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Tear-Out Booklet

**HOW TO BUY AND USE LUMBER**

# POPULAR MECHANICS

FEB 1970  
50 CENTS

**Build This 3-Way  
CAMPER-BOAT-  
CARTOP  
CARRIER**

Page 158

**Junior, Herb  
and Lee Roy—Can  
They Win  
Again at  
Daytona?**

**11 Pages of  
All-Time-Great  
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**Mini-Bikes: Just for Kids? Page 117**

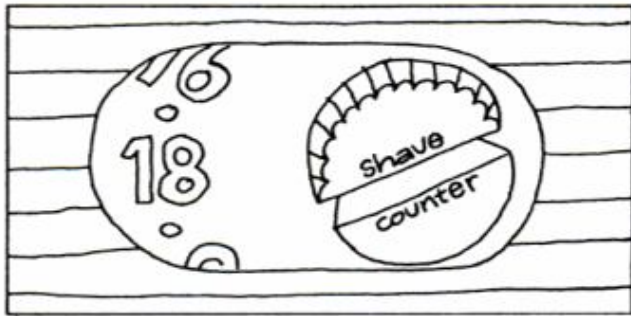
**Across Canada in a Motor Home Page 122**

**Easier-to-Fix Cars • Pushbutton Fishing Gear**



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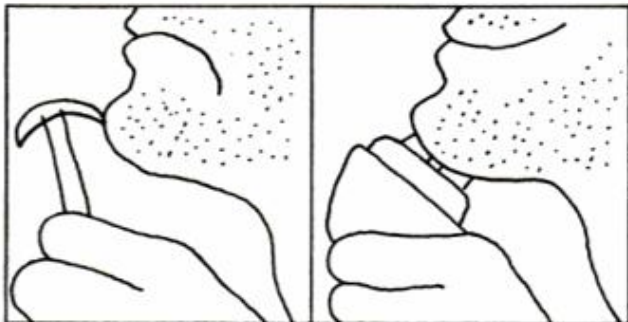
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On a single charge.

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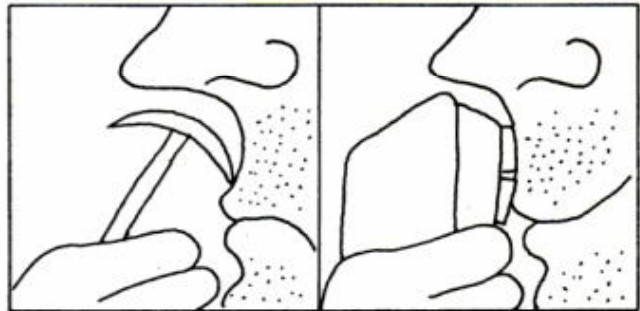
The Rechargeable Tripleheader has 18 self-sharpening rotary blades, inside of 3 Microgroove™ shaving heads.

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If it feels like you could use a closer shave, get yourself a Norelco Rechargeable.

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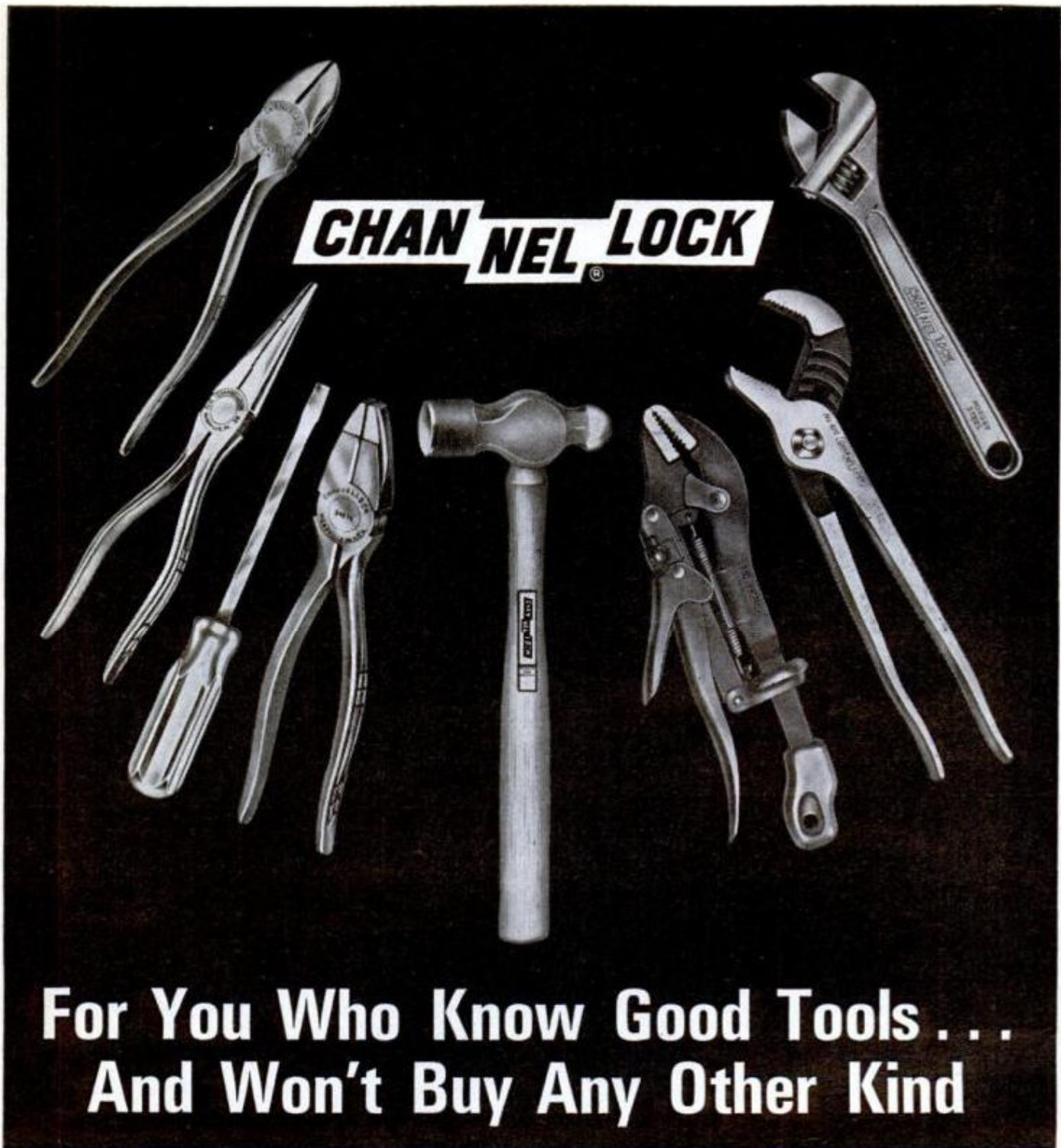
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# POPULAR MECHANICS®

INTERNATIONAL EDITIONS: AUSTRALIA, BRAZIL, CARIBBEAN, DENMARK, FRANCE, MEXICO, SOUTHERN HEMISPHERE, SWEDEN

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Cover Photo by Monty Mont de Oca at Cypress Gardens, Fla.  
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**Build PM's Back-Yard Cookout Gazebo:** a handsome entertainment center for \$500.

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FEBRUARY 1970

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



# fill'er up

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—limited time only

**THE TRUE OLD-STYLE KENTUCKY BOURBON**

# LETTERS

TO THE EDITOR

## Make Orbis an outlaw?

The author of the article about Orbis (*Smile! You Just Got a Ticket*, page 73, Dec. PM) seems to think there is no way to put it out of business except with the crude and highly illegal method of ramming it with a car.

I can think of several ways just as effective, and probably not nearly as illegal. How about a whiff of spray paint or a handful of mud on its lens?

As for the individual protecting himself from getting a ticket, why not mount a mirror just above the front license plate? If adjusted right, it ought to reflect the flash of red light back into the lens.

Something ought to be done to outlaw the device. If it's set to flash every car that is even the tiniest fraction over the limit, it would, in effect, require driving well below the limit; nobody can drive exactly at a certain speed constantly. To do so would require that he watch the speedometer constantly, rather than the road. That would make him a more dangerous driver than a speeder.

SWISHER, IOWA                      ROBERT D. SMITH

Orbis represents an electronic computer way to collect taxes (you can call it fines) from plain citizens, and it will no doubt be the cornerstone of many a new speed trap. One *real* way to cut down on traffic accidents would be to make a scientific study of insurance files. They will reveal that higher than normal percentages of accidents take place in certain locations, regardless of speed. These are particular road conditions or traffic patterns which are dangerous. These would take money to correct, but lives would be saved.

MIAMI, FLA.                      HAROLD PALLATZ

## Weird gadgets!

Are those gadgets for stopping a car (*New Barriers That Cushion the Crunch in Crashes*, page 91, Nov. PM) really practical except for performing stunts? Don't nearly all fatal accidents involve the abrupt deceleration of head-on collision with another car or with a pole, tree, bridge and so on?

Obviously, except to gadgeteers, the solution is the insulation of the passenger from the vehicle's interior. Ever hear of a driver being killed by hitting a tree? No, he hit the interior of his own car.

In the same class of nonsense are the

water bumpers. Effective up to 2.8 mph, according to GM.

And air bags that inflate with a bang, leaving you dazed? They deflate in one-half second so you're unprotected in the impact following a sideswipe or ricochet.

For the love of humanity, let's be practical. These weird gadgets you tout aren't.

The answer? Package engineering. Occupant restraint, passive if possible. No one has yet improved on Barney Oldfield's seat belt preferably with shoulder harness.

BURLINGTON, VT.                      FRED BLACKSTONE

## Joint project

We've received many compliments on both the design and workmanship of the *Cradle-Bassinet* (page 138, March '68 PM). This was a joint project. I purchased



the rock maple rough-cut 1½ inches thick. Brother Louis Lachauc of the Marist Seminary here finished all the wood, and my dad, Joseph Bober Sr., did all the assembly, pegging and finishing. It's a marvelous piece of work.

FRAMINGHAM, MASS.                      ROBERT E. BOBER

## And hardly bloodthirsty

Vampires do not suck blood (*Science Worldwide*, page 20, Nov. PM). They scoop skin off the victim and lap up the blood. I would think that such a reliable magazine as PM would always print the right facts. What kind of editors do you have, anyway?

COLORADO SPRINGS, COLO.                      JAMES GOODWIN

*Old ones who still believe in Dracula.*

## Right speed, wrong plane

In Ralph Emerson's *Fastest Prop in the World* (page 94, Dec. PM), the statement that Fritz Wendel flew an Me 109R in 1939

*(Please turn to page 8)*



# "Look who's smiling now!"

"The department head's job had just been left vacant. When the boys in the office learned I was gunning for it, they gave me their widest grins. One thing they didn't know: I had made up my mind sometime back to take LaSalle training that would qualify me for a better job. My study paid off so fast it surprised even me—I was picked for that shiny promotion over everyone's head. Who wouldn't be smiling with a neat new \$1,500 increase!"

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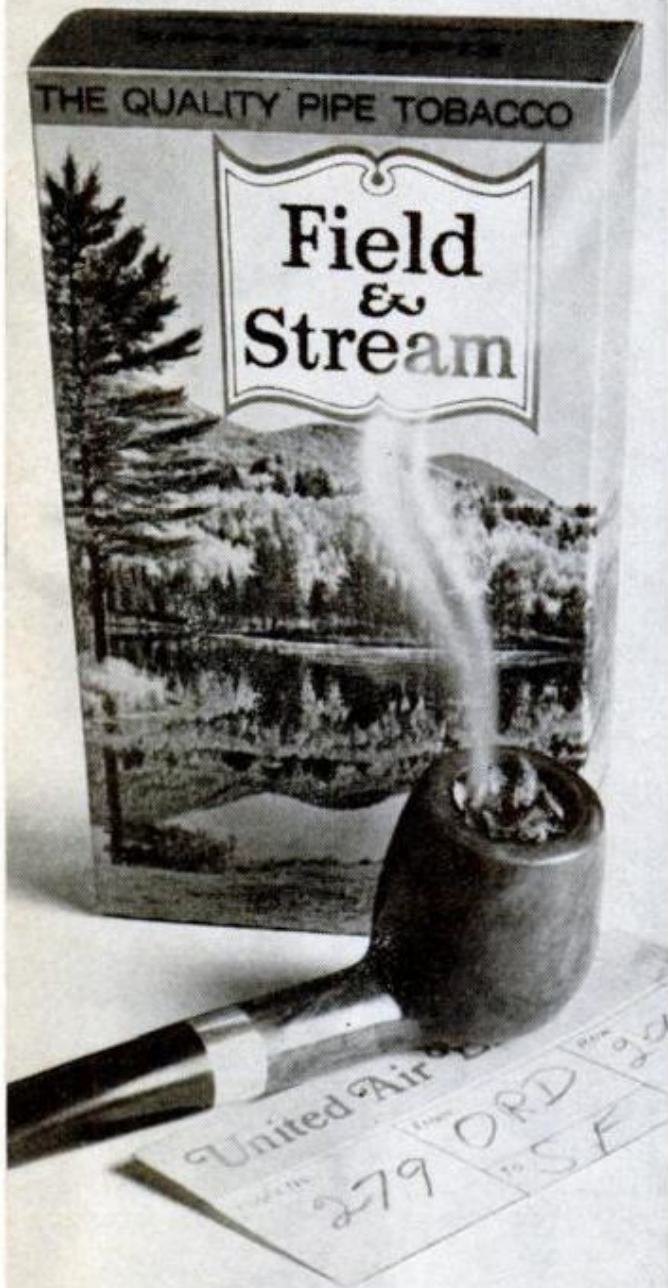
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If your wife says she  
doesn't go for the  
great autumn day  
aroma of Field  
& Stream...



send her  
home to  
Mother.

A quality product of Philip Morris U.S.A.

## LETTERS

(Continued from page 6)

to set a world speed record of 469.22 mph is not quite right.

In April 1939 Wendel flew an Me 209VI at that speed. The Germans changed the name for propaganda purposes, and the plane was entered in the record books as the Me 109R. The truth was not known until after the war, but the record was not corrected.

OMAHA, NEBR.

STANLEY R. JAKES

### 'Remarkably effective'

I just read your editorial on my *Esquire* piece (*Everybody's Happy But Esquire*, page 48, Nov. PM), and of course I'm squealing with annoyance that you caught and exposed my historical and scientific mistakes. Nice going.

But, really, didn't you realize that I was 1) only half serious, and 2) remarkably effective? According to Henry Cooper's piece in the *New Yorker* back in August, Armstrong read the *Esquire* piece and thought by making an issue of what he would say it put him on the spot. Accordingly, he agonized over his words and came up with something quite nice.

NEW YORK

WILLIAM H. HONAN

*And you are 3) of good humor and 4) a good sport. Guess if you did challenge Armstrong, it was all worthwhile.*

I, too, thought Neil Armstrong acquitted himself well as an originator of historic phrases. I'm sure most of us could not have done as well . . . but, then, those of us who knew Neil had no cause for concern.

MARSHALL SPACE  
FLIGHT CENTER, ALA.

WERNHER VON BRAUN  
DIRECTOR

### Rereading the oil can

*How to Read an Oil Can* (page 134, Nov. PM) is dated in one respect. The current recommendation of the American Petroleum Institute is: Change oil every three months or 3000 miles, whichever comes first (but never exceed the carmaker's warranty).

AMERICAN PETROLEUM INST.  
NEW YORK

B. W. CECIL  
ASS'T DIRECTOR

### Words don't fit fittings

Two captions were transposed in *New Building Products* (page 174, Dec. PM). The fittings shown on page 175 are made of stainless steel by Truly Tubular Fitting Corp., and those on page 177 are plastic sewer fittings by Olin Evanite Plastics. ★★

**START YOUR NEW CAREER NOW! WITHOUT OVERHEAD! ANY PLACE! ANY AGE!**

# UPHOLSTERING JUST ONE

**you don't even have to quit your present job!!!**

**CHAIR can pay you as much as your present weekly paycheck!**

Start learning now. At home, or in the garage, in your spare time — no outside classes to attend. If you can tie a knot and drive a tack, you can learn this business, quickly, easily. You start learning the basics right away through the proven MUI Home Training Plan. And before you're barely into it, you can start doing the simple upholstering jobs that are all around you waiting to be done. Chairs, cushions, seats, footstools. Even before MUI students finish their training, people start bringing upholstering jobs to them, and remember—the world is full of furniture that needs fixing and re-upholstering and more is wearing out all the time!



**"What started as a hobby, now pays me \$10 an hour"**

Yes, many MUI graduates make better than \$10 an hour turning old wornout furniture into bright new decorator pieces! **Stack it up against what you're doing now!** Are you making \$150 a week? \$200? \$250? Do you put in long hours of dull work, with small raises? Is that the way you want to spend the rest of your life? Just imagine, you can make \$150, \$200, \$250 upholstering just one chair or sofa these days! And if you're the kind of person who likes to work and earn, you can sometimes finish a job like this in a day. That's pay, ... and it beats what most college graduates make!

**AS YOU LEARN, YOU JUST SLIP INTO THE IMMENSE FLOW OF UPHOLSTERY WORK!** Think of all there is! . . . Sofas, lounging chairs finished in beautiful fabrics, which MUI tells you how to get at the right price — even leather and all the new vinyls. And then you have built-ins and breakfast nooks, boats, trailers and all the millions of automobiles in America. Yes, you learn all this and more! When we finish teaching you, (in your own home in your spare time) and when you get our California state approved diploma, you know this business . . . as a real professional! You will then have one of the most fantastic moneymaking skills in America built into your head and hands! No one can ever take this skill away from you . . . and no one can ever fire you, because **you're the boss** of a business that you can take with you . . . You can make big money from then on . . . any time, **anyplace** you want to put out your shingle!

When you read the papers you see there's a strike here, a lockout there. Detroit lays off 150,000 men. A plant is shut down and moved out of state. A new automated machine eliminates 5,000 jobs. They talk about dislocated workers and try to do something about it. What pays the bills if you get caught up in one of these situations? When you know upholstering, life gets very simple and lots of fun. It's simple because where there are people, there are upholstering jobs and lots of them. It's fun because life is fun when the bills are paid and there's money in the bank, even enough to buy those things you've always wanted for yourself.

**YOU GET SIX BIG FURNITURE KITS FREE**



**YOU GET THIS AUTHORIZED DIPLOMA WHEN YOU GRADUATE**



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MODERN UPHOLSTERY INSTITUTE  
Box 899-CRH Orange, Calif. 92669

## WORK THE HOURS YOU LIKE TO WORK!!

If you favor a regular 35 hours a week, upholstery lets you do it and make a really fine living. On the other hand, if you're really ambitious and want to work 60 or 70 hours a week, you are starting to talk about some big, big money! The important thing is that the choice is yours, not somebody else's! (Not like when you're working for someone else.) Many students of retirement age just do a few pieces now and then just to keep things nice and comfortable.

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**APPROVED FOR VETERANS**

# WHAT'S NEW OUTDOORS

BY GEORGE REIGER

**WATER-RESISTANT MATCHES** newly developed by Diamond International (photo at right) should have a special attraction for all active outdoorsmen. I've tested them and found their resistance to be darn near "proof." I left a pack in the bottom of my fishing boat last fall and found the matches eager, willing and able to light *hours* after they had been in and out of shifting bilge water. Made of strike-anywhere wood splints, they are treated with a special coating to resist moisture and humidity without interfering with ignition or burning qualities. In formal tests, they are said to have lighted after eight hours of complete immersion. For more information, write Diamond Match Div., 733 Third Ave., New York, N.Y.



**SUPERSOFT IRON SHOT** may solve the problem of enormous waterfowl losses due to lead poisoning. Dabbling ducks ingest spent shot picked up from marsh and feeding-ground bottoms and as a result more than a million of them die each year!

Lead is the ideal element for ammunition. Only gold, silver and a few other precious metals match its ballistic qualities. Gold, however, is just too expensive to fire at ducks! Are we then destroying the future of waterfowling by firing thousands of lead-loaded rounds annually over choice marsh lands which in time become death traps for feeding ducks?

The Sporting Arms and Ammunition Manufacturers' Institute is even more concerned with this question than the av-

erage duck hunter. Four years ago, it commissioned the Illinois Institute of Technology to work with the staff and facilities at the Patuxent Wildlife Center in Laurel, Md., in the search for a suitable substitute for lead shotgun pellets. After considerable research, their efforts have centered on iron shot.

Many shortcomings had to be overcome, most significant, perhaps, the fact that hard iron shot will erode or "scar" gun barrels and deform chokes. A supersoft iron in wire form that was finally evolved has no such adverse effects. Results of tests in which both live and simulated birds were used indicate that shotshells containing one ounce of No. 4 soft iron shot have the same ballistics and identical killing effectiveness as those containing the conventional lead loads at in-range shots not exceeding 50 yards.

There remains the problem of finding a practical mass-production method. Until now, supersoft iron shot has been practically hand-made. Once mass-production is achieved, it is fervently hoped that waterfowling will do their share to preserve their favorite sport through purchase and use of this new generation of bird shot.



**FOGPROOF GLASSES** for skiers and snowmobilers can be prepared by coating glasses with a new material called Hydron. Developed by the Woodstream Corp. of Lititz, Pa., the product apparently absorbs lens moisture, yet it's water-clear and is chemically bonded to the lenses for durability. For further information, write to Woodstream's subsidiary in Aspen, Colo.: Trappe of Aspen Inc. ★★★



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# RCA STEREO 8 TAPE CLUB

## Fabulous Savings!

## Spectacular Get-Acquainted Offer!



10280



03258



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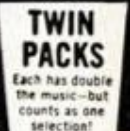
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# Take Any 5 STEREO 8 TAPE CARTRIDGES

# for only \$6.95

Worth up to \$49.75 at regular Club prices!  
You merely agree to buy as few as six more cartridges within a year from hundreds to be offered.



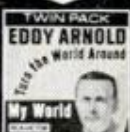
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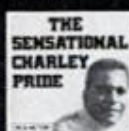
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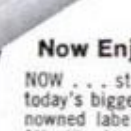
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Now . . . start a library of today's greatest Stereo 8 hits by today's biggest stars . . . at top savings! Choose from such renowned labels as RCA, Warner Bros.-7 Arts, Reprise, London, Atlantic, Atco, Mercury—in every music category. Just look at these exclusive membership benefits:

- Start savings RIGHT NOW! Choose FIVE tapes for only \$6.95 (worth up to \$49.75 based on suggested manufacturers' list prices . . . optional with dealers). After trial membership, receive one tape of equivalent value FREE for every two you buy at regular Club price (usually \$6.95)—a 33 1/3% average saving!
- All tapes guaranteed. The Club's own Warranty unconditionally guarantees you perfect tapes for one year after purchase, regardless of label.
- Enjoy a charge account! We'll open a "pay later" account in your name; pay after you receive tapes and are enjoying them.
- Keep posted! Monthly SOUND TRACK brings news of almost 200 Stereo 8 releases, featuring a Selection of the Month. If you want this tape, do nothing—it will be shipped automatically. If you want other tapes, or no tapes, indicate your choice on the coupon provided, and return it by the date specified.
- Send no money! Just choose 5 of the 50 top-label hits shown here; we'll bill you \$6.95 plus small shipping-service charge later. You can cancel membership after accepting six more tapes . . . or keep enjoying savings of one-third for years to come with no obligation to buy.



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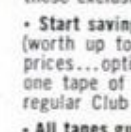
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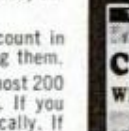
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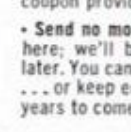
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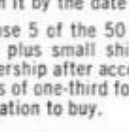
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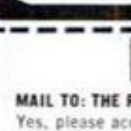
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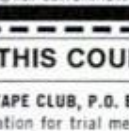
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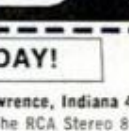
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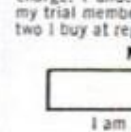
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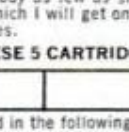
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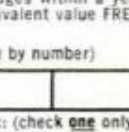
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### MAIL THIS COUPON TODAY!

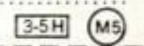
MAIL TO: THE RCA STEREO 8 TAPE CLUB, P.O. Box 26888, Lawrence, Indiana 46226  
Yes, please accept my application for trial membership in The RCA Stereo 8 Tape Club, and send me the 5 cartridges I have selected for only \$6.95 plus small shipping-service charge. I understand I need buy as few as six more cartridges within a year to fulfill my trial membership, after which I will get one tape of equivalent value FREE for every two I buy at regular Club prices.

MAIL ME THESE 5 CARTRIDGES (indicate by number)

\_\_\_\_\_

I am most interested in the following type of music: (check one only)  
 Popular (Instrumental/Vocal Moods)  
 Country & Western  Today's Sound (Rock/Soul/Folk)

Mr. \_\_\_\_\_  
Mrs. \_\_\_\_\_  
Miss \_\_\_\_\_ (Please Print)  
Address \_\_\_\_\_  
City & State \_\_\_\_\_ Zip \_\_\_\_\_  
One Membership Per Family.  
APO/FPO addresses write for special offer.



# This Seal means exactly what it says



It's a replacement or money-back guarantee.

It means that Good Housekeeping will replace to the consumer, or refund the full purchase price of any product accepted for advertising in Good Housekeeping, if that product or its performance should prove defective.

How do advertisers get the right to use the Seal? They have to *earn* the right. How? By submitting representative samples of their product to the Good Housekeeping Institute. If we satisfy ourselves that it is a *good* product and that the advertising claims offered to us are truthful, two things can then happen.

1. The product may be advertised in Good Housekeeping and will be covered by the Consumers' Guaranty, *whether the advertiser chooses to use the Seal or not.*

2. The product may then also display the Seal on its package and wherever it is advertised, subject to the issuance and conditions of a Seal licensing contract.

This simple, honest, and dedicated process has always had one basic purpose: to provide our readers with the most dependable and believable

editorial matter and advertising a magazine can possibly carry between two covers.

All this is not without cost to Good Housekeeping.

It requires a budget of approximately one million dollars a year just to maintain the Good Housekeeping Institute with its many laboratories and workshops, its scientific equipment and staff of 100 people. It also means that over the years Good Housekeeping (however reluctantly) has had to decline millions of dollars worth of advertising that could not meet the above-described requirements. But that's what makes us Good Housekeeping.

And remember, in back of it all is a *money-back guarantee*—something all consumers can readily understand and believe—

As the more than 13 million consumers who read and believe in Good Housekeeping can attest—

—as millions more who respect and respond to the Guaranty Seal wholeheartedly agree—

—as you can clearly see for yourself by *just reading the Seal.*

# If you're earning less than \$1,000 per week, we think that you're selling yourself short.

**T**HE very fact that you're reading this says something important about you: either you are now in business for yourself, or you plan to be in the near future. If so, here's something for you to consider. As a self-employed individual, your earning power should be in the neighborhood of \$1,000 per week, or about \$50,000 per year.

We didn't just pull this figure out of the air. It's based on our years of working with people who work for themselves. What's more, common-sense arithmetic bears us out.

Not too many years ago, a man was on his way to Success if he was earning \$10,000 per year by the time he was 30. But times have changed, and that \$10,000 figure has lost most of its glitter. Today, many kids straight out of school command starting salaries of \$12,000 to \$15,000. By the time they're 30, those same young men are being paid \$25,000 to \$35,000 per year—working for somebody else. Which brings us to our conclusion: if you can make, say, \$25,000 working for somebody else, you can make \$50,000 working for yourself. Because you'll work harder, and you'll work longer hours, and because you won't have to split your earnings with bosses.

If this kind of arithmetic makes sense to you, and if self-employment is indeed your near-future goal, American Unifax would very much like to hear from you, because our success is based upon attracting the interest and support of persons like you.

We're in the office products field. When we entered this field, we did so with two important principles fixed firmly in our mind.

The first of these principles was that we would offer for sale only those products which were demonstrably superior to any other products available from other companies, regardless of brand or price.

Our second principle was that we would make these products available to the

business community through Direct Distributors—men who had the drive and determination to earn \$50,000 or more per year.

We have never wavered from these two guiding principles, even though the kind of product we seek is rare, and the kind of man we seek is rarer still. As a result, we have enjoyed a steady, healthy growth, both in our merchandise line and in the team of Distributors which carries that line to the public.

It started with COPYFAX, our Space Age replacement for old-fashioned carbon paper. COPYFAX represents a totally new concept in multiple copying. Instead of the conventional combination of flimsy tissue and a carbon-grease-wax mixture, COPYFAX employs an incredibly strong film of DuPont MYLAR® only .001" thick, which, by means of a patented process, is treated with a liquid ink similar to that used by printers. One piece of ordinary carbon paper is good for about five rather smudgy copies before it's ready for the wastebasket. One sheet of COPYFAX gives as many as 200 crisp, clear, print-like copies—at about one-fifth the cost of carbon-paper copies.

Carbon paper is a \$203 million industry in America. Steadily and surely, COPYFAX is taking over the lion's share of that industry.

COPYFAX is just one of our products. We've introduced the American Unifax Typing Ribbon, which is based on the same patented process that makes COPYFAX possible. And American Unifax Correction Paper, a unique solvent-ink paper that makes correcting typing errors almost unbelievably easy. More new products are on the way.

In selecting our Distributors, we exercise the same care as in selecting our products. It seems to us that our kind of company—dynamic, flexible, and doing a very high sales volume—is better off with one man who demands \$1,000 per week than with five men who'll be

happy with \$200, or with ten who'll settle for \$100.

This is not to say that the bulk of our Distributors come from the ranks of the supersalesmen. Quite the contrary. One, for example, is a bank manager who makes over \$300 a week in his spare time, selling COPYFAX through the mail. Another is a printer who, with our help, has recruited over 100 sub-distributors who sell for him. A third, a housewife, had "never sold a thing in her life"—but who landed a \$785 order in less than five minutes.

Another thing about our company which might interest you—we don't charge franchise fees. We believe that your effort, interest, and loyalty are more valuable to us than any fee we could reasonably ask from you. Therefore we don't ask for any fee at all.

These are some of our principles and attitudes. We intend to stick by them, because they work. In two short years, American Unifax has grown into a company of major importance in the office products field. And we're growing faster all the time.

We'd like you to grow along with us. We won't guarantee that you'll make \$1,000 per week, but we promise you this: we'll give you all the tools you need to earn that much money. And if you're the kind of man we hope you are, you'll know how to use them.

**AMERICAN UNIFAX, INC. Dept. P27  
95 Madison Avenue  
New York, New York 10016**

The American Unifax way of doing business makes sense to me—give me the tools to start making \$1,000 per week.

- Rush complete information, FREE and without obligation.
- I enclose \$9.00. Rush me 1 pack COPYFAX, 1 Typing Ribbon, and 1 pack Correction Paper (retail value \$12.40), plus complete information.
- I enclose \$49.00. Rush me a special starter kit with profit potential of \$300 or more, and a balanced assortment of American Unifax products, plus complete information.

If you wish, specify make and model of typewriter.

NAME .....

ADDRESS .....

CITY..... STATE..... ZIP.....

**american**  
**unifax**

**AMERICAN UNIFAX**

Dept. P-27, 95 Madison Ave., New York, New York 10016

# DETROIT LISTENING POST

BY BILL KILPATRICK

**CONTROVERSY** between insurance companies and automakers re higher premiums for hot performance models is really starting to boil (see *DLP*, page 24, Jan. *PM*). One major insurer has already boosted muscle-car premiums, others are in line to do so on theory such cars are involved in higher percentage of accidents than so-called "average" cars (kids?), that fixing 'em costs more because damage is more extensive (higher speeds?). Auto men view the insurance industry's attitude darkly, threaten to offer coverage of their own for hot models. Guess here is that the auto industry—already up to here in red tape (the warranty snafu, for example)—is whistling in the dark, will threaten, bleat loudly, then back down and settle for some form of compromise, maybe a little less hp for an only slightly higher muscle-car premium.

**CHEVROLET'S FORTHCOMING XP-887** will be powered by an OHC water-cooled Four, much of it made of aluminum, a development that has the competition intrigued, to say the least. Aluminum blocks, heads are old hat, but Chevy's new Four is said to feature the exotic metal in heretofore unknown (unlikely, at least) applications. Result is said to be a great saving in overall weight, meaning the comparatively modest Four might make the XP something of a performer, a factor that could be a big thing in the mini-car sales race.

**CHRYSLER'S MINI-CAR**, due for introduction in the spring of '71, has been shelved for the time being. Corporate profits are down and the brass has put brakes on development of the car—dubbed the "25"—along with other research projects, presumably including the well-advanced turbine engine program. When the "resume" button will be pushed depends on the balance sheet.

**PONTIAC'S NEW FIREBIRD**, due for public introduction this month, will be another expression of the industry's overall effort to ease problems of serviceability, particularly in a car's electrical system, the most common form of car malfunction. The new Firebird's instrument panel, for example, has an easily-removable (via two quarter-turn release fasteners) lower panel through which all bulbs, flashers and the speedometer cable are accessible. Pontiac claims all lighting and warning bulbs in the instrument cluster can be replaced in 60 seconds.

**CONFUSION REIGNS** regarding industrialist Bill Lear's steam-car plans, quite grandiose a year ago, now seemingly on-again, off-again. When we reported Lear's originally-announced plans—a steam-powered Indy-type race car, a fleet of steam buses, a steam passenger car, and so on—as being "postponed indefinitely" (*DLP*, page 36, Sept. '69 *PM*), he wrote saying we were all wet (see *Letters*, page 6, Dec. '69 *PM*). Since, Lear has been quoted—and widely—as telling a meeting of the Detroit section of the Society of Automotive Engineers that, "No matter what you do, you'll never come up with a steam car that's good for the public." He told the SAE he had decided any plan to build a steam passenger car would be "utterly ridiculous." Perhaps the right hand knoweth not. . . .

**GM'S ANTITHEFT LOCKING SYSTEM**—a setup that locks the steering column, ignition switch and transmission—seems to be doing the job. The auto giant reported recently that National Automobile Theft Bureau figures for the first six months of last year show a 23 percent reduction in thefts of GM cars. If the system, introduced on the '69 GM models, has a "flaw," it's human, the corporation reported. In Chicago, for example, police studies show that 40 percent of the '69 GM cars stolen were stolen

*(Please turn to page 16)*



# Make sure the guy who tunes your car hits all the keys.

There's more to a tune up than meets the ear. It's not just a matter of points and plugs and timing.

There are other sour notes. Like a dirty, clogged-up air filter. Or a gummy, waterlogged fuel filter. Or a little gadget called the PCV valve you maybe didn't even know you had.

These clinkers can throw your engine out of tune—maybe stop it cold. So have 'em checked.

If they need replacing, replace 'em. Replace 'em with Fram. And when you drive out we'll have you humming a different tune.



**Fram Automotive Division, Providence, Rhode Island 02916**

# EARN BIG MONEY IN AIR CONDITIONING REFRIGERATION & HEATING

25 KITS SENT TO BUILD THIS  
COMPLETE REFRIGERATION SYSTEM



**APPROVED FOR GI TRAINING**  
If you served since January 31, 1955 or are  
in service, check GI line in coupon

A better job, top pay and steady work are easily within your reach. Learn to repair and install air conditioning systems, refrigerators and freezers. Air conditioning is one of America's fastest-growing industries. Millions of autos and homes are being air-conditioned. The need for trained men is immediate and great.

**Make Home Your Training Center**—Learn by practicing. CTI sends 25 kits of tools and parts to build a complete refrigeration system—which you later convert into a refrigerator or freezer. The course is easy!

**Earn Money As You Train**—Since the CTI course includes training with real equipment, many students earn money repairing units soon after enrolling. On completing training they go into top pay jobs. Many get started in their own business.

**Mail Coupon Today for FREE book.** No obligation. Prove to yourself that the air conditioning, refrigeration and heating field is best for you—the easiest training to master and loaded with top pay opportunities.

**Commercial Trades Institute, Chicago, Ill. 60626**

**COMMERCIAL TRADES INSTITUTE**  
1400 Greenleaf Avenue  
Chicago, Illinois 60626 Dept. PM-270



Send book, Be a Success in Air Conditioning,  
Refrigeration & Heating. No obligation.

Name \_\_\_\_\_ Age \_\_\_\_\_

Address \_\_\_\_\_ Zip \_\_\_\_\_

City \_\_\_\_\_ County \_\_\_\_\_ State \_\_\_\_\_

Check for facts on GI Bill

Accredited Member National Home Study Council

## DETROIT LISTENING POST

(Continued from page 14)

because they were not locked and ignition keys not removed.

**A DELICATE SNIFFER** that can take a whiff of your car's exhaust and diagnose real or potential ills has been developed by Honeywell, Inc., scientists, working with Ford's Service Research Center. To check an engine, a hose is connected to the exhaust pipe while the engine is idling. The emission passes to a small combustion chamber where a hot-wire filament burns a small portion of it. Ultraviolet radiation emitted from the filament is counted by a sensor and displayed on two meters, one indicating volume of carbon monoxide gas, the other the level of hydrocarbons. A skilled technician can read the meters, determine what needs adjustment, and how much, what elements in a combustion system are nearing the end of the line.

**LOOK FOR ADDITIVES** (chemistry anyway) to take over more and more of the car's "keep it running" chores. Specialized automotive chemicals have come a long way since the old so-called "mouse milks," now are highly sophisticated combinations designed to do specific jobs. Case in point is the new antileak antifreeze put out by Du Pont, capable of sealing off all but the most severe leaks or hose ruptures. Another boon is Cromwell's X3 PCV cleaner and conditioner, a "really works" brew designed to keep antipollution systems at peak efficiency. The big oil companies, noting the quick growth of additive outfits, are said to be working feverishly to come up with a single, all-purpose concoction, the aim of which will be to handle all forms of internal combustion engine contamination.

**IF YOUR SON** says he wants to be an auto mechanic, refer him to a recently published book entitled *A Job With a Future in Automotive Mechanics*, written by J. Robert Connor and published by Grosset & Dunlap. Connor's view of the trade is complete, explaining in no-nonsense terms the goods and bads of what in the past has been a much-maligned activity. The book will help a young man determine what area of automotive mechanics is best for him, how to get started, what he can expect in the way of earnings and future. Connor also covers such in-trade considerations as whether it's best to work for a large dealership or a small service station. Connor told us that in the course of his research he was surprised to learn how many mechanics are making \$10,000 and over. ★★★

# Take command of your future...now!

## Choose the job you want from 266 ICS Courses

Dozens of new careers are open to you with ICS training. Oldest, largest correspondence institution. 8,000,000 students since 1890. Learn facts, theories, practical applications. Instructors guide

you, answer your questions. Texts, written by authorities, are yours to keep. Famed ICS diploma to graduates. Convenient payment plan. Send our coupon for three FREE booklets.

### ACCOUNTING

Accounting (U.S.A.)  
Accounting (Canadian)  
Accounting for Business Programmers  
Accounting for Man'g'm't Decisions  
Auditing  
Business Law (U.S.A.)  
Canadian Business Courses  
Cost Accounting  
CPA Review (U.S.A.)  
General Accounting  
Income Tax (U.S.A.)  
Industrial Accounting  
Junior Accounting  
Office Accounting  
Practical Accounting  
Public Accounting  
Small Business Accounting (U.S.A.)  
Starting and Managing a Small Bookkeeping Service (U.S.A.)

### ARCHITECTURE AND BUILDING

Architectural Drawing and Designing  
Architecture  
Building Contractor  
Building Estimator  
Building Inspector  
Building Maintenance  
Carpenter-Building  
Carpentry and Millwork  
Fundamentals of Urban Planning  
House Planning and Interior Design  
Mason  
Painting Contractor  
Reading Arch. Blueprints  
Review in Architectural Design and Practice  
Review of Mechanical Systems in Buildings

### ART

Amateur Artist  
Commercial Art  
Commercial Cartooning  
Illustrating with Options:  
—Magazine  
—Advertising Layout and Illustration  
Interior Decorating  
Oil Painting for Pleasure  
Show Card and Sign Prod.  
Show Card Writing  
Sign Painting & Designing  
Sketching and Painting

### AUTOMOTIVE

Automatic Trans. Spec.

Automobile Air Conditioning Specialist  
Automobile Body Rebuilding & Refinishing  
Automobile Engine Tune-Up  
Automobile Mechanic  
Automobile Technician  
Diesel-Gas Motor Vehicle Engines

### BUSINESS

Advertising  
Business Administration  
Business Practice (Cond.)  
Canadian Business Course  
Condensed Marketing  
Direct Mail and Mail Order Advertising  
Industrial Psychology  
Inventory Control  
Magazine & Newspaper Advertising  
Managing a Retail Business  
Managing a Small Store  
Marketing Management  
Marketing Research  
Modern Exec. Management  
Office Automation  
Office Management  
Production Management  
Purchasing Agent  
Retail & Local Advertising  
Retail Bus. Management  
Retail Merchandising  
Retail Selling  
Systems and Procedures Analysis

### BUSINESS: SALES

Creative Salesmanship  
Real Estate Salesmanship  
Salesmanship  
Sales Management

### BUSINESS: SUPERVISION

Basic Supervision  
Industrial Foremanship  
Industrial Supervision  
Management, Salesmanship and Sales  
Modern Woman as a Supervisor  
Personality Development  
Personnel-Labor Relations (U.S.A.)  
Supervision

### CHEMICAL

Analytical Chemistry  
Chemical Engineering  
Chemical Laboratory Techn.  
Chemical Process Equip. Design & Operation

Chemical Process Operator  
Elements of Nuclear Energy  
General Chemistry  
Instrumental Laboratory Analysis

### CIVIL ENGINEERING

Civil Engineering  
Construction Eng'r'g Tech.  
Highway Engineering Tech.  
Principles of Surveying  
Reading Highway Bl'pr'ts  
Reading Structural Blueprints  
Sanitary Engineering Tech.  
Sewage Plant Operator  
Structural Eng'r'g Tech.  
Surveying and Mapping  
Water Works Operator

### COLLEGE COURSES

American History  
Calculus  
Economics

### COMPUTERS

COBOL Programming  
Fortran Programming for Engineers  
Programming for Digital Computers  
Programming the IBM 1401 Computer  
Programming the IBM System/360 Computer, Introduction

### DRAFTING

Aircraft Drafting  
Architectural Drafting  
Design Drafting  
Drafting Technology  
Electrical Drafting  
Electrical Eng'r'g Drafting  
Electronic Drafting  
Introductory Mech. Draft.  
Mechanical Drafting  
Pressure-Vessel and Tank Print Reading  
Sheet Metal Layout for Air Conditioning  
Structural Drafting

### ELECTRICAL

Electrical Engineering  
—Electronics Option  
—Power Option  
Electrical Appliance Ser.  
Electrical Appliance Ser. with Equipment Training  
Electrical Contractor  
Electrical Engineering Tech.  
Electrical Home Maint.  
Electrical Home Maint. with Equipment Training

### APPROVED FOR VETERANS

Accredited member, National Home Study Council.  
Convenient payment plan.  
Special rates to members U.S. Armed Forces

Electrical Instrument Tech.  
Electric Motor Repairman  
Industrial Electrical Tech.  
Power-Line Design and Construction  
Power Plant Operator —Hydro Option  
—Steam Option  
Practical Electrician  
Practical Electrician with Equipment Training  
Practical Lineman  
Reading Elec. Blueprints

### ENGINEERING (Refresher Courses for Graduate Engineers)

Chemical Civil Electrical  
Industrial Mechanical  
Sanitary Structural

### ENGLISH AND WRITING

Better Business Writing  
English for Spanish (U.S.A.)  
Free Lance Writing for Fun and Profit  
Introductory Tech. Writing  
Modern Letter Writing  
Practical English  
Short Story Writing

### HIGH SCHOOL

High School Business  
High School (Canadian)  
High School General  
High School Mathematics  
High School Secretarial  
High School Vocational  
High School College Preparatory—Arts  
High School College Prep—Engineering and Science  
Preparatory Course for High School Equivalency Test

### MACHINE SHOP PRACTICE

Grinder Operator  
Industrial Metallurgy  
Lathe Operator

Machine Shop Inspection  
Machine Shop Practice  
Metallurgical Eng'r'g Tech.  
Multicraft Maintenance Mechanic  
Practical Millwrighting  
Reading Shop Prints  
Rigging  
Tool & Die Making  
Tool Engineering Tech.  
Welding Engineering Tech.  
Welding Process

### MATHEMATICS

Advanced Mathematics  
Math and Mechanics for Engineering Technicians  
Math and Physics for Engineering Technicians

### MECHANICAL

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**A supersensitive "fish" for locating sunken ships** has been developed by scientists at the U.S. Naval Oceanographic Office. Called *Teleprobe*, the device uses side-scan sonar to locate a target. Then it photographs it, using strobe lights, still cameras and TV. The sonar is so precise it can pinpoint a 4-foot-diameter object at a distance of 1200 feet. All of *Teleprobe's* instruments are mounted on an 18-foot-long sledlike frame that is towed by a surface ship. Designed to perform effectively at depths to 20,000 feet, *Teleprobe* could have speeded up the locating of the *Thresher* and *Scorpion*, nuclear subs that sank with great loss of life.

**No income-tax deductions to be allowed for children?** That provocative idea comes from Stanford University biologist Paul Ehrlich who also suggests that "luxury taxes should be placed on diapers, baby bottles and baby foods. It must be made clear to our population that it is socially irresponsible to have large families." Instruction in birth-control methods should be mandatory in all public schools, according to Prof. Ehrlich, and federal research funds should be applied to birth control rather than death control. "It is absurd to be preoccupied with the medical quality of life until and unless the problem of the quantity of life is solved."

**Icebergs—not seawater desalting plants**—might be the most economical source of fresh water for arid coastal regions. That's the theory of U.S. Geological Survey scientists who say that the flat slabs from Antarctica would be easier to tow than the ice "mountains" common to the Arctic. A slab about 140 yards thick and 2700 yards square would contain the equivalent of more than 200 billion gallons of water. It would cost about \$1 million to tow such a berg from Antarctica to northwest Australia, making the water far cheaper than that of a typical desalting plant. The scientists say that Antarctica's ice cap, which holds about 80 percent of the world's fresh water, could supply water for dry regions in South America and Africa as well as Australia.

**A greeting card that sounds off** has been invented by two Indianapolis men, according to an Ohio State University engineering publication. It is made up of two panels. The bottom panel contains a recorded message in the form of a sound strip that runs lengthwise. The upper panel holds a pickup needle and a tiny speaker. To hear the message, the recipient pulls the top panel, running the needle against the sound strip.

**Exceptionally smooth railroad travel** could be achieved by building into cars "reflexes" that would be able to sense out-of-line motions and react to keep the car steady. A study by Westinghouse researchers shows the method to be sound. Basic components would include sensing elements, hydraulic actuators and a hydraulic pump. Conventional suspension systems depend on springlike devices to simply soften bounces or swaying motions. The proposed "active" suspension system would actually eliminate such motions by lifting the wheels as they go over bumps, by pushing them down into depressions or by pushing or pulling the car back into line as it starts to roll or sway.

**An atom-powered traffic sign, easily visible at night from 500 feet**, is being tested in Phoenix. It works in a fashion similar to that of a TV tube. Electrons from a radioactive form of krypton gas hit a phosphor-coated surface, causing it to glow. The fuel, which keeps the sign illuminated night and day will reportedly last 10 years. The sign poses no safety hazard, say state officials, should it be shattered in an accident. The krypton is in a chemically inert form, and there is very little of it. If released, the gas would dissipate in the atmosphere almost immediately. Big advantage of the device is that it requires no electrical lines or replacement parts. ★ ★ ★

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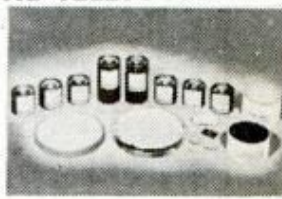
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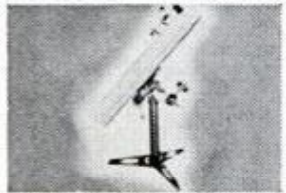
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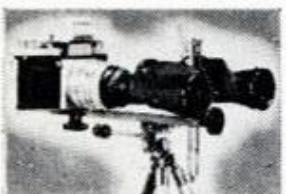
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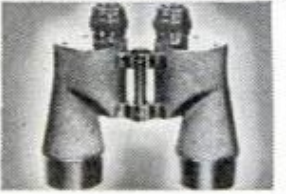
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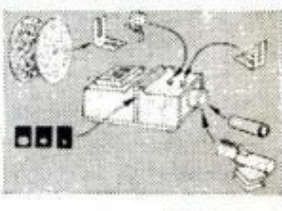
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ON-THE-GO

# CAMPING

BY WADE MITCHELL

**CHEVROLETS MID-1970 VANS WILL BE MOST POWERFUL.** Early reports indicate that the new Chevy vans will have long wheelbase and a gross weight about 600 pounds heavier than Ford's 1969 E-300 series. The vans will also provide an outside front-service panel for oil, water and battery. Biggest lure is expected to be the 350-cu.-in. V8, most powerful engine yet offered in the field. Engine will be pushed farther ahead.

**WILL NATIONAL PARK SYSTEM GO ON RESERVATION BASIS?** Some recreation specialists predict that within three to five years, the pressure from millions of new campers may force a campsite reservation system onto harried park administrators. Or a lottery system may be devised whereby campsites in choice locations will be drawn by chance for such over-used and abused parks as Yosemite, Yellowstone and Grand Canyon. NPS would like to end long lines of vehicles waiting at the gates each morning.

**TENT-TRAILERS SET NATIONAL RECORDS.** Starcraft produced over 21,000 folding trailers last year, making it the "General Motors" of its field. Apache pushed hard with about 15,000 units. With over a score of folding-trailer manufacturers now in business and the Coleman Co. entry into this market, the tent-trailer may one day rival or exceed in number all other forms of recreational vehicle.

**CAMPGROUND SIGNS NEEDED ON U.S. HIGHWAYS.** Many travel experts lament the fact that while most other essential services are noted along major highways (such as *Food—Garage—Lodging*) there is no nationwide policy covering *Campground* signs. We believe such signs should be placed at all off-ramps leading to local facilities, whether they be public or privately operated, in order to end the late-night confusion facing millions of vacationers trying to find an overnight site. The U.S. Department of the Interior is just beginning to erect such signs. Iowa gets the treatment first, and we hope the program will spread cross-country.

**ADD A FABRIC ROOM TO YOUR CAMPER!** A new 6 by 7-foot room extension is now available on Wonder-Land Campers and, presumably, will be available for others. A drop-down design, it utilizes a sliding door for access into rear of main coach body. Owner says it sets up in eight minutes and is weathertight with screens and flaps for better control. (Wonder-Land Camper Co., 18500 Plymouth Rd., Detroit, Mich. 48228).

**SOME OF THE BEST PLACES IN NORTH AMERICA** to pitch a tent or pull up a trailer are listed in a booklet published by the Canadian Government Travel Bureau. The 52 pages of *Canada Campgrounds* give an easy-to-read, province-by-province run-down of tenting, trailer and picnic sites along the 5000-mile Trans-Canada Highway which extends from Victoria, B.C., to St. John's, Nfld. The colorful booklet uses easily-recognizable symbols to denote facilities available at each site. Readers can tell at a glance if the site is supervised, and if it has electrical and sewage outlets for trailers, fireplaces, campfires, picnic tables, drinking water, firewood, ice, supplies, and water for swimming, fishing and boating. Copies of *Canada Campgrounds* are available free from Canadian Government Travel Bureau offices throughout the United States.

**BUILT-IN VACUUM DUCT IS NEW OPTION FOR 1970 TRAILERS!** Streamline Trailer Co., (South El Monte, Calif.) recently released news of its new snap-in vacuum cleaner duct for trailer coaches. User can plug into the system anywhere in coach and use vacuum with handy short pickup hose. The special dust canister can be emptied outside, independent of the vacuum head itself. With a tentative price of "about \$200," the snap-in vacuum cleaner is the latest option in modern housing. ★★ ★

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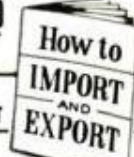
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Nationally recognized name? .....	Yes	_____
Previous experience necessary? .....	No	_____
Training and supervision provided? .....	Yes	_____
Operator required to purchase supplies from franchisor? ...	No	_____
Type of business operation .....	Cash & carry	_____
Stock inventory necessary? .....	No	_____
Delivery service needed? .....	No	_____
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# What You Need to Know Before You Buy a Franchise

Here are the questions you should ask before you sign a contract, and the answers given by Dr. Charles L. Vaughn, director of the Boston College Center for the Study of Franchise Distribution, in an interview with PM editors

**If I'm considering a franchise, should I seek a company with a well-known or well-advertised name?**

Yes. If you go with a company that is not well-known, you don't get the benefit of a nationally advertised name.

Many companies start with a product or a process or a service and build on it to create a brand name through advertising and satisfied customers. In the last few years, some companies have tried the op-

posite approach. They take a name and then build a service.

**Let's take the fried-chicken business. Col. Sanders wasn't a name to begin with. He became one because his chicken was good and was well-promoted. But what about Minnie Pearl or Eddie Arnold or some other celebrity who never fried any chicken, but is a name? Which am I better off with?**

If you buy a franchise from an organization based on a personality in entertainment or sports, you could be getting into a business that's not really set to go. Such a franchise is only as good as the franchisor's management.

**You would say, then, that if you're going to go into the restaurant business it would be safer to be in with experienced restaurant people?**

Right.

**Rather than with somebody who says, "I'll get a celebrity, and we'll start some restaurants?"**

Right. Again, you have to weigh the possible returns against the risks. Generally you take a bigger risk with a new organization, even though it has a big name to work with. If you have speculative money that you can put out, and the potential return is high, then it could be that you're getting a *better* deal with a new group with a big name than with an old, established group where you wouldn't

*(Please turn to page 26)*



*Charles L. Vaughn, Ph.D., is executive director of the Boston College Center for the Study of Franchise Distribution. He initiated the conference for top management on franchising held annually at Boston College since 1965. Editor of Franchising Today 1969 (Farnsworth Publishing Co., New York), Dr. Vaughn has written numerous articles on franchising and has lectured all over the nation on the subject. He has also been engaged full-time as a consultant in consumer- and systems-research firms.*

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## BEFORE YOU BUY A FRANCHISE

*(Continued from page 25)*

be taking as much risk, but where the potential return might be less.

**Does it cost more to get into an established operation than a brand-new one nobody ever heard of?**

It generally would cost more, and your expected return would not be as great.

**Your volume might be bigger?**

Yes, your volume might be bigger, but your net might be smaller. If you go in with a new, untried group, you're taking a greater risk, because they haven't established a track record. Therefore, your *expected* return—not promised return—should be greater because of the greater risks you're taking. If you recognize that, fine.

**What are some of the risks?**

Well, there's a risk that you won't make money. That's the basic risk. In fact, you may lose it all. Why might it net nothing? Well, maybe the name doesn't appeal. It may not be appropriate for the products or services you are trying to sell. Or you may not get enough good advice and counsel from the franchisor. He may advertise that you don't have to be a cook or restaurant man. "We'll give you all that," he says. But it's possible he can't give you that or that he won't.

**How can you check a franchisor's claims of what he will do for you?**

It's difficult. If it's a well-established operation, and you can interview other franchisees, it's relatively simple. If it is public you can go through his prospectus. If it's a well-established, well-known company, you can talk to local banks and maybe take a trip of a couple hundred miles and see what banks and other franchisees have to say. With a new outfit, it's hard to estimate the risk involved. It's probably high.

**There are agencies that help you find franchisors. Is it wise to approach an agency?**

*(Please turn to page 28)*

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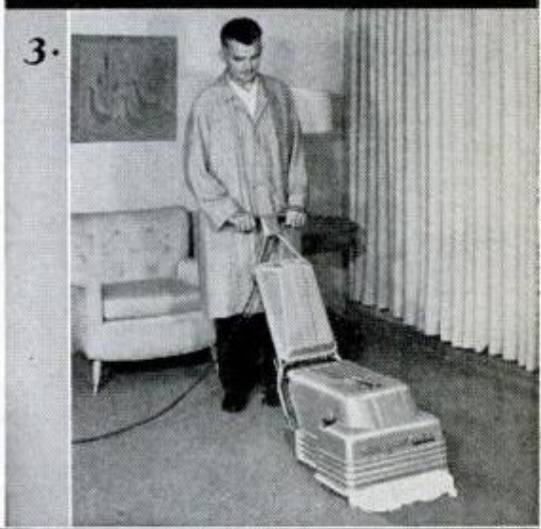
because each service helps to sell the other two

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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## BEFORE YOU BUY A FRANCHISE

(Continued from page 26)

No. That's the last thing I would do. They are not your agent—they are the agent of the franchisor. He is the one who pays the money. It is the commission on that sale that keeps the agency going.

Should I buy an ice-cream parlor or should I go into the rug-shampooing business?

That I can't answer. You have to invest so much cash and so much work—personal effort—in an ice-cream stand. The same is true in the rug-cleaning business. Which business do you want to be in?

Let us say that I've been a mechanic all my life. Should I take on a barbecue-beef franchise or would I be better advised to go into relining brakes?

Sometimes the franchisor wants the fellow who *doesn't* have a lot of experience so he won't have a lot of bad habits. But today the tendency is to try to get people with a little business experience.

Why have some businesses turned to franchising instead of becoming chains? Why do they become a franchisor instead of opening a store and hiring a manager?

A chain of men's clothing stores found recently that one of its company-operated stores was losing money. It put a franchisee in, and he made money hand-over-fist. The franchisee had a more realistic approach to inventory. He wasn't ordering just to be filling his shelves. He ordered stock that would sell. It was his own money. He exercised a lot tighter control.

I'm a 45-year-old magazine editor. If I should decide to take the plunge and buy a franchise, would I be a favorable risk?

At 45? Sure. But it depends a little upon the particular field. Many people who are 55 or 60 think they can "retire" into the motel field. That's the last place in the world they ought to go to retire.

Are franchises in general good retirement opportunities?

(Please turn to page 30)

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## BEFORE YOU BUY A FRANCHISE

(Continued from page 28)

A franchise seems like a logical retirement business, but I'd shy away from it.

**If I should fail, what is the obligation of the franchisor to help prevent the total loss of my investment?**

He'll usually buy it back if you're losing money, but you may not get much out of it. Let's say you put \$30,000 into a franchise, and you're not doing very well. The first thing the franchisor is supposed to do, according to the agreement, is to give you management and marketing counsel and try to help you. Some will put a man right in there to run it for you or to help you run it for a few weeks or months. The older companies have more of a capability there.

**What are the give-away signs on a fast-buck outfit? What do you look out for?**

Somebody who's so new you can't get any information on him from the Better Business Bureau, or who doesn't have any franchises in existence, who doesn't have any company-owned stores and who makes exaggerated claims—that you're going to get rich overnight. I don't know one legitimate franchisor who promises riches overnight. If a franchisor says that you'll definitely make \$45,000 net or \$25,000 net, you can begin to wonder, because nobody can predict precisely what your revenue will be or what you will receive in net profits.

**Will most franchisors allow you to have an attorney go over your contract?**

Sure! The good ones recommend it and some even insist on it. If a franchisor says, "Oh, you don't need an attorney," I'd hesitate about putting out \$10,000.

Getting back to that age thing: Age doesn't seem to be a big factor in the franchise business. Kentucky Fried Chicken was started on Col. Sanders' social-security checks. On the other hand, some of the McDonald hamburger franchisees and the managers are in their 20's and making money hand-over-fist.

**How do I know whether a business is**

(Please turn to page 32)





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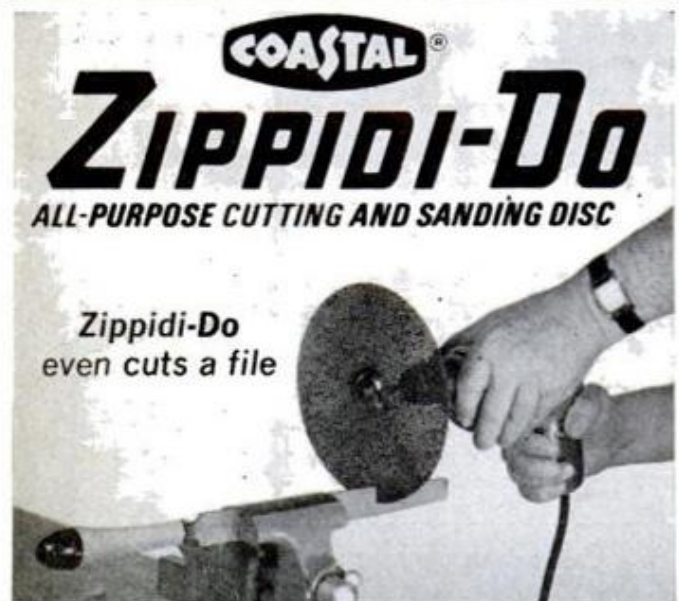
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**BEFORE YOU BUY A FRANCHISE**

*(Continued from page 30)*

over-franchised? The chicken business is a good example. I mean how much fried chicken can people eat?

The saturation concept is pretty weak. When McDonald's started its hamburger business, who would have thought you could build up a string of over 1000 establishments selling hamburgers. Everybody can make a hamburger; everybody's selling hamburgers. Yet this "new" chain is highly successful. In other words, people didn't have all the hamburgers where they wanted them and at the price they wanted to pay. It's difficult to estimate the market, but much of the talk about saturation is unjustified.

Franchisors have information that helps them select new locations. Take Holiday Inns. They can tell from their records how many reservations were requested for a town 50 miles down the line from where they have a Holiday Inn, 200 miles down the line, and so on. So when they put up a Holiday Inn they can estimate accurately how many reservations they are going to get.

**What is considered a fair royalty?**

Around five percent. That's gone up a little bit lately. It varies from zero to say seven or eight percent.

**Prime sites for fast-food operations are getting scarcer, aren't they?**

Yes, they're hard to find. But I've noticed one thing. When one fellow opens a Kentucky Fried Chicken, let's say, there are soon six or eight franchised eating places all on the same little stretch of highway.

**Does this help or hurt?**

It probably helps, up to a point. But if you could break away and go someplace where you could get a cheaper site, maybe you would do just as well. Sometimes businesses cluster together, seeking what we might call an "umbrella effect," or mutual attraction of customers.

**If it's true that a franchisee must have**

*(Please turn to page 34)*



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## BEFORE YOU BUY A FRANCHISE

*(Continued from page 32)*

some initiative and know-how in such complicated areas as marketing and merchandising, how's a young fellow coming back from Vietnam or a high school graduate with no experience going to succeed? The know-how has to come from the parent company, doesn't it?

Yes, right. The advantage of a franchise is that it makes you an instant manager. If you went to work for a chain, you couldn't be a manager until you had worked for it for 5, or maybe 10, years. Franchisors have so simplified the operation that almost anybody can succeed. That's why when you're talking about really fancy restaurants, or a complex department store, you're getting out of the field of franchising. You can't be an instant manager there. There's too much to it. Fifteen items on the menu, plus lobster: Just cutting the meat takes a guy who really knows his stuff. Say there's a little piece the average person would throw away. If you discard so much of it for every portion—365 days a year—your

profit's shot to beans. You can't franchise that type of restaurant. The real successes are the highly simplified operations. The more complex the operation, the more hazard there is.

Are there factors that a franchisee might not be aware of that make him a poor manager? Are there things he can do by himself to be better than he is—things the parent company might not catch or help him with?

Well, reliability and dependability: Those are two biggest factors. Opening up on time, being there, keeping the place clean and so on. The parent company will check up on your reliability and dependability. Marketing and public relations are things the average new manager may not be good at. If you get a chance to cater doughnuts and coffee for the Ladies' Aid Society, do it. You may not make any money on that particular occasion, but it builds acceptance for your place and its name.

**Does the franchisor set prices or do I?**

*(Please turn to page 36)*

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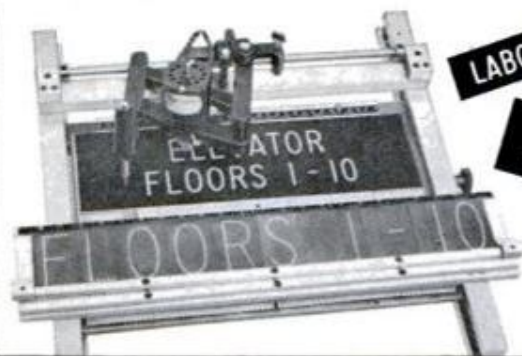
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(Continued from page 34)

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**If the parent company puts in its own manager, we're right back to a chain operation, aren't we?**

Right. There's a delicate balance between company-owned and franchised units. Sometimes franchises become worth so much that no one but the parent company can buy it.

**Is there a trend back to the \$8000-\$10,000 franchise? When it gets beyond that, Mom and Pop can't afford it.**

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**Plymouth Valiant's Duster:** Owners Report.

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BY CATHERINE BILSKI

**MAKING A SAIL** for your boat needn't be a complicated task, thanks to a new booklet written by sailmaker Ted Bowen. The booklet, *How to Make Main and Jib Sails*, describes and illustrates, in simple and easy-to-follow terms, just how to make your sails. It is available for \$3 from E. S. Bowen, 41 Yonge Street North, Richmond Hill, Ont., Canada.

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crafting at home with this 94-page illustrated book entitled *Handbook of Jewelry Metalcrafting*. It contains sections on what materials, tools and supplies are needed, handy reference tables and lots more. Priced at \$4.95 from Craft Training Institute, 7438 S.E. 40th St., Mercer Island, Wash. 98040.

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- Universal's training-by-mail has been the path to success for thousands of men in this high-pay field, mostly men with no college and no experience.

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It was easy. Ted simply studied his brief, interesting lessons at home in his spare time. He kept right on with his old job until he could start making money quickly in Accident Investigation.

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# Drivin' with Dan

When is the best time to buy a new car? What class of Formula racing cars is the fastest? Why don't dragsters run pure oxygen in their engines? Dan Gurney answers these and other automotive questions

**Q.** *Isn't the best time to buy a new car about six months after new models come out since improvements have been made by then as a result of customer complaints?—Peter Yeljenick, Union City, N.J.*

**A.** I have often had the same thought, but, with the knowledge that I have, I would say that it is rarely true. The new early-year versions are good, just as good as later ones. The key word is rarely. In other words, you're right a little, sometimes. When so-called "running" changes are made to a model in production you benefit. Otherwise, the earlier ones may be better because tools are not worn as much.

**Q.** *I am interested in Formula racing cars. What class is the fastest of them all?—Cliff Michaelson, Spotswood, N.J.*

**A.** Formula A, or Formula 5000, as it's known overseas, probably has more potential, although Formula 1 is undoubtedly a more highly developed type of racing right now, and at the moment would be the fastest. The

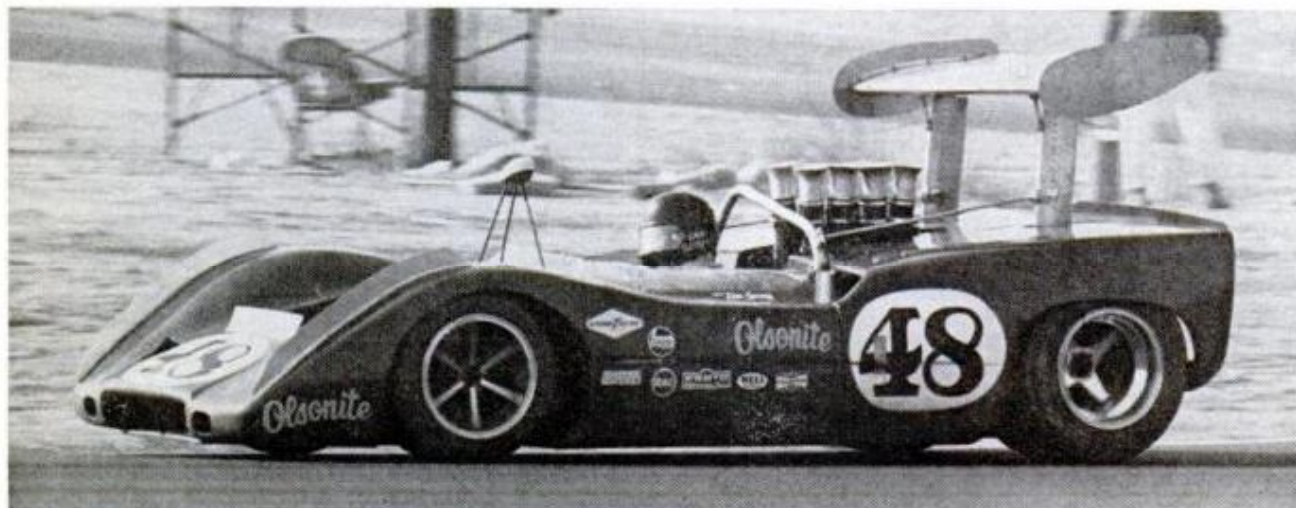
"A" cars have the advantage of still utilizing wings (banned in F1) and their 5-liter (305-cu.-in.) displacement gives them the biggest, most powerful engines. Also, the "A" weight minimum of 1250 pounds with water and oil allows for a car very close to Formula 1 weight in the same form.

**Q.** *Why don't dragsters, or any cars for that matter, run pure oxygen in their engines? I would think that horsepower and efficiency would be greatly increased.—Harold Andresen, Duluth, Minn.*

**A.** Yes, it would increase horsepower, but I'm not certain what you mean about efficiency. I suppose that it would be difficult to work out the necessary metering of the oxygen in sufficient quantities, and also to control the extra heat or instability caused by such a fuel mixture. The cost would probably be the toughest thing to handle. The technology would be all new and costly to work out.

**Q.** *What is a supercharger and how does it operate? Can it be used for street? If I installed one*

**FINISHING FOURTH** in the McLaren M6B-Chevy at last year's Times Grand Prix at Riverside International Raceway, Dan placed 11th in points and cash for 1969 Canadian-American Challenge Cup series of road races







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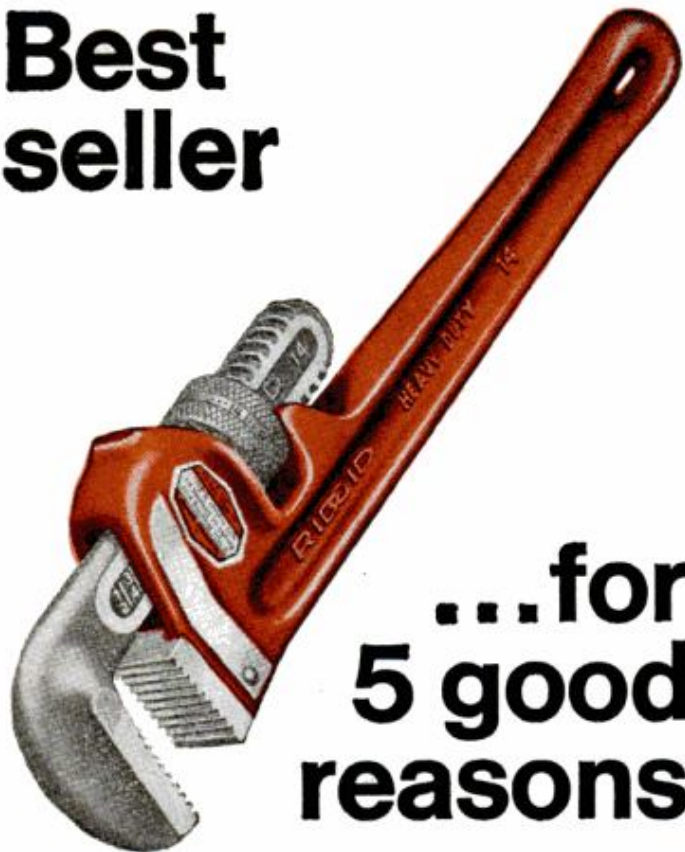


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## DRIVIN' WITH DAN

*(Continued from page 40)*

on my 283 Chevy, what would be my power increase?—Fred Craig, Ballwin, Mo.

**A.** A supercharger packs air into the inlet port of an engine under pressure so that more goes in when the valve opens. It can be used on the street. It usually increases power, hurts mileage and reliability, and increases maintenance requirements.

**Q.** What is the highest horsepower ever produced from a Formula 1 engine? How many cylinders did the engine have?—Hugh McCrackin, Derwood, Md.

**A.** Something over 600 hp out of approximately 360 cu. in. in a prewar German Mercedes Benz eight-cylinder, supercharged car. Another interesting one was a supercharged British BRM 16-cylinder engine that made over 575 hp in 1957.

**Q.** What final drive ratio is used in NASCAR racers to get to such speeds as 180-200 mph? How fast would the engine be turning at these speeds?—Brian Fohse, Spalding, Saskatchewan.

**A.** Between 2.90 and 3.10 to 1 and usually at 7200 to 7500 rpm.

**Q.** What are the consequences of removing all the smog-control contraptions (pump type) from a 1968 Cortina? Would it harm the engine if the whole kit were removed and the holes plugged?—A. A. Rassier, Minot, N.D.

**A.** I doubt if this would harm it. But don't sue me if it does. How's the smog up there in N.D.? You might want to change jets in the carb to enrich the mixture a little bit. The competition department of Ford of England could give you much better advice: Write Ford Motor Co. Ltd., Brentwood, Essex, England.

**Q.** Recently I had to turn back from a trip across the desert because my car's cooling system wouldn't take it. Do certain kinds of cars have difficulty with their cooling systems in deserts and mountains?—Donald Pickering, Saugus, Calif.

**A.** The basics are: It is easier to boil water at high altitude; it's harder to cool water with hot air than with cold air; cars with

*(Please turn to page 45)*

## DRIVIN' WITH DAN

*(Continued from page 42)*

airconditioning require more cooling capacity when it is switched on; some cars can cope with heat and altitude better than others. Crossing at night is usually easier on man and machine.

**Q.** *I'm taking a course in auto shop at school which requires having a car to work on. I was thinking about a small-block Chevy. Do you feel this is a good engine to work on and learn from?*  
—David Christenson, Aromas, Calif.

**A.** Yes, it is excellent. There is a vast array of special equipment, and information about this engine is available.

**Q.** *I read recently that you and A. J. Foyt held the record average speed at Le Mans. Why don't you race there any more?*—Jim Brown, Leawood, Kans.

**A.** I decided one win was sufficient so I'm racing elsewhere now. It took about eight or nine tries. I'll ask A. J. next time I see him. By the way, we still hold the record average speed there.

**Q.** *Where can I get information on the technique of small sports-car racing and racing rules?*—P.V.A., Peachland, B.C.

**A.** Write to the Sports Car Club of America at P.O. Box 791, Westport, Conn. 06880.

**Q.** *I was surprised to read of your switch from Ford to Plymouth. I think it was a stupid mistake. Does this mean you will not run stock-block Fords on the USAC trail or turn out heads for small-block Fords?*—Jeff Glazier, Allentown, Pa.

**A.** Our effort with the Plymouth 'Cuda will be in Trans-Am racing only at the moment. I plan to run a Plymouth Super Bird in the 1970 Motor Trend 500. We are continuing with our Ford-based 320 Gurney Eagle Indy stock-block engine. The Plymouth stock-block engine also looks excellent. We at AAR love racing, Jeff; we'll see if it's a mistake. We love competition and there will be plenty! ★ ★ ★

*If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 82).*

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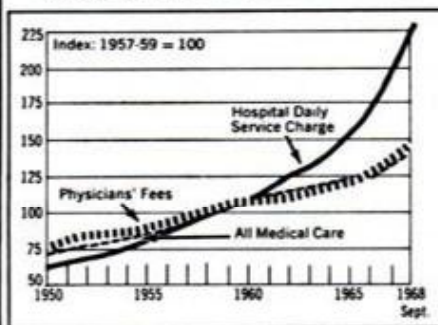
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National Health Plan can now provide you and your entire family with tax-free Extra Cash Protection for just 25¢ the first month only because we enroll a large number of people direct by mail. Of course, if we don't receive your Enrollment Form the same time as all the others we cannot pass on to you the savings that come from processing many policies at one time. That's why the deadline date must be, and is — strictly enforced.

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45-49	only \$3.75
50-54	only \$4.25
55-59	only \$4.75
60-69	only \$5.70
70-74	only \$6.60
75 and over	only \$8.50

Naturally, at these low rates, we can issue you only one policy of this type.

**Only \$1.90 more covers all your dependent, unmarried children . . .**

from the age of month through 18 years. And then, if you wish, just add 95¢ more to that, and you're covered for Maternity Benefits, too! Newborn children are covered automatically at the age of one month — at no additional cost!

NOTE: The regular monthly premium shown here (for age at time of enrollment) is the same low premium you will continue to pay; it will not automatically increase as you pass from one age bracket to the next! Once you're enrolled in this National Health Plan, your rate can never be changed because of how much or how often you collect from us — or because of advanced age — but only if there is a general rate adjustment, up or down, on all policies of this type in your entire state!

**Act NOW—"Later" May Be TOO Late!**

TIME IS PRECIOUS! Act quickly. (No salesman will call.) Get your Enrollment Form into the mail today — once you suffer an accident or sickness, it's TOO LATE to buy protection at any cost. So act now — before anything happens.

**ENROLLMENT FORM MUST BE MAILED BEFORE MIDNIGHT  
SAT. FEB. 21 OR IT CANNOT BE ACCEPTED.**

**Now add up to \$9,600.00 EXTRA CASH  
to your health protection.  
Only 25¢  
covers your entire family the first month!**

## **THESE 11 QUESTIONS AND ANSWERS**

tell you how National Health Plan's \$9,600.00 EXTRA CASH HOSPITAL COVERAGE gives you the protection you need. Costs only 25¢ for the first month! Nothing else to pay now—then you may continue at our regular low rates.

- 1. How much will my Policy pay me when I go to the hospital?** \$400.00 per month—starting the first day—to the full maximum of \$9,600.00 cash. The same applies to other Covered Members of your family. If you're 65 or over, you collect up to \$9,240.00 cash benefits *on top of any Medicare benefits*. (\$280.00 a month for the first three months and \$400.00 monthly while continuously hospitalized afterwards, for an additional 21 months.) You can count on National Health Plan for extra cash—when you need it most!
- 2. When do I collect \$2,000.00 extra cash for accidents?** You collect \$1,000.00 extra cash for complete accidental loss of one hand or one foot or sight of one eye, and \$2,000.00 extra cash for loss of both hands or both feet or sight of both eyes—even if such loss occurs 3 months after time of the accident.
- 3. What if I am hospitalized by the same illness again?** You still collect to the full \$9,600.00 maximum.
- 4. Do you pay me cash for my children, too? And... for any children I have in the future?** Yes! You collect up to \$5,760.00—at the rate of \$240.00 a month with Coverage for Children added to basic Plan — *each time* any dependent, unmarried child (age 1 month through 18 years old) is hospitalized for sickness or injury. Newborn children are covered *automatically* when they're a month old.
- 5. How much do you pay me for pregnancy?** You collect \$400.00 a month for pregnancy, childbirth or miscarriage that results in a hospital stay when you have Coverage for Children and Maternity Benefits. (Both parents must be enrolled in this Plan during entire pregnancy.)
- 6. Am I allowed to stop paying premiums during a long stay in the hospital?** Yes you are! We pay all premiums that come due after you—the person to whom the basic Policy is issued—are in the hospital just 8 weeks or more!
- 7. What doesn't my Policy cover?** Your Policy covers everything except conditions caused by: war or act of war; mental disease or disorder; pregnancy, except as provided under the Maternity Benefit provision; and any sickness or injury you had before the Effective Date of your Policy. (Even this last "exclusion" is done away with after you've been a policyowner for just 2 years.)
- 8. Does this Plan pay in any hospital?** You are covered for care in the hospital of your choice except, of course, a U.S. Government hospital or a nursing or convalescent facility.
- 9. Will you cancel my Policy if I make too many claims? Or because of age?** No! National Health Plan guarantees never to cancel your Policy for any reason whatsoever!
- 10. What are the requirements to enroll in this Guaranteed Renewable Plan?** You must not have been refused or had cancelled any health, hospital or life insurance due to reasons of health; and, to qualify during this Enrollment Period, you must enroll before midnight of the date shown in the Enrollment Form.
- 11. How do I enroll?** Fill out the brief Enrollment Form and mail it with just 25¢ to: National Home Life Assurance Company, Valley Forge, Pennsylvania.

**Only 25¢ enrolls your entire  
family for the first month**

**ACT NOW! YOU MUST MAIL THE ENROLLMENT FORM ON ATTACHED CARD  
BEFORE MIDNIGHT FEB. 21 OR IT CANNOT BE ACCEPTED.**

# LIMITED ENROLLMENT PERIOD ENDS SOON

## MONEY-BACK GUARANTEE

We will send your National Home Policy by mail. Examine it carefully in the privacy of your own home. Show it, if you wish, to your own insurance agent, doctor, lawyer or other trusted adviser. If you decide, for any reason, that you don't want to continue as a member of this Plan, return the Policy within 15 days, and we will promptly refund your money. Meanwhile, you will be fully protected while making your decision!

*T. Robert Wilcox*

President  
National Home Life Assurance Company



**NATIONAL  
HEALTH  
PLAN**

a service of National Liberty Corporation

**National Home Life Assurance Company**

*The Honorable William W. Scranton, Chairman of the Board*

**Adm. Office: Valley Forge, Pa.**

This plan is underwritten by National Home Life Assurance Company, an old line legal reserve company of St. Louis, Missouri. National Home is licensed by your state and carries full legal reserves for the protection of all policyowners.

### HERE'S ALL YOU DO TO RECEIVE YOUR POLICY:

1. Complete this brief Enrollment Form.
2. Cut out along dotted line.
3. Enclose form in envelope with 25¢ and mail to: National Health Plan, Valley Forge, Pa. 19481

Official Enrollment Form for the Hospitalization Indemnity Plan 0-0354-0-01

**NATIONAL HOME LIFE ASSURANCE COMPANY**

An Old Line Legal Reserve Company of St. Louis, Missouri

**ADMINISTRATIVE OFFICE: VALLEY FORGE, PENNSYLVANIA**

**NAME** MR. \_\_\_\_\_ MRS. \_\_\_\_\_ MISS \_\_\_\_\_  
(Please Print) First Middle Initial Last

**ADDRESS** \_\_\_\_\_

**CITY** \_\_\_\_\_ **STATE** \_\_\_\_\_ **ZIP** \_\_\_\_\_  
Street or RD #

**DATE OF BIRTH** \_\_\_\_\_ **AGE** \_\_\_\_\_ **Sex** Male  Female   
Month Day Year

**OCCUPATION** \_\_\_\_\_

List all dependents to be covered under this Plan: (DO NOT include name that appears above. Use separate sheet if necessary.)

NAME (Please Print)	RELATIONSHIP	SEX	DATE OF BIRTH			AGE
			MONTH	DAY	YEAR	
1						
2						
3						

Check here if you want Coverage for your Children.

Check here if you want Coverage for your Children and Maternity Benefits.

To the best of my knowledge and belief neither I nor any person listed above has been refused or had cancelled any health, hospital or life insurance coverage due to reasons of health. I hereby apply for the Hospitalization Indemnity Plan. I understand that I, and any person listed above will be covered under this Policy for a recurrence of any injury or sickness I (we) had before the Effective Date of this Policy after two years from Effective Date, but not before; and that this Policy shall not be in force until the Effective Date shown in the Policy Schedule. I am enclosing the first month's premium for coverage for myself and all other Family Members listed above.

**Signature X** \_\_\_\_\_ **Date** \_\_\_\_\_

NHA-01

VH-995

**MAIL THIS ENROLLMENT FORM BEFORE MIDNIGHT, SAT., FEB. 21, 1970**

NH-02-369

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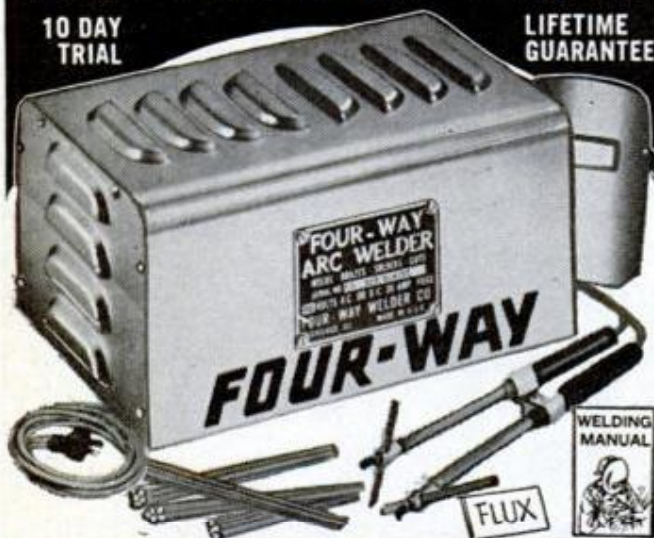
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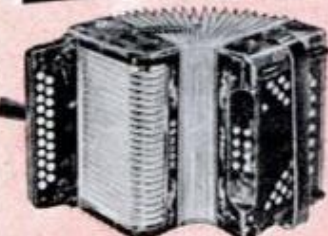


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# HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

## Case for lightning rods

*My house was struck by lightning last summer and although there was limited damage, I was badly scared. Is there any truth in the saying, "Lightning never strikes twice in the same place"? I've thought of installing rods but do they offer any protection?—T.L., Mo.*

According to well-established records it is not true that lightning never strikes twice in the same place. Tall buildings attract repeated strikes; homes and other buildings, on farms and in urban communities, have been struck more than once.

Lightning rods, properly installed, do protect against damage by lightning. Venerable old trees in parks, structures of historical interest, church steeples, country homes, barns and outbuildings and many industrial installations have been protected by lightning rods for years. Tall buildings of structural-steel construction are lightning rods in themselves and need no additional protection as a rule. You will likely find competent installers listed in the Yellow Pages of your local telephone directory or in those of nearby cities.

## Cedar shakes over old roof

*My asphalt-shingle roof is nearing the end of its normal life and I want to install a cedar-shake roofing. The deck, of boards laid edge-to-edge, seems to be in good condition. Do I need to take off the old shingles or can I lay the shakes over them? Should I replace the felt under-covering? If so, with what?—N.O., Ohio.*

I would remove the old shingles—everything right down to the decking—then go over the decking to make sure no boards are loose or cupped. The latter should be replaced and the former nailed securely. Any deck boards that seem deteriorated, rotted, full of knots or otherwise defective due to aging should also be replaced. It's important to provide a solid nailing surface for shakes.

While you can use an ordinary felt under-covering, or liner, this may tend to prevent the underside of shakes from drying. I would, rather, install the "breather-type" liner usually recommended for use under shakes. This should be available

through your local building materials dealer, and laid according to the manufacturer's recommendations. If you do the job yourself, be especially careful to avoid splits or hammer dents and make sure you use the right nails.

## Rotary or reel mower?

*Finally I'm going to discard my hand lawn mower and buy a new power mower next spring. I don't like the awful racket made by a rotary mower, but I'm told it's the one to buy—more efficient, cheaper in cost and in upkeep. What do you say?—G.K., N.Y.*

Perhaps a dozen rotary mowers are sold for every reel type. Somewhat lower initial cost is a likely factor in the wide disparity of sales. The rotary is efficient when cutting fine and coarse-bladed lawn grasses and it'll buzz through quite tall grasses and weeds without stalling; that is, if the blade is razor sharp.

You don't mention a choice between the rotary self-propelled and push types so I'm assuming you refer to the latter. If I were discarding a hand mower I would want to discard the "push" also.

On the other hand, the reel-type mower can be set to make the very low cut required on some varieties of lawn grasses, usually works better on slopes and terraces and operates efficiently at a much lower blade speed. When properly sharpened and correctly operated, it does an unbeatable job on a smooth lawn. Most reels are self-propelled and easily maneuvered around shrubbery, near fences and along quite steep slopes. Blades and bed knife must be sharpened by someone with special equipment. If blades are damaged by a stone, repair may be more costly.

The reel type is generally less efficient than the rotary on a rough lawn and, though operational hazards are present with both types, is generally considered less hazardous.

## Waiting game

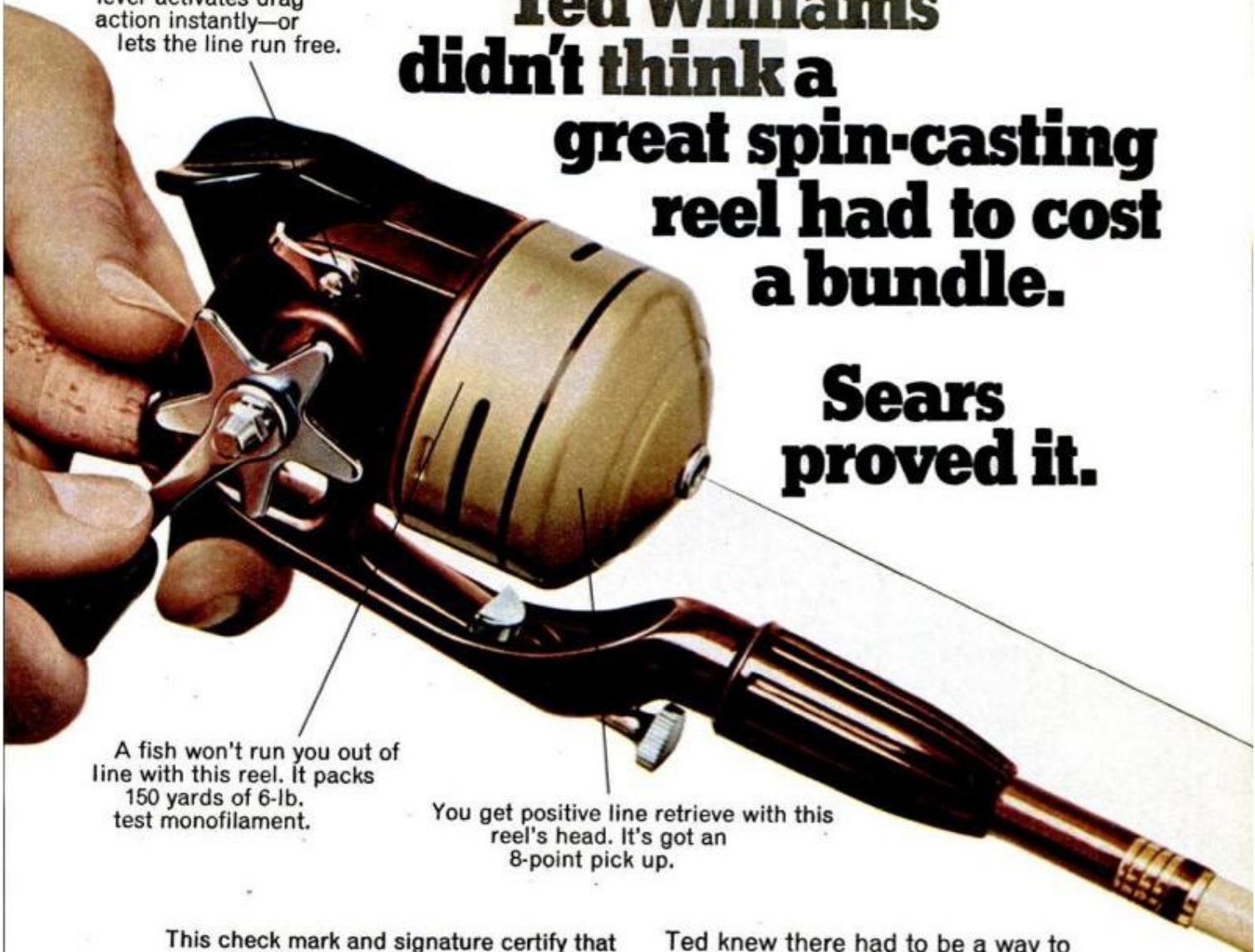
*Why do I have so much trouble taking off old finishes with a remover? I put the stuff on, but can't get the old finish off. After several applications, I still have to do a lot of scraping.—I.L., Ore.*

Perhaps you don't wait long enough for the remover to "work," or you may be using a liquid remover on a vertical surface, where a paste-type should be used. Give it time—10, 15, 20 minutes or even more—to cut through the old finish. You'll find the washoff-type less messy. ★★★

This on-off anti-reverse lever activates drag action instantly—or lets the line run free.

# Ted Williams didn't think a great spin-casting reel had to cost a bundle.

## Sears proved it.



A fish won't run you out of line with this reel. It packs 150 yards of 6-lb. test monofilament.

You get positive line retrieve with this reel's head. It's got an 8-point pick up.

This check mark and signature certify that Ted Williams, Chairman of the Sears Sports Advisory Staff, personally tested and approved this Model 240 reel and Model II rod.



Ted knew there had to be a way to make a great reel—without making it expensive. With his help, that's what Sears did with this one.

It's loaded. With features you'd expect only on more expensive reels. Like the big star drag that gives you the proper line tension for any fish. Precision, diamond-cut 4 to 1 gears that pack plenty of fish-fighting power.

Ted and Sears put a lot of other great things on this reel—including a price tag of under \$12.

Tomorrow, see this Ted Williams Model 240 reel and other great spin-casting reels at the Sears Sports Center in a Sears, Roebuck and Co. store. Or the Catalog.



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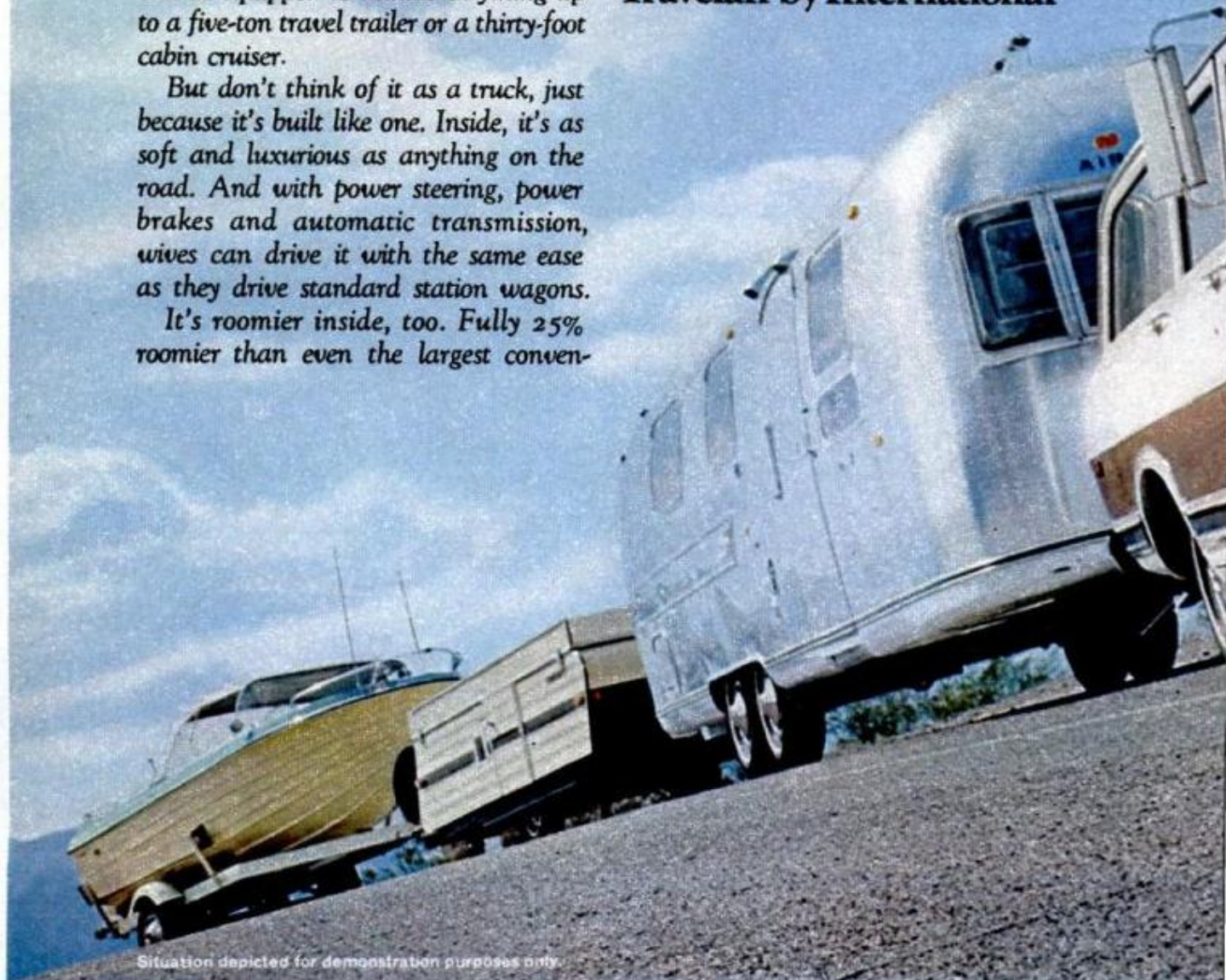
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# SOLUTIONS FOR MECHANICAL HEADACHES

# AUTOMOBILE CLINIC

BY MORT SCHULTZ

## Back in the saddle

*The rear springs of our 1966 Chevrolet Impala station wagon have squeaked and squawked since the car was new. Replacement springs haven't helped at all, and the Chevy garage is at a loss. Any suggestions?—George Parks, Greensburg, Ind.*

Rear-spring squeak is usually the result of interference between the spring and the upper seat or the spring and the lower retaining-bolt saddle. Interference at the upper seat can be corrected by using a rear-spring insulator (part No. 9775680). Be sure the insulator fits correctly—it might be necessary to trim the insulator to get the upper seat and upper end of the spring to fit properly.

Should interference be located at the lower retaining-bolt saddle, reposition the spring and retorquer the attaching bolt to 30 ft.-lb.

## Spark knock mystery

*Replacing the distributor breaker points, timing the ignition and changing from regular to premium gas have not stopped the spark knock in my 1968 Plymouth with 318-cu.-in. engine. The knock is particularly loud under load, as when I speed up to pass another car. The dealer says that all 318s do this, and I have to live with it. Do you agree?—Michael McDaniel, Erie, Mich.*

You might have to if your dealer has readjusted ignition timing to the standard now called for by the manufacturer. That 318-cu.-in. engine is designed to run on regular fuel, so I'd switch back to that. Now, make sure that the basic timing is in accordance with revised specs made in the service manual, which is wrong. This engine should be timed to  $2\frac{1}{2}^\circ$  after top center if the car has an automatic transmission— $5^\circ$  after top center with a stick. If there's no improvement, you can safely retard the spark up to  $3^\circ$  in trying to clear the knock.

## A lot of static

*I get loud static from my radio when I operate the electric windows on the right front, intermittent noise when the driver*

*side window is operated, and no noise at all with the rear windows. The car is a 1967 Buick Wildcat with electric antenna. Is there anything I can do?—Nat Schleger Levittown, N.Y.*

There are things you can try, but I won't promise that you'll eliminate all static when operating the right side window. That's the one nearest the antenna. When the window's motor is operated (each window operates on a separate motor), some pickup by the antenna must be expected. Anyway, to minimize the static, make sure the connection at the antenna lead-in is clean and tight. Although your antenna might not be so equipped, there should be a ground wire from the antenna sleeve to the car body. Make sure this ground connection is absolutely clean and tight. Remove any paint at the ground connection to bare metal. Finally, remember that too much static could also result if brushes in the window motor are worn.

## For a Peugeot manual . . .

*Where can I get a shop manual for a 1969 Peugeot 404 sedan?—J. H. Fielding, Orange, Conn.*

If the parts department of a Peugeot dealer can't help you, write to the Peugeot-Renault distributor in the United States. That's Dolphin Magna Motors, Inc., Parts Department, 76-02 Northern Blvd., Jackson Heights, N.Y.

## Rough rider

*I've been experiencing a violent vibration with my 1967 Chrysler Newport at speeds in excess of 65 mph. When the car hits an irregularity or bump in a highway, the result is a terrible up-and-down movement. My dealer says it's nothing, so I took the car to a local garage which assured me that shocks, ball joints, wheel alignment, wheel balance and the idler arm are in good order. What do I do now? Daniel F. Kelly, Old Bethpage, N.Y.*

First, make sure that wheel balancing is done correctly. Wheels must be balanced dynamically as well as statically. I'll bet you'll find that wheel balance is off when you balance by spinning the  
(Please turn to page 82B)

# Crank up your spirits.



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## AUTOMOBILE CLINIC

(Continued from page 82)

wheels. If not, there are about 10 sets of bushings in that front end holding such things as struts and torsion bar. The problem is probably weak or worn bushings that have to be uncovered. Also keep in mind that tires which are out of round will cause vibration.

### Collected condensation

*My 1969 Ford pickup is equipped with a toolbox on the right side of the bed. It sweats terribly, so that any metal I keep in the box gets rusty. The Ford dealer doesn't have the answer. Any solution?—J. E. Shook, Woodburn, Ore.*

I guess FoMoCo hasn't received word of this trouble from the field, because it hasn't issued a service bulletin. Yet, the solution is simple. Just drill a small hole in each corner to vent the box.

### Check the obvious

*I have a 1960 DeSoto with a 361-cu.-in. engine in beautiful shape, except that it refuses to start when the engine is at operating temperature. I've had the starter rebuilt, new battery installed, a complete motor overhaul (including a carbon and valve job) and, of course, endless ignition tune-ups. Everything's been done according to the manual. The car's cost me too much to get rid of it. Please help.—John Cetani, River Edge, N.J.*

Could it be, John, that you've overlooked the obvious in your search? Hard starting when the engine's hot is usually caused by an oversupply of fuel because of various conditions such as nonoperable automatic choke, float level set too high, leaky float, worn or dirty needle-valve seat, sticky float and percolation. If you've gone this far, take a step back and check the fuel system.

### Depressing clutch

*The clutch pedal of my 1965 Chevrolet Impala with four-speed transmission is hard to push in. The dealer says it's normal. What can be done?—Fred Burkhardt Jr., Robstown, Tex.*

I assume you have a heavy-duty clutch and it's working properly. If so, your dealer told you the truth. It requires

greater effort to operate than a conventional clutch because of the high pressure-plate force. Effort can be kept to a minimum by cleaning and lubricating the clutch-fork fulcrum ball, clutch cordon, shaft supporting studs and the clutch-pedal shaft. If it's really tough, there's a chance that the clutch-bearing retainer is scored. If so, replace the retainer and the release bearing.

### A gusher

*My 1963 Oldsmobile 98 is leaking a tremendous amount of oil from the rear of the pan. We've dropped the pan and replaced the gasket. This helped for 100 miles; then the leak started again. Why are these gaskets shrinking?—George J. Bass, Westport, Ind.*

Gaskets don't shrink. I'll bet that the upper seal on the rear main bearing is shot. The reason the condition seems to be alleviated with a new gasket is that the leak is slowed down by the new gasket and a lot of gasket sealer.

## Service Tips

● **Ford-built 1969 cars** with the 351-cu.-in. engine may experience cranking problems when a hot engine is restarted. If starter and battery repairs, including lubrication of the starter's drive housing bearing, fail to cure the condition, battery-to-relay, relay-to-starter, and battery-to-ground cables should be replaced with the following cables, respectively: C2RZ-14300-H, C2RZ-14431-E, and C2RZ-14300-C.

● **Cadillac** advises that before taking drastic action to correct a low brake pedal the car be driven backward and forward several times with the brakes applied at the end of each directional movement. If the car has seen only forward driving over a prolonged period, which prevents the automatic self-adjusting mechanism from doing its job, a low pedal will result.

● **All 1969 Chrysler products** with the 383 or 440-cu.-in. engine and a Holley carburetor may have a hard hot-starting and rough-idle condition that normal adjustments haven't fixed. The cause is probably a warped secondary-metering block in the carburetor. The company has issued a secondary-metering-block modification kit (part No. 3514459) and service bulletin 69-14-4 that tells your mechanic what to do. ★★

---

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

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Because the engine is forward out of the way, the driver can step from his seat into the load area. The loadspace is not only bigger, it's easier to reach. Check all the better ideas in the best selling van—at your Ford dealer's.



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## Now all Mercs have it.

Thunderbolt is Mercury's exclusive ignition system that zaps up to 40,000 volts to the spark plugs in microseconds.

With Thunderbolt, Mercury continues to have the hottest spark, the fastest start, the smoothest run in the industry.

For 1970, every Mercury in the line, from 135 hp down to 4 hp, has Thunder-

bolt ignition. *Breakerless* Thunderbolt (no points at all) from the 135 hp through the 40 hp. Mercs from 20 hp through 4 hp have new *Maker-Point* Thunderbolt: the plug is fired by the points making contact.

There's more: Perma-Gap spark plugs. A new, super-tough metal alloy for the center electrode resists spark erosion. You may never need to change spark plugs, because under normal conditions, Perma-Gap spark plugs can last the life of the engine.

Thunderbolt ignition and Perma-Gap spark plugs prevent preignition and fouling problems formerly caused by lead deposits. This means you can now take advantage of regular gasoline (in the 50:1 gas-oil mix) for every 1970 Mercury.

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Coming  
Down the Pike:

# Easy-to-Fix Cars

**Bit by bit, cars are being simplified to make service easier, less expensive**

By ROBERT LUND

**D**ETROIT IS TRYING to take some of the sting out of owning and operating an automobile. Repair bills and service charges on cars of the '70s won't wallop your wallet as hard as they did on cars of the '60s. Automakers are finally trying to simplify repairs, improve accessibility, and reduce overall service.

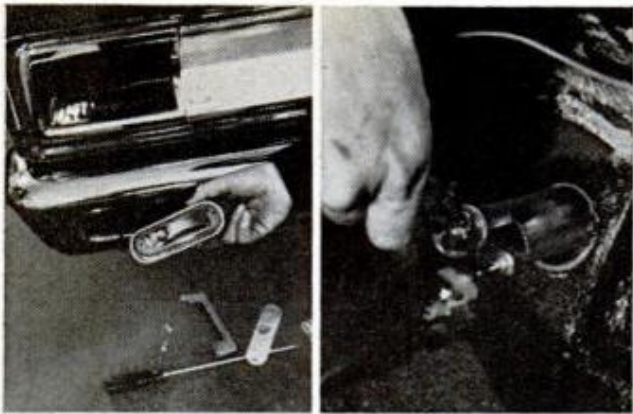
"Vehicle serviceability is going to be one of the most competitive areas of our business in the years ahead," says Harold C. MacDonald, in charge of product development for Ford. MacDonald's prediction is shared by his counterparts throughout the industry.

MacDonald had a hand in development of the new service-it-yourself Maverick, a car that—along with

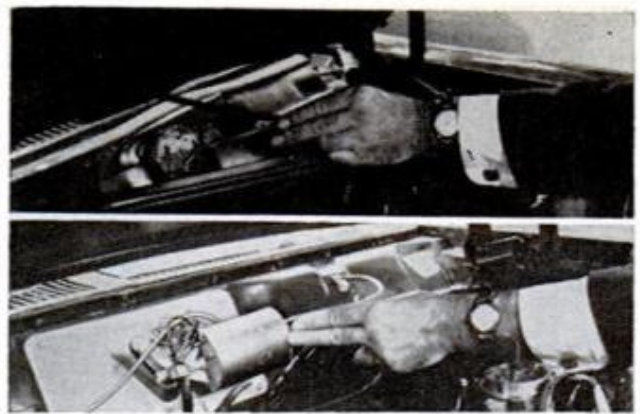
American Motors' new Hornet (see page 96)—is a lap ahead of the competition on easy-service features. That's because both cars were engineered with the Saturday mechanic in mind. But other carmakers are moving to close the gap. Take a look at some of the easy-service innovations on rival '70 model cars:

Several of GM's standard-size cars have pop-out dash panels. Instrument bulbs can be replaced by removing a snap-off bezel and four screws. A mechanic used to have to remove part or all of the instrument cluster to install a 25-cent bulb. GM is expected to extend the pop-out panel to other car lines over the next few years.

All '70 model Ford products have ex-



**REPLACING** taillight bulb on AMC Rambler required unit disassembly (left). On new Hornet, it snaps in



**WINDSHIELD WIPER MOTOR**, behind cross bar on the Rambler, is in open, easy-to-get-at spot in Hornet

ternally adjustable headlamps. The job can be done with a screwdriver without removing the decorative hardware surrounding the headlight.

American Motors has a list of 19 easy-service features on its '70 cars, some new, some carryovers from '69. They range from an easy method of adjusting parking-brake linkage to a central, one-panel location for all fuses. In the case of Hornet, the list of easy-do innovations runs to 22 items, including sparkplug changing, ignition timing, adjusting wheel bearings, setting the carburetor choke—all jobs that usually require an experienced mechanic. (AMC rates at least a nod for having pioneered the whole idea a decade ago when it promoted self-service on the 1960 Rambler American.)

Chrysler's approach is somewhat different from that of the other companies. Its focus is on building more life

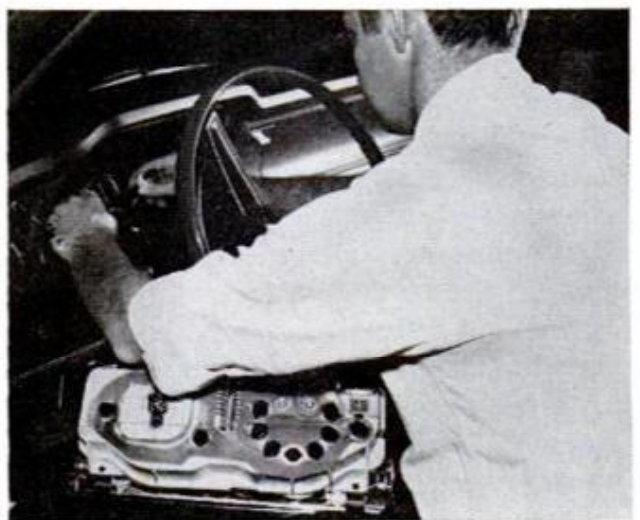
into critical components to reduce the frequency of service. A case in point is the electronic voltage regulator on the firm's '70 cars. The unit has no movable parts, lengthening the life of battery and lights. For one of its axles—the 8.25—Chrysler has devised a cover plate for the differential. The plate can be removed to inspect bearings, ring and pinion gears without dropping the differential or removing the axle. This is a real time-saver. However, under pressure from other automakers, Chrysler's program could change direction, with more emphasis being put on how-to advice for the motorist who wants to handle his own service.

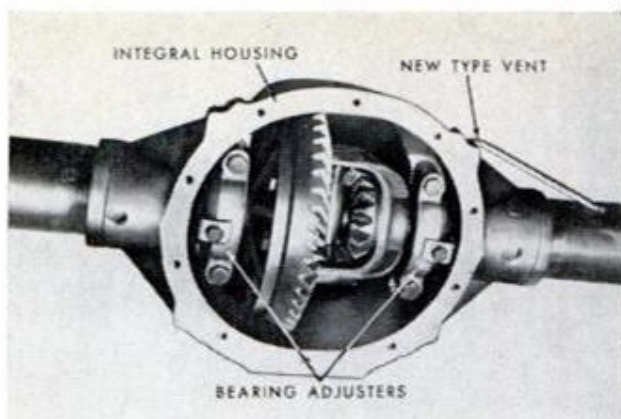
If these concessions to do-your-own-thing don't strike you as anything to get excited about, consider a few ideas Detroit has up its sleeve for cars of the immediate future:

- A built-in unit that will let you make



**INSTRUMENT PANELS** on new Hornet (left) and Maverick are easily removed, providing quick access for check-out of wiring, instrument repair, bulb replacement. Note foolproof printed circuit on Maverick





**EASILY REMOVABLE** plate on pinion housing of many new Dodges makes possible quick inspection, repair



**SNAP-IN, SNAP-OUT** components, featured on many new cars, represent trend in future car engineering

a precise adjustment of headlights without stepping out of the car.

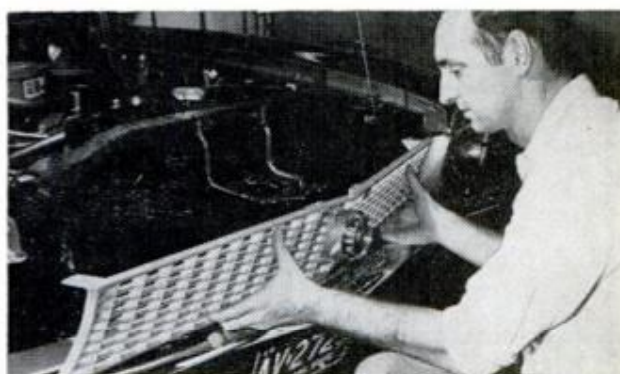
- More self-contained, plug-in, pull-out units—radios, tape players, heaters and other add-on accessories—which you can repair yourself or drop off for a mechanic to work on without surrendering use of your car.

- Printed circuits that can be installed only one way, so there's no chance of making a mistake.

- A new family of warning lights that will tell you when a part needs service—ahead of time, before trouble develops.

Detroit engineering departments are intentionally vague on how soon these improvements will show up and how far and fast they expect to move in simplifying service. In some areas, the goal is to knock 20 percent off the time it takes to repair or replace a part. Opti-

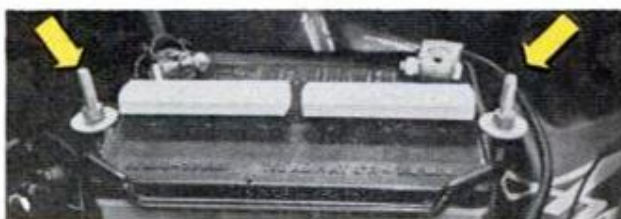
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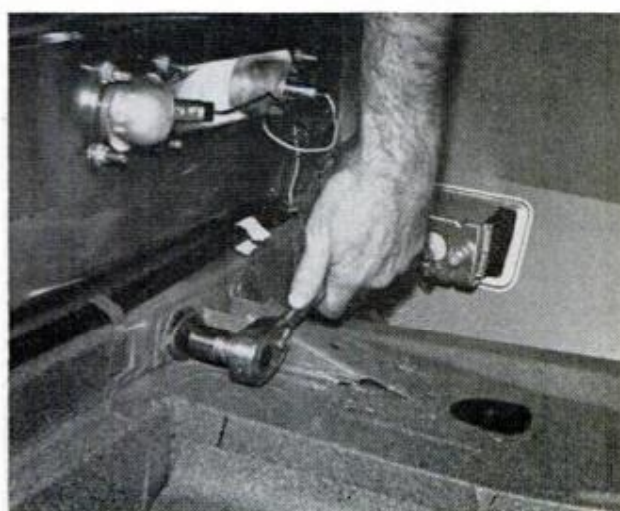
**PLASTIC GRILLE** of Maverick is attached with only five screws, can be replaced in a matter of minutes



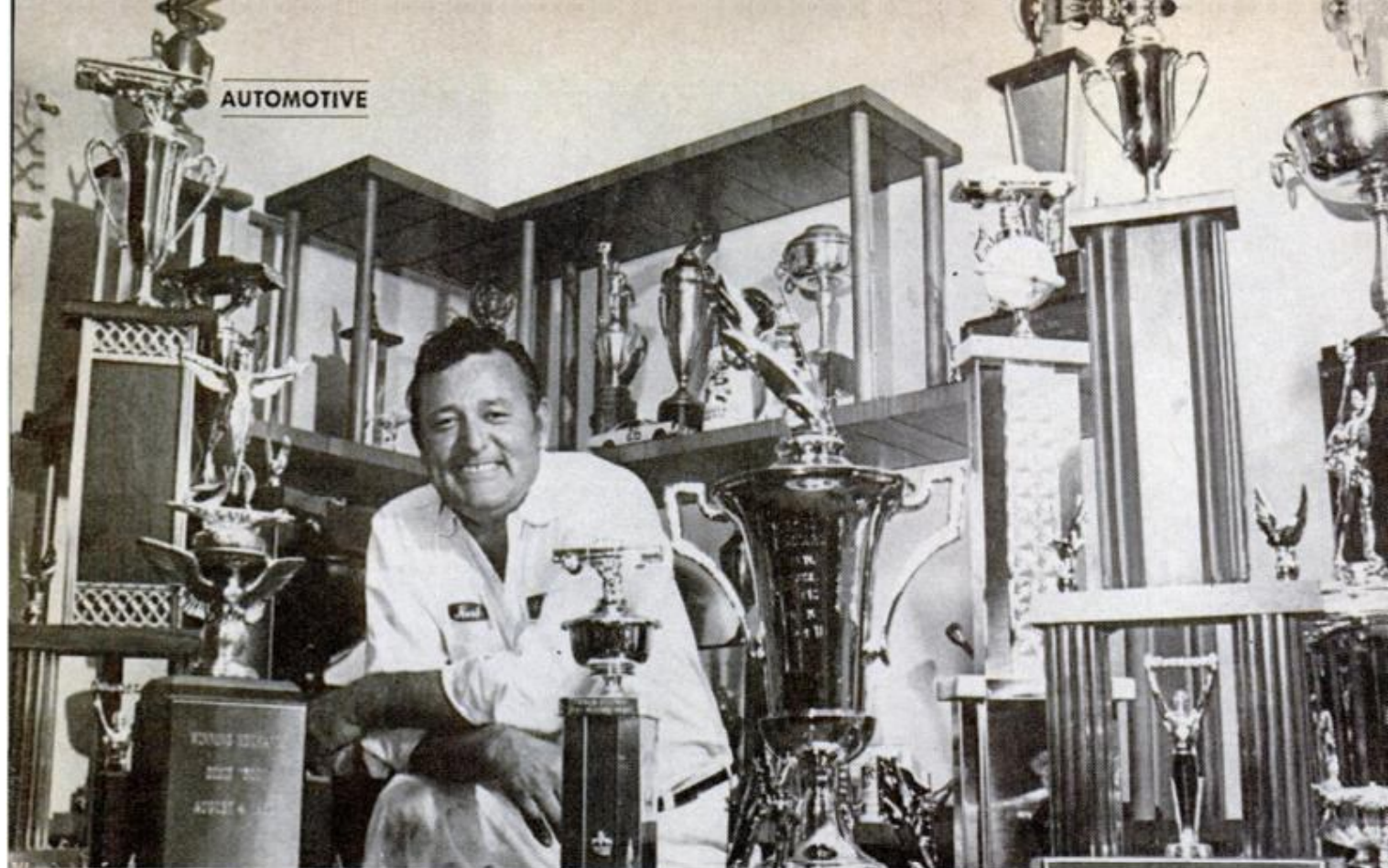
**RADIO** of Maverick can be removed via four screws in fraction of time required for most installations



**BATTERY** OF AMC Rambler is held in place by means of two bolts. Same job is done by one on the Hornet



**REAR BUMPER** of Maverick can be removed easily via four bolts located at corners of car's trunk floor



TO THE VICTOR go the trophies, and Herb Nab has earned a lot of them in his long career as one of the top mechanics in stock-car racing. One he'd like to add is another symbolic of winning the Daytona 500

# Lee Roy's Secret Weapon

When Daytona's green flag drops, Herb Nab may just be the best setup man on pit row

By **BILL KILPATRICK**, Auto Editor / Photos by Don Hunter

**T**HE TUNE Herb Nab whistles through his teeth as he works is nothing you ever heard. It's an aimless, pleasant phrase that these days might be titled "Daytona On My Mind."

This is the month of the Big One—the annual Daytona 500, the richest, most prestigious stock-car race in the world. And Nab is a race-car crew chief who finds himself in the position of the high-climbing monkey—the higher up he goes, the more vulnerable he is.

Nab sets up cars driven by Lee Roy Yarbrough and masterminded by former stock-car star Junior Johnson, a three-way combination that last season

set records at which every other man on the NASCAR circuit will be shooting.

The formidable threesome started their phenomenal year by winning the 1969 Daytona 500 at a record speed of 157.950 mph. They followed with wins at Darlington, Charlotte, Daytona again, Atlanta, a repeat at Darlington, and Rockingham for a total of seven superspeedway victories in a single season, more than any team had won in NASCAR history. As this is written (mid-November), the team has taken home \$187,135, another record. Last fall Ford Motor Co. named Yarbrough "Man of the Year."

But now, of course, all that is his-

tory. On the 22nd of this month the entire racing world will be watching to see if Nab, Johnson and Yarbrough can keep the ball rolling.

"There's no doubt about it," Nab says with the weariness of a winner who must give his all every time out, "the guy that wins at Daytona is the guy to beat for the rest of the year.

"Riverside is important, and all that, but winning out there doesn't give a team the psychological 'leg up' that Daytona does. Like last year, no foolin', when we won down there we just *knew* we were in for a helluva good year. Lee Roy felt good, Junior had a big grin, and I was on Cloud Nine. Man, you couldn't have beat us with a club."

Car owner Johnson, the team's master planner, says the Daytona race not only gives the winning team a great boost in spirit, but it also serves as a sort of final proving ground.

"What with all the practice and the race itself," Johnson says, "we get to know the car real well. We find out—all of us, Herb, Lee Roy, me—what the car'll do and what it won't do. You might think that if you win down there one year, why, you just go back and set up the same way. But it doesn't work. Every year is a whole new ball game."

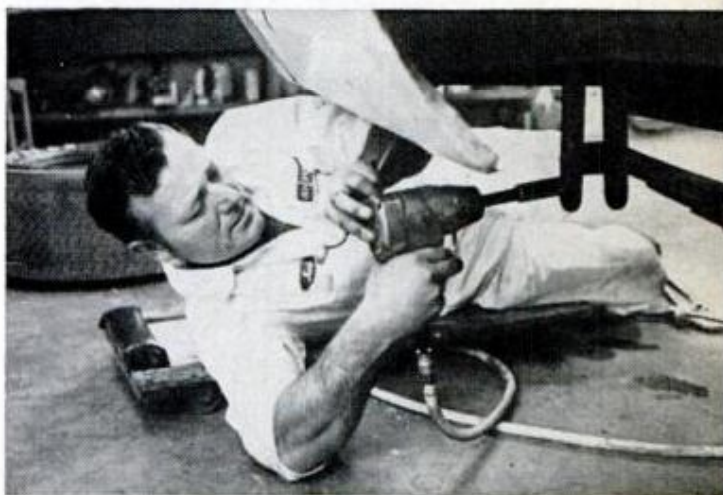
Asked about the famous bump coming out of Daytona's Turn Four, Nab says it's enough to give a chassis man nightmares.

"Oh, it's a beaut, I guarantee. When a car comes off it, all sorts of things happen. For one thing, the car damn near bottoms out, meaning the suspension has to be stiff enough to take it, yet not so stiff the car's a stone. For another, the wheels toe *out* when the car lands, something that doesn't happen anywhere else on the track. So you have to set up to take that jolt, but still be just right for the rest of the track. Each year, you know, we seem to pick up a few more rpm, a little more speed, maybe we're working with a little bit different tires, and so on, meaning that each year we have to

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**NAB PERSONALLY** handles the right front tire on Lee Roy Yarbrough's car during a pit stop. "They all have to be right," he says, "but 'specially that one'"



**SETTING UP** suspensions is Nab's specialty. Each race requires a different setup, regardless of how often a crew has run various tracks on the circuit



**FORMER DRIVING GREAT** Junior Johnson, winner of the Daytona 500 in 1960, owns and masterminds cars on which Nab works. He calls Nab "One of the best"



**OUT FRONT** (where he finished seven superspeedway events last year) is Lee Roy Yarbrough at the 1969 American 500 at Rockingham, a race he won. Nab says, "Seeing your man out front makes the work worth it"

start with pretty much a clean sheet of paper.

"Now if we figure it out about right, maybe even win, well, we got pretty good evidence we can set up for just about anything."

Johnson, who himself won the Daytona 500 in 1960, adds that the race is every factory team's maximum effort if

only because a victory simplifies administrative problems for the rest of the season.

"Win Daytona," he says, "and you'd be surprised how many people you can get to answer the phone."

Smiling slightly, Nab adds: "No, we didn't have much trouble getting parts this past year."

The 1969 season saw a big change in the way at least one part of Ford's stock-car racing program was handled. In the past, all engines provided the various Ford teams on the NASCAR circuit came from a common pool at Holman-Moody, the Charlotte-based "factory branch" that builds the basic Ford and Mercury racers and engines.

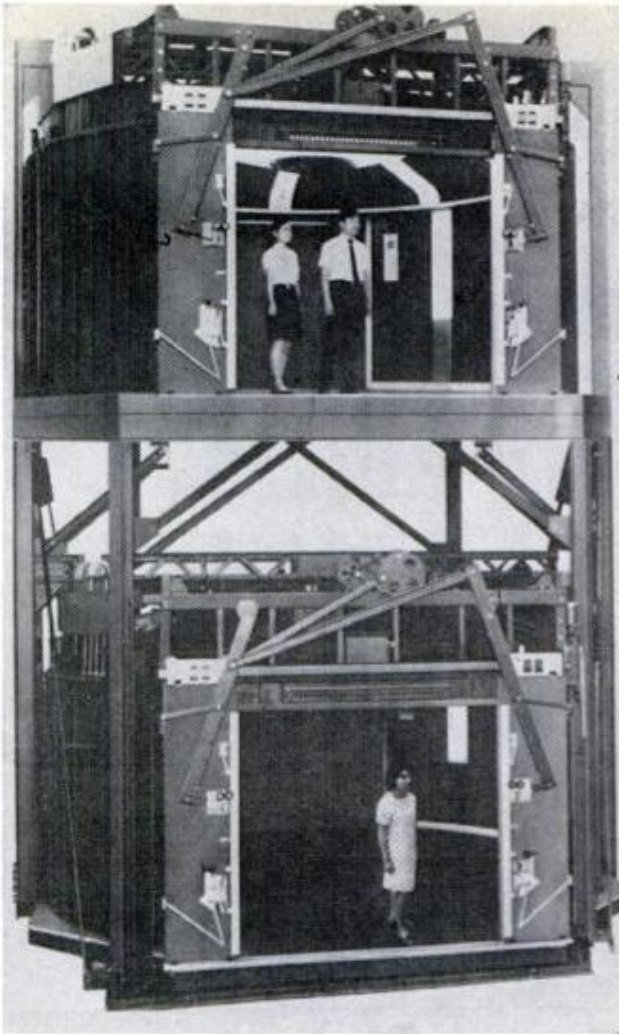
"Of course they got their own team," Johnson says, "and they want David (Pearson) to win just like we want Lee Roy to win or the Wood Brothers want Cale (Yarborough) to win. So naturally, the engines that seemed to pull a little better on the dyno, or seemed to run a little better, they went into Holman-Moody cars. We raised a

*(Please turn to page 212)*



**AT THE READY** is Nab, here flashing instructions to Lee Roy Yarbrough during last year's Daytona 500





### Double-decker for Expo 70

Largest elevator in the world, this double-decker will be able to carry 260 passengers at a time in the Hitachi Pavilion at Expo 70 in Osaka. The elevator, which operates on an oil-pressure system, was built by Hitachi for its "Air Travel Simulation" exhibit.



### Honest Abe in fiberglass

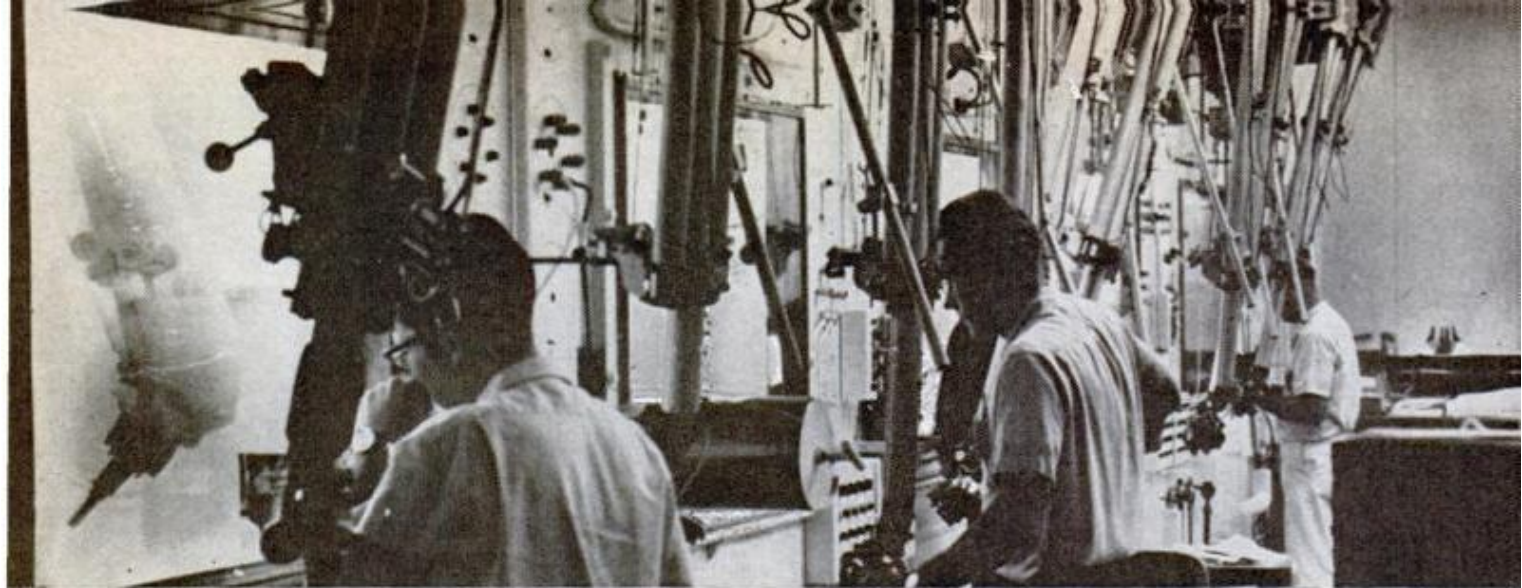
A heroically proportioned statue of Abraham Lincoln, made of fiberglass and steel, stands in the new Lincoln Memorial Park near Charleston, Ill. The statue, 62 feet in height and 16,000 pounds in weight, is the work of Bob Eglett of Minneapolis. Some idea of its scale can be gained from the relative size of the lady standing at the base.



### It all started with a matchbox

To amuse his son, handyman Leslie Abrahams of Shawford, England, built a small house of "bricks" that he made by casting cement in matchboxes. Now, some 75,000 matchboxes and 11 years later, an entire village made of those little cement bricks covers Abrahams' vegetable garden and most of his yard. Visitors keep adding to his matchbox supply.





**SHIELDED CHEMISTRY LABORATORY** at Battelle-Northwest is used for analyzing radioactive materials. Operators are very skilled with the manipulators, can pour liquids from one small vessel into another

# THE BIG LAB THAT TACKLES



**SIMPLIFIED PUMP** was developed for use and manufacture in underdeveloped lands



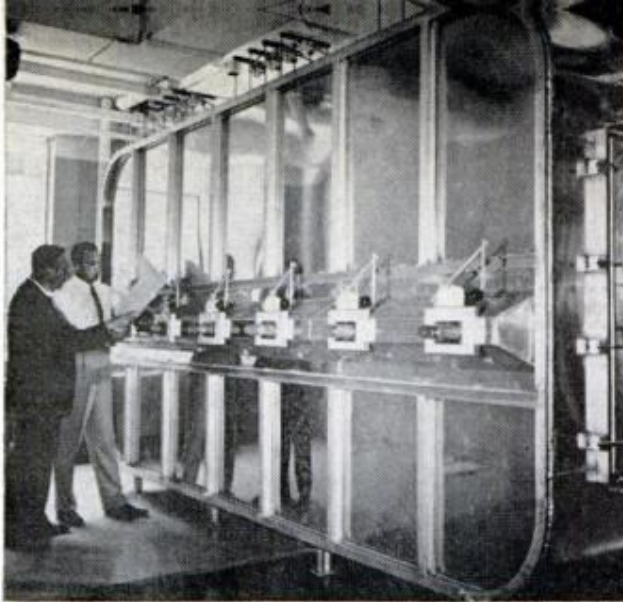
**ARTIFICIAL HEART STUDIES** and other experiments involve use of miniature pigs of strain developed at Hanford lab



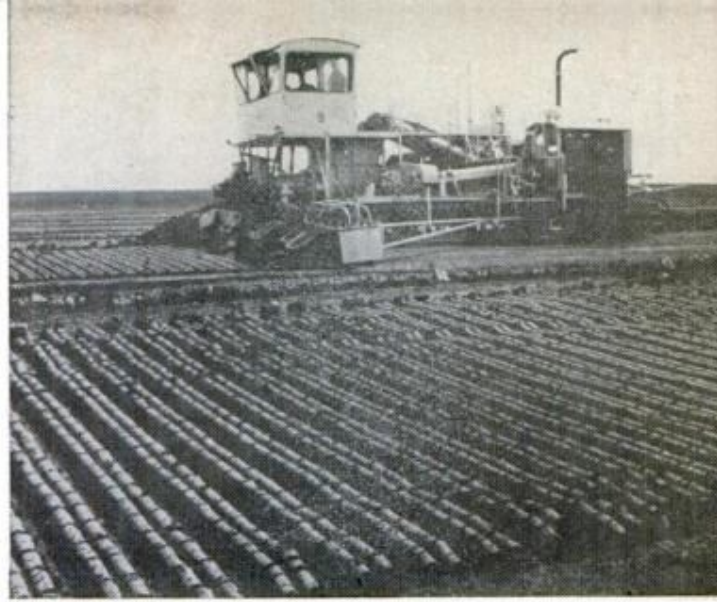
**SPINNING PROCESS** is used at Geneva laboratory in making nonmeat protein food



**MAGNIFIED PHOTOMOSAIC** of cross section of a half-inch-diameter fuel element is studied for possible improvement



**COLUMBUS SMOG CHAMBER** has ports in one wall to permit test subjects to expose eyes to pollutants



**BIG NEW MACHINE** for cutting peat sod in Ireland was developed with the help of Battelle engineers

# THE TOUGH ONES

By **JOHN F. PEARSON**  
Science Editor

**Fish farming, better artificial hearts, a gel "blanket" for the sea floor—they are but a few of the fantastic array of studies now pursued by the Battelle Memorial Institute**

**C**ONSIDER THIS GRAB BAG of research problems:

- The U.S. Agency for International Development seeks a design for a simplified water pump that would be easy for underdeveloped countries to make.
- The Navy wants to find a way of preventing ocean-floor silt from being stirred up and clouding water during bottom salvage operations.
- The National Heart Institute seeks a way to treat plastics so that they are compatible with human tissue and don't cause blood clotting when used in devices like artificial hearts.
- A group of European and North American companies want a projection for the next decade of trends in sea and air cargo operations across the North Atlantic.

It's a big stretch from water pumps to transatlantic cargo forecasts, but that doesn't faze the Battelle Memorial Institute. These are but a few of the hundreds of studies in progress at vari-

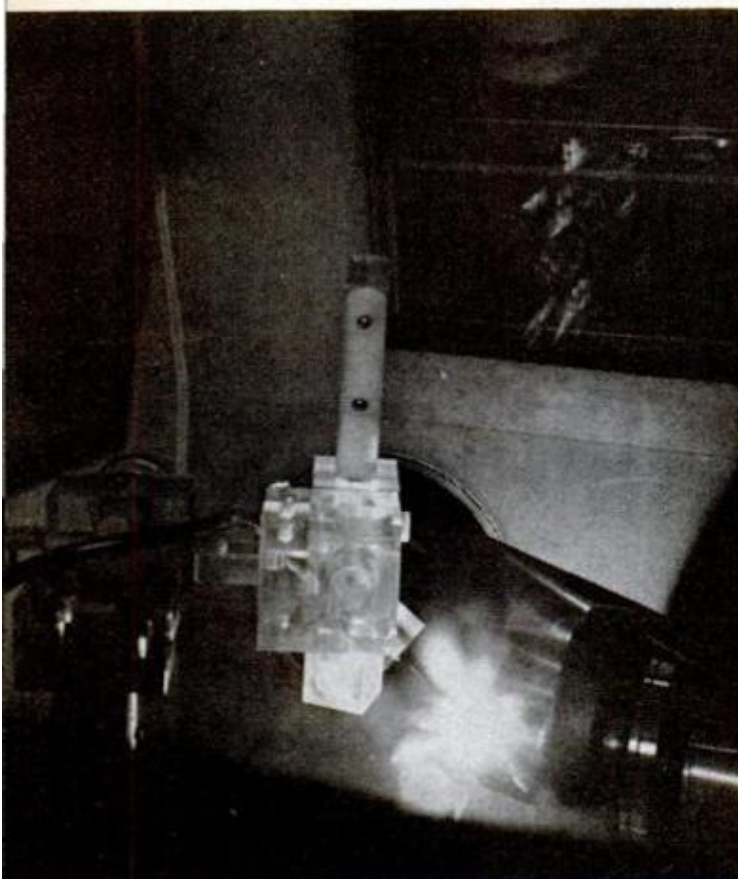
ous Battelle laboratories, and applied research is only one of BMI's areas of concentration. It is also committed to the generation of new knowledge, to the support of advanced scientific education and to programs for moving new methods and inventions from the laboratory to the marketplace.

If you've never heard of BMI, you're not alone. Though it has existed since 1925 and has made impressive technical and scientific contributions—perfecting the Xerox process, for one—BMI doesn't go in for horn-tooting.

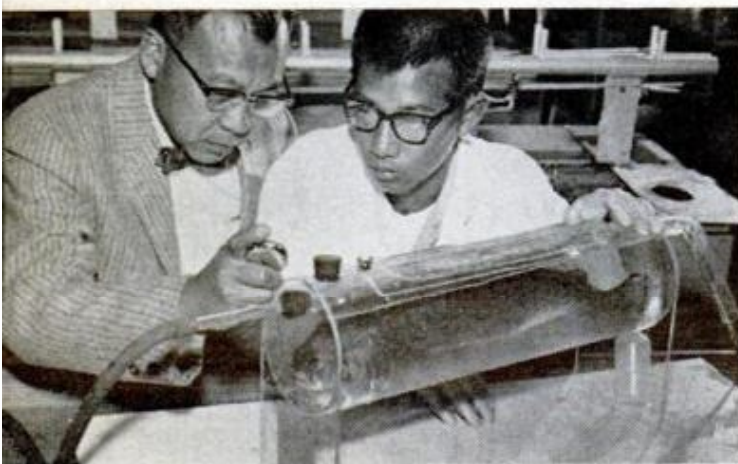
Battelle is considered to be the largest organization in the world doing research under contract. Its headquarters is in Columbus, Ohio, but it has other applied research complexes in Richland, Wash., Geneva, Switzerland, and Frankfurt, West Germany, and a center in Seattle, a "think tank" created expressly for basic research and scholarly pursuits. In addition, it maintains smaller facilities or offices at about a



**RADIOIODINE IN THYROID** of miniature goat is monitored by staff members at Battelle-Northwest lab



**TUNGSTEN-ARC WELDS** are used to seal ends of plutonium fuel rod. Helium provides inert atmosphere



**RADIOACTIVITY IN FISH** is checked by Northwest researchers. Marine biology program is extensive

dozen other American and foreign locations.

I recently visited the Columbus headquarters and the big facility in the state of Washington called Battelle-Northwest. I met and talked with some of the 7000 administrators, scientists, engineers and supporting personnel that are the backbone of this widespread organization. And I saw building after building crammed with scientific gear: lasers, electron microscopes, banks of computers and huge machines such as a 2750-ton press used in making atomic reactor fuel elements.

It was at the Columbus lab that I talked with Robert D. Fannon who bubbles with enthusiasm when he explains how the simplified pump will benefit countries like India and Pakistan, where ponds and rivers are sources of disease because they're used for waste disposal, bathing and drinking.

"The object is to encourage the drinking of groundwater, which is pure water," explains Fannon. "But for a pump to be useful it must be simple. No nuts and bolts—they're hard for poorly trained machinists to make, and they're too easy to steal. Our design has relatively few parts and is held together with cotter pins.

"Another problem is that the machinists can't make smooth bores in the pump cylinders. We got around that by using ordinary cast-iron pipe and coating it with a nickel's worth of epoxy. That bit of plastic makes the cylinder as nice and smooth as brass."

Dr. Richard D. Falb, chief of biochemistry at Columbus, is investigating materials that may be used in an artificial heart. He and his colleagues currently are trying to find ways of treating plastics like Dacron and Teflon to make them compatible with the human organism.

"The basic problem is that these plastics do damage to the blood and cause it to clot," Dr. Falb told me. "The body, in turn, attacks foreign substances and breaks them down.

One of the more promising methods

Dr. Falb is exploring is the chemical bonding of heparin to plastics. Heparin is the blood's own anticlotting agent. The permanency of such bonds is now under study. Dr. Falb's group is also involved in a fascinating study for NASA: how to convert the carbon dioxide in a spaceship's atmosphere into edible carbohydrates. Such a system would be useful for long flights.

The Battelle scientists are taking a different tack than most other investigators looking at the problem. Instead of thinking in terms of living plants, they are isolating the enzymes in plants that accomplish the conversion.

"We've taken three of the key enzymes that operate in the cycle and shown that we can get the sequential steps to occur," says Dr. Falb. "We still have a way to go but I think the principle is sound." He envisages a cylindrical device in the spaceship containing enzymes in solution. Carbon dioxide goes into solution at the top and carbohydrates come out at the bottom.

The Naval Ship Systems Command asked BMI to try to develop a system for stabilizing ocean-floor silt during salvage. When agitated, silt clouds the water and cuts the vision of divers and submersibles almost to zero—a problem that added to the difficulty of recovering the H-bomb lost off the coast of Spain three years ago (*How We Found the Missing H-Bomb*, page 72, Aug. '66 PM).

BMI chemists and engineers have developed a system in which two solutions are squirted from a single, three-foot-wide nozzle. The solutions don't disperse in seawater; they react to form a tough, rubbery gel that settles like a skin over the silt. In tank tests the gel has proven stable and strong, capable of supporting tools.

"Support strength is one of the Navy's requirements," a young chemical engineer told me. "When you drop a wrench or a hammer in silt, it just disappears."

Though the bulk of BMI's investigations are focused on current problems,

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ECOLOGISTS follow migratory paths of salmon and steelhead in Columbia River. Fish carry sonic tags



HEATED, titanium alloy "remembers" original coiled shape, as shown through time-lapse photography



UNDERWATER TOOL can drill through quarter-inch steel in 20 seconds. It was developed for the Navy



**ARCTIC FALLOUT**, Battelle study shows, results in a high level of radioactivity for Alaskan Eskimos

many of its experts are taking cool looks at the future. One such hard look (made for the air-pollution unit of the Department of Health, Education and Welfare) predicts that the Rankine cycle (steam) engine is the auto power-plant of the future because it creates much less air pollution than the standard internal combustion engine. Battelle's forecast recently prompted HEW to start research on steam powerplants for cars.

And when a group of 27 European and North American railroads, airlines, ship lines and port operators wanted to know what transatlantic cargo trends for the next decade would be, they also came to Battelle. This study, started just a few months ago by staffers at both Columbus and Frankfurt, will consider many factors: jumbo cargo planes, fast containerized ships and palletization systems.

There are so many investigations in the works at the Columbus laboratories that it's impossible to describe more than a few. In addition, many are in the "top secret" category, not discussed with anyone but the sponsor. Under contract research, all findings belong to the firm or government group that pays the bill.

But here are several other interesting studies that aren't hush-hush:

- Research focused on the development of an electronic system capable of automatically sorting mail with an accuracy approaching 99 percent.
- Development of a computer technique for predicting smoke movement



**BATTELLE HEADQUARTERS** in Columbus, now staffed by 3000, did pioneering work in metals technology

in tall buildings, so that potential dangers due to smoke flow can be eliminated during the design phase. Tall buildings tend to act like huge smokestacks. In a recent New York City fire, for example, smoke and fumes traveled up from a basement blaze and killed two firemen on the 22nd floor.

● Operation of a fish farm at Daytona Beach by scientists from Columbus and from another BMI facility in Massachusetts. Their goal: to determine if food fish (in this case, pompano) can be raised under controlled conditions to produce fleshier strains.

BMI dates back to 1925 when it was established in the will of businessman Gordon Battelle, who believed there was a need for a not-for-profit foundation that could provide applied research for industry. He also wanted to perpetuate the family name; hence, the Battelle Memorial Institute.

"There are people who think we make grave vaults, caskets and monuments," a smiling David C. Minton Jr., director of the Columbus laboratories, told me.

One man who knew better was Chester Carlson, inventor of a copying process that enjoys some success today. He came to Battelle with his invention in the mid-forties after failing to interest several manufacturers. BMI's eventual financial interest in the invention, which it turned into a marketable product, led to the ownership of a large block of stock in the firm that was to become the Xerox Corp. Mon-

*(Please turn to page 221)*



### No question about it

It's a clock shop. And the hands in the front window of Carl Jansen's shop in Elspeet, Holland, actually tell time.



### Aid from amusement park

Thalidomide-handicapped children in England are being given modified amusement-park "bump cars" to move about easily.



### Watchmaker's hourglass

It took watchmaker Svend Andersen five months to reconstruct this clock inside a bottle. The bottle's mouth measures 18 mm.

FEBRUARY 1970



### Headed for Japan

Skillful maneuvering was required to get this "20-story" Douglas fir out of British Columbia and on its way to Osaka for Expo 70.



PM ROAD TEST

# AMC's New Hornet

It has a lot of good things in a not-too-small package

By BILL KILPATRICK, Auto Editor/Photos by Jeannie Weaver

**A**MERICAN MOTORS these days seems to be doing everything about right.

- It offers buyers an interesting line of competent cars backed by an imaginative ad campaign.
- It's seeing a little black ink, a refreshing change we can assume contributes in part to board chairman Roy Chapin's radiant good health.
- It signed the red-hot racing team of driver Mark Donohue and strategist Roger Penske to campaign a Javelin in this year's Trans-Am series.
- It announced plans to introduce a new model every six months, a move bound to attract a little attention.
- It makes the Hornet.

There's probably a lot more good stuff rattling up and down the halls of AMC's Detroit headquarters, but the above is more than enough to convince

even skeptics that things ain't what they used to be. Take the Hornet.

Unlike the Rambler, it's not an *economy* car (although the minimum model—a 199-CID Six widely advertised at \$1994—can be gloriously close with a buck, should that be what you want). It's just small, yet small without being puny. It's comparatively inexpensive (in low-line versions, anyway) without being cheap. All in all, it looks, "feels," and drives like a car that started out as a total concept—compromises and all—and wound up as just about what everyone had in mind. This last is a rare thing in Detroit; most cars start out as one thing, are quite different by the time they get to dealer showrooms. But not the Hornet. Even its goofs seem to have been lovingly retained.

The goofs are minor, probably more





**HORNET** offers pleasing, contemporary lines based on "long hood, short rear deck" theme. Car received first curious, then admiring looks wherever I went

matters of personal preference than anything else. For one thing, I don't care for the dash layout. Form follows function so severely it has a gerrymandered look about it, as if its elements have been added on rather than thought out as integral parts of a whole. A bit of my gripe may be attributed to *PM's* test car being airconditioned, necessitating outlets where—to my eye, anyway—outlets just shouldn't be.

Another thing I don't like are the armrests. (They *are* armrests, aren't they, fellas?) They're ridiculous; with the driver's seat even halfway back, one's elbow gropes for expected support, doesn't get it by several inches. I like the seat as far back on the track as it will go, and my left elbow just hung there awkwardly, looking for a place to light. But maybe they're not armrests, just door pulls.

One more gripe: The guy in charge of fitting carpeting to the floors of AMC cars ought to be ashamed of himself. Not just the Hornet, but all AMC cars. Lumpy and ill-fitting, they lie there like a tired 48 stout on a 34 short. For all I know, a good carpeting fit may be a major production problem, but I can promise AMC a certain



**TRUNK SPACE** is surprisingly good for a car of the Hornet's size, more than enough for weekend packing



**EASE OF PARKING** is Hornet plus. Car, particularly with power steering, is highly maneuverable, agile



**ARMREST** just isn't with seat all the way back on track. Even at mid-track, elbow misses the rest by inches, tends to grope awkwardly for usual support

amount of its gung-ho effort to build good, salable cars is negated by this particular oversight.

Now for the good stuff.

Let's hit again the point about the Hornet being a small car without being puny, and inexpensive without being cheap. Again, it's *not* an economy car. Available as either a two or four-door sedan, you can load it to the gunnels for scoot, handling, "comfort and convenience." This means you can wallow in all the gadgetry you care to; just is, the overall package is smaller.

PM's test car featured an automatic transmission, power brakes and power steering, airconditioning, vinyl top, elegant upholstery, rim-blow steering wheel and a snappy 304-CID V8 engine. Also, it was equipped with a heavy-duty suspension, about which more later.

When one first slides behind the wheel of the Hornet, the most noticeable thing (to my mind, anyway) is its

feeling of *compactness*, as if it was part of you rather than the other way around. Controls are within easy reach and the response to them is quick and direct . . . none of the will-it or won't-it lag so prevalent in many large cars. This feeling of fast response may be indigenous to the V8, yet I recall a similar opinion when I first drove a Hornet—a Six—at a press preview early last summer.

The next thing one notices, particularly out on an open highway (and again, perhaps because of the V8), is that traffic isn't passing you by. In fact, the tail ends of trucks and other highway monsters tend to come up in very short order. I found myself backing off quite often and glancing in the rear-view mirror to determine if I had offended the forces of law and order.

But make no mistake; the ride, however swift, is not rocking-chair smooth. This could have been the heavy-duty suspension, which—when coupled to a short wheelbase (108 in.)—may be more of a good thing than is called for (at least as such suspensions are executed in Motor City, U.S.A.). Our test car was far from subtle about making me aware of each little bump, hole and highway seam. On the other hand,



**DASH PANEL** is functional to a fault, to me having a slightly cluttered look. Legroom is outstanding



**HORNET** proved comfortably stable in tight cornering situations. Body lean was minimal, steering accurate tight cornering didn't find me almost over on my side and far off the intended line. Oh, it understeers (they all do), but cornering control isn't an adventure, even though the variable-ratio power steering tends to speed up as you turn, meaning it's easy to get in over your head if you don't pay strict attention. The wide, low-profile C78 x 14 Goodyears with which our test car was equipped to a certain extent help compensate for driver errors.

Brakes—drums fore and aft—are good, but nothing spectacular. The Hornet features AMC's anti-brake-dive setup, but still the nose tends to dip quite low in a panic situation. When I rammed on the brakes, I found the rear wheels first to lock up. Even so, I stopped in a reasonably straight line each time, with minimum fade.

Off-the-dime acceleration is respectable, period. At "green," the Hornet moves right out with everyone else, snapping no necks, but not leaving you back in the ruck, either. Again, this could have been the V8. If all goes as rumored, by the time this appears AMC will have announced a 360-CID V8 option, meaning you'll stand every good chance of being a contender at traffic-light drag meets.

The Hornet earns high marks for

front-seat comfort, at least when it comes to the optional split-bench arrangement. I felt good support down the so-called "small" of my back, and my legs had plenty of room to move about, something I find a must for sustained driving. In back, as it figures, things are a bit cramped. Youngsters, fine. Adults, let's hurry and get there 'cause my legs are killin' me back here.

Visibility is good to front and sides, a bit restricted out the rear corners, a fault of far too many cars today. I'm one of these look-before-I-leap guys and looking out the rear corner of the Hornet (or anything else, by and large) is little more than a neck exercise.

Trunk room is surprising, considering

*(Please turn to page 220)*

#### **HORNET DIMENSIONS AND CAPACITIES**

Wheelbase	108 in.
Track, F/R	57.2 in./56.6 in.
Length overall	179.3 in.
Width overall	71.1 in.
Height	52.6 in.
Weight distribution, F/R	59/41%
Fuel capacity	20 gal.
Oil capacity	5 qts.
Water capacity	14 qts.
Curb weight (PM test car)	3200 lbs.
Wheel size	14x5 in.

# Pushbutton Fishing

'Snap, crackle, pop'  
are the sounds made by the newest  
equipment for fresh-water  
fishermen

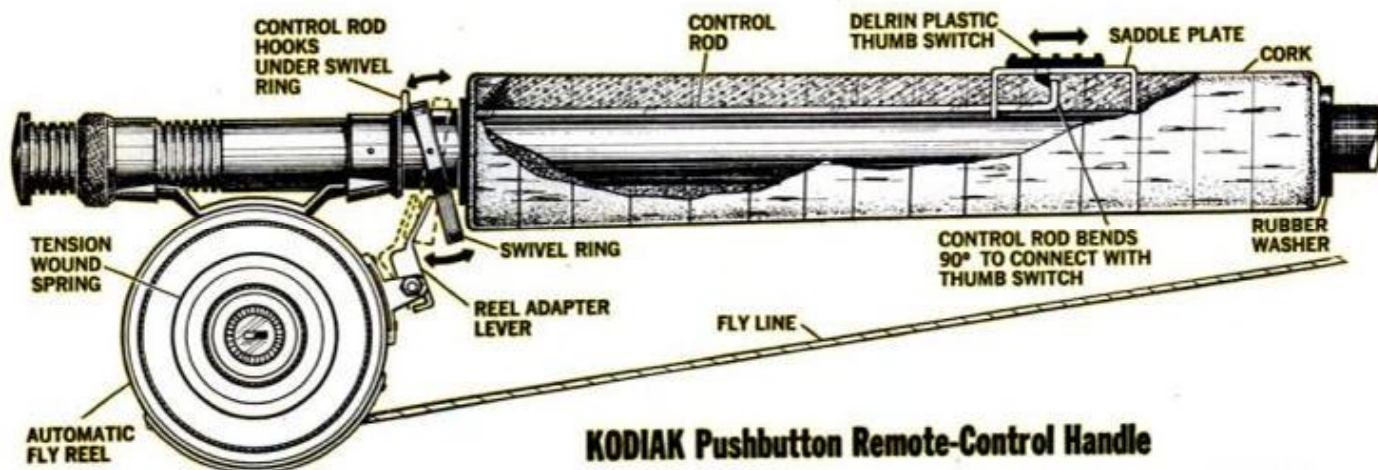
By GEORGE REIGER, Boating and Outdoors Editor

WHILE FLY FISHING is still a long way from being an armchair sport, a pushbutton net from France and Kodiak's fly-rod with pushbutton remote control for automatic fly reels make life easier for a hard-casting, many-mile-a-day wading angler.

The appeal of the Kodiak rod is in its common sense. Instead of fussing with the rewind lever of your automatic fly reel, you merely activate a switch on the cork grip where your thumb normally rests to effortlessly retrieve all loose line. There's little that can go

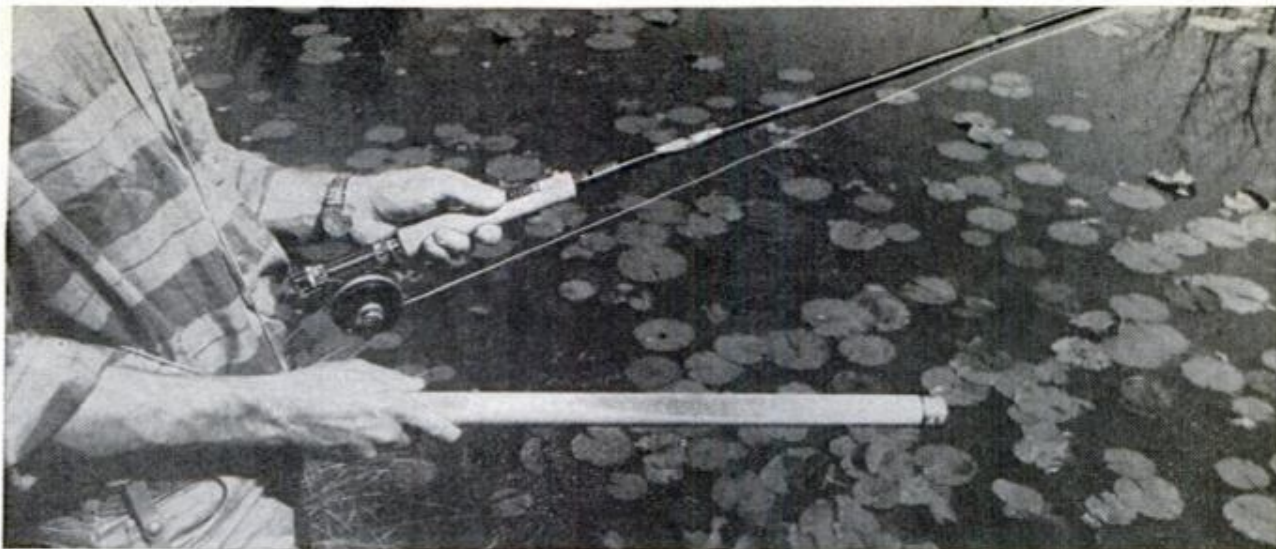
wrong with the system—no whirling gears nor loosening screws. The switch is connected by means of a metal strip inside the grip directly to the rewind lever of your reel. Kodiak makes adapters for most contemporary automatic reels, and is about to market a rod and reel combination priced under \$50.

For PM's field test, I used a Shakespeare Tru-Art (Model EC) with a full spool of Cortland 444 Rocket Taper floating line. My quarry was largemouth bass; my lures, small popping plugs. But except for one 10-incher, my



**KODIAK Pushbutton Remote-Control Handle**

POPULAR MECHANICS



A COMBINATION to take the awkwardness out of landing fish. Net is 26 inches long, loaded; 5 feet extended

catch was made up of sunnies, all of whom gave a fair account of themselves on the bass-weight 8½-foot rod.

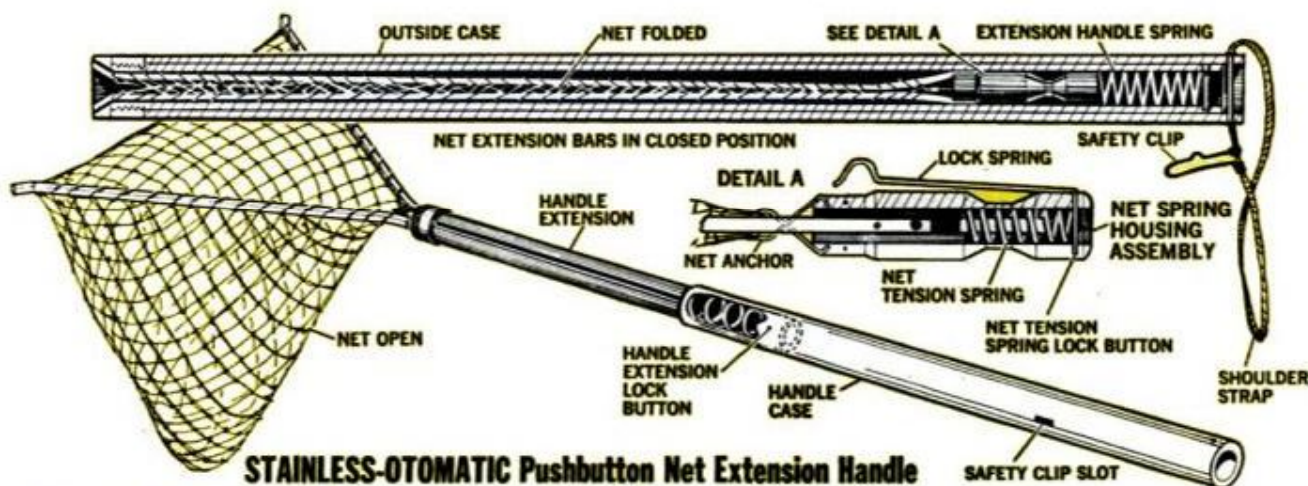
During the afternoon's fishing I found only one difficulty in using this latest idea in facile fishing. While concentrating on a cast or excited by the rise of a fish, I sometimes triggered the thumb switch by mistake. But since my line hand still controlled the flow of line onto the reel, and since the errors may have been due to my own inexperience in handling the new product, I assume the problem is eliminated with practice.

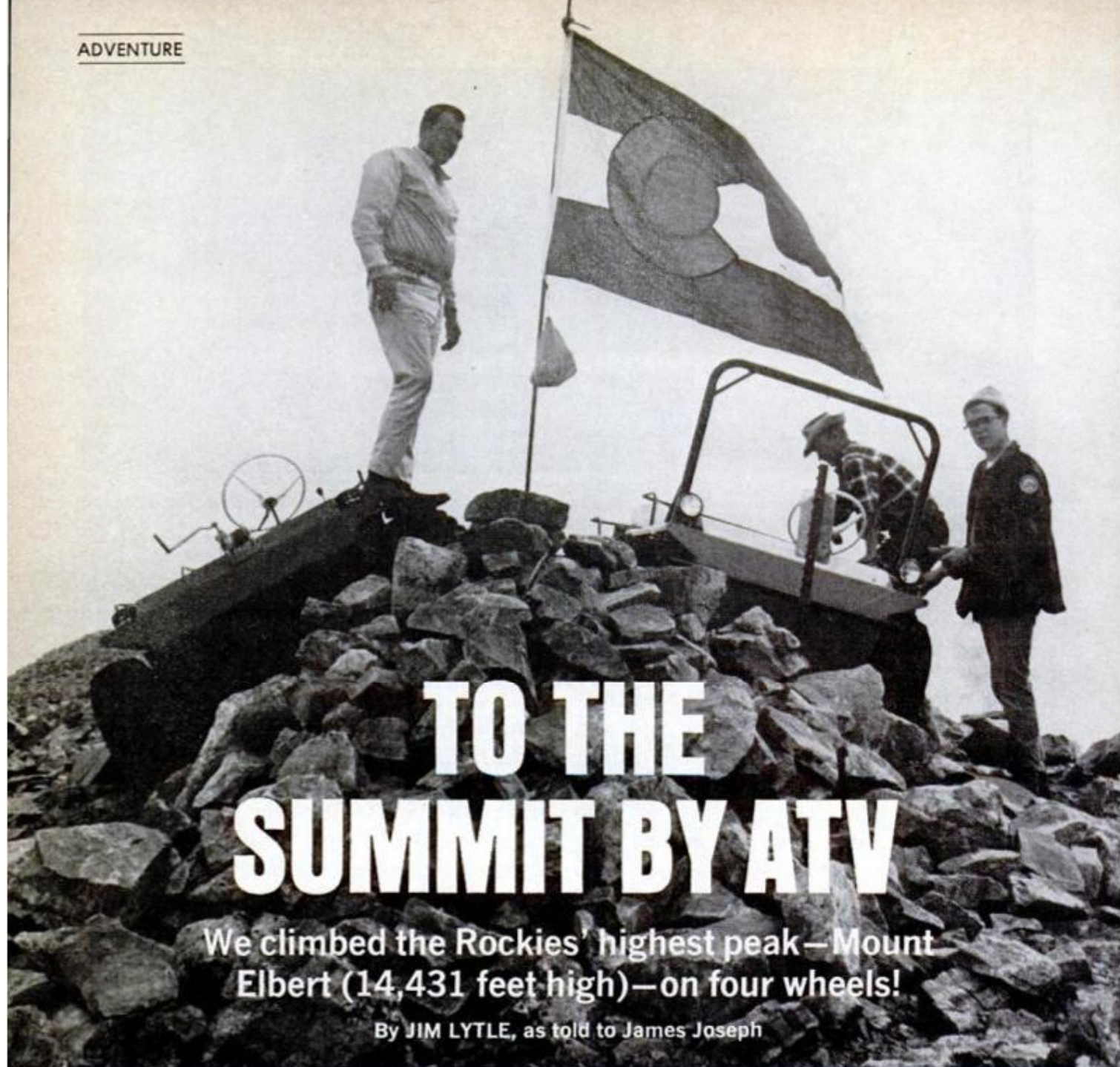
I first discovered the "Stainless-Otomatic" net at a fishing lodge in Normandy, France. Curiously handling the strange fiberglass tube, I triggered its powerful spring by mistake and nearly impaled a lady angler strolling by! Fortunately, the net we imported for the *PM* test came with a safety clip. Even so, since the net snaps out with a jolt,

it's probably best to point the container tube to one side of any fish you hope to land. Otherwise, you could end up with a severed line.

Disturbingly flimsy when extended and with a tendency to lock up after a single dip in freezing weather (grayling fishermen take note), this over-the-shoulder item does have one advantage over other nets—it never gets caught in branches or weeds while you move around a stream or along banks. In addition, a fisherman can use the stubby shaft as an emergency wading stick. Boat fishermen may find it especially handy as there is no exposed mesh to catch hooks or rod tips when it is loaded.

For more information about the net which costs roughly \$15, write Wyers Freres & Brehier, 30, Quai du Louvre, Paris 1, France; about Kodiak's new line of flyrods, Box 467, Ironwood, Mich. 49938. ★★★





# TO THE SUMMIT BY ATV

We climbed the Rockies' highest peak—Mount Elbert (14,431 feet high)—on four wheels!

By JIM LYTLE, as told to James Joseph



**AT THE SUMMIT,** Coot expedition poses on highest point in Colorado and the Rocky Mountains, second highest in the lower 48 states (only California's Mount Whitney, at 14,495 feet, is loftier). The expedition leader, Jim Lytle, stands atop four-wheel-drive Coot to inspect Colorado state flag he has just erected on summit. At right is four-wheel-steer ATV which, with Lytle at the wheel, was first to reach the top at 9:35 a.m., Aug. 3, 1969. Rock pile cairn, which is typical of those placed on the world's highest mountain peaks, is work of previous climbers of Mount Elbert

**LYTLE BREAKS OUT** of the timber at 12,000 feet (left) and pauses for a backward glance

POPULAR MECHANICS

**O**NLY A VERTICAL HALF-MILE below Mount Elbert's summit—Colorado's tallest peak and second highest in the U.S. outside of Alaska—things were all uphill and down. And so steep in both directions that a restless turn in our sleeping bags would have triggered a kind of human avalanche—hurtling the seven of us downslope with no stopping until we hit timber.

We were camped on a rocky, nearly 30° slope on the northeastern flank of the highest of 14 peaks which comprise the awesome Sawatch Range—the nation's "rooftop"—90 miles southwest of Denver. Upslope a few yards we'd parked and chocked the three tough little four-wheel-drive Coot ATVs ("all-terrain vehicles") as windbreaks. They had gotten us this far and would, we were betting, take us clear to Elbert's summit when we made the final assault at daybreak.

But our luck seemed to be running out. Gathering mist threatened rain which might make the mountain slick as glass. And one of our three ATVs, involved in a runaway accident just before dusk, was crippled.

That was only part of the challenge. While we wouldn't be first to Mount Elbert's summit on four wheels, we were doing it the hard way, via the trackless northeast approach. Scrambling up top from the northeast would prove that our ATVs, billed as "go-anywhere vehicles," were just that.

We had two even more serious purposes. One was to test the first of a new breed of ATV: Coot's 4-by-4, which is both *four-wheel drive* and *four-wheel steer*. All four wheels are powered—and steerable. The linkage is mechanical. Turning the front wheels in one di-

rection turns the rears in the opposite. Where the rear wheels of most ATVs merely "follow" in negotiating obstacles or hairpin trail-turns, the 4 by 4's steerable rears "snake" through and around the tight spots. Four-wheel steered, the ATV can turn completely around in its own 7½-foot length, and I was driving the very first of the new vehicles—Coot's model 444-SS—to come off the production line.

Our third objective was to show that ATVs don't—as some critics have charged—tear up the high country's fragile terrain. Wide-tired and as under-inflated as most ATVs ride—our vehicle carried Coot's standard, nearly 9-inch-wide 8.85x15s, inflated to 8 pounds per square inch up front, 6 in the rear—the average ATV's "footfall" is light as any elf's. And significantly lighter than the tread of either man or horse. Low gearing prevents tires from spinning, and with something like 440 square inches of tread on the ground, our ATVs weighed a maximum of 2000 pounds, including four passengers and gear. The vehicle tiptoed upslope exerting less than 5 pounds pressure per square inch distributed equally because of the vehicle's articulating features. A horse and rider, by comparison, ex-

**WHERE FOUR-WHEEL STEER** made a difference. Standard four-wheel-drive ATV hangs up between trees while Lytle (background) zigzags uphill



ert close to 24 p.s.i., a man—about 7 p.s.i.

We had shoved off on Saturday morning, Aug. 2, 1969, from San Isabel National Forest's Halfmoon Campground (elevation: 9800 feet), huddling Mount Elbert's northeastern approach. I led in the four-wheel steer. Beside me rode the expedition's guide, young Bill Peterson, from nearby Leadville, who'd previously made the summit on foot. Behind tracked Sam Umberger, Coot dealer from Riverton, Wyo. Sam had brought along a standard four-wheel-drive Coot. Riding with him were Dick Kruse, 26, sports photographer from Denver's KBTV and *Denver Post* photog Ed Sielsky. Driving tail position—also in a standard four-wheel-drive—were mechanic Dave Kittinger and Derrick Dodge, a crack snowmobile-team driver, both from Ski-Doo West, Inc., Coot's Rocky Mountain distributor.

Before pushing off, we'd roughed out a route and mapped our assault. Moving upslope, cross-country and ever southwestward, we'd climb to 12,000 feet. That would put us just above timberline. Once we'd shaken timber and with the slope steepening (our contour maps showed the north ascent to be more than 60° in places), we'd bed down as best we could for the night. Next morning, early, we'd make our try for the summit.

That first hour, working southwest by compass but with Elbert's bald summit fleetingly in view, we picked our way to 10,500 feet through dense stands of pine and Engelmann spruce.

"Power's holding," Sam told me by walkie-talkie.

Power, which would grow ever more critical the higher we went, was another of the things the climb would test: Whether factory-standard ATVs, as our own, could get up top a nearly three-mile-high summit under their own power.

An engine loses about three percent of its power for every 1000-foot increase in elevation. We were running



**DENSE GROWTH** briefly stops one ATV. Though two of the vehicles had winches, they were seldom used

with Coot's standard 12-hp, air-cooled, single-cylinder Tecumseh gasoline engine. Atop Elbert's 14,431-foot summit, the power loss would be more than 42 percent—reducing the engine's output to a mere seven hp.

Anticipating this, we'd fitted two of the vehicles (my four-wheel steer and Dave Kittinger's standard four-wheel drive) with Coot's optional 12-tooth drive sprocket. Switching sprockets increased the gear reduction by better than 25 percent—and power by the same amount to 16 hp effectively. So atop Elbert we'd have nine hp anyway. Other than fueling my four-wheel steer with cooler-burning 90-octane aviation gas, this was the only change we made. Sam hadn't bothered to make any changes at all. Yet here he was, nearing 11,000 feet, and feeling no power pinch.

By now we were running into boobytraps of timber and terrain so precipitous we often had to side-hill a hundred yards laterally to gain a few feet vertically.

"At the rate we're going," Dave shouted from his four-wheel drive, "we'll be a month of Sundays getting up top."

"The 'Sunday'," I replied, "had bet-





ON SUNDAY'S FINAL ASSAULT ON SUMMIT, ATVs picked way up slope, skirting strange snow-and-glacier-dug bowl at right. The bowl, nearly a quarter of a mile in diameter, had small, stagnant lake at bottom

ter be tomorrow." Each vehicle carried only an extra five gallons of gas. We didn't have many hours to squander during this climb.

Trouble was, the trees grew so thick that our Coots, 5½ feet wide at their tires, often couldn't squeeze through. We spent the better part of an hour backing and hawing. That's where my four-wheel steer proved itself. Often, with hardly more than a whisper to spare, I'd kick the rear wheels of my Coot around a tree that had hung-up the others.

The ever-steepening grades were something else again. Slip down a mountainside like that, and you might be an hour scrambling back up. Our Coots—with their independently "articulated" fronts and rears—managed to keep their tires planted and their cool better than some of their drivers. At times things were pretty scary. Not that we were in any real danger. We could have always bailed out. That was the reason we didn't wear seat belts or shoulder harnesses. But losing a vehicle to Elbert wasn't in our plans. Over the trickiest fallofts, we'd sometimes "walk" our ATVs: Walk alongside with one hand on the steering wheel, the

other working the throttle extension designed for just such hard-going terrain.

A little past 11,000 feet—and nearly the whole way to timberline, at 12,000 feet—we ran into tree trouble of another kind: A crazy quilt of deadfalls. Some of the logs ran to over two feet in diameter. Some deadfalls we simply rode over. Others, too high for riding, we teetered over. The trick was to power the front tires atop the log, then push off with the Coot's powered rears. For a breathless moment, the ATV seemed to teeter, taking the brunt of the punishment on its tough, nearly ¼-inch-thick steel underbelly. Then it'd nose over, literally sliding over the log until its front wheels caught hold and pulled the rears over.

Suddenly, nearing 12,000 feet, we were out of timber and into the clear. As it was too late to try for the summit before dusk, we decided to camp where we were. Yet there wasn't a flat spot or windbreak anywhere—just an endless upgrade, spotted with boulders as big as our ATVs, and naked to the winds and thunderstorms which breed near Elbert's summit. The only thing in our

*(Please turn to page 216)*

# They Handle the Hot Stuff

Radioactive materials occasionally get loose in hospital operating rooms, fall off trucks, or are lost in shipment. When the situation is too hot to handle, they call the men from REAT

By NORMAN CARLISLE

Photos: Bill Aller



**I**T WAS A BITTER winter night, but Francis X. Gavigan was out in the back yard of his suburban Chicago home, wielding a garden hose. He had promised the kids he'd put a new glaze on the ice of their improvised skating rink but until his wife stuck her head out the door and yelled, "Phone call. . . emergency," he hadn't been able to think of any good excuse for getting out of it.

As he put down the receiver he wondered, however, if the cold job in the back yard might not be preferable to the one he was about to take on.

Gavigan is not a fireman, though he knows a lot about fighting fires. He is a member of a unique organization, the Radiological Emergency Assistance Teams.

The task of the men of REAT (they number something over 100) is to speed to the scene of any emergency situation involving radioactive materials. A corresponding organization—NET (Nuclear Emergency Teams) works on mishaps that befall nuclear weapons.

These emergency forces are needed because the use of radioactive materials is now rather commonplace. Scientific labs use all kinds of "hot" materials for research purposes. Thousands of hospitals use radioisotopes for therapy and diagnosis. Industry puts them to work at hundreds of tracing, measuring and testing tasks. Over 300 powerplants use nuclear materials. And nuclear explosives are now being employed to tap earth's riches.

On 24-hour alert, REAT operates out of eight main bases—Atomic Energy Commission Labs in New York, Chicago, Albuquerque, San Francisco, Oak Ridge, Idaho Falls, Richland, Wash., and Savannah River, S.C.—where they work as engineers and researchers. NET outfits are attached to various mili-



**PHYSICIST AT MANHATTAN HEADQUARTERS** of REAT readies equipment for mobile unit. On table are alpha and beta scintillation counters. Shelves hold radioactive detection gear ready for emergencies



**REAT COMMUNICATIONS CENTER** coordinates emergency team, tells mobile, via two-way radio hookup, equipment to be loaded, activates mobile communication channel, alerts Defense Department's team

tary bases located around the country.

The Chicago emergency was at Lutheran General Hospital, where, a short time before Gavigan and three other REAT men arrived, hospital officials had put in a worried call to the AEC. Two technicians had been working in the therapy room, where patients received radiation treatment. Somehow a tiny cylinder of cobalt 60 had slipped from its case and dropped to the floor. The technicians ran from the room and slammed the door. Through the observation window they looked back with horror at a room that would now be extremely dangerous to anyone who entered it.

The first thing the REAT experts did was to determine if any radiation had gotten outside the room. Their sensitive radiation counters—variations of the well-known Geiger counter—showed that some had. They roped off the hot areas. The technicians were already being checked out; neither had received a dangerous dose.

The problem narrowed down to getting the capsule out of the room. A man, no matter how heavily shielded by protective coveralls, couldn't just run in and grab it, or even pick it up with a standard six-foot tongs. He'd get too great a dosage before he got the capsule safely into a lead container. Also, in his

haste, he could drop the thing, or it could roll into an inaccessible corner.

Gavigan had to do some fast talking to hospital authorities, reassuring them that no harm at all was being done by the capsule lying there, but that plenty could ensue if they were to bungle the job of getting it out.

The following afternoon, a strange device rolled down the hospital corridors as personnel looked on in amazement. It was a PAR (for Program And Remote Control) a caterpillar-treaded, cable-controlled device that handles radioactive materials in the Argonne National Laboratory. Operating the controls from outside the room, one of the REAT men carefully closed its manipulative "hand" over the capsule, then slowly eased it into the lead box atop the PAR. After making sure there was no radioactivity in the room, or anywhere around it, the REAT engineers marked another case closed.

#### **There's always human carelessness**

Half a million shipments of potentially dangerous materials are moved annually by truck, rail and air. Though the hot stuff is always packed carefully in lead-lined containers and plainly marked "Radioactive Materials," a certain number of accidents are bound to happen. Trains can be derailed, trucks



**INSIDE EMERGENCY VAN** is lead-shielded gamma "well" (large cylinder) into which samples are placed for analysis. Multichannel analyzer (left) gives a printout of analysis. Oscilloscope (resembling TV screen) shows spectrum, helps identify radio nuclei. Electronic gear (right) is radio communications equipment

can have wrecks, planes can crash. And then there's always human carelessness.

The AEC's lab in Idaho Falls, Idaho, had ordered some ampules of gaseous iodine from a company in New York State. When the containers reached the National Reactor Testing Station, 50 miles west of Idaho Falls, it was discovered that they had leaked; they hadn't been sealed properly by the shipper. Had they spread a trail of contamination along the entire 2500-mile route? Here was a job for REAT.

A team led by John Horan of Idaho Falls checked out the driver of the station wagon that had conveyed the iodine from Idaho Falls to the test station, the pilot and crew of the plane that had brought the shipment up from Salt Lake City, and the personnel work-

ing in the air freight station there. All okay so far.

The New York team checked out handlers at Newark Airport, where the iodine had been loaded aboard the plane, and personnel at the manufacturing plant in upstate New York, from which the vials had been taken to the airport in a station wagon. In all, the two teams examined three planes, four trucks or cars and 80 people. Of them, 50 showed some signs of having received dosages of radiation, fortunately none in harmful amounts.

One of REAT's toughest jobs is locating all the hot spots that may have been created. The leaking iodine didn't involve many. Much more complex was a case that didn't cover such a wide geographic area. A shipment made between two points 600 miles apart was

10 days in transit. During that time it moved through four different terminals, leaking all the way. The REAT engineers had to take readings on the trucks that had hauled it and on every possible place it might have sat in all four terminals. They moved their counters in a grid pattern to make sure no spot was missed. It took two men two days at each terminal before they could be sure they had found every area of contamination. Meanwhile another team was tracking down and taking readings on the four trucks that had been involved.

After they've discovered the hot spots they have to get the radioactivity out. On surfaces where the radioactive substance has soaked in, they come up against some tough problems, such as the one encountered in a warehouse, where radioactive liquid had poured onto the concrete floor. They tried washing the concrete with acid but finally had to bring in grinders that cut deeply into the floor.

A fear that haunts REAT men is the possibility of public panic. There is always the danger that their efforts to track down and get rid of radioactivity will create hysteria in people already frightened by real and imagined dangers of radioactivity. In the '50s before the REAT groups were established, there was a chemical explosion in a laboratory in New York City's borough of Queens. One person was killed as a result of the explosion, which involved radioactive materials used in the plant. Wild rumors quickly spread. Hundreds of people were concerned about whether they had been exposed to radiation, and newspapers carried scare-head stories that increased the general panic. Actually, no one, including workers in the plant, suffered any dangerous exposure.

"If we'd had a team at that time," says Arnold Weintraub, of the New York team, "public concern would have been minimized."

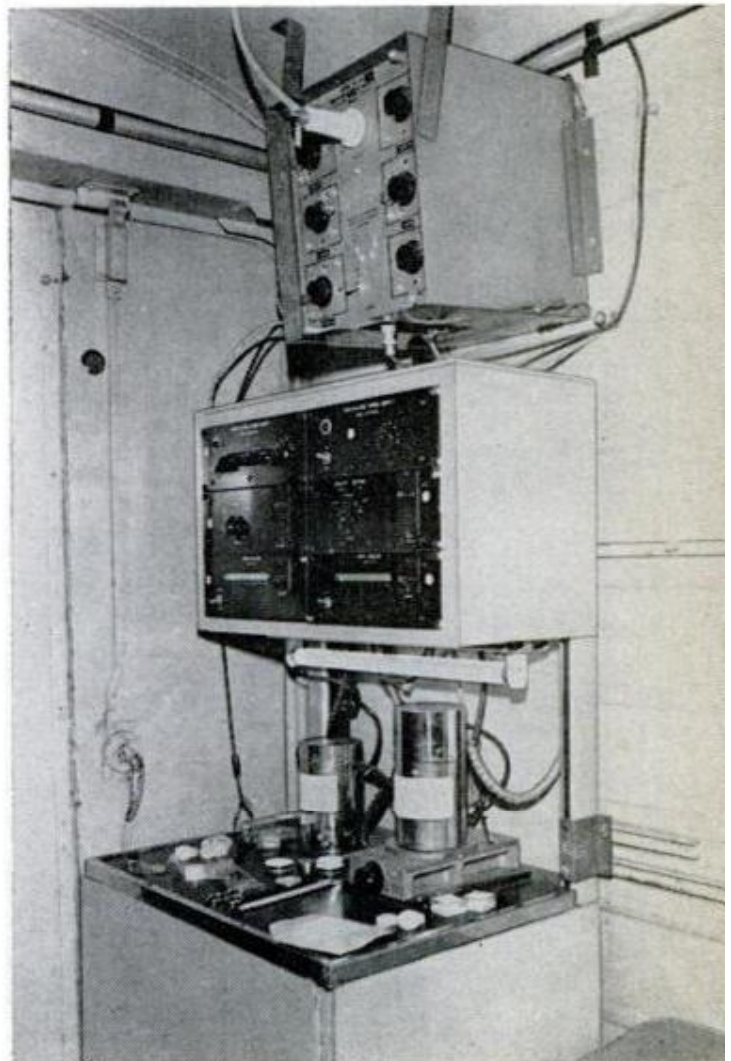
Team members are always prepared

*(Please turn to page 208)*



**REAT MOBILE UNIT** being loaded with lockers containing gear specified for a radiological emergency

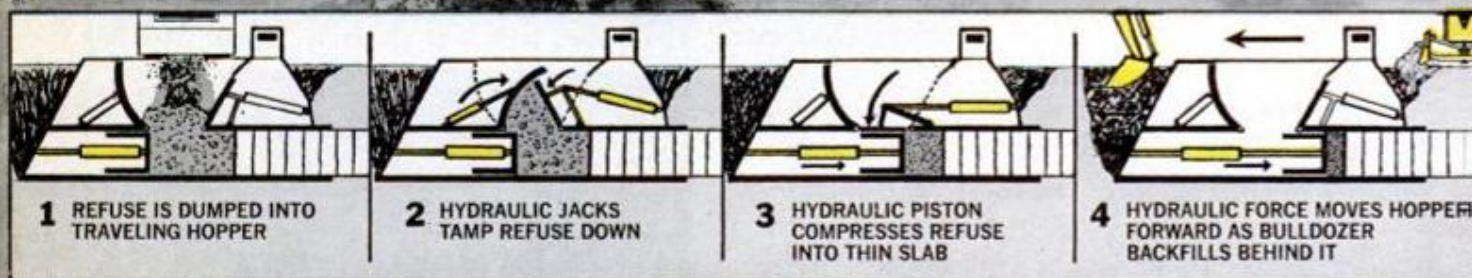
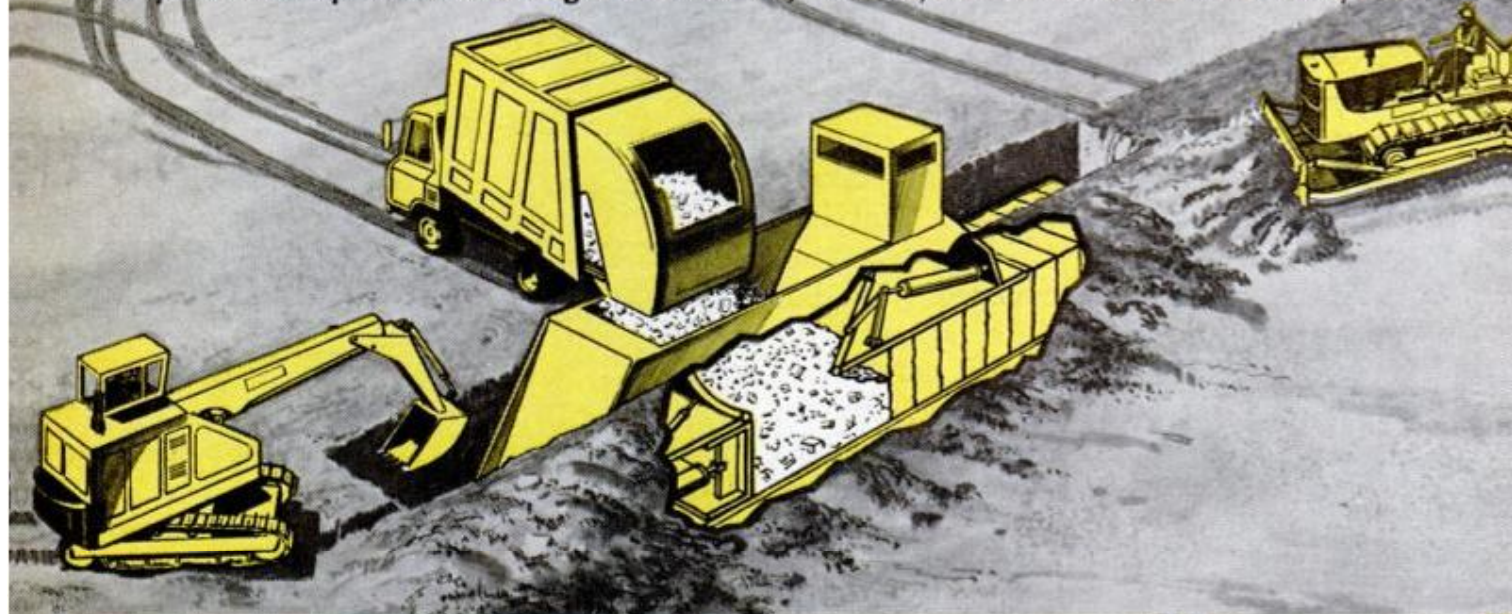
**ALPHA BETA SCINTILLATION COUNTER** in mobile unit has power supply mounted above; radioactive samples are on table and electronic "heads" give count



# Just patented

PM'S PICK OF THE NEW INVENTIONS

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



1 REFUSE IS DUMPED INTO TRAVELING HOPPER

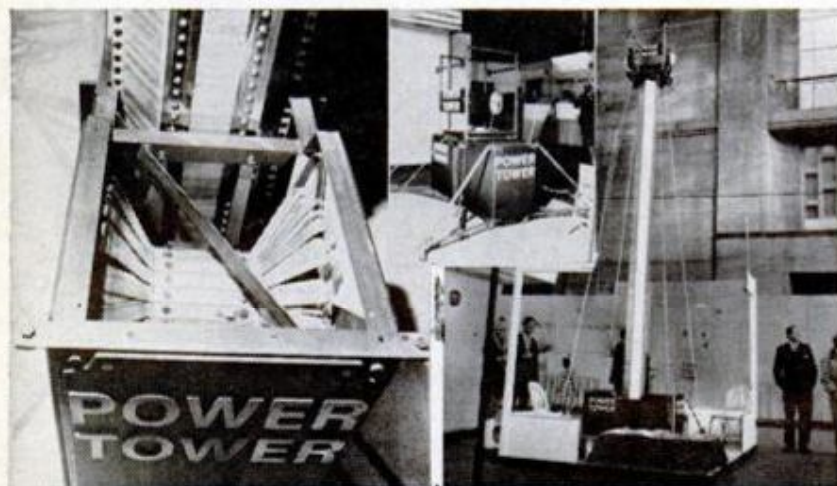
2 HYDRAULIC JACKS TAMP REFUSE DOWN

3 HYDRAULIC PISTON COMPRESSES REFUSE INTO THIN SLAB

4 HYDRAULIC FORCE MOVES HOPPER FORWARD AS BULLDOZER BACKFILLS BEHIND IT

**1. REFUSE-BURYING MACHINE** above travels slowly through the ground, depositing trash and garbage safely under the soil. Designed as an answer to the growing problem of garbage disposal, the ingenious device not only gets rid of the refuse, but makes use of it as fill material in land-development projects as well. Garbage is dumped into a hopper-like opening in the machine and doors close down over it,

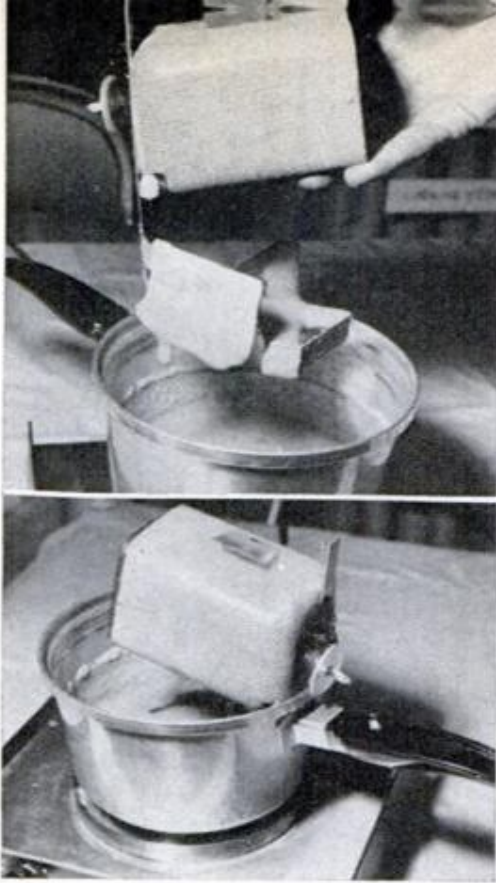
sealing it in. A hydraulic ram then compresses the refuse into a thin, compact slab, at the same time pushing the machine forward for the next load. As the machine moves ahead, the compressed slabs are forced out through the back where they're completely covered with dirt by a following bulldozer. A trench digger moves ahead of the refuse machine, clearing a path for it in the ground as it inches along



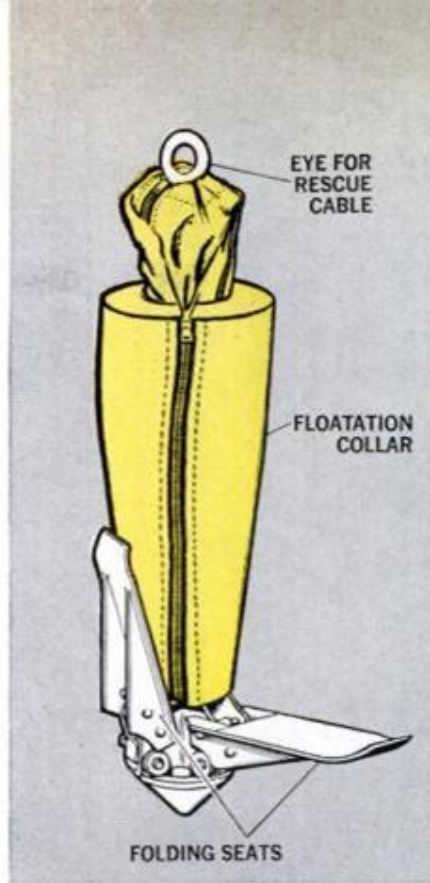
**2. INSTANT TOWER** at left extends to any desired height like a steel tape measure unrolling from its reel. Two flexible metal strips are wound onto motor-driven hubs at the base. As the strips are unreeled, they come together and fingers at the edges interlock like a zipper to form a rigid boom that can be raised to 50 feet or more. Reeling in the strips retracts the tower. Designed for power-line maintenance, as well as firefighting and similar jobs, the Power Tower can be extended faster and stored in less space than the conventional type of "cherry-pickers" now being used

Inventors of the items shown on these pages are as follows: 1. Tyman H. Fikse, 1459 Loraine St., Enumclaw, Wash. (No. 3,446,026); 2. John Lyons, 72 Eamont Court, St.

Johns Wood, London, England; 3. W. T. Sommer, 601 Orleans St., Detroit; 4. Avrom Greenberg, Granby, Conn., William H. Brown, Jr., Suffield, Conn., Clifford B. Packard,



**3. MECHANICAL SPOON** above keeps stirring the contents of a pan, freeing the cook to do other kitchen chores. The clever self-propelled device rides around the rim of the pan on a flanged wheel, turning in circles. This rotates a blade in the center to stir the food. Three ordinary flashlight batteries power a small electric motor to drive the wheel. The stirring arm of the device can be either shortened or lengthened in order to fit pots of different sizes

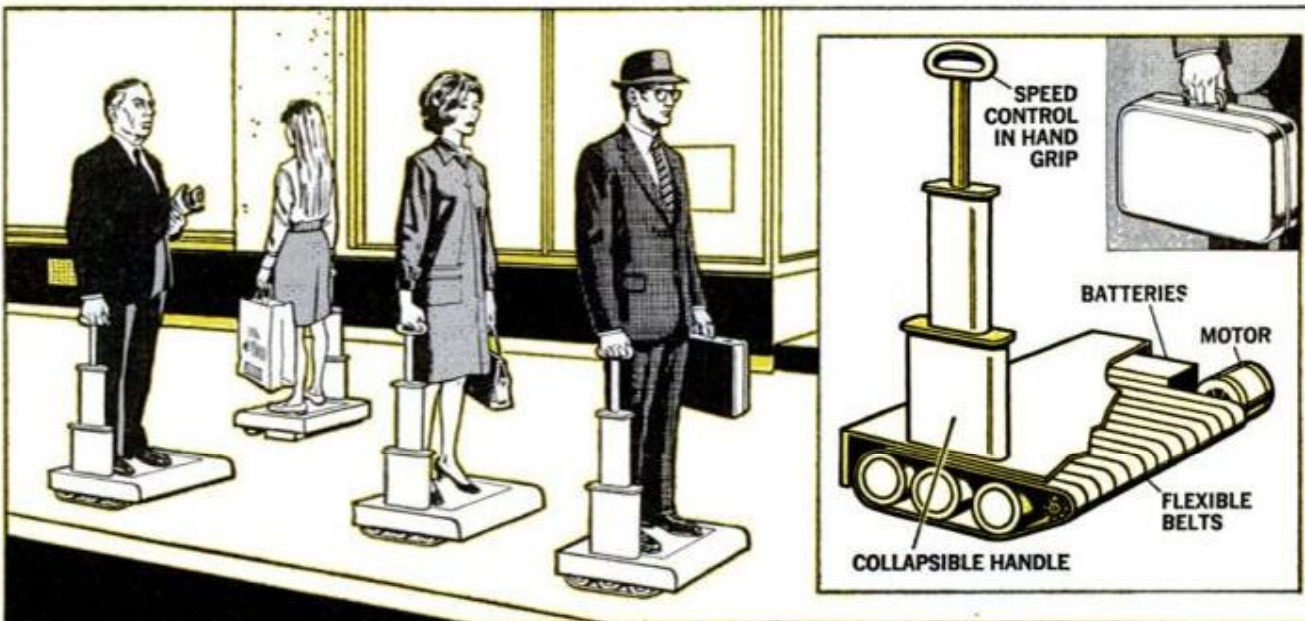


**4. RESCUING AIRMEN DOWNED AT SEA** would be easier with this floating seat. Hinged panels fold out to support up to three men around a central column of flotation material. When a rescue helicopter arrives, it just hooks onto a ring and hoists the men safely aboard without their having to hold onto ropes or get into slings. The devices could be dropped by the rescue helicopter or by crewmen in the disabled plane before ditching. There's provision for strapping an injured flyer into the seat so he can't accidentally fall out. Various types of survival gear, such as food and flares, can be stowed inside a zippered cover around the flotation material



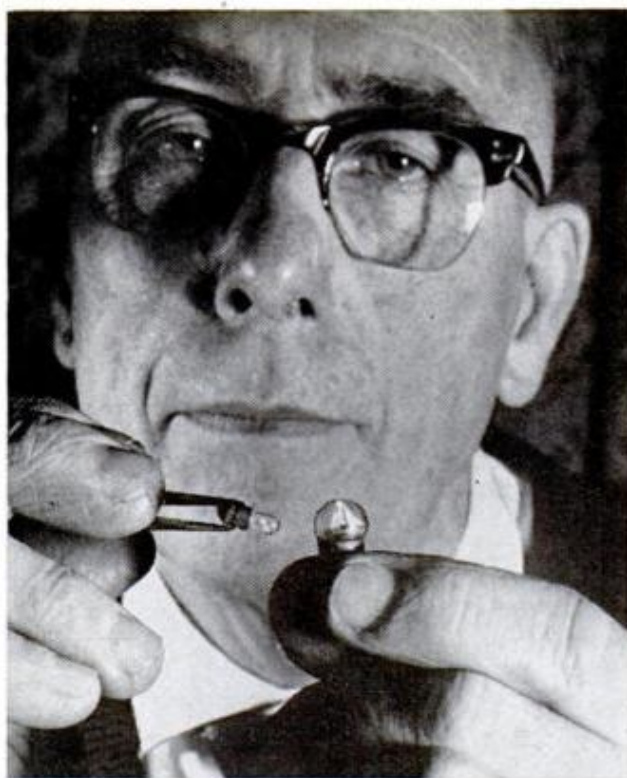
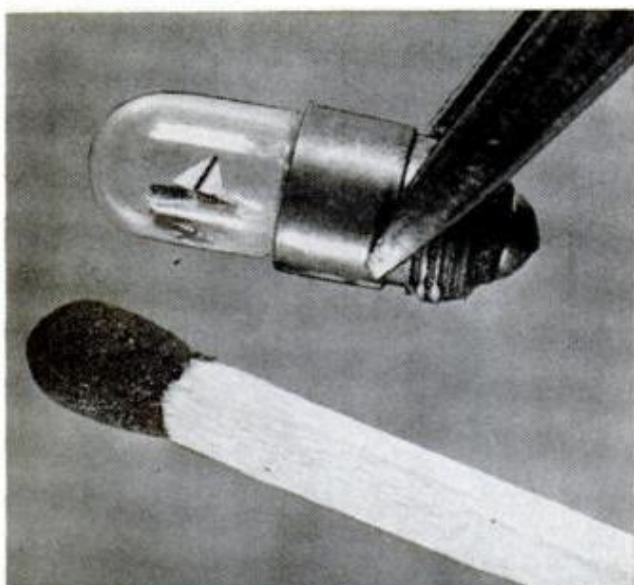
**5. PORTABLE CONVEYOR** below lets you carry your own transportation with you. The battery-powered platform, just big enough to stand on, whisks you over sidewalks and other smooth surfaces at speeds up to several miles an hour. When not in use, it can be collapsed and carried like a suitcase. The

conveyor rides on rubber belts driven by an electric motor. Squeezing a lever in the handle adjusts a rheostat to control the platform's speed. You steer by pushing or pulling on the handle to "hitch" the platform around in one direction or the other. The telescoping handle folds flat to make carrying easy



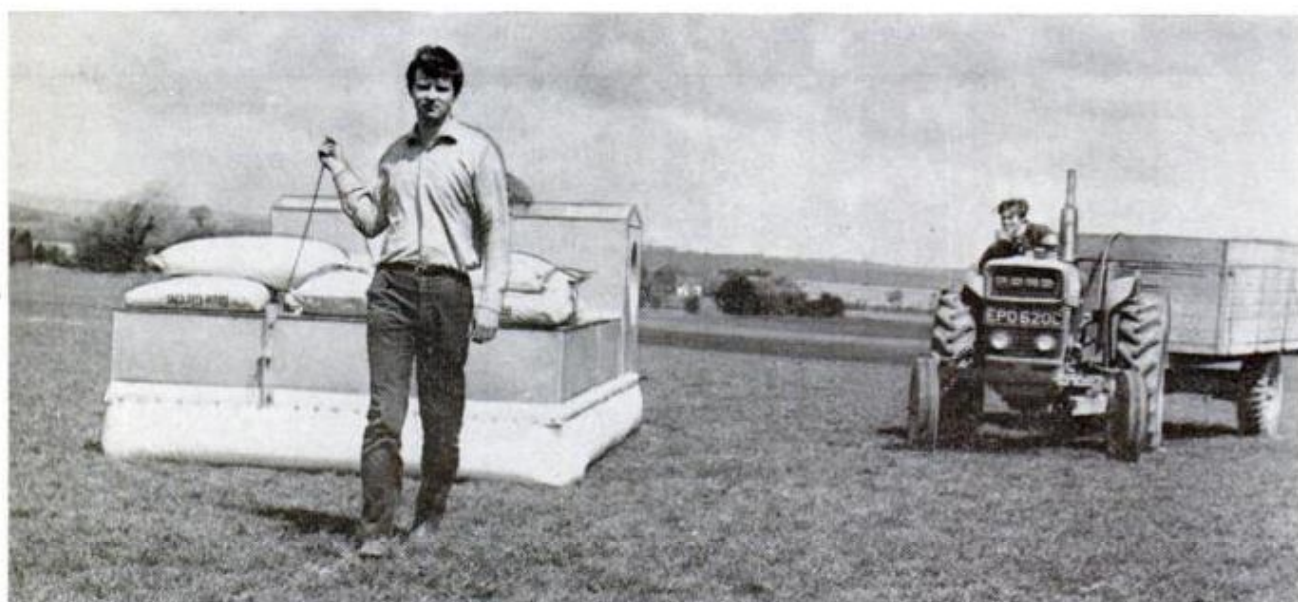
South Glastonbury, Conn. and George L. Hackenberger Jr., Suffield, Conn. (No. 3,444,569); 5. Constantin Alimanestiano, 200 S. Michigan Ave., Chicago, Ill. (No. 3,446,304). Read-

ers wishing to bring new inventions to the attention of Roger Shashoua can reach him at the International Inventors Assn., Inc., 608 Fifth Ave., New York, N.Y. 10019.



### Mini-mini-boats

Albert Stannard, London bus driver, spent three weeks building the tiny sailboat inside a computer bulb (upper left-hand photo). The boat, which he believes is the smallest of the built-in-glass boats in the world, measures just 1/16th inch from bow to stern. The hull is made of vinyl, the mast of wire and the sails of rice paper. The flashlight-bulb model (above) was easy; it took just four hours. The wood-hulled, three-masted galleon (left) is in a 40-watt bulb. Stannard does all building with forceps inside the bulbs.

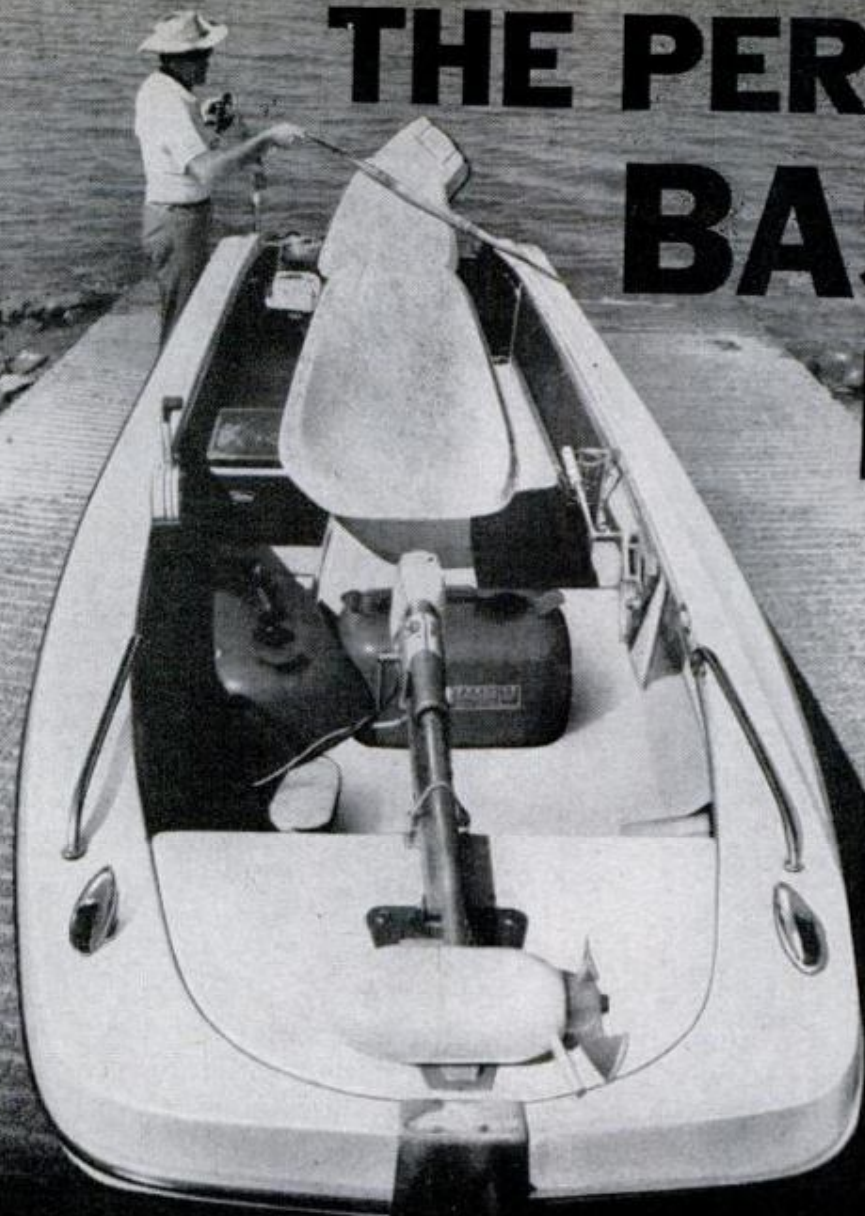


### Air-cushion trailer for hauling over marshy terrain

Loads of up to 1½ tons can be carried over marshy ground by the Hovertrailer, an air-cushion vehicle developed by Paul Jennings of England. Jennings is shown demonstrating the ease of pulling the Hovertrailer while a conventional tractor and trailer follow.



# THE PERFECT BASS BOAT



**Thoroughbred with a mongrel past—part pirogue, part jon boat—“skeeter boats” are offering new designs in comfort and efficiency that are bound to sweep the country**

By **GEORGE REIGER**, Boating and Outdoors Editor

**Y**ANKEE BEWARE! The South is rising again! Boat companies from Olive Branch, Miss., to White Bluff, Tenn., are taking the wraps off sleek craft intended to conquer the North and West. Texas has joined in the assault with secret weapons: Skeeter and Kingfisher. Border state Missouri has already succumbed to the new designs with at least two companies working for the cause. Even mighty Chrysler has sent spies south and come up with a counter-measure they call the Dart.

Intrigued by the uprising, *PM* infiltrated Arkansas, where we met with angling expert Grits Gresham for a rundown on what the hullabaloo was all about. Grits grinned at our fears and said, “Heck, this item’s no threat to you folks up north—not unless you like fishing. Then you might end up spending so much time on the water that you won’t have a family or job when you come ashore!”

Five years ago, Grits warned the fishing fraternity of this boating phenomenon in his *Complete Book of Bass Fishing* (Harper & Row, New York). He devoted an entire chapter to describing the advantages of his favorite bass craft made by the



**THERE'S MORE THAN AMPLE CASTING ROOM.** Hugh Miller sits on folding chair between Grits and author while the three work the shoreline without crowding

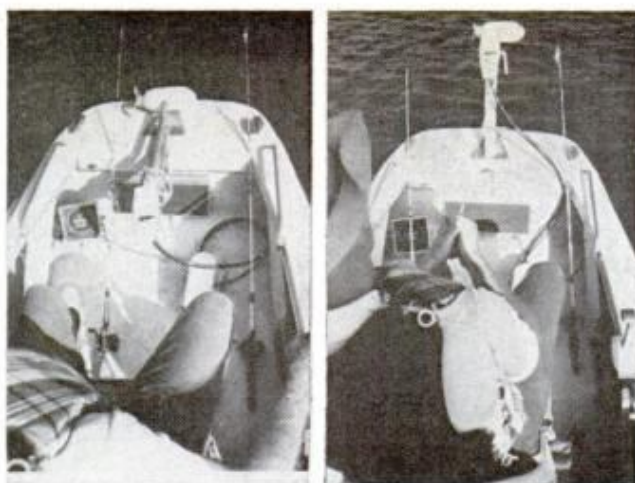
Delhi Manufacturing Co. in Delhi, La. It's nearly 15 feet long, 54 inches wide and weighs just 280 pounds, including flotation foamed between the double bottom. The craft is called the Terry Bass Boat (Model 1599) and has a trihedral or inverted "W" bow. Many skeeter designs are flat bottomed, but Grits thinks the trihedral shape has an advantage when air is scooped in on a fast ride to help smooth out the bumps.

And this boat is fast! Equipped with a 55-hp Johnson, it does better than 40 mph with two aboard. Such power is not recommended for the novice; a sudden turn could easily upset the boat.

But hull design alone doesn't give this boat the edge over conventional runabouts for sheltered-water angling. It's mostly a combination of factors that center about the driver's seat. All controls and accessories are located forward. Steering wheel and dashboard control panel have been scrapped in favor of the stick steering system first developed by Jim Dockery of Shreveport, La. Though present Delhi models use a Morse control stick shift, Grits abides by the Jim Stick: "I've used it so long now, the darned thing is practically an extension of my arm."

Grits caught so many fish during our stay at Dardanelle that I rather imagined his fishing rod, and not the Jim Stick, was the extension of his arm!

After launching at the Russellville Marina, we picked up parks official



**GRITS EASES OFF** the throttle and drops electric outboard over bow as he approaches good fishing spot. Note Lowrance Fish Locator in front of left foot

Hugh Miller and began a systematic exploration of fishing spots he knew along the north shore of the lake. Dardanelle Lake is an impoundage of the Arkansas River created by a dam located five miles southwest of Russellville. Eventually this lake will form a link in a chain of navigable channels in the Arkansas from Catoosa, Okla. (15 miles east of Tulsa), to the Mississippi.

Reservoirs generally see their best fishing during their first 10 years of existence. The Dardanelle powerhouse was completed in June 1966, and the best fishing is just getting underway.

An angling scenario with Grits goes something like this: After shutting off the Johnson and lifting its prop clear of snags with a power-tilt mechanism located beneath the starter, Grits lowers his foot-operated, remote-control electric Motor Guide over the bow. Then after checking the Lowrance (300-SL) Depth Sounder & Fish Locator to see how deep we're fishing and whether there are any big ones below us, and after putting his cold drink in a spillproof swiveled holder, Grits begins to cast. And as soon as he casts, he seems to have fish!

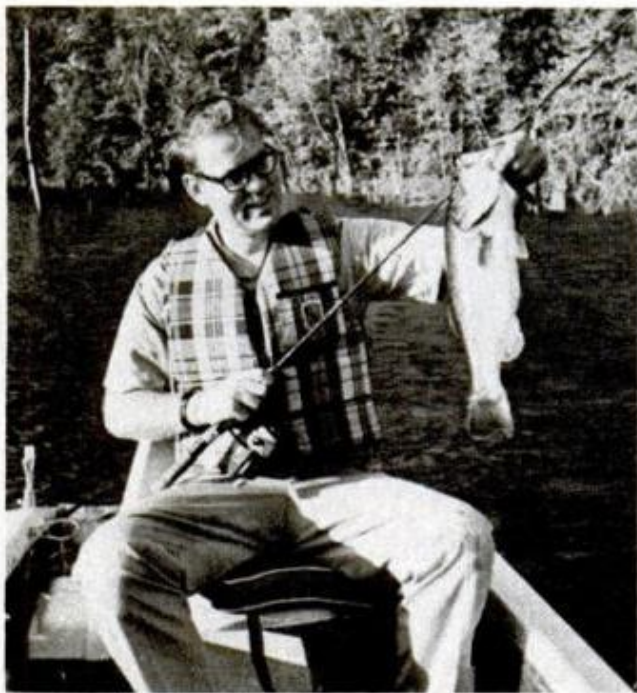
When we got restless sitting in our 360° pivot chairs, we stood on a completely flat deck with confidence in the boat's stability. Even when Grits, Hugh and I all leaned to one side, the boat merely tilted a bit.

I stress the levelness because, in ad-



**BOAT SHOWS PERFECT STABILITY** (above left) when Grits stands to cast for white bass on the Arkansas. Above right: Grits lands a lunker; then later at the Russellville Marina, weighs in a pair of big ones. Below: Grits cuts the running time between hot spots with a 55-hp Johnson. Note vest-type life preserver.





**FISHING SUCCESS** isn't confined to the driver's seat, as proved by this four-pounder landed by the author



**DURACRAFT'S ALUMINUM** bass boats have high freeboard and a sturdy bow platform to support caster



**OUACHITA'S CONVINCER** provides spotlight, bow-mounted winch anchor, trolling-rod holder options

dition to less fatigue for standing legs, a horizontal platform means that gear won't roll around or tangle in one spot. Since the boat comes equipped with under-the gunwales storage space for rods and tackle, there's really no reason to have much of anything loose.


The sensation of control is exhilarating! The waterscape sweeps by at terrific speed, but since you occupy the forward seat with nothing to obstruct your view, you have perfect visibility. Snags you might never see from the stern or over the top of a windshield are readily observed and easily slalomed by.

Appeal of the Terry Boat is in its stability, speed, excellent visibility and bow control. The family tree of bass boats is so intertwined that it's impossible to separate them into categories. If you're interested in getting one, first, decide on your requirements. For example, as a big-water fisherman you should be willing to sacrifice speed for greater freeboard. Then write for information from representative companies, some of which are listed below.

In addition to the Ranger made in Flippin, Ark., that state has Duracraft at Monticello, 71655; General Marine Industries, Inc., at Arkadelphia, 71923; Monark Boats at Monticello, 71655; and Ouachita Marine in Arkadelphia, 71923.

Tidecraft is produced in Minden, La.; Arrow Glass at 1371 Farmville, Memphis, Tenn. 38122; Ebbtide at Jones Creek Rd., White Bluff, Tenn. 37187; and PolarKraft, Box 236, in Olive Branch, Miss. 38654. Information about Chrysler's Dart can be obtained from Box 2641, Detroit, Mich. 48231, and two companies in Missouri are Beaver Boat Co., Inc., Box 740, Cape Girardeau 63701; and Richland Manufacturing Co., in Richland 65556.

While not all these firms make boats styled exactly like Grits' Terry, their designs incorporate most features of his "perfect boat." And if you can't beat this Southern way of fishing, why not join 'em? Grits insists it's only a matter of time anyway. ★★★

A black and white photograph of a man riding a mini-bike through a wooded area. The man is wearing a heavy jacket and is looking towards the camera with a slight smile. The background is filled with bare trees and brush, suggesting a late autumn or winter setting. The mini-bike is a small, motorized two-wheeler with a front fender and a rear seat.

# A Family Guide to Mini-Bikes

Any boy, girl, mom or dad can scramble through the thicket of mini-bike models for the perfect all-season, go-anywhere, two-wheel ticket to ride!

By **BILL HARTFORD**,  
Technical Auto Editor

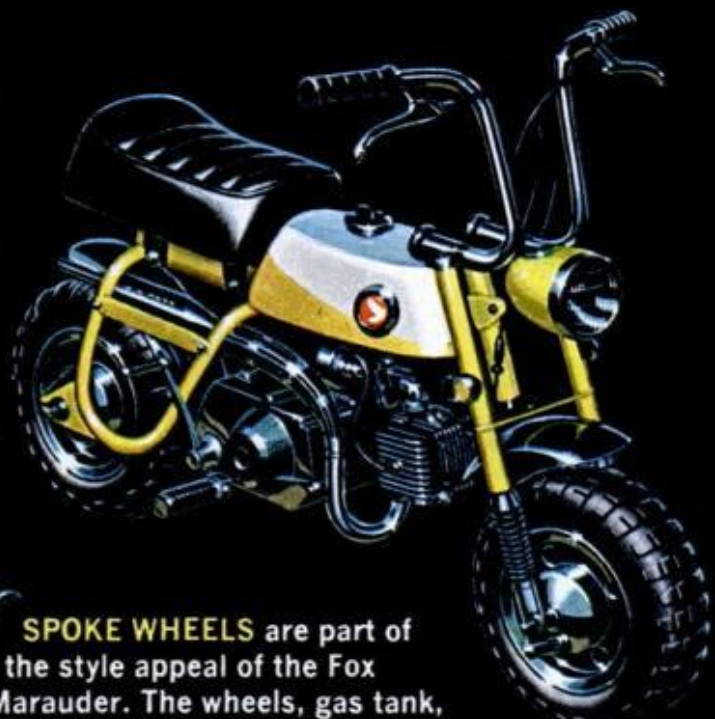
**L**EAP THE GENERATION GAP!" is a phrase that's bound to show up as part of a smart manufacturer's mini-bike advertisement. "... One for father, one for son... Instant rapport!" The six-to-sixty slogan couldn't be more appropriate to these generation-jumping machines: The first racing class of the Southern California Mini-Bike and Kart Assn., for example, is for six- to eight-year-olds! Competitive hill climbs and dusty scrambles comprise the popular mini-bike events. Dads and grandpas aren't racing the motorized two-wheelers, but they're ending the old huffing and puffing, and putt-putting into the good backwoods fishing areas.

The fun, unique appeal and versatility of these machines has sold over a million to kids of all ages during the mini-bike boom of the '60s. And it won't take a whole decade to see a second million on the roads and trails, and unfortunately, because

*(Text continues on page 120)*

## MINI-BIKES

**MOTORCYCLE ENGINE** powers Honda's 108-pound Mini-Trail. The 50-cc, single-cylinder powerplant is of four-stroke, overhead-camshaft design a la Honda. An automatic clutch is used with a three-speed transmission. Left toe selects the gears. Both front and rear internal-expanding brakes are actuated with the levers on the handlebars which fold for transport. Vent lock on the gas cap and folding foot pegs also facilitate taking it along. The 39-inch-wheelbased machine has kick starter, telescope front fork.



**SPOKE WHEELS** are part of the style appeal of the Fox Marauder. The wheels, gas tank, upswept exhaust and contoured fenders are all plated to satisfy the chrome craze among mini-bike enthusiasts. Two types of large diameter, 2.50 x 10-inch tires for street and trail provide a stable ride, and disc brakes front and rear quick, stable stopping. Engine is a four-hp, four-cycle Lauson with two-speed automatic transmission.



**ELECTRIC MINI-BIKE** is powered by a 2½-hp electric motor and standard 12-volt automotive battery. Fiberglass panels are removable to reveal the 140-amp.-hour battery which gives the Cal-Jet Electra-cycle a 60 to 100-mile cruising range. Standard sprockets allow 40 mph top speed; optional sprockets gear machine for higher top speed or lower speed with higher torque. The two-speed bike features front and rear internal-expanding brakes, front coil springs, rear shocks, dual seat for rider and passenger.





**SNOW SKI** snaps onto the front fork of Heathkit's Boonie-Bike for all-weather versatility. The 18 x 8.50 knobby on the rear wheel drives the trail bike through the snow or mud.

Output of the five-hp Briggs & Stratton four-cycle engine is geared to the rear wheel at 7.5:1 and 15:1 ratios through a centrifugal clutch and frame-mounted selector.

Horn, lights and battery are accessories for the 116-pound bike.

### MINI MINI-BIKE

is a scant 37 inches long and 21 inches high. The Scat-Kitty is powered by a 2½-hp Tecumseh four-cycle engine with built-in 12-volt alternator. Frame and fenders are of unique, one-piece cast aluminum design. The single-speed bike from Projects Unlimited has detachable handlebars for stowing. Among accessories are a deck mount for boats and campers, and a detachable sidecar!



**"CHOPPER"** is motorcycle lingo for a bike with a chopped or lowered frame and raked front fork. Bonanza's mini-bike chopper—appropriately dubbed the Minichopper—is an eye-catching machine complete with banana seat, chrome sissy bar, mag-type wheels and pegs way out front. A four-horse, four banger with centrifugal clutch drives the bike through a 6:1 overall gear ratio. The 80-pound machine has a wheelbase of 42 inches. Internal-expanding, dual-shoe drum brake acts on the rear wheel. Front shocks and spring-mounted seat cushion the ride.

of the lack of riding areas, furtively buzzing up, down, around and through public parks, closed school yards and supermarket parking lots.

Maybe there already are two million mini-bikes in action. There's no way to know. Entrepreneurs who can weld together a frame—from guys in backyard garages to industrial giants in the motorcycle manufacturing business—are welding for all get-out. And they're selling them all. The mini-bike kid-cult consumes them like Good & Plenties. They're the hottest toys going. Adults who just want a toy can rationalize the sheer fun of ownership by using their mini-bike in any one of countless "practical" applications, or for honest recreational pursuits. So the machines sell and sell—to all ages of investors-in-fun—with still no recession in sight.

**The basic machine.** The average price paid for a mini-bike has been steadily increasing. The slightly under \$100 to \$150 price range is still the kickoff point, but the demand is for ever more sophisticated, stylized, chrome-plated and powerful machines. The archetypal mini-bike—a simple frame with small, unsuspended wheels and low-horsepow-

er, four-cycle "lawnmower" engine and friction brake, if any—seems destined for the Smithsonian. At best these are "first" bikes—sometimes built from kits by teen and even preteen kids just trying their wings. They provide a great education in basic mechanics and motorized two-wheeler handling, and the rough ride is hardly noticed by enthusiastic youngsters.

Even if you're a dad and you want to find out what mini-bikes are all about, try one of these basic models. When you start some serious family mini-biking, that first bike in your stable will never go unused: The hand-me-down minibike is the most exciting hand-me-down the youngest member of the family will ever receive. Even with its small wheels, usually five-inch, that will bog down in trail ruts, and its unworthiness for street use, the smallest machines in the mini-bike family have their place.

**The engines.** Most manufacturers or distributors of mini-bikes offer a line or lines of machines that are basically the same except for engine size. The air-cooled, single-cylinder, four-cycle gasoline engine is still the prime mover

**MINI-BIKES OR ATVs?** Two departures from conventional mini-bike or mini-trail designs are the three-wheel Scoot or Ski and the flotation-tired El Burro. Pivoting rear tandem, double-drive wheels give the Scoot or Ski fantastic traction, speed of 35 mph; eight-inch wide rear track and front ski are fitted for snow. El Burro's low-air-pressure tires make it almost unstoppable. Top speed with its 5-hp engine is 20 mph





## SOME SOURCES AND MODELS

Alexander-Reynolds Corp., Hackensack, N.J. 07601.  
 American Aluminum & Steel Products, Inc., 814 N. San Fernando Rd., Los Angeles, Calif. 90065.  
 American Honda Motor Co., 100 W. Alondra Blvd., Gardena, Calif. 90247.  
 Aragon Distributing Co., Inc., 323 Maple Ave., Monrovia, Calif. 91016.  
 Bird Engineering, Inc., Box 427, Omaha, Neb. 68101.  
 Bonanza Industries, Inc. Scout Div., 1775 S. First St., San Jose, Calif. 95112.

Bonham Corp., Box 858, Provo, Utah 84601.  
 California Jet Marine, Inc. (CAL-JET), 1900 Avenue of the Stars, Los Angeles, Calif. 90067.  
 Central Cycle Supply, 51025 U.S. 31 North, South Bend, Ind. 46637.  
 Cosmopolitan Motors, Hatboro, Pa. 19040.

Engine Specialties, Inc., Croydon, Pa. 16220.  
 Floyd Clymer Motorcycle Div., 222 N. Virgil Ave., Los Angeles, Calif. 90004.  
 Fox Corp., Box 747, Janesville, Wis. 53545.

General Appliance Mfg. Co., Box 429 Downtown Station, Omaha, Neb. 68101.

G.E.M. Sales International, Inc., 3505 Long Beach Blvd., Long Beach, Calif. 90807.

Gilliom Mfg. Corp., St. Charles, Mo. 63301.

Harrison Research, Inc., 50591 Ryan Rd., Utica, Mich. 48087.

Heald Inc., Box 638, Benton Harbor, Mich. 49022.

Heath Co., Benton Harbor, Mich. 49022.

HPE, Inc., 225 Acacia St., Colton, Calif. 92324.

KAL Mfg. Corp., 18121 S. Broadway, Gardena, Calif. 90247.

King O'Lawn, Inc., 10127 Adella Ave., South Gate, Calif. 90280.

K&P Mfg., 330 S. Irwindale, Azusa, Calif. 91702.

Lomart Engine Products, 980 Alabama Ave., Bklyn., N.Y. 11207.

Manco Products, Inc., 3337 Freeman St., Fort Wayne, Ind. 46804.

B. F. Meyers & Co., Fountain Valley, Calif. 91405.

Michrina Enterprises, Inc., 11859 Levan Rd., Livonia, Mich. 48150.

Nova Products of Calif., 16800 S. Broadway, Gardena, Calif. 90247.

Powell Brothers, 5903 E. Firestone Blvd., South Gate, Calif. 90280.

Projects Unlimited, Inc., 1926 E. Siebenthaler Ave., Dayton, Ohio 45414.

Rokon, Inc., 160 Emerald St., Keene, N.H. 03431.

Rupp Mfg., Inc. Box 1095, Mansfield, Ohio 44903.

Ruttman Co., 24732 Ford Rd., Dearborn Hts., Mich. 48127.

Spreads-All Co., West Hwy. 330, Marshalltown, Iowa 50158.

Sport Craft Engineering, Box 47, Lombard, Ill. 60148.

SportStyl, Inc., RD4, Lewistown, Pa. 17044.

Starlight Tool & Mfg. Co., Inc., 3300 W. 7th St., Joplin, Mo. 64801.

Steens, Inc., 1635 W. Valley Blvd., Alhambra, Calif. 91803.

Stellar Industries, Plainview, N.Y., Joplin, Mo., and Opa-Locka, Fla.

Valiant Mfg. Corp., 4000 Toulouse, New Orleans, La. 70119.

2 to 5-hp models  
 Maverick I, II, III

Mini-Trail,  
 Trail 70  
 El Burro

Wren, Lark,  
 Duck, kits  
 Minichopper,  
 BC-1000,  
 1100, 1200,  
 1300, 1400T,  
 others  
 Mini-Gote,  
 Tote-Gotes  
 Electracycle  
 Electrocon

Charger Jr.,  
 Charger 1,2,3  
 Benelli Buzzer,  
 Hornet,  
 Dynamo  
 Broncco  
 models to 5 hp  
 Indian  
 Ponybike  
 Marauder,  
 Campus,  
 Spoiler, others  
 Trail Horse  
 GTO 1400,  
 1500, others  
 Go Devil,  
 others

Plans and  
 parts  
 Wildcat,  
 Bobcat  
 Model VT-1 kit

Boonie-Bike

Cat 400X,  
 300X, 250X  
 Bandit I, II,  
 TT  
 KB-2, KB-3,  
 Aggie Bike  
 Flea, others

Cheeftah

Little Gen  
 models to 5 hp  
 Lynx Cub, Lynx  
 53, 63, 65  
 "Lil" Indians  
 (2 1/4 to 5 hp)  
 King Cobra,  
 Ruff-Rider,  
 others  
 Challenger

Scat-Kitty

Trail-Breaker

Roadster,  
 others  
 Judge, GT140,  
 GT150, GT240,  
 GT50  
 Scoot Or Ski

Trailmaster  
 models 2-5 hp  
 Kat, Bob Kat,  
 others, kits  
 Models up to  
 3 1/2 hp  
 Taco 22, 44,  
 99, 100, kits  
 Quasi Stellar,  
 Model A, D  
 Simplex

for mini-bikes. Engines with horsepower ratings from two to five are available. Major engine suppliers and manufacturers are Briggs & Stratton, Lawson and Tecumseh.

Increasing in popularity as mini-bike powerplants are two-stroke motorcycle engines. Among the two-strokes are Hodakas and Garellis which power some Bonanza and Broncco bikes. Benelli mini-bikes, of course, use the two-stroke engines long-produced by the famed Italian motorcycle manufacturer. Part of the thrill of motorcycle-engined mini-bikes is using the integral gearbox which has anywhere from three to five gears to shift for full utilization of engine power. Honda mini-bikes—the Mini Trail illustrated on the color spread and a larger, more powerful Trail 70 model—also use motorcycle engines but they are four-stroke, overhead-cam units like those used in Honda motorcycles. Displacements of current motorcycle engines are from 50 to 100 cc with power up to 10 hp—no machines for inexperienced kids.

Most motorcycle engines are shifted using a hand clutch although some use automatic clutches of various designs. Universally used with four-stroke, "lawnmower-engine," variable-gear-ratio mini-bikes is the centrifugal clutch. Attached to the engine shaft, it engages with increased engine rpm and disengages when you throttle down to shift. All mini-bikes are chain-driven by the rear wheel.

**The popular minis.** A step up from the very basic minis are machines using these motorcycle engines or higher-horsepower four-strokes, and incorporating desirable design features. In this popular price range—starting slightly under \$200 and running up to \$300—are a host of mini-bikes and mini-trails of differing appeal. All of the machines on the preceding color spread, except the Electracycle, are in this category. All have at least a rear brake, and front and/or rear suspension (except the Scat-Kitty) and have

(Please turn to page 223)



**PRINCE EDWARD ISLAND**, a beautiful little province off the coast, was easternmost point of our trip. Above: we watched lobster fishermen work on their boat on north shore of the island. Traveling west, we visited historic Quebec City and strolled along the boardwalk in front of Chateau Frontenac (below, left). Farther west, Scott and John (below) prepared their own hamburgers at Agawa Bay, Ont., provincial campsite



# Across Canada In a Motor Home

It's a big country—and it takes a lot of driving to see even half of it. We found the quick-setup, quick-departure features of our luxurious camper ideal for the long trip.

By JOHN LINKLETTER, Managing Editor

Photos by the Author

**E**VEN ON A MAP, the great mass of land north of the U.S. border looks vast. It's no mapmaker's illusion. Canada is the second largest country in the world.

Stretching for 5000 miles from coast to coast across the country is the famed Trans-Canada Highway, the longest national highway on earth.

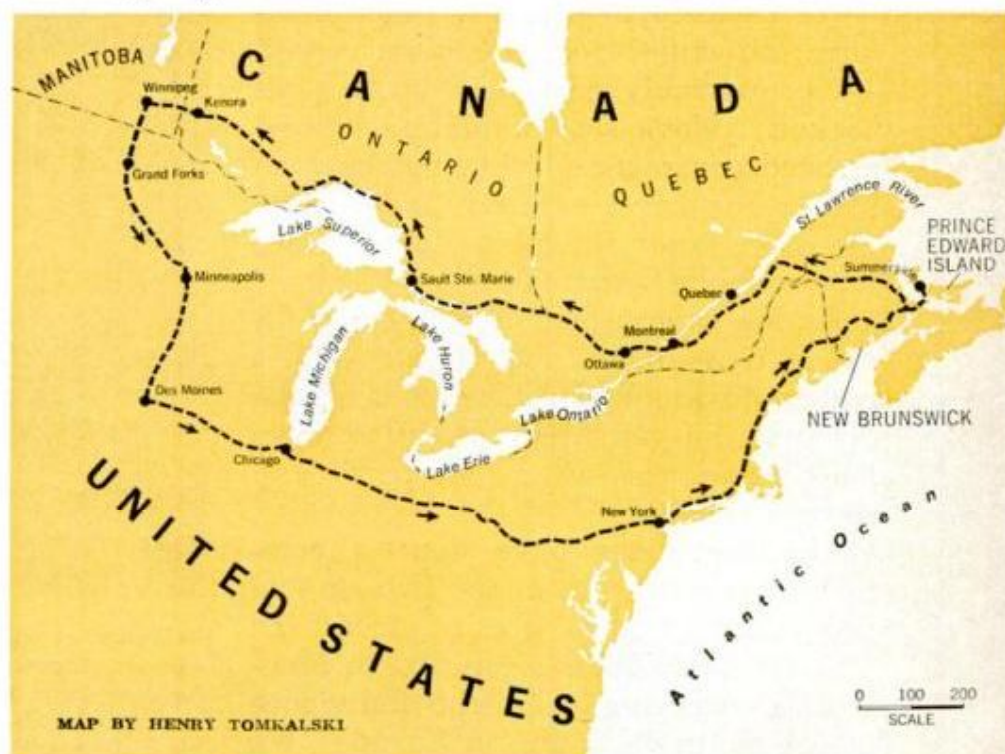
Last July, when we set off westward from Summerside, P.E.I., we were on an island off the east coast—yet we were almost 1000 miles west of the beginning of the Trans-Canada Highway at St. John's, Nfld. And when we turned south to the United States from Winnipeg, Man., we were still a long way from the west coast even though we had traveled a respectable 2222 miles getting to Winnipeg from Summerside.

It isn't that miles and speed and other statistics have anything to do with a proper vacation; it's just that when one wishes to lay claim to "crossing Canada"—or a portion thereof—one soon learns that he must reckon with great distances.

For this kind of long-distance traveling (the odometer rolled up 5356



**COLORFUL WINNIPEG**, capital of Manitoba, was western end of trip. Below: map of 5300-mile round trip from Old Greenwich, Conn., near New York





**TWO COMPARTMENTS** on side of Glastron have 17 cu. ft. of storage and ample width for folding chairs

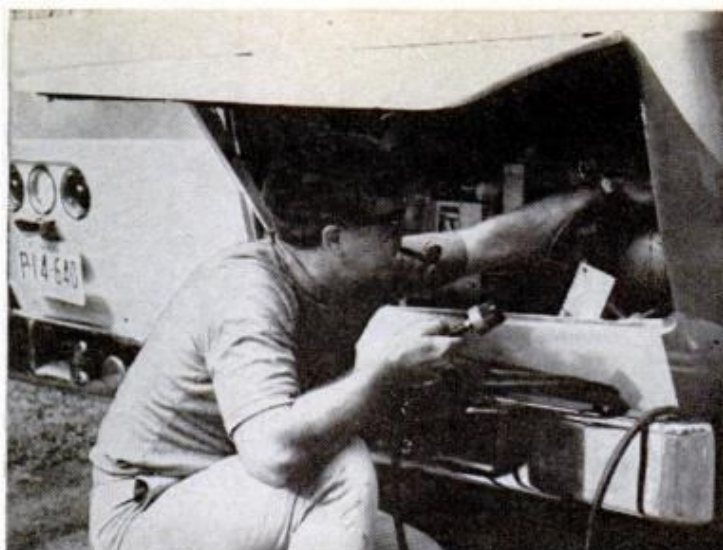
miles round trip from Old Greenwich, Conn.), I can't imagine a better vehicle than a motor home—particularly when you have a wife, three kids and a dog, all of whom must be comfortably transported, bedded and fed in order to have the vacation achieve any degree of success.

We drove a Glastron motor home (that's correct: Glastron, the boat-builder, is now making a recreation vehicle that is as handsome as the Nautaline houseboat we took on our *Houseboat Vacation* (page 100, Nov. '68 PM), and we borrowed one of the first off the production line).

We traveled in this luxurious, insulated, airconditioned, fiberglass cocoon—I comfortably ensconced in a high-backed "pilot's seat" handling power-assisted controls and viewing the road from a bus driver's vantage point while the other family members lolled about in our mobile "apartment."

As for camping—if it can really be called that amidst such luxury—all I had to do was find a level spot on the grounds and spend less than 10 minutes hooking up the water, electrical and sewer systems.

The Canadians have done a commendable job for campers. Private and provincial grounds abound from the Maritime Provinces westward to Montreal. I was reminded of the abundance of campsites we found in Europe (*We*



**GENERATOR** supplies 110-v. system. At campground, simply unplug from generator, plug into camp line

*Camped Our Way Through Europe*, page 128, Jan. '68 PM). Beyond Montreal they were spaced out, but those we stayed in were excellent provincial parks. All were well marked with road signs. (On our return trip through the United States, only in Iowa did we see a comparable frequency of road signs for campsites.)

Camping and sightseeing in Canada are not necessarily, as I may have led you to believe, a succession of long



**INTERIOR** of Glastron motor home is as slick as its exterior. Above: ol' Dad swivels driver's seat around for easy chair. At right, my wife with Gayle, John and Chumley. Gayle's on sofa that folds out as double bunk; another bunk folds out of wall behind her



**WE WEREN'T THE ONLY ONES** camping in eastern Canada. Here our Glastron waits in line to board ferry to Prince Edward Island. The wait wasn't long—four boats make continual crossings all day long

drives over vast plains with short rests in between.

In the charming little province of Prince Edward Island—variously called the “Garden of the Gulf” (it is pretty); “Spud Island” (potatoes are a major crop), and “Birthplace of the Confederation” (Canada started on its way to confederation in Charlottetown in 1864)—we spent three days camping, touring, digging for clams, swimming and enjoying beautiful, sunny days.

Our campsite there was in a farmyard next to the century-and-a-half-old farmhouse in which my father lived as a boy and where my elderly uncle and aunt still reside. Their farm, near Summerside, borders on the south shore of the island and also on a provincial campground that is immaculately clean, well equipped and offers salt-water swimming on a beach with such a shallow slope that even a toddler could wade in without causing much

concern. To be objective about the campground (it's difficult because, after all, it's on Linkletter Beach), I must report that the site is a bit flat and virtually treeless.

Another campground on the north shore at P.E.I. National Park borders on the red sandstone bluffs that overlook Cavendish Beach. It's well forested, and the swimming is superb. The water is as clear as that in a swimming pool, and there's a lively surf. I would agree with the tourist-office people who describe it as one of the finest beaches in North America.

Touring the island was, as in past years (this was my fourth trip there), a pleasant

*(Please turn to page 206)*



# PM OWNERS REPORT DATSUN

A Nationwide Survey Based on  
2,247,000 Owner-Driven Miles

By **BILL HARTFORD**  
Technical Auto Editor

Photos by Irv Dolin



1970 SEDANS have manual choke on right side of steering wheel, ventless side windows. Interior is smartly done except for crinkled carpet on tunnel

# An Economy With a

**N**ISSAN MOTOR CO. is the Japanese manufacturer that makes the Datsun line of automobiles. Last year two Nissan R382s swept the Japan Grand Prix for Group 7 cars. Drivers Kurosawa and Sunako drove the lead car 447 miles at an average speed of 121.241 mph around the Fuji International Speedway. Their 6-liter, 520-hp machine ran beautifully for almost four tense hours on the 3.7-mile circuit.

The R382 bears practically no resemblance to any of the Datsuns—two and four-door sedans, two softtop sports cars, station wagons and pickup trucks—imported to the United States and included in *PM's* survey. (The exciting new 240Z, a personal, two-passenger fastback was introduced too late to be included.)

While it's true that the resemblance stops with the number of wheels, the

## Summary of 1969 Datsun Owners Reports\*

Total miles driven ..... 2,247,780

Average miles per gallon  
(1595cc engine):

Local driving ..... 23.8  
Long trips ..... 27.6

Specific likes:

Economy ..... 61.6%  
Handling ..... 49.5  
Comfort ..... 21.2  
Style ..... 18.2  
Performance ..... 18.2  
Power ..... 15.1  
Ride ..... 10.8  
Price ..... 8.8  
Size ..... 8.1

Specific dislikes:

Rattles ..... 12.2%  
Service ..... 10.5  
Quality ..... 9.1  
Brakes ..... 7.0  
Heater ..... 5.6  
Clutch ..... 5.6  
Vent system ..... 4.5  
Workmanship ..... 4.2  
Cold start ..... 4.2

What changes would you like?

Seat style ..... 11.8%  
Better tires ..... 9.6

Quality of materials ..... 8.5  
Interior styling ..... 7.4  
Vent windows ..... 6.6  
Dash layout ..... 5.5

Body style:

4-door sedan ..... 27.1%  
2-door sedan ..... 21.9  
Wagon ..... 28.1  
2000 sports car ..... 17.4  
1600 sports car ..... 5.2  
Pick-up truck ..... 0.3

Transmission:

4-speed manual ..... 91.6%  
Automatic ..... 8.4

Had any mechanical trouble?

No ..... 71.7%  
Yes ..... 28.3

What kind of trouble?

Carburetor ..... 12.9%  
Oil leak ..... 10.6  
Clutch ..... 7.1  
Starter switch ..... 7.1  
Choke ..... 7.1  
Electrical ..... 7.1

Dealer repair satisfactory?

Yes ..... 75.0%  
No ..... 25.0

Why the Datsun?

Economy ..... 56.2%  
Style ..... 15.9  
Size ..... 13.6  
Price ..... 13.0  
Performance ..... 9.4  
Handling ..... 8.8

Is the Datsun your only car?

No ..... 58.4%  
Yes ..... 41.6

Other cars owned:

Chevrolet ..... 22.1%  
Ford ..... 14.4  
Pontiac ..... 10.5  
Dodge ..... 9.4  
Oldsmobile ..... 8.3  
Datsun ..... 6.6  
Volkswagen ..... 6.1  
Buick ..... 5.5

What options/accessories?

Radio ..... 71.0%  
Airconditioning ..... 12.5  
Cigaret lighter ..... 6.1  
Whitewall tires ..... 4.3  
Luggage carrier ..... 4.3

Age distribution of owners:

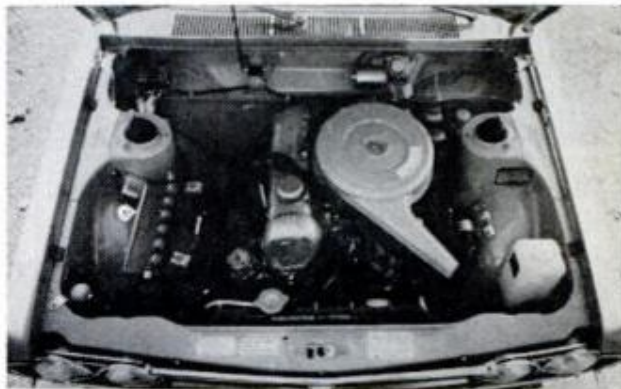
15-29 ..... 39.5%  
30-49 ..... 40.1  
50 plus ..... 20.4

\*Where applicable, percentages may not equal 100 percent due to rounding and/or insufficient sample.

# Car for Enthusiasts, Few Little Annoyances

enthusiastic reaction to both race car and passenger cars is very similar. Datsun owners in the United States—even though they are motivated by economy of purchase price and operation—are impressed by what they consider the advanced design of their car: overhead-camshaft engine, independent front and rear suspension in the sedans and sports models, and front disc brakes. These “race car” features, combined with items like whitewalls and wheel covers that are included in the list price, give them a sense of owning something special that is, as many say, “fun to drive”—even if they’ve never heard of a Nissan R382.

The economy of ownership that owners praise so strongly is mostly for miles-per-gallon figures of 23.8 and 27.6 for local driving and trips, respectively. This exceeds Datsun’s claim of 25 mpg



**1.6-LITER OHC ENGINE** is equivalent to a little less than 100 cu. in. Easy to maintain, say owners





**STYLE IS DESCRIBED** by owners with adjectives like "crisp, neat, perky," with no owners dissenting. Handling is well-liked (second to economy); over 90 percent have four-speed box. Fun to drive, say many



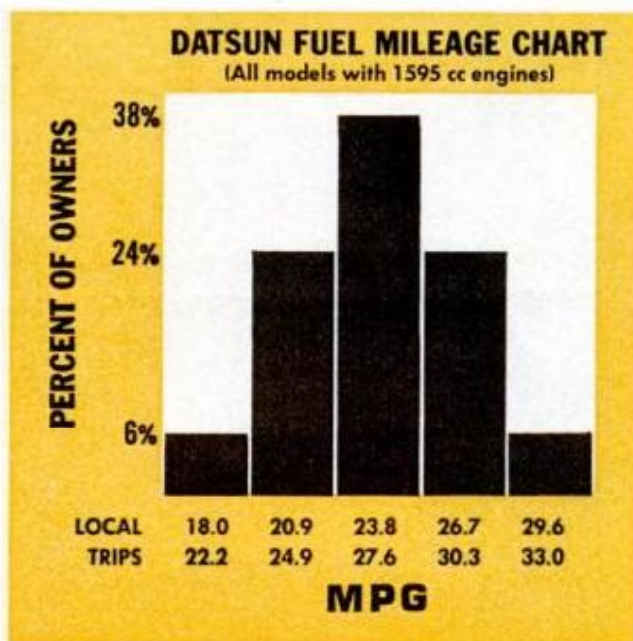
**FUN FOR KIDS** but a few adults find the rear seat skimpy. Most, however, feel it compares favorably with U.S. fastbacks and some other imports. Nice feature for rear passenger's access in the two-door sedan is mechanism that automatically slides entire front bucket forward when backrest is moved

overall. Even though owners might only grin and bear the expense of premium fuel, they feel that the payoff is performance: The small, four-cylinder 1595-cc engine puts out a full 96 hp at 5600 rpm. It's normally aspirated using a single two-barrel carburetor. "Better gas mileage from Datsun's 96 hp than from '66 VW's 50 hp," beams a Kentucky barber.

Very few owners, therefore, have any complaints about the pickup and super-highway performance of the roughly 2100-pound sedans—about 2200 pounds with the optional automatic transmission. (The 17.4 percent owning the 150-hp model 2000 sports car with its 1982-cc ohc four and twin carbs report they are getting 23.0 mpg around town and 27.8 mpg traveling.)

A North Carolina computer salesman's call for a "super sedan" model certainly isn't a complaint. He's an ecstatic owner of a two-door sedan who thinks it would be interesting to have an even more "high-performance engine and drive train in the existing sedan body." His only complaint about the car is one that is also shared by many other owners, "that the turn-signal blinker is too quiet!" and therefore is unconsciously left on.

What a few owners do not find economical about owning a Datsun is the cost of service. A USAF medic complains about "\$34 for a 9000-mile maintenance, \$24 of which is for labor." He now does his own for \$4. Most service







**FAST-MOVING FIRE AND RESCUE TRUCK** accelerates to 100 kph (62.5 mph) in 55 seconds. 1000-hp Daimler-Benz V10 diesel drives all eight wheels. Carrying 18,000 liters of water, plus 2000 liters of foam, Faun-Werke's "Flugfeld-Tanklöschfahrzeug" is designed to smother fires at jumbo jetports like Frankfurt and Orly

# TRUCKS!

By ROBERT P. CROSSLEY, Editor

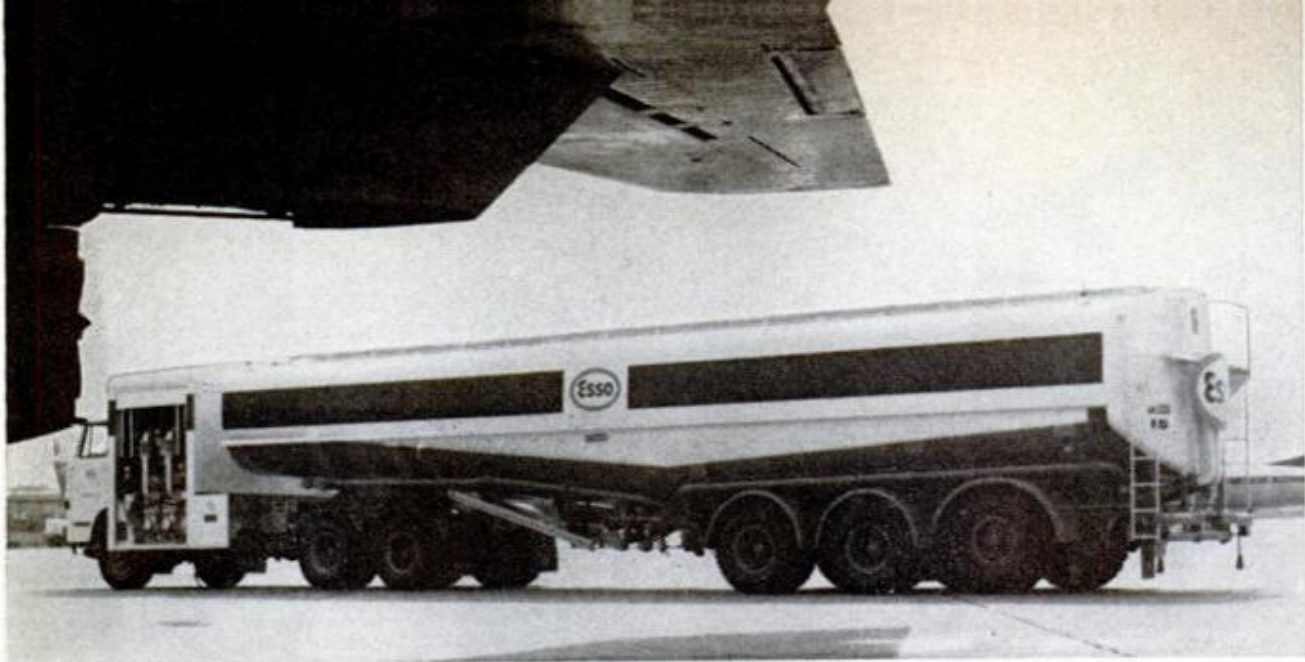
**These sophisticated European jobs do about everything but drive themselves!**

**T**HEY CALL IT the Internationale Automobil-Ausstellung. They hold it every two years in Frankfurt. It's like no automobile show you ever saw. More like a state fair in Illinois, it overflows 20 buildings; only one is devoted to passenger cars. Three contain trucks and buses, including double-deckers; two, pickups, vans and campers.

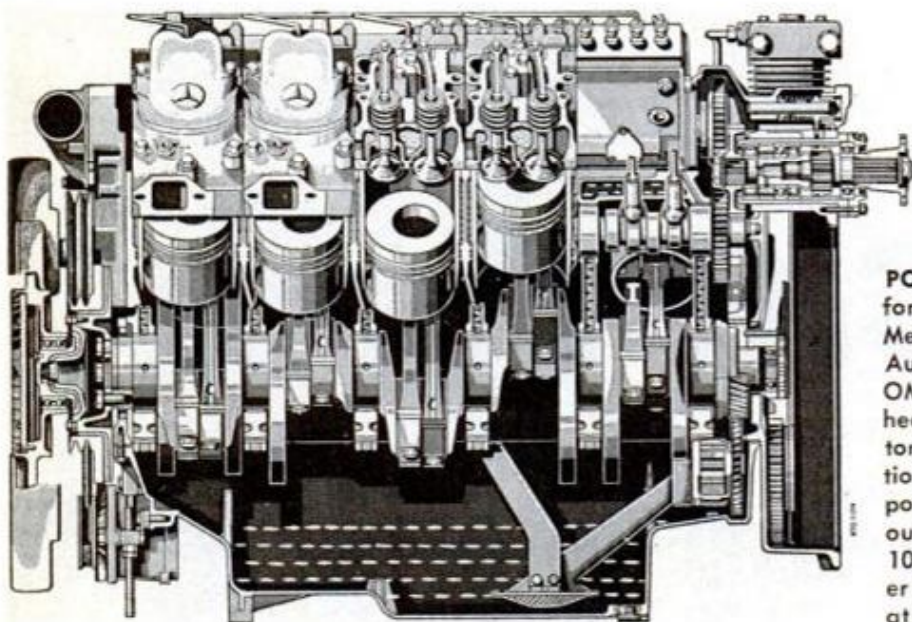
The trucks were so exciting we never got back for a second look at the Mercedes, Renaults and Lotus Europas. What kept us wandering among the trucks were advanced engineering features, many not available on American trucks or only as special options: Rear axles that steer, cab-controlled air-suspension, horizontal engines, ingenious unloading systems. Someone said, "Be sure to see 'the world's biggest dump truck.'" We never figured out which one he was talking about.



**THE 60-TON BIG BROTHER** of this huge 45-ton Berliet dump truck was purchased by the Russian government, which plans to operate it in Siberia. Many parts of the truck had to be made of special synthetics that were designed to withstand temperatures as low as minus 70° F. The giant vehicle was knocked down, packed into several containers and then flown from Lyon, France, in two Antonov cargo planes



**TANKER FOR JUMBO JETS.** Struver Flugfeldtankfahrzeug will refuel Boeing 747s later this year at Amsterdam Airport. Tanker holds 75,000 liters of jet fuel, can pump 4000 liters a minute. Despite their great size, it will take two of the Flugfeldtankfahrzeugs to refuel one of the 747s. Front axle of the trailer steers



**POWERFUL NEW V10** diesel engine for trucks made surprise debut in Mercedes-Benz exhibit at Frankfurt Auto Show. Direct-injection 970-cc OM 403 engine is available in heavy trucks and semi-trailer tractors. It is also offered as an installation engine. Notable for its low power-to-weight ratio, the V10 puts out up to 350 hp (SAE). Of this, 100 hp is available through a power takeoff that can provide power at the front end of the crankshaft

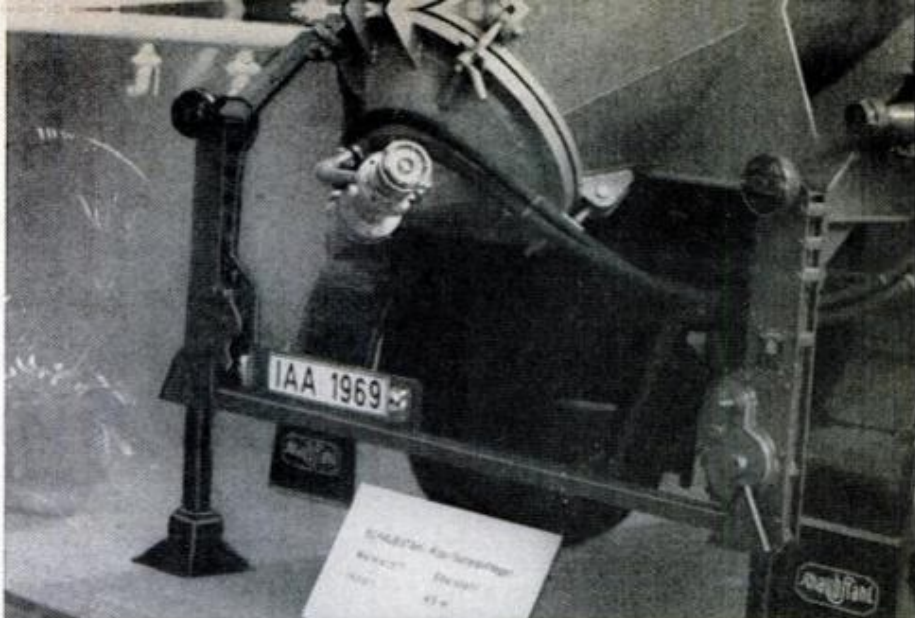


**ELEVATING LOADER**, shown here on big beer trailer, moves up and down electrically at push of a button, full length of the trailer bed on a suspended track. When you're through using the loader, you park and tote it in the "kneehole" located underneath the floor of the trailer. Loader was exhibited by Rationorm



**FRONT-WHEEL-DRIVE** gives Fiat 238 trucks and vans great capacity, low loading height (16 inches). Engine-transmission unit mounted transversely ahead of cab puts load on front wheels to give maximum traction, even when van is empty. Four-cylinder engine has 1438 cc, all four wheels independent suspension

**DRIVER CAN JACK UP TANK** of Schaubstahl-Werk chemical tanker, drive chassis home for another load

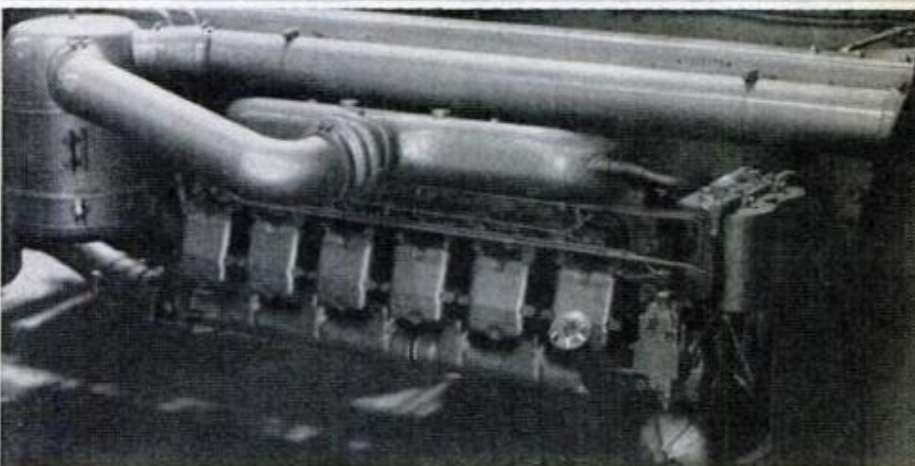


**REAR-ENGINED FOUR-WHEEL DRIVE**

Haflinger 700 AP is truck and recreation vehicle. Opposed two-cylinder, air-cooled engine puts out 30 hp (SAE). Light weight (1400 lbs. min.) permits climbing grades up to 65°. Short wheelbase (59 or 71 inches), combined with high clearance, enables it to climb embankments and over tree trunks, yet center of gravity is so low 700 AP can cut across 50° slope. Optional power takeoff operates winches, generators and pumps. All wheels have independent suspension. Differential lock on both axles. A real Alpine goat by Steyr-Daimler-Puch of Austria



**BUSSING'S** under-the-frame, back-of-front-wheels diesel takes engine out of driver's lap, makes cab a cab, not an engine compartment. Company claims easier servicing and that low center of gravity improves cornering and braking. Entirely under frame, engine can't interfere with superstructure design. U 12 D six-cylinder direct-injection diesel puts out 260 hp (SAE). The wet cylinder liners are replaceable



**MOST SPECTACULAR SIGHT** at show was Viberti's fully raised giant dumping semi. Trailer unit is 8.39 meters long overall, weighs 8480 kilograms empty, holds 20 cubic meters and can carry 23,200 kilos fully loaded on its four 12:00x20 18-ply tires. Lifting is accomplished by one single-ram hydraulic cylinder mounted in a semihorizontal position between frame members. The pressure oil pump and other controls are mounted on tractor unit



# How to Keep Your AUTOMATIC

By MORT SCHULTZ

**A**N AUTOMATIC CHOKE that's out of whack not only increases fuel consumption and causes hard starting—especially in cold weather—it makes an engine idle rough, misfire at high speed, backfire, lose power.

Choke mechanisms differ from carburetor to carburetor. However, they all work much the same. When you start a cold engine, a plate automatically closes over the carburetor throat to restrict air intake and provide a rich fuel mix for easy starting.

Once the engine starts, a piston or vacuum mechanism immediately exerts pressure on the choke plate to let it open slightly. This keeps the engine from loading up and stalling on fuel that's now too rich.

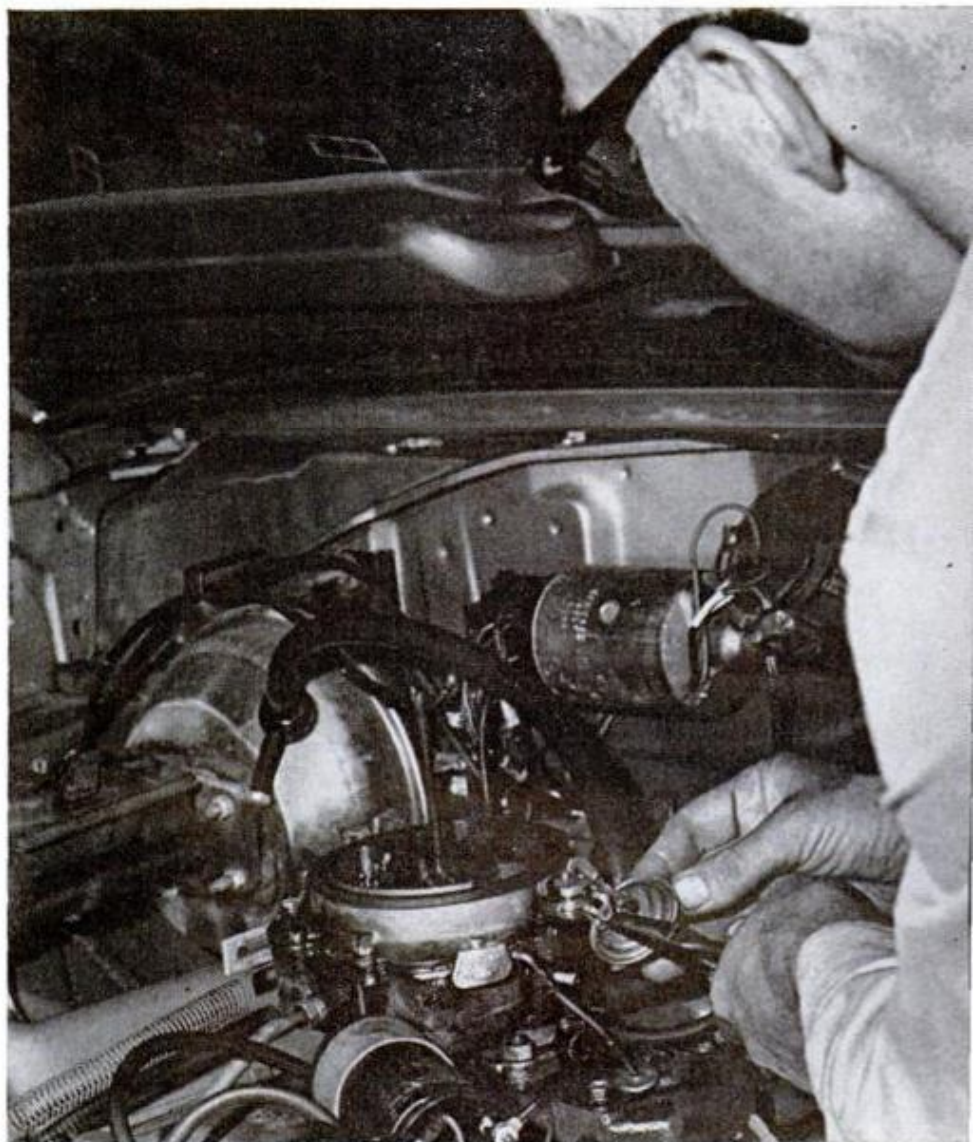
All automatic chokes also have a mechanism (fast-idle cam) to permit a fast idle while the engine is cold. This lets the engine reach operating temperature quickly and prevents stalling.

A choke unloader that relieves flooding brought about by overzealous cranking is also a part of the system.

This is activated when you floor the accelerator pedal and hold it. A cam trips a linkage that causes the choke plate to open, thus relieving an over-rich mixture.

To tell if your choke is functioning as it should, watch how it acts on a cold day with the engine cold. Press the accelerator pedal to the floor and release it. The choke plate should close.

Start the engine. The plate should im-



SOME AUTOMATIC CHOKES use a vacuum-operated piston to override thermostatic coil tension when starting. Adjust by bending

mediately open slightly, continue to open gradually as the engine gets warmer, and be fully opened as the engine approaches operating temperature.

To tell if the fast idle is working, listen. When first started, the engine should idle fast. Tap the gas pedal. Idle should drop off. As the engine gets warmer, it should drop back further.

Repairing an automatic choke is routine

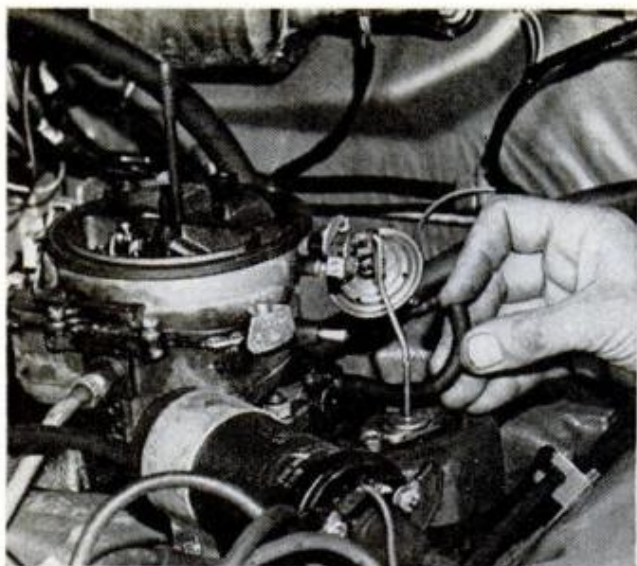
A thermostatic device connected to a butterfly valve in your carburetor is all it is—regardless of make of car or year. Here are all the details on various types, how to find them and fix them

# CHOKE WORKING



once you identify the type of mechanism on your carburetor. Unfortunately, you can't tell what you have just by knowing the make and type. For example, since 1963 the Rochester two-barrel carb has used four different choke systems. It is a mainstay for many model Buicks, Chevrolets, Jeeps, Oldsmobiles and Pontiacs.

One type is a heat-sensitive coil mounted in a housing on the air horn or throttle body and connected to the choke plate by a short linkage. Heat is concentrated on the coil through a tube that extends from the exhaust manifold. This type of



**CHOKE VACUUM DIAPHRAGM** is tested by starting engine and feeling for vacuum at disconnected line

coil is controlled by heat from the cooling system rather than from the exhaust manifold. Hot coolant circulates directly from the engine to a chamber in the choke cover.

Another choke widely used, especially on Chrysler engines, is the well-type. It's contained primarily on Holley and Carter carburetors. Actually, the well-type choke is similar to the Rochester mechanism mounted in the exhaust manifold. Both, for example, use a vacuum diaphragm to open the choke plate when a cold engine is first started. However, in the well-type the coil is mounted in a well at the exhaust crossover passage on the intake manifold. Most well-type choke coils are adjustable—the Rochester mechanism isn't.

Before you can set a choke properly, you must find out what kind you're dealing with and what adjustments have to be made to what specifications. Different types of chokes require some adjustments that are similar, but others that aren't.

Where or how do you find this information? You can usually tell what kind of choke mechanism you have by examining it. If it's carburetor mounted, you'll see a choke stove on the air horn or throttle body. If it's the well-type or exhaust manifold choke, a long rod will extend from the choke plate linkage to a cover on the engine.

If you're not sure what kind of mechanism is on your carburetor, note the carb's manufacturer and model number. This information is on a tag attached to the carburetor or is stamped into the casting.



**IF VACUUM IS GOOD** check diaphragm by depressing stem, then covering vacuum opening (see text)

If you don't have a service manual for your car, go to the library and consult *Motor's Auto Repair Manual* to learn what adjustments have to be made for the make and model number of your carb.

There is a question concerning the choke thermostatic coil setting of carburetor-mounted and well-type chokes that can be adjusted to provide a richer or leaner fuel mixture. Should you follow the manufacturer's specification?

This specification is a compromise. The choke setting required in the southern part of the country during the winter is certainly different from that required in the northern part during the winter. The specification given is for average air temperature and volatility of fuel. It's a good spot from which to start, but ideally the thermostatic coil should be set to meet the air temperature and winter grade of fuel prevalent in your area.

Whether you're adjusting a carburetor-mounted or well-type choke, set the coil a mark or two to the lean side of the specification and then move toward the rich side, if necessary, until you find the best setting. Keep in mind, however, that if you can adjust the choke more than two marks from the specified setting, either rich or lean, the thermostatic coil is probably bent or has lost tension and needs replacing.

To adjust a carburetor-mounted choke, loosen the choke-cover retaining screws and rotate the cover. Usually, moving the cover clockwise reduces choking action (lean), while counterclockwise movement increases it (rich).

Adjusting well-type chokes is done by



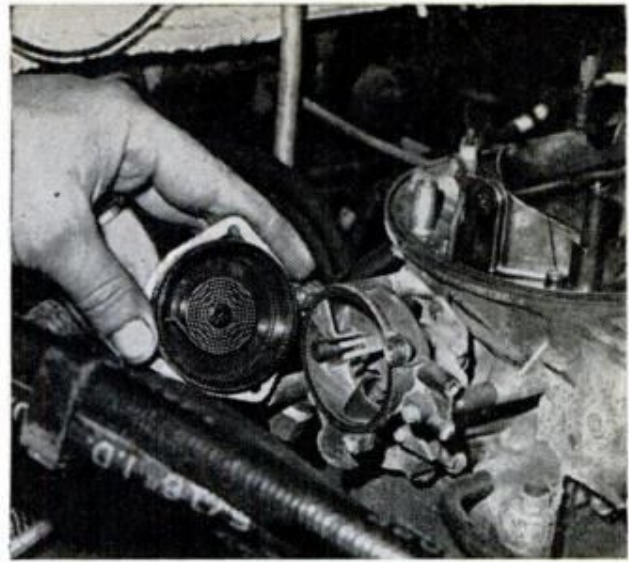
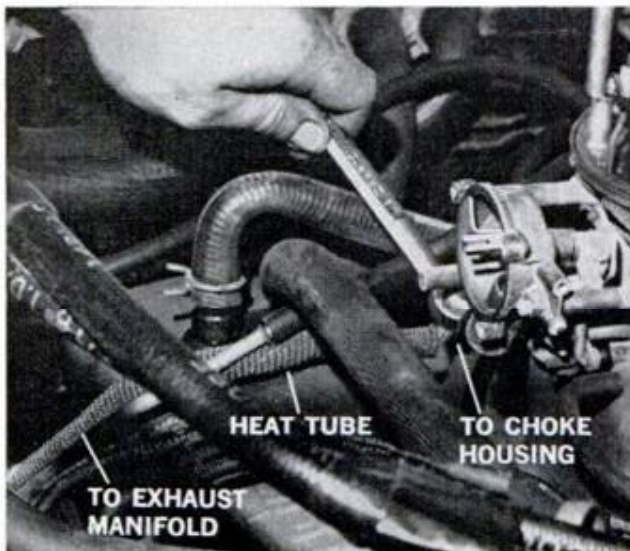
**CHOKE VALVE** sticking because of buildup of deposits is troublemaker. Clean as routine maintenance

loosening the mounting-post locknut and turning the post until the correct mark falls into position with the index. After this, place the coil back into the well and hook the choke rod to the choke plate. Make sure the coil doesn't come in contact with the sides of the well. Lift the cover disc, and open and close the choke valve manually to see if the connector rod clears the sides of the hole in the cover without binding. If the rod binds, you'll have to replace the whole unit.

Whether your choke is a well-type that can be adjusted or an exhaust-manifold thermostatic coil that can't be adjusted, the vacuum diaphragm unit should be tested and, if necessary, adjusted or replaced.

To determine whether the vacuum unit is in good shape, disconnect the vacuum

**HEAT TUBE** from manifold into choke housing enters at location that varies. Check tube if the choke fails



**CARBURETOR-MOUNTED CHOKE** should be opened and inspected. Dirt, gum indicate damaged heat tube

line and check it for splits and holes. Depress the stem of the diaphragm and place your finger over the vacuum opening. Release the stem. If the stem moves more than  $\frac{1}{16}$  of an inch in 10 seconds, the diaphragm is leaking, so replace the vacuum unit.

To set the diaphragm, close the choke valve and hold the vacuum break against its stop. Measure the distance between the edge of the choke valve and the wall of the air horn. This must be to specification. If not, adjust it by bending the vacuum break link or the choke rod. Your service manual or *Motor's* will tell you what to bend where and give specifications.

One of the best favors you can do for your choke system is to keep it clean. Dirt-clogged choke mechanisms are slug-

*(Please turn to page 222)*

**CLOGGED AIR FILTER** can have the same effect as a faulty choke. Clean and/or replace it regularly



# SO YOU WANT A *QUIET* OUTBOARD?



**DEPENDABLE AND LIGHTWEIGHT**, Motor Guide's Bass Tracker model is so silent you have to check your wake to make sure you're moving. Price is \$99.95

Electric outboards have been around for half a century. Now new developments in handling and power are making them popular with the entire small-boat fraternity.

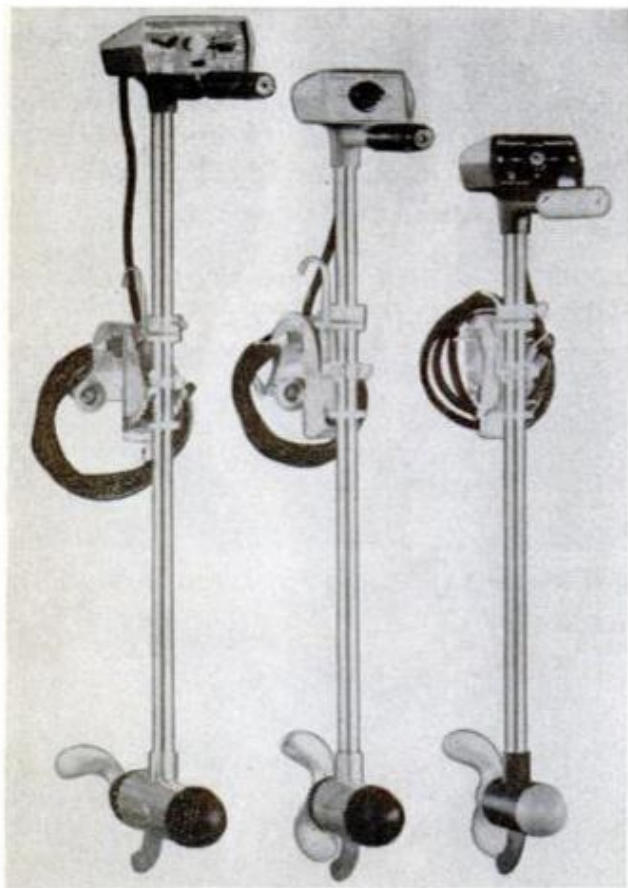
By **GEORGE REIGER**  
Boating and Outdoors Editor

**U**SED AS AN AUXILIARY or as their main power source on sheltered waters, electric outboards have become nearly as essential to serious boating anglers as life vests and an anchor. Since these featherweights pose no threat of noise, fumes or film pollution, some enlightened city water commissions permit urban boaters to use electrics on reservoirs where gas engines are forbidden.

Of the two basic designs in electric outboards, the below-water types are quieter and their new housing styles and shaft seals have greatly reduced the possibility of leaks. Electra Pal even advertises its Barracuda and Marlin models with aluminum castings and four-barrier water seal systems as suitable for use in corrosive saltwater environments.

Advocates of electrics with motors above water don't regard the necessity of transmission gears (except in the few models using a flexible-cable driveshaft) as a drawback. Instead they claim greater speeds and fewer snags for their straight-line propeller designs. They say the hum of above-water electric motors is still quieter than most household fans and claim that less vibration and noise are transmitted to the fish.

Whether motor vibration frightens the fish or not, you'll probably find that you



**PANEL NIGHT LIGHT** for night fishing is on Super 606 model of Shakespeare's stylish lineup at left. Weighing but 11 lbs., model has 8.8-lb. static thrust at 2035 rpm in highest of three speeds. Price, \$125



catch more fish maneuvering and trolling with a foot-operated, remote-control electric than you do in the same circumstances when using a manually operated engine of either above or below-water-motor design. Modern remote controls make propulsion as easy as rolling your foot around a metal plate—all you do to run forward and make left or right turns.

Electra Pal, Lazi-Trol, Motor Guide and Sears Roebuck all make remote-control models that free an angler's hands for fishing. Minn-Kota has even created a unit that not only fits all its motors but can be adapted to work with most other brands.

Perhaps, the easiest way for you to gain an overall view of what's available in electrics is to write for information and prices from this representative list:

Electra Pal Div., Osborn Engineering Corp., 1400 E. Lafayette St., Bloomington, Ill. 61701.

Lazi-Trol, Byrd Industries Inc, Ripley, Tenn. 38063.

Minn-Kota Manufacturing Co., Inc., Moorhead, Minn. 56560.

My-Te Electric, City Engineering Co., Inc., 3547 Massachusetts Ave., Indianapolis, Ind. 46218.

Motor Guide Div., Hershede Hall Clock Co., Starkville, Miss. 39759.

Pflueger Electric Fishing Motors, Pflueger Corp., 110 North Union St., Akron, Ohio 44309.

Silvertrol, Silver Creek Precision Corp., 282 Central Ave., Silvercreek, N.Y. 14136.

Wondertroll Div., Shakespeare Co., Kalamazoo, Mich. 49001.

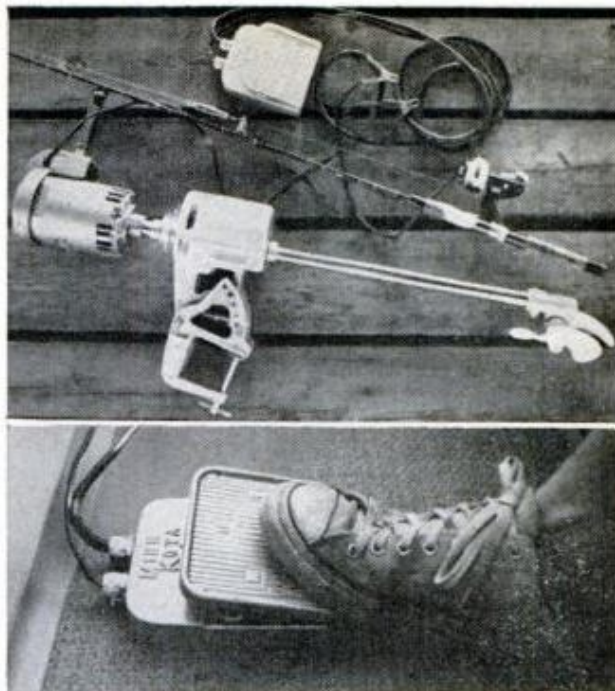
Tempo-Troll, Tempo Products Co., 6200 Cochran Rd., Cleveland, Ohio 44139.

Three mail-order firms also offer electrics: Herter's, Waseca, Minn. 56093; L. L. Bean, Freeport, Me. 04032; and Sears Roebuck, Chicago, Ill. 60607.

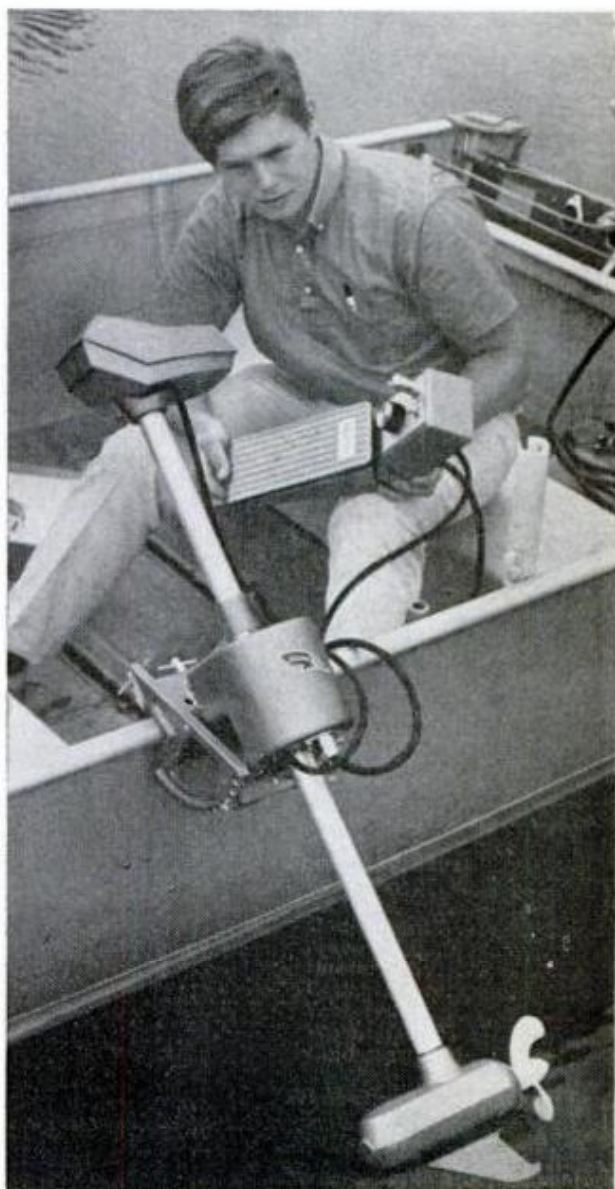
For the past two years I have made fishing trips to Maine. Last June there were high winds on the lake, and I spent far too much time with a paddle in my hand trying to keep the canoe in good casting position. This year I'm taking a foot-operated electric motor. I may be sacrificing some of the romance of canoeing—but I bet I'll catch a heck of a lot of more fish! ★★

**TWELVE-POSITION TILT BRACKET** and 31½-in. aluminum shaft are features of Electra Pal's 26-lb. Barracuda 84A. With 12-v., 60-amp.-hour battery, motor can run two days before recharge is needed. \$199.50

FEBRUARY 1970



**REMOTE FOOT CONTROL** is on Minn-Kota's HGR; reversing switch is available. Maker claims model has more power than many other units, despite 50 per cent less amperage draw. Runs on 6, 12, 18 or 24 v. \$208.95



# Crop Those Shots

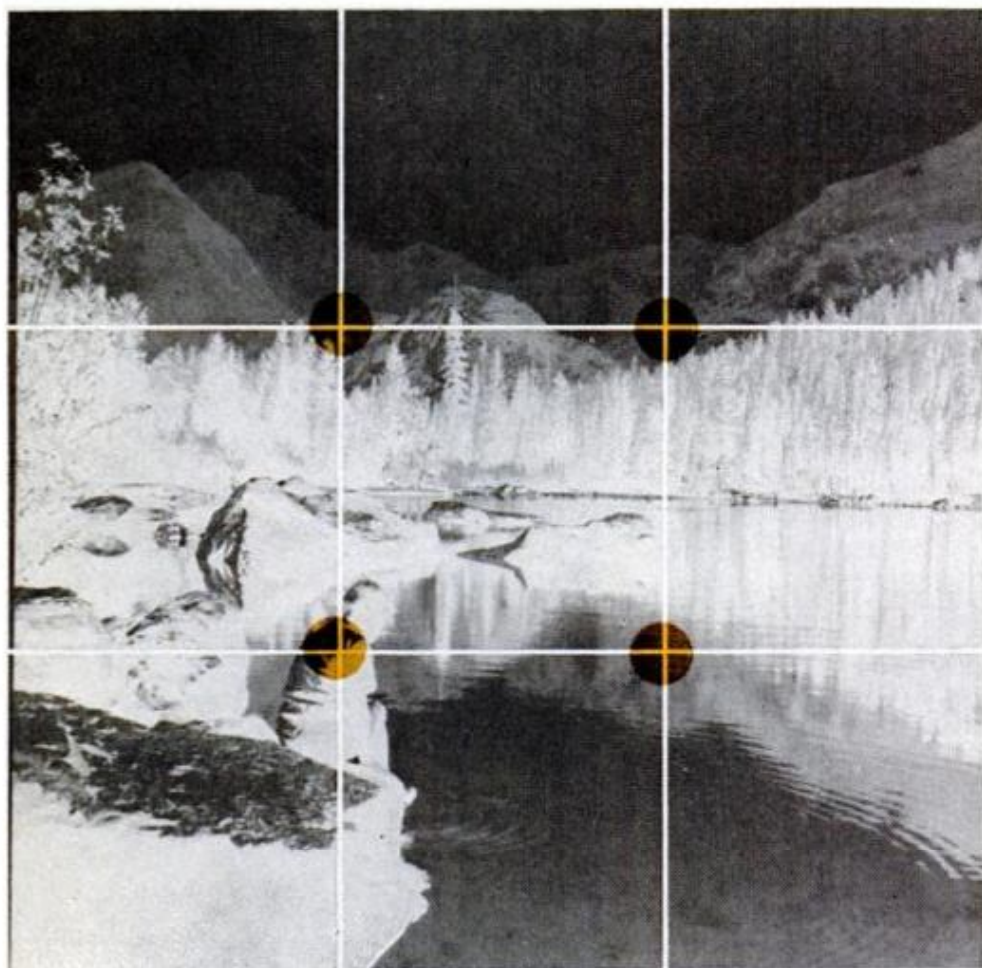
**Good composition is the key to making dramatic, pleasing blowups. Here are helpful tips on cutting out the bad spots to let the good ones show**

By PHIL GERACI



**O**NE OF THE HARDEST THINGS a photographer has to do is throw away part of his hard-spent effort. Yet that's exactly what must be done to make a good picture. In most cases, you have to discard, or crop out, some of the scene in order to make the remaining portion more dramatic, less distracting, pleasanter to look at.

When you're taking a picture, you're usually concentrating on getting the shot, not necessarily on what the finished picture will look like. Sometimes you're hurried and have to grab what you can. Sometimes you can't get as close as you'd like and you have to

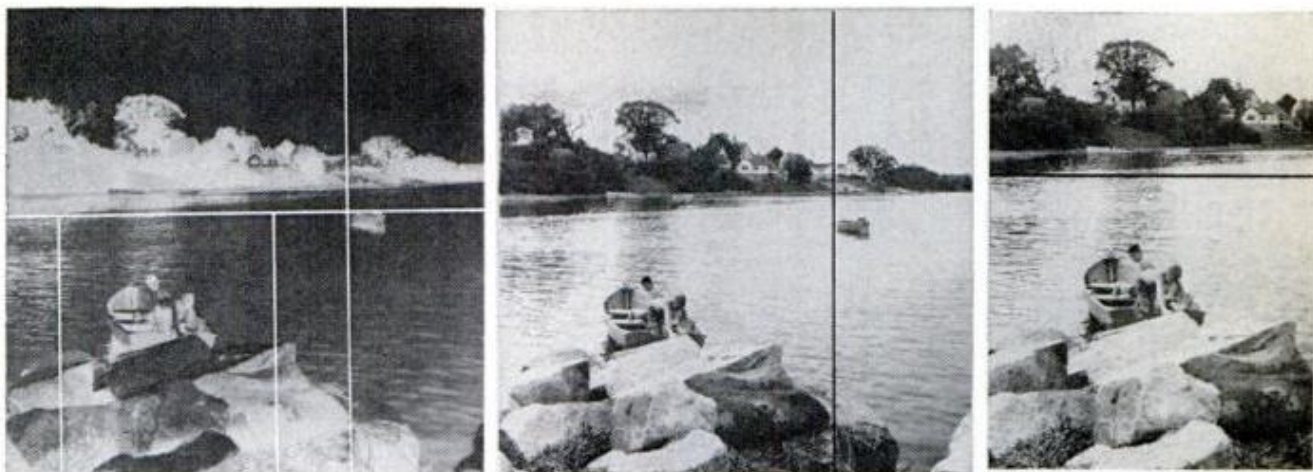


**SKY AREA** usually occupies upper third of photo in outdoor scenes for good balance, as here. Where sky is main element in the picture, it can take top two thirds

**GROUND AREA** generally fills lower two thirds of photo with foreground in bottom third. Note here that main center of interest—the boy sitting on the rock—is located off-center at the lower left where two dividing lines intersect

**RULE OF THIRDS** is a quick guide to good photo composition. Divide picture into thirds both ways. Points where lines cross are good spots for main focus of attention. Offcenter composition is more interesting than a centered subject

# for Better Pictures



**THREE STEPS** to a better picture: Boating scene above is weakened by large expanse of water on the right side, making for a dull picture. First step is to crop this off, turning photo into a vertical. But now shoreline in background tends to split the picture into two separate elements, distracting attention from main subject. Next step is to lop off upper half to get rid of shoreline. This is all right, but picture still has useless areas at sides. Final step is to trim off the edges of photo, creating a tight vertical

shoot from a distance, taking in too much area.

Your film itself limits you to a fixed picture shape, which may not be the best for the shape of your subject. The familiar  $2\frac{1}{4} \times 2\frac{1}{4}$  square format, for instance, almost always requires cropping simply because most subjects aren't naturally square. They're tall and thin, requiring a vertical format, or they're short and wide, lending themselves better to a horizontal format. Most other commonly used films produce horizontals when the camera is held in the normal fashion. This means that much of the time you're shooting pictures that are too wide for your subjects, cluttering the sides with useless, uninteresting area.

The simpler and cleaner a photograph is, the more powerful its impact and the quicker it gets its meaning across to a viewer. By cropping, you can remove unnecessary portions and concentrate attention on the main center of interest. You can turn a weak horizontal into a strong vertical or vice versa. You can zero in on a single face in a crowd and produce an eye-catching close-up.

Cropping is easiest if you do your own printing, but you don't have to have a darkroom to get the pictures you want. Custom photo processors will crop your

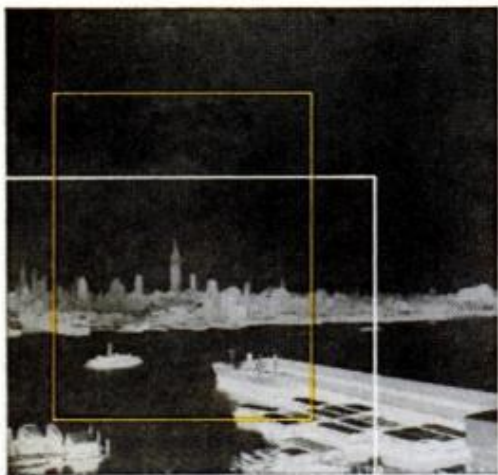
First step ▲

▲ Second step



▲ Third step



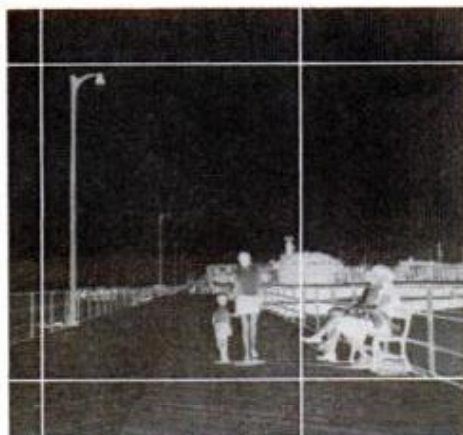


**TWO WAYS TO CROP** the same picture for different effects are shown here and on the opposite page. In the river scene above, emphasis is on docks in foreground, and city skyline is a secondary interest in background. With most of the foreground cropped out at left, skyline becomes the main center of interest

prints to your specifications, sometimes at a slight extra charge, sometimes for no more than what it would cost to have the full negative printed. Most photo stores offer custom processing or can refer you to a processor that will handle orders by mail.

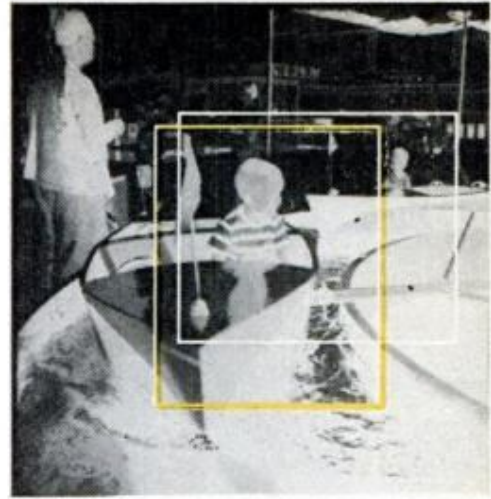
If you think you're going to want special cropping, ask for contact prints when your film is first developed. These are inexpensive prints in strip form, the same size as your negatives. From these, you can pick the shots you want enlarged and decide how they're to be cropped. Mark each contact print with a grease pencil to indicate the area you want blown up.

Often, there's more than one way to crop



**HOW CROPPING CAN STRENGTHEN** a photo's impact is shown here. People on bench at right, above distract the eye from main center of interest. Cropping them out focuses attention on boardwalk stretching into distance. Note that mother and child are offcenter but nicely balanced by tall pole on the opposite side

POPULAR MECHANICS

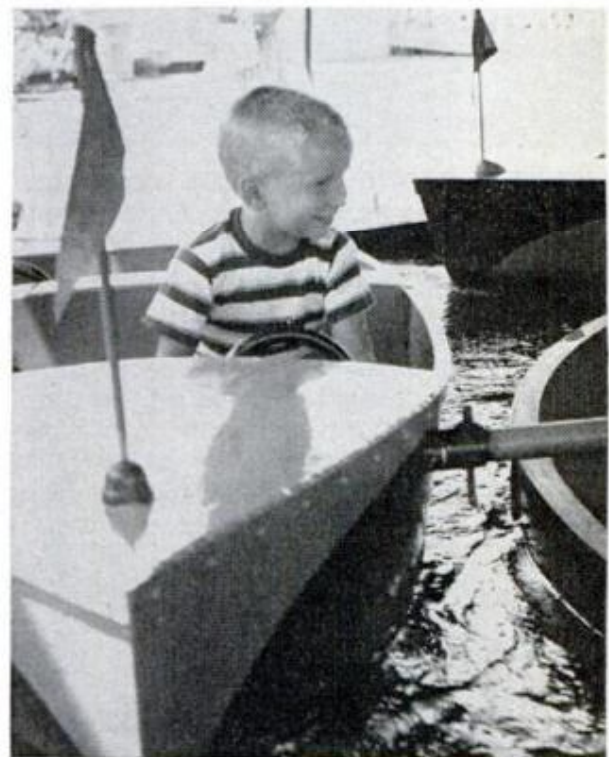


**THESE TWO PICTURES** are both good but different. Horizontal cropping above shows two boys, makes a more storytelling scene. Vertical cropping at right sacrifices second boy for appealing close-up of one. Both eliminate objectionable elements in the original picture—bystander at left and cluttered background

a picture effectively. The two shots above and at right of the two youngsters on an amusement-park ride are a good example. One way, you get a vertical showing one boy close up; the other way, a horizontal including both boys and more detail. Both are good, but they're completely different pictures. This shows how cropping can give you a choice of effects from a single negative, depending on what you want to emphasize.

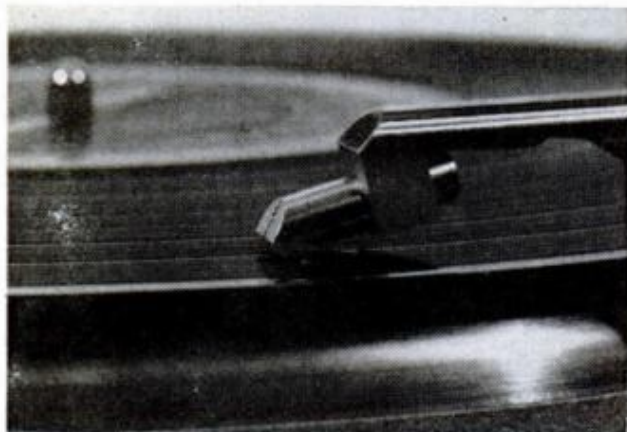
The first step in cropping is to decide what you want in the picture. This usually determines its basic shape—vertical or horizontal. Next, plan where the main subject

*(Please turn to page 224)*



**SHAPE OF SUBJECT** should determine whether picture is best as a vertical or horizontal. Tall statue at the right is a natural vertical. Cropped horizontally above, it looks smaller and the excessive background area is distracting

# NEW IN ELECTRONICS



**LIGHTEST PHONO CARTRIDGE** ever made is this new design by Matsushita Electric, maker of Panasonic hi-fi equipment. Two tiny bits of film coated with germanium semiconductor, one for each stereo channel, are moved by the stylus, generating electric signals corresponding to the depressions in the record groove. The cartridge, expected to be on the market soon, is so small it weighs only  $\frac{3}{4}$  of a gram in all and has a moving mass of just  $\frac{1}{10,000}$ th of a gram. This is said to provide perfect tracking with minimum record wear.



**TONE ARM FLOATS** gently down onto the record in new Garrard automatic turntables. A viscous damping arrangement built into the arm eliminates having to operate a separate cueing set-down lever. In either manual or automatic operation, the stylus settles smoothly onto the record by itself, preventing scratches and groove-jumping. Prices range from \$89.50 to \$129.50, less base and cartridge. Garrard Div., British Industries Co., Westbury, N. Y.



**HIDDEN INSIDE** this rear-view car mirror is a tiny, transistorized radio antenna, eliminating the need for tall masts that are often damaged by overhead obstructions or stolen. Signals are received by a small loop and then amplified for greater strength. This amplification is said to reduce interference and provide better reception than with conventional car antennas. Idea comes from the West German firm of Hans Kolbe & Co. near Stuttgart.



**YOU CAN PLAY THIS SPEAKER** in the box it comes in. The heavy cardboard carton has a slotted front-panel grill and is designed to serve as a temporary enclosure until you're ready to mount the speaker in a permanent housing. The arrangement is handy for rigging up portable hi-fi speakers or adding extra car speakers. Four sizes from 5 to 12 in. in diameter are priced at \$4.95 to \$8.95. Radio Shack, 730 Commonwealth Ave., Boston.

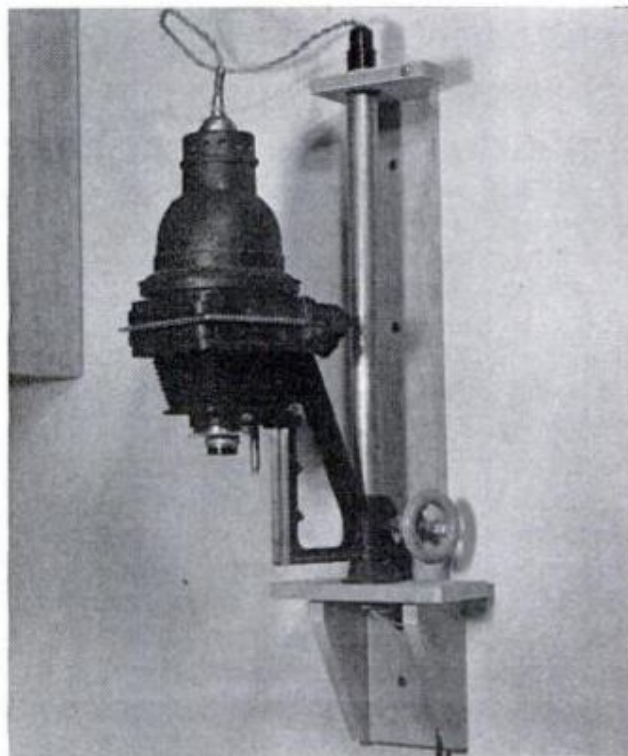
# PHOTO HINTS



**TWO-WAY TILTING BRACKET** for a light stand holds both an electronic flash and a mushroom bulb for modeling. Sheet metal is bent to form a pie-shaped box about an inch thick. This pivots on a fork bent from a steel angle. The electronic flash is mounted on top with a  $\frac{1}{4}$ -20 bolt. The modeling light is fastened to the side with a strap. You can lock the bracket at any angle by means of a bolt that rides in a curved slot.—Gerald Schumann



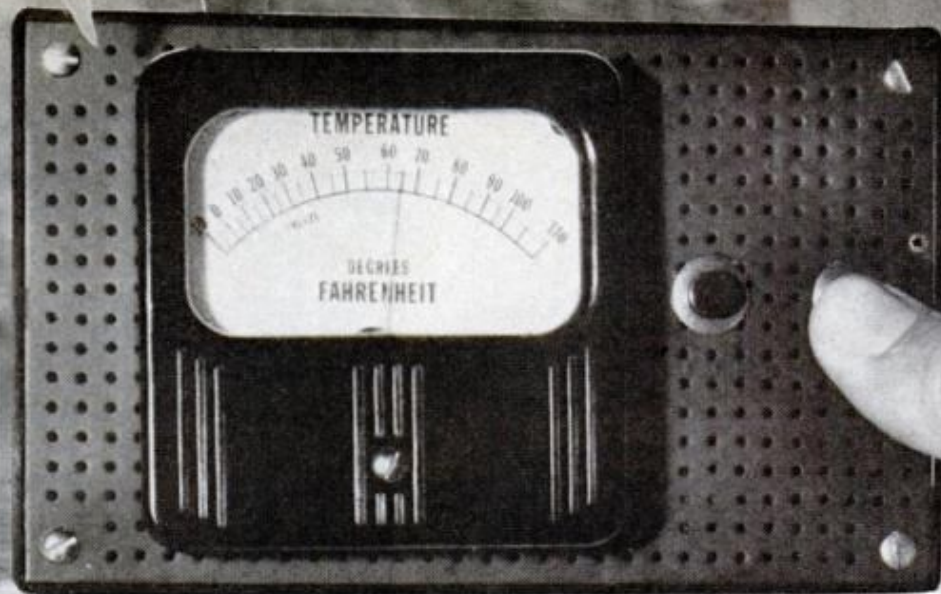
**YOU CAN KEEP CAMERAS WARM** in cold weather with this trick. Place a self-heating hand warmer on top of the camera and cover it with a plastic bag, as shown above. The bag holds in the heat well enough to keep cameras operating smoothly even in subzero temperatures. Hand warmers are available at sports shops.—Rohn Eng



**ENLARGER VIBRATION** can be eliminated with this easily constructed wall mount that anchors the column firmly to the house. The mount can be made from scraps of plywood or solid hardwood stock. The enlarger base is screwed to the small shelf near the bottom. Top of column is held in a clamp made by drilling a block, sawing it in two and then screwing the halves together.—Arthur L. Ramos



**SMALL DARKROOM SAFELIGHT** can be made from a brown plastic pill bottle. Use a small-base 115-volt bulb of the type sold for night lights. You can mount it in two ways. Cut a hole in the plastic cap and thread the bulb through this into a standard-base adapter screwed into a brass lamp socket (at bottom, above). Or use a small-base socket and wire it directly to a plug (top).—Joseph Braunstein



# Build Your Own Indoor-Outdoor ELECTRONIC THERMOMETER

Press a button and you can read the temperature in any location inside or out. Tiny heat-sensing thermistor probes give you instant checks on what's doing with the weather

By RUDOLF F. GRAF and GEORGE J. WHALEN

ANY ORDINARY mercury or alcohol thermometer will measure temperature, but it has one big disadvantage—you have to be where it is to read it. With this handy battery-powered electronic thermometer, you can tell what the temperature is outdoors or in other remote locations just by pressing a button and watching a needle on a dial.

As shown here, the thermometer incorporates two temperature-sensing elements, one in the case itself for measuring indoor temperature and one on a long cable for mounting outside or in a distant part of the house. Any number of additional sensors can be hooked up to give readings in other areas.

The temperature-sensing elements are tiny thermistors—special semiconductors that change their resistance according to changes in temperature. Measuring their resistance tells you what the temperature is. In this case, a highly accurate resis-

tance-measuring circuit known as a Wheatstone bridge is used. The bridge has two “arms.” One consists of resistors R1 and R2, the other of resistor R5 and thermistor T1.

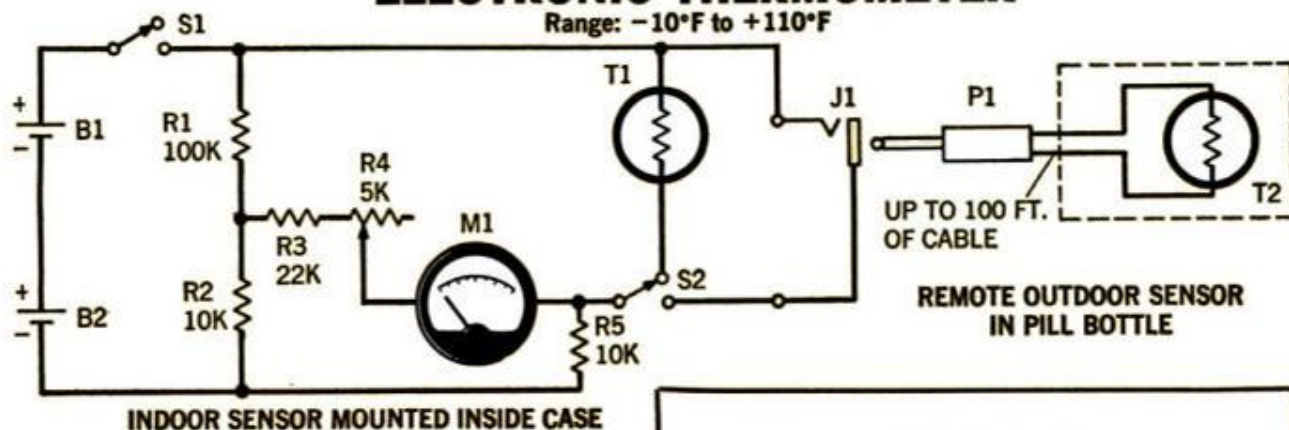
Connected between these two arms is a sensitive microammeter, M1. This meter is wired in series with current-limiting resistor R3 and calibrating resistor R4. R1 is selected so that it will equal the resistance of the thermistor at minus 10°F. R5 is chosen to limit the current flow through the thermistor to prevent it from heating up and thus impairing the accuracy of its sensing.

Meter M1 measures the current differential between the two arms. Since all the resistances in the bridge are fixed except that of the thermistor, the current differential is an accurate indication of the thermistor's change in resistance and thus the change in temperature. At minus 10°F., the two arms of the bridge are bal-



# ELECTRONIC THERMOMETER

Range:  $-10^{\circ}\text{F}$  to  $+110^{\circ}\text{F}$



INDOOR SENSOR MOUNTED INSIDE CASE

## PARTS LIST

- M1—0-50 microammeter (Lafayette 99T5042)
- R1—100K,  $\frac{1}{2}$ -watt resistor
- R2—10K,  $\frac{1}{2}$ -watt resistor
- R3—22K,  $\frac{1}{2}$ -watt resistor
- R4—5K potentiometer (Mallory type MTC53L1; Lafayette 33T1647)
- R5—10K,  $\frac{1}{2}$ -watt resistor
- S1—S.p.s.t. pushbutton switch (Switchcraft type 903)
- S2—S.p.d.t. pushbutton switch (Switchcraft type 913)
- T1, T2—glass probe thermistors (Fenwal Electronics type GB41P2; Allied 60C8630)
- J1—open-circuit jack (Switchcraft 41 Jax)
- P1—plug (Switchcraft 750)
- B1, B2—1.5-volt, C-size alkaline cells (Mallory MN-1400)
- Misc.—plastic case, pill bottle, perforated phenolic board, small bolts and solder lugs, two-conductor connecting wire.

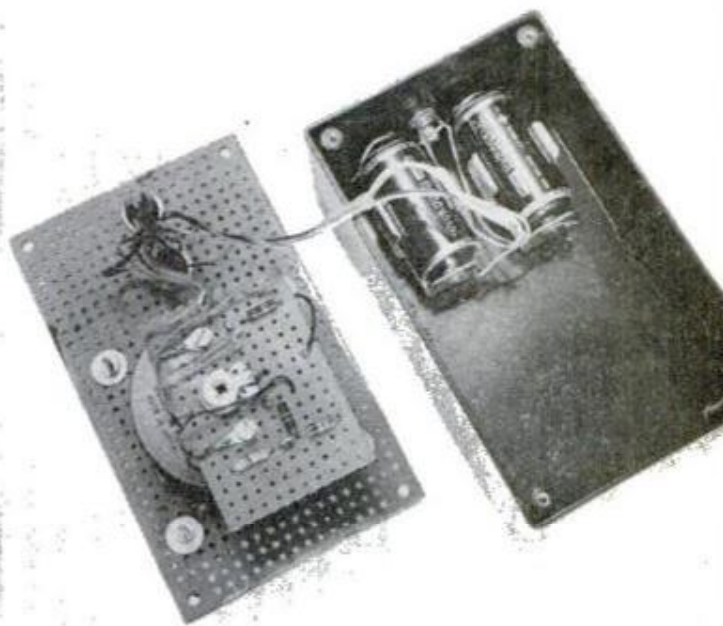
anced in resistance and there is no current differential between them. As the temperature rises, the change in the thermistor's resistance causes the arms to become unbalanced, and the meter needle records the amount, indicating the temperature.

With a new scale pasted over the original meter dial, the needle will read temperature directly in degrees. A scale calibrated in degrees is shown actual size on the following page. This can be cut out and cemented over the existing dial to give the thermometer a neat, professional look. The scale is designed as an exact fit for the Lafayette meter specified in the parts list.

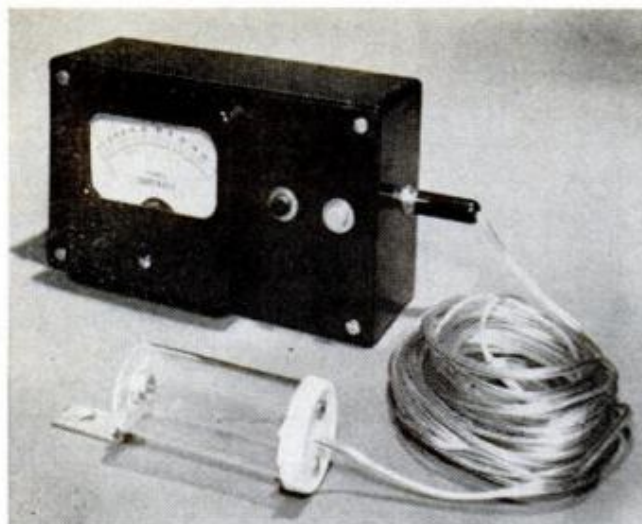
In applying the scale, handle the meter carefully. Lay it face down on a soft surface and remove the four screws in back that hold on the face. Then turn it over and remove the two tiny screws that hold the dial plate in place. Slide the plate out, taking care not to damage the delicate needle, then attach the new scale and screw the plate back in place.

The parts fit in a Bakelite box measuring  $6 \times 3\frac{3}{4} \times 2$  inches. A piece of perforated phenolic board is used as the front panel so its holes will permit air to circulate around the temperature-sensing thermistor. A smaller piece of perforated board is mounted on back of the meter to serve as a circuit board.

The remote sensor is merely a second thermistor, T2, in a small plastic pill bottle. A closed container is deliberately chosen here so the thermistor will respond slowly to outdoor temperatures and not be affected by sudden breezes. Mount the sensor in a shaded location so it measures air temperature, not direct heat from the sun. A miniature plug and jack are used to connect it to the thermometer



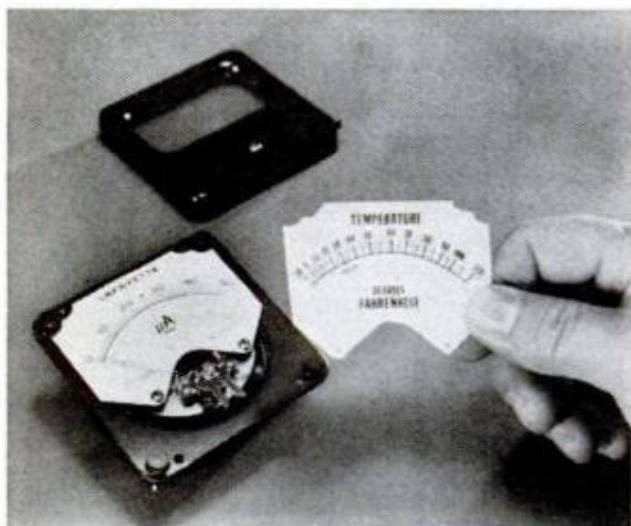
INSIDE VIEW (above) shows battery compartment and tiny circuit board mounted on the back of the meter. Batteries are the C-size alkaline type—more stable and longer-lasting than ordinary dry cells



**REMOTE SENSOR** plugs into side of thermometer. It consists of a tiny thermistor inside a plastic pill bottle. Small bolts through the plastic cap hold solder lugs to which the thermistor leads and



connecting cable are soldered, as shown at right. Up to 100 feet of cable can be safely used, but it must be good-quality, low-resistance wire, such as lamp cord. Don't use a high-resistance bell wire



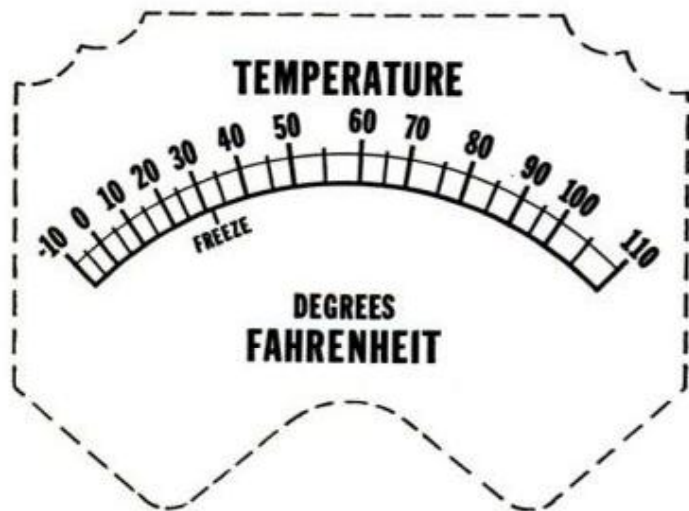
**NEW SCALE** is cut out and pasted over meter dial so needle shows temperature directly in degrees. Scale is shown full size below. Cut just inside the dotted lines and cement it to the metal face. Remove the dial from the meter before attaching the scale to avoid damaging the delicate needle

so it can easily be removed and other sensors plugged in.

Two small pushbutton switches, S1 and S2, control the thermometer. One turns on the power when you want to take an indoor reading. The other cuts out the thermistor inside the case and switches in the remote sensor. You must press both buttons to get an outdoor reading. Note that the second pushbutton, S2, must be of the double-throw type so that in its off position it closes the circuit to the inside thermistor.

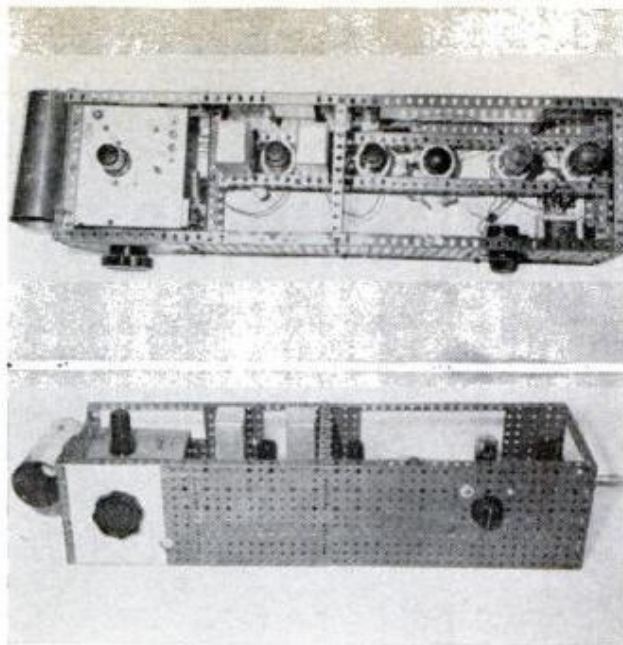
If you want more than one remote sensor, you can add others in one of two ways. You can either plug one at a time into the jack on the side of the case or, for a neater arrangement, you can substitute a multiposition rotary switch for pushbutton switch S2. With a rotary switch, you can dial whatever sensor you want and press the first pushbutton to get a reading. If you decide on this arrangement, remember to wire one switch position so it closes the circuit to the internal thermistor for indoor readings.

To calibrate the thermometer, remove the pill bottle from around the remote sensor and dangle the thermistor in a bowl of cracked ice and water. Leave it in at least a minute, being careful not to get the thermistor leads wet. Press both buttons and adjust R4, the potentiometer, until the meter reads exactly 32°F., the temperature of the ice water. Once it has been set to this reading, the thermometer will accurately record all other temperatures up to 110°F. ★★★

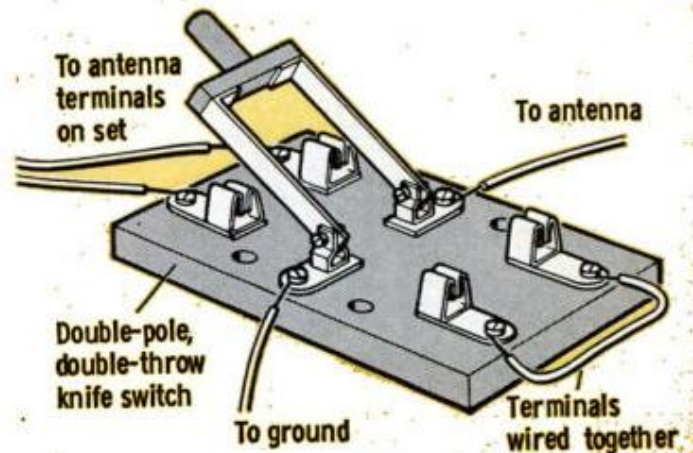


**PRINTED SCALE**, calibrated in degrees, is easy to attach, gives the thermometer a neat appearance

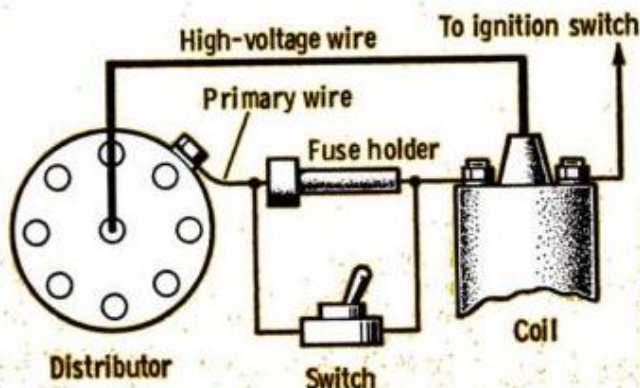
# ELECTRONIC HINTS



**OLD ERECTOR-SET PARTS** are useful for "breadboarding" experimental electronic circuits. The spaced holes enable you to assemble the pieces in any size and shape to suit your particular components. The slotted "girders" are especially helpful in mounting tube sockets and similar parts in rows. When you finish one project, you can take it apart and reuse the pieces on another.—C. E. Cohn



**PROTECT A RADIO** from lightning damage with this simple antenna-cutout switch. Wire a d.p.d.t. knife switch as shown above. With the toggle thrown one way, the antenna and ground leads are connected to the radio for normal use. When the set is not in use or a storm threatens, throw the toggle the other way to disconnect antenna from the set and connect it directly to ground.—Skip Singer



**THIS ANTITHEFT DEVICE** for cars is downright cruel. It lets a thief start your engine by crossing the ignition wires, but then shuts it off before he can get more than a few feet. Since the engine starts normally, he isn't likely to suspect that the car is bugged. He simply assumes you have a bum power plant and abandons the assault. First connect a fuse holder between the coil and distributor, as shown above. Then bypass the fuse holder with a toggle switch hidden under the dashboard. Use 18-gauge or heavier wire. With the switch closed, the fuse is out of the circuit and the engine runs normally. As you leave the car, you just flip the switch open, cutting in the fuse. A fuse of the right size will let the engine run for about 10 seconds before blowing. For a big V8 engine, a 1¼-amp. slow-blow works perfectly. Smaller engines will require lighter fusing.—B. F. Samuels



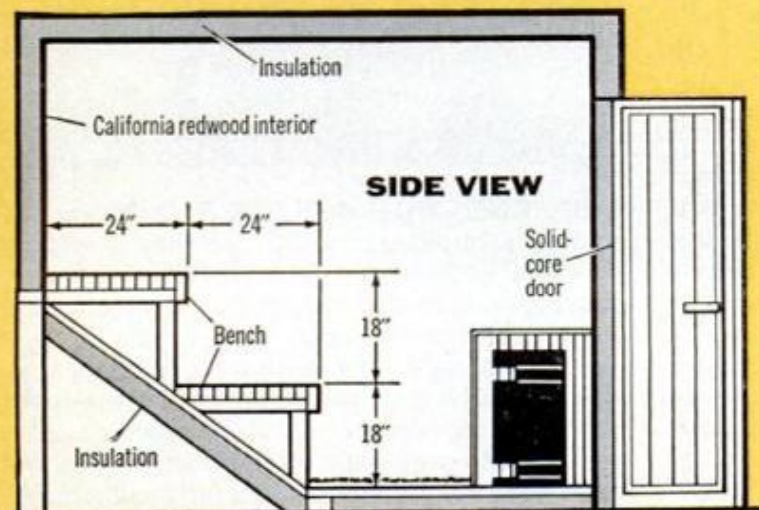
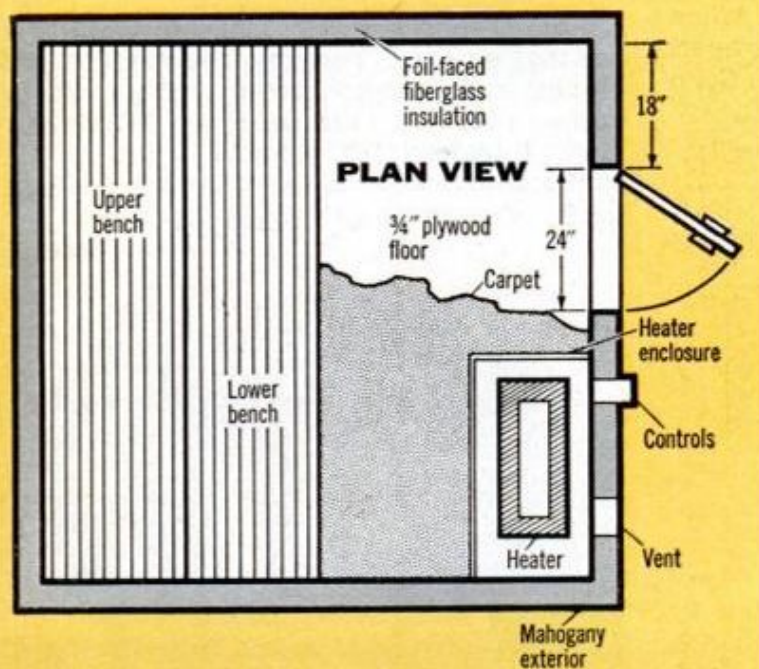
**EARPHONES WITH BUILT-IN RADIOS** are becoming a popular novelty, but they're expensive. You can make your own by taping a tiny pocket radio to the headband on an ordinary set of earphones. Most such radios have a jack for plugging in a miniature earphone. Use a matching plug for connecting the leads from the big earphones. A headset radio is handy when you want to listen in private and have your hands free.—Joseph Braunstein



**BOOTH-SIZE SAUNA** lets tired businessman unwind in "solitary" for \$695

# Now: Prebuilt Saunas That Go Together In an Hour

Shipped in a package and ready to assemble with nothing but a wrench, they come complete with heater, controls, even carpet



**I**T USED TO BE that a sauna went with the house, like the bathtub. But not any more. When you sell your home, the sauna can now be packed up and moved with the rest of the furniture.

The Viking Sauna Co. of San Jose, Calif., has introduced free-standing, self-contained rooms which let you do just that. Walls of prebuilt redwood panels lock together effortlessly and come apart just as easily. In less than an hour you can set up or dismantle a sauna that has all the quality and features of a custom-built room.

You can order one the size of a phone booth or one big enough for the whole family. Whatever the size, the precut kit includes walls, ceiling, benches and floor of California redwood, heating unit and electrical controls, sauna rocks and carpet. There is no plumbing to install, and the whole thing goes together with a special wrench that's furnished.

Prices range from \$695 for a 3x3-ft. solo room to \$2795 for a family-size one that measures 6x12 ft. You actually have a choice of five different sizes; 3x3, 4x6, 6x6, 6x9 and 6x12 ft. All have head-room of approximately 6 ft., 8 in. Except for the solo model having

## SAUNA BATH—FAMILY STYLE

GREATEST WAY YET to unwind and relax after a hard day at work or play is in the desert-dry air of a sauna. There's little sensation of heat and no discomfort as in a steam bath





**YOUR PREBUILT SAUNA** comes like this, knocked down in cartons, complete, ready to assemble in hour



**WALL SECTIONS**, redwood on inside, mahogany outside, come insulated and designed to hook together



**OPEN-SLAT BENCHES** of kiln-dried redwood come ready-built, never become uncomfortably hot to touch

a heating unit which can be plugged into a 110-v. outlet, the electric heaters of the larger units all require 240-v. wiring to operate.

A sauna can be put almost anywhere; a basement corner is perfect, especially if you have a basement shower. The ideal place for a sauna, of course, is in the bathroom, and while you may not have room for one now, a sauna is certainly something to consider if you are thinking of remodeling your bathroom. They go hand in hand.

You are not limited to an indoor sauna; you can get one that's designed for pool-side use. Built like a little house, it comes complete with exterior siding, battens, subfloor and structural roof components. Its proximity to the pool makes it especially convenient when it comes to cooling off. A quick dip in a pool is an exhilarating part of sauna bathing.

Viking also offers a way in which you can economically convert an unused clothes closet into a sauna. The firm makes a self-contained door that houses the whole works—heater, light, timer and controls, plus window. It's of standard closet-door width, 24 in., and comes ready to plug in. You simply line the closet with redwood, install a subfloor and carpet, add a suitable bench and hinge the door.



**UNIQUE LOCKING DEVICE** hooks and clamps multi-panel walls tightly together with a twist of wrench



**SAME LOCKING METHOD** is used to clamp ceiling panels in place. Panels are treated against warping

There's a heater to suit whatever size sauna you build, the smallest measures 14 in. wide, 13 in. deep and 24 in. high, the largest 23x13x24 in. They are virtually noiseless, operating on a "jet air-stream" principle to circulate the air, and all heaters afford complete protection against overheating through the use of a UL-required, high limit cut-out.

There are a number of luxuries you can add to your sauna. One is a hygrometer which shows how quickly the relative humidity drops as the sauna temperature soars. Another is a wooden ladle and bucket which are used to sprinkle water on the sauna rocks for those who enjoy the "steam shock." There's even an audio transducer that attaches to the sauna exterior, producing a stereo sound effect inside. ★★★



**FINALLY, ELECTRIC HEATER** is placed in corner and fenced-in by picket enclosure. Heater runs noiselessly

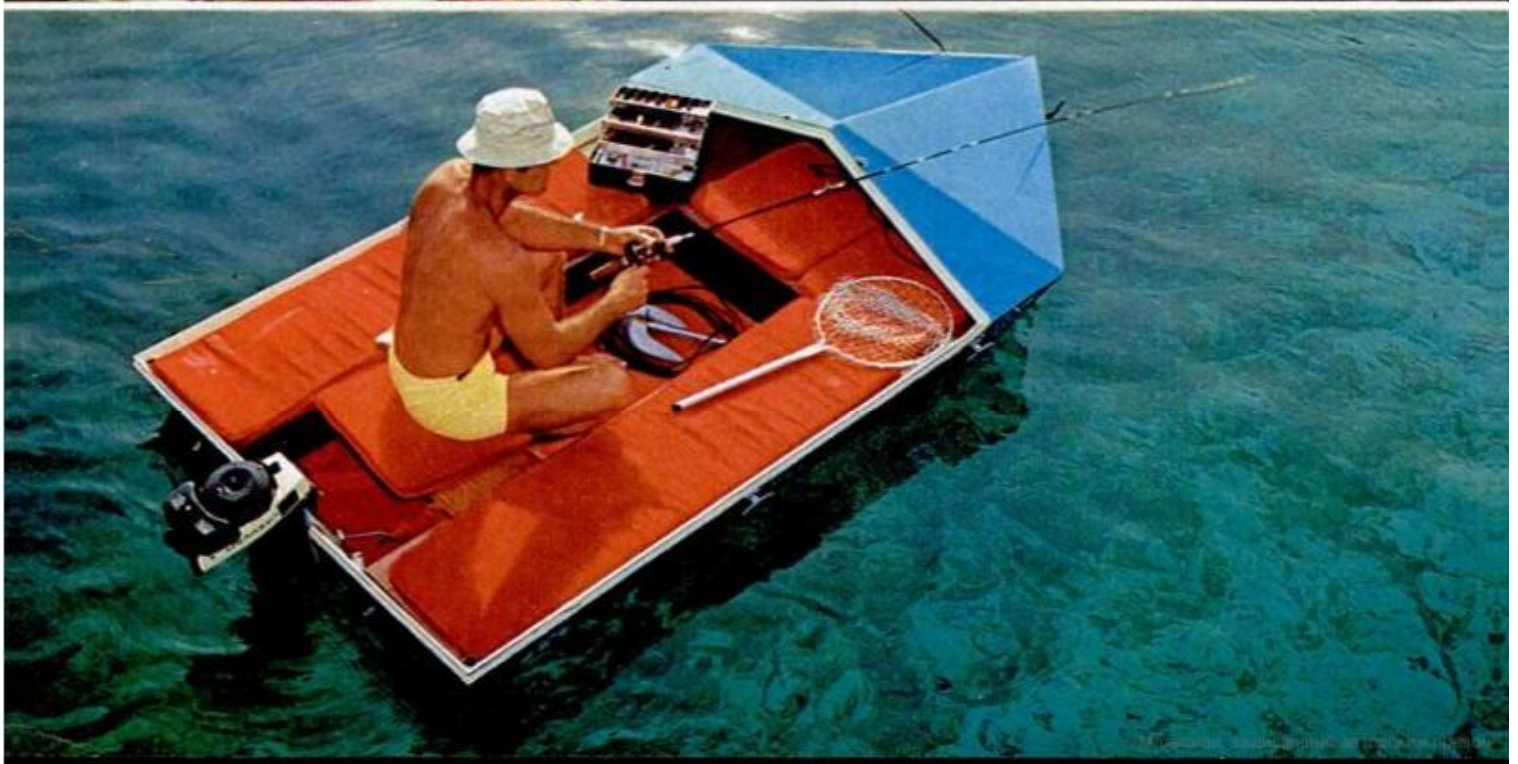
**WHAT DO YOU DO** when you step inside a sauna? Nothing. You just sit or stretch out and the 175° desert-dry air goes to work on you. It melts away business tensions and cleanses the body more thoroughly than ordinary soap-and-water bathing. There is no better therapeutic way to relax and refresh

#### HOW TO ENJOY A SAUNA

1. Heat sauna room to a temperature of 175°F. for about 30 minutes.
2. Shower with soap and water.
3. Enter sauna for 8 to 10 minutes.
4. Take a short, cool shower.
5. Re-enter sauna for 8 to 10 minutes.
6. Take a long, cool shower.
7. Relax from 15 to 20 minutes before dressing.

*Note: You should not smoke, exercise or wear clothing in a sauna.*

CAMPING PROJECT





# Build This Three-Way Travelpod

It's a boat, it's a camper, it's an equipment carrier all in one. And it closes up like a capsule for high-speed highway travel.

By CHARLES R. GRETZ



**I**F THE CAMPING BUG hasn't had his stinger in you yet, watch out! Here's just the rig that could give you the fever. It's the perfect answer to family camping in a car. After an 8500-mile trip, I should know.

What's so great about it? Imagine being able to take off with a king-size, cartop luggage carrier that packs a whopping 36 cubic feet of waterproof tote space.

Imagine having an overnight overhead sleeper when you arrive that's as easy to set up as an umbrella!

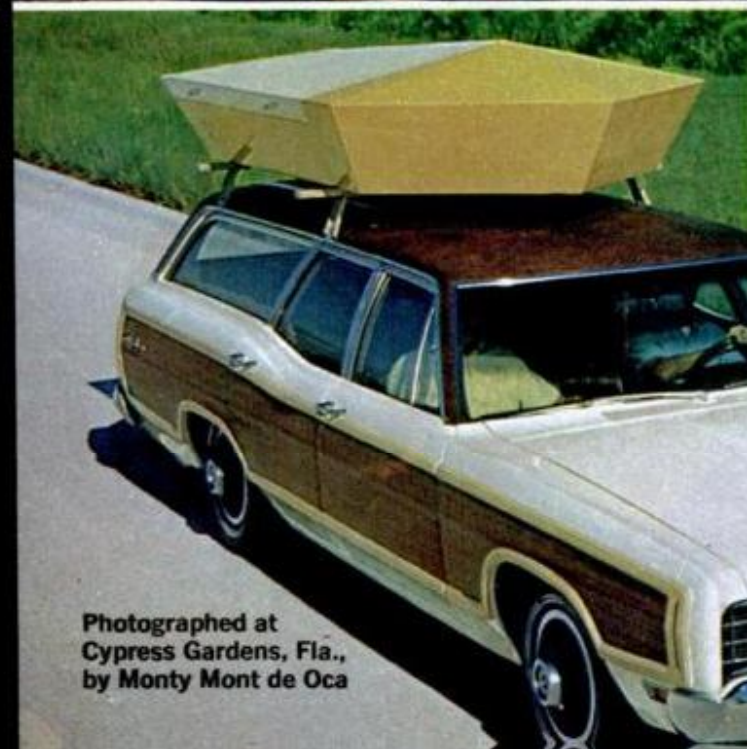
Imagine being able to take along your own boat for a day of trolling a quiet stream!

All this is possible with this all-in-one Travelpod which I designed, built and tested with 300 lbs. of camping gear.

It turned out to be the most versatile and most functional camper on the road. What's more, we had the whole car to ourselves since

everything can be stowed topside.

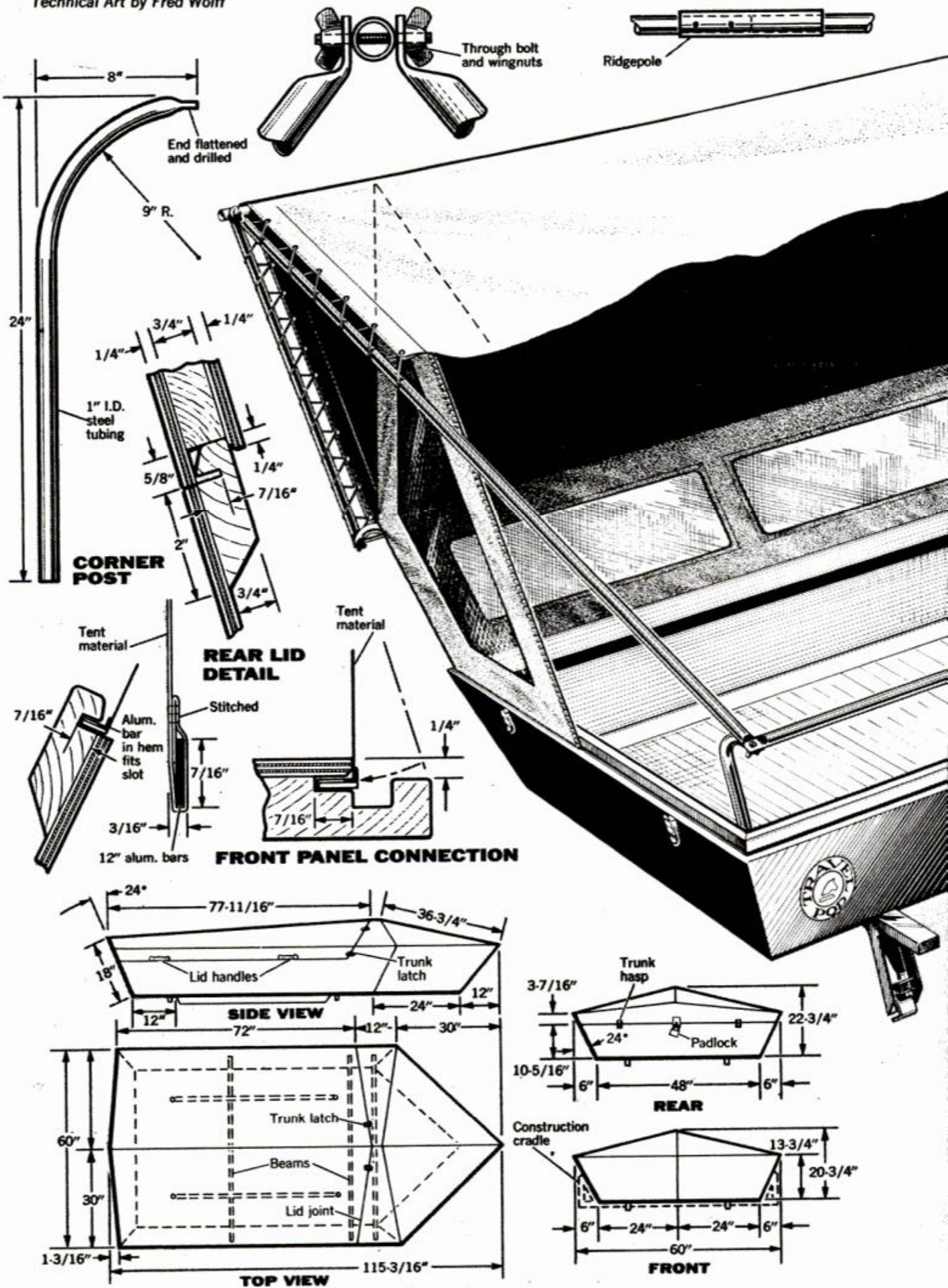
The Pod is designed to mount on

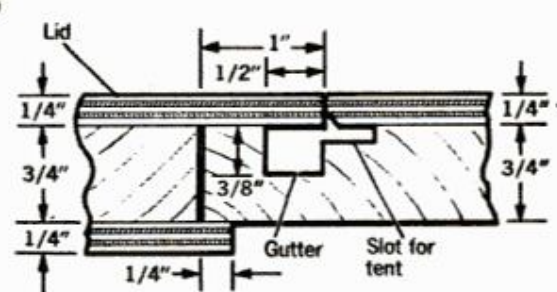
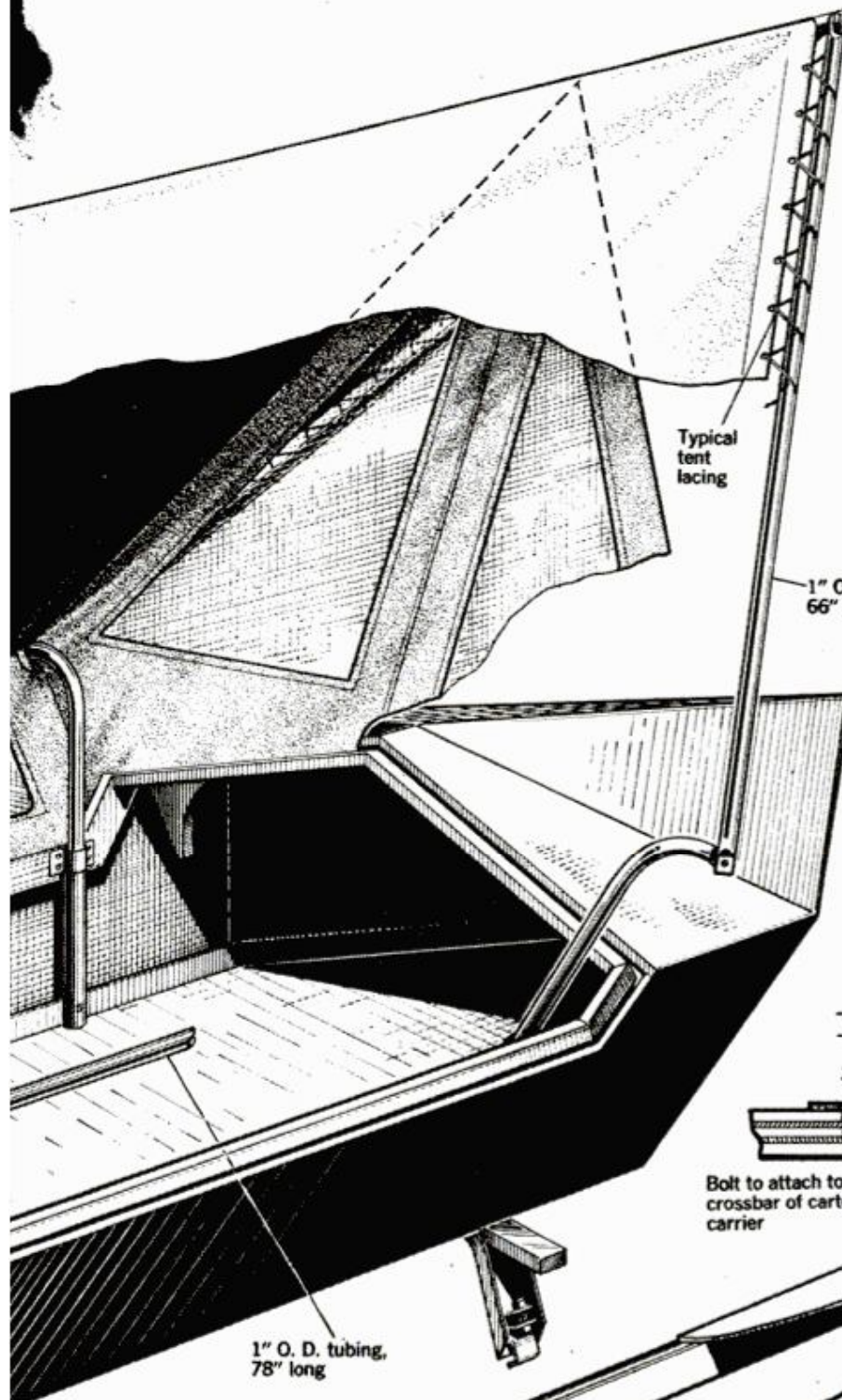


Photographed at  
Cypress Gardens, Fla.,  
by Monty Mont de Oca

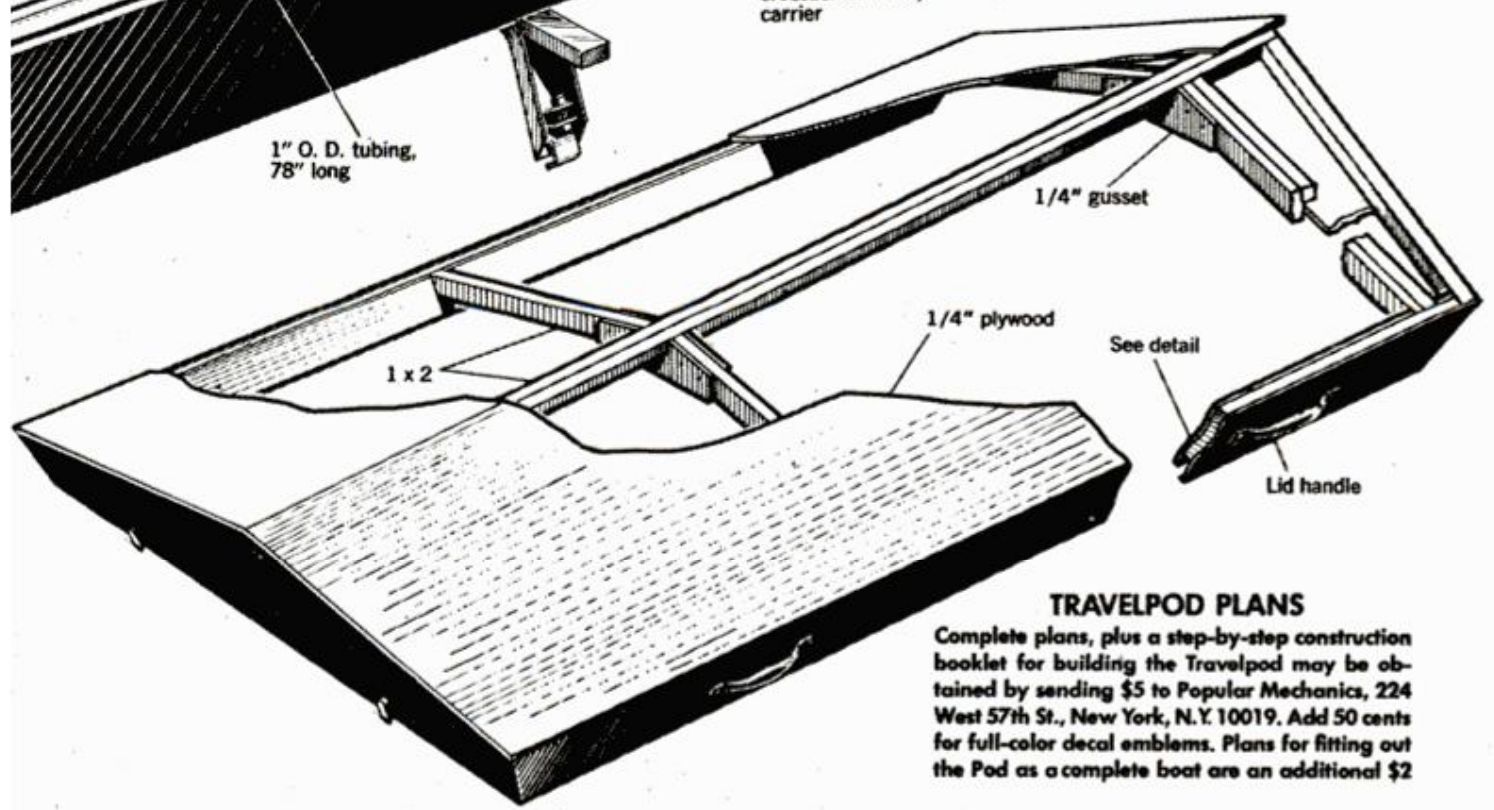
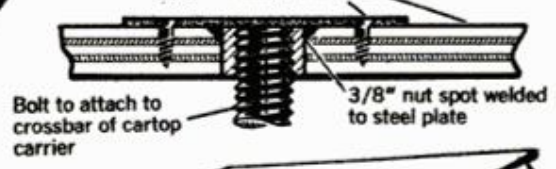
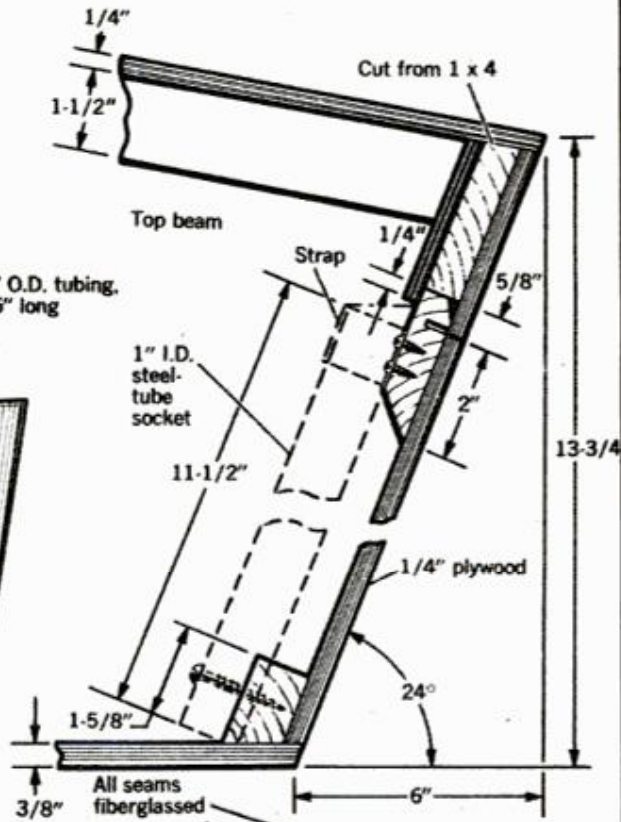
# TRAVELPOD - CARTOP CAMPER

Technical Art by Fred Wolff





**TOP FRONT LID DETAIL**



**TRAVELPOD PLANS**

Complete plans, plus a step-by-step construction booklet for building the Travelpod may be obtained by sending \$5 to Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Add 50 cents for full-color decal emblems. Plans for fitting out the Pod as a complete boat are an additional \$2

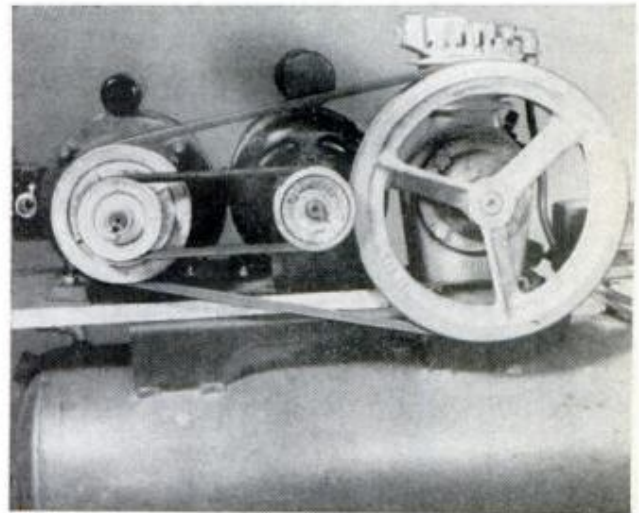
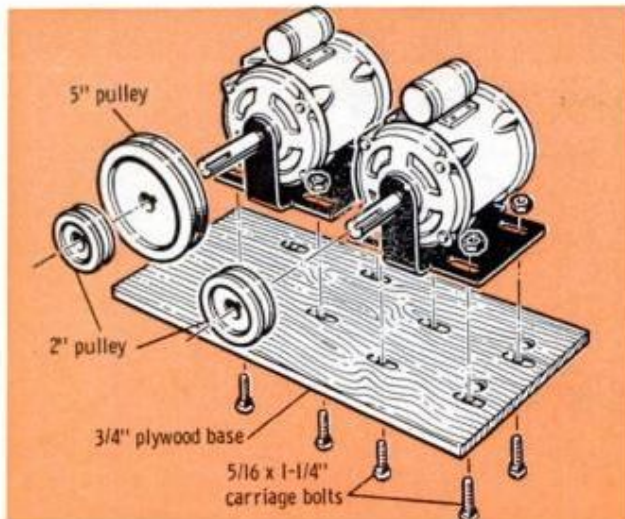
# Travelpod



regular steel luggage bars which rest on the wagontop and clip to the rain gutters. Access to the sleeper is by an aluminum boat ladder which stores on the underside of the sliding lid. To open the Pod on the road you simply slide back its lid; it has handles to lift it off. Contents are safe from rain by virtue of a tongue-and-groove waterproof track and are secured from theft by foot-locker-type trunk latches and a padlock.

One person can set up the Pod in minutes for sleeping. It's draftproof and you'll have no fear that the kids will fall out. Nylon-net windows ventilate the tent and, by design, the overhang of the roof provides adequate sun and rain protection. The tent rolls in a bundle only 8 in. in diameter by 6 ft. long and weighs 15 lbs. The broad, flat bottom allows the Pod to be a stable, minimum draft boat. A small electric [\(Please turn to page 220\)](#)

# Motors in Tandem Produce Higher Horsepower

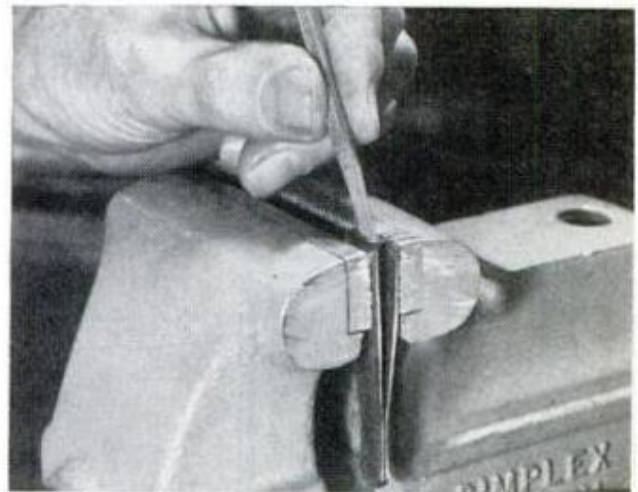


After struggling for years with an air compressor that shared a motor with my table saw, I decided that two motors I had in the shop could be paired to serve as a power supply for the compressor alone. Applications will vary depending on the equipment being driven, but there are two rules of thumb. First, the pulleys used to couple the motors must be of the same size, and second, a sub-base is required so

that the motors can be moved as a unit when you are adjusting output tension. Check the nameplate on changing rotation, or see a local appliance repairman for expert assistance. The  $\frac{1}{3}$  and  $\frac{1}{4}$ -hp motors shown above are ganged so they can be moved independently on the sub-base to adjust belt tension, and the sub-base moved to adjust the belt to the air-compressor pulley.—*Frank L. Greenwald*

## Nail clipper is shop nipper

Here's an inexpensive tool that can be added to your shop inventory for use as a bench-vise accessory. Available in drug and dime stores, these nail clippers are usually priced at less than 50 cents. For use in a bench vise, it is first necessary to remove the lever and locking arrangement (if your clipper has one). The tool can then be used for nipping corners from cardboard, fiber and leather, or for shaving "whiskers" clean on cut edges of softboards.—*Walter E. Burton*



## Doctoring damaged glass

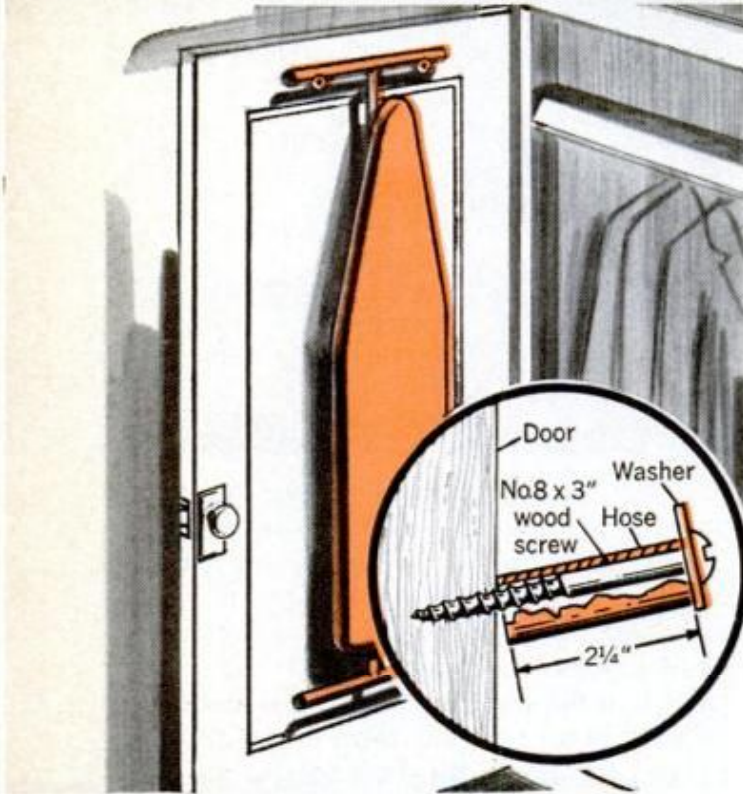
When a piece of art glass, such as a paperweight, becomes chipped, it can be fixed if the broken-off piece is located and epoxy-glued in place. Lacking the piece, you can camouflage the damage by using a fine-grit abrasive stick (of aluminum oxide or silicone carbide) as a file to remove any sharp edges. Then smooth the abraded surface with a very fine-grit stone and finish polishing with a wood stick charged with jeweler's rouge.

—*Walter E. Burton*

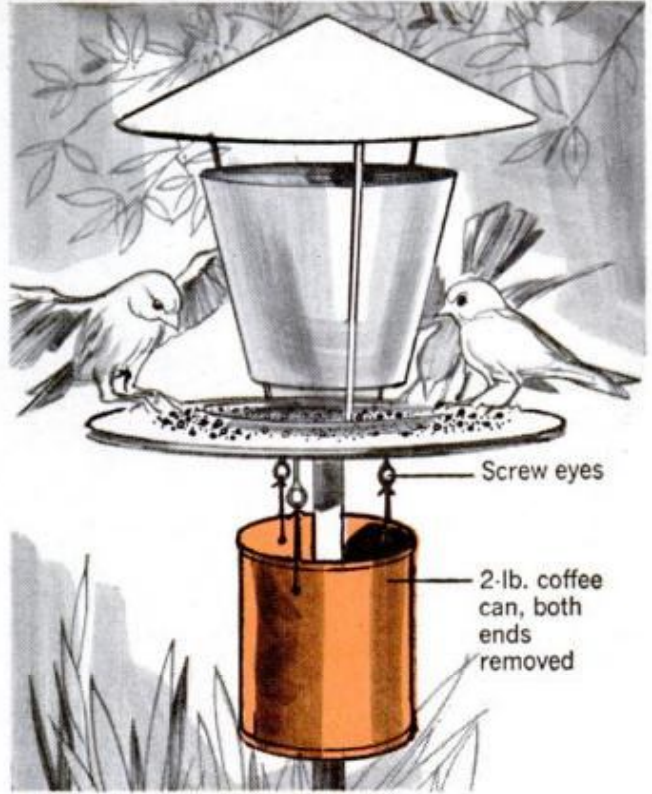




# SOLVING



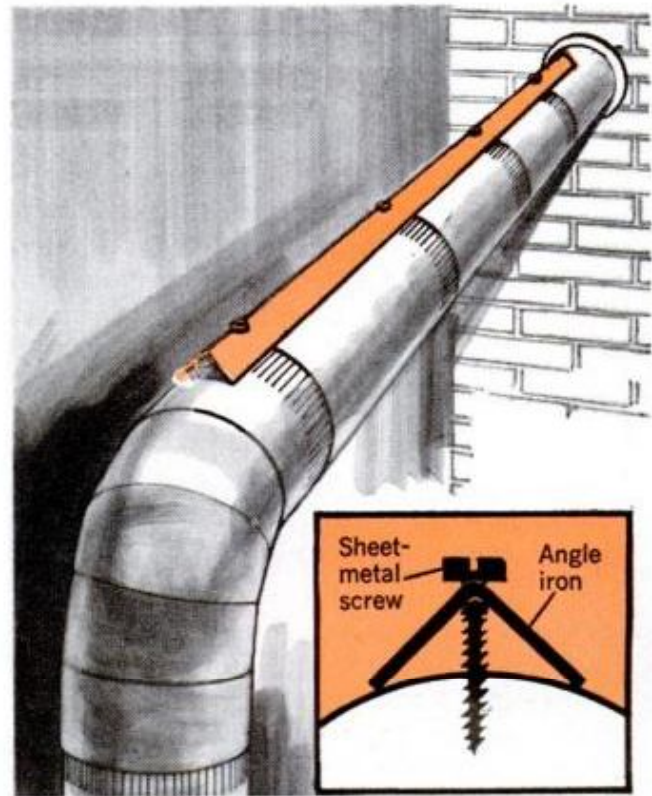
**CONVENIENT IRONING-BOARD STORAGE** can be created by using screws, washers and lengths of garden hose. Make certain screws used take a healthy bite into wood, and project amply to hold leg.—Lee Adams



**SUSPEND A COFFEE CAN** from three wires attached to bird feeder bottom and you can keep unwanted poachers from eating birdseed. It swings if touched, thus causing squirrels to lose their grip.—Carl H. Stute



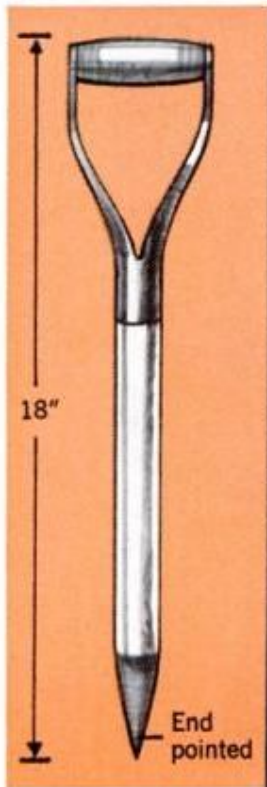
**WHEN DRIVING LONG GARDEN STAKES**, why not try standing in your wheelbarrow? The added height will simplify your chore—just make sure that the legs and wheel of the barrow are steady, not rocky.—John Krill



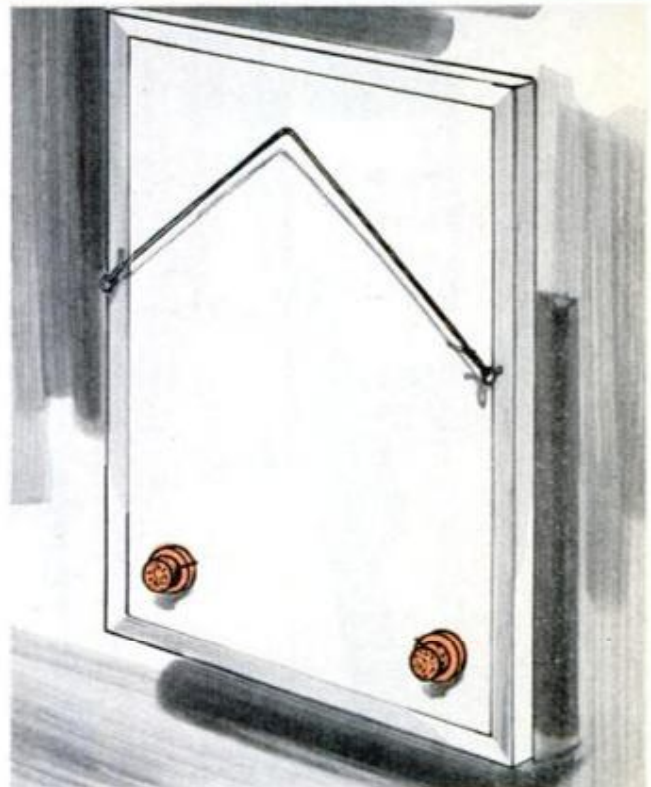
**KEEP FURNACE PIPE FROM SAGGING** on long horizontal runs by fastening a length of 1-in. angle iron along the top. Drill angle and pipe, and secure them at each joint, using sheet-metal screws.—Andrew Vena

# HOME PROBLEMS

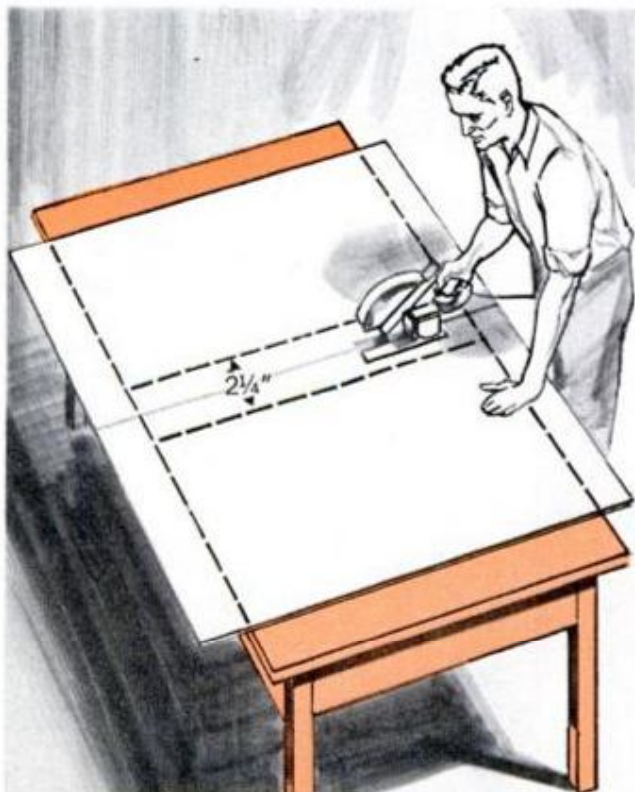
Illustrations by Adolph Brotman, Worman Associates



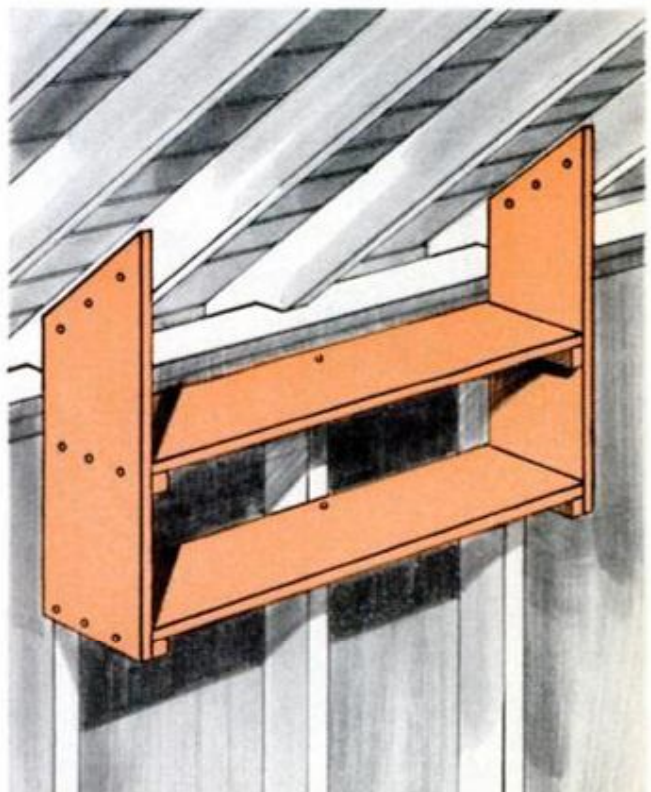
**BROKEN SHOVEL HANDLE** can be put back to work as a dibble for transplanting young seedlings. Just cut the handle to a length of about 18 in. and point the end for easy insertion in the ground.—*Albert T. Pippi*



**STOP PICTURES FROM SWINGING ASKEW** every time a door is slammed or a draft hits them. Simply glue two bottle corks to the lower back as shown. The friction they produce will eliminate the problem.—*Hi Sibley*



**OLD KITCHEN TABLE** with a removable leaf at center can be used for a portable saw table. To make a cut, remove the leaf, set the blade height to just clear the workpiece and make cut over gap.—*Robert J. Lodi*



**UTILIZE WALL SPACE** above long-handled tools in the garage by hanging shelves from the rafters. For stability against lateral movement, toe additional nails through the shelves into the studs.—*Harvey H. Haynes*



**STURDY SERVER** gives two generous-size surfaces for holding snacks and libations when open. Closed (photo opposite page), the spacesaving table folds flat for convenient out-of-sight storage in closet



# ALL-TIME GREATS No. 3

## Four Popular Woodworking Projects

Great projects never die, but sometimes we forget just how popular they were. Here are four which made a hit with PM readers years ago and are equally great today

By WAYNE C. LECKEY, Home and Shop Editor

Technical Art by Peter Trojan  
Photos by Robert Borst

### Cocktail Snack Server

WHEN HOME PARTIES reach the point of help yourself, this handsome hors d'oeuvre server will soon become the life of the party. Placed in the center of things and loaded with tempting cheese dips, chips and the makings of a drink or two, this self-service server will receive a standing ovation in more ways than one.

You'll find it equally as useful at bridge, or wherever snacks are served. Best of all, the server folds flat for storing. It made a hit with readers as soon as it first appeared in our June 1937 issue and we received many letters and photos from those who built it.

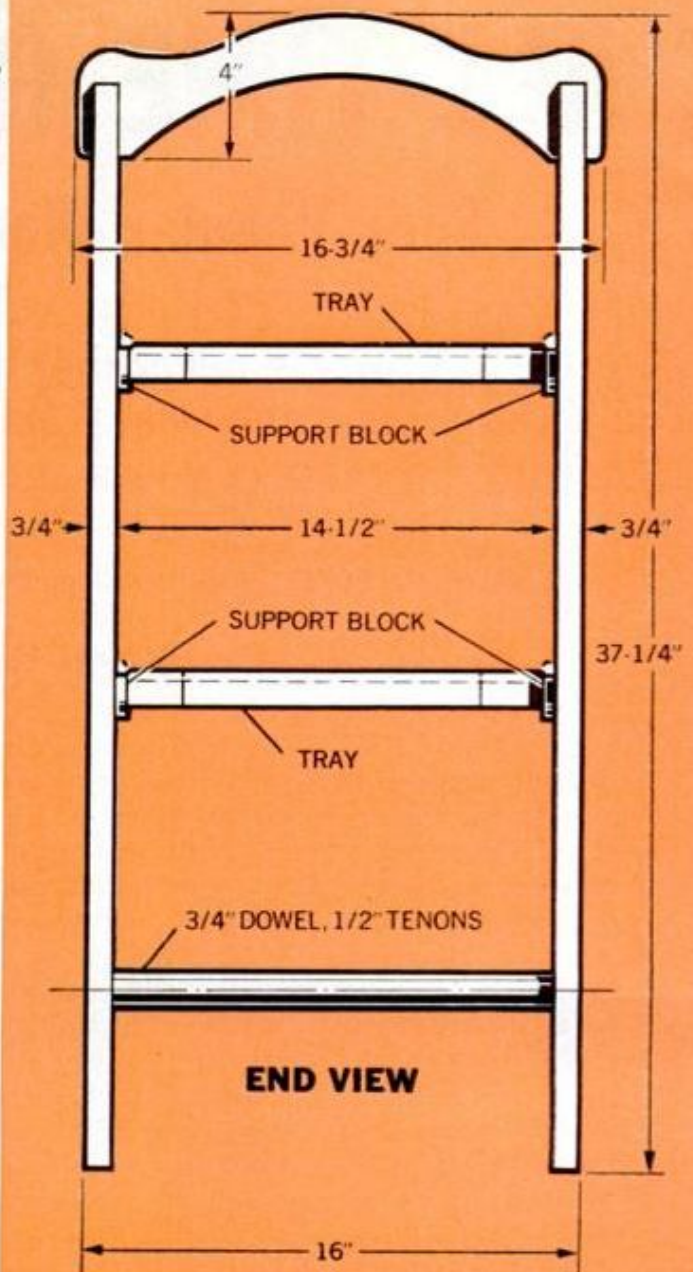
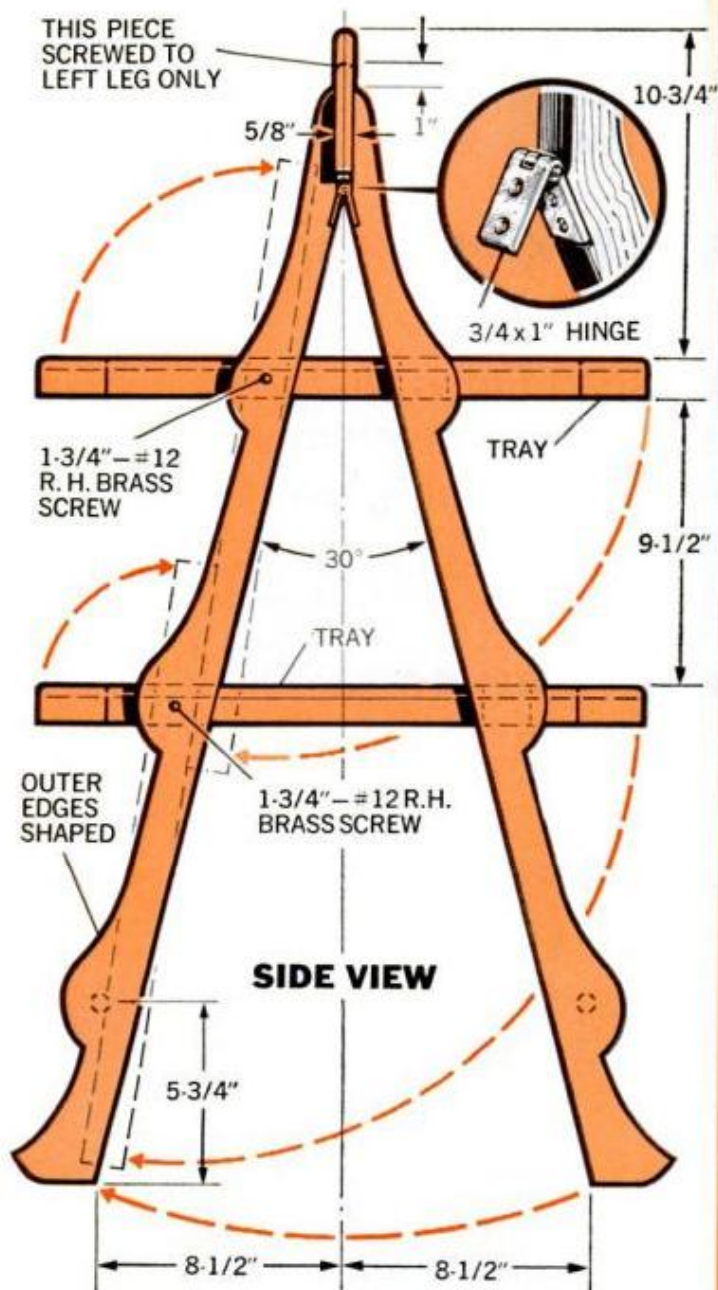
To make one like it, start with the legs. These are twin assemblies which are cut in pairs, following the pattern given on page 169. All four legs are bored for  $\frac{3}{4}$ -in.-dowel rungs, but keep in mind that the blind holes must be bored in facing surfaces. One pair of legs is drilled for four roundhead brass screws which serve as pivot-pins for the trays, and here you'll wisely drill the holes through both legs at the same time to insure identical spacing. If you own a router, run a bead cut along the curved edges of the legs; it will relieve their plainness and give that store-bought look.

One pair of legs is joined at the top with a crossrail which is shaped like the legs and then glued and screwed to the pair of legs previously drilled for the pivot screws. Two flathead screws are used at each end of the crossrail to fasten it.

Each tray consists of a hardwood-faced plywood center which is faced around the



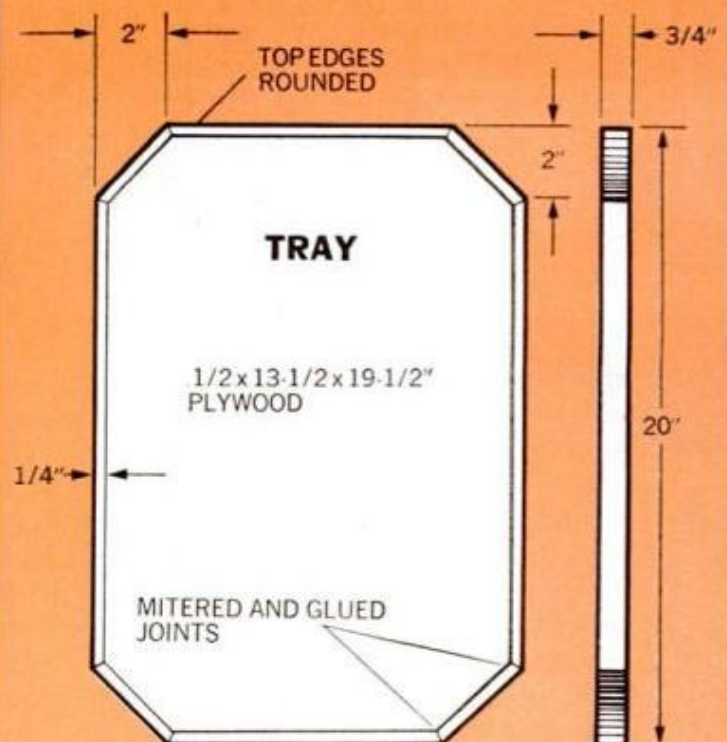
**BETWEEN PARTIES**, if you don't want it standing around, you can fold the server flat and stow it away. Trays lap and nest between the hinged legs

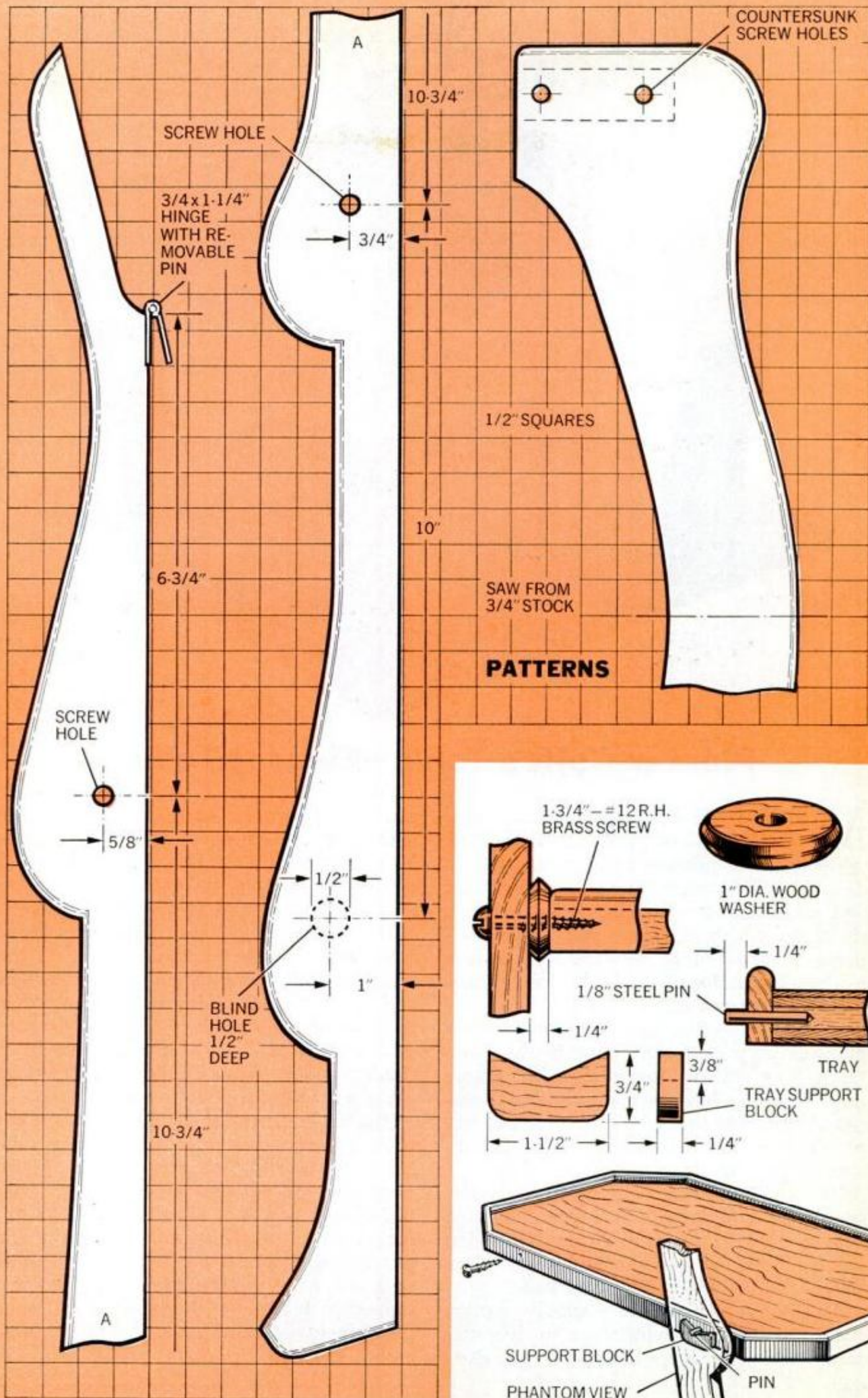


edge with a  $\frac{1}{4} \times \frac{3}{4}$ -in. molding, neatly mitered at the corners, then glued and nailed. Stop pins, made of nails with the heads cut off, are driven into the trays to rest in support blocks glued to the second pair of legs. The pins must not project so far that they rub and mar the legs. Wooden washers keep the trays from rubbing as they pivot for folding.

Pick small brass hinges to hinge the legs at the top. The hinge pins must be first driven out (if you can't get loose-pin hinges) so that the hinge leaves can be screwed in place. The pins are then replaced and your stand is completed.

Finishing the stand depends on the kind of wood you used. If it's walnut, you'll need to fill the open grain of the wood with a paste filler, then stain as desired. Two coats of rubbed-effect varnish will make a mighty handsome piece.







## Planter-Coffee Table—Elegant Today

**M**ARBLE and wood-grain decals, new to *PM* readers back in 1951, helped to make this handsome coffee table the hit it was in the January issue. The fact that you could cover common wood with a simulated finish of rare wood was something in itself. Many readers were quick to show us photos of the tables they made.

Its good looks make this table as elegant looking today and even more serviceable since one can now add the same "skin-deep" beauty to a plain wood frame with durable, long-wearing plastic laminate. Available in wood-grain and marble patterns, the plastic covering is easy to apply and provides an instant finish.

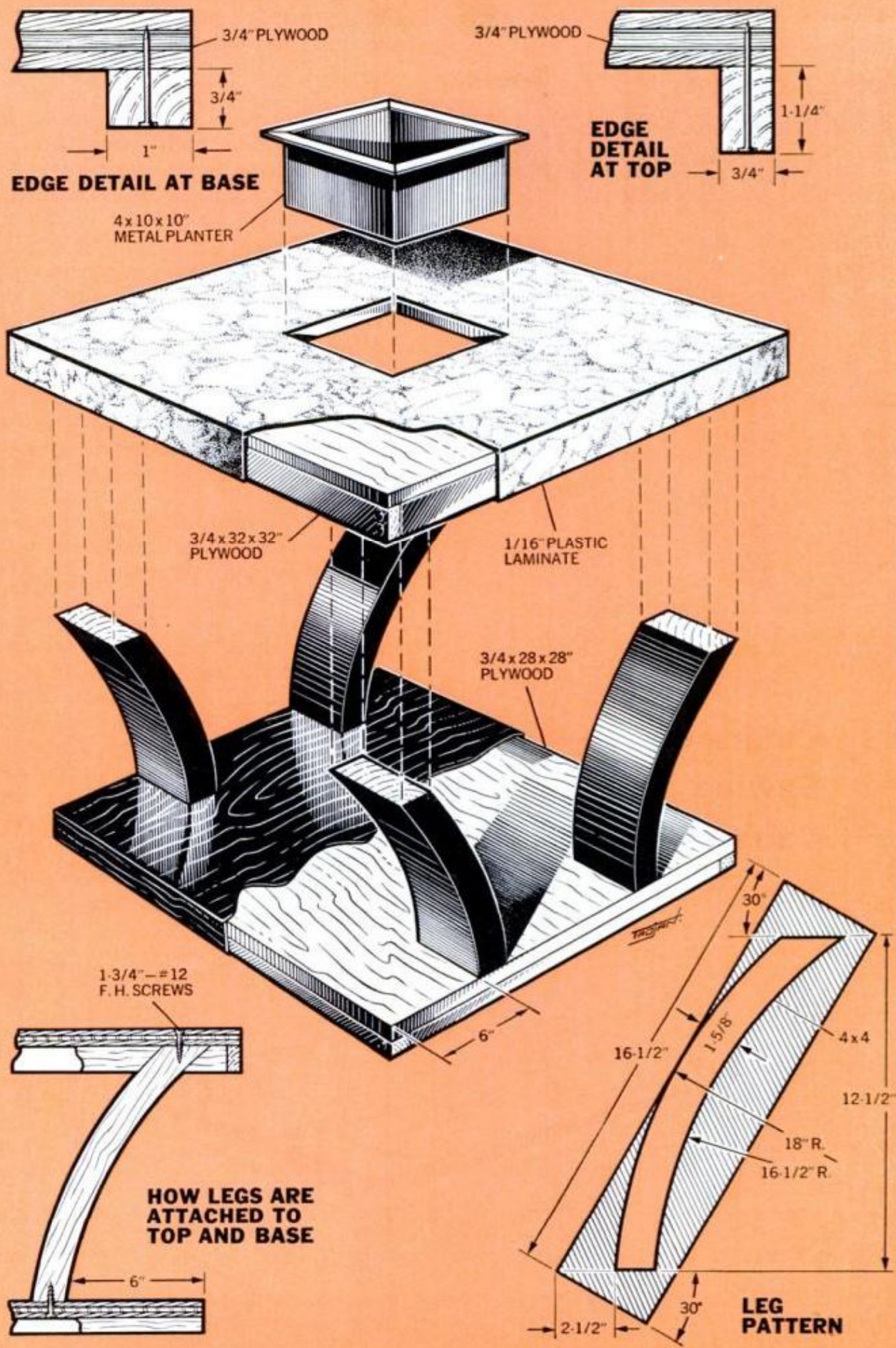
Our cabinetmaker, Everett Johnson, used J-M's Melamite to cover the table shown above. He used a tan Georgian marble finish on the top and brown Imperial walnut on the legs and base.

The top and base are simply square pieces of plywood which are made extra thick at the edges with wood strips. Both

panels are covered completely with laminate, first the edges, then the top. However, wait until after the legs are attached before laminating the top. The hole for the metal planter is sabre-sawed last.

The four curved legs are bandsawed from 4x4 blocks after you first cut off the ends at a 60° angle. Then they're sanded and covered with laminate; first the edges, then the curved surfaces. Easiest way to attach the legs is with screws down from the top and up from the bottom. They are set in 6 in. from the table-base edge.

Plastic laminate is glued to the work with contact cement. After cutting the laminate roughly to size (about 1/8-in. oversize) the cement is brushed on both the plastic and the wood and left to dry for 30 minutes. When it's just dry to the touch (use brown paper to test), the laminate is carefully centered on the work and tapped with a mallet. Remember that once the cemented surfaces touch, the laminate can't be moved.





## Chairside Sewing Cabinet

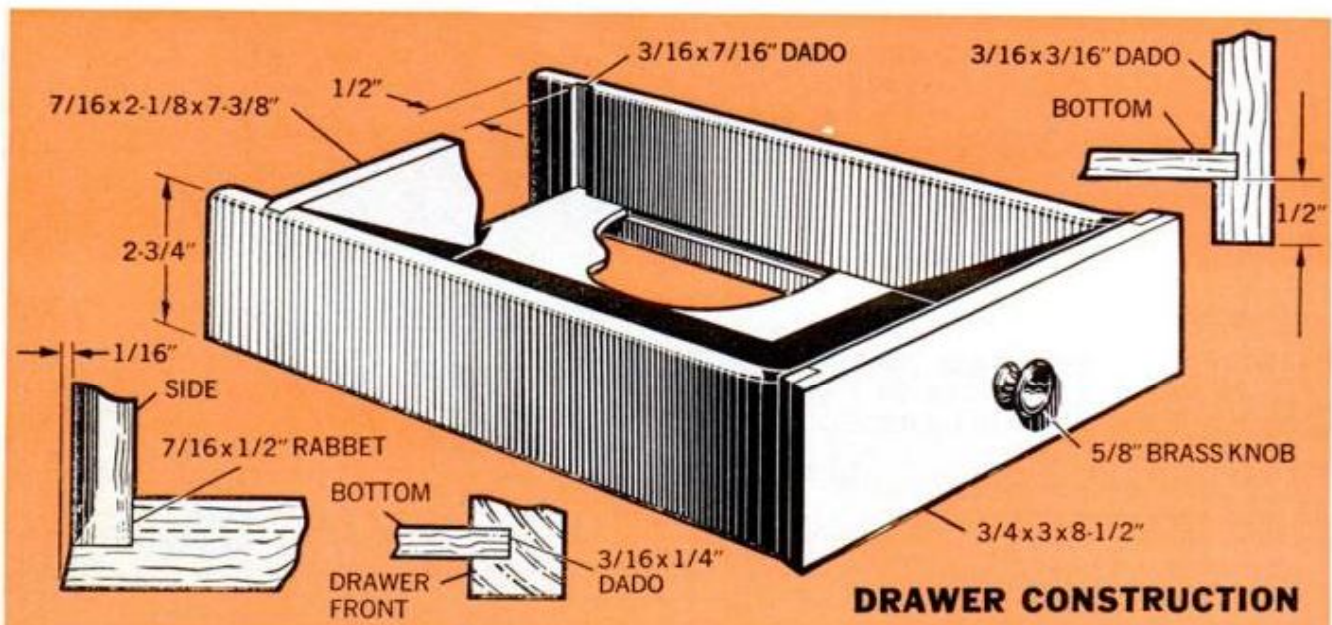
**H**ERE'S A PROJECT readers really liked. This chairside sewing-cabinet design is patterned after one published in February 1954 which won more reader praise than any other furniture project.

In this 1970 version, construction has been simplified by switching to ready-made legs that you can buy in many different shapes and merely screw in place. If your wife likes to sew, she'll love the convenience of this chairside companion.

While it will necessitate gluing up boards, you'll have a more handsome piece if you build it of solid stock—walnut, birch or cherry. Not only will you be able to shape the top and bottom edges as indicated, but you'll have no problem in finishing all edges. However, if you skip the shaping of the edges of the top and bottom members and leave them square, you can use hardwood-faced plywood and cover the exposed wood-plyies with glue-on flexible wood tape.

Start with the two inner side members. These are alike but are made right and left-hand when you're running the dados on the inside for the two  $\frac{3}{16}$ -in. drawer shelves. Notice that the  $\frac{1}{4}$ -in.-deep dados are stopped  $1\frac{1}{4}$  in. from the front edges and then finished up by hand with a narrow chisel. If they're made with a router, you won't have to chisel them. Cut the upper dado 3 in. down from the top.

The back is the same height as the sides and is simply a plain, square-edge member. Before it can be nailed and glued to the sides, the two drawer shelves must be in place. Notice that the back member projects  $1\frac{1}{2}$  in. past the sides.

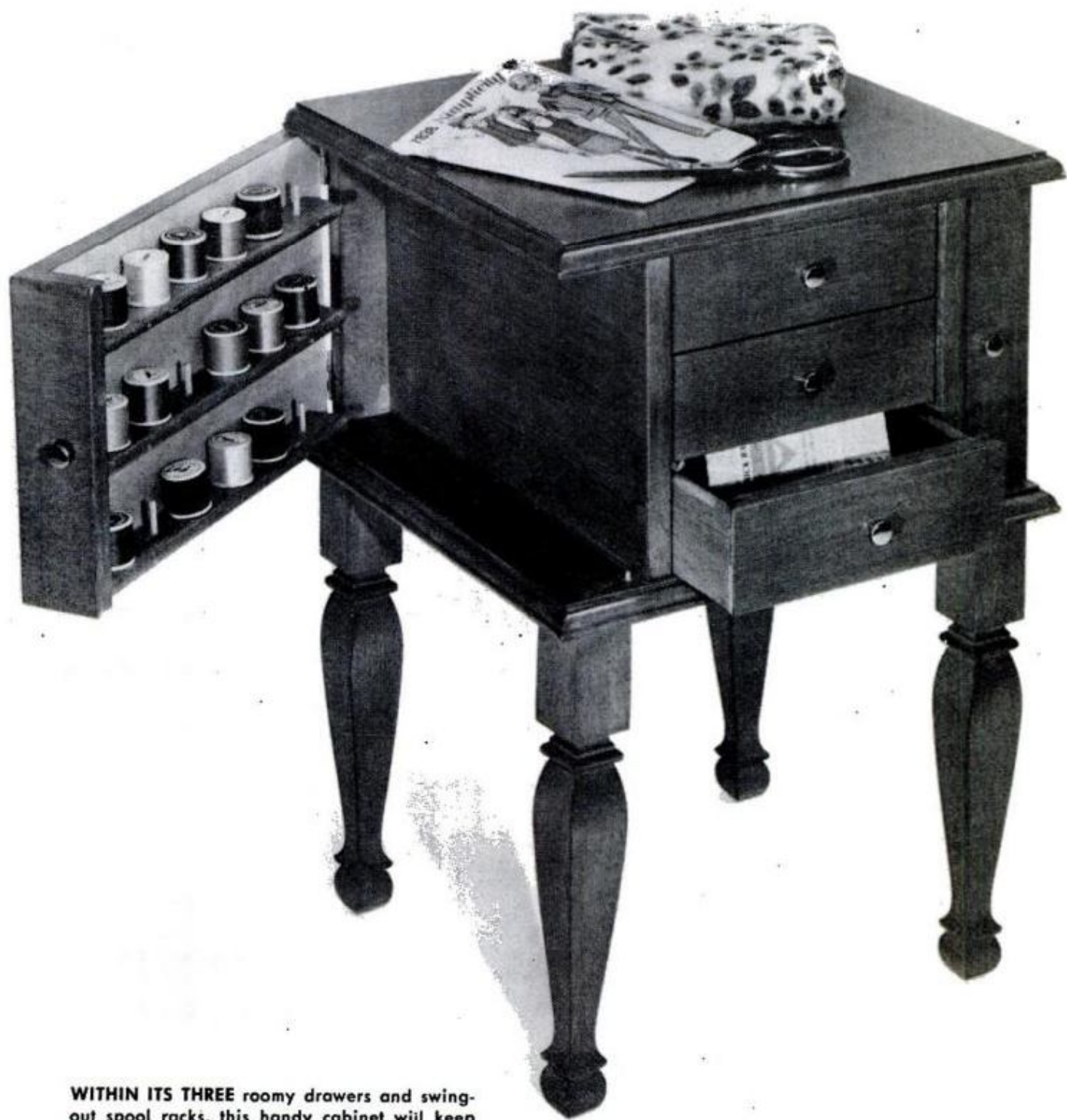


After gluing up stock to a width of 15½ in. cut the top and bottom members 16 in. long. They're shaped only along three sides, not the back. You'll notice that spring-loaded bullet catches are used to "lock" the swing-out spool doors, and you'll be smart if you bore the ¼-in. holes for them before you add the top and bottom members. The latter are kept flush with the back when you glue them.

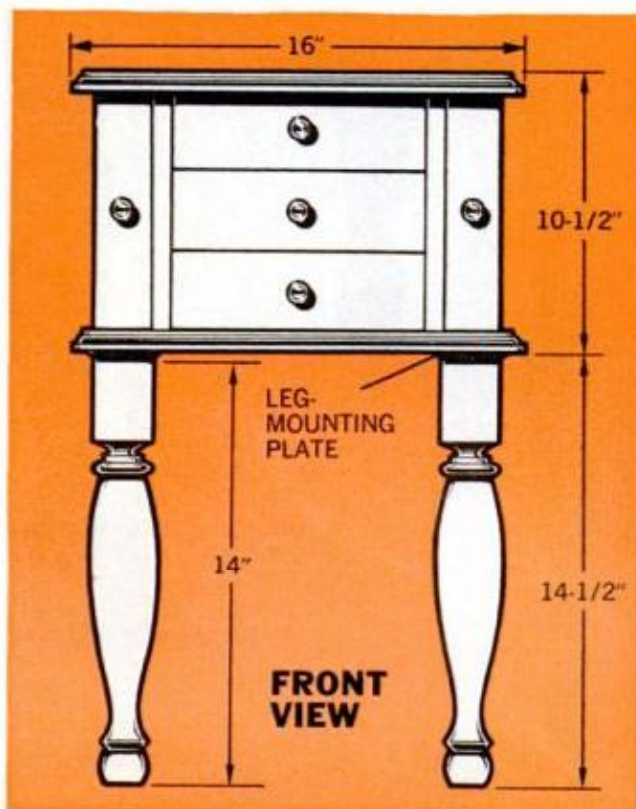
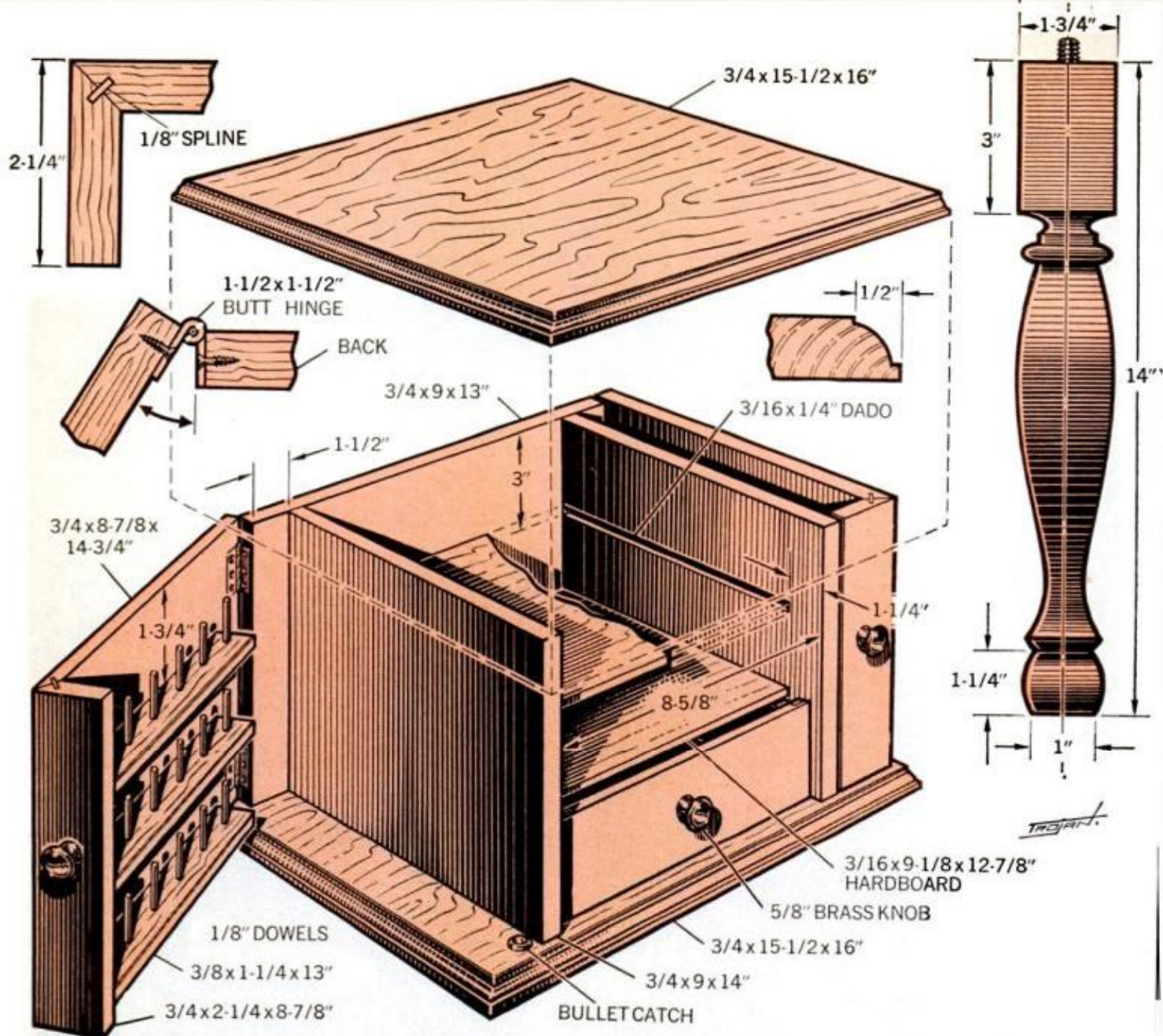
Both side doors are alike but, again,

they must be made right- and left-hand. The narrow fronts are joined to the sides with a miter-and-spline corner joint, after which three shelves, bored for rows of ⅛-in. dowels, are added. The upper shelf is located 1¾ in. down from the top and the lower one is positioned ⅛ in. up from the bottom. Each door is hinged to the back (see detail). Hinge them for 1/16-in. clearance top and bottom.

The detail on the opposite page shows



**WITHIN ITS THREE** roomy drawers and swing-out spool racks, this handy cabinet will keep sewing essentials all in one convenient place



how each drawer is made. You should actually fit them to their openings, leaving enough clearance all around for free sliding. The fronts are  $\frac{3}{4}$ -in. stock; sides and backs are  $\frac{3}{8}$  in. The fronts are also  $\frac{1}{8}$  in. higher than the sides to lap and conceal the drawer shelves. Notice that rabbeted ends of the drawer fronts have a slight inward bevel. This assures ample side clearance for the drawer itself without a sloppy fitting front. Notice, too, that the drawers set back in  $\frac{1}{4}$  in. A thumbtack at each front corner of the lower opening will keep the bottom drawer from rubbing on the cabinet and marring its finish.

If you own a router or shaper, you can give the drawers a factory-made look by rounding the top edges of the side members. You would do this, of course, before the drawers are assembled and stop the cutter at a point where the side enters the rabbet. Your cabinet is completed when you add small brass knobs.





## Flip-Over Ladder-Chair

**I**T'S A CHAIR, it's a ladder, it's unique. To top it off, it's extra handy to have sitting around. That's what a lot of readers thought of this novel chair design when first published in the February 1952 issue.

When the average chair is too low or too high to enable you to reach a cupboard shelf, attach a curtain rod or change a light bulb, this double-duty version simply flips over to become a sturdy 3-ft. stepladder.

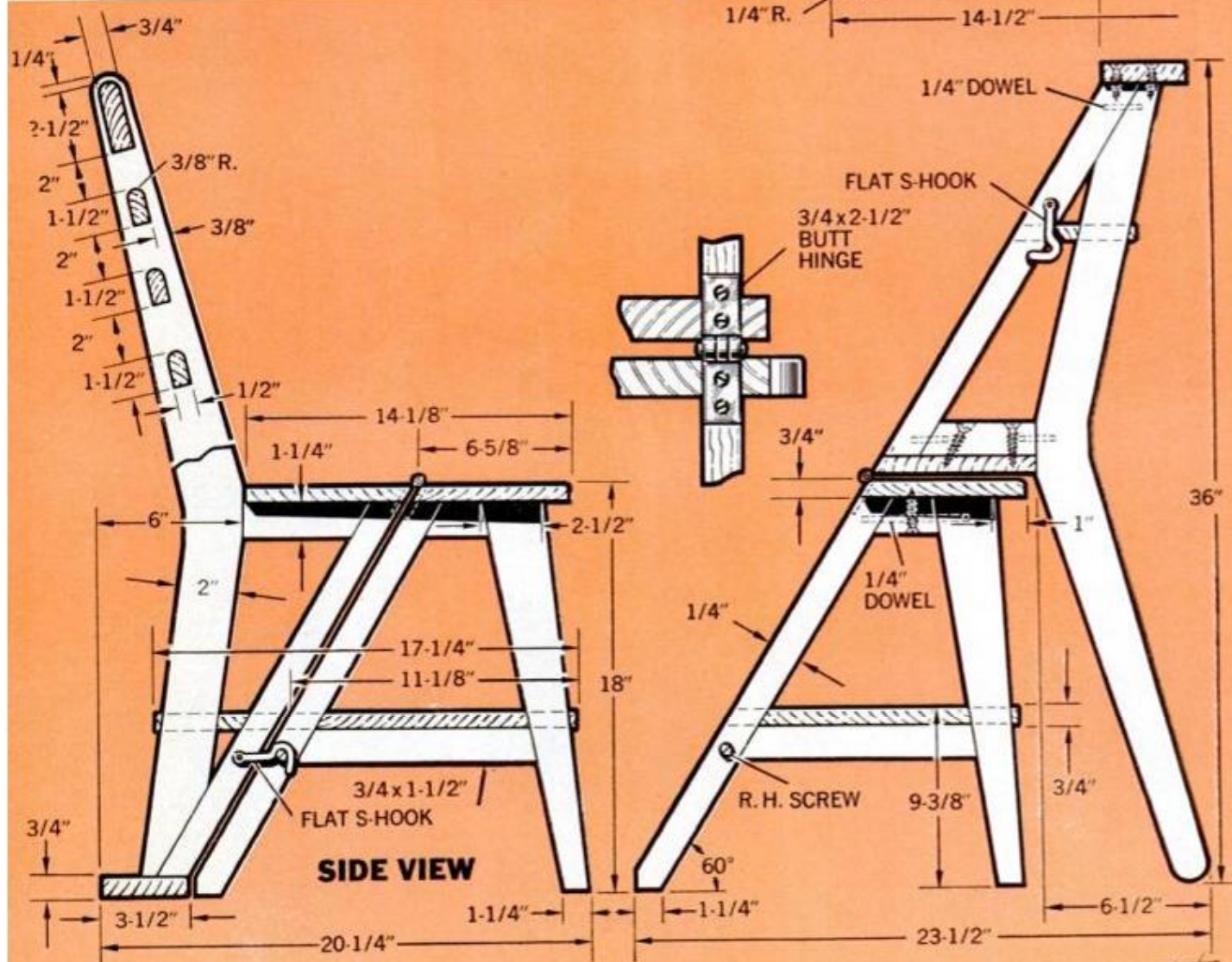
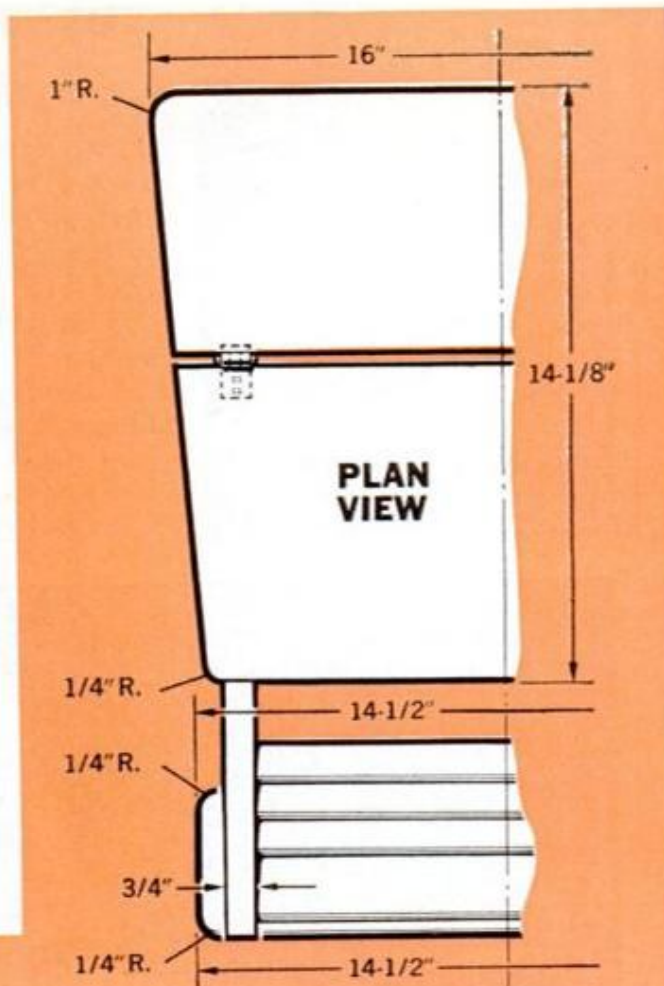
To make one like it, start with the four leg assemblies. These are made in pairs and, in the case of the back legs, the two assemblies must be made right and left-hand when you bore the holes for the slats. Dowels are used throughout to join the legs to their rails and



the slats to the legs. When you bore holes for the slats, make certain you don't go deeper than  $\frac{1}{2}$  in.

Except for the two halves of the seat, which are added last, each half of the chair is assembled as a separate unit. The steps are notched to fit around the legs, and in the case of the back assembly, the step, plus the four slats, must all be glued and clamped at one time.

The two seat-halves meet at a bevel and are cut to overhang the legs as indicated. After the seat members are aligned and screwed in place, the two sections are hinged together with narrow  $\frac{3}{4} \times 1\frac{1}{2}$ -in. steel butts. These are set flush in shallow gains hand-chiseled in the surface. Finally, when the chair is painted or varnished, as the case may be, rubber stair treads are cut to fit and tacked to the steps for added safety. Flat brass, S-hooks made to lock over roundheaded screws, are added to hold the two chair sections together when the ladder-chair serves as a chair. \*\*\*

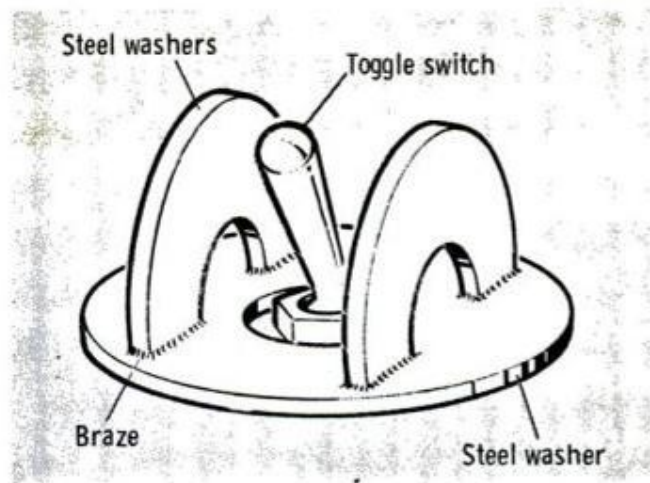


# HINTS FROM READERS

## Washers guard toggle switch

A critical toggle switch, such as one for a fire alarm, should have a guard that will prevent its accidental activation. Two washers, one smaller than the other, can be brazed together to serve such a function. Place the "base" over the switch, and cement it in place with epoxy resin.

—William S. Gallagher



## Roll out the saw table

Wanting a movable table for my table saw, I customized two legs of a laundry table as shown at right. When I'm sawing, the table is perfectly still; to move the unit I simply lift the table at the side between the two nonrolling legs. To insure no movement while you saw, be sure there is no weight on the casters when the table is on all fours.—William Slamer

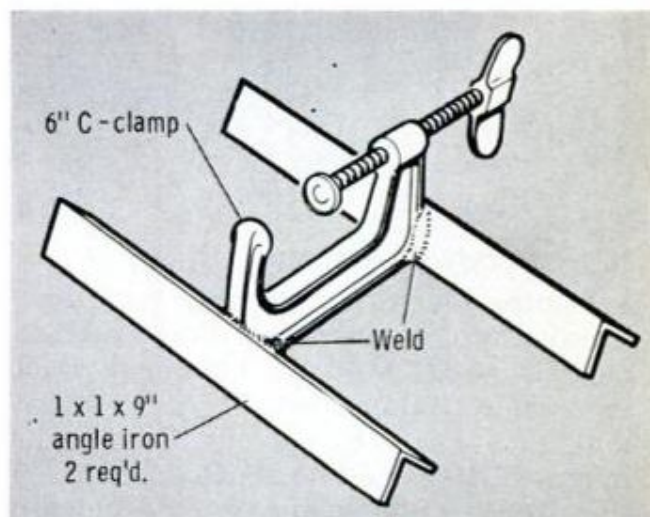
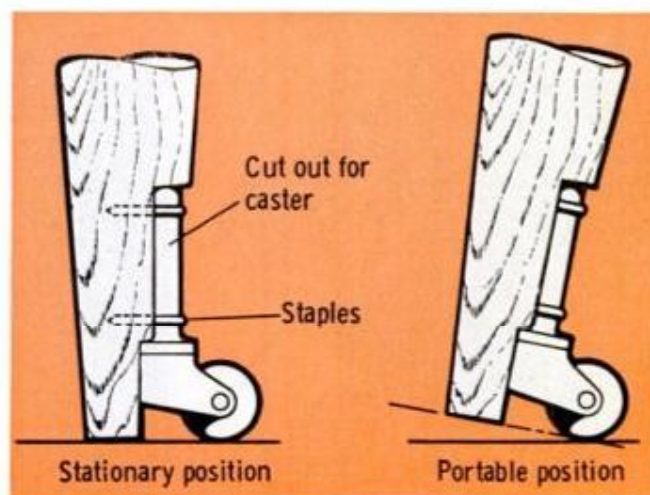
## Fast way to quiet squeaky floors

A squeaky first floor can be hushed by driving wedges between floor joists and flooring, but this is impractical on the second level because of the ceiling below. To stop such squeaks, clip the heads off underlayment nails and drive them between boards where the noise occurs. The noise will stop and the headless nails are practically invisible.—Julie Neibert

## Low-cost welding vise

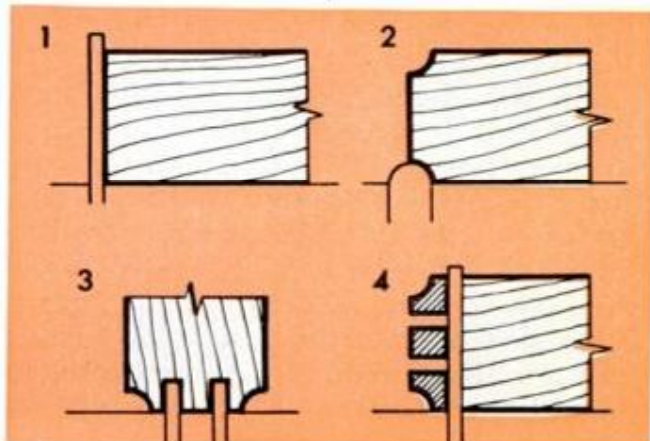
Here's a handy bench welding "vise" you can make in less than an hour for a couple of bucks or so. Simply cut two pieces of 1x1-in. angle iron to length as shown and fit with a 6-in. C-clamp. After inverting the irons, locate the clamp to insure best contact for welding, spot-weld the setup and you're in business.

—Leonard Workman



## Custom-made wood molding

On a recent project I needed some very small cove moldings which I found were impossible to buy. So, I made my own as shown at right by: 1. squaring a piece of stock; 2. routing the edges with a 7/32-in., veining bit; 3. making two saw cuts in the edge, and 4. slicing off the two lengths of molding (and scrap center) on the table saw. The result was exactly what I needed.—Eugene Florida



Before you buy an arc welder, make sure that your shop has adequate power. If not, here's how to . . .

# Install a Circuit For a 230-v. Arc Welder

By JOHN BURROUGHS

*Technical Art  
By John Lind*



**N**OT TOO MANY YEARS AGO transformer type a.c. welders had three drawbacks. For one, they didn't perform as well as d.c. welding equipment. Each time the a.c. alternated, 120 times a second, the arc tended to go out. Then manufacturers developed flux-coated electrodes that would stabilize an a.c. arc—and this made comparatively inexpensive transformers work about as well as higher-cost d.c. welders.

Another drawback was that when molten metal from the welding electrode sprayed across the arc, decreasing the arc's electrical resistance, older welding transformers drew amperage from the line in irregular surges, and this tended to disrupt power-company distribution systems. Improved transformer design solved this problem. The windings of modern "limited input" transformers provide enough reaction to limit fluctuation.

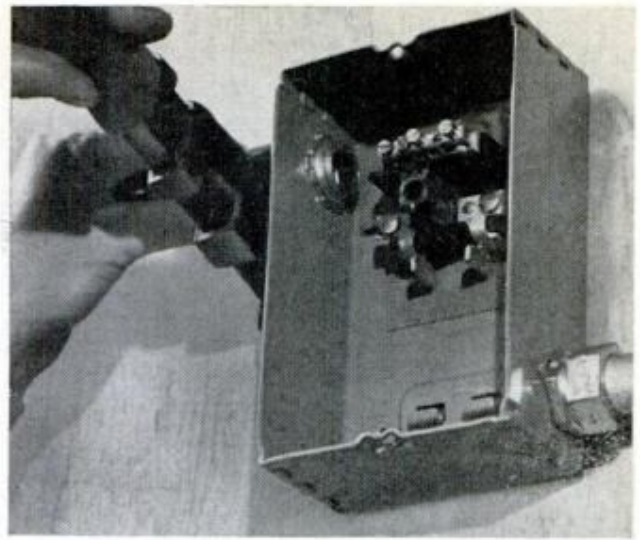
The third disadvantage was that you needed a high-capacity separate 230-v. circuit to plug an a.c. welder into. You still do. But today 230-v. circuits are common in every home. The circuit needed for a limited-input shop welder is the same as the 50-amp. circuit required for a modern electric range or clothes dryer.

Putting in a suitable circuit takes care of this last disadvantage—and you can then begin enjoying the biggest bargain in a shop tool you'll ever find. I'm convinced that no other shop machine expands your capabilities like an arc welder. You can buy a welder for around \$100 that will last a lifetime (maintaining its resale value), and it will save you its cost many times over.

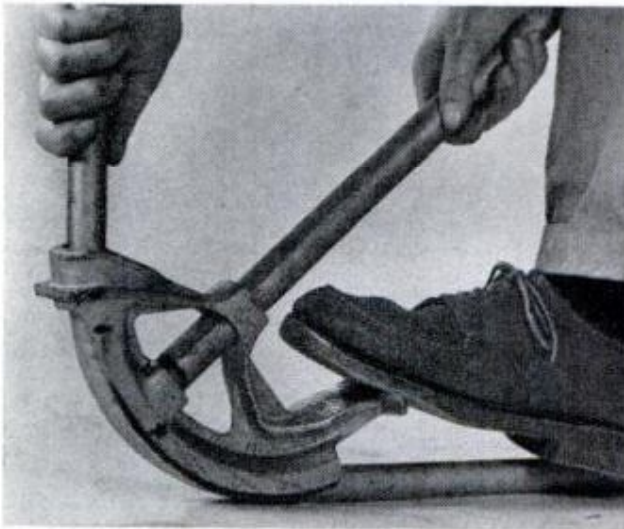
Don't let lack of welding know-how hold you back. You'll learn to weld by welding. A complete novice can catch the knack of making satisfactory welds in



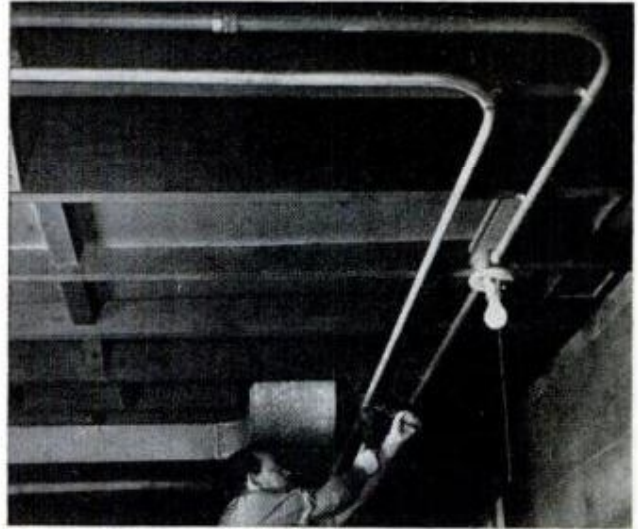
**WELDER MANUFACTURERS** advise using a three-wire cable enclosed in grounded conduit. Circuit wired with three No. 8 copper conductors has the capacity for a 180-amp. welder. Use  $\frac{3}{4}$ -in.-dia. conduit



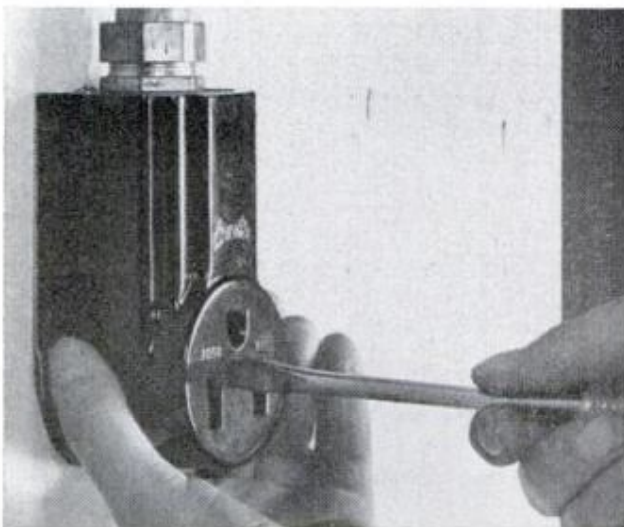
**AUXILIARY BREAKER PANEL** should be installed in shop near the machine that will use it. Except in some rural areas, permits are required for wiring the installation and work is checked by inspector



**CONDUIT BENDER** makes quick work of making 90° bends. Since the electrical code allows four 90° bends per conduit run (box to box), you'll be able to make installation without using junction boxes



**JOB LOOKS NEATER** if new conduit is run parallel to an existing circuit. Remember to ream burrs from all cut ends when installing conduit. For rigidity, pipe straps are spaced no more than 5 ft. apart



**230-V. RECEPTACLE** is installed with ground terminal at top to permit welder's input cable to hang down. Final step in the work is to check for electrical continuity by using a test lamp at the receptacle

mild steel with an hour's practice. The instruction booklet supplied with the equipment will give you enough information to get you started.

If you take an experimental crack at welding with a rented machine, an instruction booklet should come with the rental. If not, you can get a booklet on arc welding from Sears for 50 cents.

When planning a permanently-installed circuit for a welder, choose a fire-safe work area. Since the arc will throw sparks, an area used regularly for welding should have fire-rated walls, ceiling and floor. And, because welding galvanized steel produces fumes, the area should also be well ventilated.

Check with your power company before beginning the wiring job. Some localities

have antiquated distribution lines so the utility company imposes restrictions on the use of welders. Be sure you explain that you plan to perform light, home-shop welding with a limited-input, 20 percent-duty-cycle machine; not heavy-type work with industrial equipment.

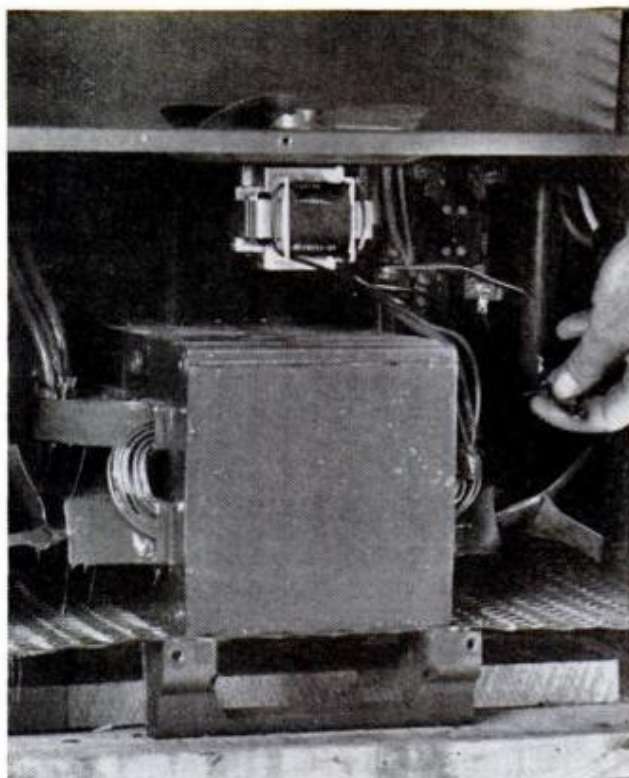
Also check with your fire department. Although fire codes require permits for arc-welding equipment, in most localities fire authorities apply this requirement only to welders used commercially.

All wiring must be installed in conformance with the National Electric Code and all installations should be UL-inspected and approved.

Provided you use common sense, you needn't hesitate to put in the circuit for an arc welder yourself. Unless you're thoroughly familiar with your home's service-entrance panel, however, don't attempt to hook the new circuit to the line. Play it safe: Run the wiring yourself, which will save you most of the labor cost, and then call in a qualified electrician to connect the circuit to the line at the service panel. He can do it in minutes.

Since the 230-v. circuit is very simple, you'll have no difficulty complying with the code. The wiring should be enclosed in grounded thinwall conduit, which makes the installation fail-safe. The code requires that the circuit shall have (1) a disconnect means, (2) overcurrent protection, and (3) conductors large enough to carry the load.

Installing either a fused switch (with a cartridge fuse for each hot leg of the circuit) or a 230-v. circuit breaker at the

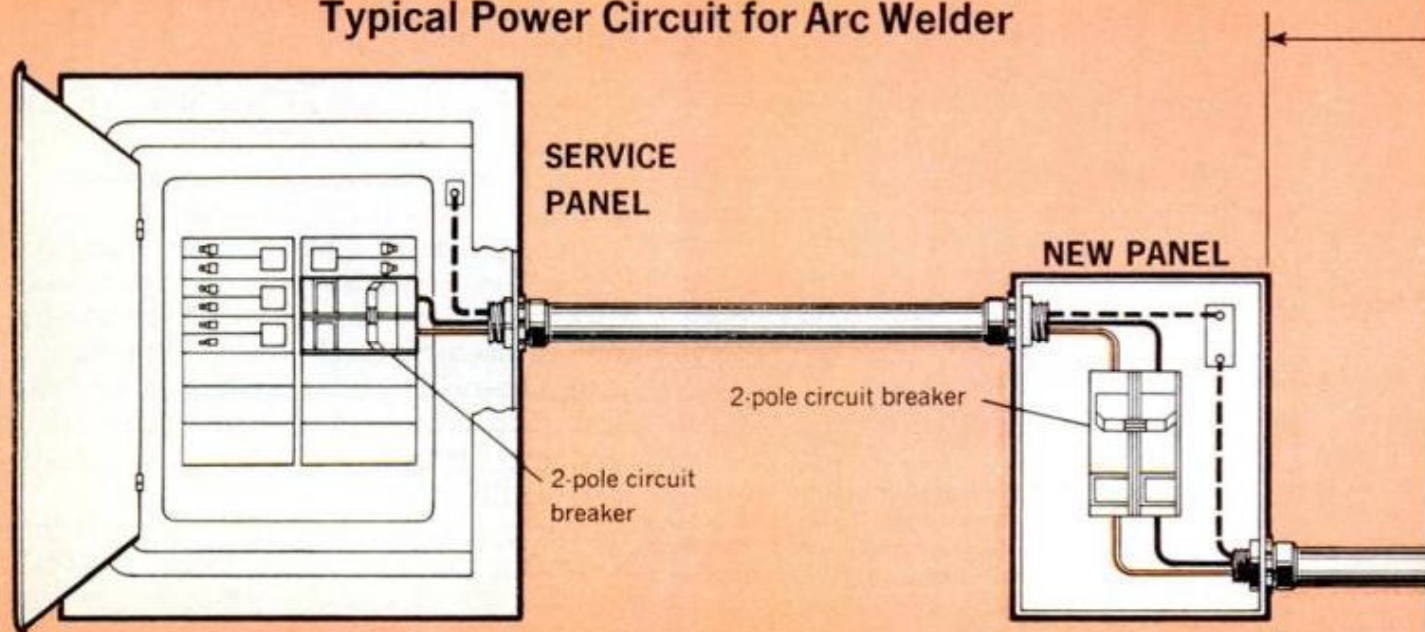


service entrance panel will satisfy the first two requirements.

Both the size of the circuit's three conductors and the diameter of the conduit needed to enclose them will depend on the welder's rating. Two arc-welder sizes, 180-amp.-output and 225-amp.-output models, are commonly used in home shops. A welder that delivers higher amperage can "burn" larger-diameter electrodes and deposit weld-metal more rapidly. But since most shop welding—pipe, angle and light-plate—is done in the 60-to-130 amp. range, a 180-amp. transformer is adequate for all but the heaviest work.

Most 180-amp. welders have 20 percent-

### Typical Power Circuit for Arc Welder





**MOST TRANSFORMERS** in 230-v. welders have 280-v. primary tap that can be disconnected to operate on low line voltage (photo, far left). Arc welding (left) should be done in fire-safe, well-ventilated area. Shop preferably should have concrete floor and walls, and sheet-metal ceiling. Fire-brick makes an adequate work surface. If you would like to experiment before buying your own welder, you can rent a machine for about \$5 a day and plug it into your dryer receptacle. Most rental firms will also supply heavy-duty, three-wire 230-v. extension cables with No. 10 conductors. You can then use the welder at 20-percent duty-cycle with settings up to about 140 amps. without fear that it will trip the 50-amp. breaker in the circuit

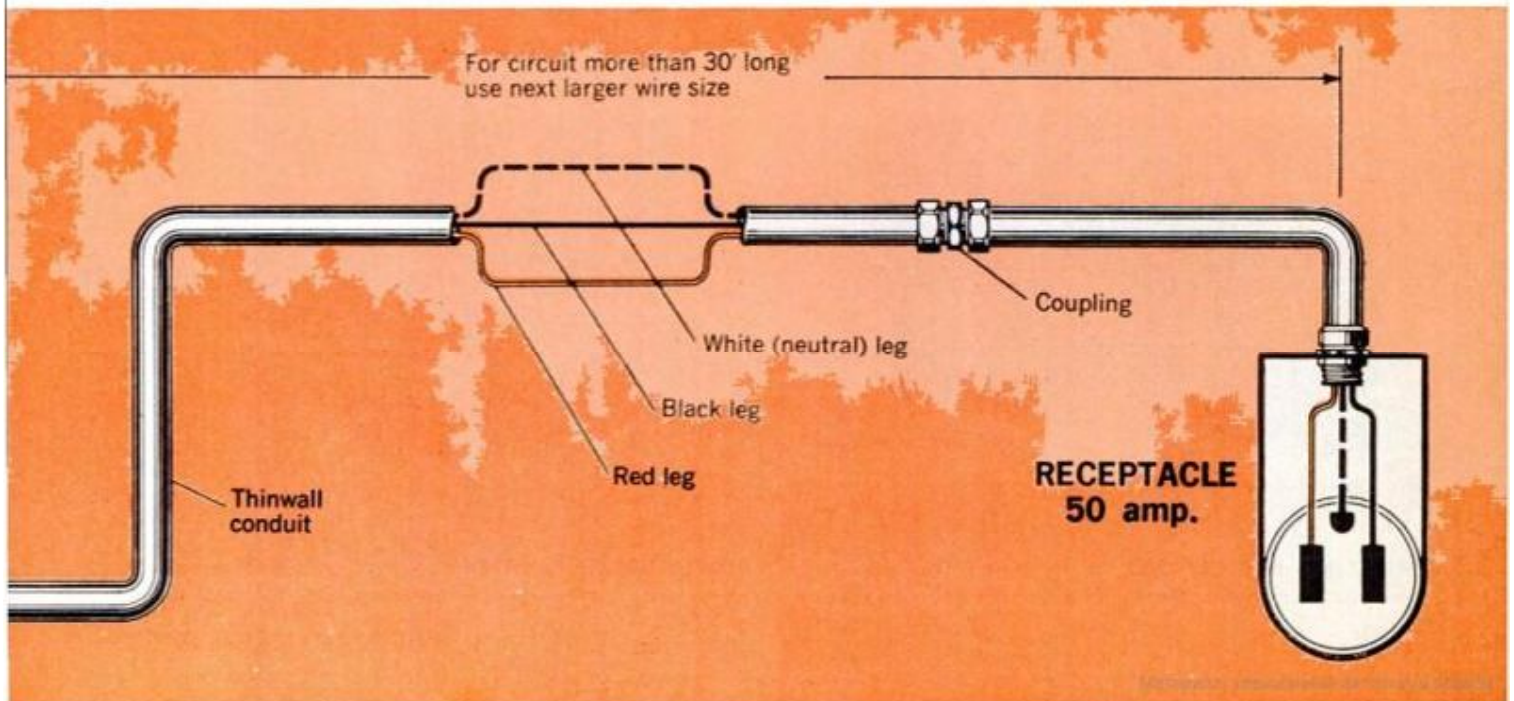
duty-cycle *input* ratings of 37 amps., low enough to permit their use on rural power lines. Most 225-amp. machines have 20 percent-duty-cycle input rating of about 50 amps.

For a 180-amp. machine install a circuit wired with three No. 8 copper conductors in  $\frac{3}{4}$ -in.-dia. conduit. For a 225-amp. machine use three No. 6 conductors in 1-in.-dia. conduit.

The conductors used must be continuous (without splices), and must be color-coded—the hot legs red and black and the neutral wire white. You can pull three separate wires into the conduit, or, as some welder manufacturers recommend,

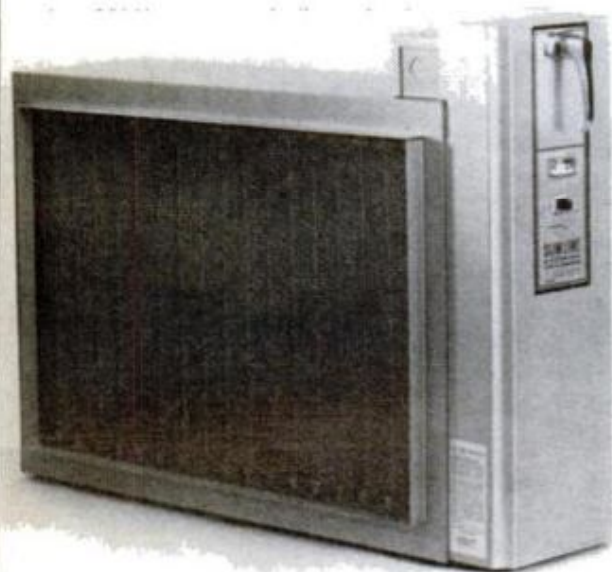
simply shove in three-wire plastic-sheathed cable. The fuses or two-pole breaker protecting the circuit must be in the two hot (red and black) legs. Be sure the white neutral runs uninterrupted.

While a 50-amp. circuit normally must have a 50-amp. circuit breaker or fuses, the section of the code devoted to arc welders allows use of larger breakers or fuses in welding circuits to avoid unnecessary tripping by momentary current surges. Use a breaker or fuses with a high enough rating that they will stay closed when the arc is struck but low enough that they will open when the welding electrode "freezes" to the work. ★★

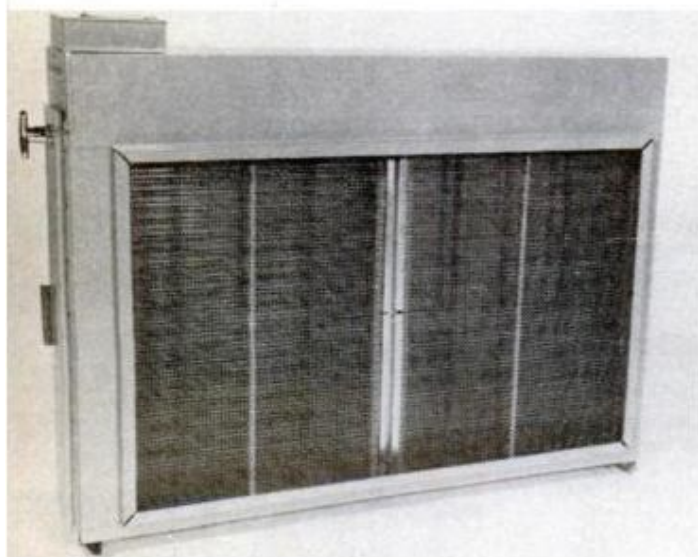


# Breathe Easier With a Home

**Air pollution is a problem that is constantly increasing. But now, activated charcoal is being put to work to create a more healthful climate inside the home**



**DOUBLE-CELL ELECTRONIC CLEANER** by Honeywell is claimed to increase air cleaning by 75 percent



**SLIM-LINE AIR CLEANER** is designed for use with central heating system. Emerson Electric makes it

**CLEANUP OF THE AIR** outdoors is too big a job for an individual. But, you can now do something about the air inside your home with air-cleaning appliances. Known variously as home air filters, cleaners or purifiers, these devices don't create completely "pure air" but they do serve to bring about a more healthful household climate.

As the name suggests, an air filter sets up a screen to trap dirt particles and other impurities as air passes through. Hundreds of models are on the market, but most fall into three basic categories: the electronic appliance which usually requires professional installation as a part of the household heating system; portable room units; and mechanical filters which can be attached to heating ducts in the home by the user.

Typical electronic air cleaners, which are installed in the return-air section of a furnace duct system, are the Slim Line unit manufactured by Electro-Air, a division of Emerson Electric Co., and the Double-Cell Electronic Air Cleaner in Honeywell's Residential Div.

Units like these are capable of removing up to 90 percent of all soot, smoke, pollen, spores, bacteria dust and dirt from the air passing through them. Their installation in a home helps to keep the furnace combustion chamber and the airconditioner cooling coils clean, which allows the furnace and conditioner to operate at peak performance.



**POWER-DRIVEN ASHTRAY** with charcoal filter eliminates, odors. Paar Manufacturing, Des Moines, Iowa

POPULAR MECHANICS

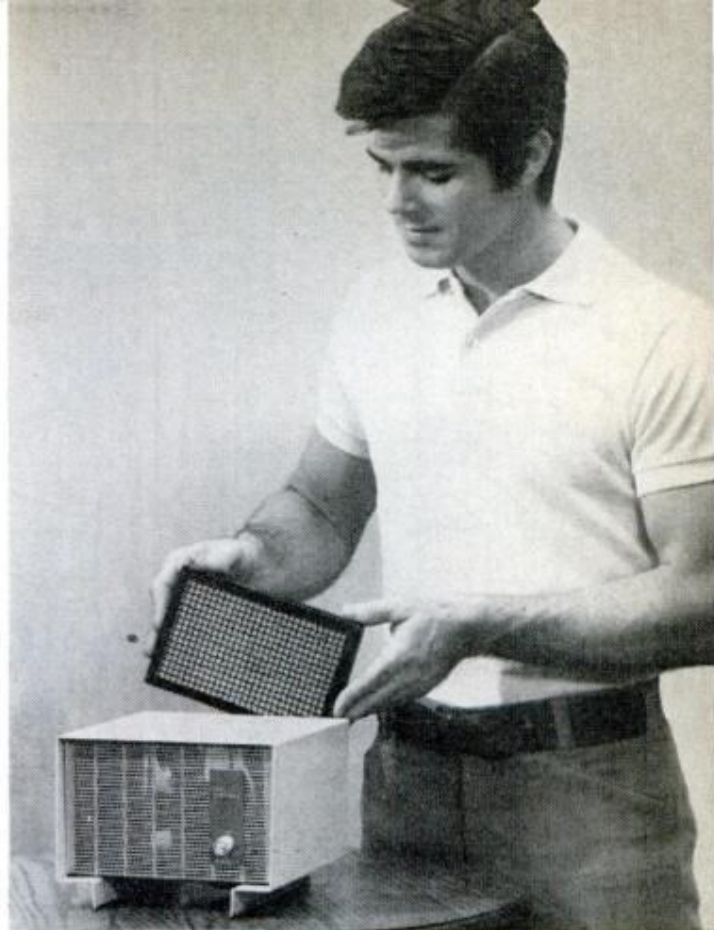


# Air Cleaner

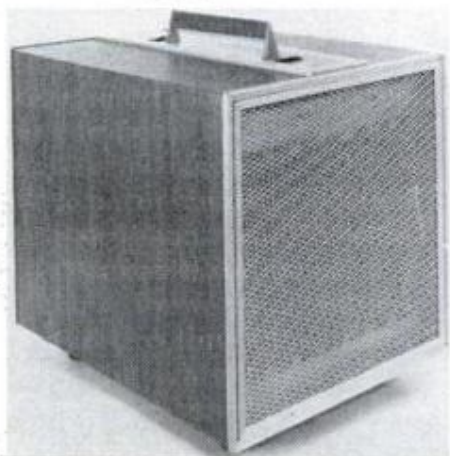
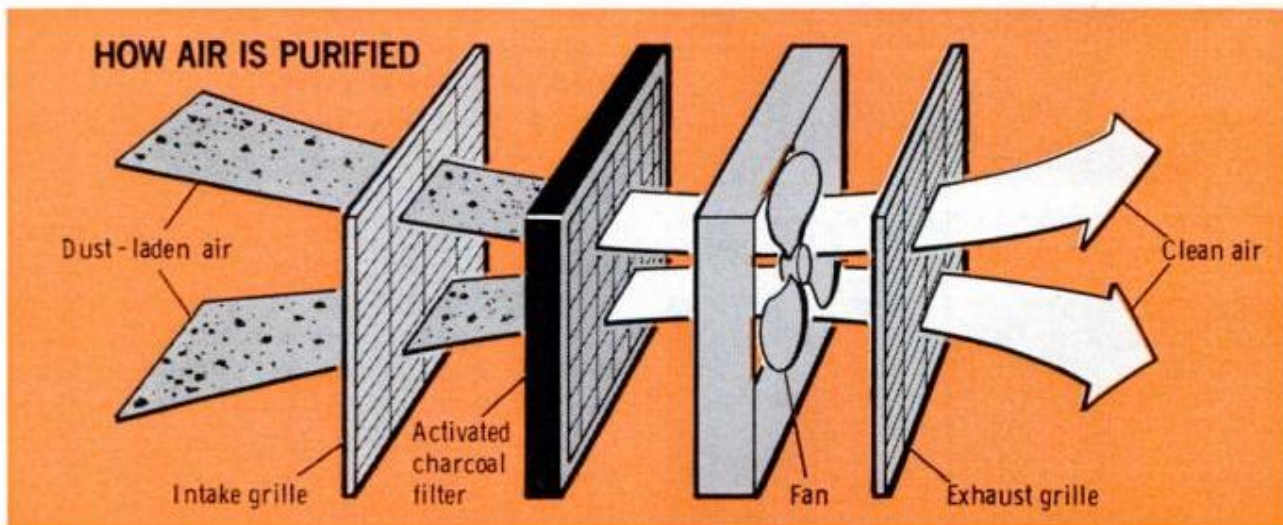
To help filter toxic or corrosive gases, vapors and household odors from the air, many electronic furnace filters utilize an activated charcoal filter. Activated charcoal has long been known for its capability of adsorbing impurities in the air. Used to filter the smoke in certain brands of cigarets, activated charcoal is so porous that a single pound of the substance offers the equivalent of 140 acres of surface to trap impurities.

For a less expensive method of cleaning the air in homes not equipped with central heating, the portable air purifiers now on the market give a highly effective means of single-room air cleaning. They can be especially helpful in the homes of allergy sufferers where the air in a single room has to be kept as clean as possible.

★★★



**LIGHTWEIGHT PORTABLE** plugs into any outlet, utilizes charcoal. Emerson Electric, McKees Rocks, Pa.

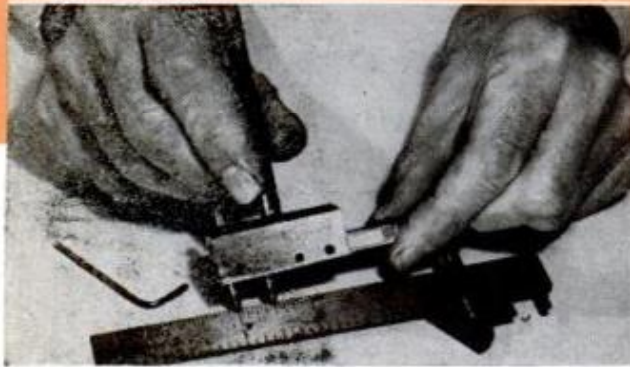
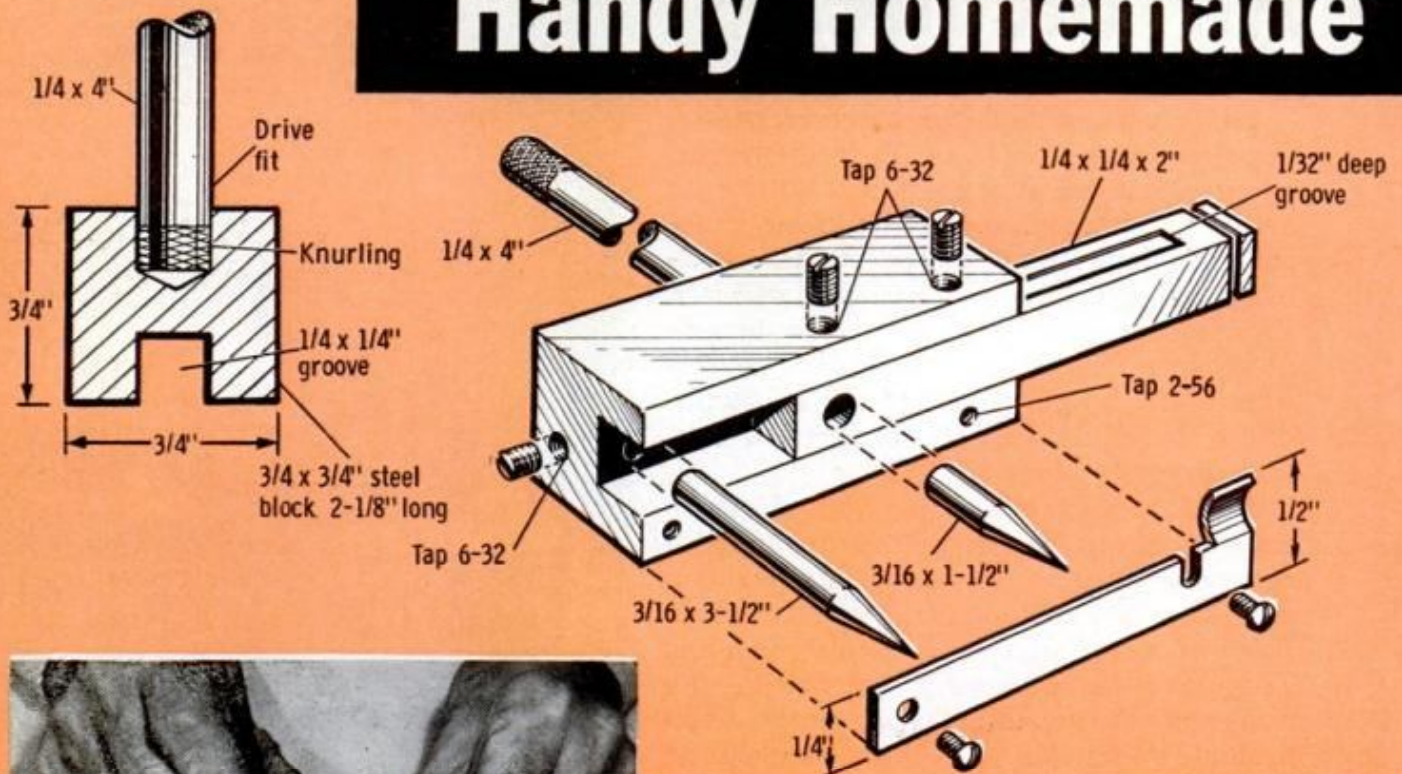


**SELF-CONTAINED UNIT** which will remove up to 95 percent of dust in 20x20-ft. room. Emerson Electric  
FEBRUARY 1970

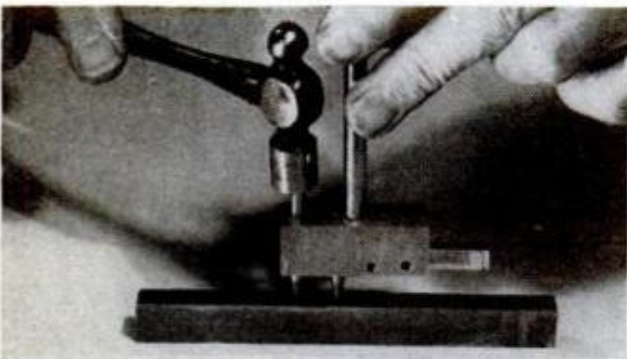


**PORTABLE UNIT** boasts patented collector plate. It's made by Radex, 2076 Elston Ave., Chicago, Ill. 60614

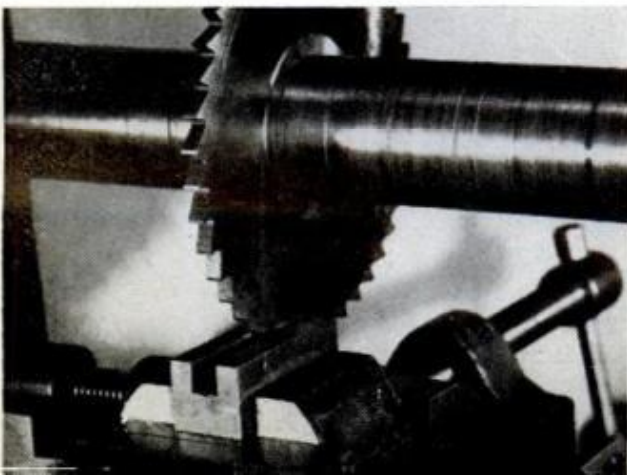
# Handy Homemade



**SET POINT SPACING** with the aid of a steel scale. Once set, jobs can be laid out in production fashion



**FOR PRECISE POSITIONING**, adjustable point is placed in starter hole, fixed point is then rapped



By **WALTER E. BURTON**

## SPACING PUNCH

This spacing punch simplifies the positioning of layout marks for drilling holes or performing other operations. It consists of a body fitted with a fixed punch point and an adjustable point in a sliding bar. In normal use, the adjustable point is placed on the reference mark (this can be a punch mark), and the upper end of the fixed point is tapped with a hammer.

The punch shown, dimensioned as in the drawing, has a normal range of  $\frac{1}{4}$  to  $1\frac{3}{8}$  in. By reversing the slide, the range can be increased to 3 in.

To use the punch in the maximum spacing range, the slide is reversed to position the point outside the body groove. To do this, it is first necessary to loosen the spring strip and swing it out of the way. Screws holding the strip need not be removed if one screw extends through a notch, as shown in the drawing.

The handle is simply a length of round rod driven with a force fit into the top hole in the body. The slide is held snug where it's wanted by the spring-strip while two 6-32 setscrews, which press against its side, can be tightened.

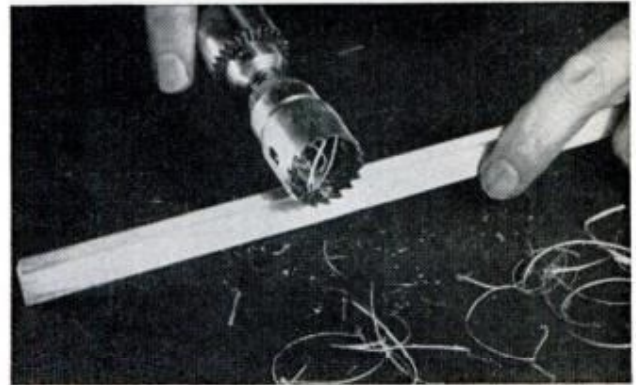
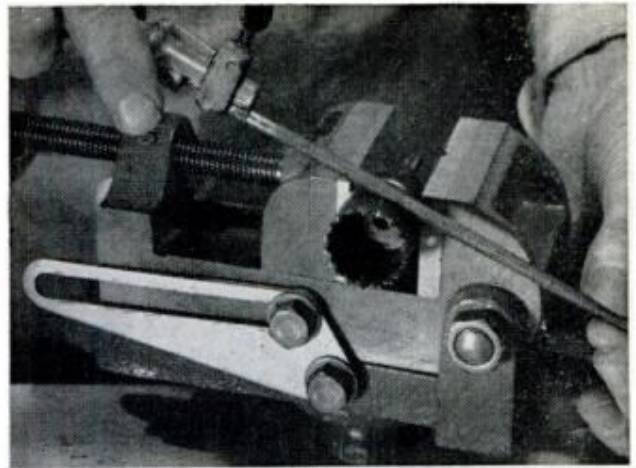
**SLOT IS MILLED** in body block for adjustable slide

# Shop Tools

## HOLE-SAW EDGE ROUNDER

If your toolbox lacks an edge-rounding tool when you want to remove sharp corners from wood, you can make an efficient one from a hole saw. In the side of the saw, file a rounded notch just deep enough to intersect the inner surface. Usually (unless you have inserted a plug to act as a support) this surface will spring inward without breaking. Remove the springy metal film with a knife, then carefully continue to file until the opening is the size desired for the edge radius. Hone the inner surface with a rounded oil stone to remove burrs and form a keen edge.

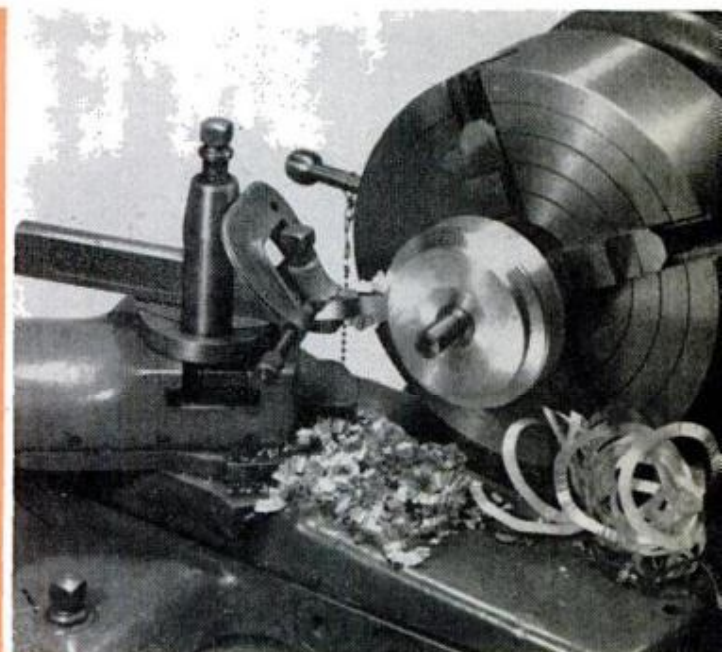
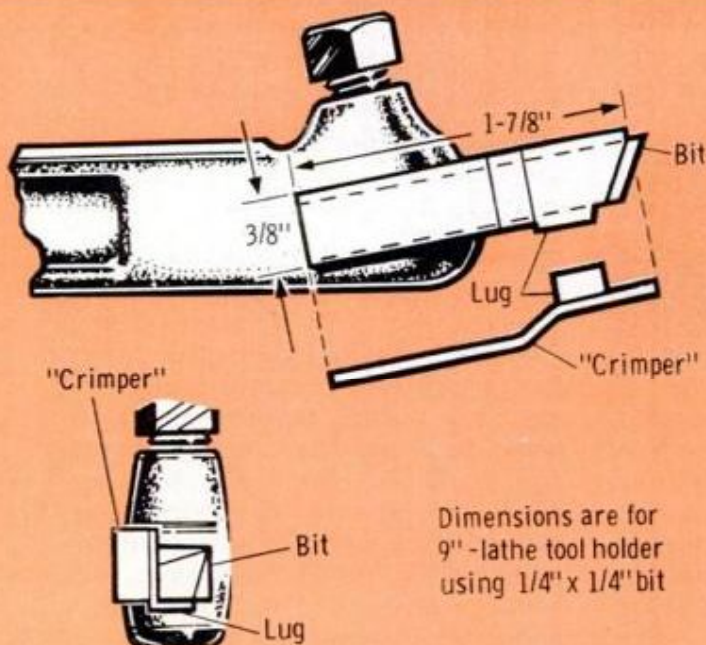
**IF METAL IS DIFFICULT TO FILE** (top right), use abrasive wheel to cut notch. To shave square edge of a board round, use edge of the notch to "plane"



## CHIP CONTROL FOR LATHE BIT PREVENTS BUILDUP

On a recent aluminum-turning job I did, the chips came off in long ribbons which wrapped around the chuck and work, making it necessary to stop the spindle every minute or so to clear the chips. To end this nuisance I installed a "chip crimper" on the toolholder. The crimper is a strip of stiff sheet metal C-clamped to the toolholder so that it presses against the bit on the side away from the cutting edge and extends  $\frac{1}{16}$  in. above the sloping top surface of the bit. The chip, sliding down this slope, strikes the projection and is crimped or broken. Chips thus accumulate in compact bunches which don't entangle the work. The lug projecting under the bit prevents upward movement of the chipper and eliminates the tendency of it to move out of the path of the chip. To do the trick the chipper need not extend to the tip of the bit. ★★

**CHIP CRIMPER** is shaped to fit around end of toolholder, C-clamps hold the crimper in place on toolholder



# EXCITING NEW PRODUCTS

By CATHERINE BILSKI



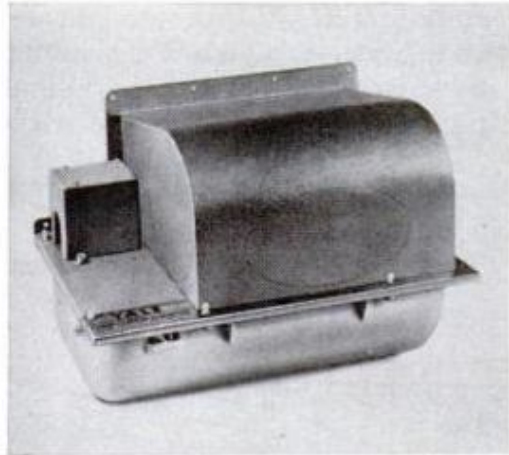
**CHESS EXPERTS** and beginners will enjoy this challenging, fun-filled game. Called Double-Chess, it can be played by two, three or four players. The set includes four "armies" (64 chessmen), a 24x24-in. game field hand-screened in red and white, plus complete instructions on how to play the game. It retails for \$14.95, or \$19.95 for a deluxe set, both postpaid from Normandy House, 4701 Normandy Drive, Fort Worth, Tex. 76103.



**HANDY WAY TO MIX EPOXY**, as well as to dispense it, is with the "Mix-Tube," which consists of two tubes hitched together. You squeeze the contents of the small tube into the large tube and mix by rolling the latter tube between palms. Retailing for \$1.80, it is made by Devcon Corp., Danvers, Mass. 01923.



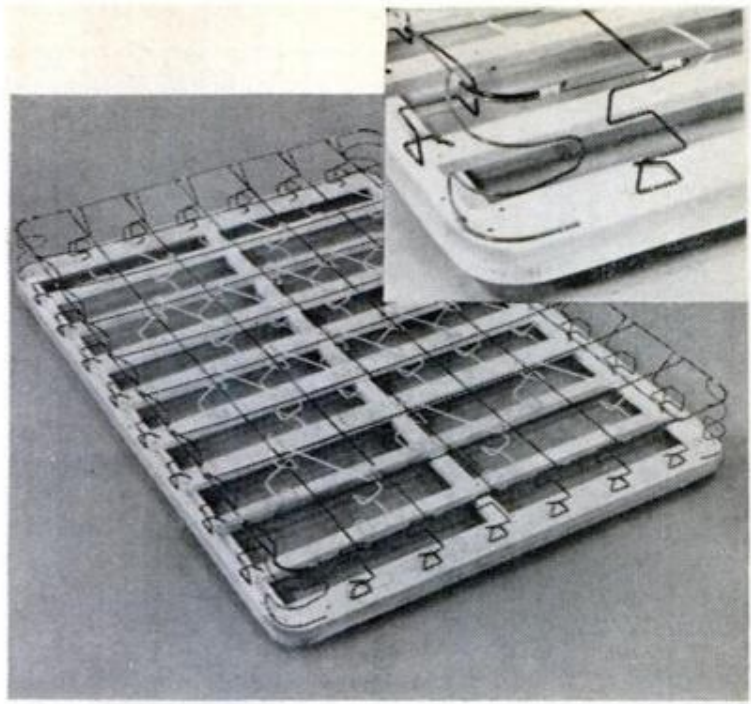
**APPLY STRAPPING TAPE THE EASY WAY** with the Strap-It 4T Tape Dispenser. It applies as much as required, cuts the tape and leaves a tab in position for applying the next strip. Ideal for wrapping, palletizing, unitizing, holding and reinforcing applications, it's available at stationery stores and office supply houses at a retail price of \$11.95. Manufactured by the Permacel Div. of Johnson & Johnson, New Brunswick, N.J. 08903.



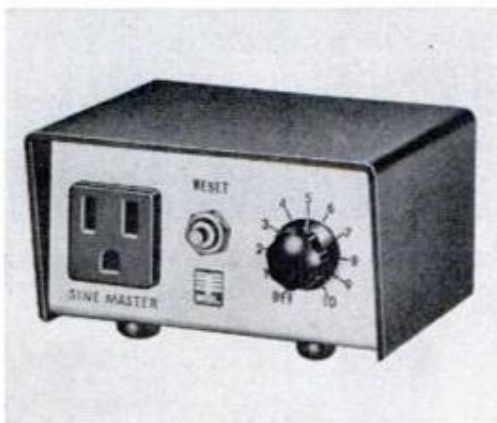
**FURNACE HUMIDIFIER** for your home is offered by Eaton, Yale & Towne, Inc., 100 Erieview Plaza, Cleveland, Ohio 44114. Humidifier has a centrifugal pump that automatically flushes the unit every six hours to clean the reservoir of residue. Warm air from plenum is forced over and around 23 moist 8-in. bronze discs, which slowly rotate in a reservoir of water. Unit comes with saddle valve and hardware, costs about \$200 installed.



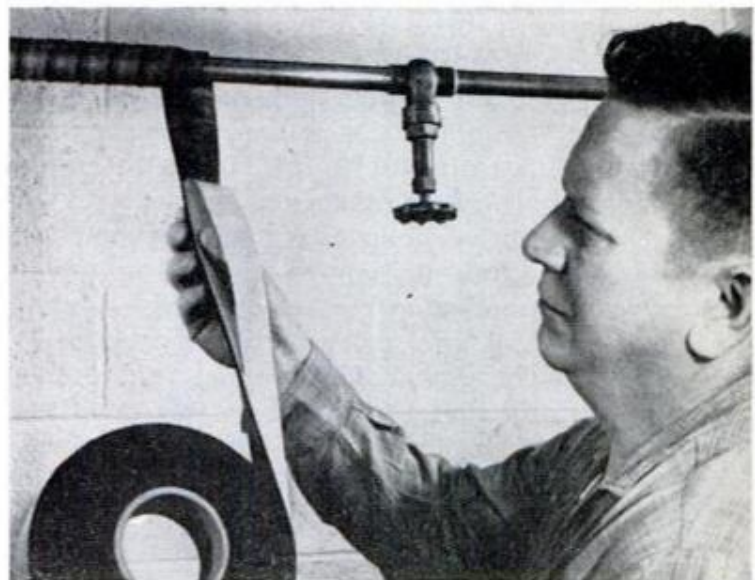
**CHAIRS TO MATCH RUGS?** Yield House, North Conway, N.H., is offering wrought-iron chair frames that are graceful, sturdy and inexpensive. The finished chairs are easy to make; just use leftover carpeting or remnant pieces. "Carpet Chairs" are sold for \$19.95 and come complete with a special cement and full instructions for assembly.



**FOR GREATER SLEEPING COMFORT,** Sealy, Inc., has developed a mattress foundation without coil springs. Called Posture-Grid, it has torsion bar suspension and is constructed with geometrically-formed spring wire to give firm support to every inch of the structure. It's designed to cradle the mattress to reduce shifting and thus keep gaps from forming between the mattress and the foundation. Prices range from \$89.95 and up. Manufactured by Sealy, Inc., 75 East Wacker Drive, Chicago, Ill. 60601.



**USEFUL ADDITION** to every home workshop is the new electronic Sine Master 100. This solid-state unit lets you control the speed of virtually any home tool or household appliance. Simple to operate, you just plug it in an outlet, (it has an a.c. current controller) and dial whatever speed you want. This control is enclosed in a handsome, all-metal housing and is available in a choice of five-amp. (priced at \$12.95) or ten-amp. (priced at \$16.95) models. It's manufactured by Howard Industries, 2420 18th St., Racine, Wis. 53403.



**PROTECT YOUR WATER PIPES** against condensation with Amaflex All-Purpose Tape. It's easy to apply—you just pull off the release backing and wrap the self-sticking tape in a spiral pattern around the pipe. Made of flexible foamed plastic, it can also be used in a number of other ways, such as insulating doors, sealing narrow openings, cushioning handgrips on tools, to mention a few. A 12-foot roll of this versatile material ( $\frac{1}{8}$  inch thick and 2 inches wide) retails for \$1.98. Manufactured by Armstrong Cork Co., Lancaster, Pa. 17604.



## INNER-TUBE DOG BOOTS

**Inexpensive, lightweight dog boots take only five minutes to make, but last a season**

By **TED PYLE**

I'VE KNOWN HUNTERS who expect their gun dogs to perform brilliantly without proper foot protection in upland bird cover so thick with grass burrs and other thorns that they crunch underfoot like popcorn. Your gun dog will do a better job if you take a few minutes to fit him with proper boots. For about 10 cents per dog foot you can make boots from a damaged or worn inner tube available free from most shops that sell or service motorcycles. Inner-tube rubber is flexible enough to allow your dog free movement and traction.

By digging through a pile of tubes in the shop, you can usually find some still in fair condition. Don't take one spattered with patches; it's probably too old. Test for flexibility and strength by pinching a fold of the tube between thumb and index finger. If breaks or cracks appear, it's too old.

Save time in the field by first getting your dog accustomed to wearing tube boots. Put a set on and let him romp in the yard. If he starts to pussy-foot around or tries to chew the boots off, attract his attention. Pet him, have him fetch, or take him for a walk. In a few minutes he'll believe he was born in dog boots.

Inner-tube boots are lightweight and compact to carry. Folded flat and wrapped with a rubber band, a set of four is less bulky to tote in your hunting-jacket pocket than the stale sandwich the Mrs. packed for lunch. ★★★



**DEPENDING ON DOG**, cut 6 to 8-in. tube length, allowing for sufficient toe room



**WRAP "STOCKING"** of refrigerator tape around dog's leg just above his dew claw



**ATTACH BOOTS** with inch-wide waterproof tape which won't work loose when it's wet



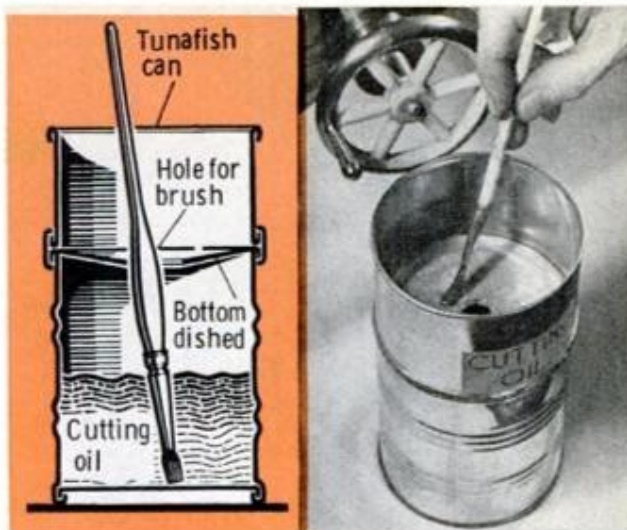
**COMFORTABLE**, durable pair of dog boots has sufficient room for circulation of air

POPULAR MECHANICS

# HINTS FROM READERS

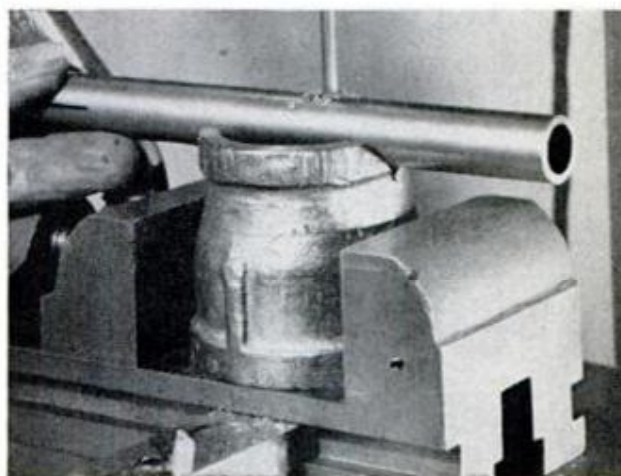
## Oil dispenser traps chips

When a brush is used to dip cutting oil from a common tin can, you can't avoid getting metal chips in the oil when applying it repeatedly to the work. I solved the problem with the double-deck container shown—two cans soldered together. The upper section catches the chips as you wipe them from the brush. Since the bottom is dished, the oil runs back clean into the lower section.—*Paul Mengel*



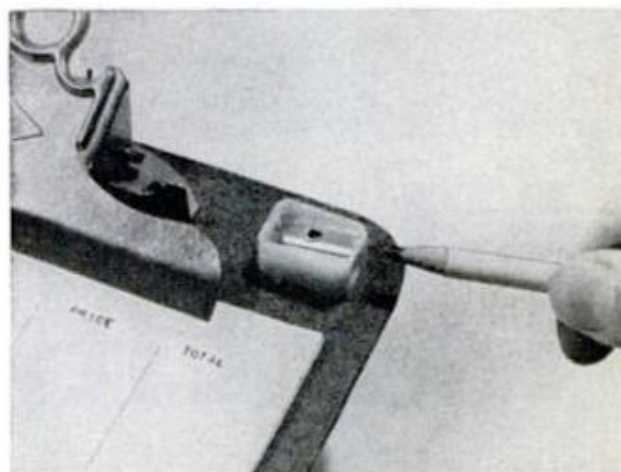
## V-block from pipe coupling

A handy V-block to hold rods, pipe and tubing can be made quickly from a large pipe fitting: File one end of the coupling to insure a smooth, even base. Notch the other end as shown so that a rod laid across the notches will parallel the coupling bottom. The  $1\frac{1}{2} \times 1\frac{1}{4}$ -in. reducer (right) has notches about  $\frac{1}{2}$  in. deep and  $1\frac{3}{16}$  in. wide at the top.—*Walter Burton*



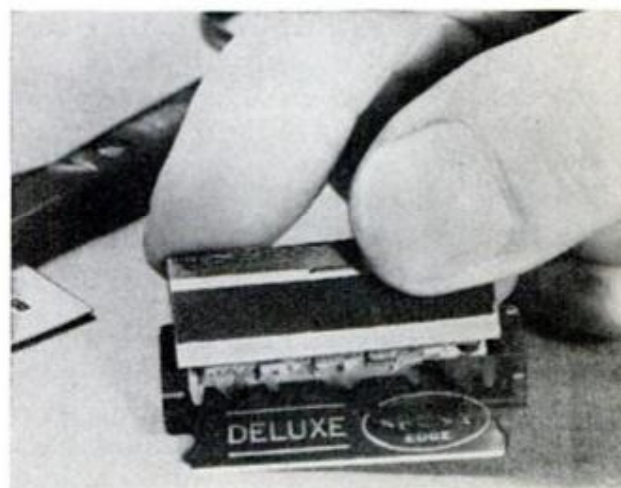
## Make a solderless connection

If you are ever short of solder when making electrical connections to brass screws, you can still continue working. This is especially true when the screw is in a solid base of a low-voltage mechanism. Simply lay the bared wire in the screw-head slot and peen screwhead toward center. This closes the slot and crimps the wire in place.—*Frank Shore*



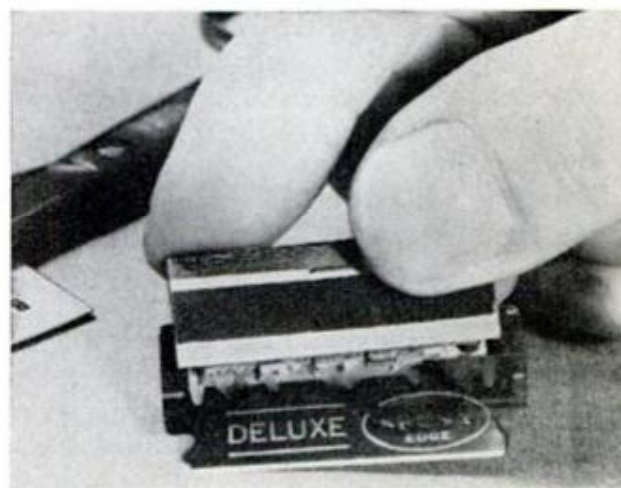
## Portable pencil sharpener

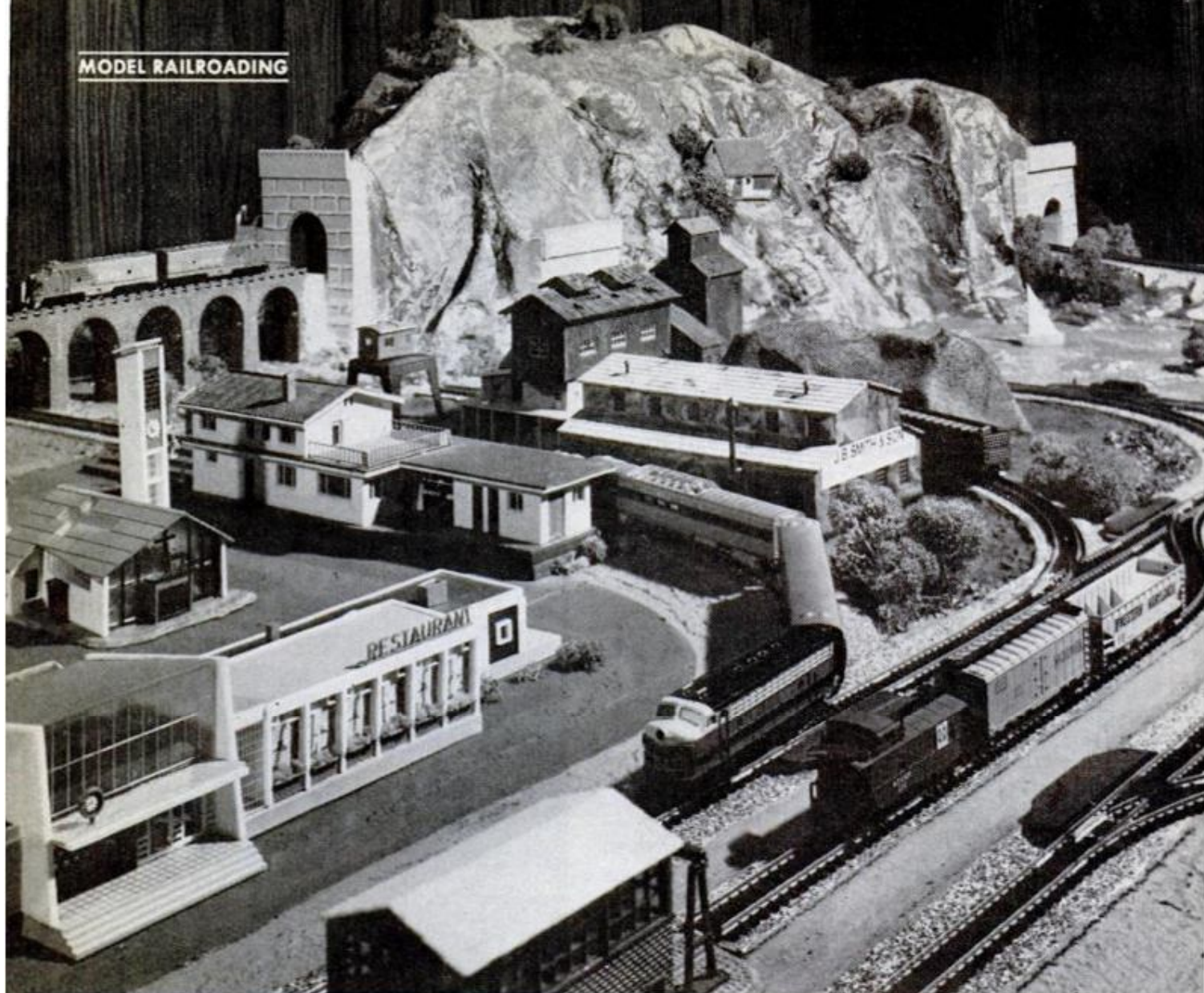
Anyone who has reason to use a clipboard usually does so because he is away from the comforts of an office. For field work, I've fastened an ordinary dime-store pencil sharpener at the top of my clipboard. Now, when the point is blunt, there's no hunting for a pocketknife to sharpen it.—*William Swallow*



## Matchbook safeguards against cuts

Next time you need a razor blade for cutting or scraping, and the only one you can find is double-edged, try this trick. Cut off the end of a matchbook cover and place it over one edge of the blade as shown. You'll have a cutting blade as safe to use as its single-edge brother—especially if you wrap a piece of masking tape around it.—*William Swallow*





# A Lot of Railroad In a Little Space

**PART 2** By WAYNE C. LECKEY, Home and Shop Editor

Photos by Robert Borst

**W**ITH YOUR TRAIN BOARD completed as described last month, you are ready to start building your system. It can be laid out in a dozen different ways, from a simple oval to an elaborate setup, depending on the size you made it and the amount you want to spend. The system I built strikes a happy medium. Scalewise, it represents a system over a mile long. Moneywise, it represents a cash outlay of about \$150. That is what I spent for two N-ga. trains (freight and passenger), track, switches, power pack and building and bridge kits. Plywood, glue, wallpaper paste

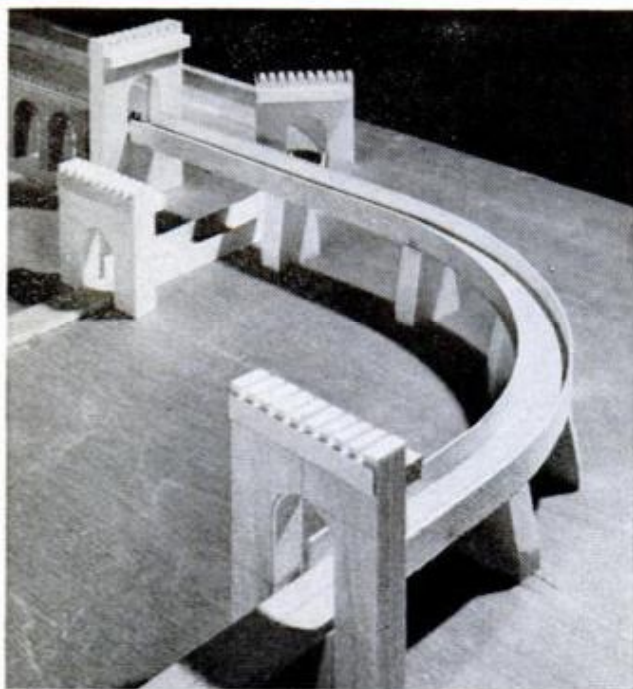
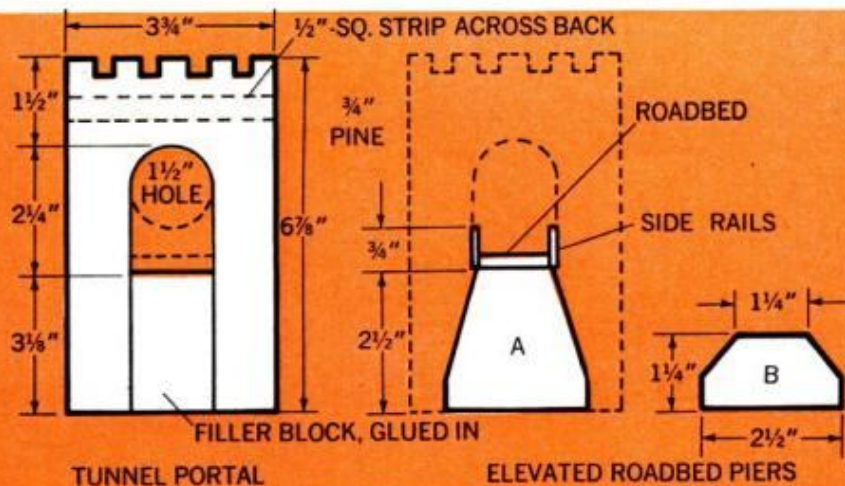
and texture paint ran another \$10 or so.

You can design your own track layout. Follow one of many you'll find in books at your hobby store or follow mine. Straight track comes in sections 1½, 2, 2½, 3, 4½ and 12 in. long. Curved track comes in three sizes (6°, 24° and 30°) in both 7½ and 9-in.-radii, which gives broad flexibility in constructing all types of curves. My layout is single-track with seven switches, three left-hand and four right-hand. However, with the curved track mentioned, your layout can have double track if you wish: I used 41 sections

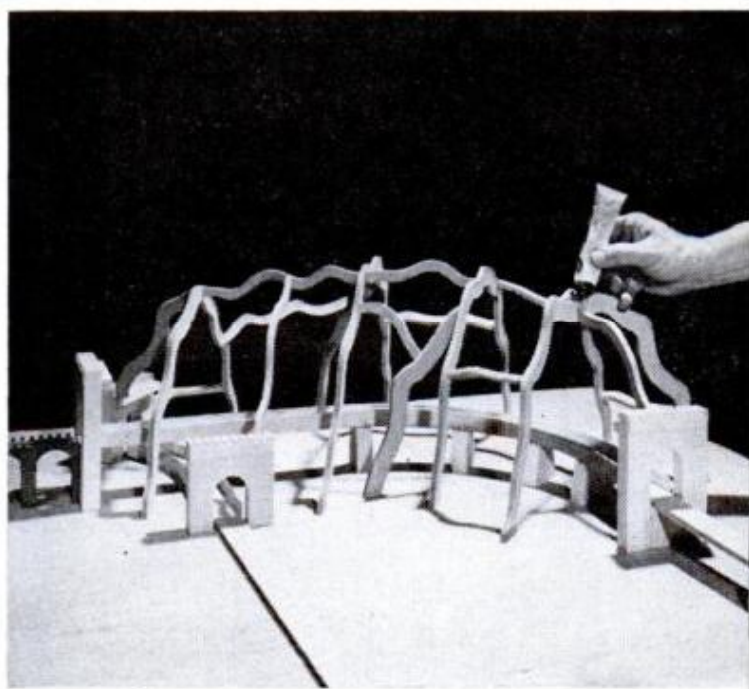




**TUNNEL PORTALS** are neatly made by first boring holes with a 1½-in. multi-spur bit, then sawing in to meet the holes and, finally, gluing blocks back in. "Stone" tops are a series of saw kerfs. Cleats on back provide a place to glue paper which is used to form the mountains. All tunnel entrances are made the same size, 1½ x 2¼ in. Piers of varying heights support elevated roadbed between portals. Like portals, they are glued to train board. Can be cut from ¾-in. scrap



**HERE'S HOW** elevated section of roadbed is supported inside mountains with piers placed between portals



**SUPPORTING CAGE** of wooden arches is erected over mountain roadbed, bridged with butt-glued strips



**WOOD CAGE IS COVERED** with strips of shopping bags dipped in wallpaper paste and draped over top



**THICK TEXTURE PAINT** applied to paper shell stiffens it, adds terrain detail. Mountain is finally colored

of 30° (9-in. radius) curved track, 12 sections of 6° curved track, 17 sections of 4 1/8-in. straight track and 19 sections of 12-in. (actually 12 5/16-in.) straight track.

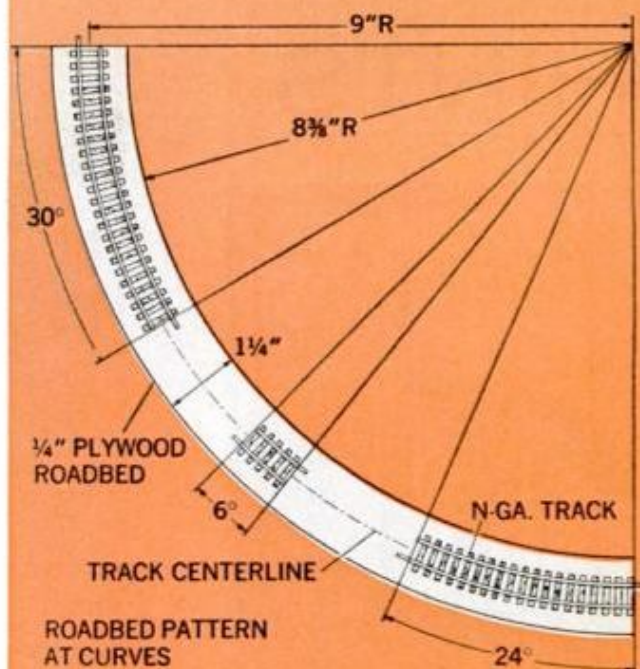
I made my roadbed of 1/4-in. plywood and laid out the complete roadbed on one full sheet by first drawing the centerlines of all the tracks. That's what you see in the diagram on page 191. Then I drew lines parallel to the centerlines to mark a roadbed 1 1/4 in. wide. Finally, I sawed out the whole roadbed in one piece with a sabre saw and wound up with a pretzel-like cutout.

Where the roadbed runs elevated inside mountains, the cutout is severed at points where the roadbed passes beneath at right angles to grade level. This is done at the three points marked "underpass" on the track diagram. You can now glue the whole roadbed cutout to the train board except portions of the roadbed that are to be elevated. These sections are left unglued. Where the roadbed is cut through, the missing sections are filled in with extra blocks.

Except for being of different heights, all tunnel portals are made alike from scraps of 3/4-in. pine. The two mountains require two 6-in. portals, two 5 1/2 in. and four 3 3/4 in. In addition you'll need a number of piers of varying height to support the roadbed between the portals. Pier A is glued to the back of the 6-in. portal, pier B to the back of the 5 1/2-in. one. Others are spaced 4 or 5 in. between. Both the portals and the piers are glued directly to the train board. Guard rails are finally glued to sides of the roadbed.

Mountains are fun to make. The first step is to build a wooden cage over the roadbeds. Here you jigsaw a number of arches of irregular shape and varying size, the largest being about 10 in. high and 14 in. wide, from 1/4-in. plywood. Cut them individually about 1/2 in. wide, making no two alike. Glue the arches here and there to the train board and brace them with anything handy until the glue dries. Stand the tall ones in the middle, the low ones on each side. Now bridge the arches with more wavy-cut strips, glued here and there, until you have a firm supporting framework. Your track, of course, should be tacked to the roadbed before you start.

The grocery bags you get at the supermarket are used to cover the wood cage.



**TRACK SECTIONS** are standardized, come in six sizes; three shown here are of 9-in. radius and three of 7 1/2-in. radius. Permit double tracks at curves

Tear up about a dozen bags in 3-in.-wide strips and crumple them in balls to produce wrinkles in the paper.

The paper balls are dipped in wallpaper paste, two or three at a time. Crunch and squeeze them repeatedly while in the paste until they are completely saturated. Open up the strips and start draping the gooey lengths vertically over the wood cage, beginning at the bottom. Stick about 1/2 in. of the strip to the surface of the train board.

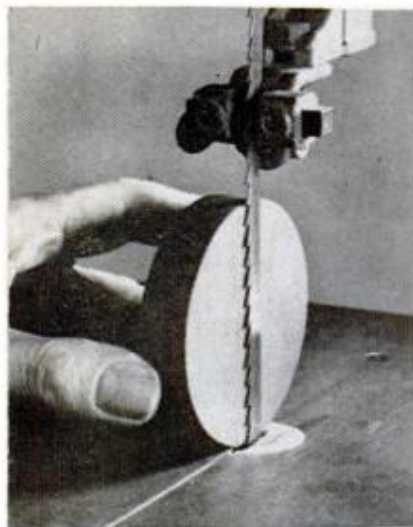
As you go, begin building up layers by placing more strips on top of the others. Use your fingers to smooth out the strips as they are applied. You'll find that the torn edges of the paper feather out perfectly in creating hills and valleys, cliffs and other mountainous terrain. Where a spot may look too flat you can use a stick on the inside to poke a bulge in the wet paper. After 10 minutes you can reach in and remove the stick and the bulge will stay. Stick the paper to the cleats on the backs of tunnel portals, also to edges.

The paper shell is now covered with a thick coat of texture paint, dabbed on with the swirl of a brush. When the paint is dry, you color your mountains with flat-drying (not glossy) green and charcoal paint. This is done with a "dry" brush so you retain some of the white undercoat. Apply the green first, then when dry, the charcoal, brushing the surface only here

*(Please turn to page 226)*

# HINTS

FROM READERS



## Honing bandsaw blade

A bandsaw blade that constantly tracks to one side makes it difficult to follow the line when cutting intricate work. To correct this, you can hone the teeth on the errant side while the machine is running. Hold a fine stone with a light touch against blade, following standard safety practice to protect fingers. When blade tracks properly, readjust guides as per maker's instructions.—*Wilfred Beaver*



## Small-parts storage

Spotting ice-cube trays on sale in a supermarket, I picked up four to make this convenient shop organizer for small parts. Using scrap lying about the shop, my total investment was a miserly 40 cents. The cabinet shown has a  $\frac{3}{4}$ -in. pine base; sides, top and drawer-runners are of plywood scrap. Use glue and brads to assemble, then paint. The cabinet has 64 compartments for all small shop items.—*Edward H. Gold*



## Cap for oil-can spout

While reaching for my old-fashioned oil squirt-can, I inadvertently jabbed my palm on the tip. To avoid a recurrence, I tried corks and Styrofoam as caps but found these soft substances tended to plug up the spout. Then I hit on the idea of using a solderless-type wire connector. It was easy to find one that fit snugly. The threaded insert grips the spout and the connector stays put.—*Charles H. Hardy*

## NEXT MONTH IN SHOP AND CRAFTS

**HOW TO WORK WITH PLASTIC LAMINATES.** Though plastic laminates are generally acknowledged to be attractive and practically maintenance-free, they also have the undeserved reputation of being difficult to work with. This story gives all you need to know about cutting, bonding and trimming laminates to give your projects the craftsmanship look they deserve. To learn how, pick up a copy of the March PM.

**BUILD PM'S COOKOUT GAZEBO.** It's a freestanding beauty that we built in the hills of Connecticut. Featuring a cedar-shingle roof and a he-man-size barbecue cooking center, the gazebo lets you enjoy outdoor cooking, rain or shine. Complete plans for building it are in PM next month.

**NEW TOOLS FOR ORNAMENTAL SCROLLWORK.** They're imported from Great Britain and will have you turning out scrolls for railings, fences and the like in no more time than it takes to read the article. Learn how in PM next month.

**WEEKEND PROJECTS.** We've rounded up a passel of woodworking projects to keep your workshop humming productively over those late-winter weekends. Included in this 16-page special are instructions for making three footstools, a desk, chair, laundry table, lamp, knife tray and coffee table. For an "album" of woodworking fun, see the March PM.

Disturbed by dull taste?

20 CLASS A CIGARETTES

**KOOL**

*Filter Kings*

MILD MENTHOL CIGARETTES

Come up to  
**KOOL**  
It's refreshing

© 1970 B&W T Co. WILSON & GORHAM TOBACCO CORP.

## EASY-TO-FIX CARS

*(Continued from page 85)*

mistically, this might be accomplished by the time the '71 cars come out. On other components, the target is an improvement of five percent a year. An improvement at even the low end of the range could translate into impressive savings on a major teardown such as a transmission overhaul.

"We have different objectives for different parts," states Robert B. Alexander, chief engineer for Ford's product development group, "so it's difficult to pinpoint an overall figure.

"I'd put it this way: On a stripped car—I mean without airconditioning or mechanical complications—we've cut service time about five percent a year over the past five years. I think we'll equal or exceed that over the next five.

"But don't lock me in on the prediction," Alexander cautions, "because as cars grow more complicated, service problems multiply. In making that forecast, I'm

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### **Detroit is . . . uncomplicating the steps necessary to get at the wearing parts of cars**

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talking a stripped car today against a stripped car five years from now."

"Don't look for miracles," a GM man adds. "I think you'll see some pretty astounding developments viewed retrospectively, looking back say seven or eight years from now, where we stand today against where we expect to be then. But it will be an inch-by-inch proposition.

"Suppose we reduce service time on a three-hour job by a tenth of an hour this year, another tenth next year, another tenth the third year and so on. Over a period of eight or nine years we might conceivably lop an hour off the total time, so it becomes a two-hour job instead of three. That's not a dramatic gain on a year-by-year basis, but apply the same rate of improvement to other parts of the car and it's a real accomplishment. So if a car requires, say, 12 hours of service a year now, it might be possible to get the figure down to six hours by 1977."

If the best is yet to come, what do the changes car producers have made thus far mean to the man interested in cutting his repair bills now? The answer is another question: How do you rate as a mechanic?

The jobs the factories suggest do-it-yourselfers tackle are not difficult—changing plugs, replacing points, fuel filters, bulbs, adjusting engine timing, idle

speed and headlights and inspecting and packing front-wheel bearings. These suggestions come from the Maverick owner's manual, which has a 24-page section of self-service tips. (To the chagrin of some dealers, incidentally.) The jobs listed can be done by anyone who has tinkered with cars and has a fair assortment of tools.

"Even your fenders are bolt-on affairs," says a Maverick ad in an obvious tit-for-tat at Volkswagen, which has had bolt-on fenders since Car One. Going Ford one better, American Motors has bolt-on front fenders on all of its '70 cars. Bolt-on parts represent a break for the car owner if only because they don't have to be torched or hacked off. The less time it takes a mechanic to repair or replace a part, the lower the labor charge on the repair bill.

Lower labor charges are what car manufacturers are really talking about when they speak of simplifying service. Prices of service parts and materials are not being reduced. What Detroit is doing is uncomplicating the steps necessary to get at the wearing parts of cars—the items most likely to give trouble—so the mechanic can get at them in less time than before.

While the labor portion of repair bills should go down as a result of such efforts at service simplification, the total bill could remain the same, even go up a little over the next few model years. The trend in automobiles for 25 years has been to more equipment, more options, more luxury accessories, more safety devices, more everything. This adds up to more service. So the gains Detroit makes in reducing labor costs could be cancelled out as car buyers add on the extras.

Why Detroit's sudden interest in saving the long-paying motorist repair money?

Detroit denies its interest in cutting the cost of service is a recent development. "We've been working in this direction as long as I can remember," declares an engineer whose experience spans 28 years with Packard, Chrysler and GM. But while the industry may deny its interest is recent, the fact is that it's only within the past several months car companies have opened up on the subject publicly. Service used to be to automobiles what the common cold is to medicine—something to be endured.

"Service and repairs are negatives," a veteran public relations man explains. "Can you blame us for not talking about them? We're trying to sell a \$3000 to \$4000 product. It's an exciting transaction for most people. Sure, the car's going to get dirty, use oil, and the sheet metal will probably get dinged up. But the customer knows that. We just don't talk about it."

There's a long list of reasons for De-

*(Please turn to page 200)*

In the midst of all this excitement, there's one large bore. It's the carburetor with a fast feed design augmented by stainless steel reed valves.

This Sea-Horse 25-hp wins a lot of praise where dependability and operating economy rank high. Whether you're looking for sea food or sea fun, this is the motor to have in a pinch.

Start here with easy pulling manual starting. Accessory electric starting kit available.

Grab it here and by the handle in front. Now lift. 25 horses at only 3¼ lbs. per horse! You can easily carry it from car to boat. And once on the water, you can leave the lifting to those 25 lightweight horses.



If smooth, quiet, float-boating is your game, more power to you with this Sea-Horse 25. Slim, flutter-free piston rings and a counter-weighted crankshaft take all the shout and shimmy out of pontoon power. You'll never lose your cool or spill your cola with this old smoothie on board.

This outboard is a moderately-priced introduction to the fun of water skiing. It can go all out, all day with someone hanging on behind. Tomorrow, it'll be ready to go again, if you are.

Like all Johnson outboards from 115-hp to 1½-hp, the Sea-Horse 25 carries this exclusive 2-year warranty: For 24 months after purchase, Johnson Motors will replace or repair without cost to the original purchaser any part of its manufacture which, upon inspection, proves to have failed in normal pleasure use due to faulty material or workmanship.

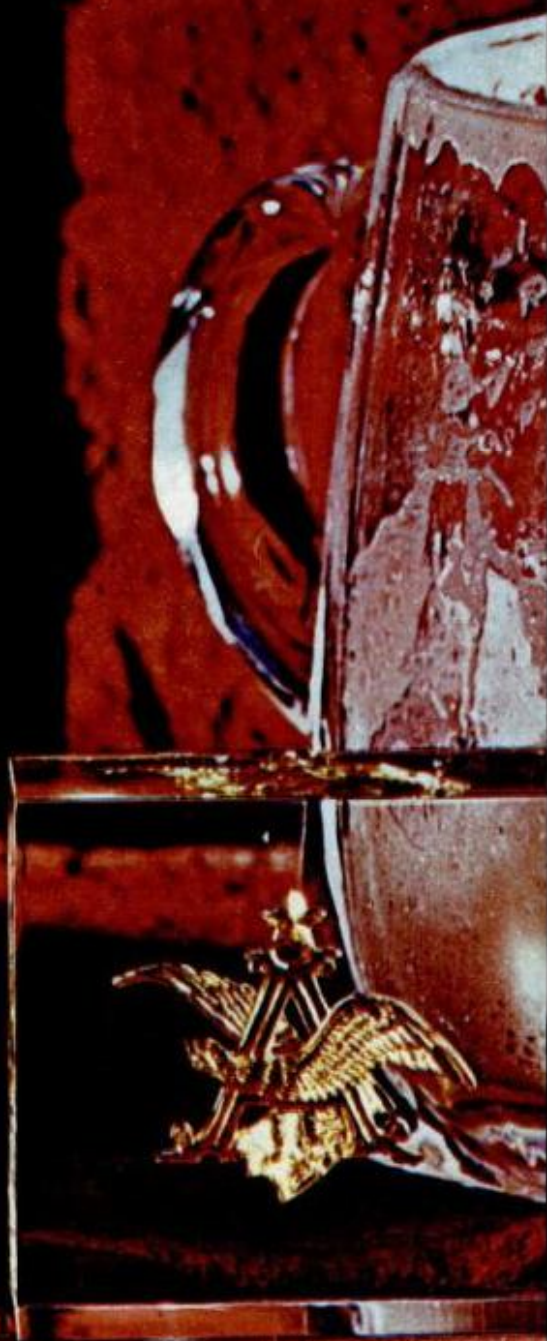


Fishermen are lured by the 25's combination of quick delivery, tireless trolling and a high performance prop that runs surprisingly weed-free. It's the greatest thing to happen to fishing since the self-opening beer can.

Snorkelers will fog their face masks over the way this Johnson jets them to the scene. Once underwater, a peek at the lower unit tells why. It's hydro-dynamically designed to minimize turbulence and drag forces.

FIRST IN DEPENDABILITY  
**Johnson** Div. Outboard Marine Corporation  
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## EASY-TO-FIX CARS

*(Continued from page 196)*

troit's dramatic turnaround. For one thing, the industry is concerned about the declining "fun factor" of owning a car. High insurance premiums, license fees, the parking problem, mandatory inspection laws, congested highways, accident statistics and frightening headlines telling of car fatalities, the cost of borrowing money to finance an automobile, the cost of repairs, not to mention higher price tags on the basic wheels—all of these factors conspire against the pleasure of owning an automobile. Detroit believes anything it can do to ease the burden will make operating an automobile more of a pleasure.

Another objective is to take the heat off Detroit. The insurance industry accuses automakers of designing cars that are cumbersome and costly to repair, a charge backed up by many mechanics.

The chorus of complaints on this count reached such a crescendo last spring that

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### **One Detroit estimate pegs the shortage of mechanics at . . . 750,000 by 1975**

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Congress held hearings on the subject. Spending on car repairs, according to Michigan Sen. Phillip A. Hart, is running at a rate of \$26 billion a year, only \$3 billion under the amount spent on new cars. Hart also estimates that the repair bill is accelerating at a rate of \$1 billion a year!

There are more Congressional hearings to come. In the first go-around, Detroit wasn't in a position to do much but take the pie full in the face. But in the next phase of the investigation, carmakers will come armed with attache cases bulging with evidence they are concerned about and doing something to reduce repair bills.

(Off the Congressional hot seat, automakers angrily refute the charge they are unconcerned about the price the public pays for service. "We have a selfish interest in keeping repair bills as low as possible," the service manager of a Big Three division snaps. "Under the new car warranty, we foot the repair bill for the first year, so it's to our advantage to reduce the cost of service.")

But there's an even more urgent reason—more compelling than any of those cited above—behind Detroit's drive to simplify car repairs. Car manufacturers won't say so for direct attribution, but they admit privately there are not enough mechanics and service capacity to care for the num-

ber of automobiles in use. In 1950, there was one mechanic for every 73 vehicles (cars and trucks). The ratio today is one mechanic for every 131 vehicles. A Chrysler vice president, Byron J. Nichols, sees the gap growing to one technician per 140 vehicles by 1975. An ideal ratio, most authorities agree, would be one man for every 80 to 85 vehicles.

One Detroit estimate pegs the shortage of mechanics at 500,000 and predicts the figure will grow to 750,000 by 1975. This assumes a recruiting rate of no fewer than 40,000 new mechanics a year and no significant drop in the present work force.

The demand for automobile service, in the words of Henry Ford II, is "an explosive problem with a short fuse already lit. The roots of the problem," says Ford, "are familiar. More vehicles being driven more miles, the growing variety and complexity of models, and the rising expectations of car and truck owners."

GM president Edward N. Cole makes the same point in more conservative language. "The magnitude of this assignment (providing service) is increasing," Cole admits, "because of a rise of more than 40 percent (in car population), the higher level of expectations by car owners, and the critical shortage of competent automobile mechanics."

The auto industry, service industry, oil companies, trade schools and other groups have undertaken crash programs to recruit more mechanics. But the lines in front of dealer service departments and repair shops grow longer and form earlier in the morning. Where Detroit used to campaign in its advertising against gas station mechanics, downgrading them as inferior "grease monkeys" to the "factory-trained" technicians employed by dealers, many industry executives now make a point of throwing in a kind word for non-dealer mechanics in discussing service.

Detroit doesn't hold much hope of restoring a balance between the number of cars on the road and the number of mechanics to work on them. But it sees a sliver of light at the end of the tunnel in the idea of simplifying repairs so (1) car owners can handle more of the minor jobs on their own and, (2) a smaller force of mechanics will be able to turn out a greater volume of work.

What are the prospects for a car you can service entirely on your own?

"I can't see it," says Ford's Bob Alexander. "We're making improvements all the time. We can lengthen the life of parts and reduce service requirements. But you can carry that concept only so far. I don't think any mechanic has to worry about losing his job." ★★★



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Come to think of it, a Chevy Mover not only has more going for it than the ordinary truck. It also has more than the ordinary car. Maybe that's why it's living in those one-car garages.



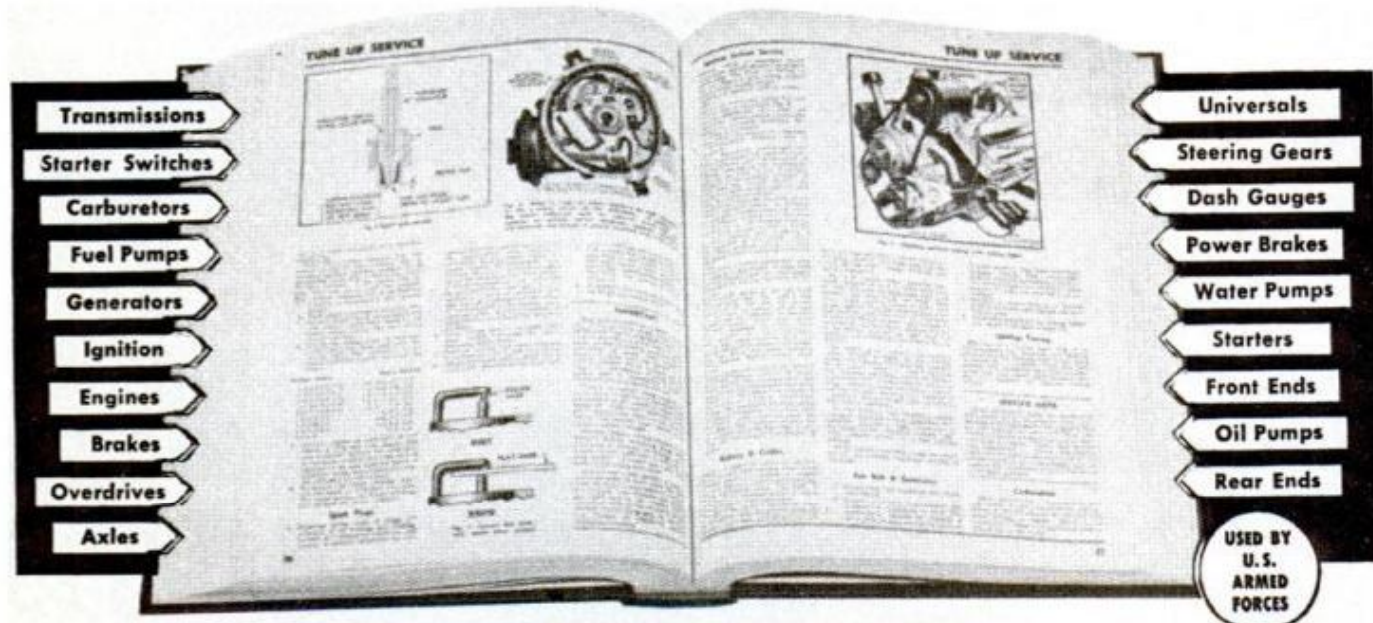
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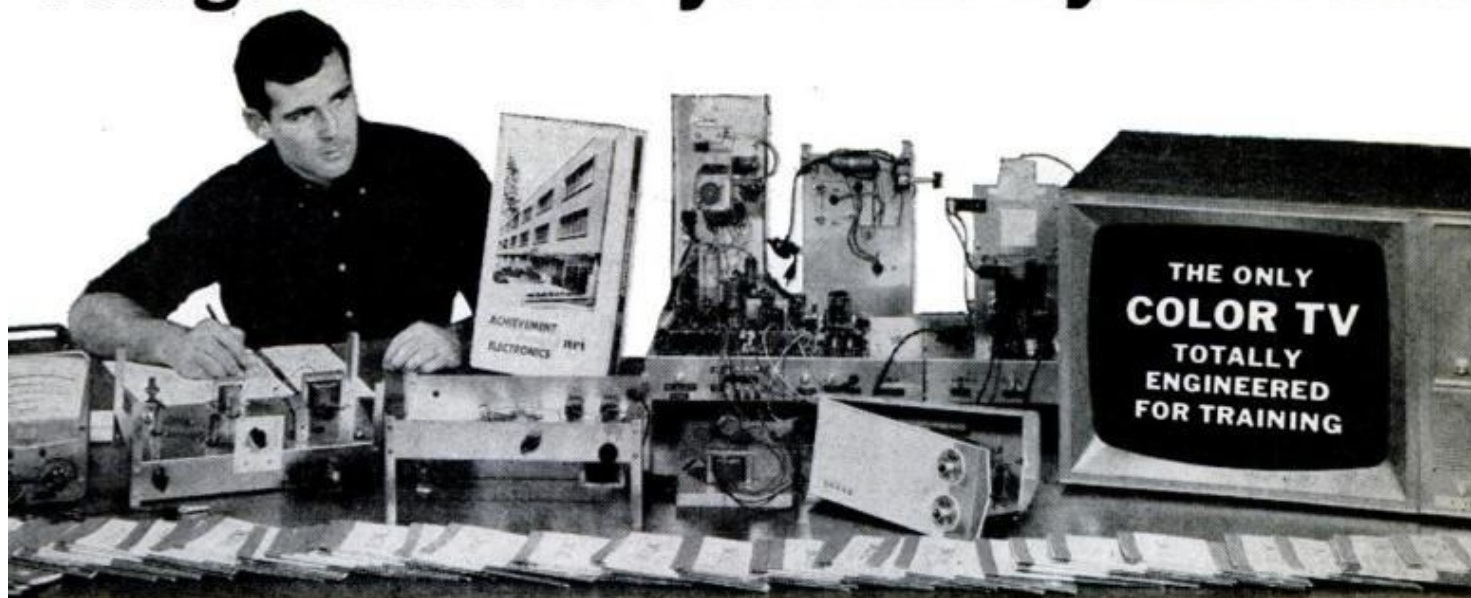
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## ACROSS CANADA

(Continued from page 125)

succession of delightful little scenes: the lobstermen's wharves; the brick-red soil of the island contrasting with the green of the crops; the neat fields trimmed with deep-toned evergreens (I'm always reminded of pictures of British countryside).

Having driven the Trans-Canada Highway part way across New Brunswick to get to Prince Edward Island a few days earlier, we chose an alternate route to the St. Lawrence River above Quebec City.

It took us along Highway 109 through a game refuge located between Renous and Plaster Rock. The scenery was exactly what the province promises: thick forests crowding the road and sweeping views of gently sloped mountains. That road, though, was something else: an unre-

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### **A long, potentially exhausting trip—but a real vacation because of the vehicle.**

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lenting gravel washboard, occupied by us and huge, log-bearing trucks. Our motor home got its most thorough shakedown, and we happily discovered that the body is so tight no dust got inside.

This was the worst road of the trip, but I must emphasize that it was not part of the Trans-Canada Highway.

As we traveled westward toward Winnipeg, we stayed in both provincial and private campgrounds. Prices averaged \$3.

At Quebec City we camped in a private site on the northwest edge of the city, then drove downtown the next morning early enough to avoid traffic and get a good parking spot. We left the motor home near the tourist center a few blocks from Chateau Frontenac. Our walking tour of the city started from the tourist office. . . on to the boardwalk in front of the Chateau . . . up the slope to the Citadel where we watched the French-Canadian Royal 22nd Regiment perform its colorful changing of the guard ceremony. . . then down into the lower city among fine old buildings that date back to the 1600s.

The next big city to the west, Montreal, is still unmistakably the site of Expo 67. Virtually all of Expo's exciting buildings still stand on the islands in the St. Lawrence, and "Man and His World" is still a fascinating exposition. The city itself is a lively mixture of culture, history and night life. We left our camper in a private site along the river and traveled by cab, bus and rail.

Our visit to Montreal points up one of the negative characteristics of a single-unit camping vehicle. If you want to leave your campsite, you either get another vehicle or take your entire camp with you—even if it's only to go a mile to a store for a loaf of bread. (Okay, okay, I *should* walk.) Our Glastron was easy to drive, and I had no particular problems even in heavy traffic, but I found that—with other transportation available—I was reluctant to take it into a city like Montreal and go through the drill of parking it.

Farther west is Ottawa, Canada's capital, where gothic Parliament buildings reassert the British heritage that a tourist may have forgotten in French Canada.

Beyond Ottawa, Ontario seems to stretch on forever. The highway leads through forests and scrubland, past tree-lined lakes, beside streams filled with sawmill-bound logs and along the edge of Lake Superior. The lake route was the most surprising part of the trip for me. It's mountainous and spectacular—especially in Lake Superior Provincial Park—where I expected relatively flat terrain. I was surprised again after we entered Manitoba and approached Winnipeg—this time by the absolute flatness of land that I had expected to find flat, but not *that* flat.

Winnipeg, too, is different from what I expected. Right now, it's probably the way I generally think of it: buried in snow. But in summer, it's a handsome, colorful city.

From Winnipeg, we headed south and returned through the United States.

In all, it was a long and potentially exhausting trip—but a real vacation because of the kind of vehicle we used. To its list of pluses, I should add the 318-cu.-in. Dodge engine that moved us as fast as we ever wanted to go (Mileage: 8.9 mpg.)

Even in luxury, though, one must complain. I'll start with the bunks. They're generally a bit tight to be called "double," and the mattresses (seat cushions in daytime) tend to slide around and leave me on plywood. There's just one door located about halfway back on the right side, and the driver must scramble back to it every time he wants out. And the back windows do not open, a situation that leaves sleepers the choice of running the airconditioner or sleeping in dead air.

But, having camped in everything from a jungle hammock to this Glastron, I'd judge a motor home the best way to go when you want to do a lot of traveling. Like maybe the other half of Canada which I still want to see. ★★

Next month, auto editor Bill Kilpatrick will describe his vacation in a smaller motor home, the Corey Cruiser.

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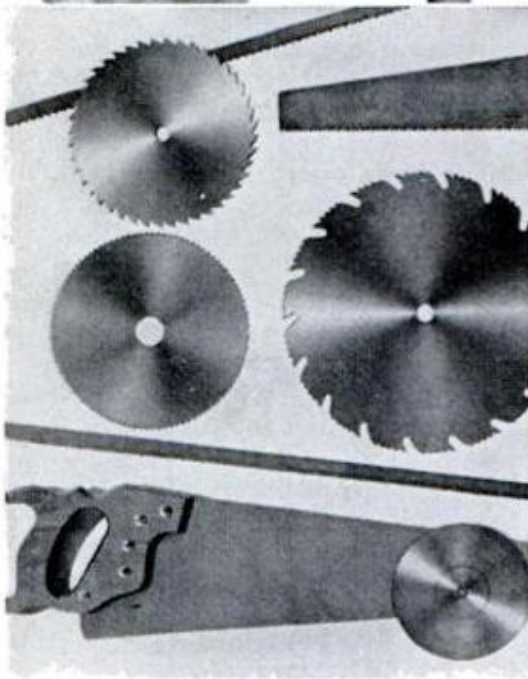
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## THEY HANDLE THE HOT STUFF

*(Continued from page 109)*

to take over the big job of reassuring the public.

"We never attempt to conceal anything" Weintraub goes on. "We give people the straight facts, whatever they are. Far from trying to avoid the press, we call in reporters and TV men, especially if the situation is a continuing one, calling for efforts on our part that might alarm people."

A situation that dramatically illustrates what he's talking about occurred at the University of Alabama. The REAT members from Savannah River responded to the call that came in from worried university officials. A container of polonium 210 used in a physics lab had been damaged. When the leak was discovered nobody knew exactly when it had started. A lot of students and teachers had been in and out of the lab during the day and had gone home and into the other buildings.

From the degree of contamination their

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### **All teams are . . . rehearsing what they'll do if they have to deal with the Big One . . .**

---

instruments showed in the lab, the REAT men were sure that the radioactivity had been spread on clothing and shoes. All "carriers," their cars, and the buildings they had entered would have to be checked. University officials were upset by the possibilities of creating public hysteria as this process went forward. Would an effort be made to conceal it?

"It'll create problems if we try to keep it secret," was REAT's advice.

The result was that the search for radioactivity was made in the full glare of TV and newspaper coverage, with briefings from REAT men. The search eventually extended to 15 cars, 40 rooms in 10 campus buildings, and 10 homes. No appreciable radioactivity was found. Nor was there any undue concern on the part of the well-informed citizens of Tuscaloosa.

Some of the most troubling public reactions have been in response to incidents that didn't involve radioactive material at all. They're hoaxes, false alarms. Typical was the call that came in from an Oregon beach community. A crowd of Fourth of July revelers was panicked by a barrel which had floated ashore. Stenciled on it in ominous red letters was "Radioactive—AEC."

When the team that flew out from Richland, Wash., arrived, a check with their instruments showed nothing. Still, to make everybody happy, they solemnly carted the barrel away, and flew it back to the labs in Richland. It turned out to contain only oil and water.

Many REAT cases involve a search for a lost radioactive item that couldn't do any widespread harm, but which might possibly injure a person who happened to pick it up and carry it around. A recent one was the affair of the missing needles. The Chicago REAT got a call from a railroad official. Somewhere between California and New York some tiny radioactive needles, used in radiation treatment, had fallen out of a crate. The boxcar they had been hauled East in had already been reloaded and sent to another destination but it had been shunted to a siding in Elkhart, Ind., as soon as the loss was reported.

The Chicago men drove to Elkhart where, sure enough, their instruments revealed that the boxcar was hot. It took almost a day to have the car unloaded. When it stood empty, the REAT men found the source of the radioactivity fast enough—one needle nestled between the floor's metal tracks. Just one. The search would have to be widened.

One at a time more needles were found. At the trucking terminal in San Diego, where the shipment had originated; in Los Angeles, in a truck; in San Jose, where the truck had picked up another shipment; in New York, in a station wagon that had carried the crate to a Queens chemical plant; on the plant's parking lot; and alongside a loading platform on a Manhattan street.

The REAT men are unhappy about the fact that they never found four of the missing needles. They conclude that they were swept away with trash or washed down storm drains. The tiny objects are not the sort of thing anybody would pick up, even if he saw one. Actually, no great harm would have been done had they not found any of them, but it's a matter of pride that REAT men don't give up trying until they know there's zero chance of success.

All teams are constantly rehearsing what they'll do if they have to deal with the Big One—a major disaster involving radiological materials. There is an ominous list of possibilities—fire, flood, hurricane, tornado, earthquake, plane crash, train wreck. So far they've dealt with an avalanche and a fire.

The avalanche occurred in Idaho when a snow and rock slide roared down on a

*(Please turn to page 210)*



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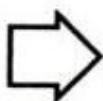
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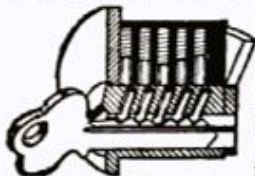
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**THEY HANDLE THE HOT STUFF**

(Continued from page 208)

train which was hauling treated uranium from one AEC plant to another. The team from Idaho Falls got there by plane, quickly started the task of locating the particular cars that contained the hot stuff. That done, they directed the process of getting it loaded aboard other cars and on its way again.

The fire rates as the greatest disaster in the history of the atomic age. One Sunday in May, 1969, plutonium used in making nuclear warheads burst into flames at the Rocky Flats, Colo., plant near Denver. Regular firefighters stationed at the plant on working days were off duty, and the fire department which responded to the alarm turned in by a watchman used water on the fire, causing it to spread. Before the flames were extinguished, the cost ran to \$50,000,000. Actually, the Albuquerque and Idaho Falls teams, though they stood by, were not needed to cope with this emergency. There were no explosions. No radioactivity was spread, and regular plant personnel was able to take over the task of supervising removal of radioactive debris to Idaho, where it was buried in an atomic "graveyard" used for the purpose.

A disaster that REAT is ready to cope with is an accident involving an aircraft carrying nuclear weapons. Actually, it's not likely to happen—and if it did, the experts are reassuring. No atom bomb is going to be set off by flames, impact, or anything short of the designed mechanism, which has proved itself to be thoroughly fail-safe.

In such an emergency, though they know how to handle it, the men of REAT would toss the ball to the parallel organization, NET, the nuclear emergency teams maintained by the Department of Defense. So far, NET's emergency calls have been few.

Most famous NET job was the one that resulted from the Palomares incident. In January, 1966, a KC-135 tanker and a B-52G collided during a refueling operation at 30,500 feet near the southeast coast of Spain. The bombs aboard fell onto land at Palomares and into the sea nearby. Within hours of the event, NET teams from Albuquerque and other bases were on their way to Spain. The earth contaminated by the bombs that fell on land was analyzed and all that was radioactive was removed. Eventually, with the submarines, underwater cameras, and many sophisticated detection devices, the bomb which had fallen into the water was located and retrieved.

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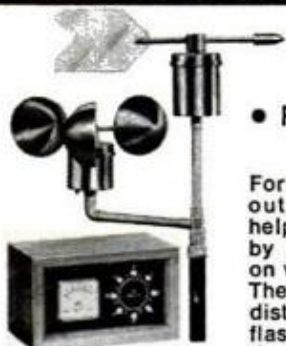
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## LEE ROY'S SECRET WEAPON

(Continued from page 88)

little hell about that, and it was decided that every team would have assigned to it one Holman-Moody engine man who would build engines for that team and that team only. We picked Bob Alman. Guess we picked about right, wouldn't you say?"

Nab says there are definite differences in engines, even though in theory they are all the same.

"It's little things—clearances, camshafts, a hair ground off here, a little something added there," says Nab. "We think Alman's the best there is when it comes to figuring out the right combination."

Nab, despite his incredible record as a winning crew chief, admits engines aren't his specialty. But he's expert at his game—chassis—attested to by his holding the NASCAR record for being the winning crew chief on superspeedways. Winners for whom Nab has served as "top wrench" include such stock car racing greats as Curtis Turner, Joe Weatherly, Fireball Roberts and Fred Lorenzen.

Nab entered racing in 1952 when he helped build a car for the Mexican Road Race. By the mid-'50s, he was in the Holman-Moody shop in Charlotte, his job the building of cars for Ford's stable of stars. In 1961 he joined forces with Fred Lorenzen, the results being several trophies in Nab's Wilkesboro, N.C. living room inscribed to "Herb Nab, from your driver, Fred Lorenzen."

Not only has Nab been crew chief for scores of winners, he has won several individual mechanics awards for excellence.

"But you know, all that stuff—the races and the awards and the competitions and so on—all that's yesterday's news," Nab says soberly. "It's the next race that counts. That's why Daytona is so important. You know everybody's out there with the best they've got and... well, you just want to beat 'em, that's all."

Nab says wind currents are always a big thing at Daytona and he's just as curious as everyone else to see how the new aerodynamically designed cars work out.

Winning at the Big D last year, Nab says, was his biggest thrill to date in racing, that it provided the momentum and confidence the team needed to carry them through their great year right up to the point where they're eager to try to bring off unprecedented back-to-back Daytona 500 victories.

"Yeah, I want to get back into that victory lane again this year. I'll never forget what it felt like last year. But then, I'll never forget the ten years it took me to get there, either." ★★★

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## TO THE SUMMIT BY ATV

*(Continued from page 105)*

favor was the temperature, balmy and in the 60s and 70s.

Before sundown we fanned out in an exploration foray toward the summit. We discovered a lingering glacier, its crystal clear melt-off a source of the mighty Arkansas River whose headwaters rise a few miles northeast of Mount Elbert. Just before dark, Dave Kittinger and Derrick Dodge, heading downslope with their ATV to our camping place, slipped the gears momentarily into neutral. The moment's error almost cost them their lives. As their vehicle hurtled down the 45° grade toward the timberline, a mile below, Derrick bailed out. Dave, staying with it, grabbed frantically for the brake, saw it was useless and buried himself in the seat cushion. The Coot slammed into a boulder,

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**. . . throttle wide open, I bulled the four-wheel steer on a beeline climb for the top.**

---

bounced six feet, flipped over once and landed upright, dropping Dave out. But the damage had been done. The crash stripped a U-joint, putting one wheel out of action. The crippled Coot, now reduced to a three-wheel (instead of four-wheel) drive, limped back to camp. For Dave and Derrick, and their ATV, the try for the summit was over.

*Sunday, Aug. 3:* The final assault. The Rockies' highest peak lay dead ahead—and half a mile straight up. But to reach it, we'd need to climb at least two miles, maybe three. Surprisingly, a rain that had hit our camp about midnight had all but evaporated. If it had slicked the slope, our Coots didn't notice.

Sam, with Bill Peterson, our guide, led in Sam's four-wheel drive. The two photographers and I, in the four-wheel steer, tracked close behind. Dave and Derrick headed back downgrade for Halfmoon campground with their crippled vehicle.

For a slow-going hour we worked upgrade. We skirted the bowl, zigged toward the southeast to avoid a particularly steep place, then zagged around toward the southwest—on compass course for the summit. The weather still held warm—in the mid-60s—and hardly a breeze stirred.

8:30 a.m. We topped a ridge and there it was—not Elbert's summit (which was now away to the northwest), but the foot trail. Our maps had indicated that the trail petered out a mile or so short of the top.

"Can't quite figure it," Sam said, "but when somebody hands me a trail, I'm not about to say anything but 'thank you'."

Actually, it wasn't much of a trail. In places it was too narrow for our ATVs. And as we worked closer toward the summit—which still wasn't visible—the path grew perilously steep. That's when Sam decided to work south around the summit where things looked easier.

"With this four-wheel steer," I told him confidently, "I'm heading straight up. And I bet I beat you up top."

He grinned and I headed upslope.

9:35 a.m. With the throttle wide open, I bulled the four-wheel steer on a beeline climb for the top. Suddenly—so suddenly it came as a surprise—we were up.

Beside me, Dick Kruse quipped: "This must be the place."

It was the summit, for sure. Beyond our perch, which was scarcely 15 feet wide in places, everything else was strictly down. And along our perch's north side, it was straight down—an almost sheer drop of more than 2000 feet.

Two minutes later Sam hove in sight, gunning fast for our summit. Getting up wasn't Sam's problem. Finding a parking place was. There we were, with one of the world's highest peaks all to ourselves—and right away we were caught in a traffic jam.

Atop Elbert's highest spot was a massive rock cairn. It'd been thrown up—a tradition with climbers—by those who, over the years, had preceded us. Nearby was a U.S. Coast and Geodetic Survey "witness post." Its weathered sign cautioned that close by was the official U.S. government survey marker, marking Mount Elbert's 14,431-foot summit. We found the peak's official "register" housed in a length of capped, waterproof pipe. Each of us logged in—signing his name, the date and the exact time we'd reached the top.

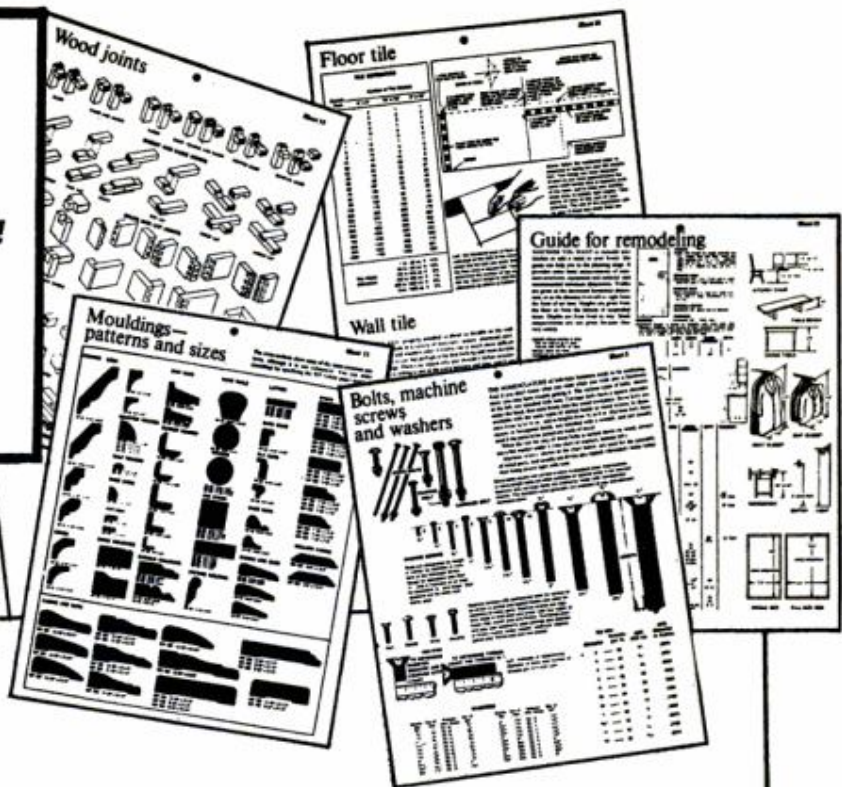
I had one final mission: Raise Colorado's state flag above the summit. I tied the flag, using pullstrings from the parka I'd brought along, to a makeshift flagstaff planted atop the cairn.

Carefully, then, and mindful of the precariousness of our perch, we stood back to take in the scenery. No artist could have painted a mountainscape more awesome. To the north reared Mount Massive, its 14,418-foot summit nearly as high as Elbert's. Far below, to the northeast, was Leadville—looking like a toy town. Seemingly within reach—but really nearly a mile below—shimmered Twin Lakes Reservoir.

We had done what we had set out to do: Climb continental America's second highest peak—by ATV. ★★★

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## AMC'S NEW HORNET

(Continued from page 99)

the overall size of the car. Enough for two weeks in the mountains or at the sea-shore, no; a weekend, yes.

Workmanship on our test Hornet was about on a par with the rest of Detroit's production—good to fair to dreadful. There were gaps where there shouldn't have been, poor fits that should have been like a kid glove. There was a good bit of interior plastic, a material I appreciate is a wonder of our times, but one whose inventor I'd like to poke in the nose. It's so . . . so . . . well, chintzy, and that says it.

Exterior styling on the Hornet is very smooth, very clean. It has a pleasing basic shape—no add-on trim, no seemingly tortured angles. Again, it looks like a car born of a single piece, not an assemblage of committee ideas. I can attest to several admiring glances; perhaps because the Hornet is still relatively new on the road, perhaps because it's simply a good-looking car. I hope with all my heart AMC stylists resist the temptation to festoon the car with the tacky, tasteless geegaws Detroit seems to have by the binful. I appreciate that cars have to appeal to kids, but the Woodstock nonsense was no epitome of good taste.

Summing up, I don't care for the Hornet's dash layout, its armrests, the fit of its carpet. I think the weight distribution could have been a little more equal (but here again this could have been because of the V8 and airconditioning); while not nose-heavy, the car leans that way ever-so. I like everything else about the car, not the least of which is its serviceability. I think the Hornet is honest goods, honestly sold; e.g., AMC doesn't claim buying the car will cure acne, restore flagging virility, make math a breeze. That it happens to be an exciting idea well done is just so much extra. ★★★

## THREE-WAY TRAVELPOD

(Continued from page 162)

trolling motor is ideal to propel it and will run all day on a fully charged car battery. There's plenty of shade under the nose cone for an ice cooler, even a mini-TV set.

You can build a Travelpod of your own for about \$125 for materials. A complete set of plans includes the cutting patterns for the tent and details tubular framework. For the most part, the Pod and its lid are made of 1/4-in. marine plywood. Members which form the tongue-and-groove tracks are of solid stock. ★★★

## THE BIG LAB

(Continued from page 94)

ey from that venture proved significant in BMI's later development.

The European laboratories were established in the fifties, and in 1965 Battelle took over the operation of the Atomic Energy Commission's big Hanford laboratory in the state of Washington. Thus, Battelle-Northwest was established.

Hanford was a key site in the Manhattan Project of World War II. It was there that the world's first reactors were built to produce plutonium for nuclear weapons.

The site was ideal. Located in the eastern part of Washington, it was a sparsely settled area of sun, sand and sagebrush, close to the mighty Columbia River, whose waters could cool the reactors.

You don't inspect the various facilities of Battelle-Northwest on foot. You go by car and pack a lunch. The original installation is scattered over an area equal to nearly half the size of Rhode Island.

Battelle-Northwest, now an organization of over 2700 scientists and support personnel, continues the Hanford pioneering in nuclear energy. But the emphasis today is on peaceful uses of this power.

Recently, Battelle-Northwest was assigned responsibility for the construction of an AEC test facility said to be the most advanced complex of its type ever conceived. It will be the prime testing complex for the United States' fast breeder reactor program. Breeder reactors produce more fissionable materials than they consume in creating a chain reaction.

Like the Columbus lab, however, Battelle-Northwest is capable of handling studies in many fields. Its researchers, for example, test the astronauts' body wastes after all Apollo flights. They study radioactive phenomena in a tunnel 360 feet below the top of the Grand Coulee Dam, and diseases that kill salmon and steelhead in the Columbia River. They recently devised a monitor that uses sound waves to detect flaws in welds during the welding process, and they developed a new type of cereal food, called Batina, designed to help alleviate world food problems.

But what lies in the future for Battelle? I put that question to Sherwood L. Fawcett, president of BMI. "There's much that needs to be done in environmental studies," he replied. "One of the things we're thinking about is the role that a laboratory can play in the development of a region. Regions have individual problems—those of the Great Lakes are different from those of Appalachia. An organization like ours can take an independent look at those problems." ★★★

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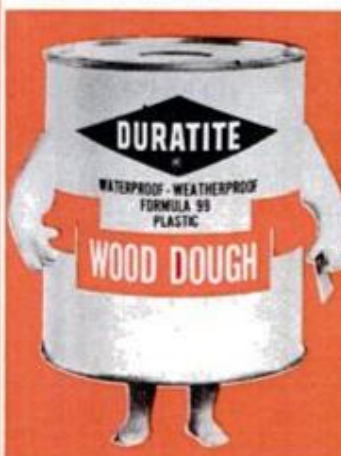
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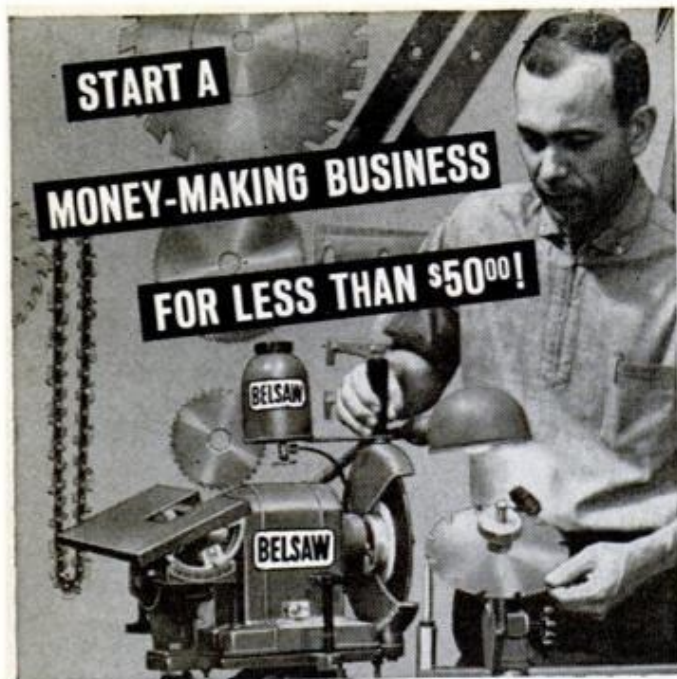


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## AUTOMATIC CHOKES

(Continued from page 141)

gish or bind, causing excessive fuel consumption, poor performance during warm-up and hard starting.

Every so often, give the choke-plate pivots and choke rods and linkage a shot of choke cleaner. This inexpensive spray-can product can be purchased in auto supply outlets. Some hardware stores also sell it.

Never oil any part of the choke system. It will cause a rapid accumulation of dirt that will bind the mechanism.

If you run into a problem with a carburetor-mounted choke, one of the first things to do is remove the cover and look inside the housing. If it's dirty, gummed or rusty, the heat tube that extends from the manifold to the choke housing is punctured. Clean choke parts thoroughly in kerosene and replace the tube. Well-type and exhaust manifold chokes have no such problem.

The automatic choke is often blamed for a problem caused by the carburetor air-cleaner filter. When the filter becomes too badly clogged with dirt, it acts like a choke that's stuck in the closed position. The engine will be fed a rich fuel mixture. Make sure it's clean. ★★★

## DATSUN OWNERS REPORT

(Continued from page 129)

to degree of rake (too much, too little, not adjustable) to amount of back and forth travel, buckets too small and the smell of the vinyl. The vinyl upholstery is actually the culprit responsible for a constant complaint: haze on the inside of the glass. "Hazing, fogging and oily film" will just have to get the elbow-grease and ammonia-cleaner treatment. No shoulder harness holding bracket is another lack.

A Louisiana graduate student finds that "parts seem to loosen up, i.e. nuts and screws, giving rise to vibrations at certain speeds, and squeaks." Annoying but correctable is the consensus of most owners who complained of rattles.

A Colorado claims adjuster who now owns his second four-door sedan had a "rattling" experience with his first: "Good metal and construction," he says, adding: "I flipped a 1969 Datsun same style as I have now. A car side-swiped me and I rolled two and a half times at 60 mph. Doors and top stood up and I wasn't even scratched."

Care to try that again for the fans at the Japan Grand Prix this year? ★★★

## FAMILY GUIDE TO MINI-BIKES

(Continued from page 121)

features such as spark-arrestor mufflers mandatory for trail use, tires or tire options for trail use, horn-light options for night use or street licensing, and various degrees of collapsibility for transporting. The Heath bike is one of the few bikes available with a go-in-snow ski option.

**Specialty machines.** Some mini machines have evolved into what can be called two-wheel adverse-terrain-vehicles (ATVs). Aragon's \$400 El Burro and Rokon's Trail-Breaker, for example, look like monster minis with their tubeless, high-flotation tires. With 1.5 p.s.i. air pressure and large footprints, the tires will take the machines practically anywhere. Spreads-All's Scoot or Ski with its double-drive rear wheels is a \$435 machine, which tops out at \$580 with optional gearbox, track, ski, lights, alternator and other equipment necessary for licensing in most states. Cal-Jet's electric mini-bike provides quiet, sophisticated, adult transportation for \$450.

**Coming down the pike.** How far can the design of the conventional mini-bike go without becoming either a full-blown motorcycle or a motor scooter? Maybe a small-wheeled machine that Benelli is about to introduce gives a clue: Would you believe 185 cc, all chrome, a scant 120 pounds and \$450? It's called the Volcano. Keep it away from the kids. ★★★

**TWO-STROKE MOTORCYCLE ENGINE** in the Ace 100 mini-bike from Bonanza is a 100-cc, 5-speed Hodaka. Portability and size of the model BC1500SH gives it its advantage over a full-size motorcycle. Here, AMA motorcycle champ Bart Markel pops a wheelie



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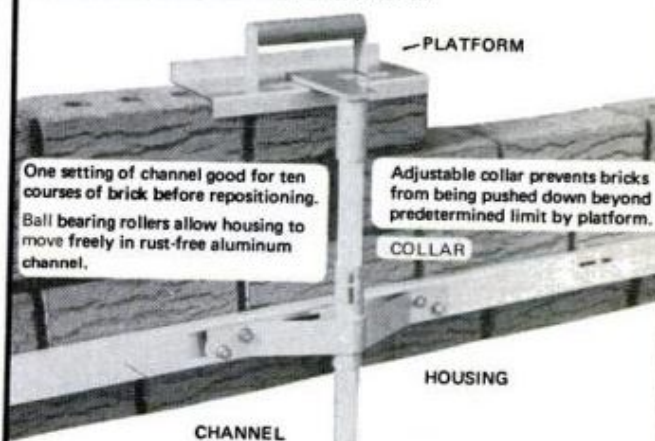
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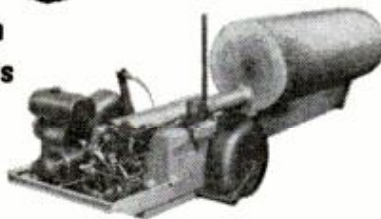
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## CROP THOSE SHOTS

*(Continued from page 147)*

or center of interest will go. Contrary to what you might expect, it should not go in the center of the picture. There are exceptions, of course, but in most cases the center of interest is best placed off to the side and above or below the middle. Dead center, it tends to destroy any feeling of action and the picture becomes static.

The classic "Rule of Thirds" is a handy guide to proper placement of the main subject. Divide the picture into thirds, both vertically and horizontally. The four points where the dividing lines intersect are good locations for the dominant element. Where the center of interest is in the foreground, it usually falls at one of the two lower points. Where it appears in the background, such as a distant mountain peak, it would logically be located at one of the two upper points.

Wherever you place the focal point, the action or direction of motion should be coming into the picture, not going off the edge. Action moving toward the center of the photo looks like it's happening now, or just about to happen, and there's a feeling of anticipation and excitement. Action that trails off toward the edge of the picture looks like it's already taken place and the viewer feels let down—as if he's come along a couple of seconds too late for the main event.

Action doesn't necessarily have to be actual motion, either. Shots of a speed-blurred racing car or a diver caught in midair are great, but there's also a lot of implied action in a chess game or a still life. The curve of a tree branch, a long, sweeping road or river, objects with sharp, angular lines, a crouching animal—all these suggest motion even though they aren't moving. Imaginative cropping can heighten this feeling of movement and make a picture more exciting.

While cropping can improve a picture after it's been taken, the best time to eliminate serious flaws is before you snap the shutter. Composing a picture well in the viewfinder can save a lot of cropping later and can also get rid of problems that cropping can't solve, such as a poor background immediately behind the main subject.

Try to pose your subjects against uncluttered backgrounds. Get as close as you can. The more you move in, the less extraneous area you include in the picture and the more you focus attention on the subject. The rules for locating your center of interest apply equally well in the viewfinder as on the printing easel. The better the picture you get on film, the easier it will be to come up with good prints. ★★

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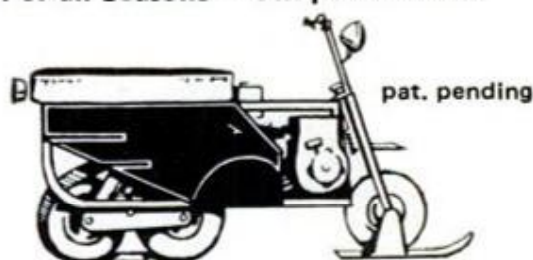
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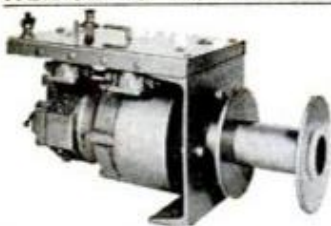
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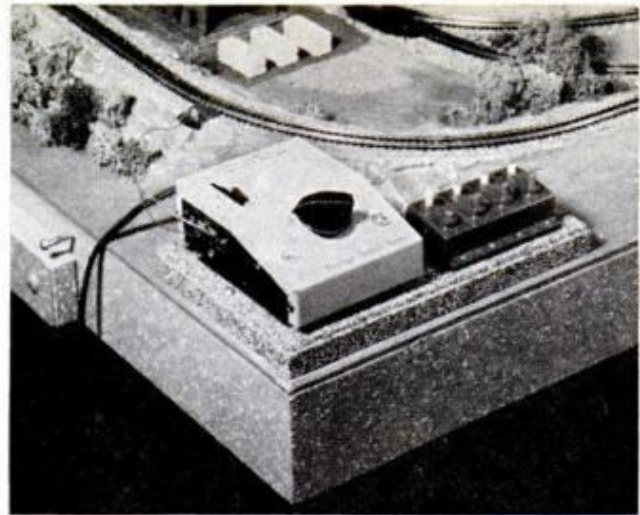
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## A LOT OF RAILROAD

(Continued from page 193)

and there. When bits of lichen are added for trees and underbrush, the overall effect is most realistic.

Embankments leading from grade-level roadbed to tunnel portals are formed like the mountains, only here the crumpled paste-soaked paper is simply stuck to the edges of the inclined roadbed and sloped down to the train board. Texture paint is applied as before.

Before I fastened the track in place I painted the roadbed with a speckled black-and-white paint called Plextone which made it look like a bed of gravel. Normally the paint is sprayed but you can apply it with a brush.

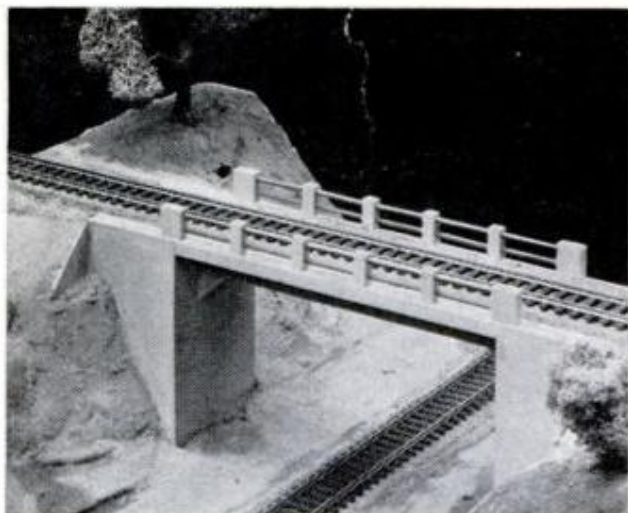
I used tiny dressmaker's sequin pins to anchor the track and found them just the right size to pass through the minute holes in the track ties. The pins are so small you'll have to hold them with tweezers or small pliers to drive them.

To add ground cover along the tracks I used drywall joint compound. If you mix it to a somewhat soupy consistency, brush it on and then roll it with a 3-in. paint roller, it will look just like rough terrain when painted flat green.

I used joint compound also to slope the sides of the square-edge roadbed, and to form rivers and lakes. In the latter case, I created white caps by applying the compound with a swirling motion of the brush. Then, when dry, I painted it flat blue with a dry brush and purposely let some of the white compound show through.

When it came to adding trees and underbrush, some I planted right in the wet compound. On the mountains I attached them with glue. Here you can plant them anywhere you want, but stick them on





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well so they won't fall off when you swing up the train board.

The elevated roadbed between the two mountains can be handled in different ways. It can be supported by a single embankment formed by piers and paper. Or you can discard the roadbed as I did and replace it with several sections of plastic viaduct. The viaduct I used is made by Atlas and comes in a kit which you assemble with airplane cement. When I had several joined together as a unit, I cut it down to make it even with the tunnel roadbed, then glued it in place. The track at that point passes through one of the arches of the viaduct.

You have a choice of manual and remote-controlled switches. If you follow my track layout, there are places where you must use remote-controlled switches since they are beyond reach. These are switches that are located along the rear of the train board. Aurora Plastics Corp. offers individual pushbutton controls for such remote switches which can be ganged together in a row at the power pack. All wiring from the button controls to the switches is made below the train board. A good location for the power pack is at the left front corner of your layout. Attach it permanently to your train board so it can swing up with the rest of your railroad.

You'll find dozens of building kits at your hobby store for creating towns, farms, factories and rail yards. They are N-ga. scale to match the trains and require cementing together. All buildings are glued securely in place so they won't fall off. In fact, your rolling stock is all you should have to remove when you swing your railroad against the wall. When your layout is completed, you can hinge it to the bookshelf and finally add the screweyes to hook the trainboard to the wall. ★★★

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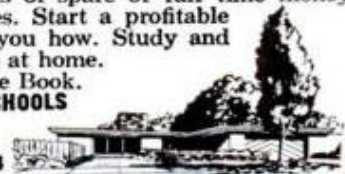
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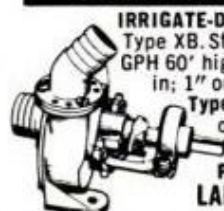


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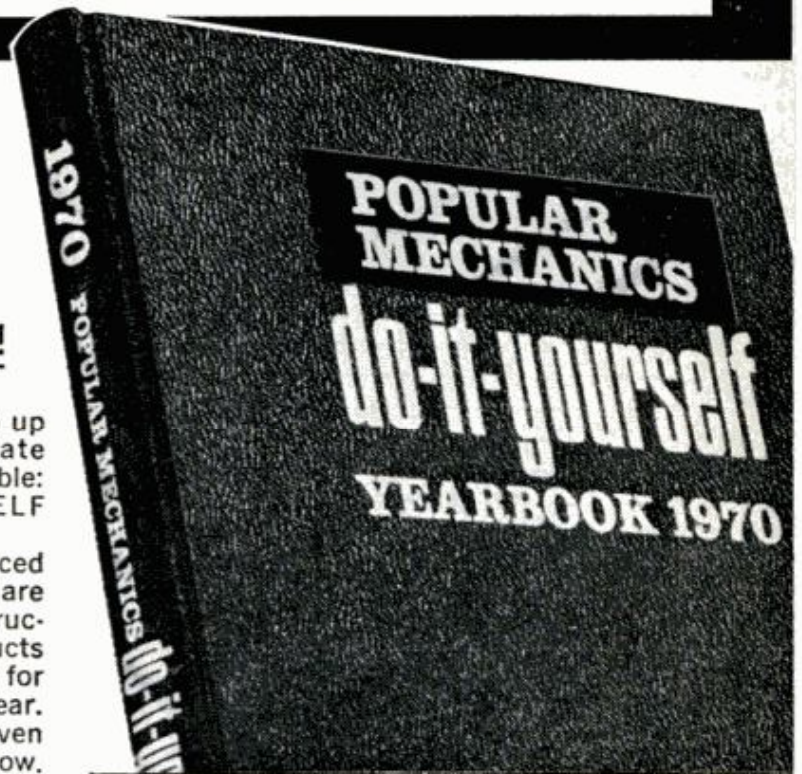
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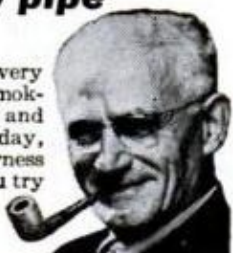
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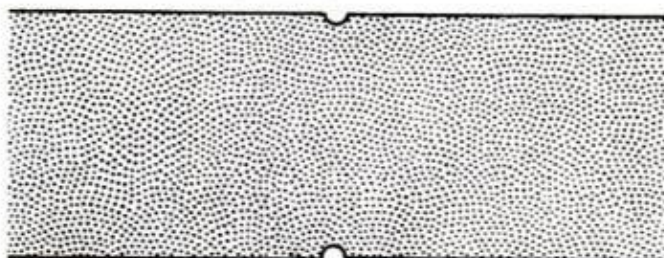


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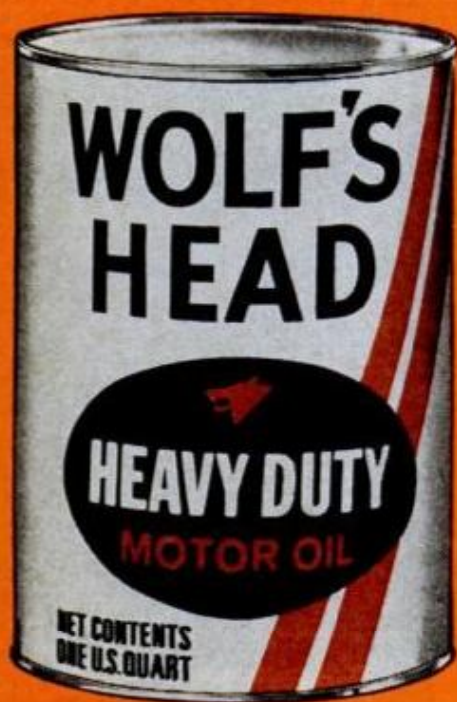
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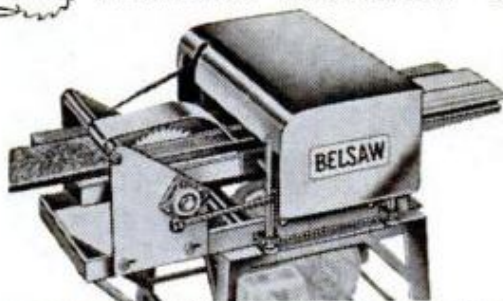
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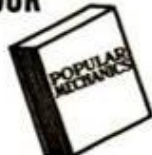
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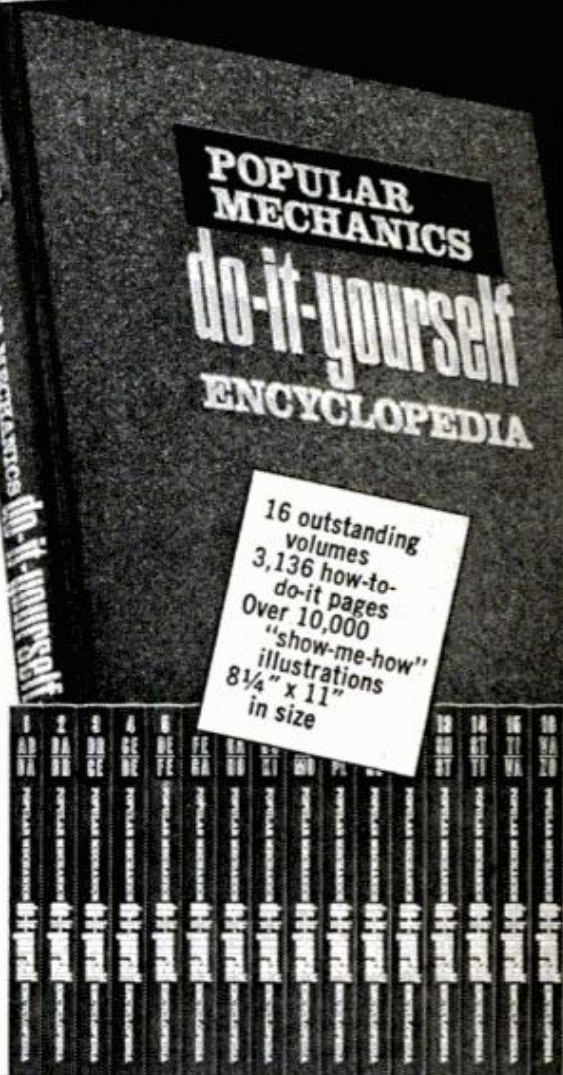
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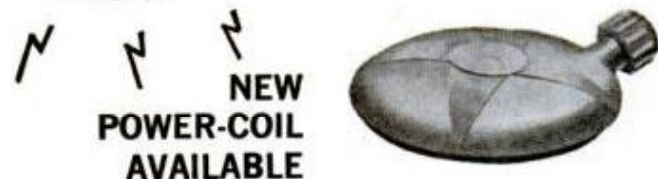
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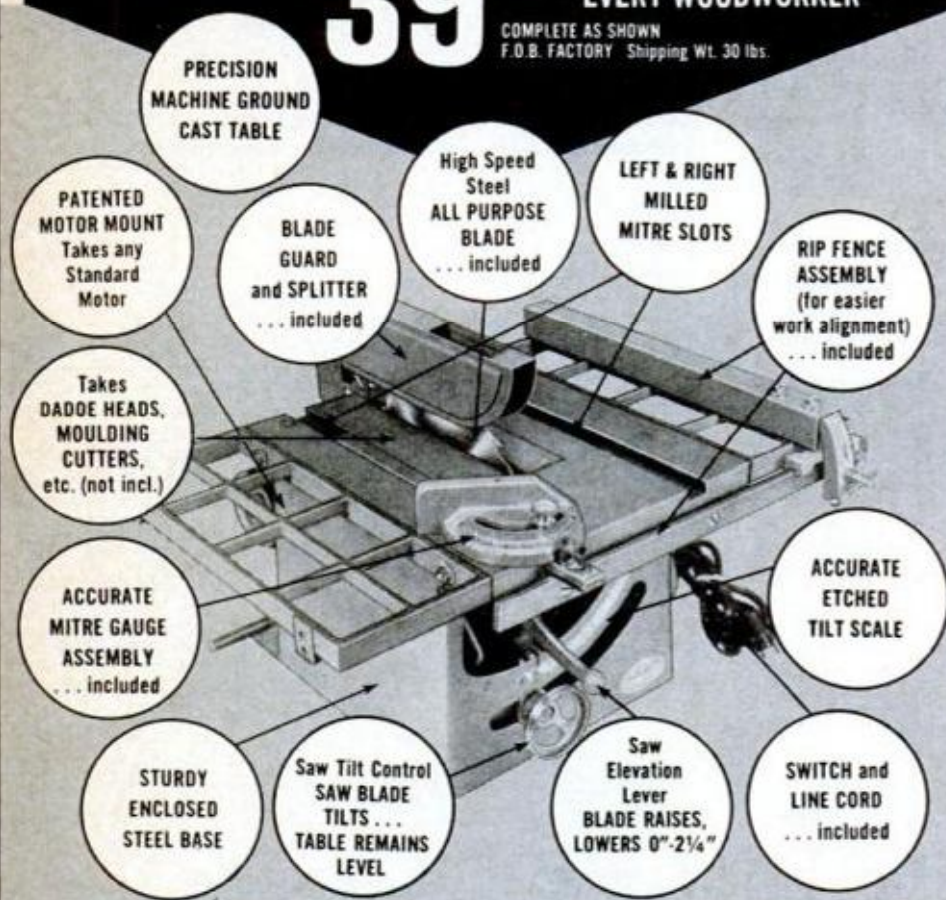
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