

MOUTH, CHEVY OWNERS' REPORTS

# POPULAR MECHANICS

APR. 1964  
35 CENTS

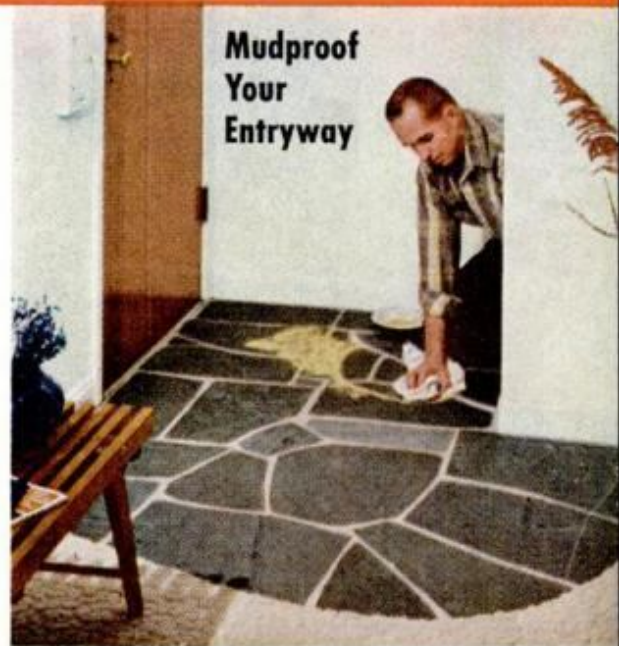
## SPRING SPRUCE UP!

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# Stop calling every portable saw a Skilsaw!

We've noticed that many men—carpenters especially—are in the habit of referring to every portable saw as a Skilsaw. And we can understand how it happens. Skil pioneered the development of the portable circular saw, and has kept at it for 40 years. Today there are more of ours in use than any other make.

Nonetheless, we hasten to point out that a Skilsaw power saw is *not* just any saw. As you might expect, in 40 years we've come up with some pretty strong improvements. Features that account for our saws having stayed ahead of the rest.

## Saws Lead a Hard Life

Abuse is the way of life for a circular saw. Green and wet lumber, stone and other dense materials make frequent overloading inevitable, and invite motor burn-out. Skil's solution: a Super Burn-out Protected Motor, encased in a special heat resistant resin and well able to stand heavy going. What's more, should the blade bind or jam, a Vari-Torque safety clutch protects gears and other parts from damage.

## Nuisances Eliminated

We've also done everything to make Skilsaws about as automatic as you could ask.

*Exclusive sawdust ejection*—With some circular saws, sawdust can be a real headache. It builds up in front of your line of cut and slows you down. Skil solves this with an air stream ejection system that blows sawdust away from you and down to the floor. Still another reason why you see where you're going with a Skilsaw: The



upper blade guard is specially designed to give you a clear, continuous view of the blade all through the cut.

*Easy-to-set depth control*—For safe, splinter-free cutting, a circular saw blade should extend about 1/2-inch below the depth of the piece to be cut. But most blade adjustments play hard-to-get-at . . . are located behind the blade or inside the blade guard. On a Skilsaw, by contrast, you can conveniently set blade depth in seconds, with one hand. (By the way, other saws tend to "wobble" when making shallow cuts. But your Skilsaw stays on the straight and narrow at any depth.)

*Bind-free lower guard*—Better demonstrated than explained is Skil's lower blade guard that retracts automatically to speed angle cutting. No binding here—even on compound miter cuts.

*Exclusive blade lock*—Blade changing on heavy-duty Skilsaw models is simplicity itself. Push a button—the blade is safely engaged and locked.

## Don't Slight Service

When a Skilsaw Power Saw leaves

our plant it carries a *lifetime* guarantee against defects in material or workmanship. And we back up this guarantee with one of the most extensive nationwide networks of factory service centers in the field. Unlike most cheap power saws, a Skilsaw Circular Saw can be serviced anywhere in matter of hours or a couple of days. (We know of instances—not too rare—where owners of other makes have waited a month or more while the tool is in repair.)

## A Size to Suit You

Skilsaw Power Saws are made for a range of blade sizes from 5 1/2" to 8 1/4", with prices starting under \$30. Look for them at lumber, hardware and department stores where you expect to find quality.

Remember—*every circular saw is not a Skilsaw*. Just most of them.

# SKIL

POWER TOOLS

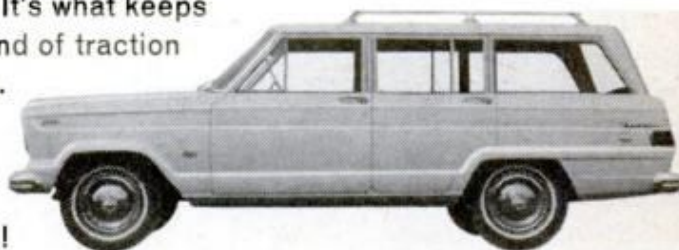
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The rain is wet . . . the road is slippery . . . the wind is fierce . . . but that doesn't trouble the Jeep' Wagoneer. No matter what's happening outside your windshield, you're safer when you're driving a Wagoneer. Why? In one word: "Drivepower."\* Jeep' 4-wheel "Drivepower" is what Wagoneer has that no other car in the world has. It's what keeps all four wheels gripping the road, providing the kind of traction that you can't get with any ordinary vehicle. The Jeep' Wagoneer will take you through mud, snow or sleet, and over rugged terrain that no other car would even attempt. So for the love o' your family — get a Jeep' Wagoneer!



\*"DRIVEPOWER" is Wagoneer station wagon's new, improved and exclusive 4-wheel drive system.

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APRIL 1964

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# POPULAR MECHANICS®

APRIL 1964  
VOL. 121 NO. 4

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NEW YORK, N.Y. 10022

INTERNATIONAL EDITIONS • AUSTRALIAN • SPANISH • CARIBBEAN • FRENCH • DUTCH

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**NEXT MONTH**—Campers atop the car, behind it and inside it are all described in May PM's roundup for families who hit vacation trail. There's advice on foul-weather camping; tips for nautical campers; the latest on go-anywhere vehicles. All this plus owners' reactions to Ford's Econoline, and news of our new Windmill sub

# BACKSTAGE at PM . . .

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President, Magazines Division      Publisher  
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Published by Hearst Corp., RICHARD E. BERLIN, Pres.

WAYNE C. LECKEY . . . Shop Crafts Managing Editor  
CLIFFORD B. HICKS . . . . . Midwest Editor  
740 N. Rush St., Chicago 11, Illinois  
THOMAS E. STIMSON . . . . . Western Editor  
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"Spring Spruce Up!" we say on our cover, and beginning on page 128 you'll find enough good ideas for the next 10 springs.

But are you ever suspicious?

Do you ever wonder if all those people who belong to the names on the masthead just sit at their typewriters and tell you about things to do—then go back to their apartments and curl up on a sofa?

Do they chortle over all the work they're creating for readers whose wives see projects in PM that they want done?

Well, you can rest easy on that point. A survey of our editorial staff reveals that our troops are in the thick of it.

For example, our production editor is right in the middle of adding an 800-square-foot, two-story addition to his home.

Our executive editor is putting in a half bath and enlarging his study.

An assistant editor in Crafts is building kitchen cabinets and painting his kitchen and den.

Our editor, who has just completed the installation of cabinets in his kitchen and pantry, is winding up work on a new half bath while painting his first-floor rooms.

Of course, not everybody's quite so gung-ho right now. The outdoors editor's spruce-up consists of building a new typing table; the auto editor is jacking up his barn "to keep it from falling down," and the assistant auto editor (an apartment dweller) allows that if he has time some week end, he may "take down his Christmas tree." The managing editor claims that he periodically raps his kitchen walls looking for studs, and when he finds one, he "may do something."

Our prize spruce-upper—and it probably comes as no surprise—is the Shop Crafts managing editor, Wayne Leckey. He has just finished tiling a bath and is now refinishing all interior doors of his home, installing a garage-door opener, remodeling a kitchen and will soon paint the exterior. Wayne has been working steadily on his house for the past year and a half, which gives rise to some good-natured ribbing. His house was built just a year and a half ago. He's the only person we know who's rebuilding a new house.

Anyway, you can believe us, readers. We're as compulsive about home improvement as anybody you'll find.



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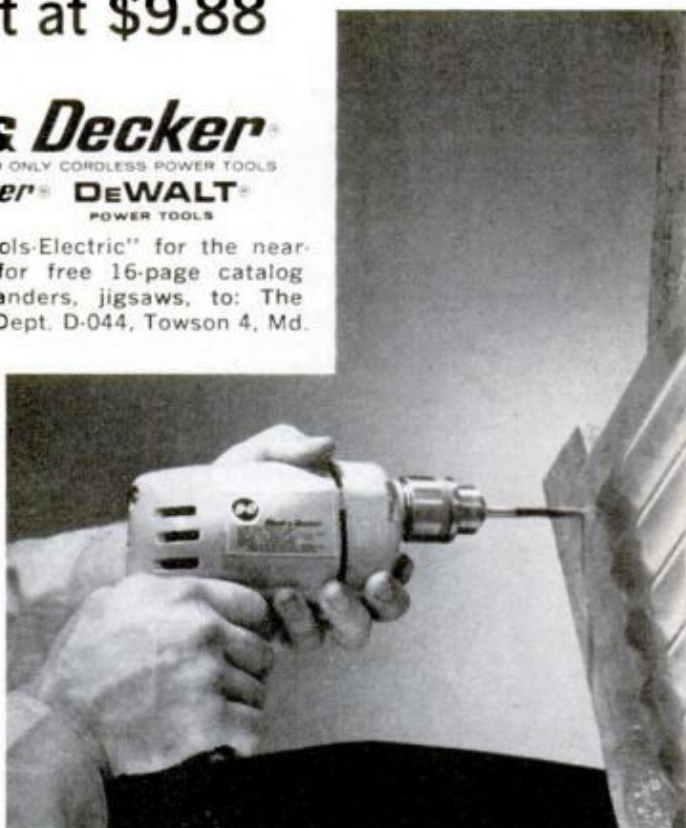
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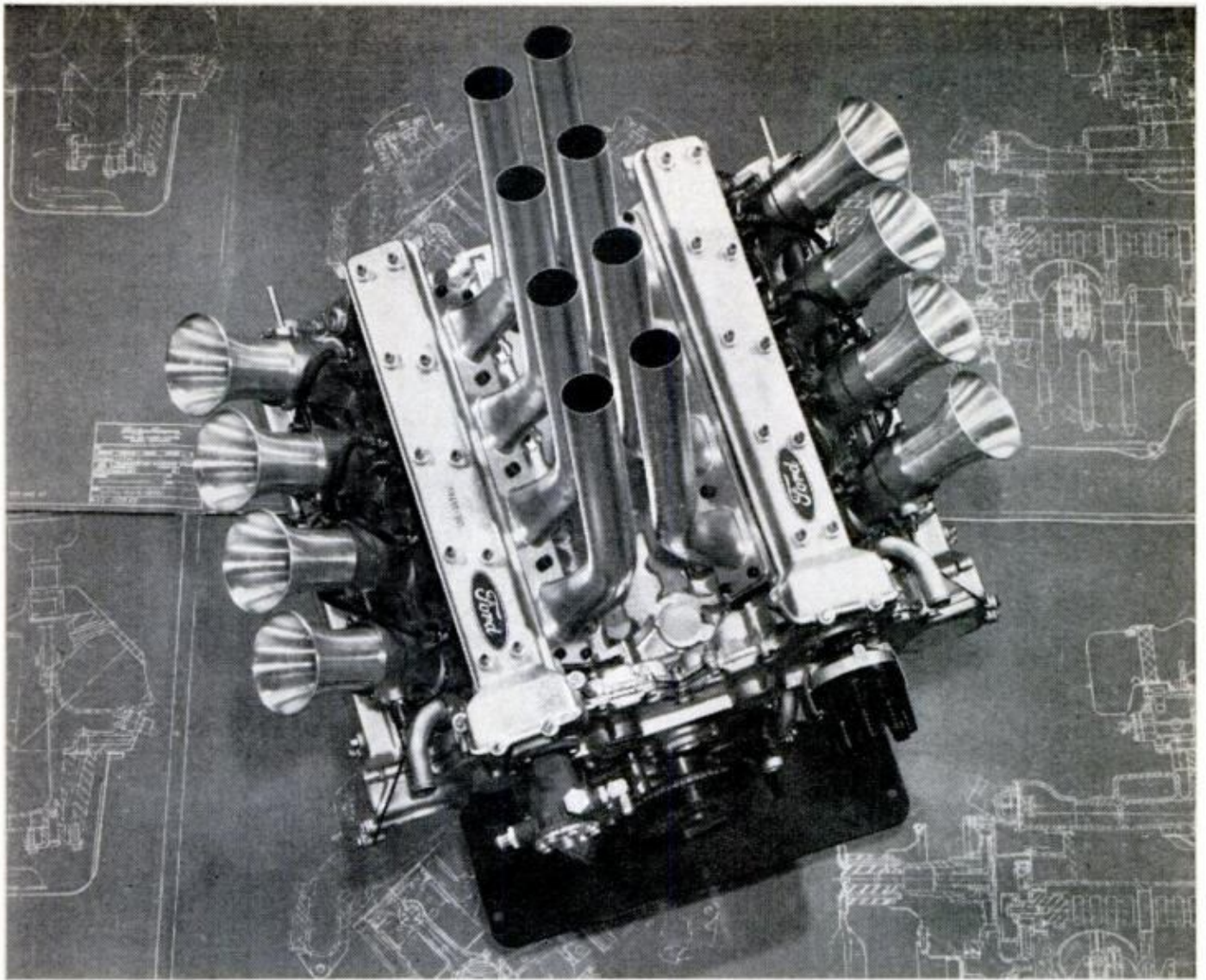


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## FORD MOTOR COMPANY ENGINEERS DEVELOP EXCITING NEW RACING ENGINE WITH DOUBLE OVERHEAD CAMSHAFTS

### **Advanced power plant puts out 44 more horses than V-8 that made history in '63 Indy '500'**

Four gear-driven overhead camshafts top a hot new V-8 developed by Ford Motor Company engineers for the 1964 Indianapolis race. The camshafts, two per cylinder bank, drive four valves per cylinder. The new engine is the same size, 255 cubic inches, as the Ford-built pushrod V-8 that startled the racing world in '63 by powering a Lotus to second place at Indy. And this four-cam engine tops last year's by at least 44 horses, delivering 420 hp or more at 8,000 rpm!

Ford engineers met many challenges in developing this special racing engine. Typical of them is a unique electrical discharge machining method

of forming combustion chambers to close tolerances. Uniform chamber volumes result, meaning smooth power impulses—an important virtue in a high-rpm engine.

This new engine is dramatic evidence of the exciting things that are happening today at Ford Motor Company—and is just one more example of the engineering skill that goes into every Ford-built product.

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# Over the Editor's Desk

## Classy Classics



I built your Classic for my kids at Christmas. In addition, I developed a reverse drive to allow backing up. It works very well—especially to back away from walls, etc.

South Wales, N.Y.      ROBERT D. TRANK

Many thanks for the plans for the *Side-walk Classic* (page 146, Nov. *PM*). I think I received as much enjoyment from building it as the kids are having driving it.

Incidentally, I made it about two inches



wider so my youngest son could ride along (with his seat belt attached, of course). I also changed the brake system from the pull cable you had to a push rod.

The 12-volt generator drives the car about five miles per hour, and it goes about two hours on a full charge. A nine-inch drive pulley was used instead of a 10-inch pulley.

Milwaukee, Wis.

ALAN F. BAUER

*Makes us sorry we grew up at a time when it took a steep hill or a willing buddy to make a home-built car go five miles an hour.*

## Squaring Away the Arch

In *The Incredible Gateway Arch* (page 86, Dec. *PM*) the builders of the St. Louis Arch discuss the possibility of vertigo among the workers. Vertigo, they point out, could result from the lack of straight lines in the Arch and the consequent lack of a frame of reference for the workers.

Here's my idea for dealing with this problem: If black masking tape was placed vertically on the outside of the steel sections before they were lifted into place, the tape would give the men the frame of reference necessary to maintain their equilibrium. Inch-wide tape could be placed at intervals of three or four feet. It would also cut down on the sun's reflection in the bright stainless-steel panels that workmen face all day.

Los Angeles, Calif.

WALTER BOYE

## Guns and Rights

Congratulations on the article, *Your Right to Own a Gun* (page 94, Feb. *PM*).

Richard Starnes represents the narrow-minded, fuzzy-brained individual who demands all the rights that he thinks he should have as an American but refuses to make any concessions for those rights because of selfish interests.

Indicative of his narrow mind is his statement that insuring that criminals, crazies, and kids cannot purchase mail-order hand guns is "perhaps" a praiseworthy goal. The insuring that Oswald could not have purchased such a weapon might have prevented the assassination of a great man and would definitely have been a "praiseworthy goal." Not "perhaps!"  
Cheyenne, Wyo.      JULIUS A. ALTVATER

I agree with Richard Starnes. The Dodd bill is so absolutely illogical that I cannot imagine any sane person supporting it. I see no more reason to require the permission of a police chief to purchase a gun than to require his permission to buy a car. Incidentally, the car has several thousand times the destructive energy of a gun.

[\(Please turn to page 10\)](#)

POPULAR MECHANICS





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322

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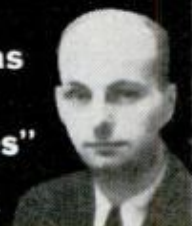
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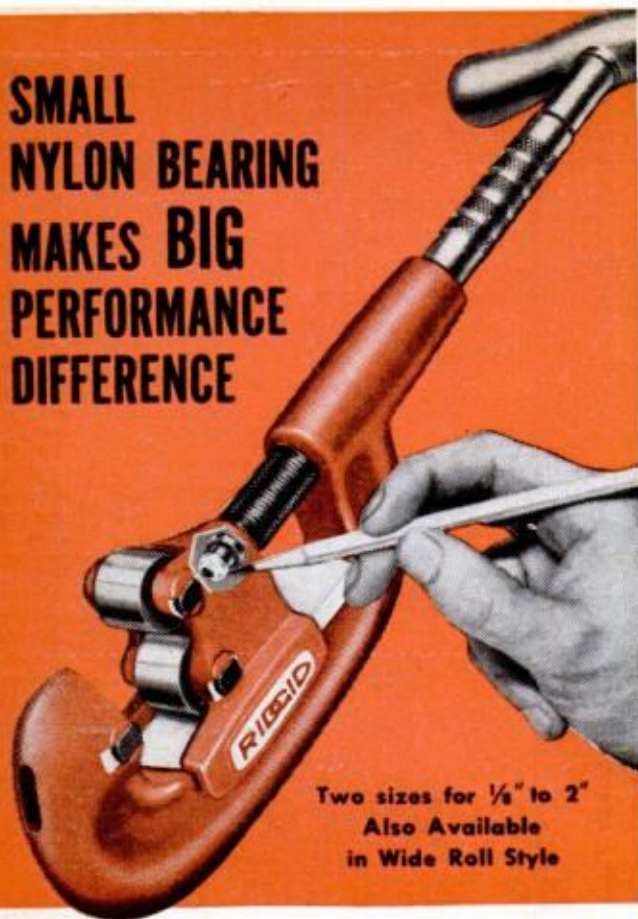


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## Over the Editor's Desk

(Continued from page 8)

The Dodd bill substitutes red tape and harassment for law. It introduces into law the idea that anyone wanting a gun will commit a crime. This same logic would imply that anyone wanting to buy a car was going to have an accident.

Senator Dodd discards the traditional basis of our right to keep and bear arms. It is true that we no longer have to protect ourselves against Indians—but what about such things as thugs and rapists?

Akron, Ohio

JERRY G. TAYLOR

New York has had the antiquated Sullivan law for years, and it has done far more harm than good. All it does is make it nearly impossible for an honest person to own a firearm—not a criminal.

Bradford, Pa.

RAY MARCELLA

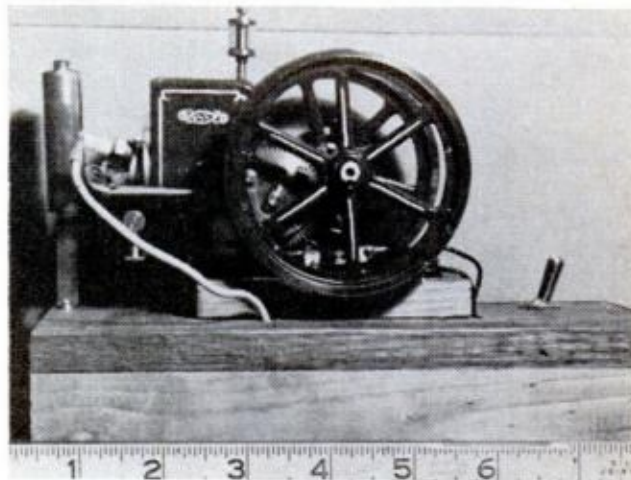
If your government can tell you who can buy guns and who can't, soon it can tell you whom to worship, and how to think and what to say.

Paris, Tex.

DAVID HINDS

### Smallest Hit and Miss?

Here's a picture of a miniature open-crank hit-and-miss gasoline engine that I built without castings. The only parts I purchased are the coil, condenser and



spark plug. The bore is 5/8 inch and the stroke is 3/4 inch.

I think this is the smallest engine of its type that runs.

Binghamton, N.Y.

WALTER WARDER

### Debugging the Fuel

In December's *Sidelights from the Services* (page 14), you refer to the problem of fungus caused by bacteria in water that seeps into the Navy's aviation fuel.

Well, I used to be in the fountain-syrup business where we had to contend with bacteria that formed in the water, even after pasteurization of the syrups.

(Please turn to page 12)



# Great NEW Idea from CTI

...to help you get and hold a fine job  
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**Air Conditioning and Refrigeration!**

"Practice" Your Way  
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REAR  
VIEW

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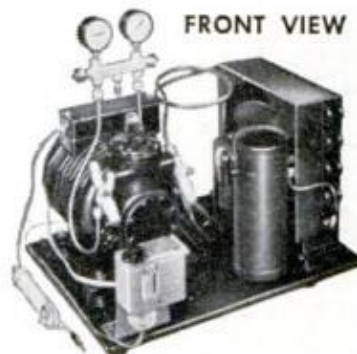
Illustrated above is a view of the new CTI condensing unit, fully assembled. This is a commercial-type, heavy-duty, 1/4 h.p. unit. You build it from 25 kits of parts (and with tools) that CTI sends without extra cost. In addition, CTI includes 25 Shop Projects, which simulate the kind of problems you are likely to encounter in the field. After assembling your condenser, you may then build an air conditioner, freezer, refrigerator or milk cooler.



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FRONT VIEW

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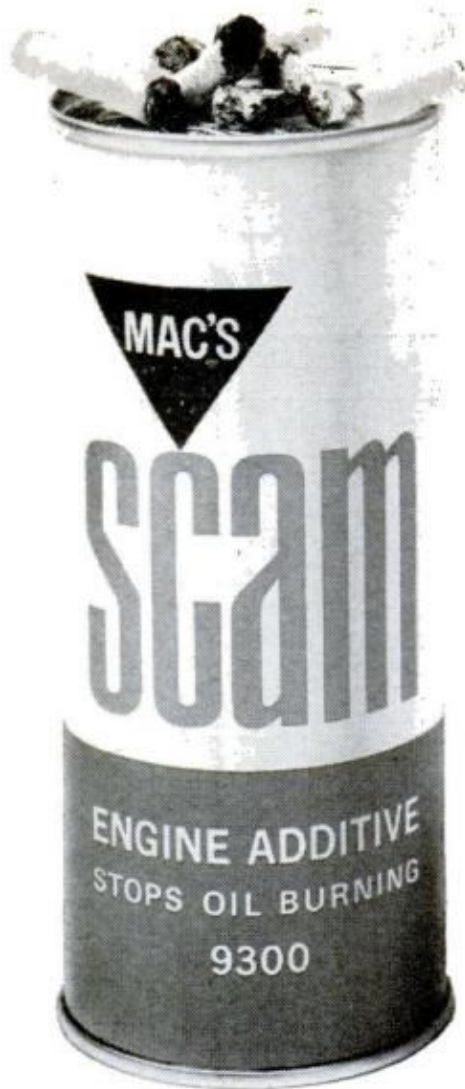
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**MAC'S SUPER GLOSS CO., INC.**

Los Angeles 42, Calif., Cincinnati 26, Ohio

## Over the Editor's Desk

(Continued from page 10)

We solved this problem with the aid of a one-tenth-of-one-percent benzoate of soda solution. But I don't know what effect benzoate of soda would have on aviation fuel.

Edgemere, N.Y.

C. J. GOMBERG

Combine a fungicide, such as the copper compounds used in swimming pools, with a tank-sealer material such as that used to seal leaks in aircraft gas tanks. Then coat the inside of the tanks with the material. Vest Aircraft Co. of Denver has such a tank-sealer material which we recently used to seal the tanks of a Forney aircraft.

If the storage tanks were aerated periodically, it would probably reduce the bacteria growing in the water beneath the fuel.

Greeley, Colo.

A. GORDON BRECKLE

If it's true that water is heavier than gas, then the water will settle on the bottom of the tank. So if a valve or faucet were put on the bottom of the tank, the water could be drained off.

Atlanta, Ga.

W. B. HALL

*There you go, Navy—three things to try on those bugs. Just go easy on the chocolate syrup.*

### Tempest Not Valiant

In your January '64 issue, page 108, you show a "Valiant" hood latch being opened, with the owner's hand very close to the license plate. If you will check the license number in your picture on page 105 of the same issue, you will notice that you goofed. Peoria, Ill.

BILL LEDDEN

*Wish our caption writer had been as sharp-eyed as you, Bill. You're right. The interfering license plate was on a Tempest, not a Valiant.*

### Electric Muscle-Maker

I would like further information on the Isotron, which was described in *Sidelights from the Services* (page 15, Jan. PM) as a device that induces muscle contractions electrically so that persons in restricted quarters (such as a submarine) can stay physically fit.

Lexington, Ky.

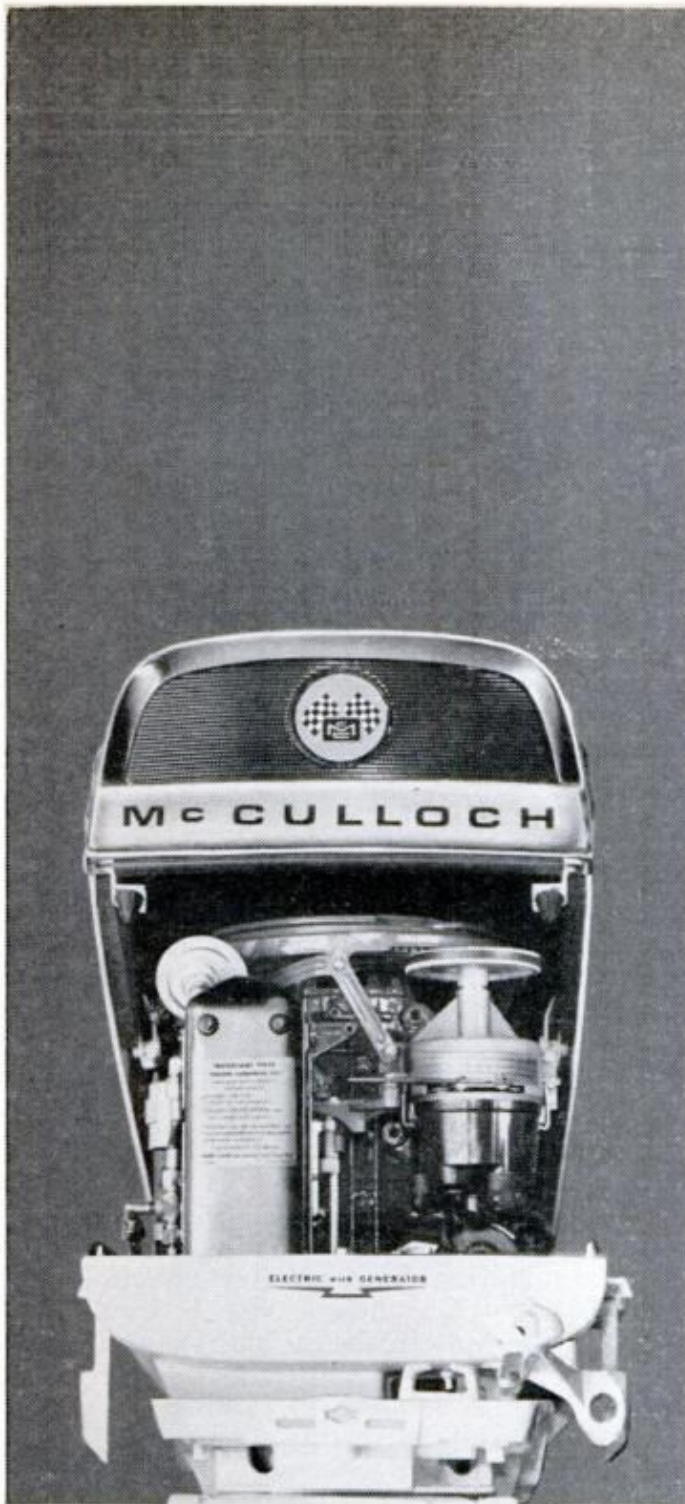
AMOS D. TACKETT

*Lots of our readers were intrigued with the idea of electrical exercise, we found The inventor of the Isotron, Dr. John B. Ziegler, Olney, Md., says he'll be glad to answer your letters on the subject.*

*The Editor*

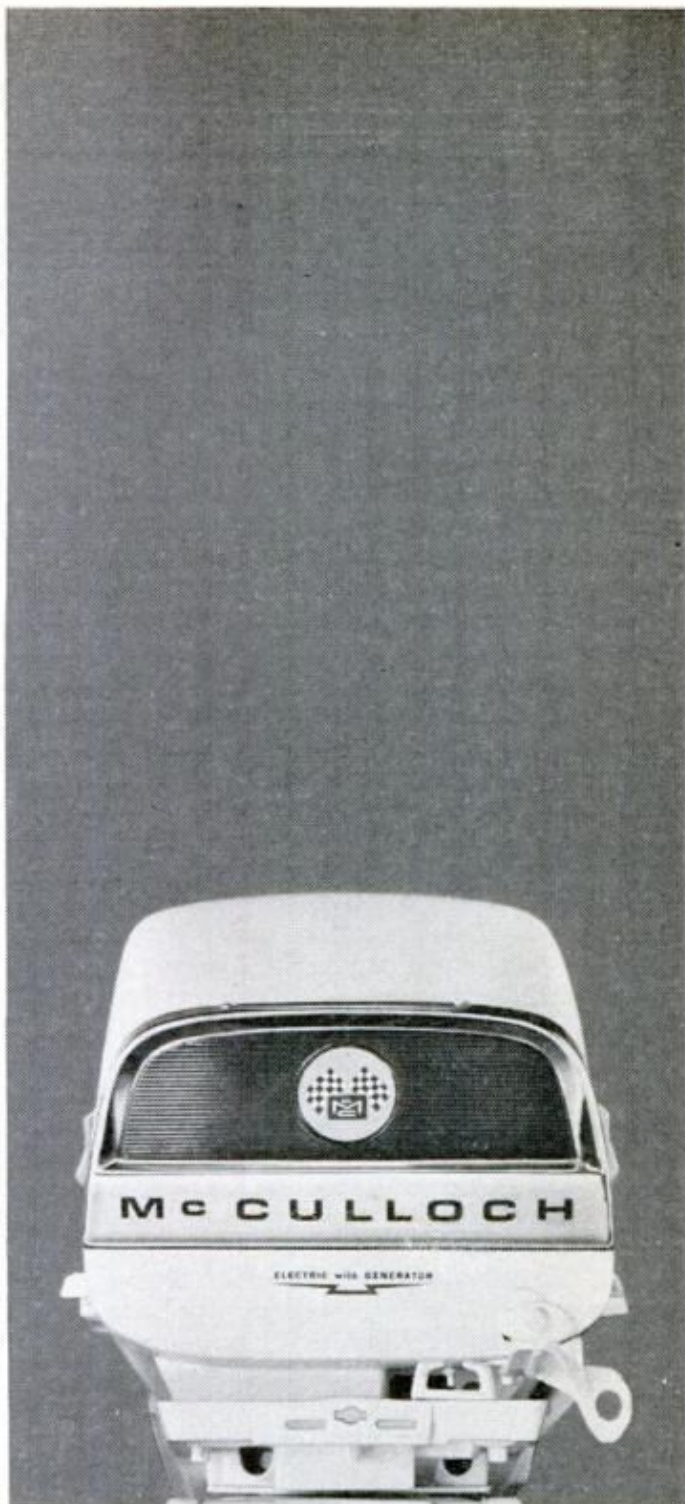
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**The Amazon River** is twice as big as had been thought. The biggest river in the world dumps an average of eight million cubic feet of water every second (3,600,000 gallons a minute) into the ocean, six times more than the second biggest river, the Congo, and 14 times more than the Mississippi. These figures came out of a recent study completed by the U.S. Geological Survey; it was sponsored by the American and Brazilian governments.

**Solitary confinement** makes rats nervous, but those who live in pairs stay normal, a team of Canadian scientists report. Studies on more than 350 baby rats revealed disturbances in the lonesome rat. "At three months the isolated rat is a nervous, aggressive, intractable animal," the investigators said, and he's likely to bite. No such disturbances were noted where rats had company.

**Foamed plastic** may be used for highway foundations—at least in cold countries. Experiments at Purdue University show that one to two inches of polystyrene placed below top layers of pavement and gravel can prevent frost penetration of the underlying soil and the subsequent weakening of the highway itself.

**Two tiny metal mirrors** about three inches square keep wildlife from death along highways in the Netherlands. The mirrors are mounted on posts set across from each other on highway shoulders. As cars approach at night, their headlights reflect light into the forest at 90-degree angles; deer and other animals freeze on seeing the light, preventing them from crossing during a time of danger.

**Dangerous landslides** can occur on practically flat terrain in Scandinavia, Canada and even the far northeast U.S. Cause of these treacherous movements is a particular kind of soil called quick clay. Known as the most mobile of all solid materials, quick clay can turn into liquid

mud and move hundreds of thousands of cubic feet of earth in a matter of minutes. A Columbia mineralogist says that quick clays consist of particles of silicate minerals mixed with water; this water has an abnormally low salt content. Salt ordinarily acts as an electrolytic binding agent to keep clay solid.

**Termites** are now infesting humans! Physicians in Dade County, Fla., recently reported that a 26-year-old Hialeah housewife, admitted to the hospital complaining of abdominal cramps, was found to be infested with "numerous, small whitish organisms." These were later identified as termites. The woman recovered following medical treatments which caused the termites to pass from the patient's body.

**An artificial leg** created especially for amputees who like to swim has been developed in Australia. Made of fiberglass, the apparatus requires no waist belt or harness and is held in place by suction. Special design features give it buoyancy.

**Air crash causes** may be easier to uncover with a new crash recorder developed in Britain. The device will record the final minutes of an ill-fated flight on continuous loop. It will reportedly survive impact shocks of 1000 Gs.

### ***Whose Missiles Are More Reliable: Goldwater's or McNamara's?***

Senator Goldwater says America's long-range missiles are not reliable. Defense Secretary McNamara says they are. Former President Eisenhower says U.S. missiles are the best in the world. What are the facts?

The Arizona senator is talking about "mechanical reliability" of *individual* missiles. Secretary McNamara is talking about "system dependability," or the ability of the *total strategic missile force* to accomplish its total mission.

Sen. Goldwater says many of our missiles may never reach their targets. He is right. Some 30 percent will fail, the Defense Department admits.

Atlas ICBMs have been fired onto targets 137 times out of 199 tries. The record for Titan I is 47 successes, 10 partial successes, seven failures. Titan II has 19 successes, 11 partials and nine failures.

Most failures, however, came early in testing and the record has been getting increasingly better. Even so, McNamara says, the mechanical reliability of single missiles is not crucial. What counts is the

(Please turn to page 16)



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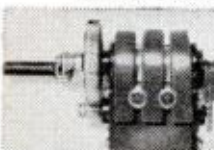
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## Science Worldwide

(Continued from page 14)

percentage of weapons ready to fire at any time, the percentage that would survive a sneak attack and the percentage that would reach their targets. (Each potential enemy target has seven or eight missiles aimed at it to guarantee success.)

McNamara says that over 90 percent of our 600 instant-firing Minuteman missiles are ready at any time. (The actual figure, *PM* learned, is nearly 97 percent, three percent usually being down for overhaul.) But only 50 percent of our 630 B-52 bombers stay in the air or on the 15-minute ground alert necessary to survive attack.

### Bombing Accuracy

When missiles and bombers do reach their targets, what happens? Bombing surveys indicate that there is no such thing as pin-point bombing. Only about 20 percent of bombs aimed at precision targets fall within circles of 1000 feet radius around the aiming points.

By comparison, Minuteman is believed to lob warheads equivalent to 600,000 tons of TNT to within a mile of the aiming point. The early Atlas hit to within four miles of its target. In 1960, this was cut to three miles, and now 70 percent of the Atlases fired drop warheads equivalent to three million tons of TNT within less than two miles of their targets.

But Goldwater raises one other point—the danger of communications blackouts and damage to missile site electrical systems during enemy attacks with high-megaton warheads. Such blasts result in Electromagnetic Pulse (E.M.P.) which can cause such electrical disturbances as tripped circuits, blown fuses and melted wires, any of which could leave our missiles dead on the ground. According to the Defense Department, though, measures have been taken to redesign electrical components for better protection; missile sites have also been given special electromagnetic shielding and ray-resistant circuits. Or, as one official put it: "I think we've overprotected."



A new cause of auto accidents has been uncovered by safety experts in London. It's a phenomenon called "aquaplaning," which occurs when front tires suddenly lose their grip on a wet road, making steering impossible. Aquaplaning was discovered at tire proving grounds, where photos showed that often the front wheels of a speeding car are motionless, meaning that they had left the ground like a speed-

(Please turn to page 20)



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Chemical Engineering Unit Operations  
Chemical Laboratory Tech.  
Chemical Process Control Technician  
Chemical Process Operator  
Elements of Nuclear Energy  
General Chemistry  
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### CIVIL ENGINEERING

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Highway Engineering  
Principles of Surveying  
Reading Highway Blueprints  
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### DRAFTING

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Electrical Engineering Drafting

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Electrical Instrument Tech.  
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Mathematics and Mechanics for Engineering  
Mathematics and Physics for Engineering  
Modern Elementary Statistics  
Value Analysis

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Industrial Instrumentation  
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Mechanical Engineering  
Quality Control  
Safety Engineering  
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Petroleum Production  
Petroleum Production Engineering  
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Air Conditioning Main.  
Domestic Heating with Oil & Gas  
Domestic Refrigeration  
Gas Fitting  
Heating  
Heating & Air Conditioning with Drawing  
Plumbing  
Plumbing & Heating  
Plumbing & Heating Contractor  
Plumbing & Heating Estimator  
Practical Plumbing  
Refrigeration

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Loom Fitting  
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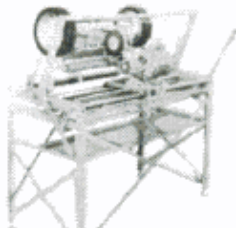
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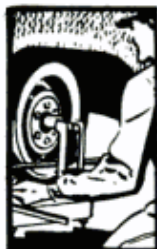
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## Science Worldwide

(Continued from page 16)

boat, the hull of which lifts out of the water. With smooth tires, aquaplaning can occur at speeds as low as 50 m.p.h.

If the Panama Canal ever proves obsolete, 30 alternate sites for a new canal are available. Under study since 1931, the sites include seven through Nicaragua, 11 in Panama itself, six in Colombia and even one through Mexico.

Part of Florida lies under the sea—and has for a million years. The Coast and Geodetic Survey says a 1300-square-mile chunk of land south of the Keys, about the size of Long Island, is part of the state even though it's 600 to 1500 feet under the water. Known to geologists as the Pourtales Terrace, it begins about 50 miles south of Miami and runs parallel to the Keys, some 12 to 15 miles to the east. If this real estate were on the surface, Cuba would be about 30 miles closer to Florida than it is now.

Long-range repair is now possible via earth satellite. A description of instrument trouble aboard the oceanographic tug *Geronimo* in the Gulf of Guinea, off Africa, was recently sent from NASA's ground station in Nigeria to Lakehurst, N.J., by way of the Syncom, circling at 22,000 miles above the earth. The data was teletyped to the Oceanographic Center in Washington, which diagnosed the trouble and sent instructions back the same way. Round-trip time was 45 minutes.

It may be better to be a mouse than a man, at least in some cases. A tiny desert mouse, *Perognathus longimembris*, is amazing scientists with its ability to tolerate 1500 roentgens of radiation, where 600 is fatal with most other mammals. Researchers think that the mouse's ability to voluntarily lessen the amount of oxygen in his blood and tissues may have something to do with it.

Atoms don't have a hard core within the atomic nucleus, as scientists have long believed. Recent experiments at Harvard University show that protons and neutrons, the building blocks which make up virtually all of the weight of matter in the universe, have a spread-out, jellylike structure. The discovery may put an end to the continuing search for atomic subunits of smaller and smaller size.

*John P. McNeel*  
Science Editor



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# Sidelights from the SERVICES

By William R. Kreh

**Dart-shooter.** The Army is testing a new rifle called the SPIW (for Special Purpose Individual Weapon) that fires a stream of deadly little darts. Its killing power is on a par with large bullets, but one soldier can carry and shoot far more darts than bullets. Called *flechettes*—French for “little arrows”—they are about the diameter of a pencil lead and a little more than an inch long. Tiny fins are attached to the tail end. The dart is mounted in a “sabot,” a small plastic plug which fits into the open end of a powder-filled cartridge. When fired, the sabot is stripped away and the dart is propelled at tremendous velocity, providing killing power, range and accuracy otherwise impossible for such a light and tiny projectile.

**Foul play.** The Navy’s taking an increased interest in the damage that marine organisms can do in fouling submarines. A special mooring has been set up in the ocean near Bermuda to study the underwater pests. The subject wasn’t too important until the atomic submarines came along with their ability to stay submerged deeply for months at a time. It’s possible their performance could be drastically reduced by marine bodies attaching themselves to the hull and fouling sensitive navigation and communication devices.

**Bean-bag sofa.** The Air Force is studying microballoons as a filling for seats in future space vehicles. Microballoons are tiny, hollow plastic bubbles that slide easily on one another and, when they’re enclosed in a fabric container, the result is something like a bean bag. The bubbles slide around until they assume the exact contour of the person sitting on them. When air is pumped out of the bag, the outside air pressure pushes the granules tightly together, forming a solid support in that exact shape that will stay that way as long as the air is kept out of the bag. Letting air back in, the support becomes soft again and can be reshaped to fit a new user.

**How big?** Lancelike buoys are now measuring high ocean waves and sending the information ashore for the Navy. The thin buoys are 26 feet long and dangle a long cable holding a square steel plate and heavy weights. These act as a sea

anchor to steady the measuring devices. Radio equipment is contained in a bulge about eight feet from the base of the spear buoy. The “spear” can measure waves up to eight feet high and 200 feet horizontally from crest to crest.

**Phony flesh.** Navy scientists have developed a special plastic that closely simulates human flesh. It’s used to test the potency of new weapons.

**For litterbugs.** All three Armed Forces are studying the possibility of developing “throw-away” radar sets. The theory is that, since servicing a normal radar costs as much as 10 times more than the original price, a “no-return” model could be designed that would make it cheaper to throw away a faulty one than repair it.

**Tall tower.** The U.S. Coast Guard now boasts the tallest structure in Europe. It’s a 1350-foot tower of a LORAN transmitting station located at a barren spot on the western shore of Iceland. The old tower was 625 feet high. The new higher one will spread its signal, used for navigation by ships at sea, over a wider area.

**A real jolt.** Four Air Force volunteers at Holloman Air Force Base, N.M., have been taking a beating on an inverted pile-driver designed to test vertical G forces. In a tilted chair, the men are jolted upward by a gas-driven piston. The trip lasts only a fraction of a second and covers only about two inches, but, during the test, each man is subjected to 95 to 130 times his own weight.

**Wire-guided.** The Navy has a unique new torpedo that takes steering instructions over a wire it streams out behind it for as far as 11 miles. The electrically-powered, eight-fin “fish” is nearly 20 feet long and weighs more than a ton. Far more accurate than a conventional torpedo, the new weapon is stabilized by a gyroscope spinning some 24,000 times a minute. A special fire-control system within the submarine tracks the target and feeds steering commands to it through the trailing wire.

**Slow slide.** The Army’s testing a new gadget to use in lowering men and equipment down a rope from a hovering helicopter. Dubbed *Sky Genie*, it’s a water-cooled rope brake that can be used to lower as much as 2000 pounds of equipment from a ‘copter. The load’s speed of descent is controlled by an operator, either from within the helicopter, or while accompanying the load to the ground.

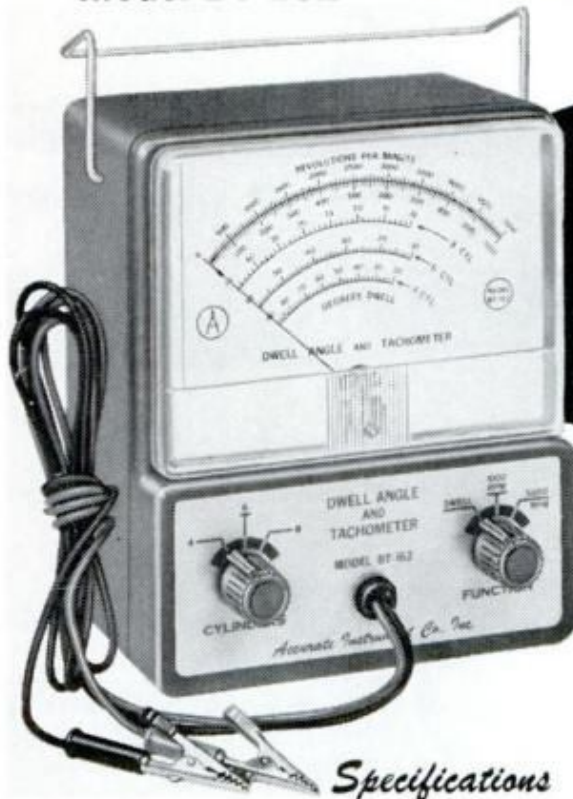


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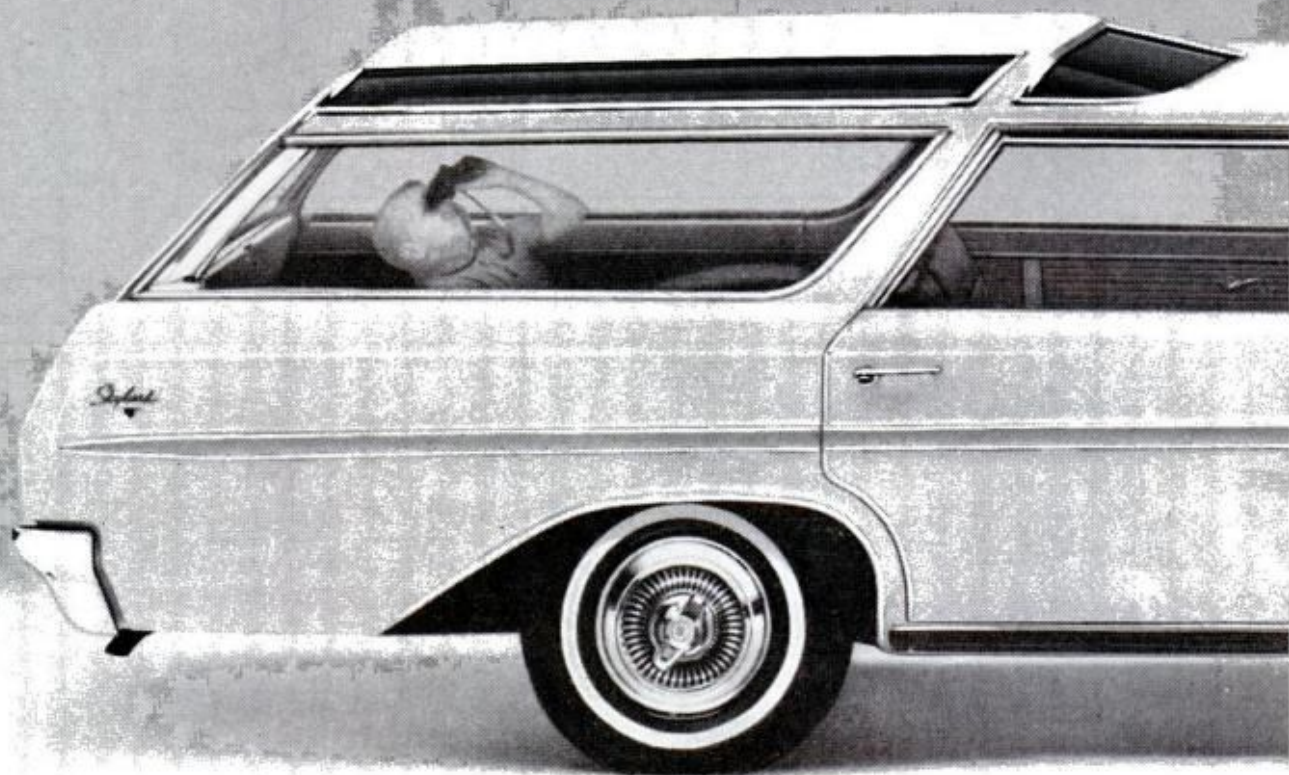
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This is the new Buick Skylark Sports Wagon. It has a raised roof so you can sit tall, and a new kind of shaded glass so you can look up and out and a forward-facing third seat. Need we say new?



**yes.**

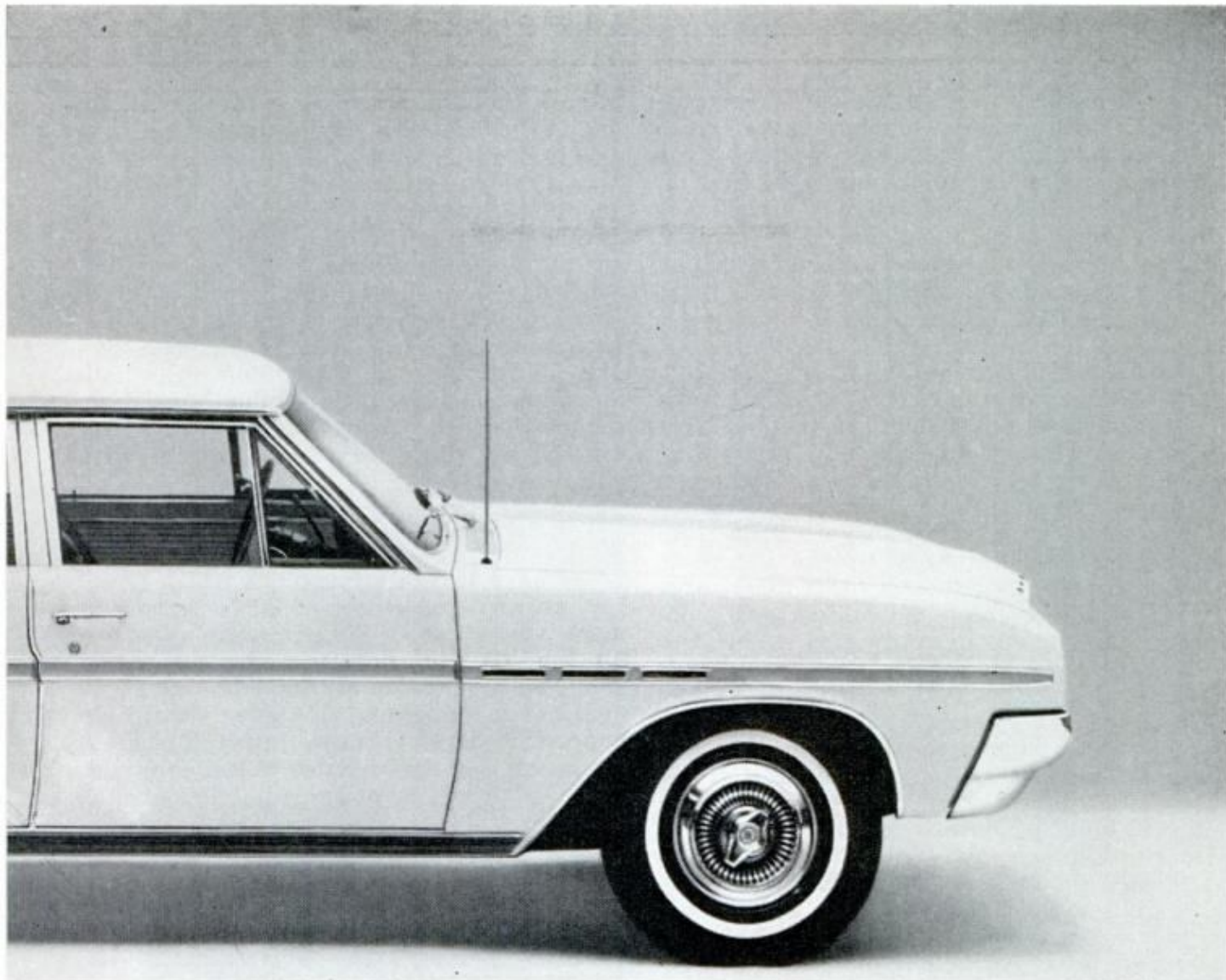
A raised roof, so you can sit tall. And plenty of legroom for one and all. And special heat- and glare-absorbing glass up top, so you can look up and out. Obviously, this is one nine-passenger wagon that won't see six people fighting to sit up in the front seat.

**yes.**

A third seat that folds flat into the floor. You can take it along with you, too; no hauling out the seat when you have a load to haul. With second and third seats down, you have 97.9 cubic feet of space to fill. Not enough? We just happen to have extra-cost roof racks...







**yes.**

A forward-facing third seat, for extra safety and so the last people in don't feel left out. And there's still lots of loadspace left behind that third seat. (If you carry more cargo than people, you can get a two-seat version.) And think all it took was a raised roof.

**no.**

Not the tried and true Skylark name. The whole package rides on a 120" wheelbase, spanked along by a 300-cu. in. Wildcat V-8 and cradled by that famous Buick ride. You can see the Skylark Sports Wagon at your dealer's now. What's keeping you?

Buick Motor Division



*Skylark*






# CLINIC FOR HOMEOWNERS

**Q** What is a "driven well"? I've recently acquired a summer home on a small lake and friends tell me that I can assure myself a water supply in the immediate locality by "driving" a well. But they don't seem to be too clear on how this driving of the well is carried out. Can you set me straight? What's it all about?—M.M., Mass.

**A** You don't actually "drive" the well. What you do is drive what is known generally as a well point, a pointed, perforated tube, or pipe, usually 30 to 36 in. long, down to a water-bearing sub-surface strata, or water table. The depth to which the point can be driven is, of course, limited and is determined by the nature of the subsoil. As a rule 25 to 35 ft. is about the maximum depth to which a well point can be driven by ordinary means, although of course, points have been driven to much greater depths. As a rule it is not practical to attempt driving a point in heavy clay soils or those containing coarse gravel or stones, and, of course, it is not possible to drive a well point through rock. Only in loose sandy soils where the water table is quite near the surface is the driven well practical. The procedure is quite simple: You drive the point down to grade level with a sledge and driver, which protects the top end of the pipe, then screw on a 3 or 4-ft. length of pipe, drive this down to grade and then screw on another length, and so on, until the point reaches water. Have a sample of the water tested before using.

**Q** I want to build a terrace across the front of my small home. It's to be about 8 ft. wide and perhaps 18 to 24 in. high and faced with natural stones. I intend to make an evergreen planting on the terrace. But the best way to lay the stones is my problem. Should the stones be laid loose or laid in a cement mortar?—J.L., Nebr.

**A** If you use flat stones of more or less uniform size they can be laid dry, that is, without mortared joints. If you must use field stones, more or less round and irregular in shape, then these should be laid in mortar. By your description we gather that you intend to fill the area back of the wall with soil to the top of the stone walls. If this assumption is correct then you will need to incline the walls

slightly inward, about 5 degrees or so, as they are laid up. In laying the stones dry (without mortar) you also should dig a trench four to six inches deep and fill with medium gravel, thoroughly tamped, to provide a more stable foundation for the walls. Select the stones for size and lay with "broken" joints, the stones of each succeeding course overlapping half on the stones of the former course. Provide the same tamped-gravel fill under walls laid up of field stones in irregular sizes. Use a ready-mixed mortar which you can buy in bags and make sure each stone is fully mortared in place.

**Q** I have several evergreens which have grown to a height of 20 ft. or more. Last winter two of these became so heavily loaded with snow that the tips were bent nearly horizontal. I'm told that they will never straighten, that they should be topped. I do not know, but think they are some variety of cedar. What should I do, wait, or top them immediately?—G.K., Wis.

**A** What you should do depends, we would say, on whether the trunk has been split and at what point the bend is located. If the latter is one-fourth the height of the tree, or less, it is possible the tips will straighten in time. This is not certain; it can be counted only a possibility. For this reason we would suggest that you wait for a time and note progress. If, at the end of a month or two, there are indications that the tips are straightening, then we would wait until fall before deciding whether topping is advisable. If, by this time, the tips are not fully straightened, or nearly so, then it may be advisable to consider topping, for the sake of appearance if for no other reason. If you do attempt topping the tree yourself, cut the trunk just below the bend, being very careful not to damage the bark or adjacent limbs. Make the cut at a slight angle rather than square off and coat the wound with asphaltum or a protective tree wax made for the purpose. Don't let snow accumulate on the remaining branches near the top. In some cases it may be advisable to "train" the upper branches after topping by tying them with an encircling cord to bring them in closer together and make a more attractive tip. In this connection, of course, each tree would offer an individual problem.





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# INVENTORS' CORNER

By Joseph H. Kraus

Mr. Kraus has been helping inventors solve their problems since 1919. Readers may send queries on ideas, inventions and patents to him, care of *Popular Mechanics*. Questions of general interest will be answered in this column. Please include all information necessary to understand the proposed idea or invention, plus your return address.

**Poor man's patent:** How good is it, Samuel S. Servidia of Downey, Calif., wants to know.

*It depends on what you mean by a "poor man's" patent. You can attempt to get one yourself by following the Patent Office regulations. For details, write U.S. Department of Commerce, Patent Office, Washington, D.C. 20230. You also could remove your own appendix by following instructions given in books on surgery. Neither is recommended. Even if you file the application yourself, you'll have to pay all the government fees. Also, a patent may be only as good as it is worded. My advice is to get yourself a patent attorney.*

✓ ✓ ✓  
**An electronic level** of an inexpensive design which can be used even in dark areas. Submitted by J. R. McKeever of Mulga, Ala. Has anyone ever protected it before?

*It seems doubtful that your suggestion is original. However, although I have examined many thousands of patents, I don't recall having seen anything like it. I suggest you order a patent search through an attorney. Possible variations of your device could shake your chances of acceptance by a manufacturer. But if you have any assurance of production, I suggest you apply for a patent immediately, provided you get a favorable report from your attorney.*

✓ ✓ ✓  
**Lavatory deodorizer**, designed by Belford L. Gilberson of Millville, N.J. What is its marketability?

*None at all. An exhaust fan in your bathroom will do the same job. It is easier to install, keep clean and is less expensive. Incidentally, such fans may be found in many hotels and new apartments where they are most useful for exhausting water vapor resulting from hot showers.*

✓ ✓ ✓  
**Crushproof luggage;** diagram and description of invention, which contains a special

liner, sent by E. M. Richardson of Kinta, Okla. What is market potential?

*Excellent if you could prove the value of your design. But your promise needs evidence which I doubt you can provide. There is no mechanical basis for the belief that you could sit on such luggage unless the sides are strong enough to support your weight. If they are, then your liner will contribute nothing to its strength.*

## Inventors Face 300 Percent Increase in Fees

Legislation that would more than double patent fees has passed the House and is due for Senate action this year. The bill, if it becomes law, will also introduce new "maintenance fees" which would put the bite on inventors for an additional \$300—though not all at once. Such a law could have the effect of further stifling individual inventive genius in the U.S.

Here is a schedule of present fees and those proposed in the new bill:

	Now	Proposed
Filing application	\$30	\$ 50
Patent issue	\$30	\$ 75
Oral hearing	\$25	\$100
Written appeal	\$25	\$ 50
Recording assignment	\$ 3	\$ 20
Filing for reissue	\$ 0	\$ 50
Reissue of patent	\$30	\$ 75

In addition, each claim, which now costs \$1 each over 20, would cost \$2 each over 10; on issue of patent, each page of specifications would cost \$10, plus \$2 for each sheet of drawing.

As "maintenance fees," inventors would have to pay \$50 per patent at the end of five years, an additional \$100 after nine years, and a final payment of \$150 after 13 years. Nonpayment would void the patent.

To ease the load on individual inventors, they would be permitted to defer the fifth- and ninth-year fees until the 13th year of the patent's life; at this time, they would have to fork over the full \$300.

The theory is that an inventor should know within 13 years whether his patent is valuable. If a patent doesn't earn as much as the "maintenance fees" within that time, it's felt that most inventors would let their rights lapse for the remaining four years of the patent's life, saving themselves \$300.

Backers of the bill seek to make the Patent Office more nearly self-sustaining; to weed out "deadwood" and "defensive" patents, which are expensive to maintain and complicate the unwieldy patent searches necessary with new applications. (Defensive patents are rarely

*(Please turn to page 30)*



**Spark plug electrodes that were new in the fall...**



**may look like this now—**




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After hard winter driving, your spark plugs are probably worn to the point where they need replacing. If so, they are wasting gas and impairing performance. Tests show that one spark plug firing only half the time reduces gasoline mileage seven percent at 60 miles an hour.

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# NEW 2-YEAR WARRANTY POLICY

on every '64 Johnson—  
covers both parts and labor!



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We lay it on the line for all 13 models in 9 power classes (90, 75, 60, 40, 28, 18, 9½, 5½, and 3 hp) of our '64 line. "For 24 months after purchase, Johnson Motors will replace, without cost to the original purchaser, any part of its manufacture which upon inspection proves to have failed in normal use due to faulty material or workmanship." Compare! No outboard builder exceeds this—and some are 21 months behind.

**Johnson**

Johnson Motors, 1689 Pershing Rd., Waukegan, Illinois. Division Outboard Marine Corporation

## INVENTORS' CORNER

(Continued from page 28)

used; they're designed to keep competitors from using their ideas.)

According to patent experts, the new fee schedules would probably put the expense of the average patent close to \$600—a trifling sum to a corporation but a crushing burden to most inventors.

Few other countries make inventors pay through the nose for contributing their genius to the general technological good. In Russia, for instance, even unpatented ideas and suggestions are rewarded with bonuses and incentives. We should go slow on any law that penalizes individual American inventors who account for nearly 40 percent of inventions patented.

Letters protesting the increase in patent fees should be addressed to the Senate Committee on the Judiciary, Washington 25, D.C.

## NEW PATENTS

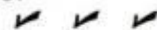
**Ice skaters** with cold feet can now skate in comfort with a heating apparatus recently granted patent 3,119,921. Electric batteries mounted on the skates warm the feet and also make skating easier by increasing the lubricating water film caused by the combination of pressure and friction. Inventor was Julius Czaja of Syracuse, N.Y.



**Beaches and harbors** can be protected with a new perforated breakwater structure made of a series of hollow caisson units. Waves lose energy in flowing through holes into a covered chamber and back again. Railroad tracks can be laid on top of the 60-foot-wide structure, which received patent 3,118,282. It was invented by Gerard E. Jarlan of Ottawa, Canada.

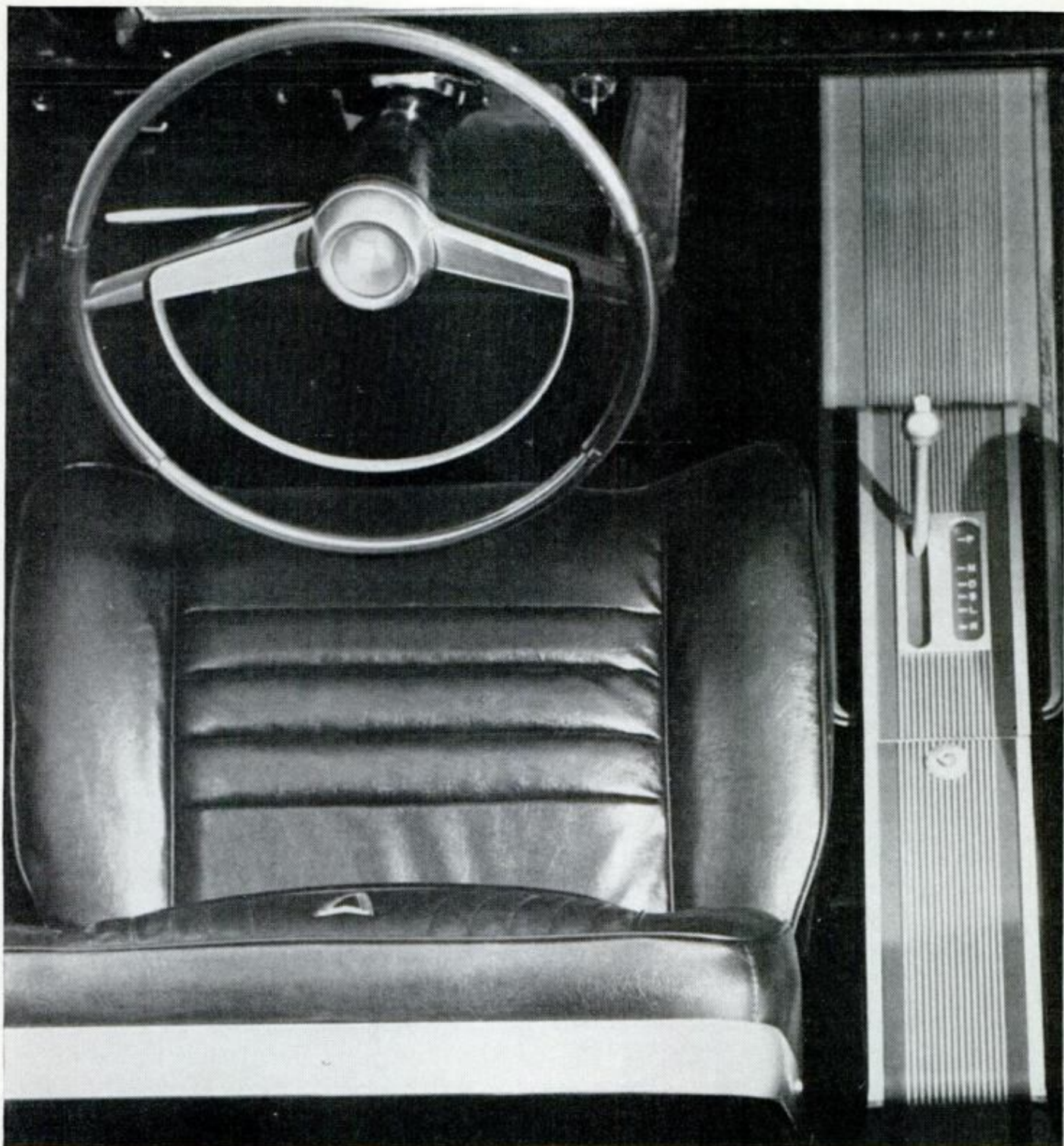


**Ancient water wheels** can be operated with a new solar engine designed to provide electric power for remote areas. Energy from the sun is absorbed into a "window" of quartz which passes it directly into the engine. Patent 3,117,414 was granted to Dr. Farrington Daniels of Madison, Wis., and Dr. Theodor Finkelstein of Columbus, Ohio.



**Instant coffee**, completely sealed in pressurized aerosol cans, would insure that just-brewed flavor down to the last cup, according to patent 3,119,695 won by Mortimer J. Kahan, Whitestone, N.Y. A blanket of nitrogen inside container prevents impurities from coming into contact with the coffee.





**Get in, turn on,**

**leave abruptly.**

This is where you aim a Catalina 2+2 from. Bucket seats, nylon-blend carpeting, custom steering wheel, the whole bit, all color-coordinated, in either sports coupe or convertible form.

The standard 389-cubic inch engine puts out 283 bhp when coupled to a 4-speed box\*, 267 bhp with Hydra-Matic\*. (The 2+2 comes only with one of these

two transmissions.) Both shifters are mounted in the standard console.

Much automobile.

If you want to make even more automobile of it, there's nothing to stop you from huddling with a Pontiac salesman and a list of performance options and doing wild things with an order form.

*\*Optional at extra cost*

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## Items from All Outdoors

**U-Paddle** canoe rental is the latest thing in wilderness outfitting. Hudson's Bay Co. is putting 28 canoes into rental service in Manitoba, Canada, charging \$25 a week. The main feature of U-Paddle is that you can pick up a canoe at a prescribed site, then drop it off at any one of Hudson's Bay's 200 trading posts. The Manitoba tourist bureau in Winnipeg will supply full information about pick-up sites. Another Canadian outdoors innovation is a floating fishing camp on Lake Athabaska in northern Saskatchewan. Whittings' Outdoors Unlimited, Uranium City, Saskatchewan, has built a 65-foot catamaran with staterooms for 14 guests and a crew of ten, which will ply the 290-mile-long lake with all the comforts of a modern lodge.

**Cork guns can kill** is a startling revelation from the National Rifle Assn., which reports a number of accidents involving children trying to shoot .45 and .30-06 cal. cartridges in a toy cork gun. The cartridge is placed in the muzzle of the gun and the plunger flies forward to explode the cartridge. In most cases the barrel is blown apart, inflicting injury on the child. This is just one more demonstration of the need to keep live ammunition away from kids.

**Campers** desiring a makeshift bellows for starting a fire can emulate J. M. Gaines of Brevard, N.C., who uses an empty cardboard milk carton with a metal pouring spout. Just point the opening at the fire and pump the sides with both hands.

**Hunters eat crow**, according to the people over at the Winchester News Bureau. They told us quite seriously about a recipe for fried crow. You skin the crow, cut it into pieces and parboil it until tender. Then brown some onion in a skillet, add the pieces of crow and fry. This brings to mind the wife of an Alaskan acquaintance of ours who was about to give us her own special recipe for moose stew. "Well, first of all," she said, scribbling on her pad, "you take one moose." It is little problems like this that make the new freeze-dried foods so appealing.

**STUART JAMES**  
Outdoors Editor

POPULAR MECHANICS





## New tool anchors wood or metal to concrete with 5 hammer taps

It's called Shure-Set.<sup>®</sup>

And it's so simple, it's a wonder no one thought of it sooner.

A fastener goes in one end of Shure-Set. You tap the other end with a hammer. A few light taps get the fastener started. Then tap-tap-tap-tap. It's done.

You've anchored a 2x4 into concrete. Or a furring strip. Or even light-gauge metal.

How does Shure-Set work? Inside the tool is a piston. It concentrates all the force of the hammer blow into the work. Makes fastenings, faster.

Without drilling. Without expansion devices. With-

out a lot of time or effort. But with every bit as much holding power as any other method of fastening.

Builders are already using a heavier, more expensive Shure-Set model. In fact, it's practically standard equipment for construction workers. And electrical contractors. And maintenance engineers.

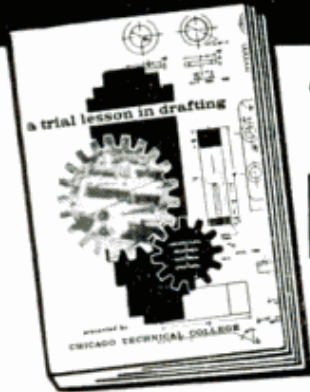
You'll find our Shure-Set Fastening Kit just as handy. You get the tool and a starter assortment of fasteners for only **\$3.95.**



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## Sidelights on

# AVIATION

Now aviation has an abominable snowman of its own and, while it's just as invisible as that legendary Himalayan beast, it is much more real and genuinely feared.

The unseen CAT described in the story beginning on page 104 is a not-new but a newly recognized phenomenon—clear-air turbulence. Pilots flying in an uncluttered, clear-as-a-bell sky are suddenly, violently, thrown about as if they were riding a chip on the ocean. Some planes have lost thousands of feet of altitude when caught by CAT, and others may have crashed.

Philip Geraci, the author who got the story from the U.S. Weather Bureau's new department assigned the task of studying CAT, is new to *Popular Mechanics*. His first story is a fascinating, if frightening, account of a mystery of weather.

A recent news story was a sad one for me. It said that the U.S. Navy had decided to slaughter some of the gooney birds on the Midway Islands.

I visited Midway two years ago (*PM*, September, 1962) to do a story on the Navy's hilarious attempts to shoo the birds off the island so its planes could take off and land safely without running into them. To prove it, I've still got a scar where one of the birds bit me.

They are a lovable, if frustrating, batch of birds, but I can't blame the Navy for its decision. One in seven of its planes was getting hit. Previous efforts with scarecrows, fireworks, loudspeakers and burning tires were useless.

The Navy, with the cooperation of the National Audubon Society, used carbon monoxide gas in sealed enclosures to put to sleep the birds that nested nearest the runways. If this works the others elsewhere on the island may be spared.

Another solution for scaring away birds that nest in hangars has been used successfully at a Navy base. They hang paper bags, with nothing more than air in them, from the rafters on strings. When the hangar doors are open, the breeze sways the bags enough to discourage any birds from flying near them. The bags, they say, have been up there for 20 years, and no nest has ever been built in the hangars.

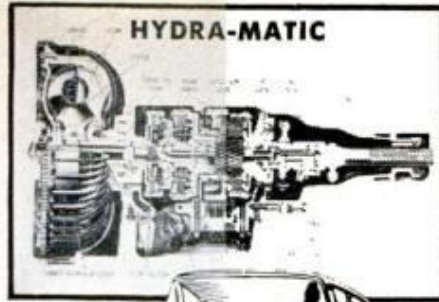
*Kevin V. Brown*  
Aviation Editor

POPULAR MECHANICS





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**HYDRA-MATIC**



**STARTING MOTORS**



**VALVES**



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By Jim Whipple



## Chrysler's New "Hemi" Engine—550 b.hp., 175 m.p.h.!

### Indy '64: They'd rather switch than fight

Big-time stock car racing could be even more exciting this season than it was in '63. **Dodge** and **Plymouth** need only keep charging the way they did in Daytona (at 175 m.p.h.), where they first ran their new "Hemi" engines in competition.

Results were startling, to Ford boosters at least, with Richard Petty's Plymouth winning over the nearest Ford by a good two laps in the NASCAR 500 mile classic. Two more Plymouths finished 2nd and 3rd while a Dodge placed 5th. When the smoke blew away six of the first 12 places were occupied by hemi-engined Plymouths or Dodges.

Called "Super-Commando" when used in Plymouths and "Hemi-Charger" on Dodges, the new engine is based on the current 426-cubic-inch Commando and Ramcharger engines. Bore and stroke (4.25 x 3.75) are the same on both engines.

Big difference is in the cylinder heads which have hemispherical-shaped combustion chambers and dual rocker shafts to operate the inclined valves. This design is similar to that of the big Chrysler engines of the mid-50s. However, the new engine is lighter in weight.

Published horsepower ratings are the same as the current 426-cubic-inch engines with their conventional wedge-shaped combustion chambers. The drag-strip versions with 11.0- and 12.5-to-1 compression ratios are rated at 415 and 425 horsepower respectively. These two versions of the hemi-engine have two four-barrel carbs mounted on a ram manifold.

The track version which promises much on both NASCAR and USAC racing circuits has a single four-barrel carb with two-level intake manifold. This one is rated at 400 horsepower. Torque ratings of the new engines are 470 and 480 at 4600 r.p.m. for the drag engines and 465 at 3800 for the racing powerplant—figures that also shadow those of the "old" 426 engine.

At this point you might wonder why all the big engineering effort to design the new "hemies" with no apparent differences in power rating. The key word here is "apparent." In actual fact the new hemi

engines are considerably underrated. Due to the greatly improved breathing through opposed (and larger) valves, more fuel is drawn into the same size combustion chambers. The result is gobs of added power. We wouldn't be surprised if these new Chrysler power plants were developing 550 b.hp. or better on the test stands. But watching them move out on the track gives you a better clue. As another example of this unusual modesty **Fords** with 427-cubic-inch racing engines have "410 HP" painted on their hoods. But Holman and Moody, who set up these cars, won't install an engine if it doesn't check out at least 475 b.hp. on the dyno.

Before you run down to your friendly **Dodge** or **Plymouth** dealer waving a check-book, be advised that, according to Chrysler officials, the hemies are "offered exclusively for the serious competitor who wants to enter supervised racing events."

"They'd rather switch than fight" could well be the slogan of most Indianapolis competitors this year. According to plans presently announced, they will field more rear-engined cars than front. There also will be at least as many non-**Offenhauser** engined cars at qualifying as traditional big fours. Of the 33 cars on the starting grid last year, 26 were **Offie**-powered, front-engined roadsters.

After a long look at "rookie" Jimmy Clark's performances in the rear-engined **Lotus Ford** at Indy and Milwaukee (2nd and 1st place); and a short, unsportsman-like squabble concerning the potential eligibility of the new lightweights, "the boys" have decided to follow the ancient rule and join (or at least emulate) those whom they can obviously no longer lick.

With the 64½ cars just about in the showrooms—Ford's semi-sports **Mustang II** and Plymouth's fastbacked **Barracuda**—our thoughts turn to early reports of the 1965 model year.

Sixty-five, it seems will be a big year for bodies. New ones are due at **GM**, **Ford** and **Chrysler**.

**Ford** and **Mercury** bodies will be new

(Please turn to page 38)





**This Super Hi-Miler tread design gives you  
 an extra 130 square inches of rubber  
 ...and thousands of extra truck tire miles!**

**Yes, outwears! Yes, any other!**

With every turn of the wheel, the Super Hi-Miler truck tire puts almost 130 extra square inches of rubber against the road. And more rubber means longer wear.

This Super Hi-Miler tread is made up of solid continuous ribs. No little segments here with excess space between. It's a wider tread.

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The Super Hi-Miler tread is actually made of two kinds of rubber. Outside, an abrasion-resistant tread; inside,

a softer, more resilient rubber that absorbs flexing and creates less heat-building friction.

This, plus a new specially grooved shoulder design, keeps Super Hi-Miler running up to 25° cooler, mile after pounding mile.

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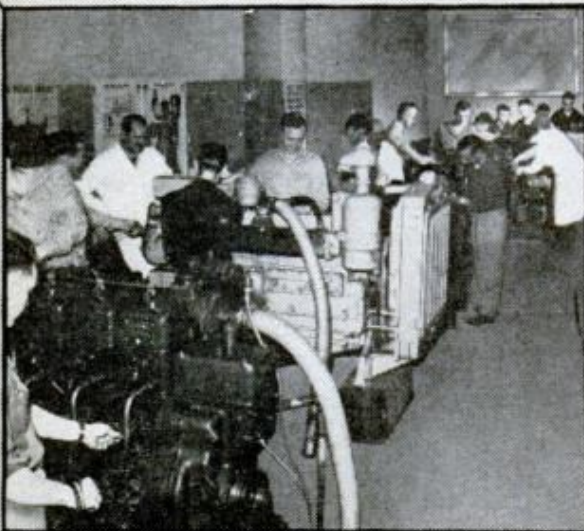
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**Detroit Listening Post**

(Continued from page 36)

from the road up and will bear a more than casual resemblance to the 1964 **Pontiacs**. If it seems a mite odd that the 2nd place car in over-all sales should follow the 3rd place make, remember that styling is what moved **Pontiac** up from 5th place.

**Ford** and **Mercury** will also share independent rear suspension, which will have the differential mounted to the frame, and will drive through swing axles. Transmissions will be up front with the engines. The IRS deal is aimed at shrinking the driveline tunnel and smoothing the ride.

There will be a new "B" body for **GM's** full-sized lines in **Chevrolet** and **Pontiac**, plus smaller **Buicks** and **Oldsmobiles**. It's quite possible that all these cars may get the same automatic transmission—the switch-pitch torque converter job now used on **Olds' Jetstar** and the **Buick LeSabre**.

You can look for completely new bodies on 116-inch wheelbase **Plymouths** and 119-inch **Dodges**. Styling is reported to be show-stopping. There will be a big **Plymouth** for '65 to match the present **Dodge 880**. Like the 880 the new **BIG Plymouth** will share basic body-chassis and engines with **Chrysler's Newport**. This move will put **Plymouth** in a fully competitive position with **Ford, Chevy** and **Dodge** dealers who already offer cars in three sizes—small, medium and large.

**Brakes** will get attention in '65 for a change. It will be the real beginning of the disk era, with this type of brake probably on more than one luxury car of the **Cadillac-Imperial** class, and on more than one hot medium-priced car such as **Buick's Wildcat**, **Chrysler's "300"** or the **Ford Thunderbird**.

Three big firms, **Bendix, Kelsey Hayes** and the **Budd Co.**, are deeply involved in disk brakes, but are not yet ready for high-volume low-cost production. But that disks will be on **Ford, Chevrolet, Plymouth** and the compacts is a shoo-in bet. They are already on two imports (**MG 1100, Hillman**) selling for under \$2000. ★ ★ ★

**Rugged Planet**

**Mercury**, smallest and hottest of the nine planets, may have a much rougher surface than either **Mars** or **Venus**, according to scientists at the Jet Propulsion Laboratory in Pasadena, Calif.

A series of radar experiments by the scientists also showed that the planet's rotation period is 88 days.





PHOTOGRAPHED UNDERWATER AT FLORIDA'S SILVER SPRINGS

## Shallow water takes the strut out of ordinary inboards

*MerCruisers have no fixed struts, rudders or shafts on the bottom of the boat. Power tilt lifts the stern drive to the proper angle for shallow-water running.*

MerCruisers run through shallows as easily as open water . . . beach under power like an outboard. There are no rigid struts, fixed drive shafts or rudders to damage. If you plan to run through water you know is "thin," just switch the power tilt to the "up" position. The control is on the dashboard. The stern drive unit rises to the desired angle and you zip right through without digging sand or mud with your prop.

Of course, if you should accidentally hit a sandbar or other submerged obstacles, the stern drive unit kicks up like an outboard. Hydraulic shock absorbers cushion the impact. A Safety-Tilt switch cuts the ignition to prevent the engine from over-revving . . . restores the power again when the prop re-enters the water.

Boats powered by MerCruiser Stern Drive Power Packages give you the prestige of an inboard, the power range and fuel economy of 4-cycle engines . . . combined with the maneuverability, portability, propulsion efficiency and impact protection of an outboard.

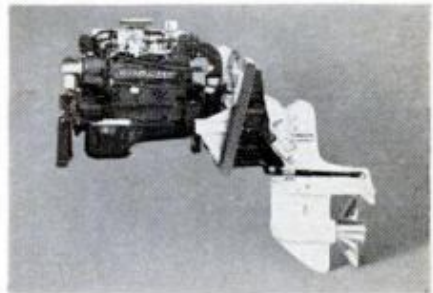
More than 165 different manufacturers are build-

ing boats powered by MerCruiser . . . giving you a far wider boat and power choice than with ordinary inboards or other stern drives.

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### **MerCruiser 120:**

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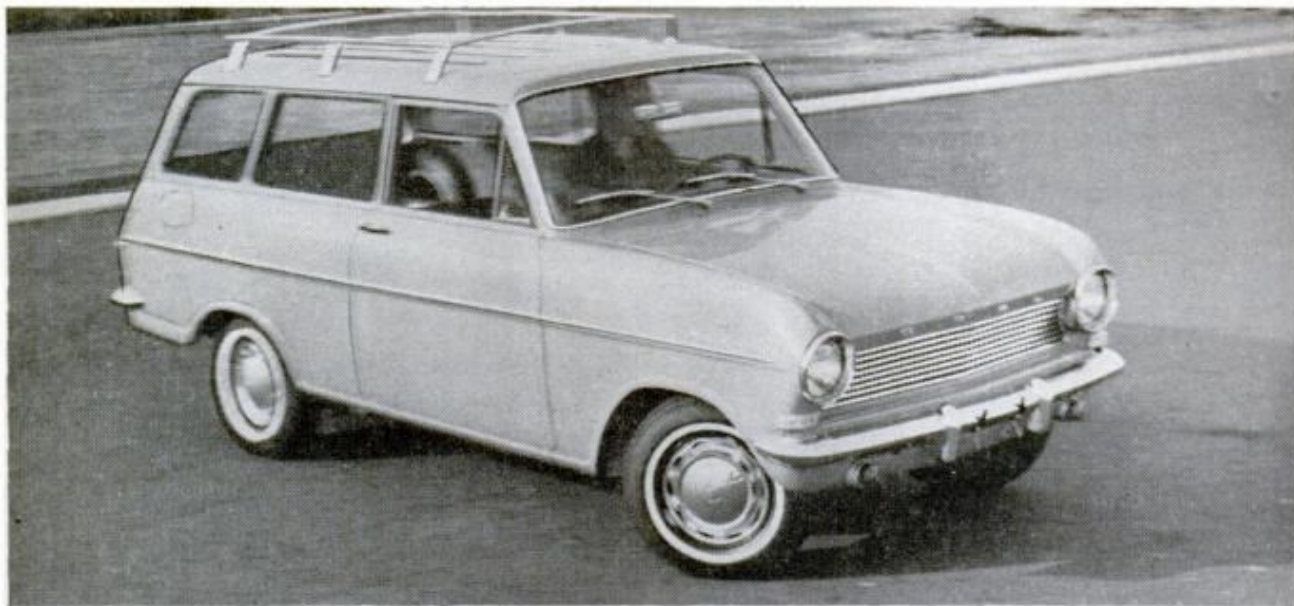
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# Spotlight on the OPEL KADETT



**THE OPEL KADETT'S TURNING CIRCLE**, only 33.8 feet across, lets you maneuver through nearly any situation. The car's steering ratio is a quick 16 to 1

*New competition for VW comes from Germany  
—you'll find it at your friendly Buick dealer*

By Ed Nelson

**S**OME KNOWLEDGEABLE OBSERVERS are suggesting to Volkswagen's managing director, even if he isn't listening, that he'd best be looking over his shoulder. The new Opel Kadett may soon be on his heels.

The Kadett sedan's basic East Coast POE price—\$1635—puts it in competition with VW at \$1595. Fighting the other imports, the "beetle" had the advantage of a well regarded service network reaching throughout the U.S. Now here comes the Kadett billed as "the new little German car with General Motors behind it." Buick Division takes primary sales and service responsibility. That surely doesn't spell s-m-a-l-l p-o-t-a-t-o-e-s to VW.

The Kadett is available in two other models, the sport coupe (\$1818 POE) and the wagon (\$1793), which we picked to test because it seemed to offer good utility at modest cost.

For your \$1793, what does the Kadett wagon offer? Thousands of beetle aficionados will insist with their dying gasp that nothing as pure and fine as the VW ever came off an assembly line. They'll never be converted. But could the Kadett grab a slice of the un-VW-sized market?

PM editors spent a couple of weeks in a station wagon to find out.

Granted that its standard 46-hp. 7.8:1 compression ratio engine doesn't give you neck-snapping performance. However, there's an 8.8:1, 54-hp. Super engine available as an option. And with the smooth, all-synchro, four-speed transmission, even the standard engine feels lively. The ratios—3.764, 2.156, 1.406 and 1.000 with a 3.797 reverse—move you smoothly from one speed range to the next without over-extending the engine at any time.

[\(Please turn to page 42\)](#)



# Anything four paints can do this one paint can do better

*Forget about different paints for siding and shingles, masonry, trim and galvanized metal. Just remember this one new kind of paint. Dutch Boy Latex House Paint.*

**By James Symon**

Before you start painting this year, or next year, or any year, take a look at your house. Then take a break. And think. If your house has surfaces of masonry, shingles, concrete, wood siding, you'll not need up to four different kinds of paint to do a good job. You'll need just one. Dutch Boy Latex House Paint.

Want to know why a latex house paint works where conventional paints won't? Here's why. Dutch Boy Latex House Paint has a latex base. It does a perfect covering job on just about any surface you can name. But that's not all. It has lots of other advantages.

To start with, a latex house paint goes on more easily. It flows out to an even surface without leaving brushmarks. You can stop or start without it showing. (This is a real

time-saver when you are painting your house bit by bit.) Another point: Latex doesn't chalk away. And that means colors stay brighter longer. In fact, Dutch Boy Latex House Paint has been found to hold its color so well you can come back and touch up 3 or 4 years later and not see the difference.

How long does Dutch Boy Latex House Paint last? Well, frankly, nobody really knows. (Houses painted four or five years ago are still bright and weather-tight.) One thing is certain, however. This new paint is just about the most efficient house paint ever developed.

Where can you buy it? From any Dutch Boy dealer. See him. He'll give you any help and advice you need. He's in the Yellow Pages.

Is this what your house looks like?

1. Siding.

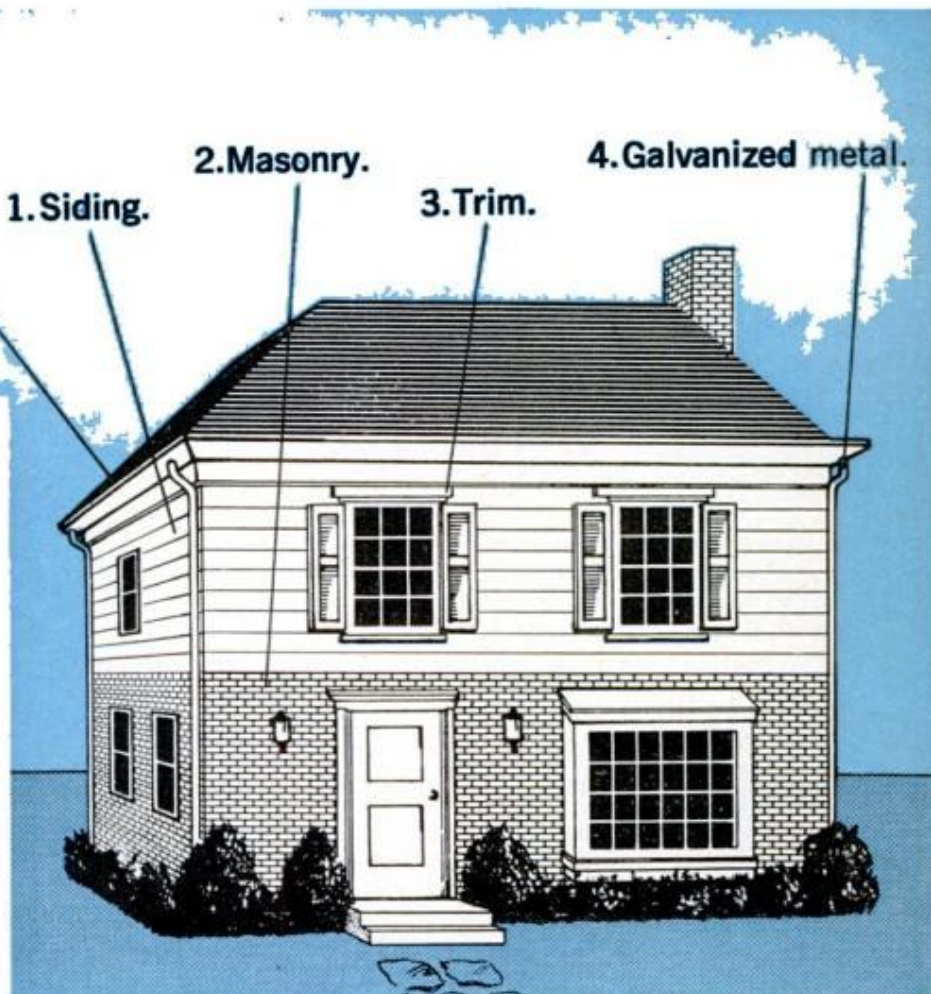
2. Masonry.

3. Trim.

4. Galvanized metal.



This is the remarkable paint that does so many jobs so well. If you haven't used it, try it. If you have, congratulations.



You can use up to 4 different paints on a house like this. But wouldn't you rather use just one? PRODUCT OF NATIONAL LEAD COMPANY



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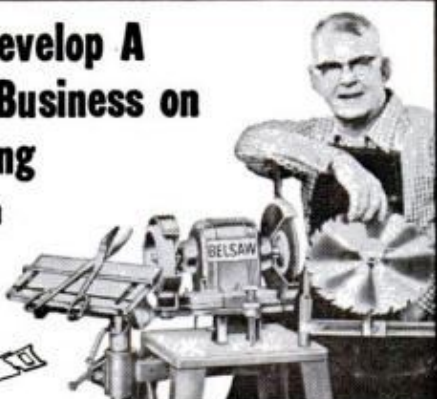
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## Spotlight on the Opel Kadett

(Continued from page 40)



INTERIOR SPACE IN THE KADETT'S unit body is good. Floor-mounted stick is convenient, but must be long because of seat height. Instrumentation is simple

When we picked up our wagon, it had only 129 miles on the odometer. The transmission, although not terribly stiff, was obviously new. From second to third, for example, the corners of the "gate" in the H-pattern felt sharp. The shift required three distinct movements. The odometer was pushing 1000 miles by the time we were done, however, and shifting had long since become smooth and snappy.

One test driver complained, nevertheless, that going into third a trifle carelessly meant the stick often popped into neutral later. It's as though the gears don't mesh as deeply in third as they do in the other gears. The cure: Be careful.

A rubber flex joint in the stick helps isolate transmission chatter from the knob, although you still get a good idea of what's going on in the box.

On regular gas, we got an over-all fuel figure of 28.4 miles a gallon. The bulk of the driving was either in city traffic or bumper-to-bumper thruway snarls. Whenever possible, we enjoyed pushing the boxy Kadett to the snappiest action of which it was capable. There's no serious problem holding your own with U.S. highway cruisers—unless you try accelerating from 50, say, or unless you want to hold 65 up a long hill. City traffic, on the other hand, was an enjoyable challenge.

If we credit lively action to the Opel gear box, we should credit the engine with much of the economy. It's small and simple, hardly charged with exciting engineering features. It's a straightforward,

(Please turn to page 44)





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## Spotlight on the Opel Kadett

(Continued from page 42)



**LOAD SPACE BEHIND SWING UP** tail gate is narrow, but designers kept floor low, permitted a cargo well by standing gas tank and spare upright at the sides

in-line Four—water-cooled and front-mounted, driving the rear wheels.

A roller chain kept under tension by oil pressure, drives the camshaft located well up one side of the block. That allows a set of short push rods, which reduces reciprocating masses and helps to extract everything possible from the 60.59 cubic inches displacement. Yet the Opel isn't involved in the complexities of an overhead camshaft. Rather high engine speeds are possible because the short push rods permit the rest of the valve train to be light in weight. Power of the over-square engine (bore and stroke are 2.84 x 2.40 inches) peaks at 5200 r.p.m. The torque peak, 54 lb.ft., comes throughout the range from 2600 to 3600 r.p.m.

Top speed is advertised as 74 m.p.h. We found, for practical purposes, it's about 72 m.p.h. indicated—at which point the front end begins to float a little.

Inside the car are some agreeable surprises. In contrast to most "economy imports," the Kadett driver has no problem finding a home for his left foot. Suspended pedals leave welcome floor space. Since the wheels are well forward, their housings don't intrude. In as little as five miles, this becomes a boon.

Headroom is another surprise. There's plenty—in back as well as in front. Credit straight-line styling. Opel spokesmen also make a big point of the almost bolt upright driving position, but one PM tester felt more rigidly erect than he preferred. With the gas pedal well back from the toe board, your right leg is drawn up without thigh

(Please turn to page 46)

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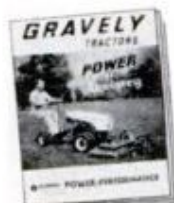
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## Spotlight on the Opel Kadett

(Continued from page 44)

support. And if you're a sizeable driver, it's not at all unlikely you'll find your knee knocks the steering post now and again. But for us the seats themselves were very comfortable.

This front seat situation—even with the seat at full rear—has one happy result. The back seat passengers get a good deal. The same lanky test driver who found the steering post a potential knee knocker found knee room generous in back.

One result you might expect from this practical approach would be the rejection of an automatic choke, on the theory that reasonable drivers can handle a choke themselves. Sure enough, the Kadett has a manual choke. And a good thing; for the first five minutes running on a cold morning, you'll need it.

The wagon's 50 cubic feet of cargo space (with second seat folded flat) is slightly more than 3 feet wide between wheel housings. With width restricted, designers got height by standing the spare behind the left rear wheel and the fuel tank behind the right rear. That leaves space for an under-floor locker, space that becomes a foot well for the wagon's optional, rear-facing third seat.

A roof-mounted luggage rack is standard on U.S. models of the wagon. It begins to sing in the wind at about 55 m.p.h., but the note isn't irritating. All-around vision is good. Slight distortion at the windshield edges is hardly noticeable unless you sight along the plane of the glass.

The Kadett's handling characteristics make you sit up and take notice. The suspension's essentials are ordinary enough, but the elements cooperate so well you feel they must be special. Instead, there's an ordinary leaf spring under the front crossmember. It gives such cornering stability that no stabilizer bar is needed.

In the rear, the flexibility of the links between springs and axle give a ride that's softer than you might expect from such small springs and a 91½-inch wheelbase.

The rack and pinion steering is self-adjusting and precise. Turn the wheel and obediently the car follows its front end around a corner. Steering feels light, yet crisp. You go from lock to lock in only three turns and the turning circle is less than 33 feet across. Steering gear—in fact, the whole car—is lubricated for life.

With GM's massive backing and a well designed product, it's our guess the Kadett can make solid news in the import field. If your need is for a comfortable, low-cost, low-upkeep vehicle with generous room for four, you should take a look. ★★



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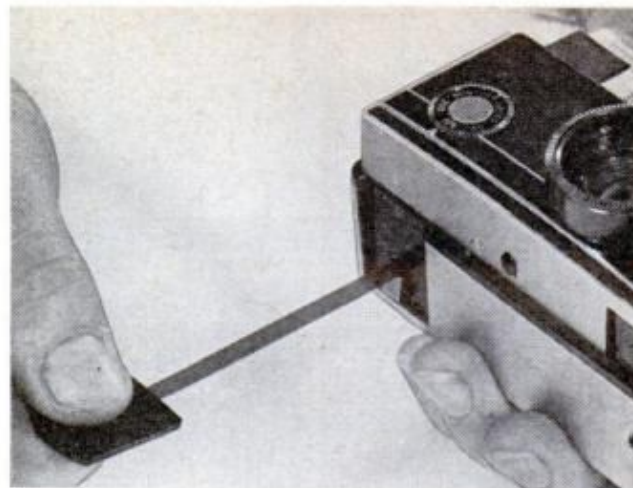
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Also new to the Instamatic line is the Model 500 (below), which has an f:2.8 lens, shutter speeds of 1/30 to 1/500 and bulb, plus built-in exposure meter. The meter activates a needle which shows in the viewfinder, superimposed on a step-like configuration (inset). You move a lever on the front of the camera to keep the needle centered. As long as it's centered, the lens is set for the shutter speed being used. Accessories offered for the 500 include the tiny Kodablitz flash gun. The No. 500 sells for under \$95.



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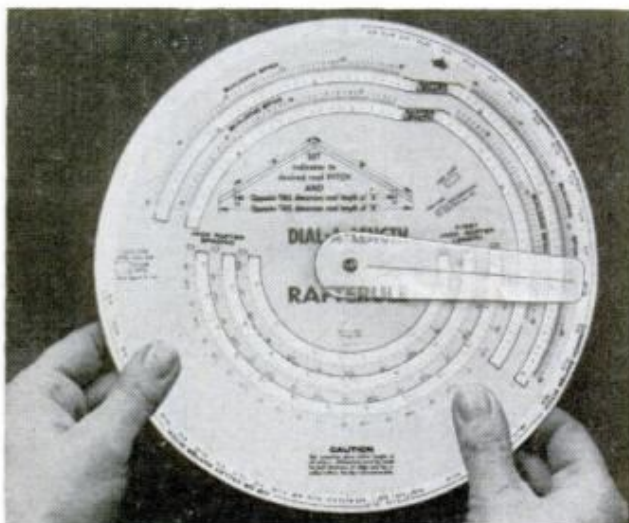
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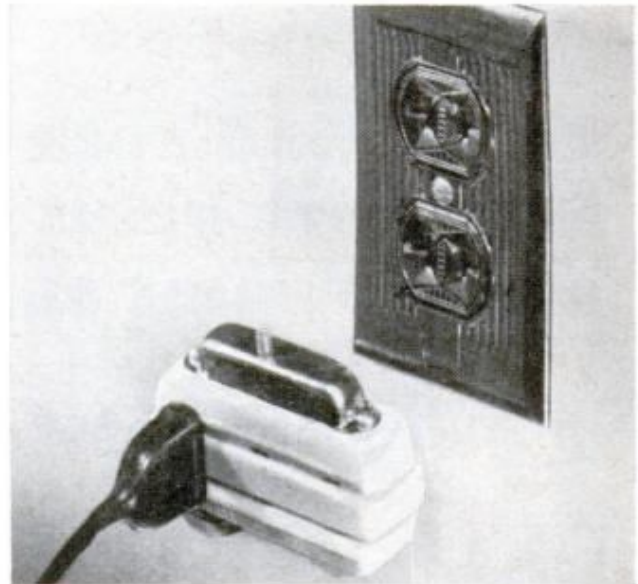
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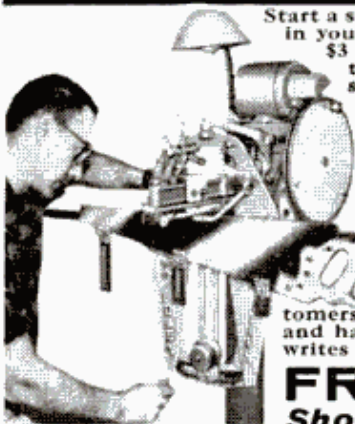
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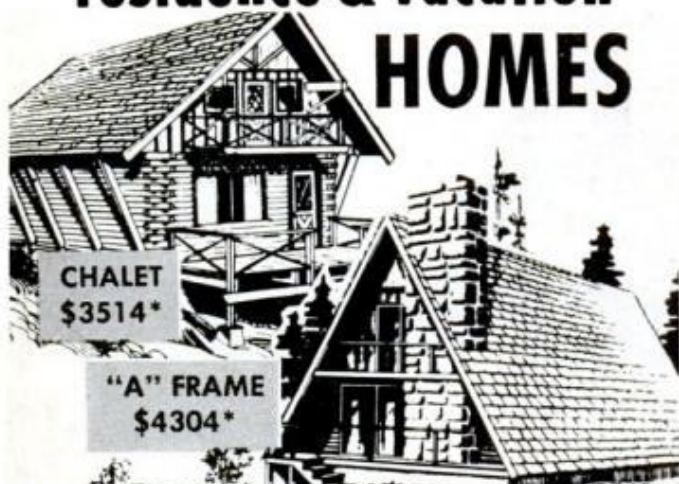
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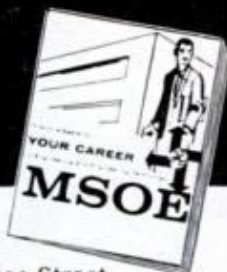
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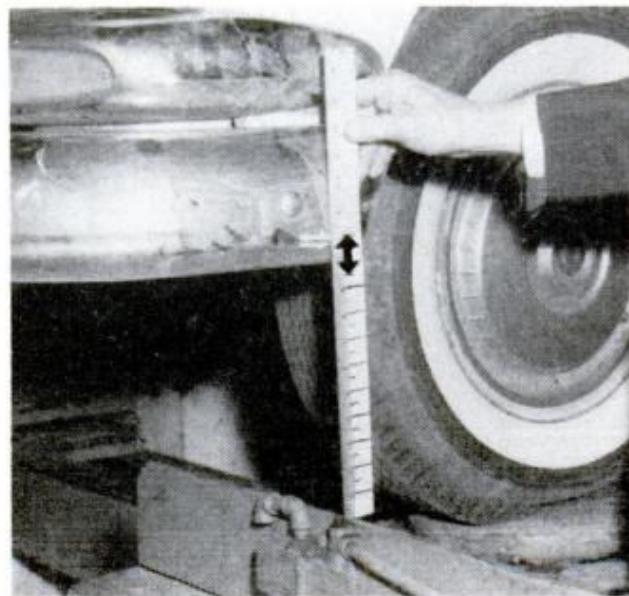
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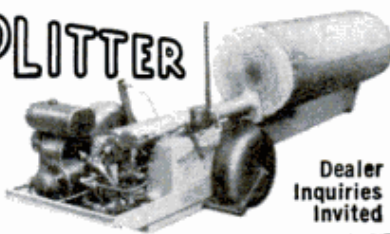
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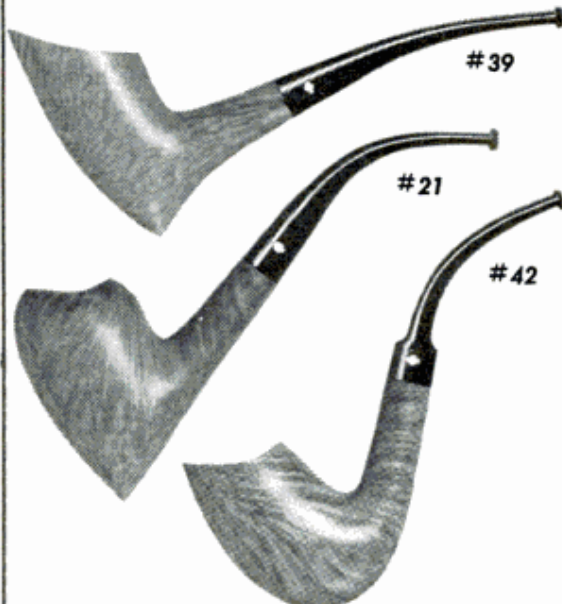
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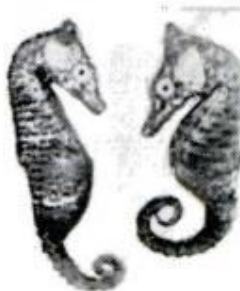


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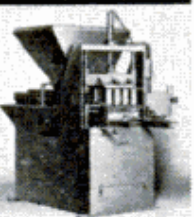
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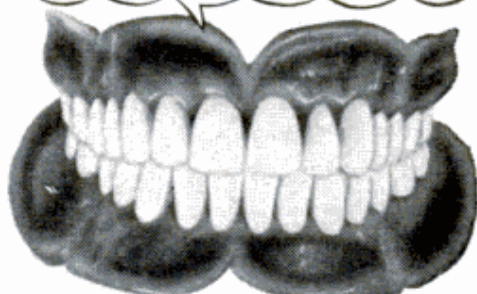
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#### RECTAL-COLON DISORDERS

Are often associated with Glandular Inflammation.

Either or both of these disorders may be treated at the same time you are receiving Glandular Inflammation treatments.

#### REDUCIBLE HERNIA

is also amenable to a mild Non-Surgical treatment.

### Write For New FREE Book

It's fully illustrated. Gives excellent factual knowledge about diseases peculiar to men and women. Tells HOW and WHY New Modern NON-Surgical methods are so successful. Write Today.



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Gentlemen: Kindly send me at once, your New FREE Book. I am interested in full information. (Please Check Box)

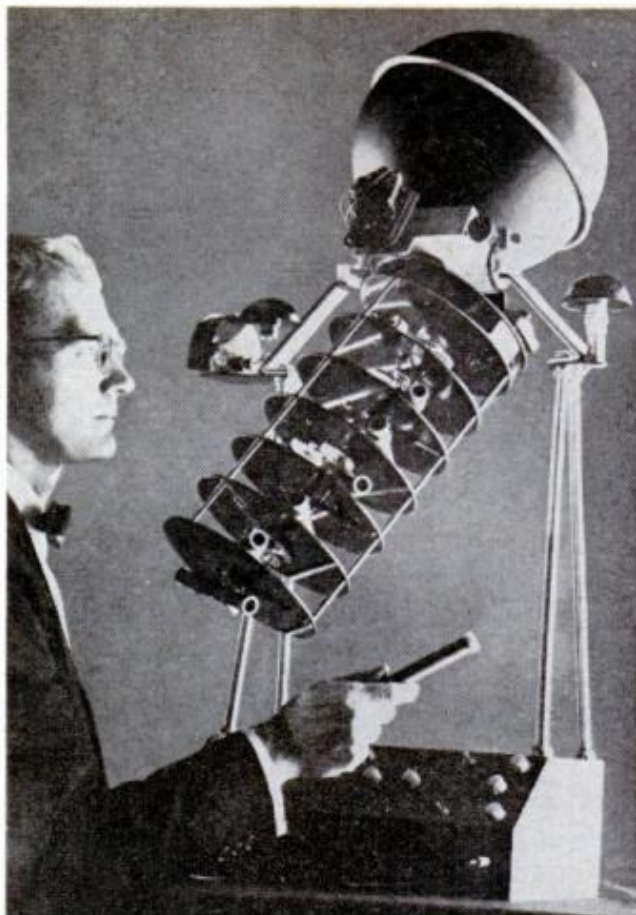
- Glandular Inflammation       Hernia  
 Rectal-Colon

Name.....

Address.....

City..... State.....

## Compact Planetarium



The complete yearly movement of the planets in relation to the stars can be visually presented with a new, low-cost planetarium designed for school and college use. Housed in a 14-foot rigid plastic dome, the apparatus also demonstrates both sunrise and sunset motion, cloud effects, landscapes and horizon effects. Planetary motions can be shown in reverse as well as forward gear. The Nova III is available for under \$4000 from Harmonic Reed Corp., Rosemont, Pa.

## Biggest Bang

An exploding galaxy, blown apart by the most gigantic bang ever known in the universe, was recently photographed on the 200-inch Hale telescope at Mt. Palomar, Calif. Light from this vast explosion has taken more than five million years to reach the earth, since the galaxy is some 5.2 million light years away.

Known to astronomers as M-82, the detonation spewed material out of the heart of the galaxy at velocities up to 20 million miles per hour. Photos show tremendous jets of matter 60 million billion miles long (or 10,000 light years) streaming from M-82's nucleus. Matter equal to five million suns is involved. Such galactic explosions may be the prime source of cosmic rays; they may also shower earth with neutrinos, sub-atomic particles.





## Eagle claws... hook and hold!

The greatest thrill in fishing is when you twitch the rod and feel that hook sock home.

With Eagle Claw fish hooks it happens almost every time.

Eagle Claw fish hooks are made for every fishing need, snelled, loose, weedless, double, treble. Send 10c for 64 page complete color catalog.

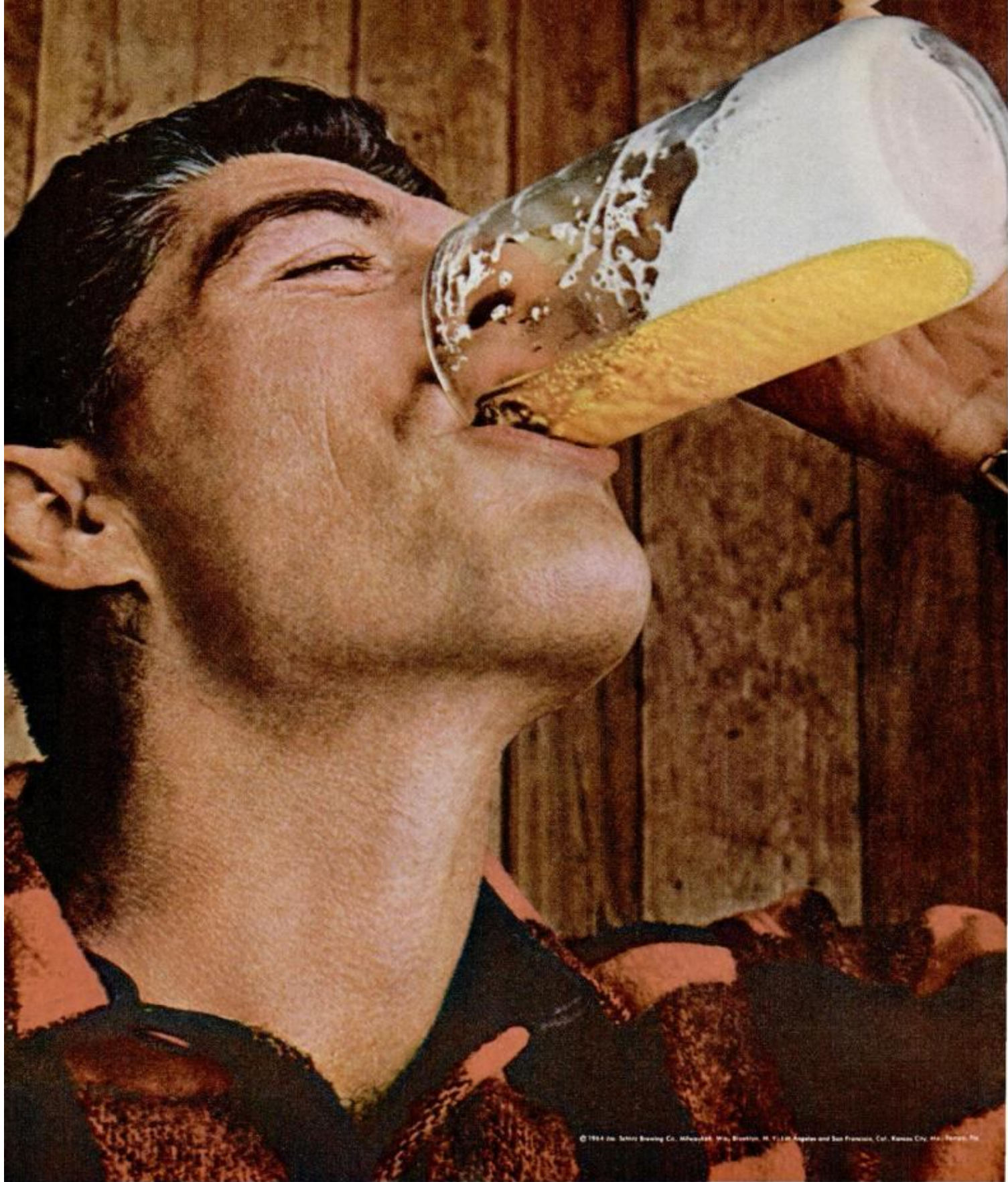


### **EAGLE CLAW® FISH HOOKS**

A product of **WRIGHT & MCGILL COMPANY**

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*Down. Down. Down. Down. Right to the bottom of your thirst. Mmmm. Satisfying Schlitz.*

**real gusto**  
*in a great light beer*



The Beer that made Milwaukee Famous  
... simply because it tastes so good.

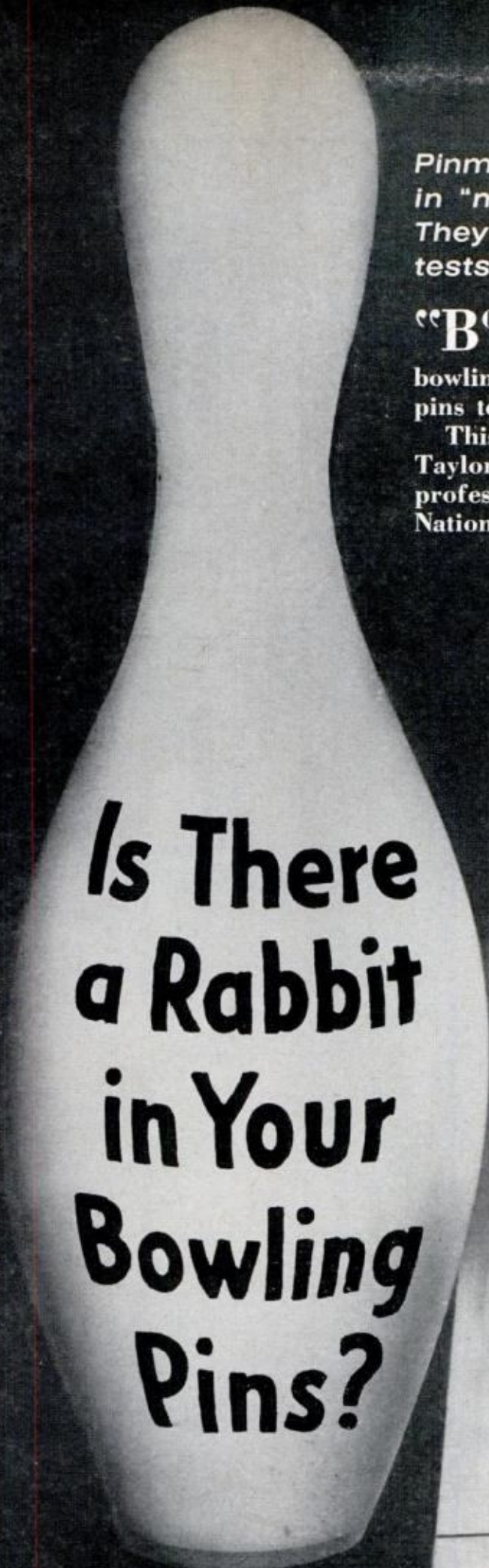
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*Pinmakers are accused of building in "more bounce to the ounce." They dispute it. Here's what PM's tests show*

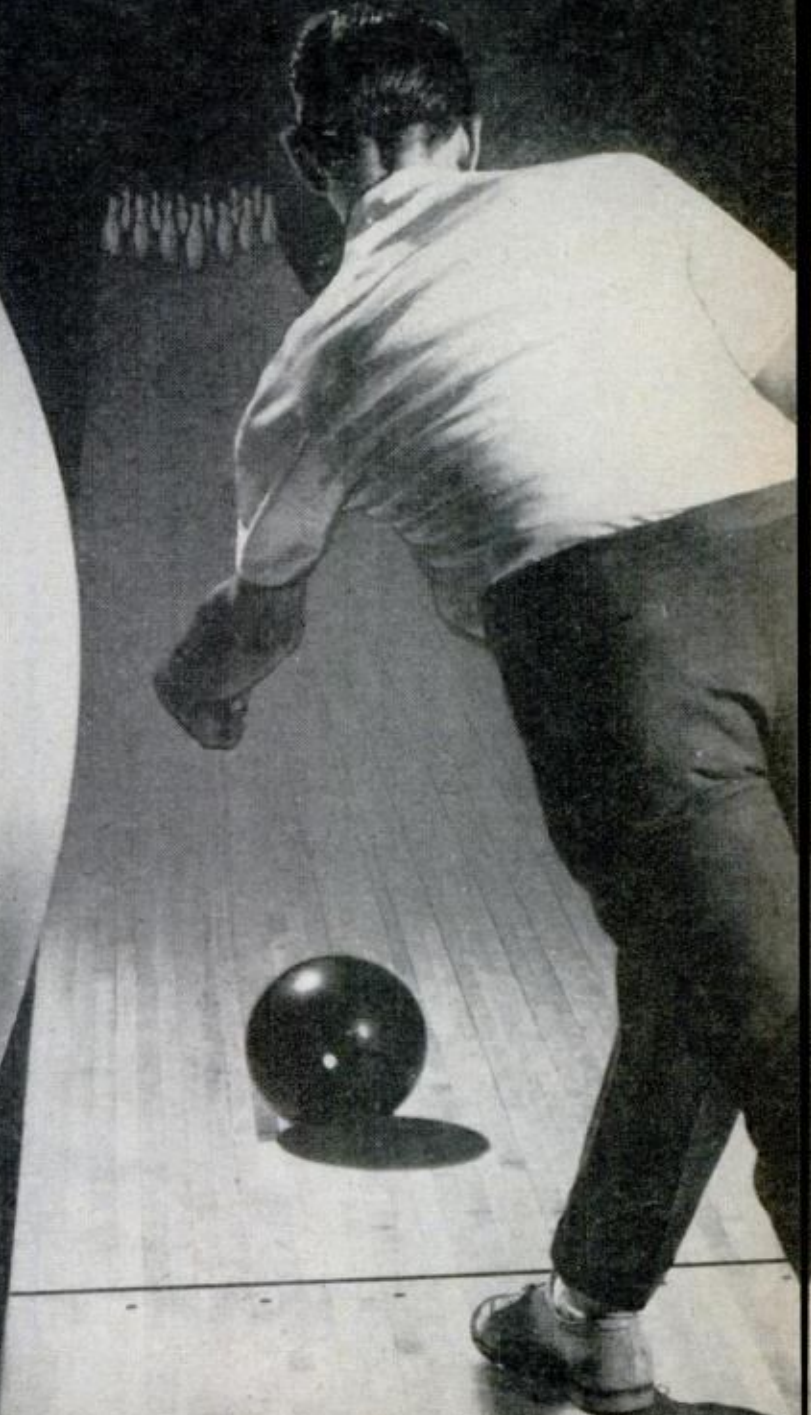
**"B**OWLING EQUIPMENT manufacturers are deliberately ruining the game of bowling. They're building extra bounce into pins to make bad bowlers look good."

This statement was made by Wilson G. Taylor of Los Angeles, head of a group of professional bowlers who have formed the National Committee for Honest Bowling Con-

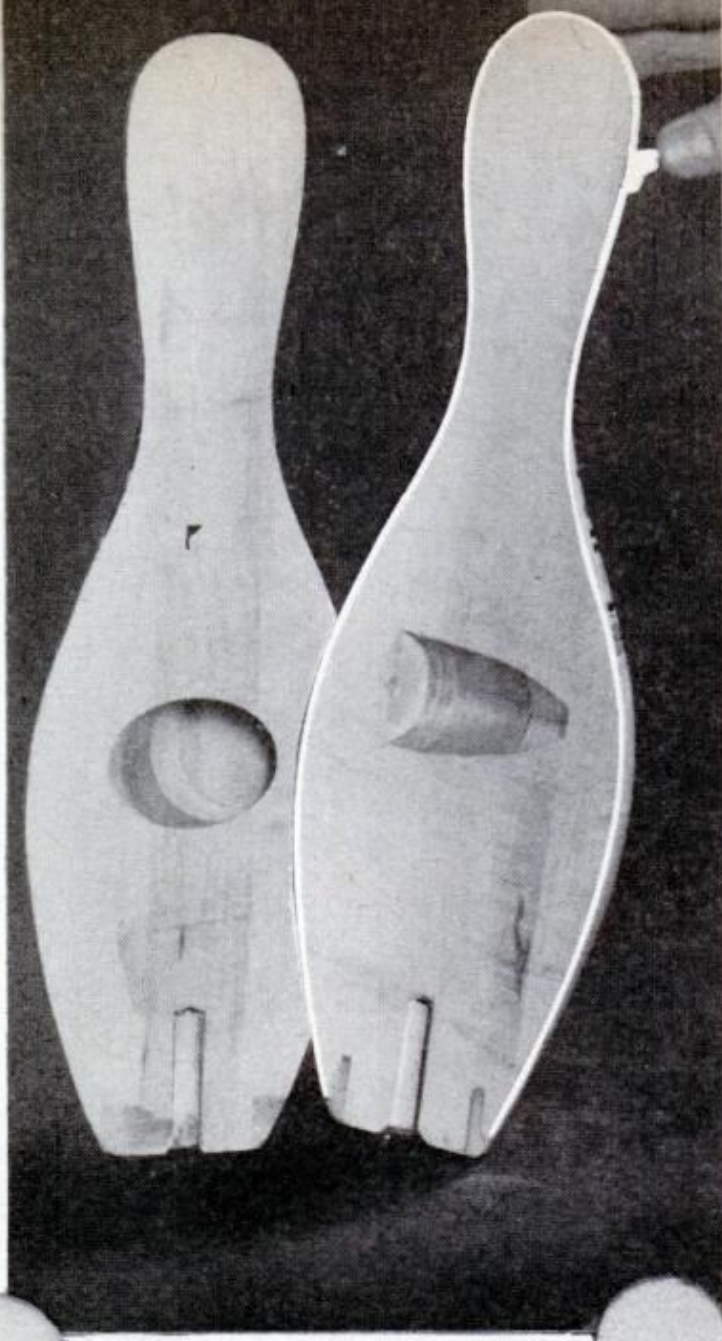
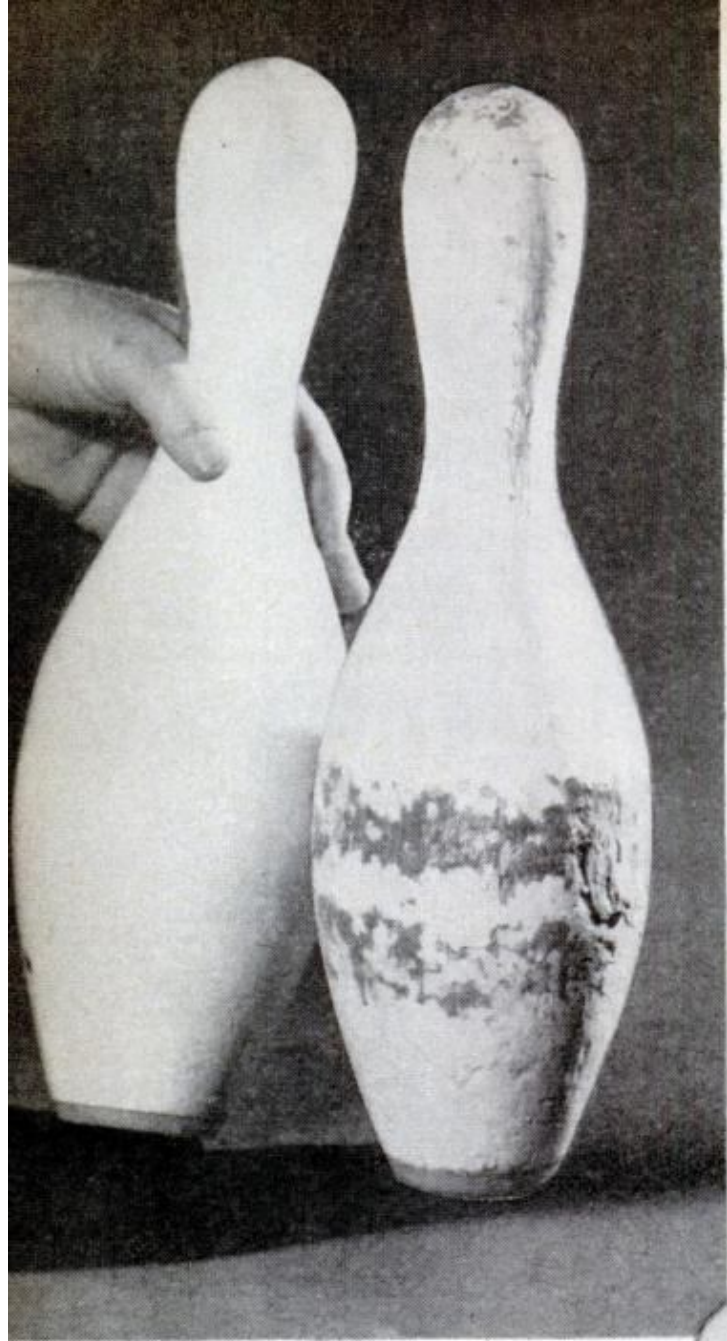


**Is There  
a Rabbit  
in Your  
Bowling  
Pins?**

By Stuart James

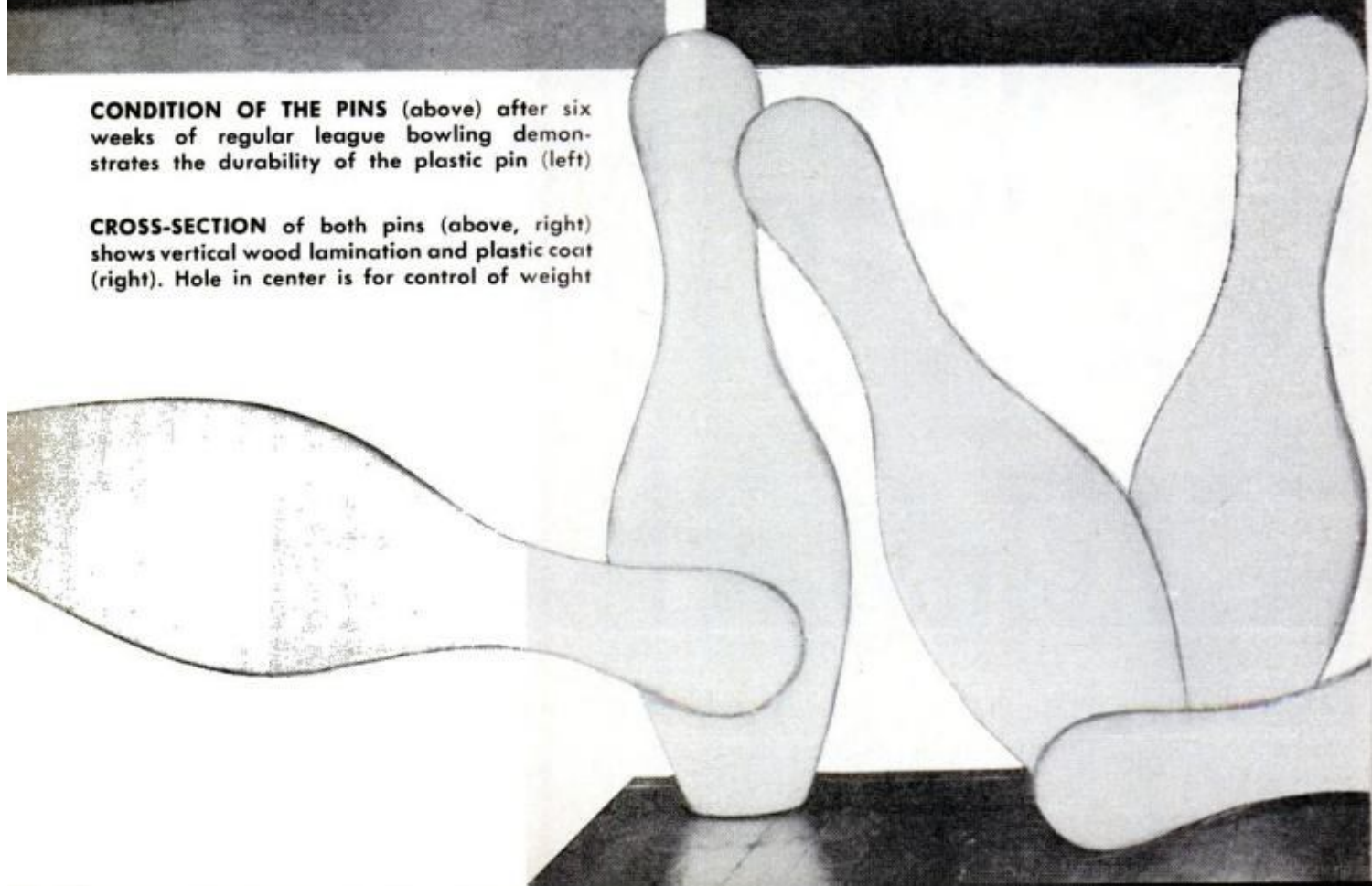






**CONDITION OF THE PINS** (above) after six weeks of regular league bowling demonstrates the durability of the plastic pin (left)

**CROSS-SECTION** of both pins (above, right) shows vertical wood lamination and plastic coat (right). Hole in center is for control of weight





ditions to protest what they say are "super-soft conditions" in bowling alleys.

"This is absolute nonsense," says a spokesman for the Brunswick Corporation, a manufacturer of bowling equipment. "All our pins meet the rigid standards set by the American Bowling Congress."

Like the baseball, the golf ball and the vaulting pole, the bowling pin has become an object of controversy—with dissenters claiming that a "jackrabbit" is being built into pins, and pin makers saying "baloney."

The villain in the piece is a  $\frac{1}{16}$ th-inch sheet of plastic that is coherred to a base of hard rock maple, creating what is known as the plastic-coated pin—an innovation that, in the past five years, has almost replaced the old lacquer-coated wooden pin.

The American Bowling Congress (ABC), regulatory body of the sport, says that changes in the pins have not affected the scoring ability of the individual. "Before we authorized the plastic pin," an ABC spokesman said, "we tested it against wood pins in league bowling. We used about seven thousand bowlers and found that the scores did not vary for either pin."

Some manufacturers do not agree with this, advertising their plastic pins as "livelier for higher scores," and claiming that they "fly briskly about the pin deck."

Paul Northrup, vice-president of Ripley Bowling Pin Co., St. Louis, says, "We try

to make a livelier pin. It's a game and we want everyone to have higher scores."

ABC specifications require a pin to be "made of sound, hard maple. Each pin may be constructed of one piece, or laminated of two or more pieces. All laminations shall run parallel to the vertical axis of the pin and the finished pin shall meet the requirements for balance. Each pin must weigh not less than two pounds, fourteen ounces nor more than three pounds, ten ounces. Moisture content of all tenpins shall not be less than 6 percent nor more than 12 percent."

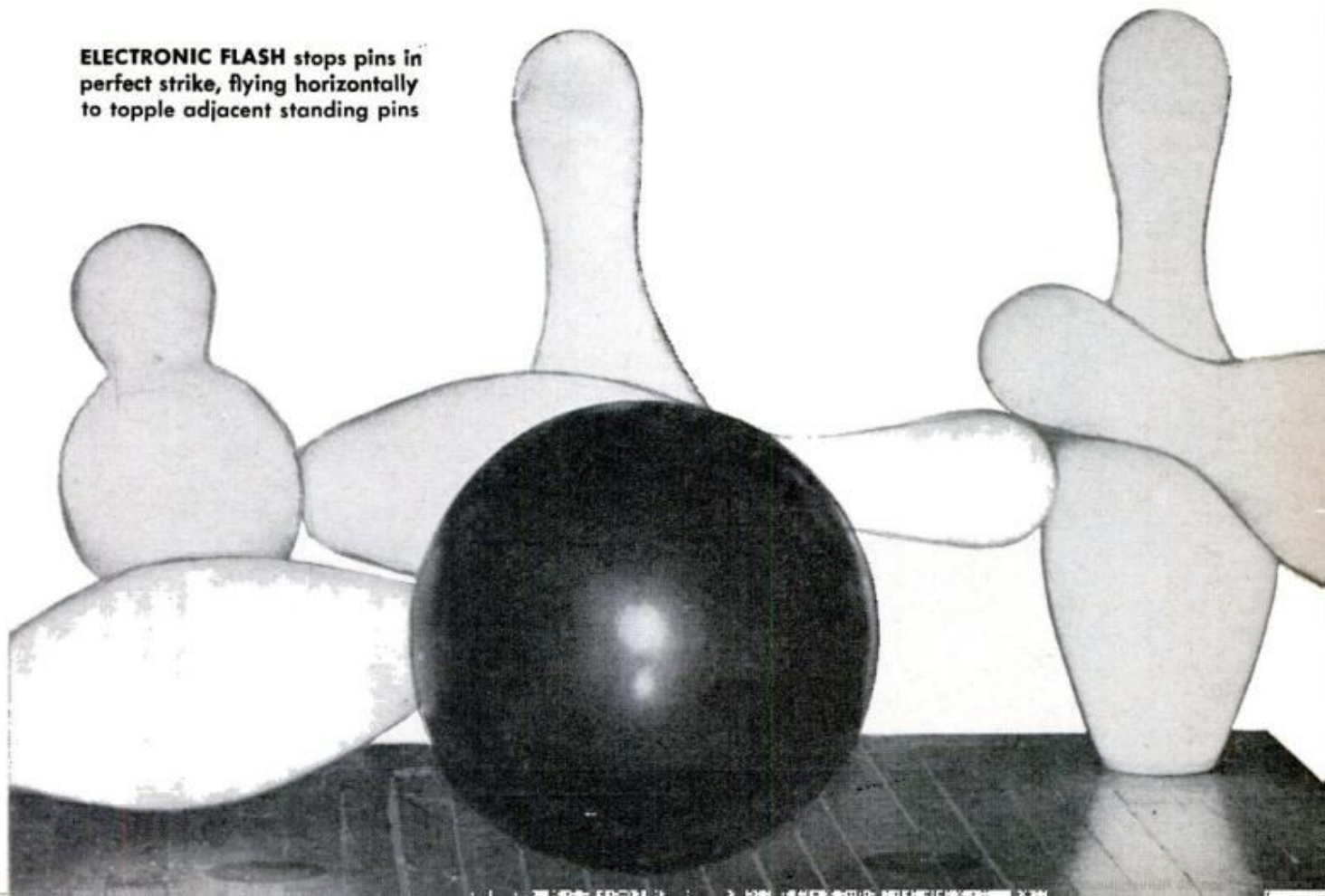
This still leaves some variables. "There is a vast difference in uniformity of woods," Paul Northrup says. "There is also the 6 percent variance in moisture content, and the quality of the wood. All these things can make a difference in the liveliness of the pin."

But what exactly is the difference? In a comparison test sample *PM* attempted to answer a simple question: *Will an average league bowler achieve higher scores with the new plastic pin?*

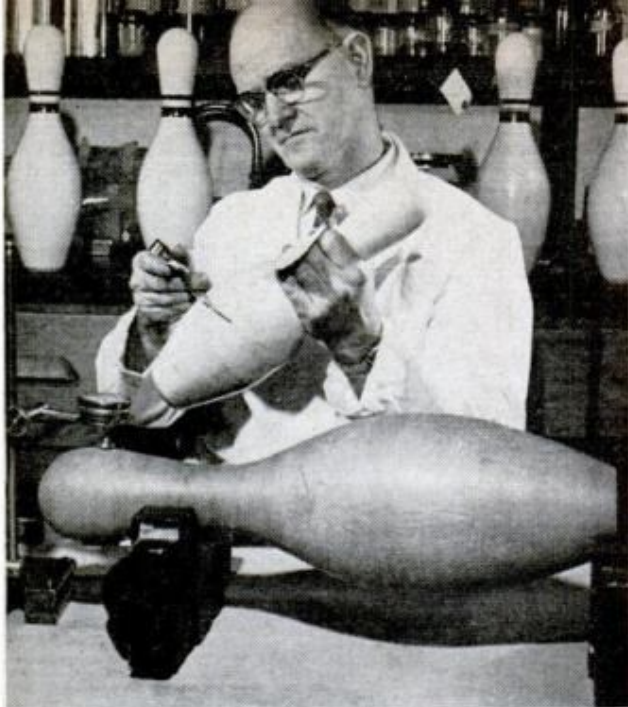
We purchased three sets of plastic-coated pins and lacquer-coated wood pins. The plastic pins weighed an average of 3.5 pounds and the wood pins weighed 3.4 pounds.

With the cooperation of the Mt. Airy Lanes in Mt. Airy, N.J., we selected two

**ELECTRONIC FLASH** stops pins in perfect strike, flying horizontally to topple adjacent standing pins







**EXPERIMENTING** with chemically compounded rubber products, Goodyear Rubber Co. hopes to produce a pin far superior to the current plastic-coated tenpin



**BOWLERS** who conducted the PM test were John Gessner (left), and Francis Dodd. Entirely different in style, both these bowlers have averages in the 180s

league bowlers who have also bowled in ABC competition. John Gessner of Washington Crossing, Pa., maintains an average between 180 and 185. His highest score in 1963 was 258. Francis Dodd of Levittown, Pa. has an average between 185 and 192, and his highest score in 1963 was 230.

Setting the plastic and wood pins in adjacent alleys, the two bowlers rolled against both pins alternately—one ball against plastic, the next against the wood.

The results were surprisingly in favor of the wood pins being livelier than the plastic.

First Game	Wood	Plastic
Gessner	190	159
Dodd	166	163
Second Game		
Gessner	266	167
Dodd	209	168

Total Strikes: Wood, 20; Plastic, 3

At this point both bowlers were tiring, so we stopped the test.

Both sets of pins were then subjected to regular league bowling for six weeks to see if there would be a marked change in the respective scoring after a good pounding. The plastic pins were subjected to 1324 games and the wood pins to 1176 games.

We then repeated the previous test, with both bowlers this time bowling three games. The wooden pins looked weary. They were chipped, beaten and scarred—ready for retirement. Except for discoloring, the plastic pins showed practically no

wear. And here's how they scored:

First Game	Wood	Plastic
Gessner	191	168
Dodd	176	167
Second Game		
Gessner	192	181
Dodd	190	180
Third Game		
Gessner	212	137
Dodd	182	161

Total strikes: Wood, 15; Plastic, 9

In every game the wood pins scored higher than the plastic-coated pins. In the five-game totals for both bowlers the wood pins held a 323 point advantage.

It would seem from these results that not only is there no "jackrabbit" in the plastic pins, but the old-style wooden pins will give better scores consistently.

"Not so!" says Wilson Taylor. "The only way that can happen is by throwing a strong ball on dry lanes."

The lanes we used for the test were not in ABC tournament condition, but we were purposely seeking *average* lane conditions comparable to what the regular league bowler must face each week. Of our two bowlers, John Gessner throws a strong ball, and Francis Dodd rolls an easy, slow ball. It is true that the strong ball scored higher on the wood pins, but both deliveries outscored the plastic.

"You're not taking into consideration the velocity that is built into the plastic pin," says Wilson Taylor. "When the plas-

(Please turn to page 232)



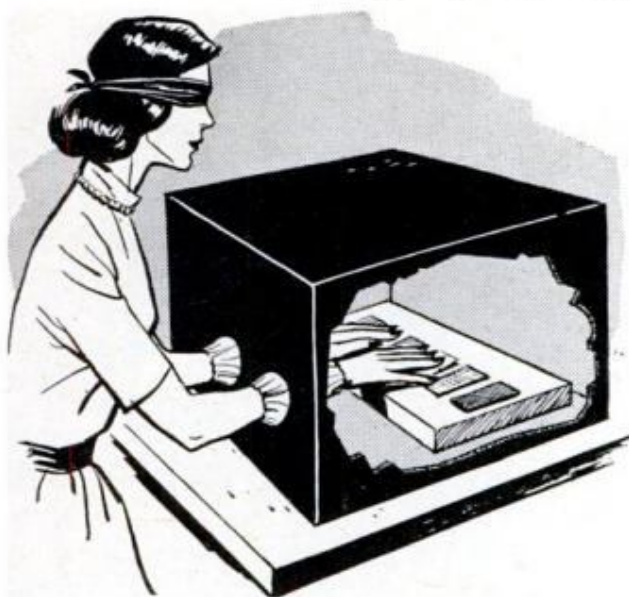


### Tarpon: One-of-a-Kind from American Motors

American Motors' Rambler Tarpon is a styling study for which, the company says, there are no production plans. But its fast back, bulging windshield, or other features could hit the mid-1965 market if the Tarpon is popular on the auto-show circuit.

It's on the American's wheelbase—106 inches long. Over-all length is 180 inches, height only 55½ on 13-inch aluminum wheels. The front end is reminiscent of the 1964 American; the fast back rear end and 'skylight' rear window are all new.

### Midwestern Woman "Sees" Colors Through Her Fingertips



A Flint, Mich., housewife, Mrs. Patricia Stanley, has the perplexing ability to identify colors merely by touching objects with her fingers.

Blindfolded, and with her arms inside a black plywood box (as in the drawing), she can rub-test objects with her fingers for from 30 seconds to three minutes and usually tell what the color is. Experiments to determine the reason for Mrs. Stanley's odd capability are being conducted by Dr. Richard P. Youtz, a Columbia University psychologist.

One group of tests involved 14 pieces of

cloth, two each of red, yellow, green, blue, purple, black and white. The first time she correctly identified 11 of the 14; the next time her score was 13 and the third time 12. The odds against these scores being due to chance are several million to one, says Dr. Youtz.

#### May Be Infrared

How does she do it? Dr. Youtz doesn't know. He speculates that it could be due to infrared heat radiation, which "illuminates" the colors for Mrs. Stanley. Heat does seem to be a factor; when the test objects are cooled to below 75 degrees, her mysterious ability disappears. Also, the successful experiments in her home were conducted in warm weather. Brought to New York in January, Mrs. Stanley was unable to perform as well.

"It could be that she possesses a previously unknown human sense mode," Dr. Youtz told *PM*. The investigation is continuing, both with Mrs. Stanley and with Barnard College women volunteers. Several volunteers show a similar ability, Dr. Youtz said. And, a woman in Russia reportedly can read print through her fingertips.

Perhaps, said Dr. Youtz, certain blind people could be taught to read through the fingers, once the mechanism is understood.



# Plymouth Owners:

**A Nationwide  
Survey Based on  
1,007,737 Owner-  
Driven Miles**

*Marginal and boldface comments by Jim Whipple,  
PM's Automotive Editor*

**T**HE NEW YORK BUTCHER delivers the kindest cut of all. He says, "It handles like a baby." But an accountant, also from New York, complains that "the roof is too low. I have to remove my hat to sit down in it."

Each is referring to his 1964 Plymouth, and the two comments are a fair sample of what owners of this year's Plymouth like and dislike most about their cars.

Actually, the comment which best explains why Chrysler Corporation execs smile so much more than they used to was made by a Pennsylvania service station operator. "I have owned five new Chevrolets, four new Fords and two new Dodges since 1946," he notes. "This is the first car I have ever owned that did not have to be taken back for minor repairs after 5000 miles."

Not all new Plymouth owners are this fortunate, as we shall see later. But enough are pleased to account for some interest-

**HEADING FOR** a narrow, snow-banked driveway can be touchy. Owners of '64 Plymouths put joy of handling at the top of the list of their cars' praiseworthy features





# "Handling Tops Headroom"

ing changes which show up when you compare this report with a *PM* owners' report on the 1962 Plymouth. Then, poor workmanship ranked at the top of the list of complaints. Today, the 1964 Plymouth owners didn't even rank it among their top five complaints.

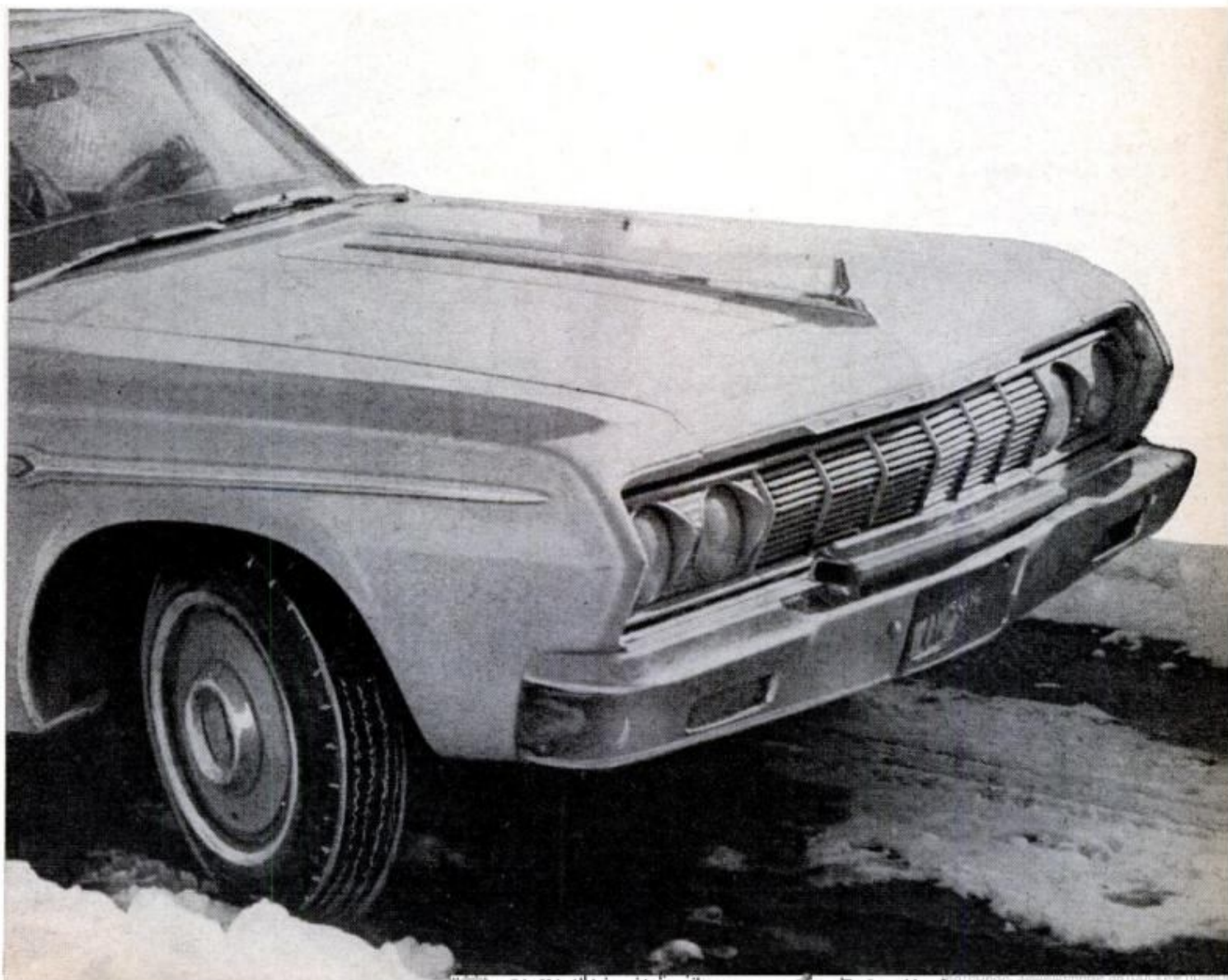
Back in 1962, 85.3 percent of owners responding said they would buy another Plymouth and 5.3 percent said they would not. Today, 88.8 percent would buy Plymouth again and only 3.2 percent said they would not. And the percentage of new owners giving their Plymouths a Poor rating dropped from a modest 3.2 percent in 1962 to a miniscule 0.3 percent in 1964.

To put it another way, Plymouth shares with the 1962 Cadillac we surveyed the distinction of having as the leading mechanical complaint one of its ashtrays.

Fuel mileage, or rather lack of it, did not represent a major problem to Plymouth owners. Some 56.8 percent felt that they were getting about as many miles per gallon as they'd expected, while 28.6 percent maintained that they were doing better. Only 14.6 percent of the owners were disappointed

**Winning a quality control battle like this ← represents a real triumph for a lower priced, mass production car**

**This low poor percentage ← was matched by Volkswagen in *PM*'s September '63 issue, topped only by Volvo's zero rating in September '59**





**Most sixes average between 16 and 22 miles per gallon, V8's between 13 and 18 and are realistic in accepting such mileage for the way they drive their Plymouths** →

**Performance like this will get you around big trailers and back on your own side of the road in good season and that's all that most people want** →

with their '64 Plymouth because of less-than-expected mileage.

To check up on matters of fuel economy PM ran constant-speed checks with fuel meter and electric speedometer. The test car was a two-door Fury hardtop with 318-cubic-inch V8 engine and two-barrel carburetor, standard tune and automatic transmission. Results were as follows:

- 23.41 miles per gallon at 30 m.p.h.
- 22.23 miles per gallon at 40 m.p.h.
- 20.47 miles per gallon at 50 m.p.h.
- 18.12 miles per gallon at 60 m.p.h.
- 15.81 miles per gallon at 70 m.p.h.

Over-all mileage, split about evenly between city streets, turnpikes and winding secondary roads averaged out to 16.9 in cold weather.

Performance of the 230-horsepower V8 proved very satisfactory with the following acceleration times clocked:

- 0-60, 11.3 seconds, 40-60, 6.1 seconds, 50-70, 7.1 seconds, 0 to 80, 22.5 seconds, ¼-mile, 17.5 seconds (75 m.p.h.).

Now let's move into the main body of the report and see how some typical owners feel about their new Plymouths.

## Owners Like

- Quick, easy handling ..... (57.8%)
- Smooth, steady Ride ..... (39.9%)
- Powerful performance ..... (31.0%)

## and Owners Dislike

- Scant headroom ..... (9.6%)
- Wind noise ..... (4.2%)
- Awkward Entry—and Exit ..... (4.2%)

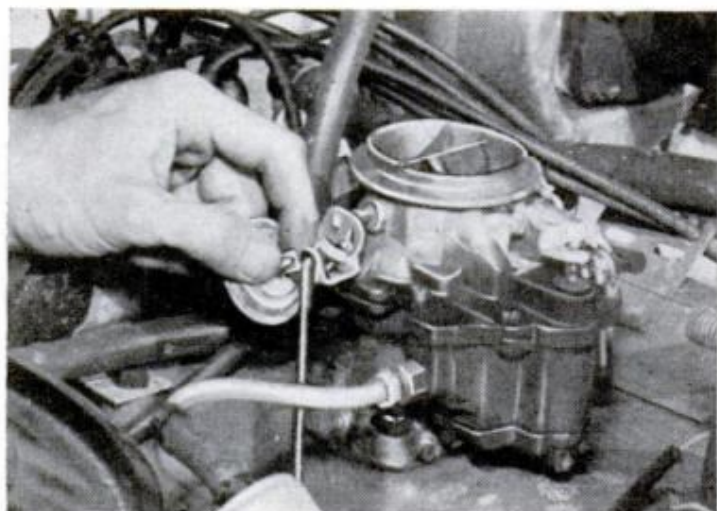
**FORE AND AFT, THE PLYMOUTH'S** trunk space is generous—when measured around the spare. But some owners complained it's too shallow for a big load



**MOUNTING SEAT BELT ANCHORS** on tunnel saves rear seat footroom, but careful foot work is necessary when you leave, in order to avoid the high door sill



**LESS THAN ONE PERCENT** of the owners questioned reported they'd had trouble with Plymouth's automatic choke. Some 2.6 percent had carburetor trouble





Owners found plenty of things to praise. Taking the most popular items first, here are numbers one through five from their list:

"I like the way it drives and handles itself."—Michigan factory worker.

"It handles with ease, especially in traffic, yet it's heavy enough to hold the road well."—Maryland housewife.

"I like the good feel of the road; I know the exact movement of the wheels."—Wisconsin repairman.

"It handles well without power steering."—Ohio toolmaker.

"I like its maneuverability, its unique operation and overall performance."—New York housewife.

"I like the smooth ride over rough places."—Alabama movie projectionist.

"This car is outstanding in driving comfort. The Plymouth is terrific in all phases of car handling."—Tennessee traffic manager.

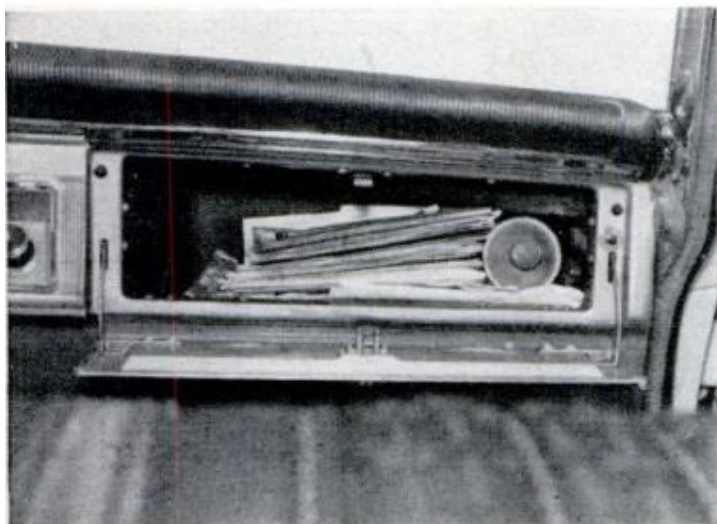
"It's got ample power for safe passing on winding mountain roads."—California engineer.

"It's got the smoothest running engine and responsiveness

What he likes is the precision of Plymouth's steering—it gives you the feeling that you could tie a brush on the front bumper and repaint the white line

There are more comfortable riding cars than Plymouth but they're all longer in wheelbase or more expensive

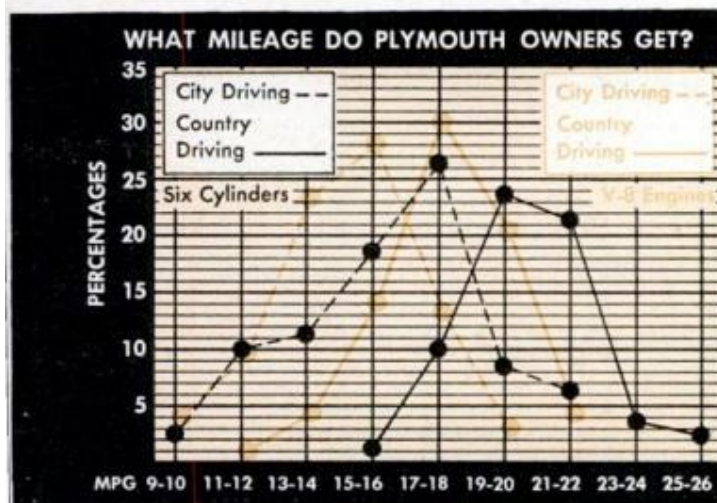
**SOME 2.2 PERCENT OF OWNERS COMPLAINED** about glove compartment but the improvement of this year's box over previous "dumpomatic" versions is immense



**PLYMOUTH SEAT COMFORT**, particularly with buckets, drew praise from the owners PM questioned. But you still have to reach for the transmission buttons



**TOP FUEL MILEAGE**, as you'd expect, comes with the six-cylinder engine on long trips. Only a fourth of the Plymouth buyers reported they owned Sixes





And you can get this power (in the V8) → without buying the premium fuel that you need in some other lower-priced V8s

Driven with a little common sense and → restraint a '64 Plymouth Six will match pennies with some compacts

It's true, tall men must ride bareheaded in → Plymouths as well as in most other American cars. Years ago when Chrysler Corporation President K. T. Keller demanded Plymouths in which he could wear his top hat—the public bought Fords and Chevys

to acceleration of any car I have ever owned in the low price field."—Michigan insurance agent.

"I like the power it has for a 6-cylinder car."—Oklahoma lineman.

"The lines of the car are simple and clean. I've had many compliments from friends."—California planerman.

"A good looking car—in fact, I think it is one of the best looking cars on the road today."—California engineer.

"It has neat, clean lines."—California housewife.

"Economy influenced me."—South Carolina public health worker.

"My Plymouth V8 uses regular gas and is so easy on gas. I just don't understand how this Plymouth can give so much mileage—19 m.p.g."—Pennsylvania printer.

Not everything can be rosy, naturally. Here are numbers one through five of the points about which Plymouth owners complained:

"My specific complaint is lack of headroom and legroom."—Illinois engineer.

"There's not enough headroom getting into and out of the driver's seat (I keep knocking my hat off and am only an average-size guy)."—Pennsylvania personnel manager.

"The wind noise is the only reason my car isn't called 'excellent.' Believe me, it's bad."—Illinois insurance agent.

"There's too much wind noise when riding with the windows open."—Indiana steelworker.

"I do not like the dropped floor because it is hard for me to get in and out of the car. I would like the floor flat and the roof higher."—New York retiree.

"The step down design makes it difficult for a woman to get

(Please turn to page 234)

### SUMMARY OF OWNERS REPORT



<b>Best-liked features</b>	
Handling ease	57.8%
Riding comfort	39.9
Power, performance	31.0
Styling	26.8
Economy	15.3
Visibility	12.5
<b>Specific complaints</b>	
Insufficient head room	9.6
Wind noise	4.2
Difficult entry, exit	4.2
Poor gas mileage	3.8
Windshield wipers	3.5
Badly fitting doors	3.2
<b>Mechanical trouble, if any</b>	
No mechanical trouble	74.1
Carburetor	2.6
Automatic transmission	2.6
Oil leak	2.6
Heater, heater controls	1.6
<b>Best-liked exterior features</b>	
Clean, simple, straight lines	10.5
Roof lines	7.7
Colors	5.8
Front end	4.8
Grille	4.2
<b>Least-liked exterior features</b>	
Rear end	3.2
Grille	2.6
Front end	1.9
No rain gutters for doors	1.9
Shallow trunk	1.6

<b>Best-liked interior features</b>	
Dashboard	22.4%
Upholstery	13.7
Comfortable seats	13.1
Bucket seats	5.8
Heater	4.8
<b>Least-liked interior features</b>	
Ash trays	9.9
Dashboard	5.1
Oil pressure idiot light	3.2
Glove compartment	2.2
Speedometer	2.2
<b>Decision most influenced by:</b>	
Previous Plymouth ownership	33.9
Styling	28.1
Price, trade-in	27.5
50,000-mile/5-year warranty	19.8
<b>Other full-size car considered</b>	
No other considered	47.6
Chevrolet	51.2
Ford	25.6
Dodge	12.2
Chrysler	5.5
Rambler	5.5
<b>Compact car considered, if any:</b>	
None considered	81.8
Valiant	6.3
Corvair, Chevy II, Chevelle	4.8
<b>Fuel economy</b>	
About as expected	55.8
Better than expected	28.5
Not as good	14.6

<b>Is Plymouth family's only car?</b>	
Yes, it is	56.3%
No, it is not	43.7
<b>Make of family's other car</b>	
Another Plymouth	11.8
Valiant	3.5
Other Chrysler Corp. make	6.1
Chevrolet	9.9
Other General Motors make	6.1
Ford	7.3
Other Ford Motor make	1.6
<b>How is dealer service?</b>	
Excellent	64.7
Average	30.1
Poor	5.2
<b>Would you buy from him again?</b>	
Yes, would buy again	77.3
No, wouldn't buy again	7.3
Undecided or no answer	15.4
<b>Make of car traded in</b>	
Plymouth	35.1
Valiant	4.8
Other Chrysler Corp. make	11.1
Chevrolet	8.6
General Motors compact	2.6
Other General Motors make	7.7
Ford	6.7
Other Ford Motor make	3.2
<b>Would you buy another Plymouth?</b>	
Yes, would buy	88.8
No, would not buy	3.2
Undecided or don't know	8.0



# Chevy's Ride Pleases More Than Mileage

A Nationwide  
Survey Based on  
1,214,197 Owner-  
Driven Miles

*Marginal and boldface comments by Jim Whipple,  
PM's Automotive Editor*

**A** SHORT-ORDER COOK from New Jersey sums up what owners of the new Chevrolet like most about it. In his words, "It's a smooth-running, beautiful-riding car."

And a Michigan manufacturer voices the leading complaint owners of big 1964 Chevrolets have to make, in this fashion: "At present, I am not getting as many miles to the gallon as I did on previous models."

This was the third Chevrolet the manufacturer owned, and his reaction indicates what a pleasant problem Chevrolet has on its hands. The car is so habit-forming, it seems, that Chevrolet's major difficulty is in competing with itself—always

**MORE OWNERS DISLIKED** than liked '64 Chevrolet's stamped grille. But riding comfort, handling ease and chrome-free styling delighted a large majority



## Owners Like

Velvety ride ..... (39.7%)  
Quick handling ..... (31.3%)  
Clean styling ..... (30.3%)

## and They Dislike

Low gas mileage ..... (9.1%)  
Poor paint jobs ..... (6.1%)  
Tacky workmanship ... (5.7%)



**Favorable trade-in allowances help to make repeat ownership an easy habit to form** →

trying to meet or top last year's model in quality.

The following comment from an Alabama tire company manager illustrates the point. He says, "I think the riding and driving qualities are much improved over the 1963 model."

Sixty-five percent of all the 1964 Chevrolet owners answering *PM's* survey had owned Chevies before and 44 percent of them listed previous ownership as their major reason for buying the new model.

Or, as a New York salesman put it: "On my 1962 Chevrolet Bel Air, performance was very good at 60,000 miles."

Disappointment with fuel mileage did cloud the picture for 24.6 percent of all owners reporting, though only 9.1 percent of them listed Poor Gas Mileage under specific complaints. To establish a basis of comparison, *PM* checked an Impala sedan with 195 horsepower V8, two-barrel carburetor and Powerglide automatic transmission. Results of constant-speed fuel consumption runs were as follows:

23.26 miles per gallon at 30 m.p.h.

19.60 miles per gallon at 40 m.p.h.

18.46 miles per gallon at 50 m.p.h.

16.47 miles per gallon at 60 m.p.h.

13.28 miles per gallon at 70 m.p.h.

Over-all fuel mileage covering all types of driving during unfavorable cold weather was 16.1 miles per gallon.

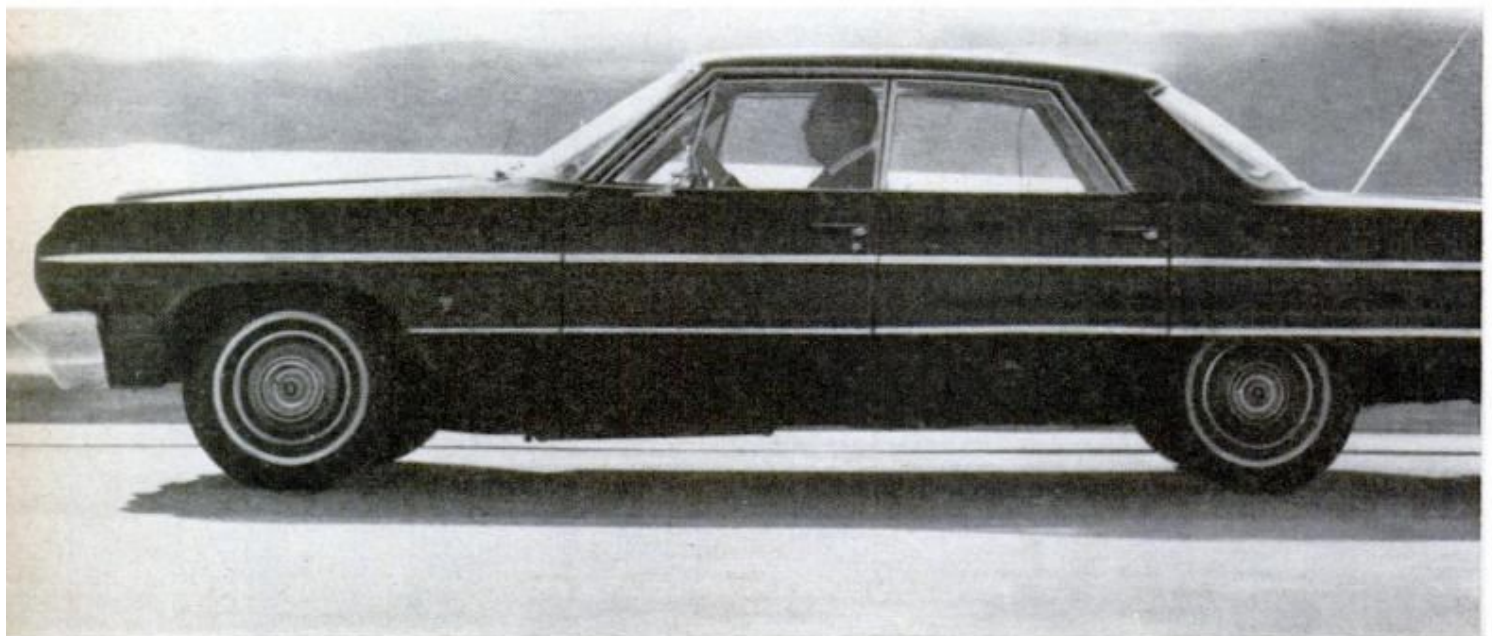
With our electric fifth-wheel speedometer and stopwatch, *PM* found Chevrolet's performance profile to be as follows:

Acceleration from 0 to 60 m.p.h. averaged 12.5 seconds. Passing range acceleration times averaged 6.4 seconds for 40 to 60 miles per hour acceleration, 8.4 seconds from 50 to 70 miles per hour acceleration.

Now let's see what the owners themselves have to say about the 1964 Chevrolet. Here are typical pro and con comments:

*With the most popular listed first, here are numbers one*

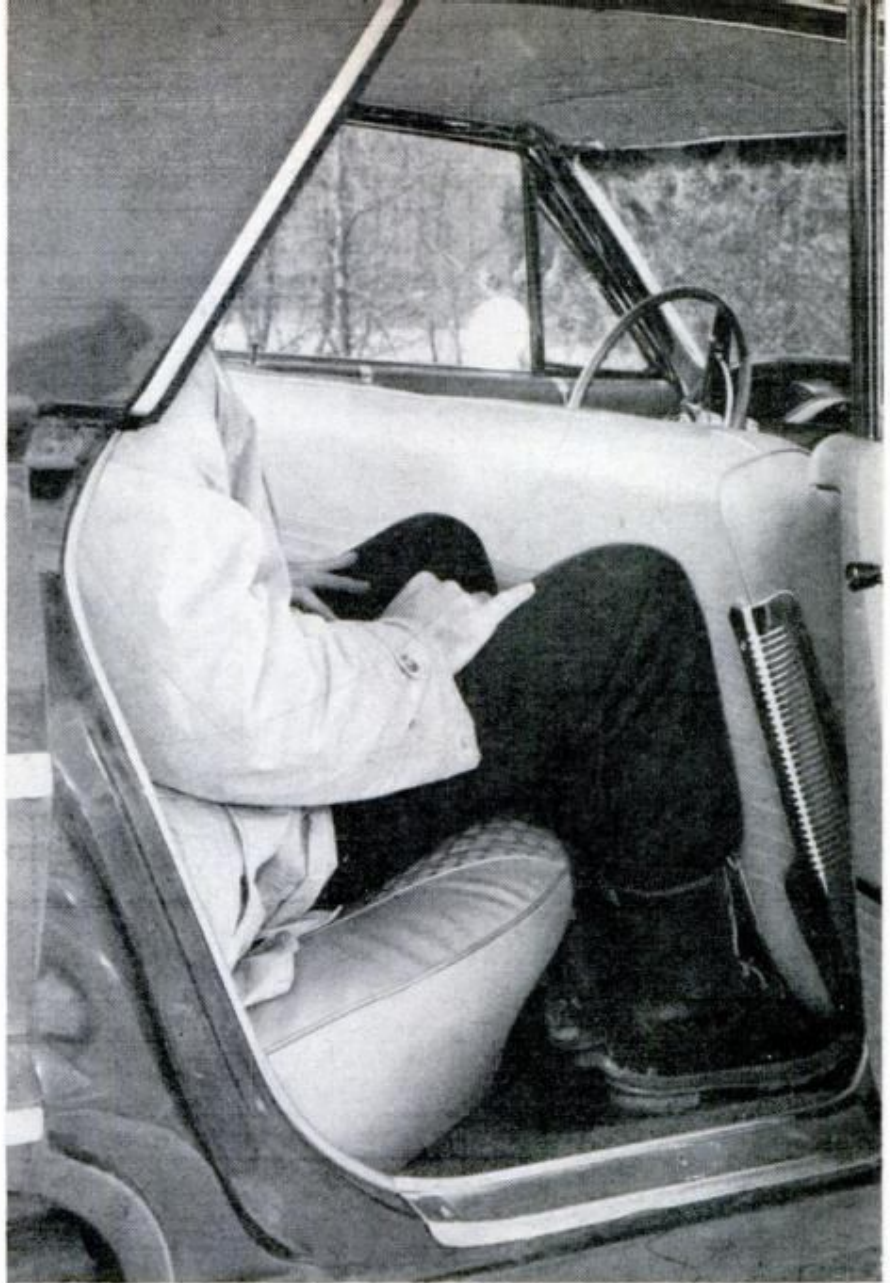
**Considering the heft of the Chevy—3700 lbs. plus—this isn't too bad mileage** →



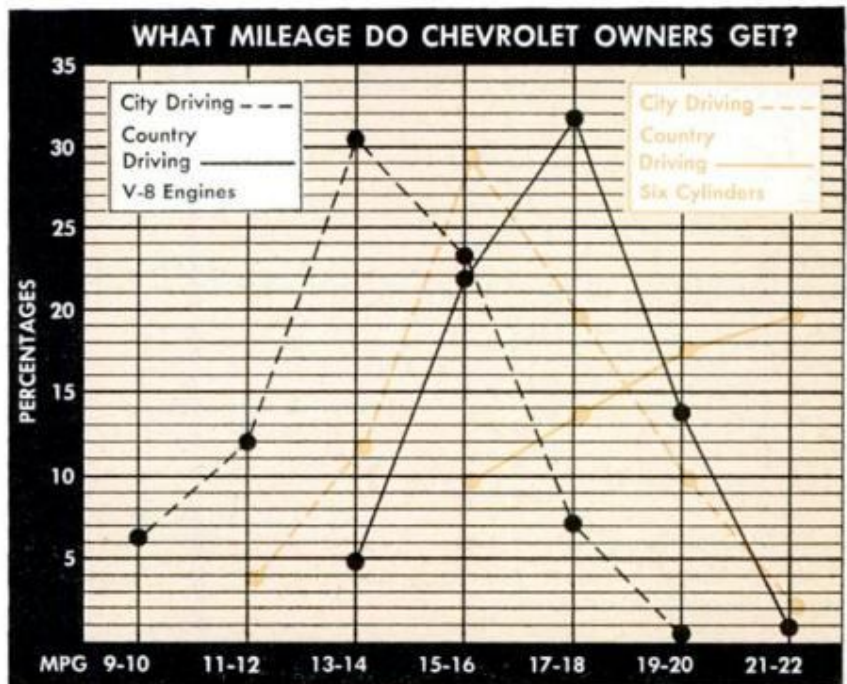
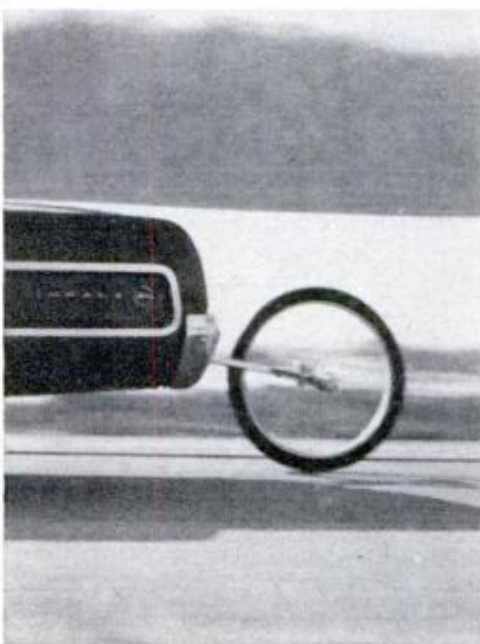


**ONLY 1.7 PERCENT** of owners complained of scant rear seat kneeroom, but an over-six-footer finds that it makes for a snug fit. Headroom drew praise while recessed floor got gripes

**PM'S FIFTH WHEEL** trails behind the test car to give precise reading of speeds, ruling out differences from tire inflation, speedometer error, or wheel slippage. The steady-speed fuel consumption results generally supported figures from owners



**PEAKS IN THIS FUEL-CONSUMPTION GRAPH** SHOW the results reported by most owners driving in the city or on longer trips with either Chevrolet's economy-oriented Six or V8 engine. About 80% bought the V8







**A CUMBERSOME FIFTH WHEEL** and an assortment of camera cases consume little of the available space in Chevrolet's big trunk. Lift height is a modest distance



**PM TESTERS OBSERVED** Chevrolet's rear bumper gives only limited protection to taillights. Rear end styling drew both bouquets and brickbats from owners

**It's all true. The '64 Chevy rides good like a big car should** →

**Someone recently tagged Chevrolet as "the workingman's Cadillac." From a styling standpoint, we'd have to agree** →

**PM testers felt 195-hp. V8 would be very satisfactory for most owners, unless they load heavily or pull trailers.** →

**Is he kidding?** →

**Time has told. If it hasn't improved by 3600 miles (and a tuneup) he'd better trade his V8 for a Six** →

through five of the items Chevrolet owners found to praise:

"The wheelbase length (119 inches) makes comfortable riding."—Pennsylvania retiree.

"I owned a 1963 Chevrolet and the ride was nowhere near this good."—New York standards analyst.

"It's easy riding. I can drive all day without tiring. It has comfortable seats and plenty of headroom."—Kansas shipping manager.

"Easy handling in heavy traffic and good take off power."—California carrier.

"It is nice driving, easy steering, and takes curves beautifully."—Michigan painter.

"Holds the road far better than any other car I have owned."—Wisconsin plant manager.

"I like the sleek, sporty appearance of my Impala convertible."—Louisiana receptionist.

"It's as big and beautiful as the high-priced cars."—Oklahoma farmer.

"Has a plain, good-looking appearance, not messed up with chrome or fins like other cars."—Michigan factory worker.

"It moves out easily; has terrific passing gear."—Utah mechanic.

"I like the response of the 327 engine (250 hp.)."—Minnesota laborer.

"Good passing power."—California painter.

"The most economical car to operate that I know of."—Texas minister.

"It's economical both in repairs and in upkeep."—New York machinist.

*Complaints, too, come from PM's owners. Here, according to the frequency with which they were mentioned, are numbers one through five:*

"Gas mileage on my 1963 Chevrolet was 19 miles to the gallon and the 1964 is only 15 miles to the gallon. Both have the same type of V8 engine."—California trucker.

"The dealer claims gas mileage will increase as time goes on, but at 3600 miles there has been no change. Time will tell."—Massachusetts postal clerk.

"I am disappointed with the gas mileage, but do not think



it fair to rate the mileage this time of year, especially with only 2610 miles on the car.”—Maine banker.

“Paint on right front fender is dingy.”—North Carolina sales manager.

“Very poor paint job on the dashboard.”—Michigan electrical engineer.

“Too many things come loose. You are a month getting everything into working order. Although the car is made well, it still inconveniences you.”—Texas student.

“My specific complaint is a sloppy installation of armrests, and small parts causing squeaks and rattles. Also, the gear-shift could operate easier.”—North Carolina textile foreman.

“Chevrolet’s factory inspection setup should be changed. At present, they must be bribed or blind to pass this poor workmanship.”—Maryland teacher.

“Hard to handle on windy days.”—Michigan factory worker.

“It’s difficult to hold steady at higher speeds on the highway, if there is a strong or gusty wind.”—Mississippi salesman.

“It doesn’t handle as well as my 1958 Chevrolet on the road with a strong wind.”—Wisconsin electrician.

“Not enough insulation around the doors. It gets very cold and windy. After a snowstorm, I found snow had drifted into the car.”—Connecticut businessman.

“One door looks as if it were made for another car.”—Iowa hardware dealer.

Going down the list of owners’ praises, here are, in the order of their frequency—numbers six through ten:

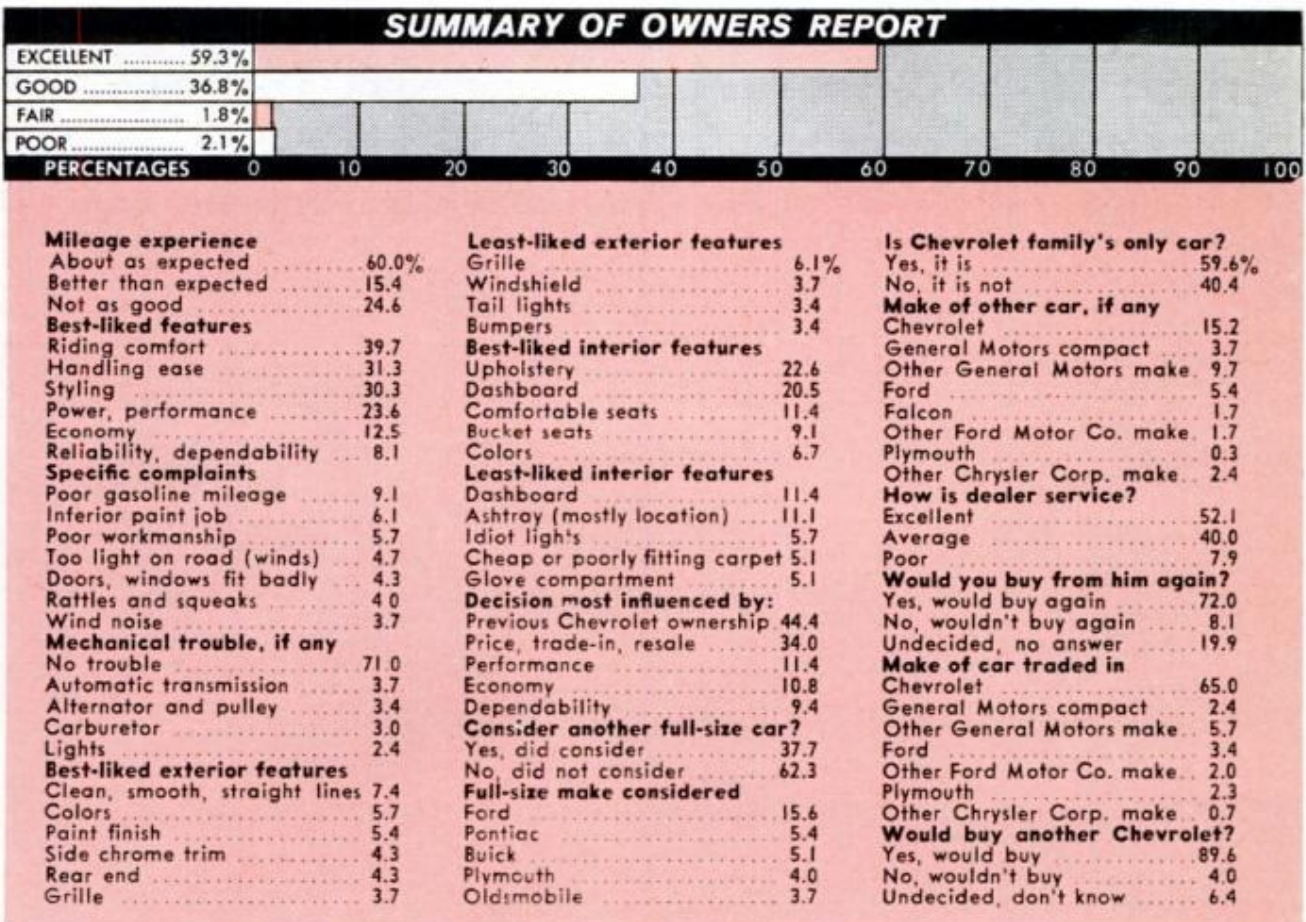
“The car is very dependable as are all other models of Chevrolet I have owned.”—Alabama storekeeper.

(Please turn to page 224)

← These paint job complaints only prove that assembly lines are far from automated—people who hold spray guns are not yet perfect

Blindness and bribery aren’t the problem. There are too many cars and too little time to finish them perfectly

← There was wind whistle around rubber weatherstripping on PM’s test four-door hardtop.







### Lighted Cane for Blind

A blinking red light (inset) identifies the bearer of a new cane as a blind person. The cane also has feelers that ring a bell on contact with objects and a wheel that indicates steepness of steps. The cane is the invention of an Australian.



### New Custom Sport for U.S.

The Gilbern GT, a custom-built British sports car with MG-B components, is to be sold in the U.S. for close to \$4000. With overdrive (optional), a 120-m.p.h. top speed is claimed by the U.S. distributor. The lightweight body is fiberglas.

### Compact "Yacht" Packs Cruising Comfort into 16½ Feet

Offering complete week-end cruising facilities for two adults, a new 16½-foot centerboard sloop weighs only 580 pounds and carries 139 sq. ft. of sail. The use of a foam-filled double bottom makes it possible to locate two 6-foot, 3-inch berths

beneath the cockpit in space normally reserved for flotation (right). Tricorn was designed by Illingworth and Primrose, a British firm well-known in ocean racing circles, and is being marketed by Cruising Dinghies, Box 716, Palo Alto, Calif.







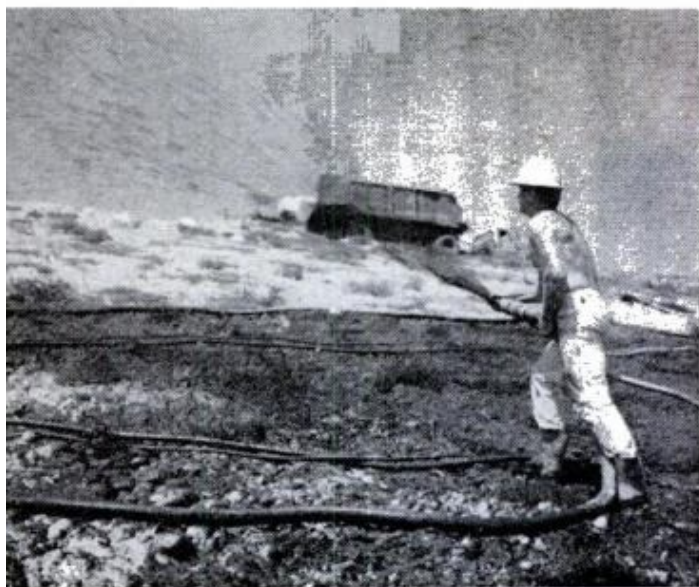
### **Kitchen Sink Turns into a Laundry**

Designed for the compact kitchen, this sink has a false bottom (inset) which, when lifted out, transforms the unit into a washing machine holding six pounds of clothes; the top of the drain-board folds back to reveal a spin dryer.

The Spacequeen is made by Whitewirl Manufacturing, Ltd., Newcastle-upon-Tyne, England.

### **Spray-On Landscaping**

Ordinary seeding methods don't work on the rocky slopes along California's new coastline freeways, so a green-colored solution is sprayed on. It contains grass seed and a soil stabilizer which soaks up rain until the grass begins to take root.



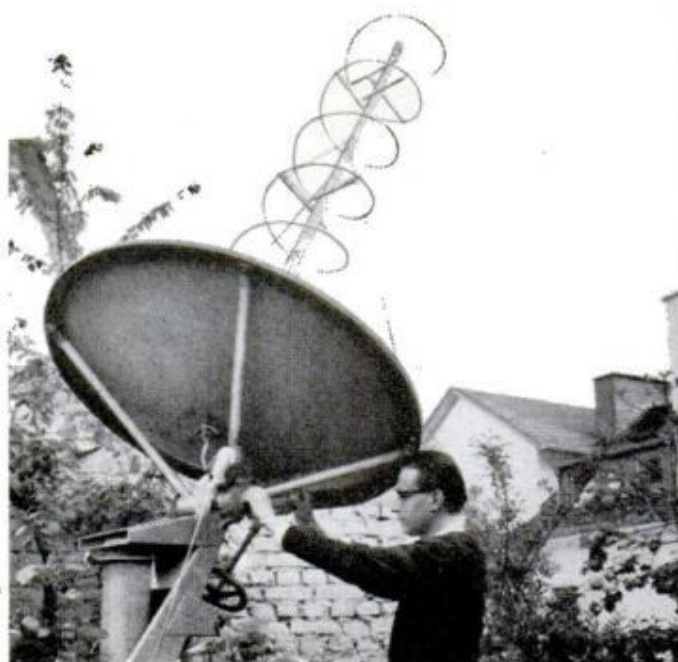
### **Kneeling Trailer**

Easy loading and unloading of a new trailer is gained by a hydraulic system that allows the front end to be lowered to ground level. Doors open at front and rear. The aluminum semi-trailer is produced by Aero-Liner Co., Spokane, Wash.





**ASSORTMENT OF ANTENNAS** atop the attic radio shack pulls in signals from both U.S. and U.S.S.R. space satellites during Oslender's listening sessions

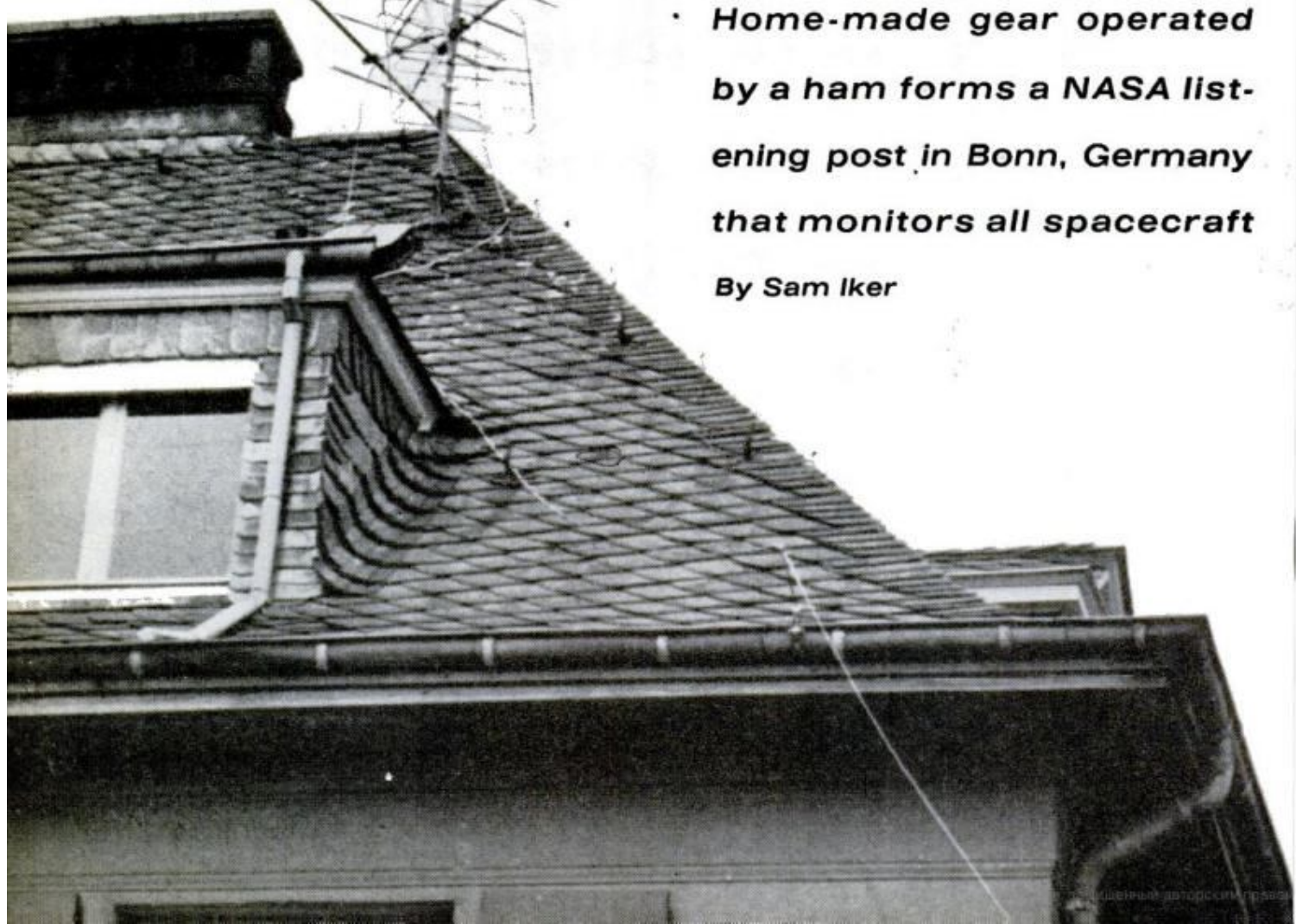


**OSLENDER ADJUSTS THE PARABOLIC REFLECTOR** and helical antenna for receiving transmissions from astronaut Gordon Cooper during his 22-orbit flight

# Satellite

*Home-made gear operated by a ham forms a NASA listening post in Bonn, Germany that monitors all spacecraft*

*By Sam Iker*







**BY PLUGGING IN** a wire, one of the nine remote-controlled antennas is selected. Each one is set for maximum reception on a particular radio frequency



**PLUGGING IN** a finely tuned crystal—the heart of the system—Oslender can grab hold of a weak satellite signal and hang onto it without any drifting

# *Eavesdropper in an Attic*

**W**HILE OTHERS SLEEP, an alert young German sits hunched in a cramped attic room listening to a "space symphony"—the other-worldly music beamed out by a score of artificial satellites—both U.S. and Russian—circling hundreds of miles above earth.

Manfred-Dieter Oslender is one of a new breed of radio "hams." For the past two years, the 29-year-old Bohn space-listener has maintained a nightly vigil, using homemade equipment to pull in several thousand separate transmissions. His attic "shack" is called "Satellit-Ort No. 1"—Germany's number one amateur satellite station.

Since October, 1962 the young amateur has made more than 3600 precise satellite transmission reports to NASA's Goddard Space Flight Center. Hundreds of them involve Soviet satellites and manned flight observations. It adds up to a lot of spare-time listening; Oslender owns and operates a stationery-tobacco shop during the normal working day.

When a major space effort is in the offing, Oslender's schedule can become exhausting. He started preparing for Gordon Cooper's 22-plus orbit in February, 1963.

After getting *Faith Seven's* telemetering

and voice frequencies, the major task was to build an antenna. He scouted around and found a surplus parabolic reflector for \$40. Next he built a helical antenna to mount in the parabolic mirror—an exacting and delicate job. Insulation also had to be perfect. Three times he soaked the wood support in linseed oil so it wouldn't warp. The 10-millimeter-thick aluminum antenna coil was coated with special protective lacquer. High-frequency plastic washers were used to prevent any moisture-formed circuits. He even built an r.f. transformer to match the cable connecting the attic receiver to the antenna. Finally, he built a crystal-stabilized converter calibrated to the right frequency. When the flight began Oslender was ready.

Oslender has been uncannily accurate in predicting Soviet space efforts. "Before Russian shots," he says, "their ground stations become very active—a hint that an attempt is imminent. Then if it succeeds the world hears about it. If it fails it is never announced." He refuses to estimate how many failures there have been.

Oslender got started in satellite listening early; he heard his first satellite in 1957 when the Russians ushered in the space age with Sputnik I.





*Invisible and unpredictable, clear-air turbulence causes violent plane rides and is the latest suspect in unsolved air crashes*

**By Philip C. Geraci**

**T**HE DELTA AIR LINES DC-8 jetliner sliced smoothly through the crisp upper atmosphere. The outside air was blue at 10,000 feet. Not a cloud marred the calm, mid-May air as the captain began his approach 30 miles from Miami International Airport.

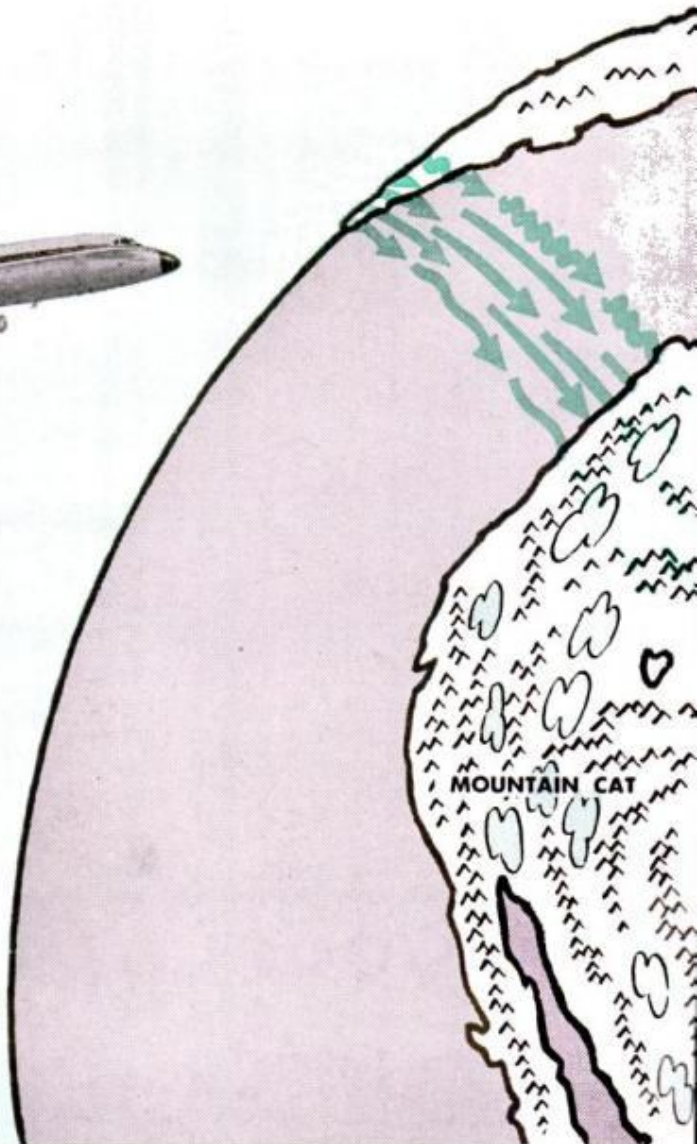
In the forward passenger compartment, Harold Martin, a Miami businessman flying home from a Chicago convention, peered through the Douglas aircraft's wide passenger window at the ground below.

He looked at his watch. Just a few minutes more and he would stroll down the ramp and greet his wife.

Stewardess Jane Foster was making the rounds in the aft compartment, advising passengers that they were nearing Miami.

She checked her watch. The flight was on schedule.

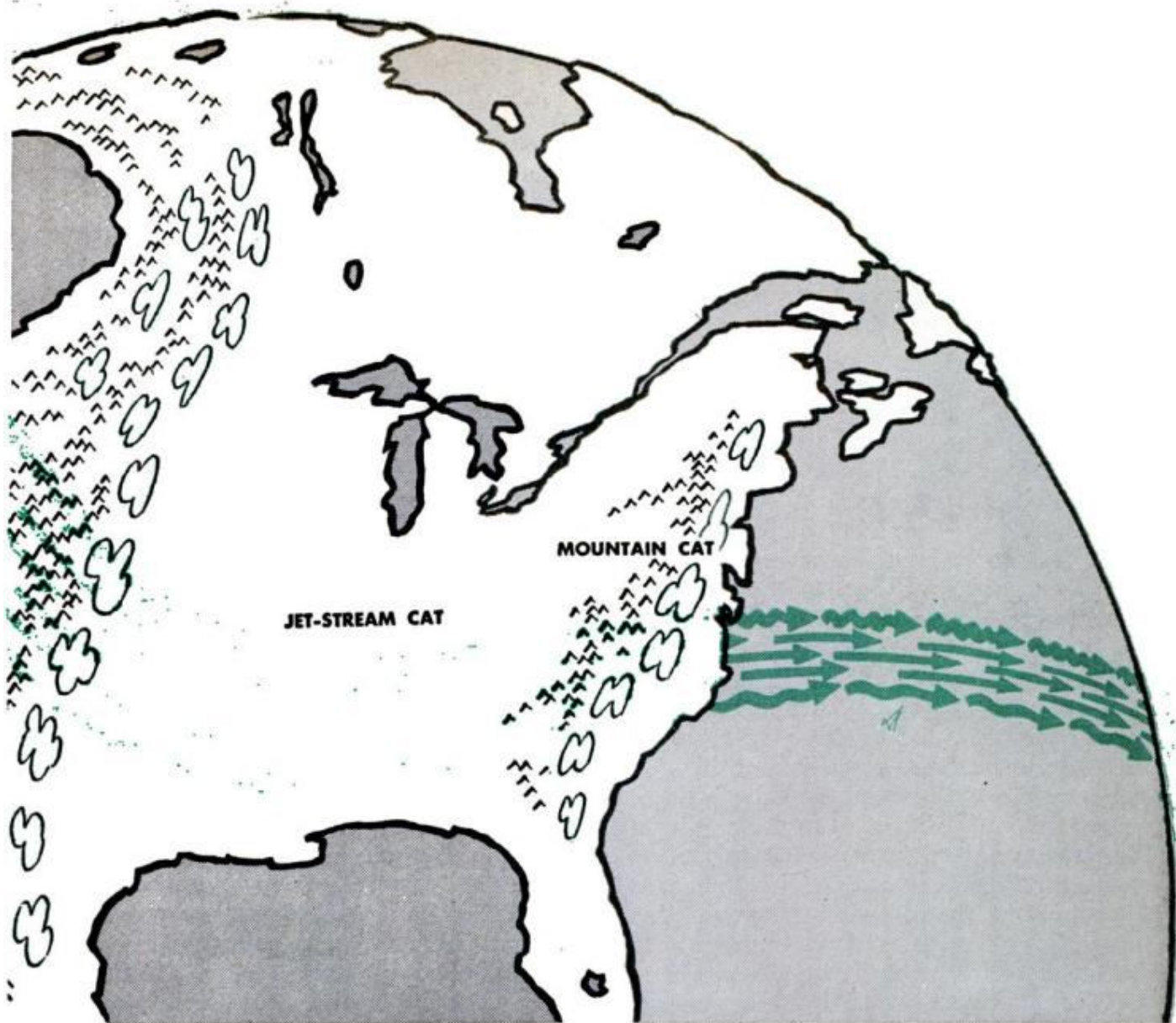
She reached the end of the compartment, turned with practiced poise to speak to passengers on the other side. Suddenly, without warning, the floor dipped violently beneath her feet. Off balance, she fell helpless against the passenger seats. A sharp pain stabbed her side as a rib bent.



**MYSTERY CRASH** at Tell City, Indiana, killed 63 persons in 1960. It may have been triggered by clear-air turbulence (CAT), invisible weather phenomenon







**VISIBLE CLUE** to one form of CAT is long, silky lenticular cloud which forms near mountain crests, indicating violent turbulence nearby. Second form of CAT, associated with upper-air jet stream, is completely invisible to pilots





The passenger compartment became a mass of flying silverware, books, stationery, pillows, garments, small luggage and bewildered passengers.

Up forward Harold Martin lay in the aisle, his bulk pinned to the floor by the combined weight of three other passengers, themselves off balance, who fought desperately to regain their seats.

For several agonizing seconds, he felt resigned to the worst.

Inwardly, Martin was certain that some terrible force had ripped the wings from the 130-ton airliner and was hurling the fuselage at breathtaking speed toward the ground. Pinned to the floor, he could not see that the wings were still in place, that the turbine engines continued to function and that control surfaces were working.

Up forward the pilot was fighting with all his skill to bring the stricken craft back to a normal flight attitude. In reality, things were topsy turvy for only a brief few seconds. After a mighty surge downward, the jetliner's wings once more felt the gentle push of aerodynamic lift. The nose came up, the engines surged and the huge craft sliced through the clear Florida air once more in a level position.

Back in the cabin, anxious passengers disentangled themselves and sought their seats. Fifty-five pairs of eyes turned to the windows and saw everything intact.

What had happened? The question was on everyone's lips. But the stewardesses

were too busy to answer, even had they known. Eleven of the 48 passengers were injured.

What powerful hand had plucked a high-flying jetliner from a perfectly clear sky to hurl it with threatening violence toward the earth below?

Delta's was not the first jet flight to encounter mysterious turbulence where none was expected. A United Air Lines DC-8 out of Chicago, soaring high over the Sierra Madre mountains on a cloudless flight to Los Angeles, had fallen agonizingly for several, painful seconds. When the aircraft finally leveled off, a stewardess had suffered an injured back, while passengers counted bruises and some fractures.

Actually, the commercial airlines had received a small taste of an unseen force that has tossed military jets about the upper atmosphere for more than a decade. In South America, jet bombers crossing the Andes have had seats shaken loose from their moorings by the turbulent air. Aircraft rivets have popped like firecrackers in the grip of this phenomenon.

The maddening thing is that it can't be seen. Ideal flying weather—clear skies, cool climate, gentle surface winds—may mask the culprit, luring flyers into its grasp. Nor can radar detect its presence.

Weather forecasters call this invisible menace clear-air turbulence, "CAT" for short. Though every other condition of weather can be shown on a meteorological

**JET-STREAM CAT** occurs near edges of this river of wind. Difference in speeds produces "washboard" effect, so pilots enter stream from its underside

**MOUNTAIN CAT** occurs above crest of north-south ranges. West-east winds soar upward over the crest, battering winds above them, producing turbulence

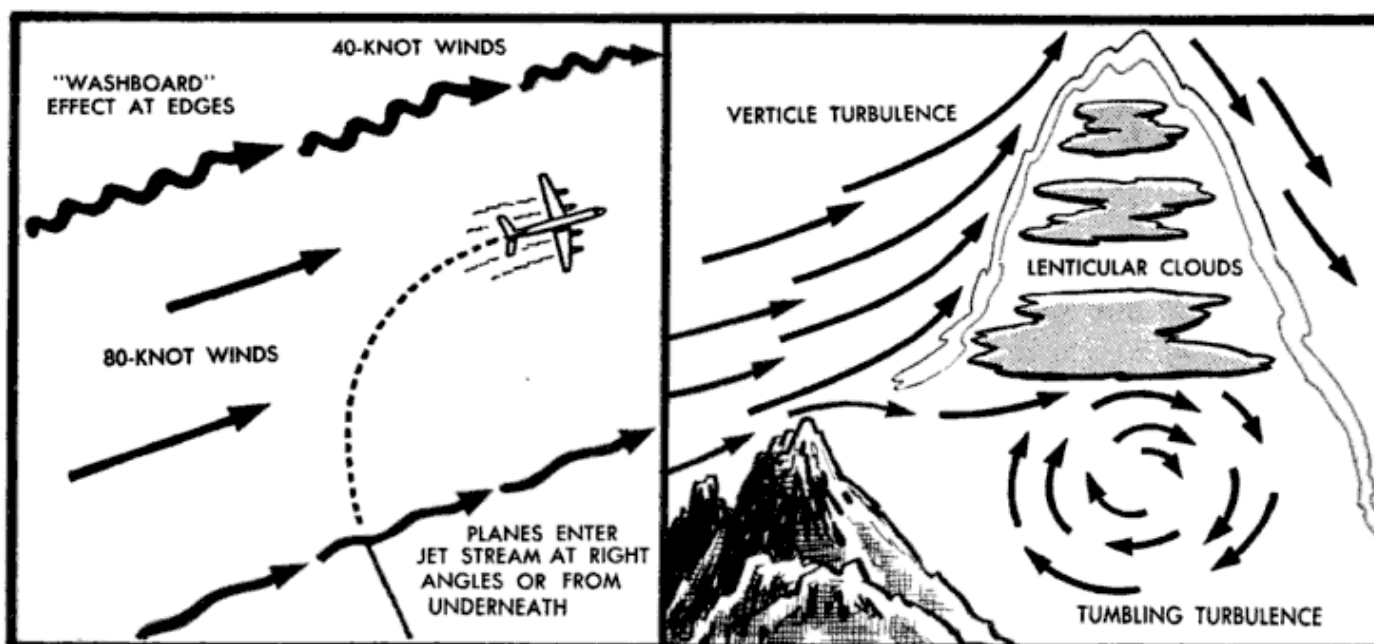




chart by symbol, no such identification is accorded clear-air turbulence. Instead, the words—usually abbreviated CLR AIR TBL—are scrawled across the map.

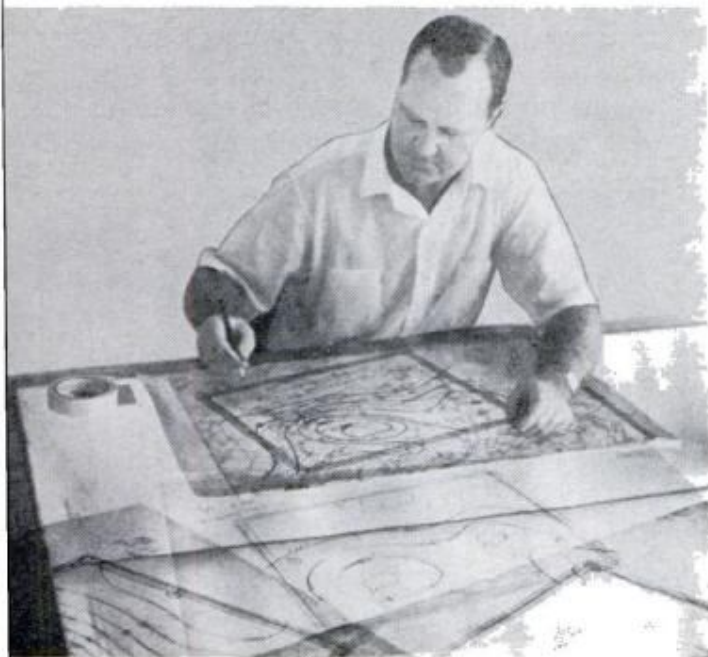
But CAT doesn't always appear where indicated. Four aircraft, traversing a zone where clear-air turbulence is forecast, may slip through unhindered. A fifth may encounter air so rough it can flip a 244-ton B-52 over on its back.

This inconsistency still baffles the experts. But they feel they are doing their best by indicating the potential presence of the elusive force.

At the Weather Bureau's sprawling headquarters in northwest Washington, D. C., analysts explain that clear-air turbulence falls into two categories. The most dangerous and unpredictable hugs the extreme northern rim of the transcontinental jet stream, a zone of rapid, high-pressure wind that snakes its way from Siberia across the northern Pacific, dips low across the central plains states, then angles upward to cross the Atlantic near Iceland.

Weathermen explain the cause of turbulence this way. In the core of the jet stream are winds which may reach a velocity as high as 80 knots. But calmer air surrounding them may be moving as slowly as 40 knots. As the fast wind slides past the slower current, the two forces conflict, setting up a turbulent, "washboard" condition. It is this "wind shear" which triggers the treacherous turbulence.

**WEATHER ANALYSTS** are seeking new ways to predict clear-air turbulence by tracking unpredictable jet stream and pinning down haunts of mountain CAT



APRIL 1964

Since the jet stream is relatively narrow, with a width of as little as 100 miles (and only a mile or two thick) the wind velocity may more than double. Its existence is marked by undulating lines on weather maps which spell out wind velocities across the globe. When the lines are widely spaced, winds are normal. When they squeeze together—as they do around the jet stream—they pose a stark warning to jet pilots.

This is the type of clear-air turbulence that sent the Delta and United jetliners hurtling toward the earth. It so badly battered the wings of a Northeast Airlines Electra over Tell City, Indiana in October, 1959, that it set up mechanical stresses which ripped the wings from the fuselage and dashed the passenger tube against the Indiana countryside, burying all on board. Although other mechanical factors were involved in the Tell City accident, many investigators feel that, had the weather been calm, the airplane never would have crashed.

### More Predictable Type

The second type of clear-air turbulence is more predictable. It follows, roughly, the curving tops of mountains. Winds blowing eastward across a mountain range soar heavenward to clear the crest. In rising, they batter slower-moving winds above them and squeeze the entire air mass above the ridge into an inverted funnel. Past the crest, they surge downward onto the valley below, pummeling calm winds on the lee side and stirring them into a twisting mass. The result is a weird "crook" in the winds at higher altitude, and a treacherous tumbling just past the mountain where the free-running winds must "jump" the roll below.

This type of turbulence often advertises its presence with a long, thin, cylindrical cloud roll which forms just past the crest. This "lenticular" cloud may extend for many miles along the mountain top, up to 70,000 feet or higher, well above the top altitude of commercial jets.

Flyers have known for years that such a cloud formation spells trouble. Airlines plan cross-country routes to avoid areas noted for recurrent mountain waves. The region south of Denver, for example, is often hazardous. So is the air above the Sierras when the prevailing westerlies exceed a critical velocity.

[\(Please turn to page 204\)](#)

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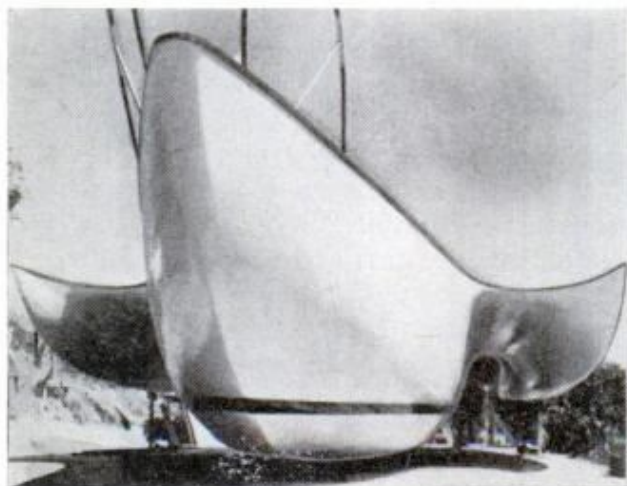
### Wide Tread for Lawn

Wide tires on the rear wheels of a new yard tractor provide good traction yet, according to the manufacturer, exert so little ground pressure that they will not mark even tender, wet grass.

The six-horsepower Broadmoor model is made by Simplicity Manufacturing Co., Port Washington, Wis. It has several attachments for lawn care and snow removal.

### Sea-Taming Trimaran

The secret of the easy sea motion of a new 48-foot trimaran is in the twin venturi tunnels between the main hull and the stabilizing hulls. According to designer-builder Dean Kennedy, San Diego, these enable *Ta'Aros* to convert lateral sea motion to directional, thus relieving drag.



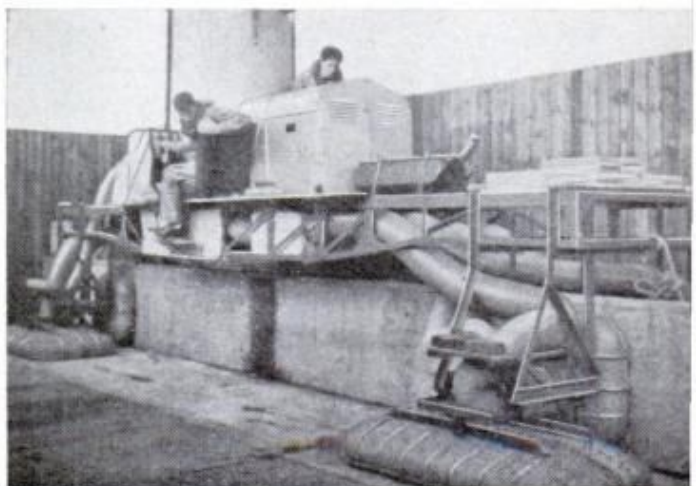
### Peg-Leg Parakeet

Crippled in a fight with another bird, a budgerigar in England was equipped with a wooden leg. Fashioned from a piece of pencil wood by the bird's owner, Robert Kelley, the artificial limb is securely attached by a winding of thread.

Named Joey, the peg-leg budgie has completely adapted to its condition, and can perch in the most awkward places.

### Shades of Casey Jones

It's a train—an experimental one, that is—which glides on air cushions over a single concrete rail. The compressed-air chambers hold the craft slightly off the horizontal and vertical sections of the rail. The train's British designers estimate a speed capability of 200 m.p.h.







### Lifeboat—Medium Rare

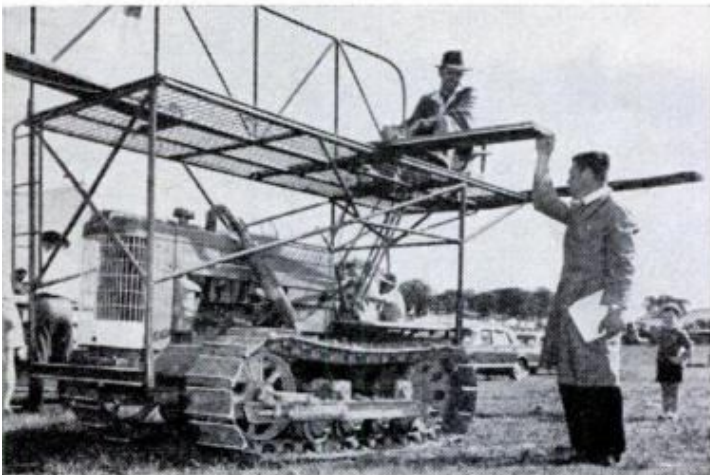
A lifeboat designed to save crewmen from blazing fuel tankers has been successfully tested by British Aeroplane Plastics Ltd., in Bristol, England.

Made of steel sheathed with resinated asbestos, it was drenched in 6000 gallons of kerosene and ignited (arrow, right). Two mice (below, right) inside survived despite temperatures of 1000 degrees C.



### In High Gear, Too?

Replacing methods of pruning trees from step ladders, an Australian farmer built a pruning platform atop his tractor to make the job easier and give him greater mobility. Tractor controls were lengthened to operate from the platform, which has planks extended to reach difficult areas.





They're Digging Up

# Bible Stories

Are these stories based on fact or legend? Here's what the archeologists are discovering in Palestinian ruins

By Stuart James

"**JOSHUA FIT DE BATTLE OF JERICHO,**" says the old Negro spiritual, "and de walls come tumbling down." Commanded by the Lord to cross over the River Jordan and take by force the land God promised to the children of Israel, the Bible relates, Joshua gathered an army of





"And Abimelech fought against the city all that day; and he took the city, and slew the people that was therein, and beat down the city, and sowed it with salt."

— Judges 9:45



**RUINS** of the East Gate of Shechem, right, are mute testimony to violence that raged under its towering walls. Artist's reconstruction shows army of Abimelech storming the city to put down an armed rebellion





"So Joshua made a covenant (treaty) with the people that day... and he took a great stone and set it up there under the oak in the sanctuary of the Lord. And he said to all the people, 'Behold this stone shall be a witness'..."  
 — Joshua 24:25-27



**EXCAVATED** by the Drew-McCormick expedition, the sacred stone erected by Joshua in the "Temple of the Covenant God," supports the Biblical account in Judges 9:46 and is a dramatically important modern archeological discovery

40,000 men and laid siege to the city of Jericho for six days. On the seventh day, he attacked.

*"When the people heard the sound of the trumpet, and the people shouted with a great shout, that the wall fell down flat, so that people went straight up before him, and they took the city."*—Joshua 6:20

This is an interesting and exciting story, but it is not true, modern archeologists maintain.

Joshua could not have fought at Jericho, they say, because at the time Joshua lived, the city of Jericho was an ancient ruin.

This revelation is just a small part of the new light being thrown on Biblical history by modern archeologists who are now unearthing the ancient sites of the Holy Land in Palestine.

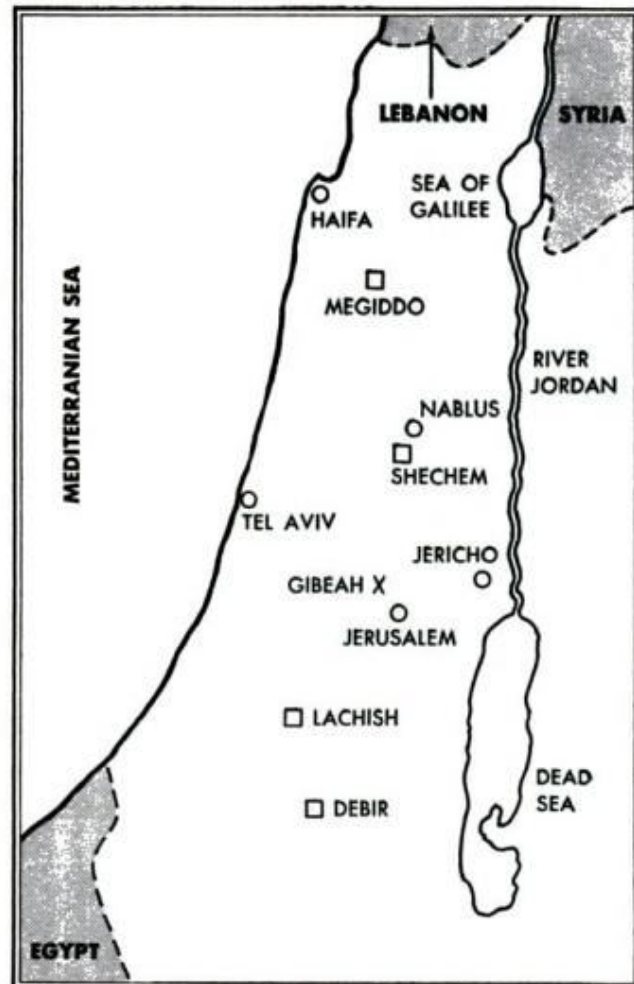
"In this country," one archeologist said, "you work with a trowel in one hand and a Bible in the other."

Considering the discrepancies that the diggers have unearthed—such as Joshua and the city of Jericho—it would seem that the Bible would lose its validity.

"Quite the contrary," says Dr. G. Ernest Wright, curator of the Harvard University Semitic Museum.

"By placing the Bible in its environment we are assembling facts to support

**COVETED AREA** of the Fertile Crescent, where Palestine saw the beginnings of modern history and the three great religions, Judaism, Islam and Christianity







**DIGGING** into the past, archeologists uncover fragments of the burial jar of an Israelite child, a somber documentary of everyday life in early Palestine

its validity as an historical document.”

Things like the Joshua enigma are being explained. Through modern trenching methods that reveal successive layers of rubble, the archeologists are able to apply pottery dating methods that pin down the times of destruction and rebuilding. Comparing times of widespread destruction against Biblical accounts of conquest, it becomes apparent that the stories of Joshua leading the Israelites in battle—far from being false—are factual. The knowledge that Biblical historians erred in the account concerning Jericho simply leads archeologists in a deeper search for the truth, resulting in a chronology that brings together Biblical tradition and fact.

Leading a team of archeologists from Harvard University, McCormick Seminary and Drew University, Dr. Wright has spent the past six years excavating Shechem, a city that faced the mouth of the Nablus pass between Mt. Ebal and Mt. Gerazim, 30 miles northwest of the Dead Sea. A major point on the caravan route from Egypt to the north, this was a flourishing trade center at the time of the patriarchal migrations.

Uncovering a religious temple area, and carefully dating each strata through potsherds and coins found in the rubble, the archeologists were able to establish that



**CLUES TO VIOLENCE**, a skull and bone fragments found outside Shechem are identified as remains of an Egyptian soldier from an invasion of 1550 B.C.

an open-air shrine within a large courtyard was used by pilgrims in 1800-1700 B.C., thus placing the time of Abraham's arrival. Or, as the Bible states it:

*“And Abraham passed through the land unto the place of Shechem, unto the plain of Moreh. And the Canaanite was in the land. And the Lord appeared unto Abraham, and said, Unto thy seed will I give this land: and there he builded an altar unto the Lord, who appeared unto him.”*

—Genesis 12:6,7

### Treaty by Covenant

“A baffling thing about Shechem,” says Dr. Wright, “is that it was never destroyed during the times of the Israelite conquests. Jacob made a covenant (treaty) with the inhabitants, and Joshua used it as the site of the covenant which brought Israel's twelve-tribe league into being in the Promised Land. It was a heavily fortified city that had seen much warfare, and there is no explanation for a peaceful surrender to the Israelites.”

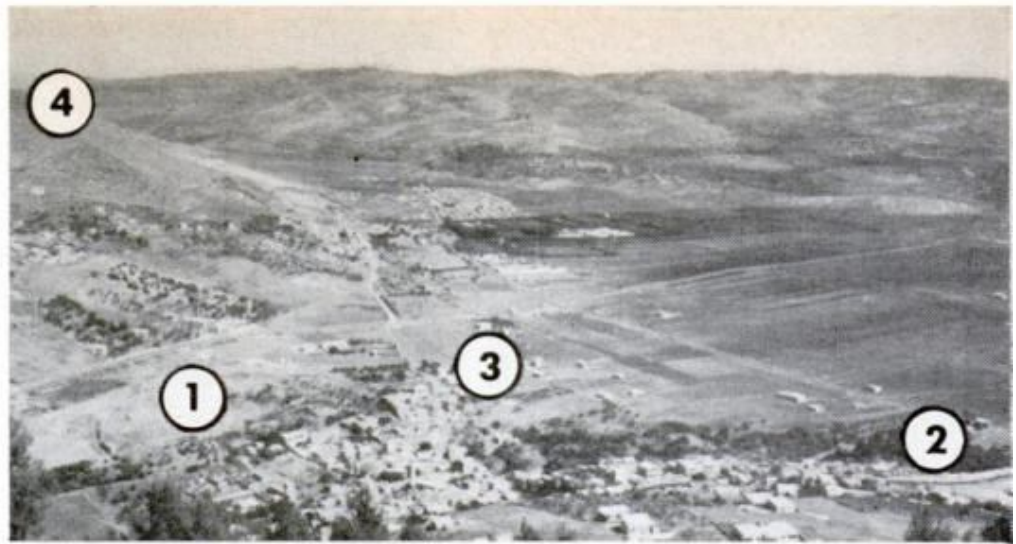
One of the most exciting discoveries by Dr. Wright's expedition in the Shechem excavations was a giant stone that was quickly identified in biblical accounts.

*“So Joshua made a covenant with the people that day, and set them a statue and an ordinance in Shechem. And Joshua*

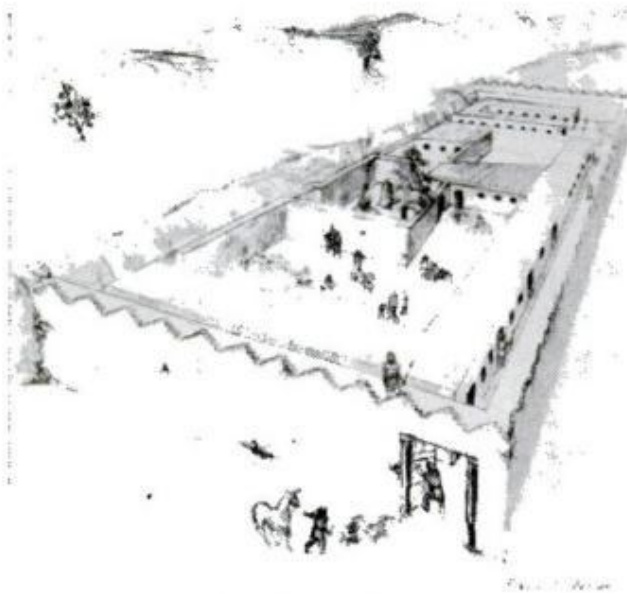


"And the bones of Joseph, which the children of Israel brought up out of Egypt, buried they in Shechem, in a parcel of ground bought of the sons of Hamor the father of Shechem for a hundred pieces of silver."

— Joshua 24:32



NEAR THE MODERN CITY of Nablus, the ruins of Shechem (1) lie below sacred Mt. Ebal (4), adjacent to the Tomb of Joseph (3), and the Well of Jacob (2), where Jesus met Samaritan woman as described in Book of John



**DRAWING** from archeological data, an artist produced this reconstruction of the sacred area of Shechem as it probably looked during time of Joshua



**ACTUAL RUINS** of the "Temple of the Covenant God," unearthed by Drew-McCormick diggers, shows complex of rooms and the open courtyard for worship

wrote these words in the book of the law of God, and took a great stone, and set it up there under an oak, that was by the sanctuary of the Lord."—Joshua 24:25.26

Today, the same sacred stone has been restored over Shechem's temple area.

To further authenticate the story of Joshua, Dr. Wright cites the excavation of the ancient city of Hazor, which lies north of the Sea of Galilee. An expedition headed by Yigael Yadin, an Israeli general-turned-archeologist, found a city fitting Hazor's description to the inch—a place that at one time boasted a population of about 40,000. Diggers brought up pottery and coins indicating a thriving trade with all the Mediterranean powers, including Greece. At about 1200 B.C., the city

dropped from all known records, never to be mentioned again—indicating that life in this metropolis suddenly ended.

According to the Bible, at this same period Joshua's army was spreading over the land, killing and burning. He took the cities of Gibeon, Makkedah, Libnah, Lashish, Eglon, Debir, Hebron and Gaza.

When Jabin, king of Hazor, heard about the invasion, says the Bible, he called together all the kings of the north to assemble their armies to fight the Israelites. But Joshua met them and "houghed [killed] their horses and burnt their chariots."

And then, at the time archeologists agree that all life came to an end in Hazor:

"And Joshua at the time turned back,

[\(Please turn to page 226\)](#)



**ASTRONAUT** tightens nut with specially designed space tool while floating in a condition of weightlessness in a Zero-G Flying Simulator. Tools designed for space use so far look just like the drills and other tools in countless basement workrooms. Basic design changes were necessary, however, to overcome reactive torque



# Power Tool for Astronauts

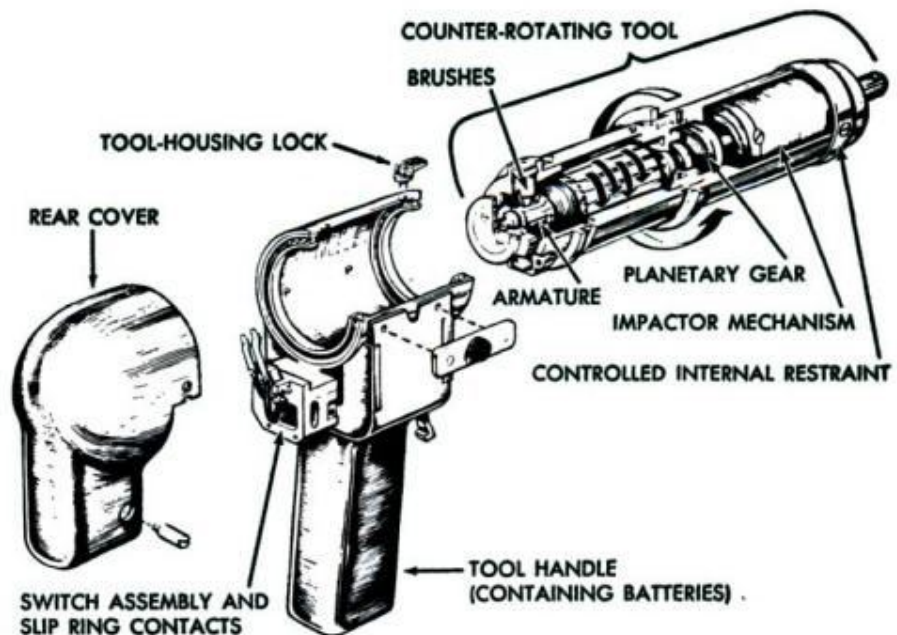
IF AN ASTRONAUT tries to tighten a loose bolt in the vacuum of space with a conventional wrench, he'll be sent spinning off into the void.

A power tool designed for use in space overcomes the reactive torque set up by a turning force. It was developed jointly by Martin Company and Black & Decker. The space tool has a reaction force of nearly zero. This low force is achieved by a freely-rotating motor and mechanisms

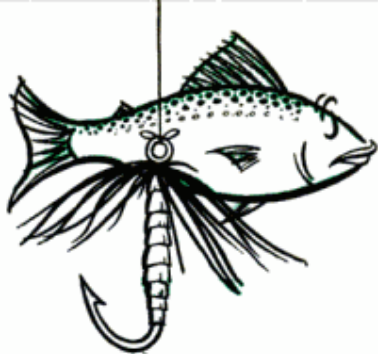
which transfer both power and reaction from the motor to the output shaft.

The eight-pound tool will tighten up to 150 bolts on one charge of its battery. Different attachments convert it into a wrench, screwdriver, grinder or thread tap. Similar tools will probably be used to assemble laboratories in space or make repairs. Earthbound tools such as high-pole drills, whose torque can knock a man off his perch, could use similar principles.

**REACTION PROBLEM** was licked by designing a motor and motor case which both rotate freely and are not locked to tool's framework. Astronauts may get an opportunity to use space tools during the Gemini flights







# When Nothing Else

*On those days when all you can do with an artificial lure is beat the water to a froth—you'll still catch fish with the lowly worm*

By Stuart James

**W**ORM FISHING, according to the most avid anglers, is poor sportsmanship.

This is true if you are the type who wants to make his sport as difficult as possible. But if you go fishing to catch fish this is a left-handed accolade for the worm.

Competing against plugs, lures, dry and wet flies, or whatever else might come out of a tackle box, the lowly, unglamorous worm proves a time-honored fact—it will

catch fish when nothing else will work.

And something the scoffers refuse to recognize is that there is something of an art to fishing with worms.

The body wall of the worm secretes a mucus for keeping the skin soft. This has an odor that fish recognize, according to worm proponents. A worm must be fished slowly to allow the fish to get the scent. On the other hand, this scent washes off, so bait must be changed every half hour or so.

Adding a small section of worm to a wet fly gives the fly an odor, and also looks as though the fly has been injured and is trailing a section of gut. This is an added incentive for the game fish to attack.

How the hook is baited with the worm depends upon the fish you wish to attract. Bluegills and crappies will nibble at the worm, so it should cover the hook with

**CASTING** a worm upstream (without a weight) permits it to drift with current like natural bait. Where current eddies into a pool (right), cast the worm above the pool and work it to outer edge of the current so it will move in a slow circle presenting itself to the fish in a natural way—as if drifting





# Works... Try Worms

the barb going clear to the tip. For bass or trout, which are smarter and require a natural bait, you must consider the anatomy of the worm. The worm's body wall is made up of a thin layer of circular muscles and a thicker layer of longitudinal muscles that make it possible to contract and expand in moving. In the water it naturally activates these muscles, so the hook is placed through the tip to allow the worm free movement so it will appear natural to the larger fish that can take it all in one gulp.

The worm is a natural food for almost all fish. After a rain, particularly, worms are washed into streams and fish gorge themselves. To fish a worm properly, you cast above the pool where the fish lurk and let it drift down naturally. You can check the current by tossing a twig into the water, then let your worm move along through the current at the same speed.

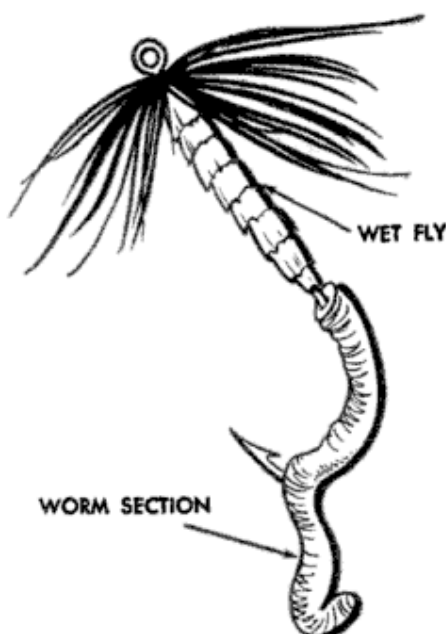
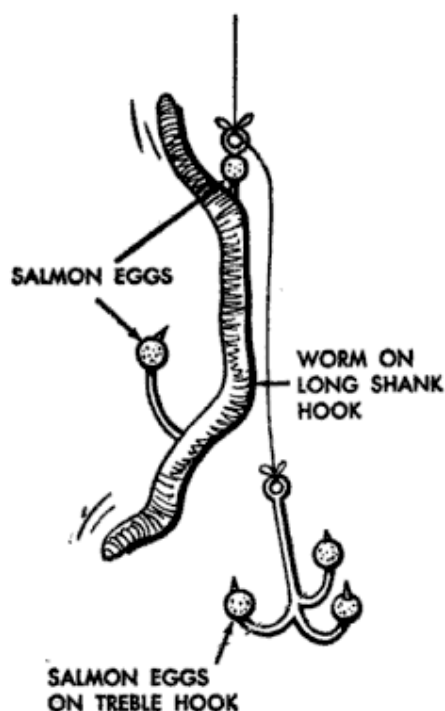
A light fly line or light monofilament is the best for fishing worms. It is not so easily seen, and it allows the worm natural movement.

You can cast a worm on a light line into a pool—without weight on the line—and it will slowly sink to the bottom as though it just fell from a bank. If you have ever fished without luck with sinkers and bobbers, and then thrown a worm into the water, you know how fish will attack this seemingly free bait.

If you encounter a pool where the current moves in a circular direction, it is ideal to bring the worm in with the current and let it swirl slowly.

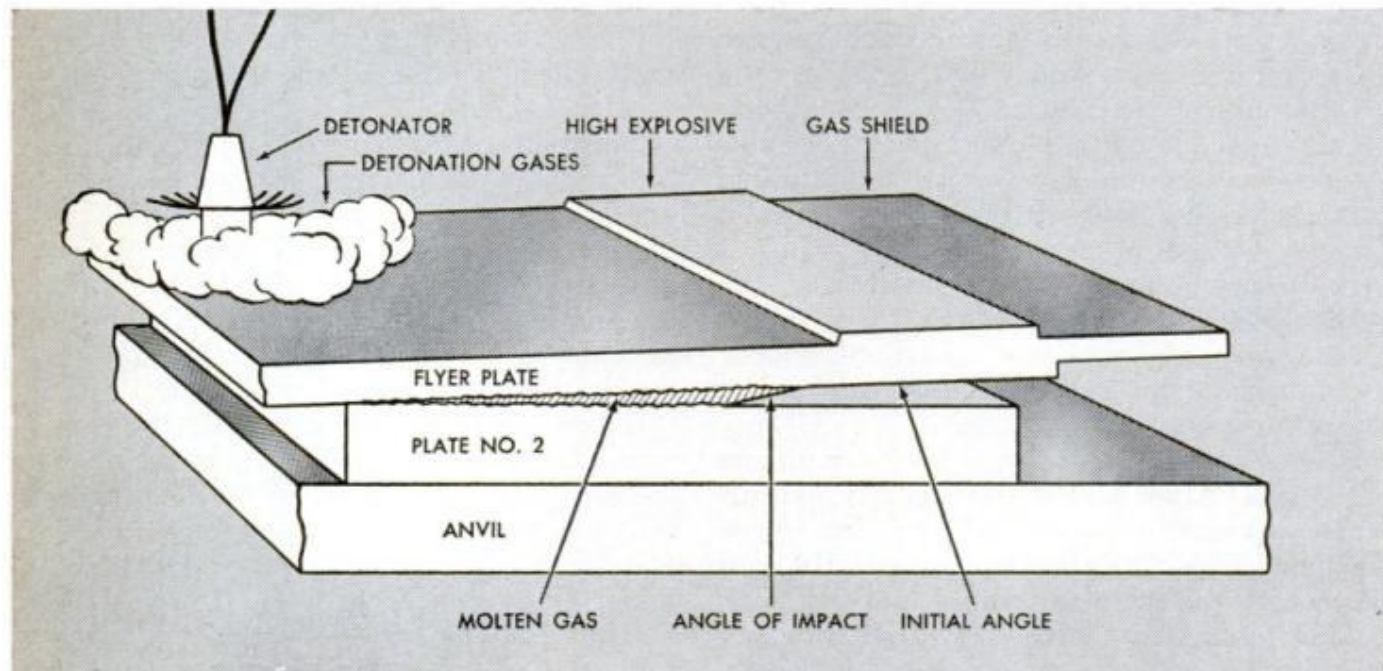
It is estimated that 50,000 worms exist in an average acre of land. It would be a foolish angler who ignored this ready source of bait. Particularly when it is the best bait for catching fish that has ever been devised.

**A KILLER** for lakes and ponds—thread worm on long-shank hook with salmon eggs fore and aft; add salmon eggs on treble hook. A section of worm on a wet fly looks like trailing viscera. For bass and trout, hook a small section of worm and cast without weight, letting it wriggle naturally on the hook



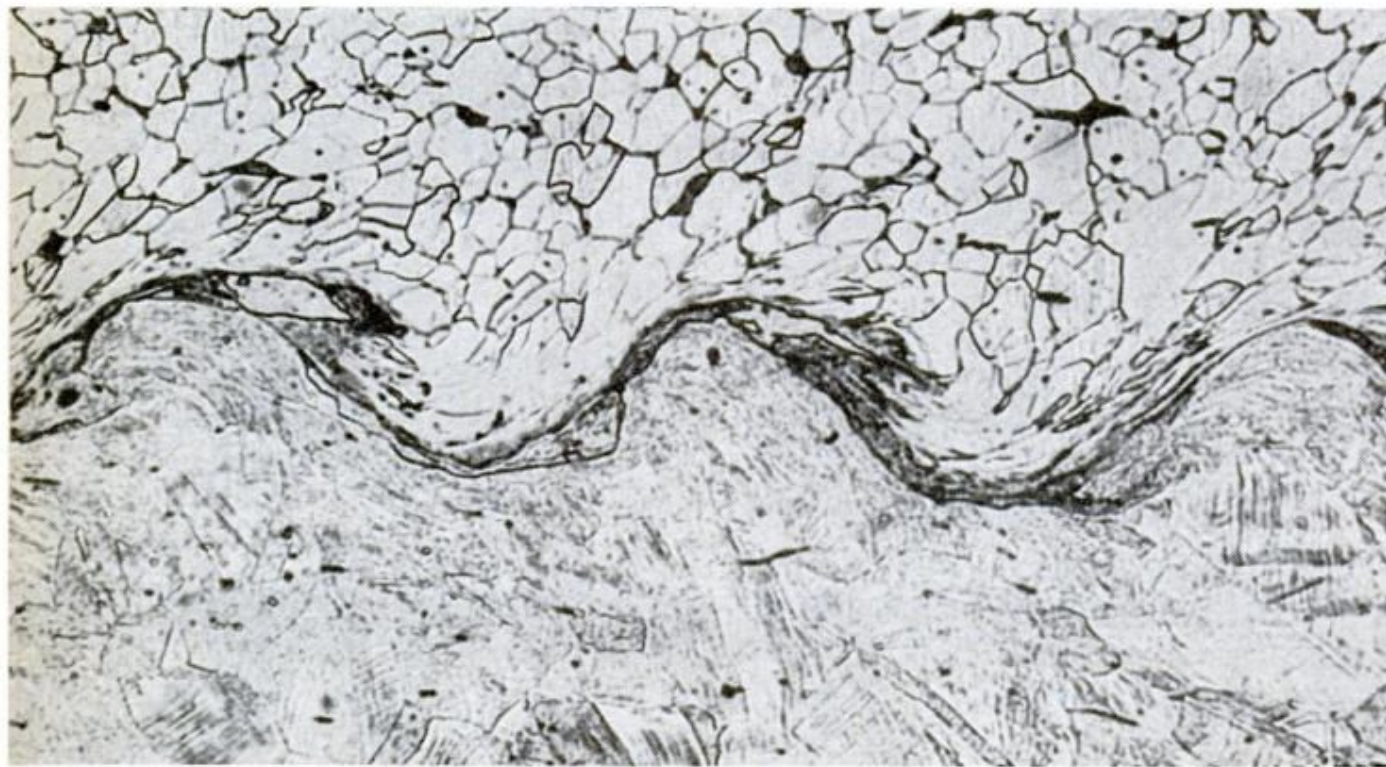


# Now They're Welding with



**IN EXPLOSIVE WELDING**, metals to be bonded are placed on an anvil at a slight angle. Explosive drives two together with such force that air or gas between them becomes fiery hot, melting and impacting metal surfaces

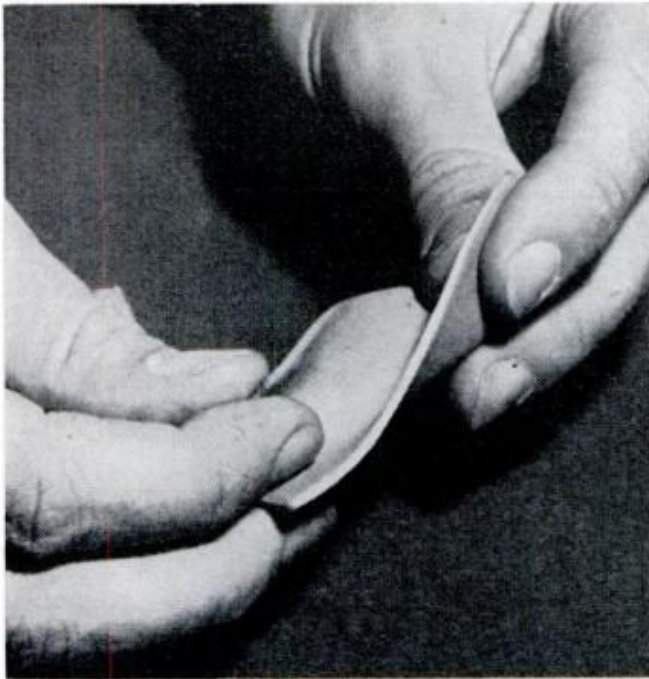
**UNDER A MICROSCOPE**, the junction of the two metals shows tiny ripples or wavelets; at the crest of the waves, the two surfaces interlock, forming a permanent bond. Stainless and carbon steel weld is magnified 150 times





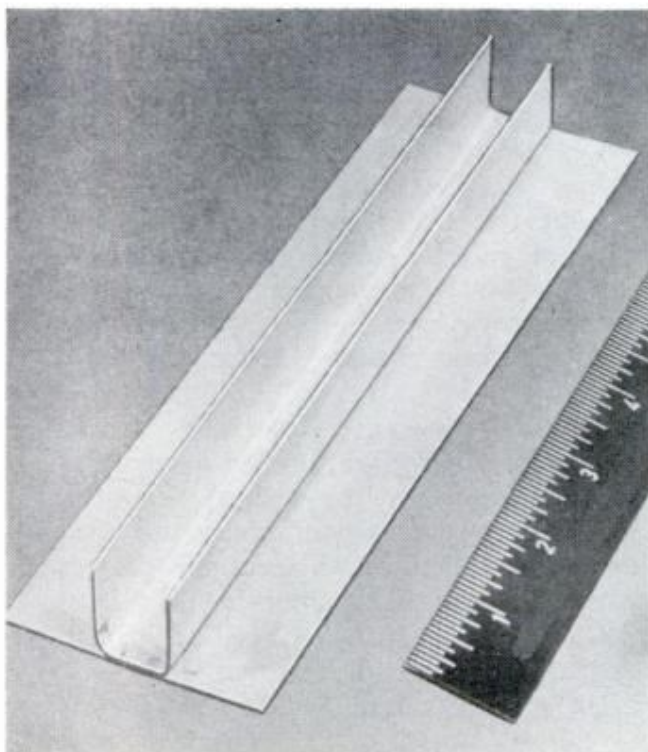
# Explosives

*Brute force slams metals together in a permanent bond, yet no beads, warps or weaknesses occur with this dramatic new process*



**CUT IN SHEETS**, DuPont's explosive, PETN, can be used to weld rounded surfaces, such as pipes. It's easy to use, can be cut with a knife

**BRUTE FORCE** of explosive bonding is used for delicate welding jobs also, such as this aluminum alloy U-channel joined to alloy sheeting



**By James Joseph**

**I**NSIDE A CONCRETE BUNKER, a technician places two steel plates on top of a huge anvil. Over the top plate, which is angled slightly to the one beneath it, he spreads a sheetlike piece of material which looks and feels like rubber. He then attaches a blasting cap to the material, ducks behind a protective wall and presses a firing button.

There's a loud explosion—and the steel plates are neatly welded.

This startling new process is called explosive welding, a quick-as-a-wink, almost heatless method for mating materials (plastics as well as metals), which is taking over an increasing number of welding jobs from conventional techniques.

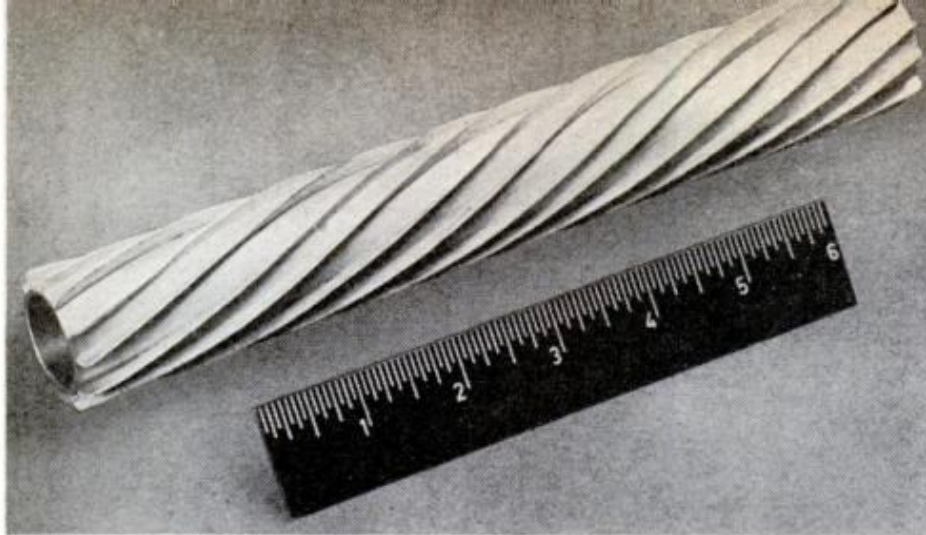
This almost-instantaneous bonding method doesn't warp or weaken metals, as do many hot-welding processes. And because there's little heat involved, explosive welding can bond materials of widely divergent melting points (aluminum and titanium, for example) which usually can't be welded conventionally.

Nor does explosive bonding leave an unsightly "bead," the torch-welder's trademark which, even when machined away, can seldom be completely erased.

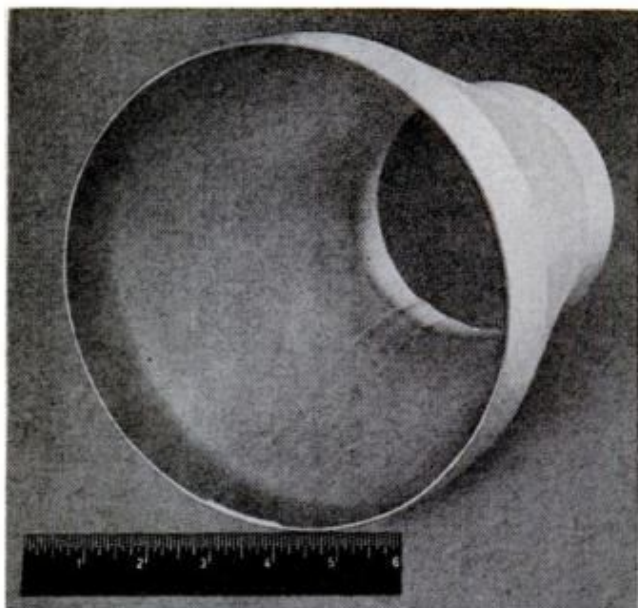
Explosive welders don't have to lug heavy, cumbersome gear or bottled gas to a work site. They carry their "tools"—linoleumlike sheets of high explosive—in a hip pocket. This explosive material, waterproof and flexible as rubber, can be cut with a knife, dropped, or even hammered without danger of its detonating. It can even be used underwater, which muffles the noise and confines shock waves.

The sheet of explosive material is stuck with adhesives to one or both sides of the materials being welded. The charge detonates with the speed of a bullet (more than 6000 feet per second) and with herculean force—creating pressures that can exceed two million pounds per square inch.





**SPIRAL FIN**s of aluminum alloy were explosively welded to tubing of the same metal. The process leaves no "bead" commonly found in ordinary welding techniques



**SINGLE EXPLOSIVE** blast simultaneously formed and lap-welded this aluminum alloy tube. Process can also be used for both line and spot welding chores



**PRECISION WELDING**, as in delicate copper grids, is accomplished with such finesse that the process may have many uses in space projects, such as in missiles

But the method is amazingly light-handed. It is capable of doing precision work which rivals the skill of the best of human welders. And it accomplishes conventional welding jobs in a fraction of the time usually required. Here are examples:

- At General Dynamics' Fort Worth, Tex., plant, explosive charges are used not only to quick-form aluminum tubing, but to weld it also, both processes being done in a single blast. Company experts recently used the technique to weld a series of delicate, spiral,  $\frac{1}{16}$ -inch fins to aluminum tubing. Impact bonding, as some engineers call the process, did the entire job in less than five microseconds compared to the hours it would have taken by conventional means. And, the bond was neater and more perfect than human handiwork.

- DuPont's Eastern Laboratory in Gibbstown, N.J., has put explosive welding

to near production-line use, welding giant 12-ton steel plates in a split second and "cladding" steel tanks with chemical-resistant metals. (DuPont prefers the term "cladding" to "welding.") The company finds that for the first time, very thin veneers of special metals (like acid-resistant titanium) can be "clad" to a backing of cheaper steel, for far less cost than if an entire tank or pipe were made from costly titanium.

- Stanford Research Institute, which often does explosive welding in a vacuum chamber to prevent oxidation, recently showed a sample of its work with the new technique: a delicate grid of copper-plated aluminum wires, their paper-thin walls a mere  $\frac{3}{10000}$ th of an inch thick. Blast impact welded the more than 100 tiny wires in a perfect bond.

(Please turn to page 218)



**PILLBOX-SHAPED** house at Gleneden Beach, Ore., was erected in less than a day, using the techniques usually employed in building wooden storage tanks

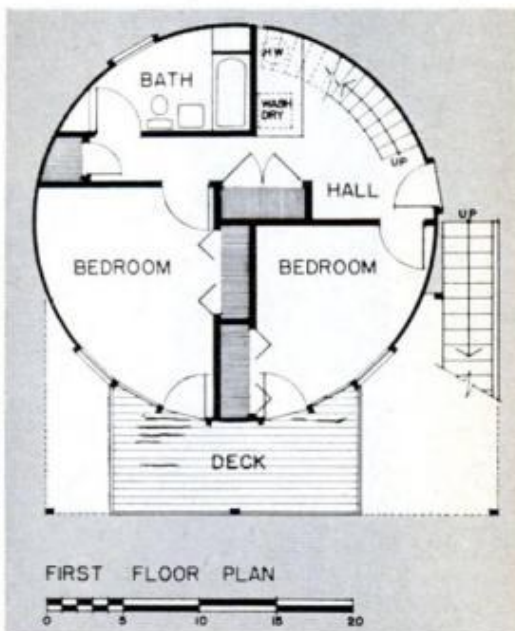
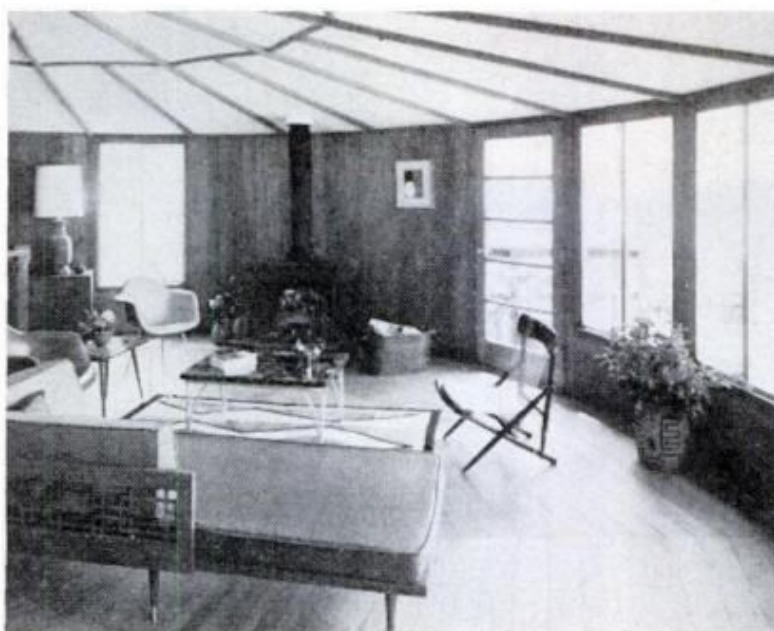


## Houses from Pickle Vats

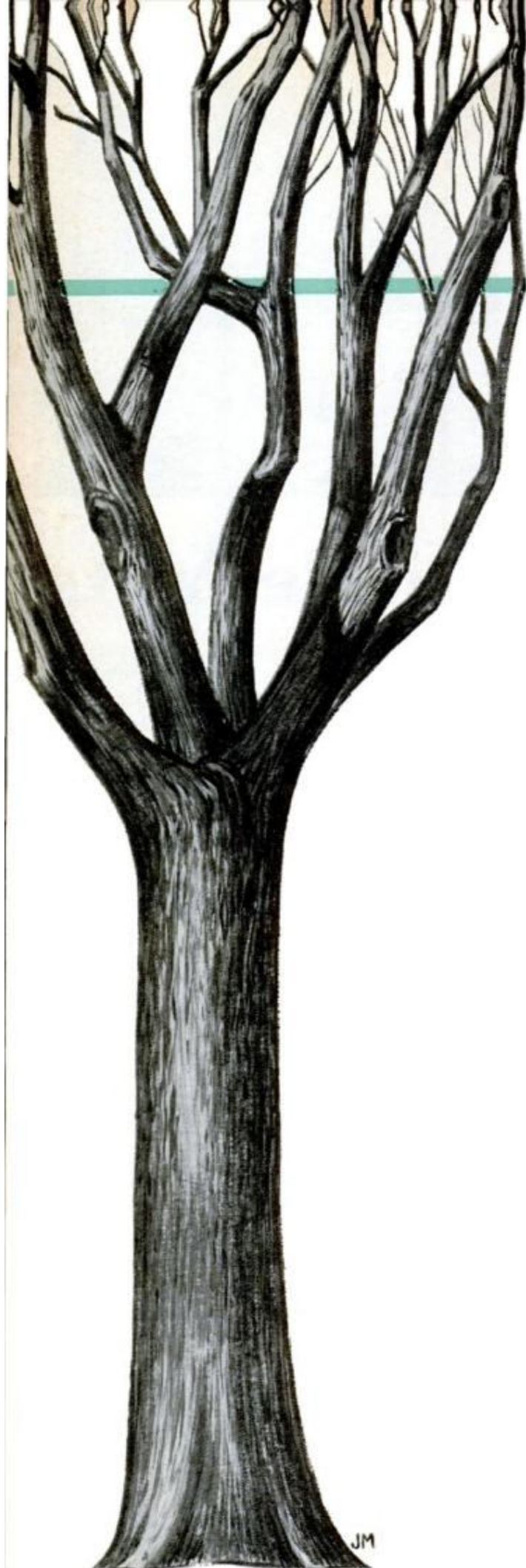
**HAD BUSINESS** taken its usual course, this beach house would have been a pickle vat or water tank. But Simpson Timber Co. changed its destiny by adding windows, doors, roof, interior partitions, etc. and came up with 1060 square feet of living space.

The two-story structure includes two bedrooms, two baths, living and dining areas, entry hall, two sun decks and kitchen. Exterior walls are vertical redwood 2x6s set on a concrete base and held together by steel bands at top, middle and bottom. Cost of the 26-foot-diameter shell, according to Simpson, was about \$4.00 a square foot, and interior finishing, wiring, plumbing, partitions, etc. can be completed for under \$6 a square foot. Similar shells are available from the company (2049 Washington Building, Seattle 1, Wash.) in redwood or douglas fir, one- or two-story height.

**RUSTIC APPEARANCE** of natural redwood makes interior wall finish unnecessary. Planks of second floor (two-inch hemlock) form attractive ceiling for first story. Each room has an electrical space heater, avoiding cost of a central system







*An inoculation that's harmless to wildlife has already proved it can save the stately shade trees from the deadly Dutch elm disease*

**By Clifford B. Hicks**

**A** BEAUTIFUL TREE can be a highly personal thing. There is a towering elm on my lawn that, to me, is the most beautiful tree in a town named for its trees—Elmhurst, Ill.

That tree, like hundreds of thousands of others from the Atlantic to the Rockies, is threatened with death. Its nemesis is Dutch elm disease which has spread its blot across half of America. Once a tree is infected with the disease, death is most often only a question of time. And whining chain saws are in my neighborhood today, as in thousands of others, toppling the shady giants.

A search for a way to save my stately friend led me to several Midwestern cities, to university laboratories and municipal nurseries. The search was worth the effort, for I learned that *my elm tree can be saved—and so can yours.*

There is a *preventive* for Dutch elm disease. It is known chemically as 3 (dimeth-

**FORESTRY EXPERT** James J. Mauget worked out the method used to inject Bidrin into elm trees. The treatment, not yet available nationally, must be applied by trained personnel und repeated annually



**POPULAR MECHANICS**



# We Can Save Our Elms

oxy-phosphinyloxy)-N, N-dimethyl-cis-crotonamide.

The method of treatment involving this chemical (trade-named Bidrin) was developed through years of experimental work at the University of Wisconsin. It can provide positive protection against elm disease. It has been tested over a period of five years on thousands of trees in Wisconsin under the most severe disease and insect conditions, and has given complete or nearly complete protection of elm trees, while up to 40 percent of the interspersed, unprotected trees were killed.

This spring the first commercial-scale use of Bidrin will be made on thousands of elms in Milwaukee. On the basis of the University of Wisconsin tests, it should provide positive protection for those trees.

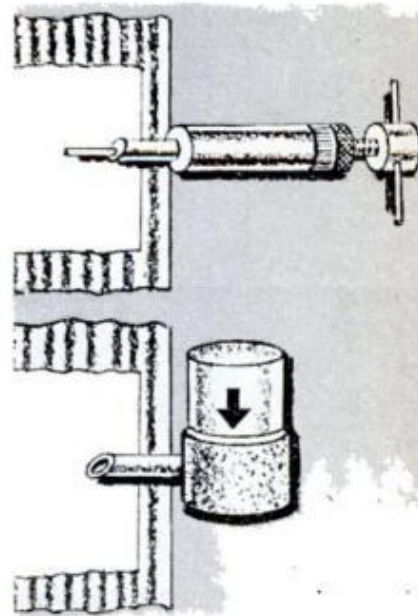
Bidrin is an extremely potent insecticide, but the method of application makes it virtually foolproof from the standpoint of safety, and it does no damage to wildlife.

The threat to the elm is the result of an inadvertent error by our forefathers, who planted it in great numbers as they pushed their settlements west. But when trees of one species are planted so close together that their soaring branches and searching roots interweave, it is inevitable that uncontrolled disease will march up one street and down another. And disease came.

Dutch elm disease probably originated in Asia and made its way into Europe during World War I. In any event it was first noticed in Holland (where it picked up strength and a name), and slowly but inexorably spread through France and Belgium; then north to Sweden; east to Russia, the Balkans and Italy; south to Portugal and Spain; and west to Great Britain. By 1930 it had crawled across Europe.

Until that year the Atlantic Ocean had provided a broad moat that protected North America. Then, during the summer of 1930, four elms in Cleveland and one in Cincin-

**RUBBER GLOVES** are recommended for handling Bidrin capsules, even though sealed. T-shaped tool, drawing top right, hammers steel tube into the tree's circulatory system; tool is then removed and capsule fitted onto tube. The liquid flows through valve, arrow, from transparent container







**TWO SCENES**, both in Detroit, emphasize the cost and tragedy of the elm disease problem. Sick trees have been stripped from thousands of streets; experts agree spraying is essential until Bidrin is generally available

nati mysteriously died. An examination showed that they had been infected with Dutch elm disease. The disease had entered America in a Trojan horse—an elm imported for furniture veneer.

Plant pathologists quickly called on their European counterparts for information.

Dutch elm disease is caused, not by the beetle that receives all the blame, but by a fungus called *Ceratocystis ulmi*. The fungus is barely visible to the naked eye, and produces vast numbers of microscopic egg-shaped spores embedded in drops of a sticky fluid.

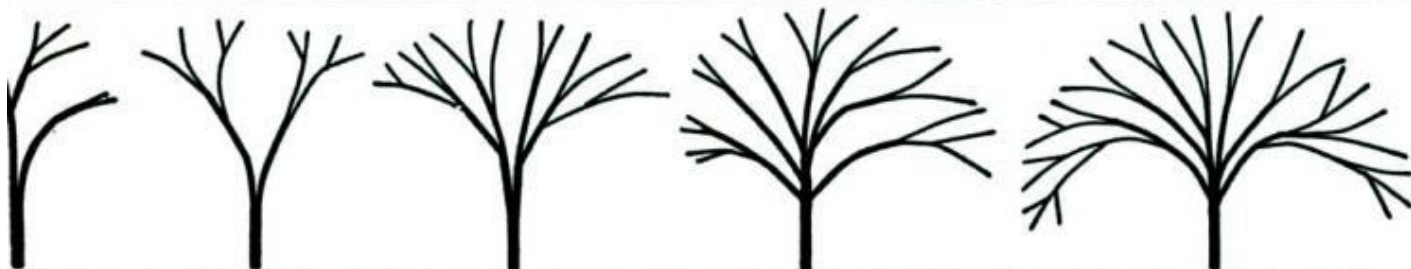
The means of transportation of the fungus is a dark brown, hard-shelled beetle only about 1/10-inch long, known as the elm bark beetle, or *Scolytus multistriatus*. The beetle's only home is an elm tree. At egg-laying time the female bores into dead or dying wood and lays as many as 100 eggs. When the eggs hatch and the young beetles emerge from their galleries, they may carry the deadly spores on or in their bodies.

The young beetles frequently head for the branches at the top of a healthy elm tree. There they feed in the crotches of twigs and on leaf stems, chewing through the young bark. In these tiny wounds they inadvertently deposit the spores.

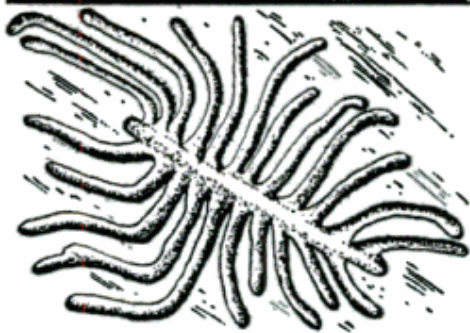
Like all trees, the elm has an incredibly intricate system of tubes beneath the bark, and as the spores move through these tubes they produce brown, gumlike substances that soon clog the tree's circulation system. An entire branch, usually at the top of the tree, wilts and dies. Once the infection starts through a tree, there is no way to stop its relentless spread. Municipal authorities will, with great justification, remove a majestic tree with only one wilted branch, despite the enraged threats of a homeowner. That tree is doomed; it inevitably will die, and meanwhile it may spread the disease to nearby trees.

Each year, two or three generations of beetles emerge. The exact time of emergence and number of generations depends upon the latitude, but in most parts of the

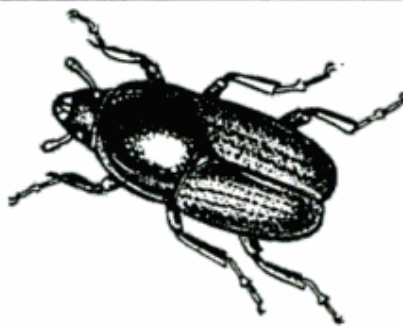
**CROWN SIZE** judged in relation to trunk dimensions, determines the exact dosage of Bidrin. The average elm requires one capsule for each five inches of trunk circumference. Below are examples of typical elm crowns



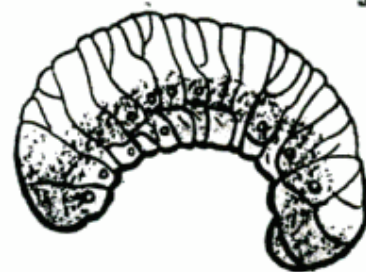




**BEETLE GALLERIES**  
BENEATH BARK ON  
TREE TRUNK



**ELM BARK BEETLE**  
1/12"-1/10" LONG—ACTUAL SIZE  
COLOR — REDDISH BLACK



**GRUB**  
1/8" LONG—ACTUAL SIZE  
COLOR — WHITE

**PULL BACK THE BARK** from a fallen elm and most likely you'll see a pattern of burrows made by the elm bark beetle. Adult females bore pathways between the bark and wood, laying eggs as they go; larvae bore smaller holes

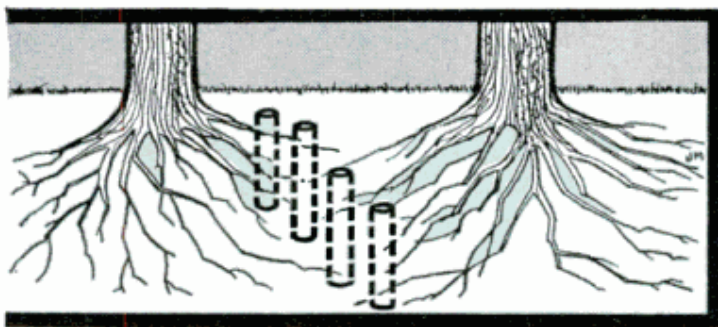
country one brood begins emergence in May, the other in July. Only the first brood is a threat to the elm, for it is only during late spring and early summer that the tree is susceptible to a lethal infection.

During feeding, the beetle usually does not carry its load of death more than a few hundred feet, but in areas with few elms it may travel for miles. In this way the disease spread throughout Connecticut at an almost constant rate of 5.4 miles per year. The beetles make major cross-country jumps by hitchhiking in cars, trucks, trains.

There is one other way the disease can spread—through root graft. If the roots of your healthy tree are intertwined with the roots of your neighbor's infected tree, you might as well kiss your tree goodbye. The distance a root graft can take place between two mature trees is about 50 feet. Because of the close proximity of elm trees in many cities—Toledo, Ohio, is a top example—the disease marched down hundreds of city blocks, devastating every tree.

In their search for a way to bring the

**SYSTEMIC TREATMENT** won't keep diseased trees from infecting others via roots. Killing adjacent root sections with fumigant plugs protects healthy trees



disease under control, entomologists and plant pathologists seized upon the beetle as the weak point in the cycle of the disease. They decided that their greatest opportunity was the critical moment when the beetle crawled out of its gallery and headed for the new growth in the tree.

The tree becomes susceptible about 20 days after the buds appear, and remains susceptible until the branches stop growing. In theory, this period only lasts three or four weeks, and actually there are only a few days—though unpredictable days—when the tree is *really* susceptible. If the beetles could be destroyed as they emerged, the disease could be stopped.

The first weapon selected was DDT. Spraying crews soon made their appearance, and the elms in many cities were coated with insecticide. The method proved effective where thoroughly used. With no spray program, a municipality could expect from 10 to 25 percent loss each year. With a good spray program, the loss could be reduced to one to four percent. And even this loss could be much further reduced if root grafts were controlled.

However, the system brought immediate complaints that birds and other wildlife were being decimated along with the beetles. In many a municipality, citizens faced a dilemma: Should they try to save their trees or their wildlife?

Research laboratories came up with new insecticides. The most effective was methoxychlor, which proved almost as deadly to beetles as DDT, but less so to birds.

At the same time, some municipalities

(Please turn to page 212)

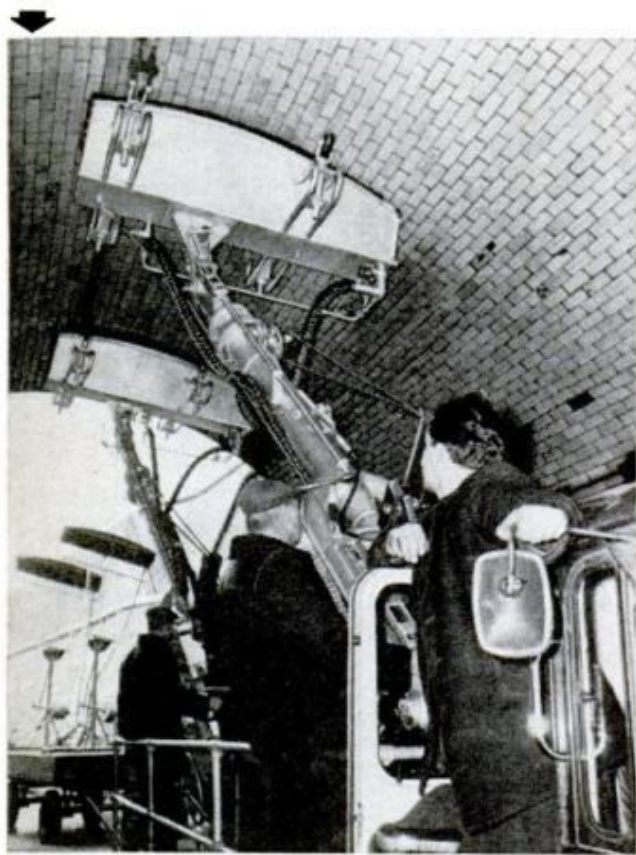


## Tunnel Cleaner

Designed to clean the brick linings of the tunnels under the Thames River in London, a specially made vehicle has two spraying heads curved to fit the walls and ceilings, each with a row of brushes to seal off the rims.

One spray head applies detergent and the other a rinse. The vehicle cleans up to four miles of tunnel an hour at a cost of about \$24 per cleaning. The job formerly took four men eight months to clean at a labor cost of \$3700.

Four rollers on each spray head limit the fore and aft tilt. The units are rigged on the truck bed of a typical British five-ton lorry.

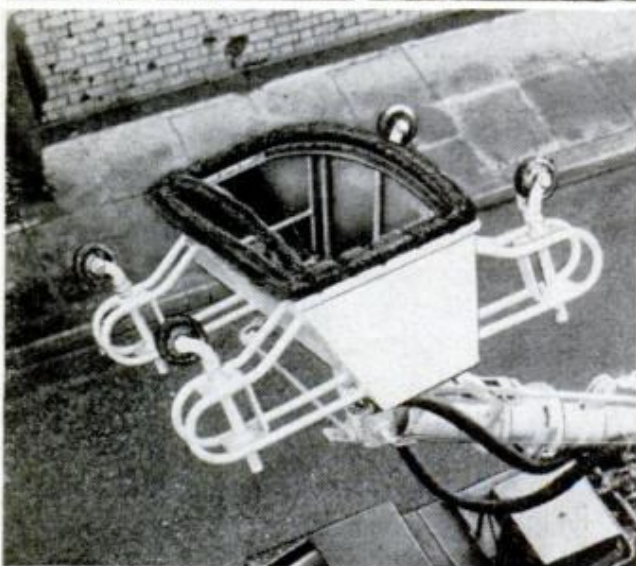


## Ready for Long Drive

Painted dots on a satellite make it look like a giant golf ball. Actually, the dots provide temperature control for the Air Density Explorer satellite, recently launched to study air conditions.

## Noiseless Scooter

Operating on a 12-volt, 90-amp. battery, a one-man scooter is virtually noiseless and fumeless. It has a range of 20 miles at eight m.p.h. before recharging the battery. \$99.50. Electro-Motive Industries, 2527 Matthews, Memphis, Tenn. 38108.







### No Scrambled Eggs

Bags of groceries will stay upright in your car in the steel Sak-Rak, which weighs four pounds and folds up when not in use. It's sold by Mailord Products, 33 Groce Road, Lyman, S.C., for \$3.95.



### Light Spirits

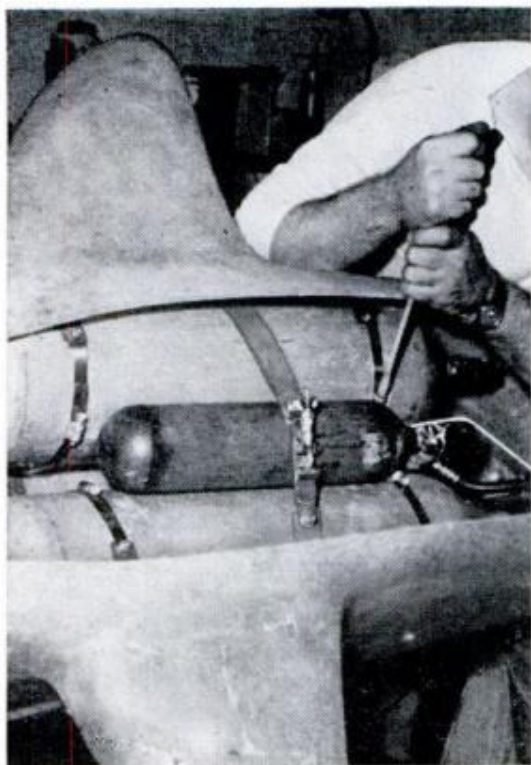
Twin fog lights appearing in the Menthon Mountain Pass of France will mean to the lost skier that a dog and his keg of spirits are close at hand. The animal patrols the area around a ski resort.

### Mermaid Rides a Mechanical Dolphin

Driven by compressed air, a mechanical dolphin entertains visitors to Florida's Weeki Wachee Springs.

With a propeller in the tail and flippers operated from a seat on its back, the seven-foot fiberglass creature is operated

by a female diver, who sometimes is unseated when the mechanism goes awry and the dolphin becomes a bronco. A technician (left) makes adjustments on the delicate innards—which include tanks of air for the motor and for the mermaid.





*Clip-on siding, vinyl flooring of real wood, and a dry well you sink in two hours, head the list*

**By Arthur J. Maher**

**S**PRING IS in the air and, inevitably, a man's fancy turns to (among many other things) thoughts of . . .

Remodeling his home. Fortunately, the building-materials manufacturers have spent the winter conjuring up a host of new materials to make the job easier than ever.

For example, if you're thinking of re-siding the old manor house, you now have six new low-maintenance sidings to choose from. Perhaps most significant of these are two made of hot-dipped galvanized steel with a baked vinyl finish. They are similar to each other and to aluminum siding in appearance, application and maintenance characteristics, and sell for about the same price as the better grades of aluminum. That puts them in the general vicinity of \$120 a square. However, U.S. Steel and Inland Steel, who supply the sheet stock from which the siding is fabricated, claim their material is more rigid than other siding metals and therefore better able to cover surface irregularities. Also, they claim, it has greater impact resistance and is less susceptible to denting from hail,

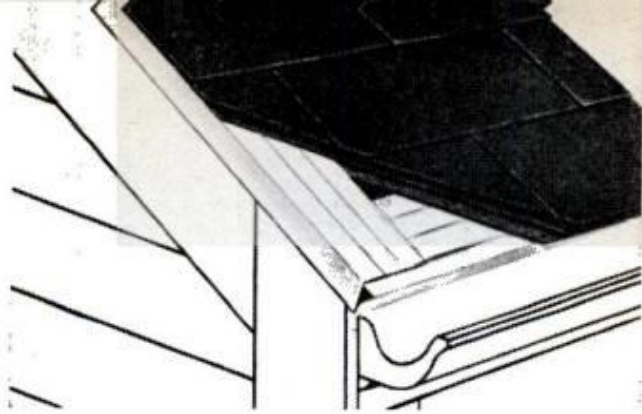


**GRANULAR INSULATION**, made of vermiculite, offers a convenient way to augment attic insulation. You pour it from bag, spread it with the back of a rake

**LOW-MAINTENANCE SIDINGS** are easier than ever to install. Most now are furnished with corner and trim pieces to speed application, give better protection

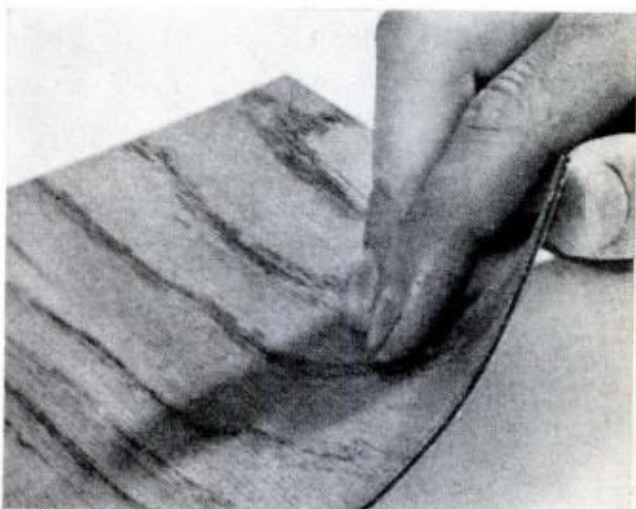






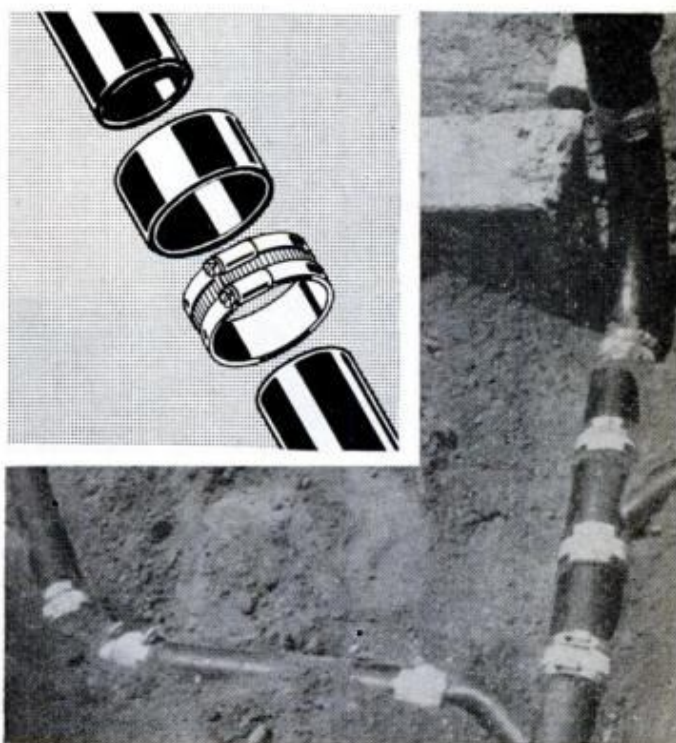
**PROTECT ROOF BOARDS** from weather damage and mildew by nailing vinyl roof edging at eaves and rake edges. Comes in 2-, 2 $\frac{3}{4}$ -, 3-, and 3 $\frac{3}{4}$ -in. widths

**FLEXIBLE WOOD** flooring is a hardwood veneer covered with vinyl. Made in tiles and planks. Planks are 4, 6 or 8-in. wide, with or without Colonial "pegs"

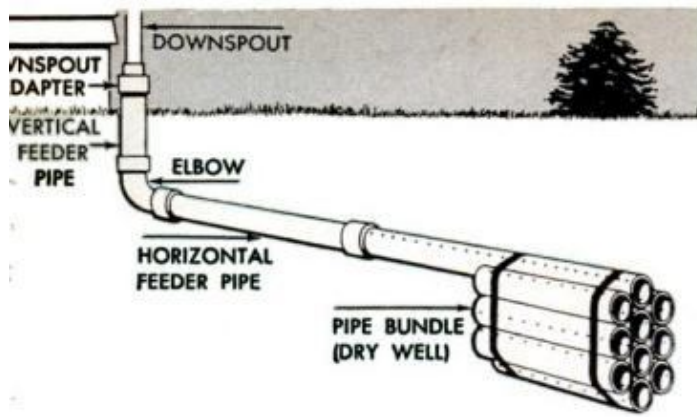


**FACE-PRINTED LATH**, which is reinforced with fiber-glas, has guide lines printed on its face to facilitate accurate cutting and help drive nails into studs

**OLD STANDBY IN NEW FORM:** Cast-iron soil pipe is now available in a quick-connect system employing rubber sleeve gaskets and stainless-steel clamps





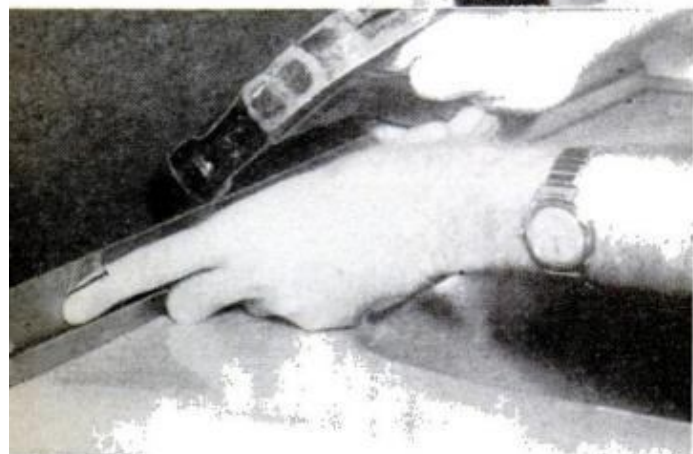


**PACKAGED DRY WELL** is made of 4-in. perforated plastic sewer-drain pipe and fittings. You bury it a foot or more deep and connect it to your downspout

**DECORATIVE MURAL PANELS** fit most bathtub-shower enclosures without cutting. Applied with special molding strips (bottom) that keep water out of joints



**PUSH THIS INSULATION** between framing members and it holds itself in place. To fit odd-shaped places, straddle pipes, etc., you merely cut it with a knife



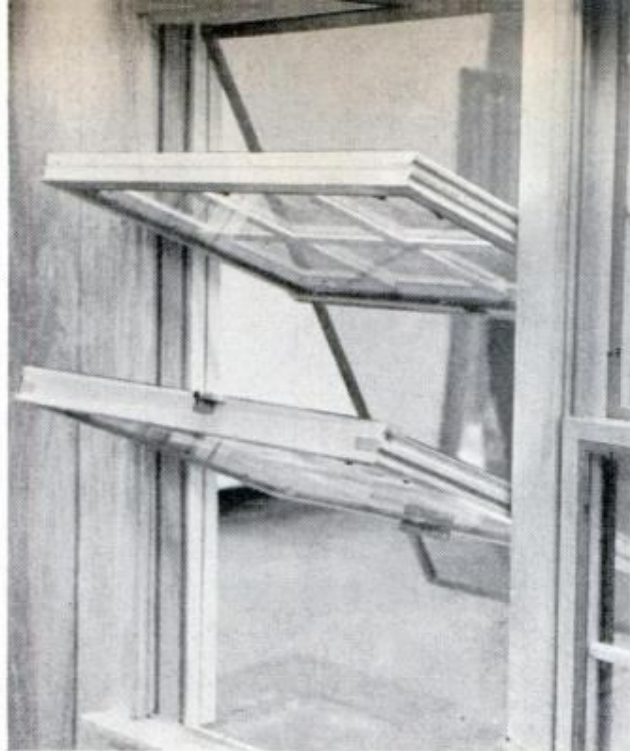
stray baseballs and ladders. Finally, steel's coefficient of expansion, being relatively low, is said to provide less strain at the nailing points, and to make fewer popping sounds as it adjusts to changes in outside temperature.

A unique siding comes from Pacific Lumber Co. It's a redwood bevel type that has a white acrylic latex coating and is clipped into place instead of being nailed (photo, page 131). According to Pacific, this method is easier than nailing, and avoids penetration of the paint film. Applied cost should run about the same as that of standard wood siding plus conventional painting, says the company.

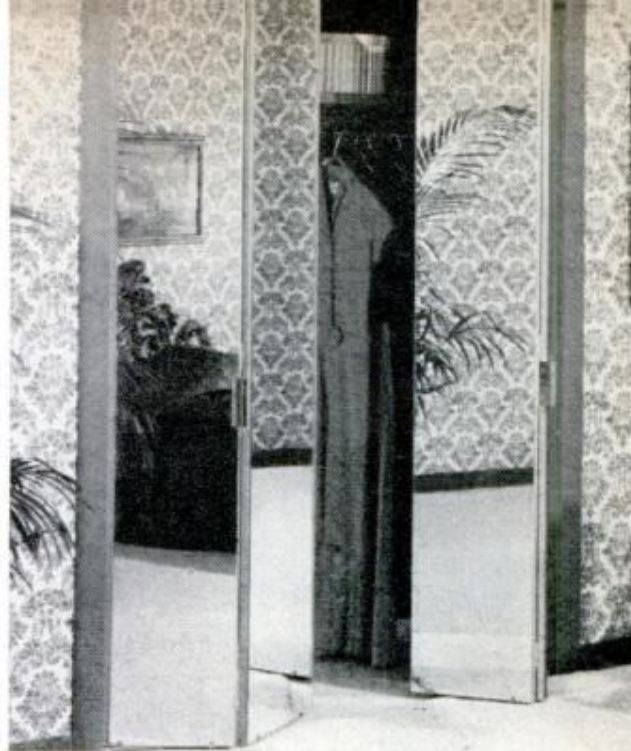
Another pre-painted siding, from Weyerhaeuser, is warranted against repainting for seven years, and against peeling or blistering at any time. It comes in five colors (white, green, grey, tan, yellow) and will be marketed first in and around Omaha, Neb. It's applied with nails that are pre-colored to match the paint. These are driven with plastic or plastic-capped hammers to minimize damage to the paint. Cost is 50 to 75 percent above unfinished wood.

The plastic industry's latest major bid for the re-siding market is Bird & Son's solid vinyl siding that's said never to need painting, as the color (white) is incorporated in the material. At present, it's the only plastic siding with a stepped, double four-inch design that gives a narrow-width effect to the eight-inch surface. This





**TILTING SASH** of Pella's wooden double-hung window make for easy cleaning. Also provides draftless ventilation when you tilt bottom sash inward slightly



**MIRROR-DOORS** for the closet are making a comeback in bi-folding form. These, trade-named K-Doors, are available in choice of 1/4-in. or 3/16-in. glass

is particularly desirable in remodeling older Colonial-style homes. Estimated applied price is \$120 a square.

From solid plastic we go to plastic-coated. Masonite's Colorlok is a tempered hardboard in 12-inch by 12-foot strips covered with Videne plastic that's guaranteed for 10 years against all visible failure. Colors are white, green, beige and grey and retail price runs 35 to 40 cents a square foot, plus freight from the factory at St. Charles, Ill.

Colorlok is primarily a new-construction material, but in remodeling, can be used on room additions. For faster application, each strip is beveled on the top edge and fitted with a hardboard spline at

the bottom. The spline of one strip engages the beveled top edge of the strip **beneath, thus speeding alignment** (see [photo, page 133](#)).

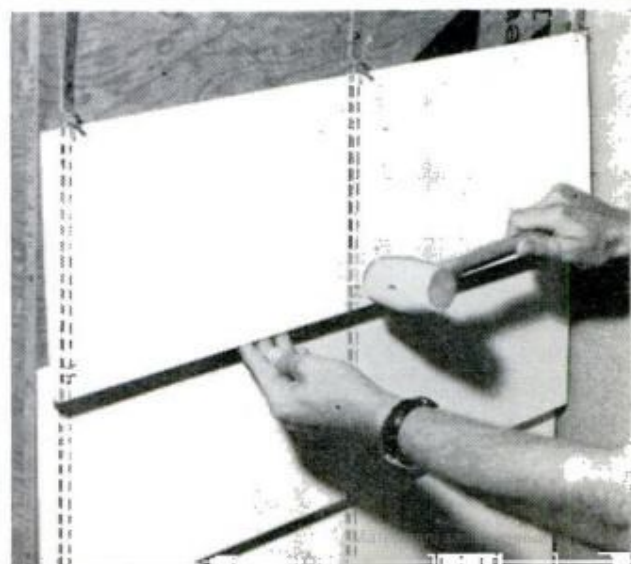
### Prefinished Steel Gutters

But new sidings are only a small part of the new building product scene. If, like millions of Americans each year, you're about to replace a worn-out gutter and downspout system, there's new help for you. It's a galvanized steel system made even more rust-resistant by two coats of baked enamel. Obviously, you don't have to paint them, which is a big advantage over uncoated galvanized steel. Price should run about 22 cents a foot.

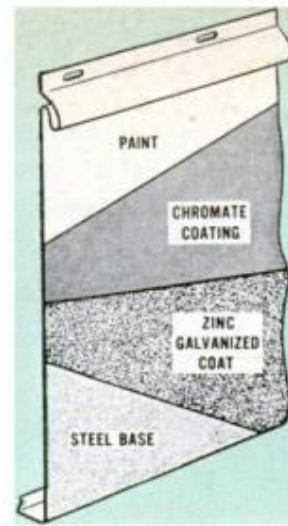
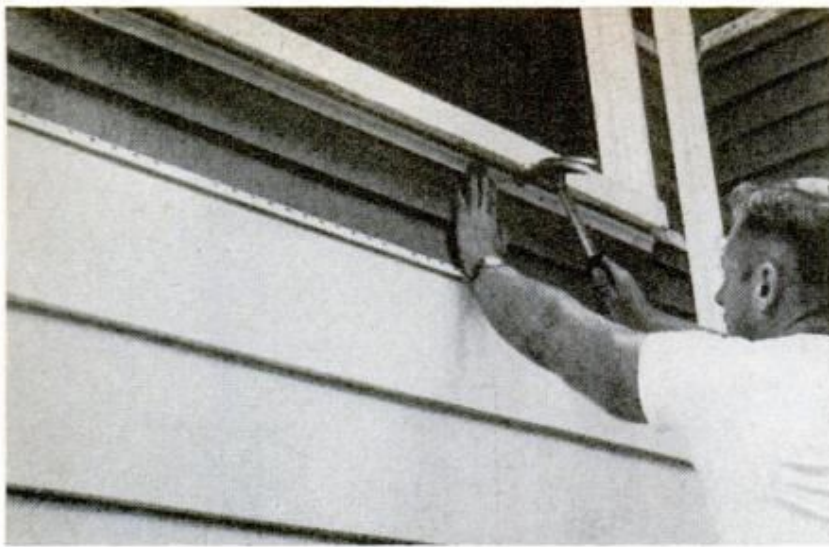
**PLASTIC CLAPBOARD SIDING** has stepped 8-in. face that makes it look like 4-in. boards. Inserts of fiberboard give extra stiffness and insulation value



**NAIL-LESS WOOD SIDING** is put on by hammering it over galvanized steel clips. Prongs on the clips grip the back of each board. End joints require no filling







**MULTI-LAYER COATING** on steel siding consists of hot-dipped zinc (galvanizing), chromate primer, then baked vinyl. Manufacturers claim that when material is cut, the zinc is pulled into cut, effectively sealing it against water

If you're planning to dig a dry well, Gering Plastics Co., for \$18.95, can save you an aching back. That company now offers a packaged dry well made of plastic pipe that weighs only 28 pounds and requires far less digging than the usual rock-filled variety. Installation time, says Gering, is about two hours unless you have boulders under your lawn.

Another plastic remodeling aid is a Bird's Vinyl Roof Edge, a white edging made of polyvinyl chloride. It's predrilled for nailing under the first course of shingles along eaves and rake edges. It retails for approximately \$35 to \$45 per 500-foot carton, and comes in five sizes and styles, in 10-foot lengths. The manufacturer claims it's highly weather resistant, cuts easily with knife, scissors or tin snips, and snaps back to its original shape when dented by a ladder.

In plumbing, there's a new hubless cast iron soil pipe that eliminates the lead and oakum caulking used with conventional C.I. pipe. The absence of hubs makes it possible to install your plumbing stack in a standard 2x4-stud wall, eliminating the need for an oversized plumbing wall. The hubs are replaced by a coupling system employing a neoprene sleeve. The fittings and pipe fit into this sleeve and the joint is fastened with a stainless steel worm-drive clamp (photo and drawing page 129). The Cast Iron Soil Pipe Institute says this system is much faster than other joining methods. Cost of the fittings is competitive with copper fittings of the same size.

What about inside the house? Well, if your attic insulation has settled or been compacted, you can beef it up with Zonolite's Econo-Fill (photo, page 128). This material, which sells for about \$1.20 to \$1.30 a bag, is a vermiculite fill designed specifically for re-insulation jobs. One bag will add two inches of insulation over 18 square feet. Thus a 1000-square-foot attic would need approximately 55 bags.

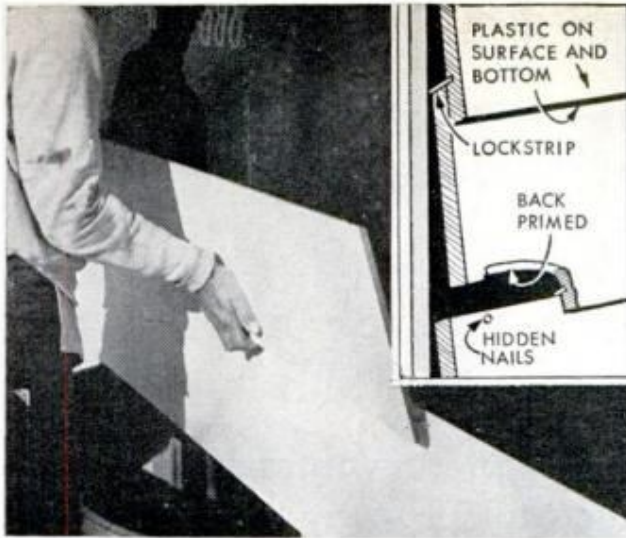
### Insulation Pushes In

For new insulation jobs, there's a fiberglass batting that you merely push into place between studs or joists. It comes in two, three, and six-inch thicknesses, and in widths for 16, 20, and 24-inch framing. You don't have to nail or staple it, but it's advisable to add a vapor barrier such as polyethylene film or foil-backed drywall. Friction Fit is made by Owens-Corning Fiberglas and sells for about four to ten cents a square foot depending on width and thickness. (See photo, page 130.)

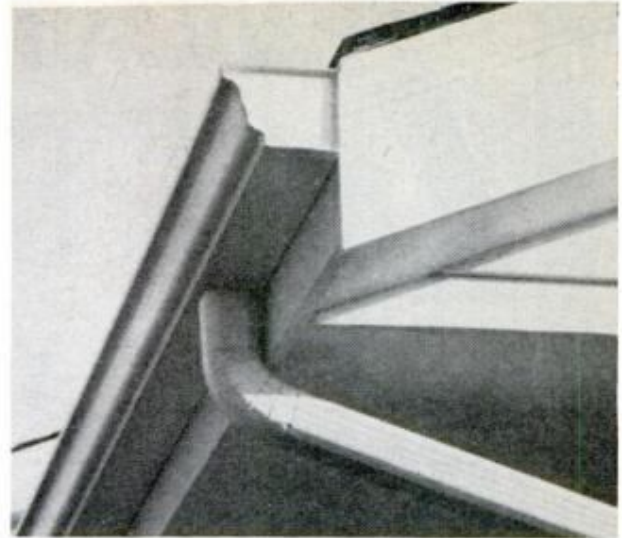
To speed the job of adding new walls or re-plastering the old ones Bestwall Gypsum now offers its lath with horizontal and vertical guide lines printed on the face. The lines guide you in sawing, scoring, or locating the studs when nailing (photo, page 129). Average retail price is four to four-and-a-half cents a square foot.

For the bathroom there's a line of Marlite plastic-coated mural panels made in five-foot lengths, to match bathtub-shower recesses (photos page 130). The panels are made of tempered hardboard and are ap-





**PLASTIC-COATED HARDBOARD** siding is self aligning after starter course is in place. Strips are nailed at top edges only, leaving the surface free of nails



**LONG-LIFE GUTTERS** and downspouts are made of galvanized steel with baked enamel coating on inside and outside surfaces in regular or flanged design

plied with metal moldings and wallboard adhesive. You have a choice of nine gold-on-white patterns in five- and six-foot heights. Cost: \$15.50 to \$18.60 a panel.

Wilcox-Woolford Corp. has announced a breakthrough in plastic floorings. Called True Wood, it's just that—a hardwood veneer covered with vinyl plastic. It's claimed to be as durable as other vinyl floor coverings, but looks like conventional wood flooring. Produced in walnut, cherry, oak and mahogany, in 48-inch planks and nine-by-nine-inch tiles. It cuts with standard tools and is applied above or below grade with a special adhesive. Price is about 75 cents a square foot.

For the lady of the house, Kennatrack offers four-panel bi-folding closet doors with full-length mirror panels. They come in four, five, and six-foot widths, and are six-feet, eight-inches high. Hardware and hinges are factory mounted. Smallest unit retails for \$90.

### Real Swingin' Windows

Another lady pleaser: Pella's new line of double-hung wood windows. Both sashes of these windows swing inward to make cleaning (and repairing) a snap. Units are fully weather stripped at the factory, and you can add double glazing panels on the *inside*, which, according to Pella, eliminates need for storm windows. Prices start at about \$37 per window.

Speaking of windows, Republic Steel's "Freedom" models, the first we know of to be made of stainless steel, are claimed to

be virtually maintenance-free. The manufacturer says the stainless frames won't rust, rot, corrode, peel, pit or discolor, regardless of atmospheric conditions. They are available in single-hung double-hung and horizontal-sliding types, and in heights up to five feet, eight inches and widths up to nine feet. Prices start at approximately \$29 to \$39 depending on size and locale.

Got to panel a room or two? A luxury material from Georgia-Pacific is made with book-matched veneers and inlaid separator strips. The cost (about 80 cents a square foot) is high, but cheaper than the previous method of matching and inlaying the hardwood right on the job from solid stock. In elm with walnut strips, cherry with walnut, walnut with pecan, and pecan with walnut—all prefinished.

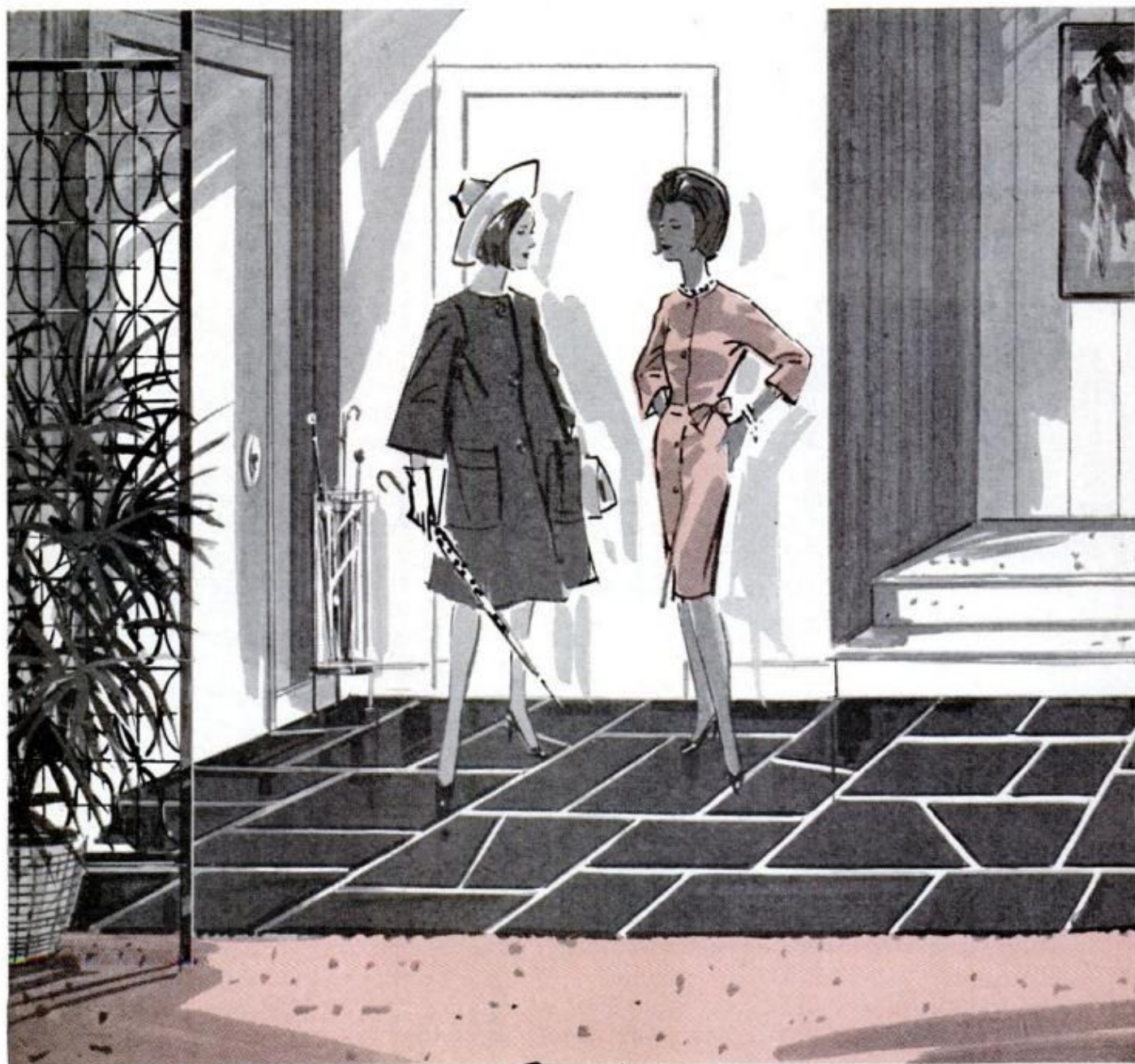
And, to help you match up the trim, U.S. Plywood's Weldwood Color Tones are said to duplicate the color of any paneling. This system employs two bases—light and dark—and a wide selection of pigments which come in plastic envelopes. Shades are controlled by mixing different combinations of pigment in the appropriate base, then varying the degree of wipe. List price is \$2.45 a quart.

The list of new building products doesn't end here, but we haven't room for them all. Among those we can't include are weatherproof styrene shutters, a plastic flooring that resembles carpeting and two more sidings that haven't hit the market as of this writing. We'll cover them all in future issues.



# 14 WAYS TO ADD SPRING TO YOUR HOME

How do you wake up a tired house after a winter of hibernation? You can do it by paving an entry-way with slate, adding space-saving built-ins or by simply banishing kitchen clutter. Like a spring tonic, these home remedies will help snap a listless abode out of its winter doldrums





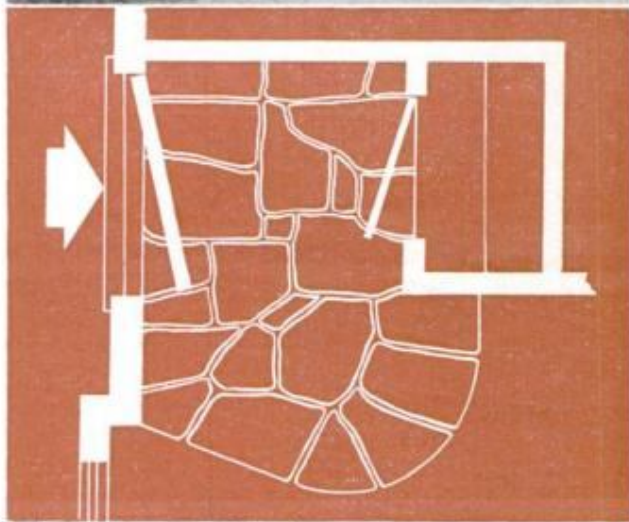
# 1

## SLATE ENTRY

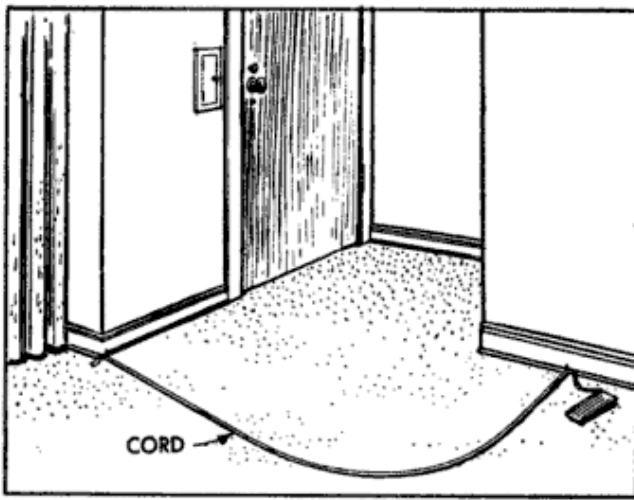
**A**PRIL SHOWERS give rise to something less pleasant than May flowers: They bring a lot of mud indoors. Modern homes seldom provide practical entryways. Often the front door opens right onto the living room carpet and this results in a constant cleaning problem as water drips from raincoats and umbrellas, and mud is tracked in on overshoes.

An elegant solution is to slate the floor of the entry. Whether it's a small alcove (right) or a stair "hall" (below) slate can transform it into a separate area that's not only practical but seems to extend the dimensions of the living room.

Look like a job for a pro? Surprisingly, replacing your finish flooring with slate requires no great skill. Full instructions are given on the next three pages.

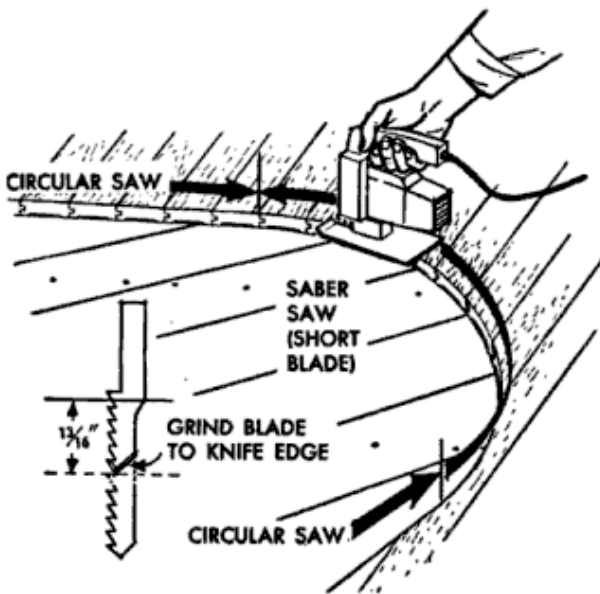
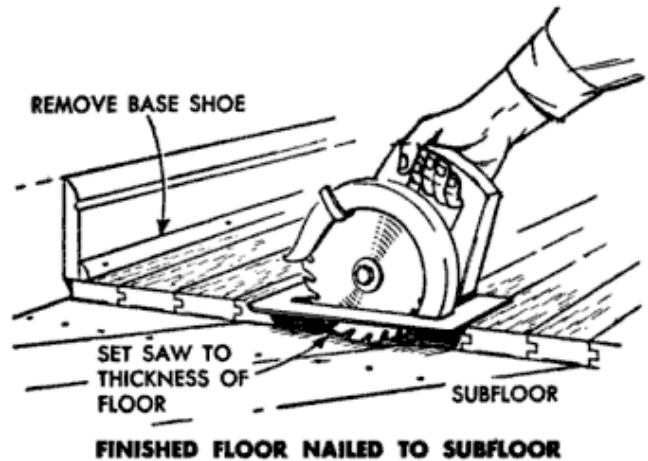






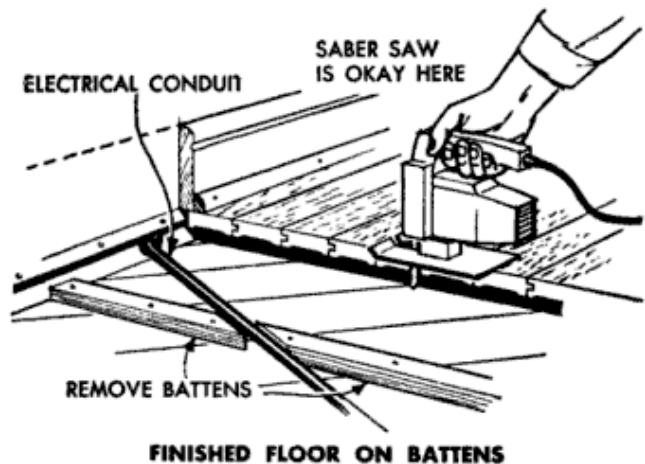
**STEP ONE:** Tack or tape a length of heavy cord between the baseboard points to which your slate floor will extend. Adjust the cord to various free-form shapes until you establish a graceful limit line, and mark it on the carpet with chalk. If you have wall-to-wall carpeting, cut along this line with shears and bind the cut edge with iron-on tape to prevent unraveling, unless you eventually intend to cap the edge with a flexible carpet bar. In that case, remove tacks and roll carpet and pad back as first step, marking cutting line directly on finish flooring instead of rug.

**STEP TWO:** If your hardwood floor is nailed directly to the sub-floor, use a portable circular saw, set to just the thickness of the finish flooring (usually  $\frac{3}{4}$  in.). Though the blade should be sharp, don't use your best new one since you are likely to hit an occasional nail, especially on diagonal cuts. In order to cut and remove flooring near walls, you'll have to pry off at least the base shoe. A circular saw will work only on straight-line cuts, of course.



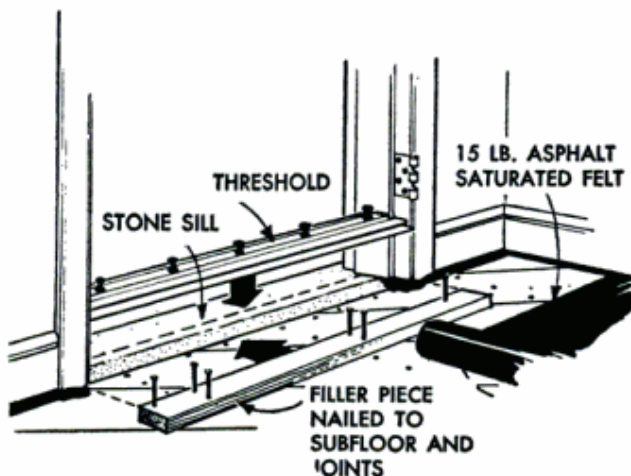
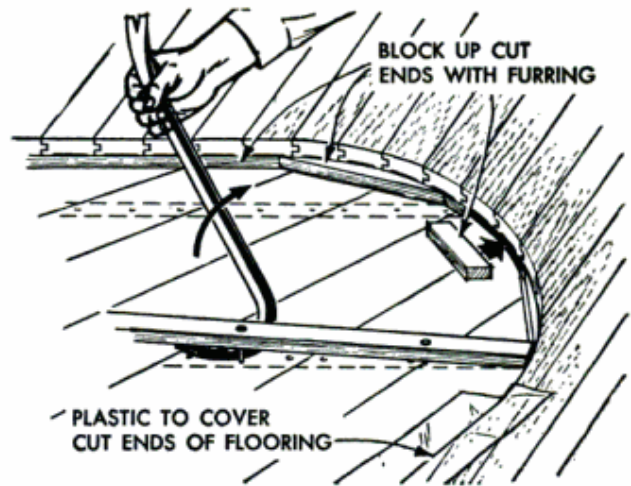
**STEP THREE:** Curved cuts must be made with a saber saw, but you'll have to modify the blade, as shown far left, if the finish floor fits tightly against the sub-flooring. Adjust your saw to the lowest point of the stroke, then mark off down the blade to the exact thickness of the finish floor. Grind off the blade to a knife edge, as shown, and lower it into the kerf of one of the circular saw cuts, extending the cut around the curved section of the limit line. Pry up the pieces of finish floor within the completed cut, pulling nails left in floor.

**ALTERNATE STEP A:** Sometimes your hardwood floor "floats" on furring strips, to accommodate electrical conduit, as shown—or where application is over a concrete slab. In such cases, the space beneath will probably let you use an unmodified blade in the saber saw. This speeds up the cutting, so you may want to use this saw for the straight cuts as well. Even so, take it slow—you're still likely to hit a nail or two. Pry up and discard the short flooring strips within the cut. Battens to protect electrical conduit aren't needed, as conduit will be buried in mortar.



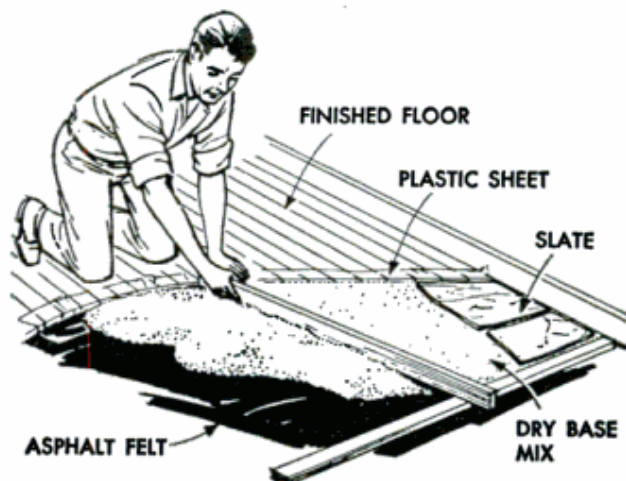
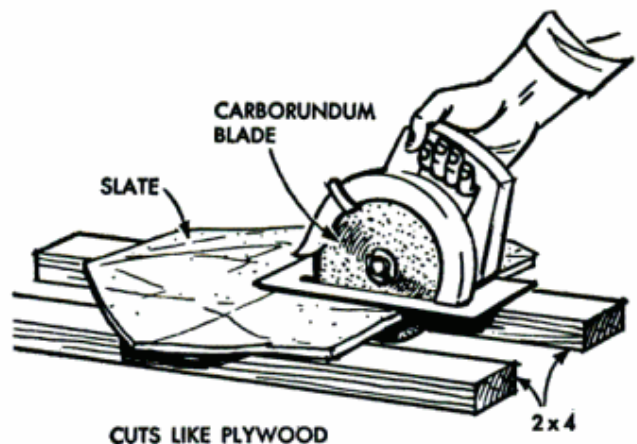


**ALTERNATE STEP B:** Cut through the furring and battens at limit line and pry out with crowbar. Cut short lengths of furring to slip under the trimmed ends of any flooring strips that project far enough beyond their last undisturbed support to be in danger of breaking off under weight. Whether floor is laid directly on sub-floor or is floating, as shown here, the sawn ends of the finish flooring strips must be covered with thin plastic sheeting (such as a dry-cleaner's bag) to prevent moisture in the mortar bed from seeping into the grain and causing water stains in the flooring.



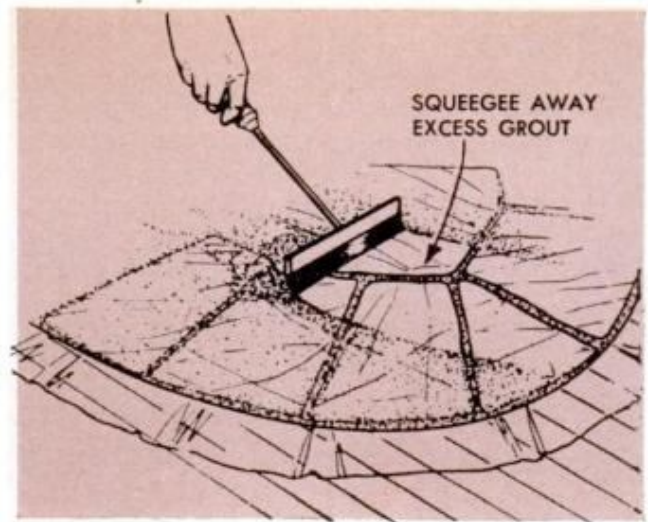
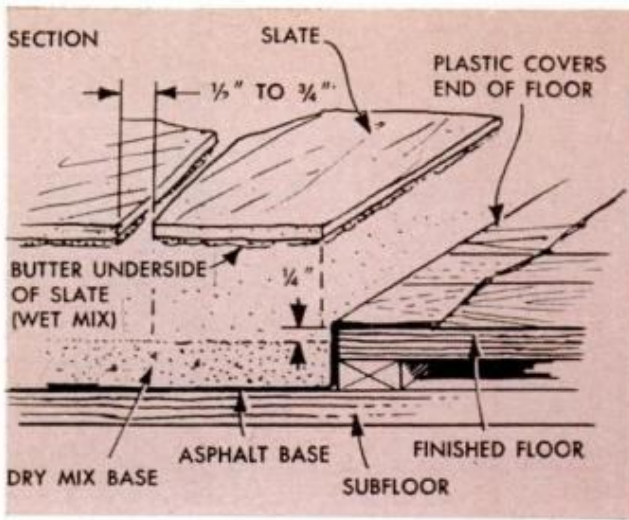
**STEP FOUR:** The threshold is often attached directly to the finish flooring and may have to be pried up before the trimmed-off pieces can be removed from beneath it. This leaves a gap between the interior trim and the exposed subfloor, so cut and nail in a filler strip as shown. The sub-floor should be covered with a layer of building paper before these various gap-fillers are installed. Drive screws through the threshold into the filler strip.

**STEP FIVE:** Use slate from  $\frac{1}{4}$  to  $\frac{3}{4}$  in. thick, in either irregular shapes or cut rectangles. To arrange the best pattern for your space, order half again as much slate as you'll need. You can usually return uncut extras. Slate is sold by weight; enough for 25 sq. ft. runs \$12-\$16. Place largest pieces first, fill in with smaller ones. For cutting, use a masonry blade in your circular saw; wear protective goggles and work outdoors to avoid dust. When all pieces are positioned, lift them out one by one, recreating the pattern on nearby floor.



**STEP SIX:** Mix two parts No. 1 sand to one part cement and add only enough water to make mixture look like wet sand and form firm ball when clenched. Spread to a level about  $\frac{1}{4}$  in. from surface of finish floor and tamp down with a 2x4 scrap or brick. If you have a large area, insert wood strips of same thickness you want mix layer, then ride one end of your leveling straightedge along the strip, as shown at left. When one section is filled level, proceed to adjacent area and use the strip as a guide here, too, before removing it and flowing the mix into the space it occupied.

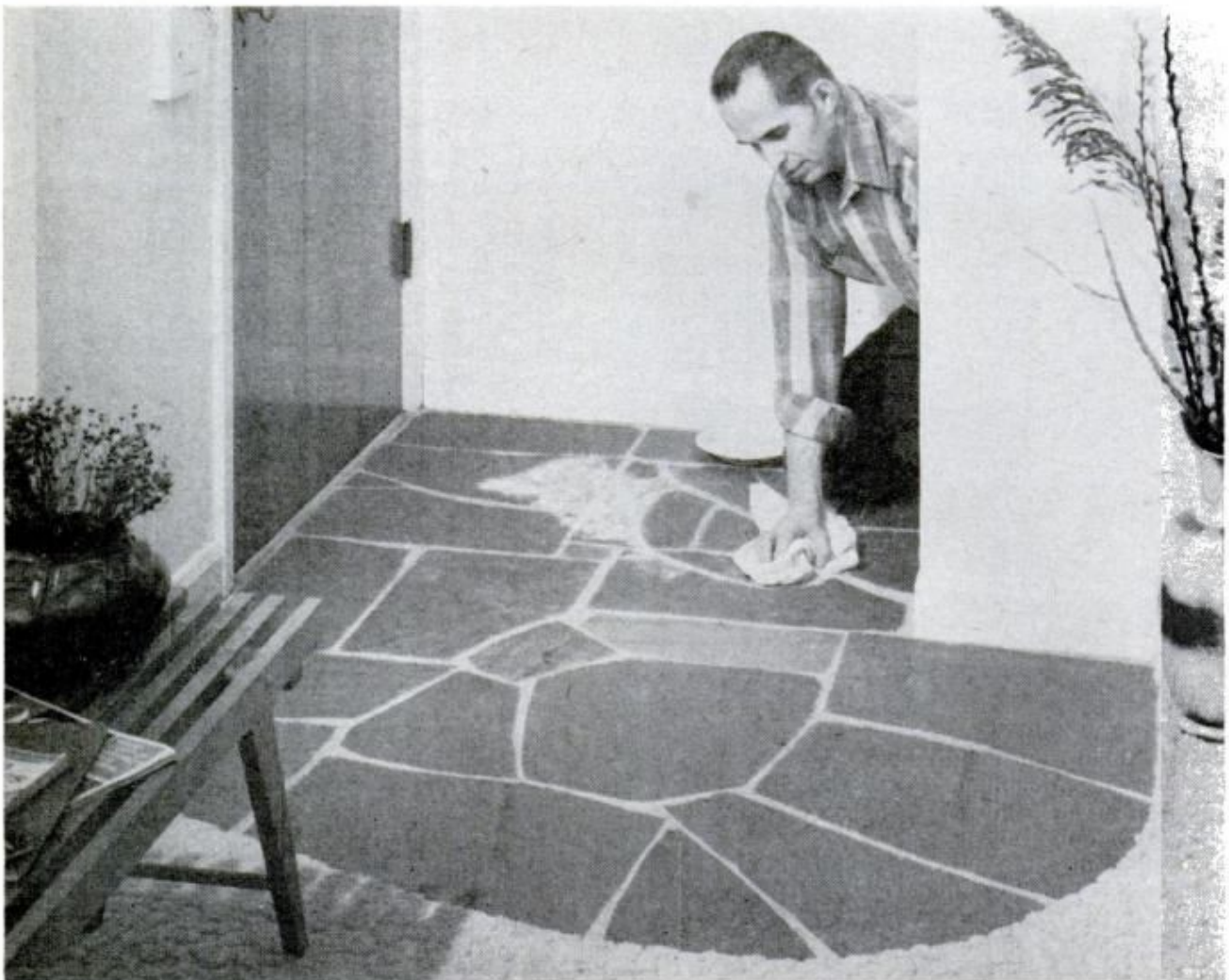




**STEP SEVEN:** Replace slate, as positioned originally. Work each piece back and forth until it's level with existing floor—a carpenter's level helps. Mix another concrete batch, this time a soupy three parts fine sand to two parts cement. Carefully pick up one slate at a time and butter the back with the wet mix. Moisten the area the piece came from by squeezing a wet sponge above it, then replace the slate, taking care to retain proper gaps for neat grout lines.

**STEP EIGHT:** When all slate is back in place, mix small soupy batch to be used for grout, adding just enough lime to whiten to the desired shade. Work this into all gaps and around the edges of outside pieces. Allow it to set for two hours. Then, with a window squeegee, remove as much of the partially dry grout from the face of the slate as possible. Finish the clean-up with a wet sponge. You may have to keep going over it, as cement tends to smear.

**CLEAN OFF REMAINING GROUT** by scrubbing with burlap and sawdust, after slate has set for six to eight hours. A week later, flow on coat of silicone sealer, rub dry in half hour. Slate can be waxed, or left as is





# 2

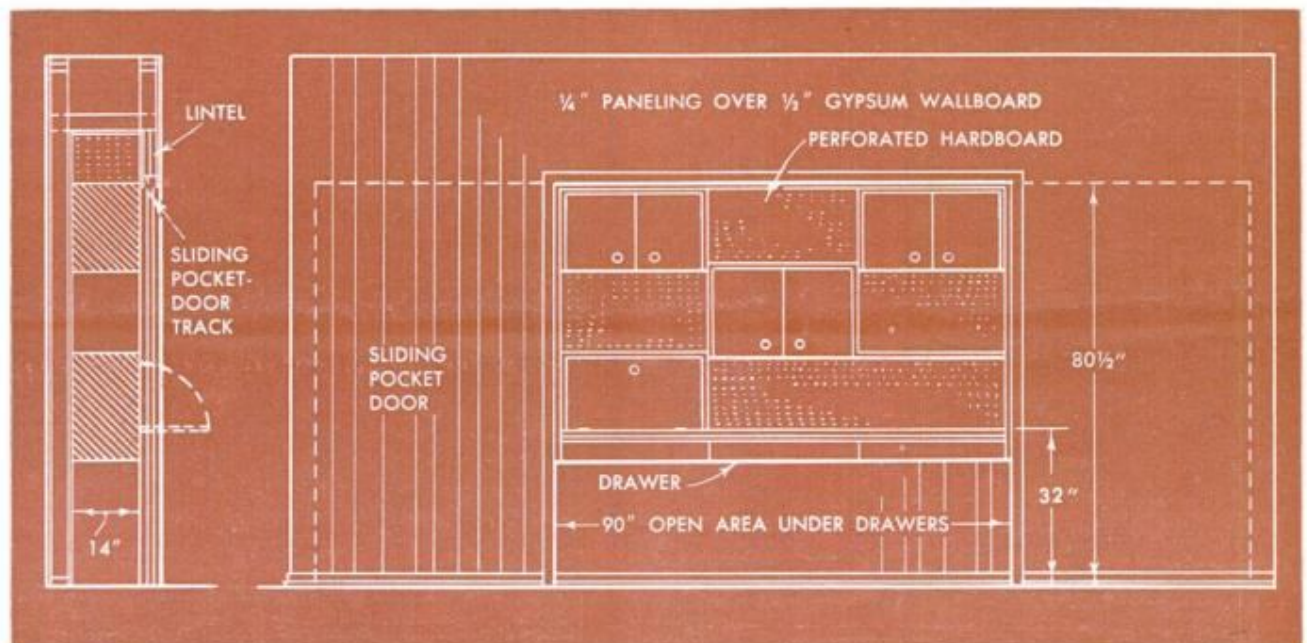
## HOBBY WALL

YOU'VE had it happen. Company drops in. Your wife tells them to sit in the family room while she makes coffee. But Junior has been at work, and the family room turns out to be a mass of model airplanes, tubes of glue, etc. Embarrassing, to say the least.

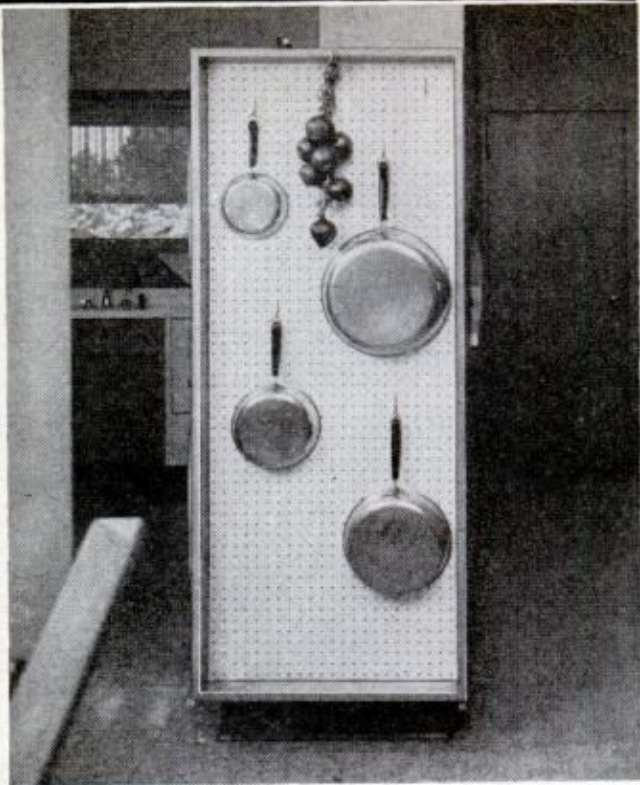
The disappearing hobby wall shown here offers a practical solution to this problem. Built in the family room of a Georgia-Pacific Corp. Research House, it contains recessed book shelves, storage cabinets and a work counter, all of which fit behind a pair of sliding pocket doors. With an arrangement like this, the youngsters can work on their hobbies as long as they please, and all you do to hide the clutter is close the doors.

As shown below, building the hobby wall is far from complicated. The door pockets are framed in the usual manner, and perforated hardboard over  $\frac{3}{4}$ -in furring is used behind the shelves for extra storage capacity.

In this particular house, the wood paneling was put over gypsum wallboard, to reduce noise transmission to the master bedroom behind the wall. However, you can save a few dollars by using furring strips instead of the wallboard, or even fastening the wood panels right to the studs.







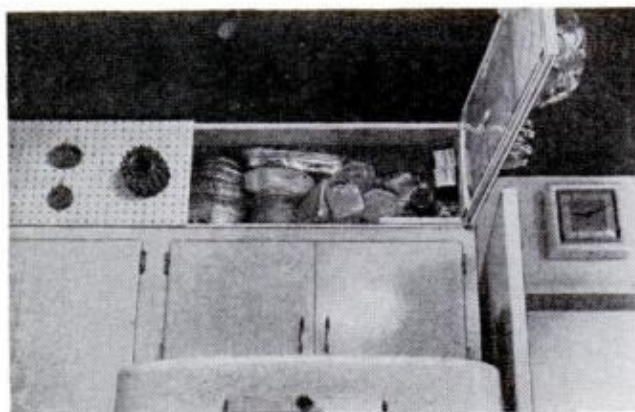
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## PAN AND POT RACK

**HIGHLY FUNCTIONAL** and decorative as well, this perforated hardboard panel for pot and pan storage is strategically at the end of a bank of kitchen cabinets, which form one side of a large U-shaped work area. The over-all size of the panel is 25 x 60 in.

4

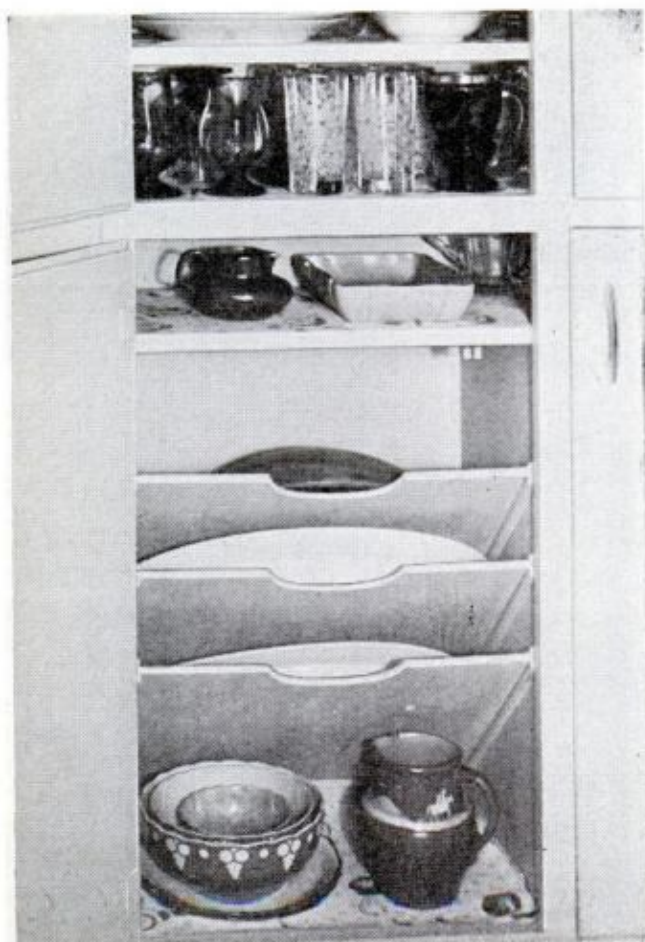
**TINY KITCHEN?** Then put waste space to work as was done here by building a storage area for seldom used items in the soffit space above the cabinets. Perforated hardboard doors serve dual purpose by providing a storage place for decorative dessert molds



5

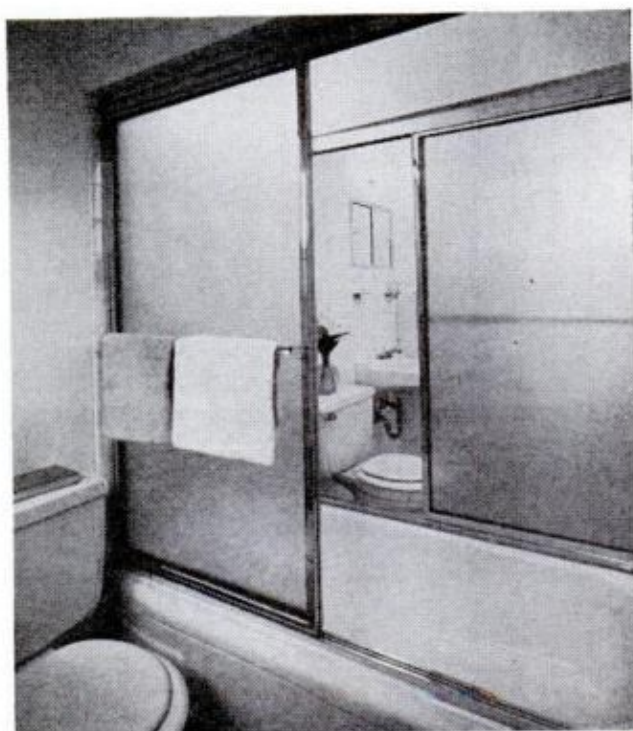
## TRAY STORAGE

**INCLINED SHELVES**, 15 in. wide, are a neat solution to the housewife's old problem of where to store serving trays and platters. When installing shelves in deep cabinets it is best to add a new back to limit the depth to 12 in. for easy tray removal



6

**THE BATHTUB** with sliding frosted glass doors on each side becomes a divider between two bathrooms. One bath serves the master bedroom; the other opens on a hallway near the children's bedrooms. The arrangement offers maximum use with a minimum investment





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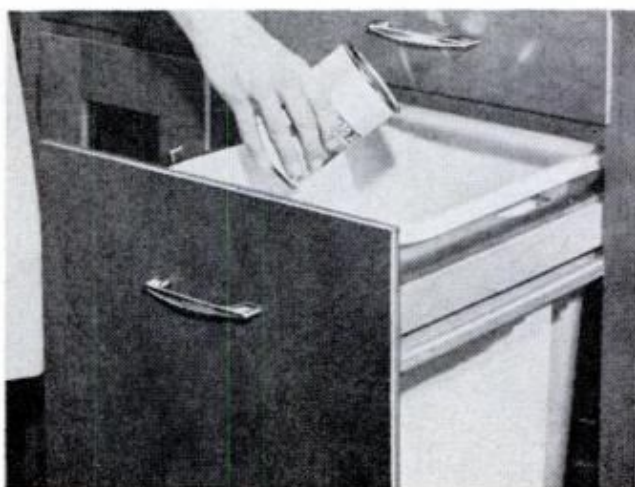
## CHINA CLOSET

**CONVENIENTLY LOCATED** near the kitchen and breakfast room, this 5-ft. wide in-a-closet cabinet stores china, glass and silver. Tracks and brackets permit easy adjustment of shelves. Prized pieces are kept out of harm's way in two pull-out storage trays

8

## WASTE DRAWER

**WHEN CLOSED**, it looks just like any of the other kitchen cabinet drawers, but slide it open and you have a kingsize lift-out waste container that provides a handy place to drop bottles, cans, scraps and vegetable parings when you're preparing a meal



10

## WASTE SPACE

**WASTE SPACE** under a stairway accepted both washing machine and dryer though it was barely 30 in. deep. Exhaust fan, vented to outside of house, draws out heat and moisture. Louvred bi-fold doors hung in a framed opening, close whole thing from view



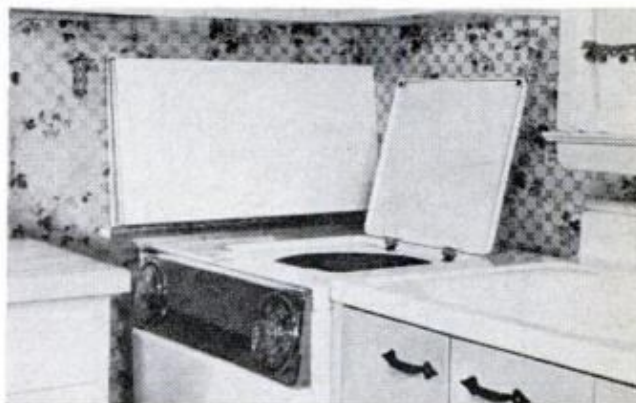
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## FLIP-OVER-COUNTER

**COUNTER SPACE** is at a premium in every kitchen, but you can gain 4-sq. ft. of work surface by hinging this counter to the wall and extending it over the washer or dryer. A center hinge lets the two pieces of plastic-faced plywood fold just like an accordion, back against the wall when the washer is being used



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11

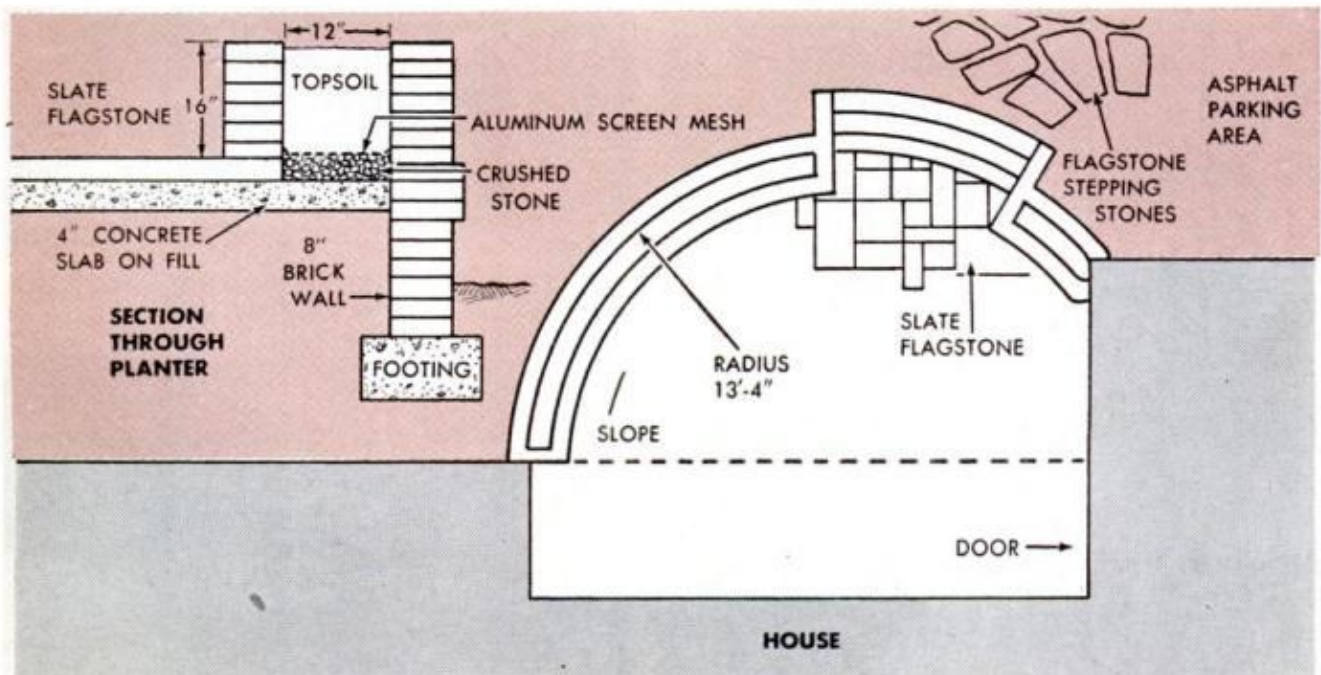
## PATIO PORCH



WHEN the Grant Joslins were planning their new home in Greensboro, N. C., a suggestion made by the landscape architect resulted in this elegant patio-porch. "Why not extend the small recessed porch into an interesting semicircular one?" he said. "This would afford a vantage point for enjoying the view of the lawn and plantings, as well as providing a fine spot for lounging and sunbathing."

In doing so, they enlarged the porch to nearly three times its original size. Its graceful curved shape, walled off with brick planters, adds architectural interest to the exterior of the house and gives a pleasant view from the picture windows.

At night the patio lights add a glow to the trees beyond and to the shrubs and flowers in the planter walls. For parties or just family use it's a favorite spot.





ORDINARILY, there's not much one can do with the dead space under the slanting roof of a second floor other than use it for storage. But architect Walter E. Blue, A.I.A., in planning the bedrooms of a Cape-Cod home, took advantage of the low head room required and built-in twin bunks back under the eaves. Closed off when not in use by louvered bi-fold doors, they appear to be regular closet doors. Swung open, two extra standby beds are always available when sleeping accommodations get tight.

Four drawers allow ample storage for a supply of sheets and blankets. At the head of each bunk is a small shelf for holding such things as books, clock and radio.

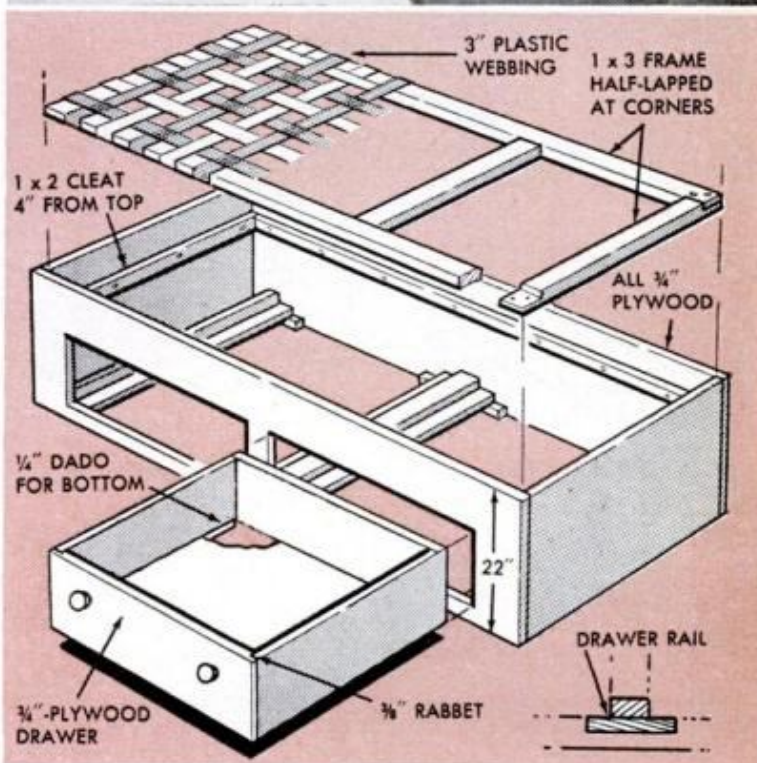
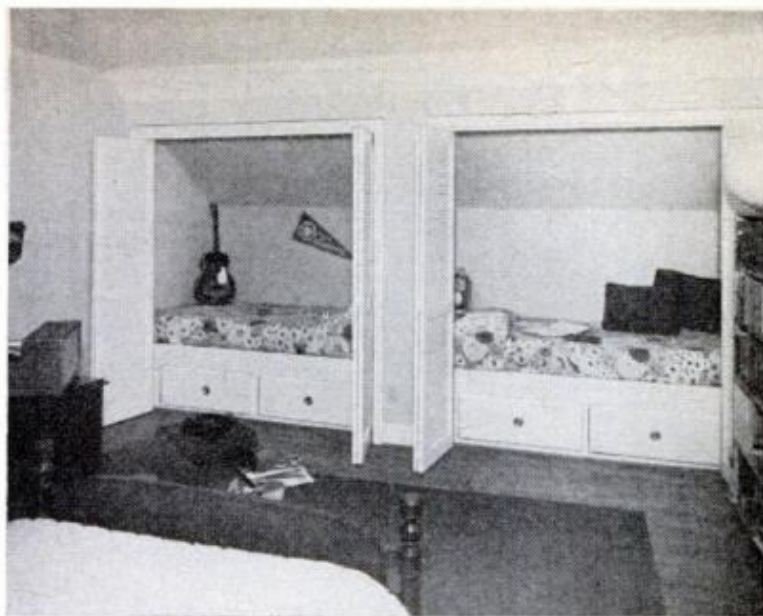
The mattress is supported by a frame laced with plastic webbing. If you prefer, a spring of suitable size may be used instead of the webbed frame. Another option is to dustproof the drawers by installing a sheet of  $\frac{1}{2}$ -in. plywood, using the 1 x 2 in. cleats as support. The spring can then be rested directly on the plywood.

The exact measurements of the built-ins will, of course, depend on the space available, and the dimensions of the room.

**TAKING ADVANTAGE** of the manner in which bi-fold doors open, you can have a handy two-way dressing mirror by using new combination wood-and-mirror doors

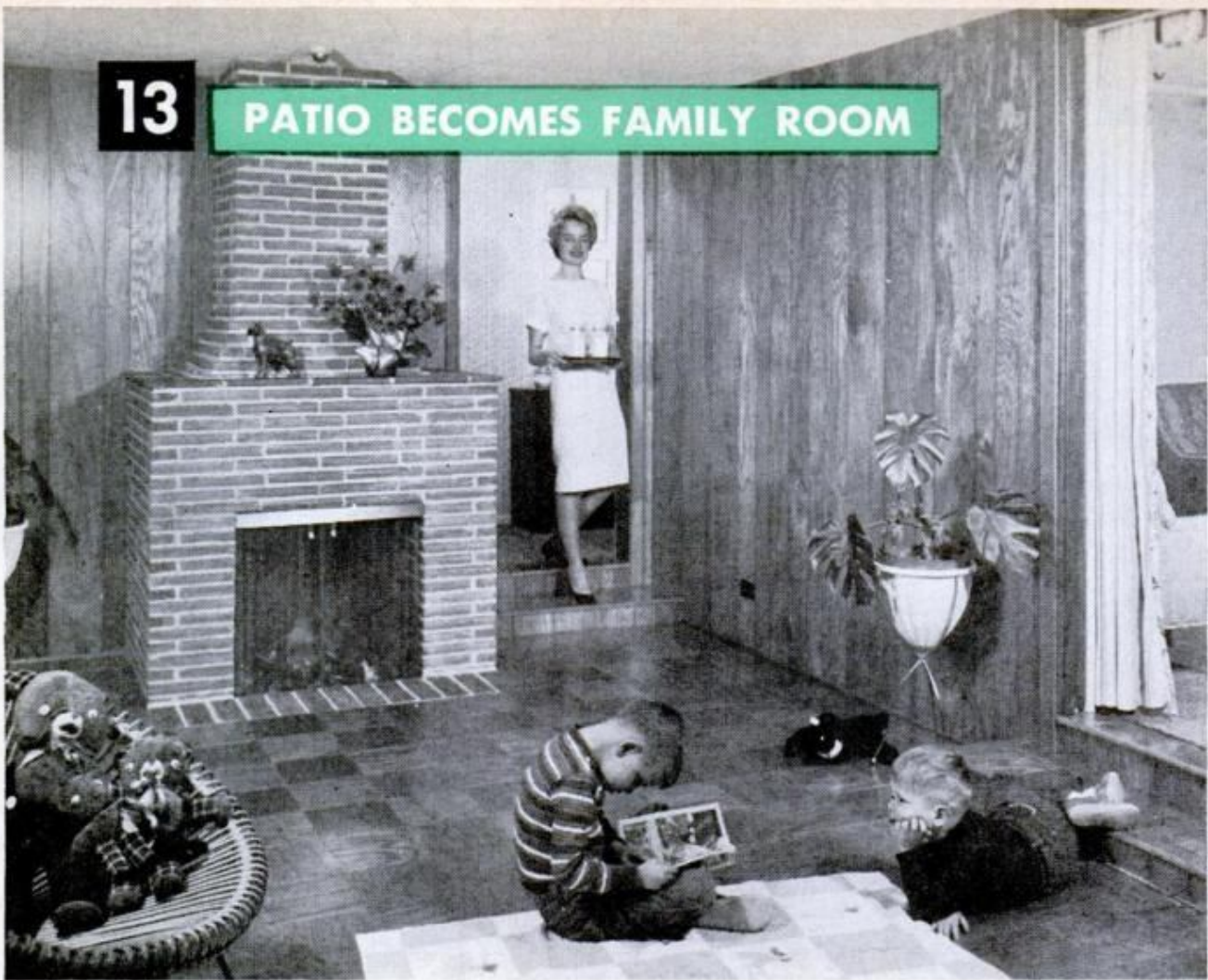


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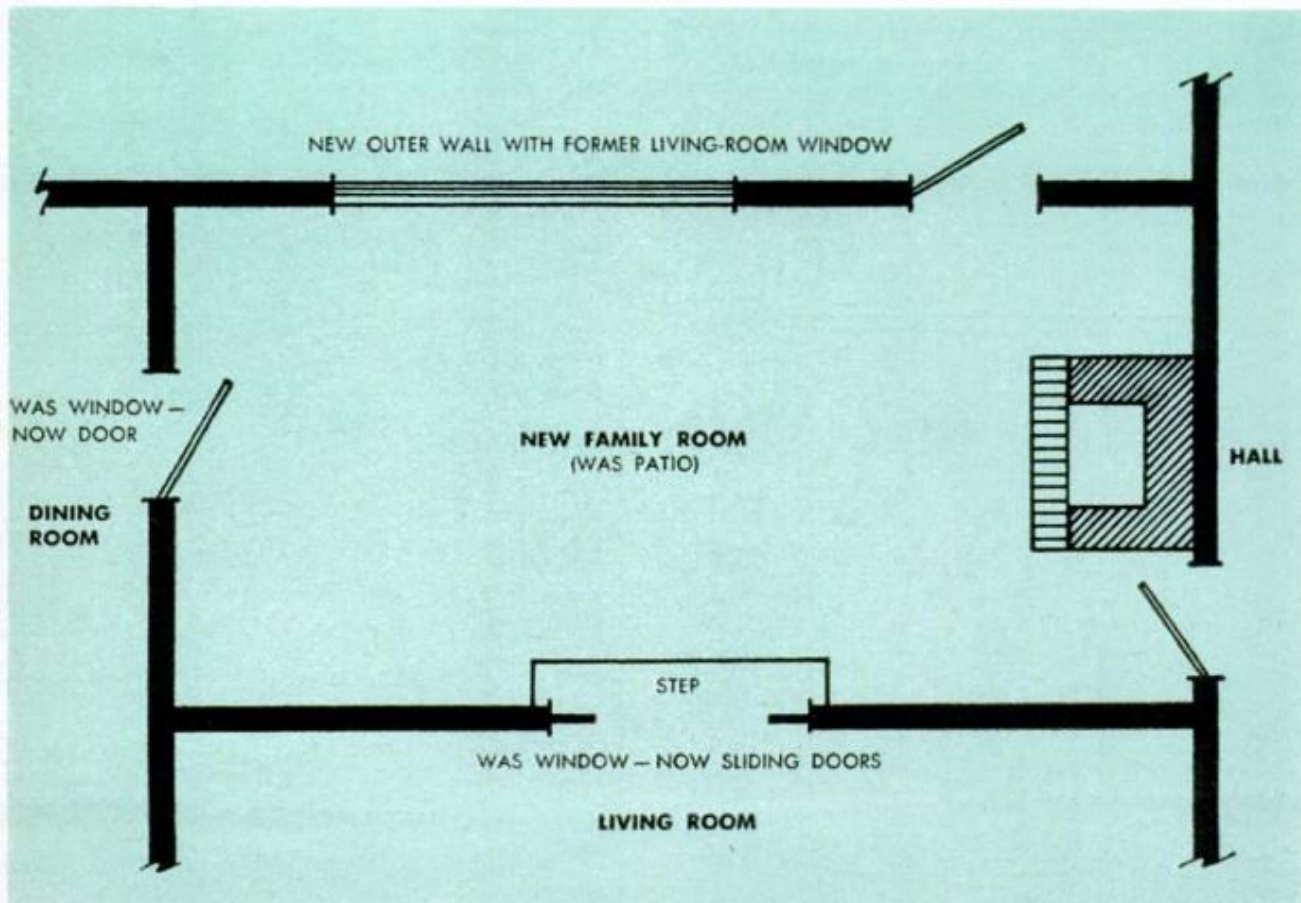


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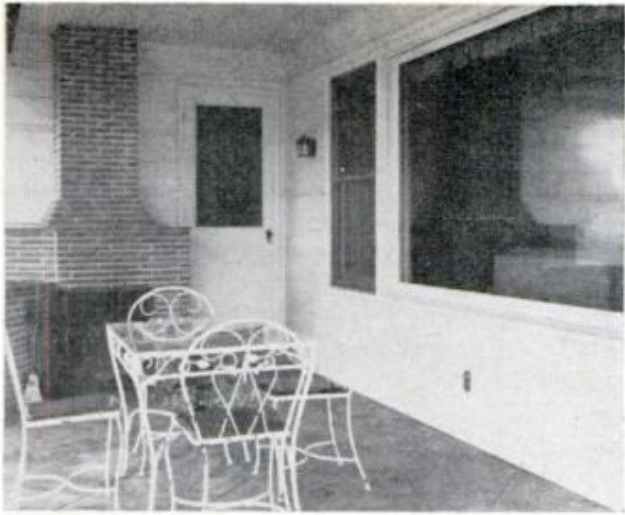




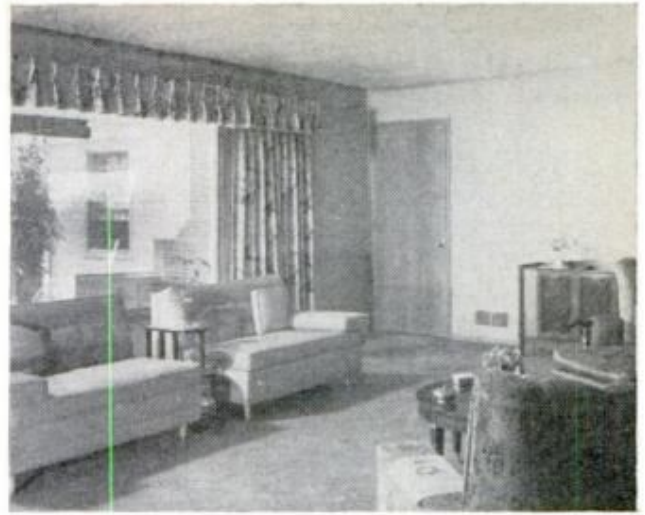
**LITTLE NEW FRAMING** was required in the conversion as only one new wall had to be added, and original floor and ceiling were merely covered. Paneling is mis-matched elm. Fireplace started life as a barbecue







**OLD PATIO** adjoined living room (behind picture window) and dining room, making its location ideal for family room. Project sponsored by Georgia-Pacific

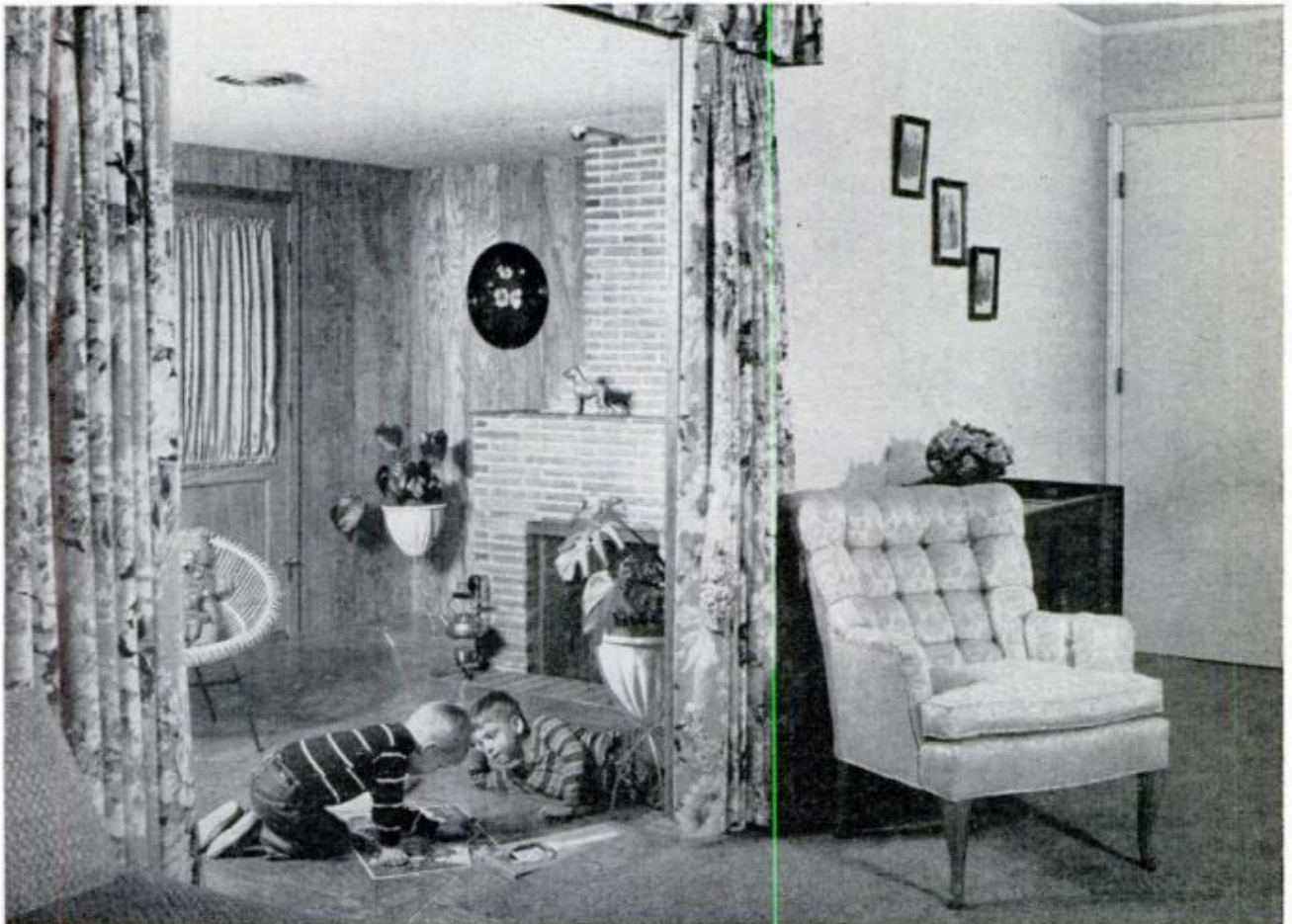


**ORIGINAL LIVING ROOM** didn't get full benefit from the large double-glazed window as patio walls kept out a lot of light and limited the view from inside

WHEN ADDING A ROOM to your house, try to use as much of the original structure as possible. By applying this principle, K. C. Swanson of Portland, Ore., added a 28'-8" x 12' family room to his house for a little under \$1500, using premium materials and help of a professional contractor. If he'd done all the work himself, using standard-grade materials, cost would have dropped to \$400—only a dollar and some change per square foot.

The main reason for this economy was the fact that the room was created by closing in a covered patio. Thus, since the area already had three walls, only one more was required instead of the usual three. The ceiling merely called for a layer of new tile, and the floor needed only plywood subflooring and hardwood tile. For additional savings, the siding and picture window of the original wall were moved out to the new exterior.

**EXISTING LIVING ROOM** is now connected to the family room by sliding glass pocket doors that recede into the walls on either side of the doorway. Projecting step takes care of difference in rooms' floor levels

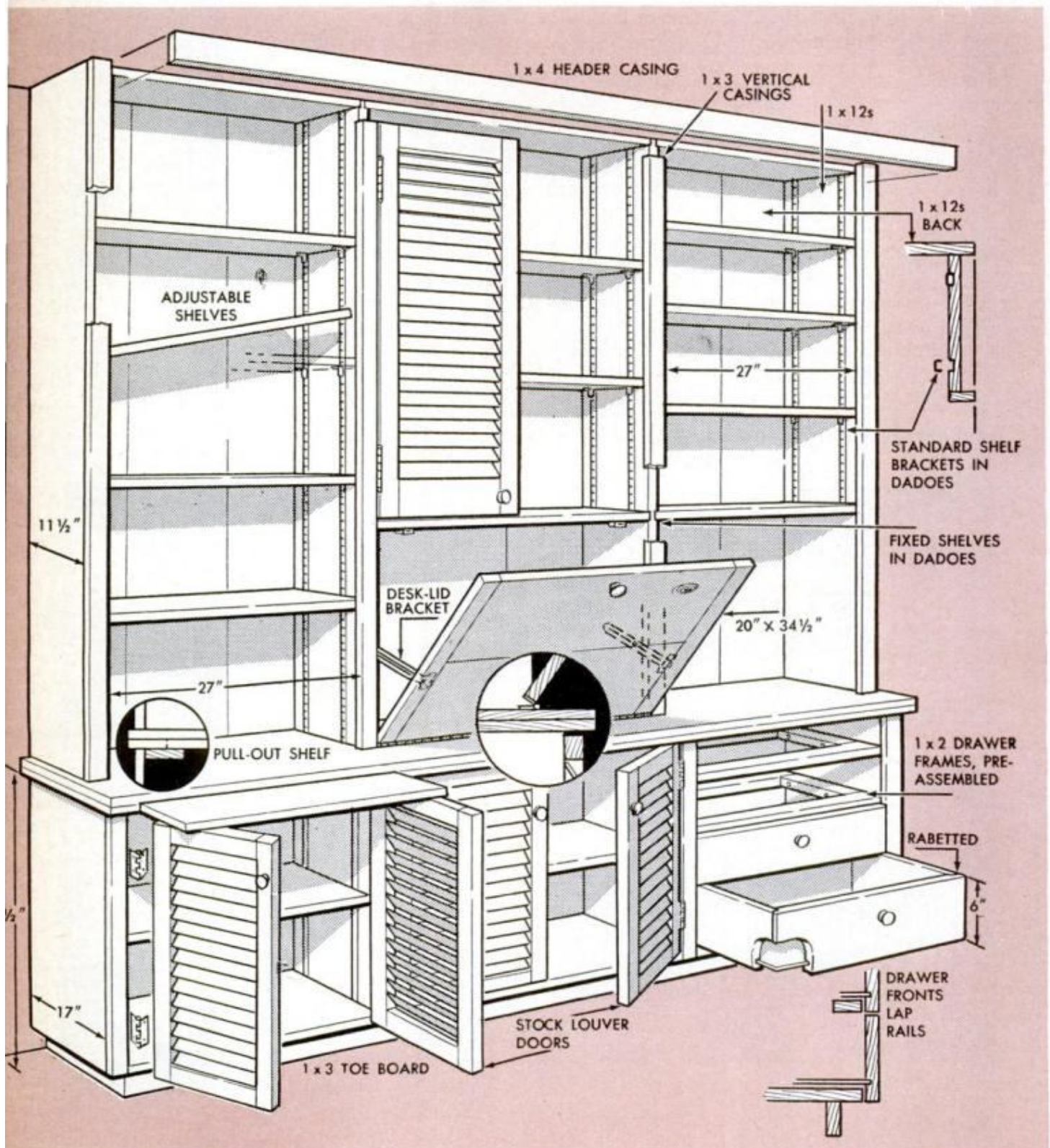




SCIENTISTS don't have a monopoly on the race for space. As American families keep growing, acquiring more possessions and plunging into new hobbies, the problem of finding sufficient storage and activity space becomes more acute. And since few families can afford to move up to a larger house every couple of years, the

only practical solution is to make more efficient use of the space available.

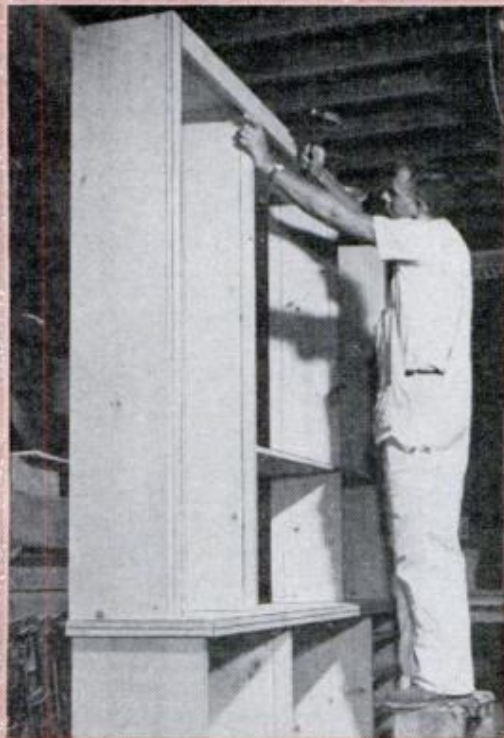
This bookshelf-sewing center is designed to cram the most possible storage and counter space into the smallest floor area. Don't be misled by that "sewing center" label; this versatile unit is equally well suited to model making, stamp collecting



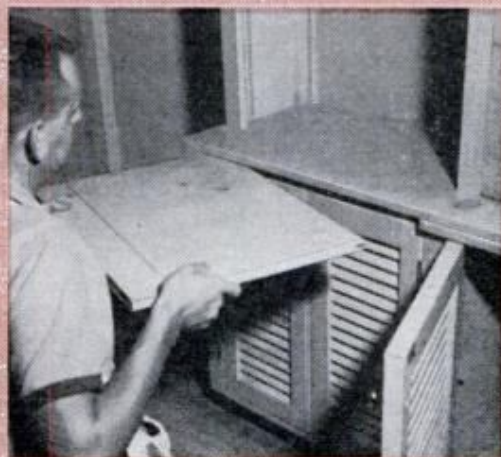


or any other hobby which doesn't require the use of bulky equipment. With yards and yards of open shelf space, it's perfect for displaying collections of any type.

What's the space-saving secret? An expandable counter consisting of fold-down and pull-out shelves, almost doubles the available work area, yet disappears into the narrow wall unit when not in use. Running the shelves right up to the ceiling makes use of *all* the



**TO ASSEMBLE** this attractive built-in, use countersunk finishing nails so the holes may be masked with wood putty. The pull-out shelf, below, extends the full depth of the cabinet and is supported by a pair of concealed wooden runners



available wall space, and while you may have to stand on a chair to reach the upper shelves, these are ideal for holding seldom-used materials.

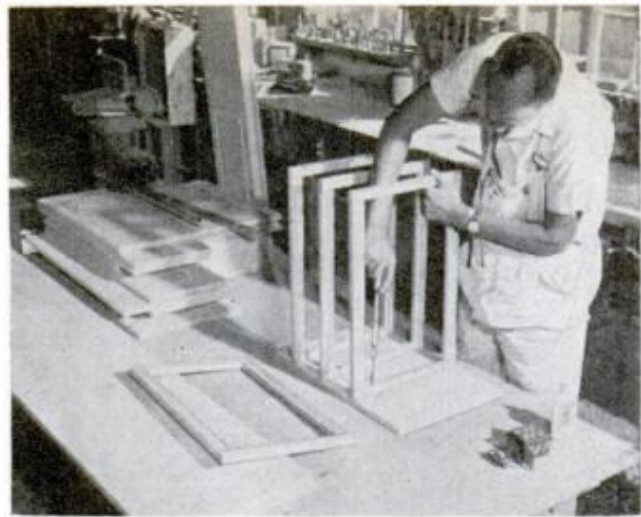
Construction is extremely simple. Sides, shelves and back of the upper bookcase unit are cut from 1 x 12 white pine. Standard shelf brackets set in dadoes in the sides support these shelves. The 1 x 3 vertical casings and the 1 x 4 header casing are also pine, and the louvered doors are available commercially. Make up the fold-down shelf from 1 x 12 and 1 x 2 stock, using glue and bar clamps to assemble it.

The bottom part of the unit is basically similar in construction, though the wider shelves, sides and top must be made up by edge-gluing narrower boards. To allow extra toe room, the 1 x 3 base frame is recessed slightly. Adjustable shelves in the two cabinets are mounted in the same way as the narrower bookshelves above. The 1 x 2 frames supporting the drawers should be assembled before being installed in the cabinet. You can either make the drawers yourself or use ready-made drawers, which are available from most mail-order houses.

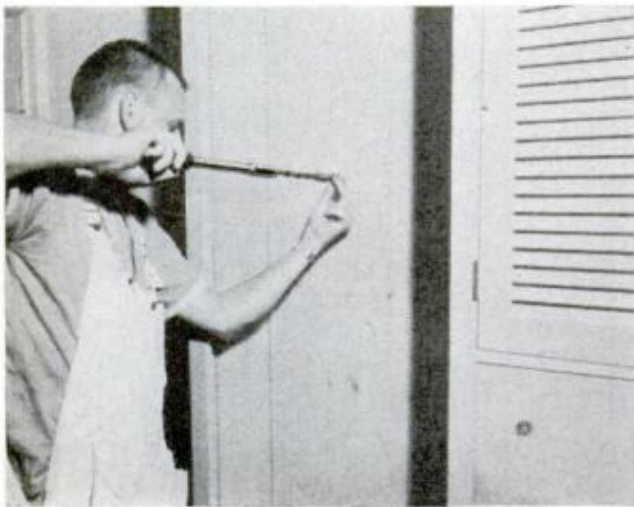




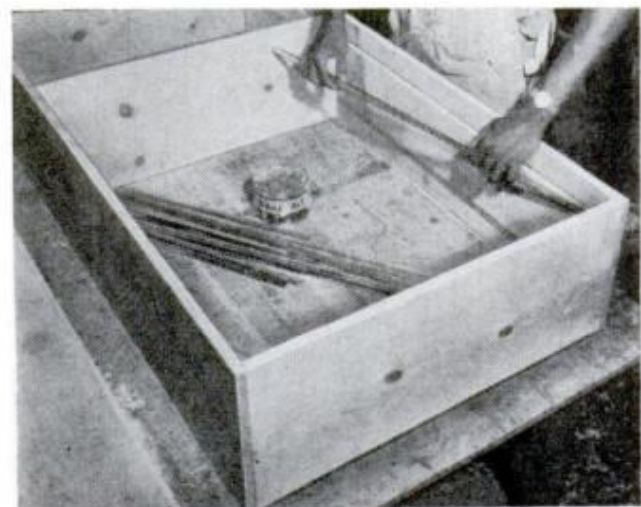
**UPPER PART** of the bookshelf sewing center is assembled first. Note that the top is actually three separate pieces attached by dadoing the uprights. Likewise, the two fixed shelves are set in dados in uprights



**TO SIMPLIFY** construction, the 1 x 2 drawer frames are pre-assembled and drilled before installation. Since these act as runners on which the drawers slide, the joints should be in perfect alignment



**STANDARD BRACKETS** for the adjustable shelves are set in dados in the uprights and secured with short screws. Be sure to stop the dados at the fixed shelves unless you plan to add shelves below these



**USE GLUE AND SCREWS** to fasten the 1 x 12 backing boards to the frame of the upper part of the unit. Then set this on the lower unit and secure it to the wall by driving screws through back into studs

**FINISHING TOUCH** applied after both parts of the unit have been secured to the wall is a strip of cove molding to cover the joint between the top of the built-in and the ceiling both in front and at sides



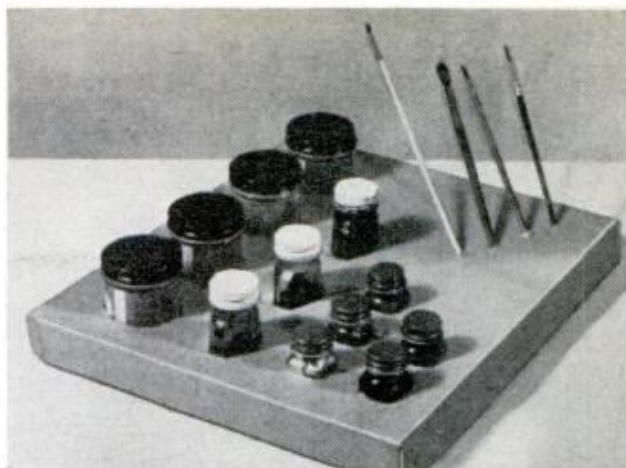
Protruding slightly over the cabinet unit, a 1 x 3 frame not only braces the counter, but provides a recess for the pull-out shelf, as shown in the detail. The edges of the counter and frame should be flush. To mount the counter, drive screws up through the frame into it, then sand the edges to assure a perfectly smooth surface. Ideally, this frame-counter construction should appear to be a single thick board once the finish is applied.

The Western Pine Association designed this unit so that it could easily be modified to fit tighter space limitations. Thus, you can restrict the width to only one cabinet, if necessary, and incorporate a number of design features in this narrower unit. No matter how you decide to modify it, this built-in will be an attractive and useful addition to any room in your home. ★★



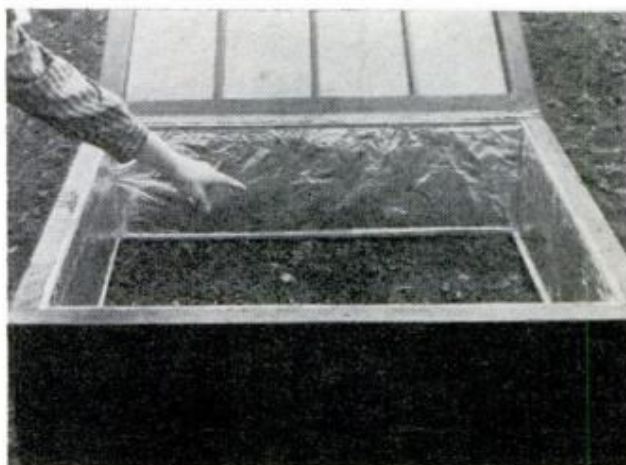
## Box-Top Palette

There's no need to run the risk of tipping a paint or ink bottle and spoiling a nearly completed piece of artwork. A sturdy lid from a cardboard box can be made into a stand for your paints and brushes. Arrange the jars and other materials on the lid and outline them with a pencil. Then use a knife or razor blade to cut an opening for each item. The cut should be made slightly inside the line for a snug fit. The paintbrush handles may be used to punch out their own openings by simply poking them through the box.—*Ann W. Harris*



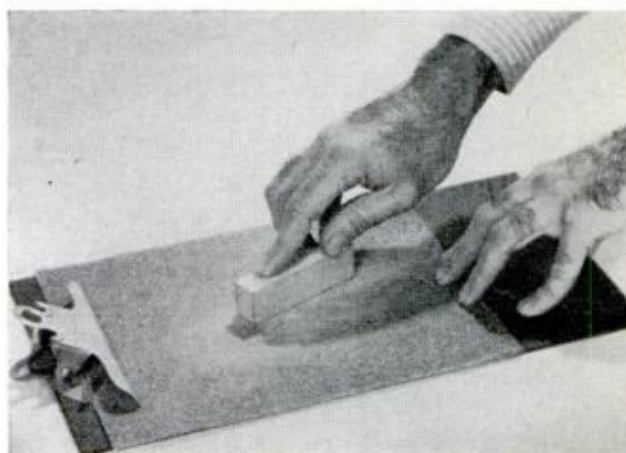
## Foil Improves Coldframe

If you have had poor results with your coldframes, here is a quick, easy and inexpensive way to increase their efficiency. All you have to do is line the frame with some heavy-duty aluminum foil. This concentrates the sun's heat and reflects light evenly to produce straight and sturdy plants that will continue to thrive when they are eventually transplanted into your garden. After stapling, nail lattice strips or scrap stock through the foil and into the wood of the frame to hold the edges of the foil securely in place.—*John Krill*



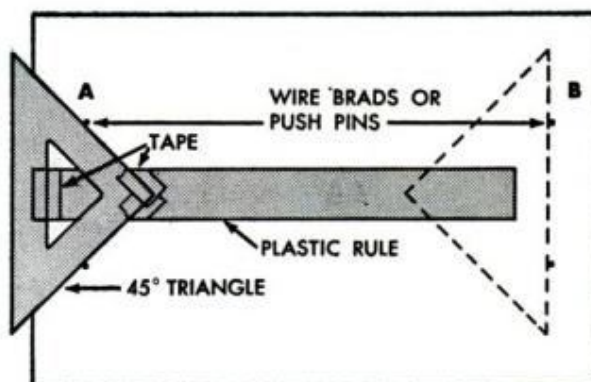
## Sanding Small Work

At best, hand sanding small work is very tedious work. Usually the most effective technique is to keep the sandpaper in a fixed position and move the work back and forth against it. But it is difficult to hold the sandpaper down with one hand and move the work with the other. The job can be simplified by using an ordinary office clipboard to secure the paper at one end. The strong spring clip will maintain a firm grip on the sandpaper and allow you to work comfortably.—*Arthur R. Tanner*



## Perspective Drawing Tool

Inspired by the perspective T-square shown in *PM's* January 1963 issue, I designed this simplified version. I drove four brads into the drawing board and then taped a 45 deg. triangle to a rule. The tool is used by placing the 90 deg. sides of the triangle against the brads. Rotating the triangle moves the rule in an arc. For parallel lines, place the triangle's straight edge against the brads.—*Fred Lettino*





## Trip to the Country Costs 30G in Gems

A \$30,000 jewel burglary in an 11th floor suite of the Hotel Drake, 440 Park Ave., was reported to police today.

Gems had been taken from the apartment occupied by the past four years by Sampson E. Field and his wife, Miriam, who had left last Saturday for the country and returned to vote.

No sign of forced entry was found, nor was the bedroom, where the jewels were kept, disturbed.

Detectives of the E. 51st precinct suspected a "celluloid burglar"—who uses a bit of celluloid to manipulate locks.

Mr. Field, one-time president of the New York Employing Printers Assn., is head of Publishers Printing-Rogers Kellogg Corp., 47-36 38th st., Long Island City, Queens. Just a month ago burglars

made a double haul just above the Field suite, on the 12th floor of the Drake.

They stole \$8,000 in furs from actress Patricia Wymore, wife of the late movie star Errol Flynn, and \$10,000 in jewels from Dr. Leonard J. Lyon of Los Angeles.

The giant of recent jewel robberies, of course, last Saturday's holdup, in Hotel Pierre, of Mary Livingston, wife of movie-TV Jack Benny.

The armed thief took 600 in gems. The prize was a 27-carat aquamarine diamond ring worth \$150,000.

## Grabbed, Tells Of 20G Haul

Bob Cornfield, 27, described by police as the dapper burglar who pulled a string of jobs at local hotels, was held yesterday in a \$15,000 bail in Criminal Court in a hearing Monday.

Cornfield was arrested Wednesday night. Detectives who had trailed him for several days, last him after he entered the plush St. Francis. They waited outside.

They were there to grab him when he stepped out at an hour later pursued by Ronald N. Night manager, who said a maid had spotted Cornfield trying to open a room door with a celluloid strip.

Police said he admitted taking \$40,000 in jewels from the suite of Mrs. Madelyn Repetti, Oklahoma socialite, last New Year's Eve, and \$6,000 in valuables from the room of Dr. Theodore Doehner of Washington Heights, last Friday.

## Another Celluloid Burglar Arrested

Further confirmation of police belief that the majority of local burglaries are accomplished with a device available to all, came today with the arrest of Harry Rinehart, 31, after weeks of careful stake-outs.

Rinehart casually told police how he had stolen \$400,000 in furs and hi-fi equipment from plush midtown apartment houses by using a celluloid strip.

Yesterday when he was caught, Rinehart said he had left his girl friend taking a bath in his apartment, taken a cab downtown, made his haul and returned before his girl had finished bathing. He didn't even know he had left.

## Orchestra Aid's Apartment Looted

The town house apartment of Mr. and Mrs. Judson Betts was looted of more than two dozen pieces of jewelry worth \$20,000 while the couple were attending a film premiere, police revealed today.

Betts, treasurer of the Philharmonic Society, and his wife, a Spanish countess and film actress, discovered the theft yesterday when they returned from a Newark screening of "Next Year at Tranquility" in which Mrs. Betts speaks.

Police said the thieves probably entered by tripping the door's single lock with either a celluloid strip or a metal pick.

By Alfred W. Lees

from material supplied by Joseph Braunstein

# YOU CAN FOIL THE LOCK ARTISTS

**YOU STEP OUT** and pull the door shut behind you, testing the knob with a brief twist. Satisfied that the automatic latch has set, you turn away with a confident stride. But it may well be a false confidence—perhaps you'll return to find unexpected visitors have stripped your home or hotel room of your most valued possessions.

If the current rash of forced-entries into luxury hotels, apartment houses and homes teaches us anything, it's that we've put

**DO THE TWIST**—double-lock your door by key. The snap latch sets automatically, but you're not securely locked till you manually shoot that dead bolt. And check to see that push buttons are set

far too much trust in the common door lock. Look at the newspaper clippings, above: in every case, the burglar walked through the front door. And chances are, he wasn't even a skilled lockpicker!

A little knowledge of how these through-the-door crooks operate can make you a whole lot less vulnerable to theft—both in your own home, and whenever you must stay in a hotel or motel.

Burglars fall into three categories: the plastic strippers (featured in our four news clips), the lockpickers, and the key forgers—in that order of predominance. In city robberies, the strip boys are the major menace, since any punk can learn the trick. Where only a snap latch prevents a door from being opened, it's not difficult to slide a piece of celluloid between the panel face and the stop strip, urging it around the corner until it bears against the bevel of the latch, as shown in the first sketch, next page. Then, as the celluloid continues across the strike plate, it pushes the spring-loaded tongue back. Who needs experience?

Skilled pick men are so much rarer that merely double-locking all doors would prevent over half of our burglaries. There's no bevel on the dead bolt. That's why you must turn it into the strike plate by hand,

POPULAR MECHANICS

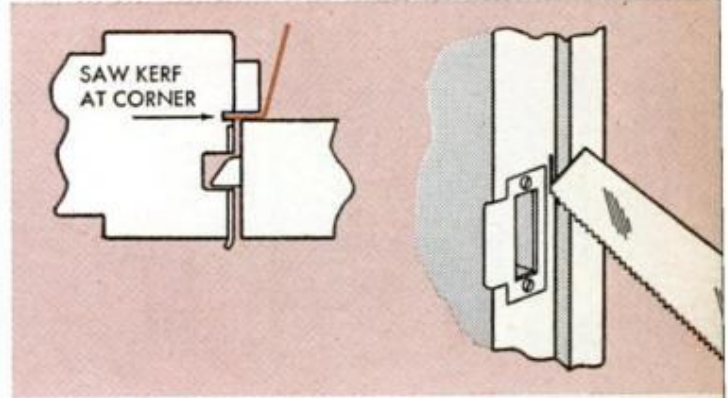
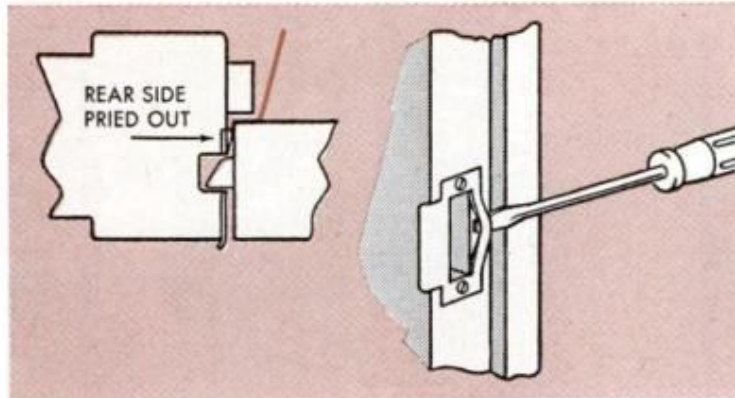
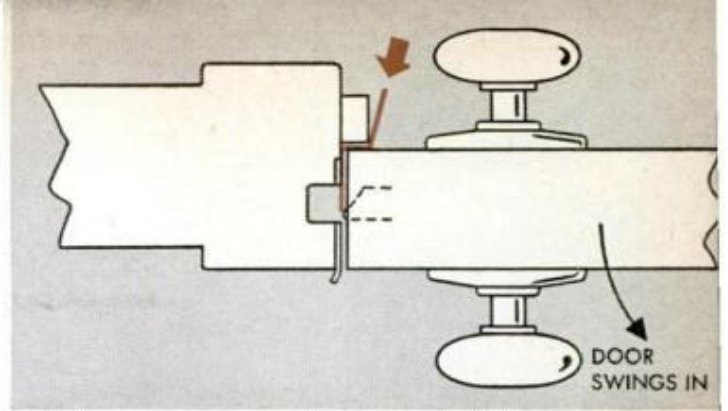
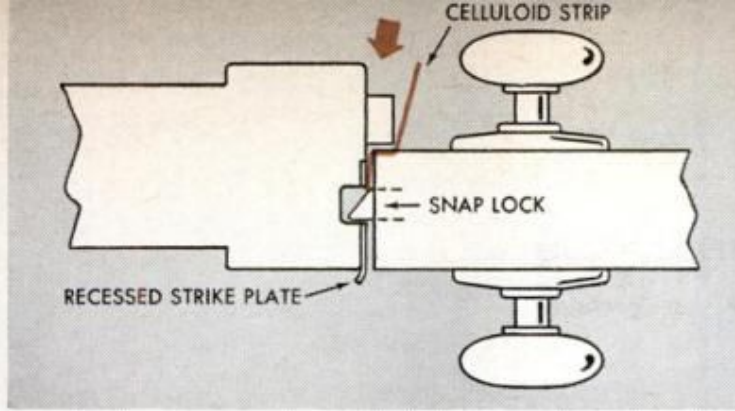
DEAD BOLT



SNAP LOCK

PUSH BUTTONS





either with a key (from the outside) or with the night-latch knob (from within). A surprising number of people merely slam the door behind them as they leave—even though they've just pocketed the key they'll need to get back in, and could insure themselves against theft in their absence by simply twisting that key in the lock.

Of course, you don't always have the chance. Some contractors cut costs by installing *only* snap locks—and these economizers include the builders of many respectable hotels and motels.

In such a case, there's a simple precaution you can take to safeguard your valuables while you're out—so simple, in fact, that you can use it on a hotel lock, if you find yourself assigned to a room without a dead bolt. It involves a slight modification of the strike plate so that a plastic strip (or any other flexible insert) will be stopped before it reaches the tongue's bevel. Where the plate is simply recessed into a wood jamb, as in the lower-left sketch above, you need only dig the blade of a screwdriver under the inner edge of the plate and pry against the stop strip to bow that edge out of the recess. Few doors fit snugly enough to cause any binding on the bent plate.

But where you can't get a pry under the plate, it's equally effective to make a saw kerf beside the stop so that the entering strip seats in it and won't turn the corner. If there's room, you might, instead, drive flathead screws or tacks in front of the plate, letting them protrude enough to halt a strip. Whichever technique you choose, it will give you a sense not only of security, but of smug satisfaction that you're frustrating someone who's out to get you.

Neither double-locking nor strip-stopping will, of course, foil lockpickers or key forgers. And though these are far fewer in number they constitute a threat because we make things too easy for them. There are all kinds of devices on the market for picking locks, and some of them require as little skill to use as the plastic strip. One wicked little gadget looks like a soldering gun. You insert its needle nose in any conventional pin-tumbler lock, pull the trigger and—you're in, without a telltale trace on the lock. To a thief, this item would be cheap at twice its \$20 pricetag.

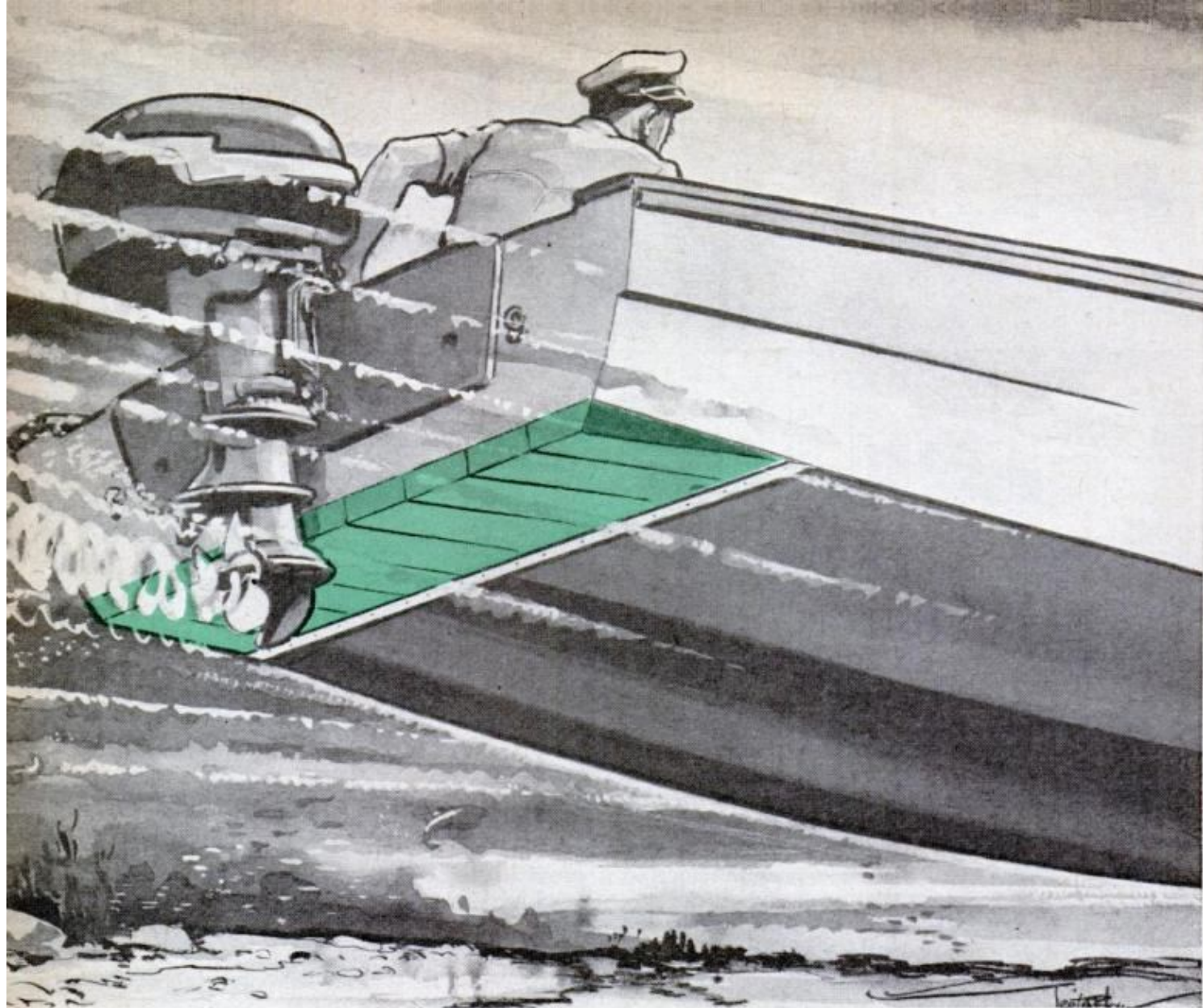
Manufacturers of such equipment, recognizing its potential danger in the wrong hands, establish conditions of sale to protect the public. This pistol tool, for example, must be ordered on a letterhead from a

[\(Please turn to page 208\)](#)

**SAFEST LOCK?** The seven tumblers, spaced around the circular key slot, must be depressed by notches of varying depths in the tubular key. They're not all lined up waiting to be manipulated by a pick







## SHIM UP YOUR STERN

By John D. and Irene Lenk

**A boat that squats at cruising speeds can't give you the best possible performance, and will probably cost you extra money at the fuel dock. Here's one way of giving that stern a lift**

**D**OES YOUR BOAT "squat" at cruising speeds? If so, your boating not only isn't as much fun as it could be, but it's probably costing you more than it should.

When the bow rides high and the stern hangs low, the wetted surface is increased, and you need more power to push the hull through the water; this bow-high attitude also changes the thrust angle of the propeller, making it less efficient. Both of these produce a loss of speed, and usually, increased fuel consumption.

There are a great many remedies for squatting—change the tilt-pin setting, experiment with different props, redistribute

the load—and there's a pretty good chance that you can pull up that dragging stern by trying one or more of these common corrections for such trim troubles. However, if you've tried them all without success, give some consideration to installing a stern lift, or wedge.

A wedge is just that: a number of tapering pieces of wood of the same size mounted side by side to form a unit which runs all the way across the bottom at the transom. Its effect is similar to that of depressing the elevators on an aircraft: the stern goes up and the bow comes down, resulting in a proper planing attitude. This,





**OUTER PIECES** should be faired to match the angle of the sides and transom to avoid creating turbulence



**METAL FAIRING STRIP** mounted along leading edge of wedge would be omitted if plan to add fiberglass

in turn, means greater speed at a given r.p.m., or less fuel consumption, or both.

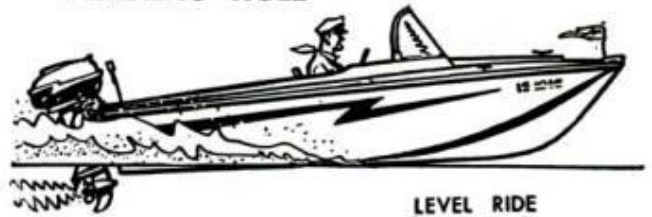
Since a wedge installation is actually a radical modification—adding a hook to the hull—be absolutely sure that you have explored all other possible alternatives. It may even be possible that your present motor simply isn't powerful enough to plane the boat, and to be on the safe side, you might arrange a test run with a larger motor. Most outboard dealers will be happy to co-operate.

Many boaters take a dim view of stern lifts, arguing that squatting is caused by a poor hull design. This may be true in many cases, but if there is a low-cost method of making the boat operate more efficiently, why not use it? Another objection is that a wedge is only effective at high speeds. Again, it's true that the effectiveness increases with the speed, but then so does drag resulting from squatting.

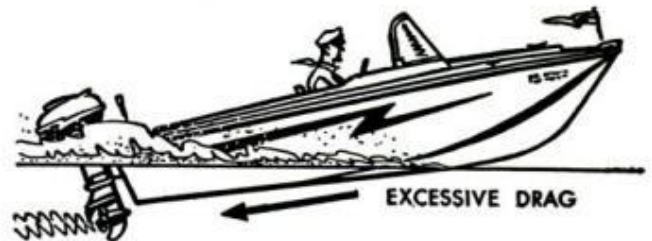
The one practical argument against a lift or wedge is that it can cause the boat to "dive" at high speeds. Since this is an indication of an improper installation—making the wedge too thick at the stern end—it doesn't make a strong case against stern lifts in general.

On the plus side, the table below shows

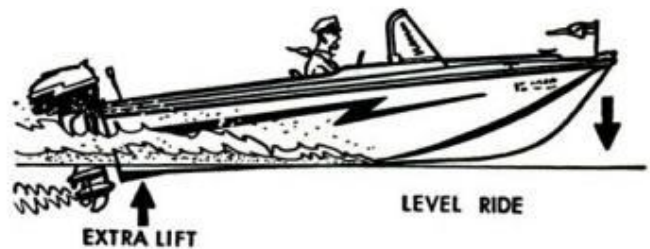
### PLANING HULL



### SQUATTING HULL



### HULL WITH LIFTS



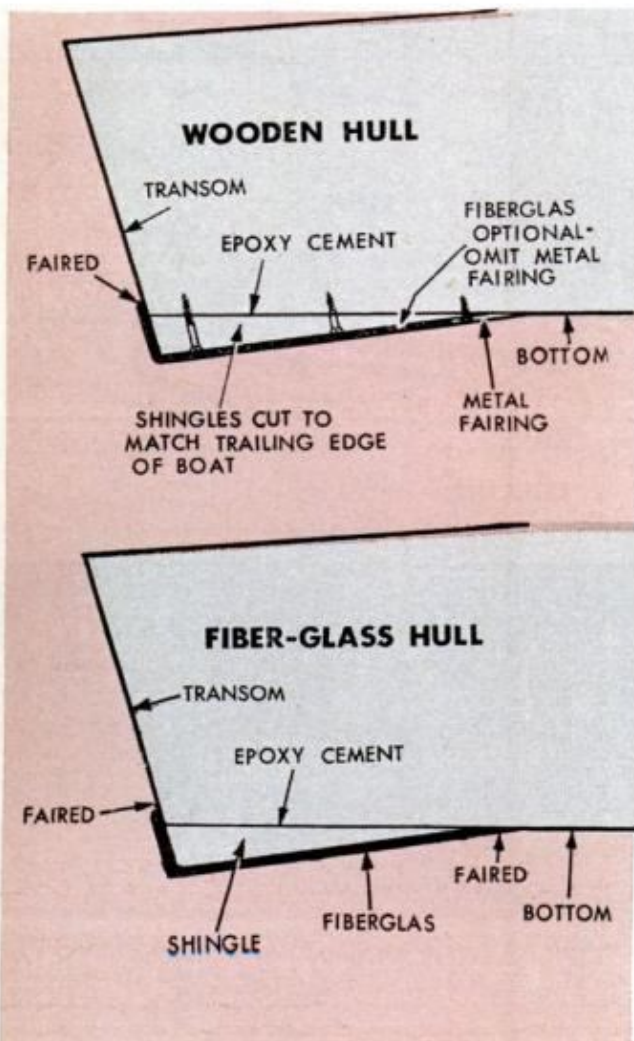
### TEST RESULTS

R, P, M.		2000	2500	3000	3500
TIME (IN MINUTES) FOR A ONE MILE RUN	WITHOUT LIFT	6.17	4.17	3.17	2.46
	WITH LIFT	5.33	3.52	2.56	2.28
SPEED (IN KNOTS)	WITHOUT LIFT	9.57	14.3	18.3	21.7
	WITH LIFT	10.2	15.5	20.3	24.3
FUEL CONSUMPTION (GALS.)	WITHOUT LIFT	(60 MILES RUN)		60	
	WITH LIFT			52	





**WEDGE INSTALLATION** on a wood hull, above, uses screws in addition to epoxy. If covered with fiberglass, fairing strip may be omitted. In drawings below, both wedge and fiberglass have been exaggerated



just how much a squatting boat's performance can be improved by the addition of a stern wedge. These before-and-after figures were obtained from a 35-ft. cruiser equipped with twin Diesels putting out a total of 350 hp.

As for installing a wedge on your boat, there are no hard-and-fast rules, and in fact, very few guidelines. Keep in mind that the thicker you make the wedge, the greater will be the lifting effect. Thus, a short wedge with a thick trailing edge is best for low-speed boats, while a longer wedge with a thinner trailing edge is better suited to high-speed hulls.

The big 35-footer used relatively short hardwood wedges which were  $\frac{3}{4}$  in. thick at the trailing edge. As a rule of thumb, a wedge for a boat up to 18 ft. long should be no thicker than  $\frac{1}{2}$  in. Following the same rough guide, the maximum wedge thickness for a 22-footer would be  $\frac{9}{16}$  in.; for a 27-footer,  $\frac{5}{8}$  in.; and for a 32-footer,  $1\frac{1}{16}$  in. Length may be anywhere between 12 in. and 15 in.

Since the wedge will become a part of the hull, it should be made of a material of comparable strength. The shingle-shaped pieces used to make up a wedge aren't available commercially, but they can easily be formed in your shop. You might even consider using roofing shingles, strengthening such a wedge with an extra layer of fiberglass. These may be obtained in the proper lengths, and they come in butt thickness up to  $\frac{5}{8}$  in. However, make sure that they are all the same size and have the same taper.

Don't try to install a wedge on a hull which already has a built-in hook, since this will usually result in excessive lift and have the same effect as using a wedge which is too thick. Check the hull from the transom edge forward with a batten, and if you discover a hook in excess of  $\frac{1}{8}$  in., forget about the wedge idea.

If possible, make a trial run after mounting the wedge but before covering it with fiberglass or paint. If you notice a tendency to dive at high speeds, remove  $\frac{1}{8}$  in. or so, since this tendency will be ever more pronounced once the fiberglass has been applied. Since every wedge is a custom installation, arriving at the exact thickness is mainly a trial-and-error operation.

Commercial afterplanes mounted on the transom will often duplicate the effect of a wedge. The rigid type simply increases the area of the planing platform. Those which are adjustable operate like the airplane elevators previously mentioned, making it possible to create a deep-wedge effect while climbing to plane, then change to the minimum necessary angle to maintain proper trim. ★★★



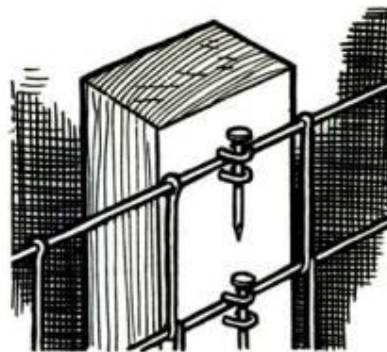
## TAKE A HINT FROM READERS



**MITER FRAMES** can be clamped with two corner blocks cut from hardwood scraps. Put waxed paper between the blocks and the work to prevent sticking



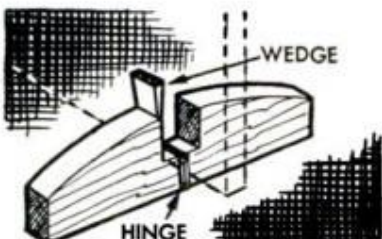
**SAWING STEEL ROD** off squarely by hand is a simple trick if you first run a guide line around the rod with a pipe cutter and saw along the line



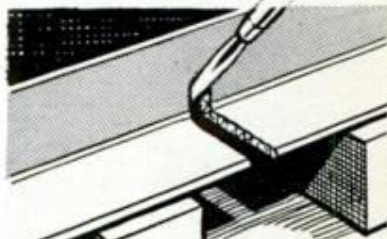
**TEMPORARY WIRE FENCING** is easy to remove if staples are driven above and below the wire. A nail slipped through each pair of staples holds wire



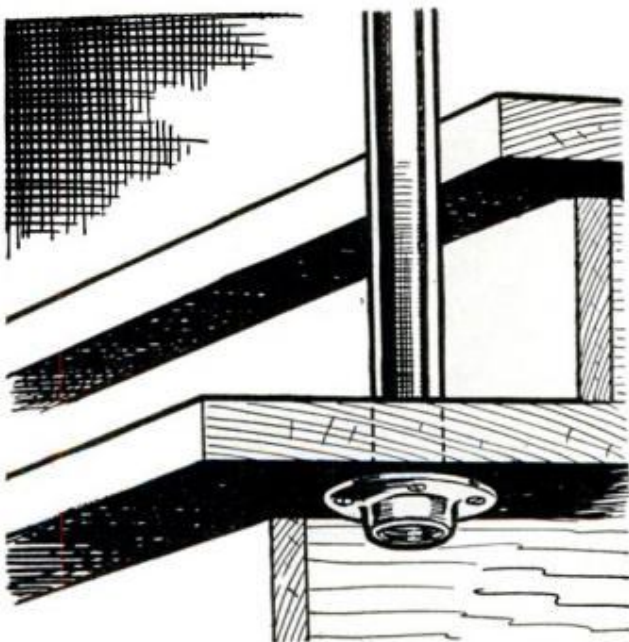
**ROUND LEATHER BELTS** used on small machines often tend to slip. This can be eliminated by slipping an open chain link over the round belt as shown



A **CLAMP** for planing doors can be made by notching two pieces of hardwood and hinging them so the weight of the door will force the blocks tightly together

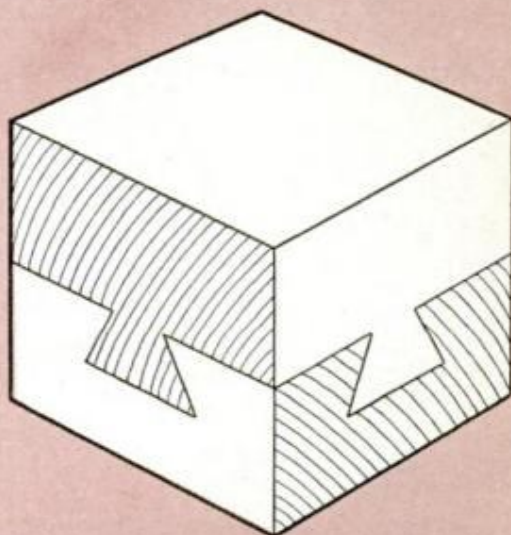


**WHEN CUTTING** angle iron with a torch, start the cut on the lower leg of the angle and work upward. This will prevent bending and result in a straight cut



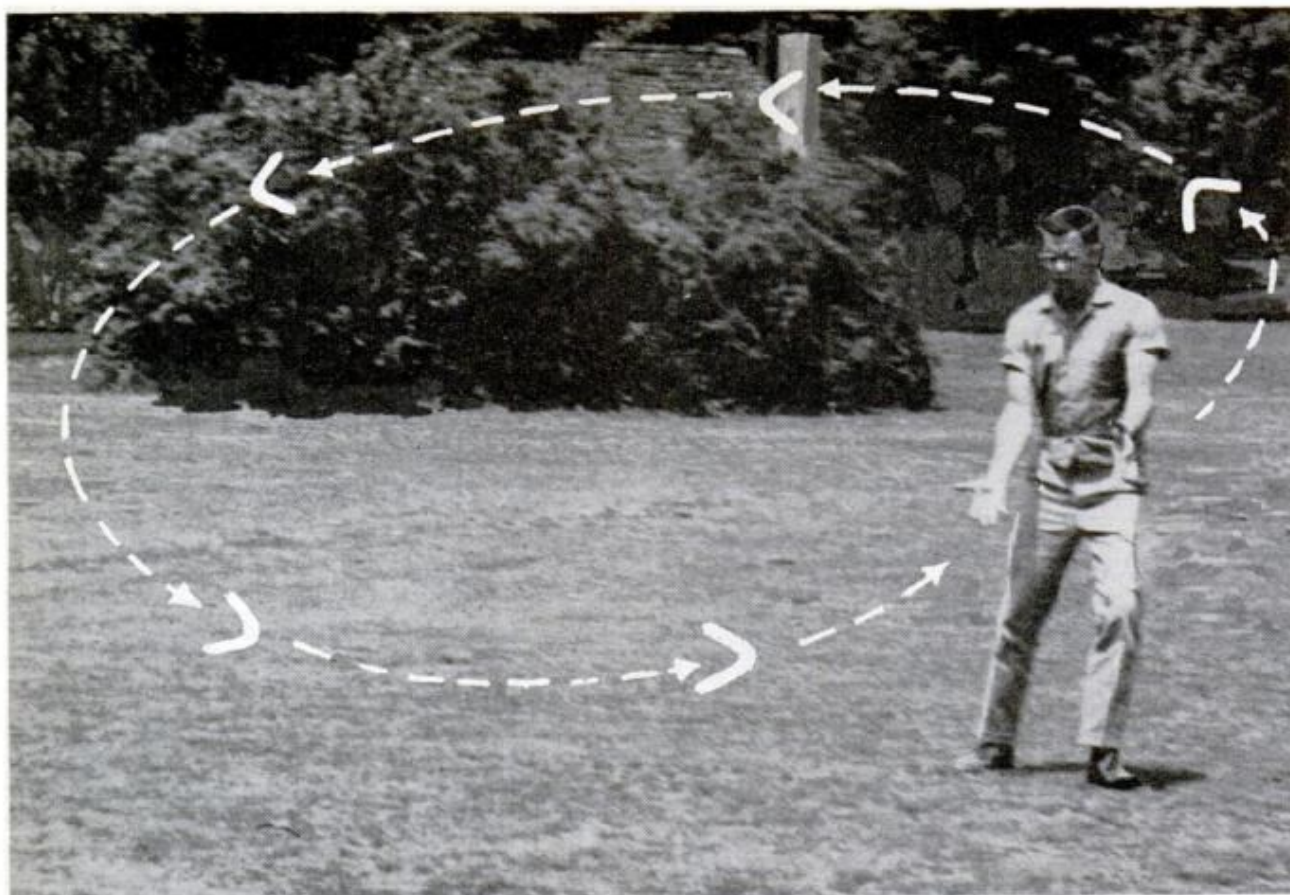
**WHEN YOU ARE FACED** with the job of anchoring a pipe railing to a flight of wooden steps, don't follow the time honored technique of screwing the floor flange to the top surface of the stair tread. Instead, make the installation as shown in the drawing, by drilling a hole through the stair tread just large enough to admit the pipe. Then screw the floor flange to the underside of the tread. When you thread the pipe into the flange you will have taken advantage of the extra bracing provided by the stair tread

### Woodworker's Nightmare



**SOMEONE HANDS YOU** two blocks of wood, dovetailed as shown. The two vertical sides not visible in the drawing look exactly like the two that are shown. Yet, you find it quite easy to separate the blocks. How is this possible? And, incidentally, how were the dovetails made? Give up? Turn to page 159





AFTER PRACTICE, you can try catching the returning stick by clapping it between your hands—but take care!

## The Stick That Returns

By Dale Rudolph

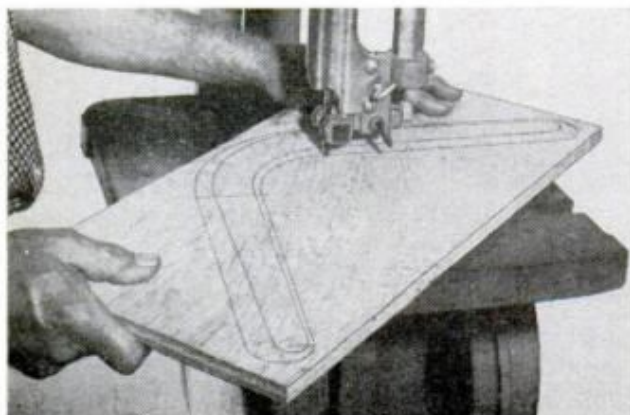
*Until you've made one yourself, you can't quite believe that a plain piece of plywood can be turned into a soaring, obedient bird*

**I**F THE SPACE AGE began when man first tried to duplicate the flight of birds, it's not very new. And it didn't start at Kitty Hawk, or even when Dedalus stuck feathers to his arms with wax. It goes far back into the cavern of pre-history, to the heart of the world's bleakest

continent, and starts with a stick.

Perhaps the Space Age dates from that day an Australian aborigine first whittled the crotch of an acacia tree into a flat, sickle-shaped blade, for use as a hunting weapon. (One can imagine his surprise when he flung his stick at some scampering animal only to find the thing arcing around through the air to come spinning right back at him!)

At any rate, these nomadic people—who through the centuries have made virtually no other contribution to civilization—have developed their skills with the flying stick into an art that makes most of our model flying look pale and fussy. The primitive Australian can throw his boom-

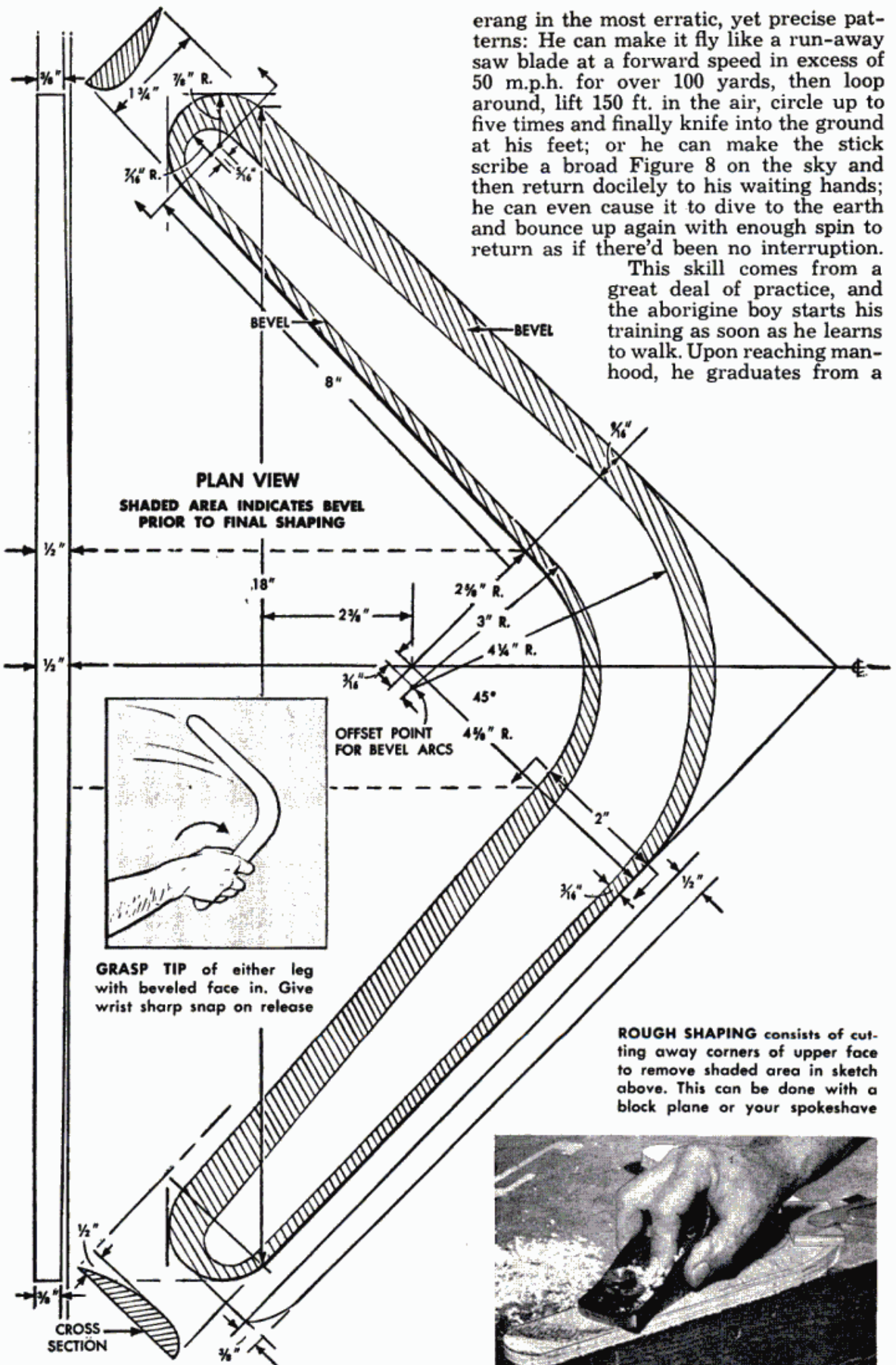


**JIG SAW IS FASTEST** way to cut outline after laying out pattern (next page) on face of ½-in. exterior-grade plywood. Keep outside the line and smooth down to outline later with drum or disk sander



erang in the most erratic, yet precise patterns: He can make it fly like a run-away saw blade at a forward speed in excess of 50 m.p.h. for over 100 yards, then loop around, lift 150 ft. in the air, circle up to five times and finally knife into the ground at his feet; or he can make the stick scribe a broad Figure 8 on the sky and then return docilely to his waiting hands; he can even cause it to dive to the earth and bounce up again with enough spin to return as if there'd been no interruption.

This skill comes from a great deal of practice, and the aborigine boy starts his training as soon as he learns to walk. Upon reaching manhood, he graduates from a







**FINAL SHAPING** is done with wood rasp, to convert the flat bevel into smoothly rounded half-teardrop cross section sketched on the previous page. Smooth with coarse sandpaper followed by finer grade



**BRUSH ON** a coat of sealer and two coats of a good lacquer. Rub down entire boomerang with steel wool and apply coat or two of wax. To keep it in good condition, re wax boomerang as often as necessary

toy stick to a deadly curved missile which he makes from a tree he must select and cut down for himself.

There are three main types of boomerangs: the returning stick, the hunting stick and the war stick. All three are curved (in shapes from a shallow V to a deep U), but the latter two don't return. Largest and most lethal is the war boomerang. Up to five feet long, this giant is thrown with both hands, wickedly maiming anything in its path. The hunting boomerang is middle-sized, with a maximum range of over 200 yards. It's capable of disabling a full-grown kangaroo.

But the popular returning stick, one

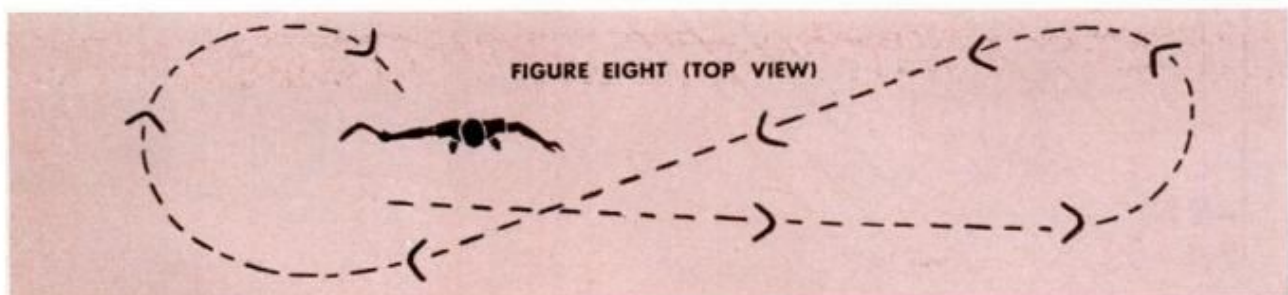
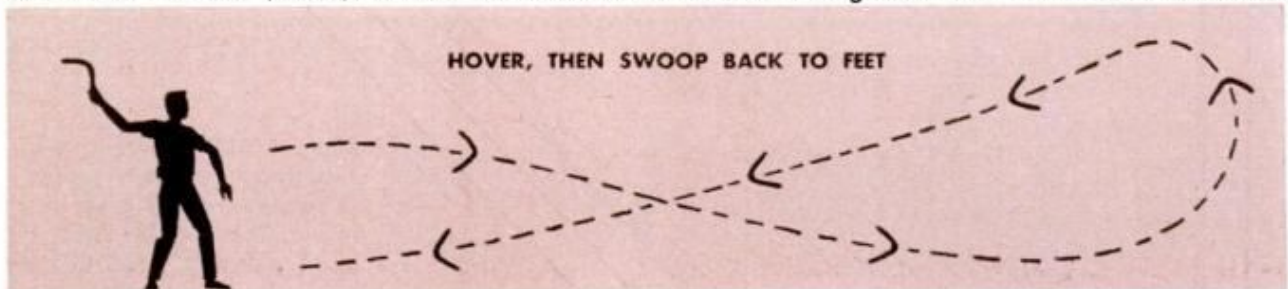
type of which is detailed here, is strictly for fun. It can be 18 to 36 inches long, with a 90-to-120-degree spread between its V-shaped arms.

The secret of the boomerang's acrobatics lies in the shape of its arms. Take a look at the cross sections shown on page 157 and you'll note they resemble the airfoil of an airplane wing. The leading edge of each arm, as it spins, is the leading edge of the airfoil, so each arm does its share of lifting. When you throw a boomerang at various angles different flight patterns result.

The plans provided are only a suggestion. After experimentation, you can

[\(Please turn to page 210\)](#)

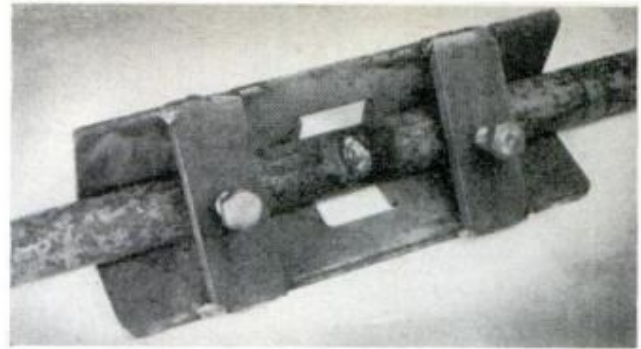
**WHEN YOU'RE AN EXPERT** at regular return tosses, you may want to try stunts that an Australian aborigine uses to test his skill (below). He can also bounce his stick off the ground and still have it come back





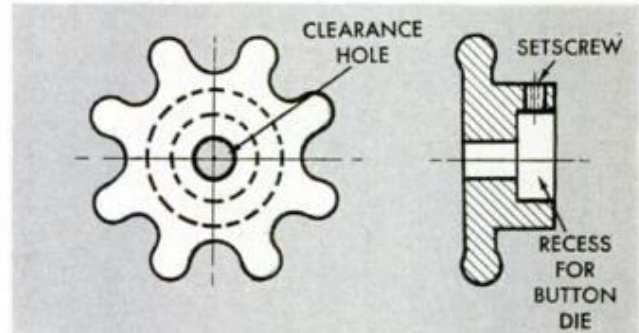
## Butt Welding Clamp

This butt welding clamp makes use of a length of steel angle to cradle rod or pipe in perfect alignment. Two pieces of steel flat are welded across the legs of the angle near each end and drilled and tapped for clamping screws. An opening across the apex of the angle, as shown, permits you to weld completely around the work without disturbing the work.



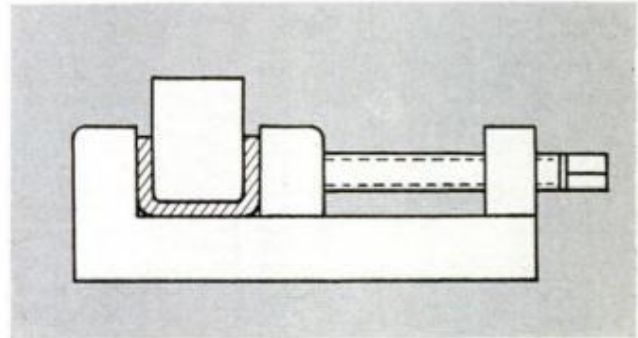
## Button Die Holder

A neat stock for a button die can be made from a machine tool handle of the type shown. After facing the hub in a lathe, bore the inside until the die is a slip fit. A clearance hole in the handle allows long work and chips to pass through. Drill through the side and tap the hole for a setscrew so that the die may be clamped in place.—*Frank L. Rush*



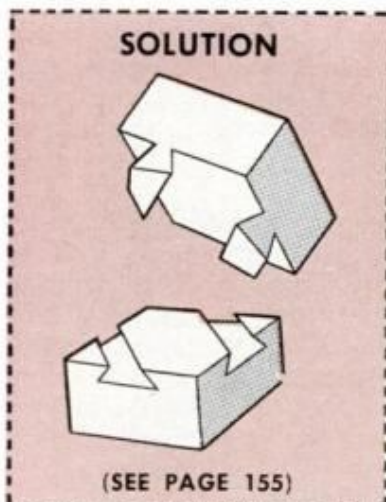
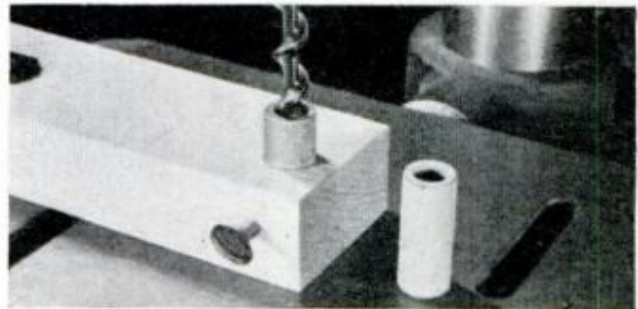
## Bending Press

Sharp bends in aluminum, copper and other easily worked metals can be made with the aid of this improvised press, consisting of a toolmaker's vise and a die made from a rectangular piece of steel. The metal is formed roughly around the die and then placed between the vise jaws. Tightening forms sharp right-angle bends.



## Center-Drilling Dowels

For production drilling of accurately centered holes in dowels you can't miss with this simple jig. First bore a hole the same diameter as the dowel in a hardwood block. Next, drill for a thumbscrew as shown. Center the block by running the bit back into the hole, then clamp the block. Insert the dowel and drill with the desired size bit.—*R. J. DeCristoforo*



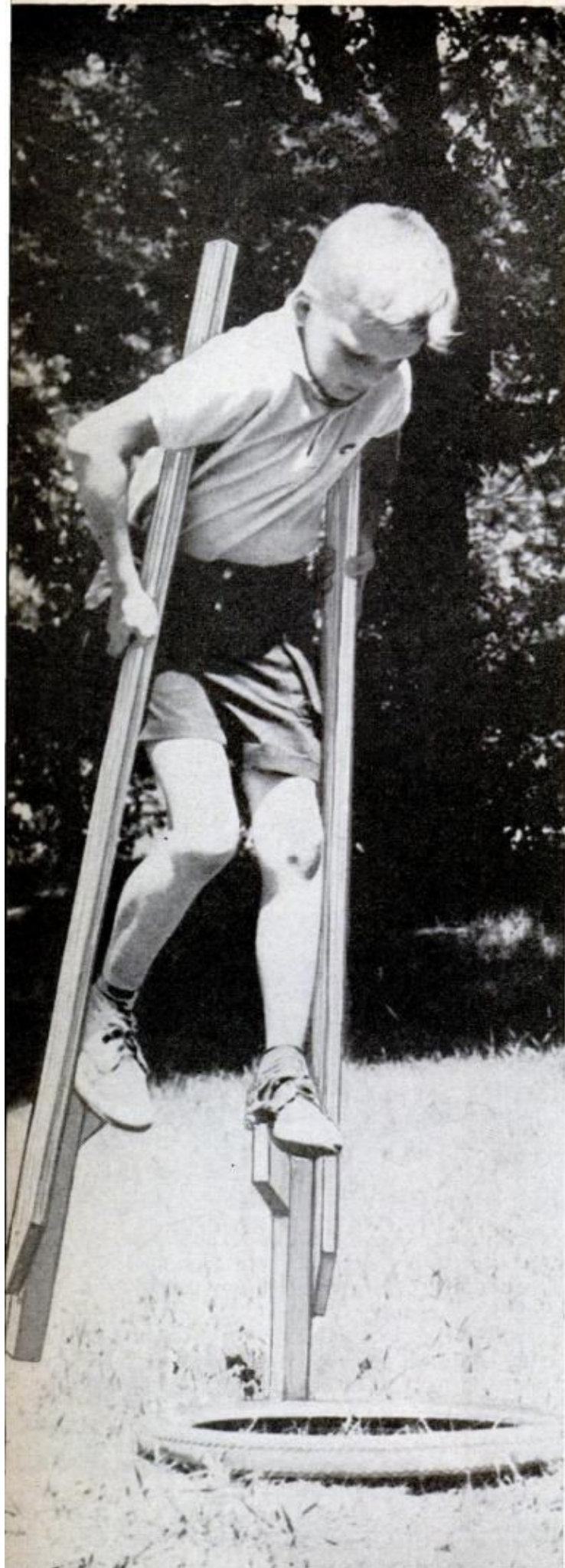
## Talcum Lubricates Shade Roller

If a window shade fails to catch when drawn, there's probably nothing wrong with the roller mechanism—it's just sticking. Remove the roller from the window and lubricate it by dusting the pawl and ratchet with talcum powder. Tap the roller lightly to work the powder into the working parts.—*Paul A. Smith*

**Getting an accurate color match** when mixing touch-up paint is easier if you remember that water-base paints should be mixed slightly darker than the color over which they are to be applied. Oil-base paints, however, dry a shade darker than they appeared when wet and should be mixed lighter than the shade required.



# NEW DESIGN FOR



YOUNGSTERS will find stilt walking a lot easier today than it used to be, thanks to Art Youngquist of Fennville, Mich., who came up with a better way to make this favorite old-time toy.

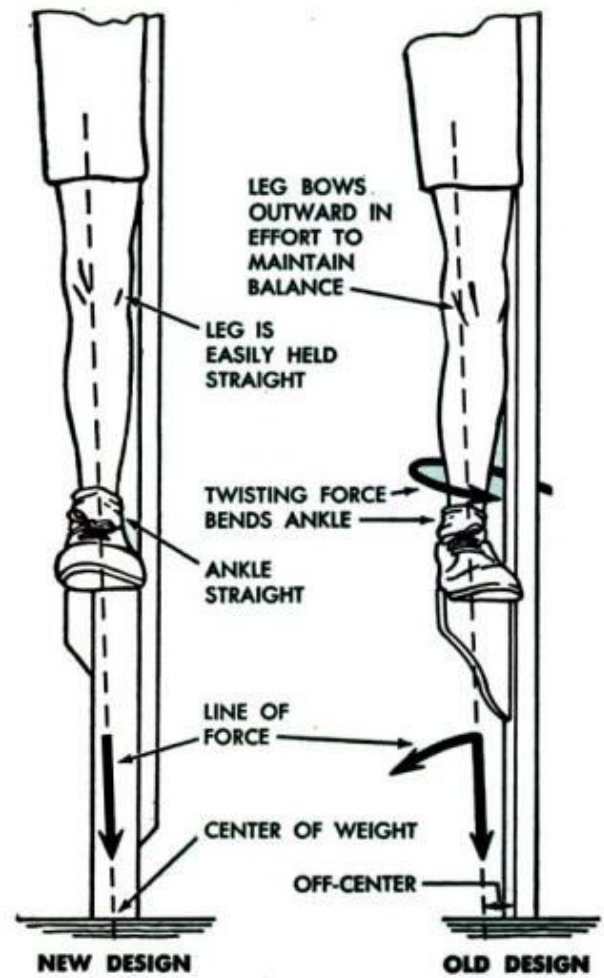
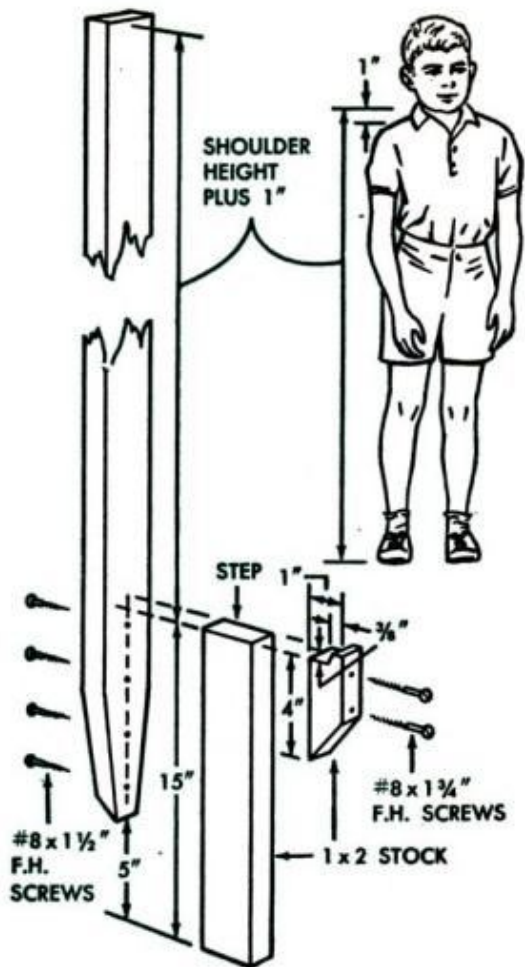
For years there was just one way to make stilts—nail a couple of step blocks to the side of two long sticks and that was it. But this placed the weight off-center, causing the stilts to lean inward against the body and to twist and turn unless grasped tightly.

Whereas the step blocks were attached to the shafts of old time stilts, in this new version, the shafts are attached to the step blocks as shown in the drawings on the opposite page. In this way, the full weight is directly over the point of contact with the ground, affording perfect balance and making it easier to walk.

Common 1 x 2 lumber is plenty strong enough for these new stilts since the shafts now serve merely as handles; there no longer is any weight on them, it's all on the step itself. The length or height of stilts above the step block is important. If they are just less than shoulder height, they may jab one in the armpits when jumping off. To determine the proper length, measure shoulder height and add 1 in. The height of the step block is variable—15 in. is a good height to start with in the case of a small beginner. As one gets more proficient, the height of the step block can be increased. Note that a notched block is added to each step to widen it and to keep the shoe from slipping off. Use screws in assembling the parts so that when you are ready to graduate to greater heights, you can salvage these blocks and the shafts. Your only new material will be the longer step pieces since the handles will simply mount higher.

When first learning to walk with stilts, hold the shafts close to the body and in back of the arms. This position permits jumping free quickly in the case of a fall. Lift the stilt as you take a step to keep the step block in contact with the foot. This comes naturally with practice. Avoid any kind of a stirrup on the step blocks which could entangle the feet and cause a bad fall when losing balance.





## The Spinning Fool Has Lift-Off Launching Handle

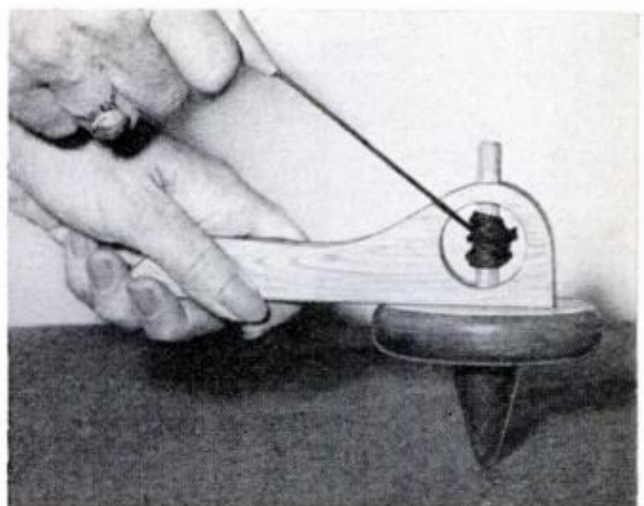
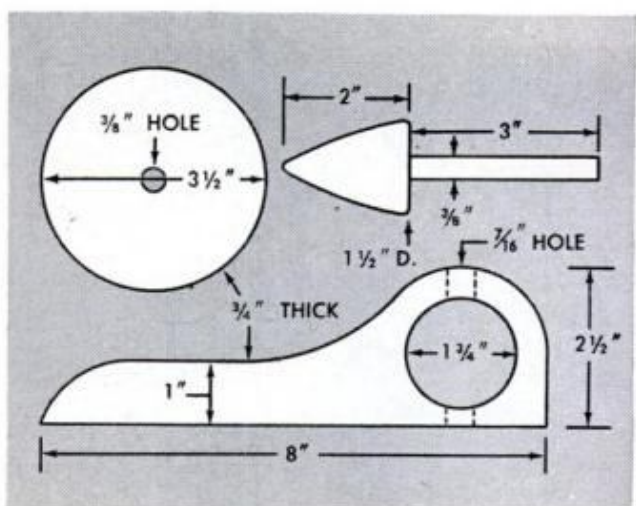
Not even the most TV-addicted child can resist the antics of a spinning top as it cavorts about the floor—which, no doubt, is why this toy is making a comeback.

The top shown below was copied from the “spinning fool”, a design that was popular with youngsters in Colonial days. Making it should take about an evening.

You’ll want to use oak, maple or some other hard, dense wood, as the moving

parts have to withstand a lot of wear. The diagram at bottom left shows how to make the individual parts.

While it’s preferable to true-up the flywheel and point on a lathe, this isn’t essential. An alternate method would be to rough out the parts with hand tools, then assemble the top, chuck it in a drill press or electric drill and do the final truing with a fine rasp and sandpaper.





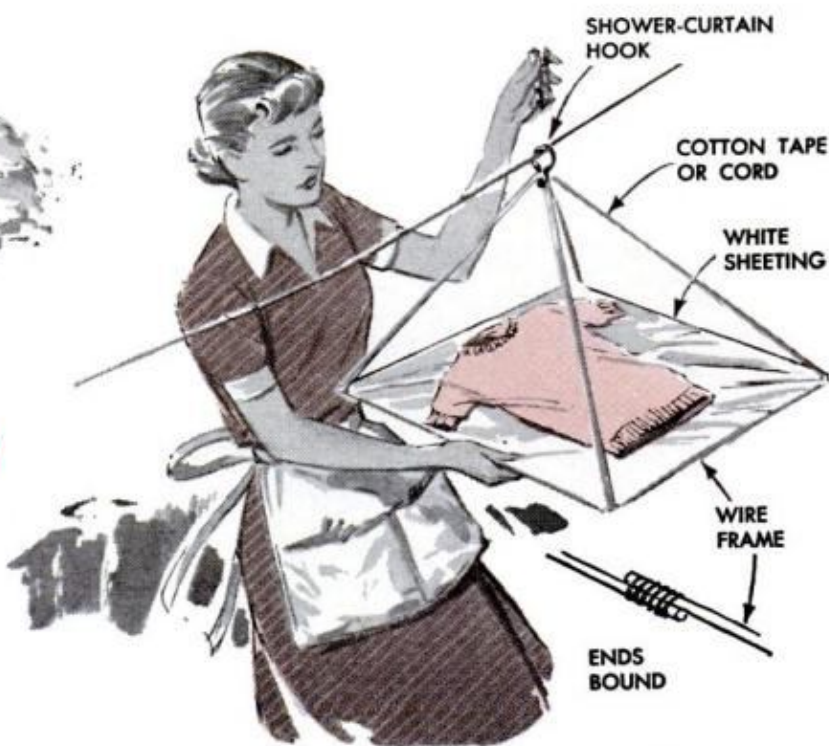
# Solving HOME PROBLEMS

**OUTSIDE PAINT JOBS** which require the use of a big roller will go a lot faster if you dump the paint into a yard cart. Fold  $\frac{1}{4}$ -in.-mesh hardware cloth over the lip of the canted front to provide a textured surface for rolling excess paint off roller



**TO PROTECT A TINY TREE** during those critical days immediately after transplanting, place a trash burner upside down over it and lay a couple of boards on this to shade the tree from hot midday sun. Use a rock to hold the boards in place. A low soil dam around base of burner will keep water near roots

**DRYING TRAY** for sweaters is made by sewing a square of white sheeting over a frame made of coat-hanger wire. Attach two lengths of light cord or cotton tape to opposite corners, draw these up to the center and slip them into a shower-curtain hook which can be clipped over the clothesline. Since air circulates freely both above and below the tray, drying time is shortened considerably



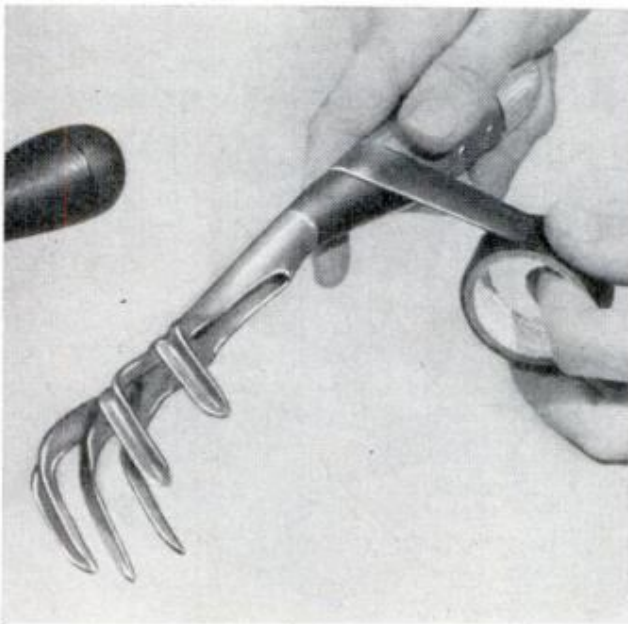




**TO LENGTHEN LIFE** of the switch in a pull-chain light fixture, attach a small spring between chain and pull cord. This spring will act as a shock absorber whenever the light is turned on or off, transmitting only enough force to work the switch

**IF YOU HAVE** a door which is loose enough in its frame to rattle whenever the wind blows, you can put a stop to this annoying noise by stapling a small piece of cardboard to the frame just above the lock. The cardboard spacer takes up any slack

**SPLINTERED OR CRACKED** handle needn't spell the end of a tool's usefulness. You can often repair this type of damage by wrapping the handle spirally with plastic tape which not only protects your hand from splinters but provides a good grip as well



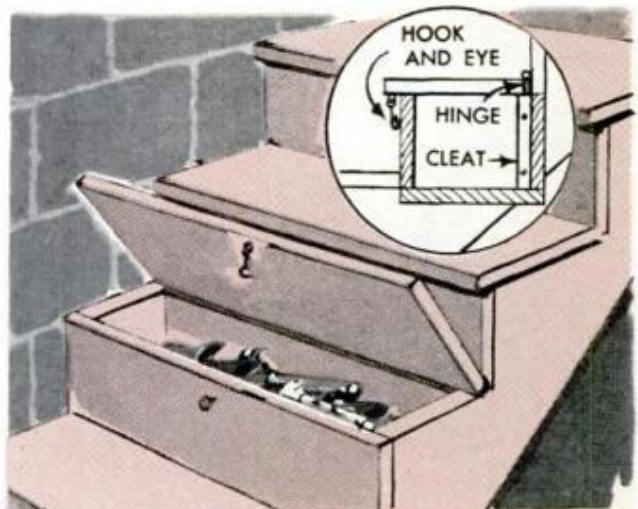
APRIL 1964



**PACK CHARCOAL** in cardboard egg cartons for those picnic barbecues. To start the fire, just squirt the lighter fluid over the cartons and touch a match



**WASTE STORAGE** space in your basement can be put to use by boxing in the space under one or more steps and hinging tread above to provide access to it



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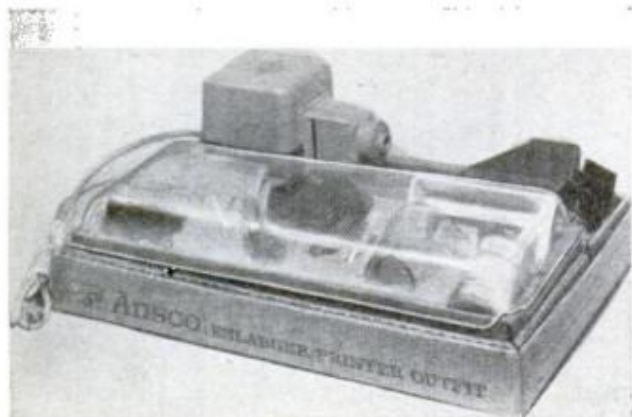




**PHOTO ALBUM** has pages covered with a clear plastic sheet which is magnetized to make it adhere to the page. The 9½ x 12-in. "Magnet-Vue" album comes complete with five leaves and can accommodate photos up to 8x10. The price is \$6, with extra refills selling for \$3. The Holson Company, Norwalk, Conn.



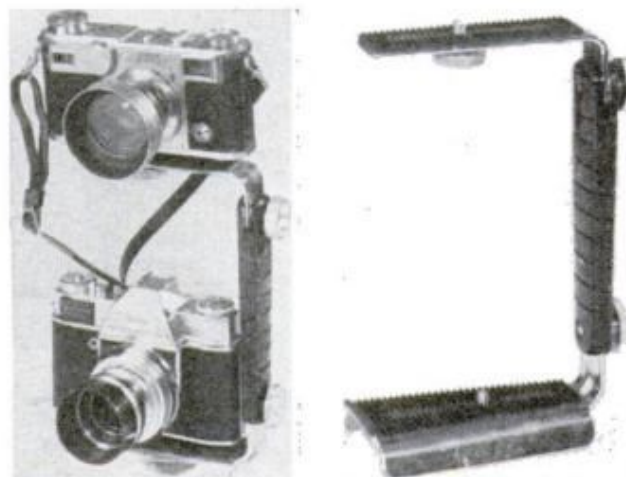
**BEGINNER'S ENLARGER KIT** includes horizontal type enlarger for 126, 127 and 35-mm negatives. Also included are a developing tank, enlarging paper, hypo, developer, trays, safelight—everything you need to learn the basics of darkroom procedure. Sells for under \$30. From Ansco, Binghamton, N.Y.



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By Arthur J. Maher

**DAYLIGHT TWIN BEAM** is a movie light that uses a sealed beam unit balanced for daylight color film. Lets you shoot daylight film indoors. Also features a choice of "spot" and "flood" effects at the touch of a button. Retail price is \$19.95. Flex Electric, 39-08 24th Street, Long Island City 1, New York



**VERSATILE CAMERA BRACKET** can be used to shoot two cameras simultaneously (to record the same scene in black-and-white and color), or to hold a flash-gun for either direct or bounce flash. Also makes good holder for movie lights. Sells for \$4.95. Master Photo, 7908 W. Grand Ave., Elmwood Pk., Ill.

**TWO-TRANSISTOR SLAVE UNIT** sells for \$14.95. Will fire conventional or electronic flash gun equipped with a PC-fitted cord, and is activated by regular or electronic flash on the camera. Will fit standard tripod screw, and uses regular 15-V battery. Accura Limited, 708 Byron Ave., Franklin Square, New York

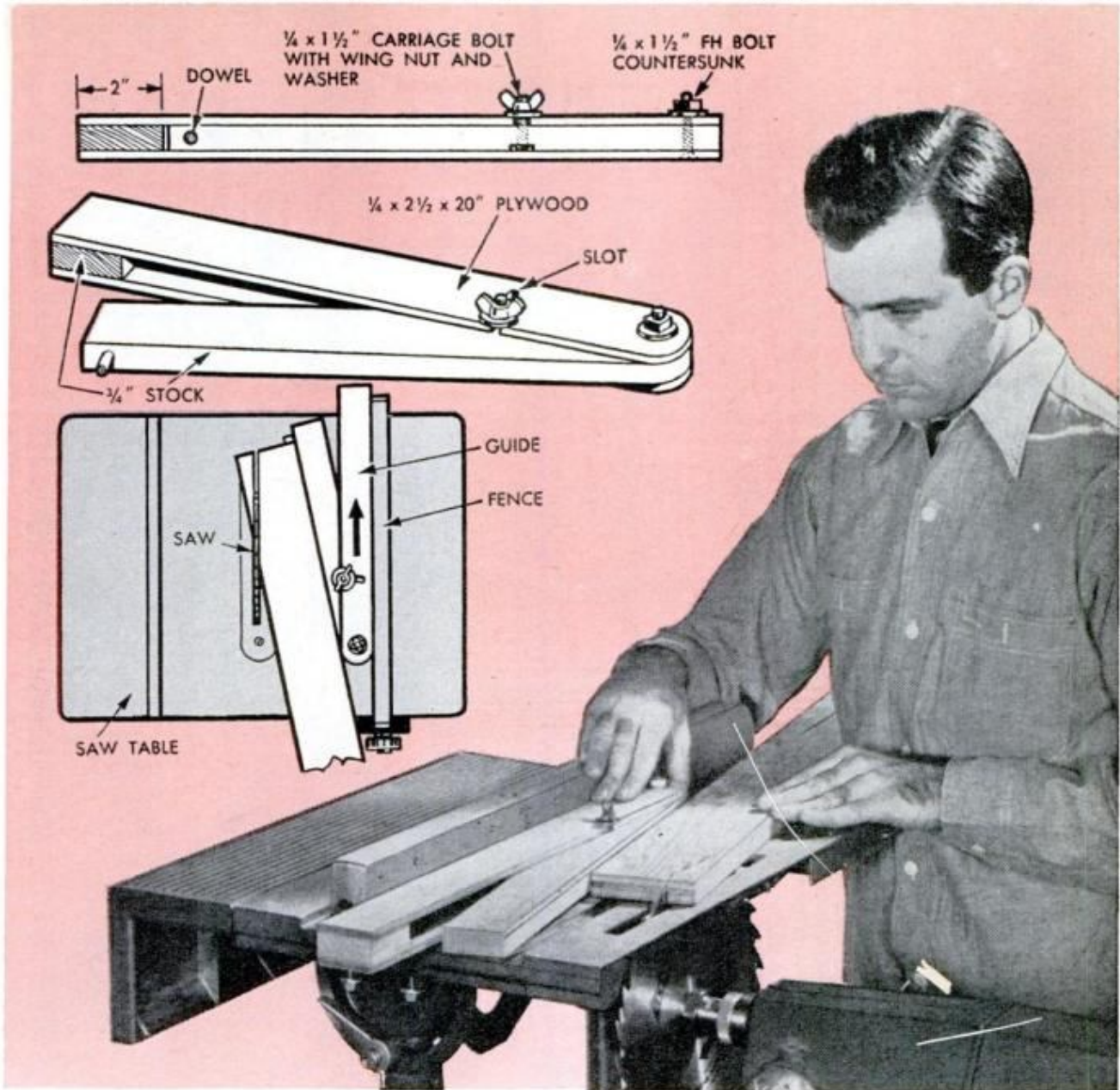


POPULAR MECHANICS

Материал, защищенный авторским правом

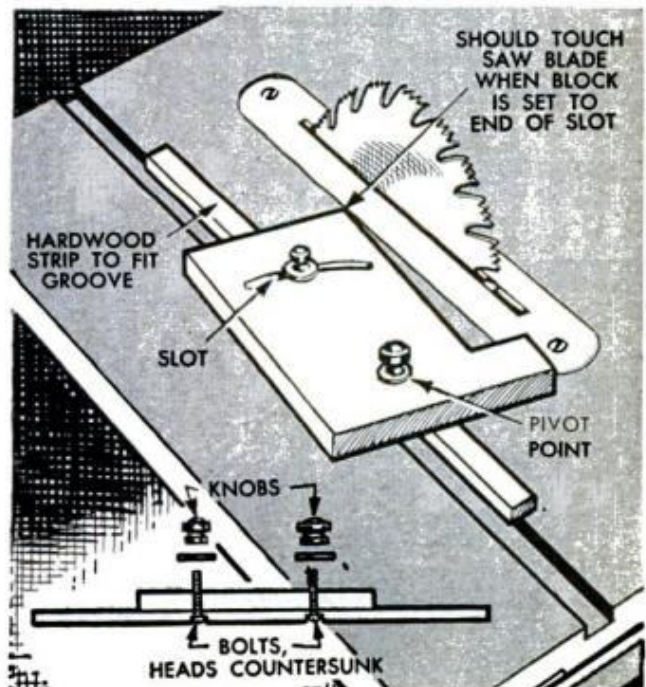


# UNIFORM TAPERS CUT IN JIG TIME



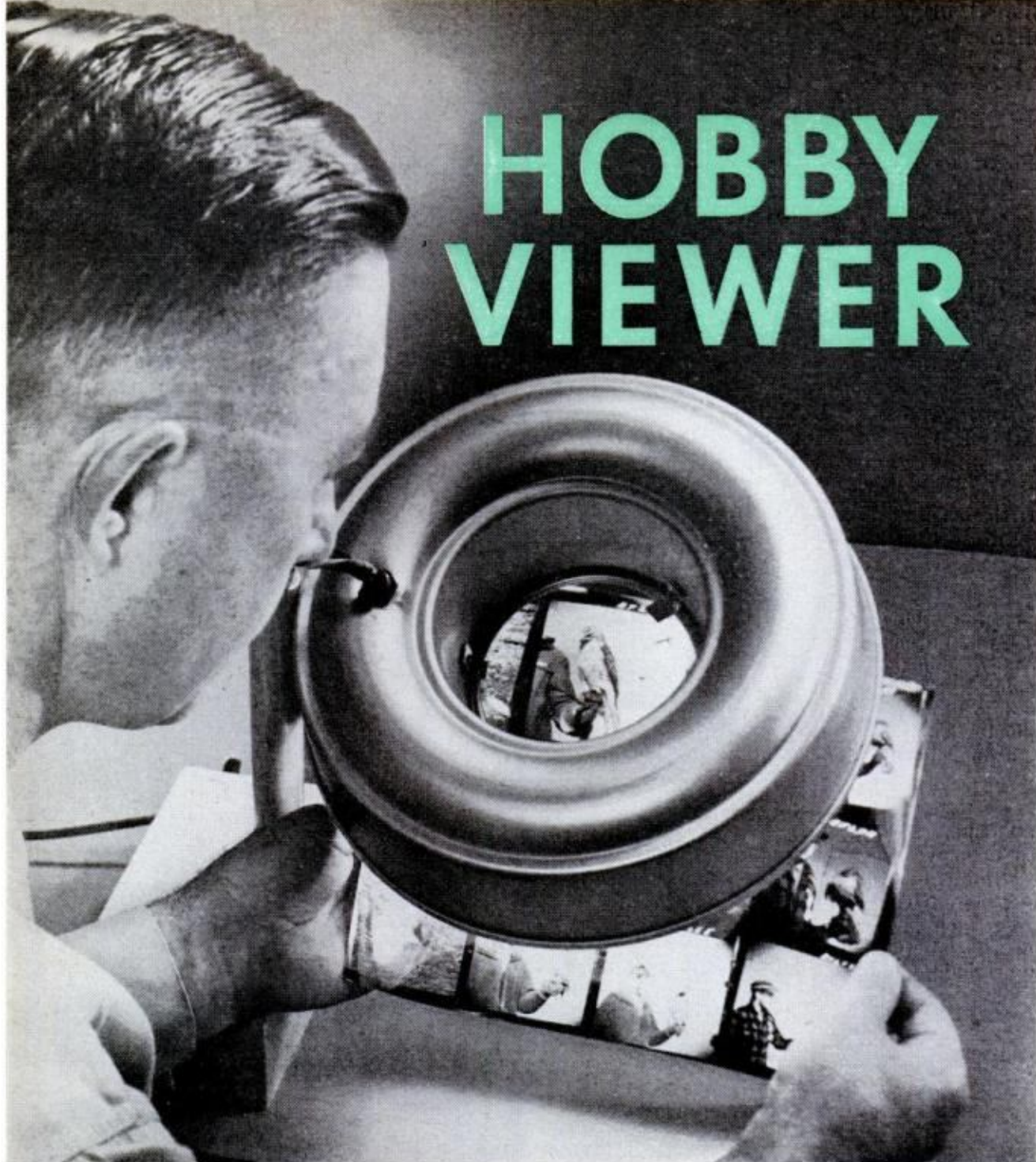
YOU CAN MAKE short work of cutting a batch of fence pickets, or for that matter, duplicating any taper cut with these two adjustable jigs. The block jig, detailed at the right and designed by Victor Lamoy, is for use with relatively short work. As you see, it rides on a hardwood strip which fits the groove in the saw table. You adjust the angle of cut by loosening the two knobs and swiveling the block on its pivot point.

The second jig, designed by Henry Flacke, is used against the saw fence, and because of this, can handle wider as well as longer work. Actually, it's just an adjustable wedge which folds inside itself. A dowel in the far end provides a stop against which the work is held when pushed with the jig. It's adjustable to cut angles from 1 to 20 deg. A couple of scraps of plywood, a length of 3/4-in. board, plus a couple of bolts, are all you need to make this handy saw accessory.

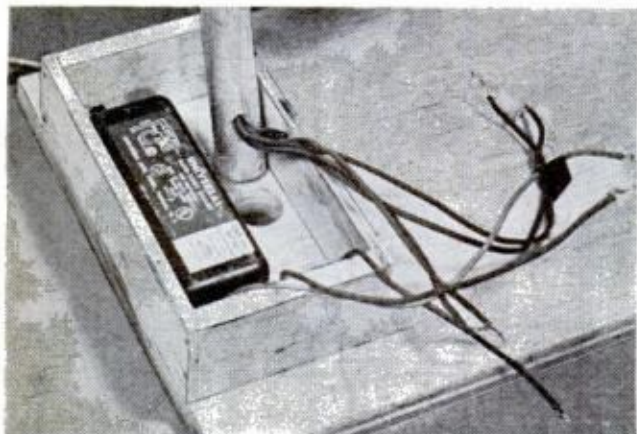




# HOBBY VIEWER



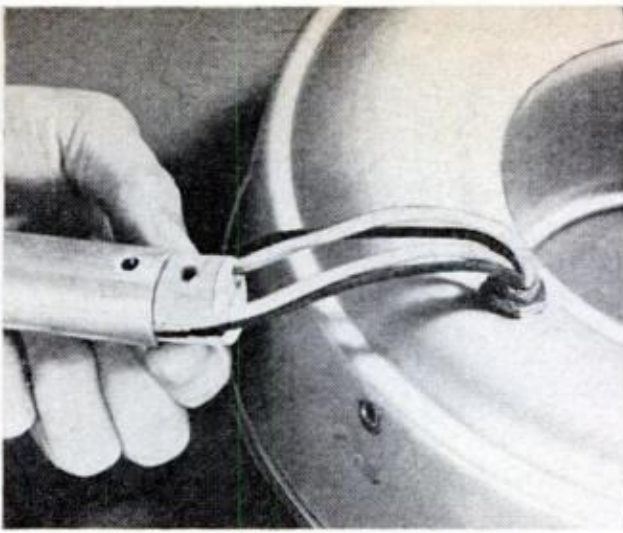
**BALLAST REQUIRED** is Universal No. 574-RS, which is supplied with wiring diagram. The four 12-in. extension wires are passed through hole drilled in tube



WE BUILT this illuminated magnifying viewer so that we could get a good look at our contact prints, but it proved to be such a handy gadget that we've put it to many other uses—examining our stamp collection, modelmaking, and even following out intricate printed radio circuits.

The viewer's neat appearance is due largely to the reflector, which is actually a 12-cup ring mold, the kind used for making gelatin desserts. You're not likely to encounter any difficulty when shopping for the parts, though finding a suitable magnifying lens may present a problem; if so, you can obtain a 4-in.-dia. one from the Edmund Scientific Co., Barrington, N.J. for \$1.25 pp.—Willard and Elma Waltner

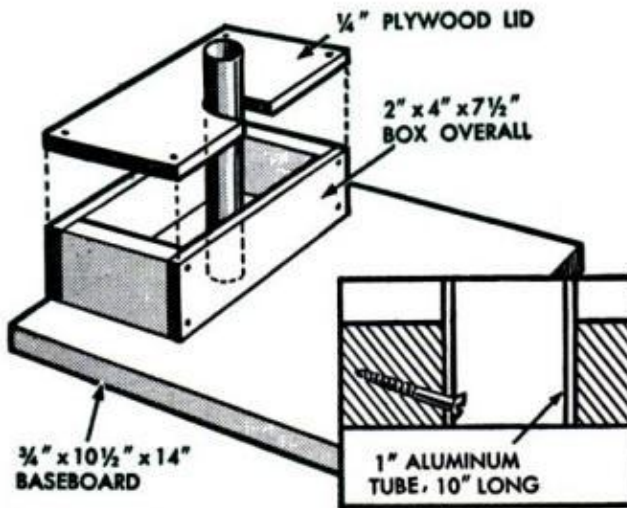




**HARDWOOD STOPPER**, 1½ in. long, is turned to fit flush in tube. Drill ⅛ in. hole through both and cut two wire grooves on opposite sides of stopper



**STOVE BOLT**, 1½ in. long, is passed through hole in mold, three washers are needed, then bolt is inserted in hole in tubing and secured with wing nut



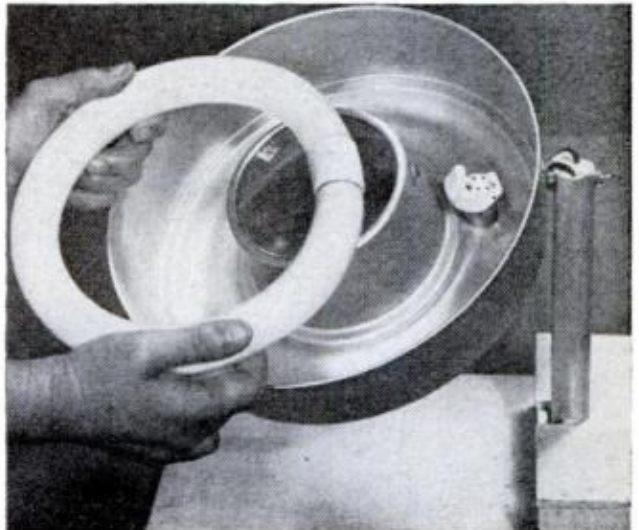
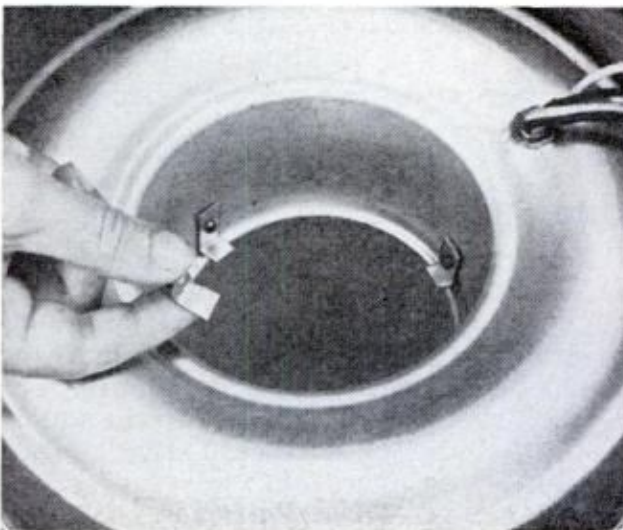
**BUILD BOX** as shown and fasten it with screws to the base board. Fit the tubing into a 1-in. hole in base and secure it with a screw driven at a slant



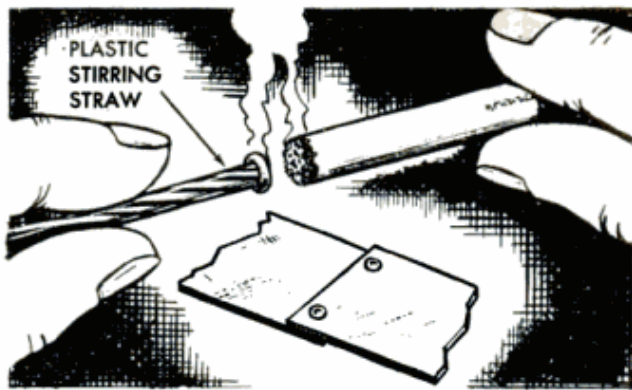
**MAGNIFYING LENS** is placed on rim of mold opening. If lens is a bit small, bend rim outward with pliers, then secure lens in place with the three clips

**THREE HOLES** drilled through the inner wall of the ring, ½ in. from the top edge of the mold, permit attachment of right angle metal clips to support lens

**INSERT PRONGS** of Circline fluorescent lamp into socket. Lamp may be given added support with metal clip curved to fit and attached to lens clip bolt

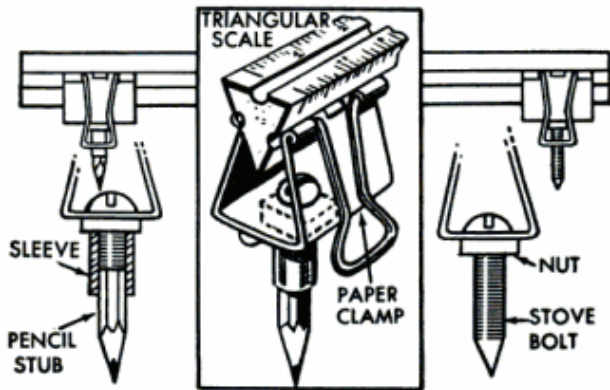






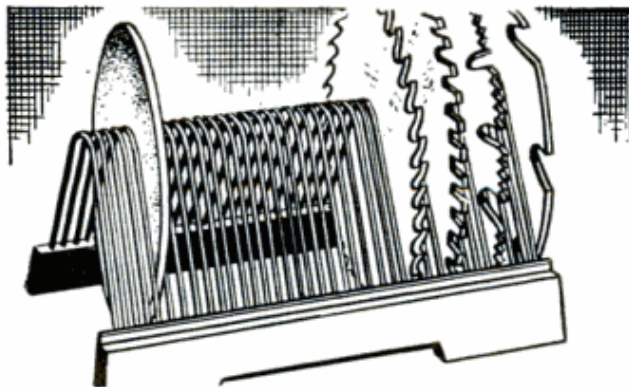
## Make Your Own Rivets

Light duty rivets, eyelets and grommets may be made from hollow plastic straws such as those used for mixing drinks. All you have to do after cutting the straw to the desired length is to flare the ends by applying heat with either a lighted cigarette or a soldering iron. You will find that the straws, which are obtainable at most supermarkets and bar-supply counters, are especially handy for assembling models and repairing toys.—*Kenneth Tripp*



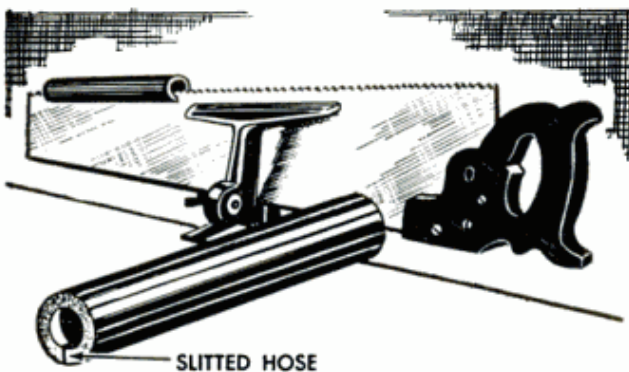
## Quickie Compass

A beam compass may be rigged up in a few minutes' time. The beam is a draftsman's scale; the compass point is a stove bolt with its end ground to a point. A pencil stub is force-fitted into a short piece of tubing, which in turn is forced onto a small stove bolt. A hole is drilled in each of the spring-type paper clamps to accept the bolts which are fastened with nuts. Most stationers stock these clamps.—*R. Paxson*



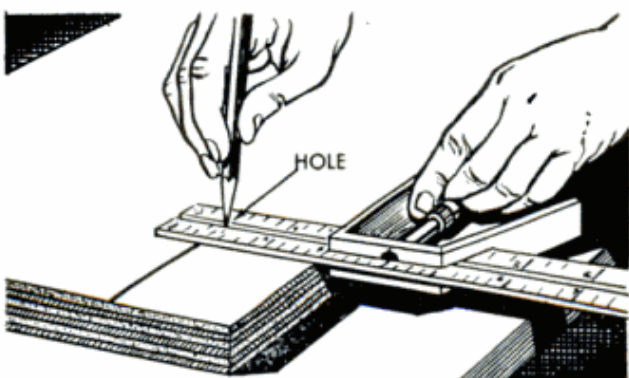
## Record Rack Stores Saws

If organized storage is a problem in your workshop you can put a wire-type record rack to good use. The rack is ideal for storing extra circular saw blades, sanding disks and abrasive cut-off wheels. It allows easy selection and, where the blades are concerned, prevents the dulling that commonly results when they're stacked on the workbench among other tools, or ganged on a tool-board hook.—*Arthur Tanner*



## Screech Stopper

The annoying screech that usually accompanies the filing of a handsaw can be muffled by slipping a split section of rubber garden hose over the teeth of the saw. The hose may be a foot or more in length as it can be easily moved along the blade as the filing progresses. In order to reduce the noise as much as possible, the hose should be placed close to the teeth being filed.—*G. E. Hendrickson*



## Need a Marking Gauge?

Even home shops with a fairly complete set of hand tools may lack a marking gauge. You can easily improvise one by drilling a small hole at the 1-in. mark on the blade of your combination square. With a pencil inserted in the hole, run the square along the edge of the board. Don't forget to subtract an inch from the measurement on the square.—*Ken Patterson*

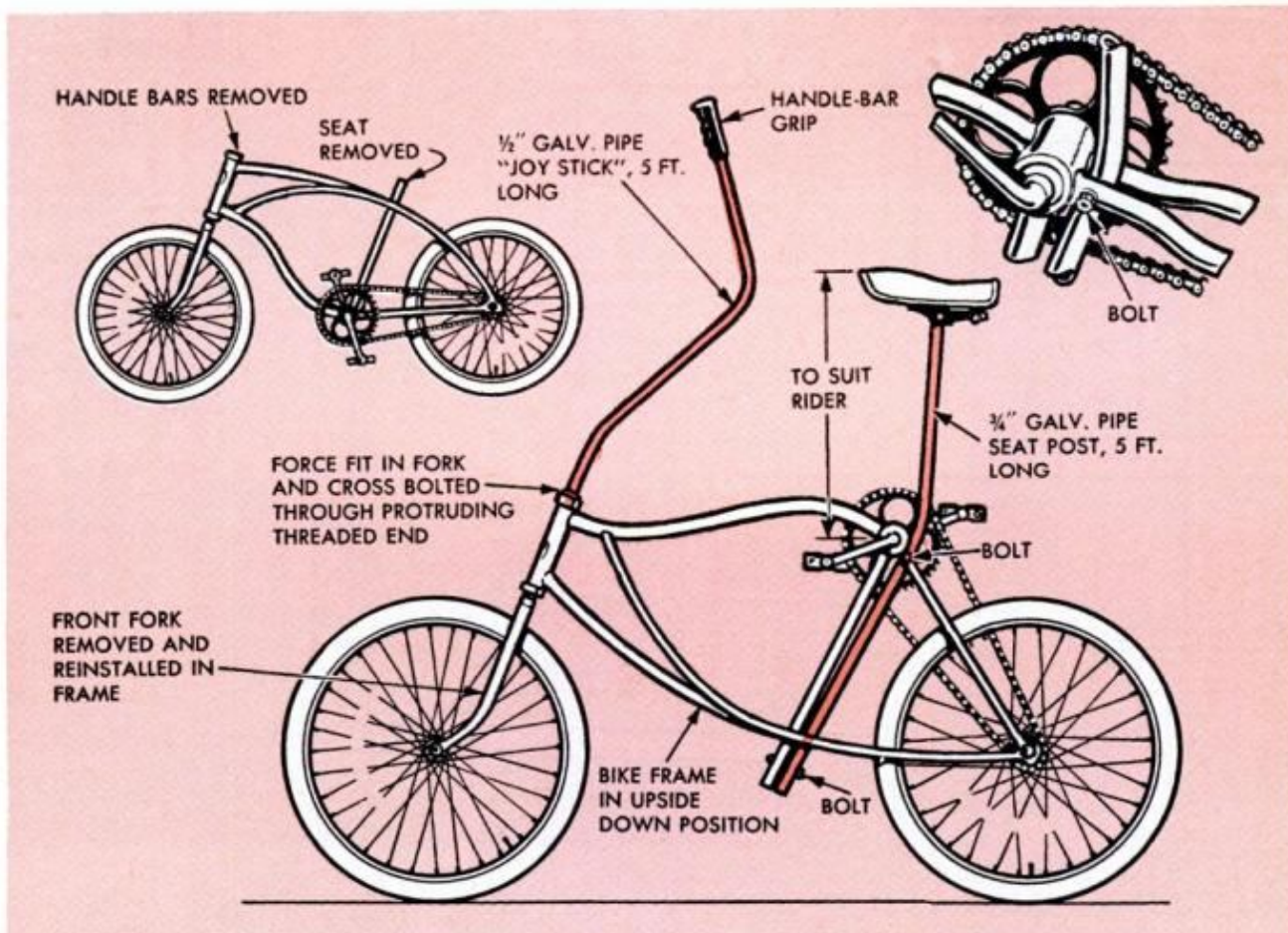


# HI-CYCLE

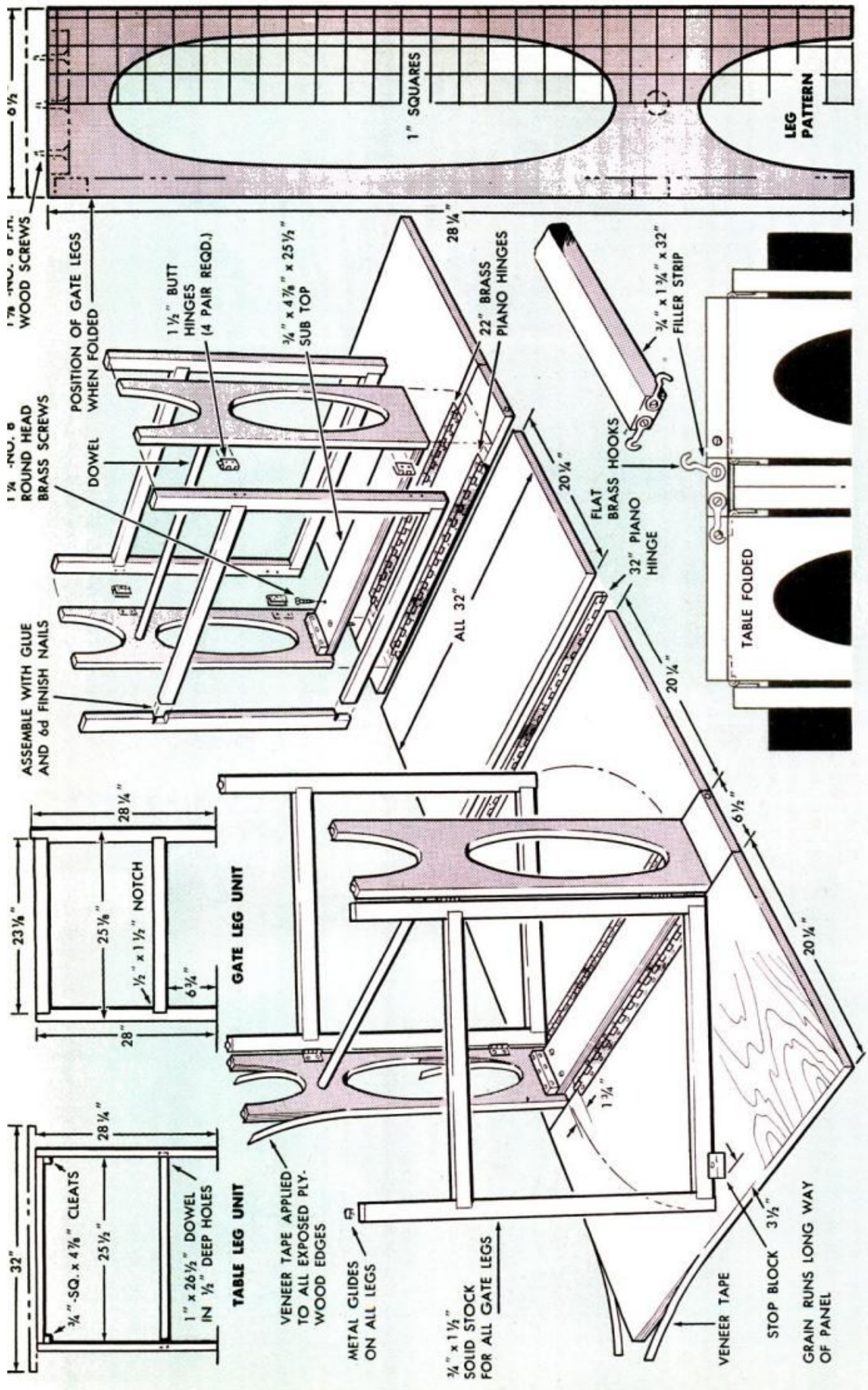
Jon Brown of Fort Wayne, Ind., found a new way to keep kids off the streets—high off, that is—when he turned his bike upside down. Like an old fashioned two wheeler, the altered bike lifts you into the upper strata. But unlike the 1890 version, it's easy to convert this conversion back to a lowly "earth" bike since no welding is involved.

First, remove the handle bar, seat, wheels, pedal crank and chain; then wash all parts and bearings in solvent and pack with grease. In reassembly, both the rear wheel and pedal crank must be on the side of the frame opposite to their original position.

The fork is removed, the frame inverted and then the fork is re-installed in the handle bar socket. A 5 ft. pipe forced into the fork serves as a "joy stick." It is secured by drilling through both parts and bolting them together. The seat post is also a 5 ft. length of pipe and is forced through the frame behind the pedal crank bearing housing and secured with bolts.—*Morris G. Hulst*



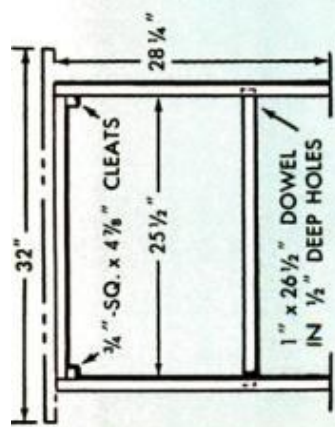
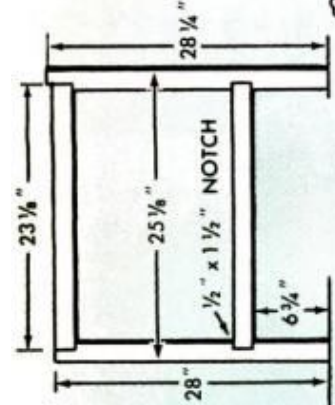




1 7/8" - NO. 8  
WOOD SCREWS

1 1/4" - NO. 8  
ROUND HEAD  
BRASS SCREWS

ASSEMBLE WITH GLUE  
AND 6d FINISH NAILS



VENEER TAPE APPLIED  
TO ALL EXPOSED PLY.  
WOOD EDGES

METAL GLIDES  
ON ALL LEGS

3/4" x 1 1/2"  
SOLID STOCK  
FOR ALL GATE LEGS

VENEER TAPE

STOP BLOCK 3 1/2"  
GRAIN RUNS LONG WAY  
OF PANEL

POSITION OF GATE LEGS  
WHEN FOLDED

1 1/2" BUTT  
HINGES  
(4 PAIR REQD.)

3/4" x 4 7/8" x 25 1/2"  
SUB TOP

ALL 32"

22" BRASS  
PIANO HINGES

FLAT  
BRASS HOOKS

32" PIANO  
HINGE

3/4" x 1 3/4" x 32"  
FILLER STRIP

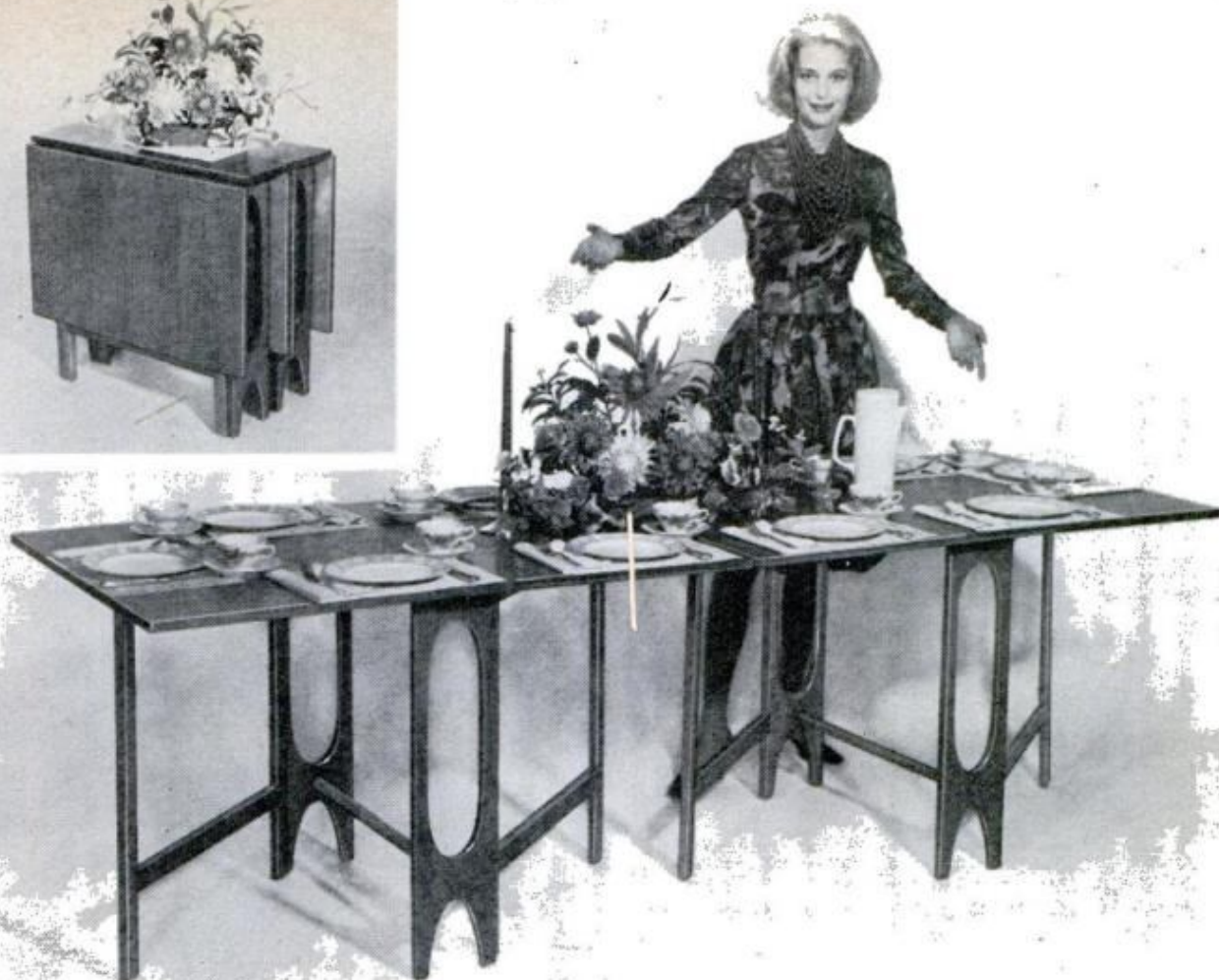
TABLE FOLDED

1" SQUARES

LEG  
PATTERN

6 1/2"





## GATE-LEG DINING TABLE

Steve Ellingson is Mr. Pattern himself. One of the leading producers of do-it-yourself plans, he is well known in workshop circles for his good design and simple construction. We hope you like his initial Popular Mechanics project

**By Steve Ellingson**

**G**RACIOUS living calls for gracious dining and both are yours with this elegant stowaway table. Fully open it's an eight footer which will serve ten persons nicely. Half open it serves four, and folded, it's a mere 17 in. wide to tuck away in a corner between dinner parties.

The clever design centers around twin drop-leaf tables which are hinged together, leaf to leaf, in a manner which permits them to stand side by side when folded. A filler strip, fitted with flat hooks at the ends to engage round-head screws in the tables, actually hooks the two together as a single table.

With the exception of the gate legs (which are solid stock) and the sub-tops; the whole affair can be cut from a 4 x

8-ft. panel of a 3/4-in. hardwood-faced plywood. Begin by cutting out squarely the six top panels, plus the filler strip, and cover the plies of all panel edges with a ribbon veneer made for this purpose. Next cut out the two sub-top panels from 3/4-in. common fir plywood, and the four leg cleats from scrap stock. Enlarge your pattern for the center legs, trace it on your plywood and saw out with a saber saw or jigsaw. Bore a blind hole 1/2 in. deep on the inner face of each leg for a 1-in. dowel stretcher.

Now start putting together each leg assembly by gluing and screwing the cleats to the ends of the sub-top members, then screwing the cleats to the legs. Follow by gluing the dowel stretcher in the holes.





**THIS VIEW** which shows outer leaves down and inner ones raised, pictures table half open and set for four

If you want to save yourself the work of enlarging the leg pattern, you can purchase a large-size working plan for this table, which includes a full-size leg pattern, by writing to Steve Ellingson, Popular Mechanics Pattern Dept., Box 2383, Van Nuys, Calif., enclosing \$1.00 for plan #334.

### MATERIALS REQUIRED

1 pc.  $\frac{3}{4}$ " x 4' x 8'. Birch plywood—Table tops  
 13 8-ft. rolls flexible wood tape, plus contact cement  
 1 pc.  $\frac{3}{4}$ " x 8" x 9' solid birch—Gate legs  
 16— $\frac{1}{2}$ " three-prong furniture glides  
 12 ft.  $1\frac{1}{4}$ " piano hinge  
 1 gross #5 x  $\frac{3}{8}$ " O.H. nickel-plated wood screws  
 2—1" x 36" dowels—Leg stretchers  
 34—#8 x  $1\frac{3}{8}$ " F. H. wood screws for sub-tops  
 4—flat brass hooks and R.H. screws  
 4— $\frac{3}{4}$  x  $\frac{3}{4}$  x  $4\frac{7}{8}$ —Leg cleats  
 2— $\frac{3}{4}$  x  $4\frac{7}{8}$  x  $25\frac{1}{2}$ " fir plywood—Sub-tops  
 8— $1\frac{1}{2}$ " brass butt hinges for gate legs  
 Small quantity of 6d finish nails

Now place all six table-top panels flat on the floor, underside up, and hinge them together with fine piano hinges. Note that four of the hinges are 22 in. long and are positioned to provide clearance for the gate legs. Now, while the hinged panels are still on the floor, attach the leg assemblies, by driving screws through the sub-tops, using  $1\frac{1}{4}$ -in. screws so they won't poke through the top surface.

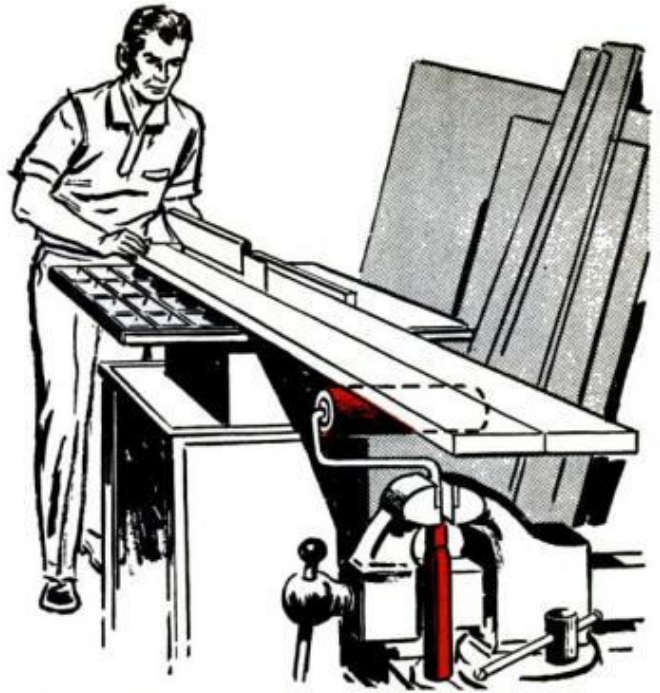
The four gate legs are made alike from  $\frac{3}{4}$  x  $1\frac{1}{2}$  in. solid stock. Note that one leg of each gate projects  $\frac{1}{4}$  in. above the other. Fit the rails in  $\frac{1}{2}$  x  $1\frac{1}{2}$ -in. notches in the legs and assemble with glue and 6d finishing nails. You can use screws here instead of nails if you wish, burying the heads in counterbored holes and capping with regular wood screw plugs. Add furniture glides to all legs, both gate and center, and hinge the gate legs along the 28-in. side with  $1\frac{1}{2}$ -in. butt hinges. Stop blocks are provided on the underside of the top for the gate legs. Finally, attach the flat brass window-shutter hooks to the ends of the filler piece so they will hook snugly over the heads of brass screws turned into the edges of the table tops. ★★



## How to Be Self Supporting

My wife got tired of holding up the end of the board every time I ripped a long piece on my table saw. "Look here," she said, "Why don't you clamp your paint roller in the vise and let me go up and watch TV?". Well it worked like a charm and now when I need help to hold the out-board end of a long board, I simply roll my saw over in line with the vise, clamp the roller in it and crank the table up so the board rides on the roller as I push it through the saw.—*Stephen N. Stresnic*

**Do a good job of dressing the worn surface of your grinding wheel by using a metal wheel furniture caster.** Turn the grinder on, grasp the caster by its leg and press it against the rotating grinding wheel.



## Speedy Metal Polisher

Producing a high luster finish even on irregular surfaces is a snap with this steel-wool polisher. It is made by end notching a 1/2-in. dowel, about 5 in. in length. Chuck the dowel in a drill press and place the notched end against a ball of steel wool, which it will grip firmly and spin against the work. For best results, manipulate the work so that the steel wool polishes the surface evenly.—*Walter E. Burton*

**A rubber floor mat on your bench top** not only protects it from damage but the corrugations in the surface also catch small parts, screws, etc., which otherwise might roll off onto the floor and get lost.



## NEXT MONTH IN SHOP AND CRAFTS

**CAR-TOP SLEEPER.** Summer camping is just around the corner, but you'll still have time to build the compact folding car-topper which will be featured in the May issue. Its sleek low profile offers minimum wind resistance while driving, yet you only need five minutes set up time to turn it into a roomy and luxurious sleeping cabin for two

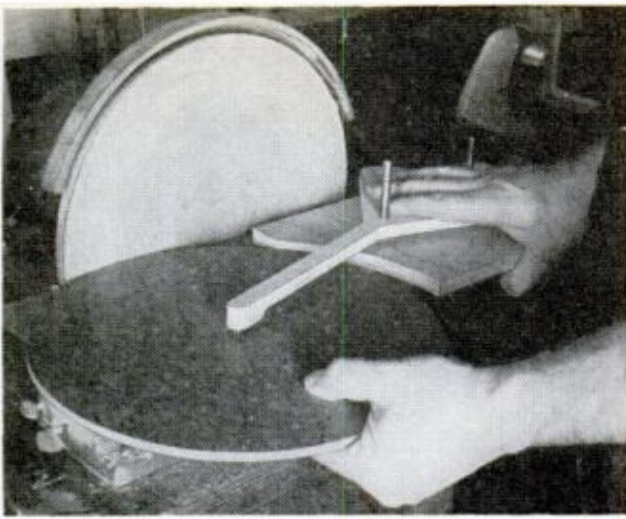
**WATERBUG.** Sure to delight your youngsters, this 4½-ft. hand-powered sidewheeler is operated by turning two bike-pedal cranks which control the two small paddle wheels. It can splash along in just 6 in. of water and even has a plastic window in the bottom for spying on marine life. Next month's *PM* will include full plans for this trim little craft

**REUPHOLSTERING.** That comfortable old chair with the sagging seat and worn cover can take on a like-new appearance right in your own workshop if you reupholster it using the new types of foam rubber. The May issue will include a profusely illustrated A-to-Z article describing just how to do it, so be sure to pick up a copy at your newsstand

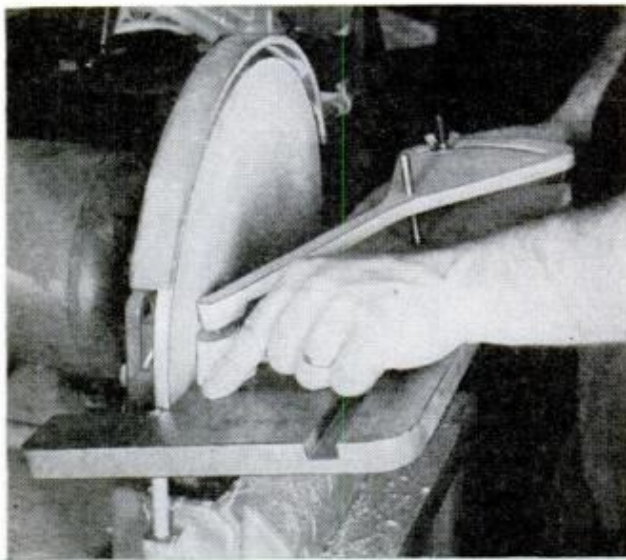
**BENDING METAL IN THE HOME WORKSHOP.** Here's one to clip and file away for reference. Combining basic bending techniques with a pro's short-cut tips, this fact-packed article also includes plans for two handy bending jigs that you can make yourself. If you're at all interested in metal working, you won't want to miss this May shop special



# Perfect Disks Every Time



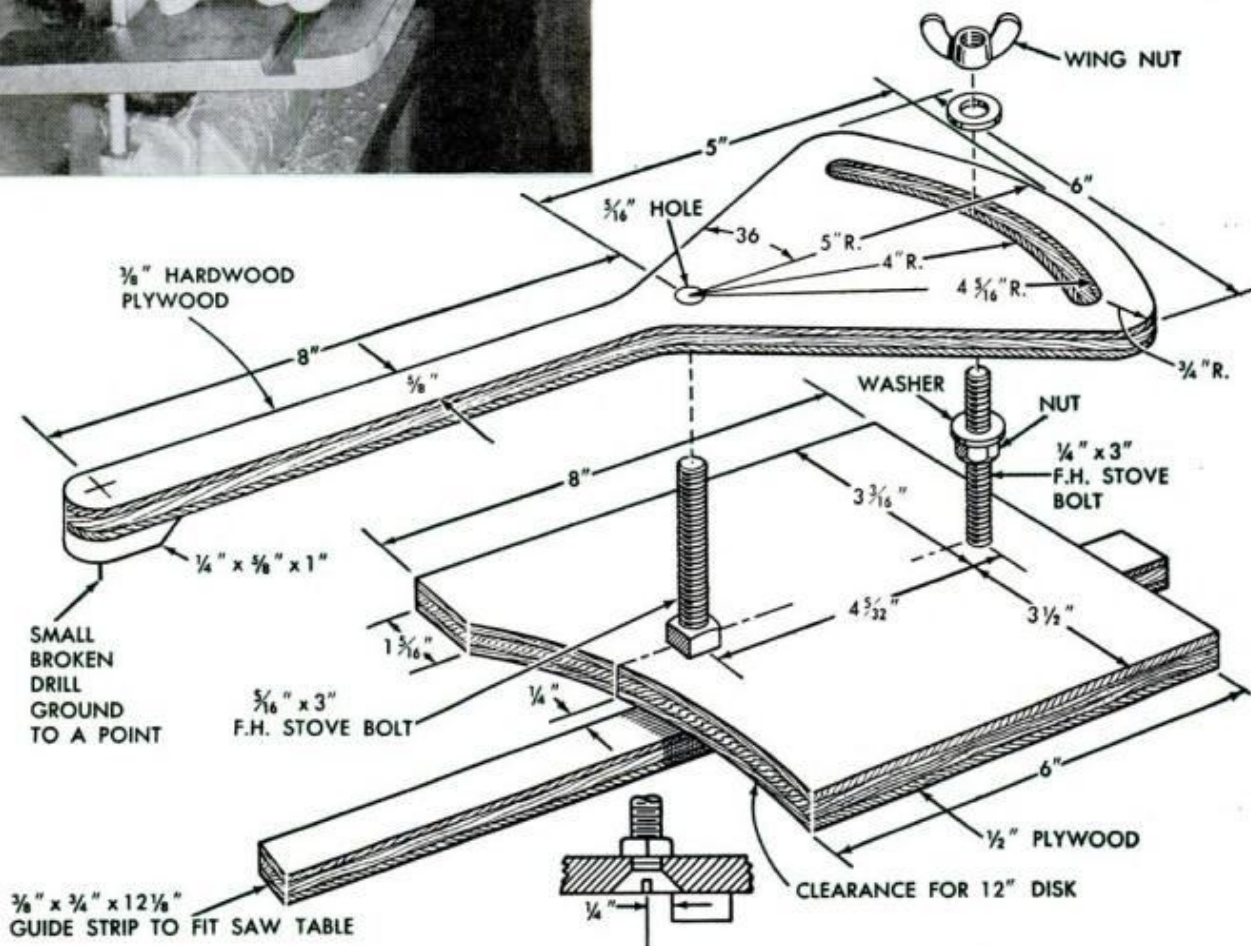
THE JIG can handle any diameter of work from  $\frac{3}{4}$  to 12 in. and thicknesses up to  $1\frac{3}{4}$  in. As shown in lower photo, sander table can be tilted in either direction when you need to sand a bevel. Lock the wing nut for repeat sanding of identical disks



WHETHER you "turn" one, a dozen or a hundred, every disk will be exactly alike with this adjustable sanding jig which rides in the miter-gauge groove of your disk sander. It will accommodate stock up to  $1\frac{3}{4}$  in. thick and handle disks up to 12 in. in diameter.

To use the jig, first adjust it for the thickness of the stock to be sanded, then tighten the wing nut and place the jig's point in the center of the work. By rotating the precut circle against the sanding disk, the edge of the circle will be smoothed without disturbing the accuracy of the original cut. Hardwood plywood is used for construction, though the guide strip may be maple, if desired.

The size and positioning of the guide strip will of course, vary, depending on the sander being used. To determine its position, place the jig so that there is enough clearance for work up to 12 inches in diameter. Then mark the groove's position on the base and attach the guide strip with screws.—*Emil P. Kushner Sr.*



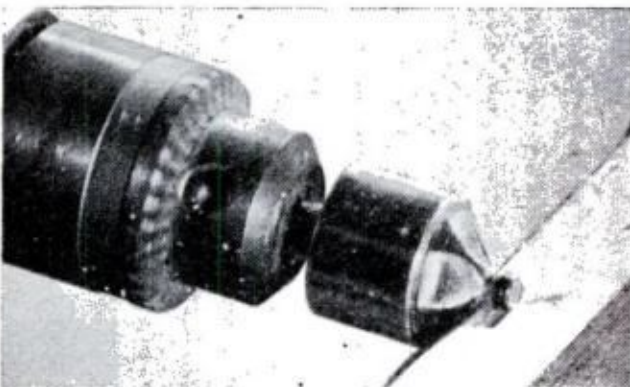


## Shopping for Tools



**PAINTING CORNERS** is easier with the No. 85 foam plastic paint roller. Its wedge shape fits into the corner, lets you cover almost an inch of one wall without touching the other. Especially useful when adjacent walls are to be different colors. Costs 98¢. Thomas Industries, 207 E. Bdway, Louisville 2, Ky.

**RADIAL SAW BECOMES PLANER** with the addition of this planer head that fits any radial-arm saw with a ½ to 1 in. arbor. Operates at 3,000 to 6,000 r.p.m. and cuts up to ¾ in. deep in any wood or plywood. Sells for \$14.95 postpaid, including grinding wheel and arbor for sharpening cutters. Available from Gilmore Pattern Works, 1164 North Utica, Tulsa 10, Okla.

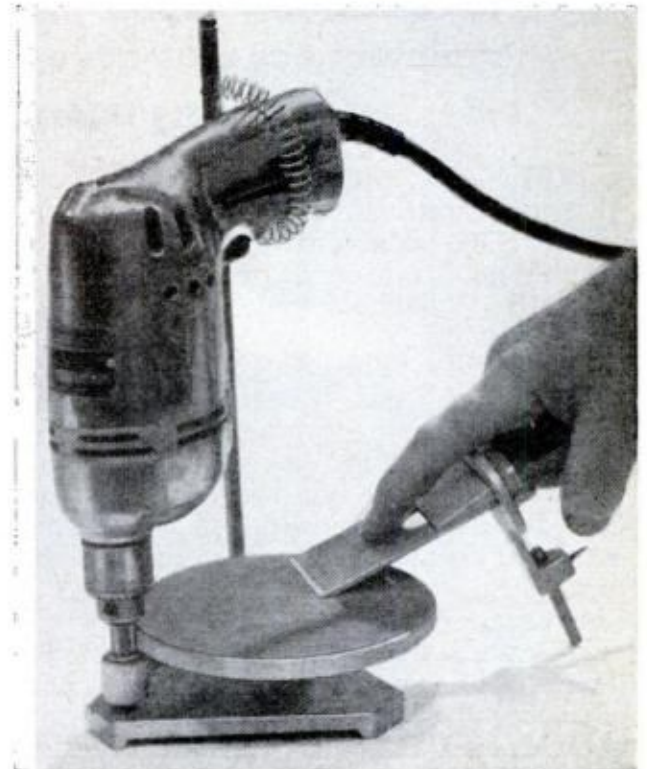


**CUT CORNER BEVELS** with your electric drill or drill-press, using the Bevel-Cutter. Cuts 45-deg. bevels ⅓₂ to ⅝₁₆ in. wide on wood, plastics, soft metals. An adjustable shoulder and a pilot tip guide the blade to assure a straight cut. Sells for \$1.98. Arco Tools, Inc., 421 West 203 Street, New York 34, N.Y.

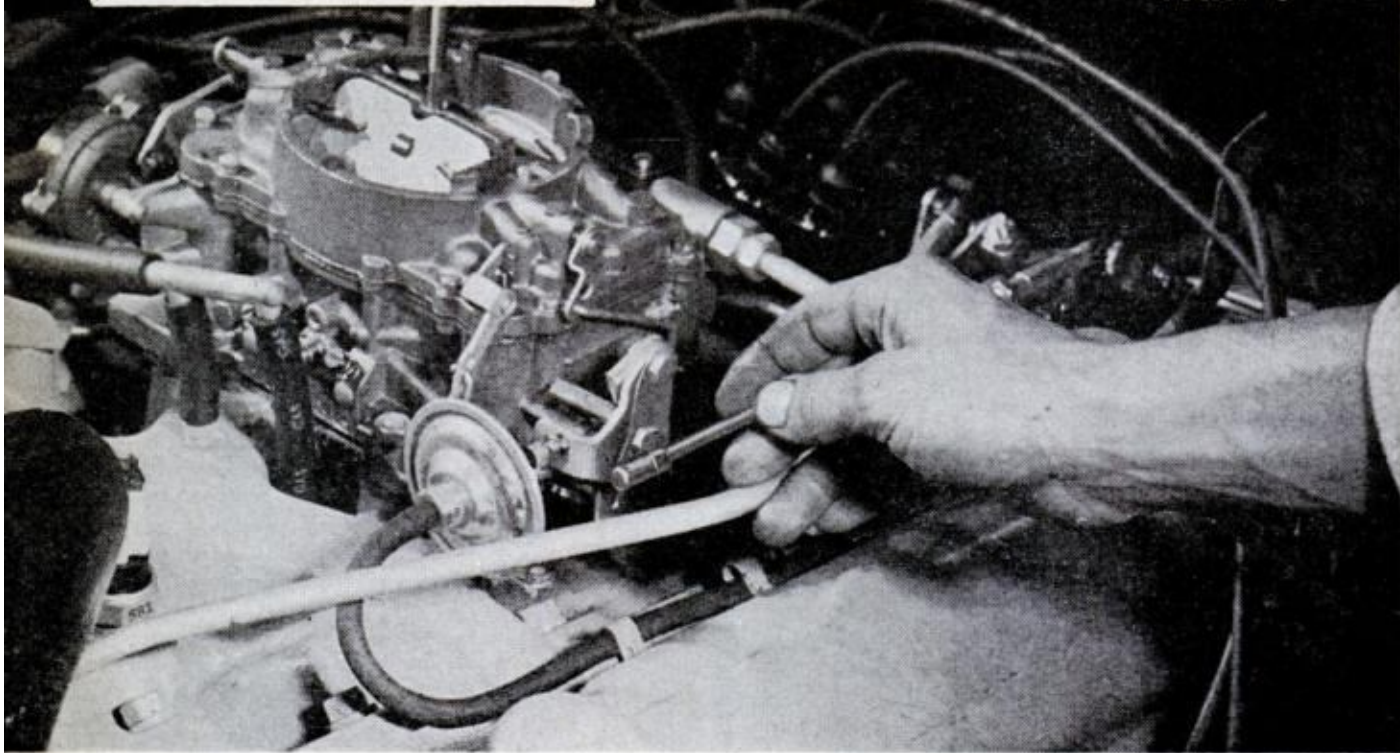
**HONE KNIVES, CHISELS, PLANE IRONS** and other edge tools with any ¼" electric drill. You hold the edge against an abrasive disk which revolves on a turntable. Gives razor-like sharpness in a few seconds. Retail for \$4.95, plus 30¢ postage. Riverside Enterprises, 7 South Buffalo Street, Corning, N.Y.



**MOTOR SPEED CONTROL**, for varying the speed of any power tool, appliance, etc. mounts on the wall outlet. You remove the screw holding the receptacle face plate, plug the control unit into the outlet and insert a screw provided with the unit. Costs \$29.95. Aero Systems, 1275 Route 23, Wayne, N.J.







# SHOULD YOU LAY A HAND ON YOUR CARBURETOR?

Some mechanics say only an expert should attempt to clean or repair these vital units. But a little maintenance may save you an unnecessary overhaul

By Morton J. Schultz

**F**OR MANY MOTORISTS, do-it-yourself maintenance screeches to a halt when they confront their carburetor. There's good reason to be wary of upsetting the balance engineered into this "vital organ." Functioning as your car's lungs, it must gulp in a roomful of air for each gallon of gas. If the mix proportions are disturbed, the motor can't "breathe" properly, and you're not long for the road.

Carburetors are big business. Year after year, for the past decade, U.S. repair shops overhaul an average of close to 11 million units. And more than 15 million units are replaced annually.

This adds up to 26 million carburetor jobs a year. That's a lot, especially when you consider that the total number of vehicles on U.S. roads is around 75 million

—meaning that one out of three U.S. cars are experiencing a carburetor problem every year.

These statistics lead us to several conclusions: First and most obvious, that carburetors are one of the most troublesome of all auto parts. Second, it looks as if only a few auto owners repair their own carburetors—or even attempt to clean them. Third, surely among those 26 million are carburetors that are being needlessly overhauled and replaced. The fault for this must rest with the car owner who takes neither time nor trouble to learn about carburetors, leaving himself wide open to a big repair bill when the real cause of his trouble may be minor.

Carburetors used on today's high compression engines aren't the easiest part



of the car to understand. But neither are they beyond the layman's ken, as many pros insist. In this two-part article, *Popular Mechanics* doesn't expect to make a carburetor expert of you, but we hope to show that there's no reason to be intimidated by the unit.

If we succeed, many readers may wish to try their hand at carburetor cleaning and repair. In certain cases, this isn't difficult, but in others it can present problems. It depends on the complexity of the particular unit.

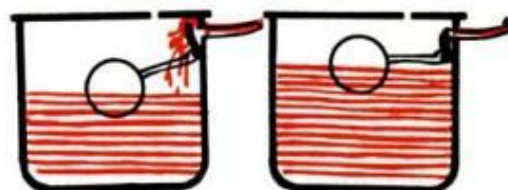
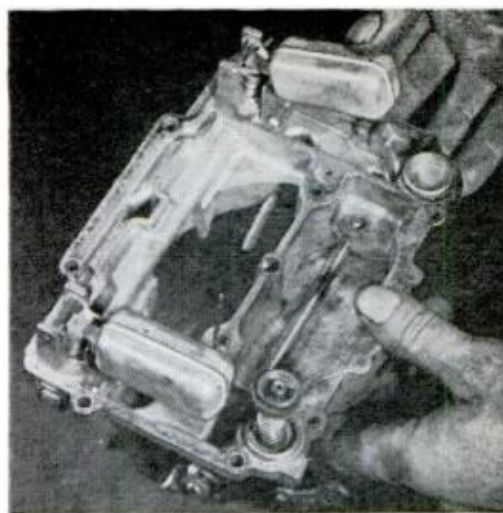
Everyone, however, should get a good appreciation of how a carburetor works, and how it can be maintained. Armed with this knowledge, you'll be able to pinpoint the cause of a carburetor problem. This will at least enable you to bring the likely area to a mechanic's attention and may save an outlay for unneeded parts and labor.

Part 1, this issue, deals with how a carburetor works, and the maintenance you can perform without removing it from the car. In Part 2, next month, we'll go on to more extensive troubleshooting, overhaul and adjustment.

The job of the carburetor is to mix air and fuel in the proper amounts and deliver this mixture, through the intake manifold, to the combustion chambers. Proper balance of the air-fuel mixture is vital, or a host of problems can arise: hard starting, flooding, stalling, rough idle, backfire, fouled plugs, and poor gas mileage.

Basically a carburetor consists of only two major units: bowl (or chamber) and throat (or air horn). The bowl is just a reservoir that holds a certain amount of gasoline until it's needed. Gas comes into one end of it from the gas tank and flows out the other end to the throat. A constant level is maintained, as shown and described at the right.

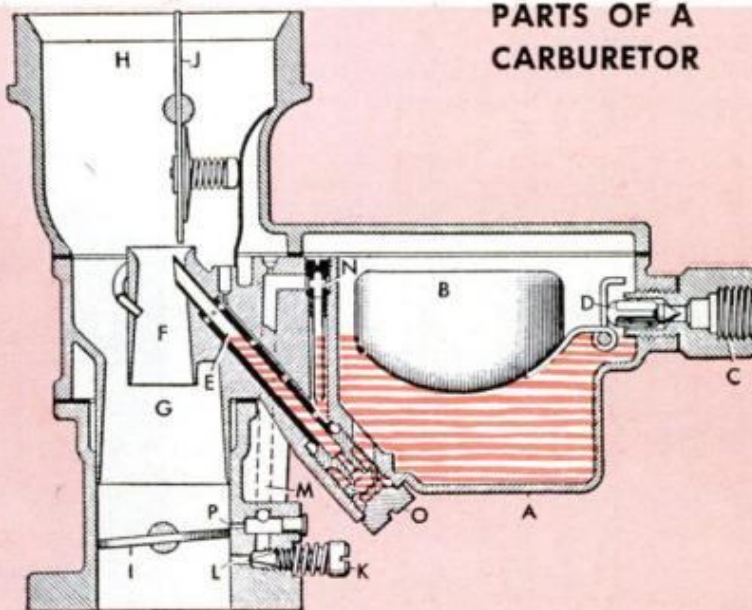
The throat is a mixing pod where gas and air are blended. The gas flows from the bowl up a nozzle extending into the middle of the throat's narrowest part, which is called the venturi (see sketch below). As the pistons in the engine move downward,



## HOW A FLOAT VALVE OPERATES

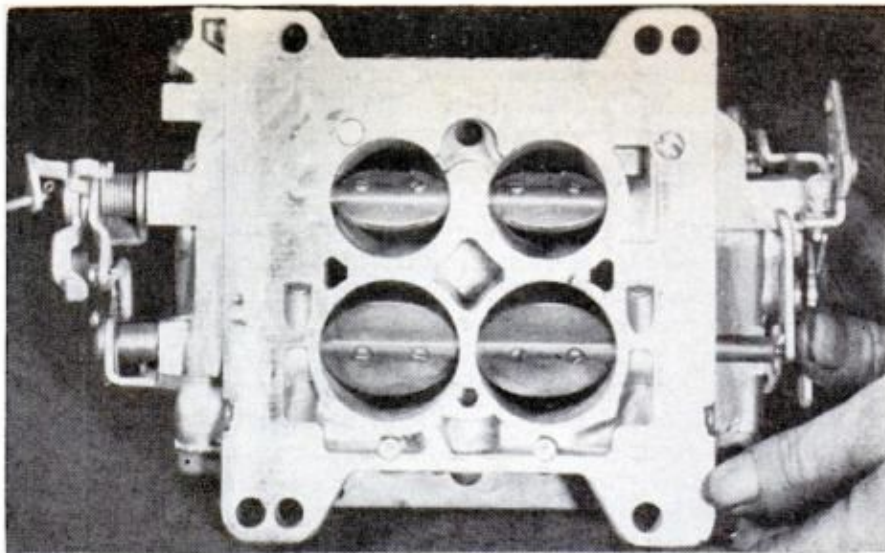
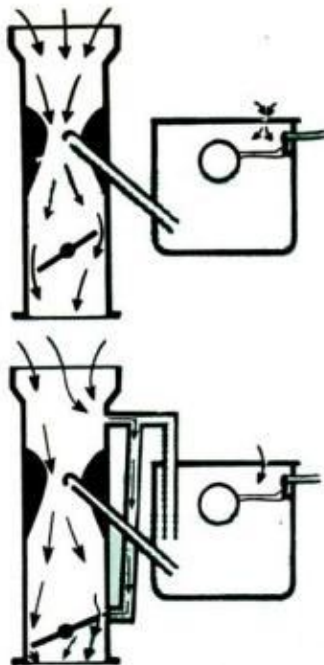
TO KEEP GAS in bowl at constant level, so it neither overflows nor sinks too low, a needle valve is placed at fuel inlet port. This valve is controlled by a float, much like the one in a toilet tank: As gas gets low, sinking float pulls valve open (left, above), allowing gas to flow in. As bowl fills, float rises and closes valve. Four-barrel carburetor (top photo) has two floats—one for each of two circuits, the primary and secondary. Single- and two-barrel carbs have only one float. Relation of bowl to other parts is shown in cutaway of typical carburetor below

- A Bowl
- B Float
- C Fuel Inlet
- D Needle Valve
- E Main Nozzle
- F Venturi
- G Mixing Chamber
- H Throat
- I Throttle Valve
- J Choke Valve
- K Idle Mixture Adjust Screw
- L Discharge Hole
- M Idle Passage
- N Idle Tube
- O Main Discharge Jet
- P Idle Circuit Inlet



## PARTS OF A CARBURETOR





**AIR ENTERING BOWL** (top sketch) puts pressure on fuel greater than that at venturi, so fuel climbs nozzle to throat where it mixes with inrushing air. Bypass (lower sketch) feeds idling engine when throttle valve is closed. Photo shows paired valves of four-barrel carburetor

they create a vacuum in the throat which causes air to rush in at speeds approaching 250 miles per hour. This vacuum is greatest at the venturi since it is narrow. The high atmospheric pressure on the surface of the gas in the bowl, combined with the low atmospheric pressure at the venturi, causes gas to be pushed up and out of the nozzle into the throat, as shown in the top sketch.

As this gas pours into the fast moving air stream entering the throat, it's broken into a fine spray that mixes with the air. The mixture rushes down the throat to the intake manifold, which is connected to the throat, and into the combustion chambers where it's ignited by sparks.

This, then, is the way a carburetor works. Simple enough! But we have to add refinements because of our demand for quick engine pick-up, high and low

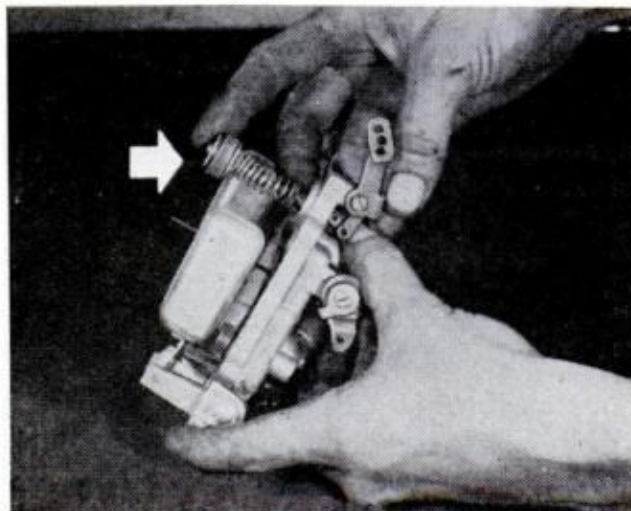
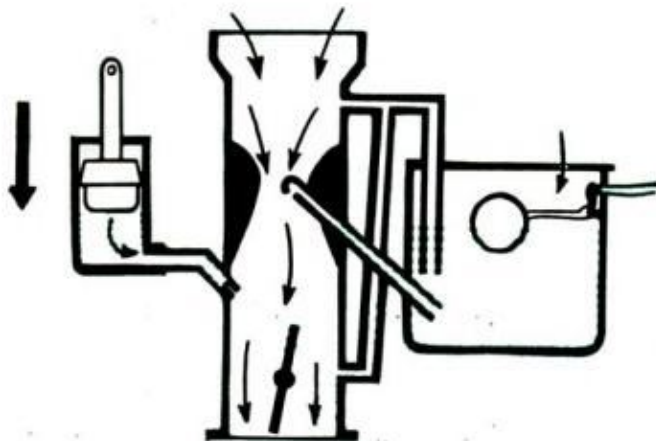
speed operation, ease of starting, and smooth idling. These are things a simple carburetor can't supply.

To permit us to vary the speed of our engines, a throttle valve (or valves) is located at the bottom of the carburetor throat below the venturi. It's the valve you operate when you step on and release the accelerator pedal.

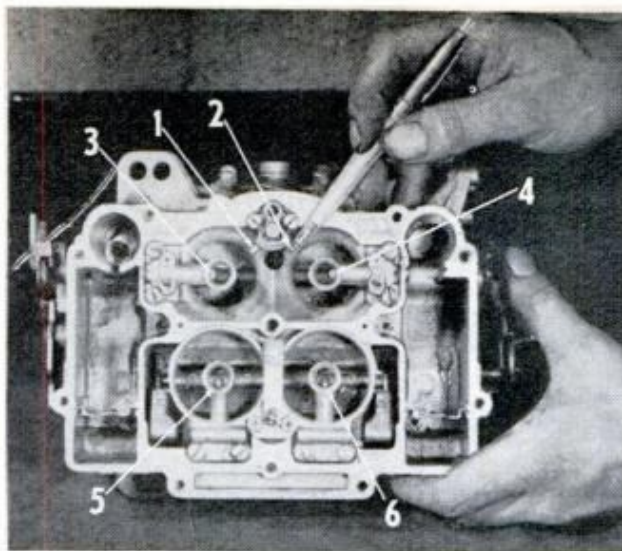
As you depress the pedal, the throttle valve opens and allows more air-fuel mixture to enter the combustion chambers. This, of course, causes the engine to run faster. Releasing the pressure on the pedal causes the throttle valve to close, letting less mixture into the chambers and slowing the engine down.

This still doesn't cover all requirements. The carburetor must provide for *idling*. Without such provision, the engine would stop when you let the throttle valve close

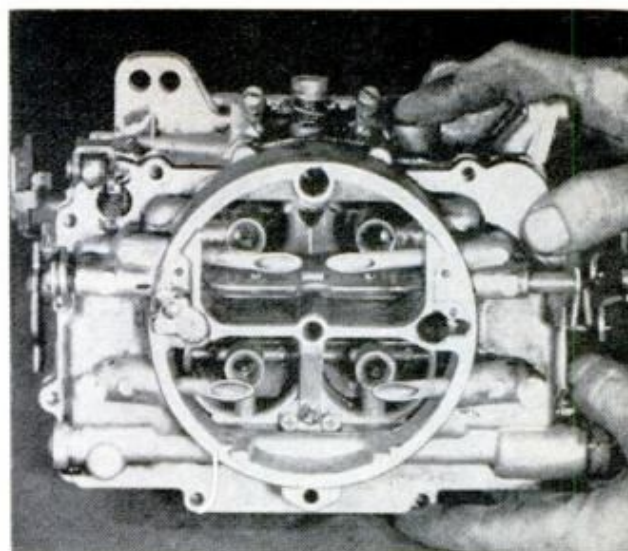
**ACCELERATOR PUMP** (arrow in photo) gives shot of gas to cylinders when you suddenly depress accelerator. Pump moves downward (arrow in sketch) to force gas into throat. This is only stop-gap measure that ceases when regular fuel flow to venturi catches up to demand for speed, but it prevents flat-spot acceleration







**FOUR-BARREL CARBURETOR** has six jets to control amount of gas flowing from bowl to throat (or into bypass) to prevent flooding. Four feed the primary circuit; the other two take care of the secondary



**LOOKING DOWN THROAT** of four-barrel carb that's less disassembled than one at left, you can spot the two sections. Two barrels on top (normally covered by choke plate) are primary. Bottom two are secondary

all the way by taking your foot off the accelerator, since *no* fuel-air mixture could enter the chambers.

The idling system is simply a tube that bypasses the carburetor throat, extending from the bowl to below the throttle valve. It allows just enough gas and air to enter the combustion chambers to keep the engine running while the throttle valve is closed (second sketch, top of page 178).

Something has to control the amount of gas flowing from the bowl to the carburetor throat or into the idling circuit, or carburetor flooding would occur. That's the job of the jets—small openings in the bottom of the bowl at the entrance to the idling and high speed circuits (above). In most carburetors, there's also a tapered rod, called a metering rod, that raises and lowers in the jets to control the amount of gas going through them. This rod is operated by the driver as he controls the accelerator pedal, since it's connected to the accelerator by a linkage.

Another essential carburetor part is the accelerator pump (below, left). When you step on the gas for quick acceleration, the throttle opens and air rushes into the carburetor throat immediately. But it takes time for the right amount of gas to move up the nozzle from the bowl and into the throat to provide the fuel for speeding up. If it weren't for the accelerator pump, you would experience flat-spot acceleration (a hesitancy in movement) as you stepped on the accelerator.

The accelerator pump—also called the

**CLOGGED AIR FILTER** reduces gas mileage by as much as 10%, so clean it if possible. The air cleaners on some newer cars are saturated with oil; these can't be re-soaked for reuse since this expands them so they won't fit case. This type must be replaced

pump plunger—is linked to the throttle and forces an extra charge of gas into the air stream during the time the throttle is actually opening. It aids in starting the car, as well. As you press the accelerator and turn on the ignition, it provides the charge of gas which flows into the combustion chambers for starting.

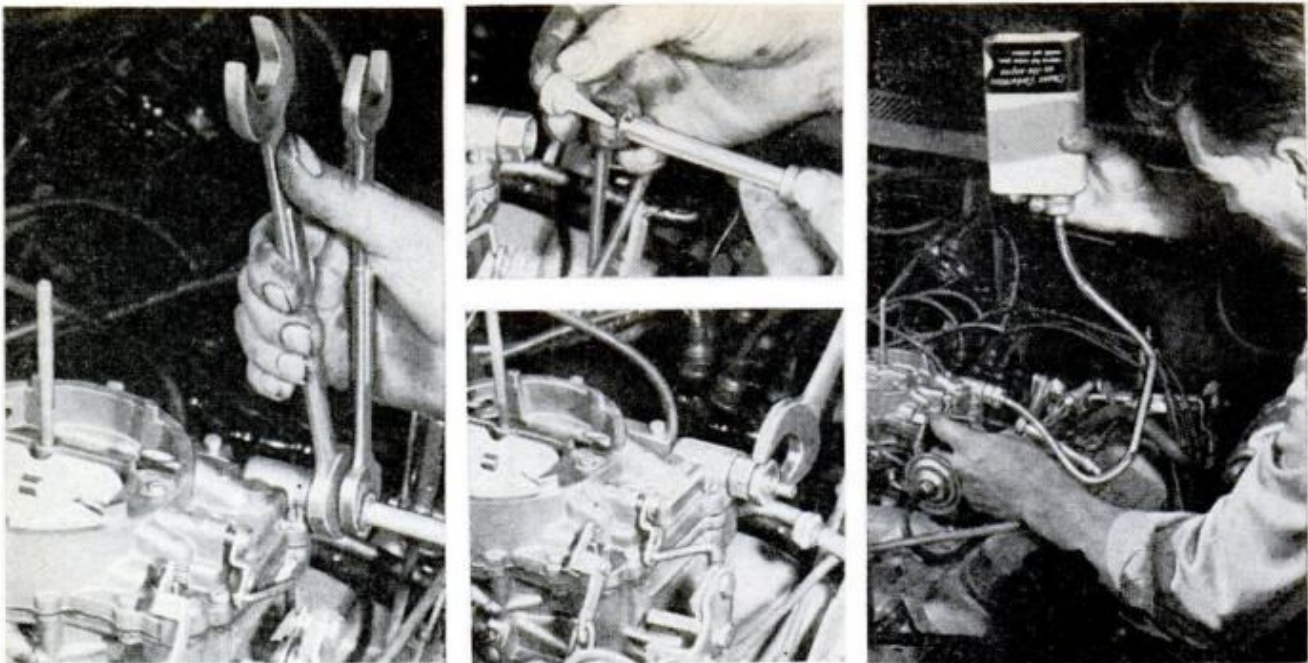
The choke is an integral part of the carburetor. It changes, either manually or automatically, the proportion of air and gas being fed to the engine to meet various conditions. A cold engine, for example, needs a mixture rich in gas to start the car without any trouble. When the engine is running at normal temperature, a leaner mixture is required, so the choke opens to let more air in.

These, then, are the essential parts of a carburetor. Other parts are added by manufacturers to meet specific conditions.

Some of these are: economizers that provide more fuel when required; anti-percolation passages through which boiling gasoline in the carburetor can escape and not cause vapor lock; a built-in filter







**TO CLEAN CARBURETOR** on the car, you'll need a force-flow kit. You must disconnect fuel line at carburetor (left) and plug it with kit's block-off adapter (top center) to stop flow of gas when you run engine during cleaning. Turn kit's universal adapter into inlet port (bottom center) and attach plastic hose between it and can of fluid. Invert can, start engine and pump throttle at carburetor by hand (right) to force fluid through

screen located at the fuel line connection just before the needle valve to trap dirt particles entering the bowl; choke modifiers to prevent overchoking during warm-up; idle compensators that let additional air into the throat under extreme hot idle conditions; and dash pots which are used on most cars with automatic transmissions to close the throttle slowly when the accelerator is released rapidly, thus preventing a stall. Such a unit shows clearly in the opening photograph, page 176. It's the tube-fed disk to the left of the hand.

Most late model cars are equipped with two- or four-barrel carburetors. The word "barrel" refers to the number of inlets and throttle valves the carburetor possesses. The basic theory of the single-barrel carburetor, which we just described, applies

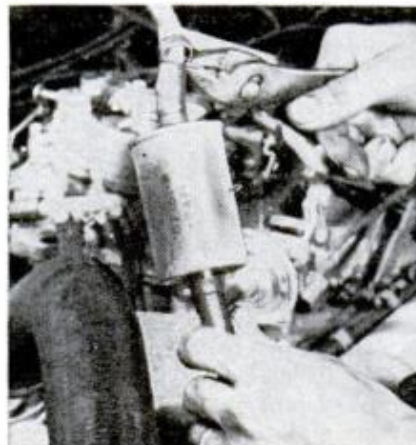
to these. The chief difference in multiple-barrel units is their ability to deliver a greater volume of fuel mixture, particularly at high speeds.

The two-barrel carburetor is identical in operation to the single-barrel unit, except for the fact that it has two fuel passages to the intake manifold, providing better fuel distribution to the cylinders.

The four-barrel carburetor is divided into two sections as shown on page 179. The primary section, which consists of two barrels, supplies all fuel to the engine at idle and up to about three-quarters of full throttle. At speeds above this point, the secondary section, which also contains two barrels, comes into operation to provide the additional supply of fuel and air re-

[\(Please turn to page 200\)](#)

**IN-LINE FUEL FILTER** should be removed. Type shown at left can be dismantled, cleaned and reused. One at center is replaceable type you can't use again—but change it as often as manufacturer recommends. Filter screen located in gas inlet port (right) can be backed out and cleaned in carburetor solvent. Many four-barrel carbs have both an in-line filter and this screen. But if car has filter in gas tank, don't fool with it





# AUTO CLINIC

**Q** My 1963 Corvair is hard starting when the engine is warm. I've checked with my dealer's service department several times, but they have not found a cure. Is there one?—N.Q., Washington.

**A** This is a problem experienced by many Corvair owners—it seems to be inherent to this car. Chevrolet has stated that if the car starts within 10 seconds, then there should be no cause for concern. Although it seems like a long cranking period, this is normal for the Corvair. If, though, starting time exceeds 10 seconds, there is a modification that can be tried. It involves venting the carburetor, and instructions are contained in Chevrolet Service Bulletin DR 589. Take the car back to your dealer—he'll apply the modification for you. Be aware, though, that this information concerns only those Corvairs which are hard starting when the car is warm.

**Q** My 1959 Simca is getting compression on only two of its four cylinders. Could you tell me what's wrong?—R.H., New York.

**A** The trouble you're having is one which most Simca owners have sooner or later. Odds are that the cause lies with the head gasket, which has probably blown. The reason for this occurrence of blown gaskets in the Simca is improper torquing of the head. When you take the head off, check it for warpage. If warped, plane it until perfectly straight. Then put on a new gasket, but be careful of the torque. Torquing must be done with the engine absolutely cold. And apply no more and no less than 40 foot pounds of pressure to those head bolts. This might seem like a little, but it's for this reason that the gaskets are blowing in the first place. People think the head's not tight enough and over torque it. After 300 miles, retorque the head again to 40 foot pounds. And keep checking it every 2000 or 3000 miles just to make sure it's OK.

**Q** I have a bad squeak in the front end of my 1961 Thunderbird. I've tried everything to correct it. Have I missed something?—T.P.F., Iowa.

**A** Maybe! Have you tried lubricating the upper control arm? This has been an area that many T-bird owners (and those who do the lubricating) overlook, and it's a prime place for a squeak to start and continue. You'll find some nuts on the upper suspension shaft. Back these off and get plenty of lubriplate down into that upper control arm. Bet that does it.

**Q** I've replaced the timing chain of my 1961 Tempest five times, and now it's ready for a sixth. The only way I can see to get rid of this problem is to dump the car. I'm afraid that chain will break while I'm driving. Should I sell out?—E.J., Rhode Island.

**A** Not yet. This problem is one that's plagued the Tempest from 1961 through 1963. But it's possible that Pontiac has found the solution. They've come out with a new chain and sprocket kit in which the sprocket gears and the chain are now perfectly matched. Reports from service departments show no call-backs after the new kit has been applied. The kit's part number is 524622. Take the car back to your dealer and have him put on this new chain. Make sure, too, that he installs the bumpers.

**Q** My 1959 Chevrolet smokes like a chimney through the breather pipe and oil filler cap. Yet, it doesn't use oil. I change oil and filter every month, I've added sludge cleaner, and I've cleaned the tappet covers. Yet, it still puts out smoke like a band of Indians on the warpath. What now?—L.W.A., Connecticut.

**A** Look to blow-by. Those pistons have two types of rings on them. One is compression—the other is oil. It sounds as if those compression rings are bad, while your oil rings are still in good shape. This would account for the smoking without the oil loss. It might just be time for an engine overhaul. Check the compression of each cylinder. If it's off, then the compression rings are probably bad.

As a service to the readers of Popular Mechanics in solving problems relating to their cars or to driving in general, you are invited to submit your questions for answering either through this column or by mail. Address Auto Clinic, Popular Mechanics Magazine, 575 Lexington Avenue, New York 22, New York.



Part 1



# the **SCOOTER** that **HITCHES A RIDE**

By Manly Banister



*Our Tom Thumb motor bike folds up and tags along when you're off to the beach or a country weekend*

**T**HE BEST SPOTS for motor scootin' are often so far from home you'd be worn out by the time you rode a scooter there. If you've ever longed for a motor bike you could collapse compact enough to stash in the trunk of your car, as shown in the photo at left—this project's for you. We've dubbed it the Tom Thumb—both because it's a midget, and because it thumbs a ride to where the fun is.



Even if the take-along feature doesn't grab you, maybe you just don't have any place around home to park a scooter, and need one you can pick up and tuck in a hall corner. The Tom Thumb weighs only 77 lbs., complete with accessories. Yet, with its rugged welded-steel construction, it's far from a kid's toy. The one we built will carry a 225-lb. man at a top on-the-level speed of nearly 16 m.p.h.—without even flexing the frame!

As the profile below indicates, the seat support and steering fork fold toward each other, once you've loosened two lock bolts at the front and removed the rear stanchion. The unfolded scooter stands 30 in. high at the handlebar, is 42½ in. long and 24 in. wide. Its miniature 5½-lb. ¾-H.P. powerhouse is an Ohlsson & Rice Model J, retailing at around \$50. It has an engine speed of 6300 r.p.m., geared down to 900 r.p.m. at the driveshaft. This two cycle job runs on regular gasoline, with 12 oz. of outboard motor oil added to each gallon. A tankful of this mixture lasts 45 minutes; a jumbo tank is available that provides an hour's run. The built-in centrifugal clutch takes hold smooth-as-butter at 3000 r.p.m. engine-shaft speed (450 drive-shaft speed) and lets go when the engine is throttled below this r.p.m.

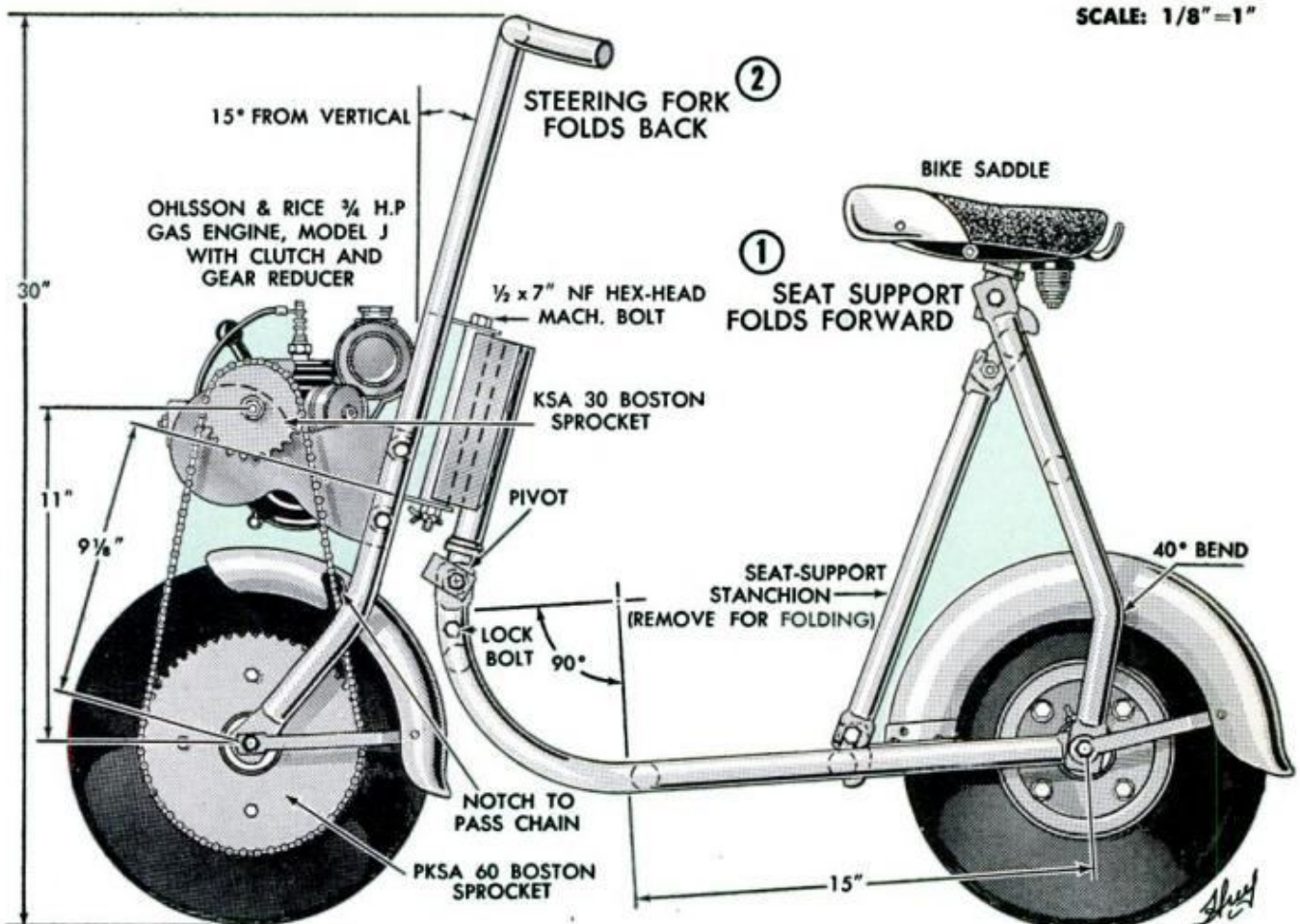
At the same time you buy the engine, get a throttle control, a 7-cup remote

muffler and four feet of flexible exhaust tubing. You can (at slightly less cost) substitute a 5-cup muffler for a little extra power at the price of more noise; it would be okay for use out of the city.

The 5-in. wheels are equipped with 4.10/3.50-5 tires mounted on long Timken tapered roller bearing hubs. The bearings are standard Ford front wheel bearings. For less money, you can secure other hubs with a choice of Timken or ground ball bearings, and these can be adapted to our design by installing shaft collars on the axle at both sides.

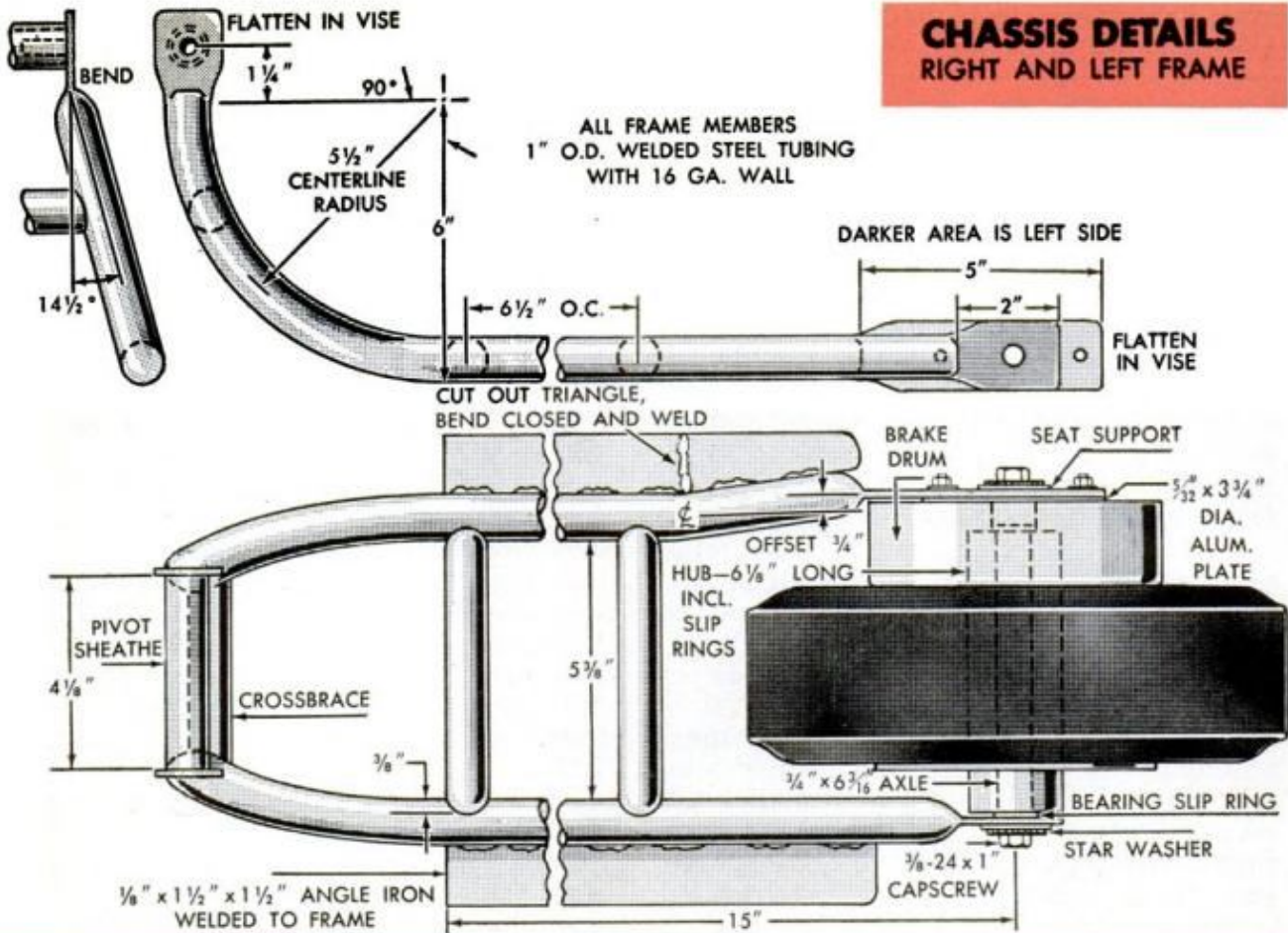
Before starting work on the scooter, collect all wheel parts and the two drive sprockets. Full information on the wheel sprocket is given on page 186 where all wheel parts are shown. Short lengths of 2-in. pipe are included in both front and rear assembly to provide a firm base for the drive sprocket and brake drum, respectively. This prevents cupping the metal and permits the retaining bolts to be drawn up tight. The engine sprocket is a KSA 30 Boston with a 1½-in. hub, ½-in. bore, 3.59-in. pitch dia., ⅜-in. pitch, for No. 35 chain.

Once you have your axles machined, begin the chassis assembly. All major frame members are 1-in. o.d. welded-steel mechanical tubing with a 16-ga. wall. The drawings show clearly which parts need

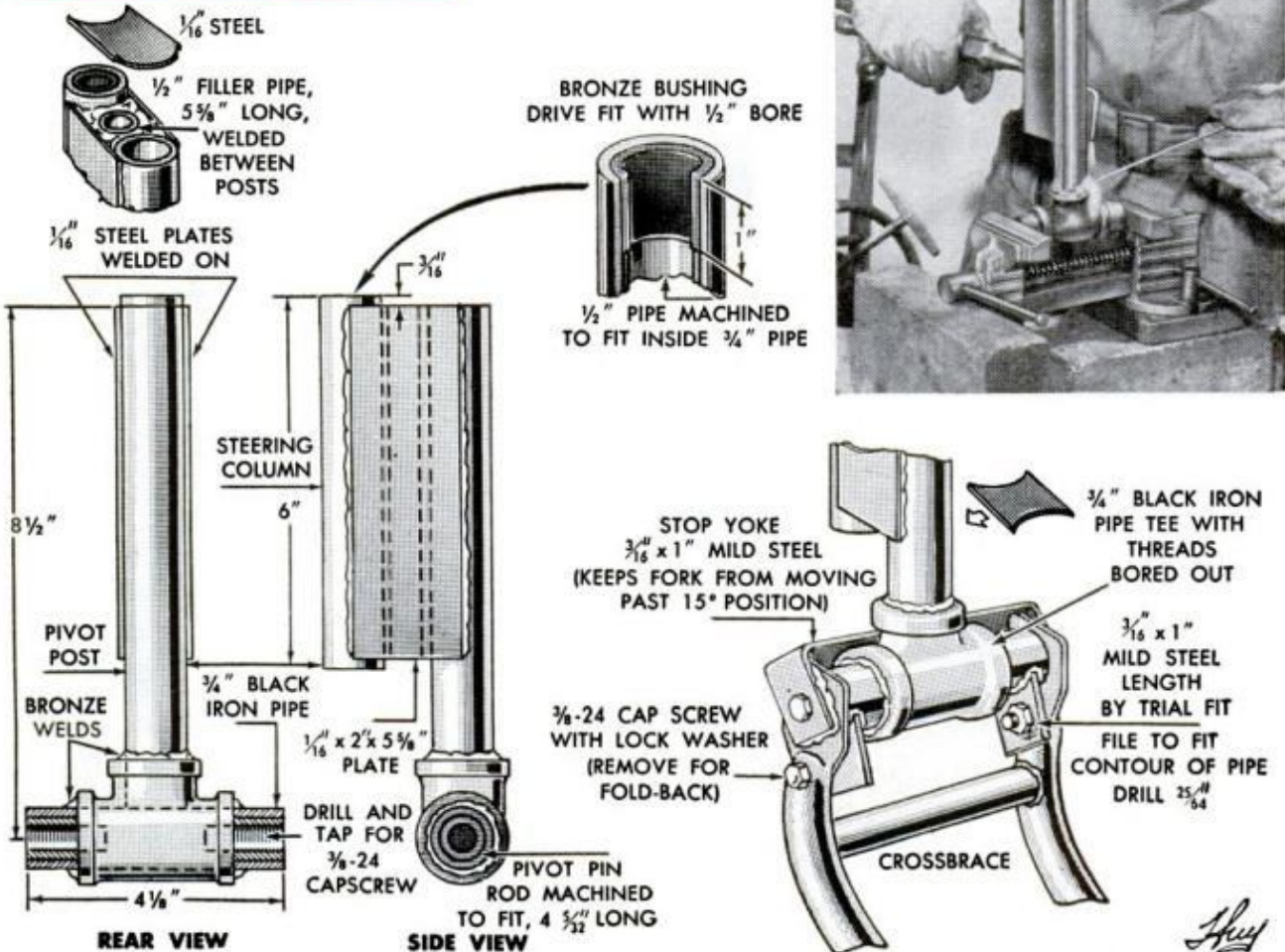




# CHASSIS DETAILS RIGHT AND LEFT FRAME



# STEERING COLUMN





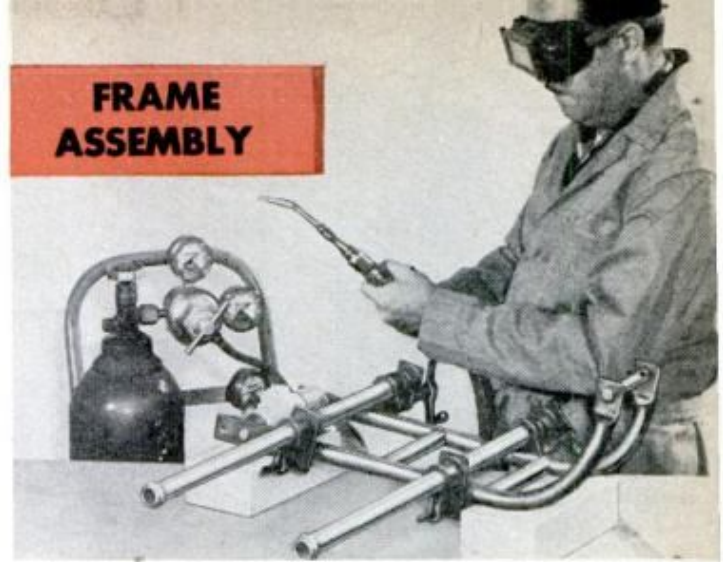
bending, and how much. The easiest and most accurate way to do the bending is to cut those parts 6 in. or so overlength and take them to a pipe-bending firm near you (look under Pipe or Tube Bending in the yellow section of any city phone book). You should be able to get the whole job done for a few dollars. If you'd rather do your own bending, you'll have to make a jig that will accommodate the 1-in.-dia. tubing. Fill each piece to be bent with dry sand and plug both ends. Heat the bending area as you move along, using an oxy-acetylene or air-acetylene torch to bring the metal to red heat. (Don't substitute water pipe for the tubing; it's too heavy, and too hard to bend.)

Assemble the chassis first, as shown at the left. Cut excess tubing from the ends of the bent parts after locating the flats and holes required at each end. Do this accurately, using a carpenter's square. Make your welding set-up as shown in the top photo at right. Before welding in the first crossbrace, make certain the pivot pin is perfectly parallel with the rear axle. Keep the assembly bar-clamped while welding with either the oxy-acetylene torch shown, or an arc welder. When the two crossbraces are welded, check the frame for trueness. Welding heat may have pulled one or both of the long tubes out of line. If so, find the point of divergence, clamp the part in a vise, bring that point to red heat (a propane torch will do for this) and pull the part back into line by hand. When all is satisfactory, weld in the final crossbrace, under the pivot pin, positioning it low enough to leave room for the locking wings which must be welded to the pivot sheathe.

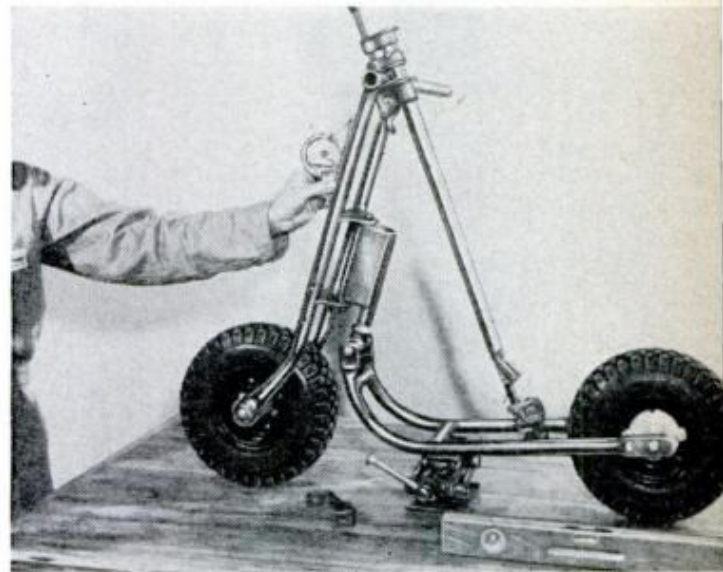
Finally, tack-weld the two angle-iron flanges in place, with their vertical legs pointing groundward and trimmed down to a 1-in. width on a metal-cutting band-saw. The one on the right side must be reshaped as indicated to match the frame.

Next comes the front fork, as detailed on page 187. After slotting both fork members half-way through to take the yoke plates, fit all parts together (including the front axle) and clamp as you did the chassis. Weld in the yoke plates and brace rods first, then check to see if the fork's been drawn out of line. If so, straighten as before, then weld on the handlebar.

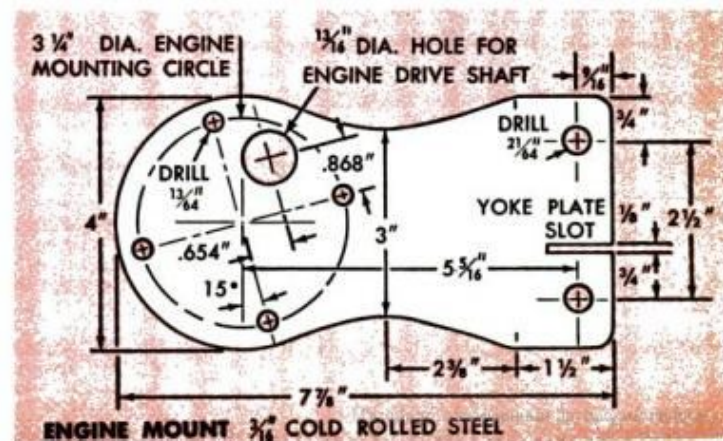
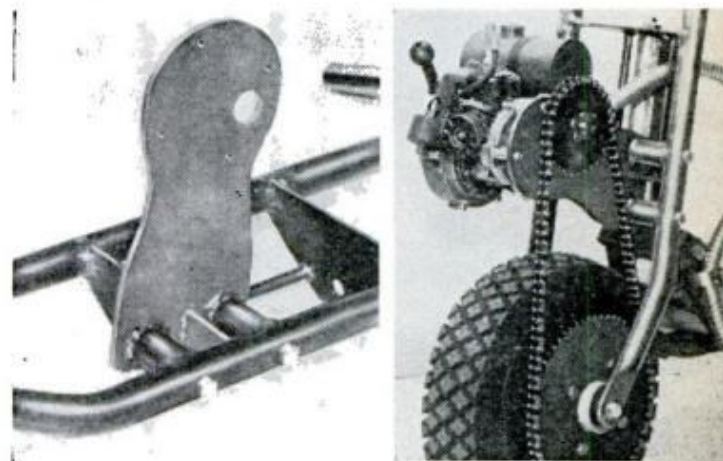
The steering-column pivot-post assembly (left) is a critical part of the construction, since it must bear the weight of both scooter and rider. Strength is the only reason for the 1/2-in. filler pipe welded between the posts, or for the side plates and fitted top and bottom covers—all cut from 1/16-in. steel and welded on to form a boxed-in unit of great rigidity.



**CLAMP CHASSIS** for welding with rear hub and pivot pin in place. Front crossbrace is last one to go in



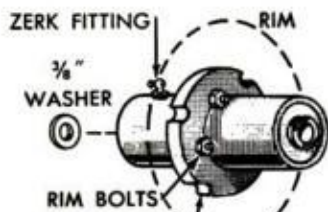
**TO WELD STOP YOKE**, place scissors-jack under frame and raise until protractor-level reads 15 degrees





## FRONT WHEEL ASSEMBLY

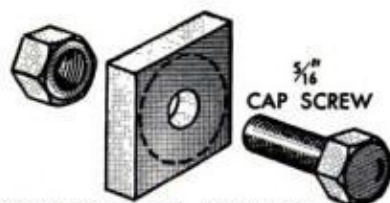
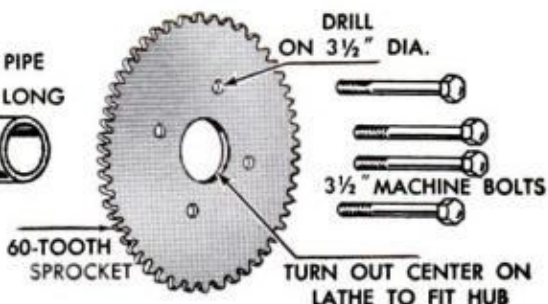
**ALL PARTS** laid out before assembly in steering fork. Wheel with Timken hub has Zerk fitting and tire valve both mounted on side opposite sprocket. Just below tire is front axle with  $\frac{3}{8}$ -24 cap-screws that turn into each end. In front row, PKSA 60 Boston steel plate hubless sprocket (7.17-in. pitch dia.,  $\frac{3}{8}$ -in. pitch) for No. 35 chain. Displayed on it are C-shaped buffer washers to fill space between hub flange and rim center (providing bearing surface for washers and nuts on retaining bolts) and the recess ring



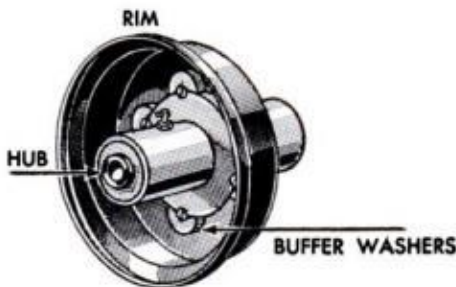
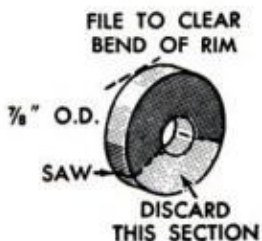
FILE NOTCHES IN HUB PLATE TO PASS SPROCKET RETAINING BOLTS (DO SAME TO REAR HUB)



$\frac{1}{8}$ " x  $\frac{3}{8}$ " ALUMINUM RING FITS IN RIM RECESS

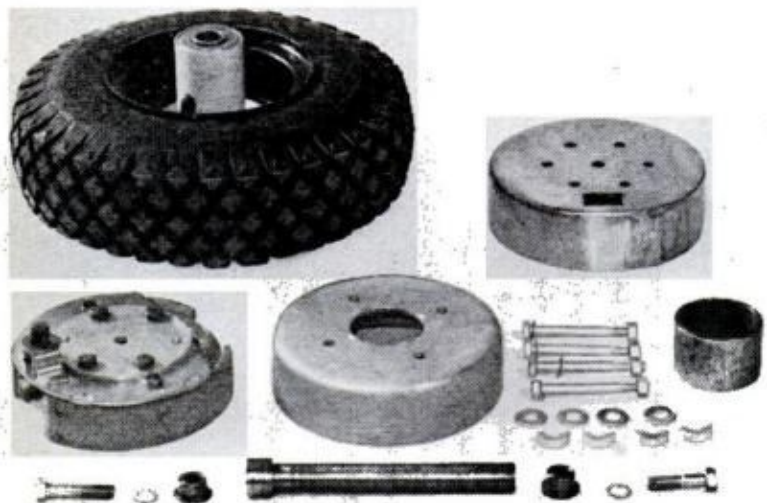


MOUNT  $\frac{1}{4}$  x 1 x 1" ALUM. ON BOLT, TURN TO  $\frac{3}{8}$ " DIA., THEN CUT AS SHOWN AT RIGHT

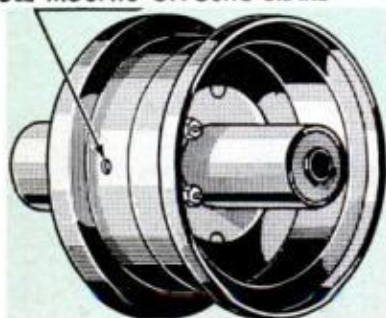


## REAR WHEEL ASSEMBLY

**BRAKE COMPONENTS** are shown below tire, left. Drum's original  $1\frac{1}{2}$ -in. hole is bored out to fit 2-in. hub. Four other holes are for retaining bolts. Brake shoe plate, farther left, has aluminum plate bolted over center opening. To solder nuts to inner face (see sketch at bottom of next page) remove brake shoes and springs. Two retaining springs protruding from shoe plate in photo (in line with center hole) had  $1\frac{1}{2}$  rings clipped off to seat optional homemade brake-drum cover, at right of wheel. To take rear wheel off fork, you must remove bolts from aluminum plate, plus two axle bolts



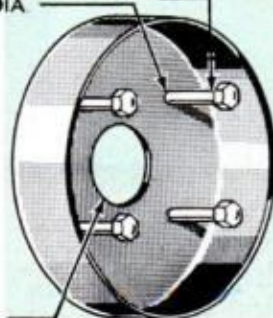
FLANGE WITH TUBE-VALVE HOLE MOUNTS OPPOSITE BRAKE



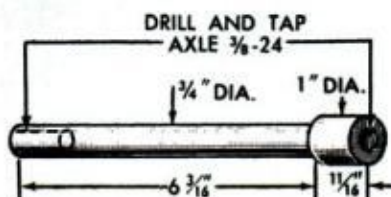
DRILL  $\frac{3}{16}$ " ON  $3\frac{1}{2}$ " DIA.



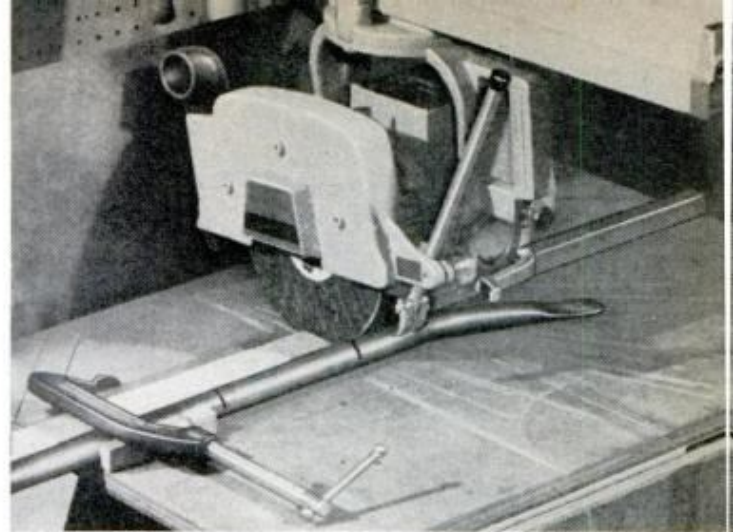
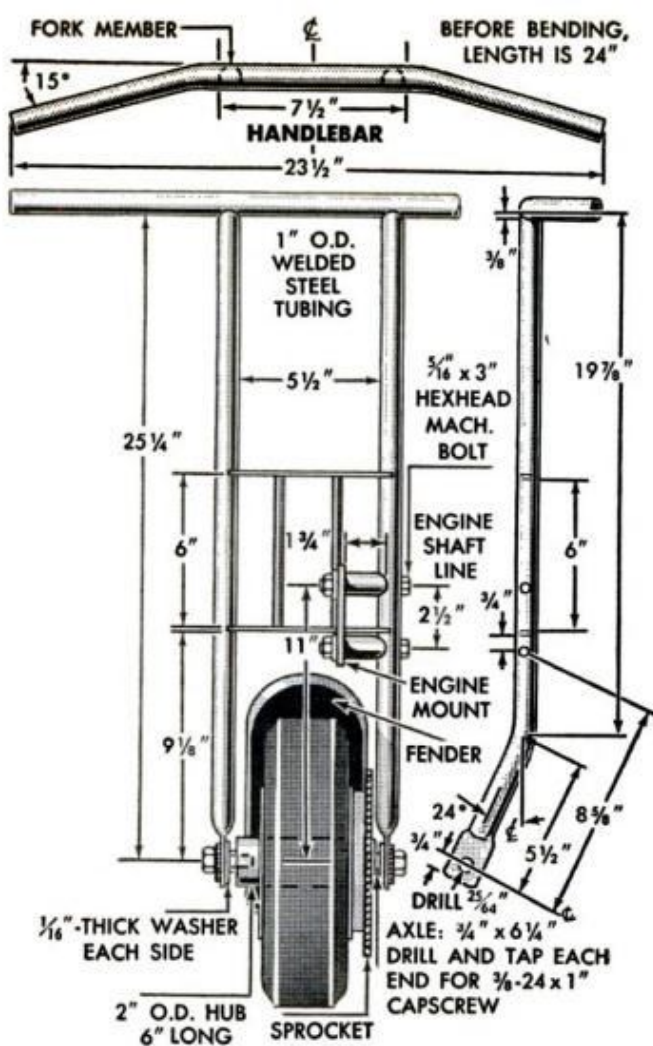
$\frac{5}{16}$  x 3" PLATED MACHINE BOLTS



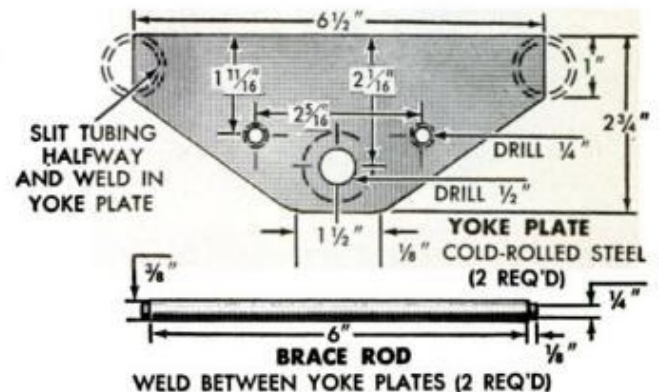
TURN OUT CENTER ON BRAKE DRUM LATHE TO FIT HUB







**SLOT FORK MEMBERS** (after shaping and drilling as detailed left) to take yoke plates (below). Cut half-way through with  $\frac{1}{8}$ -in.-thick ferrous metal blade



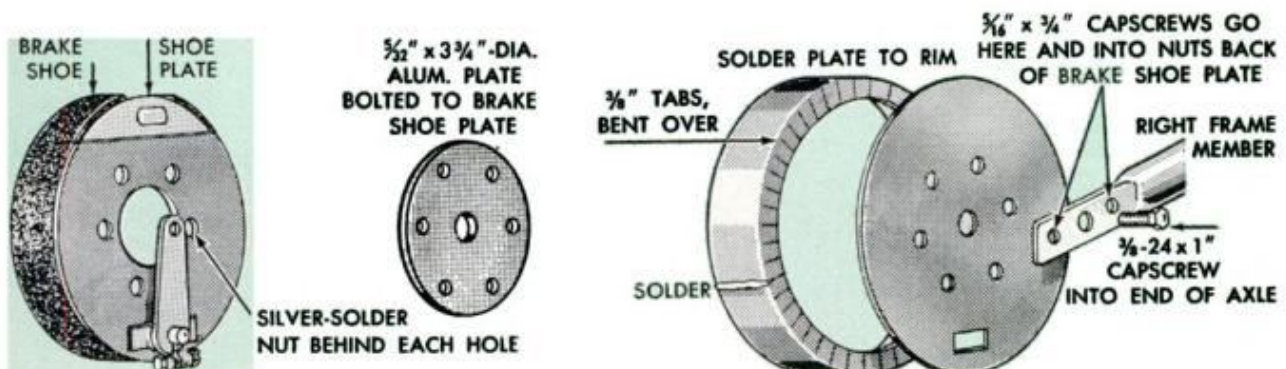
The  $\frac{1}{2}$ -in. steering-post pin must fit its bronze bushings like an axle. These bushings are driven in both the top and bottom of the steering column, although only the top detail is shown, page 184. Since the steering post turns on the pin (instead of vice versa) the latter is held stationary by a castellated nut that screws up tight against the bottom yoke plate. A cotter pin prevents this nut from working loose.

The photo on page 184 shows how the steering-column pivot-post unit is bronze-welded. All three openings of the  $\frac{3}{4}$ -in. tee are first bored out to accept  $\frac{3}{4}$ -in. pipe. This pipe is welded around each opening, using an oxy-acetylene torch and bronze welding rod. Don't use steel rod or arc welding equipment: Pipe tees are made of malleable iron—white cast iron, heat-treated for hours to withstand shock, vi-

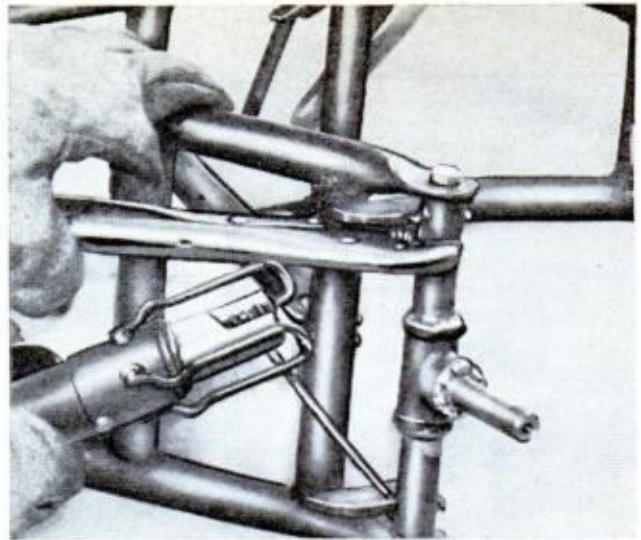
bration, twisting and bending. When malleable iron is melted, as in steel or arc welding, it turns back into brittle cast iron when it cools. This weakens the material so that it might break if you drove the scooter over a sharp bump.

The  $\frac{3}{4}$ -in. pipe you weld through the tee is, in turn, bored out enough to remove irregularities and make a snug turning fit for the pivot pin.

The position of the stop yoke determines the steering fork's degree of slant. The second photo on page 185 shows how to hold the two units in proper relationship while welding the yoke in place. After you have established the angle as shown, clamp the two sections together (we used a bar clamp with a small pipe wrench secured to the open end to provide an auxiliary jaw). Carefully remove the pivot-pin bolts, slip

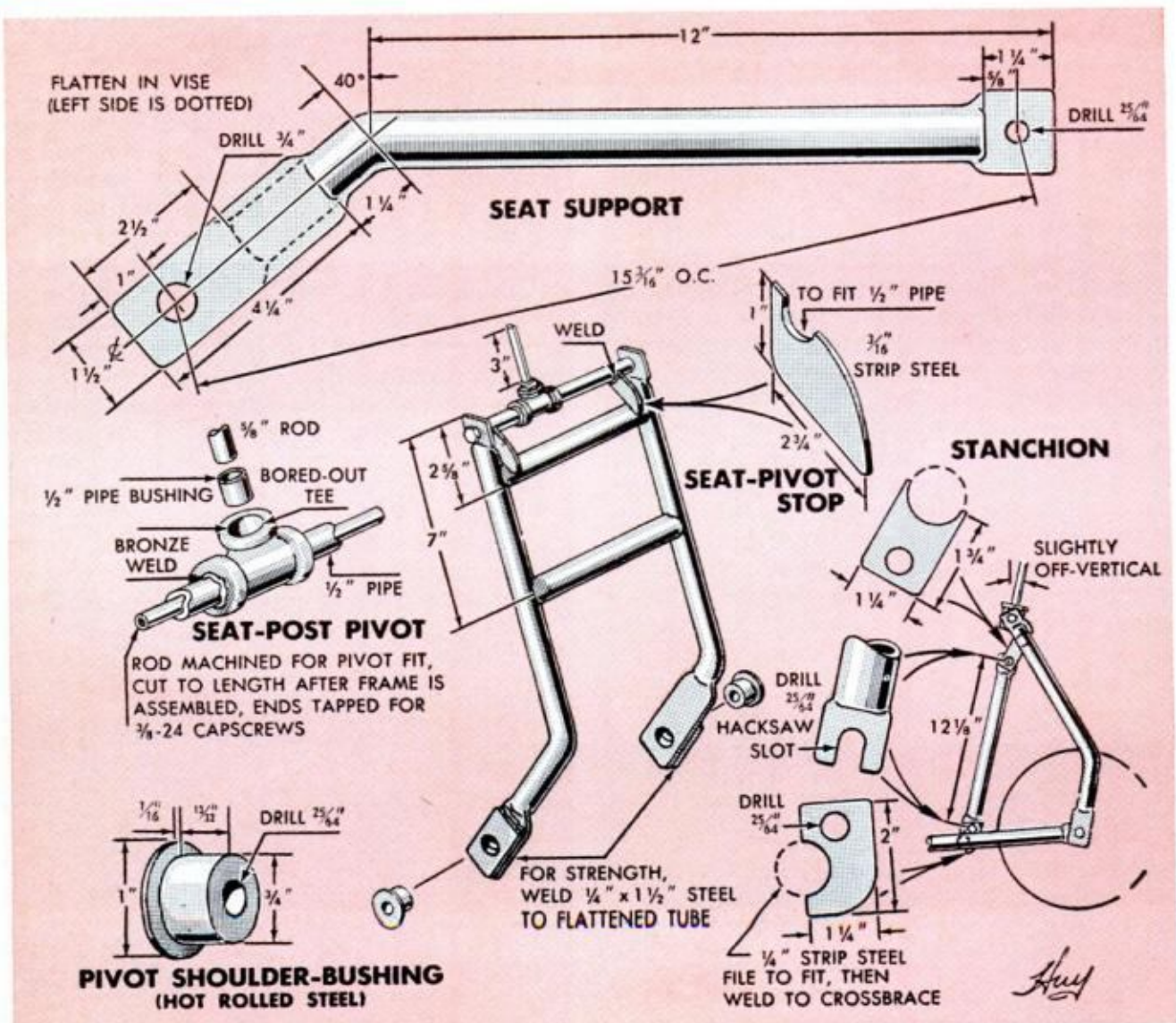






**DURING WELDING**, seat-pivot stop lugs are held on sheathe pipe with machinist's clamps (already removed above). To prevent pipe from shifting out of position, clamp plier-wrench on it and hold this firmly against crossbrace, as shown, until welds set. Be sure seat post tilts to rear enough to hold seat in position by its own weight when in place on bike (left)

## REAR ASSEMBLY HAS DOUBLE PIVOT





the yoke in place over the bolt holes, replace the bolts and weld the stop to both sides of the frame. Then, weld on the two locking wings, and bore mating holes through the frame and wings for the cap-screw lock bolts.

The two bottom photos on page 185 show how the engine mount is welded to the steering fork. Spacers are cut from scraps of the frame tubing and welded between the plate and the frame. The assembly bolts, passed through these spacers, can be left in place. The center of the drive shaft must be vertically above the center of the wheel sprocket; these two centers must not be closer than 11 in. or farther apart than 14½ in.—a parameter based on charts of chain efficiency and life. This allows considerably leeway, so make the mounting plate an inch or two overlength, locate and drill the engine mounting holes, then locate the plate's own mounting holes in respect to those already drilled in the fork. Trim the end of the plate, cut the slot to pass the yoke plate and weld the plate to the fork. Whatever the plate's position, be sure the engine is mounted with its cylinder *vertical*.

To secure the engine to the mount, use 10-24 x 1½ in. RH brass machine screws instead of the mounting screws provided, since the latter aren't long enough to pass through the mounting plate and engage the threads in the gear box.

#### Making the Rear Frame

With the front end of the bike completed, set to work on the seat support, as detailed at the left. Don't fail to weld ¼-in. steel plate to the flattened ends of the tubing, here, as greater strength is required for direct support of the rider.

In flattening tubing as heavy as this, incidentally, it's best to first heat it red hot, then squeeze it in a vise, making as many heating-and-squeezing sequences as required to reach the upper limit of flatness you can achieve with this procedure. The final process is to heat the entire squeezed area red hot once again and hammer it on an anvil with a forging hammer.

No length is given for the crossbraces or pivot sheathe of the seat support, since this unit should be fitted to the frame you've already assembled. To assure true fit and easy pivot (for folding) the large holes in the bottom ends of the support members should be *drilled* with a ¾-in. bit—not filed to size. Machine the shoulder bushings ½ in. or so longer than the thickness of the flat (including the welded-on steel plate). This will give clearance between the support members and the chassis flats, to eliminate binding.

Mount the completed bent members

with the rear-axle bolts through the shoulder bushings and devise a way of holding them while you measure the width between them to determine what length to cut the cross-braces. Add ¾ in. to this figure for the ⅜-in. deep cove you must file in each end to match the o.d. of the tubing the braces butt against. Clamp the crossbraces in place, check the assembly for squareness, and measure between the upper flats for the seat-pivot pin.

The seat pivot is made the same way as the steering-fork pivot; the ½-in. tee is bored out (all three openings) to pass ½-in. pipe. The pivot sheathe is passed through the tee and bronze-welded to it.

One thing to note: The seat post is *not* centered on the pivot sheathe, but rather on the rear wheel. It should be directly above the tire's crown. When folding the scooter, tip the seat forward so the whole unit rests flat against the floorplate.

#### That First Road Test

Now the fun begins. Take the assembled bike out on the street, straddle it and walk it like a kiddie car. Coast it downhill—do anything to make it go, so that you can see how it performs. If a bug or two doesn't show up, congratulate yourself for being a skilled workman. If either of the wheels is slightly out of line, it'll show up now. The axles must be parallel, and the warning that they *aren't* is a scraping or rubbing noise, or a point of holding back with each revolution of a wheel. Check it out thoroughly, and if the axles require lining up, adjust by filing out the required axle-bolt hole in the direction indicated by your study. But you can't leave an oversize axle-bolt hole, so fill the excess space with bronze welding rod, using an oxy-acetylene torch. True up the hole in its new position with a drill bit of the required size, and it'll be the same as if you'd started with it there.

With everything squared away, you can decide whether you want to make the optional brake-drum cover. You can make this out of 20-ga. galvanized sheet metal, as detailed on page 187. The tab strip is cut to the circumference required to clear the drum you buy. Form the tabs by jigsawing v-cuts *before* soldering the strip into a circle, bending them over *afterward*.

Or wait for next month's instructions for molding the fenders of fiberglass; the same technique can be applied to molding a brake-drum cover or chain guard. In addition, the final half of this article will detail all remaining accessories, tell you how to install a twist throttle in the left handlegrip, and explain the wiring for the head lamp and stop light. ★ ★ ★





1  
BENCH  
GRINDER

# POWER TAKE-OFFS FOR A FLEXIBLE SHAFT

By John Burroughs

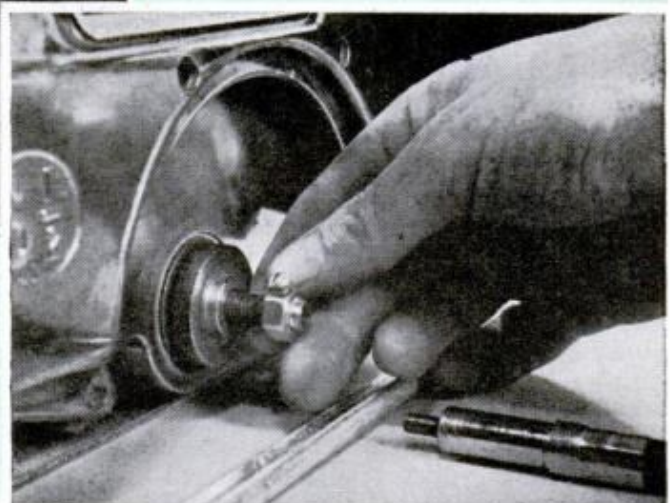
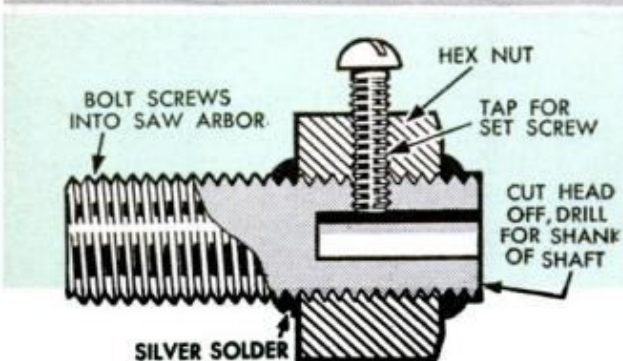
**R**IG A DRIVE for a light flexible shaft and you have one of the most versatile, lowest-cost power tools you can own. Whatever your shop specialty—model-making, wood carving, engraving, gunsmithing, toolmaking, lapidary work—you'll find this miniature machine tool will handle hundreds of otherwise-difficult jobs. It'll polish engine ports . . . smooth

filleted welds . . . scribe your name on tools, sharpen gouges, carve plastic—even trim your fingernails! Chuck the right rotary head in the fountain-pen-sized handpiece and you can grind, rout, buff, drill, deburr, carve, file, wire-brush or sand.

Simplest power setup is to grip the shank projecting from the shaft's tail in a chuck on the spindle of any high-speed power



2  
PORTABLE SAW



**WITH BLADE REMOVED** and coupling (detailed at left) screwed into arbor, saw makes portable power drive



tool. Besides the bench grinder, above, you can make use of a drill press or lathe. Just shift the tool's belt for top r.p.m. and you're ready for business.

Or, with an easy-to-make coupling you can tap the power of your portable circular saw. Just turn a hex nut on any bolt that will screw into the saw's arbor, solder the nut in place, saw off the bolt head and centerdrill to accept the shank of your shaft. A setscrew makes the shank spin with the bolt coupling.

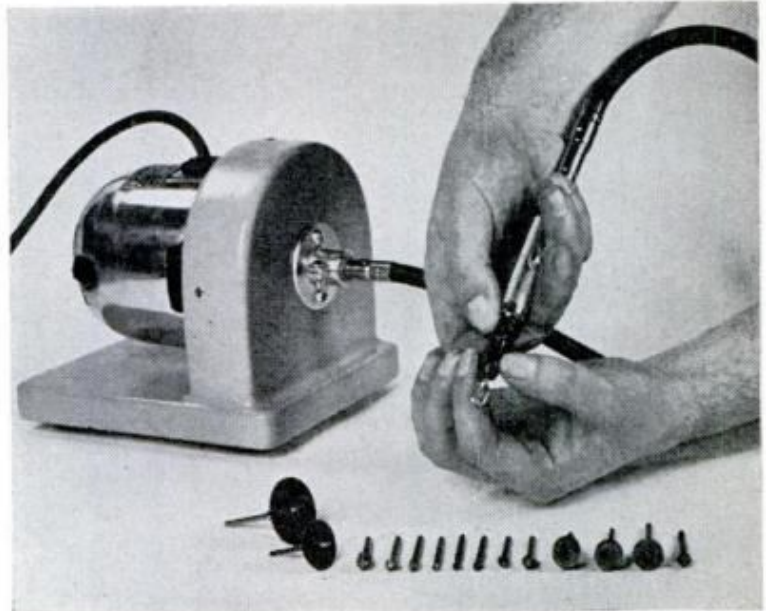
If you'd prefer a permanent assembly, hunt up a universal motor from a junked vacuum cleaner or almost any AC-DC appliance. They're usually flange-mounting, so are easy to fit into a simple stand like the one detailed below. Standard couplings are available for  $\frac{1}{4}$ ,  $\frac{3}{16}$  and  $\frac{3}{8}$ -in. motor shafts.

Which of these three take-offs is best for you? That depends, of course, on which

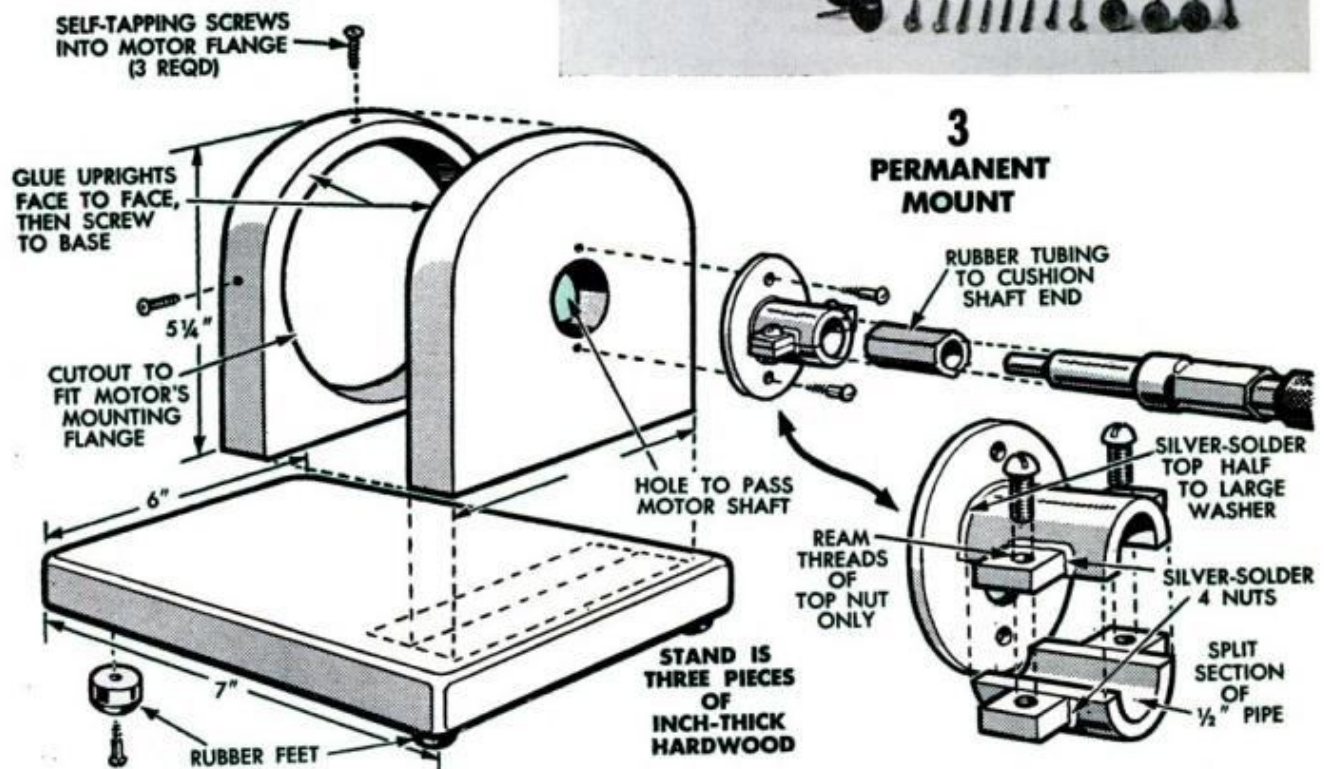
power source is handy, plus what type of shaft you have, and what work you want it to do. You can spend from \$5 to over \$20 for a small flexible shaft like the ones shown on these pages. The cheapest are imports and they work well enough for occasional use. A quality-built, neoprene-sheathed shaft with a sleeve-bearing handpiece will run about \$12. Shafts with ballbearing handpieces and tail couplings retail at a higher price.

Since the carving burrs and grinding points you'll be using are small in diameter, the shaft must turn at high speed—3500 r.p.m., at least—for the tool to perform well. Very cheap shafts may heat up when run at speeds above 6000 r.p.m., but a sleeve-bearing shaft can be revved to 10,000 without overheating, once the bearings are run in. The no-load speed of a portable saw motor is from 4000 to 5000; vacuum-cleaner motors turn at 5000 to 8000. ★★

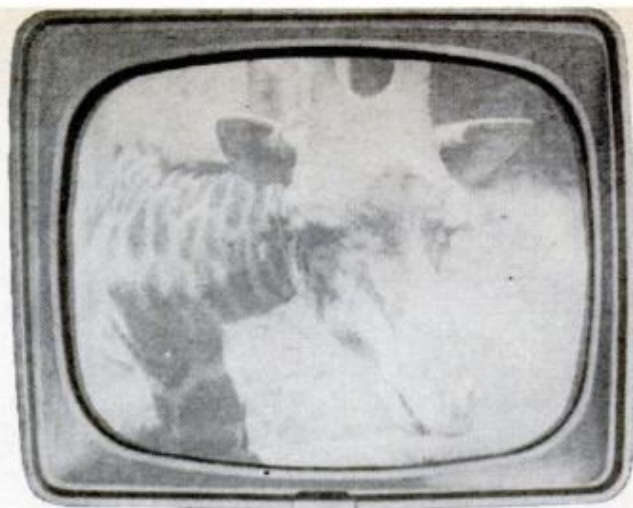
**WOODEN STAND** turns universal motor (salvaged from upright vacuum cleaner) into permanent high-speed drive for light flexible shaft (right). Collet-chuck handpiece accepts variety of rotary tools with  $\frac{1}{8}$  or  $\frac{3}{32}$ -in. shanks, lined up in foreground, for model-making and carving



**CLAMP FIXTURE**, soldered from standard parts, screws to front of motor mount to grip the flexible shaft's casing, eliminating the slight torque you'd feel at the handpiece if no clamp were provided. The rubber-tube insert slips onto shaft for cushioning while shank is coupled to motor

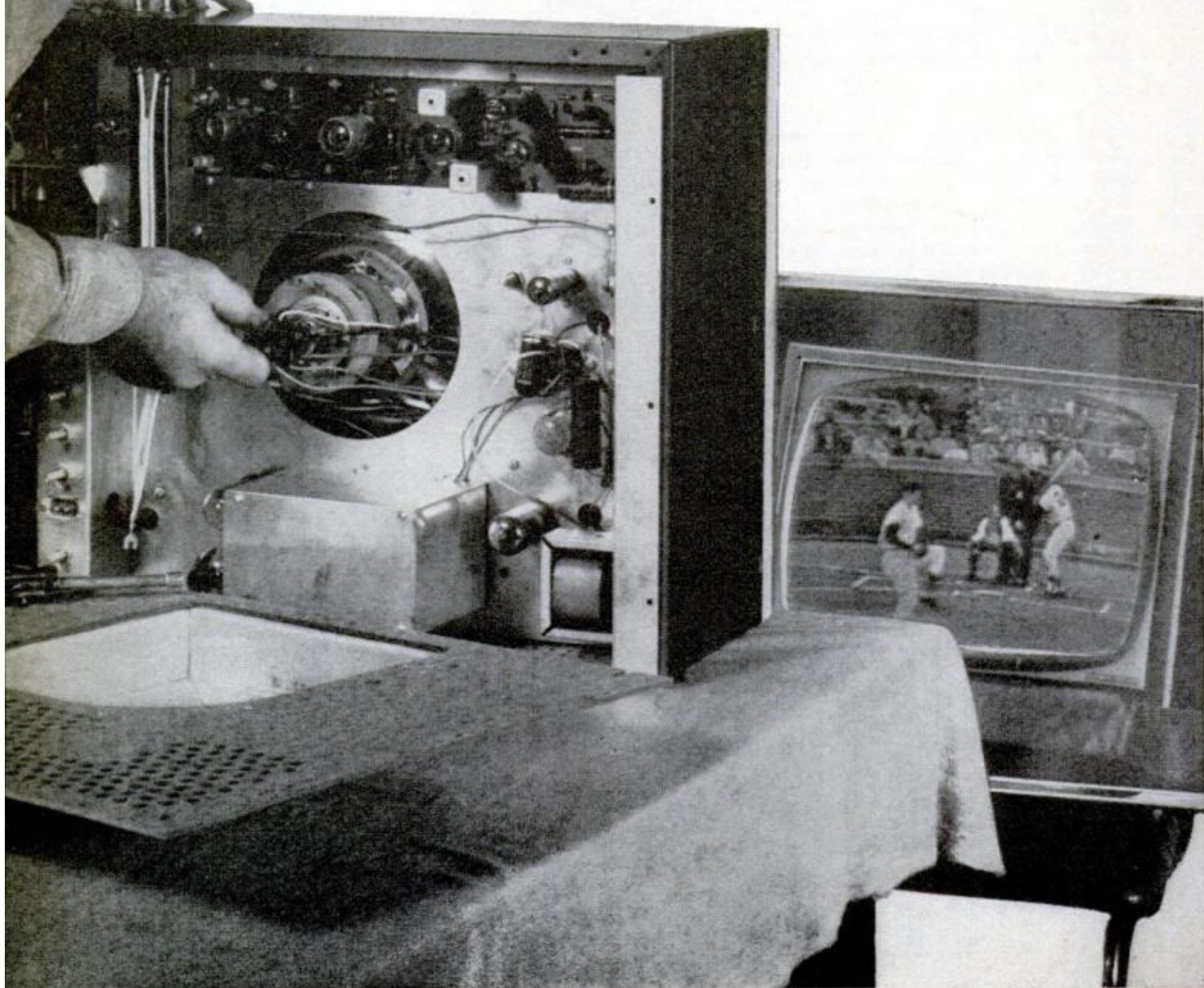




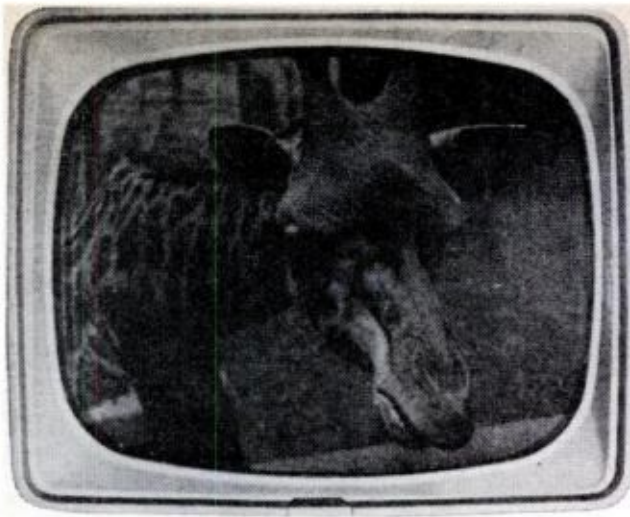


**PICTURE** is bright enough, but isn't black enough. Such a loss of contrast can be caused by a bad video tube or a roof antenna that isn't up to par

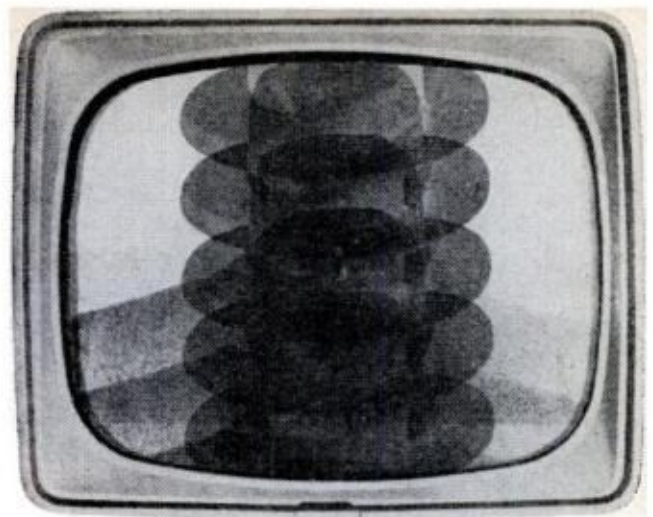
**THE PICTURE WAS RUNNING OFF** the side of the picture tube. With the rear cover removed and watching the results in a mirror, the centering tabs are carefully adjusted to put the picture back in the center of the screen again







**BRIGHTNESS** full on, but the picture is still dark and dingy. This is the most common symptom of a failing picture tube if it has occurred gradually



**VERTICAL HOLD** isn't holding. The picture should lock in and stay locked in. Any vertical and sync tubes are suspects; check them all by replacement

# Fix Your Own TV

*Trimming controls and changing a tube or two may keep your TV out of the repair shop*

By Lewis A. Harlow

**W**HEN YOUR TV is out of order, it is a cooperative patient. It can describe its ailments to you—if you can understand the language it speaks. It will tell you the answer to questions like: Do I really need a new picture tube? Should I get this service job done now? Can I do that repair myself? Should I nurse my invalid set along in its present condition until I'm ready to buy a new one?

Your TV describes its aches and pains with picture and sound—especially by the way these “voices” respond to the manipulation of its adjustment controls. Some of these controls are easily accessible and well identified; you use them every day. Others are slightly out of reach, but you can handle them if you know what you are doing. They are located a little inconveniently to prevent that blind and destructive frenzy of knob twisting when the set doesn't play and you don't know why. Still others are tucked away inside where you can't possibly reach them.

There are about 50 adjustment devices in your black-and-white TV. In addition to a few switches, the rest of them either compensate for manufacturing tolerances or for tube aging.

Let's examine these controls and see what effects they can have on the operation of your TV.

**On-Off Switch.** Consider this symptom: You turn on the set and nothing happens. There are three probable causes: 1. The set is unplugged. It sounds silly but it's quite common. 2. A fuse is blown. If you can locate it, try one replacement. If the replacement goes, call for professional help. 3. The entire system is “cold”. If your set is a portable, the tubes are probably strung like Christmas-tree lights; when one goes out, the others won't light. Tube testing is in order, but only to locate the dead one.

**Volume Control.** Symptom: Good picture, no sound. If there is absolutely no sound with the volume control full on, try replacing the audio output tube. You'll probably find a replacement chart inside the cabinet showing the tube locations.

If you get a hissing sound with the volume control full on and can't locate a dead tube, the repair is not a simple one and you'll have to call qualified help.

**Channel Selector.** Trouble here is fortunately rare. The most common type shows up as stations you can't get unless you



keep jiggling the knob to get it into just the right position. Try a little tuner cleaner spray when this happens. You can get it from the larger electronics dealers. Remove the tuner knobs and squirt.

**Fine Tuning.** With this control can you change a condition of mushy-picture-sharp-sound into one of sharp-picture-mushy-sound? If so, some alignment work at the repair shop is called for. It's not a difficult or particularly expensive adjustment, but if you can make a satisfying compromise adjustment with the fine tuning control, you can put up with the trouble until something more serious takes your set out to the service shop.

**Brightness.** This control is your easy check on picture-tube condition. Switch to a blank channel and turn the brightness up full. If the level of light coming from the screen is not white enough for your tastes, the picture tube is nearing the end of its useful life. There are other symptoms of a failing picture tube too: Black in the picture where white should be; a silvery metallic look to contrasty areas of the picture fine white lines in the picture that no setting of the brightness control will get rid of.

**Contrast.** This control adjusts the black areas of your TV picture. If you feel your blacks aren't black enough, try a new video output, video amplifier or sync separator tube. But if you can find even one station with proper contrast, look for trouble in your antenna.

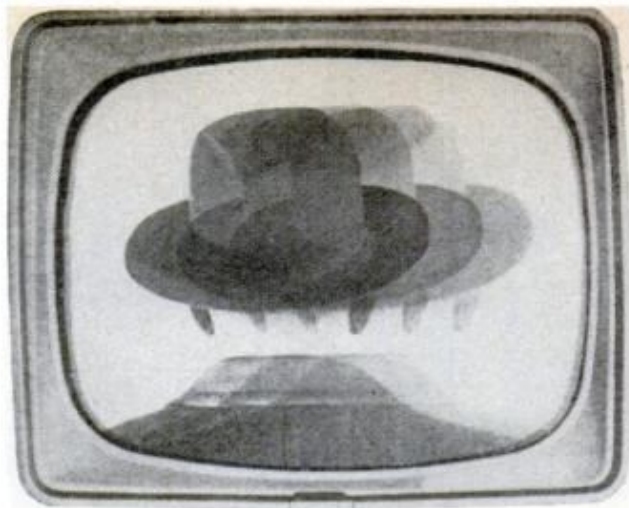
**Vertical Hold.** This control should stop the upward or downward roll of the picture near the middle of the control movement. If it seems too critical or the rolls can't be stopped at all, try a new vertical oscillator and/or vertical multivibrator tube. Also, check the vertical sync tubes.

**Horizontal Hold.** This control is often on the rear of the set as it is less likely to require adjustment. Trouble with horizontal hold calls for a check of all horizontal tubes-oscillator, output and damper.

**Secondary Controls.** In the early days, these controls were on the front panel. Now they tend to be either on the rear of the set or hidden inside. To adjust or not is often a serious problem. The rule of thumb is if the effect of the adjustment shows directly on the screen or in the sound you can do it yourself.

A service manual for your set, obtained from the set manufacturer, is a must. It will show you where the secondary controls are located.

**Height and Vertical Linearity.** As vertical tubes weaken with age, the TV picture will shrink from the top or bottom until it no longer fills the screen. You can correct this by adjusting both the height



**DON'T BLAME** this on your set. You've got ghosts and they're caused by a poor antenna installation. Try a more directive antenna for a clear picture



**THIS PICTURE** is tilted. Readjustment is simply a matter of rotating the yoke which sits around the picture tube. Use a mirror to see what's happening

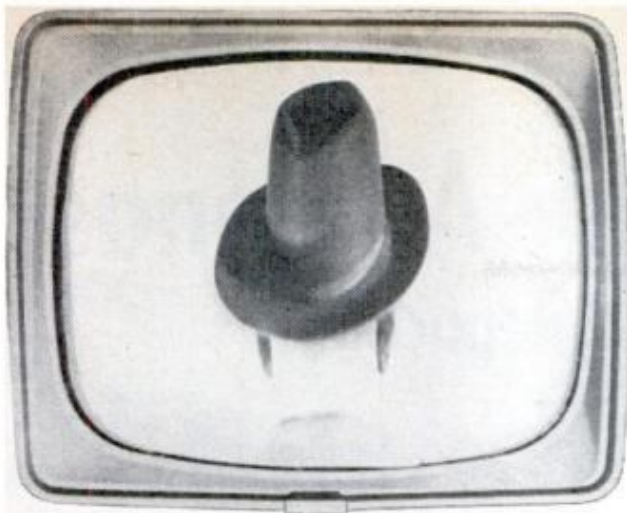
and vertical linearity controls. They interact with each other, and adjusting one demands a compensating adjustment of the other. In addition, as these controls are varied, the picture may start to roll and you'll have to go to the vertical hold control to stop it.

**Width.** Usually, this control is well hidden if it exists at all. As the set gets older, the picture may shrink at the sides. This can be caused by either a weak horizontal output or horizontal oscillator tube.

**Focus.** Originally, this control was an outside knob. More recently it may be a moveable magnet (screwdriver adjustment) around the neck of the picture tube. On some sets there is no focus adjustment.

**Buzz.** Many of the newer sets have this control. It minimizes the buzz caused by

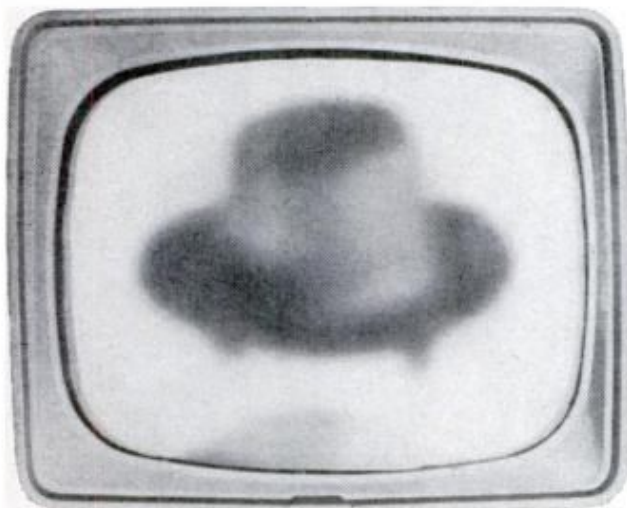




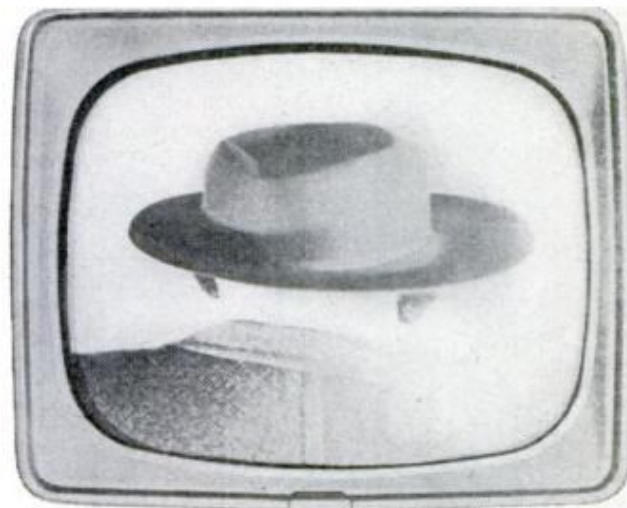
**SOME SETS** don't have a height control. In such a set this stretched picture can be repaired only by replacing tubes in the vertical circuit of the receiver



**MISADJUSTED** centering controls pushed the picture off center. Call a technician if you don't feel capable of probing around inside the set yourself



**FOCUS CONTROL** is often an adjustment on the neck of the picture tube. Check the service manual to locate the control and learn just how to adjust it



**SOMETHING** went wrong and somebody tried to correct it by twisting a few knobs. Looks like the width has been turned up too far. Just turn it back down

unwanted interplay of picture and sound. This is usually a screwdriver adjustment and should be set for minimum buzz.

**Tiny-Vision Portables.** These small-screen receivers are not as different from the big sets as you might think. Getting in to them is different, but once you are inside, what you find will be surprisingly standard. The minimum priced models will not have height or focus controls, but the better sets have miniaturized versions of just about everything you find in the big boys.

**Picture Tube.** Almost any TV is worth its second picture tube, but the decision to give it a third one should be made with care. Here is where your knowledge of the language of the controls will be very helpful. If besides the picture tube you are only going to need a few smaller tubes,

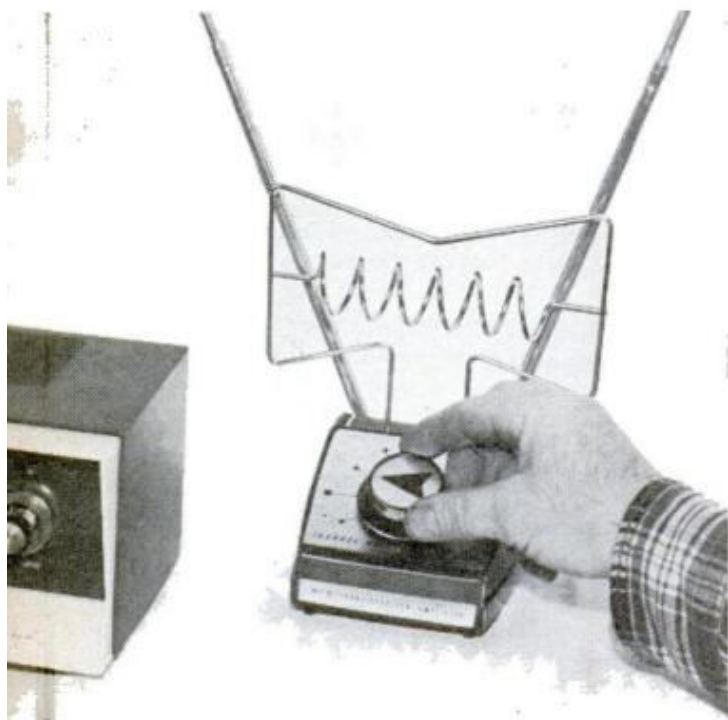
the added investment in the old set is certainly worthwhile. If, though, you can see (by the action of set's controls) that it will soon have to go out to the service shop for an extensive overhaul, you might be wise to weigh the cost of possible repairs plus new picture tube against the price of a new set with a larger screen.

If at picture-tube time your set is suffering from an intermittent—a fault which shows up as a set working fine for a while, then going haywire, then clearing up and so on—you may be better off with a new set. Such a fault usually leads to a rather expensive repair bill. The fault, when found, may be minor, but will often require several hours of work before it can be located by a technician—and you'll be paying for this time. ★★★

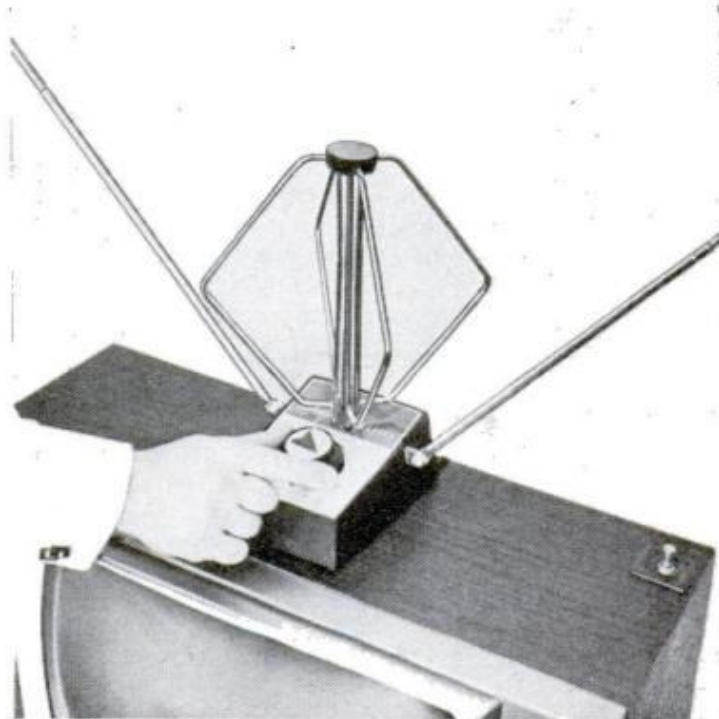


# Indoor Powered Antennas

## PM Tests and Reports



**MODEL 3731 FM Stereo** indoor antenna, with built-in transistor amplifier and multi-position matching switch, brought in more than 20 FM radio stations



**THE APOLLO**, a powered antenna for TV, proved to be as good as the simpler outdoor antennas at distances to 35 miles from the TV station's transmitters

**FM STEREO AND TV ANTENNAS** for use indoors now have built-in transistor amplifiers to increase their effectiveness.

They are all fairly high priced (\$15 to \$35), but the results they give vary considerably. After testing several makes we found one pair of Channel-Master antennas outstanding, both the FM and the TV versions.

In one location in Yonkers, N.Y., for example, some 25 miles from New York City, a standard twin-lead dipole FM antenna would not pick up any reliable FM reception. When one of the transistorized indoor antennas was used, the situation improved; then there were six stations to listen to. But with the Channel Master model 3731 FM stereo antenna, reception really came to life. There were more than 20 stations that could be locked in for good clear reception. The secret is a good antenna design coupled to a high-gain transistor amplifier which boosts the signal the antenna picks up to a more-than-usable level.

On the TV side of the ledger the Channel-Master model 3721 Apollo transistorized indoor antenna was also a winner. When compared to various outdoor antennas at a distance of 35 miles from New York City, the Apollo gave the same results as an outdoor "V" or a simple dipole.

In areas where ghosts were a problem results varied. Sometimes repositioning the antenna would eliminate all traces of a ghost. In other areas, the ghost could not be eliminated.

Over-all impression: There's a real need and place for these antennas anywhere an outdoor antenna installation is not convenient or practical or means you'll pay \$2 or \$3 per month to the building owner. But don't expect miracles; a good outdoor antenna will usually give even better results than the best indoor antenna. Don't expect that little indoor device to equal complex multi-element Yagis. Use it where intended, however, and the indoor antenna is hard to beat.



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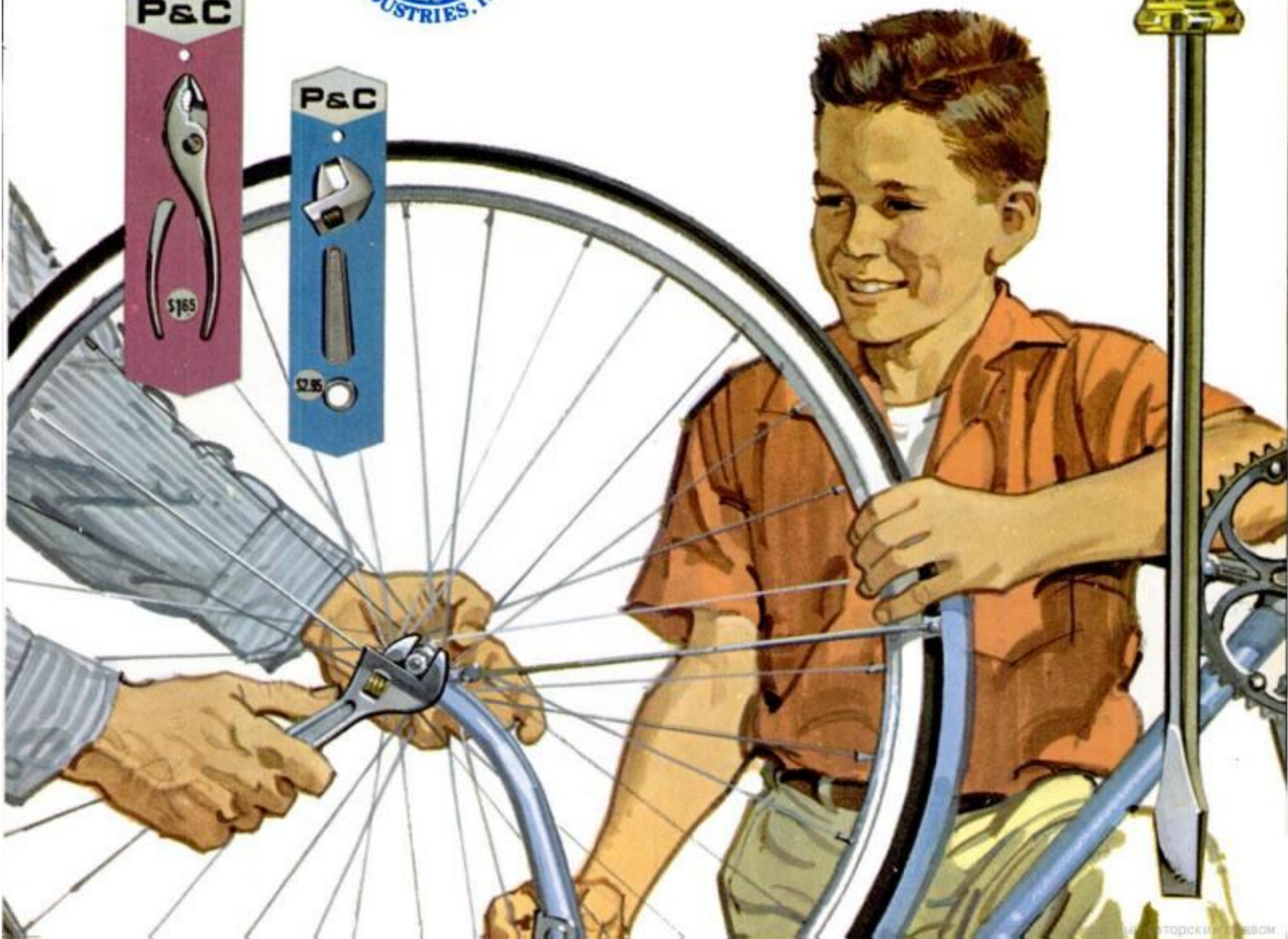
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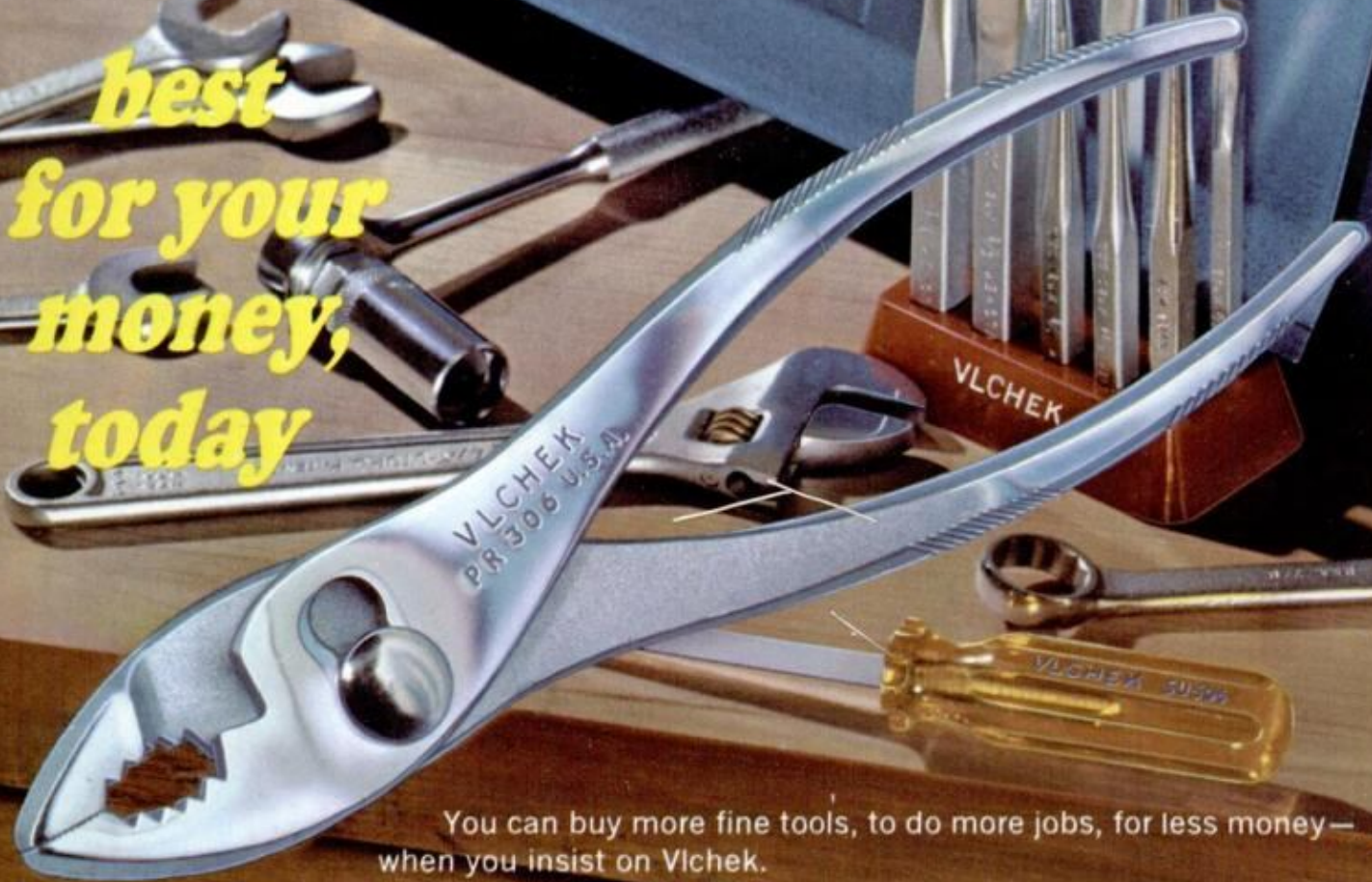




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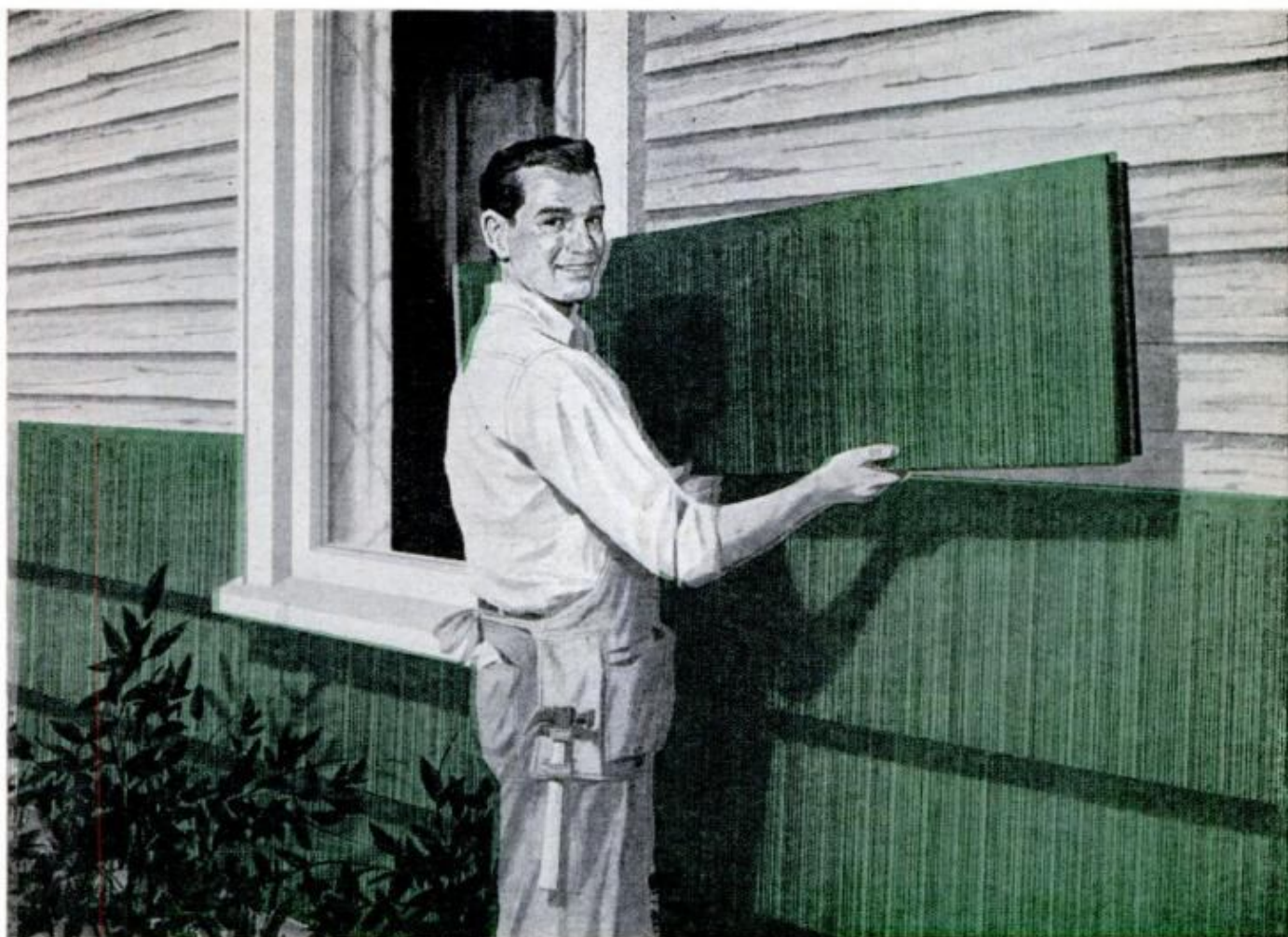
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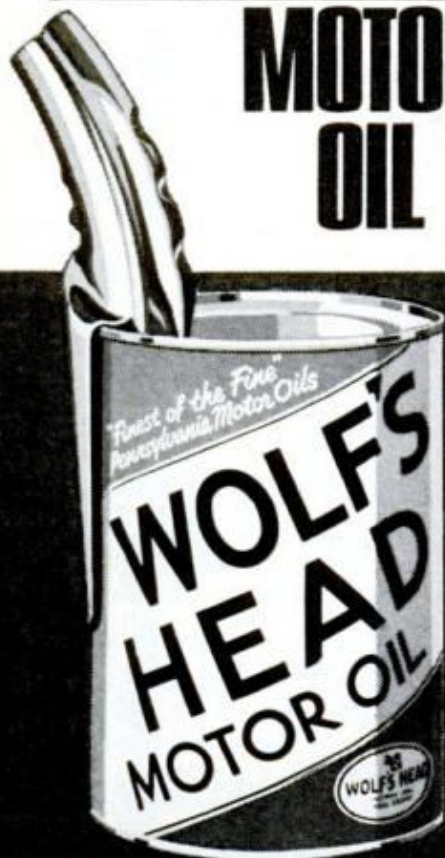
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OIL CITY, PA.**

## Troubleshooting Carburetors

(Continued from page 180)

quired by the engine. This secondary or high-speed section is usually activated by a vacuum-operated device that opens and closes the secondary throttle according to the fuel requirements of the engine.

Some engines—the really souped up models—could be equipped with two, or even three, four-barrel carburetors. Each supplies a portion of the cylinders with fuel. The carburetors are linked together mechanically to provide a smooth, equal fuel supply to each part of the engine.

There are many makes of carburetors on today's cars. Yours might have a Holley, Stromberg, Carter, Rochester, Ford or what have you. Don't let this variety throw you since all carburetors operate on the same basic principles, though they may not look much alike. Once you grasp these principles, you'll find that you can work on any carburetor, regardless of its type.

What are the results of poor carburetion? Aside from the immediate effects such as flooding, stalling, rough idle and hard starting, poor carburetion effects engine life in two ways. First, if the mixture going through the carburetor is too rich—if there's too much fuel—this gas will deposit on cylinder walls and wash away oil, preventing adequate lubrication.

In addition, gas will run down the cylinder walls into the crankcase where it will dilute oil and reduce its ability to lubricate engine parts such as bearings, valves and the crankshaft.

### The Menace of Pre-ignition

The second way in which bad carburetion can affect the engine is quicker and more devastating. If poor carburetion results in an over-weak fuel mixture, pre-ignition could occur. When the mixture entering the cylinders is too low in gas, it burns at a higher than normal temperature. This results in hot spots being created in the combustion chambers—hot spots that can cause premature firing of the mixture on subsequent compression strokes.

This premature firing occurs while a piston is still in its compression stroke and results in excessive pressure on that piston. For this reason, broken pistons in today's engines are not uncommon.

Pre-ignition can also cause excessive piston ring wear. When pre-ignition happens, most of the lubricant on the cylinder wall has either been evaporated or burned away because of the excessive temperatures in that chamber. When the piston travels, expanding combustion gases press the piston rings against the cylinder wall

(Please turn to page 202)

POPULAR MECHANICS





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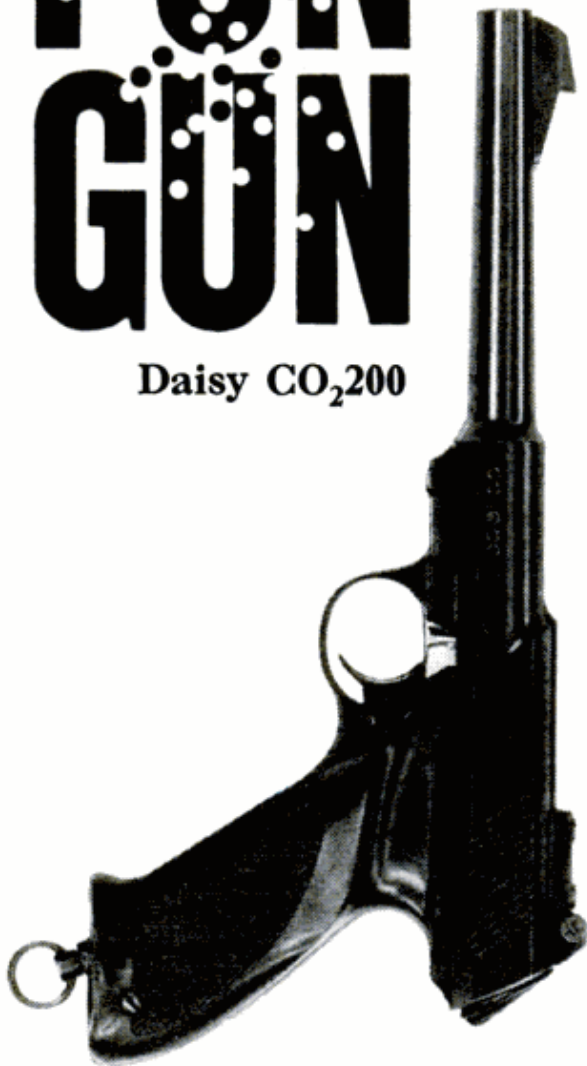
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## Troubleshooting Carburetors

(Continued from page 200)

with unusual force. Enough heat could be generated between the two surfaces—rings and wall—to weld them together. As the piston continues to move, the welded spots are torn apart and the result is damage to both rings and wall.

Dirt is the chief cause of poor carburetion. If it weren't for dirt, chances are that a carburetor would operate efficiently for the life of the car without any service except for an occasional adjustment.

Dirt in carburetors takes two forms. One is road grit, dust and water that get into the carburetor with fuel and intake air. The other is gum that forms inside the carburetor as gas evaporates.

Whatever its form, dirt harms carburetors by plugging up or partially blocking passages. This upsets the calibration of the unit and leads to improperly balanced mixtures being delivered to the engine.

Dirt in the form of road grit can also prevent the needle valve from closing, which results in flooding. It can cause wear on the parts of the unit as well—parts such as the needle valve and seat, accelerator pump, jets and small passages.

There are several ways to get rid of dirt. The most effective and only method to use if the carburetor hasn't been cleaned for some time is to take the unit off the car, dismantle it and clean each part separately in solvent. This procedure will be discussed in the second half of this article in next month's issue.

### Forced-flow Cleaning

Another way is to use a forced-flow solvent through the carburetor while it's on the engine. This method is effective if you start carburetor cleaning early in the life of a car and keep it up periodically—say once every 5000 miles.

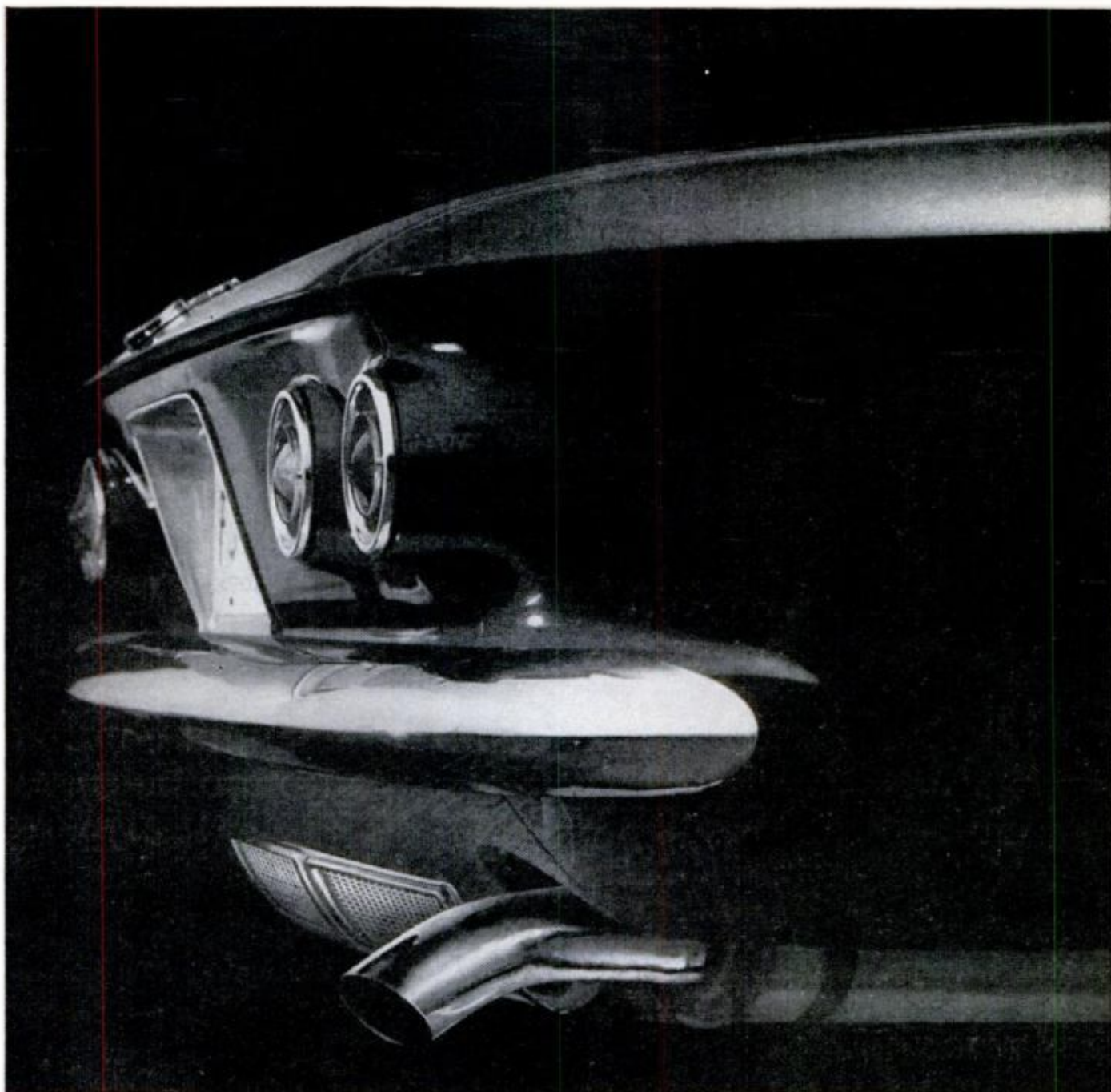
The first step in the forced-flow method is to warm the car to operating temperature, then take off the air cleaner. As you do this, check the air filter for dirt.

Dirt from a dry-type filter can be blown away with an air pressure hose. Replace the filter every 25,000 miles. If your car has the old oil-bath type of filter, the oil should be changed every 5000 miles.

Now, follow the steps shown at the top of page 180, using parts from a forced-flow kit, which can be purchased in any automotive parts shop. Just make sure it's for internal cleaning of the carburetor—not external. To be certain that the fluid reaches all passages and air bleeds, place your hand over the carburetor throat occasionally to choke the unit.

(Concluded Next Month)





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**CORVAIR MONZA SPYDER by CHEVROLET**





## Unseen CAT Pilots Dread

(Continued from page 107)

In other parts of the world wherever a chain of north-south mountains exist, high-altitude pilots proceed with caution.

The rugged Alps are considered relatively peaceful. Weather experts say it's because they range from west to east. Because of the earth's rotation, winds traditionally blow eastward. When winds reach the Alps, they blow down the valleys, without being forced up and over as they are by north-south ranges. The upper atmosphere remains unsqueezed and calm.

What is the Weather Bureau doing to forecast this upper air menace? We asked Ralph James, senior meteorologist at U. S. Weather Bureau headquarters in Washington, how his department handled clear-air turbulence.

"We make every effort to predict turbulence of all types, clear air, cloudy air, thunderstorm, or what-have-you. I think we have been fairly successful in predicting turbulence on the northern edge of the jet stream, but we are constantly seeking new methods of forecasting which will give us a better indication of how much turbulence to expect."

For purposes of weather analysis for

far-flung U.S. airlines, the Weather Bureau has carved the world into sectors, each headed by a weather analysis group. For the continental U.S., weather headquarters is at Suitland, Md.

"Wherever an American airline flies," James explained, "the U. S. Weather Bureau must provide weather data." Thus outposts at Hawaii cover the Pacific routes of Northwest Orient and United Air Lines. The New York headquarters at John F. Kennedy International Airport, prepares weather data for flag-carriers Pan American and Trans World Airlines. The Miami station handles airlines bound for the southern hemisphere.

Although the airlines seek Weather Bureau forecasts daily, a needier customer is the U.S. Air Force with bases scattered around the globe.

Weather reports are collected from local weathermen, regional analysts and pilots who are required to file a weather report on every flight. These fragments funnel into the weather-analysis branch at Suitland, where they are received on paper tape, transferred to punch cards, then converted to magnetic tape and fed to an IBM computer.

After digestion, the computer coughs up a voluminous sheet of numbers, re-

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ferred to as "nonsensical figures" because, by themselves, they mean nothing. But when a weather analyst places them under a transparent acetate map of the U. S. and traces the clear areas with a black grease pencil, he converts a senseless mass of type to a meaningful weather chart outlining regions of constant wind velocity for all altitudes from sea level to 45,000 ft.

Weather *analysts* (the job classification for professional weather forecasters) update the reports hourly. Four times a day, charts indicating wind speeds, pressure and other weather data are sent by facsimile wire to airports across the country. Local forecasters peel the data from the machines and use it to guide their own forecasts which they prepare for departing flight crews.

At New York's bustling Kennedy Airport, Pan American Airways weather experts brief crews assigned to North Atlantic flights and warn them of expected turbulence. Pan Am's flight plans are mapped out well in advance. If the frolicsome jet stream is known to be kicking up her heels, pilots are advised to steer clear. This may mean fly higher, fly lower, or take a roundabout course.

The best-laid plans often become inextricably snarled. If an east-bound flight

unwittingly blunders into an unforecast area of turbulence, pilots are instructed to order seat belts for passengers and to reduce speed to minimize buffeting.

Officials feel that clear-air turbulence across the North Atlantic is not too serious. The same is true of most of Europe. But south and west, Air Force pilots report a wicked zone of turbulence between Alaska and Japan, where the jet stream slips off the lower tip of Korea, dips under the Japanese homelands, then whirls northward, east of the Japanese Islands. In South America, where the lofty Andes rim the western edge of the continent, mountain-wave turbulence can be severe for "down under" carriers.

### Most Danger in U.S.

It's across the continental U. S., however, that the dangers of clear-air turbulence are most pronounced. The eastward-blowing jet stream follows an undulating path across the States, beginning high in northwest Washington, dipping low to brush the northern Texas border, then winding north to whirl out into the Atlantic east of the Carolinas.

Turbulence may be found anywhere across the narrow northern border of this

(Please turn to page 206)

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NEW YORK WORLD'S FAIR '64-'65

## Unseen CAT Pilots Dread

(Continued from page 205)

stratospheric wind tunnel. With hourly weather reports as a guide, pilots attempt to chart flight patterns so as to bypass areas where turbulence is expected to be severe. But thus far, data showing the existence of CAT is sketchy and often unreliable. And, to avoid the jet stream altogether means to ignore the boost in speed these fast-moving winds can provide.

The dangers of clear-air turbulence to high-flying jet transports are not being taken lightly by either the weather bureau, the Federal Aviation Agency or the airlines. The Weather Bureau has organized a research team, under veteran forecaster DeVer Colson, to probe the mysteries of CAT and arrive at workable measures to combat it. Using pilot reports and the bureau's upper-air studies as a guide, Colson and his team look for patterns in air movements which may give a clue to the whereabouts of the bumpy winds.

Much research has been accomplished by the airlines. Henry Harrison, chief of meteorological studies for Eastern Air Lines, has been poring over the problem for years, analyzing reports from his pilots.

The Air Force has been studying CAT perhaps longer than any other agency. Findings have been made available to all who seek a solution to the baffling meteorological phenomenon.

### Flow Indicators Help

New technology is being brought to bear on the problem. Air-flow indicators are being developed which will provide a continuous record of the air flow around an aircraft, giving an indication of wind speeds and revealing areas where buffeting, due to CAT, may arise.

Soon most of the jets flying the North Atlantic, and many domestic and foreign carriers flying transcontinental routes across the U.S., will be equipped with new navigation gear (Doppler radar), which will indicate any change in an aircraft's ground speed. By watching his Doppler indicator carefully, a pilot can tell the exact moment when his aircraft enters the jet stream. This knowledge will alert him to the potential onset of clear-air turbulence, so he can take precautionary measures.

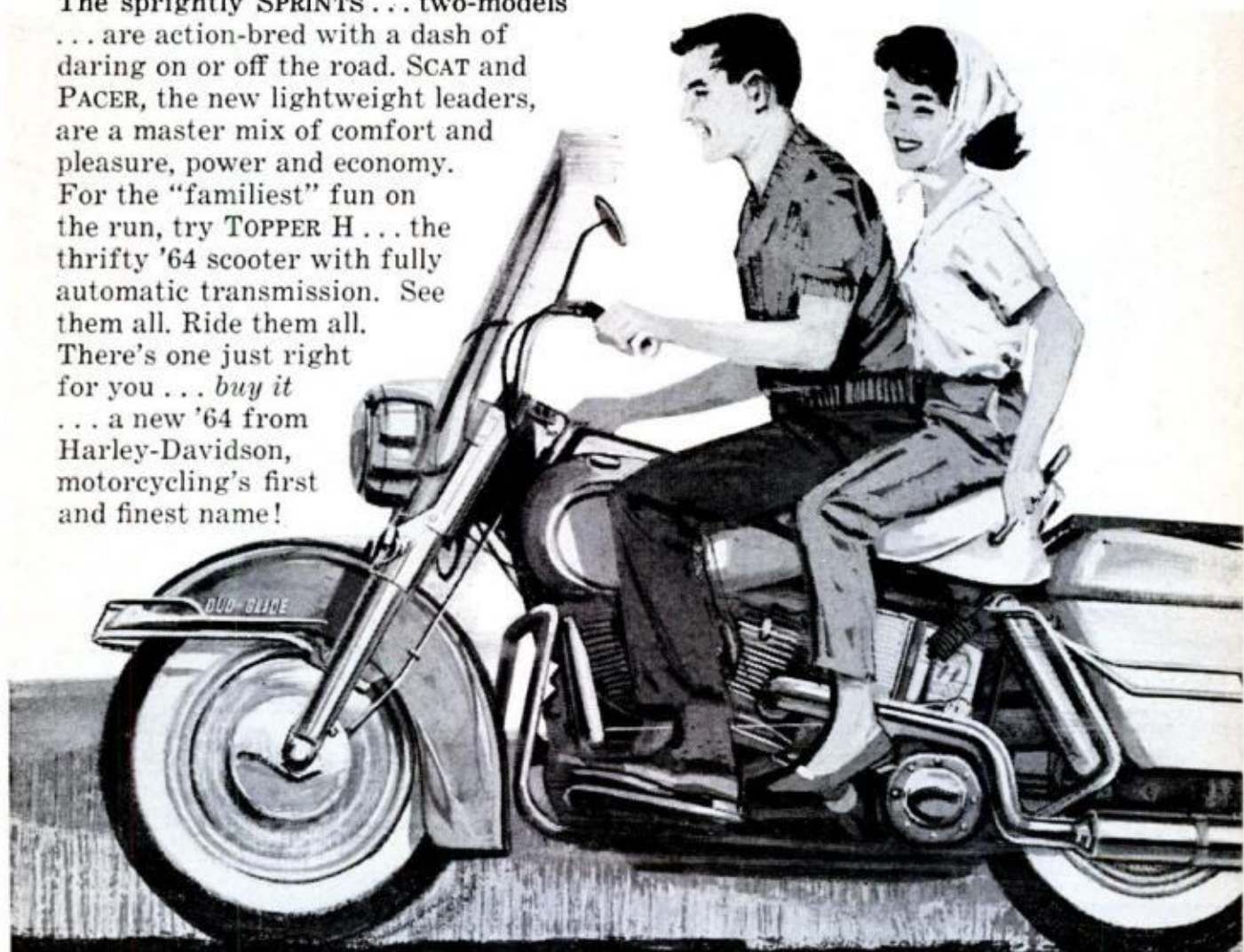
Once a sufficient volume of jet stream reports is available, the Weather Bureau can chart the fickle path of this high-altitude air stream on an hour-by-hour basis. Armed with reliable data, a pilot can slip into the jet stream from its calm lower edge, ride its fast-moving core to near his destination, then drop safely out of it without a bump. ★ ★ ★



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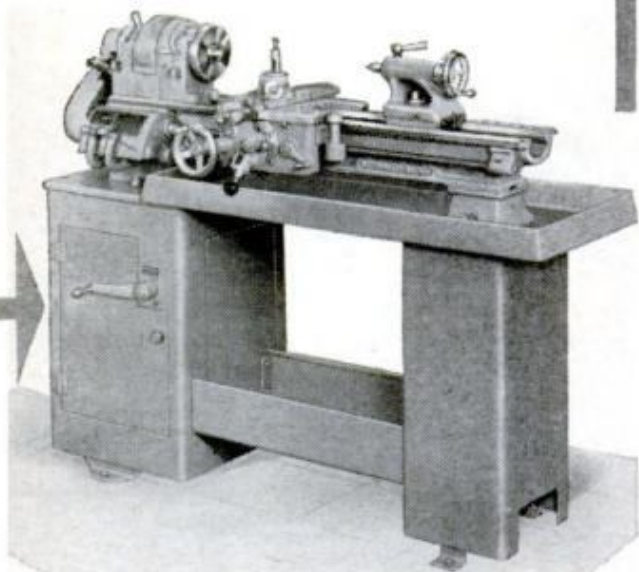
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## Foiling Lock Artists

*(Continued from page 151)*

store or shop owner—or a recognized locksmith (there are about 4000 in the U.S.). Each tool is a registered responsibility.

But such precautions aren't likely to apply to items that cost only a few cents. You can buy a snap pick, for example (sort of a palm-sized safety pin of spring wire), for 65¢—or an elaborate set of flat picks or tension wrenches for under \$10. Not all communities have (or enforce) regulations concerning such sales, and even the best-intentioned restrictions can be circumvented—especially via mail order. A professional lockpicker would certainly find it worth his while to have a few phony letterheads printed up.

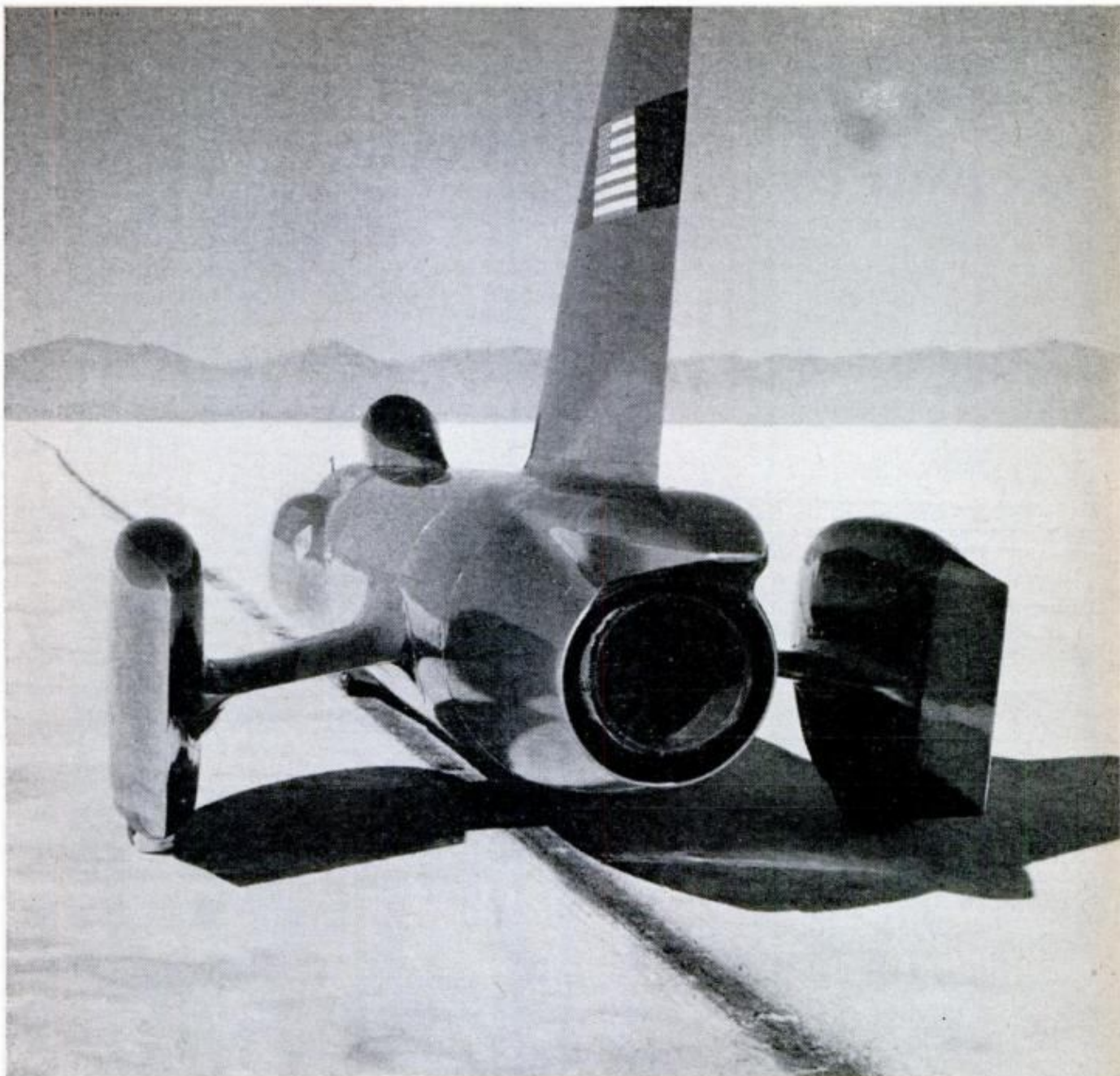
What makes things easy for the key forger, on the other hand, is our obsession with master-key systems. A burglar will often case the building site while a new apartment is under construction. If he can swipe a couple of cylinders before they're installed, he can study the similarity of their tumbler patterns and fashion a key that'll open any door in the place, later.

Protecting yourself against these sharpies involves a more drastic measure: changing your lock to one designed for maximum security. One of the best is shown in the photo on page 151. The circular key slot requires a tubular key that is next-to-impossible to forge, though the lock design is ideally suited to master-keying. The seven pin tumblers, set around the circle—run parallel to the key's shank—not vertical to it, as in standard tumbler locks. Since the pins are actuated by direct pressure from the key, not by a camming action, standard picks are useless.

This type of lock is not new. It's been made by Chicago Lock Co. (under the name "Ace") for nearly 30 years. Cabinet and padlock versions have long been adopted for the confidential files of the U.S. Secret Service and many telephone companies. Perhaps because of such major markets, the manufacturer makes little attempt to introduce the lock to the general public. Yet the Ace is offered in a cylinder version with a standard-diameter threaded body so that it can easily be substituted for most existing door locks. Any locksmith can order and install it for you.

Failing that, your locksmith can put pick-resistant pins in a standard tumbler lock. A skilled—or at least persistent—pick man might still be able to open it, but it will take him much longer, and often that's enough to discourage him. No crook likes to expose himself "in the act", and it's hard not to look guilty when you're caught kneeling in front of a stranger's door. ★★





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## Boomerang

(Continued from page 158)

vary the angle and length of the arms. The vital thing is the shaping of the airfoils. You have a big advantage over the aborigine, here, since he must gauge the shaping of his solid stock by eye, while you, using plywood, can do a uniform job by watching the spacing of the lamination lines. Theoretically, the greater the height of the camber, the greater the lift. And remember that the pattern given is for a right-handed boomerang. If you're going to throw it with your left hand, the bevels should be reversed.

Leave the bottom face flat, with only a slight rounding of the edges. And when the stick is shaped to your satisfaction, go over the entire surface with progressively finer grades of sandpaper. A smooth surface makes for an efficient airfoil. You'll probably want to have a test flight before you apply the finish, so you could alter the foils if adjustment seems necessary.

Throwing technique isn't hard to learn, though you may break a boomerang or two before you've mastered it. Hold the stick vertical, the beveled face toward you. It doesn't matter which arm you grip, but you may find it easier to set spinning if you launch it with the concave edge leading. Throw overhand, with the stick tipped slightly toward its flat face. At the end of your delivery, give your wrist a strong snap to set the stick spinning. All it takes is patient experimentation.

If you don't want the boomerang to return, throw it sidearm, with the curved side down. It will loop out and to the right. For soaring height, throw sidearm with the curved side up.

You can organize a contest by awarding various feats with a set number of points. For returning throws, it might be: 1 point if boomerang lands within ten yards of the thrower; 3 points if it lands within three yards; 5 points for touching boomerang upon return; 10 points for a catch.

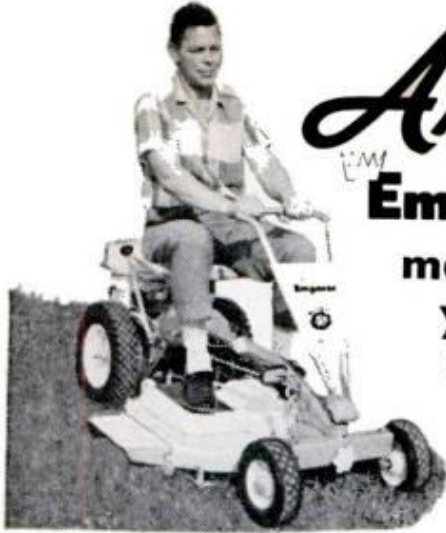
But make certain only one thrower is on the field at one time—and be sure he has learned that most important of the boomeranger's skills: How to duck! ★★★

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The mat, similar to those which open doors at a supermarket, was developed by the U.S. Department of Agriculture. It could replace a photoelectric cell sprayer which is less efficient, uses more pesticide and requires more maintenance.





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## We Can Save Our Elms

(Continued from page 125)

made a relentless effort to eliminate the beetle's home—dead elm wood. Infected trees toppled by the hundreds of thousands, Boy Scouts took elm tree censuses, and city budgets soared. Detroit, for example, made an emergency appropriation of \$300,000 just for equipment when Mayor Albert Cobo pointed to the new \$26,000,000 city-county building, the city's pride, and said, "We can better afford to lose that building than our trees."

These have been the only two weapons—spraying and sanitation—and they have been successful in varying degrees depending upon the thoroughness of their use. But, despite millions of dollars spent on these control measures, elm trees have continued to die because of inept programs.

In Wisconsin, the infection first appeared in 1956, and the state immediately passed a small emergency budget to deal with the problem. Part of the funds were set aside for research by Dr. Dale Norris of the Department of Entomology at the University of Wisconsin. Dr. Norris is a young man with a positive attitude that can only lead to optimism when he faces a problem. He and his associates began a search for other weapons that might be more efficient than sanitation-spray.

### Making the Elm Fight Beetles

One promising avenue to investigate was systemic insecticides. A systemic is injected *into* a tree rather than being sprayed *over* it. If properly applied, it reaches every living leaf and twig through the tree's own circulatory system.

Dr. Norris found a promising systemic insecticide in the laboratories of the Shell Oil Company, where scientists had been testing potent insecticides for years. The minutest trace of Bidrin attacked the nerve system of an insect.

A batch of Bidrin was sent to Dr. Norris for his experiments. He began by placing various quantities of Bidrin into holes drilled around the trunks of elm trees, then exposing beetles to the trees. He soon learned that an overdose of Bidrin not only killed the beetles, but the tree as well. He also learned that the correct dose of Bidrin, properly applied, worked its way to every twig, killed beetles on contact, and still did not harm the tree.

By now, the disease was moving through Milwaukee, and the city in desperation presented the university with 30,000 elms, in the city nursery, for experiments.

Tests on these and other trees soon turned up some difficulties. In the first place, Dr. Norris found that proper dosage

of Bidrin could not be determined simply by measuring the tree trunk. Through trial and error he learned that the optimum dose could be calculated by a formula which involved not only the size of the trunk, but the shape of the tree's crown. This meant that only a specially trained person could judge the right dose.

In the second place, the holes drilled into the trunk were open wounds. They not only damaged the trunk, but around these holes were traces of a chemical so potent that it could be dangerous to anyone who touched it.

To solve this problem, Shell chemists called in James J. Mauget of South El Monte, Calif., who had already worked out an ingenious method of injecting chemicals into forest trees. His equipment consists only of a tool small enough to fit into his pocket, some small metal tubes, a hammer, and sealed plastic capsules containing, in this case, a measured quantity of Bidrin and a liquid propellant.

### Unique New Syringe

To treat an elm tree with the new system, the proper number of capsules is first precisely determined through the formula developed by Dr. Norris. Then one of the small steel tubes is slipped onto the shaft of the tool, and the shaft is tapped through the bark of the tree until the slanted end of the tube reaches the xylem, which contains the tree's circulation system. The tool then is removed, leaving the end of the tube protruding from the tree. A valve in the plastic capsule is pushed onto the tube, breaking an internal seal. This releases the liquid propellant, which mixes with the Bidrin to form a gas, driving all the Bidrin from the capsule into the tree.

The entire process is fast and easy. It takes one man less than a minute to install a capsule, six or eight minutes to install them at intervals around a tree. Within 10 minutes the capsules usually are empty and can be withdrawn from the tubes. When the tubes are pulled out, the holes are so small they are self-sealing.

The beauty of the system is that a highly effective, but dangerous chemical is kept sealed from factory to tree leaf. The capsules can be applied even during rain and high winds, conditions which keep spray crews from operating effectively.

Dr. Norris found the capsules an excellent method for inoculating a tree. Within five minutes, a couple of his trained men can put a ring of capsules around the largest elm tree. A third man follows along to make sure that no one touches the capsules until they are empty (the capsule is translucent, so the level of the

(Please turn to page 215)





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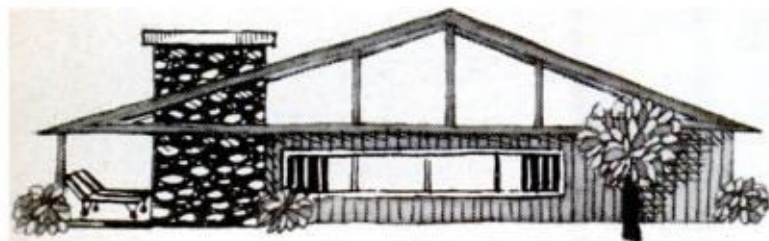
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## We Can Save Our Elms

(Continued from page 212)

liquid can be observed), removes the empty capsules and pulls out the tubes. The entire process may require only 10 to 15 man-minutes per tree.

Experiments with dyes prove that Bidrin reaches every part of the tree in one to two days depending upon the weather. And any beetle which feeds on any part of a properly dosed tree is a dead beetle.

Without question the system, in the hands of an adequately trained crew, works. "We can guarantee that a properly dosed elm tree will not contract Dutch elm disease," says Norris flatly.

In addition to its effectiveness, the system has other advantages over the sanitation-spray method. The effects of DDT spray are unselective, killing birds as well as insects. Bidrin harms only insects that live in a tree, and is completely broken down by the time the leaves fall.

### Having Your Elm Shot

Furthermore, even though trees must receive a "shot" once a year, the system is relatively inexpensive. Materials to treat the average municipal tree cost about one dollar. On private property the total cost may run up to \$5 or \$10 because of the "service" call involved. But even at this rate, you could protect a tree for 10 or 20 years for the same money you would pay simply to have it removed.

However, there are certain drawbacks to the systemic method, which Dr. Norris quickly points out.

"To be most effective, Bidrin should be applied during the critical two-week period just prior to the emergence of the beetles in the spring. Furthermore we are working with a very narrow margin of tree safety. Too much of the systemic insecticide can seriously injure a tree. (However, in one group of 1200 trees experimentally treated in Wisconsin, only two died from miscalculation of the dosage.)

"It is certain that Bidrin will never be sold directly to the homeowner. Municipal crews can be trained to do the job, but if the homeowner wants protection he will have to call a tree expert specializing in systemic treatments and order his tree 'shot.' At present such specialists are only available in Wisconsin."

One other drawback is that the systemic treatment will not prevent infection by root graft. Further experimental work at the University of Wisconsin has produced a solution to this problem, too. The University recommends that if you have a healthy tree situated near a diseased tree,

(Please turn to page 216)



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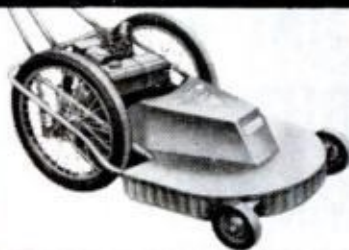
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## We Can Save Our Elms

(Continued from page 215)

you drill a series of 3/4-inch holes, nine inches apart and 30 inches deep, along a center line between the trees. Pour four to seven ounces of Vapam solution (a fumigant), mixed one part Vapam to four parts water, in each hole. This may cause some spotty injury to the lawn, but it kills a small section of the tree roots, isolating the diseased tree.

A longer-range approach is the development of disease and beetle-resistant varieties of elms. Certain Asiatic elms appear highly resistant to the disease, probably because the disease spread across Asia scores of years ago and only the naturally resistant trees managed to survive. Some species of elm also are undesirable to the beetle. Today there are 12 acres of elm trees of many species growing at the University of Wisconsin, trees brought in from all over the world. These provide a great potential for resistance research.

Dr. Eugene Smalley, another elm expert at the university, is testing a novel approach. Certain growth regulators, such as the weed killers you use on your lawn, also affect the growth of trees. Dr. Smalley has tested hundreds of such chemicals; a

few of them, injected into a tree, shift the time of tree growth from the susceptible period, just before the beetles emerge, to the resistant period a few weeks later.

Other experts have come up with the left-field proposal that the flavor of the cell sap be altered to make it disagreeable to the beetle.

But the systemic method developed by Dr. Norris provides a highly significant control measure. Other approaches, still in the experimental stage, may be more practicable in the long run. The important point is that the elm can definitely be saved for future generations.

What can you do—now—to save your own elms? Dr. Smalley offers the following advice:

"First, have your trees sprayed early each spring, before the buds emerge, to give them the best possible protection until the systemic method—and others—are available in your area; second, remove all dead branches; third, if elm disease appears near your property, trench and/or fumigate between trees to prevent infection by root graft."

If you follow such a program, the chances are extremely high that your magnificent elms will still be shading your lawn a generation from now. ★ ★ ★

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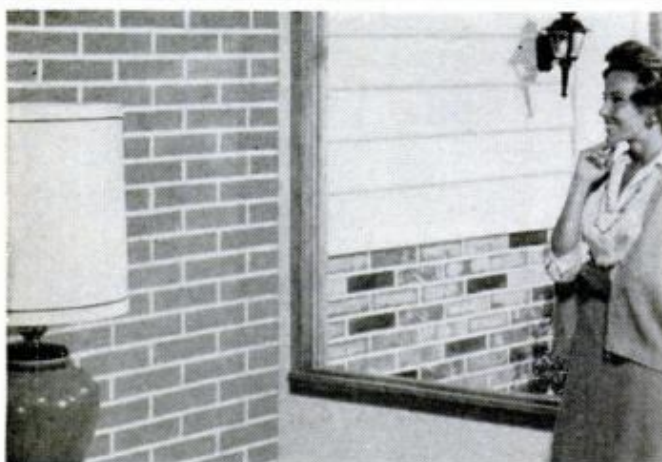
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## Welding with Explosives

(Continued from page 120)

Explosive welding, in principle, is simple. If two metal surfaces are driven together with enough impact and pressure, they'll bond permanently. Impact bonds materials that are impossible to weld conventionally, such as Lucite and steel. And, because explosive welding is a near-heatless process, it permits flammable materials, such as rubber-insulated wires, to be encapsulated between welded plates or sealed in explosively-welded conduits.

The new technique was only recently discovered, by accident, during metal-forming processing, which is also done by explosive impact. A charge forces metal blanks into steel dies forming the metal to the contour of the dies.

"Examining some aluminum we'd formed explosively," says General Dynamics research engineer Don W. Cole, "we found that the formed metal and the dies sometimes stuck together so fast we couldn't separate them. The same force that shaped the metal had welded it."

### Surfaces Melted Together

Microscopic examination proved the point. The heat of the impact had caused the two surfaces to melt together. (While impact heat is basic to the process, it is present for such an infinitesimal time that the process is essentially heatless.)

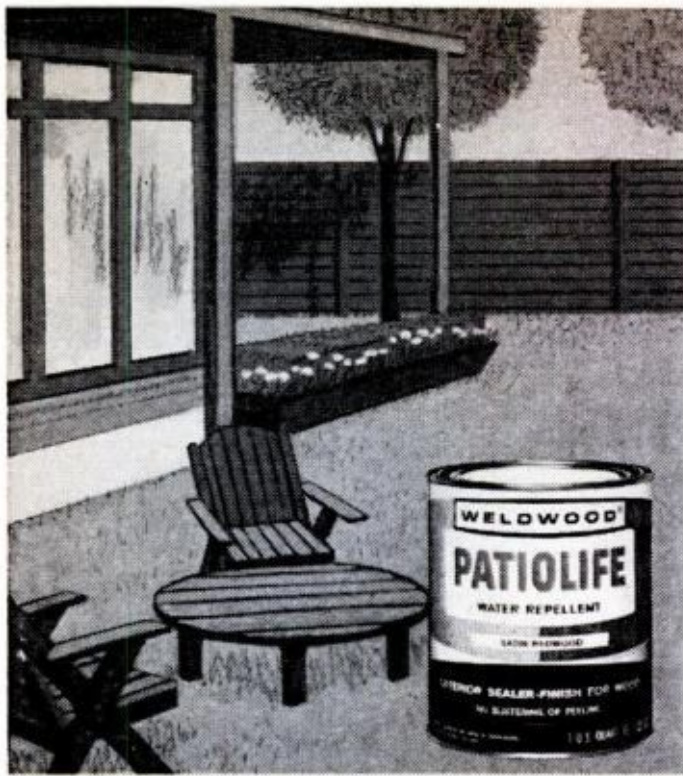
Stanford researchers point out that the joined surfaces of explosively-welded materials reveal tiny ripples or wavelets. "The waves," says Poulter Laboratories director Donald E. Davenport, "look like miniature ocean waves. The curled wave tops in one impacting surface interlock with the wave tops in the other and hook together to form an unbreakable bond."

Impact velocity and pressure must be great enough to cause such ripples, if only a few ten-thousandths of an inch high. The surfaces of the materials must be slightly separated (distance equal to one-fourth to one-half the thickness of one of the metal plates) and preferably one plate should be slightly angled, from two to four degrees.

"When the two plates collide," says Donaldson, "a hump forms at the point of impact. This hump is converted into wavelets in the faces of the materials. If the angle of collision is too small the point of impact moves across the plates faster than the speed of sound and the hump never has a chance to form. If the angle is too great, too high stresses are set up in the weld."

(Please turn to page 220)





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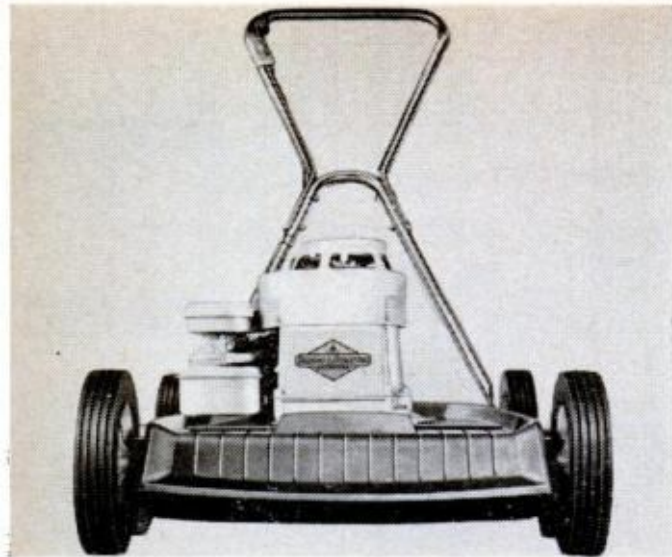
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## Welding with Explosives

(Continued from page 218)

Tests at General Dynamics show that the impacting surfaces are molten but only for a fraction of a second. "Entrapped gas or air is compressed to zero volume at the moment of impact," says researcher Cole. "This heat is absorbed by the two surfaces, liquefying them to a shallow depth, no deeper than 1/1000th of an inch."

A few months ago, Cole's staff announced a modification of the technique called "high-velocity joining . . . by a new physical phenomena." No details have been divulged, but the welded metals are so closely joined that the two become one, in what the company calls a "solid state union." Not even high-powered microscopes can discover the weld line.

Explosive welding, however, doesn't work on all materials or even on all metals. Results at Stanford showed that attempts to mate tungsten to steel, zirconium to steel and aluminum to both steel and copper were not very successful. On the other hand, the process welds materials that conventional techniques usually flub, such as copper to copper, and copper to gold. Other successful bondings have included steel to steel and steel to niobium and tantalum.

The technique wouldn't be possible without super-velocity explosives, among them DuPont's PETN (Pentaerythrite tetranitrate), a waterproof, granular explosive which behaves something like nitroglycerin, except that it's much safer to handle. Some sheet explosives, including PETN, have a higher detonation velocity (8400 feet per second) than nitroglycerin (about 7800 feet per second).

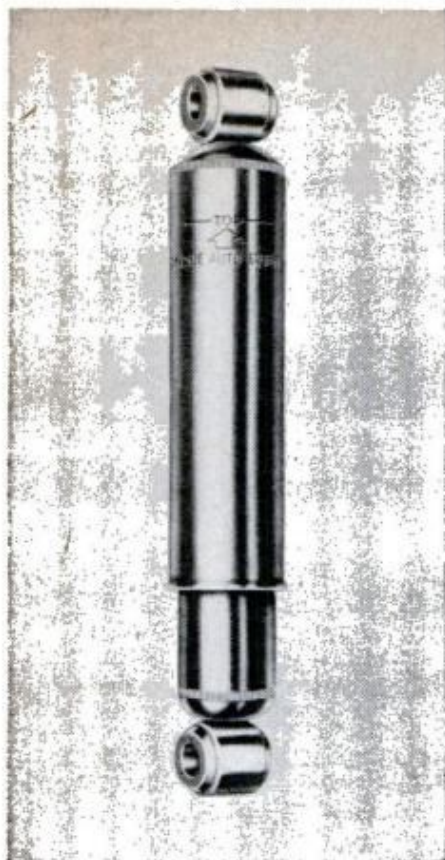
Usually, the explosive is cemented to one of two metal pieces and detonated with a blasting cap. But Stanford researchers now use two sheets of explosives which are timed to explode at precisely the same moment. Since dual detonation makes an anvil unnecessary, Stanford calls it the "explosive anvil."

Explosive welding isn't limited by the size or thickness of the metal. DuPont regularly welds steel plates up to 20 feet by seven feet. And the company recently bonded 3/4-inch thick stainless liners inside tubes of 1 1/2-inch-thick carbon steel.

However, because of the noise, explosive welding will be confined, initially at least, to open-air construction or production sites, or to laboratories. So don't expect the local garage mechanic to use the technique soon.

In any case, the process has added two items to the welder's kit—high explosives and ear plugs. ★ ★ ★





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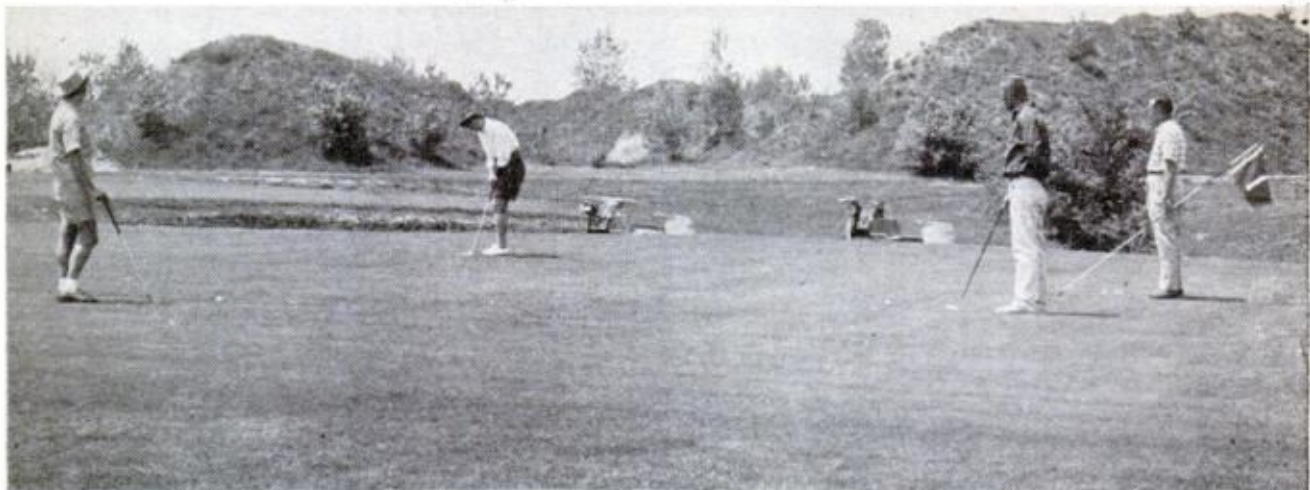
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ONCE a wasteland left by a strip mine, this area in Illinois became the Wee-Ma-Tuk Hills country

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Cursed for years as "spoilers of the earth," strip miners had done away with the old methods of shaft mining, and were simply peeling away the earth to get to the coal. They employed giant mechanical shovels to level mountains and gouge out canyons that spread over hundreds of acres. And when they moved on to virgin

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But this has changed. The operators now restore the land.

Bulldozers break "spoil banks" into rolling hills that are scientifically planted. Pits are landscaped and flooded to create lakes for boating and fishing. Some lands become game refuges, and one area 190 miles south of Chicago, Wee-Ma-Tuk Hills, has been converted into a golf course.

**GIGANTIC EXCAVATOR** peels away the surface to expose coal when a typical strip mine is in operation



**WORKING** on a "spoil bank," mine employees plant trees and shrubs that will restore an Indiana mine





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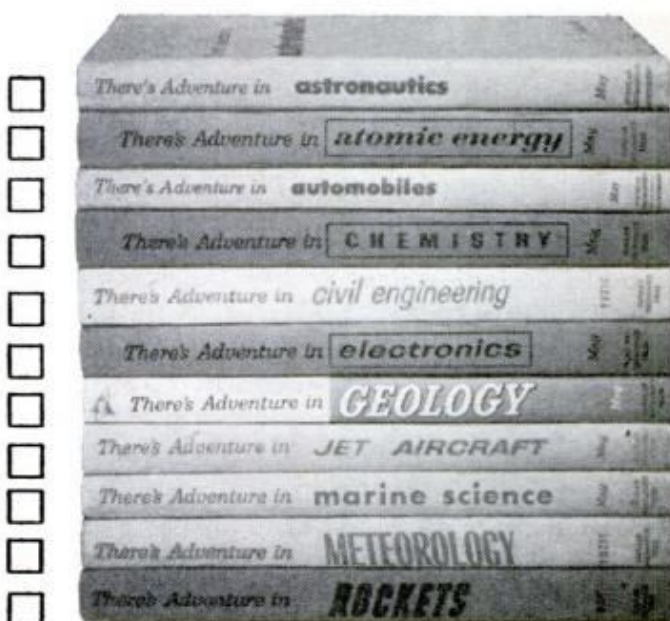
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## Owners Report—Chevrolet

(Continued from page 99)

"It's dependable in any weather—will always start and go over ice, snow, mutilated country roads or any terrain where other cars may be stuck along the way."—New Jersey secretary.

**Chevy's a good mud plugger, especially with Positraction rear axle.**

"It's roomy—in between the larger and compact cars."—Massachusetts postman.

**In width of passenger compartment the 1964 Chevy is right up with the luxury cars, but fore and aft rear-seat legroom is scant.**

"The interior trim is rich looking."—Illinois salesman.

"The car is made of very good materials; interior is very pretty."—Georgia grocer.

"I like the huge trunk. There is more than ample room for luggage."—New York housewife.

**With spare tire stowed on shelf above rear axle, Chevy's "deep-dish" trunk is a dandy.**

"It will, I expect, hold its resale or trade in value better than any comparable competitive American-made automobile."—New York manufacturer's representative.

**Brickbats keep pace with bouquets. Here are complaints numbered six through ten:**

"It rattles much more than I expected, especially under the dash."—Mississippi salesman.

**This is the most difficult area to stop squeaks in, too.**

"It vibrates at speeds of 65 m.p.h. and over."—Michigan mailman.

"My Chevrolet was just returned from the garage because of a transmission problem."—Pennsylvania physician.

"I have had trouble with a broken alternator pulley."—Washington salesman.

"I've had some carburetor trouble."—Pennsylvania furniture finisher.

**So do a certain number of owners of any car you can mention. The carburetor is the engine's weakest link, the one item most prone to maladjustment.**

"There is no adjustment on the automatic choke, the gas mileage is poor and the choke is terrible."—South Carolina postal clerk.

**Wrapping up owners' salutes, here are numbers 11 through 16:**

"I like the wide vision you have."—Indiana storekeeper.

"It's maintenance free, easy to keep clean."—Rhode Island businessman.

**This last is one of the virtues of simple, straight styling, without hard-to-clean frills.**

"This heavy car grips the road nicely

and gives a smooth ride over rough roads—terrific in snow."—Pennsylvania teacher.

"It corners well on mountain curves."—Arizona engineer's aid.

"It holds the road well at high speeds."—California banker.

"I like its quiet operation."—Texas manufacturer.

**Often, low-priced cars look expensive but sound cheap. Happily, this isn't true of the '64 Chevy.**

"It starts well on our sub-zero mornings."—Iowa serviceman.

"It starts in the coldest weather (10-15 below) after being outside all night."—Illinois chemist.

**This is the sort of thing that really builds owner loyalty, performance when the chips are down.**

"It runs perfectly with no noises and rattles."—New York advertiser.

**Finally, complaint points numbered 11 through 16 wind up the reactions from PM's Chevy owners.**

"There are air leaks around the windows and door areas at a mileage of 65 m.p.h."—Tennessee salesman.

"The switch wires fell off low beam."—Pennsylvania merchant.

"The trunk is not dust or water tight."—California engineer.

**Something has got to be done about this trunk-sealing problem before the populace gets up in arms. PM has found it cropping up on every car reported on for several years.**

"The dealer service is poor. However, I may be too opinionated here. Probably I have been spoiled by the superlative service rendered by my Buick dealer. I may now be getting normal service."—Maryland analyst.

**You may get good service from a Chevy dealer or poor service from a Buick dealer. It depends on the individual dealer and not the car involved.**

"Heat does not reach the floor in the rear. People in the rear are cold all the time on trips."—New York accountant.

"Defrosting system is not as good as the '58 Chevrolet I owned. It doesn't get the entire windshield."—New York foreman.

**He's right. Hot air should hit windshield halfway up to the thaw-out eye-level section. Instead, it starts melting at the bottom.**

"It takes too long for the car to warm up."—New York contractor.

"The body chrome is too loosely fitted."—Wisconsin millwright.

**That winds up PM's report gleaned from a group of owners who have run up a grand total of 1,214,197 miles on their 1964 Chevrolets.** ★★





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## Digging Up Bible Stories

(Continued from page 114)

*and took Hazor, and smote the king thereof with the sword: for Hazor beforetime was the head of all those kingdoms. And they smote all the souls that were therein with the edge of the sword, utterly destroying them: there was not any left to breathe: and he burnt Hazor with fire."*

—Joshua 11:10,11

Digging into the ruins of ancient Bethel, which was also destroyed during this period, archeologists discovered proof of a fantastic conflagration. Charcoal was five feet deep. Limestone was calcined and adobe was burned to red brick—all bearing out the truth of Joshua's conquest.

### History's Beginnings

In the book-lined living room of his summer home in Jaffrey Center, N.H., the soft-spoken Dr. Wright stepped through a maze of pictures and maps spread on the floor. They brought to life the beginnings of recorded history.

"After the initial excitement of finding walls and masonry," he said, "and removing them to find another layer of ruined Israelite homes, then another and another, it became monotonous. But soon I began to see in this succession of devastation and rebuilding the birth throes of our religious heritage—an unremitting pattern of violence, pillage and sudden death."

The scene of all this carnage is the Fertile Crescent, a semi-circle of arable land that arcs like a scimitar from Egypt up past Jerusalem and Damascus, across Mesopotamia and down to the Persian Gulf. About 2000 B.C. Semitic nomads, known as Amorites, migrated to this area from the deserts of western Arabia, moving with their flocks of sheep, fighting for water and grazing land, inexorably moving toward the Mediterranean.

"These people were almost religious fanatics from the standpoint of many moderns," Dr. Wright said. "They firmly believed that they were directed by divine authority and were under the protection of Yahweh (Jehovah God)."

Although the actual origins of the Hebrew patriarchs was long in dispute among scholars, an archeological find has placed them in Mesopotamia. Grave diggers in eastern Syria turned up a strange statue, which led to the excavation of the city of Mari, capital of a state that flourished from 3000 B.C. to 1700 B.C. In the ruins of a vast 300-room palace that covered seven acres, they found the archives of King Zimri-Lim—more than 20,000 clay tablets, 5000 of them letters from kings throughout Syria and Mesopotamia.

The letters tell of "westerners," Amorites moving in from the Arabian desert. There are also numerous references to the city of Haran—treated in Genesis as the home of the patriarchs—as being in the northern country of Mesopotamia.

Moving with their flocks, the patriarchs filtered down the east coast of the Mediterranean, through the section of the Fertile Crescent that is now Israel and Jordan.

Following their trail, archeologists place them in Egypt around 1890 B.C. In the tomb of an Egyptian nobleman at Beni Hasan, they discovered an elaborate wall painting depicting a large clan of Semites, the men wearing the typical kilt of bright patterns and the women wearing colorful tunics that fasten over one shoulder, leaving one shoulder bare.

Settled close to the border of Palestine, the Israelites were a ready source of slave labor when Pharaoh Rameses II decided to build a military base to support an offensive campaign against Palestine and Syria in 1300 B.C. This fact has been inferred from hieroglyphic records of the period.

When the slavery became unbearable the Israelites made their Exodus, fleeing under the leadership of Moses into the desolate Sinai Peninsula. This was long doubted by Biblical scholars who knew the terrible wasteland of Sinai and could not accept the claim that when starvation faced them they received manna from God.

*"And when the dew that lay was gone up, behold upon the face of the wilderness there lay a small round thing, as small as the hoar frost on the ground. And when the children of Israel saw it, they said one to another, it is manna: for they wist not what it was. And Moses said unto them, This is the bread which the Lord hath given you to eat."—Exodus 16:14,15*

This has been proven as solid fact. In 1927 a zoologist seeking an answer to the mystery spent the summer in Sinai and discovered that every morning small drops







## Digging Up Bible Stories

(Continued from page 226)

to secure their "promised land," the Israelites became a power in the Fertile Crescent. But once in control of a coveted piece of land, they faced invasion.

The written records of Assyrian, Babylonian and Egyptian rulers that have been recovered and translated draw close parallels to the record of constant violence during this period in the Bible. And this was also the period—about 1175 B.C.—when the Philistines came down from the Greek islands and attacked Egypt. Repulsed by the armies of Rameses III, they settled along the Palestinian coast in the cities of Gaza, Ashkelon, Ashdod, Ekron and Gath.

### Philistine Secret Weapon

The terror of the Philistines is well known—and archeologists have dug up the reason. Excavations in Philistine territory have unearthed some of the first iron weapons. Israelite ruins of the same period reveal no evidence of iron, establishing the fact that the Philistines guarded their new found secret of iron production with jealous care.

The excavation at Shechem lends credence to the Bible's claim that during this period part of the loosely organized tribal league of Israel attempted to unite under a single monarch. Gideon refused to be king, saying, *the Lord shall rule over you*. But when he died, his half-breed son, Abimelech, killed all of Gideon's sons, except Jotham, and called on the people to make him king. The ceremony, says the Bible, took place at the sacred stone erected by Joshua:

*"And all the men of Shechem gathered together, and all the house of Millo, and went, and made Abimelech king, by the oak of the pillar that was in Shechem."*

—Judges 9:6

Abimelech ruled for three years until the people of Shechem rebelled against him. In a strata of the ruin bearing definite signs of fierce burning and planned destruction of houses the Drew-McCormick team found many fragments of the typical 12th century B.C. Hebrew unpainted pottery, but not more than a trace of the Philistine pottery that is much in evidence in many ruins of the period between 1150 and 1000 B.C., when the Philistines conquered much of the Holy Land. This pinpoints the fire and destruction at about 1100 B.C., supporting the Biblical account of Abimelech's treatment of the offending rebels:

*"And Abimelech fought against the city all that day; and he took the city, and slew*

*the people that was therein, and beat down the city, and sowed it with salt."*

—Judges 9:45

Following the rebel soldiers who had escaped, Abimelech trapped them in a tower at the city of Thebez, and in the ensuing battle he was killed by a millstone thrown upon his head.

The strata of most of the ruins of ancient Israel contain many fragments of the Philistine pottery. Again, the diggings verify the Biblical records:

*"And the children of Israel did evil again in the sight of the Lord; and the Lord delivered them into the hand of the Philistines forty years."*—Judges 13:1

After 30 years under Philistine domination, the tribes of Israel came together and elected Saul, a Benjamite, to be king. The reasons for this sudden change in Israelite rule—they had always been individual tribes—is apparent to archeologists. Saul was a fighter and had led skirmishes against invading tribes from the north—and Israel needed someone to lead them in battle against northern Ammonites and the Philistines.

The city of Gibeah, Saul's home, bears relics of occupation by Philistine troops in a strata that also shows burning and sudden destruction. In the strata of reconstruction there is nothing of the Philistine.

"We know that Saul lived a spartan life," Dr. Wright reveals. "Excavations at Gibeah show that his throne room would have been rudely furnished, and boasted little splendor."

The reign of David, successor to Saul, is better documented.

### Iron Tools and Weapons

Iron tools, implements and weapons of Israelite design are found in the Israeli ruins of this period, proving that David must have defeated the Philistines in order to wrest the secret of smelting from them.

The Bible's stories of David's conquests are backed up by Egyptian and Mesopotamian documents, which also indicate that this was a time of international weakness. He had the strongest army between the Euphrates and the Nile.

The golden age of Israel came during the reign of Solomon, son of David. He was a scholar and a clever trader. During his reign scribes began setting down the oral traditions of the Israelites.

The country prospered. Solomon's ships plied the Red Sea and the Mediterranean. The excavation of Megiddo revealed a vast network of stables that may have been used as a trading center for horses and chariots, as the Bible explains:

*"And a chariot came up and went out of*

[\(Please turn to page 230\)](#)



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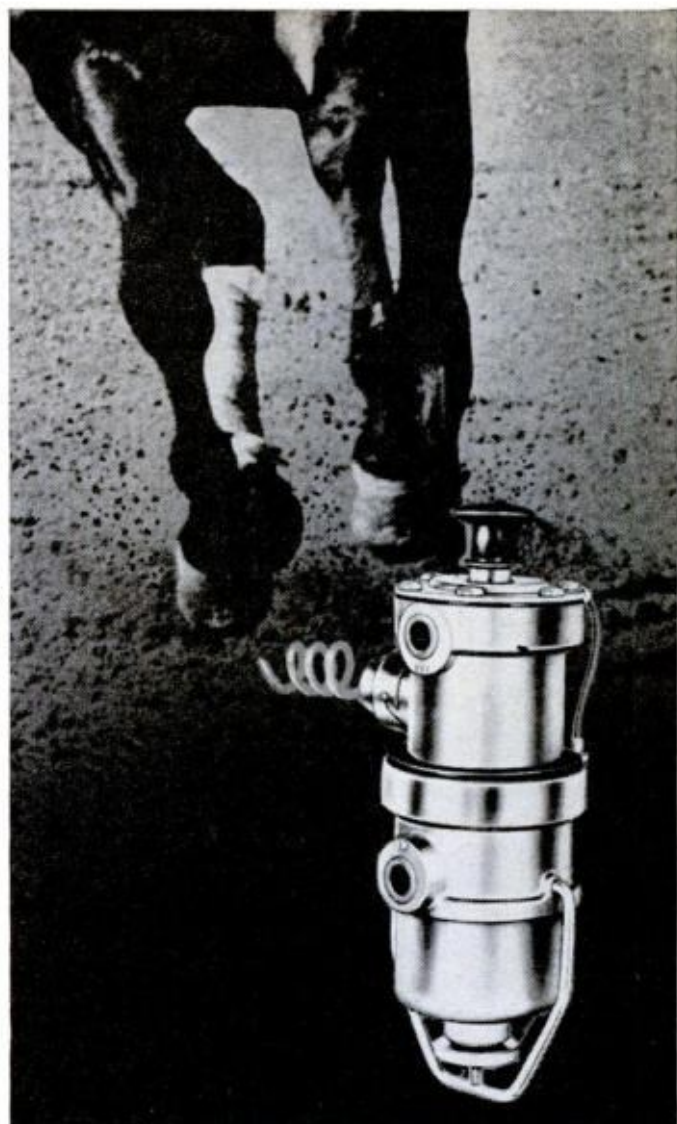
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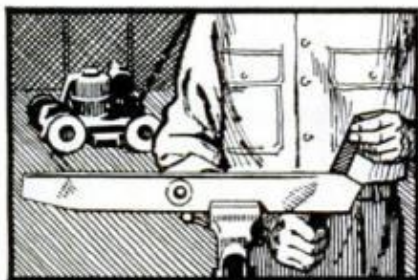
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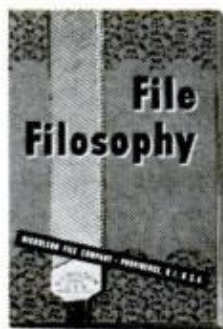
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# NICHOLSON



## Digging Up Bible Stories

(Continued from page 228)

*Egypt for six hundred shekels of silver, and an horse for an hundred and fifty: and so for all the kings of the Hittites, and for the kings of Syria, did they bring them out by their means.*—I Kings 11:29

The death of Solomon heralded the collapse of Israel as a power in the Fertile Crescent. Torn asunder and weakened by civil war and political intrigue, the country was easy prey for outside invaders.

The decline, as chronicled in the Bible, is authenticated by careful cross-reference with archeological finds in Egypt, Assyria and Babylon. Inscriptions found at Karnak, Egypt, claim 150 victories over the Israelites, attesting to the total destruction found in the excavations at Debir and Beth-shemesh, and Megiddo. The annals of Assyrian King Tiglath-pileser III, found in 1840, agree in detail with the Biblical account of the Assyrian invasions from the north. The annals of King Sennacherib, successor to Tiglath-pileser, were discovered in the ruins of Nineveh, and here again the Biblical stories are closely paralleled. This is also true of the Chronicles of the Babylonian, Nebuchadnezzar, who conquered Palestine in 597 B.C., and destroyed Jerusalem in 587 B.C.

### Only the Beginning

Despite the vast wealth of information gathered to date, it is commonly agreed among archeologists that this is merely the beginning. Modern technology is making the difference.

Under the direction of Dr. Wright, the excavation at Schechem is being used as a training ground in modern methods for young archeologists. Of prime importance is pottery dating, according to the system of the dean of Palestinian archeology, William F. Albright, for accurately dating fragments of pottery through hundreds of different variations of thickness, color, curvature and material. There are also the new methods of trenching, carefully digging to the bottom of a tell (a mound of ruins) and dating the successive strata through pottery and coins.

"We are not looking for monuments or treasure," Dr. Wright explained. "In what archeologists of the past might have considered rubble, we are assembling the true facts of our past—the day-to-day life as it was lived five thousand years ago. And it is exciting and rewarding to find that the Bible is not merely a testament of faith, but a testament that arose in relation to real people and real events in the country that is the bridge between Asia and Africa." ★★★



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# Springfield

QUICK MFG., INC. the House of Power • Springfield, Ohio

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## Bowling Pin Rabbit?

(Continued from page 88)

tic pin is hit by a slow ball it bounces just enough to knock down the other pins; when it is hit by a really hard ball it flies into the air and leaves the more expert bowler with a split and a difficult spare."

For our test we had two cameras set upon a bridge over the alley. They were triggered electronically when the ball made contact with the pins. Photos show the plastic pins—hit by Gessner's hard ball—flying horizontally into the other pins.

"There is definitely a difference," says Francis Dodd. "I was surprised, because I believed the propaganda about the plastic pin. But with slow or fast ball the plastic pins are harder to knock down."

A representative of Bean Bros., Inc. of Walton, N.Y. a pin manufacturer, says, "There really isn't a great difference. If you have pins of comparable weight they'll score pretty much the same. The only great variable is the individual bowler."

"Bowlers are improving all the time," says a spokesman for American Machine & Foundry Co., a major pin producer. "How much any pin contributes to better scores, we don't know, but we do know that with more bowlers spending more time at their game, scores have to improve."

However the controversy is resolved, it is apparent that the plastic pin is here to stay. Major manufacturers are no longer producing wood pins, because proprietors are not using them. It's economics; plastic pins last five to six times as long as wood, and although they cost about twice as much there is still a great saving.

"Durability is the major factor in the plastic-coated pin," says the Brunswick Corp. spokesman. "We're doing nothing to make bowling easier, but we will continue to do our best to make better equipment."

A number of manufacturers are experimenting with completely plastic pins, and the Goodyear Rubber Co. is currently testing a pin made of "chemical wood," a composite of hard rubber, resins, pigments and fillers. The advantage of the chemical substitute, says Goodyear, is that it will not be affected by moisture or humidity, and it can be compounded with a constantly exact weight and density not generally found in tree wood. Neither of these innovations have received ABC approval.

What effect will this have on the bowling controversy? "We'll continue to fight this thing," says Wilson Taylor. "The Professional Bowlers Association will demand fair bowling conditions."

The representative of the ABC sighed and spread his hands wearily. "Mr. Taylor is tilting at windmills," he said. ★★



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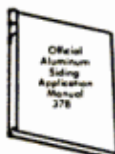
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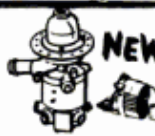
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**Owners Report—Plymouth**

(Continued from page 94)

in and out of the back seat even with four doors."—Illinois signal maintainer.

**Detroit would just love to solve this problem if it could be licked without making the car unfashionably high, or expensive.**

"There's not enough mileage for the gas being used. I feel I should get at least 16-18 miles per gallon in town with my Six instead of 11.9."—Michigan agent.

**Cases like these indicate poorly tuned engine and/or uneconomical driving habits.**

"I would like to see the wipers changed to clear the central triangle on the windshield."—Maryland engineer.

Following down the list, here are numbers six through ten from owners' praises: "The lack of fins improves rear view visibility."—New York accountant.

"What I like most is the way I can see over the steering wheel. I am 5'4" tall and the other makes of cars just do not sit high enough."—Missouri retiree.

"It takes curves better than any car I have driven."—New York foreman.

"The interior looks as if it were made with a lot of care."—Washington planer feeder.

"The doors close quietly and have no rattles."—Virginia supervisor.

**There's a thorn for every rose. Let's look at numbers six through ten of owner complaints, listed in order of their frequency.**

"The doors don't seem to catch unless they are slammed and they don't close flush with the body."—Connecticut teacher.

**This sounds like an adjustment problem.**

"My complaints are the droning body noise on rough tar and gravel roads and the whine of the transmission in low range."—Michigan farmer.

**All Plymouths (in fact almost all Chrysler products) have that low gear whine. Let transmission upshift as soon as possible.**

"The exterior had several scratches in the finish. I do believe the quality control could be improved."—Ohio insurance agent.

"Several rattles are in the dashboard. The windows also rattle."—North Carolina textile worker.

"I don't like the squeaking-slipping fan belt or the rattle of the trunk lid torsion bars."—Texas credit manager.

**Try taping each bar separately where they are most likely to come in contact.**

"On the first 100 miles I only averaged 10 miles per gallon. The dealer installed a

(Please turn to page 236)



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EXCESS INVENTORY  
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## ELECTRIC CAR MOTOR Ratio 24 to 1

• Item #564. Powerful hi torque. Build boy's car, golf cart, winch, elevators, etc. Runs 12-v battery. Reversible. 100-150 rpm. Ball bearings. Wt. 30 lbs. SALE . . . . \$18.95



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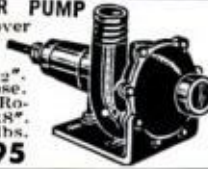
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• Item #1810. Gov't pressure spray tank. 60-lb. gauge. Hose and nozzle. Fill with air and fluid. Spray weeds, flies, fertilizer, etc. Size 26" high, 10" diameter. Wt. 18 lbs. Cost Gov't. \$38. SALE . . . \$11.79



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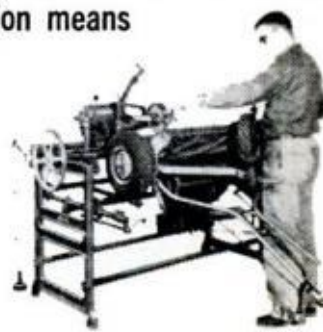


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THE FATE-ROOT-HEATH CO., Dept. PM-4, Plymouth, Ohio

235



## Owners Report—Plymouth

(Continued from page 234)

new carburetor and the mileage increased to 16 miles per gallon."—Michigan retiree.

Wrapping up the comments from the bright side, here are numbers 11 through 16 that most pleased Plymouth owners.

"It is smooth, quiet and comfortable at high speeds."—California engineer.

"My wife selected it because she didn't want another heavy car and didn't want a compact car."—Delaware insurance agent.

"The new guarantee is attractive, although I probably won't keep the car long enough to use it."—New York bank teller.

**But, since that 5-year, 50,000-mile warranty is transferable, the second owner should appreciate a guaranteed used car.**

"I gave it the supreme test when it stood out all night in 25-below-zero weather and, with one crank of the engine, started right off in the morning."—Minnesota freight agent.

"Chrysler Corporation has an excellent automatic in the three-speed TorqueFlite. I've owned two Corvettes with four-speeds with no trouble, but this TorqueFlite has them beat for performance. Excellent response."—Wisconsin teacher.

In the order of their frequency, here are the last six—numbers 11 through 16—of the most common complaints by owners:

"My transmission had to be adjusted."—District of Columbia clerk.

**This is pretty frequent in case of new cars with automatics, most mechanics check for adjustment within first 5000 miles.**

"I had trouble with an oil leak; the distributor shaft was too long."—Oklahoma electrician.

"On cold days the heater doesn't heat; this is the first car I've owned that I didn't have to turn the heater down after several miles."—Indiana railroader.

**Have dealer check, sometimes hot water valve doesn't get fully opened.**

"The windows when lowered more than two inches pull away from the vertical bar and you get a strong draft right in the back of the neck."—New York contractor.

"The angle of the front windshield causes excessive need for the use of the defroster in slightly inclement or cold weather."—New York office manager.

*That wraps it up; a balanced rundown of typical raves and gripes chosen from the questionnaires of a group of 1964 Plymouth owners who've driven an average of 4079 miles.*

★★★




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M-44 Rod Magnets for Elec. Guitars 1/4" Dia. x 1 1/4"—12 for . \$ 4.00  
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M-35 Science Experimenter Kit of 8 magnets . . . . . \$ 2.00

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M-CS43 Surplus Bar—Sizes 7/16" x 1/2" x 3" . . . . . 4 for \$2.00  
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M-C70 Kit of 7 assorted Ceramic Magnets . . . . . \$2.00

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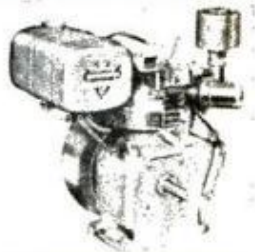
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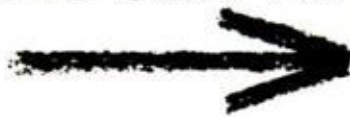
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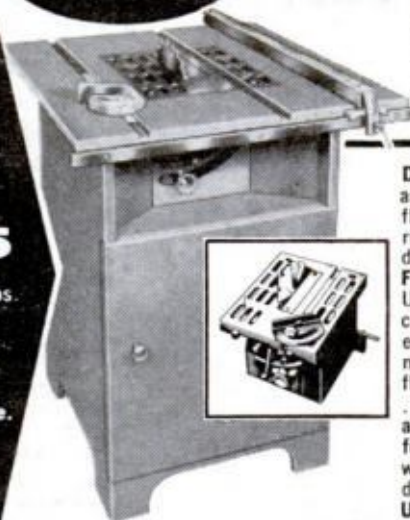
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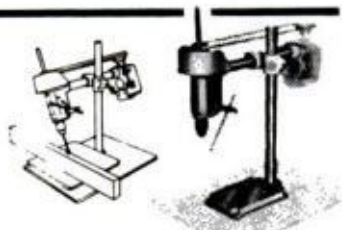
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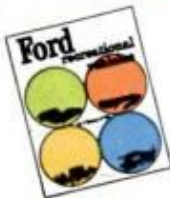
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