

BONUS
Tear-Out Booklet

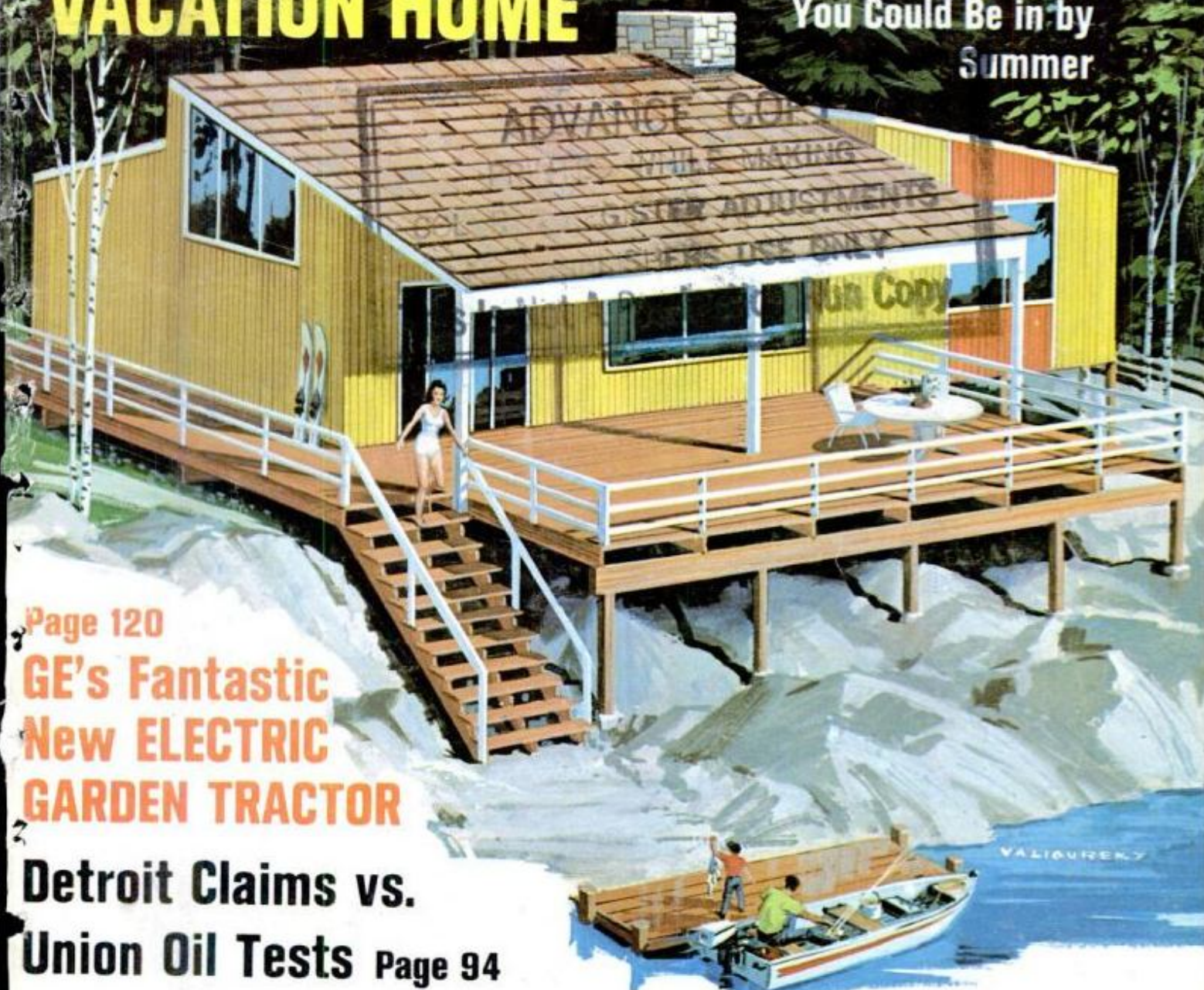
Money-Saving Emergency Home Repairs

POPULAR MECHANICS

APRIL 1970
50 CENTS

**Build This 3-Stage
VACATION HOME**

See Page 132 for Others
You Could Be in by
Summer



Page 120
**GE's Fantastic
New ELECTRIC
GARDEN TRACTOR**

**Detroit Claims vs.
Union Oil Tests** Page 94

Driving the Gremlin - Detroit's First VW-Size Car

**Best Car Lock Yet • New Low-Smog Gasoline • Apollo's
Fearless Firemen • Weekend Projects • New Electric
Mowers • Dan Gurney's Column • Saturday Mechanic**

the motor
that bridged the



generation gap



new loop-charged 60hp Triumph

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Div. of Outboard Marine Corporation

Caution: The Spoiler[®] is habit-forming.

Not a pill. Not a powder. It's a razor blade. The Gillette Spoiler.

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you've been hearing so much about.

Invented by Gillette, this coated edge reduces the pull to a fraction of what it would be without the coating.

You'll notice the difference especially when you shave those extra sensitive spots, such as under your nose, under your mouth, around the edge of

the chin and on the neck.

Caution: This blade is habit-forming. (The men of America have become so dependent on it, they buy more Gillette Spoilers than all competitive double-edge blades combined.)

Yes—the Spoiler edge is also available for injector blade users.



This One



8NQE-SC4-K1K9

The Gillette Spoilers.

*Manufacturer's suggested retail price, standard Swinger 2-door hardtop. Price excludes state and local taxes, destination charges, optional equipment required by state law, and dealer preparation charges, if any. Reduction includes replacement of fiber-glass-belted tires by polyester-cord, and elimination of day/night rearview mirror as standard equipment.

**Manufacturer's suggested retail price for TorqueFlite automatic transmission on 8-cylinder models—\$191.15; 6-cylinder models—\$175.45.



DODGE DART SWINGER 2-DOOR HARDTOP

FLASH!

DODGE CUTS THE PRICE ON DART

For example, the price of the Dart Swinger, America's lowest priced hardtop going in, now reduced \$187^{00*}

It's true. Dodge has reduced the price of all 1970 Dodge Darts. And that's just the start. Don't forget the Dart Swinger Automatic Sale. Buy the specially equipped Dart Swinger 2-door hardtop shown above, and if you check the sticker, you'll find there's no charge for the automatic transmission. (That's the same as having \$191.15** taken off the sticker price.) Simple addition (\$187.00 + \$191.15)

shows Dodge has reduced the price on this specially equipped car a whopping \$378.15. In addition to Dart's sporty styling and torsion-bar suspension, special sale package includes:

- Vinyl roof
- Whitewall tires
- Deluxe wheel covers
- Deluxe vinyl interior trim
- "Rim Blow" steering wheel
- Left, remote-control mirror
- Carpets
- Vinyl body-side mouldings
- Bumper guards (frt. & rear)
- Wheel lip/belt mouldings

It's the opportunity of a lifetime to get the Dart of your choice at reduced prices. Add to this Dart's traditionally high resale price and you've got it—America's biggest compact value. See your nearby Dodge Boy today!

ACT NOW!

Prices reduced as much as \$378¹⁵



Simoniz[®] Master Wax[®] is tougher than the toughest detergent.



Actual photograph after 44 car washes.
Master Wax still beads, still shines...
it won't wash off.

Master Wax your car and you'll have a detergent-proof shine. And your first wash will prove it. Get out a bucketful of the toughest detergent you'd use on a car. Scrub and clean all you want. After the rinse you'll find Simoniz Master Wax still beading and shining... the wax protection just won't wash off!

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Tested through 44 consecutive car washes—
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Won't wash off!



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Build This Three-Stage Vacation Home

NEXT MONTH IN POPULAR MECHANICS

Camping '70: Valuable 32-page tear-out section, full of ideas, tips and new camping equipment. You'll want to keep it in your glove compartment.

The Electrolung: Radical new scuba gear that may make 1000-foot dives possible.

Indy 500 Preview: Can the Can-Am kings blitz the Brickyard?

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APRIL 1970

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the experienced
pipe smoker.



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LETTERS

TO THE EDITOR

Are saunas fun anymore?

Tish, tish. Somebody has taken all the fun out of sauna baths as so clearly revealed in your photo on page 155 (*Now: Prebuilt Saunas That Go Together in an Hour*, Feb. PM). No wonder the poor guy has got his arms folded and wears a somewhat detached frown. What the two gals are so glad about I'll never figure out!

MIAMI, FLA.

HAROLD PALLATZ

The gals are happy because they found some towels lying around to wear for the picture. The guy is solemn because he knows he goofed; he forgot to put up the towel rack.

Passing grade

Your article, *A Lot of Railroad in a Little Space* (page 150, Jan. PM) is very interesting as I am working on an N-gauge line.

You forgot to mention an important point in the construction of elevated trackage. To elevate track five-eighths of an inch or more, you must start the grade at least 43 inches from the highest point; this will give a four percent grade—which still requires a great deal of power in the loco to move six cars.

MINEOLA, N.Y.

EDWARD SKILLMAN

Camping in Canada

I have to thank you for the excellent article, *Across Canada in a Motor Home* (page 122, Feb. PM).

During a vacation to your West Coast last year, I was amazed at how many people thought Canada was ice and snow all year. Last summer we had one solid week of in-the-sun temperatures of 120° to 127° F. Canada, and especially Toronto, has so much to offer U.S. tourists.

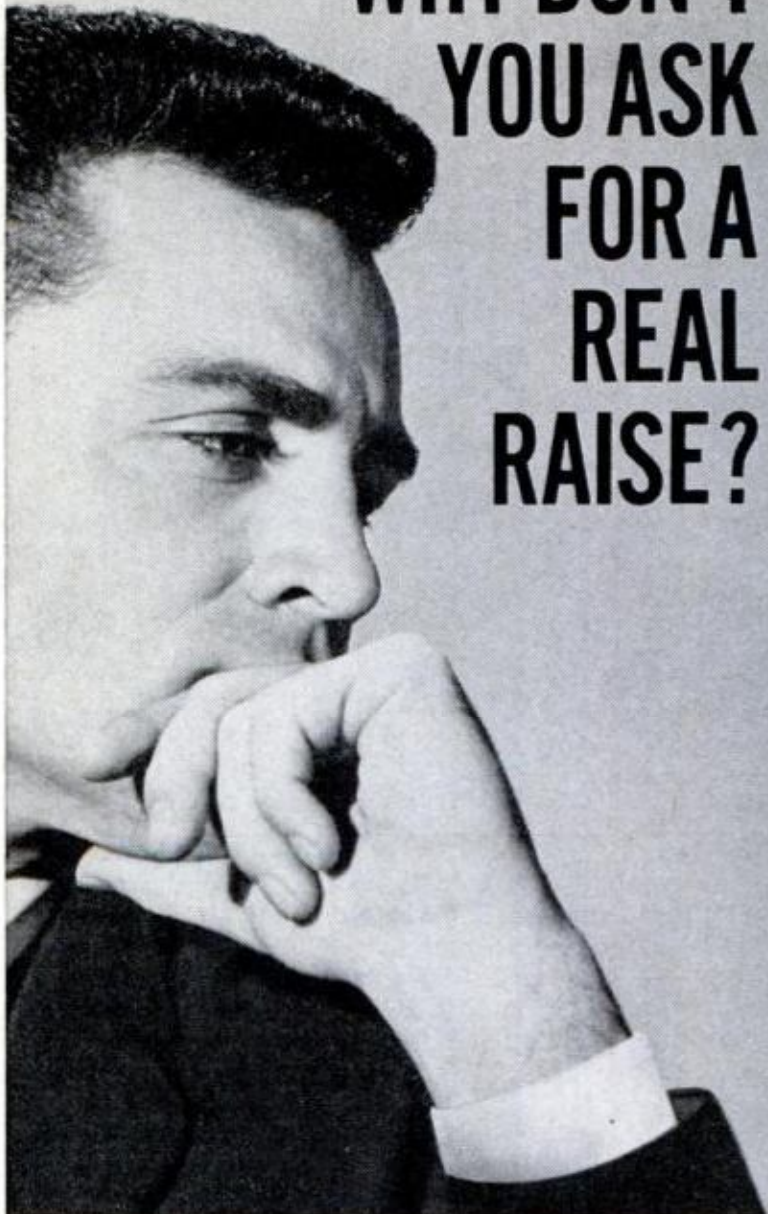
TORONTO, ONT.

BRUCE W. LOVATT

I can appreciate your fascination with the Trans-Canada Highway. My wife and I traveled it, all but the eastern 700 miles, this summer—but we went much, much farther than you did.

We have a camper—a second-hand Econoline panel job I bought in 1964 and fixed up to suit myself. I built in two bunks with storage underneath a wide seat across the back, a grocery closet and an ice chest. My wife and I, both now 75, live

(Please turn to page 8)



WHY DON'T YOU ASK FOR A REAL RAISE?

Think you may be turned down? Here's how ambitious men get important promotions without even having to ask.

If it's been a long time since you've celebrated a raise in salary, ask yourself why. Are you really worth more money? If you're not sure, look again at men who have moved ahead...men so clearly marked for promotion that when it came it was just what everyone expected.

How did they do it? The most usual answer: *through special training*. Special training is the direct way to increase your personal value, your income, your rate of advancement. Soon other employers are likely to seek you out—because *many important positions today are going begging for lack of qualified people to fill them*.

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- Income Tax
- Accounting Fundamentals
- CPA Training
- Modern Bookkeeping

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- Credit and Collections
- Office Management
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Age _____

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Make your kid a fancy dresser.

If it's battered looking, spray it brand new. With Krylon® spray paint.

Then give it pinstripes. Or pinwheels. Or something personal like initials. With Mystik® tape.

Maybe your kid won't always be neat. But at least he'll have a dressy dresser.



You'll find Mystik® Tapes, Krylon® Spray Paints, and Elmer's® Adhesives at Borden's "Love Thy Neighborhood" displays at your local store.



LETTERS

(Continued from page 6)

and sleep in the camper while traveling.
KERHONKSON, N.Y. ALDRICH L. MUNRO

Fine little camper-boat

Your *Three-Way Travelpod* (page 158, Feb. PM) is about the finest little camper-boat I have ever seen. It'll be just the thing to meet my "once in awhile" camping needs.

GREENWOOD, IND. EARL L. COTTEN

747s for back-yard airlines

Unfortunately, the model of the Boeing 747 you showed (*Styrofoam 747 Is Real Jet*, page 98, March PM) is not the actual scale model (bearing American Airlines



insignia) that will be sold. The plane will retail for \$4.95 without a jet engine; with a jet engine and four CO₂ cartridges, it's \$6.95. Inquiries should be directed to Dymo Special Markets, 280 Madison Ave., New York, N.Y. 10016.

NEW YORK GEORGE KLING, MGR.

Shootin' iron

The *Supersoft Iron Shot* item in *What's New Outdoors* (page 10, Feb. PM) has revived some memories. While I was employed by the Olin-Mathieson Corp., my main research during the years 1946 through 1951 was on lead substitutes. This research was finalized in 1950, and eventually two patents were granted, both assigned to Olin Mathieson.

Disclosures and claims of the two documents give the advantages and some of the disadvantages.

Soft iron shot should be made from ingot iron, melted by an induction furnace. Cost per pound of iron shot would be about one cent. Use of iron shot necessitates use of hardened-steel-choke shotguns. It will "shoot out" swaged chokes.

Use of iron shot on a 100-percent basis would increase wild game waterfowl more than tenfold in 10 years.

ALBUQUERQUE, N.M. LEWIS P. WILSON

POPULAR MECHANICS

TOM McCAHILL SAYS:

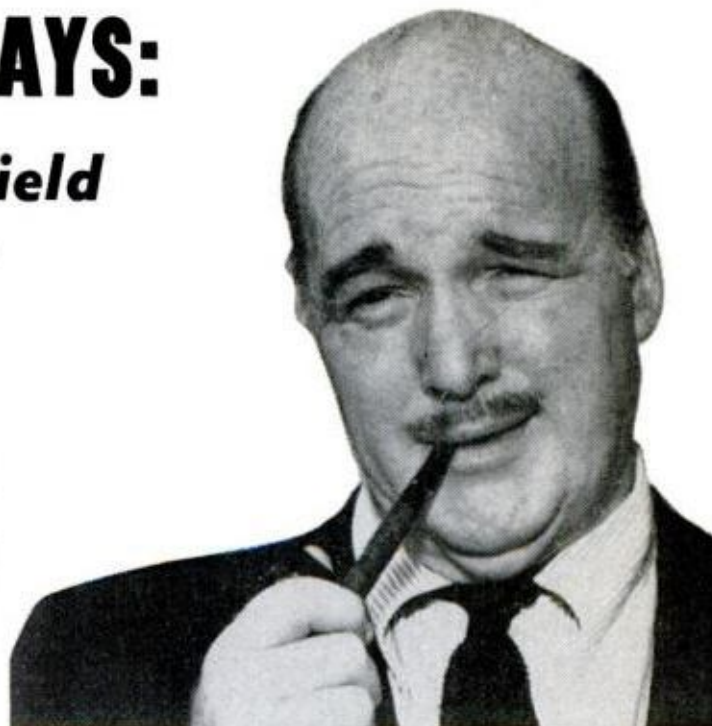
"The appliance repair field is so uncrowded it's almost lonely!"

Someone once said that if you build a better mousetrap, the world will beat a path to your door. In the home appliance business, a lot of enterprising companies have gotten rich peddling a list of handy electrical gadgets for the home longer than Wilt Chamberlain's arm. The trouble is, the dozen or more appliances in the average American home can go on the fritz, and men with the proper training to do repairs are as scarce as knee-length skirts on teen-agers.

Good Appliance Repairmen are a rare breed these days. Those with a little ambition are booked so solidly you can wait days to get somebody to fix a balky refrigerator or cantankerous toaster. Sometimes, you have to settle for a bum job from a guy who had no business calling himself an Appliance Repairman in the first place.

This brings me to my point. If you want to make money in a field that's begging for trained technicians, there's a fine, low-cost home-study plan available that teaches you how to handle every type of Appliance repair in detail—including refrigeration, air conditioners, and even small gas engines. The course was prepared by the instructors at National Radio Institute. This is the oldest and largest home-study school in the Electronics/Electrical fields with more than fifty years' experience training men like yourself for new careers or spare-time or full-time businesses of their own.

A few years ago, NRI recognized the increasing demand for trained Appliance Repairmen. They set about preparing well-illustrated, easy-to-understand lessons that teach you how to repair home, commercial and farm Appliances. NRI even added a professional Appliance Tester that's included in their low tuition. With the Tester and a few basic tools you probably already have,



you're equipped to service most Electrical Appliances. If you aren't making as much as \$4 to \$6 an hour in spare time fixing Appliances for friends and neighbors within a few months after enrolling, my name isn't McCahill.

The reason I'm no doubting Thomas, is because the staff at NRI is composed of experienced instructors who guide you through the course with more personal attention than you'd get in many classrooms. With the kind of help they give a student and the kind of course they have, you can be the man in demand in this field—even if you've never tried to rewire a plug, or got fed up with school at the 9th grade.

The best advice I can give you is to clip the coupon below and send for the NRI Appliance Training Catalog. It's free, and there's no obligation. NRI doesn't employ salesmen, so nobody will be knocking at your door. All it will cost you is a postage stamp. Take it from Uncle Tom, the Appliance Repair field needs good men. Now.

Tom McCahill

TOM McCAHILL

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

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

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OK—I want to see for myself. Send me the free book on Professional Appliance Servicing. No salesman will call.

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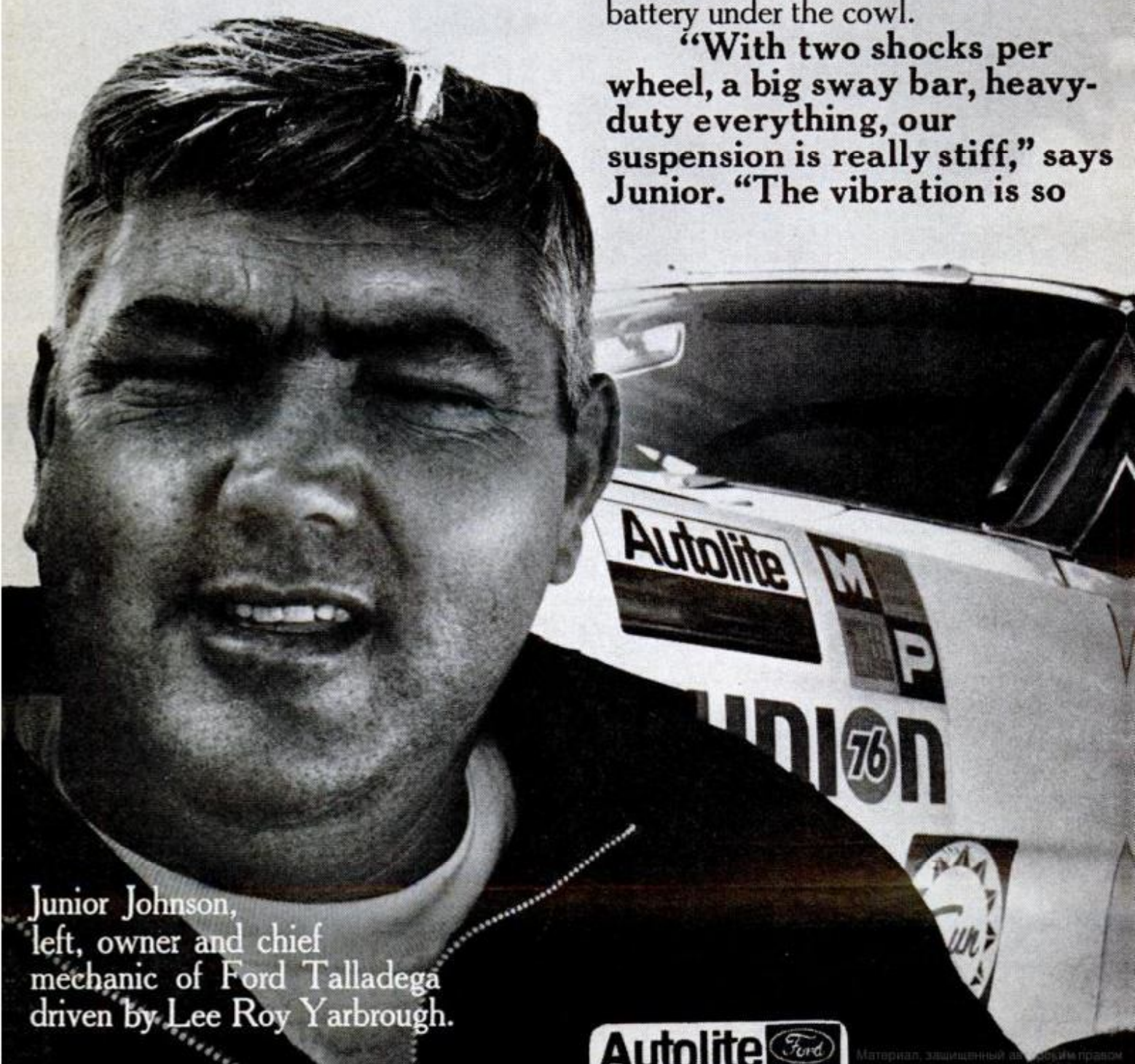
Accredited Member National Home Study Council.

Check for facts on new GI Bill.

“We sprung our Firecracker 400 passenger rig. The vibration was really You’re tougher on yours.”—Junior Johnson

Junior Johnson sets up racing cars with the same charging determination that made him a legend as a driver. By mid-1969, his Fords and Mercurys, with Lee Roy Yarbrough driving, had won the Daytona 500, the World 600, the Firecracker 400, and the Darlington 400—all with an Autolite battery under the cowl.

“With two shocks per wheel, a big sway bar, heavy-duty everything, our suspension is really stiff,” says Junior. “The vibration is so



Junior Johnson,
left, owner and chief
mechanic of Ford Talladega
driven by Lee Roy Yarbrough.

Autolite 

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winner about 400% stiffer than a tough on our Autolite battery.

bad, Lee Roy can hardly sit down next day. That Autolite battery takes all that vibration right nicely. The plates in my Autolite have never come loose."

Autolite racing batteries have a patented Vibration Guarded design. Plates are mechanically bonded, top and bottom. And press-fitted to stay put, despite 200 mph vibration.

"Racing's tough on batteries. You're tougher. You cold-start a lot. That drains fluid and

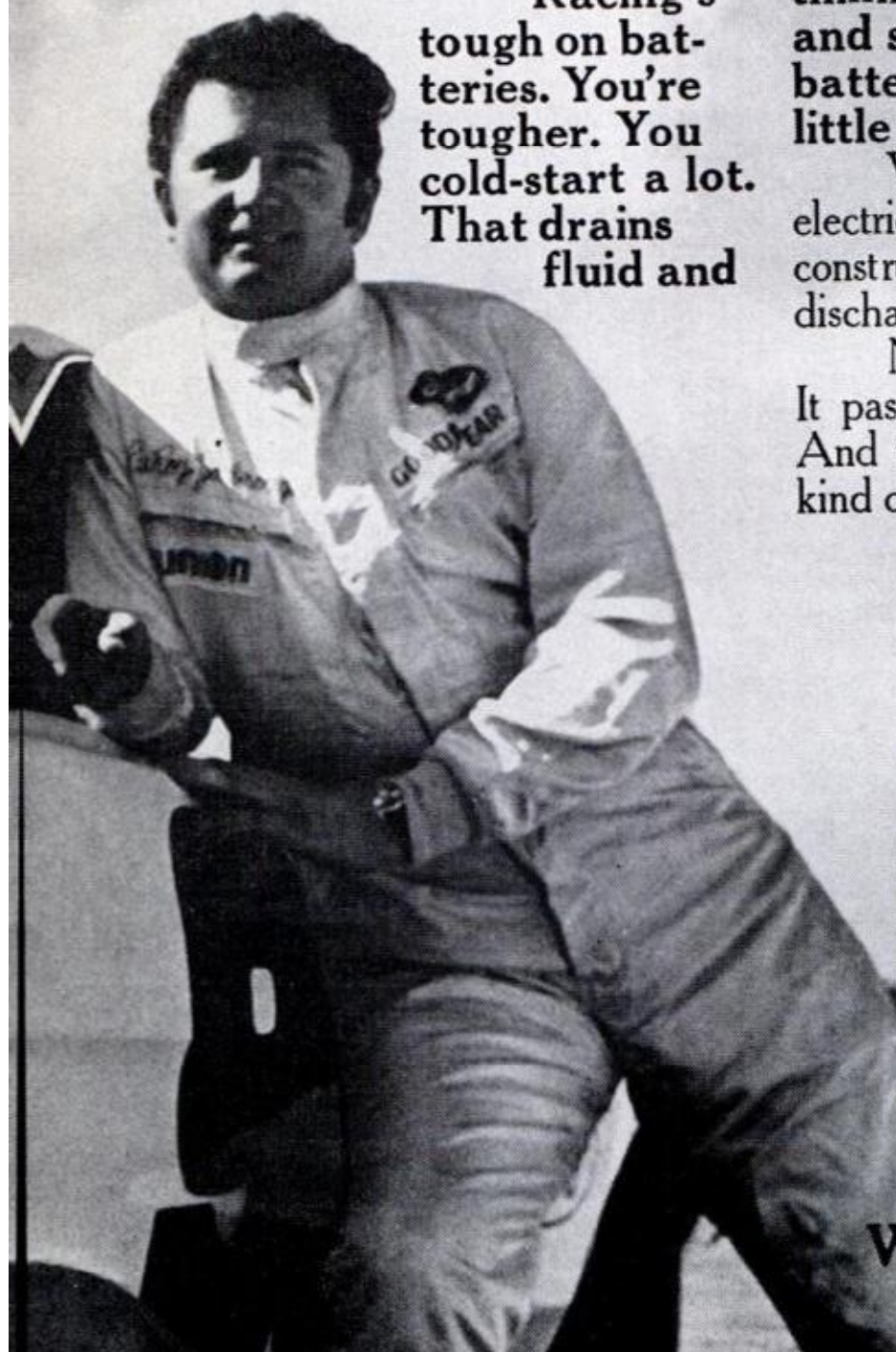
power. And then you don't let the gas station fellow take time to refill your battery."

That's okay with Autolite. Its Sta-Ful reservoir has up to 3 times more water above the plates. And, in normal use, needs filling only about three times a year.

"We change batteries like socks. You'd stick with yours for 40,000 miles—and never think about the dust and salt and stuff piling up on the battery, and making a nice little path for electric leaks."

With Autolite, you can forget electric leakage. The one-piece cover construction virtually eliminates self-discharging across the battery top.

Next time get an Autolite battery. It passes the toughest test in racing. And the toughest test there is. Your kind of driving.



Autolite 



We pass the toughest test.

SCIENCE worldwide

A plastic paint applied to the grinding surfaces of teeth can prevent decay. That report comes from the Eastman Dental Center, Rochester, N.Y., where healthy teeth in 60 children were given a single treatment. Though the treated teeth showed no decay a year later, untreated teeth in the children's mouths had developed cavities. Coating is a simple procedure. After the paint is applied it's irradiated with an ultraviolet lamp, causing the plastic to harden immediately. As yet the materials and equipment used are not commercially available.

A "falling star"—a 22-pound stone meteorite—recently was found within six days of its plunge to earth. It was spotted by cameras in the Smithsonian Astrophysical Observatory's Prairie Network—a system of 16 unmanned camera stations stretching from South Dakota to Oklahoma and from western Nebraska to Illinois. Photos from two widely separated stations permitted scientists to plot a probable impact point. After a three-day search, a Smithsonian field manager found the meteorite on a country road near Lost City, Okla., less than half a mile from the predicted point. Such quick recovery allows scientists to study a meteorite before its low-level radioactivity is dissipated.

Cellulose waste is turned into a low-cost, high-protein food in a pilot plant designed by Louisiana State University engineers. The cellulose is ground, sterilized and fed into a fermenter, where microorganisms metabolize it. The edible end product—a single-cell protein—is straw colored and has the texture of rough flour. The plant can produce 50 pounds of protein per day from 250 pounds of raw material. Sugarcane stalks are the cellulose source used, but scientists think the system can be used to convert grass, hay, cornstalks, wood chips and newspapers.

Beagles with a tobacco habit have helped to establish a closer link between cigaret smoking and lung cancer, according to Dr. E. Cuyler Hammond of the American Cancer Society and Dr. Oscar Auerbach, a pathologist at a New Jersey Veterans Administration hospital. The researchers trained 86 male beagles to smoke up to a maximum of nine cigaretts a day. Through a neck incision, each dog was fitted with a tube into its windpipe that connected with a cigaret holder. The pooches became so addicted they "wagged their tails and whined for a cigaret." Some of the dogs died during the course of the experiment; others were put to death after smoking for over two years. Autopsies showed that 12 dogs had developed lung cancer and that almost all of the "heavy" smokers showed signs of lung problems. Some of the original group are still alive and still puffing.

A dry powder that turns to foam on contact with high heat is used in a new fire extinguisher patented by Britain's Atomic Energy Authority. The powder is made from perlite, an aluminum silicate of volcanic origin that contains about five percent water. Blown on a fire, the powder creates its own steam, which in turn generates a foam that's up to 20 times the original volume. The perlite foam, which kills a fire by cutting off its air, is said to be more stable and viscous than the usual high-expansion foams.

A system that reclaims water from a space crew's urine, perspiration and respiration is slated for a 90-day test at a McDonnell-Douglas Corp. facility at Huntington Beach, Calif. The system, designed for long space voyages, uses nuclear capsules to supply the thermal power needed to work its evaporators. Four men will be involved in the experiment.

Champagne contains little histamine, but burgundy is loaded with it, say French researchers who found varying amounts of the substance in all types of wine. Thus the question: Should antihistamines now be added to that long list of popular hangover cures? ★ ★ ★

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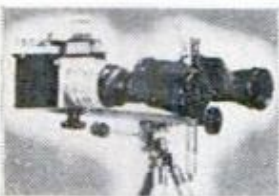
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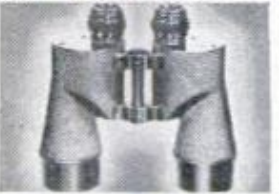
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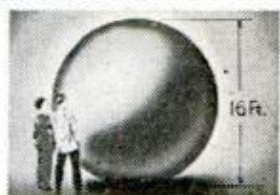
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DETROIT

LISTENING POST

BY ROBERT LUND

THE SMALLER-THAN-MAVERICK MINI due from Ford in August or September, depending on how soon Ford Div. can get rolling in volume, will offer two engines: 95 horses for the power fiends and a sedate 75-hp plant for the nonperformance crowd. To keep interest stirring, the Official Company Source in Charge of Circulating Rumors continues to come up with new names for the car. You can pick from Phoenix, Special Maverick, Colt, Pony, Pinto or something else.

While everybody's attention is riveted on the mini, Ford has been quietly working up another car in the back room. It will be a senior version of Maverick—larger and higher priced—under the Mercury nameplate. The idea has been kicking around more than a year, but Ford felt no pressure to push it unless GM and Chrysler threatened to move in the same direction. With Chrysler promising a scaled-down Dodge for '71, the car has been reactivated and Mercury will get a new compact. We bet it'll be called Comet. Late flash confirms that, in addition to the Comet, Linc-Merc will be importing the Capri (see page 22).

Speaking of Maverick, this model run will be your last chance to buy one at \$1995 (plus the mandatory extras footnoted in the ads). The same trend to more car, more equipment and higher prices that prevented the original compacts of a decade ago from giving Volkswagen a real run for its money is surfacing again. Maverick gets the Tiffany treatment this summer, including hood scoops and a peppy V8.

WITH THE '71s due to go into production in four to five months, the automakers should be locked in on changes in the new cars. Most of 'em have been buttoned up, but not the standard bread-and-butter Chevys, Fords and Plymouths. There's still a lot of last-minute activity to give the standards more pizzazz. Detroit foreseers fear these cars will be gunned at from up and under come fall. Fire at the top will come from the hot-selling intermediates; the blast at the bottom from the new mini cars. So the search is on for innovations and eye-catchers to give them the stuff they need to fight back.

PORSCHE-AUDI DEALERSHIPS are springing up to market models of two exciting imported cars: front-engine, front-wheel-drive Audi sedans and Porsche 914 mid-engine sports cars. *Porsha Oudy* (rhymes with howdy) is the way it's pronounced and the organization is a division of Volkswagen of America. A four-cylinder, 1679-cc, 85-hp VW engine powers the Porsche 914, in fact. The 914/6 model is essentially the same car except that its powerplant is a two-liter, 125-hp, six-cylinder Porsche. The \$3600 914 is the lowest price Porsche you can buy and shares with the \$6000 914/6 appealing versatility: The roof panel is removable (leaving a built-in roll bar) and stows in the rear trunk (there's a front trunk, too) and a cushion that fits between the bucket seats for an emergency third person. With the engine right behind the passenger compartment and ahead of the rear axle, the cars have extraordinary handling.

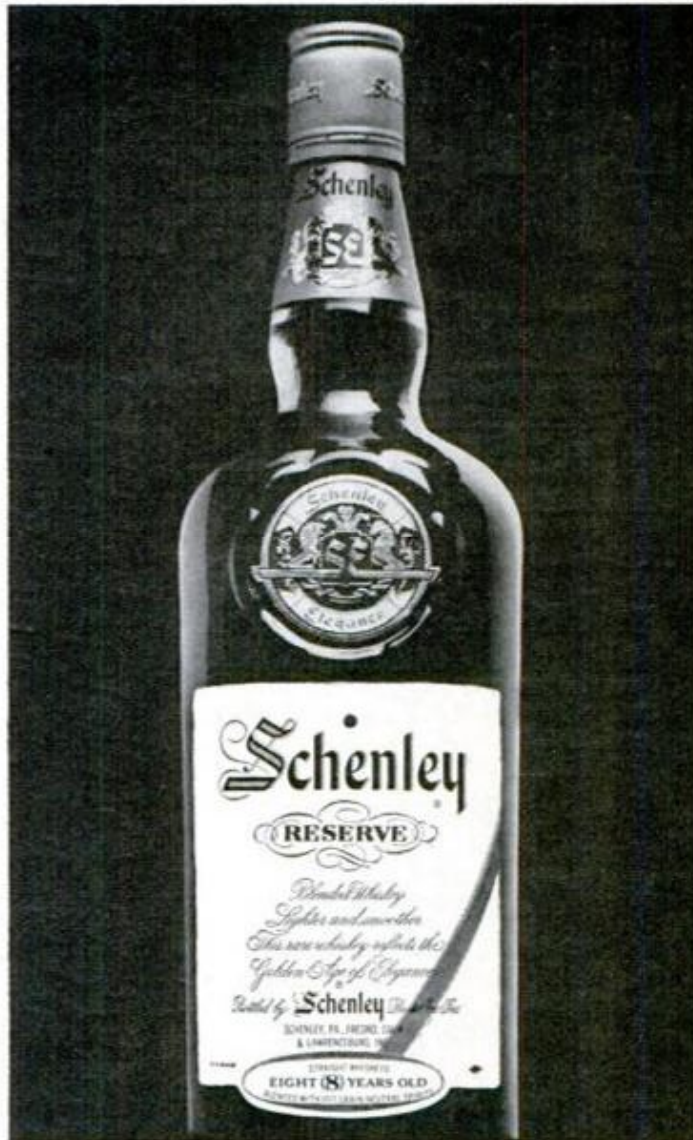
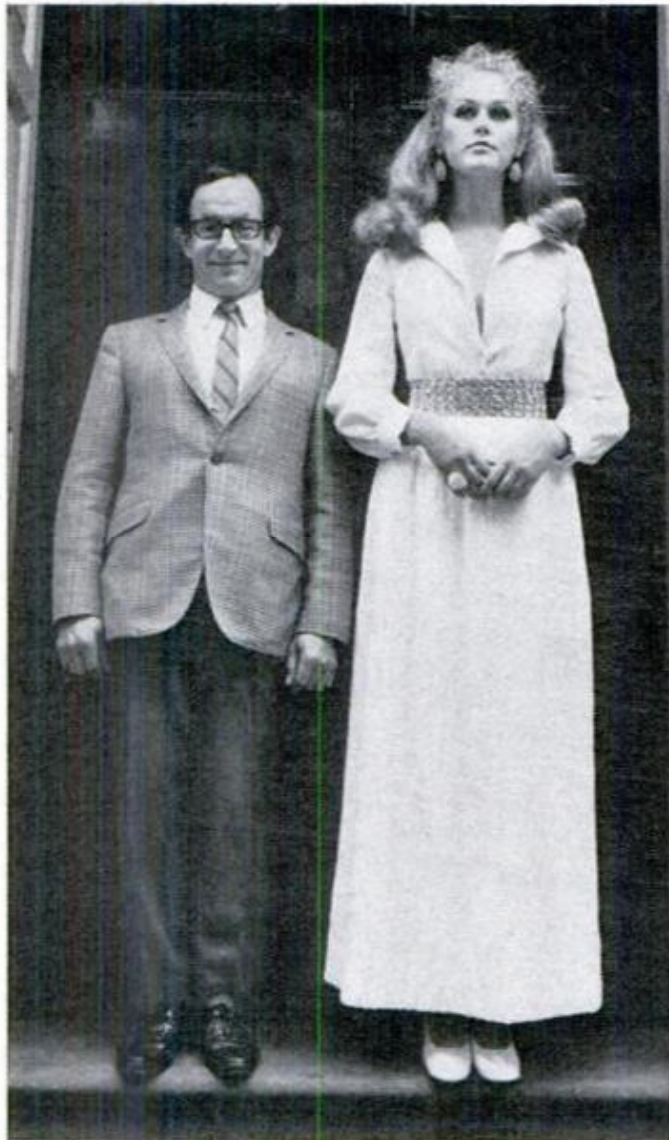
Styling of the Audi is plain and straightforward by American standards, but handsome in the tradition of European luxury sedans. Front wheels are driven by an in-line,

(Please turn to page 20)



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DETROIT LISTENING POST

(Continued from page 14)

1760-cc, water-cooled, four-cylinder engine that will deliver up to 26 mpg and drive all models a bit better than 100 mph. The two and four-door sedans and station wagon models start at \$3000. Wheelbase of Super 90 models is 98 inches; of 100 LS models, 105.3 inches. The Audi is not new (see *Good Cars You Can't Buy*, page 108, Nov. '67 PM); this German success just took a long time to get here.—B.H.

FORD HAS MOVED UP the deadline it gave De Tomaso on the mid-engine job the Italian car builder is producing to Ford specifications. *Listening Post* said last month that the first edition is due in the United States in July. That's not soon enough. As this is written, Ford hopes to have one show job for display at the International Auto Show in New York in April.

MICHIGAN SENATOR PHIL HART, whose Antitrust and Monopoly Subcommittee has been holding hearings on the cost of repairing cars, tells *PM* he looks for automakers to bring out bumpers that bump under impact, instead of crinkling up, "by 1971." The senator says he thinks we've about seen the end of left-hand-doesn't-know-what-the-right-is-doing engineering, such as hanging bumpers that have to be dismantled before a taillight can be replaced. He also looks for the trend to replacing, instead of repairing, parts to be accelerated. "Many will be replaceable by less-skilled mechanics, often by the motorist himself," he predicts.

THE AUTO COMPANIES periodically work up a froth over publications running stories about cars before the factories have packaged their formal press releases. If you tell the customers what's coming, Detroit contends, they won't buy the current cars. Maybe, maybe not. There have been times when newspapers and magazines have been loaded to their mastheads with stories on forthcoming cars and sales of then-current models managed to balloon into the blue, hitting new highs. But if car builders are as disturbed over peeks and leaks as they claim to be, they might consult their long-time nemesis, Walter Reuther, head of the United Autoworkers Union, on how to keep a secret.

Reuther has been sitting on the best-kept car secret since the Model T—plans for an American version of Volkswagen! As it looks now, the car won't be put into production. Here's how it came about:

(Please turn to page 22)



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DETROIT LISTENING POST

(Continued from page 20)

The UAW, like the car manufacturers, has been fretting over the fact that imports have been going gung-ho while sales of domestic makes have dropped. The more VWs, Toyotas, Opels, et al, sold in the United States, the fewer jobs in the auto plants for UAW members. As Reuther watched foreign firms move in to fill the demand for small, low-price cars during the '60s, he came up with the idea of an American "people's car"—Reuther's description. He shipped the plans to Washington, where they've apparently been interred with other best-laid plans of mice and union chiefs.

CAPRI IS COMING OVER from England and will be in Lincoln-Mercury showrooms mid-April. Introduced by Ford of England in Jan. '69, it has been a hot seller since then. Styled in the tradition of European GT coupes, the Capri has a wheelbase of 100.8 inches and a length of 167.8 inches. Basically the same as the European

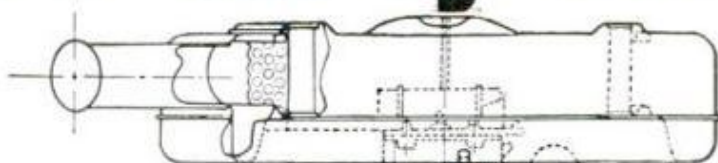


version which impressed us when we saw it in London last year, the U.S. version has a 1.6-liter (98-cu.-in.), four-cylinder, ohv, 71-hp engine. Four-speed, fully synchronized transmission has a floor-mounted stick. The list of standard equipment including power front discs, sports wheels, radial tires, and carpeting makes the \$2295 price tag of the Capri 1600 that much more impressive.—B.H.

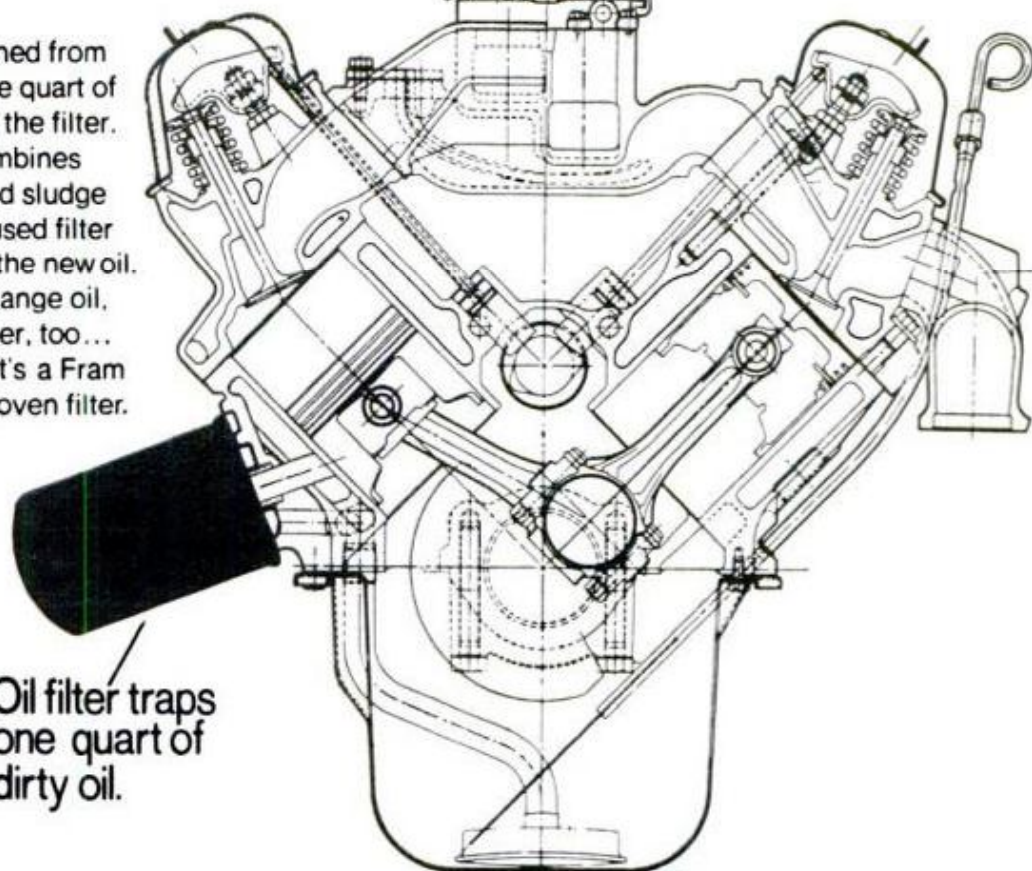
FROM NOSE JOB to distinguished back side—that's the turnabout in styling on the '71 cars. The in idea this year was to outprow the bullet snout pioneered by Pontiac. Emphasis on the '71s will be aft.

Chevy's small car will have a half-door, half-trunk-lid arrangement in the rear. Another Chevy product, a wagon, will have a disappearing tailgate—the glass-top half will roll up into the roof; the solid bottom half fold away into the floor. At Chrysler, Dodge and Plymouth are trying to get corporation clearance to mount Superbird-size wings on the deck lids of a couple of medium-price jobs. If double-breasted suits can come back, why not fins? ★★★

One quart of your new oil change will be dirty oil...

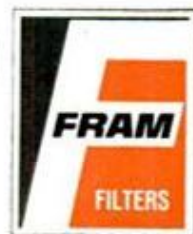


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Drivin' with Dan

Would Trans-Am be better with engines of 350 instead of 305 CID? Did you use two-way radio in the Riverside 500? What can happen when speed-shifting a VW? Dan Gurney answers these and other automotive questions

Q. Don't you think Trans-Am racing would be even better if they would allow, say, 350-CID engines instead of 305?—Ben Palmer, Fort Lauderdale, Fla.

A. I believe it would be better because it would be cheaper and more like the popular stock-size engines. On the other hand, a trend toward smaller cars and engines is fine as far as I'm concerned.

Q. Would it be possible for a person to become a race driver without knowledge of engines?—Thomas Kinsel, Champaign, Ill.

A. Yes, of course, but at the same time he would be handicapping himself.

Q. Do you think that electrical or power equipment, such as windows and seat, are items worth taking a chance on when purchasing a used car? How do you feel about the life of these rather

expensive options and whether it would be likely that I could make the repairs myself?—W.S. Ovitt, San Diego, Calif.

A. I wouldn't be afraid to purchase a used car with the options you mention. It would be likely that you could make repairs yourself if you are so inclined and have some tools.

Q. In the Riverside 500, did you use the two-way radio, with which I heard you experimented? Why or why not?—Bill Crosley, New York.

A. No, I didn't use the radio in the race. However, I did try it in practice and I could hear very well. They had some trouble hearing me when I was using full throttle but otherwise it was satisfactory. The installation in the helmet was cumbersome, heavy and crude. It also compromised the helmet's strength and protection so I didn't race with

(Please turn to page 30)

DAN AT THE WHEEL of a Plymouth SuperBird in 500-mile NASCAR Grand National at Riverside. Starting on the pole, Dan finished only sixth. An early rear-brake-system problem forced him to run with front brakes only



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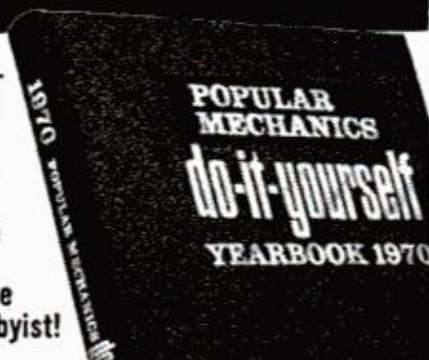
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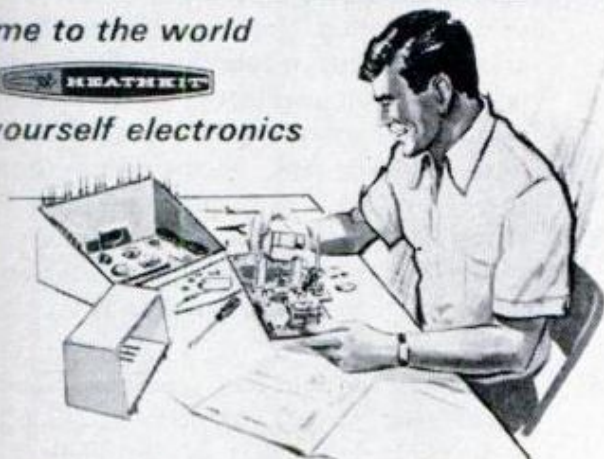
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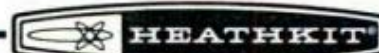


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DRIVIN' WITH DAN

(Continued from page 24)

it. The next try would probably overcome most of the initial problems.

Q. What is the meaning of letters such as "GT" that are found on some of today's cars?—Paul Whetstone, Cincinnati.

A. G.T. stands for Grand Touring which originated as the name of a racing category for limited-production cars under the rules drawn up by the F.I.A. in Paris, France. I think that Ferrari was the first to attach the "G.T." to a car-model name.

Q. What is the worst thing that could happen to a Volkswagen when speed-shifting? Is it true you get better tire life and better gas mileage if you have larger tires and wheels than those which came with the car?—David Naugher, Amarillo, Tex.

A. It wears out the synchromesh system faster. It's harder on the shift linkage. Of course you can break the gearbox if you butcher it enough. Within certain limits I'd say economy is better with the larger tires. However the bigger tires usually give you a taller gearing (less engine r.p.m. at the same speed) but sometimes they may have more rolling resistance and drag also, so you may not improve the mileage. Maybe your gearing is more ideal with the smaller tires.

Q. It has been said that your stock-block engine went "sour" during the 1969 Indy 500. What was the exact ailment of the engine?—Arthur Siegel, Rego Park, N. Y.

A. The engine was in good shape after the race except for an oil seal at the front of the crankshaft which was leaking (causing the smoke you may have seen). In addition, we played it overly safe on our fuel and sparkplugs, so the engine was down on power, but safe. My big problem was with the brakes and my left-rear shock absorber, which was covered by body work, soon overheated and then failed.

Q. Why aren't the fiberglass-belt-type tires used for racing?—Dana Stahl, Visalia, Calif.

A. They have been used on some racing applications and may be on others. Passenger-

(Please turn to page 32)

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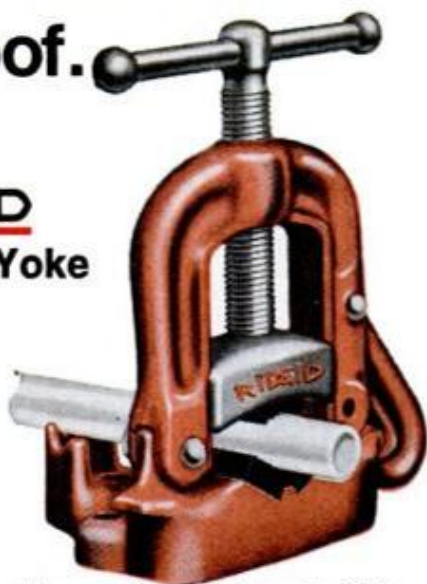
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DRIVIN' WITH DAN

(Continued from page 30)

car requirements are very different from those of racing cars. Racing-tire research and development is almost entirely classified or secret information so I do not have much access to it. I'm a Polyglas fan myself.

Q. Why don't they put 428s and Hurst shifters in police cars? Wouldn't they get better speed? Do 309s and automatics get that much speed?—Larry Truelove, Albion, Ind.

A. The 428s do give more speed, as a rule. They also use more gas and brakes and tires. I would guess that a smaller engine with an automatic gearbox would be a bit more reliable and less expensive to operate. If you're going to chase bandits, you ought to have the 428 with the Hurst shifter.

Q. I am 17 years old, drive a Meyers Manx and do a lot of road racing with friends on the street although I know this is very dangerous. Did you do much street racing before you were able to get on the tracks?—Bill Burt, Bloomington, Ind.

A. I did a bit of street drag racing in locations we felt safe, also some racing with American and foreign cars against a stopwatch on circuits around deserted housing projects or dirt roads. It all helps.

Q. I have a friend who drives a 1968 Citroen. In appearance it's a real monstrosity but he claims it offers great engineering advances such as aerodynamic body with less drag than any other car resulting in 120 mph with a 103-hp engine; "inboard" disc brakes; hydraulic self-leveling suspension; front-wheel drive; headlights that turn with the front wheels; practically no noise at high speeds. Does it have these features, and if so, why isn't Detroit building something like it for \$3500?—William Young, Harper Woods, Mich.

A. It's all true. It's a good car, but there is more than one way to skin a cat. Fortunately, not everyone likes or dislikes the same things. French driving conditions are considerably different from ours. We have some mighty fine cars here for \$3500. ★ ★ ★

If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 84).



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ON-THE-GO

CAMPING

BY WADE MITCHELL

LUXURY IN LIMITED SPACE is quite possible with the new Blazer Sports Camper, as yet just a show-model prototype from Chevrolet. Mounted on the new Chevy Blazer 4x4 utility vehicle, the Sports Camper features fold-out sleeper sections, gas appliances, day couch, full-length closet, utensil racks, transparent plastic skylight and rooftop luggage carrier. Sounds astonishing to have so many accessories in such a small space, but it's true. The Blazer Sports Camper is being displayed this season at shows across the country.

BEWARE DANGEROUS FUMES IN YOUR COACH! Too many fatalities have occurred from such seemingly harmless acts as heating a closed coach with a charcoal stove, allowing a propane lamp to burn all night with windows and doors shut tight, or leaving LP-gas burners going on a cold night without adequate ventilation. *Don't make those mistakes!* The state of Colorado, in investigating the continuing menace of death by asphyxiation, found cases where snow covered the roof and vent stacks of camper coaches. Problems can occur in both homemade and manufactured campers that aren't vented properly. So always leave one window cracked open to guarantee a fresh-air return.

IS OREGON CONSIDERING A NONRESIDENT CAMPING TAX? Just a rumor now, but according to Oregon sources it's nothing to laugh off. A recent editorial in an Oregon paper blasted campers who allegedly clog Oregon's highways and occupy every shady spot. Statistics printed in an RV dealer magazine claimed that about 1,500,000 campers visited Oregon's coastal parks during only nine months of 1969, and one out of every six was turned away. If Oregon *does* declare such a nonresident camping tax will it set a precedent for other overvisited states such as Wyoming, Montana and California? Suppose other states enact "reprisal taxes" against Oregon campers? The outcome may be explosive.

1970 CHEVROLET TRAILERING GUIDE is now available, showing allowable gross trailer weights of 4000 pounds for the Nova; 6000 pounds for the Chevelle, Chevrolet and two station wagons. The maximum allowable trailer weight for the Monte Carlo is listed at 2000 pounds. The new guide also includes special tips to towers and a host of other useful ideas for recreation with a travel trailer.

HIGHER TONGUE-LOAD LIMITS AT FORD. Automakers seem to be competing with each other to prove their vehicles are strongest for towing service. At a special briefing attended by members of the *PM* staff, Ford increased the allowable trailer tongue loads for the Ford Galaxie to 700 pounds on models equipped with the new towing package equipment. This is the highest rating for tongue loads in the field. However, it is true that passenger-car suspension systems, tires and wheels are beefed up to handle the increased loading.

FREE-STANDING BATHROOM ONLY A FEW FEET WIDE, known as the Duomatic Sanitation System, is an amazingly compact, new unit containing a shower, wash basin with faucets, vanity mirror, medicine cabinet, and a toilet that slides in and out of a hidden position. The entire sanitation cabinet is only 9 inches deep, a little over 72 inches tall. The initial six-gallon charge of water provides up to 160 flushes, says the maker. (You can also hook this cabinet directly to a sewer outlet.) This new system should easily convert thousands of old coaches to self-containment. For more information, contact Monogram Industries, Inc., 6537 Arizona Circle, Los Angeles, Calif. 90045. ★★

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World's Most Thiefproof

No one can outwit this ingenious electronic auto protection system. It's expected to be on the market soon in a handy kit you can install yourself.

By SHELDON M. GALLAGER

ANYONE TRYING TO STEAL a car equipped with this antitheft device would run smack into enough baffling electronic wizardry to drive him up a wall. The first thing he'd see is a trim little 10-push button keyboard under the dash. To start the car, he'd have to press four of the 10 buttons in exactly the right coded sequence. Pressing any of the wrong buttons—or any of the right buttons in the wrong order—causes the device to shut off and nothing happens.

At a time when car thefts are mounting at an alarming rate, this clever new protection system promises a welcome deterrent. What it amounts to is an electronic combination lock. Each car owner has his own four-digit code. If, for instance, you select 7395, you must push the buttons numbered 7, 3, 9 and 5 in that order. As each button is pressed, it causes a combination of transistors and silicon-controlled rectifiers to fire and conduct electricity to the next stage. When all four stages have been properly energized, they trigger a relay that sends power to the car's ignition system. Only then can the engine be started and the car driven away.

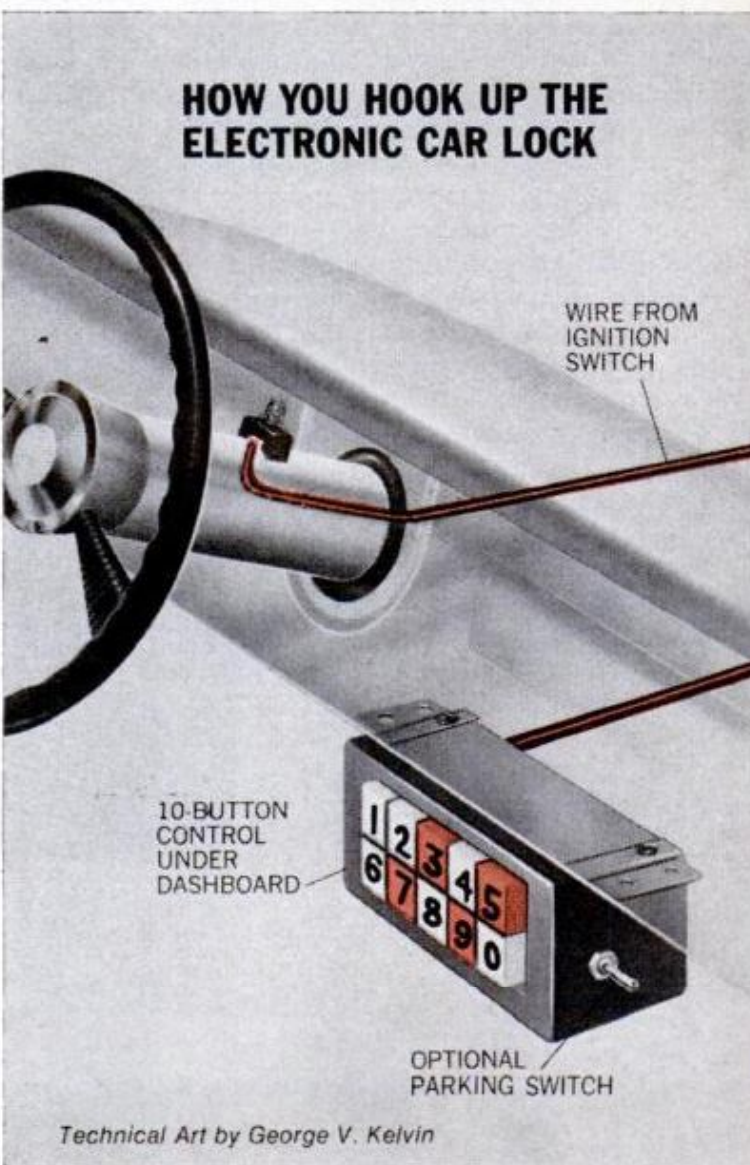
The transistors and SCRs are arranged in such a way that no stage will fire unless the right preceding stage has been activated first. Thus even the correct numbers must be pressed in the proper sequence. The keyboard is lighted so you can easily see the buttons even in the dark. When the code has been correctly entered, the lights go out, indicating the engine is ready to be fired up. All the solid-state circuitry is hidden neatly away in the engine compartment in a small box called the decoder unit.

Frantically pushing the buttons at random in an attempt to break the code by chance won't help a would-be thief at all. With the 10-button system, there are more than 5000 different four-digit code possi-

(Please turn to page 42)

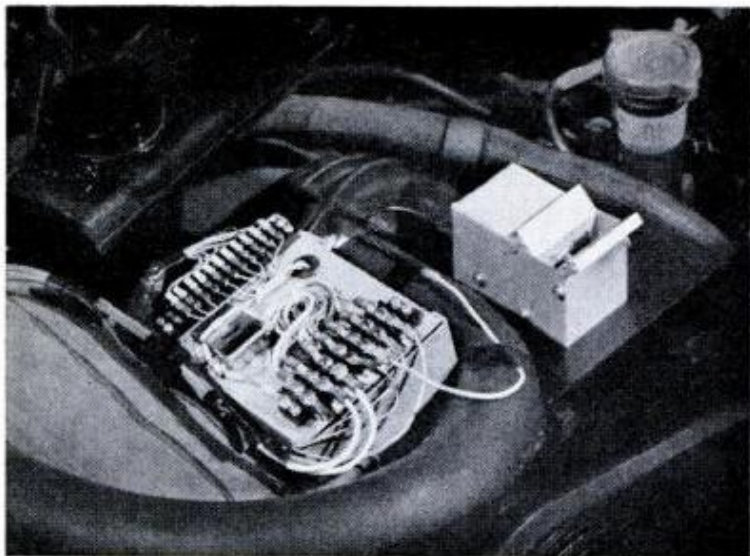


KEYBOARD CONTROL mounts under the dash, has 10 numbered pushbutton switches. To start the car, you must press four of the 10 buttons in a coded sequence. Possible number of different codes: 5024



Technical Art by George V. Kelvin

Car Lock



DECODER UNIT and hood latch can mount anywhere in engine compartment, against a side wall or on engine itself with brackets. The code can be changed merely by rearranging connections on the decoder



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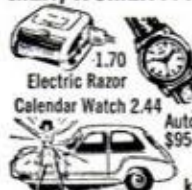


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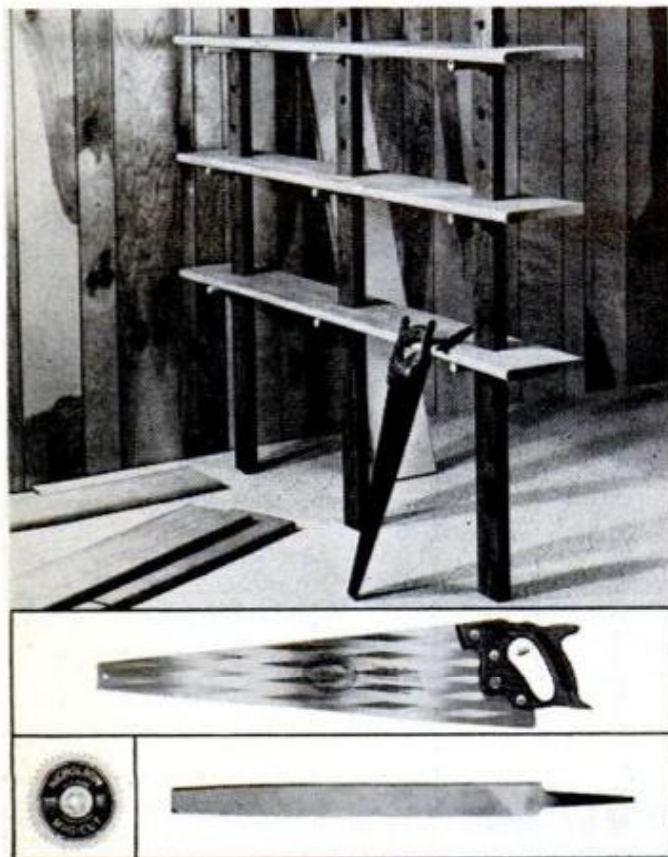
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THIEFPROOF CAR LOCK

(Continued from page 38)

bilities, only one of which is correct. Each time a wrong button is pressed, the system automatically deactivates itself and a built-in electronic delay prevents it from being reenergized for 10 seconds. This means that a thief, working at top speed, could try only six combinations every minute or 360 an hour. At this rate it would take him 14 hours to run through all the code possibilities—a hopeless task for even a tenacious thief.

Jumping the ignition wires wouldn't get a thief anywhere, either, since no current flows through the ignition circuit until the decoder unit in the engine compartment has been properly activated. In fact, it doesn't even make any difference if you leave your key in the ignition switch. Since 43 percent of all stolen cars are driven away with keys their owners forgetfully leave in them, this feature is expected to be especially helpful in reducing auto thefts.

Now suppose a thief attempts to open the hood to get at the decoder unit. Foiled again. A solenoid-operated latch prevents the hood from being opened without the code. This consists of a striker plate bolted to the underside of the hood that engages a latch bolt when the hood is closed. The bolt is withdrawn, freeing the hood, only when power is supplied to the solenoid coil from the decoder unit.

The ingenious antitheft system is the brainchild of two young Long Island electronics experts, Marc Hoff and Rod Solomon, of 45B Old Oak Lane, Levittown, N.Y. Hoff and Solomon plan to have a kit of parts for the system on the market by early summer. Priced at about \$35, it will contain all necessary hardware, including a handy preassembled wiring harness.

Anyone concerned that his code might eventually be found out needn't worry. The code can be changed periodically merely by rearranging the wires running from the dashboard control to the decoder unit. The hood latch can be mounted in a variety of locations so that a thief attempting to cut through the hood to disable the latch would not know where to start.

For drivers who park frequently at garages and lots, an optional parking switch is available. This overrides the code control and energizes the ignition circuit so you can leave your car in the hands of a parking attendant without his having to know or use the code. To discourage any temptation there might be to make off with the car, a buzzer sounds loudly from under the locked hood while the parking switch is in use. ★★★

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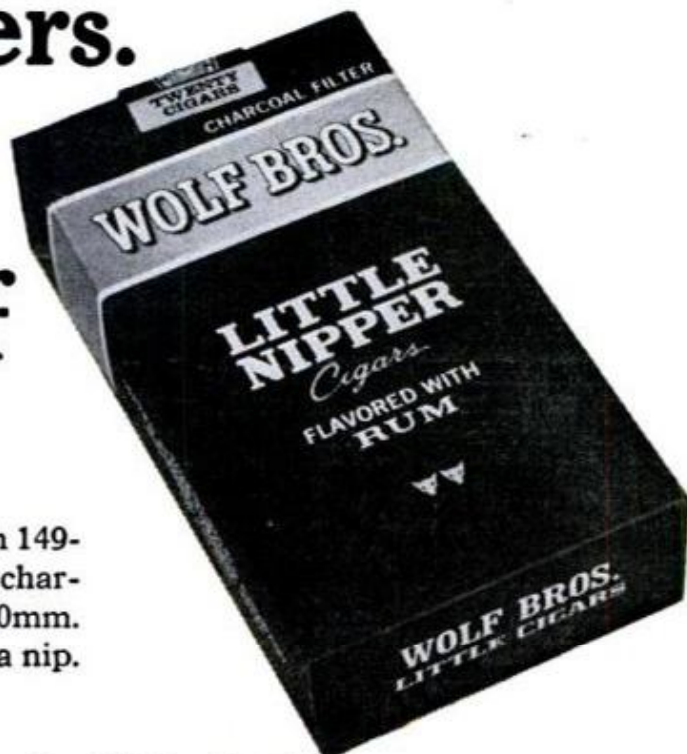
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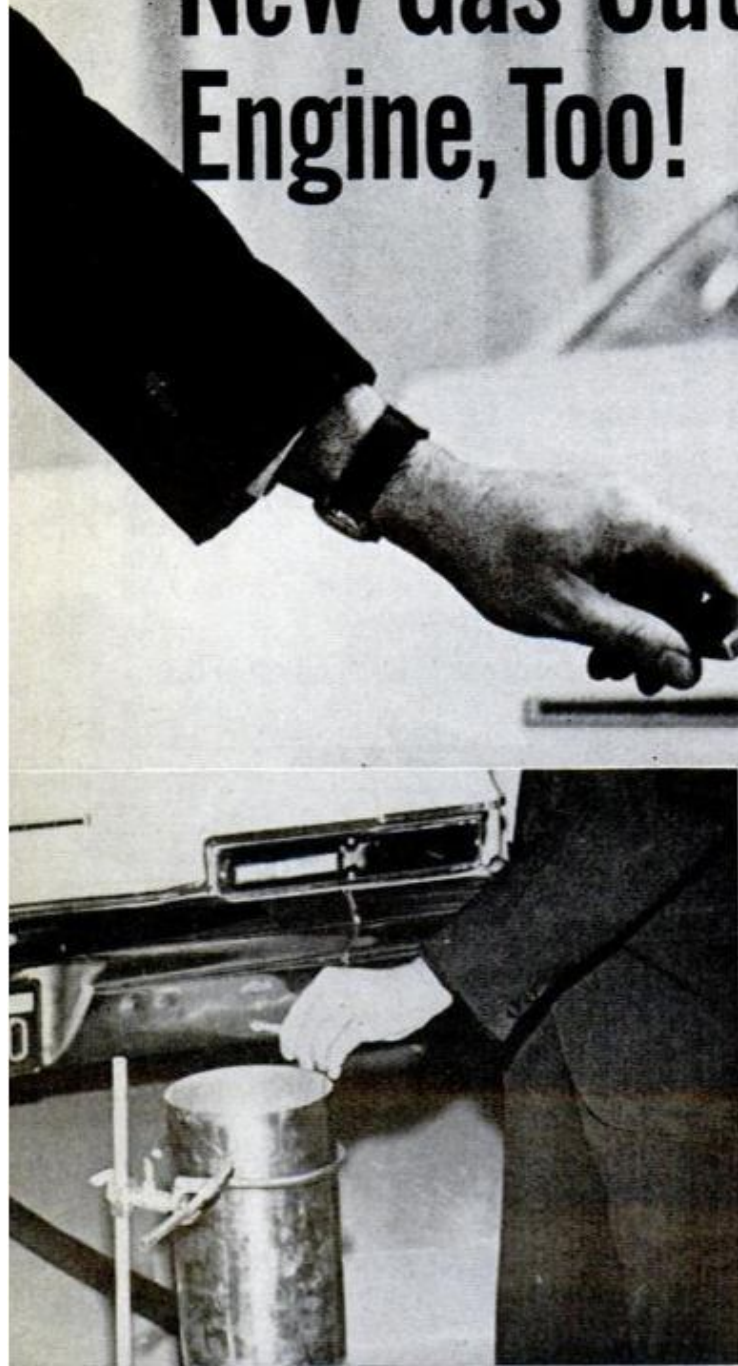
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New Gas Cuts Smog, Cleans Engine, Too!



That's what Chevron Research claims for a new additive they've put in their gasoline

By JOSEPH SMUDA

UNBURNED HYDROCARBONS ignite in exhaust. No combustion after 1600 miles of running on F-310 gas

IMAGINE YOUR CAR getting better instead of worse with each passing day: You notice quicker starts, smoother idling, more zip and power, and greater overall drivability. Gasoline mileage has improved slightly while the smog-control system is actually doing its job of reducing harmful emissions without sacrificing engine performance. All this, they say, from nothing more than filling up with gasoline containing Chevron's new F-310 additive.

F-310 acts to reduce hydrocarbon and carbon monoxide emissions to factory-set levels and keep them that way. It's a dispersant, detergent, deposit-inhibiting com-

pound of chemicals that—in new cars—prevents the buildup of harmful carbon deposits in the carburetor, on smog-control positive crankcase ventilation (PCV) valves, and to some extent in the “downstairs” area: rings, piston skirts, crankcase.

An engine that's already belching clouds of black unburned hydrocarbons due to deposit buildup will run like new in less than 2000 miles of driving. While total improvement takes six or seven tankfuls of gasoline, you begin noticing the difference after a few hundred miles.

Chevron's initial tests were performed

(Please turn to page 46)

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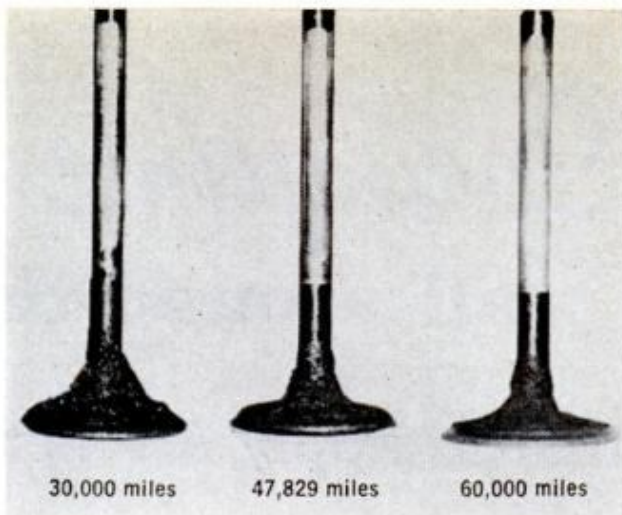
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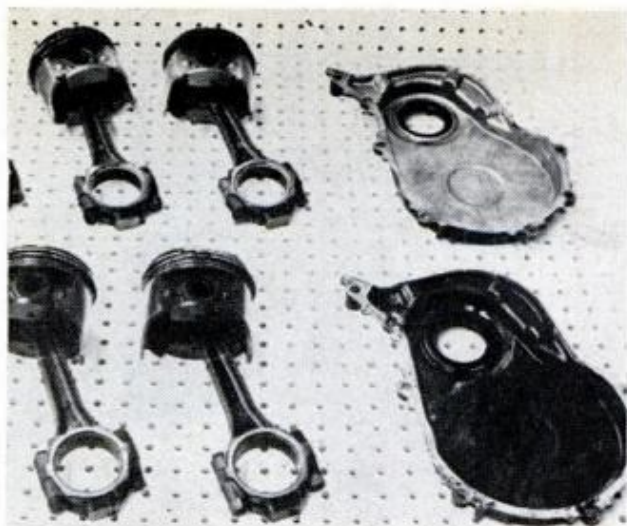
(Continued from page 44)

on laboratory engines and then in the field on fleet cabs. Late-model, high-mileage cars that manifested the problems of unusual carbon buildup were run on F-310 gasoline. Short-term results were astounding: PCV systems worked like new; carburetor valves looked as if they had been scrubbed with steel wool (see photo at right). Same was true over long periods: Heavy, air-restricting carbon buildup on intake valve-stems was being substantially reduced. Crankcase sludge was actually disappearing.

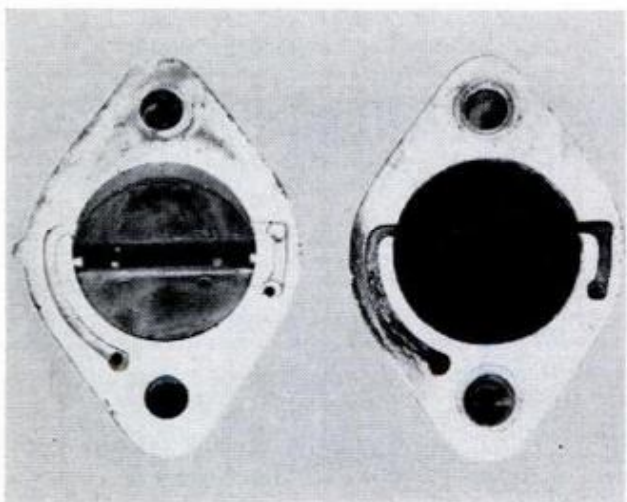
Chevron employed Scott Research Laboratories of San Bernardino, Calif., to make independent field evaluations of F-310. Late-model used cars were purchased by Scott, properly tuned and cleaned to factory-new condition. The cars were run 5000 to 18,000 miles to dirty up the engines. When the cars began stalling and running poorly, hydrocarbon and carbon monoxide emissions were recorded.

Next, cars went 2000 miles on F-310 gas before the carburetor, PCV system, and emissions were rechecked. Drivers noticed improvement in operation after only 100 to 200 miles. At between 1000 and 2000 miles of test-course driving hydrocarbon emissions were found to be reduced by 50 to 80 percent. Carbon monoxide levels went from an average 2.5 percent to 1.6 percent. PCV and carburetor valves looked like factory replacements rather than used components. Engines ran smoothly, using an average 21 percent less fuel at idle and 11 percent less when driven at a steady 25 mph.

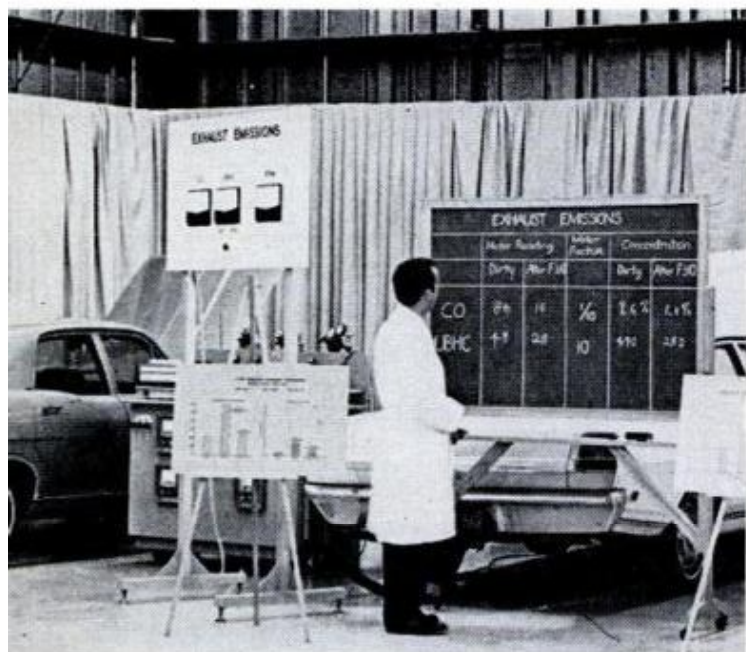
These tests, examination of engine parts and Chevron engineers' demonstrations seem to indicate F-310 is a boon for the car owner and our environment. ★★



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DROP IN LEVELS of unburned hydrocarbons and carbon monoxide is recorded after 1900 miles on F-310

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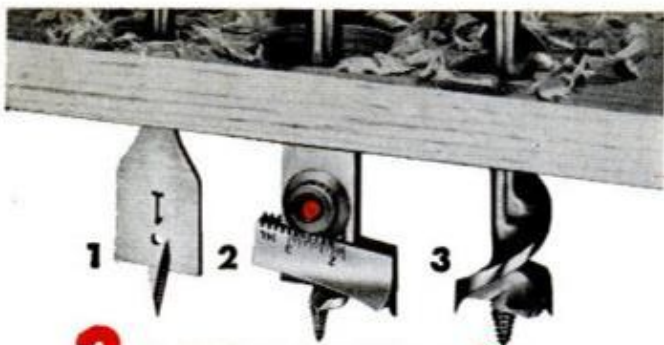


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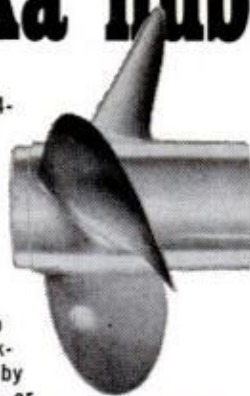
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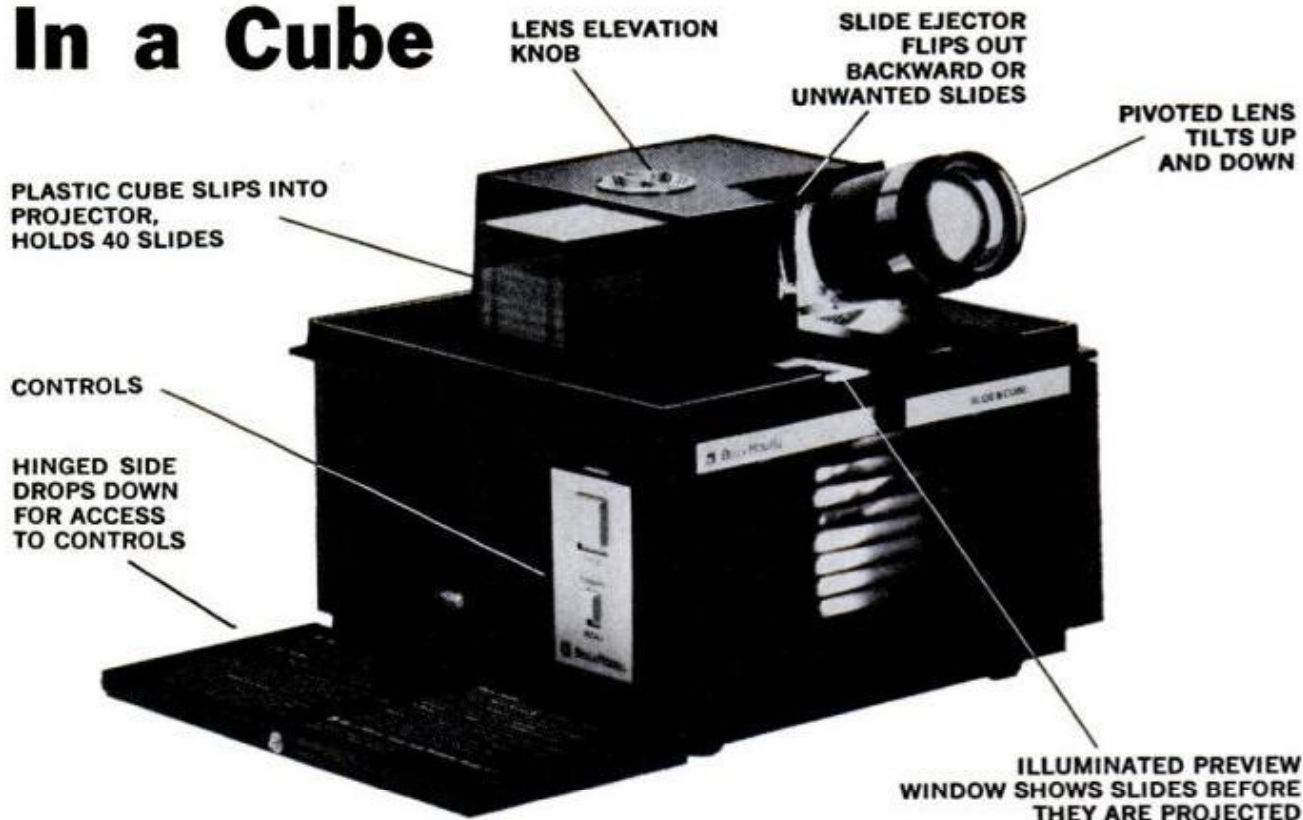
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The trim, compact projector fits easily on a bookshelf and is smartly styled in a black and wood-grain finish. Prices are \$112.50 to \$184.50 depending on whether you want extra features like automatic focusing, slide recall and a zoom lens. Accessories include a slide-storage lid that replaces the regular cover and holds nine cubes, an automatic slide changer and a slide synchronizer for use with a tape recorder. Bell & Howell, 7100 N. McCormick Rd., Chicago, Ill. ★★★



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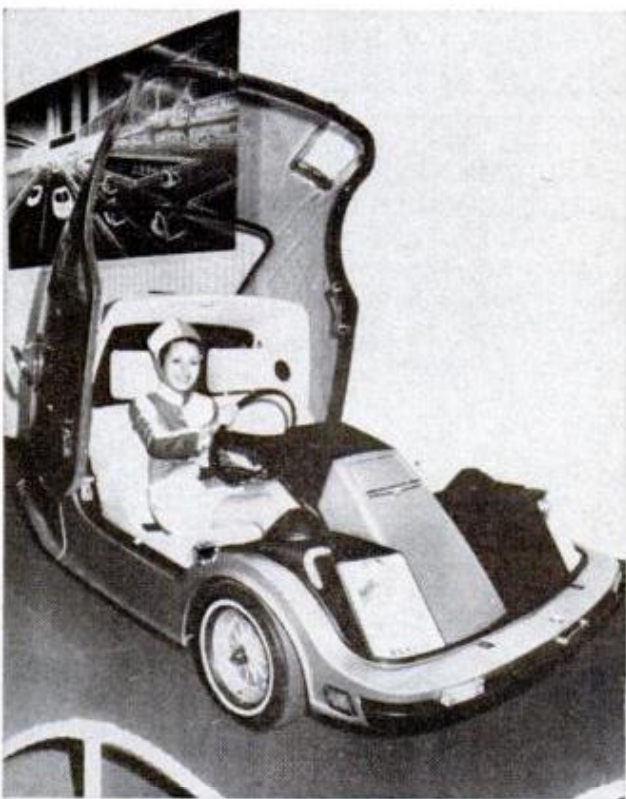
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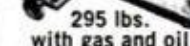
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(Continued on next page)

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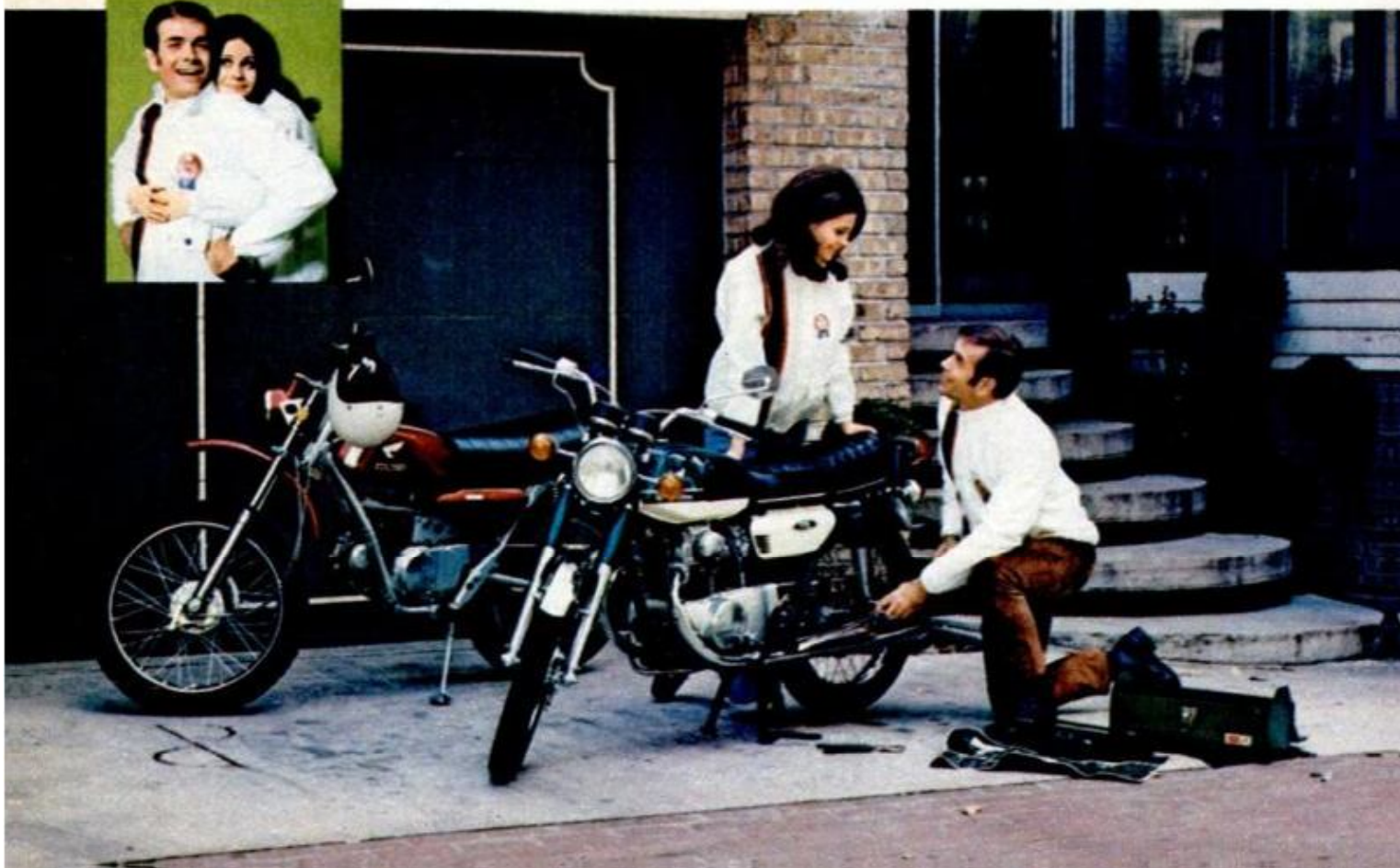
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Danny Ongais drove Mickey Thompson's Mach 1 to victory against a super tough field. He couldn't have won if someone hadn't tamed that Mustang; tuned it, toughened it, and turned it on to mechanical perfection. That took a Great One, head wrench Amos Satterlee.

Under the pressure of big-time racing, professional mechanics must produce top quality work in minute amounts of time. Because of demands on them, the Great Ones demand perfection in hand tools... S-K hand tools... so easy and comfortable to use that they serve as extensions of your brain and hands. It's what you expect from the experts who perfected the famous ratchet wrench.

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FAMOUS S-K RATCHET & 1/2" DRIVE SOCKET SET

Regular retail price, if purchased separately: \$36.49. You save \$12.61 during Great Ones Spring Special Sale

"Sweet Sixteen" intermediate set to keep mechanical things in sweet running condition. 16 pieces include 13 standard sockets, ratchet, 5" extension and 17" flex handle. Packed in steel case: 1 1/4" x 17" x 3 3/4".

\$23.88*

LIMITED QUANTITY—SPECIALLY PRICED

*Suggested User Price

Thousands of mechanics rely on S-K Tools to handle jobs easier and faster. If you use tools, why not the best?

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The "thin-line" head permits working in tight areas. Machined to micro-tolerances to assure precision jaw operation. Highly polished nickel chrome faces. Cushion grip, green vinyl handles.

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Mechanics: Be proud of your profession. Display this colorful 5" x 7" decal. Enclose 25c for handling and mailing with your request. We'll also send you an illustrated catalog free.

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S-K TOOLS

HAND TOOL DIVISION,
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Chicago, Illinois 60604

SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

Short stop

If the battery in my car were completely run down, could I get the engine started by connecting a battery from another car by means of jumper cables? One mechanic I asked said yes. Another said it can't be done, because the juice from the good battery would just be absorbed by the dead battery and there wouldn't be enough left to start my car. What do you say?—Art Glaser, McKeesport, Pa.

I say it depends on the condition of your battery. If it's just drained, you will be able to start the engine by jumping another battery. However, if your battery has a dead short in one of the cells, then you probably won't get started. The short would cause grounding of the current coming from the auxiliary battery.

Not many mpg

I have a problem with a 1968 Chrysler with 440 engine and four-barrel Holley carburetor. I get only six miles per gallon. Mechanics tell me there's no adjustment that can be made on this carburetor and that six mpg is all I can expect. Please help.—Clyde D. Nolan, Lilburn, Ga.

This carburetor can so be adjusted, but a mechanic has to know where to look. The mixture adjusting screw, for example, is found inside the air-horn casting. It has a left-hand thread. Frankly, if a mechanic doesn't know this about the four-barrel Holley, I wouldn't let him lay a hand on mine.

Freeze-up

Every time the temperature drops below freezing, the internal linkage of the door locks of my 1968 Mustang hangs up. This isn't outside where I can apply the "hot key," but inside the door panel. I can get the door open, but then the locking jaws won't trip and I have to tie the door shut. Can you offer a solution?—William R. Gardner, Detroit, Mich.

Apply a liberal amount of silicone lubricant spray to the latching mechanism. This will free up the mechanism and will also provide a protective coat to repel an accumulation of moisture. If you get into

a bind again and the door won't close, push the locking button down and slam the door without holding the outside door button in place. This will usually snap the mechanism free.

Hawaiian horrors

No one can solve the problem I'm having with my 1969 Chevelle Six. As I'm driving, the engine will go dead on me. Sometimes it will happen when I'm making a turn; other times when I apply the brake. It always starts immediately afterward. It may not happen for two or three days, and then will occur a few times in one day. What's the trouble?—Candy Candelori, Honolulu, Hawaii.

One of six things: a plugged carburetor gas filter, a misadjusted carburetor float, distributor breaker points that are closed or fouled, a loose connection at the main electrical connector on the firewall, a loose condenser on the breaker-plate attachment, or a primary wire that's grounding against the distributor body. Aloha!

Clogged exhaust

Will engine damage result if the exhaust of a running engine is clogged for even a short time?—Oscar Winkel, Calgary, Alta., Canada.

That depends on what you mean by a "short time." One-half second, for example, will not cause damage. Generally, though, it's damaging. A clogged exhaust causes valves to burn and warp.

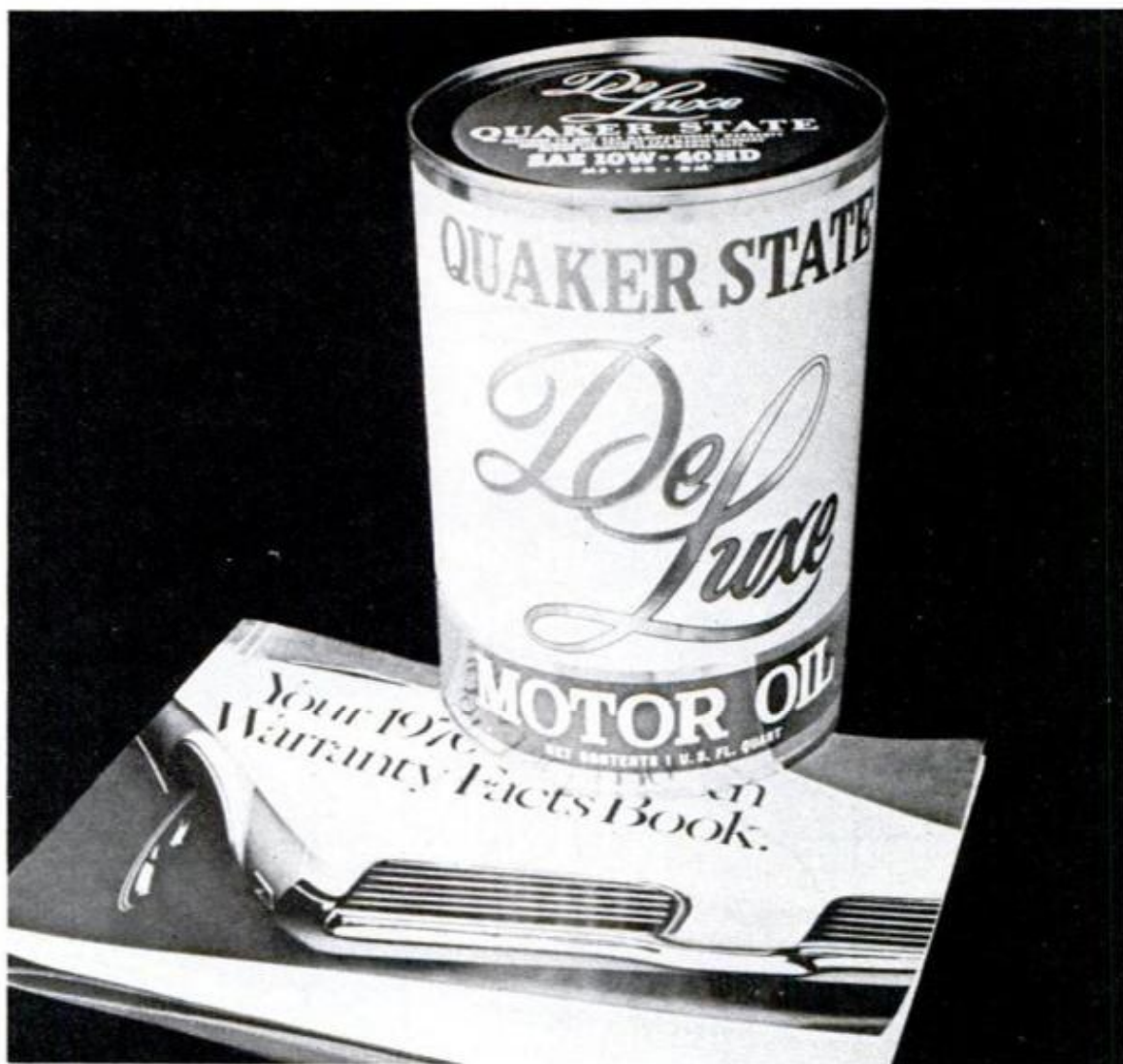
What gas?

The owner's manual for my 1968 Opel Rallye says to use premium fuel. Why? The car's engine is only 102 horsepower with a 9.0:1 compression ratio. My V8 Falcon engine has 9.3:1 compression, uses regular.—Wayne Spicer, Arcadia, Calif.

You can use regular, but make sure your ignition timing is on the button. That owner's manual was written in Europe for a European car that uses European gas. That gas has a lower octane rating than American gas. What passes for premium

(Please turn to page 88)

The warranty guarantee.



Every new-car maker urges you to use a high-quality motor oil to keep your warranty in effect.

If you use Quaker State, you have the peace of mind of knowing your motor oil does not just meet every car maker's warranty requirements. It exceeds them. Quaker State Motor Oils are your warranty guarantee.

Quaker State is refined only from 100% Pure Pennsylvania Grade Crude Oil. And fortified to protect against rust, sludge and engine deposits.

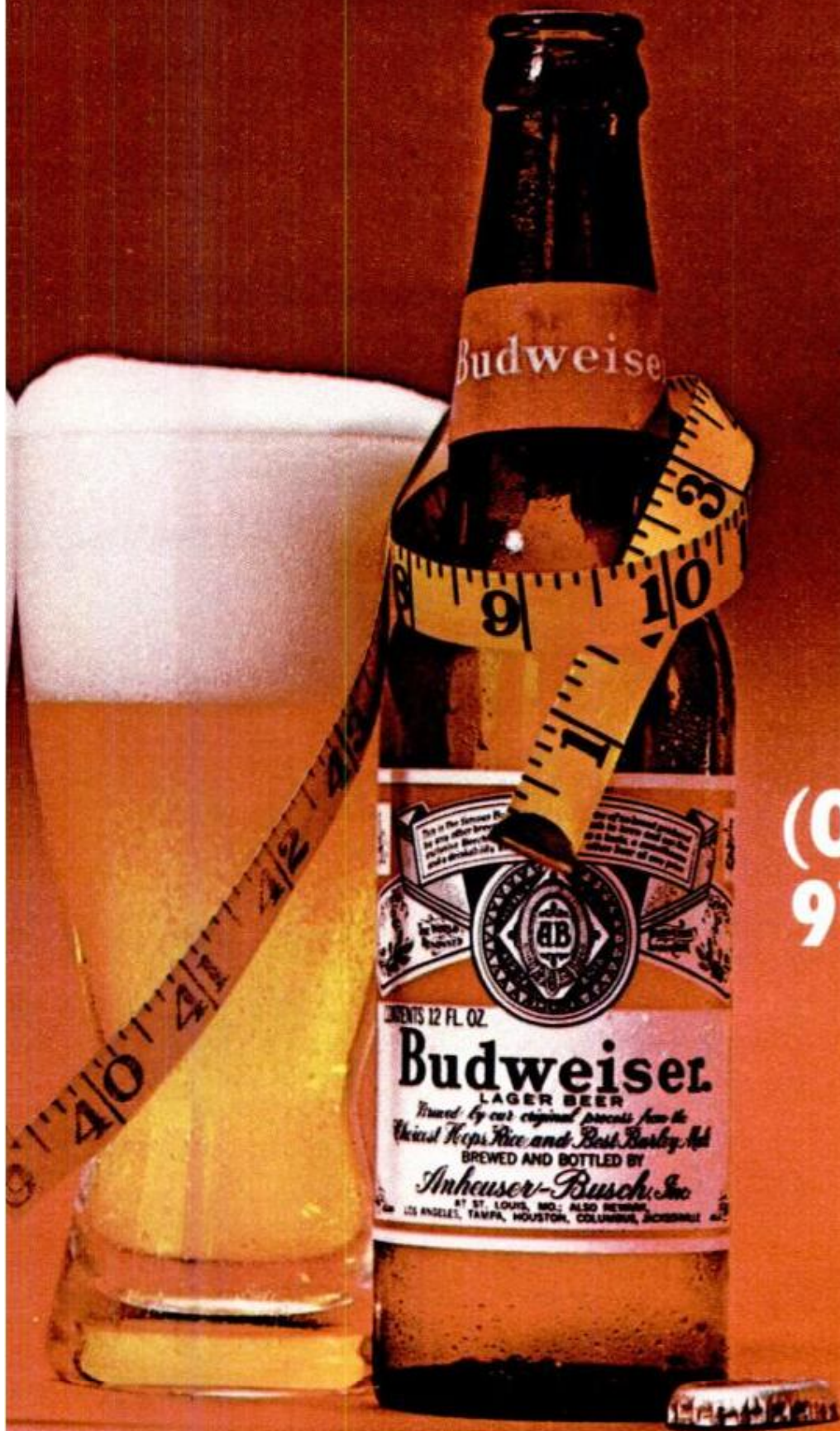
Read about motor oil in your warranty book. Then buy some peace of mind: Quaker State.

Quaker State your car to keep it running young.



**If you stacked all
the Beechwood Aged
beers in America
on top of each other,
how high would
the stack be?**





(Oh...about
9½ inches.)

AUTOMOBILE CLINIC

(Continued from page 84)

in Europe is comparable to a good grade of regular gas here. Keep in mind that even American gas differs in octane from company to company. If one brand causes problems, switch—don't fight.

Brake break problem

My dealer tells me that it's normal for my 1969 Plymouth Fury emergency brake to lock, especially in rainy weather and when humidity is high. When I release the brake cable, I have to break the brake loose by accelerating. Any solutions?—Harry Kelman, Central Islip, N. Y.

It's been a problem, and you're not alone, Harry. The emergency brake has been known to hang up with these models. The cable's been binding. To solve, replace the cable. Make sure the new cable is well lubricated with graphite grease before it's installed and grease it periodically.

Shock life

My 1964 Chevrolet station wagon has 50,000 miles on it. When it was new, I had a set of heavy-duty shock absorbers installed in the rear. The car still handles fine—no bounce, switch or sway. My question: How can I determine when the shocks need to be replaced?—Herman H. Eichorst, South Gate, Calif.

I assume you're not beefing, Herm. Anyone who gets 50,000 miles on a set of shocks is doing pretty good. There are two ways to check them. First, visually. If the shocks are leaking, they need replacing. Second, by feel. Take the shocks off the car and activate them by hand. If they aren't stiff, they've seen better days.

Burned up

The points of my 1962 Rambler Classic with 192 engine burn constantly. What causes this?—Tom Austin, Toledo, Ohio.

If points are installed properly and keep burning, more than likely the trouble is a bad ignition resistor. Since the resistor in this car is located in the coil, test for resistance, which should be 3.3 to 4.1 ohms. If this spec isn't met, replace the coil with the right one, which is a Delco-Remy part carrying part No. 1115066.

Also make sure that the ignition switch isn't shorting, that the voltage regulator isn't set too high, that there isn't a bad engine ground, and that there are no loose wires. These, too, can cause points to burn.

Pulley problem

I had an airconditioner installed on my 1963 Fairlane Six by Sears. When I tried to use a timing light on the engine and couldn't set the pointer because it was being blocked by the airconditioner compressor, I took the car back to Sears. They assured me that they didn't touch the damper pulley to install the unit and that the pulley had slipped because it is set in rubber. Are they kidding me?—R. J. Taylor, Detroit, Mich.

No—they're telling you a straight story. This damper is mounted in rubber and it does "give" after awhile. The fact that you've had an airconditioner installed has nothing to do with it. You'll have to replace the pulley to fix the problem.

Service Tips

● **1970 Fords and Mercurys** with 351-cu.-in., 4V engines are experiencing a surge and slight hesitation upon accelerating from speeds below 25 mph. The trouble is easily corrected by discarding the distributor vacuum hose between the distributor secondary diaphragm and the "T" connector in the line. The "T" connector and the secondary diaphragm connector are then plugged. Your serviceman knows about this job, so see him.

● **1968-69 Chrysler and Imperial** headlamps that stay on low beam if you have an automatic headlamp dimmer are probably plagued by an improper connection. The hookup between the automatic headlamp dimmer wiring harness and the automatic headlamp dimmer power relay is not correct. Have your serviceman straighten it out as outlined in SB 69-8-3.

● **Oldsmobile**, starting with the 1969 models, has incorporated a foam-rubber oiler in the distributor to lube the cam. The company advises that this oiler may be installed backward by a serviceman who doesn't know better. This will result in premature rubbing-block wear. Be sure the flat side of the oiler's retainer is toward the cam. The oiler should be relubricated when contact points are replaced or every 12,000 miles with lubricant No. 1948792. ★ ★ ★

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



*There's a rhythm to it...
hill after hill... mile after mile.*

The DT-1C Enduro is a 250 single for the back country. Way back, where a bike has to handle like a quarter horse.

It's set up with special Enduro forks designed to smooth out the roughest ground. Autolube

oil injection mixes oil and fuel automatically. And a wide-ratio 5-speed gearbox puts power where you need it. So start up a DT-1C like the one below and on the left, above. Or an AT-1C 125 Enduro, a smaller edition also shown above. You'll hear some great traveling music, maestro.

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YAMAHA
It's a better machine

HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

'Gypsum' odor

My north bedroom has only one window. There is a strong, musty, gypsum-like odor present. The walls are painted. Airing the room seems to help some, but when it's closed the odor is detectable. Other rooms don't seem to be affected. A neighbor tells me it's the plaster. Do you think so? What can I do to eliminate this disagreeable condition?—I.N., Ore.

No, I don't, assuming that the plaster has been properly applied and has "cured." If you examine the walls closely, especially along baseboards and near where walls meet the ceiling, you are likely to find clusters of very fine, brownish spots. This will be mildew and the cause of the odor you describe. It's not so easy to eliminate in a room having inadequate cross ventilation, especially in a relatively warm, damp climate. If there is shrubbery along the north wall or any low branching trees nearby, I would remove both to permit air to circulate more freely. Then I would wash the walls with a medium solution of trisodium phosphate, a tablespoonful or more to the gallon of soft water. Then I would repaint the walls with a mildew-resistant paint. This should eliminate the objectionable odor entirely, or at least make it no longer objectionable. During warmer months drop the top window sash a few inches and raise the lower one about the same to improve air circulation.

Clogged drain

My drain into the sanitary line seems to clog up continually. There are no trees near the drain, so root stoppage cannot be the cause. I have to rod the line frequently, sometimes weekly, to keep it clear. Could a disposal unit in my kitchen sink be the cause?—T.E., Mich.

If the drain clears freely after rodding, this would tend to rule out any breaks or crushing of the tiles as a cause. That leaves either no pitch or too much pitch as the probable cause. In the first instance, movement of waste materials through the drain is sluggish to the point of creating stoppage somewhere along the length of the line. In the second, the pitch, or fall, of the tiles is such that the liquid outruns the solid materials, leaving them behind to

gradually fill the drain to the point of near-complete stoppage. If you flush toilets twice at a short interval and run a quantity of clear water into the sink immediately after using the disposal, the drain may remain clear.

There is also a more remote possibility that one or more tiles may have become tilted due to settling of the grade or other cause. If so, about all you can do until you can get the help of your plumber is to use the stopgap measures suggested, or rod the line frequently as you have done.

Replacing sash cord

I have old-type sash with cords and balancing weights. The cords need replacing. I can see how to replace them on the lower sash, but how do I replace those on the upper sash? That is, how is the upper sash removed?—C.R., Utah.

After you've removed the lower sash you have to pry out one of the two parting strips you'll see between the sashes. On an old window frame these strips may have been "painted in," and you'll have to proceed very carefully to get one out without breaking it or splintering the frame. Perhaps the best way is to break the paint seal on both sides of the strip by tapping the edge of a chisel in lightly at the point where the strip meets the sash frame. Do this at spaced intervals along the exposed length of the strip on both sides. Then tap the edge of the chisel into the strip and pry *very lightly* until it loosens at the lower end. Repeat this along the length until the strip loosens sufficiently for you to lift it out with your fingers. Be especially careful in this step not to break the strip or, worse, splinter the frame. Once the strip is out the sash can be lifted clear without removing the strip on the other side of the frame.

'Cold' siding

I want to cover my old wood siding with new aluminum siding, but I've been told that this siding is "cold"—that my old house will be cold and difficult to heat. Right or wrong?—D.F., Kans.

To me, "cold" is a new term applied to house siding. Much would depend on what your informant meant by it. Perhaps he is right in what he meant to say. But I don't think application of aluminum siding will make your home colder temperaturewise, or more difficult to heat, provided that it is installed according to accepted practice and that your heating installation is adequate to cope with winter temperatures in your locality. ★★

The 1970 GRAVELY Riding Tractor.

We'd sell even more of them if the old Gravelys didn't last so long.



That old tractor is 15 years old and still going strong. Which should come as no surprise to you, if you've ever talked to a Gravely owner. We sell many of our new tractors because of word-of-mouth praise by owners who know how long their old Gravelys last.

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Please let us send you a new catalog on Gravely Riding and Convertible Tractors, and the name of your Gravely dealer. Write: Gravely Corporation, 5804 Gravely Lane, Clemmons, N.C. 27012.

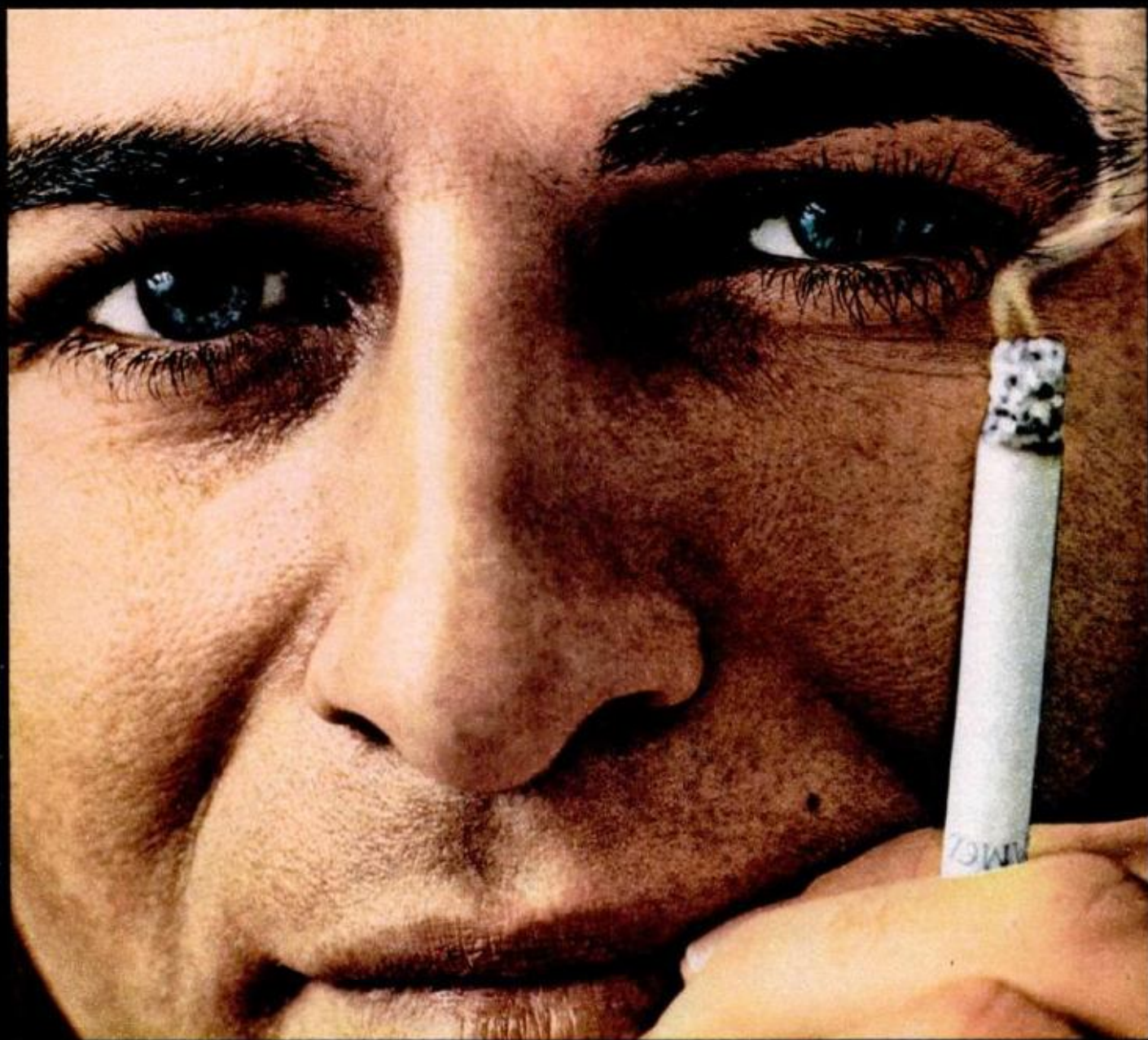


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smooths out taste
in a cigarette.

Who's got it? Camel.
Start walking.



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The Hottest Job In The World

Next to the astronauts, the men nearest the fiery blast of an Apollo launch are members of a rescue team. Their job: to get to the astronauts if there's trouble. They'll be on guard when Apollo 13 blasts off this month.

By MARTIN CAIDIN *Author of Marooned*

IT'S THE BIGGEST BOMB EVER MADE. Sixty-five feet across at the base, 33 feet thick through its massive belly. Standing on its ponderous steel launch pedestals, it towers more than 400 feet above the ground.

That's a bomb . . . 6,400,000 pounds of supercold, superhot hell waiting to explode in a titanic blast if just one of several million parts doesn't work exactly as designed.

If it works properly, if the millions of parts mesh in a beautiful blending of energy, it generates more power than Hoover Dam. And it sends three men and 50 tons to the moon.

If it ever explodes, it will be the nearest thing ever to an atomic bomb.

When the Saturn V cooks slowly before coming to life on its pad, and finally erupts in a cataclysmic blast of flame and thunder, a handful of men only 1800 feet away are poised and ready to rush into what would seem to be certain death. They are the 14 men of

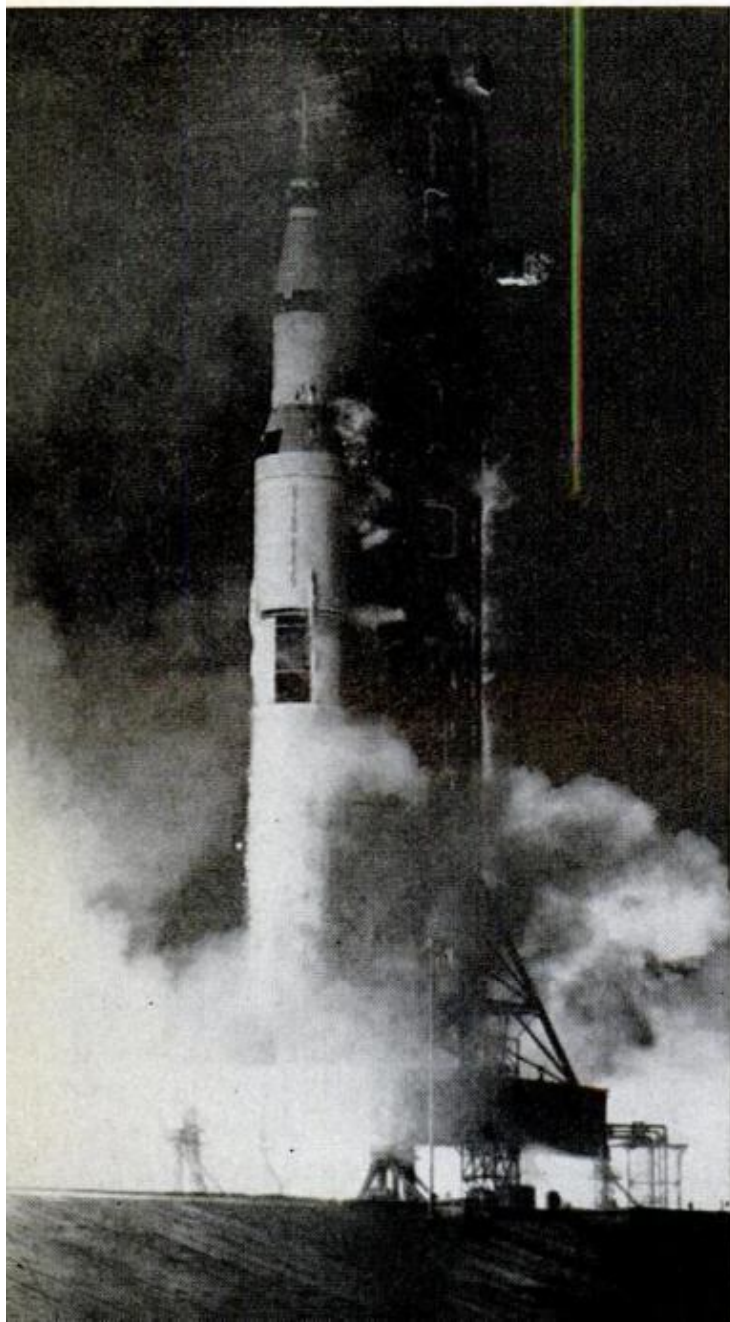
At 1800 feet, sound is a cataclysmic shriek

the Astronaut Rescue Team, a select group who make up the toughest, best-trained, fastest-moving and most highly skilled firefighting and rescue force in the world. Their job: to save the lives of the three astronauts who are strapped in and sealed within the thick-hulled Apollo spacecraft atop the Saturn V booster rocket—if there's a pad fire or explosion before, during, or immediately after a launch begins.

The rescue team will stand guard when Apollo 13, scheduled for this month, lifts off with James A. Lovell (commander), Thomas K. Mattingly II and Fred W. Haise Jr. aboard.

The 14 men of the team live, train,

FANTASTIC POWER of Saturn V creates shock waves that feel, at 18,000 feet, like blasts from rapid-fire explosions. Photo shows the Apollo 12 launch



work—and wait—at the Kennedy Space Center in Florida, the world-famed moonport from which four teams of men have left this planet to reach out to the moon. No one knows exactly what would happen if the Saturn V should burn on the pad or explode. It's filled with millions of pounds of kerosene, liquid oxygen and liquid hydrogen, solid-fuel rockets, miles of high-pressure lines and electrical connections. The danger of blast from an explosion is so great that press and TV reporters and VIPs aren't allowed to get closer than 18,000 feet to the launch pad.

Even 18,000 feet isn't much for a Saturn V blast-off. At that distance the shock waves are so great they feel like blasts from a series of rapid-fire explosions. The noise crashes in on you. You can even feel the heat from the nearly 8 million pounds thrust being developed by the five engines of the first stage.

The rescue team for the astronauts waits only a tenth of that distance from the launch pad. At 1800 feet the sound isn't even noise any more. It's a cataclysmic shriek that pounds with painful force against the body. The heat rolls over you like a wave from an open furnace door only a few feet away. It's hot enough to hurt.

During the final moments of a countdown the men of the Astronaut Rescue Team sit or crouch within tanklike vehicles (modified armored personnel carriers, shielded with an ablative material), their senses tuned to *the* signal from the firing room miles behind them. They hope they never receive that signal to *GO!*

Should the rescuers ever receive the word, they would slam their rescue vehicles into gear and pound as fast as they can move to the launch pad. If there's a fire there's imminent danger of an explosion. With a rocket as big as the Saturn V that spells catastrophe. It's a race with the clock, a race where

seconds mean the difference between life and death. At the pad, wearing glistening rescue suits and helmets, they scramble for high-speed elevators that lift them quickly to the 320-foot level of the big bird. Perhaps a fuel line may have ruptured, sending flames cascading across the pad or anywhere along the service tower.

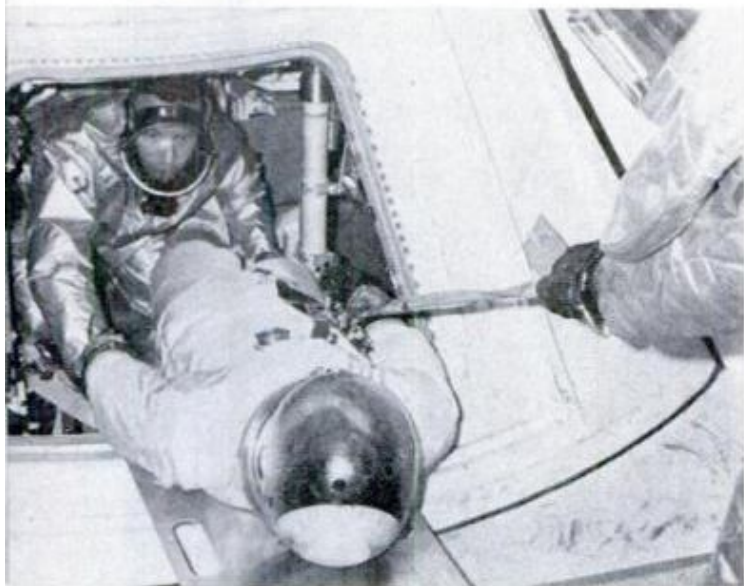
Whatever the danger, once members of the team are committed to the rescue attempt, they don't stop. It's *all the way*, even if the whole pad seems about to go up with the force of 1000 tons of TNT.

They know that three men in that Apollo are counting on them. Back in January, 1967, with an Apollo atop a smaller Saturn 1B, a fire started in the

spacecraft. The space agency didn't have an Astronaut Rescue Team then. They didn't have hair-trigger procedures or skilled personnel. The three men in that Apollo—Gus Grissom, Ed White and Roger Chaffee—burned to death. Nobody at the space center ever forgets that.

At the 320-foot level, the team moves with extraordinary precision. Every man knows what to do and in what sequence. The section immediately outside the spacecraft is known as the White Room. Its normal prelaunch quiet would be shattered by a screaming siren, should an emergency occur. If the rescue team is on the move, there'll be a new sound—booted feet pounding on the catwalk leading from

AFTER ASTRONAUT'S RESTRAINT HARNESS is freed, rescuer "hooks" his man and pulls him from craft

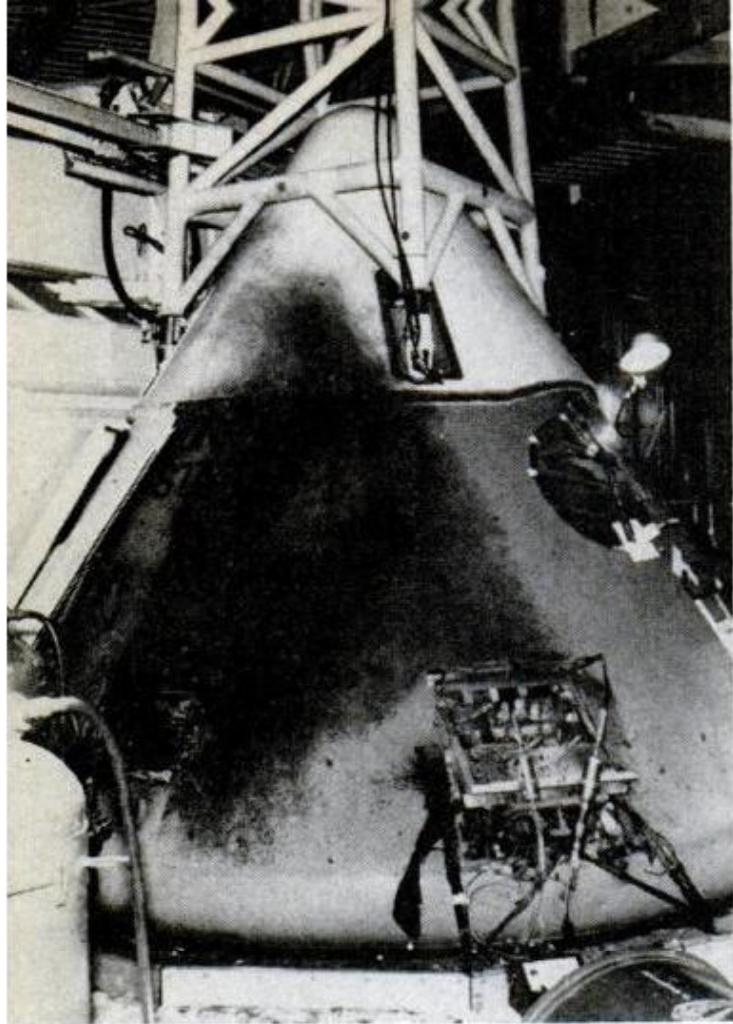


RUSHED TO CAGE, astronauts take 2000-foot, slide-wire ride to safety—one of three escape methods



ALTERNATE SAFETY ROUTE: High-speed elevator to ground, then dash to specially protected personnel carrier





ASTRONAUTS Gus Grissom, Ed White and Roger Chaffee burned to death in this Apollo module in 1967. That tragedy led to new safety procedures and to the formation of the skilled Astronaut Rescue Team

the high-speed elevator to the White Room and the Apollo.

Swinging doors burst aside and the "hot team" of four suited rescuers rush for the spacecraft. If the astronauts inside haven't opened the hatch, or can't open it, the rescue force breaks the seal. One man hauls the hatch out of the way. A second man pushes his way into the spacecraft. Working with a precision born of months of practice, he disconnects oxygen life support, communications and other lines from the Apollo to the astronauts' suits. Then he snaps free their restraint harness, and immediately gets out of the way. A third rescue-team man leans in with a special "gaff hook," snags it on an astronaut's pressure suit, and literally hauls the spaceman from the Apollo the way a fisherman drags a tuna out of a boat. The fourth team member gets the astronaut to his feet even as another man is being hauled from the Apollo, and then the third.

What happens next depends on what the situation is. The rescuers have

(Please turn to page 220)



AS MOON MISSION NEARS, THEIR TRAINING IS ESCALATED. Shown after a practice session are (left to right): G. E. Bidault, Adolph Garza Jr., Al Wozniak, Roderick A. Hobbs, Charles H. Short and Randle Marlow



Spanish tribute to Apollo 11

First statue to honor the Apollo 11 astronauts is this one erected in Malaga, Spain.



Air passengers get a boost

A luxury vehicle designed to load and unload jet-plane passengers at congested airports was recently displayed by the Budd Co., Fort Washington, Pa. The "Plane-Mate" can carry up to 150 passengers between terminals and airliners. It eliminates step climbing by elevating the passenger lounge (top photo) up to 18 feet to the doors of jumbo jets. The lounge is lowered (bottom photo) when the vehicle travels between plane and terminal.



Fiberglass three-wheeler is new all-season sports vehicle

Able to go on snow or dunes, ford low streams, skim over high grass and underbrush, speed 45 mph on level ground and tackle steep slopes, the new SPD Tricart is an all-season, all-terrain sports vehicle. The three-wheeled fiberglass machine, built by the Special Products Div. of Sperry Rand Corp., is essentially a one-man vehicle, but can accommodate a piggyback passenger. Powered by a 230-cc JLO two-cycle engine, Tricart sells for about \$750.



ECONOMY TEST in the Union 76 Performance Trials uses a separate fuel supply mounted on front of the car

PERFORMANCE TESTS—

The automakers rated their '70 cars and submitted their figures to the government; then Union 76 ran its 13th Annual Performance Trials. The results are different

By **BILL HARTFORD**, Auto Editor/Photos by Pal Parker

EVERYBODY'S TESTING CARS these days. Tests have long been the bread and butter of magazines like *PM*. Editors scrutinize a new model and wring it out for their readers' benefit. Test results range from seat-of-the-pants impressions to hard data gathered by sophisticated instruments.

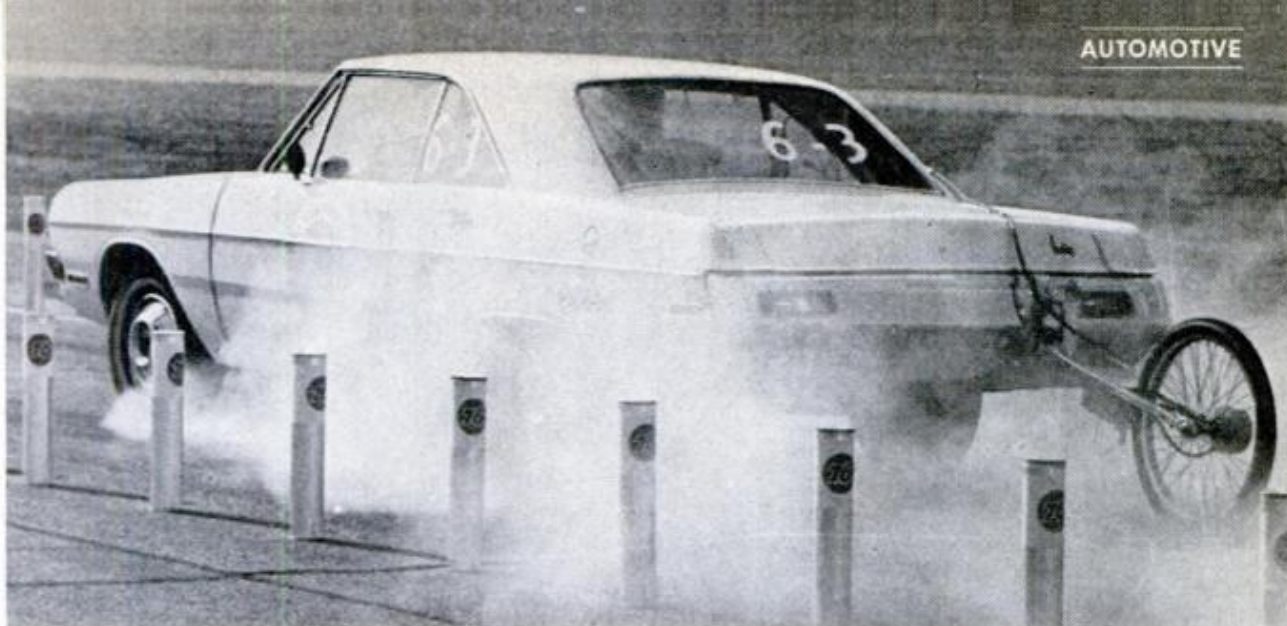
Also in the business is the Union Oil Co. of California. For the last 13 years it has sponsored annual performance trials supervised and sanctioned by NASCAR—the National Assn. for Stock Car Racing. The yardsticks of performance are fuel economy, acceleration and braking. Representative models of domestic passenger cars in nine classes are run through these three series of tests which are set up to minimize driver skill and objectively determine a winner in each class.

Latest to join the ranks of car testers is the federal government. Civil servants clutching steering wheels in panic-stop brake tests is not the way it works, however. The U.S. Department

of Transportation's Federal Highway Administration has established regulations that require auto manufacturers to submit to the agency data that "... reflect actual vehicle performance capabilities."

Last January, almost at the same time the National Highway Safety Bureau was publishing this *Performance Data for New Passenger Cars and Motorcycles*, Vol. 1, No. 1, of its Consumer Information Series, the Union 76 Performance Trials were being held at Daytona International Speedway.

The 304-page government publication (for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for \$2.25) contains the information the agency regards as vital yardsticks of performance and safety, mainly: 1) acceleration and passing, 2) tire reserve load, and 3) stopping distance. Tire reserve load is the percentage by which the rated load exceeds the actual tire load when the vehicle is loaded to



BRAKING TEST in the Union Trials measures distance for emergency stop from 65 mph in 12-foot-wide lane

DETROIT vs. UNION OIL

its maximum recommended capacity.

Fuel consumption figures are not a safety-related aspect of performance and so are not required of the manufacturer by the government. Economy is certainly important to a prospective car buyer and it is determined in the Union 76 Trials. Economy and tire reserve load are, at a glance, the obvious differences between Union 76 data and government-compiled data. The most important difference, however, is the fact that manufacturer-supplied data would seem to protect the manufacturers more than they inform the public. The figures are arrived at and released only after company engineers—and lawyers, probably—feel they can be sure that all cars in a model line will perform within certain limits.

In the Union Trials, on the other hand, a representative model car, purchased unannounced from a dealership and under the watchful eye of NASCAR, is subjected to performance tests. The Union tests *evaluate* the cars in a certain class in a contest.

The accompanying chart of results can be read with the following rules in mind. For the braking test:

Union 76: Emergency stop from 65 mph in a 12-foot-wide lane. Wheels can

be locked. Stop is made after a series of warm-up stops that heat lining or pads to induce fade. Unlimited pedal pressure can be used.

Manufacturers' Data: Emergency stop from 60 mph. Wheels cannot be locked. Brakes are not warmed up. Pedal force cannot exceed 150 pounds.

The Union tests run with driver and one passenger corresponding to "light load" in manufacturers' data. In simulating a highway lane and the danger involved in skidding due to an uneven lockup of brakes, the Union rules provide footage penalties for knocking down lane-marker pylons. Other penalty provisions in the tests minimize driver skill, "cheating," or error.

In the acceleration tests, Union measures time for a car to reach 75 mph from 20 mph. In manufacturers' figures, low-speed pass means passing a 55-foot truck by starting from 40 feet behind, accelerating to 35 mph and finishing 40 feet ahead. In the high-speed pass car starts 100 feet behind, accelerates to 80 mph from 50 mph and finishes 100 feet ahead of the truck—which maintains a steady 20 and 50 mph, respectively, in the two tests.

In the chart, manufacturers' data is given only for cars that ran in the



EMERGENCY STOPPING LANE is 500 feet long marked with pylons. If brakes lock unevenly, car will not stop straight. Penalty imposed is 2 feet per pylon



Union 76 Trials. The government book lists data for all domestic automobiles, imported vehicles and motorcycles. The book also includes further data—braking distance with failure of power-brake system or with partial failure of one brake subsystem, for example. It's not necessary to have a copy of the book, however, since a dealer must make available to a buyer or prospective buyer the data on the cars he sells.

For the official results of the Union 76 Performance Trials, which includes a further description and rules for their tests, write: Union 76, Box 1763, Chicago, Ill. 60604.

Buying a car is still mostly emotion, personal preferences and requirements—style, color, size, price, prestige, brand loyalty and trade-in—but in case you want them, two sets of performance data are in. ★★★



PENALTIES

(DE denotes driver error; first digit in car's number identifies its class, second indicates its order of appearance in class list on opposite page).

Economy: cars 3-4, 9-4, each .3 mpg, average speed, DE.

Acceleration: None.

Braking: car 1-1, 5 ft., decelerometer, DE; car 1-2, 8 ft. (5 ft., decelerometer, DE; 1 ft., qualifying distance, DE; 2 ft., pylons); car 1-3, 10 ft., decelerometer, DE; car 1-4, 9 ft., qualifying distance, DE; car 1-5, 32 ft., pylons; car 1-6, 63 ft. (5 ft., decelerometer, DE; 3 ft., qualifying distance, DE; 7 ft., qualifying time, DE; 48 ft., pylons); car 2-2, 54 ft., pylons; car 2-4, 3 ft., qualifying distance, DE; car 3-1, 42 ft., pylons; car 3-2, 54 ft., pylons; car 3-7, 5 ft., decelerometer, DE; car 4-2, 36 ft., pylons; car 4-4, 73 ft. (3 ft., qualifying distance, DE; 10 ft., qualifying time, DE; 60 ft., pylons); car 4-5, 5 ft., decelerometer, DE; car 5-2, 20 ft., pylons; car 5-3, 4 ft., qualifying time, DE; car 5-5, 10 ft., pylons; car 5-8, 1 ft., qualifying distance, DE; car 7-1, 16 ft., pylons; car 8-1, 2 ft., qualifying distance, DE; car 8-4, 22 ft., pylons; car 8-5, 48 ft., pylons; car 9-2, 2 ft., pylons; car 9-5, 4 ft., pylons; car 9-6, 4 ft. (2 ft., pylons; 2 ft. qualifying distance, DE).

ACCELERATION TEST in Union 76 Trials starts at 25 mph; time to reach 70 mph is measured electronically

1970 UNION 76 TRIALS RESULTS

MANUFACTURERS' DATA

CAR AND MODEL	ENGINE Cu. In.	ECON- OMY Mpg	ACCEL. (25-70mph) Seconds	BRAK- ING (from 65mph) Feet	ACCEL. & PASSING				TIRE LOAD BRAKING		
					(20-35mph) Feet	(50-80mph) Feet	Secs	Secs	Reserve %	Light Load Feet	Max Load Feet
CLASS I—SUPER DELUXE—8-CYLINDER (\$5500-\$6000)											
Buick Electra 225 Custom	455	15.179	9.325	190.9*	421	9.1	1249	13.3	7.7	209	195
• Buick Riviera	455	15.722	8.465	196.8*	421	9.1	1249	13.3	6.5	209	195
Chrysler New Yorker	440	14.581	10.865	232.3*	400	8.5	1180	12.4	2.5	205	205
Oldsmobile 98**	455	15.010	10.80	229.0*	421	9.1	1249	13.3	8.2	205	195
Oldsmobile Toronado**	455	13.388	10.775	213.9*	404	8.5	1200	12.8	6.4	196	200
Thunderbird**	429	14.823	9.14	305.3*	299	8.4	1110	11.4	.77	220	213
CLASS II—DELUXE—8-CYLINDER (\$4900-\$5500)											
Buick Wildcat Custom	455	15.808	9.145	185.5	434	9.6	1385	15.1	4.6	226	228
Chrysler 300	440	15.416	9.745	271.0*	400	8.5	1180	12.4	4.0	205	205
Dodge Monaco	440	14.753	9.310	228.6	400	8.5	1180	12.4	5.2	205	205
Mercury Marquis**	429	13.997	9.59	253.1*	403	8.5	1150	11.9	1.71	234	208
Oldsmobile Delta 88 Custom**	455	15.105	9.935	229.9	434	9.6	1385	15.1	6.2	207	206
• Pontiac Bonneville	455	15.811	9.375	177.8	434	9.6	1385	15.1	2.0	226	228
CLASS III—MEDIUM—8-CYLINDER (\$4500-\$5000)											
Buick LeSabre Custom	350	15.851	12.545	221.8*	434	9.6	1385	15.1	4.6	226	228
Chevrolet Caprice**	350	16.627	11.245	239.8*	434	9.6	1385	15.1	3.5	207	206
Chrysler Newport Custom	383	16.114	11.705	(1)	410	8.8	1315	14.2	4.0	205	205
Dodge Polara Custom	383	16.134*	10.645	230.3	410	8.8	1315	14.2	5.2	210	200
Ford LTD**	351	16.096	11.945	207.6	410	8.9	1272	13.6	2.71	234	208
Mercury Monterey**	390	15.102	11.89	220.2	412	8.8	1240	13.2	1.36	234	208
Oldsmobile Delta 88**	350	15.073	12.86	238.0*	434	9.6	1385	15.1	6.2	207	206
Plymouth Sport Fury	318	16.517	13.555	194.5	435	9.6	1430	15.8	1.0	210	200
• Pontiac Executive	400	16.619	10.590	178.9	434	9.6	1385	15.1	2.0	226	228
CLASS IV—STANDARD—8-CYLINDER (\$3900-\$4300)											
• Ambassador DPL	304	16.717	12.585	173.1	413	8.9	1292	13.9	3.5	249	237
Chevrolet Bel Air	350	17.819	11.255	220.8*	434	9.6	1385	15.1	2.5	226	228
Dodge Polara	318	15.652	15.340	180.5	435	9.6	1430	15.8	5.2	210	200
Ford Custom 500**	302	17.182	14.555	285.6*	414	8.9	1314	14.2	3.83	234	208
Plymouth Fury II	318	17.670	13.770	235.0*	435	9.6	1430	15.8	0.3	210	200
Pontiac Catalina	350	14.930	13.160	185.1	434	9.6	1385	15.1	2.0	226	228
CLASS V—INTERMEDIATE—8-CYLINDER (\$3200-\$3900)											
Buick Skylark Custom	350	16.853	10.87	187.1	427	9.4	1421	15.7	11.1	228	229
Chevelle Malibu	307	17.348	12.33	205.3*	427	9.4	1421	15.7	2.5	228	229
Dodge Coronet 500	318	17.349	11.795	186.7*	405	8.6	1320	14.3	8.2	210	205
• Ford Torino	302	18.082	10.695	170.1	404	8.6	1213	12.8	0.01	254	213
Mercury Montego MX	302	18.165	11.435	212.8*	403	8.5	1222	12.9	3.36	254	213
Oldsmobile Cutlass	350	15.870	11.015	175.6	427	9.4	1421	15.7	5.4	228	229
Plymouth Sport Satellite	318	17.511	11.83	196.3	405	8.6	1320	14.3	5.5	210	205
Pontiac LeMans Sport	350	16.435	10.53	180.4*	427	9.4	1421	15.7	11.8	228	229
Rebel SST	304	16.597	11.475	180.4	406	8.6	1241	13.2	3.0	238	269
CLASS VI—COMPACT—6-CYLINDER (\$2300-\$2800)											
• AMC Hornet SST	232	25.075	14.960	190.9	417	9.1	1502	16.8	5.5	244	262
Chevy Nova 6	230	20.531	18.005	185.4	430	9.5	1316	14.3	4.0	218	219
Dodge Dart Swinger	225	22.487	15.915	159.9	420	9.1	1435	15.9	7.4	215	205
Ford Maverick	200	22.153	17.370	204.7	414	9.0	1493	16.7	0.29	253	220
Plymouth Valiant Duster	225	22.190	19.390	177.2	420	9.1	1435	15.9	14.4	215	205
CLASS VII—SPORT INTERMEDIATE—8-CYLINDER (\$3700-\$4200)											
• Buick GS 455	455	16.325	6.29	189.2*	427	9.4	1421	15.7	11.0	228	229
Chevelle SS 454 (2)	454	—	—	—	427	9.4	1421	15.7	2.5	228	229
Dodge Charger R/T	440	13.279	6.20	183.1	390	8.1	1005	10.0	4.2	200	190
Ford Torino Cobra**	429	14.059	6.38	184.8	385	7.9	1000	9.9	0.43	216	223
Merc Cyclone GT** (3)	429	—	—	—	386	8.0	1010	10.1	5.67	216	223
Oldsmobile 442**	455	15.571	6.11	209.9	427	9.4	1421	15.7	5.5	219	206
Plymouth GTX	440	14.417	6.155	207.7	390	8.1	1005	10.0	4.2	200	190
Pontiac GTO**	455	15.913	6.55	264.1	427	9.4	1421	15.7	11.9	219	206
CLASS VIII—SUPER SPORT COMPACT—8-CYLINDER (\$3500-\$4200)											
Chevy Nova SS**	350	17.503	8.72	197.3*	418	9.2	1316	14.3	4.0	197	202
Dodge Challenger 340	340	16.208	7.21	167.2	400	8.5	1020	10.2	1.7	210	205
Javelin SST	360	17.302	8.69	177.3	392	8.2	1112	11.4	4.5	252	259
Mercury Cougar XR-7**	351	16.978	7.16	193.9*	391	8.2	1104	11.4	2.58	221	213
Mustang Mach I**	351	16.952	7.035	231.0*	390	8.2	1146	11.9	12.00	221	213
• Plymouth Cuda	340	16.260	7.08	164.9	400	8.5	1020	10.2	1.7	210	205
CLASS IX—SPORT COMPACT—8-CYLINDER (\$3000-\$3750)											
Chevy Nova 8	307	19.492	10.72	182.2	418	9.2	1316	14.3	4.0	218	219
Dodge Challenger	318	16.997	10.66	211.95*	400	8.5	1260	13.5	3.3	215	210
Javelin	304	16.681	10.725	162.6	398	8.4	1164	12.2	4.5	252	259
• Mercury Cougar	351	17.233*	8.915	191.1	391	8.2	1104	11.4	2.58	254	213
Mustang	302	18.335	10.25	177.2*	390	8.2	1146	11.9	2.44	237	222
Plymouth Barracuda	318	17.565	10.475	173.6*	400	8.5	1260	13.5	3.6	215	210

• Denotes class winner in Union trials.

* Includes penalty or penalties (see list on opposite page).

(1) Brake test figures disallowed—sudden driver illness.

(2) Car classified but not available for purchase.

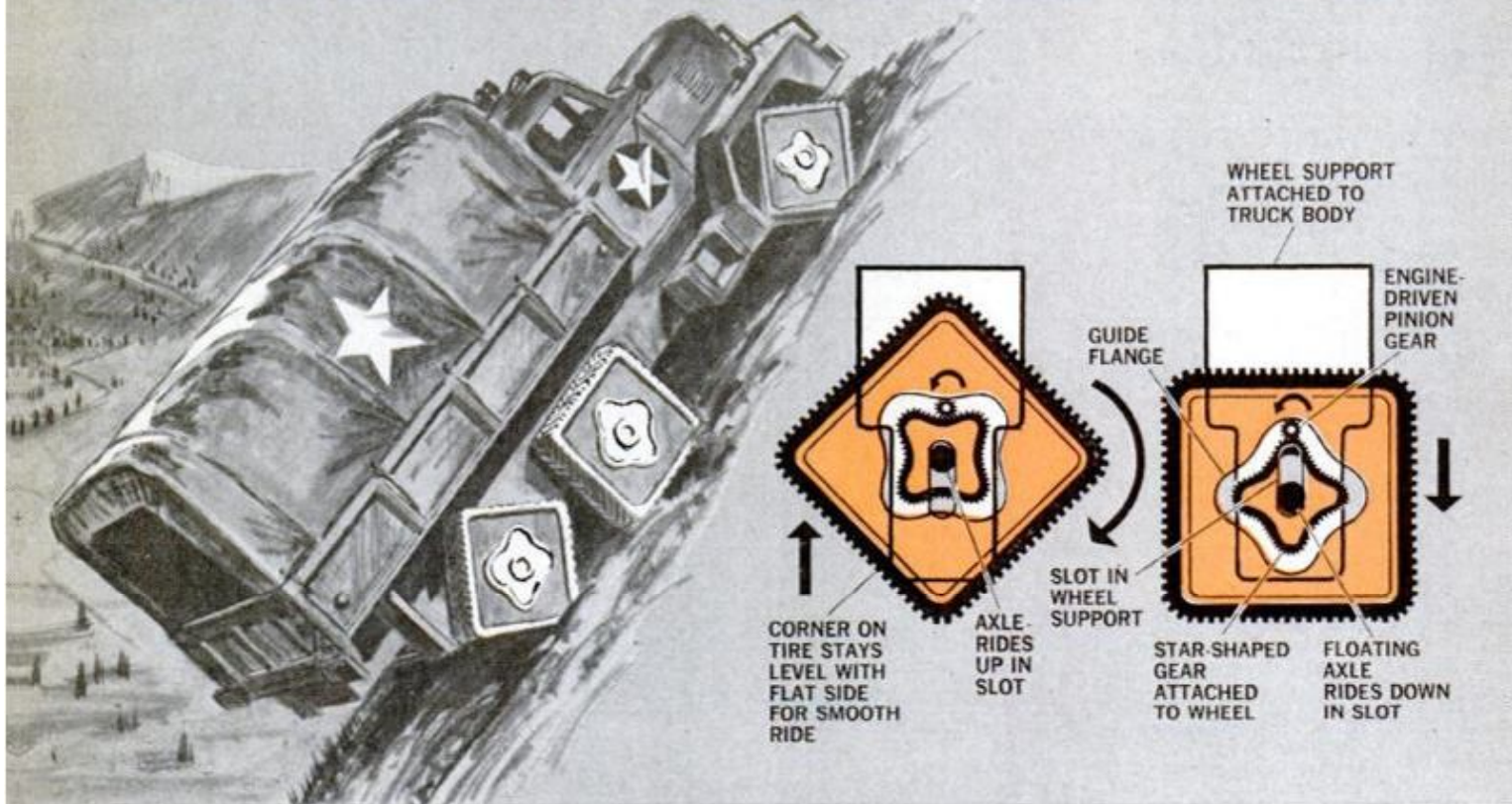
(3) Car withdrawn—faulty drive train.

** Disc brakes. All cars in Classes I through IV and Classes VII and VIII equipped with power brakes.

Just patented

PM'S PICK OF THE NEW INVENTIONS

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

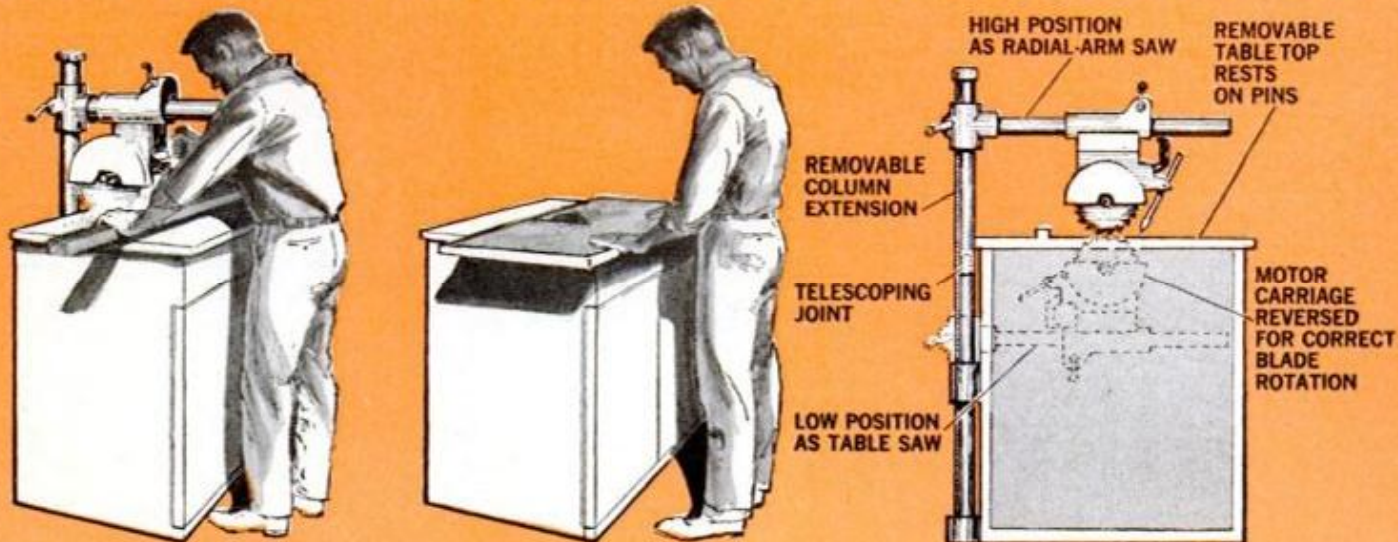


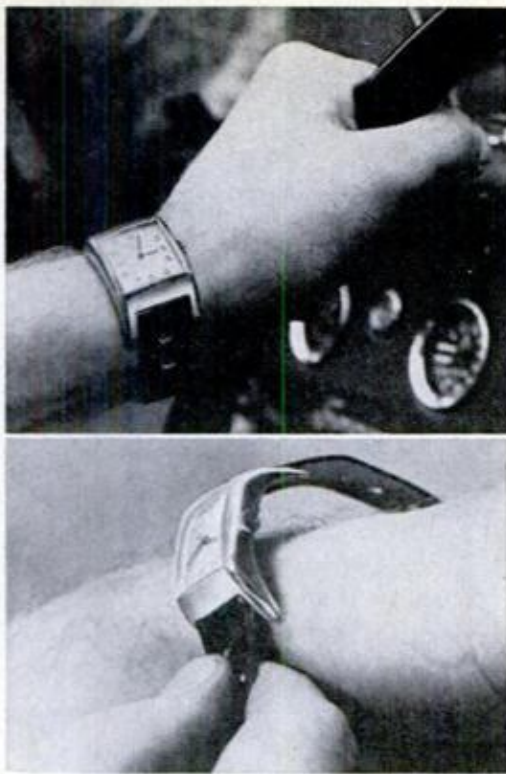
1. SQUARE WHEELS WORK BETTER than round ones in this system for use on rough terrain. The sharp-cornered treads dig in on snow, mud, sand or steep grades, providing increased traction for trucks, tanks and other military vehicles. At the same time, ingenious self-leveling geometry provides a smooth ride on even surfaces. Each wheel is driven by a

pinion gear engaging a star-shaped ring gear. Mounted on a floating axle, the wheel automatically rides upward as the corners approach the ground and downward as the flat segments come around. This produces the effect of a round wheel with all parts of the tread equidistant to the ground, thus permitting the use of high speeds on a level terrain

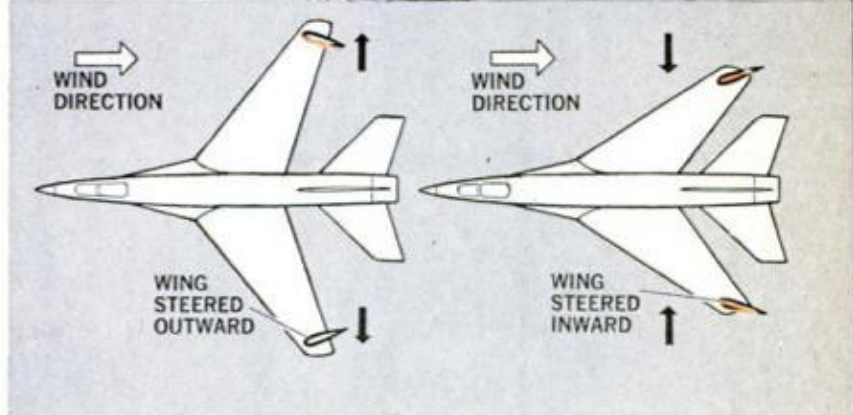
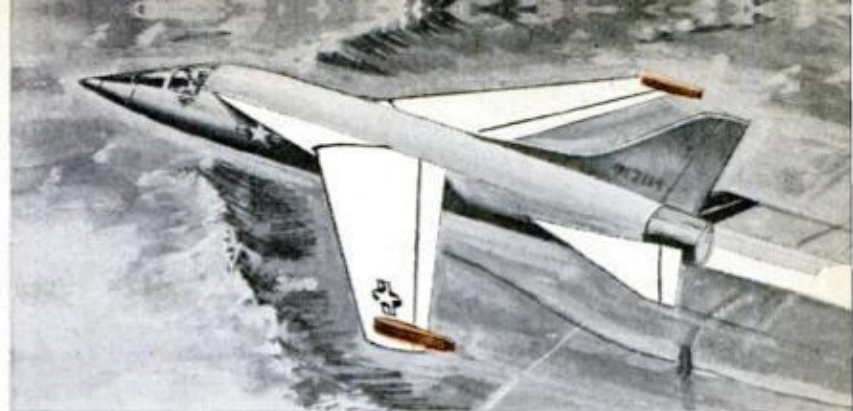
2. CONVERTIBLE SHOP TOOL is designed to provide the advantages of both a table saw and radial-arm saw in one. For cutting narrow boards, the motor carriage and blade are suspended from an overhead arm, as in a conventional radial saw. For sawing large panels where the column gets in the way, the

arm is slid down into the base cabinet and the motor is rotated upward so the blade projects through a slot in the table. The upper section of column is slipped off for unlimited clearance. A removable fence can be clamped on the table lengthwise or crosswise depending on the type of cutting

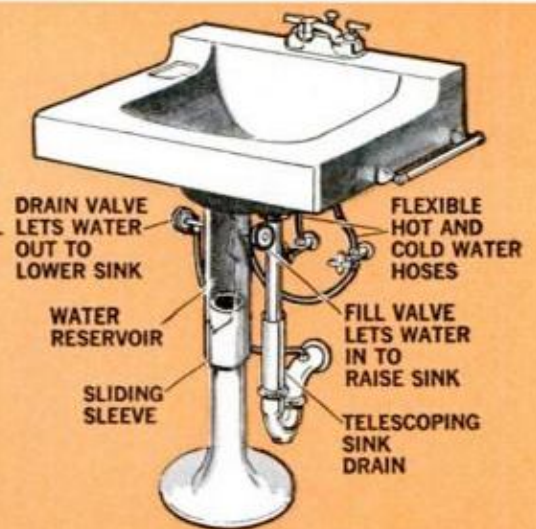
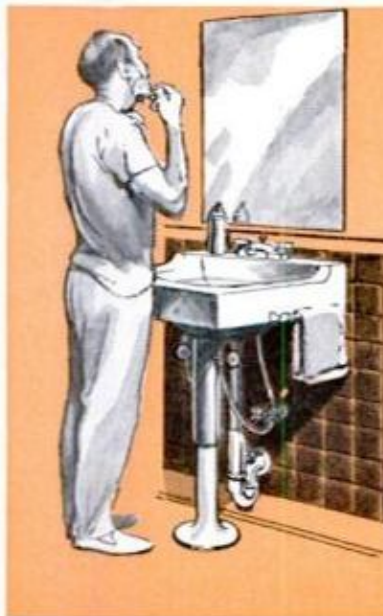




3. CURVED WRISTWATCH is designed to be worn on the side of your wrist so you can see the time while driving without removing your hand from the steering wheel. The case is shaped to fit snugly around the narrow part of the wrist so it can't slip out of place once the strap is tightened. Unusual design is intended especially for rally drivers who find it necessary to check the time frequently while they're racing



4. TINY WINGTIP RUDDERS on the supersonic plane above do the work of moving the swing wings in and out to vary their angle and lift. The idea behind the clever system is to eliminate the bulky motors and hydraulic gear usually needed on variable-wing aircraft to extend and retract the heavy surfaces. For added lift in low-speed flight and landings, the pilot just pivots the rudders outward, spreading the wings wide. For high-speed flight, he steers the rudders inward, folding the wings back. The rudders are operated by simple control cables running over pulleys, saving crucial weight



5. ADJUSTABLE SINK can be raised or lowered for easy use by either grownups or children. The sink basin is supported on a column of water that acts like a hydraulic lift. One valve feeds water into the reservoir to raise the basin and another valve lets water drain out to lower it. Flexible hoses

connect the hot and cold-water inlets to the faucets so that the sink is free to move up and down. The sink column and waste drain are sections of telescoping pipe that also allow the basin to slide up and down. Water for the hydraulic lift is piped to the reservoir from the regular cold-water inlet

Inventors of the items shown on these pages are as follows: 1. Albert P. Sfreda, 2106 Iris Pl., Bethlehem, Pa. (No. 2,786,540); 2. Peter Zuk, Cressona, Pa. (No. 3,465,793); 3. Jewellers Supply Co., Ltd., 19-21 Hatton Garden, London, England; 4. Rashid M. Rashidian, Pomona,

Calif. (No. 3,463,419); 5. Michael Flagg, 4345 California St., San Francisco, Calif. (No. 3,456,264). Readers wishing to bring new inventions to the attention of Roger Shashoua can reach him at the International Inventors Assn., Inc., 680 Fifth Ave., New York, N. Y. 10019.



After logging 5000 miles on his first bike—a 100-cc street scrambler—*PM's* Auto Editor reaches some conclusions about motorcycling

MY FIRST YEAR ON A MOTORCYCLE

BY BILL HARTFORD *Photos by Irv Dolin*

COORDINATING SPEED with turning radius in a fast curve on new Honda 175: It takes practice!



NIGHT RIDING requires extra precautions. Amber directionals, standard on some new bikes, are good; hand signals are better in daylight. Wear high-visibility gear

THE FIRST THING I DID was read all the books. That's why I automatically eased over to the inside half of the lane—off the slippery middle stripe of accumulated oil—as I swept into the long, gradual, left-handed curve. The riding weather was perfect: a dry morning, bright and sunny. With almost 2000 miles on my first bike, I was thinking about why it took me so long to discover motorcycling—not only as an inexpensive, exhilarating way to commute to and from the office, but as a great outdoor sport. The parkway I was on is kept in pretty good condition—no commercial traffic allowed—so the hazard of truck-tire carcasses and other debris is at a minimum.

Still riding the inside of the lane, I banked into an underpass on the curve. The combination of the bright sunlight, my sunglasses and the deep shadow underneath created a near blackout. I saw the outline of a gigantic pothole at the same time I went into it. No time to dodge, no time to get up on the pegs. My small bike crunched into the hole and all the air ex-



SNUG HARBOR (right) is in swirl of Manhattan traffic. This free motorcycle parking area is convenient two blocks from PM offices. Openings in traffic (above) are boon to cautious city cyclists



ploded out of my lungs. Dazed, but realizing I was still upright, I eased over to the shoulder.

The damage: Two ruined rims and a cracked rear hub. The road surface had taken its toll. Luckily, I hadn't spilled and the traffic was light; I didn't encounter another big danger to a motorcyclist—the automobile.



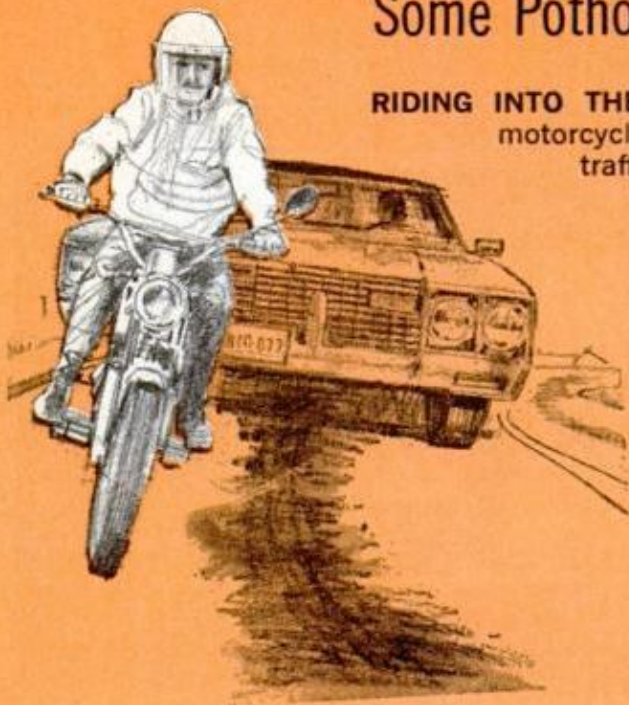
The third biggest threat to a motorcyclist is the rider himself. Having settled into my thirties, I figured I was mature enough not to have to prove anything. With a wife, two kids—even a dependent dog—I didn't need a bike just for popping wheelies. I could smugly contemplate that an overwhelming percentage of motorcycle-accident victims are under 25. That's a rough statistic to live with if you're a tender, young motorcyclist or thinking of becoming one. I had thought of becoming one at least once a year for the last dozen years, but somehow I never got around to it.

Last year, something clicked, and, armed with \$400, I set out to pick a brand-new bike. After a lot of looking, I went back to Nassau Cycle Center, near my home. I fell for an orange, 100-cc Suzuki street scrambler. I'm a sucker for style as much as the next guy, and the bike sure had that. Superb craftsmanship from stem to stern and a 12-month 12,000-mile warranty were more rational bases for my decision. Moreover, I found in Otto and Bill two

TYPE AND SIZE of motorcycle you choose depends on intended use. My first bike, 100-cc, is bottom motorcycle at left. Great first bike, but small for doubling up. New machine, a 175-cc Honda (top left) is faster, more comfortable, better size for a passenger. My wife Judy obviously agrees

Some Potholes and Pitfalls of Street Riding

RIDING INTO THE SUNSET is fine if you're on a horse. On a motorcycle, you'd best keep your eyes on the road and the traffic. Even when you do, you can get into some slippery situations—as I found out . . .



◀ **OIL STREAK** runs down the center of all traffic lanes. On blacktop you can't see it and it can be very slippery when wet. Always ride on either side of it. When in traffic or when you may be overtaken by automobile traffic—riding at the minimum speed limit breaking in a new bike, for example—stay on outside of the lane, not curb side as here. That way cars can't crowd and pass you in your lane.

FLINCH! A motorcyclist's vulnerability forces him to anticipate what automobile drivers are going to do. A car that makes a left in front of you because the driver didn't see you or misjudged speed and distance is a common cause of accidents. It's not fun to always be able to stop, but it's safer. Here, I was sure the driver saw me, yet he kept inching out. Before slowing too much I realized he wanted to cut behind me and ahead of the oncoming car that I saw in my rear-view mirror—a tricky situation that could put all three vehicles on a collision course.



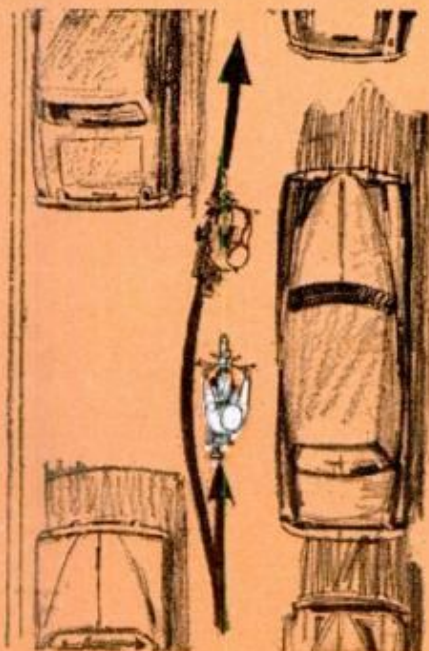
guys who are in the business because they love it. Enthusiasts, mechanics they're the kind of guys who'll give a novice the straight poop.

I figured most of my riding would be on the street. The cruising speed of the Suzuki—50-55 mph—would be okay for highways, and the scrambler design would give me the option of the trail. I bought it. Mistake number one: I should have scraped up another couple of hundred for that 250-cc twin. But I made the most frequent mistake in buying a first bike: Getting one that's too small. Still, it's a mistake that *should* be made. It's easy after you've learned the ropes and survived your

own clumsiness on a smaller bike to come to decide you should have started with a big-time model right off the bat.

I was afraid that a bike as powerful as a 250 and as big (almost 300 pounds) would be too much to handle. I wanted a machine I could physically throw around. The 184-pound Suzuki was perfect for that.

So, last March, helmet-in-hand (law or no law, wear it!), registration-in-wallet and bike-in-garage, I visited the motor vehicle bureau. As a licensed automobile operator, I had only to exchange 75 cents for a motorcycle learner's permit and schedule a road test—and pass it—before the coveted "MC"



Streaking Between Lanes Is Dangerous and Riles Motorists

DARN MOTORCYCLES! It may appear that I was riding illegally between the lanes of traffic, scaring motorists as I cheated along, but actually I was preparing to move into the right-hand lane. All of a sudden with a startling roar a reckless, hell-bent rider zoomed up between lanes, arced around me and continued on his merry but suicidal way. His speed relative to the automobile traffic was appalling. For more on this controversial subject see the story.

Illustrations by Bill Johnson

LURKING IN THE SHADOWS is a pothole that drove home a lesson—luckily, not too late for the learning. Wearing sunglasses against the bright morning sun, I banked into the shadowed underpass. In the resulting blackout I didn't see the pothole until I went into it with a crunch. A couple of hundred wobbly feet, two bent rims and a cracked rear hub later, on the shoulder of the parkway, I started breathing again. On a bike a lot can happen in the wink of an eye.



would be stamped on my existing license.

On the appointed day I appeared at the test site with permit, road-test appointment stub, motorcycle (and its registration, don't forget). As required, I also brought a licensed auto driver—my wife—and a car so she could chauffeur the examiner while he watched me ride in traffic and perform figure eights and circles. I transported the bike to the test site in my station wagon. With a learner's permit, if you want to ride your bike to the test site, the automobile driver must be a licensed motorcyclist, too! (With a permit in New York State you're supposed

to be always within a quarter mile of a licensed motorcyclist.) On top of all the legalities, I made a point of dressing neatly and smiling politely.

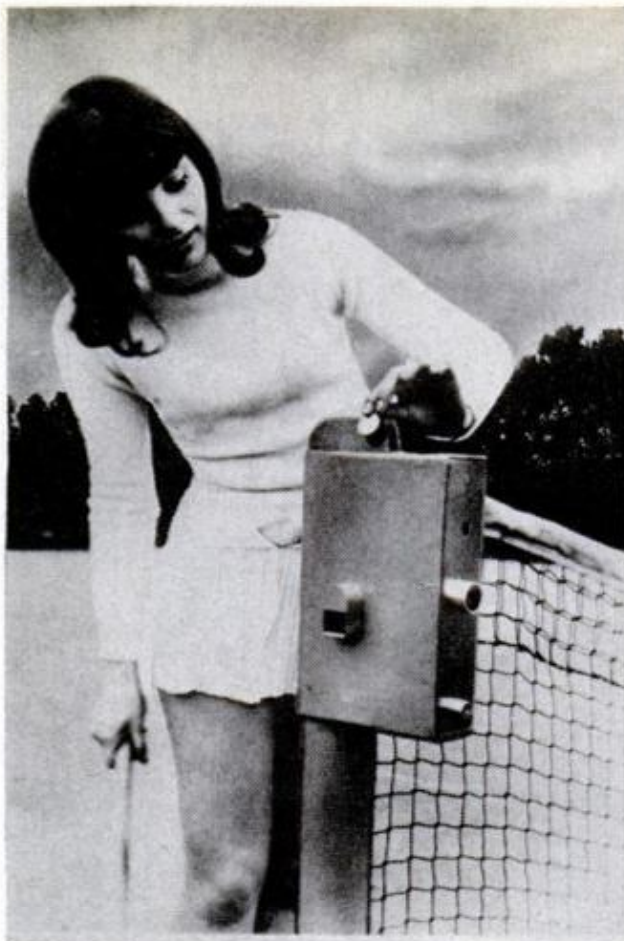
Before I took the test, I rode around and around my home neighborhood. I interpreted the quarter-mile rule as a quarter-mile from home when *not* with another licensed rider. Since I had never given up bicycling for recreation and practical around-town transportation, I didn't have to learn how to balance at slow speed or master the basic characteristics of a two-wheeler. It was just a matter of establishing reflex actions for the Suzuki's controls: **Right**

(Please turn to page 216)



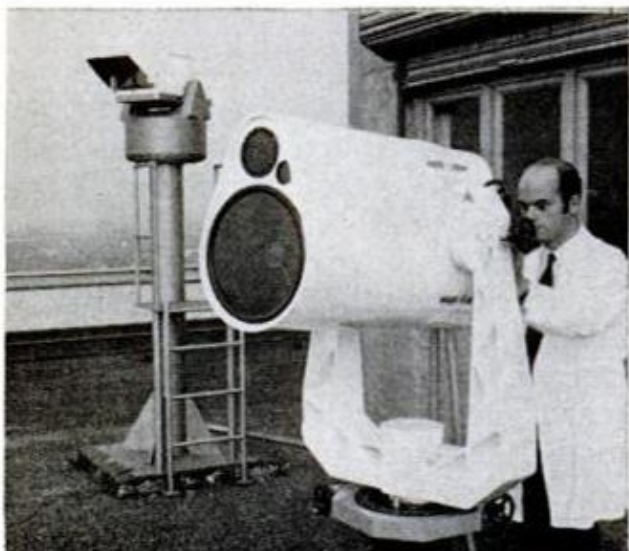
One-wheel cycle

Inventor LaFrance Bressen of Galesburg, Mich., built this one-wheel motorcycle for himself after seeing a picture of a similar machine built in the 1920s. He sits inside a 36-inch wheel that's powered by a 50-cc engine.



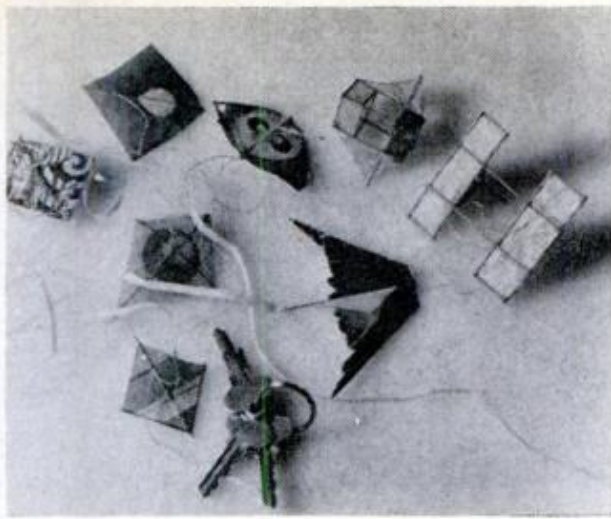
Tennis meter

Tennis meters may one day be as common on tennis courts as parking meters are on streets—and they'll serve approximately the same purpose. A player inserts a coin in the "Tennis Time" meter; the device then raises the net to playing height for a preset time. At the end of playing time, the net drops.



New artillery against smog: TV and Lidar

Television and Lidar (light detection and ranging) have entered the battle against air pollution in Duisburg, Germany. A television system constantly monitors smokestacks, and, when smoke emission appears excessive, a technician shoots a beam from a laser "cannon" (left) at the smoke. Density of the smoke is recorded on the scale next to the TV monitor in the right-hand picture. Photos are taken of the monitor and emission scale for evidence.



Mini-kites that fly

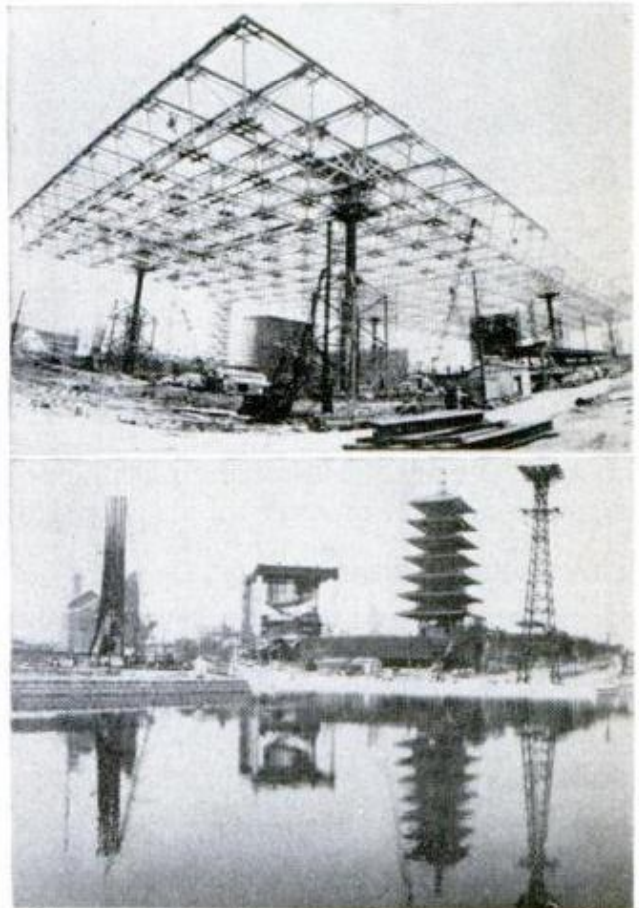
Kites no longer than a car key—but which really fly—are a specialty of Fumio Yoshimui, New York artist. He makes them of bamboo and paper. Yoshimui occasionally makes big ones, too (photo, right).



Electronic aid for jumpers

A former broad jumper, Prof. Melvin Ramey (left, above), has developed an electronic "force platform" that records the force exerted by a jumper at the moment of takeoff. Purpose of the device is to determine the potential of the athlete and thus guide coaches in training and conditioning the jumper so as to achieve his best jumping form. The electronic platform is used in conjunction with motion pictures that depict the movement of the jumper's center of gravity. Prof. Ramey, who competed at Penn State, now teaches at the University of California at Davis.

APRIL 1970



Expo 70 construction

Shown being raised on hydraulic jacks is the world's largest roof (top) which will cover the theme area of Expo 70 in Osaka, Japan. The roof is almost 1000 feet long. Nearly completed pavilions in the lower photo include those of the Japan Gas Assn.; a whiskey maker; electric power producers; and (the tall tower at right) British Columbia.

105

The Gremlins Will Get You If You Don't Watch Out!

By MICHAEL LAMM,
West Coast Auto Editor

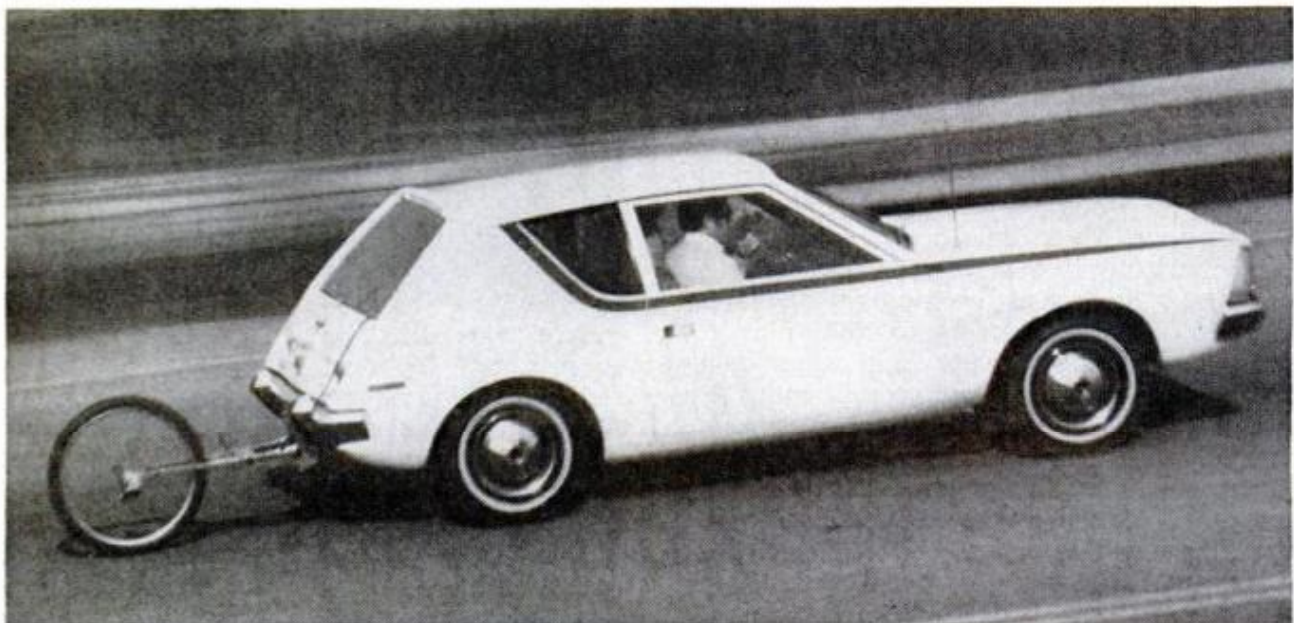


Perky looks and plenty of spunk from AMC's latest wee one

SHE'S A CUTIE, no doubt about that—cleverly styled, a touch of the future. She goes pretty well, too, considering the Gremlin's size and price class. With 128 bhp standard and 145 optional, American Motors' new subcompact has the acceleration and passing reserve to dust off most economy imports.

AMC's Hornet and Gremlin offer identical engines and running gear, the base Hornet weighing about 200 pounds more than the Gremmy. This weight accounts in part for a slight acceleration difference in favor of the Gremlin. But to compensate, the Hornet comes in V8 versions. Not so the Gremlin;

WITH 128 BHP STANDARD and 145 optional, Gremlin has enough pickup to dust off most economy imports



it's offered only with the 199 and 232-cu.-in. Sixes. Yet there's no reason why the 304 V8 (or even the 360/390 V8s, because block dimensions are the same) can't be an option. It'll drop right in.

The Hornet and Gremlin share *everything* forward of the door latches: bumpers, front-end sheet metal, all unit-body components, windshield, dashboard, doors, even suspension, steering and brakes. Among minor differences, the Gremlin has a hood bulge and oblong parking lights. The only major difference between a two-door Hornet and the Gremlin is the body section *behind* the front doors. This leaves the Gremlin's wheelbase a foot shorter (96 inches instead of 108), with 1.5 feet less overall length. The only running-gear component different between the two cars is the driveshaft.

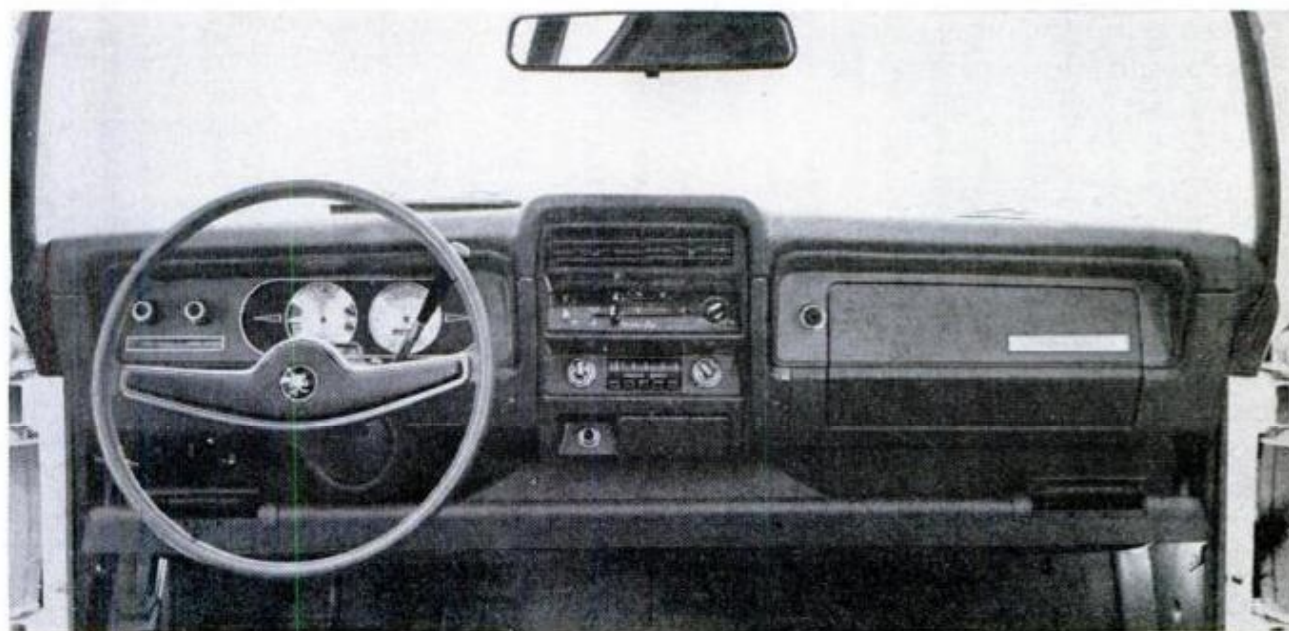
While go-power puts the Gremlin above most economy imports, its cornering power rates so-so and braking leaves quite a lot to be desired. The Gremlin's rear end feels awfully light. AMC spokesmen give weight distribution as 57/43, but that's the Hornet's ratio, so I'd say the Gremlin must be nearer 60/40, because both cars' front-end weights are the same while the Gremlin's rear is much lighter.

Pouring around sharp, graveled turns brings the Gremlin's rear end out with



FOUR-PASSENGER MODEL has a rear seat that folds flat to give a good-sized cargo deck or playpen! The rear window in this model hinges upward for access to the cargo space. Adults would find rear-seat legroom a bit tight; the seat is really for kids. The entire rear area of the four-passenger Gremlin is neatly carpeted, and there's even a cover over the spare tire (it's visible in the top photo)

TASTEFUL, CLEVER DASH has gauges in round dials, controls in center nacelle, locking glovebox at right



Gremlin



HINGED REAR WINDOW in the four-passenger model raises to gain cargo-area access. Back seat folds flat

fair ease. There's an optional heavy-duty suspension package available that might help here. And one powerful argument for ordering power steering: six wheel turns lock to lock with manual, three with power. The car's general ride, though, lacks the usual chop and rock and roll—it's steady and smooth, little affected by crosswinds.

Hard braking from 60-80 mph takes restraint, because if you cram down the pedal, weight shifts forward and the rear wheels lock up right quick. I made the mistake of trying my first panic stop from about 75 mph and immediately found the rear end trying to pass the front. Better brake-line proportioning would do wonders for this car. However, when I didn't lock wheels, my Gremlin stopped amazingly short—about 135 feet from 60 mph.

The Gremmy comes in either two or four-passenger form, the two being strictly utility. On the four-passenger, the rear window hinges upward and the rear seatback flattens to give a good-sized, carpeted cargo deck. Then there's an optional roof rack for surfboards ("Gremmy," get it?) and extra carrying capacity. The entire rear area of the four-passenger Gremlin is neatly carpeted, and there's even a cover

over the spare. The rear window opens with a simple, lockable twist release, and it's held up by two spring-loaded cylinders. In the two-passenger version, the rear window doesn't open.

Gremlin options run the gamut from airconditioning to rally stripes. And here's one subcompact with enough engine to handle a good load of power equipment—steering, brakes, automatic trans, and air—you can get it all.

Standard transmission in both versions and with both engines is a three-speed manual. With the 199 Six, you get column shift, but with the 232 it's a very handy floor stick. I would have liked synchro on low, but there's certainly no need for four speeds. In fact, the 232 takes off easily in second from a dead stop. Overdrive isn't offered and would be redundant anyway because of the high rear-axle ratios (2.37 to 3.31). The engine loafes even at high road speeds. AMC claims fuel mileage in the 25-mpg range, and I don't doubt it.

The Gremlin's interior is just as cleverly and tastefully done as the outside. Two round dials with brushed aluminum faces house the gauges. Controls for heater, airconditioning, radio, plus lighter and ashtray stand in a central nacelle. Then there's a big glovebox at the right, with its lockable release knob at its left, so the driver can reach it easily. Both kick panels have fresh-air vents, and you can order a full-width under-dash shelf. This has outlets in airconditioned models.

Nothing cheesy-looking about the



CLEVER STYLING should give Gremlin lots of appeal. Among its accessories: a roof rack for surfboards!

upholstery or carpeting, either. The basic Gremlin interior comes in black or white vinyl, with blue, green, or red-pleated bench or bucket seats optional. Those buckets are great. The cockpit area has every bit as much room as any full-sized car, but the rear is a bit abbreviated. It's for kids or short hops. Pinched legroom, as usual.

Like the Maverick, the Gremlin prides itself on being easy to repair. Eleven screws hold the grille in place. Front fenders bolt on. There's plenty of room around the engine to get at plugs, carb, distributor, PCV, filters and accessories. Five screws attach the dash pod, and the main wiring harness has only one plug-in socket. Easy adjustments are built into clutch and parking-brake linkages, front-wheel bearings and headlights.

Gremlin prices weren't available at press time, but guesses hover around \$1850 base. With average accessories, the car should run out at \$2550 or so. It's a lot of automobile for those amounts, especially considering power, styling and durability. If this car catches on with the kids the way the VW did, look out VW! ★★★

GREMLIN SPECIFICATIONS

ENGINES

199-cu.-in. OHV-6 (std.)	
Bore & stroke	3.75 x 3.00 in.
Max. bhp @ rpm	128 @ 4400
Max. torque @ rpm	182 @ 1600
232-cu.-in. OHV-6 (opt.)	
Bore and stroke	3.75 x 3.50 in.
Max. bhp @ rpm	145 @ 4300
Max. torque @ rpm	215 @ 1600

TRANSMISSIONS AND REAR AXLES

With 199-cu.-in. OHV-6	
3-spd. manual, column (std.)	2.73 std. (3.08 opt.)
3-spd. automatic (opt.)	2.73 std. (3.08 opt.)
With 232-cu.-in. OHV-6	
3-spd. manual, floor (std.)	3.08 std. (3.31 opt.)
3-spd. automatic (opt.)	2.37 std. (2.73 opt.)

DIMENSIONS

Wheelbase	96.00 in.
Overall length	161.25 in.
Overall width	70.58 in.
Overall height	51.80 in.
Curb weight (est.)	2633 lb.

BRAKES, TIRES, CAPACITIES

Brake drum diameter	9.00 in.
Brake lining area	153.50 sq. in.
Tire size: std., 6.00x13; opt., 6.45x14, B78x14	
Cargo cap., 6 cu. ft.; fuel tank cap., 21 gal.	



3:00 o'clock and all's well

Driver of Ford's new long-haul Louisville Line trucks can spot malfunctions at a glance, thanks to grouping of instrument gauges in angled panel at his right. Instant recognition of an abnormal condition is facilitated by fact that all gauges except fuel gauge read at 3:00 o'clock when indicating normal operation. This panel also houses heater controls, rocker-type electrical switches and warning lights. Panel directly in front of driver contains speedometer and tachometer only. Left-hand panel groups all air controls in one area. Ford claims new cab has largest glass area in the industry, hence greatest visibility. Truck's fiberglass front end can be tilted 60° so that engine can be worked on easily by mechanic standing on ground. Ford's new Louisville factory, said to be largest truck factory in the world, can turn out 336 trucks a day.

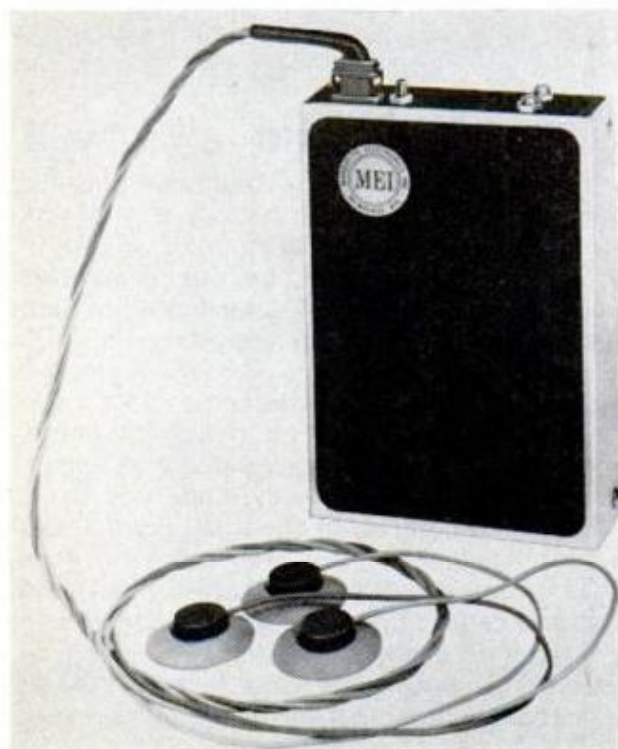
MECHANICS OF MEDICINE:

- *Shirt-Pocket Tape Recorder
For Daily Electrocardiograms*
- *Fish-Tank Babies*
- *Shop Tools for the Blind*
- *Marker Buoys for Artificial Legs*

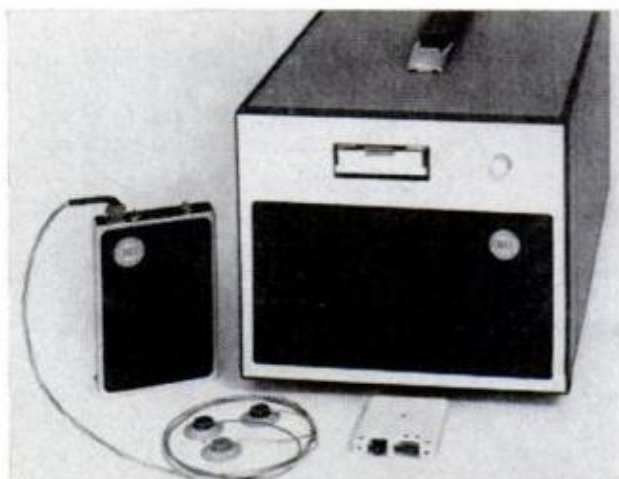
By ARTHUR FREESE

Heart-Spy! Willy Gray was 16 years old, yet for several years he had suffered from spells of wildly rapid heart-pounding. Even his doctor's powerful drugs had failed to control this, and Willy finally found his way to the Mayo Clinic. Dr. Ralph Zitnik of that institution tells how Willy was fitted with a new electrocardiograph not much larger than a pack of cards. With this in his shirt-pocket and three rubber cups from it on his chest, he left—to return with the first electrocardiogram ever made of this pounding, over 150 beats per minute (the usual is 60 to 80). The spy had worked, and with questioning at the clinic came the diagnosis—just the reaction of any normal teen-ager to a school examination!

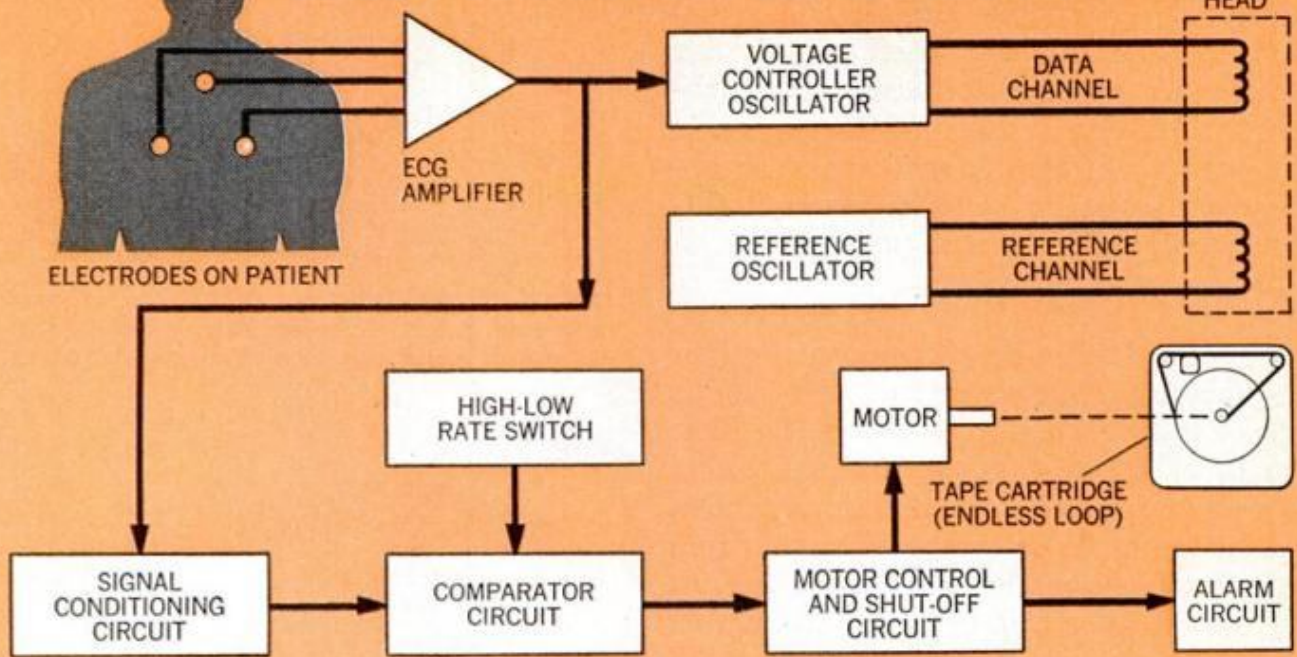
William W. Kowalski, project engineer of Marquette Electronics, Inc. of Milwaukee, manufacturer of this device, explained to me how the spy works. Electrical signals from the heart muscles are picked up on the skin and fed into the



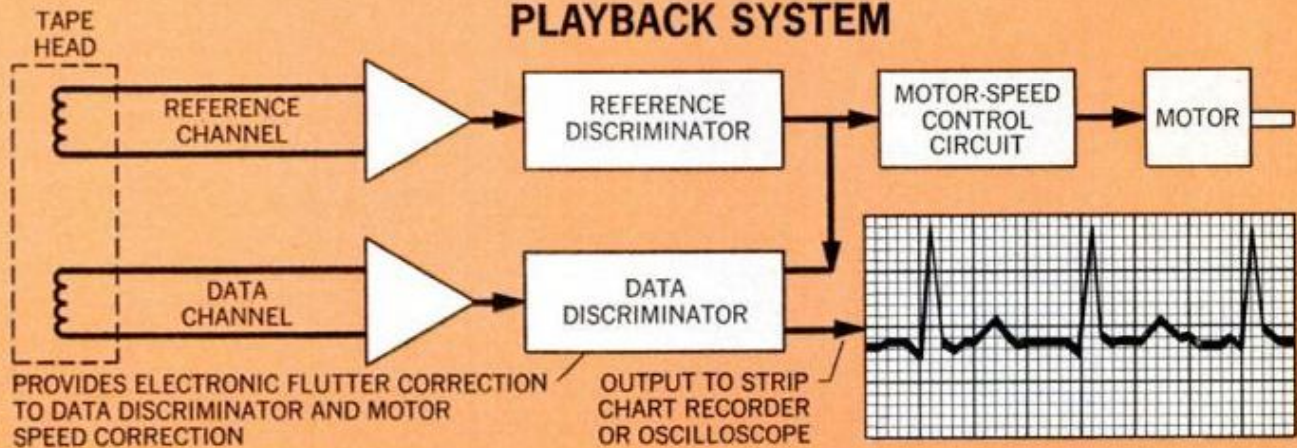
POCKET EKG RECORDER, 3x4½ inches, 11 ounces, is miniature cartridge tape recorder. It transcribes and erases patient's electrocardiogram on endless loop until heart rate limits, or patient-activated push-button (in cases of angina and the like), stops recording process, leaving complete data before and one minute after attack. Paper recording is made on the play-back unit (below) for the physician's analysis. Adult patient (right) carries recorder in shirt pocket



CIRCUIT DIAGRAM OF POCKET RECORDER



PLAYBACK SYSTEM



electrocardiograph (ECG) amplifier which converts these from *thousandths* of a volt to actual volts. This in turn is fed into a voltage-controlled oscillator which changes the amplitude variations into frequency modulations which are transcribed on an endless loop of tape in a special cartridge.

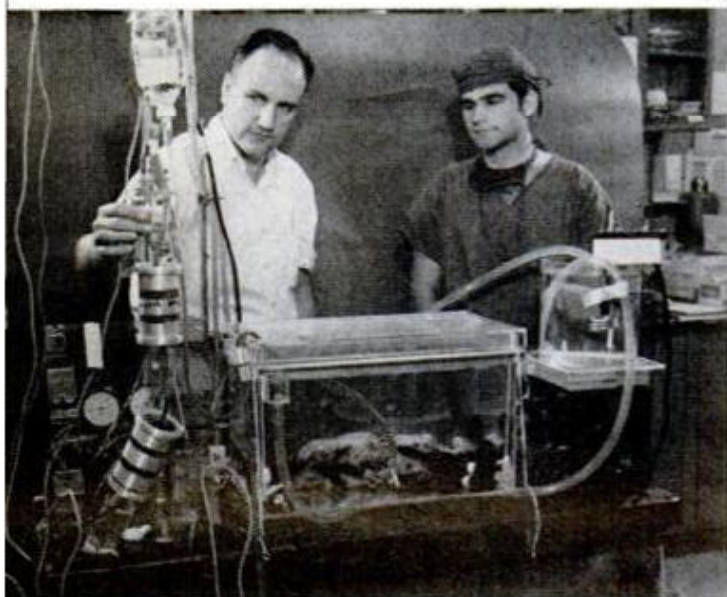
The amplified signal has also been fed into signal-processing circuitry which converted the varying heart rates into varying d.c. voltages. These are compared with reference ones selected to correspond to those heart rates the recorder is designed to monitor. When the d.c. voltage from the heart intersects with a reference voltage, high or low, a timing circuit turns on, shutting off the motor after a set time. Then an alarm sounds and the owner replaces the cartridge, keeping the tape for the doctor's examination.

Thus the doctor has the most important part of the incident—the ECG record just before the disturbance, during it, and immediately after. The device is

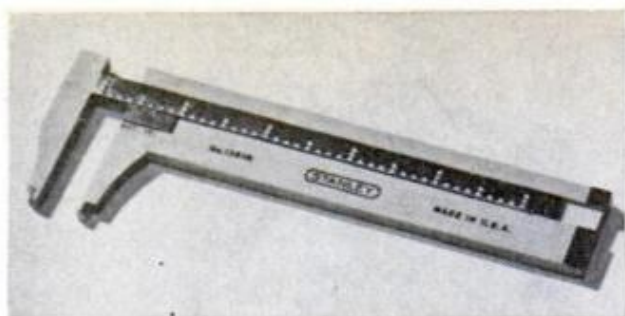
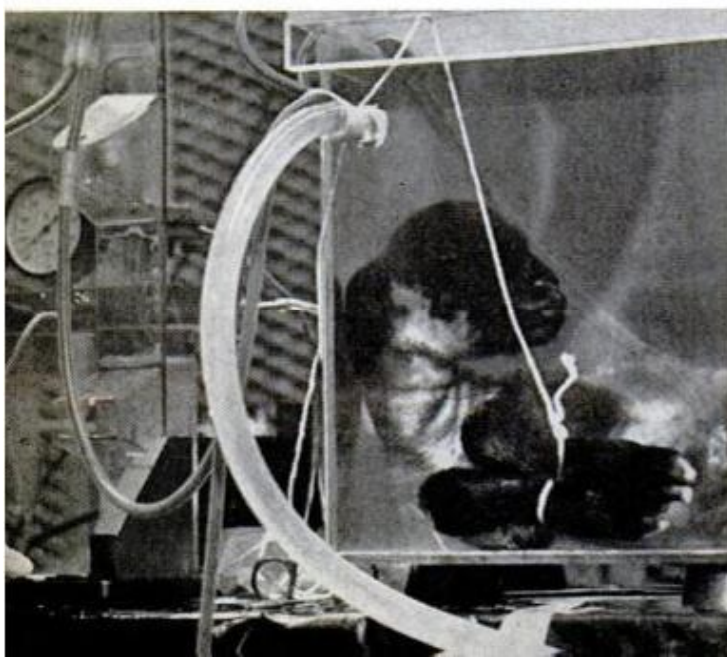
adjusted to time-out at one-half the time of the cartridge loop—when a five-minute cartridge is used, the motor shuts off 2½ minutes after a disturbance. Dr. Zitnik told me the device is of increasing benefit in diagnosing obscure changes in heart rhythms, fainting spells and chest wall pain.

Fish-Tank Babies

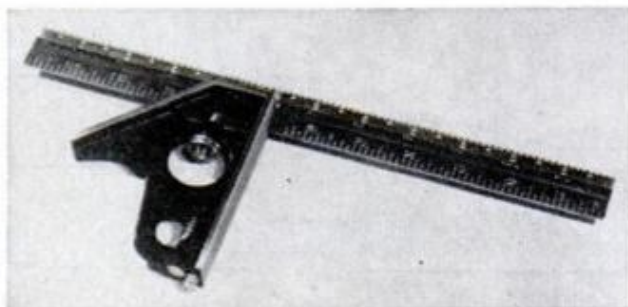
Today, lambs are being “grown” in aquariums! Tomorrow, babies? This is the exciting possibility raised by four medical scientists at the National Heart Institute’s Laboratory of Technical Development. They surgically removed the lambs from the mother’s womb at what would be well before eight months in a human pregnancy. The first 29



ARTIFICIAL PLACENTA SYSTEM developed by Drs. Kolobow (left) and Zapol at NIH uses new type of artificial lung (pint-sized cylinders) for respiration. Fetal lamb (below) rests in synthetic fluid

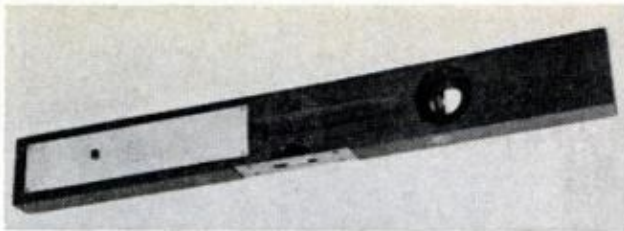


STANLEY CALIPER RULE for sightless can be read with raised dots. Combination square (below), with strip of dots added, can be used as marking gauge

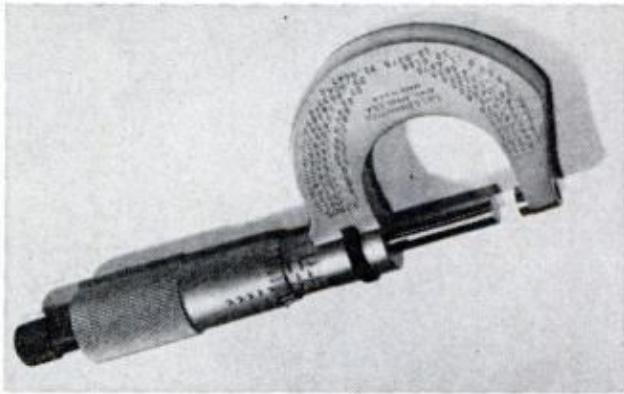


lambs survived up to 56 hours. But then three lambs were weaned away from the artificial womb about May, 1969, and are still living and thriving.

The water in the “fish tank,” which is what the lamb’s artificial womb looks like, contained a mixture of antibiotics, salt, sugar and minerals similar to that contained in the fluid in the placental sac in which the baby grows in the uterus. A man-made umbilical cord provided food and oxygen, took away carbon dioxide. The cord consists of two tiny tubes (inserted into the umbilical blood vessels) of stainless-steel-spring-supported, nonkinking, segmented polyurethane. Even though the walls are only 1/1000 inch thick, the tubes are strong enough to be passed through all the body’s blood vessels. At the navel, they connect to much larger-bore tubing (¼-inch) which passes around a slow roller pump (7-rpm). This gently milks the blood along to the system’s most important innovation, a pint-sized artificial lung in a cylindrical housing. Made of 1/200-inch-thick silicone rubber membrane supported by nylon knit, it’s in the form of a flat tube or envelope, some seven feet long and wound around a central plastic spool. A slight intermittent vacuum brings oxygen in at one



LEVEL WITH AUDIBLE SIGNAL is silent when level or plumb. Modified Starrett micrometer (below) has raised dots for fingernail reading by the blind



port of the housing and carbon dioxide out at another. The blood flows through this artificial lung, giving up its carbon dioxide and picking up oxygen by diffusion across the silicone membrane. Gentle cyclic suction prevents oxygen bubbles from entering the blood and provides more thorough oxygenation than does the conventional machine.

An equilibration chamber collapses if excessive suction develops, activating a cutoff switch to the roller pump.

The artificial lung alone may provide improved hope for newborn infants with certain breathing difficulties, possibly even for adults. Perhaps some babies too will be "grown" during the last few months of their intrauterine life—in a "fish tank!"

Tools for the Blind

The blind carpenter puts up shelves and partitions with a carpenter's level. But this level is electronically equipped; instead of the standard single horizontal and vertical fluid-filled tube with its air or gas bubble, his tool has a pair of tubes with a ball of mercury in each. A 9-volt battery operates a continuous tone which is controlled through two parallel wires at the ends of each tube. Adjoining tubes are set with their wires at opposite ends. When the level is ab-

solutely true both balls of mercury are centered in their tubes and act as off-switches. When there is no tone, the shelf or post is true.

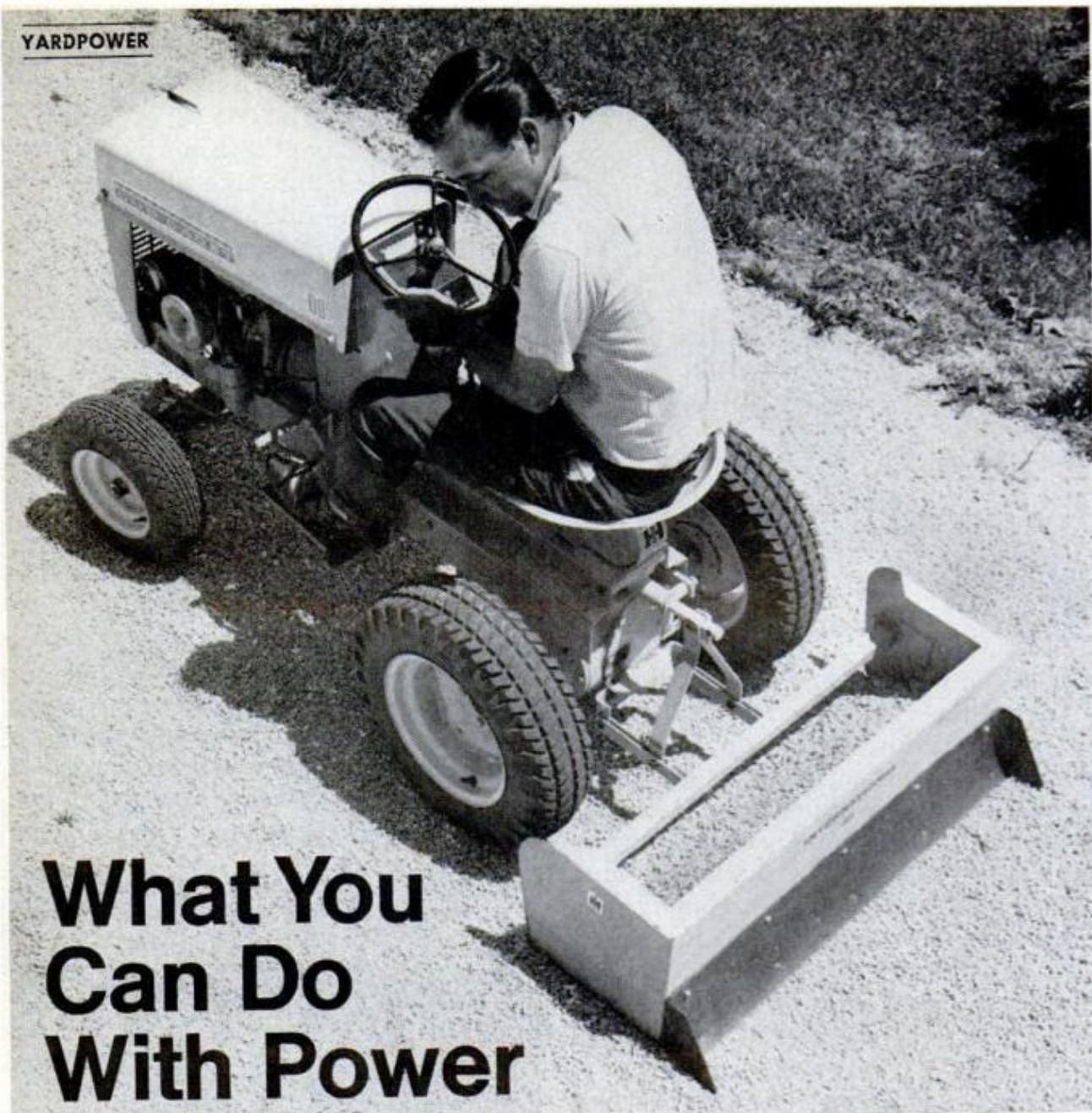
Obtainable from the American Foundation for the Blind, like this level, are potentiometers—all solid-state in design and with an accuracy of better than 2½ percent. The blind rotate a dial until the tone stops (the same as when your dial reads "0") and then feel the face to "read" its deeply engraved scale. Servo-voltmeters, self-balancing or automatic potentiometers, can be "read" to an accuracy of better than 1 percent.

The foundation also buys blank micrometers and adds deeper markings and tiny steel dots to permit fingernail readings. A caliper rule has raised dots instead of numbers and lines—a single dot for each ⅛ inch, two for each ½-inch mark and three for the inch mark. The stationary jaw has two dots—the first for outside measurements,

(Please turn to page 224)

MARKER BUOYS of vinyl foam (left) were used to form these two legs. Dark limb has been coated with urethane "skin." Leg at right is in an early stage





What You Can Do With Power

There's an attachment to do practically every outdoor job

THE BACK-BREAKING JOBS a small gasoline engine can make easy grow in number as new attachments appear for tractors and riding mowers. Many still regard their package of portable power as a mower. If you do, you're not getting your money's worth.

The man in the photo above has a long, gravel drive. He used to spend hours with shovel and rake ridding it of ruts and weeds—while his tractor rested. Now he spruces it up in no time with a box scraper. It's fun. Other jobs being done with power are *work*—but you'll never know it.—James M. Liston

SIMPLE CART is most useful, versatile attachment to speed work and save labor. Cart shown: \$90



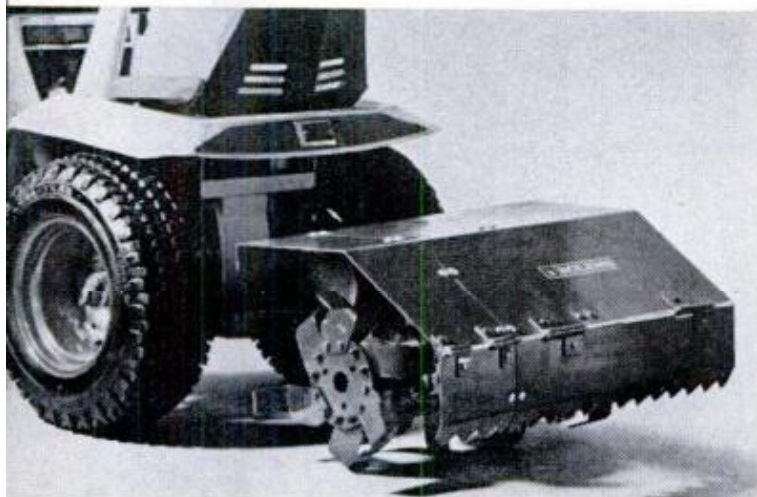


COMPOST MILL (above) can be driven to job and powered by tractor's engine designed for all Sears Suburban, SS-12 and Hydro-Trac models. Front-end loader (top right) lifts 500 pounds 65 inches high, is ideal for light earthwork, cleanup. Hydraulically controlled, it's mounted on Economy Power King. Tractor-powered alternator-generator (right) delivers 115 volts where needed to run tools, pumps, light job. Price range: \$185-\$245, depending on wattage



—from tilling to hand-trimming—better, quicker and easier

REAR-MOUNTED TILLER (on Bolens 1256) comes in 25, 30, 33-inch widths with extensions. About \$275



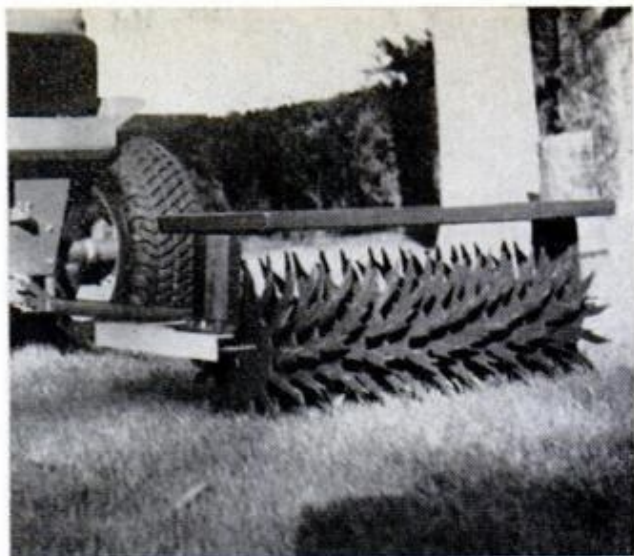
APRIL 1970

ROTARY PLOW (on Gravely 430) prepares seedbed without other preparation; it's \$128, plus adapter kit

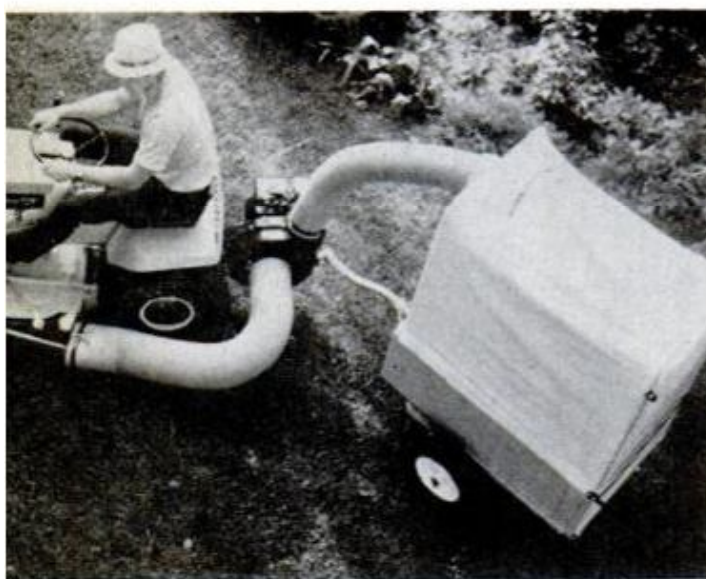




LAWN VAC inhales leaves, twigs, litter. Hose gets window wells, tight spots. About \$190; hose \$29



SPIKER AERATOR for Massey-Ferguson has reversible teeth for smooth or rough-spiking 32-inch swath: \$80



VACUUM COLLECTOR with high profile cover for Simplicity cart has 26-bushel capacity. About \$250



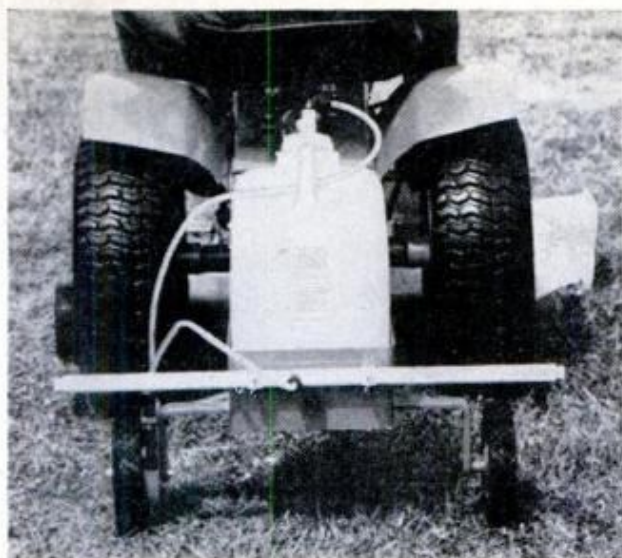
PLANTER-FERTILIZER attachment puts 10 or 12-hp tractor to work on the small farm or acreage: \$90



GRASS CATCHER (on Ariens Emperor) leaves lawn clear of clippings, leaves. Capacity: 2½ bushels. \$45



LAWN-SEEDER-FERTILIZER, 30 inches wide, has 85-pound hopper. Lever at seat starts, stops flow. \$102



LAWN SPRAYER (Sears) with 42-inch boom covers 20,000-square-foot lawn on one 5-gallon filling. \$60



FIVE GANGPOWER cuts time, trips and a 93-inch swath. Three-gang mower, \$312; five-gang unit, \$579



50-GALLON POWER SPRAYER for orchard work can be run from driver's seat. Sprayer, \$440; hitch, \$16



AIR COMPRESSOR (on Massey-Ferguson) lets you spray paint in the field, inflate tires. About \$165



ROW CROP CULTIVATOR eliminates hand weeding. It adjusts for 6 to 42-inch rows, \$50; hitch is \$30



LAWN ROLLER, 32 inches wide, 415 pounds water-filled with scraper, pulls easily behind Wheelhorse. \$57



Skil's Powerful Electric Mower

If you have the lot for it, this 18-inch rotary has the power. And its grass catcher gives you a clean sweep

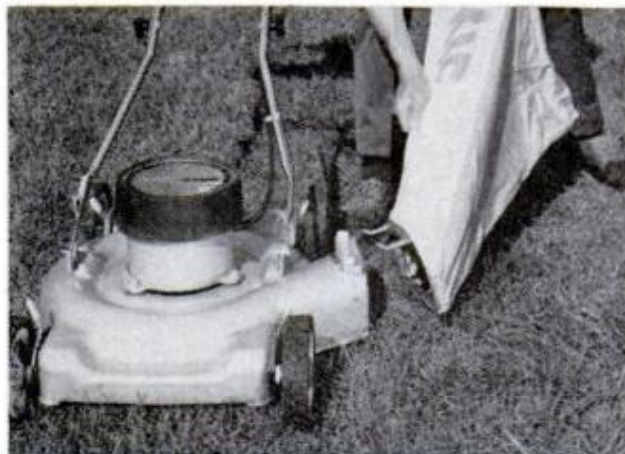
EVERYONE can't be happy with an electric mower. If your lot is studded with trees, shrubs and flower beds, you'll spend too much time handling the cord that binds you to an outlet. But if you have clear areas of "picture" lawn—lush growth that responds beautifully to frequent barbering, Skil's 18-inch electric will make you as happy as anyone can be pushing a mower.

The pushing is easy—the mower is light, the handle right—and your wife will like pushbutton starting. The 2-hp, 4300-rpm motor is powerful; it defies overloading, prevents chute clogging. But the high rpm of the blade makes it almost as noisy as a gas mower.

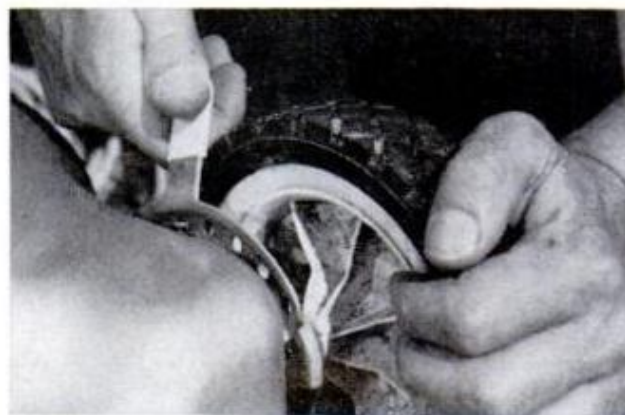
The catcher, not the chute, clogs before it's half full. Compensation for this: a swath so neat it looks vacuumed. Price: \$110.—*J.M.L.*



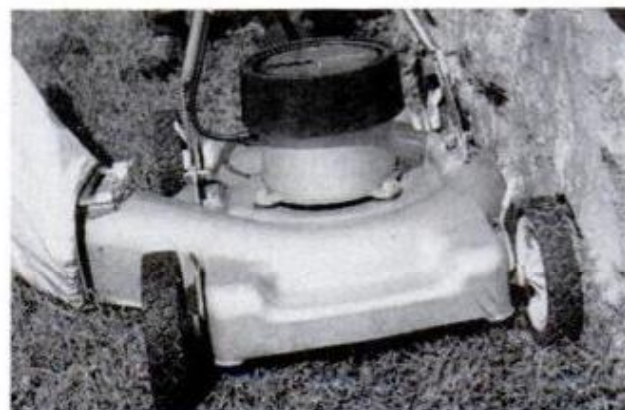
HANDLE FOLDS EASILY for compact storage. Mower can also be stored off floor using hang-up method



GRASS CATCHER is removed by slipping rod ends out of bracket. Clippings are dumped from zippered end



CUTTING HEIGHT ranges from $3\frac{3}{8}$ to $\frac{5}{8}$ in. (for Dichondra). Adjustment levers aren't very cooperative



CUTTING NEXT TO A WALL, the mower is excellent; it leaves an uncut strip less than half an inch wide

POPULAR MECHANICS

Black & Decker's Cordless Mower

This 18-inch reel-type unit is safe, quiet and self-sharpening. Power moves the reel, you move the mower

ACCORDING TO Black & Decker engineers, the first cordless electric is "the safest, quietest power mower yet developed." True. But it's a somewhat specialized tool for a small, level lot. It snips lush growth easily, so women will love it. But a slight grade can be disillusioning; it's not self-propelled.

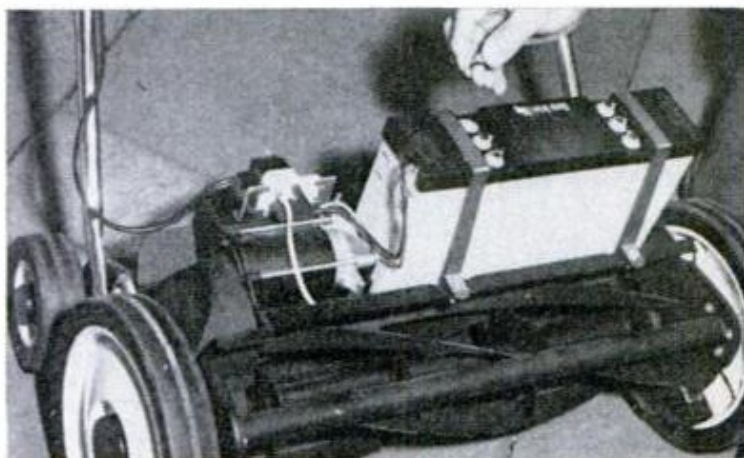
Without battery, the cordless weighs 40 pounds; with battery, 58. (A conventional 18-inch push weighs 46 pounds.) Its powered reel offsets its 12-pound handicap, but you still push uphill. On the plus side: self-sharpening (reverse the reel), easy height adjustment from 1/2 to 3 inches. Price: \$129.95.—J.M.L.



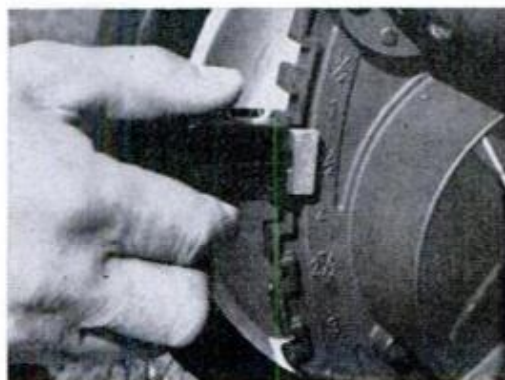
CLEAN-LINED PLASTIC SHROUD conceals motor, battery. Rear wheels replace the conventional roller bar



CONTACT SWITCH is quick-release type. Safety lock prevents accidental starting



PERMANENT-MAGNET MOTOR and 12-volt battery are under shroud. Both are shockproof. Charger is included with machine



CUTTING-HEIGHT adjustment levers work easily; bed-knife adjustment is also easy



MOWING UPHILL takes leg power, the only drawback. One charge cuts 10,000 square feet. Grass catcher is easy to remove

GE Introduces the Electric Tractor



The first production-line, electric-powered home garden tractor, GE's Electrak, is cool, quiet, safe and vibration-free. Its electric motor develops amazing torque. And it takes the electric plug outdoors to power a complete line of tools—or anything you plug in

By JAMES M. LISTON, Executive Editor

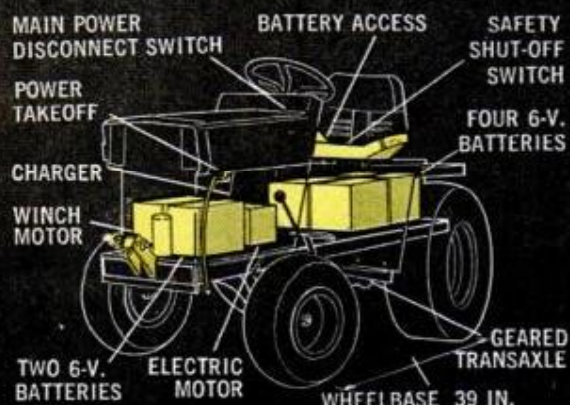
Photos by Burns Photography, Inc.

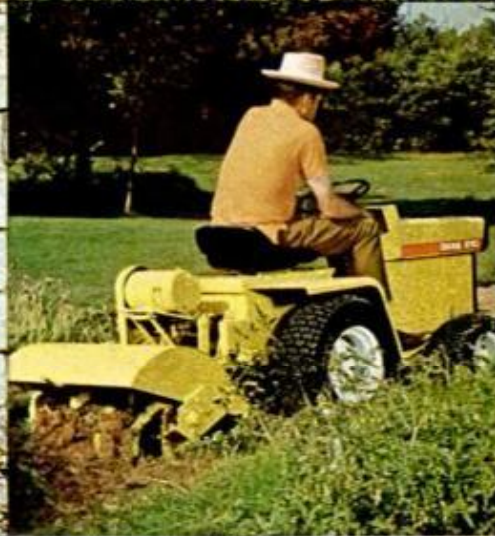
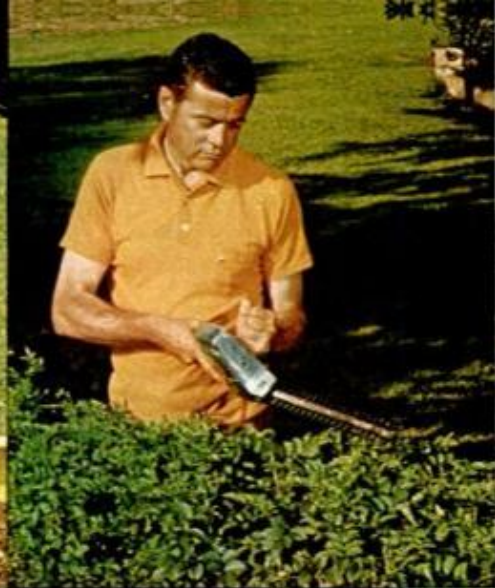
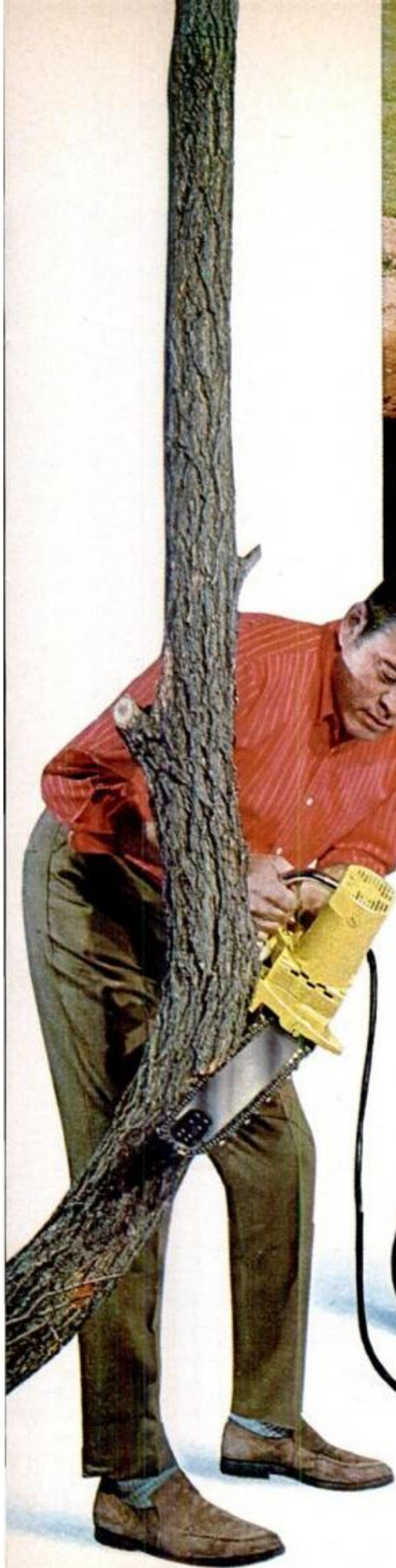
THIS MONTH GE—yes, General Electric—will introduce an electric-powered home garden tractor that can mow up to 3½ acres without recharging. The Electrak packs plenty of power for plowing, tilling and snowblowing. You can fell trees or shave with it. One of its attachments, a new electric chain saw, plugs into the power takeoff. And—if you use an inverter—an electric shaver or any 115-volt a.c. tool or appliance you choose can be plugged in.

Three models of Electrak will compete with 10, 12 and 14-hp conventional tractors and, while prices haven't yet been announced, "will be priced at mid-range with competing stock."

The Electrak is the brainchild of fast-moving Bruce R. Laumeister, developer of GE's Delta electric car.

"In three years we produced the equivalent of five model years of electric tractors," he says. "We're ready now with three models that will outperform 10, 12 and 14-hp conventional tractors. We developed our own





ELECTRAK HAS REAR-DISCHARGE, front-mounted mower (opposite page) with separate motor for each blade. Its weight and torque make it ideal for bulldozing, plowing, tilling. Tools that can be plugged in include drill, hedge trimmer and electric chain saw. Standard 115-volt tools can be used with an inverter that costs under \$100

full line of attachments and believe we have the safest mower and the best snowblower in the industry."

Laumeister, who lives on an acreage, has an engineer's intolerance of poor design and performance.

"I wasn't satisfied with several conventional tractors I wore out," he says. "That's how I got started looking for a better answer."

To avoid questions from his neighbors about the project during the period of field-testing, Laumeister mowed and plowed late at night. He had no complaints from the neighbors—proof that the Electrak was quiet. And proof that GE is convinced he is onto something big is that the corporation has set up a new outdoor power equipment operation which he now manages.

***The mower is shock-mounted;
you can hit a tree . . . and
not break the mower mounts.***

Laumeister believes the cool, quiet, vibration-free ride is an advantage buyers will recognize quickly.

On the dash of the Electrak are two gauges—"Fuel Level" and "Power Use." "Fuel Level" shows the amount of charge in the batteries; "Power Use" indicates the rate at which power is being used. Plowing takes a lot of power; ordinary mowing requires little. At the right of the dash is the drive lever, with forward, neutral and reverse positions. The more you advance the drive lever, the faster you go; it acts as the throttle.

A speed-selection lever offers four speeds: D-2 is the highest, 7 mph, for plowing snow, towing a cart. D-1 is typical mowing speed; L (low) is for heavy pulling, tilling, fast snow-blowing; LL (low low) is for heavy snow-blowing, deep plowing.

The "sound of silence" takes a while to get used to, and men who like a tractor to sound like a tractor may feel let down when they turn the key

starter. I drew a blank the first time I started the Electrak.

"I have the key in the on position," I said to Laumeister. "What am I doing wrong?"

"Nothing," he said. "It's on."

I moved the drive selector forward and took off. There are no neck-snapping starts. You take off smoothly and the tractor accelerates rapidly. If you listen carefully you hear a series of clicks. These are the relays and contacts that program the motor control. The control has a "memory" that won't let you go through the control and apply torque faster than the control will allow. The same thing happens when you shift from forward to reverse. It won't let you jerk-start or jerk-reverse the motor.

"There's a brake pedal on the left," said Laumeister. "You should use it before reversing. If an electric motor is going fast in one direction, it's possible to reverse it, but it does the motor no good. If you try to do this too fast, the circuit breaker will cut out. You'll have to wait a moment for it to come on, so you don't gain anything by 'shifting on the run.'"

I headed the Electrak for a bunker on the grounds of the GE Research Center. I'd been told it was a 40 percent grade. It was covered with an inch of snow; I doubted that I could climb it without chains. I stopped at the foot of the grade and selected D-2. The Electrak climbed the full length of the hill without wheel spin. Heading down, my first inclination was to hit the brake, but the dynamic braking effect of the electric motor held the tractor down to the same speed at which it had climbed.

We mounted a snow blade on the tractor—a simple matter of inserting a few hitch pins—and placed the blade against a concrete curb. Laumeister put the Electrak in Drive and the wheels continued to turn, burning rubber. A 200-pounder added weight by standing on the rear axle. The tires smoked, but the electric motor continued to run. (Try that with a gas engine and it will

stall out.) Laumeister did it to show the tremendous torque developed by the motor. Coupled with ideal weight distribution and a control system, it lets the motor deliver full horsepower—through a conventional geared trans-axle—to the drive wheels.

When GE engineers “started from scratch” to design the Electrak, they worked overtime on new safety features. One of the best—a safety cutoff switch—prevents accidental restarting. When the driver leaves the seat, the mower blades are braked to a stop in less than three seconds; the tractor stops and brakes. It cannot be restarted simply by remounting. To resume operation, you bring the drive lever back to neutral and move it again in the direction of travel. The mower is then restarted by switching the PTO to off and then on again.

Pressing a main power disconnect switch (at the driver’s left) completely disconnects the battery pack from the tractor. It can be used for an emergency stop or to prevent operation when the tractor is stored.

The 42-inch, rear-discharge mower is a three-blade rotary; each blade is powered by its own small d.c. motor. The mower floats on ball joints and is shock-mounted. If the mower hits an obstacle, the shocks absorb the impact. You can hit a tree with it and not break the mower mounts.

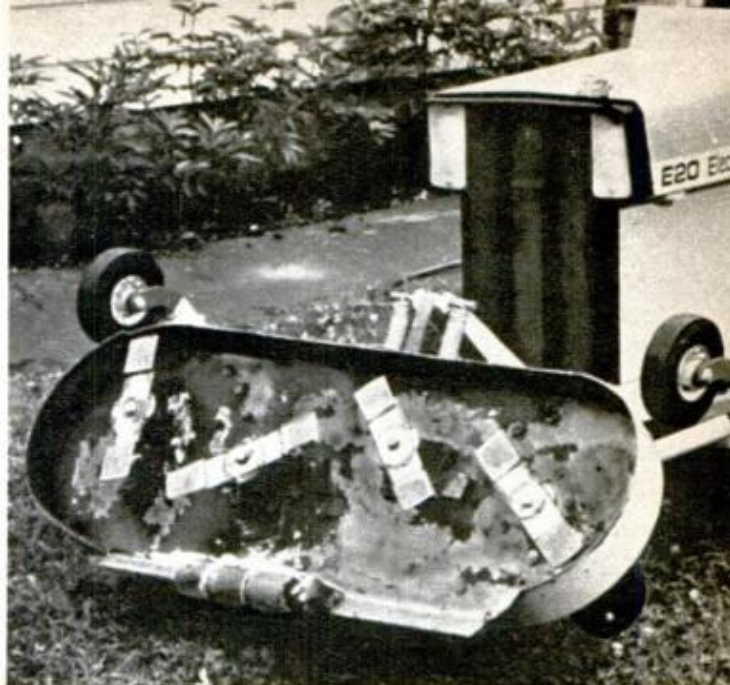
The mower lift mechanism is a simple electric winch using a nylon webbed belt as a lifting cable. GE engineers demonstrate its capacity by standing on the mower and being lifted as the winch operates. When raised, the mower can be flipped for cleaning and sharpening.

The Electrak has an unconventionally short wheelbase for its size—39 inches to allow a 47-inch turning radius.

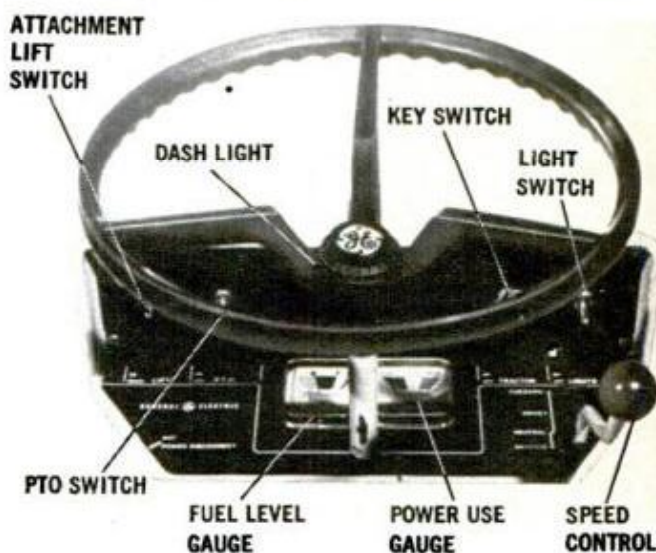
“The short wheelbase was designed to get better maneuverability with the front-mounted mower,” said Laumeister. “If you have a long wheelbase with a front cutter, you end up turning cir-

(Please turn to page 202)

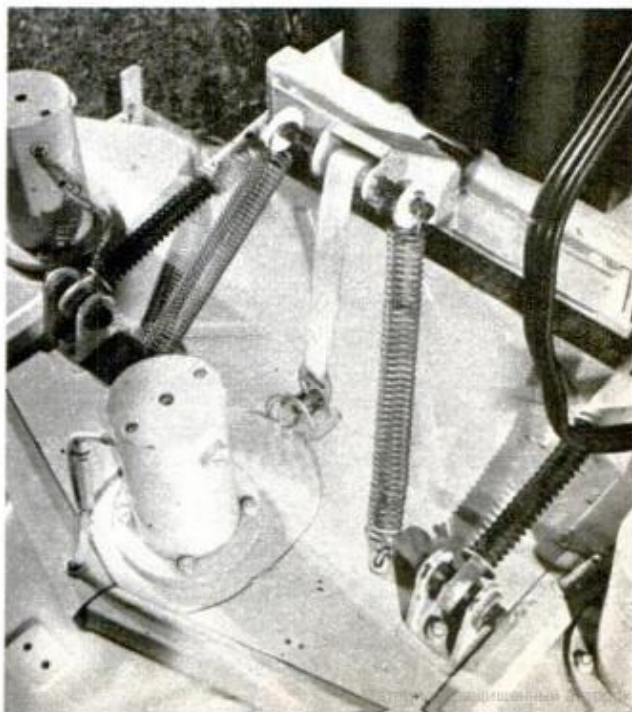
APRIL 1970



MOWER CAN BE FLIPPED for cleaning, sharpening. A prototype is shown; mower now has three blades



GAUGES ON DASH show amount of charge in batteries, rate at which power is being used. Mower (below) floats on ball joints, and is raised by an electric winch with a rugged nylon belt as cable



Build This Poolhouse

By SVEN CORSAK as told to HARRY WICKS

Technical Art by Peter Trojan



YOUNGSTERS CAN'T RESIST second-level playhouse, use it frequently for overnight sleep-outs. For contact with house, solid-state intercom is used

for Less Than \$500

Don't let its mini-size fool you. This little house not only is attractive, but also functions five ways to add fun and convenience to any pool

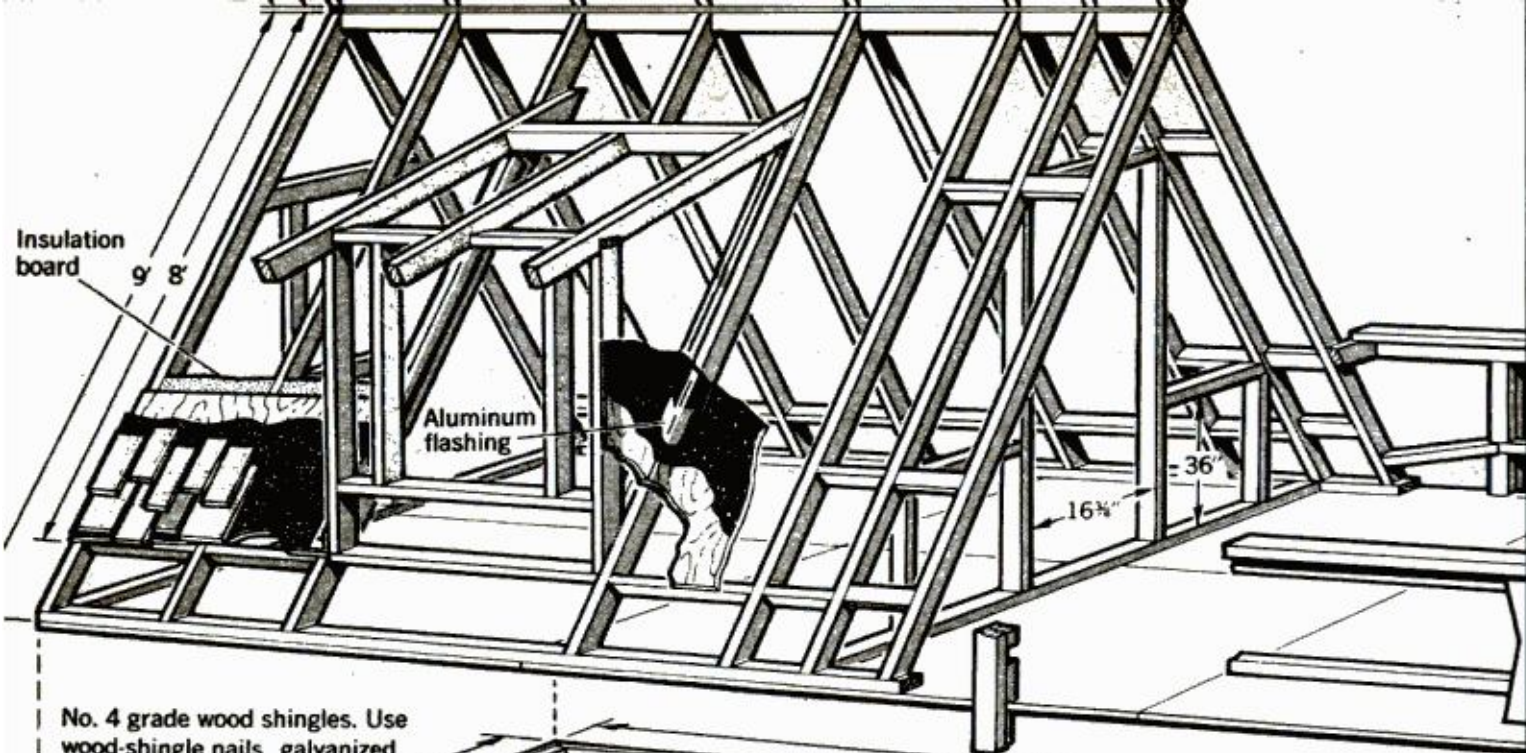
IT DIDN'T TAKE LONG after the christening of our new pool for us to realize that we needed a pool-side cabana to save wear and tear on the main house—which, by the way, is PM's Ranch House (page 154, May '51 PM). Using simplified construction techniques, and inexpensive materials, I built the poolhouse shown here almost two years ago for approximately \$250, although allowing for the current runaway lumber prices, I'd guess the structure today could cost up to twice as much. Prudent shopping, of course, keeps total cost down.

Though small, the house performs five functions. In addition to housing the pool filter and accessories, it offers a screened-in area for bugfree barbecues, a lavatory and dressing room, a deck for sunbathing and an upstairs playhouse for youngsters.

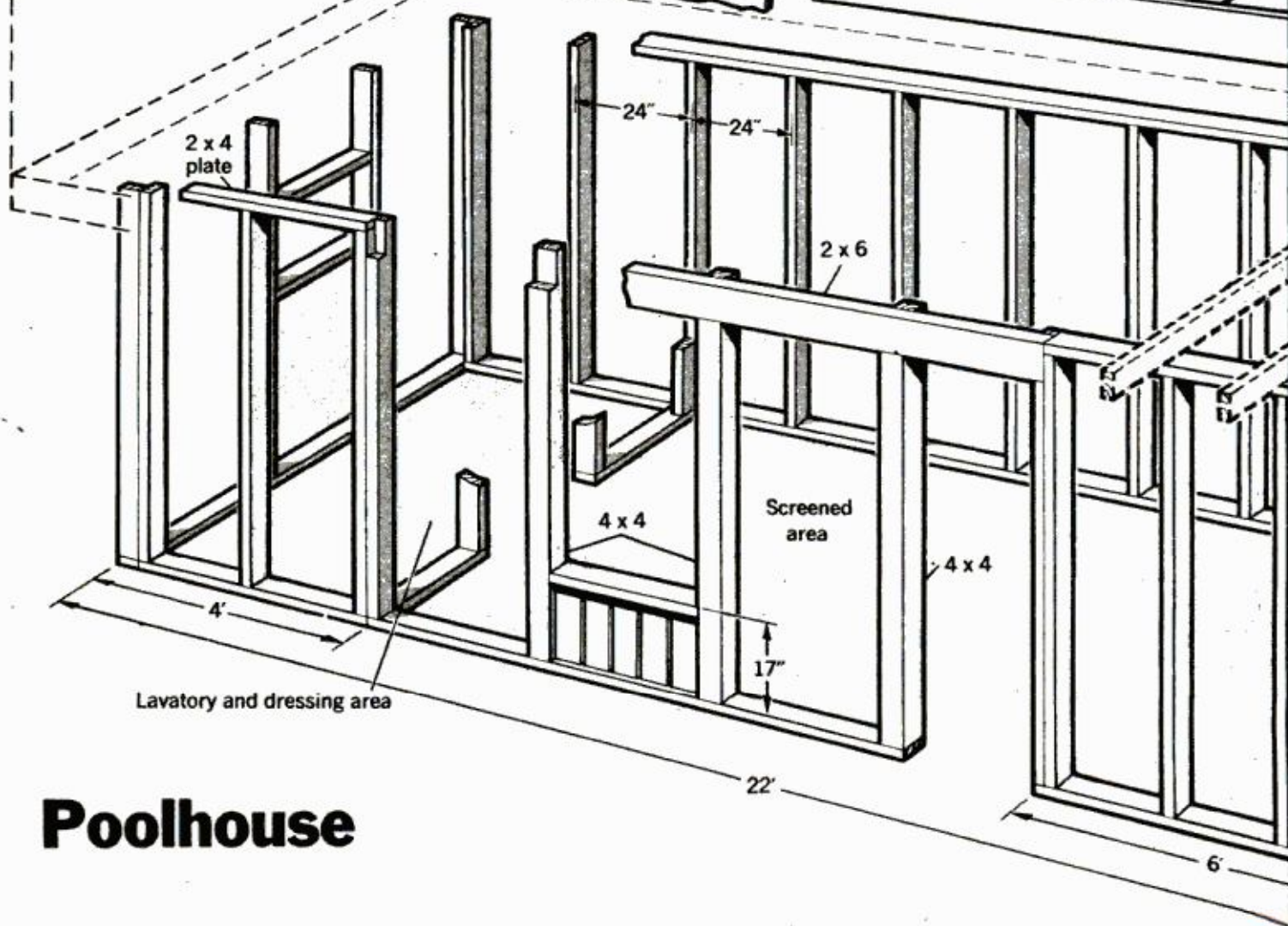
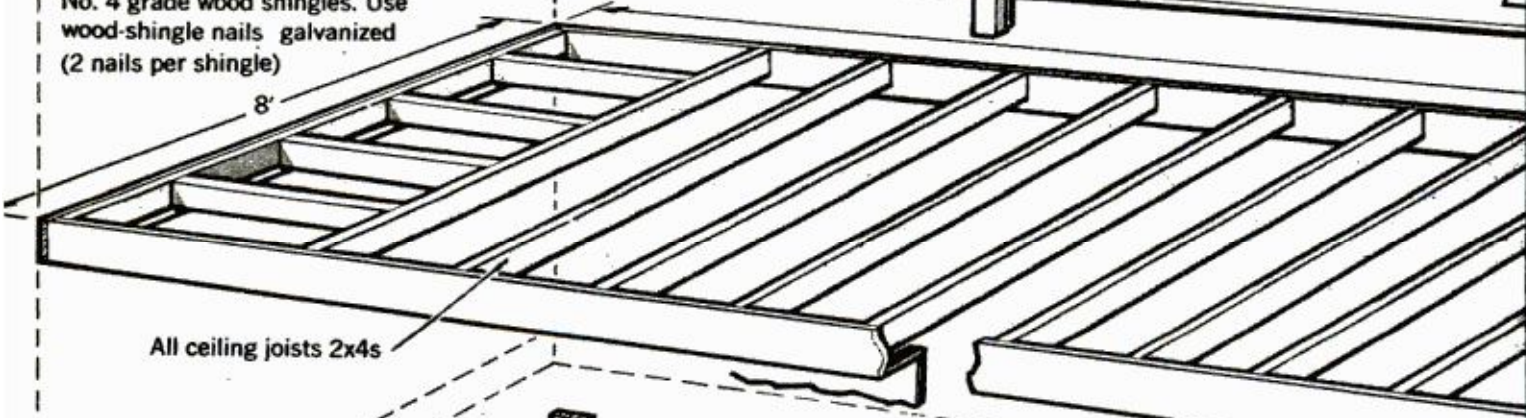
Originally, I had planned to continue the rear roof past the back wall right on down to the ground. My plan was to use this overhang as a "carport" for my garden tractor. But, since my wife was pleased with the little house as is, the idea was shelved. Another optional (but practical) feature is to install a separate septic tank for the lavatory rather than tying the plumbing system into the existing waste system.

The building rests on a 4-in. concrete slab poured on a perimeter footing. For framing I used 2x3s for studs and 2x4s for the joists. The cedar

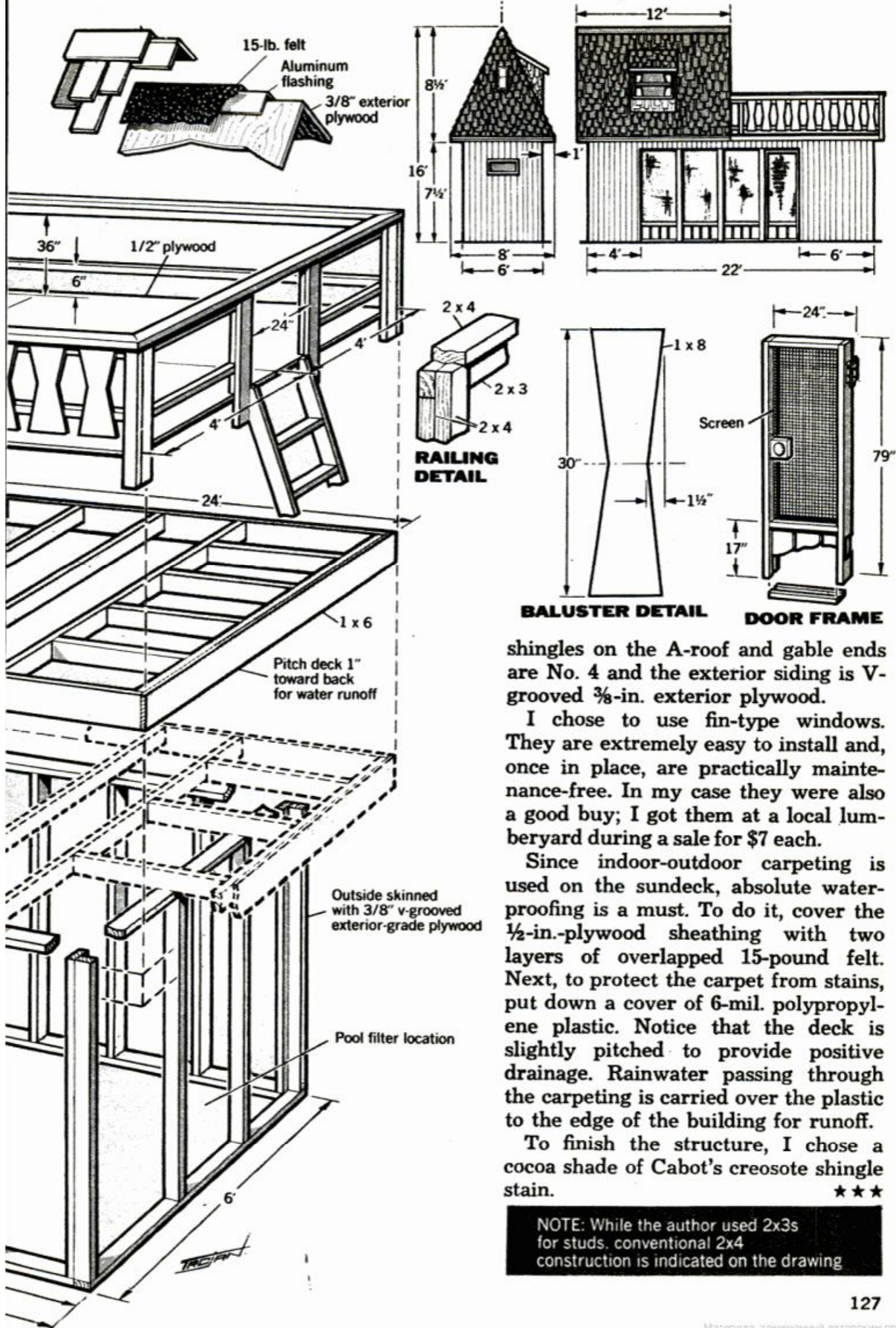




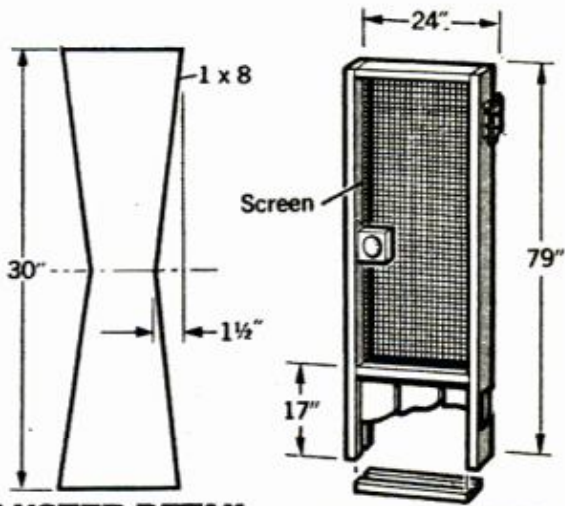
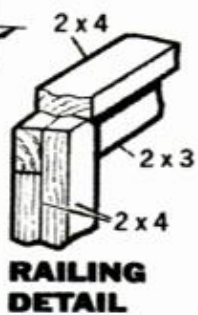
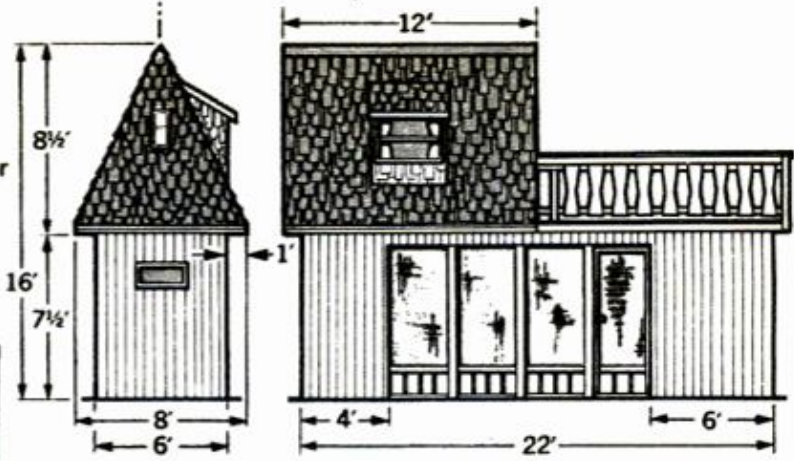
No. 4 grade wood shingles. Use wood-shingle nails galvanized (2 nails per shingle)



Poolhouse



15-lb. felt
 Aluminum flashing
 3/8" exterior plywood



Pitch deck 1" toward back for water runoff

Outside skinned with 3/8" v-grooved exterior-grade plywood

Pool filter location

shingles on the A-roof and gable ends are No. 4 and the exterior siding is V-grooved 3/8-in. exterior plywood.

I chose to use fin-type windows. They are extremely easy to install and, once in place, are practically maintenance-free. In my case they were also a good buy; I got them at a local lumberyard during a sale for \$7 each.

Since indoor-outdoor carpeting is used on the sundeck, absolute waterproofing is a must. To do it, cover the 1/2-in.-plywood sheathing with two layers of overlapped 15-pound felt. Next, to protect the carpet from stains, put down a cover of 6-mil. polypropylene plastic. Notice that the deck is slightly pitched to provide positive drainage. Rainwater passing through the carpeting is carried over the plastic to the edge of the building for runoff.

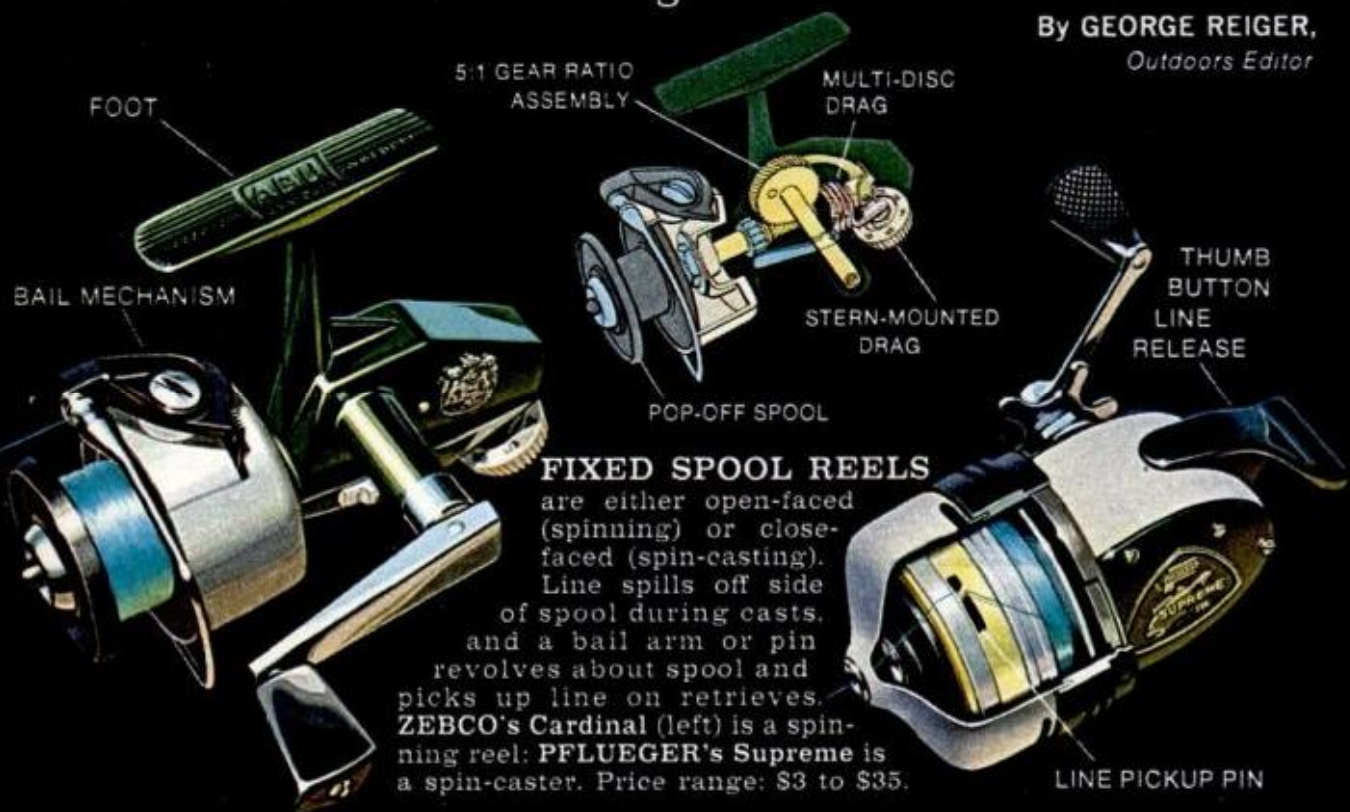
To finish the structure, I chose a cocoa shade of Cabot's creosote shingle stain. ★★★

NOTE: While the author used 2x3s for studs, conventional 2x4 construction is indicated on the drawing

An \$800 Reel?

Rolls Royce to Rebel, Rolex to Timex. Like cars and watches, fishing reels range widely in price from a \$795 Fin-Nor to a \$7.95 Pflueger. But cost alone is not the point. Reels vary in type and function, and even workaday models are marvelous pieces of engineering and workmanship. This article may not eliminate all your confusion when you confront the variety of a tackle store, but we'll help you decide which reel you want for what kind of fishing.

By **GEORGE REIGER**,
Outdoors Editor



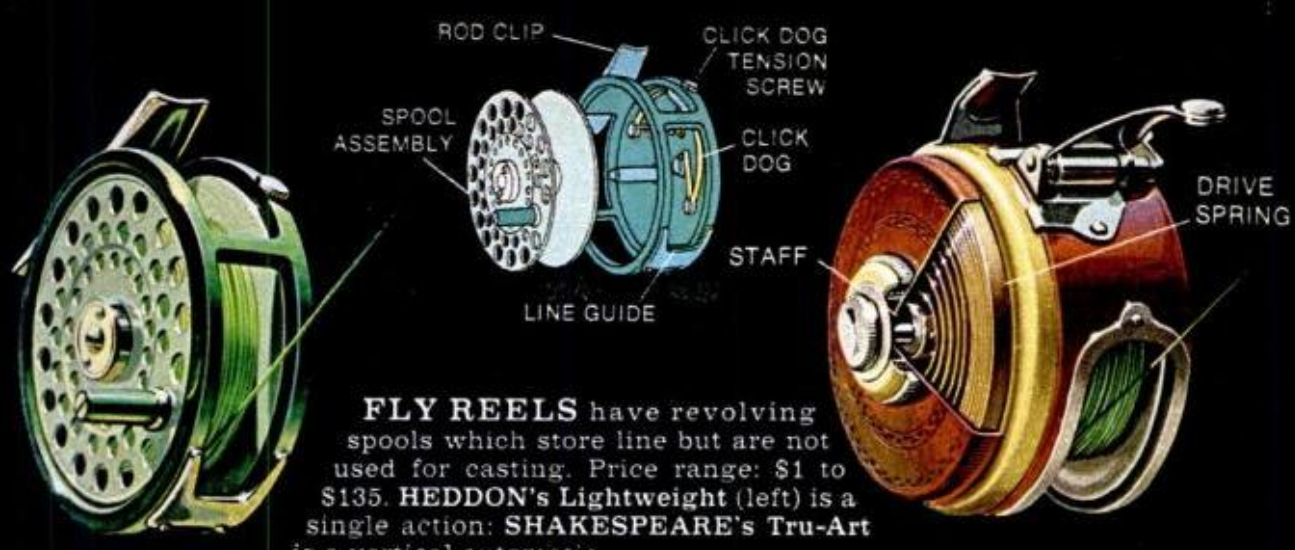
FIXED SPOOL REELS

are either open-faced (spinning) or close-faced (spin-casting). Line spills off side of spool during casts, and a bail arm or pin revolves about spool and picks up line on retrieves. **ZEBCO's Cardinal** (left) is a spinning reel; **PFLUEGER's Supreme** is a spin-caster. Price range: \$3 to \$35.



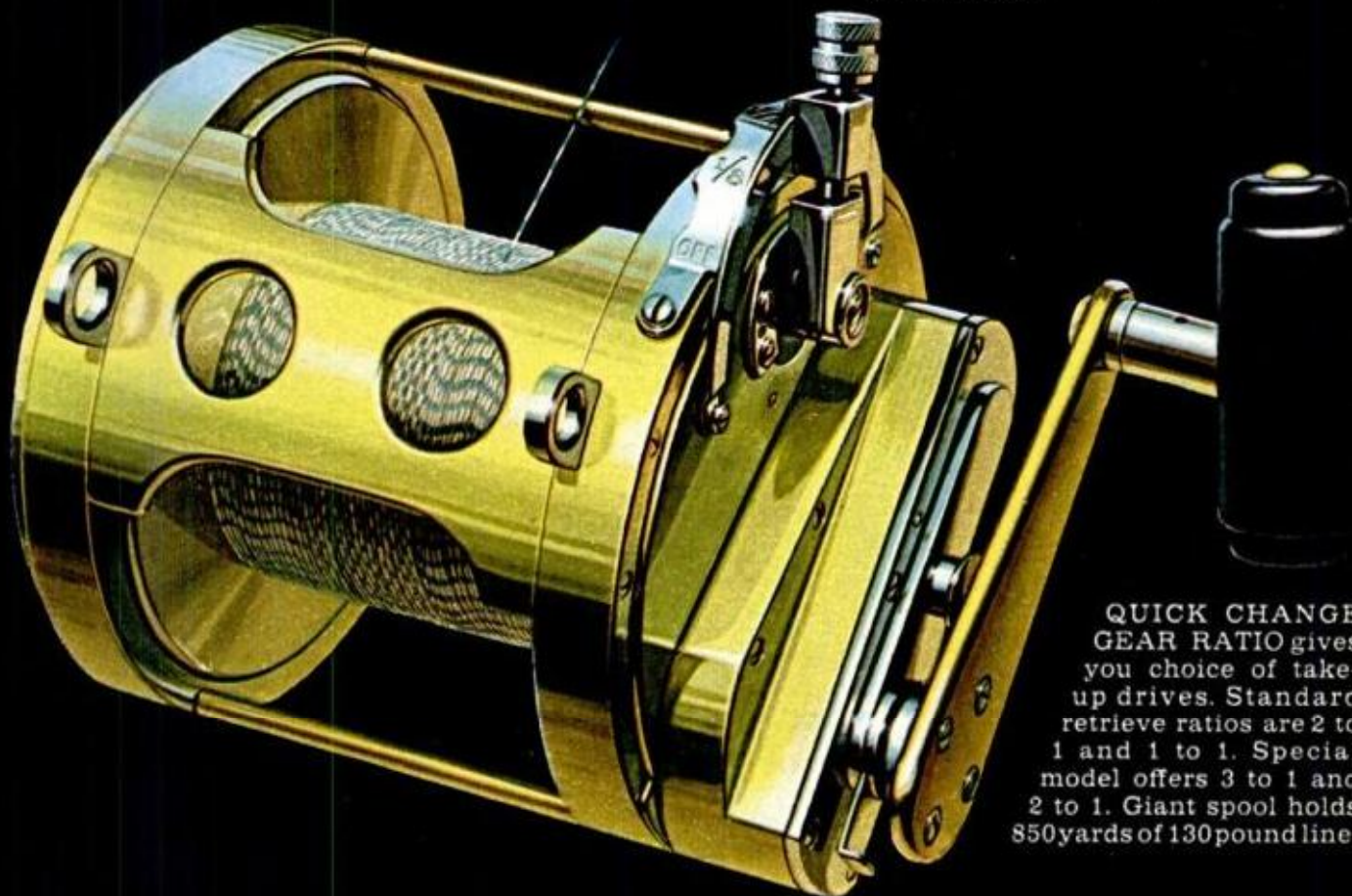
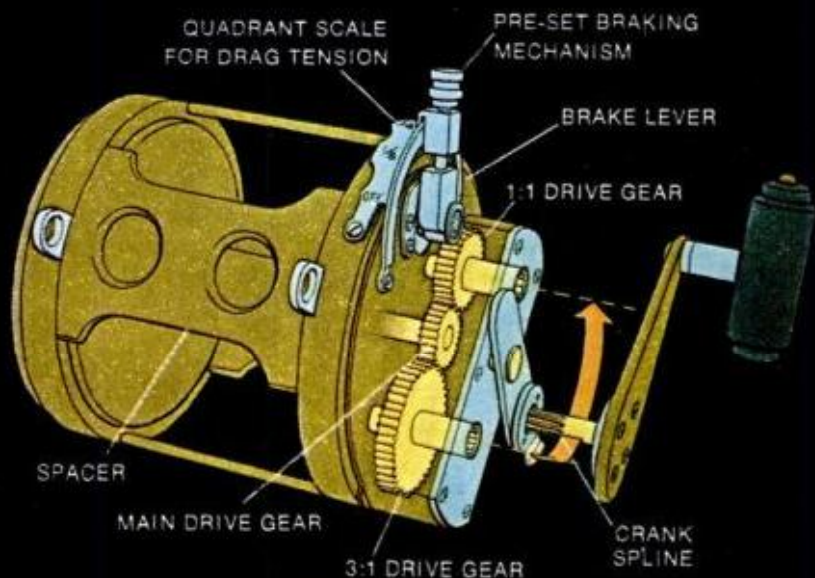
CASTING REELS

with revolving spools require "educated" thumbs to control rush of line which is paid out according to weight and momentum of cast lures. Cheap imports cost as little as \$1; refined versions run to \$75. **GARCIA's Ambassadeur** (left) is a baitcasting reel; **PENN's Squidder** is for surf casting.



FLY REELS have revolving spools which store line but are not used for casting. Price range: \$1 to \$135. **HEDDON's** Lightweight (left) is a single action; **SHAKESPEARE's** Tru-Art is a vertical automatic.

TROLLING REELS are sturdier versions of the revolving spool casting reel. Used for trailing wire line and big spoons on the Great Lakes for lake trout or drifting six-pound baits in the Gulf Stream for sharks and marlin, these reels are built to take the abuse of an hours-long battle with giant fish. Inexpensive models cost \$25; the **FIN-NOR 12/0** depicted retails for \$795, is over ten inches wide and weighs precisely ten pounds.



QUICK CHANGE GEAR RATIO gives you choice of take-up drives. Standard retrieve ratios are 2 to 1 and 1 to 1. Special model offers 3 to 1 and 2 to 1. Giant spool holds 850 yards of 130 pound line.

MAYBE you're already a fisherman and figure you know all about reels. And maybe you plan to pack your favorite spinning outfit into the mountains for trout or down to the coasts for striped bass. But will it do the job? You might be better off with tackle adapted to the local fishing. What do you really know about fixed-spool reels versus multiplying revolving-spool reels? Here are a few basic thoughts about four essential designs:

SPINNING was first introduced to America from France in 1935. However, the principle was developed in Great Britain, and we know that a Scotsman, Peter Malloch of Perth, fished with a fixed-spool type reel as early as 1884. Yet spinning didn't really catch on in the United States until after World War II when its facility for lengthy, generally snarl-free casts was appreciated by a host of newcomers to the sport.

Unlike revolving-spool reels in which considerable inertia must be overcome by the momentum of the lure being cast, the fixed-spool type offers

little initial resistance, reducing the likelihood of tangles known as backlashes, bird's nests or, in France, wigs! Also, because there is little inertia to overcome, spinning tackle can cast extremely lightweight lures impossible to throw any distance with revolving-spool outfits. Ultralight spinning, a French development of the 1930s, employs 2 to 4-pound test line and rods weighing 3 ounces to cast lures weighing less than $\frac{1}{16}$ of an ounce 50 feet with little splash and no shadow to alert wary trout in frequently fished waters. At the other end of the spinning spectrum, 30-pound test line and 6-ounce lures are used to take king mackerel and grouper from ocean reefs.

In addition to their versatility, spinning reels are relatively inexpensive,

cast well into headwinds and handle a vast variety of lures for any given outfit.

SPIN-CASTING an American variation on the fixed-spool principle, was first developed by Lloyd E. Johnson of Mankato, Minn. A tool-and-die maker by trade and a fisherman by preference, Johnson liked the ease of spinning but was dissatisfied with what he considered an unorthodox (upside-down) position for the reel and an awkward method of line control. He therefore created a fixed-spool reel with a cone-shaped hood mounted on a plug-casting rod. Though spinning and spin-casting reels may look different, the fixed-spool principle is the same—it has revolutionized fishing and is largely responsible for the 40 million anglers in America today



BAIT-CASTING REELS were created to do precisely that: cast live baits. A watchmaker-angler from Paris, Ky., produced the first *multiplying* revolving-spool casting reel in 1810.

With professional understanding of gear mechanics, George Snyder built a reel in which the spool revolved three times for every turn of the crank handle. The advantage of this multiplying system over *single-action* (1:1) reels for casting and playing fish was immediately appreciated by anglers everywhere. Soon other Kentucky watchmakers began to make bait-casting reels. For close to a century they built precision instruments which, except for latter-day refinements, would compare favorably with today's models. However, these handmade gems are more often collected today than cast.

Since artificial lures are used with



bait-casting reels, this type fishing is often called "plug casting." And here lies the real advantage of the multiply-revolving-spool system. Great accuracy plus good control of a plug's action makes bait casting especially popular with experienced bass fishermen. In addition, bait-casting rods are generally less whippy than those used in spinning, affording a firmer strike into the hard mouths of bass and pike.

SURF CASTING REELS sometimes see triple duty on boat rods for trolling,

bottom fishing, as well as casting. Quick take-apart designs and anti-backlash devices are standard features on almost all quality models. But though these refinements greatly re-

duce maintenance and the aggravation potential of a long day's casting, no device for any revolving-spool reel has supplanted the need for an experienced thumb and a feel for rhythm in casting.

BALANCED ROD AND LINE are what make for effective fly casting. It's the weight of the line that gets the lure out there—not the other way around as in spinning and bait casting. Fly reels are the least important part of a fly-fishing ensemble. Mostly a passive partner, yielding to the stripping action of casts or used to wind up slack, the reel becomes critical only after a sizable fish grabs the feathered hook and rushes off. The reel is then palmed so the click mechanism and hand create an adjustable brake on the fish's run.

A MANUAL FLY REEL is the beginner's best bet. It should be light, easily maintained and inexpensive. For most stream work, the reel should weigh 3½ to 5½ ounces and have a 3 to 3½-inch spool diameter. It should

be single-action and be provided with a click device, either audible or silent, to prevent overruns.

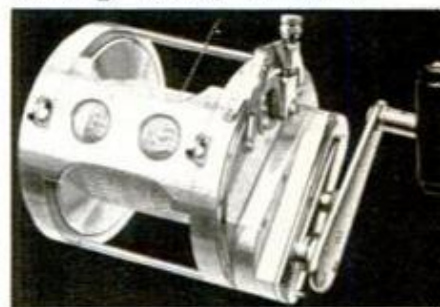
AUTOMATIC FLY REELS offer fingertip retrieval of all loose line, which you may feel is ample compensation for handling heavier pieces of equipment. The spring mechanism creates the extra weight, but it does the work your hand and wrist would normally have to do in cranking line back onto the spool. If you've been reared on 6 or 8-inch trout, you eventually get the urge for salmon or steelhead or even tarpon and snook. While your stream reel may handle small saltwater gamesters, you'd best go to a large-capacity reel with adjustable drag for the larger fish. Fly line's expensive, and it's a pity to lose it on your fish's first rush!

TROLLING may seem like a passive way to fish after you've examined the various other kinds of fishing. But all effective angling requires effort, and successful trollers continually check their lines for weed, change lures or bait, search for diving birds, or run to new grounds.

And their equipment must be in top-flight condition. Don't let the size of trolling reels fool you. Six-nine rods and 4/0 reels may seem unwieldy at first. But they tend to shrink to toothpick-and-thimble dimensions during battle with a determined denizen of the deep. Fishermen who pursue 200-pound alligator gar and giant catfish know what I mean. So do deep-sea anglers.

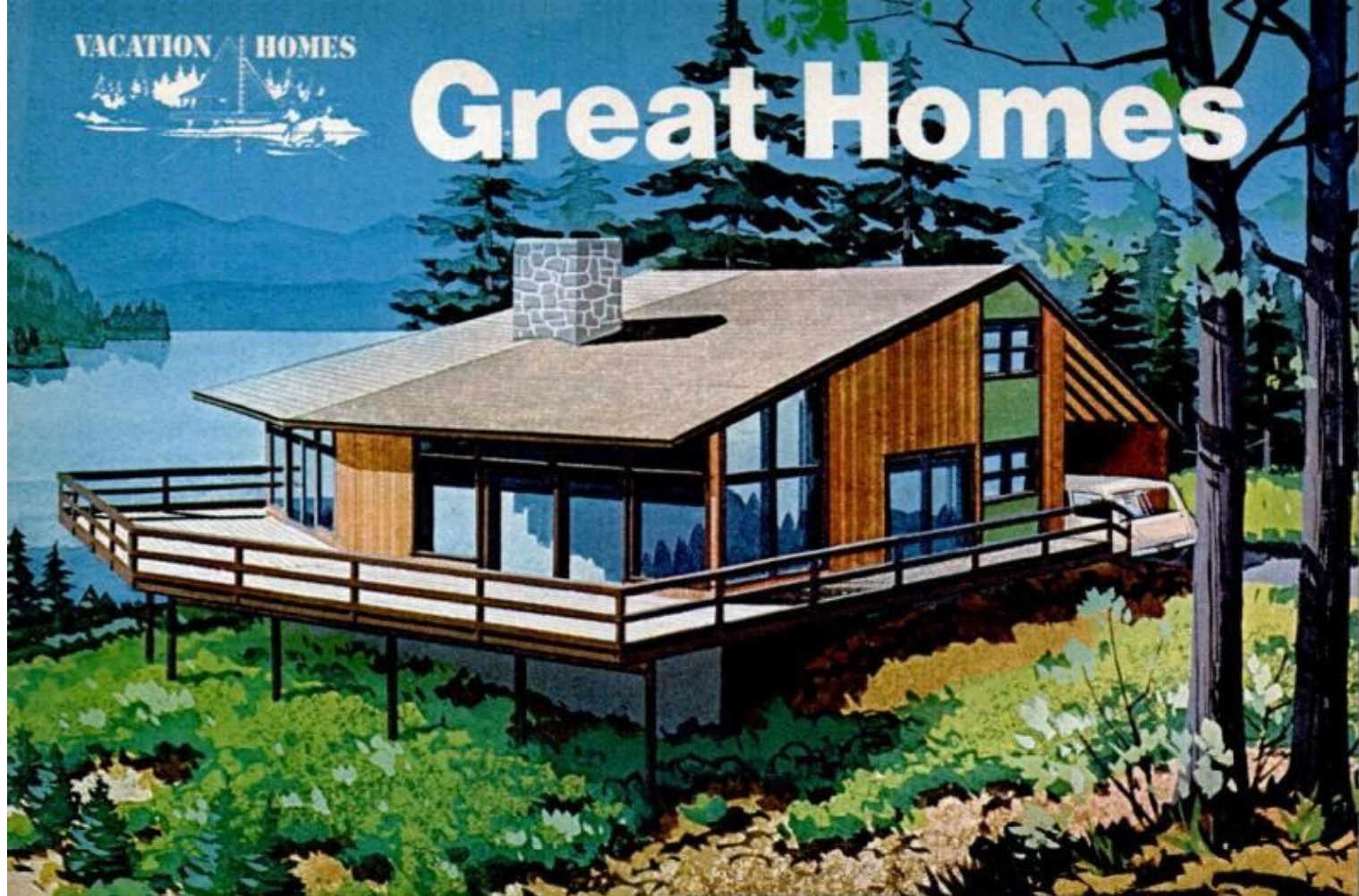
Not long ago I unpacked a Penn 6/0 reel and what appeared to my smiling, nonfishing friends to be a baseball bat for a rod. "To club the fish to death

(Please turn to page 229)



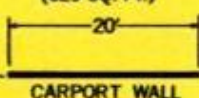


Great Homes

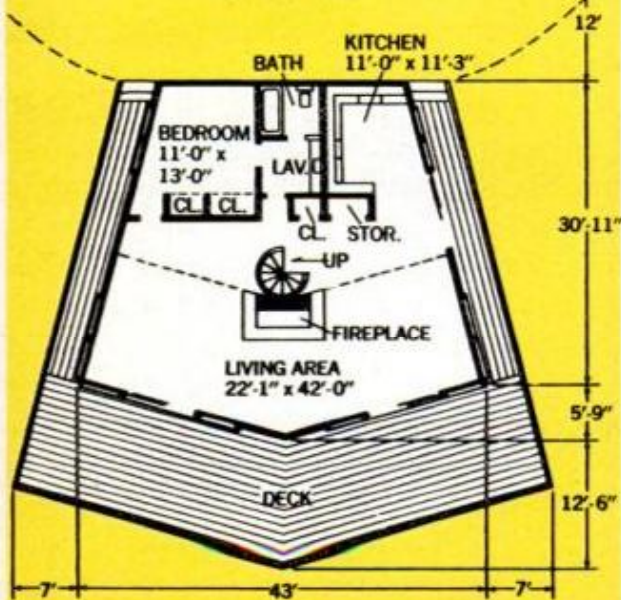


PLAN WWP-13

UPPER LEVEL
(629 SQ. FT.)



CARPORT WALL



MAIN LEVEL
(1314 SQ. FT.)



Hillside Hideaway

At some time or another, just about everyone has the urge to get away from daily routine, city noises, commuting and the like. And what better place to get away to than a weekend retreat that *you* own? This, the first of seven well-designed homes in *PM's* Vacation Homes section, is a spacious hideaway with a wraparound deck, centrally located fireplace and exterior that blends with its environment. It was designed by Ralph Rittenour for Western Wood Products. To order, specify plan WWP-13. (See page 138.)

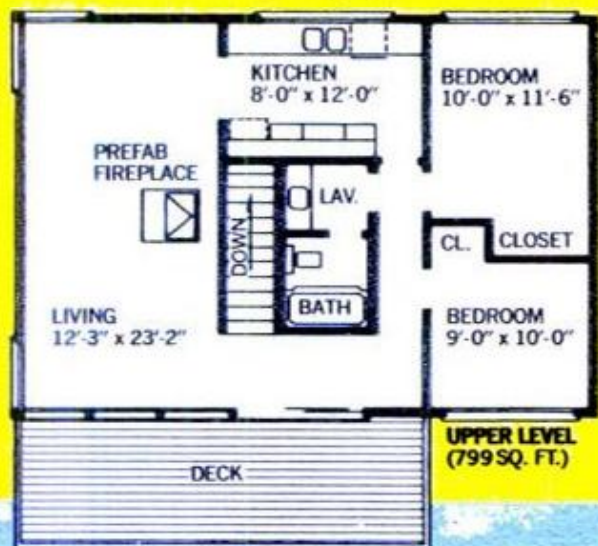
for Vacation Living

Today's second homes range from simple to sophisticated structures. Here are seven good designs to choose from

By HARRY WICKS, Workshop Editor



LOWER LEVEL
(276 SQ. FT.)



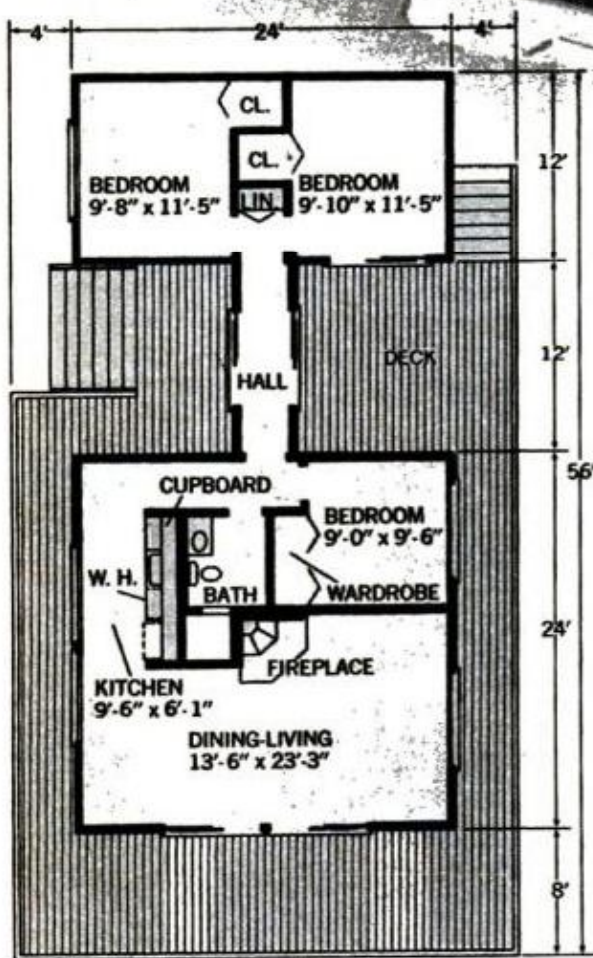
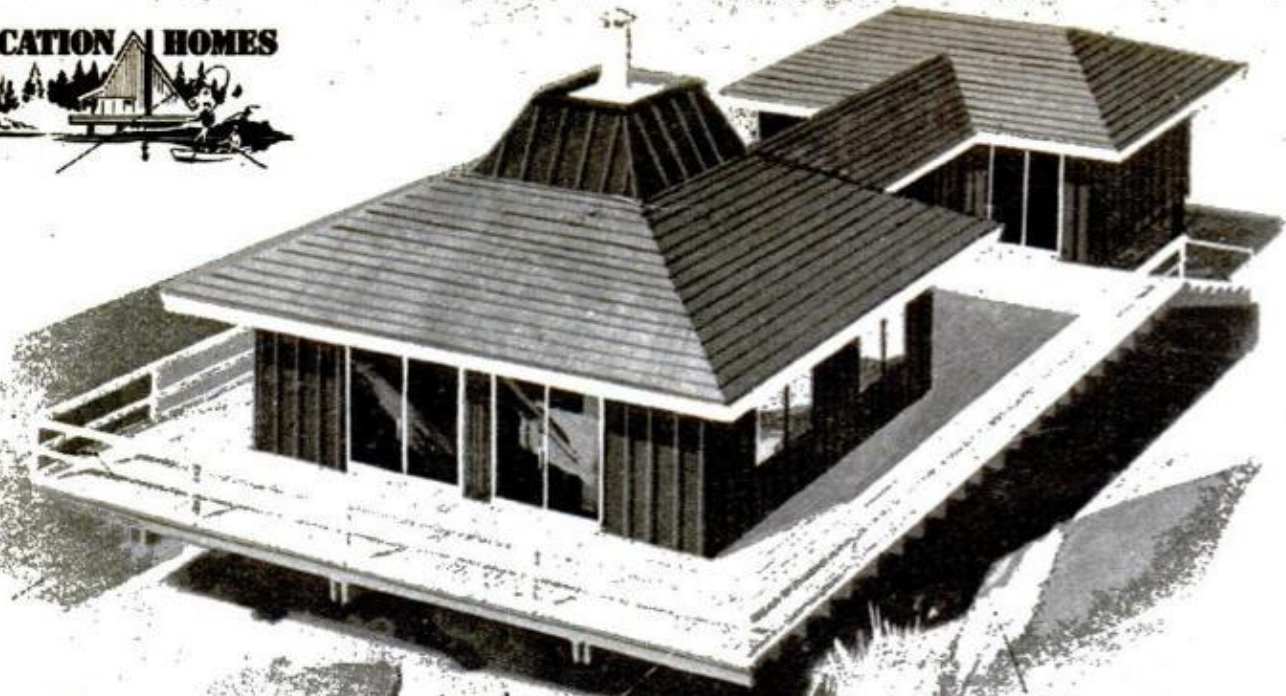
UPPER LEVEL
(799 SQ. FT.)

Low-Cost Luxury

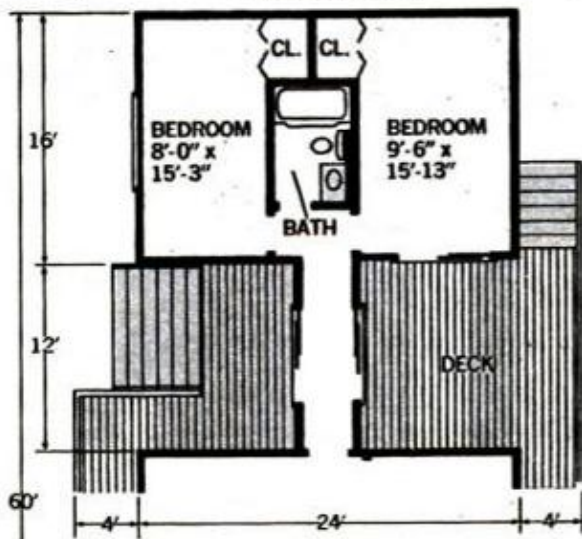
The clean, uncluttered lines of this contemporary-designed second home camouflage the fact that the house has more than 750 square feet of living space. It features a sheltered carport that gives access to the home through the spare room. It can also serve to house your boat during winter dry-dock. Designed for economy in building, the house's rectangular shape allows maximum use of money-saving, standard four-by-eight construction materials. To keep initial cash outlay down, the interior (walls and ceilings) can be left with studs exposed at the start, completed as funds are available. The prefabricated fireplace is an optional extra, but it does let you stretch the vacation season a couple of weekends in spring and fall. Specify plan HBPS 827-1 when ordering.

PLAN HBPS 827-1





PLAN APA 106

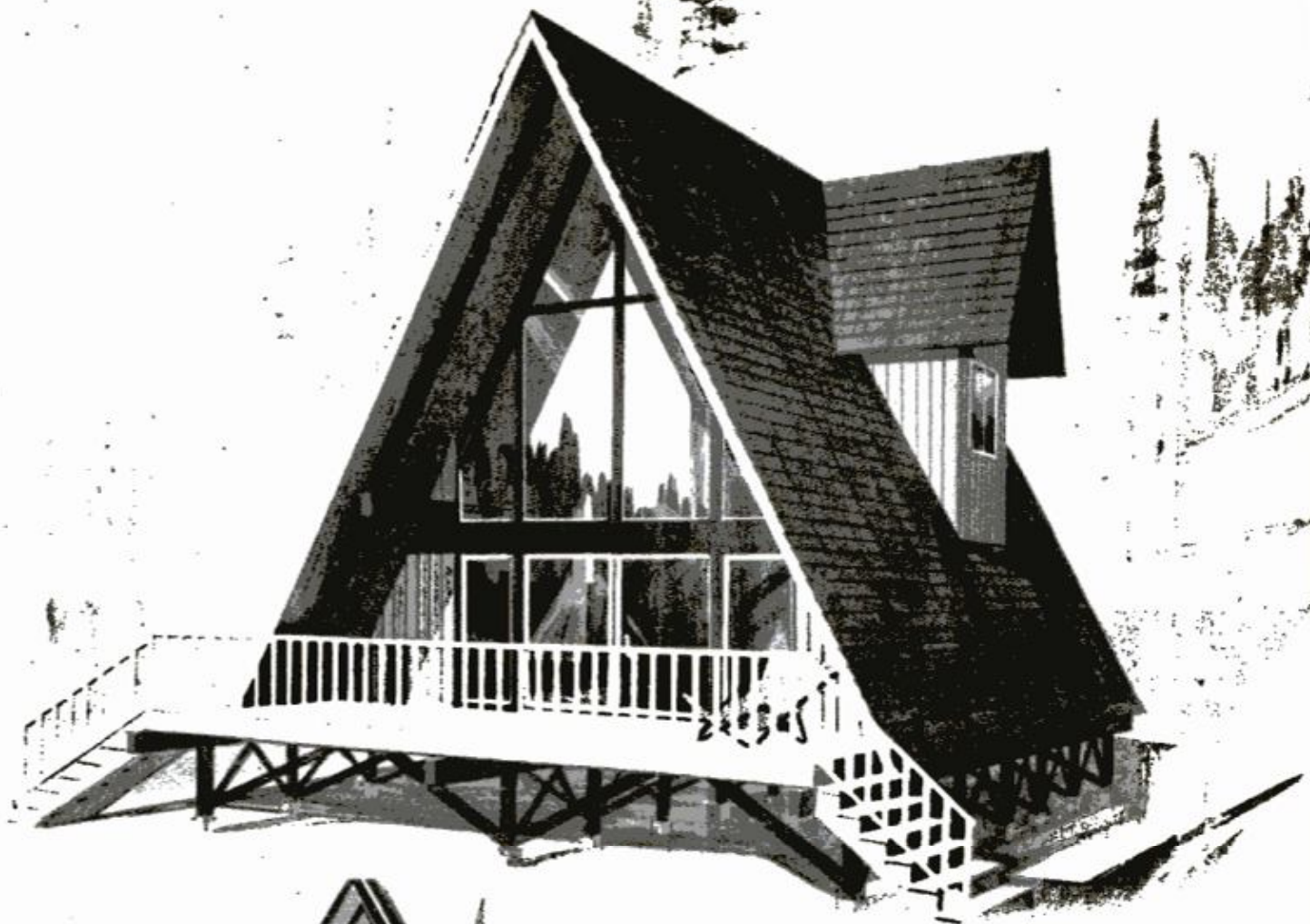


High-Style Living

Here's a compact design that lets you get under cover with a building no more than 24 feet square. The hip roof and spacious deck provide comfortable outside living during the summer months. In chilly weather, the central fireplace warms up the dining-living area. For rustic appeal, battens are used over textured plywood siding and the same rough-sawn paneling is used to cover the indoor walls to carry out the natural wood design. When you need more space, simply add a hallway and two bedrooms. APA plan No. 106.

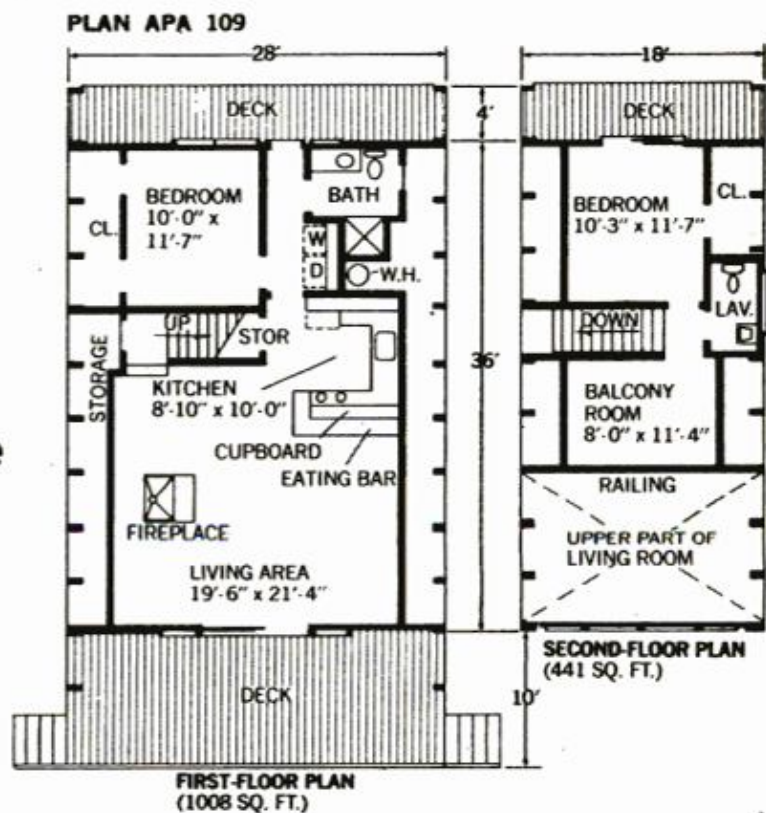
POPULAR MECHANICS





All-Purpose A-Frame

A-frame design has more or less become a standard pattern for a recreation home because walls and ceilings are one and the same—making construction inexpensive. But recently, designers have found that buyers were demanding such creature-comfort extras as access through a rear door, a bathroom near that door, and a second-level lavatory. This updated version boasts all three improvements, as well as exposed beams over a textured plywood



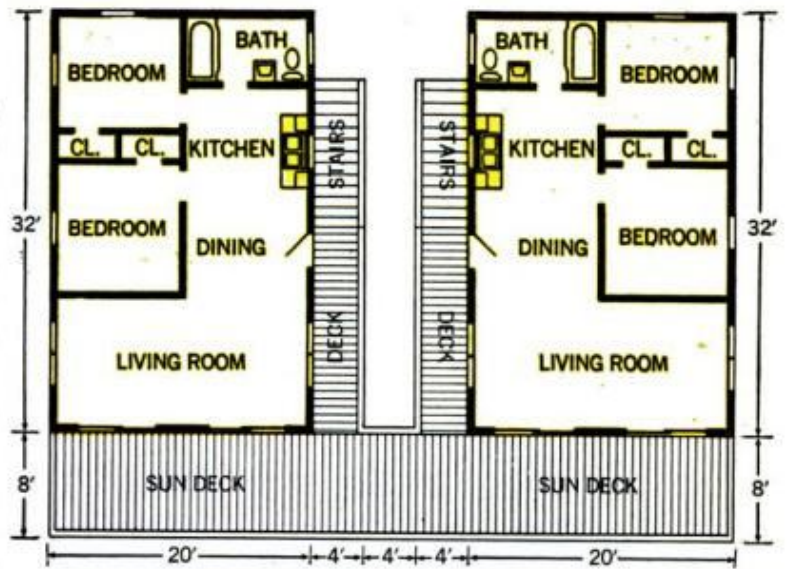
ceiling and space for a washer and dryer. Unexpected guests can be accommodated easily by converting the balcony room—which overlooks the vaulted ceiling—into a sleeping loft. Order APA plan 109.

VACATION HOMES



Twofold Savings

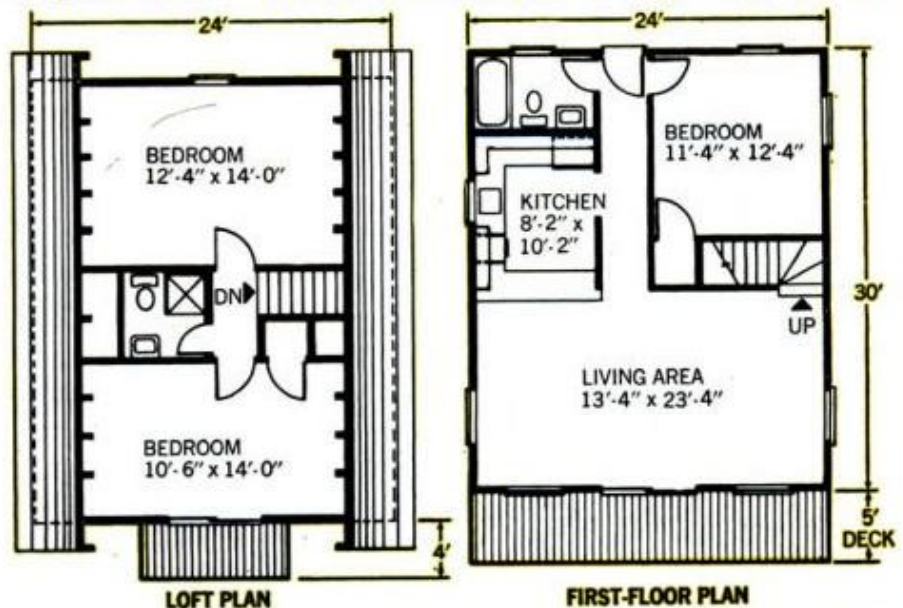
Because vacation-home sites where they wished to locate were premium-priced, two Florida couples halved their property costs by erecting two homes on a single plot. To further reduce expenses, the John Mills and Albert Ayers families then purchased shell homes from the Jim Walter Corp. (Box 9128, 1500 N. Dale Mabry, Tampa, Fla. 33604) and finished the interiors themselves. The homes were constructed as mirror images of each other with decks and stairs between buildings. Thus, the sleeping area (quiet) in each is placed at maximum distance from the living area (noisy) of the other. Starting with Walter's Casual model (floor plan above), both couples added 120 square feet of living space to the shell's basic 640 square feet. Shell cost, about \$6500.



A prefabricated version of a chalet, this 24x30-foot luxury retreat has 1440 square feet of floor space that includes three bedrooms, two baths and a generous-sized dining-living area. Delivered complete to your site, the package includes sink, range (gas or electric), prefinished kitchen cabinets, Formica countertop and 100-ampere elec-

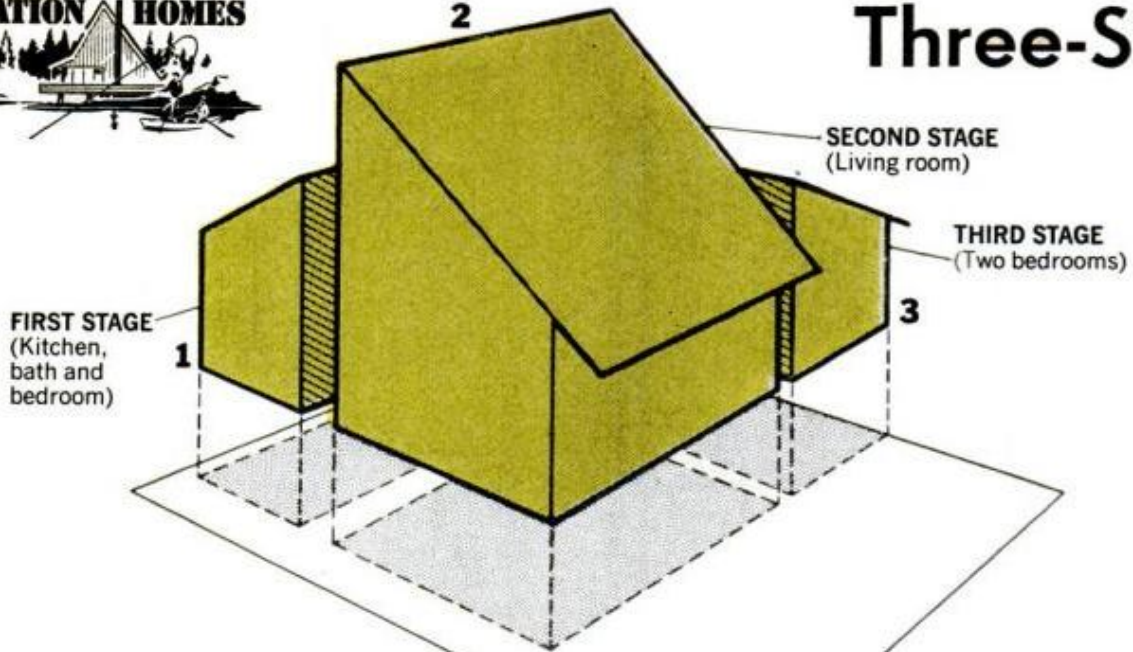
trical service. It can be contractor-erected in one week or owner-built in six to eight weekends, depending upon your carpentry skills. Named Chalet 30, it sells for \$19,500 plus transportation costs based upon mileage from the maker's plant to site. For information, write Stanmar Leisure Homes, Inc., Boston Post Rd., Sudbury, Mass. 01776.

Elegant Chalet In the Woods

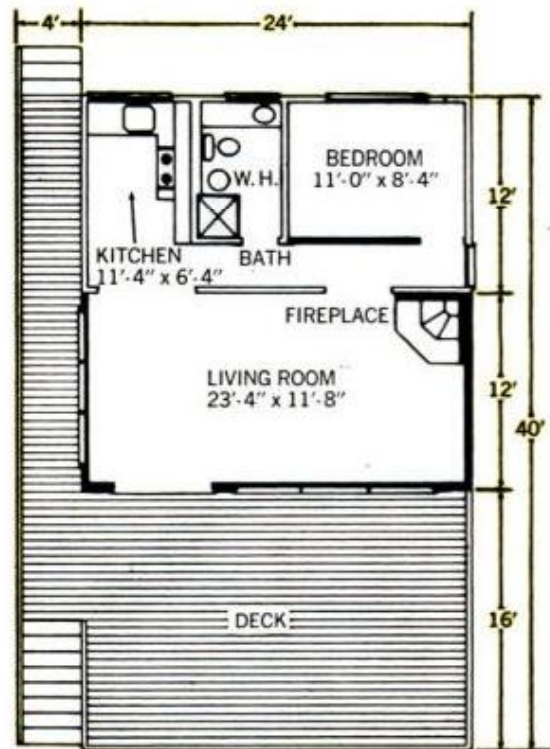
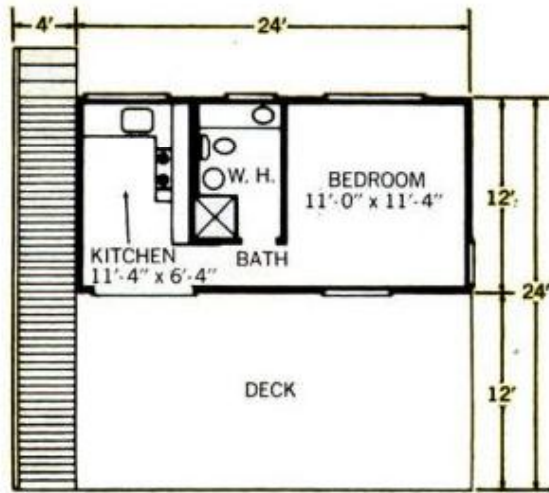




Three-Stage



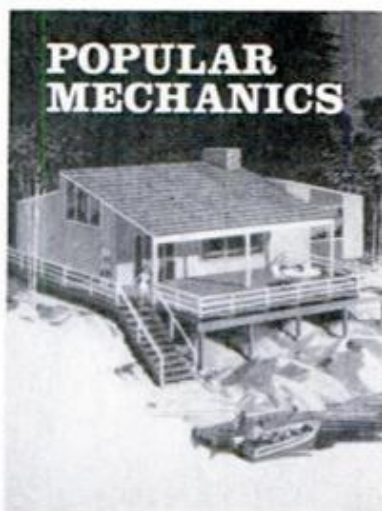
PLAN APA-119



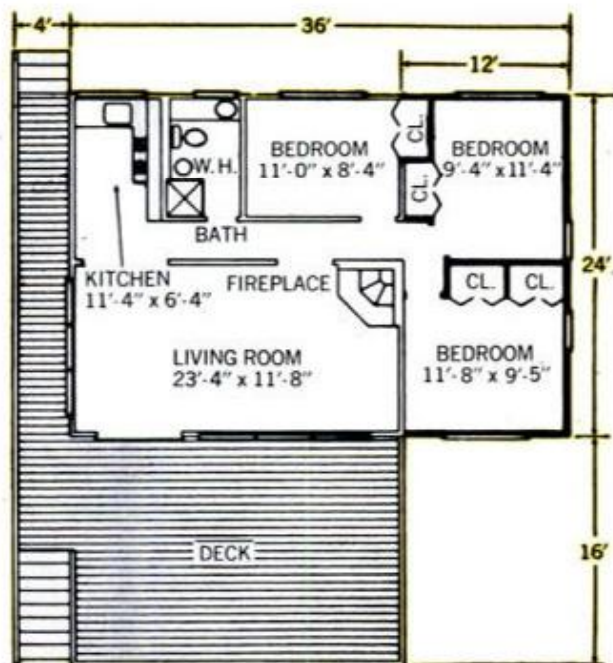
HOW TO ORDER: Plans for five of the homes are \$25 each, or \$35 for four sets of the same plan, from Home Building Plan Service, 2235 N.E. Sandy Blvd., Portland, Ore. 97232. Make certain you specify the plan number that's shown on the floor plan



Cover House



ECONOMY approach to building a second home can be realized with this design because it's especially planned for the add-on building method. With first section enclosed, you can enjoy weekend living, build the second and third sections as time and your budget permit



THE COMMON-SENSE WAY to construction of this contemporary beauty is certain to appeal to the do-it-yourselfer who plans to do most of the work himself. The first stage, which gives 288 square feet of living area, can be gotten under cover quickly so you can finish the bathroom and kitchen—the two most expensive rooms in any house—initially. The second and third stages (which double and triple the starter's living area) can be added at your leisure in future seasons. In the meantime, you'll be getting full use from your country property.

When the second stage is added, a new bedroom wall creates a hallway that will eventually provide access, through a door at the end, to the second and third bedrooms. The deck originally placed is sufficient for the first and second modules; additional decking is required after the second stage is built. The generous roof overhang at front can be screened-in for additional outdoor living space. Each stage is skinned, inside and out, with plywood panels. Thus, both installation and future maintenance labor hours are kept to a minimum.

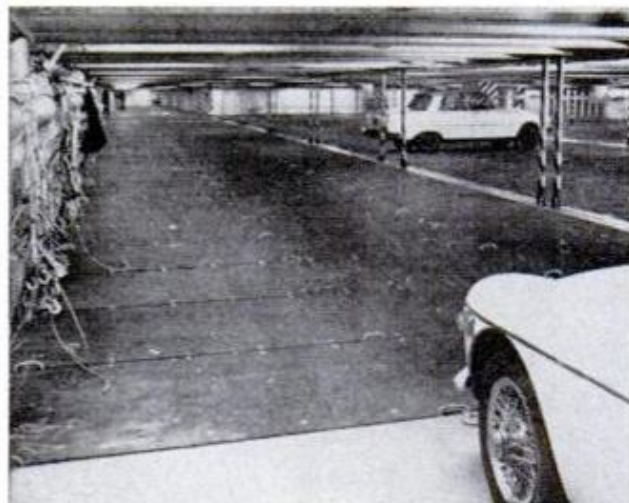
Designed for owner-builders, all five sets of plans offered are more profusely detailed than they would be for a contractor. For example, plans for this three-stager show each of the steps in its completed state. To order, specify plan APA-119. ★★★





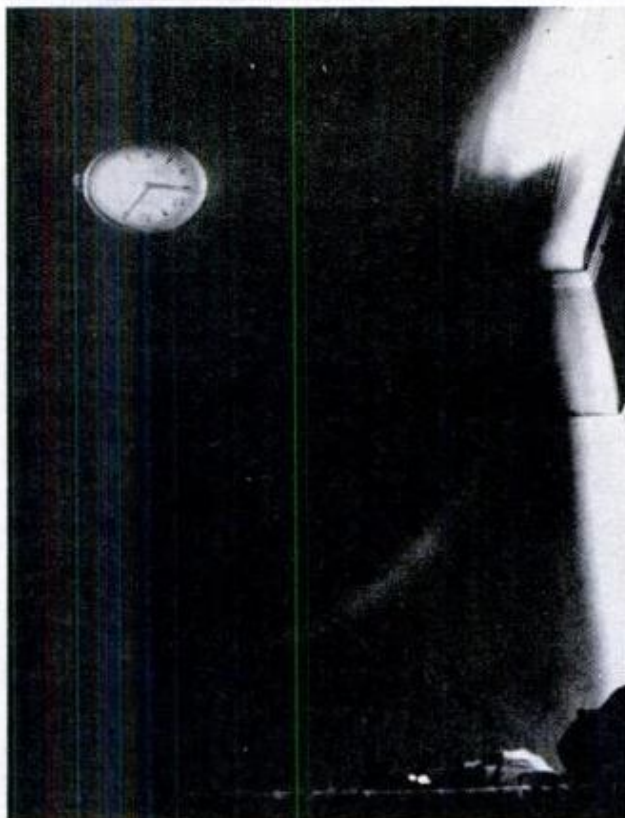
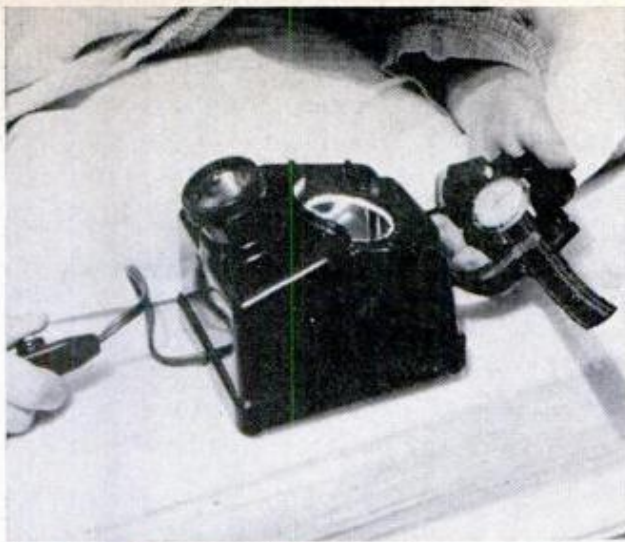
Sam has fiberglass lungs

Sucker Sam is a 40-cigarette-a-day man—or, more accurately, robot—whose main function is to provide graphic evidence to reinforce the antismoking theme of Jack Mahon's lectures. Mahon travels about England with Sam, giving talks before young people, lighting Sam's cigarets and squeezing the bulb (above) that draws smoke into Sam's fiberglass-wool lungs. One lung (far left) is cleaned up for each demonstration, while the other (left) is never cleaned—just to show what happens to a smoker's lungs, says Mahon.



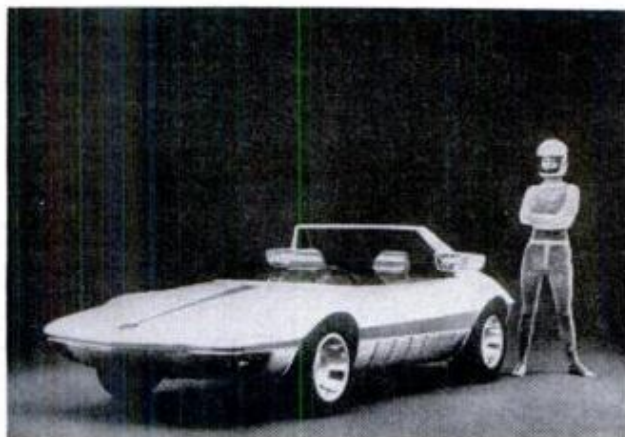
Overseas 'motorway' from England to America

"Motorway to USA" is the sign over the loading ramp (left-hand photo) of the SS *Atlantic Causeway*, one of the Atlantic Container Lines ships that sail weekly between Southampton and America. The 695-foot ship, built by Swan Hunter Shipbuilders, can accommodate 913 cars; the longest car deck (620 feet) is shown in the right-hand photo. (See *Oceangoing Drive-In*, page 100, Nov. '69 PM, for an earlier report on "roll on/roll off" ships.)



For insomniac clockwatchers

People who wake up at night wondering what time it is now have an answer. All the sleeper need do at bedtime is insert his wristwatch into a bedside projector; a touch of a button projects the dial onto the ceiling.

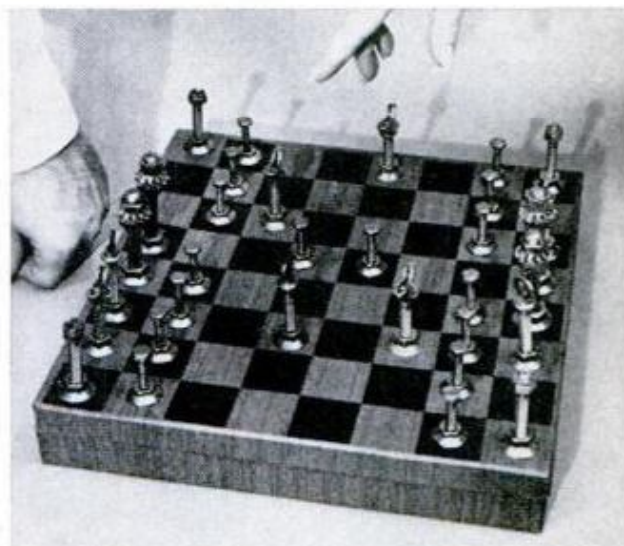


APRIL 1970



Land-Rover that floats

Peter Winter, who lives on the Isle of Wight, has turned his Land-Rover into a water rover with the addition of huge tires that will keep it afloat. The 5½-foot super-soft balloon tires, made of synthetic fabric, can be inflated by the vehicle's exhaust.



Chess for mechanical mind

A chess player with a mechanical bent would feel himself in familiar surroundings with these chessmen. They're all made up of bronze nuts, bolts and washers that have been given an anodized brass finish.

Lights and engine at rear

One of the newest of Nuccio Bertone's car designs is the Runabout, a sleek, wedge-shaped auto that has its 903-cc engine in the rear and the headlights situated "behind the ears of the passenger and driver." Another unusual feature is the use of stainless steel for the frame.

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Styling Couldn't Be Greater, but Workmanship Might

By **MICHAEL LAMM** / Photos by *Irv Dolin*



IF YOU DON'T LIKE the looks, you won't like the car." This warning came not from a Monte Carlo owner but from the man who designed it, Chevrolet's chief stylist, David Holls.

Obviously lots of buyers do like the looks, because styling remains the biggest single reason most owners bought Monte Carlos. And sales have been brisk from the start.

"It's a little Eldorado," says an Indiana dairyman. A Boston secretary: "I bought it because it's so beautiful and chic. . . ." A druggist: "I thought it would look newer for the next three years than a Cutlass or Skylark, be-

cause the Monte Carlo will change very little while the others are due for a big face-lift." Or, "Classic design." And, "Interior looks like a Rolls-Royce."

A South Carolina cafe owner exults, "This is the only car I've had that I can say to my wife, 'Honey, you sure do fit into the car perfectly.' In other words, I feel like a king." And a retired Pennsylvanian mentions, "Everywhere I go, people stand by the car and admire it."

Yet while all owners raved about styling, 44.3 percent had encountered mechanical problems. Leakage and other troubles with automatic transmissions and power steering plagued 25

percent of this group, and smaller workmanship complaints ranged from poor paint (more often the dealer's spotter's fault than the factory's) to badly attached chrome, misaligned doors and windows, and generally sloppy assembly. Some owners vented a fair amount of spleen.

Kansas mail carrier: "Mine's terrible—must have been put together in the dark." A New York law student: "Emergency brake fell off three times. Doors and windows don't fit."

Texas foreman: "Rattles and wind noise. Inside trim loose and puckered. Trim around rear window falling out. Many stripped screws. Chrome in wiper cavity loose. All metal screws stripped, some left out."

Indiana fireman: "Poor paint, dents all over car, lousy workmanship."

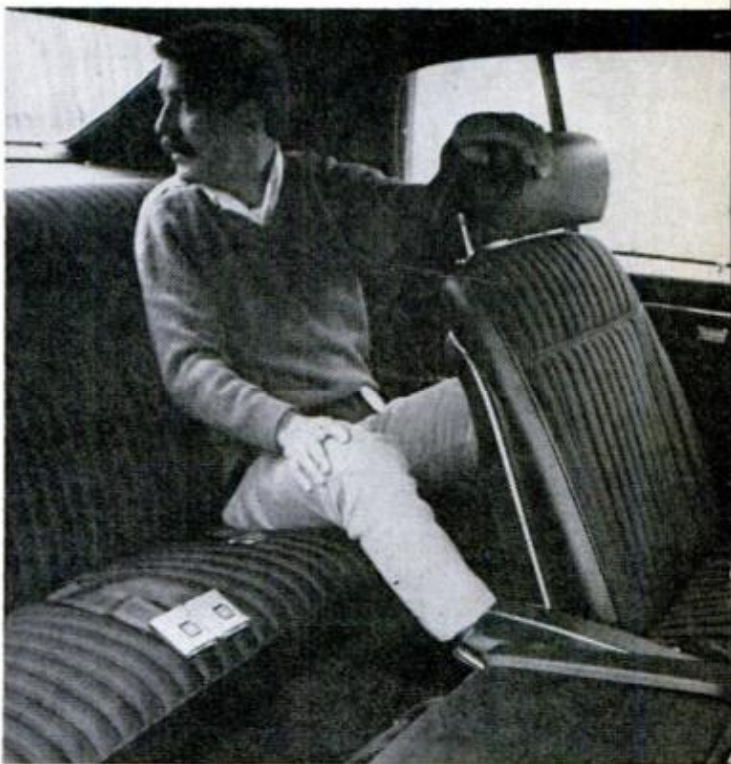
Roughly half the owners who complained about quality also complained about dealer service. A California housewife grumbled, "Went to dealer a number of times. He would never repair all items. My husband, an engineer, had to finish GM's assembly job." And another owner's rather typical complaint: "Cash customers have priority over warranty work. Out of seven items, two might be gotten to. Had to take taxis to work three days in a row, this after paying \$5000 for the car."

But on the brighter side of dealer service (57.4 percent were satisfied), little things seem to mean a lot. "It was Saturday and they sent an emergency crew out to start it, and then on Monday they picked the car up and put a new alternator on at no extra charge. I call that excellent service," says a Kansas secretary. And a New York engineering technician: "Dealer sent a repairman at 5:00 p.m. Have had no trouble since; 4900 miles on car."

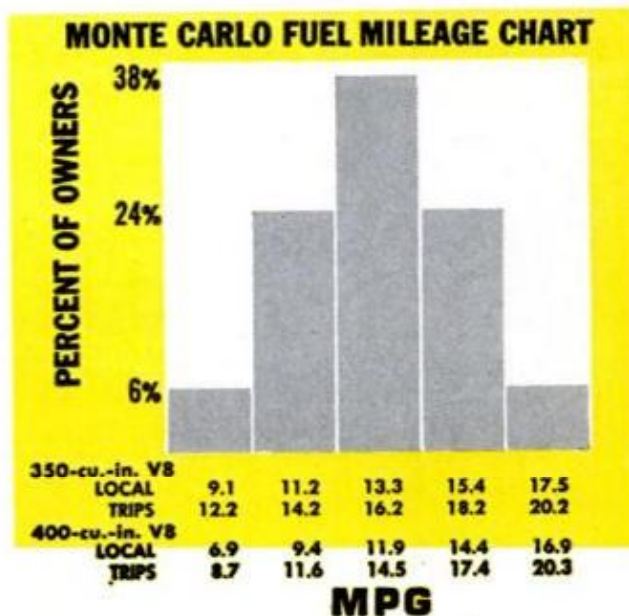
Most owners enjoy driving their new Monte Carlos and give them excellent marks on handling and performance. Two felt they should have ordered a larger engine than the standard 350-incher to cope with airconditioning,

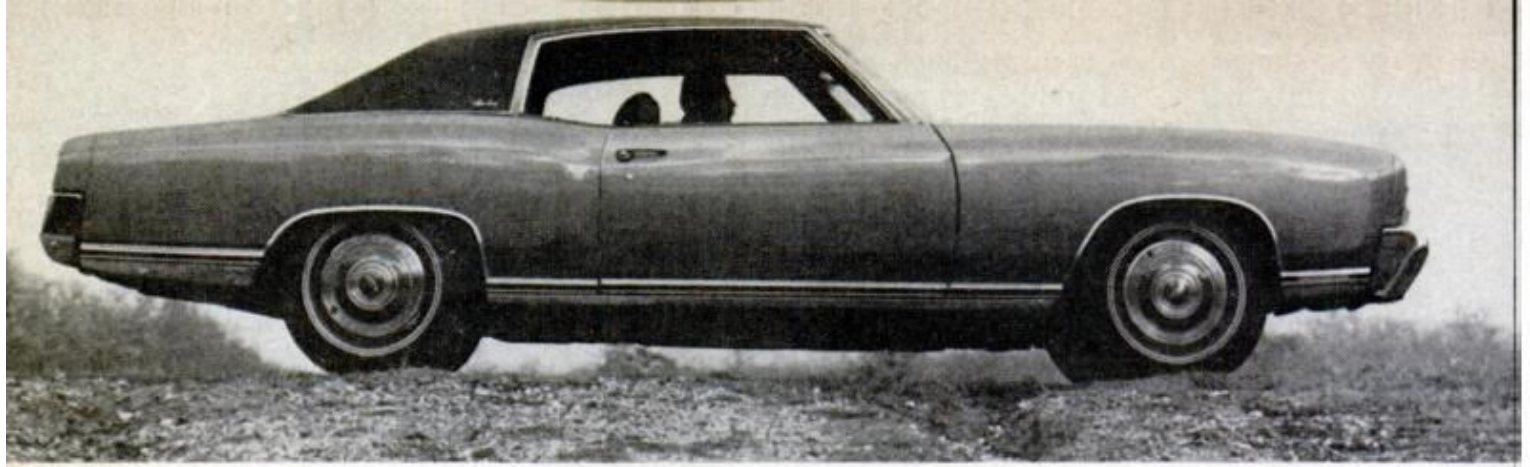


MONTE CARLO OWNERS generally agree car handles well, though some complain of rear-end skittishness

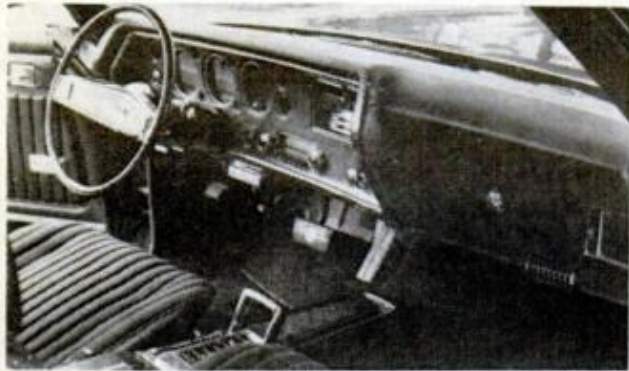


REAR LEGROOM isn't one of car's strong points, but folding front seatbacks, big doors give good access





ONE MONTE CARLO owner calls it his baby Eldorado. All concur that styling—inside and out—sells the car

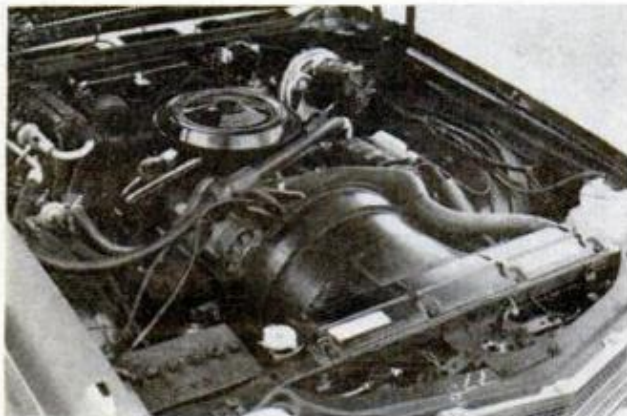


CHEVY'S CHIEF STYLIST, Dave Hollis, studied Packards, Duasies, Rolls, as inspiration for this classic dash

but other than that, no complaints on "stepping out," as one lady put it. An extremely small number had ordered the 454-cu.-in. V8—only 2.3 percent. But since the 454 has only 30 bhp more than the four-barrel 400, owners probably felt the extra cost wasn't worth it. An Ohio glass grinder said, "I might have gotten the 454 V8 if not forced to order the Super Sport option."

Handling, which to many owners means ease of parking and steering in traffic rather than stability in fast cornering, got generally good marks. "Fine stability at freeway speeds. An easy car to control." However, there were a few who thought otherwise. "Rear too light in winter." Or, "No weight on rear wheels. Rear slides even on dry ground; gets stuck too easily in snow"—this from a New Jersey bus driver.

Most owners realize they'd gotten disc brakes as standard equipment, and all but a handful gave the brakes rave reviews.



RADIATOR PRECEDES engine 2 feet. Owners like performance, yet some feel 350 V8 too small for air



FAIR NUMBER of wind-noise and rain-leak beefs, apparently because side glass is too big to adjust well



NOT ENOUGH ROOM here (never is), but no owner ordered Space-Saver spare. Several missed trunk light

POPULAR MECHANICS

Summary of 1970 Monte Carlo Owners Reports*

Total miles driven 713,661

Average miles per gallon:
 350-cu.-in. V8, local driving 13.3%
 long trips . . . 16.2
 400-cu.-in. V8, local driving 11.4
 long trips . . . 14.5
 454-cu.-in. V8 . . . n.a.

Engines:
 350-cu.-in. V8 . . . 74.0%
 400-cu.-in. V8 . . . 23.7
 454-cu.-in. V8 . . . 2.3

Transmissions:
 Automatic . . . 98.2%
 4-speed manual . . . 1.8
 3-speed manual . . . none

Why the Monte Carlo?
 Style . . . 82.2%
 Size . . . 11.5
 Handling . . . 8.6
 Price . . . 5.2
 Performance . . . 5.2

Specific likes:
 Styling . . . 68.1%
 Handling . . . 47.2
 Ride . . . 26.4
 Comfort . . . 23.3
 Performance . . . 13.5
 Economy . . . 11.7

Specific dislikes:
 None . . . 23.2%
 Workmanship . . . 15.5
 Rear legroom . . . 10.1
 Dealer service . . . 9.5
 Gas mileage . . . 8.9
 Wind noise . . . 8.9
 Rattles . . . 7.7
 Ride . . . 7.1

What changes would you like?
 More legroom . . . 15.3
 More quality . . . 9.3
 More headroom . . . 8.7
 Bigger trunk . . . 7.3
 Styling . . . 6.7
 Ashtray location . . . 6.7

Had any mechanical troubles?
 No . . . 55.7%
 Yes . . . 44.3

What kind of trouble?
 Transmission . . . 15.8%
 Power steering . . . 10.5
 Oil leaks . . . 9.2
 Electrical . . . 7.9
 Hard starts . . . 7.9
 Brakes . . . 6.6

Dealer repair satisfactory?
 Yes . . . 57.4%
 No . . . 42.6

Is the Monte Carlo your only car?
 No . . . 52.6%
 Yes . . . 47.4

Other cars owned:
 Chevrolet . . . 64.4%
 Buick . . . 8.9
 Ford . . . 8.9
 Pontiac . . . 7.8
 Mercury . . . 5.6

Power options/accessories:
 Power steering & brakes . . . 92.9%
 Radio . . . 57.2
 Airconditioning . . . 55.4
 Tinted glass . . . 20.5
 Vinyl top . . . 20.5
 Rear defroster . . . 16.9
 Tinted windshield . . . 15.7
 Whitewall tires . . . 11.5
 Stereo . . . 9.6
 Bucket seats . . . 9.6
 Power steering (alone) . . . 4.7
 Power brakes (alone) . . . 2.4
 Power windows . . . 1.8

Age distribution of owners:
 15-29 years . . . 34.2%
 30-49 years . . . 33.1
 50 plus . . . 32.7

Would you buy another Monte Carlo?
 Yes . . . 69.8%
 No . . . 30.2

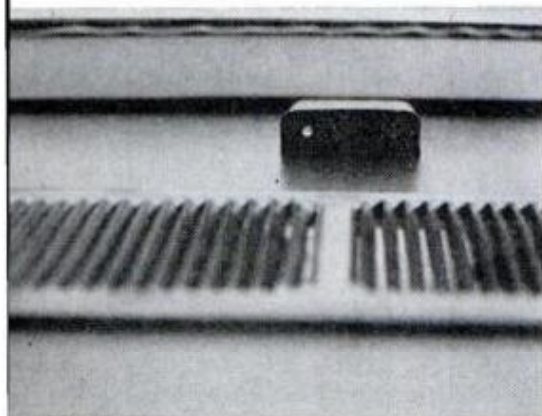
*Percentages may not equal 100 percent due to rounding and/or insufficient data.

On changes they'd like to see in future Monte Carlos, here's a rundown. Many would like a return to front vent panes. Of these, a majority attributed wind noise, rattles, and poor sealing to the size of the glass. Next, there was solid agreement that the inside rear-view mirror blocked forward vision. This mirror, as Chevy proudly points out, is a full foot wide. And the ashtray seems too small—not only that, but the plastic above it discolors when touched by a lit cigaret. More legroom would have been welcome to 15 percent, and

half that number also voted for a larger trunk—one with a light in it.

Monte Carlos are usually sold "loaded," but several owners mentioned that Chevrolet didn't offer enough options. Others would have liked to order single items without having to buy a whole package.

But generally, the unsilent majority agreed they'd simply bought a good new car. They expressed no complaints or very minor ones, and 70 percent vowed they would buy another Monte Carlo. ★★★



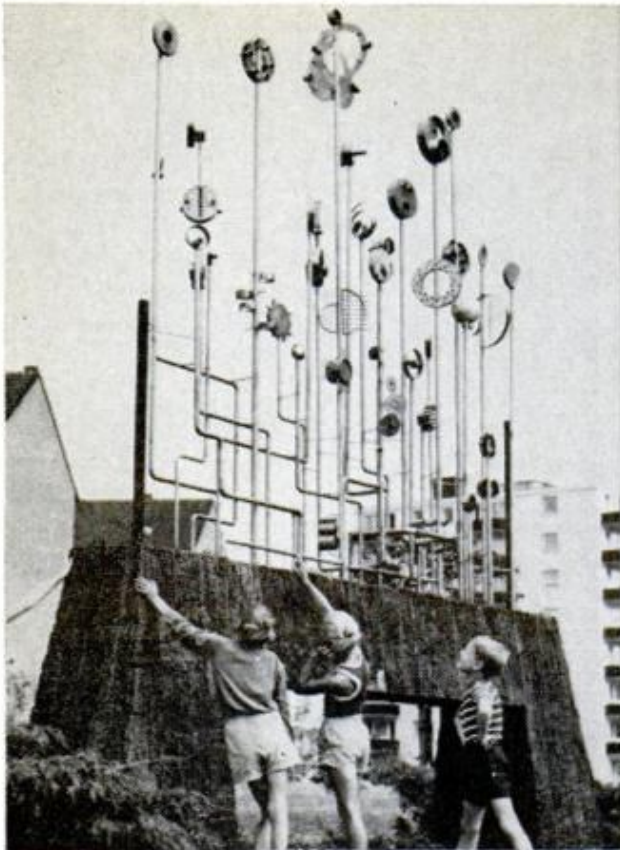
OPTIONAL turn-signal monitor uses fiber optics, winks with exterior lights. It's seen in mirror



SEVERAL OWNERS didn't like the rearview mirror—too big (12 in. wide), blocks their forward vision



SEATING COMFORT is tops. Owners like buckets, console, shift handle; prefer a bigger ashtray



Is an auto part fine art?

Residents of Engelsbu, Germany, aren't quite sure what their new piece of modern sculpture represents—or whether they like it. It was made of pieces of wrecked cars placed on poles. The local sculptor has no comment.



Deadly 'toy'

The Kolibri automatic, now a collector's item, is one of the smallest pistols ever made commercially. It fires a bullet about the size of a ball bearing in a bicycle wheel; cartridge and bullet are less than half an inch long.



Big repair shop

A repair dock recently built at the Sasebo Heavy Industries shipyard in Japan will accommodate the huge new tankers that are now hauling the world's oil (see *The Biggest Thing That Ever Moved*, page 70, May '68 PM). The dock is 370 meters long, 70 meters wide and 15 meters deep.



Let this be a warning

This experimental road sign on the auto-bahn is the result of long study by psychologists and artists. The lines, which crowd together and fragment, warn drivers of the dangers of traveling too close together—even if the sign is seen only fleetingly. The slogan below warns: "Keep your distance!"



Souvenir toy is pattern for back-yard trolley

Using a souvenir model of a San Francisco trolley as a guide, James Anstett, Loveland, Colo., built this kid-carrying vehicle of auto tailpipe (the frame) and hardboard (top and sides). He powered it with a 2-hp mower engine via pulleys and belts from a washing machine.



'Gear down and locked'—and it's a switch engine

Retractable guide wheels fore and aft on the "Shuttle Wagon," a converted four-wheel-drive Dodge truck, keep the vehicle on railroad tracks for use as a switch engine. With guide wheels raised, the Wagon moves onto roads. George Lynch, Clyde, Ohio, does the conversions.



Search for secret TV viewers

In Britain, owners of TV sets must have a license to watch programs. Some folks try to get by without the license, so they become the target of a periodic search by government cars equipped with TV-set-locating antennas.

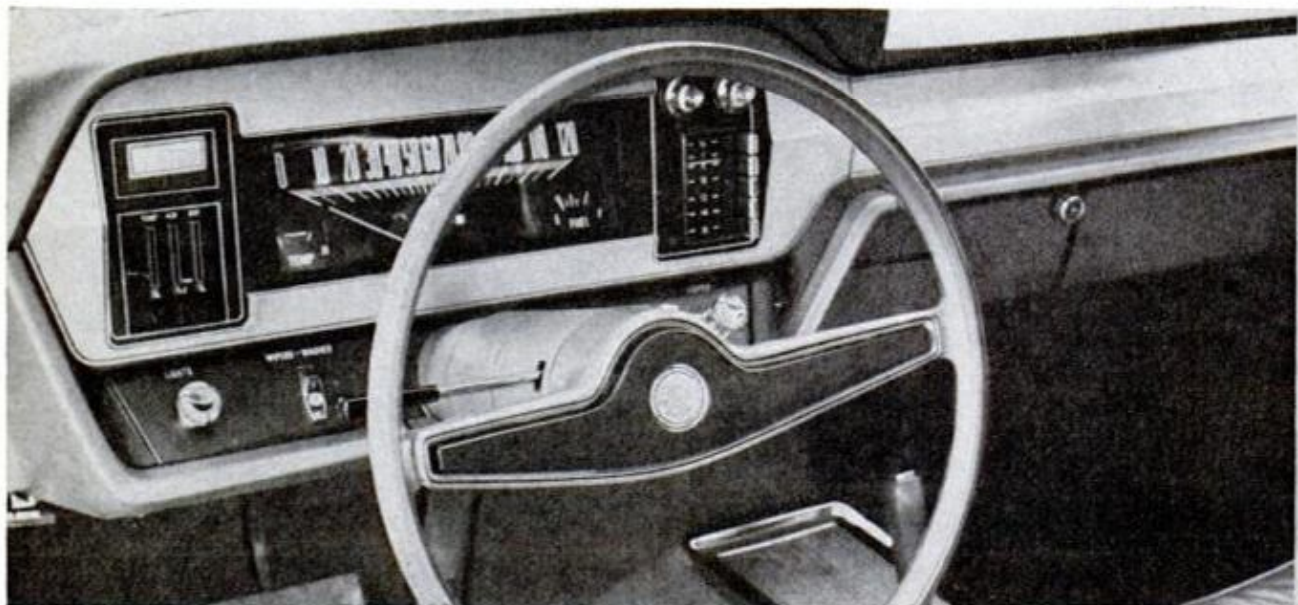


Homebuilt Formula Ford

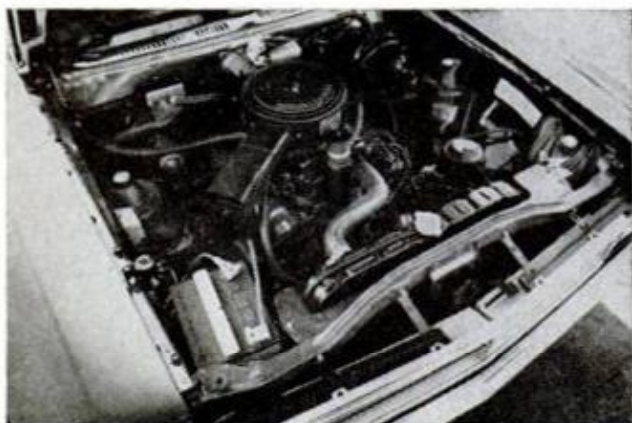
The Macon MR7 Formula Ford is a one-of-a-kind. It was built in his garage by Tony Macon, who plans to enter the car in competition. The 1600-cc racer cost Macon just a little over \$3000 to build.



OWNERS OF AMC REBELS usually don't drive their cars this hard, but they like Rebel's steady handling



DASH DESIGN brought complaints from 11.3 percent of owners. Too square, sill too high, wheel too low



MOST REBEL OWNERS ordered the 304-cu.-in. V8. They like its performance, AMC engine durability



ABOUT THE TRUNK, owners say "lip too high, lots of space but the spare tire should stand upright"

Style, Handling and Comfort Abound; So Do Annoying Rattles

By MICHAEL LAMM, West Coast Auto Editor / Photos by Irv Dolin

Rebel does what it's supposed to, say the buyers. Their complaints are mostly minor, such as that of the guy who dislikes the name. More than half the owners are over 50

REBEL OWNERS TEND to be much more loyal and perhaps a bit fussier than most. As a group, 54.2 percent were over 50 years old, a figure that coincides with American Motors' findings. (Surprisingly, *PM's* 1969 *Ambassador* Owners Report showed only 39.7 percent over 50.)

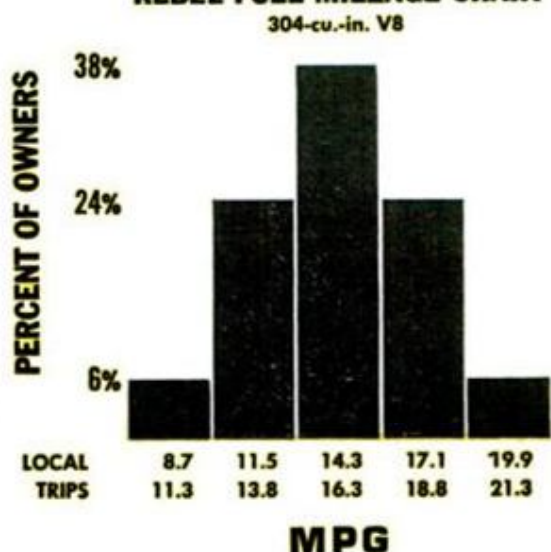
By and large, Rebel owners have driven AMC products for many years and plan to make their next car another (88.6 percent). "This is my 27th Nash and AMC car since 1936, all new," boasts a Wisconsin mechanic. Several owners similarly cite loyalty from Hudson days. More typically: "Driving Ramblers 11 years, never had any mechanical trouble," says a Kentucky maintenance man.

Flashy looks and runaway performance aren't of primary interest to the average Rebel owner. Workmanship, comfort, fuel economy and freedom from mechanical worries mean much more. Amazingly few owners (2.4 percent), though, had ordered the standard Six. Instead, 85.7 percent took the 304-cu.-in. V8—also standard, but slightly

more expensive to buy and run. The bigger optional V8s—360 and 390—found few buyers in our sampling.

As for freedom from mechanical troubles and workmanship complaints, the Rebel excelled here. Usually, when we poll owners of any car, nearly all say they've had to take it back to the dealer for at least minor adjustments. Not so with the Rebel. Many Rebel

REBEL FUEL MILEAGE CHART





REBEL STYLING was the second-most-cited reason for purchasing the car. Loyalty was first reason



ALL HARDTOPS seem to be short on head and leg-room and owners say that the Rebel is no exception

owners admitted taking delivery of perfectly-put-together cars—quite a remarkable feat.

This isn't to say that Rebel buyers had no complaints. Some 15 percent tended to be unhappy with workman-



GREAT PRAISE from owners for seating comfort, especially for the bucket seats with reclining backs

ship, and of these, most suggested refinements that weren't of the "I'm disgusted" nature. For example, wind noise and rattles bothered 13 percent. Wiper controls, the fact that vacuum wipers were standard (electric optional), airbound gas-tank filler pipes, rough engine idle and incompetent mechanics were frequently mentioned.

On the topic of comfort, a taxi owner/driver from Michigan, aged 70 and holding City Bond Plate No. 1, said, "My Rebel is a taxicab. I'm constantly hearing compliments on comfort. Tried 1968 and 1969 Buicks, but *no service*. I've gone back to American Motors and will stay there." Most other owners likewise rated their Rebels high on comfort. Comments: "Roomy, yet not a large car." "Smooth ride." "Reclining seats, the greatest thing about long trips."

As for handling: "Handles very well in parking," says a Maine dairyman, "and also on the highway." "Ease of handling on open road and in city traffic excellent," echoes an Ohio engineer. Brakes came in for both praise and brickbats, most owners agreeing they were fine but a few complaining of squeaks. One owner said flatly, "My car has the poorest brakes of any I have owned since a 1938 Ford."

Rebel owners and dealers generally get along fine, but not always. "Have dealt with the same dealer five years now, trade each year, haven't had to use his service much, and I pay cash



WHY ONE OWNER BOUGHT: "100,000 miles of troublefree operation from my '67, so why not another?"

for everything." Or, "My dealer is fair and honest. Buying a car from him, I always feel I'm treated squarely at all times." But then again, "Courtesy fair, sales methods very poor, doesn't seem to care." "Mechanics not qualified; small dealers need better mechanics than large ones." "No liaison between sales and service. Once you take delivery, you're stuck." Yet most often: "Most courteous of them all." "My dealer always gives me a much better deal than others offer."

What would Rebel owners like to see next time they buy? "More headroom."

"Less plastic parts." "Hood lock." "Trunk is big, but big things are too hard to lift up so high." "Dash lowered." "Steering wheel raised." "Brake lines to rear wheels badly exposed; could be cut by scraping." "A lot better gas mileage." "I'll order the Six next time—this V8 doesn't give me nearly the economy of my old '64 Classic."

If a single comment has to sum up the general feeling Rebel owners have, perhaps this simple, direct no-nonsense statement by a Massachusetts foreman will do: "I like my car. After 10 Ramblers, I guess a person becomes partial." ★★ ★

Summary of 1970 Rebel Owners Reports*

Total miles driven:316,108

Average miles per gallon:

232-cu.-in. Six n.a.
 304-cu.-in. V8,
 local driving 14.3
 long trips 16.3
 360-cu.-in. V8 n.a.
 390-cu.-in. V8 n.a.

Engines:

232-cu.-in. Six 2.4%
 304-cu.-in. V8 85.7
 360-cu.-in. V8 10.7
 390-cu.-in. V8 1.2

Transmission:

Automatic 98.9%
 4-speed manual 1.1
 3-speed manual 0.0

Why the Rebel?

Past experience 53.0%
 Style 14.5
 Economy 13.3
 Size 12.1
 Service 6.0
 Price 6.0

Specific likes:

Styling 35.4%
 Handling 34.2
 Comfort 34.2

Economy 25.6
 Size 13.4
 Ride 12.2

Specific dislikes:

Workmanship 15.3%
 Fuel economy 14.1
 Rattles 12.9
 Wind noise 12.9
 Brakes 5.9

What changes would you like?

Better workmanship 11.3%
 Dash layout 11.3
 Windshield wipers 8.5

Had any mechanical trouble?

Yes 33.3%
 No 66.7

What kind of trouble?

Battery 19.2%
 Electrical 19.2
 Gas gauge 15.4
 Carburetor 11.5
 Transmission 11.5

Did you repair it yourself?

Yes 0.0%
 No 100%

Dealer repair satisfactory?

Yes 77.8%

No 22.2

Is the Rebel your only car?

Yes 57.5%
 No 42.5

Other cars owned:

AMC products 43.2%
 Dodge 13.5
 Chevrolet 10.8
 Ford 8.1
 Volk wagen 8.1

Power options/accessories:

Power steering 69.4%
 Radio 68.4
 Power brakes 25.9
 Reclining seats 21.1
 Airconditioning 18.4
 Light group 15.8
 Tinted glass 14.5
 Vinyl top 10.5
 Whitewall tires 9.2
 Power windows 1.2

Age distribution of owners:

15-29 years 11.7%
 30-49 years 34.1
 50-p'us 54.2

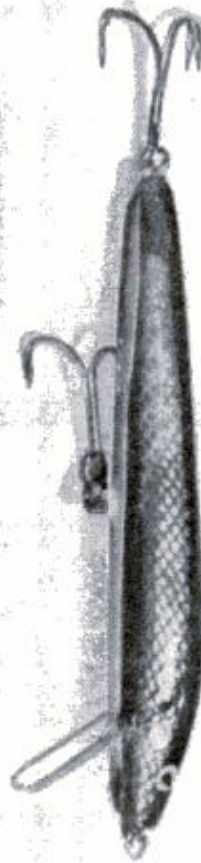
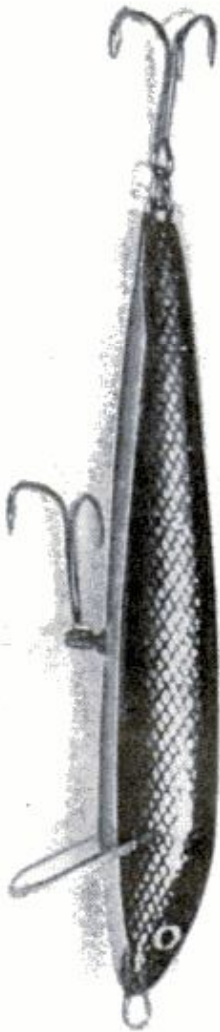
Would you buy another Rebel?

Yes 88.6%
 No 11.4

Percentages may not equal 100% due to rounding and/or insufficient data.

HOW TO MAKE A WOBBLER MINNOW LURE

By PETER CAMPANER



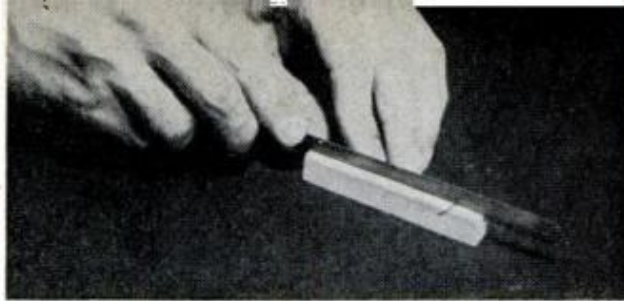
You can produce your own version of the most successful lure in recent angling history for a fraction of the cost of a store-bought model.

THIS LURE not only looks like a baitfish, it imitates the wobbling, darting action of one that's injured. And nothing turns on hungry pike or large-mouth bass like the sight of crippled bait!

Yet these lures are among the most expensive on the market. A good deal of hand labor still goes into the manufacture of some versions of the wobbler, and the loss of two or three of them can really sour the memory of an otherwise pleasant outing.

Since so much of the cost is in manual labor, why not do the work yourself? You can make a dozen or more lures in different sizes and colors at a fraction of the retail cost. Besides the work will give you a chance to use up those nearly empty cans of spray paint you've been saving!

In addition to the satisfaction of turning a dull balsa plug into a bright baitfish replica, you'll experience a kind of pride that can



1. **MAKE DIAGONAL CUT** $\frac{1}{4}$ inch deep $\frac{3}{4}$ inch from end. Make another $\frac{1}{4}$ -inch cut down center of block



2. **CUT BALSAWOOD** to basic minnow shape, removing an even amount of the material from each side



3. **TRIM AND SAND SMOOTH**— $\frac{1}{4}$ -inch lengthwise cut is to hold wire prepared per color diagram below



4. **SHAPE AND SOLDER** wire insert; with waterproof glue, fix it in slot. Diagonal cut is for plastic lip



5. **COAT ALL SURFACES** and crevices with red oxide primer. When dry, smooth with No. 400 wet paper

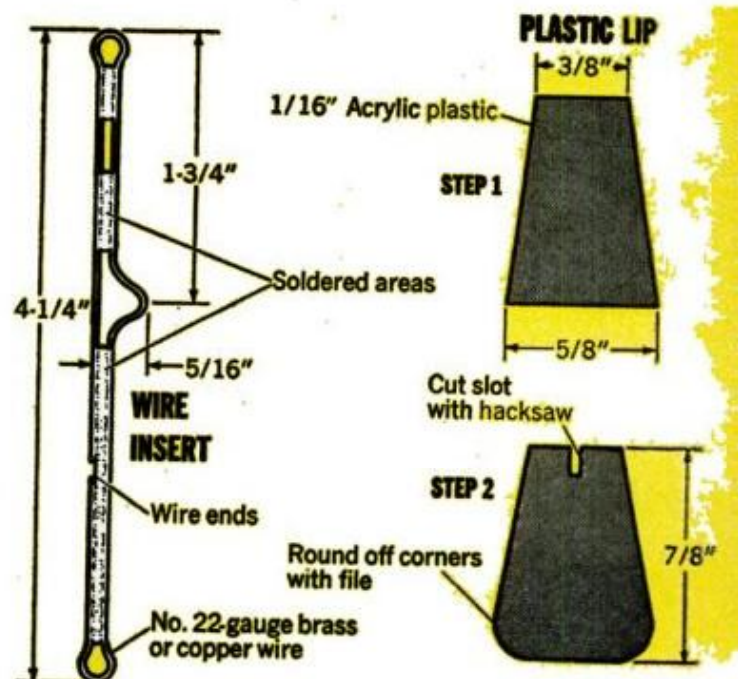


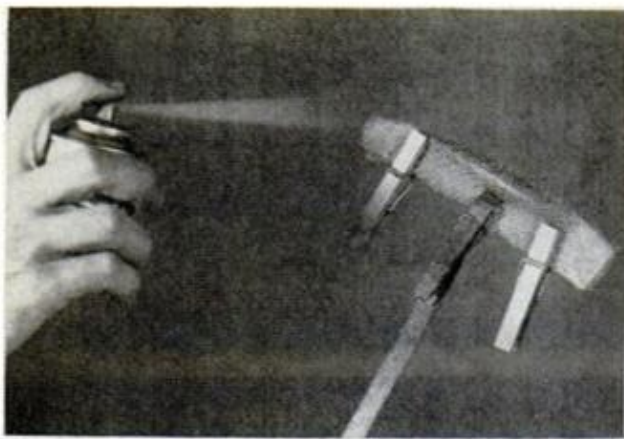
6. **ANY COLOR MAY BE USED**, but glossy black enamel offers the best contrast. Paint the entire lure

never be bought when you land your first fish on a lure you made yourself.

Basically the lure consists of a balsawood body in the shape of a minnow with a wire insert to hold the hooks and a plastic lip to supply the swimming action. Materials available at most hobby shops are: balsawood (stock piece $\frac{1}{2}$ by 3 by 36 inches), 22-gauge (or a substitute approximately this size) brass or copper wire, red oxide primer, spray paint (black, silver or gold), acrylic plastic sheet $\frac{1}{16}$ or $\frac{3}{32}$ -inch, white waterproof plastic tape (type used to repair wading pools), split rings and treble hooks.

You'll need a sharp knife, hacksaw





7. FOR SCALE EFFECT, wrap lure in fiberglass window screen. Hold it diagonally with spring-type clothespin and spray it with gold or silver paint



8. CUT WATERPROOF TAPE 4 inches long and $\frac{1}{4}$ inch wide; make slit where wire insert protrudes. Fasten to lure bottom and cut slot for plastic lip



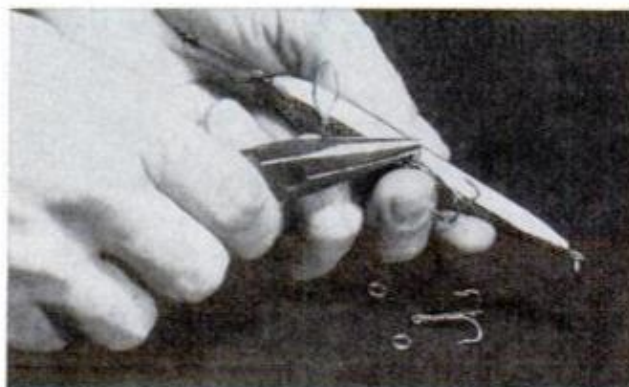
9. PLASTIC MAY BE CUT with soldering gun attachment or by scoring with a sharp knife and breaking along score line. Set in slot with waterproof glue



10. OPTIONS FOR COLOR CONTRAST are as varied as the rainbow, but a combination of painted yellow eyes and red mouth has worked best for the author



11. FOR SHEEN and a permanent bond to protect paint from knocks and fish's teeth, coat entire lure with polyurethane liquid plastic synthetic varnish



12. FASTEN HOOKS with split rings to wire insert. No. 3 or No. 4 split ring and No. 4 or No. 5 treble hooks seem to offer the best balance for this size lure

blade, soldering gun, fine sandpaper, and No. 400 wet or dry oxide paper.

Instructions are for a 4-inch minnow lure made from a balsa plug $\frac{1}{2}$ by $\frac{5}{8}$ by 4 inches. Alter dimensions and hook size for larger plugs.

After Step 7, the top of the lure can be resprayed with black enamel if gold or silver scaling overlaps too much. The plastic lip is made from acrylic plastic or scrap pieces salvaged from

plastic lids. Action of the lure can be changed by bending the front end of the wire insert. Bend down to increase the wobble; up for less action. If the lure tends to turn over, bend wire in the opposite direction until it runs true.

Best results are obtained with a small snap swivel on a light line. Split shot or a small trolling sinker can be used 18 inches in front of the lure to increase depth. Good luck fishing! ★★★



1. **MAKE FIRST CUT** with a sharp fillet knife just behind gill, stopping when the knife hits backbone



2. **CHANGE DIRECTION** of cut, slice down along backbone, cutting away part of the rib cage as you go

Blitz Fillets

By **GEORGE REIGER**

EVER HAD A FISH DINNER spoiled when your pan-fried catch came out tasting muddy? Don't blame the cook. Perhaps, you need a new way to prepare fish for the skillet. Next time eliminate that tainted taste sensation by filleting and *skinning* your catch with this jiffy method shown to me by Arkansas guide Charles Ray. He can handle a pair of four-pound bass in less than a minute!

When one side is done (steps 1 through 4), flip the fish over and repeat the process. Rib bones can be cut away with a simple slice of the knife. Use a sharp knife with a seven or eight-inch narrow blade. A butcher knife with a wooden, slip-resistant handle will do, but Charlie prefers Rapala's "Fish 'n Fillet" special. ★★ ★



3. **DON'T SEVER SKIN** when knife reaches tail. Flip fillet and start another cut between meat and skin



4. **LIFTING FILLET** from carcass as you work, cut meat from skin as though it were a butter patty on paper

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BE YOUR OWN BOAT TESTER

PART 2: ON THE WATER

By BOB WHITTIER

THOUGH IT'S UNWISE to stand in canoes, much can be learned about stability characteristics of any small craft by leaning cautiously from side to side. At least, you'll be respectful of its limitations in rough water

BEFORE WE SHOVE OFF, first a word about stability. There're two kinds: static and dynamic. The former acts when a boat is at rest or moving slowly; the latter when speed picks up, and water rushes under the hull with great force.

Static stability is created by the volume of water pressing to each side of the hull's centerline. When something makes a boat roll to one side, that side settles deeper, displacing more water. The center of buoyancy shifts to that side. The boat rolls until it has displaced a weight of water equal to the force causing it to roll.

When you first step aboard a new boat move from side to side to feel how it rolls under you. A boat having high static stability is called "stiff"; one that rolls easily and suddenly is called "tender." Cathedral hulls are typical of "stiff" boats, canoes of "tender" ones.

STATIC STABILITY comes into play when a boat is at rest and is important in such activity as fishing

You will encounter all kinds of stability characteristics. A narrow hull with low center of gravity can be just as safe as a wide one with high center of gravity. A round-bottomed boat might be "tender" through the first few degrees of roll, but as more and more of its amply-flared side goes under, the volume of water displaced increases rapidly, and the boat "stiffens up" so that it will be in no danger of capsizing.

The famous Grand Banks dory is a good example of a boat that is "tender" when lightly loaded. But as the load of nets and codfish increases, the boat settles deeper in the water. Due to the ample flare of its sides, the dory's beam at the waterline increases substantially and the boat becomes "stiff."

There is much emphasis on wide beam today. But really, a boat's width across

DYNAMIC STABILITY is created by the pressure of water rushing under hull. Note two men on one side



the gunwales as set forth in specifications is no indication of its stability. Depending on the amount of flare to its sides, a boat that is six feet wide across its gunwales can be six feet wide or only four feet wide down at the waterline. Take a runabout hull and build a cabin on it: with no change in beam or hull shape, you now have a completely different center of gravity, and the beam in inches is no more reliable an indication of stability than engine horsepower is of the number of seats in an airplane.

Exploring this matter of beam, let's take a runabout of conventional, pointed-bow type. Its bottom is very wide at the stern and the part that is actually in water narrows steadily toward the bow. Such a boat is widest across its gunwales at the location of the main passenger seats—but look closely and *consider how narrow the bottom is underneath the seats*, where it touches water! Such a boat may be “cranky” when at rest or moving slowly. When you stand at the aft end of the cockpit and move from side to side, it feels quite stable. But move forward and do the same thing where the bottom is much narrower, and you'll find the boat rolls nervously and disconcertingly under you.

This does not mean such a boat is poor, for actually it will “stiffen up,” thanks to dynamic stability, when under way; you and your passengers will all be seated when crossing rough water, and when fishing somebody will be in the cockpit aft to counter the weight of anyone up forward.

The point of all this is, stability is an involved subject, with many facets to it. You can tell much about any particular boat just by walking around in it, observing its behavior, and noticing the “imprint” its shape makes in the water.

Ideally a fishing boat should have high initial stability, that is, be “stiff” so that occupants can work over the sides without a nervous feeling that they are in imminent danger of toppling overboard. But good things can be overdone, and there are boats that are too wide and stable. They feel reassuringly stiff when at rest on calm water, but when going broadside to waves outside the harbor, they roll so quickly and sharply in obedience to their great stability that it is most uncomfortable.

On the other hand, there are boats that



POWER IS LOST in overcoming water resistance with a heavy boat; it may not lift much from water

WHEN A BOAT IS LIGHT for its power, it lifts well from water and more oomph is available for speed



VISIBILITY BECOMES A PROBLEM in the boat that normally carries its nose in air when fully under way



roll quite easily when at rest, but which stiffen up quickly and substantially when they accelerate and dynamic stability begins to appear. You have noticed how an airplane's wings angle upward—it's called dihedral. Flying level, right and left wings angle upward equally. When a gust of wind rolls the plane a few degrees, the low wing is nearly horizontal and lifts more than the other one, which is angled up even more than before. The difference in lift rolls the plane back to level flight. It works just like that on the bottom of a boat, too. It rolls, and rushing water presses up more on the low side. As pressure increases on the square of the speed, dynamic stability builds up rapidly and can become very powerful.

In fact, a boat can have so much dynamic stability that it will resist banking into turns. The centrifugal force sends it sliding to the outside of the turn. No good, especially on winding rivers and channels. Or if it slides sideways on choppy water, it may hook a wave and flip over. A too-stable boat can be made to turn without skidding by installing assorted bilge keels and experimenting with chine shapes that grab rushing water and resist skidding. Such appendages require much experimenting to get them right. They also generate spray and consume power on the straightaway.

Boat design is an art, the essence of which is an ability to make intelligent compromises between many conflicting requirements. Canoes and sailboats have limited stability, not out of negligence, but as an outcome of the designer having chosen long, slim hull lines for the sake of easy propulsion by limited power. The tenderness of such hulls is compensated for by mechanical means, such as ballast in sailboats, or by depending on the skipper to distribute the load so as to maintain acceptable stability. That's one of the things they mean when they start talking about seamanship. Safety afloat does indeed depend partly on the boat—and partly on the skipper!

Now, before getting underway, look at a boat's side and stern to see what provision has been made to protect the hull from scrapes.

A good boat will have a rubrail of some kind—often called a spray rail by landlubbers—or else the trim stripping on its gunwale will be made to serve well as a dock fender. If there's a metal cap at the aft end of the gunwale stripping, it should be so designed or located that it will not catch on a dock pile and get knocked off.

If the boat to be tested is tied up at a slip and must be backed out, this is an excellent chance to observe behavior when reversing. A propeller turning in reverse will tilt back the lower unit of an outboard or stern drive. If this happens without the driver realizing it and he then opens the throttle, thrust of the accelerating propeller can slam



WATER FLOWS UP SIDES of round bilge boat causing skin friction without adding to hull's lifting ability when on a plane



WATER DOES NOT TOUCH SIDES and shoots clear of hard chine hull's bottom, giving exceptionally dry ride, greater lift



DEEP VEE HULL is a good rough-water design which plows groove in the water, sending it out to sides with much spray



SIMPLE TEST of controls is to release steering wheel when running straight to see what boat will do

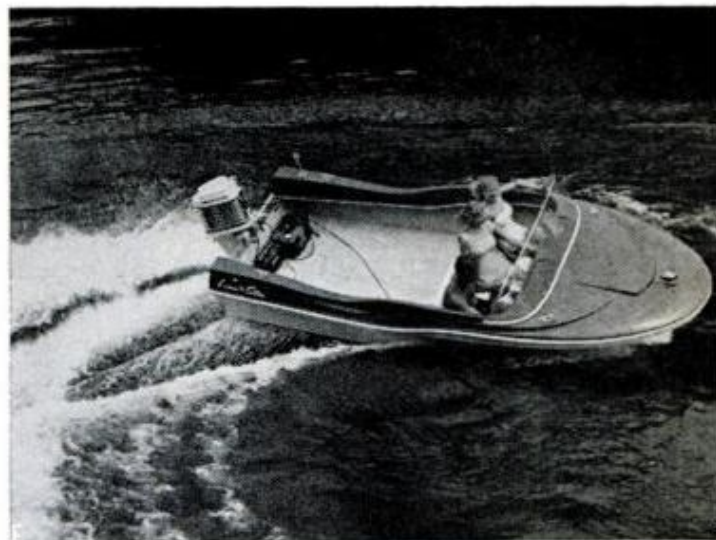
the lower unit forward against its stops. So, on stepping aboard, take a look at the motor or the controls to see what is provided in the way of a tilt lock. This is a device, sometimes automatic, sometimes manually released, that holds the lower unit from tilting against the drag of a slowed propeller but which will release and allow the lower unit to tilt if it strikes something in the water.

Moving out of the marina in forward gear, take note of a boat's attitude in the water. The shape of the immersed part of a conventional pointed-bow hull at the waterline is close to triangular, with the narrow end forward. So sometimes there is relatively little buoyancy under the weight of occupants on a seat mounted well forward in the hull. At low speed the boat will progress in noticeably bow-down attitude. This isn't good on a craft that is going to have to slow down to safely negotiate stretches of short, steep waves. It could "submarine"!

The larger a hull is, that much more volume does it have to displace water and afford generous buoyancy to carry a load.

When trying out a new boat you can sense this in a practical sort of way while moving slowly away from the dock area; you feel you are riding "on" a small boat but "in" a larger one. When you start feeling you're riding "in" a boat, you are in a size range that can make sense for open-water use. Boats that make you feel you are riding "on" them are, by and large, best used only on small or protected waters.

Clear of the marina, you can open the throttle. Many things start happening, so



BOATS TURN from stern. Keel area amidships and forward determines how well boat will answer helm

we'll have to digress to explain things that an experienced test driver takes in quickly as his boat accelerates and begins to move along over the water.

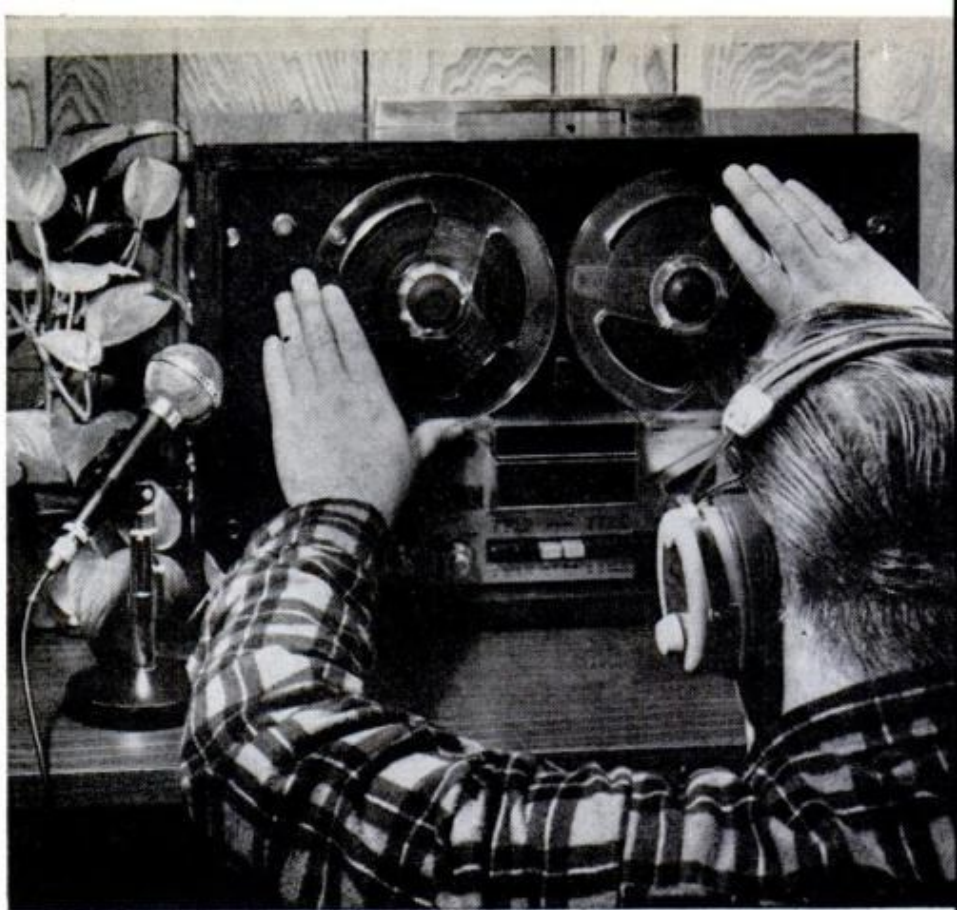
There are two basic kinds of hulls—displacement and planing. The former settles into the water until its hull has *displaced* a volume of water that weighs the same as the boat and its load. Water weighs about 64 pounds per cubic foot; a sailboat weighing 190 pounds carrying three persons totaling 450 pounds grosses 640 pounds and so displaces 10 cubic feet of water.

Being supported by the water, any such boat has to progress *through* the water. When it begins to move ahead slowly a small wave angles out from its bow. As speed increases, you can see this get larger—and at the same time a second wave begins to angle out from the bow a short distance back from the first one. As the speed increases, waves get bigger and since they are bigger, the distance between their crests must become greater. So, the second one moves farther and farther back along the hull sides.

Next time you see a tugboat or large sailing yacht moving along at good speed, either in actuality or in pictures, you can see this second wave in its ultimate position, tucked up under the stern. Water piles up at the bow and makes a strong bow wave, it then swoops down well below the painted waterline amidships, and swoops up again under the stern. There, it clings to the hull—and no matter how much more power you add, the boat cannot go faster. It just creates more and

(Please turn to page 230)

How to Keep Your Tape Recorder Humming Happily



By **WALTER SALM**/Photos by *Robert D. Borst*

Simple periodic maintenance jobs you can do yourself will give you better sound and keep serious trouble from developing. Here's a rundown on products that are readily available to make the task easy and fun

TAPE RECORDERS need more care than you may realize. Two absolute musts, for instance, are regular head cleaning and head demagnetizing. Depending on how much you use your machine, these jobs may have to be done as often as once a week. Keeping the heads in good shape will improve your sound and prevent serious trouble later on.

Hi-fi dealers are stocked with many handy aids for making recorder maintenance quick and simple. In addition, splicers, timing tapes and other accessories can increase the usefulness of your machine and help you have more fun with it. Most techniques described here apply equally to full-size reel-to-reel recorders or their smaller cassette and cartridge cousins.

Frequent head cleaning is important because fine oxide particles rub off the tape, leaving a reddish dust on the heads. As this builds up, it can clog critically tiny head gaps, resulting in poor recordings.

Special head-cleaning fluid is available with an applicator brush attached to the bottle cap. Or you can buy isopropyl alcohol at a drugstore. Apply cleaner with the brush supplied or a cotton swab and rub it gently over the heads. Follow with a dry cotton swab, being careful not to poke too hard at the delicate head gaps.

On most recorders, the heads are easily exposed by pulling off a cover plate. In addition, swab cleaner on the metal tape guides and capstan spindle. Do not get any on the rubber pressure roller; it may cause the rubber to deteriorate.

Demagnetizing the heads, called degaussing, is necessary because they are electromagnets and gradually build up some residual magnetism of their own. This is permanent magnetism—different from the heads' changing electromagnetic fields. It can cause a high level of background noise and spoil your tapes.

To degauss the heads, you'll need a spe-



YOU CAN GET AT THE HEADS EASILY on most recorders by slipping off a cover plate over the tape transport mechanism, as shown at far left, above. With the parts exposed, carefully brush a liquid cleaner on the heads and tape guides, wiping away dust and dirt (second photo from left). Some makes of cleaner come with an applicator brush, as here, or you can use cotton swabs. Keep the cleaner off the large pressure roller or it may deteriorate the

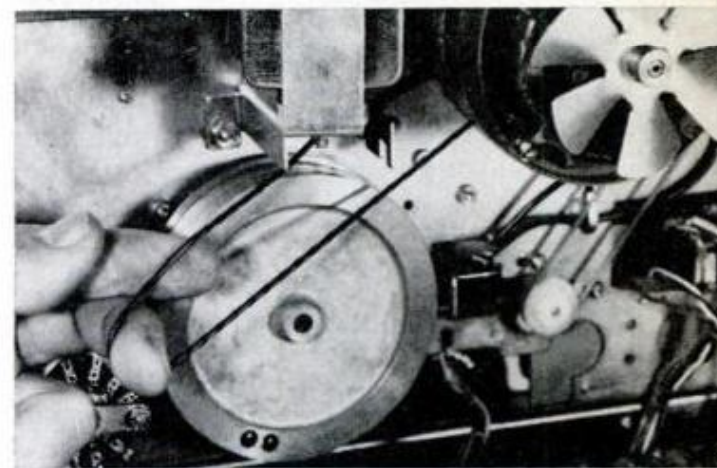
rubber. After this, demagnetize the heads using a special prong-tipped coil (third photo from left). Bring the tip close to each head without actually touching the metal, then slowly back it away. At far right, the pencil indicates tiny felt pressure pads that frequently wear down or fall off. Replace these with fresh felt, available in adhesive-backed sheets. Cut small pieces the same size and just press them gently onto the metal pressure fingers

cial instrument called a head demagnetizer. This is a coil with a pointed pole piece sticking out from the end. Before you plug it into an a.c. outlet, be sure no tapes are within about 20 feet. It will demagnetize everything in sight—including your precious recordings.

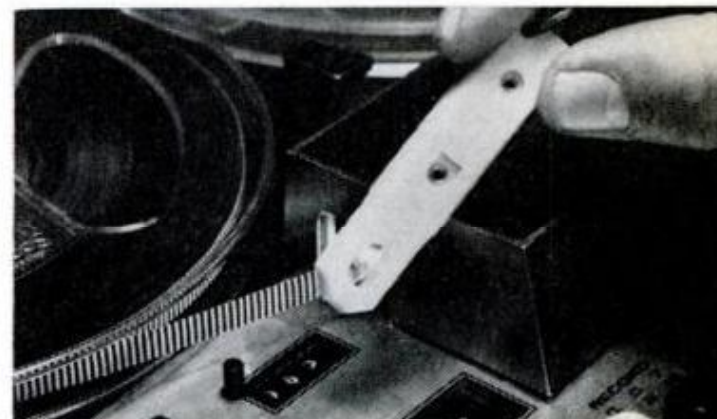
Bring the tip of the demagnetizer up to the head gap—almost but not quite touching it. You'll feel and hear a buzzing in the coil as it interacts with the head. Wave the tip in a tiny circle over the gap, then back it away slowly until you're as far from the recorder as the line cord will let you get before disconnecting it. Shutting off the coil abruptly while it's still near the head can leave magnetism in the head.

Repeat the procedure for each head except the erase head. It's not necessary to degauss this, as the bias voltage used for erasing keeps the head demagnetized. The erase head is the first one the tape reaches—the one on the left in recorders where the tape runs from left to right. Also demagnetize metal parts that touch the tape, such as the guide posts and capstan.

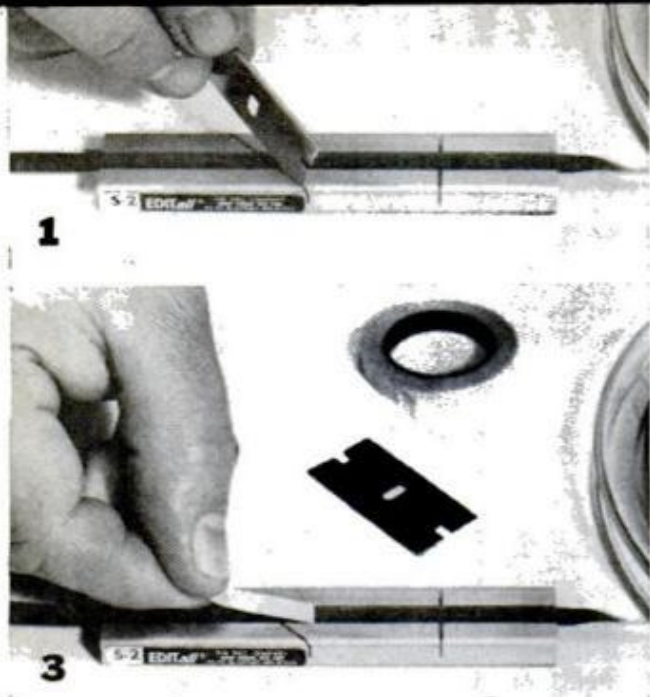
You can clean and demagnetize cassette and cartridge recorders the same way as the big machines, but be careful of the tiny, delicate heads. Usually not as accessible, they must be approached cautiously. While cleaning with a liquid solvent is best, you can get a special head-cleaning tape in cassette or cartridge form that



RUBBER DRIVE BELTS stretch with age and slip, causing erratic tape speeds. Check belts to see if tension is good, as above, and replace any that are weak. A stroboscopic speed tester, like one below sold by Robins, can also help you check recorder's accuracy. Special timing tape with black bars is viewed under a small strobe light. Speed is correct if the bars appear to stand still. If they creep forward, machine is fast; if backward, machine is slow



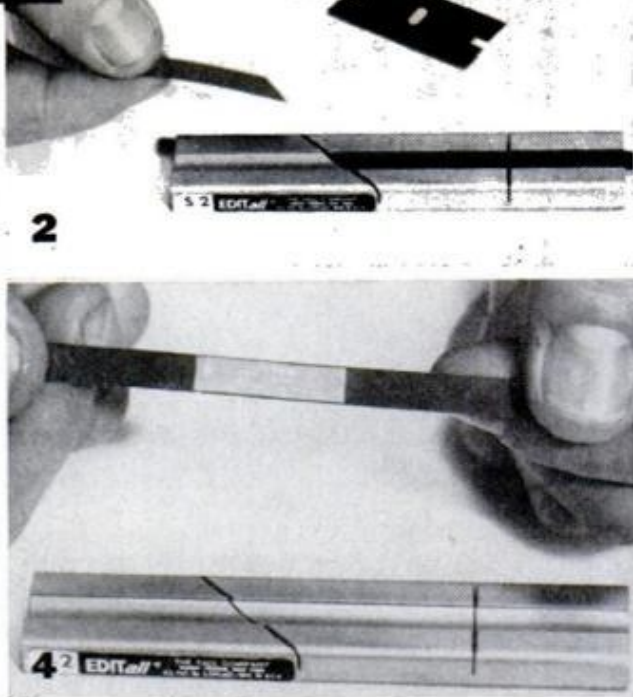
HOW TO USE A SPLICING BLOCK



SIMPLEST SPLICING TOOL is a slotted block for making cuts with razor blade. Tape is first cut at desired point, using diagonal slot to guide blade (1). Ends, butted together, are held in block's groove as splicing tape is pressed over joint (3).

wipes away dirt as it passes the heads. You put it on and let it run as if you were playing a regular cassette or cartridge tape. For automobile cartridge players, there's a head demagnetizer that plugs into the cigaret-lighter socket.

While you're working around the transport mechanism, examine the pressure pads that hold the tape against the heads in reel-to-reel recorders. These are small bits of felt cemented onto spring-loaded metal fingers, one for each head. In time,

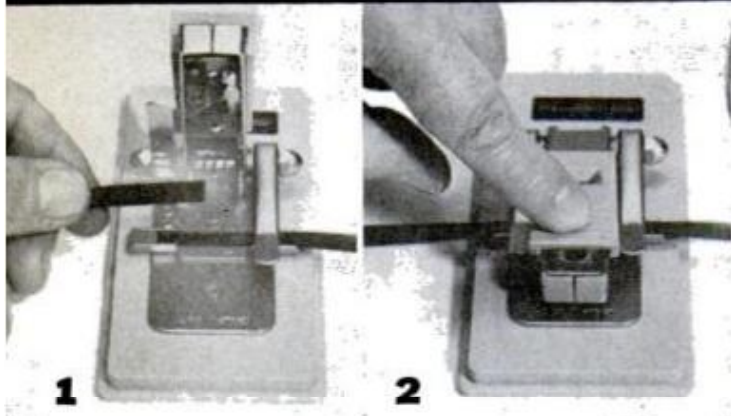


Splicing tape is $\frac{3}{16}$ inch wide—slightly narrower than $\frac{1}{4}$ -inch recording tape—so it can't interfere with transport mechanism (4). It's placed on underside of joint, away from heads. Editall block shown is made by Elpa Marketing, New Hyde Park, N.Y.

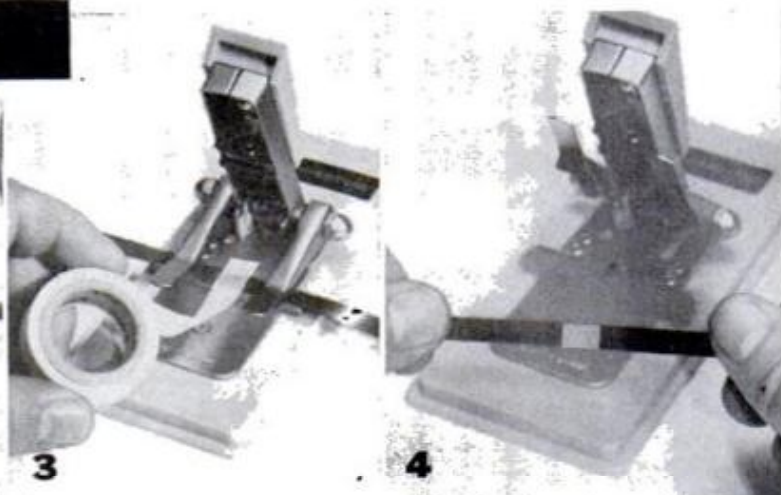
the felt wears down or comes off and must be replaced to keep the metal from scratching the tape. Replacement felt is available in a self-sticking, adhesive-backed sheet. You just cut off whatever size pieces you need with scissors and press them onto the metal fingers.

Also subject to periodic failure are rubber drive belts and drive wheels. Heat and age cause the rubber to dry out and lose its resiliency. Belts stretch and slip. Wheels get hard and bumpy. The results

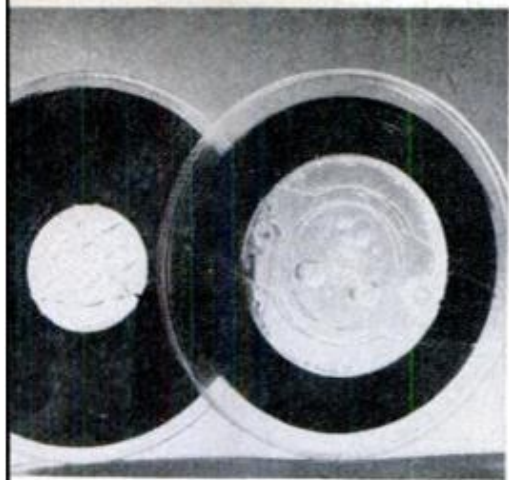
HOW TO USE A TAPE SPLICER



SPLICING MACHINE cuts and joins tape automatically. Tape ends are overlapped under hinged cutter and held in place by spring-loaded fingers (1). Pressing cutter down (2) slices through both tapes, leaving ends butted together. Splicing tape is then



applied to the joint (3) and cutter is pressed again, this time trimming off excess splicing tape to make a neat splice (4). Wide splicing tape is used in this method since it's put on crosswise. The splicer shown is made by Robins, Flushing, N. Y.



NEW LARGE-HUB REEL at right above offers more even takeup tension, but doesn't hold as much tape as standard reel at left. Not intended for storing tape, it's useful for playing or editing short tape passages



HANDY HEAD-CLEANING TAPES are designed for small cassette and cartridge recorders where heads may not be easily accessible. You just play the tape and it polishes the heads clean. Tapes for making recorder tests are also available



TIMING TAPE made by 3M Co. has identification marks every $3\frac{3}{4}$ and $7\frac{1}{2}$ inches. Marks are one second apart at $3\frac{3}{4}$ and $7\frac{1}{2}$ -inch tape speeds so you can splice in accurately timed pauses between taped passages

are erratic tape speeds, wow and sloppy takeup or rewind.

Replacement belts and wheels are available from recorder manufacturers for most models. Installing them is easier on some machines than others. You will first have to remove the tape chassis from its case or base to get at the back. With the chassis exposed, run the machine through its various functions to see if you can spot which belts or wheels are slipping. On some models, new belts and wheels can be put on without disturbing the rest of the machinery. Others may require a major

disassembly. If you aren't sure how to proceed, leave this job to a repairman.

Worn connector cables are a major source of grief with tape recorders just as with other hi-fi components. Check for fraying or looseness at the plug ends and replace any cables that show wear.

Editing your tapes can add a lot more enjoyment to your recording. You can cut out bad portions and save only the good. You can group similar selections together so a whole collection is instantly available—say, a reel of popular music, a reel of

(Please turn to page 226)

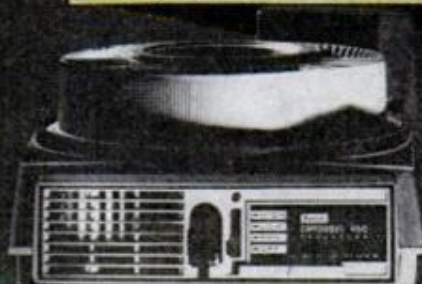
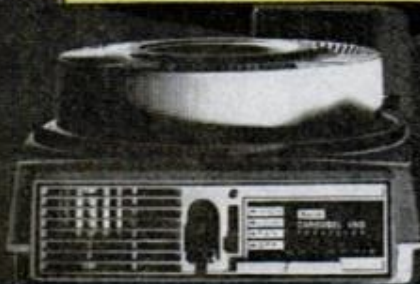


TAPE-CARE KIT at right contains a head cleaner, head demagnetizer, splicer, splicing tape, tape clips, identification labels and extra reels of recording tape all in a handy carrying case. Price is \$33 from Robins Industries, 15-58 127th St., Flushing, N.Y. Also helpful are the inexpensive booklets above. They are, left to right: *Tape Recording the Sounds of Your Life*, \$1.50, Robins; *Tape Editing and Splicing*, 55 cents, Robins; *What You Should Know About Your Tape Recorder*, \$1.30, Robins; *Your Tape Recorder*, \$1, Elpa Marketing Ind., New Hyde Park, N.Y., and *Recording Basics*, 50 cents, 3M Co., St. Paul, Minn.

ANIMATED

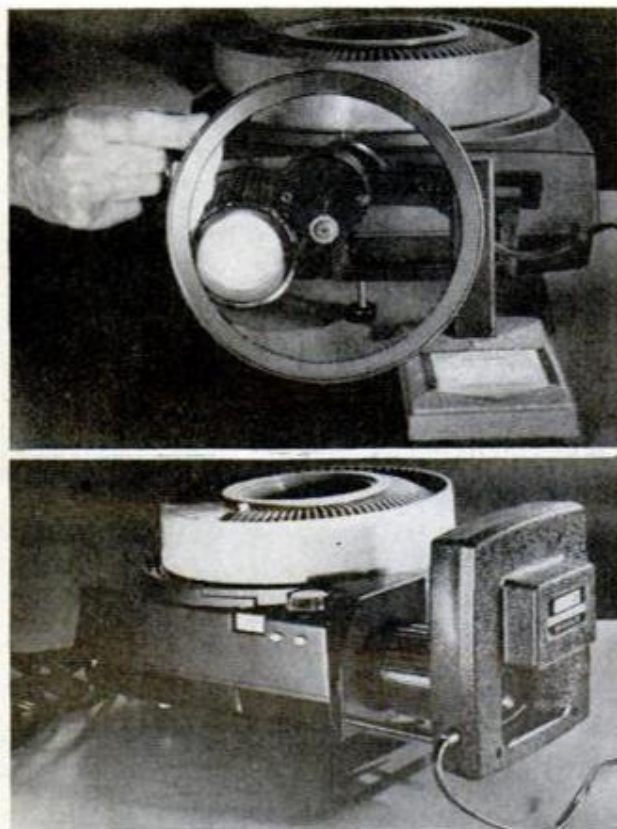


SLIDES



ADD MOTION TO YOUR

A spinning filter in front of your projector can make your transparencies look as if they're really moving. Here's how the ingenious system works and what to buy

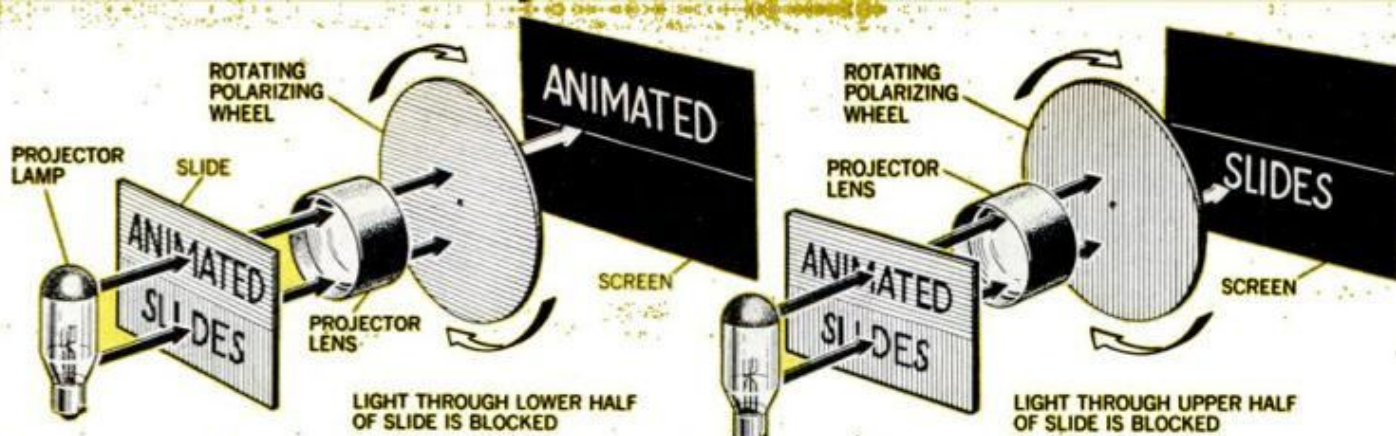


POLARIZING SPINNER is key to creating simulated motion in animated slides. Two types of motor-driven wheels are shown above. At top is inexpensive model made by Technamation, Inc. and sold by Edmund Scientific for \$9. Somewhat more elaborate one at bottom is made to fit Kodak Carousel projectors. It's available at Kodak audio-visual dealers for \$24.50, plus about \$7 for mounting bracket

BLINKING TITLES, lights that flash on and off, water that appears to flow, colors that dance wildly on the screen—these are some of the fascinating effects you can add to your slide shows. Nothing actually moves; the motion is simulated by a trick process, just as the lights running around a theater marquee appear to move but really don't. Such lights are merely turned on and off in a progressive sequence giving an illusion of movement.

Animated slides work in the same way. You "turn off" one portion of the scene and at the same time "turn on" another portion, and the result is apparent motion. The secret lies in polarizing filters. These are sheets of film with fine, closely spaced parallel lines. The lines act like tiny venetian blinds—only light waves vibrating in the same plane as the lines can get through. If you shine light through one filter with the lines horizontal and place another filter in front with the lines vertical, the light is blocked. Turn the second filter so its lines match up with those of the first and light passes easily through.

This is the principle of adding motion to slides. One piece of polarizing material is attached to the slide itself and a second polarizing filter is placed in front of the projector. The front filter is in the form of

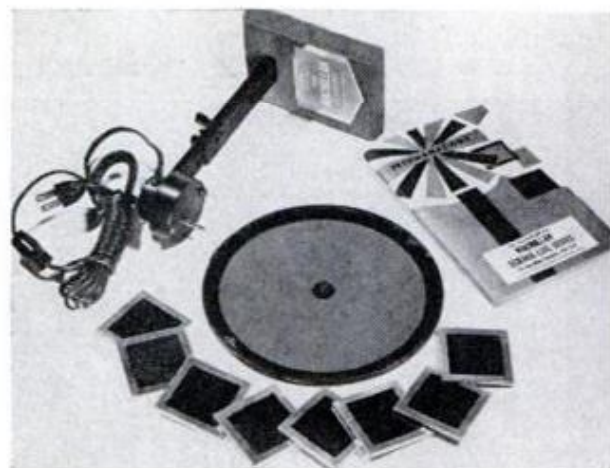


TITLE WORDS FLASH ON AND OFF magically in demonstration setup above and on facing page. Upper word on slide is backed with polarizing material with lines running horizontally. Lower word is backed with the same material but with lines running

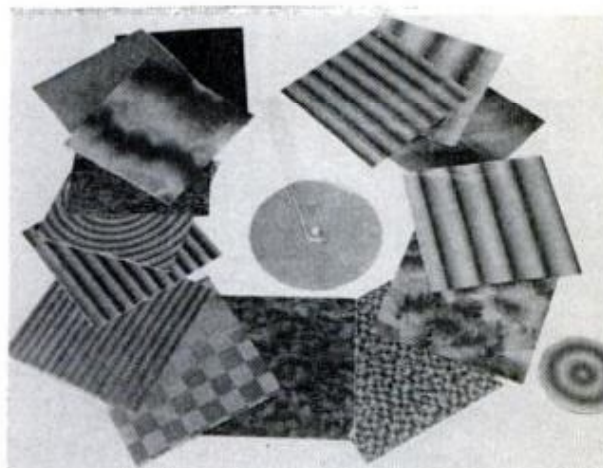
vertically. Rotating polarizer wheel in front of projector lens first lets upper word show through while blocking lower one, then lets lower word appear while blocking upper one. Words thus blink on and off alternately for an eye-catching effect

PHOTO SLIDES

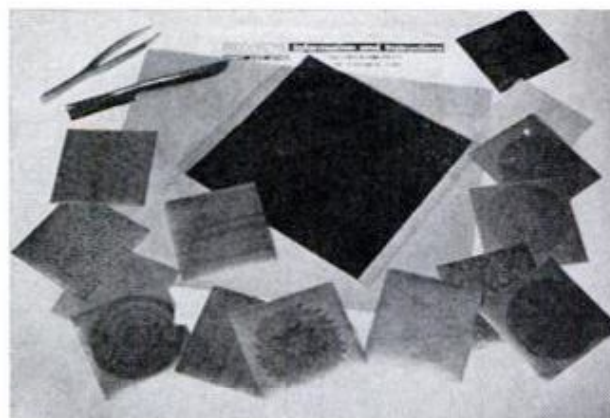
By WALTER E. BURTON



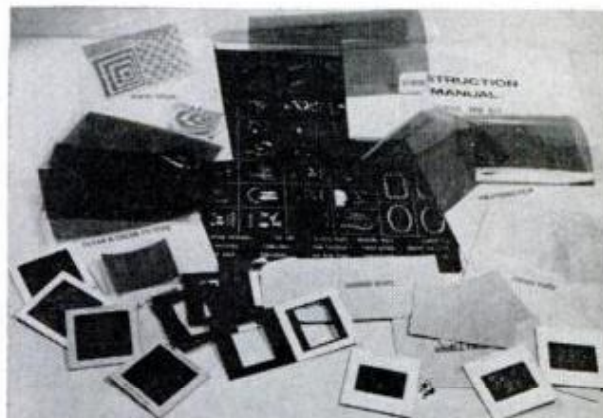
LOW-COST STARTER KIT includes motor-driven polarizer wheel and eight sample motion slides showing workings of ear, heart and other functions. It is \$9 from Edmund Scientific or Technamation, Inc.



STOCK GEOMETRIC PATTERNS offered by Technamation, Inc. include the array above. A pocket spinner, shown at center, lets you preview each effect by turning the disc slowly as you view the pattern



ASSORTED SUPPLIES for adding motion to slides are available in this kit from Edmund Scientific. It contains polarizing material, geometric designs and slide-making tools. Two sizes are \$10 and \$20



SLIDE-MAKING KIT contains printed words for titles, decorative borders, polarizing material, colored filters and other aids. Available from Polarized Animations, the Series 100 kit costs \$7.95

a motor-driven wheel. As the wheel turns, its polarizing lines change from vertical to horizontal and back to vertical again in rapid succession. The polarizing material on the slide is put on with its lines running in different directions over different areas. Say you make up a title slide having one word backed with vertically polarized film and another word backed with horizontally polarized film. The first word will be visible on the screen only when the spinning filter wheel has its lines vertical, and the second word will be visible only when the lines are horizontal. The two words will thus appear to flash on and off alternately as the wheel rotates, adding an interesting effect to your slide presentation.

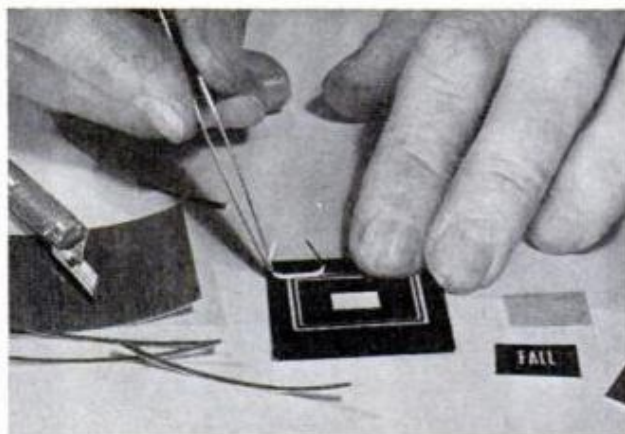
Polarizing materials are available in a variety of forms. Some can be applied directly to slides you already have. Others can help you make eye-catching title slides. Still others can be used by themselves to produce novelty slides for livening up an evening's entertainment.

In addition to regular polarizing film in which the lines all run in the same direction, there are also special polarizing materials designed to produce particular motions. Suppose you have a slide that shows a waterfall or fountain. You can get polarizing material that simulates falling water. With a piece of this cut to fit the shape in your scene and pasted over it, the water will actually appear to flow. Other specialty motions that are available include rising vapor, sound impulses and explosion bursts.

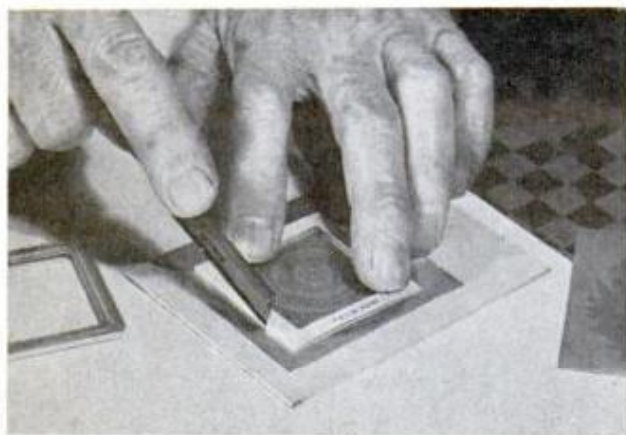
One of the handiest polarizing aids is called linear motion material. This is polarizing film in narrow strips with the lines arranged alternately in such a way that they produce motion in a straight line—like the traveling lights on a theater marquee. If you paste strips of this around the edges of a title slide, you can create the effect of a theatrical sign with flashing lights. Two strips running in opposite directions will make the lights appear to



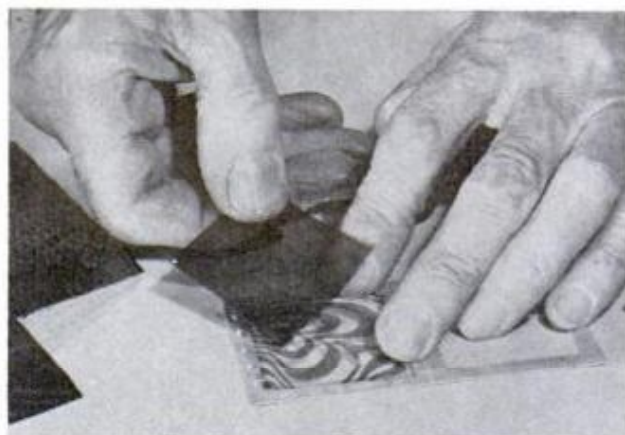
CRUMPLED CELLOPHANE combined with polarizing filter produces striking patterns of changing color. Bind a small piece of each together in a slide mount and insert with filter toward the projector lamp



ADDING "MOVIE MARQUEE" BORDER around a title slide is done with narrow strips of linear motion material. Strips are self-sticking. You just peel off backing paper with tweezers and paste them on

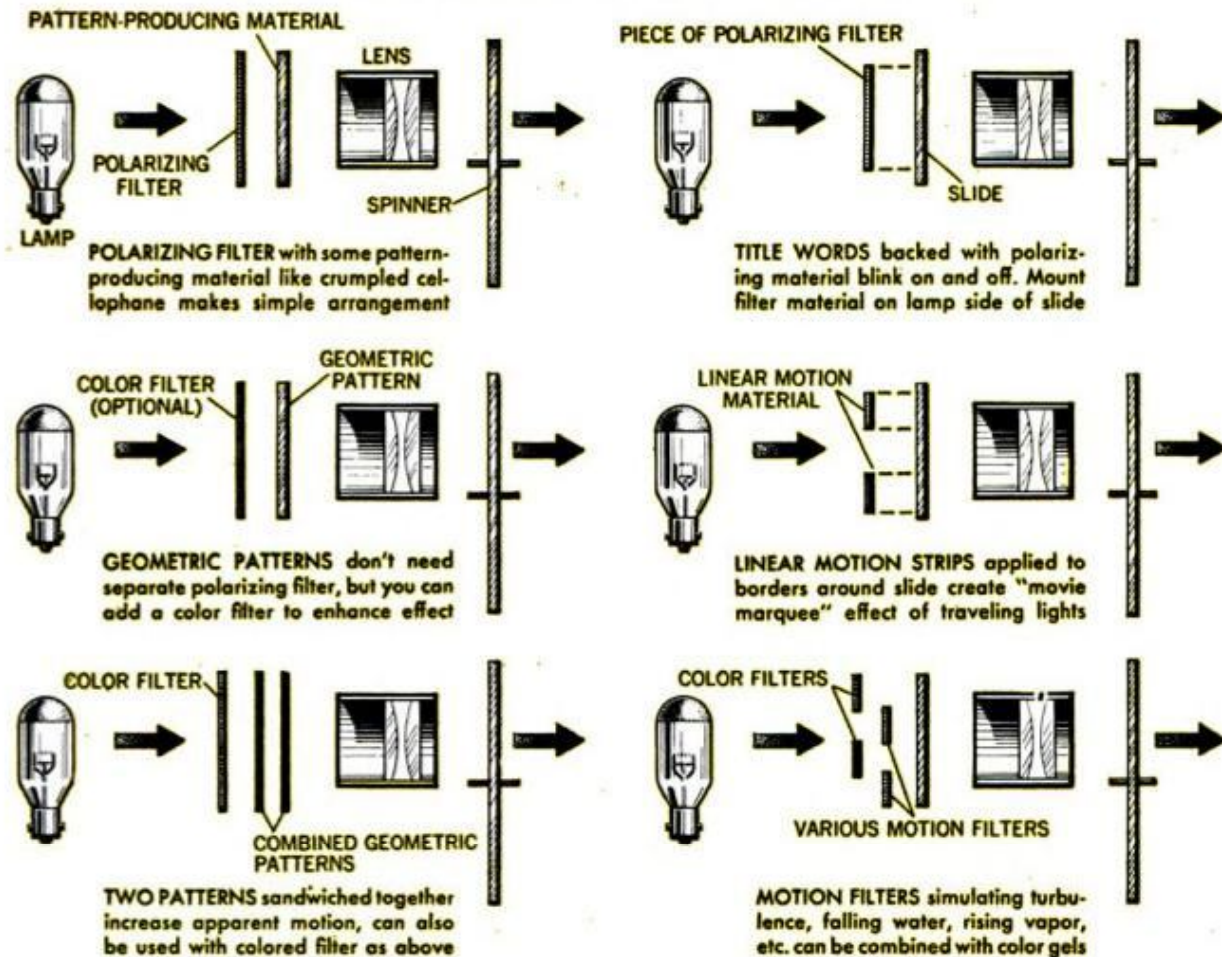


GEOMETRIC PATTERNS—here a whirling pinwheel—come in kit form in many designs to create exciting motion effects. Cut to fit in standard slide mounts, they contain their own polarizing material



COMBINING A COLOR FILTER with a piece of geometric polarizing material can enhance effect you get. You simply sandwich the two together in a slide mount. The filters are available in many colors

SIX WAYS TO ASSEMBLE MOTION SLIDES



move both clockwise and counterclockwise at the same time. These border effects can be combined with other motions, such as alternately flashing title words. The result can be spectacularly impressive to an audience that has come expecting to watch "stills."

Polarizing filters in the form of geometric patterns are another way to pep up a slide show. In this case, the filters are used by themselves instead of being applied to an existing slide. You can intersperse them through your regular slides to add unusual touches. There are pinwheels that spin, checkerboard designs with shifting squares, exploding sunbursts and so on. The patterns come in sheets and are cut to fit in standard slide mounts. Often you can enhance the effect by combining a geometric pattern and colored filter. An-

(Please turn to page 227)

SPINNING COLOR WHEEL, set up in front of polarizer disc (top right), adds varicolored effects to simulated motion. Wheels are available in several sizes from Edmund Scientific for about \$15 to \$17



Turn That Camera Carton Into a Fancy Fitted Case

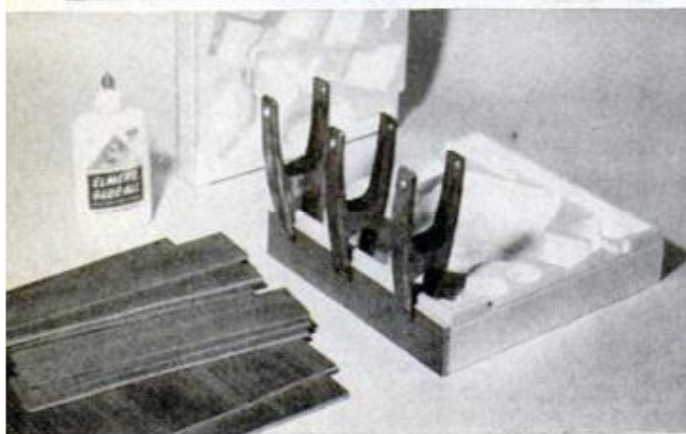
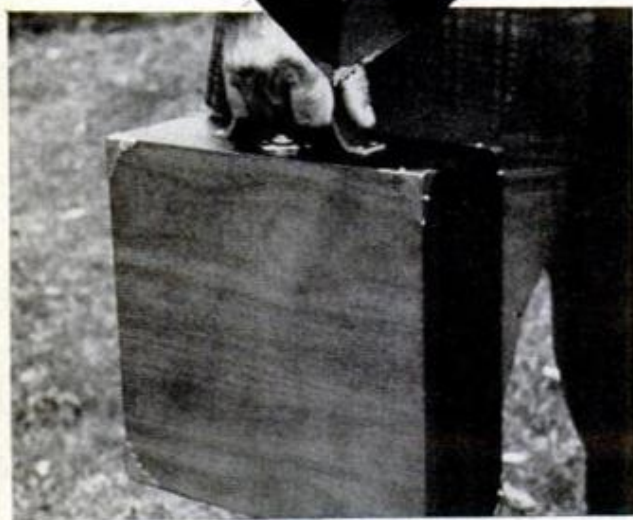


MOST NEW CAMERAS today come packed in handsome, contour-molded cushioning material to protect them from damage. These foam-plastic carton liners provide the perfect makings for a custom-fitted camera case. They'll not only keep your equipment in good condition, but will give it a neat appearance as well. In most cases, there are handy pockets for accessory items, or you can add your own cutouts with a knife.

The simplest way to make the case is to build it right around the liner instead of trying to fit the liner into it. You just glue strips of thin material directly to the plastic. Cover each half of the liner separately, then hinge the two together. The case shown here is made of scraps of 1/4-inch veneered plywood, but you could also use plain plywood or hardboard and paint it. Use white woodworking glue to fasten on the pieces, not a solvent cement that might melt the plastic.

Small hinges, catches and decorative metal corners are available at luggage and hardware stores. For a handle, you can use a door pull or a strip of leather. Luggage shops can usually supply metal anchor strips for strap handles. For easier carrying in the field, you might also want to add a shoulder strap. ★★★

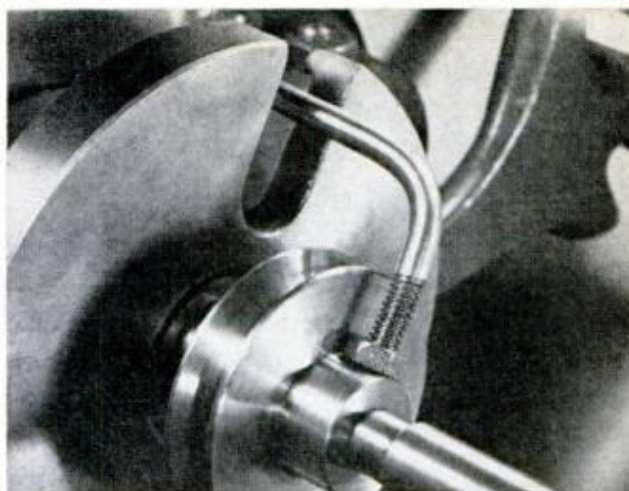
SPRING CLAMPS temporarily hold strip of thin plywood against the plastic liner until the glue sets (bottom left). You could also use large rubber bands or string. Use butt joints for simplicity. Covering the exposed plywood edges with paint or stain will make them practically unnoticeable



HINTS FROM READERS

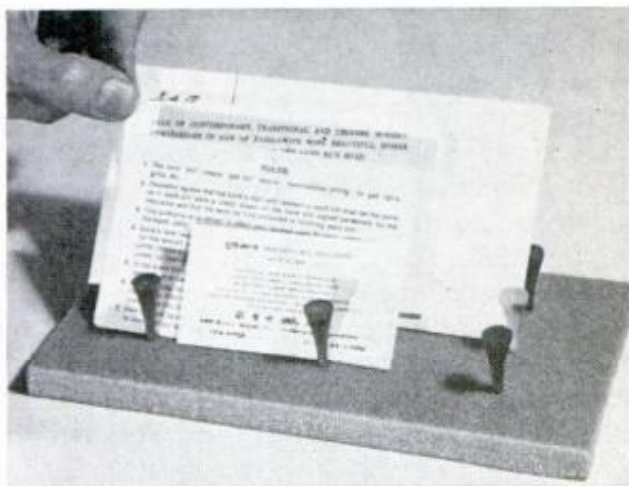
Pulley pinch-hits for lathe dog

Lacking the right-size lathe dog for a special job, I used a pulley instead. A cast pulley with its projecting hub works best. Simply thread a shaft to fit the setscrew hole, then bend it to engage the slot in the lathe's faceplate. Clamp the pulley on the workpiece with the L-shape setscrew and lock the setup with a nut. Shims are inserted in the setscrew hole when necessary to bring the tail in line with the slot in the faceplate.—*Peter Legon*



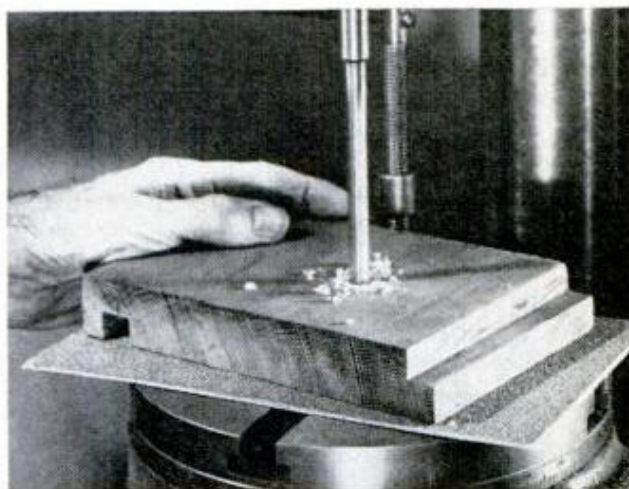
Quickie letter rack

In just minutes you can make a desktop rack for holding letters, cards and the like. Simply cut a piece of Styrofoam to desired size and push in several golf tees to form three rows paralleling the length of the plastic. For eye appeal, try using colored foam and tees of various colors.



Tired tires put back to work

Recently, while using my portable saw to rip some large sheets of plywood at a friend's house, I was dismayed to learn that he didn't own a sawhorse. Then I hit upon the idea of spreading old tires about and placing the plywood on top. It actually works better than sawhorses, because you can kneel on the sheet and follow the cutting line clear across.—*Harold Miglin*



Holding drill-press work

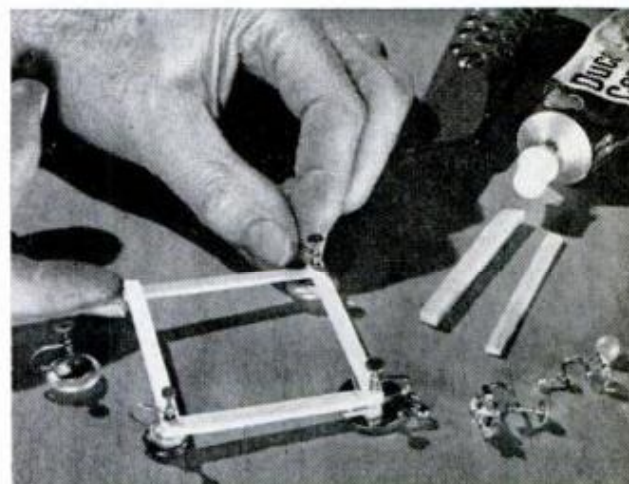
A good stunt sometimes used to help hold wood or other material on a drill-press table is to glue two pieces of sandpaper back-to-back to form a nonskid insert between the work and table. Another good way to provide a means of keeping the work from whirling is to use a single sheet and attach a C-clamp as shown.

—*Walter E. Burton*

Mini-size work clamps

Don't let your wife throw away any earrings she no longer uses; they make dandy clamps when you're involved in modelmaking and other small projects. One type has a spring-action which lets you do fast, one-handed clamping. A second kind is the familiar threaded type which requires two hands to secure.

—*William Slamer*



How to Do a Complete

THE TOOLS YOU'LL NEED for a brake job are not unique or expensive. A drum turning machine is an exception, but not all professionals have this large, expensive equipment on hand, either. You can do what they do: Take drums to a professional brake shop that has a machine.

Although all drum-brake setups are essentially the same—consisting of a wheel cylinder, shoes, springs and a drum—differences between them require that you have service instructions for yours. If you don't have these instructions in your car's service manual you can get other manuals for \$1 or \$2. They are published by manufacturers of brake replacement parts. Two especially good ones are the *Delco Moraine Drum Brake Service Manual for American Automobiles* (Delco Moraine Div., GM, Dayton, Ohio) and *Raybestos Brake Service Guide* (Raybestos Div., Raybestos-Manhattan, Inc., Bridgeport, Conn.). Order from the company's publications department.

First determine what tools you'll need. Some tools required to overhaul some systems may not be needed for another system. For example, take a wheel-cylinder hone that costs about \$8. One would think that all wheel cylinders are

overhauled in the same way, but such is not the case.

General Motors does not recommend honing of cylinders originally placed on its cars. Wheel cylinders used on Chrysler Corp. cars may or may not require honing, depending on the degree of damage. Honing of cylinders used on Ford Motor Co. and AMC products is required if damage is present.

As explained in *How to Do a Complete Brake System Checkout* (page 100, March PM), wheel cylinders should be repaired or replaced if fluid leaks out when you pull back the boots. Furthermore, it's a good idea to overhaul cylinders during a complete brake job. Wheel-cylinder overhaul kits are sold at auto supply stores.

Although you may determine that you can rebuild your wheel cylinders while they're on the car, it's better to remove cylinders and work on a bench. You can inspect and clean more thoroughly.

After disconnecting the brake line feeding the cylinder, place tape over the open end of the line to keep out dirt. Don't bend the line.

With the cylinder on the bench, pull off boots and discard them. Press out pistons, cups and expanders. Discard old parts that are duplicated by new parts in the rebuild

DISASSEMBLED WHEEL CYLINDER has these parts: external boots, pistons, cups and spring expanders



170

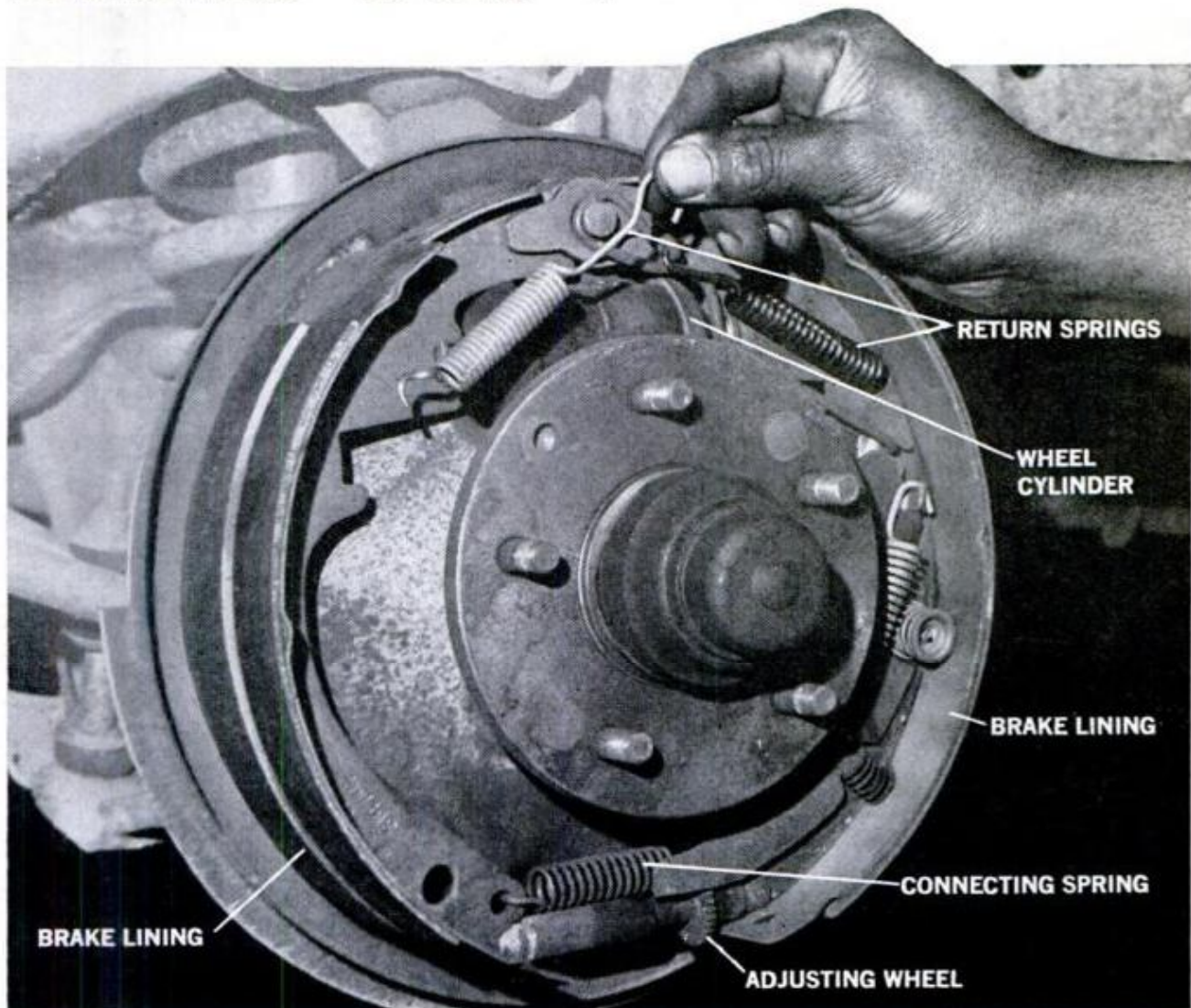
CROCUS CLOTH can be used to literally polish bore of wheel cylinder from GM car. Don't use pressure



POPULAR MECHANICS

Brake Job

By MORT SCHULTZ



COMPONENTS OF TYPICAL DRUM BRAKE include hydraulic cylinder, springs, linings, "star-wheel" adjuster

kit. Parts generally retained are those made of metal.

Clean retained parts in fresh brake fluid or alcohol. Inspect them for scratches or corrosion. Be sure spring-expanders are not cracked or distorted. If you're working on cylinders off a GM car and you find that the bore is corroded, replace the entire cylinder. Corrosion will show up as pits or roughness in the metal.

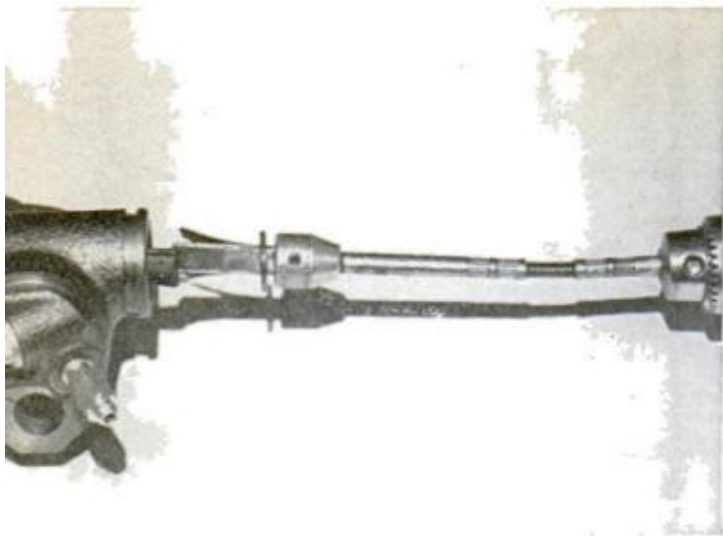
If the cylinder is just stained, polish it with crocus cloth. Revolve the cylinder supported by your finger on the cloth. Don't use emery cloth or sandpaper, don't slide the cloth across the bore in a lengthwise manner, and don't use pressure. Clean the cylinder in brake fluid or alcohol after polishing.

Cylinders used in Chrysler Corp. cars can usually be cleaned with crocus cloth

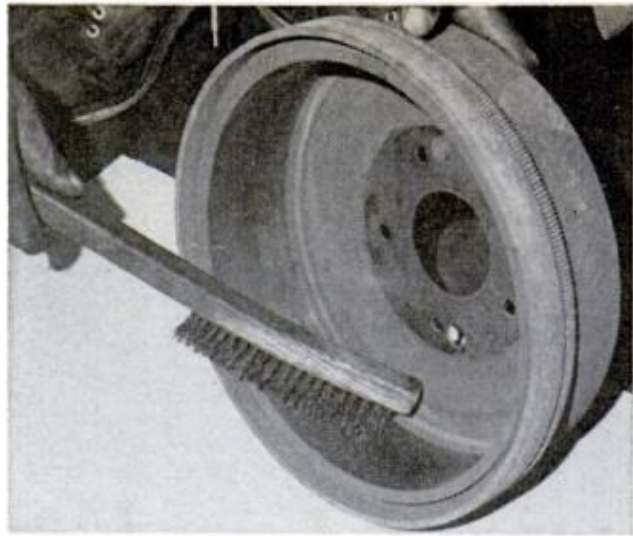
if they have light scratches or show signs of corrosion. Use a circular motion. If cylinders have deep scratches or are scored, they can be honed. However, the diameter of the bore must not be increased by more than 0.002 in. If the cylinder doesn't clean up by then, replace it. To check the bore diameter, insert pistons into the bore. Use a brake or piston gauge, which has extra-long feelers, to check clearance between the piston and bore.

If cylinders of Ford Motor Co. and AMC cars are scored or rusted, hone the bore. However, don't increase the diameter of the bore by more than 0.003 in. Before inserting replacement parts into the bore, coat them with clean brake fluid. This acts as a lubricant.

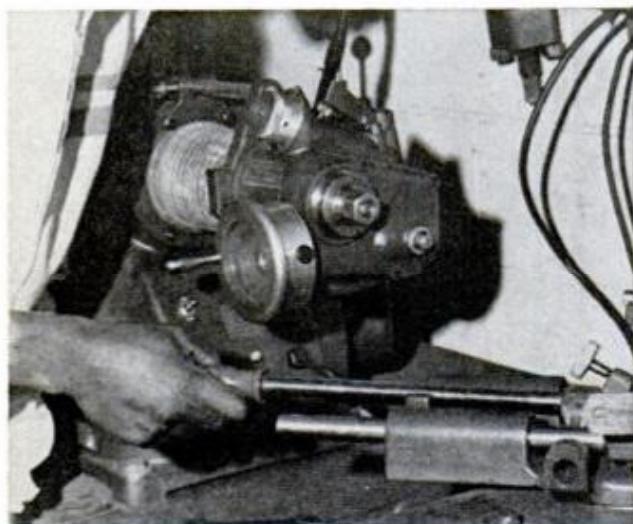
When you inspect brake linings carefully they will often give a clue to defects



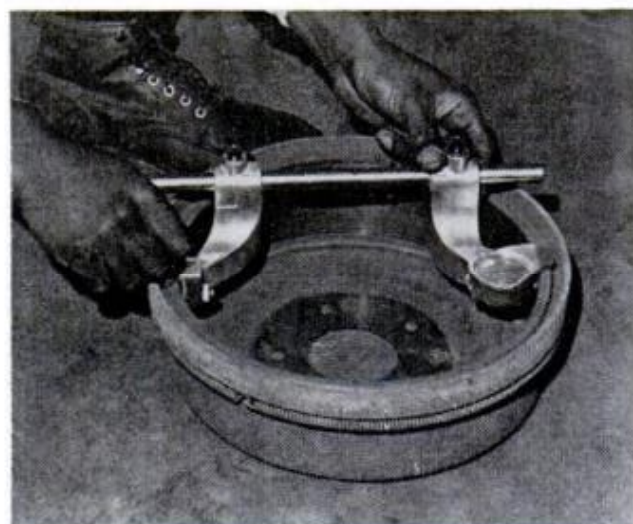
HONING a wheel cylinder removes scratches. Never remove more metal than is recommended (see text)



CLEANING BRAKE DRUM with wire brush is slow, but best way if you don't have compressed-air source



DRUM-TURNING MACHINE is professional equipment. Cost to turn one drum should be about \$2.50



DRUM IS MIKED to check that metal isn't too thin, and to allow matching of new linings to the drum

in the brake drum. If linings of one wheel are worn more than the others, it often means a drum's surface is rough. Uneven wear from side to side on any one set of linings is caused by a tapered drum. Linings that are worn badly at toe or heel indicate an out-of-round drum.

Clean drums thoroughly. Use a stiff brush to remove hard deposits. Then clean the drum's surface with a non-oil-base solvent such as carburetor cleaner or lacquer thinner. If grease or oil is on the drum, find the source and fix the leak.

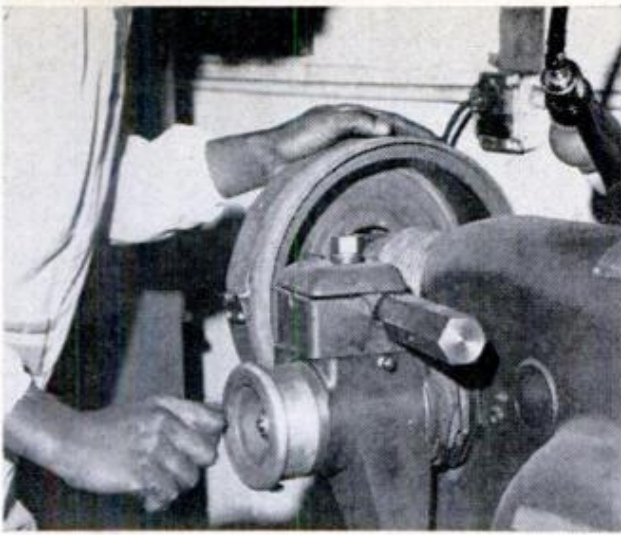
If a drum is cracked, it must be replaced. Don't attempt to weld it. Most surface defects, such as roughness and scoring, can be removed by having the drums turned. Go to a brake shop to have this done. Only a thin cut is usually necessary. After taking the cut, check the drum with a brake-drum micrometer. If the

maximum diameter reading exceeds a new drum's diameter by more than 0.060 in. (0.030 in. for Chrysler total-contact brakes), replace the drum. If drum metal is too thin, the drum will crack when it gets hot.

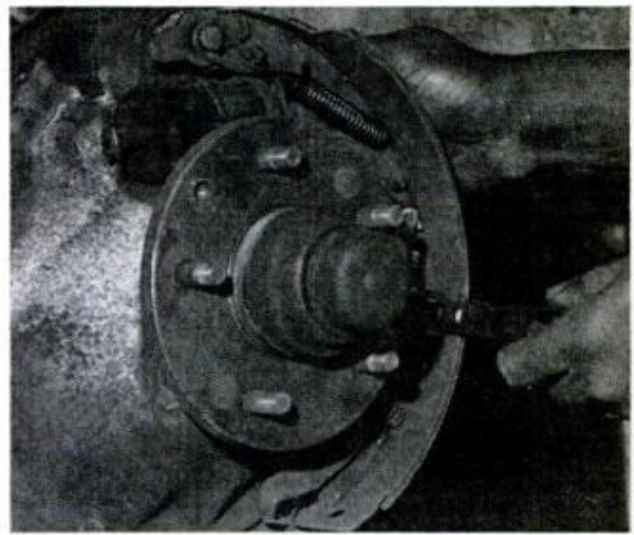
Also have the brake shop match the new linings to their respective drums. If linings don't come into full contact with their drums, braking will be difficult and linings will wear rapidly. To match linings to drum, the machine is set to the drum's micrometer reading. The lining is then ground down where necessary.

As you remove return springs from the backing plate, examine each carefully. Weak springs can cause drum scoring and excessive lining wear. Replace any spring that has lost tension, or is damaged.

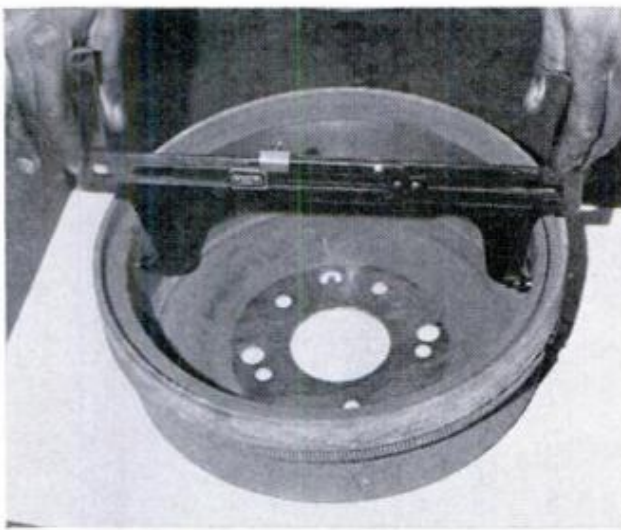
Examine the raised shoe pads on the backing plate to make sure they're free of



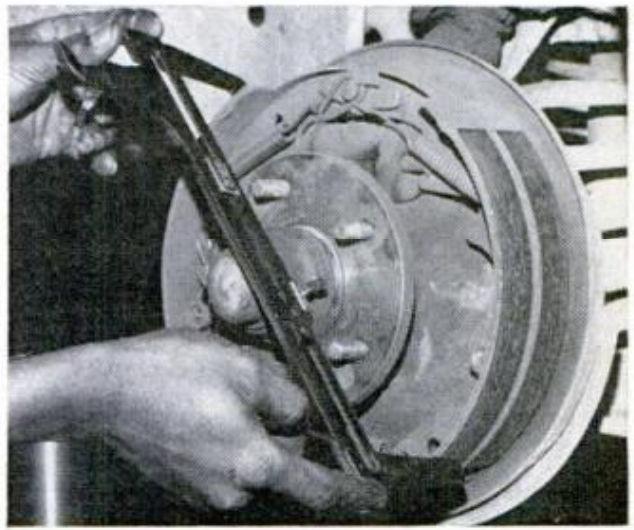
GRINDING BRAKE LINING removes high spots, and insures full contact with the drum for longer life



BACKING PLATE should be inspected for damage and then cleaned before you install new brake shoes



GAUGE METHOD of adjusting brakes is best way. Here, gauge is set to inside diameter of the drum



GAUGE IS THEN SET on the linings and heel-to-toe measurement is set by turning the wheel adjuster

corrosion and dirt that can prevent shoes from sliding freely. Use fine emery cloth to remove minor defects on the backing-plate surface.

When new shoes have been installed and the brake reassembled, it's important that brakes be properly adjusted. Adjustment of self-adjusting brakes, which have been in general use since 1963, is made easy and more accurate by using a brake shoe adjusting gauge. Set the tool to the inside diameter of the brake drum and tighten the lock screw.

Turn the tool over and fit it over the brake shoes. Expand the brake shoes by manually turning the star wheel until the gauge just slides over the linings. Rotate the gauge over the lining surface to assure that it has correct clearance from heel to toe.

If you don't have a gauge, adjustment

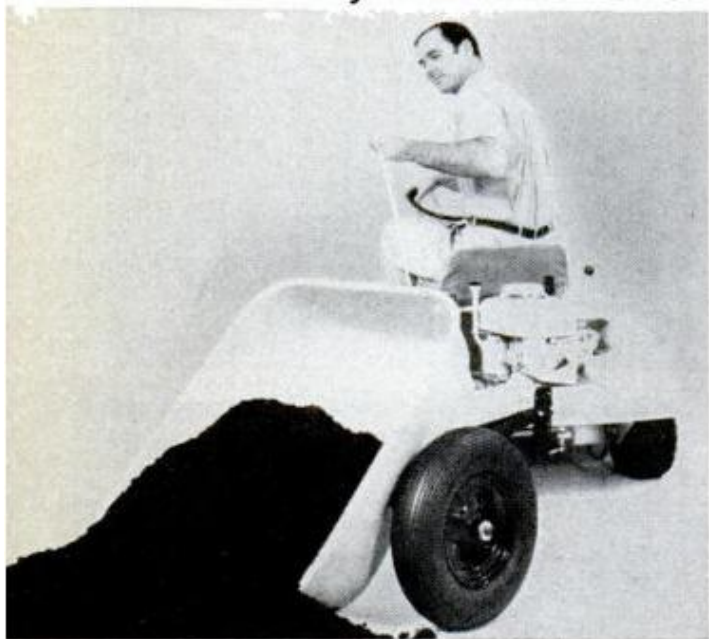
can be made on most cars with the brake drums installed. Remove the cover over the adjustment hole in the backing plate. On some GM cars, access to the star wheel is made through the drum rather than from the backing plate side.

Insert a star-wheel adjusting tool to engage the teeth of the star wheel. Expand brake shoes until a heavy drag is put on the wheel. Now, back off the star wheel until there is no drag. This takes about 30 notches of the wheel when adjusting Delco brakes, and about 20 notches when adjusting Bendix and Wagner brakes.

After making the adjustment, apply firm pressure to the brake pedal to be sure there's adequate pedal to allow you to drive the car. Now, make a number of alternate reverse and forward stops in order to bring your pedal reserve up to normal. ★★★

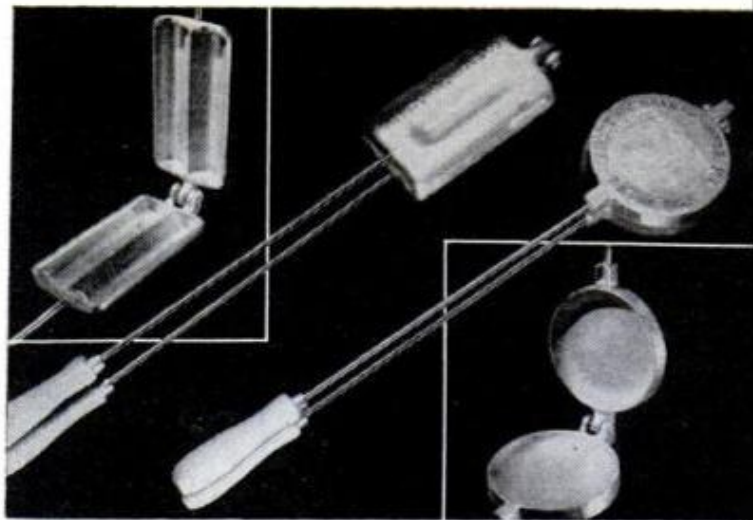
EXCITING NEW PRODUCTS

By CATHERINE BILSKI

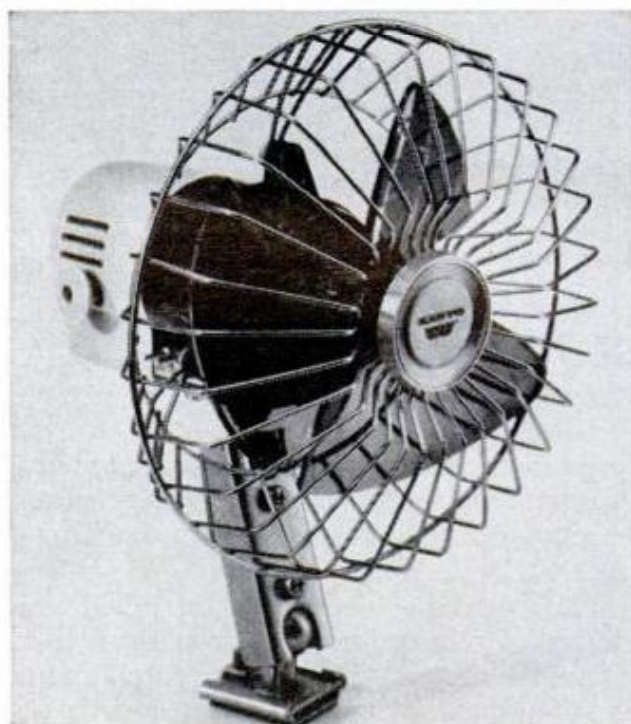


WORKHORSE DUMP TRAILER for garden tractors holds whopping $5\frac{3}{4}$ cu. ft. of sand or dirt. It features one-piece seamless tray, a hitch which is adjustable to six different heights and a latch that releases and catches simply by pulling cord from driver's seat. Dumps automatically and rolls on two rugged 16-in. ball-bearing wheels. Knocked down, sells for \$40. Made by Radio Steel & Manufacturing Co., 6515 W. Grand, Chicago, Ill.

OWNERS OF TRAVEL TRAILERS, truck campers, motor homes, cars, trucks and boats can stay cool in the summer and warm in the winter with the help of a new 12-v. oscillating fan from Kenco Engineering Co., Box 316, Middlebury, Ind. 46540. The fan features 90° side-to-side movement that keeps air on the move in close quarters. The compact fan sells for \$24.95. A remote on-off switch is available for an additional 98 cents.

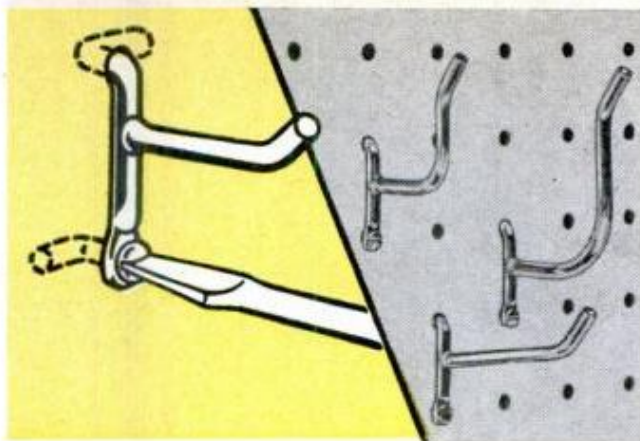


ENJOY CAMPFIRE SNACKS in one minute with either the Minute Pie Mold or Wiener Mold. Use either of these molds in the campfire, on the stove at home, over charcoal or in your fireplace. Just heat the mold, butter the interior surfaces, put in the bread and filling, then heat. Priced at \$4.95 each, post-paid from Minute Pie Mold Co., Box 9221, Cleveland, Ohio 44138.



ALL-PURPOSE SILICONE SEAL comes in a new 12-oz. cartridge-size that fits all standard caulking guns. Permanently flexible sealer can be used to mend fabrics and mount objects, also as a permanent caulk for gutters, windshields and in the joints between bathtub and tiles. Available clear or mildew-resistant white, the sealer is sold through hardware and department stores for \$1.98. It's made by General Electric Wiring Service Dept., Providence, R. I. 02907.

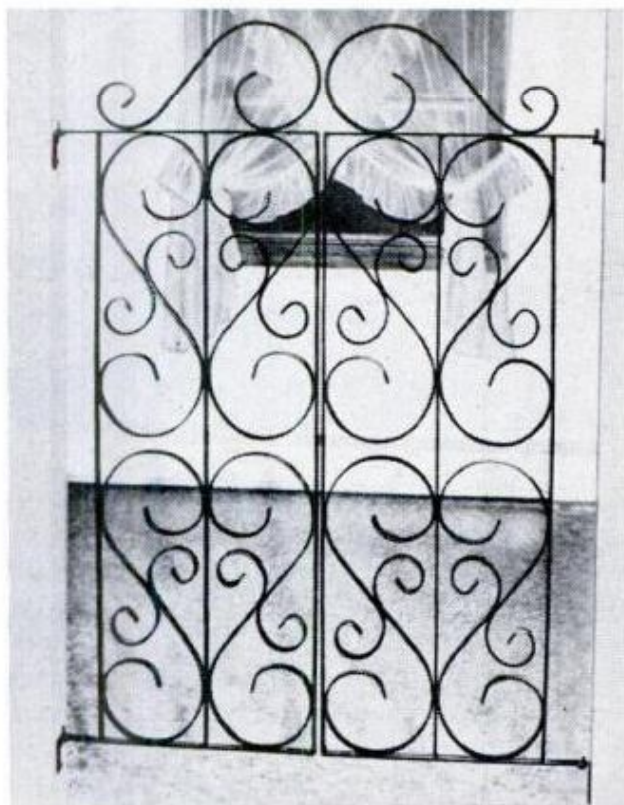




PERFORATED BOARD HOOKS that stay put when you remove a tool, called Hugger Hooks, are made by Roman Products, Box 891, Dept. PM, Golden, Colo. 80401. Positive locking units not only prevent accidental hook fall-out, but let you keep your storage or toolboard unmarred after resetting the hooks. Pack of eight hooks, in $\frac{1}{8}$ or $\frac{1}{4}$ -inch size, sells for \$1.

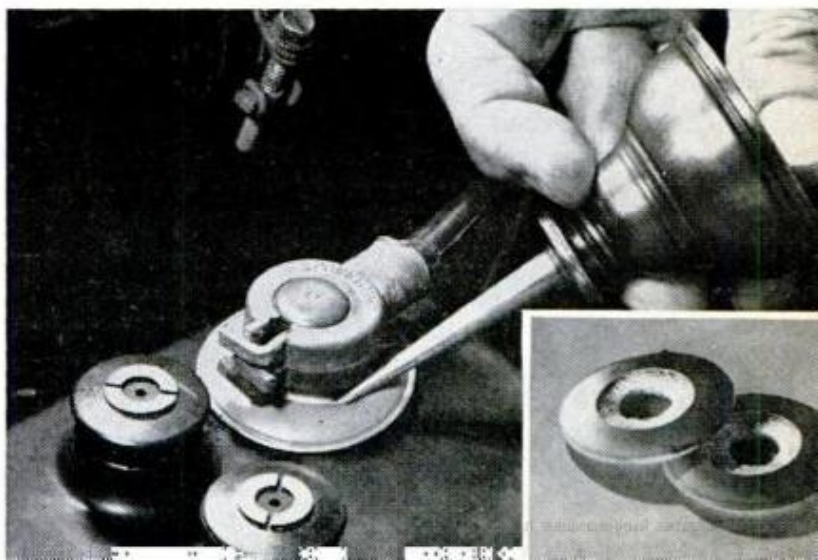


PROTECT YOUR HOME against forced entry through your sliding doors with the Dalton Katy-Bar. It fits all sliding glass doors and is adjustable from 27 to 48 inches wide. A twist of the wrist locks the telescoping bar at the length required. Adjustable feature allows door to be opened partially for ventilation and still be locked. Made of rustproof aluminum tubing, bar retails for \$4.50 from Dalton Manufacturing Co., 30 S. Central Ave., St. Louis, Mo. 63105.



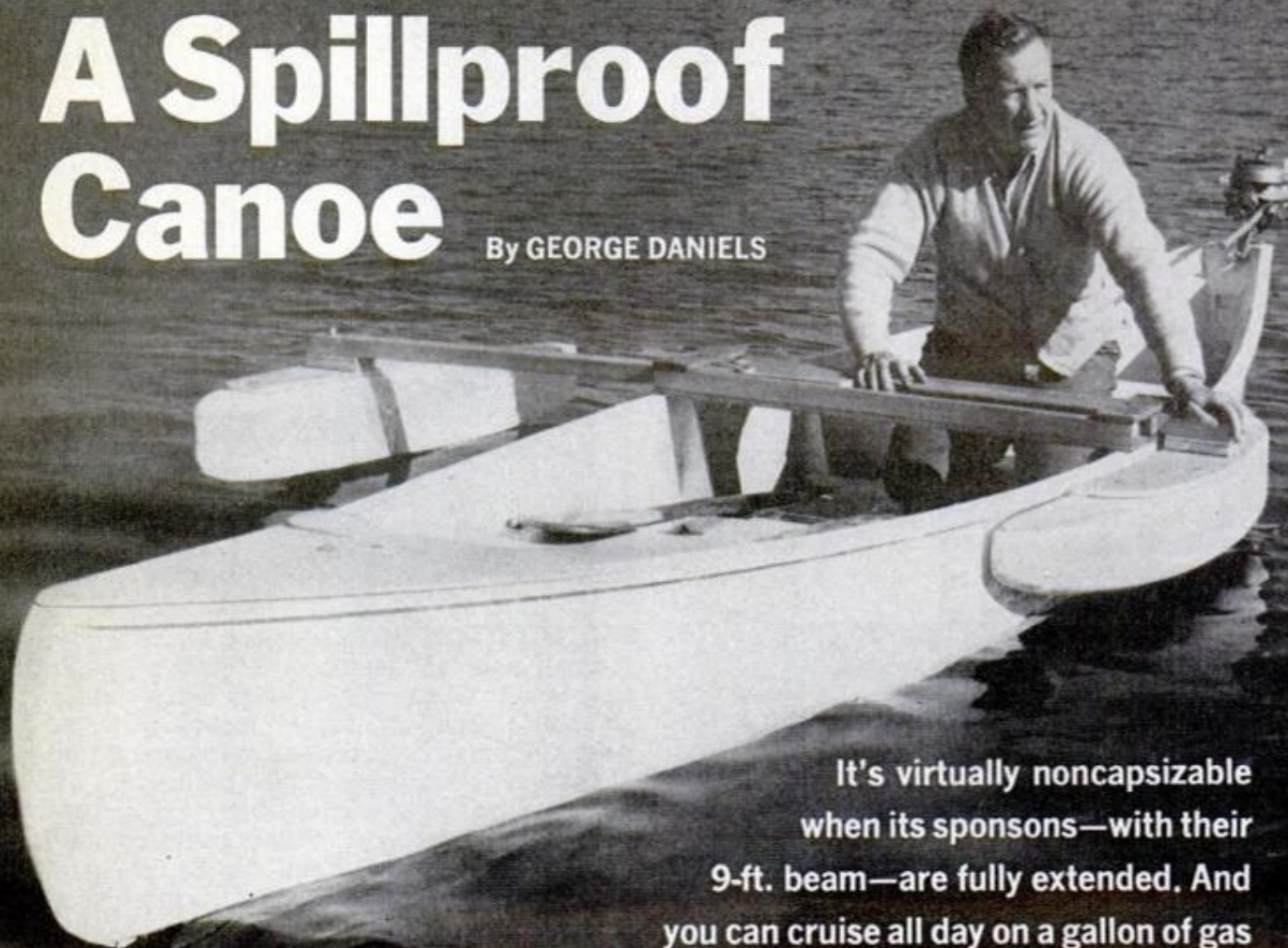
ADD DISTINCTION to the open entryways in your home with wrought-iron cafe doors. They feature a decorator-styled, multiple-scroll design which complements most interior decors. The doors are 48 inches high and will fit doorway widths of 30 to 36 inches. Ideal for entrances to dining room, den, recreation room or as a divider for your kitchen and serving areas. Priced under \$30 and manufactured by Versa Products Co., 2872 W. Market St., Akron, Ohio 44313.

INCREASE THE LIFE of your car's battery and save on maintenance costs with a unique vinyl battery accessory called Battery Savers. The Savers fit all standard battery posts and help prevent corrosion formation. Their honeycomb-core construction suspends standard motor oil and provides a continuous flow of anticorrosive oil by capillary action to area between cable clamp and battery post. Set of two \$1 post-paid from Jacqueline Todd Mail Order, 53 Mondview, Jackson, Tenn. 38301.



You Can Build A Spillproof Canoe

By GEORGE DANIELS



It's virtually noncapsizable when its sponsons—with their 9-ft. beam—are fully extended. And you can cruise all day on a gallon of gas

BUILD THIS CANOE and you will be able to do things you wouldn't dare to attempt with an ordinary one. With sponsons extended full-out, this version lets you stand up to cast a fishing line (or stretch your legs), hang a swimming ladder over the side on the gunwale and swim wherever you choose to anchor. You can take your youngsters out canoeing without the slightest fear of a spill.

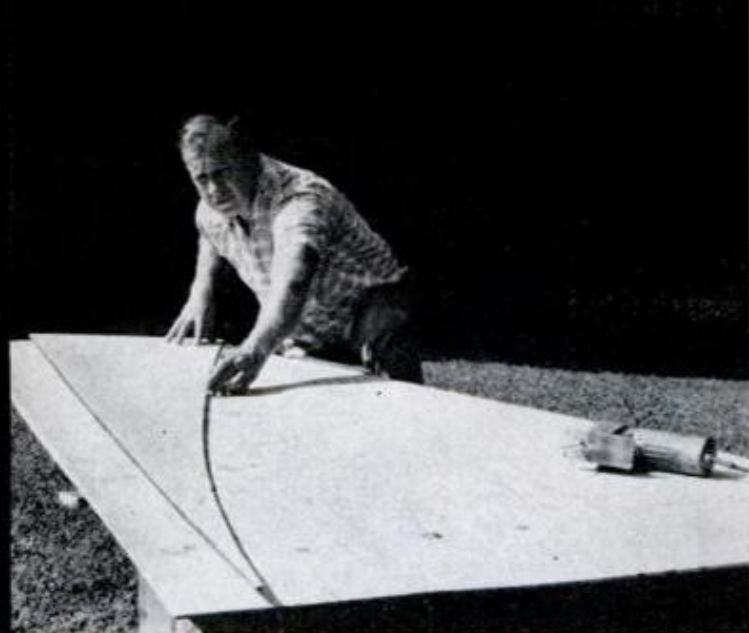
Paddling is a breeze. The sponson-pon-toons create no drag whatever as they never touch the water when you're on an even keel. And, when fitted with even the smallest outboard, you'll have full design speed. I've tried motors up to 4 hp, but our 1/8-hp Mighty Mite drives the craft about as fast, and costs only pennies to run.

It's easier to build than most small boats for several good reasons. First, there are no sharp bends or twists in the hull, just gentle curves that stock materi-

als can make without forcing or soaking. Second, your lumberyard can save you work by cutting the 16-in.-wide side planking strips for you. And finally, a time-honored boatbuilding method, brought up-to-date, practically eliminates the chance of a foul-up. The natural bend of a chine is your guide in marking the shape of the hull. Most parts take their form by being fitted on the spot.

Four panels of 1/4-in. exterior plywood, a short list of stock lumber and a quart and a half of Weldwood resorcinol resin glue are all it takes. The glue gives the hull much of its strength and rigidity, so don't build without it.

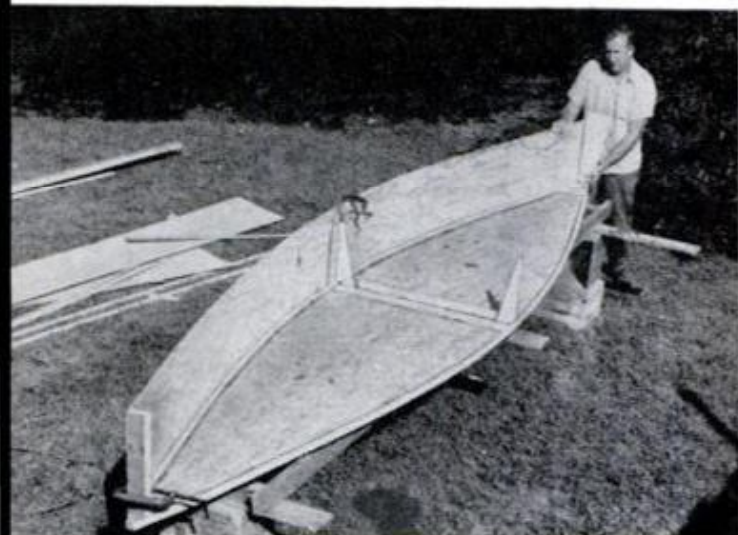
To start, butt two plywood panels and use scrap wood and some brads to join them temporarily. Then bend one of the chines around blocks on the plywood as shown and mark along the outside of the curve. Cut along the line and use the cut-



FIRST STEP. Brad two plywood panels together, flex chine in position and draw hull outline with a pencil



REST BOTTOM PANELS (still joined) on raised surface; glue and nail chines in place along edges

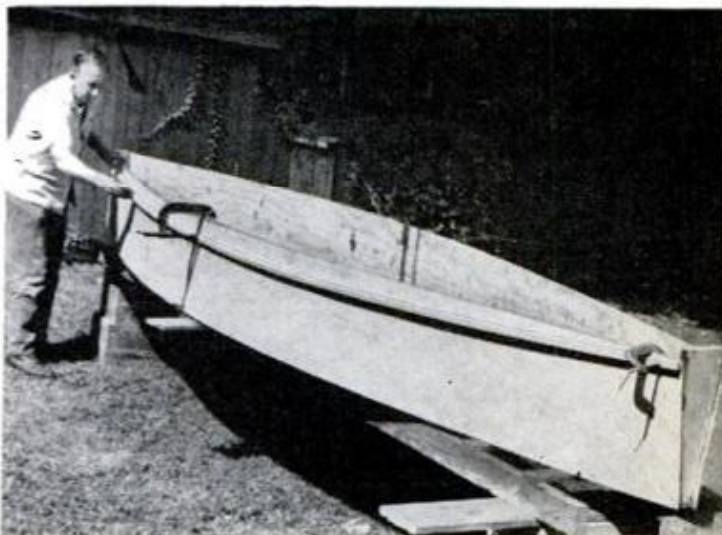


MOUNT SIDE PLANKING DRY, using clamps so glue areas can be pencil-marked. Remove and apply glue

off pieces as templates to mark the cuts on the other side.

Place the cut-out bottom panels on a rigid *raised* support and fasten the chines in place along the edges with glue and 1½-in. finishing nails driven down through the chines into the plywood. Coat both meeting surfaces (chine and plywood) with glue. If dry areas appear before the parts are assembled, apply additional glue. Leave the nailheads slightly above the surface for pulling later. (You fill the nail holes with glue.) Later, when the boat is inverted, "buck" the plywood with another hammer under each location where a nail is being driven, 24 in. apart.

With both chines in place, center the butt piece across the mid-seam between the bottom panels. Mark its position on the bottom, coat both meeting surfaces

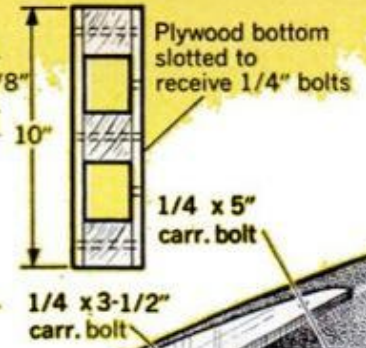
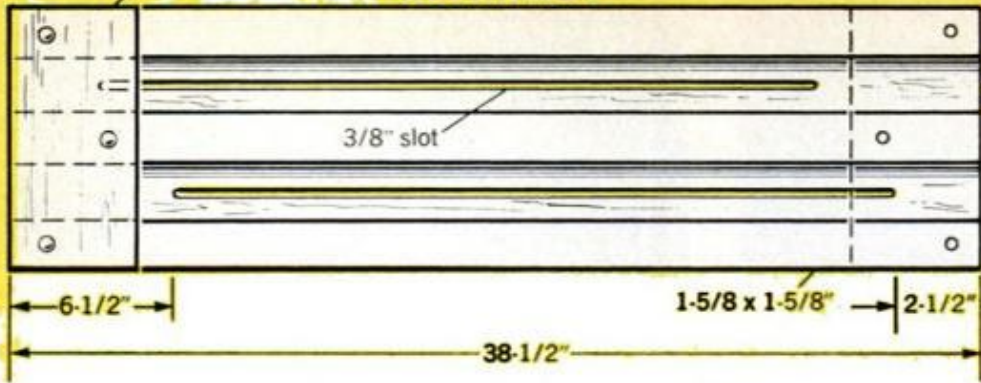


CLAMP THE RUBRAILS 1 ft. above bottom at mid-frame, 16 in. above bottom at stem and transom

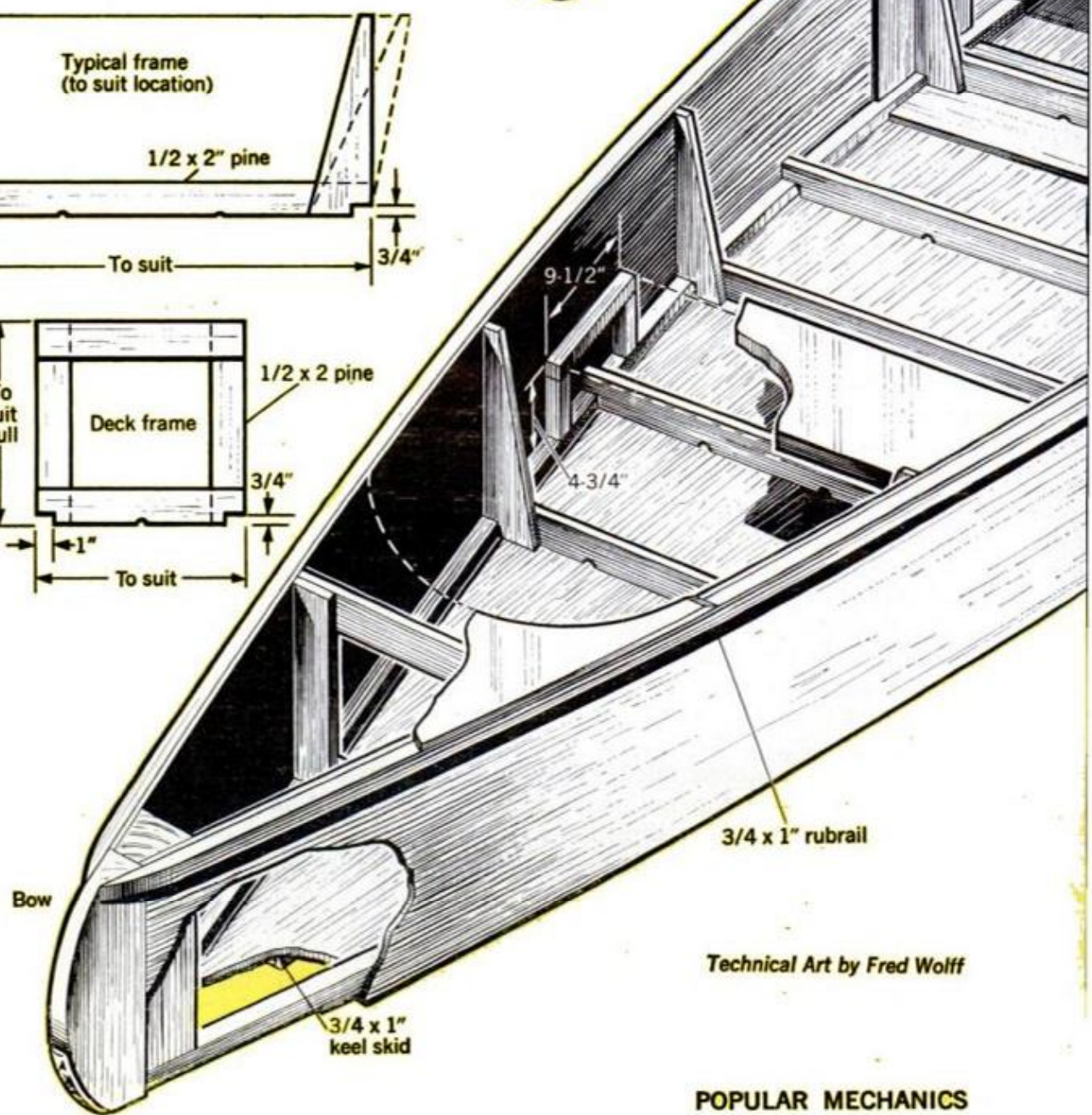
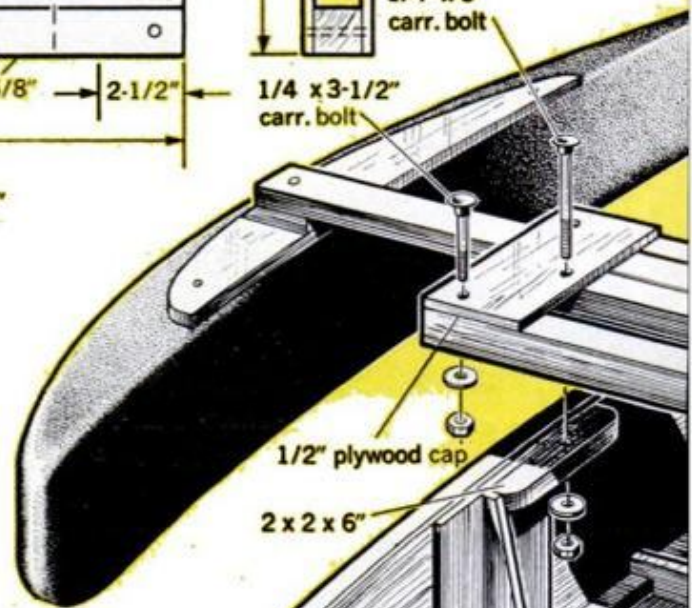
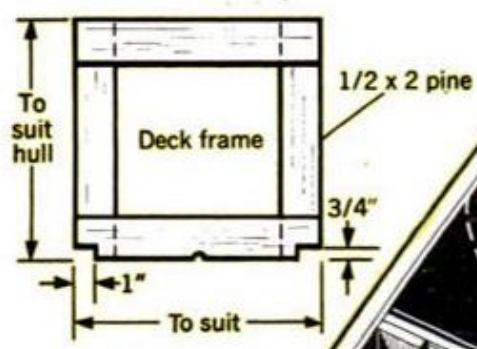
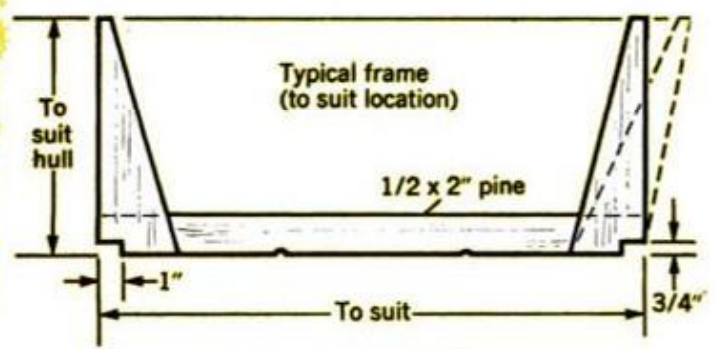
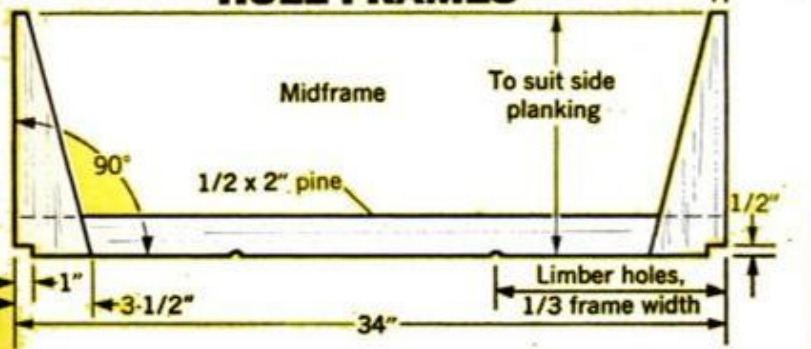
with glue and fasten it in place with brads or ½-in. No. 6 flathead brass screws, spaced as needed for thorough contact. (Brads may be pulled or clinched after the glue sets.) Be sure the butt piece fits snugly at the chines.

Join the side planking sections in the same manner, with glued and bradded (or screwed) butt pieces. Next, assemble and glue the midframe. I found that mixing a half pint of glue at a time usually worked well. Also I kept the glue pot in a bowl of cracked ice to stretch out its working time. Keep the glue components handy for extra batches as needed. When bottom, sides and mid-frame have been completed, set them aside to glue-harden overnight at 70° or more.

Next day, use a coarse disc sander to remove any hardened glue squeezed out

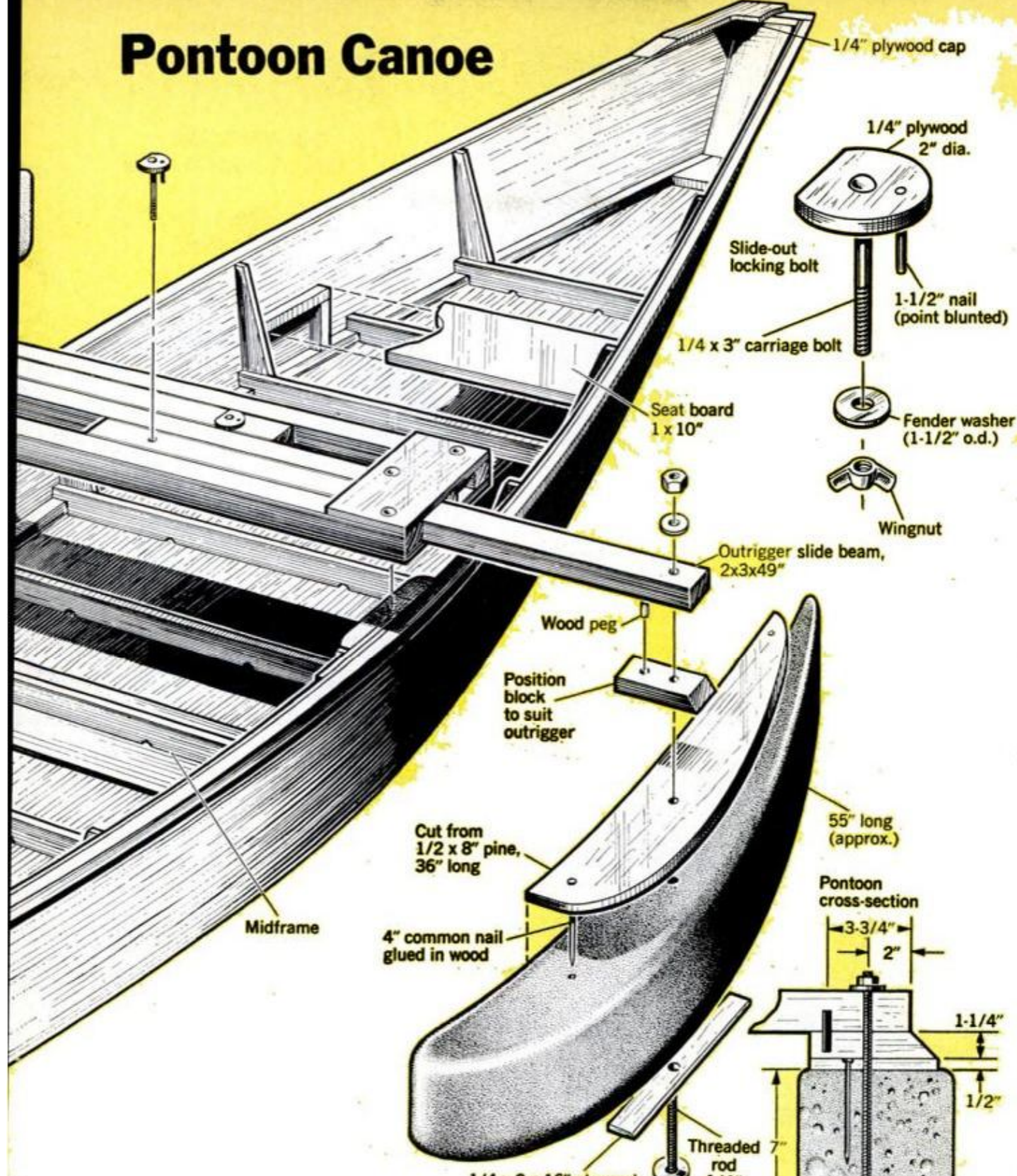


HULL FRAMES



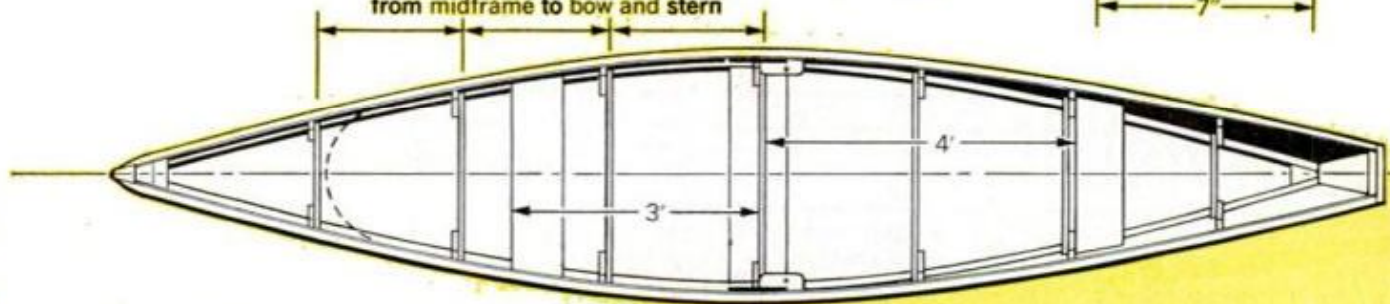
Technical Art by Fred Wolff

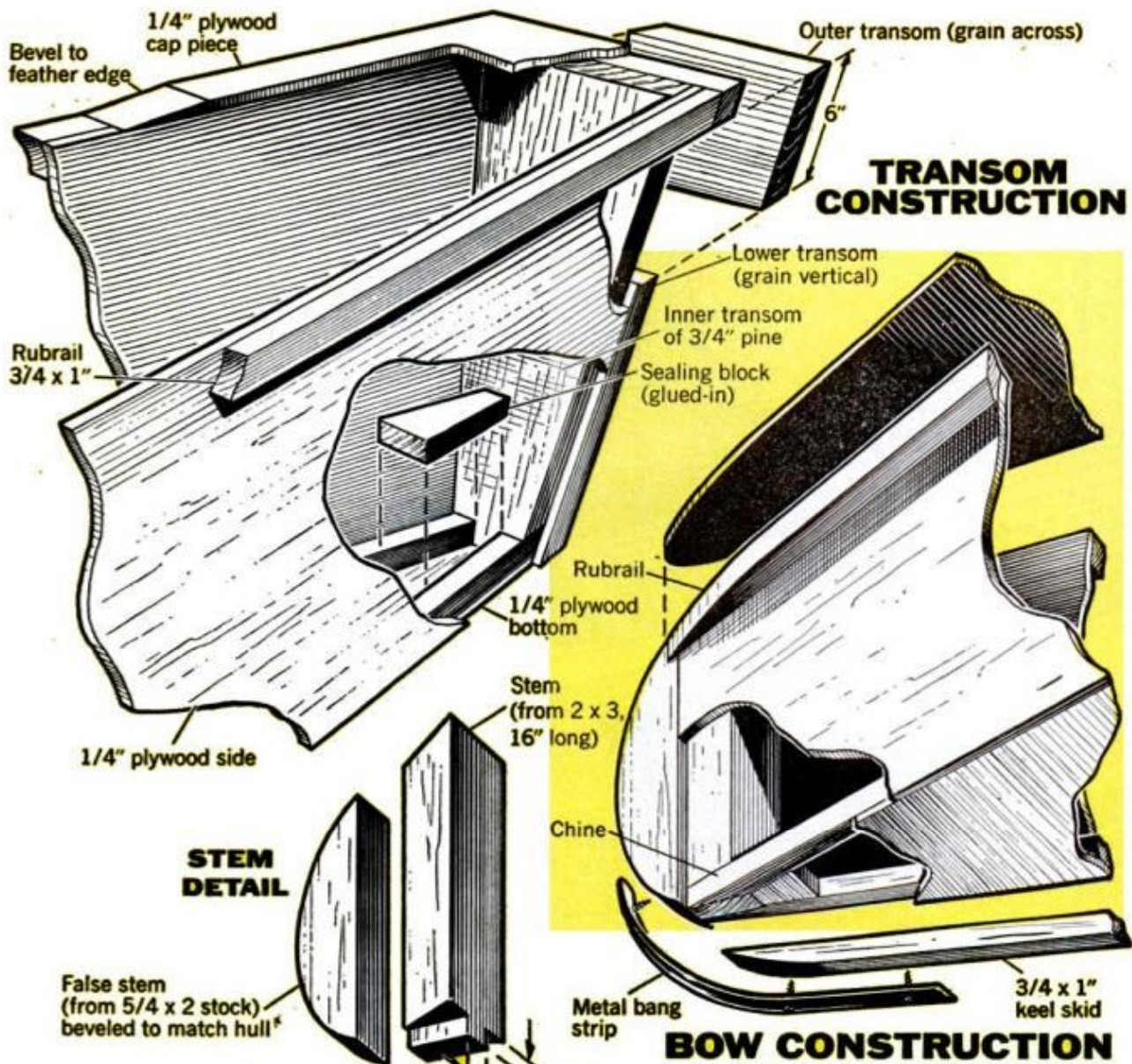
Pontoon Canoe



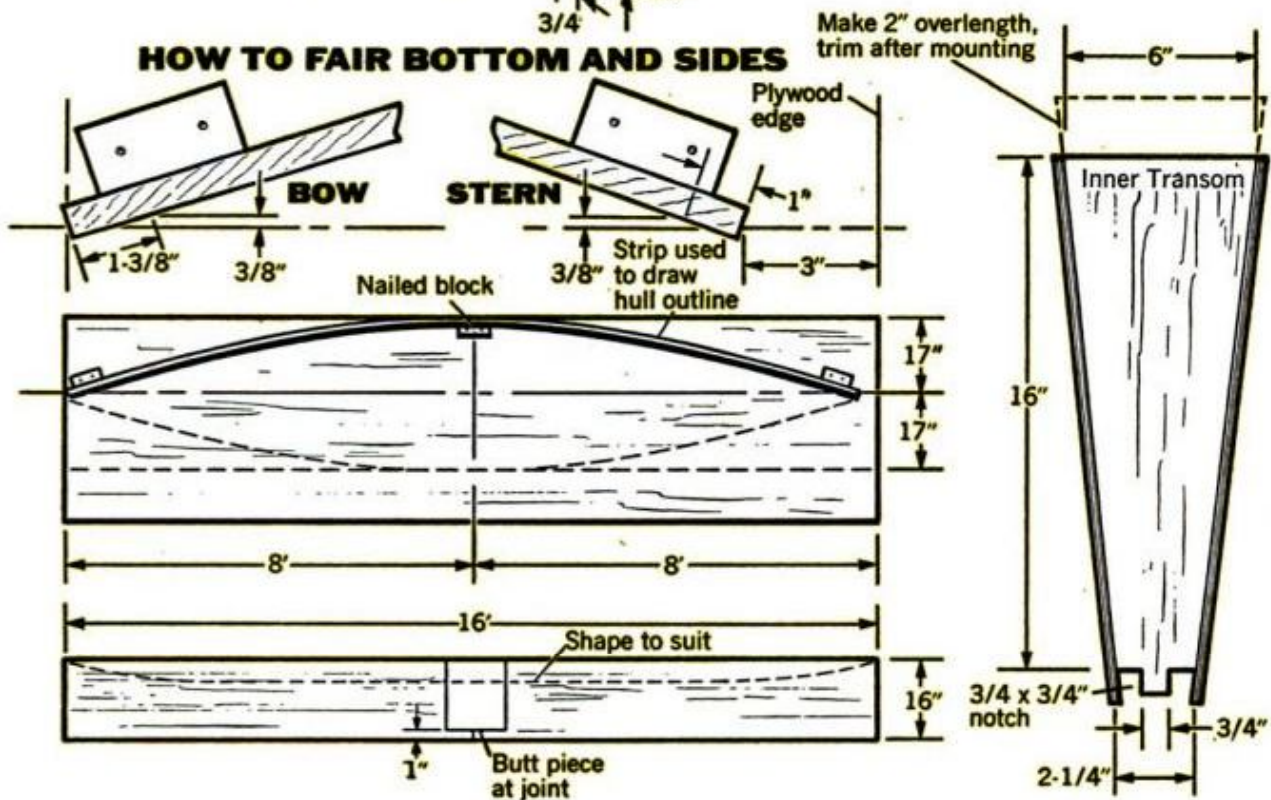
FRAME LOCATIONS

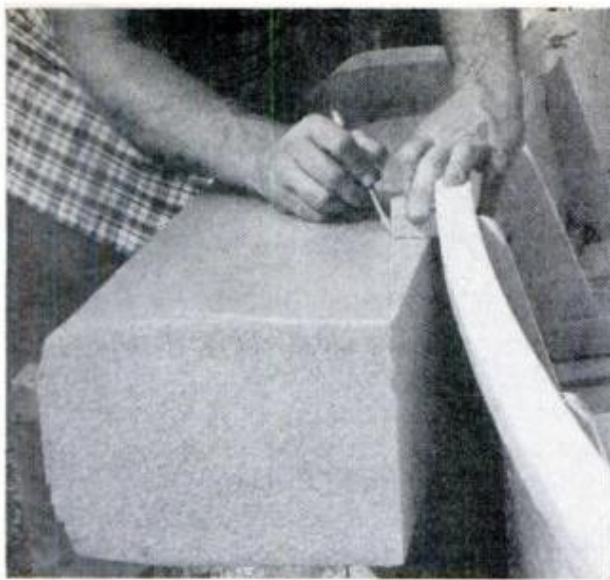
All frames 2' apart o.c. measured from midframe to bow and stern





HOW TO FAIR BOTTOM AND SIDES





TO MAKE SPONSON, rest foam block beside hull, use a block of wood and pencil to scribe the curve

FINAL STEP in building the canoe is installation of seats (right). Paint craft in colors of your choice



along the chine edges of the bottom, and at any other points where it might interfere with subsequent fitting.

Assemble stem, mid-frame, transom and side planking on the bottom temporarily for marking all gluing areas (for coating later). Then disassemble. Remount the stem and transom with glue and a single 1½-in. finishing nail driven up through the bottom into each. Remount the mid-frame with glue and brads toenailed through it into the bottom. Then attach the sides, one at a time, with glue and brads. (These brads are left in.) The side planking should be flush with the bottom at the midpoint. It will protrude slightly below the bottom toward the ends, to be trimmed later. In bradding, work outward from midpoint toward the ends.

When both sides are attached, clamp on one rubrail. Pencil-mark the plywood along the rubrail's upper surface. Then take the rubrail off and sabre-saw along the line to remove the section above it. Use this section as a template to mark the other side for cutting. After cutting the second side, glue and brad both rubrails in place, using clamps at ends if needed.

The rest of the frames should now be fitted on the job, cut to size and assembled and mounted with glue and brads. Seats, foredeck, sealer blocks and all other parts are also fitted and glued in place. To avoid loosening freshly glued joints, the assembly is left to glue-harden overnight. When dry, turn the canoe over, glue on the

keel-skid and trim the bottom edges of the side planking. The rest is merely a matter of sanding and finishing. Plywood leftovers are used for the floor.

To make the sponson-pontoons, cut a Styrofoam billet (7x20x108 in.) to half length, then saw down the centerline. This provides two 7x10x54-in. blocks which are then shaped and fitted to the contour. (Many boatyards will sell half a billet.) The centerline cut is made with a coarse rip saw, curved cuts with a keyhole saw. Final shaping is with a rasp. To protect the completed pontoons from waterborne gas and oil (which can damage Styrofoam) give them two coats of a water-mix-type exterior house paint. (Never use oil paint directly on Styrofoam; it breaks down the foam.) After drying, this can be followed with a quick-drying enamel. To finish the main hull, I used two coats of Save-Cote.

The sponson slide-out unit is made of fir guides on a ½-in., sheathing-grade plywood base. To assure free sliding, set all parts, including beams, in place with cardboard shims between them when drilling the bolt holes before gluing. Use thin wood shims between the end cap pieces and the 2x2s (but not across the space between them) when gluing. The clearance thus allowed provides easy action after the finish is applied. When retracted, the sponsons should fit snugly under the rubrail. If too low, trim down the block on the pontoon. If too high, glue a wood shim on the block. ★★★

Four Projects You Can

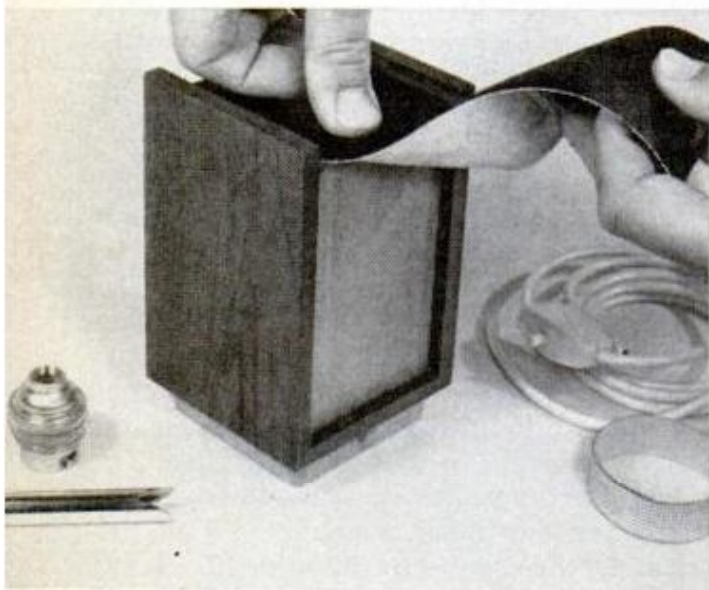
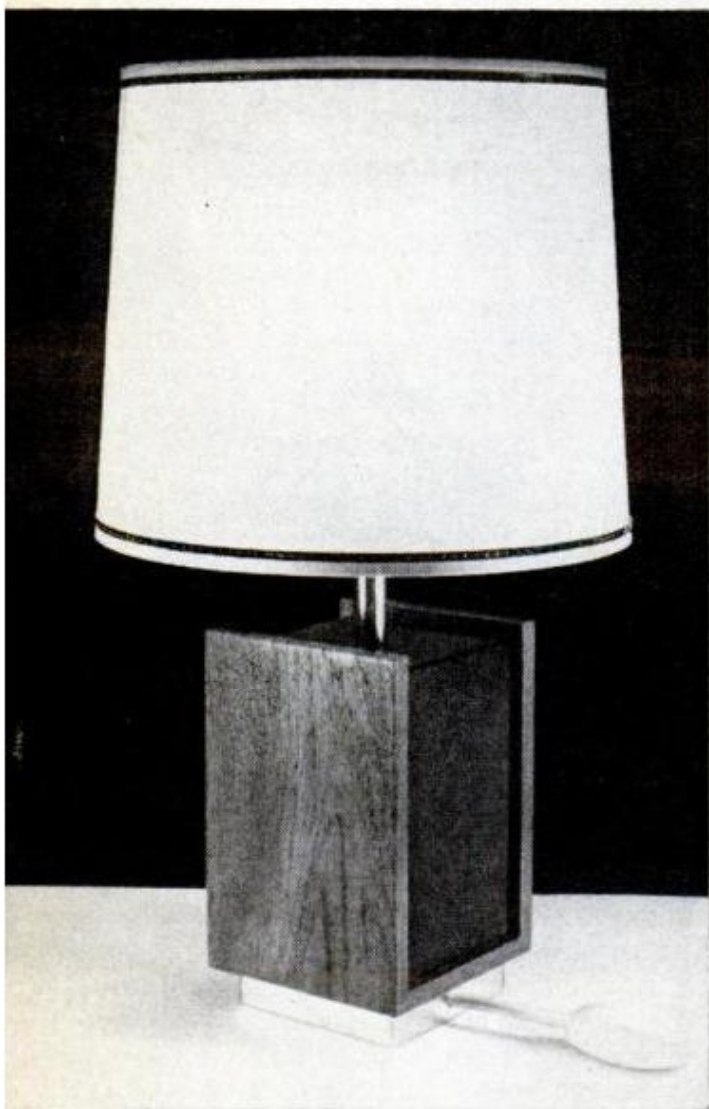
Modern Lamp Base

CONSISTING of a center block of scrap wood faced on two sides with pieces of teak and covered in the middle with a strip of simulated vinyl leather, this smart lamp base is not only good looking but exceptionally simple to make.

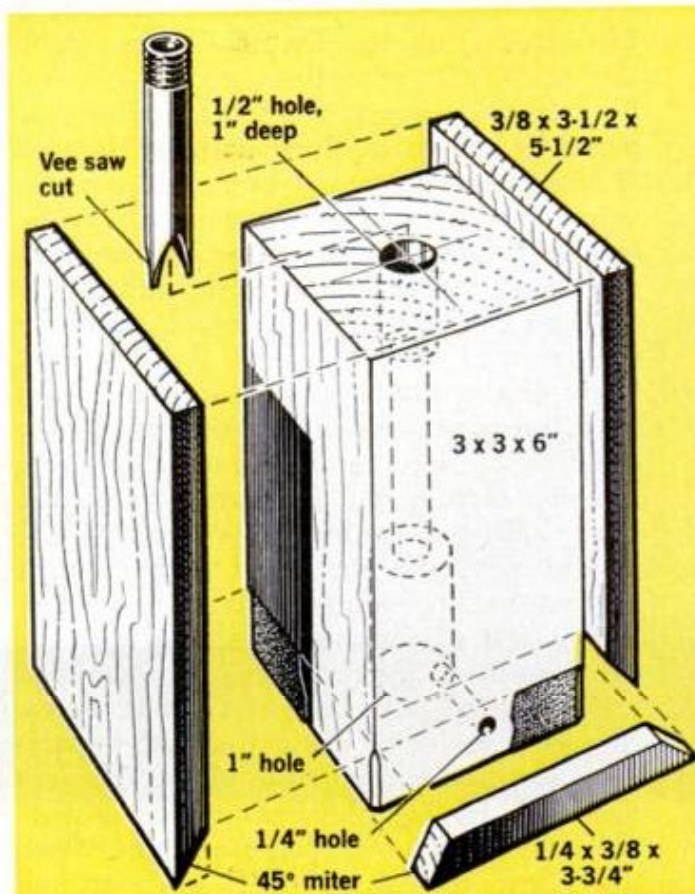
The center block extends to form a recessed base that is later covered with a strip of gold metallized tape. The bottom edges of the teak sides are mitered 45° to accept mitered fill-in strips of the same wood and same thickness.

Make a central hole through the block for a 3-in. length of 1/2-in. threaded brass tube and a length of lamp cord. The V-cut in the end of the tube lets you drive it in tightly.

Finish the teak parts first, then cement the vinyl in place with contact cement. The vinyl should actually be applied before you drive the brass tube in place. Drill a hole in from the side for the lamp cord and add felt to the bottom to prevent marring polished surfaces.—Kenneth Wells



AFTER COATING both center block and vinyl with a pressure-sensitive adhesive and allowing it to set for 10 minutes apply vinyl between the teak sides



Finish in a Weekend

Bootjack Bookrack

USED BY COWHANDS to help remove their boots, the lowly bootjack with slight modifications makes a unique conversation piece when used as a bookrack.

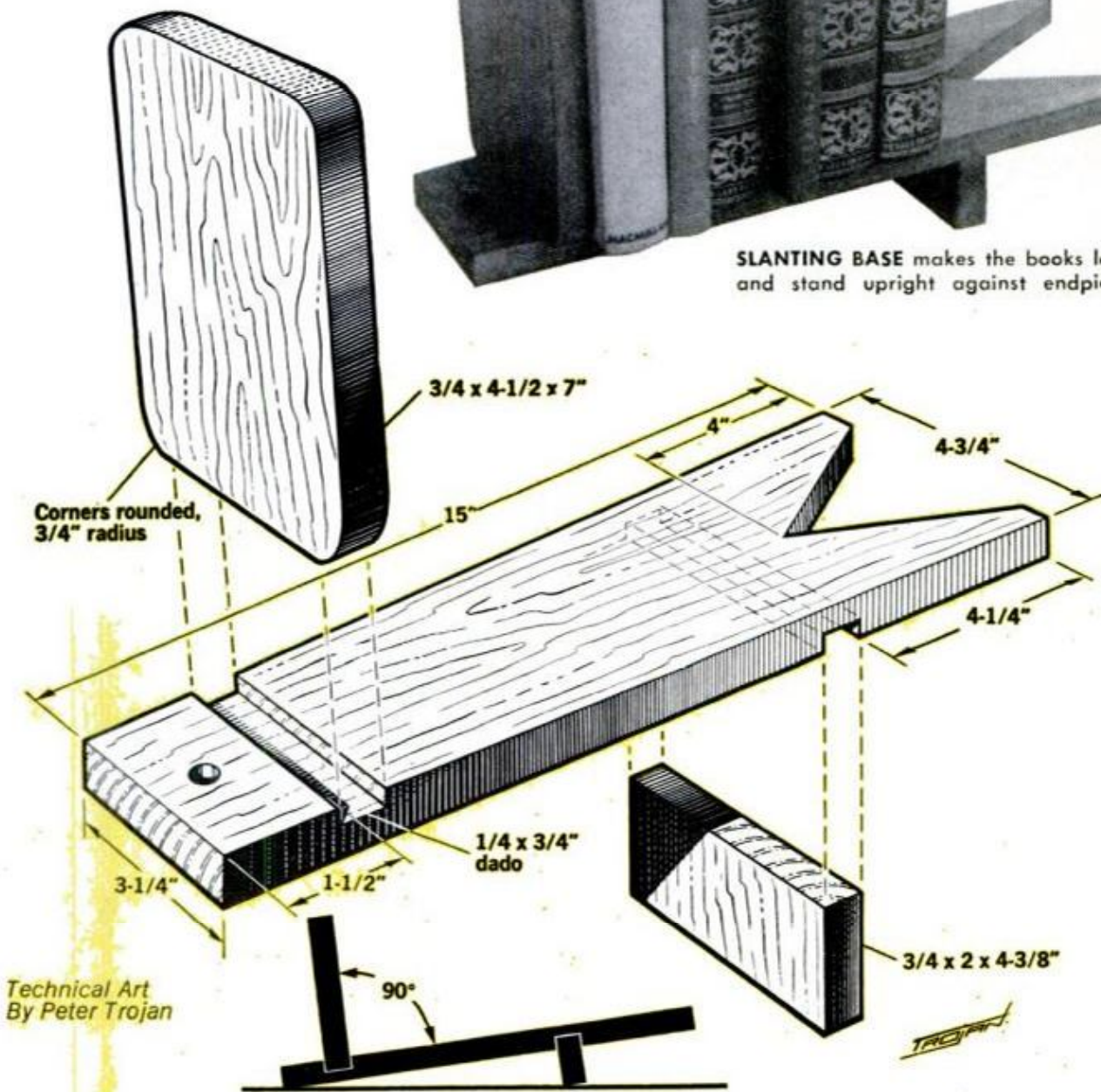
By adding an endpiece and reducing it in size, the bootjack detailed below will hold a half-dozen books.

It's about as simple as can be, requiring only three parts. The V-notched piece is dadoed top and bottom for the $\frac{3}{4}$ -in. endpiece and foot. If you make it of wal-

nut, finishing is made easier when it's done before final assembly. This way you'll do a better job of filling the open grain with paste filler, and you'll not risk "sealing" the wood at the joints with glue so it won't take stain evenly.—Harold Jackson



SLANTING BASE makes the books lean and stand upright against endpiece.

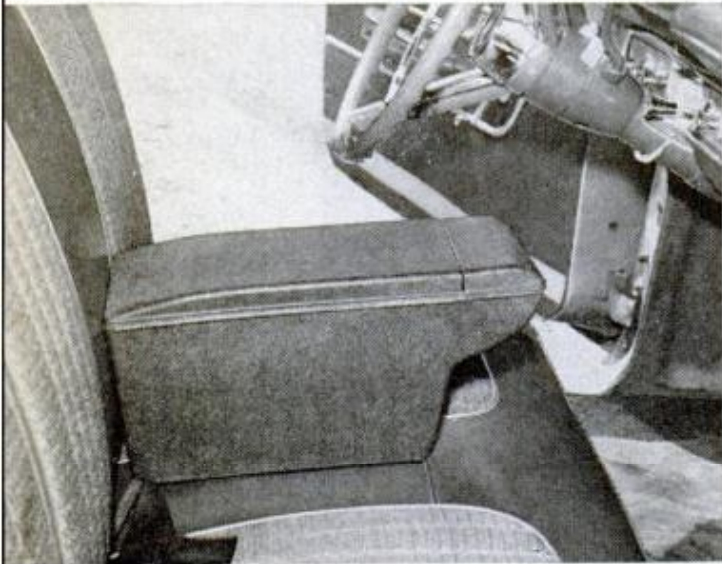


Armrest Tote Box

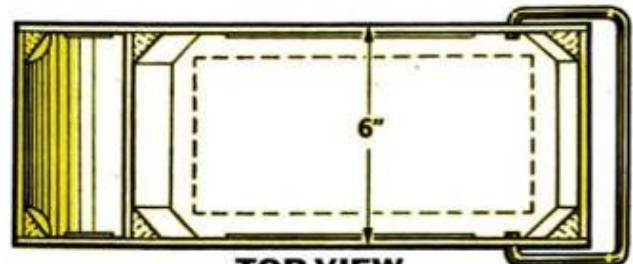
FAR HANDIER to the driver than the car's out-of-the-way glove compartment, this front-seat storage box serves also as a comfortable armrest when placed between the driver and passenger. Its double compartment offers roomy storage for countless items which the average glove compartment won't begin to hold. Best of all, they're all within easy reach.

The box hooks to the seat by a wire bail that tucks under the cushion, and its separate forward compartment keeps cigarettes, toll coins and the like handy.

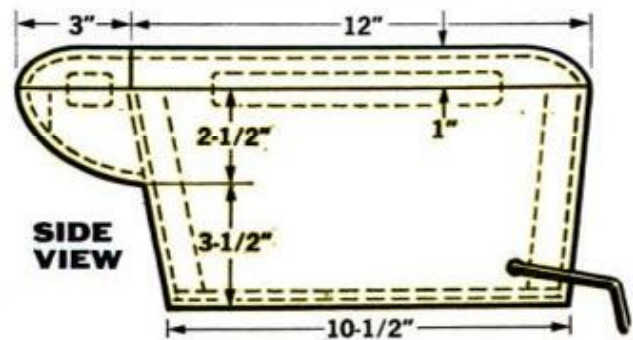
It's made of 1/8-in. plywood or other thin material, glued together and reinforced on the inside with triangular corner cleats. The bottom is supported by a 3/4-in.-wide frame, and strips of thin plastic cemented to the top of the box hold the lids in place.—Hi Sibley



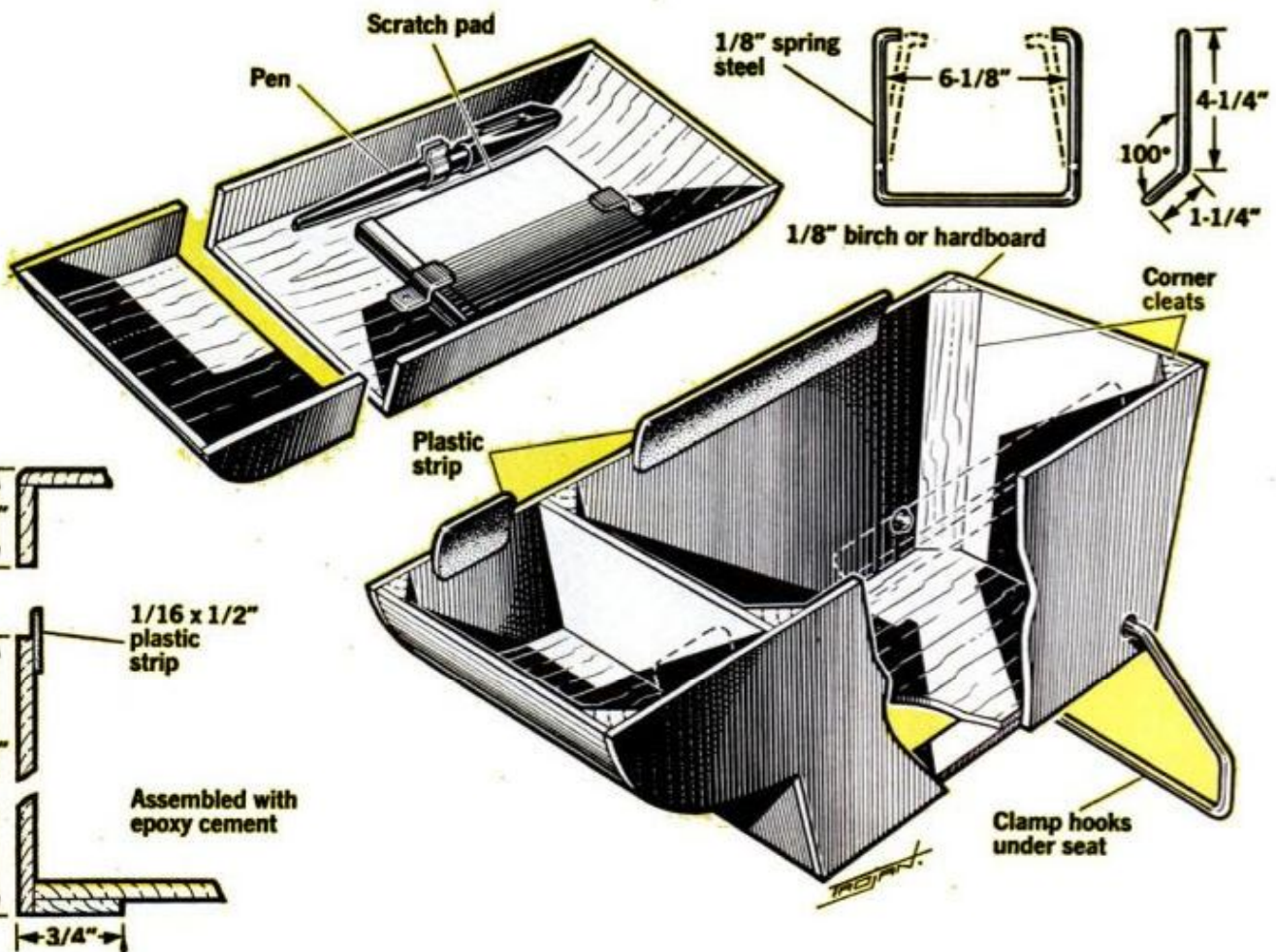
MATCHING VINYL COVERING makes box look like part of car. Hook under cushion holds the box in place

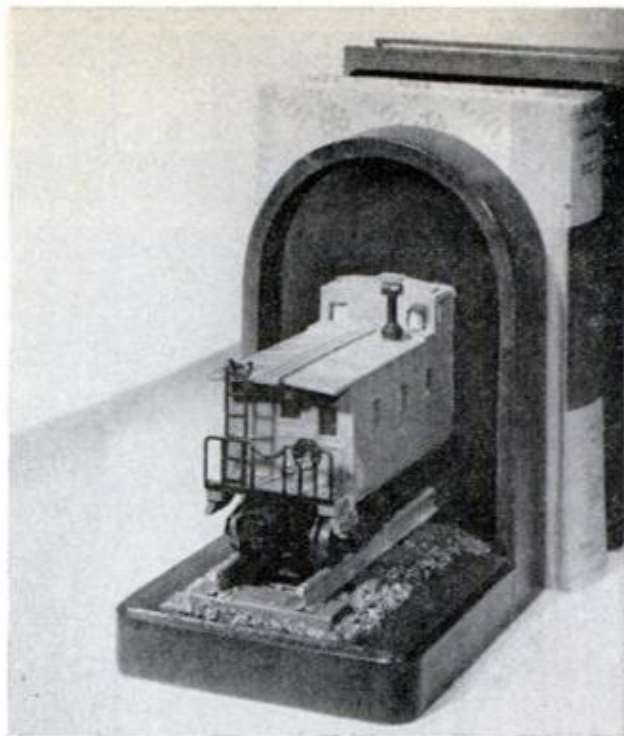


**TOP VIEW
WITHOUT COVERS**



SIDE VIEW





Train-Tunnel Bookends

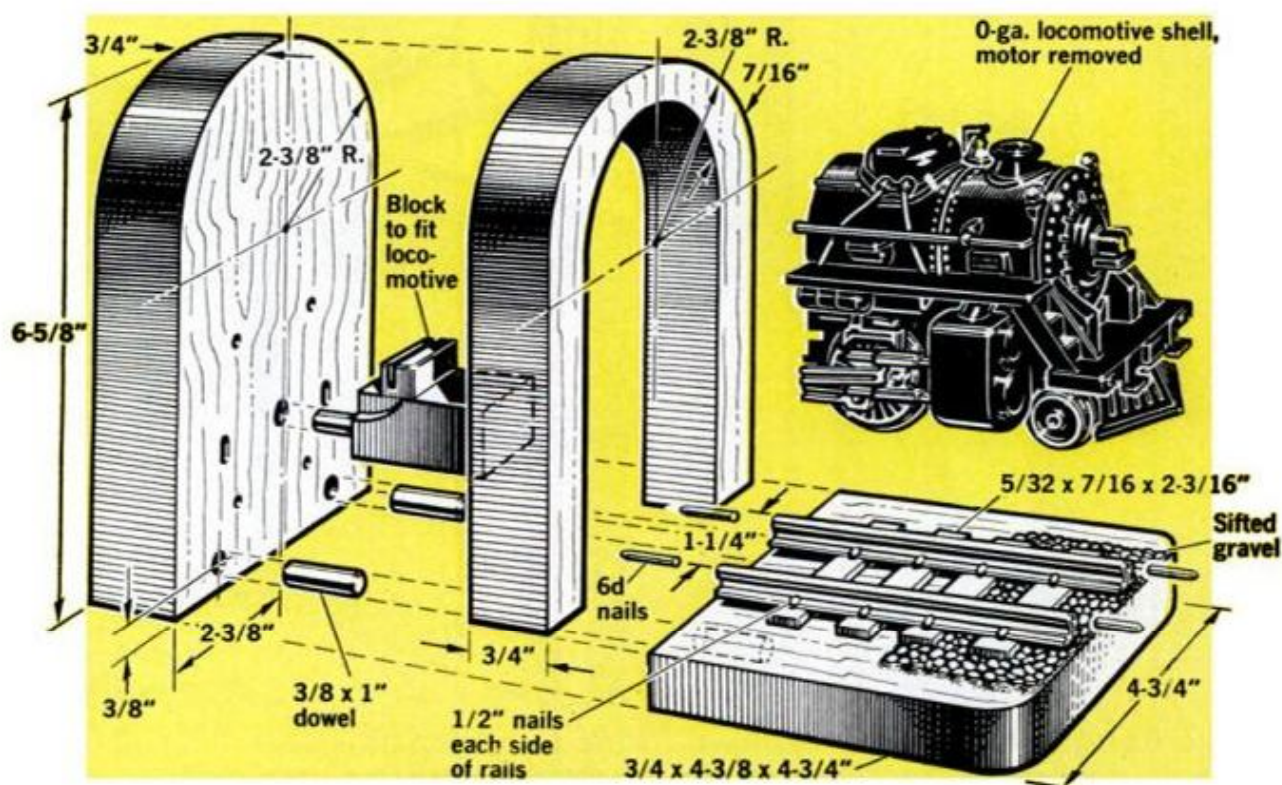
THESE NOVELTY BOOKENDS, which represent tunnel portals, make it look like a fast freight is passing right through your books. The project makes good use of the locomotive and the caboose of an old O-ga. train set.

Both bookends are made alike insofar as the wood parts are concerned. Cut and sand the inside of the front arch first, then glue it to the tunnel block and cut and

sand the outside shape of both at one time. A disc sander is best for this. The base is attached to the tunnel block with dowels and glue. Give the inside of the tunnel two coats of flat black paint; paint the outside whatever color you wish.

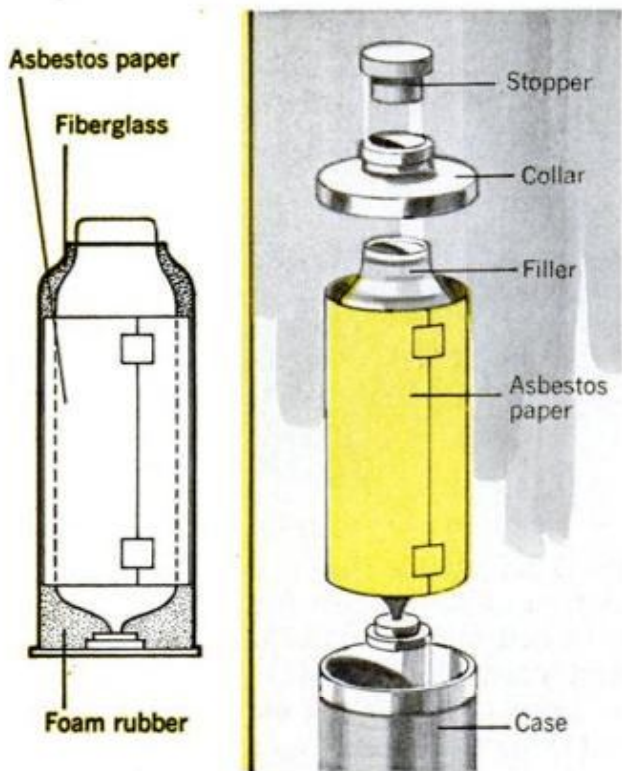
Now remove the metal ties from a length of O-ga. straight track and saw the rails in half. Wooden ties replace the metal ones and are glued to the base as shown and painted black. The rails are fastened

(Please turn to page 208)

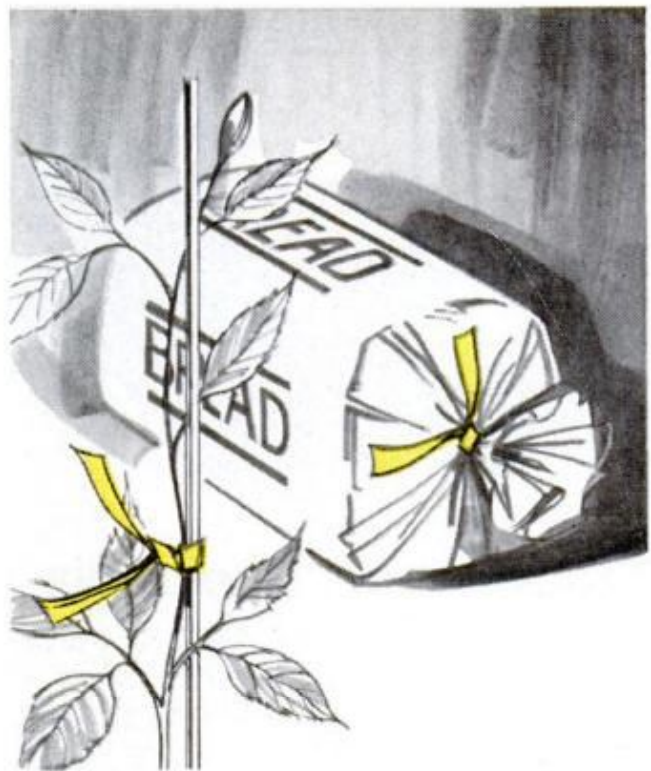




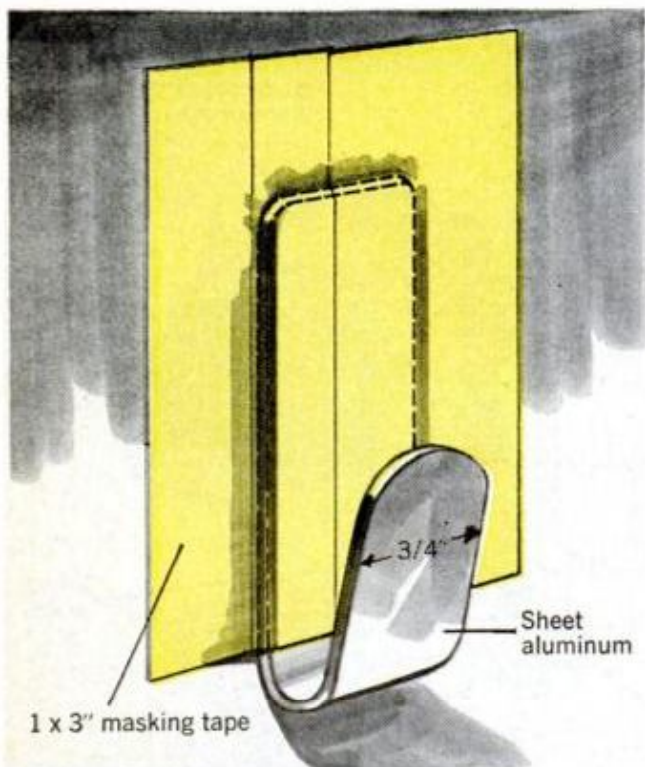
SOLVING



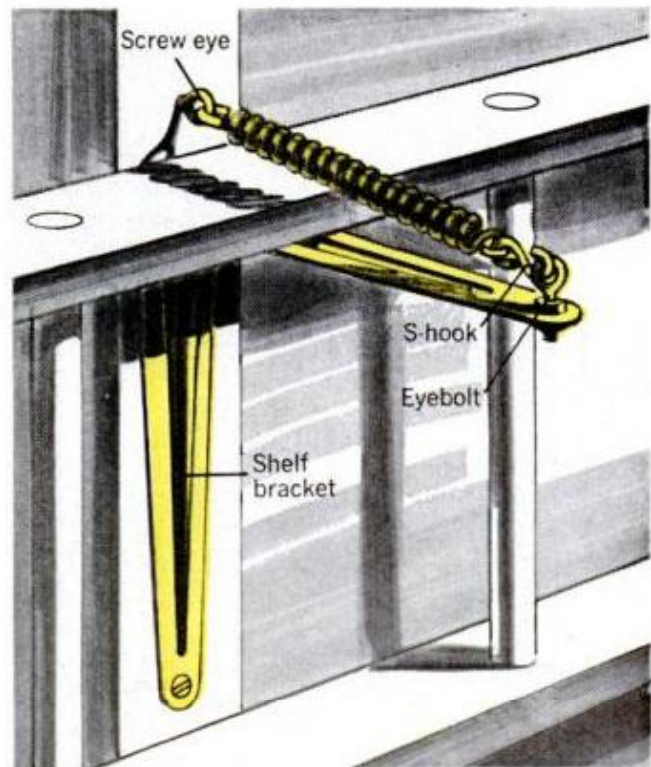
CONTENTS OF VACUUM BOTTLE will stay hot or cold longer if you remove the filler, place foam rubber in the bottom, wrap filler with asbestos paper and pack fiberglass around the neck of filler.—*Jan Van Eerde*



IF YOU START SAVING the wire ties you get with bread wrappers, you'll have enough when spring comes for tying tomato and other tender plants to stakes. The wires work fine and won't rust.—*John Krill*



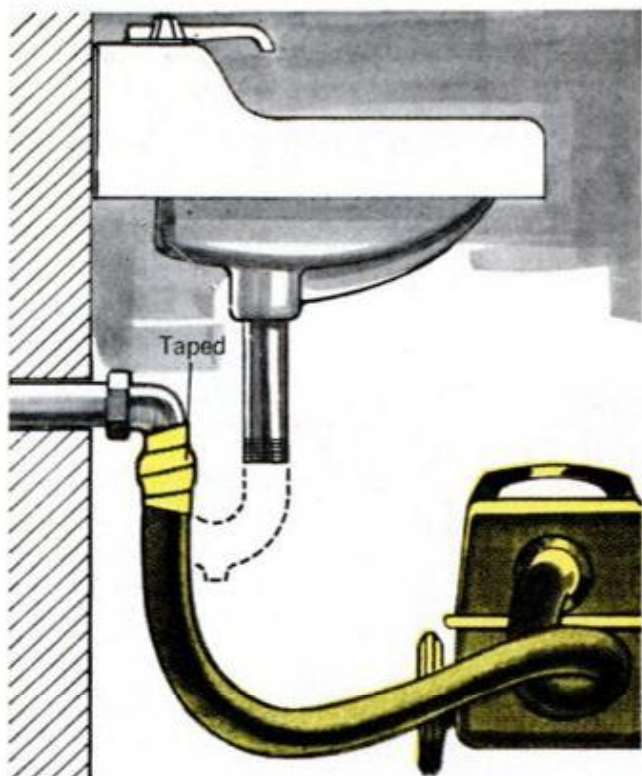
TO HANG LIGHTWEIGHT OBJECTS try this: Make a sharp bend in thin aluminum strip to form hook, cover with strips of masking tape and press firmly to the wall. Hook will hold five pounds or more.—*Wilbur Wardell*



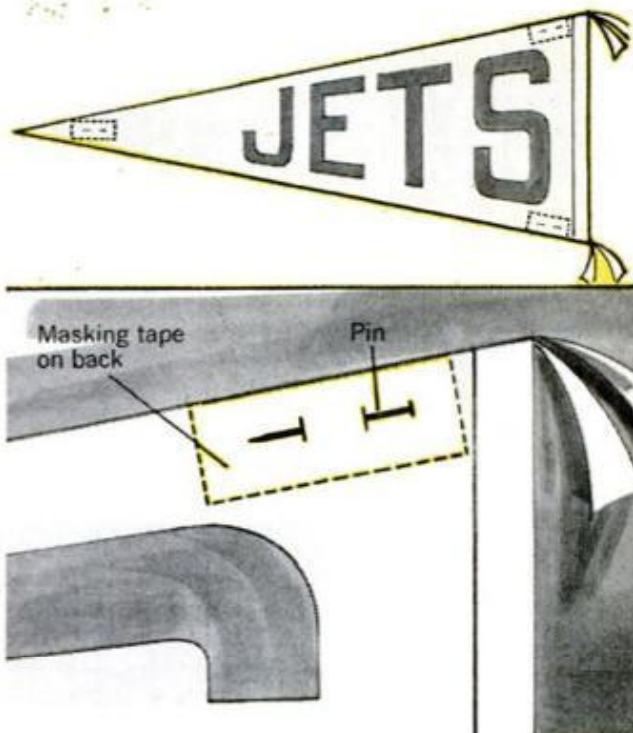
TWO SHELF BRACKETS attached to studs make a fine ladder rack. Screw them several studs apart and add tie-downs to brackets. The ties are screen-door springs fitted with S-hooks to engage screw eyes.—*Victor Lamoy*

HOME PROBLEMS

Illustrations by Adolph Brotman, Worman Associates



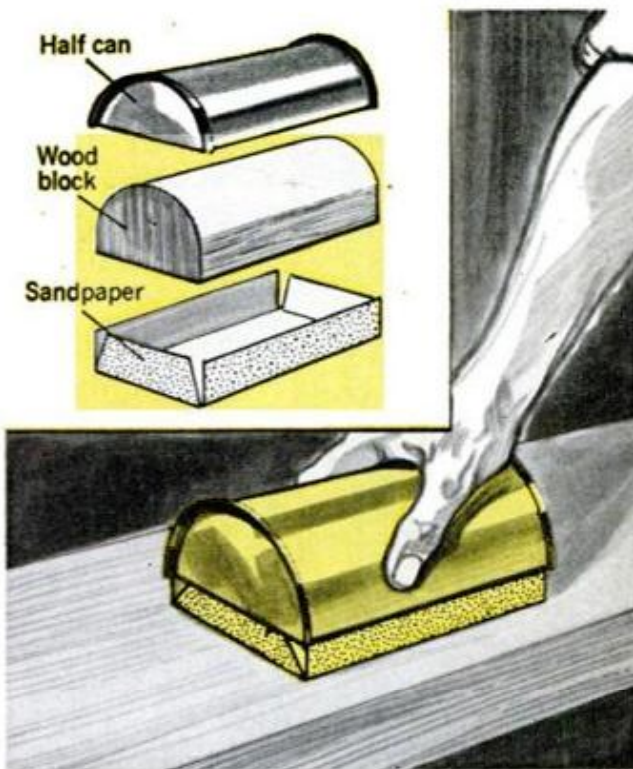
WHEN A DRAIN CLOGS, use your vacuum cleaner to blow out the obstruction. Remove the trap, tape the cleaner hose to the pipe so it's airtight and then turn the cleaner on "blow." Works great.—S. N. Stresnic



YOU CAN AVOID HOLES in the wall when hanging pennants if you pin tabs of masking tape to the backs of the pennants at corners and press tape against the wall. Pulls off without a trace.—Victor Lamoy



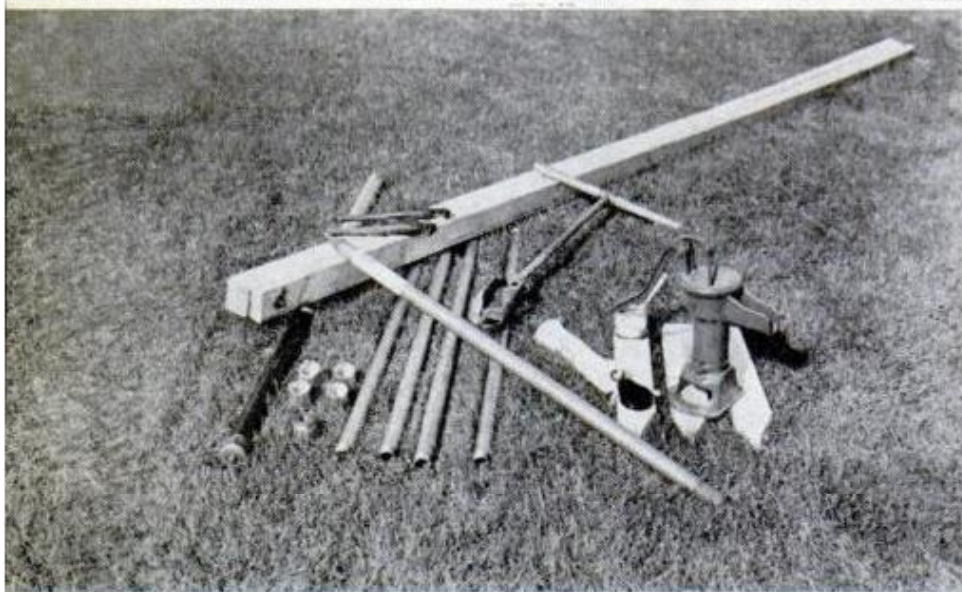
SEED WON'T WASH AWAY in "greenhouses" made from pint plastic freezer containers with clear tops. Cut out bottoms, serrate edge. Keep cover ajar for air, remove when second leaves appear.—Nellin Ives



HOLDING SANDPAPER on a sanding block is made easy with a tin can cut in half lengthwise. Round the top of the block, then use the can as a cover to grip upturned end of paper covering block.—Peter Legon

You Can Drive

By R. G. CHRISTOPHERSEN



TO DRIVE A WELL you need quality equipment shown above. You'll speed up the job by first boring hole with a post-hole digger (above right). A sledgehammer can be used for driving, but a tripod and pulley arrangement (shown at top) saves arms and provides superior driving with less chance of damaging the pipe

Your Own Well

If the water-bearing sand formations in your area make it possible to obtain water at depths down to 40 feet, you can drive, rather than drill, a well.

MANY PEOPLE who own rural and country homes, lake cottages and even suburban homes install their own primary or secondary water-supply systems. If the soil formations permit, *driving* a well is a relatively easy, and possibly, one-day chore. But to avoid frustration or disappointment, it is wise to check with your state geological survey office before starting. If you submit a legal description (survey) of your property, it will advise you if the conditions in your area are suitable for a well.

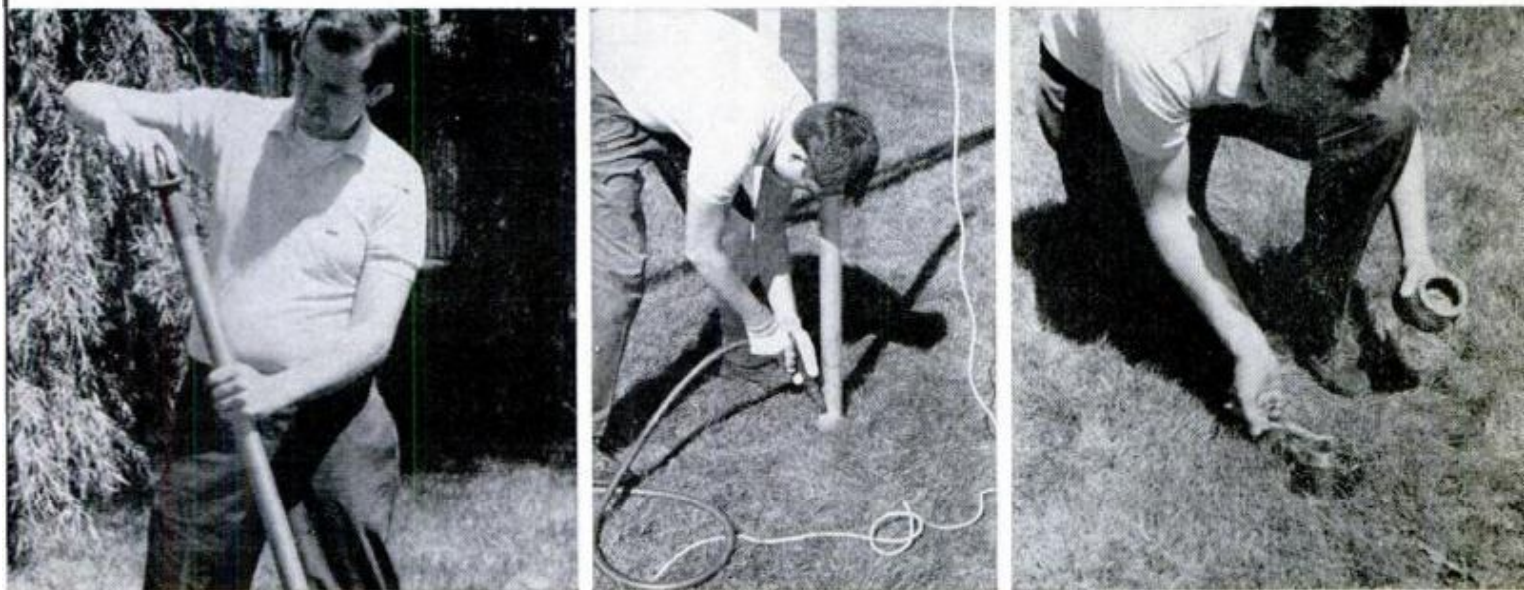
Where to drive a well. It is important to locate a well away from any source of contamination such as marshy areas, cisterns, septic tanks and the like. And the well should be situated on higher ground than any of these areas. If a sewer line is present, stay at least 50 ft. away. Also, check with your utility company to make certain that you do not start your well on top of underground service lines. Before beginning construction, check your local building department. In many communities, this work requires a building permit.

It is wise to use the best possible equipment. You will need a pump, a wellpoint (1¼-in. diameter recommended), lengths of galvanized steel riser pipe, couplings, a drive cap, and pipe-thread compound. Tools include an auger or a post-hole digger, a driving device and pipe wrenches.

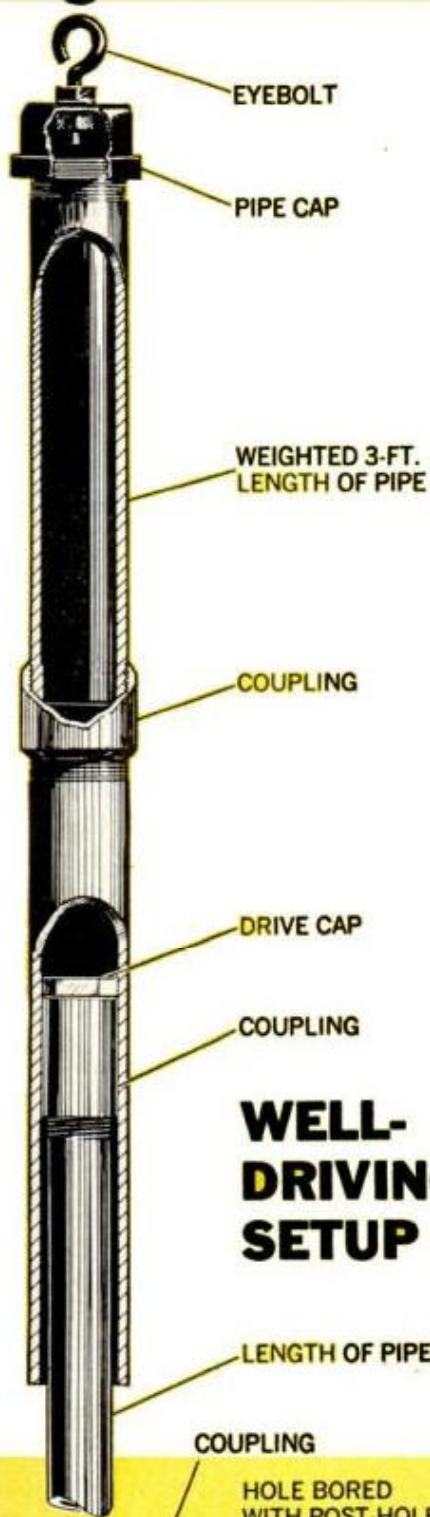
A hand-operated pitcher pump is sufficient for driven wells when the water lift does not exceed about 22 ft. at sea level. At 5000 feet above sea level, the limit of water lift is about 20 ft. Pitcher pumps depend upon a partial vacuum to operate; it is essential that all joints be airtight. Pipe compound helps achieve this.

If the water lift in your area is greater than the limits mentioned, a power-driven centrifugal pump and 2-in.-dia. equipment must be used. Normally, 40 ft. is about the limit to which a 2-in. well can be driven with hand tools. A 2-in. well is not only more difficult to drive than a 1¼-in. well but, also requires that a 1¼-in., drop-pipe (with turned couplings) be permanently installed inside.

Of three basic wellpoint types, one has



WELLPOINT is prepared for driving by threading on the drive cap (left). Driving is easier if you add water to the hole as you go (center). When the point is fully driven, remove cap and apply pipe compound to the threads (right) then, add the next length of pipe and continue the driving operation



EYEBOLT

PIPE CAP

WEIGHTED 3-FT.
LENGTH OF PIPE

COUPLING

DRIVE CAP

COUPLING

WELL-DRIVING SETUP

LENGTH OF PIPE

COUPLING

HOLE BORED
WITH POST-HOLE
DIGGER

WELLPOINT



WITH TRIPOD ERECTED, new section of pipe is added. Notice that two wrenches are used to prevent the bottom section from turning. For smoother driving, coat each of the sections liberally with soap

three sets of holes: round holes or slots in the pipe, a metal screen over the pipe and a jacket with holes over the screen. The second has screen inserts behind holes in the pipe. I chose the third type: a nonclogging point of continuous V-shaped slot design. In addition to being nonclogging, its maker (U.O.P. Johnson Div., 315 N. Pierce St., St. Paul, Minn. 55104) claims it provides four times more open area than other points. The design is available under the Red Head brand name through hardware dealers or by order from Montgomery Ward.

Since it is of double galvanized steel, you will not have to worry about galvanic corrosion when it is used with galvanized steel pipe.

Which wellpoint-size opening to use is determined by the sand in which it will operate. Screen-type wellpoints use 60-gauze for coarse sand, 80-gauze for medium and 100-gauze for fine sand. With a nonclog, V-slot wellpoint, use No. 10 slot for all conditions except where the sand is so fine it is practically quicksand; in that event use a No. 6 slot.

Pipe sections five to six ft. long are generally used in driven wells. Make certain you use galvanized pipe and couplings with good clean threads free of defects. Couplings should be of the reamed and drifted (R & D) variety.

These couplings will provide tight joints since they have more threads than conventional couplings. The additional threads help prevent the couplings from becoming loose during driving. They also have a recessed design feature which aids in preventing corrosion of the male pipe threads. Hand driving is easiest when



TO DRIVE PIPE, simply raise the weighted section and let it fall (left). Periodically, stop and use a weighted line to test for water level. When the desired water level has been reached, clean (purge) the pipe by surging with stick and rags, or with water pressure from hose lowered to the wellpoint tip

the equipment you use pictured on page 188. The drive shown in the sketch is easiest to construct. Basically, it consists of a length of capped pipe with an inside diameter just large enough to slip over the capped riser pipe. The driver is partially filled with enough lead (lead wool can be used) so that it can be handled by one or two men.

Driving can be done with a heavy maul or sledge or with a tripod as shown. Since it is difficult to deliver square, solid blows with the maul, this is not recommended. Glancing blows may break or bend the pipe or strip the threads. Whichever method of driving you decide to use, remember that the riser pipe must be kept perfectly vertical.

The first step is to dig a hole in the ground. The hole can be made with a post-hole digger or hand auger. Here, again, the hole should be vertical and should be dug as deeply as possible to cut down on driving distance.

Assemble the wellpoint, using R & D couplings and pipe-joint compound, to one or more lengths of riser pipe, depending upon the depth of the hole. Fasten a malleable-iron drive cap to the top of the riser pipe. Make certain that all joints are as tight as possible. To avoid breakage of the pipe or splitting of the couplings it is advisable to use pipe wrenches no longer than 24 in.

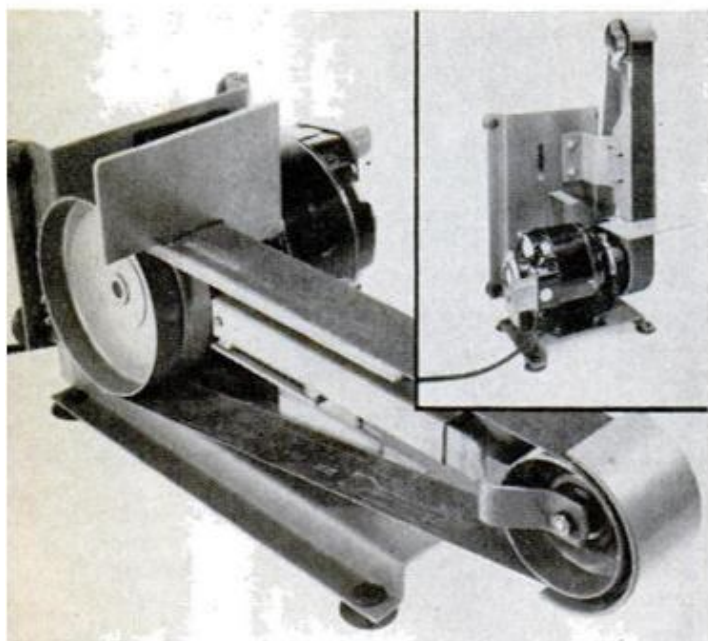
COOL, FRESH WATER is the fruit of your labor. Before drinking, water should be laboratory tested

Insert the assembly into the hole and begin driving. Check frequently to insure that the pipe stays plumb and that the threaded joints remain tight during driving by giving the riser pipe a half turn with a wrench. Always turn to the right,

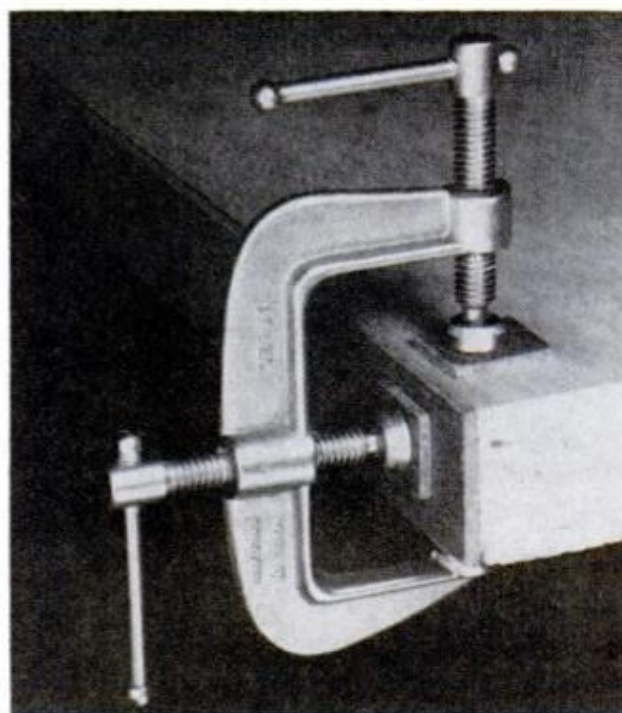
(Please turn to page 228)



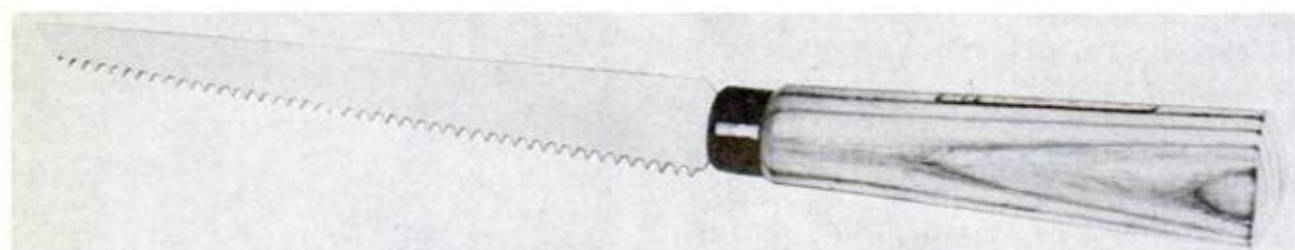
New tools you should know about



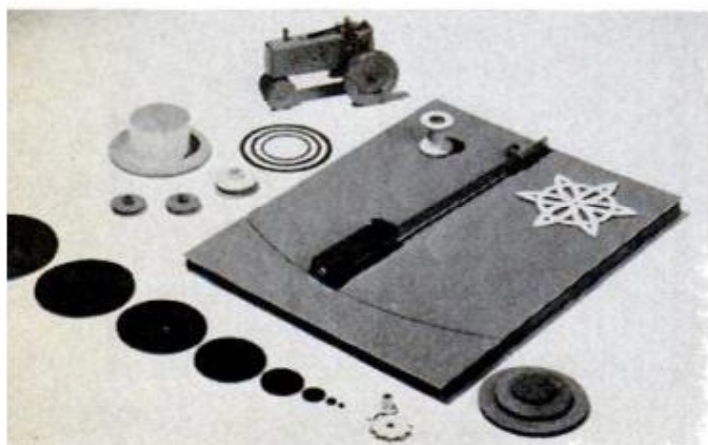
PORTABLE BELT SANDER can be used horizontally or vertically (inset) to grind, polish and deburr materials from wood to diamonds by using the correct belt and grit. Intended for a 1/2-hp, 1725-rpm motor, Model 369 uses 2x48-in. belts that are quick and easy to change (one comes with machine). Portable unit has adjustable worktable to make sanding chores easier. \$50 less motor. Arco Manufacturing Co., Box 817, 1701 13th Ave. N., Grand Forks, N.D., 58201 makes it.



PRECISION-BUILT TOOL of unbreakable fine steel is designed to provide a third hand on tricky clamping jobs. Standard C portion holds one piece, while the secondary screw holds a second piece to the first. Throat opens from 1 1/4 to 2 3/8 in.; depth of throat is 1 1/4 in. Priced at \$4 each, or two for \$6.50. Available from E. S. Bowen, 40 Yonge St. N., Richmond Hill, Ont., Canada.



LIGHTWEIGHT UTILITY SAW can be used to cut plasterboard, hardboard, plywood, wood, frozen food and more. Featuring a high-quality tempered-steel blade with teeth filed 8 points per inch, the 11 1/2-in.-long saw has a tapered, conical-shaped handle for user comfort. It's sold through hardware stores and housewares, camping and hobby centers in department stores. True Temper Corp., 1623 Euclid Ave., Cleveland, Ohio 44115. Price is \$1.49.

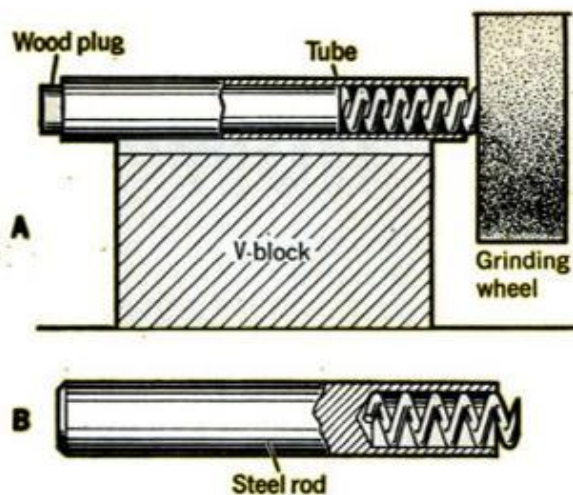


CIRCLE CUTTER is designed to cut perfect circles from 1/8 to 24 in. in diameter from cardboard, bristol or corrugated board, vinyl, acetate, gasket material and other soft materials 1/16 in. or thicker, depending on the material. The complete kit features a basic plastic and steel cutter, extension bar and clamp, cardboard protector, cutting board, plus 10 extra blades. By mail order only, Accu-Orb Circle Cutter sells for \$7.95. Technological Devices, Inc., 39 Echo Hill Drive, Stamford, Conn. 06905.

HINTS FROM READERS

Easy way to grind springs

Compression springs will work properly and seat better if both ends are ground square. Since grinding by hand is difficult, make a holder from a short length of tubing in which the spring fits snugly and will not turn, and plug the other end as in sketch A. For small springs, drill a rod to a depth that lets the spring project $\frac{1}{8}$ in. as in sketch B.—*Daniel Bousha*



Garage-door spring adjustment

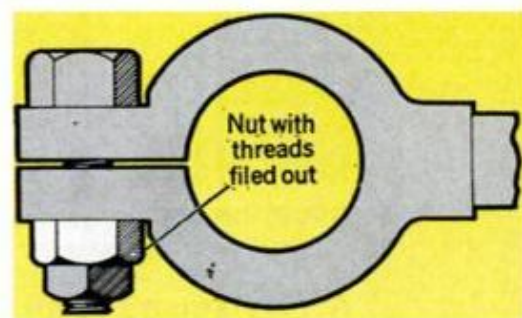
Here's a fast way to adjust overhead-garage-door tension. Prop the door open and attach upper end of the spring to the counterbalance arm. Hook lower end of the spring into last link of the adjustment chain and close door. Insert 12 8d nails in stretched spring and reopen door. Move adjusting hook down as far as it will go and reclose door.—*E. D. Merwin*



Easier battery-clamp removal

The nut that holds the lead clamp on the battery terminal is usually difficult to remove because there's little room for the wrench. However, if you file the threads out of an oversize nut so that it slides on the bolt as a spacer without meshing, it will serve as a filler to give you enough room to use a box wrench on the nut.

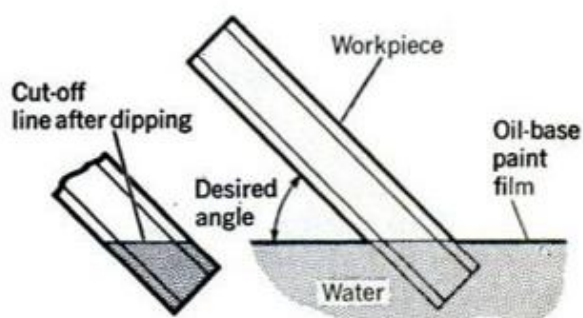
—*Walter Fehlberg*



Marking angles by dipping

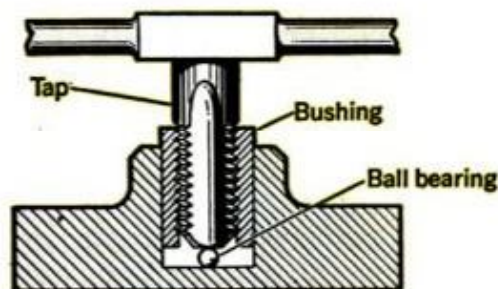
Laying out cutoff angles on odd-shaped workpieces is sometimes difficult and laborious. To do it I pour a small amount of contrasting oil paint into an open container of water. When the piece is eased along the set edge of a protractor into the container, the oil film on the water leaves a perfect cutting line around the piece.

—*William Slamer*

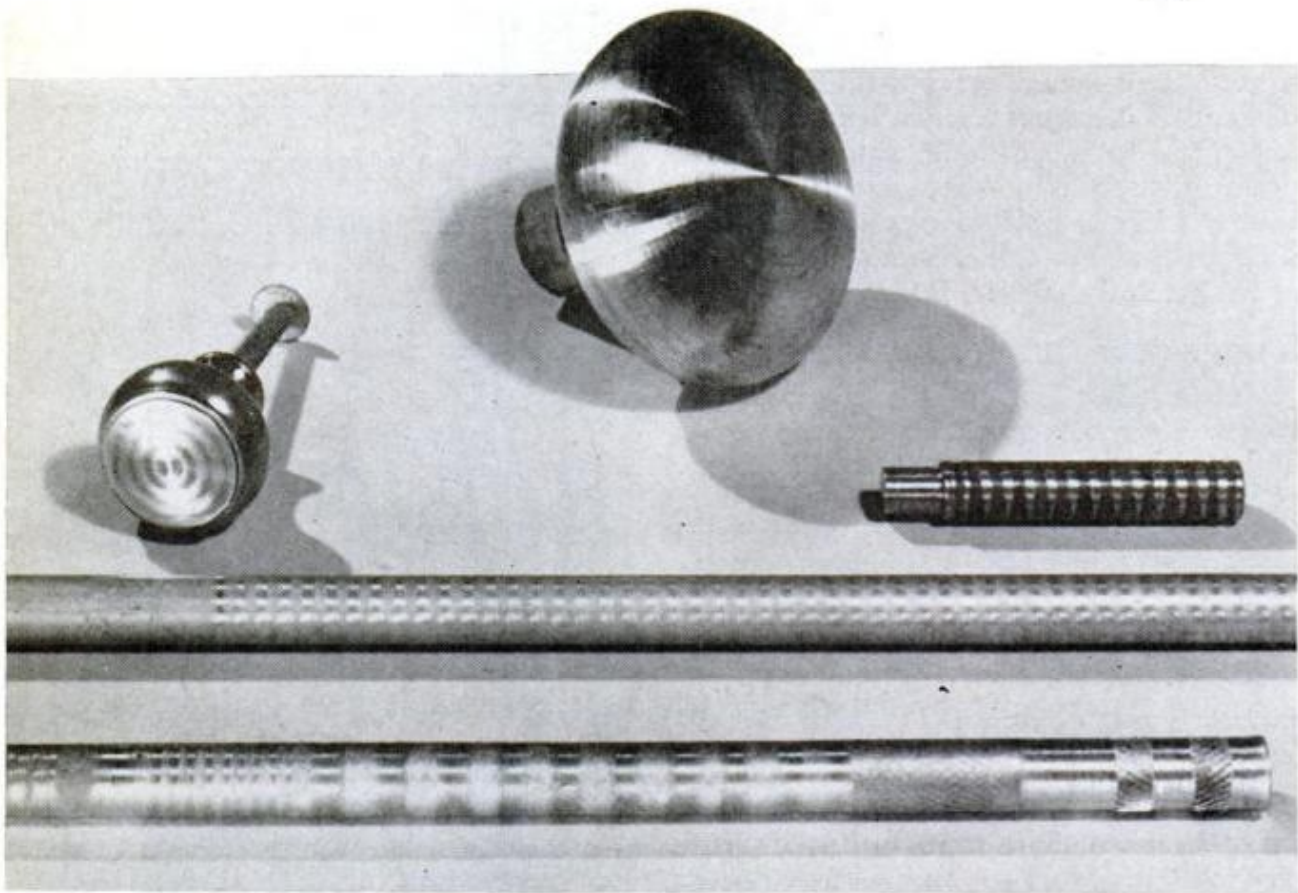


Tap removes worn bearings

Fast way to remove worn press-fitted bearings and bushings from closed-end housings is to drop a ball bearing into the hole, then tap into the hole with a tap slightly larger than the hole diameter. When the tap reaches the ball, it will force the bushing out enough to be removed with other tools. For bronze bearing, use rough-thread tap.—*Peter Legon*



How to Put the Right



TYPICAL LATHE-PRODUCED FINISHES. Aluminum tubes were polished with abrasive rubber; their decorative bands were made with a knurler. Knobs were done with abrasive-rubber pencil or bit and abrasive cloth

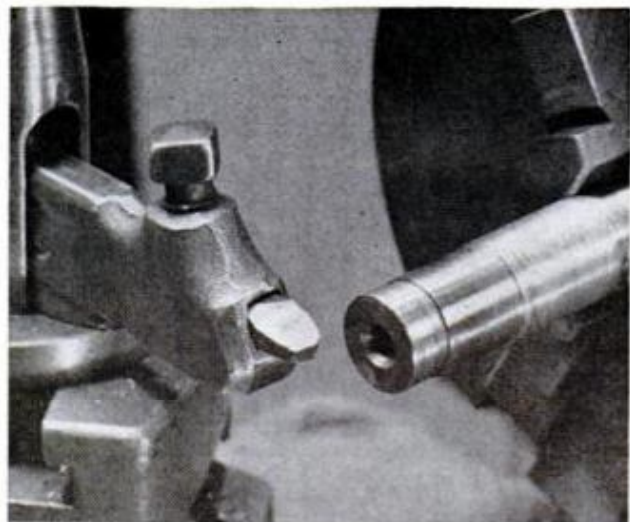
A craftsman's skill and patience are often judged by the appearance of his finished job. Here are a number of ways for you to apply that final touch

By WALTER E. BURTON

A COMPLETED SHOP PROJECT is generally rated by the appearance of its finish—the treatment applied to the surface to bring out its beauty and, perhaps, enhance its functional value. This can be particularly true when doing home shop lathe work on a model, a special tool or an instrument part.

There are so many ways of finishing turned metal that it's just about impossible to present them all in one article. But this abundance can be stimulating—it provides a lot of room for experimenting; you can enjoy the adventure of working out and trying other stunts on your own.

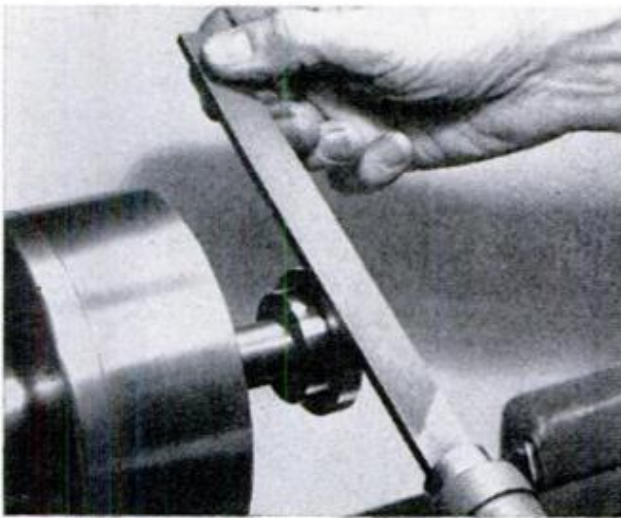
As a general rule, the type of finish to apply depends on the use to which the



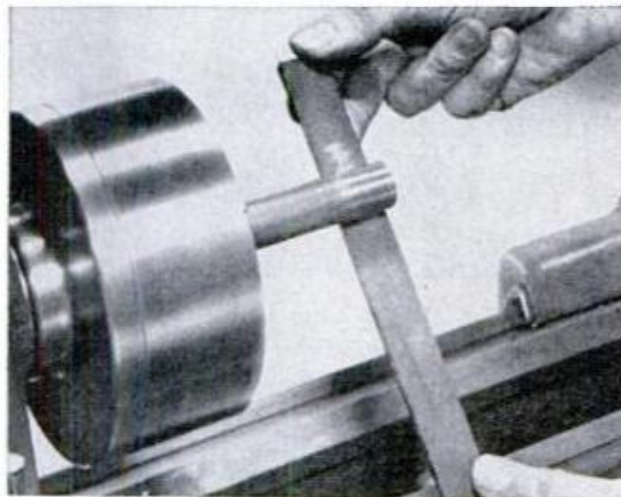
SHARP TURNING TOOL used with a light touch produces smoothness. Lathe bit should have rounded tip

POPULAR MECHANICS

Finish on Lathe Projects



FLAT FILE with its teeth cut at sharper angle than conventional file removes marks left by turning tool



ABRASIVE CLOTH mounted on stick can be used for smoothing. Like file, abrasive should be kept moving



RIGID PLASTIC-FOAM BLOCK, rubbed over a cake of buffing compound, provides an adequate sheen, too

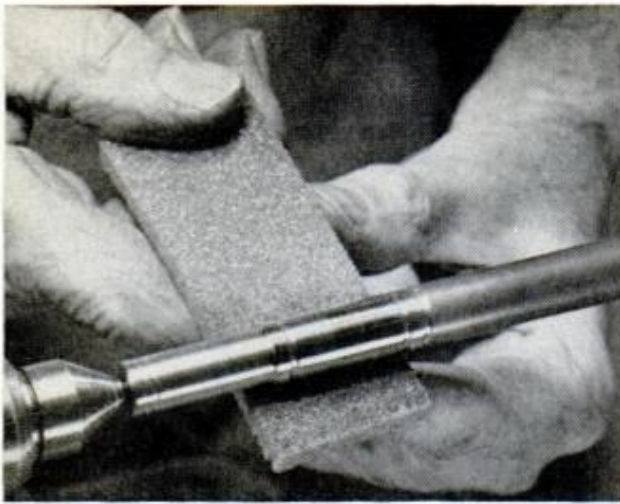
turned article is to be put. Roughly, some procedures can be grouped, as follows:

● *Turned finish.* For many purposes, as in making a punch for rough work, the finish left by the turning tool is good enough. A rounded tip is likely to produce a smoother finish-cut than a sharp, pointed tip. For the final, finishing pass, set the tool for a shallow cut and feed it very slowly along the work. Sulphurized oil or other lubricant may help. You'll find that nature of the metal, as well as tool shape and sharpness, has a lot to do with the appearance of the turned surface.

Finish can be improved by using an oil-stone (such as an Arkansas stone) to hone the cutting edge keen and smooth. *Tip:* If, when you attempt a very light cut, chatter develops and mars the turned surface, a switch to a lower spindle speed (even through back gears) may be a cure.

● *Filed finish.* When a turned surface isn't quite smooth enough, a bit of filing may be all that is needed. Although conventional files can be used on a lathe, steeper-toothed lathe files designed specifically for smoothing rotating work are better. Flat lathe files usually have untoothed edges. The work and file should be free of oil and other material, and the teeth kept clean by frequent brushing with a stiff wire brush. Bits of metal accumulating on and between file teeth can produce some unsightly grooves in the area being smoothed. Some mechanics rub a file with chalk to discourage chip pile-up. (When using a lathe file, take care to prevent fingers, sleeves and other parts of clothing from being snagged by the chuck, dog, or workpiece and always grip the file as if you are left-handed.)

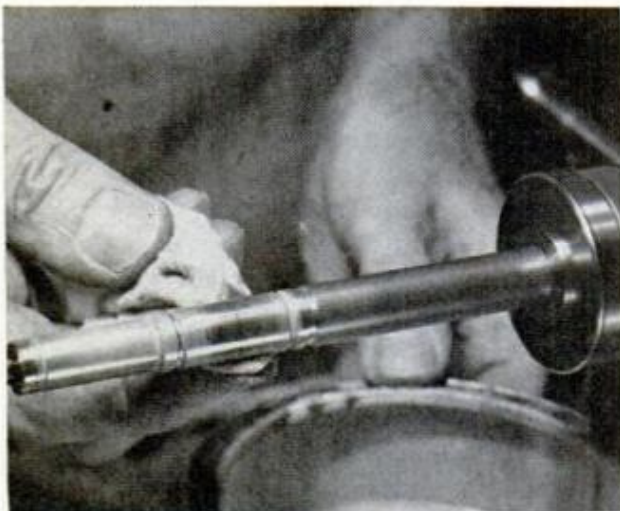
● *Abrasive paper and cloth.* Coated abrasive materials include cloth and paper treated with aluminum oxide, silicon carbide, emery, crocus, or other abrasives such as grains or powders in various degrees of fineness. Grit size indicates the number of holes per inch in a sieve through which the grit will pass and may be expressed by that number, a fraction such as 4/0 or by an adjective such as



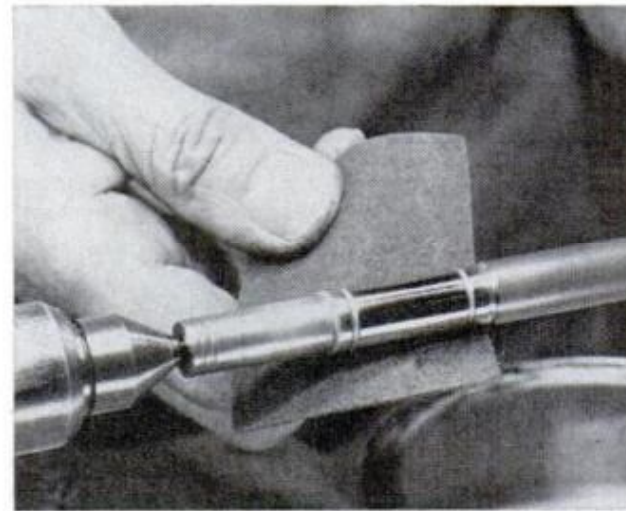
ABRASIVE-CHARGED FOAM PAD is used to polish a brass rod after you smooth it with an abrasive cloth



TIGHT GROOVES ARE POLISHED with flat stick charged with abrasive grit mixed with a light oil



IMPORTED BUFFING POLISH, though intended for aluminum, works well on brass when applied with cloth



TO DEVELOP A LUSTER after polishing, use a piece of felt from old hat to remove any dried compound

“fine.” You can use loose abrasive grit; there will be more on this later.

You often see emery cloth or paper recommended for polishing steel and other materials. (Emery, a natural variety of corundum, contains aluminum oxide and other minerals.) Probably some recommenders had in mind man-made aluminum oxide (such as Aloxite), or even silicon carbide (such as Carborundum) which is suitable for polishing hard, brittle materials. (Aluminum oxide seems preferable for tough steels and the like.)

One polishing procedure is to glue or staple a strip of the abrasive-coated material to a flat wooden stick, and use it like a file—dry or sulphurized, or with machine oil as with an oilstone.

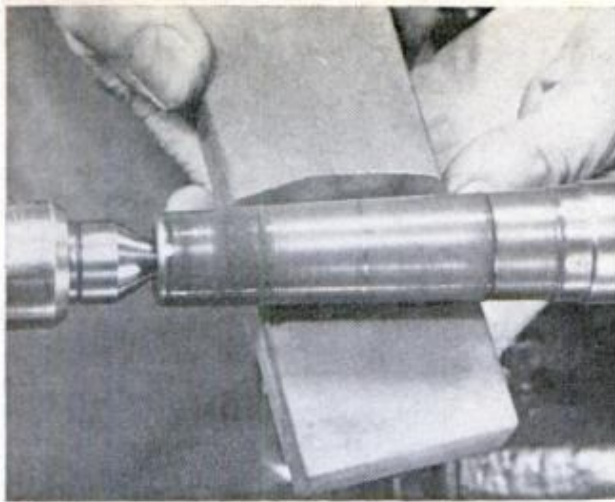
Whether abrasive cloth, paper or loose grit or powder is used to smooth turned work, the accepted sequence is to start with a certain size grit (for example, me-

dium No. 150, or 4/0) and proceed by steps to finer and finer sizes. The first grit polishes out tool or file marks; subsequent grits remove scratches caused by the preceding, coarser grit. The second grit might be fine, No 180 or 5/0, followed by extra-fine, No. 220 or 6/0; and then finer polishing could be done with buffing compounds or commercial polishers. In the end, there may still be polishing scratches—but so fine they can't be seen without magnification.

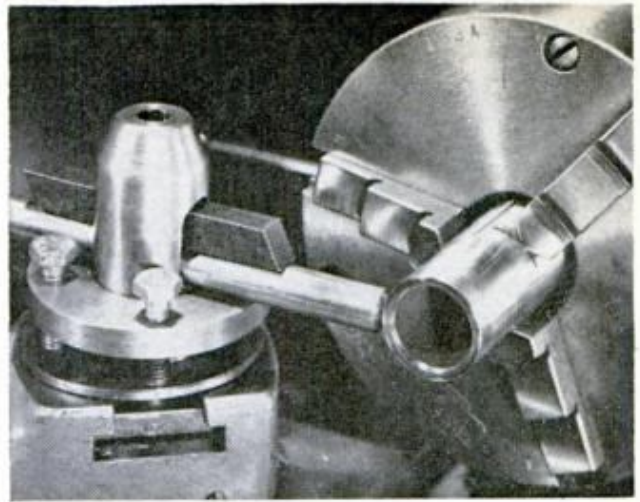
The precise grit sizes to use can be found by trial. Usually, in home-shop work, a sufficiently smooth surface can be developed in two or three polishing steps.

A worthwhile economy in the shop is to never throw away a piece of abrasive cloth that still holds together. The longer it's used, the finer it cuts; eventually it may produce a shine equal to that from the finest new material.

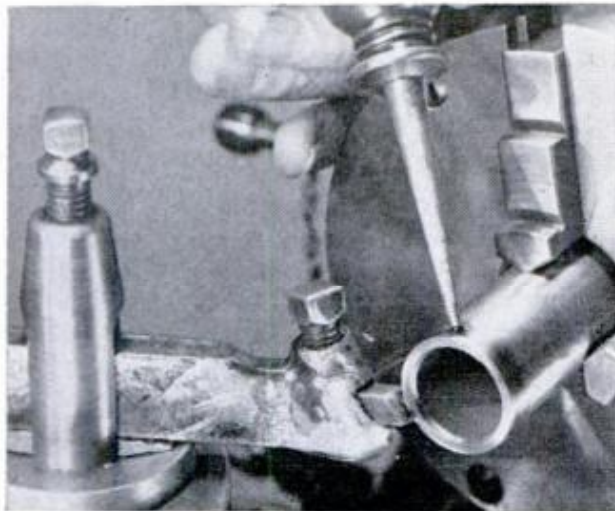
Instead of a stick to support the abra-



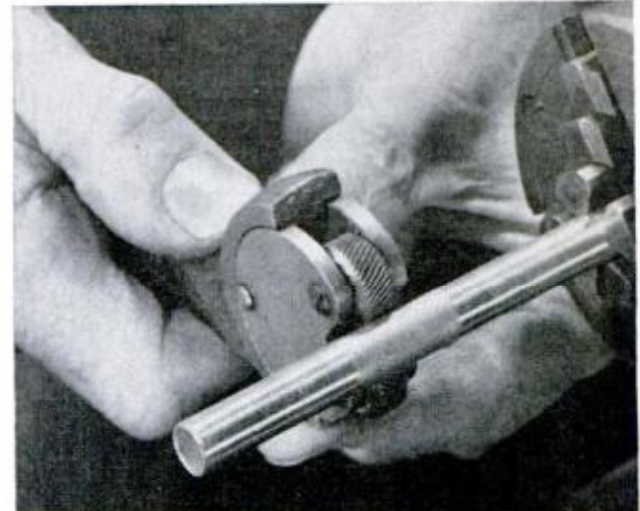
TAPER IS TURNED, using a flat oilstone lubricated with light oil. Move oilstone in back-and-forth motion



SMOOTH FINISH is given oiled brass tubing with diamond-tip grinding-wheel dresser used as burnisher



HIGH-SPEED LATHE BIT can be used as a burnishing tool. Be sure that the work is kept well oiled



HAND-HELD KNURLING TOOL gives fine, crosshatched texture when held in lathe against spinning tubing

sive cloth or paper, you can shape various blocks, pads of felt, plastic foam, leather and the like to polish rounded shapes, including grooves.

● *Buffing, honing, and burnishing.* Buffing removes flaws left by previous polishing. Buffing compounds usually consist of finely divided material mixed with a binder (dry powder in oil or other fluid). In normal lathe work, you probably would be more likely to buff brass, copper, aluminum or silver than steel.

A buffing compound designed for "cutting" is intended to be used first, followed by final buffing with a "coloring" preparation. Tripoli is a typical cutting material in buffing, while rouge (producing a burnishing rather than a cutting action) is used to bring out the final luster.

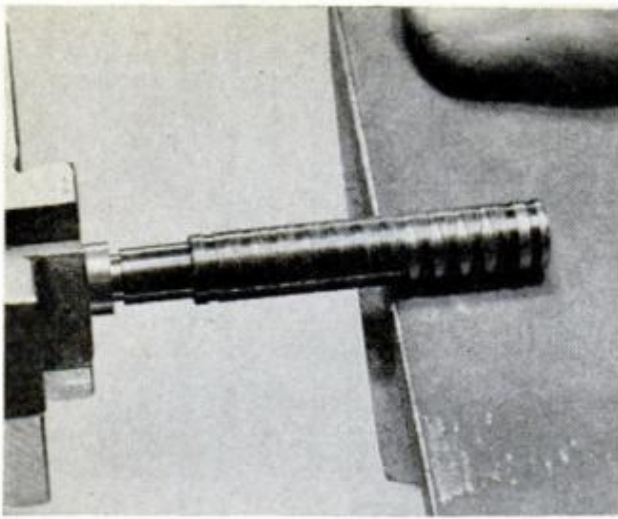
The buffing compound can be used on work spinning in a lathe by spreading it on a block or pad serving as the tool. The

pad may be of leather, felt or plastic foam.

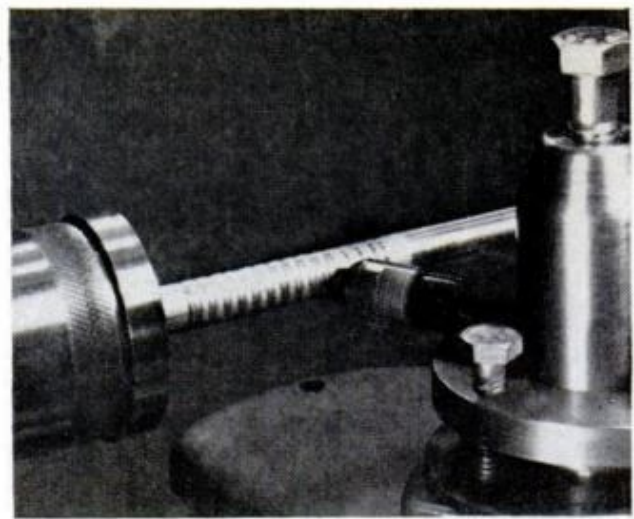
Of course, a piece can be polished on a conventional buffing wheel after removal from the lathe. Such a wheel, made of cloth or felt and charged with compound, might be mounted on a toolpost grinder and used to buff revolving work. Finally, buff with an uncharged wheel.

In oilstone lathe honing, an abrasive stone is held against the revolving work, primarily to grind down any metal points that might be projecting. Machine oil or special oilstone oil is the lubricant. The stone generally is moved back and forth parallel to the work axis, in circles or in figure-8s. "Superfinishing," a process attributed to David A. Wallace of the Chrysler Corp., is a form of honing with moving stones. Lathe headstock spindles operating in solid bearings are among parts on which superfinishing may be used.

Since a honed surface generally has a



DESIGN IS BIT-CUT in blued-steel handle, and then polished with an abrasive cloth for two-tone effect



DOUBLE-SPIRAL DESIGN was turned in aluminum by abrasive-rubber pencil mounted as a "lathe tool"

duller finish than a polished one, it can form a basis for subsequent polishing.

Lapping is an operation performed (often by hand rather than power) with abrasive grains plus oil or other fluid, to achieve close fitting of parts, bring gauges to precise size, even out surfaces and so on. Thus, you might lap a taper shank into a taper hole. Some lapping compounds are designed to break down readily to make their action self-limiting, and thus prevent "overlapping."

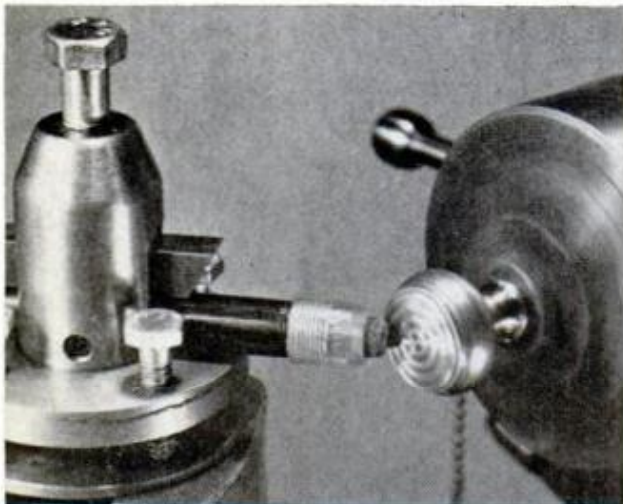
Lathe burnishing is simply a rubbing operation with a hard, highly polished tool pressed against the revolving, lubricated surface. Its desirability is best found by trial, for sometimes a similar smoothness can be produced readily by other methods. A sort of burnishing can be achieved with a diamond-point grinding-wheel dresser by adjusting it for light rubbing contact, employing fine feed and keeping the work

well-oiled. But, some diamonds may prove too rough for a satisfactory result.

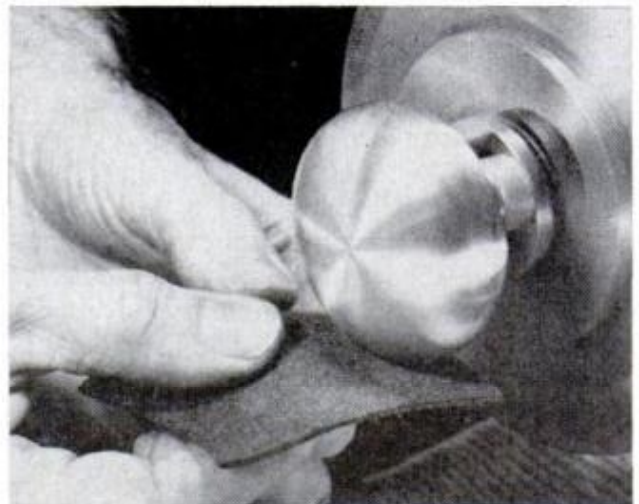
Sometimes the use of a commercial metal-polishing compound as a final finishing operation will develop on brass, aluminum, and the usual metals, a shine comparable to that achieved by wheel-buffing. Apply the polish to the spinning work with a small cloth or felt, manipulate the pad in contact for a while, then clean and polish with another cloth or felt. Always use a small cloth and check for roughness on the work that might snag it.

● *Texturing and "inlay" patterns.* Texturing consists of producing on the surface of turned work a pattern of lines or grooves that blend into a pleasing appearance. One way is to hand-hold a knurling tool lightly against the revolving work—preferably after polishing. Keep knurling pressure at a minimum, and frequently

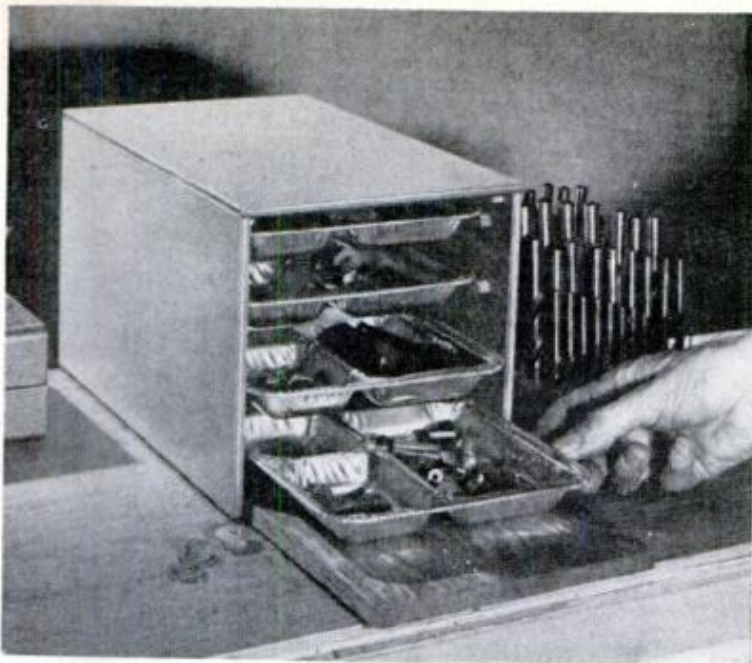
(Please turn to page 208)



DECORATIVE CONCENTRIC RINGS are also produced by rubber. Space rings with aid of cross-feed scale



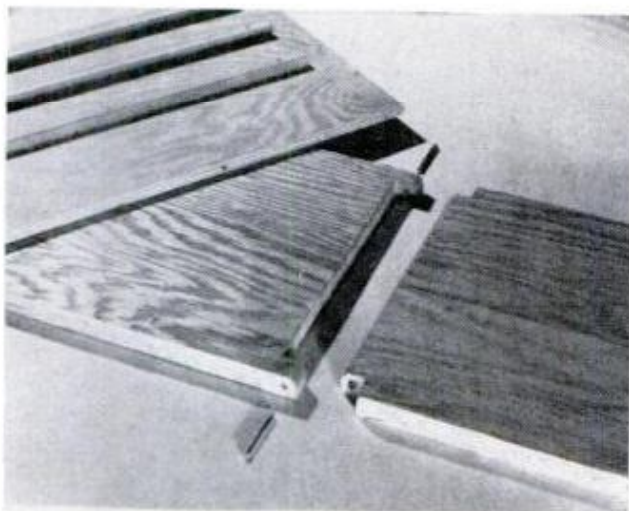
COUNTLESS CONCENTRIC SCRATCHES made with abrasive-charged cloth give starlike light reflection



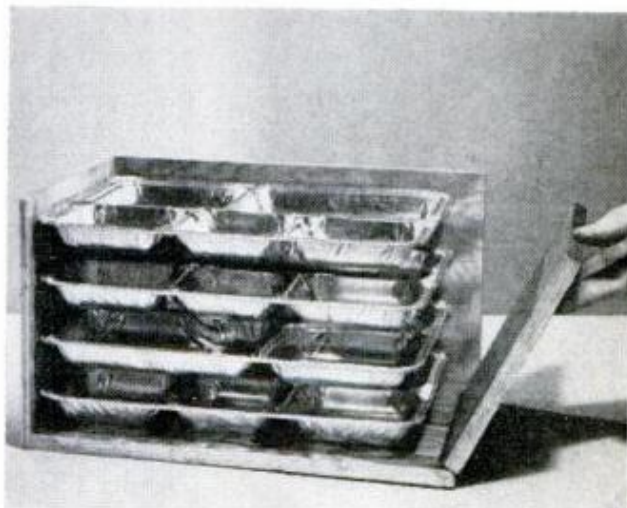
PARTS-CABINET DRAWERS are aluminum trays left over from four TV dinners. Compartments are adequate for small items

Small-Parts Cabinets From TV Dinner Trays

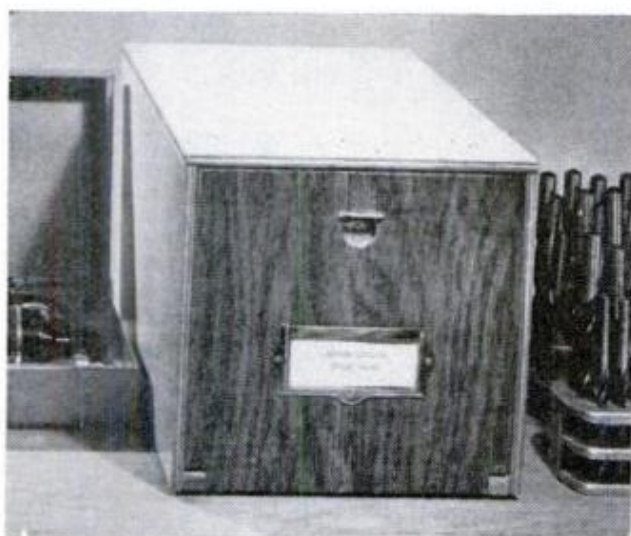
By **WALTER E. BURTON**



PIVOT PINS, about 1¼ in. long, serve as hinges. Door is hinged first, then the sides are attached



CUTAWAY INSIDE VIEW. Note that door swings down flat, provides surface for bottom tray to slide on

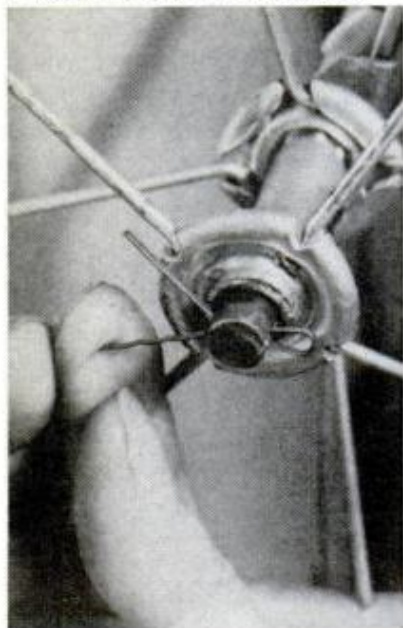


CABINET rests on four feet ¾ in. thick and 1 in. square to give clearance for door bottom edge

USED AS DRAWERS in a parts cabinet, TV-dinner trays can be put to work to store anything small enough to go into their compartments. The "full-course" dinner trays are best because they are of sturdier construction than the small, individual serving sizes.

The four-drawer unit shown is built of ¼-in. plywood except for the door and bottom. The latter are of ½-in. oak, which just happened to be kicking around my shop. The lowest tray rests on the cabinet bottom, while those above slide in and out on ⅝-in. wood strips nailed and glued to the side panels. These strips are spaced so that there is clearance above each tray in case any of the contents project a bit upward. ★★★

HINTS FROM READERS



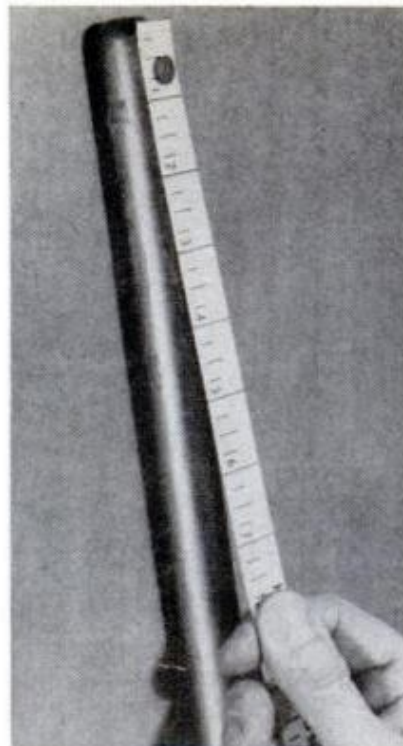
Emergency cotter pin

If caught short, you can substitute a bobby pin for a cotter pin on a baby-carriage, stroller or other small-size wheel. If the axle pinhole is of large diameter, use several bobby pins for a force-fit. The fasteners, of course, should be replaced with the proper size pin as soon as possible.—*William Swallow*



Improved caulking gun

If you have ever had a caulking gun break down during a Sunday caulking session, you know the frustration of having to leave the job unfinished. To continue working, use a sliding wood clamp as a gun. Maintain pressure as the pusher plate moves forward, by feeding in wood blocks.—*Michael Burn*



Homemade 'yardstick'

Lacking a wood yardstick when I measured a room for wallpaper recently, I thumbtacked a cloth tape measure to a broom handle as shown. The result was that I was spared having to move a ladder around to get vertical dimensions, and I didn't need a helper to hold the other end of the tape.—*William Swallow*

NEXT MONTH IN SHOP AND CRAFTS

TOO PRETTY TO CALL A SHED. Its western styling will make it an asset in any backyard because it doesn't look like a storage shed. It's roomy enough to serve as a playhouse when the youngsters are small and, when they outgrow it, Dad will have a convenient garden and yard-tool storage house. You'll find it in the May *PM*.

IMPROVE YOUR LATHE WORK WITH INDICATORS. A test indicator can do a lot to improve your accuracy on a metal lathe and, chances are if you use one, you will save time in the long run. Learn how to use it in next month's issue of *PM*.

THE FORGOTTEN HAND TOOLS: CABINETMAKERS' SCRAPERS. Before sandpaper, the scraper was one of the cabinetmakers' more valuable tools. Used primarily to smooth off blade-marks left by planing, the tool has now fallen into near oblivion. Pick up the May issue of *PM* and add this woodworking technique to your skills.

WHAT YOU SHOULD KNOW ABOUT IN-SINK GARBAGE DISPOSERS BEFORE YOU BUY. Few can argue with their purpose and healthful advantages. But, before you lay your money on the line, read this in-depth report on disposers, how they operate and which type is most likely to fill your requirements. It's in *PM* next month.

PLUS: a special four-page roundup of the latest in garden and yard tools.

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GE'S ELECTRIC TRACTOR

(Continued from page 123)

cles so big you can't cut a corner of the lawn without a lot of jockeying."

The short wheelbase was possible because of evenly distributed weight. A conventional tractor (with front-mounted engine and front-mounted mower) would be nose-heavy with a 39-inch wheelbase.

"The Electrak has almost the same pounds per square inch on front and rear wheels," said Laumeister. "The average tractor has 2 to 1 on front and rear—because of the engine—and the greater weight is on the front where you don't want it."

The Electrak weighs 865 pounds; battery weight accounts for 350 pounds. Four six-volt batteries are in a closed compartment under the driver's seat. Two more and the motor are under the hood.

"It's that weight distribution that lets you climb the hill without wheel-spin,"

Battery weight an advantage ... most tractors need additional weight for traction.

said Laumeister. "In an electric car, the weight of the batteries handicaps performance. In a tractor, battery weight is an advantage because most tractors need additional weight for traction. By putting battery weight in the right place we use it to get a tremendous amount of drawbar pull. Secondly, a gas engine develops its maximum power only at high rpm. The electric motor develops its rated horsepower at high rpm, but as you slow it down it develops up to 10 times its rated torque."

The motor in each Electrak model is capable of putting out up to about 20 hp on peak loads. The motors differ only in the amount of time that each will sustain the peak load. The reasoning behind this: People will buy 14-hp tractors to have extra power when they need it. In most applications they use much less. E-20 is the "Commercial" model designed for professional groundskeepers. The E-15 outpulls standard 12-hp engines; the E-12 outpulls 10-hp engines.

GE is reluctant to discuss the motor other than to say it bears no resemblance to the type used in electric cars and is a "very heavy industrial-grade motor."

"It is unique," says Laumeister. "There's nothing like it in any other vehicle at present. The motor and the control system are electrically integrated and matched."

GE also makes the batteries, guardedly referred to as "a new wet-cell type."

How many hours of use can you expect from the batteries?

"That depends on the job," said Laumeister. "One day we cut an alfalfa field about 1½ feet high. We had the mower at a low setting, which is a ridiculous application. Our power lasted two hours; we cut two acres. Normally the charge will last 2½ to six hours. It may last three or four hours if you're doing average mowing; five or six if you're towing a cart."

Does this leave you stalled in the field, far from an outlet for the charger?

"You won't 'run out of gas' because toward the end of the charge the voltage drops off; you feel the tractor or the mower blade slowing. Even if you run the Electrak to a standstill, just let it sit for five minutes and the batteries recover sufficiently to take you home. When the fuel gauge shows 'Empty,' you still have enough to return to a power source."

Will you run out before you finish?

"If you have over 3½ acres," said Laumeister. "Let's say you go out at 8:00 o'clock in the morning and cut 3½ acres (that's a lot of mowing) by 10:00 o'clock. You can recharge and go out at 4:00 o'clock and do as much again, because most of the charge is replaced in the first four or five hours. Batteries charge very fast and then taper. You have to put the taper in because it equalizes the cells, but the actual power is restored in four or five hours. Our built-in charger is designed for that. After a complete discharge, it takes about 10 to 12 hours for a 100 percent charge. However, in the first three hours you restore almost half the charge; in the first six hours you replace three-quarters of the charge."

How long will the batteries last and what will it cost to replace them?

"With normal care, we expect them to last 8 to 10 years. They carry a five-year warranty. Replacement cost should be between \$16 and \$32 per battery, depending on type purchased. But since recharging costs only pennies, you might say that included with the Electrak is an 8 to 10-year fuel supply."

Another plus for the Electrak: It doesn't have to look far for a "gas pump." The home electric outlet licks a common problem for mower pilots—running out of gas on Sunday when local stations are closed.

It remains to be seen whether an electric tractor will appeal to men who like the sound of an engine when they pour on the power. GE is aware of this; Laumeister seems happy about a slight natural gear noise that comes from the transaxle when the tractor is under load. ★★ ★

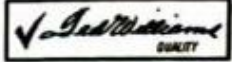
The new Sears fiber glass boat. It takes the rock and roll out of fishing.



Here's real fishing comfort—a swivel seat that screws into the boat's seat.

Ice chest, rod storage grooves, anchor rope guide, carrying handles—they're all molded right into the boat.

There's not a seam or rivet to leak. The boat's molded into one solid piece of fiber glass.

This check mark and  signature certify that Ted Williams, Chairman of the Sears Sports Advisory Staff, personally tested and approved "The Jonfisher."

A flat-bottom boat's great for still fishing. Stable. Comfortable. But on the move, it's something else. It rocks, rolls.

Ted Williams and Sears wanted a boat that wouldn't.

With a marine engineer's help, they got it. He designed a shallow-draft boat with a bottom flat as a raft's. Almost as steady, too. Next he added a modified V bow that makes this boat ride smooth even in choppy water.

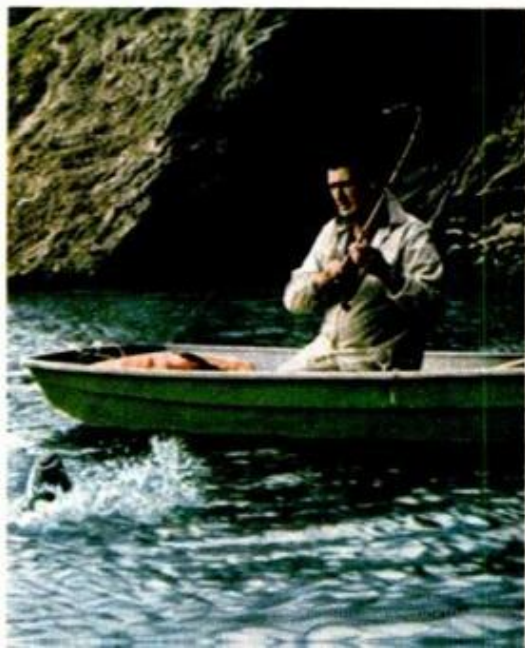
Then Sears had the boat

molded into one solid piece of fiber glass. And with all the things a fisherman needs built in.

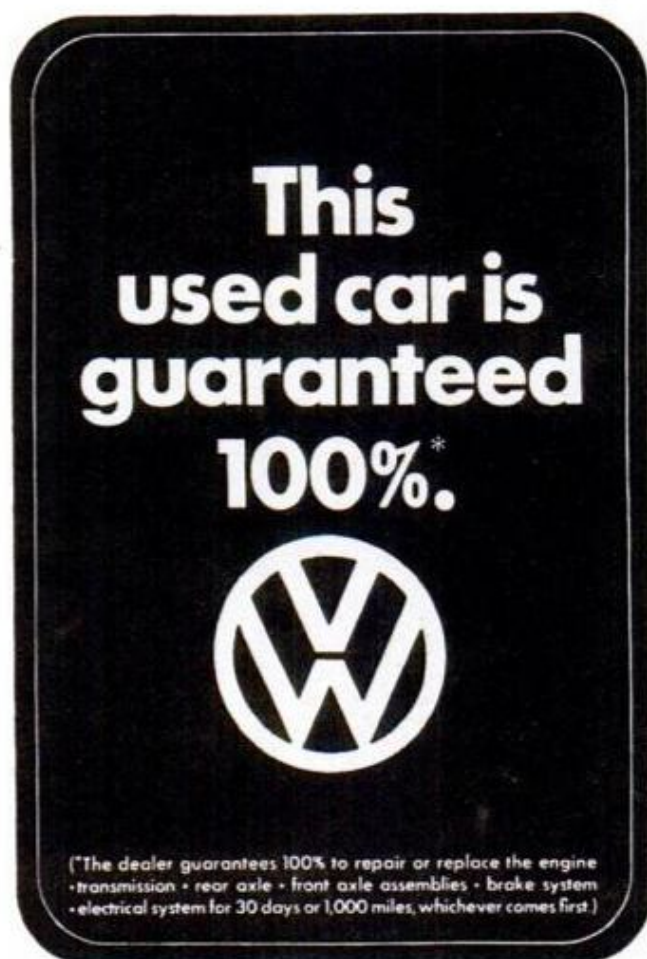
See this great new boat, "The Jonfisher," at a Sears Sports Center. Or in a Sears, Roebuck and Co. Catalog.

Sears 
SPORTS CENTER

where the new ideas are

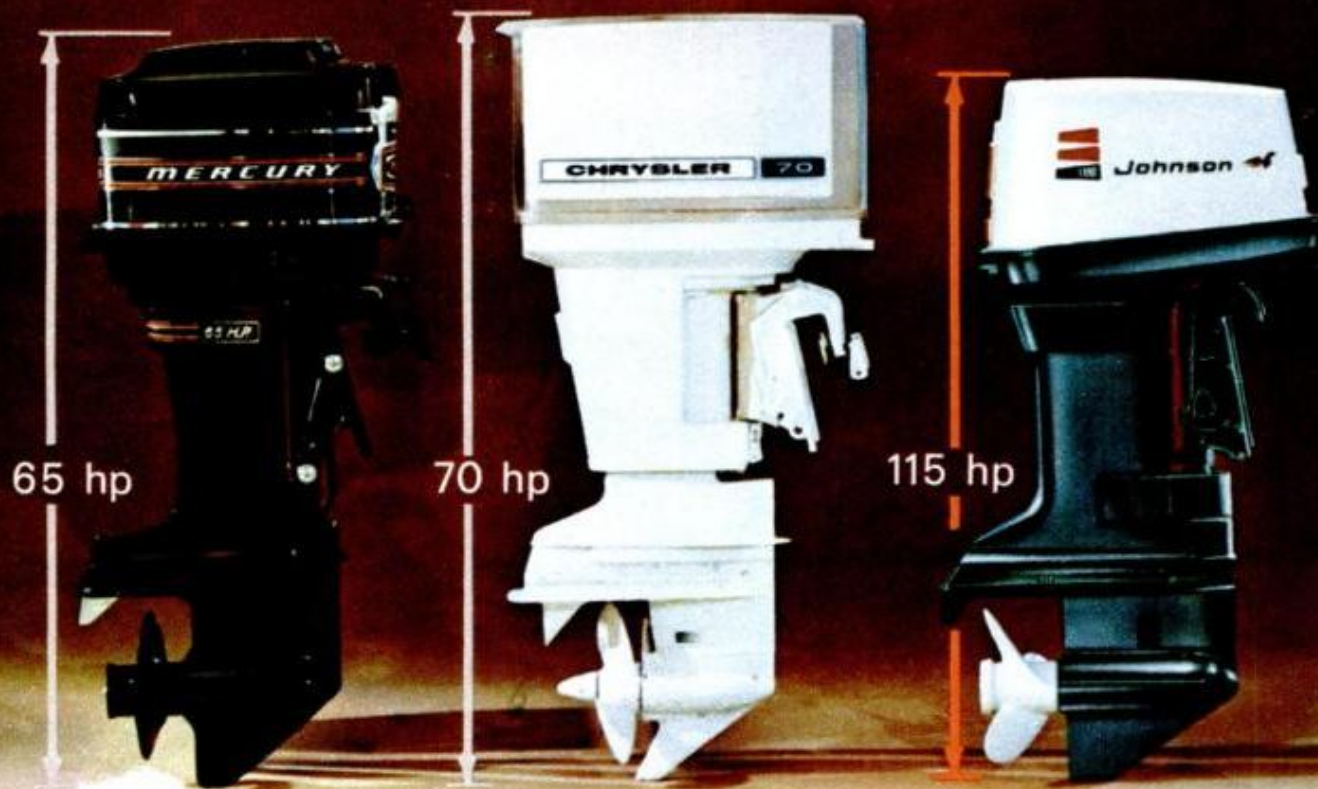


35 reassuring words from your Volkswagen dealer.



*This sign appears only in cars selected by your VW dealer.

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that's about the size of it

Standing still, these three outboards are approximately the same size. In action, there's no comparison. Under the low-down lid on the right, Johnson has tucked a powerful V-4 engine that churns out 115 horses with quiet, calm dependability. In addition to the efficient excitement of the V-design, this Sea-Horse also features Power/Pulse solid state ignition, new lightweight pistons with super-slim (no flutter) rings and a pair of fast-feeding two barrel carbs. Down where power becomes performance, you choose from six standard prop configurations with three more high performance bronze options. And to put

you in command of power and performance, Johnson's exclusive Hydro-Electric power shift is combined with the throttle in a new single lever remote control. You can buy other outboard motors with horsepower comparable to our new Sea-Horse 115. But you'll have to settle for something noisier, quite a bit taller, with fewer innovations and without Johnson dependability. It will be a big motor. And it could be a big mistake.

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Build an auxiliary table to enlarge your band saw. Your 12- or 14-inch band saw will cut anything you can get under the blade guide. The problem is to support and guide a large workpiece while it is being cut. Here's a 3 x 4 foot plywood table that gives any small band saw big-machine capacity and flexibility. Plans help you do it inexpensively.

Learn arc welding basics quickly. No need to shy away from arc welding. Practical tips help you lay a good weld in 6 hours easy practice.

Children love the Free-Flight Parashot Plane. Build this model for your children and you'll get a big hand at any flying competition. It may look like a flying dinner plate, but this way-out model is a rugged performer.

Brazing fixture for band saw blades. You can save half on blade costs if you buy bulk 100-foot rolls and make

your own. But you have to know these steps to silver-solder the joints.

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FORD ECONOLINE VANS



RIGHT FINISH ON LATHE WORK

(Continued from page 198)

lift knurls from the surface and replace them, so they do not tend to follow a repeat path (as would occur in conventional knurling).

For metal tool handles and levers to be grasped, an interesting, nonskid effect can be produced by first knurling or cross-threading the surface, blueing the piece if it is steel or applying colored lacquer if it is another metal, then filing and polishing it to remove color from the high spots while leaving it in depressions. Steel can be blued chemically or by heating until the desired oxide color develops. (See *Lathe Inlaying*, page 170, July '65 PM.)

● *Pattern polishing.* Selective polishing with an abrasive rubber eraser (or with Brightboy stick) can produce interesting effects. The surface to be decorated should not be highly polished, but preferably a dull finish such as that developing on aluminum over a period of time.

Spiral patterns on cylindrical work can be produced by mounting the abrasive pencil like a regular lathe tool and using a coarse-thread setting, such as 4 t.p.i. (threads per inch), to control tool movement. Tracing right and left-hand overlapping "threads" produces a lattice effect. A series of bright bands or rings can be made with abrasive hand-held or in the toolpost.

By mounting the abrasive pencil as you would a conventional bit for a facing operation, you can produce concentric circles, spirals, or lattice designs on the flat surfaces or knobs, push plates and other items.

Those striking, circular-diffraction-grating-like effects you sometimes see on the front of transistor radios can be achieved on doorknobs, push plates and the like by mounting the item on a lathe faceplate or in a chuck and holding against it, as it spins, a fine-grit abrasive paper or cloth or a felt pad charged with fine abrasive powder.

● *Loose abrasive grits.* Almost any abrasive, if finely divided, can be used for polishing lathe work. It's fun to try different materials—such as aluminum oxide or silicon carbide grains and powders, pumice, Damascus ruby powder, rottenstone, valve-grinding compound, various abrasives used by rockhounds—and even household cleaning materials such as Bon Ami. Generally you can mix the abrasive with oil and use it to charge a pad or stick held against the spinning work. It's a good idea, when using any abrasive that could fall on the lathe, to cover the carriage and bed.

● *Grinding.* A toolpost grinder can produce a smooth finish on both hardened and unhardened metal. While grinding is often used primarily to bring the work to a definite dimension, or work metal too hard to cut with tool bits, the proper abrasive wheel can produce a very smooth finish. Recommendations for wheel choice can be obtained from suppliers of grinding materials and equipment.

There exists a considerable array of materials for producing smoothness and brightness, or achieving novel effects. In many cases, the best way to find out what is most suited for the job is to do some experimenting—to polish or treat some scrap pieces before tackling the main one.

Sources for various polishing and buffing supplies include William Dixon, Inc., Box 99, Newark, N.J. 07101; also various abrasive manufacturers such as Norton Co., 50 New Bond St., Worcester, Mass. 01606 and the dealers who handle their products. ★★ ★

FOUR WEEKEND PROJECTS

(Continued from page 185)

to the ties with ½-in. flathead nails, one being placed on one side of the rail and one on the other. Round the points of a couple 6d nails with a file, cut into ¾-in. pins and press them in the ends of the sawed-off rails. Finally, sift and sprinkle some fine gravel in a coating of wet shellac painted around the ties to simulate roadbed.

I used a Lionel No. 1101 metal-shell locomotive, but any train, even one with a plastic shell, will do. First remove the motor and scribe a line around the shell 4⅛ in. from the pilot. Then saw off with a hacksaw and file the end square. Fit a wooden block in the cavity and cement it in place. Also glue the small block that holds the shaft of the wheels.

To pinpoint the dowel hole in the cavity block, insert a dowel transfer plug in the hole and place the locomotive on the track. Then press the point of the transfer plug into the tunnel block and drill for a ⅜-in. dowel. Cut the side rods and the wire handrails so they extend ¼ in. beyond the cut end of the locomotive, drill tiny holes for them in the tunnel block and then with everything aligned, press in place.

The caboose is mounted similarly. It should be cut through at a point in the center of the observation roof.

If you wish, you can spray locomotive and all with several coats of clear acrylic. The last step is to glue felt to the bases and trim with scissors.—S. O. Dodge

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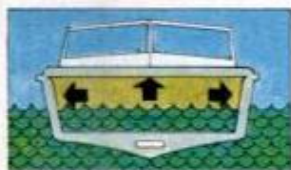
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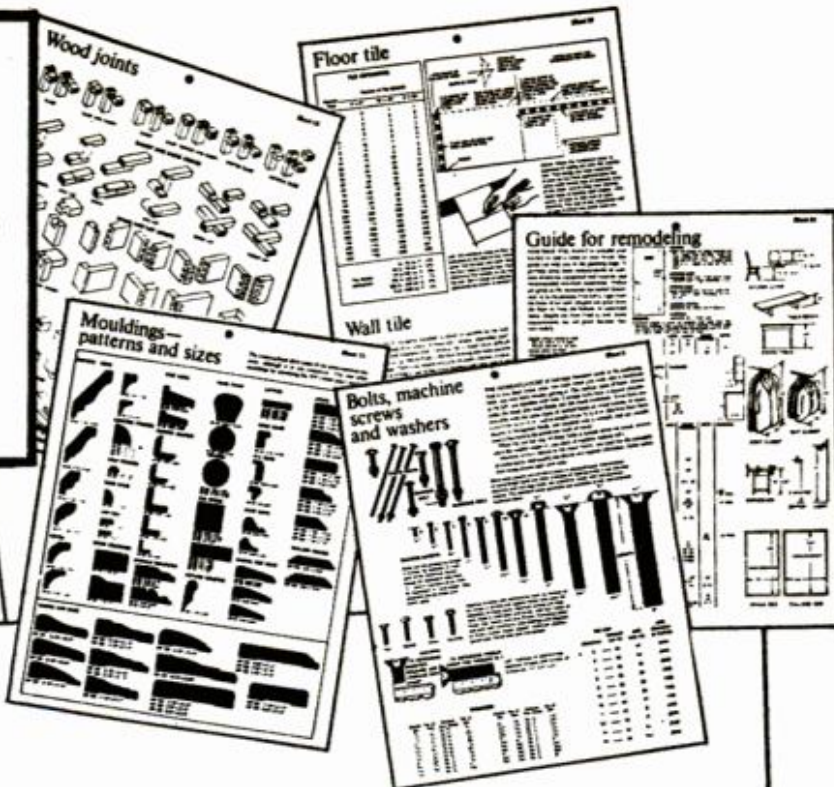
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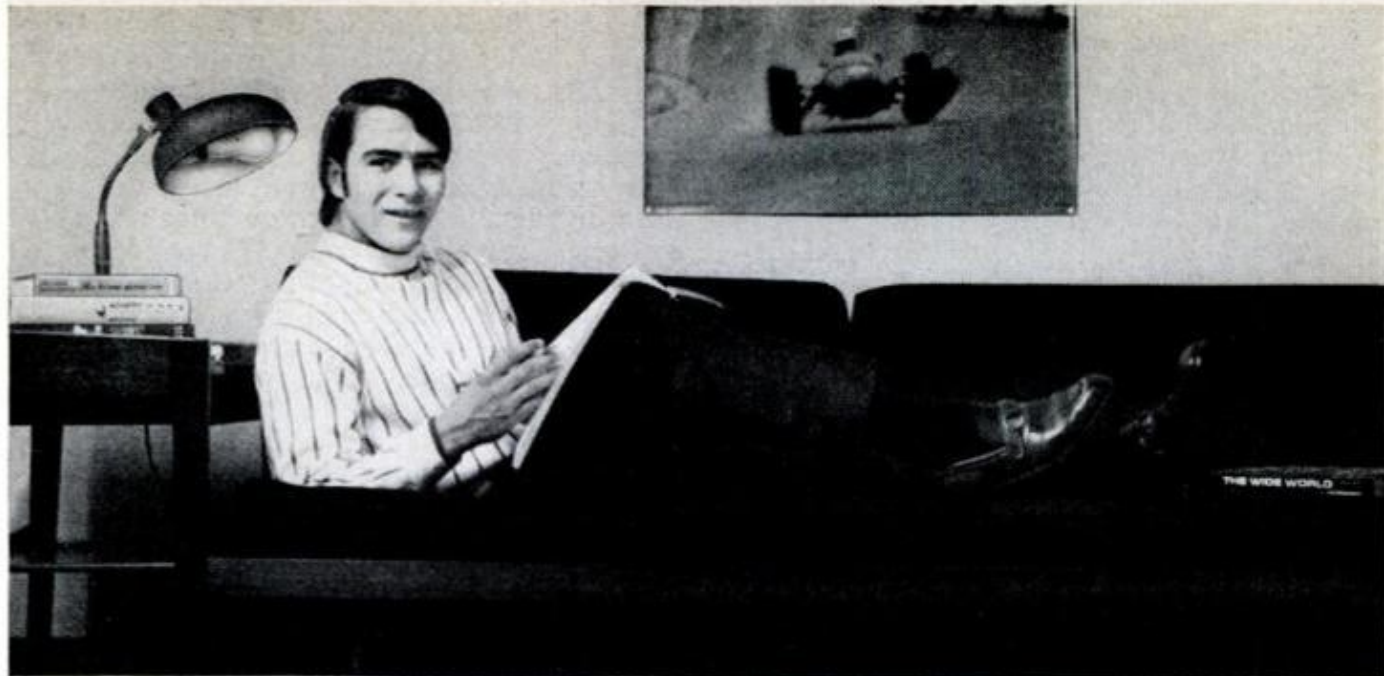
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foot, rear brake; right hand, front brake and throttle; left foot, gearshift; left hand, clutch. Directional indicator switch, headlight high-beam switch and choke give your thumbs something to do. Applying quickly becomes habit. And the toe shift—usually all the way down for first gear, up to neutral, up again for second, third and so on—is not at all as clumsy as it may sound.

However, I did find that on a motorcycle coordinating speed to the turning radius for a curve takes some practice—especially a variable turning radius. From bicycling, I was aware of the “invisible man” concept: Always assume that motorists and pedestrians don’t see you. Be prepared to take whatever action is necessary to protect yourself *and* them if indeed they don’t see you—as is so often the case. To be seen, I sometimes ride with my headlight on. Such

**Always assume that
motorists and pedestrians
don't see you.**

a safety precaution may become law, in fact.

If I hadn’t passed the riding test the first time, I wouldn’t bring up the subject. But I did and I will. After a few days’ wait, I got the good news to come down and have my license stamped “MC.” So, last summer while the Long Island Rail Road taxed commuters’ tempers, and with auto traffic as bad as ever, I took to the roads with a “vroom!” Well, more exactly, with a “ningningningning”—the sound made by smaller two-stroke bikes. They’re called ring-dings by four-stroke fans, for whom the throaty roar of a four-banger is an integral part of motorcycling.

Seventy miles per gallon from my 100-cc two-stroke meant a round-trip cost of one gallon of gas. My 35-mile trip from Long Island to Manhattan takes no longer than the railroad. It takes considerably less time if you streak along illegally between lanes of traffic even when cars are moving at or near the speed limit. In my book, doing that’s an abuse of the freedom a motorcycle gives you. The most safety-minded rider might do it occasionally, but only when traffic is at or almost at a standstill. Then you weave through slowly, very slowly.

I’ve sat in my lane in snarls and questioned riders who came up between lanes and slowed down to chat. I’m sure most of

The attitude of the wise guys was, “How are they going to catch you in all this traffic?” Most however, considered it unrealistic—impossible—for a rider not to use his machine to advantage, and figured that as long as he was careful and courteous to auto drivers he would not endanger himself or be stopped by police. A big danger in this situation, though, is incurring the resentment of automobile drivers stuck in traffic. Once I watched a driver in creeping traffic weave back and forth to block a motorcyclist from passing between lanes. The rider—I spoke to him later—was a mild-mannered older chap in a business suit who was not particularly upset by the motorist’s bullying tactics. The motorcyclist knew riding between lanes—however carefully—is illegal in New York. He felt the law should be amended for certain traffic situations.

To me, one of the most satisfying parts of the commuting trip is pulling into a marked space in a special motorcycle parking area and ambling the two blocks to PM’s offices. No trains, no subways, no buses, no aggravation and the Queensborough Bridge is free to all traffic. There’s talk about levying a toll on this bridge to help keep traffic from clogging Manhattan. If this should come to pass, motorcycles should be exempt. They’re not a substitute for rapid-transit systems, but a motorcycle doesn’t clog the streets like a Cadillac.

Heading back over the bridge one evening, I realized how important it is to have a checklist before you take off. I was riding on the bridge’s steel grating, fighting a broadside wind blowing up the East River. With a taxi on my tail, my engine started to quit. Luckily I realized I hadn’t opened the fuel-tank shutoff. I haven’t forgotten it since!

The only thing missing in that situation was a little rain. I find suiting up for rain just a matter of donning an inexpensive, lightweight, rubberized-nylon storm suit plus thin rubber stretch boots, all of which take but a small corner in a briefcase that rides my luggage rack. A helmet with face shield keeps the rest of you dry. I’ve ridden 35 miles in a downpour and stayed dry. In cold weather, a good snowmobile suit and a pair of gauntlet mittens will lengthen the riding season by months.

The thin, rubberized nylon of the storm suit is extremely wind-resistant. That’s the secret. In cool weather it’s warmer than a half-dozen sweaters. Traditional leather is still the tried and true riding gear cutting the wind. And, of course, it’s spill. Conventional shoes and socks are

(Please turn to page 218)

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FIRST YEAR ON A MOTORCYCLE

(Continued from page 216)

the best thing to be wearing if you spill. Conventional shoes and socks are fine. I only don a pair of dress boots when the temperature drops below 50°.

After putting 5000 troublefree miles on the Suzuki, I put a "for sale" sign on it. It sold fast to a family from the next town. By now the boys—Mike and Jamie Simon—have it stripped of lights and fenders and, along with their dad, are having fun scrambling the machine.

My first year of motorcycling began as an experiment, but I haven't been grounded by the sale of the Suzuki: I'm breaking in a second bike—a Honda 175K3 Super Sport. I'm hooked.

I plan to own bigger bikes, but for now the 175-cc Honda is fine. At 261 pounds, it's still under the 300-pound limit—meaning liability insurance costs half the automobile rate. Over that weight, or over 250-cc in some cases, the rates are the same as for a car. I spend \$52 a year to insure it. At that price I'll take a bike as a second car any day.

The four-stroke Honda, despite its 175-cc engine, heavier weight and better cruising speed and comfort, is as economical to operate as the two-stroke 100. Fuel economy is one advantage of four-strokes, but they do require a little more routine maintenance—valve-tappet adjustments and engine-oil changes, for example. It's too soon to tell if I will ultimately side with the two or four-stroke buffs—or straddle the fence. I'd like a stable of bikes including a couple of each!

More than one motorcycle is the only answer to the question: "How big a bike?" The 175 is perfect for commuting, but for rocketing up the freeways or throughways a couple of hundred miles—perhaps with a passenger—forget it. That means at least a 500-cc machine. If you're small you can get away with something smaller, but comfort starts at 500.

Recently I've gone out of my way to ride other machines. I recently borrowed a Yamaha 250—an extremely fast bike. A ride on a Triumph 250 was equally exhilarating, if a bit more nerve-racking because of the reverse foot controls on English bikes: Rear brake on the left, gear-box on the right. Nothing wrong with this when your reflexes are programmed for it, but my vote is for standardizing right-foot, right-hand for brakes. It is unlikely I will ever own the world's biggest production bike, a 1200-cc four-cylinder, 80-hp, \$4000 Mammoth, but I know I'll always

(Please turn to page 220)

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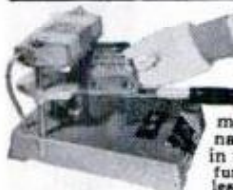


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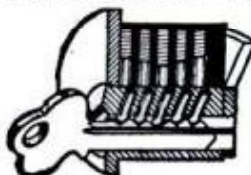
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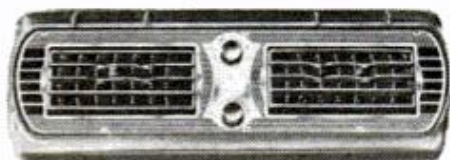
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FIRST YEAR ON A MOTORCYCLE

(Continued from page 218)

be looking around for my next machine.

A few parting words of wisdom about motorcycling: The dangers are real—a cyclist is extremely vulnerable. Some riders I know have given up street-riding altogether and concentrated on trails. The joy of riding is reason enough to own a motorcycle—justify it if you will with a practical reason. Don't get carried away with the power and freedom and—in the pecking order of trucks, cars and motorcycles—you'll have nothing to give up but your right of way. ★★★

HOTTEST JOB IN THE WORLD

(Continued from page 92)

three choices: They and the astronauts can ride a slide wire 2000 feet down to ground level to a concrete bunker where other members of the rescue team wait for them; they can take the high-speed elevators down to the launch-pad base, and continue to where the shielded personnel carriers are waiting; or, as a final alternative, they can make a dash for the "doom room"—a shelter directly beneath the Saturn V, designed to let the astronauts and rescuers ride out in safety an explosion of the 3200-ton rocket.

Getting into the doom room is a nonsense procedure. At the bottom of the elevator is a Teflon-lined tube large enough to take a man in a pressure suit. Astronauts and rescuers dive or jump into the tube and drop onto a heavily padded crash base. From there they run several feet into the doom room. They seal the door, strap themselves into padded chairs, and ride out the blast atop huge coil springs.

The Astronaut Rescue Team is made up of 11 men from the TWA-Wackenhut (contractors to the space agency) fire-control force, plus three medical technicians from the Department of Defense. The chief training officer is Roy Terry; directing the team with him is his "right-hand man," Al Wozniak. The two men have been part of the team from the start. Wozniak is also the leader of Team 1.

Terry and Wozniak ride their men with an almost ruthless demand for perfection—and the men give it to them. M. Sgt. Jim Tanner is a medical technician in tank No. 3. Tanner served as a medic in Vietnam. He feels that at T minus 10 seconds in the countdown, when they're "buttoned up and waiting for liftoff," the tension and strain are just about as rough as in combat.

David Fullam is a tank driver; Randle

Marlow serves as anchorman in the White Room; Albert Praetorius is tank No. 2 driver; Adolph Garza Jr. has the White Room job of pulling out the second astronaut from the Apollo; Roderick A. Hobbs is the first man to enter the Apollo command module to release the connections from the spacecraft to the astronauts; G.E. Bidault is the lead man in the White Room who opens the hatch and then pulls out the first astronaut.

Senior M. Sgt. Joseph L. Nobles is a medical technician with tank No. 1; his primary Air Force duty has been as the NCO in charge of an Air Force hospital operating room suite—a far cry from hell at Pad 39A. Senior M. Sgt. William R. Churchill is a medical technician in tank No. 2.

The final three men are Charles H. Short, James P. McCallum Jr. and George H. Hoggard. Short is part of the White Room rescue force; he and Bidault have the job of rushing the first astronaut from the White Room and on his way to safety. McCallum drives the No. 3 tank, and Hoggard, in tank No. 2, is the team's trouble shooter.

For many weeks before a moon mission, the Astronaut Rescue Team follows full-time training schedules. The men practice eight hours a day, pushing themselves until ready to drop. It's grueling, brutal work. Some people might even consider it vicious physical punishment. The team members don't look at it that way, even when their training becomes downright frightening.

Wearing their silver suits and hoods, gas masks and special boots, they practice under conditions that duplicate the real thing—alongside a deep pit where rocket fuels create a small package of blazing, roaring hell. The fumes from the fire are *lethal*—and temperatures reach 3000° F.

No sooner do they finish this rescue session when, at double-time, they move to another area where huge oil fires roar into the air. Their job? To go into the fires and put them out.

Roy Terry says, "We haven't been able to toss anything at this team that the boys couldn't handle."

Before the team came into being, the fastest the astronauts could evacuate their Apollo spacecraft was in two minutes from the moment the emergency alarm sounded. But two minutes, said safety scientists, wasn't good enough.

So the Astronaut Rescue Team was formed. The team evacuates the astronauts from their spaceship in less than 54 seconds.

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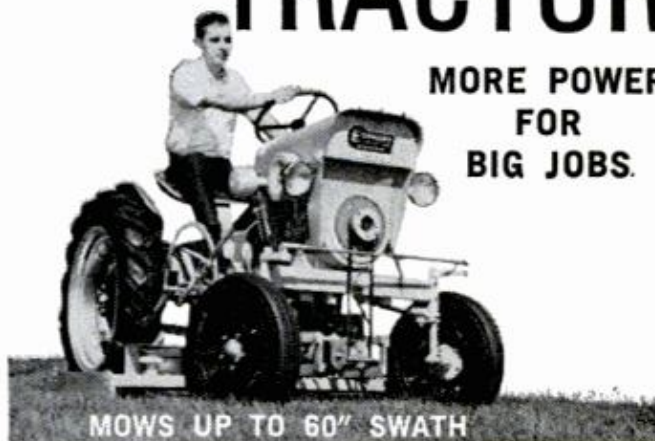
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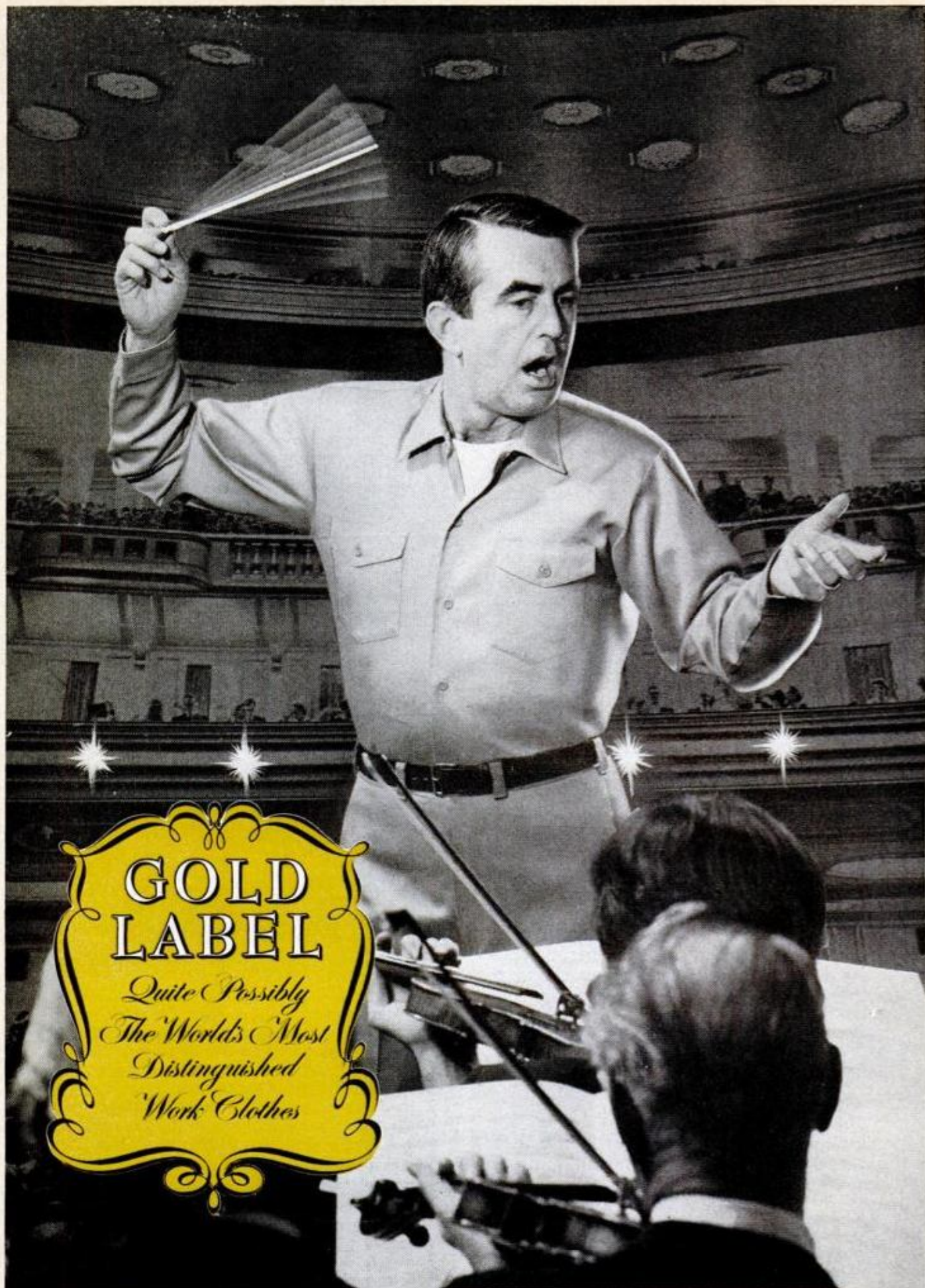
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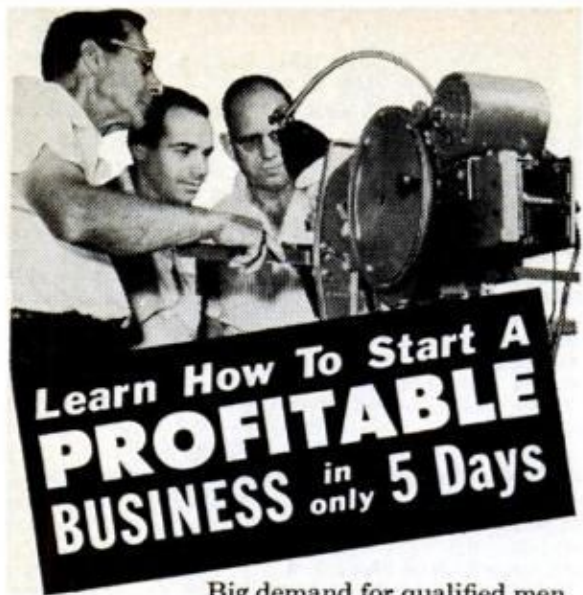
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MECHANICS OF MEDICINE

(Continued from page 113)

the second for inside. The underside of the caliper has a 5-inch ruler with raised markings. The combination square uses the same dot system and the torque wrench is exactly like yours but with deeper markings.

A clinical thermometer made in Switzerland with a stainless steel case and stem, has a dial at one end—not unlike a meat thermometer, but smaller and far more accurate. The thermometer is inserted and left in place for four minutes. A button on the dial is then depressed—this connects the pointer on the dial, holding the reading which can be read from the raised buttons on the face.

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Utilizing this nut-and-bolt system, it takes only a few minutes to correct any error in the original alignment. It's also a simple matter to make a new socket and then attach it to the coupling.

From this coupling, aluminum tubing (the "pylon")—about 1 1/8 inch inside diameter and 1/8-inch thick walls—goes down to the foot. The usual hole through two B. F. Goodrich vinyl-foam marker buoys—normally used in the fishing industry—need only be enlarged. Common tools shape the leg and a urethane coating seals the material.

The pylon itself is split just enough to slip it over a boss on the undersurface of the coupling, then tightened with a simple hose clamp. At the foot end, the pylon ends in a large serrated bearing surface to which any standard foot is held by a bolt coming up through its bottom. ★★



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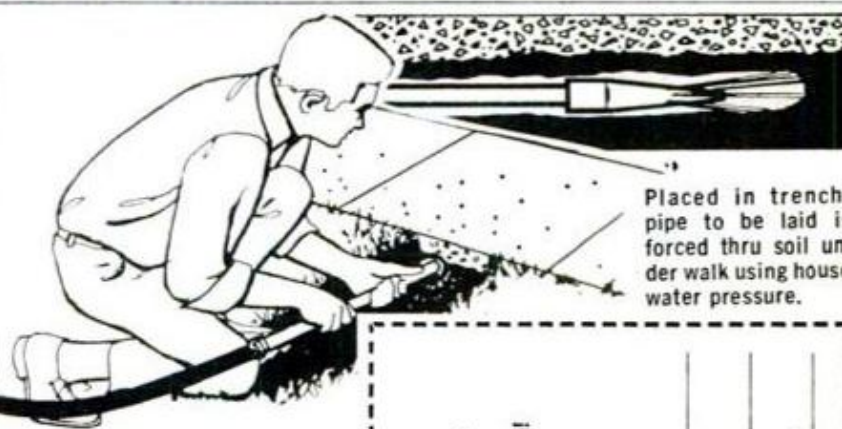
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CARE OF TAPE RECORDERS

(Continued from page 163)

classical, a reel of show tunes and so on. You can also intermix your own recorded remarks with prerecorded music, such as for making a movie sound track.

For editing tape, you need a splicing aid. The two basic types are the splicing block and the splicing machine. The block is simplest and costs only a few dollars. The machine splicer, a little more expensive, requires less skill and is faster.

The accompanying photos show how each type of splicer works. In either case, the tape is sliced diagonally instead of straight across. This allows the joint to pass over the heads progressively, instead of abruptly, and lessens the chance of sudden annoying noises. The joint is held together by special splicing tape. Ordinary cellophane tape won't do because it shrinks and gets tacky with age. Splicing tape is made to match recording tape's elastic characteristics, is ultrathin and adheres permanently.

In addition to editing, you'll need a splicer for repairing broken tapes and adding blank strips of leading and trailing tape at the ends of a reel. Leaders and trailers make tape handling easier and protect the ends, which otherwise tend to break off a bit at a time as the tape is played. Another use for such strips is to splice in "pauses" between recorded passages—short lengths of blank tape that help to keep your musical selections from running together. One blank tape made by 3M Co. (Scotch Brand) has timing marks one second apart at a tape speed of 3¾ or 7½ inches a second. By counting the marks, you can insert pauses timed precisely to any number of seconds you want.

As part of your program for regular tape care, run seldom-played tapes through your machine once in awhile to exercise them. You can do this at a fast wind if you don't care to take time to listen. Unless tapes are run occasionally, they may take a "set" and become brittle. Worse, some print-through may occur. This is when the recorded material on one tape layer makes a slight "print" or magnetic impression on the next layer. As a result, you may hear an annoying pre-echo of loud passages before they're due.

Recording supplies and accessories are available individually and in handy kits. Some best-known names are the Robins line, Robins Industries Corp., 15-58 127th St., Flushing, N.Y.; the Ultima line, Ehrenreich Photo-Optical Industries, Inc., 623 Stewart Ave., Garden City, N.Y.; and the Editall line, Elpa Marketing Industries, Inc., New Hyde Park, N.Y. ★★★

ADD MOTION TO YOUR SLIDES

(Continued from page 167)

other possibility is to set up a rotating color wheel in front of the spinning polarizer wheel. The color wheel won't add any motion, but will change color dramatically as patterns flash on the screen.

Ordinary clear, crinkled cellophane, combined with polarizing film, will also produce an array of changing colors. Crumple up a piece in your hand, then spread it out and sandwich it together with a piece of polarizing filter in a slide mount. The wrinkled cellophane creates a prism-like rainbow of colors as the polarizing wheel spins.

Most polarizing materials come with a self-sticking adhesive backing. You just cut out the size piece you need, peel off the protective backing paper and paste the film onto your slide. If you don't want to attach the film permanently to a slide, you can paste it onto a piece of clear cellulose acetate first. This makes it easier to change effects if you want to experiment a bit.

In most cases, it's recommended that the polarizing material be placed on the back side of the slide—the side facing the projector lamp—although it will usually work in front as well. If you like, you can make your own rotating polarizer wheel by cementing polarizing material onto a disc of clear plastic, but commercial wheels, complete with a small motor and stand, are available at moderate cost. Always keep the wheel turning while the projector lamp is on to prevent heat from damaging the polarizing film.

Polarizing materials are available in convenient kits, some of which are shown in the accompanying photos. Three major suppliers are Edmund Scientific Co., Barrington, N.J. 08007; Polarized Animations, 5153 Butler St., Pittsburgh, Pa. 15201; and Technamation, Inc., 30 Sagamore Hill Dr., Port Washington, N.Y. 11050. Color filters, called gels, can be obtained from Edmund Scientific or at photo shops and stores specializing in theatrical lighting supplies. Slide mounts are included in some kits or can be purchased at photographic dealers.

One particularly useful kit, sold by Polarized Animations, includes blank title slides and a selection of typical title words that can be inserted, along with polarizing film, linear motion strips, colored gels, slide mounts and an instruction manual. This Series 100 assortment sells for \$7.95. Catalogs listing individual items as well as kits are available from most suppliers and are helpful in ordering specific materials. ★ ★ ★

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DRIVE YOUR OWN WELL

(Continued from page 191)

but do not twist the pipe severely. Use the wrench just enough to take up any slack. When the driving tool will no longer strike the cap, add another length of riser pipe.

Pour water into the well, and alongside the drive pipe, at regular intervals. It makes driving easier, and tells when you have reached a water-bearing sand formation. When the wellpoint reaches water-bearing sand, you will notice an increase in the rate of descent of the drive pipe. It can be as much as 6 in. with each blow. When you think the point is in water-bearing sand, pour water into the pipe. If it stays in the point you guessed right. If it drains out, it's back to the driver. If the point is in clay, or other nonwater-bearing material, the water will either remain in the pipe or the drop in water level will be extremely slight.

Another method used to check for water is to lower a weighted line into the pipe. When you've hit water, the wet portion of line lets you know how deep the water stands in the well; the dry portion is a measure of depth from top of well to water level.

In some instances a greater length of the wellpoint can be brought into contact with water-bearing sand by raising or lowering the assembly about 1 or 2 ft.

When the wellpoint is at desired depth, it must be cleaned of sand and muddy water. Cleaning also helps to properly position loose material around the outside of the point which in turn brings the well up to maximum yield ability. Use either method shown (top of page 191) and then remove the fine sand from the well with a pump. Probably the better purging method is to jet water into the well with a garden hose inserted to the bottom of the well. The dirty water and sand will wash up and out around the hose. Repeat this flushing procedure until no more sand is obtained by pumping.

Before final installation of the pump, remove all sand particles from its interior, paying particular attention to the valves and plunger. Before drinking any water, contact your state health department to see if it will test the water for you. If not, use a commercial laboratory. They are listed in the Yellow Pages under "Laboratories, Analytical" or "Laboratories, Testing." ★★★

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AN \$800 REEL?

(Continued from page 131)

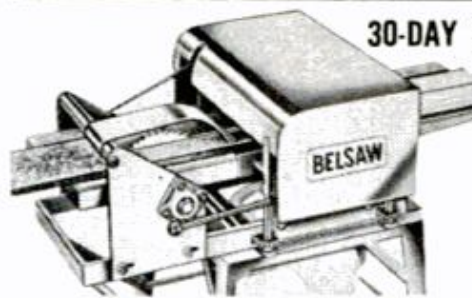
when I had 'em alongside," one comedian joked. Four days later this same fellow sat stunned with burned thumbs and bruised pride after foolishly trying to stop the run of a small blue marlin that inhaled his bait and snapped the 50-pound test line like cotton thread.

On June 1, 1898 Dr. C. F. Holder caught a 183-pound tuna off San Francisco, a feat that fired the imagination of saltwater fishermen everywhere. However, the reel used was without a mechanical brake, and since busted knuckles and blistered thumbs are not conducive to happy angling, New Yorker William Boshen and the Englishman Mitchell-Henry began developing a mechanically braked trolling reel. Their work was independent of one another and so were their triumphs: On Sept. 12, 1913, Mitchell-Henry took a 520-pound bluefin tuna off Nova Scotia; that same year off Catalina Island in the Pacific Boshen became the first man to catch a broadbill swordfish on rod and reel. Dawn became sunrise for big-game angling.

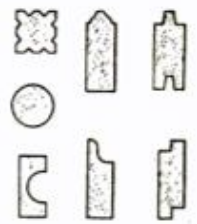
Trolling reels range in size from compact 1/0s up to giant 18/0 models. The origin of this 1/0 - 18/0 scale is a mystery. One myth has it that the first digit refers to the hundreds of yards of 9-thread (approximately 27-pound test) line each reel can spool. Another story says that the first digit is the thread number best suited for that size reel. But since each thread represents only 3 pounds breaking strength, it seems unlikely that many offshore anglers would be willing to use 3 and 6-pound test line on reels the substantial size of the 1/0 and 2/0. And it's anybody's guess what the "0" stands for! Some insist it means *ocean*; others claim *zero*. Again, these explanations do more to cloud than clear the mystery, further compounded when you consider that the spool capacity of one company's 4/0 reel may be less or exceed that of another manufacturer's for the same diameter line!

But puzzlement notwithstanding, even today, saltwater reels reflect the watchmaker's skill first brought to fishing by George Snyder. For example, Fin-Nor's 12/0 spools, end plates and spacers are all hand tooled. An automated machine could stamp out a spool in minutes; the Fin-Nor process takes three hours. The assembly of all finished parts is frequently done by a single craftsman, and his precision is the closest thing to 21-jewel movement you'll find outside a horologist's workshop. Is the reel worth \$795? That depends on whether you'd like to buy equipment your great grandchildren can use. ★★★

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BE YOUR OWN BOAT TESTER

(Continued from page 159)

more suction under the stern and crazy things begin to happen—the boat becomes cranky to steer, planking under the stern can be ripped off by the suction; there are even cases of boats becoming so unmanageable they have rolled right over in reaction to the awful suction forces!

The top speed of a displacement hull depends on its waterline length, for that in turn controls the distance possible between the crests of the two waves just mentioned. It can be figured from a formula and works out to about four or five knots for a 20-foot waterline length such as on a powered lifeboat, and up to about 40 to 50 knots for the 1000-foot waterline lengths of big aircraft carriers.

To make boats in the small pleasure class go faster than four or five knots, the stern is cut off square so it will "let go" of that big second wave without creating suction, and the bottom is flattened out to

Practically all powered pleasure boats today have planing hulls.

provide a lifting surface. It is then possible for the boat to shrug off stern suction and lift onto the surface of the water so it can skim along swiftly. This is called "planing" and except for such craft as pontoon boats and dinghies, practically all powered pleasure boats today have *planing hulls*.

A planing hull can have a dead flat bottom, a mildly veed bottom, a deep-vee bottom, a round bottom, or any combination of these basic shapes such as the involved ones seen in cathedral hulls. A completely flat bottom can be shown to produce the most lift for the least expenditure of power, because every drop of water rushing under it pushes straight up on it. But such a bottom banks poorly, skids on turns and can pound like an aquaplane—ever ridden an aquaplane over choppy water?

So some degree of vee is wanted to encourage banking into turns, in addition to its beneficial effect on dynamic stability. Designers refer to the amount of vee as the "deadrise." Where the bottom meets the sides, the joint can be sharp (as on a sheet plywood boat) or somewhat rounded (as on a lapstrake boat). Designers refer to the first as a "hard chine" hull and to the latter as a "round bilge" hull. The round-bilge hull got its start in the days

when small wooden boats had steam-bent ribs, the roundness being due to the bent ribs. This shape is still used in fiberglass and in aluminum boats made by the stretch-forming process. Regardless of the shape in that area, *most* of the bottom is flat enough to provide a surface on which water can press up and provide the lift needed to plane. The deep-vee hull can be compared to an airplane whose wings have abnormally great dihedral; naturally, some lift is lost. Characteristically, deep-vee hulls need plenty of power to get up on plane.

The thing to do when testing a boat is to observe how water shoots free of the sides of the hull. Most of the water is being pushed down by the speeding hull, but some of it "spills out from under the edges." While a lot depends on the speed being made good and the load aboard, as a general rule water will shoot clearly out from under the sides of a hard-chine boat without touching the sides, but it will tend to roll out from under and flow up along the sides of a round-bilge hull. Logically, all the water passing under the hull of a hard-chine boat contributes to lift and none of it to unnecessary drag, because it does not touch the sides. The water rushing past the sides of a round-bilge hull creates skin friction while adding little to the lift.

The deep-vee hull characteristically "plows a groove" in the water, which flows up and out with considerable spray due to its being broken up by the lift strips on the hull bottom. You get a good ride but it consumes power.

Comparing these three hulls, you'll see that although a collection of boats may have the same overall length and width, they can still have a different amount of flat lifting area on their bottoms. Their "effective bottom loading" can thus vary, and so will their planing qualities. Compare the width of the flat part of the round-bilged boat's bottom at the stern with the width of the hard-chine boat. In rounding off the chines to make a round-bilge boat, some of the bottom area is taken away. This does not mean that round-bilge boats are necessarily inferior to boats with hulls having other shapes; I am merely calling attention to the differences that do exist which an experienced boat tester knows about and takes into account.

You're now a step closer to being such a boat tester. Next month, in Part 3, we will put the finishing touches on our survey of essential things to see when examining or handling a new boat, and add a detailed discussion of steering and riding characteristics. ★★★

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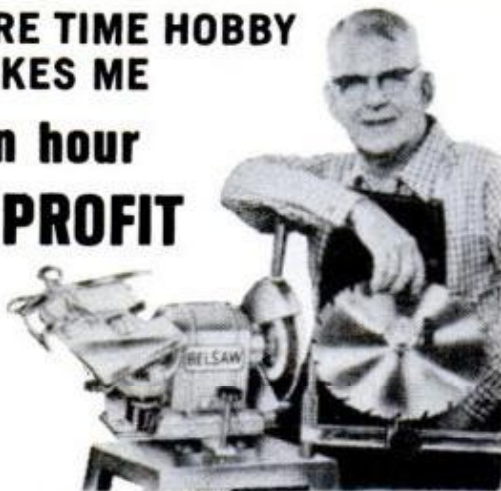
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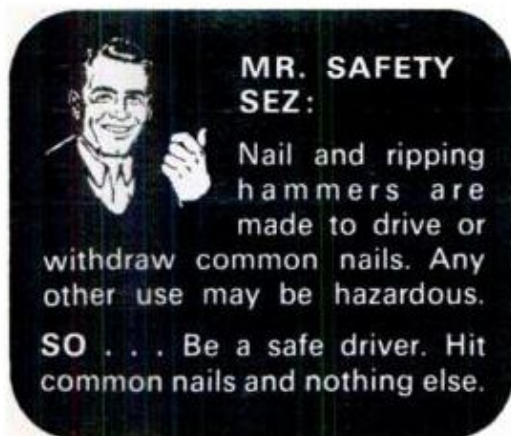


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WHY LOSE! \$5 WIN

GET UP TO \$2 STAKE

A RACE DAY WITH \$2 STAKE



I WAS DEPRESSED—I'd lost again. This guy joked that with \$20 stakes he'd made \$1516 profit, also \$874 and \$1082 other days. Then I found out he wasn't joking, he had PENCLIFF world's top race computer.

Can YOU add up to \$1.87?

Of COURSE you can. The instrument was specially designed on the basis that after you have fed race information into it, figures in **Dollars and Cents** appear on the dials, and these are simply *added up* to make the ratings for each horse. The horse with the **HIGHEST** rating is calculated by PENCLIFF as being the best.

Get FACTS about PENCLIFF

We supply **FACTS**—complete *proof* that PENCLIFF is all that we claim. We supply **thousands** of Latest Checkable Big Win Results.

What EXACTLY IS PENCLIFF?

The instrument has 6 predictors and 1 Master Director Dial. You feed into the predictors: age of horse, position it finished in its *last 6* races, weight in current race, and comparison of weight to that carried in *last race*. Then the figures which appear on the dials are added up to make ratings.

MONEY REFUND GUARANTEE

When you receive PENCLIFF You **TEST** it, and if unsatisfactory you may return for a full **REFUND**. What fairer offer CAN we make?

PERCENT OF PENCLIFF WINS

Ron Hitchings first of all ran through the I.B.M. the results of 97,263 races to find out the best percent of **WINS** possible with PENCLIFF. He then conceived the idea of feeding them in from an entirely different angle, to find out what combinations of form, weight, etc., gave most **PROFIT**. Although under this basis the percent was lower—28%, the **PROFIT** was more than 50% **higher** than the 'most winners' basis and in fact the latter would have to be over 70% to be as good. The wins shown below in the panel are those at principal tracks only, but PENCLIFF operates equally successfully at **ALL** tracks.

DAILY WINS

LIKE THESE WAITING TO BE WON
ALL WON WITH ONLY \$2 STAKES

HIA	WON	\$187	} More recent wins Higher even than our heading		
HIA	WON	\$173			
HOL	WON	\$151		MON	WON \$107
HOL	WON	\$141		TRO	WON \$103
DMR	WON	\$134		PIM	WON \$102
BAY	WON	\$121		TRO	WON \$88
HOL	WON	\$118		HOL	WON \$87
BAY	WON	\$113		MON	WON \$87
HIA	WON	\$112		AQU	WON \$83
HIA	WON	\$108		SAR	WON \$81

SEND THIS COUPON NOW →

INVENTED BY RON HITCHINGS

EXPERT Handicapper with over 25 years of racing 'Know How'. Has been actively engaged in horse race computer research for many years. His facility at race reading has always proved a major asset, as it is in this art of being able to read into a race the hidden meaning behind the performances of the entrants—both winners and losers, that any logical basis of prognostication may be founded.

12 OTHER RACE EXPERTS

ALSO gave Ron Hitchings invaluable assistance towards the PENCLIFF invention.

OVER 4,000 BIG WINS

DON'T take our word for what we claim for PENCLIFF! We supply **OVER 4,000** latest *checkable* Big Win Results. Big Payoffs to \$2 stakes incl. \$89, \$106, \$169, etc. Big Track wins incl. \$151, \$173, \$187, etc., all won on the DAY with \$2 stakes on all selections in the 9 races.

A GIANT I.B.M. COMPUTER

Is one of the main reasons why PENCLIFF is so **successful**. *Thousands* of races were fed into the I.B.M. individually examining all the entrants. Whereas 50 mathematicians working a 35 hour week would have taken over 3 years, this magnificent instrument had it all worked out in a total of 97 and one-half hours! The instrument was first placed on sale by us in April 1965. Since then the consistent wonderful results continue to delight not only US but **THOUSANDS** of satisfied operators.

INVENTED BY 'ACCIDENT' BY RON HITCHINGS

We were trapped in the engine room of my yacht, the Titania. The hatch had jammed, and although straining and sweating and hammering, fit to burst our lungs, we just couldn't shift it. It occurred to me that if we had a radio in the engine room we could have called for help. Then I remembered that there were 12 other parts of the ship where we might have been trapped, whereas from only one, the chart room where the radio was, could we have called for assistance. Later in thinking about a new race computer and that previously I had always used only **one** dial on it, I remembered the incident on the yacht and thought, 12 places to radio from—12 times the chance of safety, now how about a race computer with **12 dials**, maybe **12 times as good**. Experimenting on those lines I eventually found that the ideal number was 6 with 1 Master Director Dial.

R.H.P. Co., P.O. BOX 5715 PWE7, CARMEL, CALIF. 93921.

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We'll do a lot to please you. We even supply over 4,000 LATEST CHECKABLE PENCLIFF Big Win Results!

TREASURE & COIN DETECTOR

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New electronic detector penetrates deep into earth to locate gold, silver, coins, minerals. More penetrating power than ever before. Sensitive enough to locate a single coin or small nugget. Works through earth, wood, vegetation, water, rock, etc. Not a "probe" type but a fully electronic detector that is guaranteed to have at least twice the detection ability of any detector in this price range or return in 10 days for refund. Uses inexpensive 9V battery. Fully transistorized. Weighs only 2 pounds. Loudspeaker signals when object is detected. Has plug-in earphone for treasure hunting in privacy. **NOTHING ELSE TO BUY!**



29⁹⁵
POST PAID

Comes complete, ready for operation. Shipping container has compartments for detector and all accessories, serves as a carrying case. Send only \$29.95 check, cash or M.O. for postpaid shipment or \$2.00 and pay \$27.95 plus small C.O.D. when delivered. Viking Detectors, Dept. V-2, Box 10880, Houston, Texas 77018

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Don't keep worrying whether your false teeth are going to come loose at the wrong time. For more security and more comfort, just sprinkle famous FASTEETH on your plates. FASTEETH Denture Adhesive Powder holds false teeth firmer longer. Makes eating easier, more natural. FASTEETH is alkaline—won't sour under dentures. No gooey, gummy, pasty taste. Dentures that fit are essential to health. See your dentist regularly. Get easy-to-use FASTEETH today at all drug counters.

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NATIONALLY ADVERTISED \$18.95 VALUE!—NOW 40% DISCOUNT! WELDS—BRAZES—SOLDERS—CUTS—ALL METALS! Plugs into ANY 110 volt socket. **MAKE—REPAIR 1001 items for CAR—HOME—BUSINESS.** Lifetime **BURNOUT GUARANTEE** 10 day money back trial (if retnd). **HEAVY DUTY** Design—Uses \$85.00 welder work. No experience needed—**FREE WELDING LESSONS!** (cash, ck, M.O.) and pay postman \$9.99 **SEND ONLY \$2.00** COD postage or send \$11.99 plus \$1.00 postage for paid del. in U.S.A. **COMPLETE READY TO USE—** includes **BIG** pack steel, Brazing, Solder, Carbon "touch" rods. **ELECTROFLAME ARC TORCH! OFFER LIMITED—ORDER TODAY!** MIDWAY WELDER Dept. EPM-4 Kearney, Nebr. 68847

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2 for 1 WAREHOUSE CLEARANCE SALE



TWO \$1.98 FOR \$3.96 VALUE **10 Year Guarantee** **TWO FOR THE PRICE OF ONE** Razor sharp blade opens with flick of finger and automatically locks in place. **PUSH-BUTTON** release. Tough, razor steel blade honed and polished to mirror-like finish. Balanced for target throwing. Blade **GUARANTEED 10 YEARS.** If blade breaks we replace free. **30-day MONEY BACK GUARANTEE.** A favorite with sportsmen. Priced for quick sale of 200,000 knives. Makes excellent gift for any man or boy. Two for \$1.98 plus 50¢ shipping. Send cash, ck, or M.O. to **VIKING KNIVES, Dept. K-3, Box 10880, Houston, Tex. 77018.**



Chances are that pickup cover ahead of you is a Winnebago.

One out of every four on the road is.

Winnebago dealers sell more pickup covers than any other company in the world. Here's why they're so popular.

Selection: Winnebago has 90 versatile models to fit most any pickup.

Comfort: Fully foam insulated and lined with prefinished plywood.

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Price: From less than \$200 to \$700.

Service: Over 140 assembler-dealers from coast to coast and Canada.

Chances are this is the kind of pickup cover you're looking for.

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Designed from the inside out

Send for a free catalog and the name of your nearest dealer!

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Please send me the units checked. Payment in full enclosed \$.....
or \$3 deposit each item enclosed, balance C.O.D. I MUST BE FULLY
SATISFIED OR WILL RETURN UNIT WITHIN 10 DAYS FOR FULL REFUND.
No questions asked.

- 8" Power Saw at \$14.95
 Standard Rip Fence at \$3.50
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G.E. Motor \$18.00 (with other item) \$24.85 (purchased separately)

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AS...
80% WITH
QUALITY 
POWER TOOLS

DIRECT FACTORY OFFER AND REVOLUTIONARY PATENTS decrease costs, increase efficiency. Full scale power tools of heavy duty 100% cast iron and steel. Streamlined design reduces weight, cuts material and production costs. Special patents provide added efficiency, accuracy, savings. Parts made, assembled, tested, packed right in our own factories shipped direct... save store profits.

ENDORSED BY AMERICA'S TOP MAGAZINES... Here is what the editors say:

"A good bit of sound—imaginative—engineering." Popular Science; "(saw) boasts many features of bigger brothers." Popular Mechanics; "Amazingly versatile." Workbench; "Highly substantial construction, sturdy enough for production line use."

UNCONDITIONAL 10-DAY MONEY BACK GUARANTEE
You must be fully satisfied. If not, return in 10 days, freight collect. Money promptly refunded in full.

Industrial Woodworking. And Workbench awarded these tools their coveted "Work Tested" Seal.

OVER A MILLION USERS confirm their precision, versatility and rugged performance.

***10-YEAR FULL SERVICE GUARANTEE**... Any part or parts of any AMCO power tool (except motor) which may become inoperative for any reason within ten years after the purchase date will be repaired or replaced by the factory without cost to the purchaser. Your only cost: for postage.



8" TILT ARBOR POWER SAW

DOES WORK OF \$75 BENCH SAW as is. Converts easily to equal any \$300 floor model cabinet units! Crosscuts, rips, mitres, cuts compound angles, dadoes, makes coves and mouldings.

\$14.95 f.o.b. factory. Wt. 25 lbs. Includes completely assembled cast iron and steel 8" saw with ground cast iron table... less blade. **RIP FENCE**, if desired, for easier work alignment, \$3.50 add'l.

PRECISION BALL BEARING SPINDLE for Commercial Service, \$5.00 add'l.

SAW BLADE TILTS... TABLE STAYS LEVEL

Locks securely at any angle up to 50°, raises, lowers 0°-2¼". Patented tilt mechanism, accurate etched scale. Patented motor mount takes std. ¼ h.p. or larger motor, keeps belt tight, assures perfect alignment at

any angle, transmits full power. Takes std. blade, saw insert removes to take dadoe heads, cutters, etc. (not incl.). Accurate mitre gauge assembly. Ground spindle. Enclosed steel base. "Compo" bearings. Access. Std. size (for bench saw) \$3.50; larger fence (for cabinet base, as ill'd.) \$4.50.

FREE CABINET BASE PLANS Use as portable bench saw as received (inset photo) or transform easily and inexpensively into floor model (as shown) guar. to do work of floor models costing \$300. **FREE plans**... all you'll need are a sheet of ¾" plywood and 3-4 hours. Use your AMCO saw for cutting. Plans provide 27" x 24" work surface, 33" height, tool storage compartment.

10-YEAR FULL SERVICE GUARANTEE*

6" SWING 3-FOOT LATHE



Optional faceplate for turning bowls, trays, lamp bases, rosettes, etc. \$2.50. **\$14.95** f.o.b. factory Wt. 14 lbs.

Set of 3 high speed turning chisels, \$4.95 add'l.

DOES THE WORK OF \$40 UNITS... with same precision and speed. Turns wood, plastic. Sturdy cast iron with tubular steel bed. Ball thrust cup center, spur center, T-rest assembly, lever action tail stock, 2-speed pulley. Fits any motor.

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PRECISION 4" x 36" BELT SANDER

f.o.b. factory. Wt. 15 lbs.

\$14.95 + Disc Sander attachment incl. disc bracket, ground cast table (tilts 0-45°): \$7.95 add'l.

DOES WORK OF \$50 SANDERS... The world's most talented belt sander. Heavy cast sander incl. 4" x 36" sanding belt, V-pulley drive, multi-purpose drive spindle. Changes from horizontal to vertical sanding in secs. Uses ½ hp or larger motor.

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Mitre gauge: \$1.95 add'l.

FULL 22" LONG, 4 1/8" JOINTER-PLANER

\$19.95

f.o.b. factory. Wt.: 19 lbs. Complete as shown.



100% precision ground cast iron and steel.

DOES THE WORK OF \$60 UNITS... Professional power planing at a hand tool price. Make faster, more accurate joints, rabbets, bevells for windows, doors, drawers, square tapered legs—Adjustable precision ground cast iron tables. Patent-pending design holds knife to table clearances at any depth. Rabbett depth ¾". Fence adjustable 0°-50°. Hardened, ground hi-speed steel knives. Dual cutter guards. Balanced cutter head.

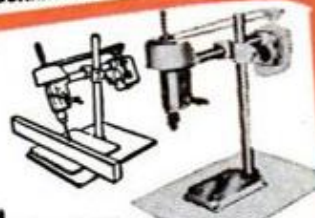
10-YEAR FULL SERVICE GUARANTEE*

32" RADIAL DRILL PRESS

All cast iron and steel
f.o.b. factory
Wt. 30 lbs.
½" cap.
\$34.95

Jacob's chuck incl.

DOES WORK OF \$90 UNITS... and much more. Industrial quality precision unit with all standard features, many extras. Head raises, lowers. Depth of throat up to 16". Pre-set to any angle for on-or-off table drilling, even horizontal drilling. **10-YEAR FULL SERVICE GUARANTEE.***

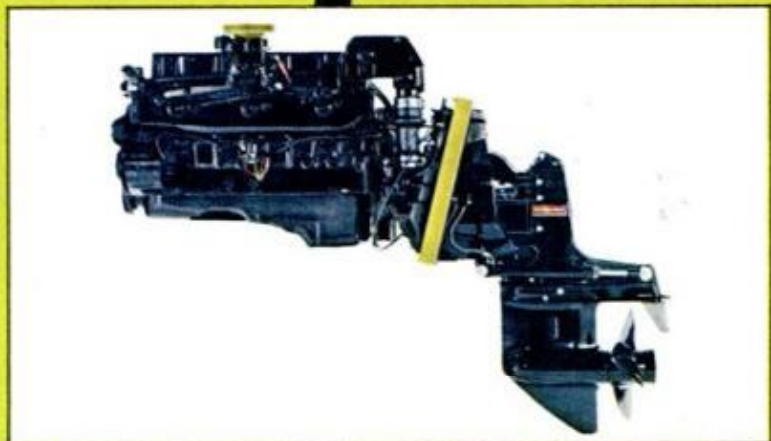
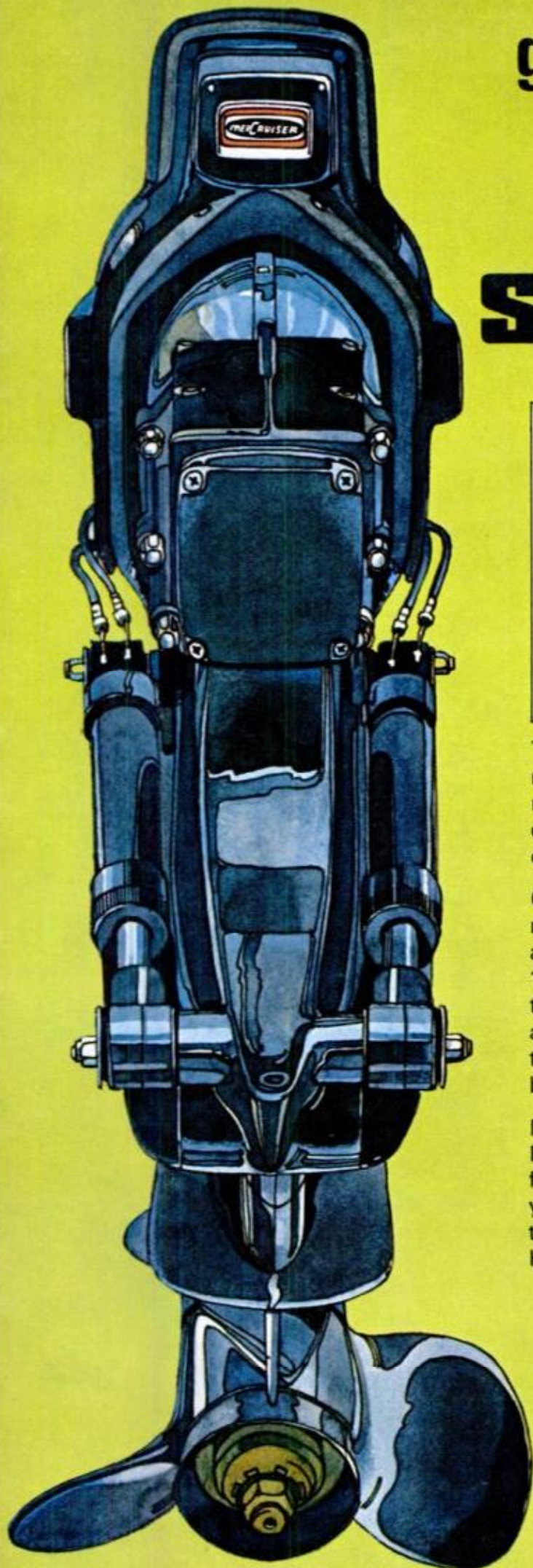


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This sleek mechanism is a MerCruiser stern drive. The result of a perfect marriage between computer technology and experienced marine craftsmanship. Engine, drive, prop, even the controls—are designed for each other by Kiekhaefer Mercury engineers.

Only MerCruiser offers drive systems balanced and matched to engines by computers for maximum power and performance. Nine power units—90, 120, 140, 160, 165, 215, 270, 325 and 390 hp. Four drive units. And there's a Quicksilver prop designed for every conceivable speed and load. MerCruiser's got a combination that's just right for just about any size boat, any type boating application.

MerCruiser is a complete marine propulsion system. Everything from prop to tach designed and matched for precision handling, maximum performance. Before you buy a new boat or repower the one you've got, get the **INSIDE STORY** on MerCruiser from your dealer. He can find the perfect match for you.

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100's
20 CIGARETTES

PALL MALL

FAMOUS CIGARETTES



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U.S. Government
figures
show
PALL MALL GOLD 100's

**lower in
'tar'
than the
best-selling
filter king**

...longer yet milder



"Tar"
PALL MALL GOLD 100's 19mg.
Best-selling filter king 21mg.