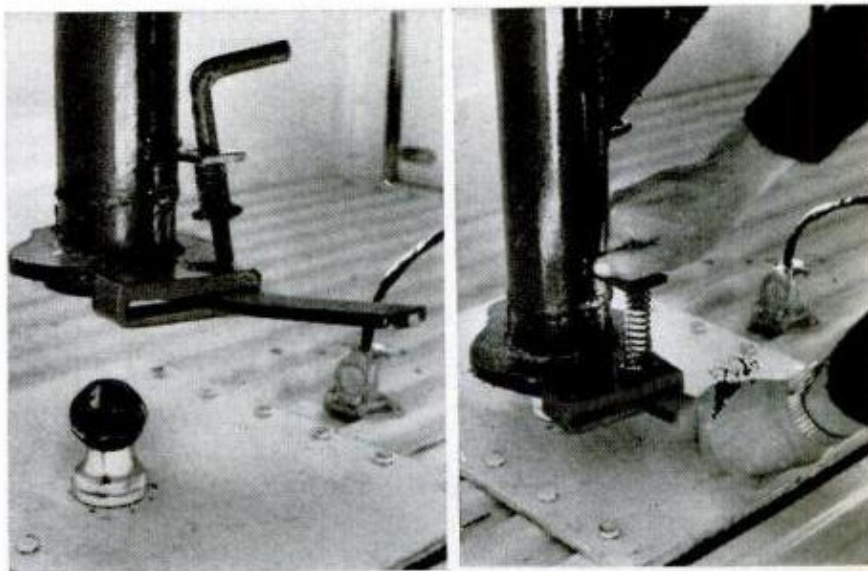
**DINETTE** at back of trailer becomes 4x6-ft. double bed. Sink is of stainless steel. On opposite wall is 4-cu.-ft. gas/electric refrigerator

**READY** for insulation and aluminum skin after plumbing and wiring are installed, left side is pattern for right with door added



**DOUBLE BED** forward is 54 by 81 in. Water heater, furnace under sink, stove

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**HITCH** for fifth wheeler secures to 2-in. ball on  $\frac{3}{8}$ -in. steel plate bolted through cargo bed to truck-frame cross members underneath. The connection (right) is locked in place with an insert pin

# Movie cameras:

## What do you get for under \$100?

By BURT MURPHY

**The answer is simple operation and just enough frills to make your movies interesting**

**Y**OU DON'T HAVE TO SPEND a fortune to make good home movies. Sure, if you want to use all the tricks Hollywood has at its command, you'll have to spend a lot on your camera. But between \$50 and \$100, you'll find lots of cameras that can assure you reasonably sharp, well-exposed pictures. You'll still need ingenuity to put punch in your movies—you'd need that even with the most expensive cameras. But many of the low-price cameras are surprisingly versatile.

You'll find a fairly complete list of \$50 to \$100 cameras on page 110. But since cameras are so widely discounted, you'll often find models with higher list prices selling in the same bracket, so it's worth shopping for bargains that may not appear in the buying guide shown here.

Just about all movie cameras today—and certainly all those in this survey—

have electric film drive and electric-eye, exposure-control systems. Both are major conveniences: With electric motor drive, you can shoot scenes of any length up to the full four minutes of an entire film cartridge; earlier, spring-driven cameras were restricted to shorter scenes—sometimes unexpectedly short if you'd forgotten to rewind the spring beforehand.

The electric-eye exposure system automatically adjusts the lens aperture according to lighting conditions and the type film you're using; you never have to measure the light and adjust the lens yourself. This feature, always handy, is especially useful if lighting conditions change during a scene—if your subject moves from bright sunlight to shadow, for example.

Electric eyes work indoors, too. Almost all of them today are adapted for Kodak's



new ASA 160 High-Speed Ektachrome color film as well as for the standard Kodachrome II. Snap in a film cartridge, and the meter automatically sets itself to the film in use. (The Fujica P1 takes only Fuji Single-8 cartridges, which don't fit Super-8 cameras though both can use the same projectors; its high-speed film is 200 ASA.) With high-speed films, you can often get surprisingly good (if grainy) color movies in brightly lighted rooms, especially with the fast  $f/1.8$  or  $f/1.9$  lenses found on most cameras. And if there isn't enough light for that, or if you're using the slower, standard film, you can illuminate your subject with a movie light.

This brings up another common feature, the built-in filter. Super-8 films are balanced for color accuracy with indoor, tungsten light. But since most home movies are shot in daylight, an orange filter, built into the camera, normally converts blue daylight to the redder light the film is balanced for. (With Fuji's Single-8 system, though, you use either a daylight-balanced film or a tungsten film with an externally mounted filter.) It may seem odd to use a filter for more normal shooting conditions; but since filters cut down the light as they color it, it's more sensible to "waste" daylight—there's so much available.

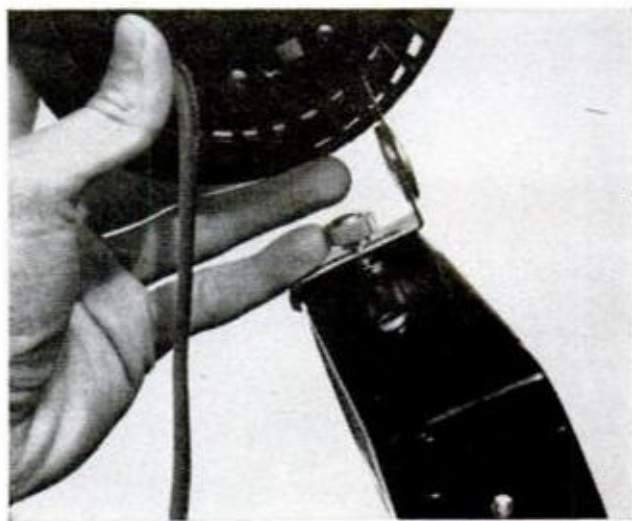
To shoot by indoor light, of course, you must disengage the filter. Usually, attaching a movie light to the camera does that automatically. But when shooting by existing tungsten light, or when your movie lights are mounted off the camera, you must usually insert a filter key into the movie-light socket to disengage the filter.

Some electric eyes read the light actually passing through the lens; others have their own little windows on the world. The through-the-lens type has a slight edge, since it automatically compensates for any filters you put on the lens (which few home moviemakers bother with) and

**HOLD YOUR CAMERA STEADY** and you'll get smooth, shake-free shots. Cameras should be braced against your face, held firmly in both hands. Pistol grips are a major steadying influence, but even cameras without them (second photo from bottom) can be held securely. Awkward, top-heavy grip (bottom photo) is a sure way to get wobbly pictures, especially with zoom lenses on telephoto settings; your hand should grip the camera body well as zoom control lever. Photos here show basic hand positions and must be adjusted, of course, so fingers can easily reach the shutter-release control on your particular model



**SAMPLING OF SUPER-8s** (above) includes Bell & Howell, GAF, Hanimex, Kodak Instamatic and Mustang, in that order. See the table on page 110 for a near-complete list of cameras and features. The cameras' built-in conversion filters must be disengaged when shooting with tungsten movie lights or room light. Special keys inserted in movie-light sockets (left, Hanimex; below, left, Bell & Howell) displace filters for shooting with off-camera lights. But filters automatically disengage when you attach a movie light (shown on GAF at right below). Fuji Single-8 (not shown) has a different system: You can use daylight film without a filter, or mount a filter on the camera lens when you're switching from one type of illumination to another. Most new cameras take ASA 160 film; with fast lenses, you can shoot pictures without movie lights in brightly lighted rooms. With the filter in, the fast films will allow shooting on dim or overcast days, as well as in the evening



can help you get correct exposure when shooting a telephoto shot of a backlighted subject. Most of the time, though, you'll find little difference between through-the-lens and separate metering. Nor does it seem to matter much whether the electric eye has its own little battery or draws its power from the ones that run the motor—except that a separate meter cell is easier to forget accidentally when you change batteries. One meter feature that may make a difference to you, though, is a manual override that lets you deliberately under or overexpose for special moods and effects or in situations, such as backlight-

ing, where the meter might read inaccurately.

To prevent accidental exposure errors, most cameras above \$50 have warning signals in the viewfinder that tell you when there's too little light for correct exposure with the film in use: several warn when there's too much light as well. A few viewfinders give you even more data: What f/stop is in use (Eumig and Kolvex), whether or not the film is running (Eumig) and when you're out of film (Kodak).

The finders themselves are usually optical sight types, like reversed telescopes. On cameras with zoom lenses, the finders

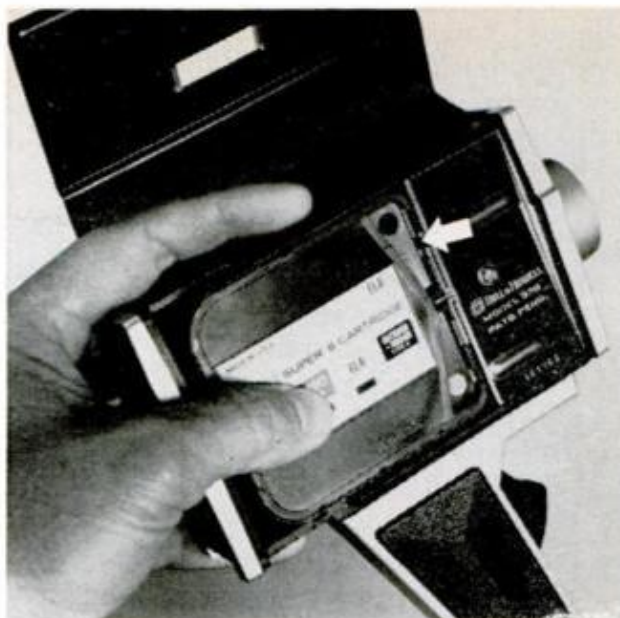


change their angle of coverage to match the coverage of the lens. Though several cameras in this class have reflex finders that look through the lens to see exactly what the film sees, hardly any have reflex ground-glass focusing; if you want to do much tilting and closeup work, you'll want that feature. Cameras with ground-glass focusing (and some others) have diopter eyepiece adjustments that let you focus your eyes clearly on the ground glass, even if you aren't wearing your glasses. If you do wear glasses when you shoot, you'll want a rubber eyecup to protect them from being scratched. And you'll want to make sure you can see the entire finder (including exposure and other warnings) with your glasses on.

One reason few of these cameras have ground-glass focusing is that few of their lenses focus. Most are fixed-focus types, set to keep all objects from about six feet to infinity fairly sharp. The near focusing limit on zoom lenses will change as you zoom from wide-angle settings (where greater depth of field maintains focus over a greater range of distances) to telephoto (where depth of field is limited). Eumig's "Servofocus" system even changes lens distance setting as you zoom to keep depth of field always at the maximum possible.

Zoom ranges are limited, in this price class, usually from 2X to 3X ratios (if the lens zooms at all), though the Kolvex has a 4X zoom range. Even 2X will let you add some variety to your home movies—

**SLIDING ZOOM CONTROL** atop this Hanimex looks like the rocker switches used for power zooming on some more expensive cameras. But it's actually a manual control—and, if anything, a bit less conve-



**SUPER-8 CARTRIDGES** load in a jiffy, hold 50 feet of film for four minutes of shooting. A film-speed coding notch in cartridge (arrow) adjusts camera's electric eye to match film's sensitivity. Film type can be read through a window in the film-compartment lid. Most Super-8s load like this Bell & Howell

and for beginning moviemakers, a limited zoom range may help overcome the temptation to zoom too often.

For best results, you should consider zoom lenses primarily as handy ways to carry both wide-angle and telephoto lenses, and use the zoom control to frame your scene before you shoot; zooming during a shot should be reserved for times when you need its special impact. Because telephoto settings give a bigger image, they're often thought of as equivalent to moving the camera closer; that's not com-

nient than the average. Zoom ranges on under-\$100 cameras are modest; Hanimex's 2X range is typical, though one camera has a 4X zoom (and powered at that; see chart). Many Super-8s don't zoom at all



pletely true. Move closer to your subject, and the background grows a little smaller by comparison. Zoom in, and both subject and background grow in size (move too close, though, and a subject's nearby knees or nose can loom frighteningly out of proportion).

If you do zoom while shooting, motor-driven "power zoom" controls will make the action a bit smoother. But since you may not want all your zooms done at the same speed, you'll still want manual zoom control so you can speed up or slow down at will. (Variable-speed power zooms are available—but not in this price range).

Most Super-8 camera lenses have maximum apertures of f/1.8. You'll find little differences between these lenses and those with a maximum aperture of f/1.9; but f/2.7 or f/2.8 lenses let in only about half as much light, which can make a real difference when you're using Kodachrome in comparatively dim conditions. The f/1.8's

extra "stop" of light-transmitting capability is also important with reflex cameras, whose finders see only a portion of the light coming through the lens. All reflex models on our list do, in fact, have f/1.9 or faster lenses.

Trigger locks are about the only remaining controls commonly found on these cameras. Some cameras have a safety lock that prevents accidental running of the camera. Others have run locks that let you set your camera on a tripod, start the shot, then leave the camera running while you step into the scene. And quite a few cameras have both types of lock.

Under-\$100 cameras are all fairly compact and lightweight—after all, they lack most features that add bulk to the more expensive models. That makes them handy to carry on trips. But some are easier to pack than others. The difference is in the pistol grips; on about half the cameras we surveyed, they folded or were removable

## MOVIE CAMERAS IN THE \$50 TO \$100 RANGE AND

| MAKE AND MODEL          | PRICE | LENS          | ZOOM RANGE, TYPE | METER TYPE, FILM SPEED RANGE | FOCUS, NEAREST DISTANCE | FINDER TYPE, FEATURES    | GRIP      |
|-------------------------|-------|---------------|------------------|------------------------------|-------------------------|--------------------------|-----------|
| Argus 818               | \$ 65 | 13-26mm/2.7   | 2X, M            | TTL, 25-100                  | Fixed                   | Si, Ue                   | Fixed     |
| Bell & Howell 372G      | 55    | 14mm/2.8      | None             | EE, 25-160                   | Fixed                   | Si, Ue, Ec               | Removable |
| Eumig Mini-3            | 100   | 9-28mm/1.9    | 3X, M            | TTL, 25-160                  | Servofocus*             | Rfx, Ue, F/S, RI, Di, Ec | Accessory |
| Fujica P1               | 80    | 11.5mm/1.8    | None             | EE, 25-200                   | Fixed                   | Si, Ue, Oe,              | Fixed     |
| GAF SC-100              | 55    | 15mm/1.8      | None             | EE, 25-160                   | Fixed                   | Si, Ue, Ec               | Removable |
| GAF SC-102              | 80    | 12-24mm/1.8   | 2X, M            | EE, 25-160                   | Fixed                   | Si, Ue, Ec               | Removable |
| GAF 64                  | 80    | 12-24mm/1.8   | 2X, M            | EE, 25-160                   | Fixed                   | Si, Ue, Oe, Ec           | Fixed     |
| GAF Lentar 2MZ          | 80    | NA/1.8        | 2X, M            | TTL, 25-160                  | Fixed                   | Rfx, Ue, Oe, Ec          | Fixed     |
| GAF Lentar 3PZ          | 100   | NA/1.8        | 3X, P            | TTL, 25-160                  | Guess, 5'               | Rfx, Ue, Oe, Ec          | Fixed     |
| Hanimex Load-matic M220 | 79    | NA f/1.8      | 2X, M            | EE, NA                       | Fixed                   | Si, Ue, Ec               | Removable |
| Kodak Instamatic M24    | 50    | 14mm/2.7      | None             | EE, 25-160                   | Fixed                   | Si, Ue, FE, Ec           | Folding   |
| Kodak Instamatic M26    | 65    | 13mm/1.9      | None             | EE, 25-160                   | Fixed                   | Si, Ue, FE, Ec           | Folding   |
| Kodak Instamatic M28    | 85    | 13-28mm/2.7   | 2 1/4X, M        | EE, 25-160                   | Guess, 6'               | Si, Ue, FE, Ec           | Folding   |
| Kolvex                  | 100   | 9-36mm/1.8    | 4X, P            | TTL, 16-250                  | Rfx, 4 1/2'             | Rfx, Ue, Oe, F/S, Di, Ec | Removable |
| Mustang                 | 60    | 9-23mm/1.8    | 2 1/2X, M        | EE, 25-40                    | Fixed                   | Si                       | Fixed     |
| J.C. Penney 3806        | 50    | 12-24mm/1.8   | 2X, M            | EE, NA                       | Fixed                   | Si, Ec                   | NA        |
| J.C. Penney 3809        | 65    | 12-34mm/1.8   | 2X, P            | EE, NA                       | Fixed                   | Si, Ec                   | NA        |
| Sears 3A 9128           | 50    | 11.5-22mm/1.8 | 2X, P            | TTL, 25-160                  | Fixed                   | Si, Ue, Oe, Ec           | Fixed     |
| Sears 3A 9129           | 80    | 10-30mm/1.8   | 3X, P            | TTL, 25-160                  | Rfx, 5'                 | Rfx, Ue, Oe, Di, Ec      | Fixed     |



**EUMIG MINI-3** (above) is a pocket-sized reflex. Since a pistol grip would make it too large for pocket portability, none is supplied, but one is available as an optional accessory. The Mini-3 has 3X zoom lens with unique Servofocus system that shifts the lens focus as you zoom for maximum depth of field at all zoom settings. Tripod sockets vary in position from one camera model to another. Socket at the base of this Mustang's fixed pistol grip (left) has good balance, raises camera conveniently for tall moviemakers. Some grips must be removed for tripod use, a nuisance

## THEIR FEATURES

| BATTERIES         | SPECIAL FEATURES       | ACCESSORIES             |
|-------------------|------------------------|-------------------------|
| 4 AA              | SL                     | Lt                      |
| 4 AAA             | RL, SL                 | Cs, Lt                  |
| 2 AA              | Pocket-size, SF, MO    | Cs, grip                |
| 4 AA, PX-13       | Single-8*, SL          | (Cs), Tele, Filters, CU |
| 3 AAA             | SL, RL                 | Lt, Cs                  |
| 3 AAA             | SL, RL                 | Lt, Cs                  |
| 2 AAA             |                        | Lt, Cs                  |
| 2 AA, PX-625      | SL                     | Lt, Cs                  |
| 2 AA, PX-625      | SL                     | Lt, Cs                  |
| 2 AA, PX-13       | SL, RL                 |                         |
| 2 AA, PX-13       | SL, RL                 | Cs                      |
| 2 AA, PX-13       | SL, RL                 | Cs                      |
| 2 AA, PX-13       | SL, RL                 | Cs                      |
| 4 AA, PX-13       | BC, Remote, SL, RL, MO | Cs, RC, Filters         |
| 4 AA, PX-675, BCs |                        | Cs, Filters             |
| 2 AA, PX-13       | NA                     | NA                      |
| 2 AA, PX-13       | NA                     | NA                      |
| 2 AA, PX-13       | SL, RL                 | Lt                      |
| 2 AA, PX-13       | SL, RL                 | Lt                      |

(on one, the pocket-sized Eumig Mini-3, the grip was an optional accessory).

A camera's weight makes a big contribution to its feel, too. The heavier the camera, the easier it is to hold it steady—but the harder it is to carry around on long shooting expeditions. Virtually no camera spec sheets mention weight; but in any case, none would cover the related and equally important question of balance. My preference is for cameras whose weight is biased slightly toward the rear to settle firmly against your face rather than toppling forward away from you; but see which cameras feel most comfortable.

Balance at another point—the tripod screws—is of some importance if you use cheap tripods whose tilt heads don't lock

*(Please turn to page 134)*

### KEY TO ABBREVIATIONS IN CHART

|     |                             |      |                           |
|-----|-----------------------------|------|---------------------------|
| BC  | Battery check               | Rfx  | Reflex                    |
| BCs | Battery case                | RC   | Remote control            |
| Cs  | Case                        | RI   | Run indicator             |
| Di  | Eyepiece diopter adjustment | RL   | Run lock                  |
| Ec  | Eyecup                      | SF   | Single-frame release      |
| EE  | Separate electric eye       | Si   | Optical sight finder      |
| F/S | F-stop scale in finder      | SL   | Safety trigger lock       |
| FE  | Film-end indicator          | Tele | Telephoto-lens attachment |
| Lt  | Movie light                 | TTL  | Through-the-lens meter    |
| M   | Manual zoom                 | Ue   | Underexposure indicator   |
| MO  | Manual meter override       | ( )  | Supplied accessory        |
| NA  | Not available               | *    | See text                  |
| Oe  | Overexposure indicator      |      |                           |
| P   | Power zoom                  |      |                           |

## PM OWNERS REPORT: FULL-SIZE FORDS

# Ford faithful get great ride,



By **MICHAEL LAMM**  
West Coast Editor

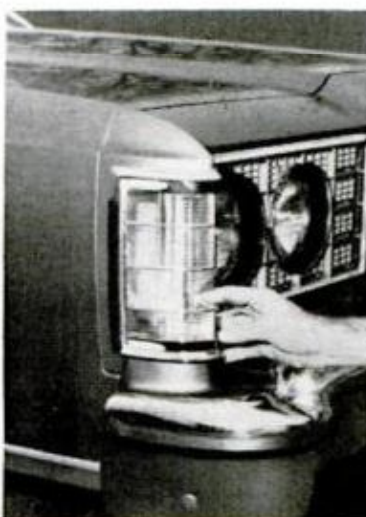
*Photos by the author*

**P**EOPLE SOMETIMES ASK US why we give such-and-such a car a bad, or good, writeup. We tell them we're only the instrument through which Owners Reports get written—we put together these reports from owner responses. What they say, we say. PM sends questionnaires to a random sampling of new-car owners through R.L. Polk & Co. in Detroit. When the questionnaires come back, responses are tabulated by the Statistical Service Center in Spring Valley, N.Y. Everyone involved tries to be as impartial as possible.

For this Ford report, we've decided to pick four typical owners' questionnaires and will simply run them as

A nationwide survey based on 650,000 owner-driven miles

# but pay at the pump



**THE FORD NAMEPLATE** was more important than styling; car's lines offended a few. Owners praise comfort, ride, layout of dashboard, and Ford's overall quiet. Many feel, though, that the engines aren't delivering full power, and gas-mileage gripes run rampant. Surprisingly, the three largest V8s all deliver similar mpg. Big bumpers, even with overrides, dip low in braking so other cars ride over, crack lamps. Handles are an unhandy reach

written. No punches. "Ask the man who owns one!" is an old advertising slogan; still a valid way to judge a car.

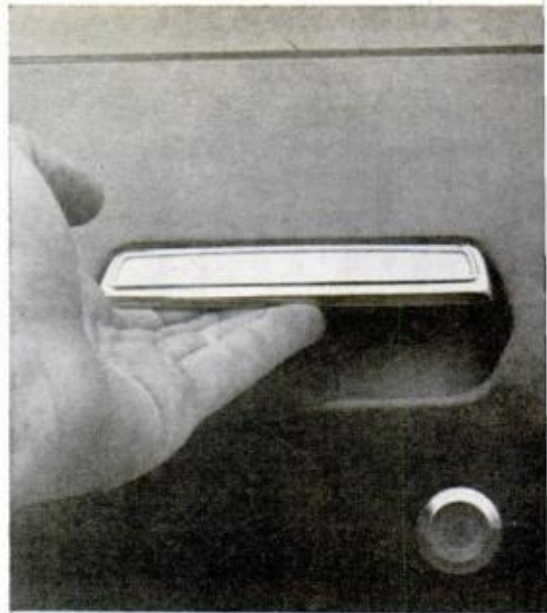
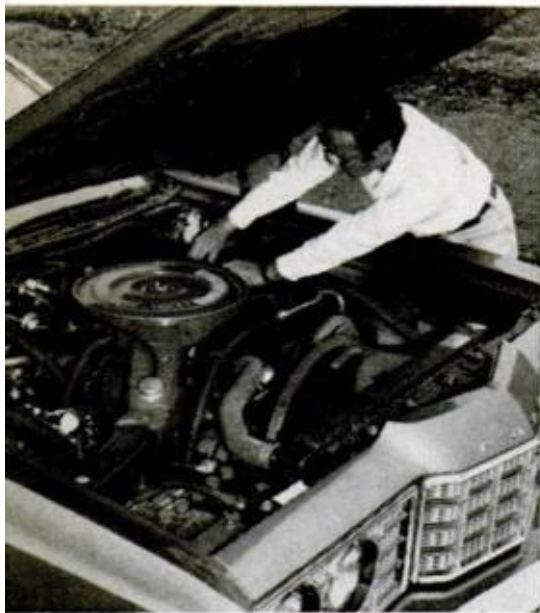
First is a 56-year-old architect field rep of Levittown, N.Y., who drives a two-door LTD with the 351 cu.-in. V8. Here are his answers:

*Have you had any mechanical problems with your Ford?* "Yes, dieseling after ignition turned off."

*Were the repairs satisfactory?* "Yes, but it's starting to diesel again after 3000 miles."

*What do you think of your dealer's sales and service policies?* "Satisfactory."

*Why did you choose a Ford over other cars?* "Ford



**FORD OFFERS FOUR V8s** in its full-size lines. The trunk space is mostly vertical with a 26-gallon tank behind the rear seat. Easily accessible taillamp fixtures make the bulb changes easy. Door handles are recessed

gave me the best trade-in offer on my previous car."

*What do you think of your Ford's workmanship?* "Interior is poor."

*What changes would you like to see in your car?* "Return to movable front vent windows."

*Is your car comfortable?* "Yes, and quiet, but there's not enough rear legroom in the coupe."

*What are your specific praises of the car?* "Easy handling, comfortable ride, comparative silence."

*How about specific complaints?* "It's underpowered; also needs a better adjustment device on front windows to prevent squeaking. Too, water comes up through the floor in heavy rains."

*Would you buy another Ford?* "Yes."

Next, a 35-year-old Michigan office worker (male) who owns a two-door LTD Brougham with 460-cu.-in. V8:

*Mechanical troubles?* "Engine surge, front tires misaligned and out of balance,

and right taillight filled with water."

*Repairs?* "Engine still surges but not so much. Tires shimmy at 70 mph. I emptied the taillight myself, but it's filled up again since."

*Dealer opinion:* "Salesman very courteous; service people seem too busy, but they listen and smile. On warranty work, I understand they do just what you ask."

*Why Ford?* "I like the ride, and the styling isn't too bad."

*Workmanship?* "Good but not the greatest. I found initials scratched into the underside of my hood. An upholstery button was missing. The dealer promised to replace it by October but hasn't yet."

*Changes?* "Better acceleration from the 460-cu.-in. V8 and better gas mileage."

*Comfort?* "Very comfortable."

*Praises:* "Quiet car. The stereo is great. Seats comfortable. Trunk adequate. I can use regular fuel."

*Gripes:* "Lousy acceleration and gas mileage. Window glass rubs against rubber weatherstripping and squeaks. Should



**FORD LTD MODELS** were most popular with owners, most of whom ordered 400-cu.-in. V8 engine for their car

## Summary of 1973 Ford Owners Reports\*

|   |         |
|---|---------|
| <b>Total miles driven</b> .....                     | 651,071 |
| <b>Average miles per gallon:</b>                    |         |
| Local driving .....                                 | 10.4    |
| Long trips .....                                    | 13.1    |
| <b>Average mpg by engines:</b>                      |         |
| 351-cu.-in. V8: Local driving .....                 | 11.3    |
| Long trips .....                                    | 13.8    |
| 400-cu.-in. V8: Local driving .....                 | 10.3    |
| Long trips .....                                    | 12.9    |
| 429-cu.-in. V8: Local driving .....                 | 10.5    |
| Long trips .....                                    | 12.8    |
| 460-cu.-in. V8: Local driving .....                 | 9.3     |
| Long trips .....                                    | 12.8    |
| <b>Series:</b>                                      |         |
| Custom 500 .....                                    | 1.1%    |
| Galaxie 500 .....                                   | 21.9    |
| LTD .....   | 39.6    |
| LTD Brougham .....                                  | 27.3    |
| Ranch Wagon, Country Sedan,<br>Country Squire ..... | 10.2    |
| <b>Body styles:</b>                                 |         |
| Four-door sedans .....                              | 45.8%   |
| Two-door coupes .....                               | 35.0    |
| Four-door wagons .....                              | 19.2    |
| <b>Engines:</b>                                     |         |
| 351-cu.-in. V8 .....                                | 30.7%   |
| 400-cu.-in. V8 .....                                | 54.3    |
| 429-cu.-in. V8 .....                                | 9.5     |
| 460-cu.-in. V8 .....                                | 5.5     |

|   |       |
|---|-------|
| <b>Why did you buy a new Ford?</b>      |       |
| Past experience .....                   | 46.3% |
| Price .....                             | 18.2  |
| Styling .....                           | 16.3  |
| Dealer service .....                    | 10.3  |
| <b>Specific likes:</b>                  |       |
| Handling .....                          | 49.3% |
| Ride .....                              | 45.7  |
| Style .....                             | 36.2  |
| Comfort .....                           | 32.2  |
| Silence .....                           | 21.1  |
| <b>Specific dislikes:</b>               |       |
| Poor gas mileage .....                  | 34.2% |
| Poor workmanship .....                  | 10.4  |
| Lack of power .....                     | 9.9   |
| Bad emission-control<br>equipment ..... | 8.9   |
| Rattles .....                           | 6.9   |
| <b>What changes would you like?</b>     |       |
| Better gas mileage .....                | 19.4% |
| Different styling .....                 | 8.6   |
| Vent windows standard .....             | 7.4   |
| Remove smog equipment .....             | 6.9   |
| <b>Had any mechanical trouble?</b>      |       |
| No .....                                | 63.2% |
| Yes .....                               | 36.8  |
| <b>What type of trouble?</b>            |       |
| Carburetor .....                        | 20.5% |
| Cold starts .....                       | 17.9  |
| Engine diesels .....                    | 15.4  |
| Wheel alignment .....                   | 9.0   |

|  |       |
|--|-------|
| <b>Did you repair it yourself?</b>     |       |
| No .....                               | 94.9% |
| Yes .....                              | 5.1   |
| <b>Dealer repairs satisfactory?</b>    |       |
| Yes .....                              | 71.0% |
| No .....                               | 29.0  |
| <b>Is the Ford your only car?</b>      |       |
| No .....                               | 54.0% |
| Yes .....                              | 46.0  |
| <b>Other cars owned:</b>               |       |
| Other Fords .....                      | 46.2% |
| Chevrolet .....                        | 15.4  |
| Volkswagen .....                       | 6.0   |
| Mercury .....                          | 6.0   |
| <b>Workmanship opinion:</b>            |       |
| Good to excellent .....                | 71.1% |
| Average to poor .....                  | 28.9  |
| <b>Age distribution of owners:</b>     |       |
| 15-29 years .....                      | 7.1%  |
| 30-49 years .....                      | 45.9  |
| 50-plus .....                          | 47.0  |
| <b>Would you buy another new Ford?</b> |       |
| Yes .....                              | 90.7% |
| No .....                               | 9.3   |

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

have tops to windows instead of bare glass."

*Buy another?* "Undecided."

An Illinois schoolteacher (female, 58) with 400-cu.-in. LTD Brougham coupe.

*Troubles?* "One power window wouldn't lift after being lowered, and the intermittent wiper system didn't work."

*Repairs okay?* "Yes. Window only needed an adjustment, and a part was missing from the wipers."

*Dealer opinion:* "Wonderful."

*Why Ford?* "Best car on the road. Do they make other kinds?"

*Workmanship?* "Excellent."

*Changes?* "I'd like to have a choice of colors and fabrics available in any Ford product. I wanted a white interior that was available only in Thunderbirds. I'd also like better gas mileage."

*Comfort?* "I think the car is very comfortable, but a friend with back trouble considers the seats too soft and has to use a firmer seat cushion."

*Praises:* "Handles beautifully, corners very well, starts immediately, quiet as they claim."

*Gripes:* "None."

*Buy another?* "Yes."

A 24-year-old Chicago layout engineer who drives a two-door LTD Brougham

equipped with the 460-cu.-in. V8 engine:

*Mechanical problems?* "FM radio floats and has static. Also had minor adjustments to doors to make them fit flush. Other than that she runs like a champ."

*Repairs okay?* "No charge for the first three months on this type of repair work."

*Dealer opinion:* "I believe that if you shop around for the best price and stick to your guns, you get a fair deal. If not, they take you for plenty."

*Why Ford?* "Have owned four before and liked them all."

*Workmanship?* "Ford seems to do better than the rest."

*Changes?* "A couple of inches more legroom. I'm 6-3, and my legs feel cramped on long trips."

*Comfort?* "Except as stated."

*Praises?* "Ride, handling and silence."

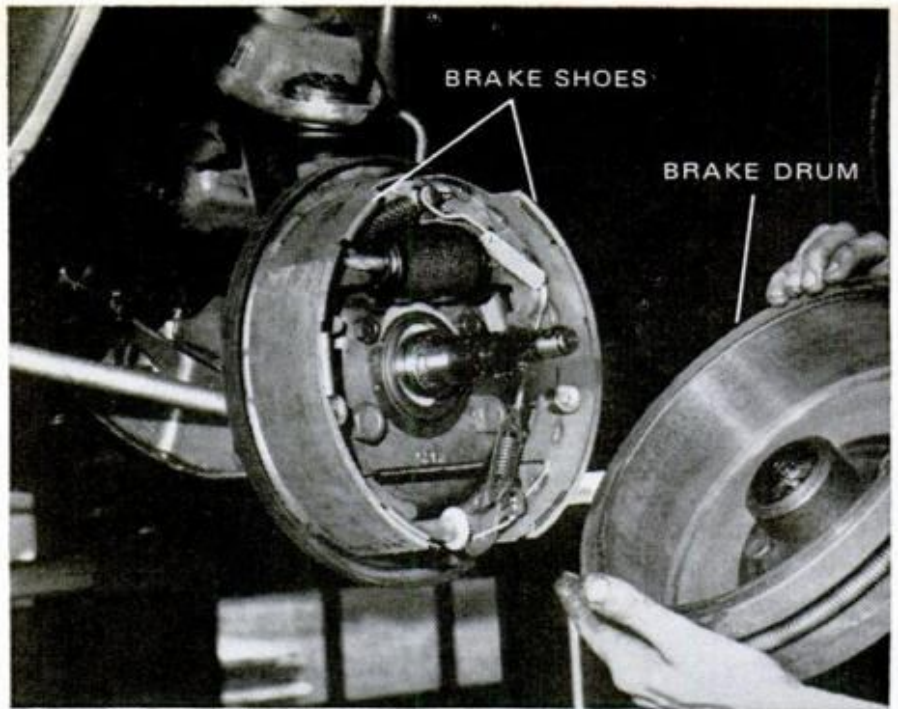
*Gripes:* "I'd like to see more horsepower from those engines, and that includes all makes and models."

*Buy another?* "Not sure yet."

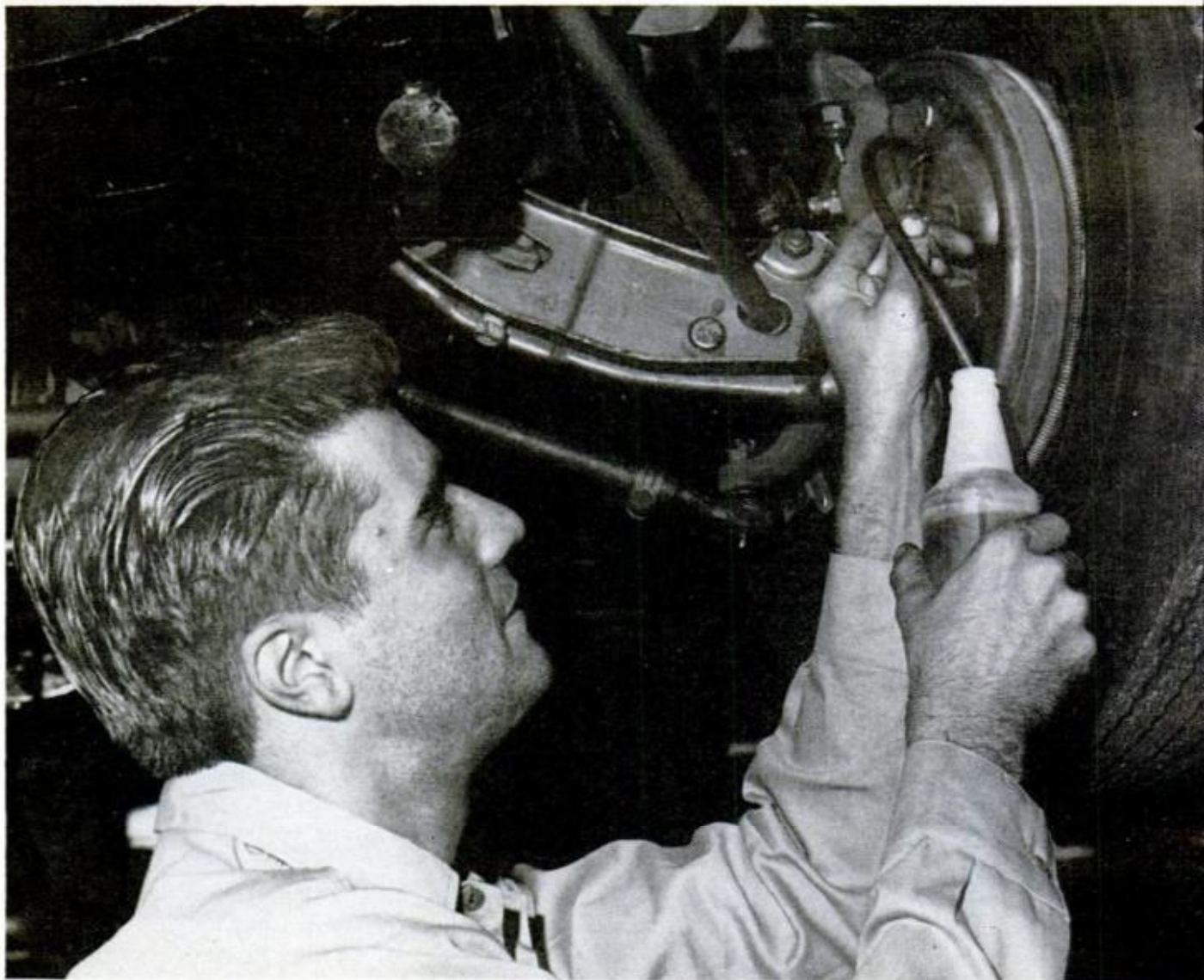
The majority (90.7 percent) said they will buy Ford again. Most rated dealers high and thought well of workmanship.

Many of the owners blamed dieseling, poor gas mileage, and weak performance on Ford's antipollution devices. This led 6.9 percent to recommend removal of smog hardware. ★★★

**SAVE MONEY** by following a preventive maintenance program. Pull your brake drums at intervals of about 12,000 miles to make sure that brake linings are not worn so low that brake-shoe metal or rivets are chewing up the machined drum surface. As shown below, bleeding and refilling your hydraulic system with fresh fluid can be done yourself. Length of hose connects to bleeder valve at each wheel



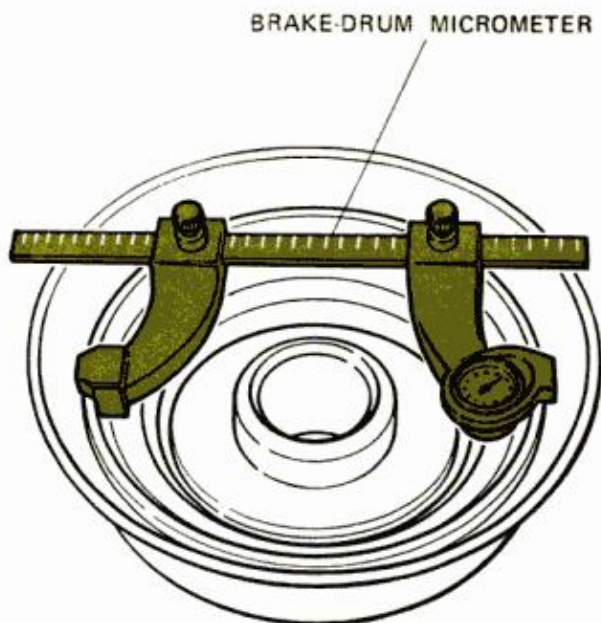
## How to get a







WHEEL CYLINDER CLAMP



BRAKE-DRUM MICROMETER

SOME SPECIAL TOOLS are worth investment, most too expensive. Some can be rented or borrowed (see text)

# professional brake job at a do-it-yourself price

By MORT SCHULTZ

**C**AN YOU STILL SAVE MONEY when the brake job you are doing suddenly requires the use of professional mechanic's equipment that you don't have?

I got an answer to this question not long ago when I removed the brake drums from a 1968 Pontiac and found that two of them needed to be resurfaced.

Drums are resurfaced (turned on a lathe and machined) to even out wear and remove glaze, but they must be replaced if machining will cut them beyond the minimum safety specification which is stamped on most units.

I took the drums to a professional brake shop which charged me \$2.50 per unit for turning, for a total of \$5.

"How much more would it have cost me if I had brought you the car instead and had you remove the drums?" I asked the mechanic.

"Another \$10," was his reply.

I saved a quick \$10, proving that lack of major equipment is no reason for not doing your own brake work. Brake-drum resurfacing and other tasks not generally considered within the province of a Satur-

day mechanic can be done by a brake specialist, but don't let him do all the work.

The first way to avoid unnecessary costs is to avoid unnecessary damage. You can't, of course, prevent brake linings from wearing out as they are used. But brake drum and disc damage can often be prevented by replacing linings before brake-shoe metal comes into contact with drums or discs.

Examine linings every 12,000 miles and replace shoes if any part of the lining is worn to within 1/32 inch of the shoe table of a bonded lining or the rivet head of a riveted lining. Always replace brake shoes in axle pairs in order to equalize brake action.

Although you will need a set of brake-service hand tools that you may have to buy, you can still save a considerable amount of money by relining brakes yourself. Using a 1969 Chevrolet Impala with drum brakes as an example, I found that brake shops in the New York City area wanted to charge from \$40 to \$65 to replace linings.

This cost, most told me, included inspecting and cleaning of all parts of the

brake system. However, this is a task that you can do just as well.

In checking out different sources of brake parts and tools, I found that one of the best deals is offered by Sears. The company will provide tools and instructions if you buy parts from it.

A set of linings from Sears for the Chevy costs \$6.99, which is right in line with the prices of other part suppliers. They are bonded, made of brass chips and asbestos, and are guaranteed for 40,000 miles. If they wear out before this, you get a full refund or new linings free of charge.

Thus, replacing the linings on all four wheels of the Chevy would cost \$13.98; this is a saving of \$26.02 from what the least expensive brake shop wanted to charge.

If you bought your own brake-service hand tools, such as an adjusting wrench, wheel-cylinder clamps and wheel-cylinder pliers, they would cost about \$10. As I mentioned, though, Sears will provide a toolkit for either drum or disc brake-lining installation if you submit a deposit of \$30 with your order for new linings. The deposit will be refunded in full when you return the kit within 30 days. This offer applies only to American-made cars.

Before tackling brake work you should feel sufficiently confident that you can do the job without compromising safety. You'll need detailed instructions. Help is available from a number of sources if you don't have the car's service manual.

If you decide to buy linings from Sears, the company will provide installation instructions for your type and make of brake system. You can also get specific informa-

tion pertaining to your setup at your local library from an automotive repair manual such as *Motor's*.

When beginning a brake job, you should first check the condition of drums or discs. Units that are cracked or deeply grooved should be replaced.

You probably don't have brake drum and disc micrometers available, but since you have to take units to a brake specialist anyway for possible resurfacing, it really doesn't pay to buy them. Many mechanics will check the trueness of units for you free of charge.

If a drum is scored deeper than 0.020 inch or exceeds an out-of-round tolerance of 0.006 inch, it should be resurfaced, if possible, or replaced. Drums on the same axle should be turned to the same diameter although one may not need it.

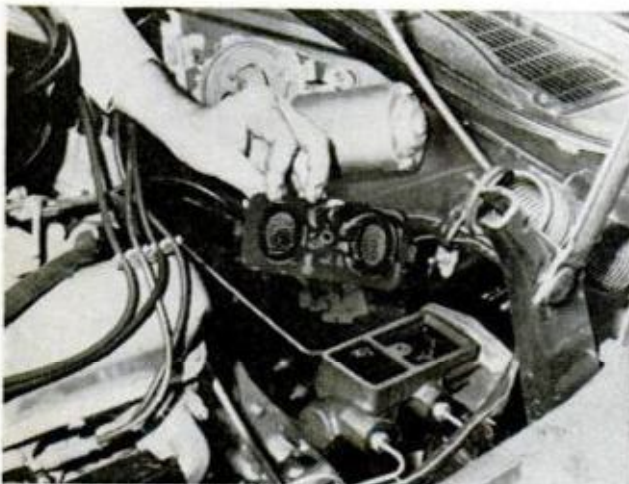
In turning a drum of a Chrysler Corp. car, make sure that the wheel and tire are mounted. Other manufacturers do not require this.

Don't compromise safety for economy. Never remove more than 0.060 inch of metal from a drum's original diameter. For example, the diameter of a drum with an original diameter of 9.000 inches should never exceed 9.060 inches after resurfacing.

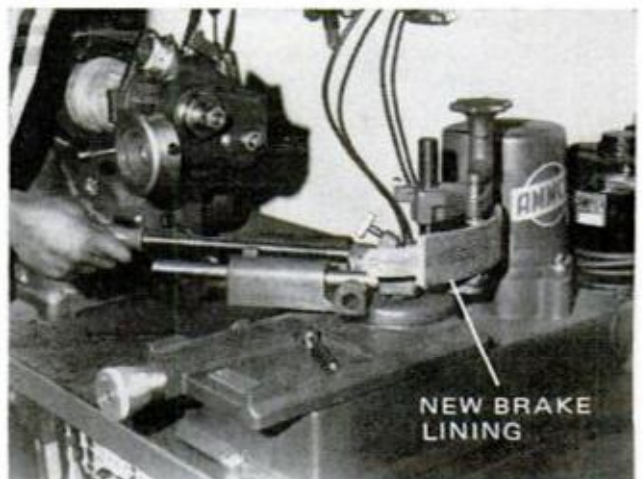
If too much metal is removed, the drum will be weakened seriously and its ability to shed the tremendous heat of braking will be greatly reduced.

The reason for checking drums before buying new linings is to assure that you buy the correct linings. If the diameter of a drum after resurfacing is 0.030 inch or more oversize, you should install oversize linings. If the diameter of the drum

*(Please turn to page 136)*

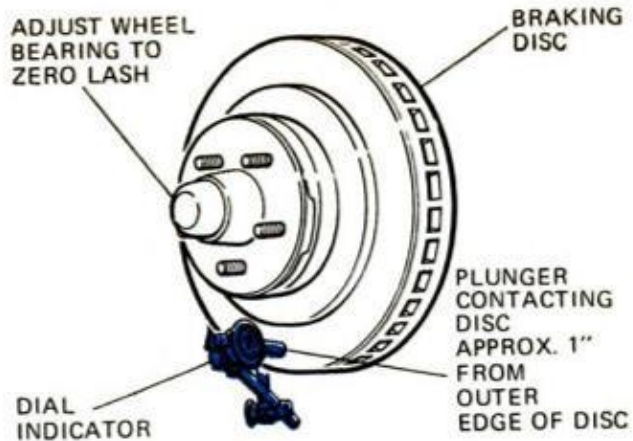


**CHECK FLUID LEVEL** at master cylinder for quick clue to troubles in your brakes' hydraulic system

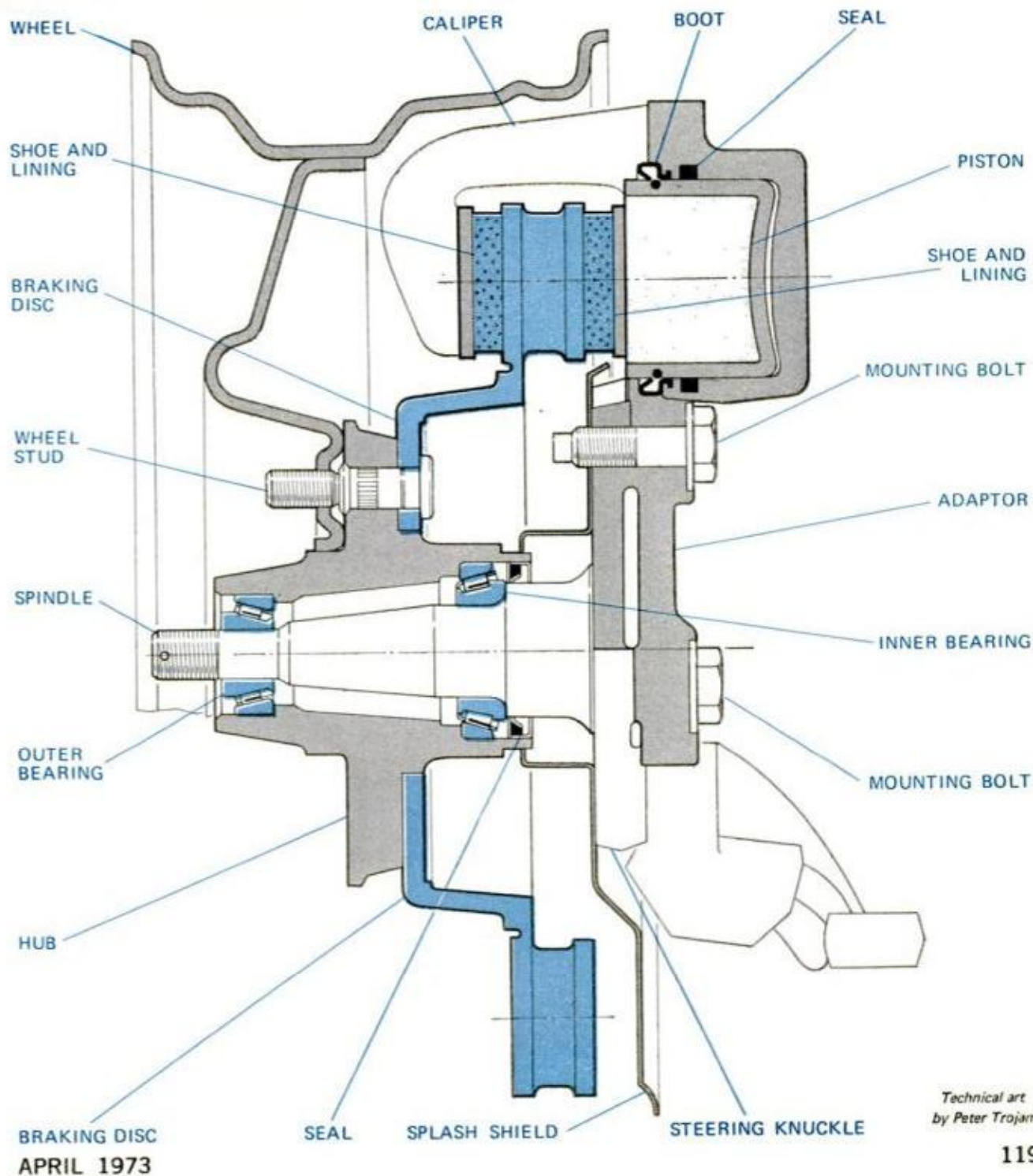


**PAY A PRO** with the right tools to arc new linings; you save in long run having full contact with drum

**POPULAR MECHANICS**



**DISC IS MACHINED** at left after being checked for lateral runout and parallelism as shown above. The cutaway shows parts of typical disc-brake assembly



Technical art  
by Peter Trojan

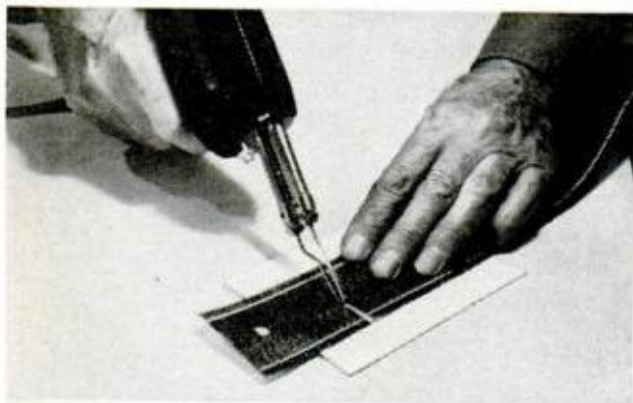


# Hints from

## Pretty sharp idea

A simple clamping arrangement converts a pair of sharp-pointed scissors into a compass divider. Clamp consists of two stiff wood strips connected by a bolt with a wingnut through their centers. Install it across the handles as shown or across the blades when point separation is adequate. Clamp strips shown are 4½ in. long.

—E.B. Walters, Chicago.



## Hot tip for cutting plastic webbing

When replacing plastic webbing on patio chairs and the like, ordinary cutting and hole-punching techniques leave frayed and raveled edges on the fabric. Run the hot tip of your soldering iron across the webbing where a cut is needed; the fiber ends will melt and join together so that you'll find it easy to make a neat cut.

—Charles Hardy, Whittier, Calif.



## Toothbrush holder in the shop

After trying several methods without success for keeping drill bits neatly corralled by my drill, I came up with the idea shown at left. I simply taped a plastic toothbrush case to my drill's line cord for use as a drill-bit holder. Since I've done this, I have never had to search for a drill bit when using the drill.

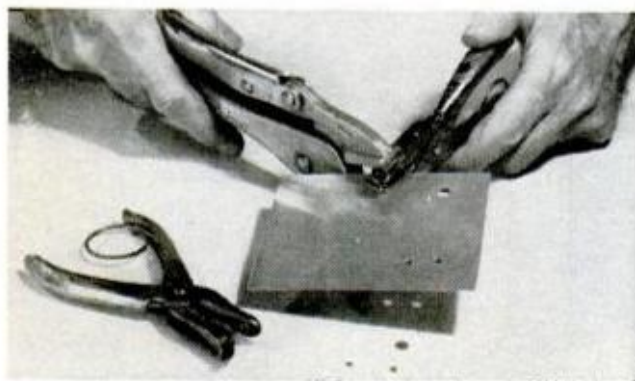
—Louis C. Davis, Albany, Ga.



## Stick with this labeling stunt

When labeling workshop jars, apply three labels equally spaced around each jar's circumference, and you can identify the contents of a container no matter what position it was returned to its shelf. If you use rectangular or square jars for small-parts storage, apply a label to each side to achieve the same results.

—W. B. May, Oak Park, Ill.



## Power to the punch

A paper punch can be used for making holes in material heavier than those for which it was designed, such as cardboard and soft-sheet aluminum. To do it, give the punch an assist by using a toggle-type wrench. The wrench is adjusted so it will squeeze the punch jaws together just enough to penetrate the material.

—B. W. Ervin, Kent, Ohio.

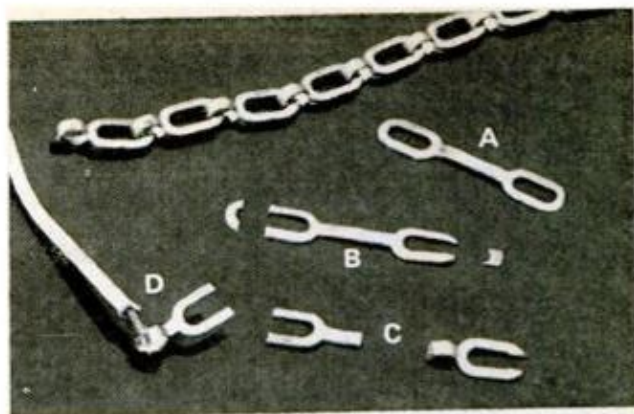
POPULAR MECHANICS

# readers

## Don't shrug off this lug

If you find yourself in need of spade lugs during a late-night or Sunday work session when stores are closed, make your own from a piece of brass chain as shown: A, remove link B, cut off the ends; C, cut the link in half. You'll end up with D, a neat lug that can be soldered to the end of the conductor.

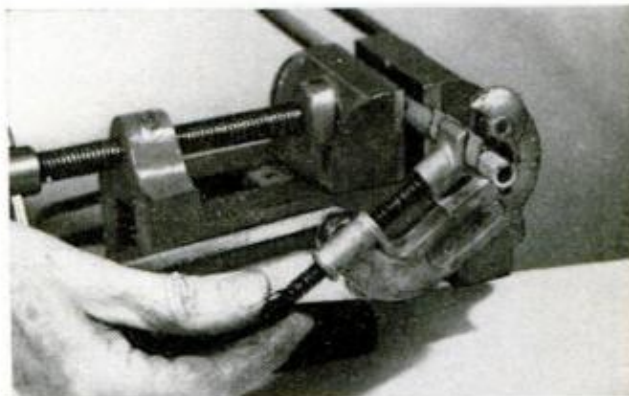
—Hugh M. Gordon, Burlington, Ont.



## Scratchless tube-cutting

When using a cutter on highly finished metal tubing you can minimize surface scratches by first wrapping the tubing with two thicknesses of sheet plastic (such as the type used for bread wrappers, vegetable bags and the like). Hold plastic on tubing with clear tape, use low or moderate feed-pressure on the cutting wheel.

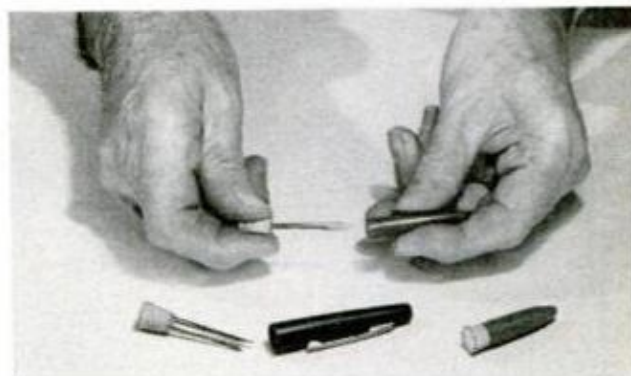
—Burt Web., Skokie, Ill.



## Ballpoint barrel pins down storage

Small and fine needles are frequently lost or tend to rust easily if not protected. A good holder can be readily made from the cap of a ballpoint pen and a small cork. Trim cork to fit cap opening tightly and stick needles into the cork so that when it is pulled, the needles will come out along with it.

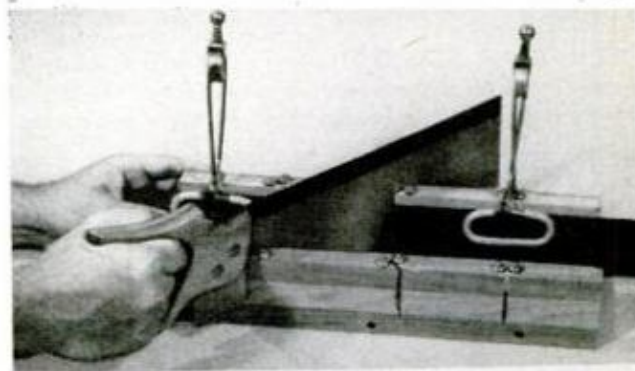
—Harry Radzinsky, Charlotte, N.C.



## Picture this clamp

Ordinarily, small, standard wood moldings are difficult to hold absolutely motionless in a miterbox because of their size. I've discovered that a pair of spring-type photolamp clamps will hold such pieces firmly while the molding is being cut. To do this effectively, fasten one clamp per side as shown in the photo at right.

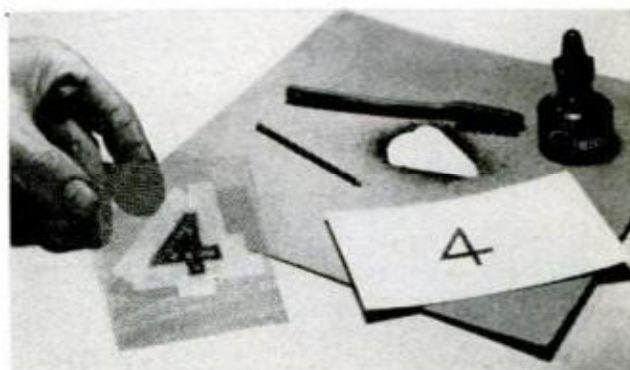
—Ken Patterson, Regina, Sask.



## Homemade stencils

Easy way to make stencils for use with airbrush, spatter-brush or similar applicator is to block squares selectively in a piece of wire screen. Stencil shown was made using household cement to block double rows of squares outlining figure, then painting over with lacquer. A toothbrush was used to spatter paint through.

—Walter E. Burton, Akron, Ohio.



# Low-cost soil-conditioning tumbler you can make

By ROSARIO CAPOTOSTO

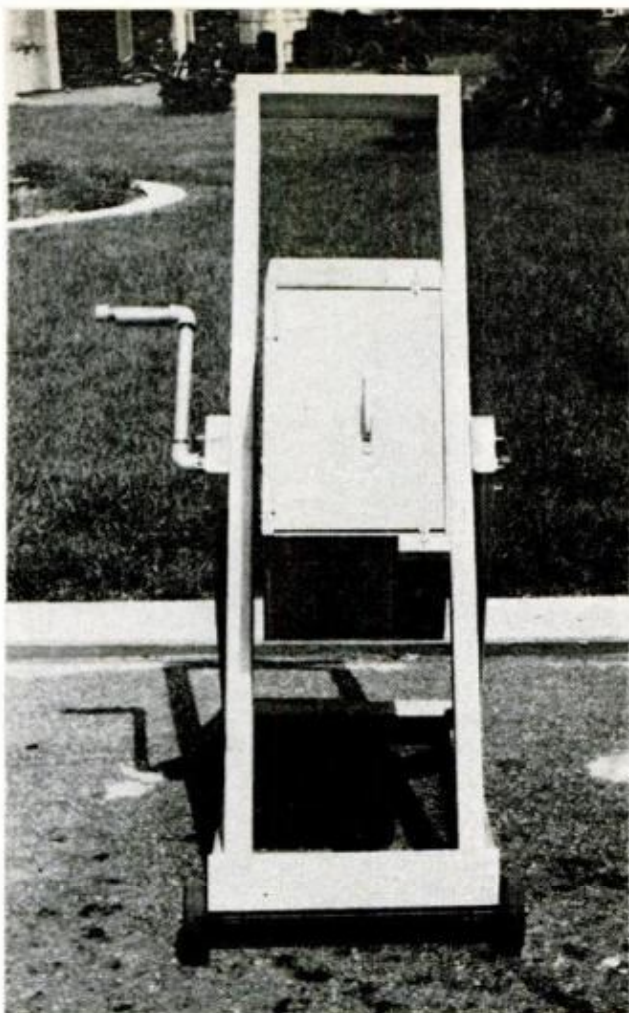
**Y**OU MAY HAVE some soil on your property that could stand reconditioning from time to time. Whether you're planting a tree, setting up a garden, or working over some tired, eroded soil in a good-sized planting bed, the task can be handled efficiently with a minimum of labor with the help of this tumbler. Generally, soil that is mostly clay can be improved by mixing in peat moss and sand; a sandy soil can be helped by adding peat and humus.

Whatever the condition and need of your particular soil, your local nurseryman will gladly direct you to the best course of action—specifically, what nourishment should be added to your soil.

The usual method of mixing in soil conditioners with a spade, fork or rake can, indeed, be a tough job—laborious at best with chancy results. The ingredients must be thoroughly blended, and the best way to do this

**SOIL, SAND AND PEAT** are tossed into tumbler for mixing; several turns do thorough job of mixing the material. Contents are emptied through a trap door

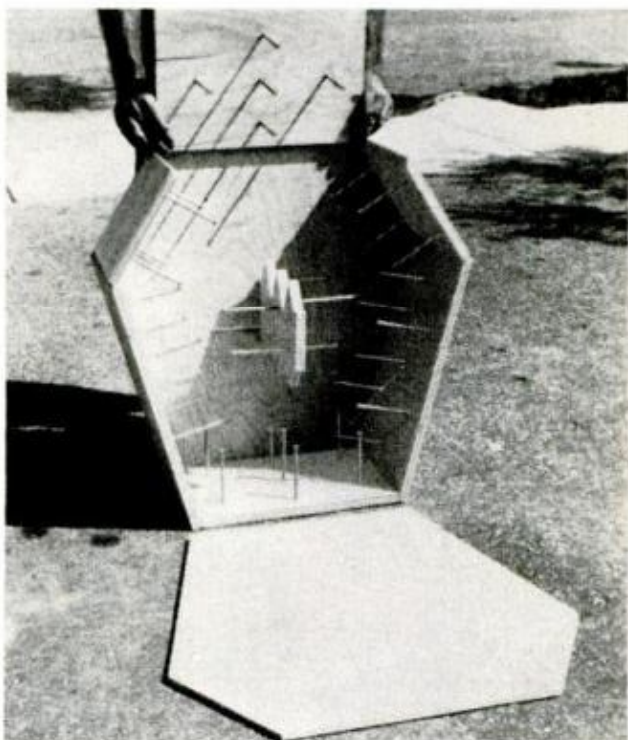




**END VIEW OF THE TUMBLER.** Though optional, the wheels are desirable if your property is good-sized

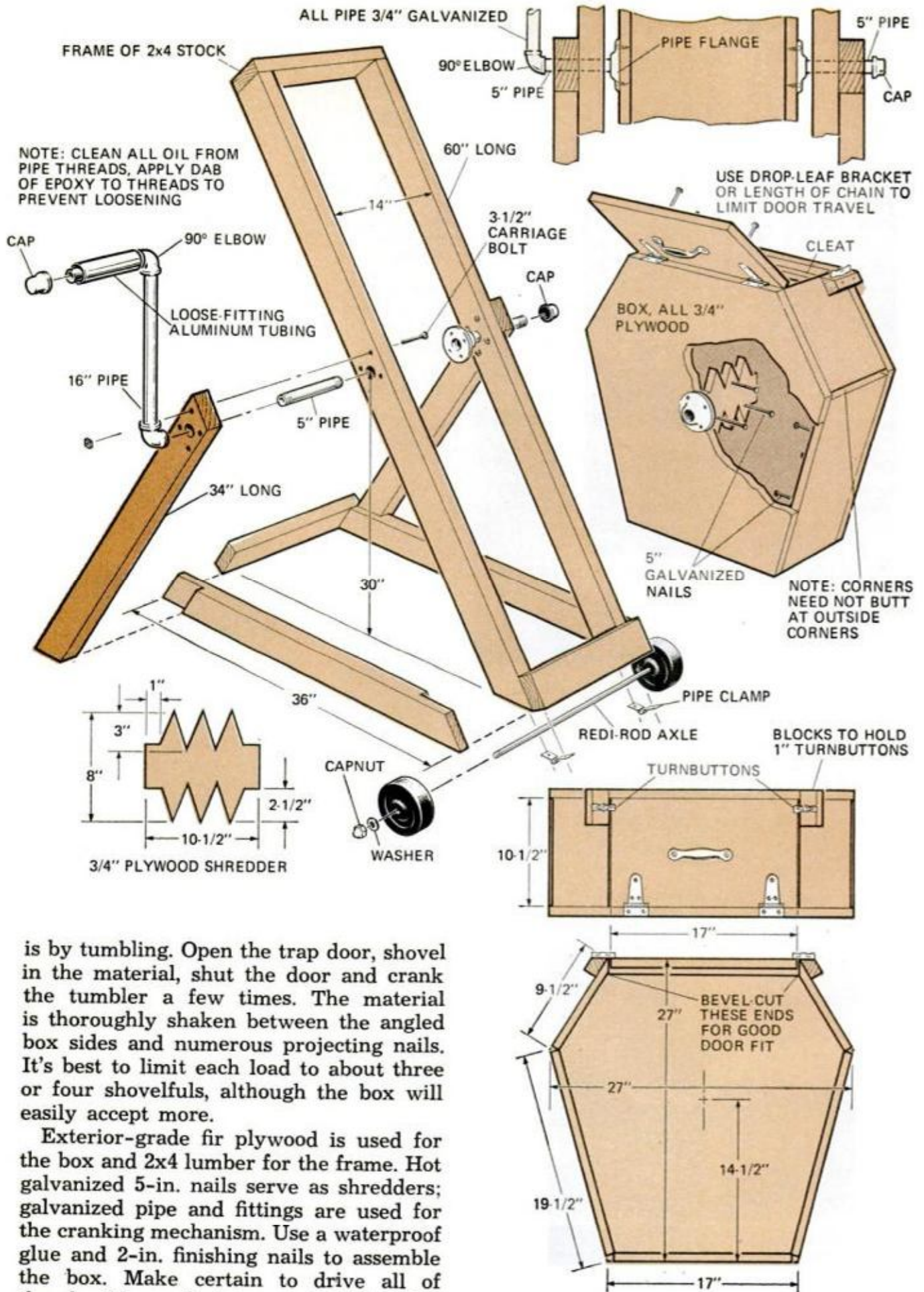


**EASIEST WAY TO CUT ANGLES**—nail a guide strip to paired plywood panels. It's important that nails are installed *before* the component parts are assembled (below) with waterproof glue, finishing nails



**WHAT TUMBLER DOES FOR THE SOIL.** Clayey soil below was much improved by quick treatment in tumbler. Hand-held finished product has sand and peat added, but the soil could need other ingredients as well





is by tumbling. Open the trap door, shovel in the material, shut the door and crank the tumbler a few times. The material is thoroughly shaken between the angled box sides and numerous projecting nails. It's best to limit each load to about three or four shovelfuls, although the box will easily accept more.

Exterior-grade fir plywood is used for the box and 2x4 lumber for the frame. Hot galvanized 5-in. nails serve as shredders; galvanized pipe and fittings are used for the cranking mechanism. Use a waterproof glue and 2-in. finishing nails to assemble the box. Make certain to drive all of the shredder nails into panels before the final assembly. ★★★



# HINTS FROM READERS



## Spraying screwheads

I've used the bottom of a cardboard box in the past for supporting screws when I wanted to paint the heads, but I've found that the bottom of a tin can does a better job. The paint soaks into the cardboard, causing the screwheads to stick to it.

—Burt Web, Skokie, Ill.



## Oiled cork holds tools

A cork from a vacuum bottle attached to a nontip base makes a dandy workbench holder for pointed tools. Saturate the cork with light oil, wipe off excess and attach it to disc made of hardboard. The oil keeps pointed ends from rusting.—W.E. Burton, Akron, Ohio



## Free toolholder

When working from a stepladder, you can waste time fumbling in pockets for small tools. Here, a tin can attached to the top step by its lid and screws makes as simple and handy a holder as you can find. Screws let you remove it easily.—William Swallow, Brooklyn

## Lint trap for clothes dryers

Here's a way to stop lint from scattering over the yard without investing a penny. I've found that by attaching an old nylon stocking to the end of the vent pipe, any lint that gets past the dryer will be collected by the stocking. It's simple to replace the stocking with another when it is filled.—Ned Killian, Costa Mesa, Calif.

## Ear syringe serves as plunger

Recently the self-defrosting condensation line on my refrigerator clogged. How to open the tiny line had me stumped until I hit upon the idea of using an ear syringe. I filled this with water, stuck it in the opening and squeezed it a few times. This worked just like a toilet plunger and opened the drain in seconds.

—Fred Woehrl, Granite City, Ill.

## Acid removes silver coating

After spending a couple of hours trying to scrape silver backing from a mirror, I was about to give up when I tried soldering acid. It worked like a charm. Be careful when using the acid; wear rubber gloves and protect eyes and clothing.—William G. Waggoner, Sacramento, Calif.

## Door pinch-hits for pasting board

Few do-it-yourself paperhangers are equipped with a regular pasting board; they use a table of some kind. But a table really isn't long enough. Instead, I remove a flush door from a closet and use that. It doesn't hurt the door at all since the paste can be easily wiped off afterward.

—Richard H. Gallot, Wantagh, N.Y.

## Glass-cutter caddy

Storing a glass cutter in kerosene between jobs is a sure way of keeping it sharp. If there's rust on it or the wheel won't turn freely, the cutter won't produce a clean score. A metal or glass cigar container makes an excellent caddy for storing the cutter. Stuff cotton in the bottom of the tube and add a little kerosene.

—Albert J. Zulowitz, Woodmere, N.Y.

## No-tangle extension cords

A heavy three-wire extension cord is particularly prone to twisting and tangling when coiled lariat-fashion or when coiled around your arm. To avoid twisting of the cord, try coiling it in the opposite direction or around the opposite arm.

—Paul D. Fiebich, Utica, Mich.

# From flush door to sofa— in a weekend

By W. M. RUDKIN

**T**HIS ATTRACTIVE SOFA is both comfortable and easy to make. The price is right, too, because the materials should cost no more than \$55. All you need to build it are a 36x80-in. solid-core door, six foam-rubber cushions, four ball-type casters and four 51-in. lengths of  $\frac{3}{4}$ -in. clear pine. The three seat cushions are 4x20x20 in., the back cushions measure 4x18x20 in.

When laying out the parts on the door, place them so any flaws or imperfections in the wood are in areas of the sofa that do not show. The cutting diagram on the opposite page shows how to lay out the pieces on the door. After marking the patterns, cut off the section to be used

for the legs. The piece remaining after the seat is cut is used for the end panels.

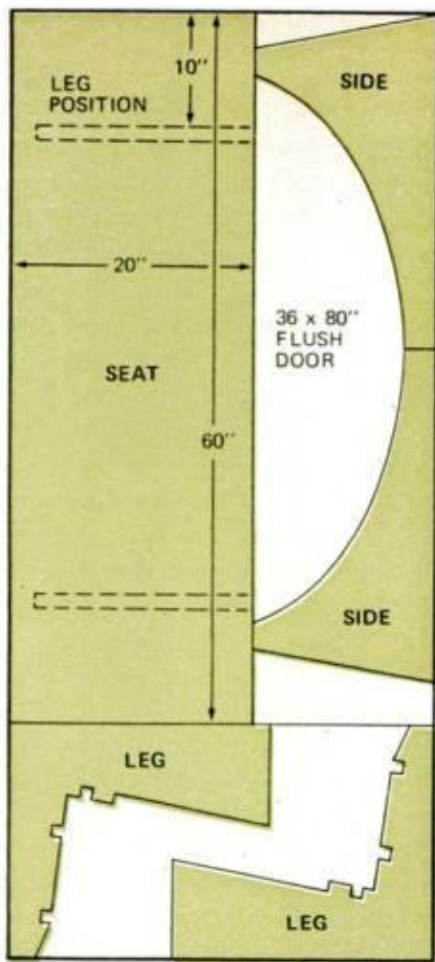
You may find that your solid core is not perfectly solid. The interior planks may have knot holes or spaces may appear between the planks. Fill any exposed holes or cut edges with filler compound. (Sawdust mixed with white resin glue makes a satisfactory filler; when the mixture dries, it sands easily.)

The photo at top right on the facing page shows how the end panels are positioned on the seat panel. The pieces are bonded together with polyester resin and fiberglass cloth. Wood dowels hold the pieces in position while the resin cures. A metal strap fastened across both joints underneath keeps the pieces tight while glue cures. These straps can be left on permanently.

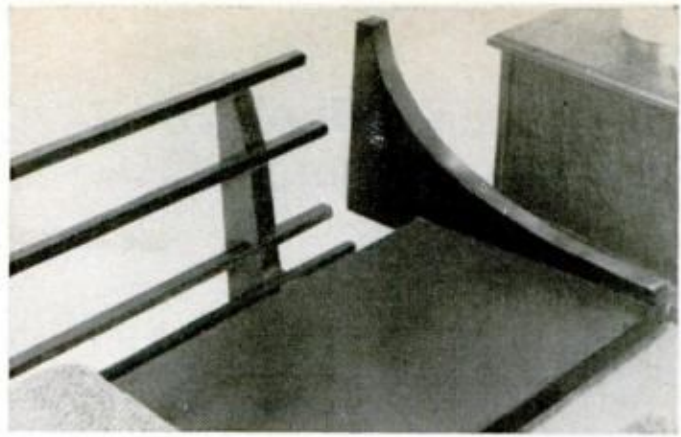
The seat with the end panels attached is then set on the legs. Use dowels to make the joint, placing some weight on the seat while the resin cures. After it has cured, put the back-support strips in the leg notches. To complete, fasten ball-type casters to front and back bottom edges of the legs. ★★★

**FLUSH-DOOR SOFA** is handsome as well as sturdy; materials you need to build it are readily available





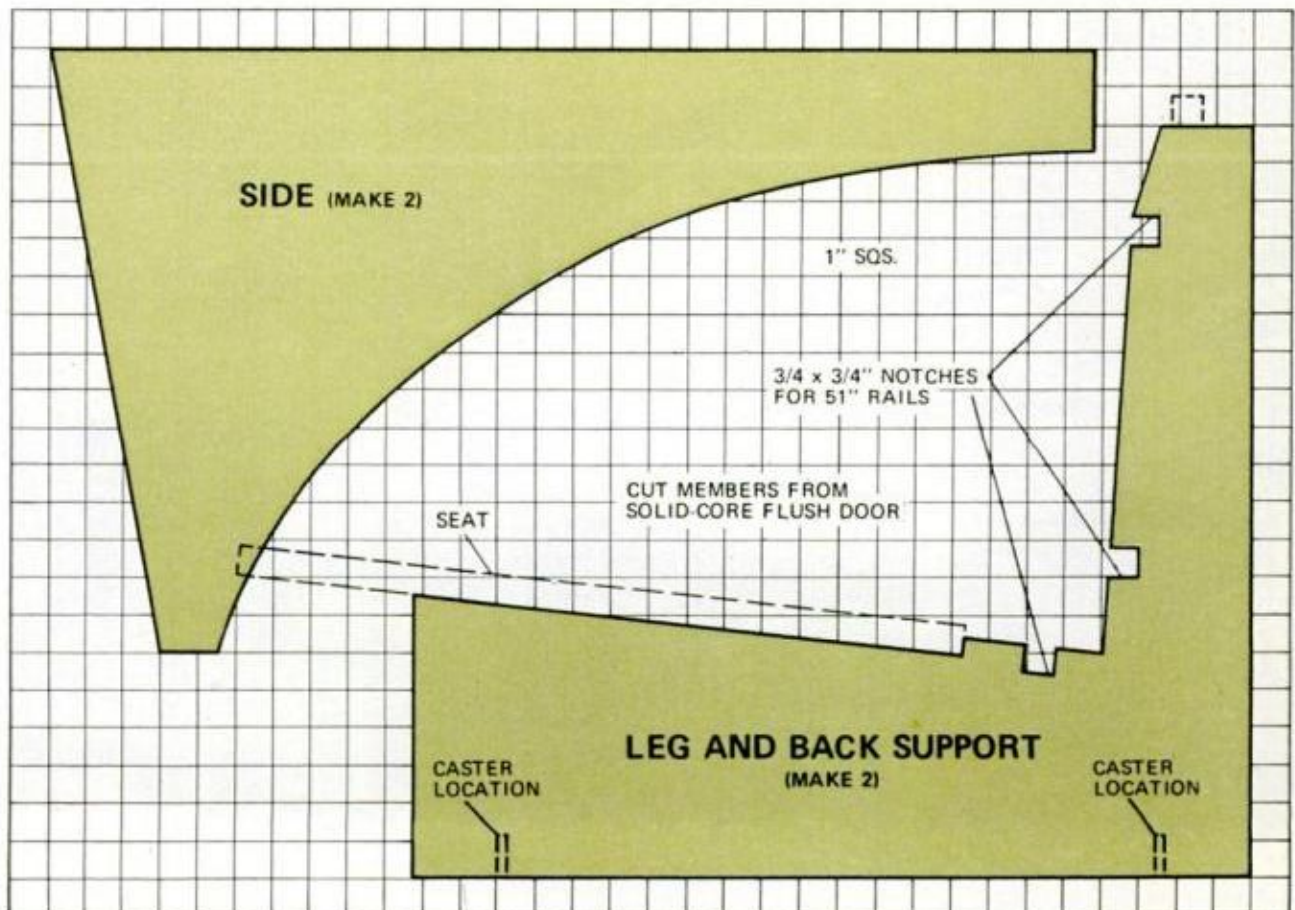
**ONE SOLID-CORE DOOR** provides the seat, panels and legs. Back-support strips are of  $\frac{3}{4}$ -in. pine stock



**FOUR STRIPS** are attached to back supports using glue and 4d finishing nails. The top strip is set back slightly



**SOFA-CUSHIONS**—three for seat and three for back—are of foam rubber, can be covered to suit room decor



**Sanding small pieces  
is a snap when you . . .**

# Mount your sander in this handy stand

By **WALTER E. BURTON**  
*Photos by the author*

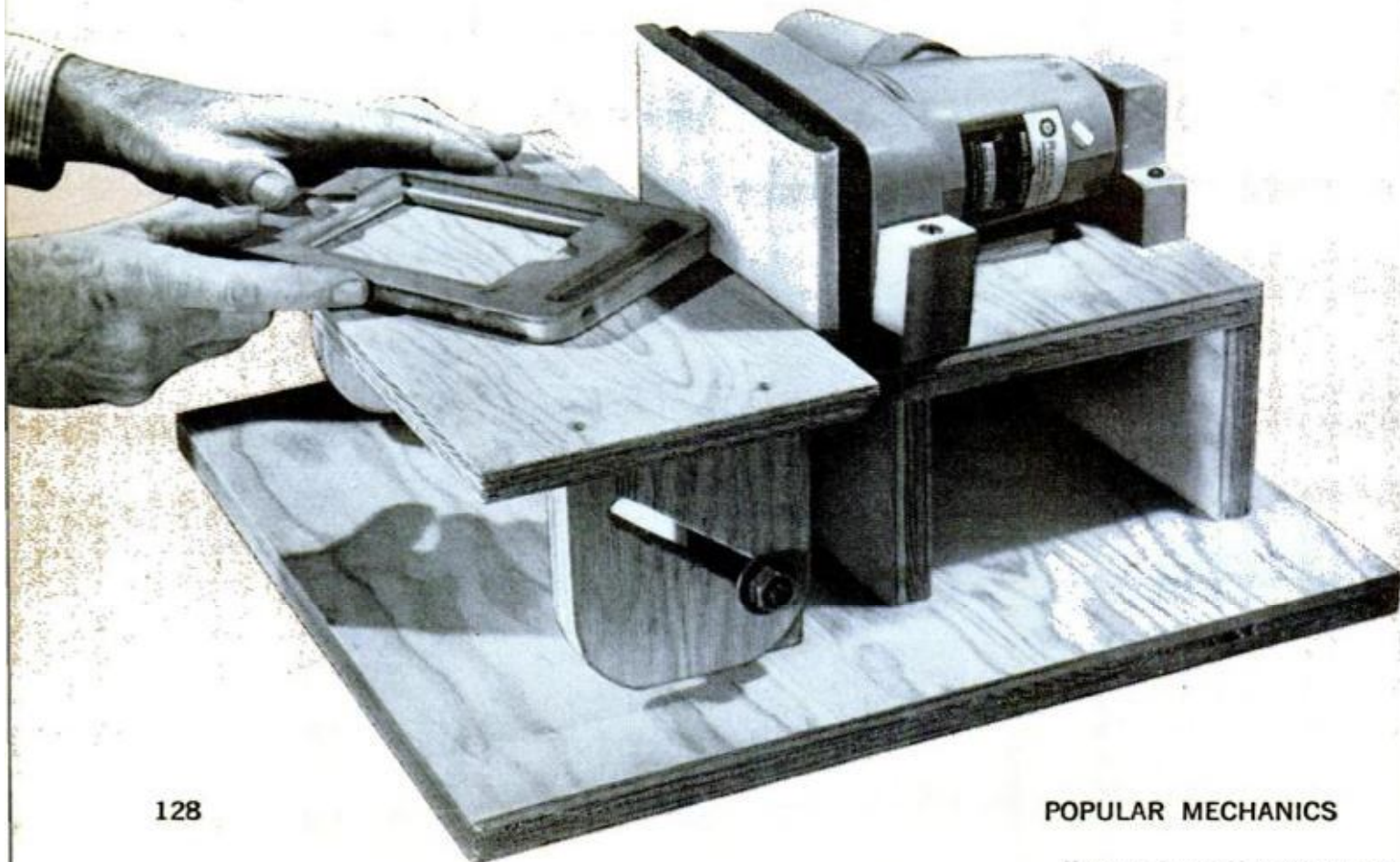
**E**VER TRY TO SAND a 1-in. wood cube with a portable finishing sander? If you have, you probably wished you had the sander firmly anchored so you could manipulate the cube instead of the machine.

The wood stand shown here provides a firm mounting for a finishing sander and a convenient means of guiding small pieces, such as model parts, against its vibrating abrasive surface. The stand was designed to fit a Rockwell sander; other makes of machines can be used, of course, although the arrangement of the mounting blocks and other elements might require some altering.

The work-supporting table is of  $\frac{1}{2}$ -in. plywood; almost all other parts are from  $\frac{3}{4}$ -in. plywood. I used ordinary  $\frac{3}{4}$ -in. pine lumber for the table column.

The sander platform was constructed first and mounted on the base with its outer longitudinal margin 1 in. from the base edge. The two vertical pieces were attached to the horizontal panel with glue and nails.

It is important that air circulate freely through the sander motor to prevent overheating. To avoid any interference with air



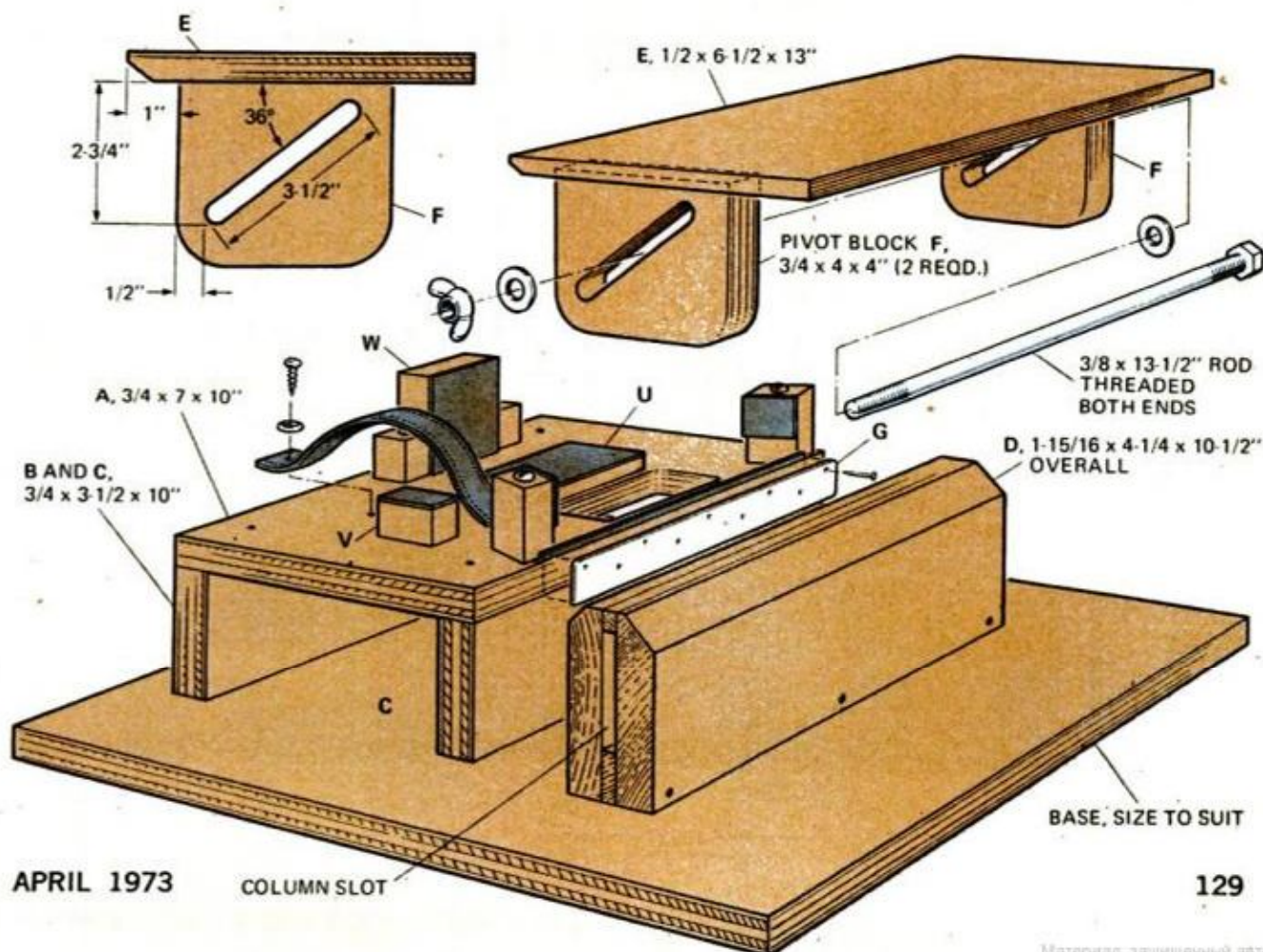
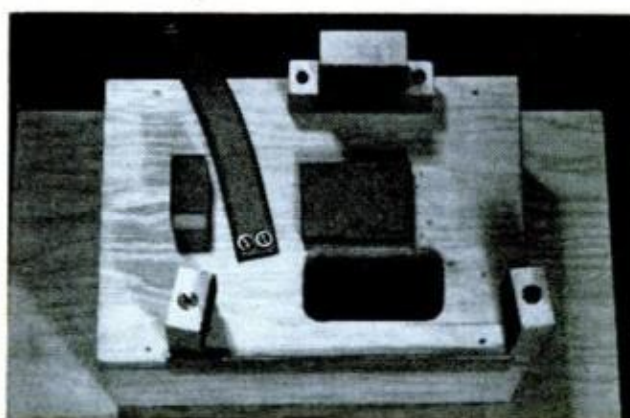
discharge from the vent openings nearer the platform when the sander is resting on its side, an opening was cut in the platform opposite these vents.

Three devices hold the sander firmly in position on its platform:

- A 1 1/4 x 8-in. strip of aluminum-siding sheet that projects 1/4 in. above the platform surface, along the edge next to the work-supporting table. A leather strip, 1/16-in. thick, was glued to the side of this strip toward the platform. This acts as a cushion to prevent marring the sander housing. This padded strip projects into the space between the sander-housing edge and the sander pad, and prevents the sander from moving toward the work table.
- Leather-faced wooden blocks installed to hold the sander against the leather-padded aluminum strip. Two of these blocks flank the housing near the sanding pad, the third presses against the outer tip of the motor portion. Two more blocks are under the sander. One supports the motor housing, the other supports the handle.
- A leather strap, attached to the platform with wood screws, and encircling the handle near the motor. Its purpose is to hold the sander in close contact with the two



**ASSEMBLING HOLD-DOWN DEVICES** on sander platform (above). Below, platform with blocks and strap in place. Note opening provided for airflow from motor



leather-faced blocks underneath. This strap should not be drawn too tight—just enough to keep the sander from moving upward. (For some sanders, it might be preferable to install the strap around the motor portion.) One end of the strap is anchored with two wood screws and washers, the other end by a single No. 8 wood screw installed after the sander is in position.

When a sander has to be removed and replaced frequently, a bolt-and-nut arrangement might be preferable.

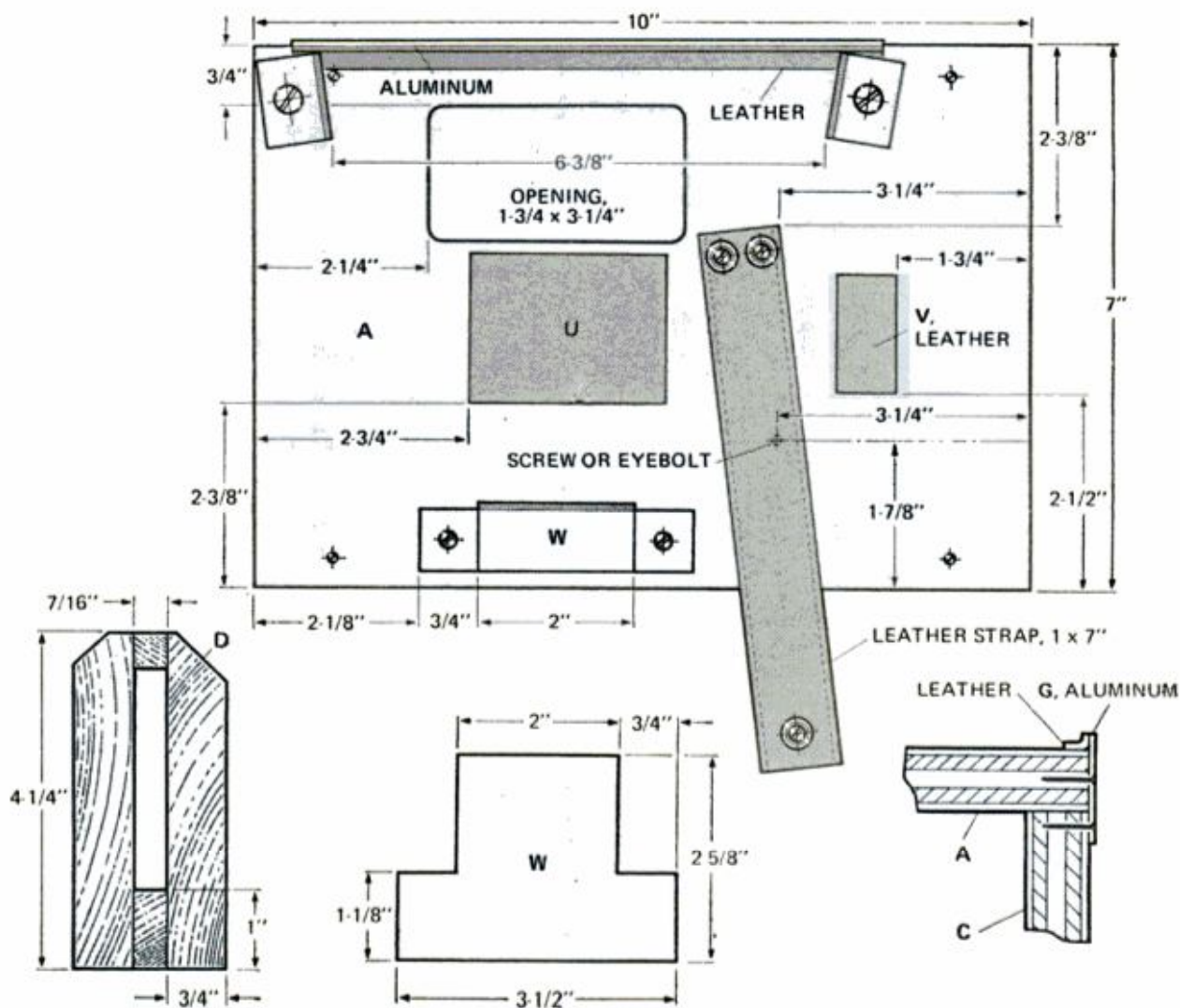
The two blocks flanking the housing near the sander pad are secured with single, No. 12 flathead screws 3 in. long, permitting the blocks to adjust to the angle of the housing surface. The block supporting the motor housing was nailed to the platform before leather was applied, and the handle block was similarly fastened with a flathead wood screw. Two No. 8 screws hold the third block.

When the sander is running, there is some vibration transmitted to the platform.

No tests were made to determine the long-range durability of the anchoring system, but no tendencies for the blocks to loosen, or other restraints to lessen, were noted.

The workpiece is normally rested on an adjustable table made from 1/2-in. plywood. Projecting downward from the table are two "pivot blocks," each having a diagonal slot. These blocks straddle the ends of a table column in which there is a vertical slot that measures about 7/16 in. wide and 2 3/4 in. high. This slot was created by assembling the column from two 3/4-in. pieces separated by a 7/16-in.-sq. and a 7/16 x 1-in. spacing strip. The column was mounted with the vertical centerline of its slot about 1 3/4 in. from the abrasive surface.

Length of the table-supporting column is 1/2 in. greater than the length of the sander platform. This provides clearance for the slotted pivot blocks to overlap the platform when the table is adjusted to a steep angle. Pivot blocks are positioned on



the table so the distance between them matches the column length.

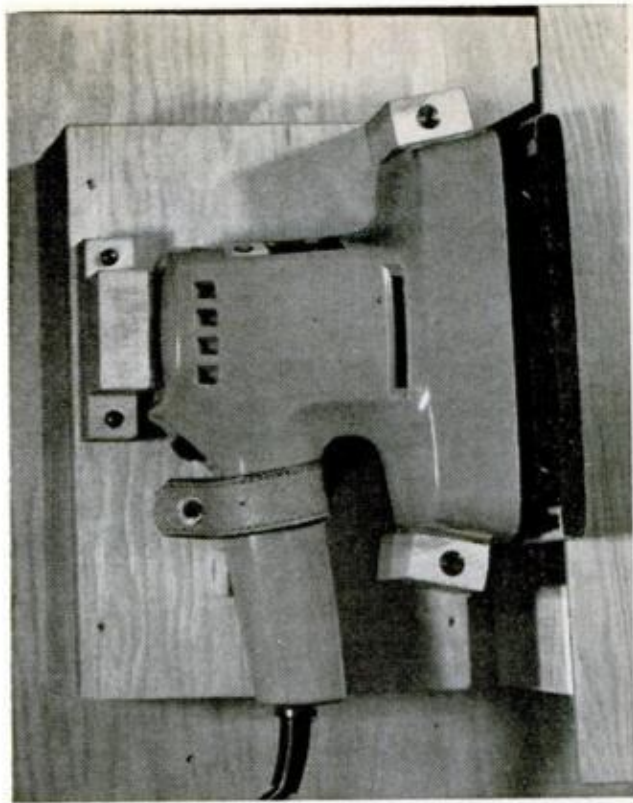
The combination of diagonal slots in the pivot blocks and vertical slot in the column provides for an infinite number of settings for the table with respect to angle and vertical adjustment, and total vertical movement is nearly 2 in.

A  $\frac{3}{8}$ -in. rod, 13 $\frac{1}{2}$  in. long, threaded at both ends, runs through pivot-block and column slots. It has a wingnut on one end and an ordinary nut on the other plus two washers. Tightening the wingnut compresses the pivot blocks against the column ends, securely anchoring the table.

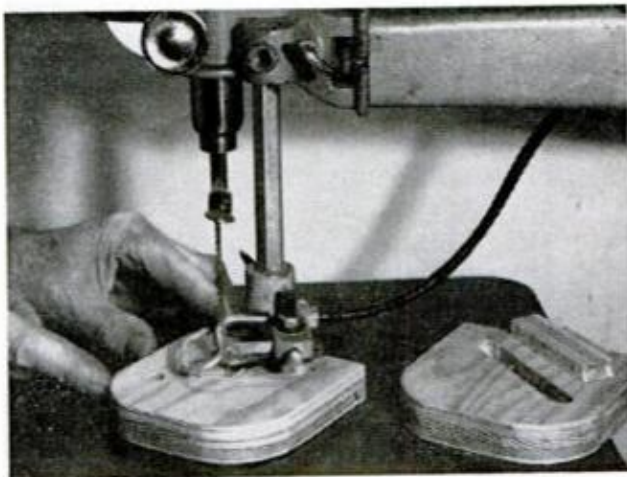
You may have to trim the column top by trial and error so the table can be tilted up to 45° without moving the table edge too far from the abrasive edge.

Although the sanding stand could be used without anchoring it to the bench, it does have some tendency to "walk." Use either a  $\frac{3}{4}$ -in. sponge rubber pad between base and bench or C-clamps to eliminate "walking."

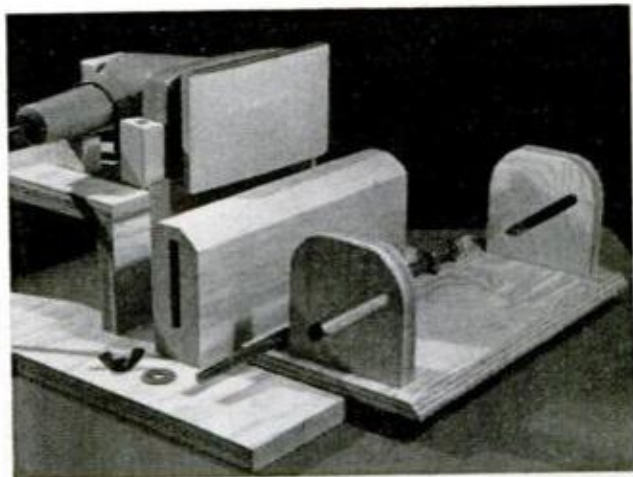
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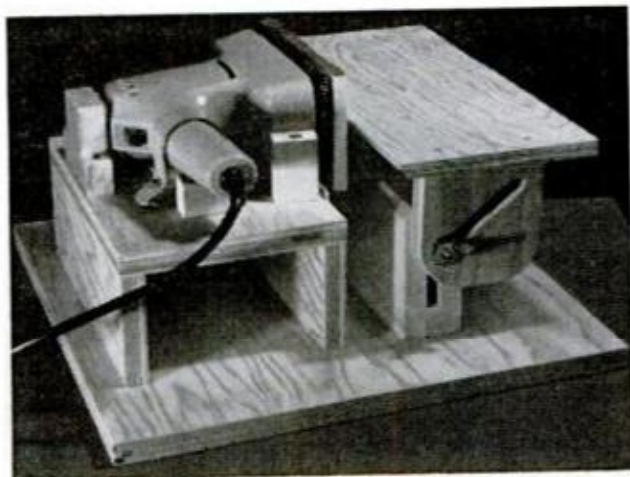
**PROTOTYPE STAND** was built to suit Rockwell's Model 65 sander, but dimensions can be altered for others



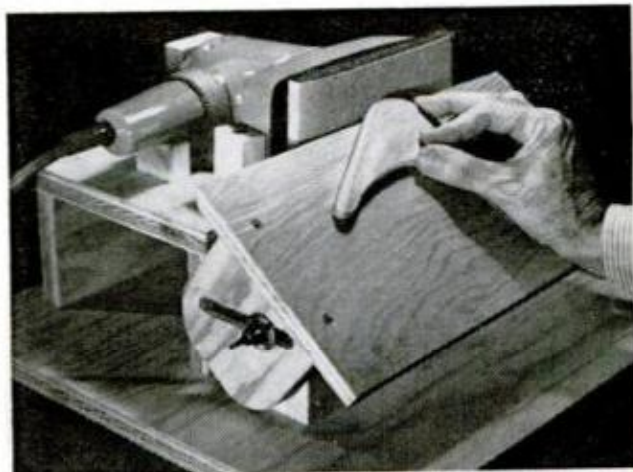
**SLOTS IN PIVOT BLOCKS** are made by boring holes at both ends and finishing with a jig (or coping) saw



**TABLE-SUPPORT COLUMN** and table before mounting the pivot blocks. Spacing strips form a  $\frac{7}{16}$ -in. slot



**ASSEMBLED SANDING SETUP** with table adjusted to an upper position for normal right-angle sanding  
APRIL 1973



**WITH TABLE AT 45°**, the concave portions of work are easily sanded using the ends of the sander's pad

# Colorful clock kit lets you see what makes it tick

YOU'LL HAVE FUN putting this Color Clock together and more fun watching it tick. Its swinging pendulum and molded gears of red, blue, green and yellow plastic are mounted between two plexiglass sides to provide a clear see-through view front and back.

A product of West Germany, the colorful all-plastic clock is sold as a kit containing some 50 parts. It stands 11 in. tall, is spring-driven, nonstriking and has an 8-in. dial. The spring, housing and drive gear come already assembled as a unit.

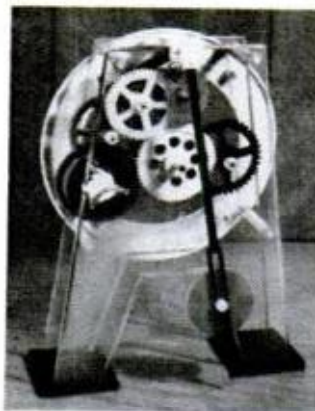
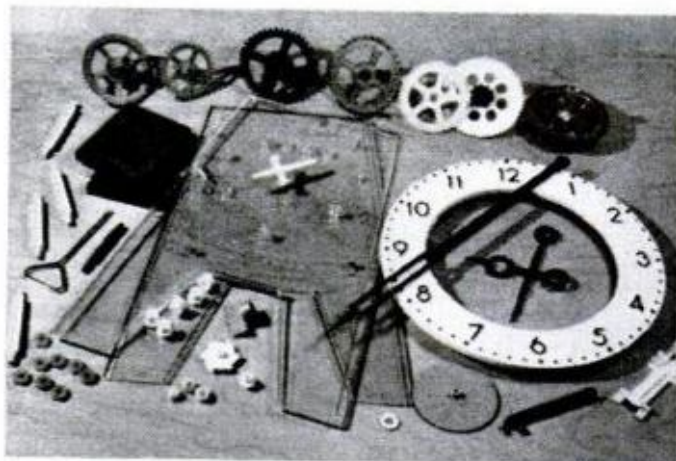
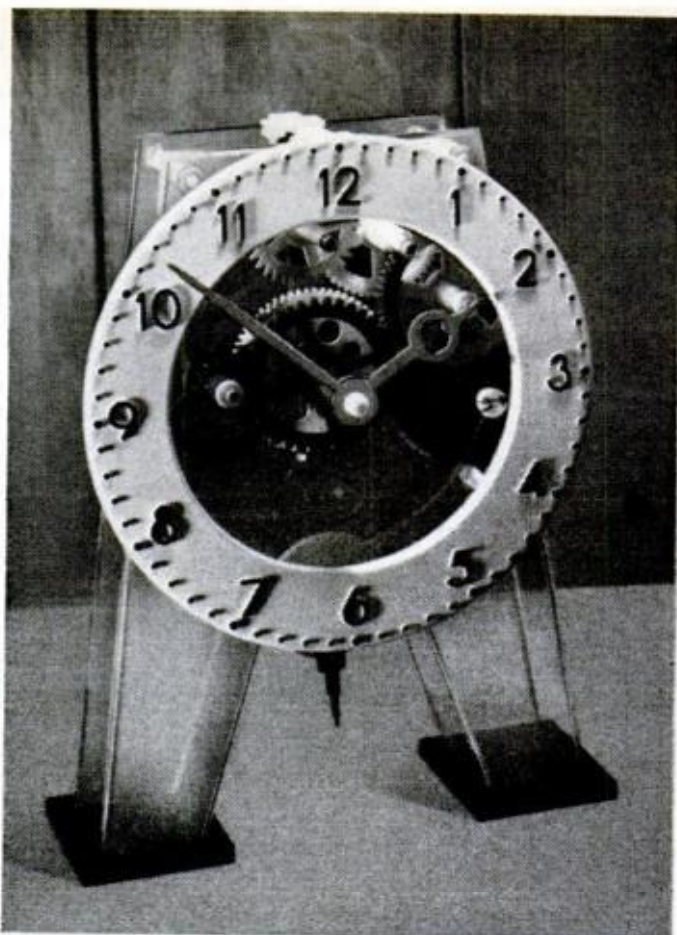
The clear plastic sides are held apart by four spacers having threaded ends. A socket wrench that's part of the kit is used to screw unthreaded plastic nuts onto the threaded posts. By manipulating a regulator arm and pendulum weight, you "tune" the clock for accuracy. A scale on the back helps in adjusting the pendulum assembly to produce a uniform tick. You set the clock by moving the minute hand.

The clock has a distinct tick. No lubrication is required, other than a little soap applied to the escapement-wheel teeth. Because it's plastic, the clock should not stand in direct sun.

Besides being an accurate timepiece, the clock serves as a decorative conversation piece as well as a fine educational project for instructing youngsters in how a clock works and the measurement of time.

The kit comes with a detailed instruction sheet and sells for \$9 post-paid from Caldwell Industries, Box 170, Luling, Tex. 78648.—Walter E. Burton

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**GEAR-TRAIN ACTION** can be observed through transparent case (top photo). Except for four metal gear shafts, all parts are plastic (center photo). Pendulum weight is adjusted up and down for timing (lower left photo). Winged socket wrench is used to install threadless nuts that hold sides together (lower right photo)

POPULAR MECHANICS



# HINTS FROM READERS

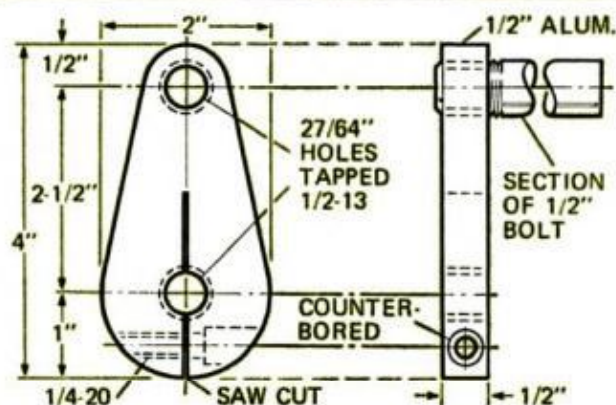
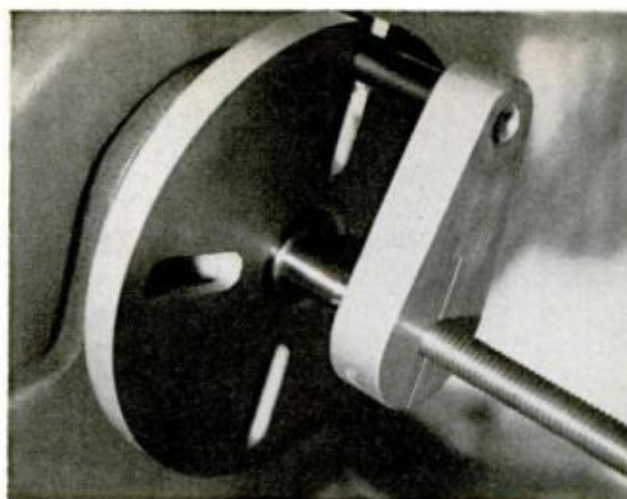
## Lathe dog for threaded shafts

Clamping a standard lathe dog to a threaded shaft is a sure-fire way to ruin the threads. Traditional shop practice calls for the use of small scraps of sheet metal to protect the delicate threads, but I prefer these homemade lathe dogs because of their gentle but exceptionally strong clamping power.

The dog shown here is for a  $\frac{1}{2}$ -13-thread shaft. Holes are drilled and tapped first, then the dog is cut to shape and a saw slit made up the center. The driving tail is a section of a  $\frac{1}{2}$ -13 bolt with the head cut off. To use this dog, you simply screw it onto the shaft and tighten the clamping screw.

While a different dog is required for each size thread, you'll soon have a number of dogs in the common sizes.

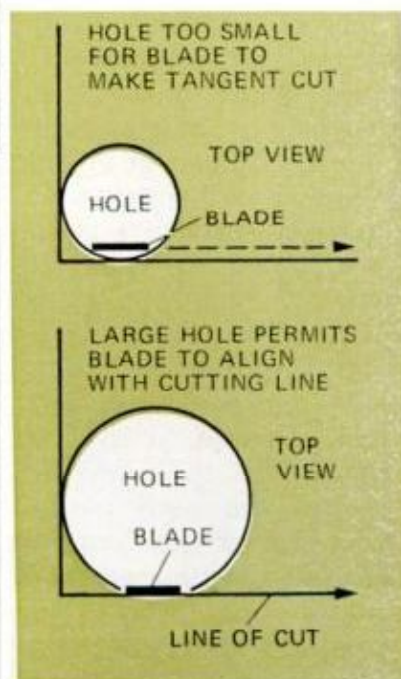
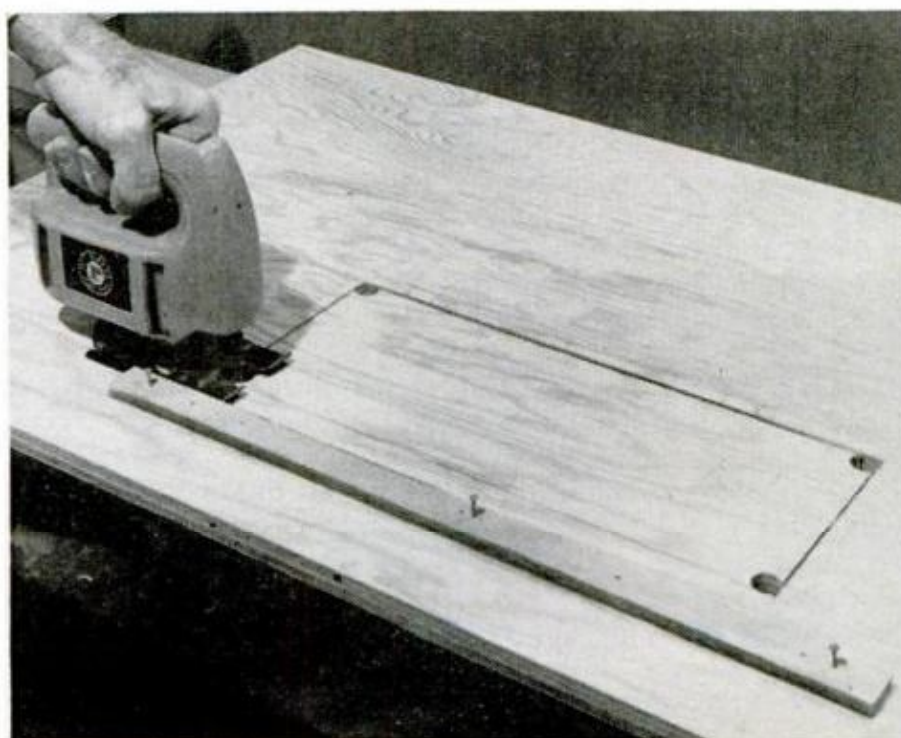
—Thomas H. Benham, Joliet, Ill.



## Sabre saw requires large entrance holes for inside cuts

When cutting a rectangular or square opening in a panel with a sabre saw, you'll do the neatest job if the diameter of the blade hole is consistent with the width of the blade. When the hole is too small for the size of the blade (upper detail) you can't align the blade with the line of cut. The starting holes for a  $\frac{1}{4}$ -in. blade should

be no less than 1 in. in diameter. Only when the blade can snug up to the line (lower detail) can you be assured of a straight cut from corner to corner. When the blade hole is too small and you try to use a wood strip as a fence to guide the saw, you can't "steer" saw up to the line.—Rosario Capotosto, Greenlawn, N.Y.



## FLYWEIGHT FLYING BOAT

(Continued from page 78)

weight is 600 pounds, with a gross of 900.

The wings are a sight to behold in themselves. They pivot birdlike in two directions at once—backward and sideways—lying snugly along the fuselage when retracted, reminiscent of the famous folding Grumman Hellcat and Avenger carrier-based aircraft of World War II. Folding the wings back instead of upward eliminates added height that would make the ship wind-sensitive on the road and difficult to stow.

Wings, hull and fuselage are all wood-framed with a fiberglass skin. The bullet-



**HIGH HORIZONTAL STABILIZER** is deliberately located at top of tail to be directly in line with the prop thrust from elevated engine mount. This helps to provide maximum of elevator control and stability

shaped nose, wingtip floats and other contoured parts are shaped from Styrofoam blocks and also fiberglassed. The engine is a 90-hp Continental, mounted backward for a pusher-type prop. Despite such modest power, the Osprey becomes airborne at 55 mph, climbs 1200 feet per minute, cruises at around 100 mph, has a range of 370 miles on 16 gallons of fuel and can reach a service ceiling of 18,000 feet. So impressive are its flight characteristics, in fact, that the Navy is testing the design for possible use as a small police patrol craft in Southeast Asia.

Flying the Osprey is tricky at first, but you get used to it quickly, says Pereira. Because of the high thrust line, the nose dips as you apply power and comes up as you ease off—the opposite of conventional aircraft. Estimated cost is \$1000, less engine and prop. Plans are \$65 from George Pereira, 3741 El Ricon Way, Sacramento, Calif. 95825. ★★

## MOVIE CAMERAS

(Continued from page 111)

properly, or if you shoot movies from a unipod. If you do much tripod shooting, it also pays to check fixed-grip cameras to make sure their grips won't interfere with tilt-head operation. On many such cameras, the tripod-screw socket is at the base of the grip, which prevents that problem and gives you an easier, stoop-free view through the eyepiece if you're tall and your tripod isn't. Some removable-grip models make you take the grip off to mount the tripod—that may be a nuisance.

Often, the grip doubles as the battery holder. But wherever the batteries go, a removable battery case is a good idea—it keeps leaky batteries from damaging the inside of the camera.

All the Super-8 cameras I've tried have windows that let you see what kind of film is loaded in their film compartments, and subtractive film counters that show you how much film is left. Most manufacturers put their film counters on the left side of the camera body, but Kodak puts its on the rear of the camera, just below the eyepiece; that sounds more convenient, but in practice it doesn't seem to make much difference because you aren't likely to look at the counter while filming anyway.

So much for what those cameras have (you'll find a complete, camera-by-camera feature breakdown in the chart). What do they lack? Wide-ranging zooms, for one thing. Move a few hundred dollars up the scale and you can find zooms with 10:1 ranges, covering everything from a really wide 6-mm to a distance-eating 70-mm telephoto. You can get faster lenses and wider-opening shutters that let you shoot High-Speed Ektachrome in even normal room light. You can get single-frame releases for homemade animation and time-lapse controls that let you "speed" action up until the opening of a flower takes only seconds on the screen. You can get close-up focusing to as little as 1 millimeter from the lens, built-in lap dissolvers, sound synchronization and slow motion. But you pay for all this versatility—in money, bulk, weight and complexity.

Even if you aspire to movies with a Hollywood touch, you'll find cameras in our under-\$100 price group that can teach you all the basics. And if you don't aspire to professionalism, you'll find about all the features you'll really use. ★★

## RECORDERS BY THE POCKETFUL

*(Continued from page 82)*

30's adapter attaches handily to the outside of the recorder). If you record in your car a lot, you can also get adapters that draw power from its cigaret lighter socket (one is provided with Wollensak's comprehensive set of supplied accessories). But be sure the adapter you buy, if not from your mini's manufacturer, is compatible with it—we blew out a Sony by trying it on Wollensak's automobile adapter, though each machine ran fine on its own power supply. Since polarities are rarely marked on recorders or adapters, you'll have to check their schematic diagrams or write to the manufacturers before you mix adapters.

The minis' closely packed controls are still easy to operate. But some minis will fit your hand better than others. The Lanier 1300, Wollensak and Hitachi TRQ-30 were especially well-arranged for dictation and note-taking: Hold the Lanier like a microphone, and your thumb

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***I find levers easier to tell apart by feel, but buttons are less likely to snag pockets.***

---

rests on a single control that lets you record a thought, rewind it, listen to it again, then pop right back into record mode for the next idea. The Wollensak does the same, but uses separate controls, less conveniently placed. And the Hitachi TRQ-30's pushbuttons, though conventional in function, are very conveniently placed on the unit's microphone side.

The Lanier 1300 also has a paper index, with a built-in pen to mark the start and end points of letters or other items dictated: Lanier's cassette transcriber has a holder for this index strip. Several other minis have digital counters, which are useful if you write down the locations of items you'll want to find again (and if you play them back on the same machine—not all digital indicators count alike).

The Sonys had a unique "cue" feature: press the fast-forward control during playback, and the tape chatters past the heads at double speed, so you can skip unwanted material yet hear the beginning of the next item you're interested in. But one Sony, the TC-40 has no true fast for-

ward, just cue; it takes 12 minutes to wind forward through a C-60 cassette (though its rewind takes just two minutes).

Some fast-forward and rewind controls are self-locking to save fingers when winding past long stretches of tape. But nonlocking controls are handiest for short skips along the tape. The same is true of pause controls, which stop the tape without taking it out of record mode: locking controls are better for long pauses, nonlocking for shorter ones. All play and record controls lock, of course, but a growing number of them automatically disengage when the end of the tape is reached, saving wear on batteries and mechanism. As to level or pushbutton controls, take your choice; I find levers easier to tell apart by feel, but buttons are less likely to snag pockets.

Though all but the Admiral and the RCA minis have built-in microphones, all but the Lanier 1300 have external mike jacks, too. External microphones are handy when you need to hold a microphone close to your mouth in noisy environments (even the lightest minis get heavy if you hold them long enough), when you need the longer reach of a narrow-beam directional microphone (the built-ins are all more or less omnidirectional), or if you want to mount your microphone on a stand or boom. If you use a telephone pickup to tape phone calls, it plugs into the mike jack, too. But make sure any mike or phone pickup you buy will fit your recorder—we discovered at least three different styles of microphone plug in our sampling.

The remote-control sockets next to the microphone jacks on cassette recorders are basically for use with the start-stop switches built into most cassette microphones. But you can also use them with hand-operated switches (useful when taping interviews via the built-in microphone), and with foot-pedal switches for transcribing notes or dictation. If you want to buy a recorder for transcribing, check its start-stop time; some minis can start and stop between syllables of a word, while others coast to a stop and glide back up to speed, losing a syllable each way.

Would I buy a mini? Sure. In fact, as soon as I finish this story, I'll be taking off to cover another one with a mini in one pocket and a batch of cassettes in another one. ★★★

## PROFESSIONAL BRAKE JOB

*(Continued from page 118)*

is less than 0.030 inch oversize, use standard linings.

Ideally, after you buy them, bring new linings to a shop for arcing. This will remove high spots and insure full contact with the drum. Arcing will cost you about 25 to 50 cents per shoe.

If you have to install a new brake drum, wash it thoroughly with lacquer thinner to remove the antirust preservative which was applied at the factory.

Discs (rotors) should be checked for lateral runout and parallelism. Lateral runout is the movement of the disc from side-to-side as it rotates. Too much lateral runout will produce brake shudder.

Parallelism refers to the thickness of the disc over its circumference. Variations in thickness will produce brake chatter.

Have the brake specialist check these conditions by first adjusting wheel bearings so end play won't be a factor. To

---

### **Brake trouble occurs as frequently from hydraulic failure as from lining and drum or disc damage.**

---

check lateral runout, attach a dial indicator so that its stylus touches the face of the disc about 1 inch in from the edge.

Move the disc one complete turn. If the total indicator reading exceeds the maximum allowable limit for lateral runout for the particular disc, have the disc refaced, if possible, or replaced.

To check parallelism, measure the thickness of the disc in at least 12 different spots. If the total indicator reading exceeds the maximum allowable limit for the particular disc, resurface the unit, if possible, or replace it.

The allowable amount that a disc can be turned is stamped on the unit. Measure the thickness of the disc before and after turning to make sure that this amount has not been exceeded.

Doing a brake job involves a thorough inspection of the system's hydraulic part as well as replacement of linings and drum or disc refacing. Brake trouble occurs as frequently from hydraulic failure as from lining and drum or disc damage.

The hydraulic parts of drum and disc brake systems differ. Both have a master cylinder and brake lines, but a drum brake setup uses wheel cylinders while a disc brake system uses a caliper equipped with a cylinder bore and piston to bring linings into contact with the disc.

If you have disc brakes on the front of your car and drum brakes on the rear, the system probably has a metering or proportioning valve. You will have to check the car or service manual to determine which one your car uses.

A metering valve is usually positioned near the master cylinder and is installed in the hydraulic line that goes to the front disc brakes. It keeps the front discs from applying themselves until the rear drum brake linings are in contact with the drums.

Problems associated with a faulty metering valve include front brakes not fully applied, hard brake pedal and brake grab. Pull back the dust cover on the valve and make sure the valve is not leaking.

A proportioning valve is positioned in the hydraulic line that goes to the rear drum brakes. Its job is to prevent premature wheel lockup by limiting the amount of hydraulic pressure going to the rear until braking has been achieved up front.

If you are experiencing rear-wheel skidding or grabbing, suspect a bad proportioning valve. Its condition will have to be tested with professional gauges that compare inlet pressure to outlet pressure.

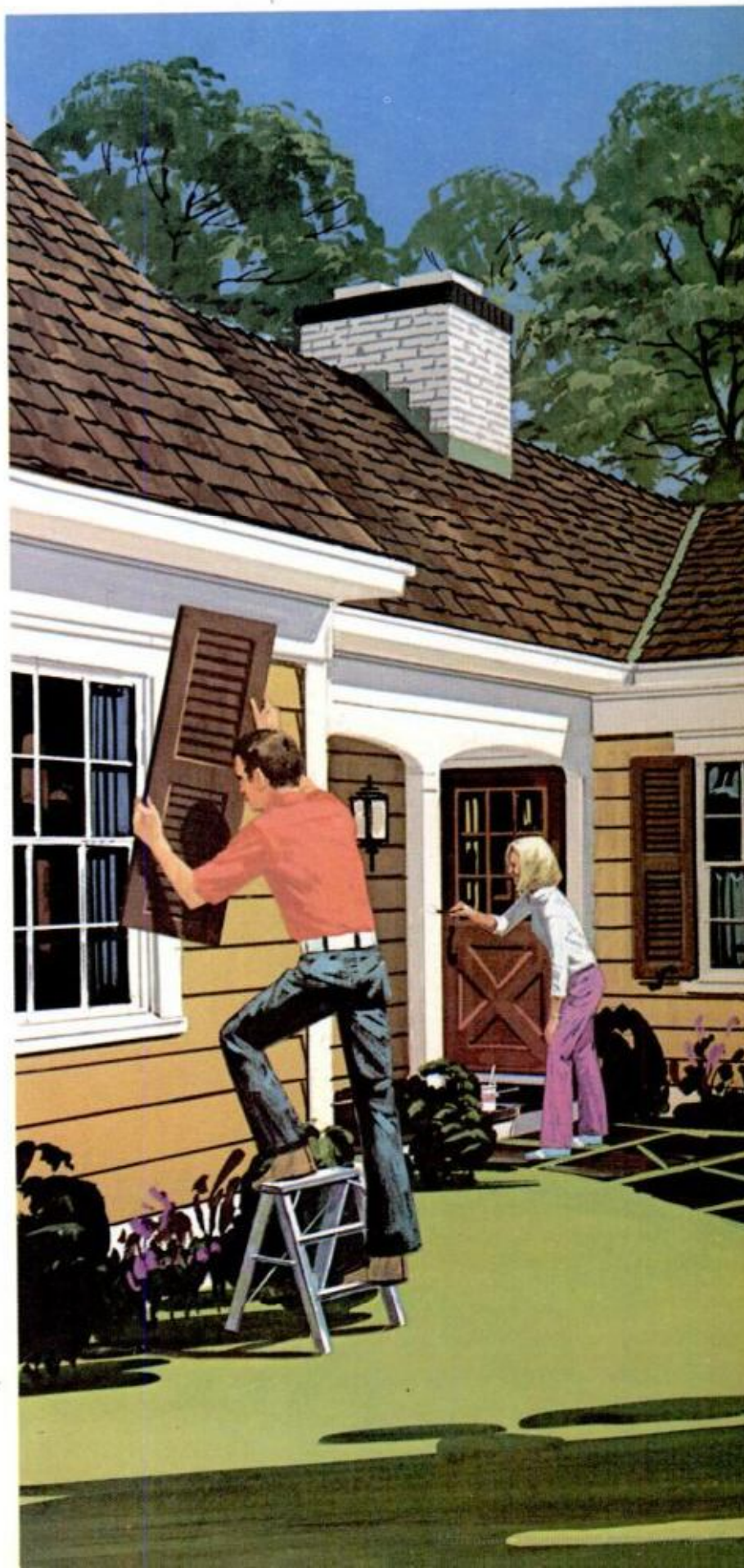
Check the fluid level in the master cylinder. Make sure it's up to the mark and that the cylinder is not leaking. If the fluid is above level, air or water may have gotten into the system. Bleed the brakes to get rid of trapped air.

When water gets into a hydraulic system, the upsurge in fluid level is normally accompanied by a brake pedal that fades under pressure. The hydraulic system should be drained and flushed with alcohol, and fresh brake fluid of high quality should be installed.

Examine all hydraulic lines for dents and kinks, collapsed areas, leaking connections, and ruptured spots. Pull back the boots covering the master cylinder and wheel cylinders to check for leaks. Remember, if a defective cylinder needs machining, you'll save money by removing it yourself and bringing it to a shop. ★★ ★

# Home Ideas Guide

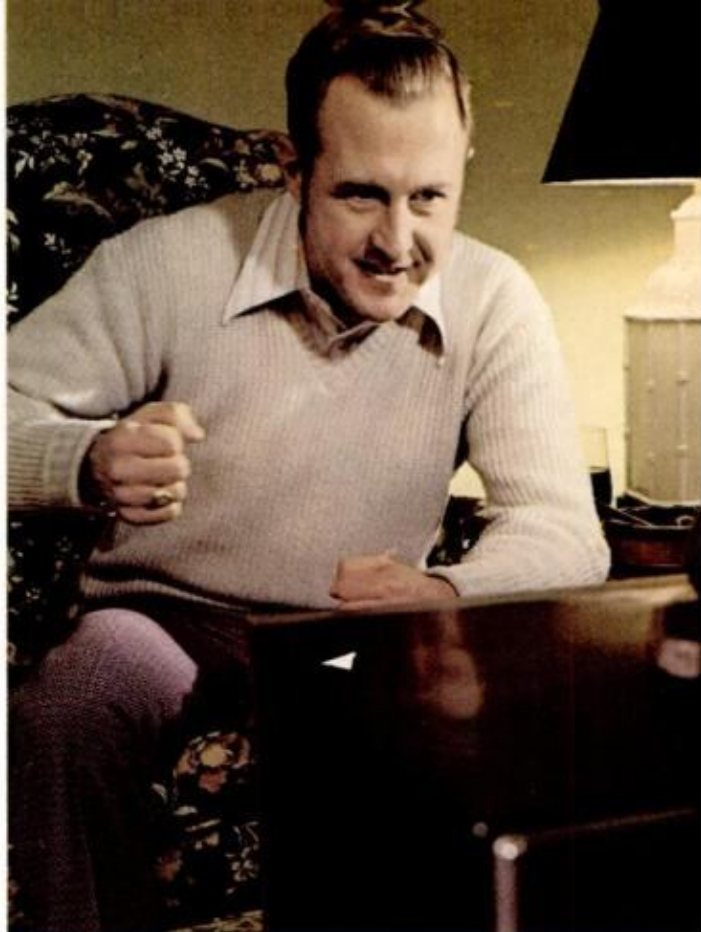
- Exciting new ways to handle a basement recreation room
- New prefab bathtub enclosures
- Quick way to get an entry foyer
- New wall coverings
- Kitchen light fixtures you can make
- Low-cost ways to facelift your home
- How to beat attic heat
- How to lay imitation brick
- How to install a garage-door opener
- How to hang a door and install a lock
- Right way to paint a room
- How to install insulation
- New furnace that heats and cools
- How to put up ceiling beams
- New products that will give you ideas, ideas, ideas...





## How to put up a beautiful new ceiling this





## weekend and still have time for the big game.



We have a great new way to put up a ceiling. It's called Integrid™. It's both a new method of installation and—with Armstrong Chandelier® ceiling tiles—a great new look in suspended ceilings. It can be dropped to any height you wish—in any room of your home. And best of all, the job goes faster. In most rooms you can begin installing it Saturday morning and be finished in time for the game on Sunday.

The big difference with Integrid is its hidden grid system. The Chandelier ceiling tiles fit into the grid so that it's covered completely. All you see is an elegant, uninterrupted expanse of rich-looking ceiling. It's simply beautiful.

And it's beautifully simple. To install the Integrid System, you nail up a wall molding; install the hanger wires for any height you desire; attach the main grid; and slip in the tiles and support runners. It's fast. It's easy. It's the winning play for the home team.

Want more information? Write to Armstrong, 7304 Watch Ave., Lancaster, PA 17604. We'll send our eight-page brochure and full instructions. Or, see your Armstrong Ceiling Center or other building materials dealer that carries Integrid. To find the one nearest you, call this toll-free number: 800-243-6000. (In Connecticut, call 800-882-6500.) Ask for the name of the Armstrong dealer who sells Integrid Ceilings.

# Armstrong

CREATORS OF

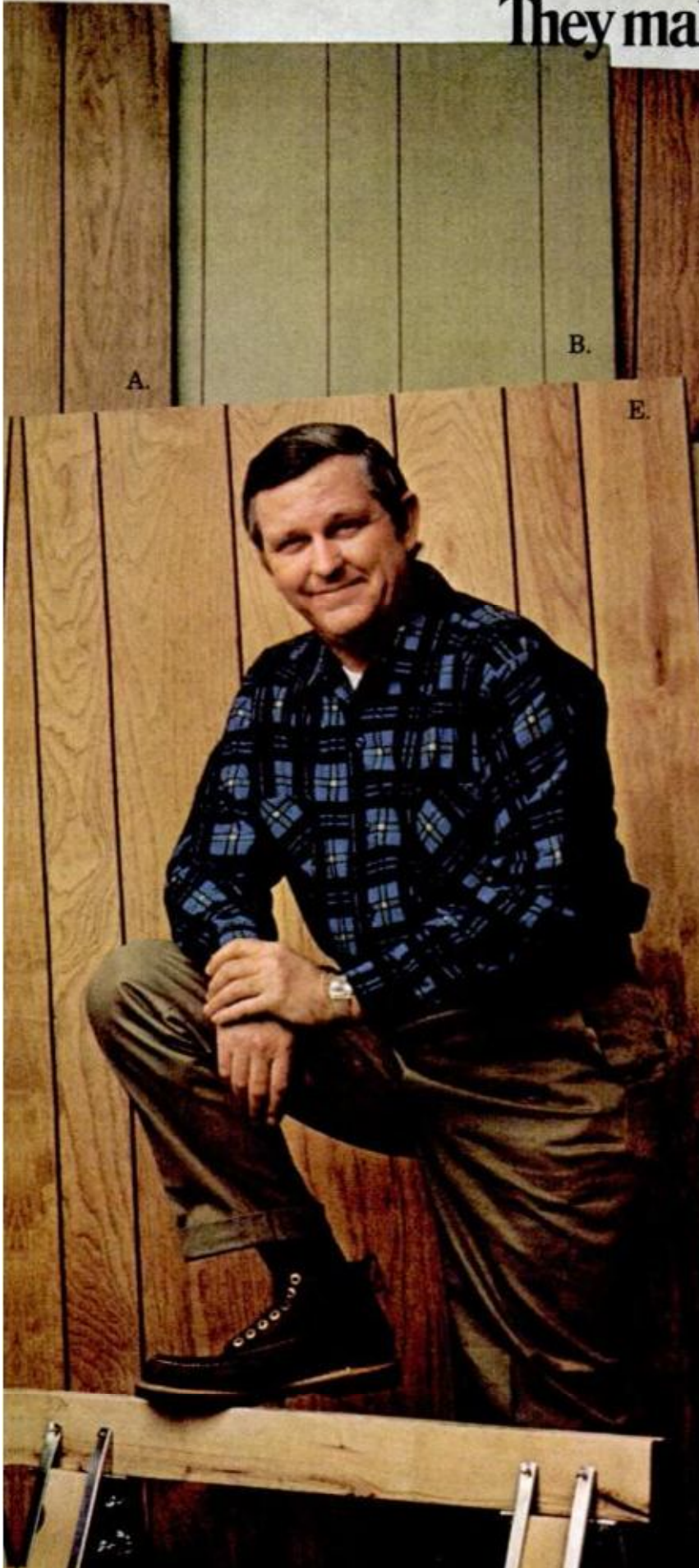


THE INDOOR WORLD®

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# "If you want a quality wall panel for less than \$5.99, see the Paneling People. They make 46 beauties."



Wally Bruner, host of the do-it-yourself television show "Wally's Workshop" knows what a difference quality wall paneling like U.S. Plywood's can make in a remodeling job. He always understands your budget. "You don't have to settle for lower quality paneling to get a low price."

"U.S. Plywood makes a complete range of wall paneling. 46 of them cost \$5.99\* or less per 4' x 8' panel. And every one has that famous U.S. Plywood quality reputation behind it—the same as the most expensive panel they sell. That's why they're known as the Paneling People."

"Here are five of my personal favorites:

**A. Tidewater.** Lauan plywood with printed oak graining. Burl and plus three more.

**B. Gaslight.** A crackle antique pattern, reverse printed vinyl and laminated to lauan-plywood.

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**D. Vinylgard.** High-fidelity reverse-printed vinyl laminated to plywood. Amarillo and nine others.

**E. Early Spring.** Printed pecan or teak grains, ranging from golden white to deep brown.

"And the Paneling People nearest you have many more. Check the Yellow Pages under Plywood for a listing of U.S. Plywood Weldwood dealers."

It's a promise—from the company that makes fine U.S. Plywood products, to the dealer in your neighborhood who carries them, you'll get quality-at-a-price from

## The Paneling People

 **U.S. Plywood**  
A Division of Champion International

\*Manufacturer's suggested retail price



## Home Ideas Guide

Smart, simple decorating ideas that can work for you



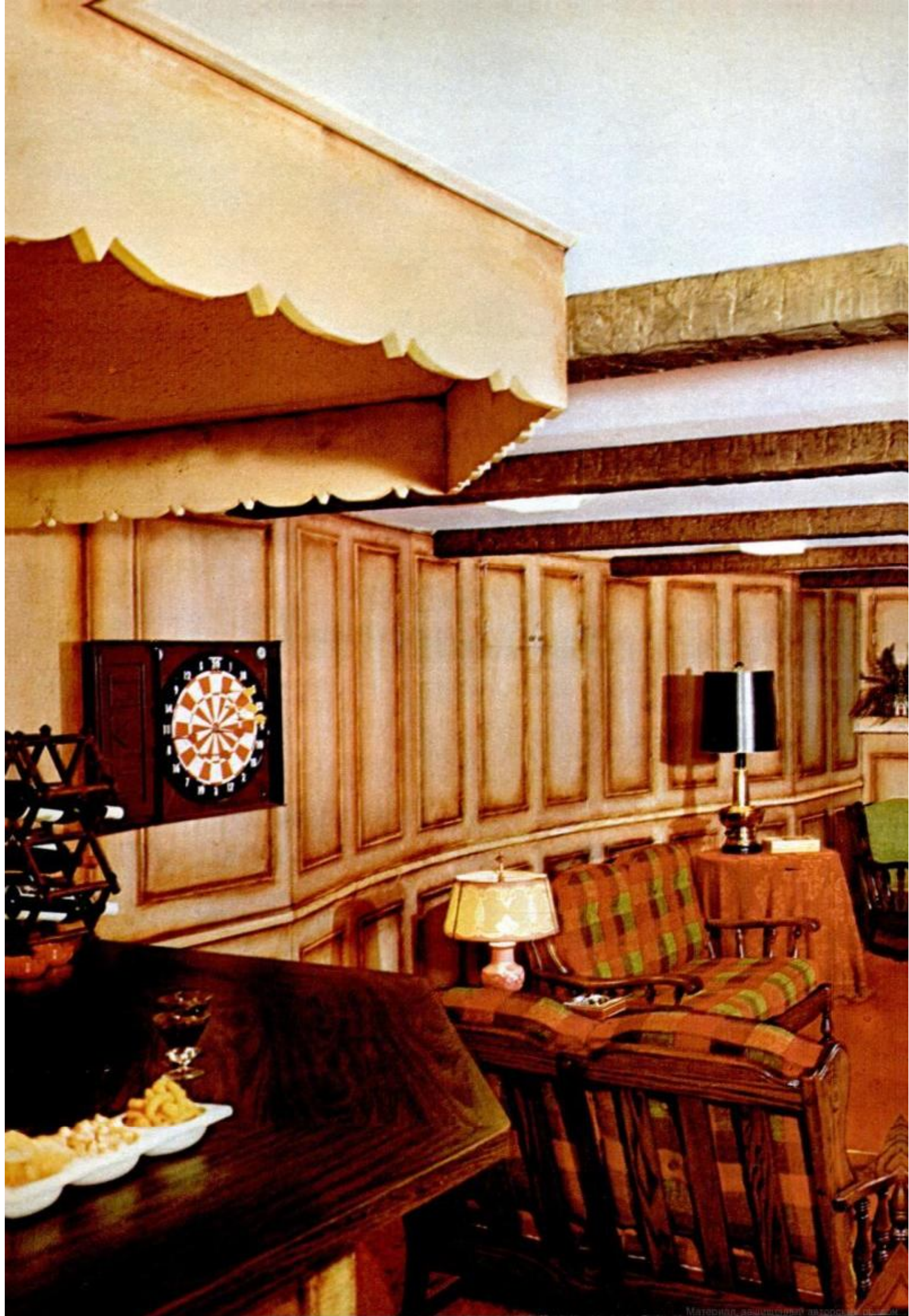
# Basement rec rooms with a family-room look

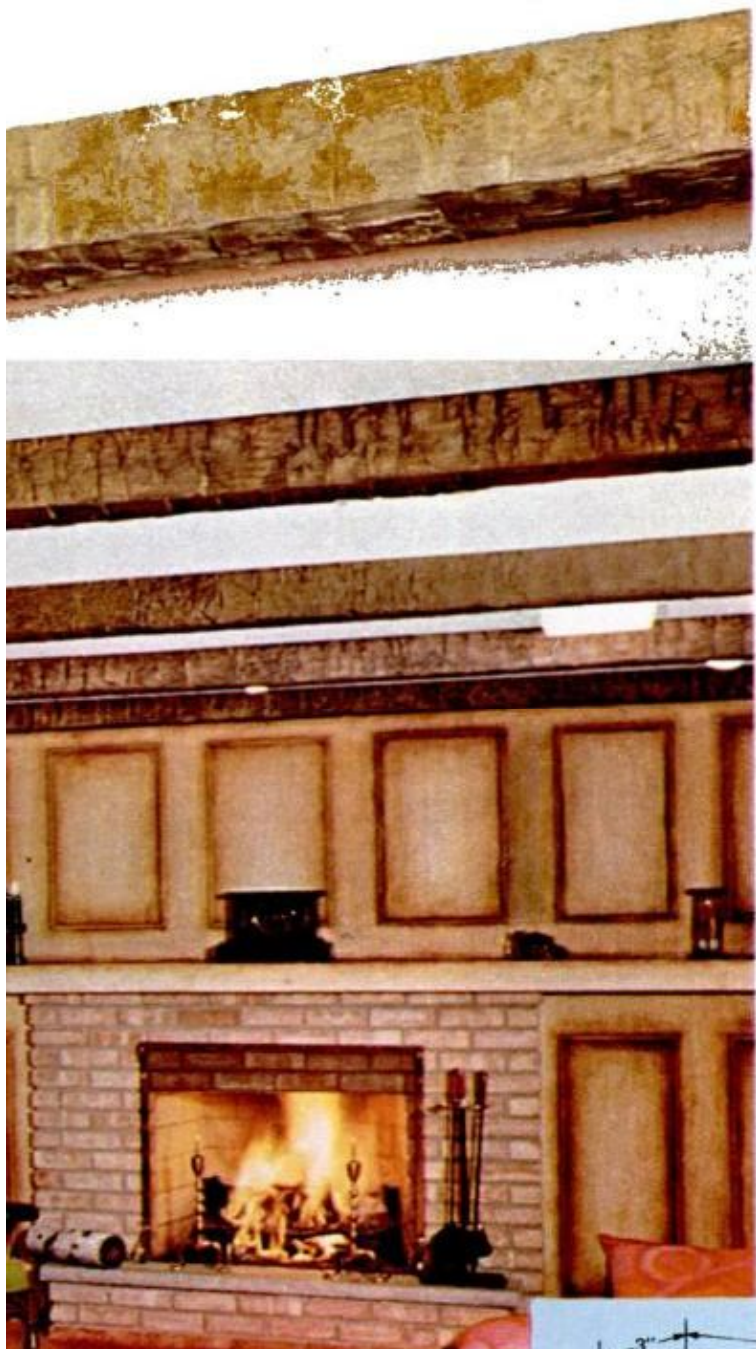
**T**HE BASEMENT used to contain the “rumpus room”—for kids on a rainy day or for that occasional Saturday night party. But you wouldn’t want to live in it. A family room is a warm, livable area of the house. If you need one—or a larger one—don’t overlook the basement. And if you want your basement to pay its way as *living* space, plan it as a family room.

The room at right is in the basement of the home of Minneapolis designer Ann Ritz. It’s not a stereotype of many basement rooms that look like empty nightclubs when they are not being



Data by Annette Sukov  
Photos by Les Turnau





used for parties. Its warm look comes from pecky cypress planks stained to achieve a weathered effect and from a bold use of color in draperies, carpeting and upholstery fabrics. Lighting was carefully planned so it could be controlled by dimmer switches to fit the mood or occasion—whether a quiet evening at home or a big party.

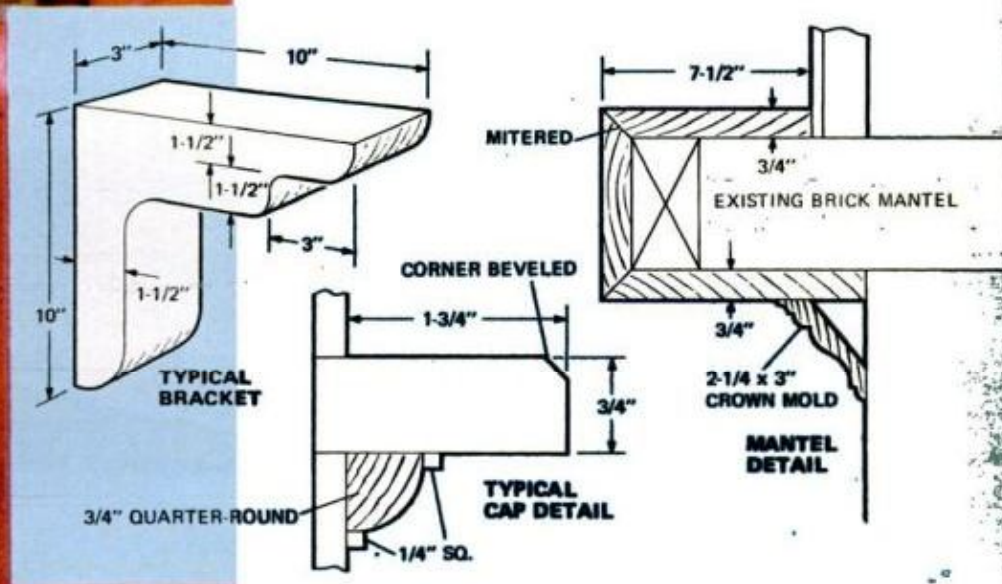
In the room at left, designed by Minneapolis architect Paul Albitz to suit the taste and living style of Dr. and Mrs. Thomas Pirisch, the elegant traditional look prevails. Though the result is expensive-looking, construction costs were kept down for two reasons: Sound, modern building techniques were used throughout, and the doctor did it himself.

The rich-looking walls are actually an inexpensive grade of 1/4-in. fir-plywood paneling. For the sculptured look, standard wood moldings were glued to the plywood, then walls were stained, "antiqued" with burnt umber and varnished.

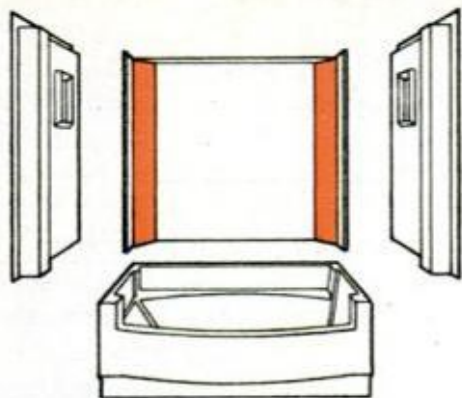
The rough-hewn simulated beams glued to conventional ceiling tiles are the foam-urethane type—easy to work with and prefinished. The attention given to small details is what "makes" the room. We have drawn three of the good ones for PM readers to duplicate. Dimensions, of course, can be altered to suit your job.

(For more family-room ideas, see page 159)

**BRICK FIREPLACE** was already in basement before facelift. Good wood-member treatments on its face now make fireplace the focal point of room. Sketches below show how they were created



# Prefab baths: easy to install



**FEATURING** color-coordinated accessory panels to complement other bath fixtures, this four-piece tub-shower has sculptured shelves, wide rim seat and slip-resistant bottom. By Owens-Corning



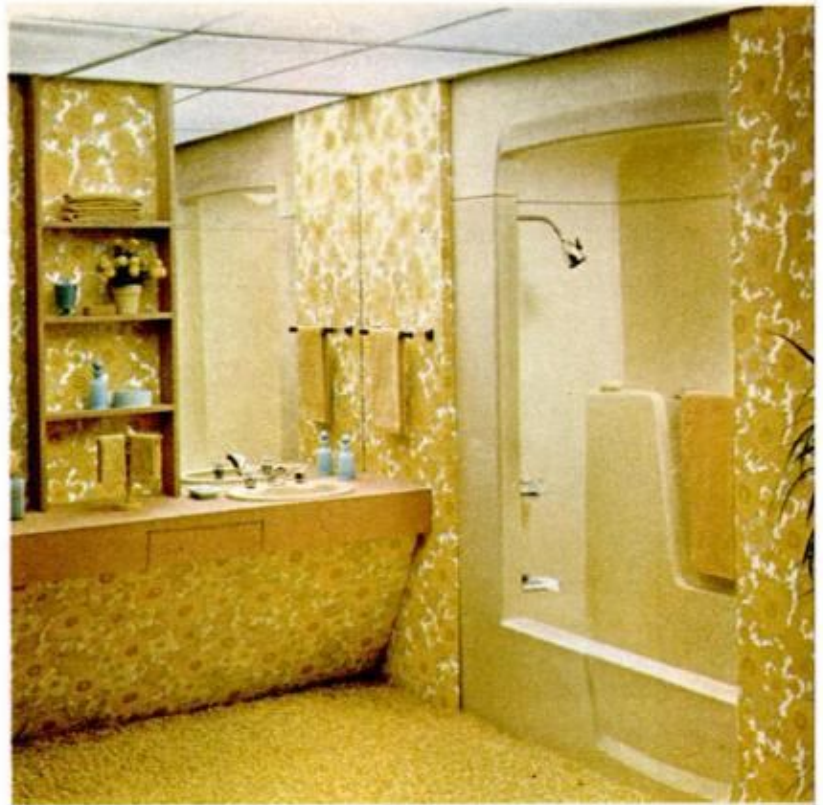
# and clean

## Home Ideas Guide

**C**ERAMIC TILE surrounding a bathtub looks nice, but it presents two problems for homeowners: All those grout lines between the tile are hard to clean, and as the house settles, there's the periodic job of recaulking the crack that invariably develops where the tile and tub meet.

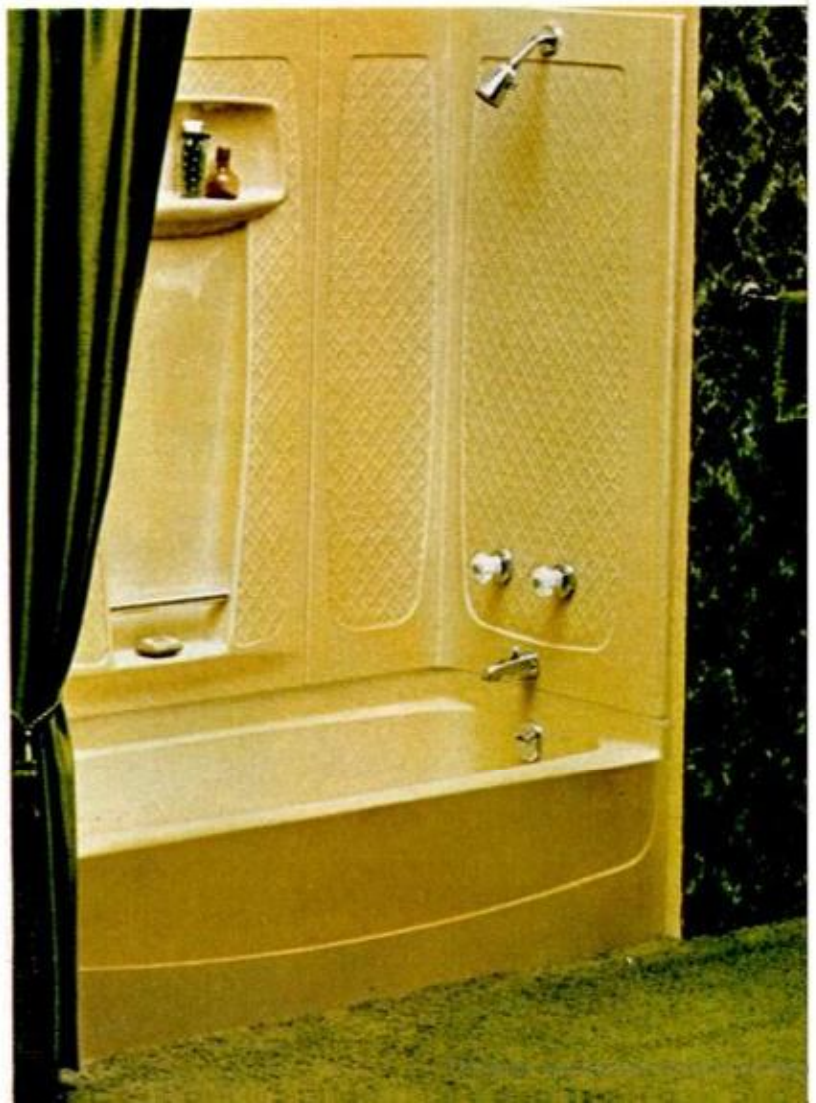
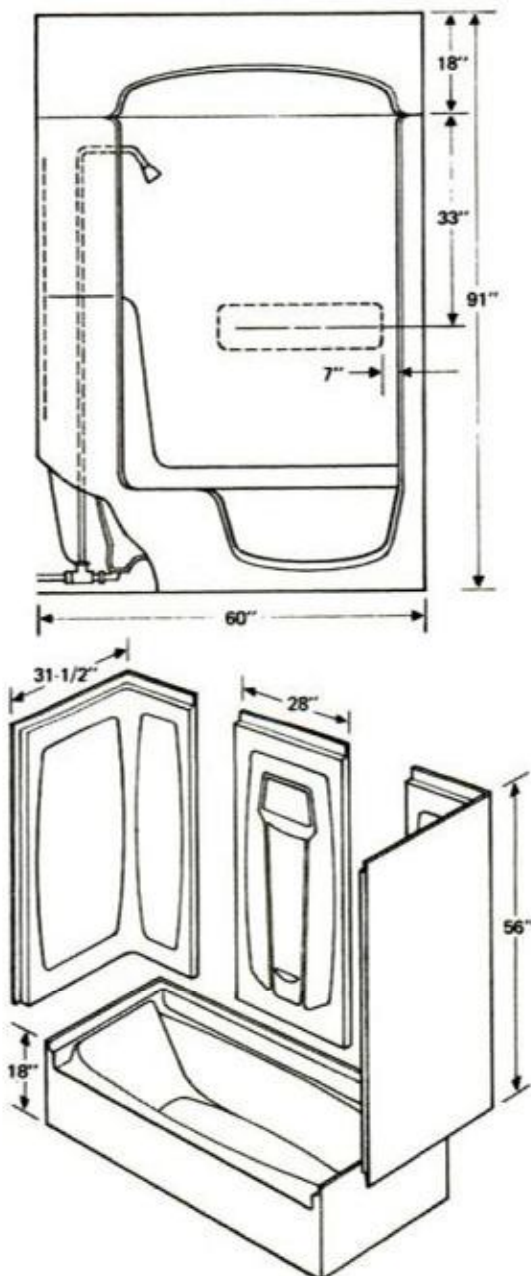
Happily, several makers of tub/showers have done something about it and are offering sectional and unitized bath units in reinforced fiberglass. Interlocking sections become a single leakproof

*(Please turn to page 157)*



**PRIMARILY FOR NEW CONSTRUCTION**, the Concept III (above) is a one-piece tub/shower that offers optional cap to finish off walls and ceiling. By Eljer Plumbing

**IDEAL FOR MODERNIZING** existing bathrooms, four-piece Versa-Bath (below) will fit through doorways as narrow as 26 in. Strong, rigid and leakproof. By Borg-Warner



# Pretty, exciting wall coverings

Home  
Ideas  
Guide

**BORED WITH BOARD LOOK?** Consider mixing wood grains with textured panel such as Chapel White Stone (left) by Masonite. It's available at lumberyards in 4x8-ft. panels

**FOREST MURAL** consists of 12 panels pasted on a wall like a jigsaw puzzle. See text for the maker



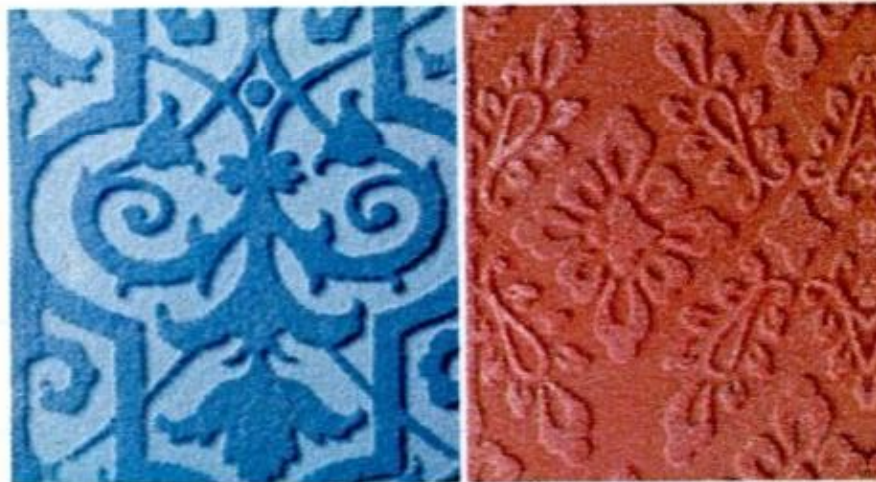
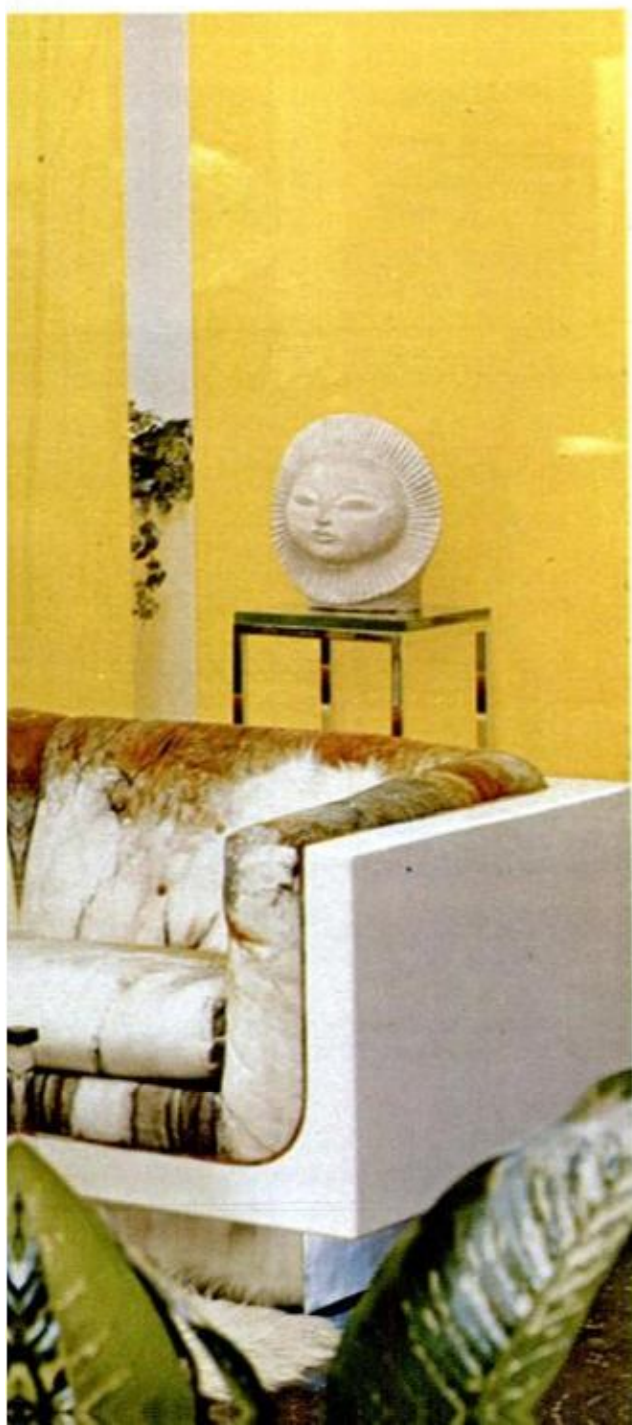
**H**OME DECORATING is more demanding than ever today. The emphasis is on smart looks—with minimum upkeep considered a "must" by most homeowners.

When wood prices started soaring, major manufacturers turned their attention to designing and manufacturing textured panels which would permit the use of lower cost materials. Most of the panels shown—except the forest mural on the facing page—are available at almost any local lumberyard.

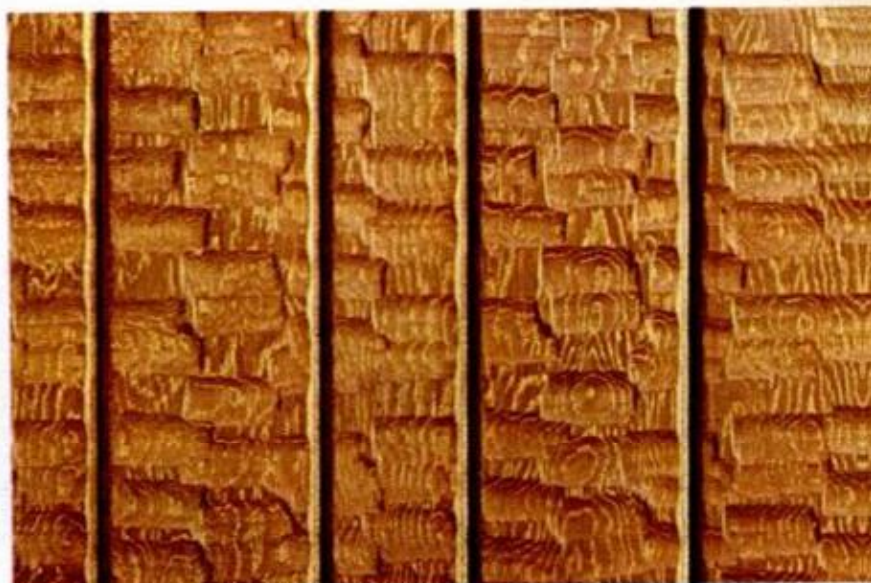
For the nearest source of the forest mural (plus details on other styles), write to Environmental Graphics, Div. of Pandora Productions, Inc., 1117 Vicksburg Lane North, Wayzata, Minn. 55391. ★★★



**DURABLE STONE AGGREGATE** bonded to plywood can be sawed, drilled, glued or nailed. Sansspray, by U.S. Plywood



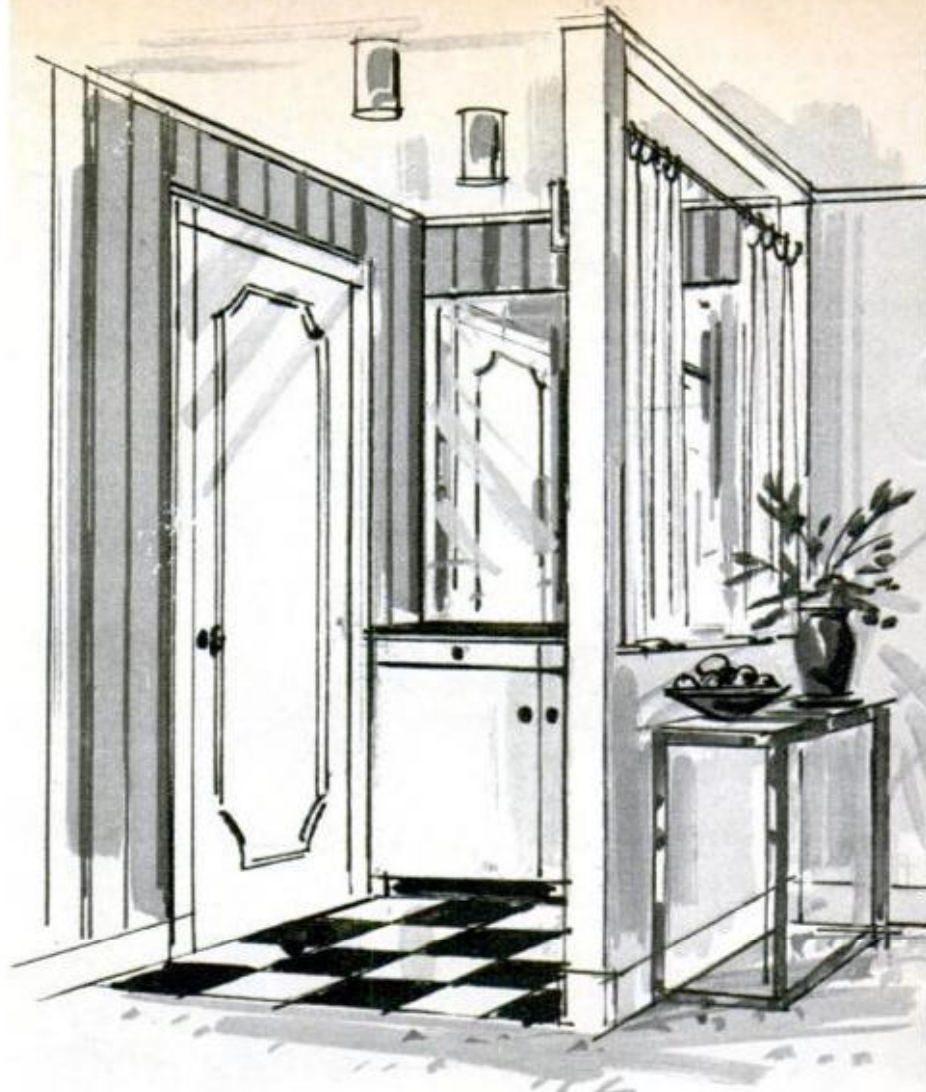
**ELEGANT PANELS** by Marlite feature lush look of velvet. Above: True Red Brocade and Royal Blue on Delphinium Blue (now being test-marketed and not immediately available)



**TEXTURED OLD-BRIDGE SIDING** with the adz marks of hand-hewn timber can be used effectively indoors. U.S. Plywood

# How to make a good entry

A divider wall inside the front door will make you feel less like a fish in a bowl when someone knocks



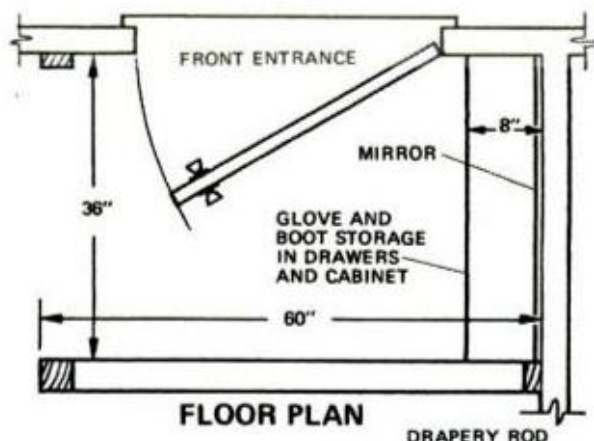
**O**NE DISADVANTAGE of most small ranch and tract-type homes is that the front door opens directly into the living room. Anyone at the door has full view of the room; family and guests have no privacy from strangers and delivery men, and in winter there's nothing to help block cold air and drafts from chilling the room.

Creating an entryway not only will provide semiprivacy, but can add convenient storage for boots, gloves, scarves and the like. Generally, a mirror can be a part of it, which guests and family members will appreciate whether coming or going.

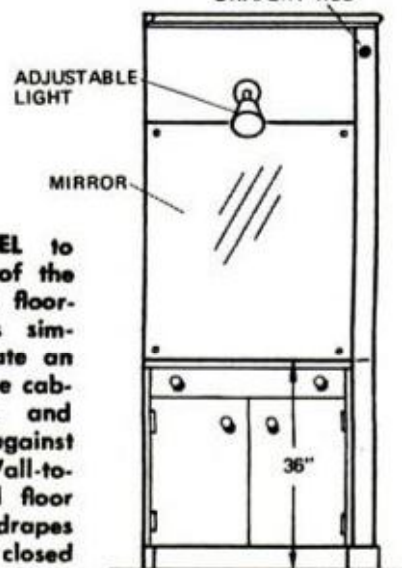
There are many ways to add a "minifoyer" to your living room; just how depends on its shape, location of its front door and amount of wall space adjacent to the door. Here and on pages 150, 152 and 154 we present three ways to do it.

## 1. The single wall

The design shown above suggests a single, floor-to-ceiling divider wall fitted with pole drapes, a wall cabinet with drawers and shelves and a mirror installed above it. The floor is covered with tile.



**FLOOR PLAN**



**ERECTED PARALLEL** to and 3 ft. inside of the front door, open floor-to-ceiling wall is simplest way to create an entry. Narrow base cabinet with doors and drawers goes against existing wall. Wall-to-wall mirror, vinyl floor complete job. Pole drapes add color, can be closed





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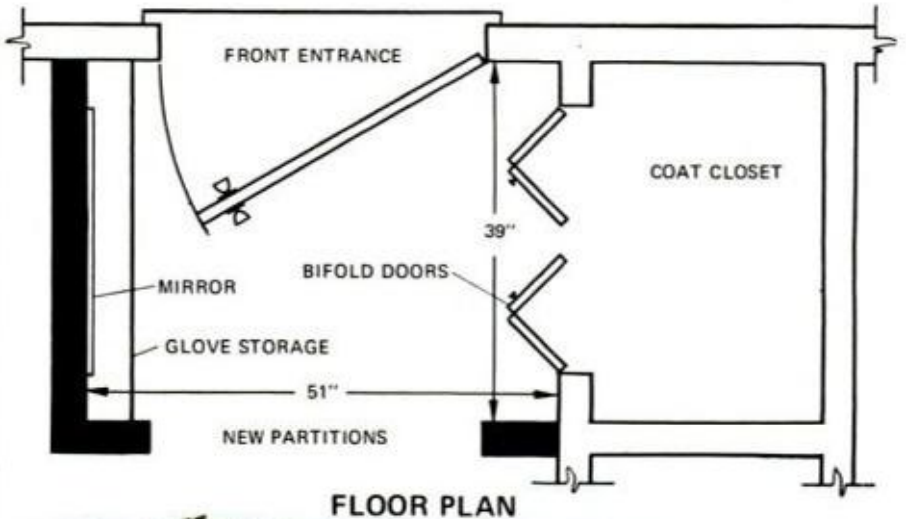
Prices & specifications subject to change without notice.  
\*Mail order prices; F.O.B. factory. CL-466R

**2. The 'vestibule'**

When a coat closet is adjacent to the front door and there is sufficient wall space between the door and a window, two simple floor-to-ceiling walls (heavy black lines in floor plan) erected at right angles and tied into existing walls form an entry that corrals wintry blasts, blocks the view and provides a functional wall for furniture and pictures.

Walls are framed by first nailing 2x4 plates to floor and ceiling, perfectly plumb, then wedging 2x4 studs between. The doorway is framed to provide a 40x80-in. opening, with doubled 2x4 headers across the top. Both sides of the framed walls are covered with plasterboard; joints and all inside corners are sealed and taped with drywall joint compound, and a length of

metal corner bead is nailed onto the outside corner. Both sides of the doorway are trimmed in the conventional manner, by mitering and nailing casing to an inner 3/4-in. frame, which is installed in the opening first. A shallow cabinet of counter height goes on an inner wall for glove and boot storage with a mirror above it.



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CHECK WITH YOUR LOCAL PLUMBING SUPPLY DEALER OR WRITE AMF CUNO, 400 RESEARCH PARKWAY, MERIDEN, CONN. 06450.

**3. The two-sided  
room divider**

**GROOMING MIRROR**, wide shelf and storage serve as handy "checkout" area to family members and guests, block view from door

*Designs by Carl Sigman  
Illustrations by Carl Kinschert*

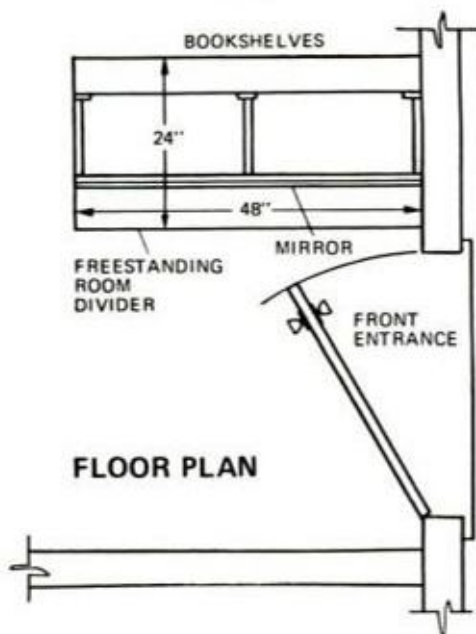


Standing ceiling high and set at a right angle to the door, a two-sided room divider can create a most practical, view-blocking entryway. Useful from both sides, it provides handy shelf, drawer and storage space, plus mirror on one side and a breakfront bookcase on the other. A tiled area in front of the door adds an entry look and provides an easy-to-wipe floor when youngsters and guests enter with wet gear and boots.

Being ceiling-tall, the cabinet has to be built on the spot (a foot or so out from the wall to facilitate assembly). Plans are given on page 154. To build it from the floor up, first cut a 3/4-in. plywood bottom 22 1/2 in. wide and 46 1/2 in. long and add a 1x4 kickboard along two sides, 1 in. in from the edge. Glue and nail it to the underside.

Next, lay out two identical T-shape ends 24 in. wide and 92 1/2 in. long and cut the upper ends 12 in. wide. Cut a shelf member 24 in. wide and 48 in. long and two scalloped fascia boards 12 in. wide and 48 in. long, all from 3/4-in. plywood.

Now start adding the end pieces, butting them against the ceiling and lapping and



nailing the lower ends to the edges of the cabinet bottom. Place temporary braces across the upper ends and nail the top shelf in place, first notching it to fit around the narrow sections of the ends.

Slide the cabinet in position against the wall and add the two scalloped members at the top, placing them against the ceiling and nailing them even with the end members. Complete with a ceiling molding. Six

# HOLD



# IT

**POWER GUN 1000 STAPLE GUN  
FASTENS MOST EVERYTHING**

There's nothing like it. Here's the staple gun with the power lever for extra heavy duty drive. Powerful enough to do any stapling job because it even drives through hardwoods (like oak) better than other staple guns. Ceiling tile, paneling,



upholstery, fencing, insulation, name it — the Powergun 1000 does it. Easily. Uses 5 staple sizes. Sold separately or as a kit with staples plus wire, shade, screen attachments. Handsome carrying cases, too. Pick one up. It's easy to use. Hard to put down.



**EXCEPT WHAT RIVET-IT  
RIVETING PLIER FASTENS!**

It fastens anything to anything professionally — the way the factory does and you've always wanted to! Ideal for autos, boats, appliances, cycles, sleds, toys, gutters and spouts, pots, pans, etc. Holds tight. Better than nuts, bolts, screws or solder. Rivets don't come loose.



You fasten from one side. Perfect for can't get to it places.

**Rivet-It riveting plier!  
Try it!**

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**PIGEON-HOLE SECTION** on bookcase side of divider becomes part of desk when latter is placed against it

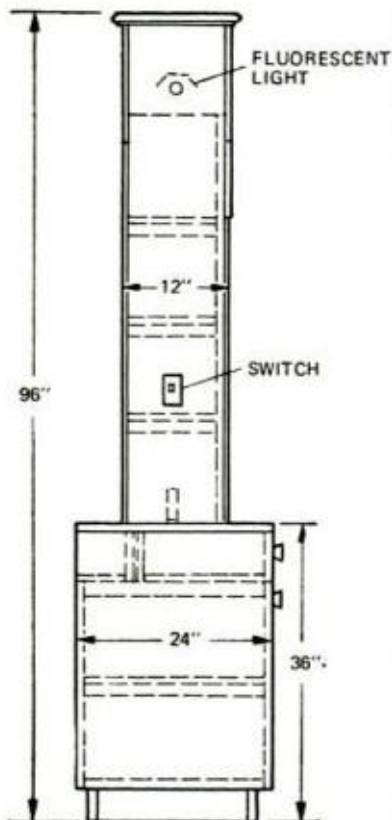
## GOOD ENTRY

*continued*

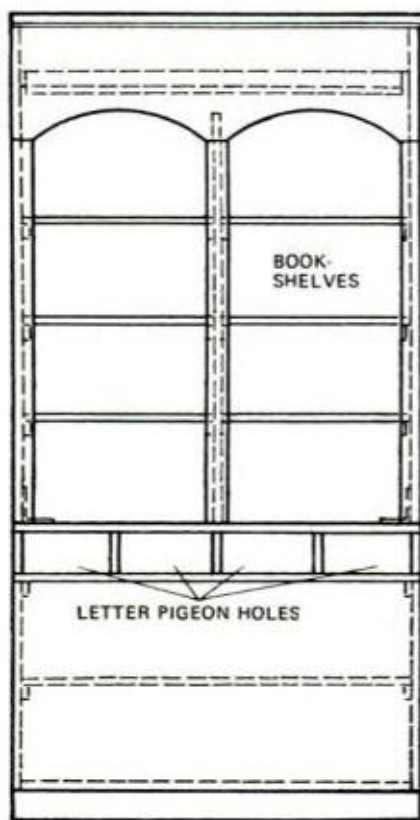
12 x 22 $\frac{7}{8}$ -in. bookshelves are supported between the cabinet ends and a center divider which rests on the top shelf and extends behind the scalloped members.

A pigeon-hole and drawer assembly is made and installed as a unit under the top shelf, then edges of the center divider and end members are covered with  $\frac{3}{4}$  x 2-in. trim pieces, butting ends against the scalloped members. A solid panel closes one side of the base cabinet, while the doors are hinged to the other side. An adjustable shelf completes the cabinet construction.

A fluorescent light installed in the top of the cabinet will highlight greenery placed on the top shelves and spill out dramatically to light both the mirror and bookcase sides of the divider. A separate switch to control the light should be added and a cable brought up to it and the fixture through the cabinet from a junction box in the basement (or down from the attic). ★★★



**END VIEW**



**LEFT SIDE**



**RIGHT SIDE**

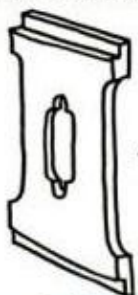
POPULAR MECHANICS

# Introducing a drill for the man who does more than just drill holes in wood.



Sears Craftsman Type-1 is a  $\frac{3}{8}$ " heavy-duty drill that can do it all.

**1.** The Craftsman Type-1 has ball bearings built-in at key stress points, it develops a full  $\frac{1}{3}$  horsepower, and actually puts out more power than other similar drills.



"Cut through  
an inch of pine  
in seconds"

**2.** The Craftsman Type-1 also has the variable speeds you need to start and drill a hole exactly where you want it without skipping or skittering around. Whether you're going into wood, steel, concrete, or even ceramic tile.



"Fit dowels  
with precision"

**3.** While the variable speeds also help you drive screws, the reversible action enables you to take them out, too.



"Drive or draw  
screws with ease"

**4.** And, of course, the Craftsman Type-1 is double insulated so it requires no grounding. Its two-prong plug fits any conventional outlet.

Sears Craftsman Type-1 is also unconditionally guaranteed to give complete satisfaction for one year, or return to Sears for a free replacement.

Sears  
**CRAFTSMAN  
TYPE 1**

The drill that's designed for  
the man who knows what he's doing.

The Craftsman Type-1 Drill, along with the accessories needed to build this desk, are available in Sears, Roebuck and Co. Retail Stores and in the Catalog. Craftsman Type-1 Drill Catalog Number 9GT 1145.



(Complete plans for building this Captain's Desk are available in the tool department of most Sears stores).

# Saw blades coated with TEFLON-S\* hum through the woods.

Cleaner. Smoother. Cooler. And fast. That's the cut you get with a power saw blade coated with TEFLON-S. Compare it with an uncoated metal blade. After you're through,

give the TEFLON-coated blade a quick wipe and store it without worry about rust. For a fast finish on your next project, get the blade with the TEFLON-S coat.

\*TEFLON-S is Du Pont's registered trademark for its non-stick and self-lubricating finish.



## GOOD FOR 10,000 BATHS



Rub-a-dub-dub, put GE Bath-tub Seal around your tub. It's made of silicone. So it's guaranteed for 10,000 baths or 10 years—whichever is longest. Permanently flexible, waterproof and mildewproof, it won't crack, dry or shrink. What's more, it adheres to most materials including ceramic, porcelain, metal, glass. So get a tube at your hardware counter. Squeeze it on and start counting baths. One, two, three, four, five, six, seven, eight, nine, ten.....

**GENERAL  ELECTRIC**

**POPULAR MECHANICS PM-BEE!** Plan for a radio-controlled model that flies on CO<sub>2</sub>. Fuel is nonflammable and odorless. Sophisticated and simple to build! To obtain full-scale pattern from which you can trace off the parts directly, send \$3.49 to **POPULAR MECHANICS, Dept. FA, Box 1014 Radio City, New York, N.Y. 10019.**



# At last! Garden tractors built for long life, quick hook-ups (without belts!) and easy riding — backed by a solid, no-nonsense warranty.

If you could look inside this New Holland garden tractor, you'd like what you see:



A direct-drive power system (1) to rear wheels. No old-fashioned belts!

A power-take-off shaft (2) replaces belt connections for attachments—makes hook-up surprisingly simple.

By eliminating these belts, New Holland 12 hp., 14 hp. and 16 hp. garden tractors save you trouble from slipping belts and adjusting belts and replacing belts. You get a modern, reliable power system. And, of course, attaching the mower is easier than ever—you don't even need tools.

**Now look at our drive-over mower.** You ride right over it to get it in position to connect the power



coupling. No more struggling to slide it underneath. The longer you own this tractor the more you'll appreciate this idea.

**You'll also appreciate** how easy we've made routine maintenance. The front hood and rear deck tilt up easily.



NEW 16 hp. model. Options include mower, snowthrower, tiller, more.

**Easy riding begins** with our step-thru platform. There's no big hump to climb over: You step aboard like a gentleman (or a lady). Sit down in the deluxe cushioned seat. The hy-



drostatic drive handle (one control for forward, reverse, stopping — without clutching) is right where your hand rests naturally. A hydraulic lever (optional on 12 hp. model) lets you raise and lower attachments effortlessly. It makes work almost a pleasure.




**Our warranty shows our confidence.** No nonsense. No loopholes. It covers everything except tires, tubes and battery—for one year. That means engine, transmission, electrical system—the works.

*Who's Sperry New Holland? We're a division of Sperry Rand. We've been doing business since 1895, mostly with farmers. The fact is, we're the country's #1 producer of specialized farm machinery. We build machines that work hard and last long, you can be sure of it.*

**FREE BUYER'S GUIDE.** For your copy, write to Dept. 145, Sperry New Holland, Division of Sperry Rand, New Holland, Pa. 17557. For the name of the New Holland dealer nearest you, phone toll free 800/447-4700. (In Ill. 800/322-4400.)

**SPERRY**  **NEW HOLLAND**

Now is the best time to buy a New Holland garden tractor (or riding mower). **Why?** Turn the page. 

# Buy now and select a great gift! See your New Holland dealer.

Buy a New Holland garden tractor (or riding mower) between April 2 and June 30, 1973 and we'll reward you with a bonus gift at no extra cost.



BUY A 12 HP., 14 HP., OR 16 HP. MODEL AND SELECT ONE OF THESE:



**Personal Calculator by Sperry Remington.** An electronic marvel! Adds, subtracts, multiplies, divides, and flashes answers—up to six figures—on display panel. Works on four penlight batteries. Fits in your pocket. Complete with zip carrying case.

**Quiet-riter™ Typewriter by Sperry Remington.** For every family! The portable typewriter that gives office-machine performance.

**GE® Digital Clock Radio.** Wake up to music! FM/AM reception. Brightly lighted one-inch numbers.

Sleep switch to shut off radio automatically.

**Crescent® Tool Set.** Ideal for the auto buff! Contains 50 pieces: wrenches, screwdrivers, ¼", ⅜", ½" square drives, spinner handle and extensions, spark plug socket.



WHEN YOU BUY AN 8 HP. TRACTOR, TAKE YOUR PICK HERE:



**Mark III Shaver by Sperry Remington.** Super-close shaves! Deluxe cord model has adjustable heads plus sideburn trimmer.

**Kodak Instamatic® 20.** The little camera that takes big pictures! Slips into your pocket. Takes big 3¼" color prints or slides. Double-exposure prevention.

**GE® FM/AM Portable Radio.** Carry it everywhere! Plays on batteries

or house current. 3½-inch dynamic speaker. Ear-phone jack for personal listening.

**Crescent® Tool Set.** Professional quality! Has seventeen sockets, with ⅜" drive, ratchet handle, wrench, pliers, more. All in steel carrying case.



RIDING MOWER BUYERS CHOOSE FROM THESE GIFTS:



**Hot Comb™ by Sperry Remington.** For today's dry, natural look! Gives you 20% more air flow. Includes brush and two combs.

**GE® Spherical Radio.** A fine AM battery radio—and a great conversation piece! The "Orbiter" model spins freely but weighted base always brings it upright. Can be wall-mounted.

**Springfield® Weather Station Trio.** Know what's happening—and what's coming! Thermometer,

barometer, humidity meters mounted on walnut-grained panel. Adjustable for vertical or horizontal hanging.

**Crescent® Socket Set.** Makes many home and auto jobs easy! Handy ¼" drive set with 9 sockets, ratchet handle, 2 extensions. Sturdy steel case.

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**SPERRY NEW HOLLAND**

Turn back for more reasons to buy New Holland...

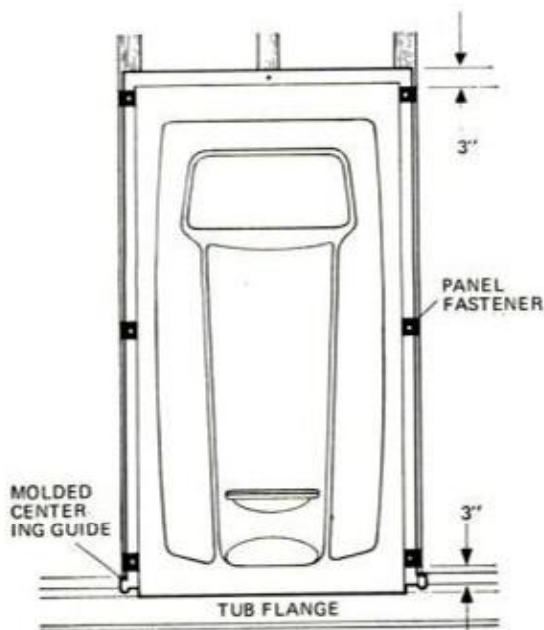


## PREFAB BATHS

*(Continued from page 145)*

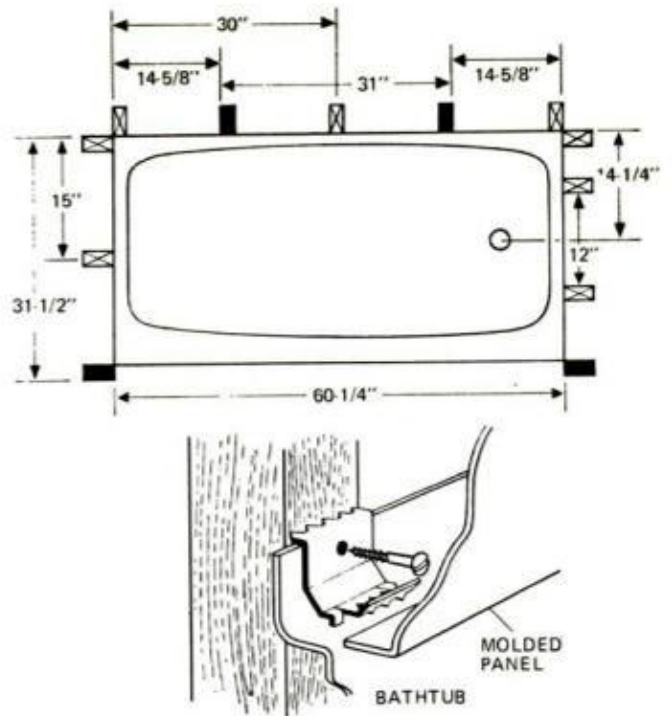
assembly, making cleaning easier than ever before and ending crack filling for good.

From a remodeling and modernizing standpoint, these new no-tile tub/showers are made to order for the do-it-yourselfer. Being molded of lightweight but strong fiberglass, the tub and wall sections are easy for one man to carry upstairs, through



**TWO MOLDED GUIDES** in tub flange serve to position and align center panel on studs. Six panel fasteners, placed as shown in diagram, attach panels to studs

APRIL 1973



**EXISTING FRAMING** requires four additional studs (diagram) for attaching three panels in Versa-Bath system. Barbed fastener locks panel when inserted

doorways and into place. They can be installed in any standard 5-ft. alcove in a matter of hours with little more than an electric drill, screwdriver and level.

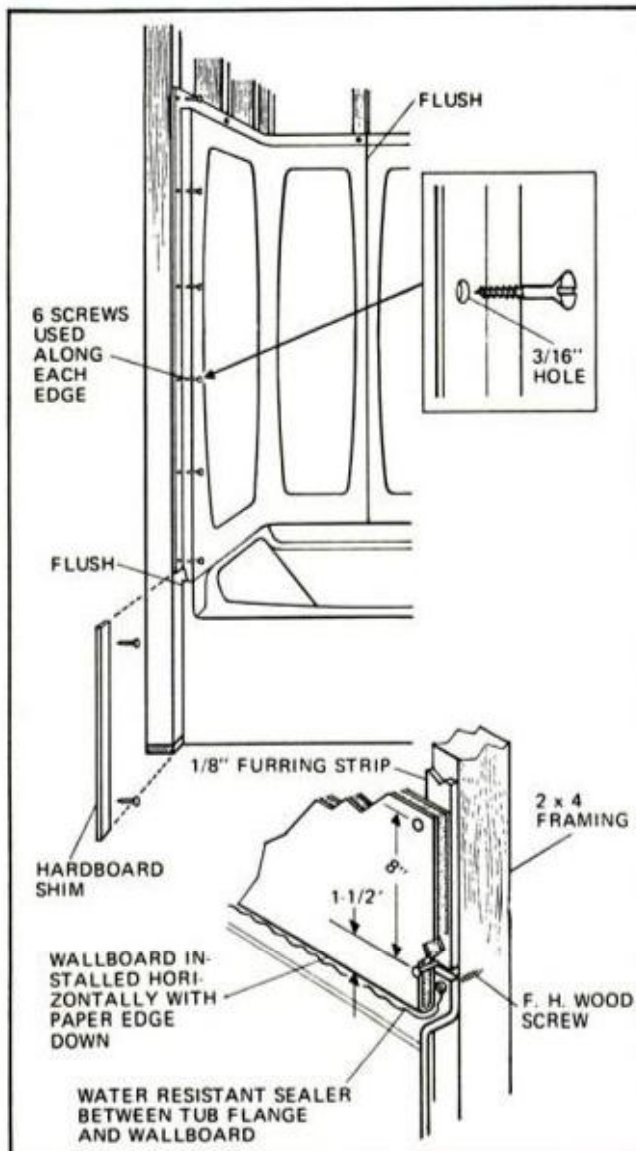
The series of pictures shown here and on page 158 show how easily Borg-Warner's Versa-Bath goes into place. Once the alcove is stripped of the old plasterboard and additional studs are added as required, installation is accomplished in four steps.

*First step:* The tub is set in place and





**TO INSTALL L-SHAPED CORNER PANEL**, place in position as shown in diagram, spring panel slightly to clear edge of center panel and let it snap into place



leveled. A leveling runner on the bottom of the tub permits shimming if necessary. Tub is held with four special fasteners attached to studs with screws. Overflow and drain connections are made and tested.

*Second step:* Center wall panel is attached to studs with fasteners and screws. Guides molded in flange of tub center the panel.

*Third step:* Holes for faucets, spout and shower head are located and drilled through corner panel with hole saw.

*Fourth step:* Finally, the two L-shape corner panels are inserted into fasteners along the center panel and pressed into place. Top and front edges of the panels are secured to the studs. ★★★

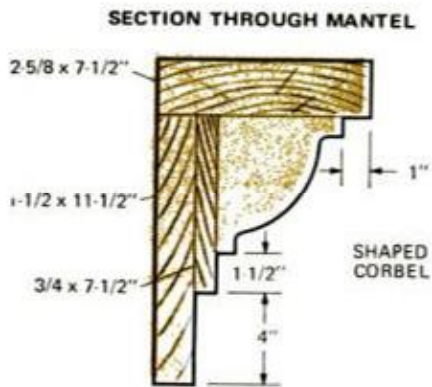


**WATERTIGHT JOINTS** are assured by caulking vertical and horizontal seams with mildew-resistant sealant. Surplus sealant can be removed with turpentine

**POPULAR MECHANICS**

**Handsome hearth**

Rustic elegance gives this fireplace the role of room mood-setter. The post at center is functional (actually a pine-encased Lally column); beam it supports is also pine-covered. To maintain masculine atmosphere, equally spaced urethane beams are glued to ceiling tiles. Sketch of mantel details (below) shows how simple construction really was.



**Window disguise**

One of the easiest—and least expensive—ways to change from basement to family room is to disguise narrow basement windows. A good method is to install fixed shutters and standard window trim (casings, apron and stool) as shown. The muntins and bars over the single-panel lights are created by gluing and tacking together 1/4 x 3/4-in. lattice with members slightly longer than the sash opening. The idea is to create a force-fit when muntins are placed so they will be removable for window-cleaning chores.

# Simple lights you can make to brighten your kitchen

**S**URPRISINGLY SIMPLE homemade lighting fixtures can make a dull, drab kitchen suddenly come alive. Soft lighting under cabinets will emphasize colorful counter surfaces. Carefully spaced "spots" will capture the beauty of the cabinetry. And light spilling out from behind valance boards and cascading over draperies will add a strikingly dramatic effect.

When adding over-sink and under-cabinet lights, your biggest job will be running wires to them. This will be easier in a ranch house where wiring can be brought down from attic junction boxes; more difficult in a two-story house. Sometimes the cable can be brought up from a

basement junction box by snaking it through a hole in the kitchen floor, between a base cabinet and the wall.

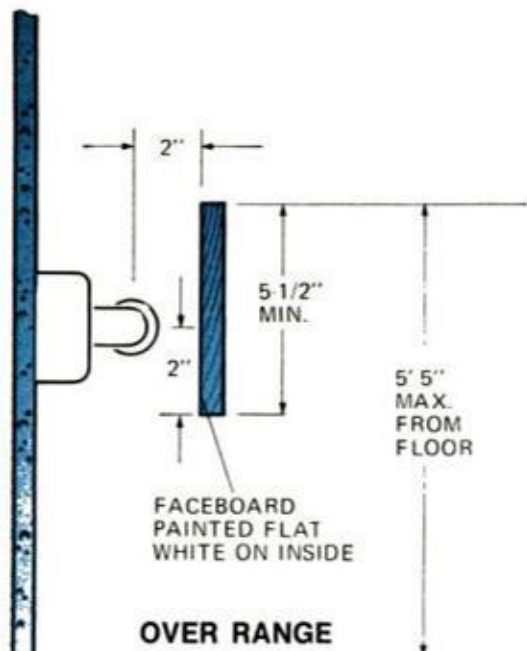
You may have to remove a wall cabinet temporarily to bring cable out through a hole behind it. Or you may have to cut a 1-in.-wide slot in the plaster behind a cabinet to permit fishing the cable from one point to another. And, when you're up against a hidden obstruction with no way to bypass or bridge it, you may have to cut through an exposed portion of a wall, which can be patched later.

In working out individual wiring problems, you must keep in mind that over-sink and under-cabinet lights must be

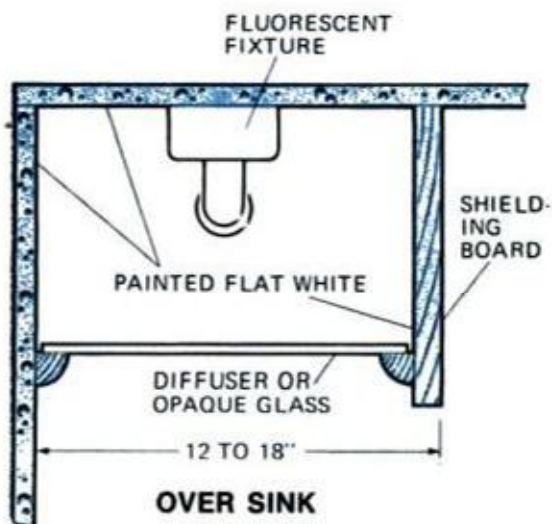
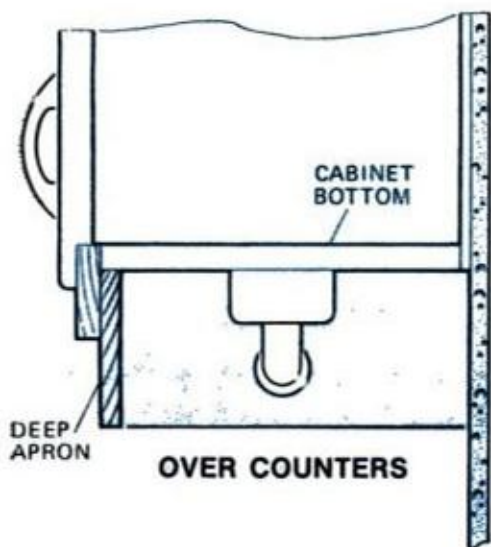
**SHADOW-FREE LIGHT** over countertops and sink helps to take eyestrain out of food preparation, while the overhead lighting prominently illuminates appliances, enriches the natural wood tones of kitchen cabinetry

GENERAL ELECTRIC PHOTOS





**LIGHTING, COLORS AND FABRICS** must be coordinated when kitchen and dining areas share a room. Here lighting tends to emphasize the colorful countertops, the wood tones and draperies



controlled by conveniently located switches which, in turn, must be connected to nearby outlets or junction boxes in basement or attic.

Romex or BX (armored) cable is generally required wherever wiring is to be concealed inside walls (some areas require that such wiring be run through conduit) and such installations must conform to your local electrical code. There are several good books that show you how to make the proper connections. One, called *Simplified Electric Wiring Handbook*, is sold by Sears for 50 cents.

Adding a fluorescent lamp over a sink often requires nothing more than fitting a faceboard across the front between cabinets. Angle brackets can be used on the inside to fasten it in place, and it can be finished to match the wood cabinets or made plain or scalloped. A diffusing glass or grid, resting loosely on strips of quarter-round molding, hides the lamp from view,

*(Please turn to page 194)*

# Facelifting—still the cheapest way to get a 'new' house

## Home Ideas Guide

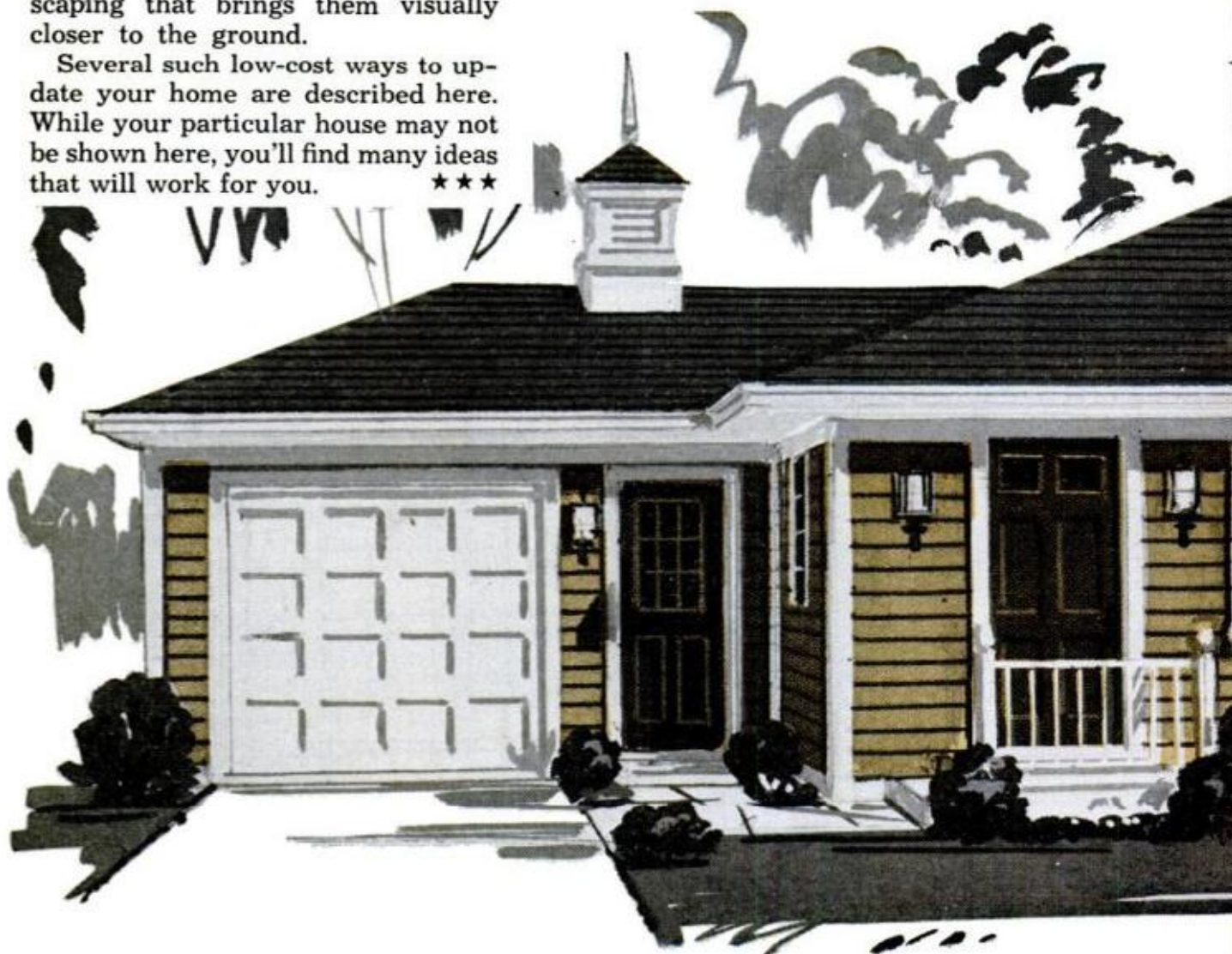
**I**F YOUR HOME is due for repainting, step back and take a long, hard look at it, then decide whether a paint job alone will give you the look you really want. Chances are the house, as well as its shrubbery, can stand some "pruning"—ornate but useless gingerbread and hardware, for example. In some cases removal of an "improvement" (something a former owner made that you probably wouldn't have) might restore the house to its original architectural concept—resulting in aesthetic improvement. And older homes will nearly always benefit by grading and landscaping that brings them visually closer to the ground.

Several such low-cost ways to update your home are described here. While your particular house may not be shown here, you'll find many ideas that will work for you. ★★★



### Add charm and value

This tract-type single-level dwelling is typical of the most economical home that can be erected today. Yet its simple design lends itself to easy, inexpensive improvement. Note how colonial touches—windows, shutters, planters, lamps—add charm. Garage extension lengthens it and adds to convenience and value of the home.

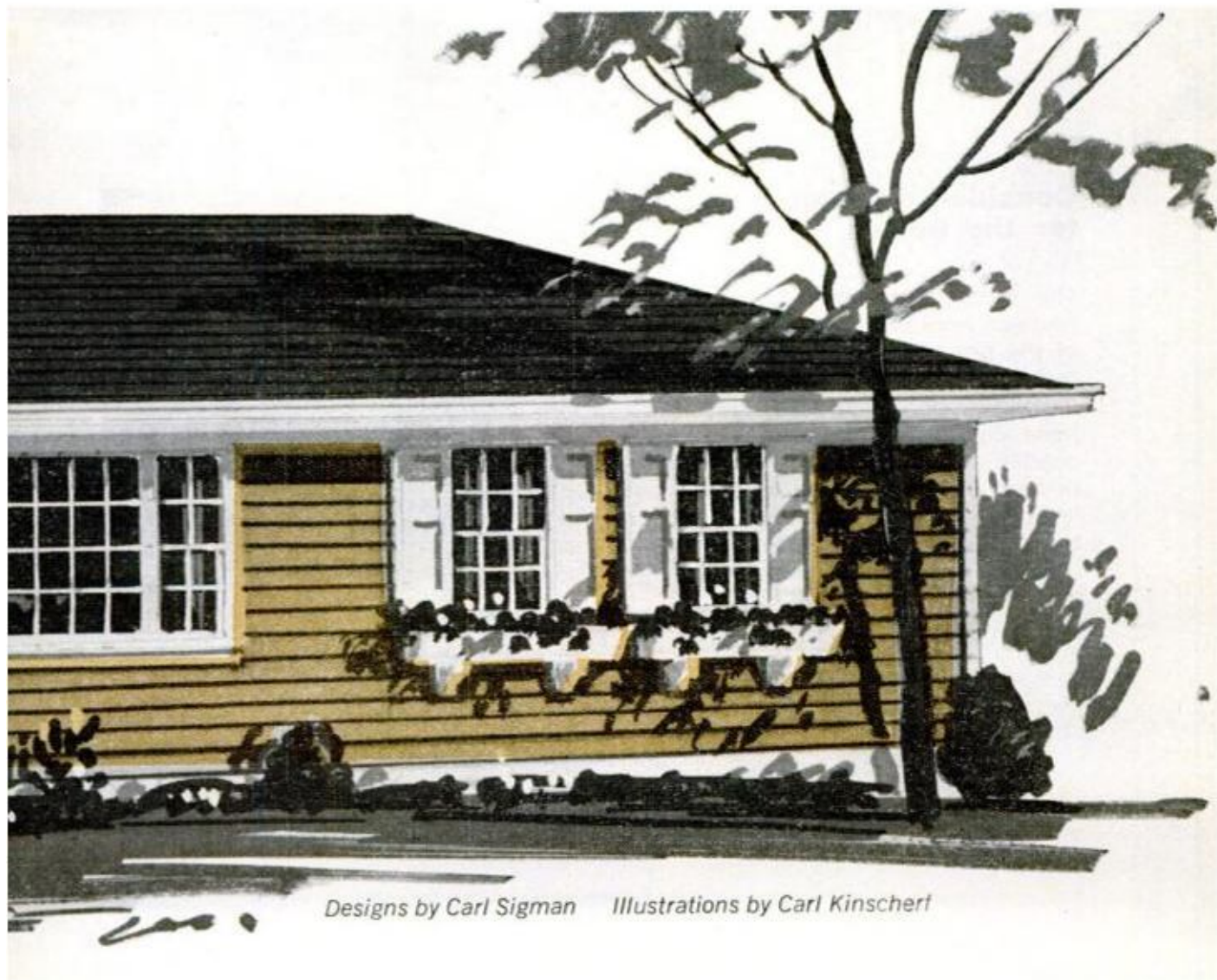






### Restore true character

Roomy, two-story frame home requires little more than a careful selection of color and removal of "improvements" that are out of character. Here removing wrought-iron railing and adding a carriage-house-style fascia restores balance and importance of the first floor.



*Designs by Carl Sigman Illustrations by Carl Kinscherf*



### Consider a change for the better

The principal change recommended here is the relocation of the porch steps to give direct access to the driveway. Moving them eliminates the need for a front walk that divides the house down the middle. The clean, unbroken lines of the new porch give the facade better proportions.

Removing overgrown bushes and replacing them with low-profile foundation plantings lets the new front show to advantage. If the upkeep of a glass-enclosed porch does not



pay off in well used living space, consider a change that will simplify maintenance and improve the exterior.

## The difference a change in grade can make

The good features of this house are all but lost in its height. To bring it down to earth a retaining wall has been added parallel to the sidewalk. The area between that wall and the house has been filled and landscaped to conceal the foundation.

A colonial-style entry, new windows, (note special treatment of the bathroom window above the entry), the addition of dormers, shutters and coordinated coach lights add up to a rather ambitious remodeling but reveal the true potential of this house.

If your home has a roofed niche as shown above, it can be left as is or closed (sketch, right) for added living space.



# Wind-powered ventilators beat attic heat

Photos by Ken Rudine and Don Daily

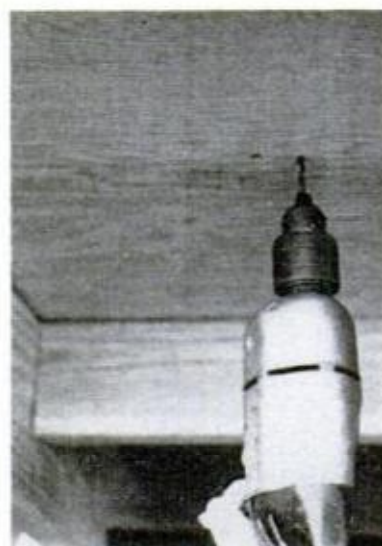
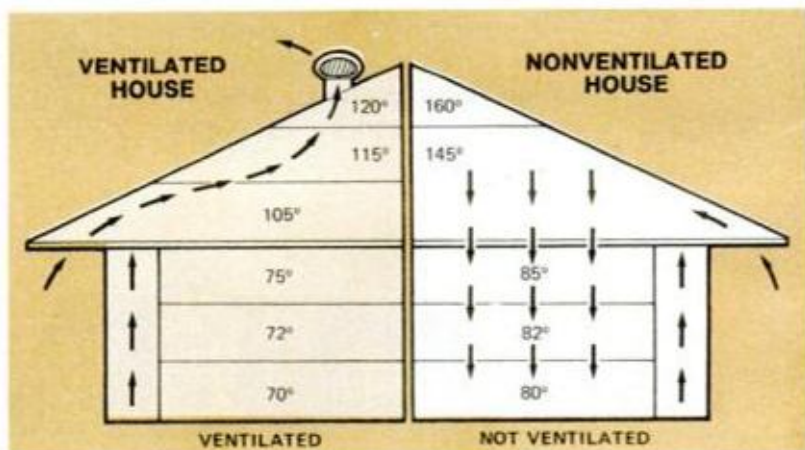
**A**N EFFICIENT attic-cooling device, the rooftop ventilator is gaining acceptance in many energy-short areas of the country. Since it is powered by the wind, it uses no electricity. By cooling the attic continually, it eliminates oven-like heat which, in turn, saves on air-conditioning.

Since a wind-driven ventilator is turned constantly by the slightest breeze, it keeps attic air moving, preventing a heat buildup that often reaches temperatures up to 140-150° F. In a well-ventilated attic, less heat is absorbed by the insulation and there's less to radiate down through the ceilings.

Even when there's no wind, a turbine ventilator continues to draw out the heat. Being drawn in through attic vents and escaping through the ventilator, the air itself causes the unit to turn.

As a rule of thumb, one 12-in. ventilator is recommended for each 1000 sq. ft. of attic space; two units are best for 1200 sq. ft.

The series of photos on these two pages show how easy it is to install wind-powered ventilators. A product of Triangle Engineering Co., Box 7464, Houston, Tex. 77008, the ventilators sell for \$29.95 or two for \$49.95, postpaid. ★★



**1. LOCATE VENTILATOR** from inside attic and at least 24 in. below ridge on rear side of roof



**2. CENTER BASE** over pilot hole in roof and use inside of base to scribe hole on roof shingles

POPULAR MECHANICS



**3. USING CIRCLE AS A GUIDE,** cut away shingles with sharp knife. Cut  $\frac{1}{2}$  in. outside circle



**4. CUT HOLE** through roof boards with sabre saw or by hand with keyhole saw, following the circle



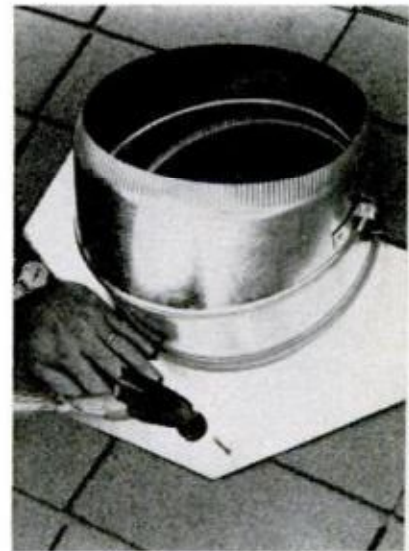
**5. WITH SCREWDRIVER,** loosen the locking screw on adjustable-pitch base so you can turn it



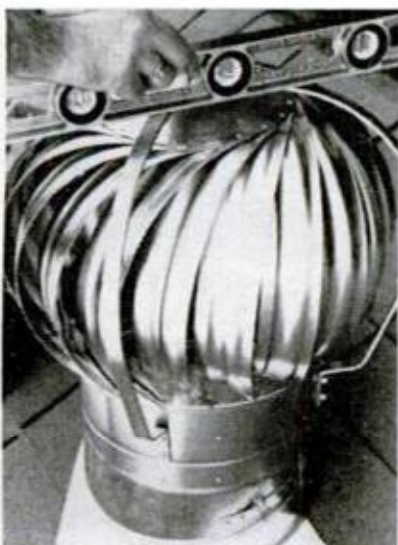
**6. WHEN LOOSE,** grip top section and turn sufficiently to make the top of the base level



**7. RETIGHTEN SCREW,** then slide top half of flashing up under shingles, removing nails in way



**8. SECURE BASE** to roof with eight roofing nails driven through the flange, then caulk the heads



**9. PLACE VENTILATOR** over crimped base; check installation by placing level across the top  
APRIL 1973



**10. USE BASE-RING HOLES** as guide in drilling matching holes around and through base flange



**11. LOCK RING TO FLANGE** with No. 8,  $\frac{1}{2}$ -in. sheet-metal screws. Drive screws home for tight fit

**Home  
Ideas  
Guide**

# Trowel-on 'brick' looks like the real thing

Rough brick texture fools everyone; only you know it's imitation



**SEEING IS BELIEVING** and certainly so in the case of this new simulated brick, for you must see it to fully appreciate its realistic texture and authentic look. It's "laid" in the most unorthodox manner with strange "bricklayer's tools"—a putty knife or trowel, pencil and razor blade.

The brick is actually spread on like thick butter over a brick design of stick-on tape. Pulling off the tape forms individual brick shapes and mortar joints.

Dacor's Brick-In-A-Can comes in a two-

can kit, Formula I and Formula II. One is a base coat, which is troweled on first to simulate mortar joints. The other is the brick coat, which is partly removed by the tape to form the bricks.

The nine steps below show how it's done. As a final step, flat white and black spray paint can be applied here and there to add an "old" brick look. The two-can kit covers up to 35 sq. ft., costs less than \$1 per sq. ft. and is a product of Dacor Manufacturing Co., Inc., Worcester, Mass. 01601. ★★★



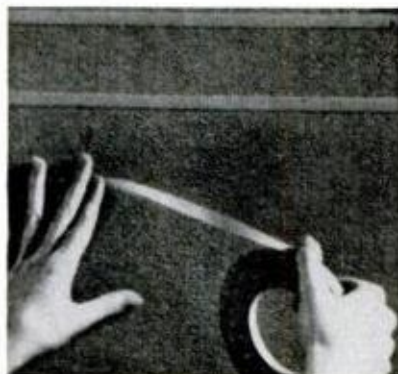
**1 USE TROWEL** or wide putty knife to apply thin layer of base coat (Formula I) on wall



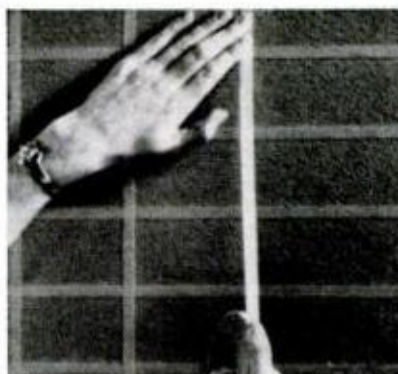
**2 LET DRY OVERNIGHT;** use trowel to scrape off roughness, ruler to mark wall vertically



**3 MARK WALL** horizontally with special ruler that comes with kit. Instructions explain its use



**4 WITH HELP,** stick tape to wall between series of vertical marks; then press tape in place



**5 IN SIMILAR MANNER,** stick tape to wall between series of horizontally made pencil marks



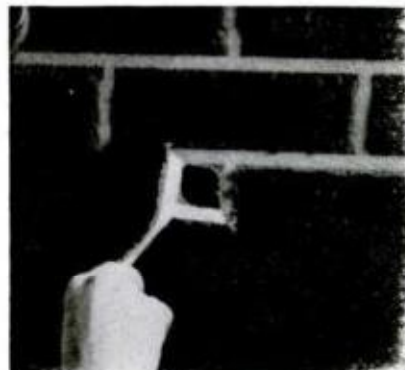
**6 WITH RAZOR BLADE,** cut vertical tapes at center where they cross each horizontal tape strip



**7 FORM BRICK SHAPES** by removing every other vertical tape in each row or brick course



**8 TROWEL FINISH COAT** (Formula II) over wall and tape; allow mixture to dry 2 to 4 hours



**9 REMOVE TAPE** from wall by grabbing end, pulling to produce natural-looking rough edges

# Low-cost garage-door



**1** PRESS THE TRANSMITTER (left) in the safety and comfort of car, and garage door slowly opens

PHOTOS BY ROBERT D. BORST

**A**SIDE FROM BEING a most worthwhile home improvement, a radio-controlled garage door affords you and your family the security, comfort and convenience of entering the garage without leaving the safety of your car. Press a button, the door goes up, a light comes on and you drive in. Press the button again and the door closes and locks behind you.

Getting out of the car late at night to open a garage door may be unsafe for the driver, whether it's you or your wife. And, of course, no one likes to struggle with a heavy door in a driving rain.

If a radio-controlled garage-door operator sounds too complicated for you to install yourself, you are in for a surprise. There's a simple do-it-yourself unit on the market, called Helpmate, which any handy home-owner can install in as little as four hours with common hand tools—for under \$125. It's powerful enough to open a wood, metal or fiberglass door up to 20 feet wide, and you can work the operator from a distance of 100 feet or more. It has solid-state controls, and its transmitter and receiver are precisely tuned and matched so no other UHF (ultrahigh frequency) signal can open the door.

● *How the operator works.* A 1-in. motor pulley drives a 7-in. pulley in the power head through a V-belt, reducing the motor

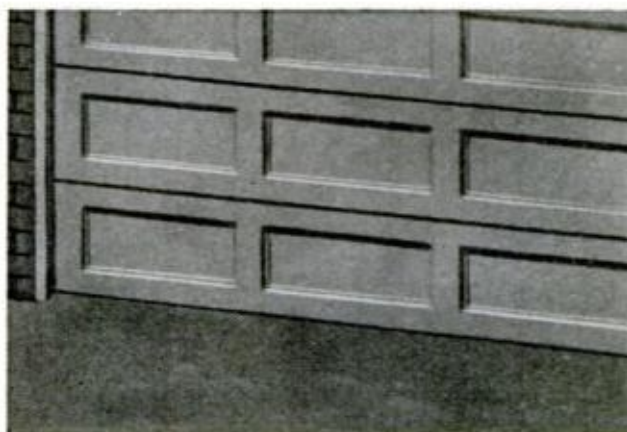
**POWER HEAD** hangs level from ceiling joists held by two flat iron bars. Radio receiver is fastened to ceiling so its antenna is parallel to garage door



# opener anyone can install



**2 DOOR-OPENER LIGHT** turns on at same time and then you can drive into a bright-as-day interior

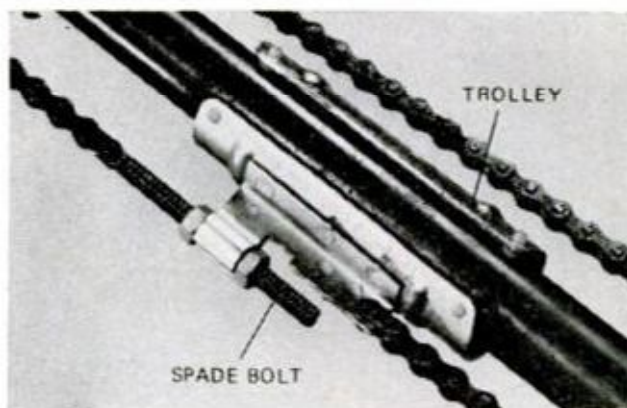


**3 PRESS TRANSMITTER AGAIN** and door slowly closes, leaving you safely behind locked door

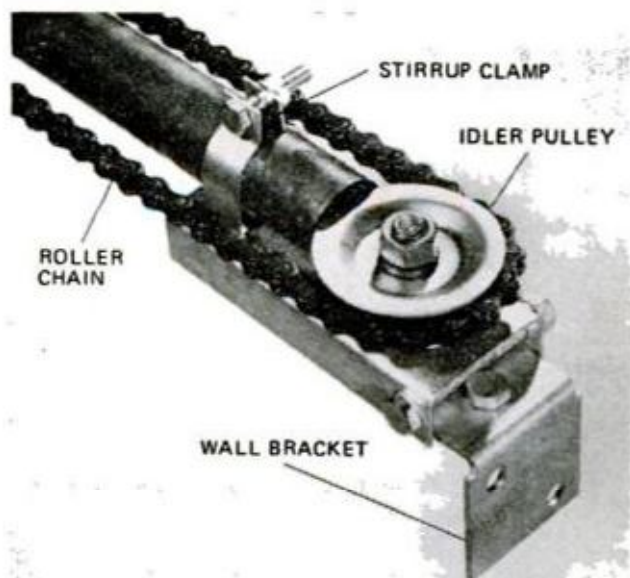
speed by a 7:1 ratio. The larger pulley is on a shaft-and-sprocket assembly that drives a roller chain attached to a trolley. The chain moves the trolley along a 10-ft. 1¼-in.-dia. rail, and the garage door is attached to the trolley by an adjustable arm. UP and DOWN lugs affixed to the chain limit trolley travel. When the UP lug strikes its spring-loaded switch bracket, movement stops and the door is fully open. When the DOWN lug strikes its switch bracket, movement is stopped and the door is tightly closed. The instant the motor is activated by the car transmitter (or wall switch), a 75-w. lamp lights and remains on for two minutes after the motor stops. If the door meets an obstruction during down travel, the chain will tighten, causing the pivot bracket to turn and close the safety reverse switch. This trips the latching relay and instantly reverses the mechanism to open the door fully. If power fails, the door can be opened by pulling a pin to unhitch it from the trolley.

For the opener to operate without undue labor, the door can't stick or bind in its tracks or opening, and it should be made to open manually with little or no effort before the operator is installed. The door can be track-type or trackless one-piece or sectional. It is recommended that a rubber door seal be attached to the door bottom so it will close quietly and tightly. The seal will also keep out snow and rain and compensate for an uneven floor.

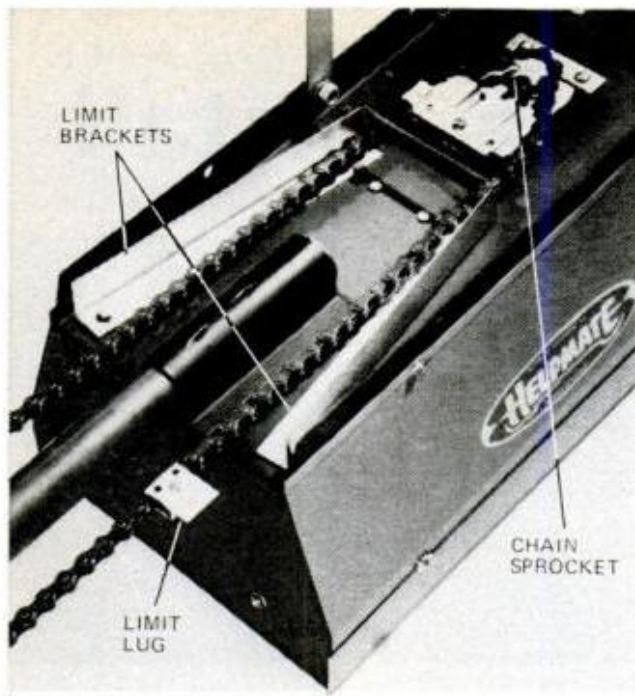
● *Wiring the operator.* Both the power



**ENDS OF ROLLER CHAIN** attach to trolley after making loop around drive sprocket and idler pulley. Chain slack is taken up by tightening spade bolt



**IDLER-PULLEY ASSEMBLY**, which includes wall mounting bracket, clamps to end of trolley rail by stirrup. Pulley bears against end of the rail, does not turn

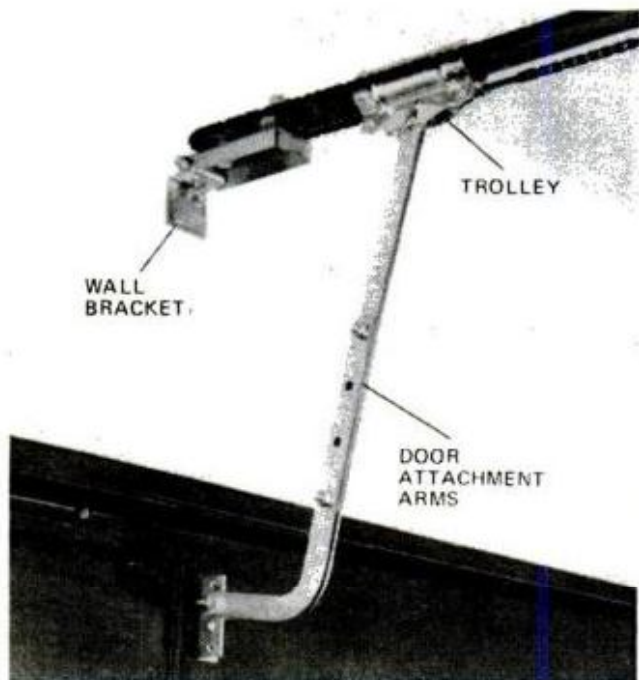
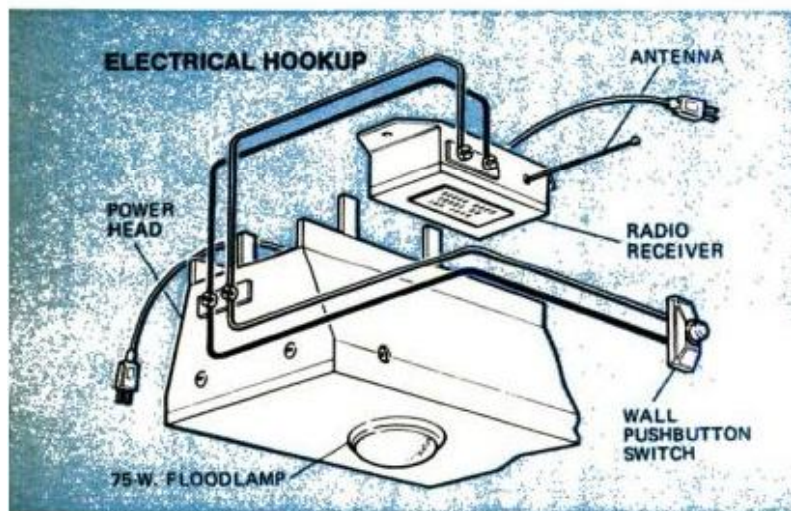


**TOP VIEW OF POWER HEAD** (left) shows how limit lugs on chain force open spring-held UP and DOWN switches as they pass and strike two pivoting brackets

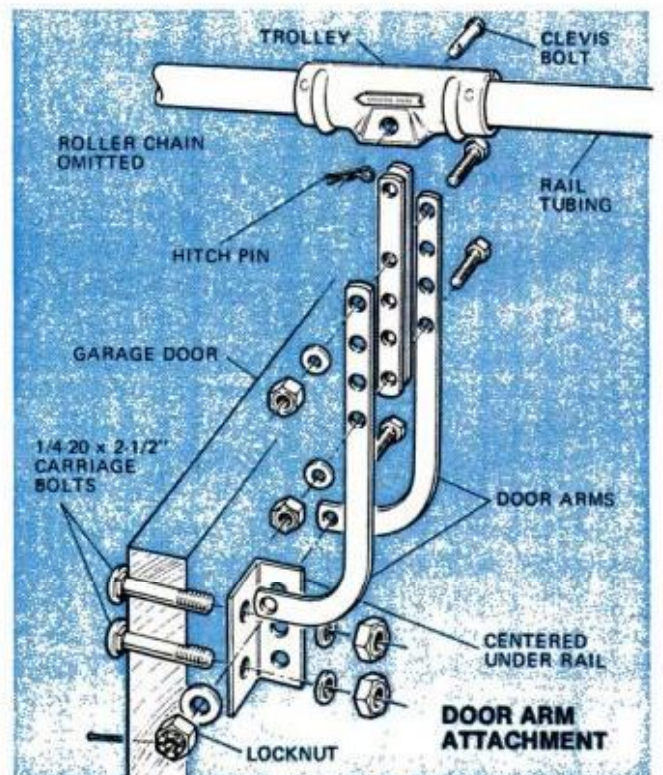
head and the solid-state receiver come with 6-ft. plug-in cords that make "wiring" a simple thing when an outlet and receptacle are installed in the garage ceiling. When this is not feasible, surface-mounted extension cords can be used to plug the units into an existing nearby wall outlet. The receiver and wall switch are connected to the power head with a two-conductor wire which is furnished. Ideal location for the wall switch is at the door leading to the garage. Additional wall switches can be mounted at various locations to provide several control positions.

The diagram at the left shows how a two-conductor wire is connected to the terminal strip on the side of the receiver and to a similar one on the end of the power head. The receiver should be mounted on the ceiling, of course, on either side of the power head, so the antenna is fully exposed to the front of the garage. It is important that the receiver's antenna *not* point toward or away from the door.

Complete easy-to-follow instructions are provided with the operator along with a troubleshooting chart. For more information and exact prices, write to Helpmate Equipment Co., First and Lake St., Baroda, Mich. 49101. ★ ★ ★



**ADJUSTABLE DOOR ARMS** attach to trolley with a clevis bolt. Arms are detachable for opening door manually and attach to door with two carriage bolts



Everything you need  
to know about bathrooms but  
didn't know enough to ask



A consumer's guide to better bathrooms  
from the Eljer Plumbingware Division  
Wallace-Murray Corporation

## A consumer's guide to better bathrooms

Like most people you probably judge bathrooms more by their decor than by their plumbing fixtures. Right?

Bad move. You change bathroom decor many times but you may only get one shot at selecting the right plumbing fixtures.

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The brochure isn't technical, just factual and free. It's a must if you're about to buy or build, or remodel a home. If you'd like a copy, complete the coupon below and send it to us.

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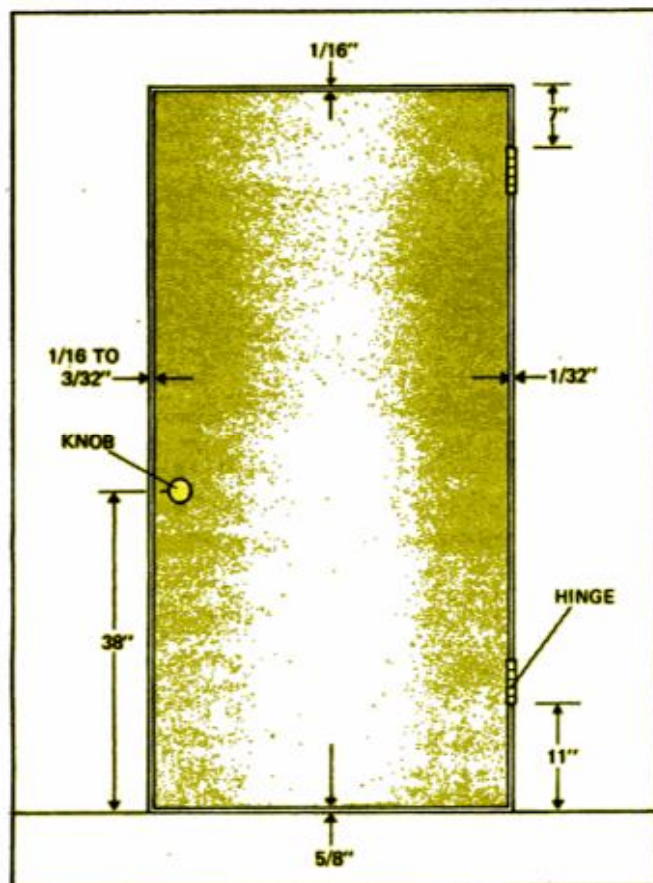
Eljer Plumbingware Division/Wallace-Murray Corporation

# How to hang a door

**I**T TAKES CARPENTRY SKILL to hang a door so it swings properly—opening and closing as it should. But the average handyman, armed with knowledge, the right tools and a little common sense, can accomplish the job successfully. Here, PM sup-

plies the know-how (architectural standards plus techniques). Now it's up to you to supply the common sense and muscle. Once you have hung a door correctly, you have acquired a valuable basic skill.

*(Please turn to page 176)*

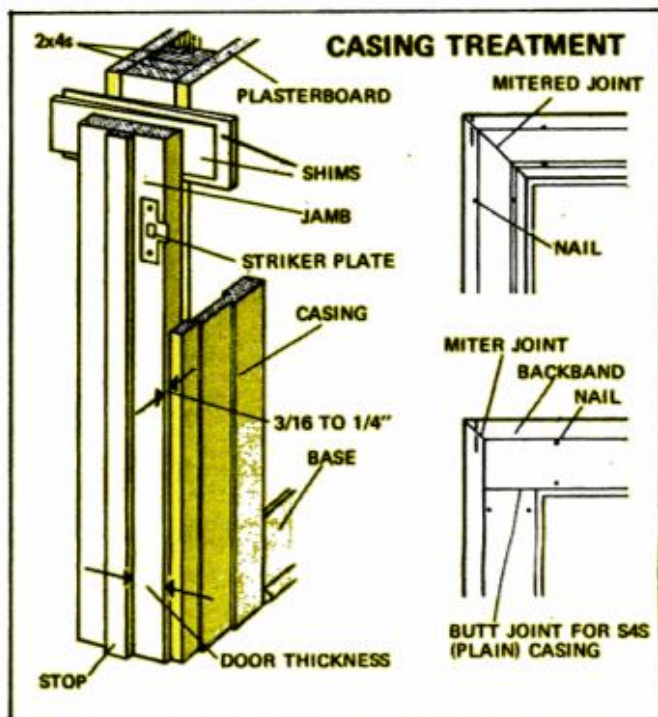


## Door clearances you should use

Door clearances and locations for door hardware are standard, as shown. If a third hinge is needed (exterior door), space it midway between top and bottom hinges. On exterior doors, allow clearance at bottom for threshold.

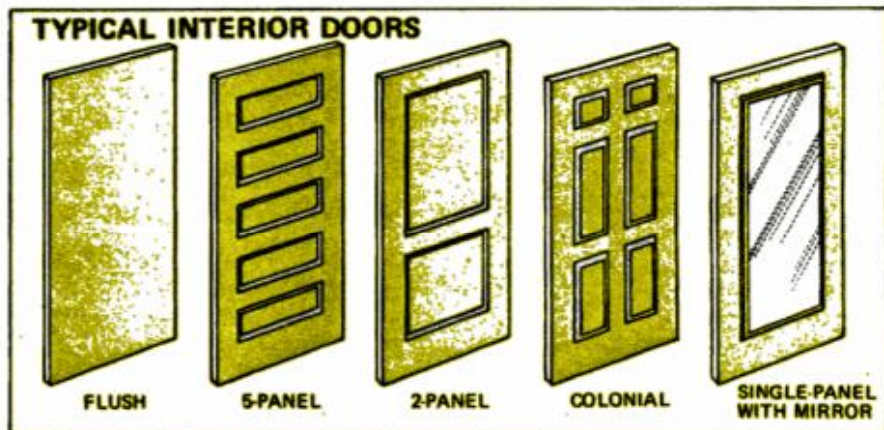
## General types of interior doors

Basically, there are two types of interior doors—panel and flush. Thickness is  $1\frac{3}{8}$  in. (exterior doors,  $1\frac{3}{4}$  in.) and they come in varying widths and heights. Flush doors have plywood facings, lightweight cores; panel doors have solid stiles and rails with plywood panel inserts.



## Door frame and trim

To set an interior door frame (jamb), wedges or shingles are used between side jambs and the rough opening. When jambs are set flush and plumb, the wedges are driven tightly and jambs are nailed to studs with 8d finishing nails through the shingles. Casings are nailed to the framing studs and the jamb with 8d and 6d nails, respectively. Two types of casings are shown. Use mitered corners on shaped type, 4d finishing nails to hold miters closed tightly.



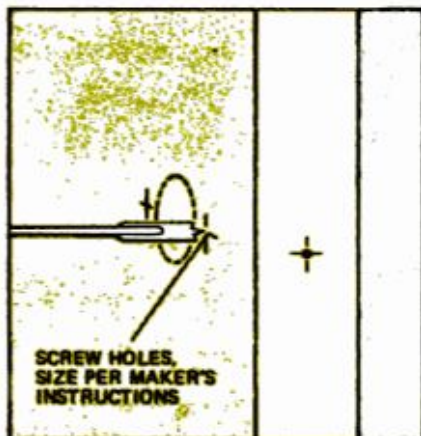
# Marlboro



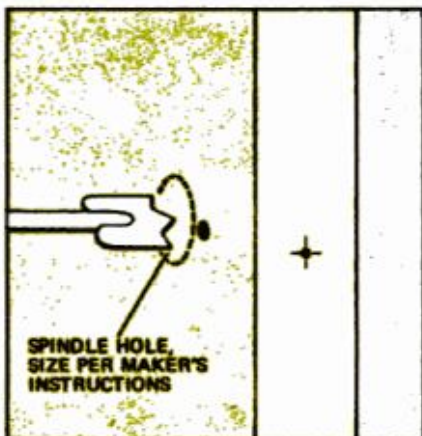
Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

Kings: 18 mg. tar, 1.3 mg. nicotine —  
100's: 19 mg. tar, 1.5 mg. nicotine — Lights: 13 mg. tar, 1.0 mg. nicotine —  
Menthol: 16 mg. tar, 1.1 mg. nicotine av. per cigarette, FTC Report Aug. '72

## How to install a common lockset in a door



**1.** The lockset shown here is the most commonly used type. Template packed with it is used to locate exact points for drilling required holes. After marking locations, remove template and drill holes.



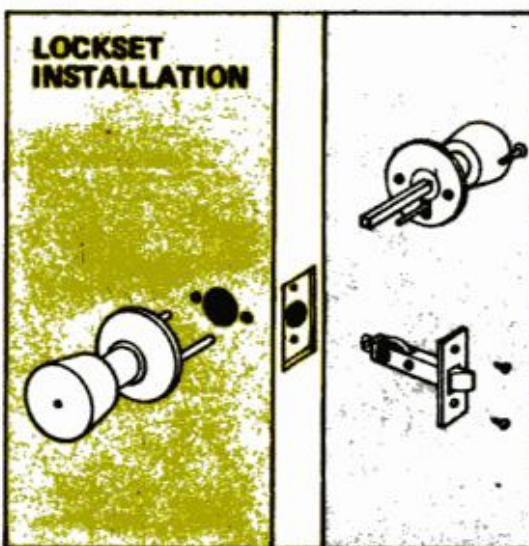
**2.** Next, bore large hole for spindle. If preferred, one large hole, usually of  $2\frac{1}{8}$  in. dia., can be used instead of 3-hole installation shown. You need a hole saw and you must drill a pilot hole for hole saw to follow.



**3.** Bore a  $\frac{7}{8}$  or 1-in. hole in edge of door to receive the latch. Insert latch and draw outline around latch-plate for the next step—mortising. Hold the drill perfectly level when boring all holes.

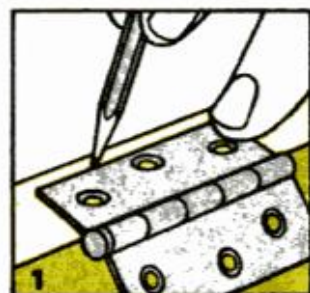


**4.** For craftsmanlike installation, use sharp chisel only. Remove stock and insert latch for test fit; plate must be flush with door edge or screwheads will project, effect fit.

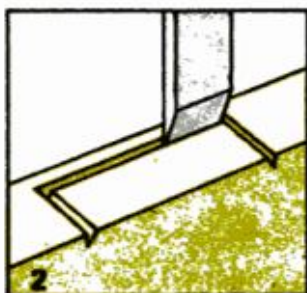


**5.** How lockset is inserted in door: Latch is permanently installed with flathead screws, then knob sections are inserted through latch mechanism and held fast by two machine screws. Swing the door to an almost closed position and mark where striker touches the jamb. Then locate the striker position. To install, drill hole for latch and mortise out jamb for plate.

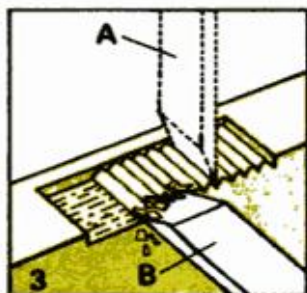
## Fitting and installing the hinges



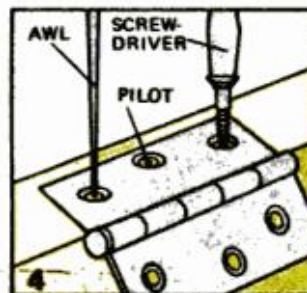
First, locate hinge positions by wedging door in opening with shingles. Then, with door on sawhorses, use a sharp pencil to outline mortise.



A trick professional carpenters use is to then score the pencil outline with a sharp utility knife. Next, make deeper outline, cut with your chisel.



Make repeat feather cuts (A) about  $\frac{1}{4}$  in. apart to depth of the hinge thickness. Hold chisel on depth line (B) and tap to remove scored stock.



Hold hinge in place, make pilot holes with awl. Turn screws so hinge is flush with door. If mortise is too deep, raise the hinge with shims.



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Olympic Stain. A division of COMERCO, INC. 

Insulation designed for use between furring strips on masonry walls is called Pre-Panel by Johns-Mansville



## How to install insulation

**T**HERE ARE FOUR GOOD REASONS why you should insist on adequate insulation when buying a new home or remodeling an existing one. *First:* The cost of heating and cooling in any given locale is proportional to the heat-loss/gain factor of the dwelling. You pay for heat and cooling that escapes through those walls. *Second: Comfort.* Insulation, installed properly, eliminates drafts and increases comfort appreciably and measurably (by the thermostat). *Third:* Acoustical privacy, particularly important if you own a multiple dwelling. Insulation in wall and floor cavities helps to reduce airborne noises, such as loud voices, and impact sounds, such as heavy footsteps. And *fourth:*

*(Please turn to page 181)*



# PUBLICATIONS **WORTH WRITING FOR**

**PM'S PICTURE-TOOLS** are a great new idea to take the confusion out of *what goes where* on workshop and tool panels.

The complete PM **PICTURE-TOOL KIT** consists of seven big sheets (9¾ x 11¾ in.) of a special heavy-weight paper with a pressure-sensitive adhesive on the back. On each sheet are beautiful drawings of hand tools and portable power tools—all you're likely to have in your shop (74 in total). Most are full size; the others nearly so.

Also enclosed in the kit is a blank sheet of the same special paper, printed in an overall color to match the tools. This sheet enables you to design your own drawings of special tools.

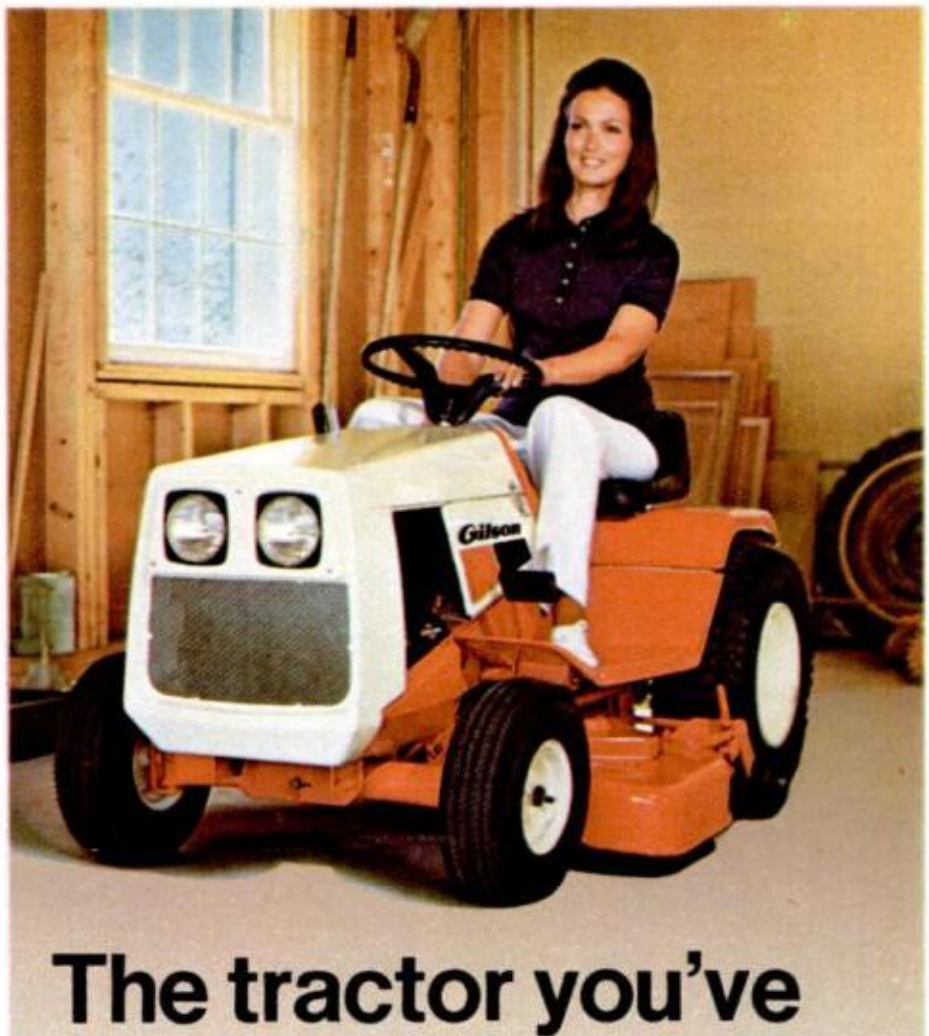
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APRIL 1973



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## **Gilson**

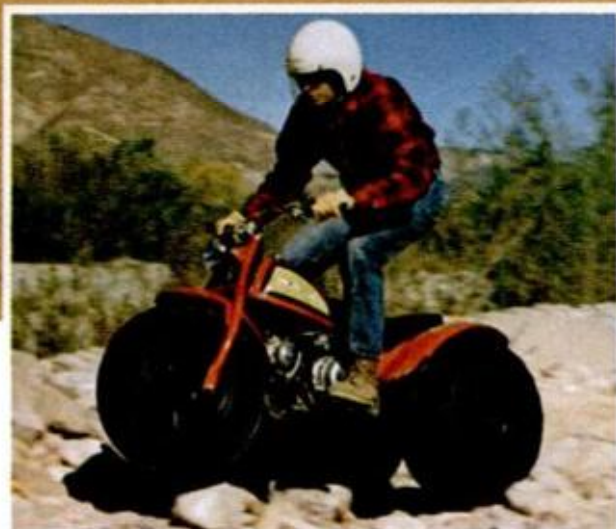
**A great machine to have in your corner.**

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## Or rough.



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course, both have the Honda overhead cam four-stroke single-cylinder engine. Famous for its dependability.

Since these are off-road vehicles only, Honda has made them with the protection of the environment in mind. Both have quiet, spark-proof USDA-approved spark arrestor/mufflers. For your safety, each has an ignition cut-off switch right next to the throttle so you can stop the engine quickly. And for your convenience, they both can

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From Mighty to Mini, Honda has it all.

For safety, we recommend that you always wear a helmet and eye protection, keep your lights on and check local laws before you ride. ATC is a Honda trademark. For a free color brochure, write: American Honda Motor Co., Inc., Dept. PT, Box 50, Gardena, Calif. 90247. ©1973 American Honda Motor Co., Inc.

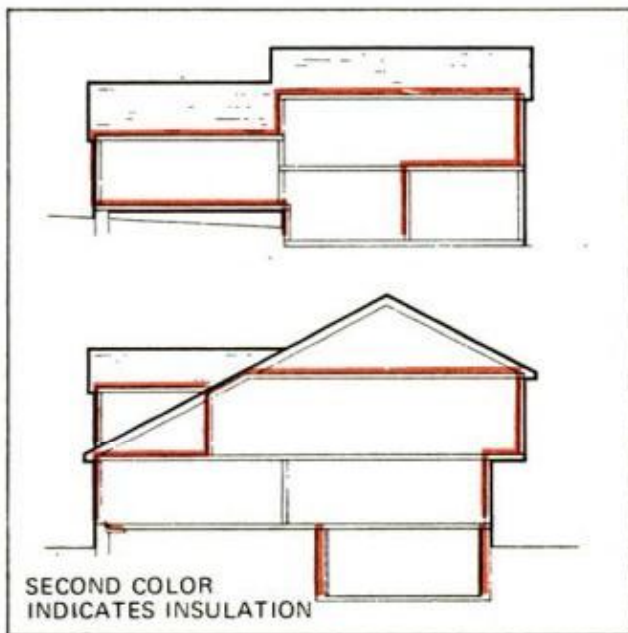
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## HOW TO INSTALL INSULATION

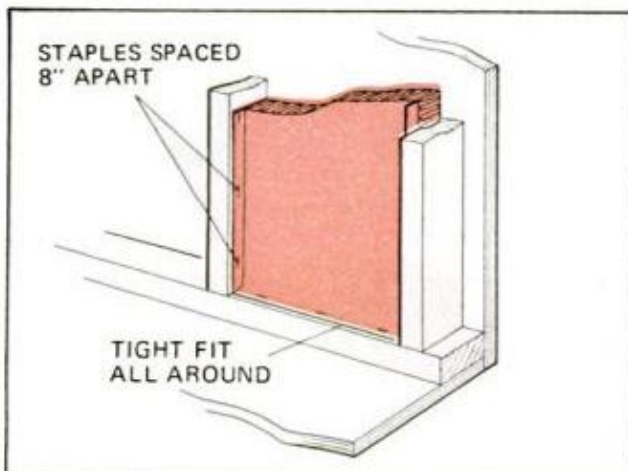
*(Continued from page 178)*

A reason seldom considered when insulation is being discussed—its effectiveness as a fire barrier. Mineral-wool insulation is noncombustible; when it fills a wall cavity, it acts as a deterrent to the vertical spread of fire. In fact, if the walls in new construction are filled with insulation, then

*(Text continues on page 184)*

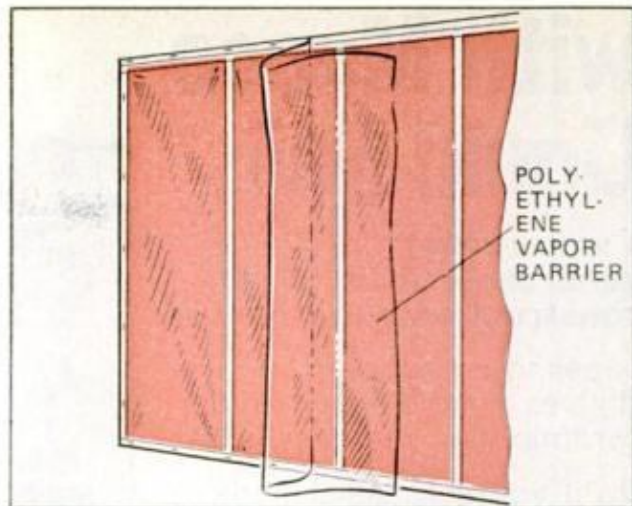


**EFFECTIVE LOCATIONS** for insulations are indicated by colored lines in the drawing above. To assure that your home is free of moisture problems, remember that you must install adequate vapor barriers. If you use one of the types of insulation that comes without a vapor barrier, install polyethylene, as described on page 182. The vapor barrier is always installed between insulation and interior of home

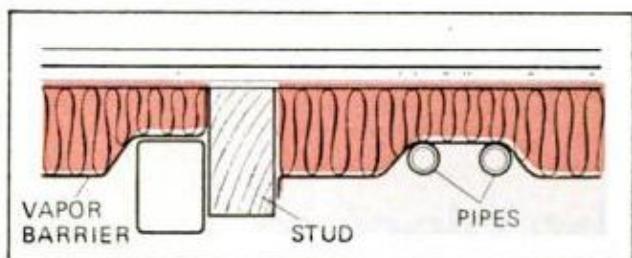


**BLANKETS** should be pushed into stud spaces so they touch siding or sheathing. Working from the top down, space the staples about 8 in. apart, pulling flanges to fit snugly over studs. Cut the blanket end slightly overlength and staple through the vapor barrier to the plates by compressing the insulation

*(Installation details continue on page 182)*



**WHEN YOU USE** pressure-fit blankets without a vapor barrier, wedge them into place and then cover the wall with 2-mil-thick polyethylene vapor barrier stapled to the top and bottom plates. Unroll the sheet to cover the entire wall area, including window and door openings, then cut to length. Staple to end studs, cut out openings and staple around openings



**IF OBSTRUCTIONS**—ducts, pipes and the like—are located in your wall cavities, push insulation behind (to the cold side in winter) those pipes before stapling. Or you can pack the space with loose insulation or cut a piece of blanket insulation to fit the space. If you do pack the space with loose insulation, make certain you cover it with 2-mil polyethylene



**USE SCRAPS** of insulation to stuff into small spaces between rough framing and door and window heads, jambs and sills. You can fill even the narrowest cracks by using a putty knife to force the pieces of insulation in until the crack is filled. Staple scraps of the insulation vapor barrier, or polyethylene, in place to cover those small stuffed spaces

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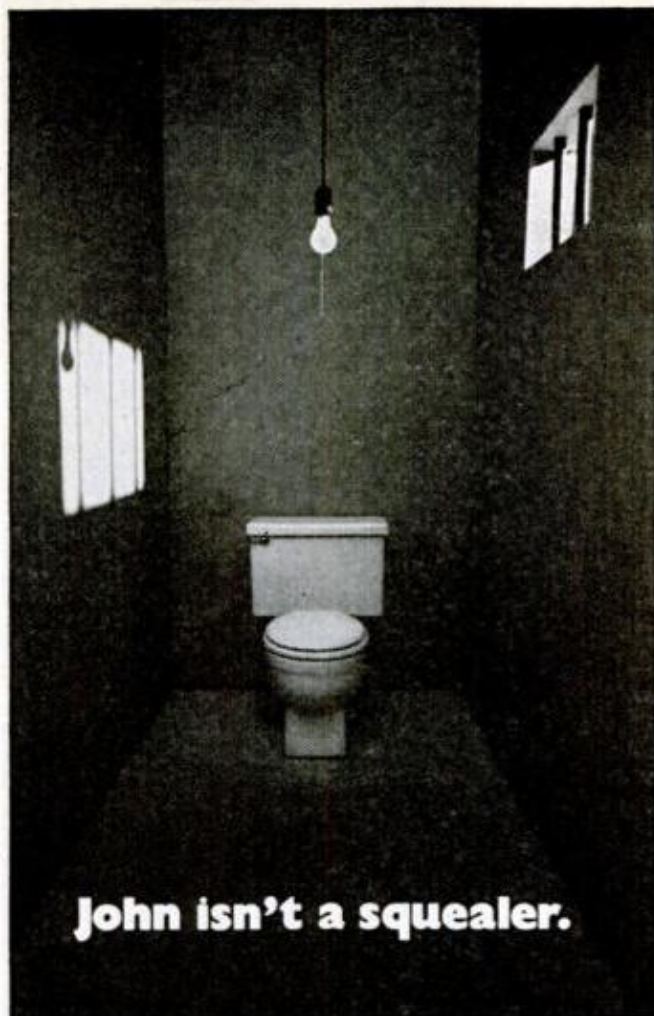
Not the traditional movable-blade contacts. Not the usual spring assembly. Instead, you see a contact capsule that contains mercury. The same 99.99999% super-pure mercury used in missile and rocket control systems. This liquid metal flows within the capsule when the switch handle is tipped, to make or break the electrical contact.

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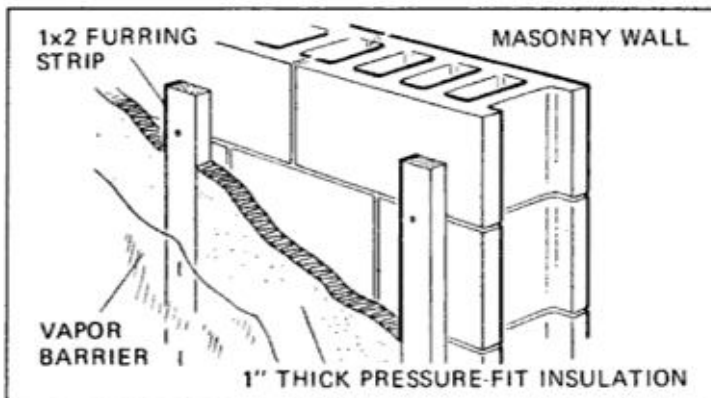
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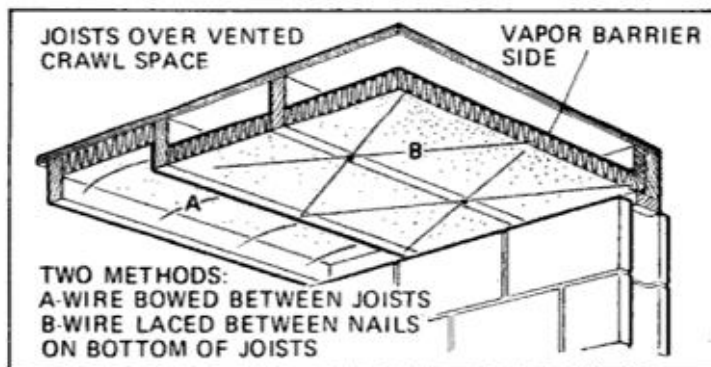
# HOW TO INSTALL INSULATION

(Continued from page 181)

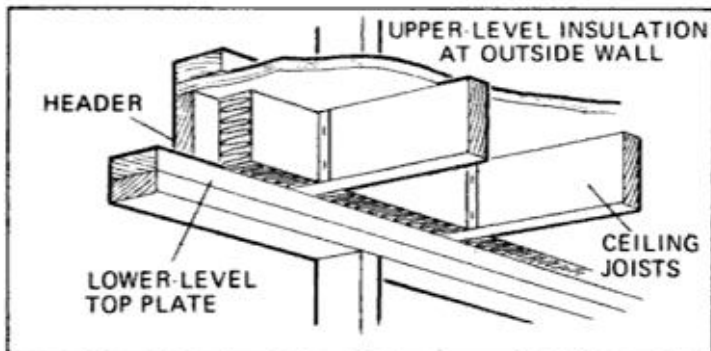
fire-blocking (fire stops) can be eliminated. What you will thus save on labor and materials can be deducted from your insulation cost. ★★



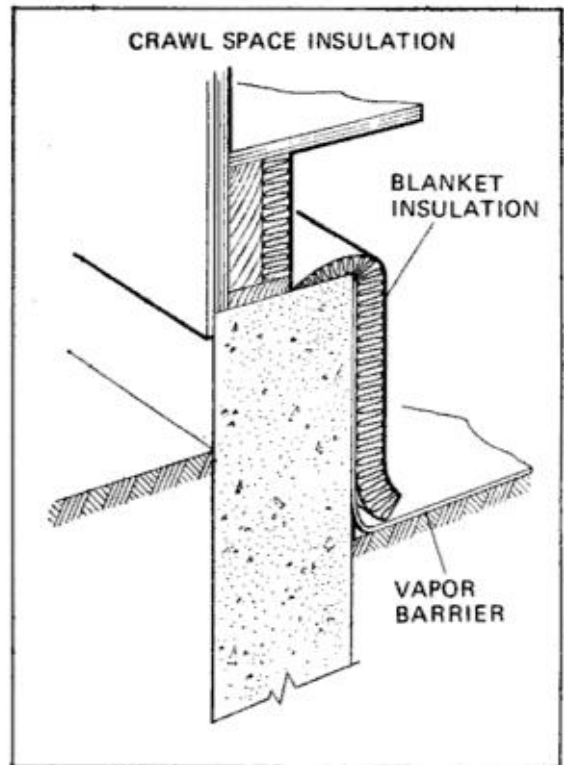
**EASIEST WAY TO INSULATE MASONRY WALLS** is to space nominal 1x2 furring strips 16 in. on center with nominal 1-in. pressure-fit masonry-wall insulation between strips. Cover with polyethylene vapor barrier. If you prefer 2x2 furring, and use R-7 insulation (with vapor barrier), strips can be spaced 24 in. o.c. This insulation backs up wall panels



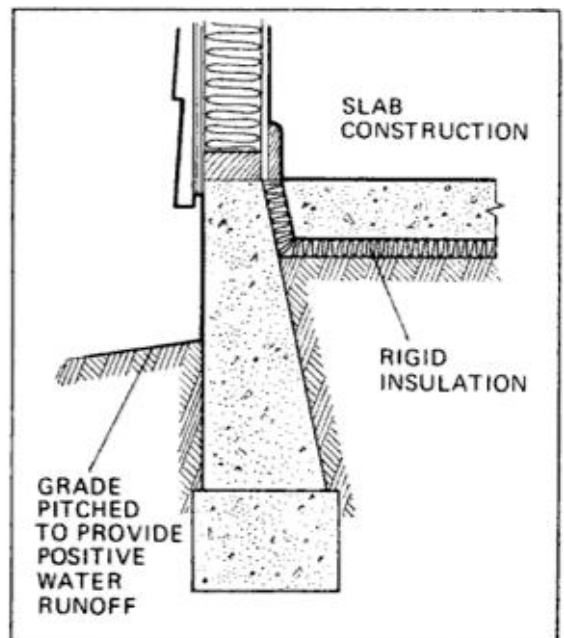
**FLOOR OVER VENTED CRAWL SPACE** can be insulated if insulating material is held between joists, using either of these methods: (A) By using heavy-gauge wires pointed at both ends, made especially for this purpose. Just bow wires and wedge them underneath insulation between joists. (B) By lacing wires between nails placed in bottom of joists



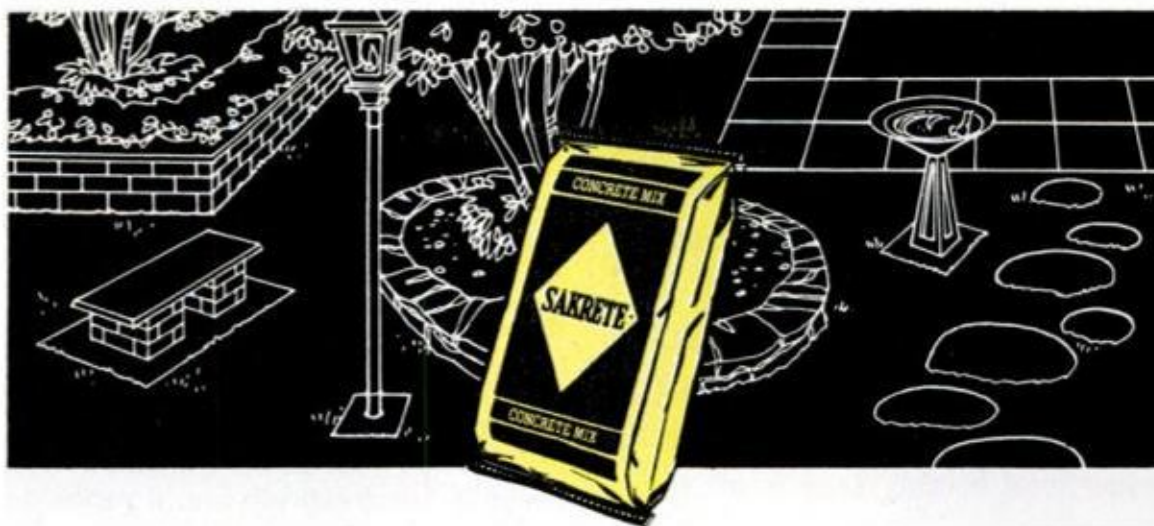
**HEADER JOIST** should be covered with insulation, too. You can do it by wedging oversize pieces of blanket insulation between joists behind the band of header joists and stapling edges to the joists. Or, when you are using insulation at the bottom of joists, you can insulate the header joist by "folding" the end of the blanket 90°, pushing it back against the header and then driving in a few staples



**FLOOR OVER UNVENTED CRAWL SPACE** usually can be insulated more economically as shown above than by methods given at left for floor over vented crawl space. Spread the vapor barrier over ground in crawl space, let it turn up onto the walls and hold it there with tape. Then place one edge of the blanket insulation on top of the foundation wall and let it drape over and against the inside of the wall. The vapor barrier must face inward



**SLAB-FOUNDATION HOMES** should always be insulated. The correct way is to lay a 6-mil polyethylene vapor barrier over tamped gravel and use rigid insulation between barrier and slab. The same material should also be used for perimeter insulation, installed as shown. For any insulating job, don't scrimp on quality or thickness. The material is relatively inexpensive and you will recoup its cost in the form of heating and cooling savings



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I am a homeowner. My house is  wood siding  other.

## The right way to paint a room

### Home Ideas Guide

**I**F WIELDING a paintbrush or roller is a new experience for you, you're apt to do a first-rate job just because you are a beginner. In their eagerness to slap on the paint, many "pros" often can't be bothered with important points of wall preparation that make the difference between a hurry-up job and a professional-looking one.

Before you lift a brush or roller, examine plaster walls for cracks and mars. Fill small hairline cracks carefully with spackling compound, using a putty knife, kitchen utensil or even your thumb and finger. Larger cracks should be filled with special patching plaster. In the case of large cracks, it is best to chisel out a triangular channel in the plaster, narrow on the surface and wider inside. Press the plaster into the channel through the narrow opening. When the patching filler is thoroughly dried, simply sand the surface smooth, and you're ready to apply an un-

*(Please turn to page 188)*

### COLOR DOS AND DON'TS

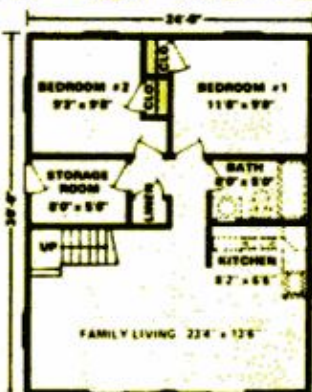
- DO** use light colors in a small room to create an impression of size.
- DON'T** use a bright color in a large area or the walls will detract from otherwise decorative furnishings and accent pieces.
- DO** have continuing color flow through your home—from room to room—using harmonious colors in adjoining areas.
- DON'T** paint woodwork and trim of a small room in a color which is different from the background color or the room will appear cluttered and even smaller.
- DO** paint ceilings of a room in a deeper color than walls, if you want it to appear lower—and in a lighter shade for the opposite effect.
- DON'T** paint unfortunate architectural features—such as radiators, pipes and similar projections—in a color which contrasts with walls or they will be emphasized.
- DO** study color swatches in both daylight and night-light, because colors often change under artificial lighting.
- DON'T** choose neutral, negative or "noncolors," just because they are safe, or you may forfeit attractive decorating.
- DO** emphasize horizontal lines in a room that is too tall, and emphasize vertical lines in a room with a low ceiling.



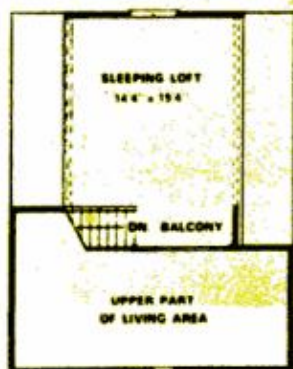


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foundation. It has two bedrooms and a large sleeping loft . . . plenty of room for the family. Other models are also available at equally affordable prices. Custom-tailored finishing packages (interior trim, plumbing, etc.) are available to complete your dream home.

\* Exclusive of taxes and delivery — slightly higher in Wisc.

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## RIGHT WAY TO PAINT A ROOM

*(Continued from page 186)*

dercoating or primer to seal the patch.

If your ceiling is quite high, it will be necessary to rig a raised platform from which you can easily reach its surface. Two sturdy stepladders and a wide plank will serve your purpose. Always remember to place your plank so that it extends at least a foot beyond the step of the ladder on which it rests.

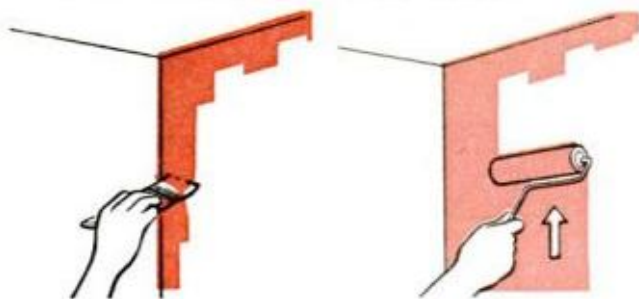
Next, remove all hardware from doors and windows, loosen the canopies on your lighting fixtures, or cover these areas with masking tape and newspaper or cloth. This will make your painting job easier and give you a chance to clean and polish the metal until it looks like new.

Dust your walls thoroughly with a dry mop, except in the kitchen or bathroom, where walls are likely to be covered with grease, or steamed-on dirt. These walls will need to be washed with a household cleanser before they're ready to be repainted.

You're now ready to paint, but even

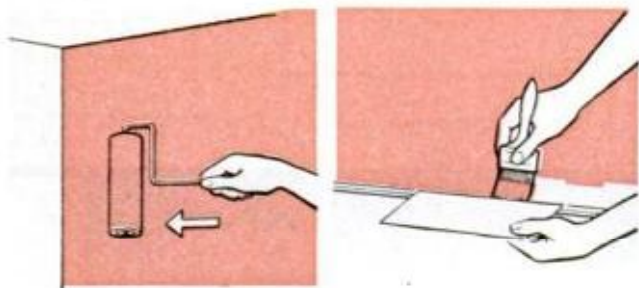
*(Please turn to page 203)*

### When using a roller . . .



**1** Brush on a strip of color about 12 in. in width just below ceiling line. Paint out from all inside corners from the ceiling to the baseboard

**2** Always roll upward with freshly loaded roller. Start short distance from brushed area; work toward it. Limit rolling to 2-ft. strips



**3** After you coat area of about 2x3 ft. with up and down strokes of your roller, go over all of this area using side to side roller strokes

**4** At bottom of walls, use a brush wherever the roller can't reach. Use of cardboard guard will help to keep the paint off the woodwork

POPULAR MECHANICS

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**The Army Reserve.  
It pays to go to meetings.**

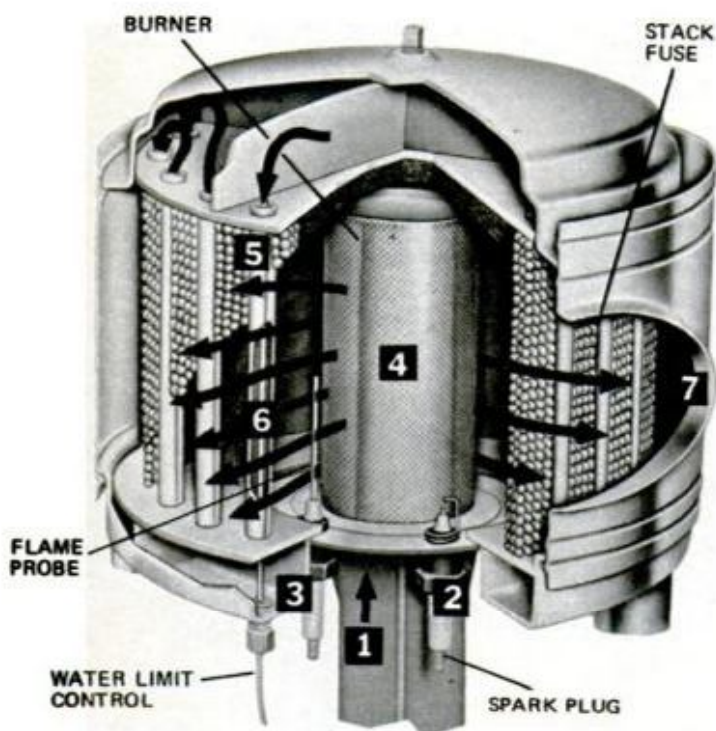
# New compact heating / cooling system stands outdoors

**Home  
Ideas  
Guide**

**A** BASEMENT FURNACE in your home could be a thing of the past. Amana has moved it outdoors and put it inside a standard central air conditioner to provide a combined heating-cooling system that requires only 8 sq. ft. of space.

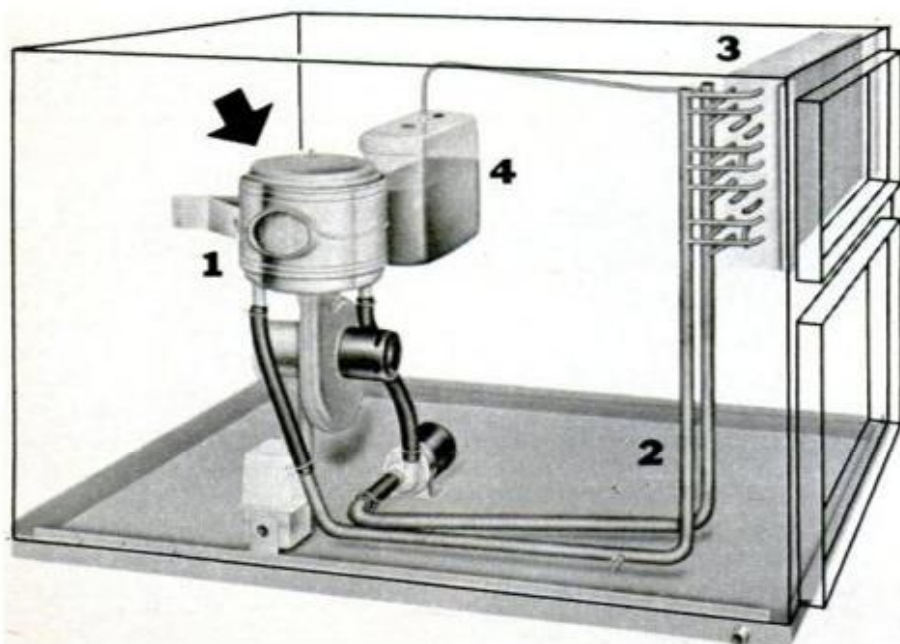
Using an HTM (heat-transfer module) burner only 9 in. in diameter and 9 in. high, this tiny forced-air gas "furnace" (left, and below) has the capacity—120,000 B.T.U.—to heat the average home more efficiently and economically than the usually installed heating plant. Its two-stage, fuel-saving burner adjusts automatically to outside temperature. A low "fire" at 80,000 B.T.U. heats your house on mild days; a high "fire" at 120,000 B.T.U. does the work on cold days.

Starting with a sparkplug instead of a



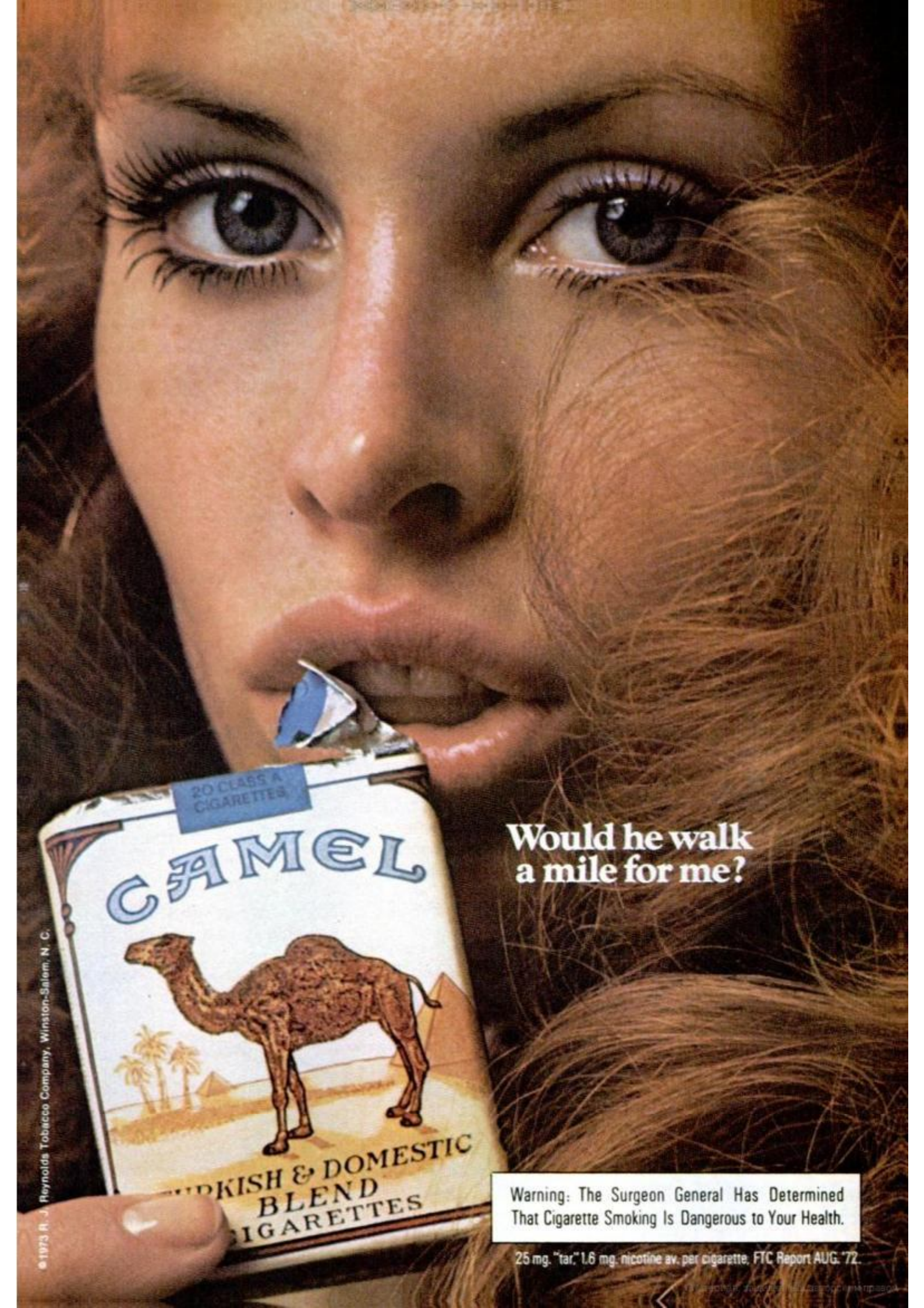
## HOW THE HTM BURNER WORKS

1. Gas is pulled from the gas valve by the combustion blower into the HTM (heat-transfer module) burner.
2. A sparkplug ignites the gas-and-air mixture in the burner.
3. A flame probe monitors the burner to give proof of combustion. If combustion doesn't occur, the flame probe will close the gas valve.
4. The stainless steel burner provides 9000 tiny flames that produce extremely hot flue gases.
5. Heat is transferred to an energy-storing liquid in the tubes as hot gases pass through a porous matrix, creating high turbulence to produce rapid heat transfer.
6. High-temperature limit control keeps solution from overheating. If it should overheat, limit control will shut down the system.
7. Gas burned produces 7 percent more usable heat because less heat escapes through the exhaust flue.



## HOW FURNACE WORKS

High-temperature gases created by the HTM burner (1) pass through a porous matrix of fused steel balls in which steel tubing is embedded. A liquid (ethylene glycol) is pumped through tubing (2) to carry off heat. Hot liquid flowing out of HTM then circulates through coil (3) and heated air is forced by blower through the fins and into ducts of the house. Cooled-down liquid is then returned to pump and another cycle begins. The increased volume of the heated liquid moves into an expansion tank (4) which provides a reserve storage area.



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To prepare a surface for painting, remove loose, flaking or blistering paint with a Red Devil **Paint Scraper**. Its precision-ground blades reach into tight corners.



For sealing openings around door and window frames, use Red Devil **Caulk**. Unlike oil-base caulk, it flows on smoothly — and may be used under any paint without staining, bleeding-through or cracking. It requires no priming, and stays flexible for years.



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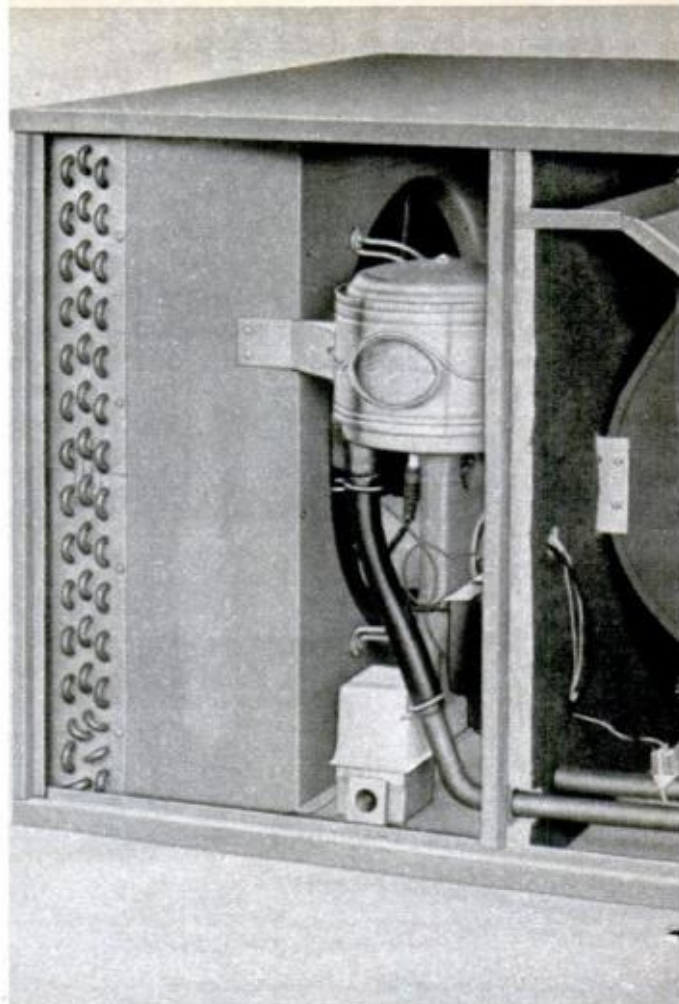
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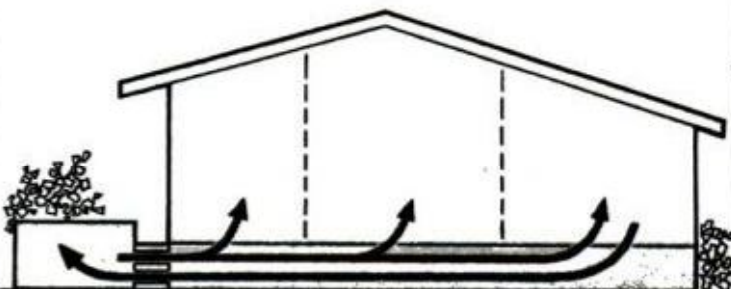
DEPT. M

OLINKRAFT, INC. Building Components Div.  
P.O. Box 21159, Louisville, Kentucky 40221



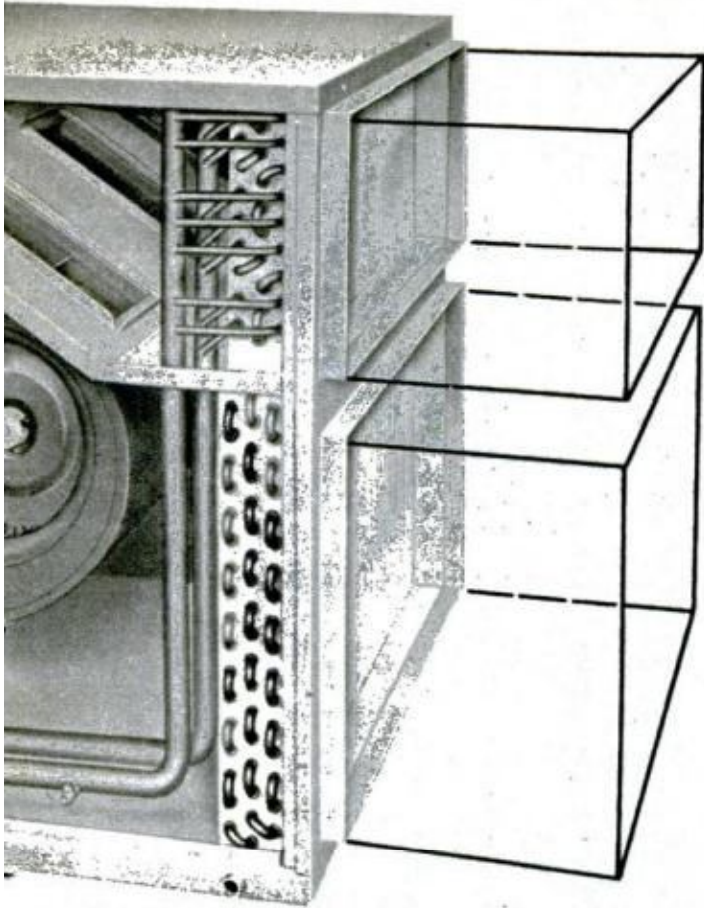
pilot light, the unit is claimed to deliver heat to registers in 15 seconds. Nine heat sensors and relay controls keep close tabs on its water thermostats and flame probes. Perhaps it's one of the safest gas furnaces made—the HTM burner holds only about 1/10 cu. ft. of gas/air mixture compared to 3 or 4 cu. ft. in a conventional furnace. And because of indirect heating with a solution, gas or combustion vapors can't get into the home.

For cooling, a standard central air conditioner (shown above, with side removed) is available in sizes ranging from 24,000 to 60,000 B.T.U. It's combined with the furnace in a case no larger than it



**TYPICAL INSTALLATION** shows how air flows out of home, through unit for reheating and back into rooms

POPULAR MECHANICS

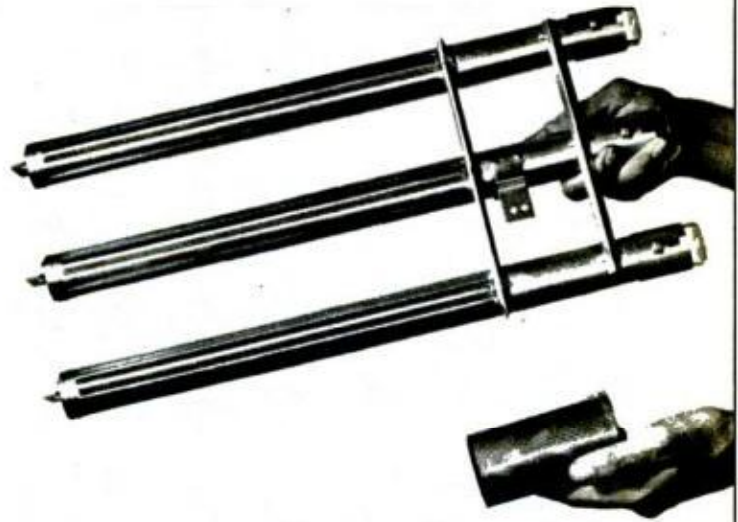


**DUCT EXTENSIONS** pass through wall of house to join unit to existing or new heating ducts installed inside

would be to house the conditioner alone.

The unit comes prewired; it needs only gas and electrical hookups. New or existing ductwork is simply extended from the house through an outside wall. For more information, write to Amana Refrigeration, Inc., Amana, Iowa. ★★★

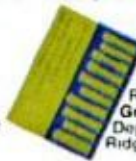
**CONVENTIONAL GAS BURNER** shown with HTM burner that produces thousands of tiny, very hot flames



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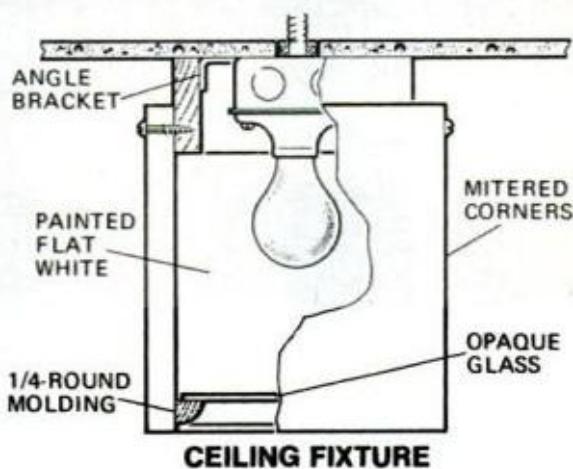
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## GLAMOR KITCHEN LIGHTS

(Continued from page 161)



**SIMPLE BOX FIXTURES** with corners mitered are made to slip over inner wood sleeves attached to ceiling

yet makes lamp replacement an easy task.

Lamps under cabinets are shielded from view by a faceboard attached to the fronts. Use Deluxe Warm White lamps here; wattage depends on the total countertop area. Lamps over draperies are shielded so light spills out top and bottom. In all cases, rear side of faceboards should be painted flat white.

Attractive modern downlight fixtures are simple to make by placing boxlike assemblies over ceiling-mounted junction boxes fitted with porcelain sockets. ★★★



# How to install plastic 'beams'

## Home Ideas Guide

**S**IMULATED "hand-hewn" wall and ceiling beams offer one of the easiest ways to add decorator elegance to an interior remodeling job.

Available prefinished and ready-to-install, the easy-to-work beams can even be cut with a bread knife. They're applied using adhesive, nails or a clip-system designed by the manufacturer. Unfinished beams—which can be stained or painted as you prefer—are available by special order.

Ceiling beams come in 8 to 18-ft. lengths (in 2-ft. graduations); wall beams are sold in 8, 12 and 16-ft. lengths. The accessories available for use with the beams include matching corner braces with 45° mitered ends, recommended adhesive for best results, matching stains to disguise any marks, and simulated hand-hammered brackets for covering beam joints. For more information and sources, write Paeco, Inc., Dept. PM, 500 Market St., Perth Amboy, N.J. 08861.

PHOTO BY WILLIAM OAKLEY



**WARMTH AND CHARM** of 200-year-old beams is captured realistically with replicas of expanded urethane

*(Please turn to page 197)*

# "One bathroom to go please."

Introducing Versa-Bath, the latest innovation from Borg-Warner. Because the bathing area is such an important part of the total bathroom, Versa-Bath can transform an ordinary bathroom into a room that is a decorator's delight. What is Versa-Bath? It's a four-piece bath/shower cove made of fiberglass bonded together with sturdy, rigid, Miracril Acrylic®. It's leak proof, stain resistant, acid resistant, and comes in Borg-Warner decorator colors to match other Borg-Warner bathroom fixtures.

The complete four-piece cove is packaged in a single carton that's only 24" x 35" x 62" — which means you can take it home with a car as small as a Volkswagen and carry it through any standard doorway.

The unit's wall panels are rigid and self-supporting and require no extra subwalls. And because Versa-Bath assembles entirely from the front, it can be installed in a bathroom as narrow as 5'. You will find cleaning your Versa-Bath a pleasure. Just wipe it down with a mild detergent and water, and it will retain its original lustre.

This new unitized bath/shower cove system is just one of the many innovative products that make the Borg-Warner Bathroom — a concept that includes a colorful selection of coordinated bathroom fixtures for new homes or remodeling.

Remodelers will find Versa-Bath sold in carry-out form at leading building supply stores nationally. Why not stop and look at one today.

For your nearest Borg-Warner Dealer call this special number free, 800-243-6000, anytime, any day. Dial as you normally dial long distance. (In Connecticut dial 1-800-882-6500). Or write Borg-Warner Corporation, Plumbing Products Division, Mansfield, Ohio 44902.

  
*The Borg-Warner bathroom*

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Solid V-4 engineering that puts big power in a com-

pact, easy to fish-see-ski over shape. And a low center of gravity to provide more stability in turns.

And you can add an extra-cost power trim and tilt accessory for on-the-move adjustments in boat attitude as load and water conditions change.

The 135. More engine than you bargained for.

For boats rated for less horsepower, look over our 115 and 85 hp Vs with the same features. Or the mid-sized 65 and 50 hp. Our 12 power choices start at 2 hp.

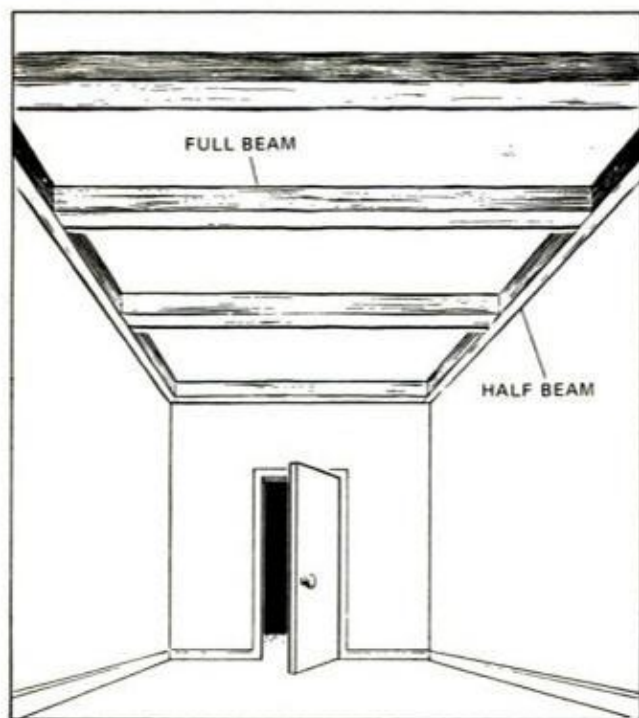
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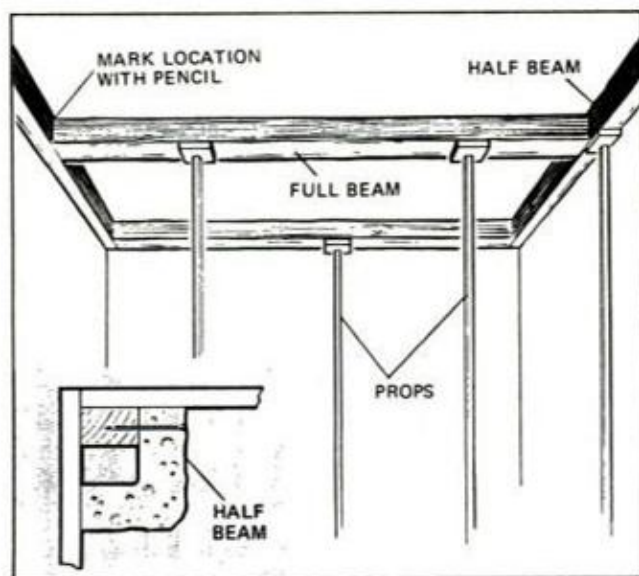
Division Outboard Marine Corporation. Write for our free catalog. Johnson Outboards, Sea-Horse Drive, Waukegan, Illinois 60085. Dept. PM-473

## INSTALLING PLASTIC 'BEAMS'

(Continued from page 195)



Before cutting any material, you would be wise to make a scale drawing of the room indicating beam locations. If the room is long and narrow, run the beams crosswise to provide the illusion of a wide room. The apron around the room, at the wall-ceiling angle, is created by using half-beams to make it seem that the other half is *in the wall*.



To assure snug butt joints, cut beams one at a time and temporarily prop them in position with thin sticks wedged between floor and beam (use block of wood under beam to prevent damage). To install half-beam apron permanently along ceiling line, first nail furring strip in the angle, then use adhesive and 8d finishing nails.

(Please turn to page 198)

## Try the joint fixer

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DAP Latex Caulk guns easily to fill cracks, joints and gaps in siding, around windows and doors. Takes paint after only two hours. Stops leaks. Won't stain, blush or bleed through paint.

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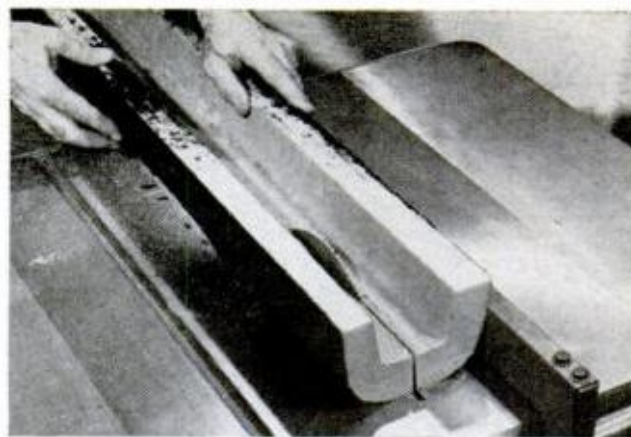
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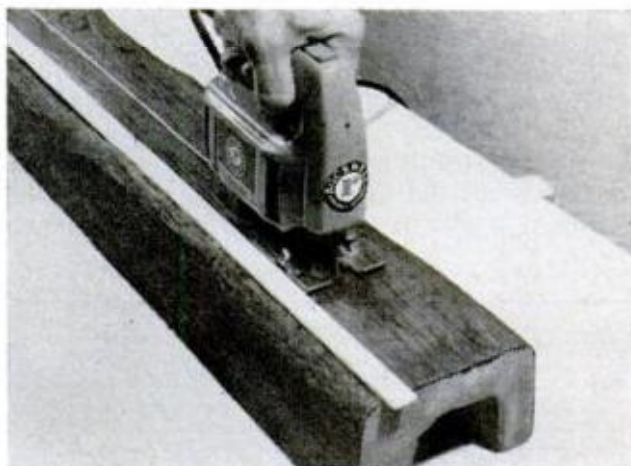
*Lindal homes are sold throughout the world.*

## INSTALLING PLASTIC 'BEAMS'

*(Continued from page 197)*



A table saw equipped with a fine-tooth combination or plywood blade is ideal for cutting urethane beams. If you don't have this equipment, the cutting will still be easy with a sharp, crosscut handsaw (and square)—it just takes slightly longer. To rip a U-shape beam, run it upside down (above) for safety and sufficient blade protection.



**BEAM CAN ALSO BE RIPPED** with a sabre saw after tacking a wood strip to the plastic for use as fence



**WHEN CROSSCUTTING**, if blade won't cut beam with one pass, make initial cut and turn over to complete

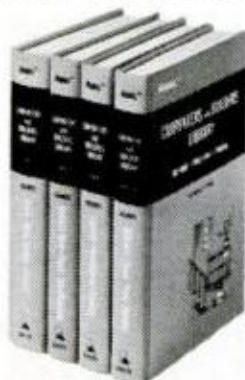
*(Please turn to page 200)*



**"For an amateur,  
he's a whiz.  
How'd he get  
so good?"**

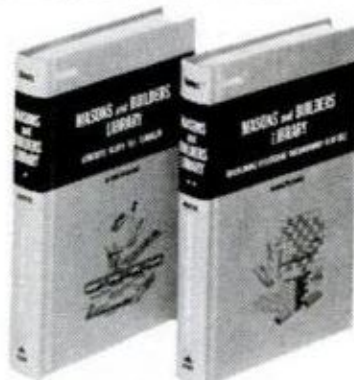
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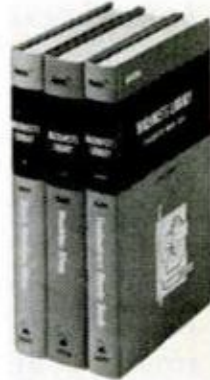
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For the man who takes care of his own yard.

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**\$99.95\***



It's the **6.9 lb.\* Mini Mac 1. Only McCulloch makes a saw this light, for this little.**

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← 20" →

**McCulloch**

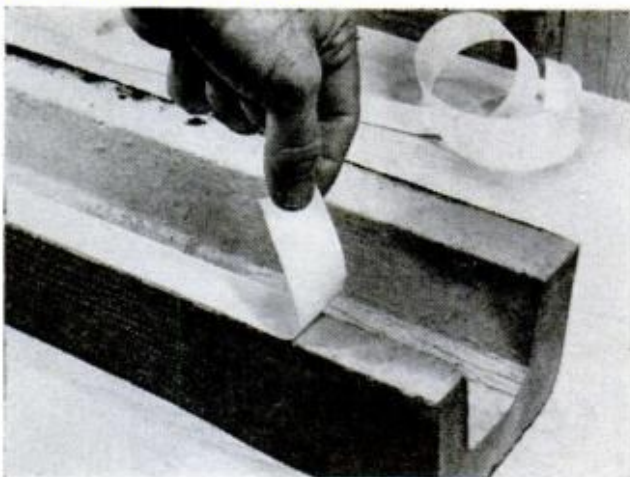
McCulloch Corporation, 6101 West Century Blvd., Los Angeles, Calif. 90045

\*Manufacturer's suggested list price, including bar and chain. Prices slightly higher in Canada and Alaska.

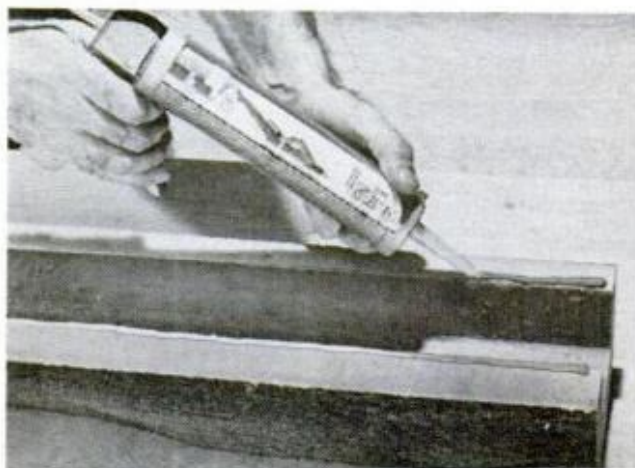
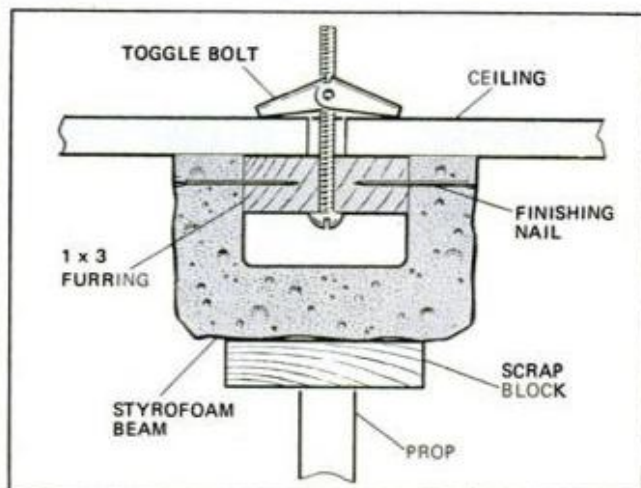
\*\*Weight less cutting attachments.

## INSTALLING PLASTIC 'BEAMS'

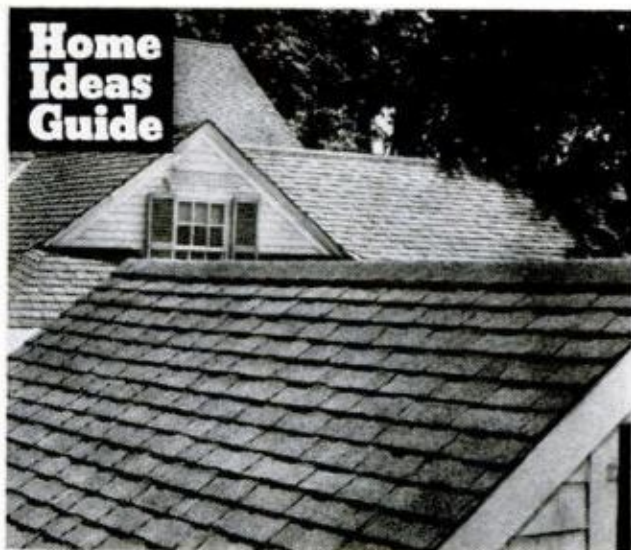
(Continued from page 198)



Techniques for attaching plastic beams: When using self-sticking beams (above), you just peel off tab and stick into place. If installing beams to be positioned between joists (drawing below), strike centerlines where beams will be applied, and then install suitable-width furring strips using toggle bolts. Beams are then secured to the furring strips with adhesive and 8d finishing nails. When applying adhesive with a caulking gun (photo, below), add it sparingly down the center of the beam surfaces to avoid squeeze-out on ceiling or wall when you press beams in place. Finally, set finishing nails, fill heads. ★★ ★



# New products for home improvement



**ROOF WITH THE RANDOM**, custom-style boldness of texture blends particularly well with most types of architecture—contemporary, colonial or mansard. Labeled Architect 70 Shingle, the heavy-duty material weighs 345 lbs. per square (100 sq. ft.) and carries the Underwriters Laboratories Class C fire label. Sold with 25-year warranty against manufacturing imperfection by Bird & Son, East Walpole, Mass. 02032



**THESE SELF-ADHESIVE** foam-rubber, cushion-backed carpet tiles create pattern through the use of texture. They can be installed in-line, color-mixed to personal taste or laid for parquet effect—by laying tiles at right angles to one another. Called Colony Point Tiles, carpeting can be installed outdoors as well as in. Available in five colors, 12x12-in. tiles sell for 79 cents each. Ozite Corp., Libertyville, Ill. 60048

*(Please turn to page 202)*

APRIL 1973

For the  
man who  
needs  
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to go



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Here's electric power where you need it, when you need it — on camping trips, outdoor building projects, for standby power during storms, blackouts and other power emergencies. McCulloch's super lightweight generators are small enough to fit in the back of your car. And the unique design, with only one moving part, means they're the most reliable you can buy. Three sizes, all with our Double Warranty.



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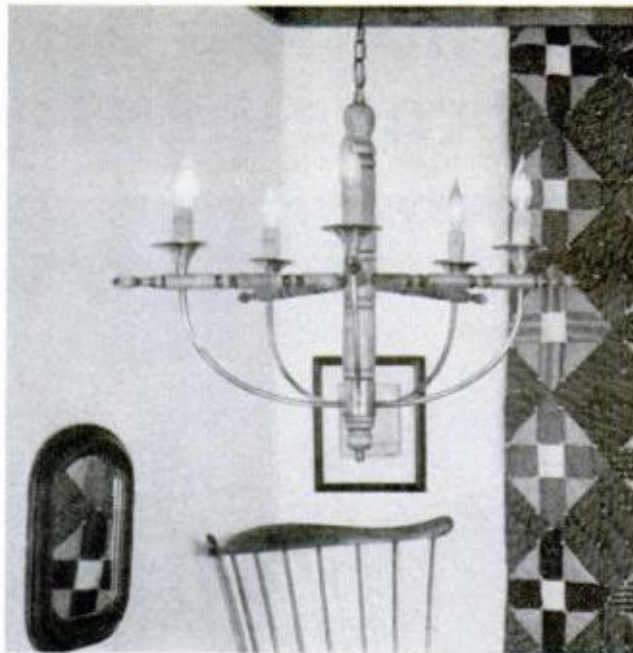
Send 25¢ for aerosol SAMPLE to Dept. 18

**WD-40 COMPANY**

5390 Napa St., San Diego, CA 92110

## HOME IMPROVEMENT PRODUCTS

(Continued from page 201)



**SHAKER SIMPLICITY** in this Early American room shines brightly with a burnished brass and light oak chandelier. Available at department stores and lighting centers, fixture is priced at \$99.50. A chain-hung light and matching ceiling light accented by maple wood and a flat-black finish are also featured in its distinctive Shaker group of fixtures by Thomas Industries, 207 East Broadway, Louisville, Ky. 40202

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No matter what Elmer's\* you use, you can be sure it's going to hold.

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Elmer's. The glue that puts it all together. For good.



For Elmer's brand new handyman booklet containing ideas on how-to "make and fix" many things around the house, send 25¢ for postage and handling to Elmer's "Make-It & Fix-It" Booklet, Dept. MFS, Box 266, Medina, Ohio 44256.

\*Registered Trademark of Dow Chemical Co.



## RIGHT WAY TO PAINT A ROOM

(Continued from page 188)

before you pry the lid off the can, read the label. The paint manufacturer knows his product and the best way to apply it. Every suggestion on the label should be followed.

Before starting to paint, play it smart and rub protective hand lotion or cream onto your hands and arms. A film of lotion makes it easy to remove paint from your skin when the job is done.

Cover floors and furnishings with drop-cloths—old sheets will do. No matter how well you cover up, however, some splatters will always appear. Incidentally, paint is easier to remove when it is wet, so clean up as you go along.

When painting a ceiling, work across the width—rather than the length—of the room. This enables you to begin a second lap before the first has completely dried. Confine each strip you paint to a width of two feet, both for good lapping and to avoid unsafe reaching.

When you begin on the walls, start at an upper left-hand corner and work down toward the floor. Follow this procedure

whether using brush, roller—or both. If you are left-handed, work from right to left.

When it comes to the woodwork, use a round 1-inch brush for window sash and a 2 or 3-inch one for the rest of the trim. When you're painting paneled doors, it's a good idea to coat the panels first, then the center rail. Top and bottom rails come next, then the vertical stiles and the edges last. ★★★

### LIGHT REFLECTANCE OF VARIOUS COLORS

If you wish to make the most of the natural and artificial light within a room or to soften the sky-glare that sometimes enters through large glass areas, remember dark colors absorb light, while light ones reflect it. This chart will help you select colors that best serve your purpose. Numbers below indicate the percentage of light reflectance for 14 representative colors:

|               |    |                  |    |
|---------------|----|------------------|----|
| White         | 80 | Salmon           | 53 |
| Ivory (light) | 71 | Pale apple green | 51 |
| Apricot-beige | 66 | Medium gray      | 43 |
| Lemon yellow  | 65 | Light green      | 41 |
| Ivory         | 59 | Pale blue        | 41 |
| Light buff    | 56 | Deep rose        | 12 |
| Peach         | 53 | Dark green       | 9  |

## TEFLON-S\* coated saw blades cut quicker, cooler, easier.

When your power saw blade is coated with TEFLON-S you get a lot of work-saving advantages. With non-stick TEFLON-S finishes, you cut cleaner, smoother, cooler and faster.

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\*TEFLON-S is Du Pont's registered trademark for its non-stick and self-lubricating finish.



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LOOKING FOR IDEAS AND INFORMATION ON HUNTING, FISHING, CAMPING, BUILDING, TOOLS, ETC.? CHECK THESE LISTINGS, THEN USE THE COUPON BELOW.

## 139. INSTALL YOUR OWN SUSPENDED CEILINGS

New decorative ceilings which enhance the best rooms in the house can now be installed by the do-it-yourselfer. This illustrated product bulletin shows how easy it is to install the new Integrid ceiling system. Well worth looking into. From Armstrong Cork Co. Free.

## 140. A HOST OF WOOD STAINS

Color foldout suggests how to achieve the most from wood's natural beauty of grain and texture. Folder shows 66 colors and gives complete instructions for staining over painted rough wood and obtaining the best results on new wood. From Olympic Stain. Free.

## 141. DO YOUR HOME FIX-UP JOBS EASIER

Colorful brochure gives details on the complete line-up of DAP fixer products. DAP fixes rust, metal, gutters, panels, woods, windows, just about everything. From DAP Inc. Free.

## 142. BATHROOMS CAN BE BEAUTIFUL

Learn how to decorate your bathroom with this booklet from Borg-Warner. Contains 25 plans and innumerable suggestions to help the homeowner be his own interior designer. 50¢.

## 143. 1973 HOWARD SAMS TECHNICAL BOOK CATALOG

Catalog lists over 400 books with emphasis on electronics and allied areas. Interesting and informative. From Howard W. Sams & Co. Inc. Free.

## 144. DON'T BURN IT—BAG IT

Amerind-MacKissic offers the latest information on their rugged "Mighty Mac" shredder-grinders. Find out how these heavy-duty machines make light-duty work out of disposing of your garden waste. Free.

## 145. 6 ROOM SAVER IDEAS WITH INSTRUCTIONS

Here's a bunch of idea booklets with colorful photos on how to decorate all the rooms of your house with wood paneling. All from U.S. Plywood. 25¢.

## 146. HIT THE MARK FOR SAFETY

Excellent booklet details "Proper Uses and Common Abuses of Striking and Struck Tools". This info can save your thumb a lot of pain. 25¢.

## 147. YOUR FLOORING DOESN'T HAVE TO BE BORING

Here's beautiful wood parquet flooring you can install yourself (or have done). Either way, an exciting new look for your home. Full-color brochures show patterns, specifications and installation tips. From Wood Mosaic. Free.

## 148. STRAIGHT TALK ABOUT ALUMINUM

Get straight answers to your questions about aluminum siding. Get Reynolds Straight-Talk Home Improvements Idea Book. From Reynolds Metals Co. Free.

## 149. PM'S PLANS, PUBLICATIONS, PROJECTS

Listed in this booklet are all the famous publications offered by PM—every "how-to" booklet

you could ever want. Also offered are plans and photocopies of a thousand and more great PM articles of the past. 25¢.

## 150. HOW TO INSTALL CEILING TILES SECURELY

Informative brochure illustrates how the Arrow T-50 Staple Gun Tacker is ideal for applying ceiling tile faster, better and cheaper. T-50 model assures non-fracturing of tile flange as well as permanent holding power. Arrow Fastener Co. Free.

## 151. "STICK'EM UP" IDEAS

Illustrated booklet gives 12 work saving ideas on how you can fasten just about anything to anything with this amazing product. From Macco Adhesives, Div. SCM Corp. Free.

## 152. GARDEN PROJECT BOOKLET

Step-by-step instructions on how to build planters, decorative screen block walls, flower bed edging, patio floors, seating walls, barbecues, pools, steps and walks with Sakrete Concrete and Mortar Mixes. 19 different projects. 25¢.

## 153. EVERYTHING YOU NEED TO KNOW ABOUT BATHROOMS

New Brochure explains the differences between good, better and best bathroom fixtures and fittings and helps select the right fixtures for any home or need. Eljer Plumbingware Div. Free.

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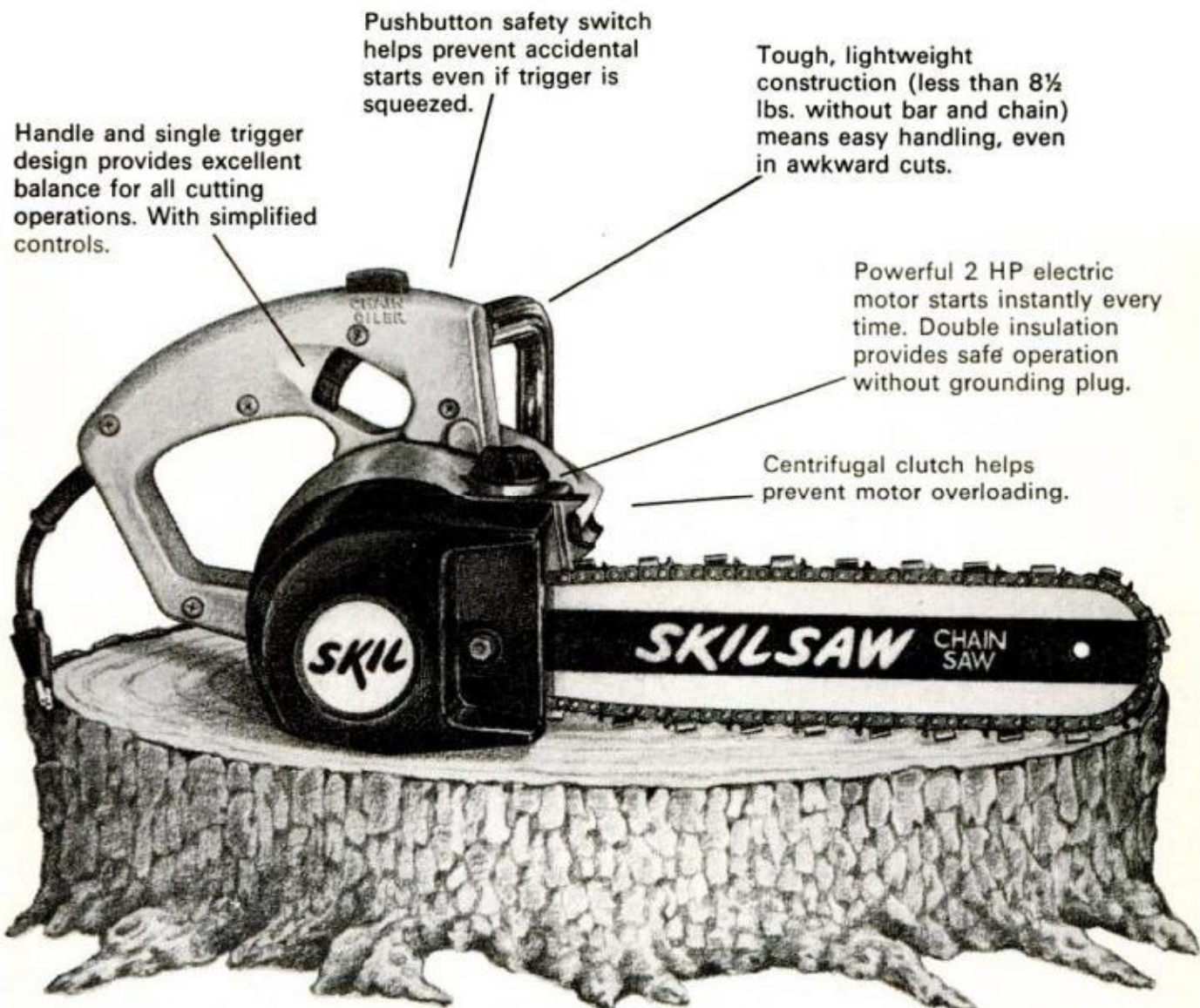
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IF YOU CARRY a lunch box to work, you can still enjoy a hot meal at noontime. All you have to do is install a light bulb inside the cover and have a place to plug it in. Three rectangular Pyrex containers fit nicely in the average-size lunch box for soups, vegetables and meats, and the heat from a 150-w. bulb will make them piping hot in 30 minutes. A 15-w. bulb, plugged in when you get to work, will keep the contents warm all morning.

I used such a lunch box for years prior to my retirement, and both my girls had one in their college dormitories where regular heating units were not allowed.

To install such a heater, drill or punch a  $\frac{7}{16}$ -in. hole in one end of the cover for a  $\frac{1}{8}$ -in. pipe nipple, then add a ceramic socket and wire it to a length of heater cord and plug.

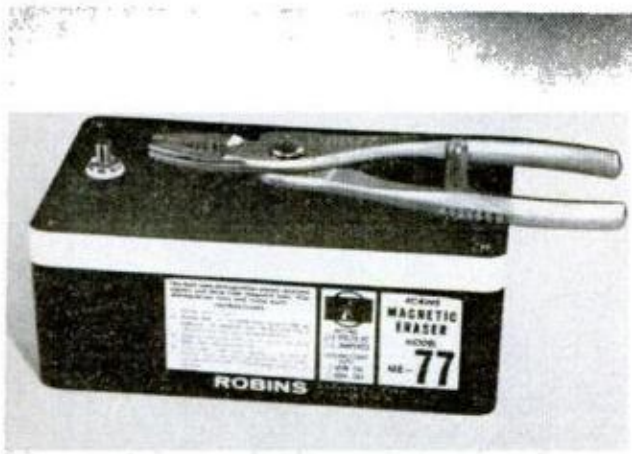
—William J. Jeffers, Jacksonville, Fla.



## Tape eraser subs as demagnetizer

Your bulk tape eraser makes an excellent demagnetizer for shop tools, watches and small steel parts such as bolts, nuts and the like. Place the tool to be so treated on the eraser and turn the power on for 30 seconds. Then slowly lift the tool until it is about two feet above the machine before turning off the power. Put the tool back on the machine end for end and repeat the power-lift cycle. After you have completed several such treatments the tool will be demagnetized.

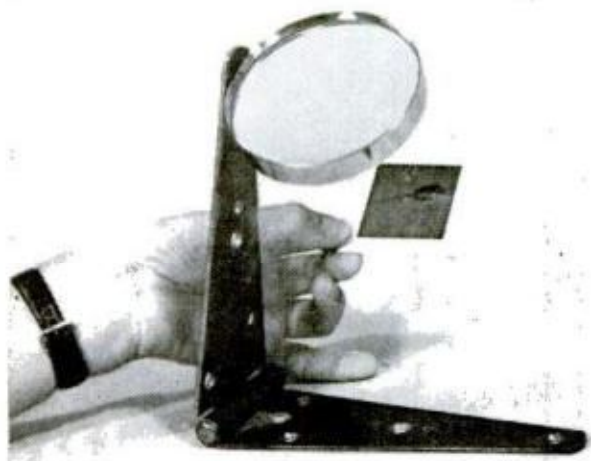
—Parry C. Yob, Fair Oaks, Calif.



## Hinge makes improvised viewer

A handy viewer for transparencies, stamps or negatives can be made by attaching a reading glass to a large strap hinge. First peen the end of the hinge pin with a hammer until the hinge opens hard and will remain in an upright position. Then attach the lens to the end of one hinge leaf so that you can adjust it easily to the best viewing angle. The handle is removed from the glass and a suitable nut is turned onto the lens screw.

—Ken Patterson, Regina, Sask.



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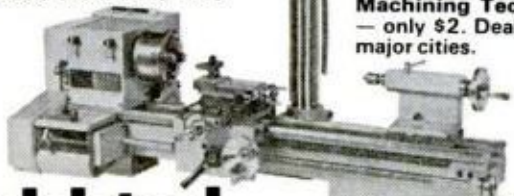


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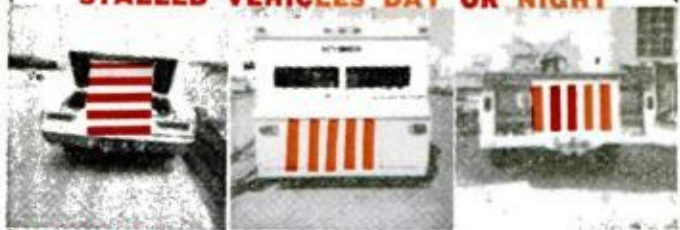
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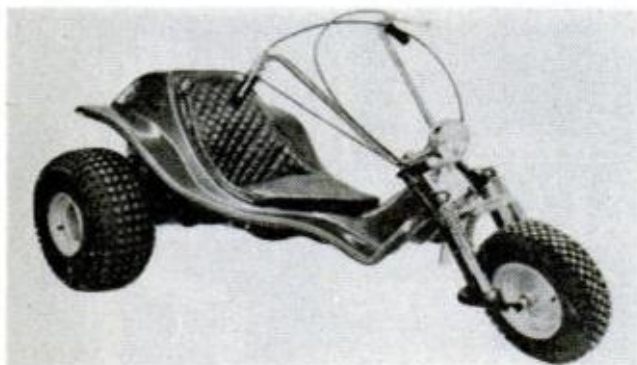
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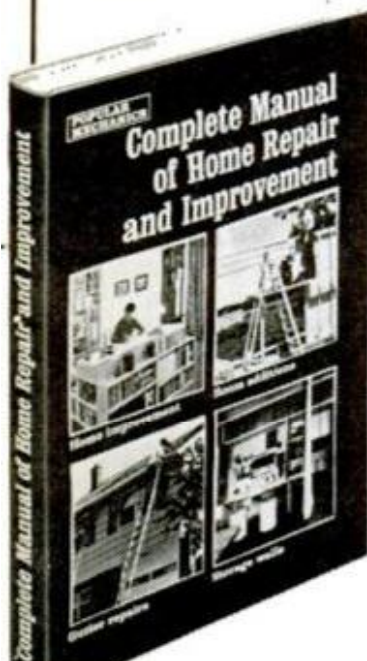
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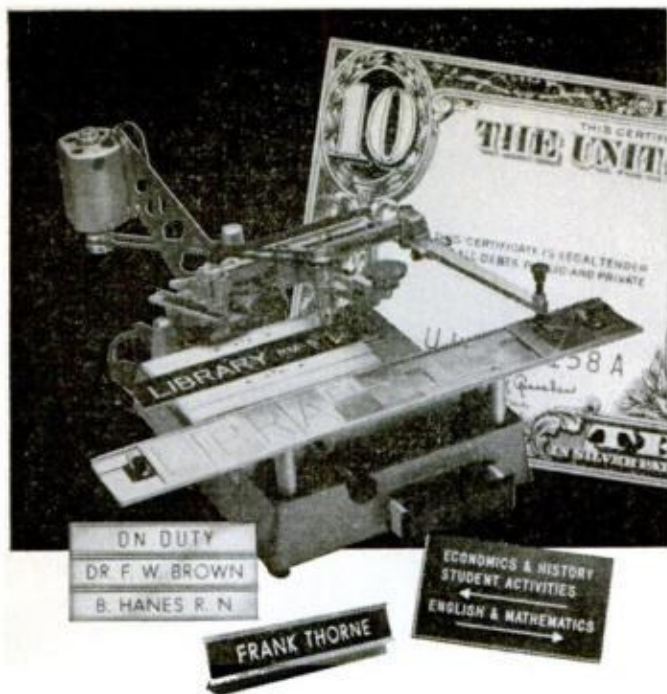
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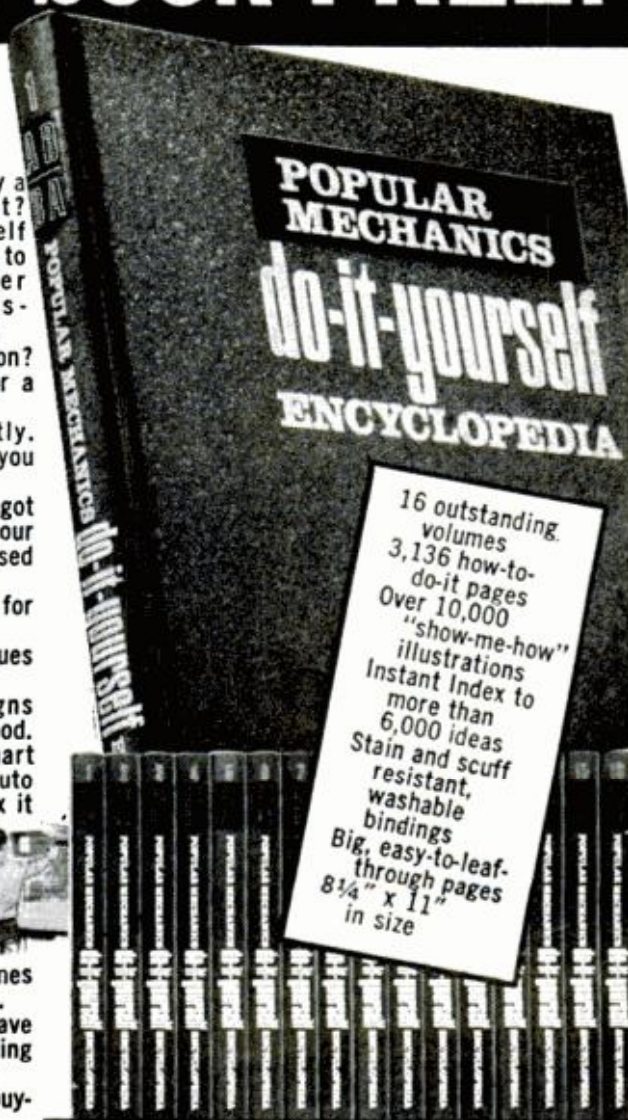
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**NAZI** War Souvenirs Free Illustrated catalog. Delta, Box 361PS, Lafayette, Calif. 94549.

**NAZI** Medals, Photos, and Jewelry. Also War Mementos from Other Countries. Catalog and War Poster, 25¢. Hutchinson House, Box 6411, Chicago, Illinois 60680.

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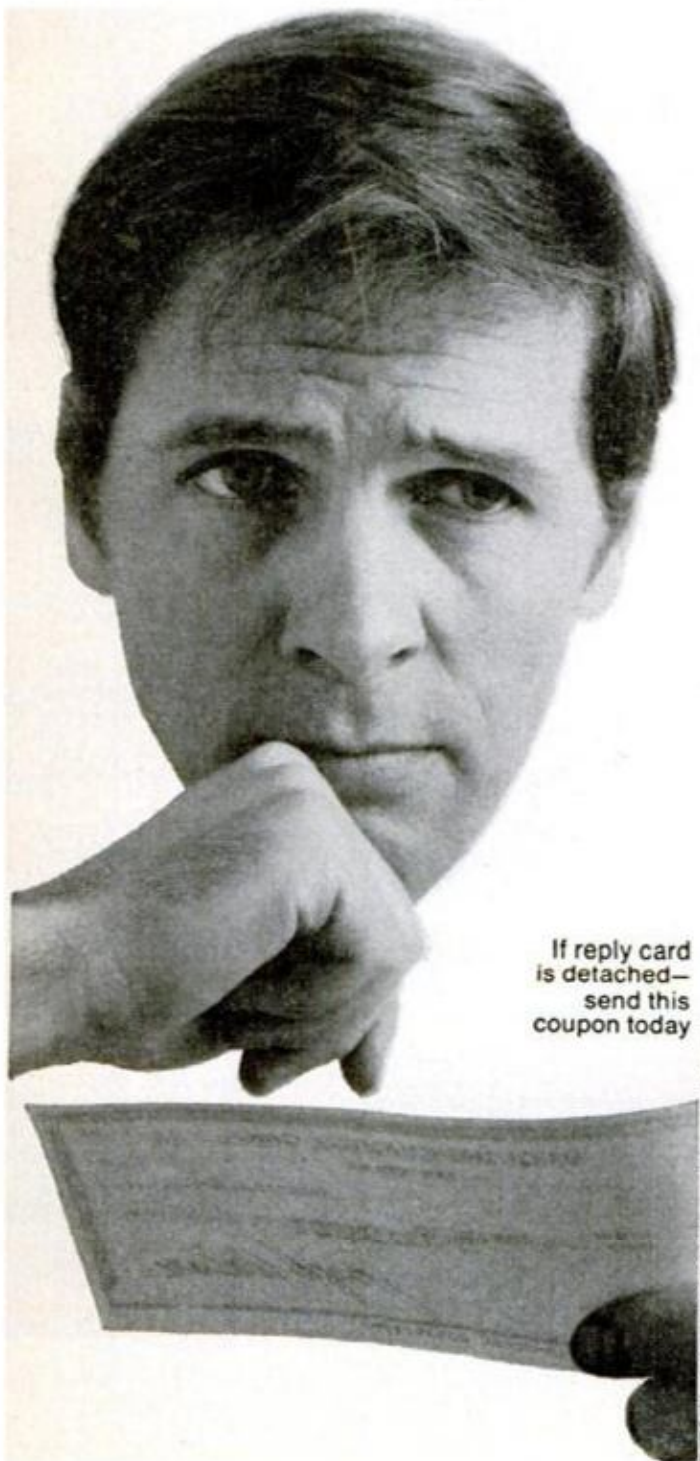
**200 WORLDWIDE** 50¢ To Approval Applicants. Polze, Box 5215, Milwaukee, Wisconsin 53204.

**JAPAN, CHINA, AUSTRALIA, KOREA**—100 Different Only 25¢ With Fascinating World Approvals. Ephemera, Box 25934-P, Los Angeles 90025.

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(Continued on page 226)

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(Continued from page 222)

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**FOREIGN** Approvals! Gigantic values! 3¢ each. ABC, Dept. 3301-A, Box 6000, San Francisco 94101.

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**100 DIFFERENT** United States Stamps, 25¢ With U.S., Foreign Approvals. ShelRon, Box 547C, North Miami, Fla. 33161.

**U.S. MINT** Specials! Flag set, complete \$1.00. 1¢, 2¢, 3¢ famous Americans (21 different) \$1.00. Free list. Brooks, 2601 Avenue "U," Brooklyn, N.Y. 11229.

**PENNY!** Approvals! Regardless catalogue! Kloster, 4164 52nd St., San Diego, Calif. 92105.

**FREE** Surprise collection sent with approvals. Gould, 1784 Union, San Francisco 94123.

**PENNY** Stamps! 1000 Mounted in book at 1¢ each! Trust Stamp Company, P.O. Box 100-P, Jamaica, New York 11435.

**ABSOLUTELY** Free United States Mint Souvenir Sheet When Requesting United States Approvals. K&B, Box 70, Brooklyn, N.Y. 11223.

**500 DIFFERENT** Stamps, \$1.00. Smith, 508-A Brooks, College Station, Texas 77840.

**100 DIFFERENT** British Empire 15¢. Approvals. Gibson, Box 34, Lansdowne, Pa. 19050.

**60 DIFFERENT** United States (30 Commemoratives) 25¢. Seidenberg, Salem 169, Oregon 97308.

**"INVERTED Error"** Dag Hammarskjold, 10¢ with approvals. Belmont Stamps, Washington, D. C. 20015.

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**WORLDWIDE COLLECTIONS** Mounted in Books. Babineau, Box 124, Biddeford, Maine 04005.

(Continued on next page)

## STAMP COLLECTING

(Continued from preceding page)

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(Continued from preceding page)

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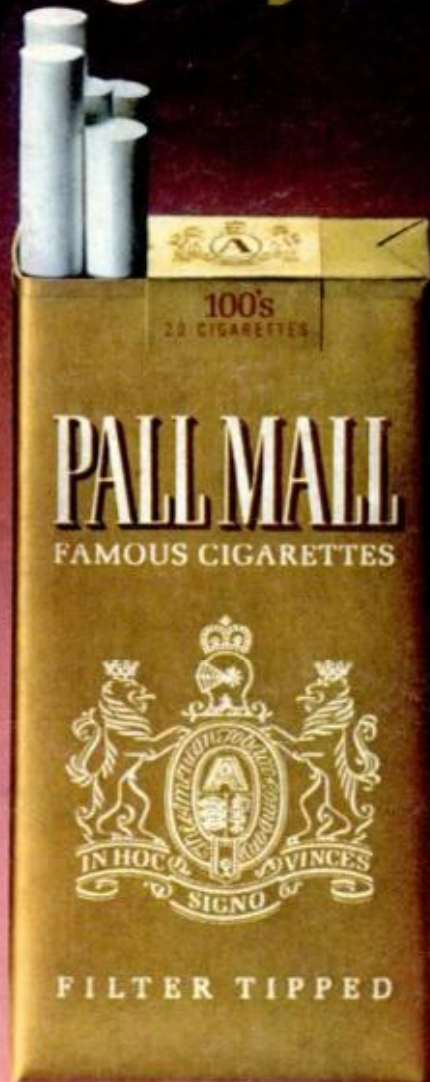
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