

The Europe You Can Afford—in a Camper

POPULAR MECHANICS

JAN. 1968
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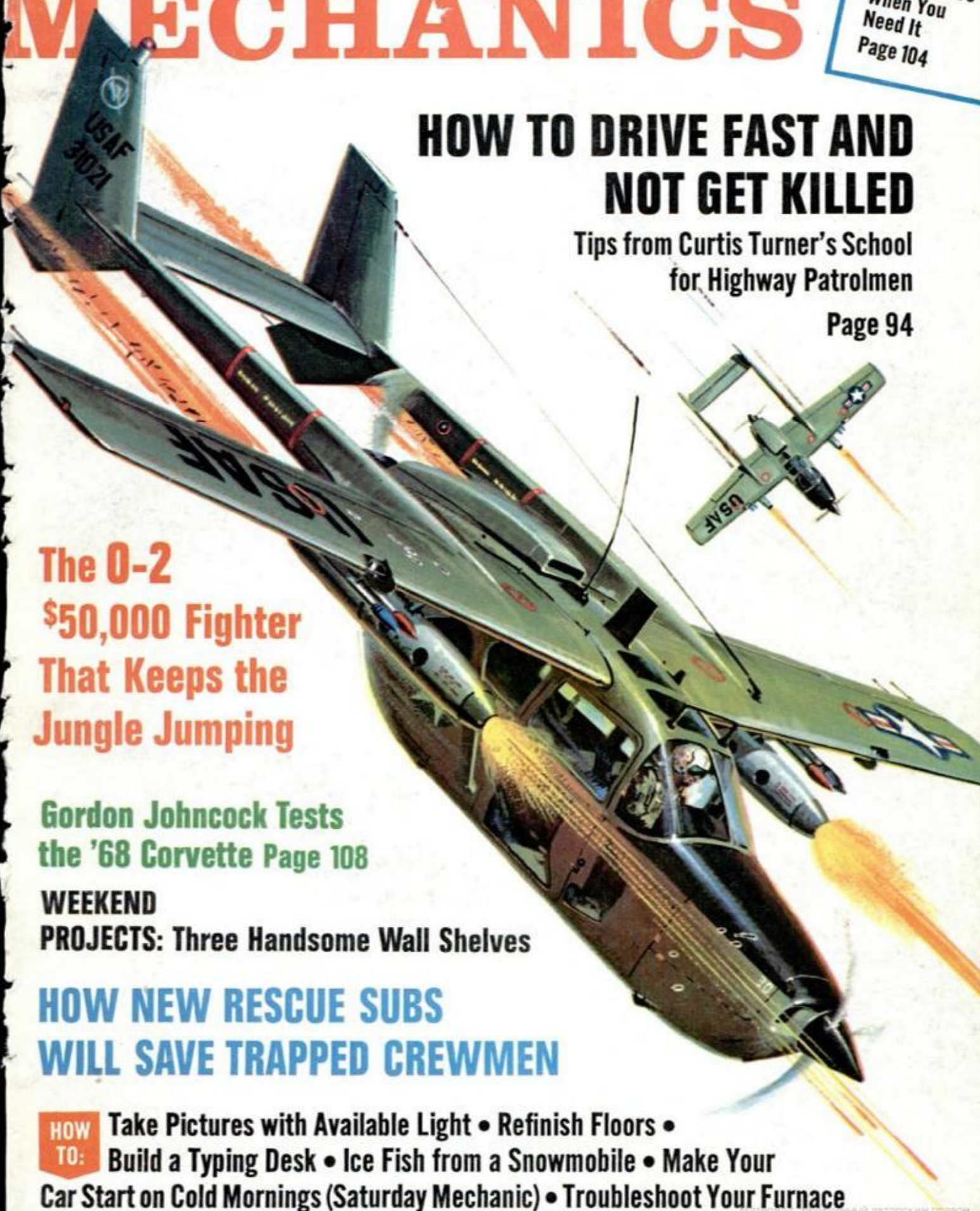
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New Merc 1250: 125 hp. A brand new engine. The world's most powerful.



The world's most powerful, most advanced outboard couples Mercury's exclusive Thunderbolt electronic ignition and system of silence to a completely new 99.9 cubic-inch 6-cylinder-in-line powerhead; newly designed pistons, connecting rods and crankshaft plus new carburetors with aircraft-type boost venturis provide greater acceleration and low-end torque with no loss in top-end performance. Introduced by Mercury in 1957, the 6-cylinder-in-line outboard is produced only by Mercury.



The Merc 1250 is the newest in the exclusive line of 6's which has set more performance and endurance records than any other outboard—every inch a Mercury. New from powerhead to prop . . . the culmination of ten years' experience in 6-cylinder production, the 125-hp Merc 1250 adds up to the new performance champion from the company that has made performance a specialty. At Kiekhaefer Mercury *The Payoff is Performance*. See your Mercury Dealer now.

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How Renault got up off the floor.

Things were none too cheery for us a while ago. We were, as they say, getting our lumps.

But those days, happily, are far behind us. We've made a comeback.

Sales are up 85% over last year. And proceeding quite nicely, thank you.

How did Renault accomplish this dramatic turnabout?

By the most time-honored means you can imagine: Hard work. Sweat. And a touch of anger.

We dropped a few dealers who were blasé about service.

We made sure every dealer we kept could get virtually any part in 48 hours. If not faster.

But most important, we built the Renault 10.

It has thicker gauge metal, thicker undercoating, and a few engineering

touches that border on the fanatical.

It delivers an honest 35 miles to the gallon.

30,000 miles between brake pad replacements.

18,000 miles or two years before you even have to consider replacing water or anti-freeze.

40,000 miles on our Michelin X tires. (\$5 more per tire, but well worth it.)

And you can pile up those miles in spectacularly comfortable seats. You couldn't get better seats if you spent \$5,000.

Yet, the Renault 10 is priced under \$2,000. Way under \$2,000.

All in all, the car is a bit better than it has to be for the money.

But then, we figure the best way for us to get back on our feet is to offer you a value that will really floor you.

RENAULT 

This One



JORF-X13-BZ8L



The Renault 10

AUTOMATIC TRANSMISSION AND
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The good neighbor kit

Be first on your block to own the DieHard and a set of booster cables.

Wait for a deep freeze to paralyze the neighborhood. Then go start your car. Sears new DieHard will start almost anything. Except maybe a big truck or an army tank.

It's the most powerful car battery of its size in America.

Spread your power around. Jump start your neighbors' cars and wave them off to work.

When everyone on the block has the DieHard, you can all sleep later on cold mornings. For the next 5 years.

That's how long we guarantee the DieHard.

You see the DieHard is not like other car batteries. Its case—rather

than being made of thick, heavy rubber—is molded of thin, polypropylene that's 60% stronger at 0°.

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That's why in all three power standards established by the Society of Automotive Engineers, when compared with other batteries of its size, the DieHard comes out Number One.

There are over 2000 places to buy a DieHard. They're all Sears, Roebuck and Co. stores. You can Charge It, of course, on your Sears Revolving Charge.

The Sears 5-year guarantee:

"Free replacement within 90 days of purchase if battery proves defective. After 90 days we replace the battery, if defective, and charge you only for the period of ownership, based on the regular price less trade-in at the time of return, prorated over number of months of guarantee."

**The DieHard
America's most powerful
car battery**

Sold only at Sears. \$27.95 with trade-in.

Sears

ALLSTATE

You can't do better than Sears.

The DieHard is so new it's available in Group 24 only. This size fits most Chevrolets, Chryslers, Dodges, Plymouths, Studebakers, many Oldsmobiles and Pontiacs, all Ramblers and Willys. Soon it will be available in all popular sizes. Sears carries a complete line of other fine batteries as well, in a wide range of prices.

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Curtis Turner's Daytona Preview. Can Ford halt the Petty parade?

Sea-Bottom Cities. We have the capability of putting a city on the ocean floor by 1978. See PM's full-color concept.

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Teflon: out of the frying pan onto the saw.

Du Pont has come up with a new, toughened-up version of Teflon® that won't peel. And we've coated our new saws with it.

The coating is Teflon-S*—a dramatic, new-formula industrial finish that enables Nicholson saws to do a faster, easier, better cutting job.

Friction can't grab hold of a Nicholson saw coated with Teflon-S. Sap and goo can't stick to it. Rust can't get a grip on it.

Why keep struggling? Switch to a new Nicholson Teflon-S-coated handsaw.

*Teflon-S® is Du Pont's trademark for its stratified non-stick and self-lubricating finish.

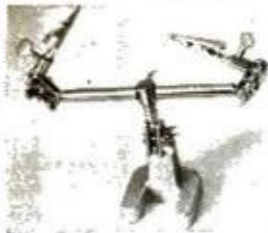
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LETTERS TO THE EDITOR

Fan of Dan

Recently you carried two articles by Tom Stimson on how to cut down on traffic deaths (*How Fast Is Too Fast?* page 71, Sept. *PM*, and *How Young Is Too Young?* page 132, Oct. *PM*).

Many suggestions were offered for saving lives, but I'd like to add one more: If people would heed the driving advice given by Dan Gurney in *Drivin' with Dan* every month, a few more lives could be saved.

I'd like to thank him for taking time out from his racing schedule to add to my enjoyment of *PM*.

MILWAUKEE, WIS.

JERRY E. PAVEGLIO

Super ears

I am sure that the medical profession in general and otologists in particular would like to meet the author of *Signal-Injector Probe* (page 196, Oct. *PM*) as he seems to have the most remarkable ears in the world. He appears to be able to hear sounds at 1000 kilocycles directly from a speaker; the upper frequency limit of hearing on normal human beings is between 20 and 30 kilocycles.

Would you either clear up the mistake in frequency or do an article on the author's hearing?

ALEXANDRIA, VA.

DON JOHNSTON

While grinding his teeth at 10 cycles per second, our electronics editor confessed that in converting the author's "hertz" designations back to the old system, he goofed and used "kilocycle" instead of "cycles" or "cycles per second."

From now on, he adds, PM will refer to frequency in units of hertz (one c.p.s. equals one hertz; one kc. equals one kilohertz; one megacycle equals one megahertz, and so on).

The term has nothing to do with car rentals. It's in honor of Heinrich R. Hertz, whose experiments confirmed Maxwell's theory of the propagation of electromagnetic waves. Many other units of measurement in electricity and magnetism—ohm, volt, watt and gauss, for example—similarly commemorate scientists.

No diploma, no car

On the subject of teen drivers (*How Young Is Too Young?* page 132, Oct. *PM*), I have always wished for a nationwide

(Please turn to page 8)

Have you the Courage to Quit Your Job ...if you're assured a Higher Income?

Yes this may take some courage... the kind of courage that takes men out of the daily grind and lifts them to positions with prestige and much higher incomes. We are right now seeking such men to become the owner-manager of their own nationally advertised service business.

We will train you, help finance you, guide you and assist you. And you can stay with your job until your own business, operated in spare time, is bringing you more income than your job salary.

Postage stamp brings FREE Book telling how We guide you Step by Step...and Help finance You

If you've wanted to be your own boss... to be financially independent... have a growing business, now YOU CAN.

Many men have said to us, "I can't afford to give up my job till I know I have a sure thing, a sound business that will provide both security and a better way of life."

That made sense. So we built such a plan. Now hundreds of men have upped their scale of living with a Duraclean dealership. You don't experiment. You use tested, proven methods. You have our backing and know-how.

You keep your job while a customer list grows. When your business profits exceed

your job salary, go full time lining up jobs for your servicemen.

Would you like this? Don't guess. Don't decide now. Mail the coupon so you'll have facts to decide wisely... and KNOW if this is what you want.

You operate from a shop, office or home. This business is easy to learn... easy to start... so easy to service that women dealers often do it.

We are now enlarging this worldwide system of individually-owned service businesses. If you are reliable, honest and willing to work, we invite you to mail the coupon. No obligation.

It's Easier than You Think to Start Your Own Business

In our illustrated booklet, you'll see the way we show you step by step how to quickly get customers... how recommendations multiply customers.

Your carpet and upholstery service not only cleans, it enlivens fibers... revives dull colors, raises pile. It eliminates soaking and fiber breaking from machine scrubbing. Mild aerated foam lightly applied lifts dirt, grease and unsightly spots. Customers become your best salesmen.

The booklet explains all 6 services which are rendered "on location." You have six ways for profit on every job.

National advertising explains your superior services, builds customer confidence... brings job leads to you.

We train and assist you. We show you 15 ways to get customers.

Don't delay! Get the facts TODAY before your location is taken.

Start Small, Grow Big... in this Booming Business

A third century ago Duraclean was an idea... but it caught fire and spread rapidly to a worldwide service. Why? Superior methods plus tested, proven ways to get customers. Our dealers, too, start small... and GROW.

A few hundred dollars establishes your own business. We furnish electric equipment and materials to return your TOTAL

investment. Men often take partners.

If you have good habits and like to please customers, you will likely qualify for a Duraclean dealership.

It's been said, "Opportunity knocks but once at each man's door." This may be that rare opportunity in your life.

You can quickly decide from facts we'll mail you. So, find out now.

Dealerships Resell at Big Profits

If, because of illness, moving, or for any reason a dealer wants to sell, we maintain a service to locate buyers and to help him sell.

Dealerships resell at up to 10 times the dealer's cost. R.D.K., after 5 months, sold for \$2,000 above his cost. L.L., after 30 months, got \$7,116 more than he had paid. The value of your dealership and franchise grows monthly.

FREE BOOKLET tells how to start Your Own Business

With no obligation, we'll mail you a letter and 24 page booklet explaining the business... how and why your income grows... how we help finance you.

Then decide if this opportunity fulfills your dream of independence and a much bigger income.

Your location could be taken tomorrow... so mail coupon today.



Find Out with No Obligation

Your Services Are Commended by

McCall's Magazine, Parents; American Research & Testing Laboratories... and by leading Carpet Mills & Furniture Makers

What Dealers Say:

Gerald Weithrauch: "Insurance job brought me \$205.70 in single day. Another, \$300".

Leo Barnett: "I started spare time and took in \$140 in one night after supper. Now, full time, I can make as much in a week as I used to make in a month working for others".

Willis Tatro: "After two years of good profits we sold our business for five times the cost".

Arlin Rae: "I have work scheduled for three weeks in advance. I averaged \$122 a day for the last ten days".

Blanche Blood: "Duraclean brought me security and an education for my daughters. We've done as much as \$3,000 on a single job".

Loren Farris: "Did the carpeting in a furniture store in less than 3 days for \$400. Now get all their customer business".

Robert Wheeler: "The professional quality of Duraclean Service has earned the respect of carpet dealers and wholesalers. I've earned \$117.50 in an eight hour day".

Wilmer Suders, Jr.: "Building steadily. Last month grossed \$2,012. One job came to \$752".

John Szymanski: "Making 50% more than on any job I ever had. I've earned as high as \$1,300 in a single week, as much as \$2,700 on one job".

Ernest Shulda: "I never knew a company as eager as Duraclean to help their franchisees succeed".

R. Geisman: "Using the direct mail program we sold 10% on actual jobs. We also get a lot of referrals from happy customers".

Jerry Baker: "I don't know of any other business in which a man can make as much per hour".

Walter Parsons: "It would take a man years to build up the fame he gets automatically with the Duraclean name. It's a household word".

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With no obligation mail letter with 24 page illustrated booklet explaining how I can increase my income and family security with a Duraclean Dealership.

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LETTERS

(Continued from page 6)

law that states that a person cannot drive a car until he graduates from high school or reaches 21, whichever occurs first.

This would discourage drop-outs and make parents more aware of school activities, since they would have to see that their student-children had some way to get to extracurricular activities.

If a minor has not the responsibility to finish high school, he certainly should not be entrusted with lives.

PECATONICA, ILL.

MRS. ROY JONES
(Mother of seven)

Among the many letters we received on this subject, Mrs. Jones, yours expresses a minority opinion. (Though doubtless, with seven children, you've been outvoted before.) Your scheme has a built-in bonus for the doddering over-30 group: Those baggy eyes and gray hairs from sleepless nights would at least be postponed until Junior got his diploma.

You mention the "Medicare set" with their impaired sight and hearing. Now, if hearing is so important in driving, where does it leave the truck driver?

Truck drivers have somehow acquired a reputation for being excellent drivers, yet when their trucks are under way they can't hear an air horn right behind them.

Other things being equal, I maintain that a driver who doesn't hear well is better than one who does, because he's used to depending on his eyesight, and this is 99 plus percent of good driving.

You're quite willing to ban the oldsters, but want to make it easier for drunks to drive safely. How about a little more consideration for people whose only offense is being old? You're going to be—sooner than you think.

NATICK, MASS.

RICHARD L. LOTRECK

Sorry. Would you repeat that. Didn't hear your last sentence.

Good to have you back

About 40 years ago I got busy on something else and stopped paying any attention to *Popular Mechanics*.

Just the other day I sent in my few bucks for another subscription.

Well, the darn issue comes and I just about reacquire my youth again. The paper it's printed on isn't quite as slick as

(Please turn to page 10)

The Devil puts a coat on!

New Red Devil Tools with Du Pont Teflon-S Coating!

Another first! Our new series of Putty Knives, Wall Scrapers, Taping Knives, coated with super-hard Du Pont Teflon-S*! Non-stick, drag-free, easiest to clean! Need no breaking-in! Resist corrosion, rust. New steel nail-setting heads, solvent-resistant handles, too! At fine hardware, paint, or variety stores. When you buy Red Devil, you buy the best!

*Teflon-S is a Du Pont Company Trademark.





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...when you train at home with NASD for a HIGH PAY JOB IN DRAFTING!

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"My first position after completing your course jumped my income from \$350 to \$820 per month." — G. W., Tenn.

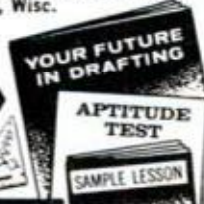


Big Promotion!

I was promoted from the production line ahead of 4 others and got a good pay raise." — W. A., Wisc.



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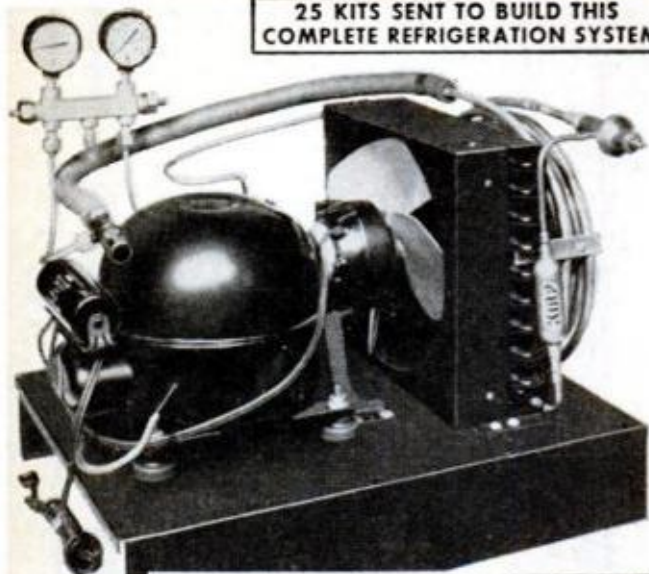
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LETTERS

(Continued from page 8)

four decades ago—but most everything else is just about the same interesting caliber.

Even the classified ads—somebody's still got frogs, fish and reptiles they haven't sold yet, and, three wars later, there's still government surplus for sale along with emblems, brassards and patches.

If—for another four decades—I just can continue my vicarious interest in all your do-it-yourself hints without doing something about it, I'll probably sleep in a happy grave.

Thanks for staying alive.

HOUSE OF REPRESENTATIVES
CONGRESS OF THE UNITED STATES
CRAIG HOSMER

It's a deal. We'll keep publishing if you won't go quitting again.

Welding warning

I am writing to comment on the hazards of your carbon arc torch (*Build This Carbon Arc Welder for \$5*, page 174, Sept. PM).

First, there should be a three-wire safety connection rather than two. This allows the framework of the torch to be tied to earth ground. Second, direct connection of the torch to the a.c. mains constitutes an extreme safety hazard for the user when working against metallic objects. Third, there will be severe television and radio interference. Fourth, copper-clad carbon electrodes can produce hazardous copper-based fumes. Fifth: Do not attempt to use the welder on cadmium-plated objects.

SEATTLE, WASH. R. V. THOMAS

The author responds: A three-wire cord is impossible, since connecting the perforated cages to this wire would result in a short circuit. I'd suggest that a builder form the end caps of nonconductive material (my patented design calls for the cages to be isolated with porcelain insulators).

Regarding television and radio interference, all I can say is that my own unit does not interfere with our TV set when I'm using it in the basement.

As for fumes, copper-clad electrodes are widely sold, and I've never seen any health warning printed on the packages. And, regarding cadmium, this little welder just won't put out enough heat to produce fumes at a rate that would cause a dangerous concentration. (When using my acetylene torch on water pipe, though, I wouldn't consider doing the job anywhere but outdoors.)

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

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APPROVED FOR VETERANS

AIRMAIL COUPON TODAY

Science Worldwide BY JOHN F. PEARSON

Duplication of individual humans is a distinct future possibility, according to Prof. Joshua Lederberg of Stanford University. This could be done, says the Nobel Prize-winning geneticist, by replacing the nucleus of a fertilized human egg with a nucleus taken from a cell of the individual to be duplicated. Since a complete set of chromosomes is carried in every human cell, the altered egg would contain all the ingredients required to develop into an organism identical to the one that supplied the nucleus. Experiments of this kind have been done with frogs.

New "Compac" toothbrush developed for use by soldiers in combat was recently tested at Fort Lewis, Wash. Soldiers in the "test" company used the 3¼-inch brush after each meal, without water or toothpaste. After a period of time, examination revealed that the soldiers had less food debris around their teeth and a lower incidence of gum inflammation than did their buddies in another company at the base who followed the usual morning-and-night pattern of brushing.

Take a flat sheet of foamed polystyrene (about 2 inches thick) and add a layer of epoxy-impregnated fiberglass. Then give the sheet a domed contour by pushing in from the edges at certain points. That's the routine followed by researchers at Purdue's School of Civil Engineering in creating "buckle shell" roofs for covering patios, cottages, swimming pools and car ports. The shells are so light and strong that the engineers wonder if they couldn't be used for big structures.

Asteroids should be monitored on a large-scale basis so that warning could be given if one were to hit the earth. That's the opinion of Dr. Harold Masursky, a Geological Survey scientist, who points out that our planet has been struck by similar objects in the past. Asteroids vary in size from one to 500 miles in diameter. Out of some 80,000 visible to telescopes, only 30 are monitored. Some have orbits that, in astronomical terms, bring them very close to earth. If the orbit of one of them, Icarus, changed by but 1°, says Dr. Masursky, it would be on a collision course with earth. Nuclear weapons could be used to destroy an onrushing asteroid, according to the scientist. Or small rocket engines could be deployed to push it off course.

A huge airplane-arresting system, capable of stopping the largest jet without discomfort to passengers, is being developed for France's Ministry of Transportation. The system consists of a nylon net that engages the aircraft for the full width of its wing span. Net and plane are brought to a slow stop by energy-absorbing devices positioned along either side of the runway.

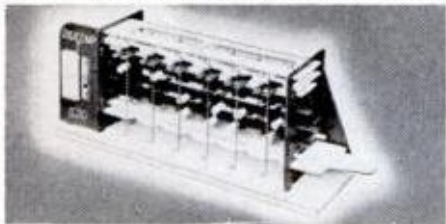
A plan to mine copper by nuclear explosion has been submitted to the Atomic Energy Commission by the Kennecott Copper Corp. The company proposes that a 20-kiloton blast (equal to 20,000 tons of TNT) be set off 1200 feet underground in a low-grade ore site in Arizona. It's estimated the blast would create a pile of material containing 1,300,000 tons of ore. An acid solution poured over the pile would dissolve the copper, and the resulting liquid would be pumped to the surface for processing.

Forecasts of Asian flu outbreaks this winter shouldn't send you scurrying to get shots for your children—not if they're healthy kids, that is. Reason: Available vaccines may cause a potent reaction. This advice comes from the American Academy of Pediatrics. Only children for whom a bout of flu might create serious consequences should get the vaccine, say the doctors. This group would include children with heart disease or chronic pulmonary diseases such as asthma and bronchitis.



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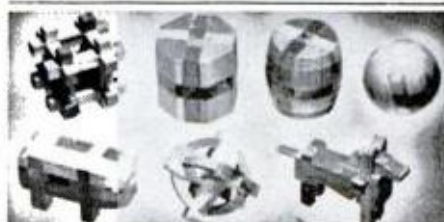
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BY KEVIN V. BROWN

AVIATION

JETSTREAM

THE BATTLE of the jumbo jets is joined. Douglas has stretched its old long-range DC-8 to accommodate more than 200 passengers, and Boeing is taking orders on its new 747 which may carry anywhere from 350 to 490 passengers. Now Lockheed has entered the lists with an odd-looking monster it calls the L-1011.

The 1011 will be offered for shorter ranges to carry up to 300 passengers on



TRIPOD JET features three engines, in unusual arrangement outside, and eight-abreast seating inside



domestic flights. Passengers will sit eight abreast in the two-aisle cabin, with no passenger more than one seat away from an aisle. A partition separates the center seats.

What makes the plane unusual, however, is the tripod arrangement of the jet engines, one on each wing and one in the tail. Usually, engines are either all on the wings or all in the tail.

Lockheed explains that, for shorter ranges, the plane will need a quick-turn-around capability to be economically efficient. Planes with engines all in the tail have had difficulty with the shifting center of gravity with different cargo-and-passenger loads.

With the tripod arrangement, the 1011's three big engines will give it built-in balance, regardless of load, and hence quicker reaction for turnaround. ★★★

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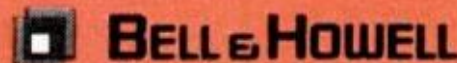
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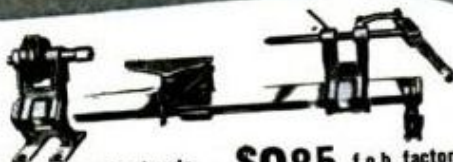
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Optional faceplate for turning bowls, trays, lamp bases, rosettes, etc. \$2.50. **\$9.85** f.o.b. factory. Wt. 14 lbs.

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Optional hold-down assembly \$2.75 add'l.

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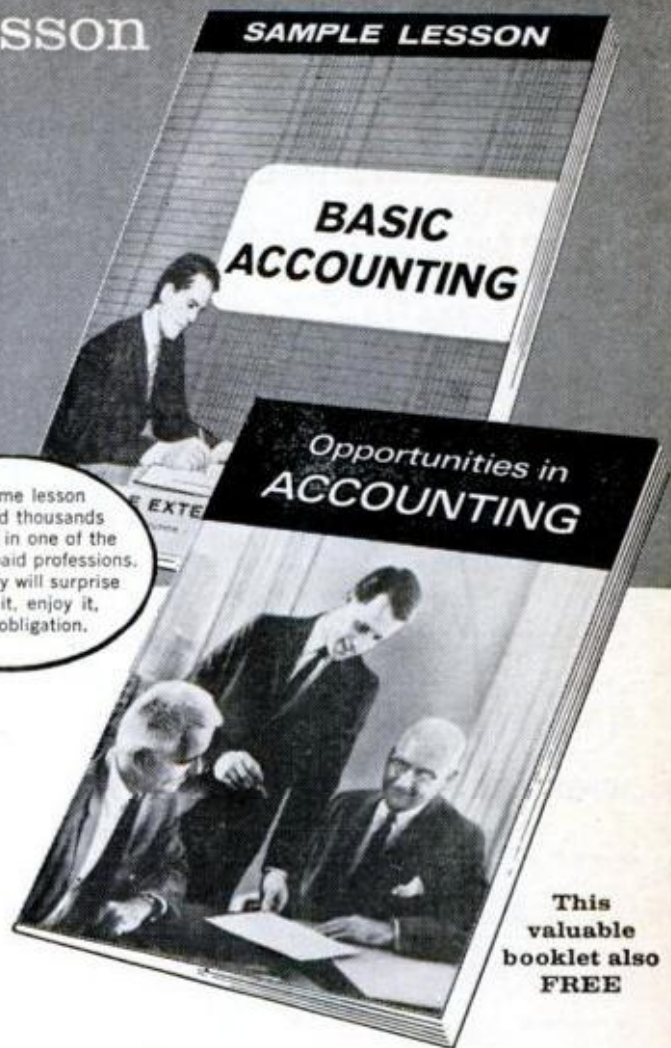
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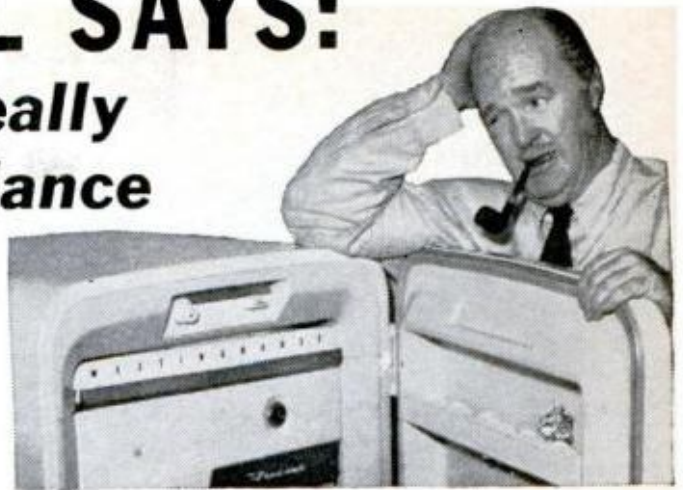
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Those electrical gadgets you have around your house are great on convenience, but if you're like a lot of do-it-tomorrow Johnnies, you don't know where to turn when one breaks down. So you call one of the busy Appliance Servicemen in your town, then drink instant until that fancy automatic coffee pot is perking again.

People have so many electrical appliances, it's no wonder Appliance Repairmen are busy as a bear in a bee nest. Count yours. The average home has at least a dozen, maybe more. There are better than 800 million appliances in the U.S.A. right now. No wonder the man who knows how to service appliances properly is pocketing \$4 to \$6 an hour, for as many hours as he cares to work!

If you're interested in making money (and who isn't), here is a job field crying for good men. And it's no sweat at all to get the training you need. Thousands have trained with National Radio Institute's Appliance Division. NRI has a great, low-cost home-study program covering every type of Appliance repair in detail. You study at home, in your spare time, learning through actual practice how to fix home, commercial and farm appliances. And not just the little stuff, either. Besides cantankerous coffee pots and toasters, you can learn how to repair air conditioners, refrigeration equipment, even small gasoline engines—and that's where the big bucks are, in the major appliances you'll fix.

NRI is one of the biggest and best schools in the home-study field. They have this Appliance Servicing course worked out to the most nit-picking detail. Yet, you'll be amazed at how little it costs. You even get a 25-buck professional Appliance Tester without extra cost. With your Tester and a few basic tools you probably have in your house, you'll be doing repair work long before you finish the course. And you can work anywhere—

in a corner of your basement, in the garage, even on the kitchen table.

NRI has been in home-study education since 1914. Experienced, well-trained instructors on the staff of 150 in Washington, D. C., give you all the personal attention a man could ask. You don't even need a high school diploma. Take it from Uncle Tom . . . this can be one of the easiest and most rewarding businesses you'll find today, either full-time or in spare hours. As a matter of fact, knowing how to service Electrical Appliances can pay off even if you don't want to strike out on your own. That coffee pot on the fritz probably needed ten minutes of a repairman's time to be perking again like the mudpots in Yellowstone Park. You can do it yourself with the training NRI gives you. And if you're thinking about Social Security years, this is a great way to pick up some money and keep yourself busy at the same time.

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WHAT'S NEW OUTDOORS

BY DAN FALES

HOW ABOUT a Sunday afternoon dive? If you have an extra \$4500 you can probably make arrangements with Reynolds Submarine Services Corp. to charter *Aluminaut*—a deep-dive research submarine. That's if you want the extra-deep day-trip of 7500 to 9000 feet. Of course, if you don't have a spot quite that deep, you can schedule a trip from 0 to 1500 feet for \$1250; or 1500 to 3000 for \$2500; or 3000 to 4500 for \$3750; or 4500 to 6000 for \$4000; or 6000 to 7500 for \$4250. These are all-day rates, and include such necessities as food, accommodations, transportation, some photography, some tape recording. An accident insurance policy for \$50,000 per passenger is carried. Actually, this service is for scientists, though it may be available for tourists some day. But sure as water's wet, someone is going to make a big thing out of inexpensive dives off Florida and California for tourists.

AND SPEAKING OF MINI-SUBS, it was *Alvin* that took on a 200-pound swordfish in 2000 feet of water off the Florida coast. *Alvin* is a research sub operated by the Woods Hole Oceanographic Institute. During a photo-taking dive, *Alvin* was suddenly attacked by the fish. The attack forced the sub to surface. The four-foot sword of the fish was wedged into a crack in the sub's outer shell. On the surface, the fish was removed, dressed out and served at the evening meal.

CIVILIAN-OPERATED SUBS, either rented or owned by companies or individuals, are becoming so popular that the U.S. Coast Guard is establishing a voluntary voyage report system. The reports help the Coast Guard control underwater traffic that might create problems when naval subs, civilian subs, recreational subs, and surface craft supporting underwater activities all operate in the same area. The reports also help pinpoint a submersible if it gets into trouble. And, surprisingly, voyage reports also "lessen the chance that a detection of a civilian submersible would be evaluated as an unidentified foreign naval submarine," says the Coast Guard.

SNOW-BOATING is the term given this new way of getting down a snow-covered slope. This downhill conveyance is neither sled, toboggan nor ski, but all three com-



bined, according to the manufacturer. Climb aboard. You can schuss at 60 mph; or slalom by maneuvering steering-braking handles on each side; or just sit in the cushioned seat and get towed by a snowmobile. The Snow-Boat is made of plastic, and is very durable. It costs \$24.95, and is available through Snark Products, Inc., 1580 Lemoine Ave., Fort Lee, N.J. 07024.

IT'S GOT TO BE A RECORD. Alfonse J. Masulla of Kearny, N.J. shot at 5000 registered skeet targets in one day. That's right, he fired at soaring clay birds for 11½ hours—taking only 15 minutes for rest and lunch. Firing at a rate of 444 targets an hour, Masulla kept a platoon of scorers, trap boys and referees busy all day at Thunder Mountain Winchester Public Shooting Center in Ringwood, N.J. When finished, though his shoulder was a bit sore, he had dusted 4470 targets of the 5000 flown—that's 89.4 percent. Nice going, Alfonse.

BE YOUR DOG pet or prized hunting hound, it is a good idea to tattoo him for permanent identification. Though dog-napping rings seldom make front-page headlines, they are active across the country. Many dogs that are snatched are subsequently sold to research laboratories, others are resold to individuals as trained field dogs. In either case, it is more difficult to get rid of an animal if identifying marks are permanent and uniformly located on all animals. So it's suggested that dogs be tattooed either in the ear or high on the inside of a hind leg. The tattoo can be a distinctive mark or a number. Whatever it is, it should be recorded. ★★★

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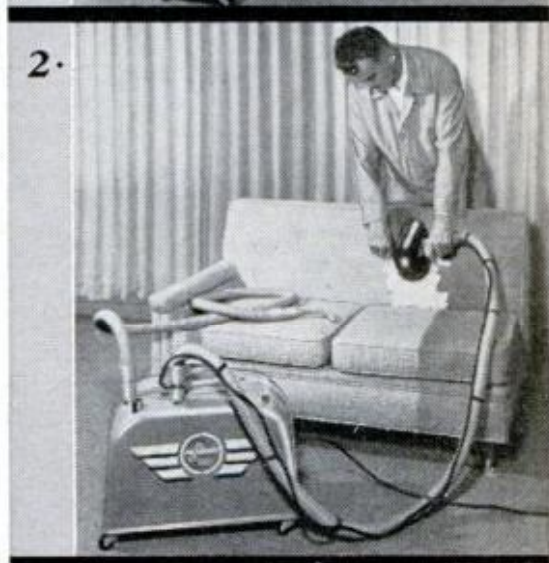
because each service helps to sell the other two

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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In the Driver's Seat of: The Fiat 124

**Comfortable,
Economical,
Fun to Drive . . .**

By ALEXANDER MARKOVICH

IF YOU'RE LOOKING for a perfect car, the new Fiat 124 isn't for you. It has some drawbacks:

Dealers may be hard to find. At this writing there are only 415 dealers coast-to-coast, though their ranks are swelling. Parts and service are adequate in metropolitan areas, but if you live in East Over-shoe, you can't afford a Fiat unless you can afford a spare one.

Turning on the headlights is like programming a computer. First you push a dash switch, then you jiggle a column-mounted stalk, and finally you jab another dash switch to turn on the panel lights.

The brake pedal is attached to what seems like a bowl of pasta. In addition to our test car, I tried a couple of 124s and the brakes felt spongy in all of them. Strangely, this doesn't hurt performance of the four-wheel discs in the least. After half-a-dozen rapid-fire panic stops from 60 mph, the brakes stopped fast and straight, with a minimum of fade.

The one front and two rear ashtrays are on the skimpy side.

But the 124 has same good points, too. For example, its ride is the best of any small car I've ever driven. It's well controlled over all kinds of road surface and, despite the short wheelbase, there's no pitching.

In a corner, the car sticks like bubble gum. The independent front and live-axle rear suspension with coils all around looks stodgy on paper, but it puts many true sports cars to shame.

Performance is amazing, especially for a little in-line Four that displaces only 73 cu. in. and develops 65 hp. From rest to 60 mph took just 13.7 seconds—which is better than many American six-cylinder compacts can do—and 40-60 takes 6.9 seconds. And that's with a tight new engine that had gone less than 800 miles. A top speed of 87 mph lets the car take turnpikes in stride. The engine is smooth at all



PERFORMANCE is outstanding in view of small engine size. Car gets away quickly, has 87-mph top speed

speeds and should prove to be long-lived, thanks to its five main bearings.

In typical Italian fashion, controls are perfectly placed for lively driving. The steering wheel is well away, allowing a straight-arm position that gives perfect control. Pedals are comfortably spaced, and their positioning encourages heel-and-toeing—simultaneous braking and blipping of the throttle when you want to slow down and downshift at the same time.

The four-speed, floor-mounted transmission is precise, exceptionally well synchronized and light enough to be shifted with the flick of a finger. The seat offers generous adjustment. Vast expanses of glass give excellent visibility all around.

The interior is more luxurious than any \$1800 car has a right to have. The richly
(Please turn to page 26)

RECLINING front seats upholstered in pleated vinyl give interior a luxury look. Seats are ventilated



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DRIVING THE FIAT 124

(Continued from page 25)

pleated vinyl upholstery looks like leather, and tiny indentations pressed into the seats give welcome ventilation where it counts. Rake of the front seats adjusts all the way to full reclining position. Legroom is more than adequate front and rear, and headroom is good enough to clear my hat.

The well-padded dash holds an accurate speedometer (only one mph fast at 60), a water-temperature gauge, a fuel-level gauge, and lots of little red lights. I missed an oil-pressure gauge and, in a car as sporty as this one, a tachometer. The glove box is immense, but has no lock.

Italians love their grab handles (maybe because it has something to do with the way they drive). The 124 has a handle over the right front door and one over each rear door; the two rear ones incorporate handy clothes hooks. Other civilized niceties include two courtesy lights, a day-night rear-view mirror, a heater that sizzles, rotating dash vents that direct air flow either at the windshield or at your face, an emergency flasher, toolkit, electric wipers, windshield squirter, anchors for shoulder harnesses, underdash hood release, full horn ring, and padded sun visors that swing back to shield the side windows.

Perhaps most impressive is the workmanship. Every panel fits perfectly, and there are no rattles or squeaks. And the chassis is greased for life.

No, the Fiat 124 may not be a perfect car. But it comes close! ★★★

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DETROIT

LISTENING POST

BY BOB IRVIN

IF TALK IS CHEAP, THE ELECTRIC CAR SHOULD SELL FOR PEANUTS. Nearly every month, someone gets charged up on the subject. Now, British Motor Holdings says it's designing an electric car with a range of 500 miles. BMH says the car will use a new zinc-air battery designed by a New England firm. It's said to be capable of producing 80 watt-hours per pound, four times more than a lead-acid battery. Ford officials, working on a sodium-sulfur battery twice as potent as the zinc-air system, aren't impressed, claim it's a long road from talk to reality.

GENERAL ELECTRIC IS HAVING A TOUGH TIME convincing people it's not ready to build a battery-powered car. Threatened with a congressional study by auto critic Ralph Nader, GE disclosed details of its electric car, the subject of many rumors over the past year. It says the car is powered by a combination of lead-acid and nickel-cadmium batteries, has a top speed of 55 mph, a cruising range of 120 miles at 35 mph, and an in-town range of 50 miles. It has a fiberglass body, a magnesium frame, an overall length of 130 inches—30 less than the VW Beetle—and can hold two adults and two children. Nader insists GE and the auto firms are hiding the true state-of-the-art out of fear the government might require electrics if it knew their true potential. That claim is hard to believe.

SHADES OF THE STANLEY STEAMER! Apparently several government researchers studying air pollution have come to the conclusion that the steam engine is the only practical alternative to the gasoline engine for automobiles. One auto company is even supposed to be experimenting with a steam-powered car.

AN ELECTRIC DEVICE AUTOMATICALLY GUIDING A MOTORIST to his destination—eliminating the need for highway-route signs—will soon be the subject of a federal government testing program. General Motors demonstrated such a system more than a year ago. Now the Bureau of Public Roads has given GM and Philco-Ford contracts to develop a system for full-scale testing this year around a large American city. The test may cost up to \$5 million. A motorist involved in the test would insert a card giving his destination into a device built into the car. Electronic roadside checkpoints would pick up signals from the device and then instruct the driver whether to proceed straight ahead, turn right or left. Each roadside location will cost \$5000 because it will contain a small, special-purpose computer. The equipment for each car will cost around \$350. All this seems like a mighty expensive way to replace free road maps.

SANDBOXES COULD ELIMINATE 18,000 HIGHWAY DEATHS A YEAR, says former race driver John Fitch. A third of the 54,000 traffic deaths occur when vehicles plow into fixed objects like bridge abutments. Fitch would place specially-designed boxes containing sand in front of those abutments. Out-of-control cars would strike the boxes, which would throw up clouds of sand while absorbing energy before the vehicle could hit the abutment. Fitch has made test runs into sand barriers at speeds up to 60 mph without injury and was even able to drive away the cars. And, he adds, officials of one Eastern state are going to test the idea on public roads.

WANKEL ENGINE IN CURTISS-WRIGHT'S FUTURE? The company has been researching the rotary piston design for several years and word is that it will begin limited production soon—but for industrial, not automotive use.

THE SAFETY HAWKS HAVE LOST. A look at the government's 1969 auto safety
(Please turn to page 30)

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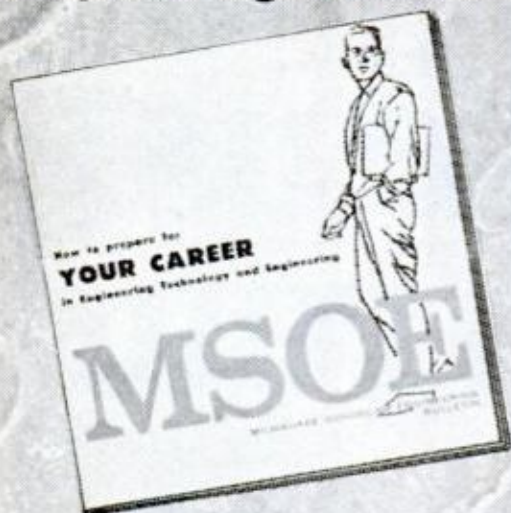
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DETROIT LISTENING POST

(Continued from page 28)

proposals proves this. Auto men have obviously convinced Washington officialdom that they need more than 12 months to redesign a car to meet new safety standards. The government's proposals for next year's cars should not be hard to satisfy. Most features like pressure radiator caps, double hood latches and windshields that don't pop out are already standard on U.S. cars. Tough requirements like energy-absorbing car bodies are being saved until later—1970, 1971 or beyond.

In the "later" category, incidentally, is formal notice of what's been rumored for a year—a speed-governing device for all cars. Will this mean the end of the factory hot rods? And how attractive will a Corvette be that's limited to an 80 mph top speed when the speedometer now goes to 160? While that fight's still a year off, the biggest controversy coming up will be attempts to write safety standards for motorcycles.

IF A BAG OF AIR should someday save your life you may have a baboon to thank. Baboons were the "passengers" in simulated crashes that proved the lifesaving value of air bags. The baboons rode an impact sled. When it stopped suddenly, a bag in front of them inflated and they plunged against it harmlessly. Eaton, Yale and Towne supplied the bags and the tests were done by Ford and the Federal Aviation Agency at Holloman Air Force Base, New Mexico. Many problems still face researchers, such as how do you keep the device from going off when you bump another car in a parking lot? Ford's now trying to solve that problem.

DESIGNERS WENT TOO FAR with the sporty-car look, some auto men feel, when they tried to give the family sedan the long-hood, short deck-treatment. "They're chopping off too much trunk space," said one top exec. He believes the trend has run its course and in the future trunk space will open up again. The opposite view comes from AMC's chief stylist, Dick Teague, who believes that some day there'll be a whole range of sporty-styled cars.

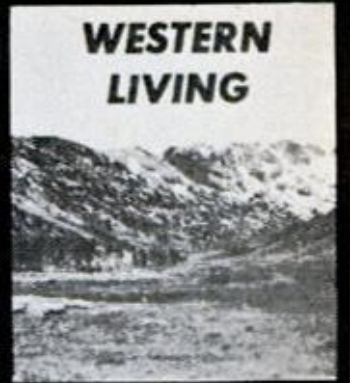
THE PADDED CELL is an old joke, but by 1969 the entire interior of your new car may be covered with padding except for the glass, according to Goodyear officials. They expect the government will require major additions of padding to protect occupants from accidents or sudden stops.

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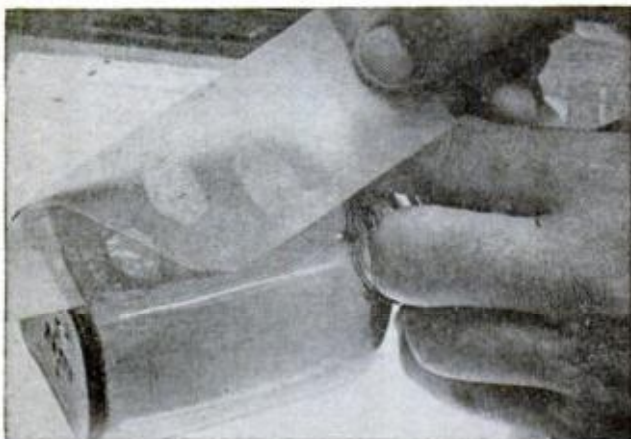
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NEWS BRIEFS



Tape helps solve crimes

Transparent tape—like that used in offices—has joined the Cleveland Police Department, and is preserving criminal evidence that is helping bring convictions. The tape is always in the kit of 18 evidence-gathering experts (called "runners" because of their speed to the scene of a crime). These experts search the area of a crime for anything that might be used as evidence. A bottle, for example, is a good source of fingerprints. At top left, an expert applies powder to raise the image of the prints and (left) presses tape onto the prints; it comes off bearing a sharp image. In a slide projector (above), the prints are compared with those of a suspect.



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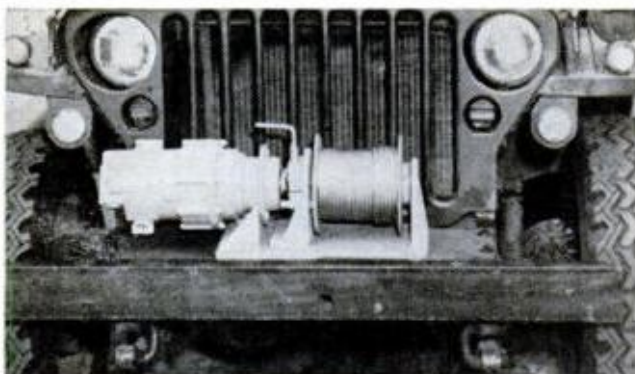
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Slim-design rivet tool

Featuring a slim nose for those hard-to-reach places, the R-25 utility rivet tool has a lower handle that's made of cast aluminum and an upper handle of heavy-gauge steel. In addition, the new design allows you to set a rivet in fewer squeezes than usual. In fact, one squeeze will set most rivets. Also, the slim design keeps your knuckles away from the surface of the work, and thereby prevents skinned knuckles. The new rivet tool is manufactured by the Arro Expansion Bolt Co., Dept. T, Box 338, Marion, Ohio.

Internal dial gauge

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Chalkline-plumb bob

Housed in lightweight cast aluminum, Chalkmaster has 50 or 100-ft. reel. Felt gasket seals opening when not in use. Chalkline has pushbutton release, nylon gears for quick rewind. With line extended as required, reel can be used as plumb bob. Priced \$3.09 and \$3.39, it's available from Dept. PID, Stanley Tools, New Britain, Conn.



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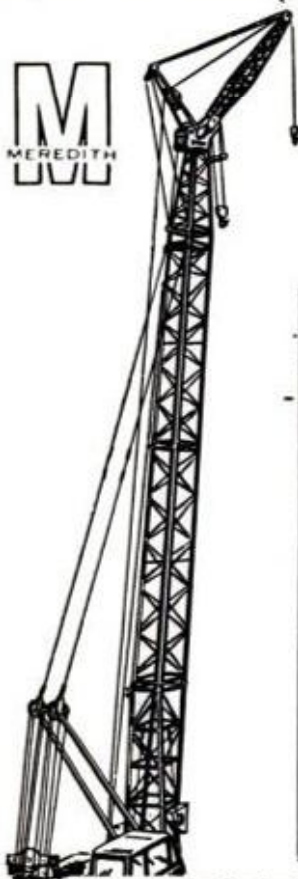
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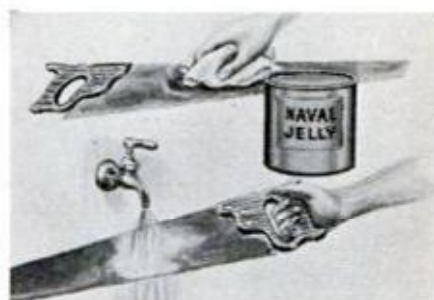
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SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

First things first

Maybe you can help straighten out a conflict. My 1964 Mercury with 427-cu.-in. engine has started to use a great amount of oil. One mechanic has advised an immediate ring job while another has said to replace the valve-stem seals first. What do you think?—Horace Milner, Charleston, S.C.

I go along with the latter. Hardened and cracked valve-stem seals rank with oil leakage as more common causes of oil consumption than defective rings. Whenever an oil problem arises, it's wiser to fix leaks, replace valve-stem seals and then judge the effect on oil consumption before plunging forward and replacing rings. It could be lots less expensive, too, assuming the problem's caused by bad seals.

Stumped by a stumble

I have a 1965 Pontiac with V-389 engine and a Carter four-barrel carburetor that's been stumbling on acceleration since the day I bought the car. It happens only when the engine's cold. Do you have an answer for this minor but annoying problem?—Ted Thayler, Lexington, Ky.

Possibly. Some early-model 1965 Pontiacs and Tempests had the problem, and hardware was issued by Pontiac to stop it. In your case, for example, a carburetor kit (part No. 9777416) should be installed and the float set at $\frac{1}{4}$ inch. For a V-421 engine with Carter four-barrel carburetor, install kit No. 9777426, change the float setting to $\frac{7}{16}$ inch, the pump stroke to $1\frac{1}{2}$ inch and the choke setting to 2 notches rich. Other Pontiac engine-carburetor setups, too numerous to mention here, are also affected. However, a Pontiac shop should have the info. Tell the man to consult Pontiac Service News No. 6 (12/64), page 67, if he needs a reference.

Bucket of bolts

As long as someone's sitting in it, the passenger bucket seat of my 1966 Dodge Coronet behaves. But when I'm alone, it sits there shaking, vibrating, rattling and sounding like a bucket of bolts. Is there no hope for peace and quiet?—Howard H. Stoffer, Reading, Pa.

Salvation in your case and for people with 1966 Darts, too, lies in installing a bucket seat back-to-cushion, anti-rattle washer (part No. 2858089) on both sides of the seat between the pivot holes and the heads of the shoulder bolts.

Slick steering

Why is it that the power-steering pump of my 1966 T-Bird is always wet with oil? There's just no reason for it that I can see. My power-steering setup functions properly and everything seems okay.—Steven A. Arthur, Boise, Idaho.

Oil may be bypassing the filler-cap seal. The problem can be caused by low engine idle rpm in cars with stick shifts, or a loose pump belt in cars with either manual or automatic transmission. During low pump speed, oil displaced by the pump piston is not recirculated through the system. This can cause the reservoir to overflow.

You can easily correct the trouble, though, by first adjusting the power-steering pump belt tension and engine idle rpm to specification. Check out the fluid level in the reservoir. On straight-neck reservoirs, the fluid level should be at the bottom of the filler neck. On angled-neck reservoirs, it should reach the correct level on the dipstick. Finally, clean oil and dirt off the pump. If you've corrected the problem, it'll stay clean.

Balancing act

Why is it that I'm ruining tires at a faster-than-normal pace with my 1966 Buick? All parts have been given a clean bill of health, and rear wheels have been balanced. Could it be because the car's equipped with a positive-traction differential?—John Scott, Hanover, Mass.

Possibly, but not because of a bad differential. I'm wondering if the person who's doing the balancing is doing it properly. When rear wheels of this car are dynamically balanced, they should be run at a speed equivalent to 75 mph as opposed to the 35 mph or less recommended for Buicks without positive traction rear ends. The procedure calls for raising both rear wheels with a jack placed beneath the differential. Balance one wheel with its

(Please turn to page 38)

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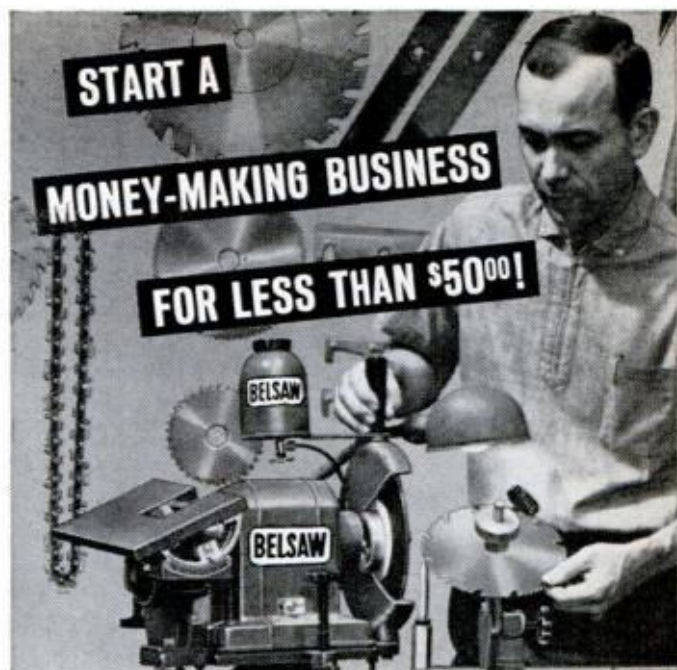
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AUTOMOBILE CLINIC

(Continued from page 36)

opposite number removed. Then, install the other wheel and balance that. Don't remove the wheel that has already been balanced.

Bees in his bonnet

A buzzing noise at idle somewhere in the engine compartment of my 1965 Chevy is driving me nuts. Do you know of anything that can cause it?—Lawrence R. Goode, New York.

Maybe it's the crankcase vent valve. Cases of vent-valve flutter, caused by air turbulence over a sharp shoulder within the body of the crankcase vent valve assembly have been reported. This has been taken care of with a new valve. You can tell the buzzing part from the quiet one by the number stamped on the valve body. The old one is a CV-590. The improved valve's number is CV590 (no hyphen between the letters and numbers).

Distressing discords

My feminine, sensitive ears are re-sounding with the effects of a squeak set forth when applying the brakes of a 1966 Rambler 220. It's worse when the weath-

er is damp. Can you tell me if this is a well-known problem and if there's a cure for it?—Doris C. Arpin, Cranston, R.I.

The answer is yes to both questions. It's common, and American Motors has distributed a brake-shoe, noise-damper kit that will quiet the noise and allow your pretty ears to hear only the sounds you should hear. Check with your Rambler dealer's parts department.

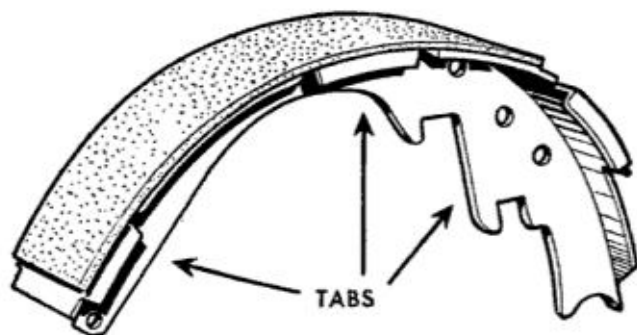
Small crack, big trouble

I'd like to pass along a tip for curing a sneaky ignition problem. In my case, the car is a 1959 Renault Dauphine that ran great for three weeks following a major overhaul. Then it started to buck at high speed, but only when I took my foot off the accelerator. I installed a tachometer and found that the ignition was quitting for a fraction of a second. The tach dropped off to zero; then bounced back again. A careful eyeballing revealed a small crack in the vacuum advance tubing at the distributor, which probably allowed vacuum to escape and points to drop back early. I replaced the tube and now the car runs as smooth as Buckpasser did in his prime. Do you think this will help your readers?—Romeo Camplese, Everett, Wash.

You can bet on it. Thanks.

SERVICE TIPS

● **Owners of 1967 Chrysler Corp. Cars—**Dodge, Imperial, Chrysler or Plymouth—may be troubled by binding brakes. If one of them, you'll want to know about the new tabbed brake shoe issued by the company. It has three tabs and looks like this:



The new design, interchangeable with the loop-type shoes originally used, eliminates binding and provides a smooth, silent brake operation. New shoes should be installed in axle sets to achieve balanced braking—that is, on both front, both rear or all four wheels.

● **When removing heater core hoses, the heat-**

er core itself can be damaged easily in the area of the attachment seams if too much force is applied. If you should try this and the hoses persist in sticking to the tubes even after the clamps have been removed, try this suggestion from Chevrolet: Cut the hoses just in front of the core tubes and split the remaining portion of the hoses lengthwise. You can then remove the inexpensive hose without damaging the expensive core.

● **1967 Oldsmobiles with speedometer noise and needle flutter** may have a loose nut—the speedometer-cable nut located at the speedometer head. So, before you start ripping out cables and clusters to find the trouble, simply check to make sure the nut is tight. This could save you plenty of aggravation. ★★★

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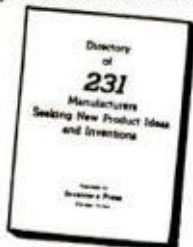
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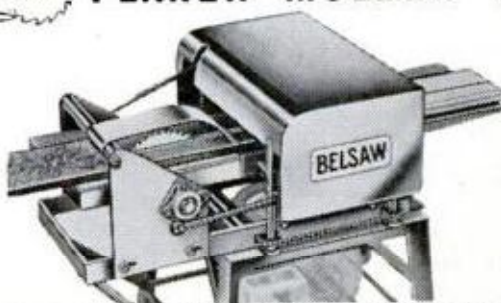
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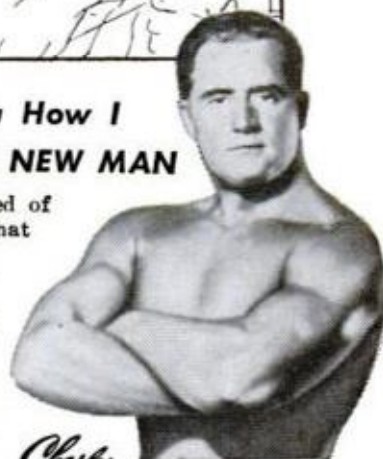
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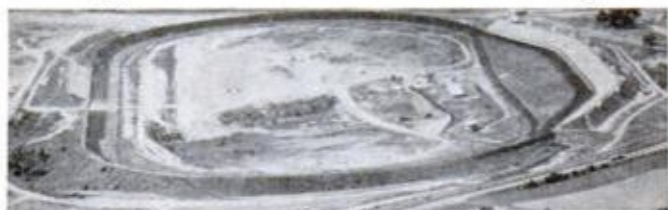
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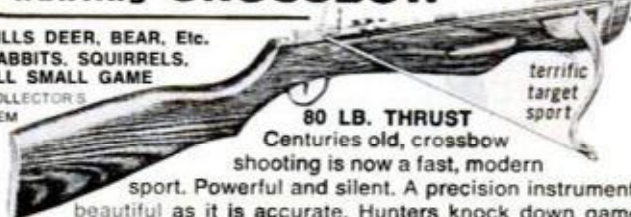
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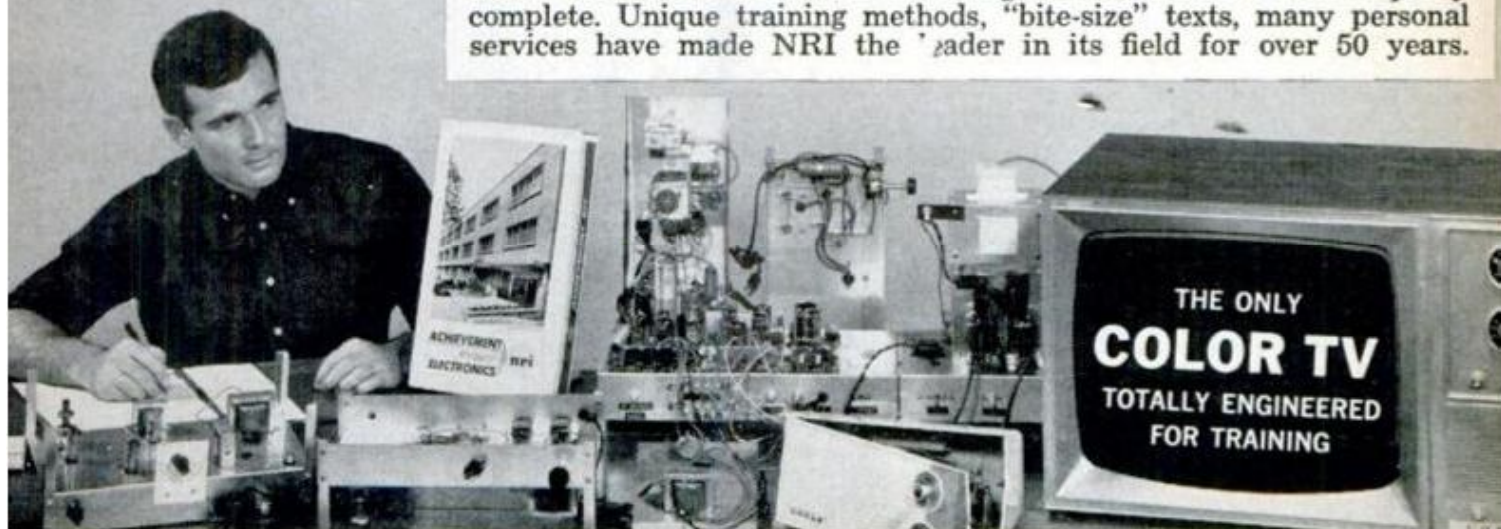
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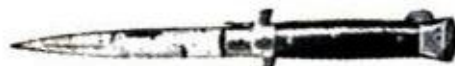


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A STUDY OF INTENSE CONCENTRATION is Dan Gurney just moments before start of the Indianapolis 500

Q. I want to use a 289 Ford in drag racing. Would your Gurney-Weslake cylinder heads be satisfactory for this purpose? If so, when would they be available? What about carburetion?—Larry Smithers, Lexington, Ky.

A. Yes. This month. They fit 289, 302 and 351 Ford blocks and, of course, all variations of these. Weber carbs are easiest, but we have a single, four-throat "street" manifold setup also, and we get top horsepower with fuel injection.

Q. Occasionally, on Interstate Route 78, I have seen trucks hauling stock cars heading west. Where are they going? My dad says there are

stock-car races in Pennsylvania; I say drag strips (they look like competition coupes to me).—Patrick Tengwall, Asbury, N.J.

A. Either you or your dad may be correct. As a rule, racing stock cars are suspended low and wear much larger front tires than the relatively high drag-racing stock cars, with their normal or skinny tires (they don't have to worry about cornering so much). Maybe you can figure out what they are next time you see them go by. As for where they are going, there are tracks all over the country, so I couldn't even guess. Why don't you drive alongside and ask?

Q. Would it be possible for Ferrari engineers to make an Indy car? Do you think they will?—Don Emery, Portland, Ore.

A. It certainly would. I think they will, but I'm not sure how soon. They have a very fine F-1 Grand Prix car. The high horsepower coming from methanol and nitromethane fuels would give them some initial durability problems, but they could lick them soon enough.

Q. Why don't you get a factory ride in a Chevy and come down South to compete at our tracks? You could pick up new followers and money, and I would like to watch you race.—James A. Brown, Englewood, Tenn.

A. I have often considered doing something of this sort (I did go the route a couple of times in the Daytona 500), but until I reach more of my present goals, there is just no way to do it. And then I'll be so old and gray that . . . well, why don't you come to see a road race some day?

Q. What do you feel will be the results of the three-liter engine limit at Le Mans next year?

(Please turn to page 72)

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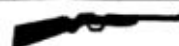
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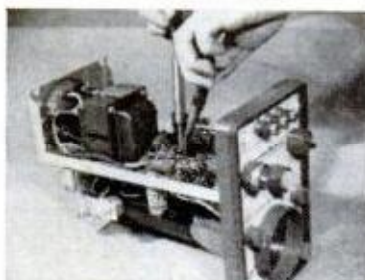


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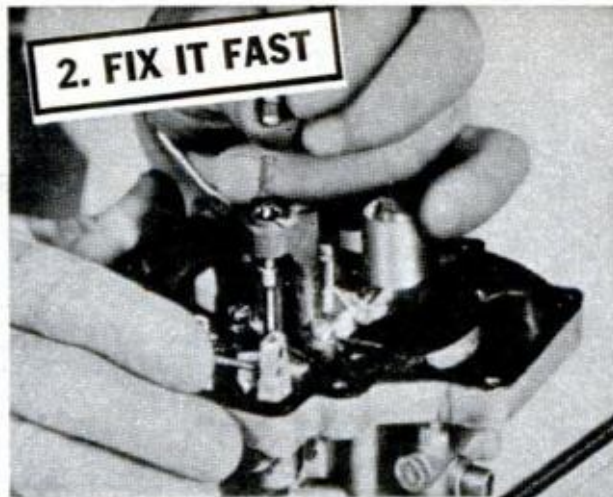
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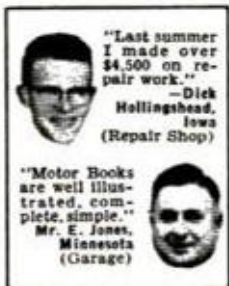


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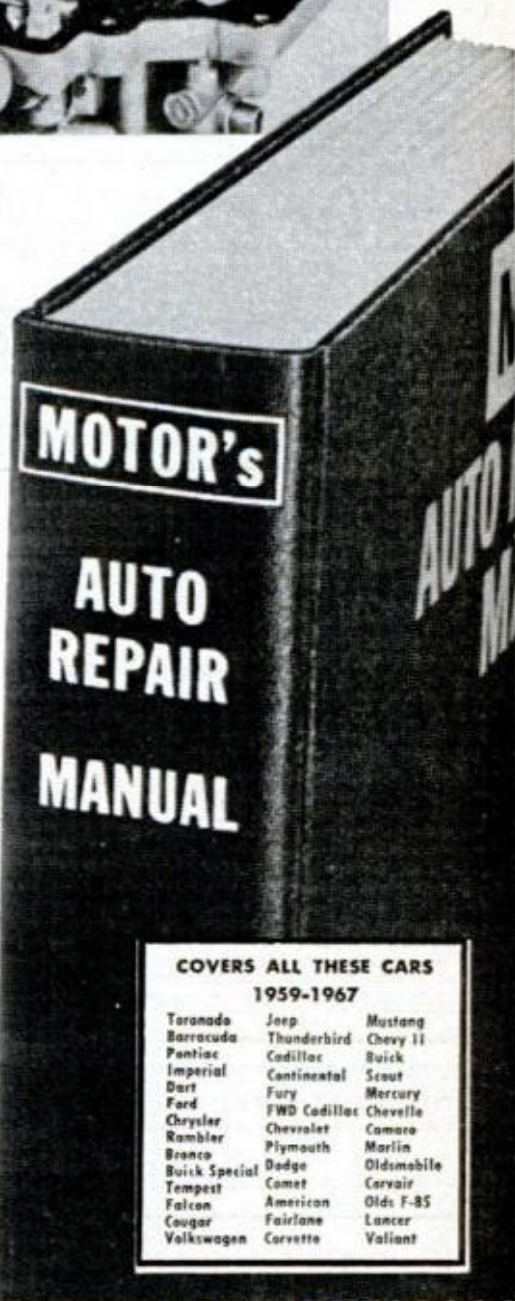
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DRIVIN' WITH DAN

(Continued from page 48)

and what do you believe Ford will do?—Jake Worthington, South Bend, Ind.

A. That's a hard one. Maybe we'll see a French car win the race. Ford could do it with its GP engine. My guess is that Ferrari will do it, but the race will not be quite as prestigious or interesting as it has been in the past few years.

Q. I understand Ford won't be at Le Mans next June. Will you? If so, for whom will you drive?—Pete Levison, Babylon, N.Y.

A. I don't plan to be there. I would rather be working on other projects of our own such as Formula 1 or Can-Am or Indy car work. Or would you believe some hunting, fishing, or a little motorcycle riding in the desert?

Q. Why doesn't Jim Clark change teams when Lotus isn't winning races?—Ron Puening, Cincinnati.

A. I can only guess. He has a long-standing relationship with Colin Chapman, and, even though they don't win all the races, the team is almost always a major threat. Jim has done very well sticking with Lotus. They won four races during the '67 Grand Prix season. This is bad?

Q. Exactly how did Lorenzo Bandini's fatal accident occur at Monte Carlo?—David Dommert, Springtown, Tex.

A. I did not see it happen. I did see that Lorenzo was trying very hard, and it appeared that he was tiring, but still putting everything he had into it. The chicane at Monte Carlo is an extremely difficult and dangerous section to negotiate, and one false move can spell disaster. And any malfunction in the racing car at a critical point can be equally disastrous. I don't think anyone will ever know what really happened.

Q. I maintain the pole position at Indy goes to the fastest qualifying time whether achieved the first or last day of qualifying. My friend says the pole position does not go to the fastest car if it qualifies on the last day.—Dr. Joseph Downey, Pasadena, Calif.

A. Your friend is correct. It goes to the fastest

on the first day. Of course, it would still be great to be fastest, even if it was on the last day.

Q. What do you think would happen if Mr. Ferrari came up with a big (six-liter) engine for the 1968 prototype season? What is your opinion of the Ferrari P-4, which ran in 1967?—Timothy Sommers, Somerton, Ariz.

A. Mr. Ferrari would probably have (though not for certain) a faster car. He would have a whole new set of durability areas (engine, drive train, brakes and so on) to tie down before he would have any confidence in going the distance. It might go faster on the straights and slower in the corners. The '67 P-4 is a great car. It broke all old records and beat everything but one Ford at Le Mans.

Q. Is it true that you have designed a whole new Eagle made of "space metal"? I saw something about it in a technical journal.—R. M. Richardson, Cocoa Beach, Fla.

A. We recently built a GP Eagle for the Formula 1 circuit utilizing primarily titanium and magnesium, which is undoubtedly the car you mean. It was the same basic design and looked the same as the present Eagles, which are built mostly of aluminum and steel. The Harvey Aluminum Co. was of great assistance in helping us obtain the metal and advising us technically, and the overall result was an appreciable weight saving, which we very much needed. We plan to continue work with new metals on subsequent Eagles, probably including a new design for 1968.

Q. We have a race up here in Montana that beats Indianapolis or Le Mans. It's a three-day endurance race for Model T Fords. The distance is 638 miles. Seventeen cars finished and the winner, Lawrence Pope of Lewistown, averaged more than 54 mph. So why don't you come up and drive in a real race?—Garry Smith, Great Falls, Mont.

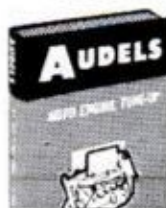
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If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 36).

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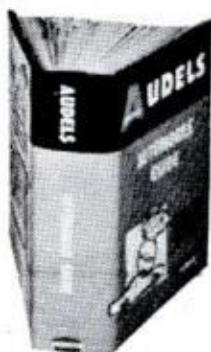
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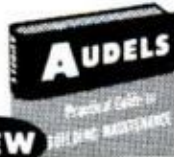
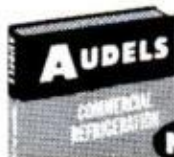
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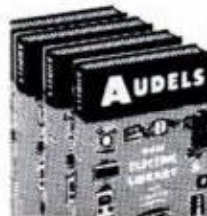
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I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there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

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

By Victor B. Mason

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

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

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

I Have All The Money I Need

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

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

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

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Ink-stained marble top

How can I remove an inkstain from a marble tabletop? The top is still quite smooth and is off-white except for the stain which covers only a few square inches.—W.R., Mass.

The problem really isn't the stain, but what caused the stain originally. If it was caused by ink, and if the stain is old, then it may take some doing to remove, with the final result still in doubt.

One way that is fairly dependable (assuming again that the stain was caused by ink) is to wash the top with a mild soapy solution to get the surface as clean as possible. It's important to get rid of any embedded dirt. Then cut blotting paper into squares large enough to cover the stained area with some margin to spare. Place one square on top of another and locate the two over the stain. Wet these with ammonia (household strength) and place a wood block over the squares to hold them in place. Allow them to "work" for five minutes or so. Remove and place a clean square of blotting paper over the stain, another square on top and saturate both with alcohol. Apply weight as before. Repeating this alternate process will usually soften the ink so that it can be removed by washing with clean water and light scrubbing with a cloth. Be especially careful not to get any alcohol or ammonia on the finished wooden parts of the table.

Cutting glass bottle

I have a colored glass bottle about 4 in. in diameter. It's about 14 in. high including the neck. I'd like to break it uniformly all the way around at the halfway point. Can it be done?—N.E., Calif.

I once saw a bottle cut successfully in a metal-turning lathe, with the cutter held in the toolpost. But I hesitate to suggest this method. Of course, other special methods have been used but I'm doubtful that even these can be considered 100 percent reliable. Thus, if yours is an old bottle and considered valuable, I'd forget about cutting it.

But if you'd like to experiment, you can try filling the bottle with clean crankcase oil to the point where you want it to

break. Set the bottle in a container that will catch all the oil should the bottle shatter. Then heat a length of 1/4-in. steel rod to a dull red and lower it into the neck. Be especially careful not to touch the glass with the heated end of the rod and plunge the hot end into the oil. Normally the glass can be expected to break fairly clean at the oil level. Any glass shop then can smooth the break with a wet grinder for a nominal charge. If you try this method, protect your hands with leather gloves and wear either goggles or a face shield. Strain the oil through a fine mesh before it's used for another purpose.

"Footprints" in the rug

My wall-to-wall wool carpeting is several years old and when I move the furniture about, the imprints of the furniture legs are unsightly. Is there a way, short of taking up the carpeting and dry-cleaning, to make these impressions less noticeable?—M.E., Colo.

Buy a small suede-shoe brush—the kind with stiff brass bristles. Scrub the impressions lightly in several directions with the brush and then in short strokes at right angles. Brushing too hard can damage the nap. Usually this treatment works; but if not, work the depressed nap with an upholstery shampoo, using the applicator made for the purpose. Follow the instructions on the container. After the area is partly dried, work it over with the suede brush, making light strokes at right angles. Or, if cost is not a factor, have the rug cleaned on the floor by a professional with special equipment.

Desert-dry air in home

The air in my home dries rapidly whenever I start my furnace. Even though I have a humidifier, the air in the rooms seems desert-dry. Why?—A.E., Minn.

Have you checked to see that the humidifier is working properly? It may be either fully or partially clogged with lime or other deposits, thus preventing sufficient water from reaching the parts that dissipate moisture into the heated air in the furnace plenum. A water-starved humidifier is, of course, of little value in maintaining the moisture at a comfortable level in the rooms. If your humidifier is of the float type, having a float-controlled valve that maintains a given water level in a pan or other container in the plenum; a little white vinegar added to the water occasionally will usually break up lime deposits. ★★★



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VIETNAM REPORT

By KEVIN V. BROWN

The Sitting Ducks Who Call the Shots

The most underrated—and most decorated—pilots in Vietnam, Forward Air Controllers have been flying small, unarmed relics at treetop level to spot targets for the big jets. Now they're getting a chance to fight back in a new twin-boom, twin-engine, winged arsenal called the O-2

WE WERE at 1500 feet, flying leisurely over green vegetation and marshlands, when Pete suddenly shouted, "Now!" The small, single-engine plane winged over on its back and, in almost the same motion, dove toward the ground in a violent "split-S."

The Gs built up, the blood drained from my head and I was crushed downward in my seat and almost blacked out before Pete pulled out at treetop

level—even below the tops of some trees—and skimmed along with the wind rushing in on us through open windows.

“That’s the best way to do it,” Pete said calmly. “If we stayed up, they’d have a better shot at us. On the deck, we’re closer but they don’t have as long to home in on us.”

I took his word for it. Capt. Peter (Pete) Bernstein, a young and handsome combat veteran, is one of the best of a strange, new breed of Air Force pilots. In an age of paradoxes, when supersonic jets fill the skies and atomic bombs threaten the world, one of the strangest paradoxes of all is that, as the weapons get bigger, the wars get smaller. Pete Bernstein fought the war in Vietnam in one of the smallest and slowest planes still flying, and he fought it without any weapons at all, except his eyeballs.

Pete is a forward air controller, or FAC. His plane was an O-1 *Bird Dog*, an all-but-obsolete single-engine, unarmed, tail-wheel trainer that goes back almost to World War II. It was thrown into the Vietnam war, without ceremony or armament, because there

PETE BERNSTEIN, now an instructor in Florida, was one of first and best of forward air controllers



was nothing better around. It’s now being phased out by the new, twin-engine, twin-boom—and heavily armed—O-2 *Skymaster* (see cover), originally built as a civilian executive aircraft.

But the mission remains the same. The FAC must fill the gap between the big jet fighter-bombers that fly too high and too fast to see the cleverly camouflaged ground targets they must destroy. So the FAC pilot exposes himself to guerrilla guns at treetop heights to get his eyeballs in position to spot the targets for them.

And if you really want to home in on how valuable the forward air controllers have been—and are—in South Vietnam consider this: 95 percent of all targets hit by air strikes are hit at the direct request of the forward air controllers, who sought them out and exposed them in the first place. It’s that kind of a war.

Further, the most heavily decorated airmen in Vietnam—including Purple Hearts—are the forward air controllers. And Captain Bernstein is one of the most heavily decorated of all. He has something like 40 decorations, including several from the Vietnamese government.

I rode in the back seat with Pete, as he put his *Bird Dog* through its paces, showing me the tricks he used to find targets and the maneuvers he used to avoid getting killed when he found one. As he said, a violent split-S is the best. Fortunately for me, we were not flying under combat conditions, or even in Vietnam, but over the scrubby swampland of northern Florida near Holley Field, where forward air controllers are trained. Nearly all of the instructors, like Pete, have been in Vietnam and nearly all the students can be sure of going there.

A FAC, in simplest terms, is a sitting duck with the eyes of an eagle. Part of his job is to expose himself to enemy fire so he can expose the enemy, and the rest of it is to find the enemy when he refuses to show himself.

“You’ll rarely find them out in the

TELLTALE SIGNS of Vietcong activity are depicted in artist's concept of comprehensive mission. VC themselves would rarely be seen, but they'd leave visual clues that FAC's trained eye could spot on daily reconnaissance. Plane is new Cessna O-2 Sky-master (see cover), now replacing obsolete O-1 Bird Dog.

1. Hidden body. VC, when they hear plane coming, duck for cover instead of acting natural. Pete Bernstein's biggest mission resulted from spotting elbow sticking out from under palm frond.

2. Wash drying. Village is known to house only so many inhabitants. Yet there's wash on line for twice or three times that number. Why?

3. Fresh dirt. Somebody's been digging. New gun emplacements?

4. Muddy water. Nobody's around but water's stirred up. Why?

5. Rippled water. And on shady side of river. Sampans could be hiding under trees.

6. Farm hands. Ha! Farm could be tended by one or two men, but there are 15 out there acting innocent.

7. Tree stumps. Trees stood there yesterday. Were they cut down to camouflage new gun emplacements?

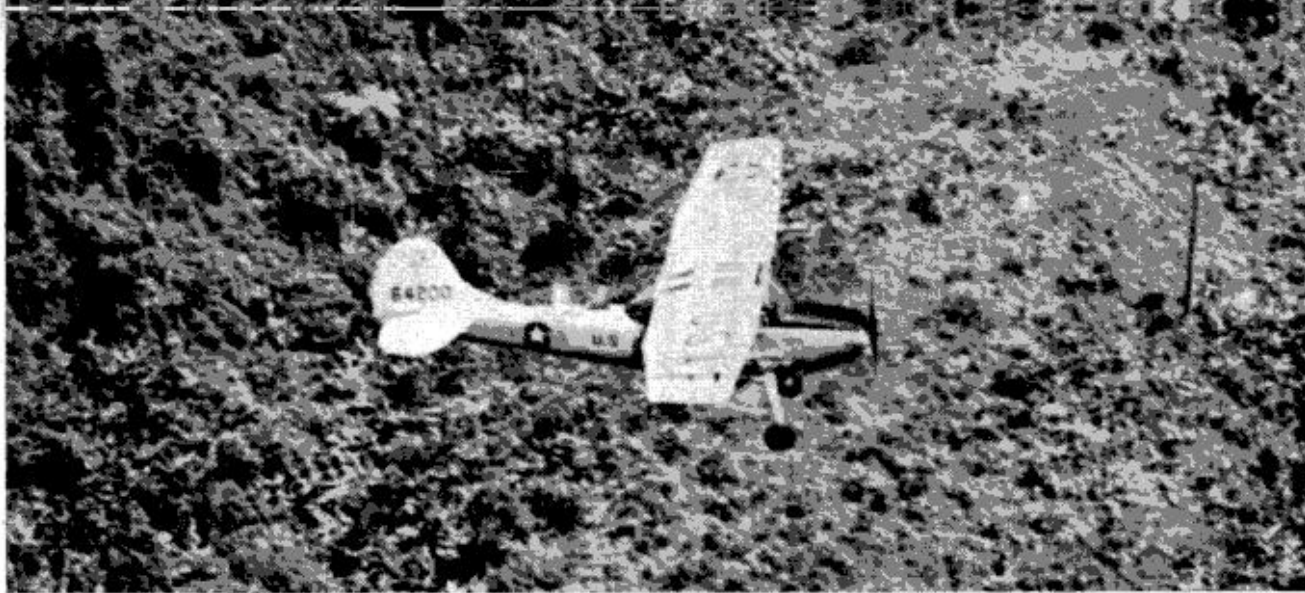
8. Water buffalo. Great beasts of burden and their milk is nourishing, but there were only three there yesterday. Were new ones brought in to support new troops?

9. Smoke. In VC territory, where there's smoke there's likely to be VC. Camp is now deserted, but VC should be around somewhere.

10. Popcorn! This is it! When FAC pilot hears popping of gunfire, he knows he has something, and dives for deck. When he's out of sight and range, he'll usually circle back to come in again from wrong side—they'll be expecting him from direction he went. He'll climb up to altitude to pinpoint target precisely, then dive once more to come in directly over target at treetop height for close inspection. If it's worthwhile target, he'll call in air strike.

Advantage of O-2 over O-1 is that it's armed and can keep VC pinned down while waiting for big jets.





LONELY BIRD DOG flies reconnaissance mission over VC territory. Lack of armament forced its phaseout

open," Pete said when we climbed back to altitude, "and getting them to shoot at you is one way of finding where they're hiding."

Pete, who spent a year in the "boonies," as he calls the boondocks of Vietnam, got shot at nearly every day. His plane was hit regularly, but foam-protected gas tanks kept them from exploding and violent maneuvers kept him from getting hit—too often. He was hit twice, once by a bullet that ricocheted off a wing mount and hit him on the arm, and again when a bullet shattered the glass in a side window. Where did the glass hit him?

"Oh," he waved a hand vaguely, "in the face and arm. I rode with the windows open after that. It saves flying glass, it's hot in Vietnam anyway, and I could also hear the gunfire better. It sounds like popcorn popping, and when I heard that I knew I had something and could call in an air strike."

But Pete couldn't depend on listening for popcorn. The strikes usually came about two ways: A ground unit that had engaged the Vietcong would ask for air support and Pete would go out to spot for them, or—more likely—Pete would eyeball the target himself. The many tricks he learned in his year in the boonies set standards for FAC pilots who followed.

Pete was assigned to a province in South Vietnam—it's like a state here, only much smaller—located in the

heavily VC-infested Mekong Delta south of Saigon. He lived and worked there, just he and another FAC pilot, two O-1s and two crew chiefs. He once spent eight months out there without a break. Local Vietnamese regulars guarded the air base, which was just a widened stretch of dirt road.

His duty was to patrol the province, and spot any irregularities that might mean VC activity. It wasn't easy, because the VC look just like ordinary Vietnamese civilians from the air.

"We started with one principle," Pete said. "If it salutes, salute back; if it shoots, shoot back."

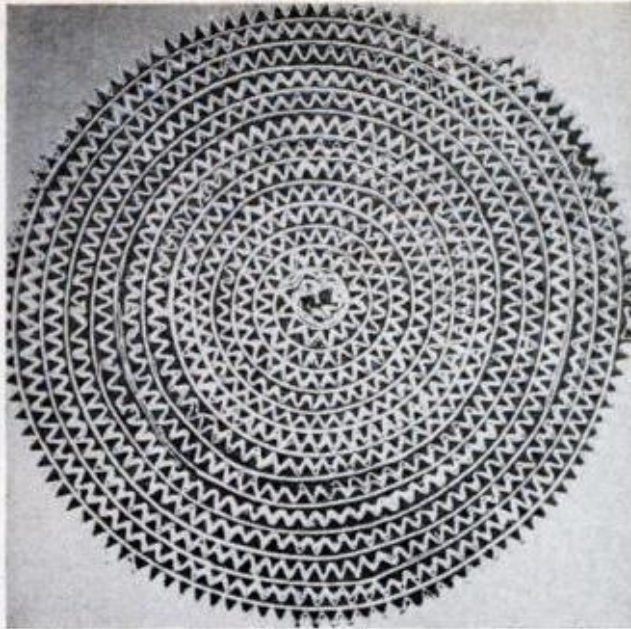
But he developed others, and Pete, as best he could in the Florida swamps, showed me those he used in the Vietnamese delta.

"My partner and I would organize our missions the night before. I'd fly over some territory, he'd fly over others. Then next morning we'd go looking for trouble.

"Rivers were good places to start. The VC wouldn't much use the roads in daylight for large troop movements or hauling artillery. But when they heard someone coming, they could hide their sampans along the banks under the trees.

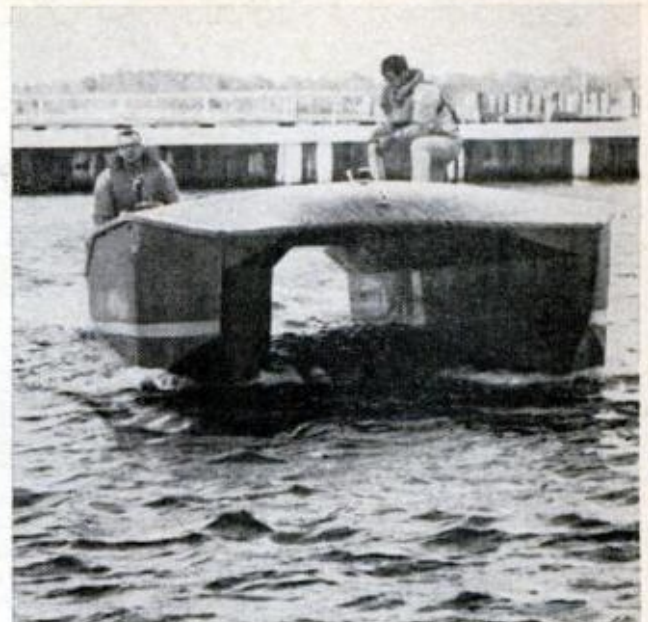
"You wouldn't see anything—but you'd see the ripples in the water, or you'd see that one side of the river bank was freshly muddied up while the

(Please turn to page 204)



High-powered yard goods

This is the end of a roll of Lockheed's Foilac rocket propellant. A thin layer of fast-burning fuel is bonded to corrugated metal that is rolled up and loaded into a rocket motor. With a large area exposed, the propellant burns for a split second, at high thrust.



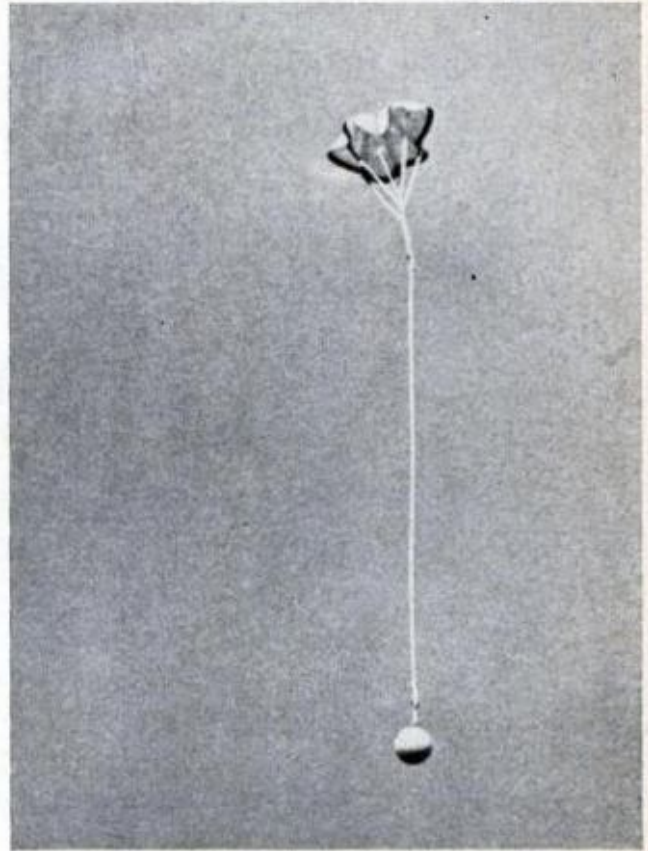
Seagoing Wildcat

The Wildcat is what resulted when Howard Weiler, three-time winner of the Miami-Nassau race, designed his own ocean racer. The 23-foot, 7000-pound (racing weight) fiberglass catamaran drives through the waves at more than 50 mph, powered by two Johnson GT-115s.



Fore! Whack! and Geronimo!

Need a little driving practice but hate that 300-yard walk to retrieve your ball after a smashing drive? With the British-made Parachute Golf Ball you can whack away to your heart's content, and each ball will parachute gently back to earth within easy strolling distance. The ball has an extra-strong cover to which a hook is attached; the parachute fastens to the hook. The golfer tees up with the chute in the direction of his drive and slams away.





OLD PRO CURTIS TURNER supervised my driving, taught me difference between reckless and controlled speed

The *Fastest* School in the World

I took the course and learned that safety on our superhighways is the all-important 'major' at this unique school of high-performance driving

By BILL KILPATRICK, Auto Editor

Photos by Elmer Horton

WHITE-FACED, my stomach at half-mast, I wanted to go home, period. Two feet into that first skid and the brand-new National School of Safe High Performance Driving nearly had its first dropout.

It was the opening session of school and the legendary Curtis Turner was doing the driving. We were on a dirt road adjacent to "the campus"—the Charlotte (N.C.) Motor Speedway—

and Turner, the school's guiding light and chief instructor, was describing in matter-of-fact terms the sort of maneuvers students would be doing. I guess I wasn't paying attention.

Suddenly, without skipping a beat of his conversation, Turner whipped the car around in a 180° spin and we were driving in the opposite direction. And just as suddenly, I didn't hear a word the man was saying; my total concen-

tration was on getting out of that car alive!

But two hours later, when, with steadily improving skill and at higher and higher speeds, I was doing controlled 180° spins myself, I realized that keeping me alive was just what Turner had in mind.

Throughout the five-day course, he and his team of instructors—all either active or former stock-car racing drivers—had me and my fellow students doing things with automobiles that few of us ever thought possible, let alone ever imagined *ourselves* doing. Yet we came to understand and appreciate that each maneuver had a direct bearing on driving situations most motorists face every day of their lives.

Once we learned some of the “facts of life” about skids, for example, we had to cope with a deliberately blown front tire on a car doing 70 mph. Also at 70, we had to negotiate a sharp “S” bend. On wet and dry asphalt, we had to do both forward and reverse spins. With future ultra high-speed highways in mind, we drove stock race cars around the steeply banked Speedway at speeds of well over 100 mph. On a small dirt track, we had to drive lap after lap at the wheel of a sliding, skittish car that was rarely on a straight line. We had to make panic stops, deal with “emergencies,” handle both routine and special highway hazards.

You might think that having successfully completed this unique course, Turner's students would grab their diplomas and rush out to become hairy-chested terrors of the roaring road. The opposite is true; I think all of us came away “believers” in driving safety. We *know* what can and too often does happen. We had drummed into us that a car—barring component failure, or a blowout—will do only what its driver makes it do. Its speed, direction and control are determined by the driver; *he* is the most important element in its safe operation.

A skid, for example, can be at least partially controlled by proper use of



FORWARD SPIN, resulting in car doing a 180° turn-about, is a basic maneuver taught at the school. Technique involves simultaneously hitting brakes, flipping the steering wheel over fast and hard to break rear end loose and swing car around. As nose comes around, power is applied, car straightens out



SUSPENSIONS WORKING, cars roar through "S" bend at 70 mph and more. Hitting pylons means penalty

brakes, accelerator and steering wheel. Even knowing this, however, the knowledge is useless unless a driver's belt is cinched down tight.

"You can't control a car if you're rolled up in a ball on the floor," Turner points out in a deep, caramel-soft voice, "which is just where most skids will throw you if your seat belt isn't fastened."

Another example: A car rammed into the car in front could, perhaps, have been *steered* to the right or left and the impact avoided, or at least partially deflected.

"People don't take advantage of all the operating room they've got," Turner says. "Take a typical turnpike. Usually there's an open area to the left and at least a car's width of room to the right. Going either way can save your life if the alternative is locked

brakes and a potential head-on crash.

"Most people don't use this room, or didn't; a lot of them have died leaning on the brakes and hoping for the best."

Speaking from experience, Turner assures students that the modern U.S. automobile will take a lot more banging around than most people realize. Survivor of one of the most spectacular accidents in stock-car racing history (during practice for last year's Atlanta 500, Turner hit the wall, flipped end-over-end 13 times and came to rest, wheels up and—thanks to the car's roll cage—uninjured, "about a par four from where I started"), he claims many accidents occur because of the average motorist's reluctance to "bend a little metal." He feels it's better to crunch a fender or crease a door than risk a head-on impact.

"Nobody likes to bang up a car,"

IN THE RACE CAR, I was literally in another world. First impression is one of awesome speed, superb handling





SCHOOL'S FOUNDERS, Shaw, Turner, Chitwood (left to right) keep constant check on progress of students



CLASSROOM SESSIONS are frequent, usually precede and follow each phase of entire training program

Turner says, "but it's better and cheaper to tear the bottom out or bend a frame than to be dead or hung up in traction for a year or more. Steer the car out of trouble if you can. Don't worry about mashing it up."

Turner and his instructors also try to disabuse students of "built-in" driving foibles. In my case, it was skids.

For over 25 years I've driven with a mortal fear of skidding. Oh, I've skidded lots, but it has always seemed to me about the worst panic situation. Now, having learned something about the dynamics of a skid—what happens, why—I'm not nearly as terrified as I've been all these years. Thanks to the course, I've learned to apply the brakes gently and evenly in order to retain as much traction as possible; I've learned to keep my foot off the gas, or, if I need power, to apply it gradually; and I've learned to *steer*.

I LEARN about skids the easy way. For me, the fear of skidding has been lifelong driving foible. No more



JANUARY 1968

"In a skid," Turner says again and again, "you've got to hang in there all the way; you've got to keep *driving* that car."

Under the sustained pressure of the course itself, students often find themselves reaching for and finding driving skills they hadn't realized they possessed. A result of these impromptu, "in-depth" plumbings is that students learn a lot about cars and a lot about themselves.

My light went on during runs through the "S" turn, marked left and right by small rubber pylons. Riding [\(Please turn to page 207\)](#)

BENT METAL is par for the course. I did this while turning around following my high-speed blowout test



97

TSUNAMIS

Often mistakenly called tidal waves, they are not caused by tides. Tsunamis are caused by underwater earthquakes, landslides or volcanic explosions. Low and almost unnoticeable at sea, they can extend for more than 100 miles, travel at rates up to 600 mph and distances as great as 8000 miles, and when they reach shallow water, build up to tremendous heights and destructive power.



EARTHQUAKE
(causes tsunami)

WHAT CAUSES GIANT

WIND WAVES

SEA WAVES

SWELLS

These are wind waves caused by local storm. Waves are generally irregular in shape, size and pattern. Wind blows tops from waves, forming foamy whitecaps, and heaping waves on one another in confused mass.

Wind waves, caused by storms at sea, break away from the storms as swells. When they reach shallow water, they build into long, high crests that curl forward; then, when close to shore, spill foam ahead of wave.

← DISTANT STORM

DIRECTION OF WAVES →

AS WAVES MOVE FORWARD, water does not travel with the waves, but moves up and down in a circular motion like a cracking whip. Ripple moves forward, but individual molecules stay in same relative position.



By WILLIAM KREH

Illustrated by Ed Valigursky

THOSE KILLER WAVES

AFTER HURRICANE BEULAH vented its fury on the Texas Gulf Coast last summer, pounding wave after monstrous wave on the battered shore, survivors called it one of the worst storms of the century. Total damage from the wind and waves was estimated at \$1 billion.

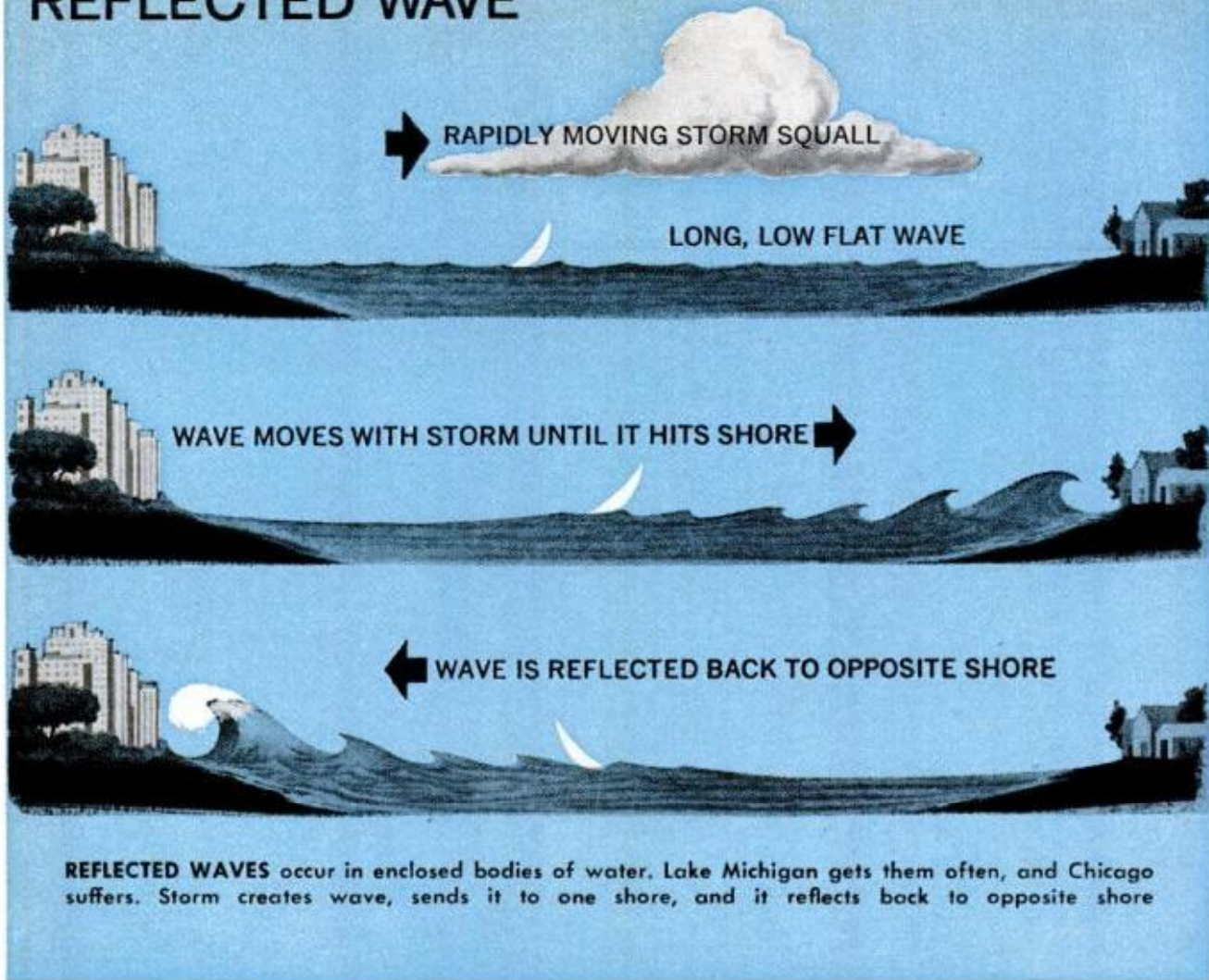
Yet the waves caused by this hurricane, or any hurricane, as bad as they are, are by no means the largest or most destructive. Some waves have nothing to do with storms at all.

For countless ages, man has watched waves at sea and from the shore, with a mixed reaction ranging from awe and admiration to sheer terror. Yet he has really understood very little about them.

What causes them? Where do they start? Where do they go? How do they get there? And, most important, how do they build up to such tremendous heights and destructive power?

- The great waves that hit Galveston in 1900, since immortalized in the folk song, *That Was a Mighty Day*, killed 7000.
- Another hurricane that poured wind and water on Florida and the West Indies in 1928, left 4000 dead.
- In 1946, with no warning, the town of Hilo in the Hawaiian Islands was hit by a series of 50-foot waves that ripped homes, tore up railroad tracks, demolished steel bridges, washed away beaches and killed more than 150 persons.
- On a sunny, clear day in 1958, 30-foot crests suddenly tore out of the

REFLECTED WAVE



REFLECTED WAVES occur in enclosed bodies of water. Lake Michigan gets them often, and Chicago suffers. Storm creates wave, sends it to one shore, and it reflects back to opposite shore

Atlantic Ocean onto the island of Barbados in the West Indies, hurling fishing boats onto the beaches and destroying homes along the coastline.

- In 1966, while riding out a storm, the Italian liner *Michelangelo* was severely damaged by a freak wave that smashed bridge windows 81 feet above the waterline and killed three persons.

- And death-dealing waves aren't always confined to open seas. In 1954, Lake Michigan suddenly sent a giant wave roaring in on a peaceful Chicago beach, sweeping seven fishermen to their deaths.

These are just a few samples of the destructive qualities of killer waves.

Just what are waves? When you watch them, they appear to be huge mountains of water rolling across the top of the sea. This is just an illusion. Actually, only the wave *form* moves forward. The water itself merely moves up and down. It's like cracking a whip.

The ripple runs down the whip, but the individual parts of the whip don't move forward at all, just up and down.

What sets off nature's watery whip?

Many things. Wind is the main cause, the most violent winds, of course, occurring in storms. But there are other causes, including underwater explosions, such as earthquakes or volcanic eruptions, or even the topography of the body of water itself.

Let's start with wind waves. Waves can be created by winds as low as four mph, but there are other factors involved besides velocity; namely, the duration of the wind and the distance over which the wind is able to act on the surface of the water. Seafarers usually refer to this distance as "fetch."

In other words, a wind wave is the product of the velocity, duration and fetch of the wind. Storms, especially storms that go on for several days, usually produce the greatest velocity and

longest durations, but not necessarily the greatest fetch. Storms are generally localized, but winds, not necessarily in storms, can and do produce fetches across the greater part of an ocean. Consequently they can produce waves of even greater destructive force than those made by local storms, including hurricanes.

81-footer strikes suddenly

The liner *Michelangelo*, mentioned earlier, probably encountered such a wave. It had been running in strong winds that produced waves an average of 30 feet high from trough to crest. Suddenly, it was struck by a wave that hit its superstructure 81 feet above the waterline. Wave experts believe such a wave could have been predicted. Waves in rough seas, though not necessarily in storms, average out in height, they say; some higher, some lower than average. But if the rough seas and waves persist long enough, one in 20 will be much higher than average, as much as 2.2 times higher. Such a wave probably hit the *Michelangelo*.

Waves of 60 feet are considered quite common in North Atlantic storms. Probably the best-measured and largest wave ever encountered, however, happened in the North Pacific in 1933. For seven days a Navy oiler, the *USS Ramapo*, had been bucking stormy weather, a storm that had a fetch of thousands of miles. One night during the worst of the storm, an officer saw a great wave rising astern, its crest at a level above an iron strap on the crow's nest of the mainmast. The ship was then on an even keel, riding in a trough between waves. This made possible an exact line of sight from the bridge to the crest of the wave. Simple mathematical calculations gave the height of the wave—112 feet!

Two kinds of wind waves

Basically, wind waves come in two kinds: sea waves and swells. Sea waves are those produced in the immediate vicinity of a storm. They are generally

a confused mass, of all shapes and sizes, running into and past one another. When the wind is brisk, it blows the tops off the steeper waves, producing whitecaps.

When the waves and the storm that produced them separate, the waves are then called swells. These swells can go on, in regular, undulating patterns, until they reach some distant shore and spill their foam upon some beach thousands of miles away from the storm. Recently the Scripps Institute identified individual wave groups as they originated in Antarctic storms and tracked them northward across the Pacific. About two weeks later they broke on the coast of Alaska.

Some swells, if the storm that produced them was long enough and strong enough, can become quite destructive when they reach shore. Almost unnoticed at sea, they can rise to great heights when they roar into shallow waters.

That's what happened to Barbados in 1958. On a pleasant day, with no storm in sight, 30 and 40-foot waves began crashing on the shore. Later it was learned that the storm that produced them had occurred two days before near Cape Hatteras.

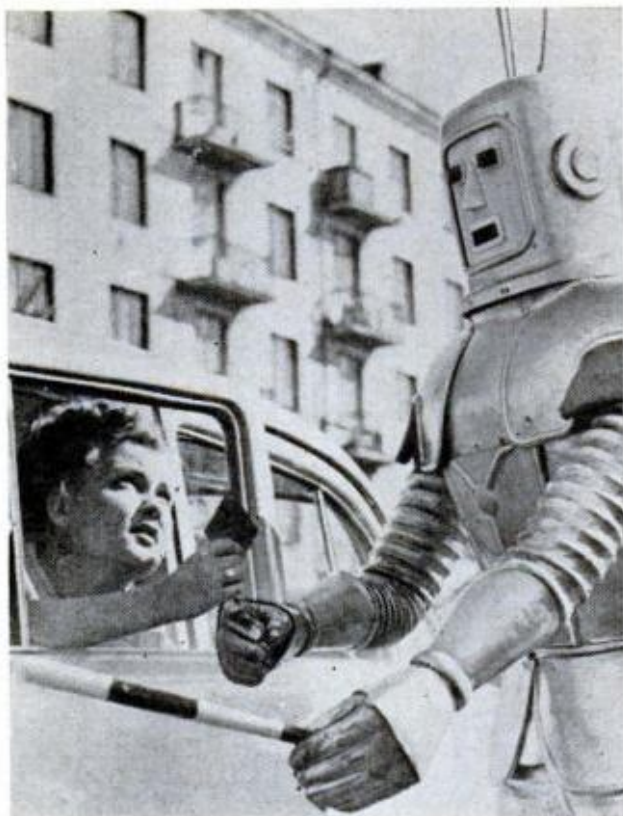
Tidal waves are just what their name implies—waves caused by the tides. But the name is often given, mistakenly, to the giant killer waves known as "tsunamis." True tidal waves are normally not dangerous unless they move in the right combination with a severe storm.

Speeds up to 500 mph

Tsunamis, however, are the most destructive of all waves. Triggered by underwater earthquakes, landslides or volcanic explosions, they can move with speeds up to 500 mph.

Ironically, tsunamis (pronounced soo-NAM-ees) are relatively harmless until they reach shore. Then they build up to devastating heights. Hilo, Hawaii, in 1946—again unexpectedly and on a

(Please turn to page 214)



Russian robot becomes one of 'Archangel's finest'

When the circus came to Archangel, one of its performers—a robot who can carry out 79 different commands—was given a chance to play traffic cop. According to the news agency, Tass, the robot helped children across the street and halted a speeding driver (right).



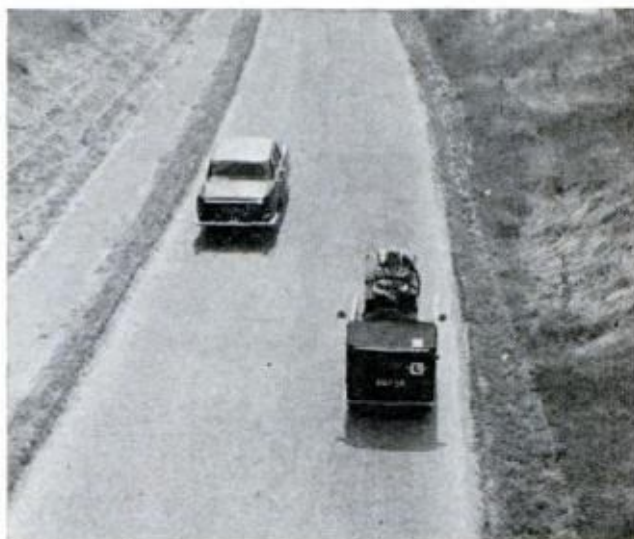
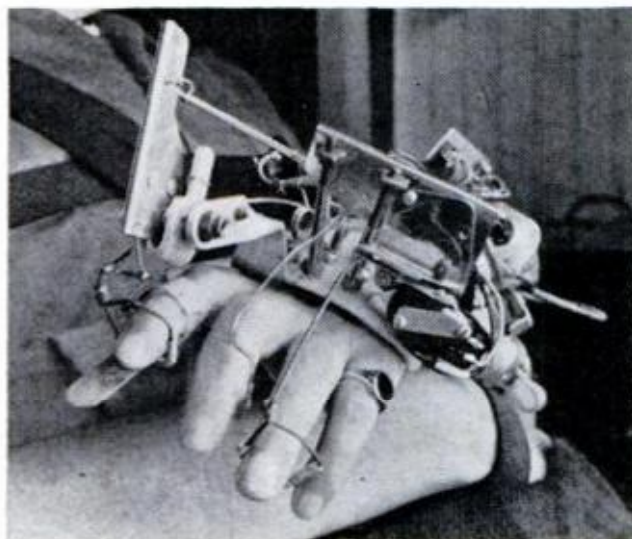
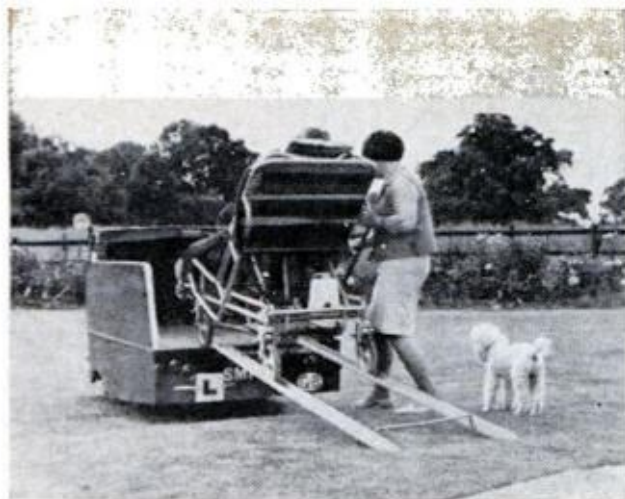
Aluminum cat for research

An unusual three-bow design distinguishes the *Ridgely Warfield*, a 106-foot, all-aluminum catamaran that will soon be put into service as a research ship by Johns Hopkins University.



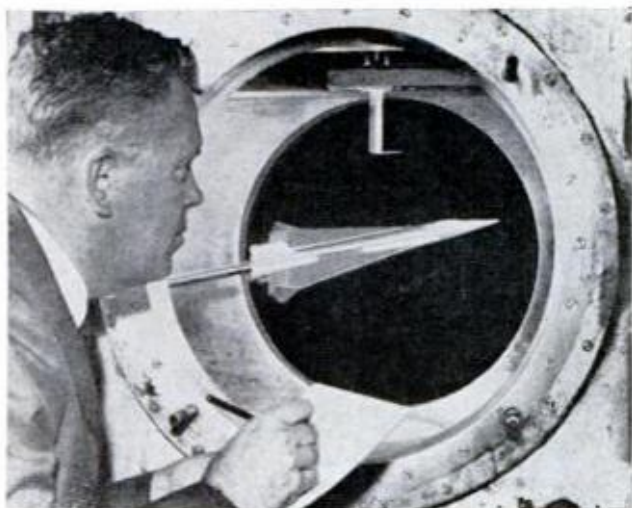
Rod burns through concrete

The Berfix concrete burner, a Swiss invention, can eat a 2-inch diameter hole through 10-inch reinforced concrete in 140 seconds. Its burning tubes are consumed in the process.



Finger controls enable invalid to drive own 'car'

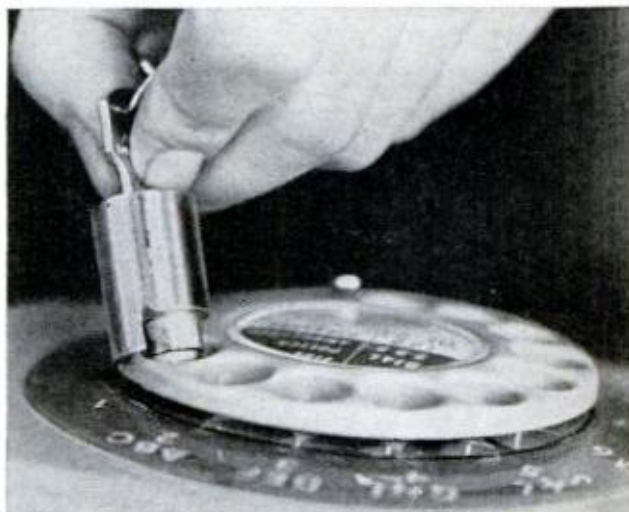
Almost completely paralyzed and able to breathe only with a mechanical respirator, Paul Bates of England still manages to get around. Friends helped him acquire an electric van onto which his wheelchair is rolled (upper left). Securely in place on the van (upper right), Bates can control the van by finger controls (lower left) and travel from place to place.



New shape for X-15

A model of the proposed new delta-wing version of the record-breaking X-15 rocket aircraft is shown here during hypersonic wind tunnel tests at Langley Field, Va.

JANUARY 1968



Talk lock

Here's just the thing for the guy who has everything, including an overly talkative family. It's a telephone lock that keeps the dial from turning, but allows incoming calls.

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Let's Have a New

By DANIEL P. MOYNIHAN

OUR AUTO INSURANCE SYSTEM is not working well. First, it is an extremely costly system. Twice as much is paid out in insurance premiums as is received back in insurance benefits. Second, it is a grievously incomplete system, which fails to cover many of the most serious accidents.

The present system is, for the most part, based on the concepts of tort liability that developed a century ago. In essence, an individual buys protection against the risk that he will *negligently* cause an accident that will injure another person, or damage another person's property. If that should occur, his insurance company is responsible

Daniel P. Moynihan is director of the Joint Center for Urban Studies of M.I.T. and Harvard and is chairman of the Secretary's Advisory Committee on Traffic Safety of the Department of Health, Education and Welfare.

for compensating the victim, up to the amount of insurance coverage. The company, as it were, goes to court and argues the case.

The problem with the system starts right there, at the beginning. It has to do with the nature of traffic accidents. If they were orderly, discreet events, in which cause and effect could be clearly discerned and ascribed to this person or that, then the present insurance system would work well enough. But accidents typically involve a whole range of contributory factors for which the concept of a single "cause" or "negligent party" is very near to absurd. Moreover, as the number of automobiles increases, the number of automobile accidents will also increase.

The result is an insurance system that is inherently unstable. The number of accidents goes up and up, and so does the number of claims and counterclaims. No one involved has any incentive to moderation or reasonableness. The victim has every reason to exaggerate his losses. It is some other

person's insurance company that must pay. The company has every reason to resist. It is somebody else's customer who is making the claim. Delay, fraud, contentiousness are maximized, and in the process the system becomes grossly inefficient and expensive.

A study of traffic accidents in Michigan has shown that "for every \$1 actually paid into the hands of the injury victim, \$2.20 must be contributed by insurance policyholders and taxpayers." By contrast, group health programs such as Blue Cross and Blue Shield can deliver \$1 of benefits for only \$1.07, and the Social Security Administration can do so for \$1.02. Moreover, the system is biased against the poor,

true that the insurance companies are in an equally difficult position. They are by definition the enemy of the victim: It is the role of the company to argue that the victim's injuries, no matter how hideous, are not as serious as he claims, etc., etc.

Moreover, given the system as it is, other than by beating down claims, the only way the companies can compete with one another is by seeking out "preferred" clients who presumably will have fewer accidents than average. For a decade now, students of the subject have been convinced that groups such as Negroes, teen-agers, divorced women and others are significantly discriminated against in the writing of

Auto Insurance Policy

Drawings by Roy Doty

who are least able to wait out the years of litigation which insurance companies are free and able—and all too often anxious—to use as a bargaining weapon.

In their monumental study, *Automobile Accident Costs and Payments*, Professors Alfred Conard and James Morgan quote persons who have found themselves caught up in the personal injury automobile accident claim process:

"They were trying to humiliate me for a quick settlement."

"If I had been financially able, I would have held out longer."

"It was too long to wait for a settlement. It seems like insurance companies prolong cases too long."

"The settlement was unfair, but the lawyer said take it or you might get nothing."

"(My lawyer) wanted me to say something that wasn't true. I wouldn't tell a lie for money."

If the system is stacked somewhat against the traffic victim who is poor and cannot wait out litigation, it is also

automobile insurance. Perhaps more significantly, many companies writing automobile insurance appear to make it a practice to cancel policies of drivers who have accidents or otherwise get involved with the law.

For some time, evidence has been mounting that a very large proportion of persons whose licenses are revoked or suspended continue nonetheless to drive. And there is hardly any question that this is the case with a great number of those who merely lose, or do not obtain, insurance. This is the beginning of the incompleteness of the present system: The large number of drivers who have no liability insurance, either because their state does not require it, or because it has been canceled.

Some of the most appalling cases of incomplete coverage, however, arise not from the failure of drivers to insure themselves, but from the concept of negligence as the operative principle behind liability. As applied to traffic accidents, the concept is obviously flawed. For example, in a line of 20 cars, car

No. 1 suddenly brakes. A disturbance is generated in the line of cars behind it. Finally, car 14 rams into the rear of car 13. Which driver is responsible? Nonetheless, the system manages through various conventions and fictions to point to some guilty party in most cases. But there are many instances in which clearly neither party is at fault, and as a result neither party is liable. A California bar report recounts a number of such cases:

- Two cars, properly driven, collide on

and sends one man to the hospital with a broken pelvis and the other is killed. Each carried full bodily injury and property damage insurance. Neither can recover for personal injury or damage to the car. Reason: Each party was guilty of contributory negligence.

- Defendant runs his car across a sidewalk and smashes into the front room of a simple cottage, killing the grandmother and crippling for life the little children. The cause of the accident was that the driver was hit in the eye with

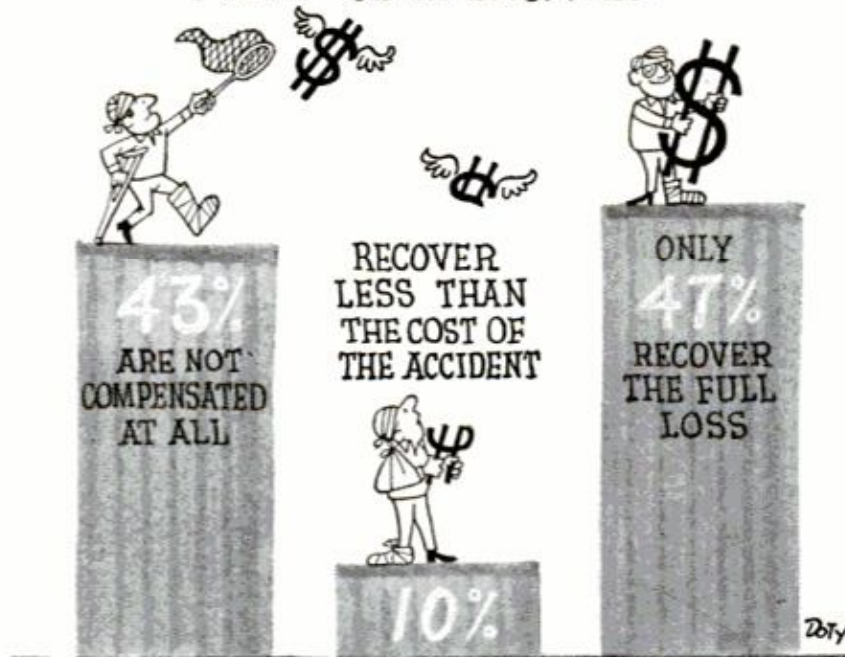
a bullet from a B-B gun shot by someone unknown. The driver carried public liability insurance, but the injured persons cannot recover. Reason: The injuries were purely accidental; the driver wasn't to blame.

We have now reached the point where accident litigation accounts for an estimated 65 to 80 percent of the total civil court cases tried in the United States. This in turn has brought us to the point where delays in justice here are the longest of any democracy on earth. It now takes an average of 30.1 months to obtain a jury trial in the metropolitan areas of the nation. In Westchester and Kings

Counties (N.Y.), it is 50 months plus. In Chicago it is 69 months plus.

There is little likelihood, however, that greater efforts toward the administration of justice—more judges, or whatever—would change matters. A New York survey has shown that of 220,000 annual claims of victims seeking to recover damages caused by another's fault, only 7000 reach trial, and 2500 reach verdict. Given the number and rate of accidents in the existing transport system, a kind of Malthusian principle governs the courts: The number of litigated cases will automatically

MOST ACCIDENT VICTIMS ARE NOT FULLY COMPENSATED



TRAGIC FAILURE of today's insurance system is illustrated by the chart above, showing that more than half of all victims of auto accidents are either not compensated at all or are only partially compensated. Chart is based on sample survey made in Philadelphia

a skiddy road without the fault of either. One driver loses his eyesight and the other has to have both legs amputated. Each carries heavy body injury liability insurance. Neither driver can recover.

Reason: No recovery unless the plaintiff can prove the defendant to have caused the injury by his negligence. Here neither was negligent.

- One party is traveling down a freeway at 75 miles an hour; the other at the moment decides to change lanes and does so without signaling. The resulting smashup demolishes both cars

increase to use up all the available judicial facilities and maintain a permanent backlog.

Only one adult response is possible: The present automobile insurance system has to change.

Two courses are open. Given the profit-and-loss record (which doubtless is more complicated than we know), it would on present appearances be a favor to the insurance industry to get it out of the traffic accident business altogether. A simple means of doing this would be for the federal government to begin automatically providing all licensed drivers with a minimum amount of insurance against injuries and property loss that they might suffer.

Claims could be adjusted in much the same manner as the workmen's compensation system that has been operating for a half century in most states. Awards would be made on the basis of loss rather than fault, and much of the vast, clumsy apparatus of claim, counterclaim, litigation, delay and evasion might be done away with.

Financing such a system might be the easiest part of all. The Federal Highway Trust Fund obligated \$3.4 billion in highway-user taxes in 1966 solely for the construction of the Interstate Highway System, which is scheduled for completion in 1973. We are therefore approaching the point when we must decide to go on pouring concrete at the enormous pace of the past decade even after the Interstate System is finished, or whether to taper off somewhat.

One alternative use for the taxes that were imposed to build the Interstate System would be to finance an insurance system. Automobile liability pre-

miums came to \$8.3 billion in 1965. For an extra penny or so in gasoline tax, an efficient national system of accident compensation could be established, modeled perhaps on the existing accident compensation system for federal employees.

By this all too familiar process, government would reform industry. The alternative is for industry to reform itself. A proposal to do just this was put forth last year by Robert E. Keeton of the Harvard Law School and Jeffrey

ONLY 3.2% OF ACCIDENT VICTIMS CARRY THEIR CASES TO COURT

OUT OF 220,000 WHO SUFFERED INJURIES IN AUTO ACCIDENTS IN NEW YORK CITY IN A TYPICAL YEAR (1961)...

70% RETAINED A LAWYER...



35% FILED SUIT...



... BUT ONLY 7,000, OR

3.2% OF THE CASES CAME TO TRIAL.



ONLY A FEW ACCIDENT VICTIMS are ever able to go through the long and costly process of litigation. Chart above, based on figures for New York City, shows that out of 220,000 who suffered auto injuries only 7000 or 3.2 percent had their cases actually come to trial

O'Connell of the University of Illinois College of Law in their book, *Basic Protection for the Traffic Victim: A Blueprint for Reforming Automobile Insurance*.

As Keeton and O'Connell see it, the basic flaw in the present system has to do first with the concept of liability in traffic accidents, and, second, with the relationship between the insurance company and the driver. As stated, for most accidents liability is an elusive and unproductive question. With 103 million licensed drivers, there are going

(Please turn to page 206)



Gordon Johncock tests the new Corvette

I found this latest version of Chevy's famed Corvette to be a formidable automotive package featuring both high-powered styling and performance plus the best handling of any U.S. production car

By GORDON JOHNCOCK
USAC Driving Star
Photos by Jeannie Weaver

EVERY NOW AND THEN I get to drive a car that surprises me. Either it's much more than I expected, or much less than I had hoped for. An example of the former is the new Chevy Corvette.

I've driven most of the so-called "pony" cars at one time or another—the Mustang, Camaro, Barracuda, Javelin, and so on—and, although I think of them as being far better from . . . oh, say, a handling point of view than the typical family sedan, I've always found something to quibble about.

I think most of them are nose-heavy, for one thing, and I feel they promise

more often than they deliver. By this I mean that their appearance is a bit deceiving; they *look* like you could rush right out to the nearest racetrack and play "hero driver." You'd be a fool to do so. All cars require extensive modification before they're equal to the stresses and strains of racing.

If there's an exception to this rule, it's the '68 Corvette I tested for *PM* over the tortuous, twisting "Seven Sisters" test course on the General Motors Proving Grounds at Milford, Mich. Never in my life have I slipped behind the wheel of an "as is" production passenger car and felt more as if I were



INSTRUMENTS are well-placed and easy to read. I like the idea of gauges rather than "idiot lights"

about to take off in a race car. And when I applied power and barreled through the course's first sharp turn, I experienced that delightful feeling of knowing I had my hands on an exceptional machine.

With me the first couple of times around was Zora Arkus-Duntov, known as "Mr. Corvette" since the car's introduction in 1955. As I watched him out of the corner of my eye, his pride in his "baby" was obvious. He gets a real belt out of having the car do all (or most all, anyhow) of the things he and his associates tried to engineer into it. I can sure understand why.

The car I drove was a red convertible powered by a 427-cu.-in. engine equipped with three two-barrel carburetors. This engine version is rated at 400 hp. You can get more (460 hp), but why anyone would want it or need it is beyond me; it's a head-snapper as is. The transmission was a Turbo Hydra-Matic three-speed. Power brakes were four-wheel discs, and the car was equipped with power steering. Tires were F70-15 Goodyears. The car had a positraction rear axle with a ratio of 3.08:1. In all, a real "Go" package.

Happily, one of the first things I noticed was that the car's weight is distributed evenly over all four wheels. In fact, when I spun out the first time (I did so a second time, but on purpose; the first was a goof, pure and simple) I noticed that the rear end didn't snap around as it would tend to do in a nose-heavy car. Instead, it came around as if in a controlled power slide, like a race



I ENJOYED chatting with Zora Arkus-Duntov, chief of the Corvette project. Car in background is a '67

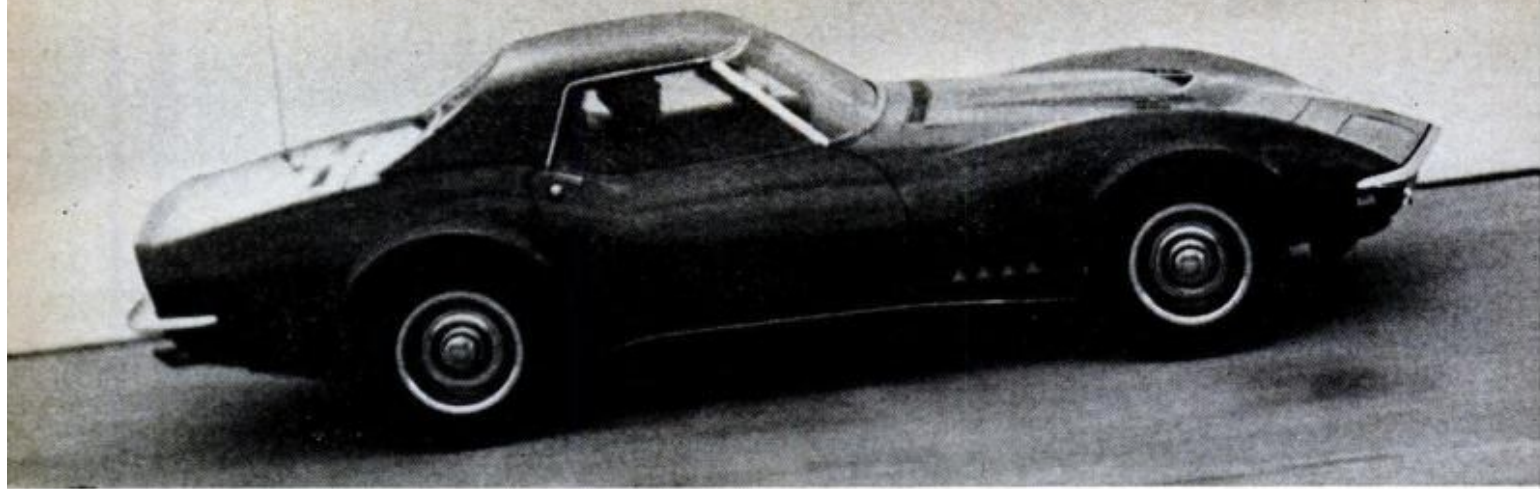
car. I came to appreciate the car's outstanding weight distribution more and more as I increased cornering speeds; not once—with the exception of my spinout goof—did the car waver from the line on which I had set it. Even "out of shape" on the spinout, the car tended to correct itself.

Another outstanding feature of the car is its power steering, the best I've ever encountered. Unlike most power-steering systems, which tend to lose effectiveness on either end of their range, the Corvette offers full and easy control from rack-to-rack, making control of the car something other than a brute-force proposition.

Acceleration is something special. There's a short straight down one side of the Seven Sisters course, and while it isn't long enough to really let the car out, it gave me a pretty fair idea of what the Corvette can do. Coming onto the straight, I tromped on the gas and watched the speedometer climb to well over 100 before I had to back off to make a turn. Unfortunately, there wasn't time to make runs against the clock (that Proving Grounds is a busy place; we had the track for less than two hours, not really enough to do all you'd like to), but I would guess 0-60 would be close to six seconds, or less.

Coupled with the quick acceleration is a braking system that really hauls the Corvette down. As is the case with all disc brakes, stopping power improves as the brakes heat up. Even after four or five panic stops, fade was minimal.

The car's automatic transmission



I **THINK** high front fenders restrict forward vision somewhat. Otherwise, vision is good. Roof comes off

proved smooth and quick and seemed to run through gears easily and quietly. To me, proof of an automatic transmission is whether or not, in a potentially tight situation, I wish I had a stick. The Corvette didn't give me that feeling once.

I don't profess to know too much about styling, but I think the new Corvette is a slick-looking car. Maybe it's too slick, as some of its critics have suggested. In any event, there's nothing else coming out of Detroit that looks quite like it. If I were to find any fault, it would be with the front fenders; they're unnecessarily high and, I think, tend to impede vision. The rest of the

car sports all the "in" design themes and carries them out well, although the retractable headlights look strangely bug-eyed when in an open position.

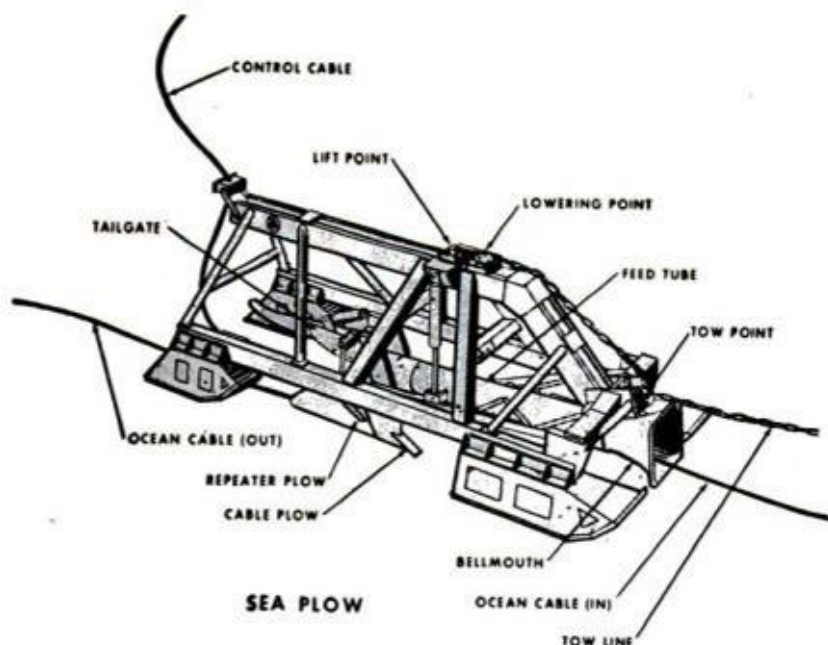
Once you master the "how to" of opening the doors from the outside, access is comparatively easy for a car of this type. In other words, you don't have to fold yourself up to get in, as you do in most sports cars.

Inside, the seats are as comfortable as any, actually more so than most. I found they fit my body well, with no hollow down there along my lower back. Leg and headroom are more than adequate for all but a pro basketball

(Please turn to page 215)

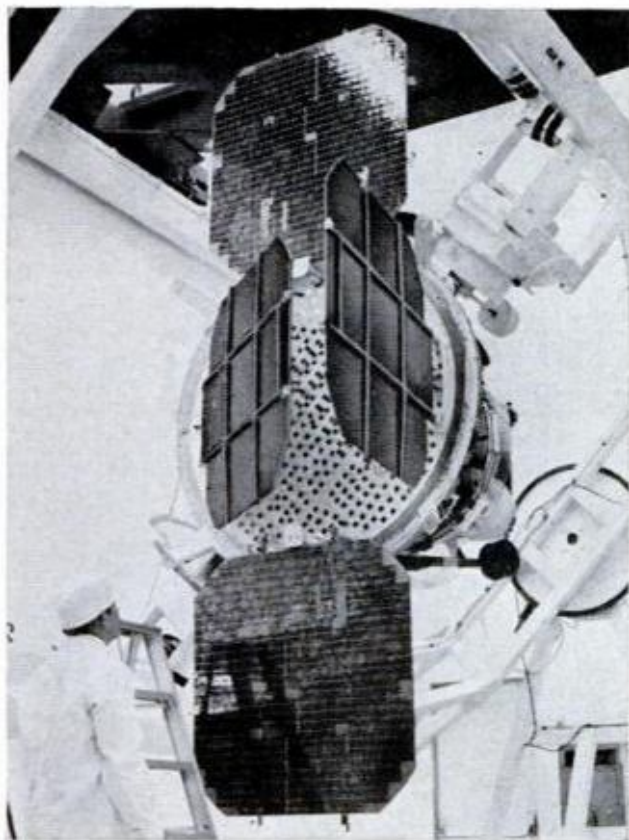
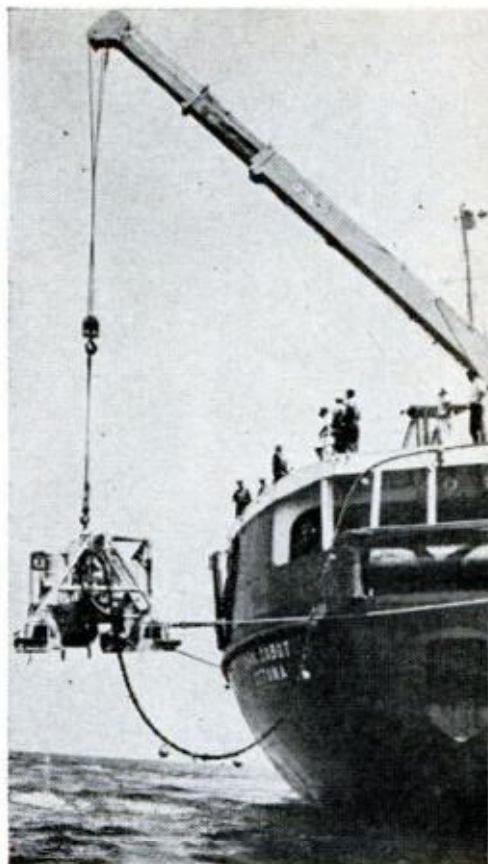
HIGH FENDER STYLING THEME gives wheels more clearance than necessary. Note spoiler and dual exhausts





Underwater plow buries cables

To guard its undersea cables against damage from fishing trawlers and dredges, American Telephone and Telegraph Co. has developed a plow that buries the cables two feet under the sea bottom. Lowered into the water (right), the plow is dragged along the bottom as the cable is fed into its bellmouth. AT&T has buried 100 miles of the shore ends of two trans-Atlantic cables.



Power for Orbiter

The four panels that provide all electricity to power Lunar Orbiter are shown being tested by NASA before launch of the space vehicle. Folded during launch, the panels open to expose nearly 11,000 solar cells to the sunlight.

JANUARY 1968



Thermal insurance

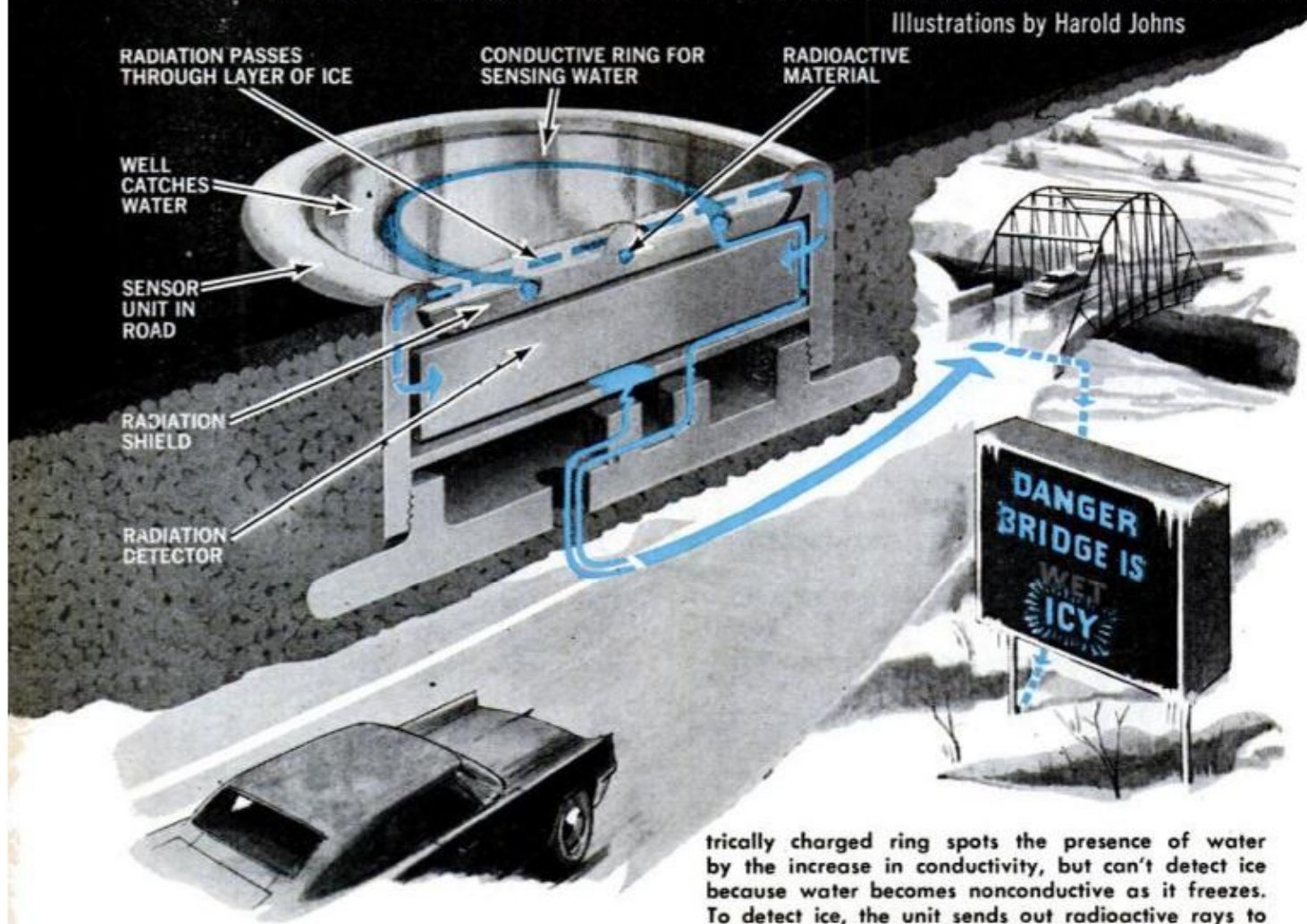
Atop a pylon on the German K8 sailplane are a Wankel engine and propeller that are used when the pilot finds he's losing altitude and must search for a thermal that will buoy the craft. The aircraft is made in Schweinfurt.

Just patented

PM'S PICK OF THE NEW INVENTIONS

Illustrations by Harold Johns

RADIATION PASSES THROUGH LAYER OF ICE
 WELL CATCHES WATER
 CONDUCTIVE RING FOR SENSING WATER
 RADIOACTIVE MATERIAL
 SENSOR UNIT IN ROAD
 RADIATION SHIELD
 RADIATION DETECTOR



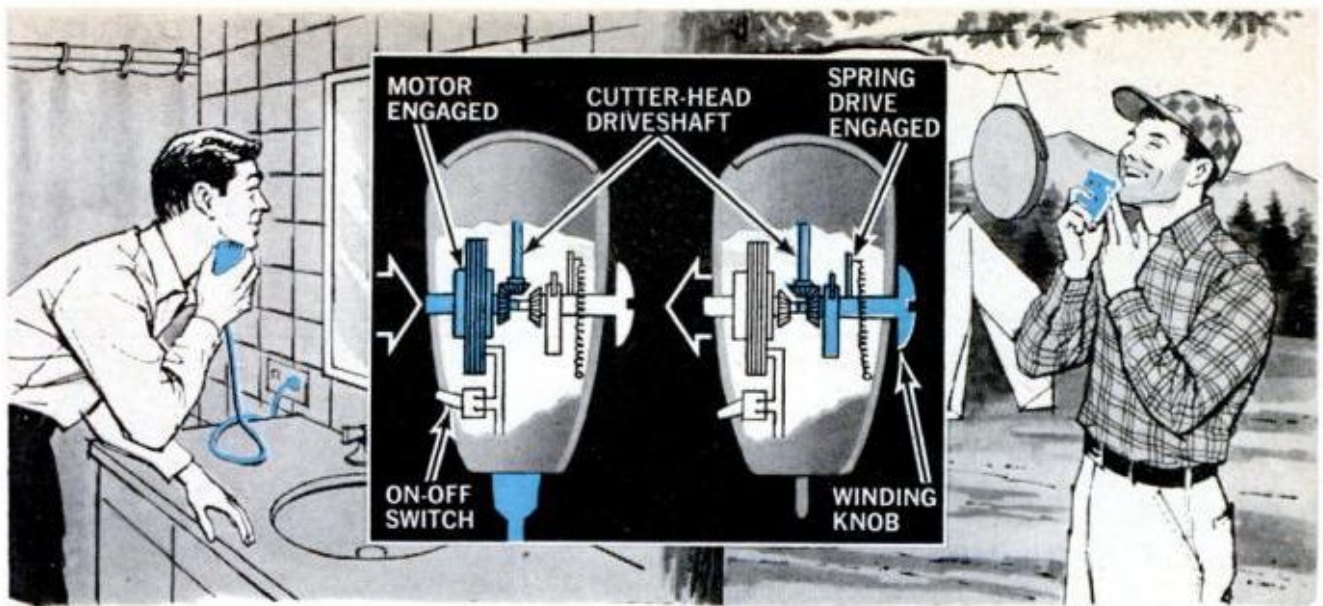
1. A FLASHING SIGN (above) warns you if the road ahead is wet or icy. The system is designed for hazardous locations, such as bridges that freeze up faster than grade-level surfaces. A sensing unit buried in the road works in two ways. An elec-

trically charged ring spots the presence of water by the increase in conductivity, but can't detect ice because water becomes nonconductive as it freezes. To detect ice, the unit sends out radioactive rays to a radiation detector that measures their intensity. A radiation shield forces the rays to pass sideways through the water before reaching the detector. As ice forms, it blocks some of the radiation, and the detector, sensing the drop in intensity of rays it picks up, automatically switches on flashing sign

2. SIMPLE RESCUE RIG for saving someone who has fallen through thin ice is so small that skaters and other outdoorsmen could carry one in a pocket. The pronged hook, not much bigger than a beer-can opener, is jammed into the ice with your foot and the attached line is thrown to the victim. The hook anchors the line so the victim can work himself clear of the hole without pulling his rescuer into the water with him.

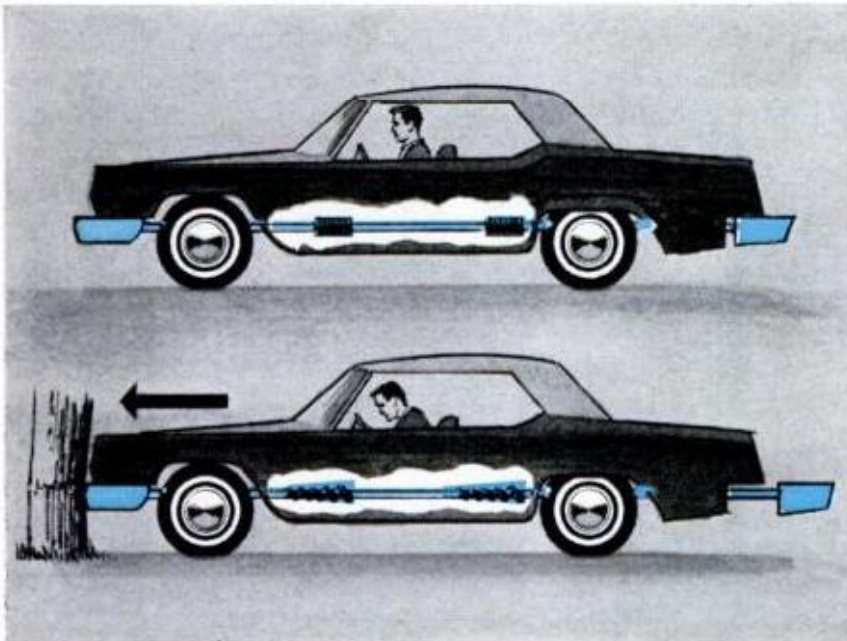


Inventors of the devices shown on these pages are as follows: 1. Howard J. Goldman, Glenview, Ill., and Harry A. Wayne, Skokie, Ill. (No. 3,239,668); 2. Michael W. Borcuk, Provi-



3. WORK-ANYWHERE SHAVER plugs into house current when you're home, then switches over to a built-in spring drive when you're away from power, as when on a camping trip. Pushing in the shaft on the left side engages a bevel gear on the motor so

the cutter head is driven electrically in the conventional way. Pushing in the shaft from the opposite side disengages the motor gear and engages a similar bevel gear on the spring drive for cordless operation. Turning the knob rewinds the spring

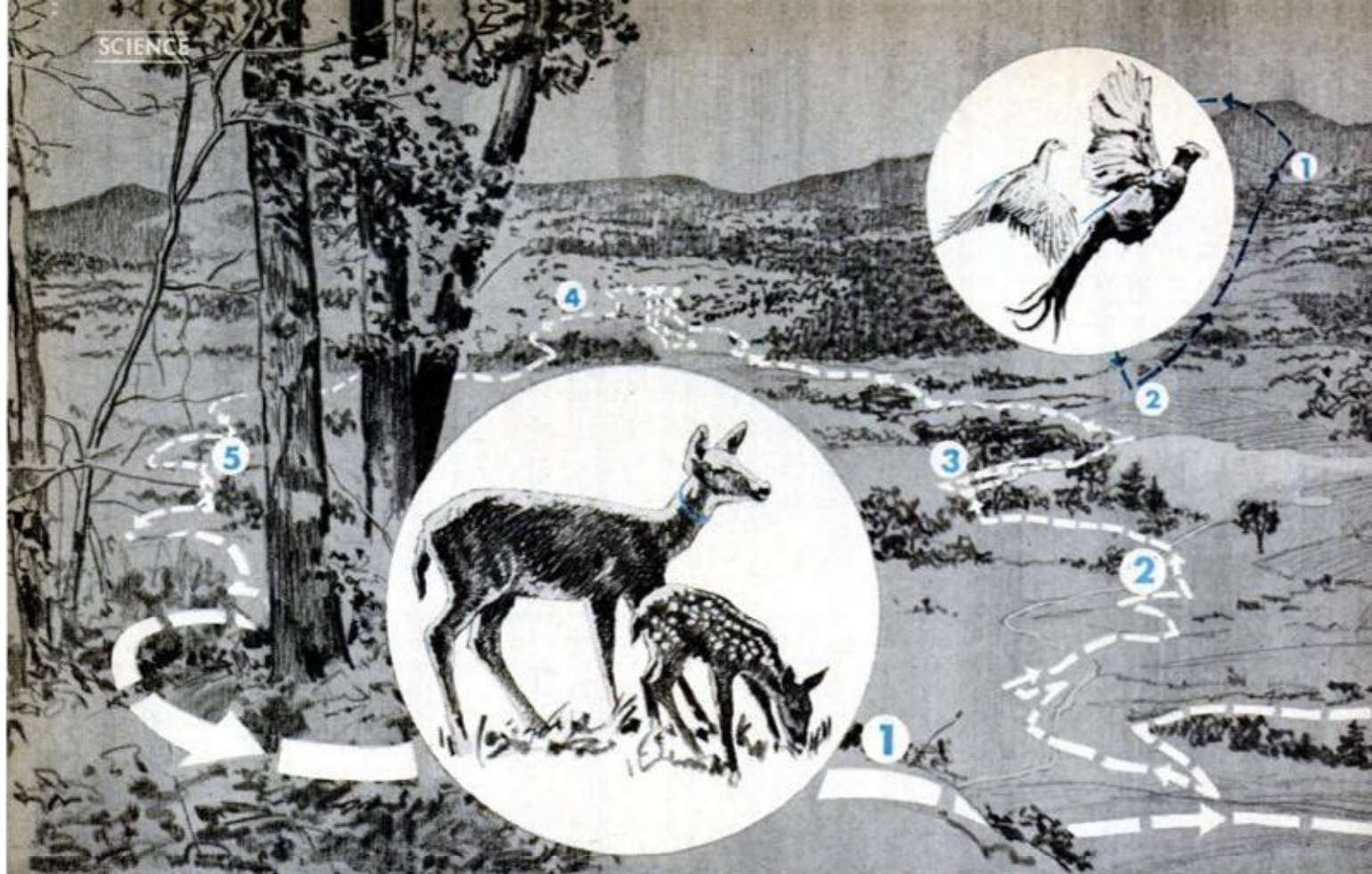


4. SPRING-LOADED BUMPERS are designed to absorb some of the shock in an auto collision, lessening the chance of serious injury or damage. The front and rear bumpers are actually connected by two parallel rails that slide through the frame of the car on greased bushings. The rails are anchored to the frame by springs that can move in either direction—forward or backward. If the car strikes something in front, the body slides forward on the rails a few inches, cushioned by the action of the springs. If the car is struck from behind, the rails are driven through the body against the springs without the body itself being hit. The rails are hidden in channels running under the seats and along the door sills so as not to interfere with the passengers sitting inside the car

5. EMERGENCY SNOW TREADS may come in the form of a long, continuous paste-on strip—like a giant roll of adhesive tape. The idea: You just unwind the roll, wrap the material around a tire and cut it off at the desired length. The adhesive-backed strip is designed to stick on by itself, even on a wet tire, and has flexible molded-in cleats for added traction. It can easily be peeled off when you no longer need it. Each roll would contain enough material to cover two tires. Carried in the trunk of car, it could be reused several times before being discarded for new roll



dence, R.I. (No. 3,305,984); 3. Lawrence Pergzola, Pittsburgh, Pa. (No. 3,323,207); 4. Joseph V. Tavano Sr., Milford, Mass. (No. 3,333,880); 5. Glen Peterson, Tulsa, Okla. (No. 3,335,776).



TUNING-IN ON WILDLIFE

Amazing space-age radios are letting scientists eavesdrop on age-old animal mysteries. These discoveries are helping preserve species—and man, too.

HERE'S A SWITCH—scientists are now putting bugs on animals and birds instead of removing them. These are special “bugs”—tiny transmitters that are part of a detective-style tracking system. With them, wildlife can be followed by radio day and night without being spooked.

Called wildlife telemetry, this system is letting experts in on secrets locked for ages deep in animal instinct. The knowledge gained is helping scientists save some endangered species, slow the spread of animal disease, plan better food-and-cover areas for wildlife.

But more important, experts are getting information that may help explain some mysteries in human behavior.

Here's some of what's been learned. Scientists now know how many deer stocked into a strange area probably will be killed during the first hunting season. They know how often a raccoon changes dens; where a grizzly bear spends the winter; and, astonishingly, how rapidly a baboon's heart beats when he's fighting.

In recent years, very few species have missed being bugged. And—get this—in Virginia, scientists hope to install telemetry devices within the air space of a mallard duck egg to determine the effects of parental care.

In this case, the transmitters will be planted internally—one of two bugging methods. In other cases, transmitters

WILDLIFE ACTIVITY KEY

DEER

1. At 1:30 a.m., deer in the midst of feeding.
2. Stops for a drink of water.
3. From 8:00 a.m. to 3:30 p.m. stays close to resting area.
4. Starts night rounds again.
5. Finishes 24-hour tour which has taken deer around a mile-square area.

RABBIT

1. Feeds in open at night.
2. Escapes to heavy area when threatened.
3. Can cover range in 3 or 4 hours while feeding.

PHEASANT

1. Roosts in higher elevations at night.
2. Feeds in open grain fields.

BEAR

1. A bear instinctively knows of approaching snow-storm that will cover his tracks leading to his winter hibernation den.

SECRETS

By **HANK and VERA BRADSHAW**

Illustration by Miller Pope

are attached to the wildlife externally.

The external system consists of attaching a tiny transmitter with either loop or whip antenna to a collar which is put around the animal's neck. For a bird, the transmitter is strapped to its back. These transmitters send out continual beeps. The signals are received through antenna either installed in permanent towers, attached to trucks, or shielded in hand-carried equipment.

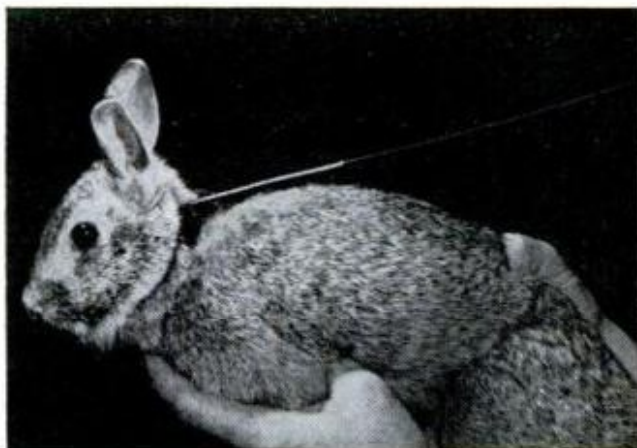
Each bugged subject is given a different-sounding beep or a different frequency, so several can be tracked at once from the same stations. Bugged wildlife can be "shadowed" within 20 miles of the receiver.

The internal system operates the

JANUARY 1968



RADIO EQUIPMENT is being used to track wild deer by Prof. John Kupa of the University of Rhode Island



COLLAR-MOUNTED TRANSMITTER for rabbit has own batteries and either whip (shown) or loop antenna

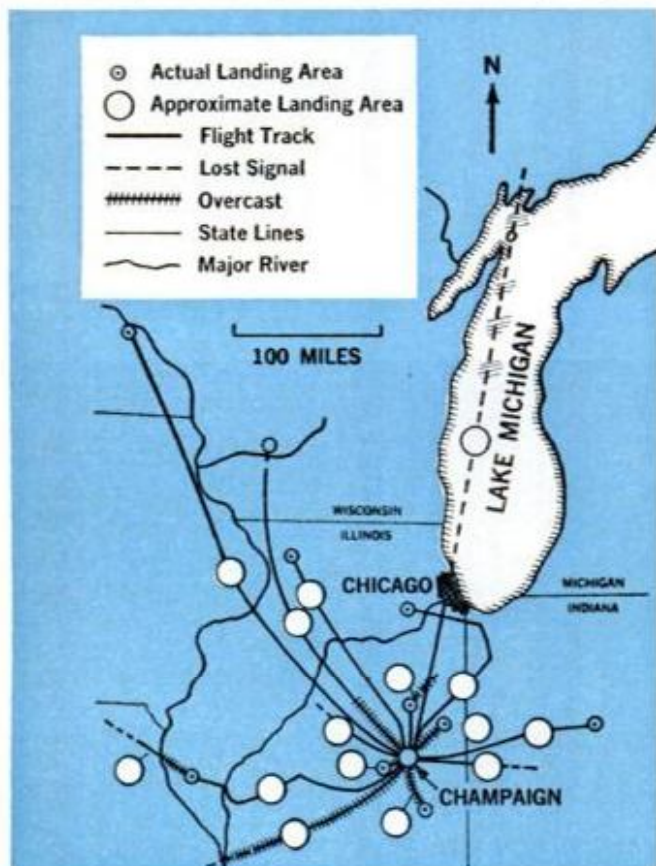


TRANSMITTER (left) with antenna and battery weighs just over 1/10th oz. It's attached to birds (right) so they can be tracked on migrations. The system was designed by Bill Cochran of the University of Illinois

same except that *physiological* sensors are attached to transmitters and implanted surgically inside the animals.

But first the wild creature must be caught before it can be bugged. And then it must be caught again to remove the expensive equipment. Experts trap animals, net birds and shoot larger wildlife with anesthetizing guns.

MANY BIRDS MIGRATE only at night—flying 20 to 60 mph—when the temperature's above 70° and the barometer is steady or rising, according to studies made by University of Illinois tracking experts



So once an animal is bugged its movements, needs and habits are recorded. Knowing where rats go at night, for example, can be very important in tracking down sources of human diseases.

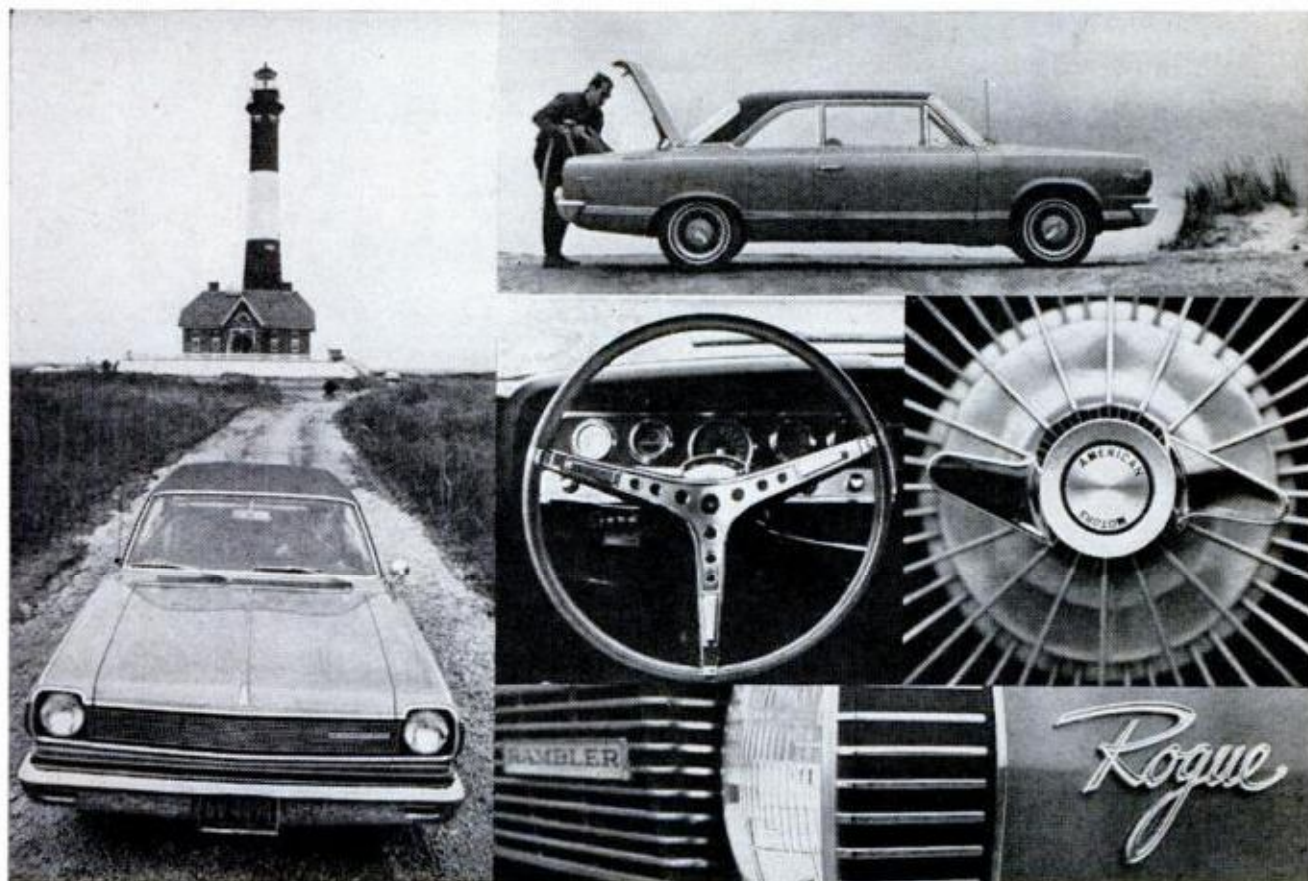
Telemetry is getting so sophisticated that experts can even detect the erratic flight of a sick bird. Actually, scientists in Montana have learned to recognize the spasms of a "bugged" blue grouse suddenly poisoned by insecticides.

To get the real feel of wildlife telemetry, we sat all night in a truck tracking five cottontail rabbits. Dr. Jim Bailey of the University of Illinois showed us how the equipment in his aerial-equipped truck worked. He'd been tracking these rabbits for five months. All the rabbits were wearing loop antennas on transmitter-bearing collars. A few hundred yards away, his assistant, Jeff Hanson, sat in another "wired" truck. They talked by radio. It sounded like two secret agents trailing a spy.

"What have you got on .041, Jeff?" Jim asked. (Monitored rabbits are numbered.) Their tracking devices were radio receivers with antennas attached to pointing needles on compass cards. Jim now twisted his antenna until the beeping of .041's transmitter blared out. As he continued to twist, it died out completely and then boomed

(Please turn to page 208)

Gas goes far but the paint's spread thin



RAMBLER AMERICAN

By **BILL HARTFORD**, Associate Auto Editor

Photos by *Irving Dolin*

AMERICAN OWNERS' CRITICISM of their cars as great on gas but poor on paint seems to indicate that American Motors has been faced with the old problem of trade-offs. A "trade-off"—the term in industry for a tossup in the design and manufacture of a product—refers to the question of how much you should spend or invest in one area as opposed to another. From what owners tell us, it seems AMC may have engineered greater fuel economy with the money it saves by increasing the speed of the assembly line through the paint shop.

Understandably, there's a limit to

how much you can spend to improve your product. Unless you're building a price-is-no-problem Rolls Royce, you could go broke. You can't bake chocolate layer cake and sell it at pound-cake prices, and you can't please all of the people all of the time—not at a profit.

On the other side of the buy-and-sell, however, American owners tell us they seem to be getting a message from AMC that they can't have their cake and eat it too—not when they're buying pound cake. Most owners would be the first to agree that their car—advertised at the lowest price of any domestic economy automobile—is inexpensive,



INTERIOR COMFORT AND CONVENIENCE got high ratings. Many owners will get airconditioning next time

economical, pound-cake transportation. But they also feel that they are at least entitled to a good protective coating of paint.

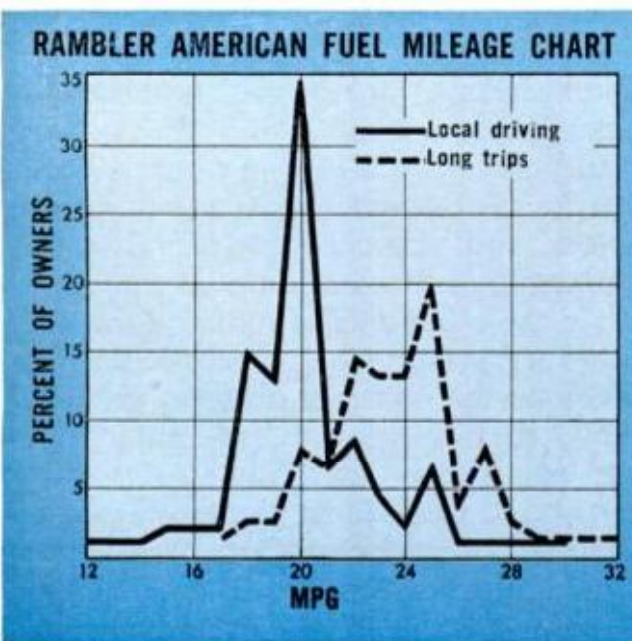
However inexpensive the basic American, it still comes in some pretty deluxe models, like the 1967 Rogue shown on these pages, and with some pretty hot engine options and accessories. But, still, 64.2 percent of American owners surveyed by *PM* own a car in the 220 series; 59.9 percent have the

smallest 199-cu.-in., six-cylinder engine; 87.6 percent have no power options; 18 percent have no accessories whatsoever to put on a little icing.

These figures, incidentally, are from *PM*'s survey of owners of 1967 model-year Americans. The car is basically unchanged for the 1968 model year. And American Motors says it will not be drastically changed in the immediate future.

For a little icing on his American,

MILEAGE FIGURES for most popular 199-cu.-in. engine. Few owners had 290 engine, none had the 343



HANDLING PRAISE was second only to economy. A few owners complained of roadability in crosswinds



The Biggest Wheel in Vietnam

The Army's new amphibious monster takes troops and supplies from ships offshore and climbs up on the beach to deliver them, or even up to the warehouse, if you like

Photos by Robert J. Ellison of Empire

NEW LOGISTICS was only one of the many adjustments the Allied troops had to make to fight the guerilla warfare of Vietnam. South Vietnam has only one port (at Saigon) but troops and supplies were needed all over the country's coastline. How to get them ashore?

The U.S. Army offered the BARC (for Barge Amphibious Resupply Cargo), a huge vehicle that eliminates the

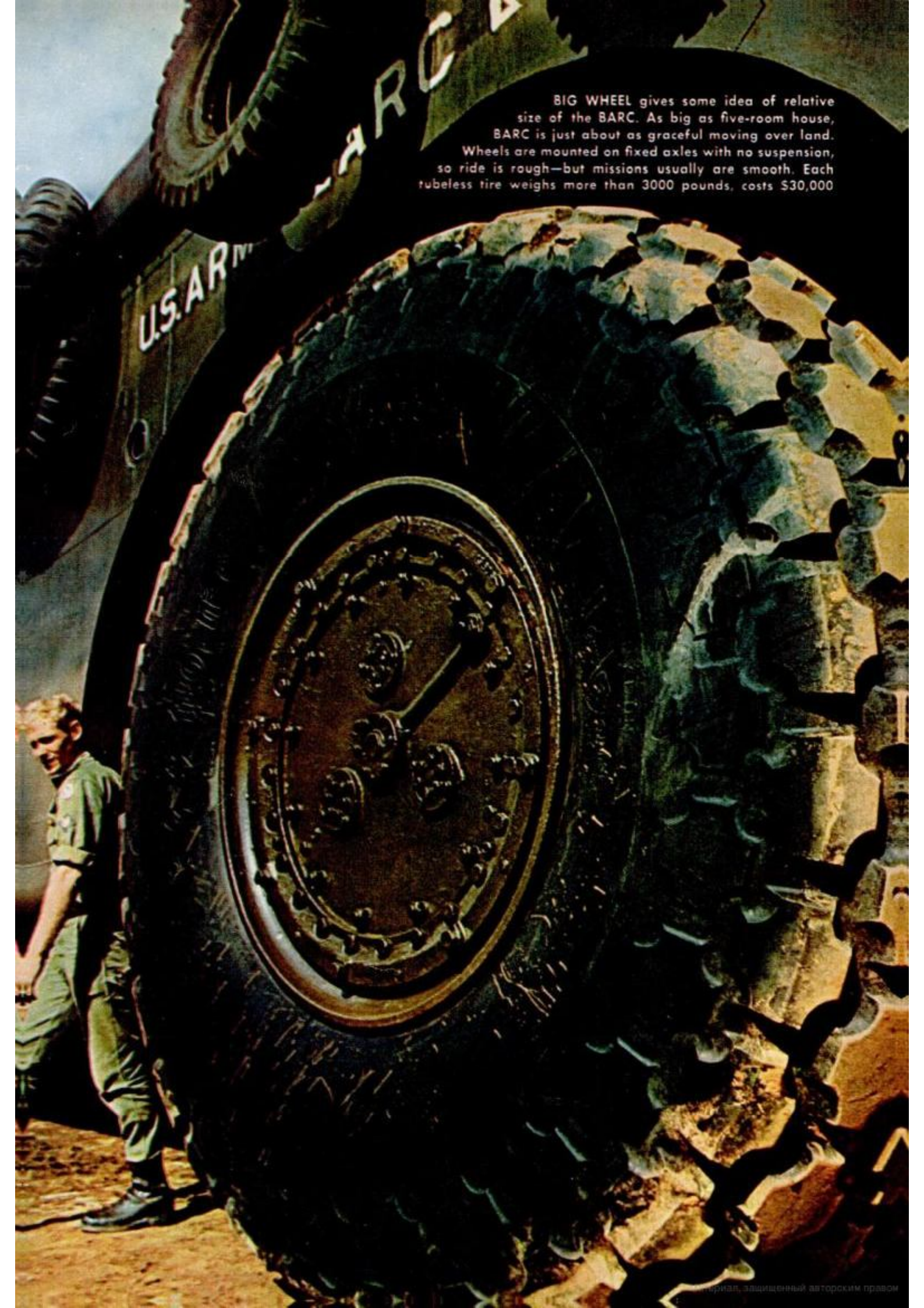
on-the-beach offloading of World War II LSTs. The BARC ignores the beach, picking up its cargo from ships anchored offshore in deep water, powers its way in, then at the shoreline switches from propeller power to wheel power.

Twenty feet tall, and about the size of a five-room house, the BARCs, literally, have made a *big* difference in moving troops and supplies in Vietnam.

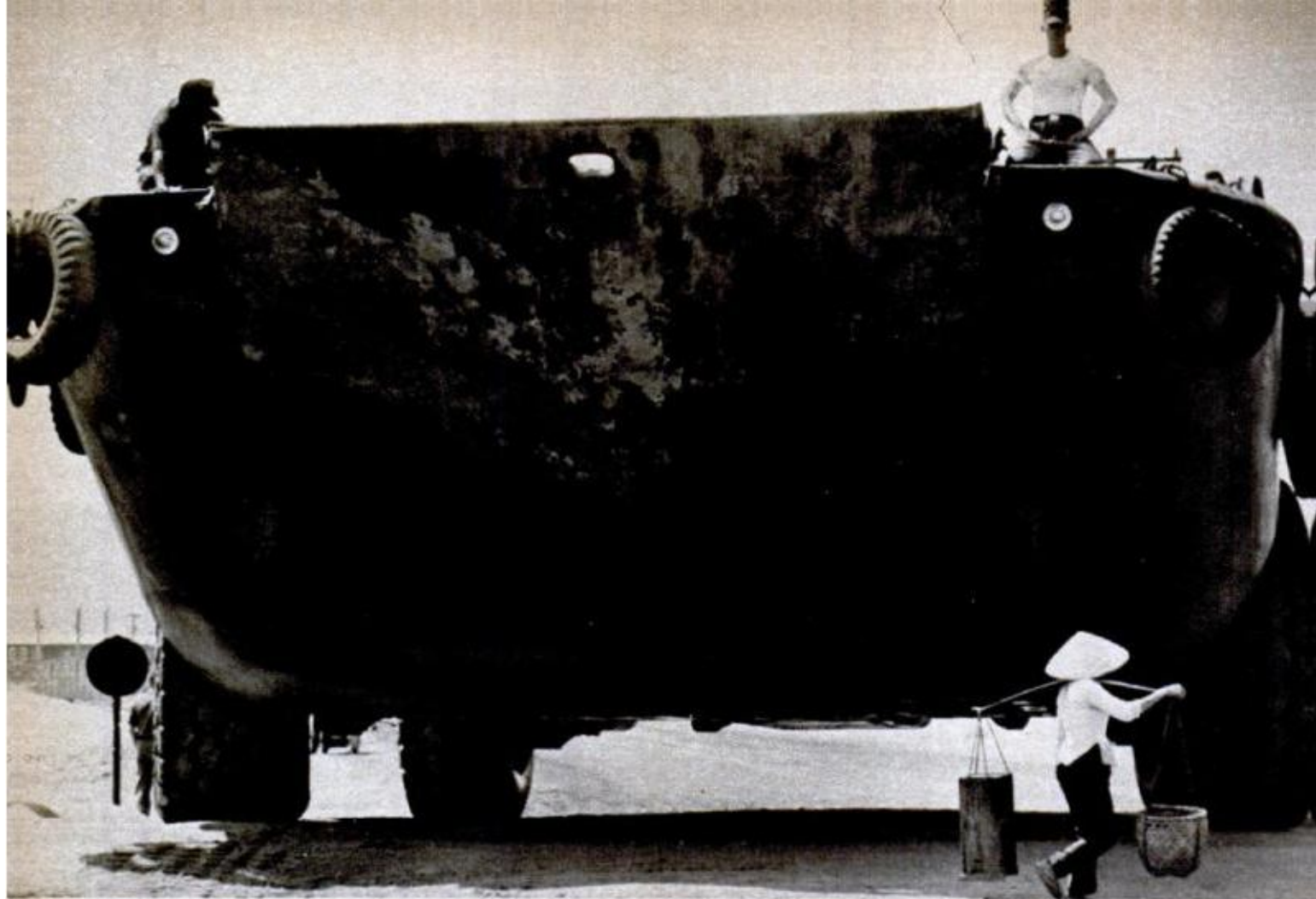
(More photos on following three pages)

BIG BARC rolls ashore on wheels after picking up cargo far offshore. Its amphibious ability has speeded up transfer of troops and supplies from ocean vessels anchored at sea to wide areas along the coastline of South Vietnam





BIG WHEEL gives some idea of relative size of the BARC. As big as five-room house, BARC is just about as graceful moving over land. Wheels are mounted on fixed axles with no suspension, so ride is rough—but missions usually are smooth. Each tubeless tire weighs more than 3000 pounds, costs \$30,000



STRANGE JUXTAPOSITION of huge cargo-carrying BARC and small cargo-carrying Vietnamese peasant is quite normal in strange war. Moving over ground, BARC can steer each wheel independently so, even on uneven terrain, it can crab its way diagonally. Wheels are disconnected when BARC is on water

BARC ENGINES, two on each side, drive four wheels or two propellers, whichever are in use. Each wheel is driven by one engine, but two engines drive one propeller. Here, while the vehicle is unloaded at warehouse area, covers are lifted to cool engines. BARC has a rated load of 60 tons, but has carried up to 130



BARC CABIN is at rear of vehicle, and vehicle is operated from here on both land and water. Only function that cannot be controlled from cabin is lowering of forward ramp. This is operated with switches at front of craft, about same way rear ramp of truck is operated from rear of truck. On water, wheels are disconnected and engines power two propellers. Vision usually is no problem on water because BARC has wider area to operate in and traffic is not heavy. On land, however, vision from rear of vehicle is limited and driver must depend on help from hand signals given by crewmen on ground. He has less room to maneuver and traffic, including local vehicles, bicycles, even animals, is heavier. Said one driver, "It's like driving your house down a narrow, twisting country dirt road from the back porch"

DRIVING RAINSTORM doesn't stop BARCs from operating. Here they return to sea to pick up more cargo from ships anchored far out in deep water. Rainstorms, in fact, are almost constant in Vietnam during part of year, but war doesn't stop, so BARCs must keep going. Some busy days, BARCs have been known to unload up to 230 tons in 12 hours, or as many as 200 troops on one trip. Construction workers in Vietnam have been laboring to build more deep-draft ports so ocean vessels can come right up to dock. Meanwhile, BARCs are keeping the supplies moving and the war going, in an area that does not have world's greatest terrain. One GI said, "When God made the world, he took all the corruptible land and put it in one spot—Vietnam!" BARC can handle it



Soon we'll be able to save men from sunken submarines. Here's how tiny rescue subs now being built for the Navy will bring them back alive.

ON APRIL 10, 1963, the nuclear submarine *Thresher* sank in the Wilkinson Deep off New England. Although the Navy had saved men from submarines disabled at lesser depths, such as the *Squalus* in 1939, it was powerless even to attempt a rescue of the 129 aboard the *Thresher* which went down in 8000 feet of water. Only two vessels in the whole world were capable of descending to such a depth, and all they could hope to do was look around. One of them, the bathyscaphe *Trieste*, was brought from the West Coast. It was nearly five months before it located the main wreckage.

While nothing could have saved the men aboard the *Thresher*, which sank in water so deep it was crushed by the

Rescue from

weight of the sea, the Navy is determined to rescue the crew of any submarine that gets into trouble down to the "crush depth" of modern subs — a top-secret figure.

Heart of the Navy's plan is a fleet of 50-foot submarines called Deep Submergence Rescue Vehicles (DSRV). When fully operative, this system will have six such subs located in six strategic spots around the world.

A distress call from a stricken nuclear

HORIZONTAL THRUSTER

BUMPER STRIP

VERTICAL THRUSTER

PILOT

CO-PILOT

LIGHT

PILOT PORT HOLE

TV CAMERA

LIGHT

MANIPULATOR



CORPSMAN

TOPSIDE HATCH

COMPENSATING BALLAST

TILTING PROPELLER SHROUD

TV PERISCOPE

SHOCK ABSORBERS

HORIZONTAL THRUSTER

MERCURY BALLAST TANKS

OXYGEN TANKS

ANCHOR AND WINCH PORT

LIGHT

VERTICAL THRUSTER

RESCUE SUB MATING SKIRT

STABILIZING FIN

TV-CAMERA

the Deep!

ESCAPE TUBE

By Walter B. Hendrickson Jr.

Illustration by Ed Vebell

sub will trigger a rescue operation designed to start removing survivors within 24 hours.

When a signal is received, rescue command will alert the DSRV team nearest the scene. At the same time, two other rescue vessels will be activated—one a surface vessel able to carry DSRV out to sea; the other, a nuclear sub that will take it piggyback down to the distressed sub.

A rendezvous harbor will be picked that's near a jet airport and as close as possible to the stricken sub. Quickly but carefully, the 59,000-pound DSRV will be hoisted into a waiting C-141A Star Lifter jet cargo plane. A support van with lifesaving gear will be loaded into a second plane.

As the two jets soar skyward, rescue command will decide strategy. If the sea is relatively calm, the DSRV will be loaded on the surface vessel. But if the sea is extremely rough, the nuclear sub will be diverted to port to pick up DSRV and carry it to the scene—underwater.

Regardless of how the rescue sub gets to the scene, it will operate from the deck of the "mother" sub. Any submarine in the nuclear fleet can be called upon to act as a mother sub. Presum-

ably, all nuclear subs will be equipped with "permanent" gear needed by the rescue craft.

Design limitations on DSRV were severe. It had to be light enough to be put in an airplane; it had to be strong enough to take the pressure of deep dives and it had to fit easily on the top of a mother sub.

Thus, DSRV uses lightweight titanium and aluminum for ribs and stiffeners instead of the heavier steel used in small research subs. But like her sisters in the research field, DSRV has an outer skin that covers a series of spheres. The skin acts as a hydrodynamic foil. There is no pressure on this skin because sea water is let into the area between foil and spheres.

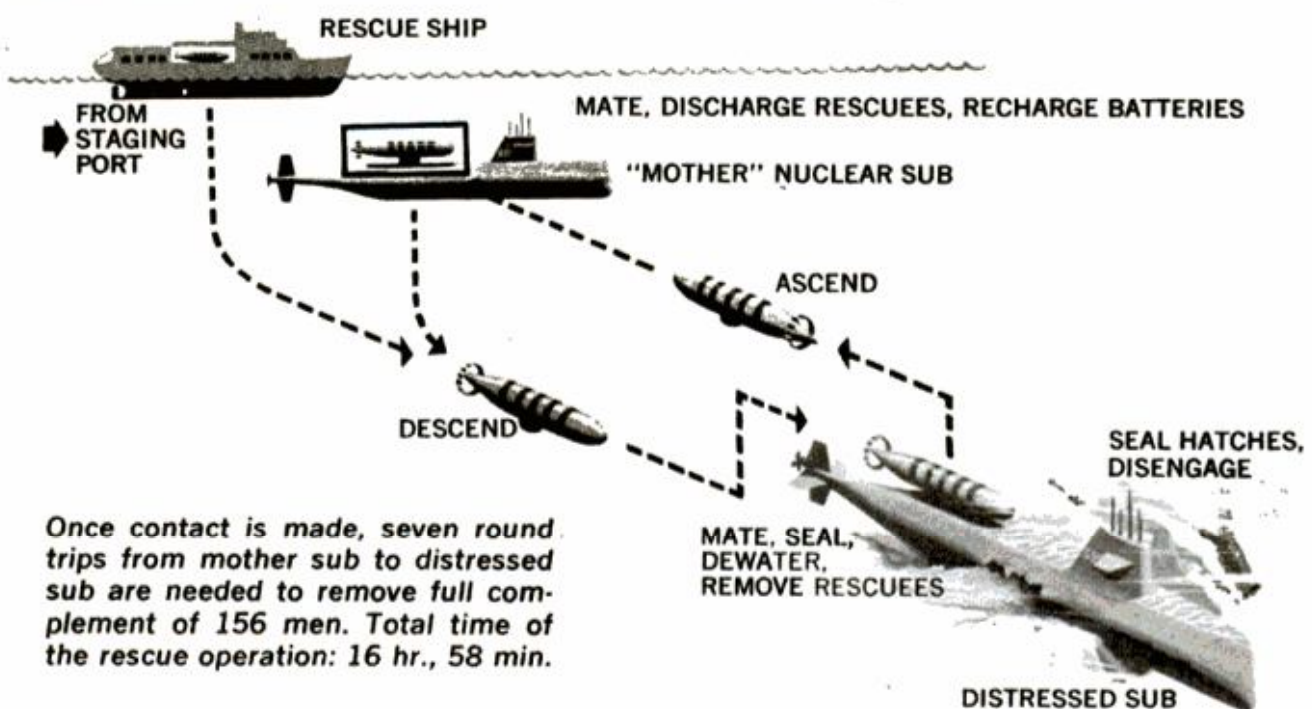
There is, however, tremendous pressure on the spheres. The first DSRVs are designed to withstand the pressure at 3500 feet; the rest will be able to go to 6000.

Lockheed Aircraft Corp.'s Missiles and Space Div. is building six subs. The first should be in the Navy's hands late this year. The rest will follow at scheduled intervals until 1970.

At the distress scene, the mother sub will approach as close as possible, using

(Please turn to page 216)

DSRV RESCUE OPERATION





Skydiving, kid style

German youngsters had a **chance** to learn how it feels to make a **parachute** jump recently when American soldiers rigged a chute harness and cable for them to slide down at the German-American festival in Frankfurt.



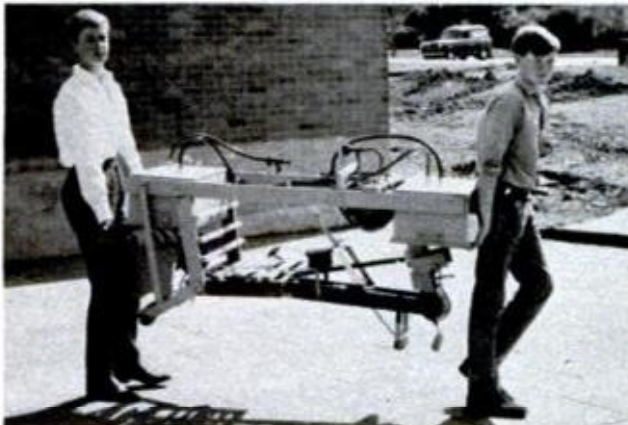
Suitcase-size school

Small enough to fit in a suitcase, RCA's electronic lesson aid includes a video screen (for viewing prerecorded lessons), a slide projector and an audio tape recorder.



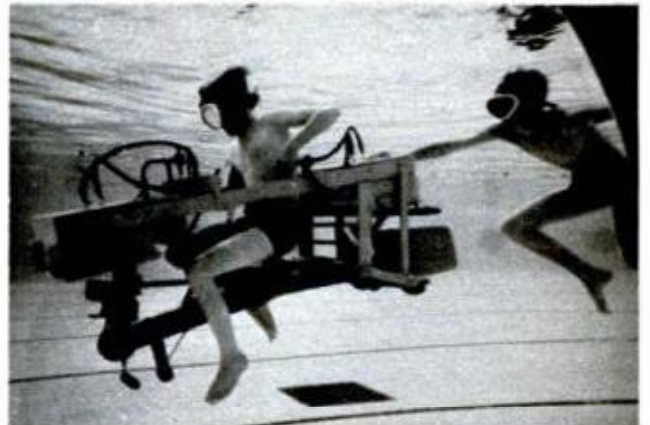
Sit-down water skiing

Three kinds of sit-down water skis appeared behind a single tow recently in a Cypress Gardens, Fla., demonstration. They included two dual-ski types and a single surfboard type.

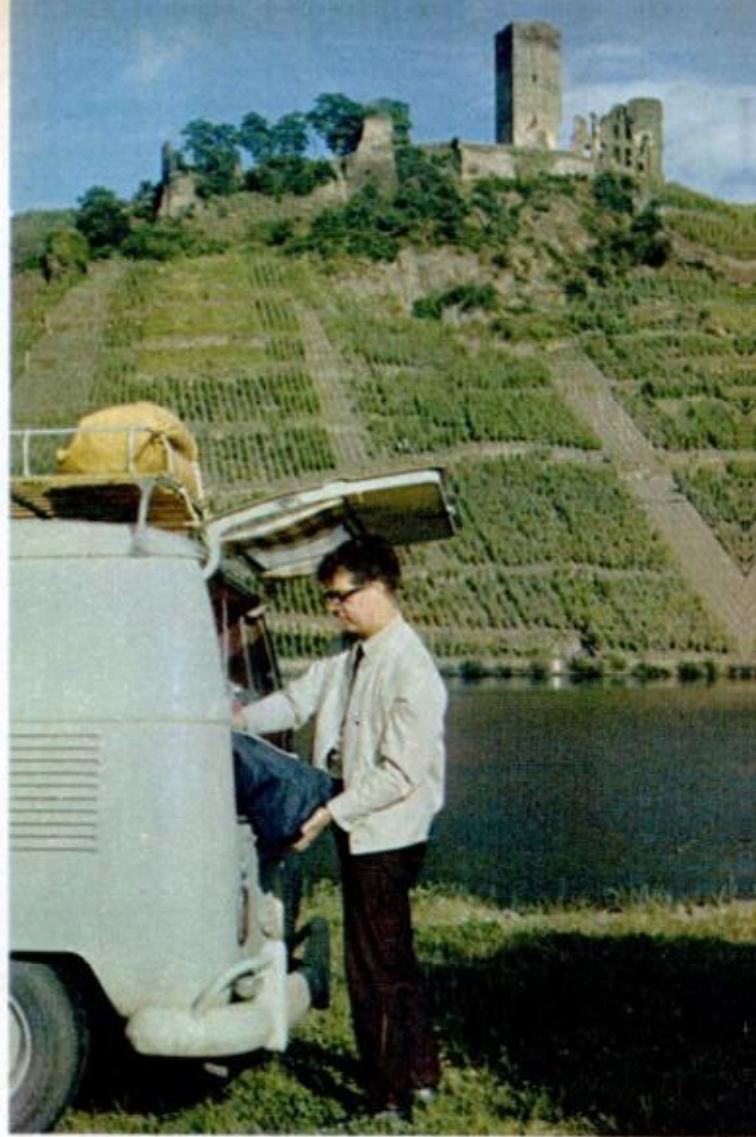
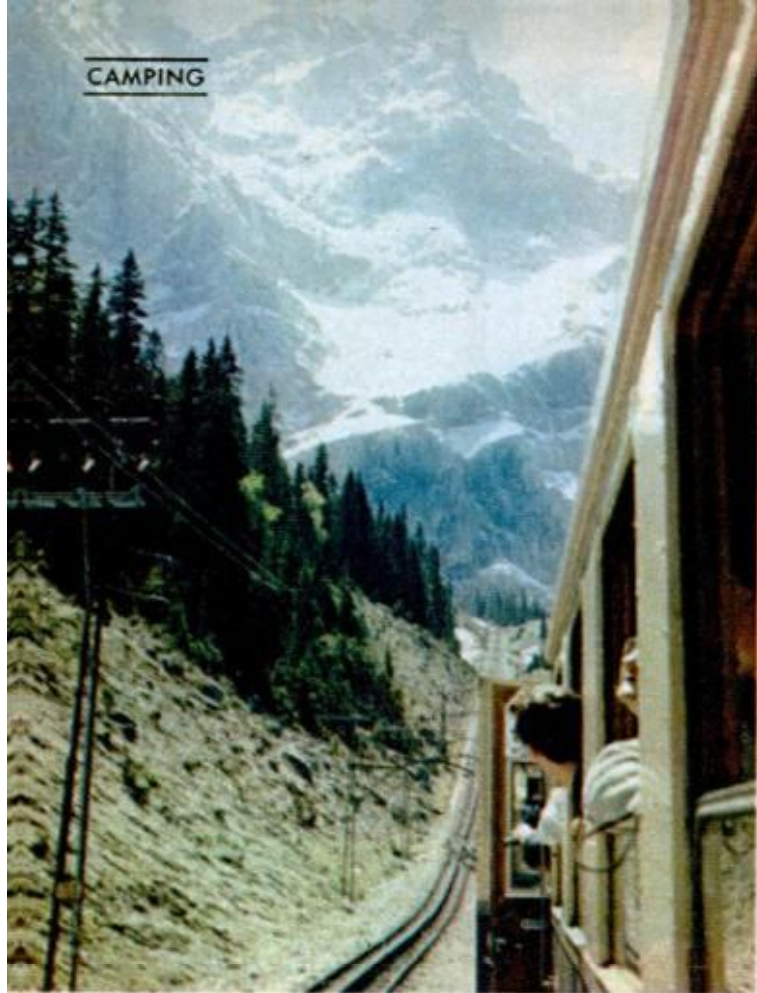


Underwater bicycle made from junkyard parts

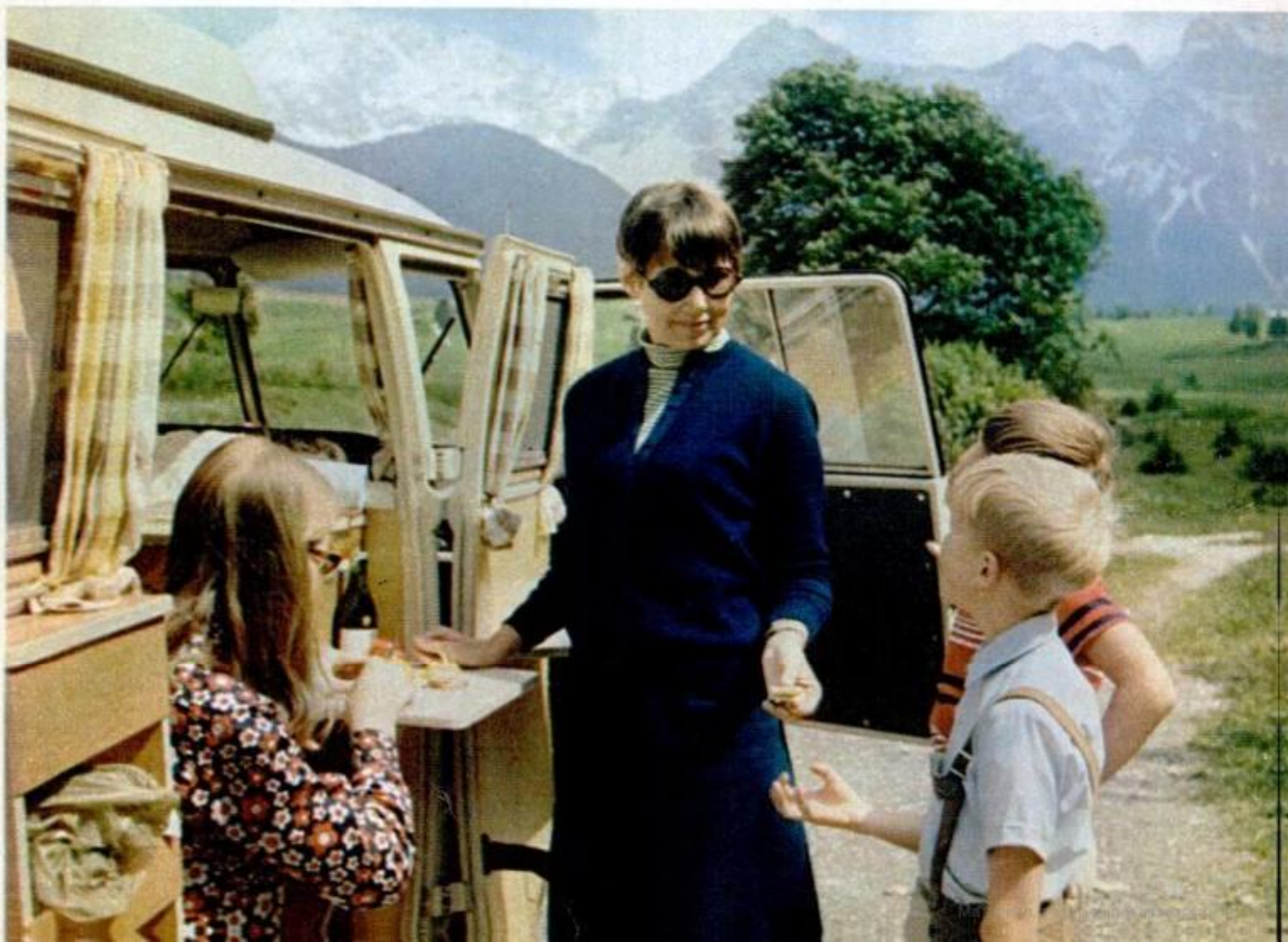
Except for the compressed-air tanks and valves, parts for this submarine all came from a junkyard. The rig was put together by two English schoolboys, who tested it in their school's pool and were able to pedal it (with discarded bike pedals) at a speed of four knots.



CAMPING



UP GERMANY'S ZUGSPITZE via cog railway (above) and cable car was our most spectacular ride; favorite camp-site was opposite Beilstein on Mosel River (right); and food was great camper-style (below) or in restaurants



We camped our way through Europe

You're not a gung-ho camper? Don't sprechen or parlez? Can't afford it? Well, you're in our league, and we did it: Three weeks . . . 2500 miles . . . the Alps . . . cathedrals . . . castles . . . the Riviera . . . great eating (plus brisk showers and exotic plumbing)

By JOHN LINKLETTER, Managing Editor

CAN AN ordinary American family suddenly be plunked down in Europe and find happiness in a camper?

If you want to enjoy—at your own pace—the great experience of touring in Europe, taking off on side trips at the drop of a guidebook and spending your money for things other than hotel rooms, the answer is yes.

You'll be even happier if no one gets overly upset by inconveniences. For instance, how does setting up a tent in rainy, 40° weather get you? Well, it got me right there, too. (But the tent went up anyway.)

When you're camping with kids, you either take to strong drink or decide to think positively. And truly, there was an overwhelming amount of positive for us on our first trip to Europe.

- There was that dazzlingly clear day that we went to the top of the Zugspitze in southern Bavaria and looked out over the Alps of Germany, Austria, Italy and Switzerland, which stretched as far as we could see in any direction.

- There was the picture-postcard quality about town after town—like Rothenburg, Dinkelsbühl, Salzburg, Florence, La Spezia, Paris—even though I didn't believe they could really be that way. They are. (After two days in Germany, 15-year-old Gayle confessed: "I thought all these towns were like fake movie sets. They're real!")

- There was the remarkably good food everywhere we went. Nowhere did we



THREE-WEEK TRIP began and ended in Frankfurt, covered 2500 miles (clockwise). Tents mark our campsites

OUR BOYS quickly invaded pool at Avignon camp



make an effort to find a particular restaurant; we ate where we happened to be at mealtime or we picked up food from outdoor markets and grocery stores. We had several memorable meals, many good ones and only three that were disappointing. (I concluded that the Europeans' disregard for life and limb on the highways is balanced by the obvious tender loving care they lavish on food.)

But maybe you're already convinced you want to go to Europe and are only wondering: Why camp?

Well, as I indicated, it's cheap. Our campground fees averaged \$1.57 per night for the five of us in a Volkswagen camper with attached tent. (Contrast that with the \$48 we were quoted for two rooms in a good hotel in Munich and \$63 in Paris.)

Another advantage is that you can set your own pace and not be tied down by room reservations or tour schedules. We dawdled too long almost everywhere we stopped, let the boys swim for a couple of hours at Nice when we really hadn't planned to and dashed off one evening on a side trip to Oberammergau and the storybook Castle Neuschwanstein. In fact, a great deal of the trip was planned as we went along.

Even at our erratic pace, we were able to find a campground whenever we wanted one. As a matter of fact,

FEEDING PIGEONS intrigued the youngsters almost as much as sightseeing in Venice (their favorite city)



THE LEANING TOWER survived their climb to the top

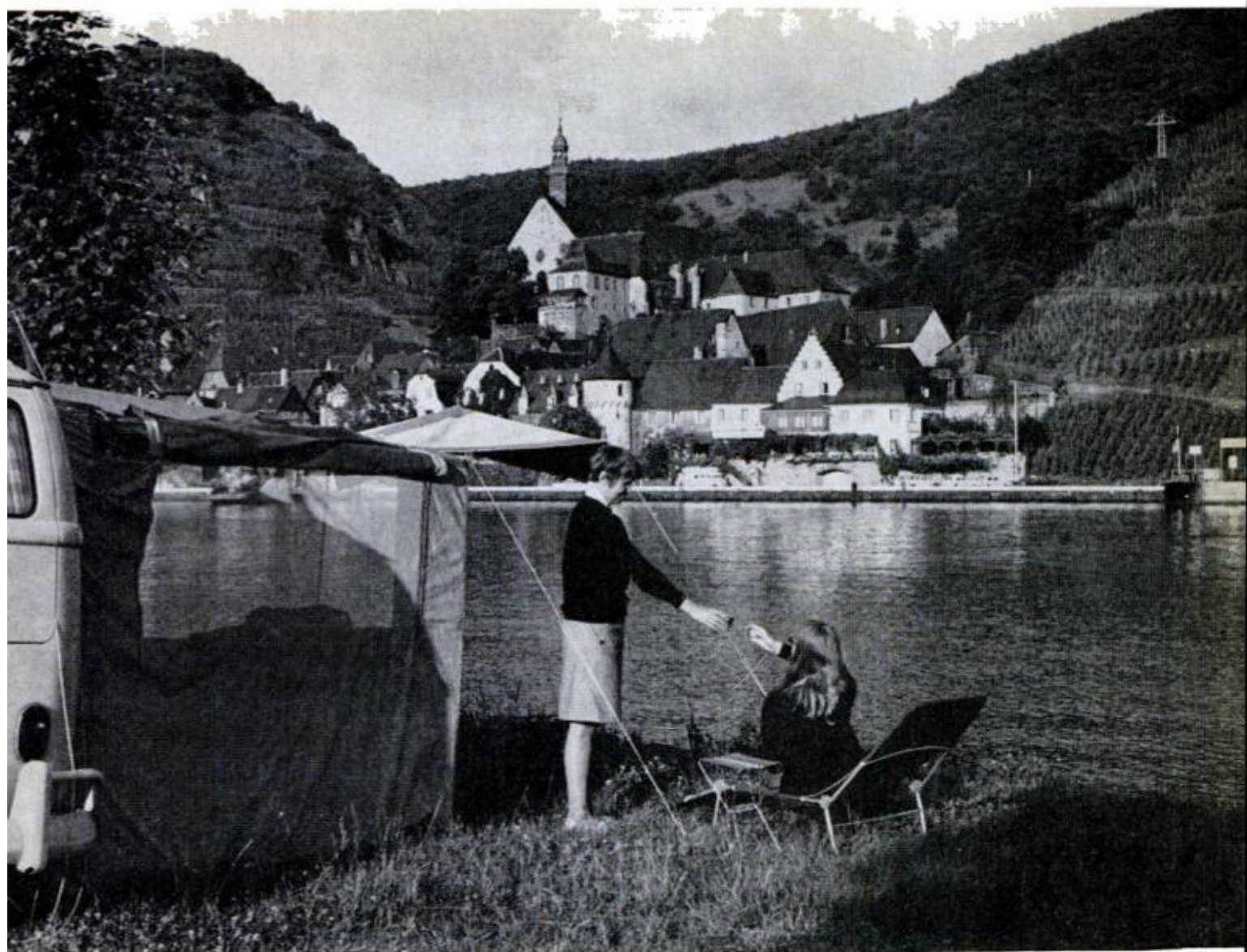


COTS that we bought in Frankfurt (\$5.50 each) were beds at night and adjustable seats (right) during day

there are more campsites in Germany, Austria and Italy than we could count, and they're well scattered along the highways. There are also lots of them along the French Riviera, but not many (that we could find, anyway) in the vicinity of Paris.

The campsites offer in cleanliness and facilities about what good American campgrounds offer. They are more colorful—because of the brightly colored camping gear over there—and are generally located more conveniently to sightseeing areas and are on more picturesque sites.

At Heidelberg, we stayed alongside the Neckar River, with the ancient town a backdrop on the other side. At Dinkelsbühl, our site was next to the wall that surrounds the city and just a couple of blocks from the soaring St.



BEILSTEIN, across the Mosel River from our next-to-last campsite, looks like the setting for an operetta. We set up the tent beside the camper each night; three generally slept in the camper and two on cots in tent

George's Church, built from 1444 to 1499. In Florence, we stayed in a municipal campground in an olive grove overlooking the city. On the Riviera, we camped about 50 yards from the Mediterranean. In the Mosel Valley, we stayed across the river from Beilstein, a town that could be used as the setting for an operetta without changing a thing. A castle ruins perched on a nearby hill offered the final touch to this, our most picturesque campsite.

Virtually all the campgrounds have some sort of restaurant on the site. All have toilets, running water and electricity.

A toilet is generally a sort of two-foot-square, shallow, enameled basin set in the floor. In the basin are molded two footrests and a hole—that's all. Just don't go camping over there with

your leg in a cast. And, on the same subject, bring your own tissue; the European kind is about on a par with a pulp comic book.

Most of the showers disgorged water untouched by heat; they were brisk. The electricity ranged from 220 (most of the time) to 125 and 115 volts. You'll need a converter (about \$6) for your shaver and other such gadgets.

Along about now, most camping writers tell how they became better acquainted with the local folk because they all lived in tents. We didn't. We stayed in the campgrounds only long enough to sleep and then moved on. And generally only the camp managers spoke English. It seemed that virtually all the other campers in June were Europeans, who, naturally, spoke their

(Please turn to page 224)

Ice Fishing a la 'cart'

DODGING through the trees is easy with snowmobiles. Often it's the only way to reach a back-country lake

Snowmobiles are giving ice anglers more freedom than ever before. Now you can get fishing on isolated lakes faster in winter than summer

By **HANK BRADSHAW**

SOME OF THE HOTTEST FISHING lakes in the country are easiest to get to in freezing weather. Now, with snowmobiles, you can reach great ice-fishing lakes that have always been inaccessible in winter.

But before you crank up your machine and charge off into a snowy wilderness, there are things you must learn.

Knowing how to plan is one of the most important. Actually, planning ahead is all but law with Jack Doty of Minnesota's Department of Fisheries. Jack and his department chief, Warren Kirsch, are taking us deep into the snowbound wilderness of Chippewa National Forest. We're going for walleyes, pike and bass.



THOUGH NOT A GIANT, this fish and several like him can be filling—and tasty cooked out on a lake

But on the night before, we pore over maps picking the most likely lake. We select one and carefully lay out our route. Jack knows the terrain and is up on area conditions.

We estimate travel time, gas requirements, clothing needs. When we fish, we know exactly where we're going,

POPULAR MECHANICS

how to get there, and how to get back.

In your area, local fish and game wardens are always good sources of information. They can recommend good lakes. They have reliable information on snow and ice conditions, too.

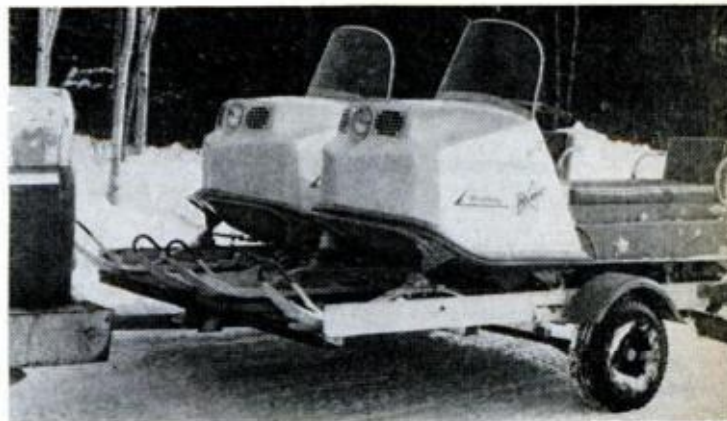
By dawn we're snowmobiling through the wilderness, skimming over unmarked snow two feet deep—snow through which a man can hardly walk.

We'd been up at 4:00 a.m. loading gear and snowmobiles on a pickup truck and tilt-type trailer. We had driven to the end of the plowed roads.

Now on the trail, the snowmobile I'm on, a Polaris Mustang, responds to my amateurish steering like a friendly sled dog. Its wide, 18-inch track provides stability. The 13-hp powerplant, developed from a 2-cycle JLO engine, gives it ideal power for a trip like this. I feel I am doing a right smart job of riding it, imitating Jack with a knee on the padded seat, a foot on the running board. Behind me is Kirsch, then my wife, Vera, and anchoring is husky Dave Bode of Polaris.

Our ice-fishing equipment is stored in the snowmobiles. Under our bench-like seats, roomy compartments (deep enough for vacuum bottles) hold our monofilament lines (won't freeze), split-shot sinkers, plastic bait bottles, artificial lures including ice flies and small spoons. We're also carrying some live bait: "Mousies," tiny rat-tailed larvae from cannery refuse that we purchased in a tackle shop. We have minnows too, poured into a plastic bottle.

Packed in one snowmobile is a



BOAT TRAILER can be converted to handle two snowmobiles. Top tilts to ease off-and-on loading

IT'S EASY TO GET THERE and easy to get home with a snowmobile. Besides, you have something to sit on



jointed hand-auger for drilling holes. I have lashed a heavy iron spud (ice-chisel) to my running board. Stored away are hunting knives, spatula-type spoons with drain openings to clear slush ice from holes and an ax.

Trouble gear is not forgotten either. Each machine carries a kit of tools, a new clutch belt in the unlikely case of burn-out and a sparkplug.

Waterproof matchboxes, compasses, chocolate bars for energy, hand warmers and snowshoes complete our gear. We take snowshoes because Dave had warned: "In 15 minutes, a snowmobile can take you farther into the woods than you can possibly walk out without snowshoes." As another safety precaution, we're going with more than one snowmobile. If one breaks down, we can go out on another, or send it for help.

As we maneuver at 5 to 10 mph (our machines are capable of 40 on crusted snow or frozen lake), I find the snow-covered pine forest both challenging and beautiful. I decide that fishing by snowmobile is just as much fun as fishing by boat in summer.

The temperature's near zero, but I'm warm in lightweight insulated clothing. Some of the others are wearing freedom-giving insulated coveralls over regular clothes. Almost every snow-

mobile maker sells them (about \$50). I'm wearing inexpensive, Army-surplus "bunny" boots—not waterproof, but the warmest footwear I've found. Vera swears by her felt packs worn inside rubber overshoes. Our hands are protected by insulated gloves—water repellent. We plan to cover our faces with tightly woven cloth masks when on the open lakes. Jack wears goggles with foam-rubber backing so they won't freeze to his face.

Breaking out of the woods, we see our lake, a white frozen expanse sparkling in sunlight.

Jack halts us. "If the ice is weak," he says, "chances are it will be more so near shore." He takes my spud, walks out on the ice and chops a hole.

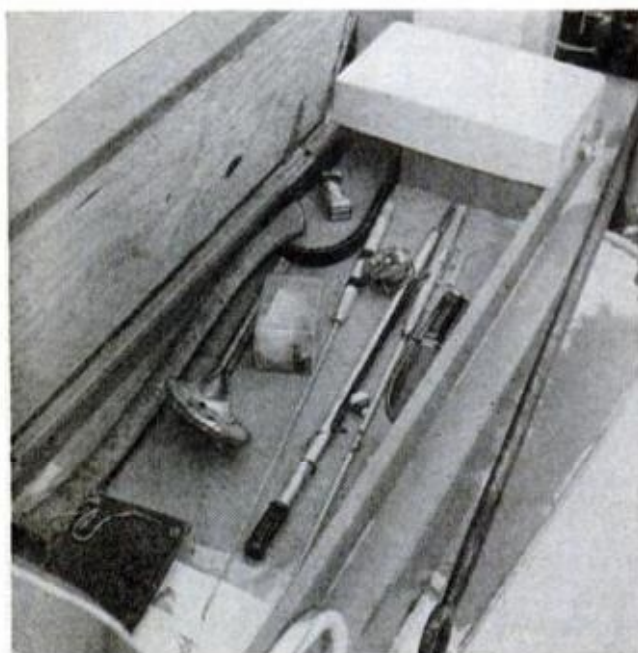
"The ice," he says, "is 12 inches thick, more than enough to hold our snowmobiles. All we need is 6 to 8 inches."

Drilling a test hole as Jack did is one good precaution. But a veteran I know swings twice with an ax; if it doesn't go through, he declares the ice safe.

On the lake, as on any lake where ice thickness has not been checked, Jack warns us to stay away from the islands and avoid narrows—anywhere a current might weaken the ice. The real curse for snowmobiles, though, is slush ice,

(Please turn to page 233)

ALL YOUR FISHING GEAR and emergency spare parts can be stored in this compartment under seat



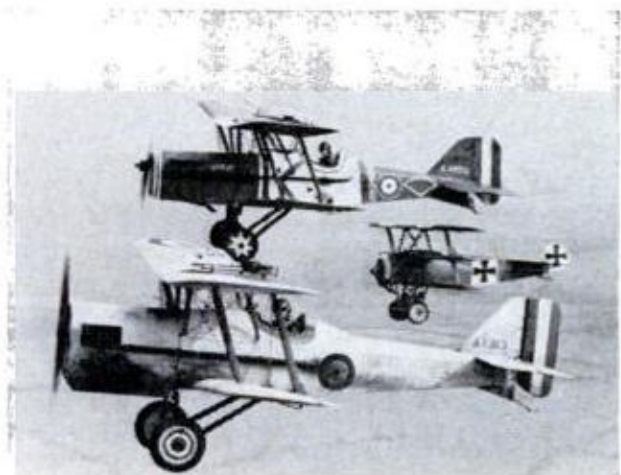
EXTRA EQUIPMENT, plus dry clothes and food, can be hauled in pack strapped securely to the stern





Stowaway pipe

Designed for easy carrying, the Vest Pocket Briar has a stem that swivels for stowing (left) or smoking (above). Folded, the pipe is an inch thick and 2½ inches square.



Watch it, Red Baron

Fokkers and SE5s tangle in the skies again just as they did during World War I—but this time the "battles" are over Ireland as Irish pilots engage in filming a war movie. Its title: *Darling Lili, or Where Were You the Night You Said You Shot Down Baron von Richthofen?*

JANUARY 1968

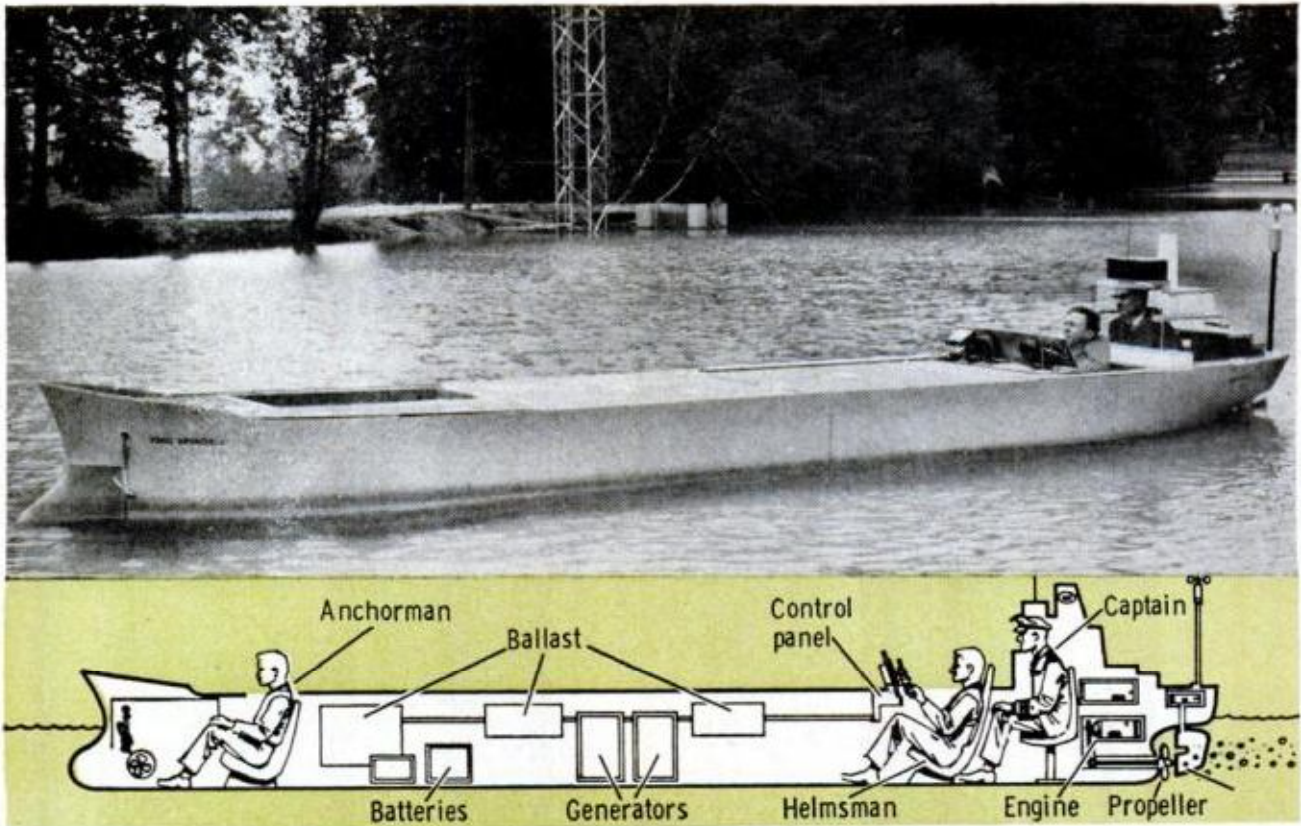


Apollo fashion

Metallic-fiber cloth covers the elbows, knees, back and shoulders of the new Apollo space suit. The suit is made of white fiberglass cloth rather than the blue nylon of the old suit.

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Maneuvering in Miniature



MINIATURE TANKER, actual size (top) and in diagram (above), simulates full-scale vessel and its problems. **Tiny oil tankers, built to scale, teach seagoing captains how to maneuver their ships on a toy ocean rigged with a scaled-down Suez Canal and Cape Horn**

By LUCIEN AIGNER

OCEAN VESSELS are borrowing something from the aerospace age—simulators. Aircraft and spacecraft crews regularly use mockups for practice. Now oil-tanker crews are getting into the act with miniature tankers on a miniature “ocean” in France.

The immediate reason for this sudden jump into the space age is the forthcoming jump from 80,000-ton tankers to the new mammoth 190,000-tonners.

Crossing the ocean from Middle East oil fields to markets in the United States and Europe will be ticklish enough with these monsters, but navigating through the Suez Canal or around Cape Horn, and finally nursing them delicately into place at docks, demands some pretraining.

So miniature models, scaled down to 1/40th size, are used to simulate actual

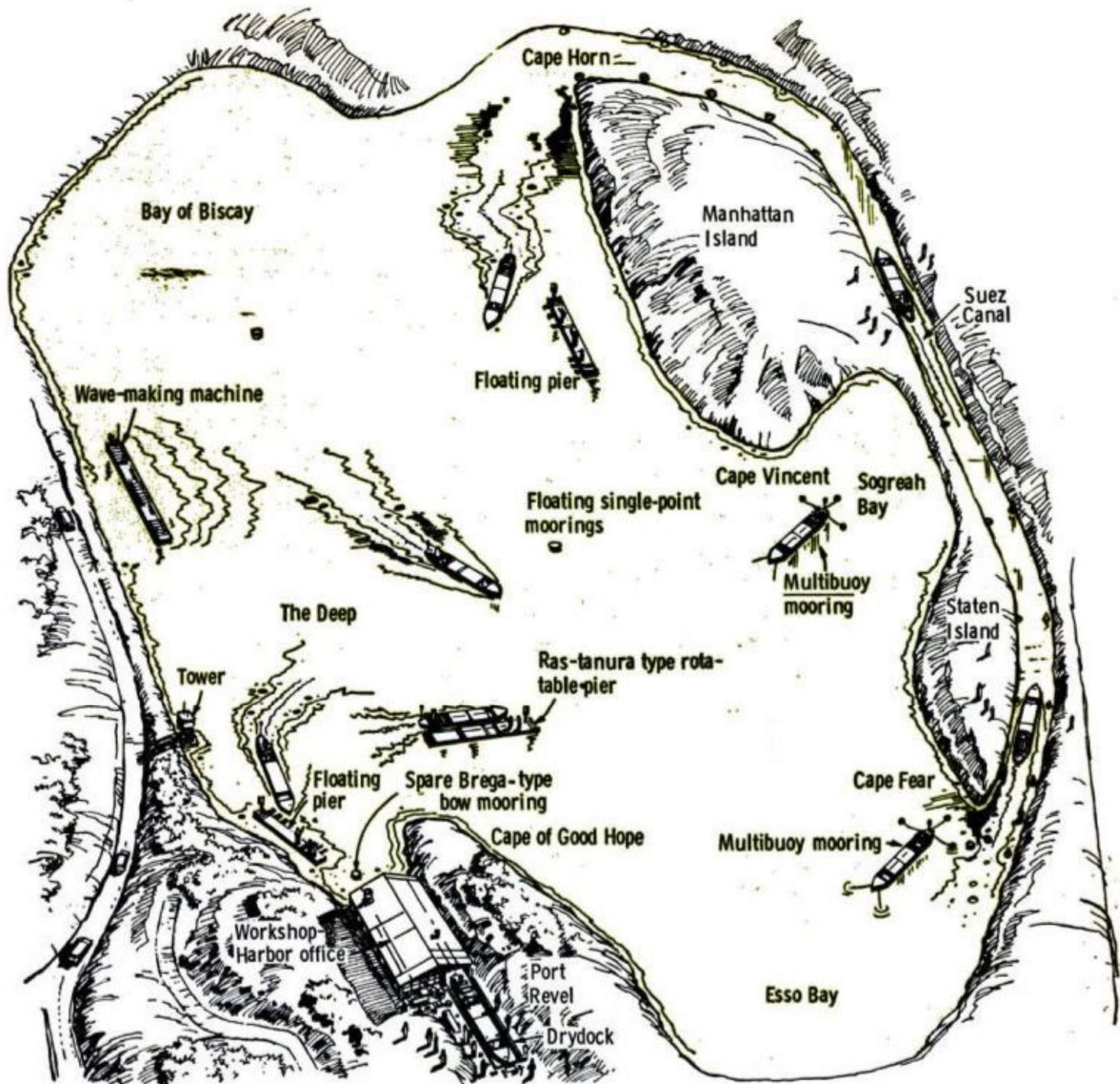
navigating problems through a scaled-down Suez Canal, around a pint-size Cape Horn and at a miniature dock.

The models can carry three students, a “captain,” a “helmsman” and an “anchorman,” and the view from each position is almost identical with that on a full-size tanker. The instructor stands on shore, with a walkie-talkie.

Basically, the maneuvering problems are relative to the ship’s tonnage and speed. A difference in either requires different maneuvers.

Lights on dock indicate relative proficiency in coming alongside: a green for good, amber for passable, red for a wreck.

The Standard Oil Company (New Jersey), which created the model lake, is training its own crews now, but hopes to open up the facilities to all. ★★★



MINIATURE OCEAN at Port Revel, France, simulates navigation obstacles huge ocean tankers will encounter

"SUEZ CANAL" is miniature replica of the real thing

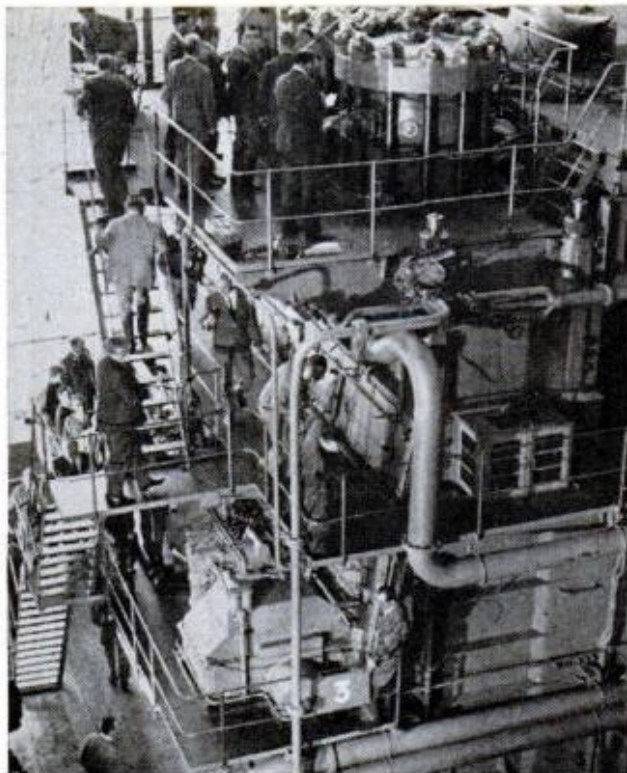
MODEL DOCK scores maneuvers with colored lights





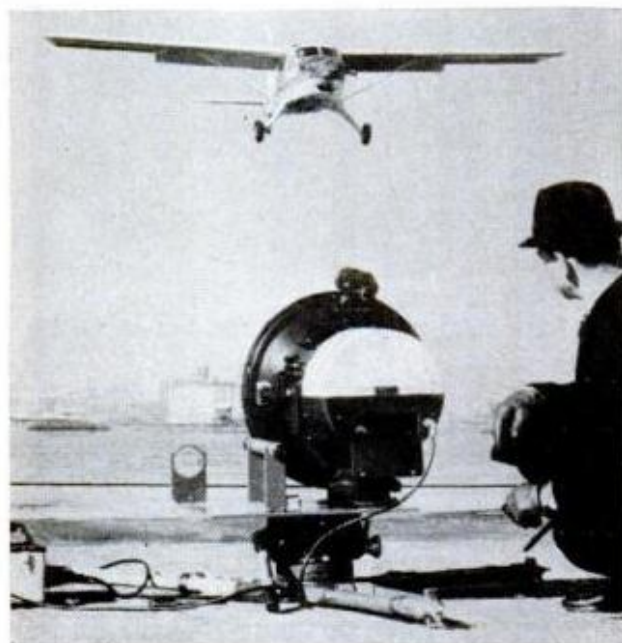
Navy's magic wand

A "magic wand" is used by the Navy to find hidden arms and ammunition aboard Vietnamese watercraft. Called the Mark 15 Ordnance Locator, the electronic rod detects changes in the natural magnetic field.



Tower of power

Standing nearly 46 feet high and producing 4000 horsepower from each of its three cylinders, this diesel engine is believed by its Bavarian manufacturer to be largest in the world. It'll be reassembled in a ship.



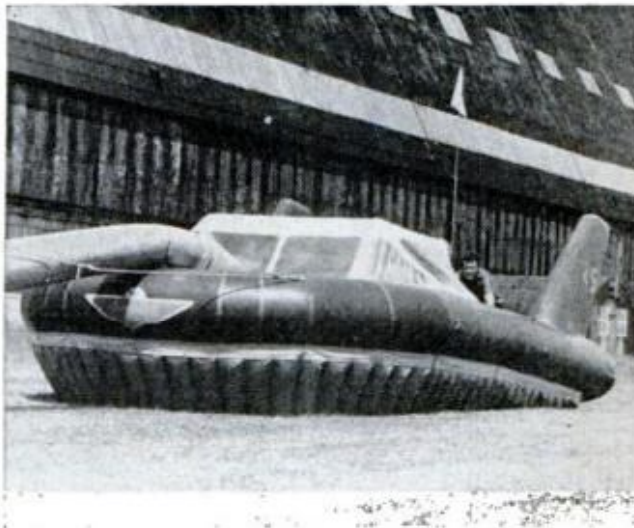
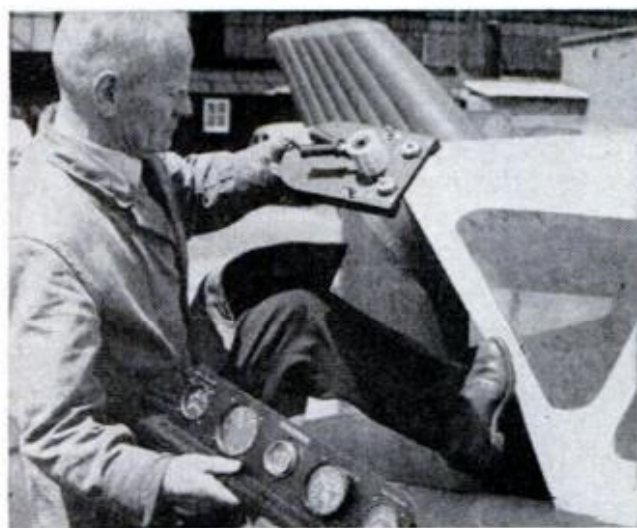
Helps in a pinch

A portable landing-aid system can be taken to airports or temporary emergency landing strips to guide planes or helicopters in bad weather. General Precision's new Talar (for tactical landing approach radio) includes a 25-pound portable transmitter on the ground and a four-pound receiver in the aircraft.



Buoy checks water, weather

Built to replace a lightship off Sandy Hook, N.J., the 40-foot-diameter *Buoy Bravo* has a 5000-candlepower light, fog horn and radio beacon. In addition, it is fitted with equipment to measure oceanographic and weather data. The 50-ton, steel-hulled buoy was built by the Electric Boat Div. of General Dynamics.



Fold-up hovercraft is inflated with a vacuum cleaner

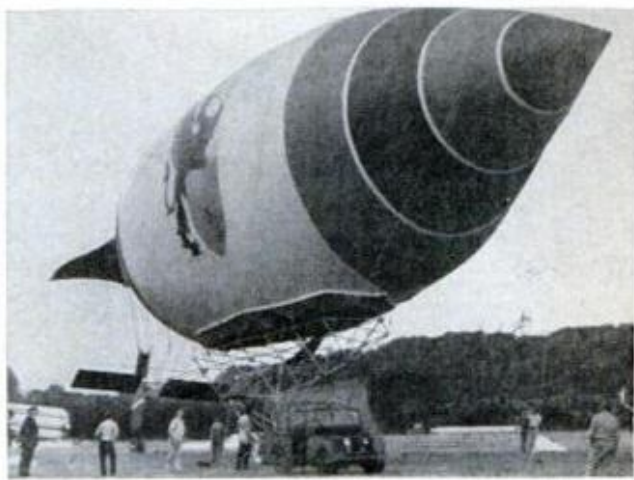
Transported in a pack about the size of a large trunk (upper left), a new hovercraft developed by engineers at the Royal Aircraft Establishment is inflated by a household vacuum cleaner (upper right), fitted with instruments (lower left) and put into use. At the time the photos were taken, the experimental four-passenger craft was not outfitted with engines, so its air cushion was supplied via a large tube (lower right) from a powerplant on a truck.



Peering pen

The electronic Blind Man's Pen enables its sightless user to determine the level of liquid in a container, detect headlights of oncoming cars and even choose ripe from unripe fruit.

JANUARY 1968



Just like 1904

Carrying the crest of the mythical state of Vulgaria, a replica of the Lebaudy airship that flew over Paris in 1904 is shown ready to fly for a scene in the movie, *Chitty Chitty Bang Bang*.

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Big Boom in Tiny Tape

Once a minority member of the tape fraternity, the easy-to-use tape cassette now comes blank or prerecorded, plays or records in mono or stereo in every kind of machine from tiny portable to complete hi-fi system

By RALPH FREAS

TAPE CASSETTES and tulips have two things in common: They originate in Holland and they pop up just about everywhere.

The tape cassette—designed by the Philips Lamp Works of The Netherlands and introduced here under the Norelco brand name—made its debut about three years ago. A gradual acceptance of the cassette concept has exploded into today's boom. Dozens of companies are now manufacturing and marketing cassettes and an amazing variety of machines that play them.

The cassette system is as simple and uncomplicated as a wooden shoe, and that's the big reason for its overwhelming acceptance. For convenience, a packaged tape has it hands down over an open reel-to-reel arrangement with its separate reels, threading and fuss.

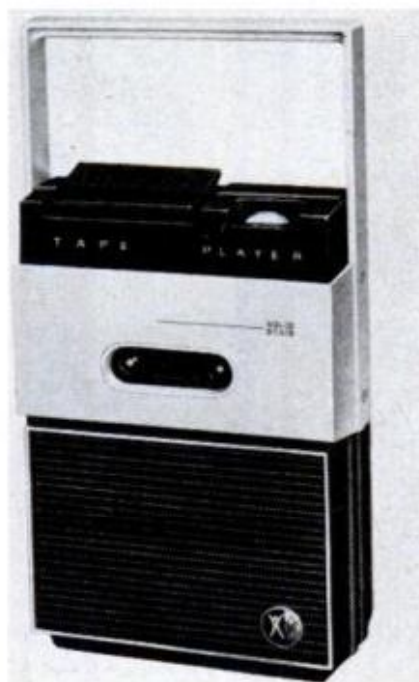
Getting tape into a handy little package

has been investigated for some time, but it was not until the sixties that successful designs hit the market. At the same time the cassette was being developed by Philips, familiar four and eight-track cartridge tapes and players were being introduced in the United States, the first ones designed for automobile use (see [The Facts About Car Stereo](#), page 106, May '67 PM).

The cartridges are based on a continuous-loop design consisting of a single reel from which the tape passes and then returns in an endless loop. This movement is activated by the player's drive mechanism. The tape moves from the hub, or inside of the reel, past the playing head, and back to the outside of the same reel. However popular as a music playback system, the cartridge does not offer such features as fast forward or rewind operation, and many industry spokesmen feel



HARMAN-KARDON SC2520 is a compact music system that features stereo record/playback cassette along with 30-watt amplifier, FM stereo and changer. It's \$400. GE "youth" player, right, is \$28



POPULAR MECHANICS



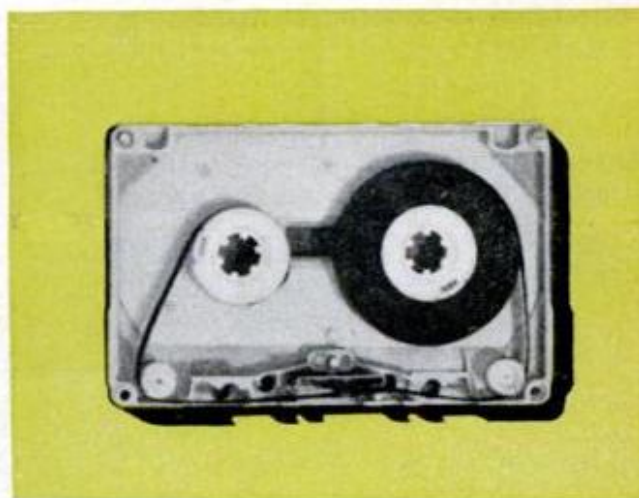
CASSETTE LOADING is literally a snap. Here the cassette slips onto the reel-drive spindles of Norelco's \$120 AM/FM portable

that the cassette will eventually replace the cartridge.

The cassette differs from the cartridge in many ways. Physically, the cassette is a reel-to-reel rather than a continuous-loop system. It is, in effect, a miniaturized version of a conventional tape recorder and functions as a conventional reel-to-reel recorder does, but both reels are housed in a plastic case. An opening on

one side of the case allows the moving tape to come in contact with the record/playback heads in the machine. Just slip the cassette into the recorder/player and it's ready to play or record.

The continuous-loop system does have one advantage over the cassette. The former operates at a speed of $3\frac{3}{4}$ inches per second (i.p.s.), whereas the cassette speed is $1\frac{7}{8}$ i.p.s. All other things being equal,



TAPE CASSETTE, above, is shown in relative size with 8-track cartridge at left. Cutaways show how tape in continuous-loop cartridge feeds in one direction only—from center of the reel past tape heads (in machine) and onto outside of reel. In the cassette, tape moves from reel to reel in either direction



ARVIN PORTABLE, above, features combination record-level (VU) meter and battery strength meter. The \$70 recorder comes with a.c. cord and mike with remote on/off switch. Sony portable, left, is smallest you can get. Price is \$100

sound quality is a function of speed—the faster the tape speed, the higher the quality. For this reason, some manufacturers do not pretend that their cassette players are music reproduction systems—they're for voice recording and playback primarily. But even though cassette speed is half that of the continuous-loop system, the quality and frequency response isn't reduced by 50 percent. The quality is lower, but not to that degree.

In a subjective test, I listened to a London recording of Tchaikovsky's *1812 Overture*, a selection that in certain disc versions constitutes an audiophile's test record as well as exciting listening. It contains passages to put a real strain on a home music system, with its dynamic climax of bells, cannon fire and full orches-

GENERAL ELECTRIC PORTABLE comes with earphone for private listening and other accessories for \$70



tra. On a moderately priced portable cassette player, it flunked my listening test: The rolling thunder of the cannon sounded more like small-arms fire. But feeding the signal from the same cassette player into a hi-fi amplifier and speakers made for thunder aplenty. The less dramatic but equally important nuances of sound were there, too.

In sum, it was a most impressive performance. That's not to say that it was the equal of the same performance on disc. But given the equipment used in this test and used in the fashion described, few average listeners would find it anything less than good listening. Popular selections—less demanding of a high-fidelity system—are quite enjoyable even when played through the cassette's built-in electronics and midget speaker.

At this stage of the game, a typical cassette machine can produce a frequency response of around 50 to 10,000 cycles per second. That's not big in fidelity, but the cassette makes it up in being the "growingest" all-around tape system to date.

Advantages of the cassette over the cartridge are many. Continuous-loop cartridges play only one way: forward. You have to go through the entire album to hear a selection repeated. The cassette, on the other hand, can operate in either direction—backward in "fast rewind" and forward in "playback" or "fast forward" to get to any portion of the tape quickly. At a total 4 inches long by 2½ inches wide and ½ inch thick, the cassettes are



AMPEX MICRO 85 is a complete stereo record and playback cassette system for the home. It's \$200

considerably smaller than the continuous-loop cartridges. The big feature of course, is that the cassette is designed for playback or recording, whereas the cartridge was designed for playback.

For stereo recording and playback, the cassette tape has a pair of tracks on each side. You just flip the cassette over for the other pair of tracks. Prerecorded stereo cassettes with 15 to 20 minutes of program material on each side can be bought for around \$6. Two-track blank tape cassettes for monaural recording are available in 60, 90 and 120-minute lengths and start as low as \$1.50.

Widespread application of the Philips cassette by many manufacturers has resulted in a very compatible system. A blank or prerecorded Philips-type cassette of any manufacturer or label can be used in any Philips-type cassette machine. This means that if you purchase a stereo-tape cassette of musical programming, you can play it in stereo on a stereo machine, or in mono on a mono machine. Some cassette machines are for playback only; they do not allow you to record a tape. But on a recorder/player machine you can record a blank tape or even erase and rerecord a prerecorded tape. And with a combination a.c. or battery machine you can do it in your home or on the top of Mount Everest.

When it comes to buying a machine, you can spend less than \$30 for a battery-operated player-only model for the kids or as much as a couple of hundred dollars for a hi-fi compact music system like

(Please turn to page 219)

JANUARY 1968

RCA PORTABLE is company's first cassette recorder. The \$50 price includes mike, cassette, batteries



NORELCO'S CAR-MOUNT adapts portable Carry-Corder for car. They're \$25 and \$70, respectively



AKKORD COMBIPHON 840 combines cassette recorder, AM, FM, shortwave; also has car mount. \$177



143

ELECTRONIC KINKS

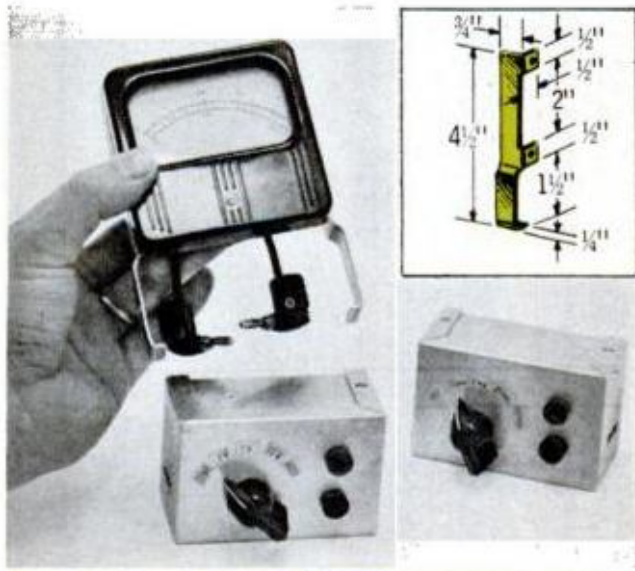
Combination ammeter/voltmeter for transistor circuits

MEASURING LOW VOLTAGES and currents such as those encountered in transistor circuits doesn't require expensive test equipment. Just wire up these voltmeter and ammeter circuits to measure voltage and current in ranges of .1, 1, 10 and 100 volts d.c., and 50 microamperes and 1, 10 and 100 milliamperes, respectively.

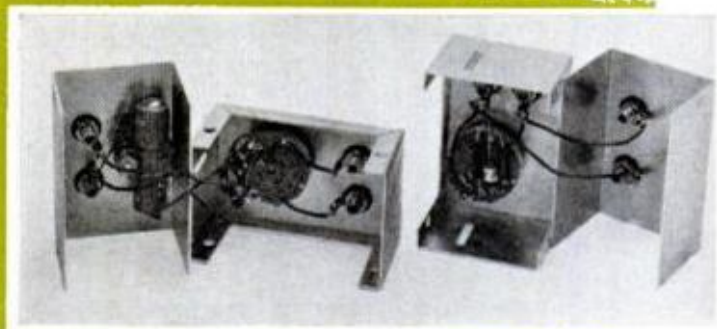
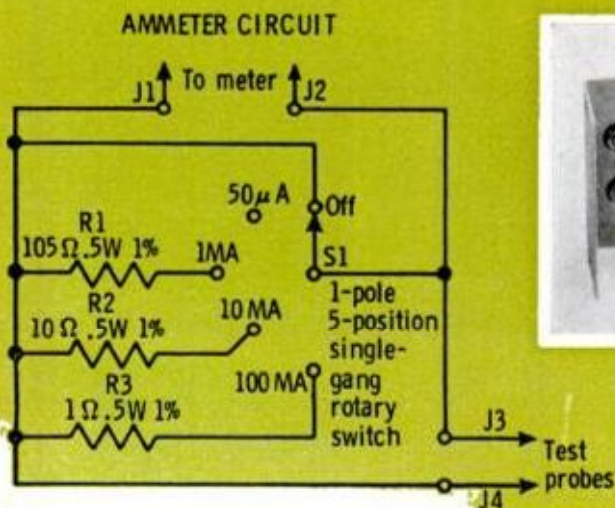
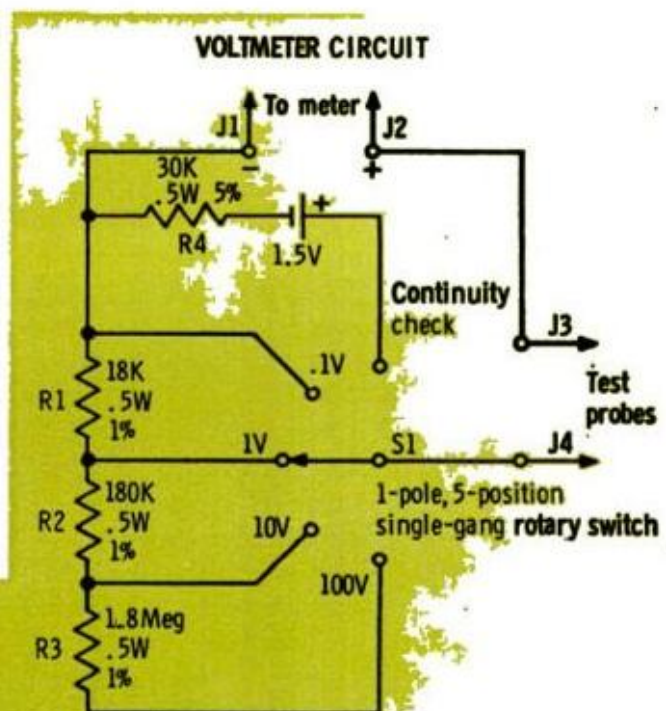
Each circuit is housed in its own minibox and uses the same meter to give the current and voltage readings. In addition to its voltage ranges, the voltmeter circuit, with its 1.5-volt battery, can be used as a continuity checker.

The meter is an accurate 0-50- μ a panel meter (Lafayette 99H5042) that is attached to the miniboxes with two simple brackets made of scrap aluminum. They fit in slots cut in the miniboxes, while two banana plugs, connected to the meter terminals, fit jacks on the backs of the miniboxes.

The meter face reads directly for the 50- μ a range and can be marked for the other ranges. If you need one of the meter circuits right away you can build it now and build the other later on. You can even wire both into a slightly larger minibox and connect them to the meter jacks with a d.p.d.t. switch.—Robert O. Pedersen



PANEL METER attaches to 3/4 x 2 1/8 x 1 1/8-in. miniboxes which are marked to indicate the ranges selected by rotary switches. Front panel jacks, J3 and J4, accept a pair of removable test leads



VOLTMETER AND AMMETER CIRCUITS are wired into miniboxes following the schematic diagrams. All parts are specified. Close resistor tolerances increase the overall full-scale meter accuracy



Desoldering aid for printed circuits

It's almost impossible to desolder and remove components from printed circuit boards without leaving solder that quickly solidifies in the hole.

You can solve the problem with a bicycle spoke or wire sharpened at one end

and attached to your soldering pencil with a solder terminal and washer. Slide it forward and pull out the molten solder with the cold tip. A thin tube fitted with a rubber bulb attached in a similar manner will blow out the solder.—*Peter Legon*

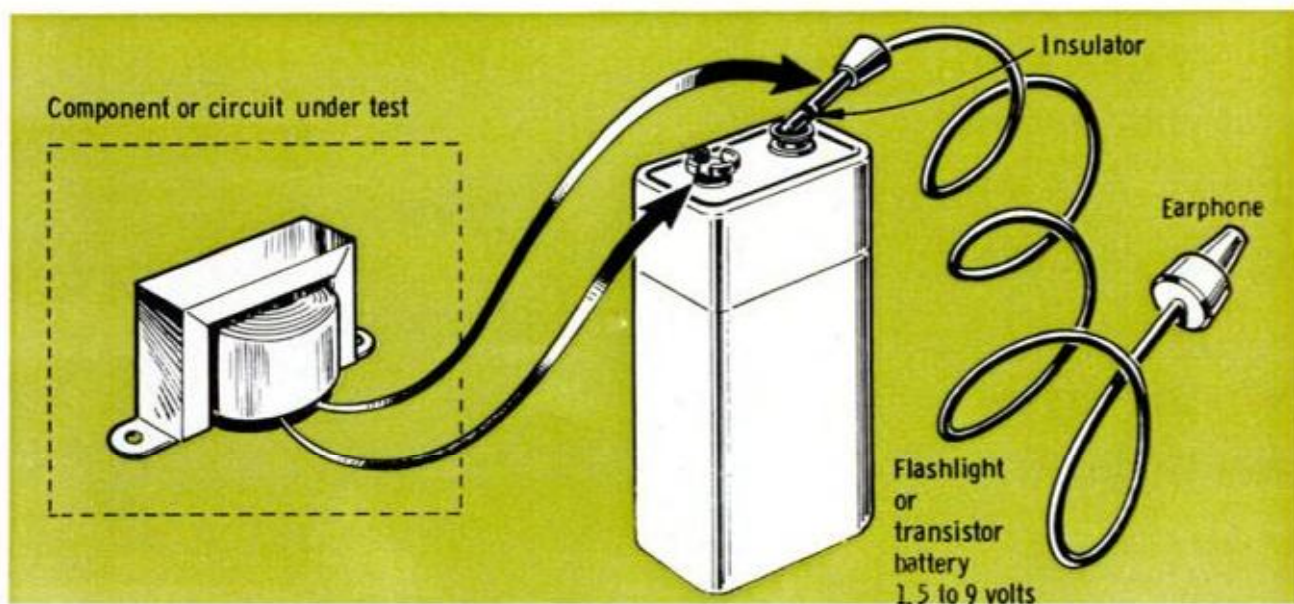
Earphone continuity tester

You can check the internal continuity of any electrical device with nothing more than the battery and earphone from a transistor radio.

Use the battery and earphone in the manner shown below to cause current to

flow through the object under test and the earphone, which are in series.

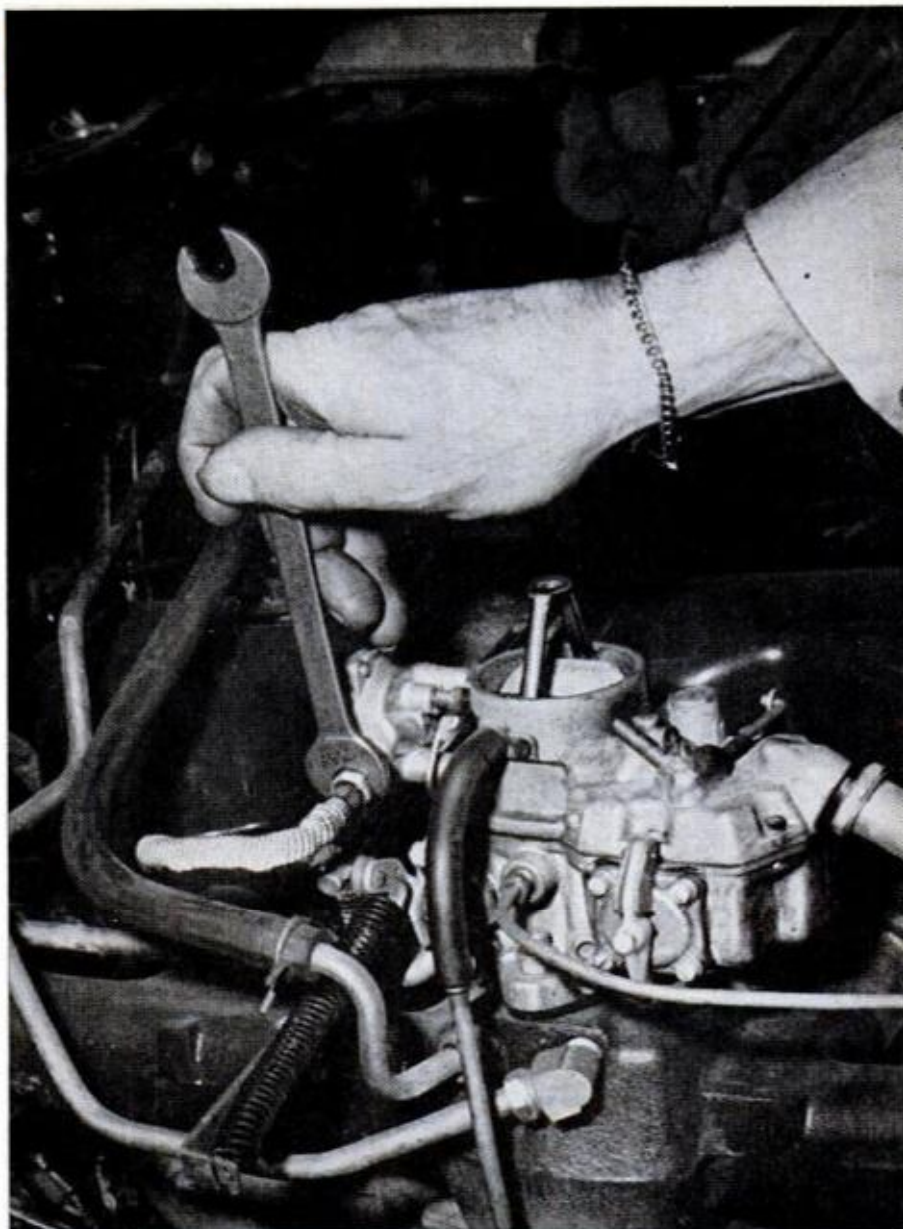
If there is continuity, touching the earphone plug to the battery terminal will produce distinct, audible clicks in the earphone.—*William Brandhorst*



Make a
4-point
winter
checkout
for
**QUICK
COLD
STARTS**

A look at battery and crankcase will assure you that your engine cranks. And a few tips on carburetor and plugs will help you make sure that it fires.

BY MORT SCHULTZ



FUEL SYSTEM can be source of hard starting. Replacing defective choke heat tube prevents condensation from entering carb

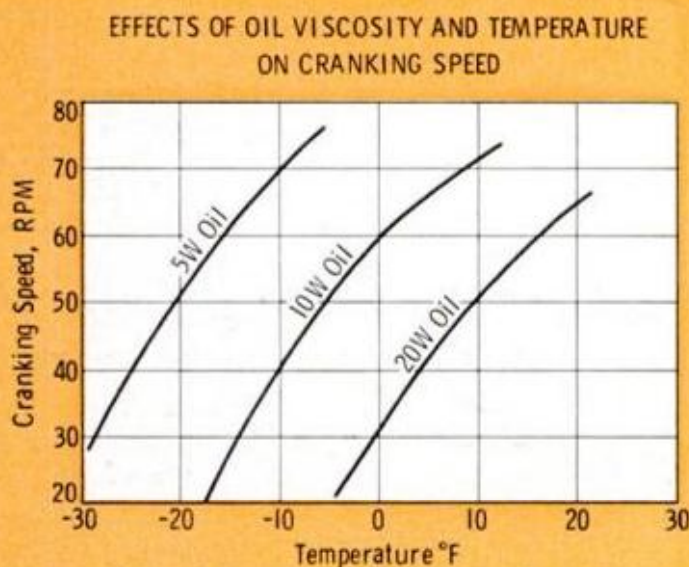


IGNITION SYSTEM must produce hot spark for cold-weather starting. Tapping plugs to close gap slightly helps in emergency

POPULAR MECHANICS



ELECTRICAL SYSTEM must provide high current for starting. Hydrometer checks battery charge, but you need cell tester, too



ENGINE OIL VISCOSITY increases as temperature decreases. Winter-weight oil allows high cranking speed for quick starts

IN COLD WEATHER, it's more important than ever to use cold, calculating precision when starting your car. Depress the accelerator to the floor once only. Hold the pedal one-third to half-way down and crank the engine. Don't pump the accelerator before or during the operation.

If the engine doesn't catch within 20 seconds, stop trying. Wait a minute or two and try again. If you don't start the second time around, you've probably got some checking to do in one of the big four cold-weather starting areas: battery, crankcase, fuel and ignition systems. If you don't start in two or three tries, you're probably going to need some emergency starting assistance.

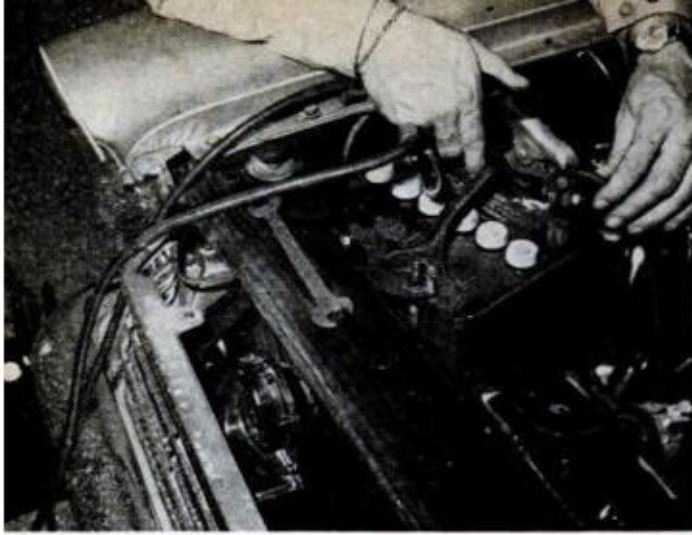
A sure indication of a battery too weak to handle the cranking load is a low, lifeless growl from beneath your hood. A good way to get some life into it for a quick start is with an extra booster battery. A reconditioned battery and a set of jumper cables cost from \$5 to \$15.

Connect the booster to your car battery in parallel: positive to positive and negative to negative. Battery and booster terminals are marked with either "POS" or "NEG" or with a positive or negative sign. Jumper cables are also marked to indicate polarity and are color coded—the red cable is always positive.

Correct hookup with an alternator-equipped car is all-important. Reversing the connections—even briefly—can burn out the diodes. Make sure of the connections before making them. Don't make them if you're not sure.

If you don't have a booster available, there are a few starting tricks you can try. One is to reduce cranking resistance by removing every other sparkplug in the firing order. Let the engine run at speed for a while, then, after your battery has gotten a boost, shut down the engine and install the plugs and restart.

There's another emergency-start



BOOSTER BATTERY and jumper cables ensure cold-morning starting. Booster's connected in parallel



BATTERY TERMINALS and cable connections should be kept clean to give good low-resistance contact

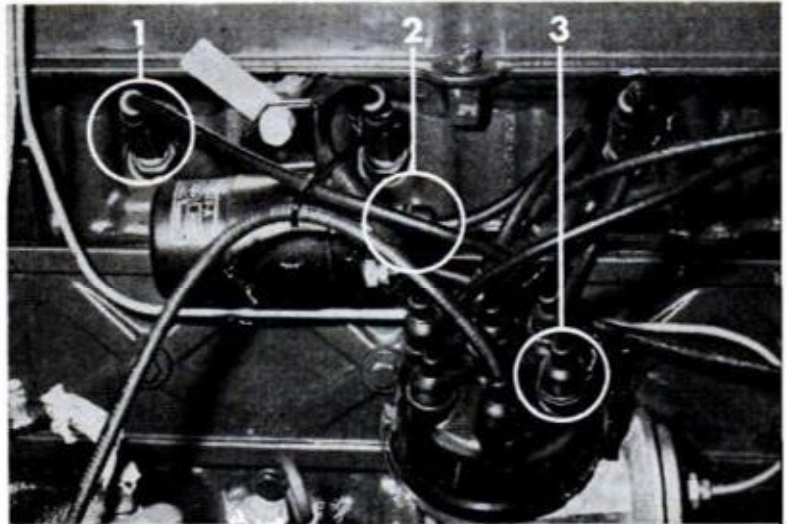
measure you can take. Remove your battery and put it in a tub of warm water. Don't let the water swamp the top, and add hot water as it cools. A half an hour or more of this warm bath will warm up the plates and electrolyte and increase battery efficiency.

Sometimes a "dead" battery is really alive and kicking. The reason for the low, lifeless growls could be corrosion that's choking off current flow. Remove the battery cables from the posts. Scrape them out, clean off the posts, then reconnect the cables and try again. It's a good idea to clean the cables and posts at the start of cold weather to be sure you have good, low-resistance connections.

Once your engine's running, don't be complacent: Failure to get your battery up to full charge can put you in the same pickle tomorrow or the day after. It almost goes without saying that every Saturday mechanic should have a battery charger, hydrometer and—too often overlooked—a battery-cell tester of the type that loads each cell. The best cell tester is one that pulls 200 amperes while indicating cell voltage. A bad cell is detected immediately when its voltage falls off under load. The cell might otherwise escape detection when tested with a hydrometer and lead you to suspect the starter and solenoid when, in fact, your battery already has seen its last days.

Boost for battery

To get started by giving your battery a quick 30-minute booster charge at a rate of 40 or 50 amperes requires a high-capacity charger. Such a charger is expensive and most often found at service stations.

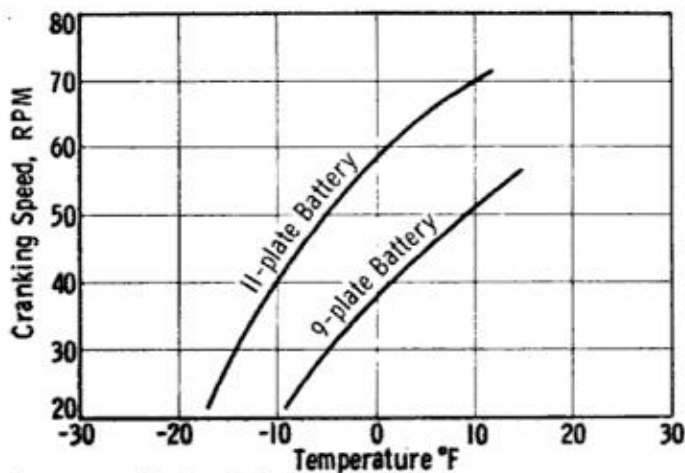


KEEP IGNITION SYSTEM DRY at (1) sparkplugs, (2) coil terminals and (3) all distributor terminals

A 50-amp. boost will get you going, but remember that unless you'll be making a long trip during which your alternator can bring your battery up to full charge, your battery will still be weak. More reasonably priced chargers for home use run the gamut from \$5 trickle types (1 amp.) to 10-amp. models costing up to \$50 or more. A 10-amp. model will bring your battery up to full charge overnight; a trickle charger can bring it up when used over a period of a few days.

If the battery refuses to hold a charge, you need a new one. Don't get trapped by trying to save a few bucks. As GM says:

"Placing a low-cost, low-performance battery under the hood and expecting satisfactory cold-weather cranking is like installing a small passenger-car engine in a heavy-duty truck and hoping the vehicle will maintain scheduled runs over the Rocky Mountains." The accompanying



THE MORE BATTERY PLATES, the better (see chart). Right, starting fluid can be good cold-weather aid

chart comparing batteries with a different number of plates shows what they mean.

If your engine cranks vigorously, but doesn't start, check automatic choke operation. Remove the carburetor air cleaner and operate the choke butterfly by hand to make sure it's free.

One part frequently overlooked with a choke problem is the heat tube in those cars that have the choke climate-control housing on the carburetor. A leaky tube lets condensation into the choke housing, impeding butterfly action. It's hard to check the heat tube so just replace it—it's cheap enough.

Go easy with starter spray

A pressurized can of starting fluid, sold at auto parts outlets, is a valuable tool. But if it's not used strictly as instructed, it's a virtual bomb.

Starting fluid is another compound that's highly volatile and is ignited by the weakest spark at temperatures as low as minus 65° F. Apply it by directing a short burst into the carburetor throat before cranking.

The guy who gets spray-happy can find himself with a ruined engine. Reports tell of damaged pistons and blown head gaskets with those who kept a heavy finger on the button. Too much spray causes a rapid, excessive rise in combustion pressure. Keep in mind that if the engine doesn't start with a five-second burst, lay off. Another tip: Use the spray only in well-ventilated areas and keep it away from flames, sparks and excessive heat. This means no smoking with a can in hand.

A quick check of fuel-system operation may explain why you're not starting: Give



the throttle linkage a quick pull or two. You should hear or see gas spitting into the carburetor. If not, ice could be impeding the gas flow. Try pouring some hot water over the fuel pump, fuel filter, fuel line and carburetor bowl. If you're stuck in the boondocks without hot water, you can try to relieve an ice jam with your gloved hand. Water, being heavier than gas, is more likely to settle in low spots. Look for a dip or loop in the fuel line and wrap your hand around it for a few minutes.

Most gasolines sold today contain an additive that prevents fuel-system ice by drying up condensation. Maybe your car needs an additional boost, though. A product sold at auto parts houses as "Dry Gas" could do the job. This fuel system anti-freeze is effective, but it does stir up sediment that could be carried to fuel filters. During the months that you use it, be sure to replace the fuel filter at the first sign of hard starting.

If your fuel system's okay, check ignition. Remove a plug wire and hold it near your engine block. Make sure you get a fat, crackling spark when the engine is cranked.

If you get a weak spark, try getting the car started by removing two or three plugs and closing their gaps to give the weak spark a shorter chasm to hop.

Wipe off ignition terminals

In addition, make sure your ignition system is dry. Take a rag and wipe off the center towers of the coil and distributor, the terminals of the coil-to-distributor wire, each distributor cap tower, the ends

(Please turn to page 228)

Merc's 'robot' corrosion fighter

KIEKHAEFER'S MerCathode anti-corrosion system "automatically" solves a big problem. The hitch is that the average boatowner doesn't understand the problem—galvanic corrosion.

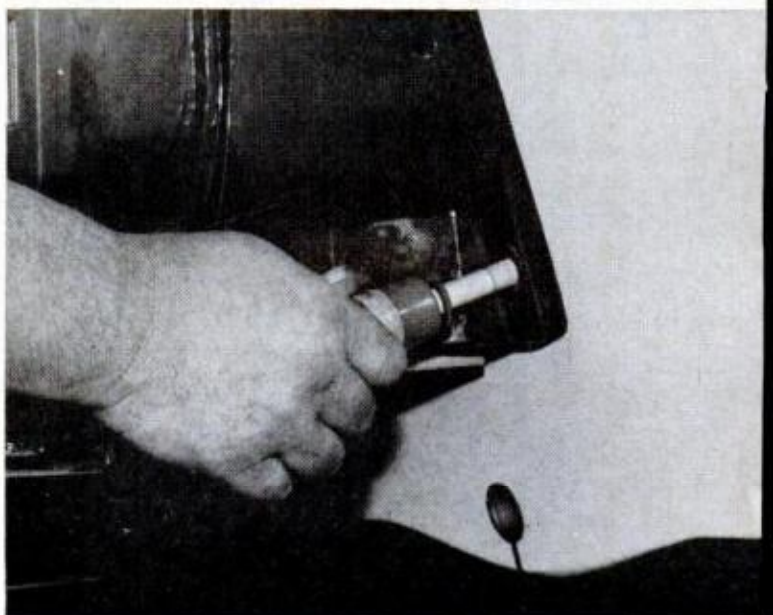
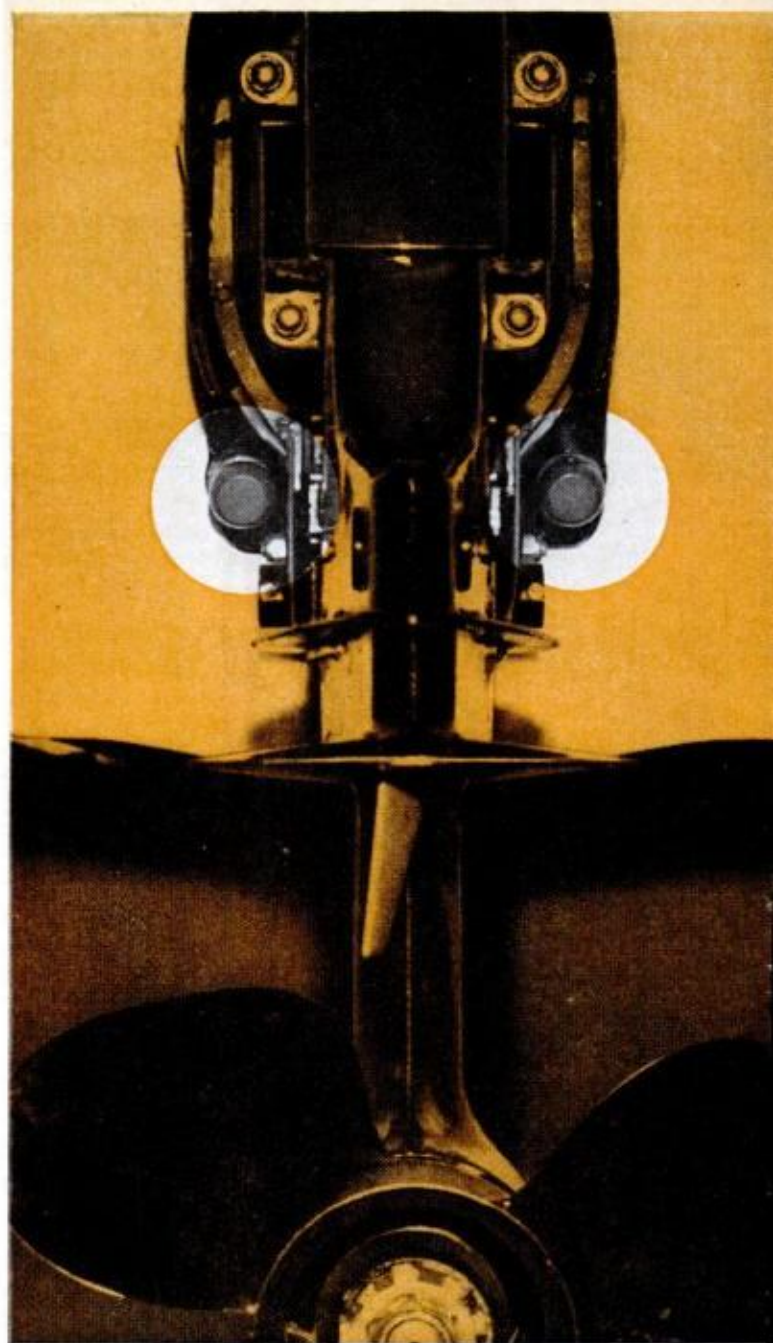
Every metal corrodes at a different rate. The "noble" metals—gold and platinum, for instance—are, for all practical purposes, corrosionproof. At the other end of the scale are the "base" metals, such as aluminum and zinc, which corrode more rapidly.

At the same time, every metal has its own electrical potential, the less noble being more active electrically.

Now, when two different metals in contact with each other are placed in a conductive solution, an electrical current will flow between them. In such a situation, the metal from which the current flows (the *anode*) will tend to corrode.

Translated into practical terms for the average boatowner, this means that the aluminum components of your outboard or stern-drive lower unit will be corroded by the presence of exposed bronze or steel in that same unit. While the problem is most common in saltwater, it's also possible for fresh water to serve as an electrolyte if it's either heavily polluted or contains a high concentration of minerals.

While paint coatings will reduce this



EARLY INSTALLATIONS put electrodes in place of through-transom bolts. Now they're farther outboard

POPULAR MECHANICS

destructive flow of current, these tend to deteriorate. Up to now, the most common small-boat solution to the problem of galvanic corrosion was the use of sacrificial "zincs."

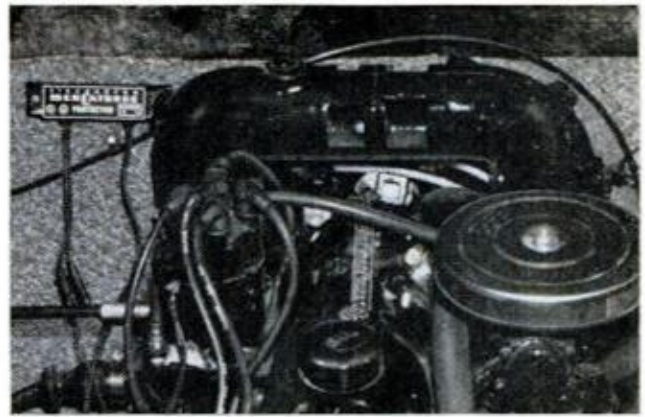
Available in a number of different shapes, these are made from a zinc alloy which corrodes more easily than the aluminum used in the lower unit. Thus, they "sacrifice" themselves to prevent galvanic corrosion from attacking the rest of the unit.

Zincs do their job well, but require frequent inspections. They must be kept clean, since any coating will insulate the metal against corrosion and defeat their purpose. Also, their efficiency goes down as they waste away, and under adverse conditions, they have to be replaced frequently.

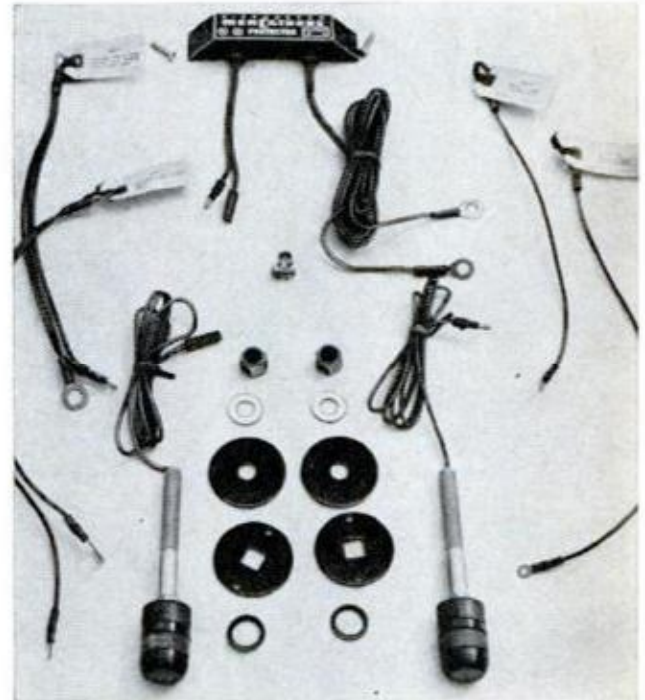
MerCathode, on the other hand, is a permanent installation with nothing to check, nothing to replace. Basically, it's just a solid-state electronic system which reads the corrosion potential of the water through a silver silver-chloride "reference electrode" and meters out enough current to neutralize the electrical flow of galvanic corrosion.

This protective current flows out through a positively charged electrode which is coated with platinum to prevent

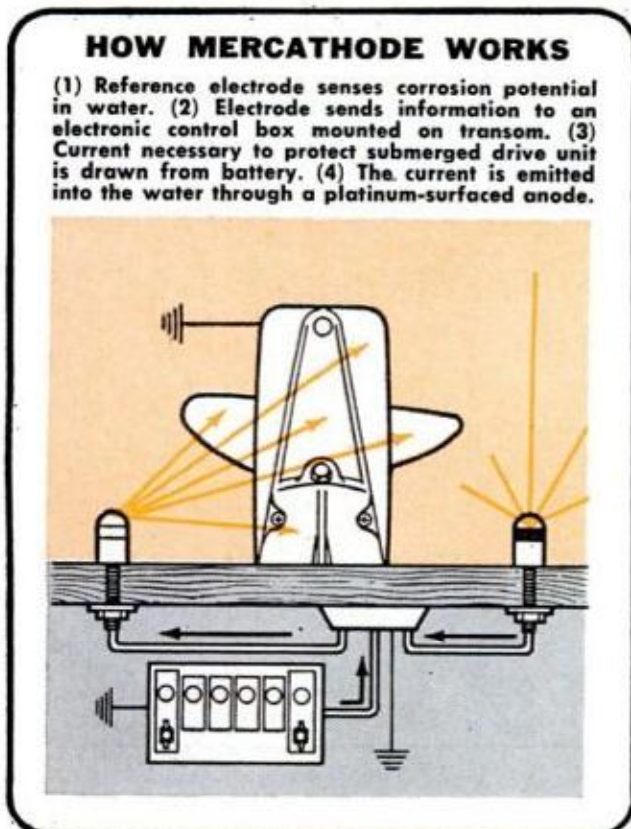
(Please turn to page 220)



BLACK BOX, the brains of the system, is a compact electronic package which mounts inside the transom



COMPONENTS include control unit, top, electrodes, bottom, and wiring necessary to connect the system



TEST METER which measures corrosion potential of the water demonstrates protection from MerCathode

Build this DOUBLE-

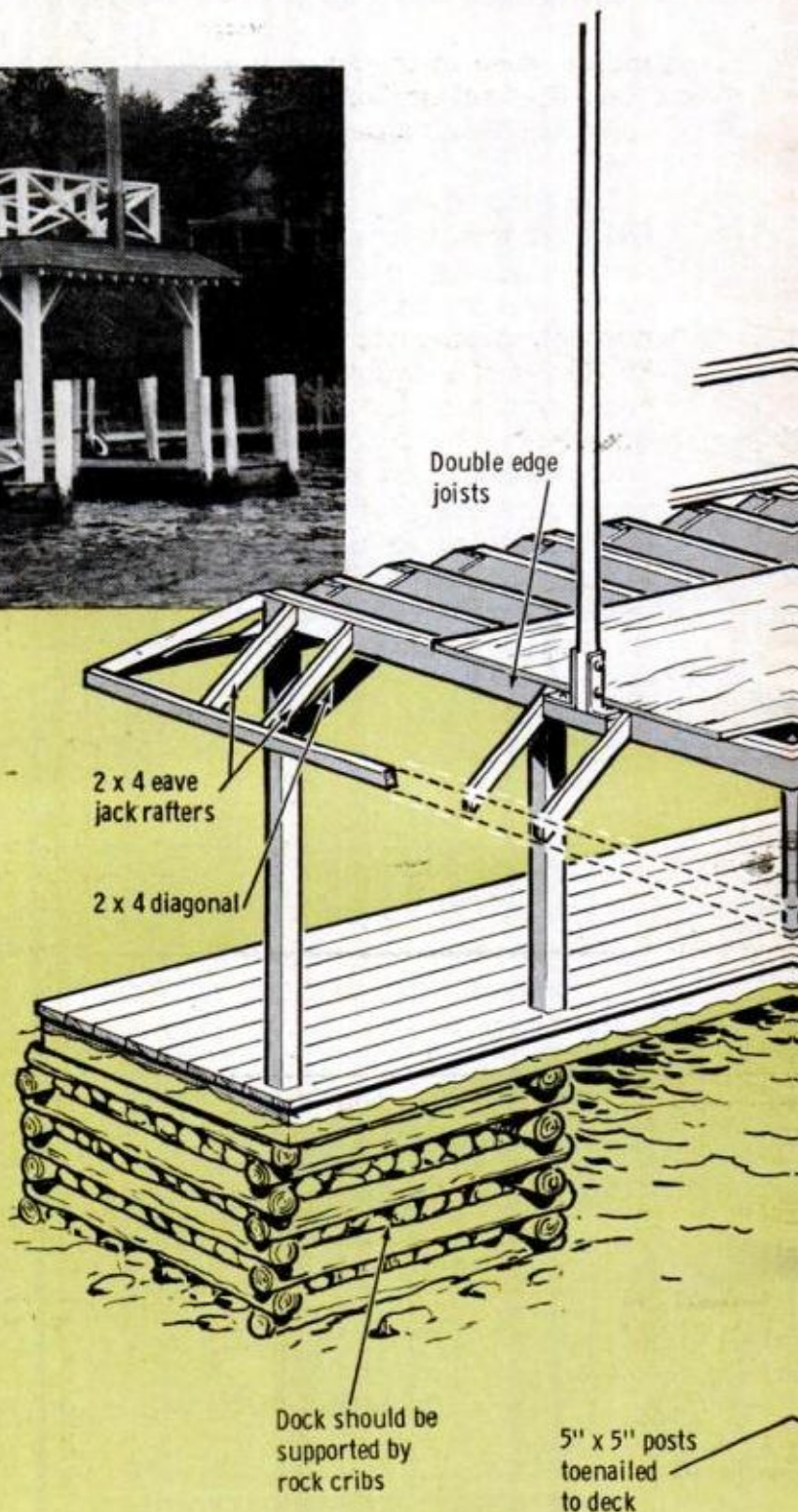


HERE'S AN IDEA for a project that can be tackled in any number of different ways, depending on your location, boat and the amount of money available.

This deluxe boat port with its roomy sundeck high above the water was originally just a pair of rock-crib piers jutting out from the shore. They were rigid and strong enough to support the roof/sundeck structure with no problem. Thus, if you don't have a dock, you can easily split the work into two separate projects by building the foundation rock-crib dock one season and adding the roof sometime during the following year.

If you already have a similar dock layout but it isn't strong enough to support a roof, it's possible to build the roof structure independent of the dock. The supporting posts can either be pointed and driven into the lake bottom or cut square so as to rest on flat cement blocks or flagstones laid on the bottom. They can be secured to the existing dock with lag bolts at the inside corners of each crib.

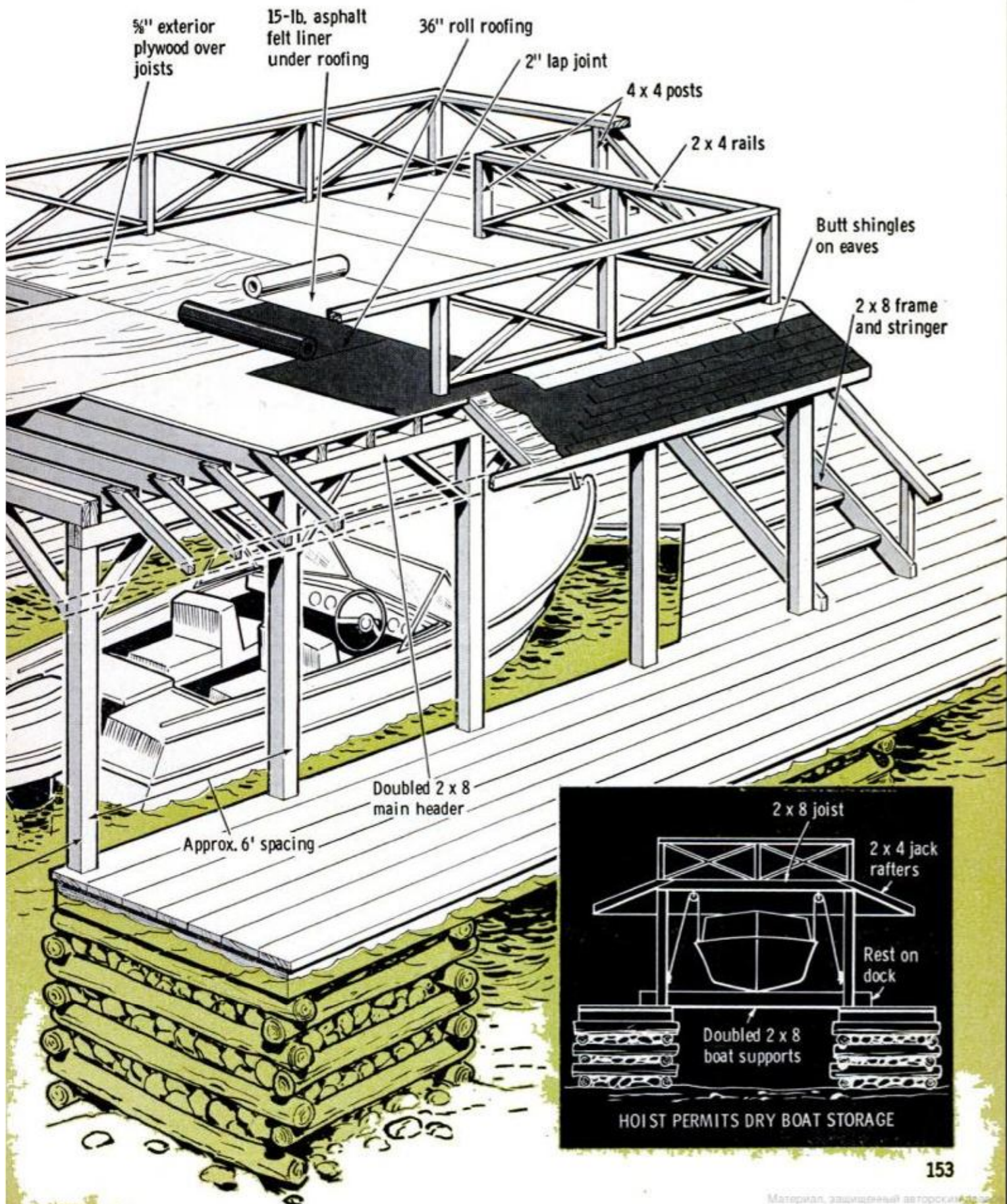
Tailor dimensions to suit the contour of the lake bottom and the size of your boat. If you want still more protection, just add walls and you have a boat-house. ★★★



Note: If roof is not to be used as sundeck, substitute 2 x 6s for 2 x 8s throughout.

DECK BOAT PORT

By HANK CLARK

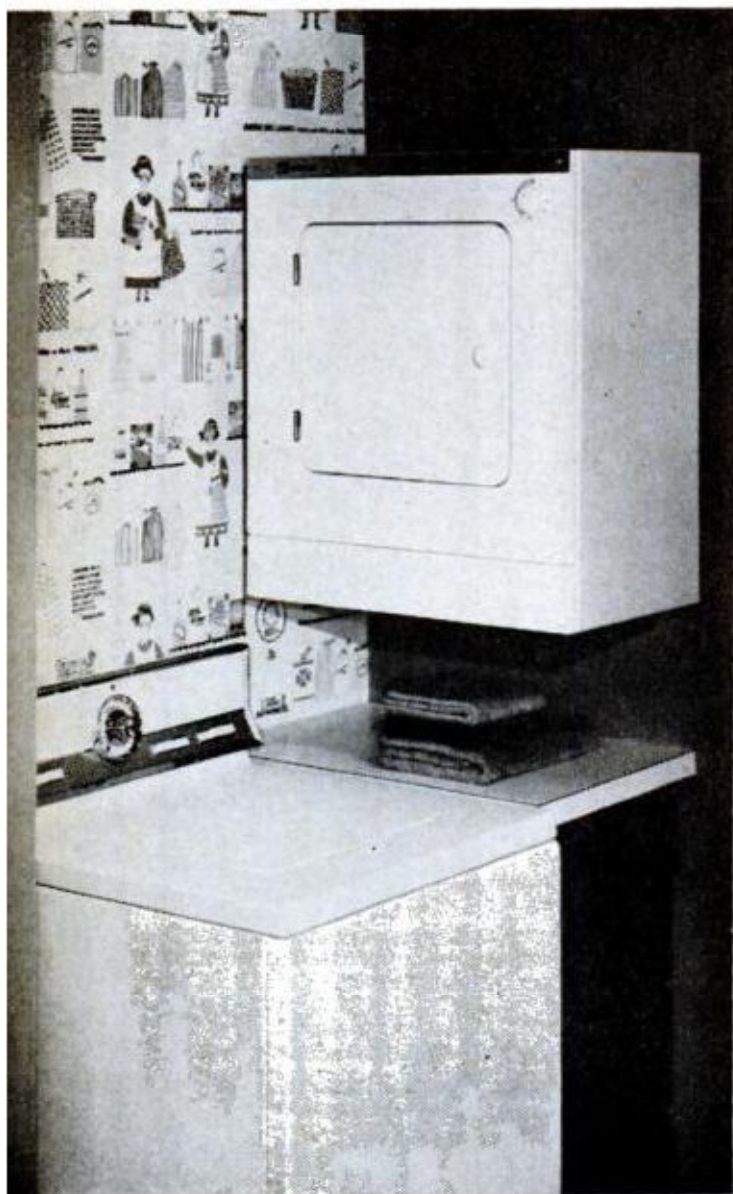
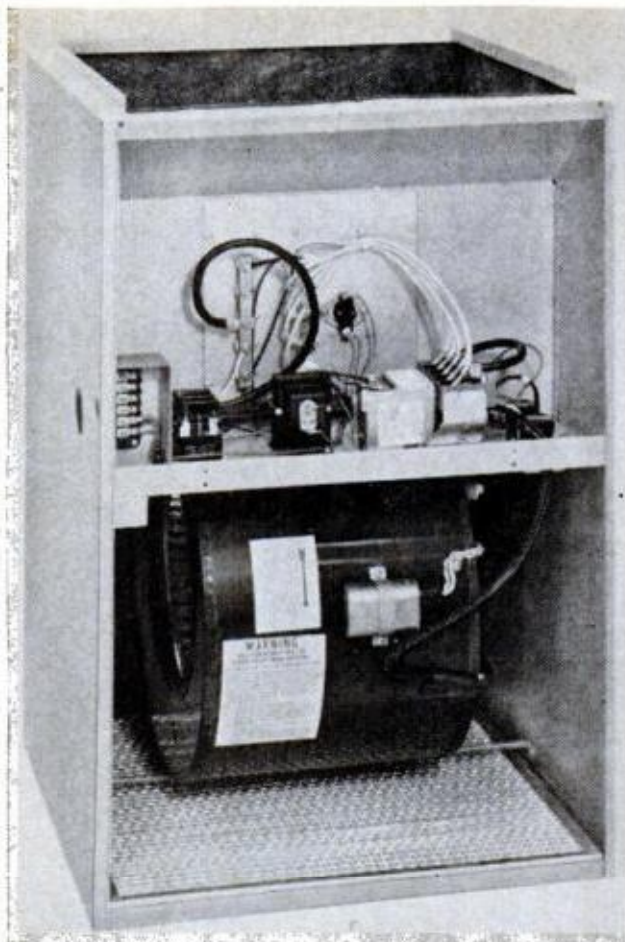


EXCITING NEW PRODUCTS

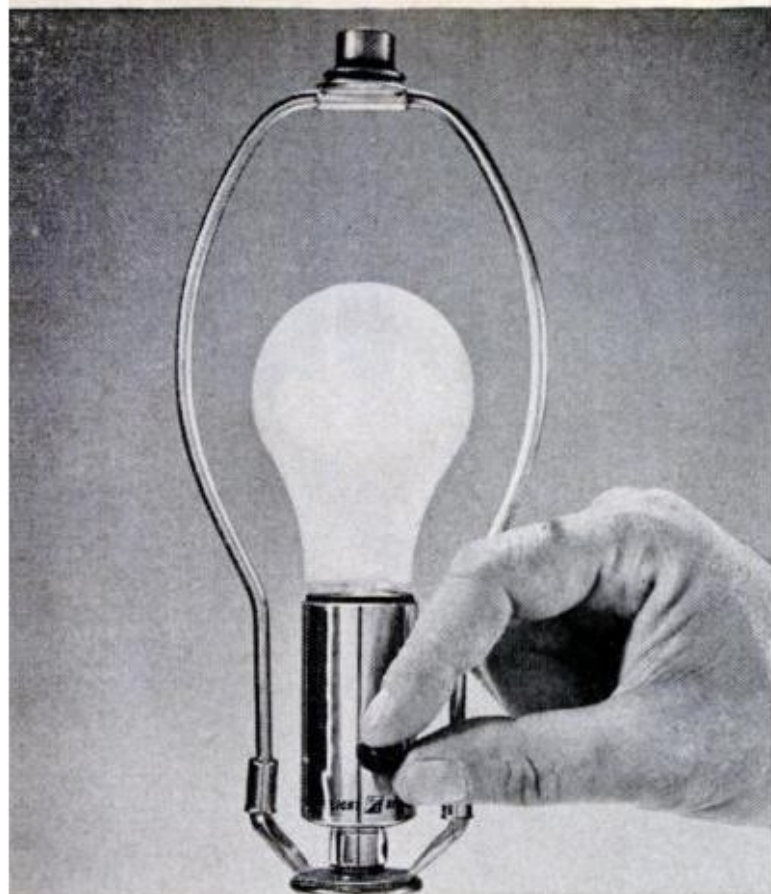
By CAROL SCHULTZ

COMPACT FORCED-AIR FURNACES have been designed to simplify servicing; all of the electric controls and the slide-out blower are in the front behind removable front panels. Air-conditioning can be incorporated into the unit without changing blowers. Twelve direct and belt-drive models available vary in price from \$180 to \$359. Manufactured by Day & Night, 855 Anaheim-Puente Rd., City of Industry, Calif.

PORTABLE ELECTRIC CLOTHES DRYER will dry anything a regular dryer can handle, with half the load capacity. Operated on any 115-volt outlet, unit can be rolled about on casters, set on counter or hung on wall; requires no outside venting. Ideal for apartments, mobile homes, lake cottages, ski lodges, boats and as second dryer in homes. Porta-dryer comes in avocado, copper and white for about \$100. Made by the Maytag Co., Newton, Iowa.

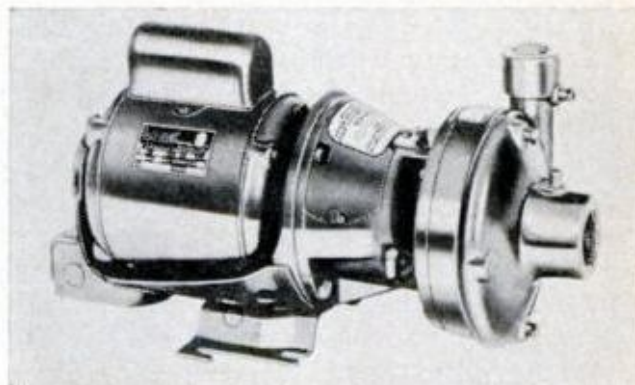


PRECISION SCALE for dieters has quarter-ounce gradations up to one pound, one-ounce divisions from one to ten pounds. Graduated matching scoop is specially designed for easy pouring and handling. The unit is made in England, and is available in red, blue, yellow or white for about \$13 from Dan Christie Associates, 1133 Broadway, New York, N.Y.



LIGHT DIMMER controls illumination from dim to full bright; replaces regular and three-way lamp sockets. Eliminates need for expensive three-way bulbs and saves electricity. Easy to install, a screwdriver is the only tool needed. Model No. 120 sells for \$9.95. Made by Slocum Industries, Box 687, Reseda, Calif.

CENTRIFUGAL PUMP is foot mounted, available in sizes from $\frac{3}{4}$ in. to $1\frac{1}{2}$ in. The 1522 pump is amazingly quiet because of its flexible spring coupler which aids in dampening noise. Uses include general pumping, and heating and cooling systems. By Bell & Gossett, Fluid Handling Division, ITT, Morton Grove, Ill.



ELECTRIC UPHOLSTERY SHAMPOOER does a quality job with professional shampoo, eliminates the possibility of soaking. The unit, for rental at \$1.50 per day, can be found in Glamorine's rental racks at supermarkets, hardware and department stores. Glamorine Products.





Build this sleekly styled SPLIT-LEVEL TYPING DESK

By MANLY BANISTER

THE GRACEFUL LINES of this dual-level typing desk are sure to complement the decor in any home. Made of birch plywood and solid alder, the desk is finished in a honey maple stain, while the plywood edges are trimmed with birch wood tape for a professional appearance.

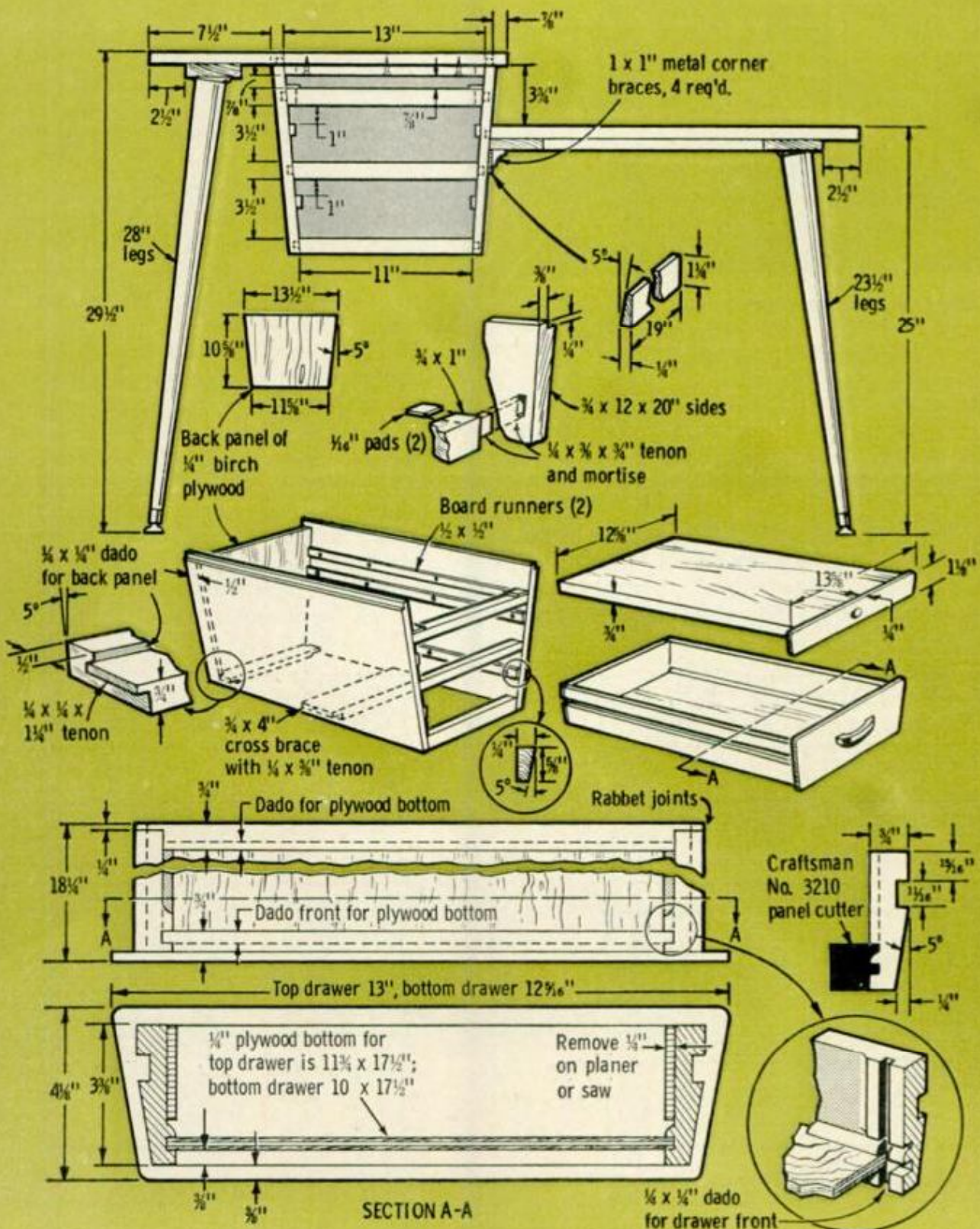
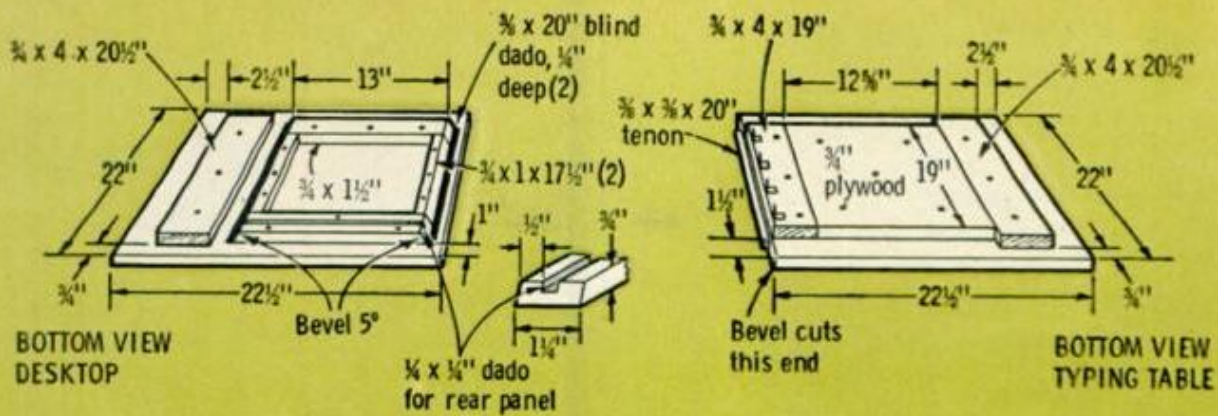
As detailed in the drawing on the opposite page, the desk consists essentially of two sections: the drawer casing and the typing table. Each incorporates components cut at a 5° bevel, so you can make all beveled cuts without changing your table-saw setting.

When cutting the plywood sides and tops, use a fine-tooth, thin-rim plywood blade or a hollow-ground planer blade to avoid splintering. Cut the tenons in the top of the 12x20-in. sides at a 5° bev-

el. Then, without changing the setting of the saw, set up a dado head and cut the 3/8-in.-wide, 1/4-in.-deep blind dadoes in the underside of the drawer-casing top.

Cut the crosspieces that fit between the drawer openings from solid hardwood. The three crosspieces with tenons cut in their ends initially are 11 7/8, 12 11/16 and 13 7/16 in. long. After the tenons have been cut, the



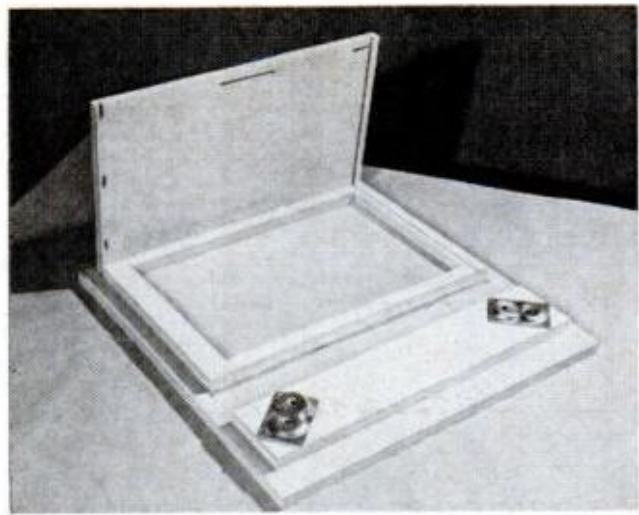




BACK FOR DRAWER CASING is of $\frac{1}{4}$ -in. birch plywood. Use of taper jig in conjunction with a miter gauge is best way to insure accurately cut panel

pieces should be $11\frac{1}{8}$, $11\frac{15}{16}$, and $12\frac{11}{16}$ in. long when measured along their tops inside the drawer casing.

To cut the tenons, follow this procedure: Cut the crosspieces to their full length and bevel the ends 5° . Position the fence on a table saw for a $\frac{3}{8}$ -in.-wide cut (length of the tenons). Tilt the miter gauge 5° to the left and cut one side of a

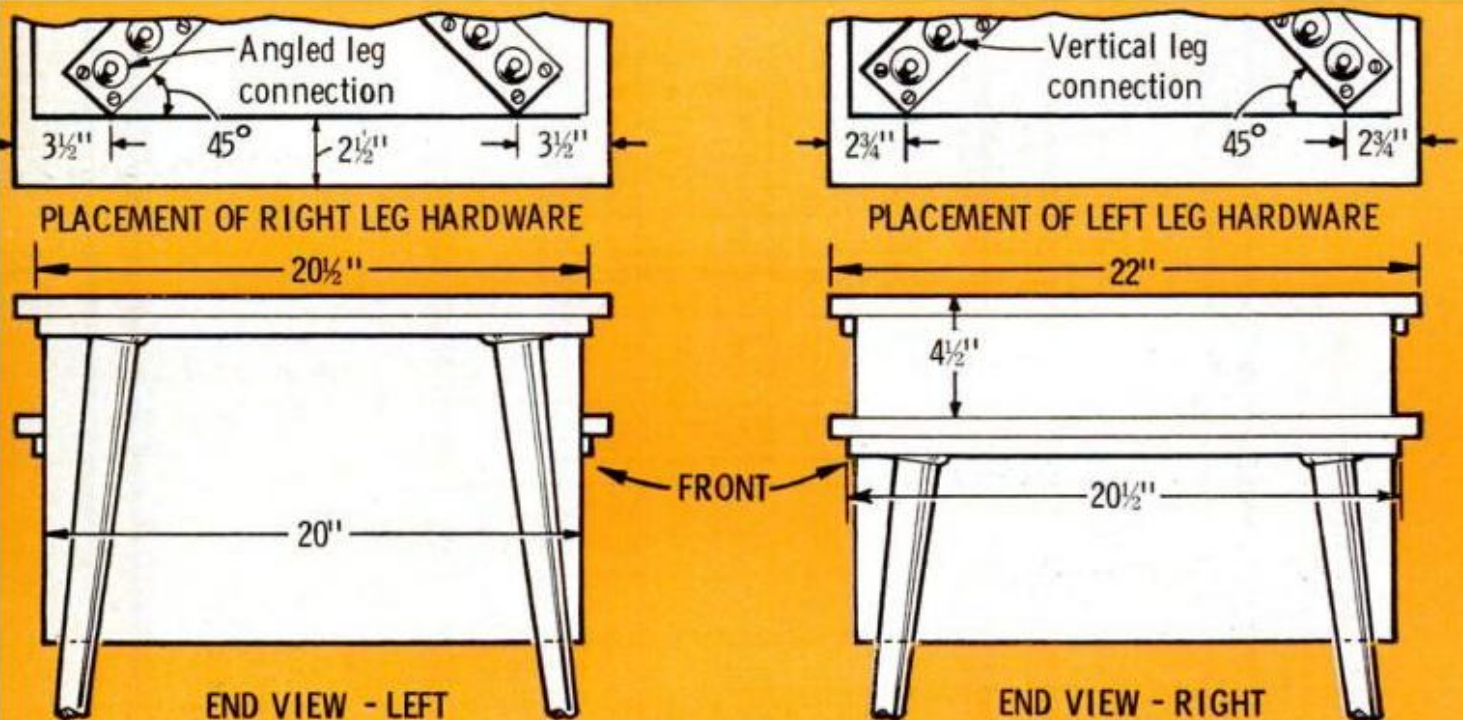


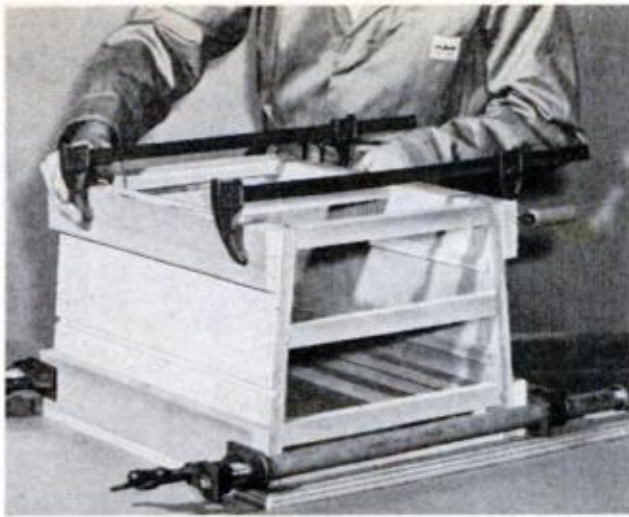
RIGHT SIDE OF CASING is glued in dado on underside of top, then screwed to long support piece. Both mortises and tenons must be made at a bevel of 5°

tenon on each end of each piece. If you use a regular tenoning blade of $\frac{1}{8}$ -in. thickness, three quick passes will complete each face. Then tilt the miter gauge 5° to the right and complete the tenons.

Rout the mortises in the sides of the drawer casing on a drill press. For the left sidepiece, tilt the drill-press table 5° to the right and check the angle with a protractor-level. Then drill the required starting hole and rout out the mortises with a $\frac{1}{4}$ -in. bit to a depth of $\frac{3}{8}$ in. For the right side of the drawer casing, tilt the table 5° to the left and repeat.

After these pieces have been cut, assemble the desk section without screws or glue. Check for proper fit at all joints and



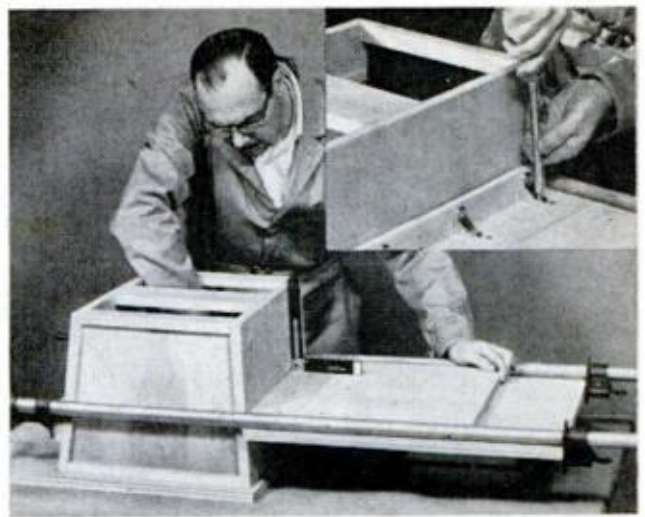
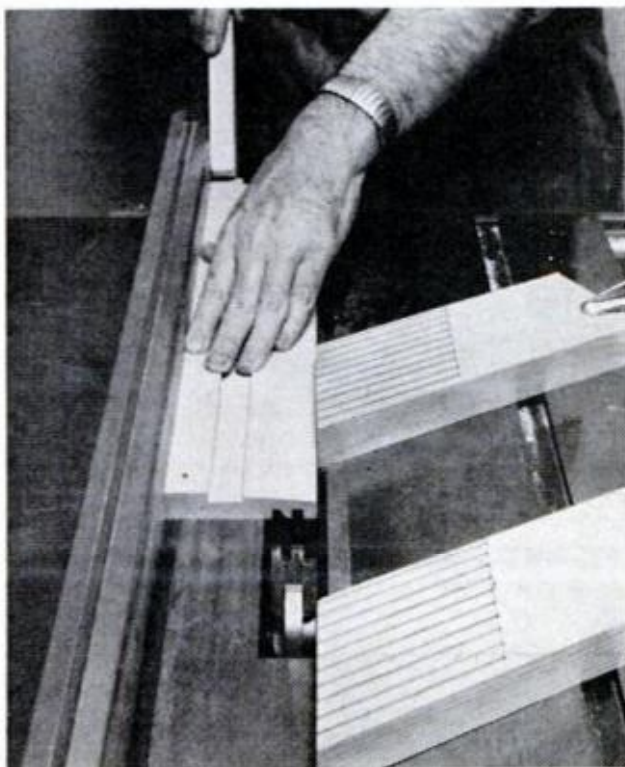


ASSEMBLE DRAWER CASING piece by piece, gluing up the joints as you go along. Then clamp the casing securely and prepare the typing table as described

check the angled sections with a protractor set at a 5° taper. Any errors, especially in the crosspieces, will show up now, so check carefully and make any corrections.

Begin final assembly of the drawer casing by using white glue and No. 8x $\frac{1}{4}$ -in. flathead (fh) screws to secure the five support pieces to the underside of the desktop (shown at top left of page 157). Then apply glue to one of the blind dadoes and carefully position that side of the drawer casing in place. Be sure to apply glue at the butt joint where the side and

SIDES FOR DRAWERS are cut in four operations: Groove outside for drawer runners; taper-cut bottom half; cut bottom groove (shown); remove $\frac{1}{4}$ -in. excess



TENON ON TYPING TOP fits into matching mortise cut in drawer casing side. Screw from inside casing to crosspiece, then attach the corner braces (inset)

the support piece come together. With the side of the drawer casing in place, drill through the support and into the side-piece. Countersink the holes and drive three No. 8x $\frac{1}{4}$ -in. fh screws through the support and into the side.

Repeat this operation for the other side of the drawer casing. Do not, however, tighten these screws until the back, crosspieces and bottom cross braces have been fitted in their respective mortises or dadoes. With the exception of the dado for the back panel, all joints are glued.

Now tighten the screws, clamp the entire assembly and allow it to dry.

Prepare the typing-table section as

(Please turn to page 235)

BILL OF MATERIALS

Size and Description (Use)

1 pc.	$\frac{3}{4}$ " x 4' x 5' birch plywood (desktop, tabletop, writing board, drawer casing sides, drawer fronts)
1 pc.	$\frac{1}{4}$ " x 2' x 4' birch plywood (drawer bottoms, drawer-casing back and writing-board front)
20'	1x4 birch, maple, alder or ash (drawer sides and backs, desktop and tabletop support pieces, drawer casing crosspieces, cross braces and board runners)
24'	$\frac{3}{4}$ " birch wood tape (finish plywood edges)
4	28" tapered legs with adjustable brass ferrules
4	1x1" steel inside corner braces (support table)
2 $\frac{1}{2}$ doz.	No. 8 x $\frac{1}{4}$ " fh wood screws
3	No. 10 x 2 $\frac{1}{2}$ " fh wood screws
	drawer pulls (drawers)
1	knob (writing board)
$\frac{1}{2}$ pt.	wiping stain (honey maple finish)
1 pt.	brushing lacquer (protective finish)
Misc.	4/0 and 6/0 sandpaper, No. 000 steel wool, white glue

Total cost of materials, including finish: about \$35

How to shoot FLASHY COLOR . . . WITHOUT A FLASH

New faster films and special techniques let you take dramatic shots by natural light indoors and at night—once thought impossible to do in color photography

By PAUL WAHL

IF YOU CAN SEE IT, you can usually photograph it—that's how fast modern color films have become. This increased speed, plus faster lenses, now makes it possible to shoot exciting color pictures indoors or at night using only whatever natural light there happens to be. Available-light photography has been a popular black-and-white technique for years, but not until recently has much thought been given to trying it in color.

Why bother? It's so simple to slap a flashgun on a camera and get almost fool-proof pictures. Shooting with flash is unquestionably easy and has its advantages. But it also has its drawbacks. Compare the two pictures at the top of the opposite page and you'll see why. The strong, flat, front lighting delivered by a single on-camera flash leaves a subject washed out. It causes deep, harsh shadows and distracting hot spots.

By contrast, existing light is usually

softer and more flattering. It doesn't wash out details. Above all, it gives a more natural, lifelike look because you record the scene exactly the way it appears in real life. By learning to use available light, you can take pictures in many places where flash can't be managed easily or isn't permitted at all, such as in churches, hospitals, museums and theaters. There are times, too, when a flash just wouldn't give you enough light anyway. You couldn't light up a street scene at night if you had a dozen flashguns, but you can shoot a street scene by its own light and come out with a far more dramatic picture.

The guide shown below gives some typical picture-taking situations with suggested exposures to help you get started. Additional exposures can be worked out through experimentation.

An exposure meter may not be much help in very dim light. A meter typically

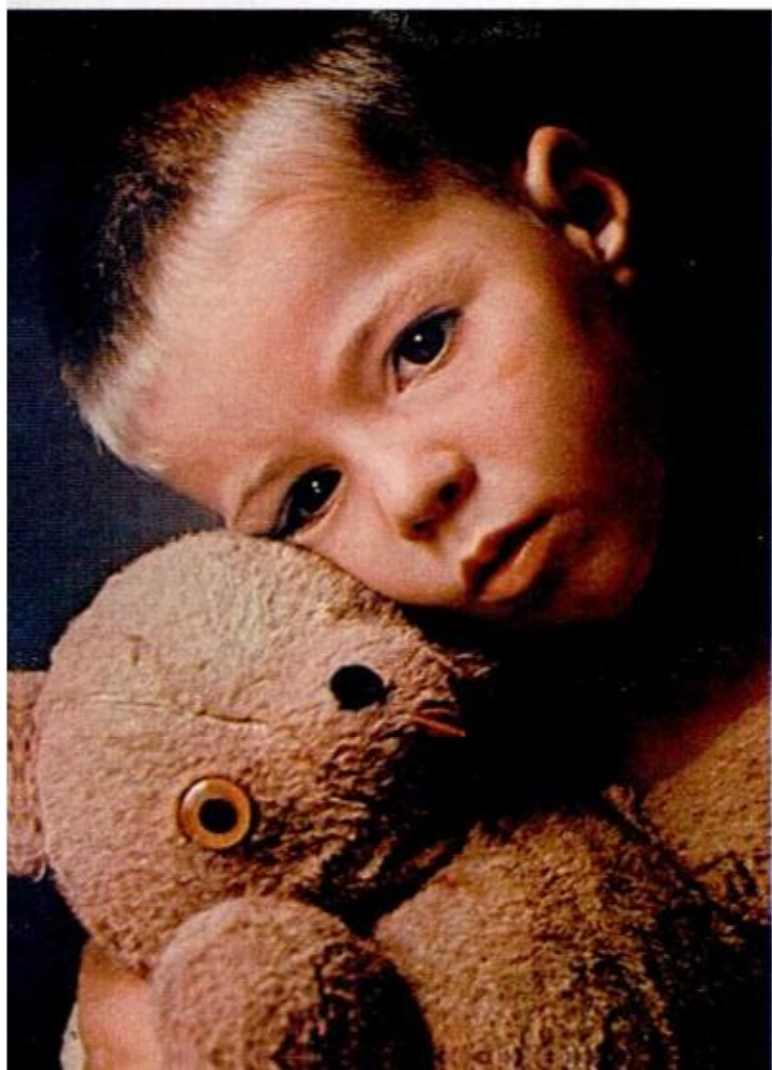
(Please turn to page 218)

EXPOSURE GUIDE FOR AVAILABLE LIGHT

TYPE OF SUBJECT AND LIGHT CONDITION	TYPE OF COLOR FILM			
	Ansochrome D/100 Ansochrome T/100 Ektachrome-X Kodachrome-X	Ansochrome D/200 H.S. Ektachrome, Daylight type H.S. Ektachrome, Type B	Ansochrome D/500	
ALL SETTINGS BASED ON EXPOSURE AT f/2				
INDOORS	Home and office interiors—daylight Circuses, ice shows, stage shows— spotlighted acts	1/125 sec.	1/250 sec.	1/500 sec.
	Hospital nurseries Office interiors—artificial light	1/30	1/60	1/125
	Home interiors—artificial light	1/15	1/30	1/60
	Museum displays	1/2	1/4	1/8
OUTDOORS AT NIGHT	Night baseball and football Very bright street scenes (theater district) Store windows Burning buildings, bonfires	1/60	1/125	1/250
	Bright street scenes (downtown areas)	1/30	1/60	1/125
	Floodlighted buildings, fountains	1/2	1/4	1/8



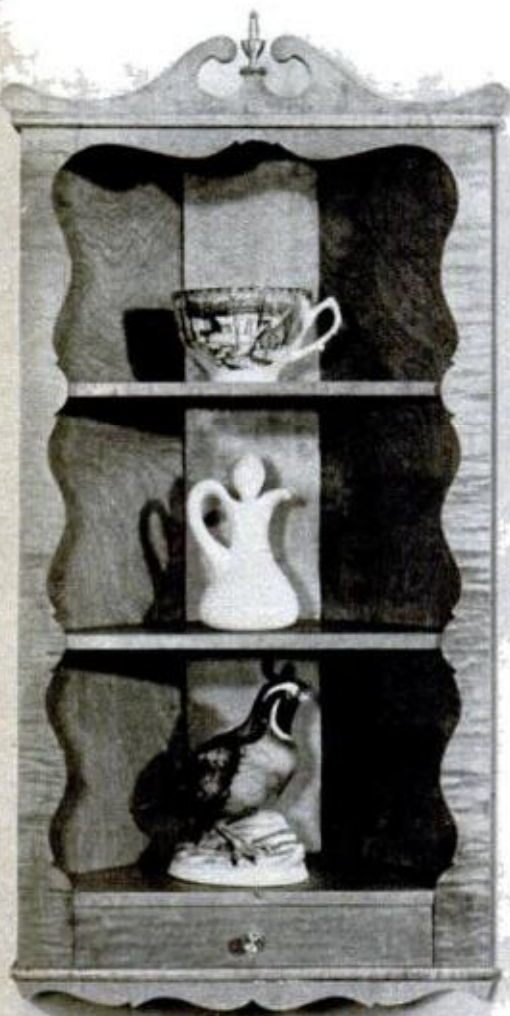
ADVANTAGES OF AVAILABLE LIGHT can be seen in photo at right made entirely by lamplight. Note soft modeling on the face, natural highlights, lack of shadows. Photo above, made with flash, shows harsh shadows, washed-out detail, pasty-looking skin tones and hot spots. Single light bulb also provides the sole illumination for the boy below. Use of daylight-type film produces a warm, reddish cast—in this case, not objectionable. Night scene at center right shows dramatic effect of lights shimmering on wet streets after a rain. Typical exposure for a medium-speed film: 1/60 second at f/2. At bottom right, bride and groom silhouetted against sunlit stained-glass church windows make an unusual wedding photo



Handsome and Distinctive

Here are three graceful shelf designs from the past that you can copy in just a weekend to add new importance to uninviting walls

Color Photos by Robert Borst
Technical Art by ZIK Associates, Ltd.



GOT A WALL that just stands there doing nothing? Put it to work holding one of these handsome wall shelves. Suddenly it will be the center of attention and the most decorative wall in the house.

The shelf-planter detailed on these two pages is designed to hang in a corner. To make it you start putting together the three frame members and the top and bottom. Before you cut the 45° angles, check the corner where the shelf is to hang. If it's off-square more than a couple degrees, you may have to change the angle a bit to compensate.

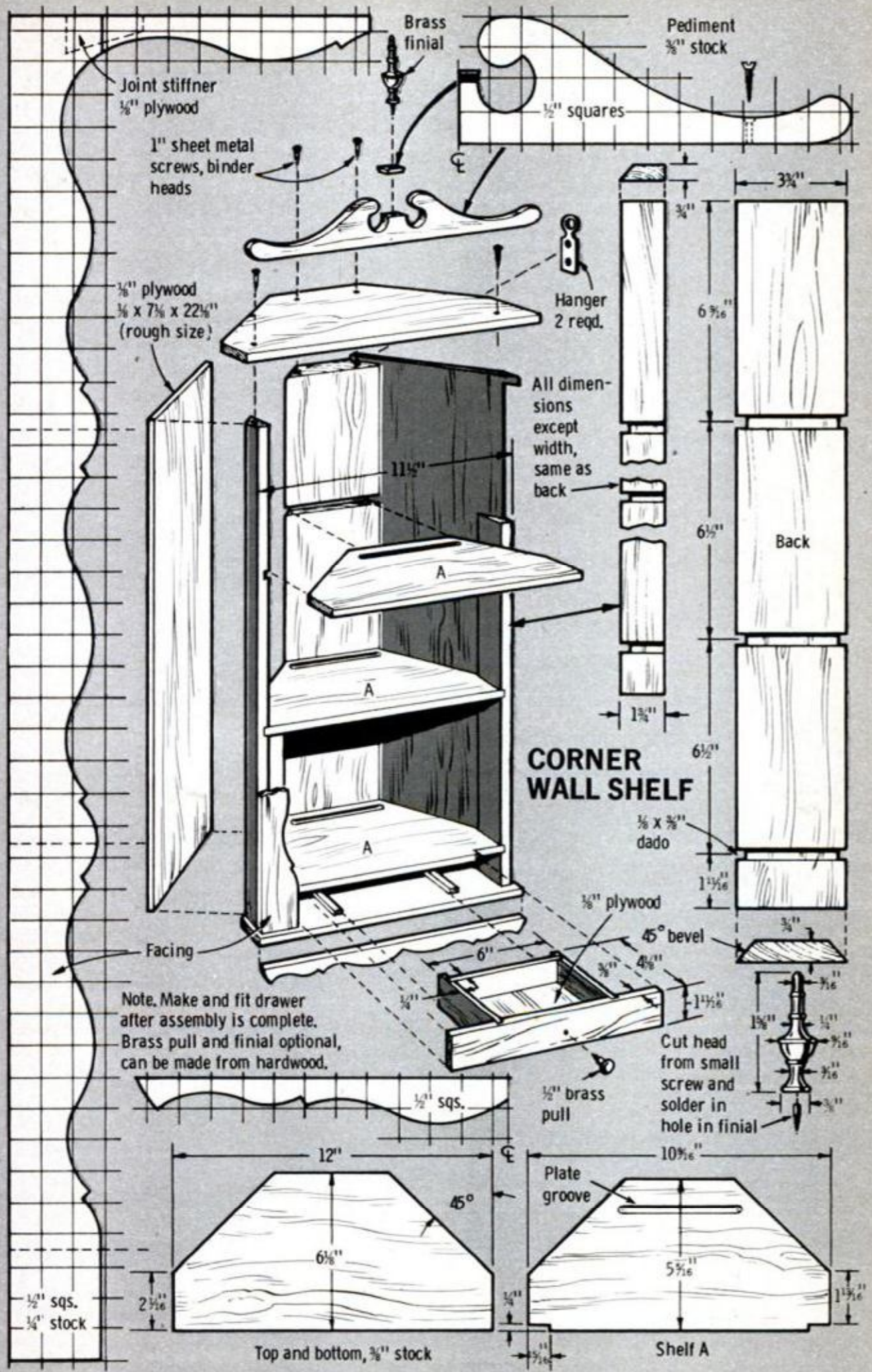
All frame parts are joined with screws and glue. Use sheet metal screws with binder heads; they hold better in end grain than regular wood screws. Round the exposed top and bottom edges, then cut the side panels to rough size. Attach the latter with 3/8-in. flathead screws and trim waste wood flush with side frame members as indicated. This saves cutting rabbets in the 45° edges of the frame members.

Notice that lower shelf A is notched to take the facings flush, but the second and third shelves are 1/4-in. narrower so that facings overlay the edges. However, don't cut the shelves until you've assembled the frame. The top facing is butt-joined to the side facings with glue, and a spline is placed across each joint. Trim the facing to project slightly beyond the edges of the frame. Now lay the shelf on its back, spread glue, position the facing and weight it with heavy objects. Wipe off excess glue before it sets.

I used pine for the back and side-frame members, birch plywood for the side panels and solid birch for the top, bottom and shelves. All the scroll parts and the drawer front were cut from curly maple. This combination will take any maple stain.

Sand all parts well and work out any saw marks in the scroll-cut edges. A spindle sander does a nice job here, but you can work with sandpaper wrapped around a 1-in. dowel. When the shelf is sanded to your satisfaction, apply a maple stain, then a wood sealer and, finally, a clear finish. Rub this with a very fine steel wool and wax, if desired.

To hang the shelf, first attach the metal hangers to each side. Then place the shelf in the corner and mark the location of the two screws to hold it.—*W. Clyde Lammey*



CLOCK PLANTER

YOU'LL HAVE TIME on your hands when you build this handsome wall planter, for in addition to providing a beautiful background for your favorite flowers or plants, it's also a smart wall clock.

The original, shown at left, was made with just a coping saw and a backsaw, which means you don't have to have a shop full of power tools to copy it.

I selected cherry for the original, but almost any other cabinet wood (walnut, mahogany or oak) could be substituted. If your tastes run to Early American, the planter makes up very well in ordinary pine with a sprinkling of sound knots.

The drawing on page 166 shows how the planter is put together. If you're using power tools, make blind dadoes, stopping them from $\frac{1}{2}$ to $\frac{3}{4}$ in. from the front. Cut back the same amount from the front edges of the shelves for a good tight gluing fit.

The depth of the shelf and the amount of material to be removed for the cutout will depend upon your choice of planter. (Incidentally, plastic flowers create almost the same effect as real flowers, but require no care.)

Make up the clock case and shelf as separate units, then attach them to the back with glue and 1-in. No. 6 flat-head screws.

The clock movement is a cordless model made by L. Harris Co., Inc., 1 Park Ave., New York, N.Y. Write that firm for the name of your nearest dealer. The 1-in. plastic numerals are available from any local sign company.—C. L. Widdicombe

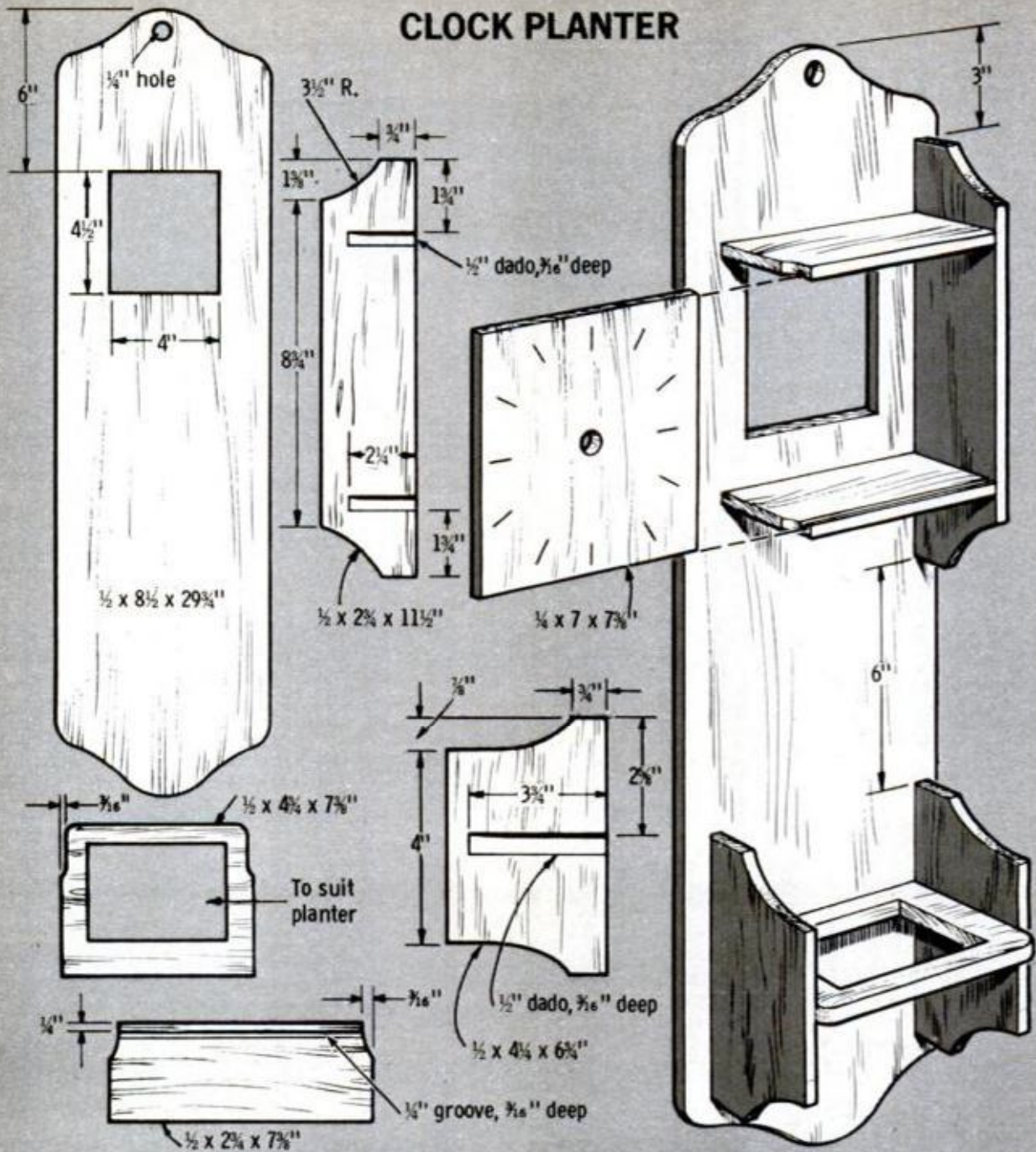


CURIO PLANTER



Please turn page for construction details

CLOCK PLANTER



THE WARMTH of native cherry combined with Early American design make the planter-shelf pictured on page 165 and detailed on page 167 a handsome focal piece.

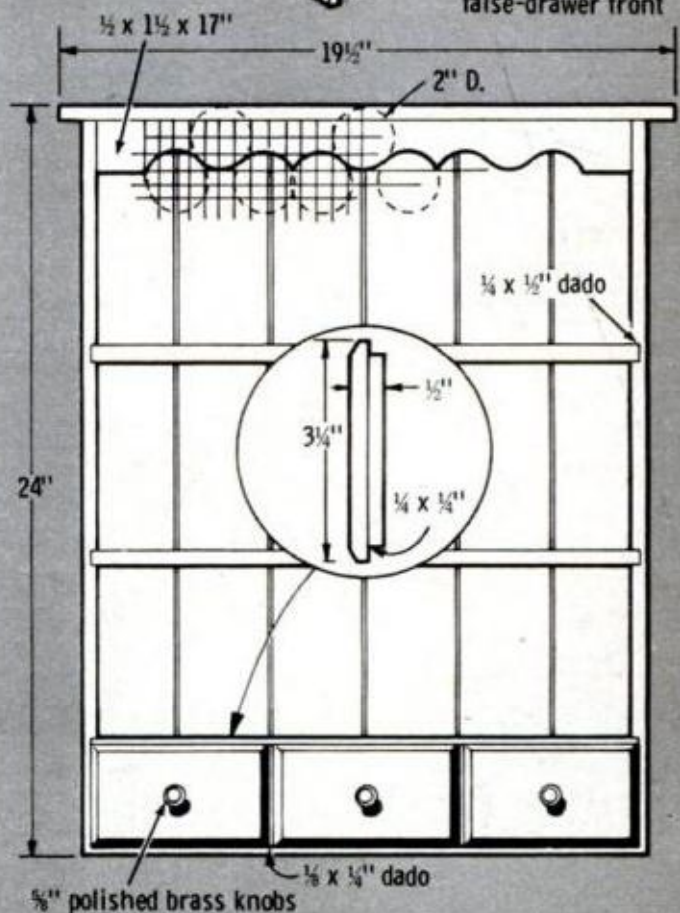
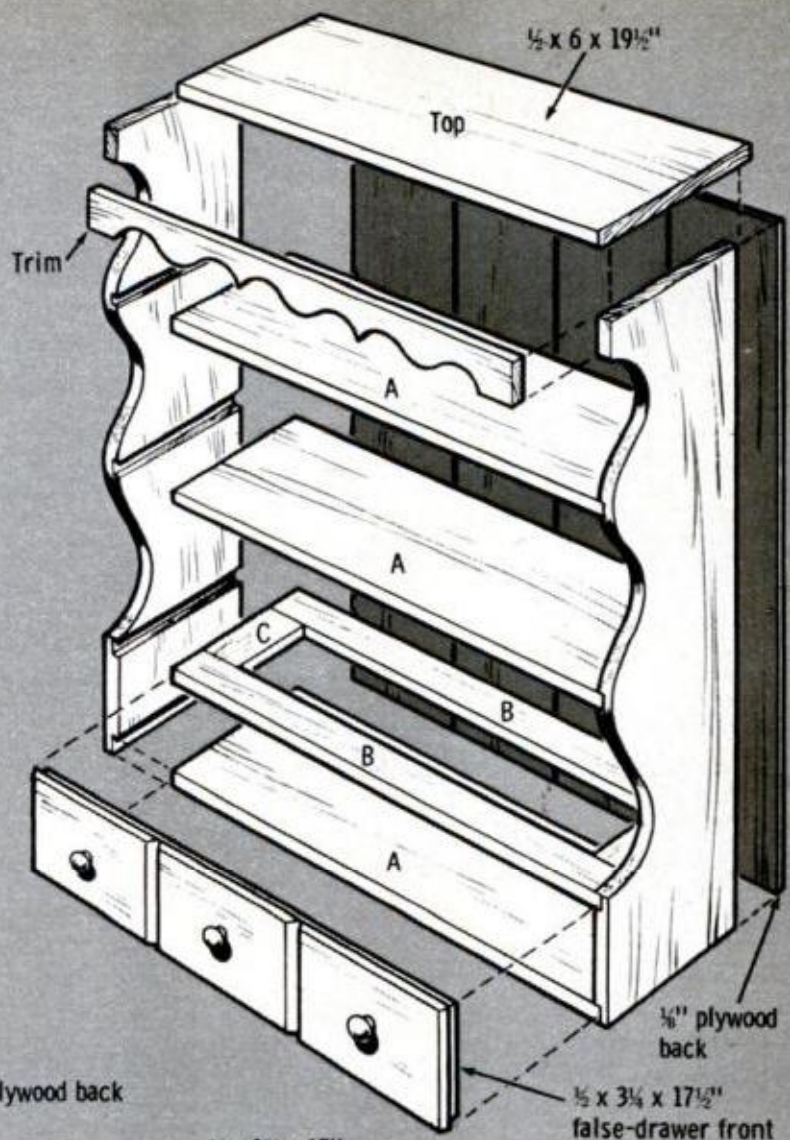
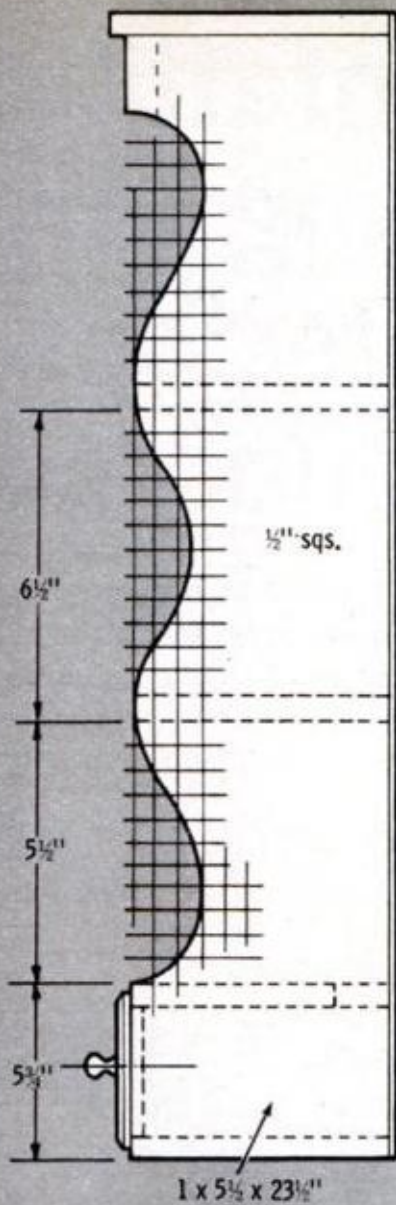
You'll first have to make a full-size pattern from the squared drawing for the scroll-cut sides. Both sides are identical, except for being made right and left-hand. By using the saw fence as a stop you can space the dados exactly the same in each piece. You'll do best to cut the dados before bandsawing the edges. This way you won't run the risk of splintering the finished edge with the dado blade.

The bottom, planter frame and two shelves are cut to the same length, but the top is made to overhang the sides 3/4 in.

Use glue only in dados and check the assembly with a square before the glue sets.

The 1/16-in. V-joints in the plywood back are made with the saw blade set at 45°. Each joint is formed by passing the panel over the saw once, then reversing the work to make a second cut. The scroll-cut trim piece across the top fits between ends.

False drawer fronts are cut from a single piece of 1/2-in. stock after it's rabbeted around the back edge and chamfered around the front. End chamfers are then cut to form the three drawers, and a small brass knob added to the center of each. A sheet-metal trough is made to fit the planter frame. A Styrofoam block will hold artificial plants.—*John E. Reppert*



CURIO PLANTER BILL OF MATERIALS

Amt.	Size and Description (Use)
1 pc.	1/2 x 6 x 19 1/2" pine (top)
2 pcs.	1/2 x 5 1/2 x 23 1/2" pine (sides)
3 pcs.	1/2 x 5 1/2 x 17 1/2" pine (shelves, A)
2 pcs.	1/2 x 1 x 17 1/2" pine (rails, B)
2 pcs.	1/2 x 1 1/2 x 3 1/2" pine (rails, C)
1 pc.	1/2 x 3 1/4 x 17 1/2" pine (false drawer front)
1 pc.	1/2 x 1 1/2 x 17" pine (trim)
1 pc.	1/8 x 18 x 24" plywood (back)
3	5/8"-dia. polished brass knobs (pulls)

'Confetti' coating for countertops and floors

Colorful vinyl flakes, tossed onto a viscous base coat and sealed in a glaze, produce a seamless surface

By L. LaBARGE



SEAMLESS MATERIAL is not only extremely good-looking, but easy to maintain as well

THE NEW LOOK in modern homes is a seamless, long-lasting and practical surfacing for floors and countertops. Just follow the manufacturer's directions and you'll wind up with a colorful, scuff-resistant, nonporous and consequently stain-resistant surface that needs no waxing.

On a floor, this product of modern technology is comfortable to walk on and easy to clean with just a damp mop or sponge; yet it's not slippery.

Applied as a countertop covering, it wipes clean easily, is completely waterproof and also allows you to cover awkward corners, joints and even the back-splash on a sink.

One of the several brands on the market is made by Dur-A-Flex, Inc., 269 Franklin Ave., Hartford, Conn. This firm's kits consist of vinyl chips or flakes, in any of 13 standard color combinations, plus a urethane glaze and thinner. On most surfaces, the glaze is thinned for use as a primer first, then applied full strength for the base coat. If you're covering laminated plastic, ceramic tile or other very slick surfaces you'll need a two-part epoxy base coat in place of the primer.

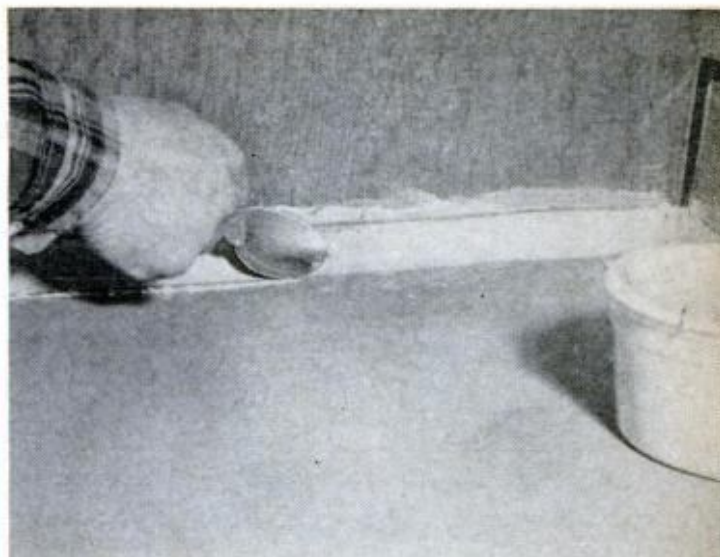
A kit to cover 35 sq. ft. will cost \$27.95. Add \$5.95 for a quart of Dur-A-Epoxy (if needed) and figure on covering 50 sq. ft.

In addition to the standard colors, you also can choose from 23 solid-color vinyl chips and 27 metallic shades. For an additional charge, you can vary the proportions of two, three or more colors to produce a custom-blended mix.

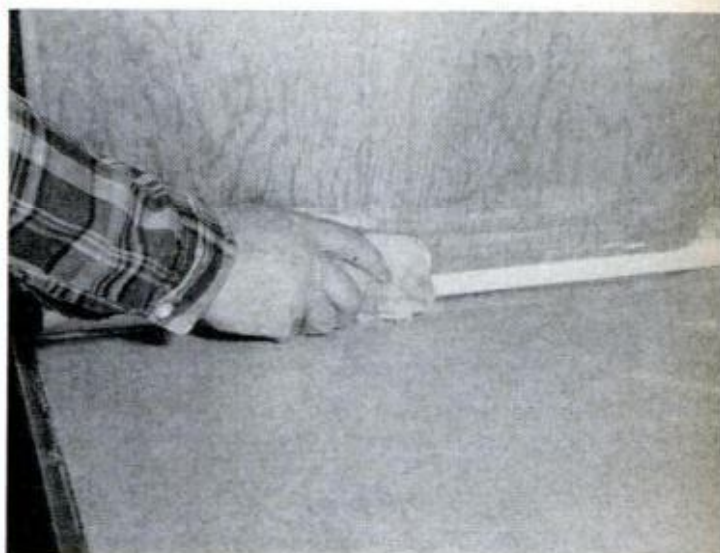
Preparation

You'll need a plastic bucket for mixing, a clean paintbrush, some masking tape and a few sheets of fine sandpaper. Included as part of the kit are plastic gloves, booties, a squeegee and a roller. Once all these items have been gathered, place them in a clean spot and prepare the surface to be covered. If you're going to cover wood, fill any cracks with wood putty and sand smooth first. With ceramic tile, make sure that all tiles are fast and fill any missing spots. If rough concrete is to be covered, apply a commercial leveling mix so it is relatively smooth.

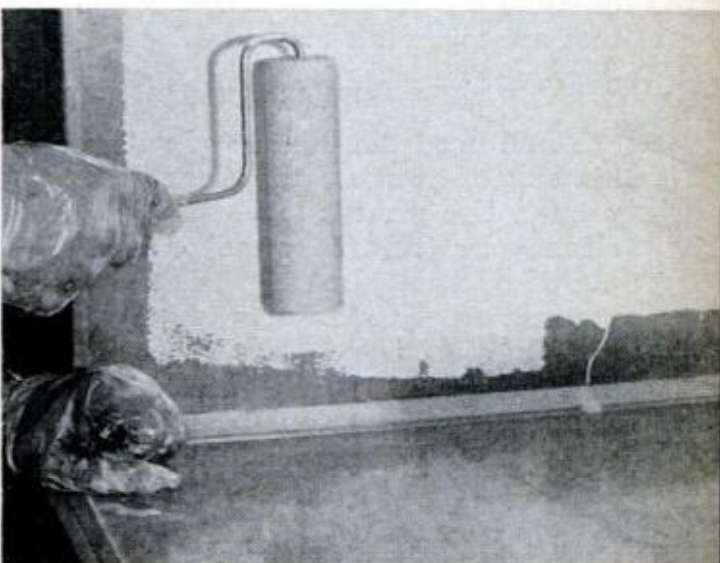
In some instances, it may be easier to put down hardboard or plywood for a smooth start. But whatever you cover, make sure it is dry, free of cracks, smooth, firm and clean (no oil, grease or wax);



COVED CORNERS are easy to form. Add wood fillet strip, apply spackling material and form with spoon



ALLOW SPACKLING COMPOUND to dry thoroughly, then clean up edges by wiping off with a damp cloth



ROLL OR BRUSH ON primer coat, then apply uncut base coat. On plastic surfaces, use epoxy for base



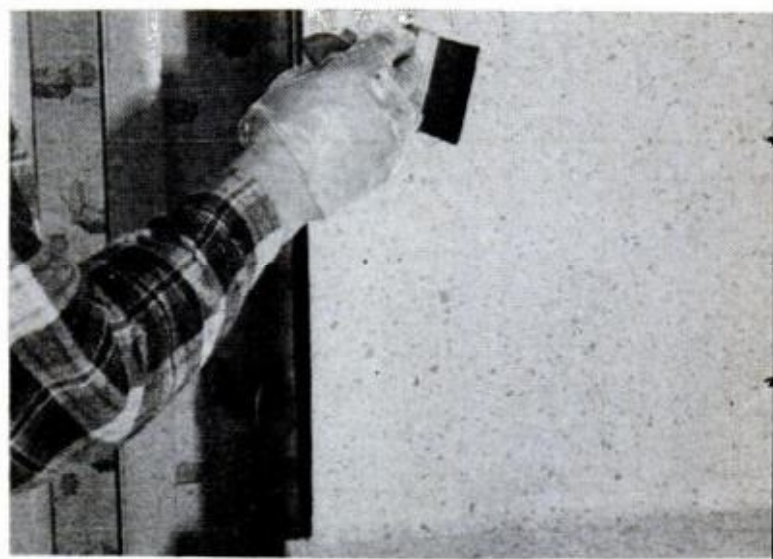
TOSS VINYL CHIPS so they cover the wet base coat. It's best to work only a small section at a time



EXCESS FLAKES can be brushed up once base coat has set. Save these for next section to be covered



SAND LIGHTLY and then vacuum to remove all dust and loose chips. Check and repair any bare sections



TWO COATS of clear urethane glaze should be applied over the chips. Let last coat dry for 12 hours

then apply masking tape along the edges of cabinets, appliances and other sections that are to be left uncovered.

Application

You'll need the thinner supplied in the kit only if you use the clear glaze as a primer. Use what is left of the thinner to clean your tools. Mix the primer in the plastic bucket—just thin the glaze 10 to 20 percent. Apply one coat over the surface to be covered and let dry for a half-hour to 45 minutes. Then spread uncut glaze over a small area and begin tossing the confettilike chips on the wet surface. Don't worry about using too many chips—they stick only in the wet base coat. Any excess chips can be swept up after the base coat has dried and then used again to cover the next section.

Once the entire area has been covered, let it dry for an hour and brush up the excess chips. Sand the surface lightly by hand and run a vacuum cleaner over the area to pick up any dust and loose chips.

Apply a coat of glaze, let it dry, then lightly sand, dust and glaze again. These glaze coats are best poured on about a quart at a time and then spread evenly with the paint roller. However, don't work the glaze back and forth so much that air bubbles become trapped in the coat. You want a fairly thick, but even, layer of glaze over the chips.

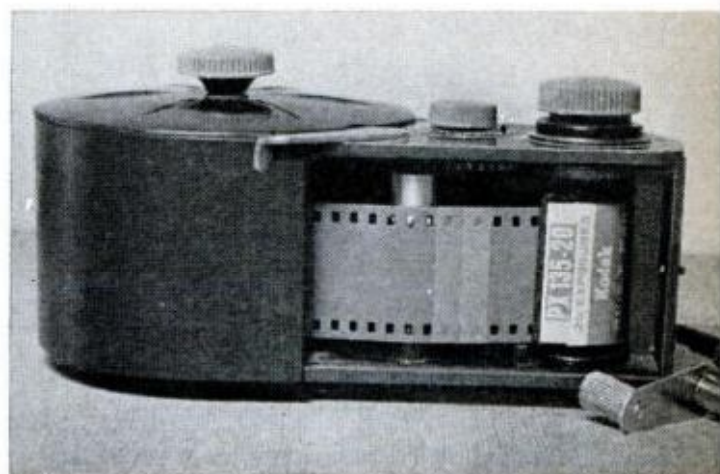
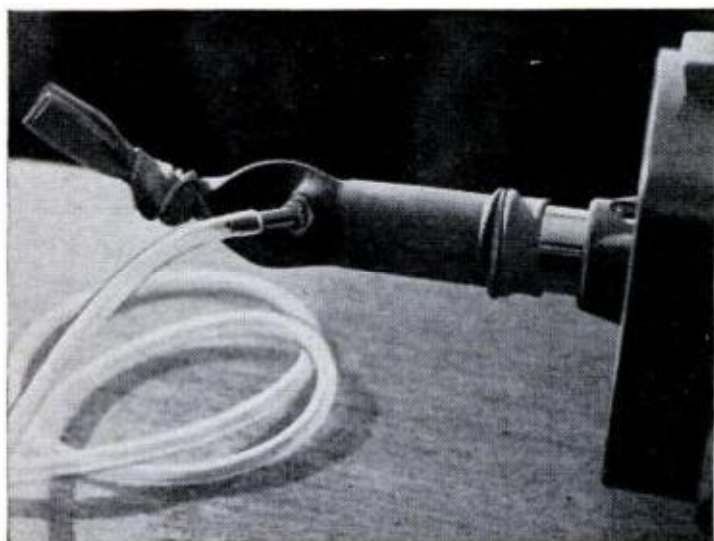
If desired, additional coats of the glaze can be applied to heavy traffic areas on floors and work counters. While each coat hardens in an hour or so, it's best to allow the final coat of glaze to harden for at least 12 hours. ★★★

PHOTO HINTS

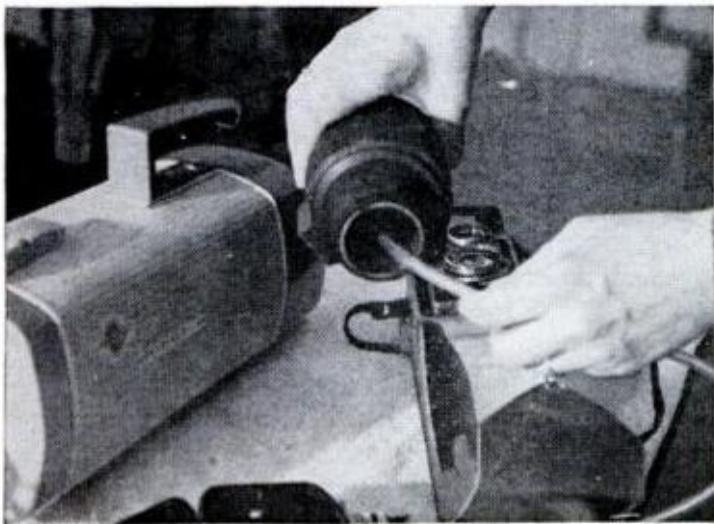


LEVELING A CAMERA is easier and more accurate if you carry a small spirit level in your gadget bag. If you're using a ball-and-socket tripod head, leveling is difficult since an adjustment in one direction tends to throw off the setting in the other direction.

The trick is to set up your tripod so one leg runs forward in line with the lens. Level the camera horizontally with the ball-and-socket, then set it vertical by adjusting the length of the forward-running leg until the bubble is centered.—*Michael Burn*



YOU CAN RELOAD used 35-mm. cartridges with this dodge. Instead of pulling the old film all the way out, cut it off leaving about an inch projecting beyond the cartridge's slot. Fasten the new film to this tab with clear plastic tape. Using a conventional loader, you can then wind the new film into the cartridge, as above.—*D. E. Anderson*



WANT TO MOUNT an odd-size lens in a ring, tube or lens board? A glue gun makes it easy to seal around a loose-fitting flange and eliminates the need for buying or machining special adapters. The quick-hardening molten plastic grips tightly and can be softened with heat whenever you want so the parts can be disassembled.—*Walter E. Burton*

A POWER BLOWER for cleaning delicate photographic equipment can be made with this simple attachment for a household vacuum cleaner. Cut the valve from a bicycle innertube, leaving about 8 in. of tube on either side of it. Tie a knot in one end and slip the other end over the vacuum cleaner's hose nozzle (top photo above). Attach a length of 1/4-in. tubing to the valve stem, turn on the cleaner, and you'll have a powerful jet of air for getting into hard-to-reach crevices.—*Rene Bachmann*



You, Too, Can Build a Fireplace

PART 2

Last month I showed you how to build the fireplace itself. Now all you have to do is add the chimney and it's completed

By **WAYNE C. LECKEY**, Home and Shop Editor
Technical Art by Graphic Presentations

THE REALLY HARD PART is behind you when you have the fireplace proper completed. Cutting through the ceiling and the roof, connecting the pipe sections and erecting the "brick-type" hous-

ing goes fairly fast, so before long you'll be having your first fireside chat.

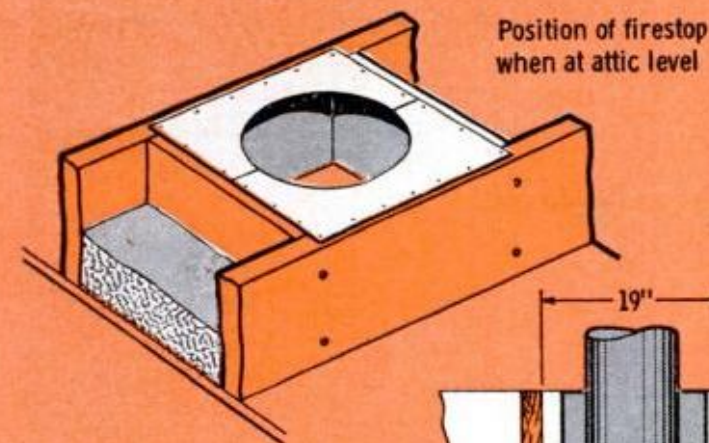
While I didn't stress the importance of starting out with the first section of pipe perfectly plumb in Part 1, it is something to watch. When it's the least bit out of plumb, you can wind up with a Leaning Tower of Pisa after connecting five or six sections. So make sure that the first section which locks to the top of the smoke dome stands perfectly straight before filling around it with concrete. I found I had to force mine in line a bit with a wooden brace after locking it to the dome.

Also, since I built my fireplace on a concrete-slab floor, I had to forget about an ash dump in the fire pit. However, where you may be building yours over a supporting pier of concrete blocks, you'll be able to mortar in place a regular ash dump in both the fire pit and a cleanout door in the supporting pier.

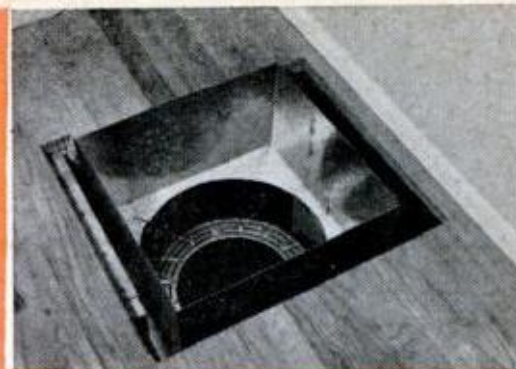
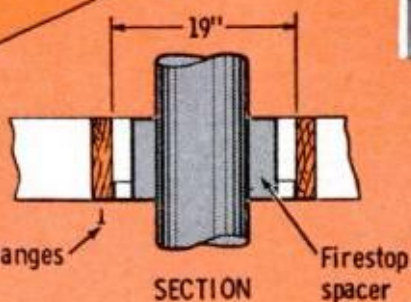
Now to continue building your fireplace: While the insulated, double-wall chimney sections do not get unduly hot, *they must not touch any wood* in passing through the floor and ceiling. (This is required by Underwriters' Laboratories.) Where the free-standing sections pass



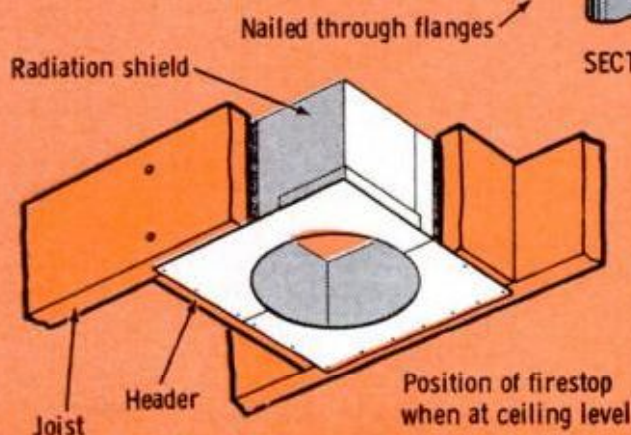
TWISTING MOTION locks pipe sections together as they're stacked. Here pipe passes through firestop



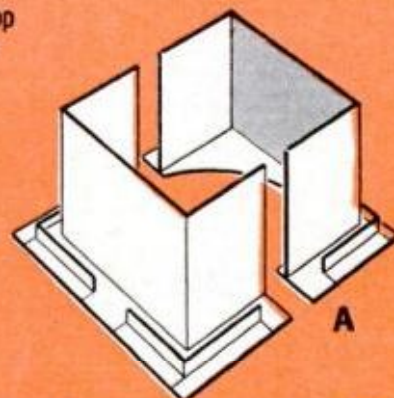
Position of firestop when at attic level



FIRESTOPS LINE HOLE where pipe passes through the floor and ceiling



Position of firestop when at ceiling level



INSTALLING FIRESTOP SPACER

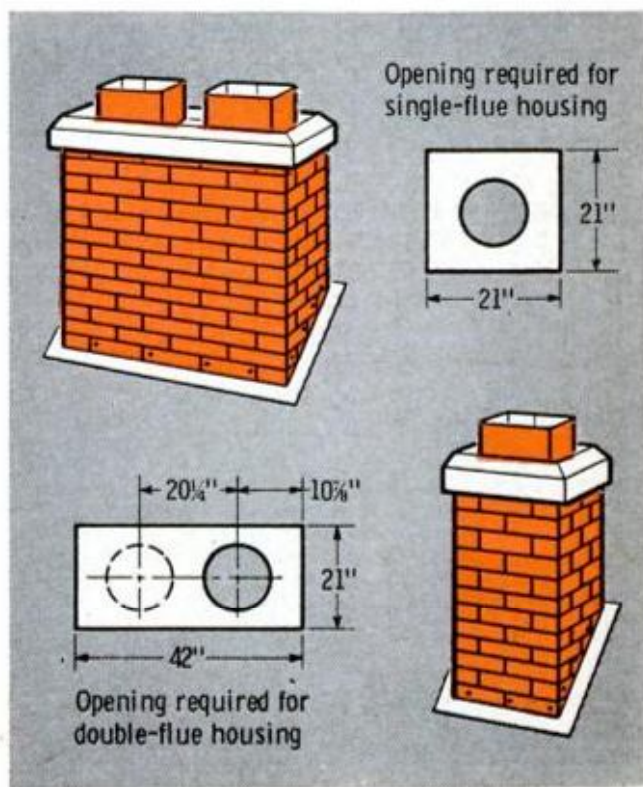
through joists, they must be separated by sheet-metal firestops which fit around the pipe. The firestops which come with the Vega Heatilator 534 are two-piece affairs that look like figure A, above, right. A flange around the edge lets you nail them in place. Note that the firestops are placed upside down when installed in the ceiling, and right side up when installed in the attic.

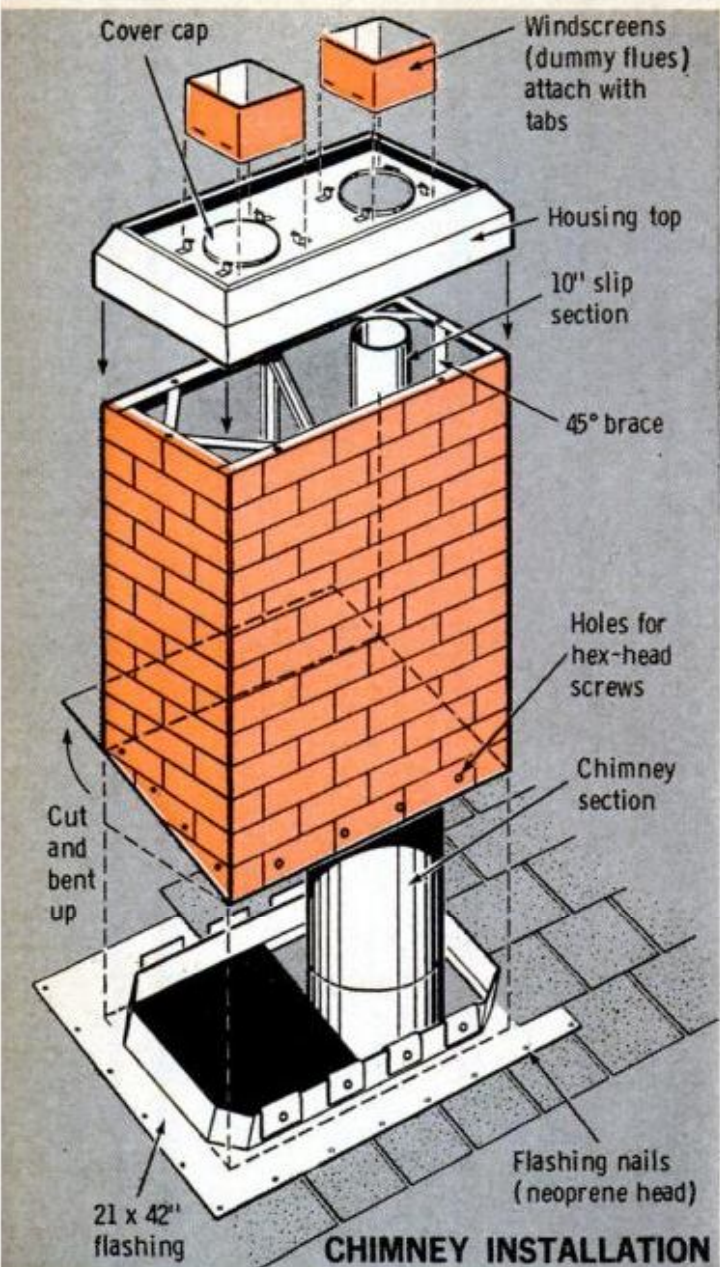
Each pipe section is locked to the other by seating it in its recessed end and giving it a quick twist clockwise. I went up about four 3-ft. sections and then used the stack to help spot the holes through the ceiling and roof. First, I held a straight-edge against the pipe and made a pencil mark where the straightedge touched the ceiling. I did this at four points around the pipe, then measured out 2 in. from each point, drew a 19-in. square on the ceiling and sawed through to the attic. Here you'll have to saw through a joist or two and install headers to box in the opening.

I spotted the opening in the roof the same way, making a pencil mark where the straightedge touched the roof boards. Then I drove a nail up through the shin-

gles at each pencil point. From the roof side I knew exactly where the pipe would come when more sections were added.

You have a choice of a single or double-flue chimney housing. I picked the





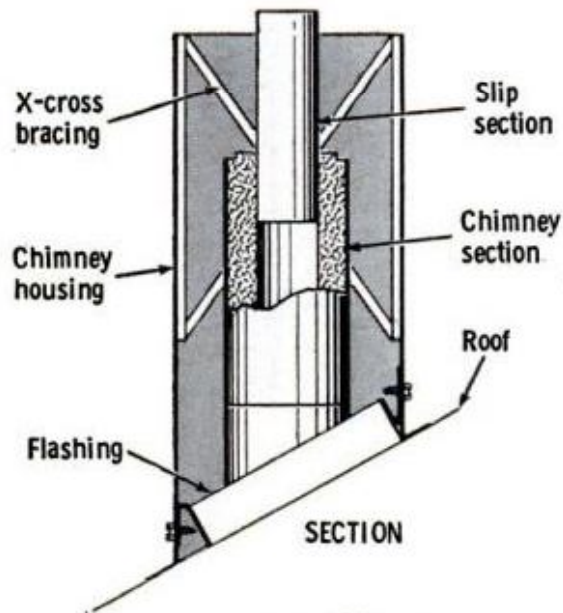
CHIMNEY INSTALLATION

FIREPLACE PART 2

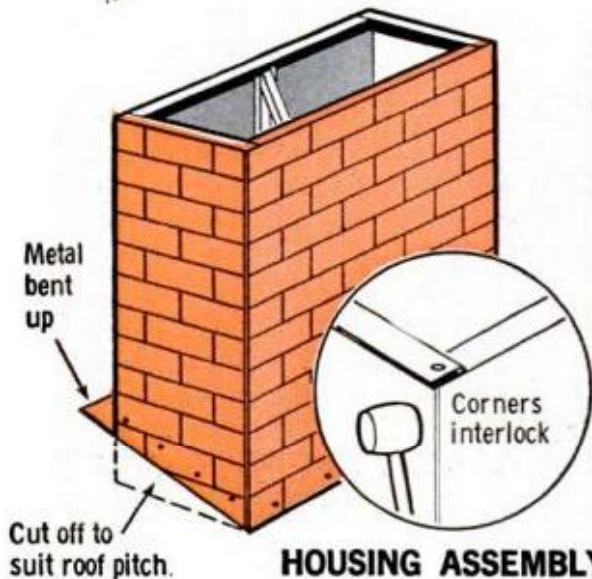
SHINGLES ARE REMOVED inside flashing and flange of the latter is slid up under the surrounding shingles



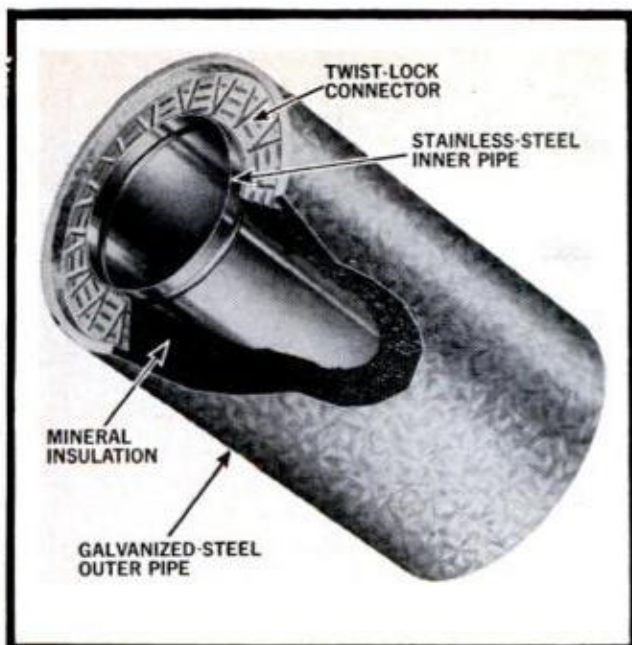
CAULKING IS APPLIED to shingles and flashing to make the chimney housing watertight at the roof line



SECTION



HOUSING ASSEMBLY



CUTAWAY VIEW shows how double-wall pipe is insulated. Note patented twist-lock connector at end

latter because it looks more like a fireplace chimney. Ordinarily, a double-flue housing is used where a second run of pipe from a furnace or second fireplace makes use of the same chimney. I, of course, used only one flue.

The chimney housing comes knocked down in four, flat metal sheets which snap together at the corners. But before this can be done, two opposite panels must first be cut to match the slope, or pitch, of your roof. You can determine the slope with a level held against a vertical stick.

SHEET-METAL CHIMNEY is hard to tell from masonry one. Brace is advised when 6-ft. housing is used



The degree of slope is transferred to the panels and the metal snapped off. The excess on the high-side panel is bent upward at a point even with the sloping sides. A board clamped to the panel will produce a neat straight bend. This up-turned end is covered later by shingles. Assemble the panels in pairs, then join the pairs to complete the enclosure.

To assemble the panels, roughly align the upper corners and press together. An audible snap indicates that the panels are locked. Rapping the corners sharply with a rubber mallet (or a wooden block and hammer) locks them securely. Four ½-in. bolts secure the top corners.

The housing is not only cross-braced at the corners, but also inside at the center to help make the metal enclosure rigid. The braces come with the housing.

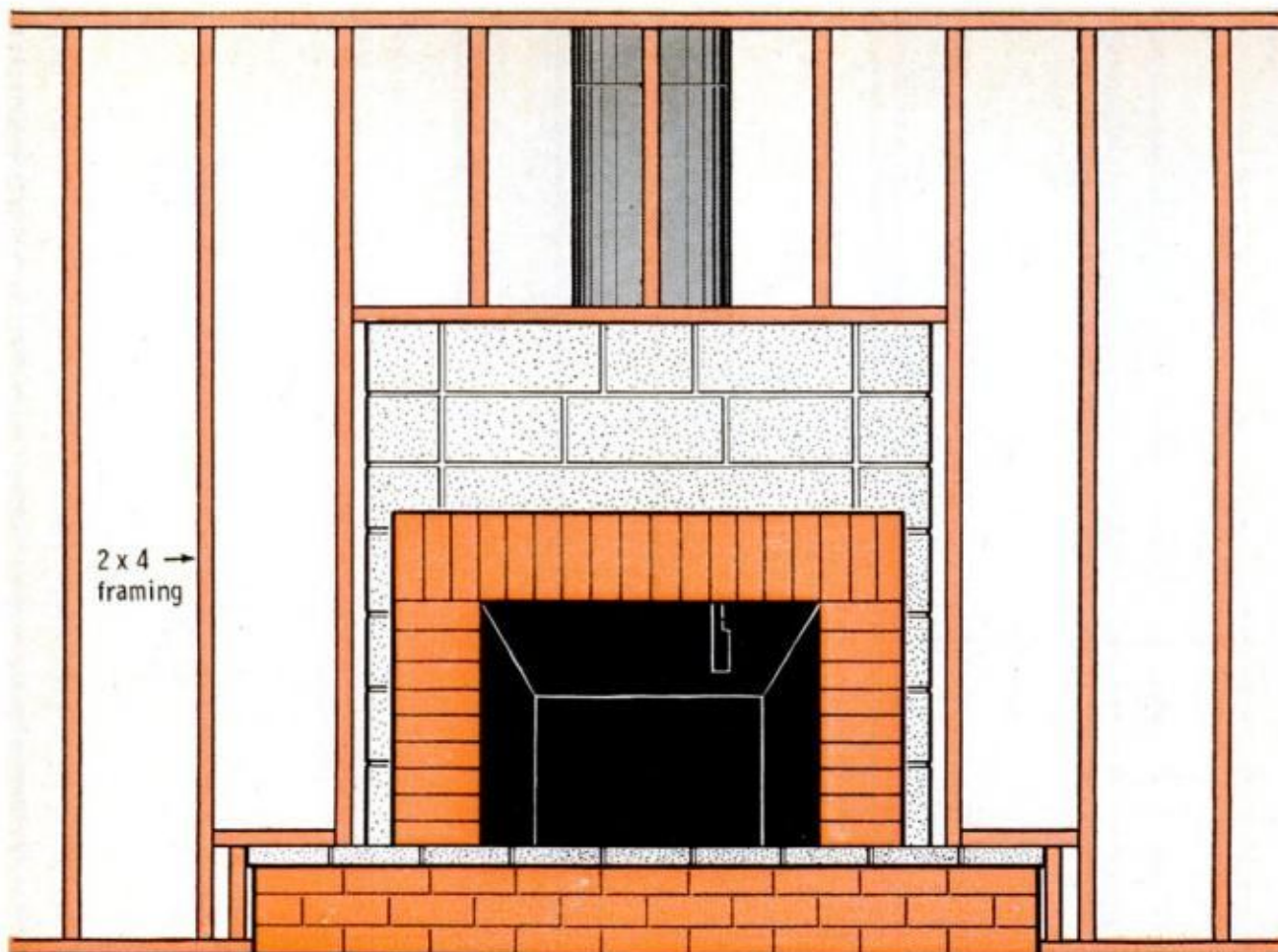
A one-piece galvanized flashing which has tabs along the high and low sides for holding sheet-metal screws, anchors the housing to the roof. Here I found that by standing the housing upside down and placing the flashing inside, it was less of a trick to drill holes through both the housing and the tabs for the screws. This way, I was able to apply a small C-clamp to hold the two together while drilling.

With the housing fully assembled and waiting on the ground, I went ahead and cut the hole in the roof. Since I was using only one flue, I cut a 21-in.-sq. hole.

My next job was to anchor the flashing to the roof. Three sides of it have to fit under the shingles, whereas the front has only to rest on top of them. To cut away the shingles I first drew the inside dimensions of the flashing on the shingles, mindful that the flashing must be positioned to one side of the hole in the roof. Then I cut along the outlines all the way to the roof boards with a sharp knife. I pulled loose the shingles inside the lines and carefully lifted up those outside the lines to remove the nails holding them. I was now able to slide the complete flashing up under the shingles to bring it in position over the hole. Once in place I nailed it to the roof with neoprene-head nails.

This done, I was ready to hoist the housing to the roof. I wrapped blankets around it to protect the "bricks," tied a rope to it and pulled it up the rails of a ladder which I had leaned against the roof.

If you're wrestling a 6-ft.-tall housing

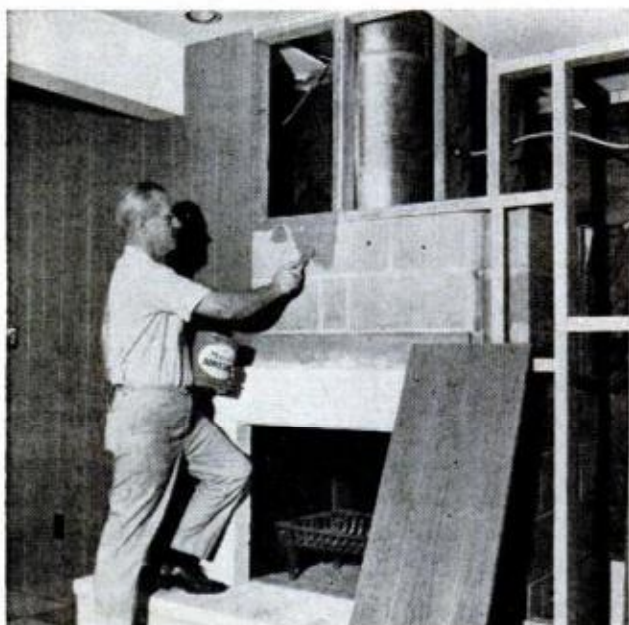


TYPICAL WALL FRAMING

alone, you won't want more than a 2-ft. stand of pipe projecting through the roof; otherwise it will be nigh impossible to lift the housing up over the pipe without help. With a 3-ft. housing you'll have no trouble handling it alone.

In either case, your pipe sections should

I USED MARSH ADHESIVE to bond the hardboard paneling. Here I'm spreading it on blocks. Coat only a panel at a time; don't work ahead with cement



end about 10 in. or so below the top of the housing. A second pipe, which slips inside the main flue pipe, is provided to continue the flue to the "cement-type" cap to which it is attached. With the housing resting over the rim of the flashing, drive the sheet-metal screws into the pre-drilled holes to fasten the two together.

Ten minutes work will now complete the chimney. This is about the time it takes to snap the "cement-type" cap to the top of the housing and to drive the three sheet-metal screws that attach the stainless-steel slip pipe. A pressed-steel cover caps the unused flue, while metal clips, spot-welded to the recessed top of the stone cap, let you attach "tile" flues to the top. Where the chimney is a full 6-ft. tall, it is well to brace it against strong winds with a length of steel angle.

How you finish the face of your fireplace is up to you. If you panel it as I did, you'll first have to erect a second wall in line with the concrete-block enclosure. Here, since I had picked Marlite random-plank paneling which comes 16 in. wide, I spaced the 2x4s the same amount so that each joint of the tongue-and-groove edges would fall on a stud. I



TAPPING PANEL WITH FIST after you have it in position assures a good bond. Work quickly as the mastic sets up fairly fast, with little time for shifting



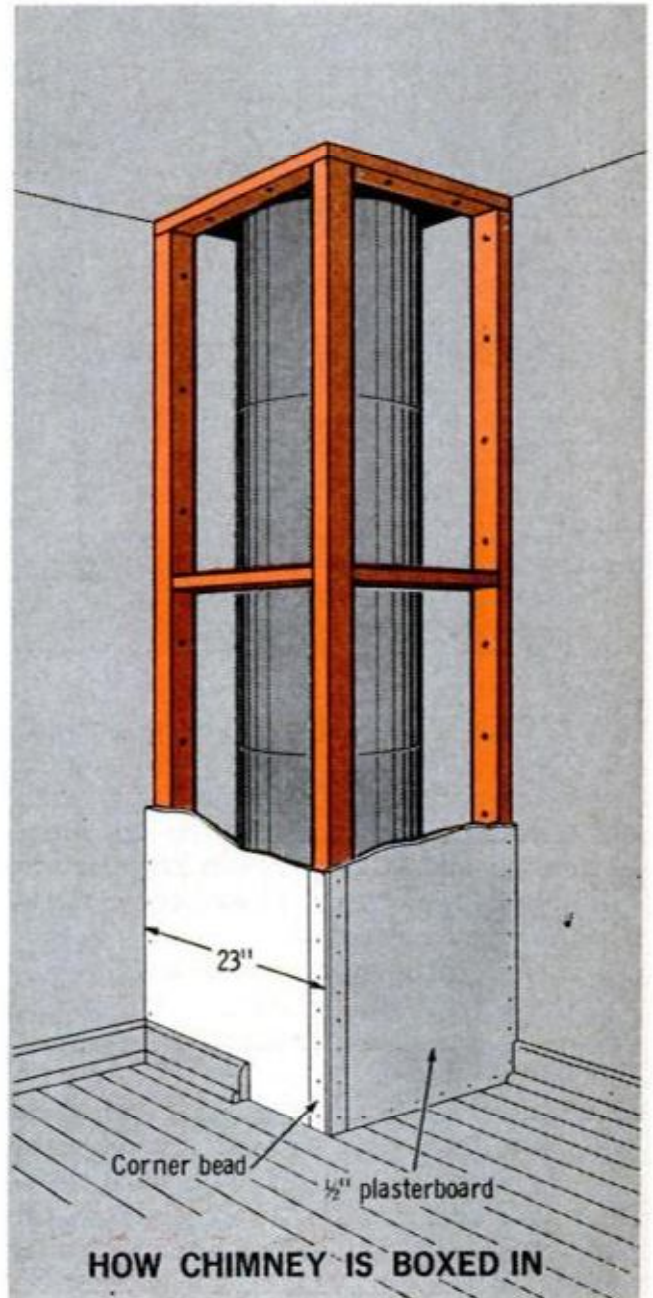
RUBBER GLOVES afford a nonslip grip in forcing slick-finish paneling in place. Avoid tight tongue-and-groove joints. Leave $\frac{1}{16}$ -in. space for expansion

preferred to use adhesive, rather than the nails and clips supplied, to fasten the paneling.

You can get the adhesive in convenient cartridge form for laying a bead down the studs, as well as in gallon cans for application with a putty knife or notched spreader. Minutes after the board is pressed in place and tapped with the fist or a wood block and hammer, it's stuck for keeps. Prior to starting the paneling I gave the brickwork and hearth a couple coats of white latex paint to contrast against the Italian cherry paneling.

Boxing around those chimney sections exposed in a corner of a room is done as shown in the cutaway drawing at the right. After 2x4 plates are spiked to the floor and ceiling, studs are cut to fit between them and then the studs are covered with plasterboard. Remember that there must be an airspace of 2 in. all around the pipe. Regular metal corner bead is nailed to the outside corner and then drywall joint compound, plus tape, is used to hide the joints where the plasterboard meets the walls and ceiling. Nail-heads are dimpled, filled and feathered out, as is the corner bead. Full instructions on how to apply and tape drywall are given in a booklet (No. H103) offered for 35 cents by *PM's* Bureau of Information.

If you enjoy your fireplace as I have, the work of installing it will be most rewarded when you sit in front of an open fire on a cold winter night. ★★★



HOW CHIMNEY IS BOXED IN



TIPS TO TUNING A WINNING SLOT CAR

WHILE WRINGING OUT the slot cars you gave the kids for Christmas, you no doubt asked "How can I get better performance?" One answer is to spend both time and money rewinding motors, building exotic chassis, or otherwise altering the cars drastically.

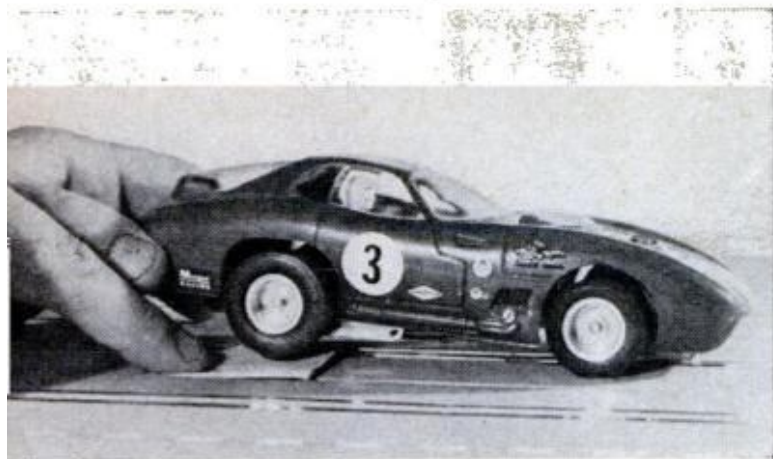
However, a far easier solution is to follow these eight simple steps that help you fine-tune standard cars into "super-stock" specials.

- Mount the tires as true as possible. Bond your tires to the wheels with a good grade of epoxy cement to keep them from shifting under acceleration. Then round off the tires by holding a piece of fine sandpaper under the spinning rear wheels of the car.

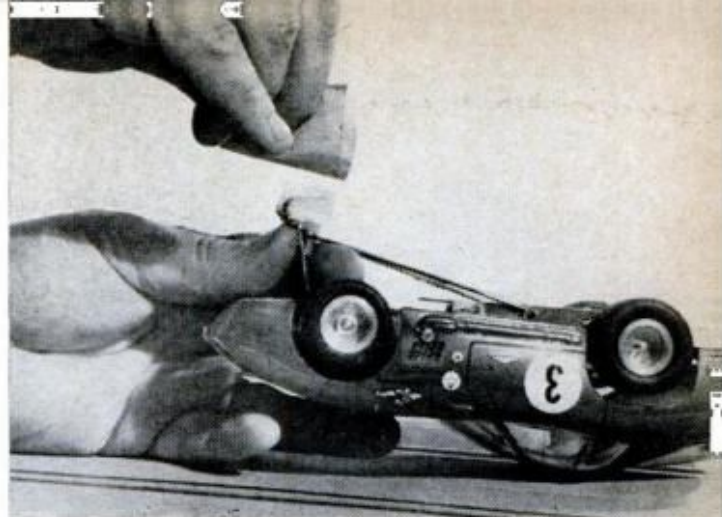
Perhaps the easiest way to connect the pickup terminals on the car to the power supply is to use a pair of wires with alligator clips. If none are available, however, you can still drive the rear wheels by tilting the car so the pickup shoe contacts the strips in the slot.

In either case, do not run the motor at full speed. With no load applied, the motor might develop enough centrifugal force to loosen the windings on the armature.

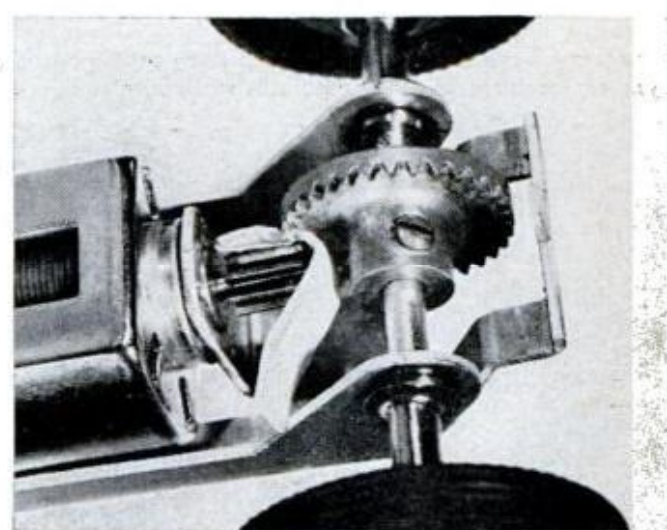
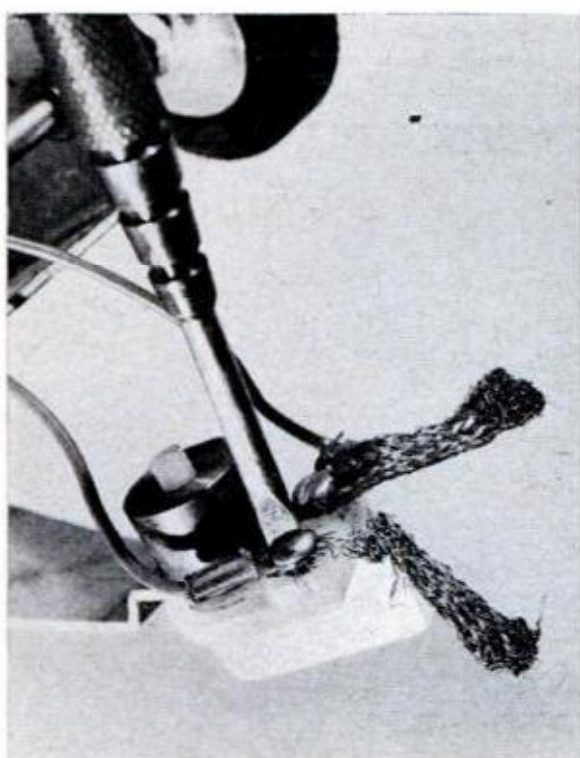
- Double check the pivot shoe. It must pivot freely and also fit into the slot without binding. To make certain that the blade on the shoe does not rub against the bottom of the slot, trim it down with a piece of fine sandpaper or a small file.



TIRES MUST BE PERFECTLY ROUND if skipping and hopping are to be avoided, especially on curved tracks. Fit the car in the slot, apply one-quarter to one-third power and lightly sand spinning wheels



PLASTIC GUIDE ON PICKUP SHOE should be sanded or filed if it drags along the bottom of the slot or it lifts the front wheels above the track. Either condition will seriously hamper performance of car



GEAR MESH IS IMPORTANT. Feed a double thickness of paper between gears as you hand-turn them. If paper won't turn with gears, loosen setscrew and readjust

PICKUP BRAIDS TAKE A BEATING. Never let yours become as worn as these, unless you don't mind losing. Check regularly; keep them free of oil, grease, dust

Also make certain that the bar or arm holding the pickup shoe is not bent—under no circumstances should either the arm or shoe raise the front wheels above the surface of the track.

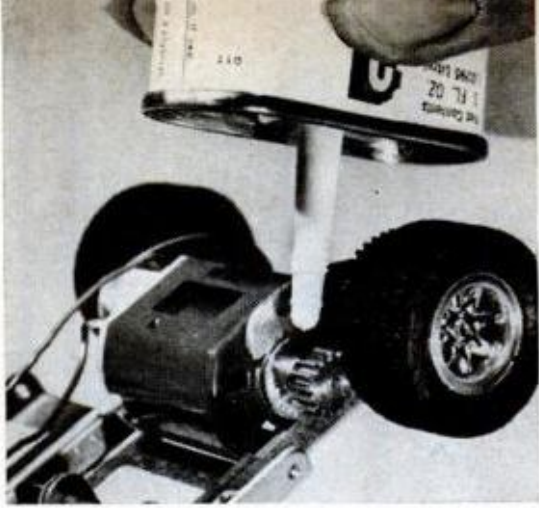
● The braids on the pickup shoe perform what is likely the most important function in any slot car. Without them, there exists no connection from the track or power supply to the motor in the car. Thus, it stands to reason that if the braids are worn, greasy or frayed excessively, the power carried to the motor is reduced proportionately.

Check the braids after every run, keep them free from dust and oil, and don't hesitate to change them when they appear

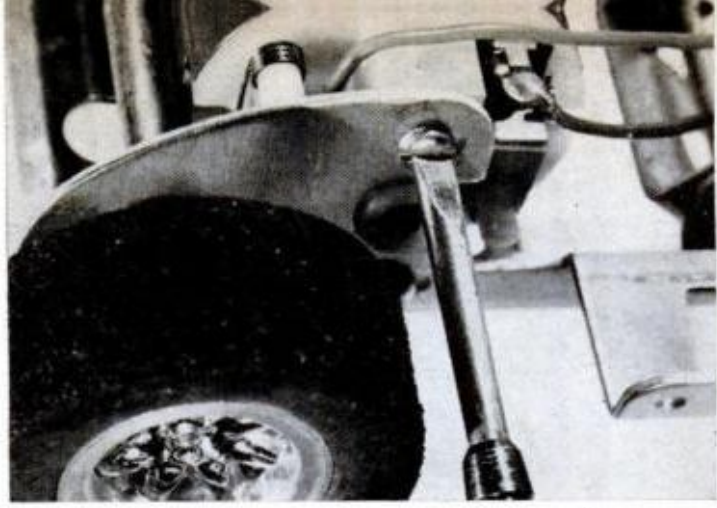
worn. *Never* allow them to become as worn as those shown in the photo above at left.

● To get the most from the gears, make sure they mesh properly and run slightly free. You should be able to feed a double-thickness of paper between the gears. If it's a new car, rotate the gears several times and check for high points that might create unnecessary drag. Then run the car for a half hour to break in the gear train and readjust the mesh of the gears.

If you find there are still some rough spots in the gear train, mix a paste of tooth powder and light machine oil. Apply a light coat of this mixture to the gear train and run it for about 10 minutes. Then



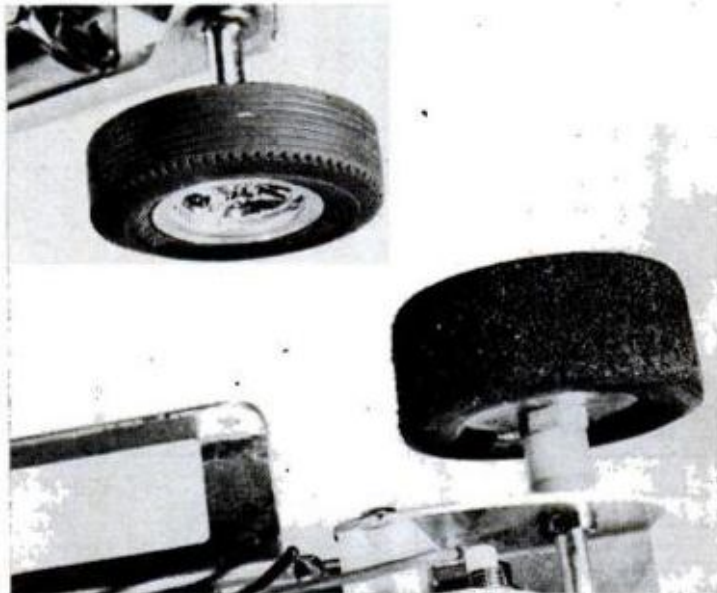
OVER-LUBRICATION MAY MEAN STOPS in the pits instead of the winner's circle. A few drops of oil are enough for entire car. And after every run, clean and relubricate car



CARS IN RACING TRIM are free of vibration due to misalignment, loose connections or other sloppy fits. Particular attention should be given to the amount of play in the axles and bushings. Motor mounting must be tight

BEFORE YOU ADJUST SPRING TENSION, remove the tiny brushes and check their length. They may have become worn or pitted and need replacement. If not, reassemble the motor

THE ONLY ITEM YOU MAY NEED TO BUY IS TIRES. In due course, the treads on the tires fitted on your car may become slick enough to warrant replacement. When this happens, try the wide-tread (and inexpensive) tires shown



clean the gears thoroughly and apply a light coat of lubricant to the drive train.

- Don't go overboard with lubrication. Oil only the axle bushings, the guide bar for the shoe at its swivel points and the motor shaft ends at the bearings.

Remember that oil-filled areas will collect dust and result in rapid wear of all parts. Thus, it's a good idea to clean the car thoroughly after each run.

- Make sure all parts are tight and properly aligned. The motor, for example, must be mounted securely to prevent performance losses due to vibration or misaligned gears.

- Tiny though they may be, the brushes in that high rpm motor play another important role. Brush tension should be high

enough to maintain the proper degree of contact at high rpm, yet the force should not be so great that the brushes become worn in a short time. However, before you change the spring tension, check the length of the brushes. They may have worn to the point where replacement and not adjustment is necessary.

- Experiment with different tires. Wide-tread tires, of course, offer substantially more "bite" and will help you get around curves and corners quickly. Changing the diameter of the tires may also work an improvement. In effect, this produces a fractional change in the gear ratio. The smaller the tires, the higher the ratio—a slight change, but perhaps enough to make your slot car a consistent winner. ★★★

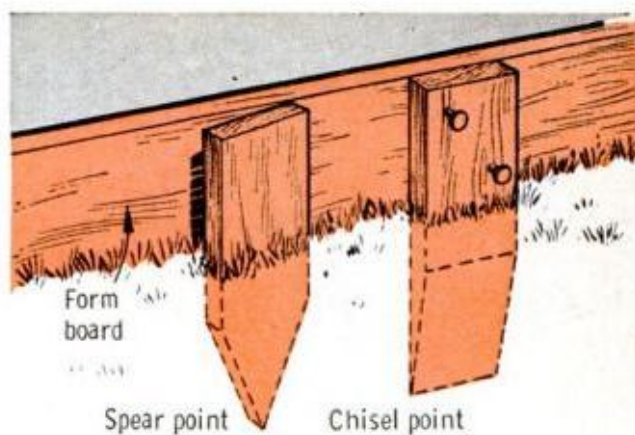
HINTS

FROM READERS

Form stakes won't twist

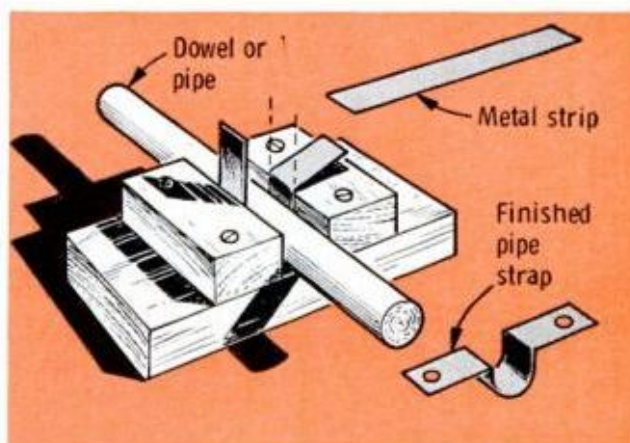
Next time you're staking form boards for a walk or driveway, remember this stunt. Instead of pointing the stakes in the usual manner, cut them chisel shape. You'll find they won't twist like a pointed stake when driven in place, and will hug the sides of the forms to keep them running straight and parallel.

—G. E. Hendrickson



Banding makes neat pipe straps

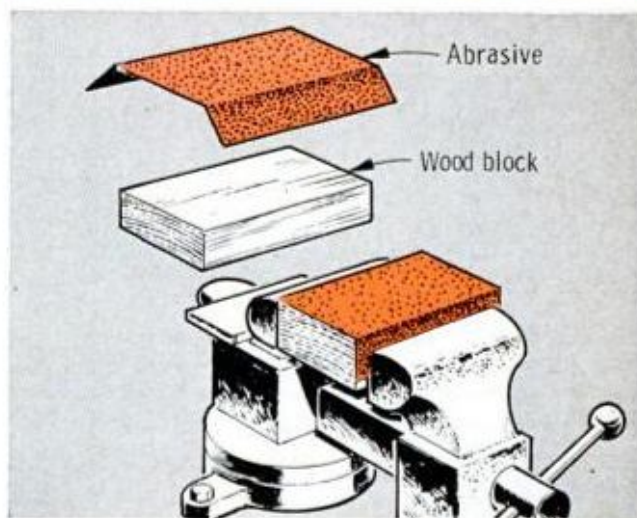
You can mass produce neatly formed pipe straps in jig-time with this block-and-dowel press and they won't cost you a cent if you use metal strapping from cartons. To form a strap, merely center a 4-in. strip over the slot, press down on the dowel and bend the ends down flat. Width of the slot should be twice the thickness of the metal plus the diameter of the dowel for a really neat bend.—William G. Wrenn



Let vise hold the paper

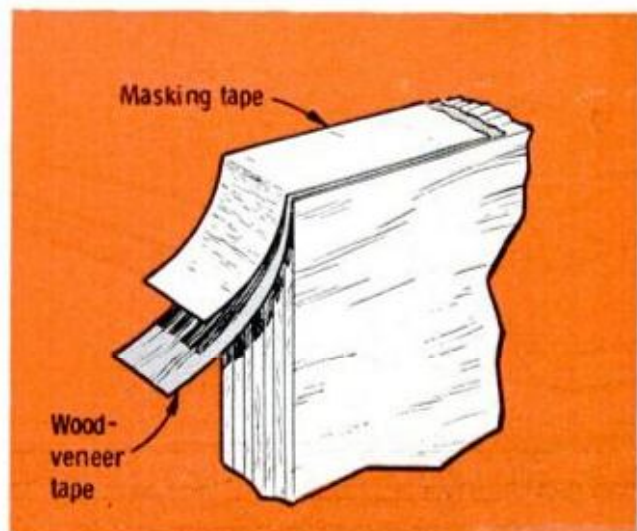
It's silly to tack the abrasive paper to a sanding block when you're going to clamp it in a vise. Simply fold the paper sharply over the edges of the block and let the vise jaws hold it. When the paper has to be renewed, you won't be wasting time removing tacks; the paper will come free as soon as you untighten the vise. This idea is especially handy when switching from one grade of paper to another while hand-sanding small parts to an extra-fine finish.

—Henry E. Johnson

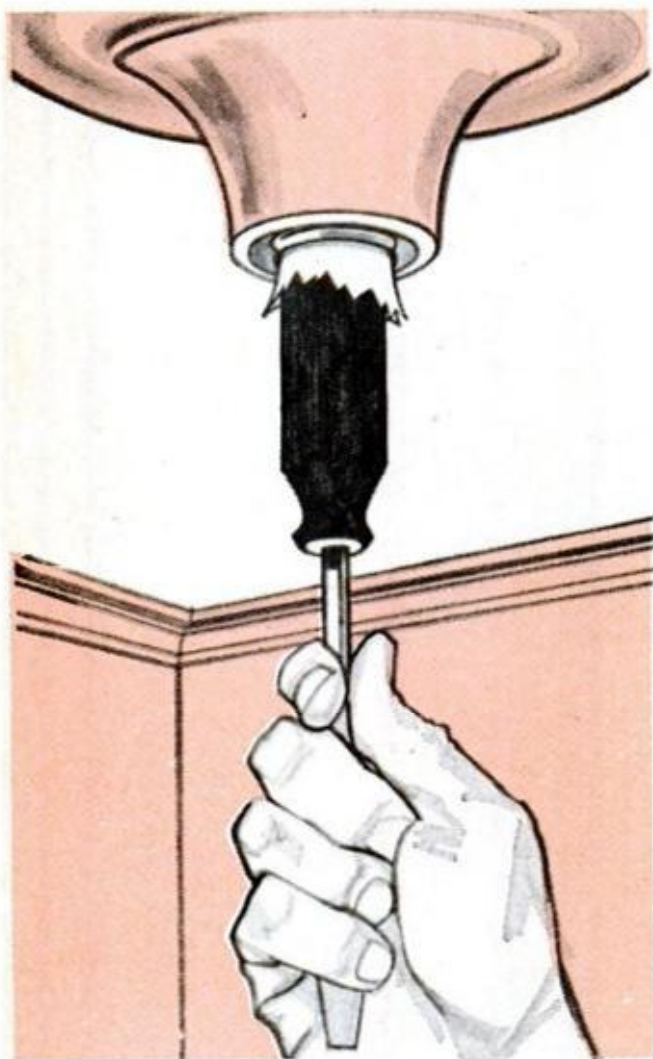


Tape backing prevents cracking

When applying wood tape to the edges of plywood, I found that the material would crack if it was bent around sharp corners. After trying several ways to prevent this, I hit upon the idea of reinforcing the wood tape with masking tape before coating it with quick-setting contact cement. The tape facing did the trick nicely and made it easy to bend the thin veneer perfectly. Once the wood tape was stuck in place, I simply peeled off the masking tape.



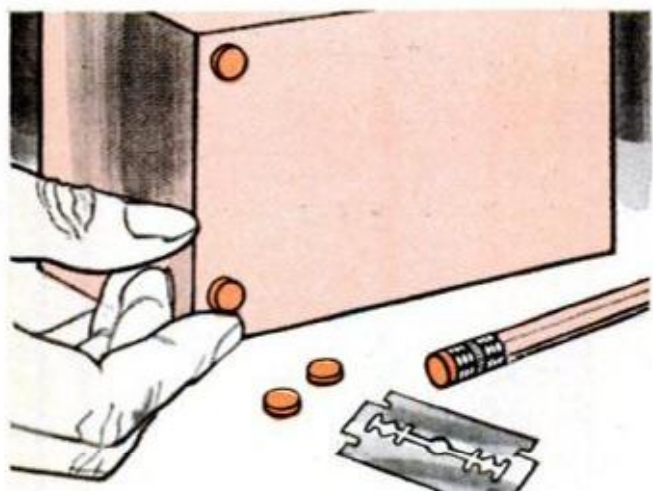
Solving home problems



SAFEST WAY to remove the base of a broken light bulb from its socket is to back it out with a rubber-handled screwdriver. Simply press the handle against the base of the bulb and turn it out of the socket



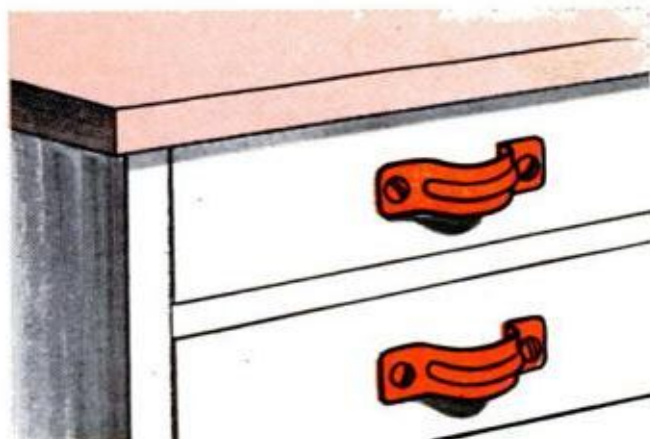
WHEN REPLACING a hammer handle, coat the inside of the eye and the end of the handle with white glue, then drive the handle into head and remove projecting end with a hacksaw. Wedge is seldom needed



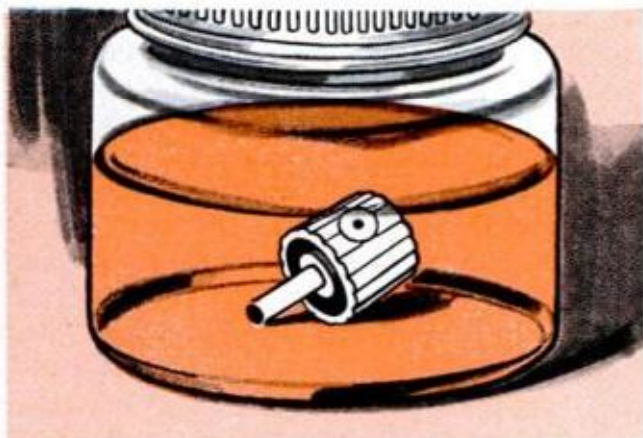
RUBBER DISCS sliced from pencil erasers and glued to the bottom of a clock, ashtray or similar article will not only act as vibration dampers but protect your furniture finishes from accidental scratches



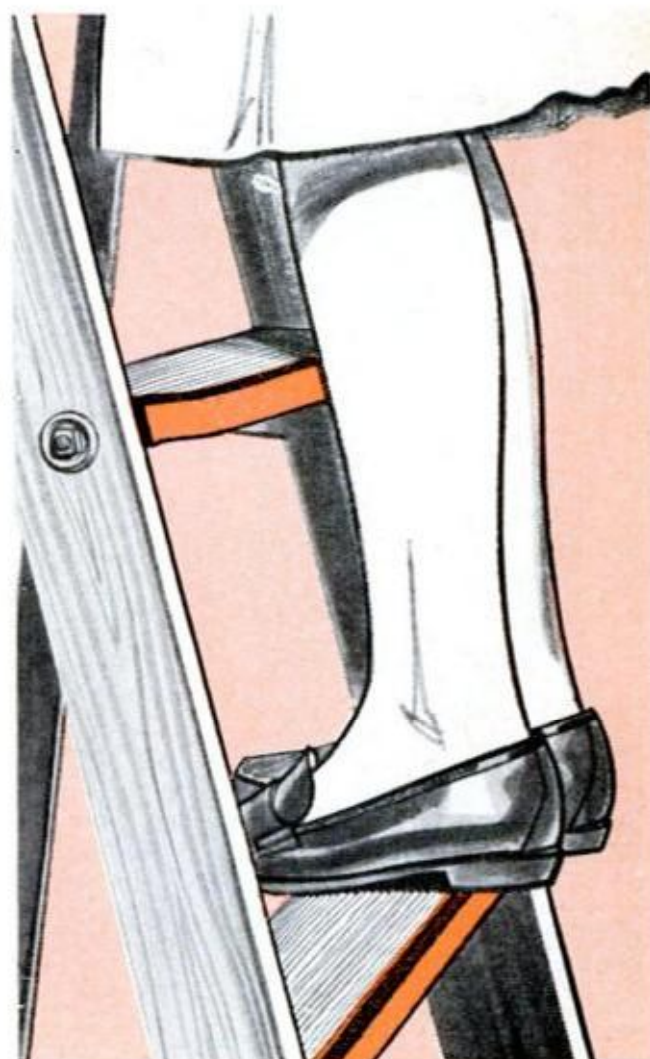
FILE SPINDLE which mounts almost anywhere and can be removed easily is just a magnetic cup hook which has been straightened so as to project slightly beyond vertical. Use a file or grinder to sharpen tip



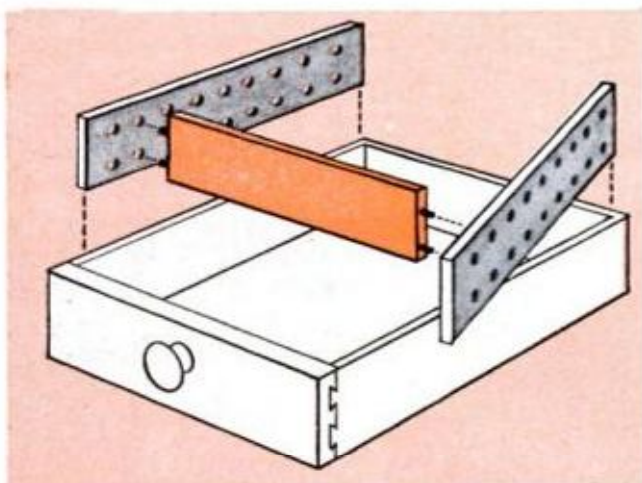
LOW-COST DRAWER PULLS for use in the shop can be improvised from the clamps designed to hold steel water pipe. When painted with bright-colored enamel, they are handsome enough to use almost anywhere



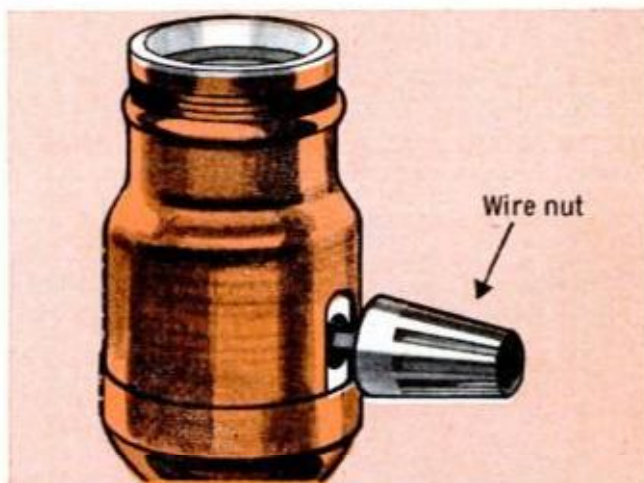
TO PREVENT CLOGGING in the nozzle of a spray can of lacquer or paint, pull the nozzle off after each job and drop it into a small jar of lacquer or paint thinner. Stored this way, it will always spray like new



EDGE CUSHIONS of weatherstripping tacked to the front of each step of your stepladder will not only protect your shins but prevent your wife from getting a run in her stocking from tiny wood splinters



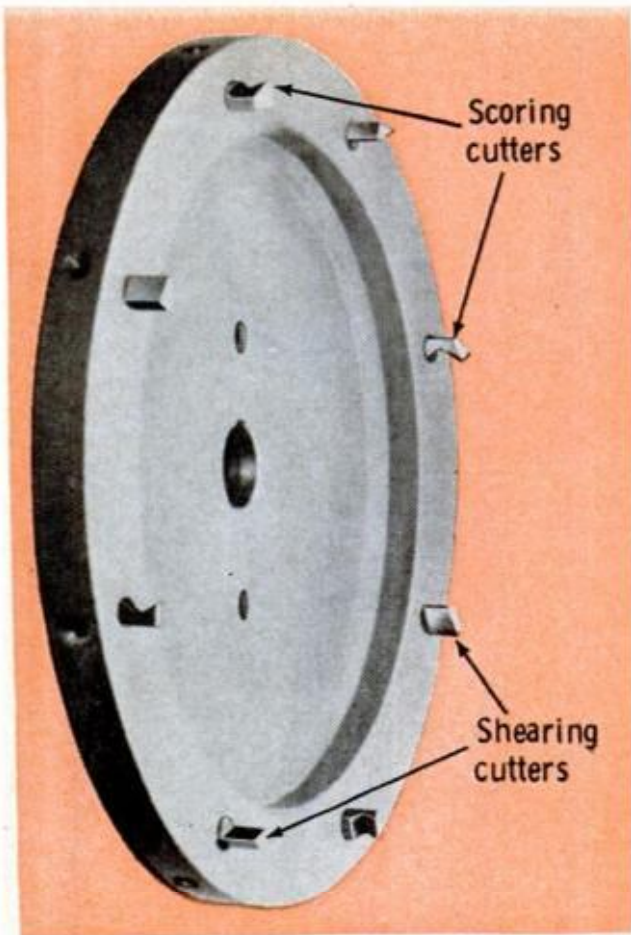
DRAWER DIVIDERS which can be moved easily are made from 1/4-in. lumber with a pair of projecting brads in either end. Strips of 1/4-in. hardboard cut to length and depth of the drawer hold them in place



GOOD SUBSTITUTE for the switch knob on a table or pole lamp is a wire nut. The conical thread will hold the 2-56 thread of the switch shaft, and it's perfectly safe since the nut is a good insulator

Rockwell's rotary planer is a whiz

By WAYNE C. LECKEY



DYNAMICALLY BALANCED CUTTERHEAD of heavy cast iron provides flywheel action for smooth cutting



PIECES AS SMALL AS A MATCHSTICK and as large as a 6x6 can be dressed smoothly with utmost safety

WHEN I FIRST SAW IT, it looked like a slicing machine for a sandwich shop. But once I tried it, I knew that Rockwell's brand-new rotary planer was far from baloney. Here was just about the slickest machine for jointing and surfacing that's come along in many a day.

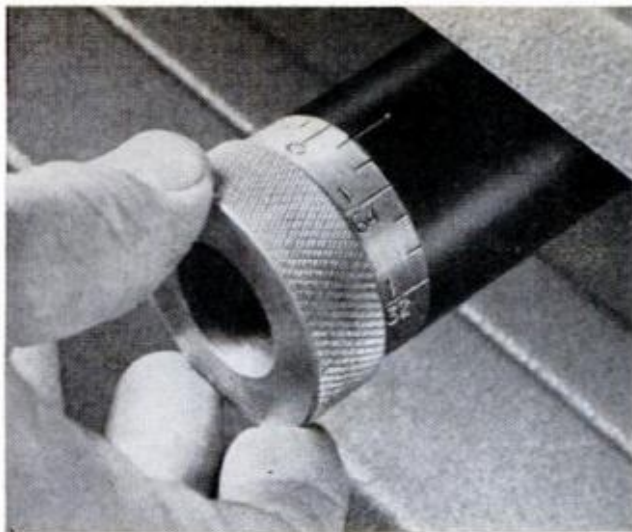
It's called a Uniplane and it works something like a disc sander, only instead of being faced with an abrasive, the flywheel cutterhead has two sets of four, razor-sharp cutters spaced equidistantly around its rim.

To me the real test of any surfacing and jointing machine is its ability to plane end grain. If it will plane end grain, it certainly will plane surface grain.

In putting the new machine through its paces, I asked for a maple 4x4. It took two passes to dress off the rough-cut end, but the amazing thing to me was how the cutters walked through the tough end grain as if it was butter. There was no kickback, no chattering. With the cutterhead making

PERFECT-FITTING MITERS, both plain and compound, can be made by tilting table and using miter gauge





DEPTH OF CUT is controlled by knurled dial which is calibrated in 64ths of an inch for accurate settings

some 32,000 cuts per minute, the end of the 4x4 became as smooth as glass.

Here's the secret: The two sets of cutters, which look like stubby router bits, are interspaced around the disc and rotate in a path only $\frac{3}{8}$ in. wide. Four of the eight high-speed steel cutters stick out .002 in. past the others. The cutter that enters the work first makes a scoring cut, while the one that follows makes a shearing cut.

Just how safe is this machine to use? A hot-dog "finger" was moved past the cutters. It demonstrated that the operator could get no more than a nicked finger because there are no cutters past the rim of the spinning disc.

But there's really little chance of getting cut. A self-actuated, see-through guard leaves only the work exposed.

As for the cutters themselves, they can't fly out; they're locked in place with special screws. Yet when the cutters must be removed and resharpened, a foolproof gauge

(Please turn to page 219)

TENONS ON DOWELS are quickly "turned" by rotating work against face of miter gauge clamped to table



JANUARY 1968



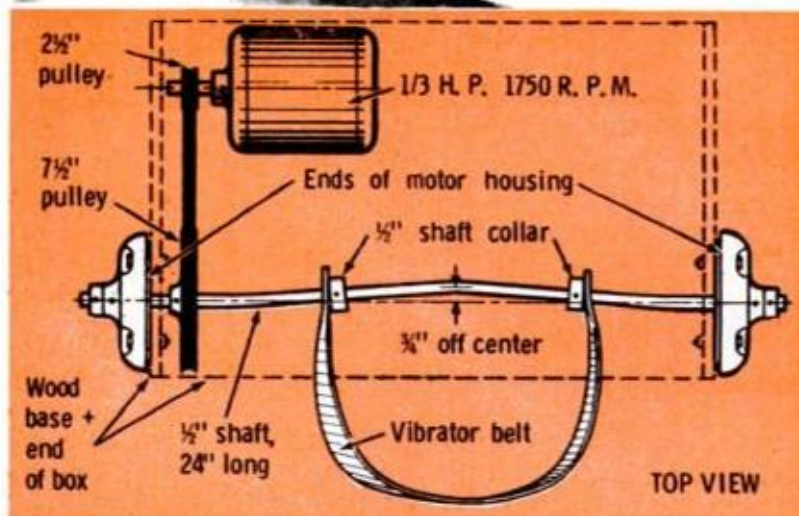
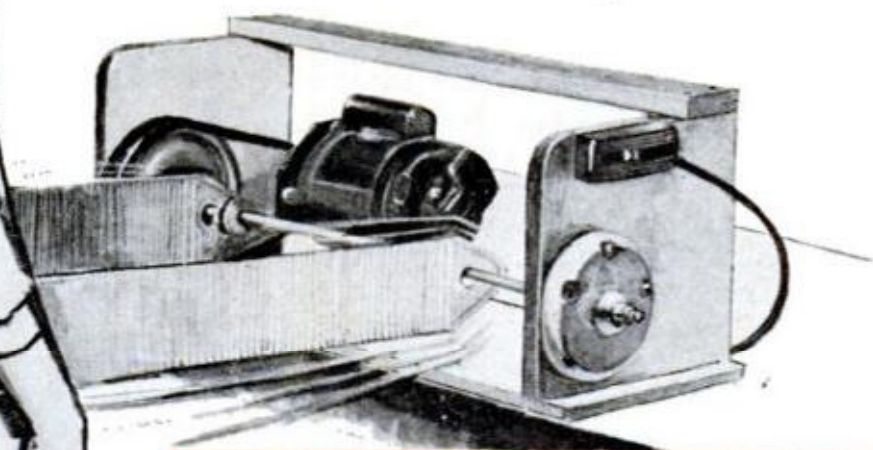
HIGH-SPEED SHEARING ACTION smooths end grain as if it were surface grain—real test for a planer. Clear-plastic guard shields cutters; you can see work

ABSENCE OF KICKBACK makes it safe to flatten the sides of round stock in wood, plastics, compositions



185

Keep trim with this 'poor man's' massager



IF YOU HAPPEN TO HAVE an old washing-machine motor sitting around, you can build this efficient massager for practically nothing. The $\frac{1}{2}$ -in. shaft, collars, pulleys and V-belt will cost under \$5, while the bell ends of a junked motor, which serve as the main bearings, won't cost a cent. Replacement belts for commercial vibrator machines run from \$4 to \$7.

Three offset bends make the shaft work like a crankshaft to provide the massaging action. Sliding collars on the shaft let you regulate the stroke and action of the mas-

saging belt by moving them closer or farther apart, as desired.

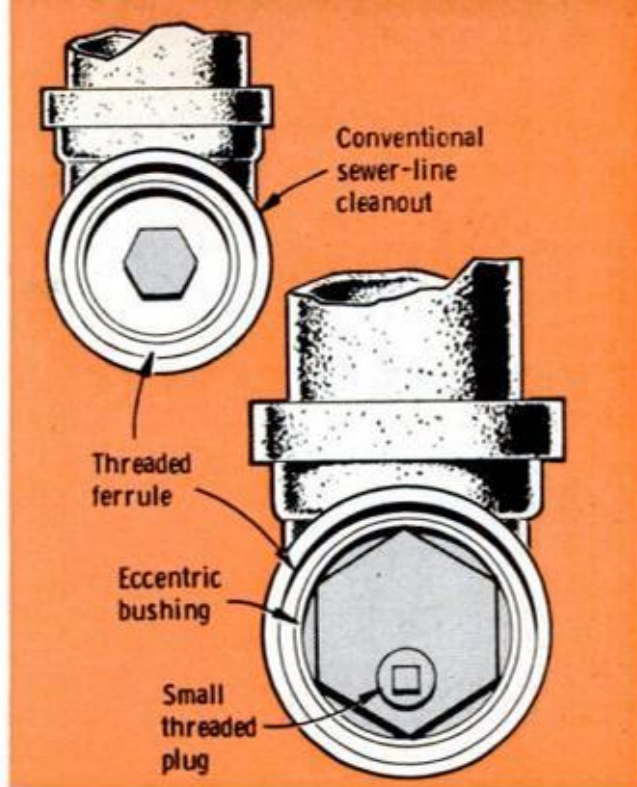
The slight bends at the ends of the shaft can be made cold by clamping the shaft in a vise and using a piece of pipe for leverage. Remember that the belt collars have to be in place before making the bends. Likewise, the shaft (with pulley attached) has to be placed between the wooden end supports before the latter can be anchored to a wooden base and sturdy table. Collars keep the shaft in place in the motor end caps.—*Donald V. Haught*

HINTS

FROM READERS

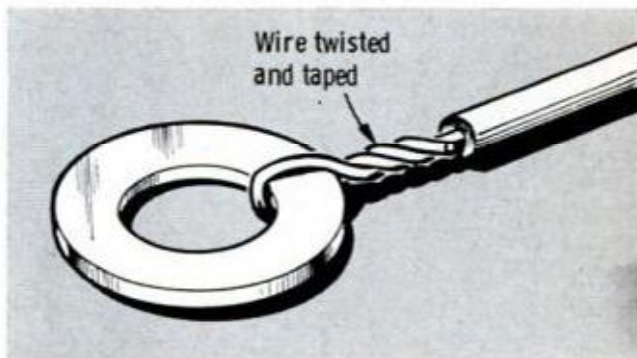
Cleaning sewer lines

The large threaded plugs that are placed along sewer lines to facilitate the clearing of a stoppage have one serious drawback—remove them and a gush of water will pour out, probably all over the floor. To overcome this disadvantage, install an eccentric drainage bushing in place of the large threaded plug. Then use a smaller plug to seal the small threaded opening in the bushing. Thus when the line becomes clogged, you simply remove the small plug to drain water and then remove the bushing to feed a wire or snake into the line to clear the stoppage.—*Thomas Trail*



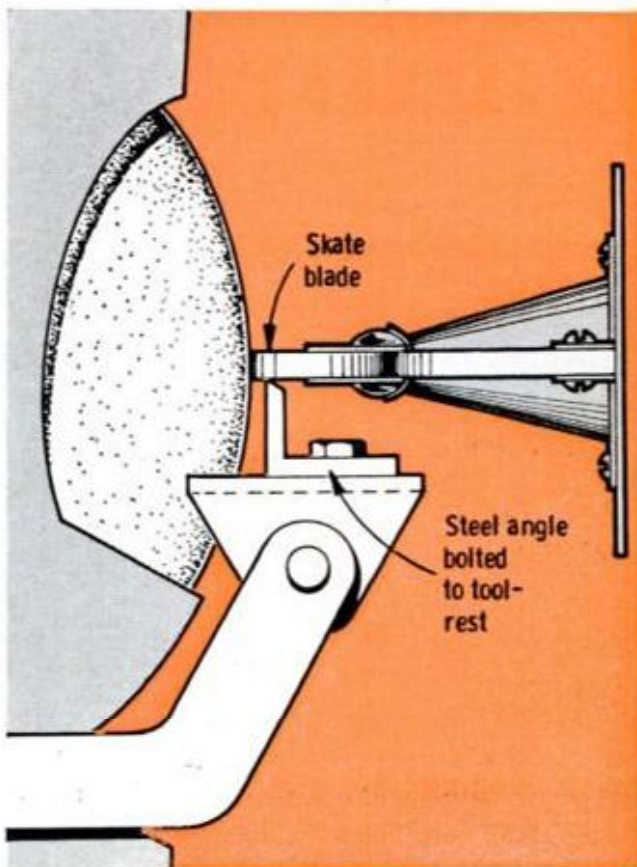
Washer makes wire terminal

If ever you should find that you need an emergency wire terminal, try this neat trick. Strip the insulation from the end of the wire, then twist it around the wall of a metal washer of convenient size. Make sure it's tight enough not to slide, and tape the exposed wire.—*Michael Zuroy*



Angle jig for grinding ice skates

To grind skates properly on a bench grinder, it's necessary to draw the blade squarely across the face of the wheel, and in line with the center axis of the wheel. For this reason, a narrow toolrest to accommodate only the metal blade must be used. Such a rest is shown at the right and consists of a section of steel angle bolted to the rest on the grinder. After grinding, remove any rough edges by using a fine stone.—*Frank L. Rush*



"Bottle" bumpers for small craft

Empty plastic containers of the sort used to hold laundry bleaches also can be made to serve as emergency dockside bumpers for small craft. Just fill the bottles about halfway with water and cap them tightly. The captive air acts as a cushion, while the built-in handles provide an easy way to tie the bottles to the craft.—*Hi Sibley*

How to refinish hardwood floors

By JAMES P. SCHENLEY

THERE ARE THREE REASONS why you should take on the job of refinishing your own hardwood floors. First, it's easy; second, you have the satisfaction of doing a first-rate job; third and most important, you save quite a bit of money.

My master bedroom is a good example of how much you can save. By doing it myself with rented equipment, it cost me only \$15, including sandpaper and finishing materials. The same job done by a professional would have cost \$45.

Now that you've decided to start on that dingy living room floor, consult the yellow pages of the phone book (under "tools, renting" or "hardware") and arrange to rent a drum sander, a hand-held edging machine and enough sandpaper for both.

RENTED EQUIPMENT includes a drum sander, shown below, and three grits of sandpaper (3½, 1½, 2/0). Also rented, but not shown, is small edging sander



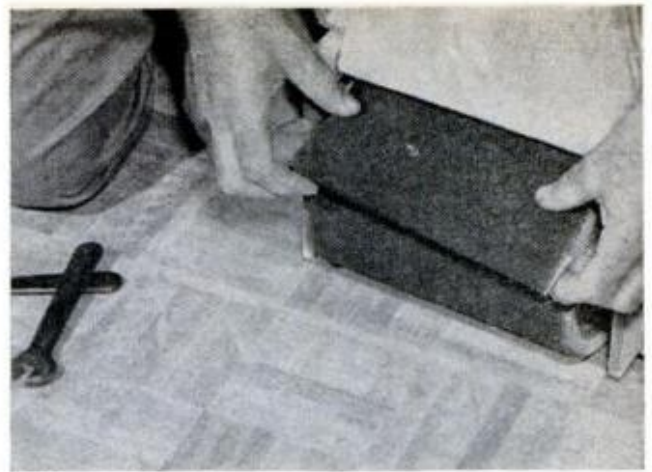
MOST IMPORTANT THING in using a drum sander is to keep it moving and to lift drum before you stop

Before picking up the sanders, remove all furniture from the room and then carefully inspect the floor for protruding nailheads and unsightly cracks. Countersink the nails, then fill the holes and the cracks with wood putty. After the filler has dried walk over the floor and locate any squeaky boards. These usually can be silenced by driving 2-in. finishing nails into the ends of the boards at an angle of about 45°. Countersink the nails, fill the holes with wood putty and let it dry while you pick up the sanders.

Begin the sanding operation by fitting the drum sander with a No. 3½ (20-grit)



PATCH ROUGH SPOTS before beginning job. Fill all cracks with wood putty, then locate squeaky boards and nail them tight. Countersink nails and fill holes



PULL SANDPAPER TIGHT around drum and slip end into groove in drum. Add paper shims if sandpaper seems loose after the drum is tightened with wrench

coarse sandpaper. Start at one wall and walk slowly, in the direction of the grain, to the opposite wall. *Then walk backwards so the machine passes over the same path.* Continue in this manner, making certain that each pass overlaps the previous pass by 2 to 3 in. (In this position, you won't be able to sand the floor close to the starting wall. Later, however, you can turn the machine around and do this area.)

It's also important to keep the machine moving. If you stop the sander while the drum is in contact with the floor, cuts, gouges and scratches will be seen in the floor later.

Most drum sanders are equipped with a lever to raise and lower the drum. If yours doesn't have a lever, tilt the ma-

chine toward you to raise the drum off the floor before stopping.

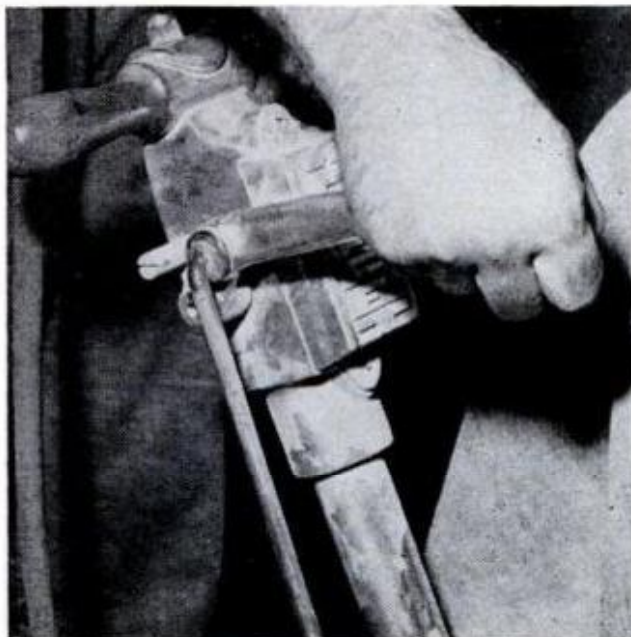
Parquet floors can be sanded in the same manner. However, since you can't sand them with the grain of the wood, use a finer sandpaper, such as grade 2½ or 3, to minimize scratching.

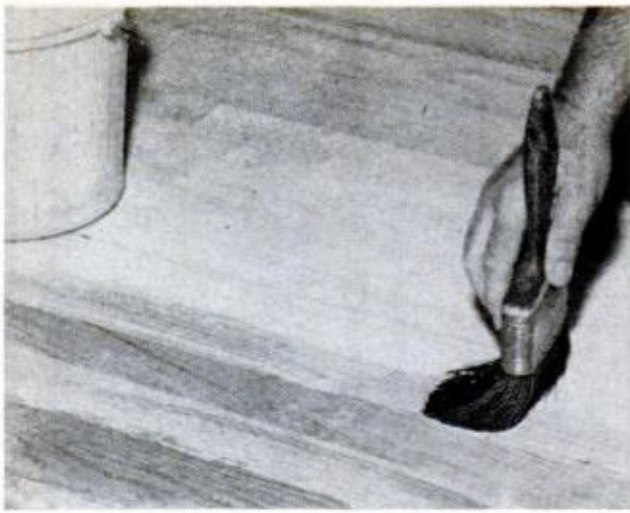
After the main section of the floor has been sanded, fit the edger with the same grit paper used in the drum sander and work the edger slowly along the unsanded edges. Use light pressure and, if possible, follow the direction of the grain.

There remain only those unsanded spots that the drum machine and edger can't get at—like corners and the areas around radiators. For these, use a hand floor-scraper and plenty of muscle. A varnish

KEEP THE SANDER MOVING. When it becomes necessary to stop, raise lever to lift drum above floor surface. Alternative is to tilt the sander back

PORTABLE EDGE SANDER will do a neat job right up to wall line. Spots inaccessible to either drum or edge sanders must be scraped and sanded by hand





APPLY FINISH AS SOON AS POSSIBLE. Otherwise moisture soaks into wood pores, forming white spots. Penetrating finish is applied with brush or roller

remover isn't recommended—it's messy and you wind up hand-sanding the floor anyway.

The floor is now ready for a second sanding with the drum machine. This time, fit the drum with No. 1½ (40-grit) paper and sand the main section of the floor as before. Similarly, fit the edger with No. 1½ paper and again sand all edges.

At this point, don't make the common mistake of thinking that the floor is ready for a finish. A third sanding is essential if a perfectly smooth surface is to be obtained. (The difference that this final sanding will make can be seen in the photo above at right).

The final sanding should be done with 2/0 (100-grit) fine paper. Follow the same sanding pattern as before and complete the operation with the edger.

Return the sanding machines to the rental shop while your wife and children wipe off the windows, door ledges and other molding with a damp cloth. Ask them to vacuum the floor thoroughly, and after you return, take the time to vacuum once more. Remember, *any* dust in the wet finish will ruin an otherwise careful and professional job.

There are two ways you can finish the floor: You can leave it a natural, grainy color, or you can choose to darken it.

If you decide on the latter, an oil stain must be applied according to the manufacturer's instructions. Allow it to dry overnight and then rub it down with clean cloths before applying the finish.

The finish must be applied as soon as possible because any delay allows moisture to penetrate into the pores of bare



REASON FOR THE THIRD SANDING becomes quite evident in this photo. Section at right was sanded only twice, while section at left had third sanding

wood. In that case, white spots may develop, or the finish may chip, peel and wear quickly.

There are four basic types of floor finishes from which you can select: shellac, varnish, penetrating floor sealer and synthetic resin varnish.

The properties of shellac and varnish are well known—chances are your present finish is one of these (probably shellac). Shellac is fast-drying, easy to use and wears well if waxed regularly and kept free from excessive moisture. Varnish dries slower than shellac and will scratch unless protected by wax; however, it has better water-resistance and gloss.

The penetrating floor sealers also are good all-around finishes for floors. An added advantage is a somewhat simplified application procedure, because these finishes penetrate deep into the pores of the wood. Thus, they don't require the use of a separate paste wood filler, as do shellac and varnish.

Synthetic resin varnish is a very durable finish that's often used for floors in gyms and industrial plants. You have to compare its value against its cost, however, because it usually is priced about \$5 a gallon more than a penetrating finish. The result is a carefree floor that only occasionally needs mopping, and seldom if ever, requires waxing.

Regardless of which finish you choose, be sure to follow the manufacturer's application directions to the letter. Unless instructed otherwise on the label, use a paint roller and an extension handle to apply the finish. And always let the final coat dry thoroughly before use. ★★★

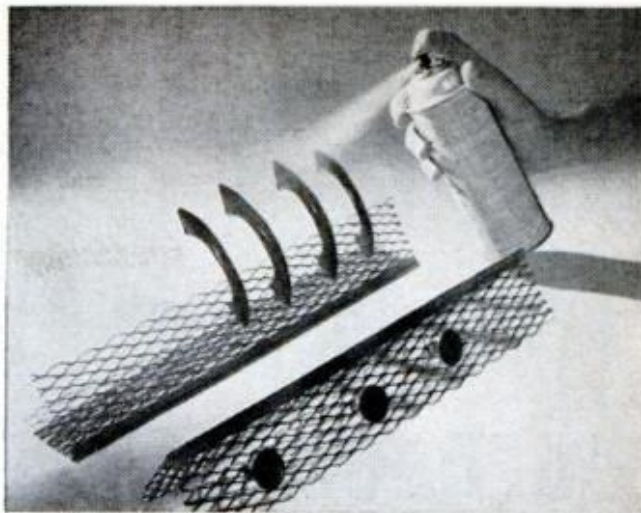
HINTS

FROM READERS

Ready-made holder for small parts

I don't know how many times I was about to toss out scraps of corner beading which were left over from a plastering job, when I discovered they were the handiest things ever for holding small parts for spraying. You can stand them up or lay them down, and they're great for holding items such as knobs and pulls.

—Gene Rapp



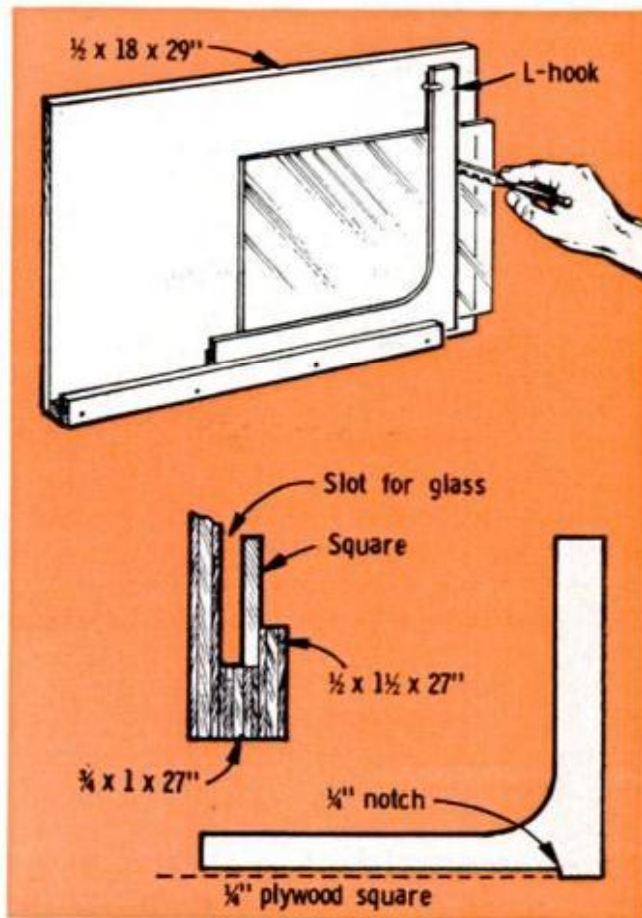
Glass-cutting board for shop wall

Cutting glass squarely is no problem when you have this handy cutting board mounted on your shop wall. Its built-in square helps hold the glass and assures a right-angle cut every time.

To make it you start out with a flat panel of plywood and add a trough along the bottom edge. This is formed with two strips, one being wider than the other.

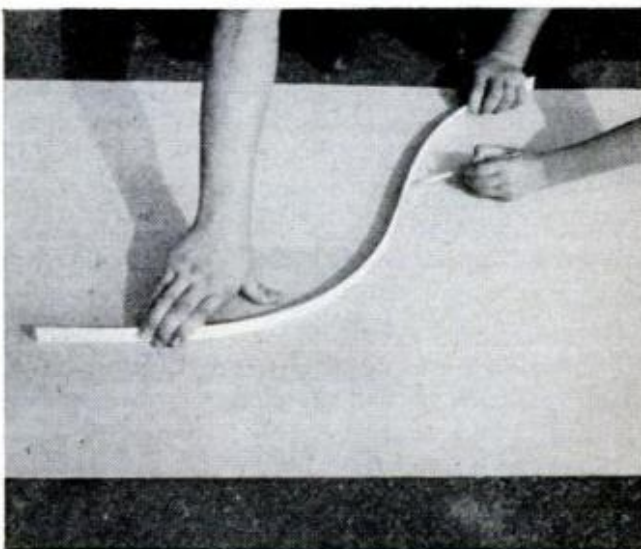
The square, which provides a straight-edge for the glass cutter, is cut squarely from $\frac{1}{4}$ -in. plywood to slide freely in the trough, and is notched along the bottom. The notch helps hold the square in place at the bottom, while an L-hook serves to clamp it at the top. A steel carpenter's square will save you the trouble of making a square and then having to worry whether it is square.

The glass is all you need to hold when drawing the cutter along the guide. With the glass held vertically, you'll find it easier to make a clean score than when it's cut on a flat surface.—G.E. Hendrickson



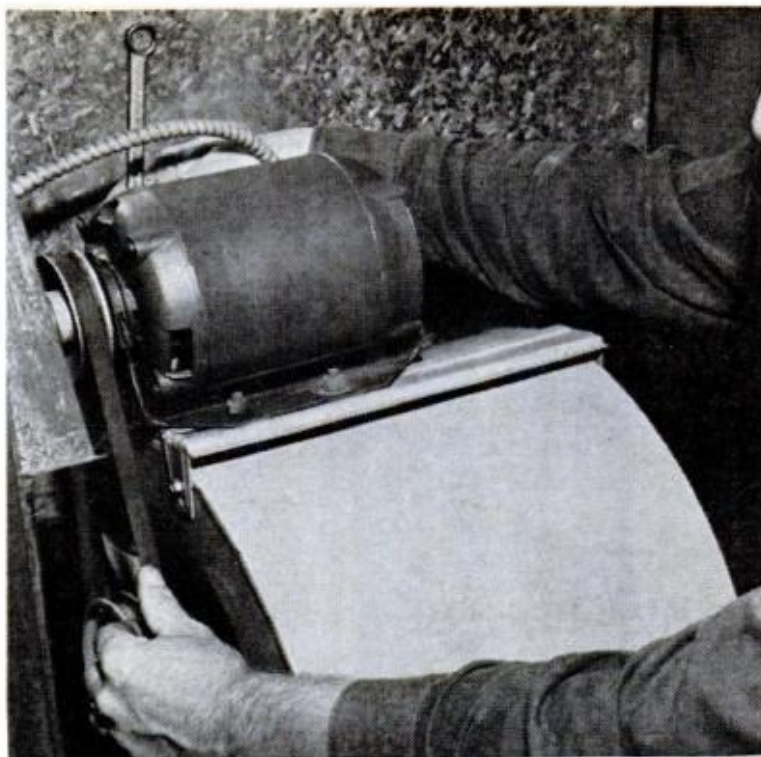
King-size French curve

When you're looking for something to help you draw a large irregular curve, see if you don't have a scrap of decorative laminate lying around. Ripped into a long strip about $\frac{1}{2}$ in. wide, it beats any wood strip. It's flexible enough to assume most any curve and the plastic is as strong as can be. Its one drawback is that it takes three hands to use it, but a holler will usually bring someone to lend a hand. If there's just no one around, you can place weights alongside the strip to hold a curved position.—Rosario Capotosto



How to Troubleshoot Furnace Failure

By STEPHEN J. HOWARD



IT'S A BITTER, 15-BELOW NIGHT and the dawn is hours away—when suddenly you awake and realize the furnace isn't working.

At such times, the chances of getting a serviceman are pretty slim, but try anyway. Only instead of just shivering while waiting, do some troubleshooting yourself. You're likely to find the problem is a minor one you can fix nine out of ten times.

Before discussing what to do, let's define some terms to avoid confusion. Most heating systems consist of two sections. One is the burner portion where either gas or oil is burned to create heat. The other section delivers the heat to the rooms. Regardless of whether you have an oil or gas burner, the delivery will be made by hot water, steam or forced air. Thus, your first checks should be concerned with the source of heat, the burner.

Checking an oil burner

If trouble hits your oil-fired furnace, try the following:

- **Check thermostat operation.** Set it 5° above the indicated room temperature and the burner should start. If you have an automatic day-night thermostat, be sure the cycle isn't reversed.

Open the thermostat cover. A mercury dial control is sealed and seldom gives trouble. But if you have a contact-point control, dirt on the points could prevent operation. Just pass a new dollar bill or a business card between the points.

- **Check all emergency switches.** Someone may have turned off one accidentally.

Most oil burners have two switches: One is usually on the burner; the other often at a distant location, such as near the head of the basement stairway or above the basement door leading to the yard. Know where these switches are and make sure they are turned on.

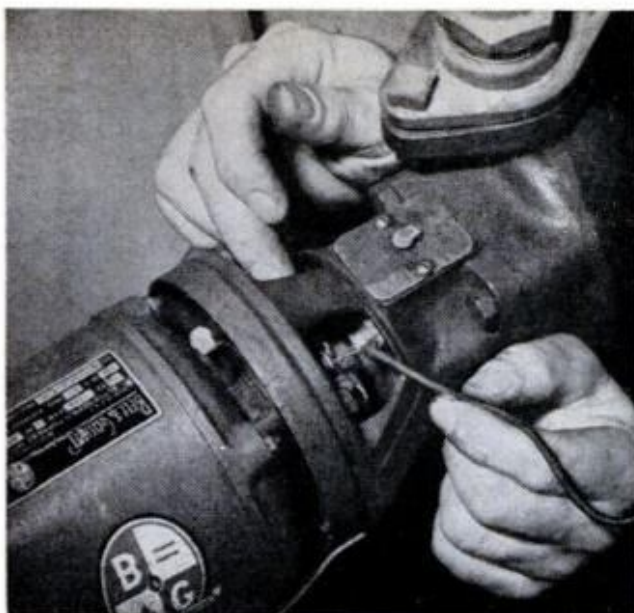
- **Check the two safety switches.** The overload and the stack control relay prevent damage if a problem develops in the electrical circuit.

The overload switch (usually painted red) is on the motor housing. Press it once only. If the motor doesn't start, activate the stack control relay (on the smoke pipe or burner housing) once only. Don't fool with these switches if the burner doesn't start or if it starts and stops. You may have a serious electrical problem that's a job for a serviceman.

Many modern oil-burning furnaces (those installed within the last five years or so) are controlled by a photoelectric cell. If dirty, it can prevent operation.

If you press the stack control relay and the furnace goes on and then off in about 30 seconds, check the face of the photoelectric cell. Remove it from its housing and wipe it clean.

- **Check the fuse or circuit breaker.** Vibration can loosen a fuse, so make certain that it's tight. If this doesn't solve the problem, replace the fuse, preferably with one you know to be good.



BROKEN COUPLING in a circulator often can be repaired temporarily by wiring the parts together



FLOW VALVE, usually hidden in a corner, can be opened to feed hot water through system by gravity

If the fuse keeps blowing or a circuit breaker trips repeatedly, there's a malfunction in the electrical system, which should be checked out by a serviceman.

● **Check the oil valve.** Another malfunction in a late-model oil-burning furnace can be a delayed oil valve that's dirt-clogged or electrically faulty. You can run the burner without it in a pinch. Disconnect both input and output oil lines on the valve and remove the valve. Then connect the input directly to the output line.

● **Check oil supply.** Gauges on indoor tanks can stick, showing an oil reserve when there is none. Tap the gauge. If the cap of an outside tank is accessible, take a dipstick reading.

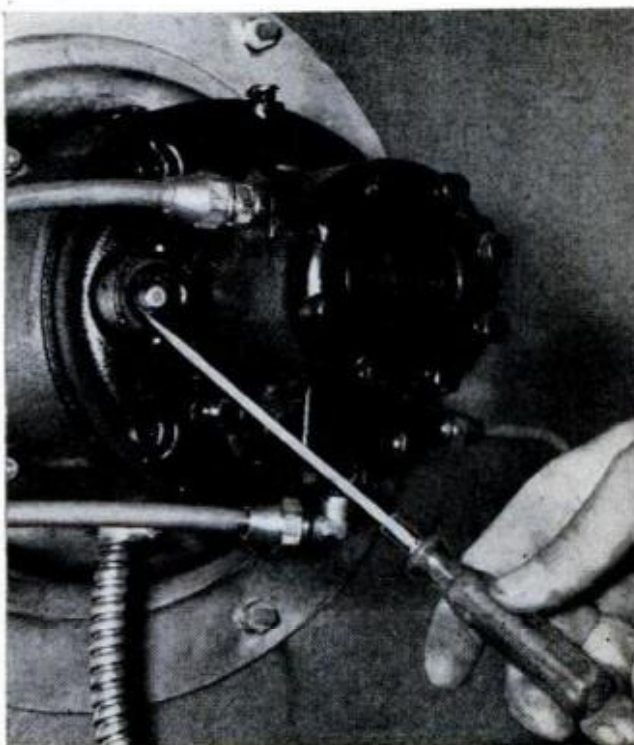
● **Check the nozzle.** Finally, the malfunction could be in the oil nozzle-and-electrode assembly inside the burner. Check them out but first be sure to turn off all emergency switches. *Never work inside the burner with the switches turned on.*

Remove the access plate, or unscrew

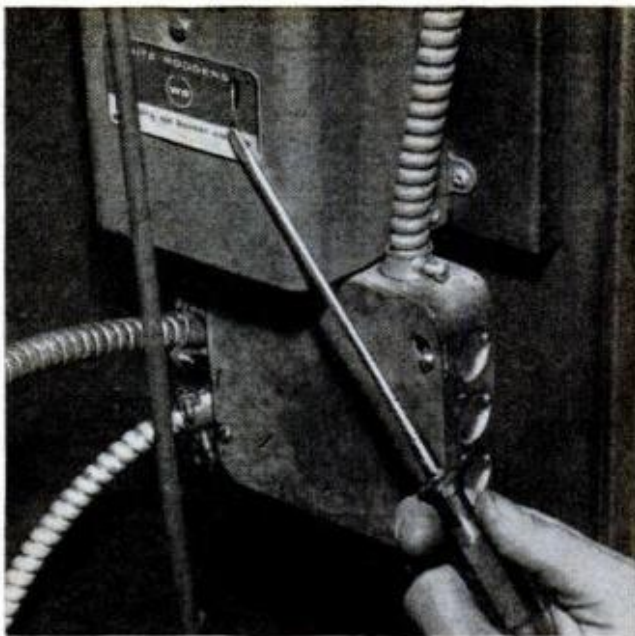


FILTERS in forced-air systems will greatly reduce available heat if dirty or clogged. Check them often

JANUARY 1968



IF OIL BURNER FAILS, locate the overload switch (usually found on motor housing) and press it once

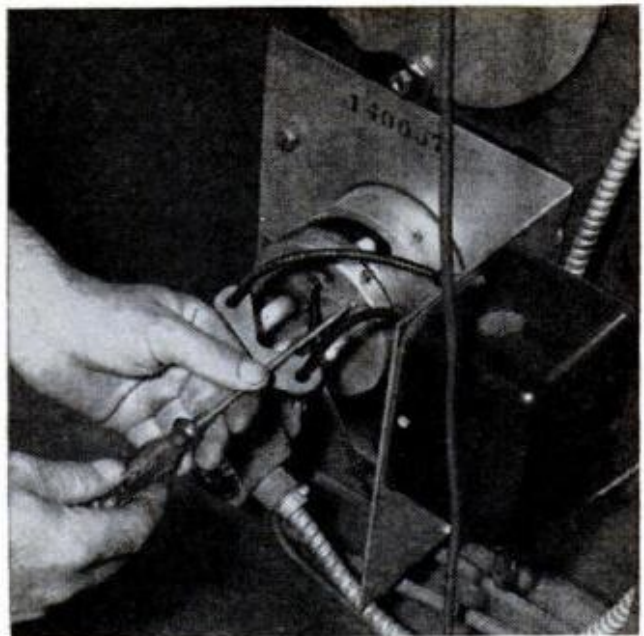


STACK CONTROL RELAY is usually located on the smoke pipe or burner housing. Press it only once

and drop the transformer so you can reach inside the burner. Loosen the oil line connection with a wrench and disconnect the transformer and electrode wires. These are usually held by snap-on connectors. Take the electrode-nozzle assembly out of the burner, being careful not to change the setting of the electrodes.

Unscrew the nozzle. You'll find a filter inside. Unscrew that and wash it in warm water. (It could be clogged and blocking oil flow.) You'll find a small setscrew inside the nozzle. Unscrew that, too, and wash it.

Now blow into the nozzle. Air will pass



OIL BURNER may be controlled by a photoelectric cell. Just remove small screw to gain access to cell

through freely if it is clear and working. If not, you're out of luck unless you have a spare nozzle on hand.

Don't try to open the preset nozzle with an icepick. Probing will widen the hole, upset the fuel ratio and cause the burner to puff. Although this can't harm the system, the burner won't function.

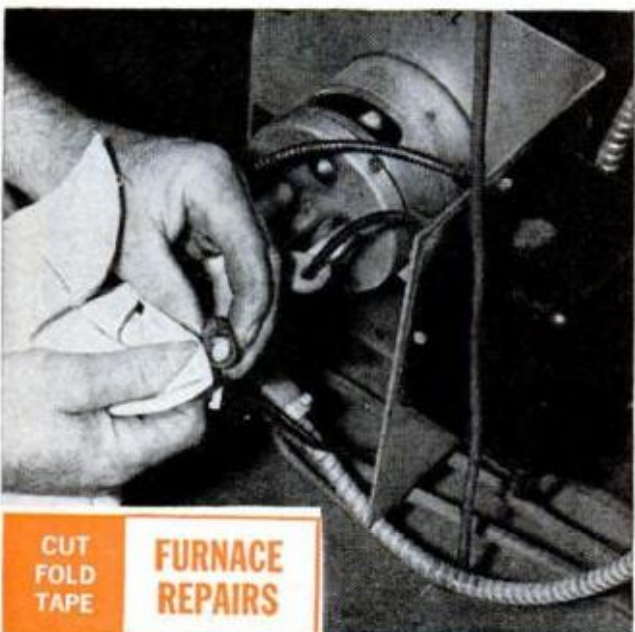
Clean the electrodes carefully, using a rag or fine steel wool. Again, *do not disturb the setting* or puffing will occur. Put everything back together, turn on the emergency switches and press the stack control relay.

If your burner is of the rotary type it won't have a nozzle. Just reach into the burner with a rag and carefully wipe the electrodes clean. And make sure that all emergency switches are off.

Checking a gas burner

If you have a gas-fired heating system, check the thermostat, fuse or circuit breaker, and boiler, circulator or forced-air unit, the same as with an oil burner. A gas burner has but one electrical switch and that's mounted on the furnace. Check it to be sure that it's turned on.

● *Check the gas pilot.* If it's not burning, relight it as detailed on the instruction plate attached to the furnace. A pilot that refuses to light may be clogged with dirt or carbon. Shut off the electrical switch and the gas valves controlling the main burner as well as the pilot. Tap the pilot burner with a screwdriver, then turn on its control valve and try to light the pilot.



USE A CLEAN CLOTH to wipe off face of the cell. On-off cycling is usual indication of dirty unit

Do not open the valve controlling the main burner before the pilot is lit, and do not try to light the main burner by hand—it could flare up when ignited. If you can't get the pilot going, wait for the serviceman to take over the job.

Checking delivery systems

If you haven't found the trouble by now, it's time to attack the delivery part of the setup. What we describe here applies to both oil and gas-fired furnaces.

● *Steam systems: Check the boiler gauge.* The burner will shut off automatically if the water level gets too low. But before refilling a hot boiler, let it cool down to avoid the chance of cracking. The burner should run again when the boiler gauge reaches the half-full mark.

● *Hot-water systems: Check the circulator.* One in need of lubrication won't circulate hot water, even though the burner itself will continue to run. However, re-lubricate only with the grades of oil and/or cup grease recommended on the instruction plate found on the circulator body.

If there is a reset button on the circulator, press it once. If no button, try giving the unit a slap with your hand.

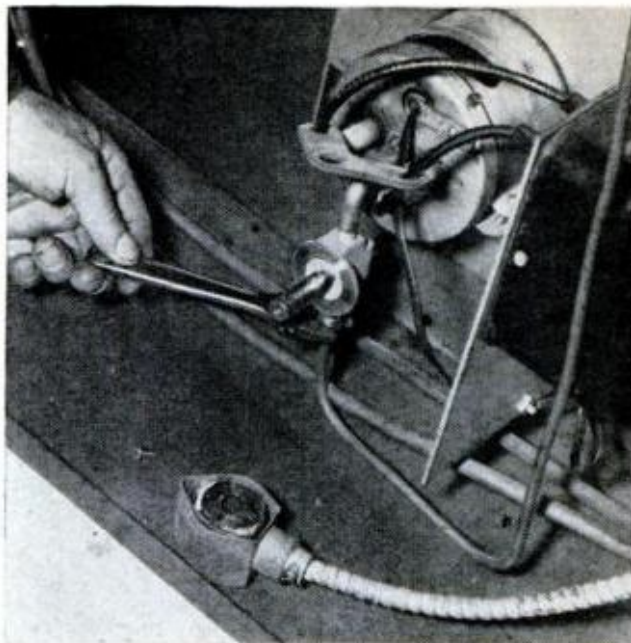
A circulator will stop heat delivery if it breaks a coupling. Put your ear close to a suspected part and listen for a sharp, rapping sound. To repair a broken coupling temporarily, remove the access cover and wire the broken crosspieces together.

If you can't fix the circulator and the burner is operating, you may still get some heat. Most hot-water systems have a flow valve on the water line that runs from the furnace to the heat-radiating components. Just open the valve and hot water will be fed through the system by gravity. But don't forget to close this valve after the circulator has been fixed.

● *Forced-air systems: Check for a clogged filter,* a major cause of reduced heat. If no spare, remove the filter (there may be more than one), take it outside and knock it against something hard to loosen the dirt. Better yet, go over the filter with the radiator attachment of your vacuum cleaner to pull out much of the dirt.

● *Check the blower fan belt.* The only practical solution for a broken fan belt on the blower-motor pulleys is replacement, so it's wise to keep a spare handy. You can buy one of the same size at a hardware

(Please turn to page 230)



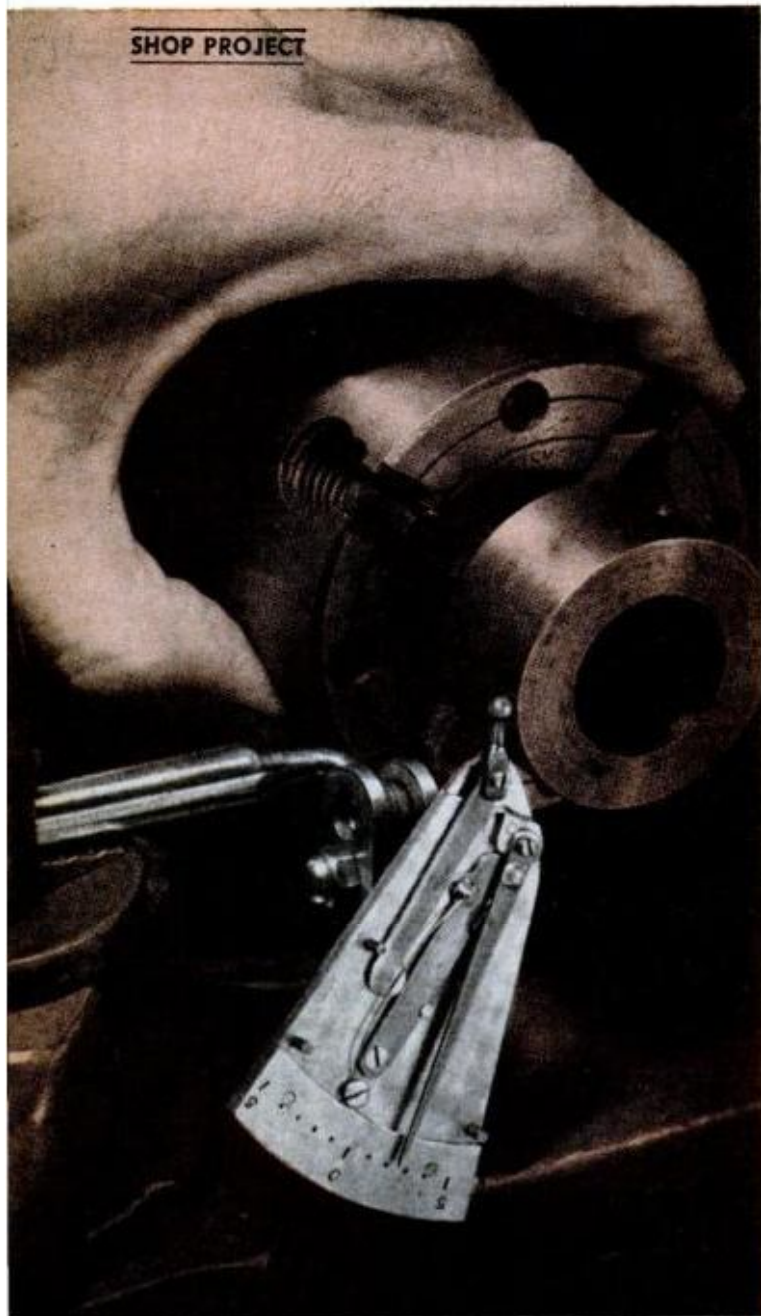
MODERN OIL BURNERS may have delayed oil valve. In a pinch, remove valve and connect lines together



REMOVE NOZZLE with two wrenches. Clean the filter and setscrew, test nozzle and then reassemble



CARBON MAY BE FOULING the electrodes. Wipe them off with either a clean cloth or fine steel wool



Make this handy indicator for your shop

With it, you'll be able to measure variations as small as 1/1000 inch

By WALTER E. BURTON

Technical Art by Graphic Presentations

YOU'LL GREATLY IMPROVE the accuracy of work done on a lathe, drill press, milling machine or any other machine tool by using this sensitive shop indicator. With it, you can center work in a chuck quickly, and also position milling cutters and other tools precisely with respect to the work. Mount it on a drill press, and it will indicate whether the table is perpendicular to the spindle.

As shown, the indicator has a range of 0.010 in., with calibration marks scribed into a scale about 1 $\frac{3}{8}$ in. long. The parts can be made of mild steel and then case-hardened for maximum wear resistance, or be formed of high-carbon steel.

The body of the indicator is made of $\frac{3}{16}$ -in. steel plate. The three levers are formed from $\frac{1}{32}$ -in. steel, while the ball-shaped contact or "feeler" point is ma-

chined from drill rod. The scale segment can be made from either $\frac{1}{32}$ or $\frac{1}{16}$ -in. steel.

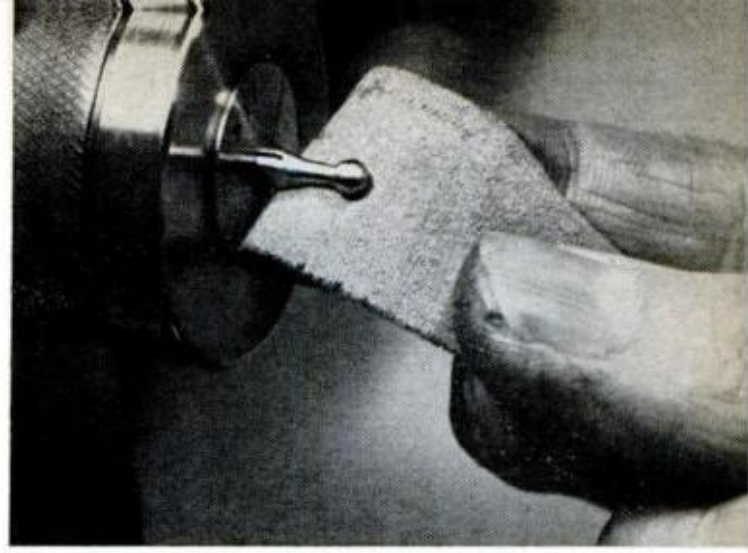
The lever-return spring should be bent as shown from a length of 0.010-in. music wire. Here it's best first to shape a long piece of wire to conform to the outline shown in the drawing on page 198 and then snip off the excess. The anti-backlash spring fitting the slot in one of the levers is a length of watch hairspring.

Greatly simplifying construction of the indicator are the full-size templates in the detailed drawing. However, instead of cutting them out and destroying what appears on another page, use this method to transfer the template to suitable stock:

First tape a sheet of carbon paper to the cardboard, heavy paper or hardboard you're using for a template. The inked side of the carbon, of course, must face



DRILL LEVERS as shown in drawings, then rough out shape by making saw cuts flush with vise jaws

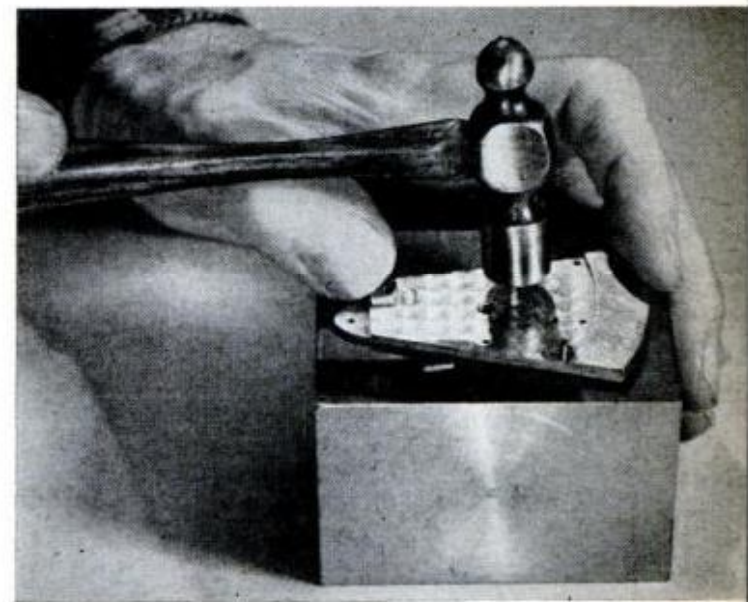


POLISH BALLS to required dimensions by chucking in a lathe or drill, using fine-grit abrasive cloth

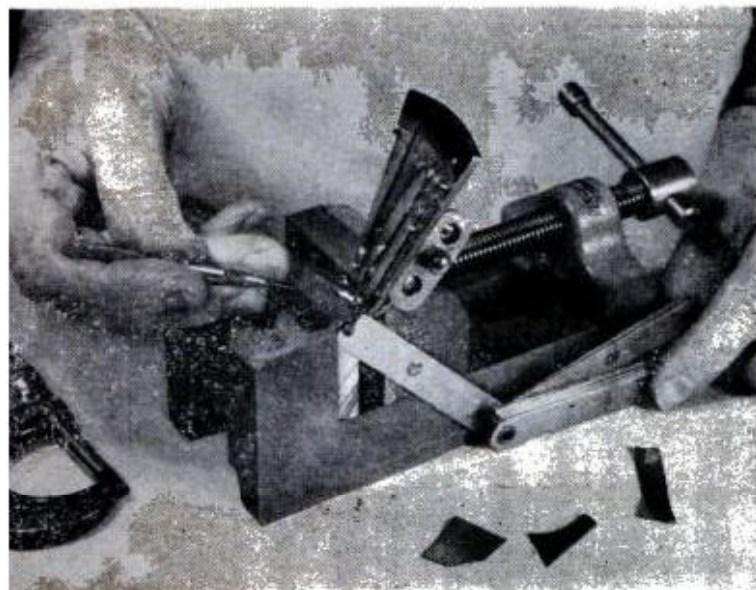
the template material. Then lay the carbon and template material underneath the page of drawings and tape the edges of the page to the template board. Finally, use an accurate straightedge and a fine-tipped ballpoint pen to transfer the drawings to the template board. There's no need, however, to try to transfer the circles to the board. Simply mark their center points and drill the holes as indicated.

Once the template of the body has been made, it becomes a simple matter to clamp it to the steel plate and then drill through the holes in the template. The same holds true for the holes in the various arms or levers. After they're drilled, just scribe the outline of each piece, cut it out and finish by grinding or filing.

The ball-tipped arm is the only section



FORCE STOP PINS into holes in body. The drive-fit pins prevent the levers from overshooting body

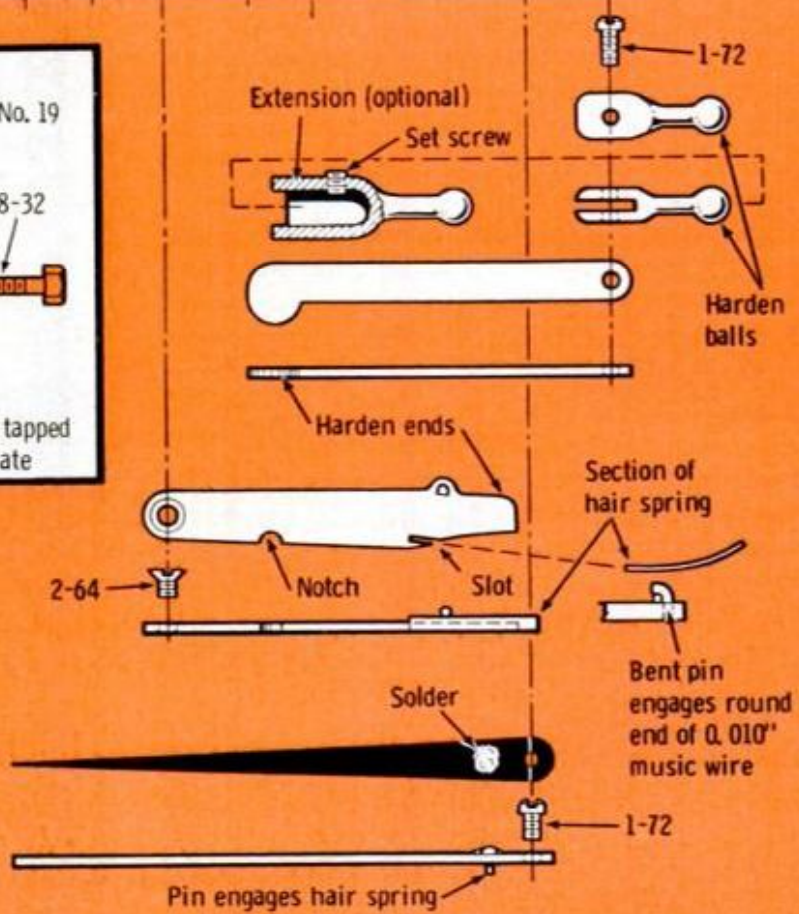
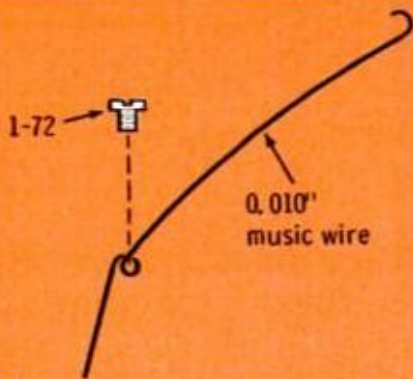
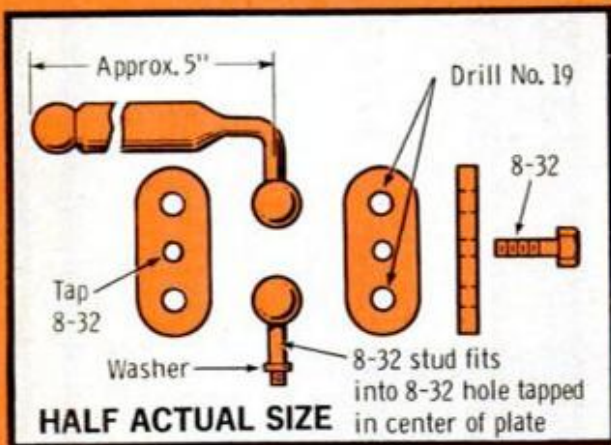
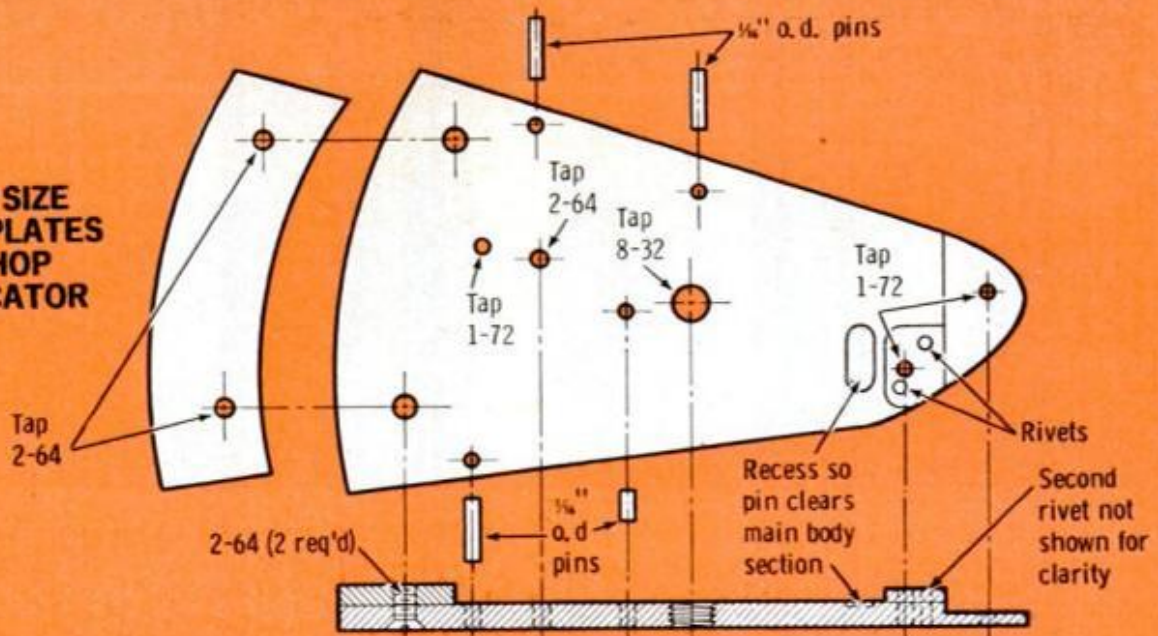


CALIBRATE INDICATOR by inserting gauges of known thicknesses between the ball and a flat surface

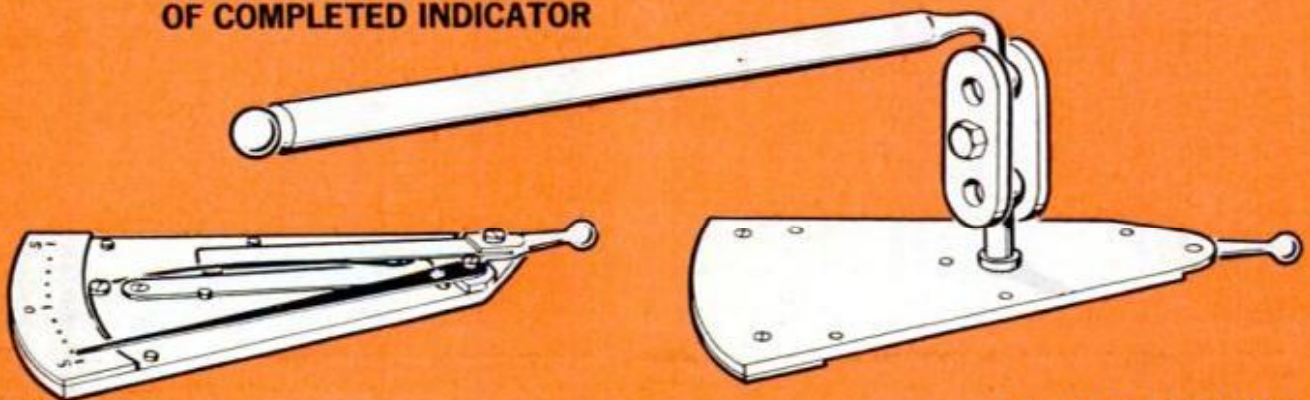


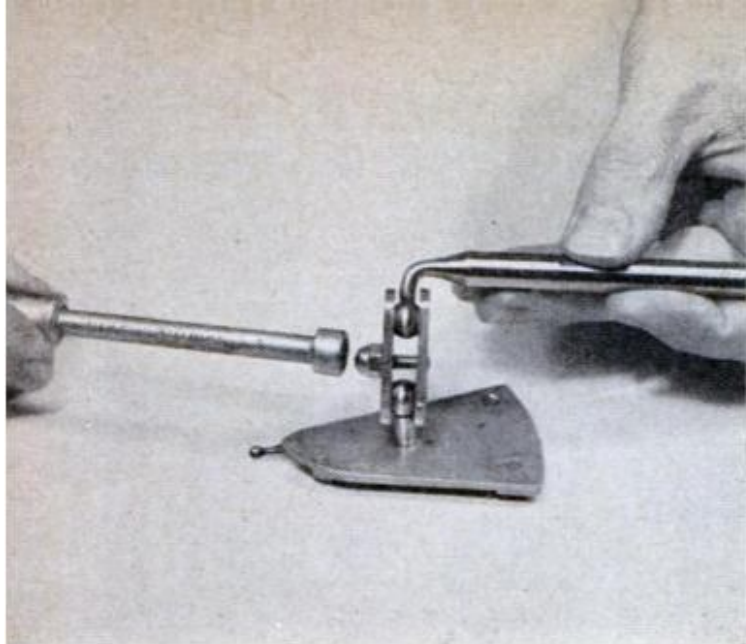
PERMANENTLY SCRIBE the calibration marks on the scale plate by using a punch and a fine-edged chisel

FULL-SIZE TEMPLATES OF SHOP INDICATOR



TOP AND BOTTOM VIEWS OF COMPLETED INDICATOR





BALL-AND-SOCKET mounts are easy to adjust. Wide range permits mounting in almost any position

of the indicator mechanism that can't be made using a template. Its slotted portion fits tightly over the end of the cam-tipped lever, while its ball tip is adjustable through an arc of nearly 180°, as required by the position of the instrument with respect to the work being gauged.

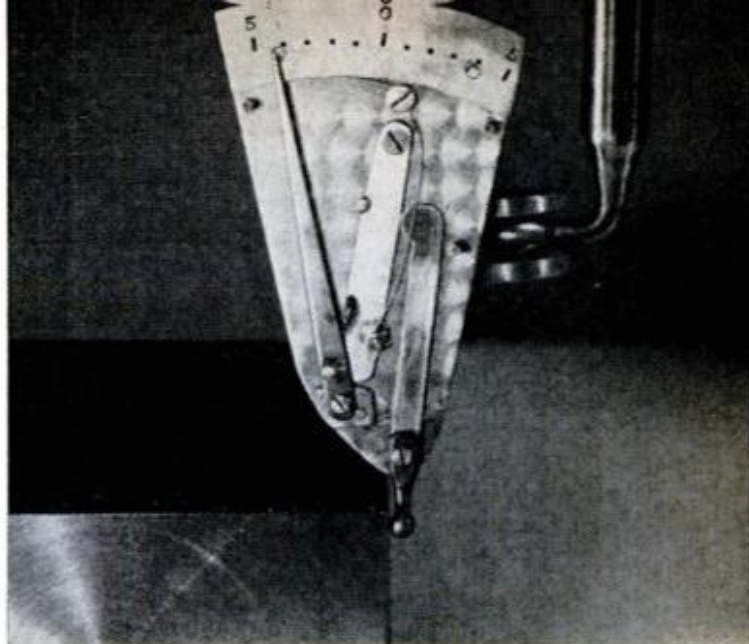
Calibration procedure

The indicator is basically a magnifier of the amount of movement applied at the ball-tipped contact point. Theoretically, the total magnification of movement works out to about 130 times the initial travel. Thus, for every 0.001 in. of travel at the ball-tipped contact point, the pointer will move more than $\frac{1}{8}$ in. along the length of the scale.

Dividing the scale into a number of equal parts of arbitrary size would be adequate for many operations, such as centering a piece of round stock in a chuck. However, to measure accurately or indicate variations as small as 1/1000 in., the instrument must be calibrated.

The easiest method to use is to coat the scale plate with blue layout ink. Clamp the indicator in a drill-press vise so the ball touches a smooth, flat surface on one jaw. Then insert feeler gauges of progressive thicknesses between the ball and the jaw, marking the position of the pointer at each 0.001-in. step. Do this two or three times to recheck the calibration marks. Once the marks agree over the range, make them permanent by scribing them with a punch and a narrow chisel.

However, the use of the optional ex-



CLOSEUP VIEW of completed indicator shows how pressure of block against ball is magnified by levers

tension on the ball-tipped contact arm essentially doubles the length of the arm and, in effect, cuts the magnification factor in half. This results in a scale range of approximately 0.020 in., so the scale also should be calibrated with the extension attached. Just use the same calibration method and simply scribe the second band of calibration marks either above or below the first band.

Mounting the indicator

The 8-32 threaded hole near the center of the body plate is used for attaching the indicator to the adjustable mount. As shown in the inset drawing at left and in the photos above, the mounting arrangement can be varied to suit almost any requirement simply by loosening a single 8-32 bolt. The indicator also can be attached to machine tools by clamps, a lathe tool-post or permanent-magnet base.

One of the most useful functions the indicator will perform is the checking of a drill-press table. To determine whether the table is at right angles to the spindle, first chuck the indicator into the spindle and adjust the height of the table so the pointer on the indicator falls at about mid-scale. Now slowly rotate the spindle by hand and watch the pointer. If the table is canted to one side, the reading on that side will be positive, while directly opposite, the indicator will show a negative reading of the same amount. When the table is perfectly level, the pointer will hold a single, steady position even though the indicator is rotated 360°. ★ ★ ★

How to convert old chisels to serve new uses

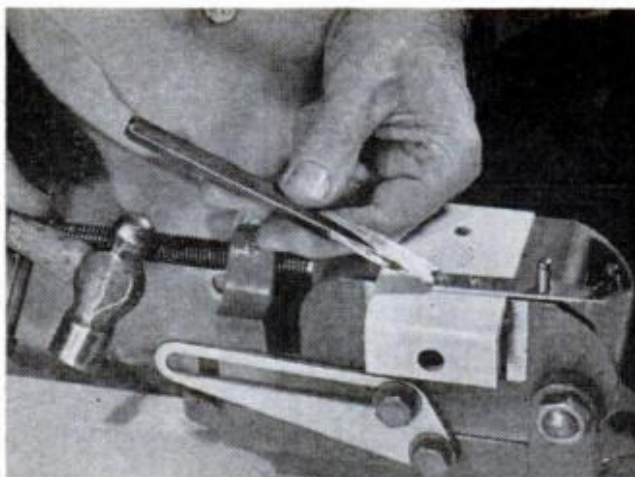
WITH A LITTLE GRINDING, any old, beat-up chisel can be put to new use in performing special cutting jobs. No matter how much of a relic it is, a wood or cold chisel still retains its hardness and temper, and even rust is no handicap in making it take on new importance.

For example, any cold chisel will chop the heads from bolts and rivets faster if a half-round notch is bevel-ground in the cutting edge. It can't creep or slip off the head.

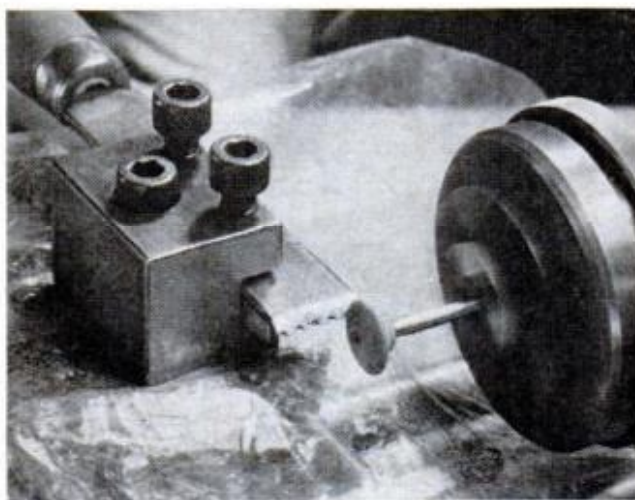
By grinding a series of tiny notches across the cutting edge of a wood chisel, you have a fine tool for making perforations in cardboard, leather and even light metal. Guided by a straightedge, the chisel will produce a neat line of perforations with a mere tap of the hammer.

Similarly, a novel stunt is to grind the notches so they produce long and short cuts arranged to form your initials in International Morse Code characters.

When reshaping a cutting edge, be sure you don't burn it and take the temper out of the metal. Dip the tool in water often to cool it.—Walter E. Burton



SHALLOW NOTCH bevel-ground in cutting edge of a cold chisel quickly chops off bolt and rivet heads



SERIES OF NOTCHES uniformly spaced and ground in edge of wood chisel makes it a perforating tool



NEXT MONTH IN SHOP AND CRAFTS

MR. BAKER BUILDS A "DREAM ROOM." A cool place for fun, study and sleep, this hide-away room gets adults out of youngsters' hair. It's another unique room from Bill Baker's house of ideas in Westport, Conn. If you have teenagers and a room that's waiting to be remodeled, be sure to read this idea-packed article.

BUILD THIS CARTOP PONTOON BOAT. There've been pontoon boats before, but not like this one. It comes apart in sections for easy carting to the lake and home again perched on the top of your car. A real fun-type "patioraft" the whole family can enjoy when having a picnic on water. Don't miss this exciting build-it-yourself boat.

MAKE YOUR OWN HEAT-TREATING FURNACE. You start out with an oil drum and add an electric heating coil. You wind up with a kiln which will produce temperatures up to 2300° F., hot enough to heat-treat high-speed steel as well as fire ceramics. Complete plans in February show every step in making it.

WHAT YOU CAN DO WITH PLASTIC PIPE. The new plastic pipes offer many advantages, especially when used for underground runs. Among these are the facts that you can install it neatly, repair it quickly, tap into it easily and fill special needs practically. Learn more of what you can and can't do with this versatile material in the February issue.



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VIETNAM'S SITTING DUCKS

(Continued from page 92)

other side was still." Then he demonstrated another split-S.

"If I wasn't sure, I'd spot the exact area, dive down to the deck, then come in low right over it, take a quick look, and if I found what I was looking for, climb away to a safe area and call in a strike."

Some of the other tell-tale signs:

- New trails through thick underbrush.
- New trench lines or gun emplacements.
- Too much wash on the lines for the number of huts in the area.
- Too many field hands in rice paddies who weren't there before.
- Too many new water buffalo that weren't around a few days earlier.
- Tree stumps where fully grown trees once stood.
- Palm leaves strewn about one spot, probably hiding something underneath.

"Actually," Pete said, as he moved the plane into position to show me something else, "it's just common sense. Once you're familiar with an area, you can spot something different pretty quickly. It's like the top of your desk. You come in in the morning, and you know there's something wrong. Somebody's been shuffling your things around. You just examine it and try to figure out exactly what."

He maneuvered facing the sun. "Look down there," he said, "You can't see any water under those trees, but wait until we get a streak of sunlight across them."

Sure enough, when we were directly opposite the sun, it reflected on the water under the trees, which were growing out of the hidden swamplands.

"That was one of their best hiding places," he said. "If there were ripples in that water, I'd know something was up. Why else would they hide?"

Once he spotted something, the FAC pilot's job had just begun.

"I'd have to make a judgment whether the target was worth an air strike," he said. If it was, he'd usually get Air Force F-100 jets or the venerable prop-driven A-1s, or Navy A-4, A-6 or F-8 jets. Then, in another paradox of this strange war, Pete Bernstein, who was then a first lieutenant, would be ordering pilots of the big planes around the skies, and some of the pilots ranked all the way up to full-bird colonels. He'd tell them exactly what they should hit and with what.

The sequence went something like this:

"They'd call in before they got there," Pete explained, "and tell me how many and what kind of aircraft they had—like four F-100s—what kind of ordnance they were carrying, and how long they could

stay over the target, say about 50 minutes.

"In turn, I'd tell them what they could expect when they got there. Like, there'd be two VC battalions in trenches, I was getting heavy ground fire, including so many 50-cal. guns—usually the most dangerous of the VC weapons—where the closest airfield was in case of minor trouble, and where the closest friendlies were in case of major trouble, like a bailout.

"I'd give them a weather briefing, especially wind direction, then, when I was sure they had me in sight, I'd mark the target with a smoke bomb."

Here is one of the most ridiculous paradoxes of the space age. Brave men went into combat with stone-age equipment. Pete, who was zigzagging and fishtailing to dodge bullets while waiting for the jets, couldn't spend too much time on a straight-in smoke run when they got there. His bombsight was a mark he drew on his windshield with a wax pencil.

"I'd just line it up with the nose and the target, fire and get out of there."

It was hardly ever a direct hit, but it usually didn't matter.

"Again, it's just common sense. I'd radio them, 'Well, the smoke bomb hit about a hundred yards north of the target, the smoke is blowing just about 50 yards east of it and, if you make a right triangle, the gun emplacement will be at the base of the triangle in that big clump of bushes.' Something like that."

Then, the jets would go in one by one, the second one waiting until Pete had assessed the damage—and accuracy—of the one before it. He'd select the armament to use, usually starting them with 500-pound bombs on the big gun emplacements. Hitting individual snipers could wait.

Just common sense.

Eyeball discovery saved a village

Pete's biggest mission, if not the bravest—that came later—developed from a strict eyeball discovery. He noticed some palm branches strewn around that weren't there the day before. Following procedures, he came in low, took a close look, saw an elbow sticking out from under one of them, then all hell broke loose.

"I saw men running from the village out to the field, and got on the radio and called in an air strike. 'I've got 30 VC in the open here,' I told them, 'No, make that 50! There's more! They're coming from all over now. There's 100 . . . 300 . . .'"

"It finally ended up about 600," he said, exhausted at the recollection.

Pete spent nine hours in his plane that day, never leaving the cockpit—just like a racer at the Indianapolis 500—returning to base only to fuel up and swig some water

and wipe sweat from his face. He directed a total of 33 air strikes before it was over. Subsequent ground reconnaissance turned up VC documents indicating a massive assault on a South Vietnamese village.

The assault never came off, and all because Pete Bernstein noticed an elbow sticking out from under a palm frond.

One hand firing; other flying

Pete won a Silver Star on another scrambling mission. He had already flown 6½ hours on reconnaissance when, late in the day, he got word that the VC were attacking a convoy. He flew to the spot and, to keep the VC occupied until the fighters got there, he fired his smoke rockets at them, then—in something out of a slapstick comedy—he flew the plane with one hand and fired his M-16 rifle out the open door with his other hand, propping the gun on his foot.

Now out of smoke markers and the fighters coming in, Pete used the plane itself as a marker, flying right at the targets to spot them. The plane was hit, of course, and partially disabled, but Pete survived it. One-hundred fifty VC didn't.

Pete has no regrets about flying the obsolete O-1 in combat, or even about being in the relatively unglamorous occupation of a forward air controller.

"The O-1 wasn't built for the kind of flying," he said, charitably, about an old friend, "but it's rugged and it stood up."

Even so, the O-2 should be better.

"It's faster, it has a better rate of climb so you can get out of there quicker and still see what's going on, but—what's more important—it will carry armament. One of our big problems was the gap between the time we called in an air strike and the time the fighters arrived.

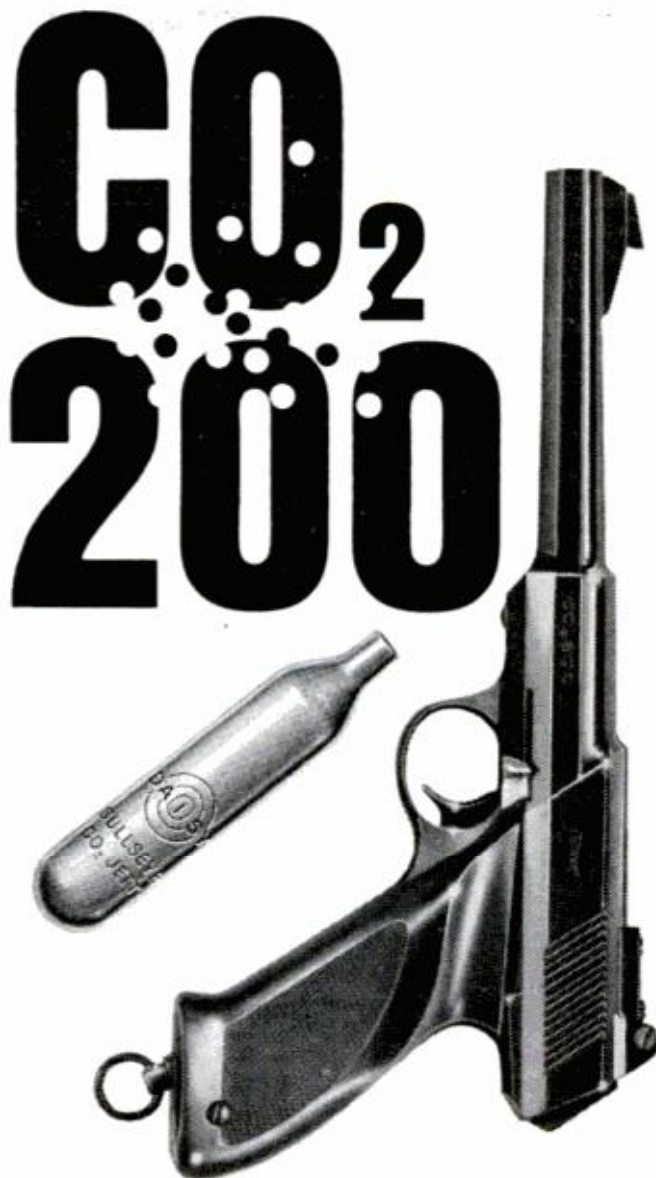
"I'd have to keep the VC in sight or they'd sneak away, and if I could see them they'd see me so I'd get shot at.

"The O-2 can shoot back and keep them pinned down until the big jets come."

I asked if he didn't envy the men he called in, flying those big, supersonic jobs while he was put-putting around in an old high-wing prop plane.

He looked at me as if I'd been out of it for the last few years. "Wars have changed. Most FAC pilots are convinced we've got the most important job in the air war, and I believe other pilots think so, too. I can walk in amongst a bunch of them; when they find out I'm a forward air controller I can see their eyes widen and they make room for me at the bar."

Wars, indeed, have changed, but courage and dedication haven't. It's an old cliché, but weapons don't make the man. It's the other way around. ★★★



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NEW AUTO INSURANCE POLICY

(Continued from page 107)

to be an enormous number of accidents regardless. The larger social need is to compensate those who are injured, or whose property is damaged, in such a way as not to bankrupt those who are supposedly responsible.

Hence they propose a system which would suspend the issue of liability for the first \$10,000. The insurance companies would routinely pay up to \$10,000 per victim for out-of-pocket losses, which consist principally of medical expenses and wage losses. Much of the time it is impossible to determine who, if anyone, was to blame for an accident, but it is always possible to find out who gets hurt.

The key difference between the Basic Protection plan and the old workman's compensation system is that the new plan eliminates the need to make the often very difficult judgment as to what a sprained back, etc., is worth. The victim is simply paid, by his insurance company, whatever his actual losses in wages, medical expenses and property damage are.

Under this system, persons would still go to court when the injury is permanent and serious—i.e. costing more than \$10,000 and, it is hoped, involving someone else's responsibility. But the overwhelming number of small cases would be handled quickly and efficiently out of court. In that way the danger is avoided that in the effort to make settlements prompt, but moderate, some victims with large and legitimate claims will be forced to settle for less than a jury would award.

Why not like fire insurance?

The second and crucial element in the Keeton and O'Connell Basic Protection plan has to do with the relationship between the insurance company and the driver. As they see it, much of the present misery derives from the fact that this relationship is, with but rare exceptions, an adversary one. The company wants to pay as little as it can; the victim wants to get as much as possible.

Keeton and O'Connell argue that this is inevitable given that the company insures the other fellow. They propose to solve it by the simple process of having the company insure the victim. This is exactly what happens, for example, with fire insurance. Householders buy their own insurance. If their house catches fire, regardless of who is responsible (barring fraud), their company compensates them.

Variations on the Keeton-O'Connell proposal are certainly possible. Thus the Massachusetts Democratic Advisory

Council has proposed a mixed system, with Basic Protection for personal injuries and liability insurance for property damage. But in all its essentials, it is hard to deny the fundamental rightness of the Basic Protection plan.

Nor is it difficult to see that it provides the private insurance industry with a means for insuring that their business stays private. What then has been their reaction?

Some insurance industry executives have given Keeton and O'Connell a hearing. The place of honor goes to Liberty Mutual with the Aetna and the Kemper companies also playing a role. But by and large the reaction of the industry has been rather like that of the *ancien régime*, hoping to live out their own careers and resigned to the deluge that follows.

This may be good enough for executives in Hartford getting on toward retirement. It is not good enough for the nation. We are paying a great cost for our present mental slovenliness in this area, which we certainly should not and probably cannot afford.

What is to be done? The first and obvious step is the opening of Congressional hearings, a matter under preliminary study by Rep. Emanuel Celler of New York and others. As a second step, it is altogether reasonable to ask that the professional business schools of the nation involve themselves with this issue. In the decade that preceded the imposition of federal regulation on the automobile industry they remained silent. But America, as David Riesman reminds us, is a land of the second chance. The business schools have such a second chance: To take on the issue of automobile insurance and develop a community of opinion as to what can and should be done.

Similarly, the American bar has a responsibility here. Apart from the American Trial Lawyers Assn., the legal profession contributed almost nothing to the effort to obtain safer automobiles. With respect to automobile insurance, not just the responsibility of the legal profession is at stake, but also its integrity. As much as half the income of American lawyers is earned in accident litigation. For the bar to remain silent about, or actively oppose, reform of the insurance system would have implications that scarcely need elaborating.

But the essential step is for the leaders of the insurance industry itself to take on the issue—directly, openly, willingly. Is this out of the question? Some small part of the future of American private enterprise will be determined by the response to that possibility. ★★★

WORLD'S FASTEST SCHOOL

(Continued from page 97)

with me was an instructor named Bobby Shoemaker. Going through the first time at 50 mph, I just sat there and steered. At 60, I just steered. But at 70, again attempting to simply steer, I clobbered half the pylons.

"You learn anything that time?" Shoemaker asked as we roared away from the carnage.

I allowed that if the pylons had been, say, a sudden and unexpected highway obstruction, we'd probably have had some serious trouble. He didn't smile.

"What you learned, even though you may not realize it, is that you can't always just steer around something. Sometimes you have to kind of 'throw' the car around it. Pull over and change places with me and I'll show you what I mean."

'Throwin' 'er through'

We were doing better than 70 when we entered the "S." Shoemaker yanked the wheel sharply to the left, then—in a split second—sharply to the right. The rear wheels broke loose a couple of feet to the right when he yanked the wheel left, then skidded a couple of feet left when he steered right, the result being that we went through on a three-legged zigzag rather than on a looping, S-shaped line. I looked behind; not a pylon was down.

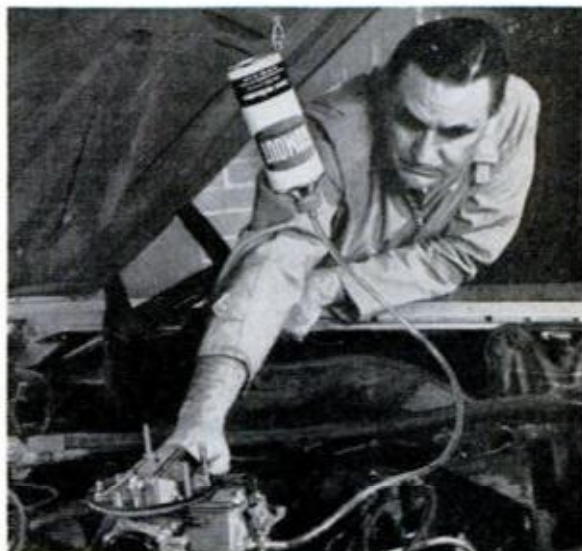
Later, after several practice attempts during which I sprayed rubber pylons over half of North Carolina, I was "throwin' 'er through" in pretty good shape myself. On four scoring runs at 75 mph, I knocked down only three pylons.

Having learned how to do this sort of thing, and having done it fairly well, I feel my overall driving skill was much improved. Knowing I can "throw 'er through" may one day save my life. So might my newly-found ability to do a 180° forward spin. This doesn't mean I *want* to do a forward spin, but it does mean that if ever I should have to, I know I can. If the alternative to a head-on crash is a 180° spin, I'm at least going to *try* the spin.

To teach people how to drive to the limits of their abilities is why Turner teamed with famed auto stunt man and former racing driver Joie Chitwood and Gilbert Shaw, founder and president of the National Heavy Equipment Schools, in organizing the driving school. Chitwood probably knows as much as anyone regarding just what both car and driver can and cannot do, and Shaw is an experienced educator and administrator in the driver-training field. For Turner person-

(Please turn to page 234)

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WILDLIFE SECRETS

(Continued from page 116)

again. He turned the antenna back to the position where the receiver was silent.

"This is the 'null' where the rabbit is," he said. The needle on the compass card pointed to 302°.

When Hanson's direction crackled over the air, Jim drew a line on a large terrain map, overlaid with a drawing of the compass face. Where this line crossed his 302° line he made a mark. "The fix," he explained. "The rabbit has moved since our last reading 15 minutes ago. He now is on mowed grass completely in the open."

He made a notation. "We want to know how far and in what kind of cover a rabbit moves during certain hours of the night," Jim continued.

Rabbits like open spaces

"Since rabbits are the most universally hunted game," he said, "conservation commissions want to know what type of areas can support more rabbits." Jim has learned that Illinois cottontails spend more time during the winter months in the open than in heavy cover. Brush piles are used primarily as escape cover, indicating that bunnies like as much short cover as heavy.

Of deep concern to all state game commissions are hunters. They buy the licenses that supply the money for conservation and game control. Take South Dakota. It is studying deer migrations between winter and summer ranges so hunting seasons can be regulated correctly. Russell Robbins, state biologist, tells about one mule-deer buck he radio-tagged during part of the study. For nine days, this monitored buck outmaneuvered hunters, although, according to a telemetry "fix," he once stood only 40 yards away. Frequently, this buck watched hunters, unnoticed, from less than 200 yards, despite a blaze orange cloth around his neck. And, these same hunters proclaimed to the chuckling Robbins that the country was devoid of deer!

On the serious side, G. Gene Montgomery and Robert E. Hawkins, of the Illinois Natural History Survey, have uncovered surprising data on stocked and native deer. They radio-tracked 76 deer in Illinois using two permanent antenna towers. Results show that it is unlikely that diseases are passed between stocked and native deer. They avoided each other. They used the same watering and feeding places, but at least eight hours apart.

The two experts learned that transplanted deer seemed unable to elude hunters. In 1965, all transplants were killed during hunting season (despite being

given months to learn the territory), while only 40 percent of the native deer were killed. In 1966, results were similar.

In another study, Dr. John Tester, of Minnesota's Museum of Natural History, has learned that deer continually change beds, two to four times during daylight hours, four to five times at night. Tester can follow 50 animals at once, with one-per-minute fixes. He has fixed towers that track automatically and plot positions instantaneously with the aid of computers.

The electronic third degree of telemetry is continually producing surprising facts. Minnesota scientists have found that as the snowshoe hare feeds, it covers its entire home in three to four hours. And that transplanted hares are likely to return to their home ranges. In probing the raccoon's habits, it was learned that unless feeding young, they change den trees nightly.

In Louisiana, by means of changes in transmission signals, scientists can tell whether alligators are sunning on land, floating on the surface, or swimming underwater. Ontario has proven—disproving an old theory—that timber wolves, after being handled by man and released, will be accepted by their hunting packs. Manitoba has determined when polar bears leave Arctic ice wastelands and move inland. South Dakota is determining the general movements of individual wild turkeys between flocks, as well as the influence water plays in choice nesting sites.

On the trail of grizzlies

And two famous telemetry experts, John and Frank Craighead, of the University of Montana, are tackling the most ticklish study of all—grizzly bears. Their results are surprising.

By actually radio-tracking grizzlies to their dens on the day hibernation began, they learned that by some sixth sense bears wait for heavy, blowing, drifting snow that will unfailingly lock their dens for winter. The snow covers their tracks as, all at once, they hurry to their widely separated and previously bedded dens. Always, these dens are on the north side of slopes immune to winter's thaws, and secreted beneath the roots of a large tree. Inside, as with Eskimo igloos, the sleeping chamber is raised above the opening so warmth will be trapped. Currently, the Craigheads are planning to count heartbeats and take electrocardiograms by external transmitters, and also to insert thermistors into the bodies of grizzlies in order to record body temperatures.

It is to such internal telemetry systems, rather than to external systems beneficial to wildlife scientists, that medical men are

looking for the answers to giving man a healthier, and better life. By embedding sensors in free-roaming animals, such as pigs and wild baboons, whose circulatory systems resemble human's, physiological reactions are being studied. Conceivably, medical science may learn what causes altitude sickness and hypertension, and gain understanding of why the heart performs as it does under stress, and answers to other medical enigmas.

At Colorado State University, Dr. Harry A. Gorman is studying mule deer and swine in an attempt to forecast and predict the effects of sharp altitude changes on humans. Although it doesn't seem flattering, the physiological makeup of swine compares favorably with that of humans. Dr. Gorman designed the sensors used on animals sent into space in the early earth-orbiting bio-satellites.

Deer take change in stride

"Both swine and deer are affected when taken quickly from our campus altitude of 5000 feet up to 10,000 feet," Dr. Gorman said. "But deer seem to take the change in stride and adjust rapidly. Swine, on the other hand, become lethargic, like humans, probably have headaches, and if they exercised much, would develop serious heart and lung problems."

Dr. Gorman is enthusiastic about the project. "We expect to continue our tests for two more years," he reports, "then we may have information which will be valuable to our military, skiers, tourists or anyone who comes to the mountains."

Another fascinating internal study is being made by Dr. Robert L. Van Citters, associate professor of physiology and biophysics at the University of Washington, Seattle. Dr. Van Citters "bugged" baboons in Africa because their cardiovascular responses are probably much more akin to man's than those of usual laboratory animals.

"We are now analyzing the data, hopeful it will lead to an understanding of how the human heart performs under stress, and more important, why it does so."

Added to this experiment was another amazing feat. Buried surgically in the baboons was a device which, on signal, anesthetized them. Then the scientists walked in to recover their transmitter packs, each valued at \$5000.

Most scientists agree that it will be about 10 years before wide-scale definitive applications can be made of most of the work which has been started. "All life has a lot of common denominators," said Dr. Sanderson, head of the Natural History Survey, "and we are trying to learn more about them." ★ ★ ★

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'ROBOT' CORROSION FIGHTER

(Continued from page 151)

any possibility of corrosion attacking the electrode itself. Both electrodes will last indefinitely.

The system is so sensitive that it automatically compensates not only for fluctuations in salt or mineral content of the water, but even for water temperature. If you scrape a little paint from the lower unit so that more current is required for protection, MerCathode automatically senses this new situation and makes its own adjustments.

Such precision is absolutely necessary since a device operating on this principle must force out only enough current to neutralize the destructive current flow. Too much protective current can actually promote corrosion of the aluminum by creating an alkaline condition on the metal surface. Thus, an independent voltage measured between the reference electrode and the metal under protection changes according to the degree of protection achieved, and it is this voltage which automatically directs the regulation of the power supply.

The idea itself isn't really new. Cathodic protection systems similar to MerCathode, but many times larger, are used on aircraft carriers, ocean liners and large pleasure yachts.

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Installation is extremely simple. When first introduced, it was recommended that the two electrodes be installed as replacements for the two bottom transom through-bolts on Mercury stern drives. Now, however, the company recommends that they be mounted through the transom slightly outboard of these locations to achieve better distribution. Naturally, this method of installation will work with any outboard or stern drive.

Merc dealers have a test meter which reads the corrosion potential present in local boating water. (If you're curious about the condition of your water, ask one of them for a demonstration.) According to the company, it's advisable that any MerCathode system be monitored occasionally with this tester because of the possibility of faulty electrical systems or varying electrical currents nearby. Otherwise, it requires no attention whatsoever.

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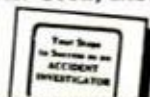
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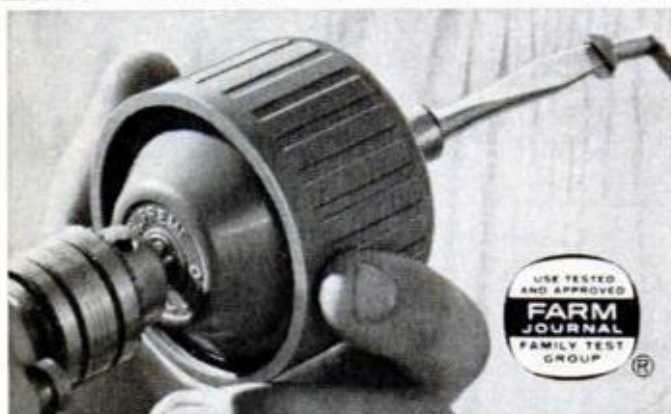
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GIANT KILLER WAVES

(Continued from page 101)

clear day—was hit by a tsunami created by an earthquake near the Aleutians. The entire waterfront was destroyed. Some of the waves were recorded as far away as Chile, which is 8000 miles to the south.

Historically, tsunamis have been blamed for some of the most tragic death tolls—30,000 in Italy in 1783 and 27,000 in Japan in 1896—and the Aleutian area is blamed as one of the worst tsunami producers, with Hawaii and Japan its chief victims. One expert claims that an underwater trough "guides" the tsunamis produced in the Aleutians toward these two hapless areas.

The third major killer wave is known as a reflected wave and has nothing to do with the open sea but is produced in inland bodies of water which, because of their shapes, are susceptible, roughly, to the same effects you'd get by sloshing water in a bathtub.

Takes Chicago by surprise

One such wave took Chicago, on the shores of Lake Michigan, by surprise in 1954. A squall line, moving west to east with the right combination of air pressure and wind effect, produced a long, low wave that hit the southeastern shore. Now on its own, and with no place else to go but back in the direction it came from, the powerful wave roared back to the Chicago shore, sweeping seven fishermen to their deaths.

Reflected waves are often erroneously called seiches. A seiche (pronounced saysh) has similar origins, but different results because the water continues to rock back and forth from one shore to another. It occurs most frequently in the United States in Lake Erie which, because of its long, narrow profile, shallow depth and prevailing winds, seems to be ideally suited.

Better warnings saving lives

Killer waves, while still dangerous, are less so today than they were years ago when thousands of people were killed. Even Hurricane Beulah, mentioned earlier, one of the most destructive of all storms on record, killed only a handful of people.

Modern warning techniques and detection equipment, including weather satellites, have done much to neutralize the destructive forces of nature by allowing the evacuation of people from coastal areas where one of the killers is expected to strike. ★★★

JOHNCOCK TESTS CORVETTE

(Continued from page 110)

star. Vision, with the exception of the high front fenders, is good all around. Instruments are easy to read even though the panel and other controls tend to give the car's interior the look of a jet cockpit. There's plenty of padding everywhere, giving the car a well-finished look.

As mentioned earlier, the car I drove was a convertible (that's what I guess you could call the "takeaway" roof you see in the photos), which means it doesn't have the built-in roll bar the coupe does. I think the roll bar idea is great, something I personally would like to see in all cars, particularly those of a distinctly sporty nature. How it could be done on a true convertible, however, baffles me as much as it obviously does car designers. Maybe the true convertible is on the way out.

The only other Corvette I ever drove was a '63. Purists will tell you that this new one is essentially the same car, the major change being, of course, the body. But don't believe them; there have been many changes (steering and suspension, to name two) made, and all of them for the better, I think. In any event, I promise you the '68 Corvette, while still a heavy, pow-

erful (too powerful?) car, sure *feels* different from the '63. It's a lot more tractable and responsive.

Summing up, the new Corvette is, in my opinion, the best one yet. It isn't everyone's dish, by a long shot, if only because it's expensive (\$5500 and up). Also, I can't think of too many places, outside of race-tracks, where the car can be driven to its full potential. It's a car for skilled enthusiasts, definitely not "cute" and not a toy. I shudder to think of an indulgent parent buying one for his darling daughter; driving the new Corvette demands that you *pay attention!* ★ ★ ★

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RESCUE FROM THE DEEP

(Continued from page 126)

sonar and the stricken sub's radio buoys. While the mother sub hovers, a three-man crew boards the rescue sub. With pilot and copilot in the control sphere, the corpsman checks the two rescue spheres. Each sphere is seven-and-a-half feet wide. Then, DSRV detaches.

Now the ticklish work starts. Operating every steering aid they have, the pilots try to locate, clear and attach to one of the distressed sub's two escape hatches—one in the bow, the other in the stern.

Using television cameras, lights, sonar and viewing ports, the pilots look for the hatch. This can be tough if the water is at all murky or unsettled.

Joining with the stricken sub

If the escape hatch, when found, is cluttered with debris, the pilots activate a mechanical arm to clear the deck section.

But there are other problems even when the hatch is located. One is joining with the distressed sub if it rests on a side. It's possible for DSRV to attach itself to an escape hatch if it's 45° off either the horizontal or vertical—but it's rough.

Another problem can be the current. If it's running at a knot or less, the five electric motors of DSRV can hold their own against it. But if the current is stronger, an anchor is attached to the hatch and DSRV is winched down.

When positioned, the sub sinks over the hatch. The initial force of contact is absorbed by three shock absorbers holding the outer "mating" skirt. DSRV is slowly dropped until the permanent skirt rests over the hatch. The water is then pumped out. This lowers pressure in the chamber. When this pressure equals the pressure in the distressed sub, the hatches are opened. The heavy pressure of the water keeps the DSRV sealed to the larger sub.

Now members of the crew can climb into the rescue vehicle. As each man climbs through the hatch, a counterweight is passed into the stricken sub. This prevents upset of the rescue sub's buoyancy or "rising factor."

DSRV can rescue 24 men at a time. Once loaded, the two hatches are closed and DSRV shuttles back to the mother sub. There the men are discharged and the small sub returns for another load.

All this is a far cry from the heavy bell lowered 243 feet to rescue survivors of the *Squalus* in 1939. But today's atomic submarines go deeper—10 or 20 times deeper. So we need DSRV to rescue crews trapped that deep. ★★★

RAMBLER AMERICAN

(Continued from page 119)

paint that any good painter could match."

► That seems like a reasonable request. After all, mass production depends on standardization.

A Florida mailman says:

"I like the car very much, mechanically, but it leaked. I had to have the windshield taken out the third week I had it. Bad body press job, they said. It also had too many wrinkles on the hood."

► He didn't say whether the wrinkles were in the paint or the sheet metal. Let's hope they were in the paint.

Other workmanship complaints are detailed by category in the accompanying summary chart. These complaints, however numerous, were overshadowed by the minor nature of mechanical complaints and the overwhelming praise of economy from initial price to subsequent care.

"Biggest bargain on the market."—Wisconsin lithographer.

"Reliable with minimum upkeep, lowest initial cost of most compacts with comparable options."—Montana meat cutter.

"Dollar for dollar it's the best car made in the U.S."—Florida security guard.

It's understandable that 85.3 percent of owners are ready to buy another American next time around when praise continues in this vein:

"For a small, comparatively light car it offers overall comfort combined with economy and very few nuisances such as rattles. Gives the feeling of a much larger and more expensive car."—New Mexico loan appraiser.

"It's very easy to handle in heavy traffic, easy to park, and always starts instantly. I like it better than any car we've ever owned."—Retired North Carolina farmer.

Of course, there are still things owners would like changed—like the three-speed manual transmission, for example:

"I would like to see the manual transmission improved for easier shifting."—Florida schoolteacher.

"Frequently have trouble getting manual gear shift lever into reverse and low," said our New Mexico loan appraiser.

Summing up the owners' experiences in regard to their workmanship complaints, specifically, leads one to draw a conclusion: The excitement of picking up a brand-new car is enough to keep you from seeing little things like paint runs until the next day. But you'd certainly inspect fine china before buying it, why not a car? If it's got a visible defect, demand to have it fixed; no fixie, no money. After all, you're the customer and the customer is always right. Right? ★ ★ ★

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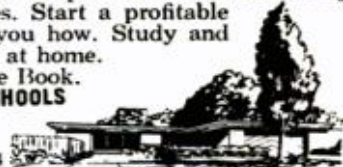
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FLASHY COLOR WITHOUT FLASH

(Continued from page 160)

"sees" all the light in a scene and gives an average reading. If the lighting is even and you can move in for a close-up reading, what the meter tells you can be quite reliable. However, where the picture includes bright areas surrounded by lots of darkness—a common existing-light situation—the meter is fooled by all that black and its needle barely moves, even though there may be plenty of light in the bright areas for an effective exposure.

Focus carefully with lens wide open

Note that the guide gives exposure times at $f/2$ —the widest lens opening on most cameras. This is because it's necessary to use a wide opening in order to obtain the fastest available speed to stop motion and minimize camera shake. When shooting with the lens wide open this way, it's important to focus carefully since there's less depth of field to cover up your mistakes.

Where depth of field and sharpness are more critical than shutter speed, you can convert to smaller lens openings without changing the basic exposures given in the guide. To do this, merely increase the exposure time one stop for each stop you decrease the lens opening. For example, $\frac{1}{60}$ th of a second at $f/2$ is the same as $\frac{1}{15}$ th of a second at $f/4$ or $\frac{1}{4}$ of a second at $f/8$.

To make sure you'll get a satisfactory picture under varying light conditions, it's best to bracket your exposure by shooting three pictures—the first at the suggested exposure, the second at four times suggested exposure, and the third at one quarter the suggested exposure. You can do this by changing either the lens opening or the shutter speed. For example: Suggested exposure is $\frac{1}{30}$ th at $f/4$; bracketing exposures are $\frac{1}{30}$ th at $f/2$ and $f/8$ or $\frac{1}{8}$ th and $\frac{1}{125}$ th at $f/4$.

Effective existing-light pictures generally call for an adjustable camera where you can vary the speed and aperture settings manually. Self-adjusting automatic cameras, unless they have provision for manual operation, are not suitable because dim light conditions tend to fool the electric eye. The eye will tell you to "use flash" and that's that.

Choosing a color film

Far and away the fastest color film for dim-light use is GAF's new Anscochrome D-500 (*World's Fastest Color Film*, page 96, Aug. '67 PM). It has an exposure index of 500—higher than most black-and-white films. Such tremendous speed is a big help where you need both a small lens

opening for maximum sharpness and a fast action-stopping shutter speed.

Other fast films from GAF are Anscochrome D/200 with an exposure index of 200 and Anscochrome D/100 and T/100, both with an EI of 100. The T/100 film is balanced for tungsten light. The other three Anscochromes are daylight films.

Kodak's available-light color films include Ektachrome-X and Kodachrome-X, both with an EI of 64, Kodacolor-X (EI 80), High-Speed Ektachrome (EI 160), and High-Speed Ektachrome Type B (a tungsten film with an EI of 125).

While all the other films mentioned are reversal types yielding positive color transparencies, Kodacolor-X is a color negative material. It delivers negatives from which either prints or color slides can be made. Its advantage for available-light use is its considerable exposure latitude—up to five full f stops. This makes it more tolerant of your wrong guesses than any other color film and practically eliminates the need for bracketing.

Shooting indoors, you'll encounter several different kinds of light: tungsten lamps, fluorescent lamps, carbon-arc spotlights (used in auditoriums and theaters), and daylight coming in through windows. Ordinarily, for best results with tungsten lighting, as found in the average home, indoor films balanced for such light are used. Some photographers, however, prefer daylight-type color films for the warmer skin tones they produce.

Fluorescent lighting is just about the worst kind of illumination for color photography. Because of a deficiency in red, it gives sickly greenish results. This can be minimized through the use of daylight color film. The carbon-arc spotlights call for daylight-type film, too. Always use daylight-type film when natural light is predominant.

Shooting night scenes

You can use either daylight or tungsten color film for pleasing results at night outdoors. Generally, tungsten films yield more natural-looking pictures, but many people like the "warmer" (more orange) effect of daylight-type films.

A good time for striking skyline views is just after sunset when there is still some light—and often dramatic color—left in the sky. Amusement parks and brightly lighted street scenes—especially in theater and nightclub districts—are favorite night picture subjects. Wet streets, reflecting lights, add interest. A wide range of exposures will produce satisfactory photos of such scenes. Even some of your wrong guesses may turn out to be quite pleasing. ★★★

BIG BOOM IN TINY TAPE

(Continued from page 143)

Harman-Kardon's, with record changer, FM stereo reception and stereo record/playback cassette. With this package you can record a cassette directly from the phonograph or record FM stereo right off the air with the flick of a switch.

In between the kiddie player and the complete sound system you'll find self-contained monaural or stereo record and playback systems. They've got separate microphones and full controls on the amplifier section and come in decorator designs appropriate for living rooms. Other home player/recorders are in "deck" form designed to be used with your existing hi-fi amplifier and speakers. One such deck has the added feature of a cassette changer mechanism. Norelco's changer stacks six cassettes and plays them one at a time automatically (*New in Electronics*, page 198, Oct. '67 PM).

The big shape of tape in the \$50-to-\$100 range is the portable cassette recorder. Small and light, most include the microphone, carrying case, and one blank cassette in the price. The majority are not too different from the Arvin, GE, Norelco and RCA portables shown on pages 142 and 143. But that in the new Ampex cassette line, for example, is somewhat larger, while Sony's is the smallest of the small. Most have output jacks for external speakers.

So compact is the design of the cassette machine that it's becoming an extra feature on such things as portable radios. Now you can have your tape along with AM, FM and even shortwave bands. ★ ★ ★

ROCKWELL ROTARY PLANER

(Continued from page 185)

makes it easy as pie to reset them right on the button.

The cutterhead will take on all comers: plastics, laminates, Styrofoam, compositions, plywood and both hard and soft woods. It will handle work as large as 6 in. square and as small as an 1/8-in. matchstick. In addition to jointing and surfacing, its 26-in.-long table tilts up to 45° to let you trim compound miters or make chamfer cuts on the smallest work. It will cut tenons on the ends of dowels and plane perfect tapers.

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The basic machine lists at \$238. With motor and stand, it's \$356.50. ★ ★ ★

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CAMPING THROUGH EUROPE

(Continued from page 131)

own languages. We did, however, talk with many people in the shops, markets, stores and restaurants.

While on the subject of languages, let me refer back to that "ordinary American family" line. We are just that. (I'm throwing this in just in case you're worried about a language barrier.) We include Gayle, 15, Scott, 11, John, 9, and two parents, ages unknown, all fluent in middle-Iowa English. The three youngsters have reached varying levels of academic skill in French; my own French is long dormant, and my wife, Joan, pantomimes recklessly in any language.

Obviously the family is no powerhouse of linguistic skill, but we managed to get along quite well. Though often amused at our attempts to communicate, the Europeans were polite and helpful enough to get us what we wanted when they understood what it was.

The point is: Go forth bravely, even if all your vocabulary comes in phrases read from a Berlitz book.

Same side of the road

Everyone on the Continent drives on the right-hand side of the road, so you won't have to change that habit. (In Great Britain, it's still left-side driving.) The roads we traveled were mostly blacktop, mostly good and mostly narrower (except for the superhighways) than those we're accustomed to. A superhighway (*autobahn* in Germany, *autostrada* in Italy and *autoroute* in France) is generally divided, with two lanes in each direction. We found those in Italy and France were newer and smoother than those in Germany. Most of the other roads were single-lane each way, though we did travel on many three-lane highways.

In addition to local-language markings, all major roads on the Continent have international road markers. These are designed on the theory that if you can't read, you can look at the pictures. Some, however (such as those that are simply geometric patterns) should be memorized—preferably before you find yourself driving somewhat dazedly on that first day on an *autobahn*.

The symbol for a campsite is a wigwam-type tent surrounded by a large C. An arrow points in the direction of the camp. A few times, we followed the arrows and wound up lost in the boondocks, but generally we'd soon spot those bright orange and blue tents of the European campers.

I did find the driving more exhausting than driving on American roads. I suppose

it was partly because I was in a car I hadn't driven before and partly because it does bother me when I can't read all the road signs. There's another reason, too: European driving habits are different.

As long as the cars will fit, they'll turn almost any two-lane road into a four-laner. I was convinced, too, that many Italian drivers are trained in fighter-pilot school. (When they pass and cut in so their taillights disappear below the windshield of a VW camper, they're close.)

The toughest drive was along the Mediterranean coast from Pisa to Nice—mostly a climbing, diving two-laner filled with cars, double-rig trucks, bicycles, motor scooters and pedestrians. Circling the Arc de Triomphe in Paris is another exercise in masochism; it's a sort of whirlpool of darting little cars save for an occasional wild-eyed pedestrian trying to make his way to the monument.

Just as you've heard, gasoline costs more in Europe than it does here. We used regular in Germany at 52 cents a gallon, but we switched to high-test outside of Germany after being warned that *ausländisch* gasoline varies in its octane rating. High-test in Italy was 75 cents, in France, 78 cents, and in Austria, 62 cents. (Gasoline coupons purchased as you enter Italy save about 30 percent of the cost.)

Two other tips from first-hand experience: Don't foul up a German traffic cop's orderly intersection; he will scream and turn red. And don't force a Frenchman off to the side; he won't scream quite so loud, but he turns just as red and waves his arms besides.

Resume of trip

Perhaps a short resume of our trip would be helpful if you're planning one.

We packed most of our gear in five Army duffel bags (to save weight), a large suitcase and an overnight case. My wife made smaller nylon bags for each traveler's personal clothing, and these were packed into the larger canvas bags. The suitcase carried such things as my sports jacket and Joan's dresses. (Casual as campers may be around their tents, almost all wear ties, jackets, dresses and the like when sightseeing.)

We flew directly from New York to Frankfurt on a Lufthansa jet, departing at 9:00 p.m. and arriving at 9:30 a.m. local time the next day. We picked up our camper from a VW dealer there, drove downtown to buy three sleeping bags (\$14.75 each), three cots (\$5.50 each) and a couple of campstools. Then we drove to Heidelberg for our first night of camping.

The next day, after walking up to 700-

(Please turn to page 226)



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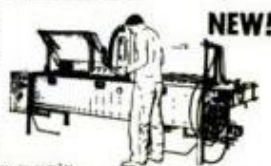
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CAMPING THROUGH EUROPE

(Continued from page 224)

year-old Heidelberg Castle and strolling through the city, we departed for Würzburg. We noted as we left the area that there were six other campsites within a few miles along the Neckar River—and all looked nicer than ours had been.

Don't miss the Romantic Road

Würzburg marks the north end of the Romantic Road, which stretches south to Füssen. We followed it as far south as Augsburg, where we turned off to go to Munich. If there's any area you seek out on your trip to Europe, let it be the Romantic Road. Along the way are magnificent gothic, Renaissance and baroque churches and palaces, such medieval walled cities as Rothenburg, Dinkelsbühl and Nordlingen, half-timbered houses and solid, fortified castles.

We visited the grim Dachau concentration camp before camping outside of Munich. (That was the rainy, 40° night.) Munich is a shopper's delight and its Deutsche Museum an incomparable display of science and technology. Next we traveled into Austria to Salzburg, birthplace of Mozart and a city we'd have happily spent all of our three weeks in.

South of Salzburg, we saw Berchtesgaden, site of Hitler's hideaway, then Innsbruck with its awesome backdrop of snow-capped Alps. We spent a day on a side trip to Garmisch, from which we took the trip to the top of the Zugspitze and made side trips to Oberammergau and Neuschwanstein.

Coming back through Garmisch, we continued on through the Brenner Pass and south to Verona, site of some remarkable Roman ruins, including the huge Arena. We turned east to Venice, camping in Mestre just outside the city of canals. Yes, we took a gondola ride, fed the pigeons and spent a great deal of the rest of our time fending off vendors of trinkets.

Florence, the next camping spot, has so much to see that it's really all highlights; it'd take more space than I have even to list the art treasures of Pitti Palace, for example. Next came Pisa (yup, the tower's still leaning), and then we headed around the Mediterranean coast to France. The little towns along the way are sparkling white against the deep blue of the water; any one of them looks like a great place for an entire season.

We camped a couple of times along the Italian Riviera and headed up through France to Avignon. It was here that I and two other campers, a Frenchman and a German, spent an hour trying to get my

VW to start. None of us spoke the other's language, so we (mostly they, I must admit) worked and acted out a running charade. Finally, the German produced a set of sparkplugs that did the trick. It was a *nein* and a *non* when I offered any sort of recompense. I finally left a bottle of wine in each tent just before we departed.

We spent another night camping before arriving in Paris. What can I say about that city in a few lines? It's all there, as advertised. There is a campground in the city—in the Bois de Boulogne—but we had no carnet (a permit), so we could not stay.

From Paris we headed east through the champagne country, stopping in Epernay to tour the Mercier plant. Then on through such World War I battlegrounds as Verdun, through the Mosel Valley to the Rhine River, down to Frankfurt and one final night of camping in that city.

Averaged 125 miles a day

In all, we traveled over 2500 miles in the 20 days. That average of 125 miles a day, plus sightseeing and camping, is strenuous, but I'd probably drive that far again on a first visit to see as much as I could.

Just to keep things honest, I guess I'd better confess about now that we spent a couple of nights indoors when rain, cold and late driving made the tent routine seem a bit too heroic. We stayed in the guest houses that every village seems to have—and about which we had heard virtually nothing before our trip to Europe. Keep them in mind if unmitigated camping seems unsurvivable; they won't wreck your budget. We paid \$6.50 one night and \$8.50 another night for two rooms and breakfast for five.

Here's a quick list of reminders that may help you plan *your* trip:

Transportation: Make your airline reservations now. We made ours in November for a 21-day excursion flight (\$360 per adult, half fare for the two boys under 12). Each passenger has a 44-pound baggage allotment—enough, we found, to carry all our gear except the new cots, which we left behind.

Passport: You'll have to show it at every border. My wife and I got separate passports (\$10 each) and we got a third one for the three children (another \$10). Your entire family can be on a single passport if you wish.

Vaccination: You must have a certificate proving you had a smallpox vaccination within the past three years in order to re-enter the United States. Use the form issued by the U.S. Public Health Service.

Car: If you're planning to buy a European car, you can pick it up in Europe, take your trip and have it shipped home. If you

want to rent one, the large U.S. rental agencies are in Europe, and there are European rental agencies, too. Some of the major airlines now are offering a group fare with free mileage as part of a trip "package." Be sure that whatever method you use to get a car, you get insurance coverage for all countries you'll visit; your papers are checked at every border.

Driver's license: Your state license is necessary, and the International Driving Permit (in nine languages) is useful. You can get it for \$3 from the American Automobile Assn., 750 Third Ave., N.Y. 10017.

International camping carnet: This membership card permits you to use campgrounds operated by clubs affiliated with the International Federation of Camping and Caravanning. Sometimes carnet holders get a discount on fees—though one camp manager told me the discount was offered only during "off months." We regretted not having one only when we could not camp in Paris. You can get a carnet through the National Campers & Hikers Assn., P.O. Box 276, 7172 Transit Rd., Buffalo, N.Y. 14221. Family membership in N.C.H.A. is \$5, and the carnet is \$4.

Helpful literature: Two books that we used extensively were *Fielding's Travel Guide to Europe* (\$7.95) and *The Temple Fieldings' Selective Shopping Guide to Europe* (\$1.95). Major oil companies offer maps and literature at low cost. Airlines serving Europe offer free literature. And the following tourist offices in New York offer literature, generally including maps of camping sites:

Austrian State Tourist Dept., 444 Madison Ave. (10022); Belgian Tourist Bureau, 589 Fifth Ave. (10017); British Travel Assn., 680 Fifth Ave. (10019); Danish National Travel Office, 505 Fifth Ave., (10017); Finnish National Travel Office, 505 Fifth Ave., (10017); French Government Tourist Office, 610 Fifth Ave. (10020); German Tourist Information Office, 500 Fifth Ave. (10036); Greek National Tourist Organization, 601 Fifth Ave. (10017).

Irish Tourist Bureau, 590 Fifth Ave., (10036); Italian State Tourist Office, 626 Fifth Ave. (10020); Luxembourg Economic and Tourist Dept., 200 E. 42nd St. (10017); Netherlands National Tourist Office, 605 Fifth Ave. (10017).

Norwegian National Travel Office, 505 Fifth Ave., (10017); Portuguese Government Tourist Bureau, 570 Fifth Ave. (10036); Spanish National Tourist Office, 589 Fifth Ave. (10017); Swedish National Travel Office, 505 Fifth Ave. (10017); Swiss National Tourist Office, 608 Fifth Ave., (10020); Yugoslav State Tourist Office, 509 Madison Ave. (10022). ★ ★ ★

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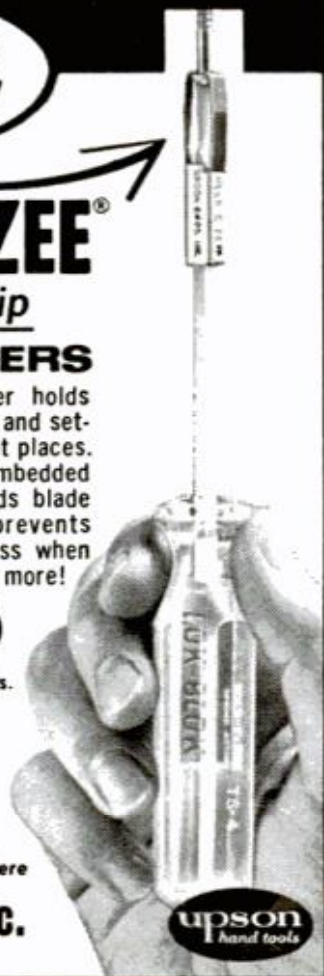
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QUICK COLD STARTS

(Continued from page 149)

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For my money, many of those who advocate engine heaters to keep crankcase oil "thin" are living in the past. Modern oil, if you pick the right one, will not stiffen and cause hard starting at temperatures down to minus 25° F. But you've got to use the right viscosity oil. You can't use the same viscosity oil in winter as in summer.

How oil helps

"Each reduction in viscosity," a GM lubricants expert told me, "lowers the minimum starting temperature by about 15° F."

The way in which the wrong viscosity oil overburdens the cranking system can be seen in the chart on page 147. With a good battery and 20W oil, the test engine wouldn't obtain its necessary cranking speed of 50 rpm below 10° F. By changing to 10W oil, satisfactory starting is obtained down to about minus 5° F. A further switch to 5W oil assures good cranking speed at minus 20° F.

Your best guide as to what oil to use in your engine in cold weather is your owner's manual. However, if you've lost it, you can't go wrong following these recommendations:

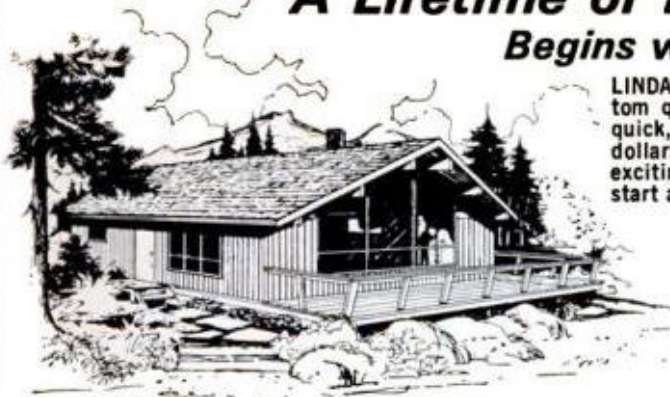
If the lowest anticipated temperature in your area is from 0° F. to 32° F., use 20W or 20W-40. If temperatures are between 0° and minus 10°, use 10W or 10W-30. If they're minus 10° and below, use 5W or 5W-20.

High-speed, long-range driving with 5W oil in the crankcase should be avoided. Engine temperature will approach normal range and cause the oil to get too thin. Use 5W-20 oil if you anticipate this kind of driving. Of course, if you're reading this in a really cold area where temperatures are constantly minus a few dozen degrees F., go ahead and use a crankcase heater!

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TROUBLESHOOTING A FURNACE

(Continued from page 195)

store, gas station or auto-parts supplier. Put it on the blower-motor pulleys and tighten the adjusting nut (usually behind the blower motor) until the belt has a 1/2 to 3/4-in. play. If you don't have a spare, try wrapping some strong rope around the pulleys as a temporary remedy.

● **Check the blower motor.** A short is usually indicated by on-off cycling in short spurts or by its refusal to run at all. However, while waiting for the serviceman, you can get some heat, since the burner is still functioning. Just remove all filters from the furnace. Since hot air rises, some heat will go through the ducts to the registers.

When there's a power failure

In the event of electrical failure in your area, you may still be able to produce heat in your home, provided your furnace is gas-fired. An oil burner requires power to pump oil from the storage tank to the furnace unit. It's easy with a self-energizing steam or hot-water system because the gas burner functions normally despite power failures. But a forced hot-water or forced-air system depends on electricity to operate a pump or blower. Also, a main burner that's not self-energizing won't ignite because it depends on an electrical impulse from the thermostat.

Does this mean you're out of luck? Not necessarily, for you can get the main burner going if it has a manual control on its motor-control valve. Simply press or turn the control or, in some cases, lift a lever protruding from the housing of the motorized valve until the burner is ignited by the pilot.

With the main burner of a forced hot-water system firing, open the flow valve on the water line to let hot water feed through the system by gravity.

With the main burner of a forced-air system on, remove the air filters from the cold-air return duct to induce circulation and let warm air be fed by gravity to the registers.

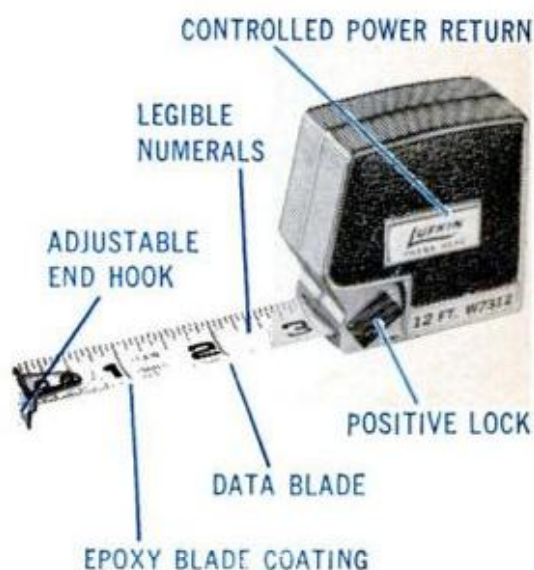
You can't sit back while this heat is getting to you, however. Watch that burner to make sure that excess pressure and temperature aren't building up. Some burners have a throttling device on the gas line to raise and lower the flame (like that on a kitchen range). Lower the flame every half-hour to let the burner cool down. If there is no throttle, shut off the manual control every half-hour for 10 minutes.

This is important! When power is restored, close that manual control. ★★

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ICE FISHING A LA 'CART'

(Continued from page 134)

where water seeps through cracks, permeates snow covers, and then freezes thinly on top. Drop through this crust and the bottom layer of solid ice will hold you, but you'll have the devil's own time getting your machine out of the slop onto firm ice again. Usually you can recognize slush by its brownish color.

"If you can't stop in time," Dave says, "maintain momentum. With a wide 18-inch tread such as your Mustang's, machine and rider exert a downward pressure of less than one pound per square inch, less than a 160-pound man on snowshoes. Keep going. You'll get across."

Dave recommends that, if you've gone through slush, you stop and tip the snowmobile sideways. Then gun the motor until the tread spits out the gumming ice.

Finding the fish

We buzz out across the lake. I know that winter crappies, walleyes, lake trout and bass usually are found in deep water; others such as perch, bluegills, northern pike, in shallow. We head for mid-lake. There we drill holes, sounding through them to locate an underwater sandbar, Jack remembers, with a drop-off into 30-foot depth. It takes several tries to find it. After drilling our fishing holes, we encircle them with our snowmobiles so we can sit in comfort while fishing. We bait up with teardrop artificial lures and live bait. Immediately, Vera catches a crappie. Then we all begin to score.

Just after lunch the sun disappears behind menacing gray clouds. It begins to snow—a regular blizzard. But that doesn't stop the crappies, nor us.

With Jack along, locating the fish has been easy. Had he not been there, we would have looked for fish as every ice fisherman unfamiliar with waters should—drill holes off shorelines, points or islands (at safe distance) until we found dropoffs.

"Time to go," Jack says late in the afternoon. "Wise snowmobilers go fishing early and leave the lake early—well before sundown."

Soon our snowmobiles head across the lake, back to the forest. We can barely see the tracks we made coming out, but we follow them. No shortcuts. It is an unwritten law that if blizzard or darkness should overtake a snowmobiler on the ice, he should follow the same safe route home—the trail he took in.

It's dark in the forest; we turn on our headlights. It is eerie, but beautiful and adventuresome. All I can think of is: "What lake tomorrow?" ★ ★ ★

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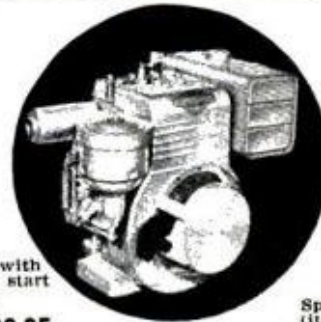
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WORLD'S FASTEST SCHOOL

(Continued from page 207)

ally, the school represents six years of effort and planning.

"I always figured an awful lot of people had car accidents because they didn't really know how to drive," he says. "I learned a few things racing and hauling bootleg whiskey and I reckoned that if I could figure out a way to teach people some of the things I knew, why we might save a couple of lives sometime."

The course is aimed specifically at policemen, highway patrolmen, firemen, ambulance drivers—anyone whose job requires him to drive at high speeds. However, Turner welcomes would-be race drivers or people who just want to improve their driving skills and learn something of the relationship between speed and safety. The course costs \$475 and runs Monday through Friday the year around. Only licensed drivers are accepted as students. So far, the school has been conducted only at Charlotte. This month a branch is being set up at Phoenix, Ariz.

In addition to the actual driving, which takes up most of the five-day schedule, the course of study includes both classroom sessions and time on a Link driver-trainer. Throughout the course you are graded on each phase of the training. A perfect score for each phase is 100. I finished up with an average of 89.5.

As you can imagine, the course is rough on equipment. A team of mechanics is kept busy making certain the cars, furnished by Chevrolet, are in A-1 shape. Tires are furnished by Goodyear, gas and oil by the Union-Pure Oil Company. Large dollops of skill and bravery are furnished by the instructors, all of whom seem to take genuine delight in student achievement.

Undoubtedly, Turner himself is the school's catalyst, its "glue." His incredible driving skills are well known and his outward-going personality places students at ease. Often referred to as "the Babe Ruth of stock-car racing," Turner is something of a legend. (It's said that throughout the South, home and hotbed of stock car racing, Babe Ruth is known as "the Curtis Turner of baseball.") He sums up and somehow manages to instill in students his unique personal philosophy.

"Pop," he'll say, using the term with which he addresses both great and small, "I'll tell you how it is with me, and you might think about it, particularly when you're pushing that car about 80. I figure that if I'm going down for the third time and all I've got sticking above the water is about half of one little bitty finger, well, I've still got a chance." ★ ★ ★

SPLIT-LEVEL TYPING DESK

(Continued from page 159)

shown in the drawing, paying special attention to the $\frac{3}{8} \times \frac{3}{8} \times 20$ -in. tenon. This fits into a matching mortise cut in the right side of the drawer casing and is therefore subjected to a great deal of weight. Make certain that the crosspiece is beveled at 5° where it contacts the side of the drawer casing. Then apply glue in the mortise, insert the tenon and draw the entire top into the groove by using clamps as shown in the top right photo on page 159. With a $\frac{3}{16}$ -in. bit, drill three equally spaced holes through the side of the casing, in line with the beveled crosspieces. Drill into the crosspieces with a $\frac{7}{16}$ -in. bit. Then countersink the holes and drive in three No. 10x2 $\frac{1}{2}$ -in. fh screws.

Apply glue to the face of the small beveled strip and press it against the side of the drawer casing. Space the four metal corner braces along the strip and screw them to the bottom of the typing table and through the beveled strip into the casing.

Set all this aside and begin preparation of the drawers by cutting the $\frac{3}{4}$ -in. side-pieces to the proper length and width. Set up the dado head $\frac{5}{8}$ in. wide and $\frac{1}{4}$ in. deep, and groove the outside of each piece for the drawer runners. Taper-saw the lower half of each side to a 5° bevel, using a hollow-ground planer blade for a smooth finish. Now set up the molding head with a Craftsman 3210 panel cutter and cut the grooves for the bottoms.

Remove the $\frac{1}{4}$ -in. excess from the inside of the drawer sides by using a molding head jointer or a jointer-planer. This material might also be removed by re-sawing or by passing the side on edge over the saw blade.

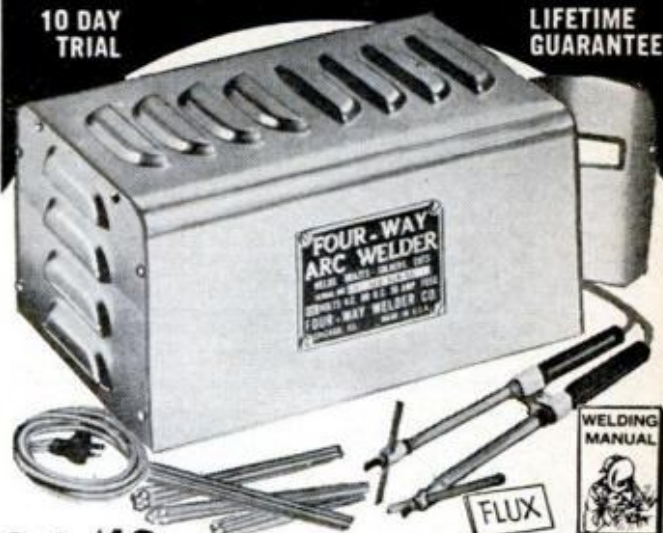
Cut the drawer fronts and backs to size (leave the fronts square), then dado them for the drawer bottoms. The fronts are cut from $\frac{3}{4}$ -in. birch plywood with the grain running horizontally. Cut the milled joints in the ends of the fronts and sides, then cut the bottom pieces and assemble the drawers without glue or nails. Test the fit of the drawers in the drawer casing, and when satisfied with their smooth operation disassemble the drawers and taper-saw the fronts at 5° . Drill through the fronts for the drawer pulls, then assemble the drawers with glue and nails applied only at the four corner joints.

From this point on, assembly is straightforward. Just cut one pair of the 28-in. legs to 23 $\frac{1}{2}$ in. by sawing them off squarely at the top, then redrilling the ends for the threaded bolts. Apply the wood tape with white glue, and follow maker's directions when using the wood finish. ★★

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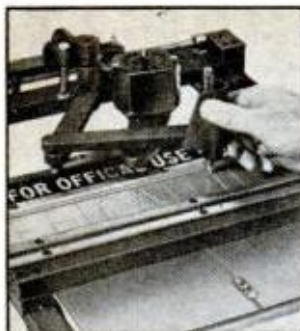
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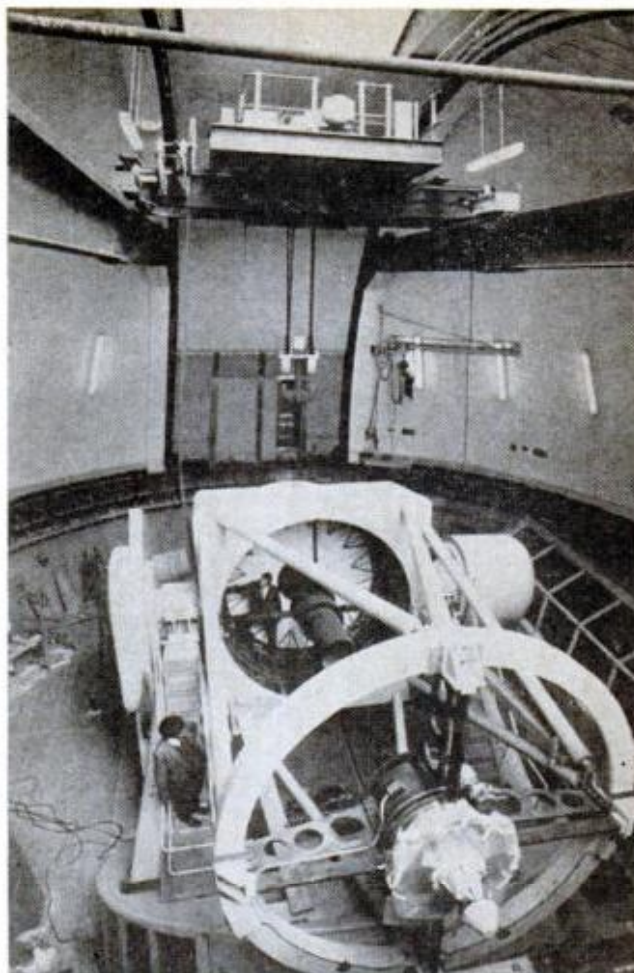
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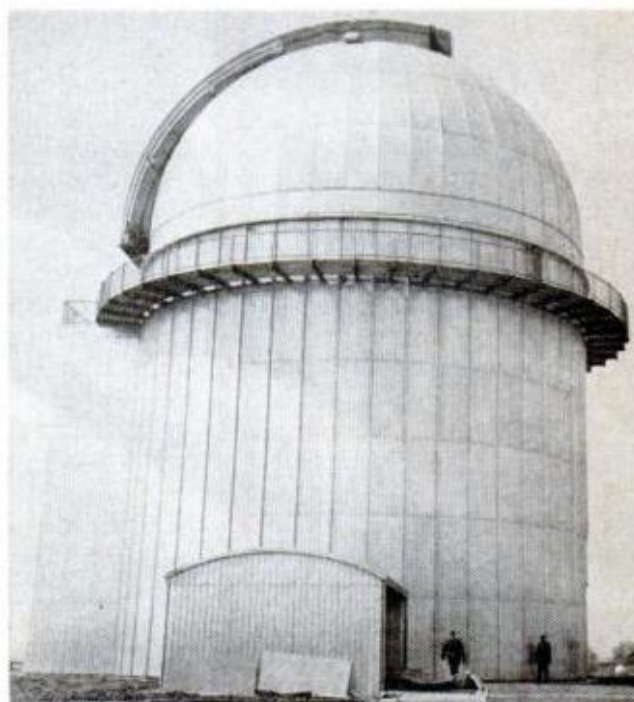
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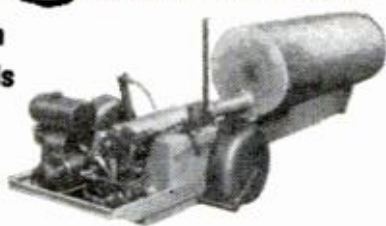
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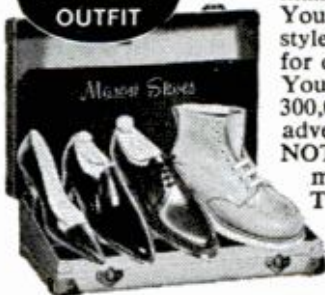
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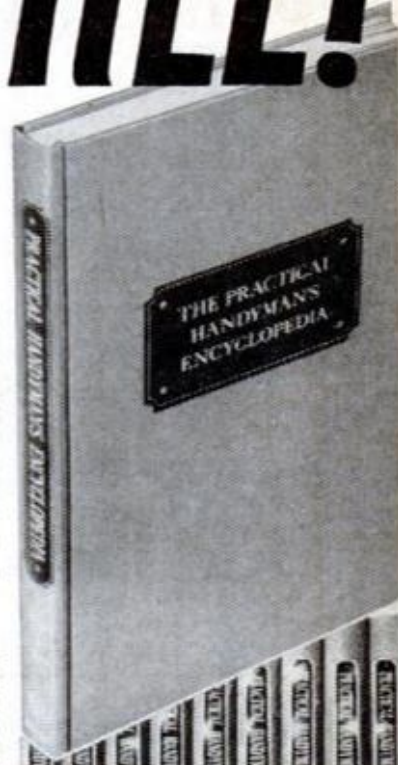
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