

**'I Lost My License'-Ordeal Without Wheels**

# POPULAR MECHANICS

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Proving  
Grounds:  
What Do  
They  
Really  
Prove?

**Special!**  
\$5.95 Book Excerpt

**HOW TO BARGAIN  
WITH A CAR DEALER**

Plus  
Coast-to-Coast  
In MIT's  
Electric Car

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Winterizing Your Outboard • Caulking Tips • Weekend Projects: Gifts  
for Christmas • Saturday Mechanic: Replacing Valve Seals • Auto Clinic  
Dan Gurney Answers Your Questions on Auto Racing and Driving



# Introducing the newest Autolite battery.

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This is the Autolite Unifill. It's up to 20% more powerful than any battery we ever made.

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And we call it the Unifill for one very good reason.

Look. Instead of six cell caps to remove, there's just a *single flap*. Flip

it open and you can check fluid level at a glance. Or service the entire battery from this one point.

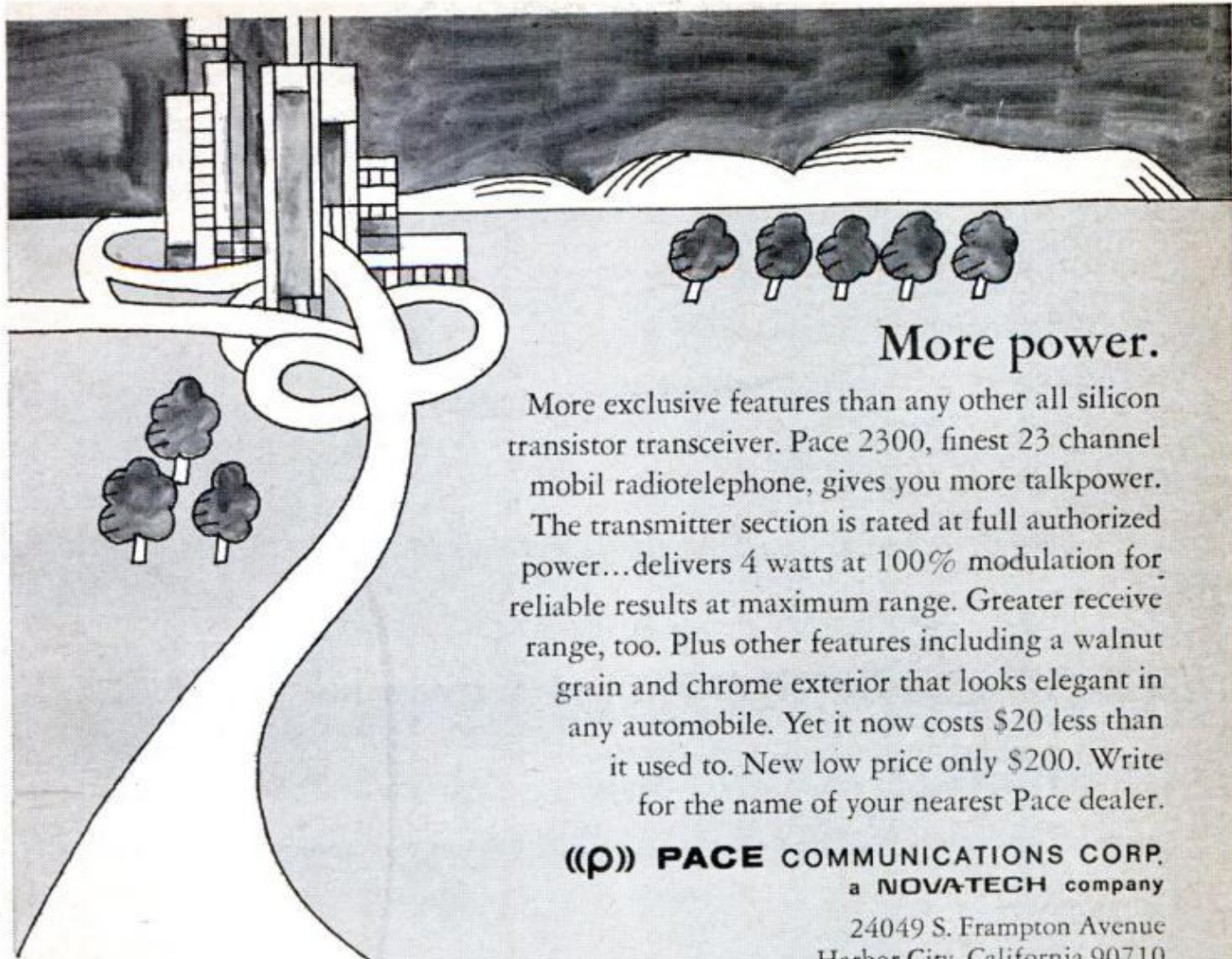
But to look isn't to know the wallop it packs inside.

Put an Autolite High Performance Unifill battery in your car and you'll know. It's like no car battery ever before. We swear to it. You'll swear by it.

**Autolite** 







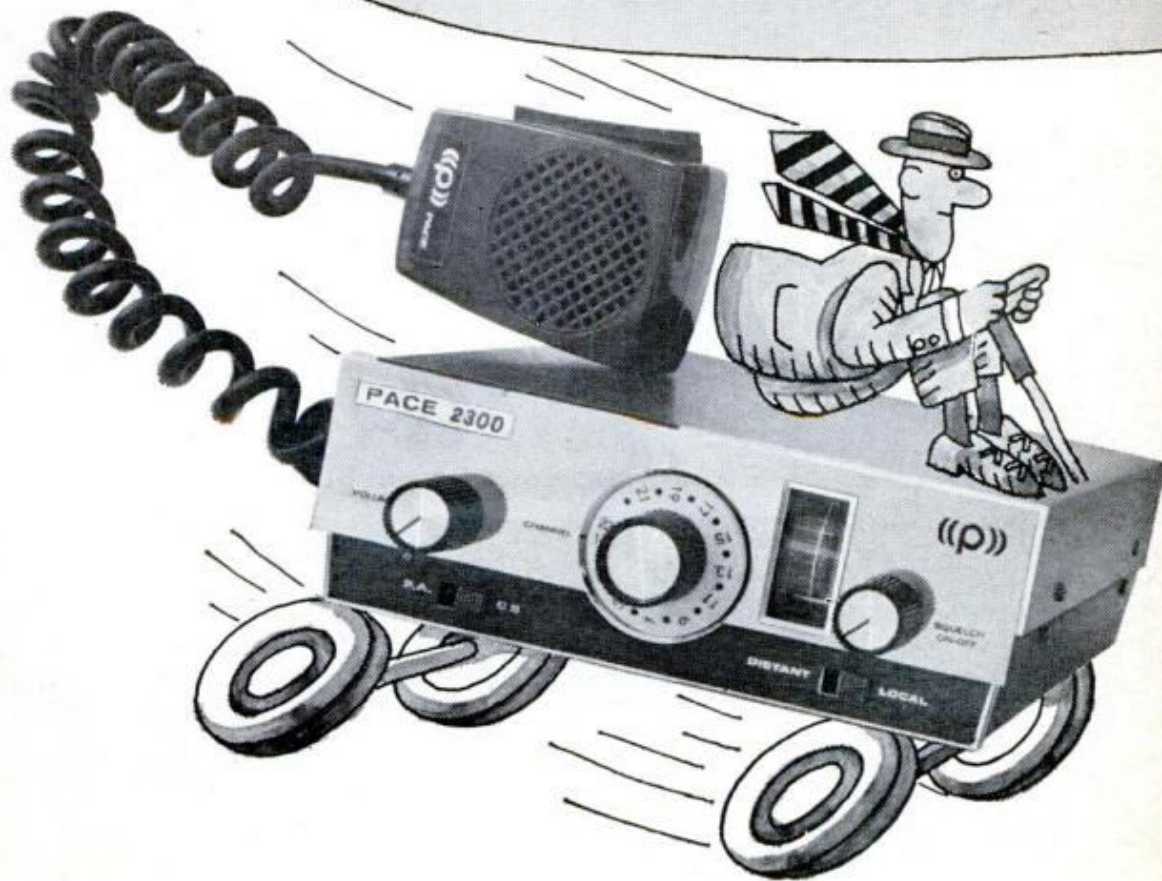
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For all the facts and figures, go talk Adventurer with your nearby Dodge Truck Dealer.

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**Dodge Trucks**





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This One



D4RW-Y16-J2R9

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Division of Ashland Oil & Refining Company





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**Sony's Tiny New Color TV.** Will it make U.S. sets obsolete?  
**How to Get—and Tell—a Good Body-Repair Job.** Tips from a body repairman.  
**Following Lewis and Clark in a Snowmobile.** A PM editor crosses the Bitterroots.



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NOVEMBER 1968

86 Proof Early Times Distillery Co., Louisville, Ky. ©1968



# let's make it

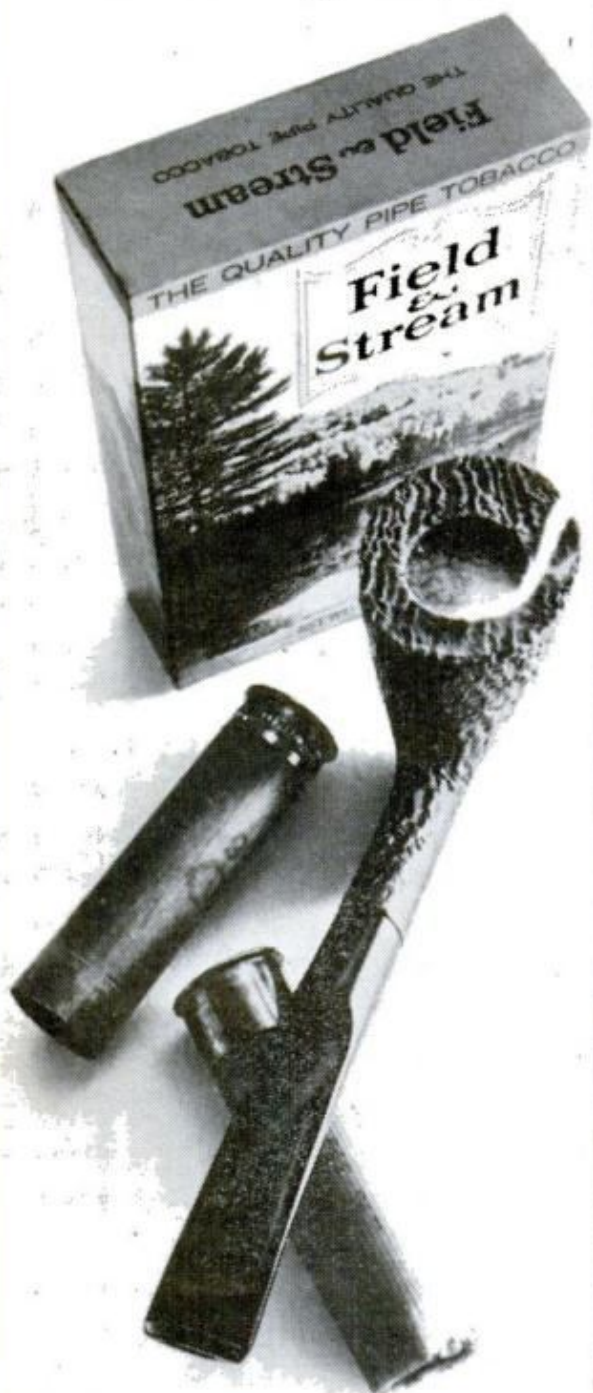
Make yourself the greatest home bartender in town. Just send \$3.50 to Early Times Glass Offer\*—P. O. Box 1080, Louisville, Kentucky 40201. We'll send you a set of 6 Giant 15 oz. Early Times Jiggers. Or send \$3.00, for a set of 8 Early Times 10½ oz. Highball Glasses. They're beautiful, so get both sets while they last. Do it now.

\*offer valid only where legal

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in the next  
apartment says the  
autumn-day aroma  
of Field & Stream  
turns her giddy,**



**marry  
the girl.**

A product of Philip Morris Inc.

# LETTERS

TO THE EDITOR

## How readers would do it

To get that new jet into the hangar (*How Would You Do It?*, page 163, Sept. PM), I would have gained 4 inches by letting a little air out of the tires.

GRANTSBURG, WIS. DALLAS M. JOHNSON

*On second thought, guess we'd have tried it, too. Then, if it didn't work, we'd have built that ramp.*

Your answer on stringing the wire cannot be right. Assuming that the driver, Pete, will return to the starting point before taking off for the rodeo, the wire-stringing job would necessitate driving the quarter-mile stretch eight times anyway.

ALAMEDA, CALIF. ROBERT J. WOOD

*Yup, it will take Pete eight trips whether he strings the wire one strand at a time or (as the answer suggested) two strands going and none on each return trip. What the answer failed to make clear was this: Unburdened by wire stringing on each return trip, Pete will be able to drive as fast as his Jeep will go. That's where he saves time. (Well, he saw most of the rodeo, anyway.)*

In the rigging item, both the problem and the solution have diagrams with the stress (vector) arrows pointing in the wrong direction; they should be along the line of action, i.e. along the direction of the rope, not simply straight down. That's why the angle makes a difference. Also, at 15° the stress (pull) in each inclined leg is 1250, not 1200 pounds. At 45° it's closer to 460 than 450 pounds.

CHAPPAQUA, N.Y. LUCIEN R. GREIF

## Water-base epoxy paint

Please read the enclosed letter from General Mills and then muzzle the eager beaver who wrote *Now: Water-Base Epoxy Paint* (page 156, Aug. PM)

CLARENDON HILLS, ILL. FRANK WARNER

*The letter from General Mills to Mr. Warner stated in part: "The article . . . was somewhat premature . . . Epoxy paint based on the new General Mills emulsion resin system is not available at the present time from local paint dealers."*

*From author Steven Howard comes this comment: "I was assured at the time I*

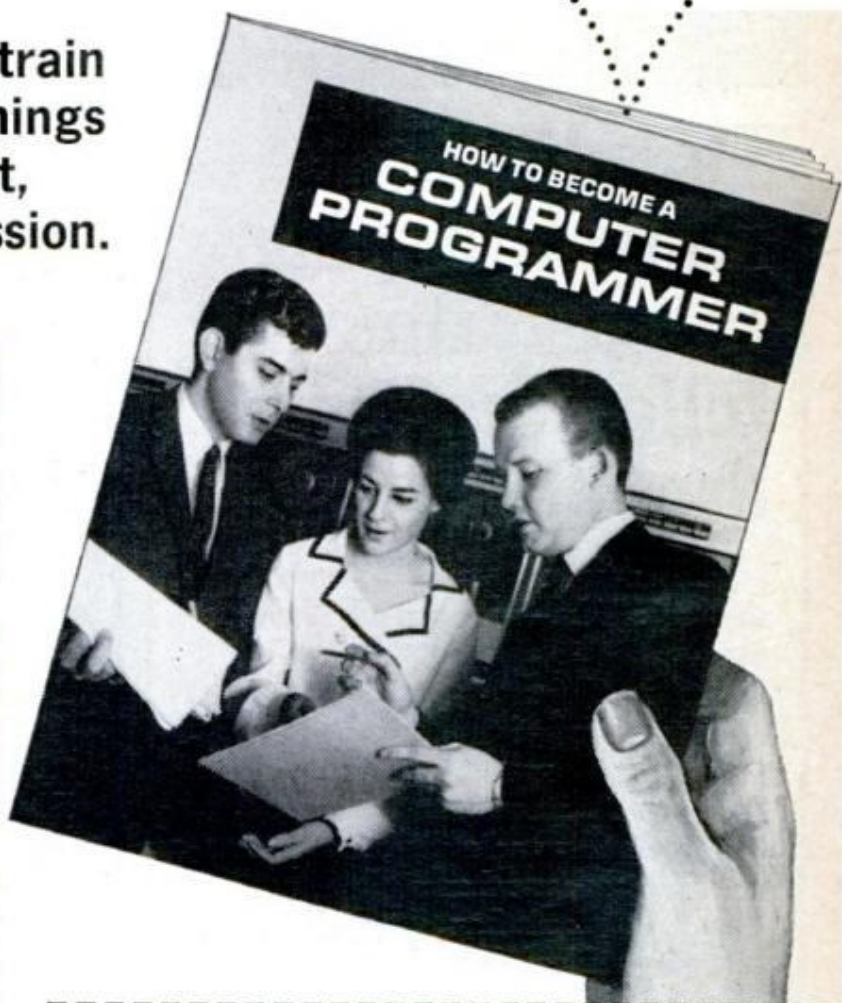
*(Please turn to page 8)*



# This free booklet will tell you how you can become a Computer Programmer

50,000 more programmers needed now! 500,000 more will be needed in a few years!

...and how you can train at home for big earnings in the world's newest, most exciting profession.



**I**F YOU'RE dissatisfied with your present job, why don't you become a programmer? So great is the demand for programmers, you'll have your choice of openings, with a growing future ahead.

For the vast majority of good positions, a high school education, a logical mind and the right preparation are all that are required. LaSalle, world leader in home education, will train you as a programmer in your spare time.

Why not plan for bigger success in the field where employers are looking for you? *Authorities agree that for many years to come there will be more openings in computer programming than people to fill them!* Even beginners are paid well; and with experience, programmers can fill major supervisory positions at salaries of \$12,000 to \$15,000 a year — often as much as \$20,000.

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LaSalle has just published a fascinating booklet "How To Become a Computer Programmer." In simple, non-technical language this booklet tells you what computer programming is; what the programmer does; how you can train by mail through the school that has enrolled more than 1,500,000 people in its many success courses. Mail the coupon for your free copy or write to LaSalle, 417 S. Dearborn, Chicago, Illinois 60605.

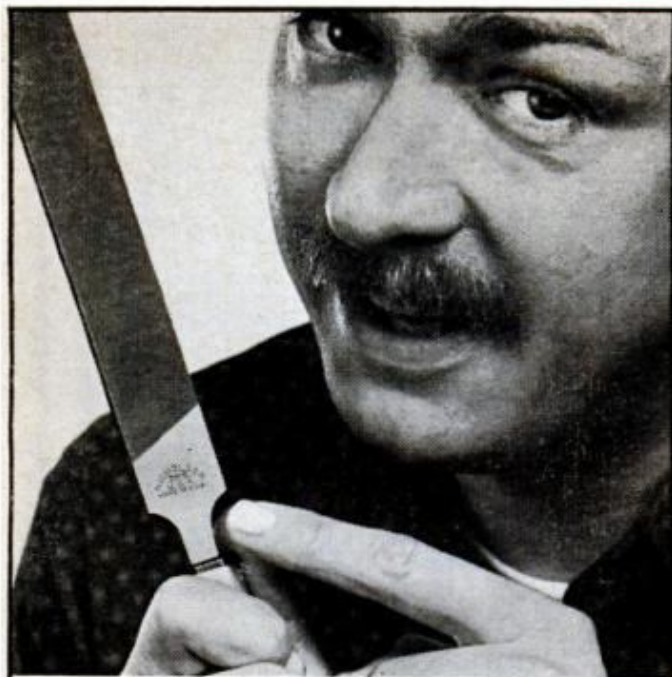
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Please mail to me the free illustrated booklet "How To Become a Computer Programmer."

Name.....Age.....  
 Address.....County.....  
 City & State.....Zip No.....  
 Occupation.....Working Hours.....A.M.....P.M.





## Do a little name-dropping the next time a fellow craftsman drops by.

He'll nose around your workbench, then say: "Aha—I see you use Nicholson files."

And you'll answer, very casually: "Doesn't everybody?"

Which will probably lead to a discussion of the many different types of Nicholson files and rasps—and the many ways you each use them.

(If you don't happen to have any Nicholson files, don't be embarrassed. Just drop by your hardware dealer and stock up.)

There's never a dull moment with

# Nicholson



Nicholson File Co., Providence, R. I.

## LETTERS

(Continued from page 6)

wrote the story that the product would be available.

"There are two companies who make it for commercial use, and they have agreed to supply it to our readers until the bigger consumer paint companies put the product in local stores. They are: Diamond Paint Co., P.O. Box 45897, Houston, Tex. 77045; and Haugen-Beegle Associates, Inc., 3348 Washington St., Franklin Park, Ill. 60131.

"Both companies have agreed to sell the material at \$11.25 per gallon, f.o.b. Franklin Park or Houston. You cannot get less than a gallon at a time."

### Use your head

In *Comparing the Versatile Vans* (page 100, Aug. PM), I disagree with this statement about the VW: "... the battery has to be removed each time you want to check the electrolyte level."

I have a '64 VW bus and I find that most gas stations have automatic battery fillers that you push down on each battery filler opening, and water stops running at the proper level. At home I use a paper cup or small pitcher and hold a mirror behind and above the openings; then I can see when water is at the proper level. No problem—just use your head.

NEW CASTLE, PA.

DONALD DOVER

### Navy had both

You show a PB4Y tanker with twin tails in *New Battle Plan for Forest Fires* (page 95, Aug. PM).

All the PB4Ys that I saw during my Navy hitch had a high single tail assembly. To the best of my knowledge, it was the Army version, B-24, that had the twin tail.

TOTOWA, N.J.

C. J. HEILMAN

*The Navy had both, adopting the AAF B-24 initially, then building its own single-tail plane specifically for low-altitude patrol missions.*

### On guard

Your article *Build This Mobile Scaffold* (page 164, Aug. PM) was well worth reading, but I found one important point left out: guard rails. When working on a scaffold of, say, over 12 feet, surely you should use some sort of guard railing.

I point this out because I work for a scaffolding company where we supply guard rails with almost every set of frames.

WEST VANCOUVER, B.C.

D. M. RANKIN



# My Wife and I started our own Anti-poverty program with this beat-up davenport—

Now that  picked up for \$5—sold for \$300! MUI taught us the secret, we'll never be poor or dependent again!

Better than \$10 an hour for our time!

"I hate to think how many years I put in, slaving away at a dull, dead-end job. My wife and family were doing without the good things in life, while right at hand were opportunities for making money I never dreamed about. Now that we know upholstery, we know that every second-hand furniture store or thrift store—where they practically give away old, beat-up furniture—is a gold mine for us!"



## UPHOLSTERY IS ON THE MOVE WITH AMERICA!

**JOIN THE GROUP—AND PROSPER!** Just open your eyes and look around you! Never in all American history has there been a boom to equal this one. New freeways, new buildings, new real estate developments, new homes, hotels, motels, restaurants, bars. Can you imagine how much UPHOLSTERED FURNITURE is required for all this? And can you imagine how much of it will be worn out and need reupholstering! America is on the move with campers, trailers, mobile homes, boats—and even these constantly need upholstery and re-upholstery! Autos—26 million of them on the road, millions in need of new re-upholstered seats, headliners, door panels! All this spells opportunity, security, independence, good hard cash in your pocket if you have the know-how to take advantage of this greatest of all booms. Don't let it pass you by!



## BUSINESS OF YOUR OWN! TOP PAY, AUTOMATION-PROOF JOB OPPORTUNITIES!

M.U.I. Step-by-step training qualifies you for jobs, or your own business, or both!

Husband-wife teams ideal!

One of the great features about upholstery is that it takes so little capital to start. Many begin in their garage, doing small jobs for friends and neighbors. Then the word gets around and your own private "boom" begins. Many have far more work than they can handle in a few short months. To get started easily, the husband often stays on his job while the wife learns the easy MUI way. Or if you don't want your own business, check the Sunday classified ads. Industry is CRYING for skilled upholsters right now. Top wages are offered. And the jobs are AUTOMATION-PROOF! Computers will never learn upholstery—but YOU can—quickly, easily, the practical, step-by-step, tried and proven MUI way!

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This free, illustrated 32-page upholstery career book may change your life in ways you can't even imagine! It has done so for others, thousands! It has taken low-pay men and women, all ages, regardless of education or experience, and has brought them up out of their workaday ruts and exposed them to the ways of prosperity, pleasure, independence, security, through UPHOLSTERY, the great boom business that is eager to share its BILLIONS with YOU! Send for FREE BOOK & SAMPLE LESSON today!

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

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**A textron  
DIVISION**

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# An untuned car is "won't start" trouble

**This winter, more cars won't start because of worn spark plugs than old batteries.**

Worn spark plugs can give you more starting trouble than your battery? You'd better believe it. Especially in winter.

Cold damp weather cuts your battery's output. There's less voltage available to start. And—worn spark plugs can easily require twice the voltage of new plugs. Result—you have a combination that can be too much for even a brand-new battery.

In fact, a seven-year study of 80,000 cars from all over the United States shows that the odds are *three times greater* that you'll have

starting trouble if your spark plugs are worn.

To avoid starting trouble this winter, get a Champion Tune-Up: that's a new set of Champion spark plugs plus any other basic tune-up items your car may need. Champion spark plugs meet or exceed warranty requirements of all vehicle and engine manufacturers.



**Champion spark plugs  
...the heart of a tune-up**



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## Introducing McCulloch's new Power Mac 6. The world's lightest chain saw. It weighs only 6½ pounds.\*

Here's a chain saw you can lift easily with your little finger. A saw so light, so compact it's not much bigger than an electric knife. Notice how the "Master Grip" handle is located directly over the center of gravity? That means you can use just one hand to move the Power Mac 6 safely and easily between cuts. The grip is padded for comfort and all controls are grouped underneath just a finger's reach away. Squeeze the trigger and the lightweight magnesium-aluminum engine

delivers more cutting power than most chain saws weighing twice as much. You can cut enough firewood in an hour to last all winter long. Zip through an 8-inch log in 6 seconds. Fell trees up to 2 feet in diameter. Use it to clear land, prune limbs, cut rough lumber, even build small buildings. The Power Mac 6 gives you a lot of saw for your dollar. Get your hands on one for real at your McCulloch dealer. He's in the Yellow Pages under "saws."

\*weight less bar and chain

### McCulloch

6101 W. Century Blvd., Los Angeles, Calif. 90045





## A Volkswagen dealer will stake his reputation on it.

No, that's not a new model Volkswagen.  
That's an old model Something Else.

And it's on a Volkswagen lot for the same reason any other car would be on a Volkswagen lot.

It's for sale. Along with most of the cars people trade in on new Volkswagens.

So why buy a used Something Else from a VW dealer, instead of from Somebody Else?

Buy it from a VW dealer, and you get his 100% guarantee for the repair or replacement of every major working part for 30 days or 1000 miles. Whichever comes first.

Engine. Transmission. Rear axle. Front axle assemblies. Brake system. Electrical system. Those are the parts covered.

They may make boring reading. But there's nothing boring about laying out a lot of dough to fix one of them.

That's why it's so nice to know that a VW dealer will take care of anything like that on any car he guarantees.

And that's why he's pretty particular about any car he guarantees.

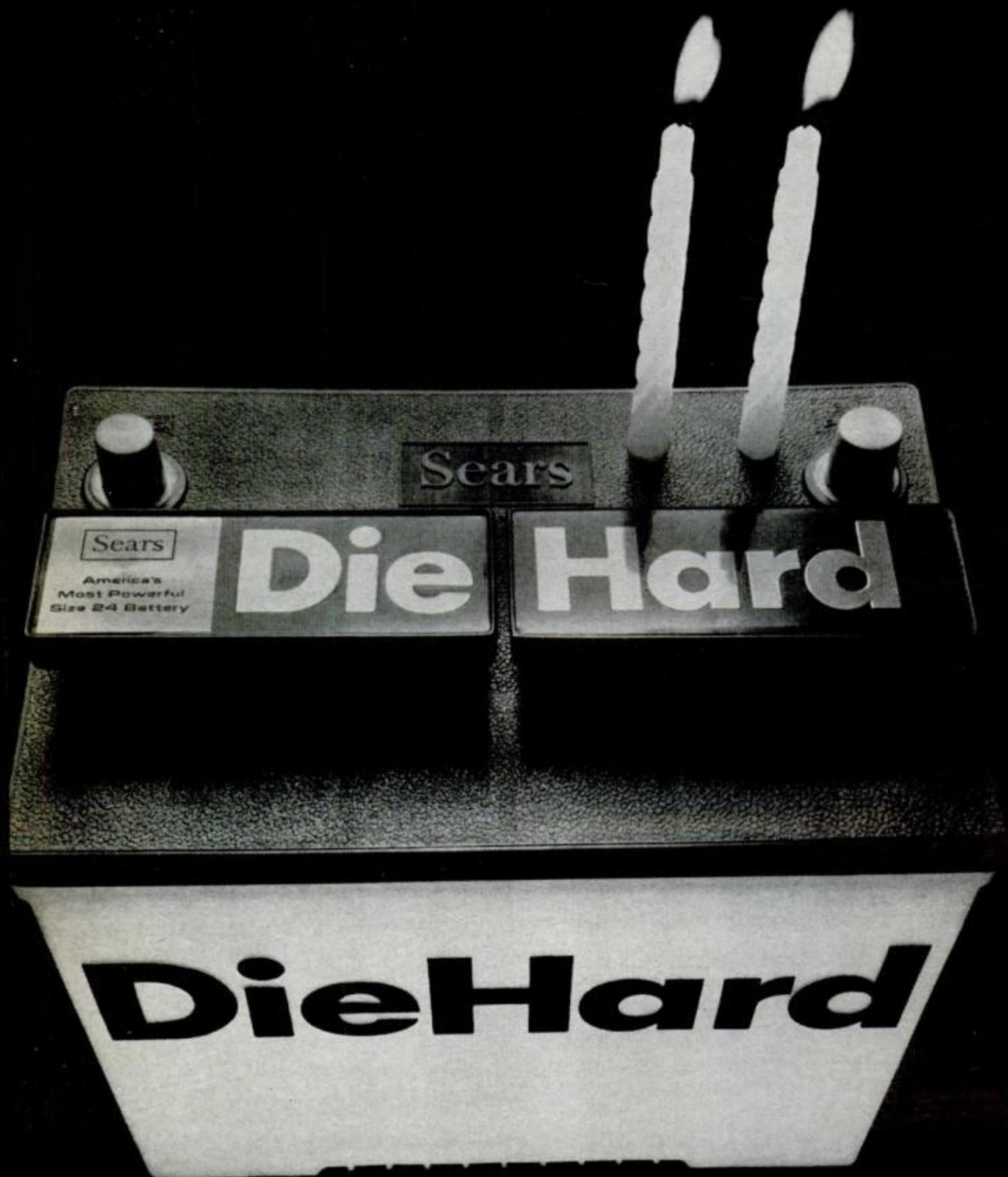
When he finally gives it the guarantee, it means he's checked out the car completely. And fixed what needed fixing to begin with.

After all, a VW dealer has a reputation to think about. He can't have it known around town that you drove off his lot with a lemon. Even if it wasn't a Volkswagen.

This used car is guaranteed 100%.







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America's  
Most Powerful  
Size 24 Battery

Sears

Die

Hard

**DieHard**



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## **America's most powerful car battery makes a great present for your car.**

If your car has reached its second birthday, its battery is facing its third winter and about half the batteries that come in new cars don't make it.

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DieHard batteries now fit 88% of the 12-volt cars on the road. Sears carries a complete line of other fine batteries as well, in a wide range of prices.



# DETROIT LISTENING POST

BY BILL KILPATRICK

**FORD'S NEW SUBCOMPACT**, tentatively dubbed Delta, will bow in late-May, early-June of next year. Car will be a five-passenger, two-door coupe powered by Ford's present 100-hp, 170-cu.-in. Six. To be made in Canada, the car will carry a price tag of about \$2000, making it competitive with several of the smaller imports. Ford hopes sporty styling, scoot, and coast-to-coast service facilities will attract buyers who normally might be interested in an import. Car will not replace the Falcon, at least through the 1970 model run.

Odd note: At the same time it will be introducing the Delta (or whatever the car will be called), Ford plans to bring in its British-made Escort, already in production and selling overseas. It's rumored that the name "Escort" may be dropped for the U.S. market, however. Although there might be minor styling changes in relation to the present Escort, the new import will presumably be competitive with both low-line Cortinas and the new Delta. Ford thus will be covering the low-price market three ways.

**AMERICAN MOTORS AND CHEVROLET** are cranking up to produce all-new sub-compacts a la the Delta. AMC's entry will be a brand-new version of its present American. Chevy's entry, as yet unnamed, will replace the Corvair, due to be dropped. Both are scheduled for introduction next fall and both will try to squeak in for under \$2000. Chrysler denies it has any subcompact plans, insists its main effort in this direction will be with its all-new, French-made Simcas. The Plymouth Valiant, however, is due for an extensive styling and engineering overhaul.

**CAR WARRANTY REPORT** from the Federal Trade Commission is due this month, has many auto people hanging by their thumbs as to FTC conclusions and recommendations. Presently-due report is said to be mild in comparison with its original draft, which was highly critical of both manufacturers and dealers. FTC is said to have watered down the original at the request of automakers, who wanted time to make warranty changes and square away subsequent dealer reaction. Main point of the FTC report will be that dealers will be required to honor to the letter all new car warranties.

**STUDED TIRES**, to date indifferent sellers in the winter tire market, are taking off like Gangbusters. According to Goodyear, the industry expects to sell 17 million winter tires, 30 percent of them studded. At present, only five states—Arkansas, Georgia, Louisiana, Mississippi, Texas—prohibit use of such tires on the grounds that studs damage road surfaces. Experience in other states, however, shows this isn't so, and the five holdouts are expected to fall in line within two years.

**GENERAL MOTORS' NEW ANTITHEFT SYSTEM**, standard on most of the auto giant's '69s, may prove a bonanza for repair shops. There's nothing wrong with the system per se, but careless towing could result in costly drive-train damage. With switch in proper position and key removed, the system locks ignition, steering wheel, shift control (*Park* in an automatic, *Reverse* in a manual). If front wheels are turned and locked, car must be towed on rear wheels to track safely. But in *Park*, rear wheels are immobile, meaning tower must use a dolly. Failure to do so can grind things up in big, expensive chunks. Best advice? Take full advantage of the system, park legally, be on hand personally when and if you need a tow.

**USED-CAR SAFETY STANDARDS** will be enforced gradually over the next several years, not right off the bat as many had feared. The Government appreciates that existing service facilities couldn't hope to cope with the needed work on a crash basis. As

[\(Please turn to page 20\)](#)



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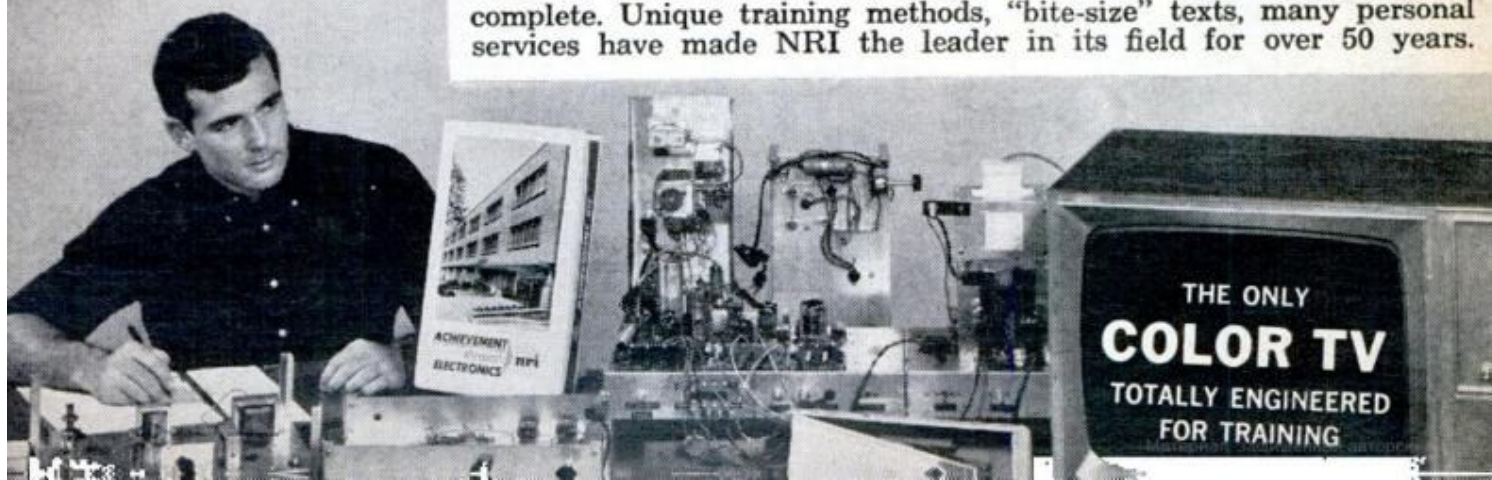
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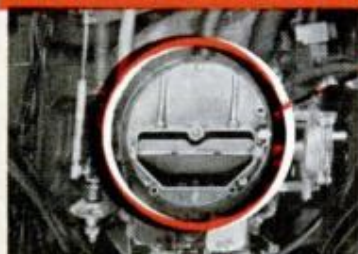
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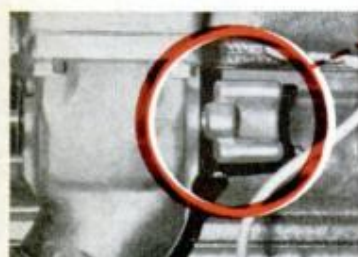
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## DETROIT LISTENING POST

*(Continued from page 16)*

standards become mandatory, owners will be given ample time to bring their cars up to snuff.

**AUTO-BODY REPAIR COSTS** may double within five years. According to industry spokesmen, an acute shortage in skilled help is driving prices up and up. Ramifications are broad. Body-shop operators, already said to be feeling a profit pinch, are contesting with insurance companies re allowable costs. Insurers want to hold rates down, keep allowable costs at a minimum. Customers want quality work only skilled help can perform, also want to keep prices down. Body men, in the meantime, must compete with coin for good personnel. Something will have to give. Most likely change? Higher rates charged for collision insurance.

**RELATIVE SAFETY** of 29 domestic and imported cars—standards, sports, specials, compacts—will be studied by the New York State Motor Vehicle Dept. under a contract from the Federal Highway Administration. Purpose of the study is to investigate the relationship of overall auto design and engineering to the incidence and severity of accidents. Study will also include such control factors as driver age, previous driving record, weather and road conditions. Scheduled for release in late spring of 1970, study results could have a far-reaching effect on the design of future automobiles.

**CONVERTIBLES** are on the way out, victims not of federal shoulder-harness safety standards, as you might expect, but of airconditioning. More and more new cars are being ordered with factory-installed airconditioning, pretty much eliminating one big reason for buying a convertible. Soft tops will continue to be available in top-line cars for the next several years, but will disappear—possibly as early as the 1970 model run—in the low-price field.

**FEEL CROWDED** on the highway lately? It figures. Federal Highway Administration estimates that U.S. motor vehicle registrations will near 100 million by the end of this year. California, with a little over 11 million vehicles, leads states in registration of cars and trucks. New York is next with more than 6 million. Then comes Texas with 6 million on the nose, followed by Ohio, Pennsylvania, Illinois and Michigan, ranging downward from 5.5 to 4 million. ★★★





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MADE ORIGINALLY FOR THE PROFESSIONAL AUTOMOTIVE TECHNICIAN, MODEL BT-162 WILL PAY FOR ITSELF MANY TIMES OVER FOR THE AUTOMOTIVE HOBBYIST AND EXPERIMENTER.

**The Model BT-162 will perform the services specified below in addition to many other tasks too numerous to mention:**

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- ✓ Read the average dwell of dual breaker points as well as individual dwell of each individual set of points.
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- ✓ To locate a "miss" you need only disconnect or "short" the spark plugs one at a time with the Model BT-162 switched to the Tachometer position. You will be able to instantly identify which particular plug (or frequently its wire lead) is responsible for the malfunction.
- ✓ Cars with automatic transmissions function efficiently only if the fluid pressures are correctly maintained and since manufacturer's instructions always refer to RPM the Model BT-162 (or an equivalent tachometer) is required to properly service automatic transmissions. Incidentally, the 5,000 RPM maximum range of the Model BT-162 is adequate for all car engines without any exceptions.

Comes complete, ready to use. Operating manual includes manufacturer's dwell angle recommendations for all cars. The manual is yours to keep even if you decide to return the instrument.

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# **Science Worldwide** BY JOHN F. PEARSON

**Rock music can be hazardous to hearing.** That recently was established by Dr. David M. Lipscomb, a University of Tennessee audiologist, who exposed a guinea pig to 90 hours of go-go music over a period of three months. Cells in the animal's right ear were damaged or destroyed. Cells in the left ear, protected by a plug, were normal. "We used 120 decibels as the sound level for these tests," reports Dr. Lipscomb, "but we have measured sound in discothèques peaking at 138 decibels, only two decibels below the pain threshold."

**Processed baby foods are so salty they can be harmful to an infant genetically prone to high blood pressure (hypertension).** That disclosure comes from Dr. Lewis K. Dahl of Brookhaven National Laboratory, Upton, N.Y., who has studied the relationship between salt intake and hypertension for 20 years. He says that, except for fruits, canned baby foods contain concentrations of salt that are five to 100 times greater than those found in unprocessed foods. The salt, he explains, possibly can create delayed effects of hypertension, a life-shortening disease. Rats of a strain genetically predisposed to developing high blood pressure were hit with it when fed a diet of processed baby foods.

**Atomic-age way to prospect for gold, silver and uranium is with a man-made radioactive element, californium.** According to the Atomic Energy Commission and the U.S. Geological Survey, the soil is hit with radiation from bits of californium, causing atoms of metals in the soil to become radioactive. The resulting radioactivity, picked up by a detector, is analyzed to determine which element is producing it. Gold in amounts as tiny as three-tenths of an ounce per ton can be detected, say the agencies.

**First successful hybrid barley has been produced by University of Arizona and Department of Agriculture scientists,** pointing the way to further possible breakthroughs. This is the first time that a small grain variety has been hybridized, say the scientists, giving promise of improved types of important food crops such as rice and beans. It is estimated that the new technique of hybridization used could boost the world food supply by 10 percent. The hybrid barley has produced yields as much as 35 percent greater than those of standard grains. Key to the new method of hybridization is the use of an extra chromosome that regulates several critical genetic events in the developing plant.

**It rains vitamin B-12.** So says Dr. Bruce Parker, a botanist at Washington University, St. Louis, who reports finding significant amounts of the vitamin in rainwater. B-12 helps in the formation of red blood cells and cures pernicious anemia. So far as is known, only micro-organisms are capable of making their own vitamin B-12. Thus, it "would seem that the atmosphere is teeming with micro-organisms that manufacture B-12." Dr. Parker's discovery may be important in studies of air and water pollution and may help to explain the rapid growth that takes place in plants after a good rain.

**Diamonds are made from methane gas in a process developed at Cleveland's Case Western Reserve University.** The gas is slowly passed over a diamond seed crystal at temperatures of about 2000° F. The methane decomposes and gives off carbon, which deposits on the crystal. The carbon atoms arrange themselves in the same atomic pattern as the seed diamond, growing into a larger diamond. The process is relatively slow and currently is used only to increase the size of industrial diamond abrasive powder. Big advantage is that very high pressures are not needed.

**Soviet scientists claim the theory that UFOs originate in other worlds merits serious examination and are calling for a worldwide investigation,** according to recent Russian technical journals. Russian observations show that UFOs behave "sensibly," are most often spotted over airfields, atomic stations and other new engineering installations. These actions give the impression that UFOs are investigating, say Russian scientists. ★ ★ ★



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# Drivin' with Dan

Why is your Can-Am racing car called a McLeagle? At what position should a steering wheel be gripped? Do any race drivers wear glasses? What's a "groove"? Dan Gurney answers these and other provocative questions



**AN ANIMATED** Dan Gurney stresses a point to young Swede Savage before start of recent Canadian-American series race at Bridgehampton

**Q.** In a big race, where you're presumably going at top speed, are you allowed to cut another driver off?—Ken Brink, Brooklyn.

**A.** The word "allowed" doesn't actually apply, Ken. The object in a race is to win it within the limits of the rules. Deliberately cutting another fellow off is most certainly poor sportsmanship, also dangerous. But there are times when such action simply can't be helped. Like jockeys, race drivers can be "set down" for "rough riding." It's a matter of interpretation, usually by the race stewards. An unofficial, but very effective, check on poor sportsmanship stems from the drivers themselves; often without a word being said, they'll "straighten out" a cowboy.

**Q.** I read that your Can-Am car is called a McLeagle. What in the world is that?—Stanley Carroni, Des Plaines, Ill.

**A.** We laughed about that ourselves, Stan. Basically the car is a McLaren M6B with sus-

pension and body changes made at our All-American Eagle shop in Santa Ana. The car's power plant, a 325-cu.-in. stock block Ford, carries our heads, too. So, what with all the Eagle thinking and tinkering involved, we dubbed the car a McLeagle. Our other car in the Can-Am Cup series is driven by Swede Savage. It's a Lola T-160 chassis powered by a fuel-injected 302-cu.-in. stock block Ford carrying our heads. Got any ideas for a good name for this one?

**Q.** Where on a steering wheel is it best to position one's hands?—Emerson Buckley, Jr., Buffalo.

**A.** I'm glad you use the plural. *Hands* is right, not a single hand. To answer your question, the most important consideration is maximum control of the car under potentially extreme handling and road conditions. A driver's hands should be placed on the wheel in any position that gives him the most control, period. To determine this position, imagine such situations as a right front tire

*(Please turn to page 48)*



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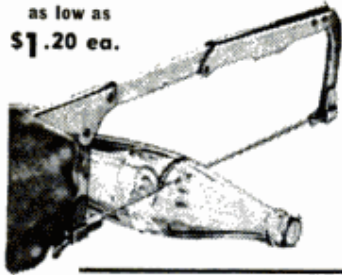
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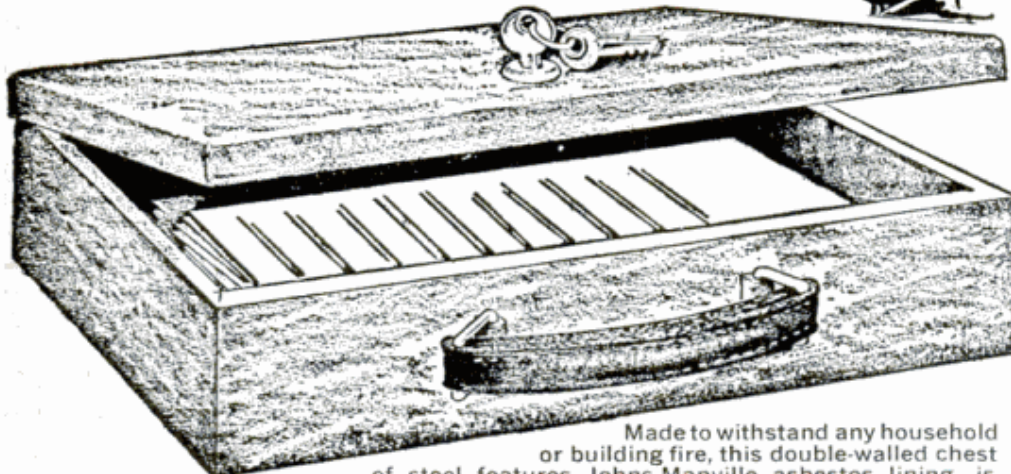
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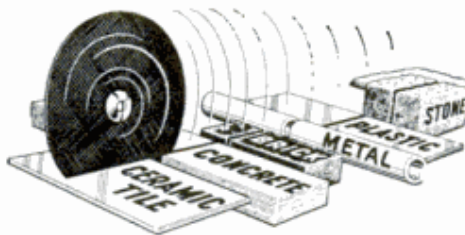
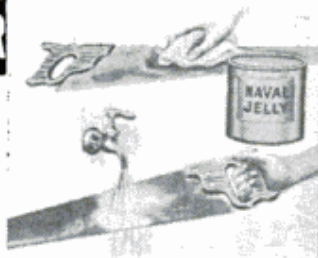
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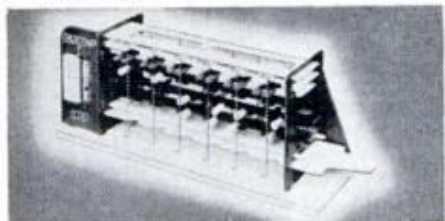
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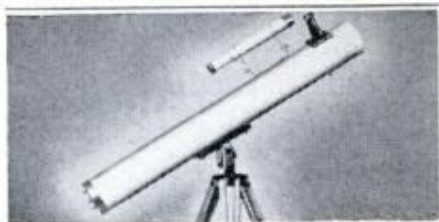


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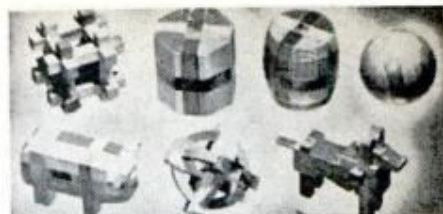
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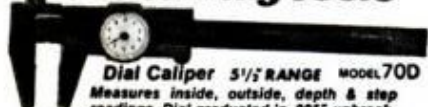


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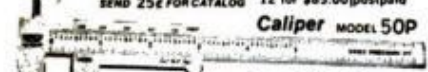
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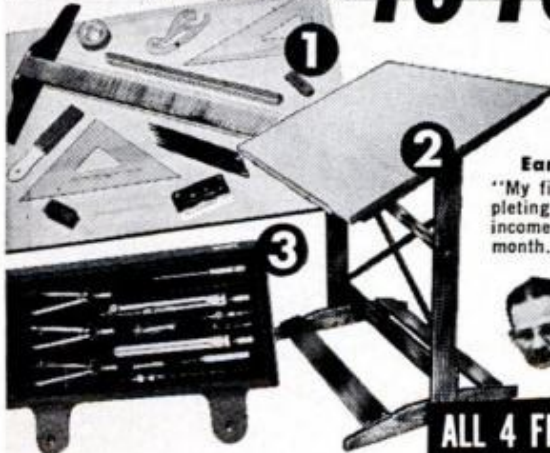
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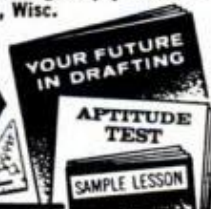
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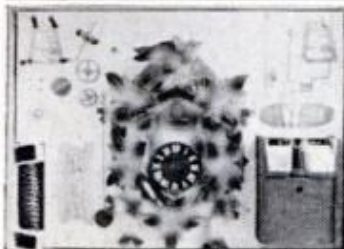


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The greatest detectives in history would be hard pressed to track down somebody to fix a bum toaster or dishwasher these days. It's funny: you have no trouble finding any number of so-called experts who'll fix a leaky pipe or a home run through the picture window. But electrical appliance repairmen are still as scarce as hippies in bathtubs.

If you're lucky enough to get a repairman to come from across town, he'll eventually have your bum dishwasher humming again like bees at a picnic. He'll also present you with an oversized bill. That's where the picnic ends.

If you're in the market for more money you don't need to be a super-sleuth to find it. Look for clues in your own hacienda. If you're typical, you own a couple dozen appliances, counting your wife's hair dryer, power tools and usual plug-ins like air conditioners, toasters, refrigerators, freezers, fry pans, and on and on. A lot of men like yourself have built rewarding full-time businesses after starting part-time earning \$5 and more an hour fixing broken appliances. Others have found full-time jobs as Service Technicians. And when you hit Social Security years, think how great it would be to pick up a little extra cash doing as much Appliance Repair as you cared to do.

The Appliance Division of the National Radio Institute in Washington, D.C., has a great low-cost, home-study course covering every type of Appliance repair in detail—from toasters and irons to air conditioners, refrigeration equipment and one-lung gas engines. There's a section on farm and commercial appliances, too, if you're interested in a big payoff, for when major appliances go kaput, they're as useful as moose antlers on a mouse.

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*Tom McCahill*

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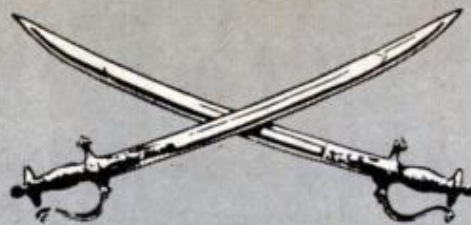
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For most of us, these are just dreams. But have you ever stopped to think that there is a way to get rich—possibly only one sure way? Most fortunes, as you know, are made by people who own their own business.

Perhaps you've thought of starting a small business of your own . . . a franchised drive-in, or maybe a service business. Trouble is, you need \$10,000 to \$15,000 to get started and even then it's a gamble—with slim chances of ever making really big money.

But there is *one* business which could make you rich—almost overnight! And the beauty of it is, you can start on a shoestring during your spare time, even while holding your regular job.

## Cash by Mail

The business is Mail Order—and it's fabulous! Come up with a 'hot' new item . . . and WHAM!

It strikes like a bolt of lightning! Suddenly, you are deluged with cash orders from all over the country . . . MORE MONEY than you could ever make in a lifetime!

Like the Vermont dealer who ran one ad in Sports Afield Magazine. His ad pulled 22,000 orders—over A HALF MILLION DOLLARS IN CASH!

There is no other business where you can make a fortune so quickly!

● A beginner from Newark, N.J., ran his first small ad in House Beautiful—offering an auto clothes rack. Business Week reported that his ad brought in \$5,000 in orders. By the end of his first year in Mail Order, he had grossed over \$100,000!

● Another beginner—a lawyer from the midwest, sold an idea by mail to fishermen. Specialty Salesman Magazine reveals, "he made \$70,000 the first three months!"

## Proof

It's a fascinating business! Running ads in newspapers and magazines . . . mailing gift catalogs . . . getting cash orders in your daily mail—steady as clockwork.

There is no other business where you can start on a shoestring and pyramid your profits—without investing in merchandise! One husband and wife mail order team took in \$40,000 selling one item. They obtained FREE ads in national magazines . . . didn't invest a cent in merchandise, and even got the supplier to ship all orders for them!

These exceptional cases are absolute proof that you can get rich in your own Mail Order business. Very rich. Even a U.S. Gov. Report stated: "A number of

one-man Mail Order enterprises make up to \$50,000!"

Pick up any magazine. Notice how the same mail order ads are repeated . . . month after month? That's concrete proof! You know those ads wouldn't be repeated over and over again—unless they were bringing in big cash profits to their owners.

## The Secret

The secret of getting rich in Mail Order lies in *financial leverage*. It's a little-known, almost secret method—using other people's capital to make money for you!

You can get thousands of dollars worth of advertising in big national magazines—without investing your own money! And you don't have to write a single ad. Tested and proven ads are prepared for you by experts. Reinvest the profits from your first successful ad—to get more, larger ads, and the profits begin to snowball! It's like building a chain of stores . . . each new store puts more money in your pocket.

You mail out beautiful catalogs which offer hundreds of dollars worth of fine, quality gifts—yet you don't invest one



The thrill of receiving money in your mail is one you'll never tire off!

cent of your own money in merchandise! Your catalogs are printed with your name and address, so all orders come to you. Everything is "drop-shipped" for you, and there's up to 100% mark-up! You pocket the cash profits immediately—even before the orders are shipped to your customers!

Repeat orders alone, just from mailing catalogs, could bring you a steady income for the rest of your life!

Yes, Mail Order is the fastest-growing, most profitable business in America! And now, with more people moving to the suburbs . . . the population explosion . . . and the expanding teenage market . . . we are on the verge of the BIGGEST BOOM in Mail Order history!

Now, with the help and backing of Mail Order Associates, Inc., of Montvale, N.J., you can follow the same proven steps to Mail Order success—using the 'secret' of financial leverage!

## Start Now

We supply you with beautiful gift catalogs throughout the year. All products are dropshipped for you, with up to 100% mark-up! You get free samples of top-selling mail order items, plus monthly trade reports on 'hot' new products . . . tested, successful ads are sent to you monthly. You get advertising directories, postal laws, complete courses, expert guidance—EVERYTHING you need to practically guarantee YOUR SUCCESS. Why? Because our business depends upon your success. It's mutually profitable!

A recent feature article in Income Opportunities Magazine stated, "Mail Order Associates Inc., offers the most comprehensive Mail Order program ever offered to beginners." They go on to say, "This could be the opportunity you've been looking for. A chance to get in on the ground floor in a little-known business which we believe is on the verge of a new boom."

## Free

We are now accepting a limited number of charter members in our new Mail Order Program. No previous experience is required but you must be over 21.

If you are sincerely interested in starting a profitable business of your own . . . if you can see the tremendous advantages which Mail Order offers . . . then ACT NOW!

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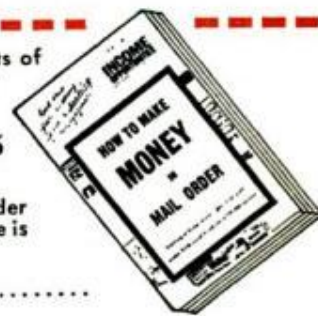
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## DRIVIN' WITH DAN

*(Continued from page 24)*

blowing at 65 mph. In that the car would be pitched violently to the right, a driver's hands should be in the best position to steer—and strongly—to the left. Fast, effective steering is of tremendous importance in safe driving.

**Q.** I've heard Opel is bringing out a new GT model. Do you know when, and have you ever driven the car?—George Burnosky, Cedar Rapids, Iowa.

**A.** Not only have I never driven the car, I've never even seen one. My grapevine tells me the car is due in Buick showrooms along about April of next year and that it looks like a sort of scaled-down Corvette.

**Q.** In racing, what do they mean when they say a driver "found the groove"?—Charles Leedson, Saint Paul.

**A.** Every race track, be it an oval or a road course, has what is known as the groove, a term meaning the best (that is, fastest) way around. When a driver is said to have "found the groove," it means he's getting around the track in the fastest possible time for his particular car. Part of the purpose of pre-race practice is to allow a driver to find the groove for himself and formulate a race plan. On any given track, however, the groove can vary due to weather conditions, general track conditions (rough, oil slicks, and so on), car performance, whatever.

**Q.** In all this talk about steam cars coming back, can you tell me the performance rating of the 1932 Stanley steam powerplant?—S/Sgt. Frank Battle, APO San Francisco.

**A.** You've got me there, Frank. But was there a 1932 Stanley Steamer? I know that throughout the 1930s there was talk of reviving the company, but I think the plan was to build buses, not cars, and I don't think anyone ever got around to actually making a prototype engine. To the best of my knowledge, the last few Stanley Steamers were built in 1925-26. Incidentally, in 1906 at Ormond Beach, Fla., Fred Marriott drove a Stanley Steamer through a measured mile at 127.66 mph!

**Q.** Do any race drivers wear glasses?—Jim Brown, Bowling Green, Ohio.

**A.** Certainly. Offhand I can think of three—Maston Gregory, Ronnie Bucknum, Bud Moore. I know there are others, but I can't think of them at the moment. You'll see a lot of drivers whip out eyeglasses when it comes to reading the small print on a contract.

**Q.** Lots of times, particularly on today's super-highways, traffic moves faster than posted limits. Trying to stay within the limits under the circumstances can be dangerous. But exceeding the limit is still breaking the law, isn't it?—Wynn Warren, Tulsa.

**A.** Technically, I suppose it is, but there are times when doing anything other than keeping up with traffic flow can be a hazard to everyone on the road. To the best of my knowledge, most traffic police operate on a "conditions" basis; that is, they go after those who are driving too fast for existing road conditions (in the rain, for example). With the exceptions of out-and-out speed traps, I've found that most speed laws have a little leeway built into their interpretation. As with all driving, good sense is the vital ingredient.

**Q.** I recently read an article that said Ford of England's new three-liter prototype would probably be quicker than Ford's seven-liter prototype of last year. If so, why didn't they start making the smaller cars sooner? Why isn't the Howmet turbine car running as well as the Indy turbines? Why isn't anyone using a turbine engine in an F1 car?—Cary Ravitz, Lexington, Ky.

**A.** Predicting is a shaky business in racing. The three-liter could be quicker, but it remains to be seen. The seven-liter was built specifically for Le Mans. I think the three-liter might have trouble there. And, the smaller car is newer. As for the Howmet, I'd say it is running about the same, but minus Andy Granatelli and gang. A turbine engine is very expensive. The F1 formula does not give turbines the same advantages as did Indy. Slow throttle response is a major turbine problem in race-car application. ★★

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*If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 54).*

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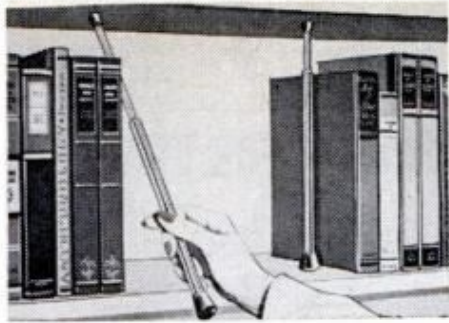


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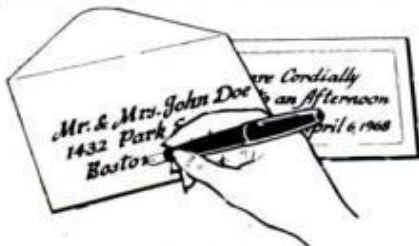
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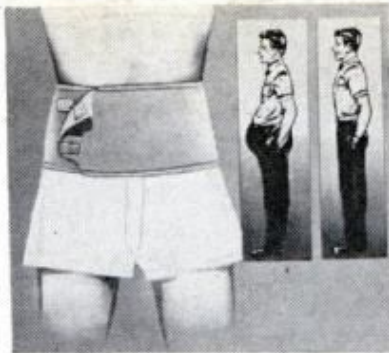
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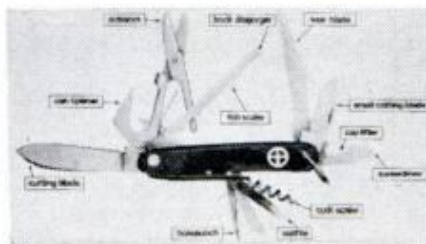


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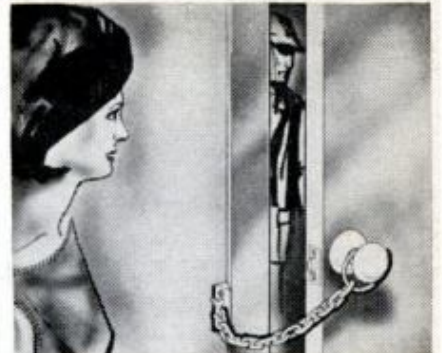
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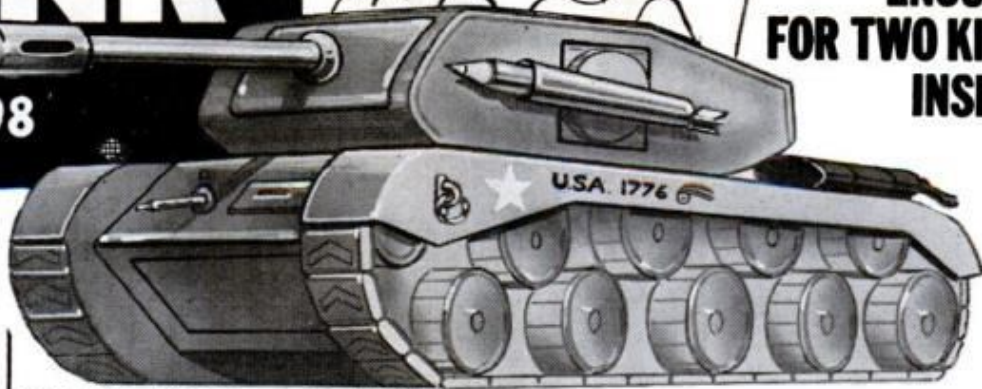


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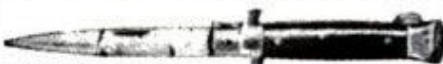
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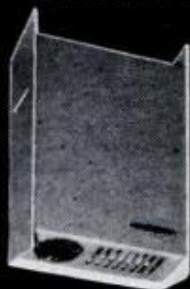


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# I'd like to give this to my fellow men... while I am still able to help!

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-MO  
CHICAGO, ILLINOIS 60626



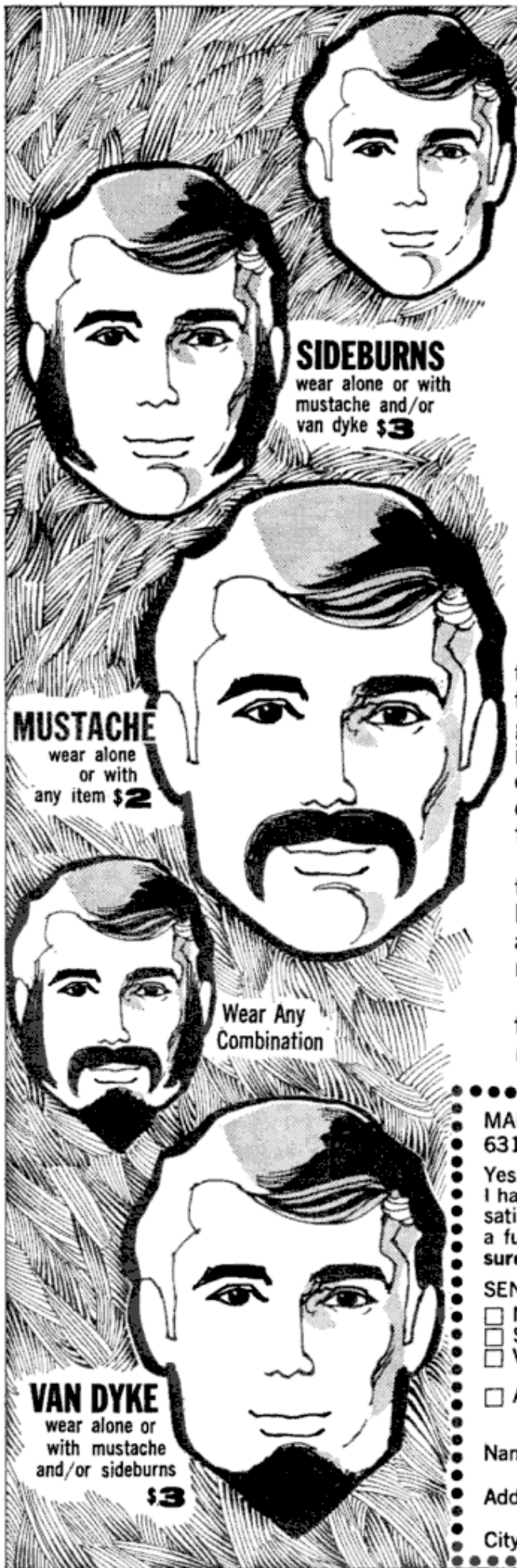
# THE LOOK YOU WANT - WHEN YOU WANT IT!

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BY KEVIN V. BROWN  
**AVIATION**  
JETSTREAM

**STATISTICS TIME!** Once a year, or whenever the mood moves us, we clean out our inventory of aviation figures.

Here are a few of the interesting ones:

**AIRPORTS.** Largest in the United States is Dulles International, covering more than 10,000 acres near Washington, D.C. Longest runway in the States is the 14,572-foot southeast-northwest runway at New York's Kennedy International. Longest in the world is the 15,500-foot strip at Salisbury, Rhodesia, nearly three miles long.

Chicago's O'Hare International is still the world's busiest airport with more than 640,000 operations last year. In one peak period, from 5:00 to 6:00 p.m. on a Friday, it set a record of 208 operations, averaging one landing or takeoff every 17 seconds.

**PILOTS.** If you had to guess, where would you say there are more pilots per capita than anywhere else in the States?

Texas? Southern California?

Neither. It's Alaska, where one in every 100 persons owns an airplane.

No other state comes even close. The runnerup for airplanes, in fact, is Nevada, where one in every 625 persons owns one.

And women pilots? Probably fewer than you think. There are about 23,500 registered women pilots in the United States, or less than five percent of the total, and this figure includes 8700 students, and, believe it or not, 57 airline pilots.

Who are the safest pilots? Though flying is usually considered a young-man's game, statistics show that safety records aren't much different in the air than on the highways.

The safest are in the above-30 age group, and those with the most accidents below 30.

**FLYING.** When are our crowded skies least crowded? The figures show that 3:00 a.m. is about the best, when an average of about 176 airline flights are airborne. The peak period, to no one's surprise, is 6:00 p.m., when about 1150 are flying around.

And the general-aviation pilot, when does he do most of his flying? Saturdays, with Sundays a close second. Monday is the least-used flying day. ★★★



**BEFORE.** With tail lights and headlights burning this car is still hard to see at night.



**AFTER.** With Hammons' Automobile Safety Lite installed this same car can be seen easily and from great distances.

## A HALO OF LIGHT MAY SAVE YOUR LIFE

Each year thousands of motorists lose their lives because of accidents that could have been avoided. Poor visibility at night contributes to the record of slaughter.

Modern blacktop roads absorb light and make cars ahead almost impossible to see at night—until you are on top of them. How many times have you been driving at high turnpike speeds at night and suddenly come up on a car with dim lights or no tail lights? Usually you are almost inside the trunk of the car ahead before you can react. Right?

Hammons' Automobile Safety Lite eliminates this serious hazard. These lights (patent is pending) mount underneath the car and shine directly down on the roadway whenever the headlights are turned on. The light that bounces from the road surface creates a halo of light on the road around the car making it visible from great distances. Even if your tail lights should fail or burn out—you will be seen and be safe.

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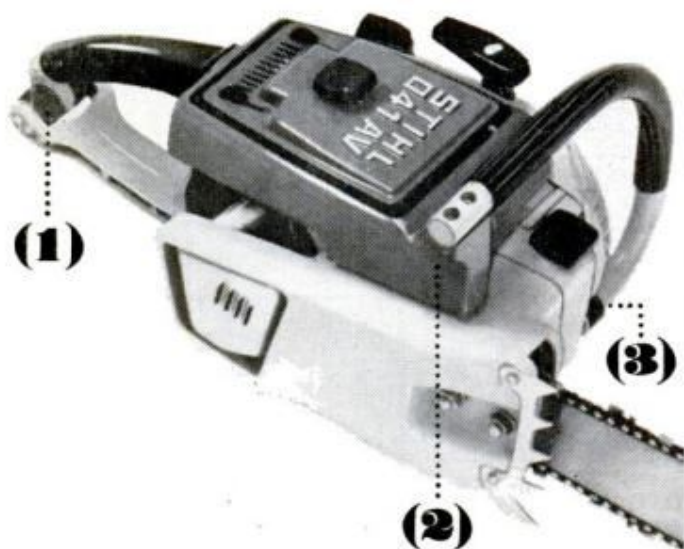
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## WHAT'S NEW **OUTDOORS** BY DAN FALES

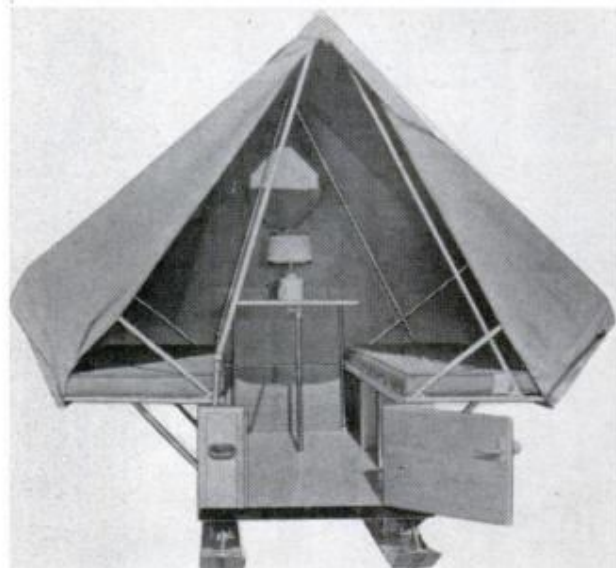
**BOATS THAT FLOAT** may not seem like big news, but that's what the boating industry is shooting for.

Actually, it's boats that float right side up when swamped. Many of the '69 small boats are being equipped with flotation systems that assure stability when they're flooded. The flotation will keep the boats upright even with people and heavy outboards aboard. All small boats should have such flotation by 1970.

Though many boats have been virtually unsinkable, some have been known to flip over when filled with water. Passengers had only a smooth hull to grasp.

Basically, the new flotation systems involve redistribution of flotation compounds. This means that even when swamped, the boats will float upright with several inches of freeboard above the waterline. They are designed to do this loaded with people and heavy gear.

**HERE'S A HOT IDEA** for cold snowmobilers. It's called Sno-Camper, and is designed to be a portable tent for all seasons, especially winter. Towed behind a snowmobile, Sno-Camper will go anywhere you can. The shelter has two bunks



and a table. It will sleep two and hold six. An optional floor plug permits ice fishing from inside. A small catalytic space heater is all that's needed in cold weather. Sno-Camper can be carried in a pickup truck or a trailer. The unit weighs 277 pounds. Suggested retail is \$498. For more info, contact General Aluminum Products, Inc., Box 30A, Charlotte, Mich. 48813.




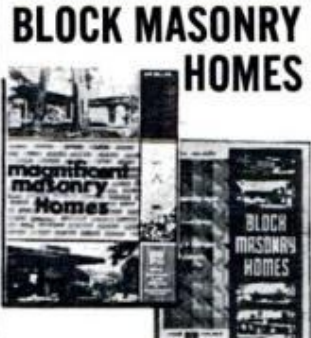


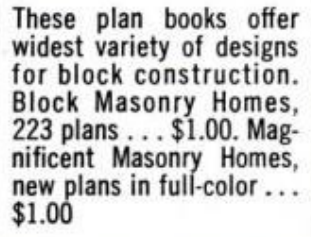






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# Across the USA With MIT's Electric Car

By LEON S. LOEB  
Project Coordinator

Starting from opposite coasts, MIT and Caltech students raced battery-powered cars across the country. Caltech won by 30 minutes. Both teams learned a lot about electric cars. Here's an exclusive report by the MIT team leader

**N**ONE OF US NOTICED the number "13" on that first toll booth. Even if we had, we felt lucky just to be off the starting line.

At the start of the race, with the sun beaming down, MIT banners dancing in the breeze and fellow students cheering us on, our excitement hid what only we knew: Things looked bad for MIT's "Tech I" Experimental Electric Car.

We had been working on it right up until the time we wheeled it to the starting line only an hour and a half before the planned 12:00 noon takeoff on Monday, Aug. 26. Earlier, we had to scrap our plan to run with an advanced-design electronically commutated motor, Dave Saar and W. Sumner Brown's part of the project, and install a conventional d.c. motor like those used on forklift trucks.

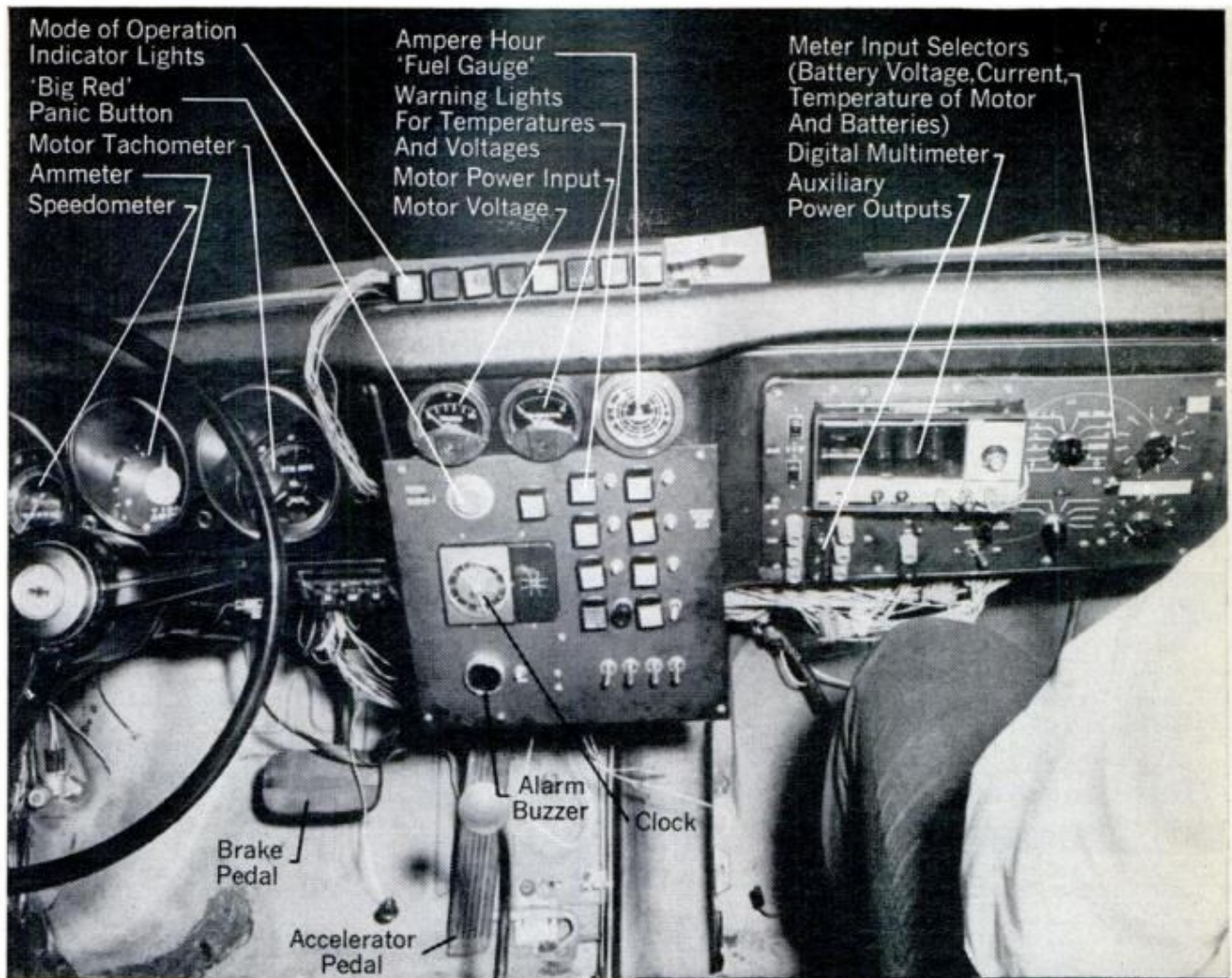
A shakedown run with d.c. motor started Friday night and ran well into Saturday. At this late date, we encountered some

real problems in our modifications of the car, a 1968 Corvair. For one thing, the motor was overheating. The series-wound 15-hp unit is rated at a nominal 120 volts and was overheating while operating from our 100-volt nickel-cadmium battery packs, due to the increase in average current draw at the lower battery-pack voltage.

Secondly, we discovered that our packaging of the batteries was such that they weren't getting enough cooling air. They, too, were overheating. While they weren't permanently damaged, their reduced capacity cut the last leg of our shakedown run to a scant 17 miles. As the saying goes: Back to the drawing board!

While the batteries were getting a very slow discharge followed by a very slow recharge, which is the standard treatment for the recovery of cells reduced in capacity by overheating, our gang of almost-frantic undergraduates kept their cool and





attacked the problem of getting batteries and motor to keep theirs.

Copper coils were fitted around the motor to circulate water from a sump in the "bilge" of the front battery compartment. This scientifically calculated measure, combined with the advanced state-of-the-art technique of throwing wet

*(Please turn to page 184)*



**THE AUTHOR** coordinates the simultaneous start of the MIT and Caltech cars at 12:00 noon on Aug. 26



**THE OPPONENT**, a VW converted to battery power by Wally Rippel, a Caltech graduate, leaves California



### Electronic Listening Device

• Hear Normal Talking 100 to 200 Feet Away!  
• Magnifies Sound Over 1000 Times!

Used by Army for secret detection. Works day or night, indoors & outdoors. What the telescope is to the eye, the Electronic Sound Collector is to the ear - only many times more powerful. Combines sound-amplifying power of **GIANT PARABOLIC "EAR"** with **HIGH GAIN TRANSISTOR CIRCUIT** and super-sensitive **STEREOSCOPIC EARPHONES** for tremendous high-gain amplification. Opens up world of sound around you - listen to conversations, baby sounds, birds, animals, etc. Operates for hours on standard 9 volt transistor battery (356). Portable with adjustable tripod legs.

6973. Big Ear Electronic Sound Collector. Complete. \$21.95

### HOME WINEMAKING SET



Makes better wine for less money. Federal law allows you to make 200 gallons of wine at home each year. All new set includes complete equipment. Fun. Easy. Delicious. Includes fermenting and aging tanks. Scientific measuring and testing equipment and all other accessories. Make wine from ciders, frozen fruit juices, fruits, etc. Compact. With booklet for all season recipes.

7028. Complete Winemaking Outfit. Price .... \$3.95

### PHOTO DEVELOPING & PRINTING SET

Have finished pictures the same day and save money doing it! Developing and printing your own pictures in easy, simple steps. No dark room. Do it for less than half usual cost. Easy. Put film or paper in developer, then in fixer and then let it dry. Set includes everything needed to process film and develop prints. Daylight developing tank for **ANY** black & white or color film including 35 mm, Instamatic, 120, 127, 620, etc. Loads in 1/3 usual time. With adaptor, 4 x 5" print frame, clips, three trays, stirring rod, safe light, chemicals, and print paper. Handy storage carton.

7042. Complete Set Only. .... \$7.95

### Big Throwing Knife \$1.00

**PIERCES METAL** specially weighed & balanced point serves right purpose with a wallop! Positive accuracy! Deep penetration! Easy throwing! Hard hitting! Cutlery steel, double edge, 10" long. Leather handle. You must be delighted or your money back. Price Postpaid \$1.00. Matched Set of 2 \$1.85; Set of 3 \$2.65. Leather Sheath 50¢. Professional Knife Throwing Book 25¢.

### "TALKING" VENTRILOQUIST DUMMY

stage & television star. You can make him talk by throwing your voice & it seems that Jerry (talking) moves his mouth & head, looks around, & talks dressed, looks like little midget, 24 in. tall, dressed in grey & green. Tan suit. White shirt, red polka dot tie. Black & white. Composite head.

6278. .... \$8.98

### Professional Magic Set

Set includes: Magic Ball & Vase Trick, Magic Vanishing Box, Royal Houdini Chain Escape with lock & Four Ball Trick, Magic Coin Box, Wonder Color Blocks, Vanishing Coin, Mind Reading Trick, Vanishing Fan, Coin thru Hat Trick, Magic Snapper, Great Number Mystery, Magic Indian Stick, Miscellaneous Card & Coin Tricks, Magic Glass Tumblers, Optical Illusions, etc. Sold separately tricks would cost nearly \$10.00. Complete in portable cabinet with compartments.

No. 6833. Wizard Magic Cabinet. Postpaid . . . \$4.95

### IT CAN'T BE TRUE, BUT LOOK FOR YOURSELF. XRAY GLASSES

Greatest illusion of the century! Apparently see bones thru skin, see thru clothes, etc. Girls will never trust you with these, but let them look for themselves and apparently see legs thru your pants. Amaze and embarrass everyone! Regular size glasses with built-in optical device.

No. 3762. Pair, Postpaid. . . . . Only 95¢

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8 power. Magnifies 64 times area. Terrific power in a small vest-pocket telescope about size of fountain pen. Precision ground lenses, all metal chrome finish. Also used as 30X microscope giving 900 times magn.

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**HARD HITTING! LOUD CRACKING!** Experts knock 4 sheaf off cigars. Vase people use for trainers, repellent. men. Loud cracker like shot-gun blast. 4-ply hand-stitched leather, with iron handle. 6-ft. Loop—\$1.95 8-ft. Loop—2.50 10-ft. Loop—3.25

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4082. Price Postpaid ..... \$2.98

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No. 4897. Camera & Case \$1.35 No. 4898. Film 6 rolls \$1.00

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Powerful, precision-made horizontal engine with grooved pulley and balanced flywheel for driving other machinery. Brass boiler stained blue, polished fittings including oscillating cylinder, safety valve, steam whistle, etc. chimney. No electricity required. Burns dry or liquid fuel. Comes complete, ready to operate. 6 1/2" metal base.

6446. Price Postpaid. \$11.95

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No. 5288. "Bug" Only \$1.00 No. 5292. Earphone \$1.50 Each

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8950. Nazi SS Swastika (Center) \$2.50  
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Genuine penny with Lincoln looking at Kennedy. Unusual and rare souvenir.

8990. Each ..... 35¢ 3 for ..... 85¢

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Special "loss leaders" for new customers. Most worth several times cost. **LIMIT: 1** of each per order. Surprise items include new samples we receive from all over world, factory surplus bargains, special novelties, etc. Money back if not delighted.

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7578. Transistor Electronic Sound Collector. Postpaid. \$8.95

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Corvette Sting Ray. Wireless Radio Control over 3000 square foot area or more! Instant action R/C system: STOP, START, TURN RIGHT, TURN LEFT. Hit control button as fast as you like. Pocket size, hand held, pistol grip transmitter. Authentic model of Sting Ray including detailed interior. Four true colors: Red, Orange, Blue, White. Ruggedly built for rough treatment. Practically unbreakable, guaranteed trouble-free operation. Precision made in Japan at fantastic low price by fine engineering craftsmen. Ready to run. Nothing to build. 1/18" scale, 10 1/2" long. Uses standard long-life, low-cost batteries. Colorful gift box.

7577. Complete Set (Transmitter, Car with Receiver) \$24.95

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Set of master keys that may prove very handy when you have lost keys to doors, locks, etc. While they will not open every type of lock, they do open over half of the common locks found on doors, cabinets, cases, etc. 5 different keys in set, each opens different type of lock. Everyone should have a set to see if they are burglar-proof.

No. 4848. Master Key Set. Postpaid \$1.25

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### Electronic Computer

ELECTRONICALLY MULTIPLIES, DIVIDES, CALCULATES PERCENTS, SQUARES & ROOTS, SOLVES LOG & TRIG PROBLEMS, REASONS, WORKS PRACTICAL PROBLEMS. Do experiments on math & science problems, rocketry, interest, radio-active decay, light, explosives, fireworks, strategy, etc. Wonderful introduction to data processing & computers. Do not confuse with mechanical, hand-operated computers. As practical as others costing several times. Easy to operate & understand. Multiplies your brain power to put you in genius class. Complete except for standard flashlight batteries that operate circuit and meter. Compact, portable.

6895. Electronic Analog Computer. Postpaid. .... \$8.50

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No. 6770. Complete Fencing Set. Postpaid. \$9.95

### Imported Stiletto Knife

OPENS WITH FLICK OF FINGER AND LOCKS INTO POSITION. Prevents blade from snapping when in use. Push button release. Convenient pocket size, yet rugged. Fine quality. Double market-steel razor-sharp blade. **PIERCES METAL**, much thicker, illustrated booklet, in box.

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| How Many        | Number or Name | Price Each | Total |
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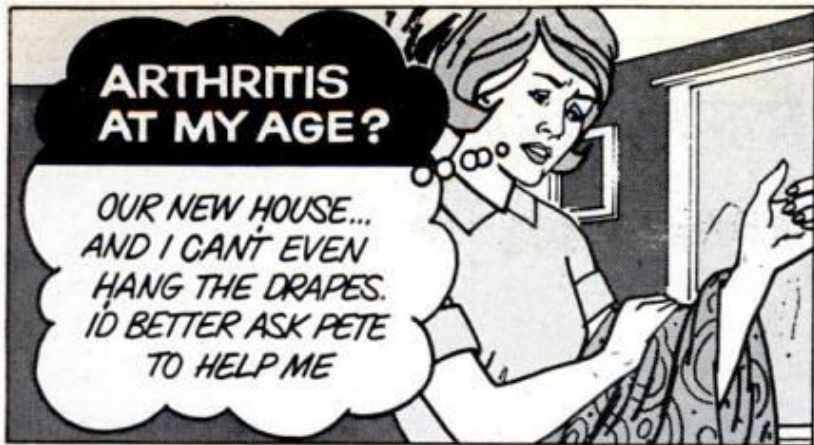
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OUR NEW HOUSE... AND I CANT EVEN HANG THE DRAPES. ID BETTER ASK PETE TO HELP ME



PANIC STRUCK ME! MY FATHER HAS ARTHRITIS BUT HE IS IN HIS SIXTIES. IM ONLY 44!



**THAT EVENING...**

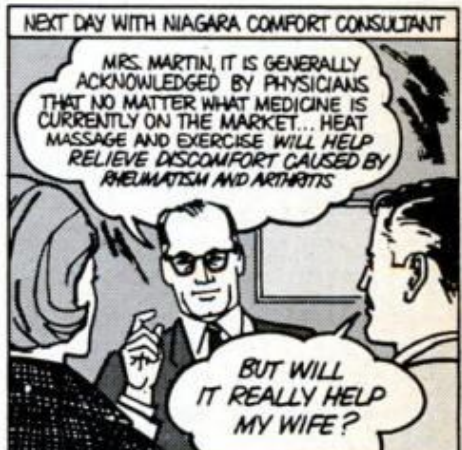
NIAGARA IS USED SUCCESSFULLY BY THOUSANDS FOR REPEATABLE AID IN THE RELIEF OF MINOR ACHES, PAINS AND STIFFNESS OF ARTHRITIS, HIGH AND LOW BACK PAIN, HOSPITAL TESTED AND CLINICALLY PROVED

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**NEXT DAY WITH NIAGARA COMFORT CONSULTANT**

MRS. MARTIN, IT IS GENERALLY ACKNOWLEDGED BY PHYSICIANS THAT NO MATTER WHAT MEDICINE IS CURRENTLY ON THE MARKET... HEAT MASSAGE AND EXERCISE WILL HELP RELIEVE DISCOMFORT CAUSED BY RHEUMATISM AND ARTHRITIS

BUT WILL IT REALLY HELP MY WIFE?



MANY DOCTORS ALL OVER THE COUNTRY USE AND RECOMMEND NIAGARA CYCLO-MASSAGE UNITS



JUST PUT THE SOFT FOAM PAD WHERE IT HURTS... YOU MUST FEEL IT TO BELIEVE IT

WHAT MARVELOUS SOOTHING ACTION. I CAN ACTUALLY FEEL THE PAIN, TENSION AND FATIGUE MELTING AWAY



**A FEW DAYS LATER... AT A NEIGHBOR'S HOUSE**

ID LOVE TO HELP YOU HANG YOUR DRAPES MARGE

THANKS TO NIAGARA'S PENETRATING RELAXING MASSAGE, I FEEL LIKE A SCHOOL GIRL AGAIN



AND CONFIDENTIALLY, MARGE, SINCE I STARTED USING CYCLO-MASSAGE, WERE A HAPPY, RELAXED FAMILY AGAIN!

AND NIAGARA CYCLO-MASSAGE COSTS SO LITTLE, TOO JUST PENNIES A DAY!

## Comfort to millions!

Cyclo-Massage brings marvelous new comfort, helps millions feel relaxed, "alive again." Helps relieve minor pains of arthritis, rheumatism, lower back trouble... provides blessed soothing relief whenever such pains occur.

**No Drugs! No Pills!**  
**You Have To Feel It To Believe It!**



**The next 60 seconds may change your life.**  
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Want a new Jet-Charged body? In 15 minutes I'll prove you can slap on 4" of muscles to your chest—3" to each arm—give you life-guard shoulders, trim your waist to athletic size—give you speedy athletic legs. I don't care if you're short or tall (skinny or fat) young or not so young, expect a muscle building miracle when you send for my free course. Send only 25¢ to cover postage and handling to Joe Weider, Dept. 38-118D, 531 32nd St., Union City, N.J.

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Put yourself in his place



(PAT. PENDING)

# MUSCLE UP & MAKE OUT

**ONE TWIST, IN JUST ONE SECOND, starts adding inches to your arms, chest, shoulders! WHY NOT YOU?**

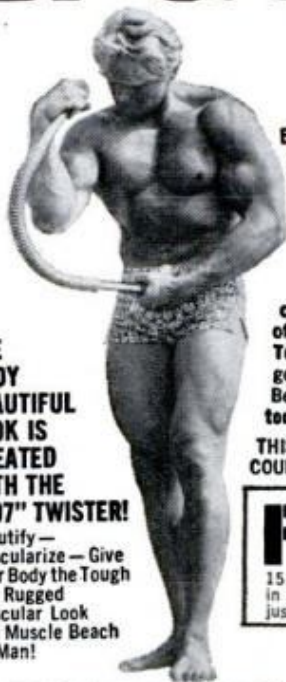
The "007" TWISTER is turning them on—even the Girls! From one end of Muscle Beach to the other, muscular things are popping up everywhere you go! The handsome, fun-going attractive fellows are twisting with the "007" TWISTER to add up to 2" on their arms, 4" on their chest, besides muscularizing their waists and building vigorous legs. They are giving the more than 500 muscles in their bodies a thorough going-over—to build power—rugged vigor—herculean muscular size, because they need he-man muscles—for surfing, swimming and lifting girls overhead with one arm! They know that one twist of the "007" TWISTER makes their muscles come alive with VIGOR...POWER...for Super Happenings! Don't you just read this ad—JOIN THE FUN! —SHAPE UP!—And What Shape You'll Be In!

## MUSCLES—ARE FOR REAL MEN!

See For Yourself What Super-Happenings You're In On When You Start Twisting With the "007" TWISTER and Build Your Own Muscular Go-Go, Action-Packed Body—all in the privacy of your own home!

**THE BODY BEAUTIFUL LOOK IS CREATED WITH THE "007" TWISTER!**

Beautify—Muscularize—Give Your Body the Tough and Rugged Muscular Look of a Muscle Beach He-Man!



**URNS A MUSCLE-STARVED BODY INTO A DYNAMIC DYNAMO.**

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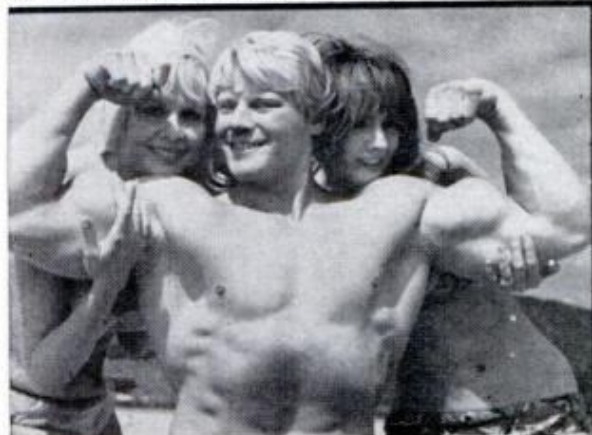
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I want to bring the excitement of Muscle Beach into my life and make my muscles "come alive" with Super Happenings, too! Enclosed is \$9.98—rush me the "007" along with free instructions and the FREE muscle building book. I understand that if I am not completely satisfied, I may return the TWISTER for a full refund.

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# SOLUTIONS FOR MECHANICAL HEADACHES

# AUTOMOBILE CLINIC

BY MORT SCHULTZ

## All choked up

*What can I do for a 1966 Buick that stalls out when I slow down to stop? Tune-ups don't help. Cleaning the automatic choke does cure the problem—for about six weeks. Then it has to be cleaned again.—Leo E. West, Garnerville, N.Y.*

An automatic choke in good shape should not need this much cleaning. I suggest you replace the choke heat tube. It probably has a hole or crack in it, and air may be causing formation of carbon inside the choke housing.

## Reverse decision

*At times, the reverse gear of my 1965 Dodge Polara station wagon refuses to work. Unfortunately, no mechanic has been able to give me a reason, because the condition doesn't occur when they test-drive it. When the problem happens, this automatic transmission trouble will last for an hour or so and then, mysteriously, clear up. What can I do?—Herbert S. Codville, Philadelphia.*

This is a tough one, but I've been tipped off to the fact that the spring behind the selector detent ball, which is located on the transmission valve body, is too light. At times, this prevents the transmission from going into reverse. I suggest you have a nose-to-nose talk with a good transmission man, preferably one at a Dodge dealer's. Ask him to install a slightly heavier spring than the one you now have.

## Rough idle

*Not one mechanic (Ford or otherwise) has been able to eliminate a distinct vibration in my 1966 Ford Mustang. The condition occurs when the engine is idling. The stick shift and steering wheel vibrate rapidly, and the engine sputters or skips. So far, I've spent a small fortune, and now my husband wants me to get rid of this bomb. Please help!—Mrs. Alva Canty, Brockton, Mass.*

I do a slow boil when I get letters like yours, because the problem has an easy solution if some mechanics would only do a little homework. In 1966, Ford issued

service bulletin 526. It gave instructions on how to enlarge the main metering jet in carburetors of Mustangs, Falcons and Fairlanes with 170 and 200-cu.-in. engines to stop surge and rough idle.

## Snap, crackle, pop

*Ever since it was new, my 1968 Chevrolet gives forth with a popping or crackling noise whenever I turn the steering wheel. The dealer has said it's not dangerous, but I thought I'd better check with you.—Herb Kelnhoefer, Hoopeston, Ind.*

It's not dangerous, but why put up with it? Your dealer now has instructions to adjust the lower mast jacket bearing in the steering column. Those same instructions say that if adjustment doesn't get rid of the noise, he should replace the bearing.

## Fallout or cop-out?

*I and other owners of 1964 Fords finished with silver gray paint would pin a medal on you if you can solve this problem. About 1½ years ago, the paint began to blister and peel, just on the roof of my car. It has progressed to the point where the rust-colored primer is the only paint remaining. A call to the local customer relations department of Ford resulted in a polite, but pointed, "tough luck." I believe the company should be responsible since this seems to be a defective paint problem.—F. D. Sullivan, Midland Park, N.J.*

You have an arguable point, but so has the company, and I'm not about to take sides. The facts, though, are these: There's been a problem of this type with cars (other makes, too, as well as Ford) that have been painted with a light metallic paint. Owners who have experienced this, and some body-shop men, offer the opinion that the paint is defective or there was a defect in preparing the metal for paint. The company's position is that air-pollution fallout settling on horizontal surfaces causes the blistering and peeling. The condition seems to strike horizontal surfaces only, such as roof, hood and tops of fenders. Another factor is that in most cases the blistering and peeling doesn't

*(Please turn to page 56)*



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## AUTOMOBILE CLINIC

(Continued from page 54)

start until two to three years after the car's delivered, which, of course, puts an owner on the short end of the warranty period. Thus, the company contends it has no obligation.

The only thing I can suggest, then, is that you have the part of your car that's in bad shape refinished and wash it more often to get rid of the fallout.

### Patching a gas tank

*I have a 1952 Plymouth in pretty good shape, except that the gas tank has a small leak. Can you suggest something I can do to repair it?—Eric Voth, Topeka, Kans.*

If the leak is along a seam, I doubt if it can be repaired. If the tank is rusted, you might patch one hole only to have others pop loose—so get a new one. However, if the tank has a hole poked into it by a sharp stone or other object, you can do a fairly good job with repair kits available at auto supply stores and consisting mainly of a self-tapping screw and neoprene washers. If they don't work, a stronger repair can be made with galvanized sheet metal and solder.

### Keep the pressure on

*I have a 1964 Ford Fairlane 500 with V8 engine. During the past year, leaks have twice developed in the radiator. The radiator pressure cap that came with the car is rated at 14½ lbs. pressure. A mechanic told me to change to a cap of 7 lbs. pressure, saying the 14½-lb. cap provides too much pressure. Will that 7-lb. cap harm my engine?—Walter Keir, Gaithersburg, Md.*

You won't harm the engine, but you won't get top performance either, since today's engines run best when they run as hot as possible. The more pressure the cap is rated, the more heat will build up in the cooling system. Instead of looking for alternatives, I suggest you yank the radiator, then have it cleaned out and all weak spots permanently repaired. Once done, you can keep the cap recommended by the maker of your engine and, with it, the good performance the engine seems to give.

## Good tips from readers

Here are two helpful tips from a couple of sharp auto clinicians:

Larry Englanders of Corvallis, Ore., writes that he was grinding his teeth in tune with the front-end grind of his 1965 Chevy every time he turned up or down a driveway ramp. A fingerful of grease on wheel stops molded to the inside of each front wheel stopped the front-end grind; toothpaste helped his other problem.

On two occasions, the carbon in the resistor-type ignition cables of his car was pulled apart by some "blankety-blank" mechanic pulling on the cable, writes A. J. Marshall of Cherry Hill, N.J. This led to a hard-to-find miss, which A.J. had to track down himself. He advises that car owners make sure the wires are pulled by their boots—not by the cables.

## Service Tips

● **Fuel-starvation problems** at carburetors of 1968 Fords and Mercurys are possibly being caused by kinked or improperly routed rubber hoses at the fuel sender unit or at the fuel-pump outlet. If you find a kinked hose, have it rerouted or shortened to get the kink out. If the kink can't be eliminated, have the hose replaced.

● **A few scratches on the steering wheel** may be eliminated, according to Oldsmobile, if they're not too deep. Just sand them lightly with No. 600 paper and then polish the area with an automotive rubbing compound.

● **Engine oil leaks** may be troubling 1968 Imperial, Chrysler and Plymouth owners whose cars are equipped with 383 and 440-cu.-in. engines. If you have an engine oil leak toward the rear, it may be because a few marine industrial crankshafts got mixed in with the auto crankshafts on the car production line. The solution is simple. Just replace the present crankshaft with the right one. Service bulletin 68-9-7 (7/29/68) provides the authorization.

● **Corvette owners take note:** The two forward right-bank sparkplugs of 1968 models with 427-cu.-in. engines and airconditioning can't be reached through the engine compartment. Even if the compressor is loosened, there's just not enough room to remove those plugs. To do the job, remove the wheel and enter through the fender skirt opening. ★ ★ ★

---

**GOT A PROBLEM WITH YOUR CAR?** Ask Mort about it. Send your questions to Auto Clinic, Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Letters cannot be answered individually, but problems of general interest will be published in the column.





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FORD PICKUPS





# HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

## Leaky leaded glass

*I have a small, leaded-glass window with several panes built into my front door. When there's a driving rain, water leaks through. I'm told that epoxy will stop the leaks. Right?—P.R., Vt.*

Possibly. But to me the real problem is to locate the exact points of leakage. Water might be driven into the joint between lead and glass, travel along the joint and then spill inside some distance away. I once solved this problem by "rerunning" the leaded joints at several points with a small electric soldering iron, using a damp cloth as a heat sink. Of course, you must be certain of the exact location of the leak beforehand and extreme care must be used to heat the lead just to the melting point, no more. I spent some time cleaning the joints involved to make sure that all dust and any other debris had been removed. The procedure did stop the leaks. True, there is risk of cracking the glass but if you use extreme care, this hazard can be reduced to the minimum.

## "Seating" floor tiles

*I recently tiled a half bath in my basement. Now the tiles have loosened and the cement is soft and oozy underneath. The top surface of the tiles seems to be damp, almost wet at times. I used asphalt tiles and was careful to spread the cement uniformly. What's wrong and what can I do now?—T.F., Ore.*

Did you use the recommended waterproof adhesive, which is also resistant to the alkali in the concrete floor? If not, then you're not going to like what I'm about to suggest: Remove the tiles, clean the tiles and the floor and re-lay them as before, using the proper cement recommended for application below grade. It's a messy and rather tedious job but there are solvents available that will ease the chore somewhat. This, it seems to me, is the only sure way to correct the trouble.

## Basement water damage

*Last summer, about 2 in. of water seeped into my basement and remained long enough to rust casters on my wife's washer, my workbench legs and two other*

*castered pieces of furniture. I succeeded in brushing away most of the rust but the flooding can happen again. Is there any way to prevent damage to casters, other than blocking everything up?—F.D., Okla.*

Seems to me it would be better to concentrate efforts to prevent more flooding. You do not say where the water is coming from—through walls or floor—but seepage through the walls can be prevented, except in extreme cases, by coating the walls with a masonry waterproofer. If water is seeping in at the point where the floor joins the walls, then a fillet of waterproof cement or caulking should seal it out. When applying the material, it is essential to follow instructions in all details; otherwise the application may not be successful. For more detailed information, see *How To Choose the Correct Caulking Compound*, page 156.

Temporarily, however, you can purchase a number of fairly heavy plastic sacks and slip these over the casters when there is likely to be flooding.

## Sawdust insulation

*My attic is insulated with sawdust. I just bought the place and apparently the sawdust has been there a long time. What can I do with it? Should I dump it out and install pour-type material or batts, or should I just leave the stuff where it is?—L.E., Minn.*

Dumping it can be quite a chore, especially if the attic is large. When contemplating the job of shoveling the stuff out—even though it may be no more than a few inches deep—one is tempted to say leave it where it is and put in a pour-type insulation right over it. But I'm afraid this wouldn't be acceptable advice. Sawdust, in any appreciable depth, is insulation of a primitive kind but it can become damp or provide a cosy home for some undesirable insects. In time, it also tends to settle. This latter tendency reduces its insulating value proportionally. One hesitates to suggest it because of the labor involved but it seems to me that it would be best to get rid of the sawdust entirely and install either a batt or pour-type insulation between the joists. The former, with a foil facing, is probably the better of the two. You could probably pull the sawdust into "windrows" with a rake and then shovel it into a chute. A rented industrial-type vacuum cleaner would quickly dispose of the residue and leave the attic floor clean for installation of the new insulating material. ★★



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# 'Grounded' for 90 Days

Nine miles over the speed limit cost me 90 days of embarrassment and frustration, three years of added expense—and sagging arches

By A. R. ROALMAN

Photo by Irv Dolin


**T**HE CHANGE in my life that started that bright, sunny afternoon when a police car with a flashing red light pulled in behind me, could happen to anybody who drives a car. It happens to more than a million drivers a year, according to the American Assn. of Motor Vehicle Administrators, a government organization that has tabulated such data.

I had been speeding. The official report, made out by the Wisconsin state policeman who stopped me, showed that I had been going nine miles an hour faster than the posted limit. No great thing. A lot of people do it every day. What's nine miles? They were enough to change my pattern of living drastically. Such a change could happen to you.

I pointed out to the police officer that my speedometer was broken. It was a lame excuse, and he treated it that way. Police don't usually concern themselves with *why* someone was speeding. They merely record the numbers and allow you to tell it to the judge.

I live in Illinois, so I never bothered to go back to Wisconsin on my hearing date to tell it to the judge. Too much trouble. I merely forfeited the \$25 cash I had posted when I was stopped.

That was that. For about four weeks. That's when I



THE THIRD TICKET of the year really hurts; in most states it means a 90-day suspension



NOTICE OF SUSPENSION

William J. Lane

Effective Date of Suspension

Mo. Day Yr.

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Date of Suspension

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6-206(a)2

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YOUR LICENSE MUST BE SURRENDERED ON OR BEFORE THE EFFECTIVE DATE OF SUSPENSION—SEE REVERSE

Drivers License Division



B. T. Donne, SUPERVISOR

**THIS IS THE WAY** State of Illinois lets driver know that he's going to be walking for next few months

received a formal notice from the Illinois secretary of state. The notice said that my latest offense was the third moving-vehicle violation I had had in the past year. Three moving-vehicle violations in one year mean that a person's license to operate a car is suspended for 90 days. (What happens in Illinois, I discovered later, is similar to what happens in most other states.)

The notice went on to say that I could have a hearing at which I might appeal the decision of the secretary.

Ninety days without being able to drive! I lived 25 miles from Chicago and used my automobile in my work a lot. All of a sudden, a wave of panic swept over me. This could be expensive! How was I going to get around?

Drive *without* a license? The thought went through my mind, but the penalty for that is *really* tough. Let the police stop you, for any reason, when you are driving on a suspended license, and you can count on losing your license for a year. Or longer. No questions asked. Zap. *That* wasn't the way out.

I decided to appeal. After all, one of the violations was nothing more serious than sliding on an impossibly slippery

street during a sleet storm and hitting another car. The damage was minimal, just over \$100, but enough to require that it be reported. The third violation also had been for speeding. Again, the excess was only nine miles an hour, and it, too, had happened when I was driving with a broken speedometer. I thought I had some decent excuses.

The man who directed the hearing wasn't having any excuses the day I came through. I had, in fact, hit the other car, hadn't I? Yes. I had been speeding, hadn't I? Yes, but you see, sir, I had this broken speedometer, and. . . He really couldn't have cared less. He wasn't around trying to be soft-hearted to violators. His main job was to see that people got what they deserved under the law. I got a three-month suspension.

As I said, more than a million drivers a year lose their licenses in the United States. The way states are cracking down to reduce highway accidents, it's not too farfetched to imagine it happening to any driver. For example, during 1965, California took away driving privileges from more than 100,000 drivers. New York lifted 46,000 licenses.



Pennsylvania took back 130,000. All states now have some form of driver-suspension program, and the trend for increased use of this device to crack down on violators is strong.

Let's assume that you're one of the million and more who loses his license to drive. You'll have to find some other way to get to work. Maybe you can take a train or a bus or ride with a car pool. But, no matter how you cut it, it won't be as convenient as your personal car. You'll have to go and come when it is convenient for others, not you. You'll have to stand on windy street corners when buses are late or have cold dinners when your train comes late.

Or suppose that you work five or ten miles from home, are in the habit of driving and can't get substitute transportation. Your wife? She will drive you to work in the morning and pick you up in the evening, but you can be sure that you'll hear, often, during her chauffeuring hours, how you'd better not lose your license again. It does something to a man's ego.

Here are some of the transportation problems I encountered during my 90-day suspension:

1. I had to get to a place that was only 18 miles from my home. Usually, I could drive there in 20 minutes. To make it without a personal car, I had to take a 45-minute train ride to downtown Chicago, spend 30 minutes waiting around a dreary station, then get on another train for 30 minutes. An hour and 4 minutes for a trip that usually took 20 minutes. Then it took me the same amount of time to get home that night, three hours and a half bitten right out of my day for a business trip that, B.S. (Before Suspension), only ate up about 40 minutes. Guess what I thought about suspension, driving too fast, and my own stupidity behind the wheel during those wasted hours?

2. I had an invitation to go on an ice-fishing trip one weekend. None of the others could give me a ride, public transportation to the lake where the group was going was impossible, and

my wife said she absolutely would not play chauffeur for four 150-mile trips, which would have been necessary for her to take me and then come and get me when the weekend was over. I stayed home.

3. One Saturday afternoon my son was playing in a basketball game in another town. I wanted to see it, but it was impossible to get there on public transportation. My wife wasn't planning to go to the game. So I had to call four other people, who might have been going to the game, to ask for a ride. Each asked me why I wasn't able to drive. When I told them, a small part of my pride dissolved.

4. One bitter cold night I wanted something from the drugstore, about a mile and a half from my home. Normally, I would have thrown on my

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**'Each asked me why I wasn't able to drive. When I told them, a small part of my pride dissolved.'**

---

coat, warmed the engine of the car for a few minutes, and gone off on my errand. Not this night. I had to ask my wife if she would put on her coat and take me. What she mumbled as we drove through dark and bone-chilling-cold streets that night got under my skin, to the pride part of my anatomy.

5. Every other Friday night I played poker with a group of men. One night I couldn't get a ride to or from the game with one of the other players. If you don't think this is a problem, imagine what a wife is like when she has to get out of a warm bed at 3:00 a.m., drive 11 miles on icy roads, and then drive those same 11 miles back? She's fairly chilly, I can testify.

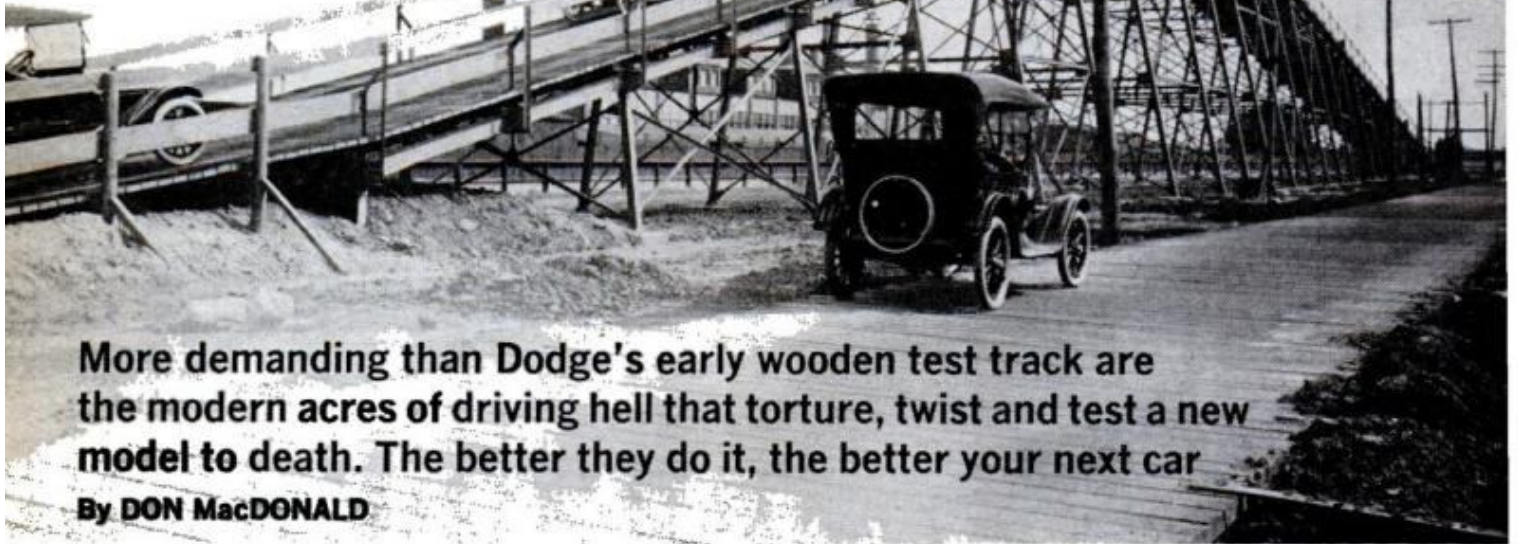
Your pride also gets tarnished in other ways.

The state that suspends a license often sends a notice to your hometown. Get your name published in your local newspaper and you'll find there are all

*(Please turn to page 210)*



# Proving Grounds: What Do They Prove?



More demanding than Dodge's early wooden test track are the modern acres of driving hell that torture, twist and test a new model to death. The better they do it, the better your next car

By DON MacDONALD

**G**ET ON THE WRONG ROAD going too fast on a modern automobile proving ground and you'll get the chassis jackhammered right out from under you. Hit a stretch of undulating "washboard" surface or vicious rock and you'll find out what a proving ground is supposed to do: Speed up the life of a car and do it fast.

It's a unique assignment for all concerned. Right from the beginning, road contractors, who get their good reputations by building smooth roads, have to bid on a proving ground project where they're expected to do their lousiest.

They are asked to duplicate, for example, a section of Florida's Sunshine State toll road so shoddily built in the original that it caused a major scandal. Instead of leveling bumps and filling potholes, they must create them. And no one makes a machine these days to speed the laying of a mile-long stretch of cobblestones.

This mayhem of cement, asphalt and holes, with some corrosive chemicals

thrown in, will accelerate normal car wear by a factor of five. A problem, however, is the definition of "normal" car use. Outside the proving ground fence it might be realistic to assume that a certain neglect of routine car maintenance plus—to put it kindly—somewhat less than skillful driving are to be expected. Thus Ford Motor Co., whose policy it is to adhere strictly to textbook maintenance and driving procedures in its testing, was caught totally by surprise recently when field reports came in of serious braking problems with the Lincoln Continental. Nothing of this nature had been experienced at the proving grounds. Investigation, however, uncovered the tendency of the average Continental owner to rest his left foot on the brake pedal with resulting dragging and overheating of the brakes, a habit that would cost a professional test driver his job. The solution, of course, was to incorporate enough play in the pedal to absorb the weight of a foot.

General Motors, on the other hand,





**SALTWATER BATH** gives Cougar an hourly dunking on its 25,000-mile durability cycle at Lincoln-Mercury

may very well have anticipated such a problem because it makes a practice of hiring seasonal types, like school teachers and golf professionals, to augment its regular staff of testers. The poorer drivers they are, the better for this purpose.

The automotive proving ground in its modern and elaborate form was pioneered by General Motors in 1924. Prior to and even long after that date, other companies relied variously on public roads, racing contests and small board tracks adjacent to the factory. Some all-new and quite radical models



**CROSSWINDS** of controlled magnitude are generated by huge aircraft engines at General Motors facility

were hardly tested at all before being offered to the public, as in the case of the 1933 Franklin air-cooled V12 whose baptism consisted of a solo cross-country excursion from Syracuse to Los Angeles and back with chief engineer Carl Doman behind the wheel. Chrysler did not open its 4000-acre Chelsea, Mich., facility until 1954, a time when Ford was still relying on a converted Dearborn airfield that originally was the home of Henry Sr.'s famous trimotors. Surprisingly, Studebaker, Nash and Packard had fairly elaborate proving grounds long before any other company

**ROCKY TEST BED** at American Motors' Burlington, Wis., facility can take a car apart at the seams







**SAFETY RESEARCH** takes a large toll of cars on the proving grounds. Remotely steered car is coasted down a grade at a speed of 40 mph in this sequence of photos of a broadside collision. Instruments in the cars, and often in dummy passengers, record forces

in the automotive industry except GM. Then, as now, production cars are very literally shaped by the tortures to which their prototypes are subjected. Their capabilities are also rather precisely limited by the testing facilities available. As a case in point no automotive writer in recent memory has awarded any prizes to American Motors for the steering agility of its products. These same writers, though, invariably praise the twist resistance of Rambler body structures. Very likely the first is due to the absence of a true, paved, high-speed handling course at that company's test facility, and the praise stems from the fact that the facility boasts the bumpiest bumps in the industry. So, too, Ford may honestly advertise that it builds the quietest car, but only when the competition is conducted on its new Romeo, Mich., grounds. Chrysler is quick to drag out the decibel meters and prove the Imperial to be quieter than both the Ford and the Rolls-Royce—but this is on the roads peculiar to Chelsea.

The Ford, AMC and Chrysler testing



**IMPACT-SIMULATOR SLED** uses vertical post to ram car down track. Impact occurs at beginning of run





**COMMUNICATIONS HOOKUP** from car to computer transmits design data which is analyzed in seconds

operations are conducted at a corporate level. Though the customer may not be aware of it or even care, a Dodge of a given size is mechanically and structurally nearly identical to an equivalent Plymouth or vice versa. The same holds true of Fords and Mercurys, Rebels and Ambassadors. Thus it would be economically senseless to test these family nameplates separately.

Within General Motors, however, there is much less interchanging of components. There, the divisions do their own testing and it is carried out with a secrecy that applies within as well as outside the family. Where a

fair degree of interchangeability does exist, as with the Camaro and Firebird, the secrecy can be and has been carried to the point where it hurts. Chevrolet, rushing its Camaro to market, depended almost totally on a computer for suspension design. Pontiac, on the other hand, turned a few human engineers loose on the same basic parts, had them drive the car which the computer couldn't, and soon spotted a pronounced tendency of the rear springs to bottom on the slightest bump. It engineered the fix into the Chevrolet-supplied parts used in the Firebird, but don't think for a minute that it passed this information on to Chevrolet. The latter found out the hard way from complaining customers.

The earlier field reports and more lately, the formal and costly failures covered by warranty, fall immediately into the proving grounds' lap on the premise that they should never have escaped in the first place. A typical example is the well-publicized failure of the headlamp covers on early Cougars. Somehow in the complex testing cycle of the prototypes, testing that encompassed well over several million miles, nobody happened to coast down a long grade with the headlights on. If someone had, he'd have discovered that the excessive engine vacuum under these conditions overrode the check valves in the flippers with the result that they



**STEEP GRADE**, one of several at Ford's Romeo, Mich., proving grounds, tests drivetrain under load



**SLICK SURFACE** at GM's Milford, Mich., proving ground is used to research four-wheel antilock brakes





**STEERABLE REAR WHEELS** are part of GM research car which simulates various handling characteristics

closed over the lighted lights and the night was suddenly quite a bit darker.

A somewhat similar failure in earlier Camaros equipped with the concealed headlight option illustrates another problem common to all proving grounds. In this case the flippers were actuated by electric motors. Chevrolet engineers did drive prototype Camaros by the hour through a saltwater trough without experiencing a failure. Yet after about a year of "normal" driving by owners through rain and shine, the motors began to fail by the hundreds even though their actual exposure to dampness was far less than during the accelerated test. Chevrolet engineers here had to relearn a bit of basic phys-

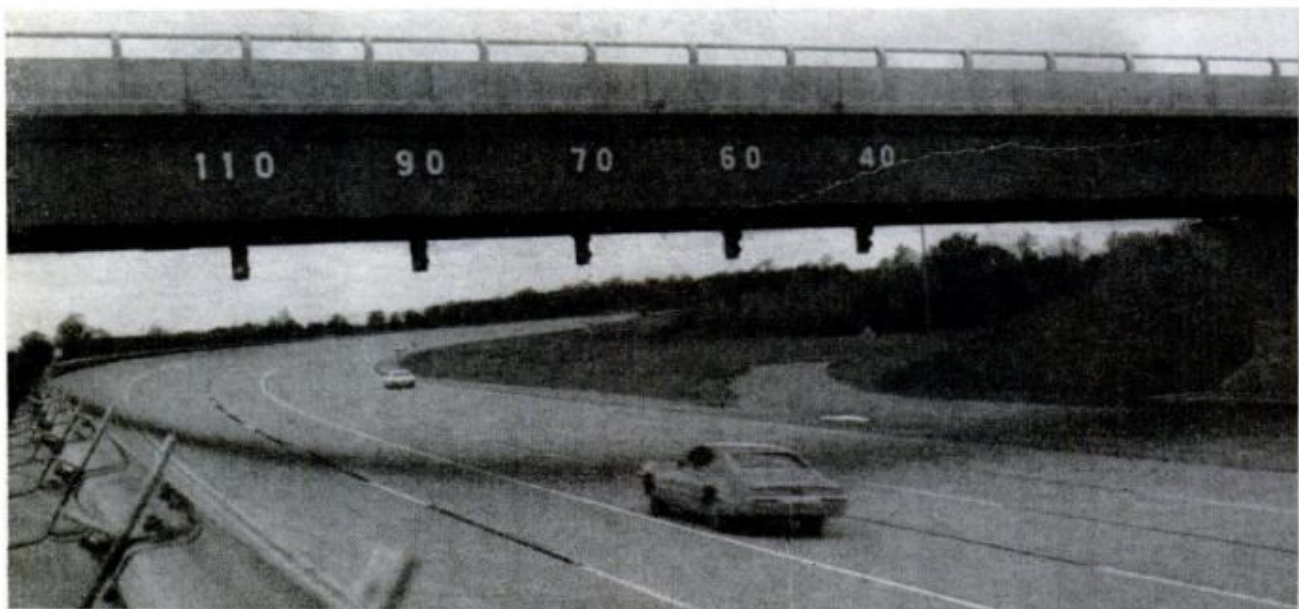
ics; namely, that while man can synthetically increase the severity of an environment conducive to corrosion, he can't accurately accelerate the process of corrosion itself. It's a situation where nature refuses to be fooled.

The processes of man in his car are subject to similar vagaries. A car may be driven 25,000 miles on a proving ground—the equivalent, presumably, of 125,000 miles of "normal" service—but the test driver sits in one position, uses one door and window handle, may or may not make much use of the heater, airconditioner or windshield wiper and maybe never opens the glove compartment or uses the cigaret lighter. As most everyone has learned, it is a combination of lesser failures that propels trading a vehicle in on a new one. Chrysler, for one, attempts to predict these through an elaborate set of laboratory machines that slam through millions of cycles, raise and lower convertible tops all day long and even punch seat cushions in imitation of human entrance and egress. Ford requires its test drivers to cycle everything movable, including sun visors, at scheduled intervals. But none of this quite matches the unpredictable wear and tear that could be caused by three kids caged for 500 miles in a station wagon on a turnpike.

Auto engineers admit that while they

*(Please turn to page 214)*

**HIGH-SPEED OVAL** for hard driving is part of all proving grounds. Minimum speeds are posted for lanes







## British and French roll out new fighter-bomber

A drag chute helps decelerate the prototype of the Anglo-French Jaguar during recent tests of the new fighter-bomber. The craft mounts missiles on its nose pylons and on its squared-off wingtips. In all, it carries five tons of weapons at almost the speed of sound.



## Nuclear-powered and lighter than air

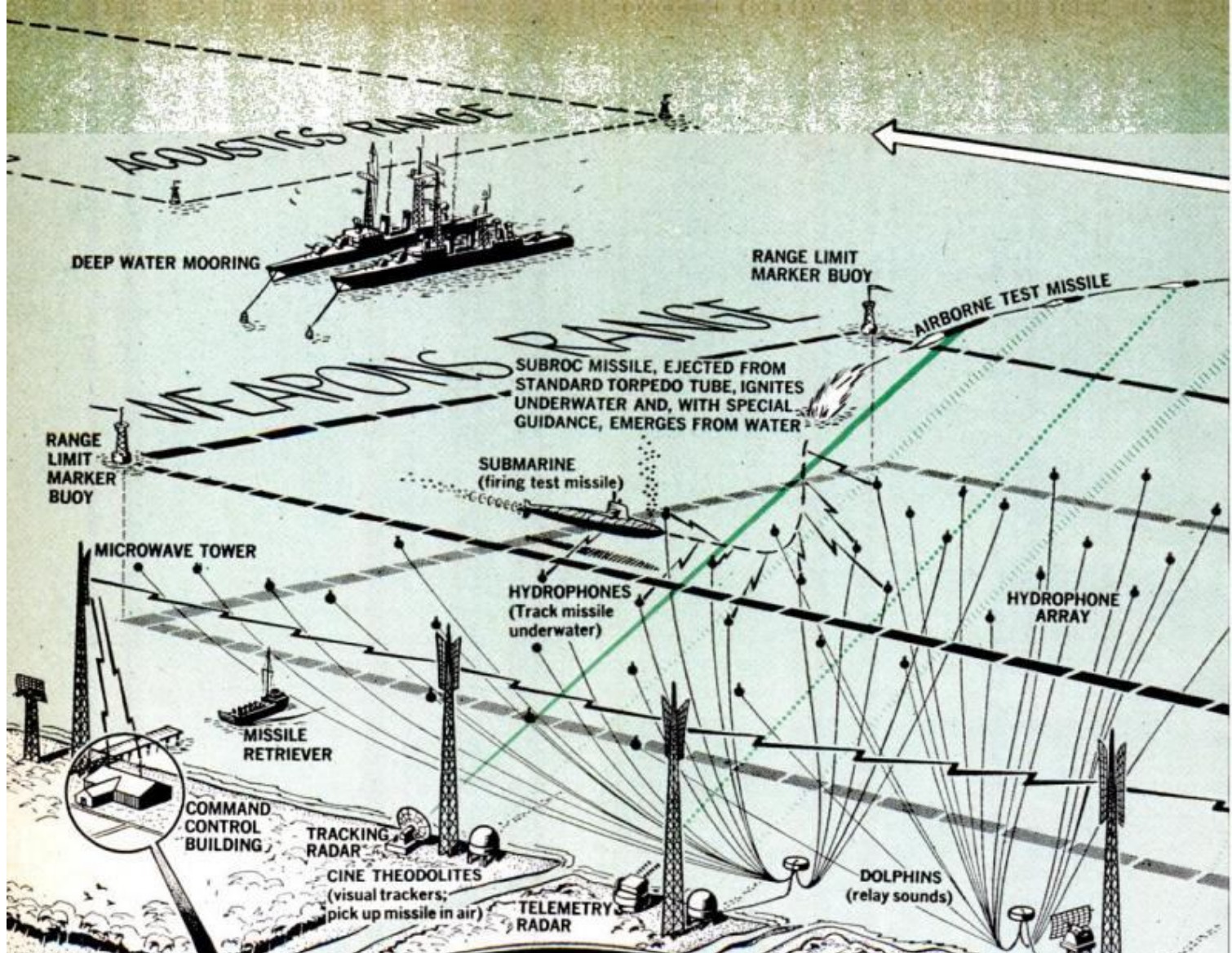
Harold Hudak (left-hand photo) of Akron, Ohio, is promoting the return of the rigid, lighter-than-air ship. His \$14,000, 36-foot-long model would, in full scale, be 865 feet long, powered by a nuclear reactor, capable of unlimited range—and able to cruise at 150 mph.



## Twister is pattern for new Army vehicles

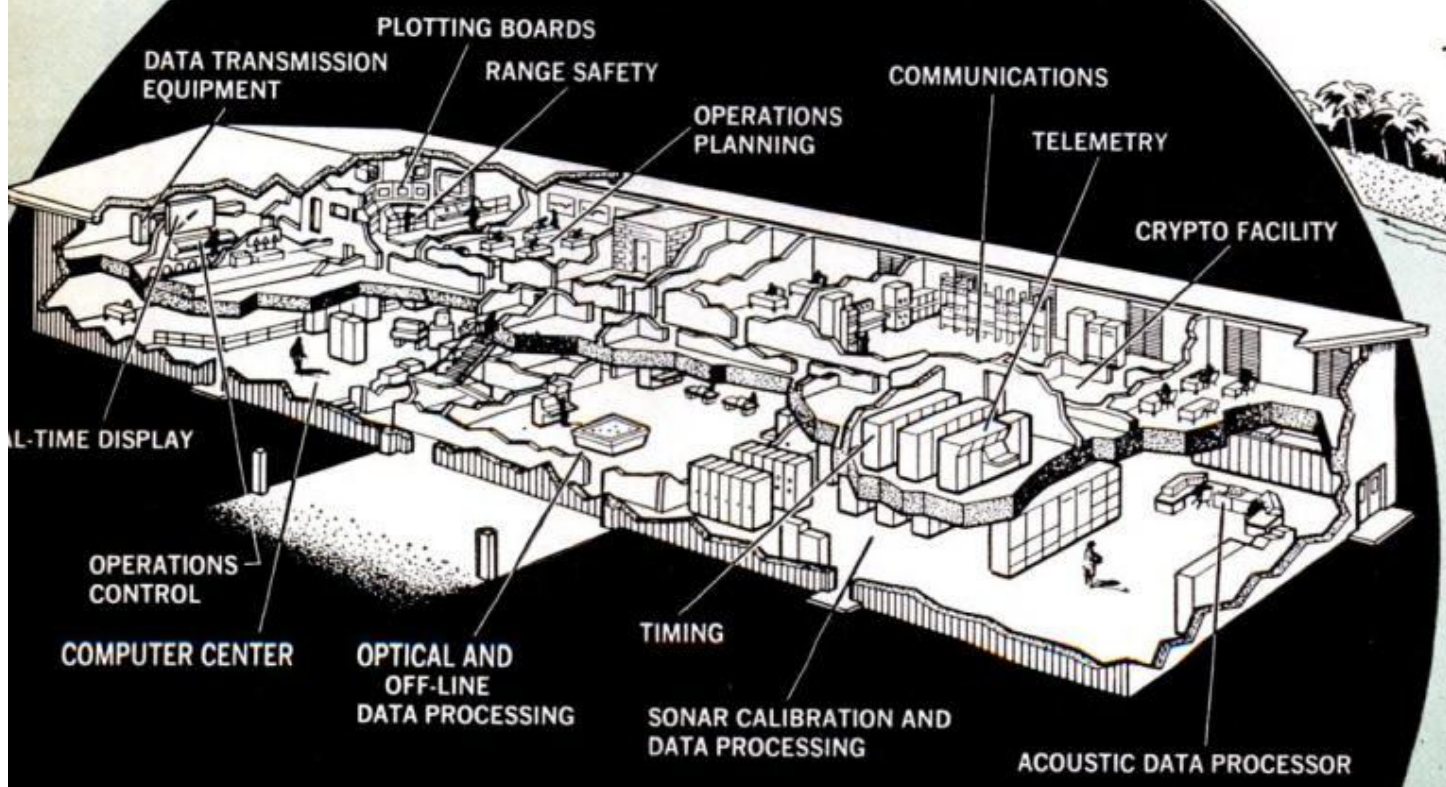
Lockheed's eight-wheel-drive Twister, a tight-turning off-road vehicle, is being developed into four new Army machines—including two armored combat vehicles.



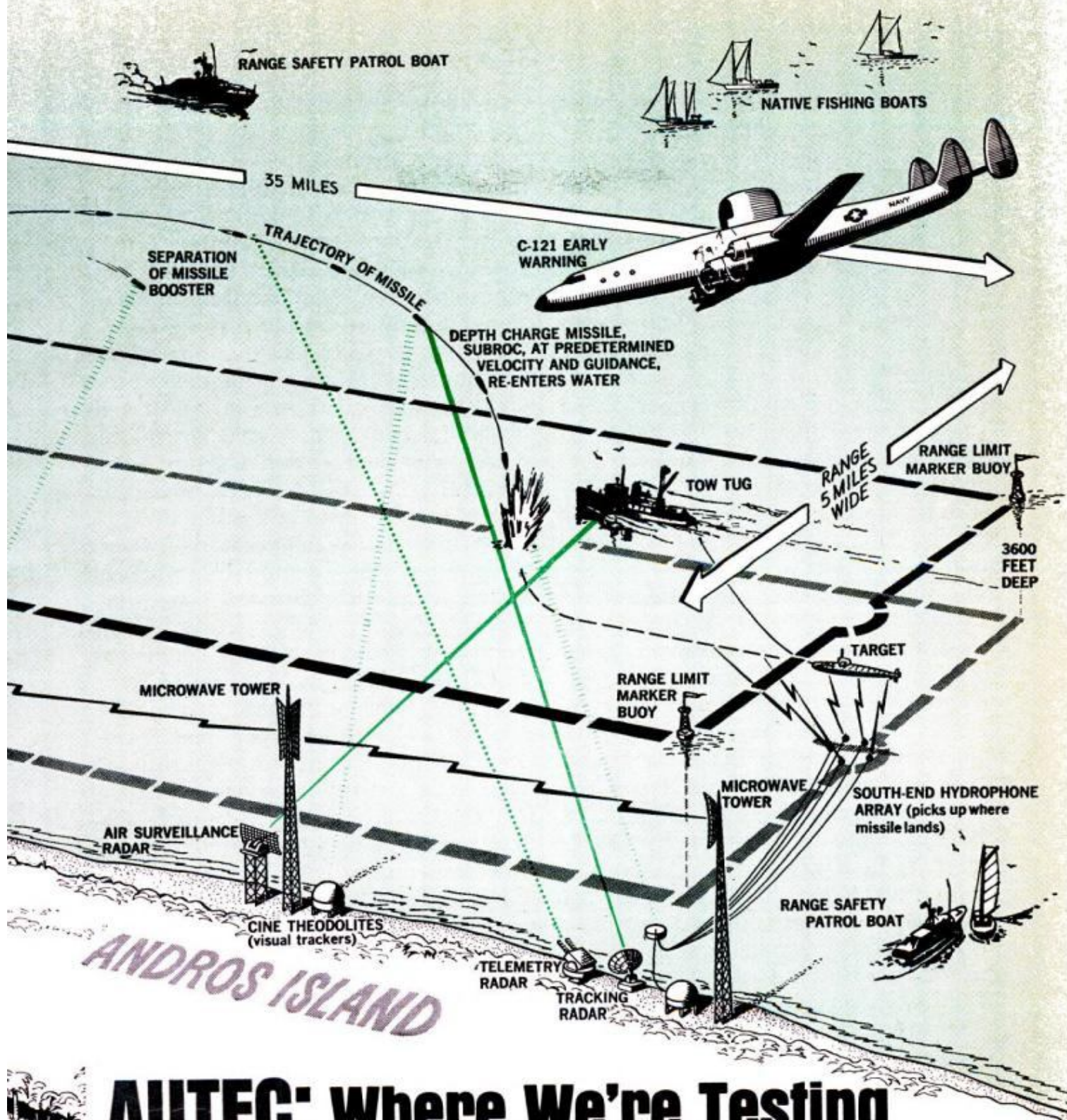


# Command Control Building

Receives technical data from all ranges: air, surface and underwater







# AUTEC: Where We're Testing Tomorrow's Underwater Weapons

Off an isolated island in the Bahamas, the U.S. Navy, under realistic conditions, checks out its new equipment in the world's wettest proving ground.

By JOSEPH ALBINO

Art Concept by Graphic Presentations, Inc. and Marian Manfredi

**A**SK YOURSELF these questions: How do you make a submarine so quiet its noises can't be measured? How does a sonar operator differentiate between the sound of a sub and that of a decoy?"

Pointer in hand, William W. Gordy, civilian electronics expert at the U.S. Navy's



# Electronic 'eyes' and 'ears' spot a nuclear sub

Atlantic Undersea Test and Evaluation Center (AUTEK), indicated the position of the oblong-shaped Weapons Range. It was outlined in bright lights on the large wall panel in the real-time display room at AUTEK's Command Control Building.

Also brightly outlined on the panel was Andros Island, one of the out-islands in the British Colony of the Bahamas. In the water directly east of Andros could be seen the Tongue of the Ocean, so named because the configuration of the ocean bed resembles the outline of a huge tongue.

Here, where the Weapons Range has been set up, sophisticated electronics equipment is used to test and evaluate newly developed weapons systems.

AUTEK's mission is to provide a deep-water facility where acoustic measurements can be made, sonars tested, and accurate underwater surface-and-air tracking data obtained on ships and weapons in support of the Navy's anti-submarine warfare and undersea research-and-development programs.

AUTEK had its beginnings in 1959, after persistent requests from various naval offices. Other sites considered included San Clemente Island in California, Chatham Straits in Alaska and Guantanamo Bay in Cuba. The Tongue of the Ocean was chosen because it met all the requirements: Isolation from shipping lanes, low ambient background noises, deep water close to land, adequate space for the free operation of ships, submarines and weapons, year-round operating conditions, stable undersea environment, proximity to the continental United States, location in a sparsely inhabited area and controllable access.

AUTEK's "godfather" was Vincent J. Prestipino, present head of its management division in Washington, D.C. As program manager for the project, he directed the development of instrumentation for underwater measurements

and accurate three-dimensional tracking of underwater targets.

In the real-time display room in command control, I was sitting in a theater-type chair and witnessing a real-time demonstration. In the center of the room, a control console, lights flickering softly, fed computerized information into a slide-type optical projector.

Across the hall, in the operations-console room, four men huddled shoulder to shoulder before a large, surveillance wall panel where circular, colored marks indicated within a 96-mile-long area the presence of fishing boats, airplanes, patrol boats and other craft in, on or near the Weapons Range. Other technicians were behind five vertical, automatic plotting boards. Here, they are able to select any variety of continuously variable testing conditions, on any scale, from inches to miles.

Unseen and unheard, except by AUTEK's electronic "eyes" and "ears," a nuclear submarine was entering the Tongue at a depth of several thousand feet. On the surface, several sturdy, PY-type boats patrolled the 35-mile-long, 5-mile-wide range.

From the small-craft harbor of the command-and-logistics site, a missile retriever, with a sloped deck of rollers, started up the 20-foot-wide channel, through the reef, to take position.

At the completion of the test, this boat's crew would pick up the costly missile for refueling and reuse.

Meanwhile, up and down the range, skilled technicians manned equipment at six separate sites on the eastern shore of Andros. Using in-water and in-air tracking systems, these sites have the capability of providing time-correlated, three-dimensional data on any object above, below and on the surface of the azure-blue waters.

At the Command Control Building, other activities were shaping up in the communications center. Here, communications specialists were in contact



with all sites by microwave radio, all military and commercial craft in the area by VHF, UHF and HF radio, AUTECH's headquarters at Palm Beach International Airport in Florida by single side-band radio, and with any U.S. Navy unit anywhere by encrypted, teletype machines via classified code.

In the background, over the sounds of machines humming and people talking, could be heard the clear oscillations of naval radio-station WWV.

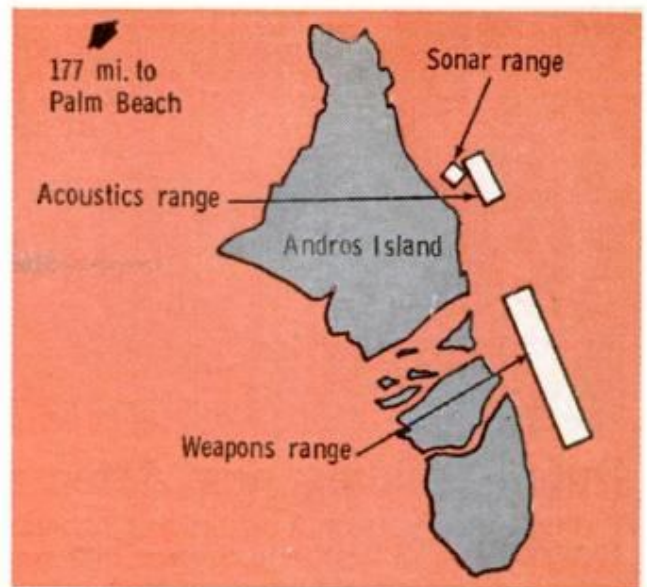
Military men usually synchronize their watches before a mission, usually to the minute, often to the second. At AUTECH, synchronization is made by all participants in a test to the *millionth of a second!* Mounted on the missile in its tube in the submarine is a pinger. When the missile is fired, this pinger emits a burst of sound energy at a predetermined frequency and repetition rate. The sound from the pinger is picked up by hydrophones (underwater microphones) and fed by cable to signal processing equipment which measures the time of arrival of each pulse at each hydrophone. The amplitude and width of the pulse is also measured to determine valid pulses from false echoes.

The in-water system used at AUTECH actually comprises 48 hydrophones in an area five miles wide and 12½ miles long. This system, selectively actuated by the command-control computer center, is capable of tracking 11 objects simultaneously. At the south end of the range is a single-array hydrophone which measures exactly where a weapon lands.

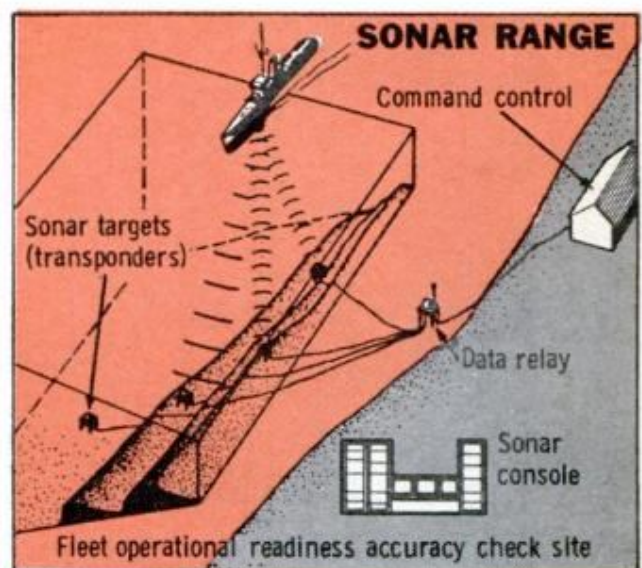
The times of arrival of pulses are transmitted to a computer, which has stored within its memory the base-line distances between each hydrophone. By computing the position of the missile relative to the hydrophones, its exact position relative to the target is known from the time of launch to impact.

Cmdr. Frank Smith, officer in charge of AUTECH, explains, "When the weapon is launched, you must be able

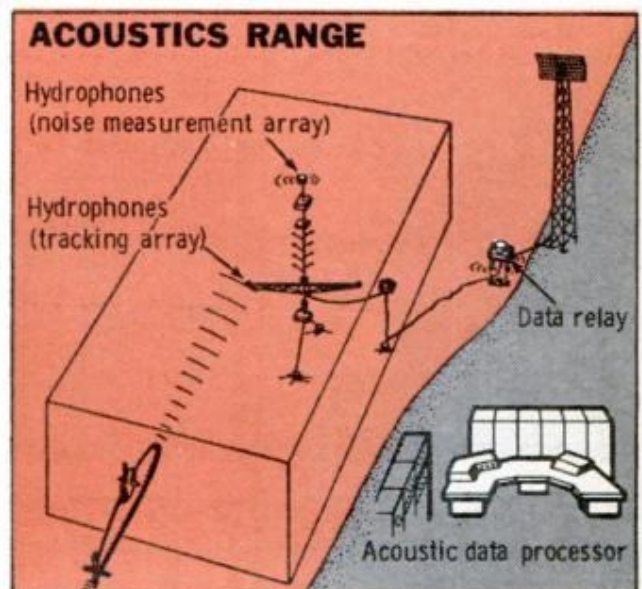
*(Please turn to page 216)*



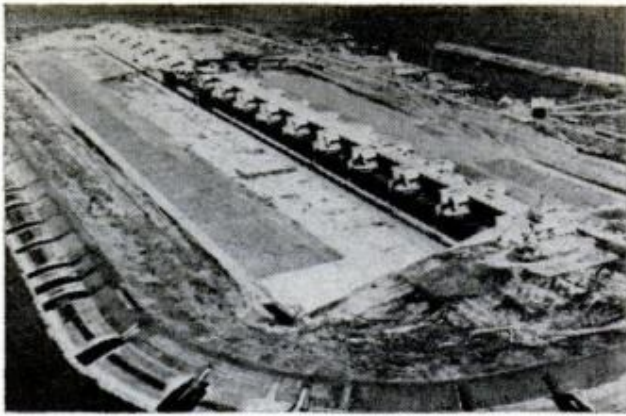
**ANDROS ISLAND** in Bahamas is site of U.S. Navy's weapons range, proposed sonar and acoustics ranges



**FUTURE RANGES** for testing sonar (above) and sound (below) will include equipment shown. At sonar range ships can calibrate sonar and fire-control equipment to eliminate any error in their own systems. Acoustics range will make in-the-water sound measurements of surface ships, underwater craft







## Dutch building new defenses against sea

After a disastrous flood in 1953, when 400,000 acres of land were covered with seawater and 1800 people killed, the Netherlands

began an engineering project to close the Haringvliet gap and exclude the sea from seven "sea arms" southwest of Rotterdam



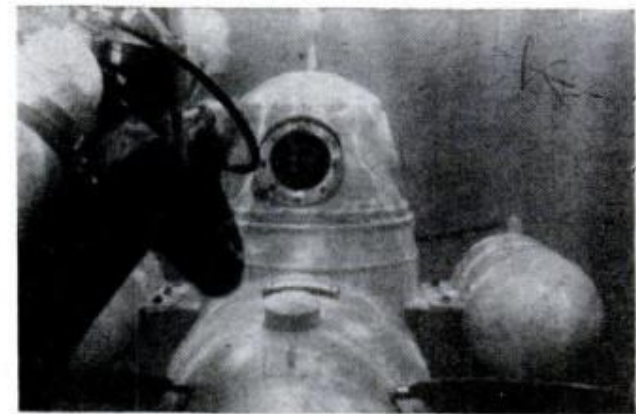
## Houseboat becomes carrier

An aerial-photo plane passes overhead after filming the landing of a Piper Cub atop a Drift-R-Cruz houseboat. A modified top deck and a 40-mph speed (provided by three 200-hp engines) enabled the boat to act as a "carrier."



## Radar 'colander'

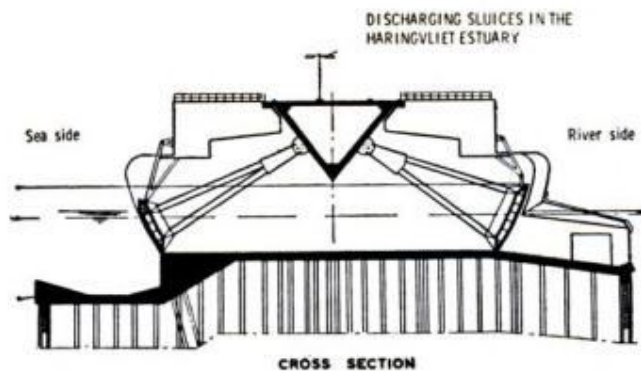
Hundreds of holes in this eight-foot-diameter radar antenna make it resemble a huge colander. It's a scaled-down prototype of a new phased-array radar system being built for the Air Force by Hughes Aircraft Co.



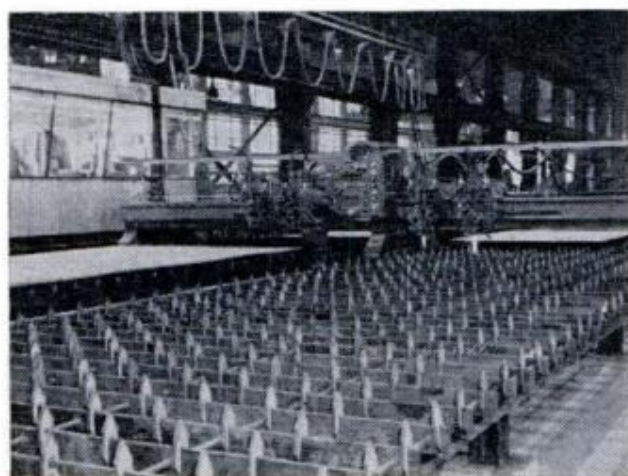
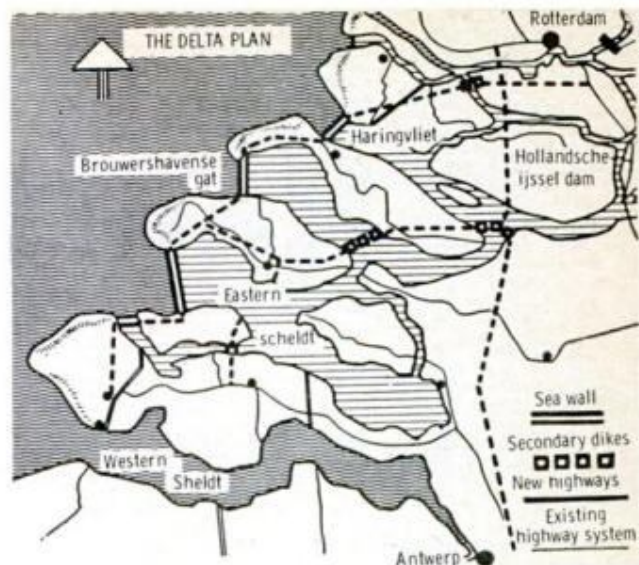
## Briton's submarine is made of scrap materials

Built of scrap material over a period of three years, Arthur Johnson's home-made submarine kept him perfectly dry in a test dive. It's driven by a quarter-hp starter motor.



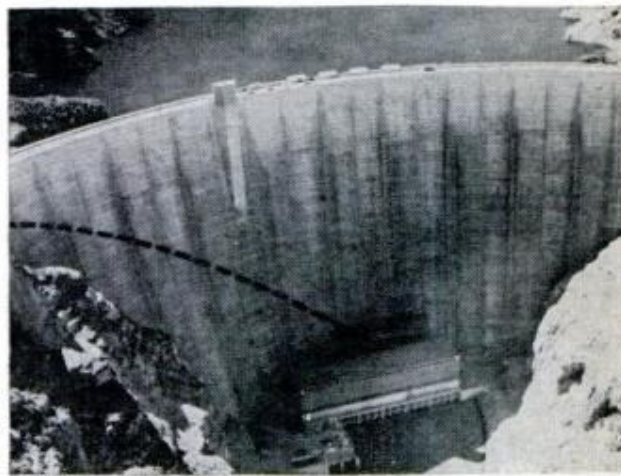


(map, far right). The job will be finished by 1980. The first photo is of the Haringvliet dam with its 17 locks; it will face the North Sea (left) and the Waal Oude Mass River (right). The second photo and the cross section above show the double gates of each lock.



### Automatic burner

An operator is shown setting up an automatic burning machine which cuts steel plates by manual, optical, or computer control. It's used by Quincy Div. of General Dynamics.



### Wireless Yellowtail

No power cables mar the appearance of Montana's 525-foot-high Yellowtail Dam. The cables are inside the dam; their position is indicated by the dotted line.



### Airplanes are painted on a giant lazy Susan

At its plant in Lock Haven, Pa., Piper Aircraft Co. uses a 120-foot-diameter turntable to transport newly built planes to and from the washing, sanding, painting and drying operations.



# How to Bargain

It's his game, but it's your money. Follow these tips and you'll have more left

By MERLE E. DOWD

From the book *How to Save Money When You Buy and Drive Your Car*.  
© 1967 by Merle E. Dowd. Parker Publishing Co., West Nyack, N.Y. \$5.95.

**B**UYING A NEW CAR can be a game you play for big stakes—or an experience of confusion and frustration. Your approach to buying makes the big difference.

You may have already decided on the make, kind, style, and size of car you want, along with specific options. Buying a new car will commit you to spend from \$2500 to \$5000. Plan to spend some time at it—no rush job for that kind of cash. With a plan and these proved bargaining tactics, you can save several hundred dollars.

**Know your adversary—or competition.** Every big-league pitcher has a “book” on opposing batters. The same is true of car salesmen. They are out to sell new cars at the best price they can get. Only salesmen who sell survive. They are capable, practical psychologists, used to tough bargaining—and, generally, in possession of more accurate information than you are. Most reputable dealers are not blatantly dishonest, but they are not averse to dramatics, softening-up flattery for your wife, and pushing a deal for a car they have in stock vs. one you want to order from the factory. Once you understand the sparring tactics and trading hoopla, you're better prepared to enter the arena.

## Save Money When You Buy

**Develop a Buying Plan**—The profusion of models, options, and prices may confuse you. Your defense is a cold, logical plan. First, set up a New-Car Buying Chart. Obviously, you can't select the specific car you want without research and study. Don't start dealing until you

have decided. Fill in the blanks: model, engine size, transmission, optional equipment desired. While you may take advantage of a good price on a slightly different combination, you will have a solid basis for determining whether a car with different equipment is a good buy.

● **Finding Dealer's Cost**—The left column of your Buying Chart is for the dealer's cost of the basic car and added equipment. The dealer's cost is not the price on the window sticker. You can estimate dealer's cost by applying the following markups:

|                         |            |
|-------------------------|------------|
| Compact cars            | 21 percent |
| Full-size, regular cars | 25 percent |
| Luxury (loaded) models  | 27 percent |

For example, take a *Super-Model Eight* with a retail (sticker) price of \$3660. The 25-percent markup is 25 percent of \$3660, or \$915. It's this markup that you bargain for. Accessories and equipment added at the factory also include a markup of 20 to 25 percent. Anything the dealer hangs on the car usually carries a markup closer to 40 percent. Using these percentages and working backward from the price on the window sticker, you can arrive at a reasonably close estimate of the dealer's cost for the car plus desired options.

● **Evaluating Your Trade-in** — Except when you buy your first or second car, you will probably have a car to trade or sell. The important value is your car's wholesale price: that is, the price it would bring at a “dog show” or used-car auction. Wholesale values are also quoted in one of the red, blue, black, or other-color books of wholesale prices. Even if the dealer plans to sell your car himself, he will figure the wholesale value as a trade-



# With a Car Dealer

in. Unless you know how much your old car is worth, you cannot judge the discount a salesman may be allowing you.

● **Financing and Insurance**—Take care of these before you go into the showroom. Inquire about financing somewhere other than at the dealer's, and know exactly how much you will be paying. If you should decide later to finance through the dealer, you will know the cost trade-off. The same rule applies to insurance.

● **Pick the Best Time to Buy**—Plan to buy when the dealer wants to sell.

● **Buy in the After-Introduction Doldrums**—One of the best times to buy is from 85 to 120 days after the announcement date for new models. Say a manufacturer unveils his new cars around Sept. 15. Prices during the following couple of

wait until spring. Sales begin luffing—losing headway. Meanwhile, back at the factory, cars are popping off the assembly line at peak rate. They begin to stack up in the dealer's lot, and he begins to count the interest he is paying on this inventory. Conditions are ripe for discounting, and you can benefit.

● **Buy in Bad Weather**—Another good time to buy is during a blizzard or after a spell of icy, snowy, or rainy weather that keeps shoppers out of showrooms—

**When you are about to buy a new car, you may detect a malady we shall call "car fever." Basically, car fever is DESIRE. Car fever has been known to completely engulf normally solid citizens, to blot out their rational responses, and to trick them into decisions out of context with their normal behavior.**

months are likely to be pretty firm. Excitement accompanying new-car showings and enthusiasm whipped up to drive the latest model will move many cars at close-to-sticker prices. Also, some car-rental and leasing firms buy heavily during early months. A dealer's sales may actually be limited by how many cars he can get. So he sells at his price, not yours.

After a couple of months, winter hits many areas. Buyers would just as soon

## NEW CAR BUYING CHART

|                                     | Dealer's Cost |    | Dealer's Quoted Price |    |
|-------------------------------------|---------------|----|-----------------------|----|
|                                     | #1            | #2 | #1                    | #2 |
| Manufacturer                        |               |    |                       |    |
| Model (4-door, station wagon, etc.) |               |    |                       |    |
| Series                              |               |    |                       |    |
| Equipment (standard) <sup>(1)</sup> |               |    |                       |    |
| Heater                              |               |    |                       |    |
| Engine                              |               |    |                       |    |
| Transmission                        |               |    |                       |    |
| Interior items                      |               |    |                       |    |
| Exterior items                      |               |    |                       |    |
| Base price                          |               |    |                       |    |
| Equipment (extra) <sup>(2)</sup>    |               |    |                       |    |
| Radio                               |               |    |                       |    |
| Engine option                       |               |    |                       |    |
| Power options                       |               |    |                       |    |
| Steering                            |               |    |                       |    |
| Brakes                              |               |    |                       |    |
| Windows                             |               |    |                       |    |
| Automatic transmission              |               |    |                       |    |
| Airconditioning                     |               |    |                       |    |
| Freight & make-ready cost           |               |    |                       |    |
| Local taxes                         |               |    |                       |    |
| Gross price                         |               |    |                       |    |
| Gross trade-in allowance            |               |    |                       |    |
| Net difference (actual cost)        |               |    |                       |    |
| Cash price (without trade-in)       |               |    |                       |    |
| Insurance premium                   |               |    |                       |    |
| Financing costs                     |               |    |                       |    |
| <b>TOTAL PACKAGE PRICE</b>          |               |    |                       |    |
| Dealer (name & address)             |               |    |                       |    |
| Salesman                            |               |    |                       |    |

(1) Different series include a varied list of equipment as "standard" in price.

(2) Optional equipment listed and priced separately.



a salesman may offer a discount to get a lift from a sale.

● **Buy During Special Promotions**—Factories run contests, during which they pay dealers an extra \$50 or \$100 on each car sold above a quota. During these promotions, dealers can sell a car for less and still make money. You can tell when such promotions are in progress by noting the ads. "Summer Sellathon," "Circus Days," "Summer Cleanup" are clues. The last day of these events is the time to buy. If your timing is right, you put the dealer over the bonus mark—and he wins a trip to Tokyo.

● **Buy Before New Model Announcement?**—Is buying a car just before new models are announced a good idea? Sometimes. If you keep cars for 6, 8 or 10 years, the year's depreciation you lose when the new models appear washes out over several years. Ordinarily, however,

the \$100 or \$200 discount the average dealer allows to clear out his old stock isn't enough to compensate for driving last year's model a few weeks later. So, if you trade often, you need to get around 24 to 30 percent off list for a year-end model for it to be a good buy. Manufacturers pay a rebate on every car a dealer has in inventory a week or two ahead of the new-car announcement. The dealer can discount the car to you, because it costs him less.

**Which Dealer Will Make You the Best Deal?**—A salesman can't offer you a rock-bottom deal unless the dealer's costs are low—both in absolute terms and on a per-unit basis. You can analyze factors that increase dealers' costs and choose accordingly. Any dealer who turns over a huge volume of cars probably spreads his overhead thinly over each car. However, if he achieves volume by spending heavily

on television and big displays in the classified section, his cost-per-car may be higher than a small dealer's. Another high-cost tipoff is the dealer who has just built a fancy new showroom and service shop. His costs include big mortgage payments or a return on his investment in real estate and buildings. A good bet is a long-established dealer with a lot of repeat business to his credit.

## Buying and Selling Tactics

Let's face it. Buying a car is like horse-trading. Counter the professionalism of the full-time car salesman by arming yourself with information. Study test reports in mechanical and car magazines. Don't expect to pay sticker price. The dealer doesn't expect to sell for sticker price, but he knows the absolute floor. Somewhere in that range you can "deal."

**What Does Suggested Retail Price Mean?**—The Suggested List Price is called the "sticker" price because it is stuck on the window at the factory and must remain there by law until the car is sold. The sticker notes the basic price of the car and details accessories and extra equipment with their prices. Freight will be added on, but local taxes and state licenses will *not* be in the total. Local preparation costs may be noted on a separate sticker. Before Suggested List Prices were posted, a dealer could add several hundred dollars to a so-called "list price," then dazzle you with a big trade-in. Remember, the sticker price is not necessarily the selling price. But it's up to you to get a dealer to "come down."

**Beware of Bait Advertising**—Some dealers depend heavily on appeals to a buyer trying to get something for nothing. Beware of such come-ons as—"Low-

***If every car owner followed the so-called professionals' advice to trade after "two years or 40,000 miles," "three years or 50,000 miles, whichever comes first," or some similar inflexible rule, who would buy the used cars? If driving a car that is three years old or less saves money, how can families with less income afford an older car? The facts are—you save money driving a car as long as the unscheduled maintenance costs are less than depreciation costs.***



est Prices in Town," "Discounts Galore," or "Buy Below Dealer's Cost." Another form of bait is the business card stuck under your wiper. It offers, usually in a handwritten note—"Would you take \$1200 for your XYZ Hardtop?" The quoted price is usually far above the going market. Or the card may offer, "No Down Payment" or "Take Four Years to Pay."

These come-ons include one or both of two appeals—low cost and lots of credit. Each may be a gimmick. For example:

● "Lowest Prices in Town" may be for a stripped-down model, probably without freight, handling charges, or local taxes. Even if you should be interested in such a model, it may be "out of stock." Or the salesman begins the "bait and switch" play—"No one of your taste and discrimination," he tells you, "would be satisfied with a company car like this! Now—over here is one that will appeal to a man of the world like you."

● "Buy Below Dealer's Cost" just doesn't happen. A dealer actually overstocked can always sell to a used-car dealer at \$25 to \$50 over his cost.

● "No Down Payment" or "Take Four Years to Pay" may not be bait. You may be able to buy the car you want on such terms; but look into the fine print and figure your own cost.

**Stay Clear of Fast Financing Deals—**Many buyers are so interested in the monthly payments, they forget to ask the total price. Remember, money has a market value all its own—expressed as interest. No dealer has access to free money. There are only two basic ways monthly payments may be kept low. One is to stretch out the financing period for two, three—even four years. But payment stretchouts add hundreds of dollars of interest. The second way to keep monthly payments down is to make the last payment a big one. A "balloon" payment for the last month might cost you \$700-\$800. Could you pay it?

**Tested Trade-In Tactics—And Ones to Avoid—**The aim here is to keep you out of the showroom until you have a plan.

**Whatever kind of car you may decide on, there's a better way of buying it and keeping it in top running trim. Even if you buy an expensive, high-performance sports car, you'll have more fun with it if you control and manage the money it costs.**

Even with a plan, beware of tactics used by salesmen to increase their commission. Some are perfectly legal; others are illegal. Salesmen try to sell you the most expensive car they can at the highest possible price for one reason—they make the most money that way. Car salesmen's commissions are figured on a sliding scale—the more profit for the dealer, the higher the commission. Buyers often pay more than they should because of one of these tactics:

● "Highball" is aimed at shoppers. The salesman offers a high trade-in value, one that other dealers can't match. The "highball" figure, however, will not stand up. The salesman may wait until you have pen in hand before realizing his "mistake." He then quotes a more competitive figure. If you take it, you've been had.

● "Lowball" offers are given shoppers with no cars to trade in. Here the "lowball" cash price quoted may be far below other offers. Again at the last minute, the offer is snatched away on some pretense.

● "Unauthorized" verbal offers usually go hand-in-hand with "highball" and "lowball" strategy. The salesman may pencil in a high trade-in value for your car and comment that he will have to get the manager's okay—but "That's just a formality." Later, when you've ironed out details, the salesman comes back with a long face. It seems the manager won't go along with the trade-in quoted. The best he will go is \_\_\_\_\_ dollars—"Sorry about that!"

**Recognizing High-Pressure Tactics—**The above are the most frequent of the high-pressure tactics you might encounter. Others include:

● *Buy today*—something special attaches itself to the immediate sale—the trade-in quoted won't be available tomorrow—another buyer may be back "this evening" for your car, etc. These appeals are aimed at closing the deal before you walk out of the showroom. The salesman knows that you might not be back.

● *Sign Now—Trade Later*—may be a



**Spend a few minutes examining the Purchase Agreement. Once you sign a contract, you are bound by its provisions.**

● **Don't sign a blank contract: Fill in all dollar amounts and conditions, such as expected delivery times and how financing and insurance are to be handled.**

● **Read the Purchase Agreement and make sure the terms and provisions agree with the deal as you understand it. Honest salesmen make mistakes occasionally. Less-than-honest salesmen may ink in different figures for your price or trade-in—or commit you to**

**buy equipment you don't want.**

● **Don't leave the trade-in value to be determined later when your new car is delivered. If a salesman will not agree to a specific dollar figure when you contract for your car—don't sign. A verbal agreement is worthless.**

● **List every item of extra equipment or service, such as make-ready charges, "service charges," or accessories that are to be delivered with your new car.**

● **Write into the Purchase Agreement a time for delivery or a limit on the effectiveness of the contract.**

combination of "highball" with "buy now." If you leave the value of your trade-in to be decided when you actually turn it in, after your new car arrives, you may find the value will be lower than that originally agreed on.

● **No Sale for Cash**—Low prices for the car you want may be tied to a financial deal. Some dealers actually do sell their cars for practically no profit, but only if the buyer finances the purchase on their terms. Such tactics merely transfer the profit from the sale of the car to the dealer's financing.

## **Buying at the Best Price**

Mentally condition yourself for bargaining. Don't begin dealing until **YOU ARE READY!** Make a new-car buying chart like the one on page 77, then use it. Here's how—

**Price the Car You Want With a Trade-In**—You have already picked the right time to buy, and you know the wholesale value of your trade-in. After you have talked about the model and accessories you want, simply ask the salesman for his best discount. He will probably start

somewhere near the sticker price. Any discount is likely to be an overstated allowance for your trade-in. You can figure the discount immediately as the difference between allowance and wholesale value. Unless you're sure the price quoted is a "barn burner," don't buy immediately. The salesman is not likely to quote you his best price the first time out. From this point, you must be prepared to negotiate with him.

**Sound Out the Cash Price**—Ask for a straight cash deal with no trade-in. Say, "I may keep my present car for my wife." This affects dealers differently. Some dealers sell their own used cars. They plan on making two profits—one from the sale of a new car, another from the sale of the car they take in trade. A straight, no-trade-in deal will not appeal to this dealer if you have a clean, relatively late model trade-in. Other dealers wholesale their used cars at an auction. Handling these trade-ins, particularly old dogs, costs them money and time. Such a dealer may offer a better no-trade-in price.

The important figure is the money you must put up—the dollar difference between the sticker price (with all acces-



sories, delivery charges, and local taxes) and the trade-in allowance. Or the dollar difference could be the sticker price discounted (with same accessories, freight, and local taxes) with a realistic allowance for your trade-in. With no trade-in, the price quoted becomes the dollar difference. If you plan to sell your own car, subtract a realistic price from the quoted no-trade-in price to come up with the dollar difference.

**Does It Pay to Shop Around?**—Absolutely! Shopping for a new car is both an art and a science.

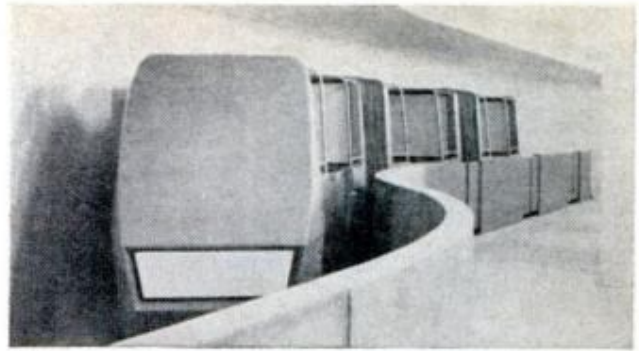
Here are some points to consider:

- Dealers are not only willing to sell cars at a discount, but actively suggest reductions.
- Bargaining ability of the buyer affects some dealers, but not others.
- Large-volume dealers, including those advertising "huge discounts," offer no better values than some small, suburban dealers.
- Discounts vary widely with little apparent reason. Two shoppers visiting the same dealer on the same day may be quoted different prices on the same car. Discounts appeared to be random, apparently depending in some cases on a salesman's analysis of the shopper.
- Shopping more than two dealers definitely pays off. Study results indicate that shopping beyond the first dealer leads (on an average) to additional discounts.

This means that, after the first discount, successive visits to other dealers may yield additional discounts. For example, say a Ford dealer offers a discount of \$400 off sticker price on a specific car. By going to a second dealer and quoting the discount offered, a buyer may obtain a total discount of \$400 plus another \$40-\$50. By the time the buyer visits six or eight dealers, his cumulative discount could reach as much as \$500-\$525.

Spending your time shopping a number of dealers pays off up to a point; then you're better off to start dickering. An experienced shopper I know starts out by saying, "Your price is too high. I'll pay you (blank) dollars." His offer is purposely too low and is invariably rejected. Then he asks, "Well, how low can you go?" or "How close can you come to my figure?" This simple bargaining offer tactic often lowers the previously discounted price by \$50 or more. ★★★

NOVEMBER 1968



## Automatic trains for airport

Four automatic trains, each consisting of three eight-passenger cars, travel a 3000-foot loop to carry passengers through the Houston International Airport terminal. Each Barrett Guide-O-Matic Electronic Passenger Train is a driverless, trackless, battery-powered vehicle that's guided by electromagnetic signals from wiring embedded in the concrete floor. The trains are programmed to stop at elevators, flight gates and other passenger pickups.



## Attention to detail

It took two years for Eugen Ziegler of Stuttgart to make this scale fire truck. It's so detailed that it includes an ignition key.



# Glacier Park's Great Grizzly Bear Mystery

By E. D. FALES JR.

Illustrations by Herb Mott

GLACIER NATIONAL PARK, which sprawls for 50 miles across the top of Montana, is a place of sparkling lakes and awesome peaks. This breathtaking Shangri-la was the backdrop for tragedy one night in August last year.

On Saturday, Aug. 13, two hikers shouldered sleeping bags. One was Roy Ducat, 18, a student at Bowling Green University in Ohio; the other, pretty Julie Helgeson, 19, of the University of Minnesota. Leaving the highway at Logan Pass they took the high Loop Trail toward Granite Park Chalet, a remote hikers' inn. Soon they disappeared among the peaks. They were hiking into one of the strangest nightmares in wilderness history.

At the same hour a second party—five in all—entered a lower trail miles away. Three men and two girls had another destination—lonely Trout Lake. This group, too, would know horror.

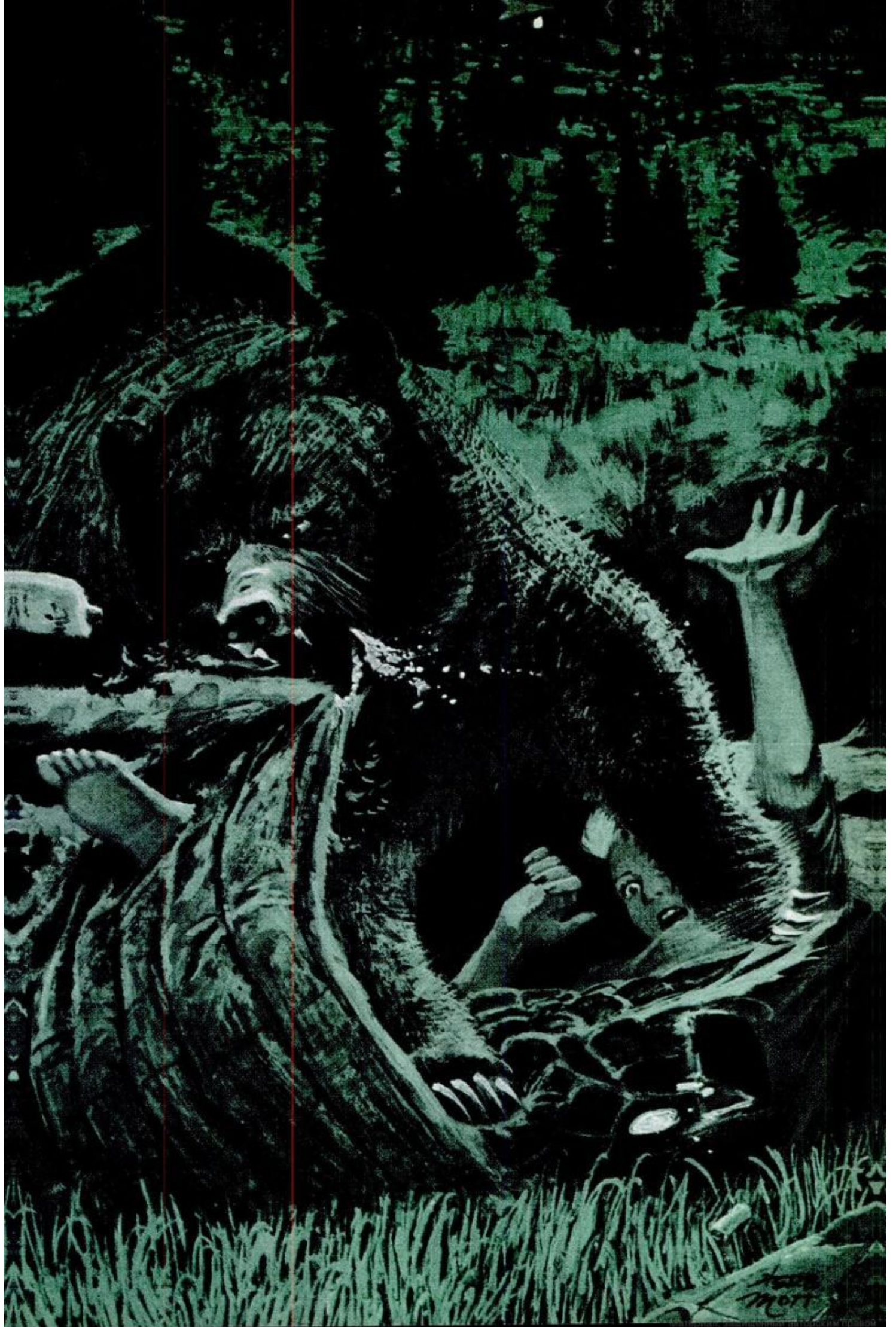
Hikers discussed an eerie "dry lightning" storm that had started many fires the night before. Now they watched a helicopter pilot shuttling firefighters among dangerous peaks.

The first two hikers, Roy Ducat and Julie Helgeson, planned to camp overnight—one of the pastimes of 200 students who work in the park each summer. At 7:00 p.m. they reached the Chalet, a lodge so remote it has no electric lights. Here they paused to sign the trail register, then took a spur trail down the mountain. Some 15 minutes later they passed a log cabin. Here they cut east from the trail, found a campsite by a stream, had supper. Then Ducat hid leftover food in a log 600 feet away. They wanted no bears in camp, but they weren't worried.

At dark they crawled into their sleeping bags, talked, then slept. At











The chopper whistled down toward the Chalet. Four bonfires marked the only landing spot.

**In horror, Ducat realized the bear was carrying Julie away, and he was helpless.**

midnight Ducat heard a sound, sprang out of his bag, saw nothing. The moon had set. Thinking it was a squirrel, he got back in his bag. Soon he awoke again. In her bag Julie was whispering, "Play dead, Roy. Bear!" Something hit Roy a terrific blow. He was hurled out of his bag.

Playing dead, he felt the bear's hot breath, heard it snuffing, saw its humped shoulders and whiskered face near his own. Then he heard a cry. Julie had been thrown out of her bag.

He knew: When grizzlies threaten, climb a tree. If you can't, play dead. Bears may pummel or bite, but usually go away. Roy kept quiet even when he felt teeth in his shoulder.

The bear bounded to Julie, bit her arm, then came back, sank his teeth into Ducat's buttocks. Again it went to Julie. Ducat heard her cry, "It hurts." Then in despair she screamed, "Somebody please help us!"

But there was no one to help. When Julie cried out again her voice was far away: "Oh, Mommie, help me!" In horror, Ducat realized the bear was carrying her away, and he was helpless.

Terribly torn, he got to his feet. To follow would be insane. Bleeding heavily, he climbed toward the spur trail, not knowing a bear was close behind.

#### The call from the cabin

Guests at the dark Chalet had retired. In one room slept Dr. John Lipinski, his wife and children, all hikers. Awakened from sound sleep, Mrs. Lipinski sat up listening. Far down the trail a girl was screaming. Mrs. Lipinski jumped out of bed and knocked on doors. A clock showed 12:47.

"What's happening?" a man demanded. "Sex attack," someone said. Then a pretty girl appeared in uniform, Miss Joan Devereaux of Ohio, U. S. ranger-naturalist.

Ranger Devereaux now took charge, formed a search party. They were ready to start when a light glimmered below and voices shouted: "Bears! Bring guns!"

Ranger Devereaux felt a chill. Among all the guests, she knew, no one had a gun.

The cries, she knew, must be from the trail cabin. She also knew that exposing unarmed searchers to grizzlies was risky. But leading the way, a two-way radio on her shoulder, she started down.

12:50 a.m.: Roy Ducat was climbing in pain. Had he seen the bear behind him he might have panicked. But he kept going, soon came to the trailside cabin.



A husky Californian, Don Gullett, camping near the cabin, heard Ducat approach. Aiming his light, expecting a bear, he saw instead a man covered with blood. At first Ducat was calm. "A bear got her. I tried playing dead." He shook his head. Then he went into shock. He began mumbling, "We've got to get her!"

The Californian called to a couple, Mr. and Mrs. Bob Cline, sleeping nearby. "He thinks a bear kidnapped a girl," he told them. "If so, we'll need help—and guns."

Leaving Ducat below, all three now climbed the roof. Over low trees they could see lamps at the Chalet. They waved a light, shouted, and it was this that may have turned back the bear that had followed young Ducat.

12:58 a.m.: Gullett and the Clines were still on the roof when the search party found them. At first the searchers thought Mrs. Cline had screamed and her husband had been attacked. They were horrified, then, when they saw Ducat. Ranger Devereaux took one look. *This man may die*, she thought. Eight men carried him on a cot spring to the Chalet.

No one could really believe a girl had been dragged away by a bear. Ducat was rambling. In shock, had he *imagined* the girl? Ranger Devereaux and two men made a quick flashlight search. They found only fresh bear droppings.

At this time Ranger Devereaux decided to ask for help. She radioed park HQ at West Glacier, 25 miles away. At 1:00 a.m. she expected no answer.

At headquarters, however, Supervisory Ranger Gary Bunney had stayed to work fire calls. When he heard Ranger Devereaux he knew he had new trouble. "We have a boy hurt—very bad," she called. "We need plasma fast."

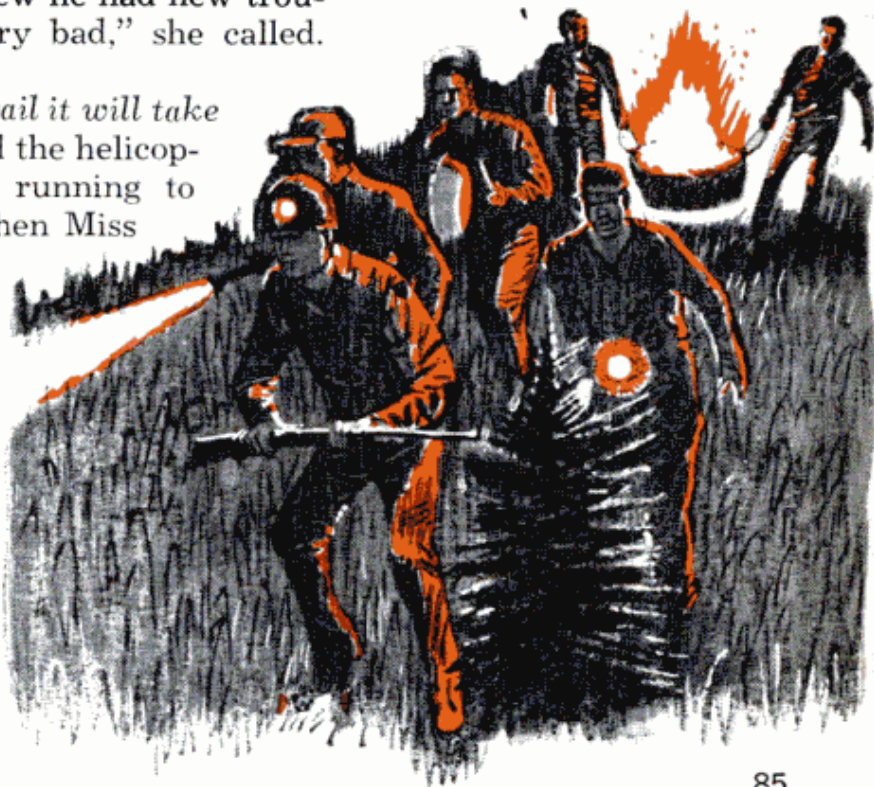
Bunney figured. *By car and trail it will take four hours*. Then he remembered the helicopter. He had just sent a man running to awaken pilot John Westover when Miss Devereaux called again. Back at the Chalet, she had checked the register. She'd found two signatures. One was Roy Ducat's. The other, in a small hand, was Julie Helgeson's.

"Mr. Bunney," she said, and there was chill in her voice, "we now think a girl may have been carried off by a bear. And we have no gun."

To Bunney this was a red alert. The time was 1:10. At

**No one could really believe a girl had been dragged away by a bear. Had Ducat imagined the girl?**

*His headlamp flickering, Bunney led the way, the .300 Magnum ready. Two men carried a washtub full of blazing sticks.*







"Everyone to the trees!" he shouted. He put Denise in a tree, tossed the dog up to her, then climbed.

**Bunney had chosen lightbearers who wouldn't run if a bear charged. "I'll need steady light because I must hit on the first shot," he said.**

1:20 Westover and Bunney took off. Twenty minutes later, after a scary flight up dark canyons, the chopper whistled down toward the Chalet. Four bonfires in a square marked the only landing spot. At the last moment the pilot faced an obstacle he didn't know about: a steel flagpole. But Ranger Devereaux had thought of that: Suddenly 24 flashlights shone on the pole. Westover missed it by inches, landed safely. Then Bunney jumped out with the plasma—and a .300 magnum Winchester.

1:45 a.m.: Julie had been missing one hour. Ducat, his bleeding checked, lay strapped to the chopper's pontoons. Pilot Westover began a second risky trip, this time to a hospital in Kalispell, Mont.—a ride that saved Ducat's life.

#### **The search for Julie Helgeson**

Bunney now asked for volunteers. Oddly, few young men wanted to go. Surprised, Bunney chose 10 men, mostly middle-aged. One was Dr. Lipinski.

2:45 a.m.: His headlamp flickering, Bunney led the way, the .300 magnum ready. Next came two men with eight-cell flashlights. Bunney had chosen lightbearers who wouldn't run if a bear charged. "I'll need steady light because I must hit on the first shot," he said. Next, two men carried an iron wash-tub full of blazing sticks. It would save batteries, might scare bears, and would warm a victim.

The men whooped, rang bells, rattled stones in cans, beat the tub. Shouting "Ho!" they passed the cabin. Then Bunney saw the bear droppings and slowed up. At 3:10 a.m. their lights revealed a scene of confusion—the camp. Shoes were scattered, knapsacks torn, Julie was nowhere in sight. But Bunney found her sleeping bag and a trail of crushed lilies where she had been dragged.

Calling "Julie!", then pausing to listen, the men advanced warily. At 3:35 a.m. they heard a faint moan. They found a crumpled little figure lying face down by a log. Julie's arms and legs had been bitten, chest punctured. "It hurts!" she sobbed. Heart-sick, the men bore her to the Chalet. The helicopter pilot, summoned again, landed in blackness at 4:15 a.m. But Julie had died at 4:13.

#### **Trout Lake: a second attack**

Even as Julie died, horror began nine miles away.



The other three men and two girls had reached Trout Lake at 5:00 p.m. With them went a small stray dog they had named Squirt.

Four went fishing, leaving Michele Koons, 19, of California Western University, in camp. At 8:00 p.m. they returned to cook trout. Suddenly Michele said, "Look, a bear!" A grizzly trotted to a stump on which she sat. No one moved. The bear turned aside, ate the supper, took a knapsack, ran up a hill.

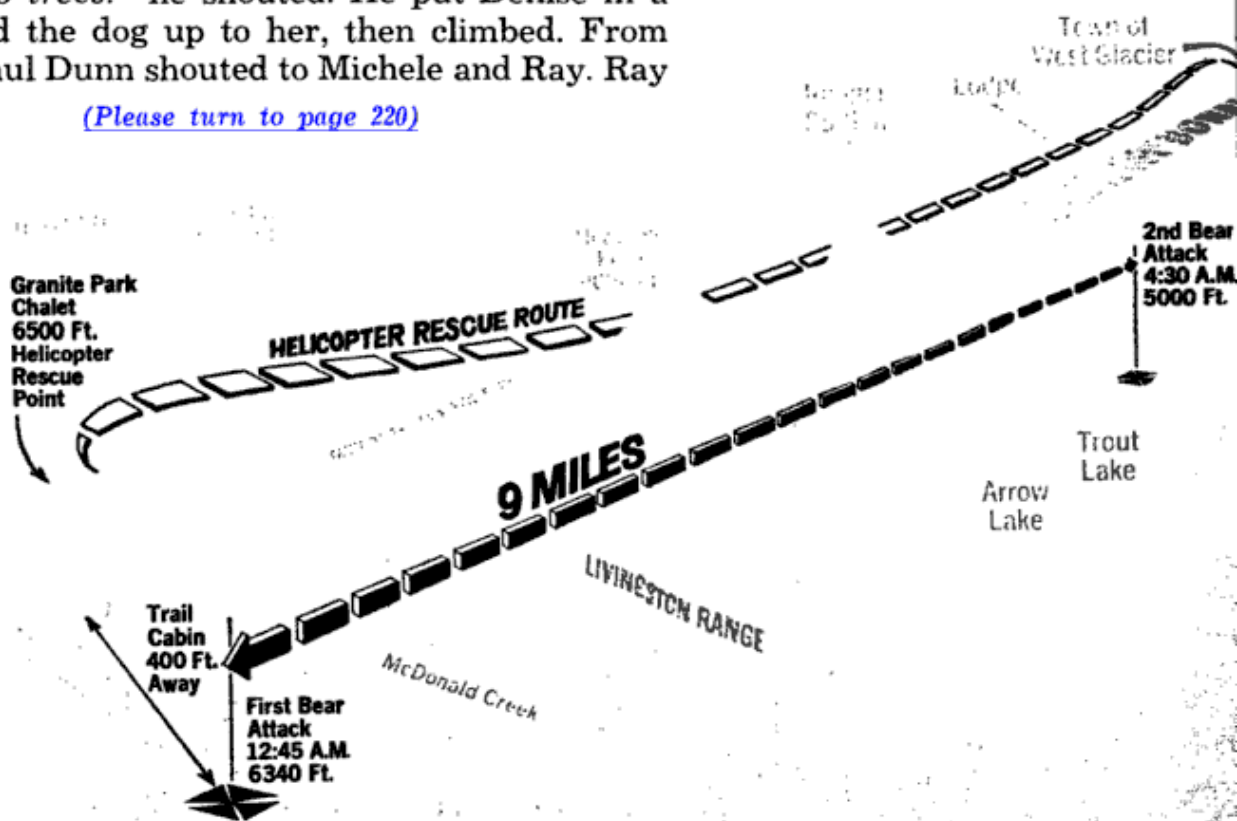
After this, camp was moved 200 feet and a bonfire lighted. At dark all arranged their bags feet to the fire. But none slept. At 11:00, Squirt sat up listening. The bear came again, stole cookies, and left. Anxious, all now wanted to pack out to the ranger station at Lake McDonald five miles away. But the moon had set, their one flashlight would not last, and they abandoned the idea. At 2:00 a.m. Squirt growled. To quiet him, Denise Huckle, 19, University of Arizona junior, put him in her bag.

4:20 a.m.: It was still dark when the bear came again. Some covered their heads. The three male campers were Paul Dunn, 16, of Edina, Minn., and Ronald Noseck, 21, and his brother Ray, 23, students at Louisville University. The bear nosed Ronald and Denise, then bit Paul's bag and swiped him hard. This was too much for Dunn. He jumped up and, by accident, or deliberately, hit the bear.

Surprised, it backed off, then charged. He ran to a tree, swung up, and the bear now nosed the others. It was Ronald Noseck's turn to jump up. "Everyone into trees!" he shouted. He put Denise in a tree, tossed the dog up to her, then climbed. From his tree, Paul Dunn shouted to Michele and Ray. Ray

**The bear nosed Ronald Noseck and Denise Huckle, then bit Paul Dunn's bag and swiped him hard. This was too much for Dunn. He jumped up and, by accident or deliberately, hit the bear.**

[\(Please turn to page 220\)](#)

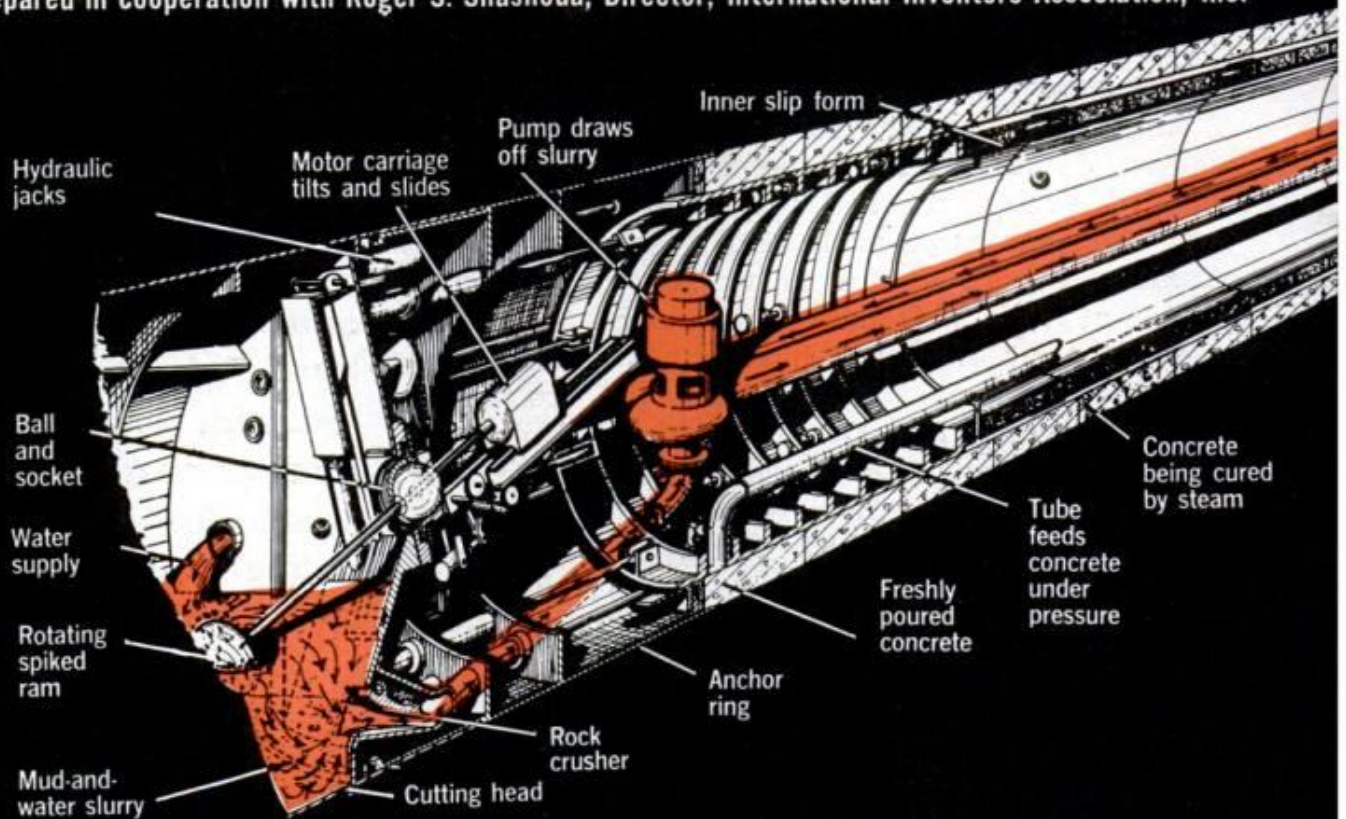




# Just patented

PM'S PICK OF THE NEW INVENTIONS

Prepared in cooperation with Roger S. Shashoua, Director, International Inventors Association, Inc.

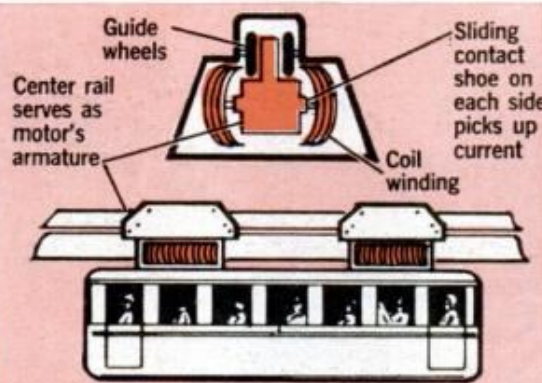
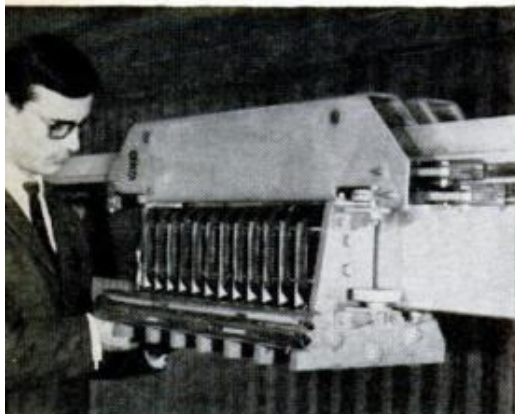


**1. LIKE A GIANT MECHANICAL WORM**, this unmanned tunnel digger inches its way along underground a section at a time. It digs a hole and lines it with concrete in a single operation, traveling three feet an hour. There are three telescoping sections—a sharp cutting head, a middle anchor ring and an inner slip form. The cutting head is forced forward by hydraulic jacks as a spiked ram chops away the

earth. The dirt is mixed with water and pumped out. The slip form is pulled into the anchor ring, then the anchor ring itself is jacked forward. Concrete is forced out around the slip form into the gap left by the anchor ring. Steam jets quick-cure the concrete as the cutting head moves forward for another bite. The idea is to eliminate the dangers of underground excavation and lower the cost

**2. THE MONORAIL CAR** below is actually sliding along a motor many miles long. That's because the overhead rail itself acts as the motor's armature. Surrounding the rail are coils in the car's roof. Instead of rotating inside the coils, as in a regu-

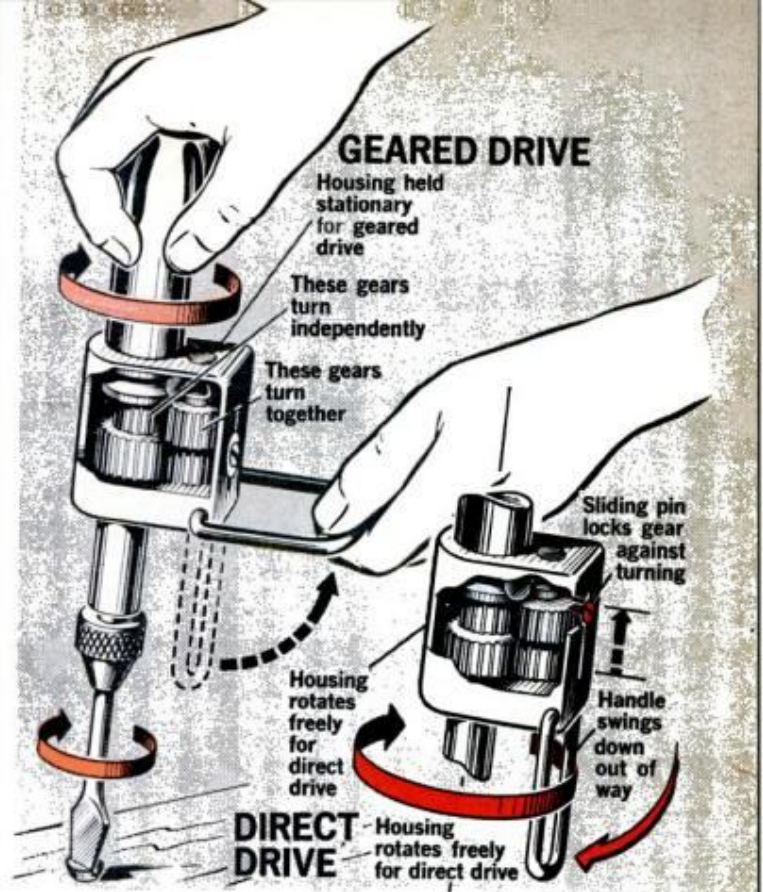
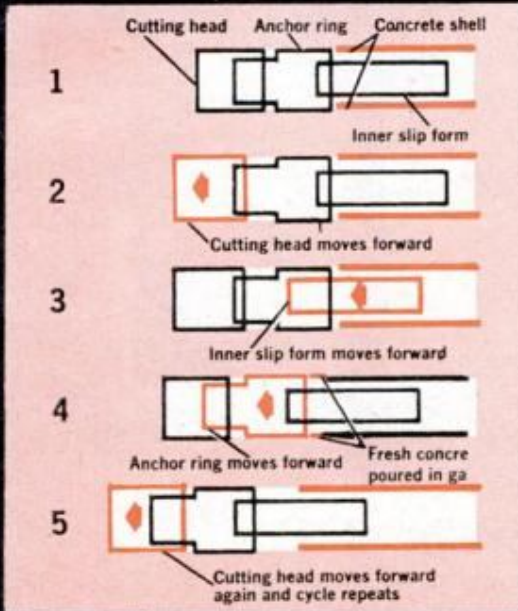
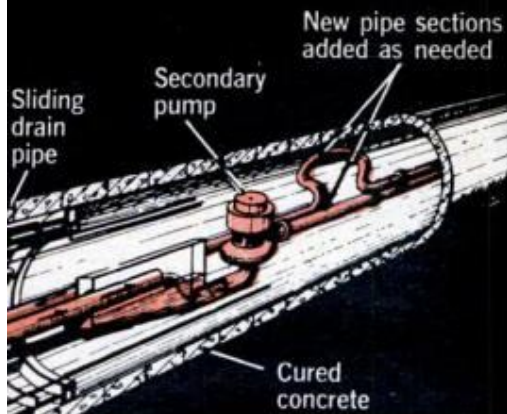
lar motor, the armature remains stationary and the coils move along it sideways. This pulls the car along the rail. Sliding contact shoes supply power to the coils. To stop the car, the magnetic field is simply reversed, providing a braking section



Inventors of the items shown on these pages are as follows: 1. Karl Sturm, North Vancouver, B.C.; 2. Merlin Gerin, Lyons, France; 3. Walter Ronc, Regensdorf, Switzer-

land; 4. Earl L. Schnoebelen, Allandale, Fla. (3,315,545); 5. Louis H. De Long, Olivette, Mo. (3,345,970); Readers wishing to bring new inventions to the attention of Roger S.





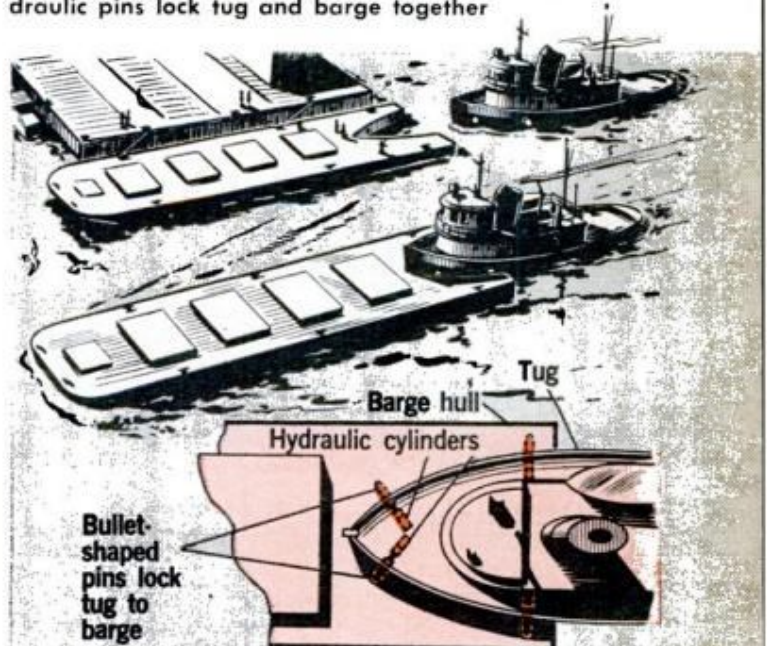
**4. YOU GET EXTRA LEVERAGE** for turning tight screws with this geared screwdriver. The handle turns a small gear that drives a larger gear in a housing at the side. This gear turns another small gear that drives a big gear on the screwdriver shaft, providing a two-stage reduction of about 4 to 1. When the gearing isn't needed, you flip up a catch that locks the gears stationary. The housing rotates instead, giving you a fast and direct drive

**3. YOU CAN'T SINK** with one of these wet suits on. They not only keep you warm—they also serve as a life jacket. The foam-plastic material has tiny air pockets that provide both flotation and insulation. The suits are designed for sailing, water skiing and skin diving. They come with and without legs and with long or short sleeves. For diving, weights must be worn

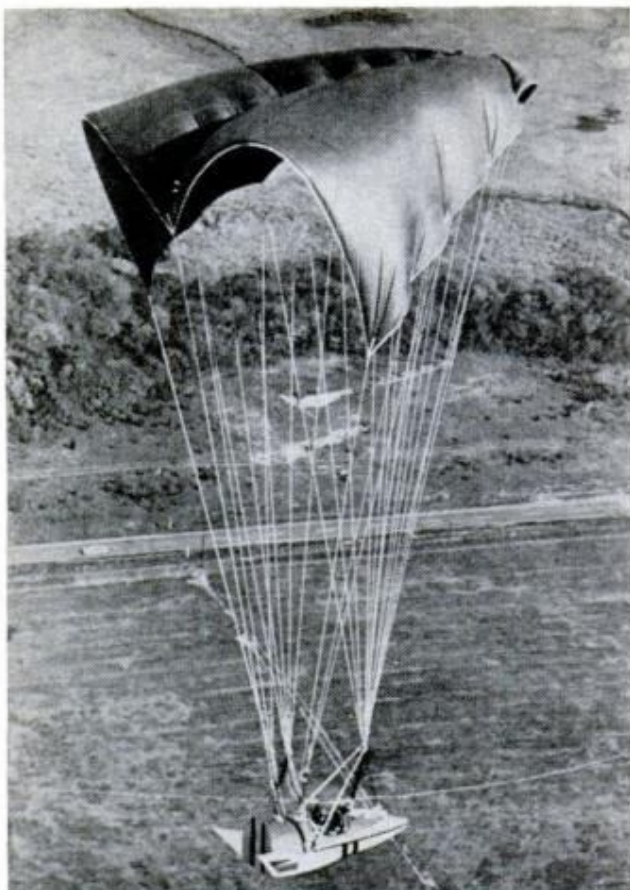


Shashoua at the International Inventors Association, Inc., can reach him at 680 Fifth Ave., New York, N. Y. 10019.

**5. THIS PIGGYBACK TUG AND BARGE** combination works like a trailer truck. The tug locks into a V-shaped socket in the barge's stern and steams off. At its destination, it uncouples, leaves the barge to be unloaded, and picks up another barge. System provides maneuverability of single ship with flexibility of interchangeable cargo carriers. Hydraulic pins lock tug and barge together







### **NASA tests parawing**

A 20-foot-long, radio-controlled parawing model is providing NASA with information that may be used in bringing manned spacecraft to earth. The tests are being conducted at Wallops Island, Va.



### **Umbrella shield**

Lowered from a helicopter to a soldier or flier in the jungle, the Navy's new jungle penetrator has a pop-out fiberglass umbrella that acts as a shield against heavy foliage as the man is hoisted to the rescue craft.



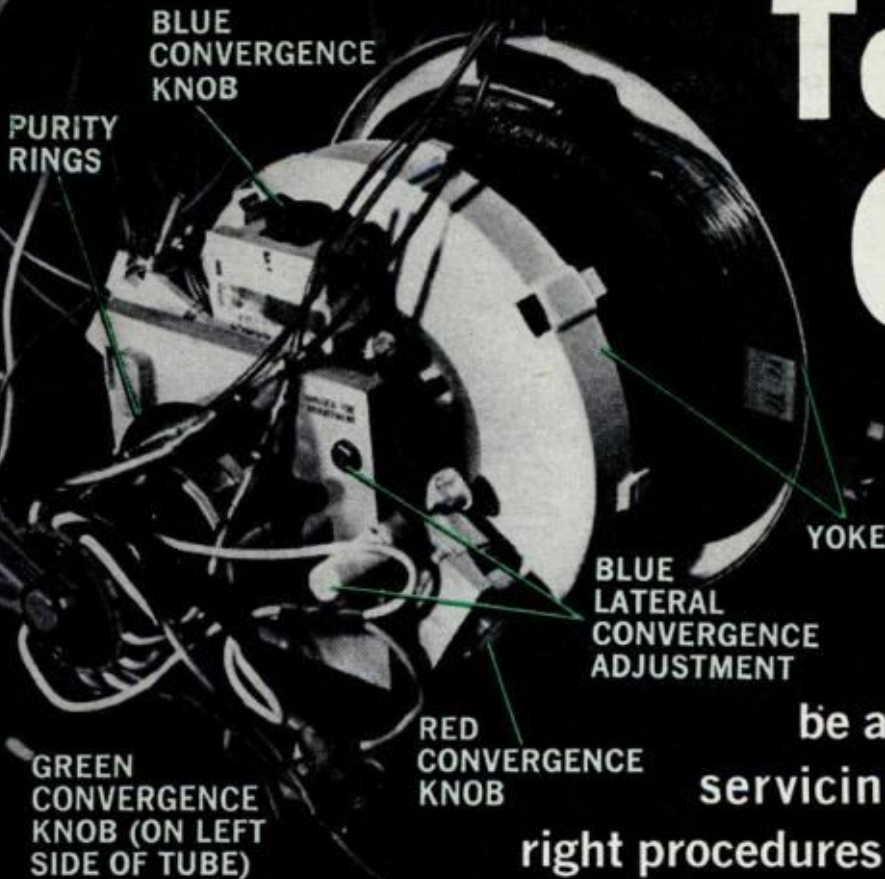
### **Well-controlled lady**

When they replace her head and get her attached by cable to a set of controls, Miss Honeywell, a robot, performs in a most lifelike manner. The photos were taken at her debut in London.





# Who Says You Can't Touch a Color TV!



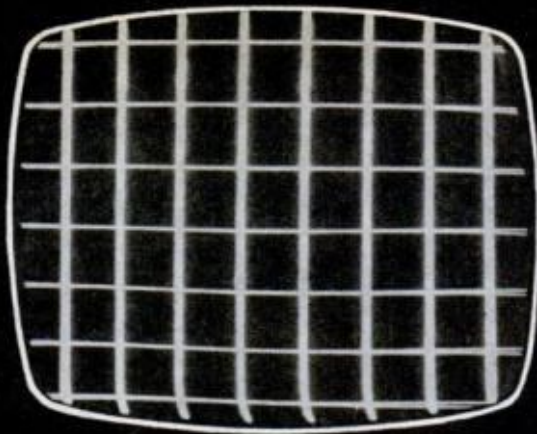
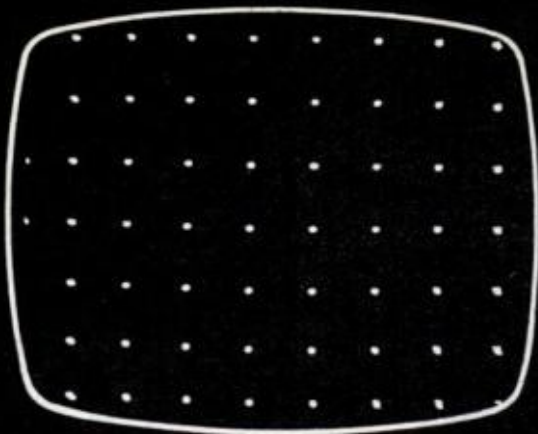
You don't have to be a pro to do your own servicing if you follow the right procedures carefully. Here are safe, simple adjustments any handy set owner can make to improve picture quality and color fidelity

**YOU MIGHT THINK** a color TV is so frighteningly complicated that to fool around inside would be inviting disaster. The fact is, there are a number of basically simple adjustments you can make to improve the quality of your color picture without calling in a serviceman. Mostly, it's merely a matter of turning a screw or knob at the back of the set and watching its effect on the screen. Anyone who is reasonably handy and willing to be careful can do this without fear of getting into trouble.

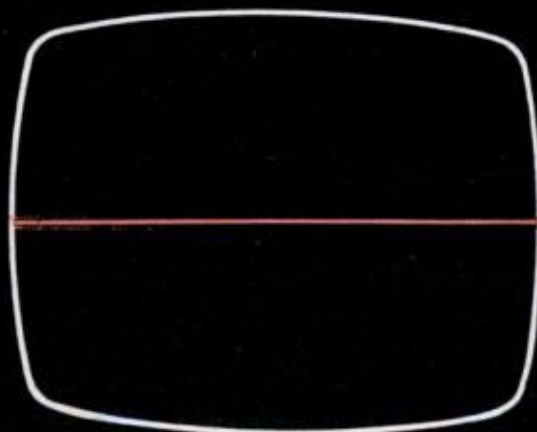
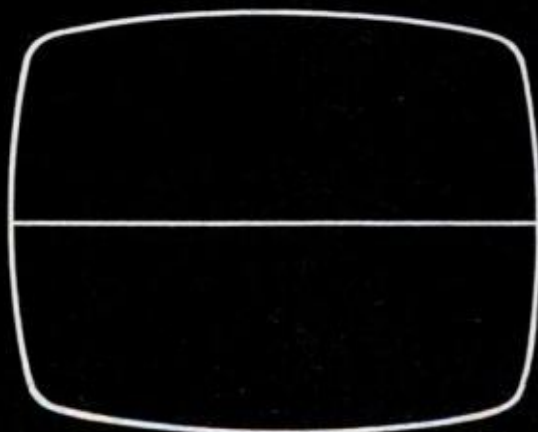
The secret is to know what to do and what not to do. Most of the adjustments are readily accessible on the apron at the back of the chassis. A few are located on the neck of the picture tube, and these must be approached more cautiously. The main danger points inside a set are the deflection yoke on the tube neck and, on the chassis, the high-voltage cage, the power supply, the horizontal output tube and the focus rectifier. Don't touch or come near any of these. If there's no parts-layout chart in the back of your set and you aren't sure where these points are, stay away from everything except the specific adjustments described here.

It's necessary to run the set with the back off to make adjustments. Unscrew the back and plug the line cord directly into the interlock socket. It's usually possible to remove the cord from the back simply by pulling out a small clip. Unplug the cord from the wall while you're doing this and keep





**DOT AND BAR PATTERNS** above are two types of test setups used to check proper convergence of the three color rasters. Dot clusters are shown approximately actual size at lower left on the opposite page. Convergence is correct when dots appear white, as here



**THIN LINE APPEARS** when servicing switch is flipped on. It may show white, as at left, if colors are evenly mixed. You adjust the line to show each color, one by one, then make the line just barely disappear. Turn servicing switch back to normal position after this



**PICTURE SHRUNKEN** on both sides? Adjust Width



**IF IT'S OFF SIDWAYS,** adjust Horizontal Centering



**SHORT PICTURE** lacks Height, Vertical Linearity



**HEIGHT CONTROL** moves bottom down; top still short

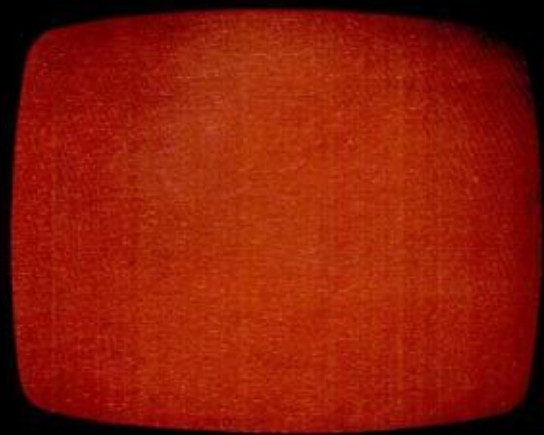
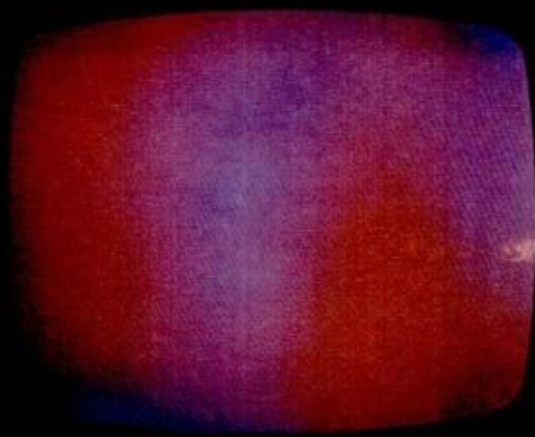


**VERTICAL LINEARITY** moves top of picture up

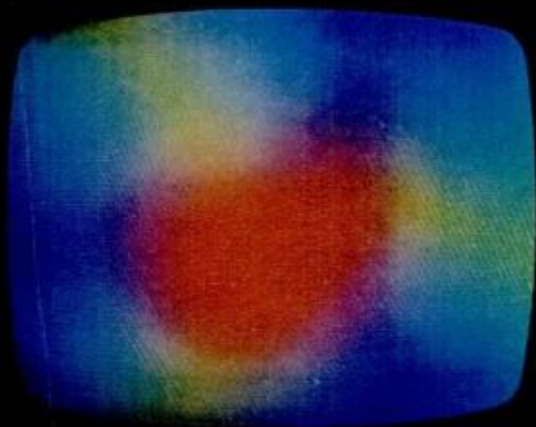
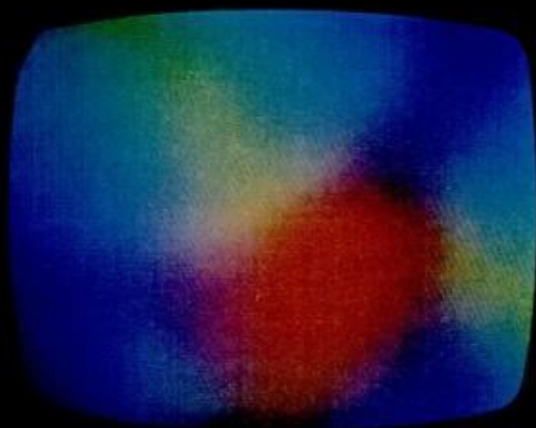


**THE BLACK BAR** should keep the same thickness





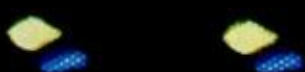
WITH BLUE AND GREEN TURNED DOWN, red raster should have no other colors "seeping" through. Mottled appearance (left above) is a sign of bad purity. Adjust purity rings until red is solid and clear (right). Take care not to touch tube neck as you move rings



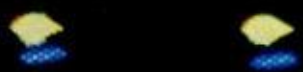
WITH YOKE SLID BACKWARD, red blob shows on screen. Note it is off-center in left photo, indicating incorrect purity. With purity rings properly adjusted, blob should be approximately centered, as at right. Keep set unplugged while moving yoke back and forth



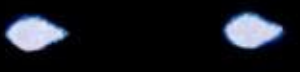
1. SPREAD DOTS apart so that they form a triangular pattern, as shown above



2. RED AND GREEN dots converge to form yellow dot with blue dot underneath



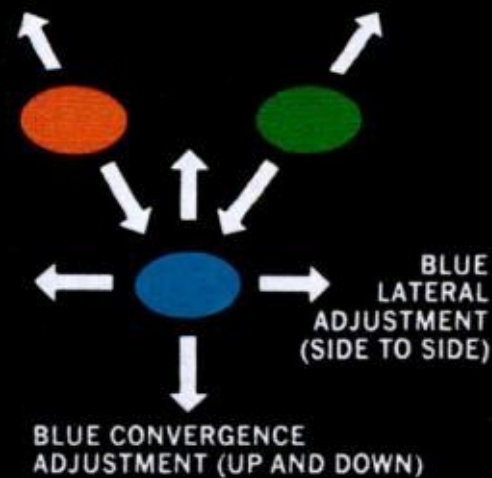
3. MOVE BLUE DOT directly under yellow dot, using the blue lateral adjustment



4. RAISING BLUE dot centers all three, forming a perfect white dot like this

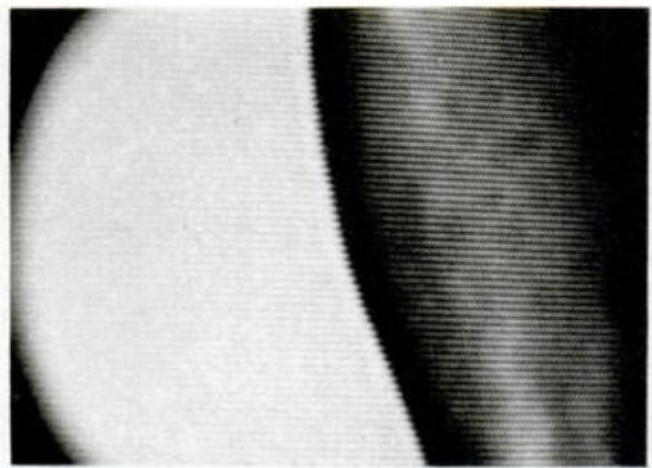
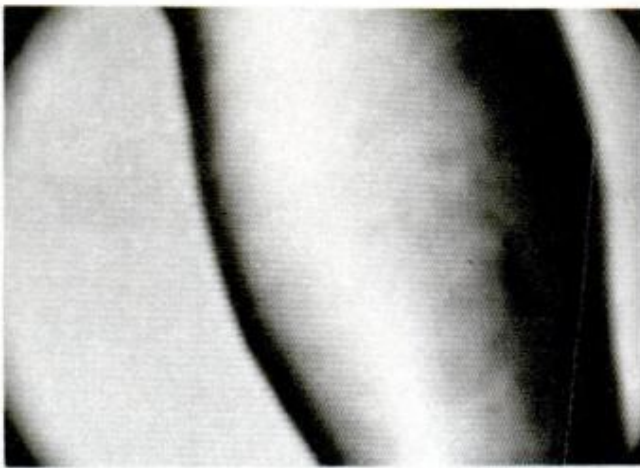
RED CONVERGENCE ADJUSTMENT (DIAGONAL)

GREEN CONVERGENCE ADJUSTMENT (DIAGONAL)



HOW YOU ADJUST DOTS is shown in diagram above. Red and green dots move only diagonally. You have to intersect their paths. Blue dot can be shifted sideways and up and down by two separate adjustments, making it easier to position





**CLOSE-UP PHOTOS** of TV screen show how raster lines look when they're fuzzy and out of focus (left) and when they're properly focused (right). Use Focus control in back to make lines as sharp as possible

it unplugged any time you want the power off during tests.

If you should mess up the adjustments, don't be too concerned. You'll have to pay a serviceman to come in and take over, but it probably won't cost you much more than if you hadn't tried at all, since he'd have to go through the same procedure whether you had fiddled around or not.

Many of the first adjustments you'll make are similar to those in a black-and-white TV. They don't really have anything to do with color circuits, but they must be taken care of because of their effect on the color adjustments you make later.

The main controls found on the rear

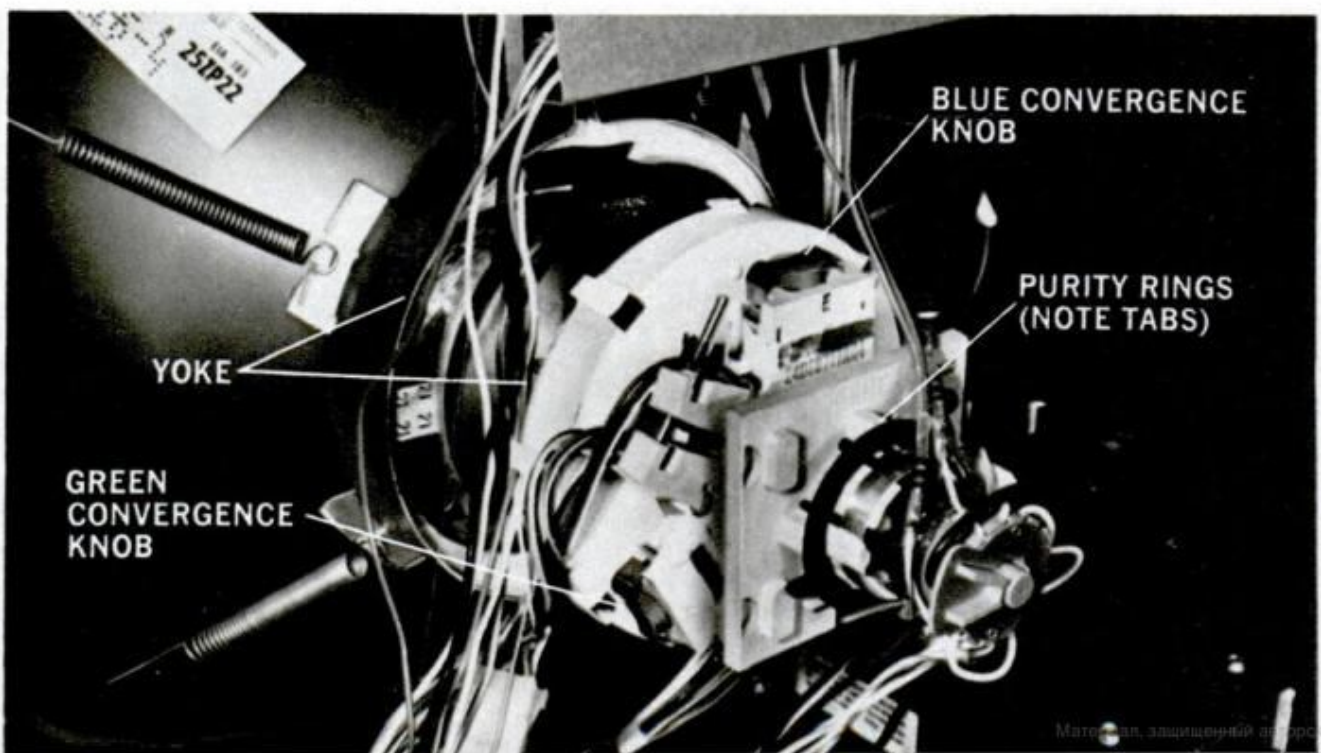
apron of most color receivers are: Width, Horizontal Centering, Height, Vertical Linearity, Vertical Centering, Focus and AGC.

Start by letting the set warm up for 15 or 20 minutes. Then tune in a program and adjust the Horizontal and Vertical Hold controls and the Brightness and Contrast for normal viewing. Make the preliminary adjustments in the following sequence:

1. *Width.* Don't bother unless the picture has shrunk on the sides. Then adjust it until it fills the screen.

2. *Horizontal Centering.* If black shows at one side, move the picture sideways until the black is eliminated or is equal on both sides. If black is

**CONVERGENCE CONTROLS** are in form of knobs around tube neck. Turn knobs back and forth slowly with your fingers to make adjustments. Knobs for red convergence and blue lateral control, not visible here, are on right side of tube (see photo at beginning of article for these positions). On some sets there are two parts of blue lateral adjustment—a setscrew that must be loosened before main knob can be turned





equal on both sides, also adjust Width.

3. *Height and Vertical Linearity.* Adjust these together. Set both controls for minimum height of the picture. First bring up the Height a little, then the Linearity. Keep alternating them so that the picture gets taller evenly. Stop when the picture fills the screen. (Note: These controls may affect the Vertical Hold; if so, keep adjusting that control as necessary.)

4. *Check the Linearity setting* further by rolling down the black bar between frames with the Vertical Hold control. The bar should keep the same thickness as it rolls slowly down the screen. If not, touch up the vertical Linearity (and perhaps Height) until it does.

5. *Vertical Centering.* If, after Linearity is good, the picture is off-center vertically, showing black at the top or bottom, center it with this adjustment.

6. *Focus.* This controls the fineness of the lines that make up the TV picture. The accompanying close-up photos show how the lines appear when the Focus adjustment is wrong and how they should look when the Focus is properly set.

7. *AGC.* Tune in the strongest TV station near you. Turn the AGC control slowly in the direction that makes the picture begin to tear and wiggle (the other direction whites it out completely). Turn the control back from the wiggly position just enough to steady up the picture. Try all other stations and turn it back a little further if any of them makes the picture wiggle.

Color-TV high voltage should never exceed 25,000 volts (25 kilovolts). A few manufacturers recommend 24,000 volts. If you don't know which is right for your set, you can phone a wholesaler or dealer and ask him. Turning the HV Adj screw should bring the voltage to the proper level. Do not attempt to check the voltage yourself, however, unless you have the proper test probe and know how to use it. Just skip this step and go on to the next one. If the adjustments described

here don't prove helpful, you will then have a clue that it may be the voltage that's at fault. In this case, it will be necessary to call in a repairman.

You can tell a color-TV set needs its purity adjusted if the screen has pink or greenish areas in the white raster.

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**FOREST H. BELT, author of this article, is a noted electronics consultant and authority on TV repair. Among his accomplishments is a six-volume course on TV servicing prepared for International Correspondence Schools.**

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The best test for purity is made with only one color of raster. At the back of the chassis are several controls labeled Drive and Screen. Mark the positions of the slots in their shafts so the controls can be returned to their original settings later. Turn down all except the ones marked Red. The result on the screen is an all-red raster. Examine the red raster for contamination by some other color. If its color is solid, leave purity adjustments alone.

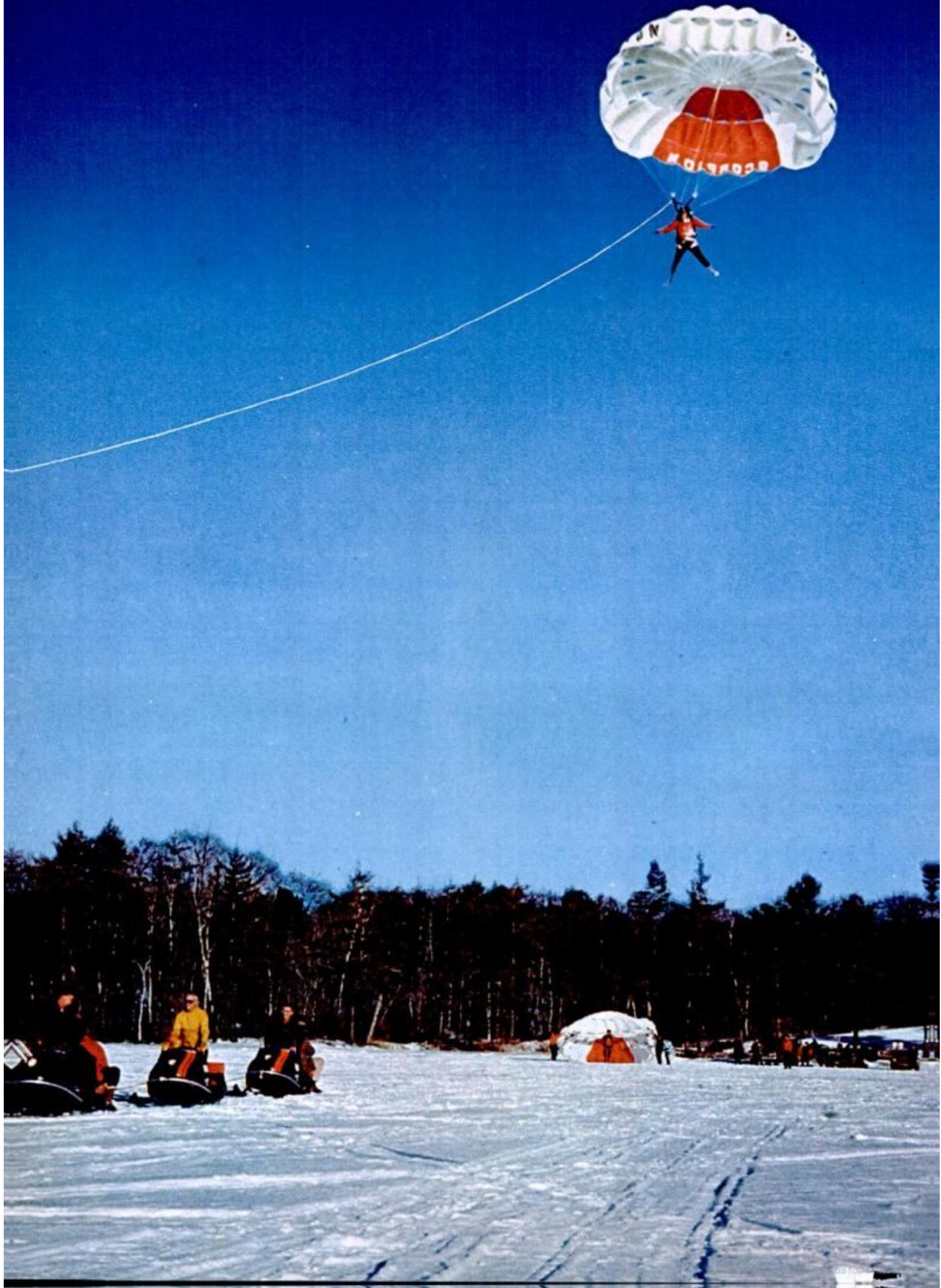
If there is blue, pink, yellow or green shading anywhere in the red raster, make whatever slight adjustment is necessary with the *purity rings*. These are on the back of the color picture tube. You'll find that the rings have little tabs projecting out around them.

To adjust a ring, grasp it by a tab and slide it in a circle around the picture tube neck. Don't move it too far. If it doesn't cure the contamination of the red raster, return it to where you started and try the other ring, moving it in both directions. Working between the two rings, you should be able to clear up any slight impurity.

If this doesn't do it, more drastic adjustment is necessary. Turn off the set for safety. Loosen the clamp or thumbscrews that hold the yoke. Slide the yoke as far backward as it will go and turn the set back on. The raster will show a mottled pattern of

*(Please turn to page 174)*









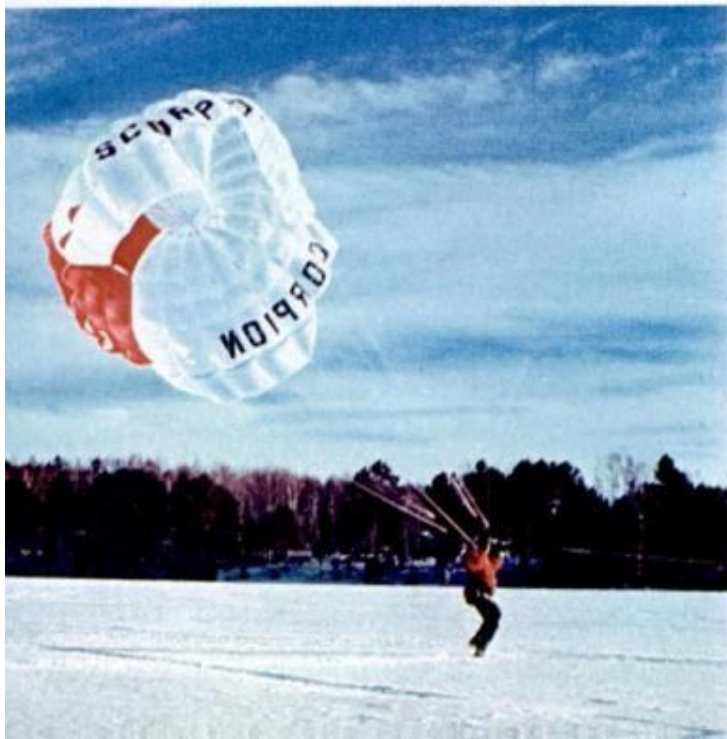
WITH CRASH HELMET, face shield and parachute harness, I feel like a spaceman rather than a skyrider

# I Became a Snowmobile Skyrider

By DAN FALES, Outdoors Editor

Photos by Pat Snook

'JUST STEP OFF' are my instructions as I land on the thick ice of Dollar Lake. Three steps, and I was down



AT THE END of 300 feet of rope, I feel myself being lifted, lifted, lifted into the air.

Three Scorpion snowmobiles in tandem are supplying the needed energy to billow a parachute which lifts me into a blue sky. I feel like an astronaut walking in space.

At first, I was scared. I'd never tried skyriding.

"It'll be a cinch," Roy Tulloch of Scorpion had told me. "Just hang loose."

It was then that they strapped me into a specially made chute designed for snowmobiles. Once buckled in, I thought it impossible to get up 150 feet in the air.

When I was all set, I gave a signal. The three machines roared down the smooth ice and snow of Dollar Lake in Wisconsin. Three snowmobiles—two with 397-cc engines; the lead machine with a 600-cc powerplant—did the work. As I felt the rope tighten I ran a few steps, fell, and found myself sliding along the ground hip first. Then with a great pull, I was airborne.

## Machines are just specks

Now I'm exhilarated. I twist my head for a view all around. I see three specks below—my tow machines. It's weird. It's thrilling.

I can't even see the giant chute ballooned above me. I get the sensation of swinging in a Ferris-wheel chair. It's quiet.

Suddenly, there's a letdown. The machines below are slowing. They're nearing the lake's end. I'm dropping. There is a slight tug on my towline. The machines are speeding slightly. My descent slows.

The ground is near.

"Just step off onto the ground," have been my instructions. I do just that. I'm down in two steps. The chute collapses. Everyone wants to know what it's like.

"Like flying all alone without a plane or wings," I'm saying.

"Let's do it again."

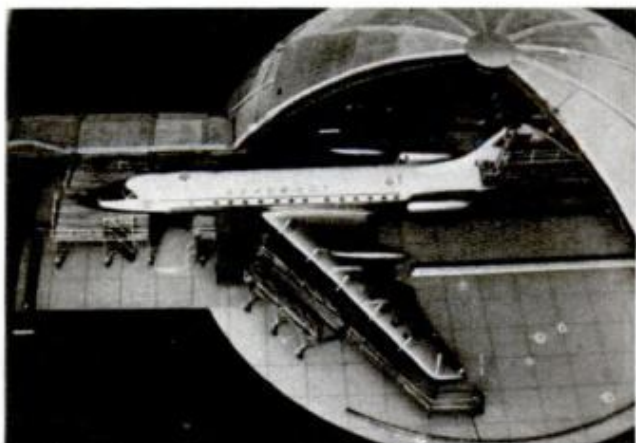
★★★





## Machine cuts concrete 'cookies' two feet thick

The Road-Bor, a machine developed by Consolidated Edison Co., New York utilities firm, can cut through pavement for underground repairs with one-third the noise and in one-third the time that conventional digging requires. Mounted on a truck (upper left), the cutter is tilted into position (upper right) so its tungsten carbide teeth can slice through the paving (lower photos). The cutter is powered by its own 110-hp gasoline engine. During drilling operations, water from a 350-gallon tank is used to lubricate the cutting edge and to keep down the dust. Con Edison has thus far made only one of the machines, but plans to have a fleet of them eventually for "spot-hole" digging.



## Tupolev hangar

Displayed in model form is a special hangar the Soviets have designed to house their Tupolev 124 and Tupolev 134 aircraft.



## Gear for the Concorde

Observers are dwarfed by the huge landing gear of the Concorde prototype during preliminary trials of the supersonic jet.





## Container carrier

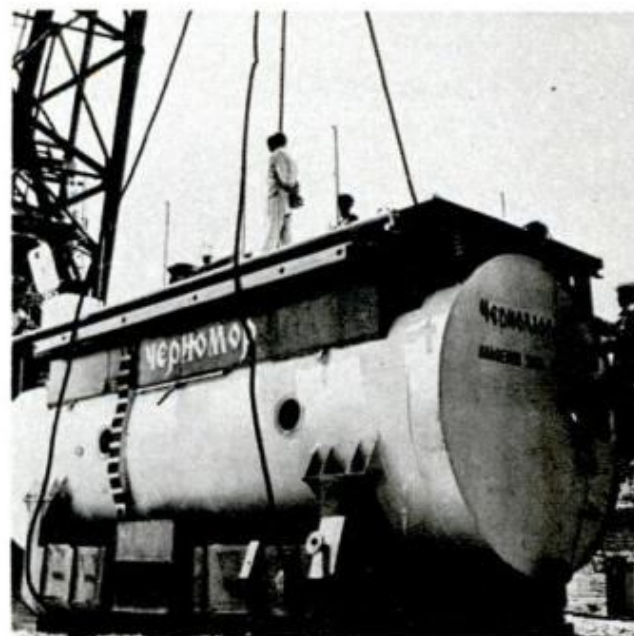
The *American Lancer*, first of the United States Lines' new fleet of "super-container-ships" is shown here being unloaded at Tilbury Docks, England, after crossing the Atlantic. Displacing 32,285 tons, *Lancer* class carriers can transport 1200 land-sea containers from New York to Europe in six days. Tilbury Docks, developed by the Port of London Authority, is the major container port of the U.K. (See *The Ship You Drive With One Finger*, Aug. 1966 PM, for a report on the U.S. Lines' automated *American Racer*, which was converted to carry 200 containers.)



## Weight lifter

Demonstrating her lifting capacity, the *Transcolorado* raises a 208-ton landing craft out of the water. This ship and a sister troopship, the *Transcolumbia*, have been outfitted with three 120-ton-capacity cargo booms by Newport News Shipbuilding and Dry Dock Co.

NOVEMBER 1968



## Soviet undersea lab

Being readied for launching is the *Chernomor*, a Soviet underwater laboratory of 62-ton displacement. Two scientists and two engineers make up the crew of the lab. It was designed by the Soviet Academy of Sciences Institute of Oceanology.

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**BOATING**

# We Took a Houseboat Vacation



We plunged into boating straight out of the novice class — and looked like it. But after three days of our 12-day cruise, we learned to relax and enjoy the luxury of houseboat living

By JOHN LINKLETTER, Managing Editor

*Photos by the Author*

CRUISING ON KENTUCKY LAKE (above) was a pleasure—and so was watermelon during overnight stop (lower left) near Cadiz, Ky. Helmsman for much of trip was 12-year-old Scott (below)





**"WE NEED A HOUSEBOAT YARN.** You know . . . typical family on a vacation cruise sort of thing. Prove to our readers that any average citizen can drive a houseboat. How about trying it? You're the most average guy we can think of."

That's the way I learned last spring that, come summer, I was going to have my own command.

"Thank you," I countered, "but I've never been on a houseboat. I might sink it."

"Great . . . great story."

"But I've hardly even rowed a boat..."

"Well, you couldn't read German when we sent you to Germany last year. Go."

You can't beat logic like that in the front office, and the Linkletters had, indeed, lived every thrilling moment of *We camped Our Way Through Europe* (page 129, Jan. PM).

So it came to be that I strode onto the

dock of Horner's Marina at Hendersonville—a few miles up the Cumberland River from Nashville—on the hot afternoon of Monday, June 24, followed by the ragtag crew that I had impressed into service (wife and three kids).

Tied up alongside the dock was a gleaming new 33-foot Nauta-Line houseboat. She was to be ours for 12 days.

"I want her to be a taut ship— but a happy ship," I commanded.

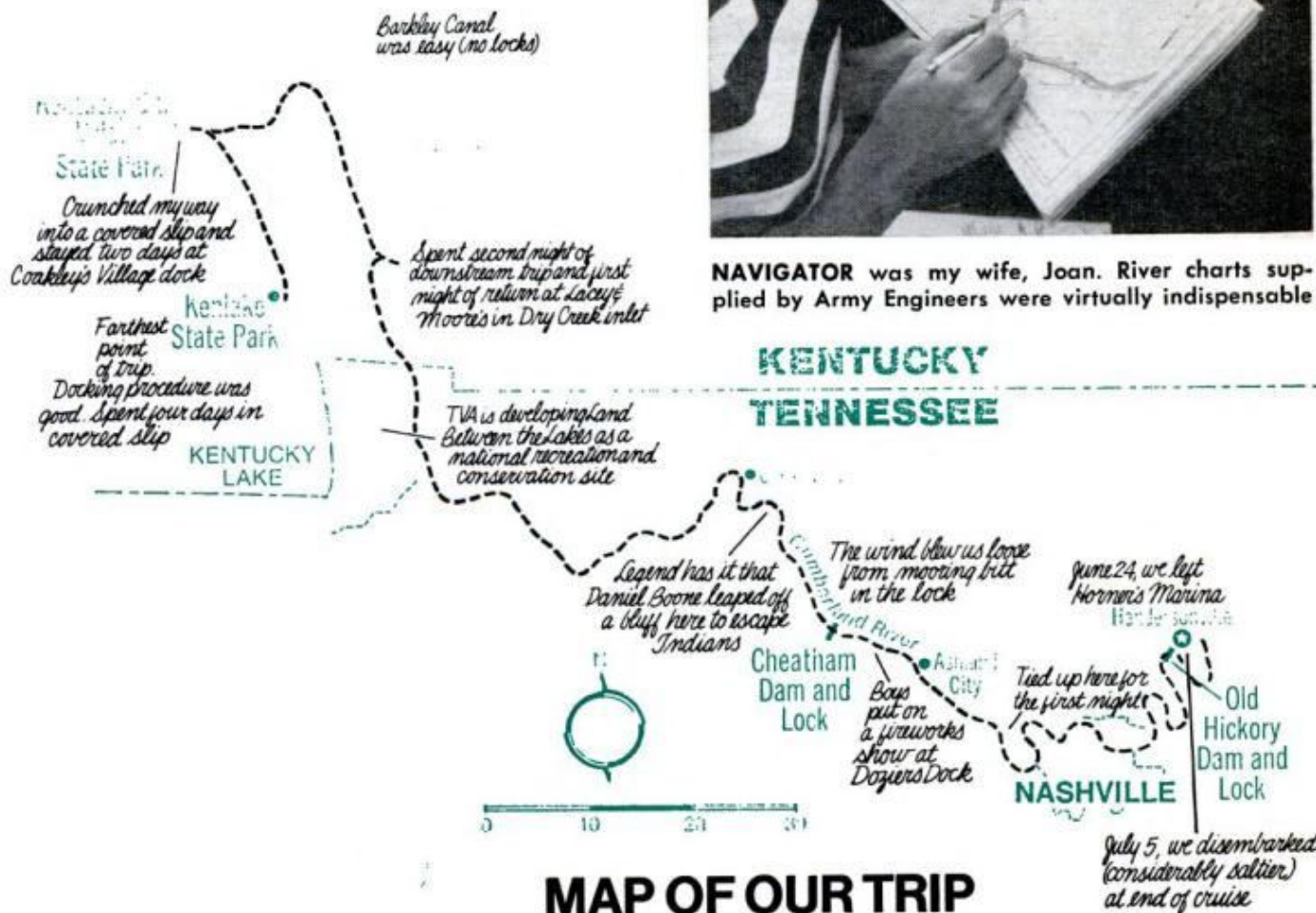
"Aye, aye, sir."

"Let's see you start it, captain."

But it was Chuck Gustafson of Nauta-Line's sales staff who did the starting. He showed me how to cast



**NAVIGATOR** was my wife, Joan. River charts supplied by Army Engineers were virtually indispensable





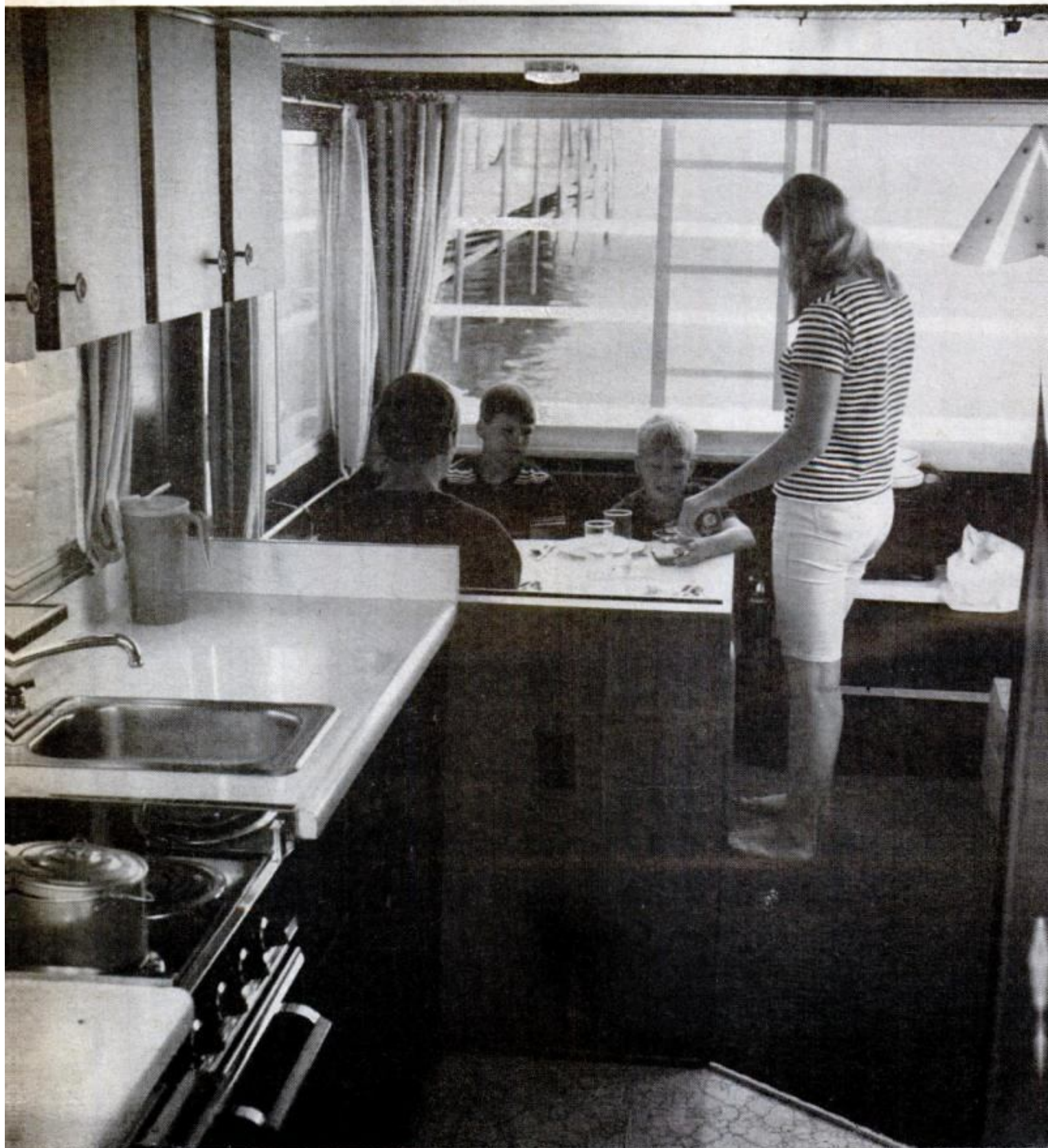
off, steer, dock and how everything worked—from the 260-hp Chrysler marine engine at the stern to the spotlight above the pilothouse.

Then it was ours. We pulled away smartly (meaning, then, that all the lines were untied before I gave it throttle and nobody fell overboard).

I still marvel at the complete aplomb with which Jack Purcell, president of Nauta-Line, waved us off as we roared away in his magnificent \$12,000 machine. A little like lending your Rolls Royce to a student driver, I reflected.

Our goal was Chattanooga. To get there, we planned to travel down the

**HOW'S THIS FOR LUXURY?** Gayle, 16, begins to serve meal cooked in the all-electric galley of Nauta-Line





Cumberland to Lake Barkley, cross the new Barkley Canal to Kentucky Lake and then go up the Tennessee River to Chattanooga—625 miles in all. It seemed a reasonable schedule: 52 miles a day in a boat that could easily cruise 10 to 15 mph or push 30 mph if we wanted it to.

For the first three days we tried to keep the schedule. We were handicapped by our tendency to perform as often out of the "Don't" lists in the boating instruction books as out of the "Do" lists.

We were eventually able to reverse that tendency so that by the time we ended the cruise, we looked fairly salty. But, back to those first three days...

Our first mistake, I think, was to try to keep a schedule. That just doesn't seem to be the way to enjoy house-boating.

A couple of vignettes will serve to illustrate the other don'ts:

● We had gone through the huge Old Hickory Lock (a 60-foot drop) just a mile and a half from our starting point. Although shipboard resembled a Chinese fire drill, nothing went seriously wrong, so 67 miles downstream the next day we approached Cheatham Lock and Dam with innocent confidence.

I hastily reread the booklet *Locking Through*, and about a mile from the lock gave the required long blast on

the horn followed by a short blast. Nothing happened, and all that cement just sat there impassively.

Then, as the booklet instructed, we approached the guide wall and looked for a line hanging in a ladder recess. I jockeyed the boat up to that. Scott, 12, gave it a tug, and a loud blast sounded on top of the wall. A flashing red light over the lock gate warned us to stand clear. Soon there was a flashing amber light ("approach lock but under full control," the book said. "We are okay," I said; "we are still afloat."), and finally a flashing green light indicated that we should enter the lock.

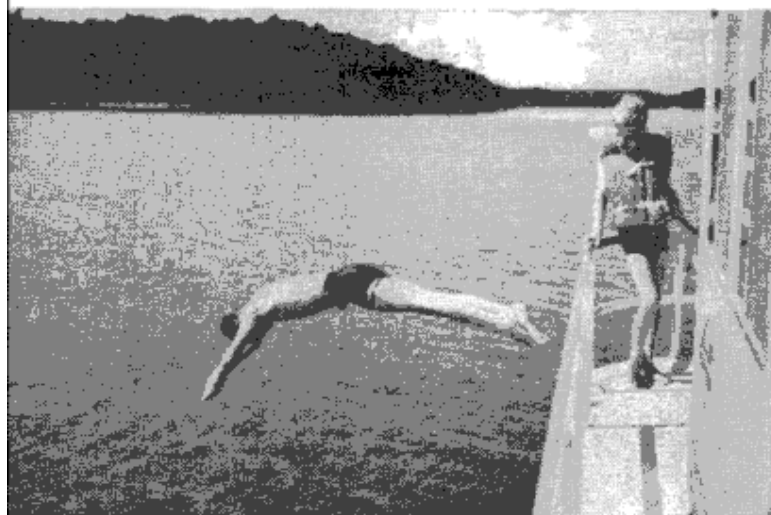
We looped a bow line around a floating bitt inside the lock, and I held on to a ladder a couple of feet from the bitt. No sooner had the water level started to fall than a gust of wind caught the stern and pulled it away from the wall crunching the bow against the concrete.

"Let 'er go!" I bellowed—and there we were, adrift in the lock.

Luckily, ours was the only boat there, so the episode was more embarrassing than dangerous. Before we could tie up again, the lower gate opened, and we fled downstream.

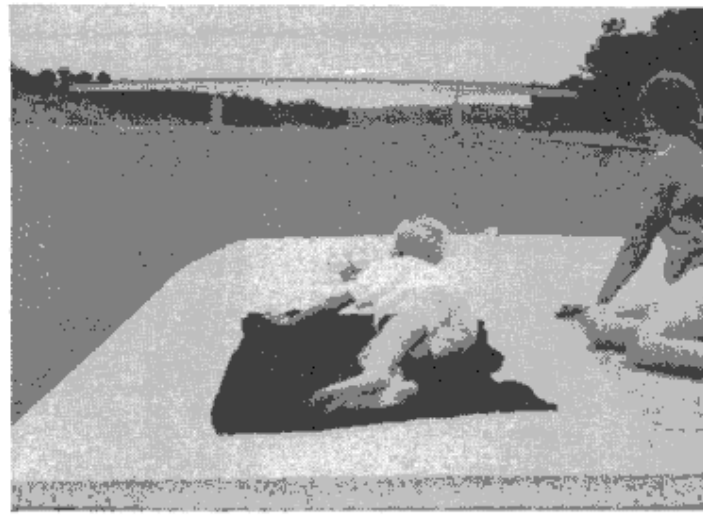
(Our later technique of running a continuous line from bow cleats to stern cleats, looped around the bitt amidships, worked much better when

**DIVING OFF THE BOW**, Scott and John enjoy Kentucky Lake after we anchored off Kenlake State Park



NOVEMBER 1968

**BARKLEY CANAL**, new passage between Lake Barkley and Kentucky Lake, holds eye of top-deck sun bathers



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we came upstream on our return trip.)

● Wednesday afternoon upon arrival at Coakley's Village Docks at Kentucky Dam Village State Park, we were assigned covered slip No. 82. The fact that the slip was just four inches wider than my boat (no exaggeration) plus a stiff wind hitting at exactly 90° to the slip made our docking something of a local spectacle. After 12 or so unsuccessful passes, I crunched into the space and nearly squashed a kindly Kentuckian who was trying to help.

"Takes a little practice," he drawled.

(It does, and I *did* improve with practice.)

● Thursday morning I tried to start the engine and nothing happened. Absolutely nothing. I found that a small wire had caught under the float of the automatic bilge pump, the pump had run constantly for two nights—and the 12-volt battery was now dead.

(Chalk that one up to inexperience, too. You can hear the pump. All you have to know is that it shouldn't run all the time.)

By this time, the crew was restless, and I thought I detected signs of mutiny.

While sitting all day waiting for the battery to be recharged, I began to realize that down here in the heart of houseboat country, the other boaters weren't scurrying all over trying to keep schedules. Most were just a-sittin' and enjoyin'.

"We're staying here," I commanded. And from that moment on, we had a real vacation.

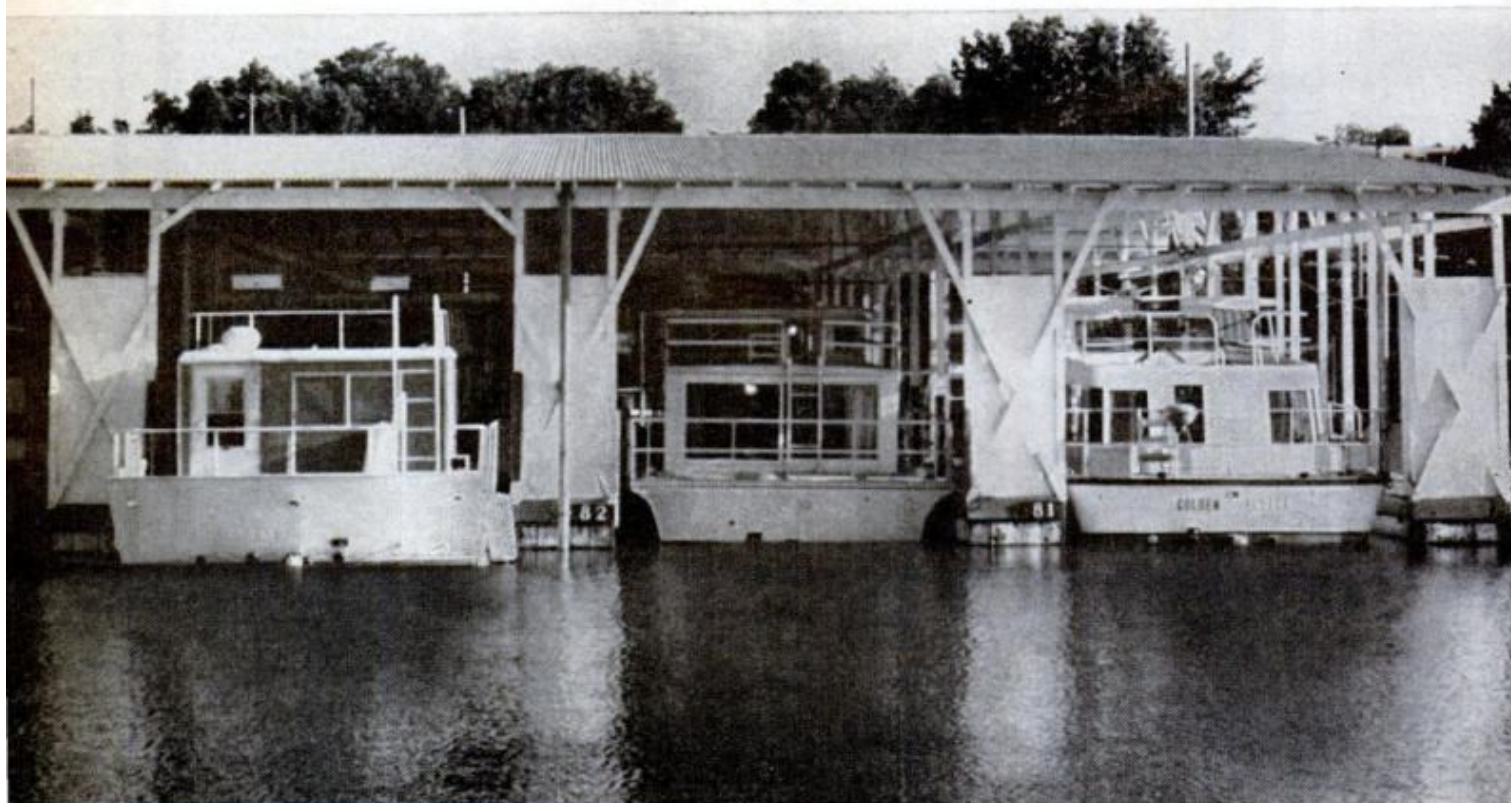
In a houseboat, everything's there for easy living—once you decide that's what you're looking for.

Ours, for instance, was outfitted with a 6.5-kw. generator that gave us the luxury of electric power to run a refrigerator, range, icemaker, water heater, airconditioner and 115-volt lighting system. (There's a second lighting system that operates off the 12-volt battery.)

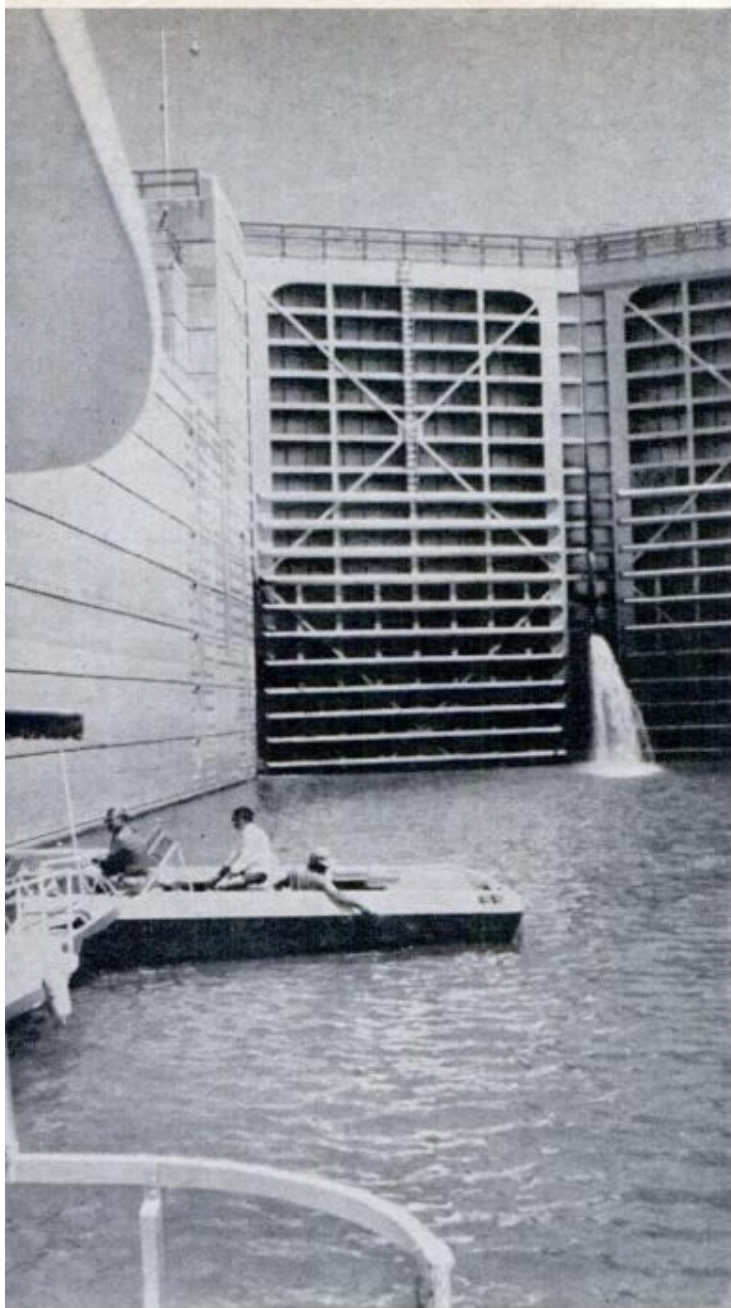
We didn't have to run the generator while we were in the Kentucky park system's covered slips; each space has an electric outlet box and water supply alongside. (Rental for a slip is \$2 a night.)

The Nauta-Line also has a pressure water system, shower and flush head. The walls are paneled in walnut, and

THAT'S OUR BOAT in slip No. 82 at Coakley's Docks. Tight fit and stiff crosswinds gave me trouble docking







**TWO MILES** from end of cruise, we approach down-river gate of Old Hickory Lock. It's a 60-foot lift

the floors covered with thick carpet except in the galley area where the floor covering is vinyl. One L-shaped lounge seat in the pilothouse converts into a double bed, as do the dinette and sofa in the cabin.

In all, our boat was a floating hotel room.

Scott and his younger brother, John, young hedonists that they are, were far ahead of me this time, I must admit. While I was still fretting about the dead battery, they were happily hurtling off the stern of the houseboat into the lake water, and, tiring of that, had caught a string of fish from the stern.

As I say, some people catch on to houseboating faster than others.

The covered slips of the Kentucky park system are first class—as, we discovered, are the parks themselves.

The marinas are like little towns. You sit out on the front “porch” and nod to your neighbors as they walk by on the center walkway.

It was there that we became acquainted with Dr. Ted Grayson and his family, of Indianapolis. We had dinner that evening with the Graysons at the nearby resort inn, toured the park with them in their car, and visited their three-bedroom “executive cottage.” Everything was topnotch. As I said earlier, Kentucky runs a dandy state park system.

The next morning, with battery recharged and no schedule to keep, we decided to cruise 20 miles up the lake to Kenlake State Park.

It was a sparkling day, and the idling engine sounded especially satisfying. There's something about standing at the wheel in front of all those shiny instruments, listening to the rumble, rumble, gurgle, gurgle, coming from the the stern. I can see why power-boaters get hooked on their machines.

By the time I had made a seaman-like departure from the slip, cruised along the beautiful west shoreline of the lake and finally eased the Nauta-Line gracefully into another covered slip at Kenlake Park (even the kids said that was a good docking), I was ready to buy the boat.

Life in the Kenlake Docks was very much like that of the previous two nights. In fact, we liked it so much that we stayed four days—taking the boat out into the lake on a couple of occasions just to cruise around and take pictures. Again, the two boys swam and fished from the stern of our Nauta-Line while those of us in our declining years propped up our feet and caught up on summer reading.

Like many of our neighbors, we were beginning to look upon the boat as a

*(Please turn to page 222)*





## HOW TO BUY

# The Right Tape for Your

You can cure the confusion of selecting audio tape by knowing all its characteristics, exactly how you're going to use it and how much you need

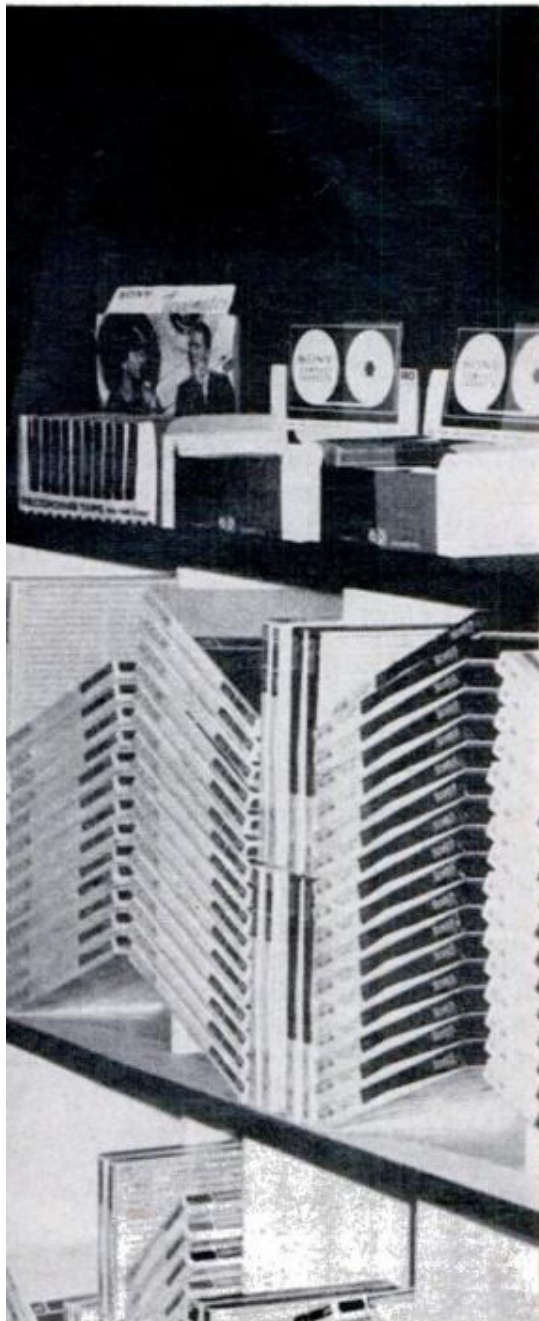
**B**UYING TAPE is simple . . . if you know the difference between various types, bases, coatings, thicknesses, lengths; what's a bargain and what isn't; and what your recording needs are. If you don't, stay away from those shelves! A hit-or-miss choice will likely be a wrong choice.

Before you buy a reel or put it on your recorder you've got to have all the answers.

Consider first: How long will it play? It's *uninterrupted* time that counts. Nothing is sadder than running out of tape right in the middle of a session—especially if you're recording a one-time event you can never recapture.

A 7-inch reel of standard tape (1200 feet) runs half an hour at 7½ inches per second before you have to flip over the





## WHICH TAPE FOR WHAT?

| USE  | TAPE   | REPRESENTATIVE BRANDS   | PRICE FOR 1200 FT. |
|--|--|---|--------------------|
| High-quality recording   | Standard coating on 1.5-mil acetate, 7-in. reel                | American 15-A, Ampex 911, Audiotape 1251, Scotch 111, RCA 15A-12, Soundcraft S-12 | \$3-4              |
|  | PVC-based tape on 1.5-mil, 7-in. reel                          | BASF 201-0005   | \$4                |
| High-quality recording with extra playing time on smaller reel | Standard coating in 0.5-mil tensilized Mylar, 5-in. reel       | American D-12MT, Ampex 951, Audiotape 1231T, Scotch 200-1200                      | \$4-6              |
| High-quality recording at slower speed                         | "Slow speed" coatings on 1.5-mil Mylar, 7-in. reel             | American ST12M, Ampex 536-15, Audiotape 1277, Scotch 202                          | \$5                |
|  | "Slow speed" coatings on 1.5-mil acetate, 7-in. reel           | American ST12A, Audiotape 1257, RCA 12ALN12, Scotch 201                           | \$4-5              |
| Good budget recording  | All types and coatings on 0.5-mil to 1.5-mil, 3 to 7-in. reels | Allied, Lafayette, Brand Five   | \$1-3              |
| "Fooling around" with inexpensive recorder                     | Rejected video and computer tape                               | Unmarked "White box"  | Less than \$1      |

By HANS FANTEL

# Reel-to-Reel Recorder

reel. You can lengthen playing time in two ways: Use thinner tape and get more per reel, or run it at a slower speed.

The plastic backing of standard tape is 1.5 mils thick (1 mil = 1/1000 inch). But you can get thinner versions cramming two or three times as much tape on a reel the same size. As a result, such tapes run two or three times longer. Commercially they're known as "extra-play," "double-play," or "triple-play" tapes. You can get quadruple-play tapes. But on the very thin tapes the magnetic coating is so flimsy

that it can't take strong signals. Triple or quadruple-play tape may be okay for recording polite conversation, but don't try it for the thumping beat of a rock-and-roll group. The sound just spatters.

Besides, extra-thin tape is tricky to handle. To thread it into your recorder you need the deft touch of a brain surgeon. And your recorder had better be in top condition so it won't jerk the tape when starting and stopping.

The best all-around compromise seems to be double-play tape with a base 0.5 mil



thick. Owners of the battery-powered recorders generally prefer this type, for many of those small machines don't take standard 7-inch reels. The 0.5-mil tape gives them just as much playing time on 5-inch reels.

The other way to extend playing time is to record at a lower speed. Most recorders offer a choice of  $7\frac{1}{2}$ ,  $3\frac{3}{4}$  and  $1\frac{7}{8}$  inches per second (i.p.s.) Each step down doubles running time. You also save money because you get more music on each track. But since you never get anything for nothing, you have to trade other factors. Slower speed means loss of high frequencies and slightly higher background noise (tape hiss).

You thus face a basic conflict: speed vs. fidelity. In the past, many people com-

promised by taping music at  $7\frac{1}{2}$  i.p.s. and speech at  $3\frac{3}{4}$  i.p.s. They got away with this because speech doesn't require as wide a frequency response and dynamic range (ability to record loud and soft with equal fidelity) as music.

Lately, however, new tape types have resolved the conflict. Thanks to finer-grained magnetic coatings, these new tapes can pack twice as much audio information (e.g., cycles per second) into each inch of tape than was possible before. At the same time, the smoother grain texture keeps down background noise. As a result, these tapes give about the same fidelity at  $3\frac{3}{4}$  i.p.s. that standard tape yields at  $7\frac{1}{2}$  i.p.s.

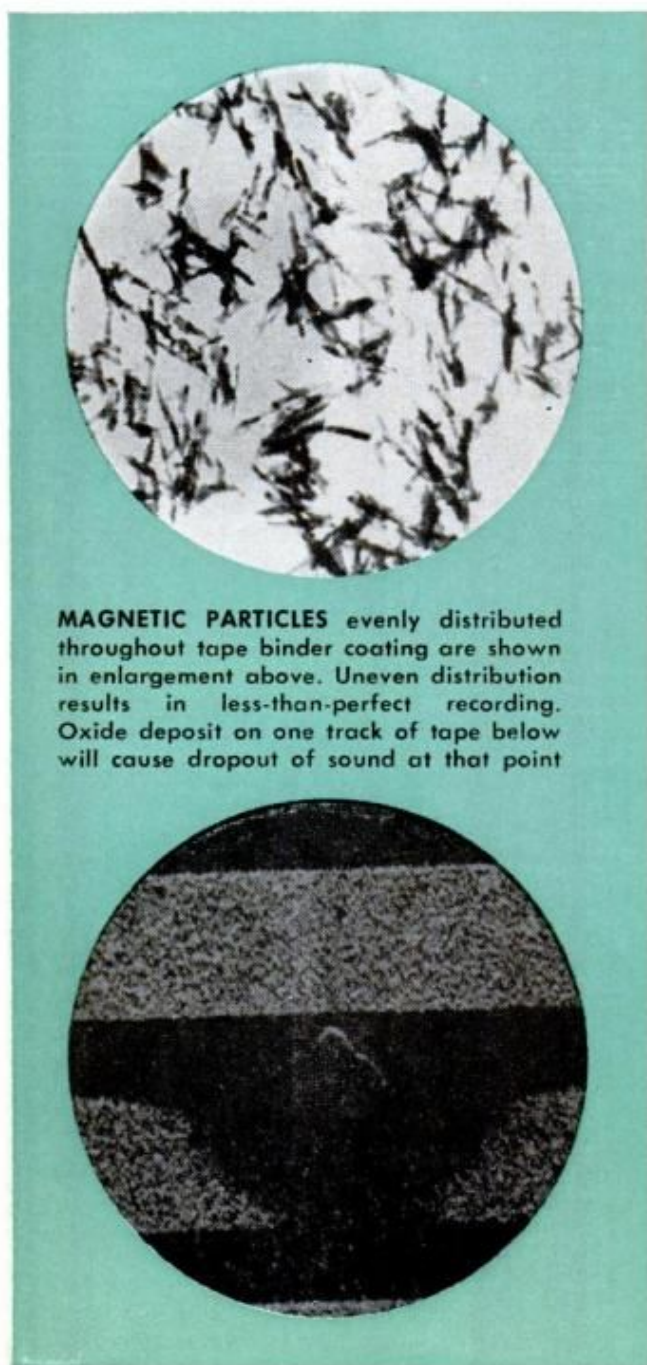
Known as "slow-speed" tapes, they are sold under different trade names, such as Scotch "Dynarange," Audiotape "Formula 15" and Soundcraft "Golden Tone" tape. In price, they run 20 to 25 percent higher than standard tape, but since you save 50 percent on the amount of tape needed for equivalent fidelity, you come out ahead.

Of course, there is no sense in buying these premium tapes if your recorder isn't good enough to show up the difference. The improvement is most striking on a high-quality tape machine hooked up for playback to a component-type sound system. But no matter what rig you own, you can demonstrate the difference—or lack of it.

Record the same material on standard and premium tape at  $3\frac{3}{4}$  i.p.s. For example, you might dub a brilliantly orchestrated passage from a record. Then splice the two samples together (using special splicing tape) and listen to them carefully. Hearing them in immediate sequence, you'll be able to judge which tape comes closer to the original sound of the disc. If you can't tell, stick with standard tape. What's the use of spending extra money for what you can't hear?

One small trick for getting maximum performance from the new slow-speed tapes is to crank up the recording gain control slightly beyond the normal setting. The new tapes take a stronger signal than standard tapes, and the needle of your recording level meter should veer just slightly into the red on loud passages. But don't overdo it. Otherwise you overload the tape and get distortion.

All top-brand tapes are dependable—

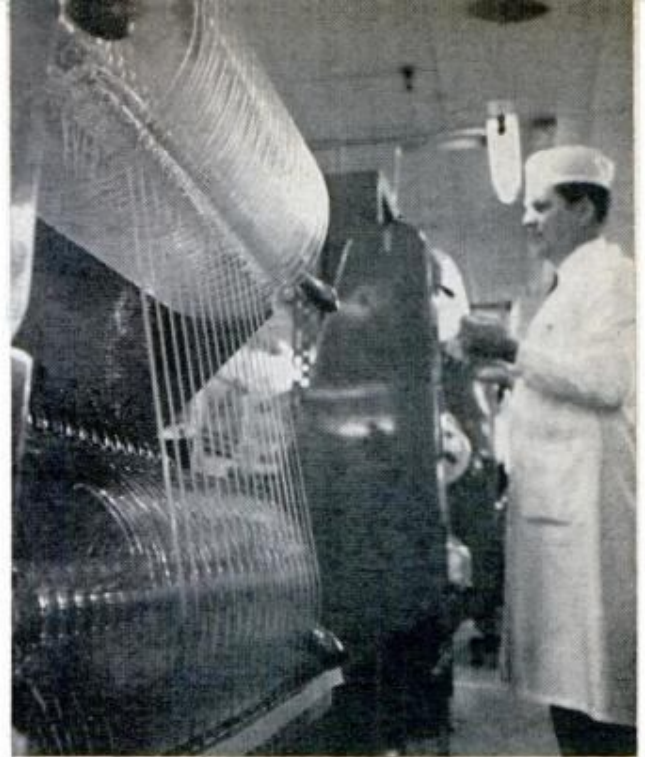


**MAGNETIC PARTICLES** evenly distributed throughout tape binder coating are shown in enlargement above. Uneven distribution results in less-than-perfect recording. Oxide deposit on one track of tape below will cause dropout of sound at that point





**TAPE BASE MATERIAL** is inspected before being coated with magnetic oxide particles and slit to ¼ in.



**MAGNETIC AUDIO TAPE** must be slit precisely from large rolls as it is wound onto individual reels

### How Long Will It Play?

| Tape Footage | Reel Size  | 1-7/8 i.p.s.  | 3¾ i.p.s.     | 7½ i.p.s.     |
|--------------|------------|---------------|---------------|---------------|
| 150'         | 3"         | 16 min.       | 8 min.        | 4 min.        |
| 225'         | 3"         | 24 min.       | 12 min.       | 6 min.        |
| 300'         | 3" or 4"   | 32 min.       | 16 min.       | 8 min.        |
| 600'         | 3" or 5"   | 1 hr. 4 min.  | 32 min.       | 16 min.       |
| 900'         | 5"         | 1 hr. 36 min. | 48 min.       | 24 min.       |
| 1200'        | 5" or 7"   | 2 hr. 8 min.  | 1 hr. 4 min.  | 32 min.       |
| 1800'        | 5" or 7"   | 3 hr. 12 min. | 1 hr. 36 min. | 48 min.       |
| 2500'        | 10½"       | 4 hr. 24 min. | 2 hr. 12 min. | 1 hr. 6 min.  |
| 3600'        | 7" or 10½" | 6 hr. 24 min. | 3 hr. 12 min. | 1 hr. 36 min. |

whether standard or slow-speed. But they are not all alike. Each company has its own recipe for cooking up the oxide, and different brands have a slightly different sound to them. Some may work better than others on your particular recorder. It all depends on which tape best matches the "bias"—an internal frequency adjust-

ment—of your particular recorder model.

The best way to find out is by experiment. Try different tape brands. Record the same material under identical conditions, then compare the results. Listen for clarity of highs, fullness of bass, and absence of background noise.

Recording tape is a strip of plastic with magnetic particles stuck on. You should know something about that strip because the properties of the tape depend largely on what kind of plastic is used as a base. The choice is between two main types: acetate and polyester. The latter is a film version of Dacron textile fiber as is better known by the DuPont trade name of Mylar. Here's how the two types compare:

Mylar is twice as strong as acetate, but it has the nasty habit of stretching like taffy

### Where to Write for Specs and Literature

| MANUFACTURER                                  | BRAND NAME | ADDRESS   |
|---|------------|---|
| Ampex Corp.                                   | Ampex      | 401 Broadway,<br>Redwood City, Calif. 94063     |
| Audio Devices, Inc.                           | Audiotape  | 235 East 42nd St.,<br>New York, N.Y. 10017      |
| Burgess Battery Co.<br>Magnetic Tape Division | Burgess    | Freeport, Ill. 61032                            |
| BASF—Computron, Inc.                          | BASF       | 122 Calvary St.,<br>Waltham, Mass. 02154        |
| Greentree Electronics                         | American   | 2135 Canyon Drive,<br>Costa Mesa, Calif. 92626  |
| Irish Magnetic Tape                           | Irish      | 458 Broadway,<br>New York, N.Y. 10013           |
| 3-M Co. (Minnesota Mining<br>& Mfg.)          | Scotch     | 1501 Hudson Rd.,<br>St. Paul Minn. 55119        |
| RCA Magnetic Products Div.                    | RCA        | 155 East 24th St.,<br>New York, N.Y. 10010      |
| Reeves Soundcraft                             | Soundcraft | Great Pasture Rd.,<br>Danbury, Conn. 06180      |
| Sony/Superscope                               | Sony       | 8150 Vineland Ave.,<br>Sun Valley, Calif. 91353 |



when pulled. If that happens, anything recorded on the stretched part is ruined beyond repair. By contrast, acetate breaks clean, almost without stretching. You can splice the broken ends without loss of recorded material.

You can also buy tapes of special stretch-resistant Mylar, known as tensilized or prestressed tapes. It takes quite a tug to pull them out of shape, but some professionals still don't trust them. "I'd rather risk an acetate break I can patch than a Mylar stretch that would ruin an irreplaceable master tape," says a top studio engineer.

### **Mylar lasts longer**

But unless you do professional recording, chances are you're better off with Mylar. It's no fun to have to assemble your tapes from broken bits and pieces. Mylar costs a bit more, but it lasts longer. Acetate dries out and gets brittle. After 15 years or so, it may fall to pieces. Nobody knows as yet how long Mylar lasts. Chemically, it's more durable than steel or stone. So if you are recording for posterity, a Mylar tape may be better than carved stone.

A third type of tape base has recently been imported from BASF, the German company that pioneered tape recording back in 1934. Essentially, it is high-strength polyvinyl chloride (PVC) with almost no stretch. It lasts about as well as Mylar and shrugs off the effects of temperature and humidity, which can play hob with acetate. What's more, PVC is extremely flexible and therefore wraps itself snugly around the contour of the recording head. This keeps the tape from flopping and fluttering as it travels past and results in exceptionally smooth frequency response.

Top brands are priced pretty much in the same range for the same kind of tape. But if you are on a tight budget, try some of the house brands offered below standard prices by some of the larger electronics supply companies, such as Allied Radio, Lafayette and Radio Shack. Chances are that you'll get good results—most of the time.

Main difference between top brands, aside from price, is quality control. The effort of making every inch of tape live up to specs is what accounts for the higher cost of the top brands. For instance, at

3-M Co., maker of Scotch tape, nearly a quarter of the total work force is in quality control. Every run of tape goes through no less than 100 performance checks.

The makers of house-brand tapes are more relaxed about inspection and tolerances. That's how they can produce them more cheaply. You may find that recording characteristics vary from reel to reel. Many are fine. But occasionally you're apt to hit one with muffled highs, tinny bass, or persistent hiss. But considering the price, maybe you can take the chance of an occasional dud.

Some bargain tapes may be no bargain at all. These are called "white box" tapes because they come in unmarked boxes. At discount houses, you may be able to buy five of these for the price of one top-brand tape. If you're lucky, you're getting reject computer tape in those white boxes. It's designed for very high frequencies—about 200 times higher than the highest sounds—to record the rapid pulse sequence of computers. So bass response is poor. If you're only recording speech, or don't care much for kettledrums and tubas, the results can be pretty fair.

But occasionally the white box contains reject TV tape. That's another story. Unlike audio tape, video tape has all the magnetic particles standing upright instead of lying down sideways. As a result, such tape will hiss at you like a cross between a copperhead and a steam kettle.

### **Slitting may be uneven**

Some TV and computer tape is two inches wide, it must be slit down to the 1/4-inch width of audio tape before being sold to hi-fiers. The reject mills are usually quite sloppy about slitting tolerances. The uneven cut makes the tape wave up and down as it travels across the recording head, and the signals fade in and out like on a seasick radio. Besides, the coating is too thin. It gets magnetically saturated by strong signals and distorts their sound.

Worse yet, the oxide layer on these rejects may have tiny bumps, dips and holes. When a bump comes along, the highs suddenly disappear. A dip in the oxide layer makes the bass drop out. A hole makes everything drop out.

I'm not knocking white box tapes—just describing them. There's a legitimate use

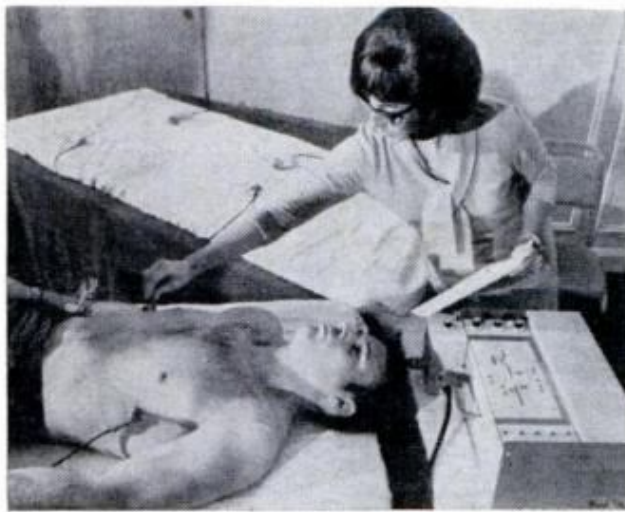
*(Please turn to page 178)*





## Distant doctor-patient relationship

Simply by aiming through the sight and pulling the trigger of this thermometer, the user can, within two seconds, take the temperature of an animal up to 100 feet away. The British instrument measures the infrared energy emitted by the animal.



## Quick heart check

A new medical machine from Thiokol Corp. checks a patient's heart and detects defects in less than 60 seconds.

## Bulletproof life jacket

Capable of stopping a .30-cal. armor-piercing projectile, a new vest made by Norton Co. also acts as a life preserver.



## World's biggest . . . for a little while

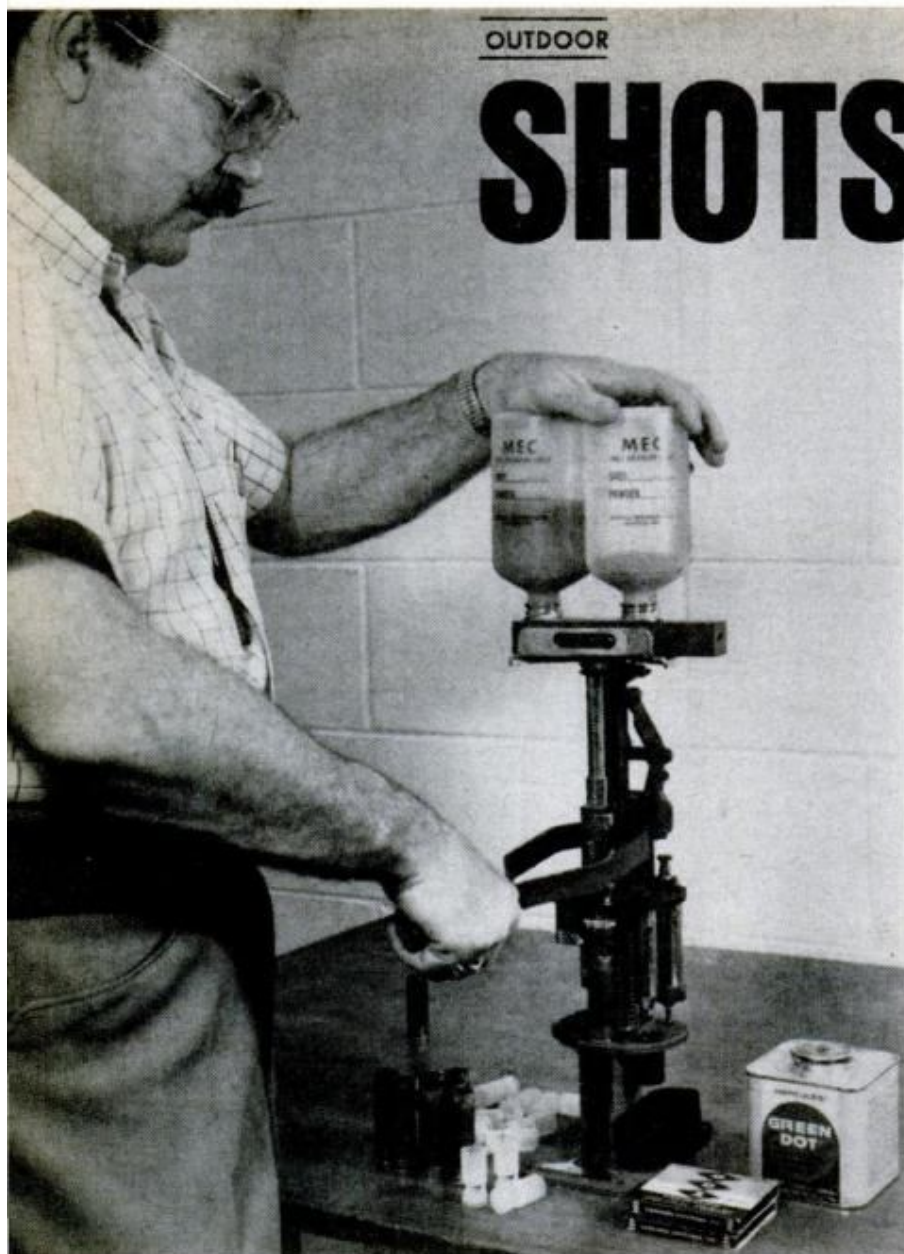
During sea trials this summer, Sasebo Heavy Industries' 210,822-ton *Bulford* was the world's largest ship. However, she has since been eclipsed by the first of six 312,000-tonners from Japan (see [Biggest Thing That Ever Moved](#), page 71, May PM).



OUTDOOR

# SHOTSHELLS: HOW TO PACK YOUR OWN

By MAJ. GEORGE NONTE Jr.  
(Ret.)



**New machinery makes reloading shotgun shells a simple, quick and cheap way of having plenty of ammo for this fall's hunting and target season**

**I**S THE PRICE of shotgun ammunition getting you down? Does this bird season look bleak because of what it will cost for the ammunition needed to get your shooting up to par? With some ammo at \$4.20 per box, this could easily be so. There's an answer—one seized upon by hundreds of thousands of scattergun hunters, and it's even more important to amateur skeet and trapshooters who burn up several hundred shells each week of the season. It's reloading.

Dozens of shotshell reloading tools are on the market, range from a \$9.95 pocket-type outfit that will load a box

of shells in an hour only if you hurry, up to \$400 semiautomatic outfits that will produce nearly 500 shells per hour. One company makes a \$700 outfit that can turn out 1800 rounds per hour. But the average, casual shooter's needs are adequately met by tools in the \$45 to \$85 price range, all self-contained units that will load at least three or four boxes (75 to 100 shells) per hour. In this range are the Pacific DL-155, Redding-Hunter No. 26, MEC No. 600 Jr. and Lyman Shotshell Reloader.

Your first move is case selection. Any clean, fired case in good condition can be reloaded. However, you must sort

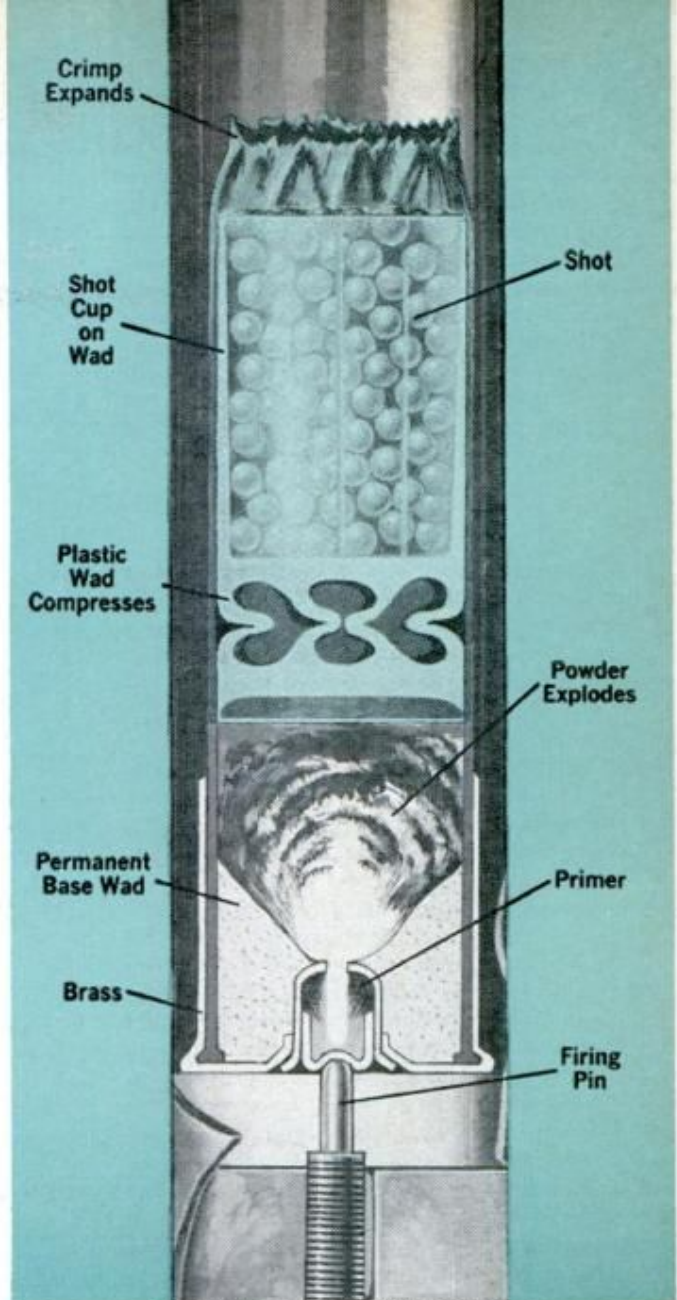


cases by make—Remington, Winchester, Federal—and type—12, 16 and 20-gauge. Both plastic and paper shells are abundant, but tools must often be adjusted differently for them. Target loads contain light charges of shot and powder, so are loaded in “high-base, permanent-wad” cases. Hunting loads use heavier charges and are assembled in “low-base, permanent-wad” cases of greater internal capacity. Sort cases by base height, as well as by make and type. Insert a marked dowel to gauge the inside depth. Make sure the case is completely empty.

Cases that have been smashed flat, seriously deformed or torn should be set aside. Begin with a single batch of clean cases in good condition, all of the same make and type.

Next, get basic components. You’ll need standard domestic “battery cup” shotshell primers that are available in several makes. All makes are good and all currently produced 12-gauge shells take the No. 209 size. The best wads are the one-piece plastic wad column/shot-cuptype (Remington Power Piston, Winchester Win-Wad). Different cases require different height wads. All dealers have charts telling which is correct for your particular cases. Shot is the same, no matter who makes it. Size No. 9 is usually chosen for target loads, but you’ll know what you use for hunting. Powder type will depend upon the load you want to use. Hercules Red Dot is most popular for target loads. Loads using other powders will be contained in your tool brochure or in the reloading manual you should buy and study before starting. *Tip:* Never

**FIVE TYPES** of shotshell reloaders used by millions of target shooters and hunters. From left to right, there’s the Lee Loader, \$9.95; the Safari, \$19.95; the Savage, \$49.75; the MEC 600 Jr., \$64.95; the Texan DPL, \$87.50; the Ponsness Size-O-Matic, \$395. The machine size dictates the per-hour shell-reloading rate



DRAWING FROM REMINGTON ARMS

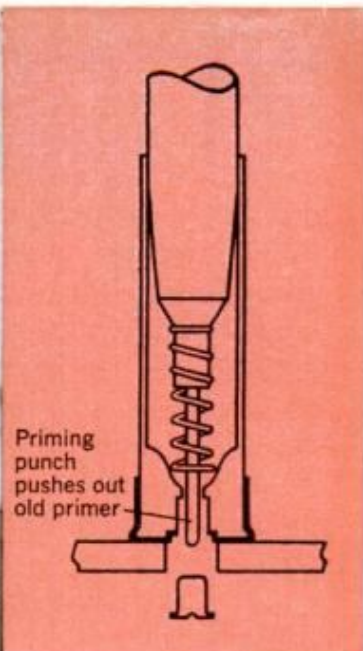
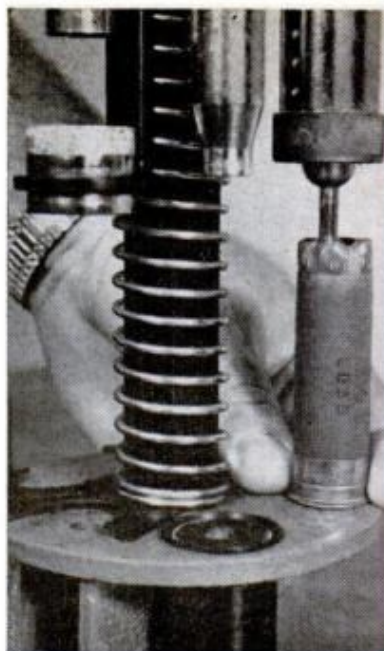
**A SHOTSHELL** is made up of primer cap, powder, wad, shot and a case which is crimped at top. You need all to reload





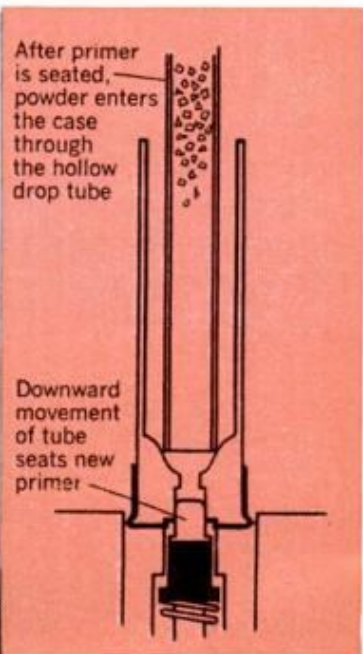
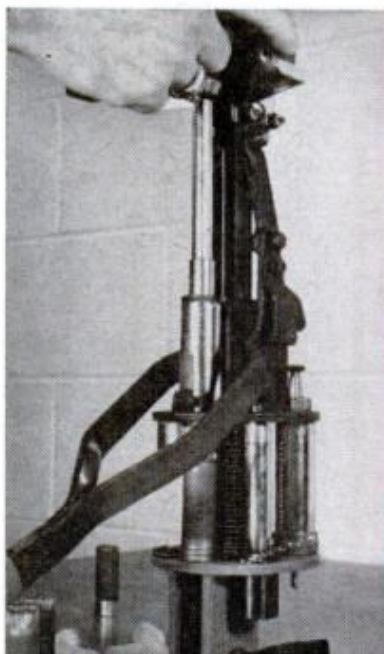
**DECAPPING:** Place the case under the decapping punch, making sure that it is centered. Bring the tool handle down and the punch will enter the case and push out the fired primer. At the same time, it will open up the case mouth-folds. On some tools, the punch is shaped to bear solidly on the base wad, thus reseating it if it happens to be a bit loose. Lifting the tool handle strips the case off the punch. Some tools partially resize the case in this operation with a die surrounding the decapping punch. Such resizing is needed to correct any disfiguration of a case caused by firing.

(Photos at the right in each of the five reloading steps show a MEC No. 600 Jr. reloader in operation. The drawings show what is happening inside the shot-shell during the particular operation.)



**PRIMING AND POWDER CHARGE:** Place a primer, flange down, in the recess of the primer-seating station, then set the decapped case over it. On some tools, alignment of case with primer is controlled by a recess; on others you'll have to do it by eye. Bring the tool handle down all the way. A punch will enter and press the case down over the primer. Raise the handle and check to see if the primer is seated flush with the case head. If it's not, adjust the primer punch per tool instructions.

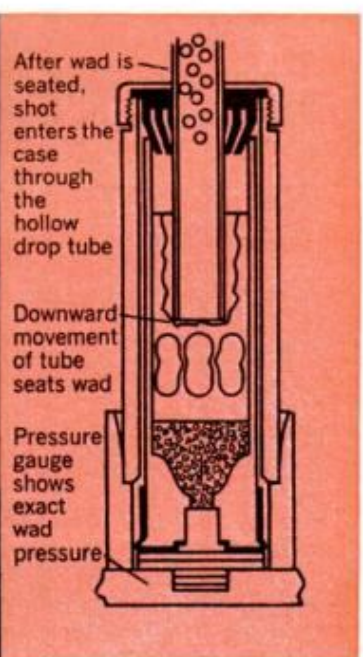
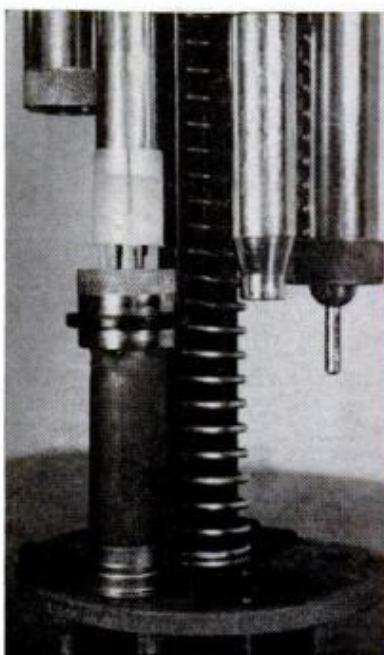
Now bring the handle down until the powder-shot drop tube enters the case mouth. Move the charge bar to drop the powder charge through the tube into the case. Make certain powder, not shot, is being dropped. Most tools use a single charge bar which is pushed one way to throw powder, the opposite to throw shot. When the powder is thrown, leave the charge bar in that position so the next movement will throw shot.



**WAD SEATING AND SHOT CHARGING:** Start the plastic wad manually in the wad guide, solid end down. Bring the handle down fully and the drop tube will force the wad into the case. The wad must be seated on the powder with a specific pressure. Most tools contain a spring-loaded indicator—either in the base or on the tube—which must be checked. If, with the handle fully down, the proper pressure is not indicated, adjust as per instructions.

For shot charging, the handle should be left in the down position after wad seating, then move the charge bar to drop shot into the case. Leave bar in this position, ready to throw powder for the next case. Raise the handle. There should be 1/2-in. to 3/16-in. of case above shot level to allow for a proper crimp.

If wad column has been properly matched to case, shot and powder, this will be so. If not, recheck wad column height and change if necessary.

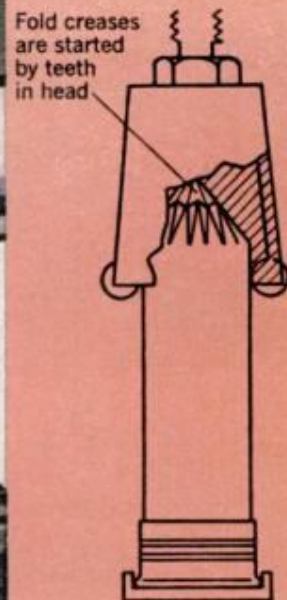
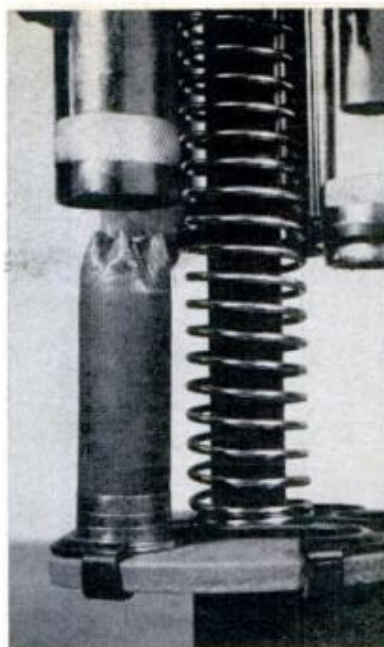




**STARTING CRIMP:** The modern folded crimp is formed in two operations; starting in one die, finishing in another which also performs the final resizing operation. Place the charged case under the crimp-start die. Some tools have fixed dies which means one of the crimp folds must be aligned carefully with an index mark. Others utilize a free-floating die head which automatically aligns itself with the existing crimp folds.

If the ribs inside of the die are not aligned properly over the folds, a spoiled crimp will result.

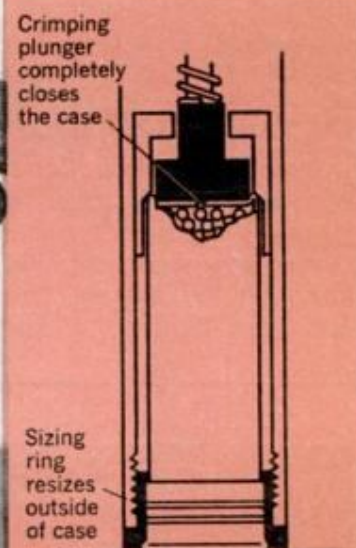
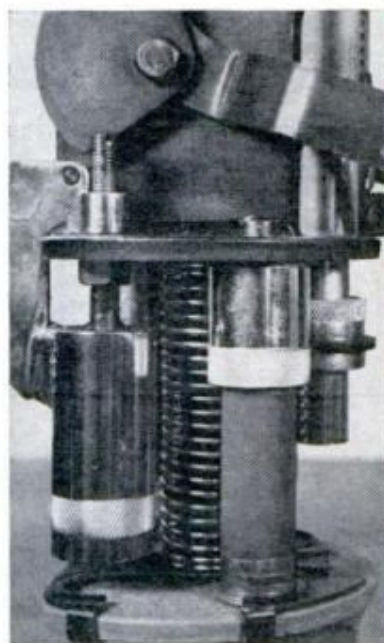
Bring the tool down gently, feeling the crimp start. Some tools do not have a positive stop for this operation, so a certain amount of "feel" is necessary. Raise handle, and inspect case. When the crimp is properly started, the mouth of the case will be uniformly folded and cone-shaped down to the faint ring left by the original factory crimp.



**RESIZING:** Move the case to the crimping station. Since considerable friction will be encountered in the resizing process, you will do well to rub just a trace of candle wax in the die or on the case in order to assure an easier operation. However, you need do this only on the first round, then repeating it every dozen rounds or so thereafter.

Ease the handle downward until you reach a point where the case is beginning to enter the die, then finish the job with a fast, powerful and smooth stroke to the stop. If your stroke is slow and halting, it will not produce the best crimp and yet it will require more effort. Now raise the handle, again with a smooth and powerful stroke, and the completely crimped shell will be ejected from the die.

It's important to avoid the use of a jerky secondary stroke to eject the shell. Such a motion can result in damaging either the crimp or case head.



DRAWINGS FROM LYMAN GUN SIGHT CORP.

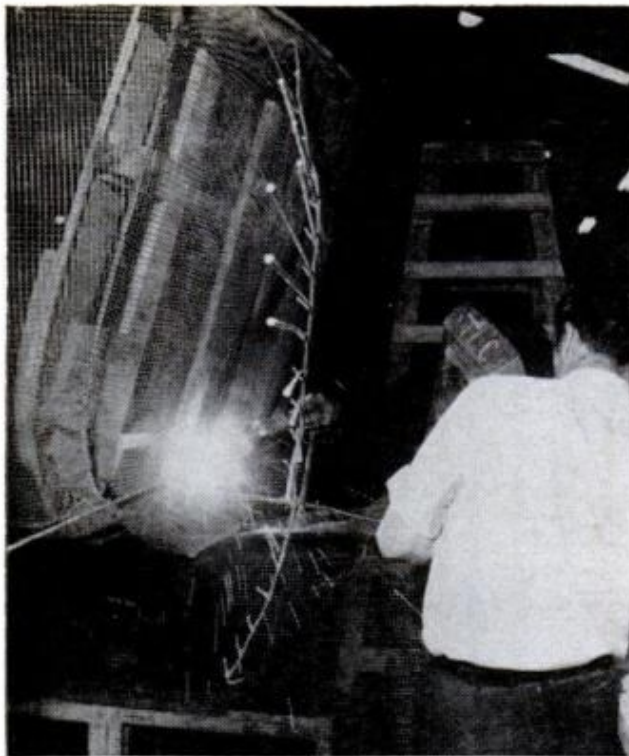
try to substitute one powder for another. This *can* be dangerous.

In the finished shell, the crimp should be tight and smooth, with no noticeable springback, and with at most a very small hole at the center where the folds meet. Neither should there be any overlap or crumpling of the folds at the center. The latter indicates too much case above the shot, the former, too little. Adjustment of either wad column height or shot charge weight is the proper corrective action. The center of the crimp should be recessed nearly  $\frac{1}{16}$ -in. below the rim. This is necessary to avoid having the crimp loosen under recoil forces. Check also

for any buckling of the case walls which indicates too much crimping force was applied. Corrective die adjustment varies among tools, so follow the instructions. Inspect all loaded shells. Occasional minor crimp imperfections can't be avoided. Such shells should be fired first. In a magazine or the second barrel of a double, they won't stand recoil well. *Tip:* Shells may be waterproofed by dripping melted wax, lacquer, or waterglass (sodium silicate) over the folds.

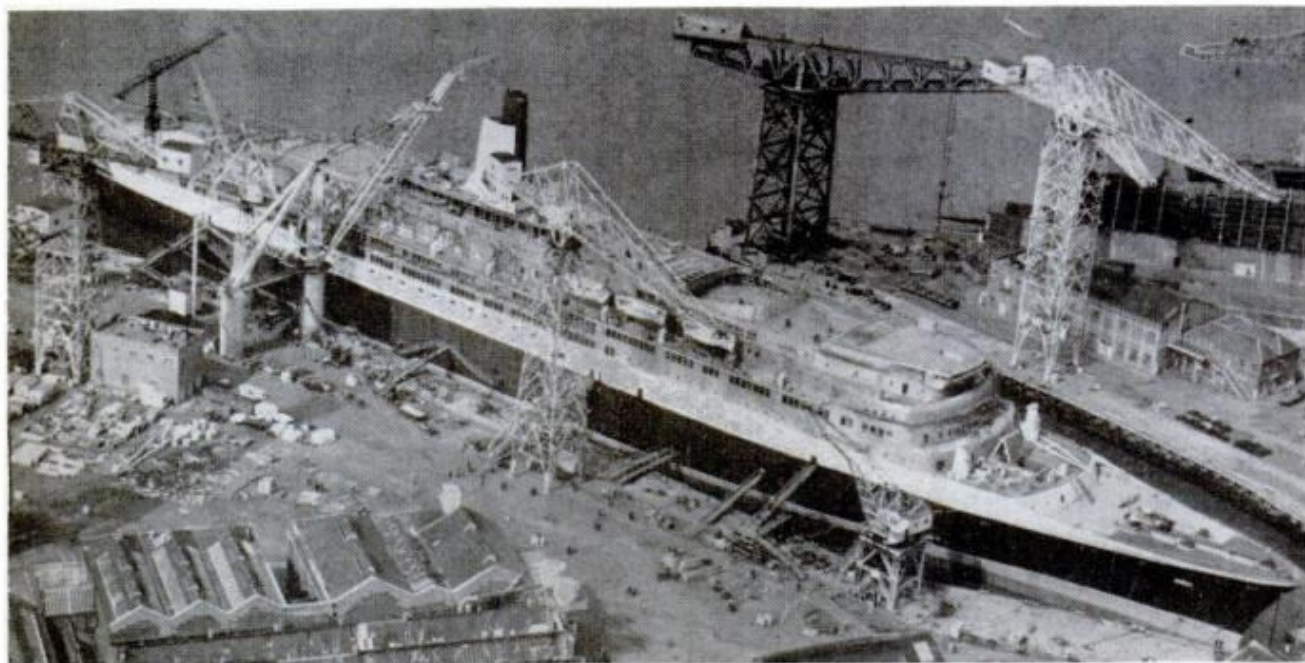
Shotshell reloading is not at all difficult. All you need is a moderately priced tool, some empty shells, and a few dollars' worth of components. ★★★





## British boat builder churns out hulls from a cement mixer

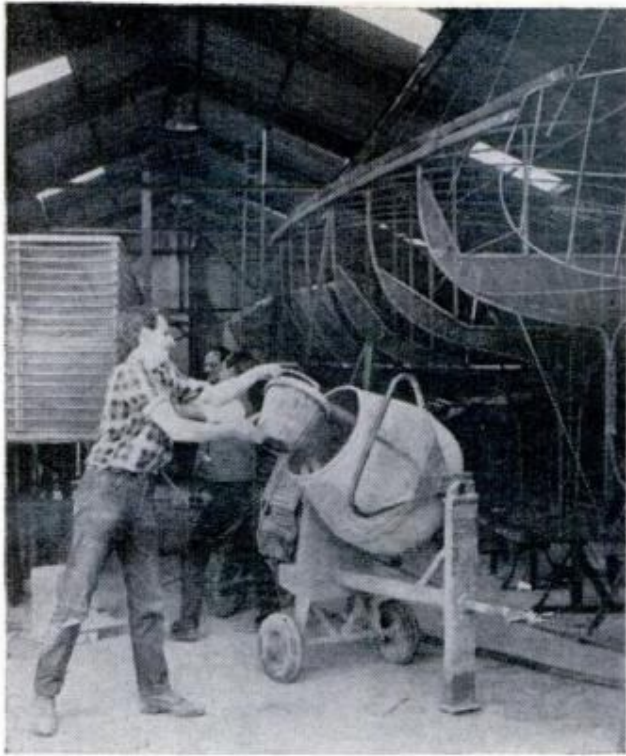
Nine years ago, Donald Hagenbach, a British boat builder, decided to switch from conventional construction to concrete. Since that time he has made more than 150 vessels—including cruisers, houseboats and fishing trawlers—and has become a world leader in ferrocement construction. His builders start with a steel frame reinforced with wire mesh (right-hand photo, above). Then (next photo) they prepare a mixture of sand, cement and special additives (which he refuses to identify) and apply it to the steel frame. The hull is kept



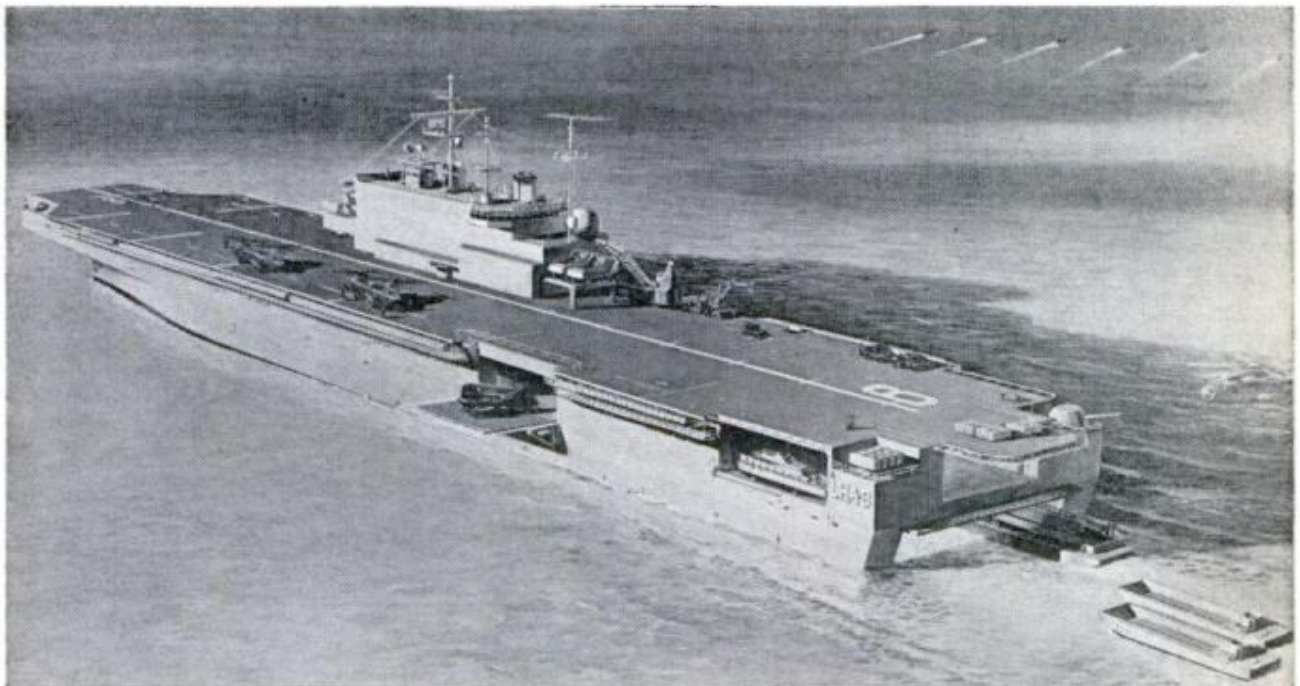
## John Brown applies final touches to Queen Elizabeth II

Shown here nearing completion, in John Brown's shipyard, Clydebank, Scotland, is Cunard's new *Queen Elizabeth II*, which will start transatlantic service early next year. The 963-foot, 58,000-ton luxury vessel will be able to carry up to 2025 passengers at 28½ knots service speed. Her tall, slender funnel will be used for radio transmission. (For an earlier story on the ship, [see Successor to the Queens, page 106, Sept. 1967 PM.](#))





wet for the four to six days it takes for the concrete to cure, then it's ground smooth, outfitted (photo, far right) and painted, if desired. Hagenbach calls his mixture "Seacrete" and says that the material doesn't corrode, rot, wear away or absorb moisture. If a hull is damaged in a collision, new cement can be applied by the owner. (A repair kit is supplied with each vessel.) While his first hulls were four to seven inches thick, the current hulls are only five-eighths of an inch.

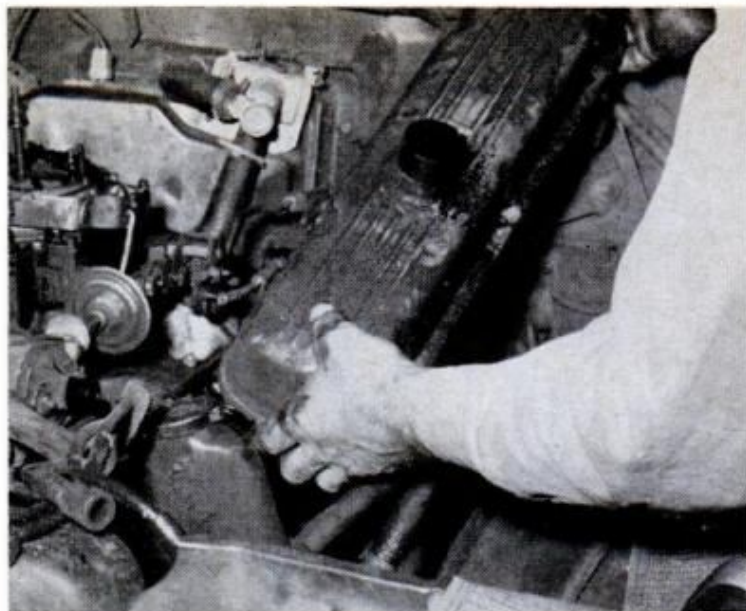


## Navy plans new amphibious assault ship

Under consideration by the Navy is a new type of general-purpose amphibious assault ship (LHA) that combines the features of several ships now in use: the amphibious assault ship, the amphibious transport dock, the attack cargo ship and the dock landing ship. The 796-foot, 20-knot LHA will perform all sea and air functions of the Marine Corps amphibious landing forces. The design is a proposal of Litton Industries.



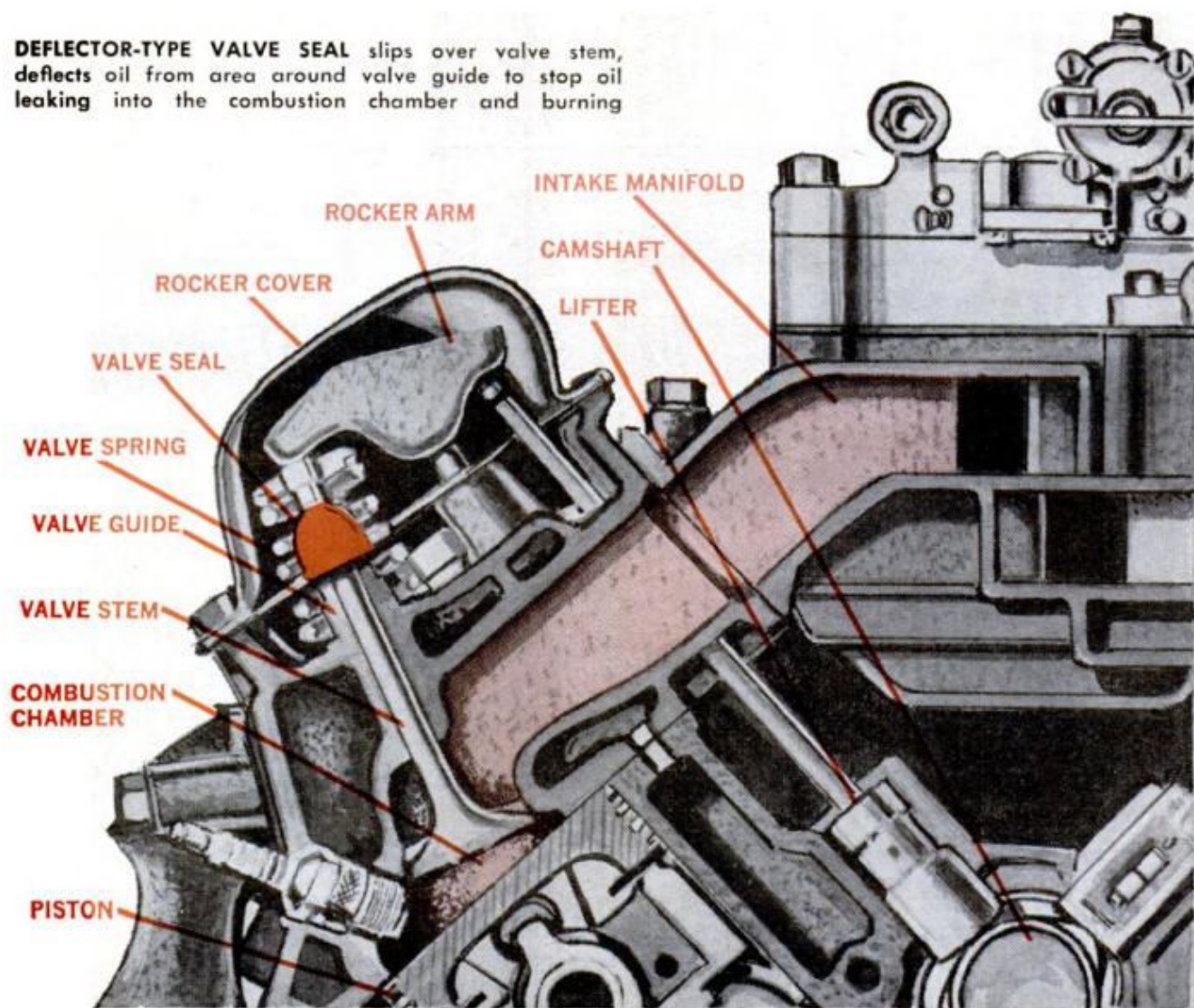
**It's easier and cheaper to pull off your rocker covers and put in new valve seals than to do a valve and ring job you might not need**



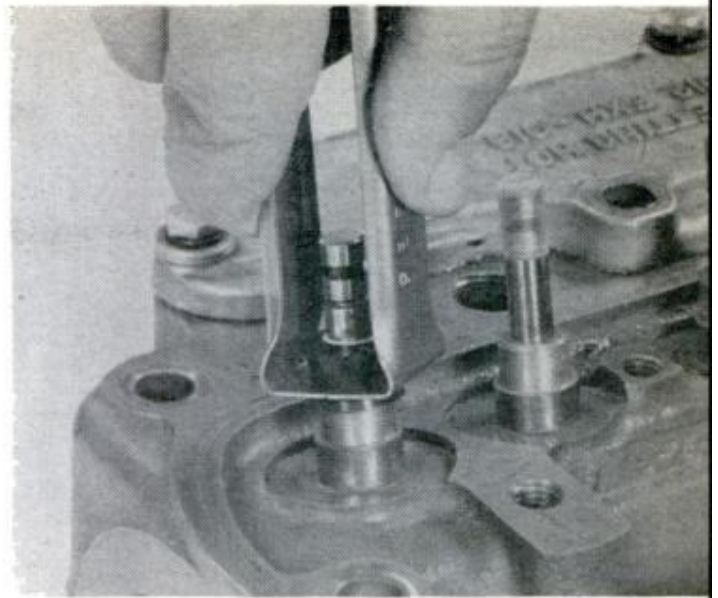
# How to Check and Replace

By MORT SCHULTZ

**DEFLECTOR-TYPE VALVE SEAL** slips over valve stem, deflects oil from area around valve guide to stop oil leaking into the combustion chamber and burning







# Valve Seals

**RUBBER-TEFLON VALVE SEAL** slips over valve stem and seats on guide. Guide has been machined to provide smooth seat. Seal remains stationary unlike deflector type which rides on stem. Plastic cap on stem at left protects seal during installation. In photo above, the seal is seated on the valve guide using Perfect Circle tool designed to compress wire clamp

**M**OST CAR OWNERS believe that worn piston rings are the main reason a car burns oil. Actually, worn valve seals are one of the biggest causes of excessive oil consumption.

A valve seal is a small rubber, plastic, or rubber-and-Teflon part that fits on every valve stem or valve guide. It keeps oil from leaking into the combustion chamber through the valve guide.

Often, a major engine overhaul is suggested when an engine is burning oil. The cost can be several hundred dollars. The big question, though, is whether a valve seal job *only* could do the trick. This work costs from \$20 to \$50, depending on the engine.

For this kind of difference in money I say it pays to take the time to thoroughly investigate valve seals. Sure, rings may still be needed—both seals and rings can be bad. But then again rings may *not* be needed.

Valve-seal replacement work requires some special tools you probably don't have—a spring compressor for one. Furthermore, the job can be rough. You may have to remove the head.

If you don't do the work yourself, at least you can discuss the problem intelligently with your service manager by do-

ing some troubleshooting first. Hopefully, your understanding will mean you'll get an efficient job at the lowest cost—with no mystery of what's being done to your car.

First question is whether oil is being gobbled up in the combustion chambers or whether you have an external oil leak. The "smoke" test will give you the answer. Warm up the engine and let it idle for five minutes. Accelerate rapidly and watch for exhaust smoke. Blue-gray smoke means oil's burning in the combustion chambers.

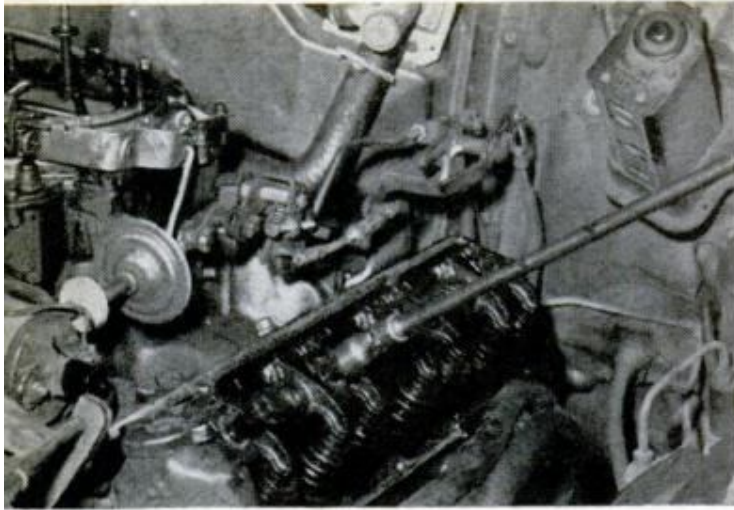
You can get a more positive indication by a road test. Drive the car at a steady 40 mph. Now, coast with the throttle closed, checking for blue-gray smoke during deceleration.

Apply full throttle at 15 to 20 mph and watch for a large puff of blue-gray smoke. White or black smoke doesn't count.

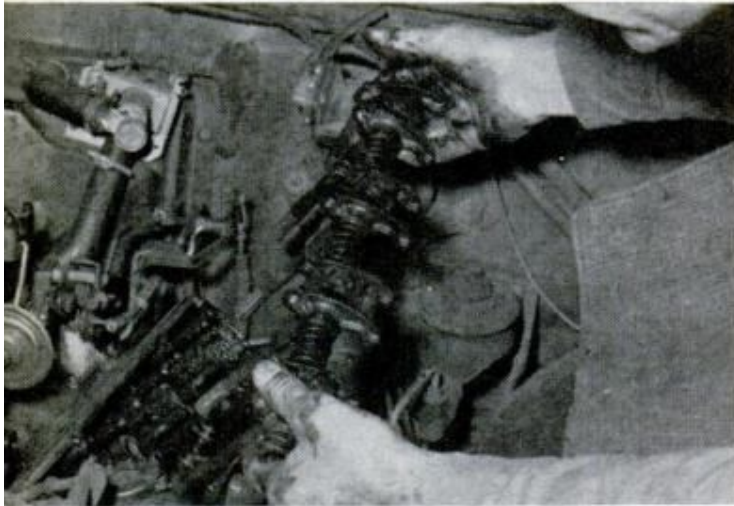
To pinpoint oil loss to valve seals instead of rings, remove the valve covers and shut off the oil supply to the rocker arm assembly. This procedure varies with engine design.

In some engines, oil is shut off by disconnecting the oil line, attaching a small length of rubber hose to the line, and directing oil flow down a pushrod hole. In other engines, the oil line enters a fitting





**FIRST STEP** after removing rocker cover is to remove the rocker arm assembly by loosening each bolt a little at a time. To keep assembly evenly stressed, always loosen and tighten the bolts gradually



**ROCKER-ARM ASSEMBLY** is lifted off after the bolts are removed. Pushrods, which in operation are pushed upward by camshaft and lifters and down by rocker arm springs, can be left in engine during job



**VALVE SPRINGS** are removed for access to the seals. With springs compressed, valve keeper is removed from stem. Some means of keeping valves from dropping into the combustion chamber is needed, however

at the front of the cylinder head. Disconnect the line at this fitting. Plug the fitting with a restrictor to prevent oil pressure drop or flooding of the valve chamber area.

In still other engines, oil reaches the valve mechanism through passages in the cylinder head. You usually have to loosen a capscrew holding the rocker arm shaft bracket and slip a small metal shim between the bracket and the cylinder head to close off the passageway.

With the oil supply shut off, warm up the engine and drive the car at least five miles. Perform the smoke test. If exhaust is no longer blue-gray, has decreased in volume, or disappeared altogether, oil has been getting past the valves, probably because of bad valve seals.

Keep in mind that this test has to be conducted for a period long enough to burn out all residual oil left in the system. You can safely operate the engine for an hour with the oil supply to the rocker arm assembly disconnected.

As mentioned, valve seals installed by car manufacturers differ from car to car. Some are simple O-rings that fit a groove on the upper part of the valve stem to keep oil from running down the stem.

Other valve seals are umbrella-type deflectors made of rubber or plastic which fit tightly on the valve stem. These ride up and down with the valve and deflect oil away from the area where the valve stem enters the valve guide.

The most modern valve seal is rubber with a Teflon ring inside the lip where the valve stem protrudes. This is a stationary



**AIR PRESSURE** maintained in the combustion chamber through the sparkplug hole will keep valves in place. Without air pressure, head must be removed to enable you to hold valves in place against their seats



seal, which fits on top of the valve guide and is held in place by a steel snap ring. The valve stem moves up and down through the center of the seal.

You can often tell if valve seals are in good shape by examining for wear and deterioration. If they look okay but still oil's being lost past the valve stems, you can try installing rubber-Teflon seals. They offer a very tight, close fit. They are, however, more expensive. So is labor to install them since machining of the valve guides' outside surfaces is usually required to make an extremely smooth seat for the seal.

Thus, you are faced with a decision whether to install the rubber-Teflon seals and try them or whether to replace the worn valve train parts. For my money, the rubber-Teflon seals are worth the try.

The replacement procedure for a typical overhead valve engine is shown in the accompanying photos. The job can be done in steps:

1. Remove the battery cable from the battery to prevent accidental cranking of the engine.

2. Remove the sparkplugs and rocker covers.

3. Remove the rocker-arm assembly. Loosen each bolt only two turns at a time to prevent breakage of the rocker shaft. You can leave the pushrods in place in the engine.

4. Remove the valve springs. This is a rough part of the job. A valve spring compressor is needed to compress the springs and remove the valve keepers. This tool, if you decide to tackle the job yourself,

can be purchased from the auto-supply store where you buy valve seals. An inexpensive model costs about \$5. The professional type seen in the photo costs about \$20.

The valves must be held against their seats while springs are removed. This is done with a special adapter which fits on the end of a high-pressure air hose and threads into the sparkplug hole. Air pressure forces the valves in the cylinder tightly against their seats.

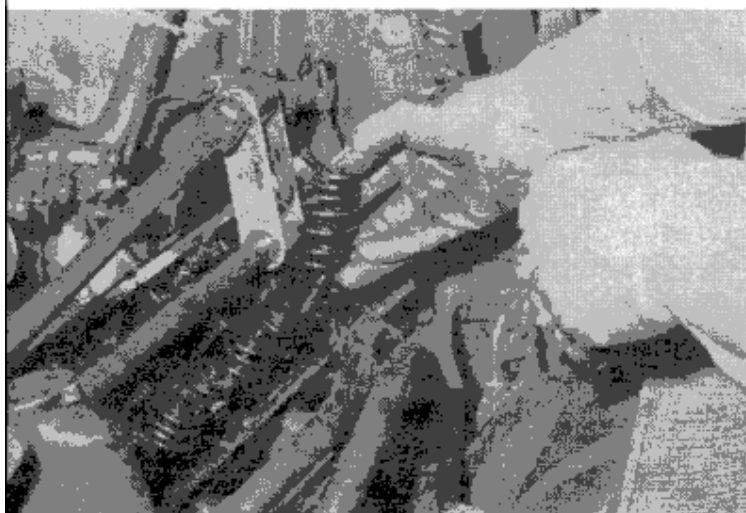
5. Remove the old seals and install new ones. When installing rubber-Teflon types, be sure to use the plastic installation sleeve that comes with the seals. This fits over the tip end of the valve stem to prevent the keeper grooves from damaging the Teflon inner portion of the seal. Remove this sleeve when the seal is in place. Be sure the seal is pushed firmly on the valve guide.

Rubber or plastic-type seals fit tightly on the valve stem. Push them down as far as possible against the guide. The first revolution of the engine places them in their full-seated position.

6. Make absolutely sure the entire area is perfectly clean before starting to reassemble the parts.

7. Replace valve springs and keepers, tightening up on each bolt only two turns at a time to prevent bending or breaking of the rocker shaft. Tighten down bolts to the torque specified by the manufacturer.

8. Install the rocker covers, using new gaskets, and install sparkplugs and battery cable . . . and start saving oil! ★★



**WITH VALVE KEEPERS REMOVED** and air pressure holding valves against seats, springs can be removed from stems for access to seals. If you remove head and all springs at once, put them back on same stem



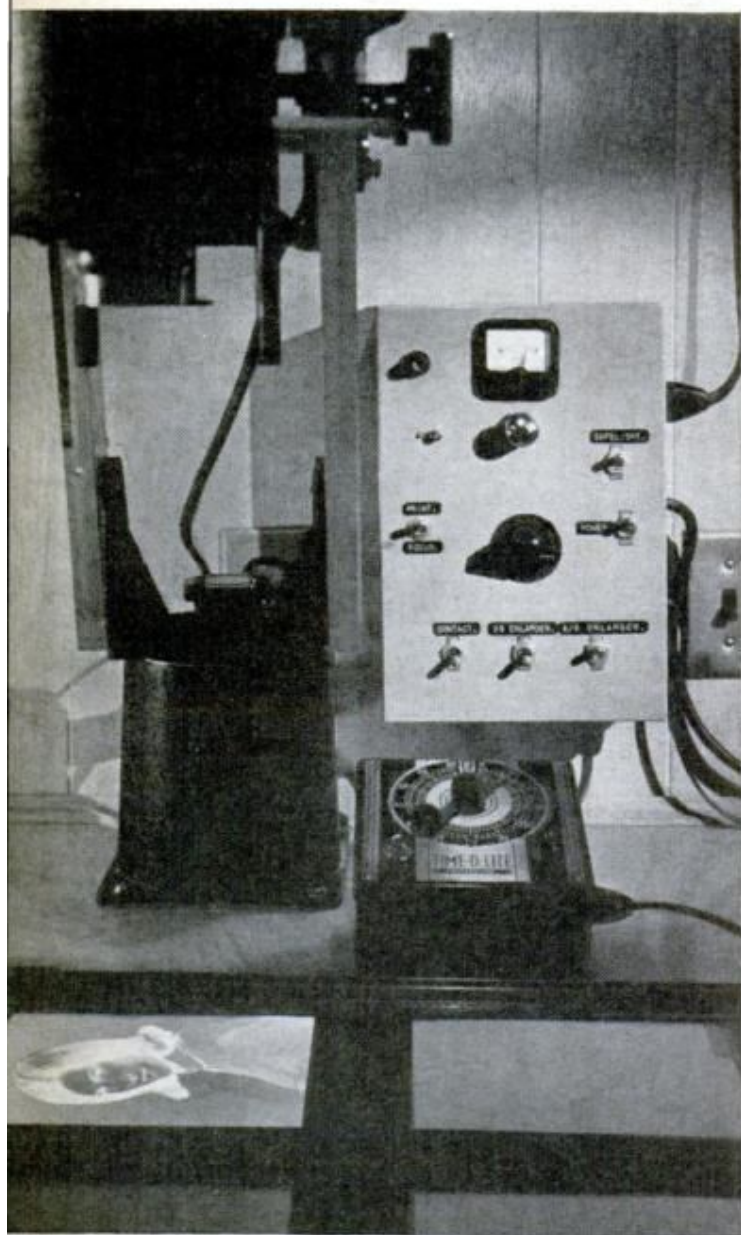
**VALVE SEALS** are removed and discarded. When installing new seals, reinstalling springs and keepers, reassembling rocker arm assembly and replacing rocker cover, make sure parts are immaculately clean



# Dial Your Light For Good Enlargements

This easy-to-make power regulator will keep sudden dips and surges in line voltage from spoiling your blowups. It will also let you print "unprintable" thin or dense negatives

By ROBERT E. LEWIS



**A HANDY CONTROL CENTER**, the power regulator puts switches and outlets for all equipment within easy reach right next to your enlarger. By watching the voltmeter, you can detect drops and surges in line voltage before they wreck your exposures. A variable transformer keeps voltage at proper level

**E**VER WONDER WHY two photographic prints made one right after another on the same enlarger don't come out the same? One is too light and the other is too dark, yet you know that both were made at identical exposures. The catch is, they *weren't*.

Variations in line voltage can play havoc with your enlarger's light output. It's not unusual for house current to drop to 90 volts or soar to 120 within a few minutes. If you happen to be making enlargements during one of those fluctuations, you're in for trouble.

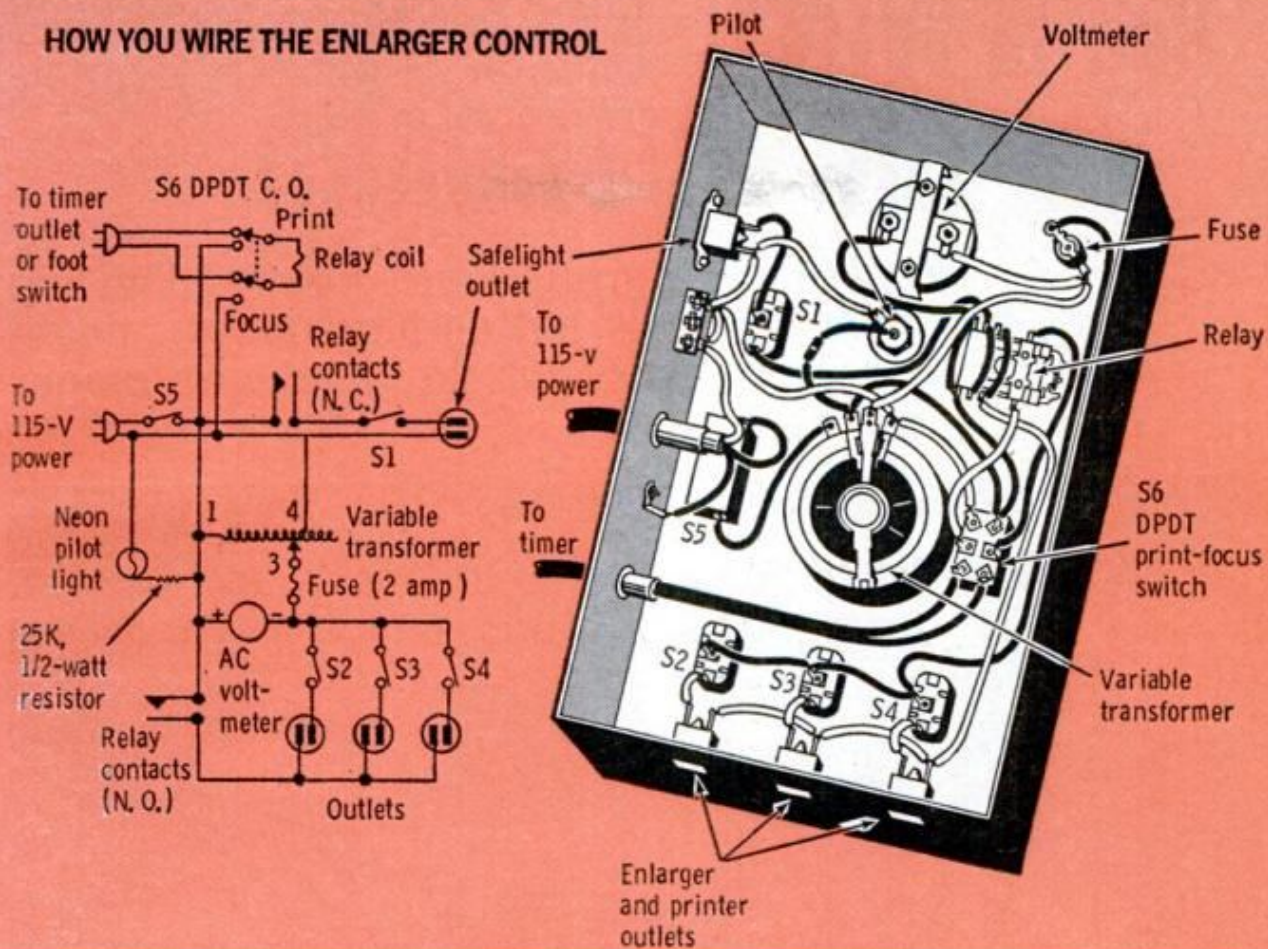
Tests conducted with an enlarging exposure meter show that a print made at 90 volts will require *twice* as much exposure time as one made at 110 volts. In other words, a drop of 20 volts cuts the enlarger's intensity *in half*. A rise of 10 volts from 110 to 120 will cause a 20-percent increase in intensity.

At this rate, it's obvious that variations of only a few volts will throw your exposure off enough to spoil a string of supposedly identical enlargements. If you're thinking about making your own color prints, you're in for even more grief. Variations in enlarger intensity affect the color temperature of its light. This, in turn, changes the color balance you get in the print. A print properly balanced at 110 volts will be lacking in yellow at 100 volts and be excessively magenta at 120 volts.

The answer is a control that will keep enlarger voltage constant while you're making prints. Various commercial devices are available, but are expensive. You can build the control shown here for \$25 to \$35 depending on how many scrap parts you already have on hand. It's de-



## HOW YOU WIRE THE ENLARGER CONTROL



signed around a variable transformer that costs about \$10. This type of transformer is known by such trade names as Variac, Autoformer and Powerstat. By simply turning a knob, you can raise the voltage if you see it start to sag or cut it back if it goes too high.

Combined with the transformer is 0-150-volt a.c. voltmeter that shows what's happening to the line current. By watching its needle, you can set the voltage at the proper level just before you press the

timer button to make a print. When you're ready to make the next print, you check the meter again and, if necessary, readjust the voltage to the same level. Result: a perfect print every time.

For a simplified voltage control, this is all you need—the transformer and meter. The circuit shown here, however, incorporates some extra features for convenience. Everything is at your fingertips in one compact 8x12x3-in. aluminum chassis box. There are switched outlets for a safe-light, two enlargers and a contact printer. A double-pole, double-throw toggle switch (S6) lets you draw power either directly from a wall outlet or through your timer. This switch is wired to a double-pole, double-throw relay, as shown in the diagrams.

With the switch in the "Focus" position, your enlarger is turned on for focusing and stopping down. Then you flip the switch to "Print." The enlarger goes off, but the safelight comes on so you can see to insert paper in the easel. When you press the timer button, the relay opens the contacts to the safelight and closes the

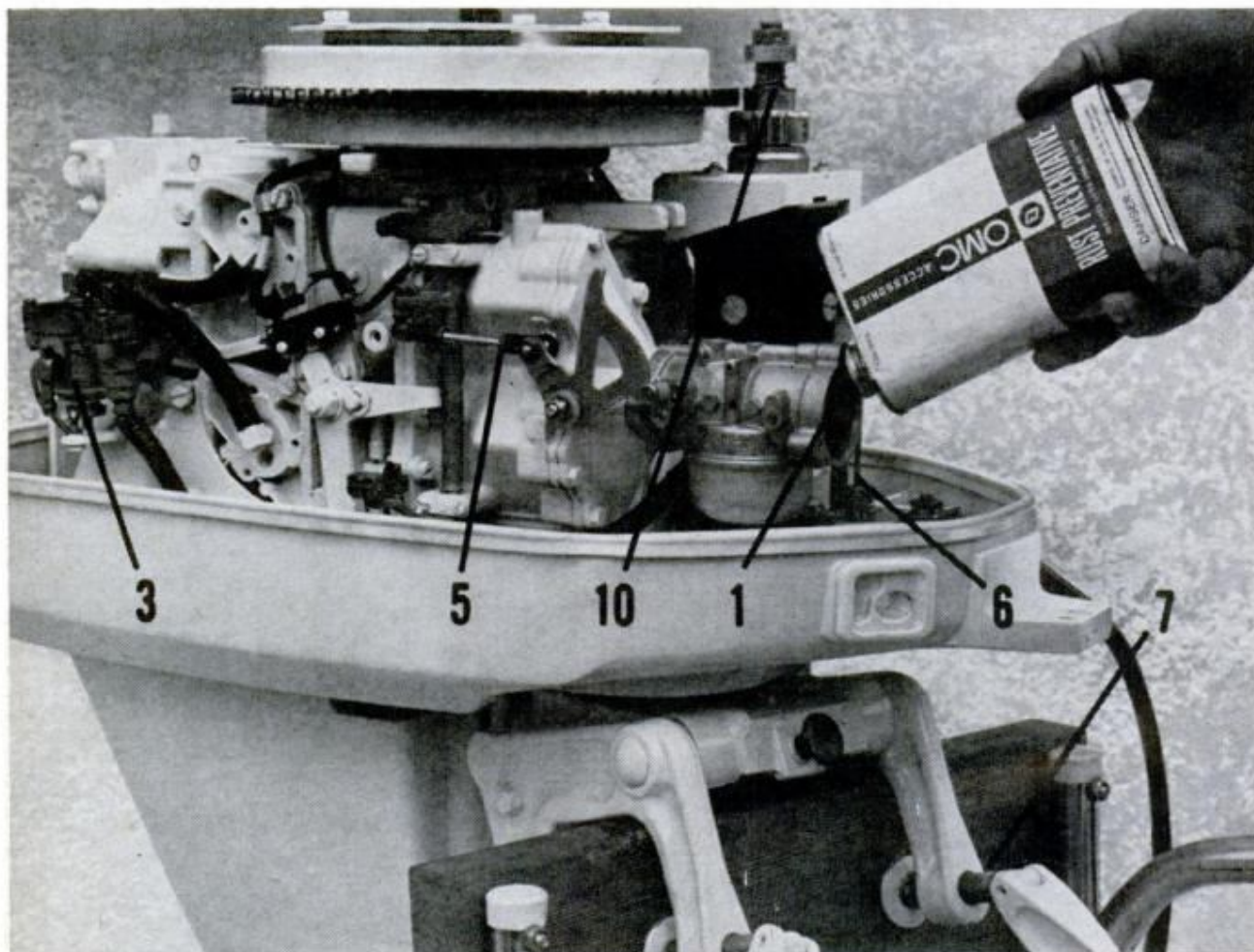
*(Please turn to page 224)*



# How to WINTERIZE A BIG OUTBOARD

Preparing a large outboard motor, 40 hp and up, for winter is not as hard as you might think. Here's how you do it and save money

By HENRY B. NOTROM



**INJECT CLEANER** in engine during storage procedure. (Text refers to numbers above and in photo at right)

**M**ANY OWNERS of outboard motors in the 40-hp and larger class pay from \$25 to \$50 at the end of every boating season to let someone else winterize and store their engines. The size literally scares them from doing it themselves.

However, a large motor is just as simple to service as a smaller engine. And the only problem, size, is easily taken care of by buying an outboard stand.

A stand capable of handling any size motor sells for only \$12. A more deluxe version with wheels is \$24. The stand ac-

tually serves two purposes: It holds the motor while you perform winterization services, and it's a great storage rack.

Some boatmen keep their large engines stored in the back yard on their boats during the winter. This is not a good idea, although you may cover the motor with a tarpaulin. Despite a cover that's loosely draped over the motor to let air circulate, condensation may form because of variations in day-to-day temperature. This condensation gives rust a chance to start.

Furthermore, if you live near saltwater,



you never want to store an outboard motor outside for a long period. Salt in the air can enter exhaust openings and penetrate into cylinders. The result can be a frozen cylinder when you attempt to start the engine in the spring.

So, pick a corner of your basement or heated garage. Set up the stand and put your motor on it without a cover. The warmth will prevent condensation.

The first step in winterizing your outboard is to flush the cooling system with fresh water. This is really a must if you've been operating in saltwater or in a silt-filled river. When towing your boat home, stop off at a clear, freshwater lake to winterize the motor. If this isn't possible, get a 55-gallon drum and fill it with water. If your boat is in a clear lake, you can work on the engine before hauling. Once it's flushed, the next step is to warm up the motor and remove the cowl. Inject outboard marine engine cleaner, such as OMC's Marine Cleaner, into the carburetor air intake (1). Run the motor at fast idle for about 10 minutes to dissolve carbon, gum and varnish formations inside the motor. The motor will smoke like heck, but don't mind that—it's normal.

Now, shut off the ignition and disconnect the fuel line, or turn off the fuel-shutoff valve. Inject several squirts of Quicksilver Storage Seal or OMC Rust Preventive into the carburetor air intake (photo, page 126). This lubricant protects cylinders and internal engine parts from rust and corrosion during winter layoff.

Start the engine again and let it run until it uses up whatever fuel is left in the carburetor. As the motor takes its last few gasps, give it a final good dose of storage seal or rust preventive through the carburetor air intake.

Pull motor and boat from the water and tow them home, keeping the motor as straight as possible to let water drain from the lower housing. When you get home, take motor off the boat and mount it on the stand.

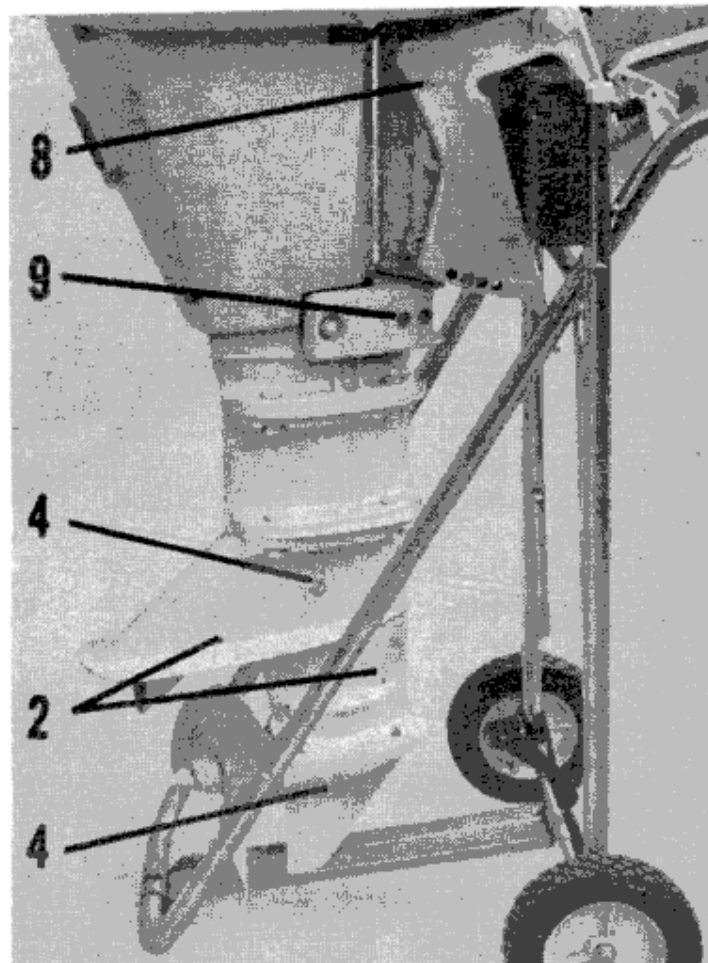
Use a wire to ream out the water drain holes in the lower unit (2). If your motor has a flush plug, remove it to let more water drain. Give the manual starter several good pulls to assure that any water trapped in the cooling system drains.

Remove sparkplugs. Using the manual starter, rotate crankshaft until No. 1 piston is at bottom dead center. Determine

position by inserting the eraser end of a pencil or a clean dowel into the plug hole.

Inject about two ounces of storage seal or rust preventive into the sparkplug hole. Let it permeate the crankcase for about two minutes. Do the same operation for the other cylinder. Clean fuel filters (3).

Remove the air vent screw and grease filler plug from the lower unit, and let old lubricant drain (4). Insert fresh gearcase lube into the filler plug hole. Squeeze it in until grease oozes out the air-vent screw hole. Use the lubricant recommended by the manufacturer of your motor.

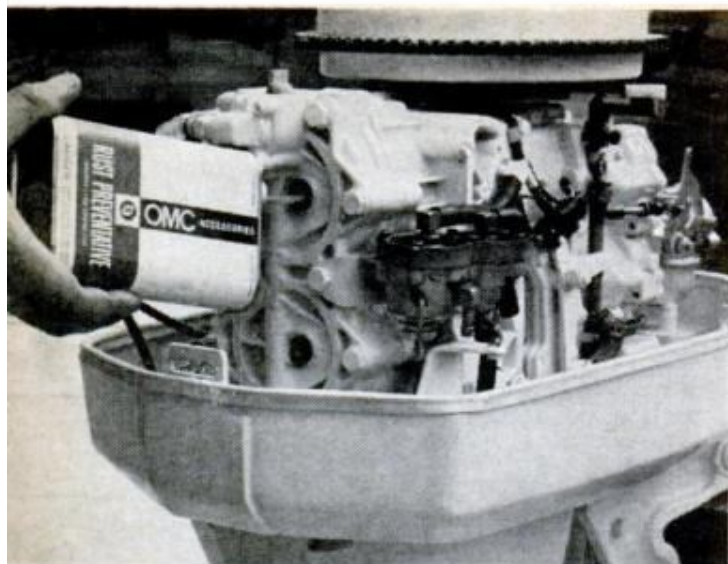


**LOWER UNIT** needs some attention for winter storing

Again using the lubricants advised by the manufacturer, grease all parts that require it. You will need the lubrication chart in your owner's manual to do this, but generally these parts include choke and carburetor linkage (5), throttle linkage and shaft (6), clamp screws (7), tilt adjust rack and pinion (8), swivel bracket (9) and starter pinion gear shaft (10).

Take off the propeller and clean the shaft with steel wool. Spread a layer of graphite silicone grease or an anticorrosive grease on the shaft and replace the





**A RUST PREVENTATIVE** should be squirted into each cylinder. The piston should be at bottom center

prop, using a new drive pin and cotter pin.

To protect the outside of the powerhead, spray all parts with corrosive preventive. This is available in a spray can.

Your motor is now ready to store. Keep it on the stand in an upright position. Don't cover it, but it's a good idea to wipe dust from the outside every two weeks.

Your remote fuel tank needs care, too. Pour old fuel from it. Add some lightweight motor oil and slosh it around the tank to put a protective coating on the inside. Pour off oil, and store the tank near the engine. Keep the cap off.

As for the battery, wire-brush corro-



**YOU CAN GET** a big-engine hauler for a reasonable amount. This lets you store your large outboard in a convenient spot such as the basement or heated garage. Such haulers come with or without wheels. Price: from \$12 to \$24

sion from posts. Check electrolyte level and add distilled water if needed. Apply a layer of petroleum jelly to posts and put the battery into a cardboard carton. Store the battery near the engine. However, it's advisable to have the battery charged every month or six weeks during the winter to keep it at peak charge. ★★

## OUTBOARD CLINIC

**Q.** Could you give me a handy checklist for winterizing my inboard/outboard?—C.F., Conn.

**A.** Sure. Here's a step-by-step rundown: Drain the crankcase, replace the filter and refill with fresh oil.

Warm up the engine, remove the flame arrester and restart the engine. Pour a cup of storage seal or motor oil into the carburetor, then allow the fuel system to run itself dry. (Make sure that the fuel tank is empty.)

Replace or clean fuel filter.

Drain cooling system.

Loosen alternator and water pump drive belt.

Lubricate starter, alternator (generator), control linkage, distributor cam surface and breaker level pivot.

Insert an ounce of storage seal into each cylinder.

Drain lower unit. Refill upper gear chamber and lower gear housing with recommended lubricant.

Lubricate steering parts gimbal housing upper and lower pivot pins, tilt pin.

Grease propeller shaft.

Clean and store battery.

**Q.** The "body" of my outboard looks awful—chipped paint and scratches all over. What should I do?—H.P., Vt.

**A.** How about some touch-up? Sand the surface with a No. 320 grit paper. You don't have to sand it to the bare metal, but just enough to break the glaze of the paint. If you're doing a complete repainting or you are down to bare metal, first apply a zinc chromate primer. If not, forget it. Mask off chrome, decals and fittings. Get some spray cans of paint from your dealer.

Hold a can six to eight inches away from the area and apply a *light* coat of paint, moving the can from side to side. You'll know it's too heavy if the paint begins to run or sag. Let the paint dry, and then decide if you need another coat. Keep a rag handy when spraying, just in case you miss your mark.

**GOT A PROBLEM** with your outboard engine? Send your questions to Outboard Clinic, *Popular Mechanics*, 575 Lexington Ave., New York, N.Y. 10022. Letters cannot be answered individually, but problems of general interest will be published in the column.



# How to Make Snowshoe Bindings From an Inner Tube

**SNOWSHOES** are becoming more and more popular with the increased use of snowmobiles. For weekend snowmobile trips into the wilds, it's a must to take along at least one pair of snowshoes. They're virtually indispensable if you have to walk out of the woods.

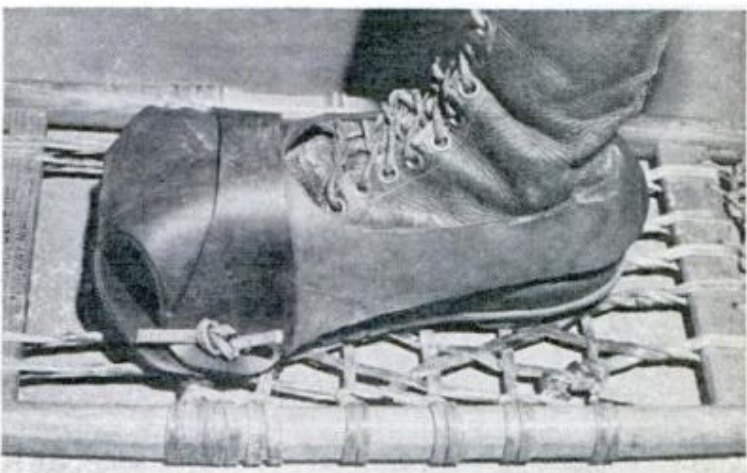
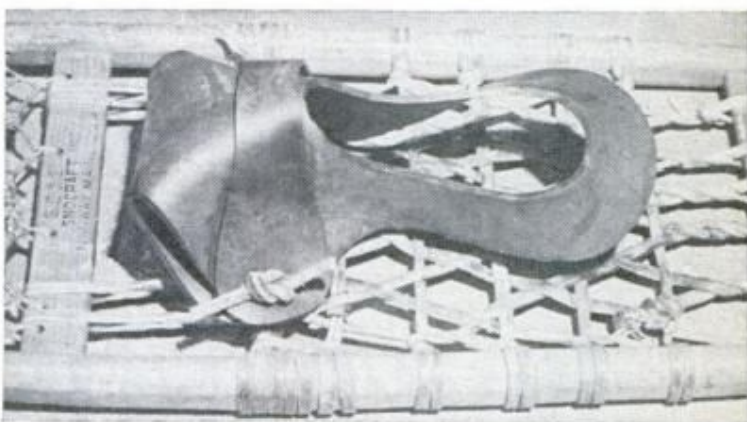
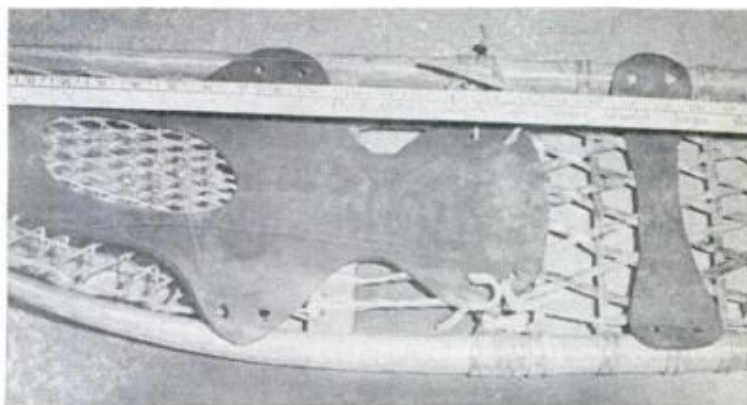
You can make your own snowshoe bindings without cost from a discarded truck-tire inner tube. The bindings shown here are for a size-nine boot. Adjust the pattern to fit your own shoe. Note shape of tie-down strap at right.

**ONCE YOU'VE CUT** the two necessary pieces from an inner tube, lace two rawhide thongs through the snowshoe and holes in the sole of the binding as seen in photo above. Then fold the toe piece back. Place the toe straps in position. Thread rawhide through holes in the toe strap. Secure with a good square knot.

**YOUR BOOT** slips into the binding as shown in photo at right. Pull back on heel strap to secure the boot. Flex the boot to make sure you can walk properly with your new bindings. The toe should fit easily into the open slot in your snowshoe.

**INNER-TUBE TENSION** will keep the snowshoe binding tight to the boot. Reinforcing the toe strap adds considerable strength to the binding. Notice the closed toe at the front of the binding. This prevents snow and ice from getting packed under the ball of your foot when you're traveling in deep snow.

When making new bindings, it's a good idea to make an additional pair in case you need them out in the field. It's a good idea, too, to make up an emergency pair even if the bindings now on your snowshoes are in decent shape.—*Frank R. Martin*







# BUILD THIS SLEIGH FOR YOUR SNOWMOBILE

**A five-man seat down the middle lets passengers sit saddle fashion to center weight over runners**

By **HANK CLARK**

*Technical Art by Fred Wolff*

**T**HE THRILLS OF SNOWMOBILING don't have to be limited to one lucky rider. With this sleek little five-passenger sleigh hooked on behind your mount, you can take the whole family on exciting rides through the countryside, charging up and down snowy slopes like a roller coaster.

A unique seating arrangement makes the sleigh safe and stable. A padded bench runs lengthwise down the middle so riders straddle it like a saddle and hook their feet securely underneath. This automatically keeps the weight in the center of the sleigh no matter how many passengers you have and makes it easier for young-

sters to hold on tight going over bumps.

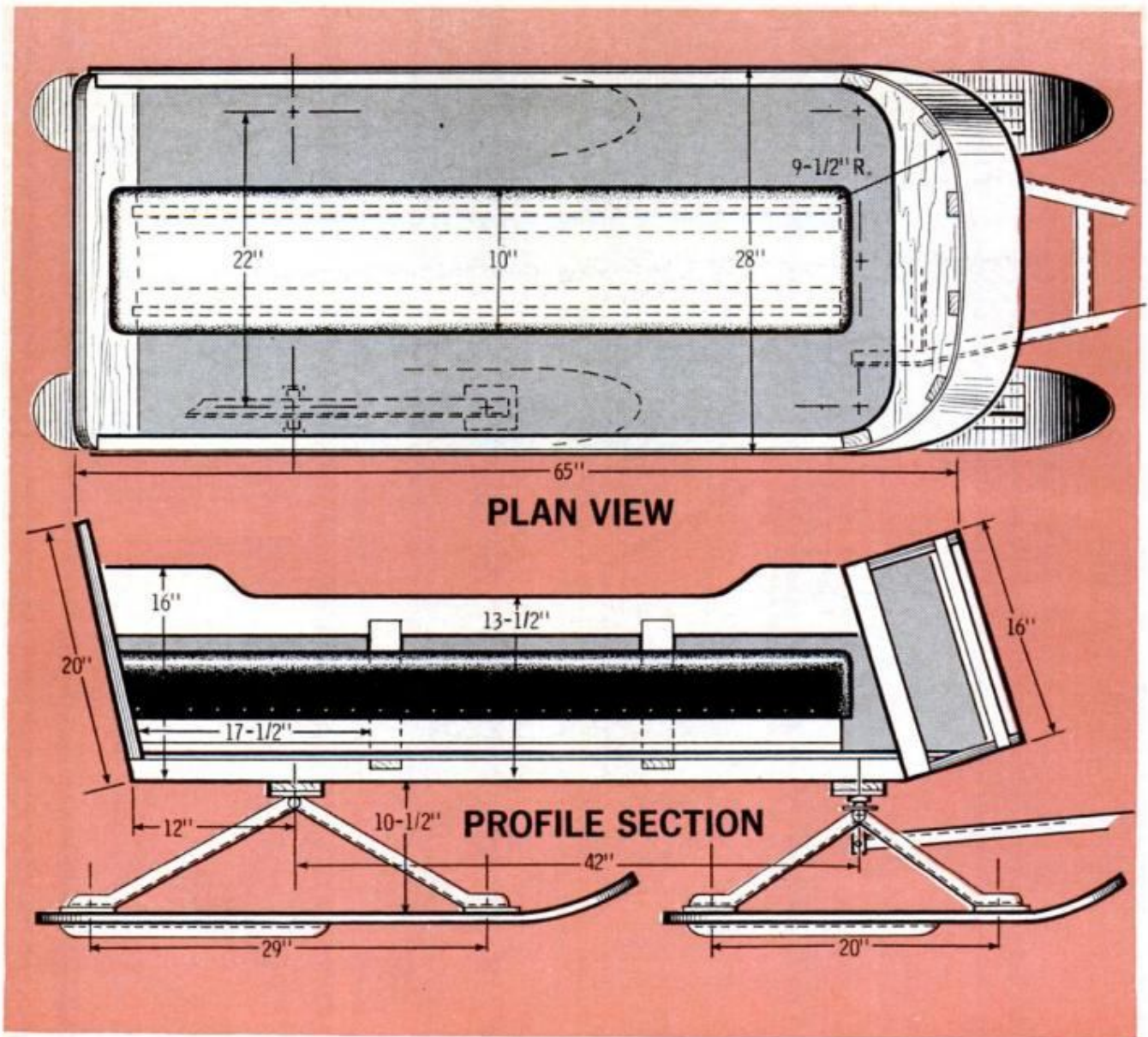
The runners are simple to make because they're actually old water skis cut down, 29 inches long in front and 46 inches long in back. If you don't happen to have any old skis handy, you can buy new short children's skis fairly inexpensively. If you prefer, you can also laminate your own skis from 1/4-in. plywood, clamping the tips against a block to provide the up-curved shape while the glue sets (see *Kick Up a Spray This Weekend*, July '66 PM, page 136).

The runners are arranged so they pivot independently, allowing them to follow dips and rises smoothly. Short lengths of









steel or aluminum channel are screwed to the undersides of the skis to give them a grip in the snow and keep them from sliding sideways. The runners are held to the sleigh body with angle-iron struts. These are bent and welded to axle bushings as shown in the drawing.

The front axle turns on a simple but rugged pivot made by threading a pipe nipple into a pipe coupling. This gives the runners a smooth steering action so they track neatly behind the power sled. The tongue is made of angle iron and is free to pivot up and down as well as sideways. The upward slant at the front of the body gives the sleigh a racy appearance and also insures plenty of clearance for the tongue to swing upward when the rig noses into a gully.

A wrap-around skin of  $\frac{1}{8}$ -in. hardboard covers the sleigh body on the front and sides. The floor consists of 2x2s also covered with hardboard, making a sturdy but

lightweight platform. Tempered hardboard is strongest and best for the flat areas, but the untempered type is easier to bend and may be handier to use for the curved cowl in front.

The back and upward-slanted floorboard at the front are  $\frac{3}{4}$ -in. plywood for rigidity. Strips of plywood are also used to stiffen the upper edges along the sides and to form the curved coaming at the front. Cross strips of 1x3 stock are notched into the floor rails and the plywood panels to form a sturdy frame for the hardboard skin.

The saddle seat is cushioned with foam rubber and covered with vinyl or leather upholstery material. It rests on 1x3 rails to raise it slightly off the floor. Pegs set in the rails hold the seat in place but allow it to be lifted out easily whenever you want. For safaris into the winter wilderness, picnic snacks, tools and other gear can be stowed conveniently under the seat. ★★★

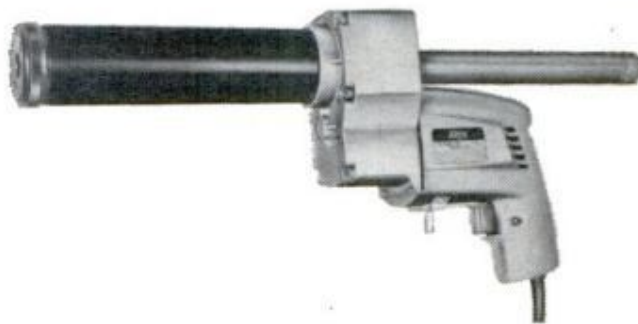


# New Tools You Should Know About

**SELF-CONTAINED WATER PUMP** from Stihl American pumps up to 4300 gallons per hour at pressures up to 70 p.s.i., making it ideal for emergency fire protection or draining pools, basements and ponds. Power for the \$190 pump is provided by the Stihl 040 2-cycle, 3.7-cu. in. engine. Total lift is 25 ft. at sea level, while the total head ranges up to 160 ft. Both inlet and outlet fittings are 1½ in. in diameter. Handy replacement kit includes three basic parts (impeller, wear plate and volute) that might in time fail. Stihl American Inc., 194 Greenwood Ave., Midland Park, N.J. 07432.



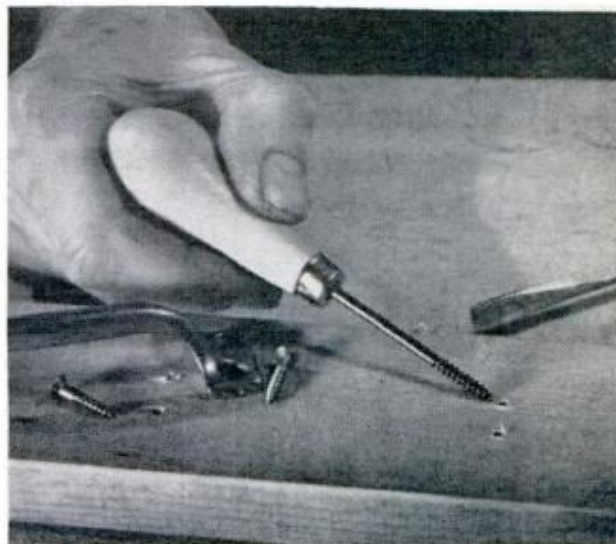
**ELECTRIC CAULKING GUN** has trigger speed control that allows operator to vary feed rate, then cut off bead by using reversing lever. Pistonlike ram develops pressure up to 800 lbs. to dispense heavy sealants and caulking without heating. The portable unit incorporates a 3-amp., 115-v.a.c. motor and weighs 7¼ lbs. without cartridge. An automatic clutch prevents ram from overloading motor at end of stroke. Price is \$69.95. Skil Corp., 5033 N. Elston Ave., Chicago, Ill.



**DISTORTION-FREE VISE** designed for precision production work assures full clamping pressure without introducing stresses in vise body or workpiece. According to the manufacturer, vise jaws on a high quality, heavy-duty, machine-tool vise can be distorted by as much as .015 in. by just normal tightening of the vise jaws. The new Micro-Vise, on the other hand, incorporates a stress bar that absorbs and nullifies these stresses. Made in two models, the Micro-Vise, without the swivel base, costs \$220 or \$286. The first has a maximum opening of 4½ in., while the second has a maximum opening of 5⅝ in. Respective weights are 56 and 92 lbs. Universal Vise and Tool Co., Parma, Mich.

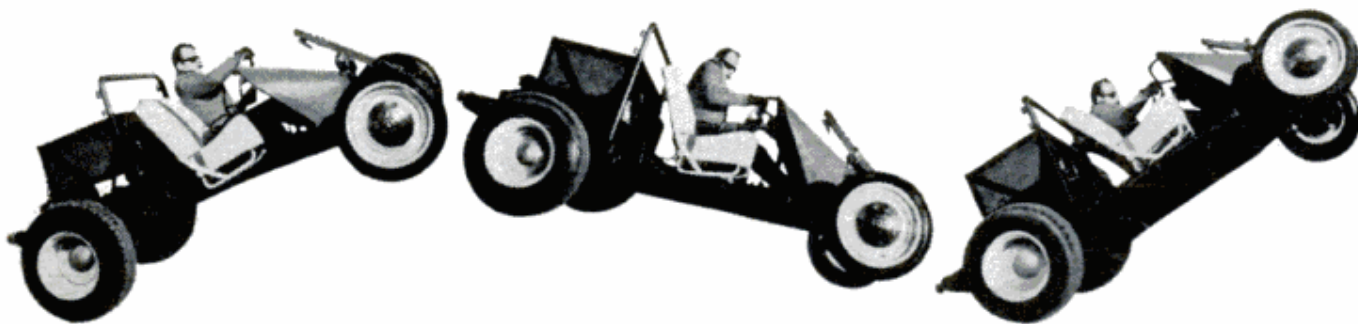


**GIMLET SCREW STARTER** looks more like an awl at first glance, but has a threaded point that threads holes for easy installation of wood screws. The point is simply forced into the wood with a clockwise motion, then is unscrewed. Use of a lubricant such as beeswax, paraffin or linseed oil makes the gimlet turn easier and also reduces wear on its threaded tip. The tool is made of high-carbon steel and is hardened and tempered during manufacture. Price of the tool is 29 cents. The new gimlet screw starter can be obtained through retail stores and outlets, or direct from the United Wire Goods Manufacturing Co., 230 Fifth Ave., New York, N.Y.





# For really rough and rugged travel, Build a Brush Buggy



The trailblazing little brother of the well-known dune buggy will take hills, streams and culverts in stride—yet it's easy to make from standard VW components

By DAVE BENNETT AND GLEN HOSTETTLER

Color Photos by Joe Munroe

**H** EARD ABOUT THE NEW RECIPE FOR FUN? It goes like this: Take one sedate German sedan (Volkswagen); add an eager hobbyist with cutting torch and arc welder; blend in Yankee ingenuity, and before too long, you have a brush buggy—82 inches of four-wheel excitement.

Although related to the much-modified and often exotic dune buggy, the brush buggy is powered by a stock Volkswagen engine—and is constructed almost entirely from standard VW components. Much to the surprise of conventional four-wheel-drive vehicle owners, a brush buggy will, in many cases, outperform conventional machines designed for rough-country use.

The secret of the startling performance of a brush buggy is its light weight—most of which is located over the rear axle. Coupled with the lack of a normal transmission and drive train that hangs down to snag rocks, and their short but wide stature, brush buggies become capable of climbing hills, creeping over rocks and fording streams which would leave four-wheel-drive jockeys stranded—or at least winching themselves out.

Pricewise, brush buggies are well within the reach of most outdoorsmen. With an arc welder and acetylene torch at your disposal, you can build a buggy for less than \$400. This estimate depends, of course, on the initial price paid for a Volkswagen. If the work is to be done at a machine shop, add another \$250 to your original investment for the VW.

**Building preparations:** All electrical wiring between the body and engine must be tagged and disconnected. Then undo the gas lines and remove the body-to-frame bolts. Gearshift, clutch, brake pedal and accelerator assemblies are disconnected next, followed by the steering column (unbolt it at the steering box knuckle). The body can now be lifted off with a chain hoist.

With the body clear of the frame (a full-length belly pan serves as the frame for a VW), the engine should be removed—this will make the later

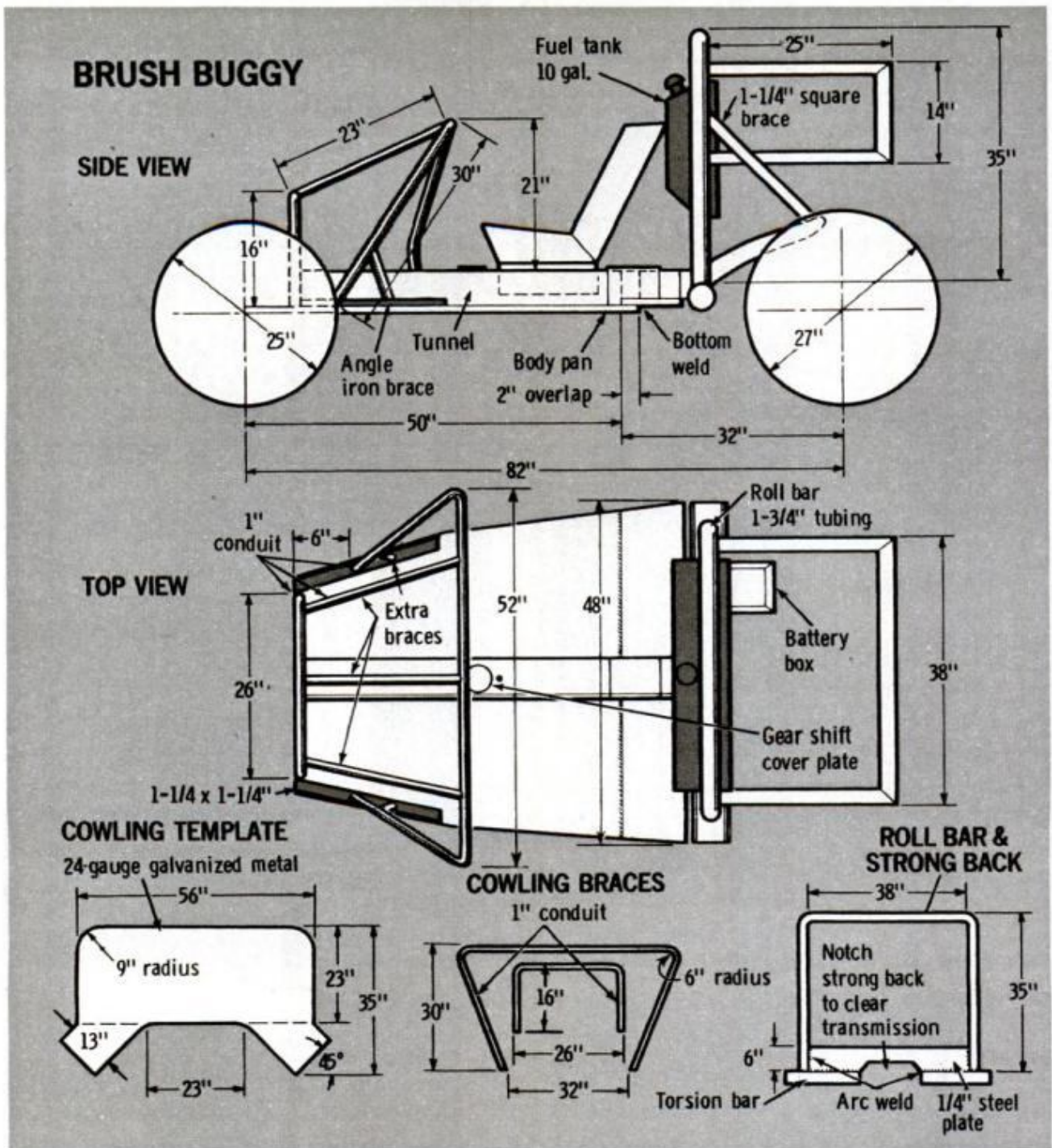




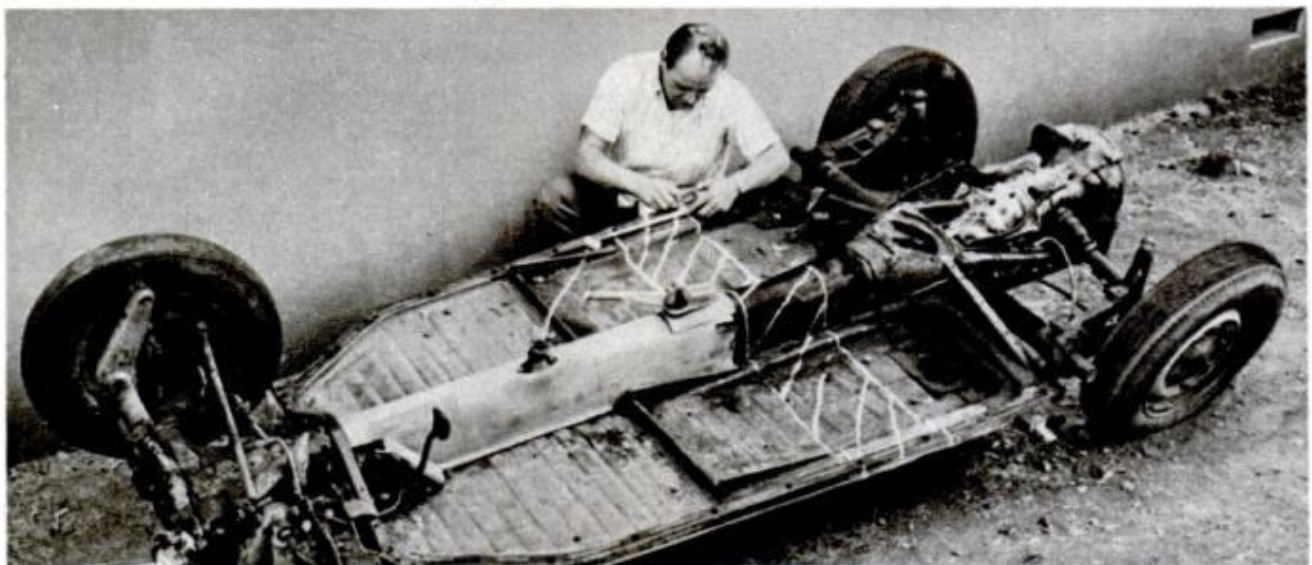
**NOT MUCH NEED TO WORRY** about becoming stranded in the bush when you've got a gung-ho brush buggy beneath you. As can be seen in these photos, the spunky little vehicle proves to be at home in the water, on rocky ground, and even (gulp!) in the air. Needless to say, strong seat belts and the sturdy roll bar are basic necessities for wild maneuvers that, while thrilling, are not for novice drivers







**SECTION TO BE REMOVED** is 10 in. long, measured from front of torsion tubes to forward end of vehicle



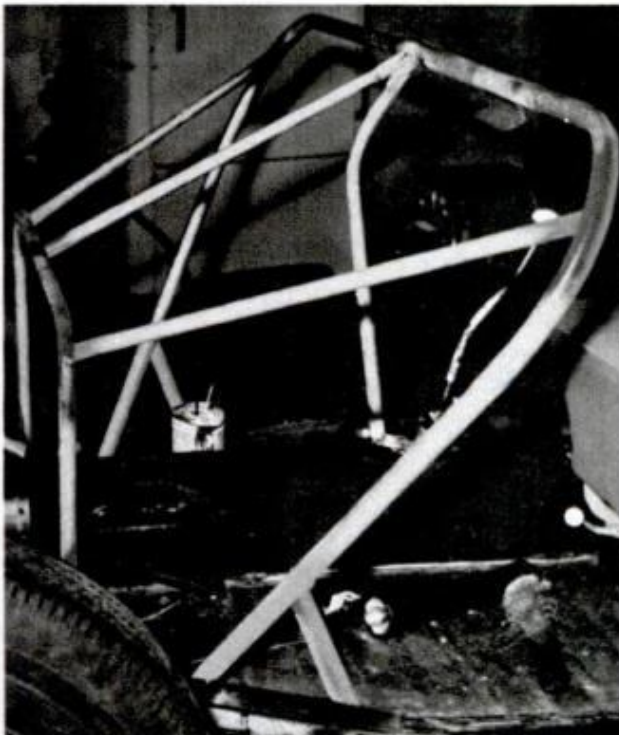




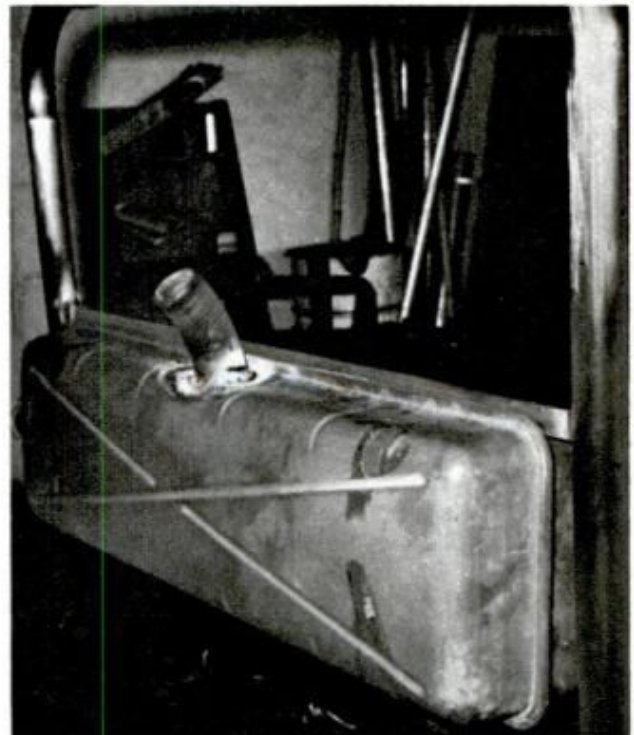
**WHEN MAKING CUTS** to remove 10-in. section, be careful that control cables in tunnel aren't damaged



**INSTALLING ROLL BAR** is two-man job. When level, the bar must be securely welded to the torsion tubes



**COWLING BRACES** are lengths of electrical conduit bent as detailed in drawings. Then template is fitted



**FUEL TANK** from VW truck or bus fits snugly between legs of roll bar. Filler spout is moved to center



**NO LONGER A SEDATE SEDAN**, brush buggy with short wheelbase is ready to take to hills and trails

operations of cutting and aligning the frame much easier.

**Sectioning:** Before removing the 10-in. section from the belly pan or frame, mark the rear cut where the transmission tube first begins to narrow at the forward side of the torsion tubes. Then mark off the next 10 in. Before beginning the cuts, however, the shift control rod (running from the gear shift lever through the tunnel to the transmission) must be unbolted

*(Please turn to page 226)*



SHOP PROJECT

# BUILD THIS 2-Way





# Season's Greeter

It's a motorized candle display that revolves to wish all the very best

**S**PREADING THE HOLIDAY SPIRIT at your home this year will begin with the first turn of this two-sided outdoor candle display.

Friends and neighbors will watch enthralled as the nine candles turn simultaneously to first spell out Merry Christmas, then continue revolving to wish all a Happy New Year. Spotlighted each night, the display becomes a dramatic showpiece and a conversational show-stopper—passersby can't help but wait out the full minute it takes the display to complete a revolution.

The candles and the base of the display are made of exterior plywood,  $\frac{1}{4}$ - and  $\frac{3}{4}$ -in. thick, while hardwood is used for the multi-crank mechanism concealed in the base.

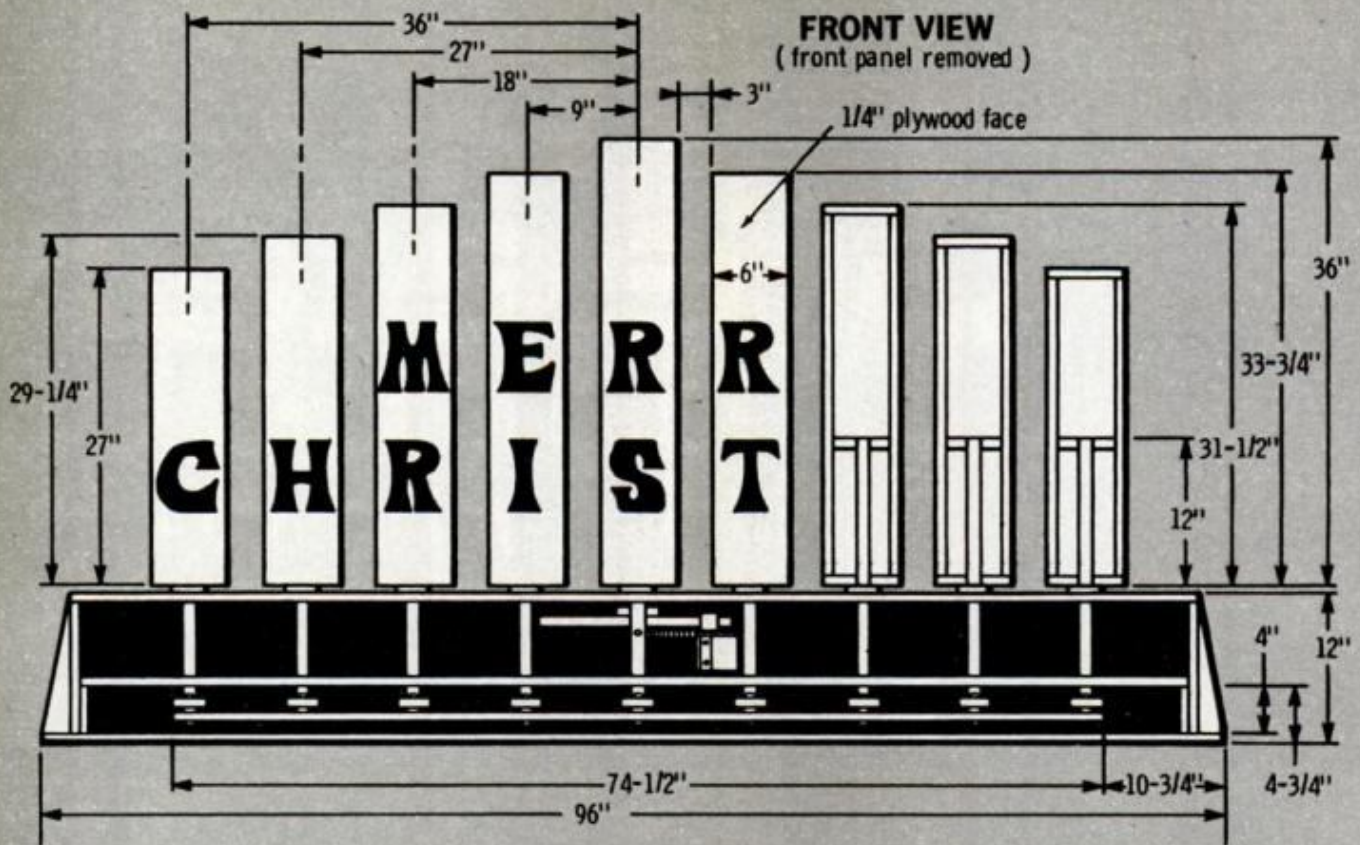
Also concealed in the base is a small, high-torque motor that turns a large plywood disc pinned to the shaft of the center candle. The bottom of



**YOUR FRONT YARD** will become the neighborhood center of attraction as people gather to read one holiday message—and stay watching for the next.





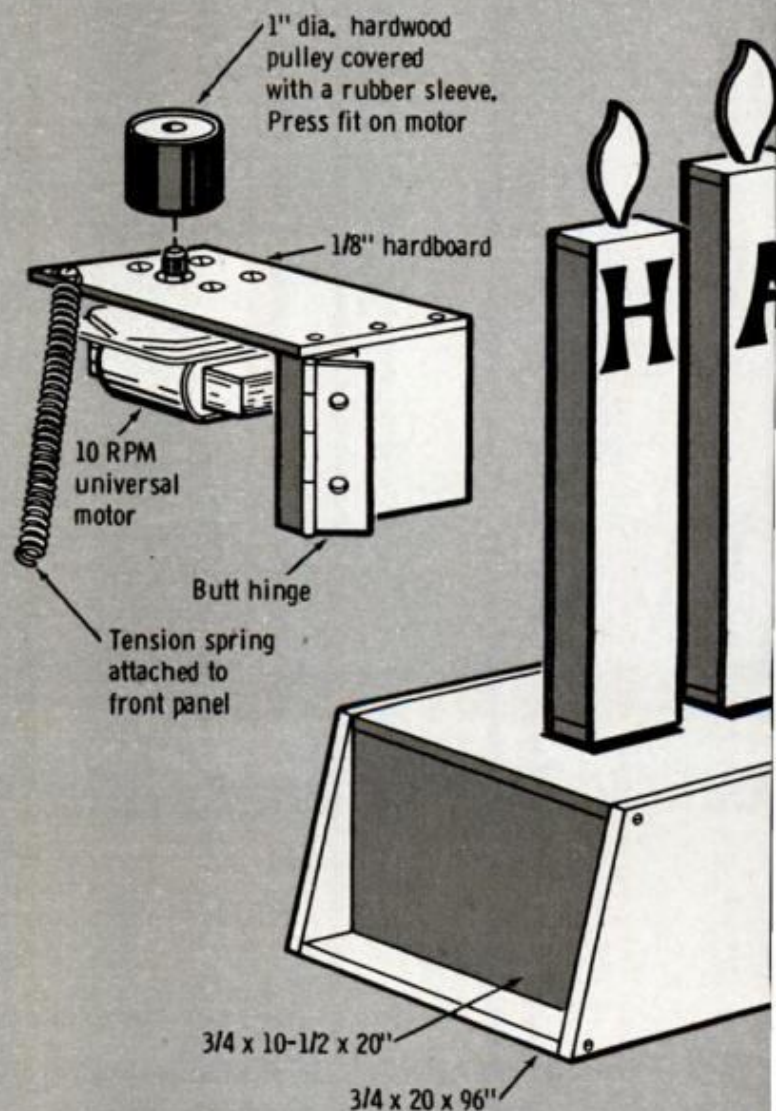


the center shaft is, in turn, pinned to one of the nine  $\frac{3}{4} \times 1\frac{1}{2} \times 8$ -in. hardwood cranks ganged together through the long  $\frac{3}{4} \times 1\frac{1}{2} \times 74\frac{1}{2}$ -in. connecting link. Thus, as the motor turns the disc connected to the center candle, the same amount of movement is transmitted to the other eight candle shafts through the link and multicrank arrangement.

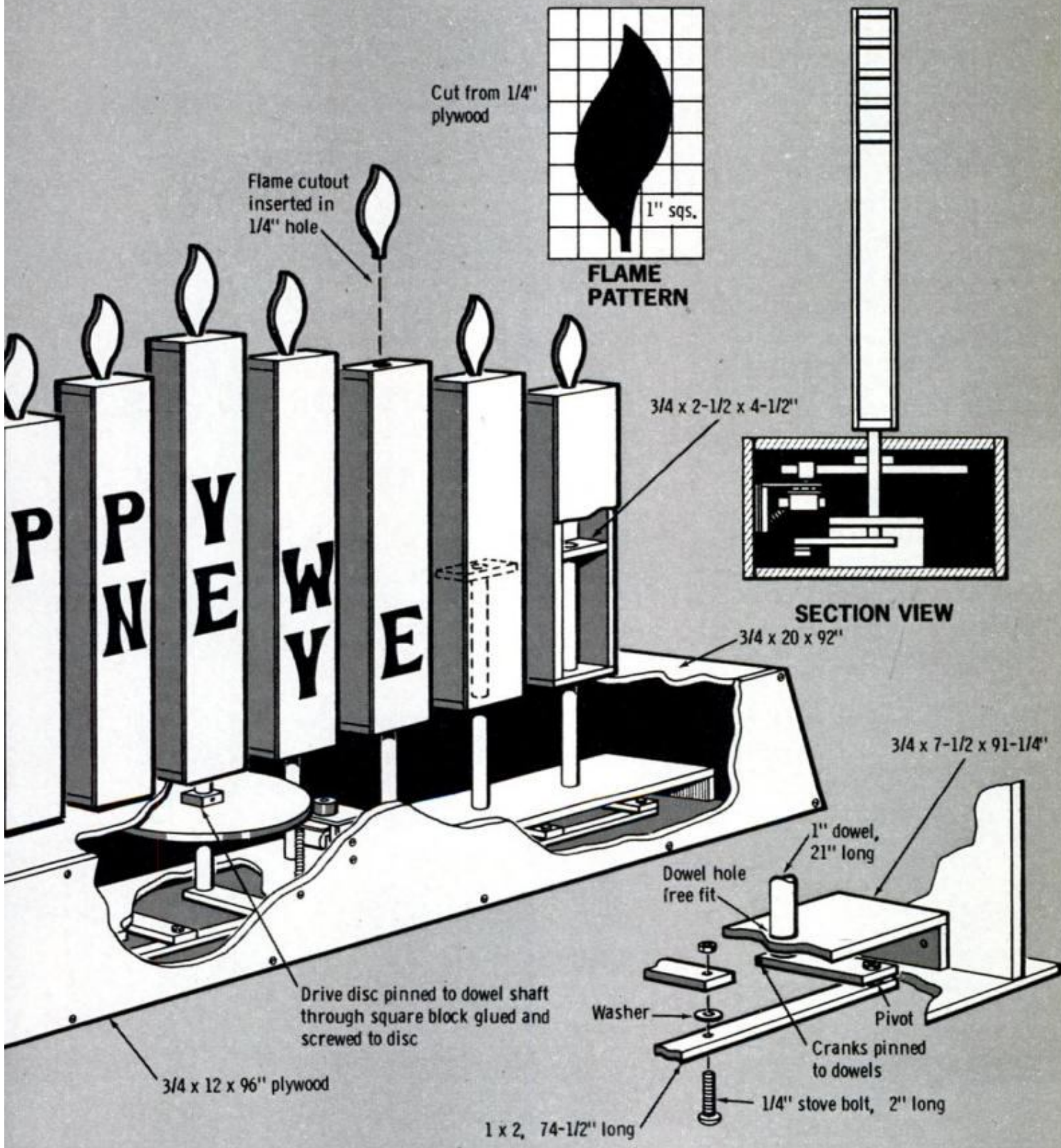
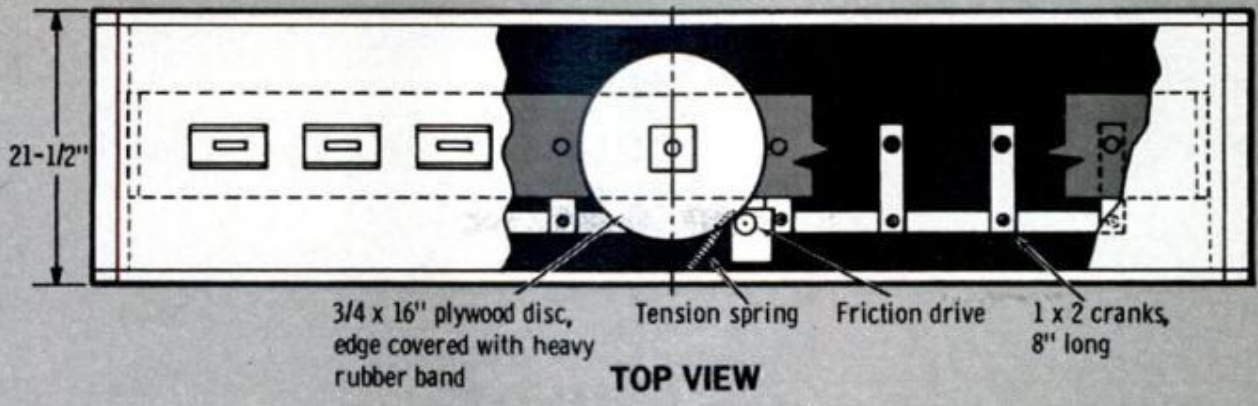
As shown in the detail drawing of the motor mount, the large plywood disc is rimmed with a rubber strip from an old inner tube, and the motor mounting block is hinged and spring-loaded so the shaft of the motor friction-drives the large disc. An alternative drive method is to make a large plywood pulley by sandwiching two larger discs over the center disc so you can belt-drive the display. Of course, a similar pulley must be fabricated or purchased and fitted to the driveshaft of the motor.

To reduce the drag between the candles and the base, a pair of grease-coated metal or plastic washers is inserted between each candle and the base. Similarly, a coating of wheel-bearing grease should be applied to the shaft-retaining holes in the two base layers of plywood.

Letters in many different styles can be purchased in press-on form from art supply outlets, or they can be jigsawed from  $\frac{1}{4}$ -in. plywood. Finally, should you have difficulty locating a 10 or 12-rpm motor, Canal Electric, 310 Canal St., New York, N. Y., has a limited supply of surplus motors priced at \$9.50 each. ★★★













**A built-in sound system,  
a bar, dozens of  
feet of bookshelves,  
cabinets to hold games  
and puzzles . . . you'll  
find them all in this**

# STEREO BOOKCASE WALL

By **HOWARD GREEN**

*Technical Art by Stanley Cohen*

**I** DESIGNED this entertainment wall to solve a number of problems, all of which come under the general heading of "clutter."

Our den was crammed with a hodgepodge of small storage units which we had acquired piecemeal over the years. This mismatched collection of bookcases, cabinets and tables seemed to be crowding us out of the room, yet it still didn't provide adequate storage for hi-fi components, television, books, magazines and the other things that end up in an informal living area used by the whole family.

The solution seemed fairly obvious—a single unit to replace the many small ones. It would have to be large enough to meet



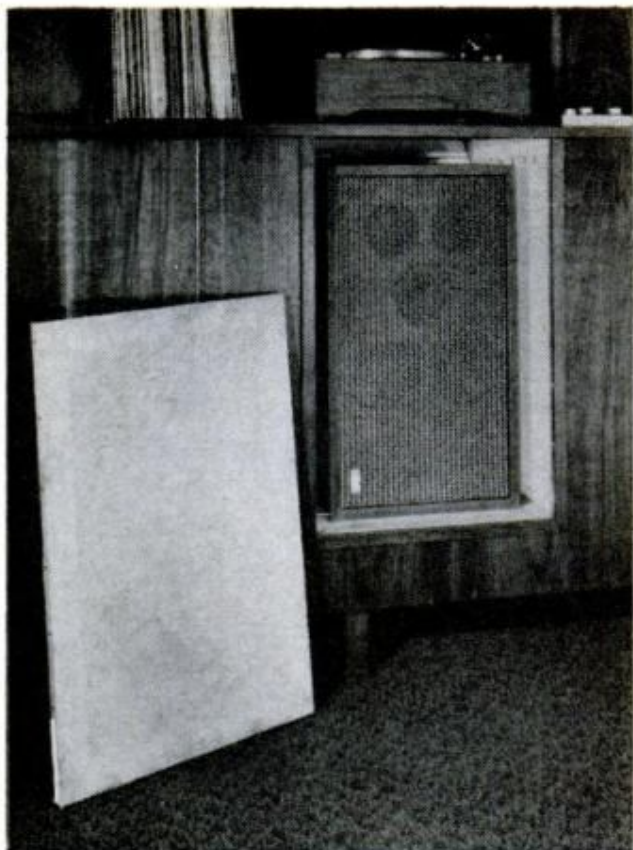
our storage requirements, yet occupy a minimum of precious floor space. And it would have to "blend" with the room.

I decided on a ceiling-height design reaching all the way across one end of the room. While this had the effect of shortening the room slightly, it took full advantage of the space available without leaving any empty corners which would be of little practical use.

The primary material I chose was  $\frac{3}{4}$ -in. walnut-veneer plywood. This was used for all the exposed surfaces, with  $\frac{1}{4}$  x 1-in. walnut strips as molding for the four columns and around the speaker openings.

Regular fir plywood worked fine for all the concealed surfaces— $\frac{3}{4}$ -in. inside the





**SPEAKER COMPARTMENTS** are larger than speakers to permit proper positioning for best stereo sound

cabinet and  $\frac{1}{4}$ -in. behind the shelves. The  $\frac{1}{4}$ -in. plywood was given a coat of walnut stain, though it's almost completely concealed by books. I applied an oil finish to all exposed surfaces, not only because of the way it enhances the walnut grain but also because it is relatively childproof and easily repaired if scratched or otherwise marred.

The TV occupies the center cabinet just below the laminated-plastic bar top. It's a small table model which doesn't take up all of the space in this compartment, so I later installed a low shelf about 6 in. above the bottom. The TV now sets on this shelf, while the space below holds magazines and newspapers.

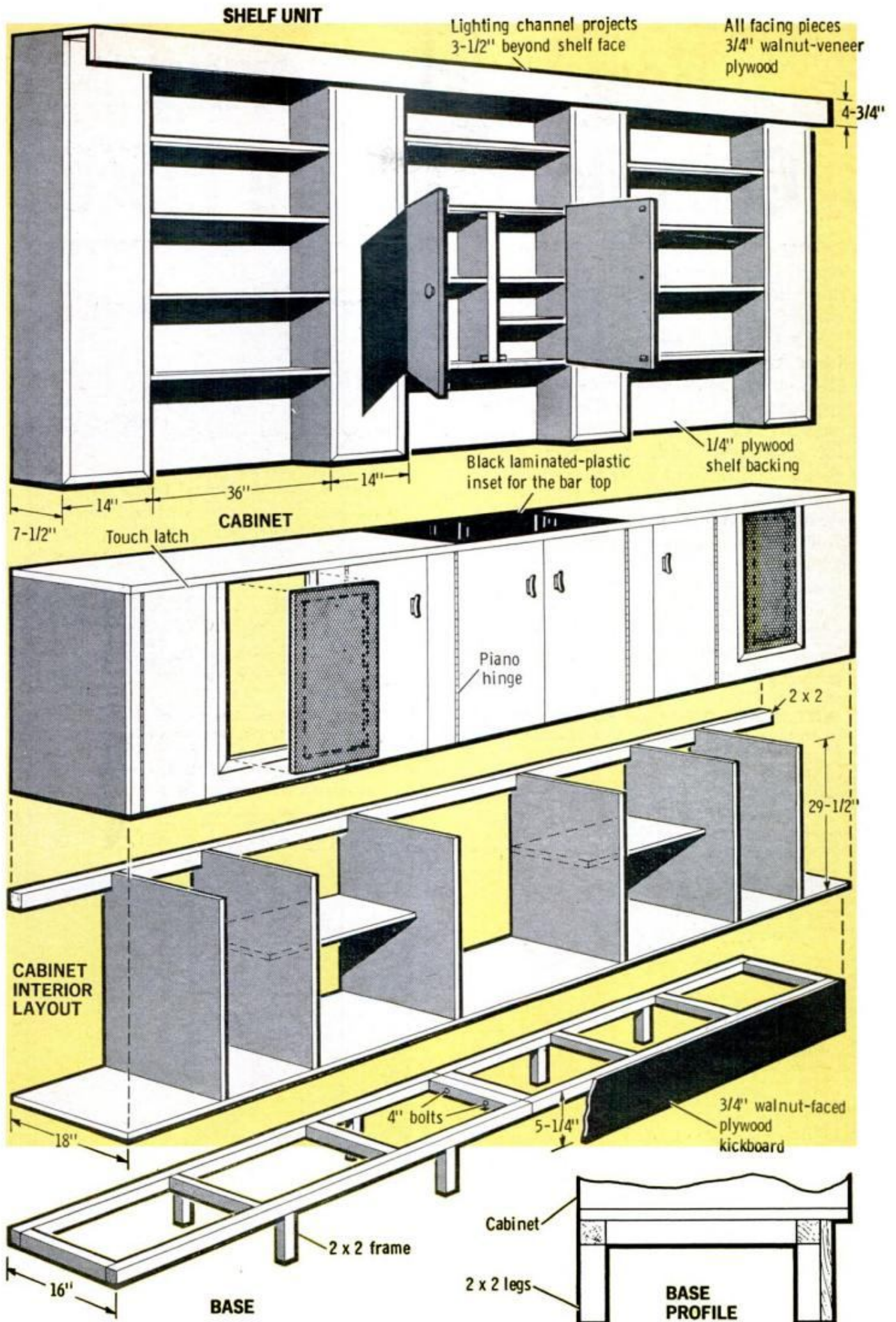
Three 3-ft. fluorescent lights above the three bookshelf sections provide indirect lighting for that whole end of the room. The on-off switch which controls them was mounted under the lip of the cabinet top on the extreme left.

All in all, the unit has been a complete success. Instead of clutter, we now have the rich warmth of a paneled bookcase wall. ★★★

**LIQUOR CABINET** above the laminated plastic inset turns this part of the unit into a compact party bar









# New Vinyl Flooring Goes Down in One Piece

LONG CONSIDERED A JOB for professional installers, laying a one-piece vinyl floor is now an easy task for the homeowner.

What makes it so easy is a new material from Armstrong Cork—one that comes in 12-ft.-wide rolls, or double the width of conventional vinyl sheet flooring. Thus it's possible to cover a 12x20-ft. kitchen, for example, with a single seamless sheet—and without any adhesive.

When using the Castilian flooring, practically no subfloor preparation is required. Just remove molding around cabinets and walls and roughly cut the sheet to the approximate dimensions of the room. Lay the sheet in place and finish trimming with a sharp knife, leaving  $\frac{1}{8}$ -in. clearance all around. Replace or renew the molding—that's it! ★★★

**SHEET IS FIRST CUT** to approximate dimensions of room, then laid in place. Be sure you don't undercut



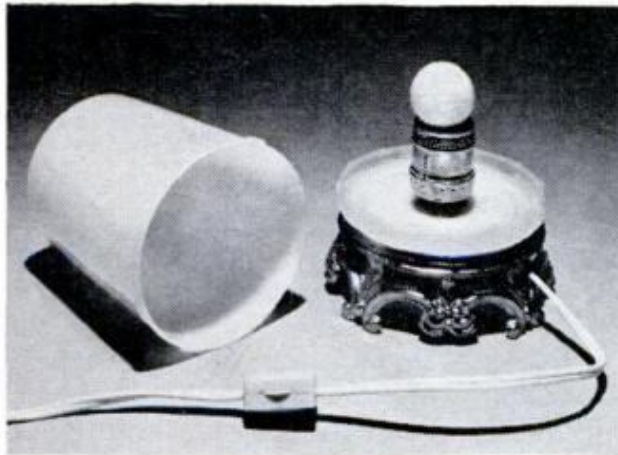
**FINAL TRIMMING** requires use of a sharp linoleum knife. Leave  $\frac{1}{8}$ -in. clearance on all sides of sheet

**ADD METAL TRIM AND MOLDING** where necessary and you have a seamless floor—without adhesive





# HINTS FROM READERS



## Make this low-cost TV lamp

The tasteful television lamp shown above and at right was assembled from a standard, white-metal lamp base and a plastic refrigerator container. When fitted with a small bulb, it provides sufficient illumination to prevent eyestrain while you watch television and can also be used as a general-purpose night light.

All the components (except the refrigerator container) can be purchased at any large electrical store. The cast metal bases come in a number of styles, so you should have no problem finding a base



that will match the decor of the room. If the base you want isn't in stock, most stores will be happy to order it.

Note that the cover to the container is installed under the socket, to attach it to the lamp base. To prevent excessive heat buildup, use only a small bulb such as shown.—*Joseph Braunstein*

## Clamp pads from plastic laminate

When resurfacing your kitchen counters, save any scraps of plastic laminate for use later as protective pads on small clamping jobs. The thinness of this material lets you use the full capacity of small clamps.

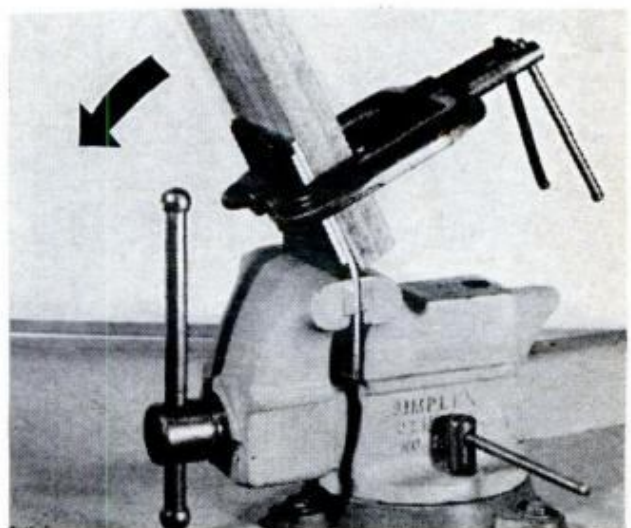
—*Sidney Abbot*

## Protective cap for trailer hitch

Cut a long slit in an old tennis ball and you have a protective cap for the ball on your trailer hitch. It offers perfect protection from the weather to keep the ball from rusting. When not needed it can be tossed into the trunk.—*John R. Walker*

## Simple setup for bending heavy sheet metal at sharp angles in your vise

To bend heavy sheet metal, mark the desired bending point and clamp the work in a machinist's vise. The bending mark should be located just above the top of the vise jaws. Then clamp a 3-ft. length of 2x4 to the back of the work to provide the necessary leverage. Using the same clamps, secure a small piece of heavy sheet metal to the front of the work. This will localize the bending action in the narrow space between this strip and the top of the vise jaws. To make the bend, simply grasp the end of the 1x4 and pull it slowly forward. The work will bend at a sharp angle every time.





# Christmas Gifts

A collection of workshop projects which you can



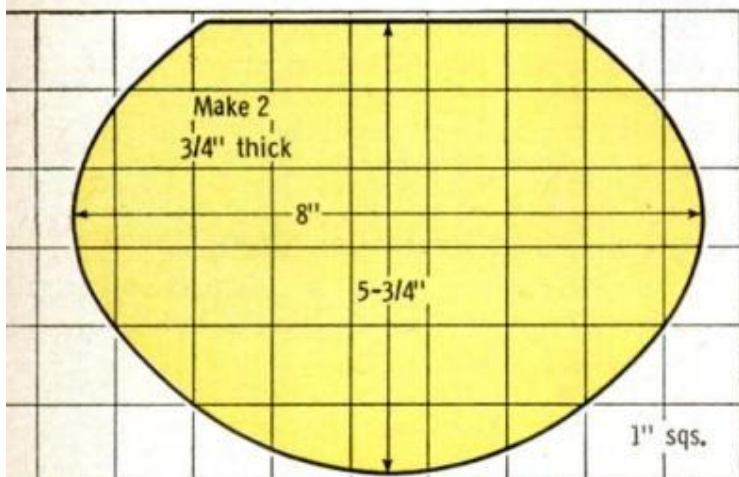
## Choice of Rustic Planters

BECAUSE THEY FIT into almost any decor, these simple planters might be the ideal gift for many of your "green-thumb" friends. The basic design consists of two redwood end pieces cut from 1x6 stock and 21 lengths of 1/2-in. half-round molding. The planters shown are approximately 1 ft. long, but the length, like the decorative touches, is strictly a matter of personal taste.

There's really no need to varnish or stain the planter, since unfinished wood is most effective in achieving the desired rustic appearance.

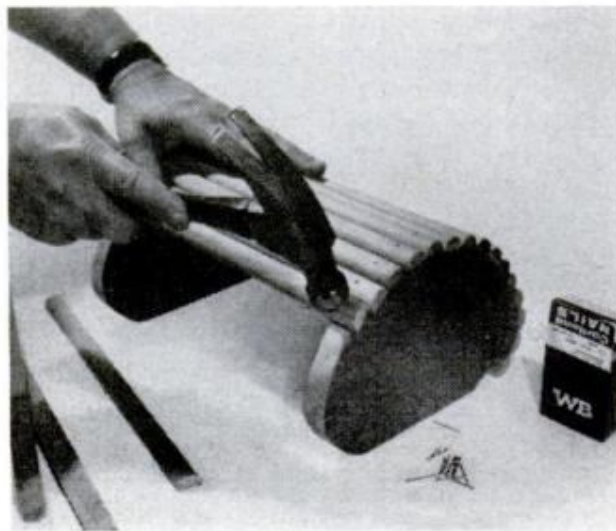
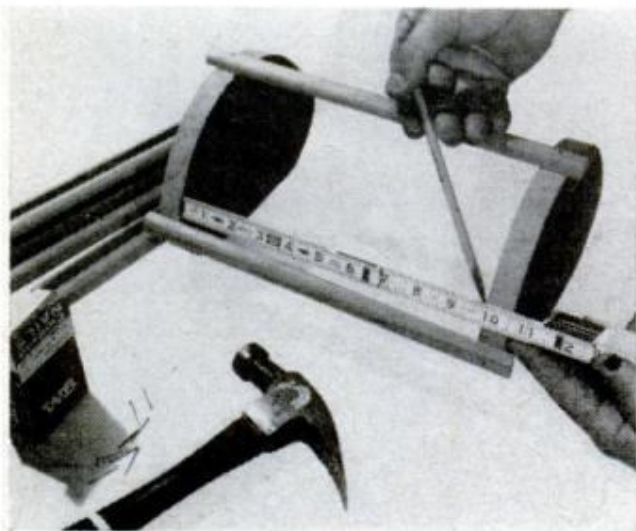
After cutting and sanding the end pieces, stand them on their flat edges the proper distance apart and connect them by nailing one length of molding down the center. This should project about 1/2 in. beyond the outside faces. To hold the end pieces square, temporarily nail a second length of molding 90° from the first, being careful to maintain the same distance between the ends. Then it's simply a matter of nailing the rest of the molding in position, ten pieces on each side.

Adhesive-backed metallic trim tape may be used to dress up the appearance. If you want to add legs, nail spools in position from the inside. To make a hanging version, all you need are two screw eyes and some fine brass chain.—*Bob Corley*



TO BRACE ENDS SQUARE, connect them with two pieces of molding 90° apart. Ends must be parallel

START IN MIDDLE when nailing the other lengths of half round in place. Use one small nail at each end





# You Can Make

make in a weekend for your home, kids and friends

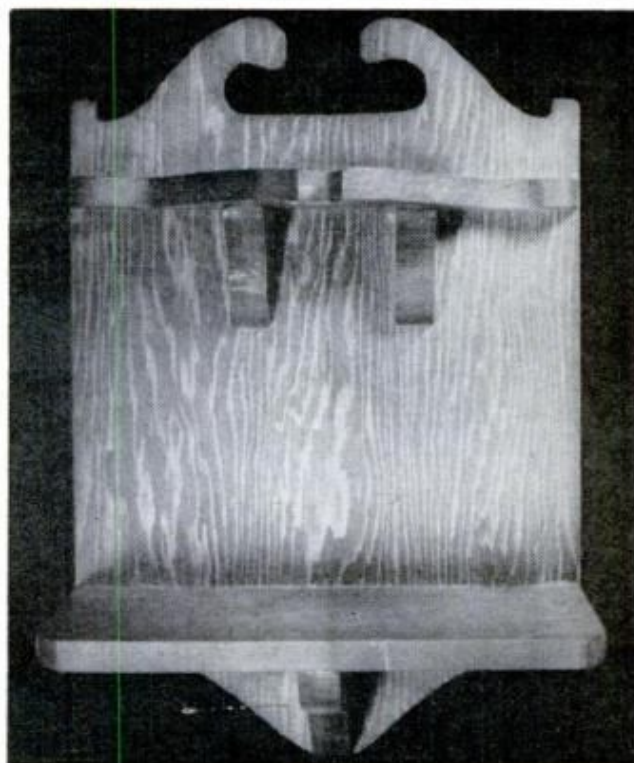
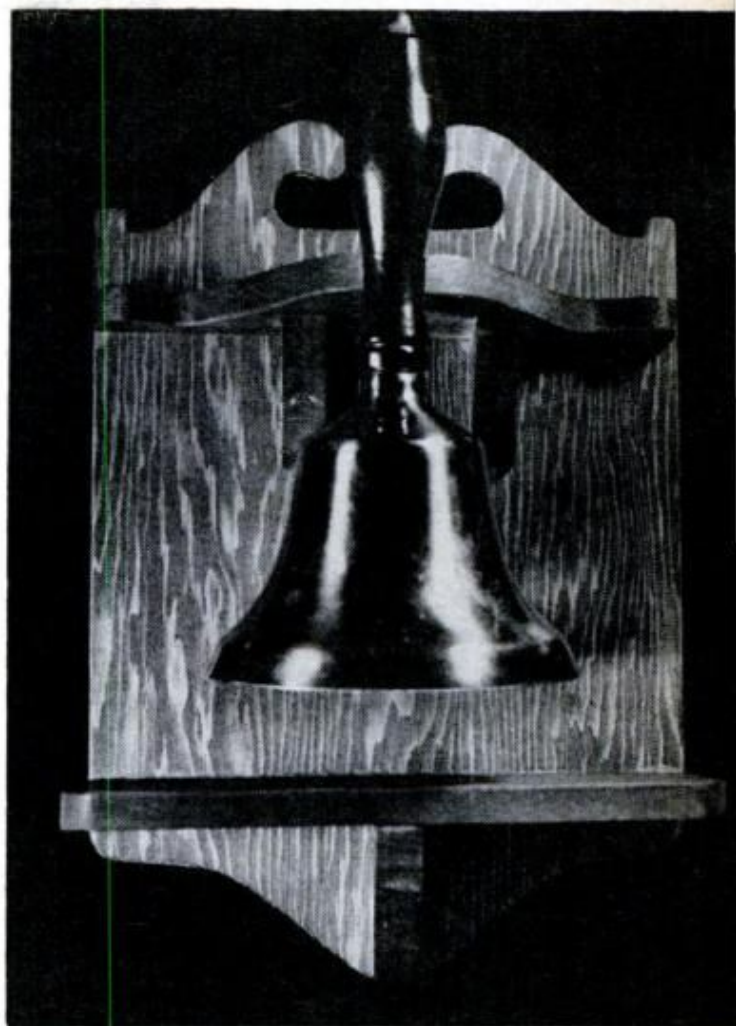
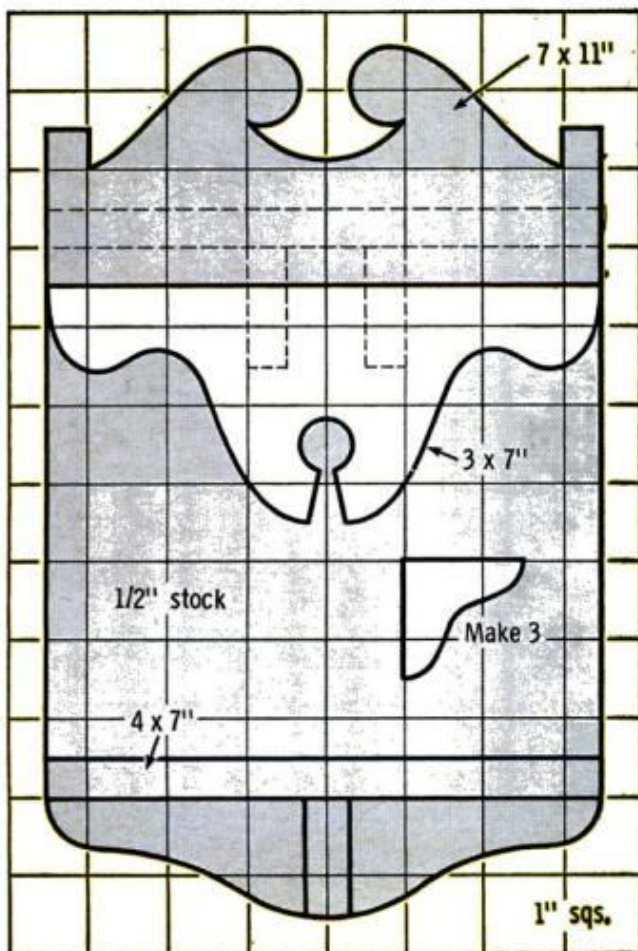
## Colonial Bell Shelf

In days gone by, the farmer's wife used a small bell to call the family together for meals. When not in use, it was kept in a decorative bracket or shelf near the kitchen door.

Such a shelf—equipped with a bell, of course—makes the perfect gift for anyone who appreciates a touch of authentic Americana. While it probably won't be used to "ring in" the family at meal time, the bell and shelf make a pleasing plus in any informal kitchen or dining room.

You can make it from any kind of lumber available. Even plywood could be used, if the shelf is to be painted. The question of stain and finish will depend on the room in which the shelf will probably be hung, so check this out beforehand.

Cut out the pieces and sand each one well. Since no great loads are involved, the shelf can be assembled with glue without any nails or screws.—*Don Shiner*





## Hot-Dish Coaster

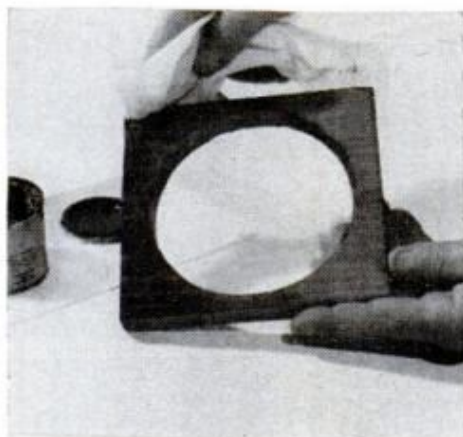
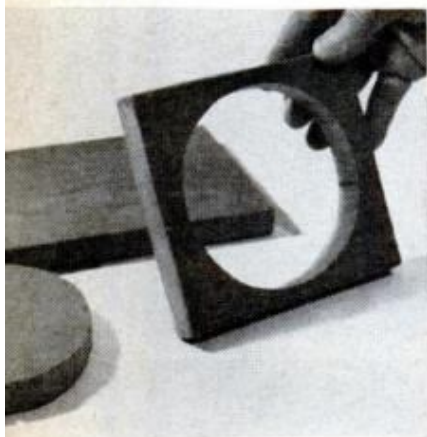
Here's a gift project that looks like it came from an expensive gift shop, yet can be made from materials in your scrap box.

The wood base is cut from any wide piece of 1-in. stock. The center design is made from bright-colored chips of ceramic tile and small pieces of stained wood, set in ceramic tile grout.

The grout dries pure white, but for special effects it can be tinted by adding food coloring or any water-base paint, such as tempera. Allow 24 hours for the grout to dry before the coaster is used.

If you're planning to make several coasters, cut all of them at one time and proceed on an assembly-line basis.—*Bob Corley*

1. To make a square coaster, cut a  $4\frac{3}{4}$ -in. hole in a length of 1x6 stock
2. Sand the wood well, especially the end grain, and apply an oil-base stain
3. Use a piece of heavy cardboard to cover the bottom. Secure it with glue



4. Mix the tile grout to a soft consistency and pour it into the center pole
5. Arrange small pieces of stained wood and tile chips in the soft grout
6. When grout begins to harden, wipe with damp cloth to remove the excess



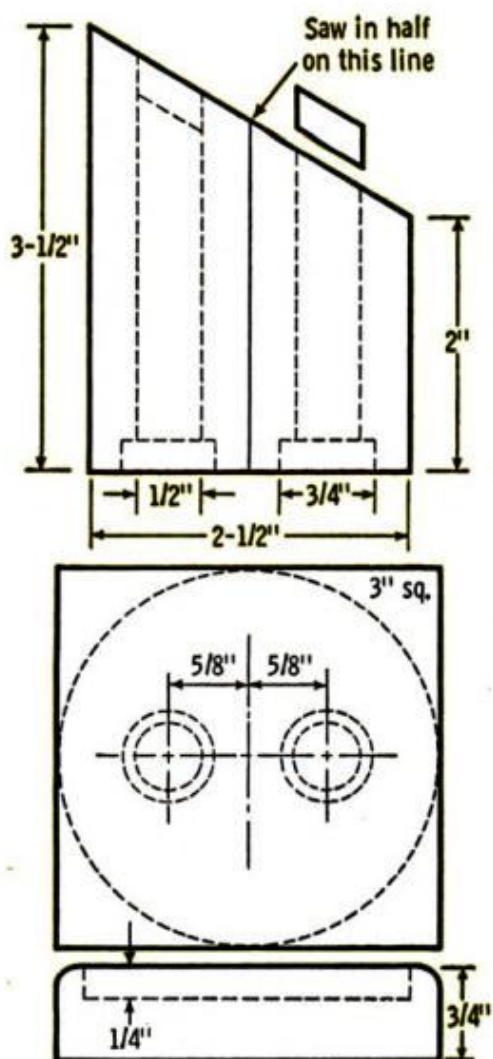
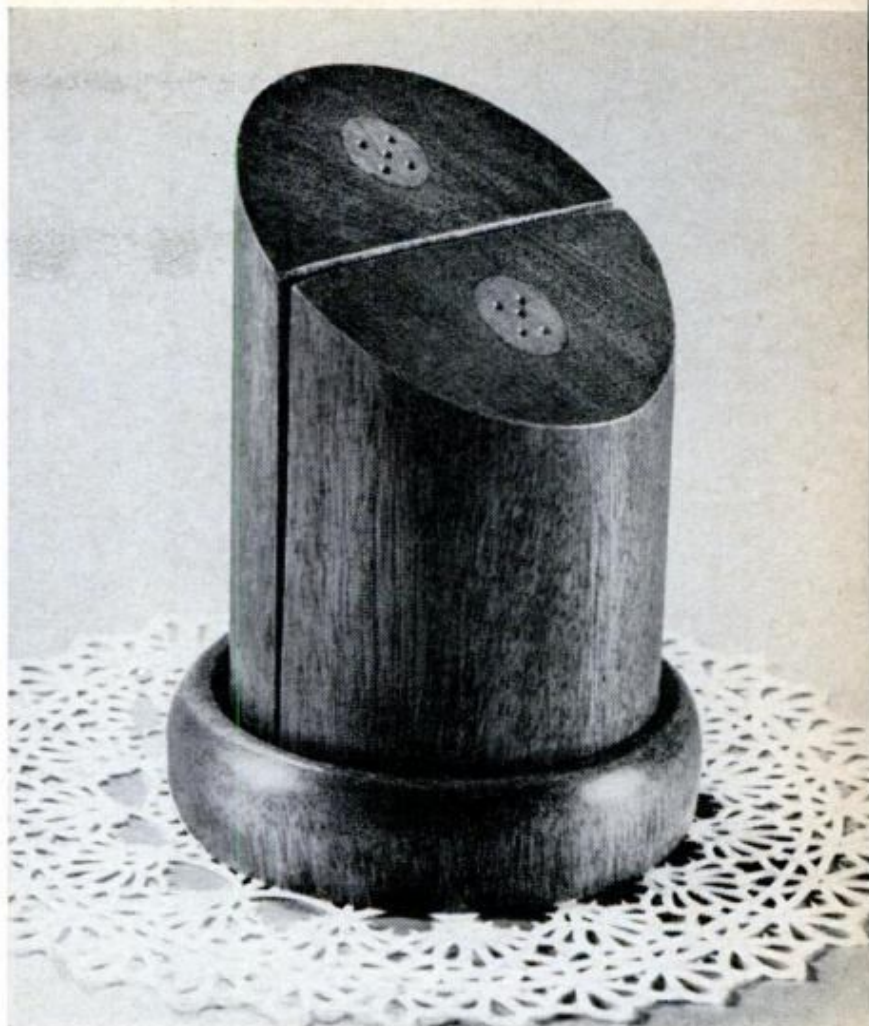


## Salt-and-Pepper Cylinder

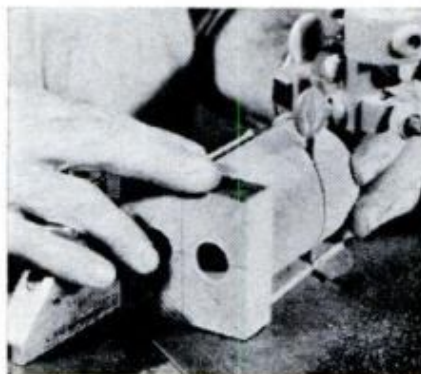
Something different in the way of salt-and-pepper shakers always makes a good gift. This novel hardwood set is made by turning a cylinder, drilling the cavities, plugging them and then sawing the cylinder in half.

The cylinder is left attached to the turning square at the bottom during drilling. Locate centers for the cavities and drill  $\frac{3}{4}$ -in. holes through the turning square extension  $\frac{1}{4}$  in. into the bottom of the cylinder for each cavity. Then, using the same centers, drill  $\frac{1}{2}$ -in. holes through the entire depth of the cylinder.

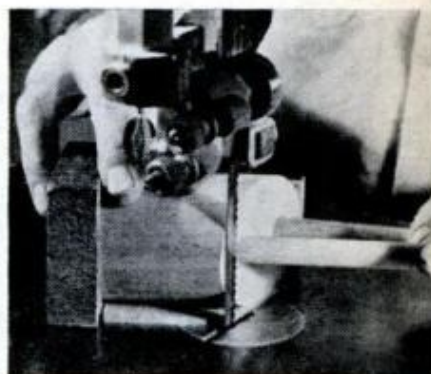
The upper ends of the cavities are plugged with  $\frac{1}{2}$ -in. dowel pegs which contrast with the dark hardwood. Drill shaker holes in these and use corks to plug bottom filler holes.—*Elma Waltner*



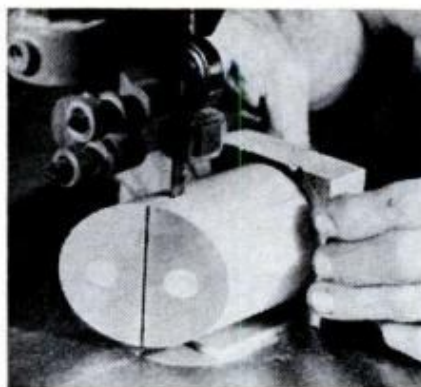
**AFTER DRILLING** cavities, saw off the cylinder top



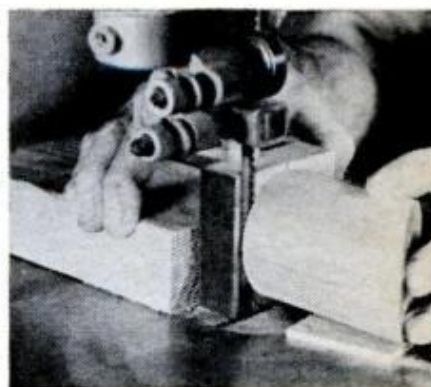
**INSERT DOWELS** and saw off to match slant of top



**SPLIT CYLINDER**, sawing only down to the block



**THEN SEPARATE** the cylinder from the turning block







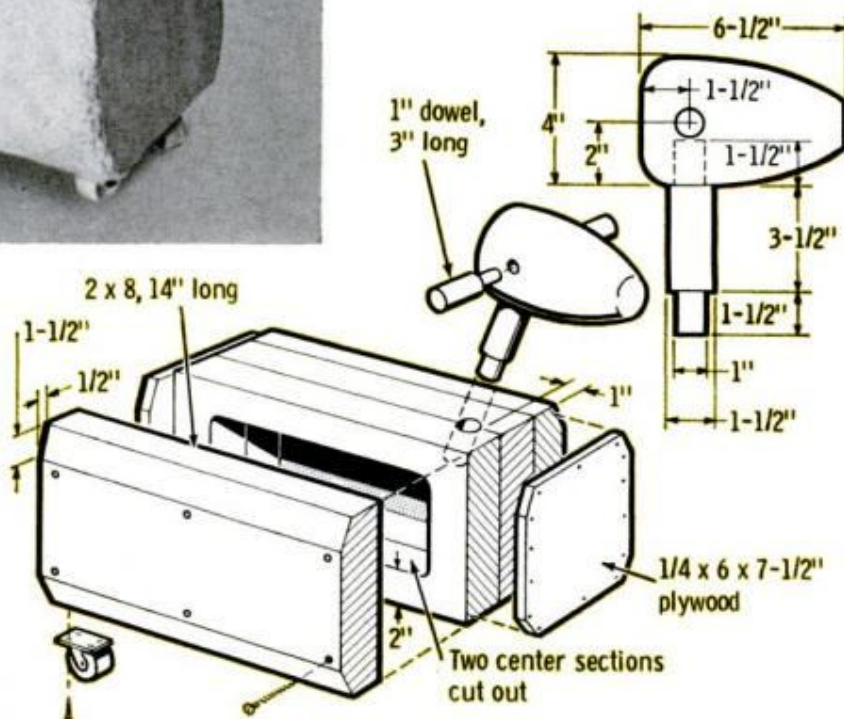
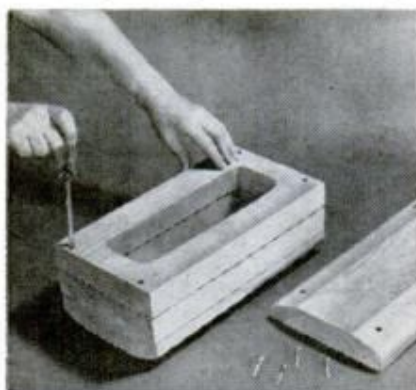
## Riding Lamb

Mary's Little Lamb will roll right out of the nursery rhyme when you complete this 1-2-3 weekend project.

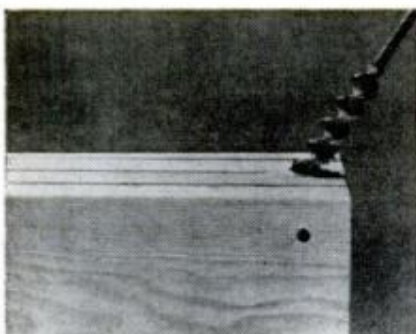
Mounted on four nylon caster swivels and covered with genuine lamb's wool, this furry-backed riding pet becomes a delight for the small fry in your family.

Construction, as shown in the drawing below, is simple and straightforward. Because the lamb will be used with children, however, certain safety precautions should be followed. Round all edges, for example, and make sure the wooden surfaces are splinter-free. Then finish the body with a nontoxic paint or clear finish. It's always advisable to follow these precautions with children's toys.—*Elma Waltner*

**BUILD UP THE BODY** of four pieces of 2x8 planking and round edges



**BORE INTO THE BODY** at an angle of approximately 45° for neck **WOOLSKIN** or fake fur is stapled, **FACEPLATES** for front and back then edged with hardwood strips keep covering from tearing loose







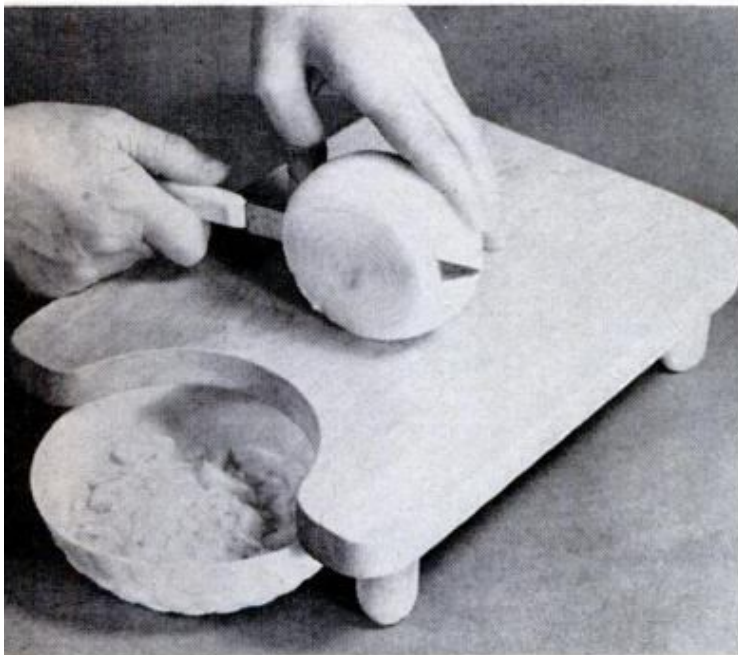
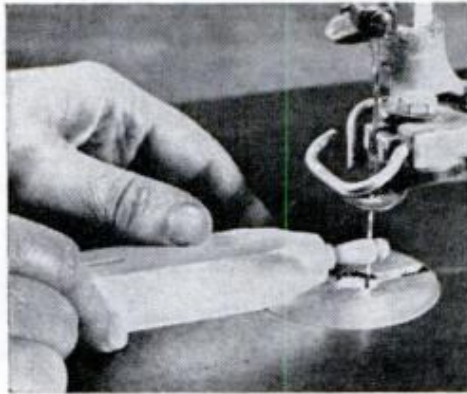
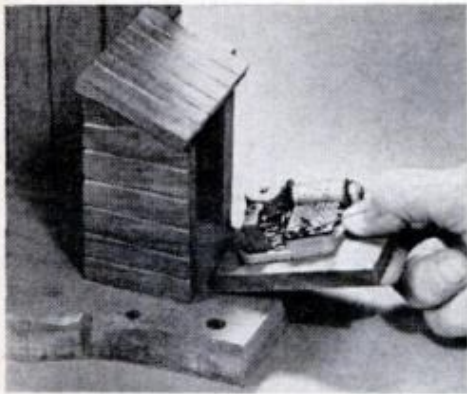
## Artisan's Musical Crèche

This classic Christmas Nativity scene takes on an unusual and thoroughly modern look when imaginatively made as a recognizable abstract.

Both the figures and the shelter require some hand carving to bring out some of the finer details but a beginner's talent here lends a realistic and authentic touch. As detailed in the patterns on page 230, the lathe-turned figures are quite presentable without the carving, however, should you so desire.

Another option is the inclusion of the music works that fits neatly in the small boxlike structure on the right of the crèche. In this case, an 18-note *Silent Night* movement is used and is available from Walters Modern Hobby Shop, 207 French Rd., Utica, N.Y. 13502.

**COMPACT MUSIC MOVEMENT** fits tidily into neat structure on right side of crèche (below left). Jigsaw is required (center) as is some rough carving (below)



## Homemaker's Bowl-Board

The lady of the house will really appreciate this functional and practical gift. It's an easy-to-make bowl-board on legs that will let her chop onions, celery and the like, and just push them off the board into the waiting bowl.

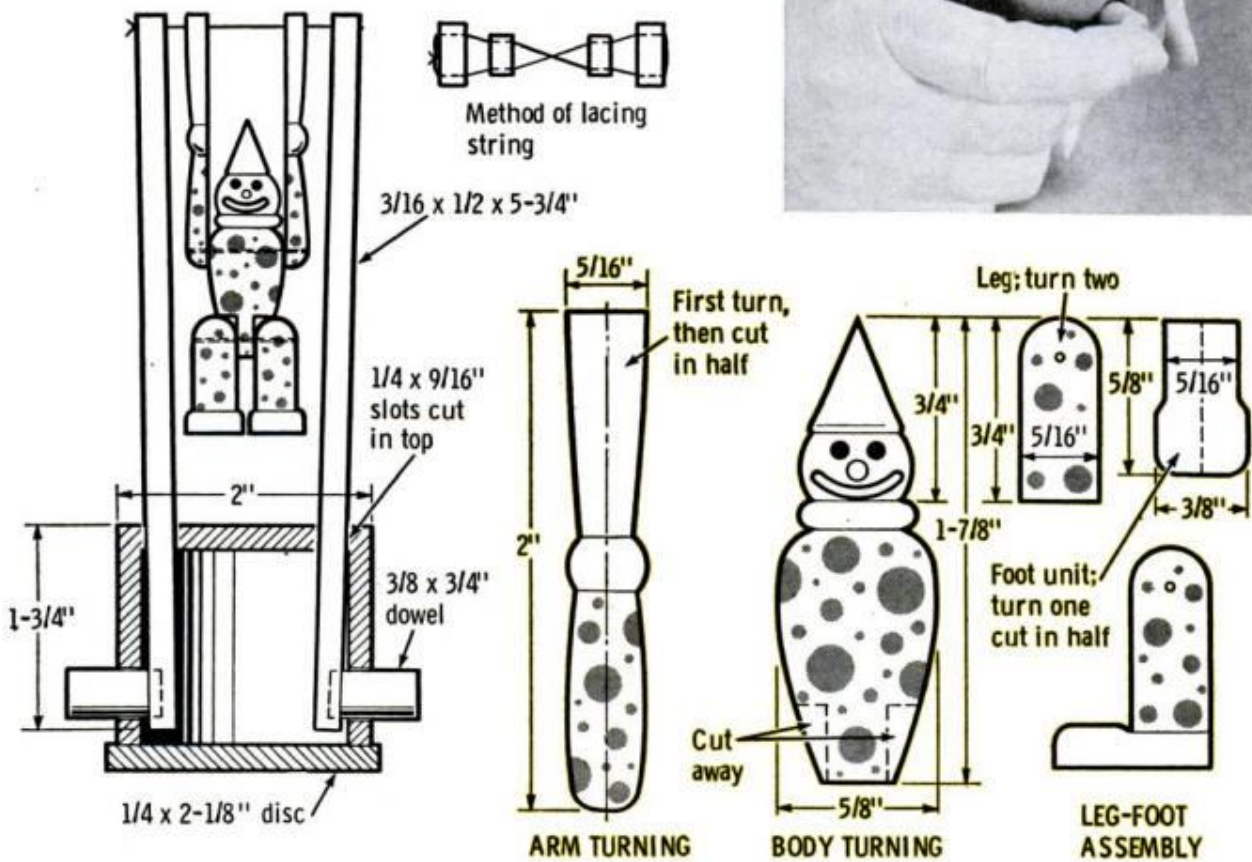
Use a close-grained hardwood such as maple or birch for all parts, sand thoroughly and leave in natural finish. The size of the board and the height of the legs will depend primarily on the size of the bowl to be used. Just remember that the bowl-stop should be approximately one-third the circumference of the bowl rim. Because the board-bowl combination is so easy to make, consider making a few for other female relatives of your family. ★★



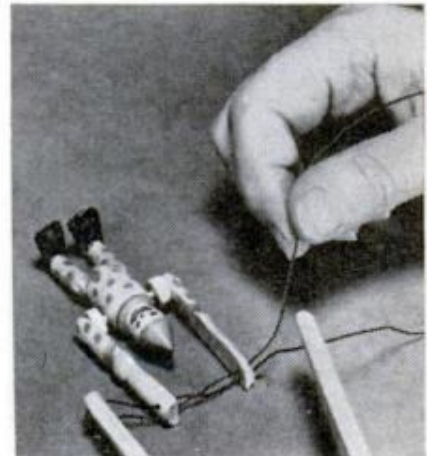
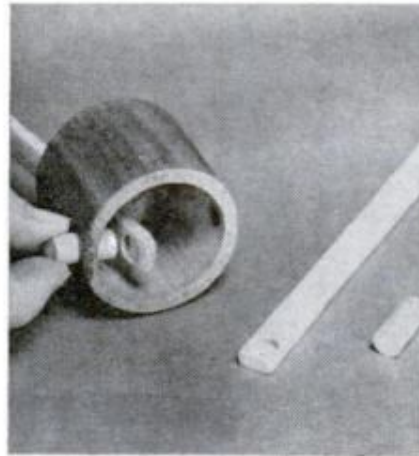
## Pushbutton Twirler

Squeeze the dowel pegs in the base and this agile little clown will perform gymnastics fitting for the Olympics.

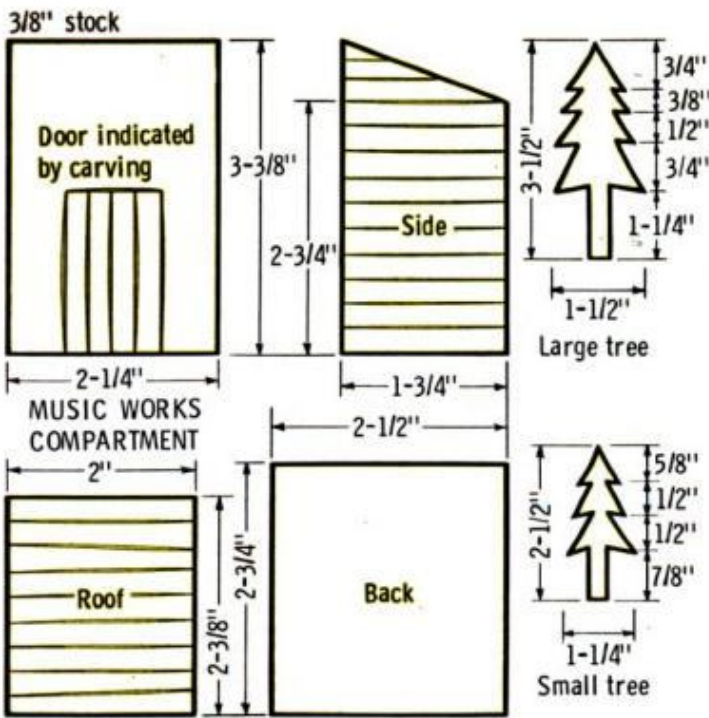
How he manages to spin and twirl is easy to understand when you look at the string-threading pattern and front view directly below. Note that the string is threaded so it crosses between the arms of the twirler. Thus, pushing in the bottom dowel pegs forces the 5 $\frac{3}{4}$ -in.-long supports apart, stretching the string and forcing it to become uncrossed—thereby causing the arms to spin, followed by the free-swinging body and legs. For maximum wear resistance, however, the string should be fishline.



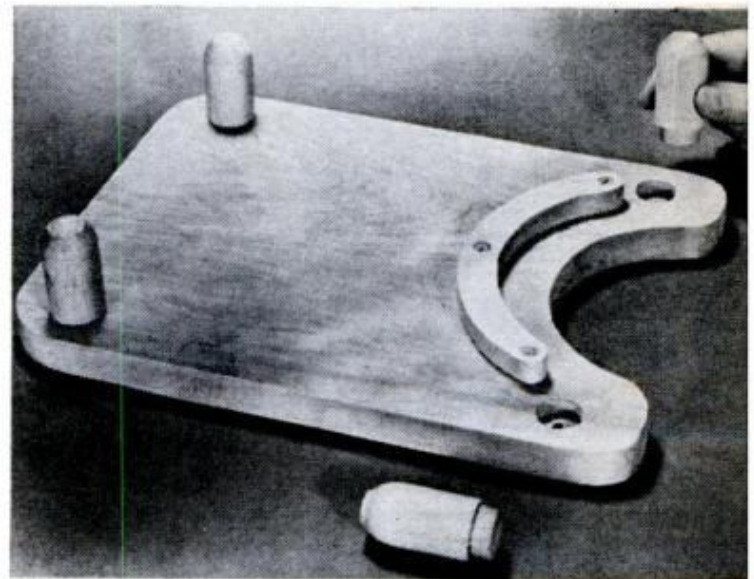
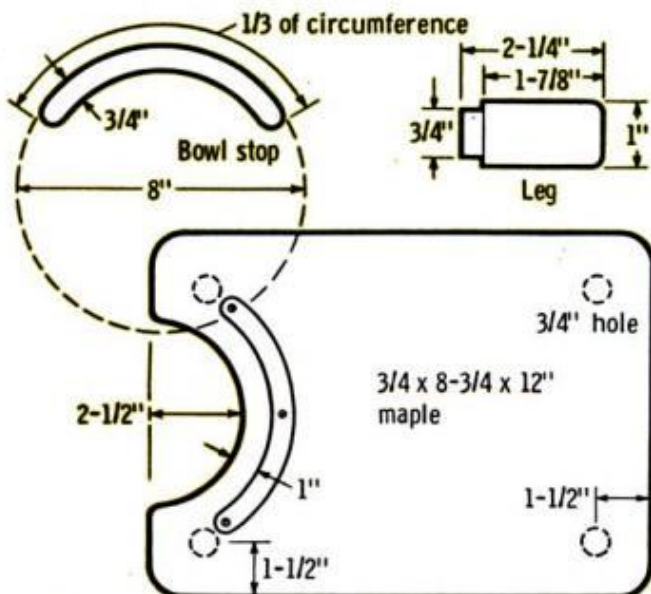
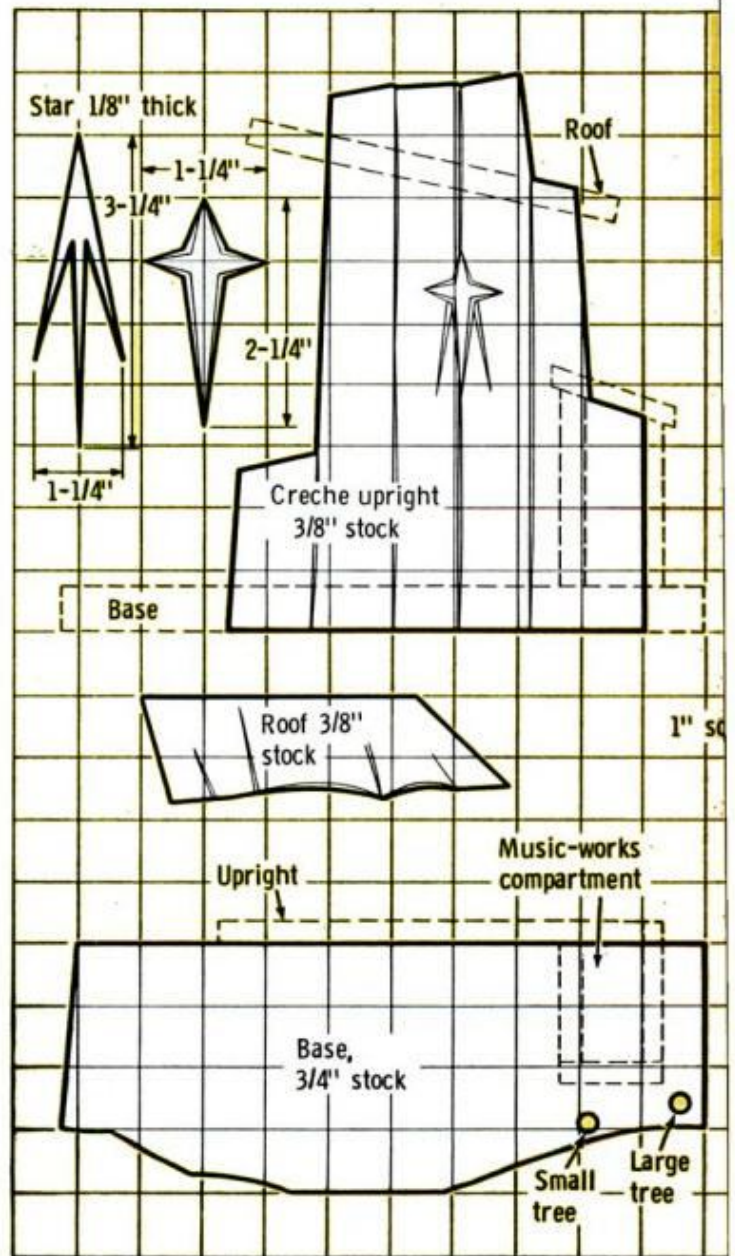
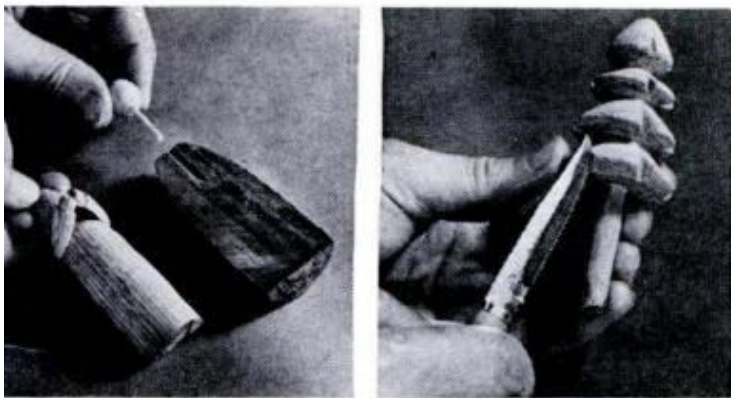
**DRILL TWO OPENINGS** for push pegs, then rasp until free-fitting **GLUE PUSH PEGS** into the holes **STRING FISHLINE** through arms in the vertical support members and supports as shown in pattern







FIGURES are made up of different wood species as listed, then finished to suit your preference (below left). Trees (below right) also need some rough carving



FOUR SUITABLE LEGS, a curved bowl-stop and an appropriately-sized cutting board go into this gift



# Solving home problems



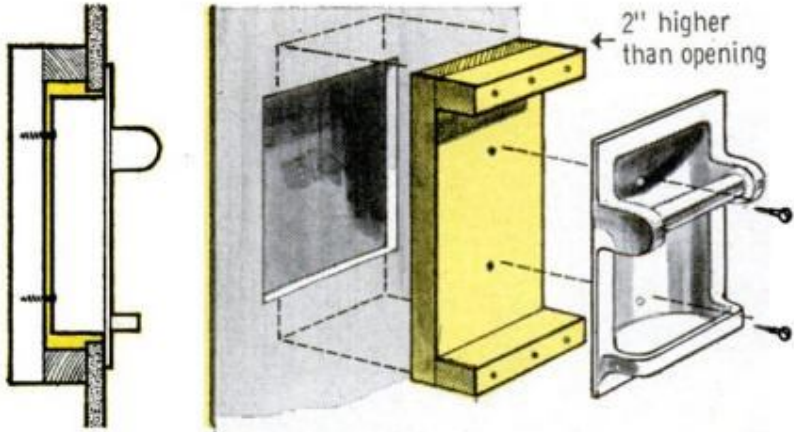
Strips of flooring

**WHEN YOU NEED** to take an in-between measurement such as when fitting a door, the best "ruler" is an adjustable measuring stick. Two lengths of tongue-and-groove lumber held with a small C-clamp will work fine, and can be readjusted as the job requires. The mating tongue-and-groove edges serve to keep the two sticks in alignment

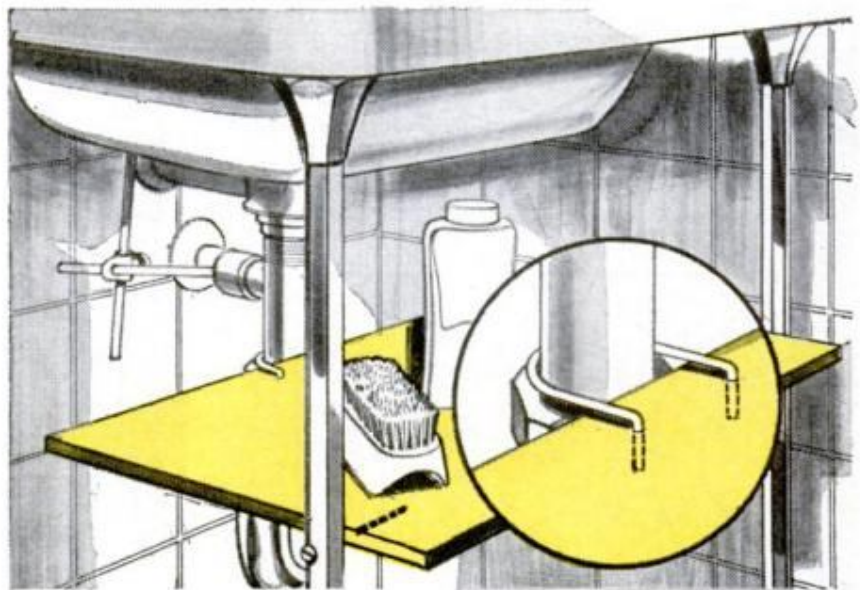
154



**CUSTOMIZED PAINTBRUSH** is designed for hard-to-reach areas. Make it by sawing off the handle and nailing an extension at right angles to the bristle portion. A few practice strokes and you can use it with ease



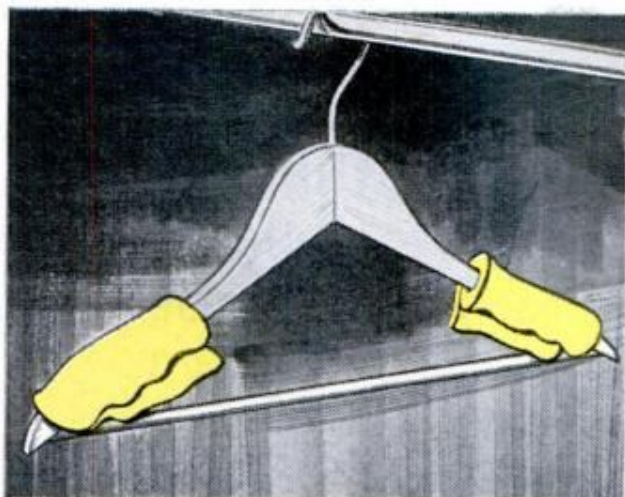
**RECESSED BATH FIXTURES** can be installed where neither backing nor mounting shield is available by using a slip-in wood backing block having two spacing cleats corresponding to the depth of the fixture



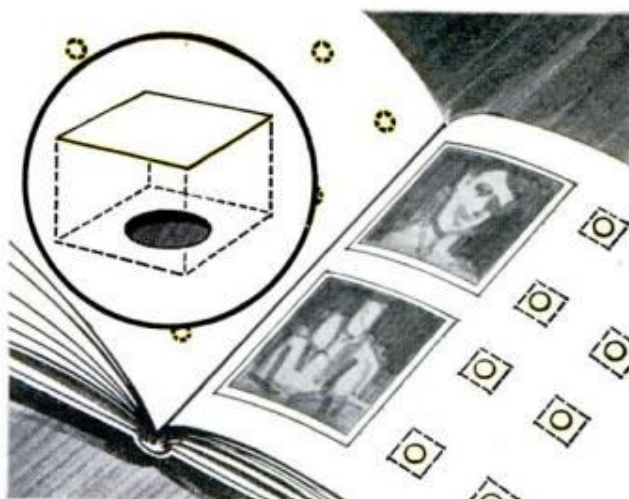
**FORGOTTEN SPACE** under the bathroom sink can be turned to good use by adding a plywood shelf. Support the front with screws through the legs. The rear rests on the drain collar, is held with a wire bracket

POPULAR MECHANICS

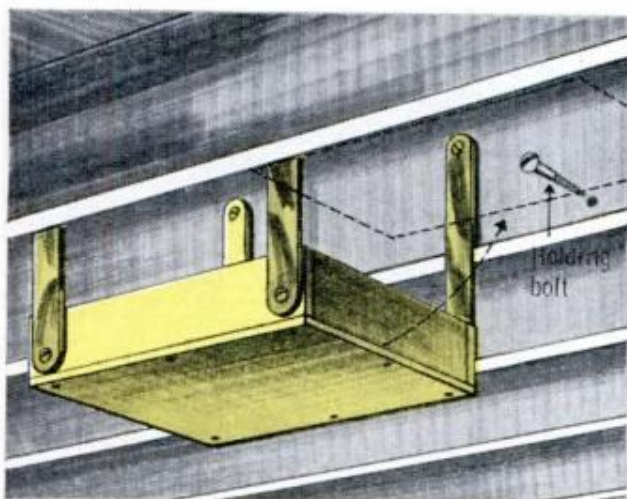




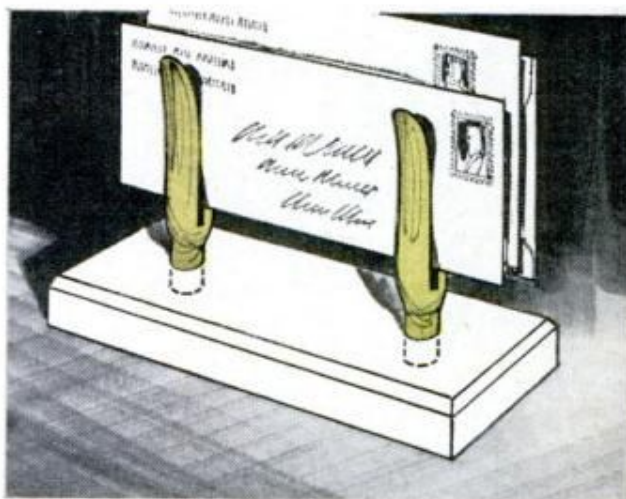
**PADDING A COAT HANGER** will not only prevent creases but permit your wife to hang garments from shoulder straps without worrying about their falling. Just staple pieces of soft foam plastic over the ends



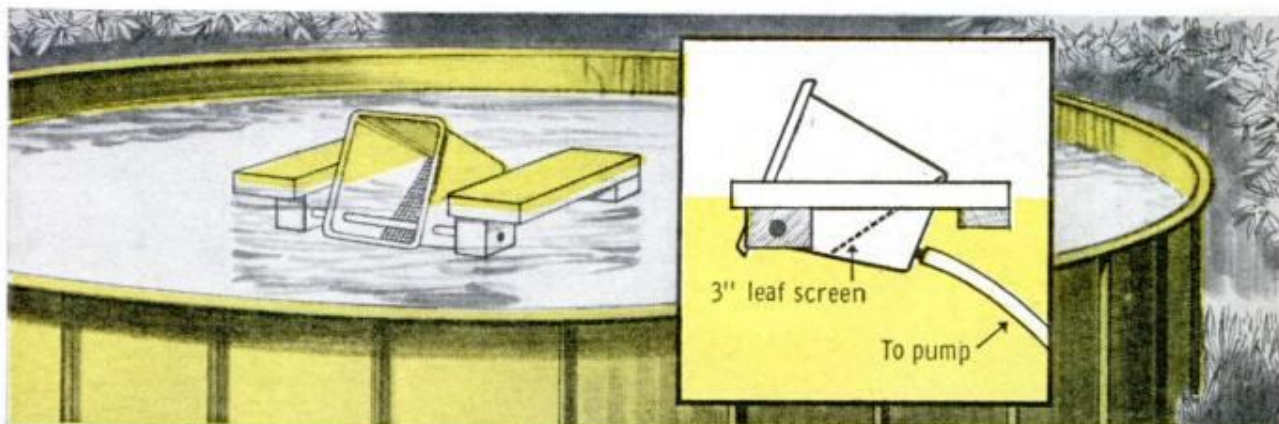
**INVISIBLE MOUNTING** for snapshots lets you remove them without damage. Simply punch holes with a paper punch and cover with cellophane tape from underside, then press photo over exposed adhesive



**SWING-DOWN TRAYS** hung from the joists in your basement will turn wasted space into useful storage. To lock the tray in the "up" position, drill a hole in the joist to take a loose-fitting bolt or screw



**YOU CAN MAKE** a good-looking letter holder from scrapbox materials. Just whittle down the knobs on a couple of clothespins and glue them in holes drilled in a hardwood base, then sand, stain and finish



**AUTOMATIC SKIMMER** for any small pool equipped with a filter system is just a plastic wastebasket on a pivot mount between wood pontoons. A hose goes from bottom to pumping system, making it self-leveling



# How to: Choose the Correct Caulking Compound

Although any caulk will close a troublesome crack for a short time, only one of the modern caulking materials can plug it indefinitely

By STEVEN J. HOWARD





**I**N THE OLD DAYS, you had a choice of two types of caulking compound—cheap and cheaper. Today, the names of compounds read like a chemistry dictionary: latex acrylic, butyl, nitrile, acrylic polymeric, polysulfide and silicone.

However, you can make the right selection easy by placing each compound into one of two categories. The first are those caulks readily available in the consumer market. They'll handle the majority of sealing jobs around your house, and you can buy them in almost any hardware or paint store.

Caulks in the second category are designed for really tough jobs, especially sealing wide cracks and joints, and those subject to unusual expansion-contraction stresses. They're expensive construction products, and you'll have to buy them

through supply outlets catering to the building industry or through paint stores serving professionals.

**Consumer-oriented caulks** are latex, butyl, nitrile and old-fashioned vegetable oil-base compounds. I won't concentrate on the latter—suffice it so say that if you want an inexpensive caulk, use a vegetable oil compound. It sells for about 30 to 60 cents a cartridge. Compared to the newer types, it gives only fair to good adhesion when applied to wood, metal and masonry. It also can last for one to five years, depending on quality of the compound and weather conditions, before flaking and falling out.

When you start to speak of high-quality caulk, you must immediately mention *latex*. Only about three years old, it's the one compound that really deserves the

### CONSUMER-ORIENTED CAULKS

|                                 | LATEX   | BUTYL   | NITRILE   | VEGETABLE OIL  |
|---------------------------------|---|---|---|--|
| Price (11-ounce cartridge)      | \$.90-\$1.10  | \$1.00-\$1.50   | \$1.75-\$2.00   | \$.30-\$.60  |
| Primer required                 | Only for metal  | None  | None  | Only where surface is porous   |
| Amount of solids*               | 75% - 80%   | 75% - 80%   | About 55%   | 70% - 80%  |
| Method of cure                  | Water loss  | Solvent loss  | Solvent loss  | Solvent loss   |
| Time until tack-free            | 15-30 minutes   | 30-90 minutes   | 10-20 minutes   | 2-24 hours   |
| Ease of application             | Excellent   | Very good   | Very good   | Very good  |
| Minimum application temperature | 40° F.  | 35° F.  | 35° F.  | 60° F.   |
| Expected life                   | 2-10 years  | Up to 20 years  | Up to 20 years  | 1-5 years  |
| Adhesion to:                    |   |   |   |  |
| Metal                           | Fair  | Excel. if unpainted   | Excel. if unpainted   | Fair-good  |
| Wood                            | Excellent   | Excel. if unpainted   | Excel. if unpainted   | Fair-good  |
| Masonry                         | Good  | Excel. if unpainted   | Excel. if unpainted   | Fair-good  |
| Old paint                       | Excellent   | Fair  | Fair  | Fair-good  |
| Special characteristics         | Use is confined to low movement areas and cracks ¼" or less. Should be painted. | Will become dirty. Use is confined to low movement areas and cracks ¼" or less. | Extreme shrinkage. Excellent water resistance. Use in low movement areas and cracks ¼" or less. | Least expensive caulk (70% solids), has less adhesive qualities, shorter life. |

\*Amount of solids dictates amount of shrinkage after cure. Thus, nitrile caulk shrinks more than latex and butyl.

### CONSTRUCTION TRADE CAULKS

|                                 | Acrylic Polymeric | Polysulfide         | Silicone             |
|---------------------------------|-------------------|---------------------|----------------------|
| Price (11-ounce cartridge)      | \$2.50-\$2.95     | \$2.95-\$3.65       | \$2.95-\$3.50        |
| Primer required                 | None              | A "must" on masonry | Bonding agent needed |
| Amount of solids*               | 90%               | 95%                 | 95%                  |
| Method of cure                  | Solvent loss      | Chemical cure       | Chemical cure        |
| Time until tack-free            | 10-30 minutes     | 24-72 hours         | 1 hour               |
| Ease of application             | Hard              | Good                | Good                 |
| Minimum application temperature | Heat to 120° F.   | 0°                  | Below 0°             |
| Expected life                   | Up to 20 years    | Up to 20 years      | Up to 20 years       |
| Adhesion to:                    |                   |                     |                      |
| Metal                           | Very good         | Excellent           | Excellent            |
| Wood                            | Very good         | Excellent if primed | Excellent            |
| Old paint                       | Very good         | Don't use           | Excellent            |
| Masonry                         | Very good         | Excellent if primed | Very good            |





**ONE ADVANTAGE** of latex caulk is ease of removal before it's fully cured. Plenty of water does the job

designation of a caulk for all purposes—well, almost all.

You can use it outside and inside, on wood and masonry substrates, over old paint and especially under new paint. Specific applications include filling and sealing of baseboard seams, trim and joint cracks, gaps around molding, cracks in stucco and other masonry, wallboard seams, cracks around window frames and wooden storm windows, gaps in exterior wood siding, and around doors and threshold strips.

Limitations? There are some. First, the life of latex caulk is markedly reduced if the compound isn't painted after application, especially when it's applied outside the house.

Furthermore, the compound has only fair adhesive qualities when it's placed in contact with metal. If such contact is to be made, the metal must be free of rust and primed with a rust-preventive paint. However, it's better to use butyl or nitrile caulk for metal. (More about these later.)

Latex caulk should not be used in cracks that are wider than  $\frac{1}{4}$  in. or those subject to more than normal expansion-contraction movement. One example comes to mind—openings in concrete pavements and patios that butt up against foundations. These cracks are continually shifting, because the horizontal slab is subjected to greater temperature change than is the foundation wall.

Latex caulk was developed primarily for use with latex (water base) paint, but

can be used with all types of paint. Like latex paint, the compound has a water base and cures by means of water loss, which causes coalescence. As water evaporates, solids cling closer together. There is, therefore, some shrinkage, but it's minimal.

Latex caulk is the easiest of all caulks to apply. You can put it on a damp surface which should, of course, be clean. Make sure air and substrate temperature are 40°F. or above when applying latex caulk.

A good quality latex compound goes on like whipped cream. Excess can be cleaned off with a damp cloth or sponge before the compound cures. Once cured, unwanted material must be cut away.

As soon as it's applied, latex caulk can be worked into place or spread, if necessary. (Dip the putty knife or spatula into water frequently.) You can paint latex after it loses tackiness, which takes 15 to 30 minutes.

Latex caulk costs from 90 cents to \$1.10 for an 11-oz. cartridge, with the more expensive material possessing more solids. It's readily available in white. A special (and more expensive) order will get you some colors. Frankly, color is not necessary because, as I've said, latex caulk should be painted after application.

The compound has a maximum life of 10 years, but as low as two years under the limitation conditions mentioned above. It's nontoxic and nonflammable.

One word of caution: a common term for latex caulk is acrylic. Don't confuse this with acrylic polymeric caulk, which has a solvent base. If you need a latex caulk, make sure the container specifies latex or water base.

*Butyl and nitrile compounds* are solvent-base synthetic rubber caulks that take over where latex leaves off. Their value lies in their adhesion to unpainted metal and masonry in particular. They're of less value when caulking a painted wood substrate, because they do not adhere well when placed over paint. Furthermore, they should not be used to fill cracks that are wider than  $\frac{1}{4}$  in.

Butyl is especially recommended for sealing cracks between dissimilar materials, such as between masonry and metal (pipes and masonry, chimney flashing and the chimney).

Nitrile holds up better when used for

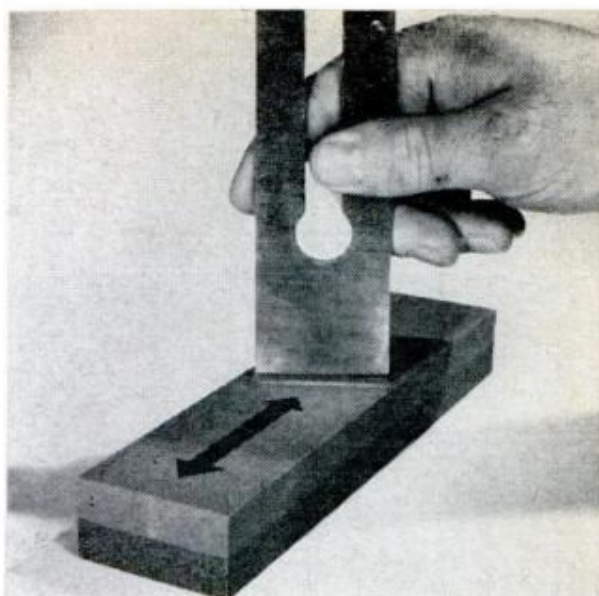
*(Please turn to page 231)*



# HINTS FROM READERS

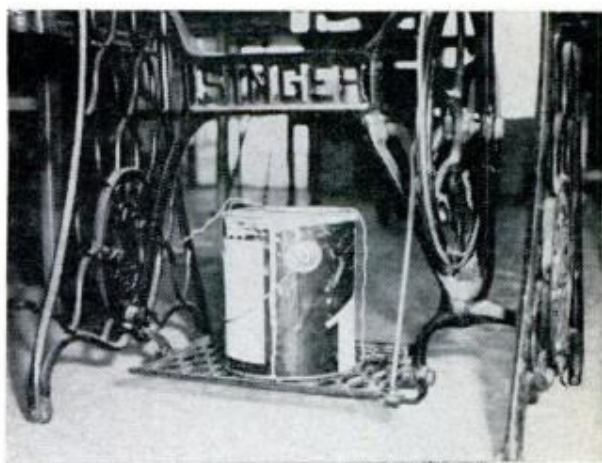
## How to square edge of plane iron

The edge of a plane iron must be almost square so it won't tend to work out of true in the plane. To true up the edge, prior to whetting, hold the blade vertically on the face of the stone and pass it back and forth while bearing down hardest on the side that needs to be taken down. Be careful to keep the blade in the vertical position. Also, lubricate the stone well with Pike oil to speed up the job and prevent it from becoming clogged with metal chips removed from the blade.



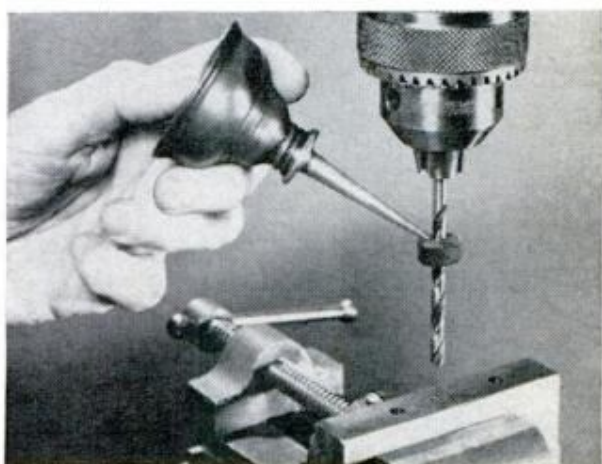
## Old sewing machine stirs paint

An old treadle-type sewing machine converted to electric drive makes an efficient agitator for mixing paint and other liquids. Just wire the paint can to the treadle, flip the switch on and hold the motor control with a stick. A few minutes of this rocking will mix the liquid thoroughly. It's a real worksaver when blending different colors or preparing paint which has been in the can for some time. Make sure that the can's lid is on tight before you start.



## Felt collar applies oil uniformly

To make a simple applicator which will deliver a uniform flow of cutting oil to a drill-press bit, cut out a small disc from thick felt and push it over the bit to a position just below the chuck. Saturate the felt with oil until a little begins to run down the bit flutes. Any additional oil applied during drilling will seep slowly down the bit instead of flowing down and flooding the work.—*Walter E. Burton*



## Tips on holding a hand saw

The way you grip a handsaw is all important to producing a clean, straight kerf. For best results, point your index finger along the handle and parallel to the blade. This not only will give a firm direction to your cutting action but it helps to stiffen your wrist. In addition, it takes the index finger out of the handle slot to produce the desired relaxed but firm grip. You'll actually find it takes less effort to saw.—*Richard V. Sawyer Jr.*





# MAKE THIS COLONIAL BUCKET-TABLE



By C. L. WIDDICOMBE

Technical Art by Fred Wolff

**H**ERE'S SOMETHING a bit different: it's a 3-in-1 combination of a coffee table, a planter and a lidded storage area. Constructed of pine in Early American styling, this functional tri-feature project is quite a conversation piece.

The legs can either be turned on a lathe or purchased from a local hardware or department store. I turned mine from 1½-in.-square pine according to the pattern shown at the right. The finished legs are 12½ in. long and each has four ¼-in. holes bored in the squared top portion to accept dowels for the end and side rails.

The end rails are semicircular in shape and are made from four pieces of 1½ x 2½-in. pine, cut to the correct angle and joined with glue and splines.

Note that the two rear pieces of each

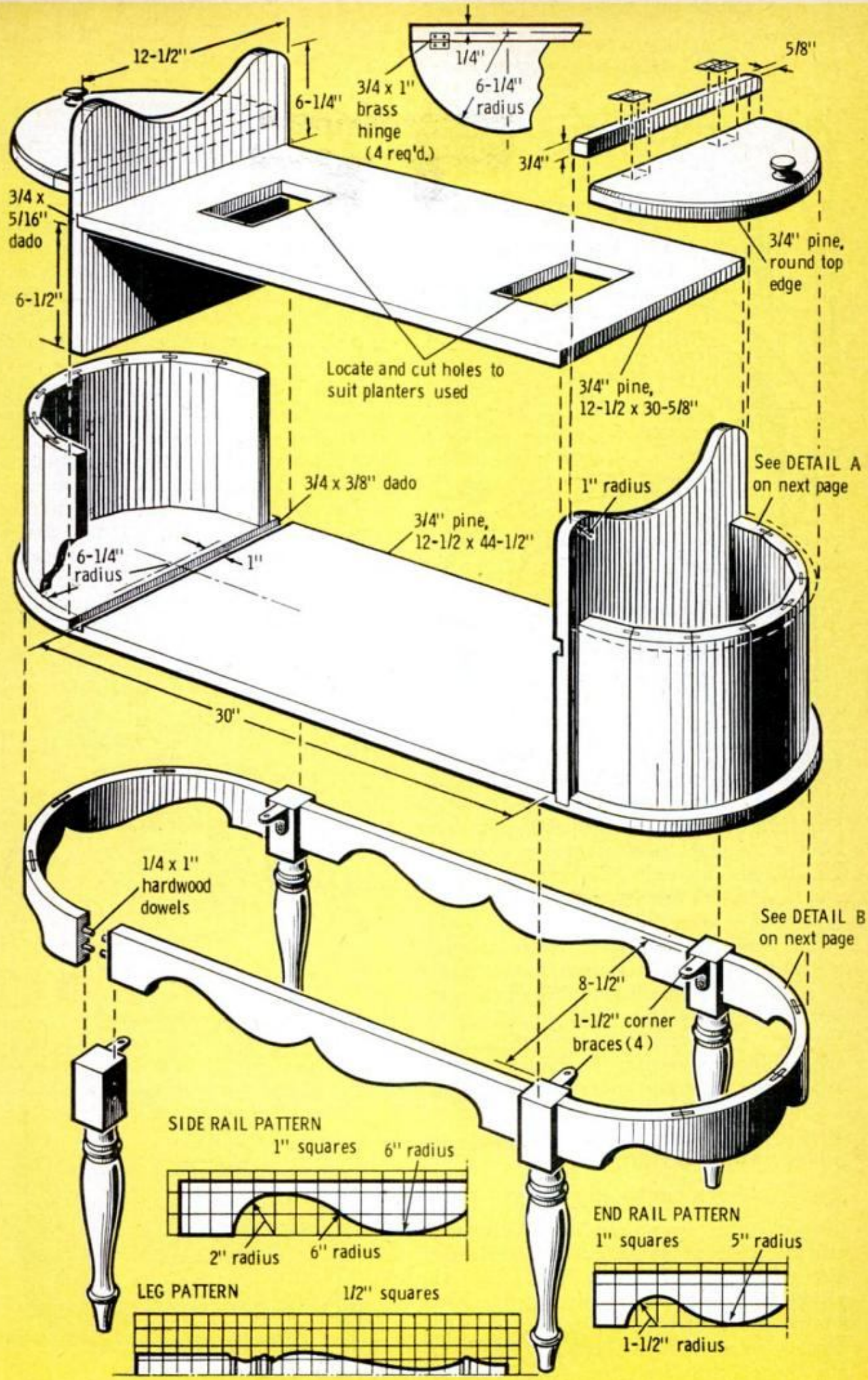
rail are longer than the two front pieces. This permits a straight joint to the legs which are set back from the radius point of the top and the end rails. Each piece is cut at an angle of 22½°, then glued and splined ready for cutting.

After bandsawing the blanks to the specified radii, drill two ¼-in. holes in their square ends to match the dowel holes in the legs. Each of the side rails also has two ¼-in. holes bored in the ends to match those in the legs. Cut the rails according to the pattern provided then sand the sawn edges and outer face.

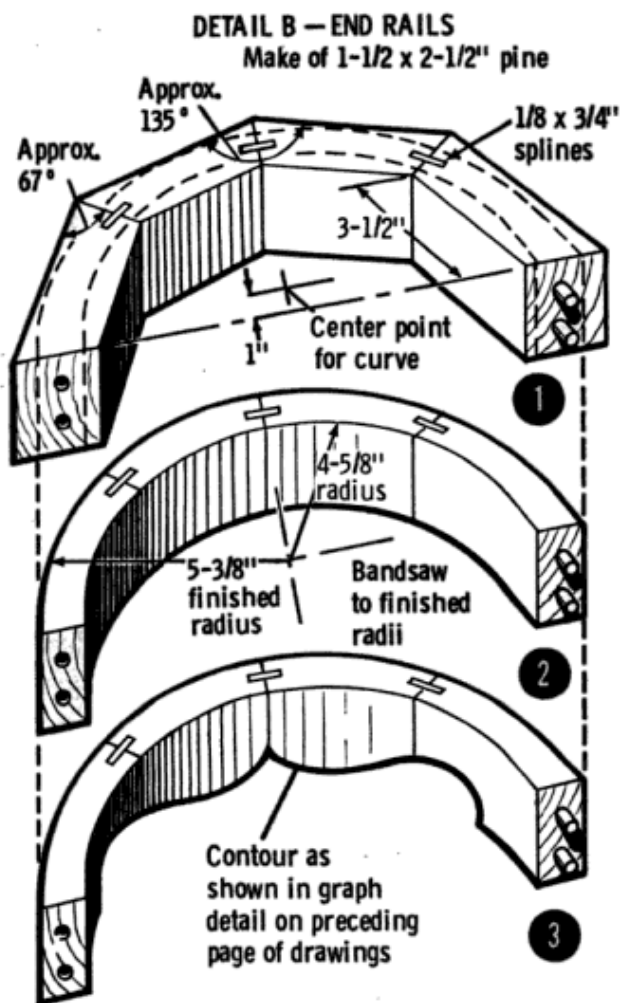
### Fabricating the bucket ends

The two bucket ends of the table are first made up as a complete unit and then are sawn in half. The circular drum is









made from 16 pieces of 13/16-in. pine, 27/16-in. wide and 9-in. long, with each piece cut at an angle of 11° and then joined with splines and glue. If you don't have a regular band clamp, you can do the job just as well by using one or two pieces of stout cord, tied as shown and tightened as if a tourniquet.

You may find it best, however, to make a trial run on pieces of scrap first in order to arrive at the precise setting of the saw. Most table saws have angle dials but the slightest error, multiplied by 16, is more than sufficient to ruin the final assembly. When clamping the individual pieces together make certain they are on a flat and hard surface so that the bottoms are aligned with each other.

#### Check center alignment

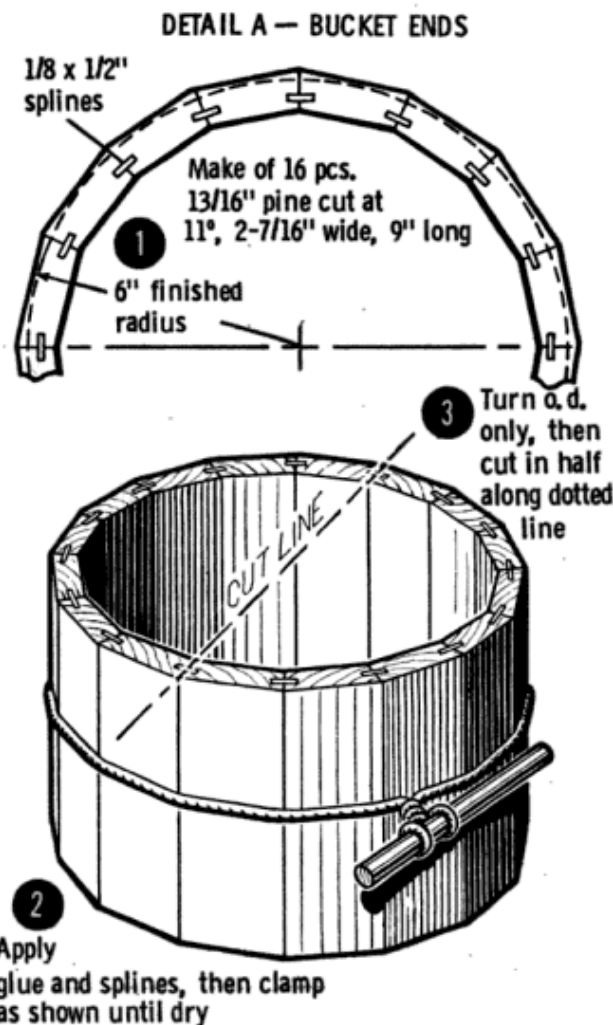
Screw the rough bucket drum to a sturdy piece of wood cut a little larger than the rough diameter, and attach the entire item to the faceplate of your lathe. Match the center of the bucket drum as closely as possible with that of the backing piece—otherwise one side of the finished bucket will be considerably thicker

than the other. Use a slow speed for the first roughing cuts and increase the speed as you finish and sand. When turned to the required o.d., remove the drum from the backing plate and cut the bucket in half using a fine-tooth sharp saw.

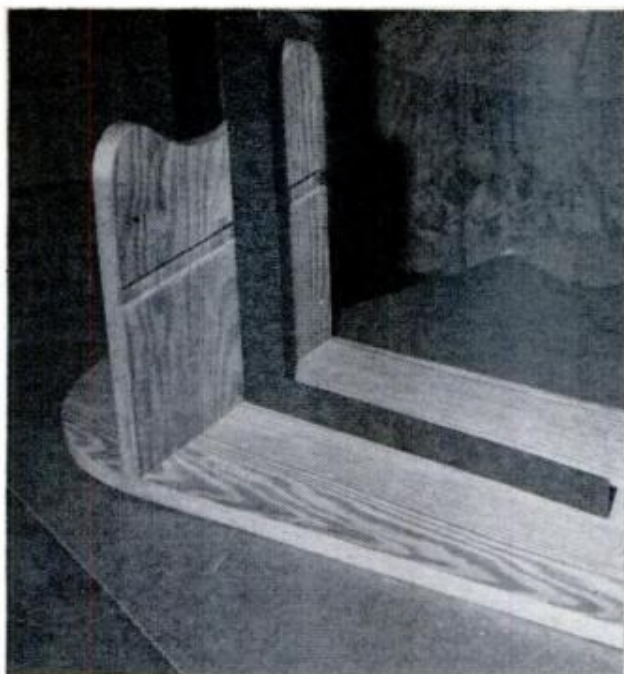
Assemble the precut sections and attach each half bucket to its end using a total of six 1 1/2-in. No. 6 FH steel screws. Screw four through the ends into the bucket sides, and screw the other two up through the top into the bottom edge of the buckets.

Before gluing the upper shelf in place, cut the openings for the planters you'll be using. I bought two 3 x 6-in. plastic planters with artificial flower arrangements from the local department store and cut two 2 1/2 x 5 1/2-in. holes in the shelf so the planters would be only slightly recessed.

The two bucket lids are cut to the semicircular shape indicated in the plans, and a 5/8-in. wide piece is ripped off the straight end. This piece is glued and nailed to the side and is used for attaching the hinges. Secure this piece in place using glue and No. 4 finishing nails driven in







**SQUARENESS IS IMPORTANT** when you assemble the table. Use glue and nails driven in through bottom

from the bucket side, so they are hidden.

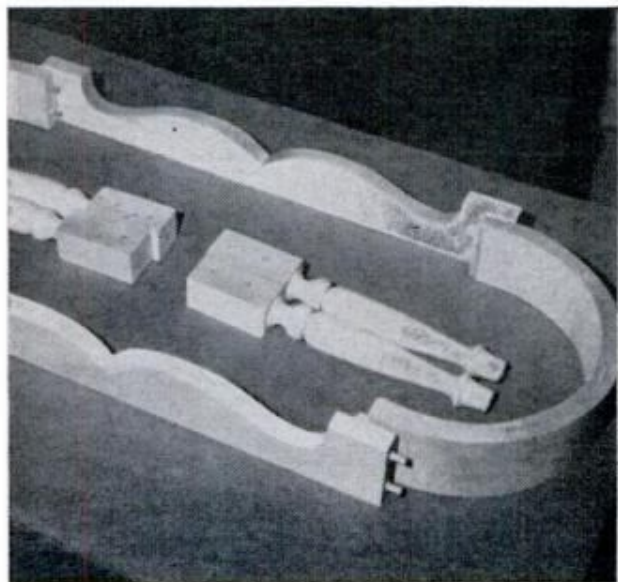
Next, attach the undercarriage to the top and clamp the end rails in place using glue and the 1/4-in. dowels previously inserted in the top. Be sure to use small blocks of wood under the jaws of the clamps—they'll mark the rail if you don't.

In addition to the 1/4-in. dowels holding the end rails in place, four angle brackets or furniture leg clamps are used to make certain the entire undercarriage assembly is rigidly secured to the top.

### Finishing the table

For finishing the project, there is a wide variety of finishes available—but for the

**SIDE AND END RAILS** are doweled to provide secure fit to legs. The end rails should not be shaped yet



**BUCKET ENDS** are turned as a single drum, then are cut in half. Lid overlaps drum as does table bottom

Early American styling, you just can't beat stained and polished pine. I used cherry stain, two coats of white shellac and a final coat of satin-finish varnish.

If you decide to use a penetrating oil stain, remember that the longer you leave the stain, the darker the wood becomes. Thus, if you desire a light finish, the stain should be wiped off immediately and allowed to dry thoroughly.

If you decide to use shellac or varnish to finish the table, make certain that you allow ample drying time between each coat. Steel wool or lightly sand each intermediate coat, and hand rub the final coat before waxing. ★★★

**GLUE AND CLAMP** doweled rails and legs to the bottom of table. Finally, the end rails are jigsawed







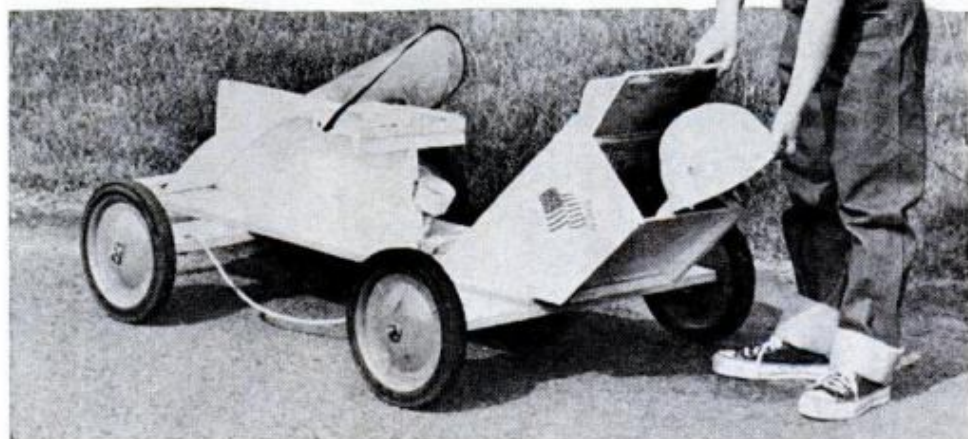
# Build This 'GRAND PRIX' COASTER For Downhill Racing

By FRED WOLFF

**S**OME PROJECTS almost seem to build themselves. This little coaster, for instance, was designed and constructed in one afternoon. It's a great father-and-son project that can be built for practically nothing, using materials from your scrap box.

Building a coaster was my son Robert's idea. I had just completed a built-in cabinet and was cleaning up the leftover pieces of lumber and hardboard when my boy wandered into the shop. "You know," he said, "I bet there's enough stuff there to make something." The

**ROOMY TRUNK** provides plenty of room for helmet or toolkit. Note bike speedometer mounted on center console. It's connected to a rear wheel





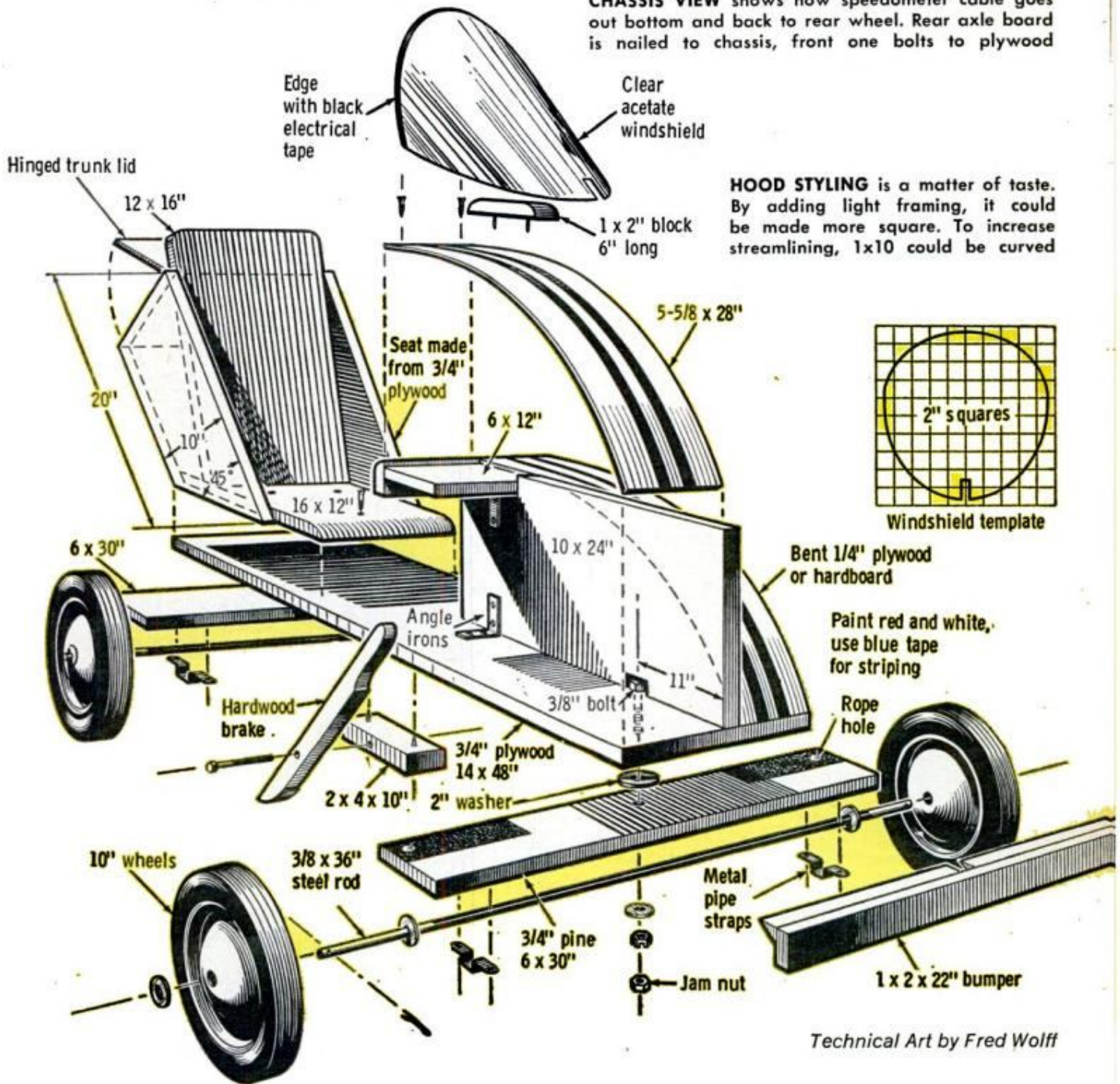
next thing I knew, we were sketching out plans for a coaster.

The design was improvised to make use of scrap-box materials with a minimum of cutting. The only things we had to buy were the four wheels and the acetate for the windshield, which came from an art supply store.

That unusual "hood line" also was Robert's idea. I had planned to cut the center board to a curve matching that of the hardboard, but my co-designer preferred the squarish spear effect, so we left it square. Any details can be changed to suit the materials available. With scrap-box design, the sky's the limit. ★★★

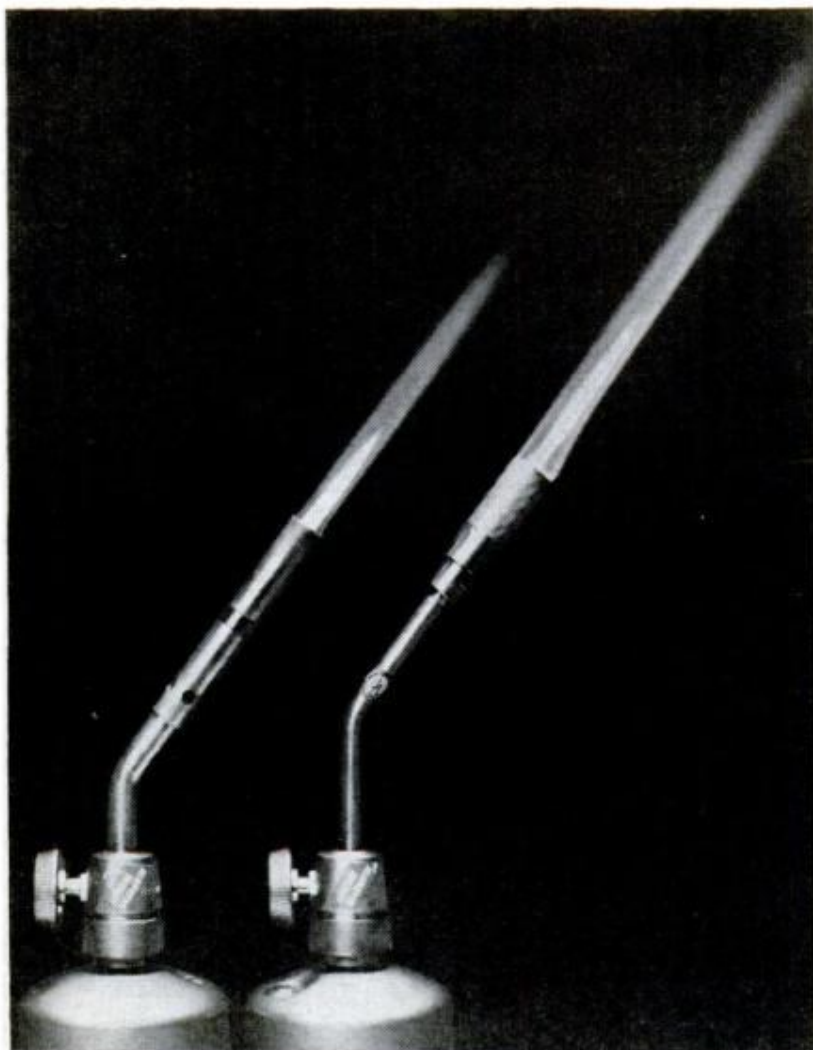


**CHASSIS VIEW** shows how speedometer cable goes out bottom and back to rear wheel. Rear axle board is nailed to chassis, front one bolts to plywood





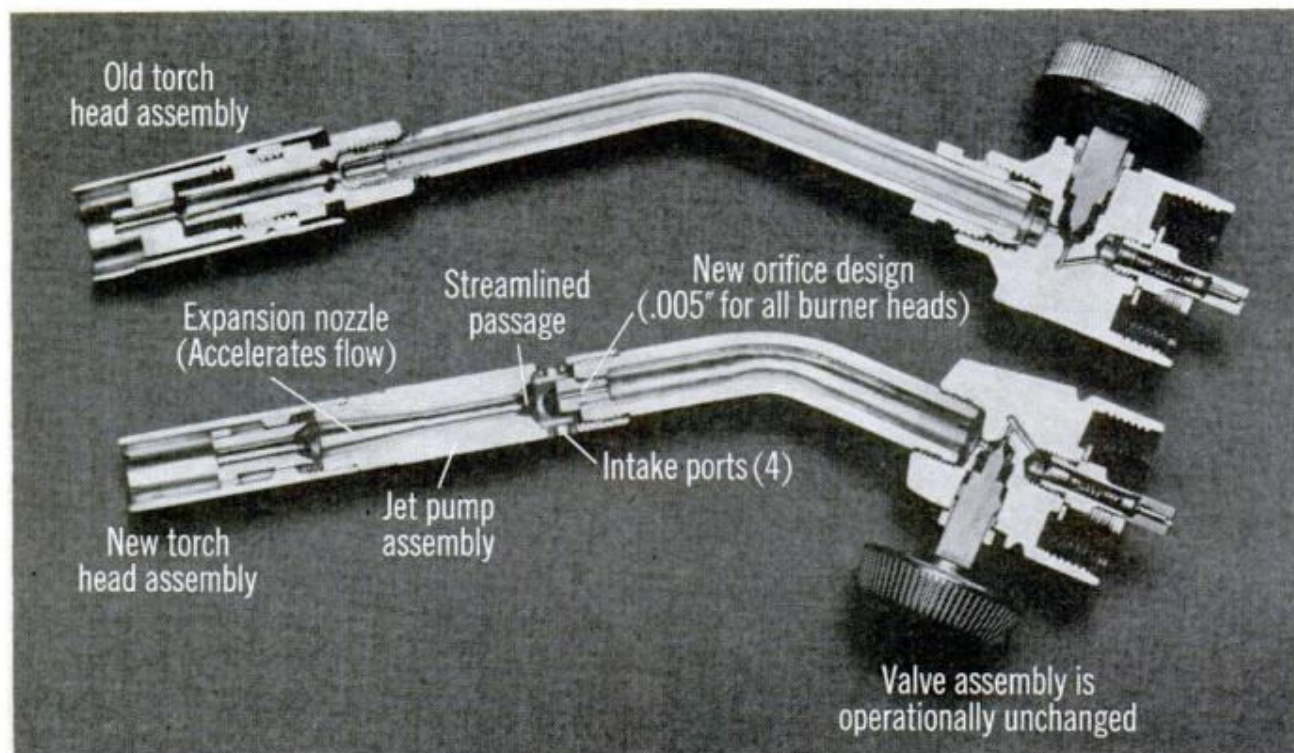
# All-New Burner for an Old Workhorse



LOOK LEFT, then quickly answer: Which flame is hotter?

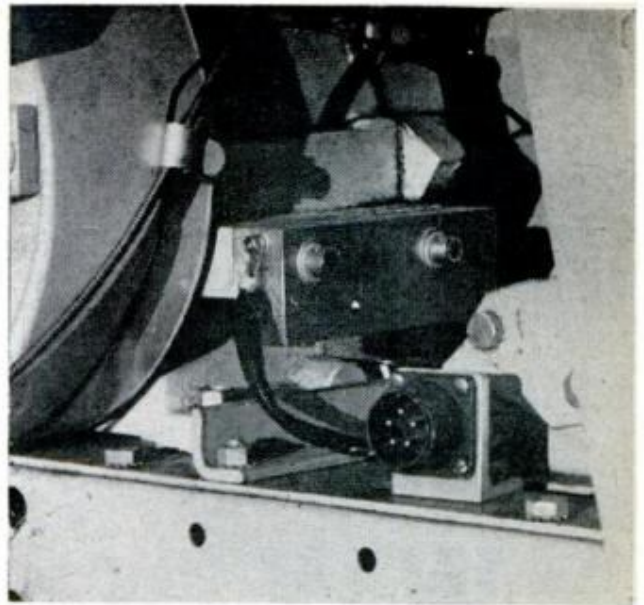
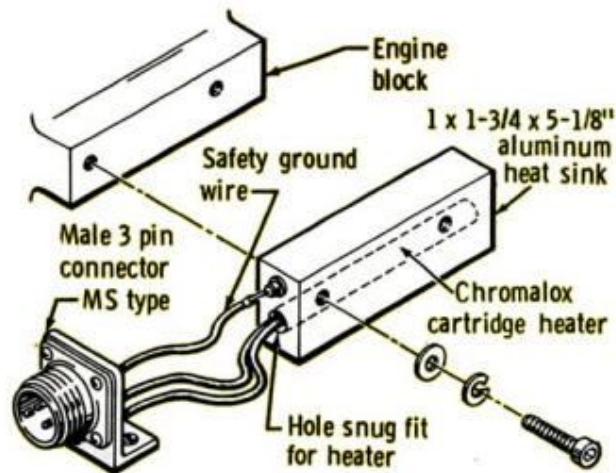
If you think it's the flame on the right, you've just learned once again that looks can be deceiving—it's the flame on the left that's hotter and more efficient. Indeed, since it increases the flame temperature to 2150°F. and operates at 96 percent heat transfer efficiency, Bernzomatic's new Jet Torch lets you cut your normal working time in half—without using more fuel.

Exactly how it manages to combine these desirable characteristics can be understood when the new torch head is compared to the old. The major difference lies with the pump assembly that draws in air and mixes it in the proper proportions with the fuel. The expansion nozzle accelerates the flow of the air-propane mix, thus yielding a richer gas—and a higher temperature—at the burner nozzle. Best yet, price hasn't increased. ★★★





# HINTS FROM READERS



## Add this heater to your snowblower engine for easier starting

Any small gasoline engine is hard to start on a cold day, yet this is exactly the kind of weather you are usually faced with when you're trying to start your snowblower. An easy way to eliminate this problem is to install an electric heating unit on the engine to preheat it.

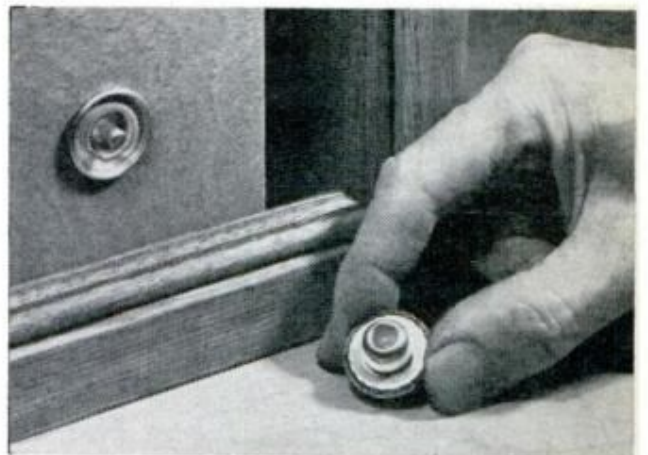
The installation shown above is essentially a 100-w. cartridge heater which fits into an aluminum heat sink bolted to

the engine. The heater shown is made by Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh, Pa. 15208. Simply plug it into standard house current for a short time. This will warm the oil enough to make it easy for the engine to crank over, especially if you start it manually. Most engines have some flat surface with tapped holes for mounting the heat sink.

—Robert German

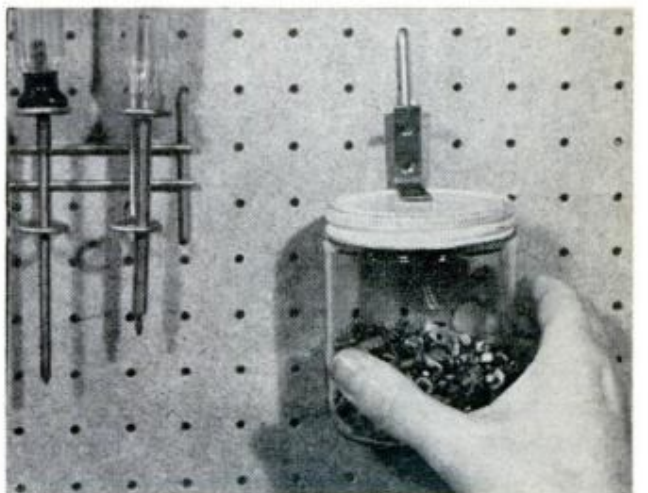
## Novel finger pulls for sliding doors

When you need something to add a finished look to the finger holes in small sliding doors, try using the roll ends from Polaroid No. 47-3000 film. They are a press fit into 1/2-in. holes, so installation is no problem. Just be sure to space the doors sufficiently far apart so that the slight projection of the pull won't interfere with operation. You'll be surprised at how neat they look.—Robert Percival



## Hang storage jars on tool board

Glass jars are ideal for storing small shop items because you can see at a glance what's inside. To make them even more handy, add hanger brackets so you can store them out of the way on the perforated hardboard tool board over your bench. Just make a hole in each jar top and attach an angle bracket with small bolts. The hole in the other leg of the bracket is slipped over a hook.—Ken Patterson



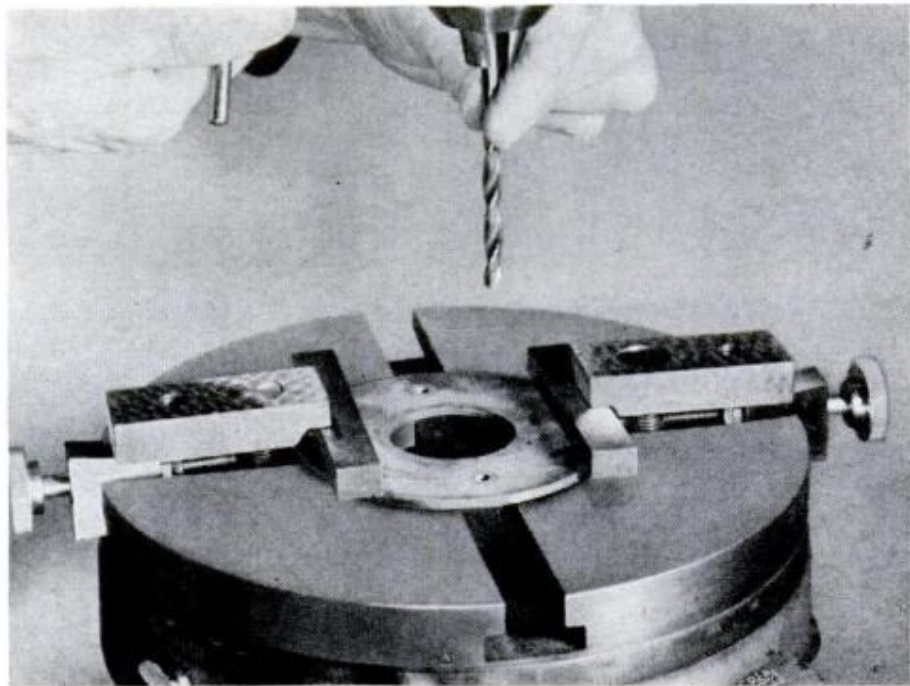
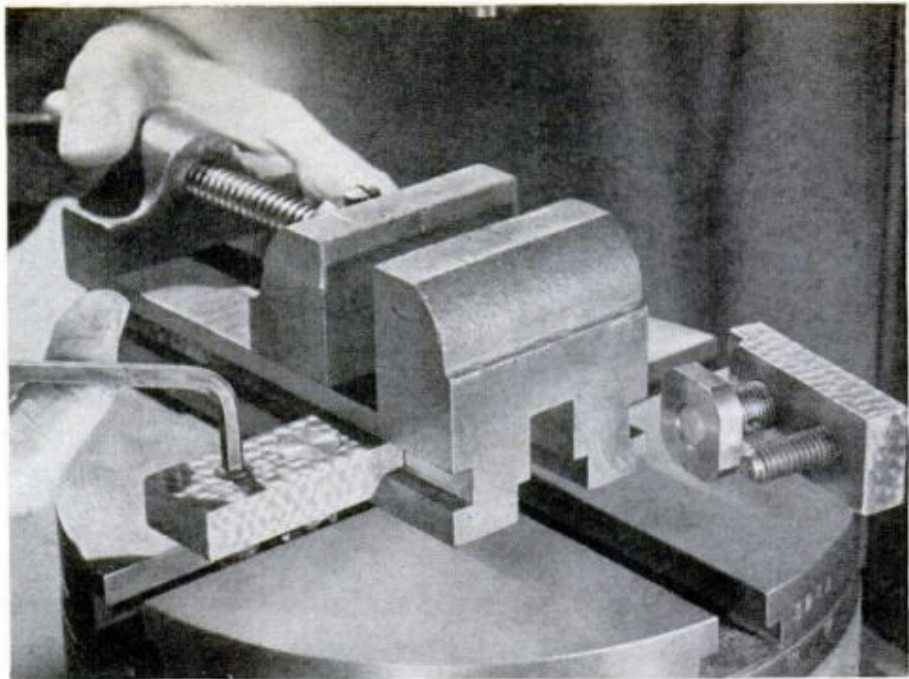


# MAKE THIS 2-WAY

# MACHINE-VISE CLAMP

By WALTER E. BURTON

**SCREW OR WEDGE** can easily apply enough clamping force to hold machine vise; flat pieces of stock; wide or odd-shaped sections too awkward for vise alone. When holding flat work, shims usually are needed



**H**ERE'S AN EASY WAY to clamp a drill-press vise on a T-slotted table without interfering with the work in the vise jaws. It's called a two-way machine-vise clamp and is operated either by a simple screw or a screw-operated wedge that's quick acting and requires no wrench.

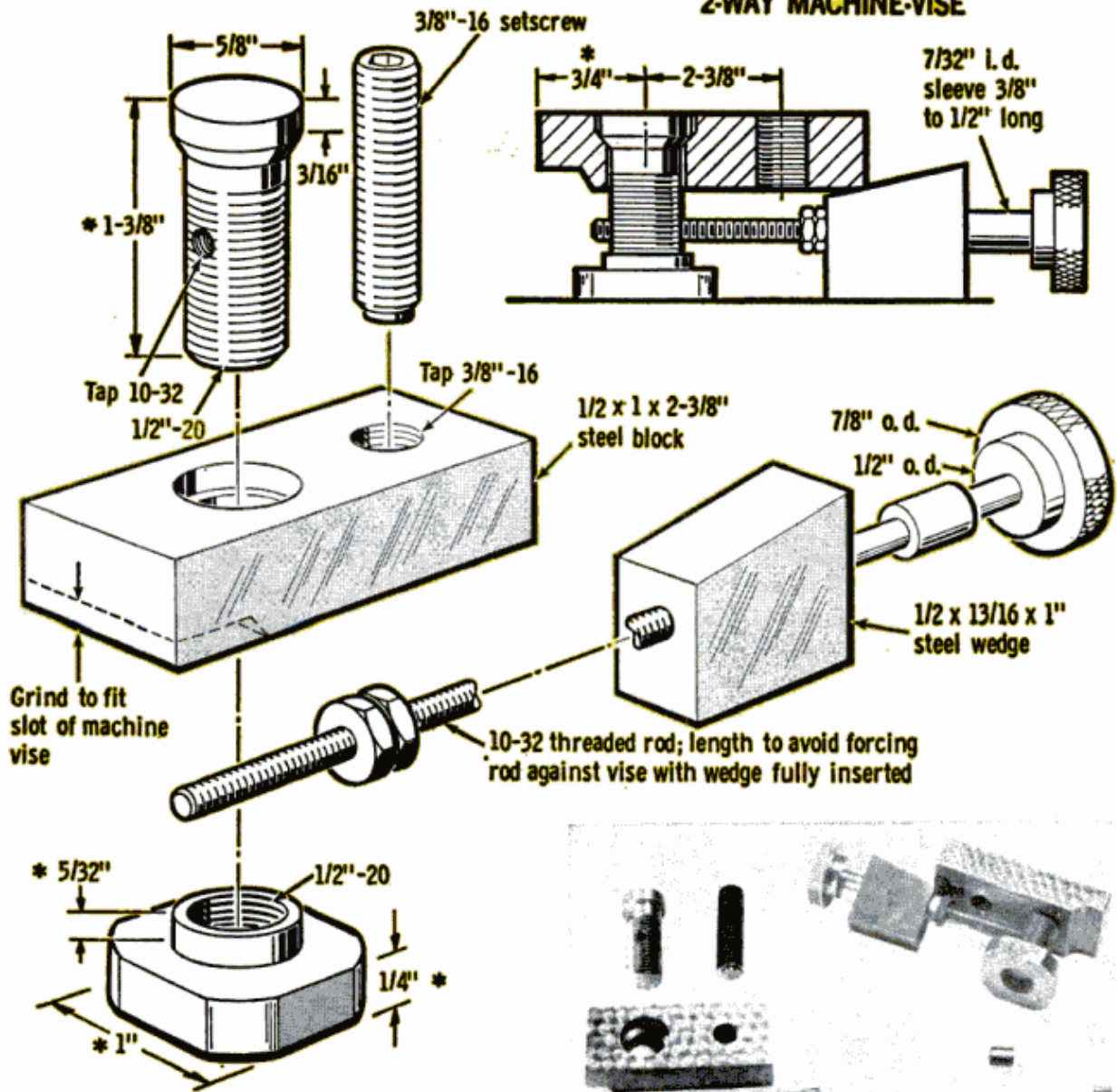
The essential clamp components include the steel block that acts as a lever; a  $\frac{1}{2}$ -20 bolt that serves as the fulcrum; a sliding wedge, and a lathe-turned T-nut threaded

on the  $\frac{1}{2}$ -20 bolt. The wedge slides along the bottom of the table slot and is applied or retracted by turning the long threaded rod engaging the threaded hole through the  $\frac{1}{2}$ -20 bolt. The collar between the knurled knob and the wedge serves to position the knob so it falls outside the table slot.

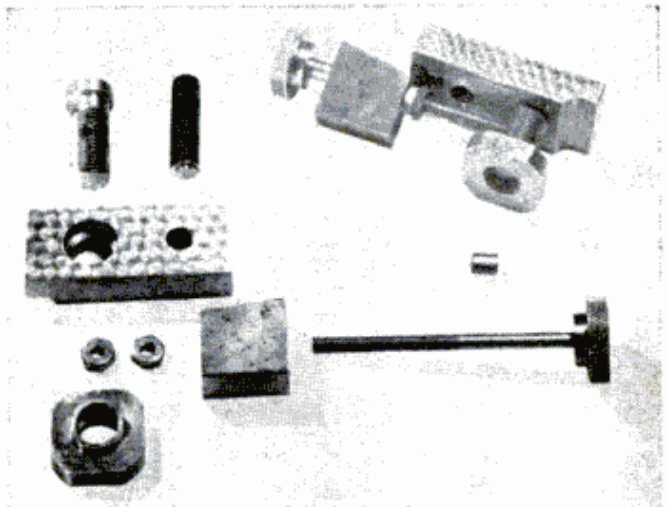
For these parts, you can use either hardenable tool steel or cold-rolled steel, case-hardened where maximum wear resistance is required. The head of the  $\frac{1}{2}$ -20



## 2-WAY MACHINE-VISE



Note: Dimensions accompanied by an asterisk (\*) may necessarily vary according to the size of the vise and machine table of your drill press



MAKE TWO OF EACH PIECE to produce a pair of these dual-action clamps. Above, ready for assembly

bolt should be turned so it is a loose fit in the counterbored hole in the steel block. Similarly, the hole for the long threaded rod through the sliding wedge should be large enough to pass the rod freely. The two locknuts on this rod serve to withdraw the wedge when the rod is backed out of its hole in the 1/2-20 bolt.

The alternate method of applying the clamping force requires an additional threaded hole (3/8-16) in the steel block. Through this extends a matching bolt long

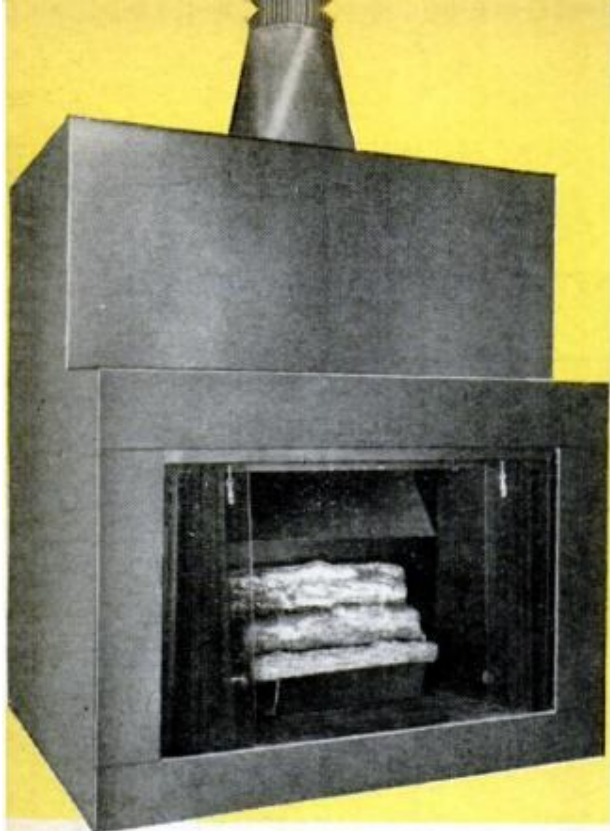
enough to press against the bottom of the table slot, but short enough to keep from projecting above the top of the block. This arrangement is compact and provides good clamping force—but a wrench is required to tighten or loosen the clamp, and the hollow-head screw will tend to fill with metal chips that interfere with the wrench.

As noted, the specific dimensions in the drawing are for the clamps shown. Dimensions marked with an asterisk may have to be varied to suit your equipment. ★★★



# EXCITING NEW PRODUCTS

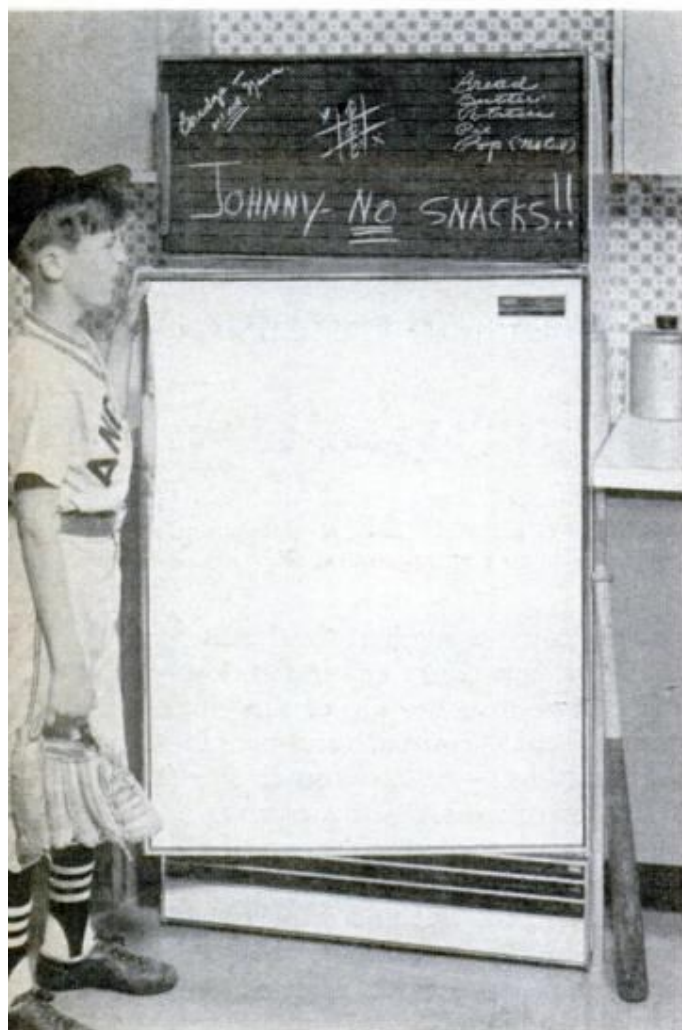
By CAROL SCHULTZ



**GAS-FIRED CIRCULATING FIREPLACE** combines old-time fireplace charm, heating circulation and maximum operating convenience with the easiest possible installation. Unit attaches to an approved 6-inch gas vent, and has pushbutton on-off control. Further information from Majestic Co., Huntington, Ind.



**KRYPTON LIGHT BULB** is smaller and has a longer life than conventional incandescent bulbs. These bulbs filled with krypton gas allow the filament to glow hotter and brighter than the usual bulb filled with argon. The 60 and 100-watt bulbs sell for \$1.29. Made by the Duro-Test Corp., N. Bergen, N.J.



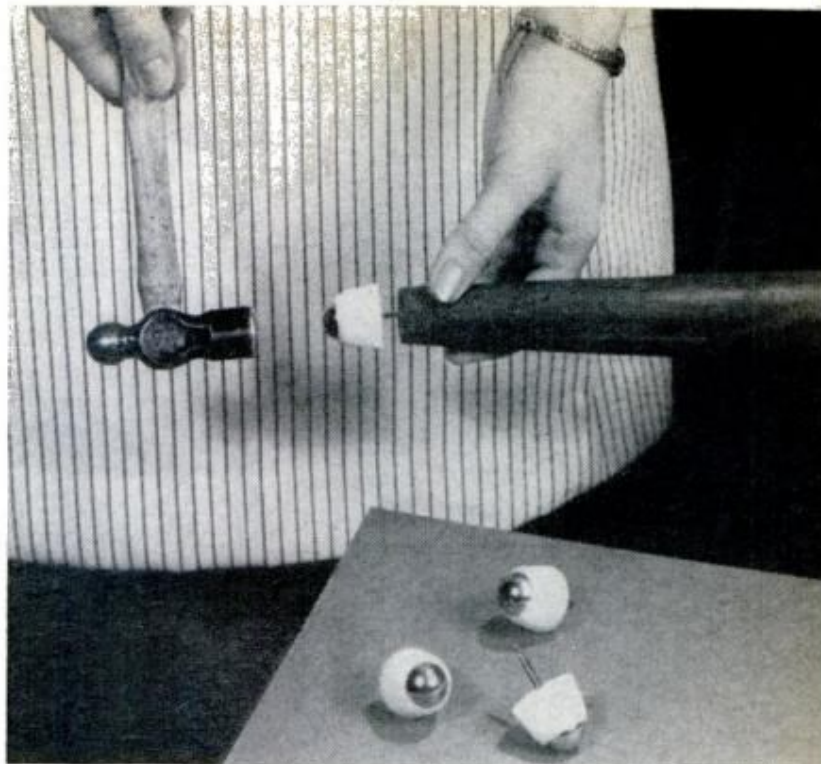
**CHALKBOARD REFRIGERATOR-FREEZER** is a standard model with a removable panel on the freezer part of the door. This panel can be replaced with a chalkboard (as shown) or a wood panel stained to match the kitchen cabinets or wallpapered to match the kitchen decor. Whirlpool Corp., Benton Harbor, Mich.

**LIGHTED HOUSE NUMBER** protects you from the dangers of darkened steps and, also, is clearly identified from the street. Made of heavy plastic with three-dimensional numerals, the unit sells for \$12.48, including postage. Midwest Ind. Corp., Box 267, LaPorte, Ind.

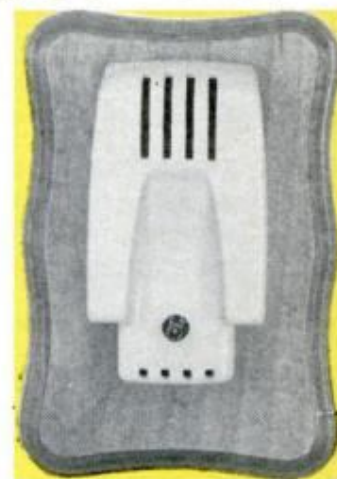
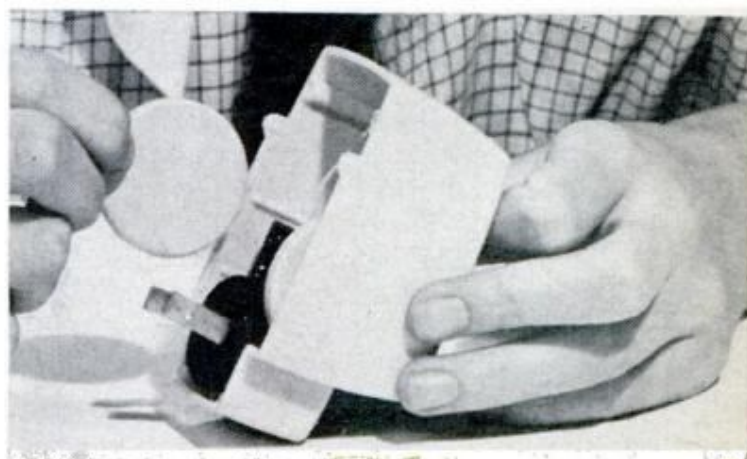




**BALL CASTERS** allow you to move furniture quietly and effortlessly. The brass-plated ball is held in place by a white nylon casing. The caster never needs lubricating and will not rust. It attaches easily. First drill a hole slightly smaller than the diameter of the caster pin in the leg of furniture. Then tap the caster into place with a hammer. Available in several sizes, they sell for 49 to 79 cents per card of four. Manufactured by U. S. Caster Corp., Overland Park, Kans.



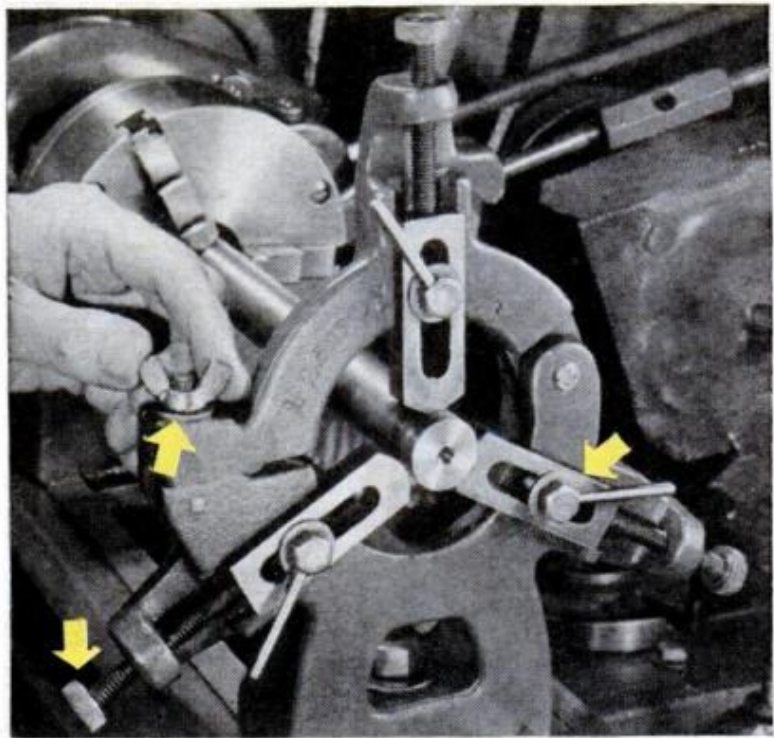
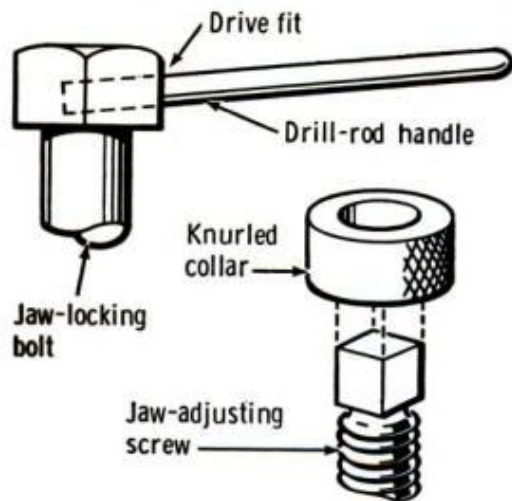
**MOBILE SHOWER** is a flexible-tube shower fitting that connects to your present fixed shower head. It not only works from fixed positions on the wall, but it also can be hand held for close-up showering, rinsing, hosing down the kids, shampooing and even washing the tub. Because there are no changes in plumbing you can install this unit yourself in minutes. For an illustrated folder and price information write to Richard Fife, Inc., 1140 Broadway, New York, N.Y.



**COMBINATION DEODORIZER AND NIGHT LIGHT** plugs into any 110-v. wall outlet and features a receptacle into which a chemical wafer is placed. When activated by heat from the electric bulb, the chemical element gives off a pleasant fragrance that circulates through small air vents in the unit. Fragrances available are pine, rose, citrus, spice, among others. Potency lasts about one month; refills are available. Conair Corp., 20 Harold Ave., Santa Clara, Calif.



# Simplified Setup for Lathe Steady-Rest



ONE WAY TO REDUCE the time required to set up, adjust and remove a conventional steady-rest is to eliminate the need for a wrench. Begin by removing the hex nut from the eyebolt that acts as a latch-and-lock for the upper section. Replace it with a wingnut. Next come the jaw-locking bolts. Drill a hole slightly more than half way through the head of each for a  $2\frac{1}{2}$ -in. length of  $\frac{3}{16}$ -in. drill rod. The rod should be a tight drive fit in the hole. To make this lever-type handle easier to grasp, angle the hole slightly so that it slants away from the rest. The handle position can be changed by varying washer thickness.

Next, install a knurled collar on the square head of each jaw-adjusting bolt.

Knurl a length of  $\frac{5}{8}$ -in. steel or brass rod and drill a lengthwise hole through it somewhat smaller than the diagonal measurement of the bolt head. Cut this knurled tube into  $\frac{3}{8}$ -in. sections and drive one on each bolt head.

While this changeover allows for finger tightening on all adjustments, you can still use a wrench to loosen nuts which have been turned too tight.

—Walter E. Burton

## NEXT MONTH IN SHOP AND CRAFTS

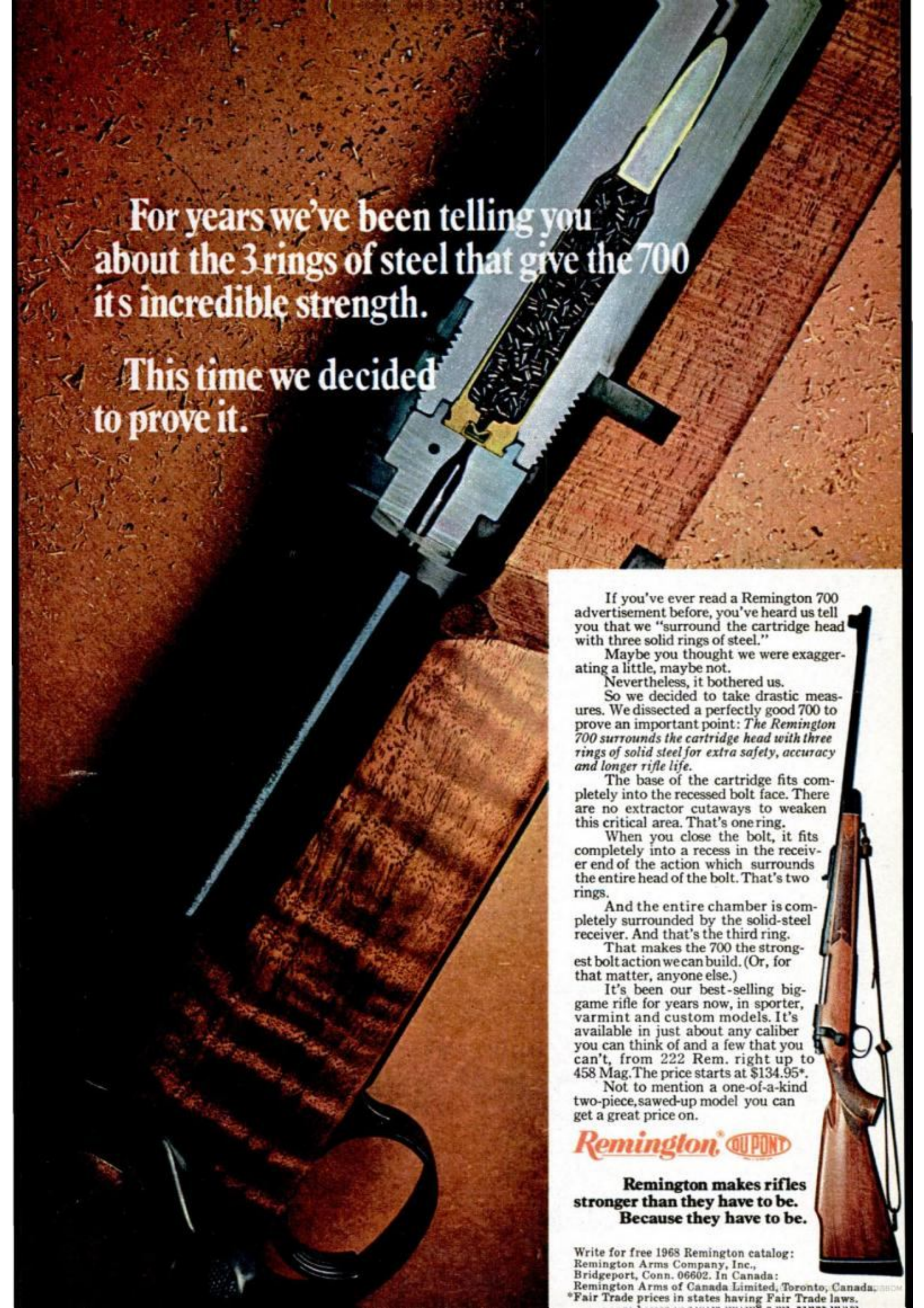
**BUILD A GRAND PRIX RACER—MINI STYLE.** Radio-controlled, gas-engine powered automobiles are finally available. Next month's exclusive kit-building report tells how easy it is to build and race a 2-ft. Jaguar featuring throttle control, clutch, full proportional steering and dynamic braking. You can operate it any distance up to a mile away!

**BUILD A WORKING WALL—PART 2.** Next month, *PM* will feature another versatile bookcase wall unit that accommodates everything from a stereo system to a concealed typewriter desk. It's a beauty in Early American. Complete plans will make it a cinch to dress up any wall—functionally as well as aesthetically.

**MUSICAL CENTERPIECES FOR CHRISTMAS.** Photographed in striking color, these handsome projects all have one thing in common. They're all designed to accept a tape recorder that will play suitable Christmas carols. The three units detailed are a candelabra, modern Christmas tree and an unusual tree base.

**ALL YOU NEED TO KNOW ABOUT WEATHERSTRIPPING.** If you've got any loose-fitting doors or windows, it won't be long before an icy draft reminds you of the need for weatherstripping. To learn all about the astonishing variety of new materials and shapes available, read this fact-filled article in the December *PM*. It's required for savvy shopping.





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## COLOR TV

(Continued from page 95)

different colored blobs. Note that the red blob is off-center.

Adjust the purity rings as much as necessary to center the red blob. Then turn off the set and slide the yoke back toward the front (bell) of the picture tube. It doesn't need to be pushed all the way against the bell—just far enough to fill out the red raster. There should be no contamination.

You may have tilted the raster accidentally by rotating the yoke while sliding it backward and forward. The tiny raster lines must be exactly level across the screen. If they're not, level them by rotating the yoke slightly before you tighten its clamps. Turn the Blue and Green Drive and Screen controls back up to where they were. The raster should be approximately white. It might have a slight color cast overall, but there should be no color contamination in any small portion of the screen. You'll cure that overall color cast in the next step.

The white raster of a color-TV set is actually three separate color rasters—red, green and blue—evenly mixed. If the three color rasters are all exactly the right strength, the white raster will be true white. If one is a little stronger than it should be, the whole white raster will take on a slight shade of the dominating color.

Any TV picture consists of several shades of gray from nearly white to black. This is known as the *gray scale*. The mixing of all three raster colors must be the same throughout the gray scale.

Strength of the color rasters in bright parts of the gray scale is controlled by the Drive controls. In the darker shades of gray, the Screen controls have more effect. Making the gray scale of a color set accurate is merely a matter of setting the various Screen and Drive controls. (Professionals call this making the gray scale "track.")

Start with a picture tuned in and with Contrast and Brightness set for normal viewing. At the back of the chassis is a switch usually labeled Service/Normal. Flip it to the Service position. The raster will disappear and leave only a thin white line, or perhaps nothing but a dark screen. Turn all Drive and Screen controls counterclockwise to minimum.

Bring up the Red Screen control until you can see a thin red line on the screen. Reduce the control until the line has barely disappeared. Do the same with the Green Screen control, and then with the Blue Screen control.

It is possible that one of the Screen controls can't be turned up high enough to show the thin colored line. If so, search the rear apron of the chassis for a switch or control labeled CRT Bias or Kine Bias. Turn up this control or switch until the weak Screen control can make a visible line, then leave the Bias control in that position. Go back, then, and readjust the other Screen controls because changing the Bias control affects all of them.

Set the Drive controls at midrange. Your color set may have only Red and Green Drive controls, for Blue Drive is often omitted. It may have only one Drive control, with an associated switch to determine which color is affected by it.

Now flip the Service/Normal switch back to its Normal position. Up front, run the Brightness control up and down to see if the raster takes on a greenish cast at some point, cut down on Green Drive a little. If reddish, cut down on Red Drive. If brownish, cut down on both. If bluish, turn both Red and Green Drive up slightly.

Your goal in gray-scale adjustment is a clear white raster at all levels of brightness. If the overall raster color seems too "warm," a little more blue from a Screen control will make it "cooler." Under most conditions, though, the initial adjustments (with the Service switch on) will produce a pure white raster.

Besides needing exactly the right amounts of red, green and blue, the color rasters must be superimposed precisely. Otherwise, when a picture is added, you may see fringes of color around figures in the scenes. This is less noticeable on color shows, but can be very annoying on black-and-white programs. The fringes mean that the rasters are not converged properly.

### The next step: Convergence

This is a good place to stop if you have any doubts. Converging a color set requires much, much patience. You also need a special convergence pattern on the TV screen. Professional technicians connect up an instrument called a dot-bar generator, which makes a pattern of dots or lines on the TV screen. The generator is connected to the set's antenna terminals. You may be able to rent one of these instruments or borrow one from a friend. If you'd like to build one, the Heath Co., Benton Harbor, Mich. 49022, sells a kit for \$67.50.

There are two distinct steps in converging the three rasters precisely. The more difficult step is called *dynamic convergence*. It affects the edges of the rasters and cures fringing. Dynamic convergence



is complicated and is best left to a professional. Furthermore, a color receiver must be in dire need of dynamic convergence before it is obvious from normal viewing distances.

The easier adjustment is called *static convergence*. It affects raster alignment over the entire screen. The adjustments for this are at the rear of the picture tube and are shown labeled in accompanying photos. You'll need a mirror so you can watch the screen as you adjust them.

Use the dot pattern produced by a dot-bar generator. Locate the dot nearest the center of the screen. With the red, green and blue static convergence adjustments, separate the white center dot into three colored dots. Very carefully, set each control so the three dots are positioned in a triangular arrangement with red at upper left, green at upper right and blue at lower center. This is shown in an accompanying color photo.

#### Moving the dots is tricky

Slowly, moving each a little at a time, bring the red dot and green dot together until they blend. This is best done by moving the red dot into the expected diagonal path of the green dot, as indicated by the diagram, and then moving the green dot down to superimpose the two. It may take two or three tries to get them together perfectly. The result is a yellow dot. Somewhere below this will be the blue dot.

Before you adjust the regular blue static adjustment, adjust the *blue lateral magnet*. It moves the blue dot sideways, whereas the other one moves the blue dot up and down. The lateral adjustment should position the blue dot exactly under the yellow dot. Then use the regular blue static control to move the blue dot upward to blend perfectly into the yellow dot, forming white. Refine the adjustment with both blue controls.

The dots may not be all the same size, but they should all be centered. This concludes static convergence. If there is fringing of dots within four or five inches of the edges of the screen, the set could probably use the rest of the convergence procedure. ★★★

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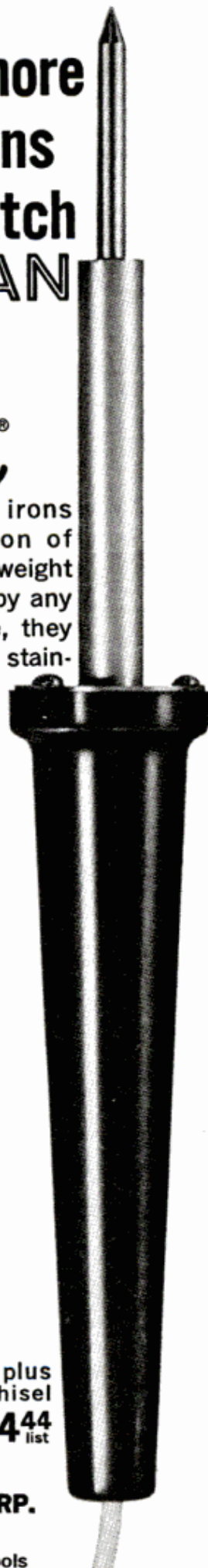
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| TYPE # | INCH   | TAP | NO. OF TAPS | DRILL   | DRILL  |
|--------|--------|-----|-------------|---------|--------|
| 1      | 1/4"   | 4   | 12          | 3/16"   | 1/8"   |
| 2      | 3/8"   | 4   | 12          | 5/16"   | 3/16"  |
| 3      | 1/2"   | 4   | 12          | 7/16"   | 1/2"   |
| 4      | 5/8"   | 4   | 12          | 13/16"  | 5/8"   |
| 5      | 3/4"   | 4   | 12          | 1 1/16" | 3/4"   |
| 6      | 7/8"   | 4   | 12          | 1 1/4"  | 7/8"   |
| 7      | 1"     | 4   | 12          | 1 1/2"  | 1"     |
| 8      | 1 1/8" | 4   | 12          | 1 3/8"  | 1 1/8" |
| 9      | 1 1/4" | 4   | 12          | 1 1/2"  | 1 1/4" |
| 10     | 1 3/8" | 4   | 12          | 1 5/8"  | 1 3/8" |
| 11     | 1 1/2" | 4   | 12          | 1 3/4"  | 1 1/2" |
| 12     | 1 3/4" | 4   | 12          | 1 7/8"  | 1 3/4" |
| 13     | 1 7/8" | 4   | 12          | 2"      | 1 7/8" |
| 14     | 2"     | 4   | 12          | 2 1/16" | 2"     |
| 15     | 2 1/8" | 4   | 12          | 2 1/8"  | 2 1/8" |
| 16     | 2 1/4" | 4   | 12          | 2 1/4"  | 2 1/4" |
| 17     | 2 3/8" | 4   | 12          | 2 3/8"  | 2 3/8" |
| 18     | 2 1/2" | 4   | 12          | 2 1/2"  | 2 1/2" |
| 19     | 2 7/8" | 4   | 12          | 2 7/8"  | 2 7/8" |
| 20     | 3"     | 4   | 12          | 3"      | 3"     |

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## THE RIGHT TAPE

(Continued from page 110)

for them. If you're just horsing around with your recorder, you need nothing better. Only attentive listeners will spot the flaws. But no tape is a bargain if it damages your recorder. It can do this by grinding down the metal surfaces of the magnetic heads and tape guides. To prevent such abrasion, all tapes contain lubricating substances. On poorly manufactured tape, the lubrication evaporates because it is not worked properly throughout the tape. Luckily, dry tape sounds its own warning: It squeals as it runs through your machine.

Poor tape also sheds its oxide as it rubs against the recording and playback heads. This makes a fine grinding compound. It also clogs the narrow head gaps that "read" the signal on the tape. Clogged heads are for a tape recorder what a stuffy nose is for the human voice. So check your tape heads after trying a new kind of tape. Swab it with some cotton. If it comes off red, switch to some other tape. (Naturally, you have to start out with clean hands to make this test valid.)

Thumb through the tape section of any audio catalog and you'll come across a couple of special types of tape. Low-print tapes, for example are designed to cut down print-through—the cross-magnetizing between neighboring tape layers as they are wound on the reel. Given years of time, each layer of tape will print its own echo on the next layer. Low-print tapes retard this process. They are of special interest for archives of documentary recordings.

High-output tapes are another type. They can take a real wallop of a signal without overloading. They're fine for bass-drum soloists and tuba virtuosos, for analyzing earthquakes and for cannon fanciers. Like low-print tapes, they require special adjustments to be made inside your recorder (bias and equalization). This gets tricky, and chances are you can get along without these special-purpose tapes.

With these guidelines, you can do your own exploring in the tape jungle. After you've tried various brands and types on your machine, you're bound to find one that gives you just what you want in both price and performance. ★★★

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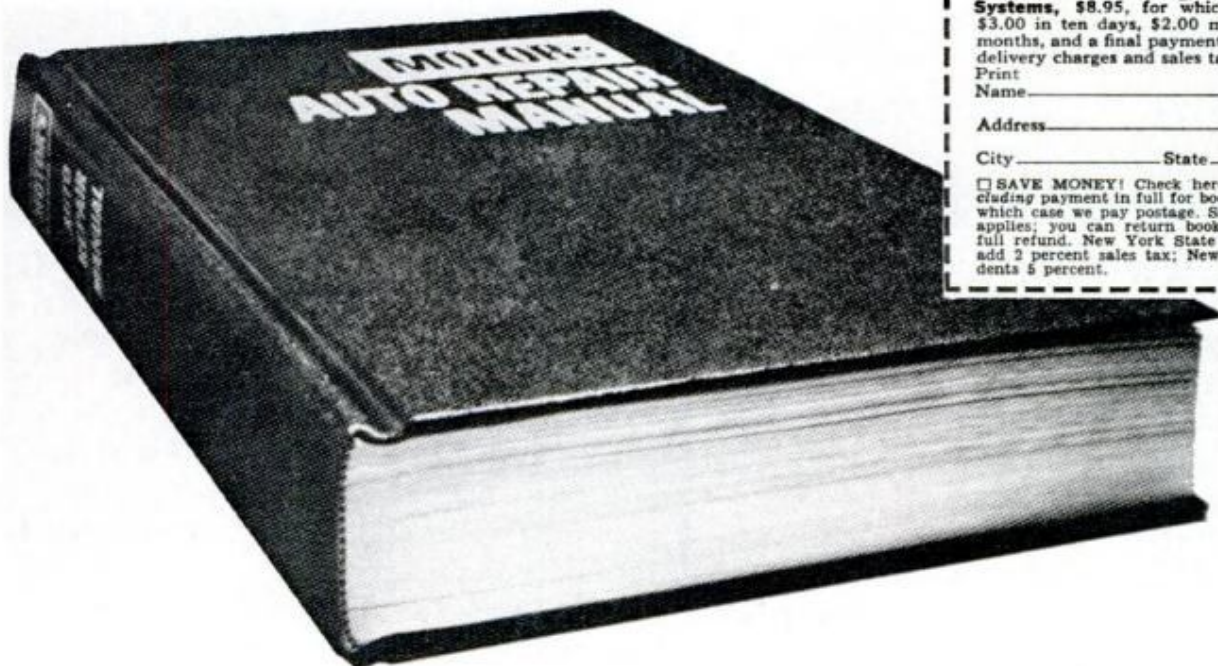
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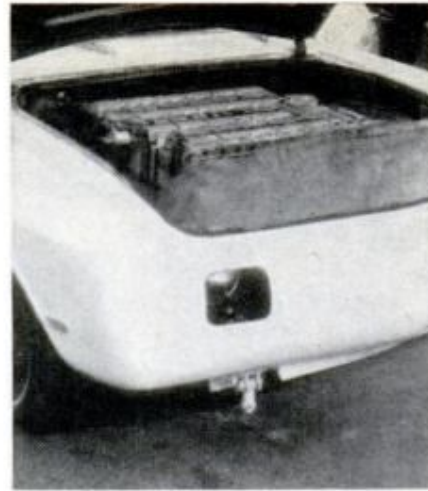




**NICKEL-CADMIUM** cells, rated 75 ampere-hours each, are installed



**BACK SEAT AND FRONT BOOT** contain 320 cells arranged in four, 80-cell, 100-volt packs. Headlight cutouts are also cooling-air scoops



## MIT'S ELECTRIC CAR

*(Continued from page 52K)*

towels on the motor at charging stops, did the trick.

Battery cooling, which had already been planned for by Fred Kern, and Norm Marx's body modifications of ducting air flow into the front compartment through the headlight cutouts, past the front battery packs, into the passenger compartment, around the rear battery packs, and out the exhaust vent scalloped into the right side of the Corvair, could only be improved slightly. We raised the top pack of 80 cells in the rear area about four inches above the bottom pack to allow more air flow. We got the batteries, all 2000 pounds of them, back into the car, got everything reconnected and amazed ourselves by making it to the starting line for the gun.

With New Englanders Chuck Kaminski and Jim Martin, electrical engineering juniors, piloting and copiloting, Tech I zipped down the Massachusetts Turnpike in an impressive start. At 50 mph, 5200 pounds of electric car and drivers effortlessly passed a press truck loaded with photographers and kept the back-up caravan, including *PM's* Bill Hartford, jockeying their infernal, pollutant-producing internal-combustion-engined vehicles in order to observe what was to be the first electric car to cross the continent. (We got to Caltech before Wally Rippel got to MIT in his lead-cobalt, battery-powered VW, but total adjusted time, taking into account towing time, gave Wally the win with a total of 210 hours and 3 minutes to our 210 hours and 33 minutes.)

My car, "Unit Zero" in our CB radio link, pulled up to lead position to spot charging stations along the route. Using a charging unit engineered by Bill Carson, mechanical engineering senior, cells can be charged in 10 minutes with 400 amps.

"Unit One," or Tech I, the electric car, radioed nothing but good reports until we were 25 miles out of MIT. At that point the car radioed an alarm and came to a quiet, dead stop on the shoulder of the pike. Behind it pulled "Unit Two," a test-equipment and luggage-loaded station wagon, driven by Prof. Richard D. Thornton, our indefatigable advisor from the Dept. of Electrical Engineering. Fred Kern pulled his '65 green Corvette in ahead of Tech I to hook up for the tow into the charging stop at Worcester—first of 53 prearranged charging stops at power company stations where high current would be available.

The actual reason for the shutdown, which came far short of the expected charging interval of 80 miles, was exhausted batteries. Apparently the pre-race slow discharge and recharge treatment was not entirely successful and the batteries could not be charged up to full capacity. This problem continued for several charging stops until we hit Albany. There we decided that piling ice cubes on the batteries might enable us to discharge them even further. The only danger was that the cubes would all slide down the drivers' necks in a quick stop. They gambled, and the ice did increase our range. But by the time we reached Buffalo our range was back to 20 miles or so. During the first 400-some-odd miles of the race our car was towed about half the distance and this really hurt our chances.

We decided to make a last-ditch call to Gulton Industries, manufacturer of the batteries, to see if there was some way to regain their full capacity. They suggested a cure-or-kill approach, over-charging them approximately one-and-a-half times their rated capacity. This really worked. We sailed past Buffalo to the next charging stop, 35 miles west—the first leg the

*(Please turn to page 186)*



# When does a tape rule get too heavy?

## ALMOST ALWAYS!

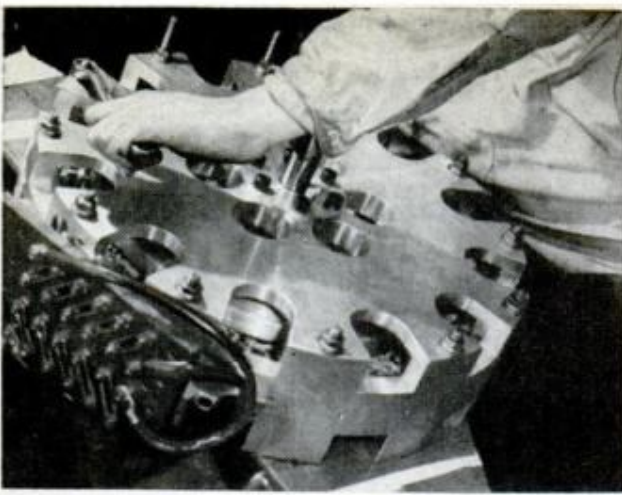
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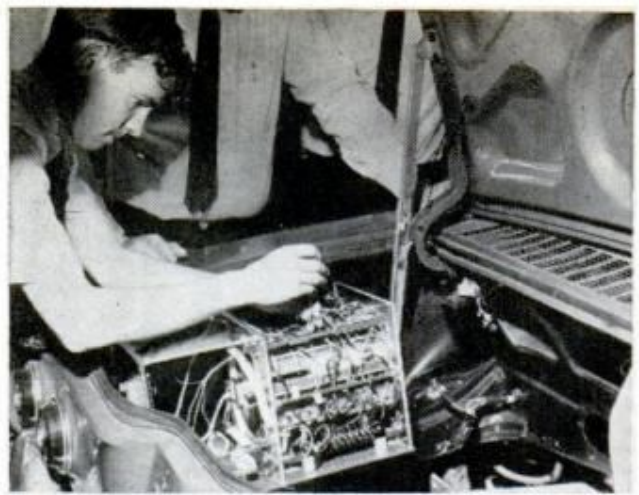


SAGINAW, MICHIGAN 48601  
A DIVISION OF  COOPER INDUSTRIES, INC.





**SOLID-STATE COMMUTATED MOTOR (SSC)** gives high power-to-weight but wasn't ready in time for race



**TRANSISTORIZED CONTROL UNIT** for SSC motor provides high frequency switching of stator currents

## MIT'S ELECTRIC CAR

*(Continued from page 184)*

car made a full run under its own power.

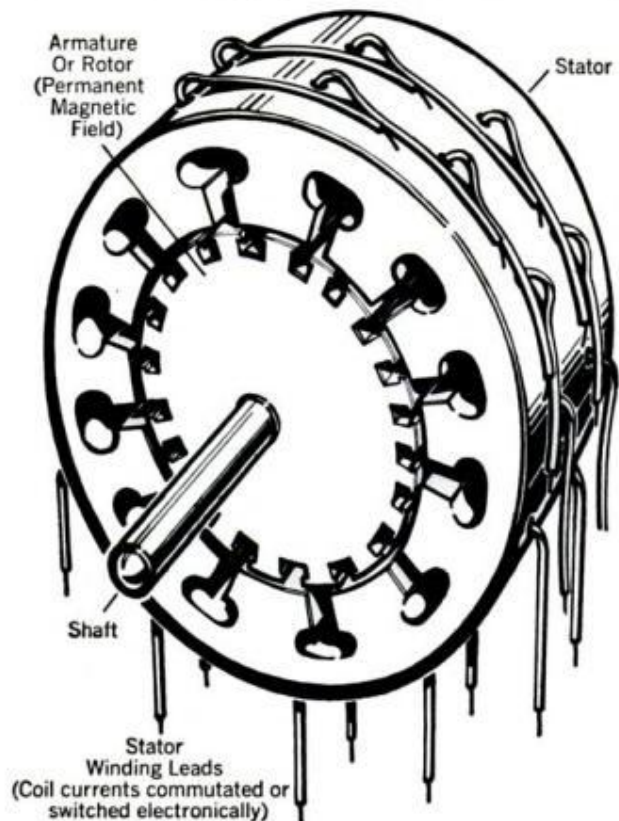
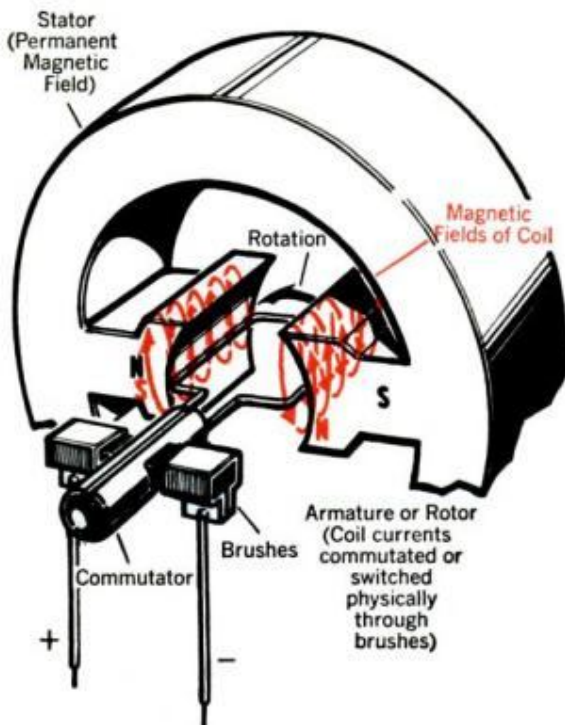
The next leg was a full 60 miles, and all of us were flying high when we cruised up to the transformers an hour and a half later. More "good" news greeted us in Ohio when we learned that Wally's "Socket-to-me" VW was down and out in Arizona with a burned-out motor.

While we gloated, he got another and got back on his way—after losing many hours.

But smiles were really wiped off our faces when in Indiana. While charging up, a bronze motor terminal went zap! It melted into a blob, obviously from a short circuit, but we still don't know what caused it. It took ten hours to repair the damage and install a new terminal.

Back on the road, we "supercharged"  
*(Please turn to page 188)*

**A CONVENTIONAL D.C. MOTOR**, which was planned to be just a back-up for a high-efficiency solid-state commutated (SSC) motor, ran the whole race. Drawings below compare the two types. D.c. motor at left turns when opposite magnetic poles on stator and armature repel one another. Single coil (representing many on a real armature) has magnetic field established by current through it. Split commutator switches direction of current to switch poles so opposites keep repelling to maintain rotation. In the car, armature shaft connects to the transmission. SSC motor at the right has permanent magnetic field on armature while magnetic fields in the stator are rapidly switched electronically at higher frequency than possible with a commutator. Students are anxious to get back to work on the highly efficient SSC motor design





# are you ready to own a business of your own...

**WITH A MONTHLY  
PROFIT POTENTIAL  
OF MORE THAN \$3,000?**



## WOULD YOU BE INTERESTED IN SUCH A BUSINESS, RIGHT NOW, IF YOU COULD BE CERTAIN OF SUCCESS BEFORE RESIGNING YOUR PRESENT POSITION?

Are you ready, right now, for the joys of independence and the many benefits you can enjoy as the owner of your own business? Do you want a business offering rapid growth with built-in repeat profits? Would you consider giving up your job and your present pay check if you could prove beforehand—in spare time—that your weekly or monthly profits could pay you two, three, and even four times as much in cash? Would you like to learn more about a business you can own outright in which you make profits not only on your own efforts, but many times more from the work of others?

It is such a business that we invite ambitious men to consider. With a spectacular record of response in many areas of the United States, our corporation is now ready to appoint Pathway Plan Sales Coordinators in a limited number of additional marketing areas. If you have a thirst to enjoy independence in a business of your own; if you can invest a modest amount in establishing a business with an almost limitless future, you may be eligible to take advantage of this rare opportunity—"rare" because once an area has been assigned it is unlikely that it ever will be available again.

Our success and the success of our Coordinators has been built on two things—Product and Plan. Both are unique.

In describing just one of our products, a highly regarded marketing consultant said:

"Seldom have I had a product submitted which so perfectly meets all the prime requirements for instant acceptance by the public, tremendous volume, and sustained and growing repeat business. The fact that Haste® is needed in every household gives you a universal market. The fact that the housewife can, for less than \$3.00, get the equivalent of approximately \$30 worth of all the cleaning compounds she is now buying in the supermarket makes her an eager customer. The fact that this product accomplishes cleaning chores beyond the scope of most products makes it extra desirable. And, finally, the fact that it is used up and re-ordered month after month gives it a growth potential found in only a few other non-food products."

That description fits one of a group of products offered under the Pathway Plan. All the other products are equally unique, and all are the result of modern technological advances in the research laboratory.

All the products provide such sensational demonstrations that the housewife who witnesses their action cannot resist buying. And, as with all extraordinary products, the woman who first uses Haste® can't wait to tell her friends of her "discovery."

The second factor which makes possible a profit potential in excess of \$3,000 a month is the Pathway Plan. No Pathway product is available in any retail store. All Pathway products are delivered to the home by individuals working under you who have regular routes to cover. As a Sales Coordinator in your area, you may have from five to as many as 30 such persons distributing the products they must obtain from you. The number working for you will be controlled to some extent by the number of households in your territory.

The men or women who may be appointed in the new areas now to be opened will receive complete training in the operation of their businesses. They will be shown how to hire and train others. Our Executive Staff will spend the time necessary to launch each Coordinator on the road to success, and will be available for help in promoting the rapid expansion of each business.

The Pathway Plan incorporates many of the advantages usually available only under a costly franchise. The profit potential is so great that you might expect to pay as much as \$10,000 in franchise fees or a continuing percentage of your profits. However, there is no franchise fee and there is no percentage to pay. You keep all the profits. Your total investment is protected by a physical inventory of products which have a resale value in excess of \$5,000. Your total investment is \$3,950, but for persons who are acceptable to the company, we will finance most of the cost, bringing the cash requirement to one any family can afford. This covers all materials, all training, and all direction and help from our home office staff.

The Pathway Plan is not one for dreamers or for those who expect success without effort. To derive the greatest profits from this Plan and Product requires the time, effort and enthusiasm of capable men (or women) who can follow the

clearly charted and proven methods developed by the parent company. If you have had some sales experience, it will count in your favor, but it is not essential to success. If you have had some experience in business management, it will be helpful, but, again, it is not necessary. The prime requirements that we look for in a Pathway Coordinator are enthusiasm and willingness to put forth the effort upon which every success is based. Not all those who apply will meet the requirements of our executive screening committee, but if you have the determination to be master of your own destiny and personally and financially independent, you will want to investigate the Pathway Plan.

We will be glad to mail complete information to anyone who has a belief in himself. All information will be mailed entirely free and postage paid. No salesman will call to influence your decision.

After learning details of the Pathway Plan, if you are then interested in one of the areas now available, we will arrange for a personal interview in which we will disclose every facet of the Plan and acquaint you with the spectacular characteristics of Pathway products. Based upon what you learn, you will then decide whether or not you wish to apply for appointment as a Pathway Sales Coordinator.

Asking for this information does not put you under the slightest obligation. But, we make one request. If you do not have a strong desire to be the sole owner of a profitable business of your own; if you do not have the funds necessary to invest a modest amount in your future, don't waste your postage.

To get complete information by mail, it is only necessary to fill in and mail the "Request for Information" printed below. But, do not delay as the towns in which we will establish Coordinators will be closed up within the next few weeks.

### PATHWAY PRODUCTS CORPORATION



60 Pompton Ave., Dept. 8-A2N  
Verona, New Jersey 07044

## REQUEST FOR INFORMATION

Gentlemen: I am interested in receiving further information about your Pathway Plan of Marketing and Pathway products. Please mail facts to me, postage prepaid. It is understood that no salesman will call on me. After reading the facts I will let you know whether I am interested in discussing the potential in my territory with a company executive.

If I decide to apply for appointment as a Sales Coordinator, I can make a modest investment. If I do apply, I will want to be considered for:

PATHWAY PRODUCTS CORPORATION, 60 Pompton Ave.,  
Verona, New Jersey 07044 Dept. 8-A2N

Please Print Name \_\_\_\_\_

Address \_\_\_\_\_

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

(Name of Town) \_\_\_\_\_





**EXHAUSTED BATTERIES** forced Tech I to the side of the pike for its first of several tows of the race

## MIT'S ELECTRIC CAR

*(Continued from page 186)*

—as we came to call the overcharging treatment—our way from station-to-station with no problems. Batteries were up to about 100 percent rated capacity. Relieved of technical worries, our drivers must have found the going too easy, so they proceeded to get lost. They switched from Interstate 80 to U.S. 66 as planned, but took the northbound direction—that's not the way to California! I was too far ahead for them to have seen me. I headed south while maintaining radio contact as usual. I wondered why reception began to fade. Alas, I was quite alone. Tech I, with

its entourage of towing car, support vehicle and judge's car, was six miles closer to Canada and closing the distance. Somehow, somewhere they all managed to U-turn and my reception got better.

This goof was quickly forgotten when Tech I rolled into Dwight, Ill., under its own power and we realized it had logged 86 miles, the longest single run of the race. Top speeds for the race were 55 mph on level ground, 75 mph downhill.

The long haul from the Midwest to the California line went quite smoothly. Except for getting lost in St. Louis, incurring a leaky cell by blocking a vent cover, starting electrical fireworks at an Oklahoma power pole and being sired to the curb by local police, we found the race no different than a pleasant Sunday drive in the family car.

But on the final day of the race, we lost it. Fatigued as we were, we did ourselves in with human error. A wrong connection on our charging unit in Newberry, Calif., wiped out the unit, and then towing the car in low gear instead of neutral overrevved the motor and destroyed the armature and commutator. We couldn't get a new motor in the eight hours it would take to tow Tech I to Pasadena, so we towed and took the penalty. Towed across the finish line!

It was a lost race no matter how you figure it, but an exciting one and an educational one. And when several of us from the MIT team present papers on electric-vehicle technology at the annual meeting of the Institute of Electrical and Electronic Engineers in Boston this month, the race will have given a boost to continuing research on a feasible exhaust-free electric car. ★★★

**FILLING 'ER UP** with electricity isn't as easy and quick as pumping gas into the family car—not yet







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PM 11-68

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**PSYCHEDELIC HI-FI CONSOLE** displays swirling patterns of light and color on a screen in time with music. The colors are triggered by different frequency bands and change rhythmically as different notes are played. They can be actuated by the console's radio or record changer or by a microphone or electric guitar. The Olympic set is sold by Lear Siegler, 34-01 38th Ave., Long Island City, N. Y.



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CL-339



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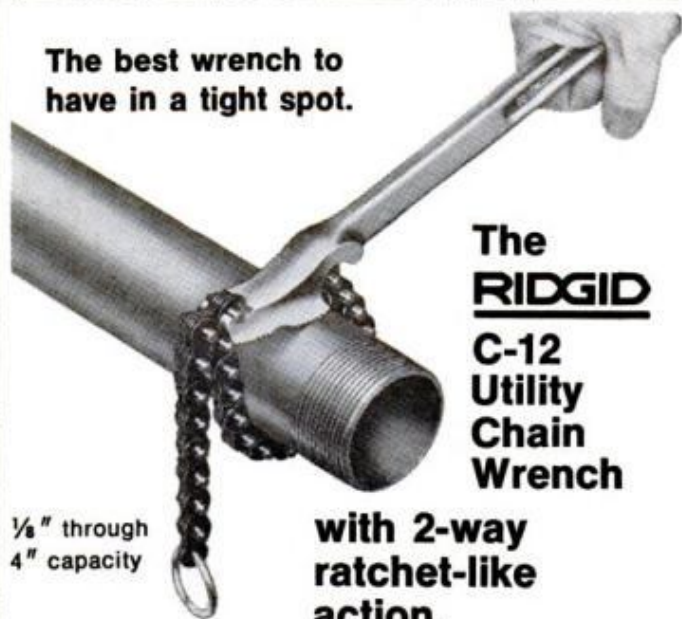
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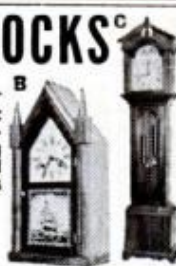


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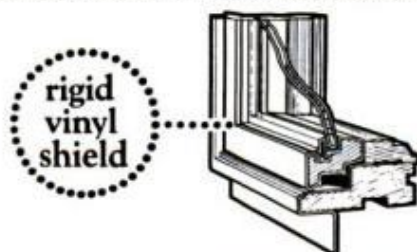
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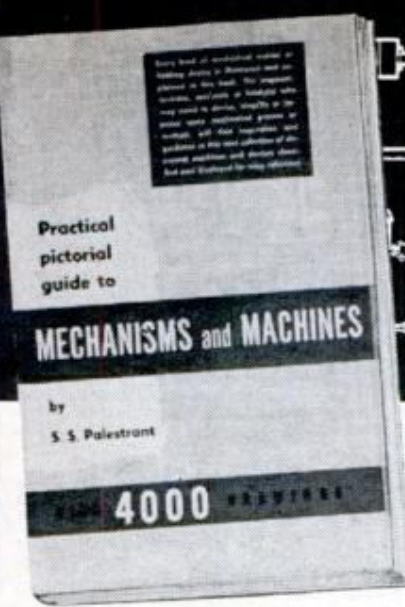
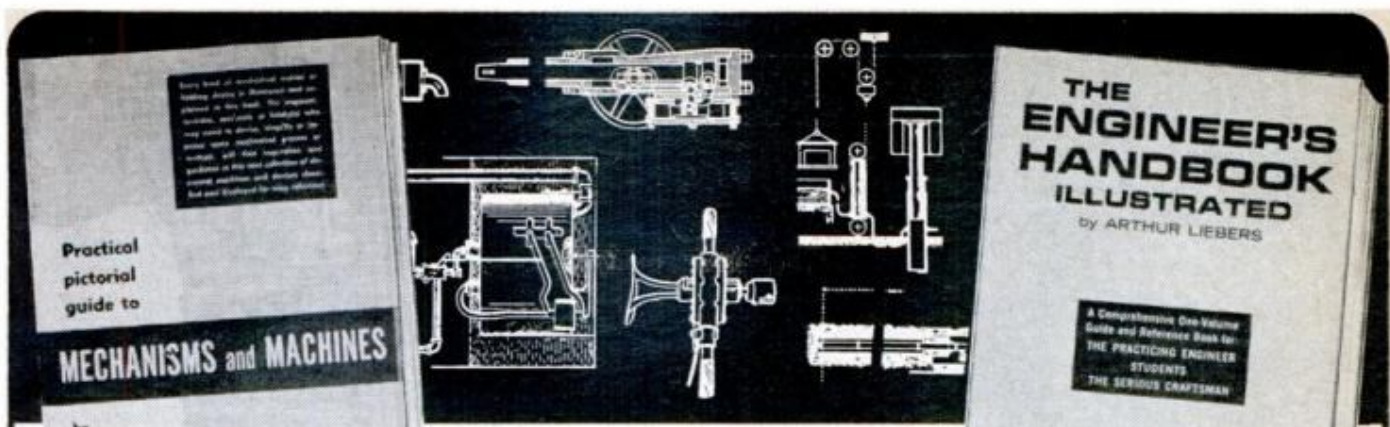
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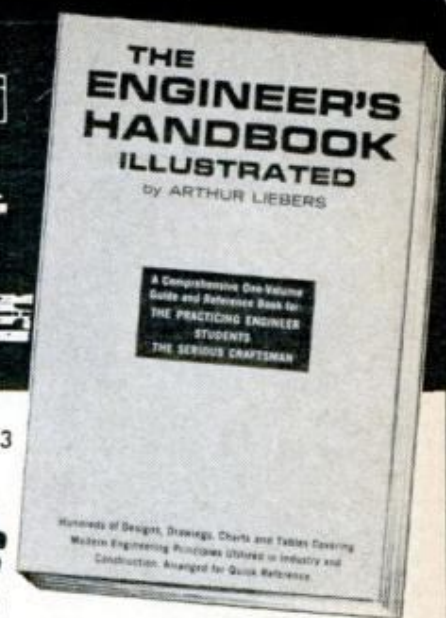
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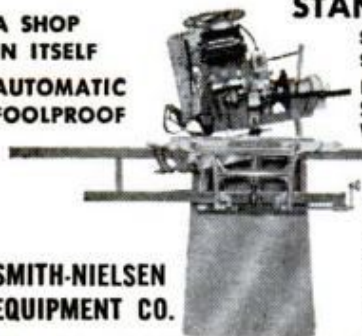
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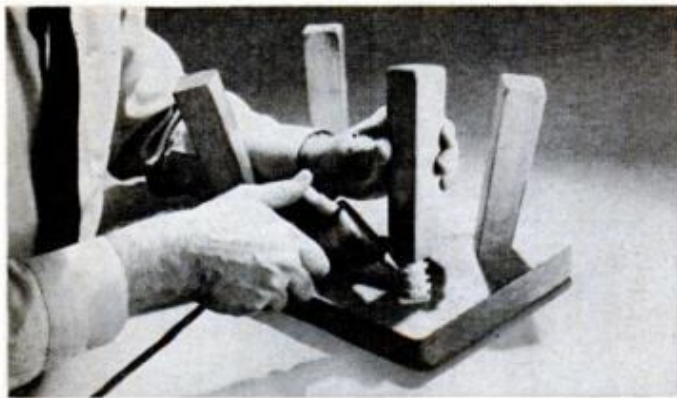
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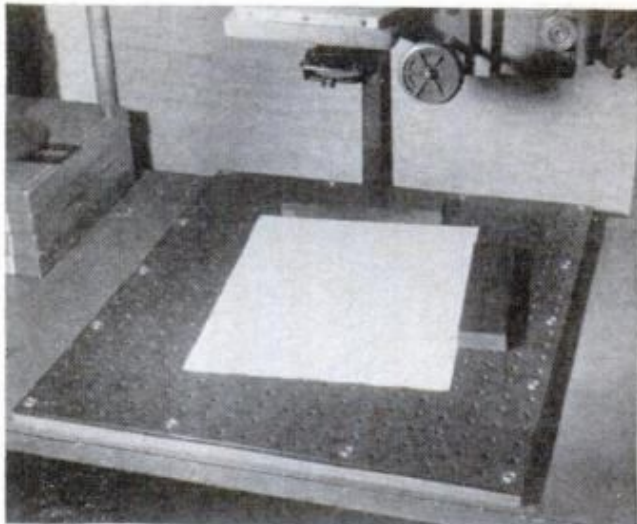


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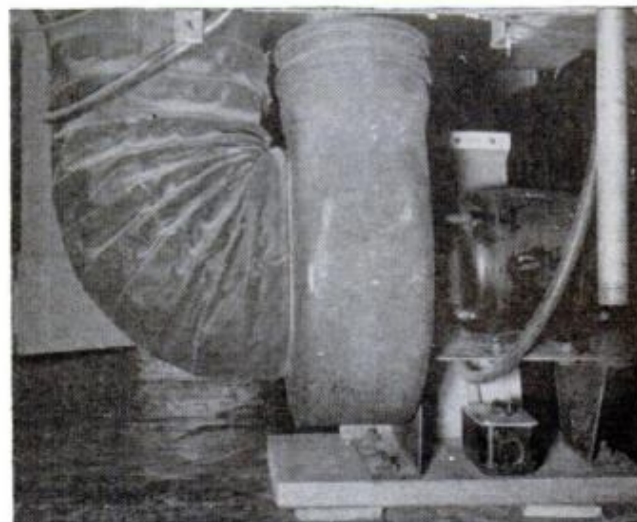
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## Photo Hints



**IT'S ONLY SUCTION**—that's all there is holding the printing paper in this unusual homemade enlarging easel operated by air. The top of the easel is a piece of perforated hardboard screwed to a wood frame. Attached to the bottom of the frame is a length of 12-in.-diameter flexible air-duct hose leading to a turbine blower from an old gas furnace. The blower rests on the floor under the enlarger, as shown in the photo below, and draws air through the tiny holes in the perforated hardboard. The suction holds the paper firmly to the hardboard and keeps it smooth and flat. The system has several advantages over conventional hinged-frame easels. Modern borderless prints are easy to make since there's no frame to cover the edges of the paper. Sheets can be inserted and removed quickly and can't accidentally shift once the blower is turned on. Focusing and composing are done on a piece of white paper the same size as the print. This is positioned against two stop blocks, as shown in the photo above. The blocks can be wood or metal, but should be heavy enough to stay put by their own weight. When you're ready to print, you remove the focusing paper, place a sheet of printing paper in the same position against the stop blocks and turn the blower on. After the print is made, the blower is flipped off so the paper can be removed easily. For convenience, the blower can be controlled with a foot switch, leaving your hands free.—Chester Chatman

*(Please turn to page 202)*







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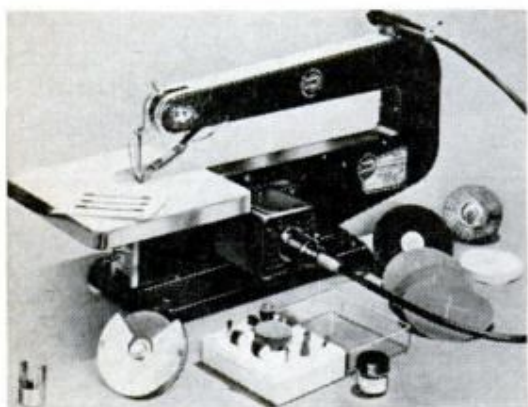
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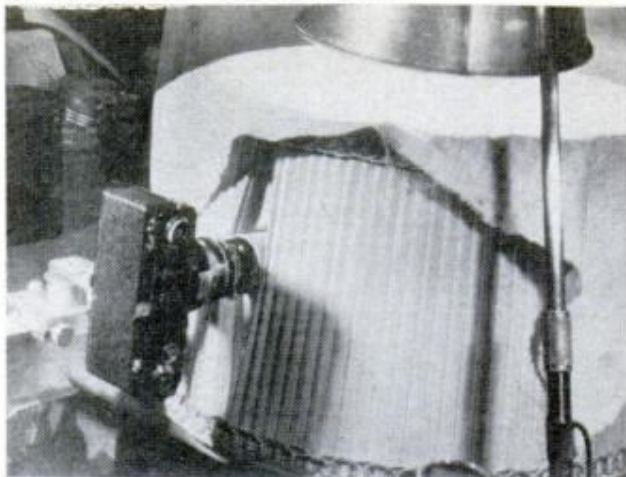


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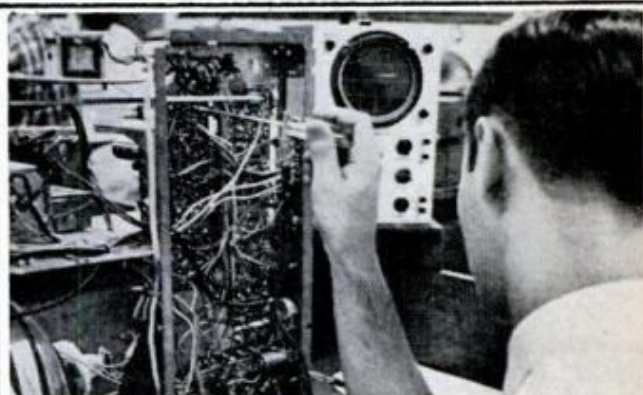
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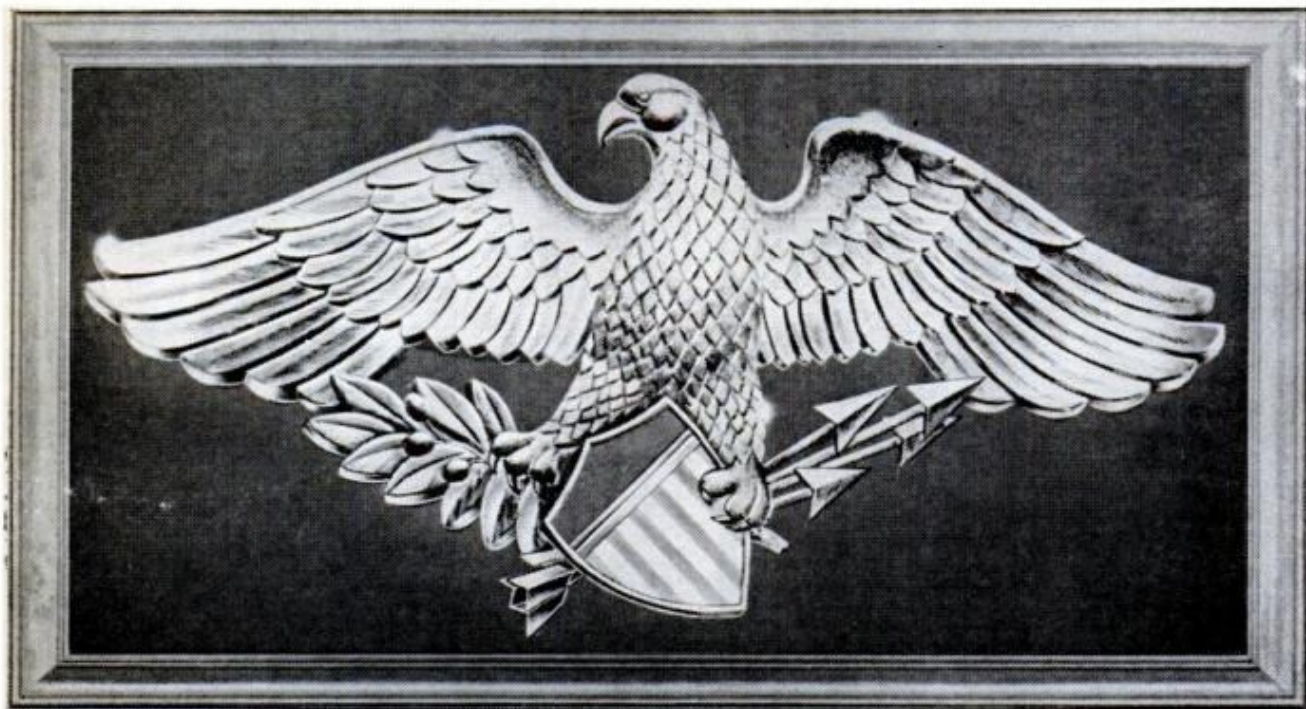
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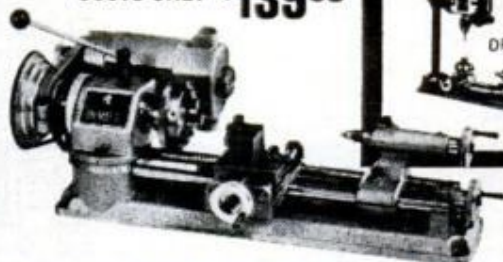
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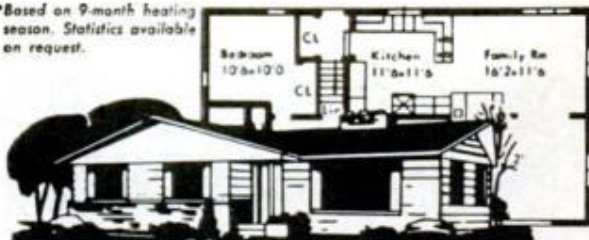
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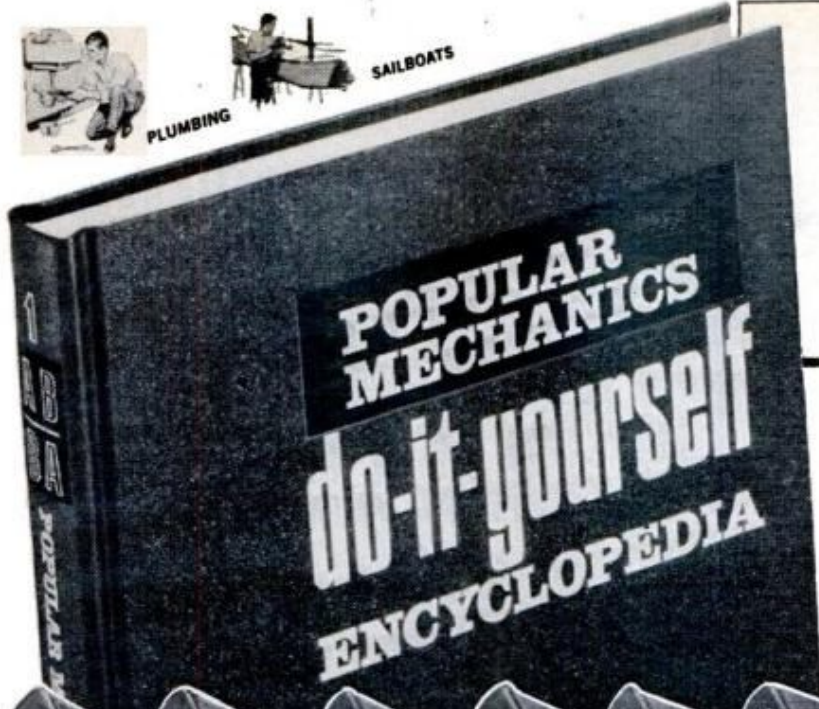




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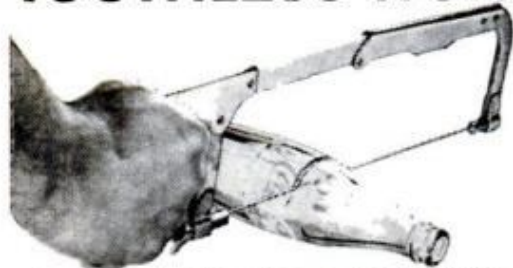
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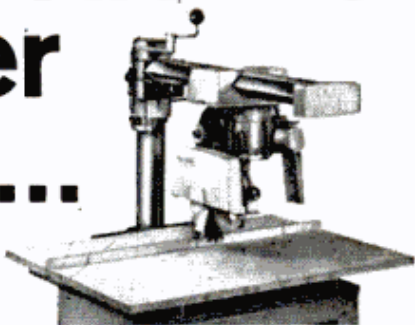


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## 'GROUNDED' FOR 90 DAYS

(Continued from page 63)

sorts of perverse people who take delight in reading such reports. They hoard such information and pull it out at inappropriate times. You can count on having to describe in public, at least half a dozen times, why you lost your license. (If you are one of those who loses a license for drinking and driving, an offense that is treated with increasing seriousness in many states, don't expect to enjoy a social cocktail at a party for the next two years without some wag smiling and saying something about how you can get in trouble that way.)

### Children are merciless

Your children will be merciless about the whole thing. You'll hear them ask the most pointed questions about why you lost your license, and at the worst times. You might be able to glare and make them shut up, but the damage will have been done with the question.

Anybody who loses his license to the state is suddenly going to discover several hard-life facts that he might have heard of before but never experienced.

For example, if you lose your operator's license, you'll also lose your regular auto insurance. All companies have a clause in the contract that reads something like this: "We'll issue insurance to anybody whose state has licensed him to drive. But lose that license, and we're allowed to cancel your insurance."

It's a reasonable enough thing. Studies show that people who have had more moving-vehicle violations than the average person are just moving accidents waiting to happen. Insurance companies are not—and should not be—benevolent societies. Their job is to provide protection for you against financial disaster, in case you are responsible for an accident. They can only do it at something like a reasonable price if they aren't forced to include, at their regular rates, people who are likely to cost them \$10,000 or \$50,000 or \$100,000 in court judgments, attorneys' fees and other costs incidental to a legal defense. The person who has had three moving violations is a candidate for that kind of cost, and they start dropping him.

That doesn't mean that the man with a suspended license won't be able to get insurance when his suspension period ends. It merely means that he will have to buy higher-cost protection, through his state's assigned-risk plan or from a company that specializes in insuring high risks—at high premiums. Such protection will cost him from \$50 to \$200 more a year



each year for the next three years. (Insurance companies who drop a bad risk usually are unwilling to take him back at regular rates until he has had a three-year, unblemished record. Have even one moving-vehicle violation and you'll have to start all over again trying to earn three accident-free years. If you have a wife or children, they also will have to have three such years. *Any* moving vehicle violation during those three years by *any* member of your family and you will continue to pay higher rates.)

Not only will the suspended driver have to buy high-risk insurance but he will find it difficult to buy all the protection he would like to have. For example, most insurance companies recognize that a licensed driver today must have some sort of liability insurance. So they provide *that* (at higher rates), but they don't feel a really compelling obligation to provide comprehensive and collision insurance, the kind that will reimburse you for most of the damages to *your* car. You'll find it tough to get such insurance anywhere when you have the mark of suspension on you. That means that, if you want to buy a new car, you'll have trouble insuring it.

The new-car salesman will arrange for comprehensive and collision insurance at regular rates. He wouldn't be able to ring up his sale otherwise. But you'll lose that policy minutes after the actuarial department back at the insurance company discovers you're a suspendo. You'll get a polite letter saying you don't have collision and comprehensive protection. After such and such a date, that is. Between now and then, you'll discover, you'll have to really scurry to get insurance protection for loss or damage to your car. You'll pay through the nose for it. And you may end up with a second-rate company that will be more trouble than it is worth.

There is a difference between a suspension and a revocation. Suspension, technically, is less serious than a revocation. It usually is for a specific period of time. After the time passes, you get back your license automatically. Revocation is another matter. It, too, is for a specific period of time, usually longer than a suspension, and you do *not* get your license back automatically. Usually, you will have to appear before a hearing officer for the state licensing body and appeal for reinstatement of your license, take a specific rehabilitation course in driving or have your license reinstated only after a governmental body decides that you are safe to have on the highways.

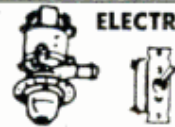
If you think you are innocent in the  
(Please turn to page 212)

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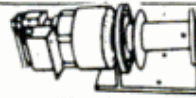
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**'GROUNDED' FOR 90 DAYS**

(Continued from page 211)

first place, tell the policeman who stops you. He will arrange for you to appear before a judge. Tell the judge your story. Once the judge has imposed sentence, there is little that the licensing body of your state can do to reverse the decision.

Some states will allow you a hardship license if your violation record is not too bad. It allows you to drive during your period of suspension. Some states limit such licenses to certain hours and certain roads on which you must travel to get to and from work. If your offenses have been relatively minor ones and only a few in number, you probably can ask for—and receive—such a license. I chose not to apply for a hardship license, because, for technical legal reasons, it would have required that I admit my guilt and forego the hearing at which I wanted to appeal my suspension.

**State doesn't matter**

It matters little where you are stopped for your moving-vehicle violations. Let one happen in Florida, another in Maine and a third in Tennessee, you'll end up with a suspended license although you live in the state of Washington. Or Illinois. Or New York. Most states now exchange information about moving-vehicle violations, and the likelihood is that it won't be long before all 50 do. Suspensions and revocations are being recorded in a Driver's Register that is kept by the federal government. More than 1,400,000 drivers' names are on file with the registry in Washington, D. C.

Twenty states now check with the registry before they issue or renew a license. All other states either check all original issuances of operator's licenses or before issuing in what they call suspicious cases. If you're on file there, you're going to find it impossible to get a license in another state during the period of revocation or suspension in your home state. It used to be that, if your license was revoked in one state, it wasn't too difficult to hop over to another state and apply for a license.

I hope your license is never suspended, but if it is, don't despair completely. Looking back, I think it was the best thing that has happened to my driving since I started 21 years ago. I'm not doing some of the dangerous things I once did. I'm a safer driver for what happened to me. That means that I'm less likely to kill someone else. Or myself. Or my family. If that's true, then the 90 days of inconvenience and my three years of added expense are worth it. ★★★



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### VON SCHRADER UPHOLSTERY DETERGER

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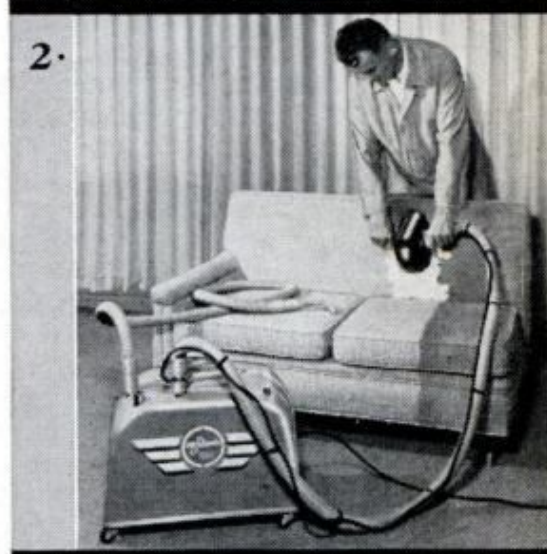
because each service helps to sell the other two

3 • Associate C. E. Nevin reports he averaged \$1000.00 a month for 12 months. An Associate father-son team grossed \$33,000.00 their first year. Von Schrader's FREE ENTERPRISE PLAN is not a lease arrangement. You sign no contract. You own the equipment. You pay no fees, dues or royalties to anyone. Every dollar you take in is yours to keep.

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## PROVING GROUNDS

(Continued from page 67)

can create salt baths and Belgian block pavements that literally make a car fall apart overnight, they still fall short in re-creating the problems encountered in "normal" usage. We continue to use quotation marks around the word normal for good reason. Ford, for example, has a stretch on its proving ground dubbed the "Oklahoma Durability Road." This, believe it or not, stemmed directly from a rash of warranty claims by ranchers who apparently prefer Falcons to horses for herding cattle. The "road" is an accurate simulation of a diagonal trip across a section of Oklahoma grazing land, and the cause of the suspension failures was soon pinpointed and corrected.

The companies go to amazing trouble in their attempts to thwart nature. GM packages what it calls its "standard test dust" from a dry lake bed near its Mesa grounds and ships it by the carload to its other testing areas around the world where the dust available is not dusty enough. Thus you can expect the cheapest imported Opel to be just as well sealed as a Cadillac. Ford, on the other hand, finds a commercial grade of talcum powder handier for its standardization purposes.

The Big Three, for reasons that some of the engineers involved privately question, devote a massive amount of money and manpower each year to dissecting competitive makes. It is not uncommon for one company to buy three of every basic type of domestic car on the market, a total that can reach 200, and run each of them through the 25,000-mile durability cycle. The validity of all this is questioned because (1) the time might be better spent in further improvement of proprietary products; and (2) total objectivity in reporting procedures may understandably be lacking. It would be a rare GM engineer who would go out on a limb with his management by reporting that Ford made a better car, or vice versa.

Others close to proving ground procedures have suggested that the programs should at least be supplemented by tests that would more closely approximate family usage of the vehicle. Ideally this would mean that whole families be hired to evaluate the "livability" of the vehicle, complete with their luggage or camping gear. That way, for example, the designers who apparently don't live in their cars might finally learn that their \$90 built-in luggage racks optional on wagons are little more than decorative unless they incorporate a provision for passing the tie-down ropes under the load. Without this

provision—and half still don't have it—the protective canvas becomes a sail at highway speeds. Certainly, had an active family been involved in the testing, GM would never have marketed the one-piece tailgate design first used on its "A" bodied wagons. When ventilation was desired, the whole works had to be swung upward, leaving nothing to prevent children or luggage from falling out on the pavement.

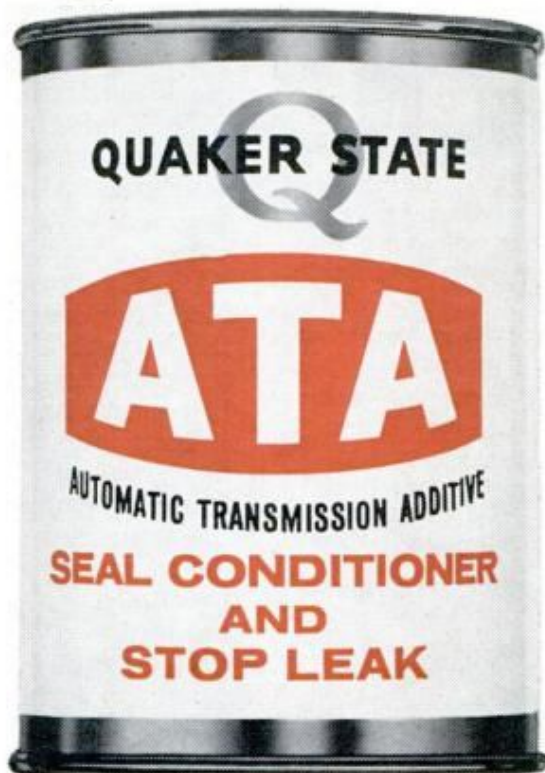
Maybe if they had to pay for their own wash jobs, Detroit's stylists would have resisted the aesthetic urge to tuck the fender skirts behind the wheels in the current crop of sporty cars. Certainly if any tester of a 1964 Chevrolet equipped with airconditioning had been a smoker, he would have discovered that the contents of the open ashtray would be blown clear back into the rear seat whenever the refrigeration was turned on. It was not until Mayor J. P. Cavanagh of Detroit nearly lost a son to an electric window that adequate safeguards to prevent children from accidentally choking themselves were provided.

These samples of bad design, some serious and some just ridiculous, that slipped through into production are not cited with an intent to criticize. They were ultimately caught, either by the ever-continuing audit of owner satisfaction, the computerized tabulation of warranty claims or by secretly taping the comments of spectators at auto shows and dealer introductions. And in addition to these sources of product evaluation, all automakers still make extensive use of public roads. They regularly visit Bemidji, Minn., because it's one of the coldest spots in the continental United States. No proving ground road quite matches the natural and varying viciousness of the Apache Trail that twists for 23 miles up Fish Creek Hill in Arizona, and, of course, there is no substitute for the Pike's Peak climb where two of the Big Three maintain permanent stations. Test cars can be seen in New Orleans and South Texas undergoing humidity checks, in San Francisco and on the Los Angeles freeways for brake checks, and on the switchback roads of West Virginia's hill country.

Proving grounds and the testing associated with them definitely prove one all-important point: "They don't build cars like they used to," but nowadays the old cliché has a reverse meaning. Cars are a lot better than they used to be, to the tune of a five times greater average lifetime in the hands of the user. Much of this improvement stems from old-fashioned, "cut and try" testing for millions of miles before a car is ever marketed. ★★★



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**AUTEC**

(Continued from page 73)

to track it continuously to determine how well it performs and whether or not it hits the target. If it did not hit the target, why did it miss? And by how much?"

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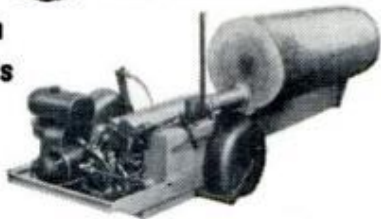
"There will be three offshore platforms in a five-mile line equipped with manned theodolites (which measure horizontal and vertical angles) to determine a ship's actual position. In addition, two radar reflectors and four underwater sonar targets will assist a ship to lock onto the target to record its bearing and range. Any error in the ship's radar system will be the difference between its actual and measured positions.

"Finally, there will be an acoustics range, consisting of tracking hydrophones, noise monitoring hydrophones, sonar reflectors and underwater communication transponders (carrying voices underwater). The purpose of the range would be to make in-the-water sound measurements of ships and submarines, so critical for antisubmarine warfare efforts." ★★



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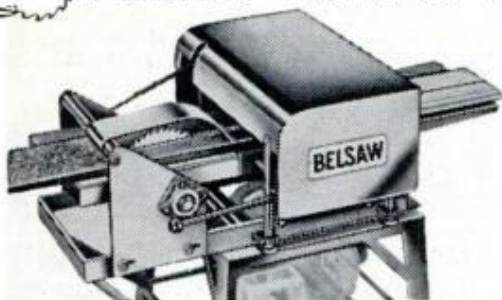


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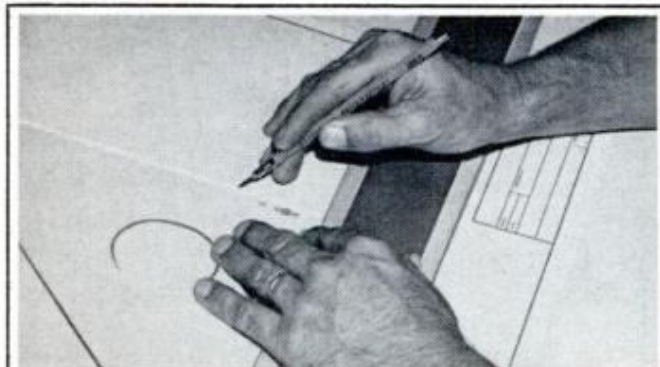


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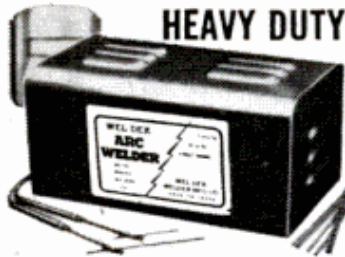


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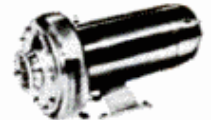
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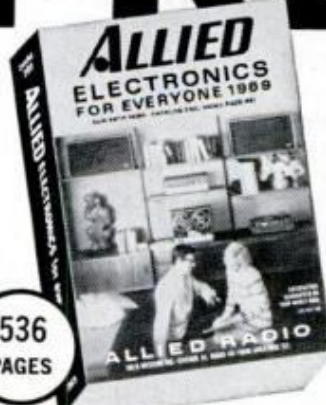
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## GREAT GRIZZLY BEAR MYSTERY

(Continued from page 87)

made it to a tree. But Michele was trapped. The bear snapped at her bag. "Open the zipper!" Dunn shouted.

"I can't" cried Michele. It's in his teeth!"

"He's got Michele in the sleeping bag," cried Dunn, "and he's going up the hill with her!" The bear went over a ridge. Michele screamed, "He's got my arm!" Then: "Oh, God, I'm dead!" The sounds died away. It was 4:30 Sunday morning.

But it was 6:00 a.m.—dawn—before anyone ventured down from the trees.

### The search for Michele Koons

No one knew of this until the survivors stumbled up to the Lake McDonald ranger station at 8:10 a.m. Ranger Len Landa at first could not believe that a *second* girl had been carried off. But he reached for his gun. "Who's going back?" he demanded. Dunn and Ronald Noseck went with him. At 10:00 a.m., running, shouting, they neared camp. They called "Michele!" Only the soft wind answered.

This camp, too, was a confusion of gear. Michele's cosmetic kit was ripped. A can of bath lotion had been drained through two toothholes. A trail of feathers led uphill. Following this, the men found Michele's sleeping bag. Next, following a trail of disturbed soil, they at last found Michele. The bear had dragged her hundreds of feet, then brought her back within 100 feet of camp.

A throbbing sound made Ranger Landa look up. It was Pilot Westover again, coming to rush Michele to the hospital. But Michele was dead.

### One bear—or two?

Stunned by the similar attacks, rangers warned campers away, then began a hunt for two killer bears.

But—had *two* bears really done it? Park Supt. Keith Neilson found it hard to believe that after 50 safe years two 19-year-old girls had been killed on the same night by *two* bears—and in the same way. Had *one* rabid bear really killed one girl, then trotted nine miles to kill again?

Bears move fast. Some outsiders thought one bear had done it all. Neilson shook his head. Later I had a look at those nine miles. A bear would have to go around an 8000-foot range: It was nine miles by *air* but 30 on *foot*. It *had* to be two bears.

It was two nights before the killers were shot. At midnight Monday rangers heard a grizzly near the place of the first attack. Flashlights stabbed the dark, showed a mean old female often seen near

the Chalet. Three guns fired. She lurched to charge, then toppled over dead.

Rangers examined claws and teeth: no trace of human flesh. Two nights after an attack this was not surprising. One foot *did* show a huge, unexplained gash. When her stomach was opened it held only a lump of bread dough.

The real clue was the *time*. This bear was shot at 12:50 a.m. The bear that killed Julie made its appearance at 12:45. Rangers felt certain they'd shot the killer.

Five hours later, at 5:45 a.m., a second old female was shot at Trout Lake. And this time there was no doubt: her stomach contained human hair.

### More trouble coming

Why did two bears, as if on signal, kill two girls? "Defending cubs" is a reason often given for attack; the bear killed at the Chalet *did* have cubs nearby. But many bears with cubs roam without killing. And the bear at Trout Lake *had no cubs!*

Rabies was not the cause; tests proved it. Cosmetics, food smells, perfume—all were suspected. Feminine odors, especially during menstruation, upset trail horses. Maybe they affected bears. Michele Koons was menstruating. Julie Helgeson apparently was about to. Were lightning and fires to blame? Rangers say it's possible. Fires upset deer. Thunder unnerves dogs.

One odd but plausible theory comes from two top naturalists, Francis Elmore and Robert Wasem: Bears today are learning to open packaged food. Did they think the sleeping bags were *packages*? Or do sleeping bags themselves worry bears? Is a bear alarmed to find a strange cocoon with something soft and alive inside? It could be. Even black bears pull people out of bags. And park records show that a camper in a bag was hurt by a grizzly in 1962.

The trouble is no one knows about bears. What's needed, rangers say, is a long overdue study of bears versus humans. What disturbs bears? And what can deter them? Tear gas? Mace? Dog-repellant? High-frequency horns. Some rangers carry whistles, ammonia spray, red flares. But do they work? No one knows.

It's time to find out. As this is written, five grizzlies have been shot by rangers—in Yellowstone—for "aggressive behavior." A sixth was shot by an Air Force officer. When a bear scared his wife he used his pistol, defying park rules.

To destroy all bears would be unthinkable. But with campers flooding our woods we must learn how to live with the animals whose land we invade. Or else more hikers like Julie Helgeson and Michele Koons will die. ★★



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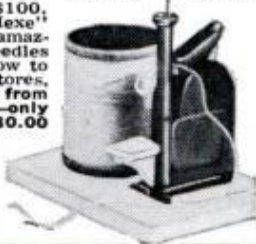
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## HOUSEBOAT VACATION

(Continued from page 105)

vacation home—movable, yes, but to be used mainly for living in. One happy feature is spaciousness. You can have guests and not have to stand around on each other's toes. One evening, we entertained the John Slaters and daughter, Kathy, old friends and former neighbors who now live near the lake. If I didn't know better, I'd suspect John's in the pay of the TVA; he does a great public relations job for Land Between the Lakes, the national outdoor recreation and conservation area now being developed (see map, page 101). Judging from what I saw during John's tour the next day, the area will be a magnificent place for vacationers and sportsmen.

Our return trip from Kenlake to Hendersonville was a relaxed sightseeing cruise. Even idyllic.

I remember one morning in particular when we got under way about 6:30, with the youngsters still asleep. Joan brewed coffee, and we sipped as we sailed along a calm river, which was rippled occasionally by a light breeze. On the left, conical wooded hills rose from the river's edge, and on the right, trees crowded the shoreline, interspersed with an occasional pasture. It was one of those memorable times that you recall with pleasure later on. Then the kids woke up.

Running a houseboat is really much easier than driving a car; even the youngest (supervised) can take the wheel. You just can't get lost on a river like the Cumberland because every bit of the route is marked by channel buoys, daymarks, beacons and the like. Using the U.S. Army Engineers' charts (\$2 for the Cumberland River set; \$2.50 for the Tennessee), we were able to mark off our progress mile by mile.

Besides learning to operate a houseboat on our 12-day trip, we found that Southern hospitality still exists. At every stop—whether a tiny dock or a big marina—the operators were happy to have us tie up, and almost without exception they refused to take money for our space. "All I want is to know you appreciate it," one commented. Mr. Horner, at the end of our trip in Hendersonville, would have passed for a fond uncle when we tied up there.

Want to try houseboating? You could start by renting a boat for a week or two. They're available all over the country. I've corresponded with many rental outfits, and they say they'll give you all the checking out that you need before you sail off. Plan now, because many are fully scheduled by mid-February. ★★



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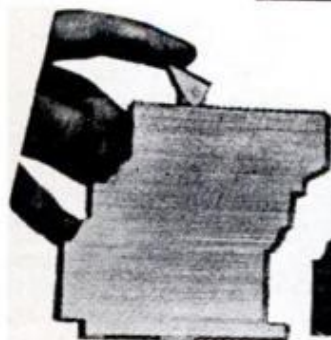
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## ENLARGER CONTROL

(Continued from page 123)

contacts to the enlarger. The safelight thus goes off and the enlarger comes on for the length of the exposure interval.

As soon as the timer stops, the enlarger goes off and the safelight blinks back on so you can remove the exposed paper. The enlarger stays off until you flip the switch back to the "Focus" position. If you prefer, a foot switch can be hooked up in place of the timer. Everything will work in the same way except that you will control the exposure interval with your foot.

The Print-Focus switch shown here has a center-off position. Though not essential, it lets you disengage the relay coil without turning the entire control off. If you use a toggle that has no center position, shut off the control at S5 whenever it's not in use to keep the relay coil from being loaded too long.

### Wiring the relay

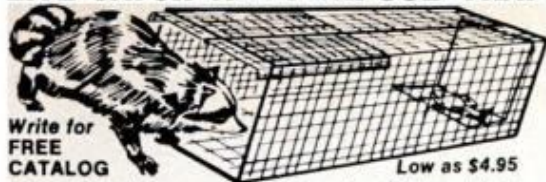
The variable transformer used here is a 0-132-volt Model 10B Powerstat made by Superior Electric Co., Bristol, Conn. 06010. The d.p.d.t. relay is a 115-volt Potter & Brumfield type KA11AY. Its coil is wired to the Print-Focus switch, as shown. In making the other connections, note that the safelight outlet is wired through the contacts that are normally closed, while the enlarger and printer outlets are wired through the contacts that are normally open. Power to the relay thus opens one set and closes the other at the same time.

The transformer, relay, voltmeter and other parts are all available from electronics supply houses such as Allied Radio in Chicago and Lafayette Radio in Syosset, N. Y. Switches S1 to S5 are all s.p.s.t. toggles. A small 115-volt neon pilot light illuminates the voltmeter dial and at the same time serves as an on-off indicator light. The outlets are all flush-type receptacles designed for mounting in a panel. To protect the transformer, there's a 2-amp. 3 AG cartridge-type fuse in a panel-mount fuse holder. Use No. 16 or No. 18 insulated stranded wire for making connections.

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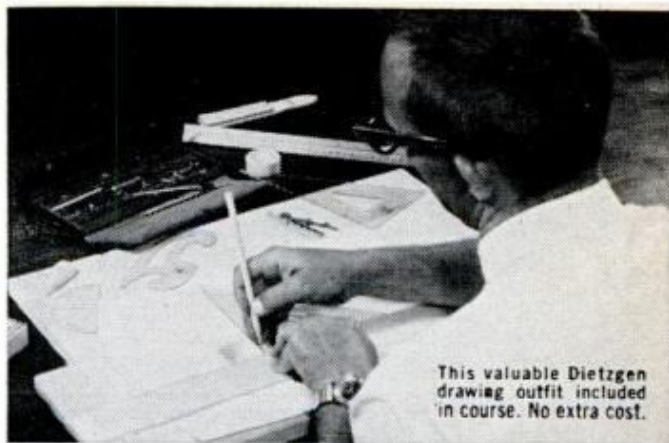


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## BUILD A BRUSH BUGGY

(Continued from page 135)

at the transmission and worked through the front of the tunnel. With both sections of the belly pan securely blocked or jacked up, make the cuts, taking care not to damage the clutch, throttle and emergency brake control rods within the tunnel. With the section removed, undo the emergency brake bracket in the tunnel (just inside the section above the cut).

The tunnel behind the rear cut is then split back about 3 in. on all four sides to allow the front section to slide into the rear when joined. Using a chain "come-along," the sections are matched up and overlapped 2 in. The rear sections should also be split at the forward corners and peened to the contour of the front panel.

Before beginning the main welds, carefully check alignment between sections. Horizontal alignment is checked by measuring both sides from the rear torsion tubes to the end of the forward section. Vertical alignment is measured from the floor upward to the joint of the sections.

Make the top welds, turn the vehicle on its side and run a bottom weld across the seam for strength. Finally, the section of tunnel which was earlier removed must be trimmed, spread and welded in place over the new tunnel joint.

**Roll bar and strongback:** The roll bar is made of 1 $\frac{3}{4}$ -in., thick-wall aircraft tubing, leveled and welded in place atop the rear torsion tubes. (The roll bar should be pre-bent to the required size at a muffler or exhaust specialty shop.) The strongback, one of the most important items in a buggy if it is to withstand rough usage, is a  $\frac{1}{4}$ -in.-thick, 6-in.-high steel plate cut to fit between the two upright arms of the roll bar. The center section of the strongback must be notched to clear the transmission housing. The strongback is welded to the torsion bars and roll bar.

**Gearshift:** Work the gearshift control rod back into the tunnel and slip it into the transmission coupling. Then mark it for the proper length (use the hole atop the tunnel where the gearshift assembly bolts on). Again remove the rod, cut it where marked and then weld, taking care that the two sections are correctly aligned. Precision here is necessary, for both the twisting and the back and forth motions of the rod govern gear selection. Finally, the control rod is installed and bolted to the transmission, and the shift lever is screwed in place.

**Cowling and steering:** Angle-iron braces are cut to fit along the front of the belly pan and are bolted in place to serve

(Please turn to page 228)



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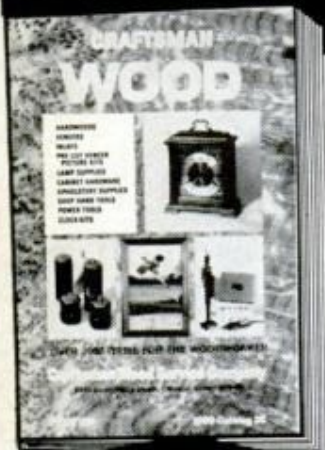
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## BUILD A BRUSH BUGGY

(Continued from page 226)

as a tie-in for the tubular cowling braces.

For steering, the original Volkswagen column and wheel are retained in the buggy. After installing a seat (the stock seat guides should still be in place) the steering column can be lined up with the seat and steering knuckle and welded to the cowling brace. A hole is later cut in the front of the cowling for the column.

The simplest and surest method of making the cowling is to first cut a cardboard template according to the provided measurements. Check the fit of the template and then cut the metal from the trimmed template. Working from the center outward, the cowling is spotted with small welds to the bracing. If the metal begins to warp, cover the main area of the cowling with wet cloths to dissipate the heat. After grinding the welds use fiberglass or auto-body lead to fill in the joint. With the cowling installed, a small metal instrument panel can be suspended from the cowling braces over the gearshift—this panel need only contain the essentials such as starter switch, light switch (if lights are fitted) and oil-pressure gauge. Then complete all electrical rewiring.

**Control rods:** The disconnected control rods (clutch, throttle and emergency brake) should protrude through the rear of the tunnel. They must be cut to the proper lengths and hooked up to the appropriate connections. The rear hydraulic brake line, which must also be shortened, can be re-installed at this time.

**Battery box and carrier:** The battery supporting frame is welded in place behind the right rear torsion tube. The top of the battery should extend no higher than the engine itself when re-installed.

The framework for a carryall box or basket is built from 1 1/2-in. angle iron and is welded to the roll bar and roll-bar braces. Then, plywood sides and bottom are bolted in place.

**Fuel tanks:** For maximum range, a 10-gallon fuel tank from a VW truck or bus is utilized. The fill spout should be moved to the center of the tank, so it will fit between the driver and passenger seats.

**Optional equipment:** A Volkswagen truck reduction box on the end of the standard VW rear axle housing will give the buggy an additional 3 3/4 in. of ground clearance, and will lower overall gearing to 1.4 to 1. Because the reduction boxes are often difficult to come by, many builders install them afterwards, since it involves no major redesign of the parts but merely a slight modification to fit the conventional axle housing. ★★★



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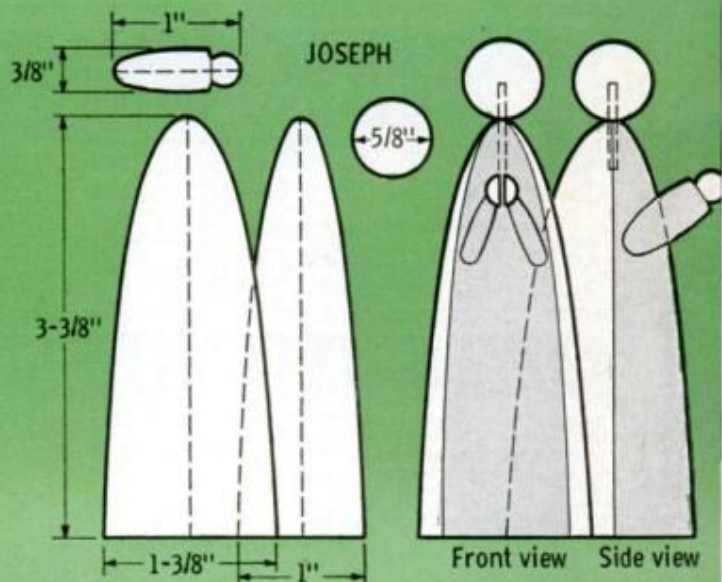
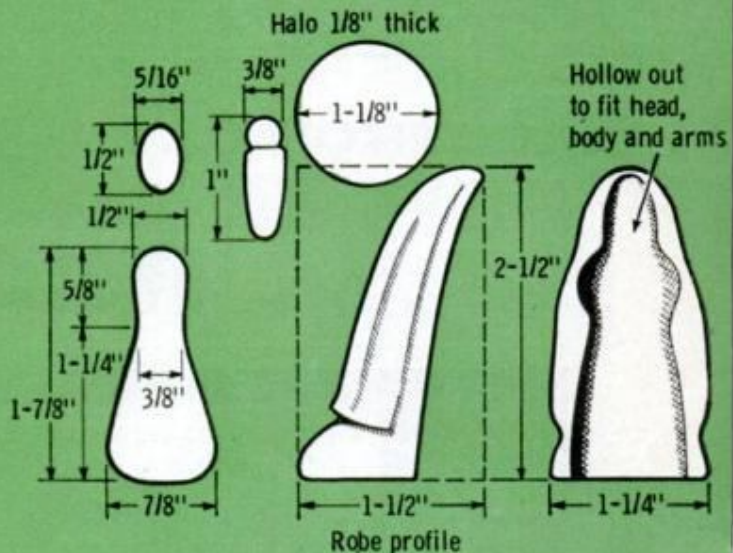
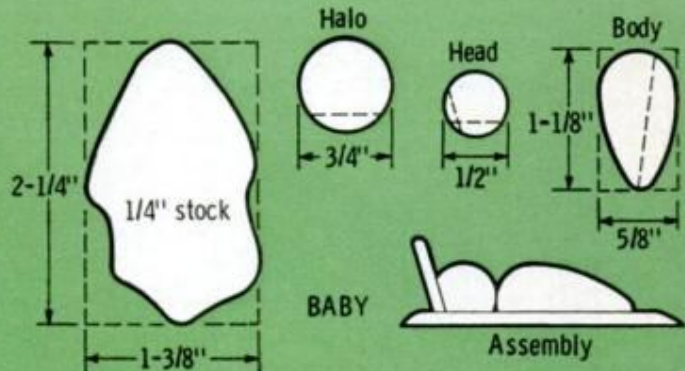
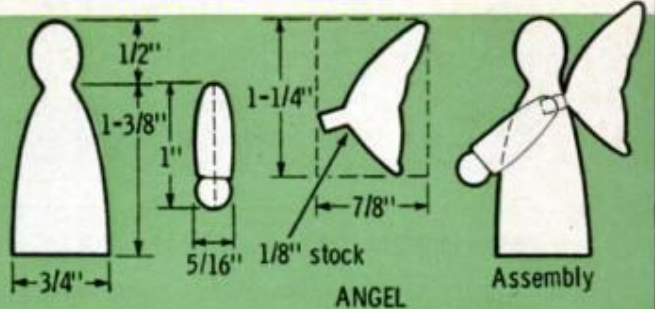
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## CHRISTMAS GIFTS

(Continued from page 152)





## CHOOSING THE CORRECT CAULK

(Continued from page 158)

sealing cracks in a substrate subjected to a high concentration of water. You can apply both at temperatures of 35°F. or above, but in cooler weather, first keep the material at room temperature for several hours before use.

Butyl becomes tack-free in 30 to 90 minutes, depending on temperature. Nitrile becomes tack-free in 10 to 20 minutes. You can paint either if you wish, but this is not necessary. Leave raw butyl exposed for at least seven days if you do decide to paint. Nitrile can be painted when it becomes tack-free.

Butyl caulk doesn't chalk, so it will in time get dirty. It has a maximum life of 20 years. Good quality butyl sells for about \$1.50 a cartridge. High-quality nitrile caulk sells for about \$2 per cartridge. Manufacturers state that life expectancy is "permanent," but since few things last forever, I would say that this compound will equal the life expectancy of butyl caulk. Furthermore, nitrile shrinks significantly after application, so refilling of a crack may be necessary.

Construction trade caulks are designed for filling wide cracks. If joints are as much as 1/2-in. wide by 3/8-in. deep, and are subject to unusual expansion-contraction because of temperature, one of these caulks is for you. These compounds adhere well to glass, metal, masonry, porcelain and wood if properly applied.

The disadvantage of acrylic polymeric caulk is its toughness in application. Using a gun is impossible below 60°F. Even at that, it's hard. Most pros get the material to flow easier by heating it to about 120°F.

If you do this, make sure to puncture the nozzle seal, and keep that cartridge away from the heat source. As are all construction trade caulks, acrylic polymeric is flammable and toxic.

The drawback to polysulfide caulk is that it takes 72 hours to become tack-free. Furthermore, you should first prime a surface, especially when using the caulk on masonry. The primer is a special one made for use with the compound and is specified by each manufacturer on the package. Finally, although not as tough to apply as acrylic, polysulfide is not a cinch.

The value of silicone caulk is that it flows on easily, even at temperatures below zero. However, it can't be used with building materials that may bleed; the caulk can't be used to seal a crack that's in a confined space since it requires atmospheric moisture to cure, and you should apply a special bonding agent to the substrate before applying. ★ ★ ★

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**CRITERION CO., Dept. PBM-49, 331 Church St., Hartford, Conn. 06101**

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Properties now being sold for municipal tax arrears. Hundreds of cottages, farms, hunt-camps, timberlands, homes from coast to coast along Canadian Border. Purchase direct from Tax authorities—NON PROFIT! For lists, pictures, regulations, write: Register, Room 16, 110 Church Street, Toronto, Canada.

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Good Profit. Raised printing like engraving too. Have home shop. We supply everything. Direct from factory, only. Easily followed rules. Write now for free details. **KELSEY PRESSES E-37 Meriden, Conn. 06450**





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SATISFIED OR WILL RETURN UNIT WITHIN 10 DAYS FOR FULL REFUND.  
No questions asked.

- 8" Power Saw at \$14.95  
 Standard Rip Fence #354 at \$3.50  
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 Belt Sander at \$14.95  
 Mitre gage for Sander at \$1.95

- Jointer-Planer at \$19.95  
 Lathe at \$9.85  
 Set of 3 High Speed  
Turning Chisels at \$4.95  
 Drill Press at \$29.95  
 Disc Sander at \$7.95

- GE Motor }  \$18.80 (purchased with other item)  
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SAVE AS MUCH AS...  
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**DIRECT FACTORY OFFER AND REVOLUTIONARY PATENTS** decrease costs, increase efficiency. Full scale power tools of heavy duty 100% cast iron and steel. Streamlined design reduces weight, cuts material and production costs. Special patents provide added efficiency, accuracy, savings. Parts made, assembled, tested, packed right in our own factories shipped direct... save store profits.

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"A good bit of sound—imaginative—engineering." Popular Science; "(Saw) boasts many features of bigger brothers." Popular Mechanics; "Amazingly versatile." Workbench; "Highly substantial construction, sturdy enough for production line use." Industrial Woodworking. And Workbench awarded these tools their coveted "Work Tested" Seal.

**UNCONDITIONAL MONEY BACK GUARANTEE**  
You must be fully satisfied. If not, return in 10 days, freight collect. Money promptly refunded in full.

**OVER A MILLION USERS** confirm their precision, versatility and rugged performance.

**\*10-YEAR FULL SERVICE GUARANTEE...** Any part or parts of any AMCO power tool (except motor) which may become inoperative for any reason within ten years after the purchase date will be repaired or replaced by the factory without cost to the purchaser. Your only cost: for postage.



## 8" TILT ARBOR POWER SAW

**DOES WORK OF \$75 BENCH SAW** as is. Converts easily to equal any \$300 floor model cabinet units! Crosscuts, rips, mitres, cuts compound angles, dadoes, makes coves and mouldings.

**\$14.95** f.o.b. factory. Wt. 25 lbs. Includes completely assembled cast iron and steel 8" saw with ground cast iron table... less blade. **RIP FENCE**, if desired, for easier work alignment, \$3.50 add'l.

**SAW BLADE TILTS... TABLE STAYS LEVEL**

Locks securely at any angle up to 50°, raises, lowers 0"-2 1/4". Patented tilt mechanism, accurate etched scale. Patented motor mount takes std. 1/4 h.p. or larger motor, keeps belt tight, assures perfect alignment at any angle, transmits full power. Takes std. blade, saw insert removes to take dado heads, cutters, etc. (not incl.). Accurate mitre gauge assembly. Ground spindle. Enclosed steel base. "Compo" bearings. Access. Std. size (for bench saw) \$3.50; larger fence (for cabinet base, as ill'd.) \$4.50.

**FREE CABINET BASE PLANS** Use as portable bench saw as received (inset photo) ... or transform easily and inexpensively into floor model (as shown) guar. to do work of floor models costing \$300. **FREE plans...** all you'll need are a sheet of 3/4" plywood and 3-4 hours. Use your AMCO saw for cutting. Plans provide 27" x 24" work surface, 33" height, tool storage compartment.

**10-YEAR FULL SERVICE GUARANTEE\***

## 6" SWING 3-FOOT LATHE



Optional faceplate for turning bowls, trays, lamp bases, rosettes, etc. \$2.50. **\$9.85** f.o.b. factory Wt. 14 lbs.

Set of 3 high speed turning chisels, \$4.95 add'l. **DOES THE WORK OF \$40 UNITS...** with same precision and speed. Turns wood, plastic. Sturdy cast iron with tubular steel bed. Ball thrust cup center, spur center, T-rest assembly, lever action tail stock, 2-speed pulley. Fits any motor.

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## PRECISION 4" x 36" BELT SANDER



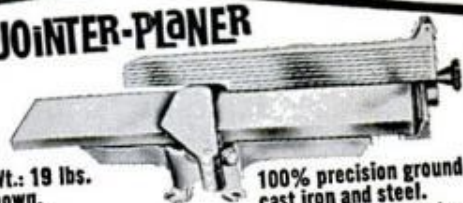
f.o.b. factory. Wt. 15 lbs. **\$14.95** + Disc Sander attachment incl. disc bracket, ground cast table (tilts 0-45°): \$7.95 add'l.

**DOES WORK OF \$50 SANDERS...** The world's most talented belt sander. Heavy cast sander incl. 4" x 36" sanding belt, V-pulley drive, multi-purpose drive spindle. Changes from horizontal to vertical sanding in secs. Uses 1/2 hp or larger motor.

**10-YEAR FULL SERVICE GUARANTEE\***

## FULL 22" LONG, 4 1/8" JOINTER-PLANER

**\$19.95**



f.o.b. factory. Wt.: 19 lbs. Complete as shown.

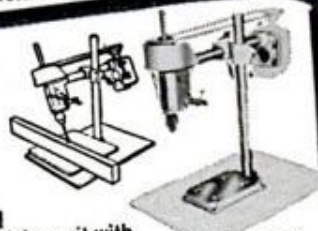
100% precision ground cast iron and steel.

**DOES THE WORK OF \$60 UNITS...** Professional power planing at a hand tool price. Make faster, more accurate joints, rabbetts, bevells for windows, doors, drawers, square tapered legs—Adjustable precision ground cast iron tables. Patent-pending design holds knife to table clearances at any depth. Rabbett depth 3/8". Fence adjustable 0°-50°. Hardened, ground hi-speed steel knives. Dual cutter guards. Balanced cutter head.

**10-YEAR FULL SERVICE GUARANTEE\***

## 32" RADIAL DRILL PRESS

All cast iron and steel f.o.b. factory **\$29.95** Wt. 30 lbs. 1/2" cap. Jacob's chuck incl.



**DOES WORK OF \$90 UNITS...** and much more. Industrial quality precision unit with all standard features, many extras. Head raises, lowers. Depth of throat up to 16". Pre-set to any angle for on-or-off table drilling, even horizontal drilling. **10-YEAR FULL SERVICE GUARANTEE.\***

**BRAND NEW MOTOR** DEVELOPING FULL 1 HP... **\$18.80** F.O.B. FACTORY / FOR ANY OF ABOVE MACHINES. WT. 17 LBS. PURCHASED SEPARATELY, \$24.85



# Stronger than winter. Tougher than trails.



## A blizzard of power from Evinrude.

### New 25 hp engines.

Three new Skeeter models are now 25 hp strong! 56% more power than before — with no increase in the bulk of your Skeeter. Besides sheer speed, you get more hill-climbing ability, more load-handling strength. And *all* Skeeter engines are American-made, two-cylinder engines. A rare thing in snowmobiles.

### New tougher suspensions.

Bring on your rutted trails, your moguls, and patches of treacherous ice. We've strengthened the suspension system of the '69 Skeeters to take such surprises in stride. And we've improved the weight distribution for better overall handling and easier steering at the same time.

### Improved reverse gear.

Three new wide-track Skeeters have it. It's a blessing in those tight spots you're apt to get into. No more lugging and tugging to turn around. Just pull a lever, apply throttle

and back away. New safeguards have been built-in to prevent foul-ups and insure proper operation of reverse gear whenever you need it.

### Still the quietest of them all.

The '69 Skeeters give you the luxury of quiet operation as standard equipment. By completely enclosing the engine and drive train, noise is effectively *confined* — then stifled by the Skeeter's muffling system. Now you can be a big sport, *quietly*. And everyone nearby will appreciate it.

There's a lot to see this year at your Skeeter dealer. Six brand new models, in two power sizes — 16 and 25 hp. All strong for winter fun.

# SKEETER '69

Write for catalog. Evinrude Motors, 4198 N. 27th St., Milwaukee, Wisconsin 53216. Div. of Outboard Marine Corp.

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outboards**  
outboard motors, boats, snowmobiles, diving equipment

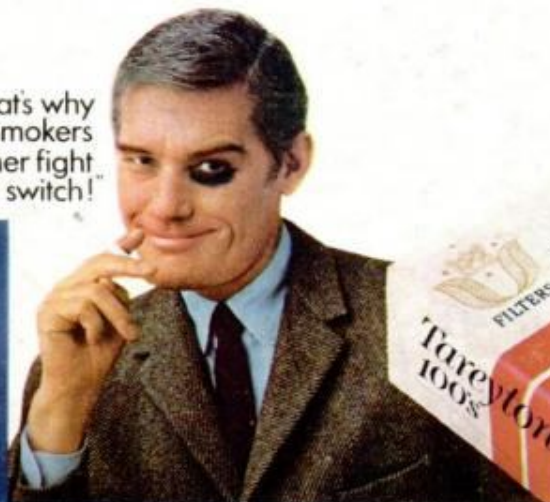


# If you could put Tareyton's charcoal filter on your cigarette, you'd have a better cigarette.



## But not as good as a Tareyton.

"That's why  
us Tareyton smokers  
would rather fight  
than switch!"



100's or king size.

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