

MARCH 1966

35 CENTS

Popular Science

MONTHLY

**ARE YOUR TIRES
SAFE ENOUGH?**
The Uproar Over 2-Ply Tires



Inside Story of the "Forgotten" F-5

OUR BANTAM SUPERSONIC JET

• How I Search for
Lost Gold Mines...and Why
By ERLE STANLEY GARDNER

• POWER MOWERS: New Designs
Are Making Them Safer
• IN COLOR: Secrets of Wood Glazing

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Scoff at our scientific proof, if you will. Your seat-of-the-pants will tell you what's No. 1 about our Pickup ride.

The electronic computers modern scientists use are pretty sharp at solving problems. But they don't know everything.

A bit of a puzzle came up recently with our Pickup truck. Under the front end we have Twin-I-Beam suspension with two axles. Each axle works independently to dampen road-shock before it can reach the driver. That gives us a ride that's No. 1. But how to prove it?



"Do it with a computer," somebody suggested. We did. Had an independent testing company use a portable computer that could be moved from one Pickup to another. Six bump-sensing devices at different points within the cab fed data to the computer as the Pickups ran over different kinds of roads at different speeds. Result? You can bet our electronic genius had an instant answer. It said that our Pickup had a better ride than any of the four other makes.

It said that our ride was 35.09% better than the average of the others.

Sounds a bit naive, now that we think about it. Like having a computer pick a beauty contest winner.

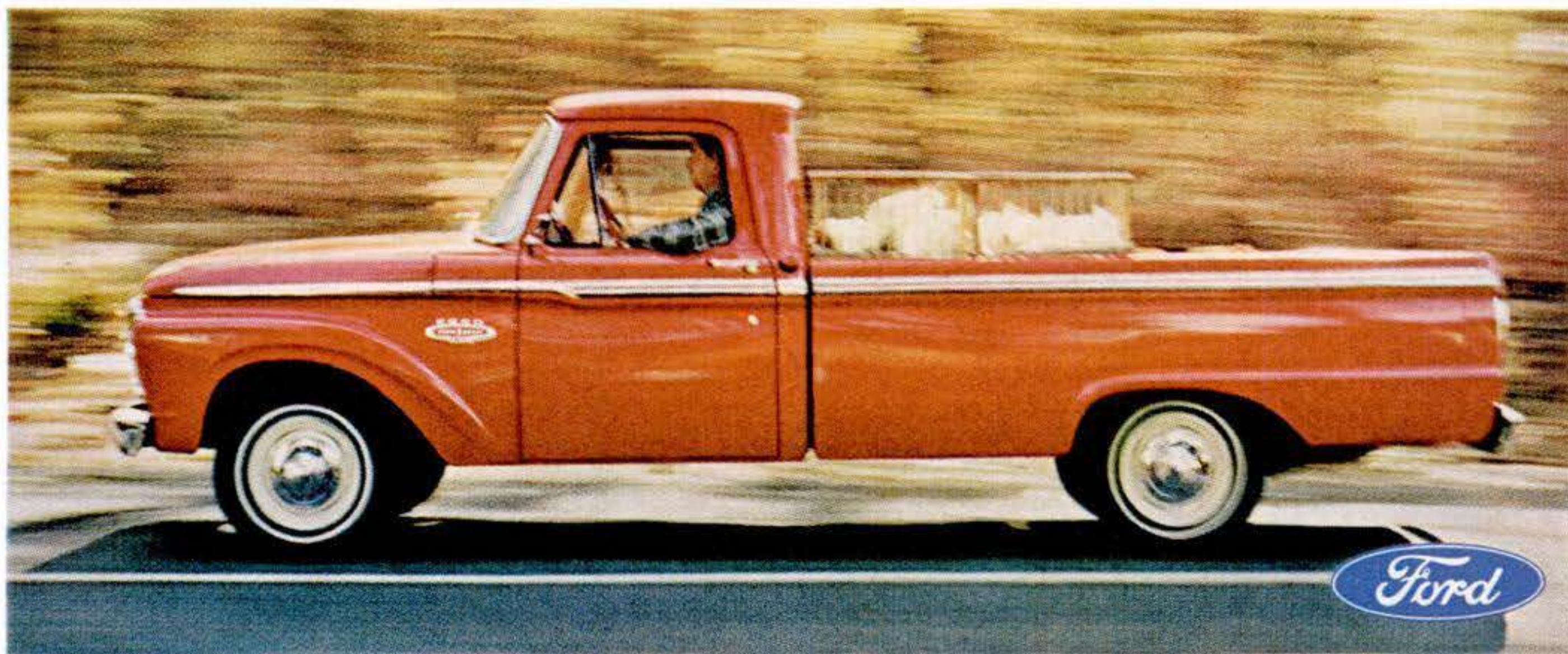
Some ride factors a computer can never figure. The sensation of the wheel. The comfort of the seat cushions. Or the feel of our engine power . . . two velvet-smooth Sixes, up to 300 cubic inches big . . . a 352-cubic inch V-8.

Wonder why we overlooked the best computer ever invented for measuring ride?

Your seat-of-the-pants.

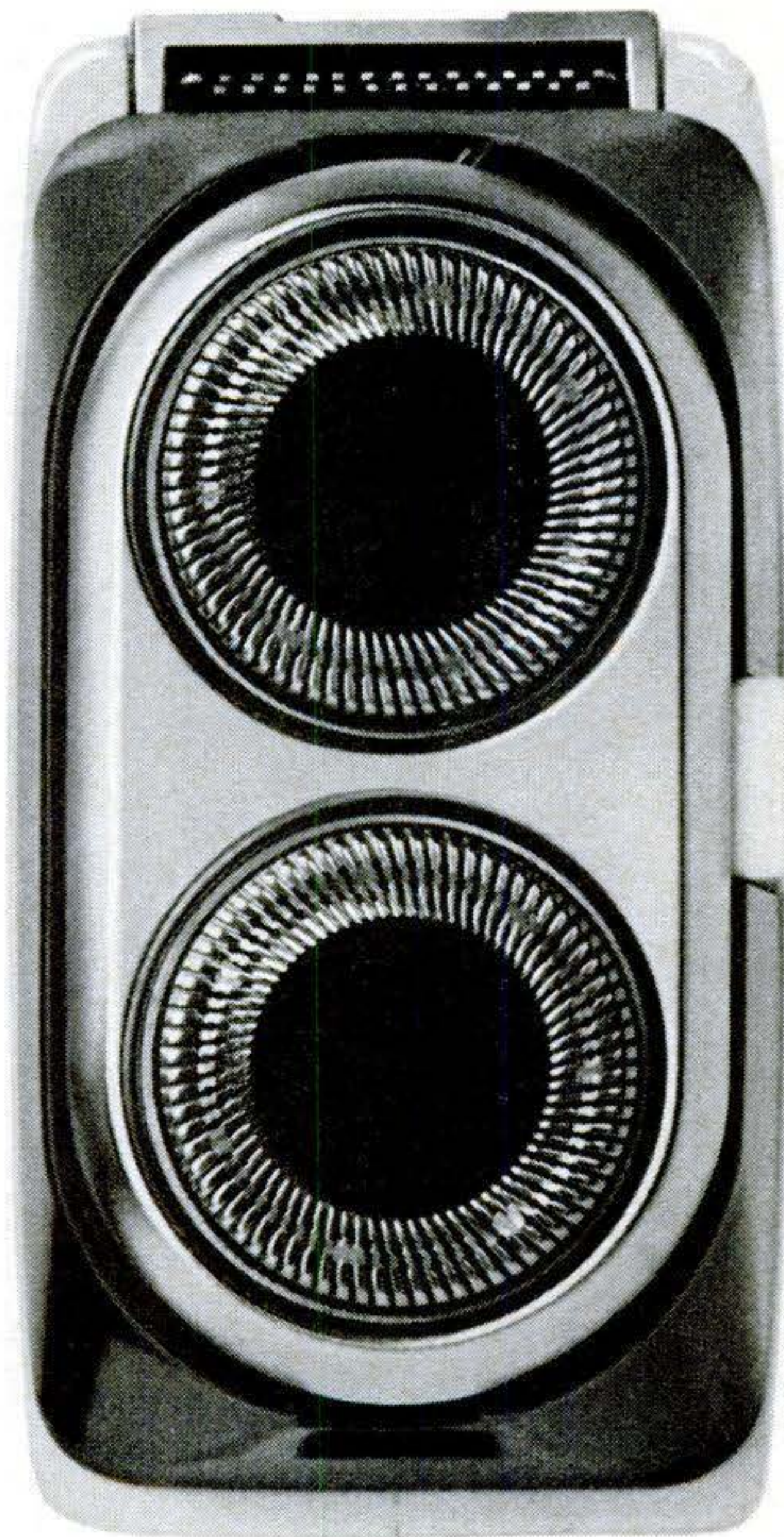
Put your built-in computer on the seat of a '66 Ford for a test ride. See if it won't certify that Twin-I-Beam design gives us the No. 1 pickup ride.

P.S. Our computer test may not measure everything, but no question of its scientific accuracy. Results, certified by the Nationwide Consumer Testing Institute, Inc., are available at your Ford Dealer's.



FORD/66

Norelco dares to match shaves with a blade.



Because we've shaved down our shaving head 35% thinner...for 35% closer shaves than ever before.

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HIGHLIGHTS OF THIS ISSUE:

The Fabulous F-5—Our Bantam Supersonic Jet PAGE 77

Neglected for years, the rugged F-5 has finally gotten its chance at combat.

How I Search for Lost Gold Mines . . . and Why PAGE 100

Erle Stanley Gardner, famous creator of Perry Mason, tells of his quest, and of the machines he uses to venture into the perilous Western desert.

Are Your Tires Safe Enough? PAGE 108

That two-ply/four-ply controversy: What's the truth behind the uproar?

Why the New Power Mowers Are Safer PAGE 158

Safety is the word for '66, and here's what mower makers have designed for you.

Glazing . . . the Expensive Look the Easy Way PAGE 182

Popular Science begins an important new series: "Best Finishes for Wood." This month, in full color: Glazing with the new wonder materials.

COVER PAINTING BY BOB McCALL

CARS AND DRIVING

- [90 Three Luxury Cars with Modest Price Tags](#)
- [95 Talking Highway Warns of Hazards](#)
- [108 Are Your Tires Safe Enough?](#)
- [119 What's New for Your Car](#)
- [120 What You Should Know About Anti-Smog Devices](#)

SPECIAL REPORTS

- [96 How Smart Can Home Appliances Get?](#)
- [100 How I Search for Lost Gold Mines . . . and Why](#)

SCIENCE AND INVENTIONS

- [82 Pushbuttons Control Mighty Colorado](#)
- [86 Your Brain: The Most Complicated Machine](#)
- [113 Cherry Picker Speeds Harvest](#)
- [116 Wood Gets a Built-In Finish](#)
- [130 Solar Still Makes Drinking Water](#)
- [141 Sunken Building Saves Paris Skyline](#)

SPACE AND AVIATION

- [77 The Inside Story of the Fabulous F-5—Our Bantam Supersonic Jet](#)
- [106 Dr. von Braun: Bonanzas on the Way to the Moon](#)

HOME AND SHOP

- [142 How to Have Instant Hot Water](#)
- [143 Make a Vacuum Cleaner for Your Car](#)
- [144 Two Projects for the Home](#)
- [145 Clean Up Your Driveway](#)
- [146 New Drill Varies Speed in Reverse](#)
- [150 Get Acquainted with Plug Cutters](#)
- [154 Improving Your Home Wiring: That New Gee-Whiz Hardware](#)
- [153 Why the New Power Mowers Are Safer](#)
- [168 Short Cuts for Machinists](#)
- [169 What's New for the Home](#)
- [170 You Can Make Your Own Paneling](#)
- [180 Repairing Window Shades](#)
- [182 Best Wood Finishes: First of a Series—Glazing the Easy Way](#)

AUTO UPKEEP

- [176 Get More Life Out of Your Automatic Transmission](#)
- [188 Gus Gives Teacher a Passing Grade](#)
- [196 Hints from the Model Garage](#)

BOATS AND BOATING

- [124 How an Expert Rigs an Outboard for Rough Water](#)
- [129 What's New in Boating](#)
- [164 A Boat for \\$12 . . . You Can Build It](#)

COMING NEXT MONTH

40 Pages of Home-Improvement News and Know-How

The April issue of Popular Science is jam-packed with fresh ideas, practical projects, new techniques, ingenious ways to make your home a more attractive, convenient, enjoyable place to live. Here are some of the articles you'll find:

- Facelift your front door
- Put storage space right where you need it
- Extend your living space with a deck
- Join indoors and out with a sliding glass door
- Rough stuff: new style in wall paneling
- What's new for your home
- The latest word on removing paint and varnish
- Handy calculator for estimating cement

Plus exciting articles on cars, electronics, space and aviation, boating, photography, tools . . . and all the regular PS features and departments. On sale March 29.

ELECTRONICS

- 132 Look Again! These Gadgets Are Radios
- 134 The Cheapest Color Set Yet
- 136 Stereo Tape Deck Built from a Kit
- 138 The PS 9-in-1 Troubleshooter

PHOTOGRAPHY

- 114 5 Picture Spoilers . . . and What to Do About Them

PICTURE NEWS

- 74 Dryer Blows Hot Air Through Wash
- 113 Electric Socks Warm Your Feet

EVERY MONTH

- 8 PS Readers Talk Back
- 18 "Say, Smokey—"
- 29 Science Newsfront
- 70 Detroit Report
- 118 I'd Like to See Them Make
- 167 Shop Talk
- 174 New Ideas from the Inventors
- 204 Wordless Workshop

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Carburetor gum can choke the life out of your engine

Remove it easily with **GUMOUT**

THE gasoline constantly being evaporated in your carburetor leaves a residue of varnish and gum. As this builds up, your carburetor has trouble "breathing." The symptoms are hard starting, stalling, rough idling, power loss, poor gas mileage.

Some premium grade gasolines now have an additive which, with continuous use, cleans the carburetor throttle plate area after about 5,000 miles. This is the roundabout, costly, time-consuming way to do the job. And the results are never complete.

GUMOUT is the right way to clean a carburetor. **GUMOUT** is a hard-working solvent you simply add to the gas tank. It goes to work instantly, removing harmful gum, varnish and moisture from your entire fuel system. Your carburetor *cleans itself* as you drive. **GUMOUT** does a fast, thorough cleaning job because it has a greater concentration of cleaning power than additives in premium gas.

By adding **GUMOUT** to your gas tank only three or four times a year, you'll get the performance your engine is designed to deliver, cut gasoline waste, and prevent a major cause of engine trouble. Get **GUMOUT** at your service station or auto supply store and let your carburetor clean itself!

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Cleveland, Ohio 44104



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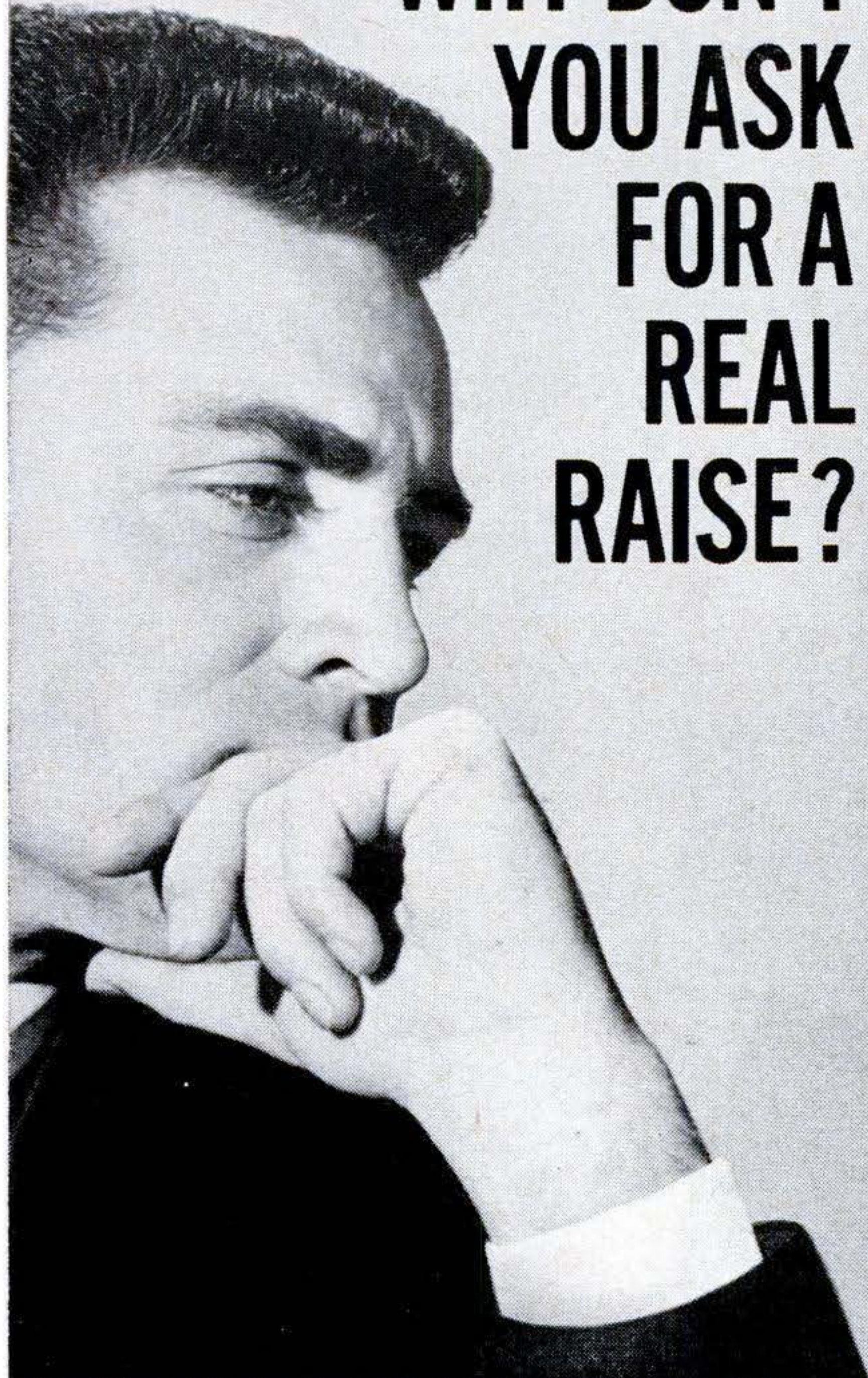
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No dirty rifle barrels when you're shooting Remington "Hi-Speed" 22's with "golden" bullets. The only 22's with famous "Kleanbore" priming, the original non-corrosive mixture that protects barrel accuracy, lengthens barrel life. Ask for them by name at your nearest Remington dealer's.

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Remington 



WHY DON'T YOU ASK FOR A REAL RAISE?

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

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

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

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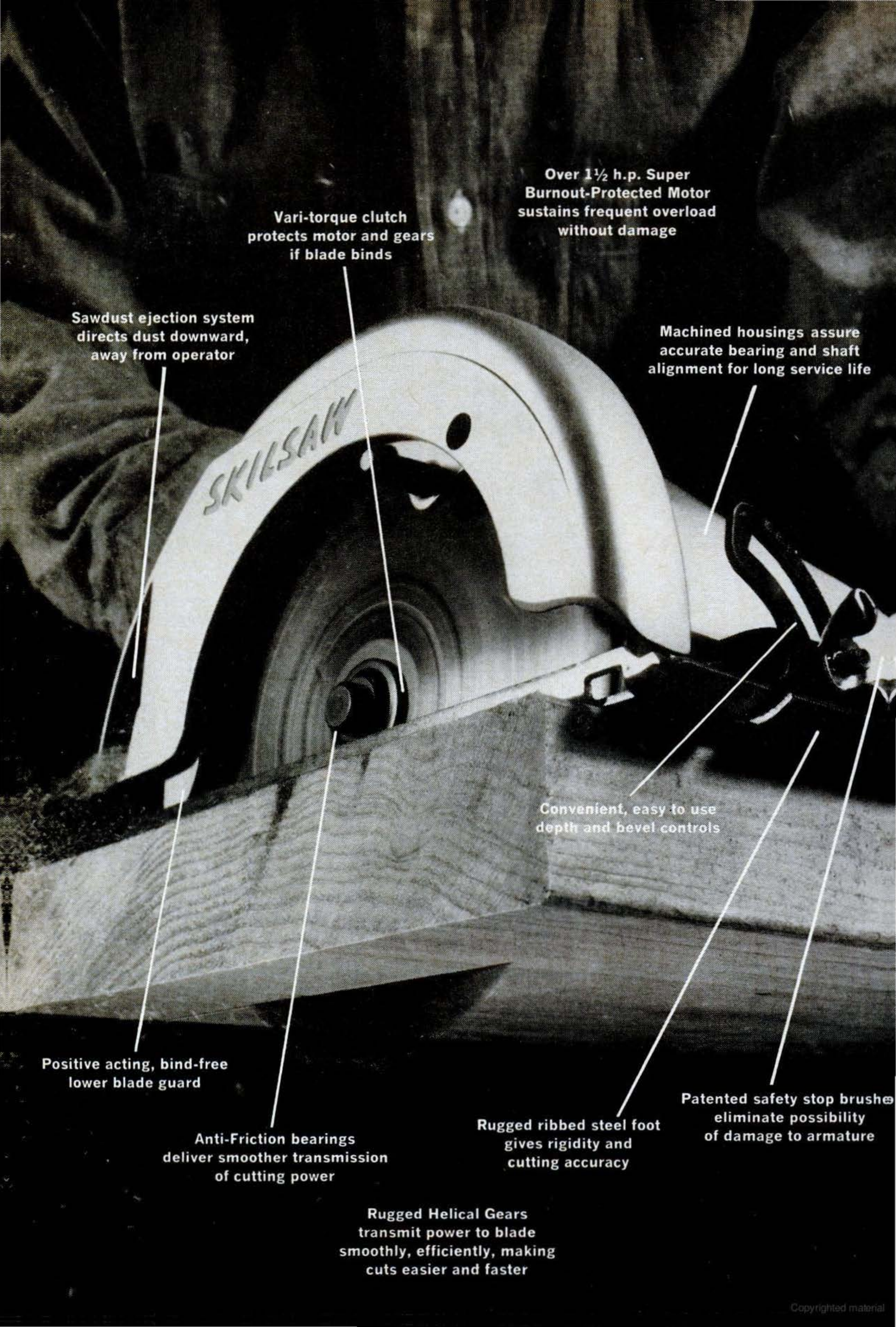
CAREERS FOR WOMEN

- Interior Decorator
- Dental Assistant
- Secretarial
- Accounting
- Bookkeeping
- Real Estate

Name.....Age.....

Address.....County.....
City & State.....Zip No.....

Occupation.....Working Hours.....A.M.....P.M.



Over 1½ h.p. Super Burnout-Protected Motor sustains frequent overload without damage

Vari-torque clutch protects motor and gears if blade binds

Sawdust ejection system directs dust downward, away from operator

Machined housings assure accurate bearing and shaft alignment for long service life

SKILSAW

Convenient, easy to use depth and bevel controls

Positive acting, bind-free lower blade guard

Anti-Friction bearings deliver smoother transmission of cutting power

Rugged ribbed steel foot gives rigidity and cutting accuracy

Patented safety stop brushes eliminate possibility of damage to armature

Rugged Helical Gears transmit power to blade smoothly, efficiently, making cuts easier and faster

New! Skilsaw[®] 7 $\frac{1}{4}$ " power saw! Skilsaw quality! Skilsaw exclusives! Famous Skil Guarantee! Priced under \$40

Any genuine Skilsaw power saw in the under forty-dollar department is news! But when it's a super capacity saw like the new Model 574 7 $\frac{1}{4}$ -incher, that's something else!

This one's got the extra blade capacity for cutting to a depth of 2 $\frac{3}{8}$ " at 90°, or for cutting 2-inch lumber at 45°. It's got the extra power to finish any cut you start without having to back off for a second try. And it's got the heft to handle everything from wood to metal, asbestos, cement materials, plastics, concrete, stone, ceramic tile and laminates.

Nobody offers as many features or as much saw for the money! Best way

to find out is to ask any 574 owner, or your hardware, department store or lumber dealer. They'll all tell you the same thing.

The Skilsaw 7 $\frac{1}{4}$ " Model 574 power saw is another Skil "Lifetime" power tool. Which means it is guaranteed forever against defective materials or workmanship.

Skil Corporation, 5033 Elston Avenue, Chicago, Illinois 60630.

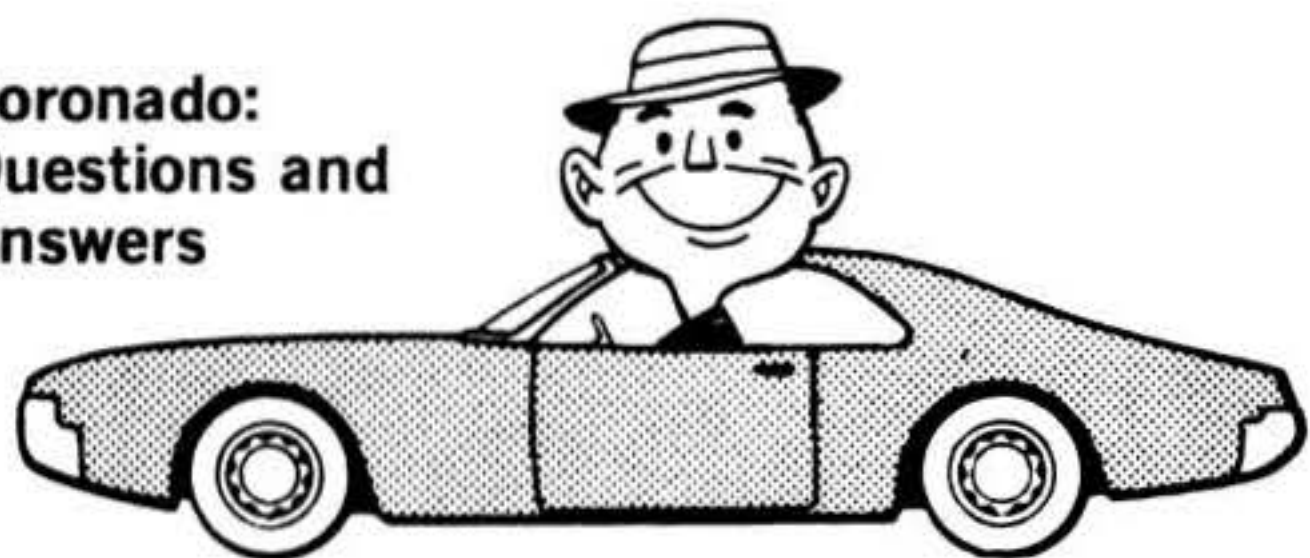
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POWER TOOLS

PS Readers Talk Back

Want to get something off your chest?
Write "Readers Talk Back," POPULAR SCIENCE,
355 Lexington Ave., New York, N.Y. 10017.

Toronado: Questions and Answers



"Is Front Wheel Drive for You?" [Jan.] confirms my own experience with the Toronado—I've just placed an order after driving one. Questions: 1) What air pressure did you use in the tires? 2) Did you switch from the original two-ply tires? 3) Did the front tires show any cupping? 4) Do you think the car has ample brakes? 5) Was there any sign of tail whip at 80-90 m.p.h.? 6) Was the article correct in stating you still had $\frac{5}{16}$ -inch rear tread depth after the trip? If so, it's amazing.

JACK D. W. WINEBRENNER, Coral Gables, Fla.

Executive Editor Luckett, who test-drove the Toronado for PS, answers: 1) 28 lb. for high-speed driving, 24 for street use. 2, 3) No. 4). The brakes are as good as, or better than, those on most Detroit cars—adequate for normal driving. More braking capacity on the front wheels would be desirable. 5) No. The car is phenomenally stable at high speeds. 6) The tread depth was given correctly—we, too, were amazed.

. . . Your story is the ultimate insult to Cadillac and Lincoln. On page 156 you compare the riding quality of a Toronado to these fine automobiles. I bought one of the first Toronados produced, and it rode so hard that I had to let the rear tires down to 20 pounds just to make it bearable.

DON MERRILL, Waverly, N.Y.

Booster Heart Applauded

"Booster Pump Gives New Life to Failing Hearts" [Dec.] was interesting and informative. I was happy to find someone bringing light to obscure, but important, phases of medical research.

KENDALL SMITH, Aztec, N.M.

How Fast Are High-Speed Trains?

The article on high-speed trains ["Due This Year: Trains That Can Go 150 M.P.H.,"

Jan.] says that "speed records so far, for U.S. diesel and electric trains on scheduled runs, are 82 m.p.h. for the Burlington's diesel-powered Morning Zephyr . . ." More than 20 years ago, I rode the Union Pacific's City of Denver. It hit 100 m.p.h. for some distance.

CHESTER F. PROTHEROE, Arlington, Mass.

You're comparing one egg to the whole basket. The article refers to "timetable" speed records—an average figure that includes starts and stops.

The Multigrade Oil Mixup

I've noticed that subzero cranking is more difficult with 10W-30 oil than it is with SAE 10W ["The Truth About Multigrade Oils," Jan.], although I've never had a starting failure because of it. I endorse the use of multigrade oil for street use—but I use a standard SAE 30 for high-temperature protection on trips.

DONALD E. BONSALE, Woodbury, N.J.

. . . Recent studies have shown that multigrade oils can suffer a serious degradation resulting in permanent viscosity loss as high as 20 percent after a 7½-hour test period. While greatest viscosity loss occurred during this time, still further losses can be expected with further use. The situation is further confounded by the fact that multigrade oils do not really cover the range claimed. Some 10W-30 oils, for example, may be nearer a 10W-20 or a 20W-30 than they are to a true 10W-30. Some fall short of their labeled viscosities at both ends.

R. W. MARTIN, Miami, Fla.

. . . A friend of mine tests the engine oil he uses by putting a ball bearing in jars of several kinds. He leaves the jars outside in



zero weather, and then checks for stiffness by noting how the bearings move through the oil when the jars are up-ended.

RAY M. GATES, St. Ann, Mo.

James Bond: Thud and Blunder

SPECTRE ["James Bond's Weird World of Inventions," Jan.] is led by Ernst Stavro Blofeld, not Emilio Largo, who was merely in charge of hijacking the atomic bombs in *Thunderball*.

FRANK A. WEISSIG, Hayward, Calif.

Continued

Can't afford a \$12,000 GT machine?

Fake it.



Pontiac Motor Division • General Motors Corporation

Just say "sports package" when you're ordering any Tempest, Tempest Custom or LeMans but a wagon, and we'll slap on goodies you thought came only on the continental jobs.

To start with, a spiffier 4-BBL version of our European-inspired 6. (Its overhead cam makes it some 200 pounds lighter than a comparable horsepower V-8. Deep skirt block makes it strong. And a removable cam cover and permanently lubed timing belt simplify service.) All of which gives you 207 horsepower at a delirious 5200 rpm. And sounds like it if you're

standing anywhere near its special split manifold exhaust, believe us.

More? Sure. We stiffen the shocks, lay in heavier springs and a special stabilizer bar. Put a 3-speed all-synchro shift on the floor. Sportstripe its flanks. Throw in a set of special emblems, and that's it. The OHC 6 sports package. (Padded dash, visors, seat belts and other safety items are standard, of course.)

And knowing it's by Pontiac, you know the one big difference between ours and the one wrapped in Europe. About \$9,000.

Wide-Track Pontiac/'66

MARCH 1966 | 9

What goes like a bat on regular fuel... digs salt water, large loads and a hard time? Answer: the new Sea-Horse 40

Want action? Here's action. Forty big horses in a 43.9 cubic inch corral. Theoretically, the new Johnson 40 is a medium-sized engine. But the truth is, under full gun, it takes off like a flicked whip. It's at its hottest and happiest on light to medium runabouts, utilities and workboats.

Three new high-performance 40's! Most posh is the Electramatic 40. With its exclusive electromagnetic transmission, it shifts elec-

trically—automatically—as you move the throttle forward or back. The Electric 40 is electric starting as well, with a new, mechanical, single-lever control as an accessory. Anchor man is the Manual 40 which offers the same thrills but less frills.

There are 16 new Johnson engines this year in 10 power classes. All stay carbon free on a 50 to 1

gas-oil diet. All are library quiet. All are round-trip dependable. For the right engine for your boating needs, see your Johnson dealer. Start a beautiful friendship now. Look him up in the Yellow Pages.

P.S. Johnson also makes a full line of

Johnson Boats and the fast, exciting, new Johnson Skee-Horse snowmobiles.

From 3 to 100hp, every '66 Johnson features:

- Famous 2-year warranty*
- Full corrosion protection
- 50 to 1 gas-oil mix

*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.


**first in
dependability**

Johnson Motors, 2169 Pershing Road, Waukegan, Ill. Division Outboard Marine Corporation

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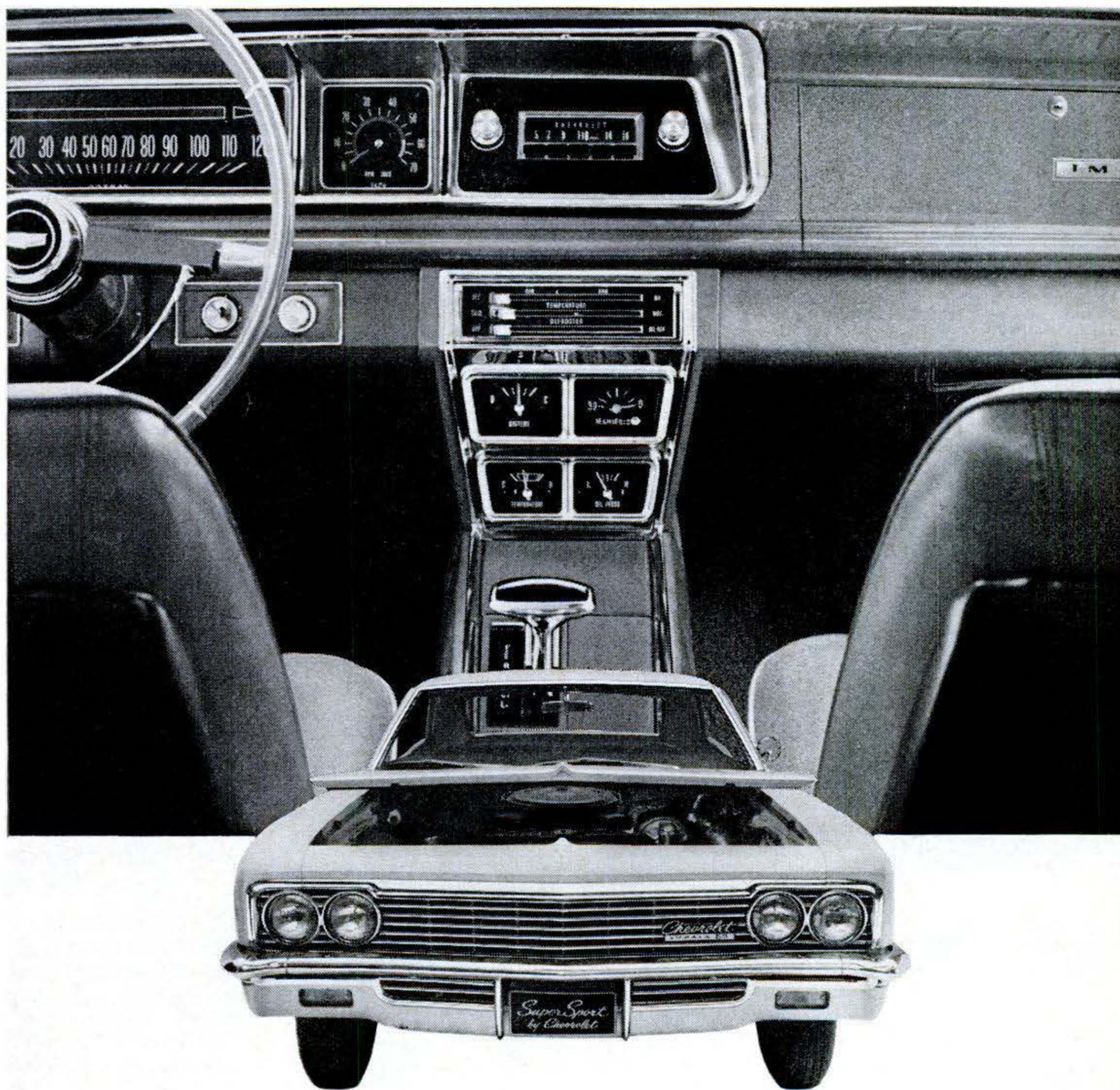
The big news isn't the gauges... it's what the gauges connect to!

The real news about Impala is the 427-cu.-in. Turbo-Jet V8 that's on the other side of the firewall. The street version generates 390 hp on hydraulic lifters. A special edition turns out 425 hp and 415 lbs.-ft. of torque on solid (ah, what sounds!) lifters.

Both engines are of the same new design that inspired our successful Turbo-Jet 396, now rated at 325 hp. Intake and exhaust

ports feed directly to the combustion chambers with little interference from valves and pushrods. As a result, the Turbo-Jets breathe in a way that makes ordinary engines feel asthmatic by comparison.

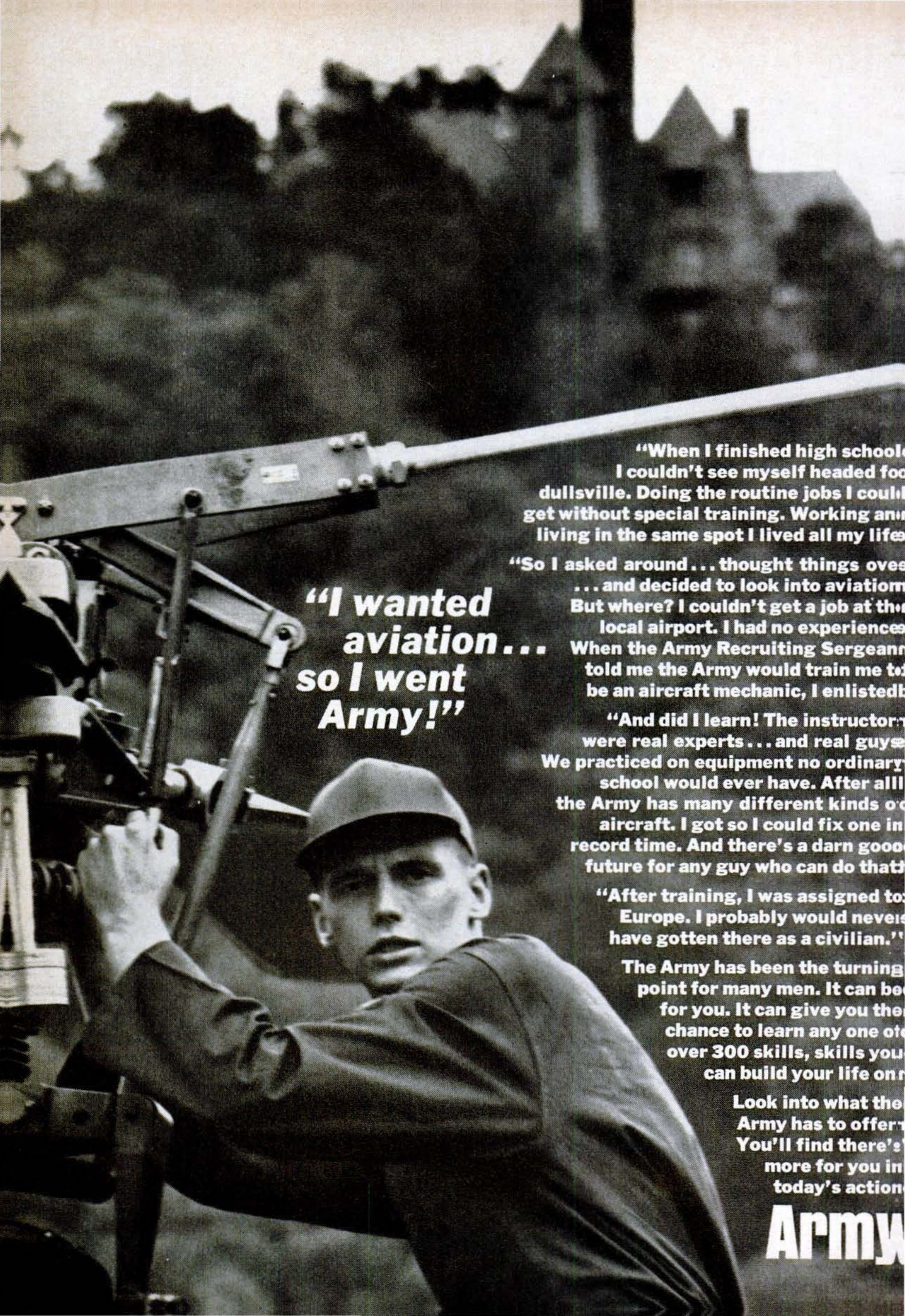
As for the gauges — they're important, too. With this much happening in the engine compartment, you'll undoubtedly want to stay tuned in on the action.



'66 IMPALA by CHEVROLET 

Chevrolet Division of General Motors, Detroit, Michigan.

MARCH 1966 | 11



**“I wanted
aviation...
so I went
Army!”**

“When I finished high school I couldn't see myself headed for dullsville. Doing the routine jobs I could get without special training. Working and living in the same spot I lived all my life

“So I asked around... thought things over... and decided to look into aviation. But where? I couldn't get a job at the local airport. I had no experience. When the Army Recruiting Sergeant told me the Army would train me to be an aircraft mechanic, I enlisted.

“And did I learn! The instructors were real experts... and real guys. We practiced on equipment no ordinary school would ever have. After all, the Army has many different kinds of aircraft. I got so I could fix one in record time. And there's a darn good future for any guy who can do that.”

“After training, I was assigned to Europe. I probably would never have gotten there as a civilian.”

The Army has been the turning point for many men. It can be for you. It can give you the chance to learn any one of over 300 skills, skills you can build your life on.

Look into what the Army has to offer. You'll find there's more for you in today's action.

Army

PS Readers Talk Back [Continued]

. . . If a helicopter had recovered the balloon as you state (in the final scenes of *Thunderball*), it would have been either forced back into Bond's lap, or the ocean would have been covered with a mass of parted plastic and chopped cable. It was recovered by a cargo plane with a V-shaped cable catch on the nose.

JIM CULLEN, Warwick, R.I.

. . . I'll bet pounds to crumpets you were totally unaware that another invention, the ejector seat for cars used in *Goldfinger*, first



appeared in PS way back in February, 1947 ["I'd Like to See Them Make"] as my creation for getting rid of nagging occupants.

DAVID E. MANN Jr, Wyncote, Pa.

Computers for Schoolteachers

Instead of making monster-like exoskeletons to do jobs that other equipment will do ["Man Amplifiers: Machines That Let You Carry a Ton," Nov.], why don't they make economical computers to help overly-busy, underpaid, vital schoolteachers?

ELIZABETH CURTISS, Bowdoinham, Me.

The man amplifiers are designed to do things other machines can't do, like performing intricate maneuvers in unusual environments. We agree, however, that schoolteachers could use an assist—see "How They Make a Typewriter Talk" [Dec.].

How to Wire a Light Switch

In "Improving Your Home Wiring" [Dec.], two of the drawings show two conductors connected to a single switch terminal. This is contrary to the National Electrical Code, and is bad practice as the top conductor cannot be firmly secured to the terminal—it will tend to spread as the screw is tightened.

F. H. FETTERMAN, Brecksville, Ohio.

Right. Best thing is to make a three-wire splice with a wire nut, and connect the third wire to the terminal.

Flying-Saucer Fans Comment on UFOs

The phrase that "not one (UFO) has ever given any indication that it was a space vehicle under intelligent control" [Why I Be-

Continued



Here's how to find out what the Army can do for you

The quickest way is to go see your local Army Recruiter. He'll answer any questions you have about your opportunities in the Army. If he doesn't have an answer right there, he'll get it for you.

And it'll be a straight answer. After all, it's his job to be sure the Army's the right place for you. He knows where the opportunities are...and can tell you where you'll fit in.

You can easily find your local Army Recruiter listed in your telephone book. Call him today. And, in the meantime, fill out this coupon and you'll receive a copy of the helpful and informative 40-page booklet, The Secret of Getting Ahead. No obligation on your part, of course.

Army

3PS3

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Westbury, N. Y. 11591

Please rush me your 40-page booklet,
"The Secret of Getting Ahead."

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EDUCATION _____

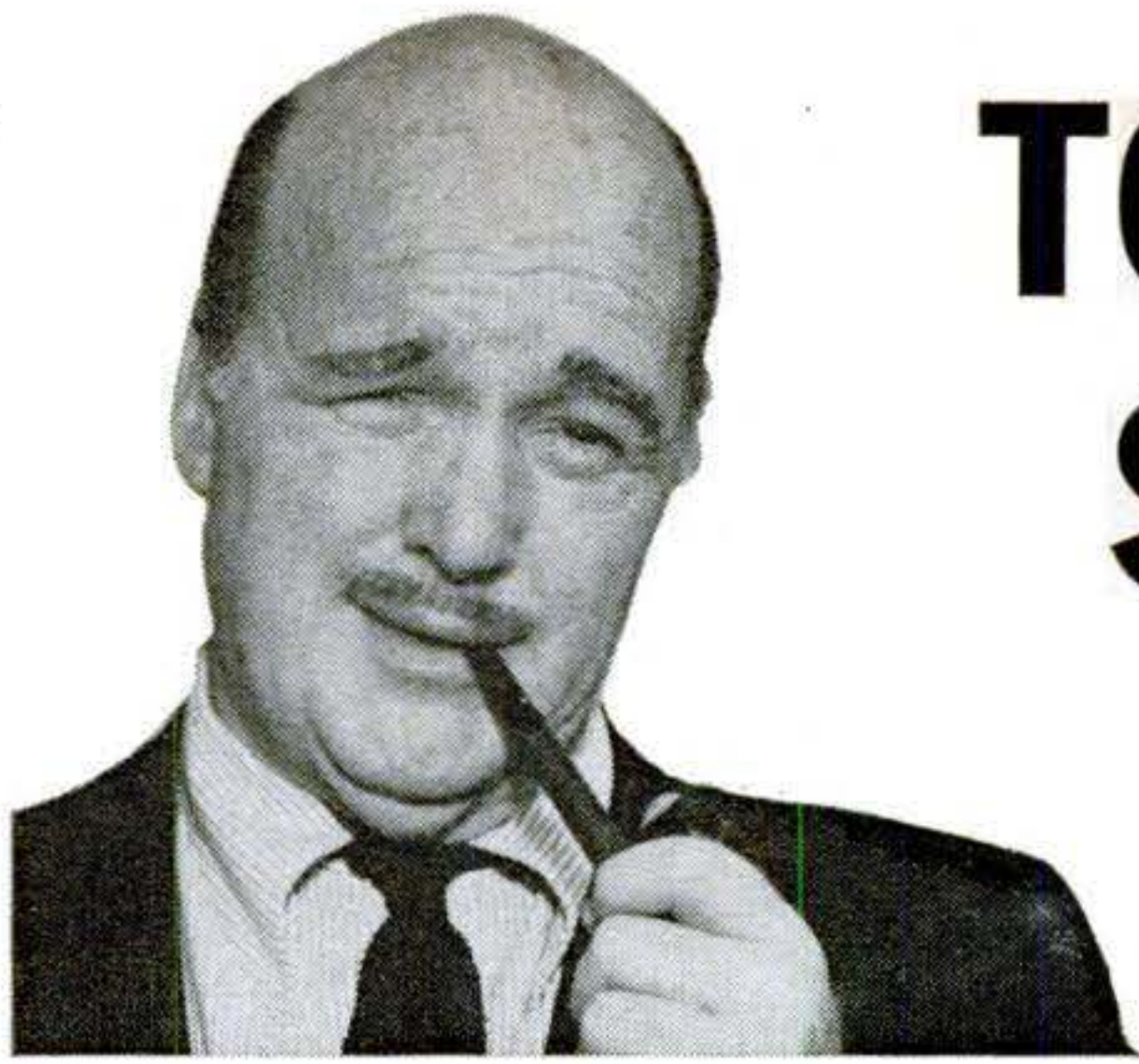
**Buy a new
Plymouth, Dodge,
Chrysler or Imperial
and get
the only warranty
that lasts for
5 years or 50,000 miles.**

HERE'S HOW CHRYSLER CORPORATION'S 5-YEAR/50,000-MILE ENGINE AND DRIVE TRAIN WARRANTY PROTECTS YOU: CHRYSLER CORPORATION WARRANTS FOR 5 YEARS OR 50,000 MILES, WHICHEVER COMES FIRST, AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP AND WILL REPLACE OR REPAIR AT A CHRYSLER MOTORS CORPORATION AUTHORIZED DEALER'S PLACE OF BUSINESS, WITHOUT CHARGE FOR REQUIRED PARTS AND LABOR, THE ENGINE BLOCK, HEAD AND INTERNAL PARTS, INTAKE MANIFOLD, WATER PUMP, TRANSMISSION CASE AND INTERNAL PARTS (EXCLUDING MANUAL CLUTCH), TORQUE CONVERTER, DRIVE SHAFT, UNIVERSAL JOINTS, REAR AXLE AND DIFFERENTIAL, AND REAR WHEEL BEARINGS OF ITS 1966 AUTOMOBILES, PROVIDED THE OWNER HAS THE ENGINE OIL CHANGED EVERY 3 MONTHS OR 4,000 MILES, WHICHEVER COMES FIRST, THE OIL FILTER REPLACED EVERY SECOND OIL CHANGE AND THE CARBURETOR AIR FILTER CLEANED EVERY 6 MONTHS AND REPLACED EVERY 2 YEARS, AND EVERY 6 MONTHS FURNISHES TO SUCH A DEALER EVIDENCE OF PERFORMANCE OF THE REQUIRED SERVICE, AND REQUESTS THE DEALER TO CERTIFY (1) RECEIPT OF SUCH EVIDENCE AND (2) THE CAR'S THEN CURRENT MILEAGE.

The warranty is good for 5 years or 50,000 miles. The repairs or replacements it covers are made without charge—parts *and* labor. It's the longest, strongest protection ever offered by any American car manufacturer. And because the warranty is transferable from owner to owner, it can mean more money when you trade. Why settle for less?



**CHRYSLER
CORPORATION**



TOM McCAHILL SOUNDS OFF ON JOBS

The trouble with too many people today is they want to start "on the job" as Executive Vice President—and work their way up.

This is fine. But, with the exception of banks, there just aren't enough VP jobs to go around. So the years tick away in a dead end job, looking for that pot of gold that's already dried up. And the worst part is—there's no middleman profit after the bills are paid every month.

If there's any field today where the average guy can make real money, it's the service business. If you can provide a service that people need, do the job right and show some old-fashioned honesty, you've got it made.

For instance.

This is the age of automation. You don't rub sticks together any more to fry bacon. Just toss it in a time and temperature controlled frypan and read the paper. Some of the kids nowadays wouldn't know how to wash a dish. They stack 'em in the dishwasher and knee the door shut. Most people think a scrub board is a thing for making music. They watch TV while two cents worth of electricity washes, rinses, spins and dries the duds.

A house just isn't a home unless it's loaded with automatic gadgets. And it's pretty easy living until something breaks down. Here's a spot where the guy who can fix today's electrical appliances can make himself a mint of money.

How does anybody get into this field? It's easier than you think. The Appliance Division of the National Radio Institute in Washington, D. C., has a unique and downright interesting home-study course that shows how to fix almost anything the way the pros do it. It covers appliances large and small, air conditioning, refrigeration, and they even toss in small gasoline engine repair for good measure—and earning power.

NRI is one of the biggest and best home-study schools in the country today. Their reputation is tops. After 50 years in the teaching business, they make learning as close to being fun as anything you've tackled. Best of all, this kind of training costs a lot less than you think.

If you're looking for a job with a solid future or want to pick up some cash in your spare time, take a look at the opportunities in this appliance repair business. NRI sends you a free book that tells all about it (and no salesman banging on the door).

The appliance field might not make you an Executive Vice President. But you could wind up with a bankroll as big as most VP's I've met—and as a bonus—no ulcers.

Tom McCahill
TOM McCAHILL

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

601-036

OK—I want to see for myself. Send me the free book on Professional Appliance Servicing and a free sample textbook. No salesman.

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LAWNMOWER'S BEST FRIEND!

Dull mower blades shred and tear your grass. But in just 5 minutes you can befriend your lawnmower and your lawn. Use a Nicholson or Black Diamond Rotary Mower file.

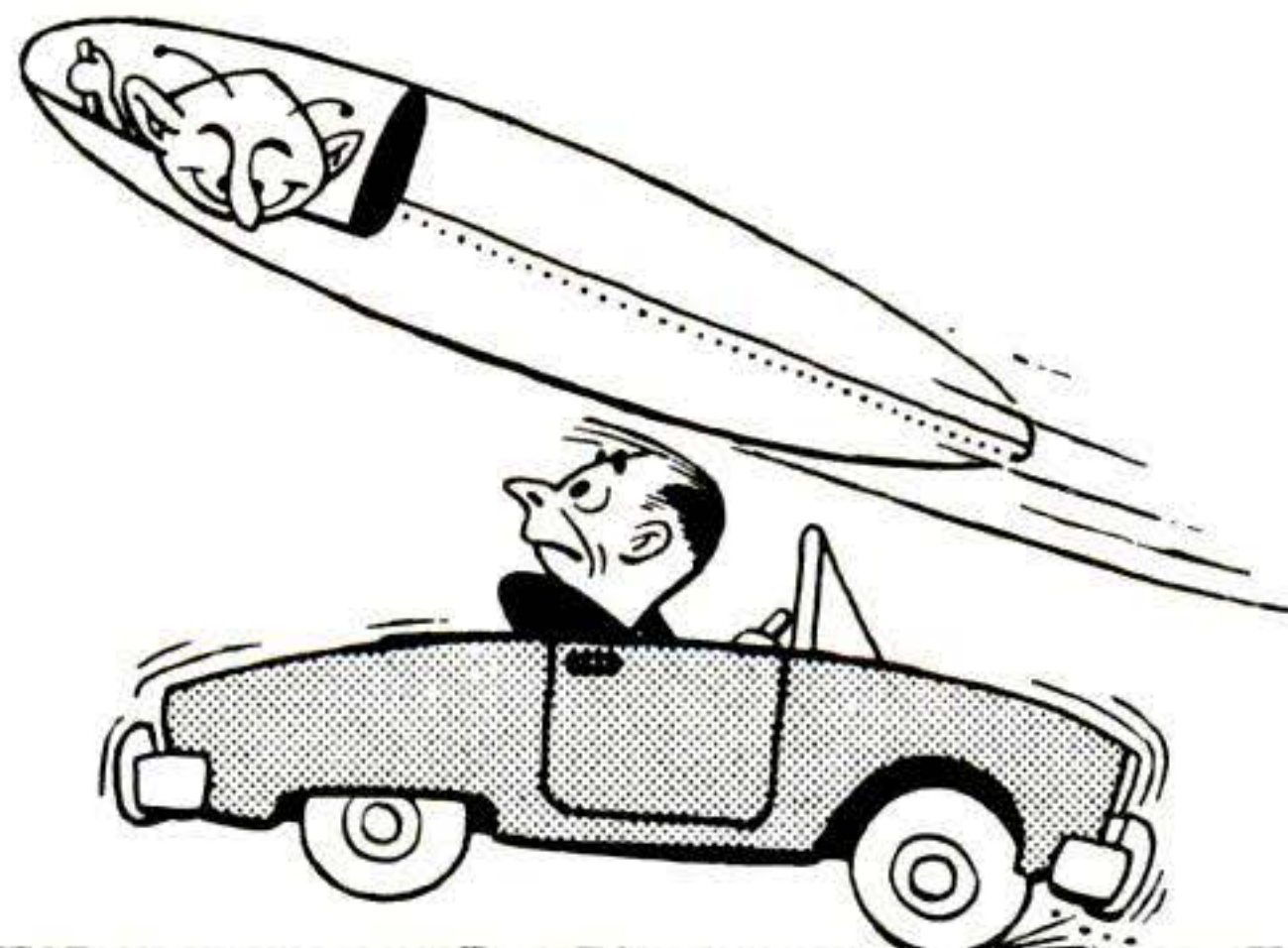
Sharpening your own blade takes far less time and effort than lugging the mower to a shop. The file pays for itself the very first time you use it and your grass will wear a big green smile, too. Get this time-saving, money-saving file at your local hardware store.

Nicholson File Company, Providence, Rhode Island
Files • Rotary Burs • Hacksaw and Band Saw Blades
Hole Saws • Ground Flat Stock • Industrial Hammers



PS Readers Talk Back [Continued]

lieve in Flying Saucers," Jan] is misleading. There have been hundreds of cases which



have definitely indicated the vehicles were under intelligent control.

ROBERT BARROW, Syracuse, N.Y.

. . . The National Investigations Committee on Aerial Phenomena (NICAP), Washington, D. C., reported in December that it had received 1,500 to 2,000 reports in 1965. They estimated that 300 to 400 were substantial ones with no easy explanation.

JAN L. ALDRICH, Meriden, Conn.

. . . We would like very much to hear from any readers who have seen flying saucers, to add to our file of 5,000 UFO sightings.

TIMOTHY G. BECKLEY

INTERPLANETARY NEWS SERVICE
3 Courtland St., New Brunswick, N.J.

Use Stick to Stir Paint

"Shop Talk" [Dec.] advises that paint should not be stirred with an electric drill as sparks from the commutator may ignite the paint. How about punching a hole in the top of the paint can and inserting the stirrer through that?

EDWIN F. HORN, Rochester, N.Y.

The fumes seeping upward could still be ignited by the drill.

Author's Royalties for Patent Holders

The price for copies of patents was recently raised from 25 to 50 cents each—and the inventor gets not one cent of this! A plan for reimbursing the author of a patent, on a royalty basis, should be instituted.

HERMAN E. COTTER, Detroit, Mich.

Wanted: Article on Battery Additives

"More Life from Your Car Battery" [Jan.] was most interesting. Now, how about an article on battery additives? My friends and I have used a cadmium additive to revive even very old batteries.

RONALD B. DAVIS, Evanston, Ill.

... is for the
Protection Plan
that assures
service satisfaction



The Owner Protection Plan is added assurance of service satisfaction for your General Motors car or truck. It tells you exactly what Guardian Maintenance services you'll need and when to get them—on both a time and mileage basis. It lists inspections and preventive maintenance services exactly as factory engineers recommend them. There's no better way to get complete service protection for your GM car or truck. And there's no better place to get complete service satisfaction than your GM dealer's.

BE SURE . . . BE SAFE . . . BE SATISFIED
WITH **GM** DEALER QUALITY SERVICE



**GUARDIAN
MAINTENANCE**

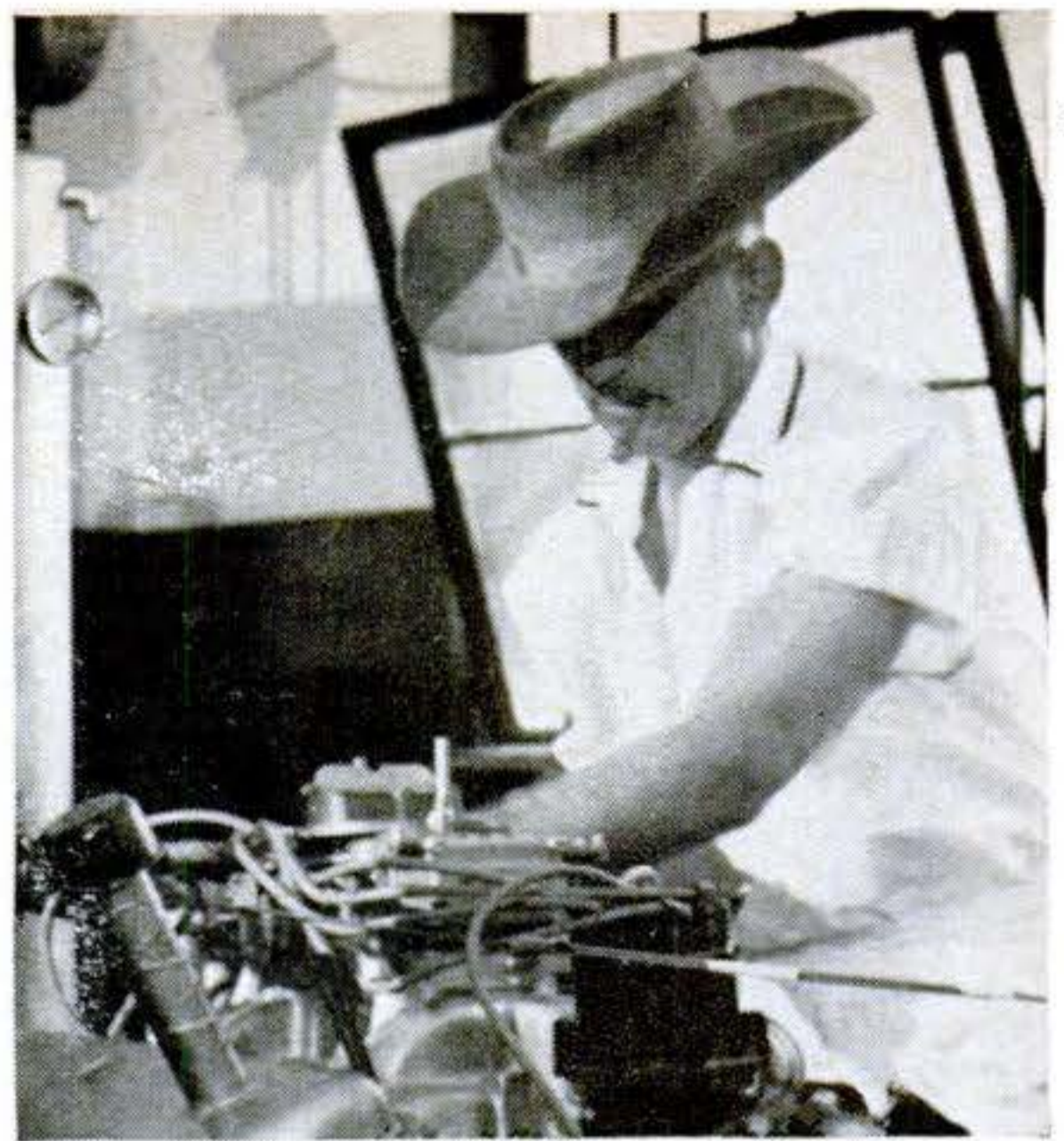
CHEVROLET • PONTIAC • OLDSMOBILE • BUICK • OPEL KADETT • CADILLAC • GMC TRUCK

MARCH 1966 | 17

"Say, Smokey—"

A clinic on cars by America's most famous mechanic

Each month in POPULAR SCIENCE Smokey Yunick answers questions on cars—family cars, high-performance jobs, hot rods, and racing cars—selected from those sent in by readers. Got a problem? Ask Smokey. You'll find the address at the end of the column. Please print your name and address.



.....

"I have replaced five resonators and five mufflers on my 1962 Lincoln Continental in 30,500 miles. What causes them to go?"

LEWIS C. HUMPHRIES, St. Petersburg, Fla.

In addition to heat, exhaust troubles stem from hydrocarbon acids and water condensation, especially in warm, humid climates such as Florida's. I suggest you install a premium-type exhaust system. These are plated to resist rust, and are better arranged inside to move water and chemicals out.

"Oil fumes, like those from oil-filler breather caps, permeate the passenger compartment of my '62 Pontiac Catalina. The smell is worse right after I accelerate the engine. This car does not have a PCV valve but does have a two-barrel carb. I cleaned the engine and can't find any oil leaking onto hot surfaces. I removed the valve covers. The oil seems to be flowing freely through the rocker-arm assemblies. The return ports are clear. How can I eliminate the fumes?"

W. C. BROSS, Westwood, N. J.

Worn piston rings could create an odor. If the rings are okay, clean all the vents and breathers and see if the firewall and floor are airtight. Also check to see if the road draft tube is at original specs.

"In your 'Secrets of a Trouble-Free Automobile' [PS, June '65], you advise checking the drive shaft for being bent or out of alignment. But how? My '57 Plymouth six runs fine up to 40 m.p.h. but at 50 it vibrates. Everything but the shaft checks okay. What is the procedure for checking the shaft?"

H. STOHLER, Richland, Pa.

The best way to check the shaft is to elevate the car so the wheels are free to turn, clean the shaft, and, while it rotates in drive, check it with a dial indicator at both ends and at a couple of spots in the middle. Actually, if it's bent you usually can spot it with the naked eye.

"My '62 Lark has burned its valves at 23,000, 32,000, and 42,000 miles. The car has been carefully serviced, the PCV device, filters, points, and plugs check okay, and the valves are kept at book clearance. The engine never overheats and the radiator water is clear. It used to run-on (diesel) on regular gas; hasn't since I switched to high test after the valves burned the first time. How can I stop this trouble?"

BEN WOODCOCK, Santa Monica, Calif.

It's heat that burns valves, so here are my suggestions. Don't lug the engine. You could have too high a gear in the rear end. Look for a stuck heat damper or too restricted a muffler in the exhaust system. Is the cam in time? A late one can cause heat. Check the valve springs and guides. Leaking oil guides or weak springs build abnormal heat. Put in premium valves—with Stellite faces, for example, if the fault doesn't turn up elsewhere. The type of valve seats is important, since the valves can get rid of heat only in contact with the seat. Stay on factory tuning specs. Use the proper plugs. Check against intake-manifold leaks. Make sure the fuel pressure is normal.

"My '59 T-bird with a 352-inch engine has the croup in starting. Immediately after a run on the highway, the starter will not turn the engine over, though it tries so hard it rocks the car. In five minutes it returns to normal. The engine has 39,000 miles on it. Help!"

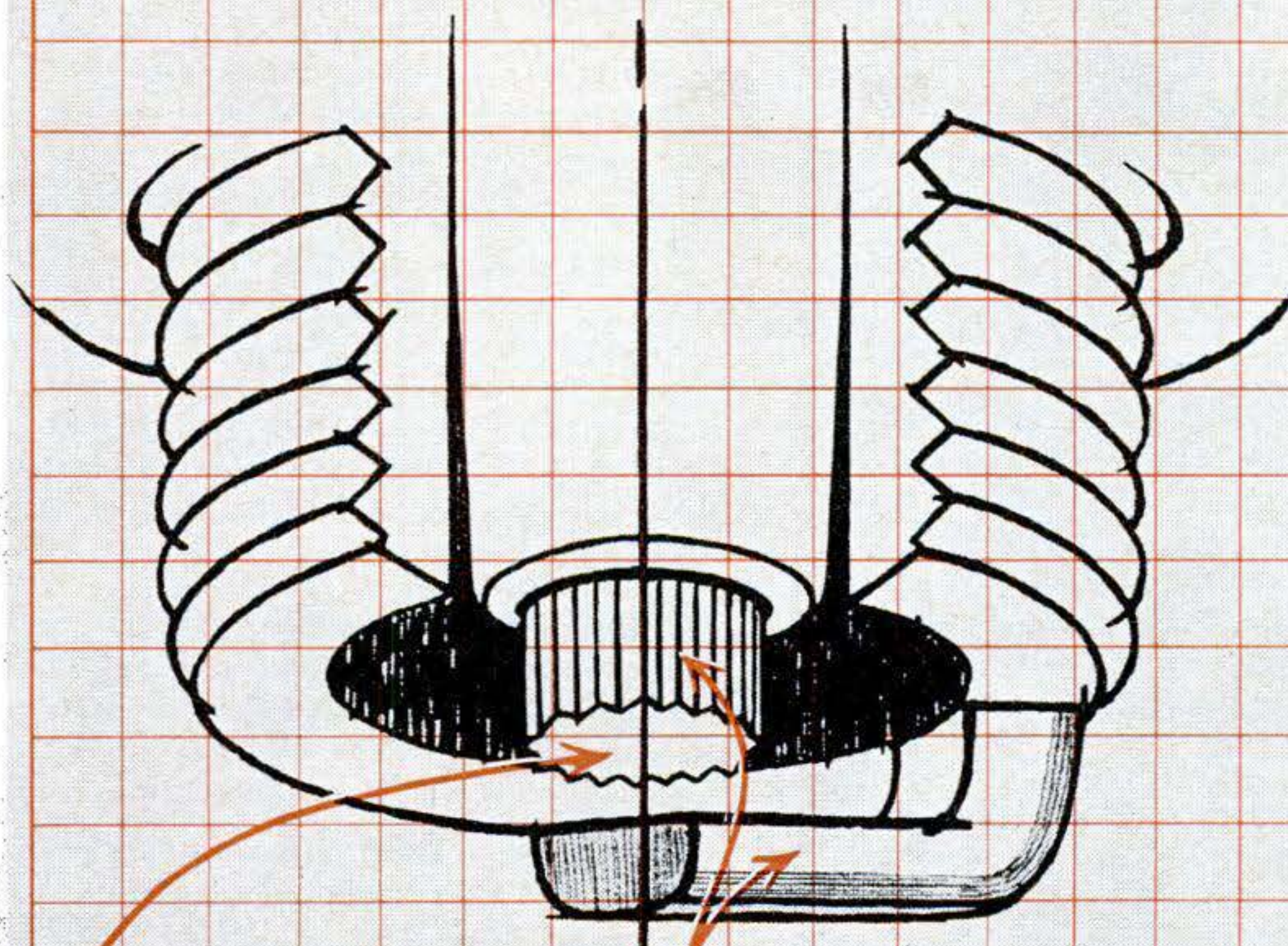
JOHN DYAL, Oklahoma City, Okla.

This sounds like a carb in which the needle and seat aren't holding, causing a cylinder or two to fill with raw fuel and forming a hydraulic lock. The next time it happens, pull some plugs out right away and see if it will turn over. Or remove the air cleaner and see if the discharge nozzle on the carb is letting fuel into the engine.

"I have a '64 Olds Cutlass with the required PCV smog device. When I wrote the factory

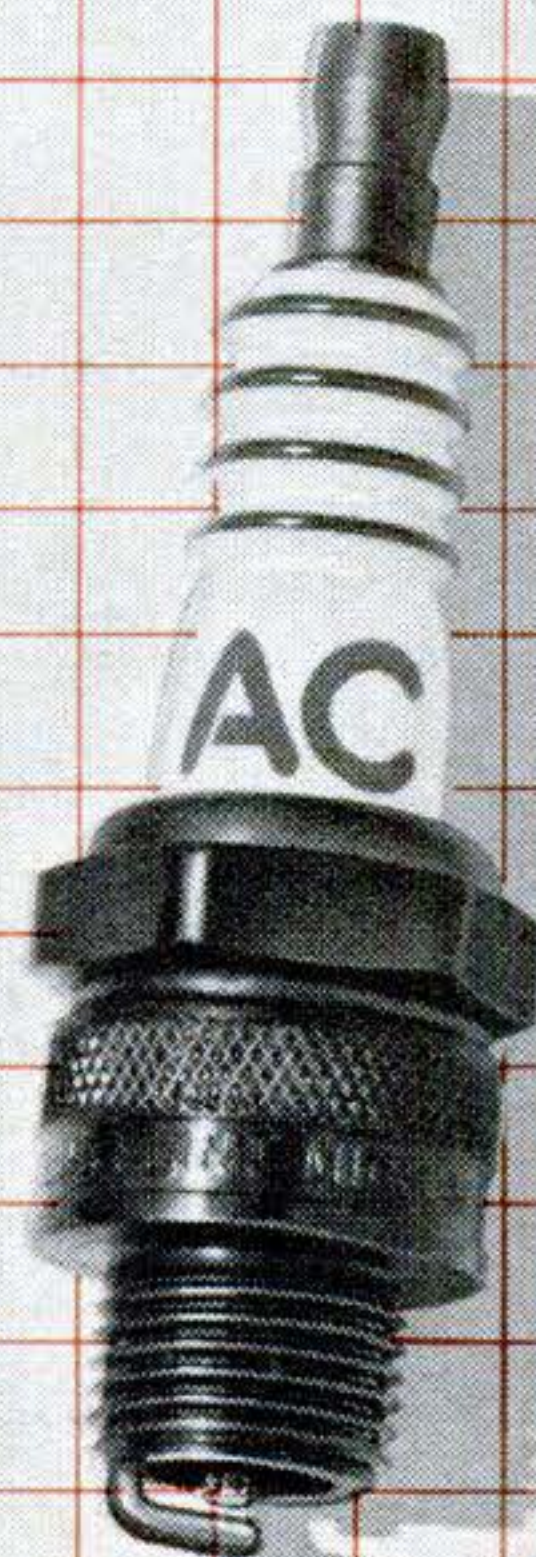
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From an AC Engineer's notebook:



Smooth-ground center electrode slows gap-growth by distributing wear over the entire sparking area.

Massive AC electrodes help extend spark plug life.



How AC Massive Electrodes help you get peak power and extended spark plug life

The smooth-ground design of AC Spark Plug's massive center electrode eliminates possible "high spots" on the firing surface that can become areas of concentrated wear. AC design results in wear being distributed over the entire sparking area to reduce gap-growth and help maintain correct gap-setting longer. In addition, AC's massive electrodes are made of long-lasting Isovolt alloy to provide unsurpassed resistance to erosion and burning. This highly conductive electrode material promotes a full charge of ignition voltage to the firing tip for every spark — helps you get more efficient, full-firing combustion for faster starts, more engine power. Gain the benefits of longer-lasting, sure-firing massive electrodes. Insist upon AC Fire-Ring Spark Plugs at your next engine tune-up.

AC SPARK PLUG DIVISION OF GENERAL MOTORS



**FIRE-RING
SPARK PLUGS**

MARCH 1966 | 19



GOOD DEAL! No more fatiguing pull back with Simplicity Supermatic Roticul® rotary tiller! Just shift into reverse with exclusive Full-Power Reverse Gear Control! Rugged 4 horsepower tackles and tames toughest soil ... breaks up sod smoothly, gently with self-sharpening tines, scientific spading action. Perfectly balanced for all-day handling ease ... automatic safety stop when controls are released.

GOOD DEALER! Your Simplicity dealer is proud to stand behind America's No. 1 sod-busters — including thrifty 3 hp Roticul with most Supermatic features ... versatile 7¼ hp Model "W" 2-wheel tractor. Other Simplicity work-savers: Landlord 101 and Broadmoor riding tractors, 3 Wonder-Boy riding mowers.



Simplicity Manufacturing Company, Inc.
6636 Spring St., Port Washington, Wis. 53074

"Say, Smokey—"

[Continued]

regarding excessive carbon buildup due to the PCV system, I was referred to the dealers. One mechanic contradicts another. One of their authorized shops told me that an additive should be used at every oil change, and hotter plugs should be used to burn off this carbon. What's your opinion?"

W. H. BAE, Lake Arrowhead, Calif.

I don't believe any smog device is just right yet. I would check again with the factory, repeating what you have told me. As the industry gains experience, they keep coming closer to the answer with PCV. Putting in additives and hotter plugs would burn off some carbon, all right, but it could be that you'd wind up burning some valves, too.

"When I floor the accelerator on my '60 Pontiac with the 389-inch engine to get into passing gear, a lot of smoke blows out the exhaust. Are the rings bad?"

JOHNNY MERCOMBE, Jamestown, Tenn.

The smoke is from either an over-rich carb or burning oil. If it's black, you need a carburetor job, or adjustment. If it's blue, better have the rings looked into.

"How can I improve the performance of my '63 Ford six, with the 233-inch engine and a standard transmission? It has the standard gear ratio, and just starts running good at 70 m.p.h. But in city traffic I have to run in second gear most of the time."

JAMES L. COOPER, Paullina, Iowa.

Your problem is lack of power in reference to gear ratio and car weight. You'll be much better off in traffic—though you'll have lower top speed—if you put in a lower axle ratio. The options are to soup up your Ford or put in a bigger engine, neither of which makes much sense from a cost angle.

"My '65 Corvair Monza, with 110-hp. engine and automatic, has 2,050 miles on it. My problems are: 1) In wind, I have to fight to keep the car on the road. Can I overcome this with 50- to 100-pound weights in the rear wheel wells? 2) On rainy days the brakes get so wet the car pulls to the left. Pumping them does no good, even two hours after a rain. A dealer's mechanic tells me not to put in metallic linings—they will score the drums. He also told me that disk brakes were no good, they also will pull when wet."

HOWARD FELLER, Miami Beach, Fla.

On Problem 1 you didn't tell me how fast you go when the drift occurs. There's not much you can do with this car at excessive speed in a hard crosswind. Weight in your trunk (up front) will help some. Higher tire pressures will help a little. On Problem 2, I once was disk-brake happy, but the more I fool with both types, the more

Continued

Do our dealers stand by them?



They even get under them.

Top Quality Used Cars. Chrysler and Plymouth Dealers have serviced many of them since they were new. A dealer's reputation is on the line, you know, every time he sells a used car. That's why Chrysler and Plymouth Dealers sell top quality used cars. And that's why the Top Quality sign is the first sign of a good used car.

CHRYSLER - PLYMOUTH DIVISION  **CHRYSLER**
MOTORS CORPORATION

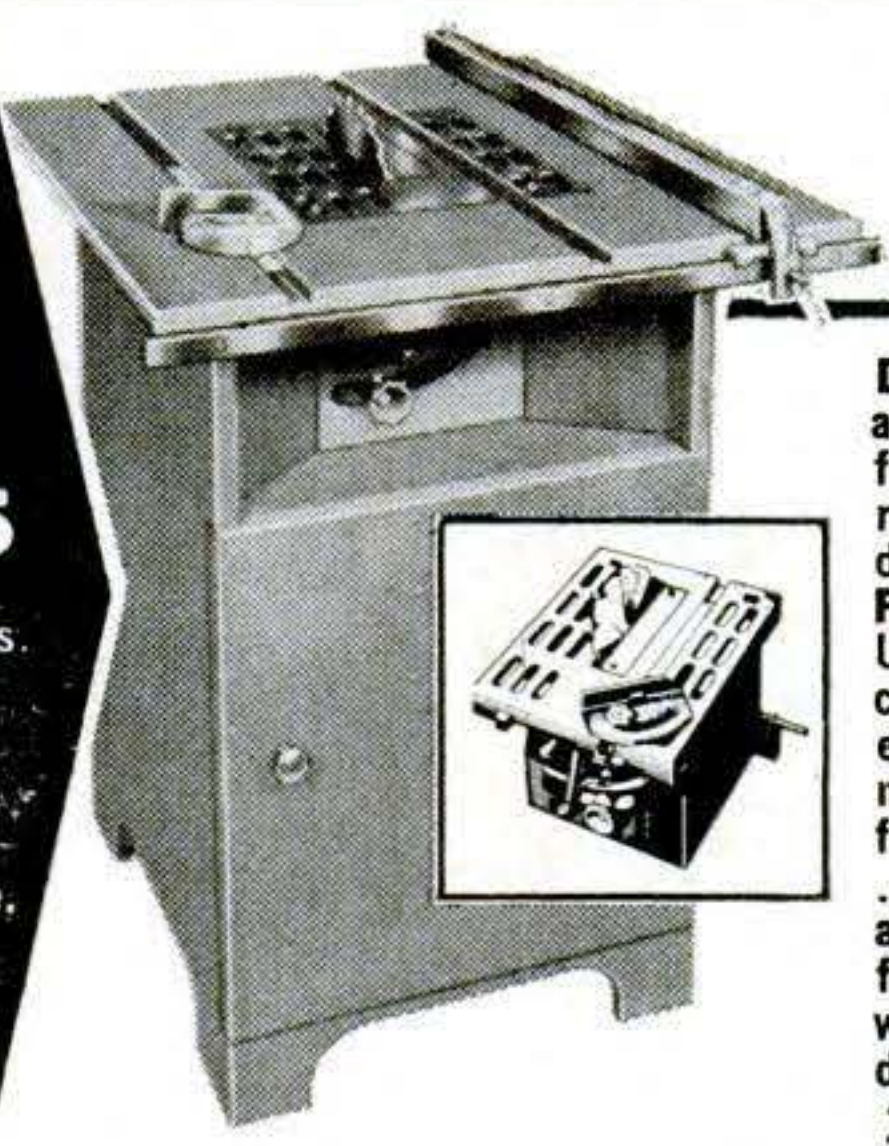
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DANA ANDREWS... Star of "CRACK IN THE WORLD" in Technicolor—a Paramount Release—writes... "Like most people, I guess, I sure had my doubts about how anyone could sell machines that are supposed to do so much... for so very little. I was never more pleasantly surprised! Every claim for them—and more—is true. Putting them through the most rugged workouts, has convinced me that the AMCO people know something no other manufacturer in America has been able to find out. These machines are, without question, a most remarkable buy in professional quality power tools."



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8" TILT ARBOR POWER SAW
\$1495
 f.o.b. factory. Wt. 25 lbs.
 Includes completely assembled cast iron and steel 8" tilt arbor power saw with ground cast iron table... less blade. If desired, RIP FENCE for easier work alignment, \$3.50 additional



REVOLUTIONARY PATENTS DECREASE COSTS, INCREASE EFFICIENCY
 Full scale power tools of heavy duty 100% cast iron and steel. Streamlined design reduces weight, cuts material and production costs. Special patents provide added efficiency, accuracy, savings. Parts made, assembled, tested and packed right in our own factories, shipped direct... save store profits.

DOES WORK OF \$75 BENCH SAW as is. Converts easily to equal any \$300 floor model cabinet units! Crosscuts, rips, mitres, cuts compound angles, dados, makes coves and mouldings. **FREE CABINET BASE PLANS** Use as portable bench saw as received (inset photo)... or transform easily and inexpensively into floor model (as shown) guar. to do work of floor models costing \$300. FREE plans... sheet of 3/4" plywood and 3-4 hours are all you'll need. Use your AMCO saw for cutting. Plans provide 27" x 24" work surface, 33" height, pullout saw-dust bin, tool storage compartment. **10-YEAR FULL SERVICE GUARANTEE ***

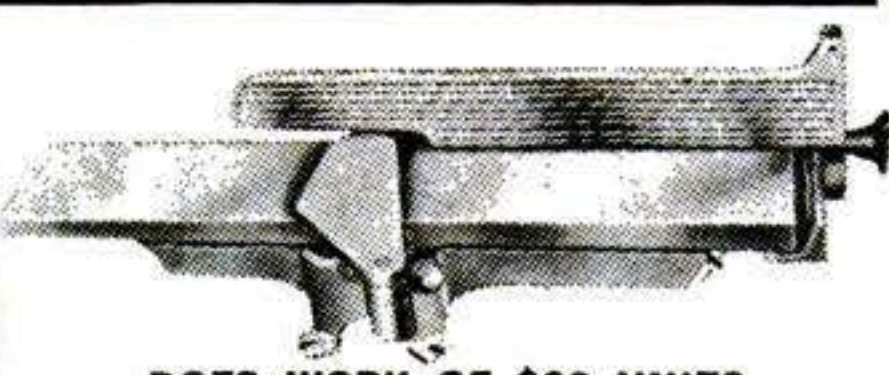
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6" SWING 3-FT. LATHE
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 Optional Faceplate for turning bowls, trays, lamp bases, rosettes, etc. \$2.50



Complete as shown
DOES THE WORK OF \$40 UNITS—Sturdy all cast iron power tool turns wood or plastics with the precision and speed of machines selling for 4 times as much. Tubular steel bed, ball thrust cup center, spur center. T-Rest assembly, lever action tail stock. 2 speed pulley. Fits any motor. **10-YEAR FULL SERVICE GUARANTEE ***

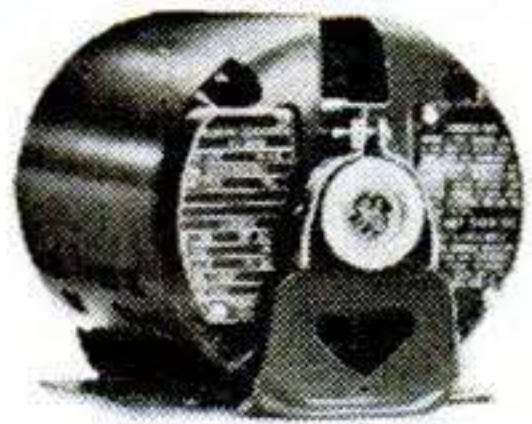
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 100% precision ground cast iron and steel.
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DOES WORK OF \$60 UNITS
 Now, at little more than a hand tool price, a guaranteed professional quality precision machine which does same work as skilled hand planing... much faster, more accurately. Make accurate glue joints; rabbeting cuts for doors, window frames, table drawers; square taper cuts for chair legs; accurate beveling.
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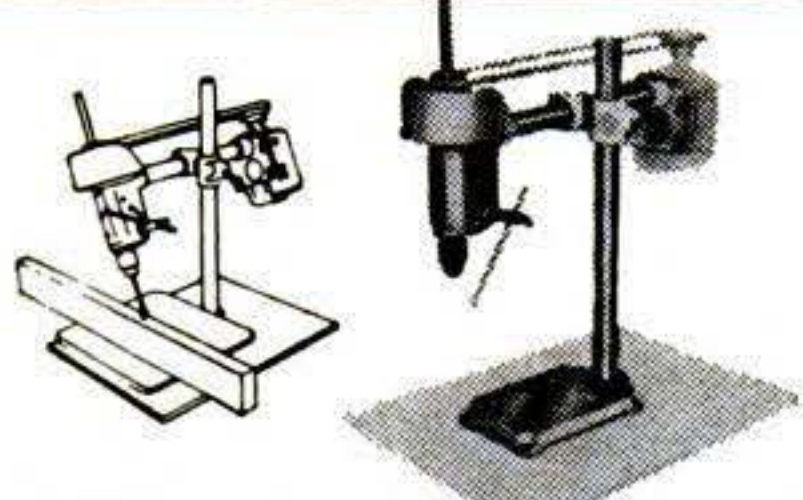
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DOES WORK OF \$90 UNITS... AND A GREAT DEAL MORE



Industrial quality precision machine with all features of standard drill press, many extras. Head raises, lowers. Greatly increased depth of throat. Can be pre-set to any angle or position for on-or-off table drilling... even horizontal drilling. All cast iron and steel.
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Professional trouble shooting electronic equipment — quickly locate electrical problems (shorts, open, power failures, etc.); professional electric repair tools; audio recordings that bring the instructors' voices into your home, making things easy to understand; thousands of exploded views, photographs and drawings showing how parts fit together, how buildings and electrical equipment are wired — charts telling you how to fix things quickly, correctly — ALL ARE SENT TO YOU.

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LEARN WIRING You learn how to completely wire or rewire homes, garages, barns and factories — their lighting and power equipment. There are no half ways with ATS training.

NO EXPERIENCE NEEDED

ATS shows you how, gives you the equipment to do it. Your own kitchen table can be where you first "set up shop." ATS men are nationally recognized by wholesale suppliers of parts and materials. We show you how to get repair business, how to charge fair and profitable prices for your work. ATS keeps graduates informed as new appliances, improved electrical techniques develop. It is a regular part of the continuing ATS training program and why ATS training is preferred by so many. You owe it to yourself to investigate the complete ATS Electrical Training Program.

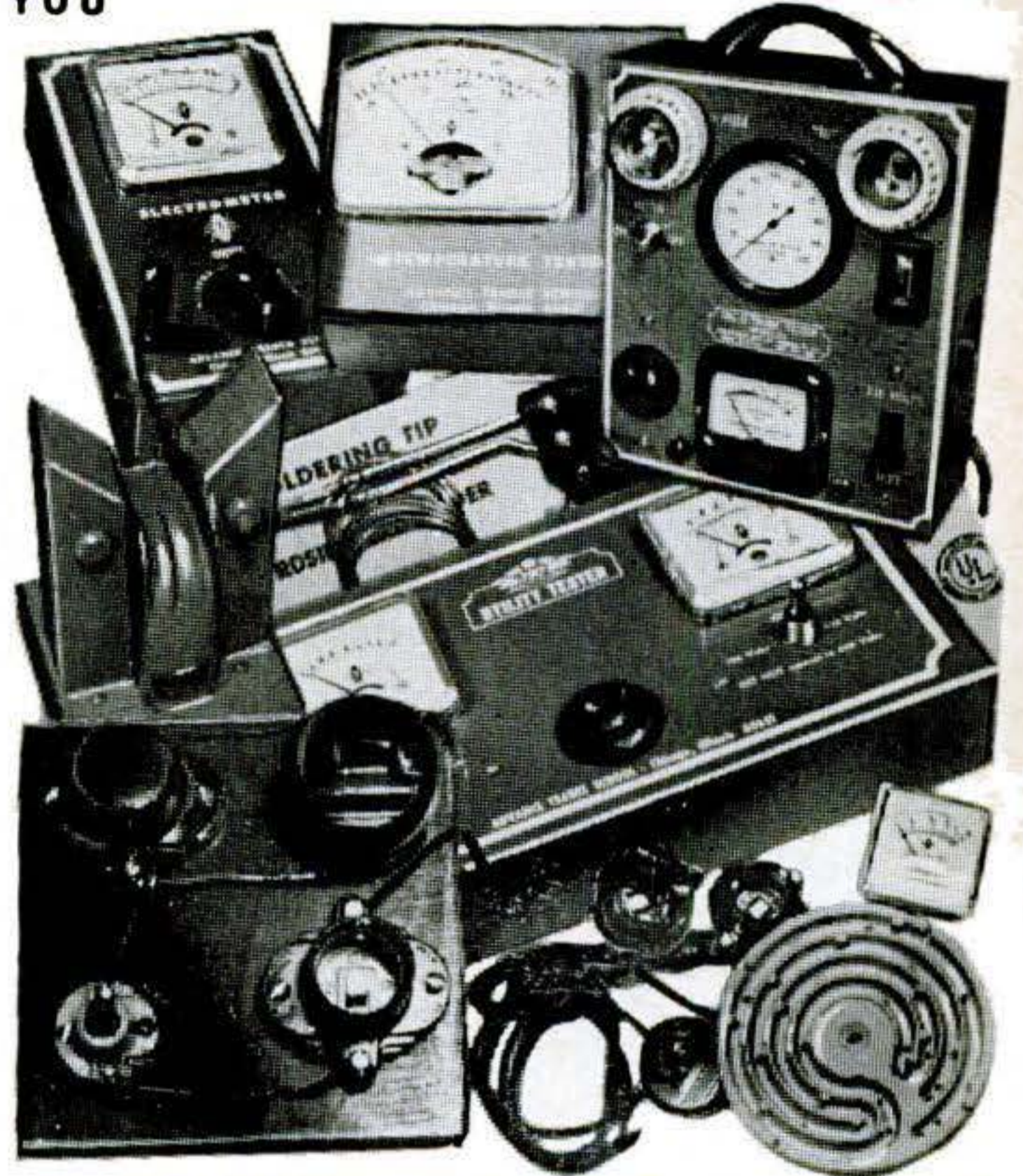
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"EARNINGS BY ELECTRICITY"

This seal certifies full accreditation by the National Home Study Council.



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Some of the Equipment I send YOU



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"Received two promotions — worker to foreman to assistant manager." J. Swanton, Oaklawn, Ill.

"My work piles up and I get behind with my studies." M. Bobo, Sr., Tacoma, Wash.

"I am now maintenance man at a large motel at a much higher salary." J. Martin, Kansas City, Mo.

"2 raises in pay since I started with the State Highway Dept. in electrical maintenance." C. DeHut, Phoenix, Ariz.

"Should have taken your course 20 years ago." A. Knoll, Michigan City, Ind.

"Chief maintenance man now at double my former income besides having a

profitable sideline business." R. DeWitt, McHenry, Ill.

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Former \$2.30 hour mechanics — "Now Head Maintenance man at Heineman's Bakeries — wages are nearly \$200.00 a week." C. Fontenot, Hales Corner, Wis.

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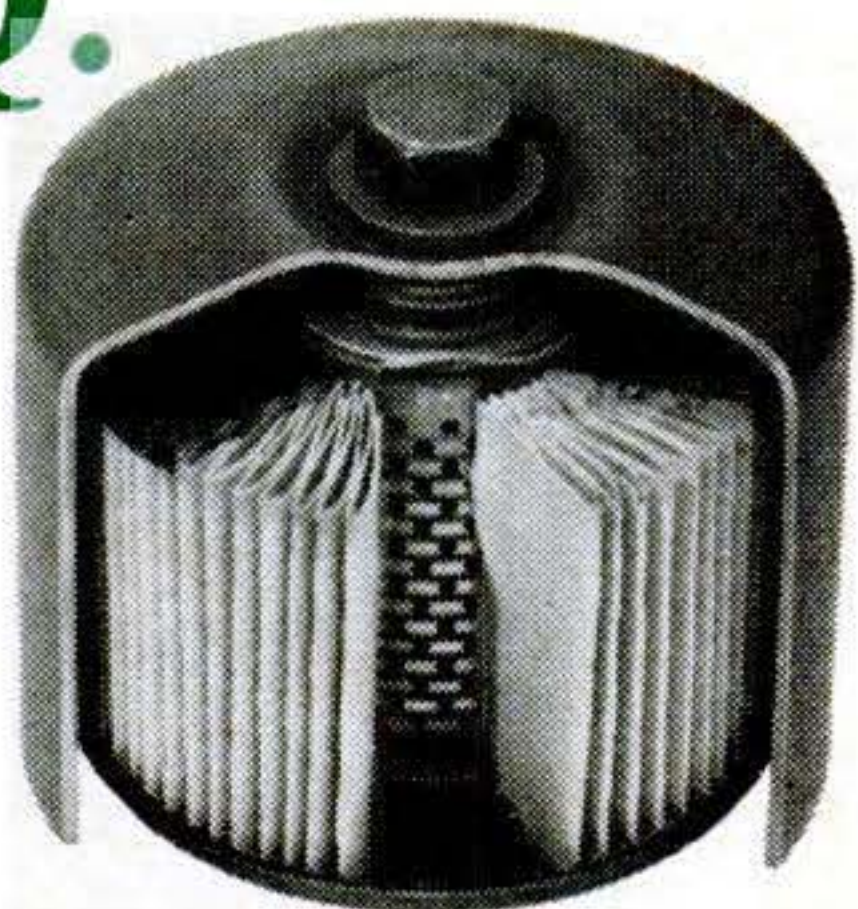
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"Say, Smokey—"

[Continued]

I like the drum type for production cars. Metallic linings, though not so smooth as regular, would be much better for you. When you change linings, check all the other components connected with pulling brakes—the drum finish, springs, and wheel cylinders, and evenness of adjustment on all wheels.

"A friend claims good mileage on his Buick Riviera since he changed to a small, racing direct-air cleaner. Would that help the mileage on my '65 Mercury? If so, what problems would I encounter? Which one should I get? My carburetor is of the single-barrel type."

LEWIS MORTON, Easthampton, Mass.

Your friend's mileage is probably accidental. Air cleaners and their cleaning elements are carefully tuned to each particular engine. The only way you can improve an air cleaner for that car is on the off-chance that your present one is not the proper type, or was poorly designed or manufactured to begin with. If you change, take the factory's recommendation. An engine tuned to proper specs, a correct gear ratio, and good driving habits are your best bets for improving the mileage of your car.

"Lots of people insist that new tires should not be balanced until driven about 500 miles. It's my opinion that they should be balanced when mounted. What do you think?"

CHARLES E. KEINATH, Largo, Fla.

It is not out-of-balance tires but out-of-round ones that give the trouble. Most people who are fighting vibration actually have a bad case of "square wheels." It is a big order, but try to get four tires that are pretty close to round, and four round wheels. Then, after you've run 100 miles or so to seat them properly, get the tires trued on a machine and balance them, in that sequence, for the best vibrationless ride.

"Driving on the highway in my '64 Oldsmobile, a 98 with only 15,000 miles on it, I continually smell gas. Changing the air filter didn't help. The dealer's mechanic says he would have to fix this by a process of elimination, which might cost a lot. Can you help me?"

JOSEPH J. WONSWITZ JR., Florissant, Mo.

A gasoline odor usually is caused by a leak, so putting off fixing it might well cause a fire. Most times, the leak is found around the filler neck of the fuel tank. If you don't find it there, check the tank all over, and then go forward in the fuel system from there. The mechanic was right, but this method probably won't be very expensive.

Got a question on autos? Send it to:

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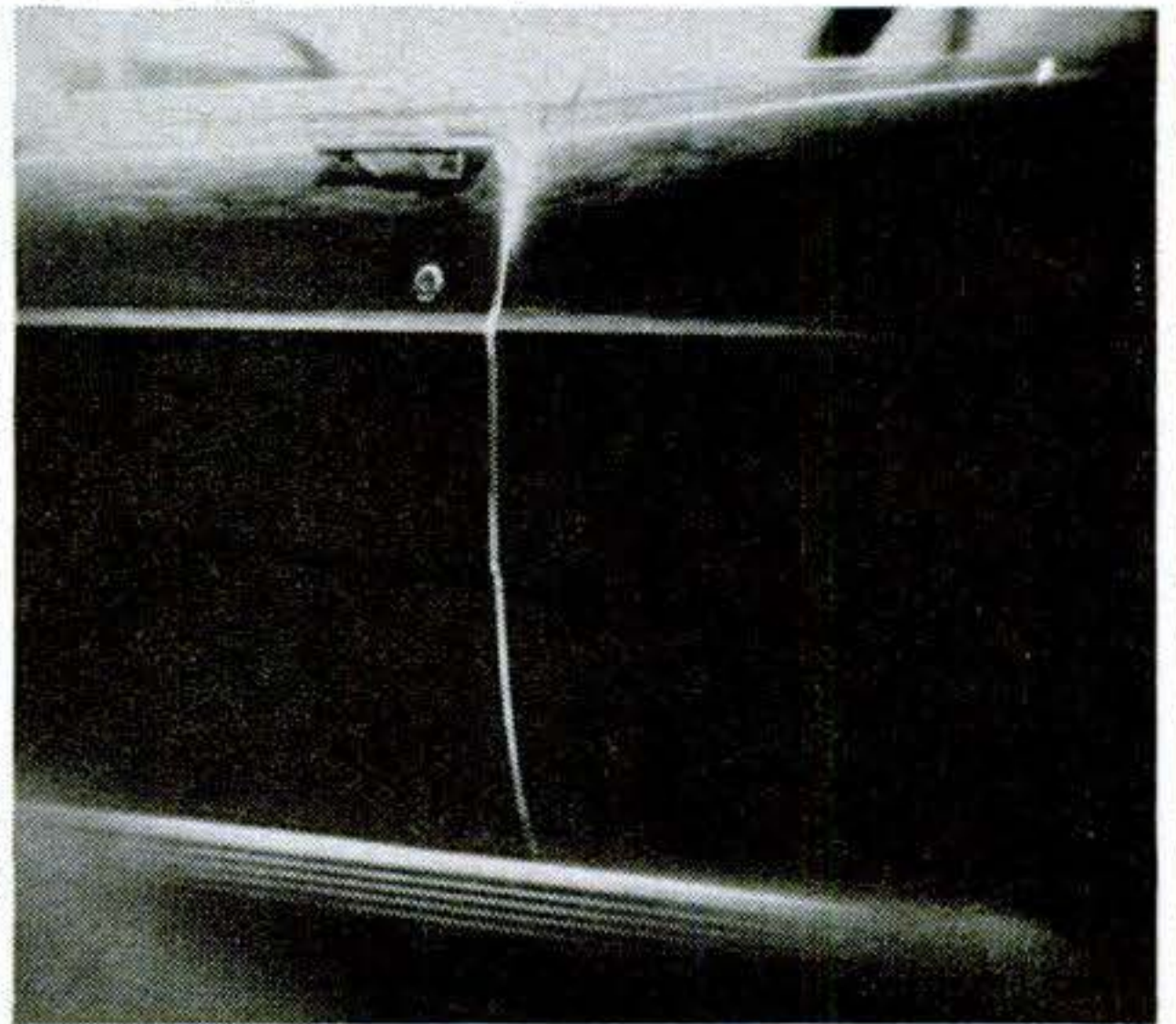


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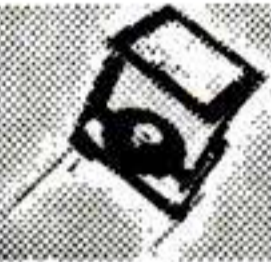
Edmund Kits are carefully planned to give any boy or girl the fun and excitement of discovering science facts. Such carefully planned projects can lead the student to awards or scholarships. Adults too will find them an excellent introduction to the various fields of science. Write for Free Bulletin 47-N "Your Science Project" covering all phases of Science Fair projects.

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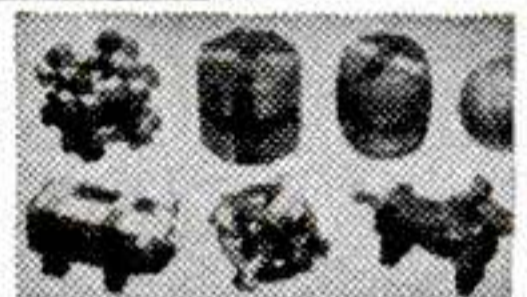
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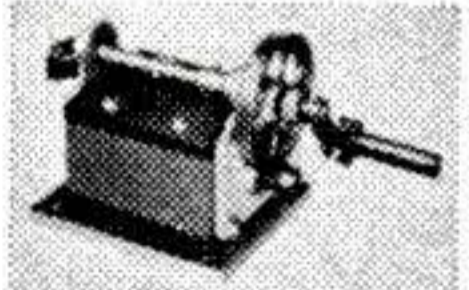
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Science Newsfront

Last-minute news and notes to keep you up-to-date

By W. STEVENSON BACON

Instant pictures from ordinary film

A \$20 gadget about the size of a lunchbox that will develop and print a roll of ordinary black-and-white film in less than one minute has just been unveiled by the Anken Chemical and Film Corp., of Newton, N.J., and Photo Magic, Inc. Film fed into the device is developed and printed almost instantly. Chemicals and paper for 12 pictures will cost under \$1. It is possible to re-use the developed negatives if a special procedure is followed. The prints are permanent.

Rainbow guides carrier pilots

A device that emits a rainbow-beam of light to guide pilots 15 or more miles away in making a landing on the short, narrow deck of an aircraft carrier has been developed by scientists of the U.S. Naval Research Laboratory. When the pilot is descending too slowly, he sees a beam that changes in color—red to white to blue, for example. If he descends too fast, he will see the changing colors in the opposite sequence. When his descent rate is correct, a steady color shows on his indicator—red, white, or blue, eventually changing to green as he reaches the glide path. The multicolor beam is projected from the ship by a lens system receiving the light from a color transparency mounted on a transparent drum and revolving around a 1,000-watt light source and condensing lens.

"Quiet" snow tires use ceramic studs

Snow tires studded with ceramic rods as hard as diamonds, making them outlast and outperform the usual tungsten carbide-studded tires, will be available by 1967. Spurred by the growing popularity of studded snow tires in the northern states, Coors Porcelain Co. developed the new material, which is made with aluminum oxide for high impact resistance and hardness. Among advantages claimed for the studs: They are relatively quiet on dry roads, wear evenly with the tire, and don't overheat, damage tire rubber, or cause sparks.

Alarm wakes sleeping driver

Drivers who fall asleep at the wheel, or who travel too fast, would be rudely and quickly awakened by an alarm recently patented by the Ford Motor Company. The invention of Fletcher N. Platt, manager of the company's

traffic-safety and highway-improvement department, the gadget keeps count of how many times the driver reverses his steering wheel. According to Platt, a driver normally moves the wheel at a regular rate. This rate falls off if the driver dozes, increases if he travels too fast. In either case, the alarm sounds.

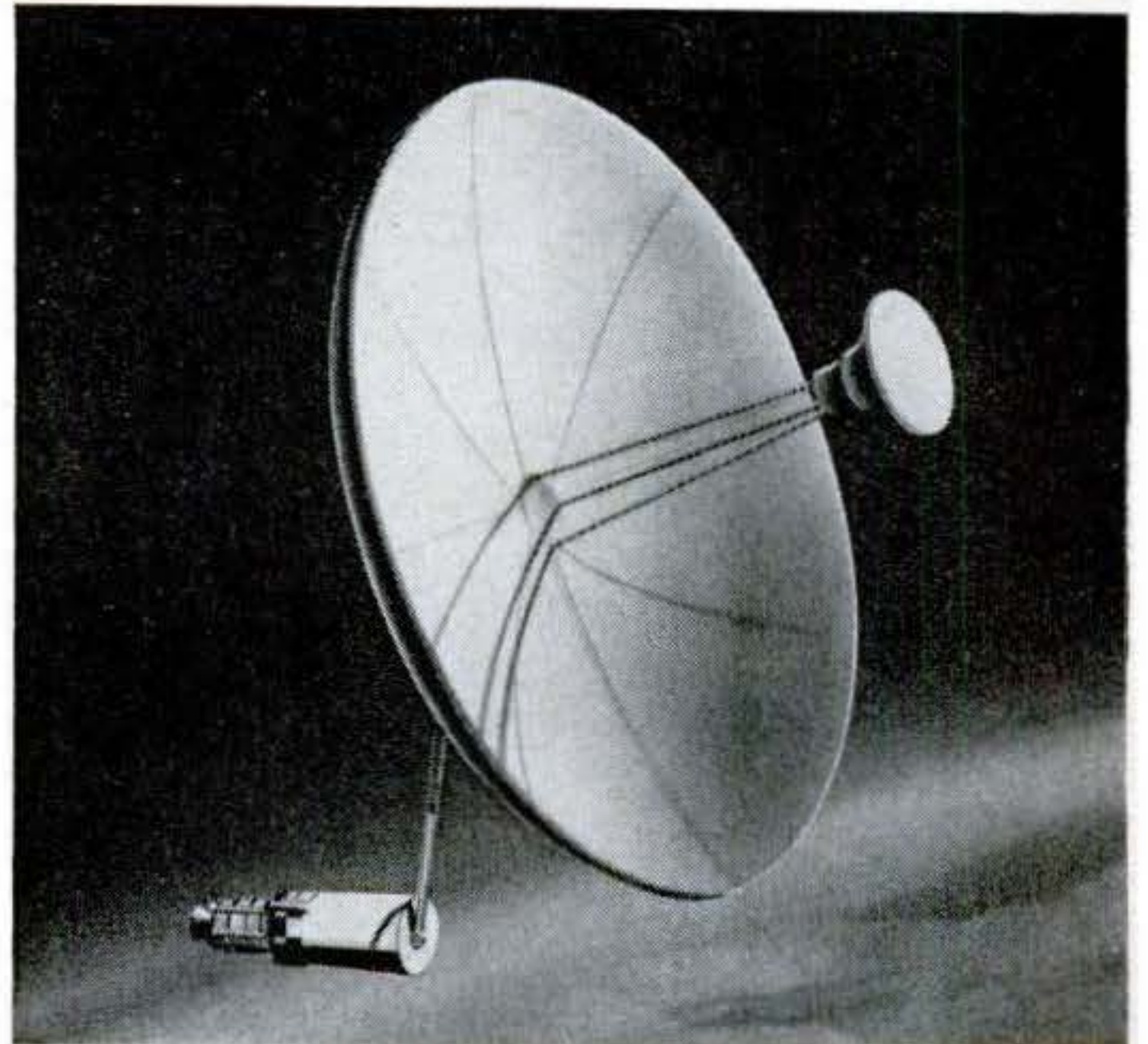
Computer-controlled robot "gets sick"

A robot that breathes, has a heartbeat and pulse, extends its tongue, coughs, regurgitates, and changes color from pink to blue to ashen gray is being developed by the University of Southern California and Aerojet-General Corp. to train doctors. Computer-controlled, it will also open and close its eyes, dilate its pupils, wrinkle its eyebrows, tense and relax its vocal cords, cough, twitch its shoulder muscles, and show responses to 10 drugs. The manikin's most important job: training anesthesiologists to insert an air tube in a patient's throat.

NASA plans radio stations in space

High-power "radio-station" satellites for broadcasting direct to home receivers all over the world are under study by NASA, which

Continued



Inflatable space vehicles that are blown up to full size in orbit are new from Goodyear Aerospace Corp., and include this 52-foot solar collector designed to convert sunlight into electricity for long space missions. Also under development is a cylindrical shelter to house astronauts while in outer space.

MERCURY announces the first major

NOW — Spark plugs last seasons, not hours!

NOW — Preignition, even with highly leaded fuel, is unheard — and unheard of!

NOW — Engine efficiency and reliability are dramatically increased!

NOW — High-powered engines idle like fishing motors!

Thunderbolt—a super-power electronic ignition . . . the first semiconductor capacitor discharge system offered to the public as standard equipment on an internal combustion engine.

Thunderbolt ignition was invented and developed by Kiekhaefer engineers. It is a complete, fully integrated system that makes use of space-age, solid-state materials and technology to produce dramatically increased spark plug life and engine performance. New **Thunderbolt** ignition is available today as standard equipment on two new 6-cylinder Mercurys, the Merc 1100SS and the Merc 950SS.

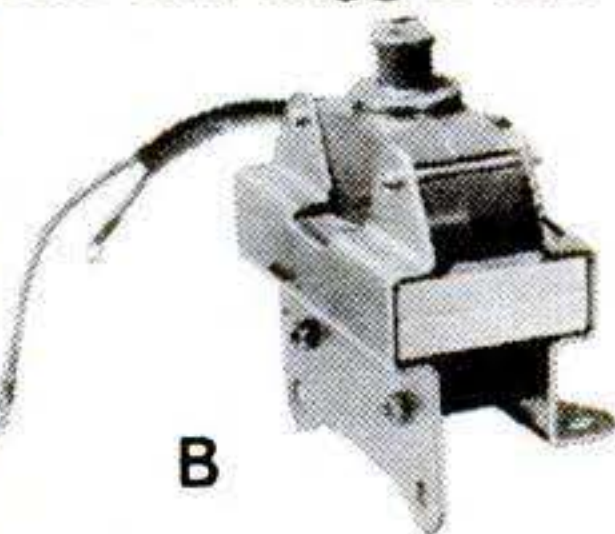
HOW DOES THE THUNDERBOLT SYSTEM WORK?

Thunderbolt ignition is so named because its spark voltage impact far surpasses that of a



conventional ignition system—and because it produces this voltage in mere millionths of a second, many times faster than a conventional system does. In **Thunderbolt** ignition, the battery's 12 volts are converted to a far higher voltage level than in a

conventional coil-and-battery system. This augmented voltage is charged into a large capacitor (condenser). Contact points, carrying only a small amount of switching current, trigger the semiconductor electronic control (A), sending the stored charge into a specially designed low-inductance ignition transformer (B). This unique step-up transformer multiplies the voltage hundreds of times, producing a "Thunderbolt" of a spark! And the output is essentially constant over a wide



range of battery voltage, from 4 to 30 volts—virtually no low battery problems ever!

FIRE YOUR ENGINE WITH LIGHTNING SPEED AND POWER

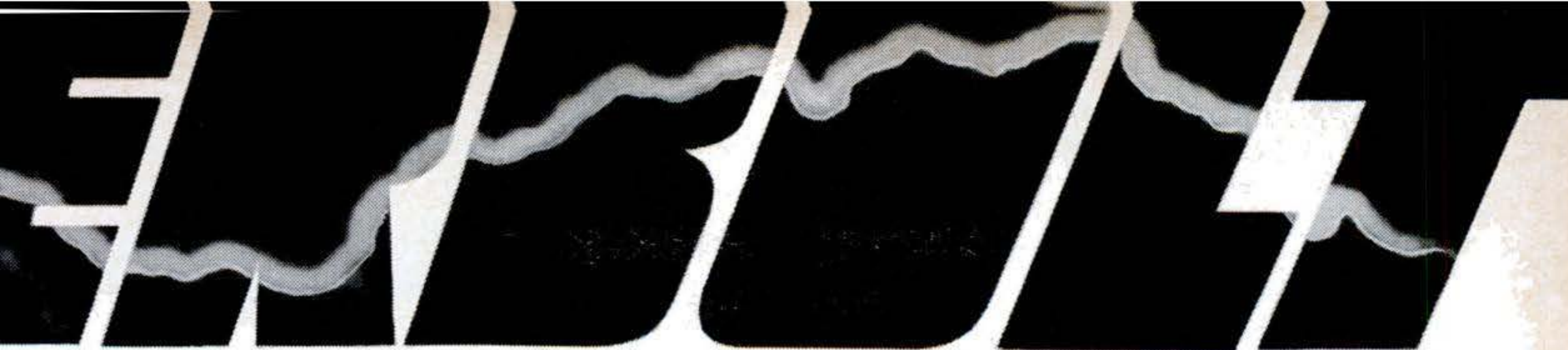
Thunderbolt's "concentrated instant ignition" snaps the engine to maximum performance; a single crack from **Thunderbolt** exceeds the energy of several ordinary ignition sparks.

In conventional ignition systems, voltage build-up at the plug is so slow relatively that much is lost by leakage across any conductive deposits which bridge the electrodes or by moisture in the distributor cap or on the high-voltage wiring. **Thunderbolt** ignition builds up a full spark plug voltage with lightning speed, forcing the plug to fire so quickly that practically no energy loss occurs through leakage. Thus, **Thunderbolt** ignition can fire plugs that are "fouled" by conventional ignition standards. And, because the triggering current required to discharge the capacitor is so small, points are not nearly so subject to pitting and burning. The result is a degree of dependability, durability and performance never before approached in an outboard motor ignition system . . . and a new standard of two-cycle performance.

THE POLAR-GAP SPARK PLUG

An integral part of the new **Thunderbolt** ignition system is Mercury's new Polar-Gap spark plug. Polar-Gap is a very "cold" spark plug: operating temperature of the electrodes and ceramic insulator is 800 to 1000 degrees colder than conventional plugs. This means that the Polar-Gap plug does not glow red hot in the combustion chamber as do conventional spark plugs. Consequently, deposits from the use of leaded fuels do not reach preignition temperature levels. The center electrode (C) receives the high voltage from the coil. A ceramic insulator (D) forms the gap, and a large mass of metal (E) forms an outer ring, which is the other electrode. The spark travels from the center electrode to the outer electrode. Spark arcing area is considerably greater than that of the conventional plug—Polar-Gaps have a 360° electrode gap. This reduces the rate of electrode





breakthrough in outboard ignition in 50 years...



erosion, partially accounting for the greatly increased life of the Polar-Gap plug.

Thunderbolt ignition and Polar-Gap plugs go together—it takes Mercury ignition to fire Polar-Gap plugs. New *Thunderbolt* ignition gives them a super spark and vastly improves the idle.

Forget fouling—Thunderbolt's higher voltage spark just about eliminates low speed

wet fouling or carbon fouling, while the very low operating temperature of the Polar-Gap plug ends fouling caused by lead deposits from automotive fuels. In comparison, experience has indicated that some competitors' high-horsepower outboards using conventional spark plugs require replacement every 10 to 12 hours of full throttle operation on leaded automotive fuels.

RADIO INTERFERENCE REDUCED

Radio interference is greatly reduced with *Thunderbolt* ignition because only a single spark is produced. With a conventional system, several sparks in rapid succession are often produced. This increases radio interference and shortens spark plug life. *Thunderbolt* brings you a bonus of minimum interference with your electronic equipment.

KIEKHAEFER PIONEERING

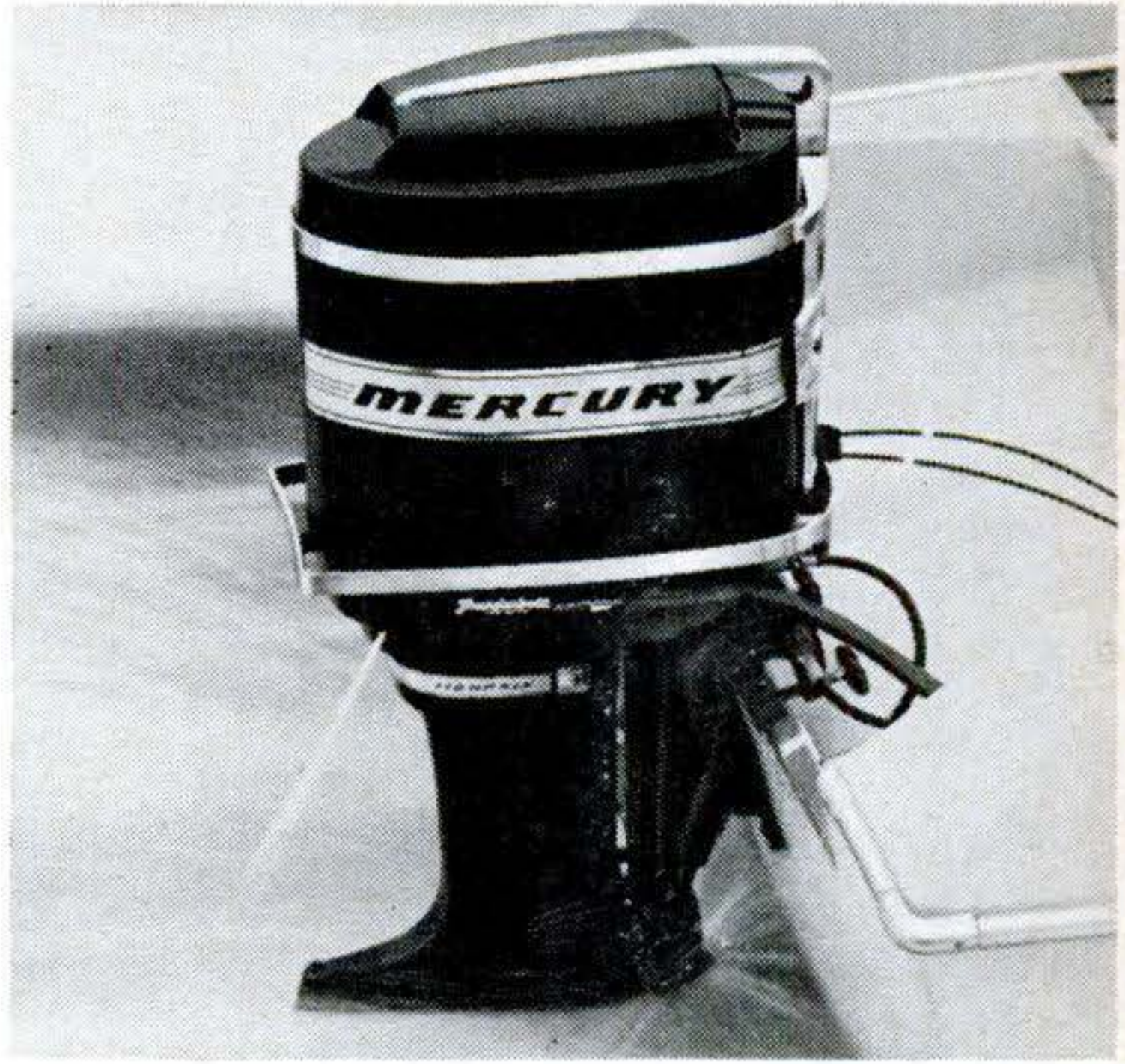
In preparing the way for production of the *Thunderbolt* ignition system, Mercury first moved towards perfecting dielectric properties in plastics for distributors, rotors, and other components. These have been in production on Mercury outboards for several years, although only this year they are being hailed by some auto manufacturers as "new developments." A feature of the *Thunderbolt* system is the new higher-dielectric non-carbon-tracking distributor.

The roots of the capacitor discharge system go back to Mercury's World War II experience in producing thousands of military engines. High costs and critical material shortages discouraged application of this advanced ignition principle to civilian production at that time. With further development of the art, today's vastly superior system has been arrived at with only a modest increase in price.



THUNDERBOLT: EXCLUSIVE ON THE NEW MERCS 1100SS AND 950SS

New *Thunderbolt* ignition makes the new Mercs 1100SS and 950SS the most advanced outboards ever manufactured, offering performance, dependability and economy never before experienced in any high-horsepower outboard.



"We are proud to add *Thunderbolt* ignition to more than 80 outboard industry 'firsts' pioneered by Mercury since 1939. With this new system, you will enjoy a degree of spark plug life, engine performance and reliability never before possible in an outboard motor. *Thunderbolt* ignition is another example of our determination to give you the most performance, dependability and pleasure for your boating dollar."

W. Kiekhaefer
President



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Science Newsfront [Continued]

has asked manufacturers to check the possibility of building satellites capable of broadcasting on the FM band and on a number of short-wave frequencies. Anyone having a reasonably efficient FM antenna or a wire antenna for short wave could receive from the satellites, which would be powered by nuclear generators or by large arrays of solar cells. Satellites constructed to date have used extremely low power and microwave frequencies.

Gas furnace generates own electricity

A gas furnace for the home that generates its own electricity with a built-in fuel cell was recently demonstrated by the American Gas Assn., which has also developed a natural-gas fuel cell that generates enough power to supply an entire home. Gas in the fuel cell is converted to hydrogen by reaction with steam in the presence of a catalyst. A separate natural-gas burner generates the steam and keeps the fuel cell at operating temperature. In the fuel cell itself, catalytic electrodes of silver and platinum are used, separated by an electrolyte of molten carbonates. Industry spokesmen say the total-gas home may be well on the way, with fuel cells generating economical electricity.

Can pills make you smarter?

The answer may possibly be "yes," if recent research with rodents is any indication. According to scientists at the Abbott Laboratories, Chicago, the learning ability of rats can be increased by five times when they are given a so-called "smart pill" composed of magnesium pemoline. And, in research at the University of California, the memory of things learned was transferred from hamsters, who had been conditioned to approach a food box upon hearing a click, to rats. After being injected with RNA (ribonucleic acid) from the brains of the hamsters, the rats responded to the click.

Irradiated food may be lethal

Food preserved by radiation can have lethal effects on plant cells and possibly other forms of life, according to three Cornell University scientists. The researchers have discovered that the sugar in foods, when exposed to radiation, breaks down into other stable chemical compounds that can transmit harmful effects of radiation despite the fact that they are not, themselves, radioactive. In experiments conducted by Prof. Frederick C. Steward, Dr. Richard D. Holsten, and Dr. Michiyasu Sugii, carrot cells ceased growing in irradiated coconut milk—normally a growth stimulant. Ill effects due to irradiated foods were also seen with other plants and with fruit flies. Food preservation by irradiation is currently undergoing testing by the Defense Department and by the food-packing industry. **PS**

ESCAPE is a Chevy Custom Camper!

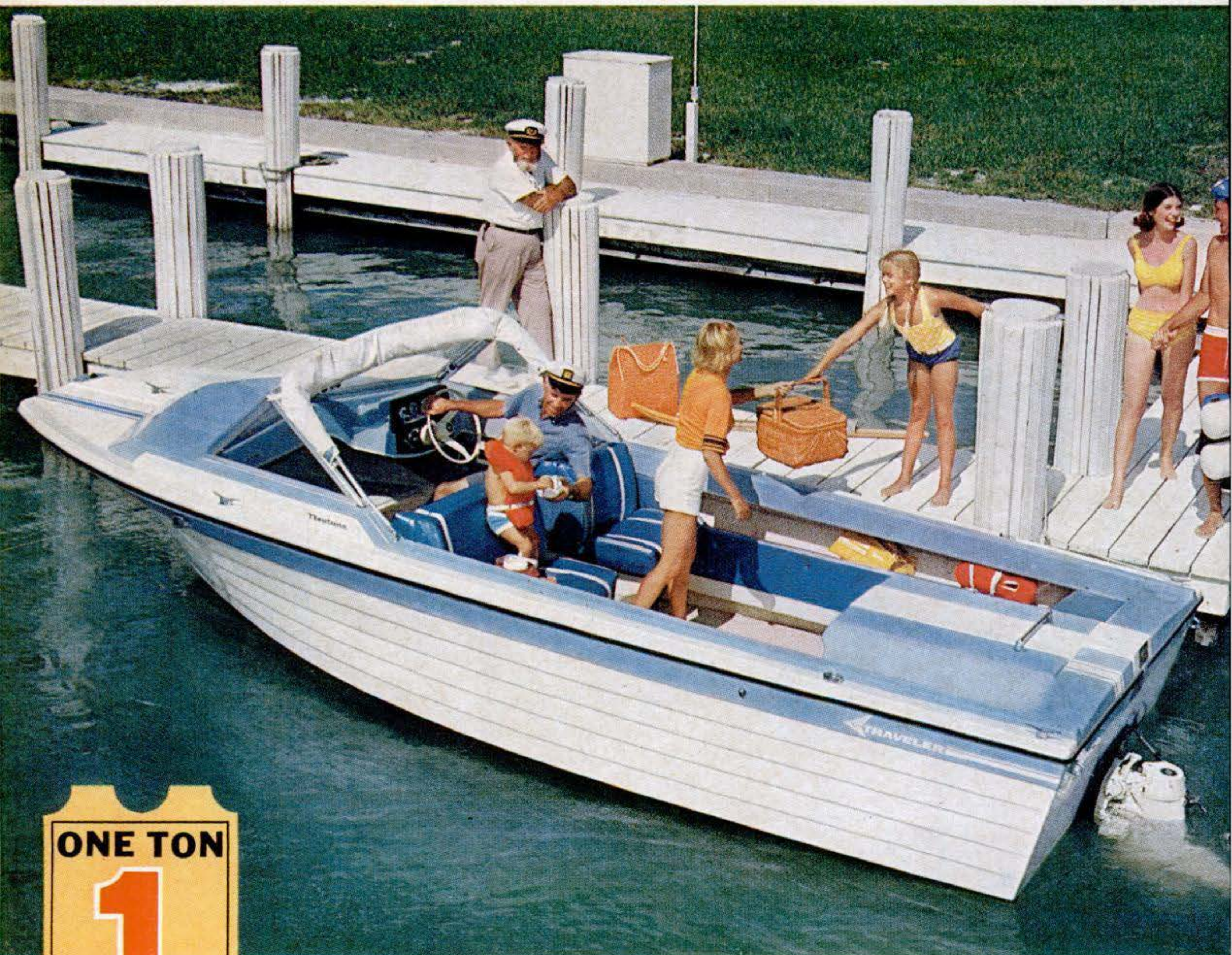


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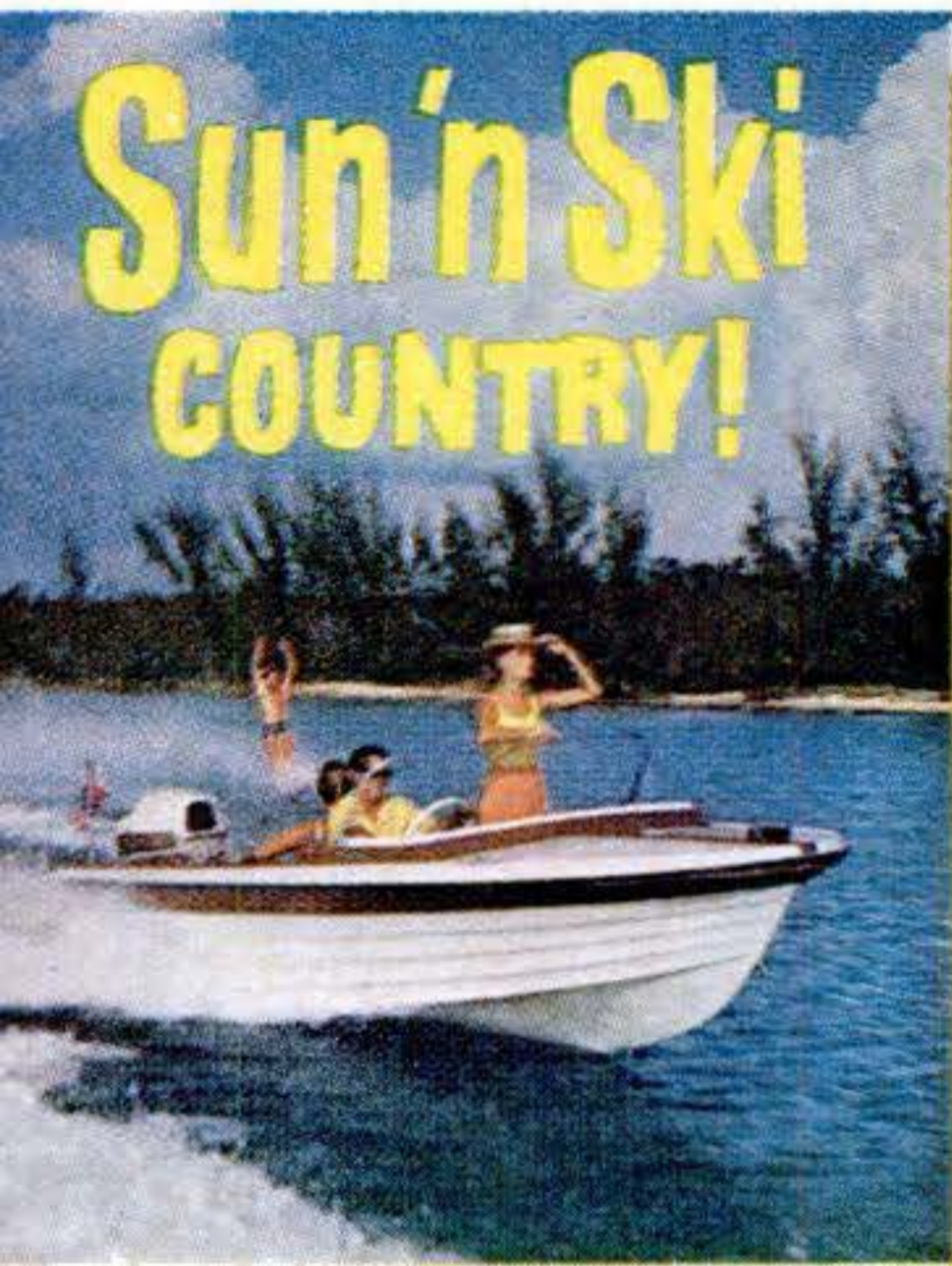
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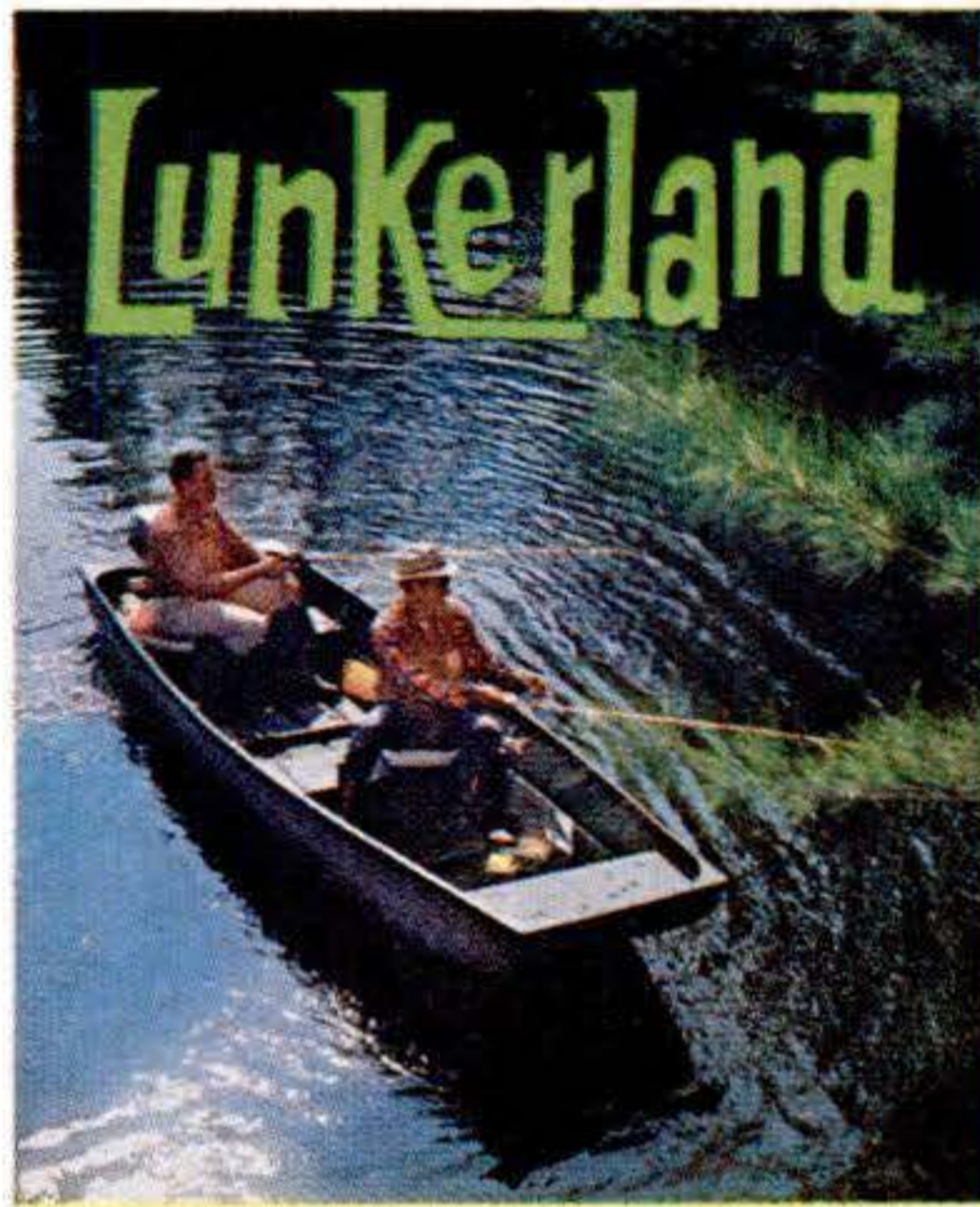
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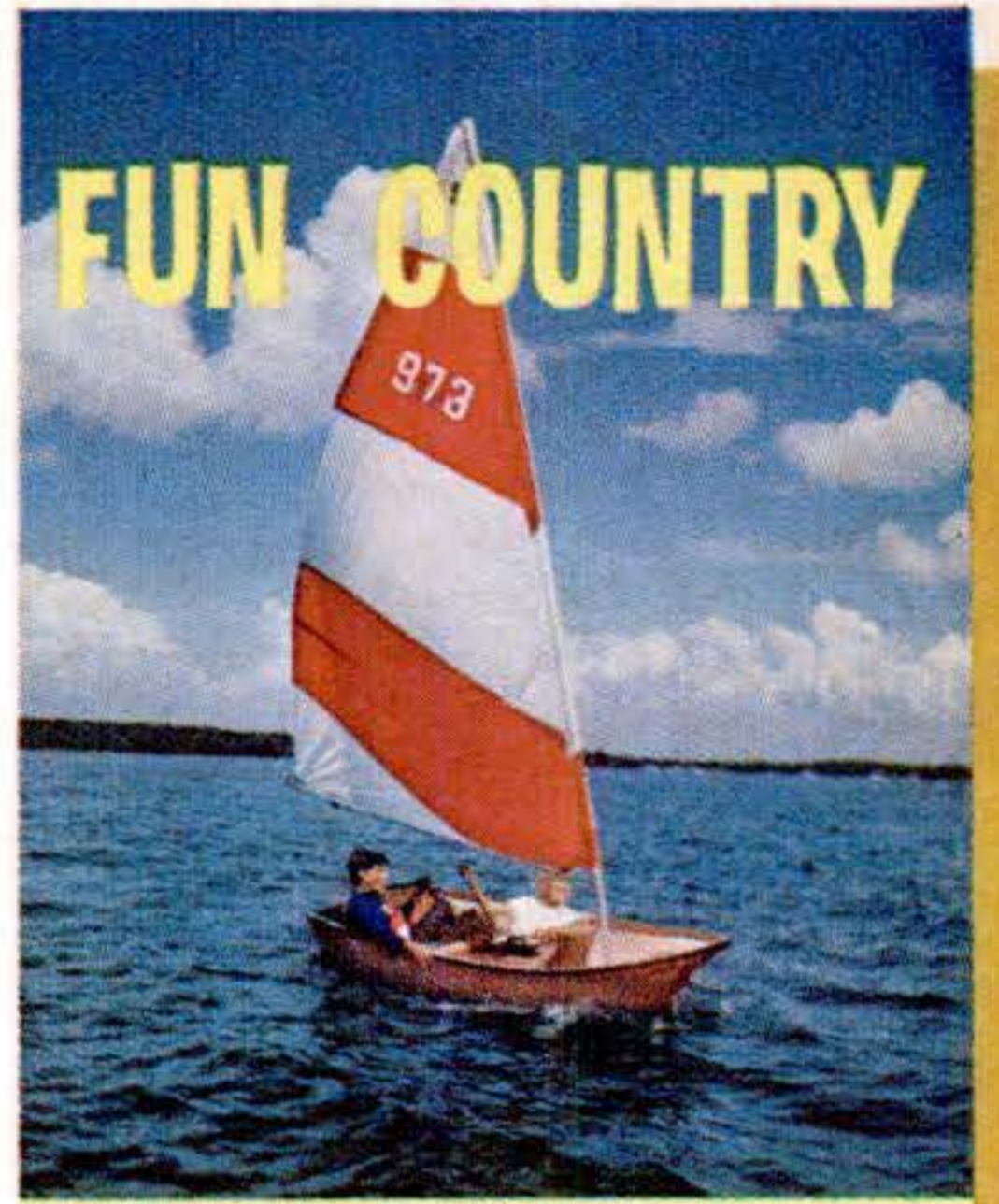
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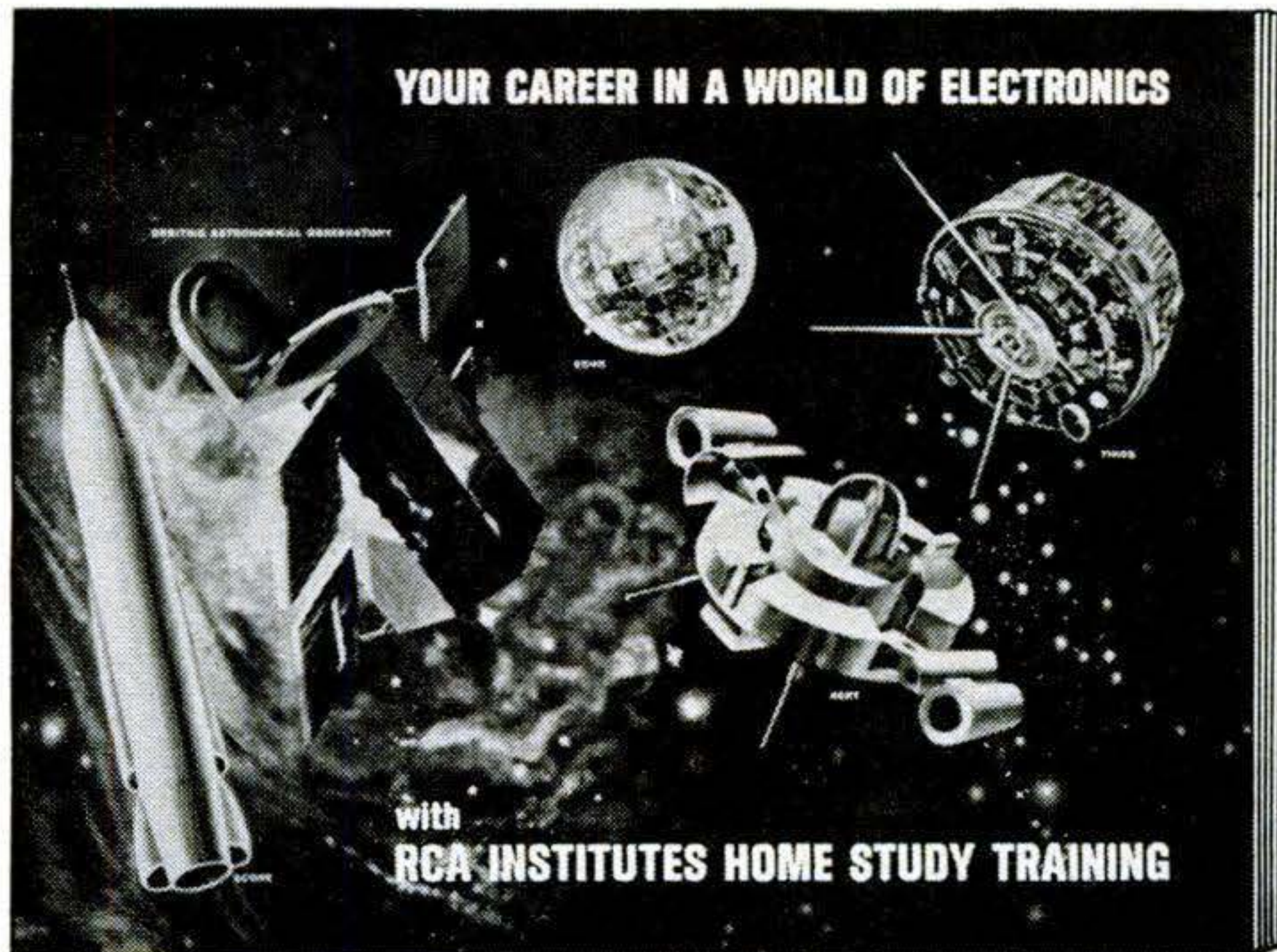


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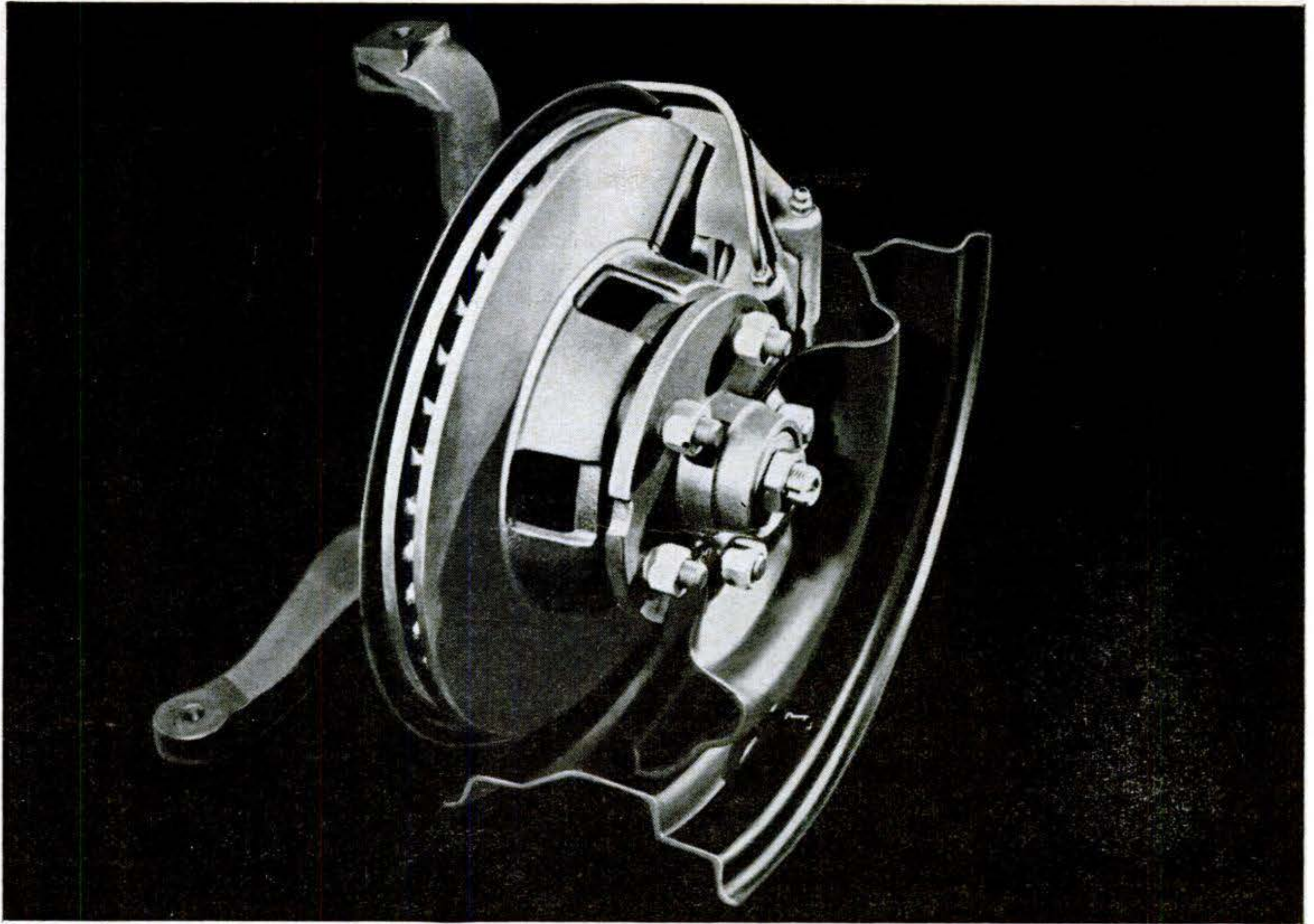
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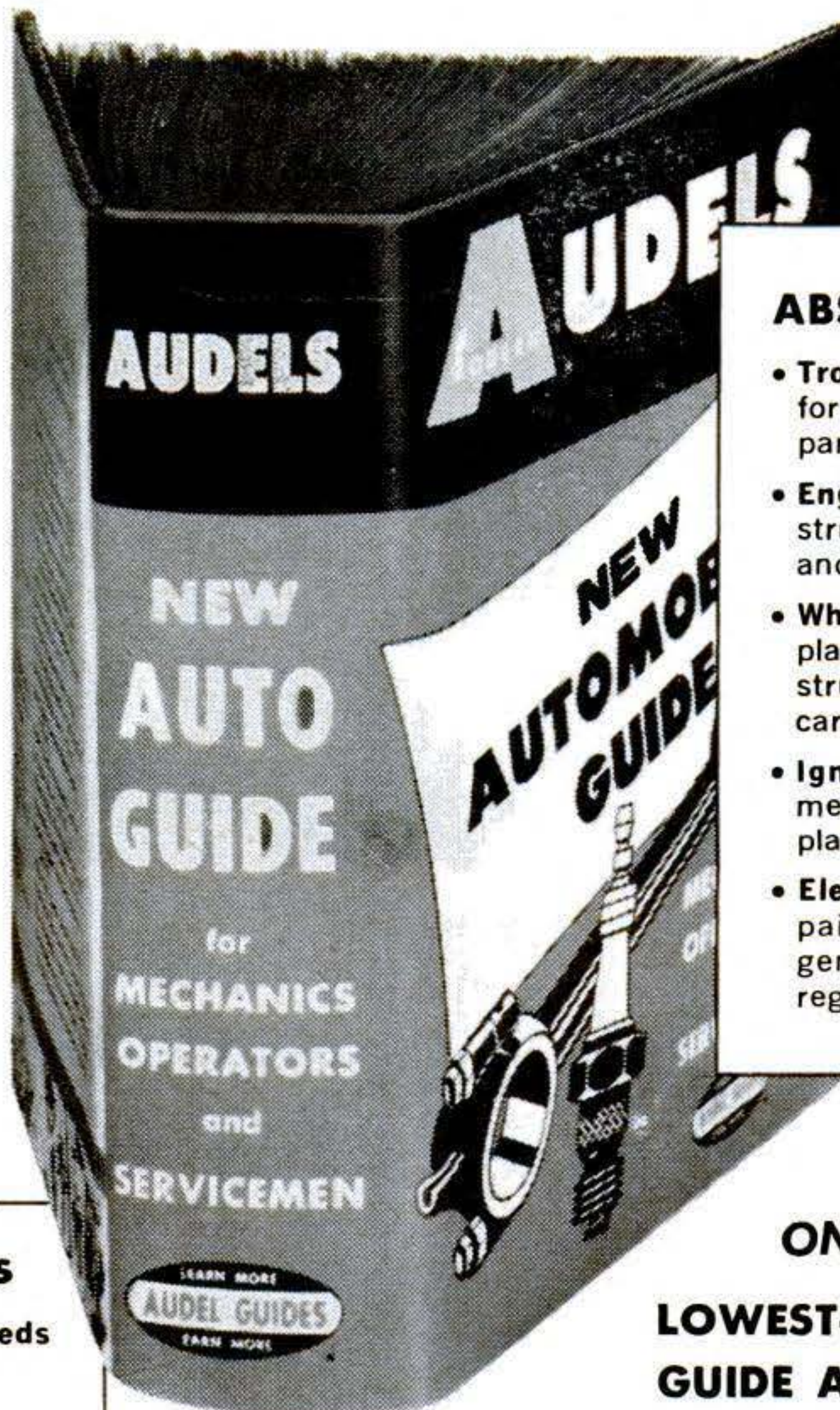


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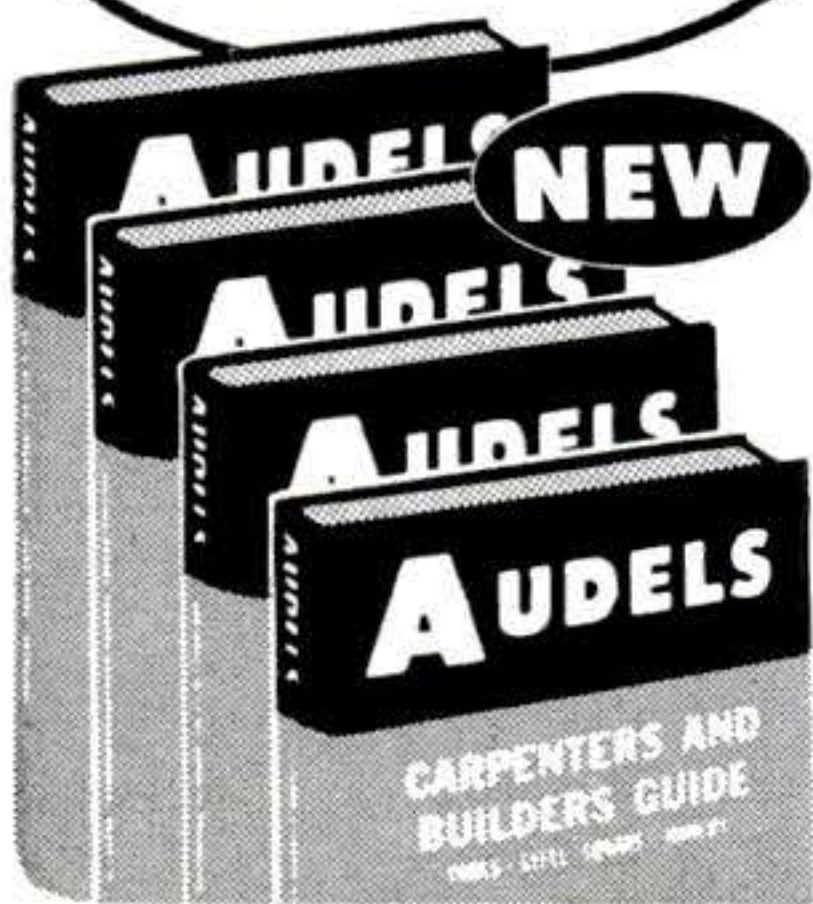
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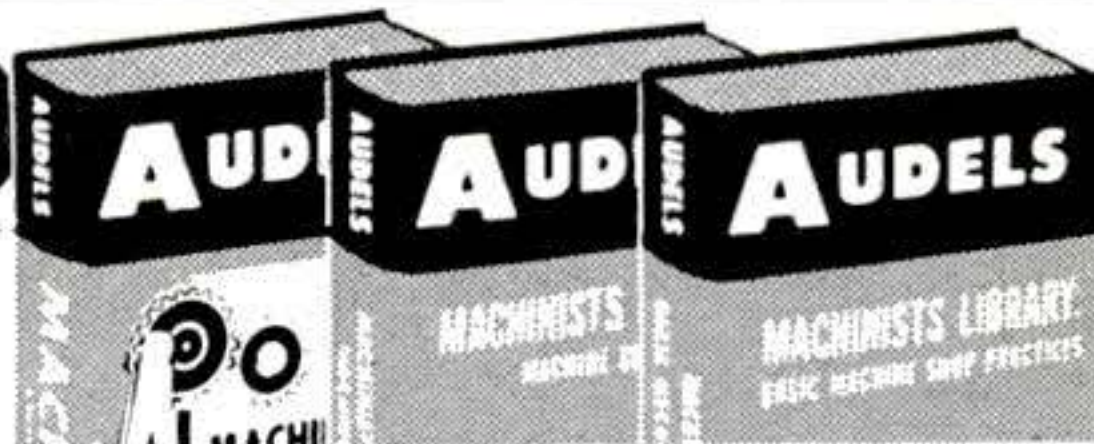


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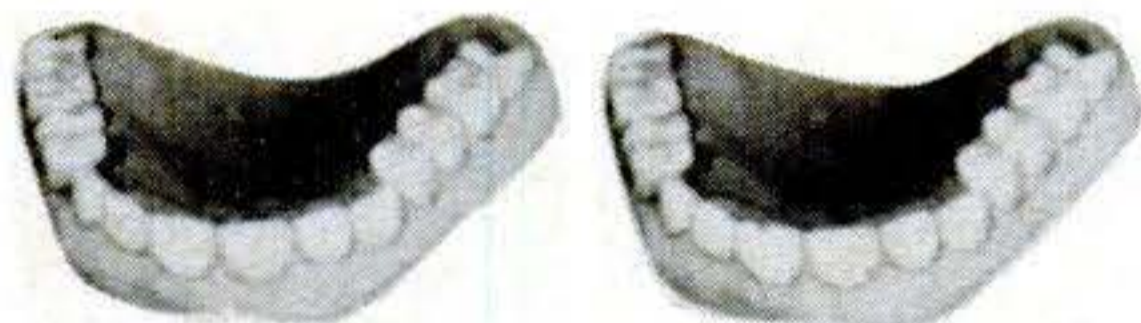
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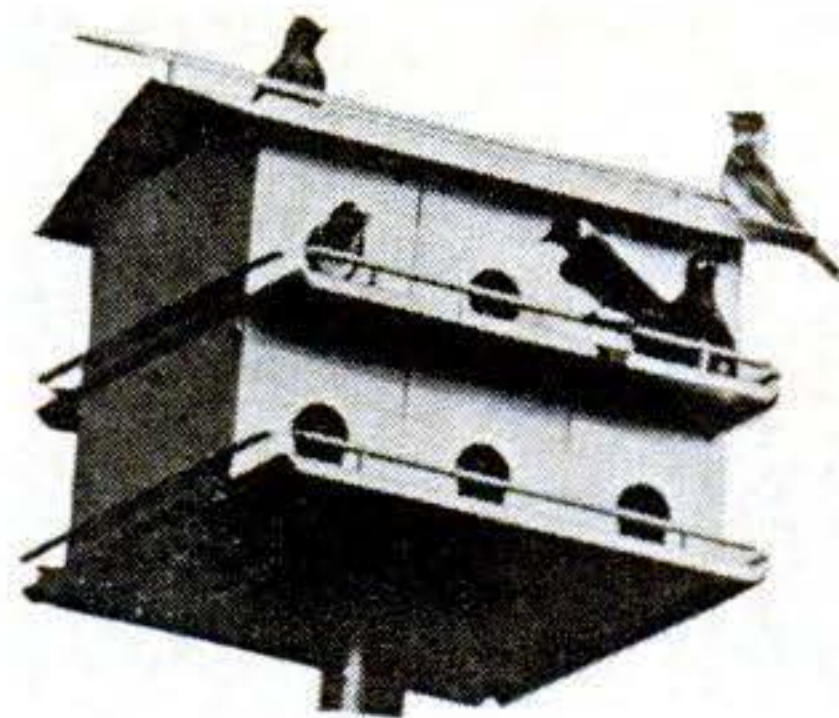
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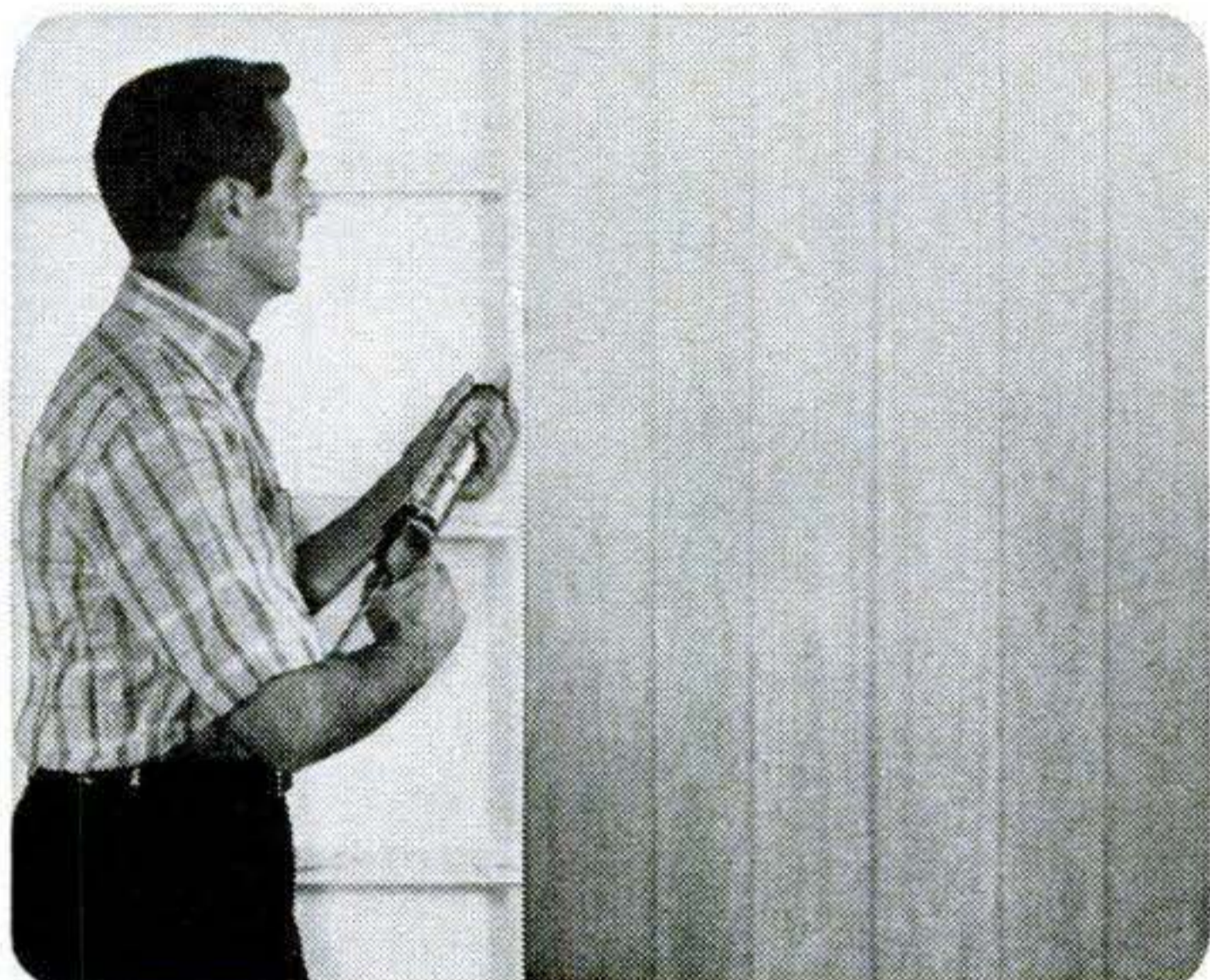
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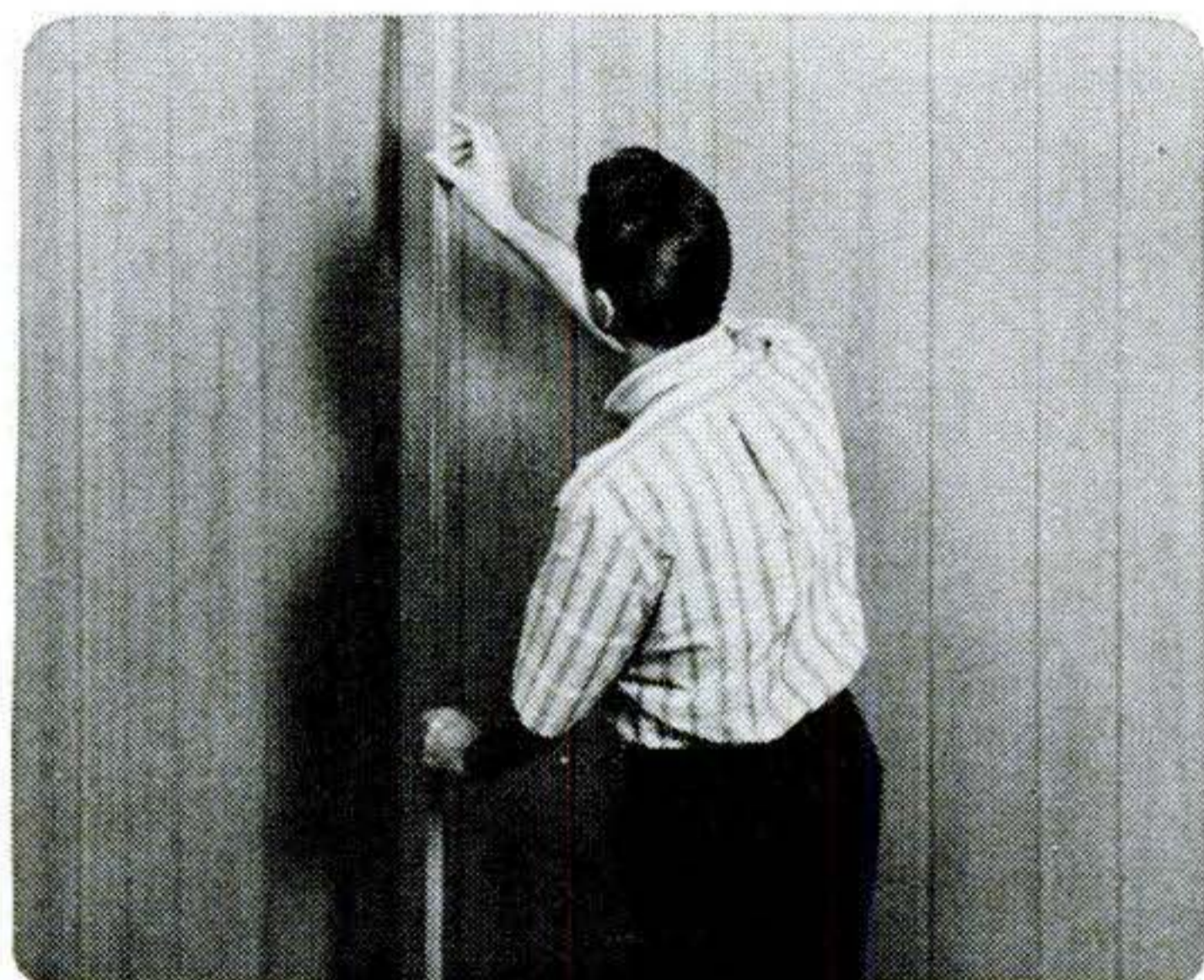
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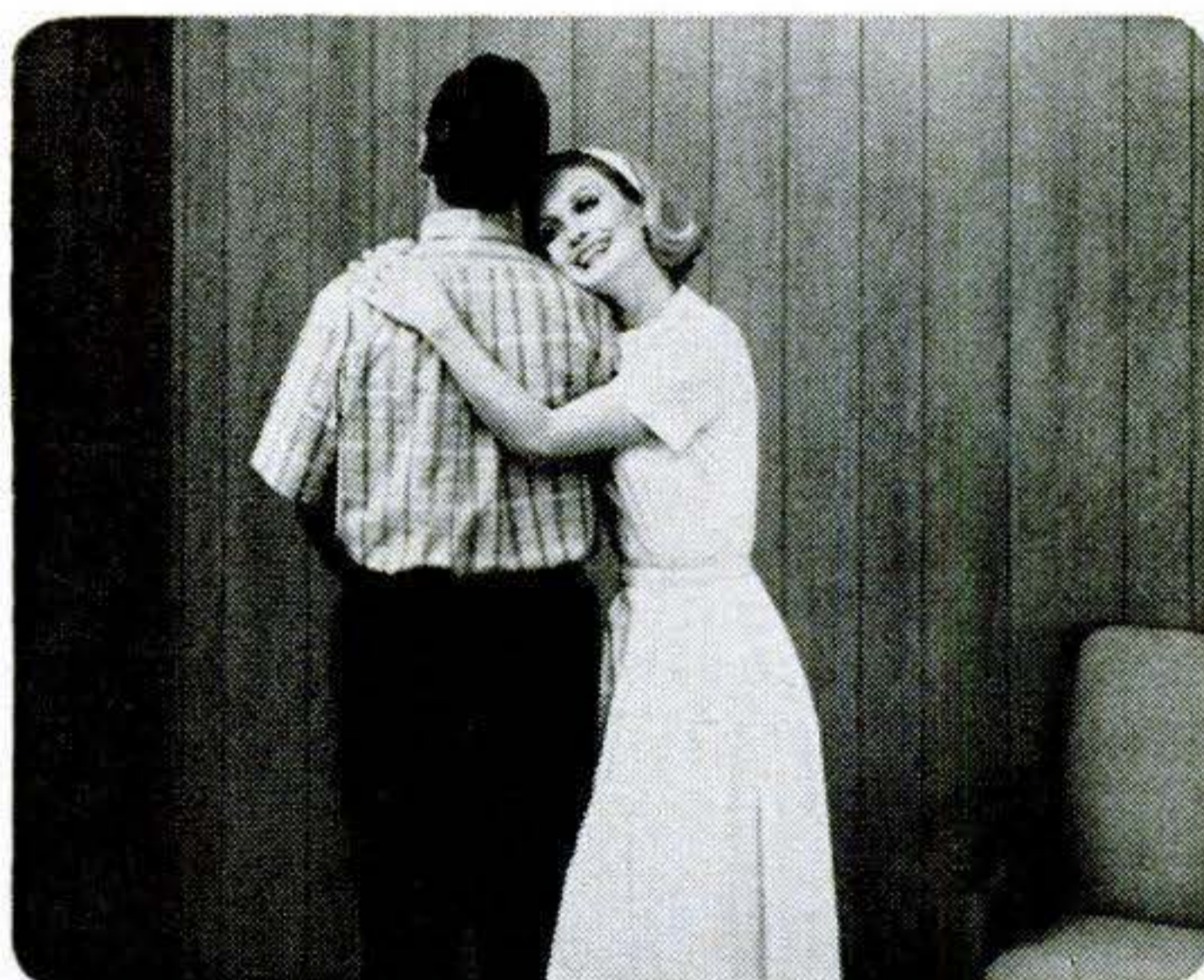
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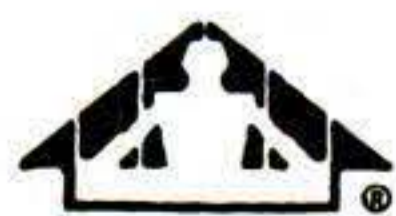
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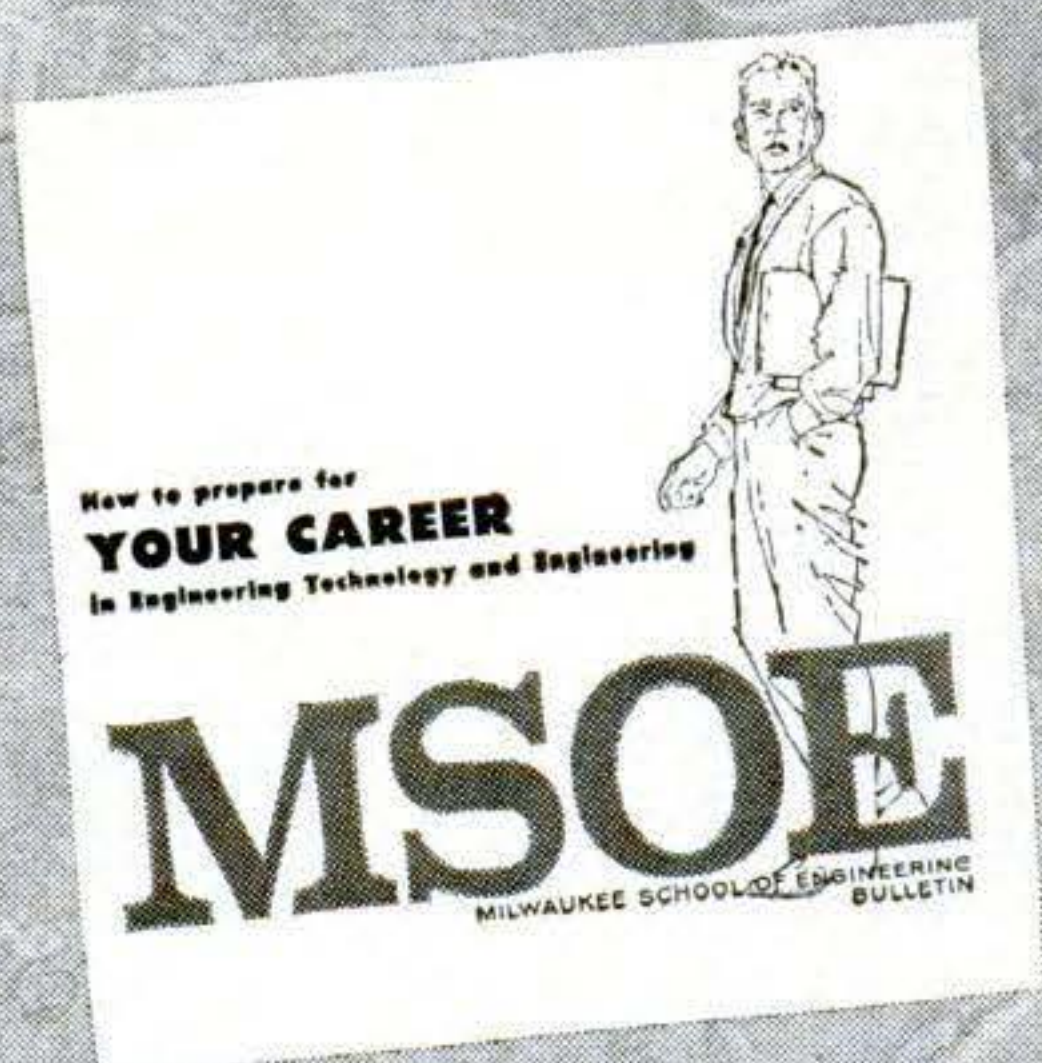
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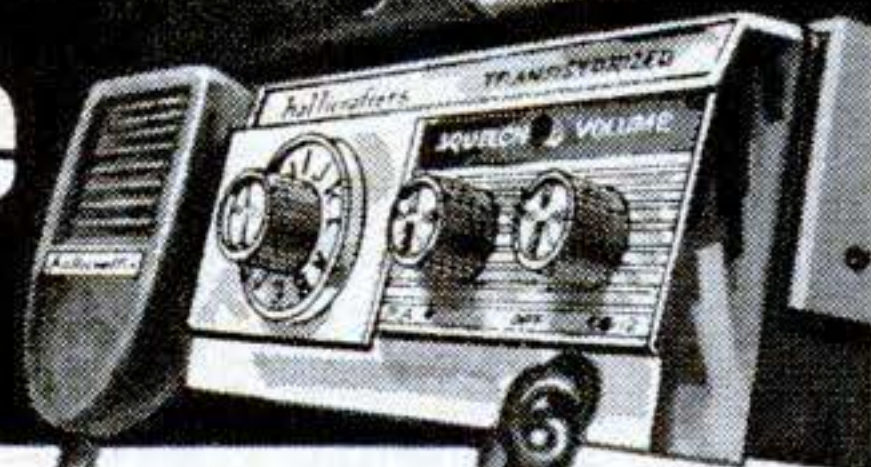
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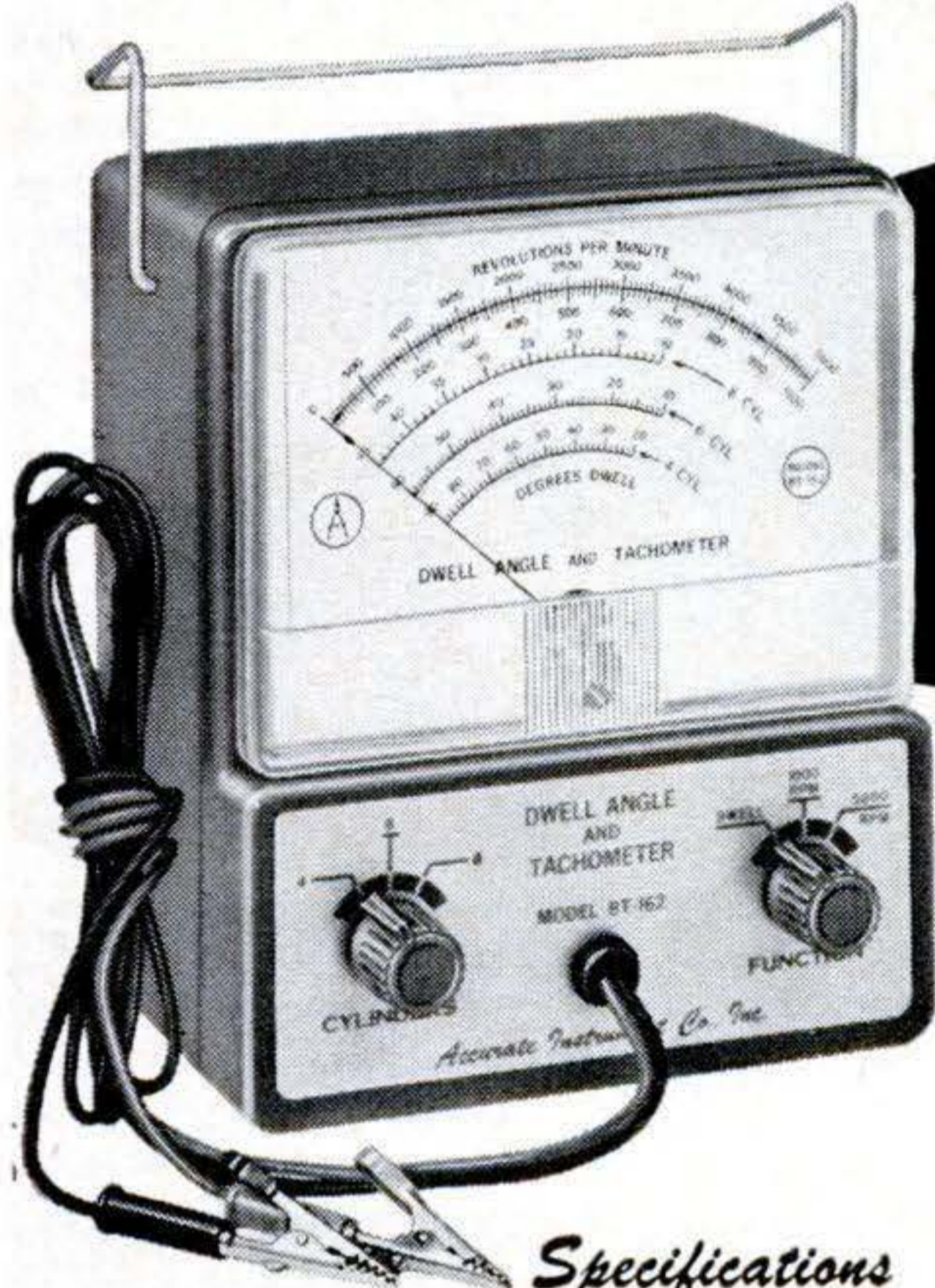
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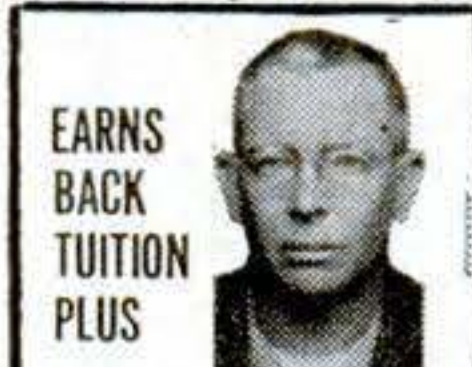
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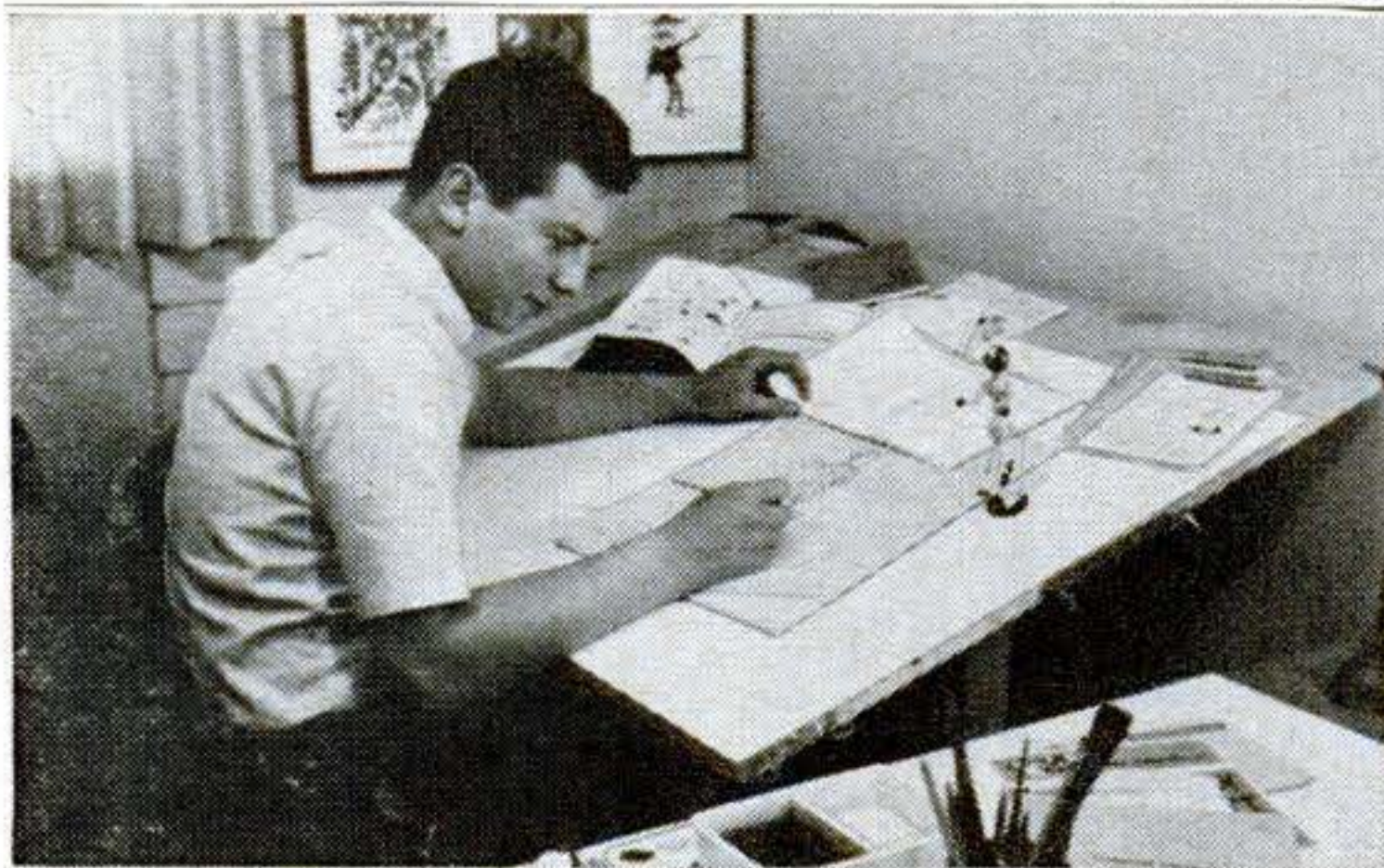
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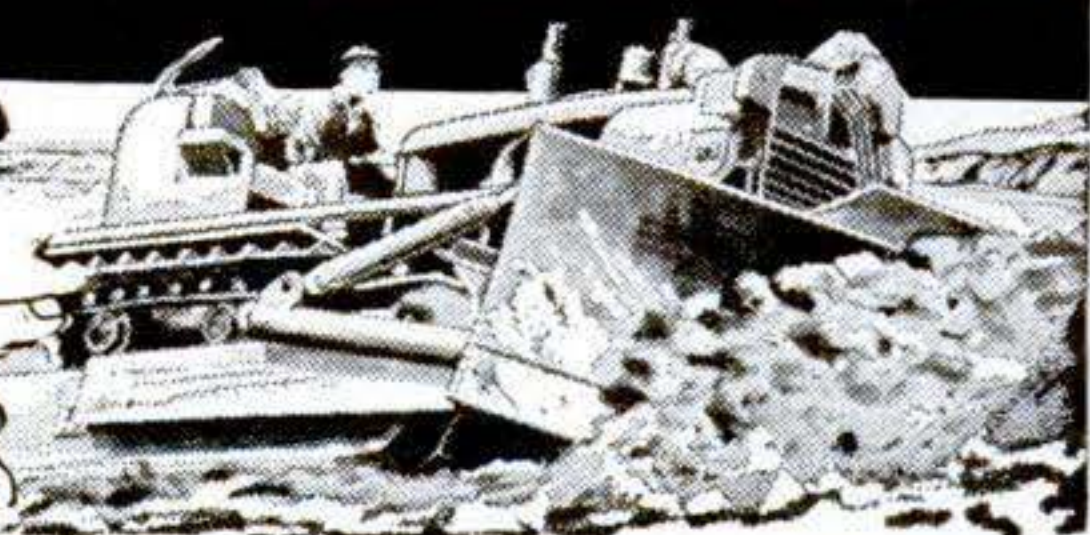


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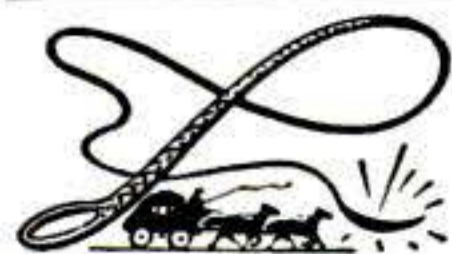
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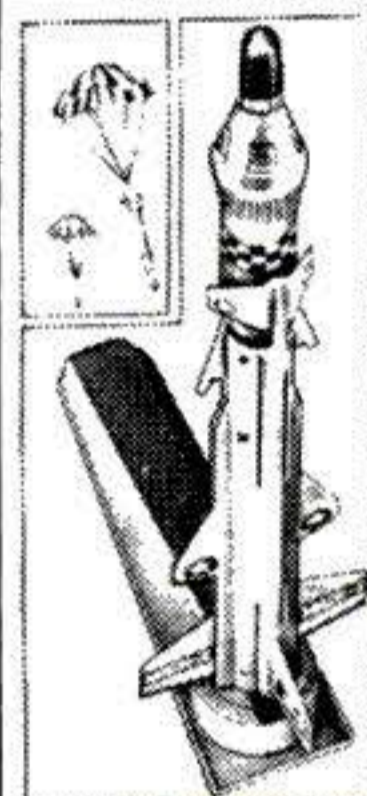
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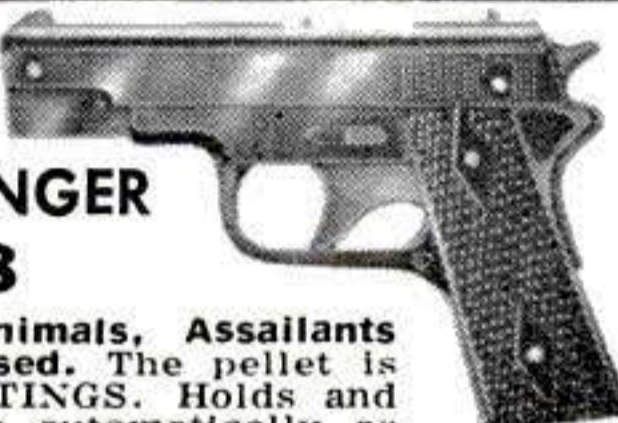
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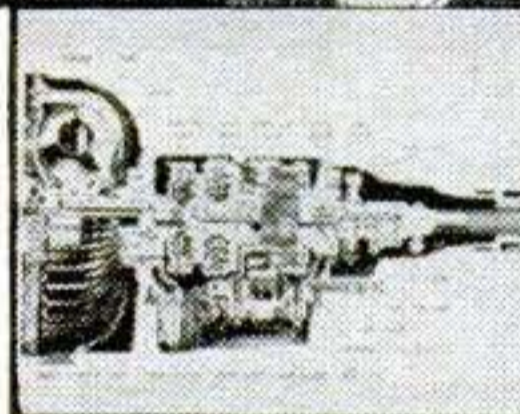
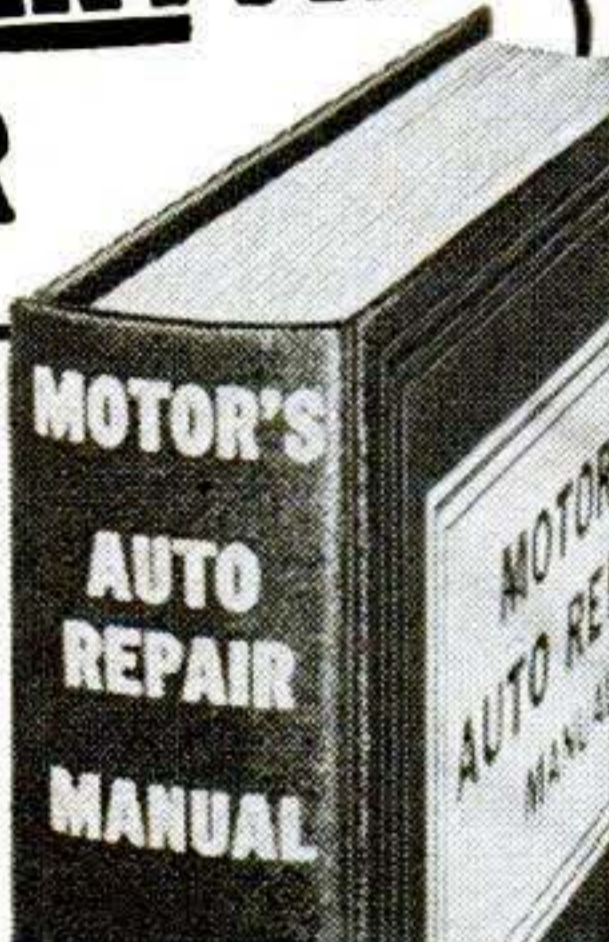
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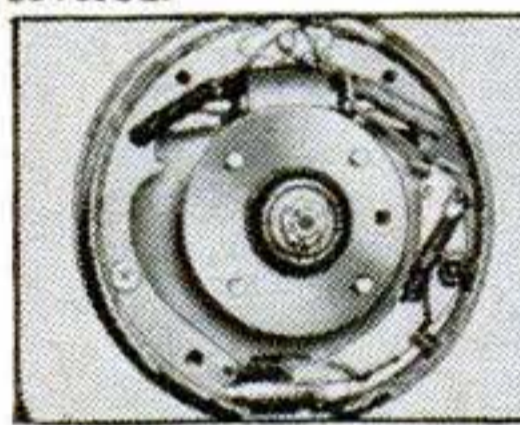
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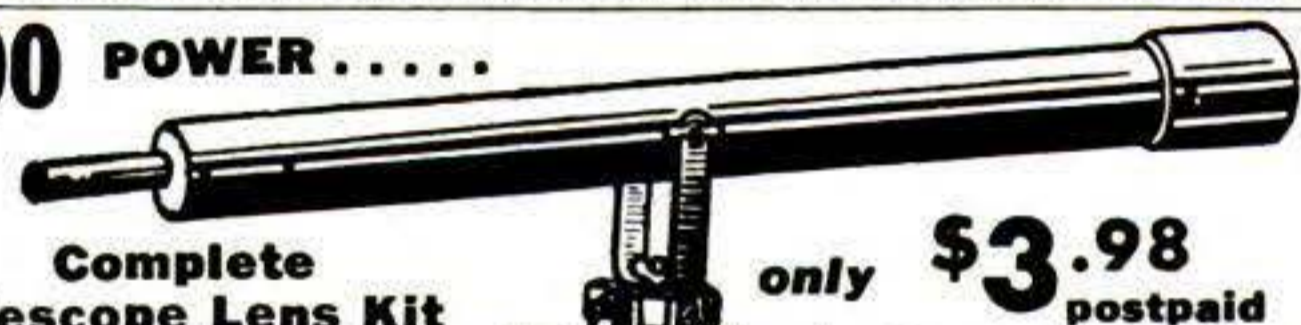
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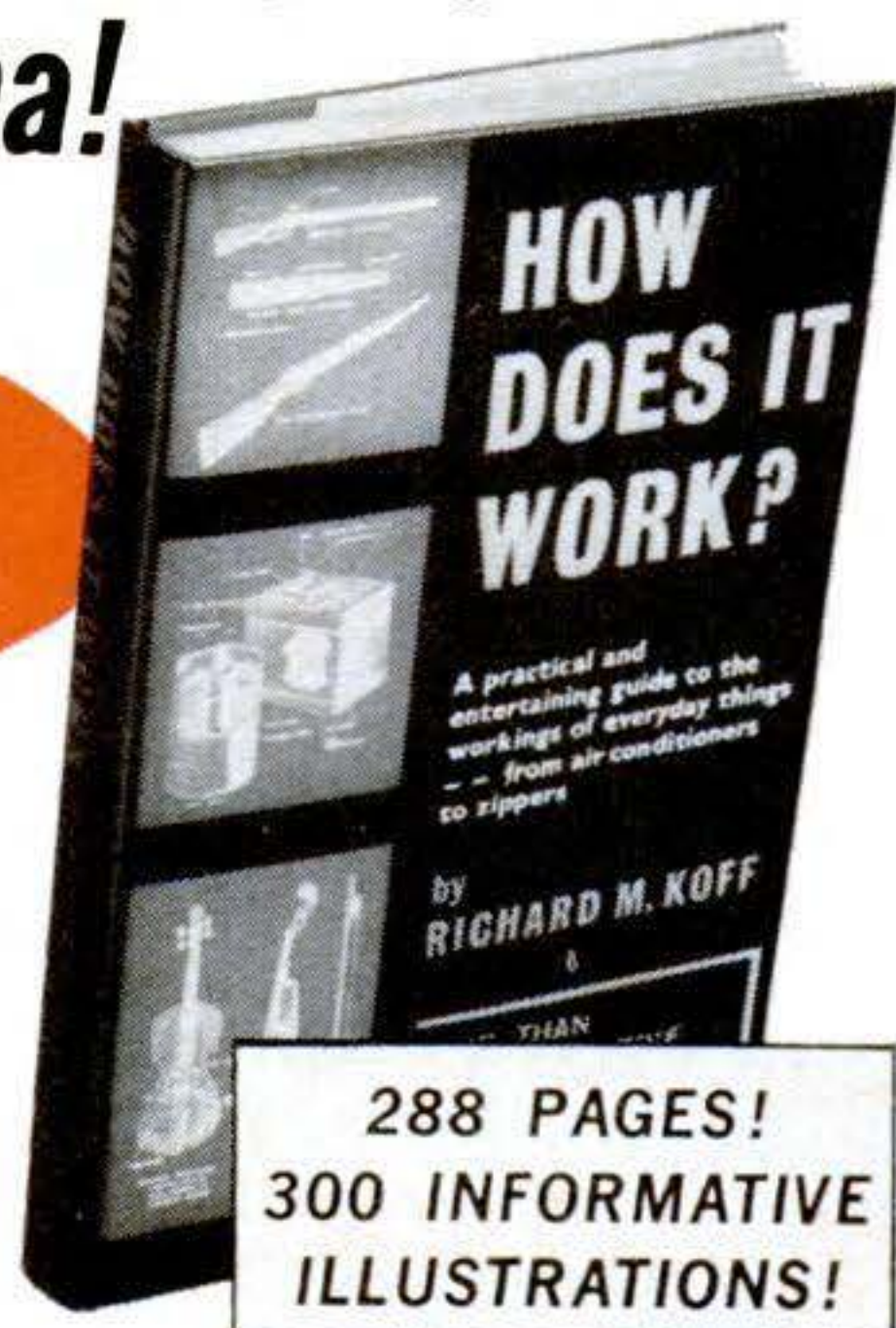
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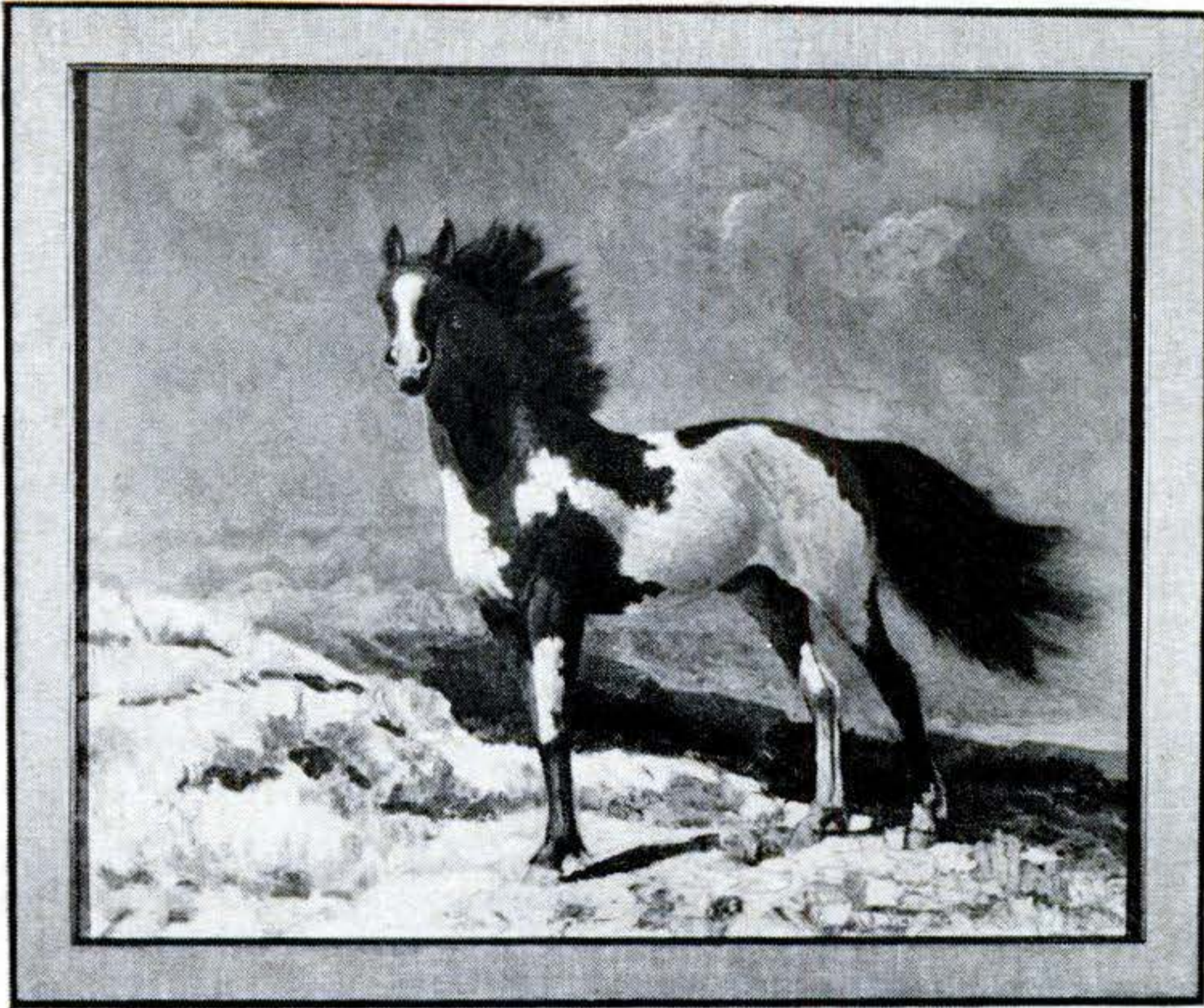
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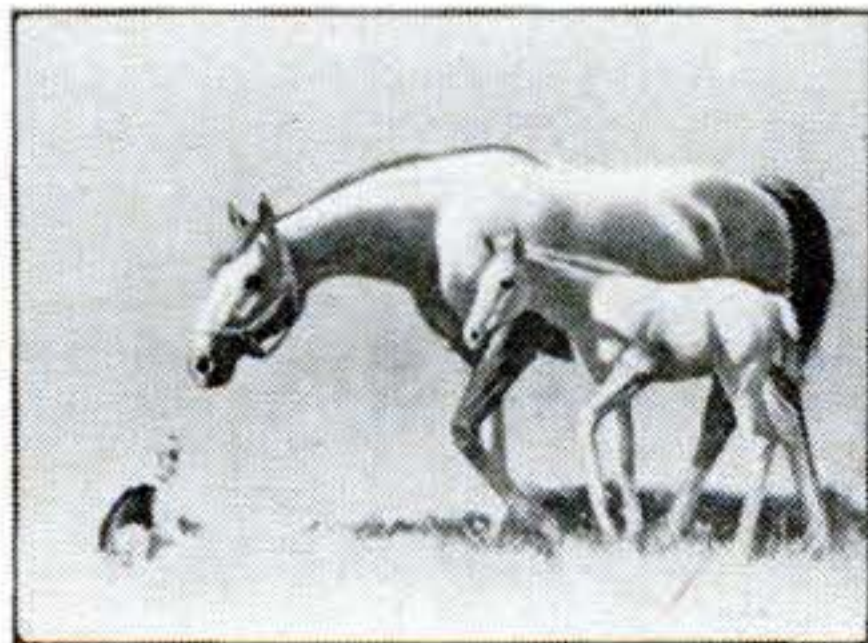
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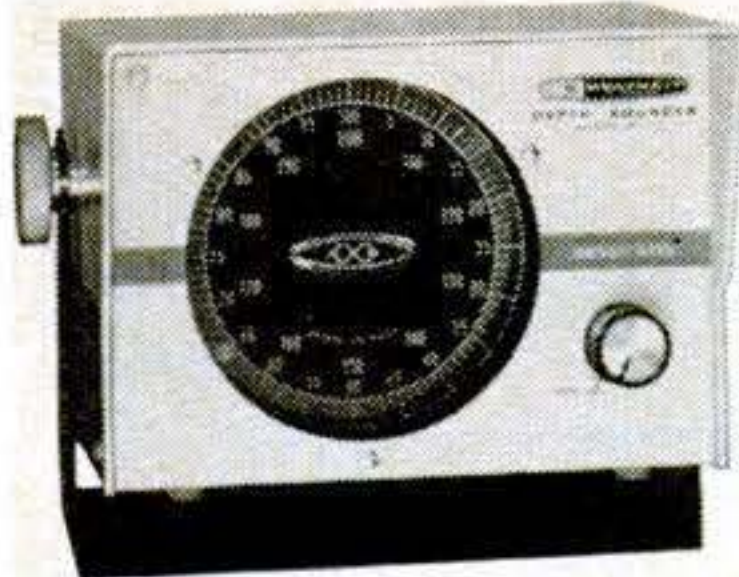
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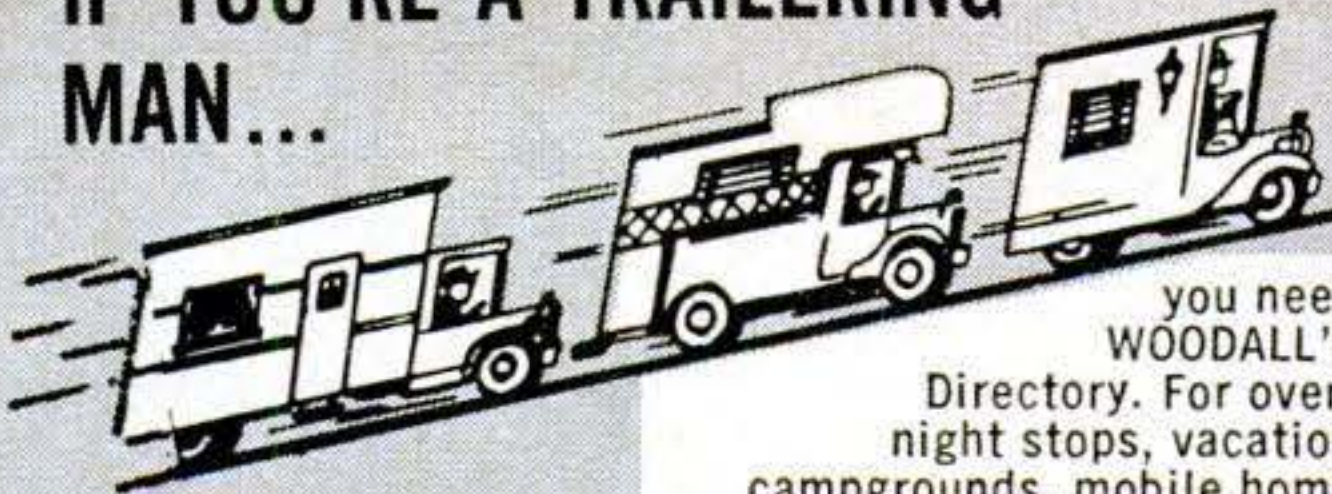
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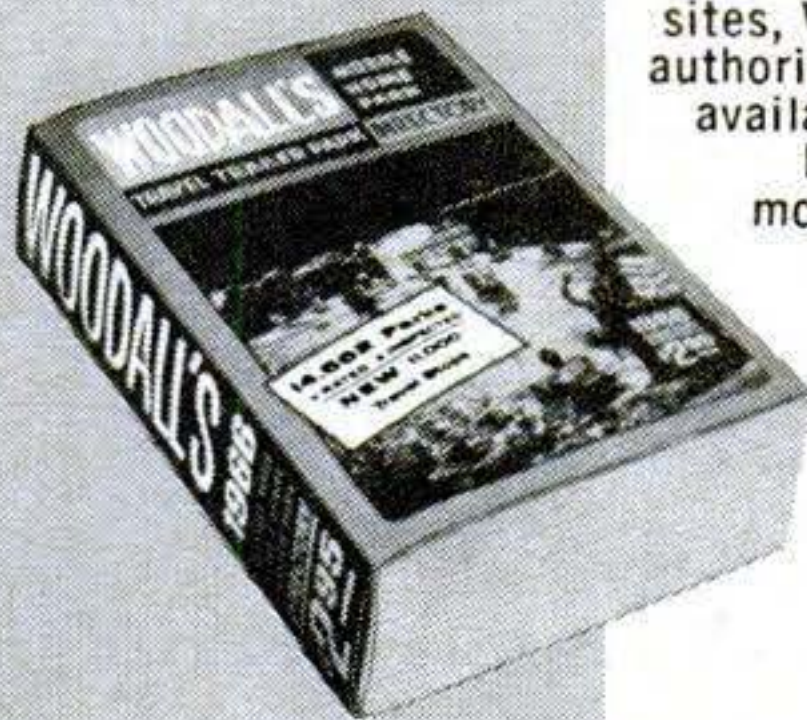
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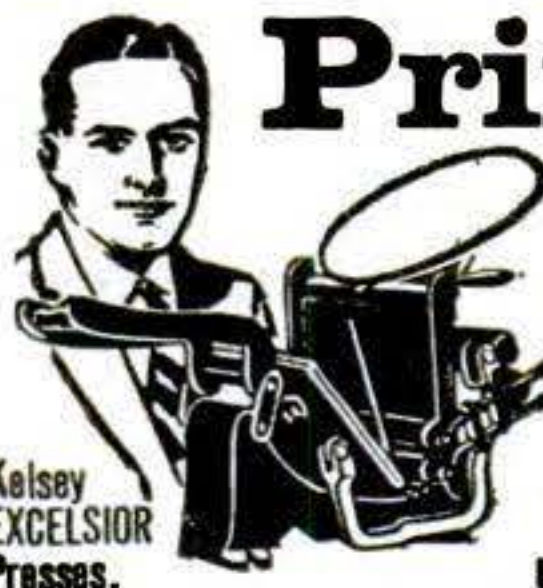


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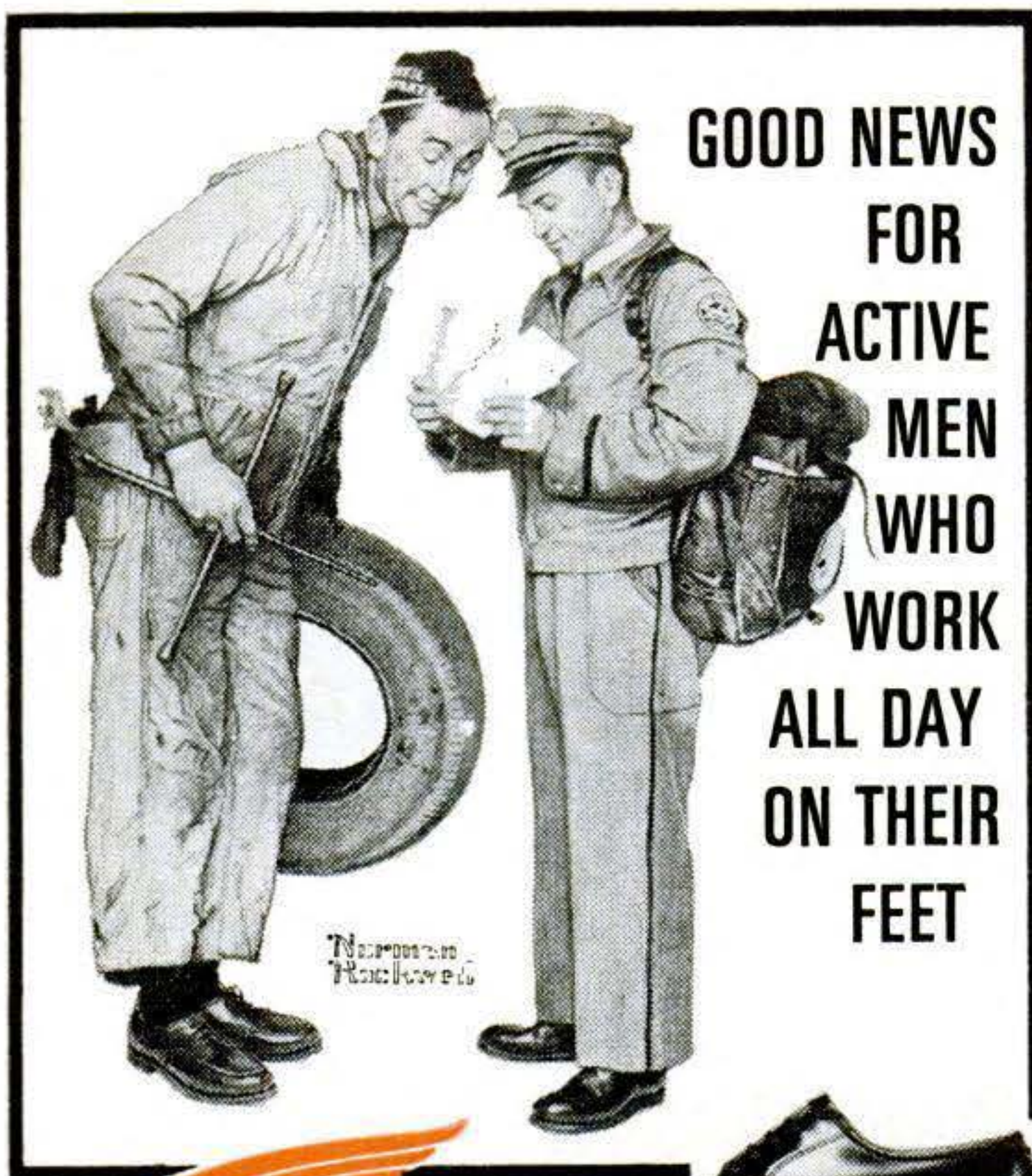
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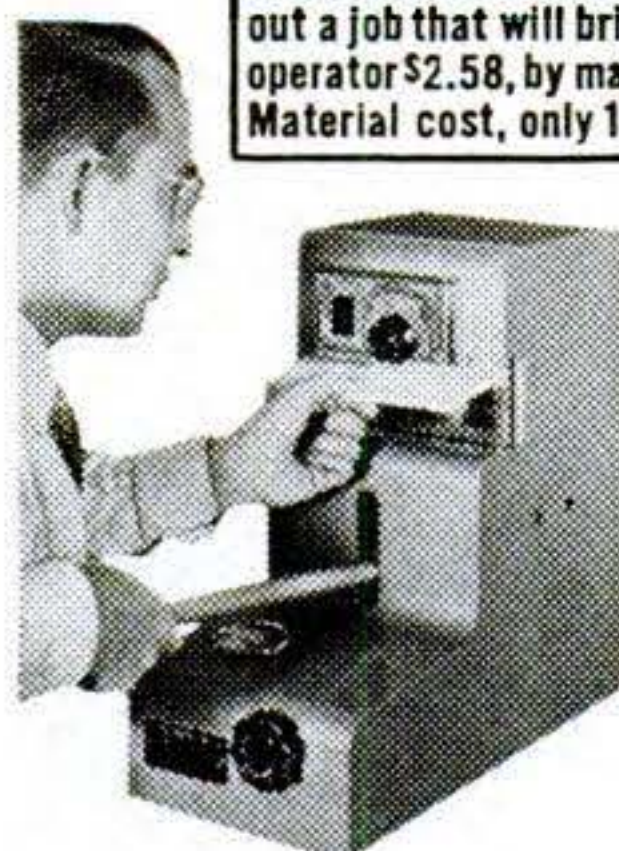
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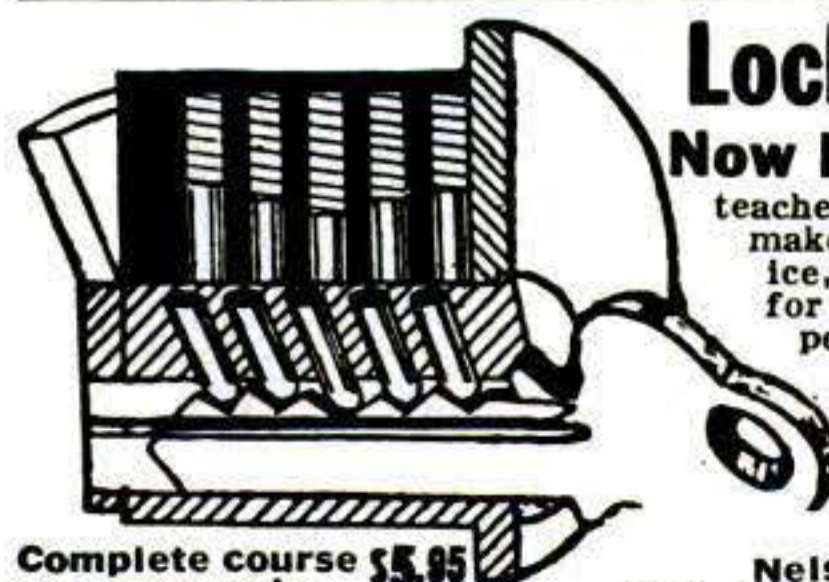
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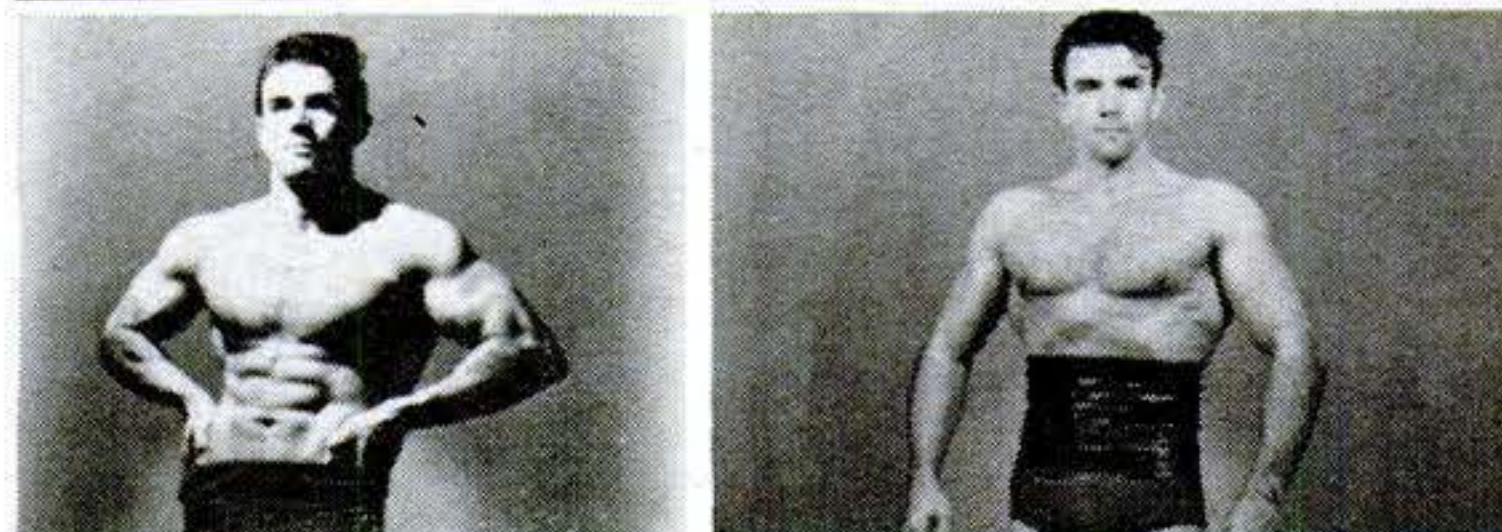


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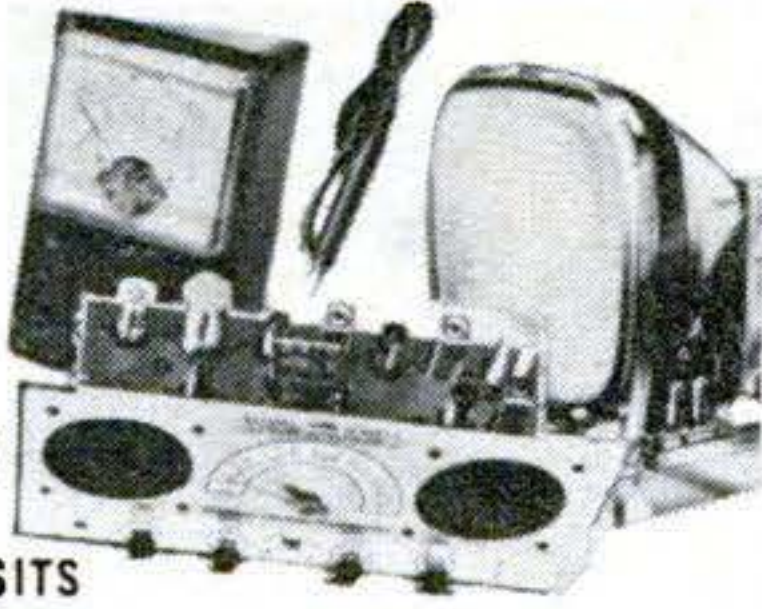
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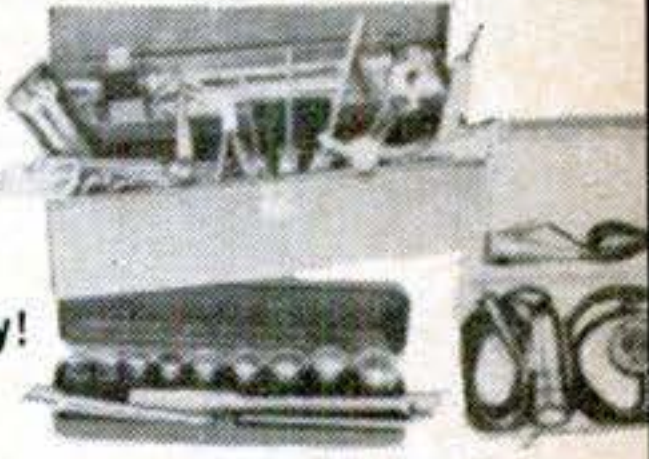
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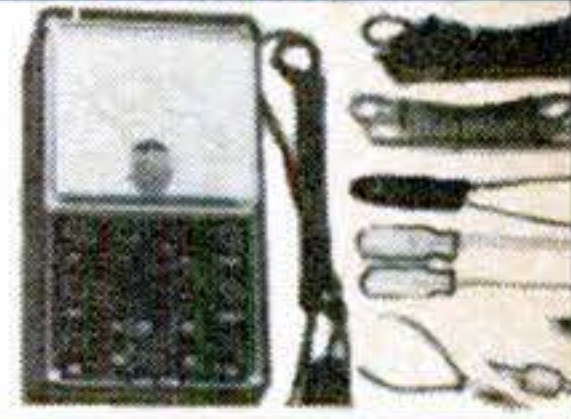
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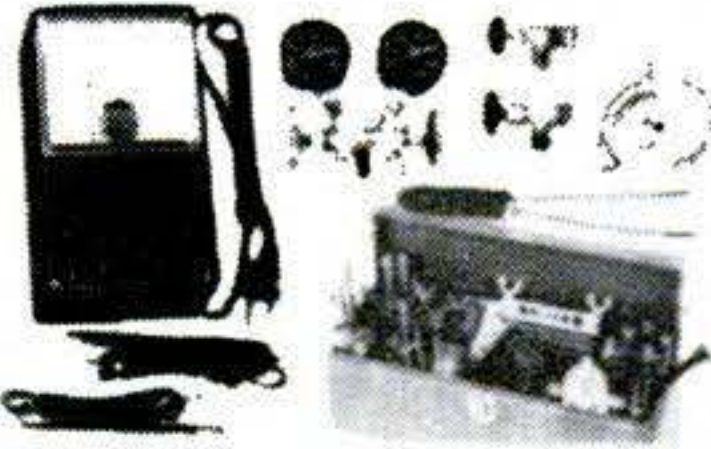
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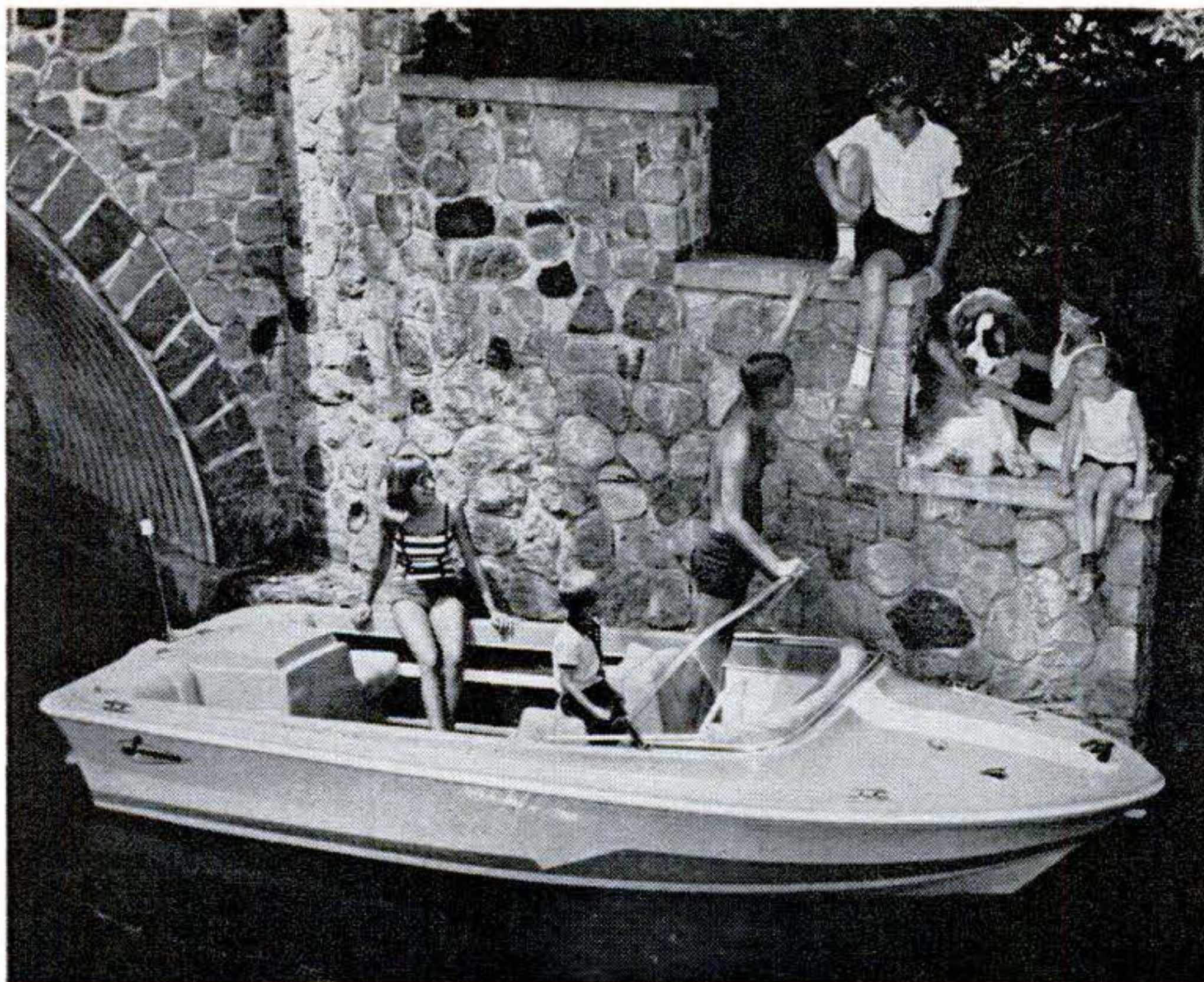
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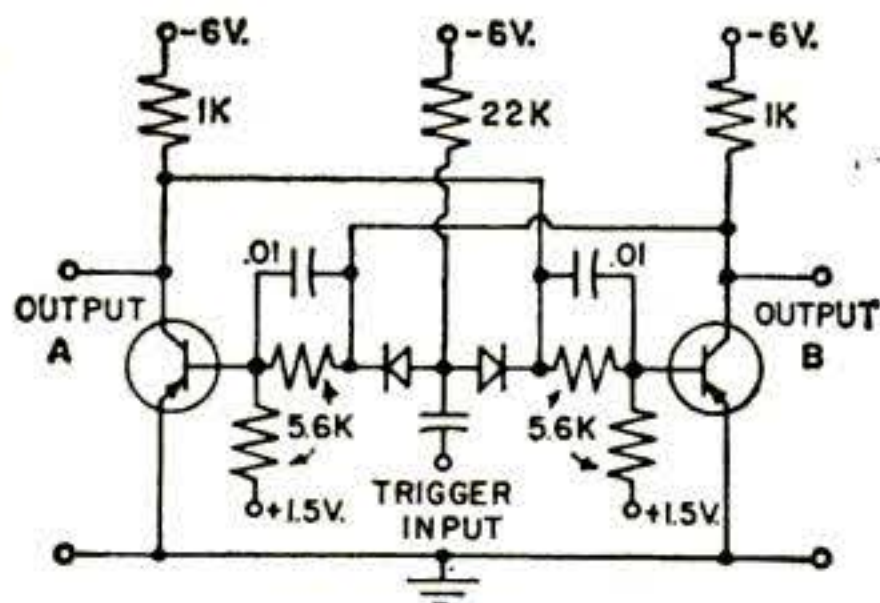
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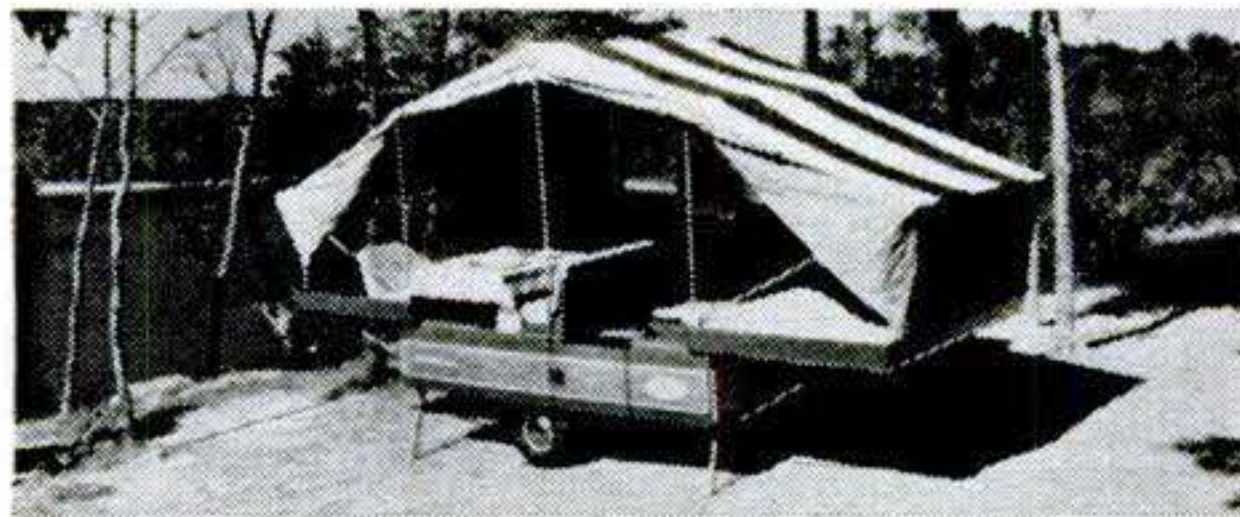


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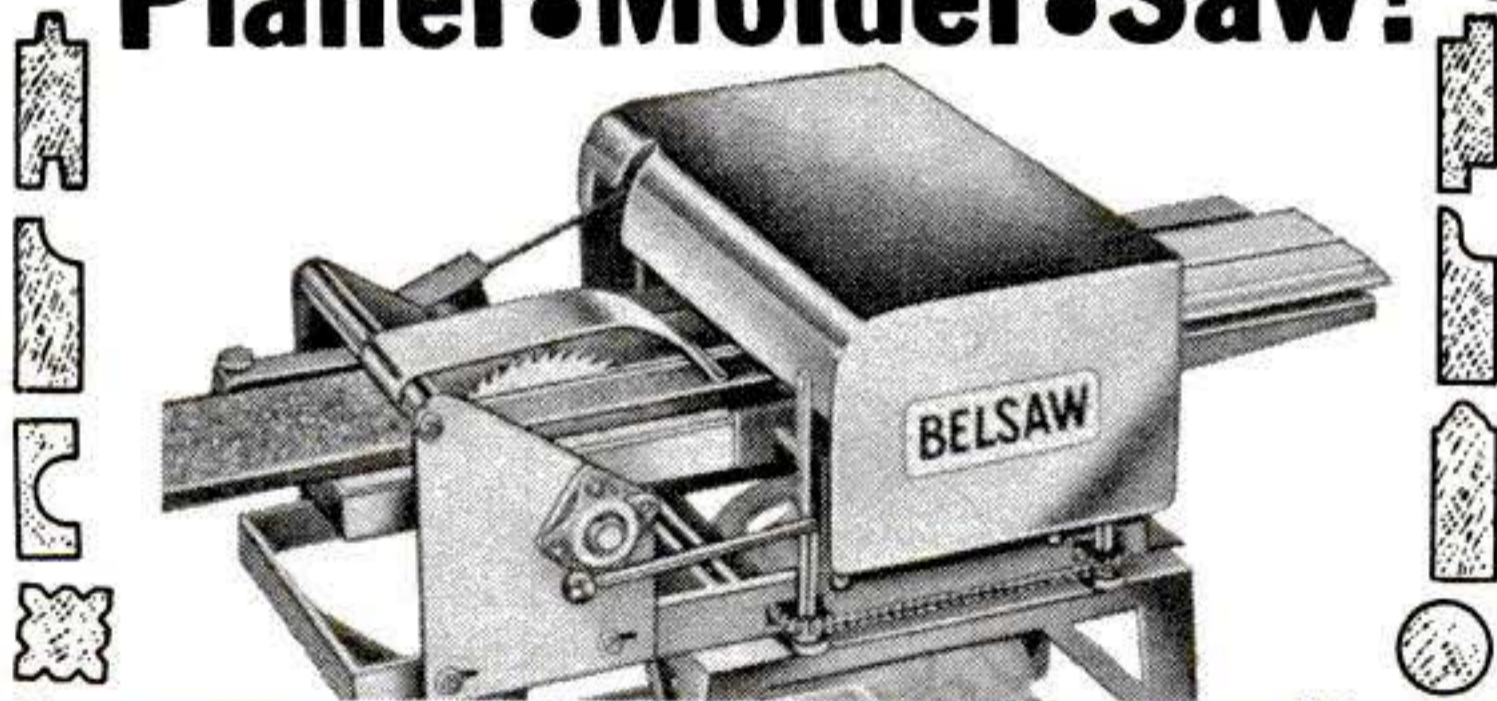
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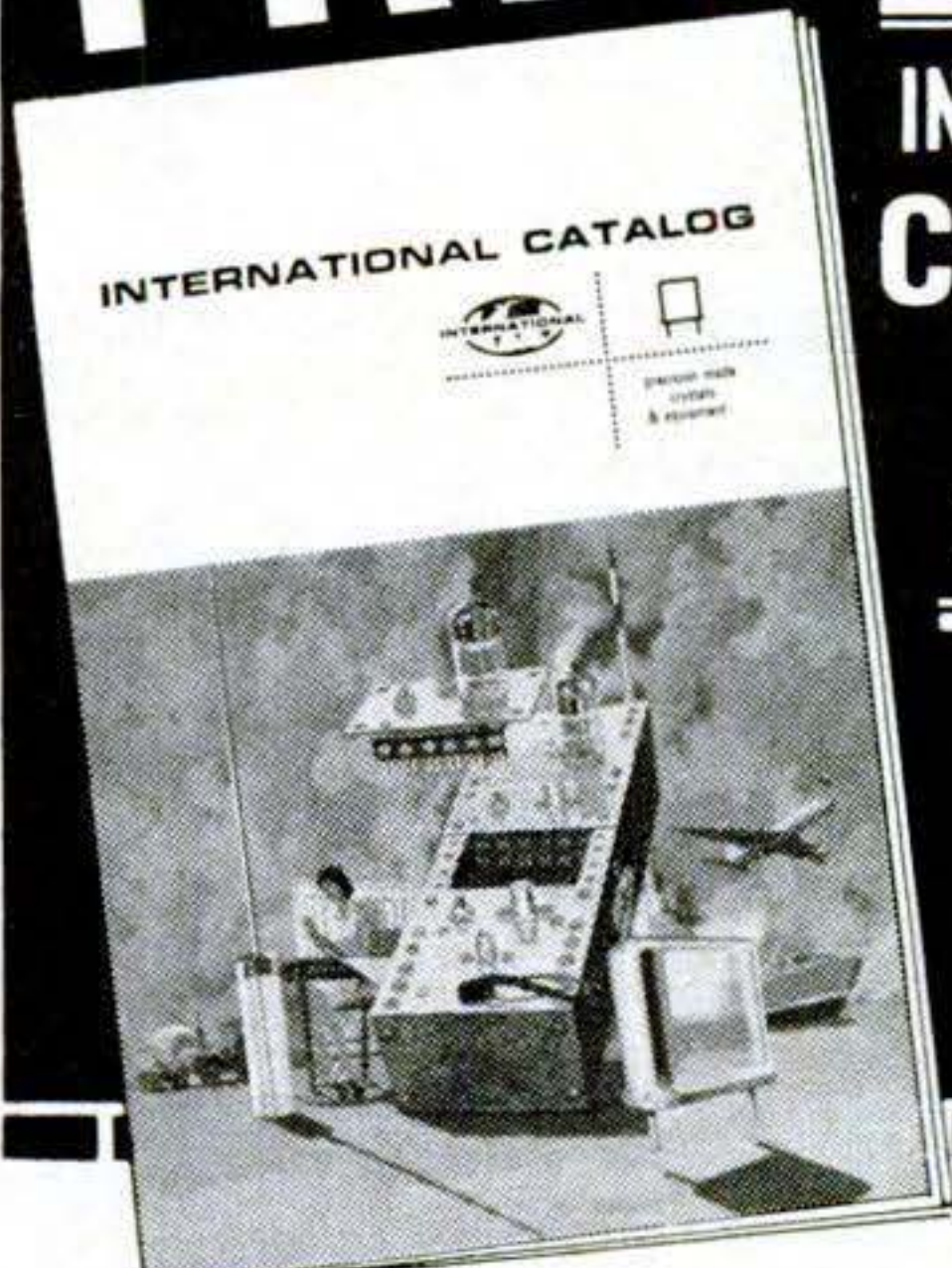
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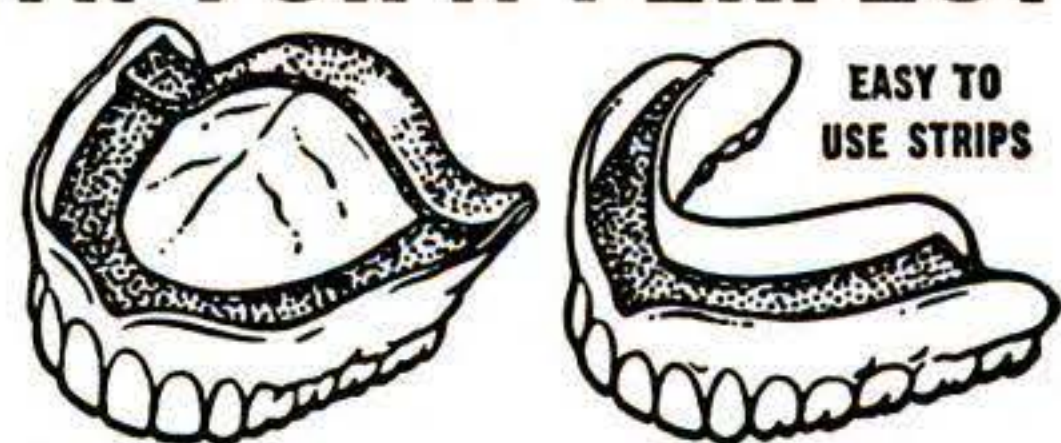
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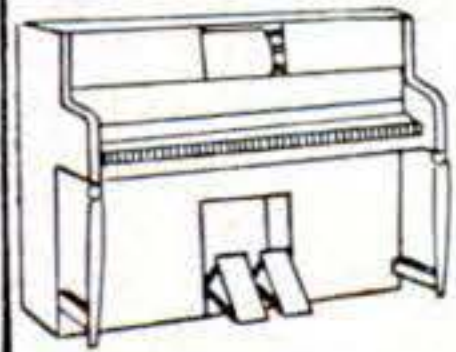
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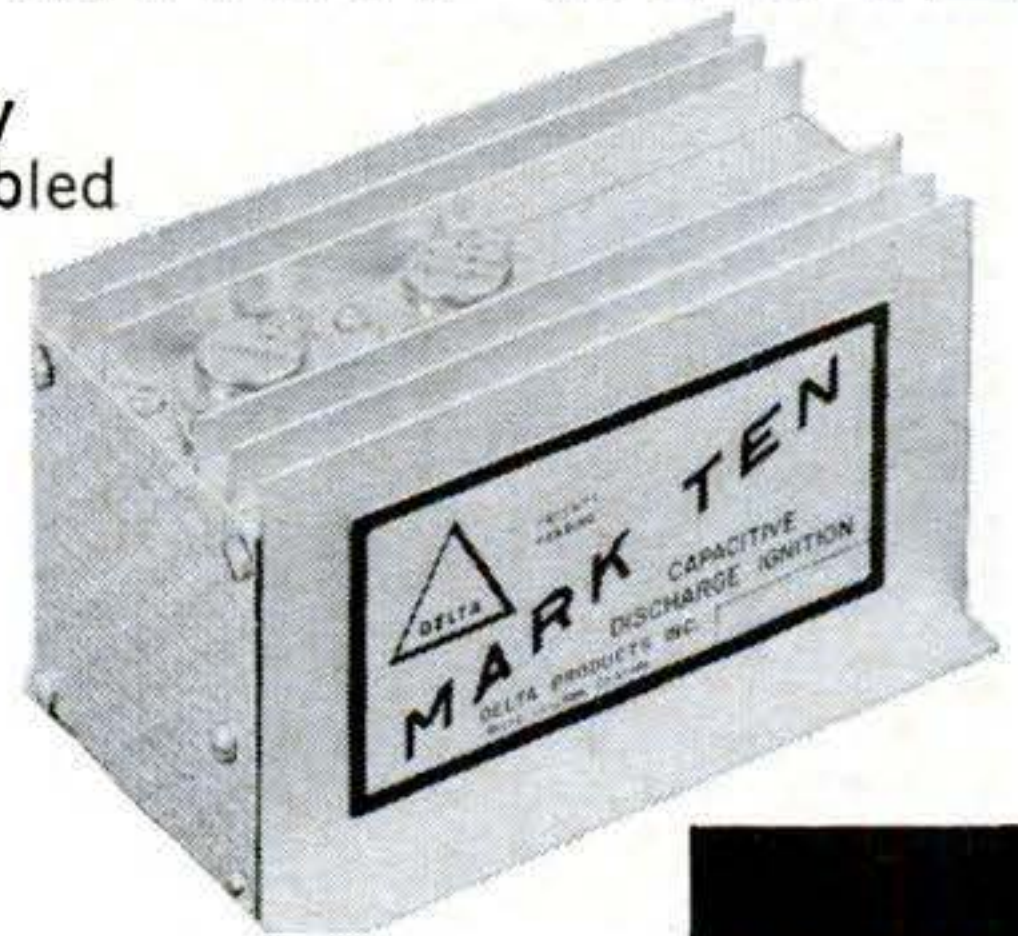
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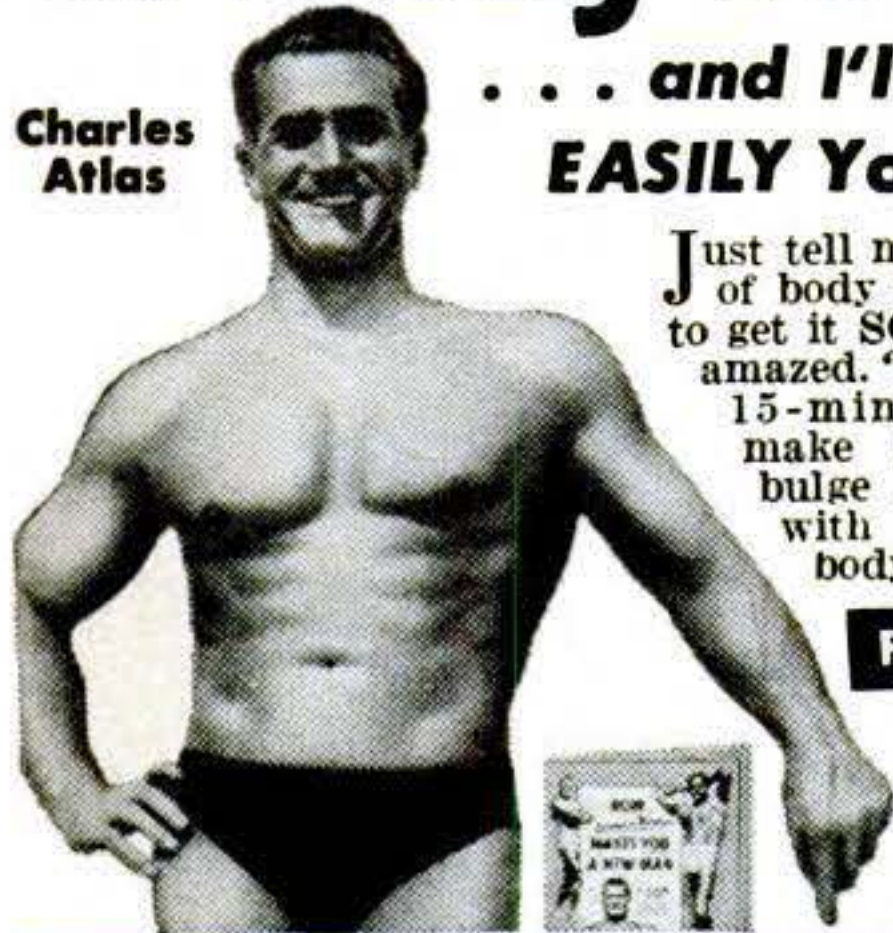
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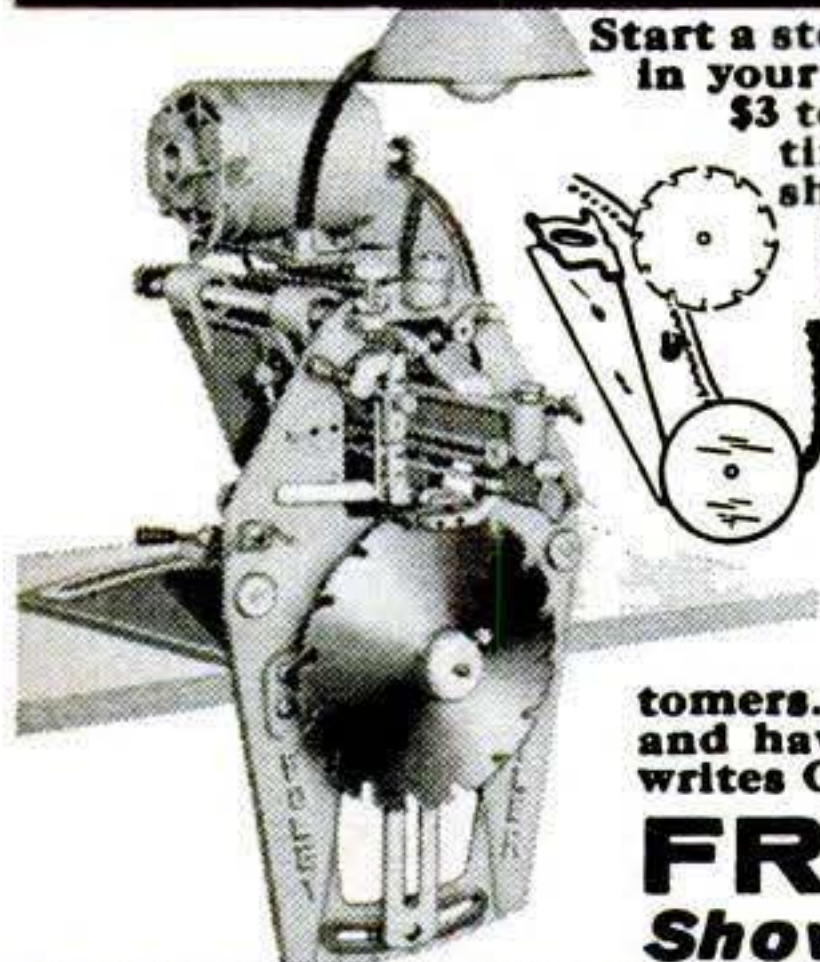
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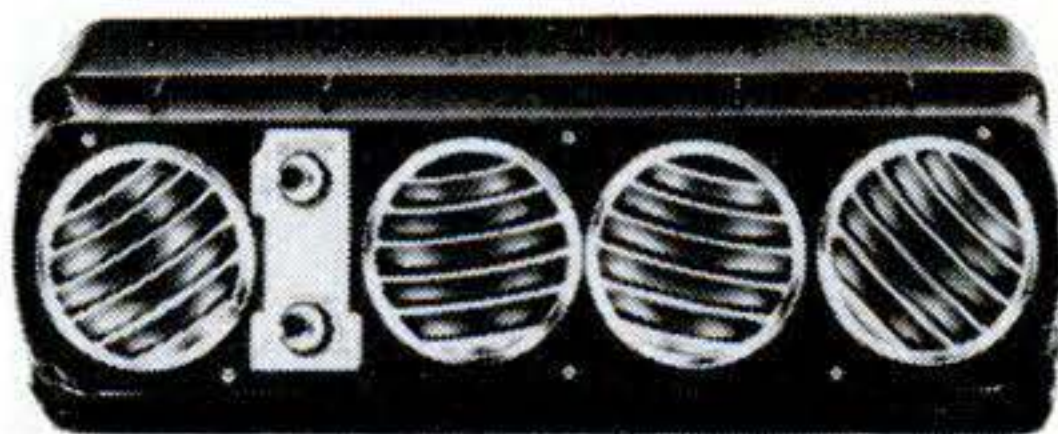
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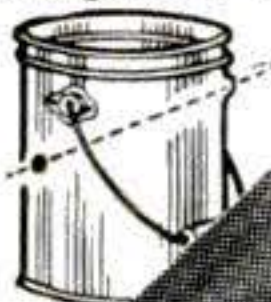
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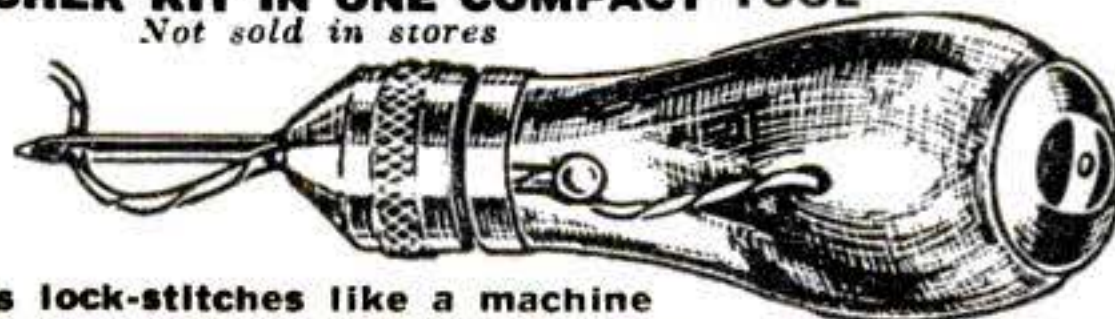
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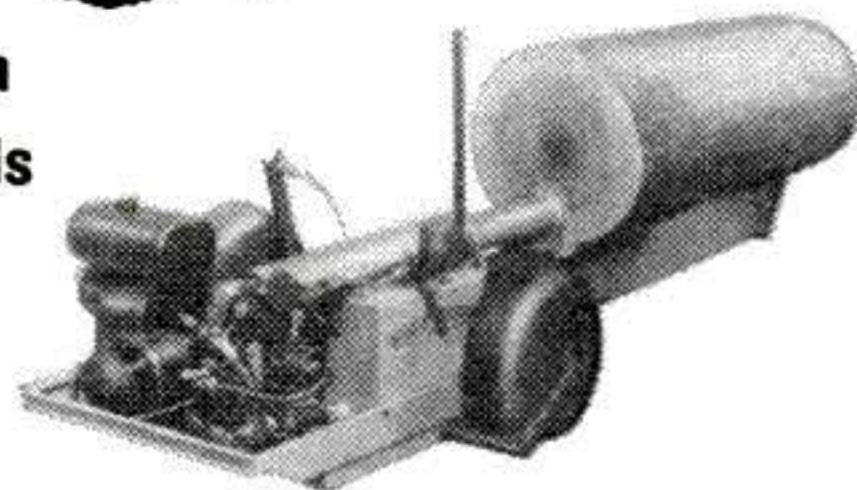


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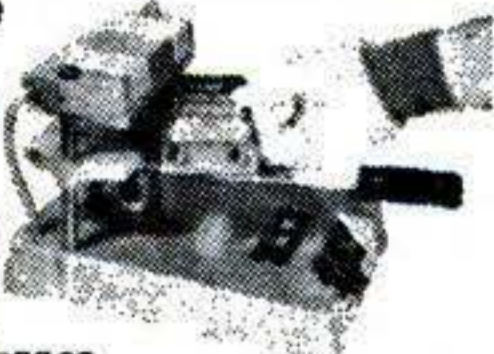
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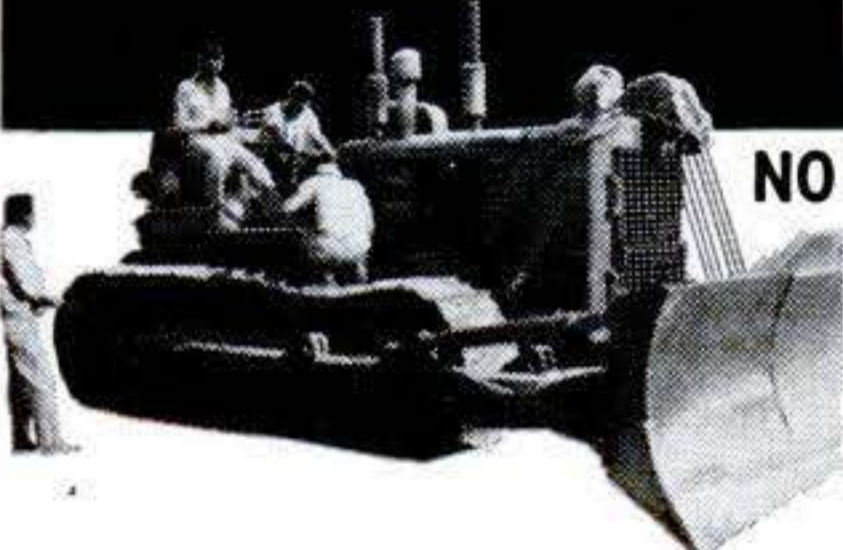


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Detroit Report...

MODERN FOUNDRY TECHNIQUES have quietly revolutionized the cast-iron block. Hot-box coring permits the production of very thin walls and saves both cost and weight. The Mustang/Fairlane 289-cu.-in. V-8 is a leader in the field, and now Ford is testing an all-new lightweight 385-cu.-in. V-8, which is said to be about 75 pounds lighter than the 352- and 390-cu.-in. units it will replace.

Another lightweight V-8 will soon be brought out by American Motors. It will not only replace the current 287- and 327-cu.-in. V-8s, but has been tested and given the okay for installation in the American. The new engine draws heavily on design detail from the excellent Torque Command Six (232 cu. in.): rugged, fully counterbalanced crankshaft with high crankpin overlap, big bore and short stroke, extremely short connecting rods, high-precision valve gear.

The next U.S.-built front-drive car will probably be a Cadillac. The current Cadillac line will continue with small changes in '67, and the front-drive car will be an addition to Cadillac's model range, insiders say. Why? Cadillac's production capacity is fully taken up, but it seems that the success of the Toronado is making the corporation take steps to exploit the situation. Right now, Cadillac is running a large-scale test program on the Toronado.

Whenever Ford comes up with a front-drive model, it will be a car with a new name, according to close observers of Ford product planning. Ford has no test program for front-drive components at the moment, which means that there will be no front-drive car from Ford until 1969—unless a crash program for '68 is started soon.

Next year's Thunderbird line will include a four-door sedan for the first time. The T-bird will also switch from unit construction to separate frame and body. The styling has a clear relationship with the present model, with a prominent full-width grille.

United States Steel's torsion-bar seat (the whole seat bottom and backrest flex by twisting steel rods anchored in the seat frame) may become standard in the '67 T-bird. The prototype was developed by Stubnetz Spring Division—a principal supplier of seats for '66 Fords.

All Rambler models will be restyled for 1967. The cars will be lower and have a longer, lean-

er look and the sloping roof and fender lines popularized by Buick's Riviera. This is the first time in history that American Motors has made a total change-over. The main reason goes deeper than the grim '66-model sales picture: When the Classic got its all-new 1963 body, American sales fell off. When the American was restyled for '64, Classic sales dropped. Next year, American Motors is aiming for gains across the board.

Suddenly, everybody wants to build a "safety car." Chrysler is having one built in California (called the 300-X); Martin Aircraft has designed one that could protect the riders in a 90-m.p.h. crash; and two European prototypes will be shown at the New York Auto Show next month—the Sigma and the Secura, both made in Italy. The latest move is a \$70,000 contract from the N.Y. State Department of Motor Vehicles under which Republic Aviation will research and develop concepts for a safety car. Republic holds the view that accidents will happen—though design guidelines pay some attention to accident prevention—and concentrates on limiting crash injuries.

As soon as Sears, Roebuck had taken their two-ply tires off the racks (see p. 108), they started to sell the French-made Michelin X radial-ply tires. This tire uses steel breaker plies and is known as the highest-mileage passenger-car tire in the business. It is standard equipment on many Citroën and Peugeot models.

Lincoln-Mercury's Cougar won't be a "stretched" Mustang but an all-new car with its own distinctive styling. The wheelbase is set at 111 inches, the grille has a vertical split in the middle, and the body is styled as a two-door hard-top. Engines will be strictly V-8s: 289 cu. in. standard and 390 cu. in. optional.

Jan P. Norbye
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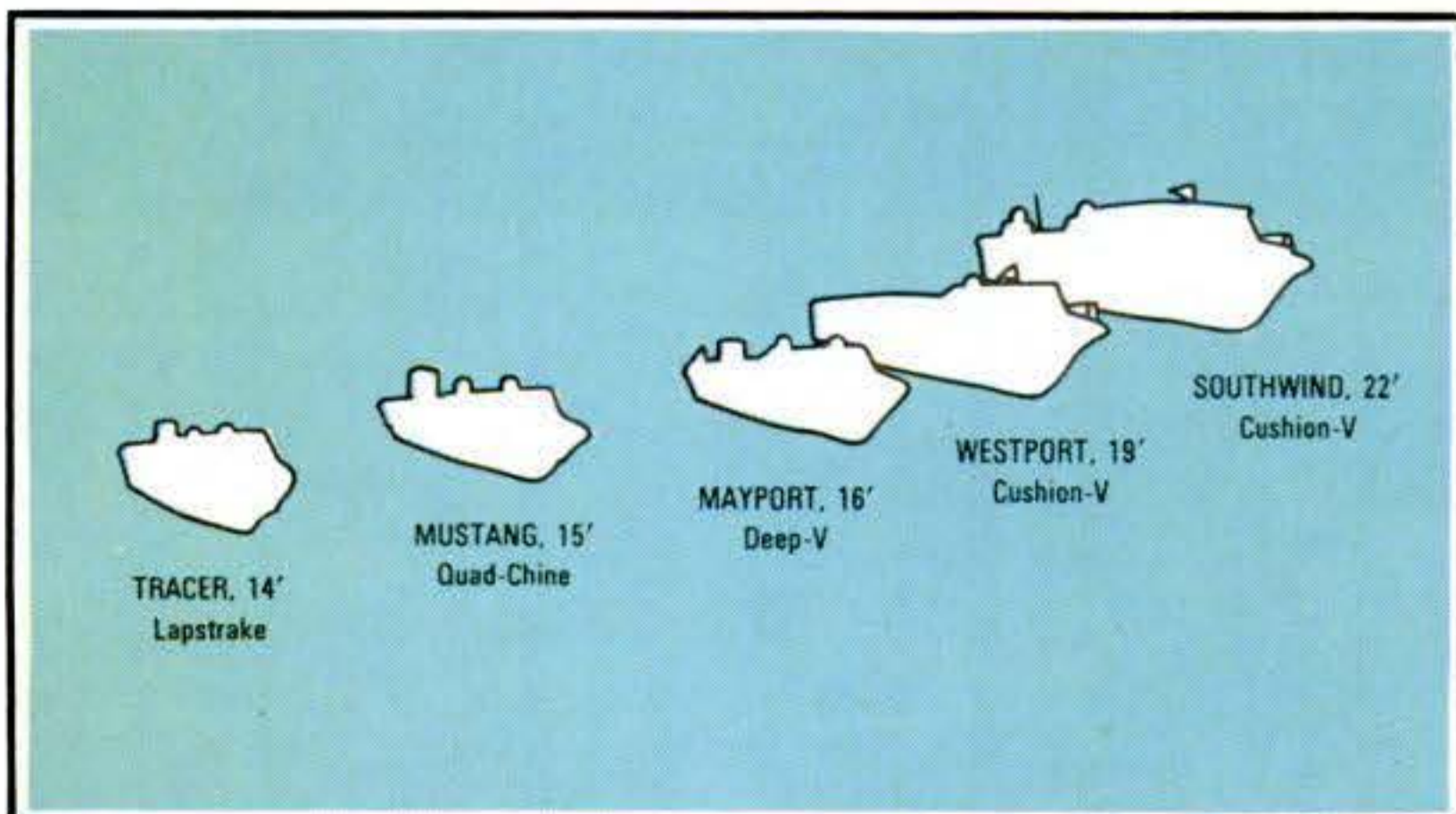
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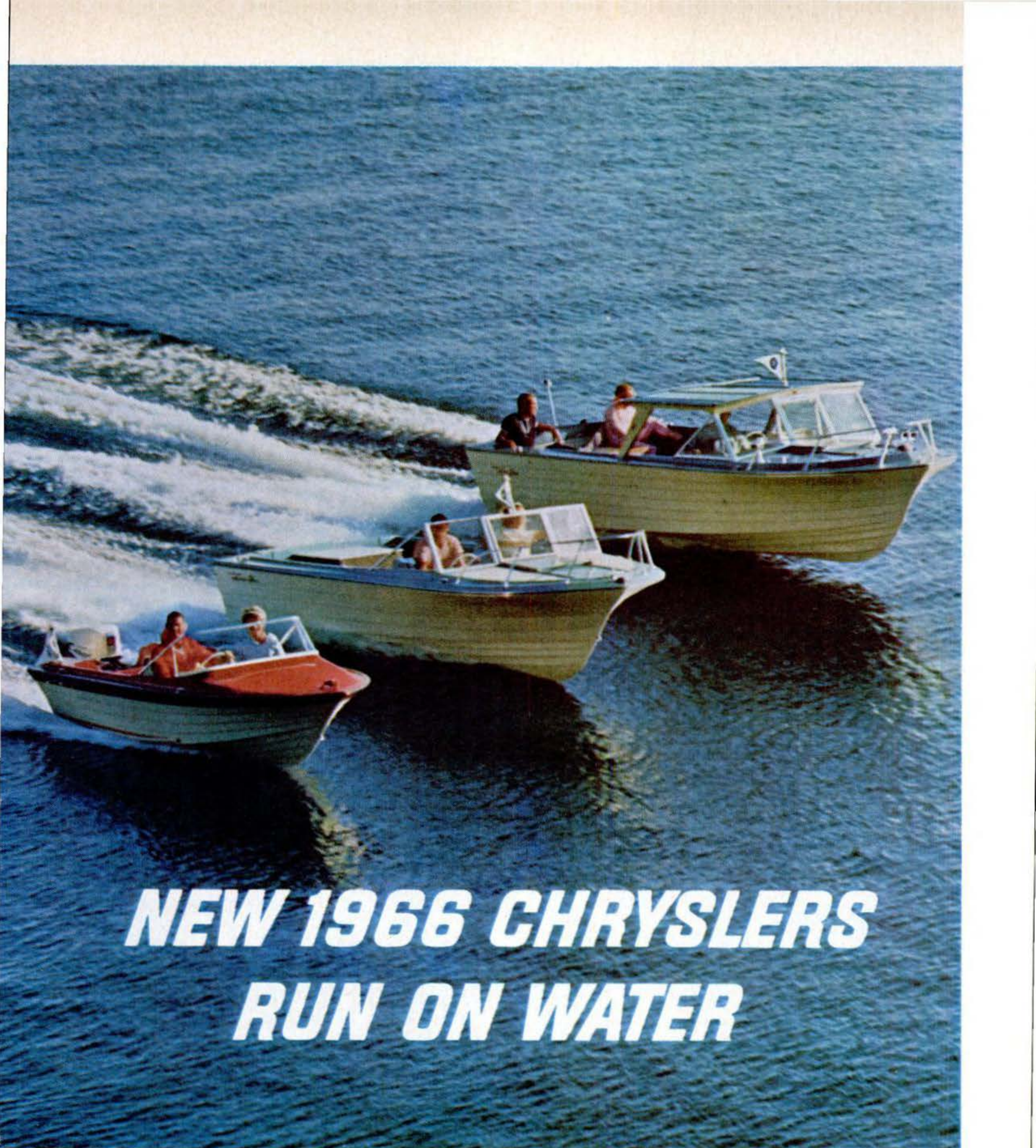
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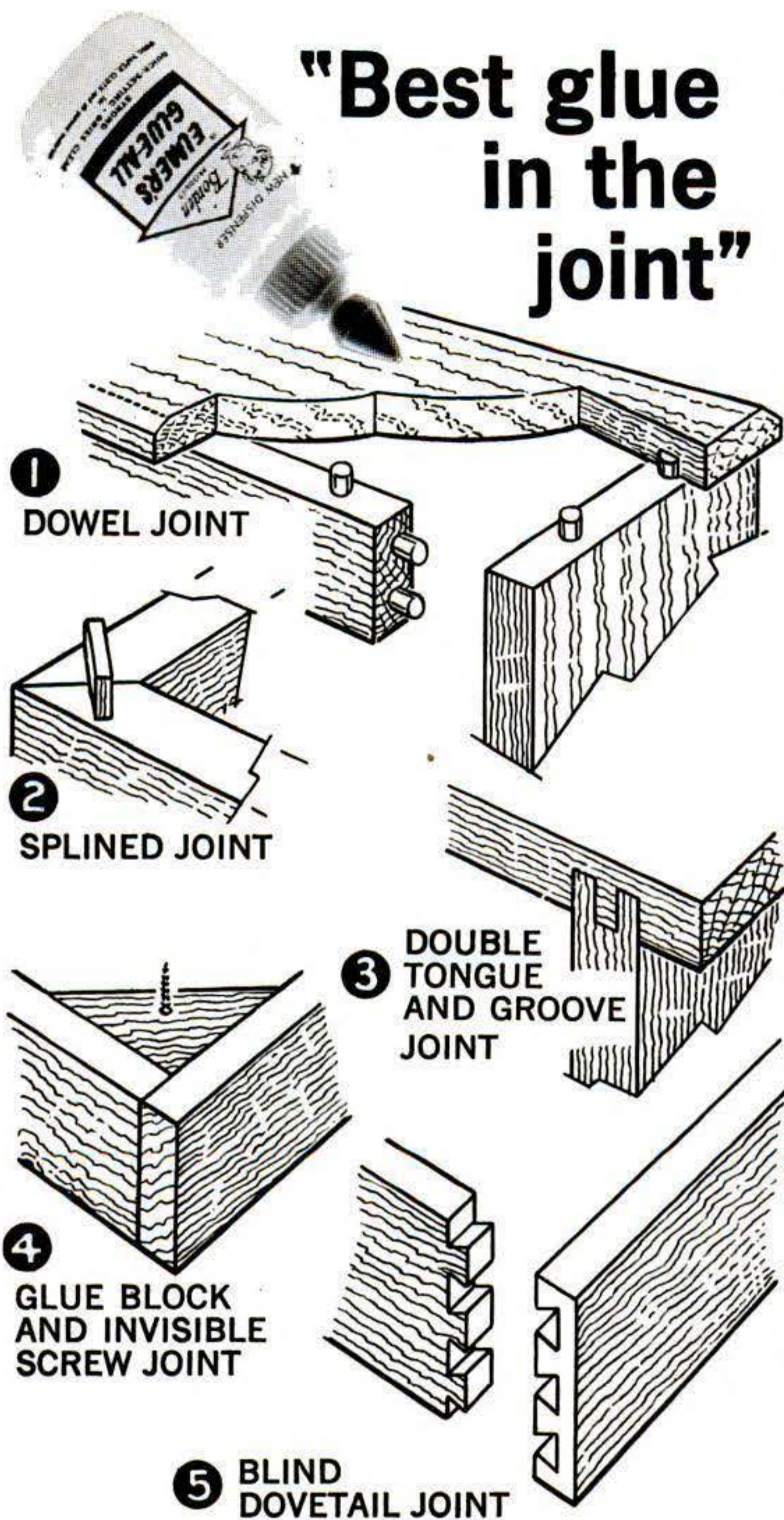
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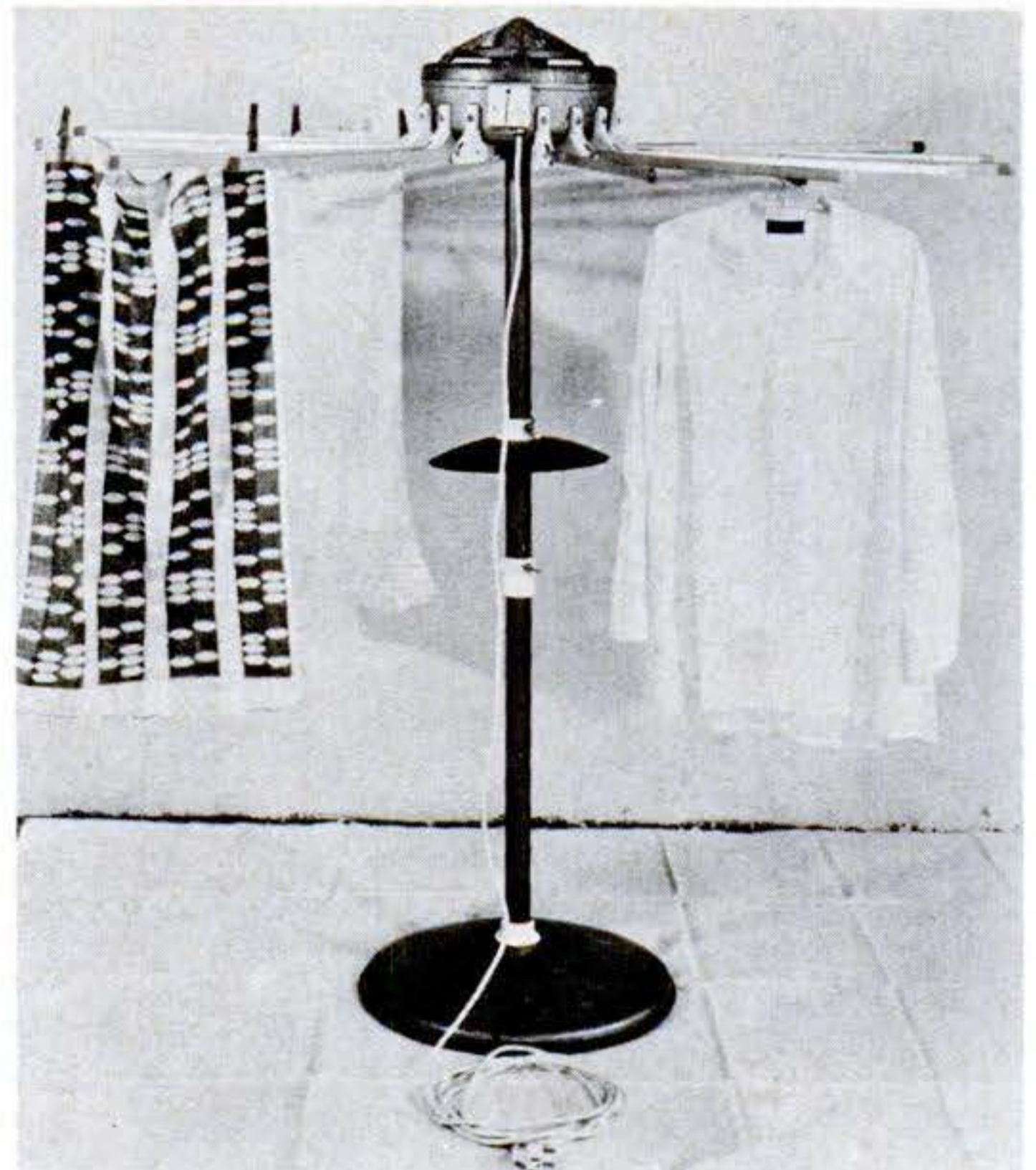


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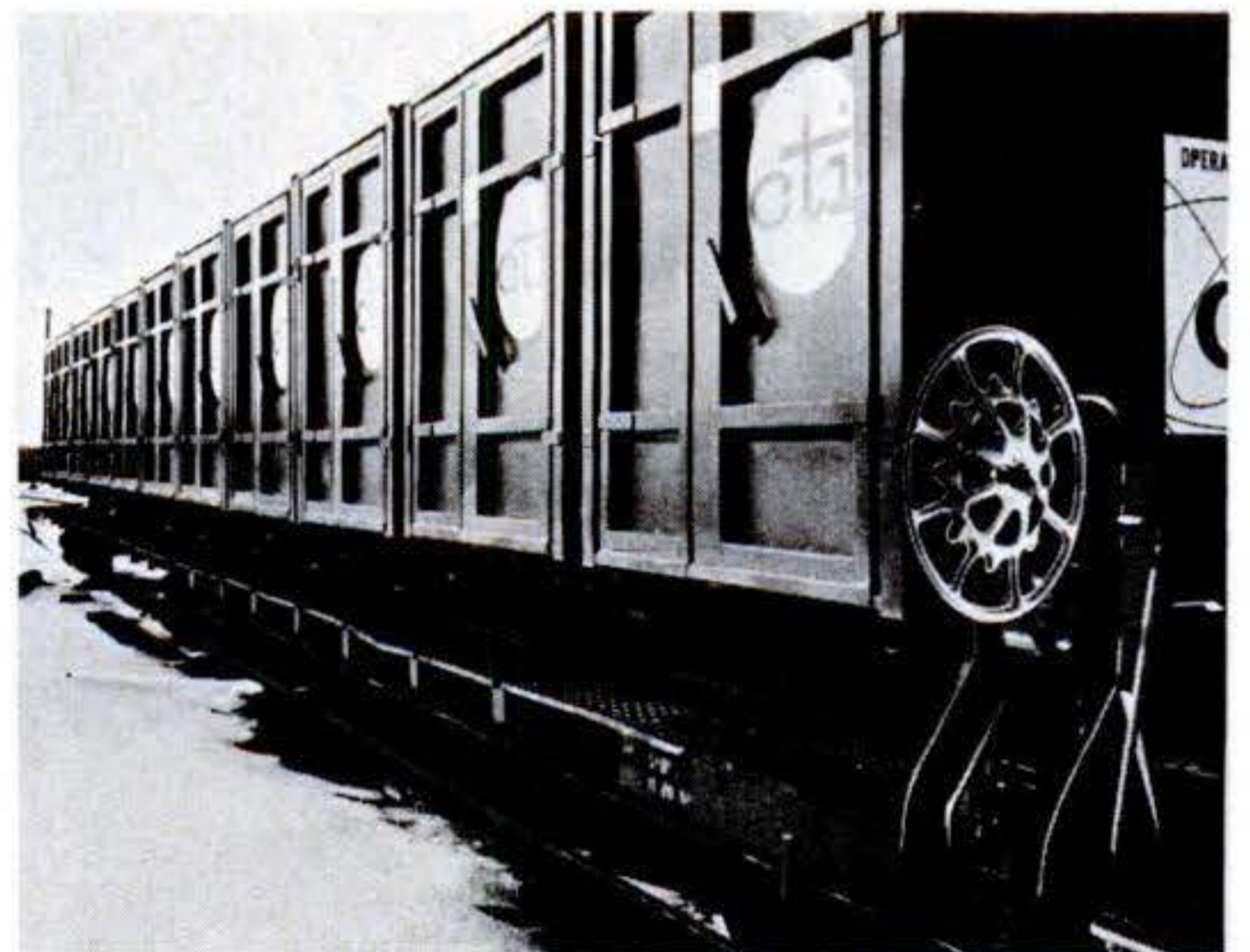
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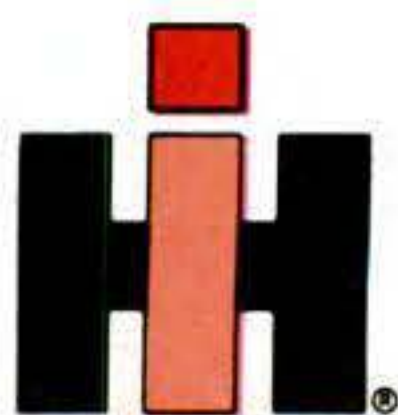
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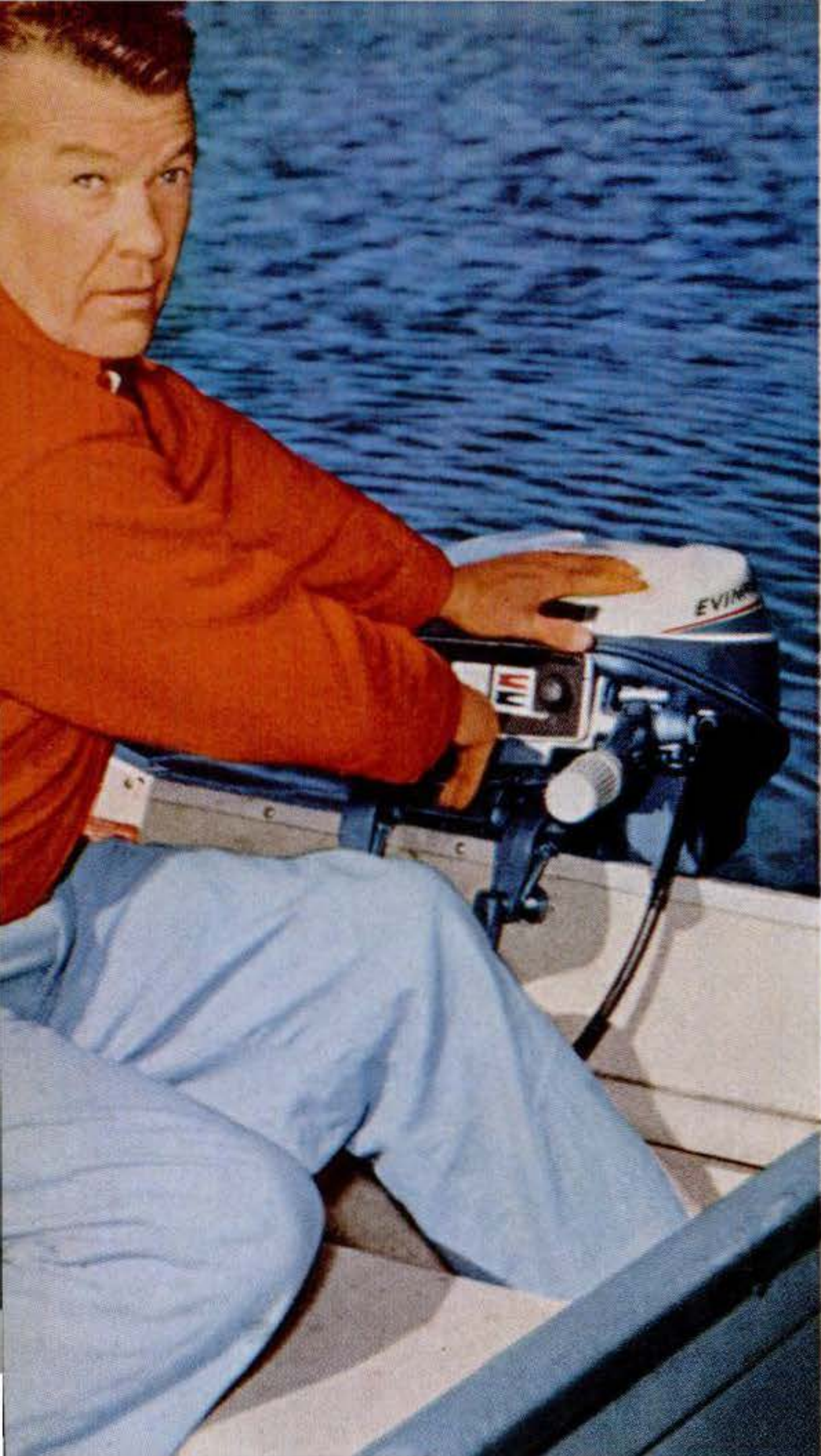
include new rotary tiller, snow blower, front and rear blades, wagon and dozens of other tools for man-size lawn, grounds or garden. For the name of your nearest International Harvester dealer, call Western Union by number and ask for Operator 25.

And there's more muscle and backbone than ever in the new IH Cub Cadets for '66. Economy and deluxe models. 7, 10, and 12 hp for bristling rough or showcase lawns. Still built for keeps (5-year-old Cadets are worth up to 2/3 their original value). Can you afford to keep on replacing cheaper machines?



International Harvester Company—the people who bring you the machines that work

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don't start that Evinrude Sportwin!...it's already running

They warned us it would happen — when we asked our engineers to make the new SPORTWIN smoother and quieter.

We told them to go ahead anyway. Fact is—there wasn't much else we could think of to do to improve the SPORTWIN for 1966.

No point in making it lower. You can fish over the top now—just as though the motor wasn't there.

We couldn't make it any lighter and still keep it rugged.

We couldn't make it go any faster without ruining its sunny disposition. Some people swear it goes fast enough now to ski with.

There wasn't much we could add. It already has full gearshift and all deluxe features — including

sixteen tilt positions—eight of them just for running in weeds and shallow water.

Oh yes — we did add a new trolling adjustment that lets you pre-set trolling speed and then return to it — automatically.

Mostly, for 1966 we made the SPORTWIN quieter. But unless we can add a warning light to let people know when it's running — we've gone about as far as we can go in that direction.

Wouldn't this be a good year to buy yours ?

See your Evinrude dealer, listed in the Yellow Pages. Catalog free. Write Evinrude Motors, 4245 N. 27th St., Milwaukee, Wis. 53216.

EVINRUDE
first in  outboards
DIVISION OF OUTBOARD MARINE CORP.



The inside story of
the "forgotten"

F-5

Our Bantam Supersonic Jet

Neglected by the Air Force for years, the rugged Freedom Fighter has finally gotten its chance at combat

By HERBERT O. JOHANSEN

Our newest tactical guerilla-warfare weapon is a pint-size, supersonic, twin-jet fighter-bomber that was born more than 10 years ago—and prophetically named the Freedom Fighter.

It's the Northrop F-5—a tough little scrapper with extraordinary combat performance: high rate of climb, quick acceleration to supersonic speed, extreme maneuverability at

Continued



A familiar sight in the skies over South Vietnam: the little F-5

Two supersonic Freedom Fighters approach the Co Dong River on their return from bombing Vietcong positions at Michelin rubber plantation, 45 miles northeast of Saigon. The F-5s wear combat camouflage for guerrilla war.

altitudes to 40,000 feet, and bantam weight. The basic reason for this prowess is its twin power plants—GE J-85 turbojets. Each produces 4,080 pounds of thrust, yet weighs only 585 pounds—a prodigious thrust-to-weight ratio of 7:1.

Low in weight, high in performance, the Freedom Fighter is also low in cost. The F-105 Thunderchief, for instance, costs \$2,067,000. The F-5 is off the shelf at \$669,175. On electronic equipment, the difference is even more amazing. On the F-105, it costs \$233,143; on the Freedom Fighter, only \$12,000.

The F-5 was designed as a supersonic tactical aircraft to replace obsolescent F-84s and F-86s in the aerial arsenals of selected allied countries under our military-assistance program; nine nations are getting them.

In the U.S., however, the F-5 was considered an underdog. We already had in

Thirsty F-5 takes a drink of fuel from a KC-135 jet tanker. Midair refueling was used to fly the bantam fighters from the U.S. to their Vietnam base.



Vietnam such supersophisticated fighter-bombers as the multimillion-dollar F-105 Thunderchief, the F-104 Starfighter, the F-100 Super Sabrejet, the F-4 Phantom.

The underdog has its day. While scorning the F-5 for combat, the Air Force did order tandem versions as supersonic trainers. More than 800 of these T-38 Talons have trained thousands of pilots to fly in a combat-plane environment. This kept the F-5 design alive. More important, it ironed out the mechanical, electronic, and maintenance bugs that plague most new planes when they first go into combat.

Then, about a year ago, the Air Force decided to try out the F-5 in Vietnam and organized a squadron of 12 planes to train for combat at Williams Air Force Base, Ariz.

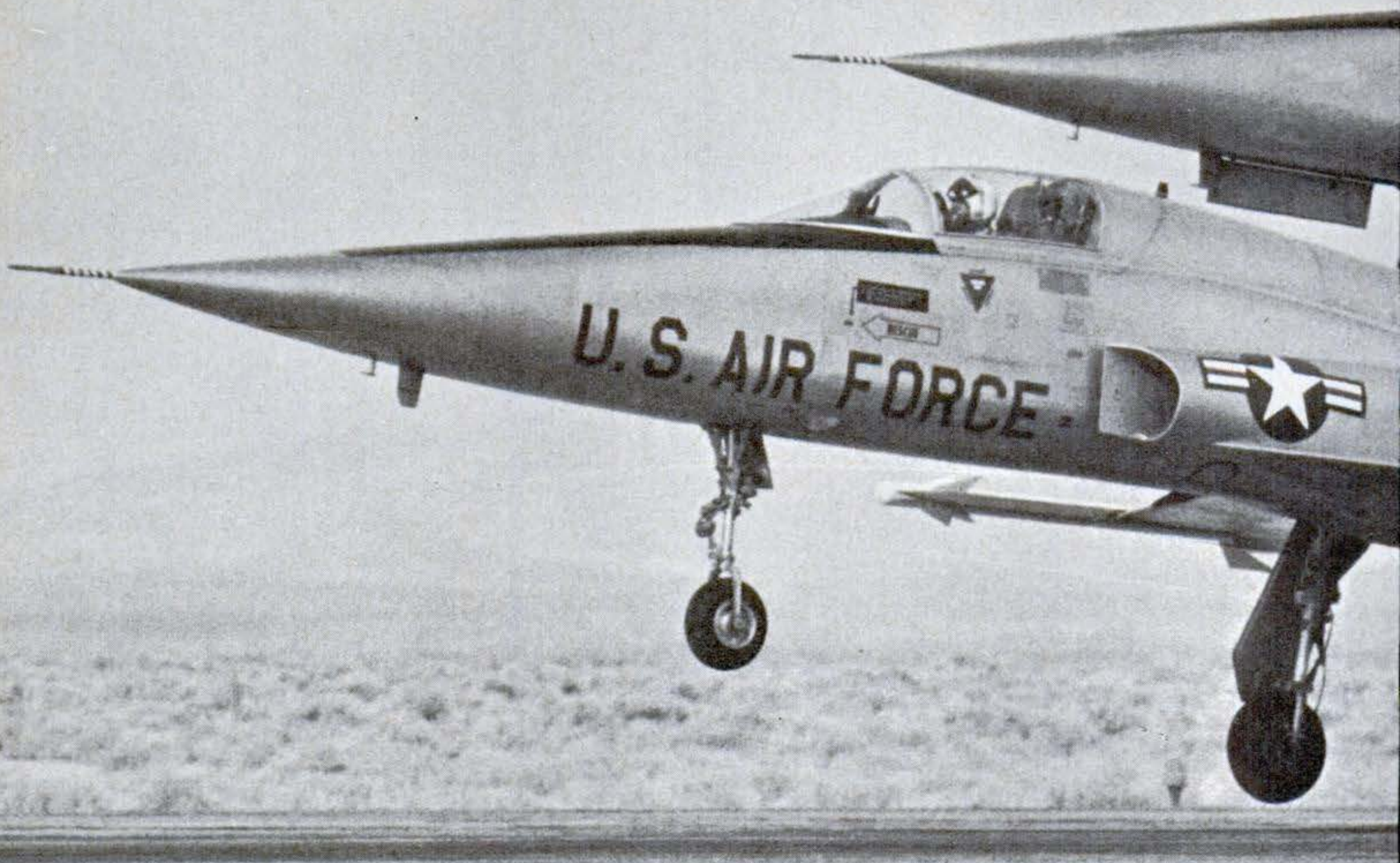
Proud of the small size of their planes, they named their squadron the Skoshi Tigers—Skoshi is the phonetic spelling of the Japanese word “sukoshi,” meaning “little.”

In October of last year, the Skoshi squadron took off for combat. Although they have a range of only about 1,500 miles, the pilots flew their F-5s to their destination target, 8,500 miles away, stopping at Hawaii and Guam. They were accompanied by KC-135 jet tankers—and en route each plane took more than a dozen gulps of fuel from the mother planes.

Within six hours after touchdown at Bien Hoa Air Base, near Saigon, on Oct. 23, two F-5s were off on a combat mission. They bombed and strafed suspected battalion-size Vietcong jungle concentrations. Since then, they have run up an impressive record of hundreds of “missions accomplished.”



Built low to the ground, F-5 is easy for mechanics to maintain. Even engine change is simple.



Dramatic shot of two Northrop needle-nosed Freedom Fighters taking off from Edwards Air Force

“When we parked our F-5s alongside some of their bigger brothers at Bien Hoa,” said one Skoshi pilot, “they looked like toys. We ground-maneuvered like Volkswagens.”

The F-5’s built-in ease of maintenance already has proved a boon in its trial operations. “Aside from its versatility,” says Col. Edward Johnson, head of a team of experts that is evaluating the trim little fighter’s combat performance, “what the airmen like most about the plane is its simplicity.

“That’s the beauty of it. The F-5 is so simply constructed that it takes 50 percent less maintenance than some of the big jet fighter-bombers. Two men can lift off the tail. Three men have removed an engine in 20 minutes.”

Keeping repairs at ground level. This ease of maintenance is due largely to Northrop design foresight. Parts needing frequent replacement or repair were put low to the ground and made readily available through access doors.

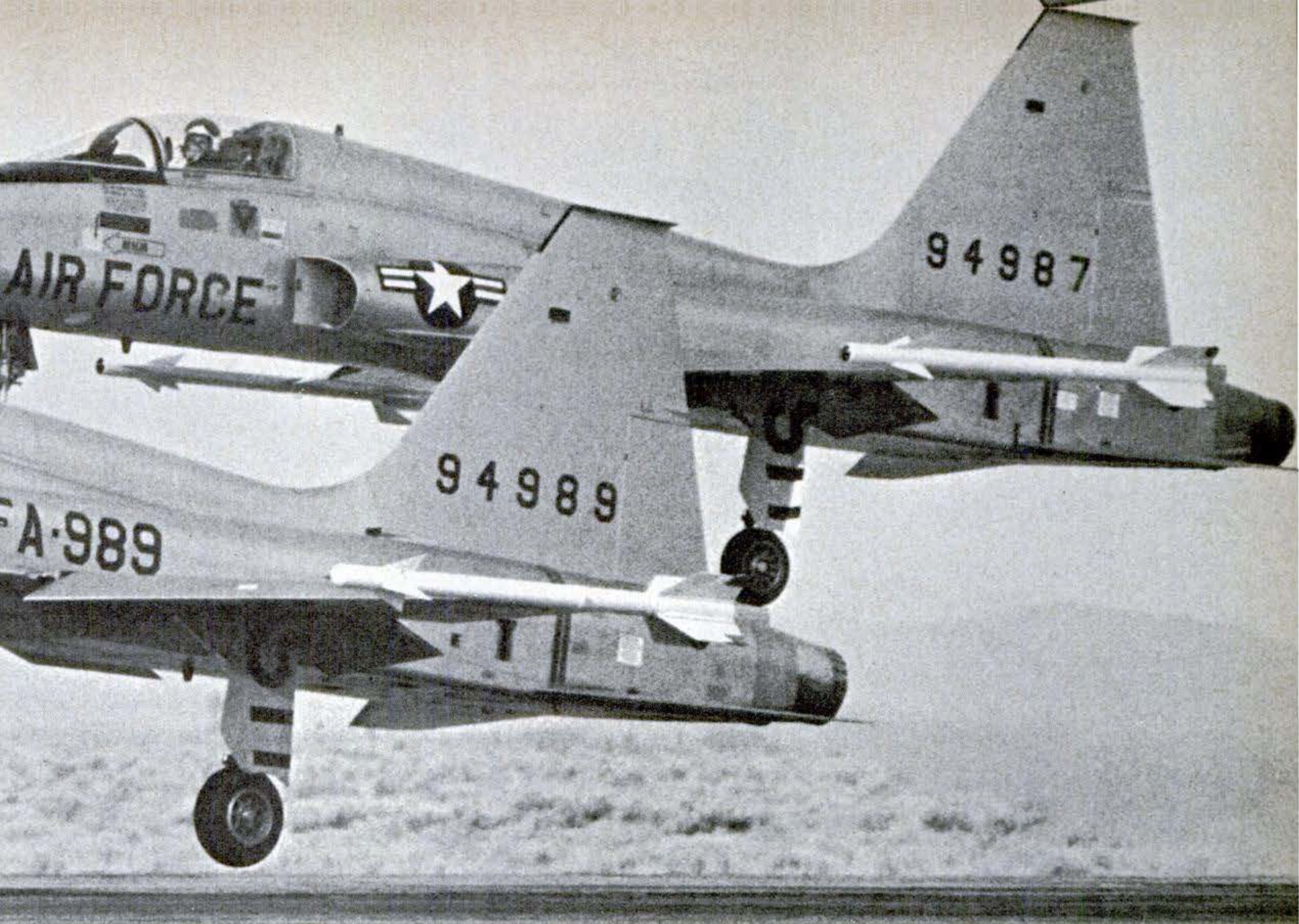
One great advantage the F-5 has as an antiguerrilla air weapon is that it can really give ground support to troops by following

them into combat. It needs no prepared runways—it can take off from sod fields in forward areas.

For their combat missions in Vietnam, the F-5s were camouflaged—painted a mottled green and brown on the top and sides, a pale blue on the bottom. This is to blend in with the jungle when seen from above by enemy aircraft, with the sky when flying low and vulnerable to ground fire.

In aerial combat, the 1,000-mile-an-hour F-5 is able to outfight aircraft of greater speed. That is what its pilots proudly say they learned during their training at Williams Air Force Base, prior to being shipped to Vietnam to prove it.

Loaded for bear. The fighting package of the F-5 is also outstanding for a midget that weighs only 12,000 pounds in its “bare feet.” In addition to two 20mm rapid-firing cannons in the nose (and their ammo), the Freedom Fighter can carry 6,200 pounds of armament externally, slung under its belly and wings. In various combinations it can mount: supersonic air-to-air missiles, air-to-ground rockets, anti-radar missiles, general-purpose bombs,



Base in California. For armament, they carry heat-seeking supersonic Sidewinder missiles.

and phosphorous and napalm incendiaries.

For extra range, fuel-tip tanks can be carried, although this naturally cuts down the armament load. For aerial reconnaissance, the F-5 can be fitted with a camera nose—at the factory or in combat areas with a kit that replaces the nose cone.

Still another advantage of the tactical Freedom Fighter is its exceptional single-engine performance. If an F-5 pilot runs low on fuel while he is still needed to hang around in support of ground troops, he simply shuts off one engine and extends his “loiter time.”

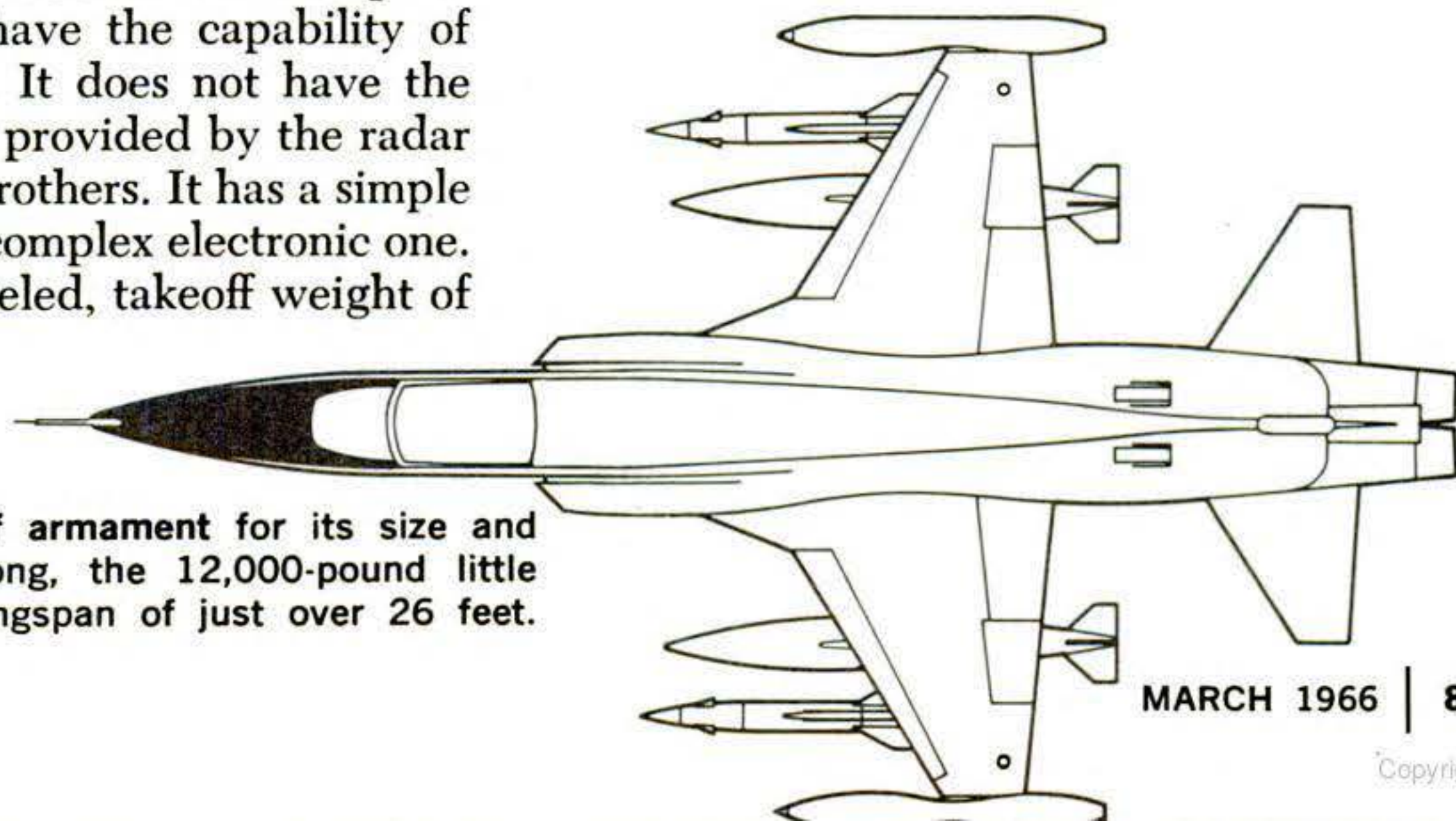
F-5 men readily admit that it is unsophisticated. It does not have the capability of blind radar bombing. It does not have the all-weather capability provided by the radar equipment of its big brothers. It has a simple gunsight instead of a complex electronic one.

Fully armed and fueled, takeoff weight of

the F-5 is about 20,000 pounds; of the F-105, more than 50,000 pounds. This, in guerrilla warfare, means the difference between long, paved runways and sod-field operation in forward areas.

The challenge. The question is, can the F-5 do close-in-support and air-fighting jobs as well, or better, in jungle warfare than its bigger, costlier, more complex brothers? The answer will come when the F-5s have completed their combat trial in Vietnam, and the evaluation team of experts reports to the Department of Defense. PS

The F-5 carries a lot of armament for its size and weight. Only 44 feet long, the 12,000-pound little fighter-bomber has a wingspan of just over 26 feet.





Giant over the Colorado? This is where the river begins at Poudre Pass high in the Rockies.

How Pushbuttons Control

Effective as a faucet are the fantastic machines that harness a 1,400-mile river

One of the world's mightiest rivers, the 1,400-mile, 4,890-billion-gallon-a-year Colorado, has become the world's first computer-controlled river. Now, for the first time, the raging Colorado can be turned on and off

with the flick of a switch, be made to run fast or slow, irrigate arid desert country, produce electric power, provide water for human and industrial consumption or lakes for recreation—all at the same time.

The reason for the computer—located at Montrose, Colo., near the Utah border—is easy to understand when you consider the number of demands placed upon the waters of the Colorado. This swift-flowing torrent is used to generate power for a vast area of

Continued



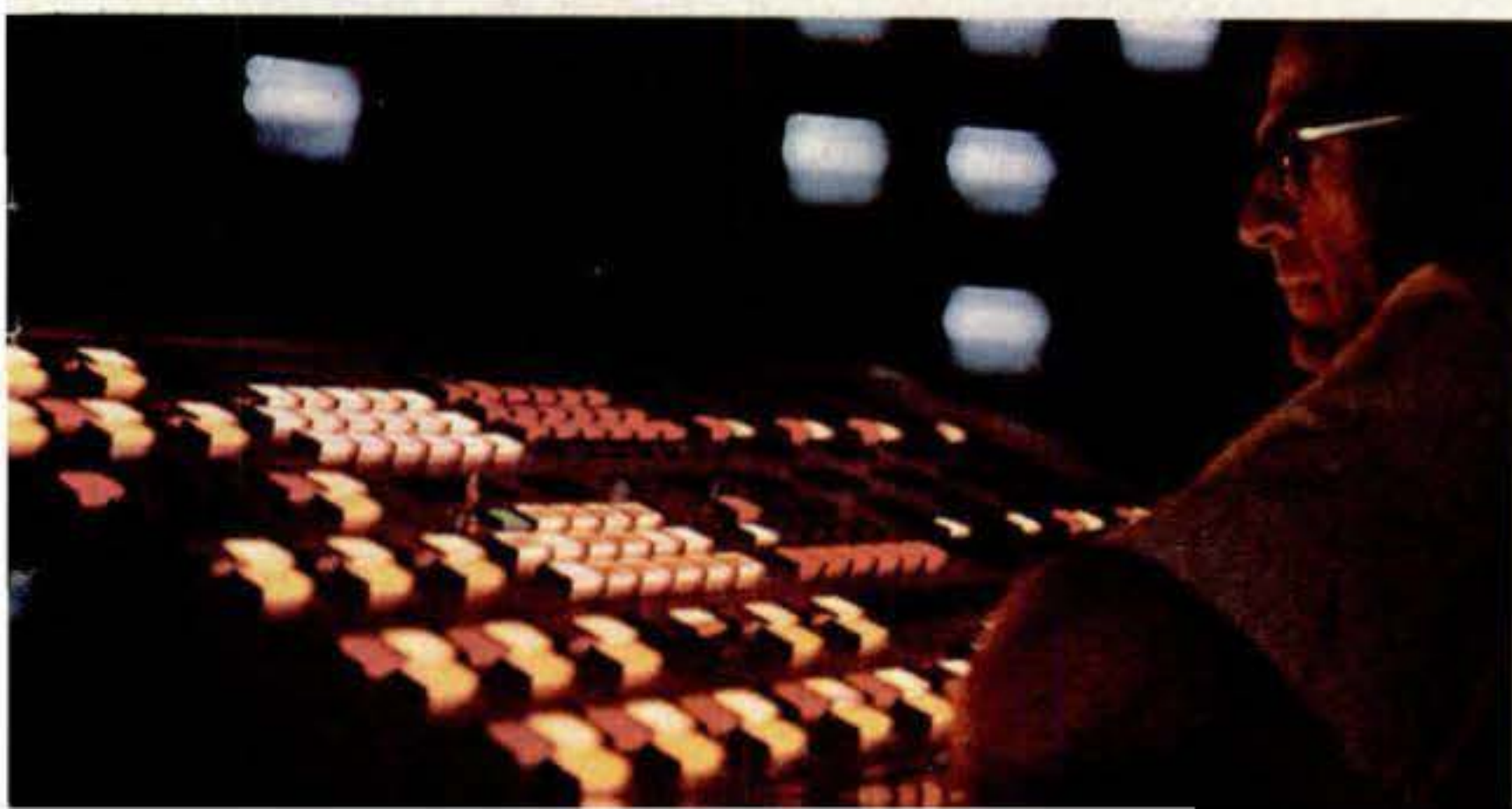
Where Green River joins, Colorado is a raging torrent, a source of power and water for millions.

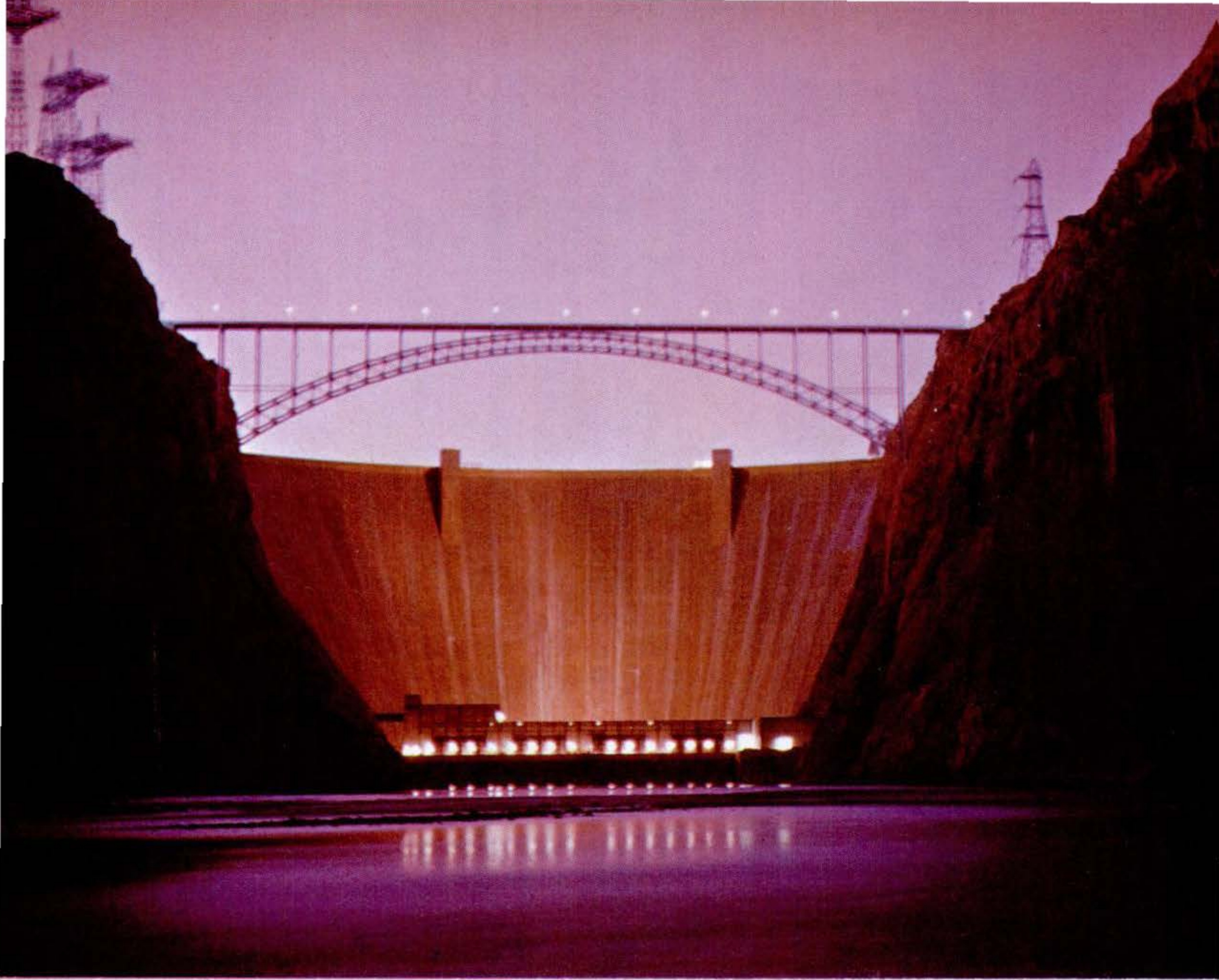
the Mighty Colorado

By ED BURKS

Water equals power: Flashing lights on a console monitor the pulse of gigantic four-state Colorado power system at Montrose control center.

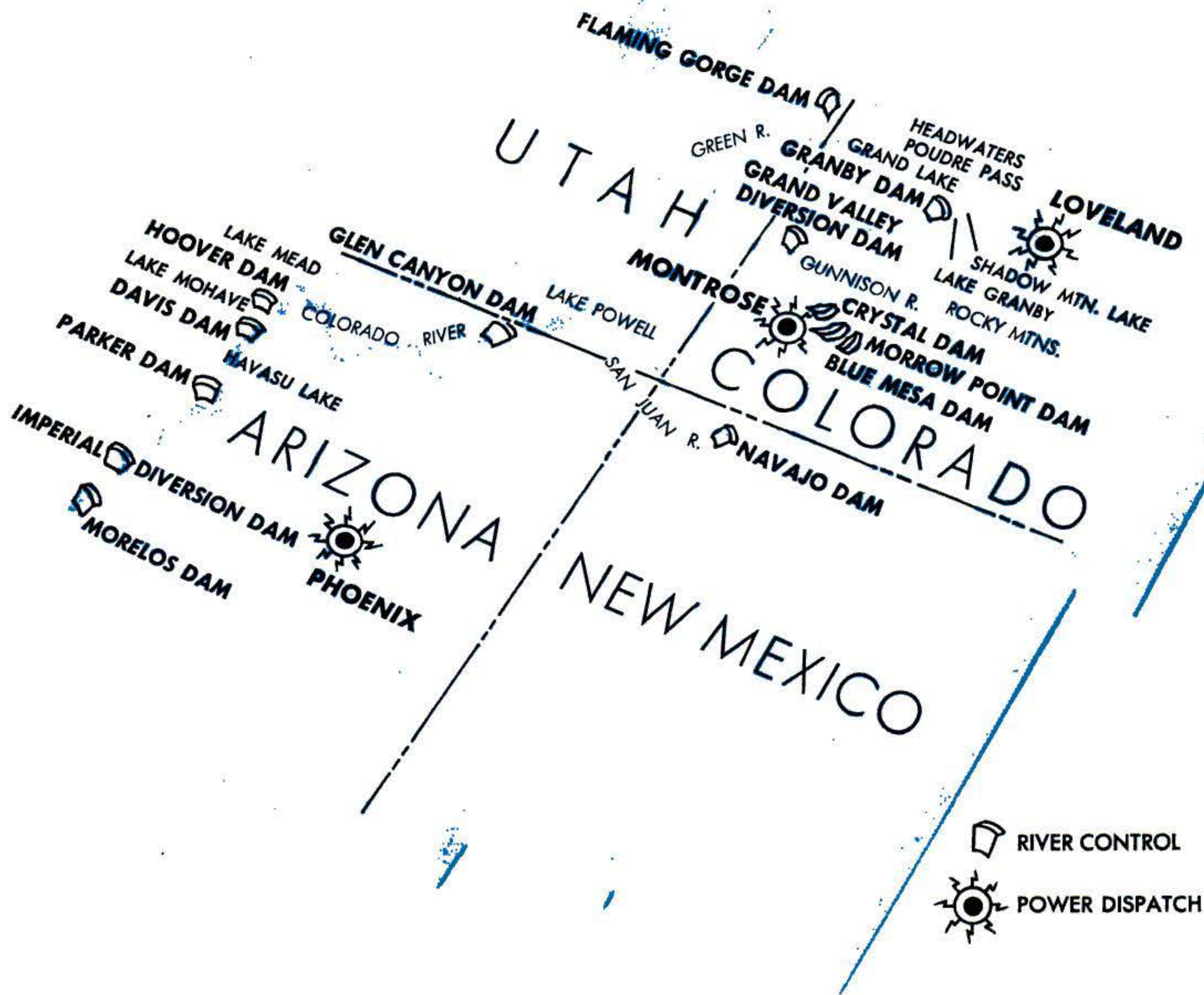
The last manual valve on the "pushbutton river" is this one shown below, at Granby, on the western slopes of the Rockies in Colorado.





Purple western dusk envelops Glen Canyon Dam—a link in chain that holds river in check. Lake Powell is one of immense reservoirs that insure river's flow. In background: Gregory Butte.





A computer guides the flow of the river through four states

the United States—an area that will grow even larger as a currently planned system of high-voltage power-transmission lines is completed. Secondly, millions of people spread over thousands of square miles depend on the Colorado for water—for homes and farms, and for thirsty industrial plants.

Basically, the computer “juggles” the waters of the Colorado, taking into account where power is needed, where water can be released to generate it, and where water is needed for other purposes. It takes an electronic brain to solve the fantastically complicated problem of how to release minimum water to generate maximum power—and then use the same water for other purposes.

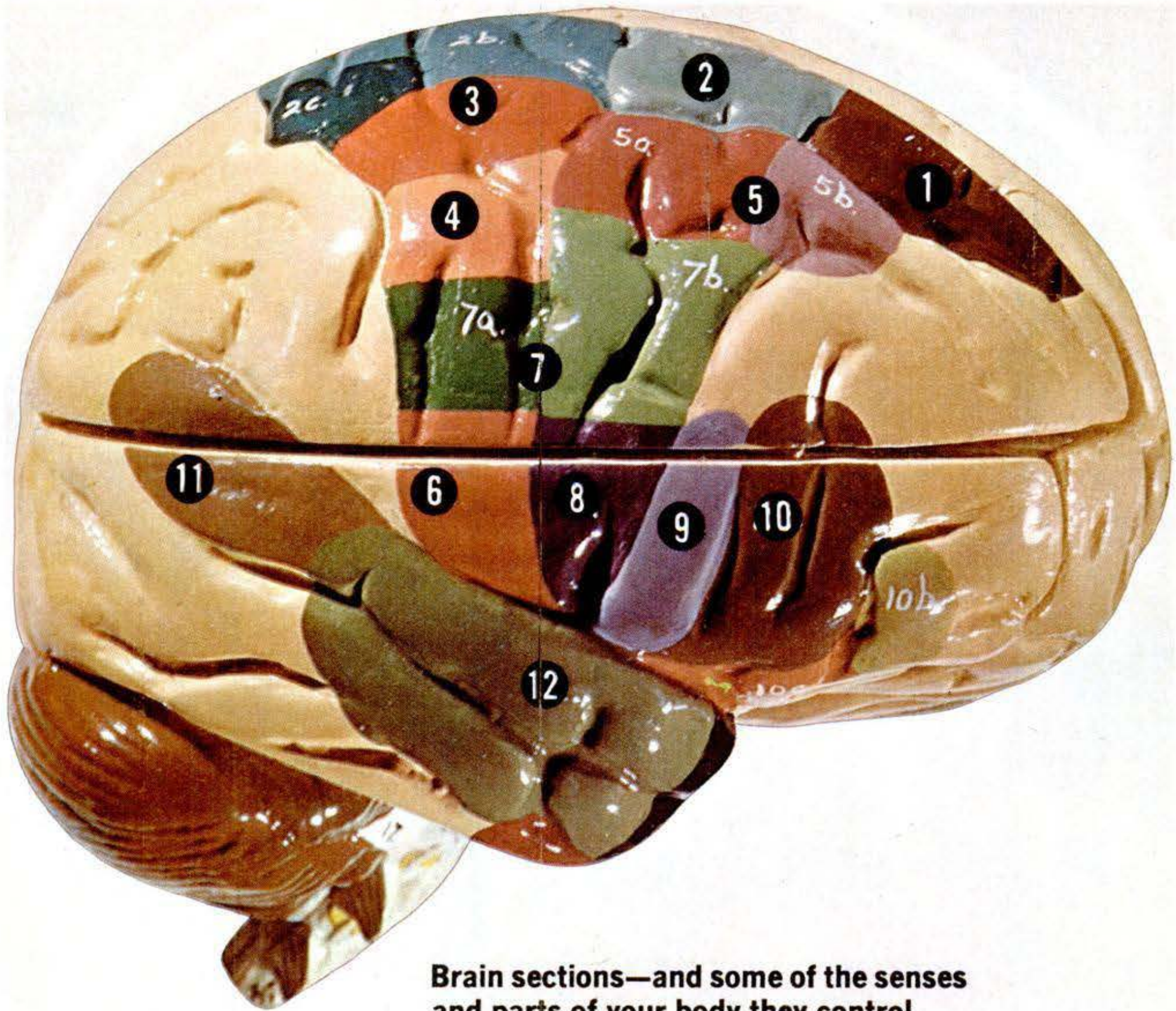
Beating the drought. Originally, the flow of the Colorado depended on the amount of rainfall. In drought years, the total annual flow has been as little as four million acre-feet, compared with a normal 15 million acre-feet. This is the “why” of great storage res-

ervoirs like Lake Powell behind Glen Canyon Dam on the Utah-Arizona border. When full, this man-made lake could supply the water needs of the area south of it for four years—with no inflow whatever.

The flow and use of the Colorado is the responsibility of the U.S. Bureau of Reclamation, arm of the Department of the Interior, which maintains four principal river-control and power centers: Flatirons/Granby in northern Colorado; Colorado River Storage Project at Montrose, Colo.; Boulder City, Nev., for the Hoover Dam; and Parker-Davis at Phoenix, Ariz. Montrose is the newest and most sophisticated center, and it is here that the Colorado’s electronic brain is located.

At the heart of the Montrose center is a high-speed digital computer capable of making 25,000 decisions a second. Every second—through microwave radio and telemetering facilities—it scans every element in the

[Continued on page 186]



Brain sections—and some of the senses and parts of your body they control

1. Trunk; 2. Leg (2a. Thigh, not visible; 2b. Shank; 2c. Foot); 3. Arm; 4. Hand; 5. Head (5a. Upper part; 5b. Eyes); 6. Neck; 7. Face (7a. Upper face muscles; 7b. Lower face muscles); 8. Chewing muscles; 9. Larynx; 10. Vocal center (10a. Speech; 10b. Larynx, in speech; 10c. Tongue); 11. Understanding of speech; 12. Hearing.

Centers shown on this side of the brain control one side of the body. The other side is controlled by opposite parts of the brain. Some sense centers are not shown because they are inside the brain.

Model courtesy of the Welch Scientific Co., New York City

The brain functions like a message center that constantly sends and receives signals

The brain is the center of a great communications network. Into it, via the spinal cord, comes a constant flow of messages from eyes, ears, and other sense organs for pain, temperature, touch, taste, and smell. After analyzing incoming messages, the brain sends orders down through the cable of nerve fibers in the

cord—and as a result you eat, laugh, cry, fight, and run.

Scientists have been able to trace the origins of many of these feelings and have been able to make people feel fear, pleasure, affection—and even break into laughter—by artificially stimulating various brain sections.

Here's how the amazing biological
"computer" that controls your life processes
makes you think, feel, and move

YOUR BRAIN

The Most Complicated Machine

By LAWRENCE GALTON

Of all the marvels of nature, none comes close to comparing with your brain. It is, as one scientist observes, "the most complicated machinery ever constructed."

Although it weighs only about 50 ounces and occupies a volume of only about 1½ quarts, it consists of some 12 billion cells. Each cell is connected, directly or indirectly, to every other by nerve fibers.

Even more amazing is the way your brain uses these cells and connections to process information received through the senses—work it over, integrate it, store it, and recall it.

Just how this occurs is not fully known. The still-unexplored regions of the brain are greater than the unexplored regions of the whole solar system. But investigators have recently turned up some striking new facts about your brain. Here's a look at what they now know—and don't know—about your brain and its workings.

How many brains do you actually have?

One—but with two major divisions. There's an inner core—the "old" brain—controlling breathing, pulse rate, other basic functions. Spreading over the "old" is the "new" brain—the cortex—which accounts for much of what makes a human being "human."

To contain the old brain, your head would need to be no larger than your clenched fist. But the new brain is about the size of a grapefruit.

Is there a "mind" distinct from the brain?

The brain is full of traveling messages—electrical currents. They must go somewhere—to some entity, a "mind," and this could explain how mere currents could lead to ideas.

But if there's a mind, it has no spatial position. "We are beginning to learn where the brain action is, but we know no 'where' of mind," says Dr. Wilder Penfield, a distinguished brain explorer.

What functions does your brain perform?

It's the center of a vast communications network. Into it, via the spinal cord, comes a constant flow of messages from eyes, ears, and sense organs for pain, temperature, touch, taste, smell. After analyzing incoming messages, the brain sends orders down through the cable of nerve fibers in the cord—and you eat, laugh, cry, fight, or run.

Does it have specialized centers?

Many. Investigators have used steel wires, finer than human hair, to shoot tiny electric shocks, similar to the brain's normal electrical impulses, into the brains of humans and animals. They've been able to map specific areas that control vision, hearing, physical movements—even emotions.

By stimulating one area, Dr. José Delgado of Yale University has increased food intake in monkeys 700 percent. Stimulating other areas, he has made monkeys spit

Continued

Your brain records everything you were ever aware of.

out bananas in disgust, turned ferocious animals—a bull in recent experiments—into docile ones, and made small and friendly cats attack large cats.

The electrical-stimulation studies have opened up dramatic new horizons for health. They've shown, for example, that defects in a tiny body, the globus pallidus, are involved in shaking palsy—and that destroying the defective area stops a victim's constant trembling.

Recently, investigators implanted electrodes in the vision area of the cortex in three blind patients, hooked the electrodes up to a special oscillator controlled by photocells. Two of the three soon learned to recognize relative brightness of various objects and to guide themselves about a lighted room. When more sensitive equipment was added, they could perceive patterns of light and colors.

Does your brain ever get tired?

The motor cortex, which controls many body movements, tires quickly. But the hypothalamus, which controls such functions as blood pressure, is almost indefatigable.

Is there a brain sleep center?

There's only a waking center, in the mid-brain, which, when it's working, rouses you and keeps you awake. You doze off when neuromuscular fatigue reduces stimuli coming from the body to the brain.

Does learning change your brain?

University of California investigators recently put some laboratory rats in an "enriched" environment with companions, toys, opportunity to learn to run through mazes. They put others in a "restricted" environment without companions, toys, or learning opportunities. After 80 days, brain analyses showed that the rats from the enriched environment had heavier cerebral cortices than the others—and larger amounts of cholinesterase, an enzyme believed important in conducting impulses from cell to cell.

It's the first evidence that learning may change brain chemistry and even structure.

How does your brain store information?

The actual mechanism of memory remains one of the great mysteries of science.

There's a theory that whenever you

have an experience, electrical potentials pass through brain cells and connections in a specific pattern. Somehow—and nobody knows how—the pattern is preserved so the record can be played back later like a tape being played back on a recorder.

Does your brain ever forget anything?

Apparently nothing. It seems to keep a record, in detail, of everything of which you were ever aware.

Most details are lost to consciousness within seconds after an event. But when areas of the cortex are stimulated electrically, the details pop back into consciousness. Under stimulation, people have recalled long-forgotten childhood episodes, old songs, snatches of conversation dating back decades.

What happens when part of the brain is damaged?

Although there are highly specialized centers, all is not lost if one is damaged. Often the brain compensates by assigning the function to another area.

What causes sudden loss of memory?

Brain injury or disease can. But very often amnesia is the result of an emotional upset.

What happens in the brain during hypnosis?

There's still no definite answer—only a theory based on the fact that when a hypnotic trance is being induced, the subject has to concentrate on some one thing, and input of other information is diminished.

Because the brain remains alert and has few incoming sensory impulses to deal with, there's increased awareness of previously recorded perceptions, including memories of childhood experiences—significantly, experiences that made the subject believe he was helpless, dependent, and would not be loved or helped unless he was obedient. And so the subject strives to please the hypnotist and becomes highly suggestible.

Can emotions kill?

These scientifically documented cases have been reported by Dr. Henry K. Beecher of Harvard:

A young Negro bushman, deceived by a

Electrical stimulation can bring "lost" memories back

practical joker into believing it was something else, ate a wild hen forbidden to his tribe. He went on his way and only several years later learned the truth. He was dead in 24 hours.

In another case, a celebrated witch doctor pointed a bone at a tribesman. The man at once became desperately ill. On being examined by a physician, he was found to be dying. The doctor sought out the witch doctor, told him to reverse the sickness or his own food supply would be cut off. The witch doctor leaned on the sick man's bed, assured him he had not really pointed a bone. Recovery occurred within a few hours.

"It appears that voodoo rites, fear, or emotion can kill, and they can save," says Dr. Beecher.

How does alcohol affect the brain?

Overindulgence in alcohol disorganizes thinking and associations even though at the time you don't think so. In sufficient quantity, its effects spread out. Coordination suffers, feet stumble, hands become unsteady, speech slurs—and, when the quantity gets high enough, even breathing centers may be paralyzed and death may follow.

Does alcohol ever improve a man's performance?

Although, generally, it decreases alertness and efficiency, alcohol does work the opposite way for some men—those who lack self-confidence and are full of anxiety.

For them, a few drinks, says Dr. E. M. Jellinek, an expert on alcohol, "may lessen inhibitions, increase confidence, make it possible to perform better than they usually can, even though the performance is less than they would be capable of if their inhibitions were removed in some other way."

How does coffee affect the brain?

The caffeine in it stimulates the cortex, produces a mental lift.

Caffeine is a tricky drug, University of Michigan researchers have found. It's quick-acting, produces peak stimulation in about 20 minutes, and continues to stimulate for 2½ hours. Curiously, if you drink another cup during the 2½-hour span, you'll get little extra stimulation from it.

The caffeine in the first cup of coffee will largely block the effects of the second cup during that time.

Does the brain feel pain?

No. Get a severe headache and it may seem that the whole inside of your skull hurts. Actually, however, the nerves that transmit pain exist almost exclusively in the blood vessels and nervous system—not in the brain itself.

Is it true that brainwork shortens life?

One recent study covered 382 Swedish university professors, 700 American professors, 741 streetcar conductors, and 508 typographers who died during the course of a year. Average life-span for the Swedish professors was 68; for the Americans, 67—as compared with 61 for the conductors and 58 for the typographers.

Can you tell a genius by his brain?

If there's any difference in brain structure between a genius with an I.Q. of 180 and a high-grade moron with an I.Q. of 80, microscopic examinations have not been able to pinpoint it.

Can anything be done to improve intelligence?

"Anything a person can do," says Dr. Donald G. Livingston of Stevens Institute of Technology, "to relieve himself of anxiety, discouragement, depression, and emotional conflict, in general, will result in more effective intelligence." It's notable, he observes, that I.Q. scores of emotionally troubled people often improve when their emotional problems are treated by psychotherapy.

What happens to mental acuity as you grow older?

It tends to decrease—in many but not all people—beginning at about 45.

Will there ever be a computer to rival the human brain?

Computers can memorize large masses of data—and can be programmed to analyze in minutes material that would require years of work by a man.

But what distinguishes the brain is its ability to learn—and no machine yet developed can do that. PS



**Three Luxury Cars with
Modest Price Tags...**

Chrysler Newport Mercury Montclair Buick LeSabre

By **JAN P. NORBYE**/*PS Automotive Editor*

EXCLUSIVE PHOTOS BY **BILL MORRIS**

Of course you appreciate comfort and convenience in a car. But perhaps you think more in terms of choosing luxury options for a low-price car than of finding out how cheaply you can get a real luxury car. The way people are spending upwards of \$4,500 for a well-

equipped Ford LTD or Chevrolet Caprice, it is time to take a hard look at the least costly cars with expensive names. In a moment I'll tell you:

- Why these cars have higher prices.
- Why you may find it worth paying more money for them.

REPORT FROM THE DRIVER'S SEAT

Don't overlook the bottom-of-the-line luxury cars if you're tempted by expensive options on a "low-price" car



● How they compare in performance, ride, handling, braking, and fuel economy, and in size and space.

Luxury cars are designed with higher-grade materials. Where the low-price cars have a little rubber isolation and some sound-deadening material, the luxury cars have a lot. The makers put more money into rubber and felt and

plastic and goo that you never see. The luxury cars are quieter and more comfortable. And new engineering materials—special alloys, powdered-metal parts, new seals, new glass, new paints—always appear first on a high-grade car.

In the time that Buick builds one car, Chevrolet has built four. For each Mercury, Ford builds three Fords. And a

Continued



BUICK corners at 60 m.p.h. with some body roll but fine steering precision. It proves that soft springing is not incompatible with good handling.



MERCURY shows excess understeer at 60 m.p.h. on the

Some understeer is desirable; too much makes a car "plow"

couple of Plymouths or Dodges roll off the lines to each Chrysler. The luxury cars have higher quality of assembly. They are built with greater care, they go through more inspections, and the factory has time to rectify imperfections instead of placing that burden on the dealer.

Standard equipment on the luxury cars includes many items that you pay extra for in most cars with a lower base price. You get dual padded sun visors, step-on parking brakes, door-to-door carpeting, and dome lights as part of the basic price. The Newport even offers a manually controlled six-way seat as standard.

Size and space. Longer wheelbases give more leg room than in the popular full-size cars. Seat springs, upholstery, and roof liners are more expensive. Interior dimensions of the three cars are very similar. The Chrysler is best on head room; Buick is best on leg room and hip room. All three weigh well over 4,000 pounds at the curb. The Buick is the lightest, and it has almost even weight distribution, with 52.5 percent of its weight on the front wheels. Weight distribution of the Chrysler and the Mercury is roughly 55 percent front, 45 rear. This small difference in weight distribution is a contributing cause to the tremendous difference in handling.

The ride. Most people like a soft ride that cushions out bumps, potholes, tar strips, and other road-surface irregularities. If the springs are too soft, some passengers get carsick. If the springs are too hard, travel fatigue sets in (because the passengers involuntarily use leg and back muscles just to sit).

In this group, the Buick has the softest springs. Mercury softened the front springs 10 percent on the '66 models, but it still doesn't have the Buick's boulevard ride. The Chrysler, with its front torsion bars and rear leaf springs, has even harder springs (higher spring rates). Buick and Mercury have all-coil suspensions. On a superhighway, all three ride well. The Mercury seems the quietest, and most people will be comfortable with its ride. I doubt that many will find the Buick ride too soft, but some might find the Chrysler ride too hard.

Handling. I don't like to talk about good handling and bad handling. I think we should talk about handling precision. By that I mean the ability of the car to respond to the intentions of the driver. The driver signals his intentions by his use of the steering wheel, the accelerator, and the brake pedal. The car with the best handling precision is the one that comes closest and with the least lag to going where the driver wants to go.

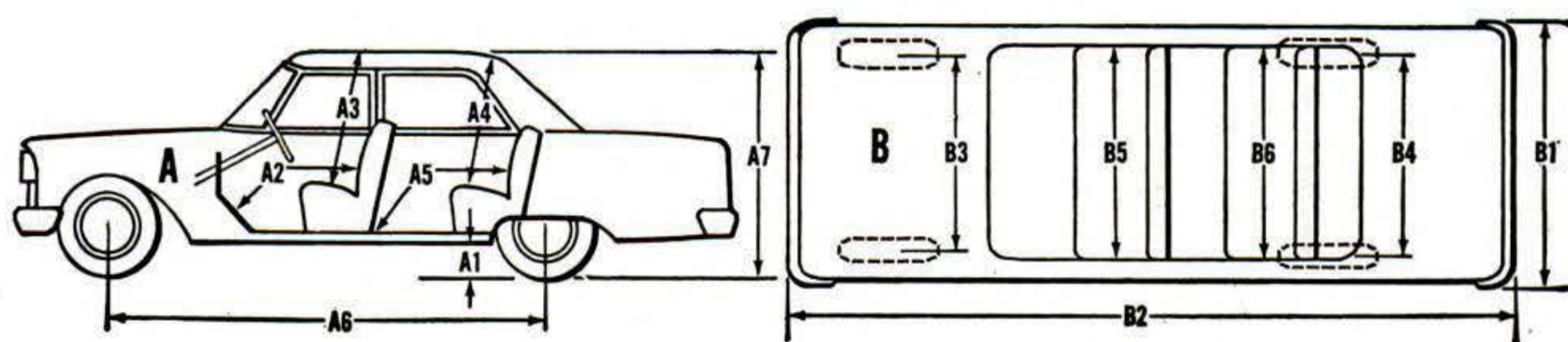
The only way to make a car travel straight on a straight road is to make it resist any deviation from a straight path. This is understeer. Some understeer is desirable. Too much understeer makes the car "plow" instead of turning in response to the steering wheel. When the car is plowing, it is no longer headed where the wheels are pointing, and the wheels are rubbed sideways along the road. Nose-heavy cars automatically tend to understeer.

The photos above show how the cars behaved on a right turn at 60 m.p.h. in



same turn, as the front wheels rub sideways along the track.

CHRYSLER corners almost flat at the same speed, and the steering angles of the front wheels show that the car is in a steady state of firm understeer.



**CHRYSLER
Newport**

**MERCURY
Montclair**

**BUICK
LeSabre**

DIMENSIONS (inches)

A1 Ground clearance	6.0	5.8	6.0
A2 Front leg room	42.0	41.8	42.2
A3 Front head room	39.3	38.9	38.9
A4 Rear head room	38.5	37.7	37.7
A5 Rear leg room	40.8	37.7	39.0
A6 Wheelbase	124.0	123.0	123.0
A7 Overall height	55.5	56.0	55.2
B1 Overall width	79.5	79.6	80.0
B2 Overall length	219.0	220.4	217.0
B3 Front track	62.0	62.0	63.0
B4 Rear track	60.7	62.0	63.0
B5 Front-seat width	57.0	57.5	58.0
B6 Rear-seat width	58.5	59.0	59.5

SPECIFICATIONS

Engine type	OHV V-8	OHV V-8	OHV V-8
Bore & stroke	4.25 x 3.38	4.05 x 3.78	3.75 x 3.85
Displacement	383 cu. in.	390 cu. in.	340 cu. in.
Compression ratio	9.2:1	9.5:1	10.35:1
Carburetion	Single 2-bbl.	Single 2-bbl.	Single 4-bbl.
Power @ r.p.m.	270 @ 4,400	275 @ 4,400	260 @ 4,000
Torque @ r.p.m.	390 @ 2,800	405 @ 2,600	365 @ 2,800
Transmission	TorqueFlite 3-speed with torque converter	Merc-O-Matic 3-speed with torque converter	Super Turbine 400 3-speed with torque converter
Axle ratio	2.76:1	3.00:1	2.93:1
Steering ratio	19.6:1	21.9:1	20.6:1
Turns (lock-to-lock)	3.5	3.6	4.08
Turning radius	20.7 ft.	22.25 ft.	19.8 ft.
Brake-swept area	328.5 sq. in.	436 sq. in.	320.5 sq. in.
Curb weight	4,378 lb.	4,392 lb.	4,187 lb.
Basic price	\$3,190.00	\$3,216.95	\$3,174.00
Price as tested	\$3,780.45	\$4,089.95	\$3,841.54

PERFORMANCE

0-60 m.p.h.	10.8 sec.	10.8 sec.	11.1 sec.
0-80 m.p.h.	19.2	19.5	20.6
40-60 m.p.h.	5.8	5.8	5.9
50-70 m.p.h.	7.1	7.1	7.5
SS 1/4-mile	17.66	17.89	18.24



Mercury came out on top in the braking test—mainly because the test car was equipped with the optional disk brakes. They were not totally insensitive to fade, but recovery was almost immediate. In acceleration tests, the Mercury did not come up to our high expectations.

dry weather. I also drove them around the Bridgehampton track in the rain. This was a wonderful opportunity to safely duplicate situations that would be dangerous on the highway. If I lost control, the car would hit sand or grass, and slow to a stop without harm.

Wet-weather steering. The Mercury's firm understeer on a dry track became excessive in the wet. There was no obedience in the steering. Entering a turn at 50 m.p.h. and turning the wheel, I found myself going straight on. I repeated the experiment on a number of turns to make sure that any differences in surface smoothness would be canceled. The result was always the same. Turning the wheel made no difference in where the car was headed—until I had lost enough speed to regain steering control. More than once I was on the outside edge of the track before the front wheels regained their grip. There is a lesson in this for anyone who drives a Mercury on a wet road. Slow down before the turns, even if it means driving *below* the speed limit. If you don't, you risk moving into the lane of oncoming traffic.

The Chrysler was a good deal better, despite its smaller wheels. It had symptoms of excessive understeer on slippery surfaces, but I always felt safe in the Newport. Entering a turn too fast in pouring rain was quite tricky. But once the car had started to turn, it was well balanced and obeyed the steering wheel. Even when I used the brakes while turning, the car slowed down without risk of wheel locking and loss of control.

The Buick is as directionally stable as the other two on a straight road, but understeers less on turns. In the wet, the LeSabre was wonderfully manageable. When I turned the wheel, the car immediately changed direction. No hesitation. No skid scene. The LeSabre went through

three Bridgehampton turns a good 10 m.p.h. faster than its rivals—and with better handling precision.

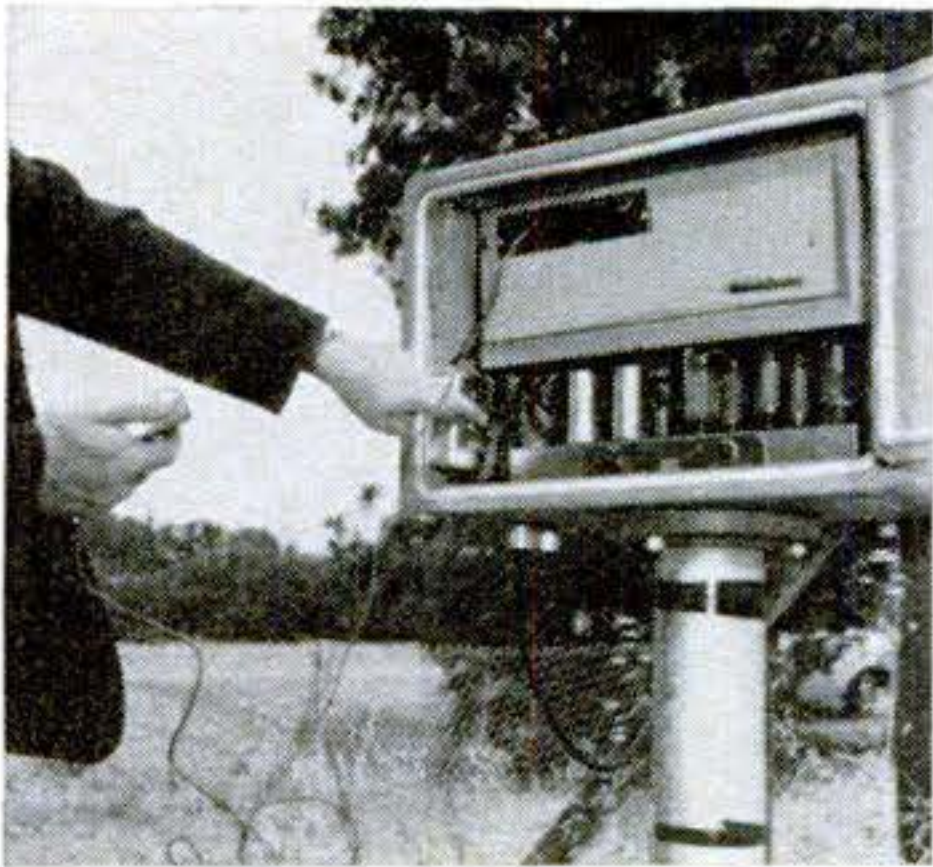
Testing the brakes. All three cars had power brakes. The Buick brakes gave a far better modulation of brake force than the servo units on the other cars. Three other drivers who helped me with the test complained about the brakes coming on too hard at the mere touch of the pedal in both the Newport and the Montclair. There were no such complaints about the Buick. Yet in a severe brake test, the Buick's performance left much to be desired despite its finned drums.

With each car, I made five "panic stops" within five minutes. This heats up the brakes, and fade sets in. (Fade is a reduction in the coefficient of friction between the linings and the drums due to heat build-up. The effect is about the same as if someone had greased the drums on the inside.) On the sixth stop, we recorded braking efficiency. With our Tapley meter, a reading of 100 percent corresponds to a retardation of 32-feet-per-second per second. This is, theoretically, as fast as an automobile can be made to stop under ideal conditions.

We tested the three cars on dry asphalt on a cool but sunny day. The Buick showed 71-percent efficiency. That isn't bad, but the figure is misleading. It reflects the *maximum* retardation on one stop—not the average. During that same stop, the brakes deteriorated to the point where no amount of pedal pressure could produce any braking effect at all. Buick has no disk-brake option.

The Mercury, fitted with optional disk brakes, gave a figure of 82 percent on the sixth stop. The Chrysler, with drum brakes, gave a 59-percent reading. Chrysler's optional disk brakes, by extrapolation of

[\[Continued on page 213\]](#)

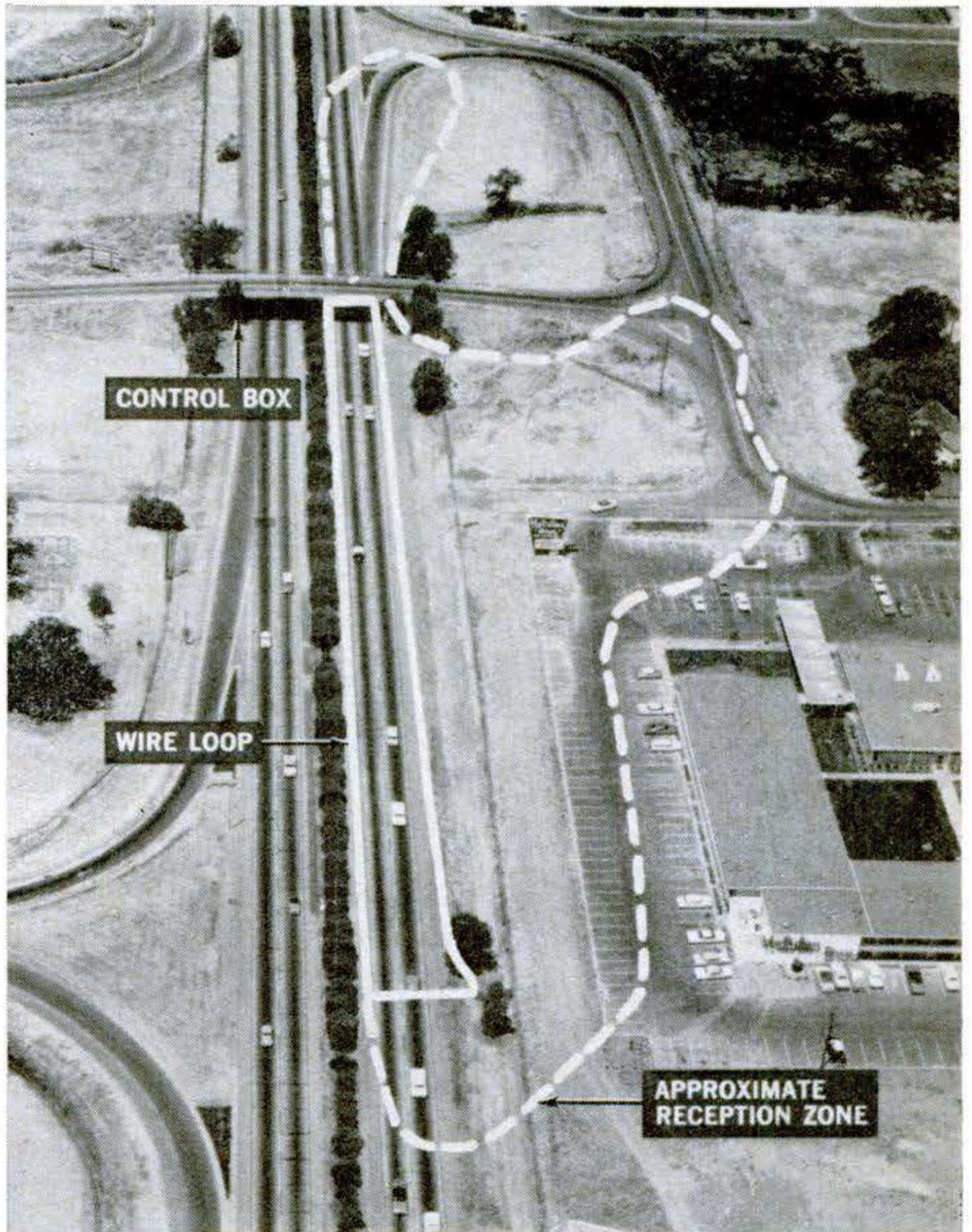


Tape with message for motorists is placed in control box for broadcast.

Talking highway warns drivers of hazards

A 700-foot section of highway near Sacramento, Calif., talks to motorists as they drive, warning them of dangerous conditions and traffic jams that may lie ahead. Test automobiles have been equipped with an antenna-amplifier-speaker in a small electronic packet that picks up taped messages fed by a control box into a copper-wire loop. The message is repeated as long as the vehicle remains within range.

The entire highway could be wired with a series of loops.



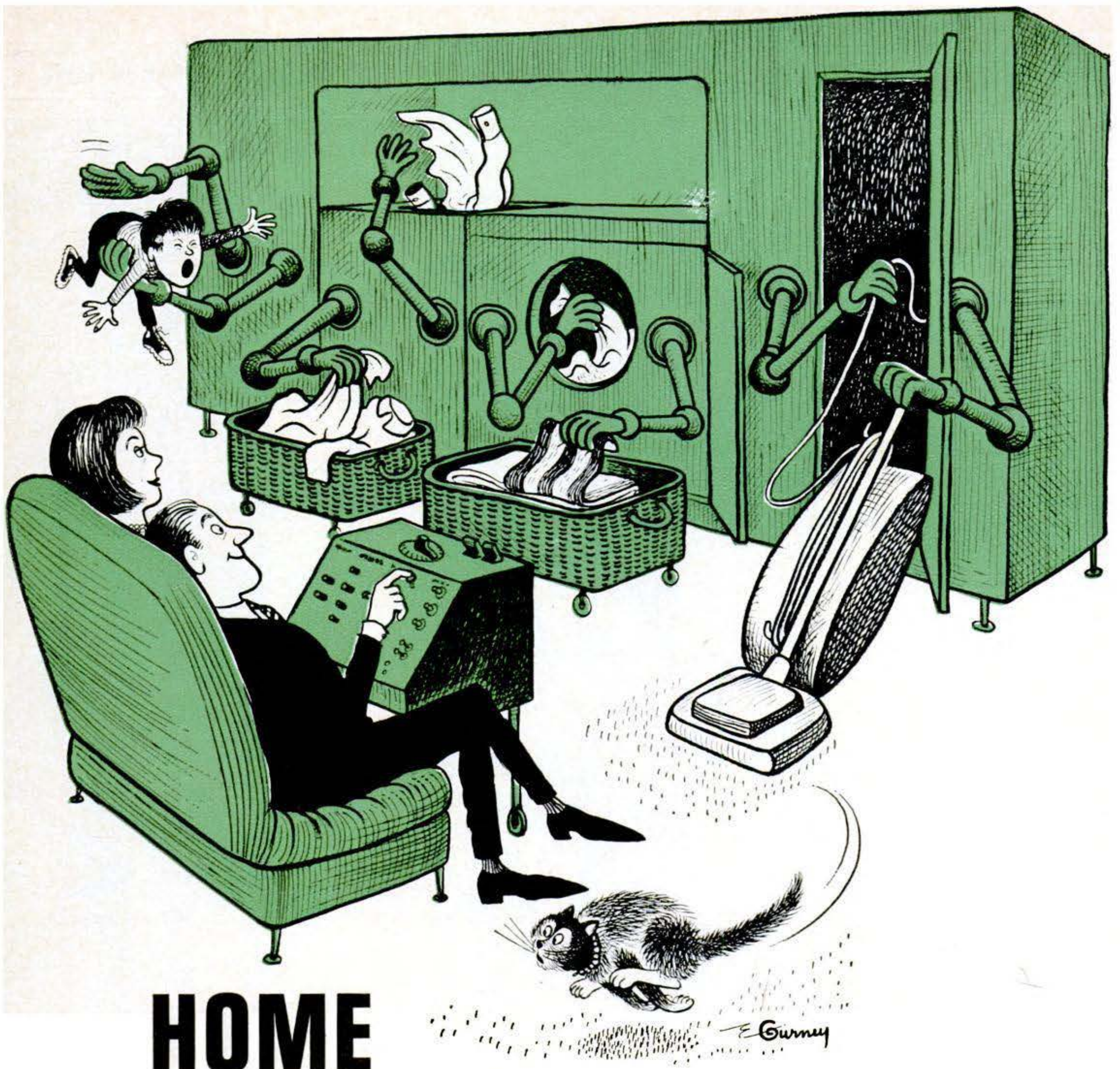
Broadcast loop in solid line surrounds 700 feet of talking highway.

Tiny station wagon holds five adults

Built like a miniature four-door station wagon, the experimental German-Italian Autonova Fam will seat five comfortably, and also take their

luggage, in its 11-foot length. It has a horizontally split two-piece tailgate and seats with hinged backrests that can be dropped flat for beds or added cargo space. A Glas 60-hp. engine in front drives its rear wheels.





HOME APPLIANCES: How Smart

The new household appliances are doing more than ever before—quietly, efficiently, and automatically

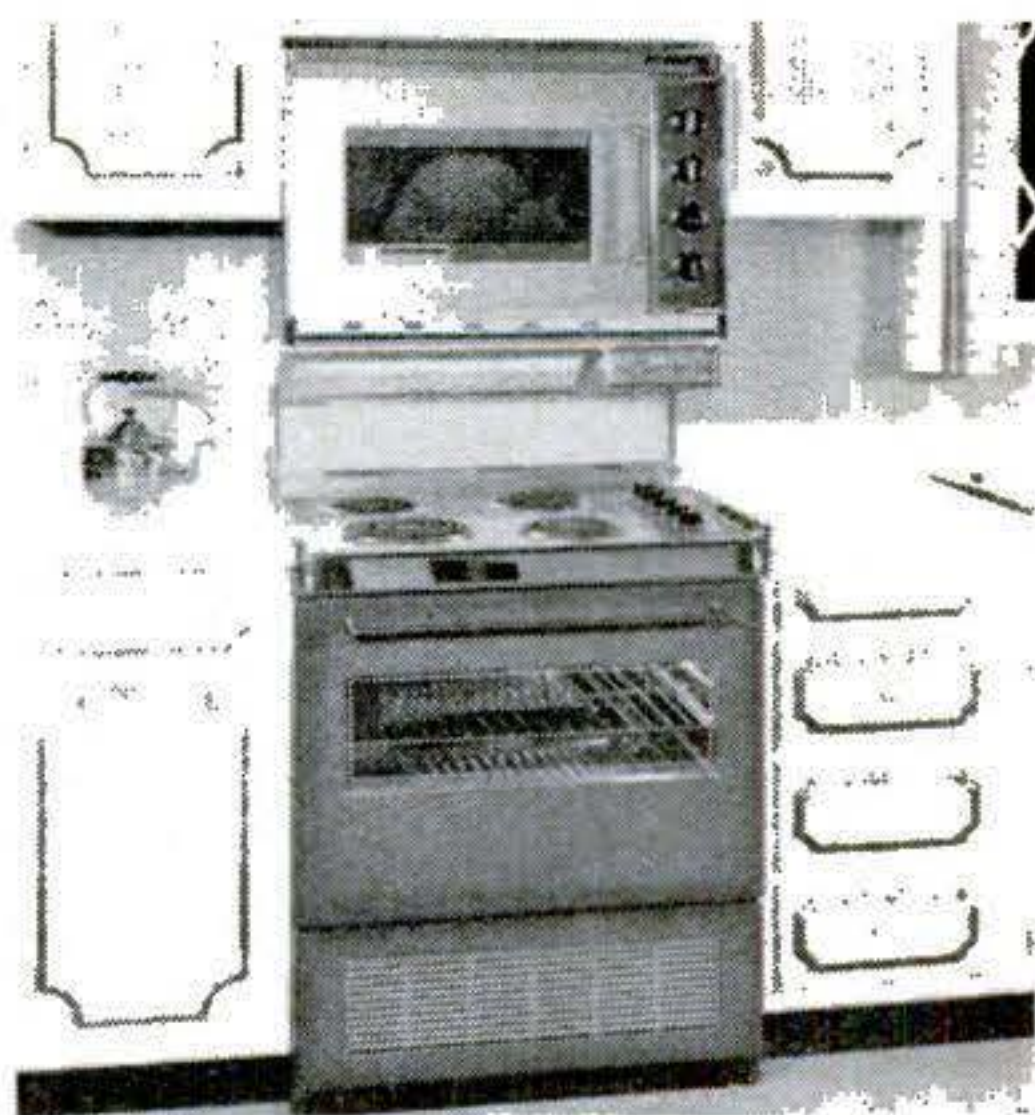
By **W. STEVENSON BACON**
ILLUSTRATION BY ERIC GURNEY

No matter what household job needs to be done, there's an appliance that will do it. Not only that: Today's appliances will do more than ever before—automatically. If you have the uncanny feeling that space-age automation is creeping into your home through the kitchen door, you're right. Here are just a few examples:

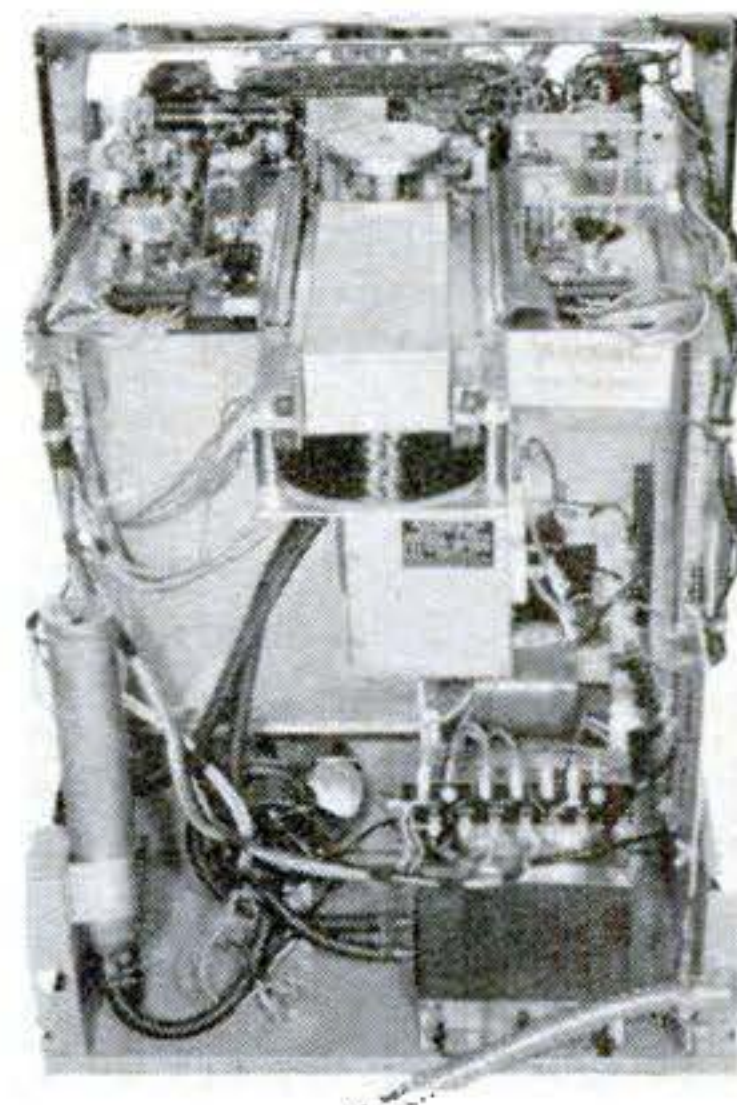
- "Computerized" clothes dryers that electrically test the clothes to determine when they're dry, and then shut themselves off.
- Programed ovens that will automatically defrost frozen food at a preset time, cook it, and then keep it warm until you're ready to eat it.
- Cordless vacuum cleaners with their own self-



A break with the past is the styling of GE's new "breakfront" refrigerator, which incorporates an illuminated countertop complete with convenience outlet under an overhead cabinet that opens to disclose a 14.6-cu.-ft. refrigerator. Lower section is a roll-out 6.63-cu.-ft. freezer with an automatic ice maker.



Fast, clean electronic cooking is moving into the kitchen. At top, above, is Tappan's new electric stove with electronic oven. Lower photo shows microwave generator for instant cooking.



Can They Get?

contained power supply—they go anywhere, do anything.

- Variable-speed transistorized washing machines with full selection of eight or more types of washing cycles.

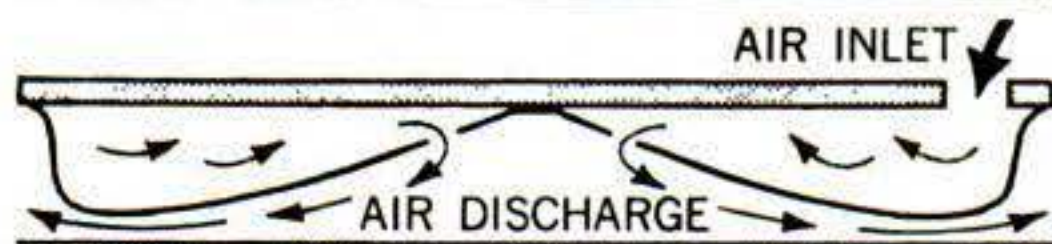
- Microwave ranges for home use that cook food electronically in minutes.

- Small, cordless appliances of all types that operate from long-life, rechargeable storage batteries.

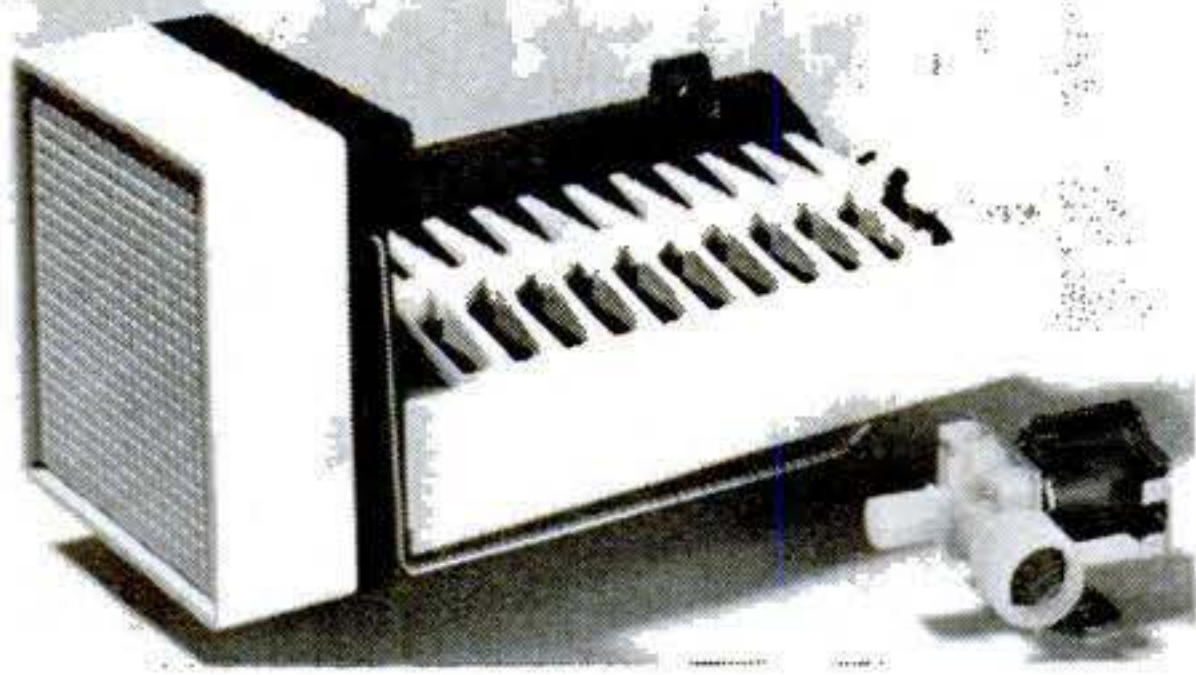
Amazing as some of the currently available units seem, even more "far-out" appliances are now undergoing testing or are in the design stage.

They include such things as waterless clothes- and dish-washers (the washing is done with high-fre-

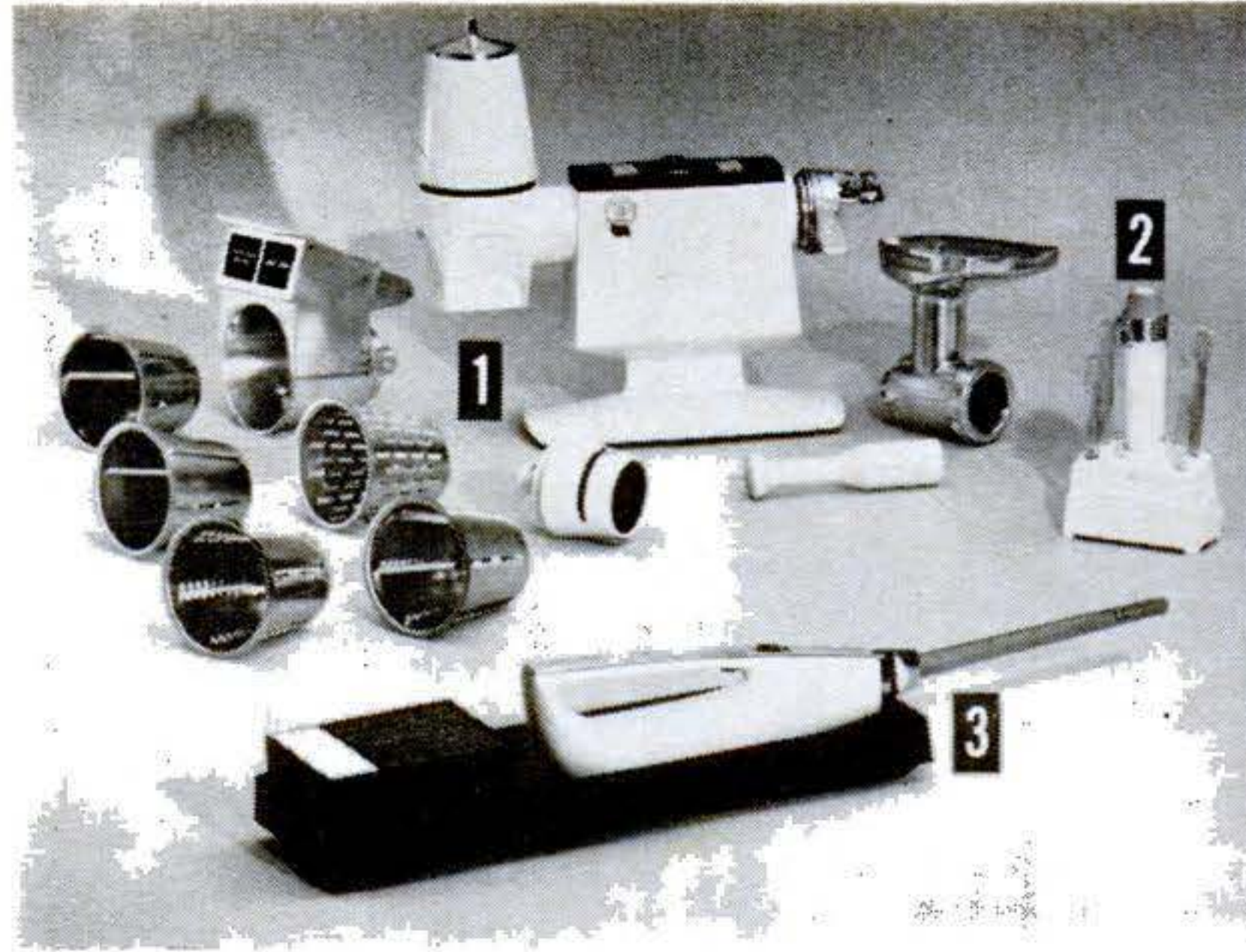
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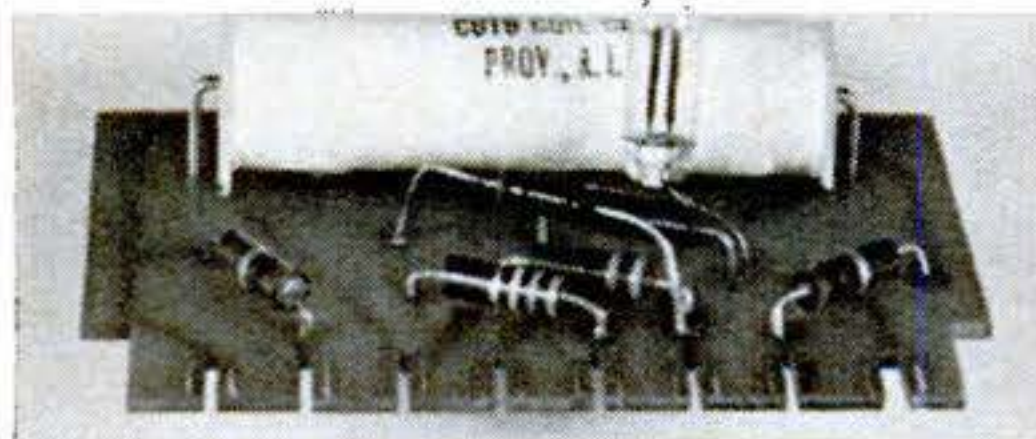
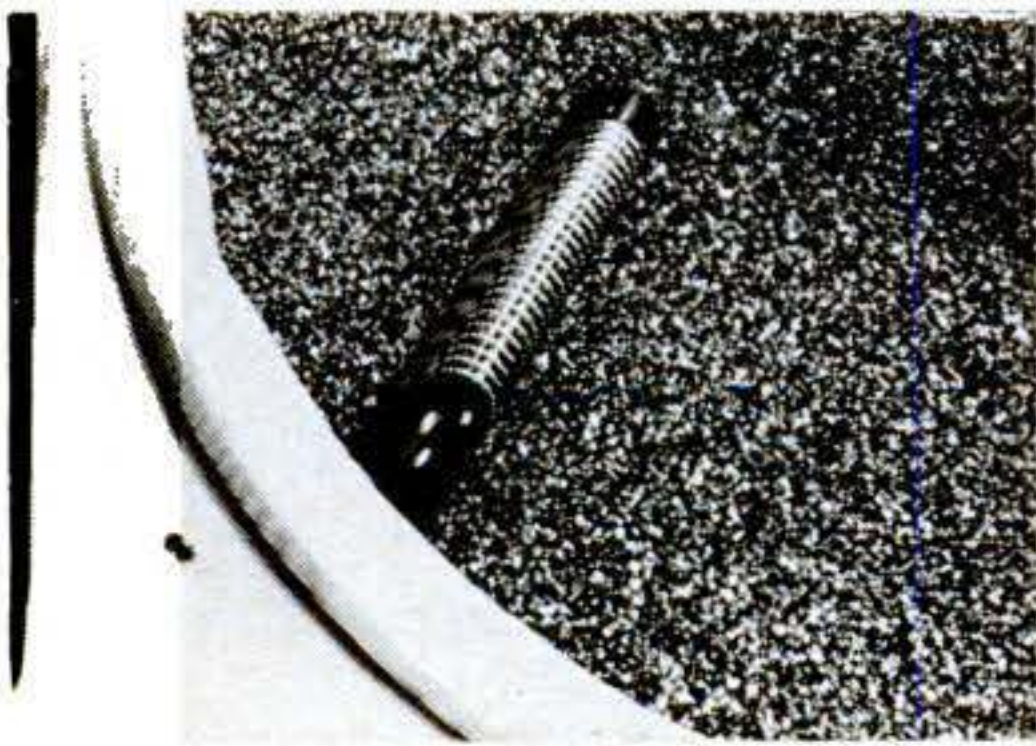
Air-cushion refrigerators that can be moved with the fingertips are new from Frigidaire. Standard vacuum cleaner hooked to inlet at front supplies air pressure to flotation unit.



Ice-cube automation: Latest model of Whirlpool's automatic ice maker demonstrates the increasing sophistication of even minor appliances. Thermostatically controlled unit automatically fills with water, freezes ice, electrically melts it free of the mold, and then ejects it into storage bin. A sensing arm stops the ice maker when the storage bin is full. Unit incorporates timing/drive motor, cam and gears, solenoid water valve.



An appliance for everything is shown in sampling of cord and cordless units: 1) Hamilton Beach Gourmet Center with salad maker, meat grinder, ice crusher, knife sharpener, and can opener; 2) GE cordless rechargeable toothbrush; 3) Hamilton Beach cordless rechargeable



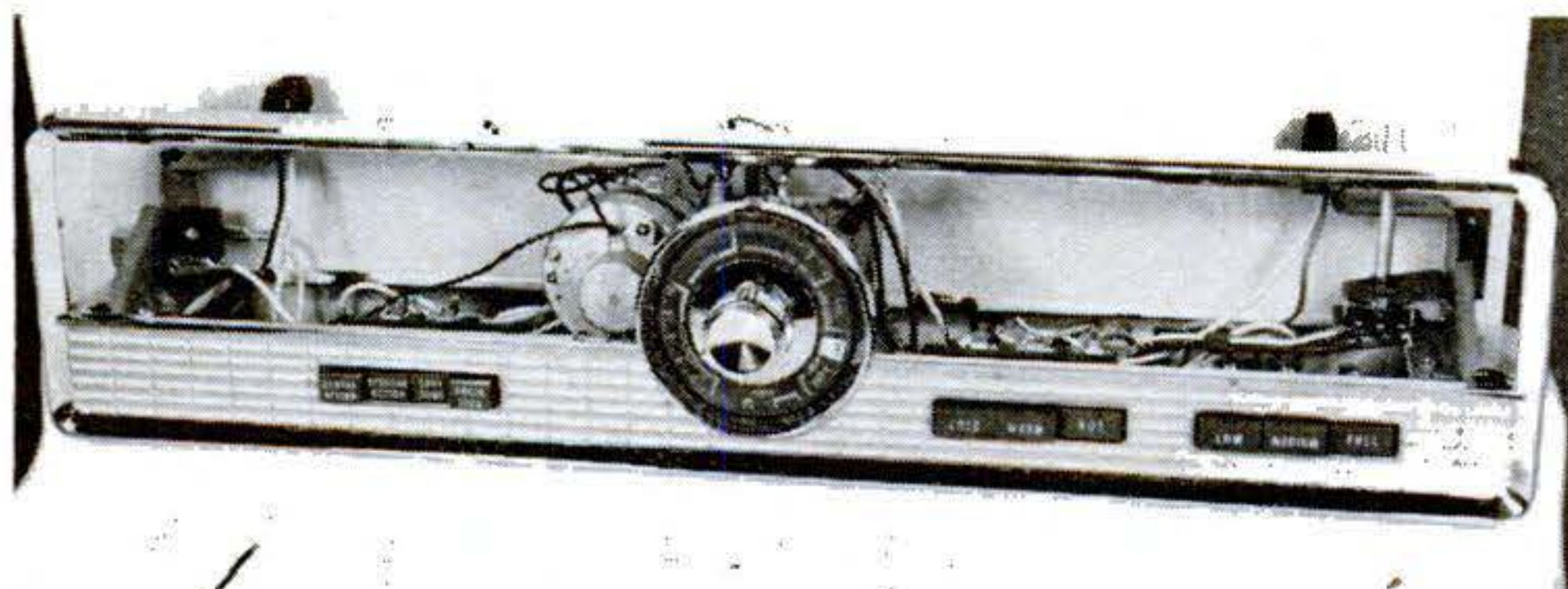
Electronic clothes dryers from Maytag incorporate sensing device in drum (above) which is connected to simple circuit below. Dry clothes cause lamp to light, activating photocell control circuit and stopping the machine.

quency ultrasonic sound), home food venders that serve up hot meals at the push of a button, dish makers that vacuum-form disposable plastic dishes for each meal, and home dry-cleaning machines as convenient to use as present-day washers.

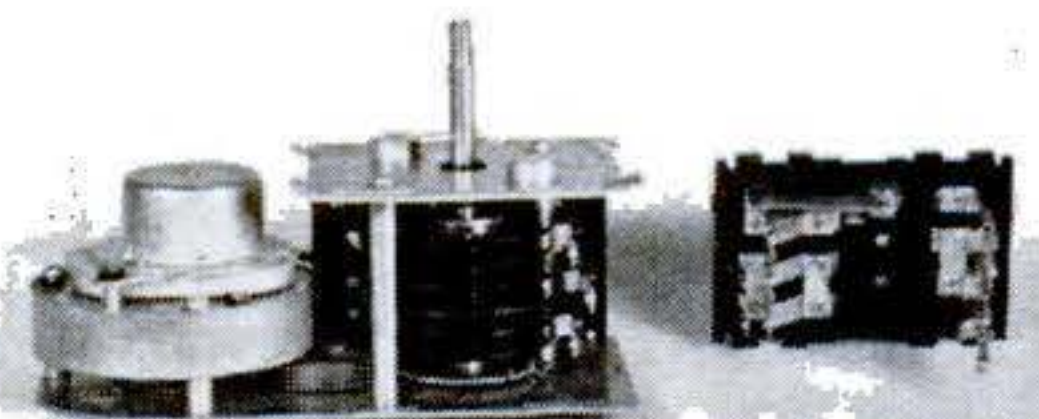
What makes it possible? Getting down to brass tacks, it's a combination of things—new components and materials that have come into existence in the years since World War II.

A cousin to the transistor, the selenium-controlled rectifier (SCR) invented in recent years is now going into continuous-speed controls for washers and mixers, light dimmers, and a host of other infinitely flexible appliances. Another solid-state component—the cadmium-sulfide photocell—forms the heart of several appliance-control circuits: those used in dryers, for example.

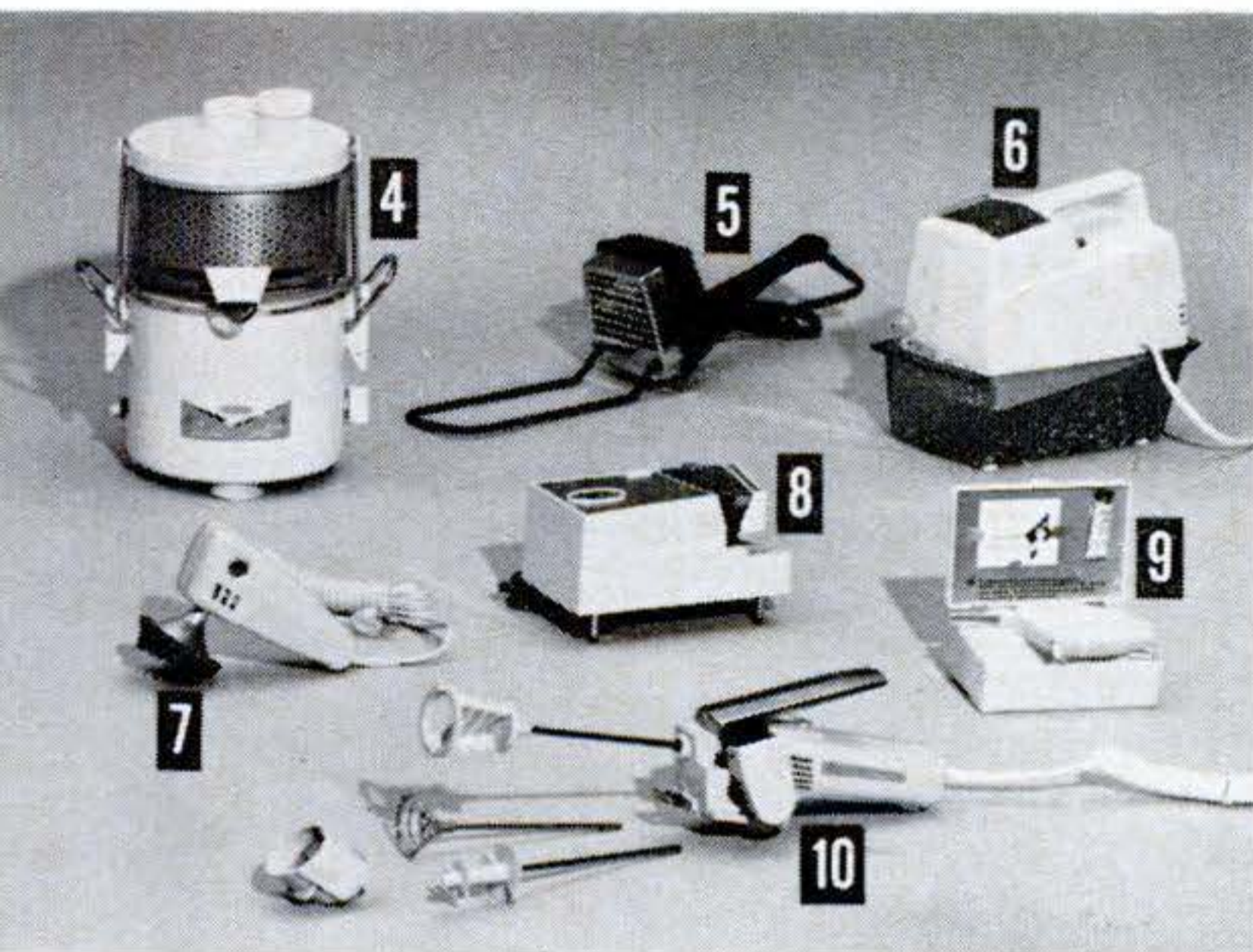
Cordless power? Yes, thanks to long-lasting, rechargeable nickel-cadmium batteries and solid-state battery chargers. Although Ni-Cads are not new in principle, it was only in recent years that we learned how to make small, inexpensive, sealed storage bat-



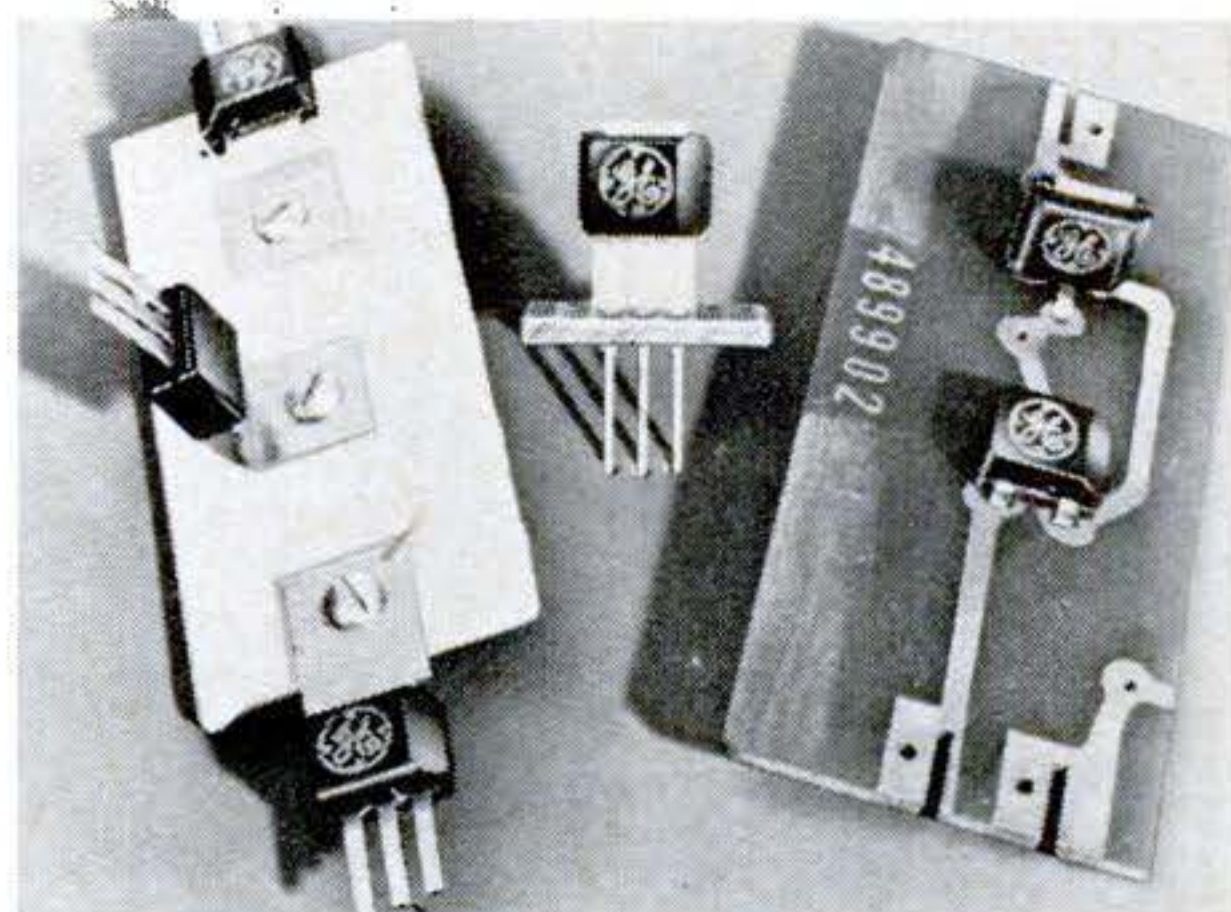
Flexibility is the keynote in laundry appliances. New ones offer you a choice of speeds, cycles, water temperatures, and a host of other features. Photos



above show a Maytag washer-and-timer assembly—the first such unit to add two additional cycles to the basic wash, rinse, spin-dry series.



1) electric knife; 2) Oster juice extractor; 3) GE fire starter; 4) Oster ice crusher; 5) Oster infrared heat massager; 6) GE knife, pencil, scissors sharpener; 7) Diamon Deb manicure; 8) Ronson "Can-Do" portable electric can opener with knife sharpener, attachments.



Cousin to the transistor, the silicon-controlled rectifier is making possible variable-speed appliances of all kinds—washers, dryers, and mixers, to name a few. The first of these space-age gadgets sold for \$300; the newest type (shown above) costs only 50 cents.

teries of this type. Then, when solid-state rectifiers came along, it became possible to build battery chargers for pennies, and there you have it—everything from cordless toothbrushes to cordless shoe polishers.

Plastics and other synthetic materials have also made an enormous contribution to the science of do-anything appliances. The new thin-walled, large-storage-space refrigerators, for example, are better insulated than their predecessors that wasted a large amount of refrigerated space in thicker walls. The reason is something called polyurethane insulation, which is blown into the steel channel in a wet mix and actually formed in place.

Other examples of synthetics making life easier are the new ovens coated with DuPont Teflon. Burned food residue doesn't stick to it, and the ovens can be cleaned with a wipe of a sponge. And today's automatic washing machines are as reliable as the nonautomatic washer-wringers—thanks to simplified, improved drive mechanisms, Neoprene-rubber seals, new plastics, and better porcelain and enamels.

Instant-cooking stoves. Although the use of microwaves for cooking food almost instantaneously dates back a number of years, microwave ovens for the home have been scarce due to cost and complexity. Now, however, a free-standing stove with a microwave oven has been introduced by the Tappan Company, and several other manufacturers—seeing a long-time-coming boom in the making—are eyeing the market. The advantages of microwave cooking are many: Baked potatoes, for example, can be cooked in just eight minutes instead of the usual hour, a layer cake takes six minutes instead of a half-hour,

[Continued on page 206]



Cordless vacuum cleaner developed by Sears, Roebuck uses an eight-cell Ni-Cad battery pack (bottom photo) to give a running time of about 20 minutes. The Cordless Vac, which can be used anywhere independent of an AC cord and outlet, comes complete with a floor stand containing a charger.

How I Search for Lost



Lonely explorers ride over the shifting sands of the Devils Playground, one of the most dangerous

By **ERLE STANLEY GARDNER**

When I'm not writing detective stories, which is how I make my bread and butter, or wrestling with television problems, which is how I make my cake, I am out adventuring, usually looking for lost mines—to put the frosting on the cake.

I can leave my study in Temecula, Calif., jump in a four-wheel-drive automobile, and within a few hours be in the land of the famous lost mines:

Warner Springs, where Peg-Leg Smith—

Author Erle Stanley Gardner relaxes at base camp during the hunt for the Lost Dutch Oven Mine.



stumbling along in a delirium, his saddlebags filled with black gold—was rescued by a cowpuncher, is less than an hour's drive from my ranch.

The fabulously rich Lost Nummel Mine in Arizona is six hours away.

The Lost Dutch Oven Mine and the Turtle Mountains where the famous Lost Arch Mine has been twice discovered and twice lost are about four hours away.

If these lost mines are now so accessible, why haven't they been rediscovered?

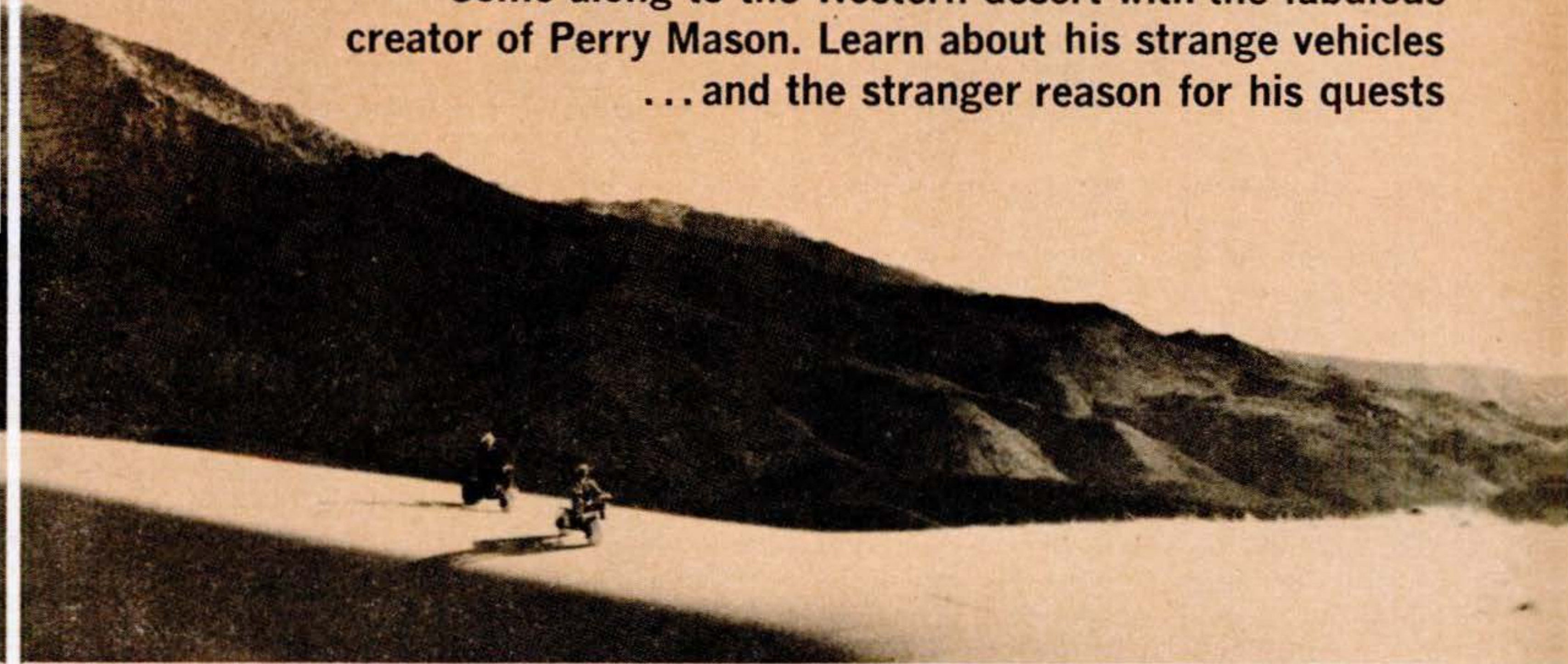
Obstacle course. Anyone can get to within a few miles of the sites, but from the spot where you leave your automobile to where the mine is probably located is usually most treacherous terrain. And the men who originally discovered the mines and left directions for subsequent searchers were probably engaging in verbal camouflage.

Take Peg-Leg Smith, for instance. He described three buttes, in a section of the desert no one has been able to locate. It is my opinion that he wanted searchers to

Continued

Gold Mines...and Why

Come along to the Western desert with the fabulous creator of Perry Mason. Learn about his strange vehicles ... and the stranger reason for his quests



spots in the Mojave Desert. The huge tires on their Pak-Jaks provide traction almost anywhere.



Four mounts for searching out lost mines: Butterfly (above, left), Pak-Jak (above, right), and Grasshopper (below, left) can penetrate the desert as

readily as the old prospector's mule. To reach the canyons and valleys inaccessible to wheels, Gardner's party resorted to light planes and helicopters.



"We found clues to the Lost Nummel Mine that should enable

go out in that section of the desert because it is actually some 30 to 50 miles south of where he discovered the gold. There is abundant evidence that Peg-Leg didn't follow the route that he said he did.

I am not anxious to discover a lost mine. I have enough responsibilities without taking on a gold mine. What I want to do is find enough clues to famous lost mines so that I can write stories that will enable some fortunate reader who really needs a gold mine to come up with a bonanza.

Tools for the job. Searching for a lost mine is hunting for a very small needle in a large and treacherous haystack. But modern tools and vehicles can be utilized to overcome the hardships of the desert.

My friend, J. W. Black of Paradise, Calif., is a genius at inventing vehicles for exploring the desert. When I started talking to Black about hunting for lost mines, and telling him that I wanted machines that would get me through deep sand, up steep hills, and over rough, rocky terrain, Black started working.

The machines he designed are fun to drive and remarkably efficient. I now have a weird stable of vehicles from Black. I have even picked up these vehicles with helicopters and used the combination to get into country that few, if any, living individuals have ever seen.

Black first designed the "Pak-Jak." A rather heavy two-wheeled vehicle with huge tires, an air-cooled motor, and a top speed of 15 m.p.h., it can go anywhere and carry a big pack of sleeping bags, water and provisions.

When I wanted something lighter and faster, he designed the "Burrito," a miniature Pak-Jak that can really travel on level

ground, yet take you just about anywhere.

Black also designed the "Butterfly," a huge tricycle affair that will carry two over loose, shifting sand so dry and powdery you can sink to your knees in it. Recently, Black built the "Grasshopper," and this promises to be the most exciting vehicle of all.

The Grasshopper is made by shortening the chassis of a Volkswagen, adding roll bars and bucket seats, leaving everything else off, widening the rims, putting on huge high-flotation tires, and making a few other changes here and there.

With Grasshoppers, we have explored sections of the desert we could never have penetrated otherwise. They have a low center of gravity and are almost impossible to tip over. They have huge tires for terrific traction and are geared down so they can go up steep grades. They're so easy riding that you can travel 50 to 100 miles over rough desert without undue fatigue.

When we had worked out all the bugs in the vehicles, we started our expeditions. Using Burritos, Pak-Jaks, and helicopters, we went into the Clipper Mountains to search for the twice-lost Dutch Oven Mine.

Strike two. The mine was rediscovered by an engineer who stumbled onto an old deserted mining camp containing a huge Dutch oven two-thirds full of pure gold. He became so excited he lost his bearings and could never find the landmarks again.

We found what we are satisfied was the location of the original Dutch oven. The oven wasn't there; the gold wasn't there; but there were evidences that 10 to 15 years earlier, at a date well after the mining engineer had given up searching, some in-

Burrito is easily carried into the Baja California desert on the front of an International Harvester pickup truck.



Gardner's party makes camp in a canyon that has never before been visited by modern



some reader to find it”

Erle Stanley Gardner sits in a Grasshopper on his California ranch. The vehicle was designed by his friend J. W. Black, a genius at inventing specialized vehicles for exploring the desert. Black uses no blueprints or sketches. Says Gardner, “He sits and thinks for awhile, then starts manufacturing.”



dividuals had camped at that exact location.

What did they do?

What would you have done?

The Internal Revenue Service would hardly expect to receive a letter from some poor prospector saying: “I have just discovered \$150,000 in gold cached in a Dutch oven in the desert. Please send me an appropriate form so I can turn over your share of this for income tax.”

Turning up clues. Searching for the Lost Nummel Mine, we found certain clues, which I am satisfied will enable some reader to locate it.

Nummel was a hard-bitten miner who would work at one mine, accumulate a stake, have a fight with the foreman, and walk 60-odd miles down to another mine where he would repeat the process.

One day when making this trek, he sat down for a brief rest. Casually he chipped off a little of the nondescript rock on a protruding ledge and found that he was looking at the richest gold ore he had ever seen in his life. He had no money for

“locating” a claim. He figured the best thing to do was to cover up his find and get a job and a stake. But he blew in the stake that should have financed the location of the claim.

Nummel had to return to the Red Cloud Mine for another stake, and, by that time, found that the Yuma Wash where he had made his rich strike was a maze of channels, all of which looked exactly alike.

Nummel, however, had one clue. He remembered stopping at a natural “tank” for water, and the mine he had discovered was within a mile or two of this tank.

So, using helicopters, we started looking—not for the mine, but for the tank. We found a formation with considerable promise.

Later we returned with our Grasshoppers and started making a more detailed exploration. We found one of those distinctive, narrow desert canyons with rocky sides towering to a great height and a twisting channel so narrow that a person can stand in the middle and touch both

Continued

man. They reached the site and brought in desert vehicles and supplies by helicopter.

Mine hunters load a Butterfly onto a trailer for a trip into the desert with the hope of finding long-lost mines.



"When you go into the Superstition Mountains—go heavily armed"

sides of the canyon walls. Moreover, this channel winds and twists in such a way that even within a few feet of the exit you can see nothing but a perpendicular wall.

Going through the canyon, we came to a place where it opened out into a valley that showed no evidence of exploration in modern days. I believe Nummel told the truth when he said he was within a mile of the tank when he discovered his rich mine; but I have a strong feeling that he was a mile on the Yuma side of the tank, not on the side of the Red Cloud Mine.

By going down the Yuma Wash to a point where the walls were less abrupt, we could get our Grasshoppers up to the mesa on top. Then, by working back, we could come to the hidden valley.

Of course, I can't guarantee that anyone is going to find the Lost Nummel Mine in this valley. But the mine has to be somewhere in this vicinity and, when it is found, I have a feeling it will be located in what we have called our hidden valley.

We also wanted to make a search for the Lost Peg-Leg Mine but, here again, there is a strong possibility that some lucky person has already stumbled onto this mine. At least, one man says he did.

"Black gold." Peg-Leg gold is supposed to be covered with a black encrustation that makes the gold look exactly like the black volcanic pebbles so profusely scattered over the desert. Only their weight furnishes a clue to the precious metal underneath.

For a long time, miners snorted at the idea of "black gold." Then engineers, putting through a railroad to the north and east of the Salton Sea, saw a squaw coming from the direction of the Chocolate Mountains and exhaustedly making her way to a water tank.

The squaw soaked her head with water, and drank copiously. She gave every indication of being almost dead from thirst.

The engineers thought they could help her, but when they started toward her, she became alarmed and ran into the desert. The engineers picked up a bandanna she had left behind, and were amazed at its weight. They found it full of the distinctive black gold also discovered by Peg-Leg Smith.

There's reason to believe someone has found the source of Peg-Leg's nuggets. Recently, Jack and Choral Pepper, publisher

and editor of *Desert Magazine*, called at my hideout in Palm Springs, and Choral excitedly held out her hand, dropping some objects into my palm.

I took one look and exclaimed, "Peg-Leg Smith's gold!" We examined it carefully. They had several nuggets *completely* covered with a paper-thin coating of a black substance. Underneath was the gleaming yellow of pure gold.

These were the nuggets that had come with an anonymous letter. The writer stated he had discovered the fabulously rich Peg-Leg Mine, that he was taking out gold as he wanted it, and that he was satisfied the mine would never be discovered by anyone else because he had removed all of the deposit on the surface. His first letter was followed by others, all authenticated by more nuggets.

Is it a hoax or was he telling the truth?

Those who have studied the sample nuggets of black gold are very much inclined to believe that it is the truth.

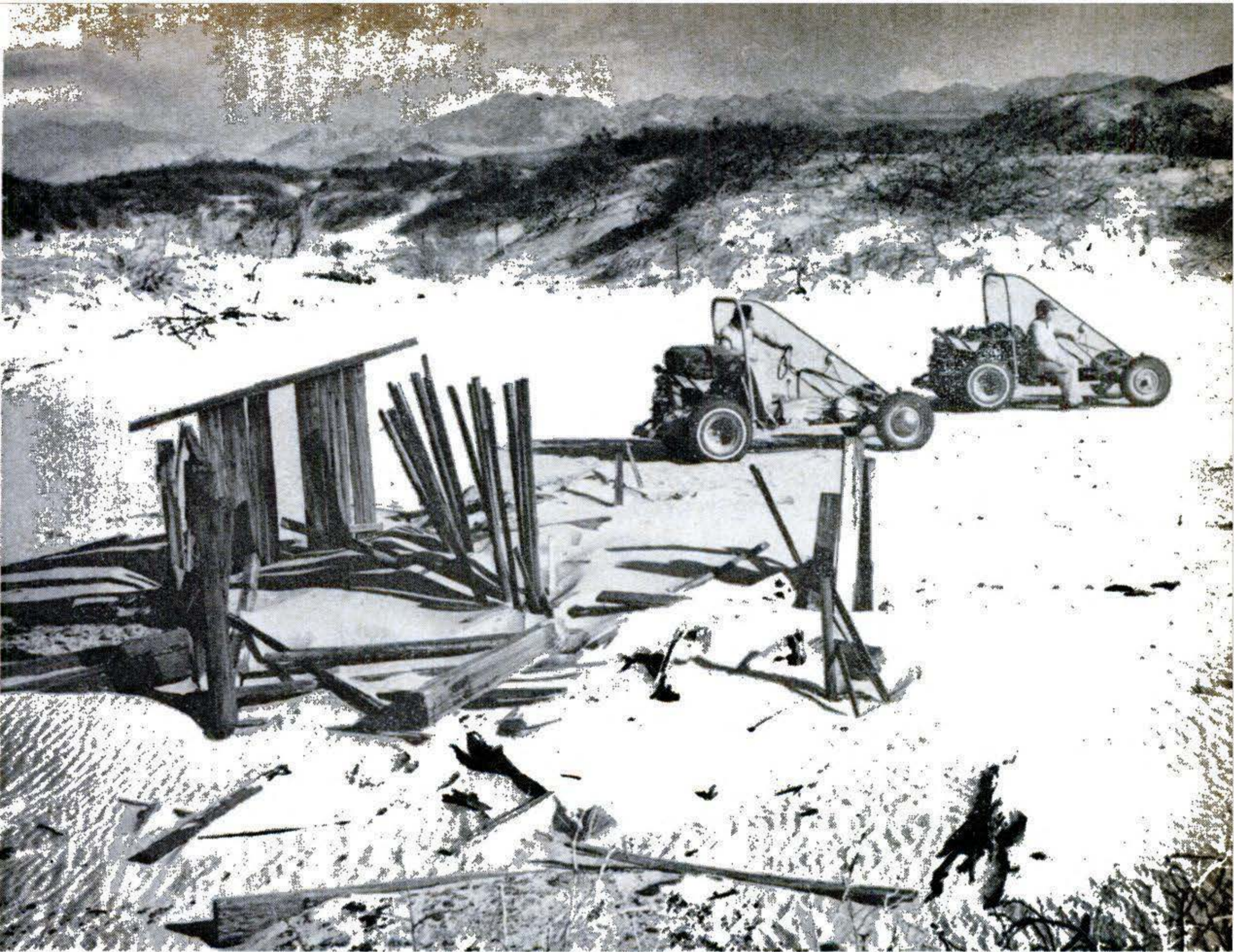
The big target. The most fabulous of all the lost mines, however, is the famous Lost Dutchman Mine in Arizona's Superstition Mountains.

Some businessmen of Phoenix have purchased ground at the very foot of the Superstition Mountains and now sponsor an annual search for the mine. With the accessibility of this campsite and the stories of fabulous wealth existing in the mine, searchers come by the hundreds.

Recently, we camped on a ranch at the foot of the Superstitions and explored the terrain by helicopter. A hundred lost mines could be hidden in these mountains.

Moreover, all through the Superstitions there are said to be piles of free gold. The ambush by Indians of the Peralta expedition, headed for Mexico with a huge mule train loaded with gold, is history. Some mules escaped during the fighting and simply rid themselves of the packs of gold. The Indians found other mules, killed them for meat, and dumped the gold on the ground. From time to time, enough of these piles of gold have been discovered to authenticate the legend that gold is still there for the taking.

The Superstitions are dangerous. Probably more than 300 people have been killed there since gold was first discovered. And when my companions and I started



Deep in the desert, the author's party comes upon the ruins of a prospector's shack—the too-frequent

end of a miner's dream to beat the boiling sun and treacherous sands, and walk out with gold.

exploring the country, the sheriff assigned an armed guard to accompany us.

Desert chase. Strange things take place in the Superstitions. Once, while I was looking for a lost mine, two horsemen approached me at an angle. Spotting me, the lead man snaked a gun out of a holster. Both men came scrambling up the grade, trying to catch the car. I didn't know what they wanted; I wasn't anxious to find out.

For about two miles the chase continued. Then I came to a steep descent to a sandy wash about 50 yards wide. I went down and shot across the wash—fortunately without cocking the wheels so they'd throw sand—roared up the incline on the other side, and around a curve in the road.

I was cussing myself for running away. I had a Colt .44/40 on the seat beside me. I stopped the car, got out with the gun, and waited for them to gallop around the curve. When they didn't come, I tiptoed forward to peer down. They were standing dismounted. Then I began to chicken.

These men looked competent with their chaps, cartridge belts, and sixguns. I was one; they were two. I headed for my car and civilization—perhaps saving my life.

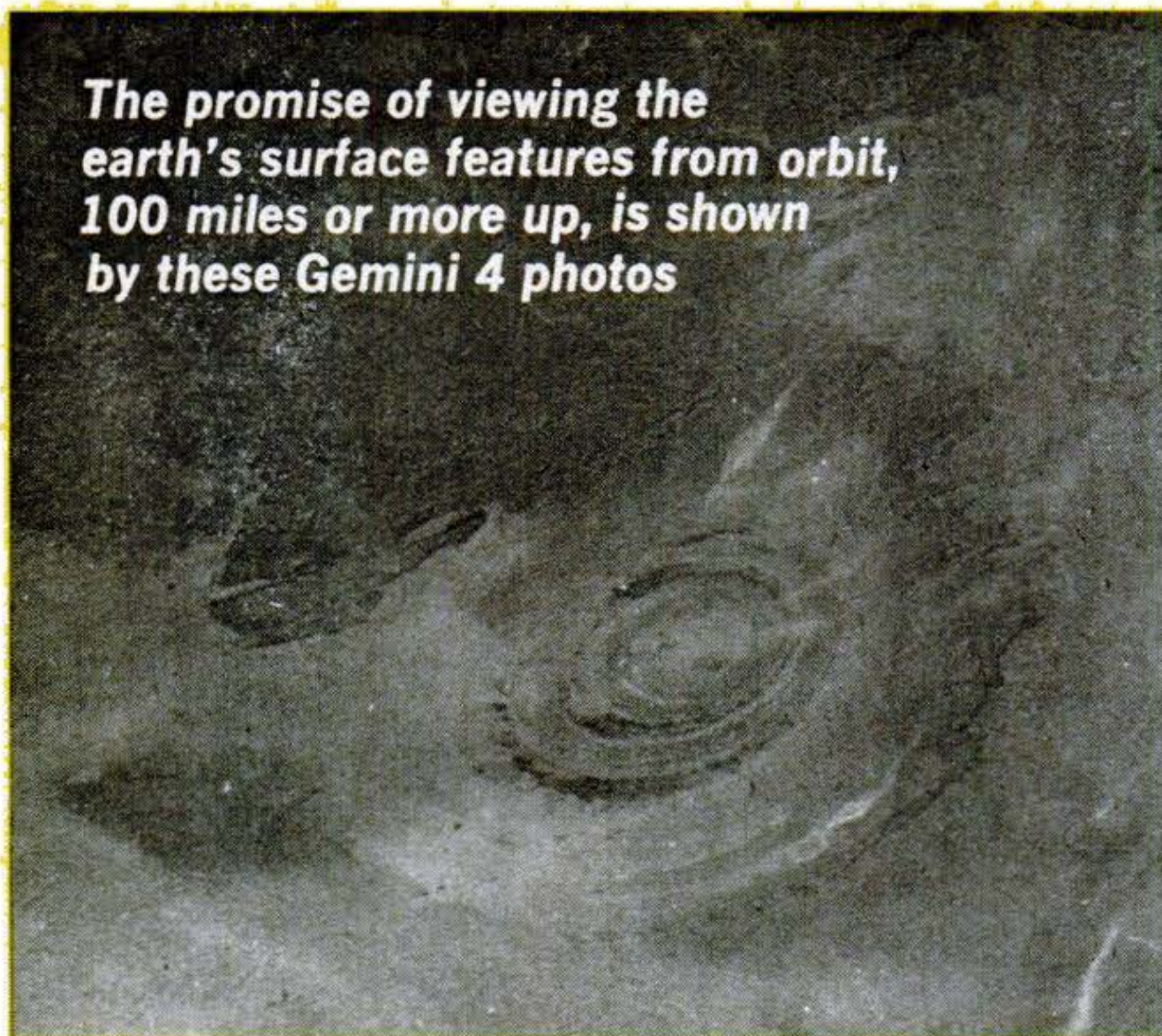
Incidentally, since my trip to the Superstitions, two people—a man and his wife—were murdered there.

As one of the deputy sheriffs told me, "Not only are there problems connected with the Lost Dutchman Mine, but we have reason to believe that Eastern crooks, looking for a place to hole up for the winter, come to the Superstitions, pretend to be prospectors, and prowl around, ostensibly looking for the mine."

The advice of the motel at the "jumping off" place at Apache Junction is not to go into the Superstitions alone, and to go heavily armed. It is perfectly safe, of course, to go on the sponsored annual hunt. It is probably reasonably safe to go along the main trails. But anyone who adventures off the main trails in the Superstitions had better watch his step.

P 5

The promise of viewing the earth's surface features from orbit, 100 miles or more up, is shown by these Gemini 4 photos



Mystery formation, possibly meteor-made, in Mauritania is eyed from orbit. Such views may aid geologists and prospectors.



Arabian Peninsula's tip is filmed by Gemini 4 with airplane-view clarity.

Bonanzas on the Way

Here are four big ways our Project Apollo-Saturn will pay off—besides its dramatic aim of a manned lunar landing before 1970

By Dr. Wernher von Braun

Director of NASA's George C. Marshall Space Flight Center, Huntsville, Ala.

As a nation we are firmly committed, everyone knows, to Project Apollo-Saturn—the plan to land an American on the moon before this decade ends.

Less well known is the fact that a successful lunar landing in this decade is not so much an end in itself, as a most effective focus for developing a broad U. S. manned-space-flight capability that will pay off in four major ways:

- Direct benefits to all mankind.
- Gains for our national security.
- Fundamental knowledge about the universe and its origin.
- Engineering and managing know-how.

The hard and simple specification of an early manned landing on the moon has served to put our manned space program

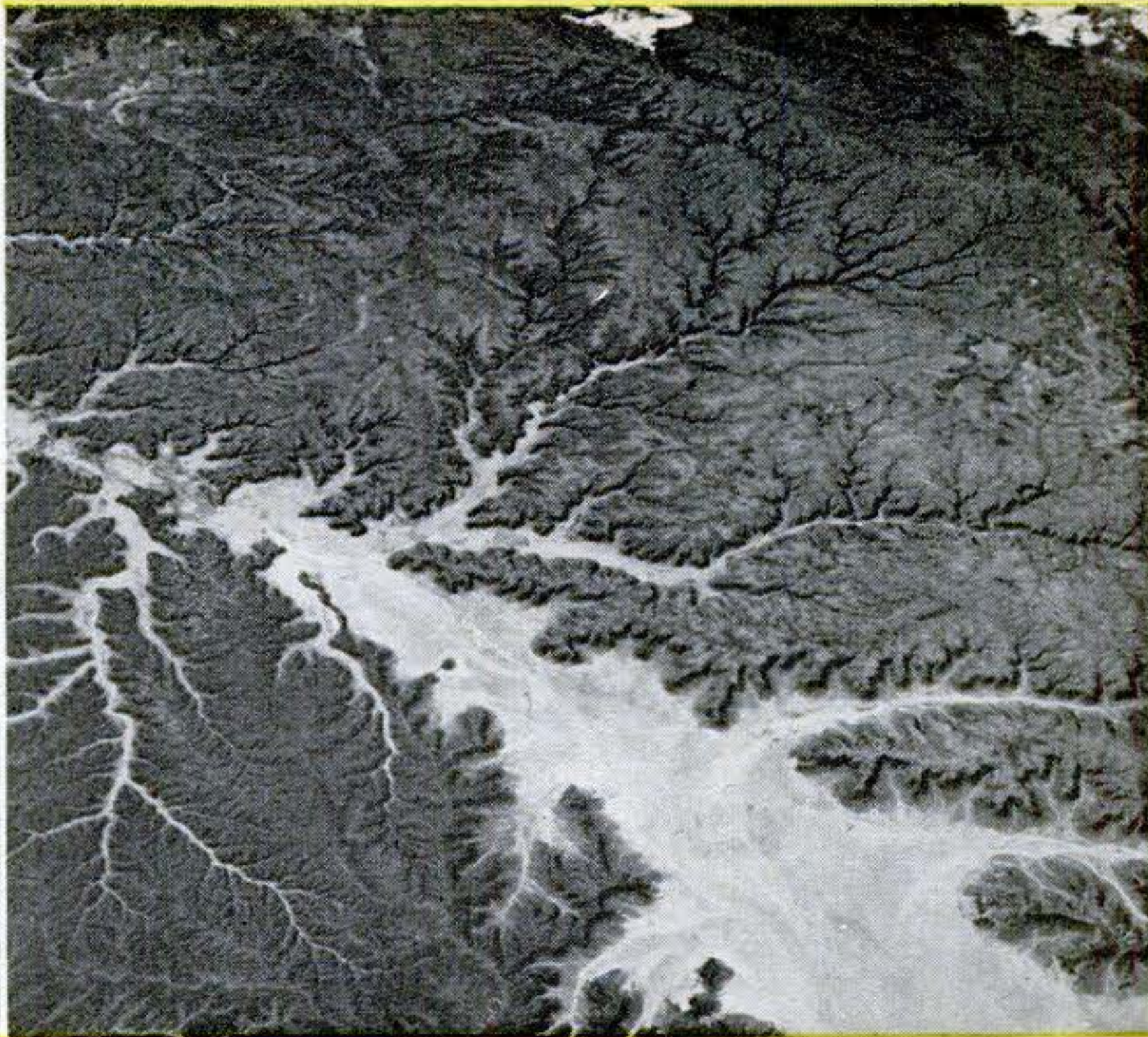
into high gear. And it has assured continuing public and Congressional support. For it would obviously be foolish to spend so much for manufacturing, testing, and launching facilities if we were not determined to invest further funds to man those facilities—and see the gigantic Apollo-Saturn program through to a successful conclusion. The moon landing, however, has never been this program's sole objective.

When Lindbergh soloed the Atlantic in 1927, he announced that Paris was his goal. But if his aim had been only to get to Paris, he might as well have taken a boat. The real purpose underlying his flight was to demonstrate, in terms everyone could understand, that the time had come to fly safely across the Atlantic Ocean. We all know what happened to aviation after that.

Today we believe the time has come for man to venture safely farther away from earth than our astronauts' voyages in low



Streets of El Paso, Tex., can be seen in view from more than 100 miles up.



Gemini photo bares topography of Arab plateau. These hand-camera shots could be excelled with space-observatory gear.

to the Moon

Dr. von Braun, right, plans this article with PS Editor-in-Chief Heyn after speech on same subject.



orbits so far. We think it is time to set foot on other heavenly bodies. The moon has become our cosmic Paris.

The payoff—as in Lindbergh's pioneering flight—will far exceed attainment of the immediate objective. Let us look into the four sorts of benefits I have named:

Aiding earth activities. First will come direct help for our earthly endeavors.

Unmanned satellites already give us a preview: Syncom and Early Bird satellites provide global television, radio, and telephone service. Tiros and Nimbus satellites and the new operational Tiros system are about to become vital elements of a worldwide weather-forecasting network. Transit satellites furnish a useful navigation aid for ships, and similar ones can be foreseen for air navigation and traffic control.

Manned satellites, including orbital space stations, will perform more and more of these tasks in the future—and new ones, too. Putting men in orbiting vehicles will

prove a great advantage in weather-advisory systems, and for repair and maintenance of orbiting communications relays.

Man will play an even bigger role in orbital earth-observation posts to come:

Worldwide crop reporting from orbit can fill what will soon become an urgent need. Present trends of the population explosion indicate that the earth will have six to seven billion mouths to feed by the year 2000—and twice as many just 35 years later. The resulting problems of famines, strife, and struggle for sheer survival are not for the distant future to worry about, but for our own children and grandchildren. We must learn how to manage our planet's resources better—and must find out, first, how much food is available and where.

Sophisticated aerial photography, it has been demonstrated, can clearly identify various crops. You can tell a rye field from a barley or oat field, a farm growing soy

[Continued on page 201]

THE UPROAR OVER 2-PLY TIRES

.....

Are Your Tires Safe

Here is a careful analysis of a controversy that affects you and your family, with a recommendation on tire care to prevent accidents

By C. P. GILMORE

Two-ply tires have been controversial ever since they hit the U.S. market on 1961 cars. Many drivers and tire dealers insist they don't stand up as well as tires made with four actual layers of cord.

Major tire makers, on the other hand, claim the furore is over nothing. People are suspicious of any new product, they say, and point to the ruckus raised when tires changed from six plies to four, and when the tubeless tire was introduced.

But while the companies that make new-car tires for Detroit maintain that the two-ply tire is as good and in some ways better than the four-ply, not all companies and sales organizations are solidly behind the two-layer shoes.

Why is the two-ply/four-ply business, despite the pushing of the major companies,

still not settled five years after the new design was introduced?

Why do dealers, almost universally among those we queried, still say two-plies can't stand up to fours?

Why is it that although Detroit puts two-plies on new cars, drivers buy four-plies overwhelmingly when replacement time comes?

To get the answers, I talked to all 14 of the country's tire makers, along with a few independent experts. I watched tires being tested in laboratories, and participated in road tests.

First, let's take a look at the manufacture and use of two-plies as of this spring:

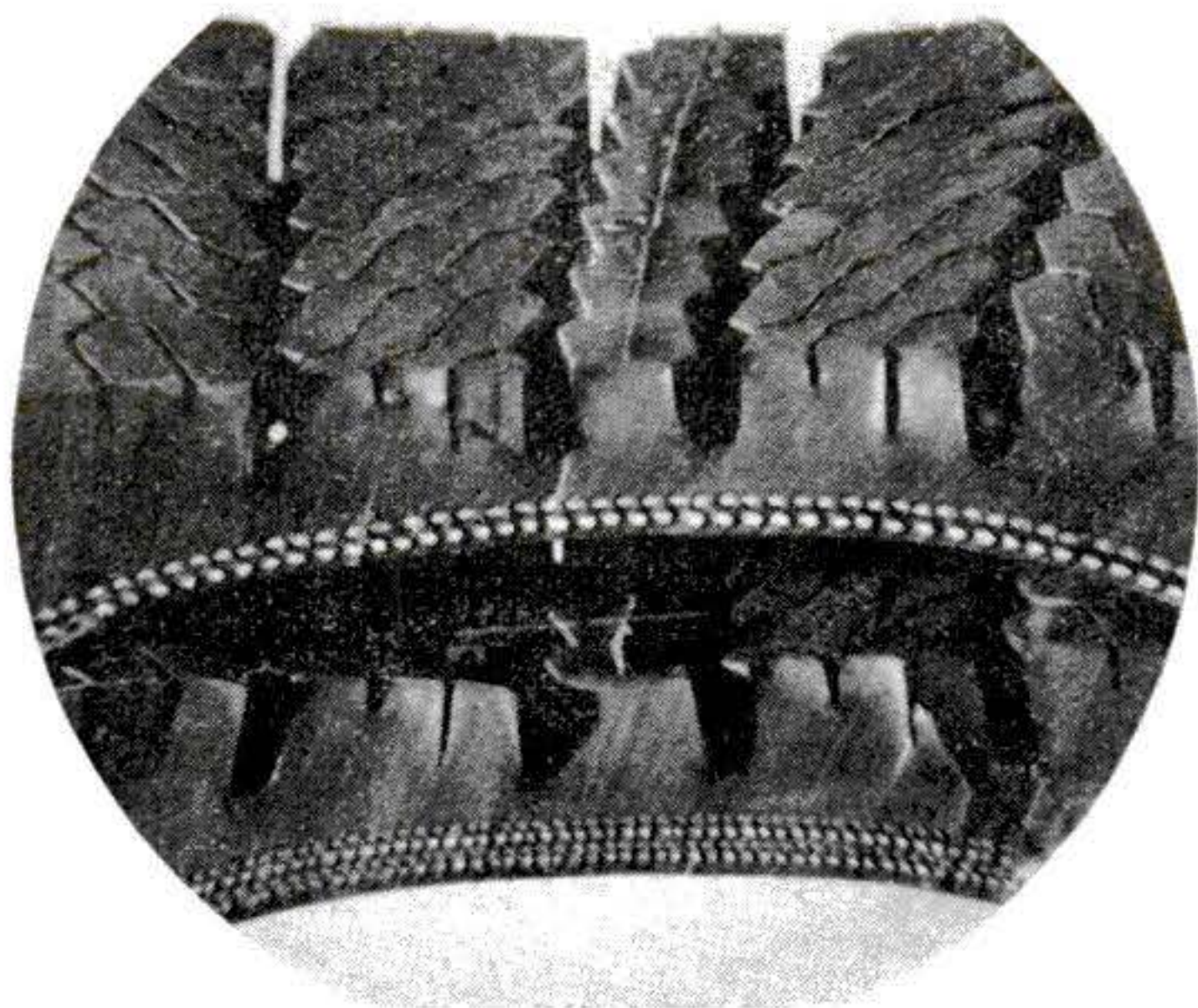
- More than 90 percent of all new cars coming out of Detroit now wear two-plies. Cadillac changed over this year. Only holdouts are Imperial, Lincoln, and Thunderbird.

- All five major tire companies—the original-equipment manufacturers (OEM) that sell tires to the car makers—build two-ply tires in their first, second, and third lines. But all premium tires and most of their second- and third-line tires are still four-ply, since most replacement-tire buyers won't buy two-ply tires. OEM tires bound for Detroit's new cars, however, are almost all two-ply.

- Five of the country's smaller tire companies make two-ply tires. But they generally make them in the third line only. They rarely push them. And two-plies account for only a tiny fraction of these companies' sales.

- Three minor companies once made two-ply tires, but dropped them. One company never made them at all.

- Montgomery Ward, one of the country's major retailing chains, tried two-plies briefly, but dropped them several years ago. Sears, Roebuck announced that it

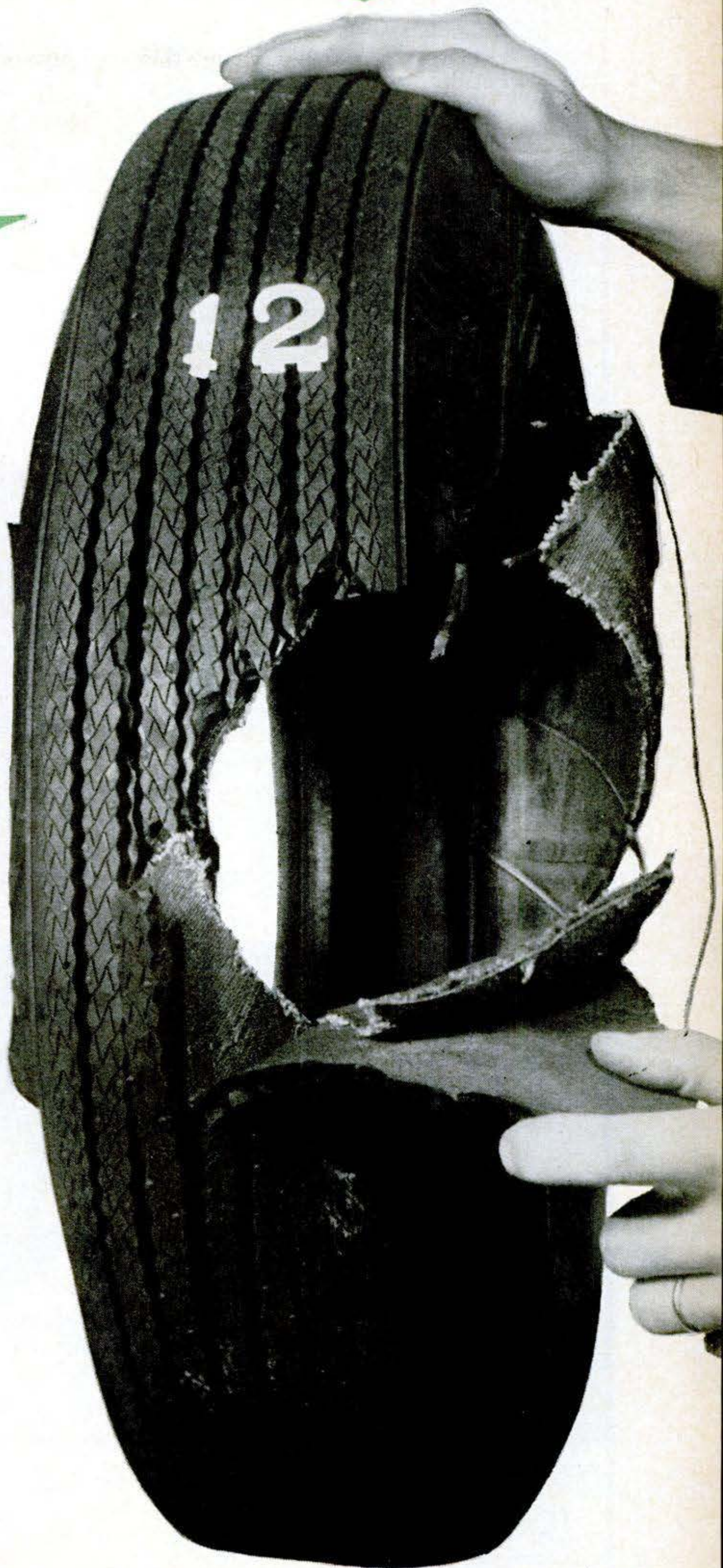
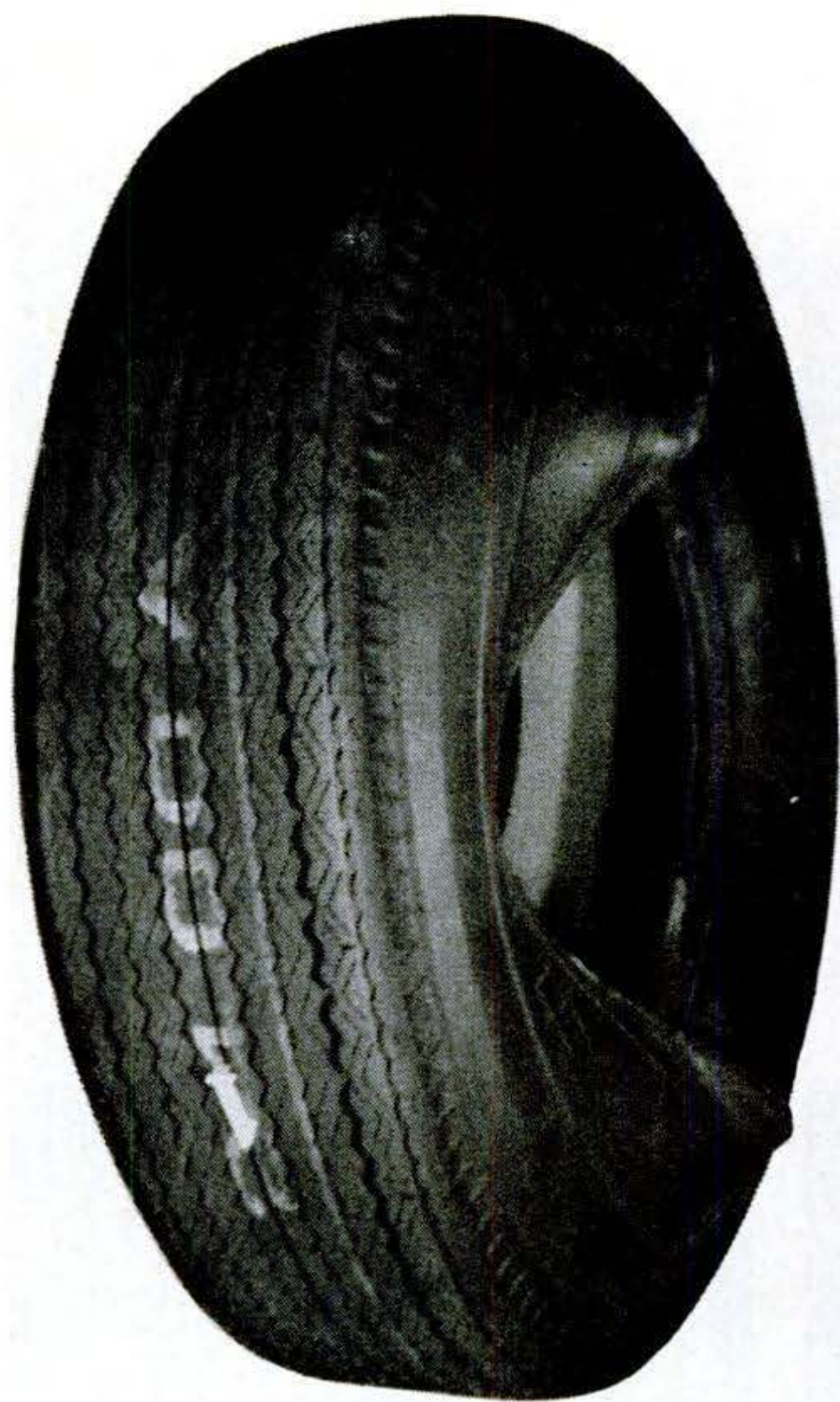


Big difference in construction between two- and four-ply tires is simply the number of layers of cord in the carcass. The picture shows four at bottom, two at top, in cross-section view.

2-PLY
AFTER TEST

Enough?

4-PLY
AFTER TEST



In tests, four-plys failed in bead, two-plys in tread

Failure: While not all tires of a given construction fail the same way in overinflation, more than half of all four-ply tires burst by Motor Vehicle Research laboratory failed in bead (above). Majority of two-plys, on the other hand, failed in tread (right). Tires were inflated slowly until failure. Burst pressure of two-plys averaged about 180 pounds, four-plys above 200. Inflation to burst point took five to eight minutes. The laboratory, operated on a nonprofit basis in Lee, N. H., has burst hundreds of tires of different brands.

“Will the two-ply stand day-to-day abuse—underinflation or overload

was shedding its two-ply tires this winter.

To find out what was behind all this, I went calling, and here is the evidence, and opinions, that I collected:

Some tire makers claim that two-plys are at least the equal of four-plys in every respect, and in some ways better. True, the two-ply tire will do the basic job a tire is designed to do. That is, if properly loaded, inflated, and maintained, it will run until its tread wears out without failure of the carcass. And it does give a softer ride. Because it is cooler-running, it may be a better tire for high-speed turnpike driving than a comparable four-ply.

But will the two-ply stand day-to-day abuse—underinflation or overload, for example—as well as a four-ply tire? And tires are often run under abusive conditions.

The difference. It starts with the basic construction. The four-ply tire has four actual layers of cord in its carcass. What the manufacturers call the four-ply-rated two-ply tire, on the other hand, has two. Akron engineers say that cord content by weight is the same in both. The two-ply gets approximately the same load-carrying capacity by using bigger, stronger cord.

The two-ply lacks no defenders.

“Heat buildup is what destroys a tire,” says Joseph F. Hutchinson, manager of

auto-tire engineering at Goodyear. “A two-ply tire has fewer flexing parts, and can run as much as 15 degrees cooler. You also get less hysteresis—that means the tire absorbs less energy when it rolls, and consequently you use less gasoline.”

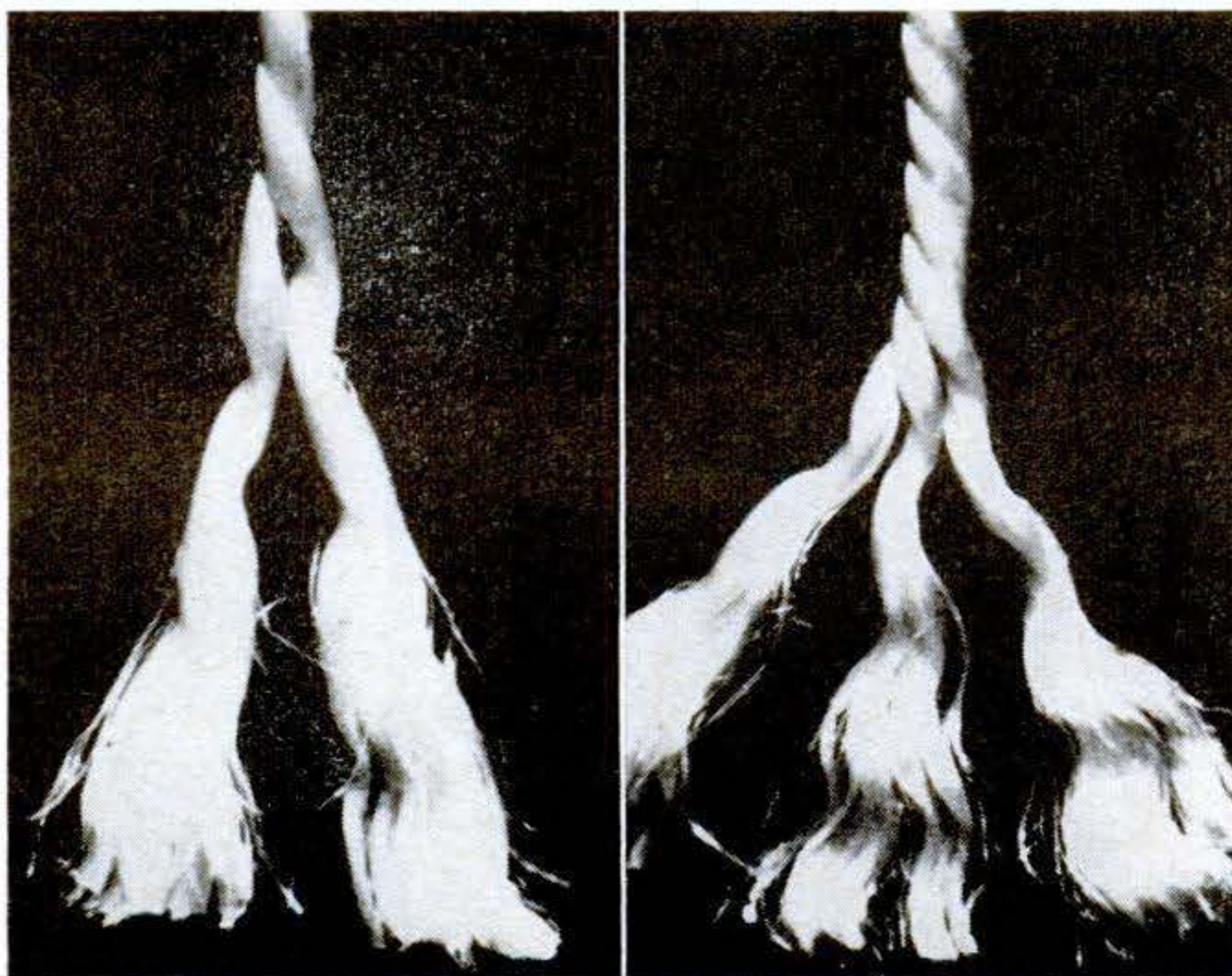
Tire men also point out that the greater flexibility allows the tire to conform slightly better to the road surface, giving better traction and skid resistance. The ride is better—that’s particularly important to Detroit. Finally, most experts agree that two-ply tires last as long as four-plys.

Generally, two-ply tires do not show up as well on some tests of carcass strength and resistance to force as do four-plys.

“If you force a plunger into a tire,” concedes senior field engineer Jim Corey of Firestone, “the distance it goes into the tire and the load required to force it into the tread develop an energy figure. And with two-ply construction, the energy yield will be somewhat lower than with four-ply construction.”

Similarly, two-ply tires will generally burst at a lower pressure than four-ply tires of the same size when slowly inflated with air or water (the so-called hydrostatic burst test generally used in Akron).

Burst-testing. One of the few independent organizations to make burst tests and



Larger cord is used in two-ply tires than in four-ply ones. Cord at left, designed for four-ply, carries a 1650/2 rating, the one on right, for two-ply, a 2200/3 rating. The larger figure in each case represents weight, in grams, of 10,000 yards of a single strand. Smaller figure indicates the number of strands.



This two-ply tire failed after running at reduced pressure for 75 miles. A four-ply, running under identical conditions on same car, went 125 miles without an outright failure.

—as well as a four-ply?”

publish the results is the nonprofit Motor Vehicle Research laboratory of Lee, N.H. In a series of tests, this organization slowly inflated several hundred two- and four-ply tires made by various manufacturers until they burst.

Although there were variations, the four-ply tires tended to burst at between 200 and 300 pounds pressure. Two-ply tires for the most part blew at 170 to 200.

Some manufacturers said the MVR figures were not out of line with those obtained in their own laboratories.

“That’s about right,” said Corey.

“There is some strength difference between a two-ply and a four-ply tire,” says Tom Young of B.F. Goodrich.

Some manufacturers—Goodyear, for example—deny such differences, at least for their own products.

Are burst-strength variations important?

“Yes,” says Andrew J. White, director of MVR.

Most tire manufacturers disagree.

“Any tire test taken by itself is just one factor of many,” says J. J. Hartz, manager of tire engineering for Goodyear.

“It can be extremely deceiving,” adds Corey of Firestone. “You’re testing only one small segment of a complex system.”

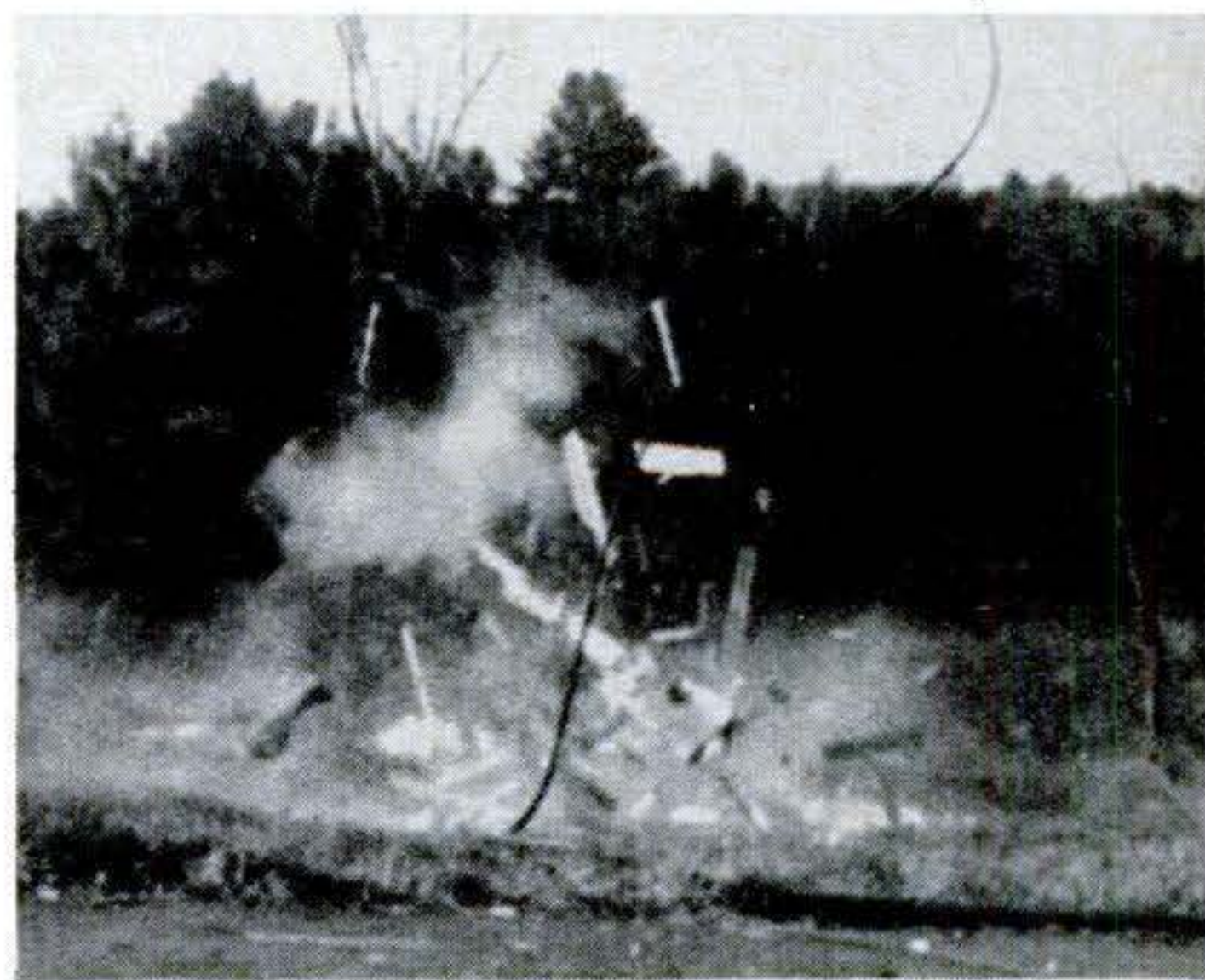
“In fact,” says Corey, “we test our tires on a rough, twisting, rocky road through the Davis Mountains of West Texas. And the two-ply tires, despite somewhat lower burst-pressure figures, show better durability than four-ply tires put through the same course, where impact damage plays an important part.”

“It’s harder to cut,” says Hutchinson of Goodyear. “When you run over a sharp object, the tire just folds out of the way.”

J. J. Robson, Firestone director of tire development, estimates that the two-ply absorbs 20 percent more shock force than a four-ply.

The evidence I have seen indicates that performance of two-ply and four-ply tires is not identical, particularly under abuse. Parking-lot surveys and other studies show that many car owners run their tires seriously underinflated.

The load-carrying ability of a tire, of course, varies with pressure. If pressure drops sharply below normal, the tire becomes seriously overloaded and subject to



Here's one tire bursting in Motor Vehicle Research tests. The tire is inflated slowly until failure. Rupturing on side nearest the ground, it rockets skyward. Hose that was used for inflating the tire can be seen arching over the horizon.

early failure. But do two- and four-ply tires show differences in the failure rate as pressure drops?

Will it last? One design criterion for any tire is that it be built to run long enough to wear out the tread before the carcass fails. Properly maintained two-ply tires will, undoubtedly, normally meet this goal. But MVR tests seem to show that two-ply tires fail quicker than four-ply tires under abusive conditions.

Most tire makers quarrel with this conclusion, although many admit that they have not tested two- and four-ply tires comparatively under severe underinflation.

“If underinflation is the same,” says Young of Goodrich, “there should be no significant difference.”

“Two-ply tires can take more punishment

Continued

of that kind because they are more flexible," says Goodyear's Hutchinson.

Firestone's Corey reflects a different point of view. "Flex breaks in two-ply tires were a problem," he says. "But that problem is pretty well over the hill now for most manufacturers."

Since there is so little agreement on the vulnerability of abused tires, I accepted an invitation from MVR to observe and participate in tests, both under lab conditions and in vehicles on the road.

Road testing. The first test involved mounting four first-line 6.70-by-15 tires made by one of the OEM companies on the back of a test vehicle, one at a time. Two of the tires were four-ply-rated two-ply. The others were four-ply. Loading was adjusted to 100 percent of the rating as given by the Tire and Rim Association, and all the tires were inflated to 24 pounds and run on a dynamometer at 35 miles an hour until they failed.

Running on a dynamometer puts a terrific strain on a tire. The tire rests on two relatively small rollers, which flex it sharply at two points. The tire flexes as it turns far more than if it were on a flat surface.

The two four-ply tires ran for 56 and 91 minutes before the sidewalls blew near the curb guard. The two-plys went only 38 and 44 minutes.

We next drove into the parking lot of a distributor of another major brand of tires and had two new first-line 7.65-by-14 tires mounted on the front wheels of

our test car; one was a four-ply-rated, two-ply tire, the other a four-ply. Front-wheel weight was 815 pounds for each tire.

The temperature outside was 37 degrees. Tires were inflated to a recommended 24 pounds. After five miles at 50 m.p.h., we reduced pressure to 20 pounds, after another five miles to 15, then to 10, measuring each time with a large, laboratory-type calibrated air-pressure gauge. At 20 miles, air was bled off until the pressure was eight pounds. After 70 miles, neither tire showed signs of cracking or other damage on the outer walls. Pressure had risen to nine pounds, and we bled off air until both tires read six pounds hot.

Just under four miles later, the car gave a sharp lurch to the right. A hole had opened in the sidewall of the two-ply tie. We removed and inspected it. The cords were separated and clearly visible, both from the inside and outside in the vicinity of the break. The inside of the tire contained a handful of chewed-up inner liner.

The four-ply tire measured an incredible 2½ pounds of air. Nevertheless, after another 46.9 miles, running at 30 miles an hour, the tire had still not failed. We took it off to inspect it. There were two small cracks in the inner liner at the splice and the tire was badly off center, but there were no other signs of damage.

Running six tires to destruction—four on the dynamometer and two on the road—does not prove a case. Only two manufac-

[Continued on page 216]

The heart of the case presented by Akron's tire manufacturers and Detroit's auto makers, in favor of the two-ply as against the four-ply, is outlined

below. These advantages, they claim, make the two-ply superior for all-around use by the average motorist. Table was compiled by General Motors.

HOW THEY COMPARE	4-ply (4-ply rating)	2-ply (4-ply rating)	Percent improvement
Power loss per tire	1.67 hp. @ 30 m.p.h. 3.36 hp. @ 60 m.p.h.	1.6 hp. @ 30 m.p.h. 3.2 hp. @ 60 m.p.h.	4.2 4.8
Fuel consumption	17.6 m.p.g.	17.9 m.p.g.	1.7
Temp. increase in 30 min.	to 136°	to 130°	4.4
Pressure increase in 30 min.	5½ p.s.i.	4 p.s.i.	30.0
Tread wear	100%	up to 120%	up to 20%
High-speed safety	100%	up to 120%	up to 20%
Bruise resistance	100%	100%	0
Stability	—	Superior	—
Ride comfort	—	Equal	—



Electric socks warm feet

If your feet get cold when you're skating, you might try a pair of these electric socks. Heating coils are woven with the thread into the toe and sole, connected by leads running up the trouser legs to two six-volt batteries in a case attached to the belt. Leads snap on and off for a change of socks. Wired socks are \$14.95 at Hammacher Schlemmer, 145 E. 57 St., NYC.



Three-man cherry picker speeds fruit harvest

Triple booms operated hydraulically on a new picking machine enable harvesters to gather orchard fruit in less than a third the time. Position of baskets is controlled by the pickers with pedal switches. An operator on the ground drives the machine. It's powered by a VW 1500 engine which produces pressure for both the booms and high-speed pneumatic cutters held by each picker.



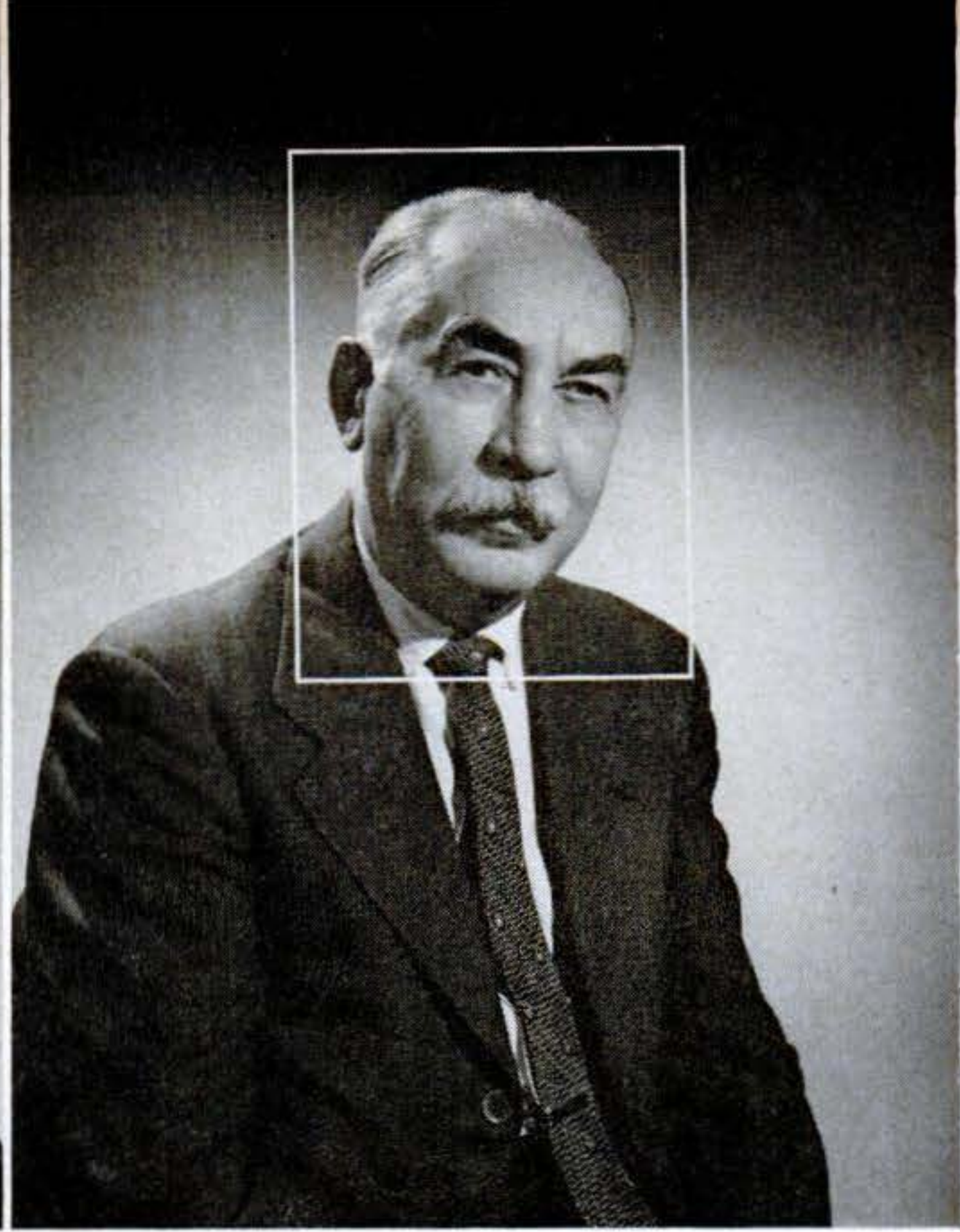
Covered bridge wins beauty prize

Think covered bridges are on the way out? After reducing the number in the state from 132 to 10, Illinois has just dedicated a new one—over the Sangamon River near Mahomet. Unlike older ones of horse-and-buggy days, the new covered bridge is wide enough for two lanes of traffic and two pedestrian walks. Architects judged it the state's most beautiful.



Motorized bike does 40 m.p.h.

Latest model of this engine kit mounts on the frame of any bicycle under the seat instead of on the front fender. Power is transmitted from the 2½-hp., two-cycle engine through a centrifugal clutch by cog V belt to a sheave attached to spokes on the rear wheel. It cruises at 25 m.p.h., can make 40. Go-Byk Industries, Rothsay, Minn., sells the kit for \$79.95.



1. PERSPECTIVE DISTORTION

Strange things happen when you bring your camera too close in a portrait—particularly with a short-focus lens. Foreground objects grow big in relation to rest of picture. An outthrust hand or foot looks immense. In a portrait, the nose will be disproportionately large, as in photo at left. Photo above at right, taken from correct distance, has no distortion. Section outlined, corresponding to distorted photo, was enlarged to make picture on facing page.

5 PICTURE SPOILERS

... and what to do about them

By **EVERETT H. ORTNER**
PS Photography Editor

It's the little things, frequently, that spoil a photograph, and the way to outwit those little things is to develop preven-

tive techniques and awarenesses. Practice snapping the shutter of your camera, without film, until you can do it without moving the camera. Ask yourself: "What kind of picture am I taking?" If it's people, move

[\[Continued on page 217\]](#)

2. CAMERA SHAKE

It's a rare person who can shoot slower than 1/50 second without jarring the camera enough to cause unsharpness, as below. Solution: Shoot faster at bigger apertures. Next tip: Lean against a tree or wall for steadiness. Best of all: Use a tripod.



3. SHOOTING FROM TOO FAR AWAY

Get closer to your subject, and you won't end up with a typical family-album photo like this. It's a good picture of the bridge, but what happened to the faces? For people, get close enough so your subject—not lawn, trees, houses—fills the picture.





Shooting the right way—from the right distance—yields this undistorted portrait. Other “right way” pictures, illustrating how to outwit four spoilers below, are on page 217.

4. BACKGROUND INTERFERENCE

Glance at the background before you shoot and you’ll save lots of spoiled pictures—like this one with a tree growing out of the boy’s head. Distracting objects indoors can be even worse—they’re usually closer. Solution: Move subject into the clear.



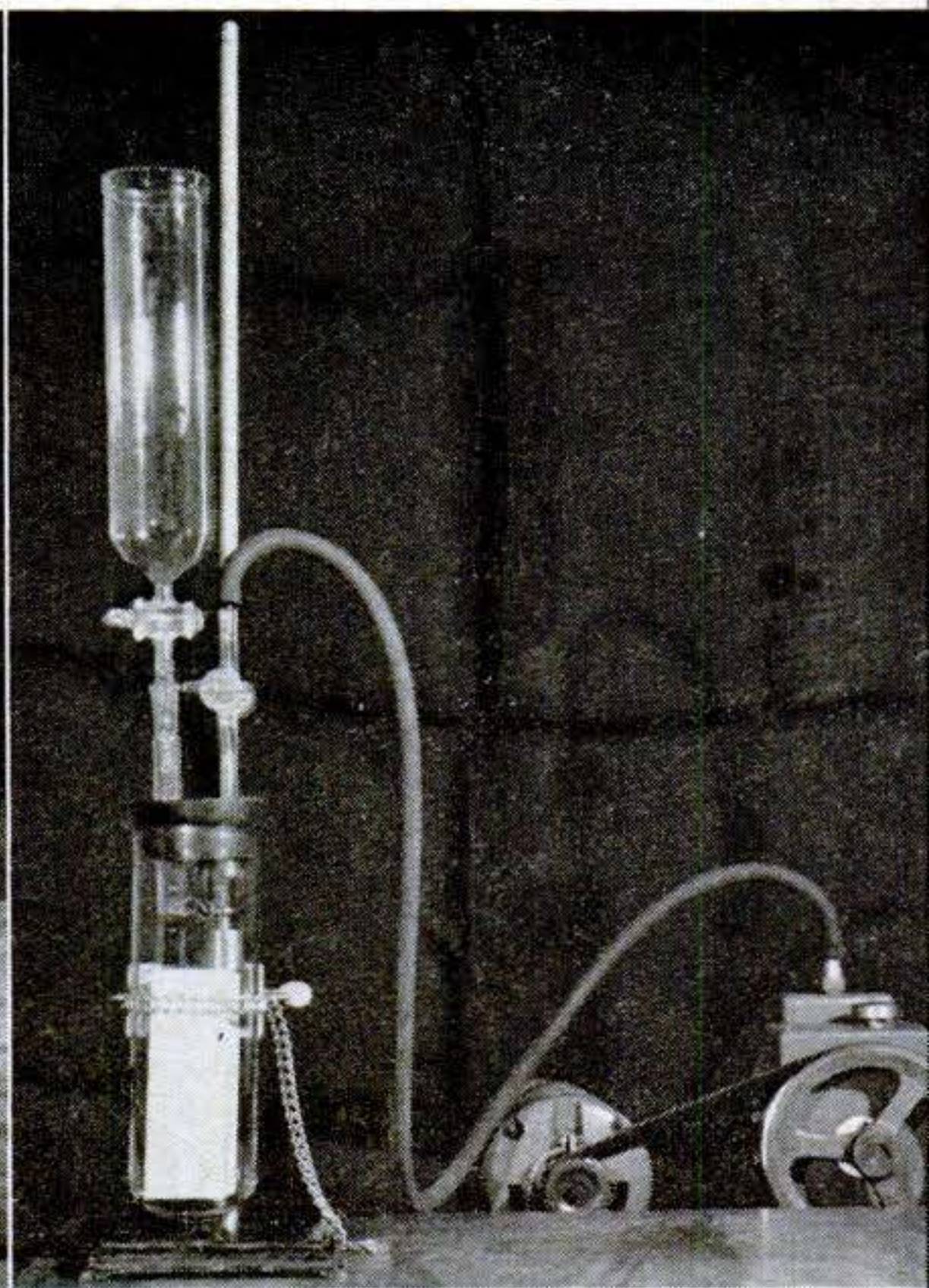
5. INCLUDING TOO MUCH

Trying for that last tree in a scenic shot can spoil the picture. Here, as a result, a meaningless roadway dominates the photo, and the dam in background, the real subject, is barely noticed. Be ruthless in sacrificing elements that get in the way.





Craftsmen's pieces are turned from vinyl-impregnated wood. Goblets have fine, thin edges. Dye added to vinyl tints through to center.



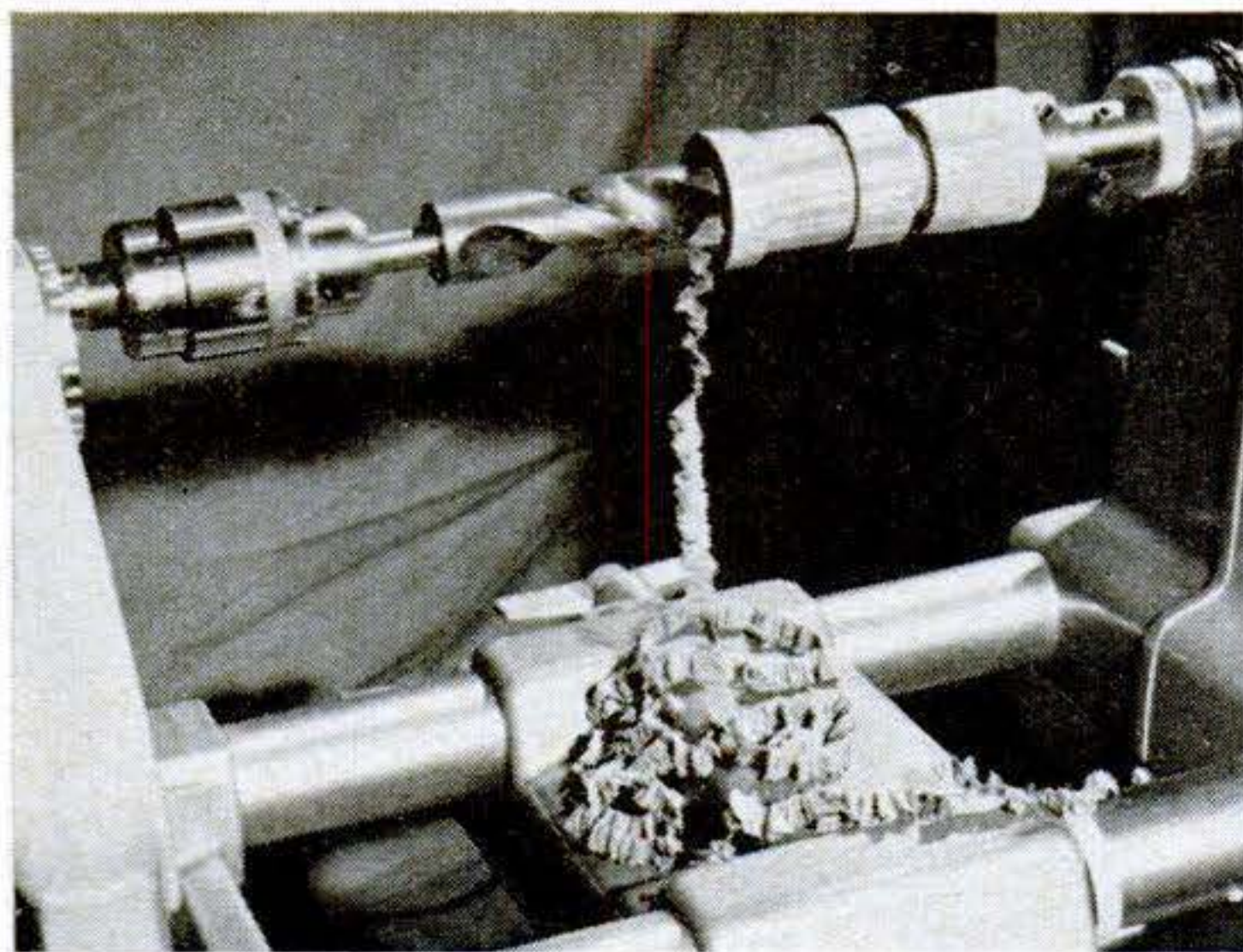
Small pump exhausts air from pores of wood held in vacuum chamber.

Now wood gets a built-in finish

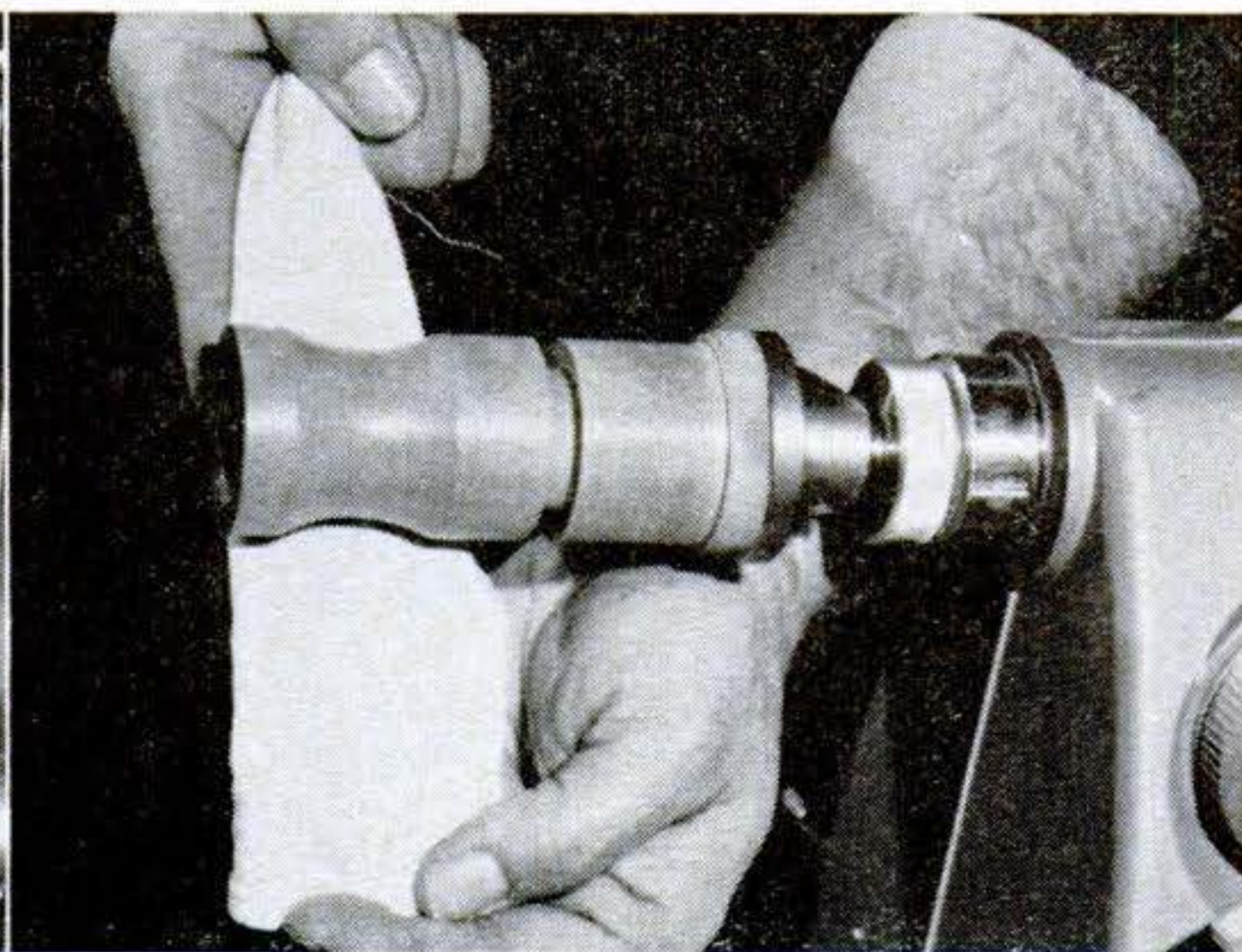
Wood impregnated with vinyl has a startling new finish. It's built in, it's harder and more waterproof than other finishes, and it's mar-proof. Working with the Atomic Energy Commission, Lockheed Aircraft and Kroehler Mfg. Co., Naperville, Ill., remove air from the pores of natural wood, then fill the pores with radioactive isotopes so that the wood retains the advantages of both wood and plastic. It's resistant to warping, twisting, scuffing, burns,

and stains. It retains its color, and can be nailed, glued, and machined.

Researchers at the State University College of Forestry at Syracuse, N. Y., have developed a simpler, cheaper method of impregnating the wood without the help of a nuclear reactor. They pump air from the pores in a vacuum chamber, admit the vinyl, and soak the wood for 15 or 20 minutes. After soaking, they wrap it in foil and cure it in an oven.



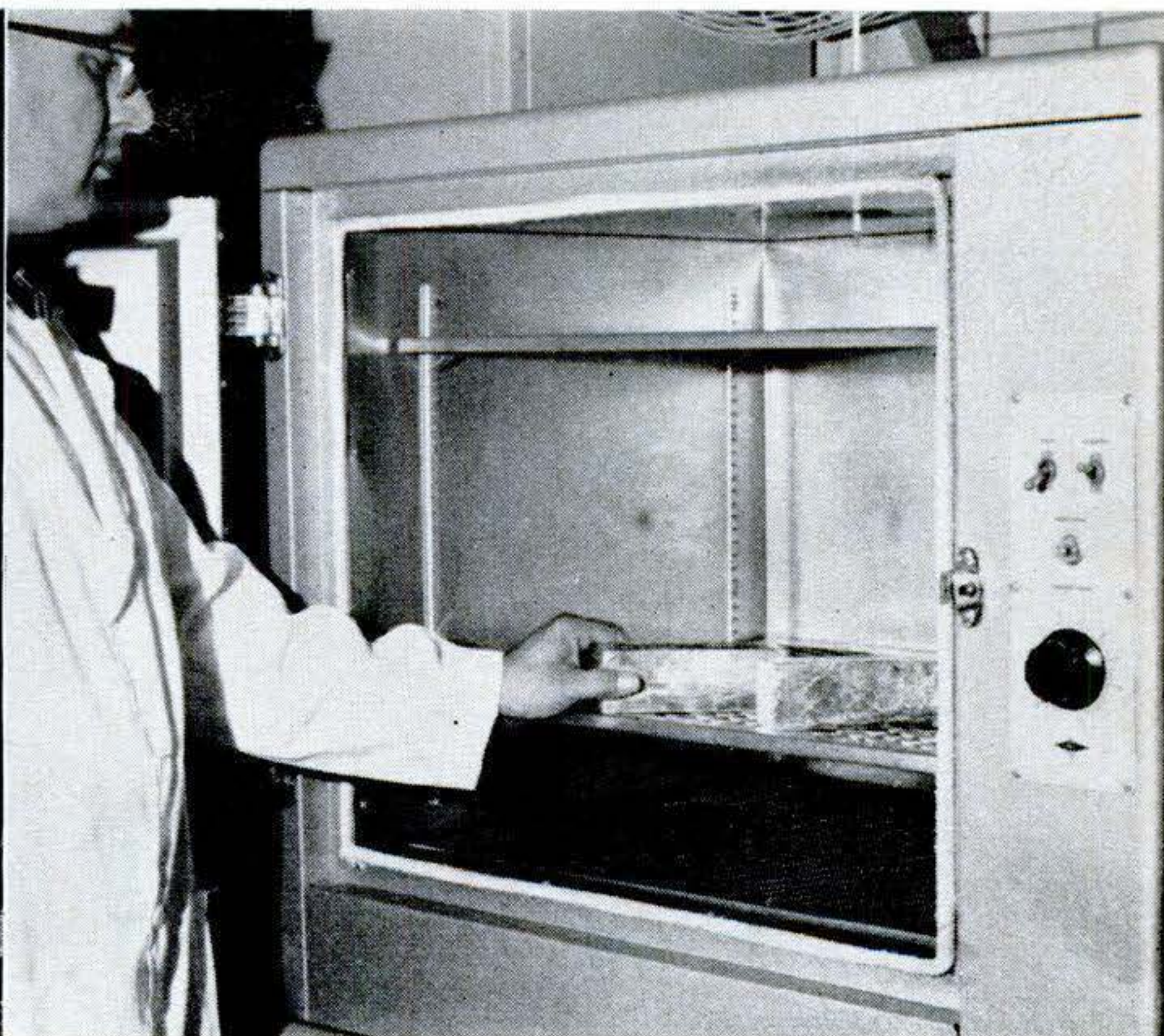
Vinyl-impregnated wood can be machined with ordinary woodworking tools. Shavings resemble metal.



Buffing puts high luster on finished piece after it has been smoothed with steel wool and sandpaper.



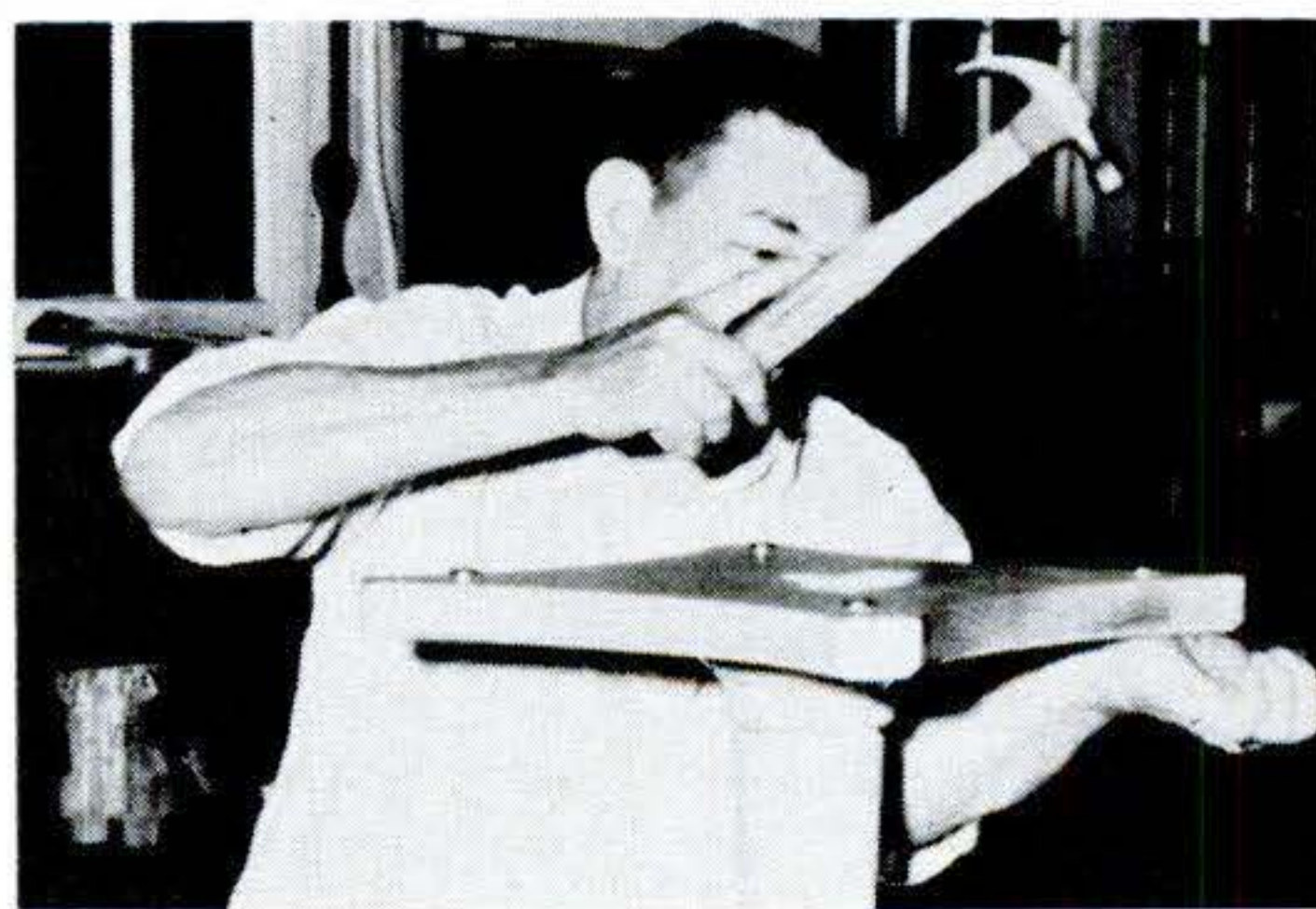
Vinyl is poured into chamber, and wood soaked in it for 15 to 20 minutes.



Wrapped in aluminum foil, block of impregnated wood is cured in oven at 154 degrees for 12 to 18 hours. Then it's ready for use.



Coffee table made in Kroehler plant withstands burn from match. Scorch can be sanded without refinish.



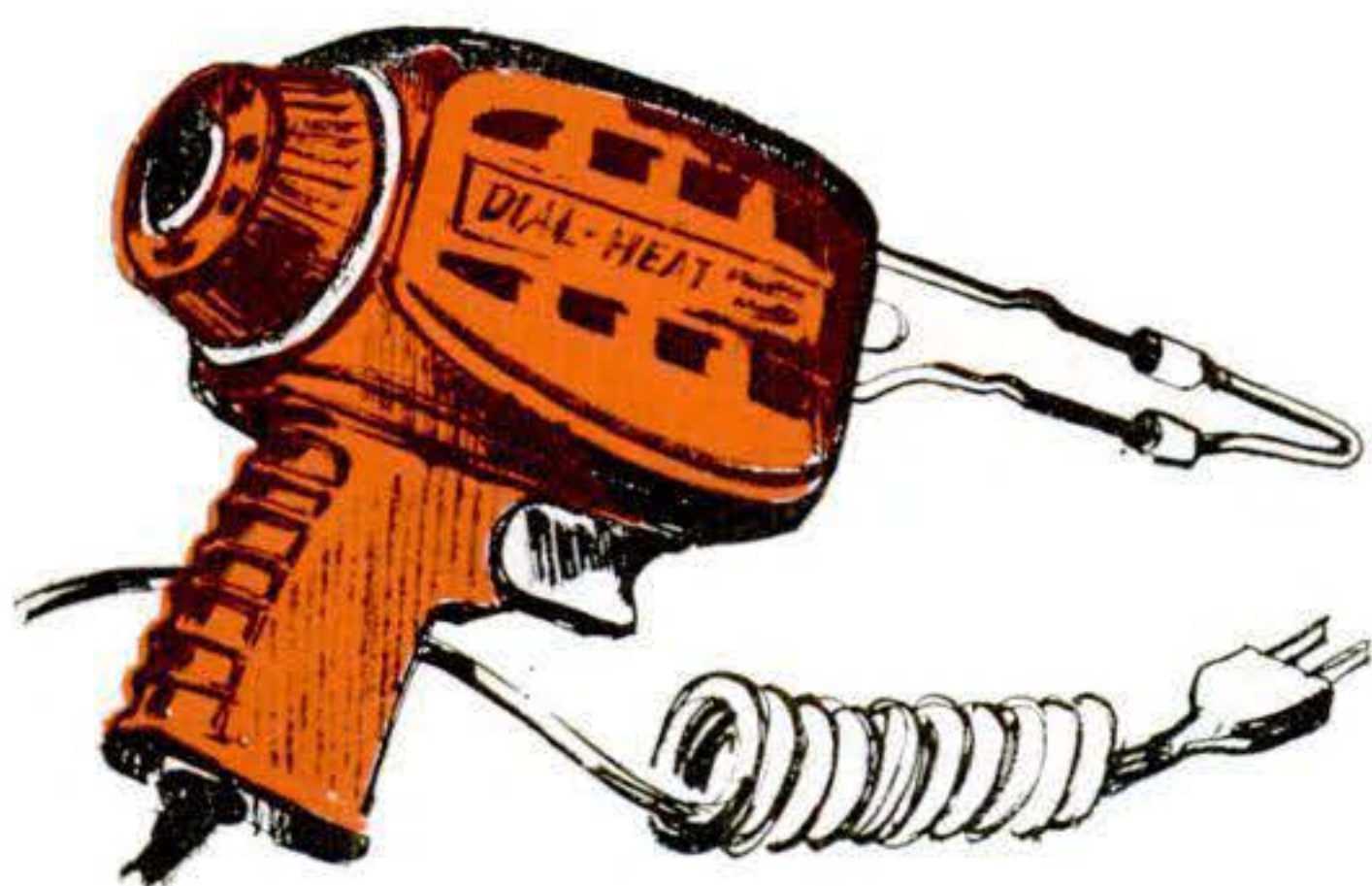
Metal runners hold securely when hammered into base. Wood also makes flooring with built-in finish.



Tabletop gets finish by sanding and buffing. Vinyl in pores doesn't change structure or beauty of wood.

**“I’d like
to see them
make...”**

Snow sweepers for light, late-season snowfalls. A small and inexpensive (under \$50) rig driving an 18-inch horizontal brush would be just the thing.—*J. R. Goffin, Hinsdale, Ill.*



Dial-the-heat electric soldering irons. They should have a widely variable range, including a low heat for soldering plastic materials.—*E. L. Miner, Gold Beach, Ore.*



Easy-spread peanut butter in wide-mouthed tubes. Three passes with the tube would cover a slice of bread. No broken bread, no mess.—*Craig Stevens, Upper Montclair, N.J.*



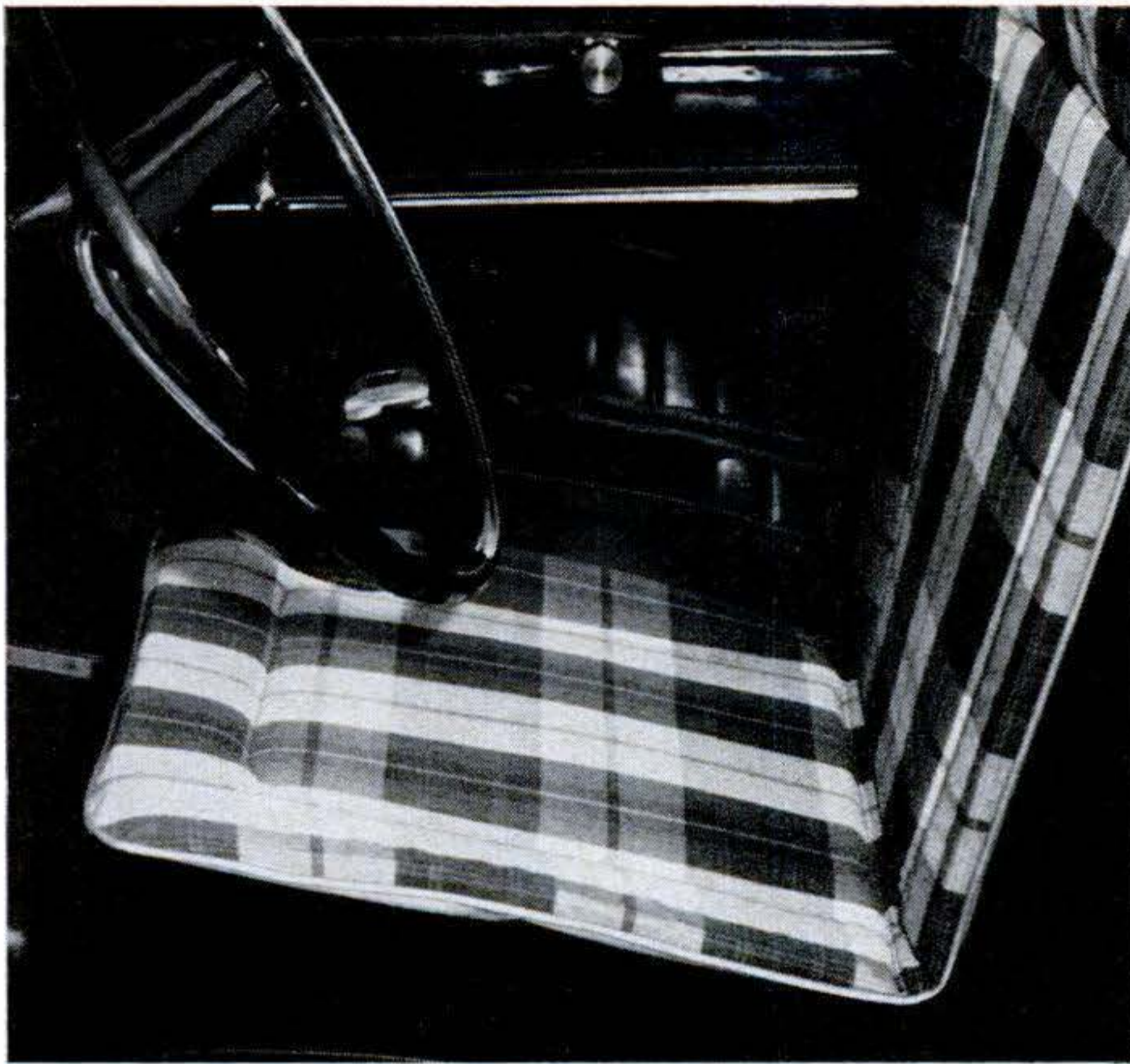
Tires with a colored cord embedded in the tread. When the rubber wore down near the danger point, the cord would show, signaling replacement was due.—*J. Luzzoder, Mecklenburg, N.Y.*



Fence-post boots of sheet vinyl or rigid plastic to prevent rotting. Before sinking a post, you’d slip one on and staple or cement it in place.—*Peter Ulrich, Darien, Conn.*

Everyone has his own pet idea of a gadget that he would like to see in general use. What’s yours? We will pay \$5 for each one published. Please use Government postcards

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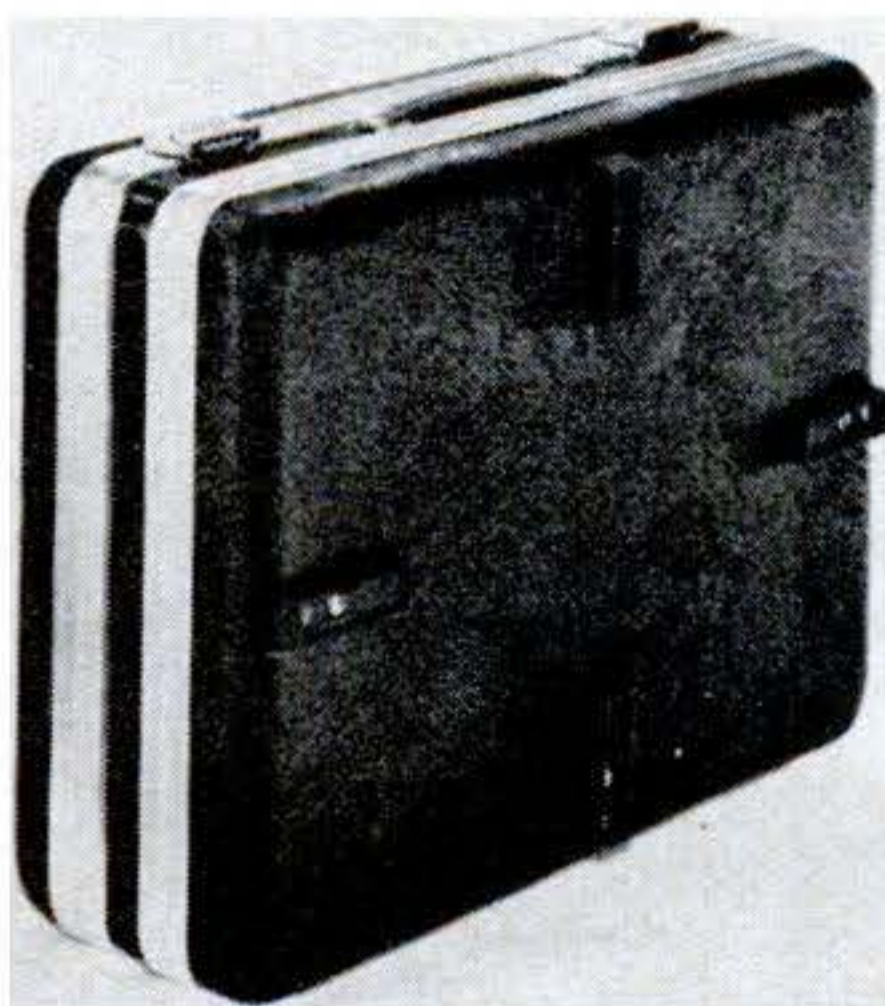
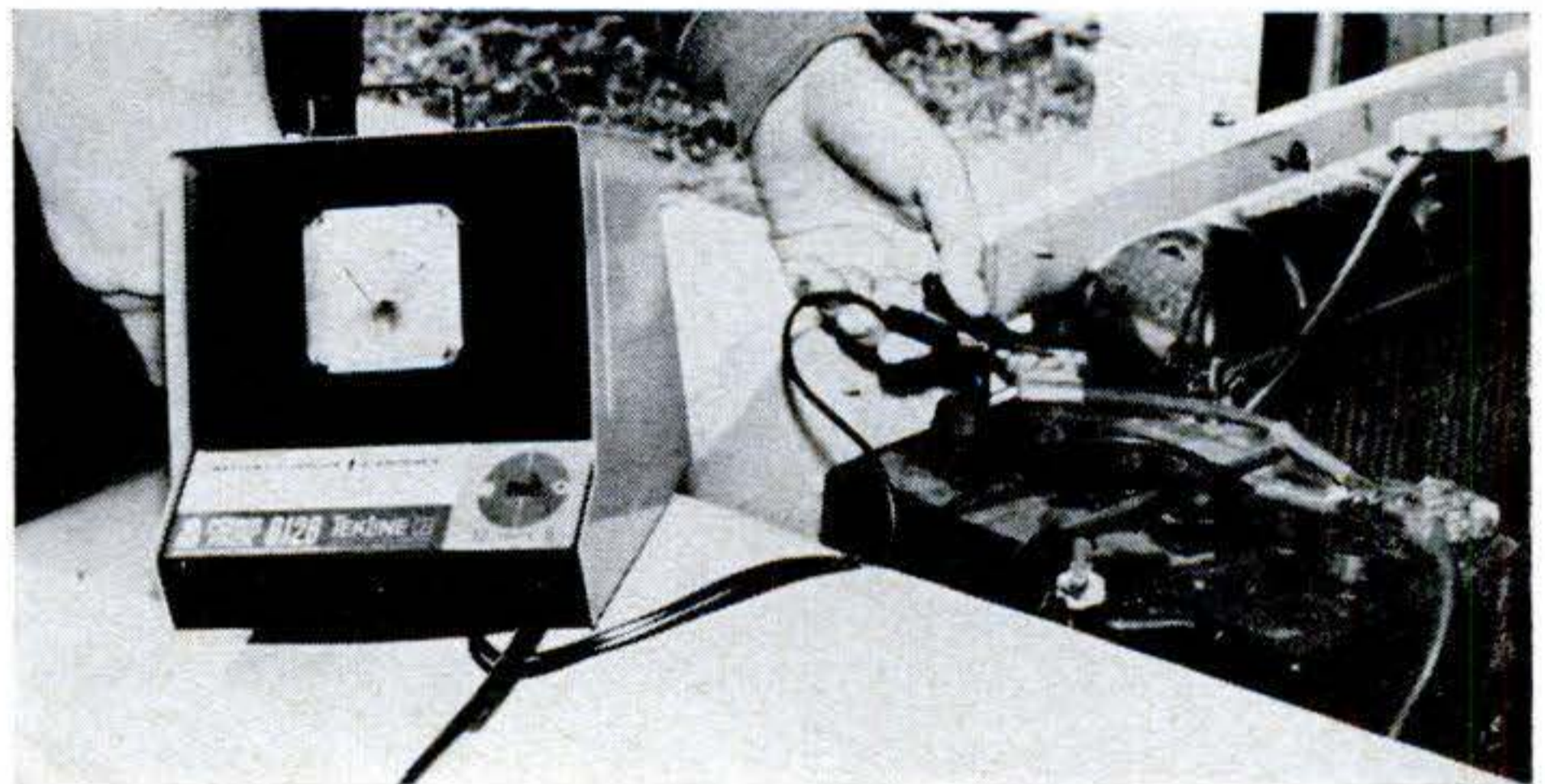
WHAT'S NEW**FOR YOUR CAR**

Seat cushion warms you by storing body heat

A Swedish development, the Kozy Kusion is now made here by Borg-Warner. The cushion is stuffed with cellular foam that absorbs body heat and reflects it through the Scotch-plaid cotton fabric to save you from the chill of vinyl car seats on cold days. The cushion bottom is sealed by a vinyl material that prevents heat from escaping. As it has no plugs or wires, the cushion can be used outdoors by race-goers, campers, boatmen, and hunters.

Charge your battery at home

A new line of six- and 12-volt TekLine battery chargers that operate on 110-volt AC are offered by Litton Industries. The specifications include a triple-density rectifier, automatic circuit breaker, and automatic taper at end of the charge. Four portable models (with carrying handles), are available from auto-parts dealers. A recharge takes three to seven hours.



Lightweight car-top luggage of molded plastic

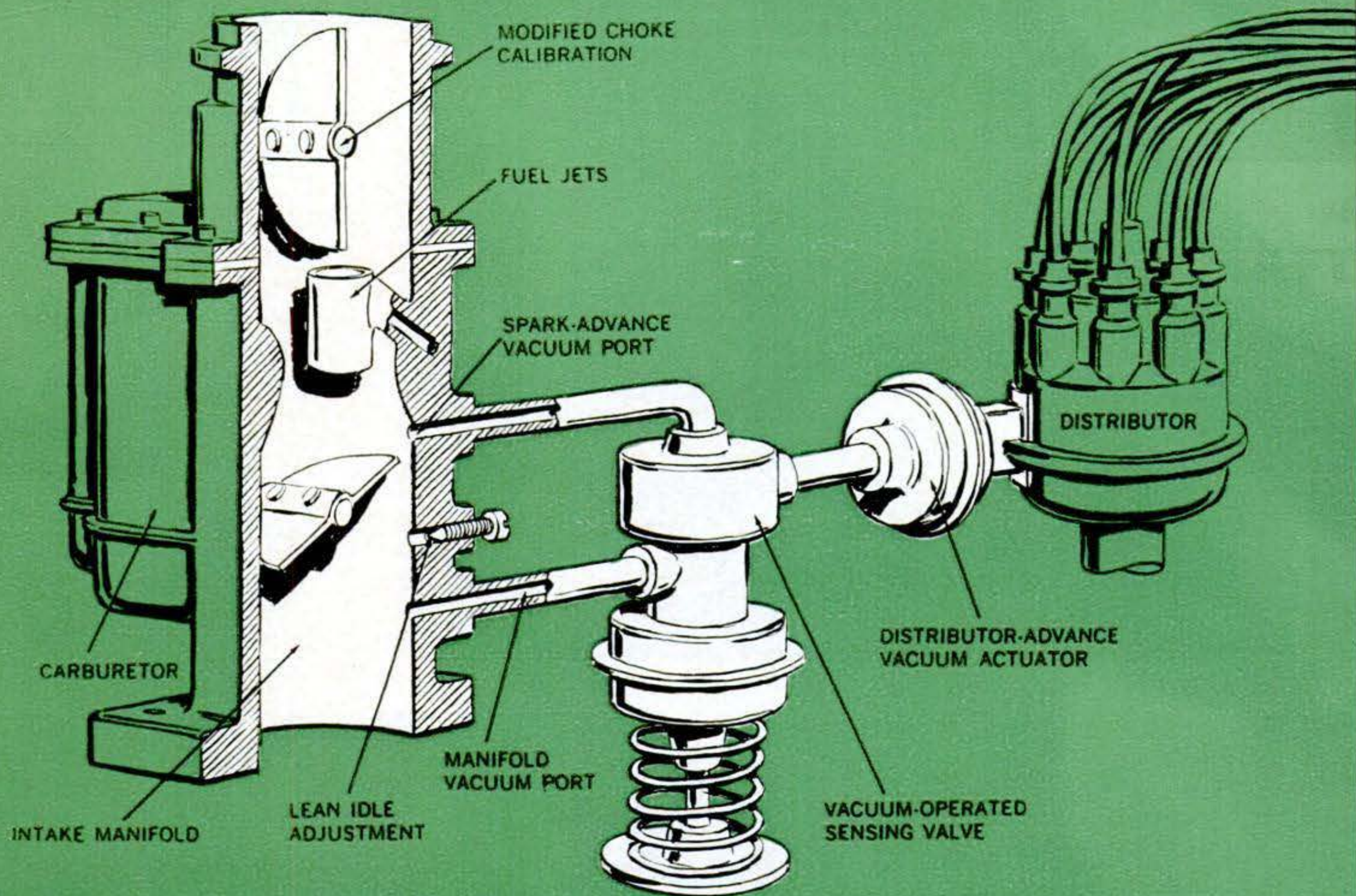
The new Voplex Car-Topper is weatherproof and moisture-resistant, easy to clean, does not need a luggage rack, weighs only 7¼ pounds. It ties down with a nylon cord, and special feet protect the paint. Cost: \$39.95 from Vogt Mfg. Corp., 100 Fernwood, Rochester, N.Y. 14621.



Taking the danger out of a one-eyed car

The Safe-T-Flector headlight ring snaps onto all five-inch lamps. With a headlight burned out, it will identify a one-eyed car as a car and not a motorcycle to oncoming traffic. It's made by the Reflex Corp. of America, 1225 East Maple Rd., Troy, Mich. 48084.

These are attachments that will make your new car cost more as



Chrysler system of killing exhaust that causes smog is to burn up the unused hydrocarbons and lethal carbon monoxide inside the engine itself. The ignition distributor's breaker plate has increased angu-

lar travel to give spark retard of up to about five degrees after top dead center at idle. A vacuum-operated sensing valve advances the spark during deceleration to burn up any excess fuel.

What You Should Know

Chrysler chooses to consume foul gases inside the engine—General Motors, American Motors, and Ford prefer injecting air at the exhaust to burn them up

By JOSEPH M. CALLAHAN

Beginning in the fall of next year, all new U.S. cars will be equipped with a system for reducing the smog-causing ingredients in exhaust gas. You should know:

- That there are two different systems.

- How these systems work and what they promise.

- What can go wrong with your car when fitted with a smog-control system.

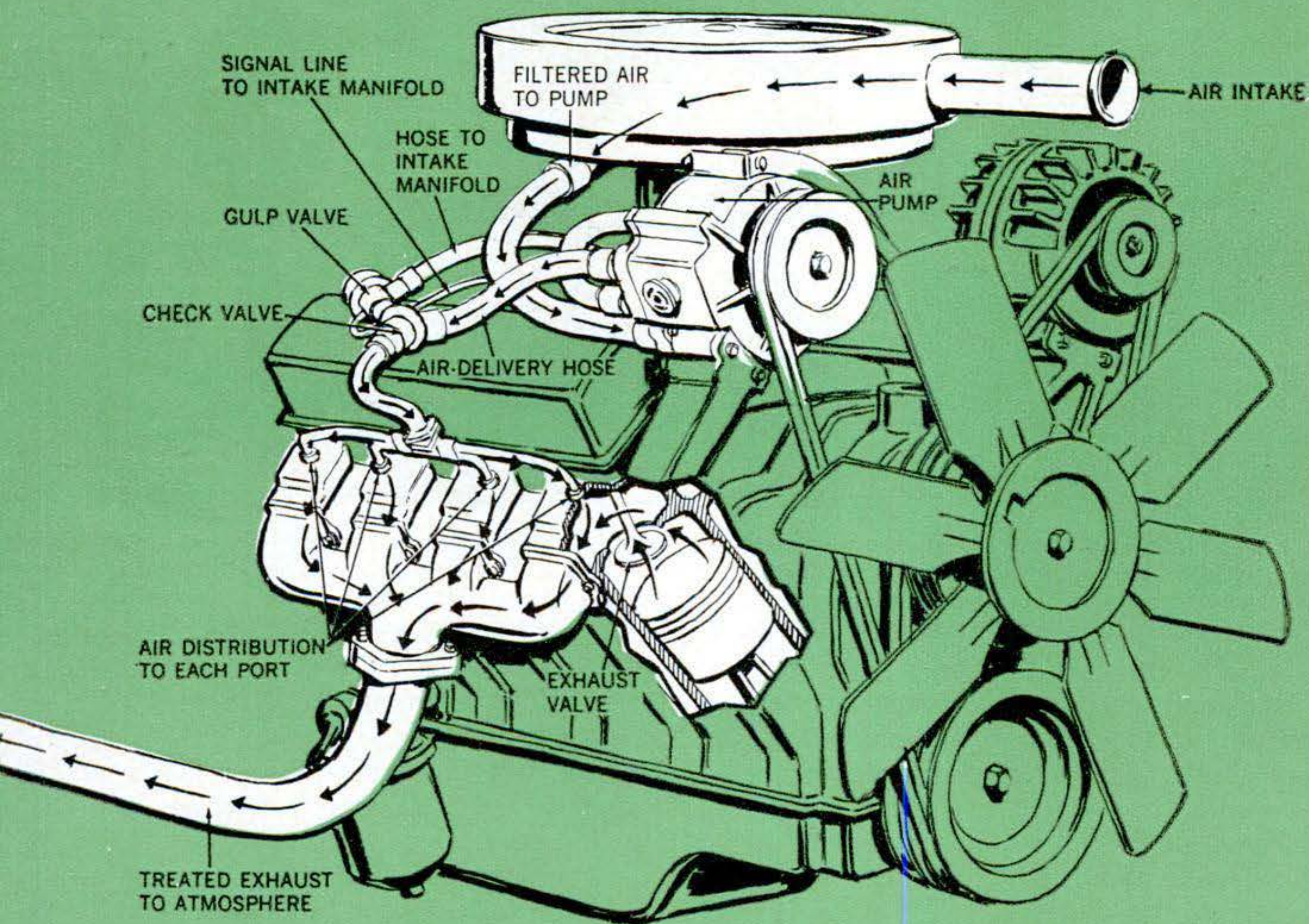
- How much these systems add to the cost of a new car.

As a car owner, you will be affected in many ways by smog legislation. Only new cars are covered by present laws, but it may become mandatory, later on, to fit smog-control devices on old cars.

Most of the information on exhaust-gas smog control now comes from California. Cars in that state are being used as guinea pigs for what is to be demanded in all 50 states.

Buying a 1968 car (to be introduced in the fall of 1967) will mean spending up

the auto industry launches its attack on noxious exhaust fumes



Rest of industry does the job in a distinctly different way. Here is General Motors', which is typical. Unwanted gases are burned aft of the exhaust. A pump draws clean air from the engine's air cleaner or from

a separate air filter. In one version—there are several—air is fed through pipes to each segment of the automobile's exhaust manifold. The pipes are made of stainless steel to withstand the great heat.

About Anti-Smog Devices

to \$50 more to get the smog-control system required.

It will complicate engine servicing by further cluttering up the engine compartment. It will raise temperatures under the hood and in the exhaust system. There may be problems we can only learn about when the units have been in use for some time.

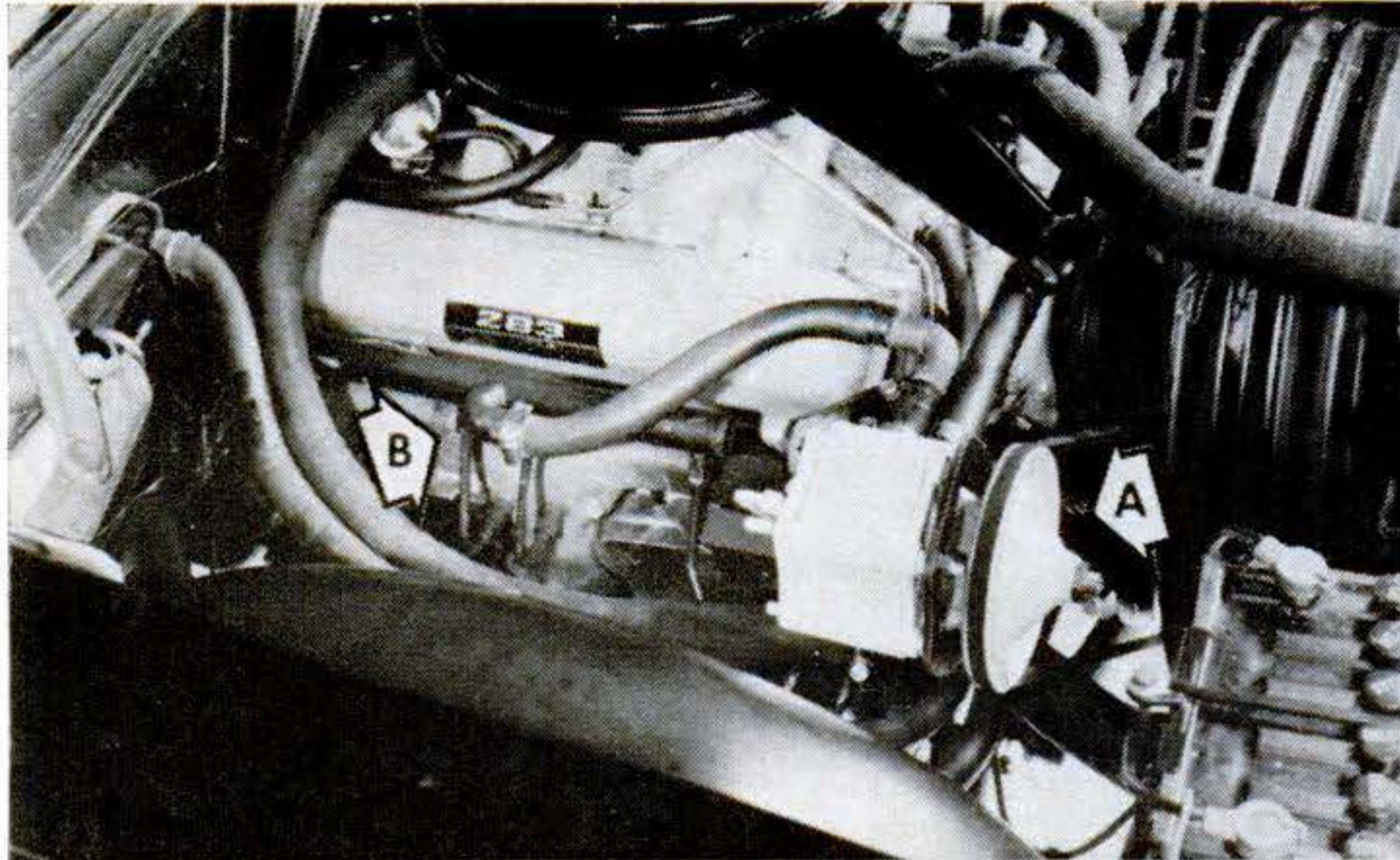
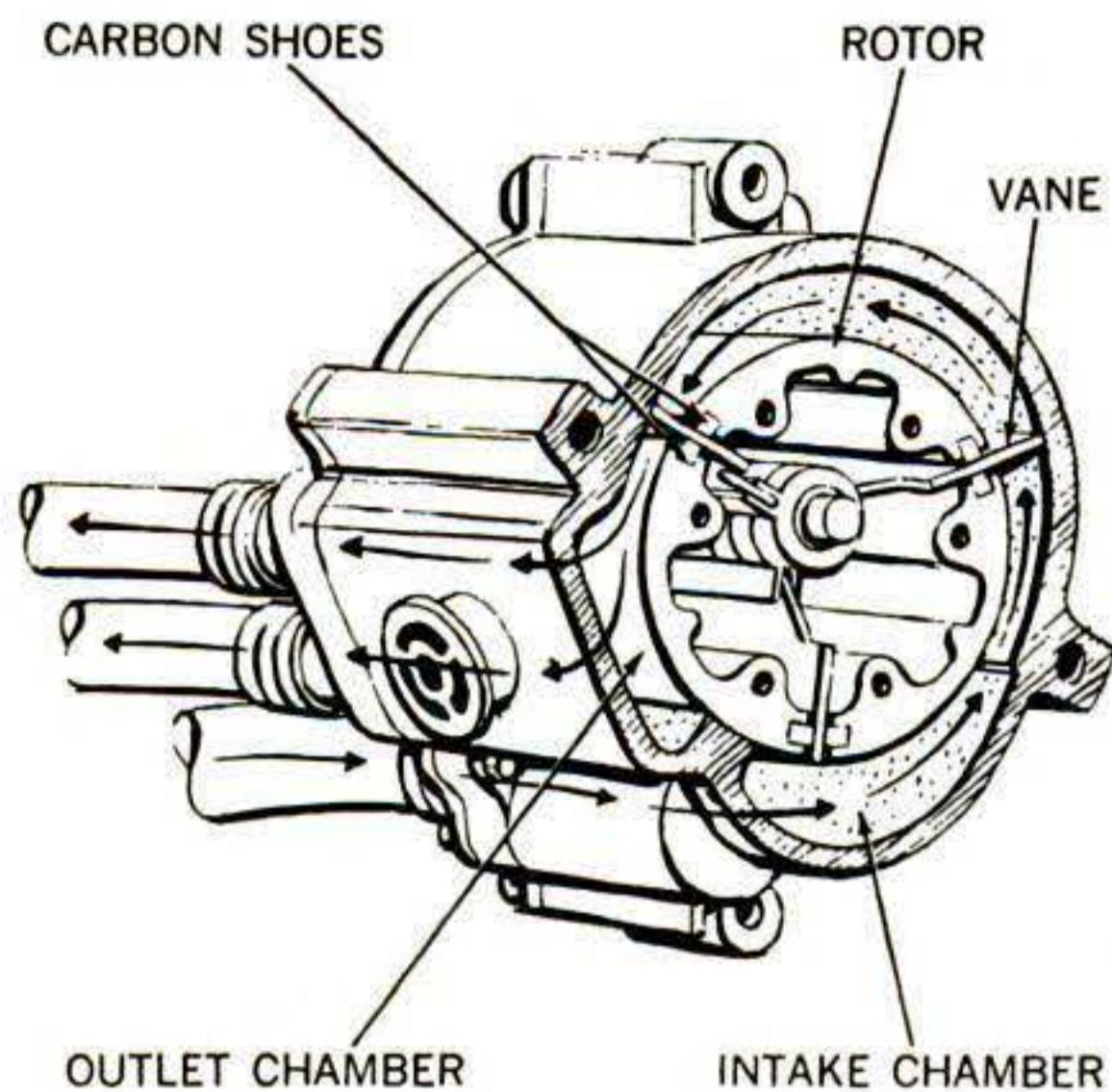
The industry is keeping close tabs on the service records of the 1966 models delivered in California. Chrysler Corp. is fitting what it calls CAP (Cleaner Air Package) on its cars. GM cars have a unit called AIR (Air Injection Reactor). Ford Motor Co. cars use a similar system called Thermactor. American Motors cars have yet another version called Air Guard.

These exhaust-control systems must not be confused with the crankcase devices (PCV, Positive Crankcase Ventilation) that have been installed on American cars since 1963 for routing piston-ring blow-by from the crankcase back into the cylinders. The exhaust-control devices are far more complicated.

Smog laws. Under the pace-setting California law, the approved exhaust devices must reduce unburned hydrocarbon emissions (raw gas) to 275 parts per million (a little more than 1/40 of one percent) and carbon monoxide to 1.5 percent of the total exhaust. Although hydrocarbons are the major cause of California smog, the carbon monoxide requirement was written

Continued

Most common system will, generally, consist of a pump and a



Pump that supplies extra air for consuming gases outside cylinders after combustion is shown in the cutaway drawing above. The pump, made by Saginaw, supplies the air needed to effect oxidation.

GM-Ford-American Motors system is shown installed in Chevrolet 283-cubic-inch engine. It consists of pump (A) piping fresh air to points near exhaust valves (B) to meet exhaust-emission standards.

into the law for general health reasons.

Last fall a federal law was passed requiring similar exhaust-control devices for all new U.S. cars. The exact time when these devices will be required was left up to the Secretary of Health, Education, and Welfare. But it's pretty well established that he'll want them on the 1968 models.

Let's take a look at the various systems proposed:

Cleaner Air Package. In contrast to the other auto makers' units, Chrysler's exhaust-control system does not include any exhaust treatment. It is a simpler system, based on consuming the unwanted hydrocarbons and carbon monoxide inside the engine. The carburetor has a choke calibration that causes the choke valve to open sooner during warm-up—the main jets thus giving a leaner mixture—and a lean idle-mixture adjustment.

CAP retails for \$18 to \$25 (depending on the engine), while the air-injection systems sell for \$45 to \$50.

Bitter remarks are made privately by other manufacturers to the effect that the CAP kit will not do the job. They say that CAP needs too much maintenance. They add that the lean carburetion will cause jerkiness in cold-starting, rough idling, and frequent engine stalling.

Still, CAP was the first system approved in California, although it's only certified to the end of the 1966 model year. This will require Chrysler Corp. to pass a new series

of tests, with particular emphasis on CAP's durability without maintenance.

One of the biggest puzzles in the industry is why CAP won't work on anything but Chrysler Corp. engines. The best information is that Chrysler engines have leaner carburetion and the cylinder heads have less quench area—the section of the combustion chamber where the mixture burns poorest or not at all.

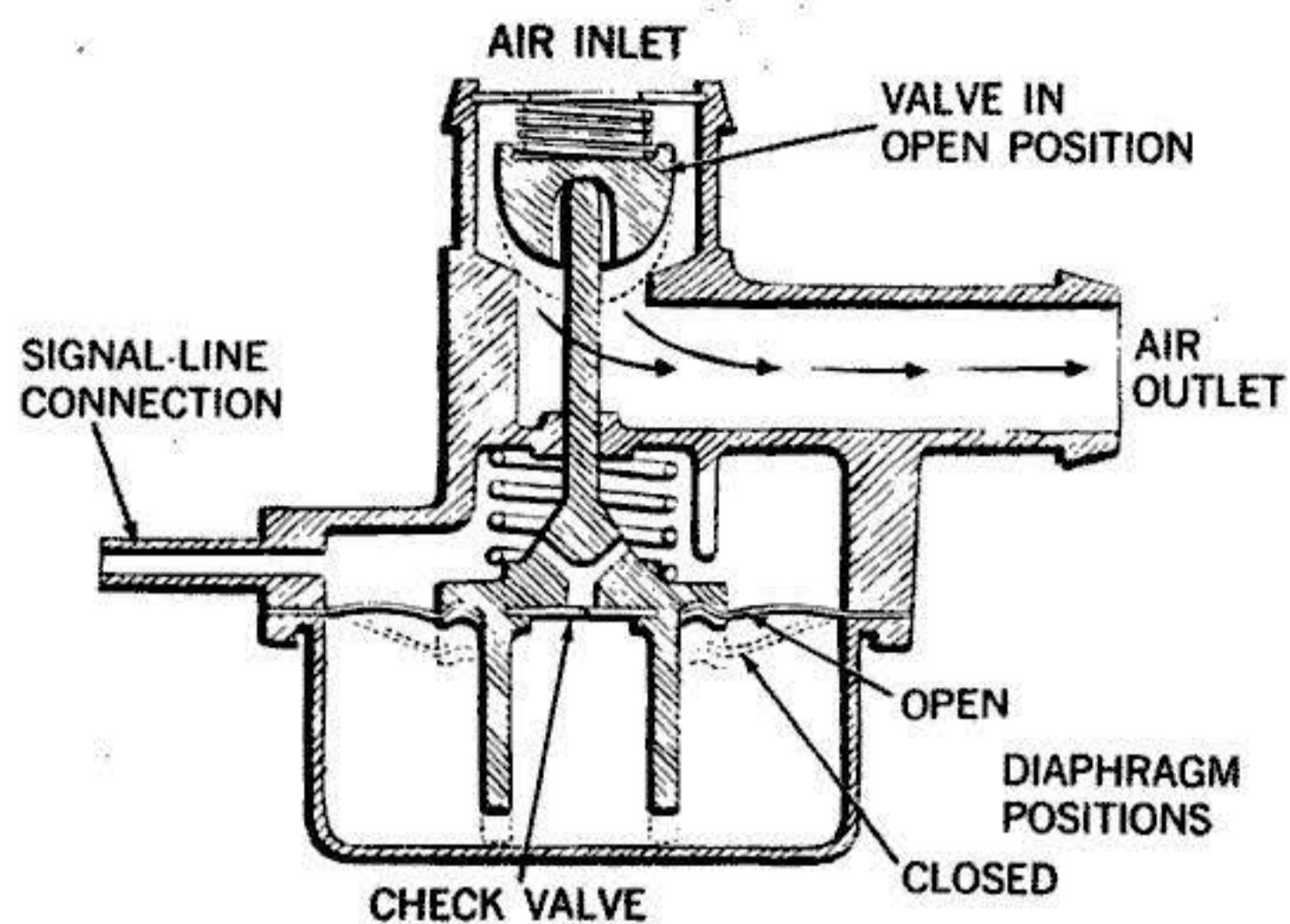
Air-injection systems. GM, Ford, and American Motors base their preference for air injection on the reasoning that CAP—even if they could make it work—is difficult to keep in tune and will need too much maintenance.

Their systems are similar to each other. A pump delivers a large volume of low-pressure air into the exhaust manifold an inch or so from the exhaust valves. This oxygen prolongs the burning of the hydrocarbons and carbon monoxide in the exhaust manifold, and converts them to harmless carbon dioxide and water vapor.

On V-8 engines, the pump has two outlets (one for each bank). Sixes have a single outlet. Each outlet feeds into a rubber hose that leads the compressed air into an air-distribution manifold via a check valve. Small steel tubes take the air from the distribution manifold to the air-feed pipes—one for each exhaust valve.

There are variations on this theme. Pontiac's V-8 has a neater system. The air is led through short rubber hoses from the

gulp valve to supply extra air



"Gulp valve" used in the system on the opposite page is a safety feature in smog control. It lets the engine gulp extra air during deceleration to dilute extra-rich fuel as carburetor butterfly closes.

pump to the end of each head. Then the air travels through a network of internal galleries.

In addition, most of the '66 California cars have more accurate carburetors. They meter out fuel with only a one-percent variation from the desired amount (instead of the three-percent error previously tolerated). The carburetors also have leaner jets and retarded distributors at idle. When the spark is retarded, heat builds up under the hood and extra cooling must be provided. Sometimes an extra blade on the engine fan is enough to take care of the heat problem.

The air pump. This is of the positive-displacement type and was developed by GM's Saginaw Division. An eccentric rotor with three vanes rotates inside a die-cast aluminum housing. The housing has cavities for intake, compression, and outlet. While one vane is picking up air in the intake chamber and scooping it up like a snowplow, another vane compresses the air it already has scooped up and leads it into the outlet chamber.

The vanes are plastic and riveted to the rotor hub. As their angles in relation to the hub change during each revolution, due to the eccentricity of the hub, the vanes need seals where they emerge from the rotor. A carbon shoe is pressed against the vane on either side by a light spring. The shoes are designed to permit the vanes to slide in and out in relation to the hub.

Air leaking past the seals into the rotor exits through two small holes in the end cover. The rotor runs on two bearings. The front one is a ball bearing; the rear one uses needles. Bearings are greased during assembly and need no periodic lubrication.

The rotor end is surrounded by a steel ring. This prevents the rotor from spreading at high r.p.m. The outlet chamber has a relief valve that relieves the pressure build-up once a value is exceeded.

Three safety features. To guard the engine against malfunctions in the smog-control systems, there are safety features. One is the check valve in the tube from the pump to the distribution manifolds. It prevents engine exhaust from backing into the pump if the pump fails. The pump's relief valve is another. The third and most important is the gulp valve. It connects the fresh-air-delivery line to the intake manifold. It permits the engine to gulp small amounts of extra air during deceleration, to dilute the extra slug of fuel vapor the engine receives at that time.

The gulp valve opens whenever there is a rapid rise in intake-manifold vacuum. Compressed air enters the intake ports and dilutes the mixture.

Troubleshooting. Other than a loose fan belt, leaking hoses, or loose hose fittings, the only potential source of trouble is the air pump. The vanes may wear, although they are not supposed to rub against the housing. The bearings may fail, of course. If they have been properly assembled, this should not occur. In case of bearing failure, both rotor and housing may be damaged. But the carbon seals are more likely to give trouble. In normal wear, they will leave carbon dust on the vanes and in the housing. This may be removed by partially dismantling the pump and blowing with an air hose.

Laws to come. Present California regulations demand exhaust-control systems on all new cars and light trucks. Next year, the devices must perform without service for at least 25,000 miles. Large trucks must have smog-control systems in 1968, while imported cars won't have to comply until 1969. Further restrictions can be expected in the permissible level of exhaust emissions. By 1970 the auto makers will be called upon to reduce hydrocarbon emission to 180 parts per million—and carbon monoxide to one percent. PS



PS

BOATING

Head-on, Howard Weiler's 22-foot ocean-racing outboard looks fairly average in appearance.

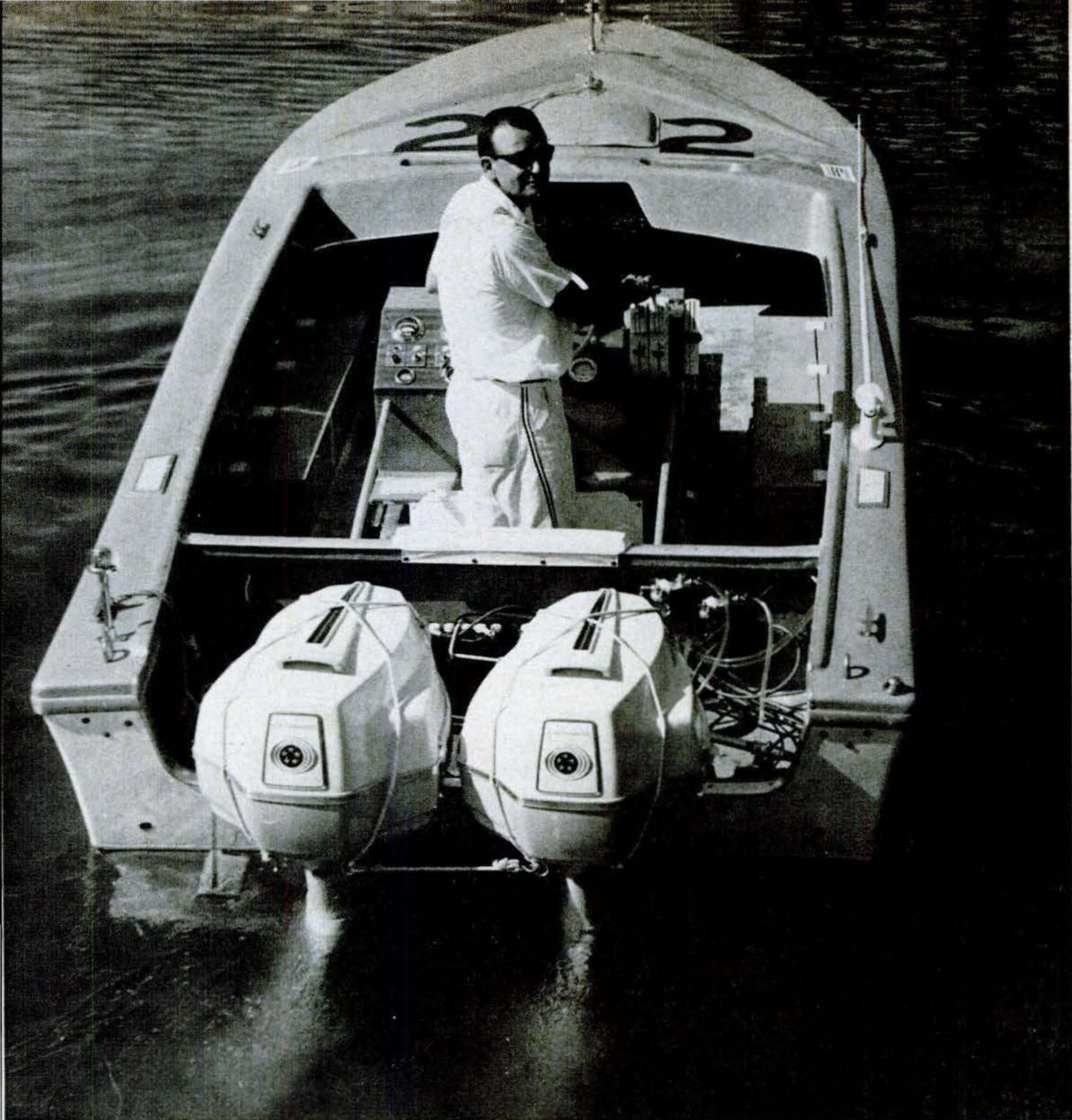
How an Expert Rigs an

You needn't be an ocean racer to profit from Howard Weiler's ideas. They can help you put together a better boating outfit, ready to take a beating

By **JIM MARTENHOFF**

124 | POPULAR SCIENCE

Gun the average outboard in rough water, and about all you can do is hang on for dear life and hope everything holds together. Often it doesn't. Accessories fly, the battery runs amok, screws pop from the windshield frame, and you wonder if your hull is tough enough to take it. If it's a modern hull built to current standards, chances are it is. But it takes more than



Stern-to, special features become evident—shock-cord lashings, body guardrails, and more.

Outboard for Rough Water

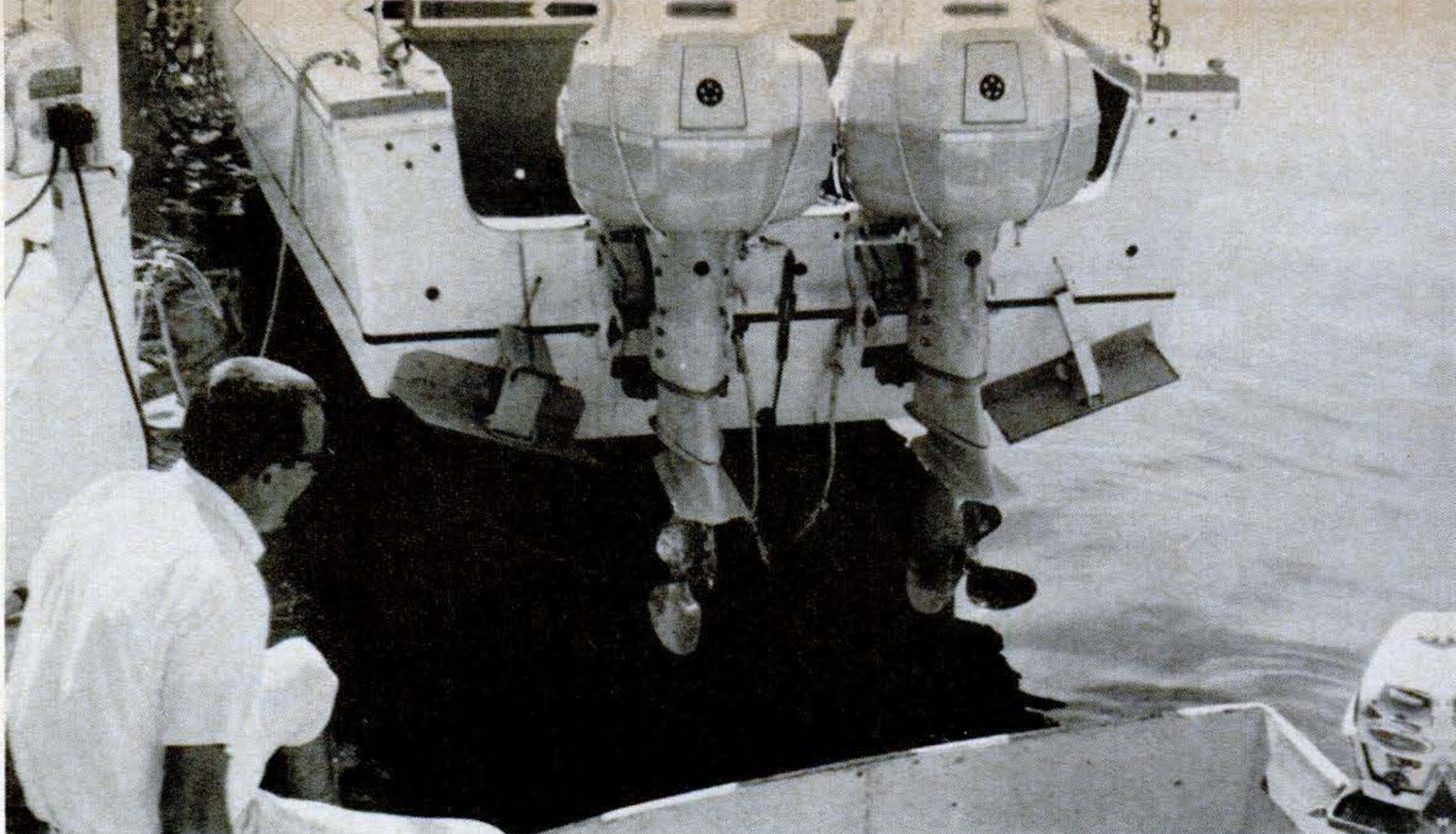
a rugged hull to go any distance safely and confidently when the water is lumpy. And the time to check out your boat is before personal experience teaches you.

The outboard skipper who knows this, perhaps better than any other, is 36-year-old Howard Weiler of Miami, Fla. His observations and boat-grooming techniques rate the attention of any boatman.

Weiler, a plastics engineer, gets his out-

boarding kicks racing in the ocean, often many miles from land. He is the only three-time winner in the outboard division of the Miami-Nassau Ocean Powerboat Race, having been the first outboard skipper over the finish line in 1961, 1964, and 1965. And he'll be trying for another win this spring. The first 50 miles of this 180-mile race is in the often turbulent Gulf

Con'inued



Trim tabs, port and starboard on the transom bottom, enable Weiler to trim the boat's bow downward for better path-cutting and course-keeping in rough water. He locks them up or down by Morse controls.

Glass cloth and resin laid over the motor brackets and adjoining transom surfaces make the brackets an integral part of the boat. Weiler bolted the brackets on in the usual manner before fibreglassing.

Stream, where seas sometimes stand as tall as a man.

"An ocean powerboat racer's biggest problem in lumpy water is shock: body-jolting, hull-jarring impact," says Weiler. It's every boatman's problem in rough water. But in ocean racing it is magnified.

By way of illustration, Weiler points out that accelerometers put aboard some of the boats competing in the 1964 Miami-Key

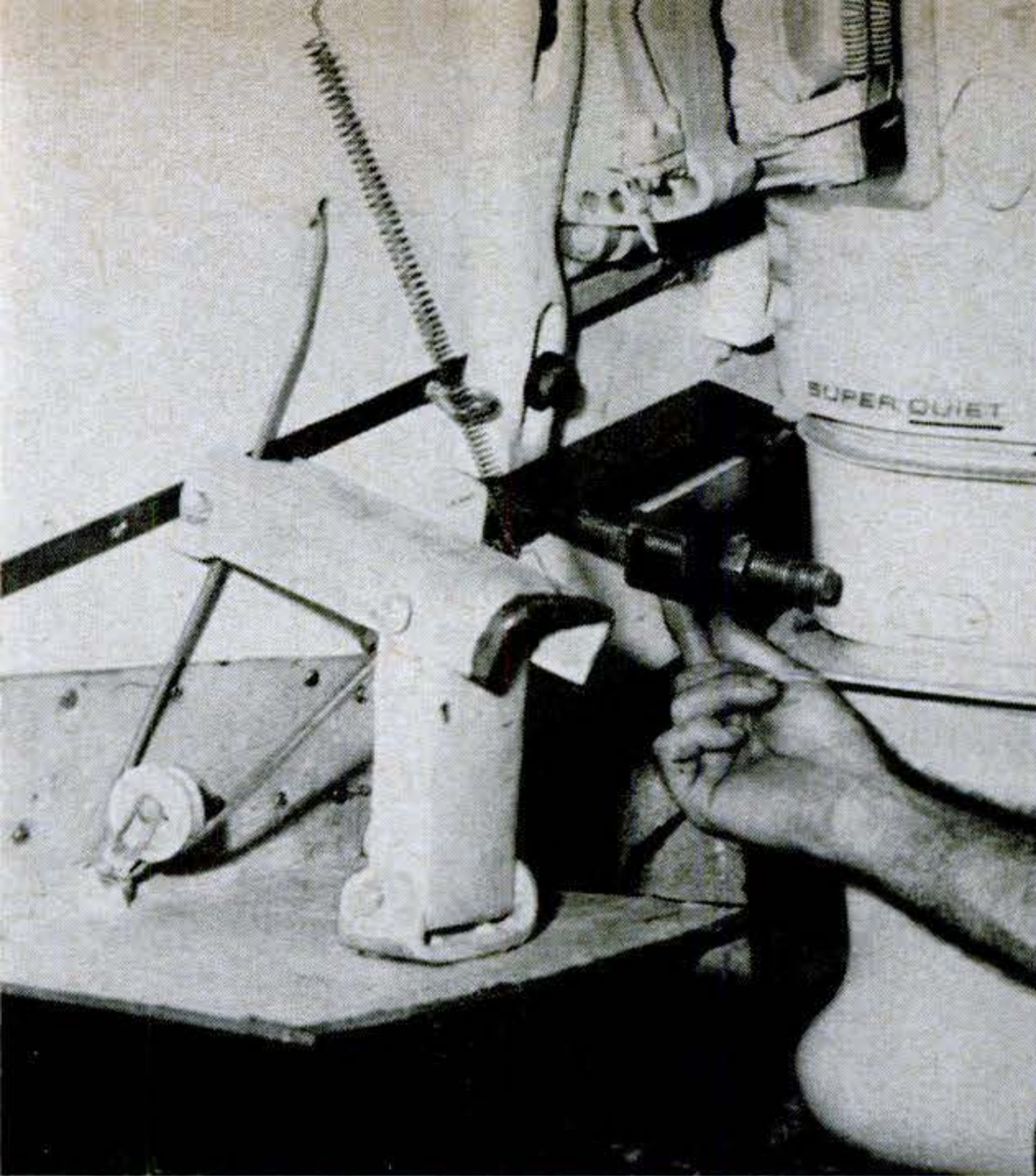
West race revealed that they took 25-G jolts at times. Spacecraft takeoff force is only eight or 10 Gs. "I'm told 25 Gs is enough to kill a man," says Weiler, "so obviously our boats soak up and shake off most of the shock."

Ocean racers like Weiler subject themselves and their rigs to tortures the average boatman can't envision. Yet they use stock boats and engines like those anyone

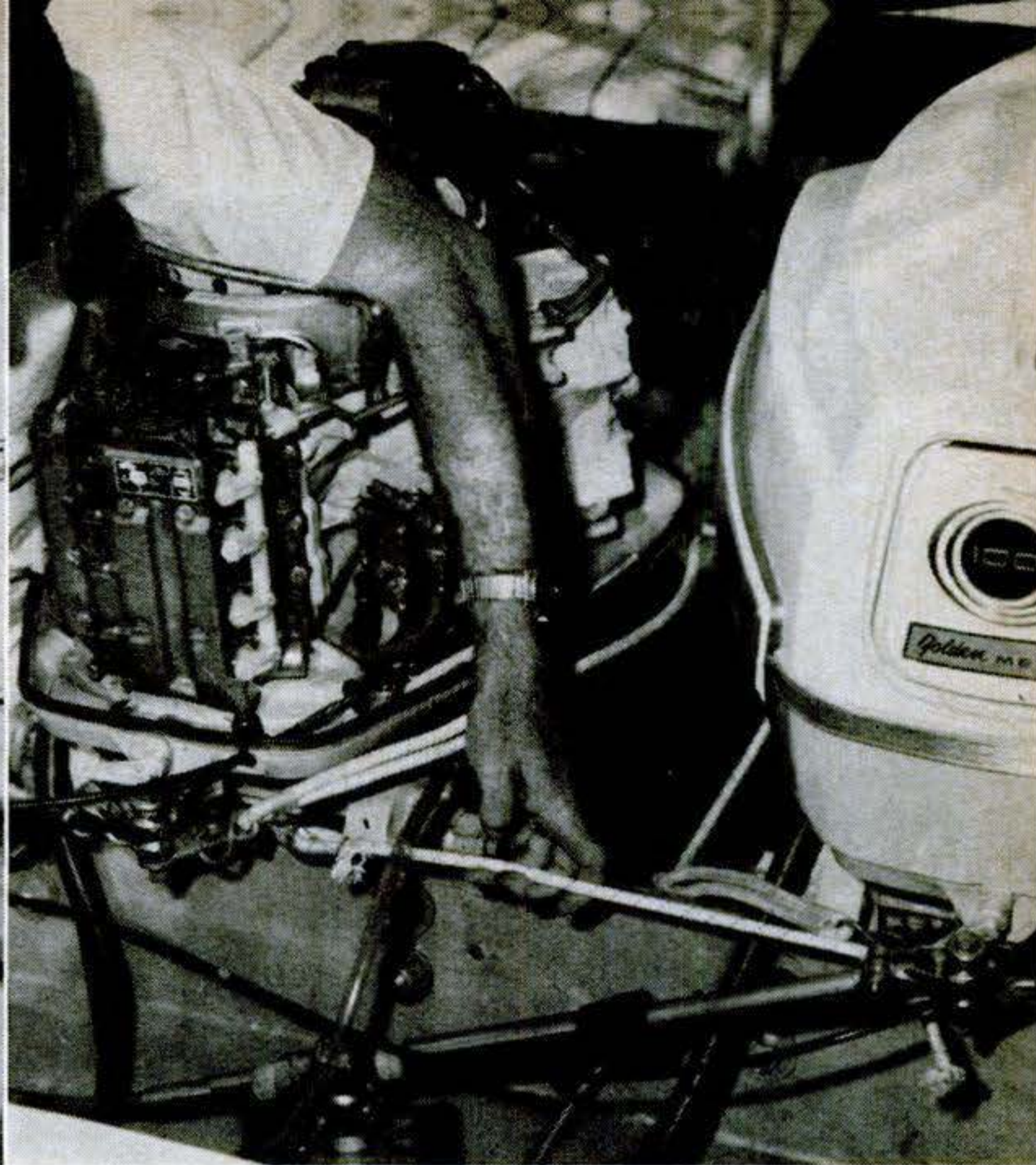


Ocean powerboat racing is a stand-up sport from start to finish. Here, with the boat riding on the props, a standing position is necessary for vision.

At sea, where the water is seldom as flat as this, drivers stand not only to see best, but also because leg joints absorb shock better than any seat cushion.



Rubber-padded thrust blocks on the transom in front of the engines' lower units keep the legs from snapping off in rough going. The reentry bite of the props slams the legs forward with great force.



Shock cord linking the two motors in the front and back reduces vibration. Each engine has its own steering linkage so one or the other can be tilted up without stopping to disconnect a tie bar.

can buy—proof that today's hulls and propulsion units are plenty tough and able. It's in the outfitting, and in the organization of equipment, that the ocean-racing rigs differ from average rigs. Weiler's secrets, and an insight into a racing man's approach to selecting a boat and equipment, can help you put together a better craft.

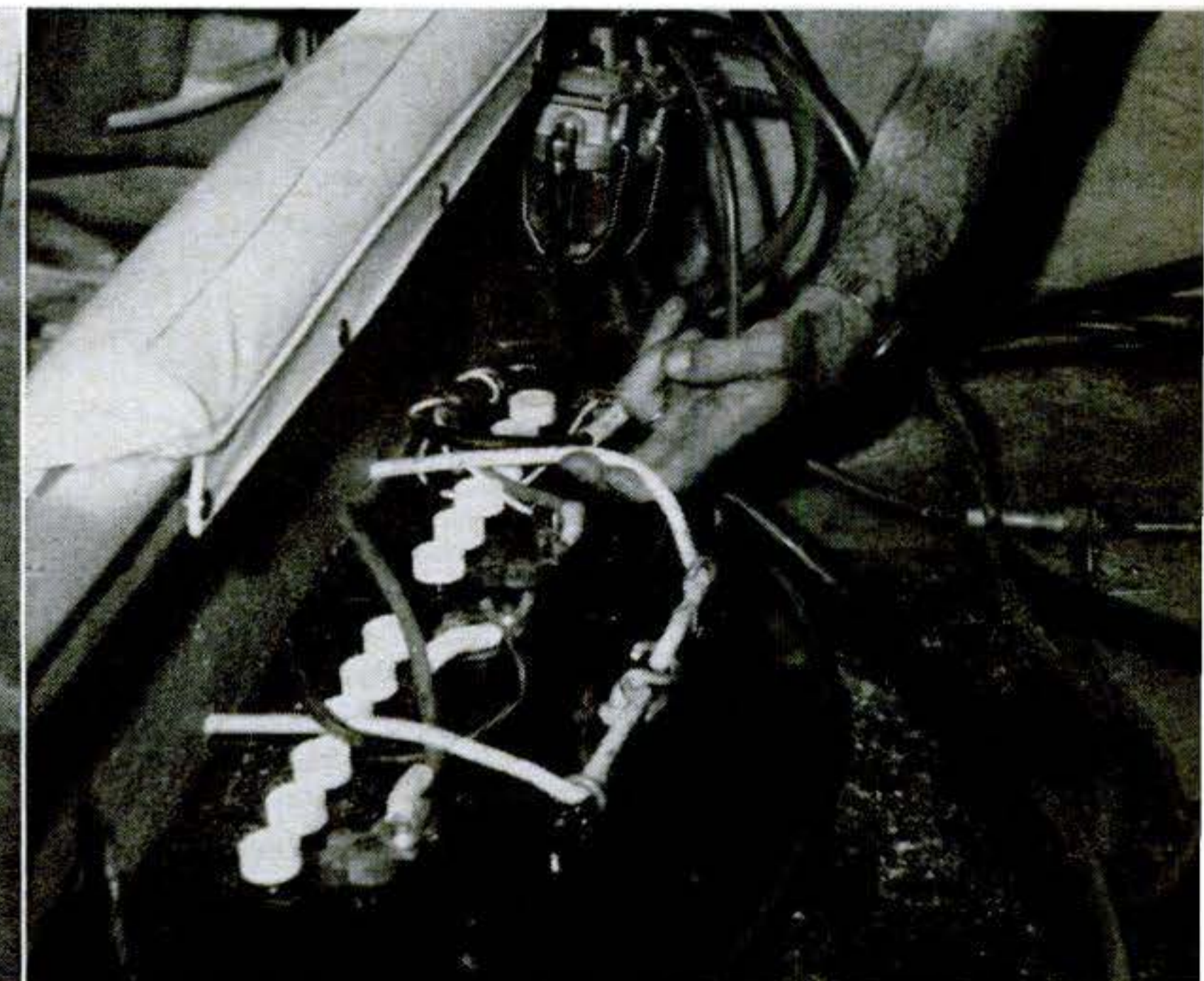
Safety in length. "First," advises Weiler, "select a boat that's right for your purpose.

The ideal hull for a fisherman, for example, may not suit the water skier. In my case, the largest hull that a pair of 100-horse outboards will push at competitive speeds fills the bill." He believes size is most important. "For the kind of thing I do, there's safety in length. Short boats have a tendency to land on their side if they leap out. Engine torque twists them in midair."

Continued



Foam rubber cushions a radio and other accessories that Weiler stows so they're out of the way and protected from spray, yet readily accessible.



Batteries are chocked in a fiberglass-integrated bin and further secured by shock cord. A primer-filter and see-through fuel lines are also shown.

Weiler's boat—built by the North American Boat Corp., of Ft. Lauderdale, Fla.—is 22 feet long. He considers her the ideal length: big enough to withstand bruising seas, yet small enough to maintain high speed with a pair of 100-horse Johnsons.

"It's amazing what a difference just a few feet makes," he says. "When I was racing smaller boats in the ocean, we could make about 35 m.p.h. in smooth water, but were slowed down to five or 10 m.p.h. when it got rough. One year it took me 26 hours to get to Nassau in an outboard.

"But now," he says, "I can do 45 m.p.h. in smooth water and maintain 35 m.p.h. even when it turns rough."

Boat length makes the difference. Yet his present hull is only four feet longer than the boat he formerly raced offshore.

Power pays. Weiler chose twin outboards for his boat and unhesitatingly urges dual engines for anyone who takes his outboard offshore.

His experience has been that bigger outboards cost no more in the long run. "You'll get where you want to go faster with a big engine," he says, "and it won't use any more gas getting you there than a smaller one."

While it may be proper to talk in terms of gallons-per-hour when discussing large inboard operation, he says, it's wiser to think in terms of miles-per-gallon (over-the-bottom miles) with kicker rigs. When operating costs are computed on this basis, the economy of larger engines is readily seen. Additionally, larger engines breathe better, handle heavier loads without strain, require less maintenance, and last longer.

Rigging for shock. The first consideration in grooming a boat for ocean-racing and rough-water efficiency is engine installation. Weiler mounted his two Johnsons so their cavitation plates are slightly above

the boat's bottom. "Plates should be either even with the bottom or up to an inch above it," he says. "If they're lower, you can lose as much as five miles an hour because of the added drag. On the other hand, mounting them too high can lift the water intake too close to the water's surface. Then you risk burning up your engines. The right cavitation-plate height for a given boat can only be determined through experimentation."

The brackets of his outboards are bolted directly to the transom. But as a safeguard, he fiberglassed the brackets to the transom after bolting them in place. In addition, he mounted specially designed thrust blocks, rubber-padded units, between the transom and lower units. "Jump off a heavy sea," he says, "and those propellers are out of the water. Come down again, and they take a big bite, slamming the lower units forward with enormous force. Without the protection of shock-absorbing thrust blocks, lower units have snapped off as a result of such reentries."

He uses heavy-duty shock cord to hold the lower units of his engines in against the transom thrust blocks. More shock cord goes over the hoods and two lengths link the engines in the front and back to reduce vibration. "The average boatman wouldn't subject his rig to the strains mine undergoes," says Weiler, "but he should know where stress is exerted."

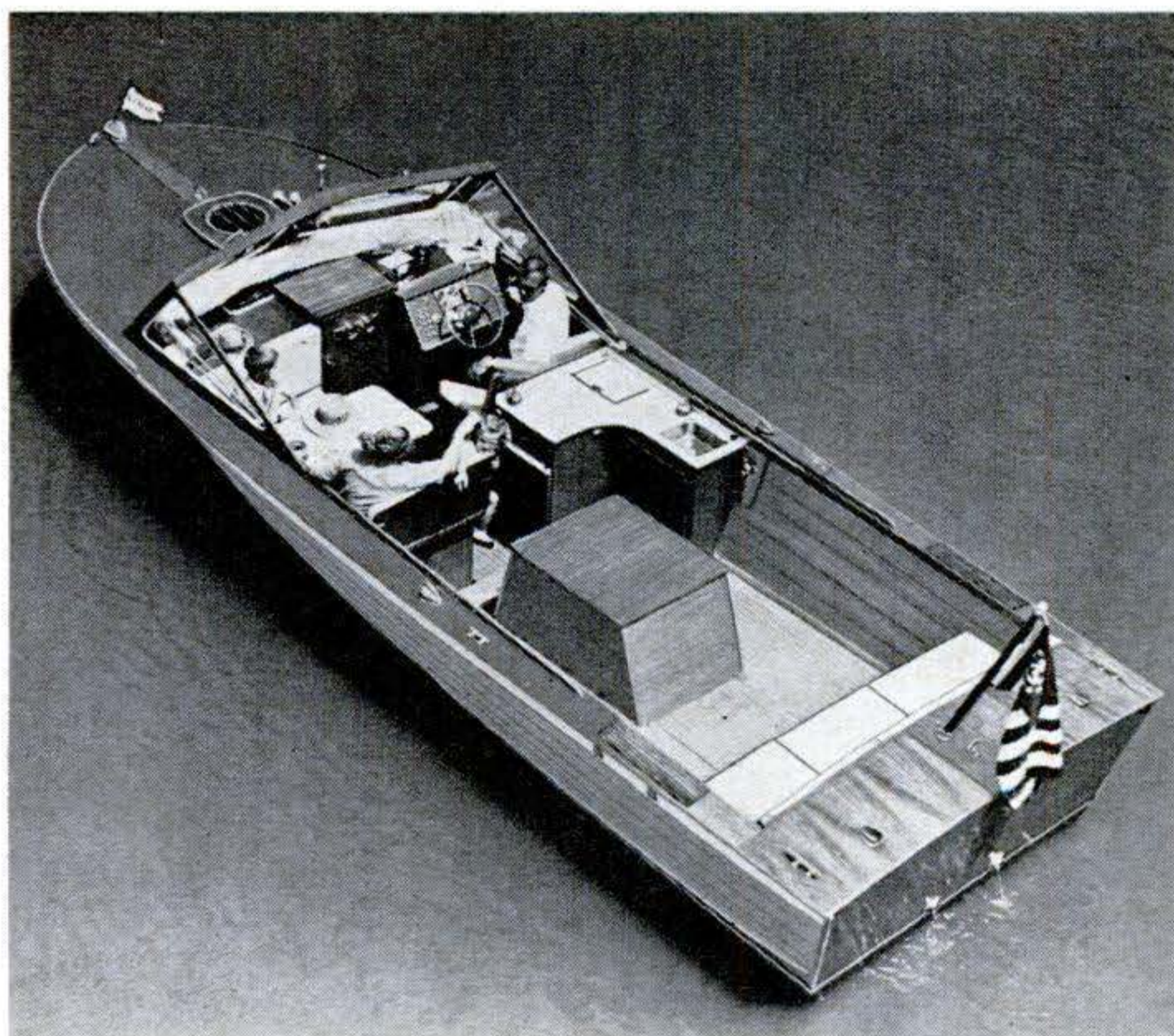
All of his accessories and equipment are stowed to stay in place. Built-in boxes hold a life raft, radio, tools, and other equipment. Foam-rubber pads wedge every item in place, yet everything is instantly accessible. And all hardware is fastened with bolts.

Steering, trim, and control. "Steering," Weiler says, "should be located as far aft

[\[Continued on page 218\]](#)

Skipping wakes at 45 m.p.h., or racing in five-foot seas, Weiler has confidence in his rig.





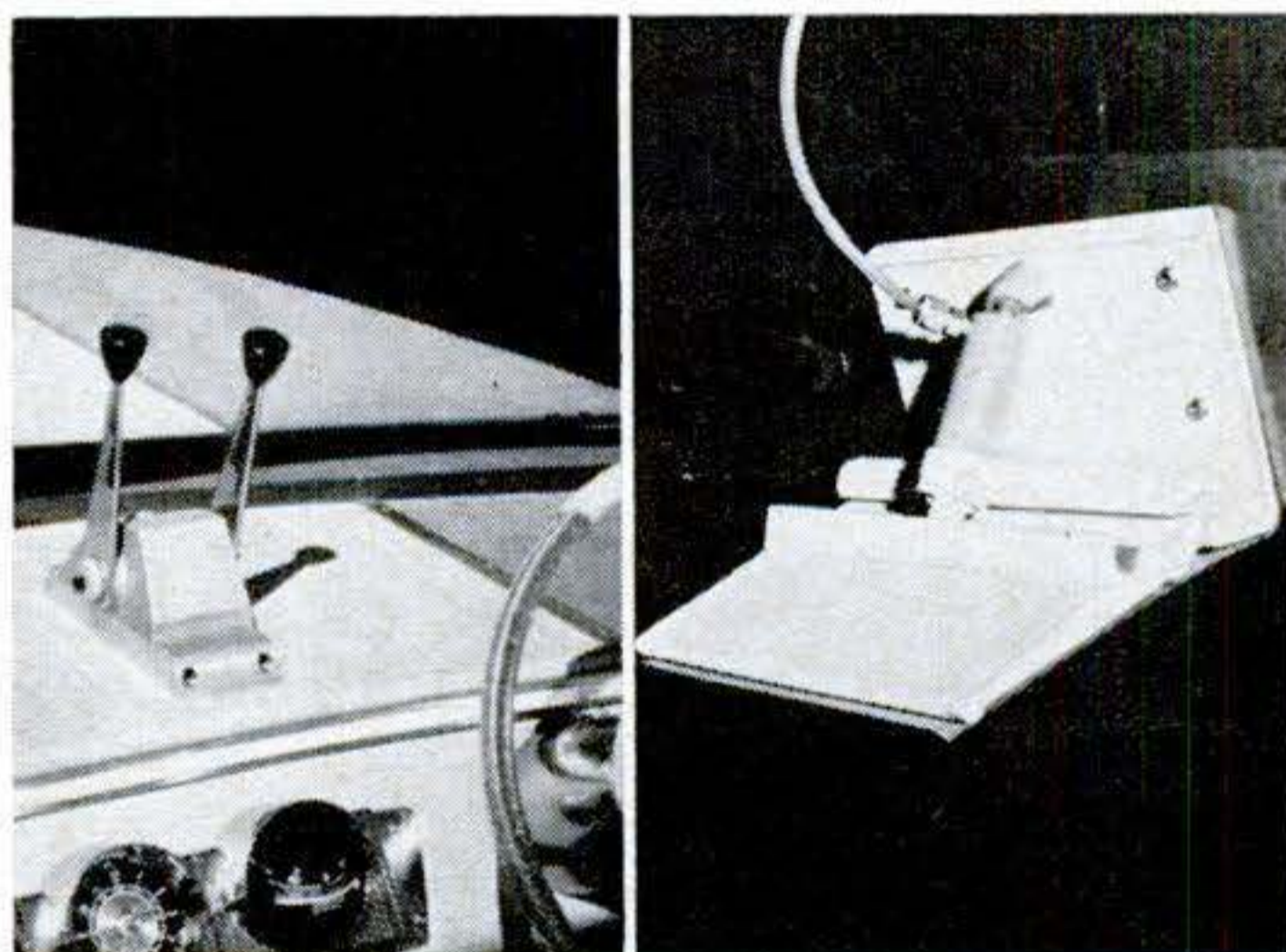
Lapstrake-plywood utility sleeps and feeds four

This 25-foot lapstrake-plywood inboard boat is outfitted for overnighting. There are two bunks and a toilet under her foredeck, and a dinette alongside the helmsman's station makes up into a double berth. Aft of the helm is a galley. Called the Cruisette, she has an eight-foot beam, and comes with 190, 195, 200, 210, or 220 hp. Lyman Boat Works, Sandusky, Ohio.



Jet-drive kicker comes in kit form

You can build yourself a jet outboard for as little as \$49.95 using kit water-jet drive components and your own three- to four-hp. air-cooled engine. Drive parts assemble without special tools. Engines are offered at \$29.95 and \$39.95. Melzer's, 6 E. Shanklin, Carrollton, Mo.



Hydraulic trim tabs are easily installed

Tempo hydraulic trim tabs feature a twin-lever remote control that enables helmsmen to adjust hull attitude readily to changing water conditions and loads. Easily installed, the trim tabs come nine inches wide for boats of up to 20 feet, 12 inches for 21- to 26-footers, and 18 inches for larger craft. Tempo Products Co., 6200 Cochran Rd., Cleveland, makes them.

An 85-pound fiberglass boat

The 13-foot aluminum-gunwaled, canoe-like fiberglass boat at right is intended for both rowing and outboarding. Features include underseat air-tank flotation and two pairs of oarlocks. She has a 43-inch beam, handles kickers of up to five hp., loads on a car top or into the tailgate of a compact wagon. The Portager is made by Shell Lake Boats, Inc., Shell Lake, Wis.



Solar still makes drinking water

A sheet of plastic, a shovel, and a bucket will give you fresh water in a parched desert no matter how far you may be from the nearest oasis. All you need for a drink and survival is to dig a hole less than two feet deep, place the bucket in its center, stretch the plastic over it, weight the edges with rock or dirt, and in an hour you can take your first drink. The sun draws water from the soil, collects it on the bottom of the plastic, from which it drips into the bucket.

There are more efficient solar stills, but the U.S. Department of Agriculture's research service holds this is the cheapest and will yield about three pints between sunrise and sunset.



If soil is dry, slices of cactus or other fleshy plants laid on sides of hole produce water quicker.

VTOL stows rotors for jet flight

One of the latest versions of vertical-takeoff-and-landing jet planes is shown in the photos of a working model at right. The fixed-wing helicopter being developed by Lockheed would take off like a conventional helicopter, stop its rotor blades in flight, fold them into a stacked pack, and stow the pack in its fuselage. Then, with lid closed over the storage hold, the craft would speed on, powered by wing-mounted jets.

Lockheed's 500-m.p.h. VTOL aircraft is an outgrowth of its Army XH-51A stub-wing, forward-thrust copter-jet [PS, Oct. '65], which has flown at 272 m.p.h. with a jet mounted on its fuselage to become the world's fastest helicopter.

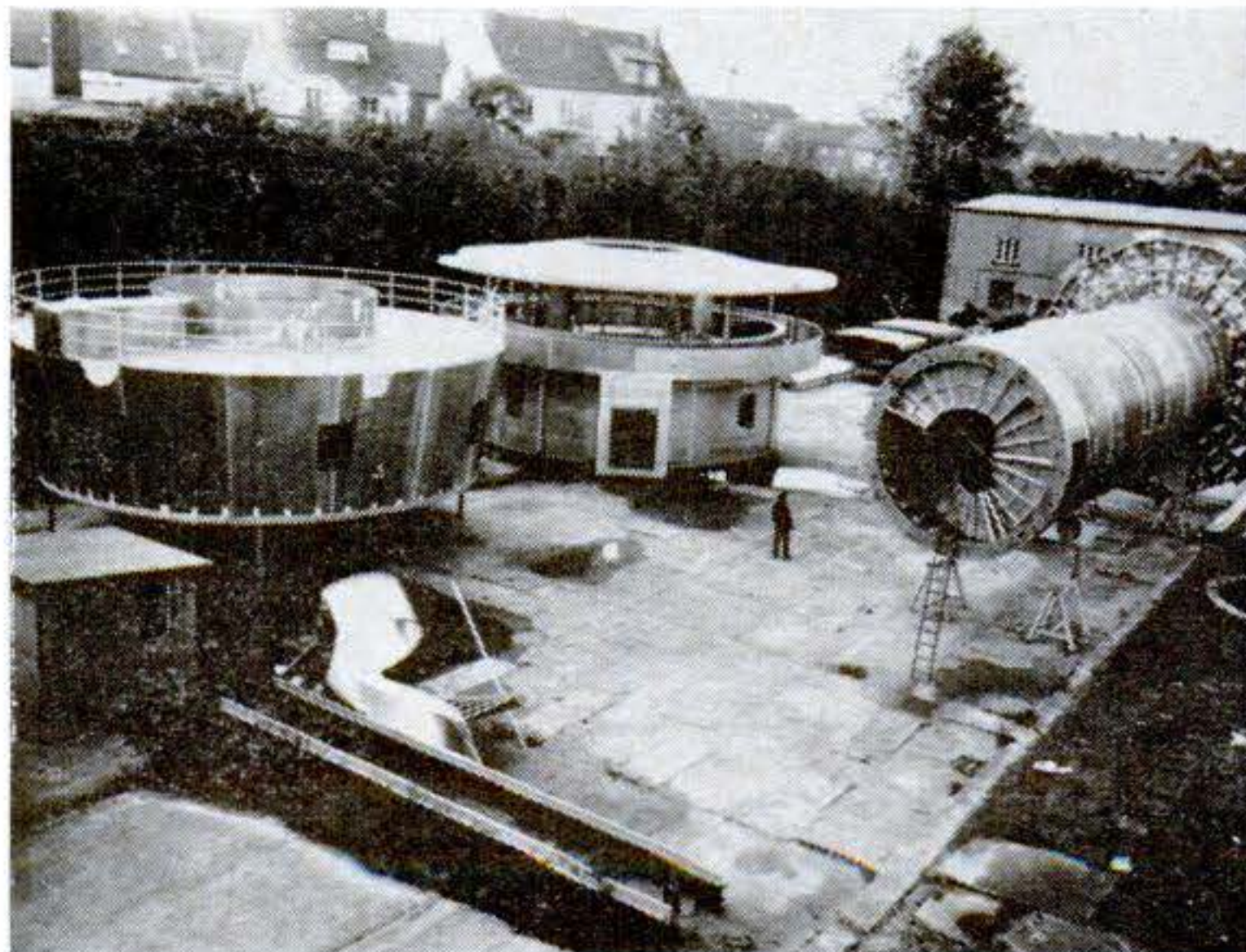


Working model of new VTOL whirls rotor blades to take off and land like a conventional helicopter.

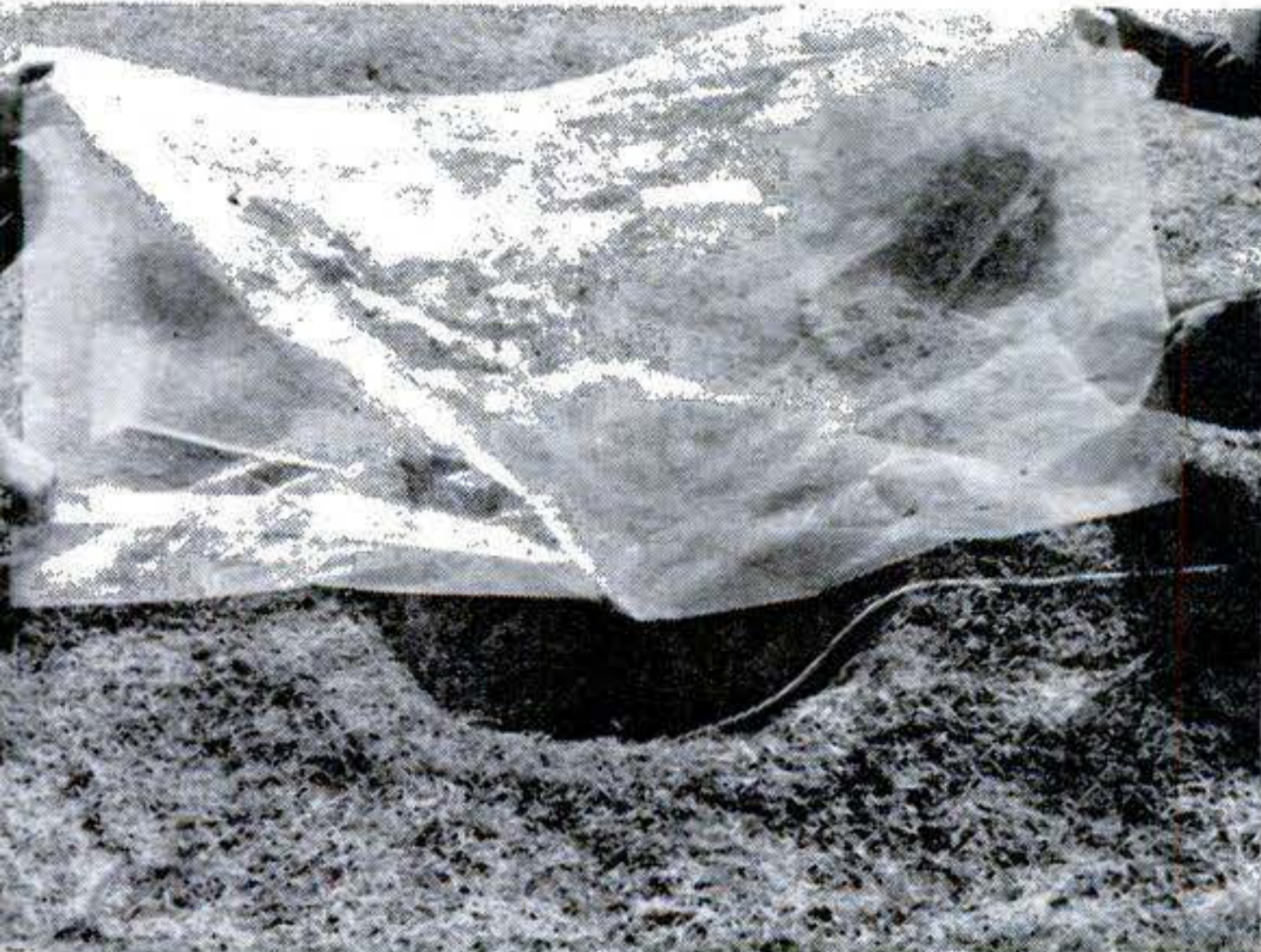
Prefabricated aluminum lighthouse

To replace an outmoded lightship at the entrance to the Baltic Sea harbor of Kiel, West German authorities have put an aluminum lighthouse on an artificial concrete island. This eliminates hardship and danger to the floating crew and incoming vessels during frequently severe winter freezes of the far-north waters surrounding the port.

The island base, 12,000 tons of concrete, was poured in a V shape to protect pilot boats from wind, sea, and drifting ice. The lighthouse, 100 feet tall and weighing 55 tons, was constructed in sections at an aluminum plant on shore, assembled there, and then transported to the island and lifted into place by a huge floating harbor crane.

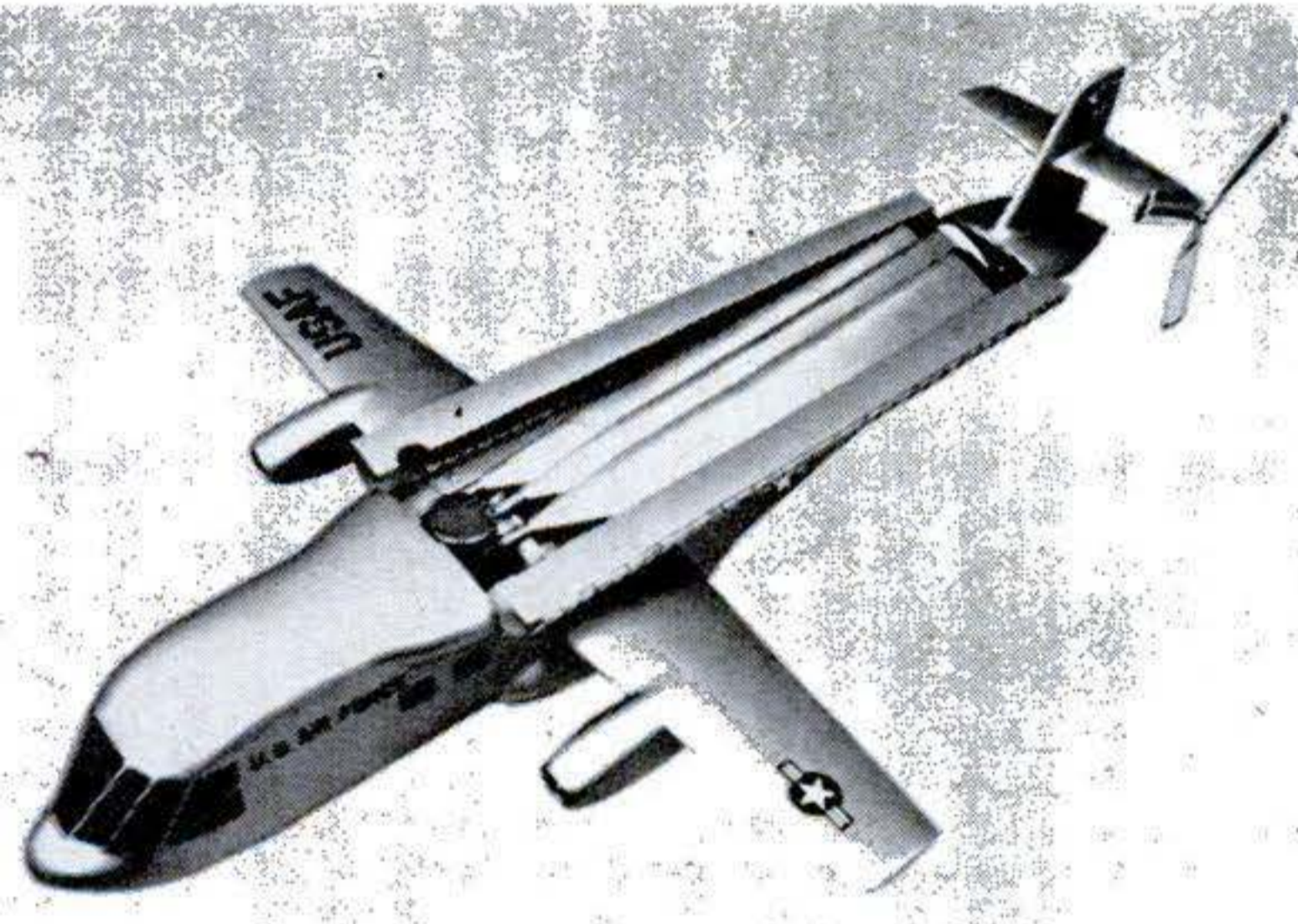


Built in three sections, lighthouse has upper floor (left) for light, crew quarters in base, and tower.



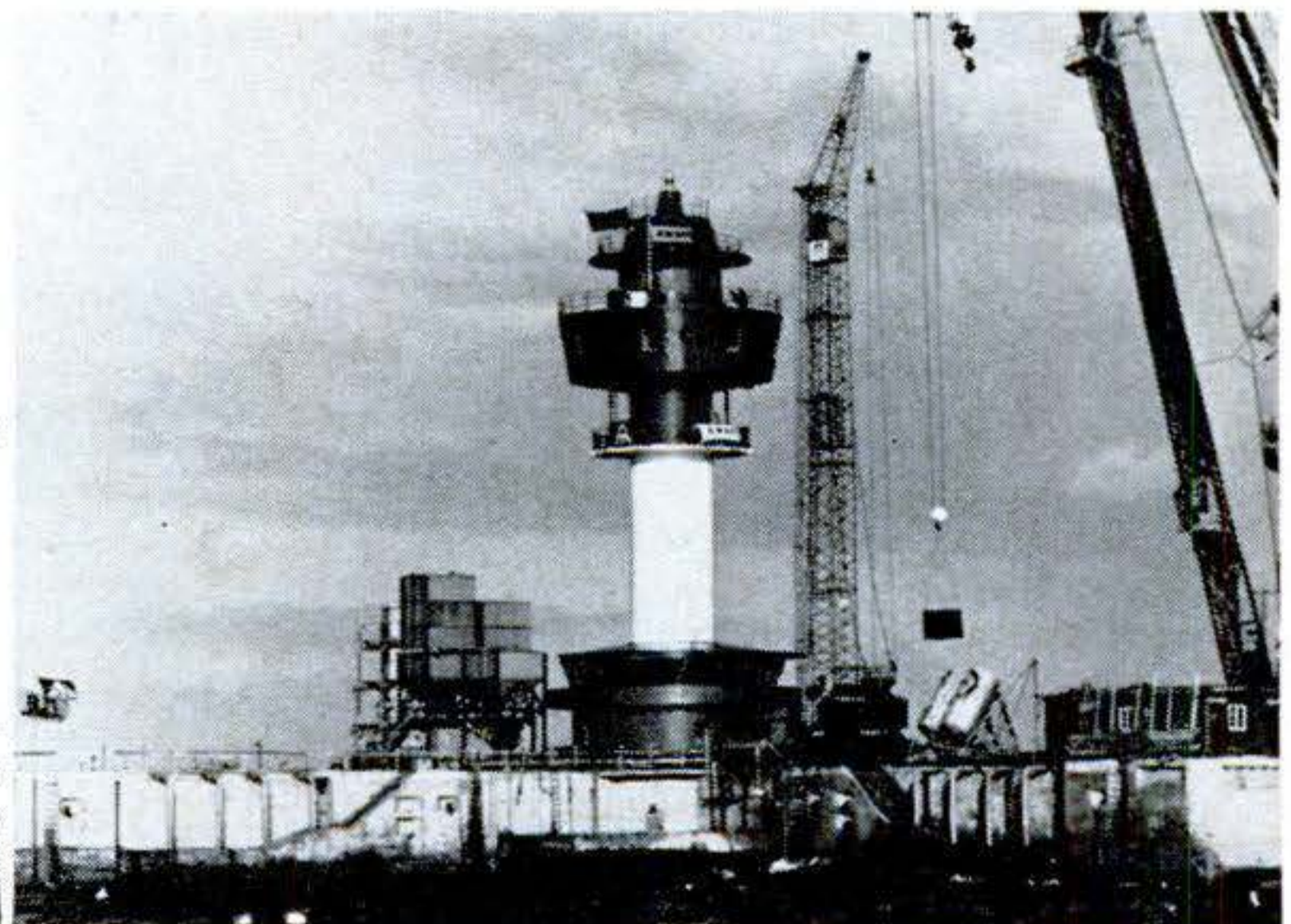
Tube from bucket (right) under plastic will enable you to drink while water is condensing.

Small rock weights down center; hot sun shining through plastic vaporizes moisture; drops run down into bucket.



Blades are stacked when flight reaches 160 m.p.h. and folded back with mast into fuselage opening.

Lid on fuselage reclosed, fixed-wing aircraft powered by wing jets flies on mission at speeds up to 500 m.p.h.



Giant floating crane raises assembled 100-foot-tall lighthouse to carry it to concrete-island base.

New lighthouse stands in place in Kiel harbor, bolted to manmade island, ready to signal ships.

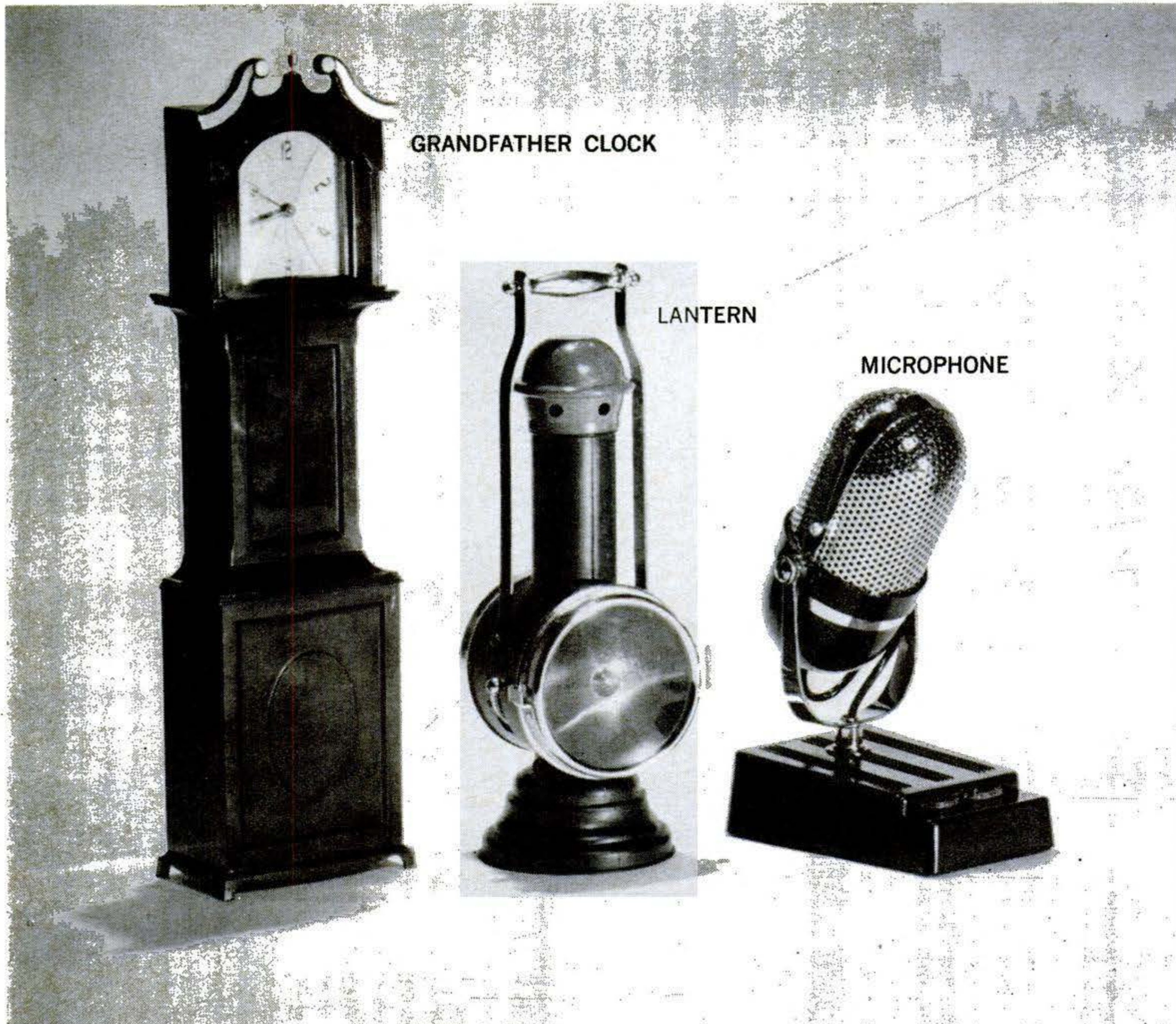
Look Again!

What happens when you cross a paperweight with a pocket radio? You wind up with a musical baseball, or a microphone that talks, or a singing hip flask, or any one of a shelf full of way-out transistor radios that look like everything but radios. The electronic oddballs pictured below are representative of a whole new breed of battery-powered table radios that are camouflaged to look like something else.

You'll pay more for them than for conventional transistor radios: These are strictly limited-production items. They are



BASEBALL



GRANDFATHER CLOCK

LANTERN

MICROPHONE

These gadgets are radios

available from Hammacher Schlemmer in New York City (145 E. 57 St.) and other specialty shops. Here's a rundown:

- Baseball (left) is built to official major-league size and weight (without the battery). Complete with three tiny wooden bats that bolt together to make a display stand, it costs \$15.

- Grandfather clock really is a clock radio. A 30-hour wind-up movement turns the radio on at a preset time. \$35.

- Lantern is an authentic miniature of a trainman's lantern (the kind Japanese train-

men use). Its long chimney houses a longer-than-usual antenna coil, making this a very sensitive receiver. \$25.

- Broadcaster's microphone uses the mike housing as a very efficient speaker enclosure. The seven-transistor circuit is housed within the base. \$30.

- Grand piano and harp miniatures both house eight-transistor radios. Both are available in white or black. \$30.

- Flask radio inside the leatherette-covered case has a seven-transistor circuit—alas, no room for liquor. \$30.

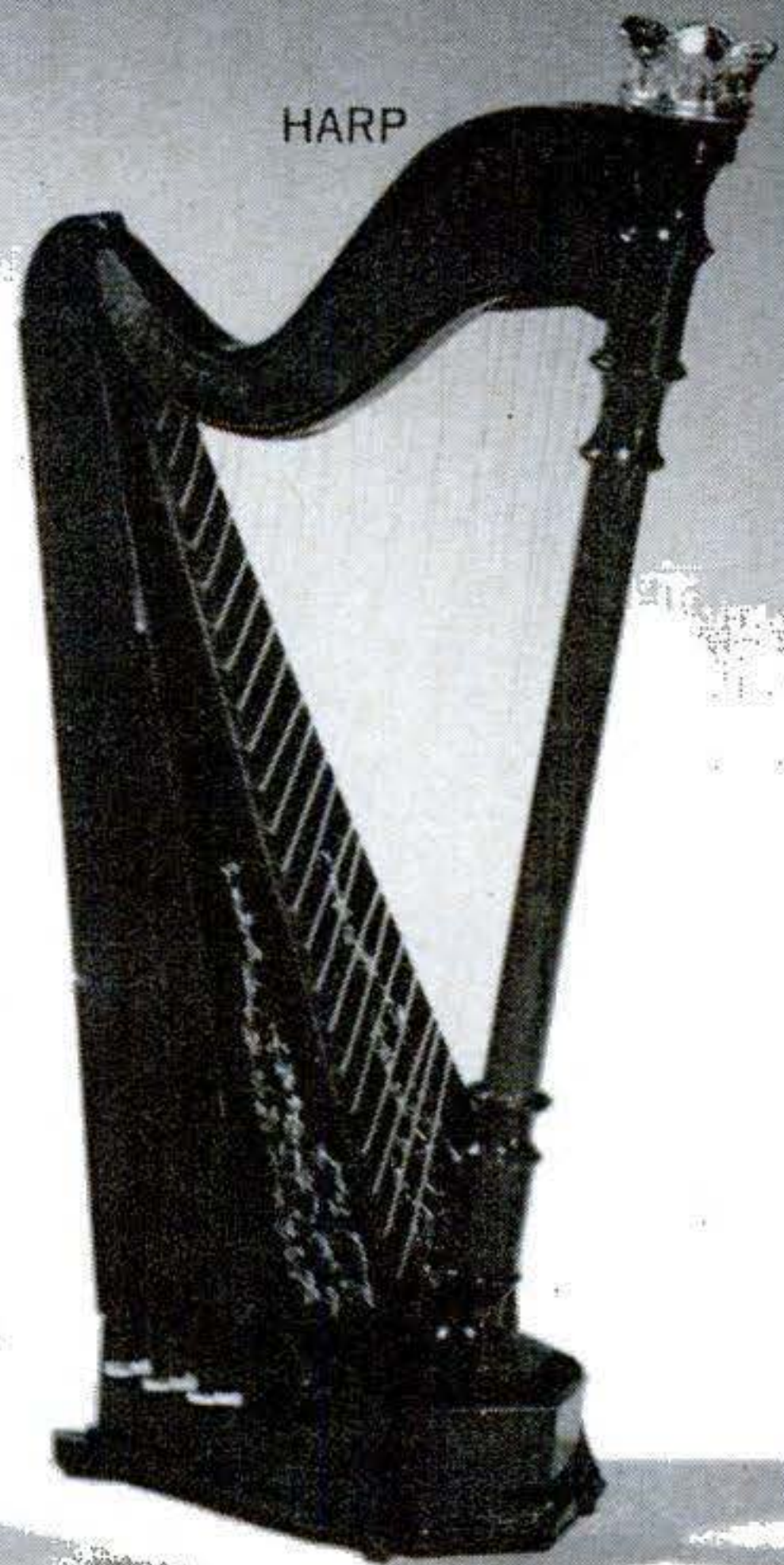
GRAND PIANO

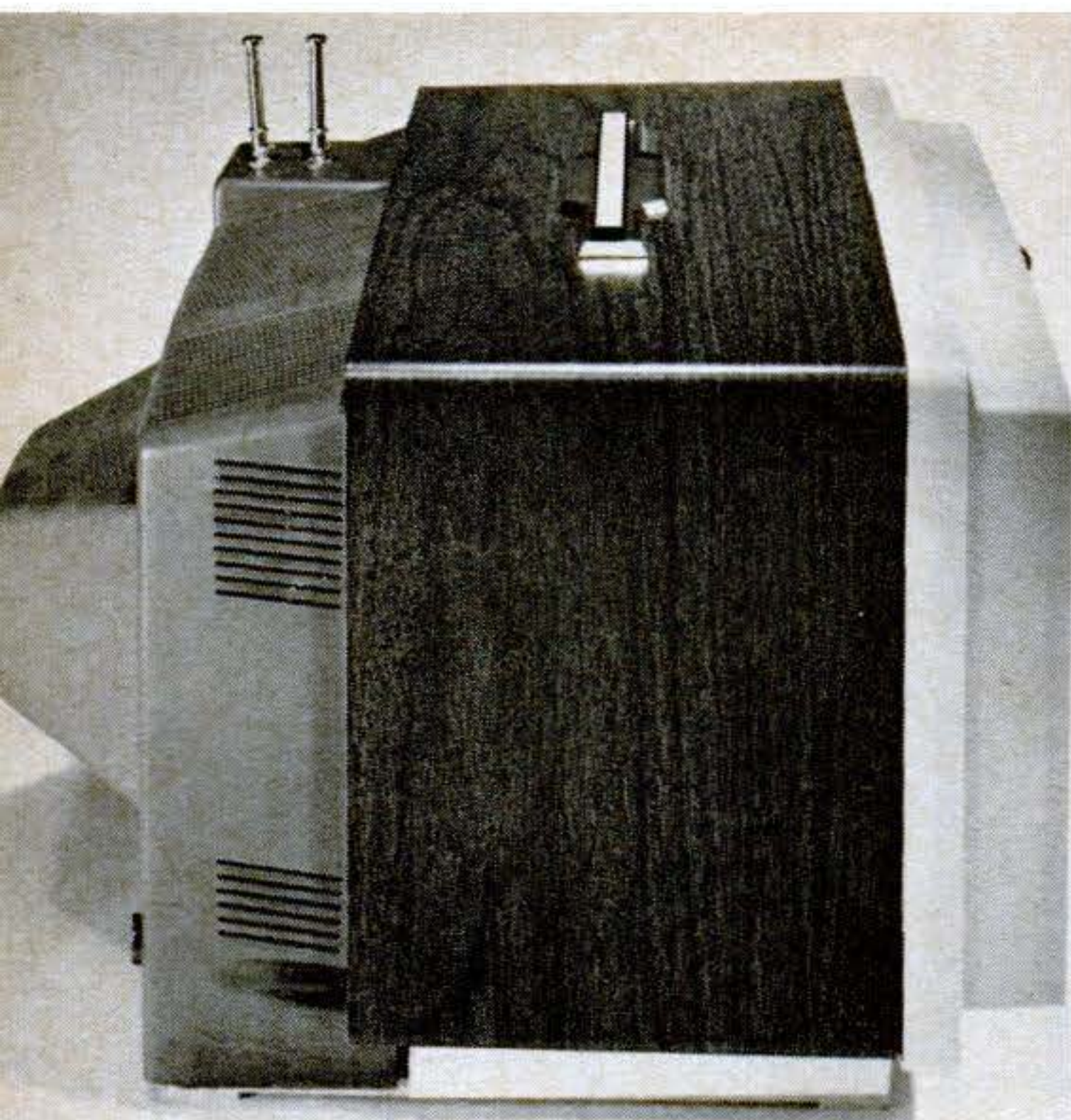


POCKET FLASK

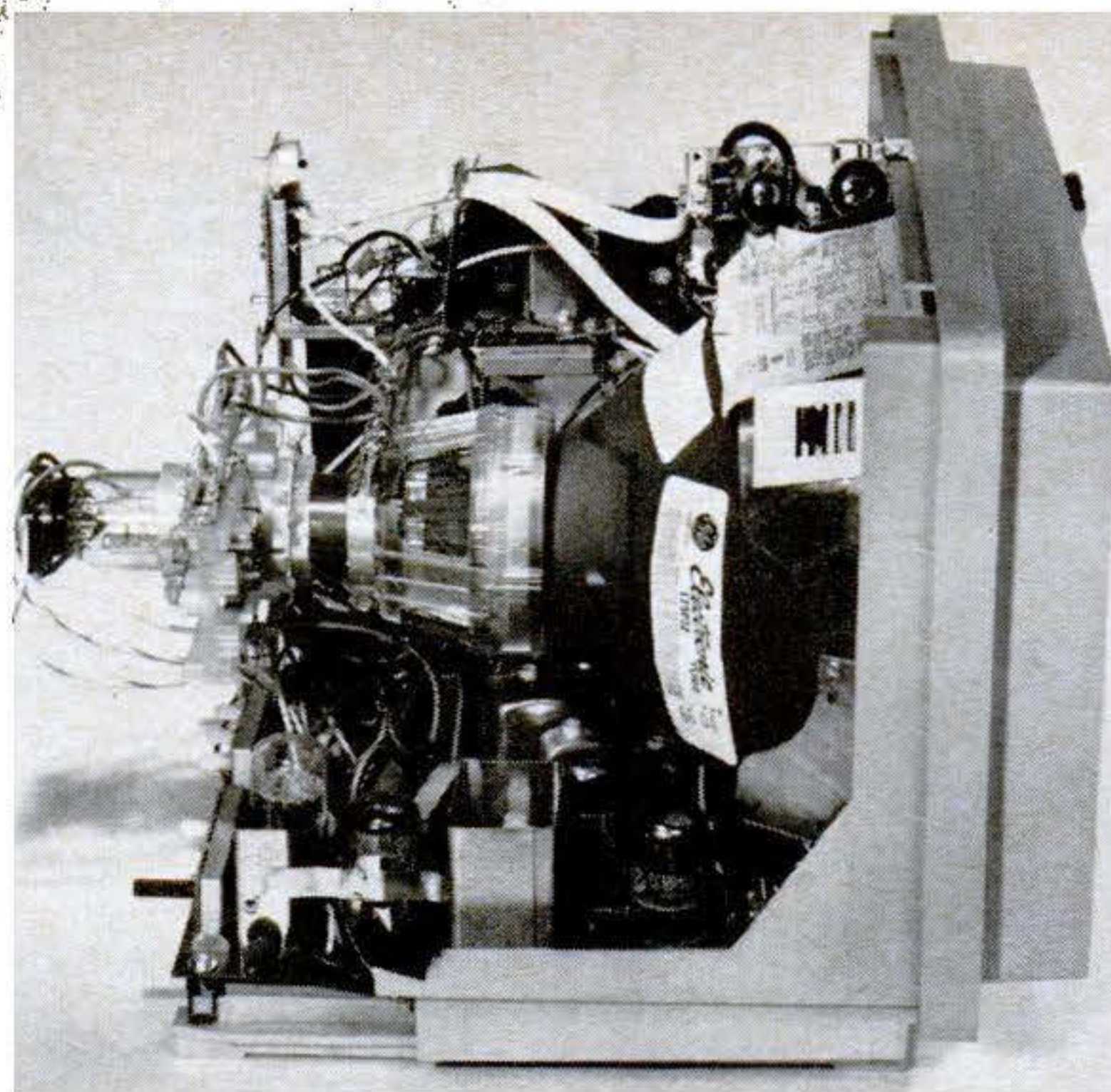


HARP





GE's pint-size color set is almost as deep as it is wide. This side view shows why a head-on photo can be misleading. Despite cube-like shape, it's the smallest and lightest color TV you can buy.



Why so deep? Blame the color-picture tube: Even a small-screen tube has a long neck. The front view (right) shows how several inches of cabinet and knobs surround picture, making it seem smaller.

PERSONAL-USE REPORT:

The Cheapest Color

It takes a mouthful of superlatives to talk about GE's pint-size \$250 color TV. The Portacolor is the smallest, lightest, simplest, easiest-to-service, and cheapest color set you can buy. But is it worth buying? That all depends on how you look at it.

Don't choose this set if you are shopping for a low-cost color TV the whole family can watch—its 11-inch screen is just too

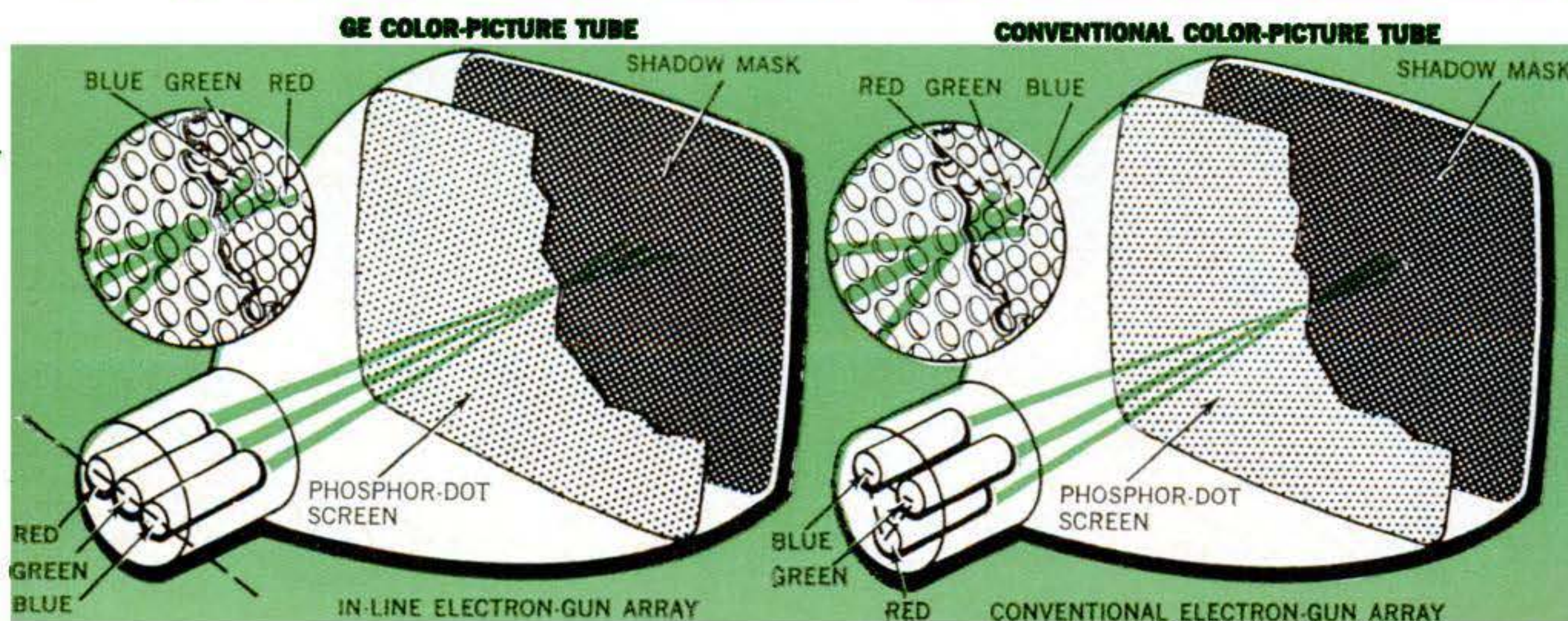
small. The ideal viewing distance is about five feet. At that range, more than three viewers become a crowd.

On the other hand, I found it an ideal second TV for bedroom or den viewing. It's small enough to sit comfortably on a bed table or desk, and light enough for your wife to tote from room to room.

Keep this in mind, though: It may not be a true portable in your home. The set's built-

A GE first: In-line arrangement of the picture tube's electron guns and phosphor dots simplifies conver-

gence. Conventional tubes use a triangular gun and dot layout, have 10 more convergence adjustments.





Set Yet

in dipole antenna will pull in a watchable color picture only in strong-signal, ghost-free reception areas. In ghostly urban, or weak-signal rural, areas, the set must be connected to a color-rated outdoor antenna.

Inside, I found striking differences between this set and its big-screen cousins:

- To shrink size, weight, and cost, there's a radically simplified chassis. A price was paid, though: The color sensitivity is not up to big-screen-set standards. This means that a marginal signal may not produce a satisfactory color picture. Also, there is noticeable picture blooming: A rapid increase in scene brightness makes the picture grow, momentarily.

- The GE-designed picture tube uses an in-line geometry that simplifies the serviceman's occasional job of adjusting the beam-convergence controls. Once adjusted, carrying the set around won't jar them loose.

All American-made color sets use a three-electron-gun picture tube. For perfect color and fringe-free pictures, the three electron beams must always converge—or intersect—

at the perforated shadow mask as they sweep across the screen. Only then will they strike the correct red, blue, and green phosphor dots on the screen. Big-screen sets may have 15 separate controls that adjust beam convergence; the Portacolor has only five.

Color picture quality is good. But I have one criticism: The two color controls and the fine tuning are finicky to adjust. It takes a steady hand to set them.—*R. Benrey*

Specifications

Model	M213BWD Portacolor
Picture-tube type	Shadow mask; 3 electron guns
Screen size	11 inches (diagonal measurement)
Screen shape	Rectangular
Phosphor type	Conventional
Number of tubes	13
Number of transistors ..	1
Number of diodes	13
Dimensions	16½" deep; 11¾" high; 17" wide
Weight	24 pounds
Price	\$250 (includes dipole antenna and degausser)
Manufacturer	General Electric Co.



PERSONAL-USE REPORT:

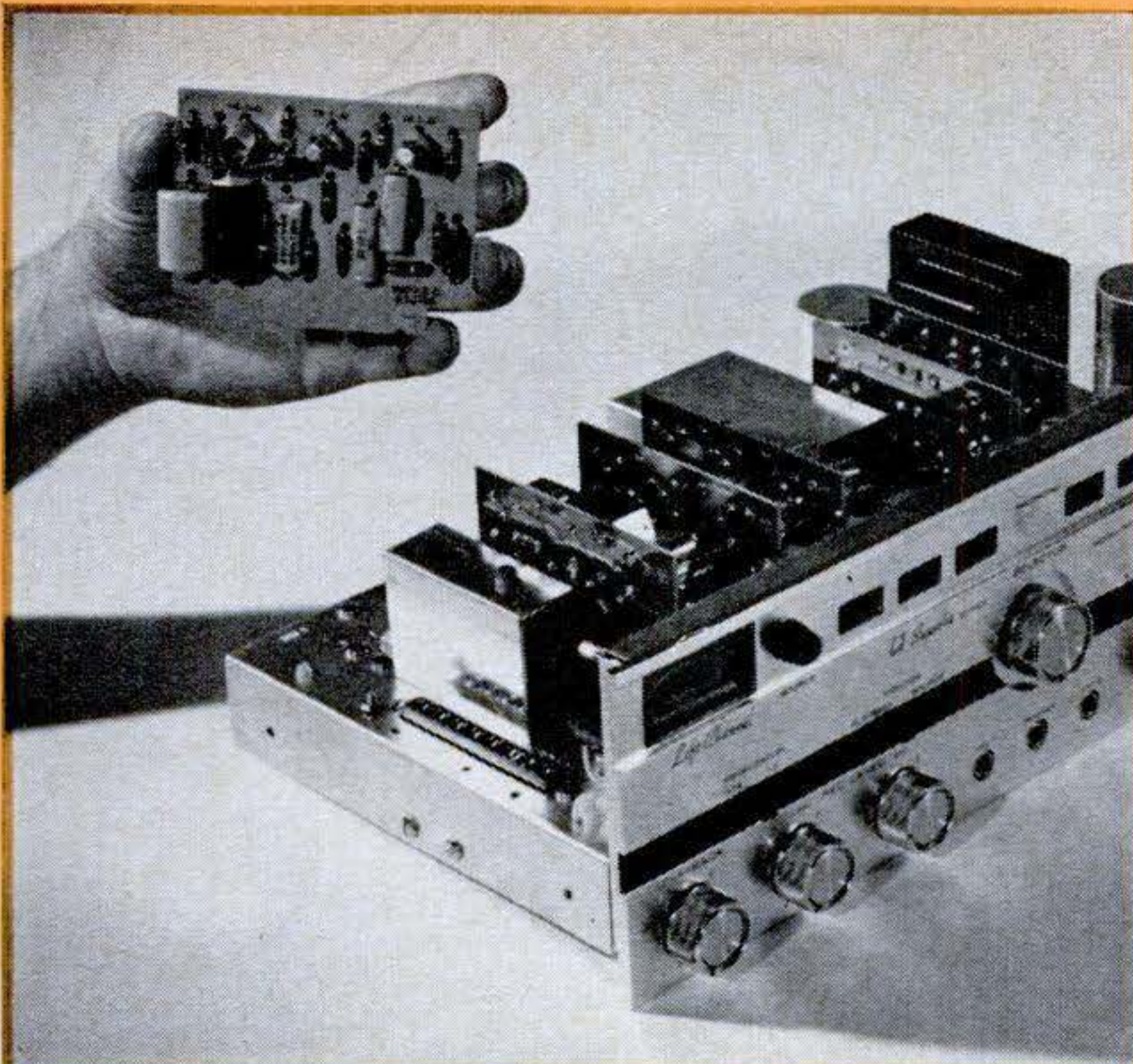
The Stereo Tape Deck



Judging by the almost flawless way it records and reproduces sound, the Knight-kit KG-415 stereo tape deck costs a full third less than it's worth—if you don't add in the value of the 25 hours of your time needed to wire its elaborate electronic chassis. The complete kit, including the walnut enclosure shown above, costs \$270 (Allied Radio Co., Chicago 60680).

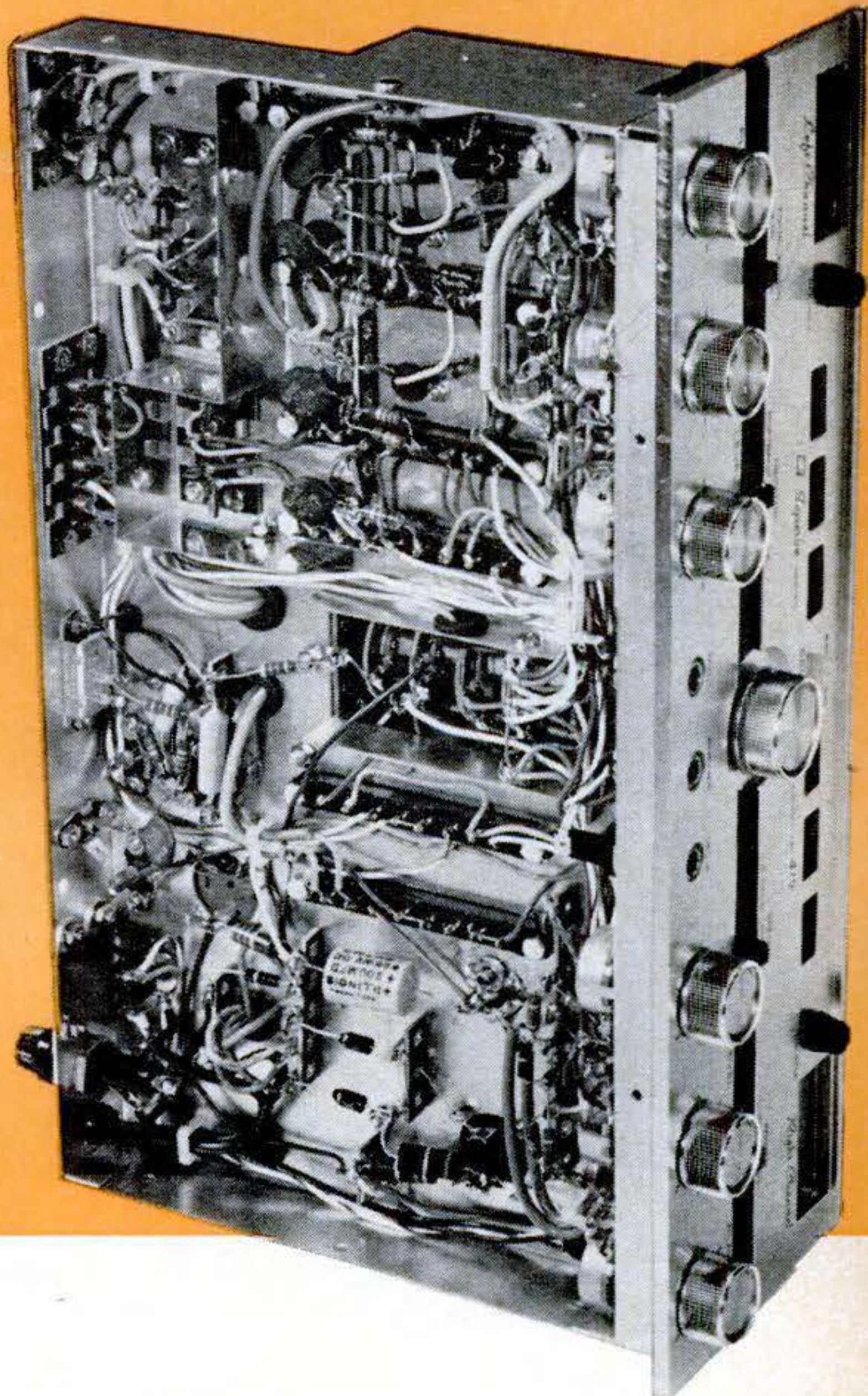
The KG-415 is a tape deck, not a complete recorder. It does not have its own built-in playback amplifiers and speakers. Like a turntable, it is designed to connect

The prebuilt tape transport has two motors—one to drive the capstan, one to power the take-up reel—that propel tape at both 7½ and 3¾ i.p.s. Shielding keeps stray noise out of the circuitry.



Six easy-to-wire printed-circuit modules hold most of the 17-transistor circuit. They plug into chassis-mounted connectors. The well-illustrated instruction manual is comprehensive and totally accurate.

It looks complex under the chassis, and it is. But mistakes are easily tracked down and corrected: A test oscillator, which you wire first, generates a tone that trouble-shoots other circuits as you build.



You Build from a Kit

to your stereo amplifier-speaker system.

Although the deck is equipped with a full assortment of features that will delight the gadget-minded audiophile (including provision for sound-on-sound recording and echo effects), I found that it is most at home when playing back prerecorded stereo tapes and recording stereo programs off the air from an FM multiplex tuner. It is an ideal rig for building a tape music library.

The quiet-running two-speed, twin-motor, tape transport—manufactured by Viking—comes completely assembled. It has three hyperbolic-shaped tape heads that don't require tape-wearing pressure pads; tape tension presses the moving tape against the head surfaces. One gripe: Tape editing would be easier if the transport had a pause

control. Here are the features I liked best:

- At a tape speed of 7½ inches per second, flutter and wow are inaudible.
- Record and playback frequency response at 3¼ i.p.s. is adequate for all but the most demanding selections.
- A built-in oscillator generates 1,000-c.p.s. audio tone that makes it easy to adjust the critical record bias and erase signal levels for optimum performance. The correct settings depend on the thickness and quality of the recording tape used.
- A built-in low-power playback amplifier permits the use of stereo headphones to monitor recording quality. A front-panel monitor switch selects either the signal being fed into the recorder or the actual signal recorded on the tape.—*R. Benrey.*



PS ELECTRONICS

Popular Science's

**Part II on the unique PS electrical test meter.
This month: Build an automotive tachometer/dwell
meter and a multirange volt-ammeter**

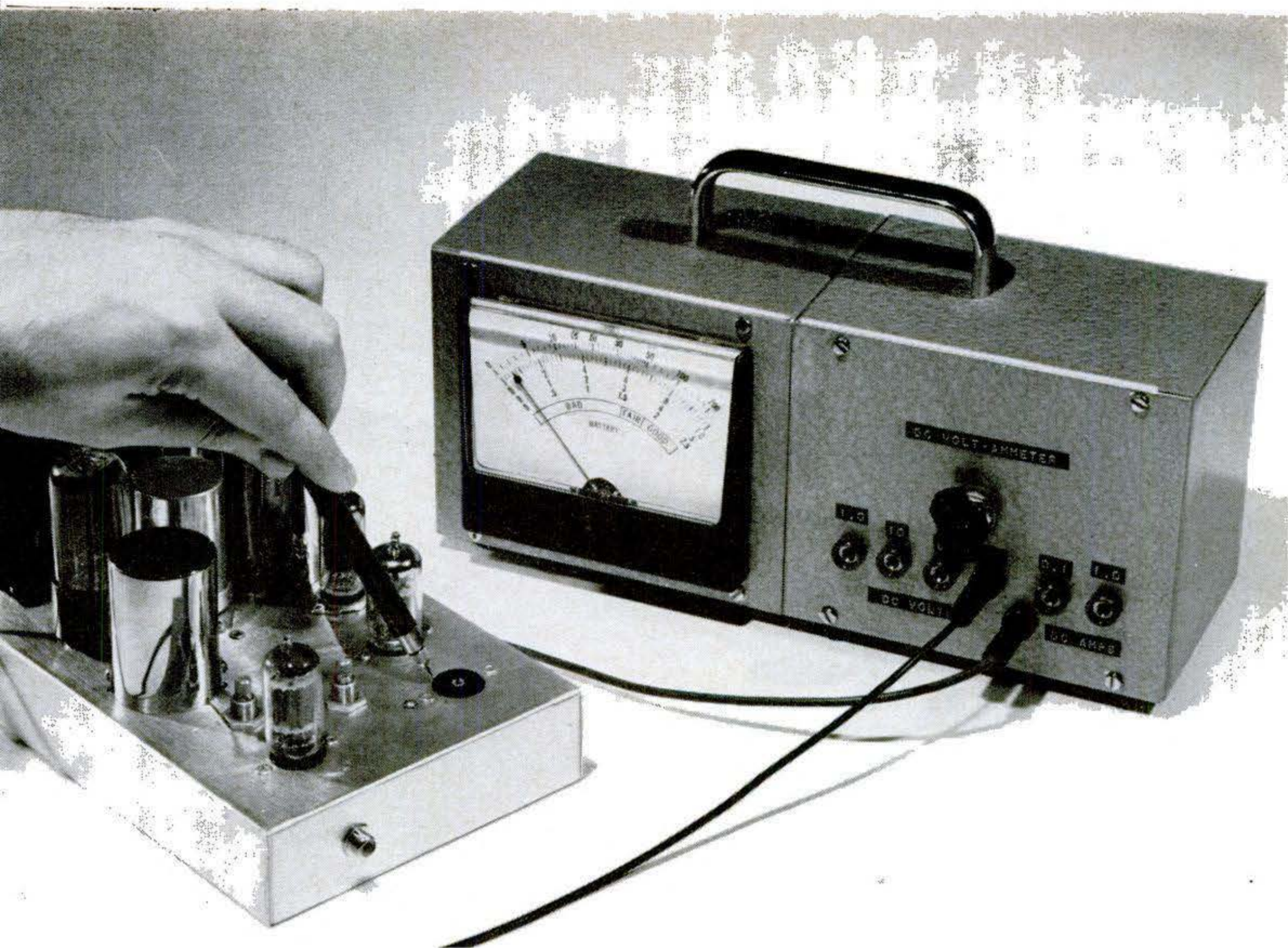
By **RONALD M. BENREY** / *PS Electronics Editor*

Here are two of the handiest test instruments you can own. One is indispensable when you tune up your car; the other makes a thousand-and-one useful measurements when you service electronic and electrical devices. Both are designed as easy-to-build modules that plug into the universal meter housing described last month and pictured farther on in this article.

● The dual-range tachometer/dwell me-

ter measures two ranges of engine speed (0-1,000 r.p.m. for setting carburetor idle adjustments, and 0-5,000 r.p.m. for a variety of high-speed tests) and, in addition, checks ignition-point dwell angle.

● The DC volt-ammeter measures four ranges of DC voltage (0-1, 0-10, 0-50, 0-250) and two ranges of DC current (0-100 milliamperes and 0-1 amp). You will use it for everything from checking



9-in-1 Troubleshooter

the operation of your car voltage regulator to troubleshooting the hi-fi kit you've just assembled.

Tach/dwell-meter module. Wire its circuit on a piece of perforated phenolic board (Vectorboard), using push-in terminals (flea clips) as wiring points. Double-check the polarity of the diodes before soldering them in place. Be careful when you solder the leads of the diodes and transistor—they are easily damaged by overheating.

The tach portion of the circuit is powered by two 8.4-volt mercury transistor-radio batteries strapped to the chassis board with a homemade aluminum bracket. A single C flashlight cell mounted in a holder powers the dwell meter.

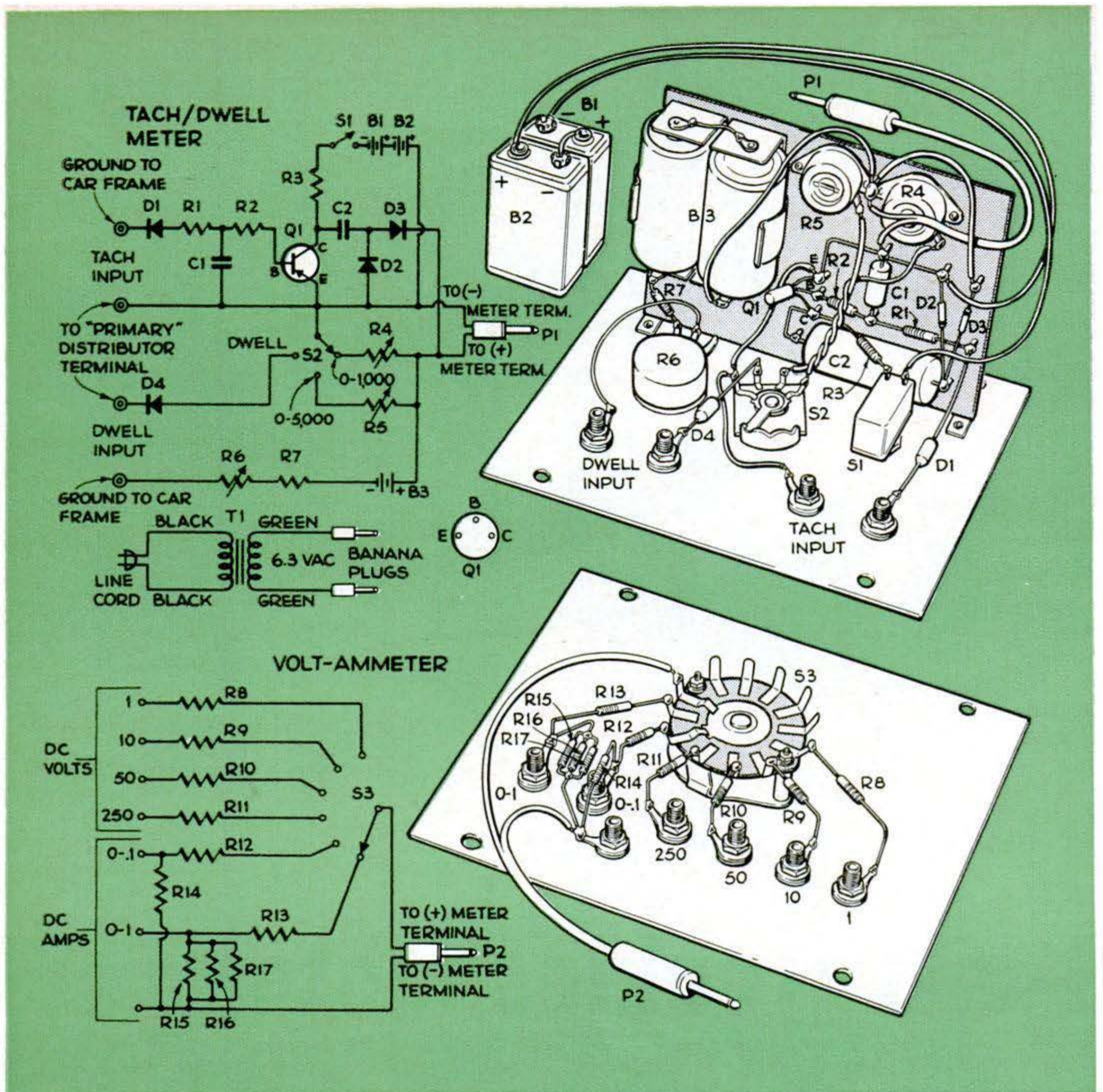
Make test leads by separating the two conductors of an 8' length of lamp cord. Solder a banana plug to one end of each lead, and a big alligator clip to the other.

Calibration. For safety, build the simple AC-powered tach calibrator (see diagram) into an aluminum minibox. Calibrating the tach is a two-step process:

1. Plug the module into the meter housing, position S2 at "0-5000-r.p.m.," connect the calibrator to the tach's input terminals, and adjust trimming potentiometer R5 to obtain the appropriate r.p.m. reading according to the table below. The calibrator's constant output of 60 voltage pulses a second corresponds to different r.p.m. readings, depending upon the number of cylinders in your car engine.

NO. OF CYLINDERS	R.P.M.
4	1,800
6	1,200
8	900

2. Measure your car engine's idle r.p.m. on the 0-5,000 scale. Then flip S2 to its



PARTS LIST

R1—3,300-ohm, 1/2-watt, carbon resistor
 R2—2,700-ohm, 1/2-watt, carbon resistor
 R3—330-ohm, 1/2-watt, carbon resistor
 R4, R5—300-ohm hum-adjust potentiometer
 R6—2,500-ohm carbon potentiometer
 R7—1,200-ohm, 1/2-watt, carbon resistor
 NOTE: Resistors R8 through R13 are 1%-tolerance precision units.
 R8—1,000-ohm, 1/2-watt,

film resistor
 R9—10,000-ohm, 1/2-watt, film resistor
 R10—49,900-ohm, 1/2-watt, film resistor
 R11—255,000-ohm, 1/2-watt, film resistor
 R12, R13—51.1-ohm, 1/2-watt, film resistor
 NOTE: R14-R17 are 5%-tolerance carbon resistors.
 R14—1.0-ohm, 1/2-watt, carbon resistor
 R15, R16, R17—0.3-ohm, 1/2-watt, carbon resistor
 C1—0.1-mfd, 200-volt,

paper capacitor
 C2—2.0-mfd, 200-volt, paper capacitor
 D1, D4—1N2070 silicon rectifiers
 D2, D3—1N34A (or equivalent) germanium diodes
 Q1—2N408 PNP transistor
 S1—SPST toggle switch
 S2—1-pole, 3-position rotary switch
 S3—1-pole, 11-position rotary switch (only 6 positions used)

B1, B2—8.4-volt mercury-transistor radio batteries
 B3—two 1.5-volt size-C flashlight cells in series (mounted in holder)
 P1, P2—phone plugs
 T1—6.3-volt AC filament transformer (Stancor P-6465 or equal)
 Misc.—perforated phenolic circuit board, push-in terminals, banana plugs, alligator clips, test-lead cable, hardware

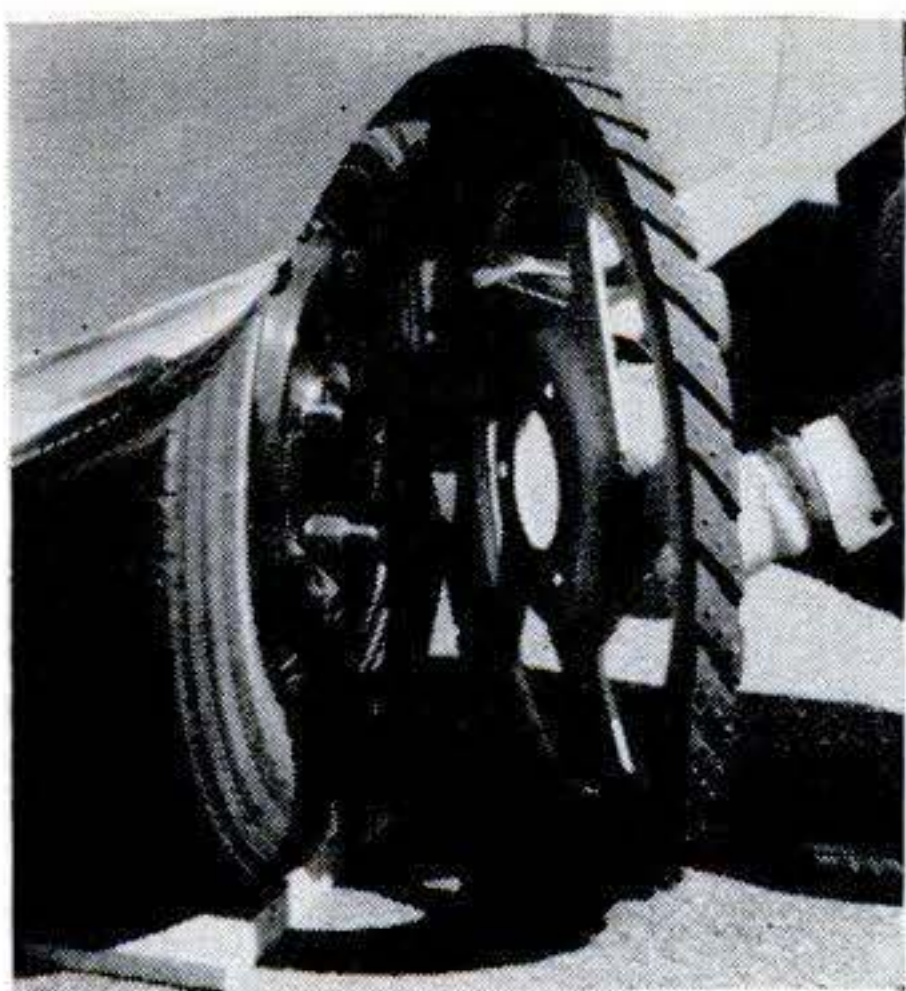
“0-1,000 r.p.m.” position, and adjust trim pot R4 for an equal idle r.p.m. reading on the 0-1,000 scale.

Calibrate the dwell-meter circuit just before you use it: Touch the two test leads together, and adjust calibration potenti-

ometer R6 for a full-scale meter reading.

Using it. To measure r.p.m. or dwell, connect the appropriate test leads—as shown on the diagram—to the “primary” terminal on the engine distributor and to the chassis

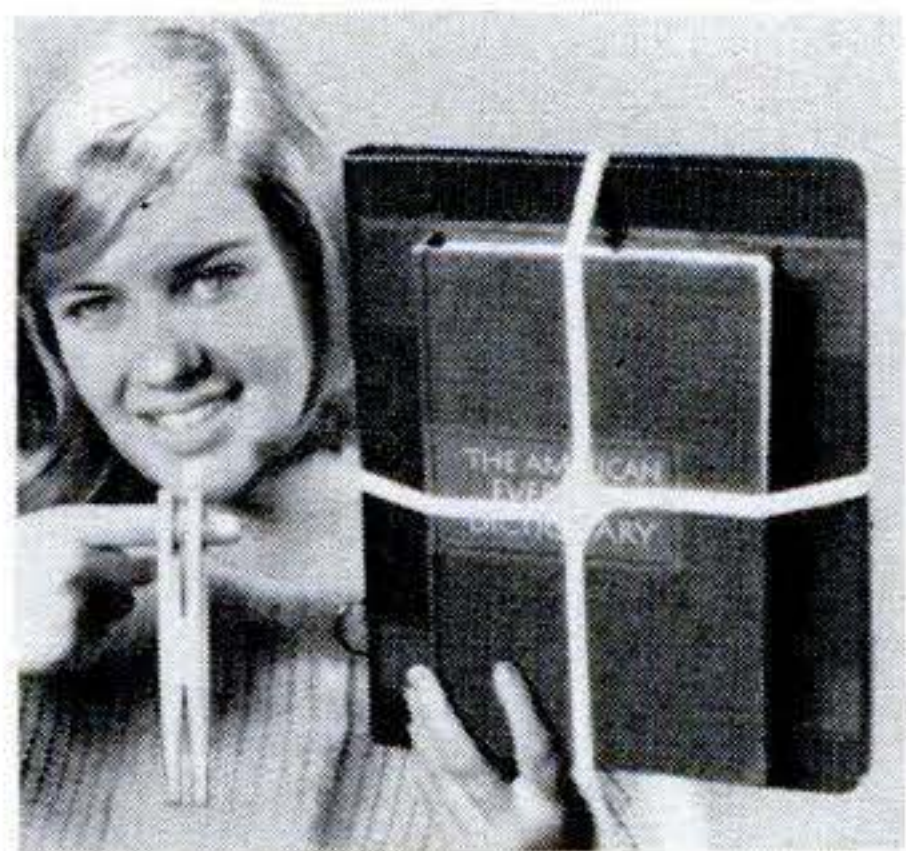
[Continued on page 211]



Quick-fit snow wheel replaces chains

A bolt-on winter wheel has coarse tread blocks for soft snow, tungsten-carbide studs to grip ice. Made in France, the hard-rubber-tired disk is a shade smaller than the regular tire, contacts the surface under the car's weight.

It's attached by extension studs replacing standard wheel nuts, mounted by driving the wheel onto a shallow ramp. No jack is needed to put it on.



Four-way rubber band

An H-shaped rubber band will stretch four ways to securely hold such odd-shaped packages as books, stacks of papers, phonograph records, and film reels. Approximately an inch wide, they are made of seamless natural rubber by Keener Rubber, Inc., Alliance, Ohio, in four sizes: 6, 7, 7½, and 8 inches long. They cost \$4.75 a hundred, or about five cents each at stationery stores.



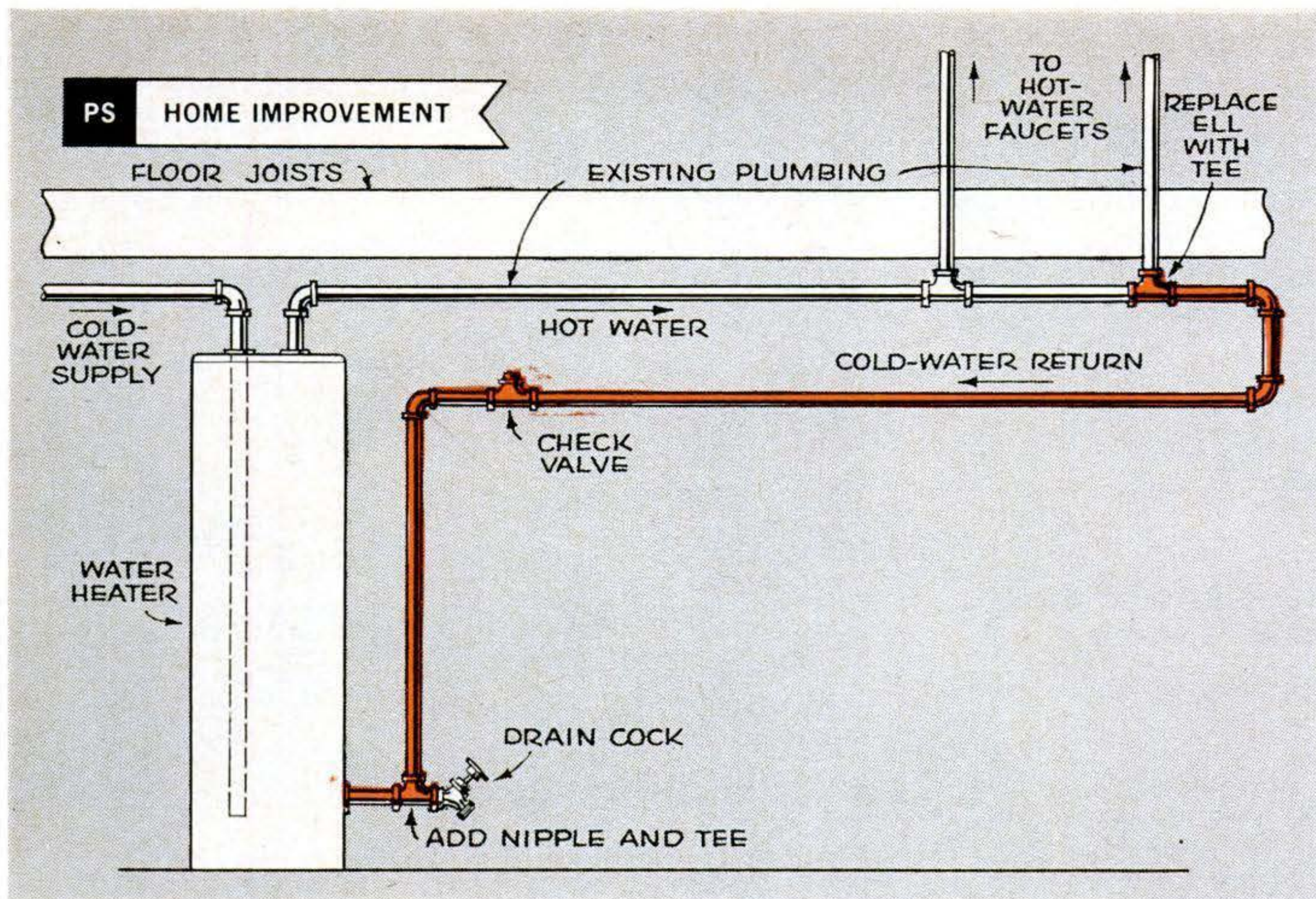
Camper for Ford's new go-anywhere Bronco

Sportsmen who like camping in rough country can now find a camper designed to mount on Ford's four-wheel-drive go-anywhere Bronco Sports Utility pickup [PS, Sept. '65]. Good for weekend and vacation camping, fishing and hunting trips, it provides cooking, eating, and sleeping accommodations for four persons. The camper unit is a box-mounted Dreamer Coach.



Sunken building preserves Paris skyline

New offices for UNESCO in Paris are below ground level to beat height restrictions near the Eiffel Tower and École Militaire. Replacing a planned 10-story project are six sunken patios, surrounded by glass-walled rooms. Under the 2½-acre site is a 350-car garage connected to the offices by escalators. Tunnels join the area with other United Nations buildings.



How to Have Instant Hot Water

Install this simple return line, and start enjoying hot water at the turn of the tap

By L. F. GRAY

If you don't get hot water as soon as you turn on the hot-water tap, you're putting up with an unnecessary nuisance. And you're also wasting water while you run off the cool water to get that flow of hot water from the tank. To enjoy the luxury of instant hot water, all you need is a line to send back to the heater any water that has cooled off while standing in the pipes.

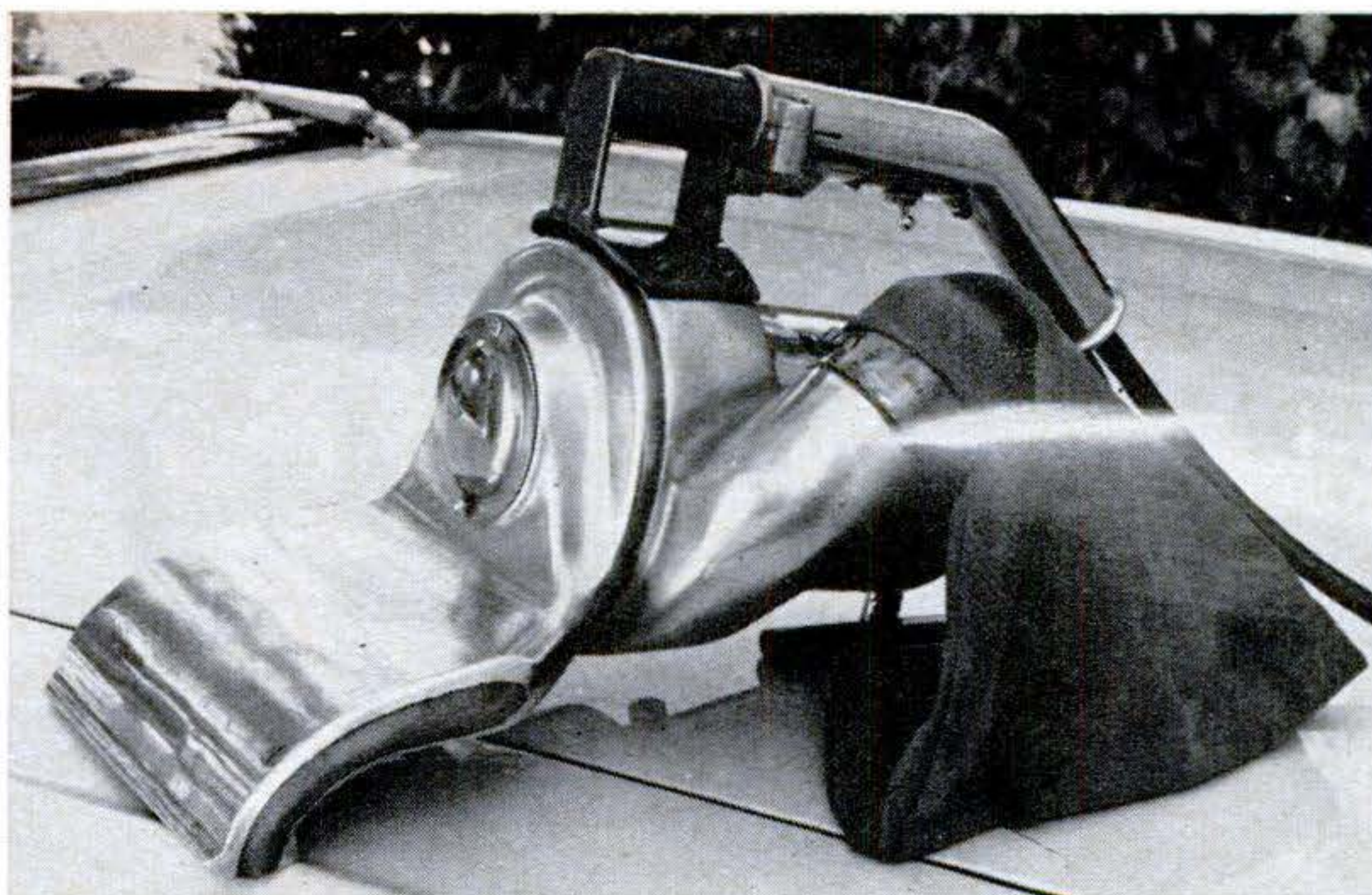
With a return line, gravity keeps water in the pipes moving. The cooler (and thus heavier) water continuously flows back to the bottom of the tank when the tap is shut off. You can install a return system in a few hours, using the fittings shown in the diagram above.

Connect the return line to your present hot-water line at the farthest horizontal distance from the tank. There is no need

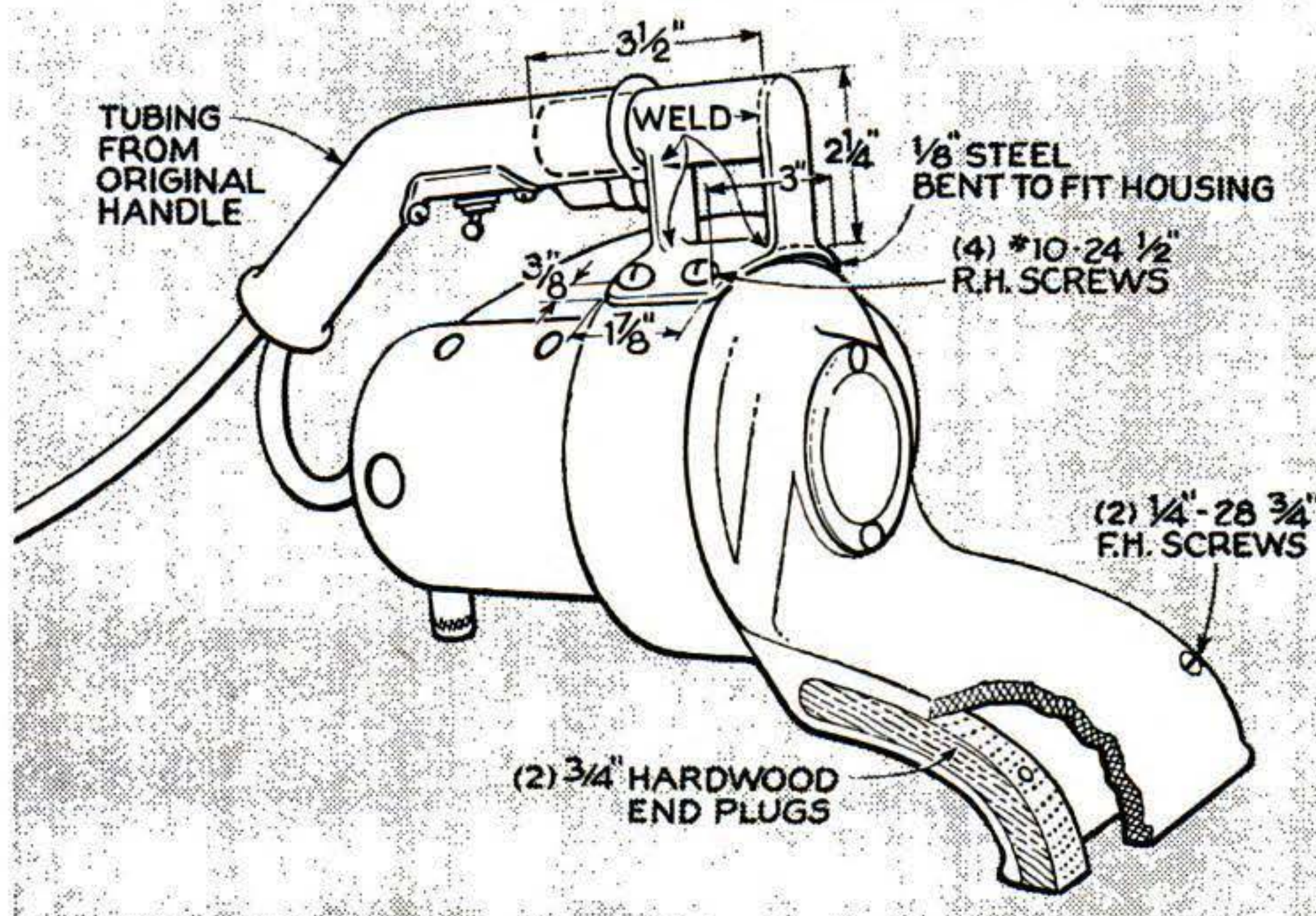
to run the return from a second story. Any pipe running vertically will automatically stay filled with hot water if hot water is flowing past the bottom of it. Usually, the easiest way to connect the return line is to replace an elbow with a tee, as shown in the diagram.

At the heater end, remove the drain cock from the bottom of the storage tank and screw a nipple into the opening. Screw a tee onto the nipple, and put the drain cock outboard of the tee. Install the return line so that it runs downhill to the drain cock. You'll also need a check valve in the return line to keep the cold water from backing into the return line.

Cover both supply and return lines with pipe insulation. Otherwise, the increased pipe surface will radiate more heat, and your heating bill will go up.



Make a Vacuum Cleaner for Your Car



One of those old upright vacuum cleaners can be cut down to make a dandy car vac. If you don't have one stowed away in the attic, you can pick one up at a used-furniture store at prices ranging from 50 cents to two or three dollars. Keep it handy in your garage and you'll find it easy to keep your car clean and neat.

Cut it down to car size like this: Narrow down the vacuum snout, attach a handle bracket, and reduce the size of the dust bag. The drawing shows you how.

Hacksaw the ends of the vacuum snout off to leave about 6". (Insert a piece of wood inside it to keep the vise from collapsing it while you cut off the ends.) Plug the openings on the sides with pieces of $\frac{3}{4}$ " hardwood.

Here's an easy way to make an accurate pattern for the end plugs: Since the open-

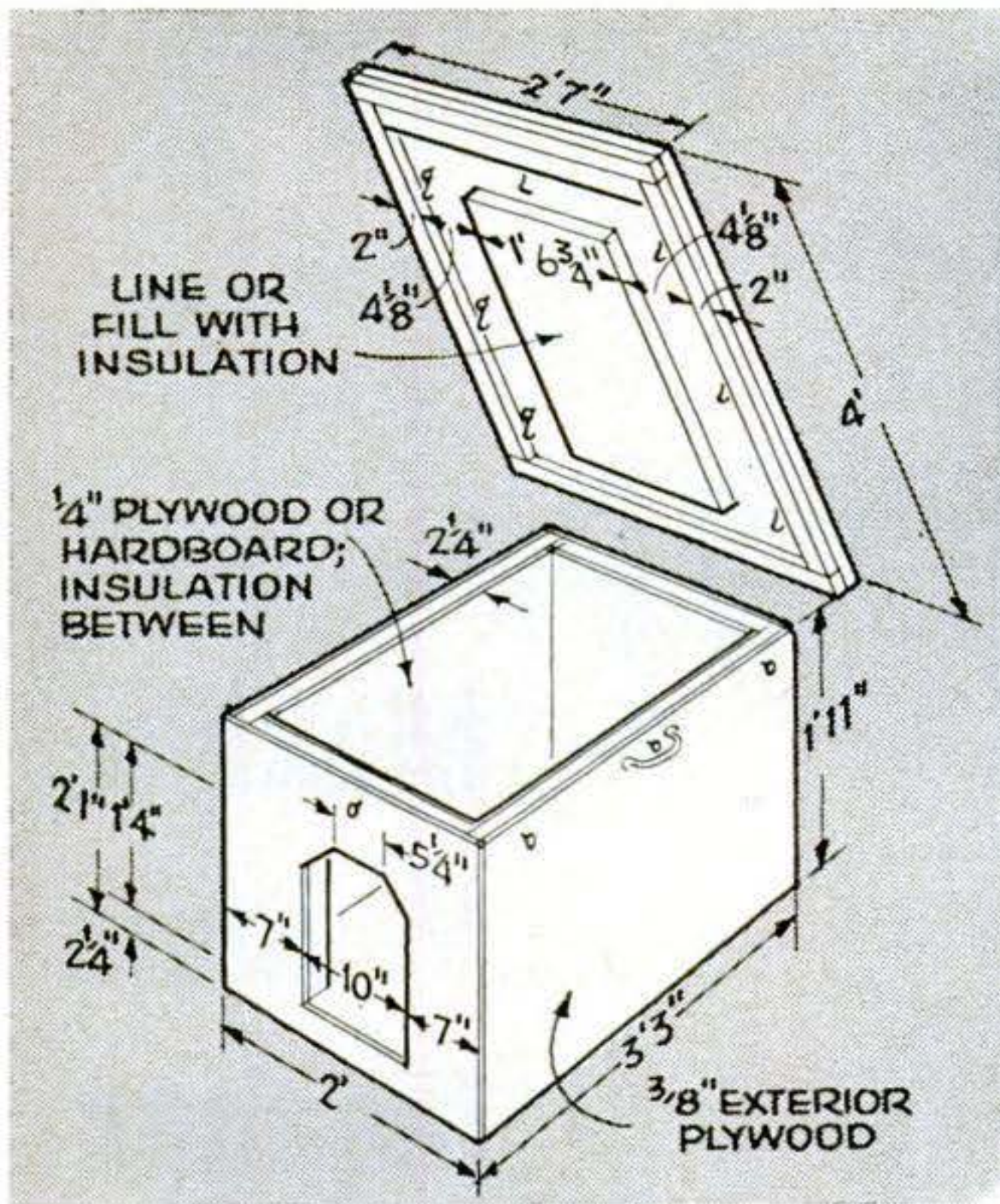
ing is too deep and narrow to trace with a pencil, hold the wood against the opening and give the inside a light squirt from a paint spray can. Glue and bolt the end plugs in place. Smooth and round off the cut and plugged ends with a disk sander.

Recondition the motor. Check the brushes and replace them if necessary. Remove the armature and clean the commutator with fine sandpaper. Don't use emery cloth; the dust will short out the commutator. Give the bearings a drop of oil. Shine up the old aluminum housing with a cloth buffer and some polishing compound.

When rewiring the cleaner, be sure to use three-wire (grounded) extension cord. It's dangerous to use an ungrounded electrical appliance around a car.

JOE McBRIDE, Stockton, Calif.

Two Projects for the Home



Insulated Doghouse

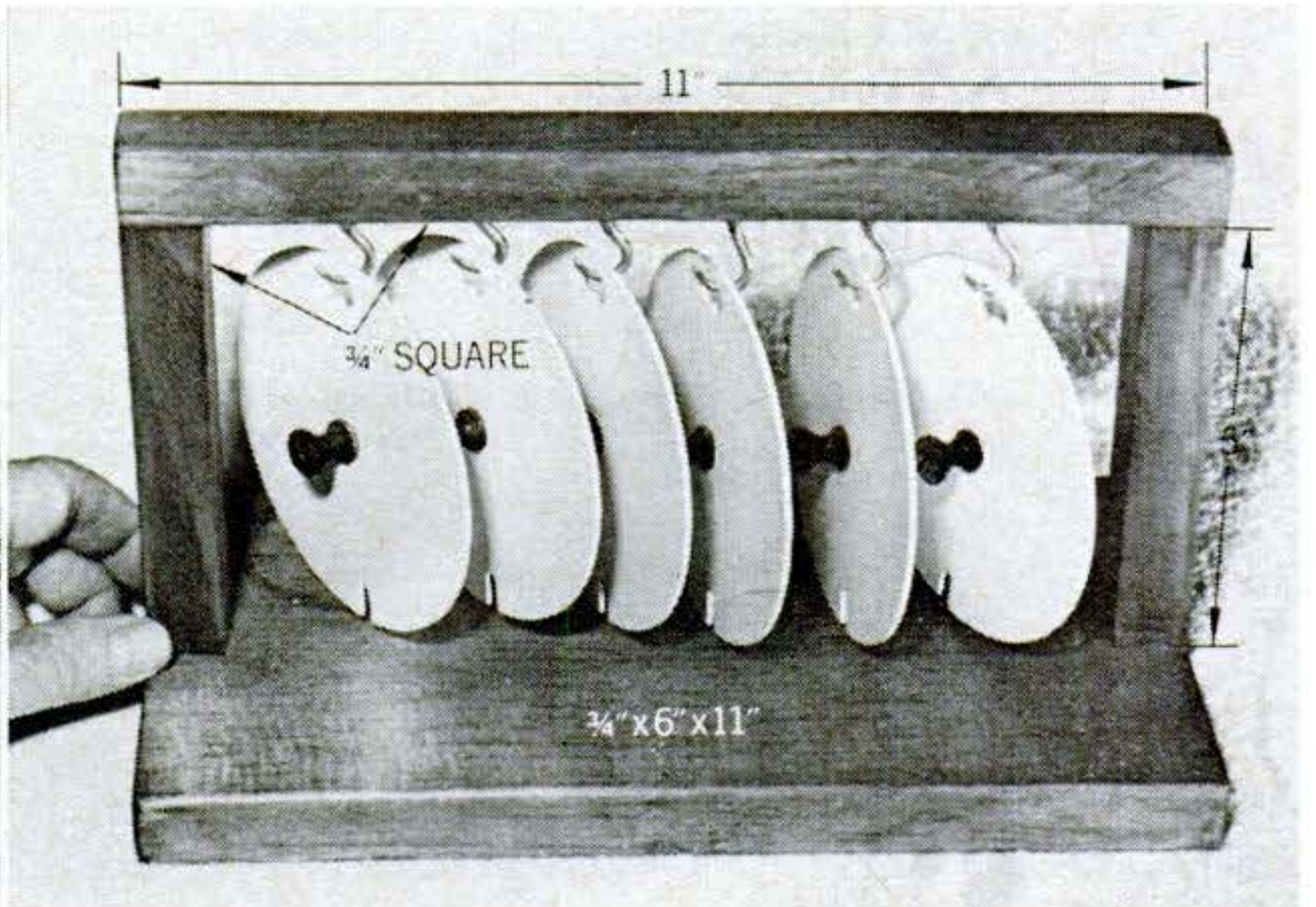
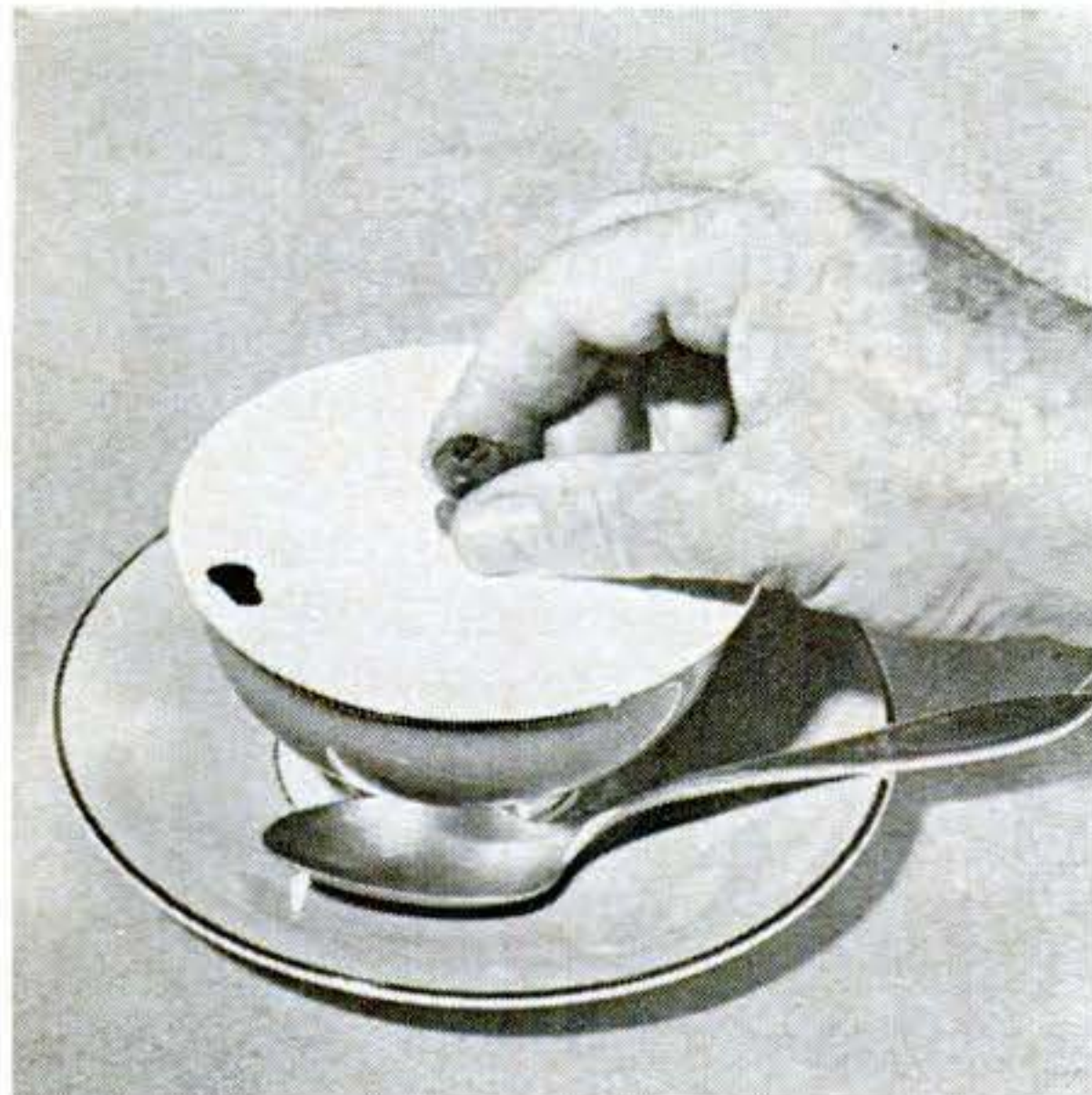
The roof of this insulated doghouse lifts off for housecleaning convenience. And handles in its upper sides are handy for moving it around the yard.

Two-by-fours split in half make the framework; $\frac{3}{8}$ " exterior plywood covers the outside; and $\frac{1}{4}$ " plywood or hardboard forms

the inner walls. Before nailing the inner walls in place, line or fill the between-wall space with insulation.

Cover the tongue-and-groove rooftop with roll roofing, and install eight sets of hooks and eyes in the roof bottom and house sides. Set the house on cinder blocks, hook the roof down, and show Fido the way in.

MERVIN HENDERSON, Bartlesville, Okla.



Patio Cup Covers

Do a lot of patio dining? Then you're familiar with two coffee-time annoyances: Coffee sometimes cools too quickly, and bugs occasionally plunge into your cup. This cover keeps your coffee hot, the bugs out.

You can make them out of junction-box

cover plates and small drawer knobs. In the center of each cover plate drill a hole for a knob fastener. Paint the covers and knobs with enamel and assemble them. Then make a hanger frame, as above. Give it a coat of shellac and mount it within easy reach of your patio dining area.

ARTHUR KENNEDY, Neptune, N. J.

Clean Up Your Driveway

By RICHARD DAY

A sparkling-clean concrete driveway helps a house look its best. But whose driveway stays unblemished for long? To restore that fresh look to your oil-stained driveway, give it this beauty treatment.

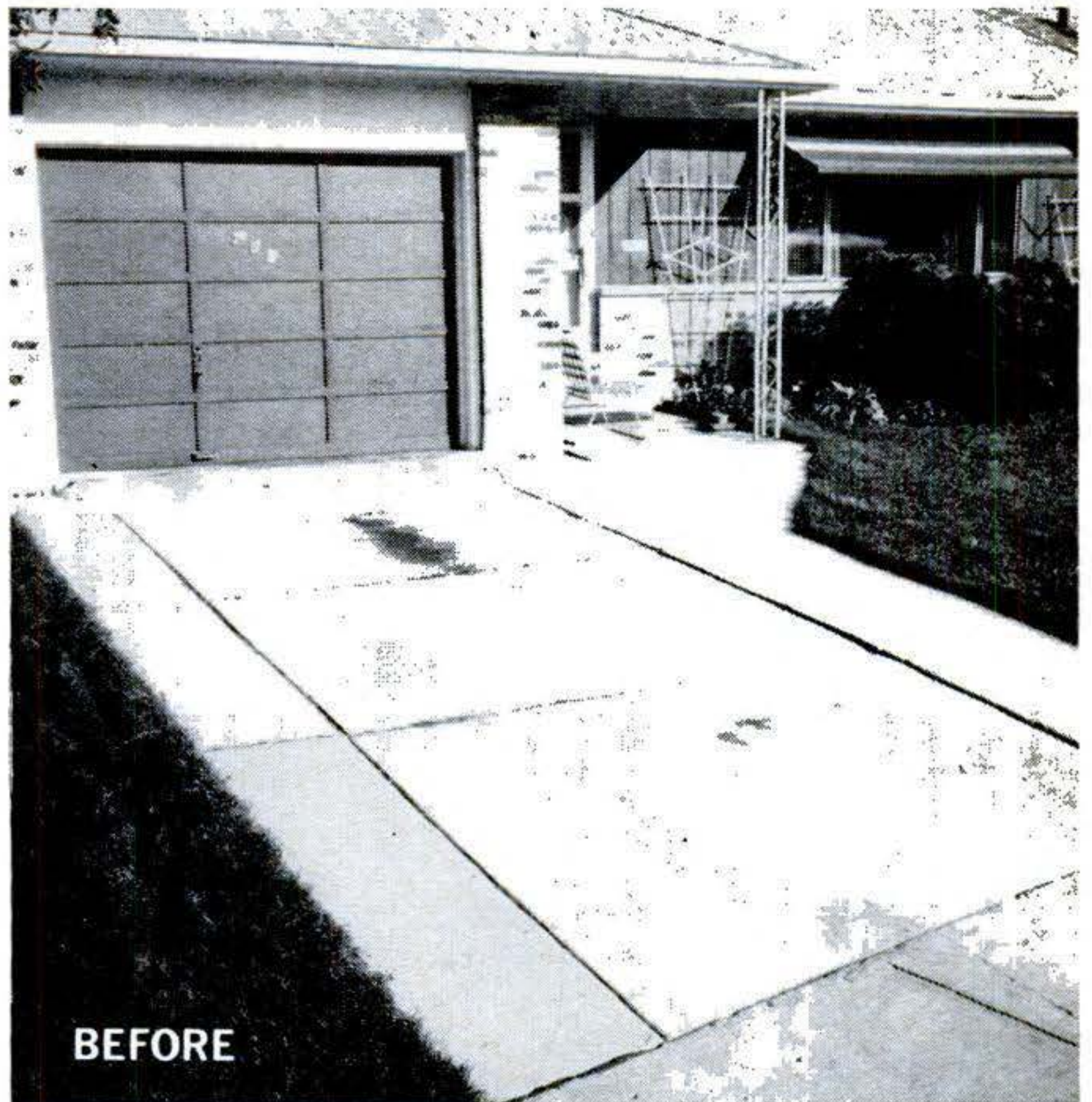
Clean up the oil stains with TSP, trisodium phosphate. Then brush a cement slurry into the opened pores. Hardware stores carry TSP. You'll need one or two pounds. Working from high to low, pour scalding water on the oily areas, sprinkle them with TSP granules, and scrub them vigorously with a stiff-bristle brush. Tackle a patch at a time, and give the rest of the driveway a quick going over while you're at it. Then hose it down.

All traces of stain won't be erased. Cement does the rest. Four pounds is enough for the average driveway.

While the concrete is still wet, dust portland cement over a 50-square-foot area. Again working from high to low, brush the cement slurry into the surface pores of the concrete. After brushing for

about two minutes and drawing any built-up slurry to the low side, repeat the process. Re-wet areas slightly as you need to.

Allow five to six hours' setting time, then hose off any excess cement. The cement you brush into the pores expands, locking itself in and hiding stains—and giving your driveway a new complexion.



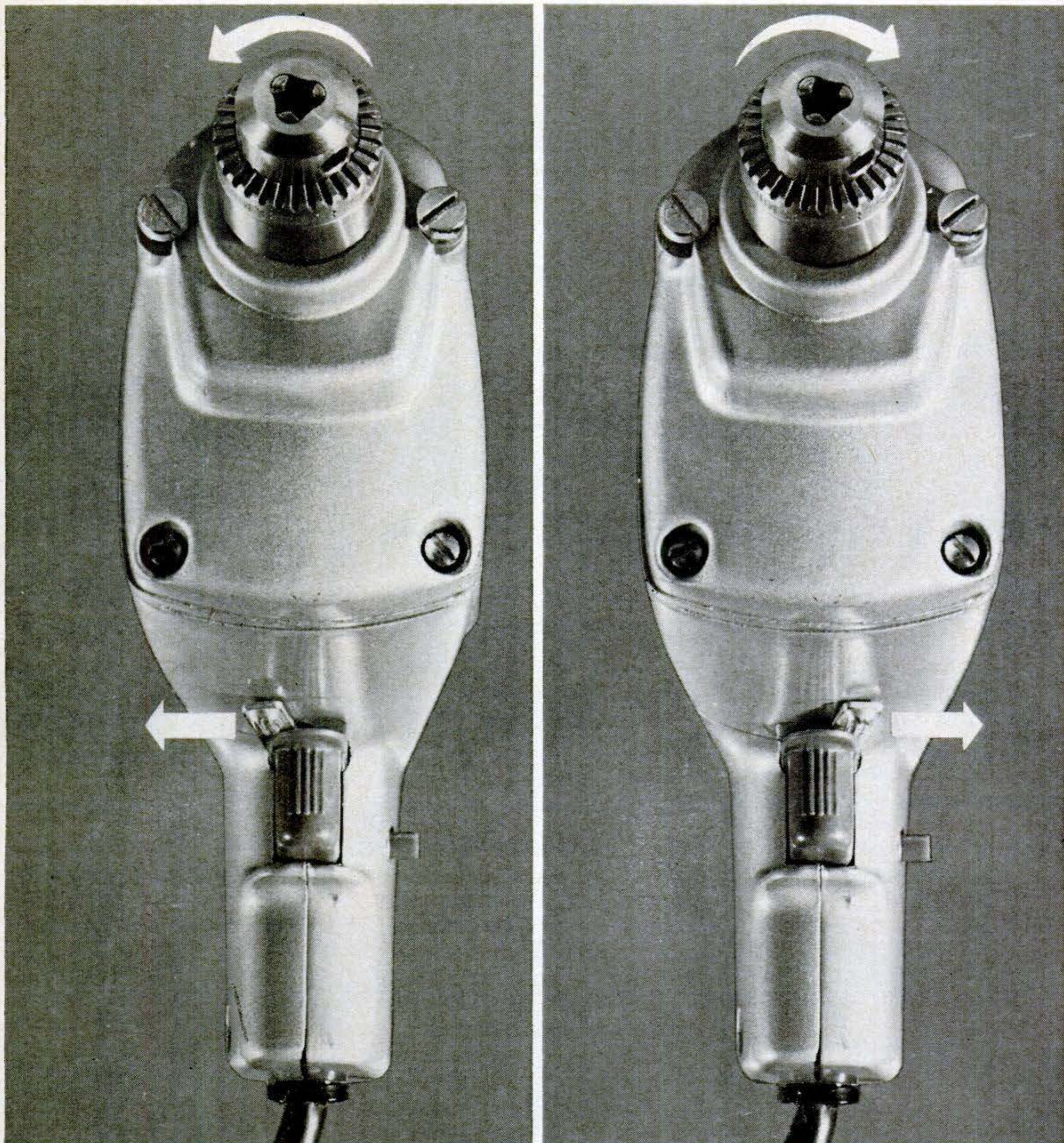
Two hours of work with TSP and portland cement will do for your concrete driveway what they did for the one shown here. TSP cleans the concrete; cement gives it a new-looking surface.



Cement slurry, brushed into concrete's pores, masks stains that survive TSP scouring. Working from high to low, slurry 50-square-foot sections of driveway at a time.



New Skil Drill Varies



Flip a small lever to right or left and your trigger finger can adjust the tool speed in either direction

Speed in Reverse, Too

By **ROBERT P. STEVENSON** / Home and Shop Editor

Skil, the company that introduced trigger-speed control of variable-speed drills a year and a half ago, has now given the same tools another important plus. Flip a lever just above the speed-control trigger and you get the same range of speeds in reverse.

Two new major uses for the new tool are immediately apparent:

- It becomes a complete power screwdriver. You can back out screws as well as drive them in.

- It becomes a handy power wrench. With an inexpensive set of sockets, it will tighten nuts or bolts. Reverse the rotation and you can also remove them.

The Chicago toolmaker is presenting this exciting new drill in three sizes— $\frac{1}{4}$ " , $\frac{3}{8}$ " , and $\frac{1}{2}$ " . With the $\frac{1}{4}$ " model, you get a speed range, both clockwise and counterclockwise, from zero to 2,000 r.p.m.; with

the $\frac{3}{8}$ " , from zero to 1,000 r.p.m.; and with the $\frac{1}{2}$ " , from zero to 750 r.p.m.

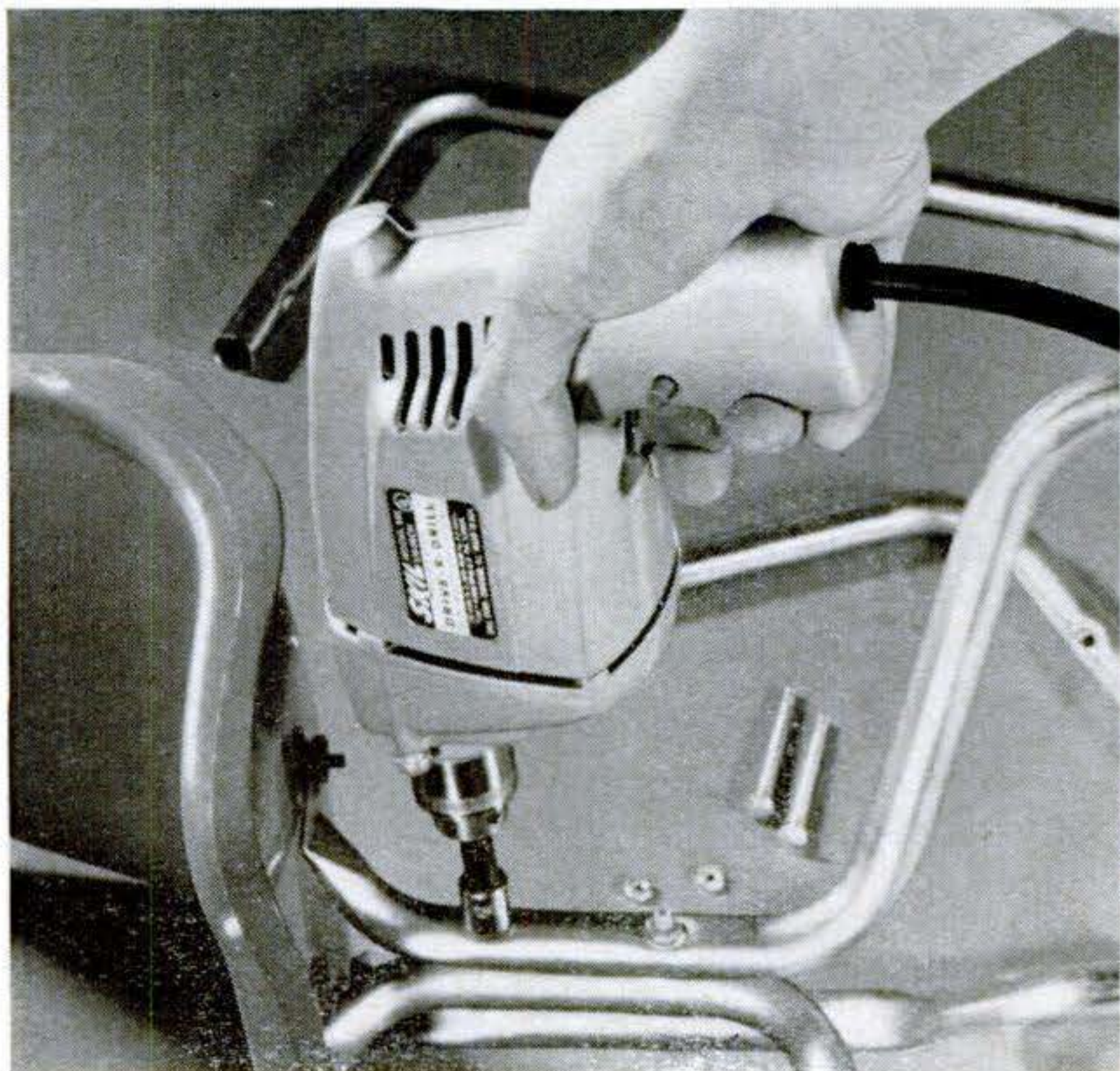
Take the tool in your hand, plug it in, and you find that the more you squeeze the trigger the faster the chuck turns. A lever just above the trigger determines direction of rotation. Flip it to the right as you point the tool away from you and the chuck turns clockwise—normal drill direction. Flip it to the left, and the chuck is set to turn in reverse. Directional arrows on top of the housing pointing to left and right and the words "reverse" and "forward" help you keep the direction of rotation in mind.

When you move the controlling lever to change the direction of rotation, an interlock device comes into operation. You can't cause damage by slamming the control lever back and forth.

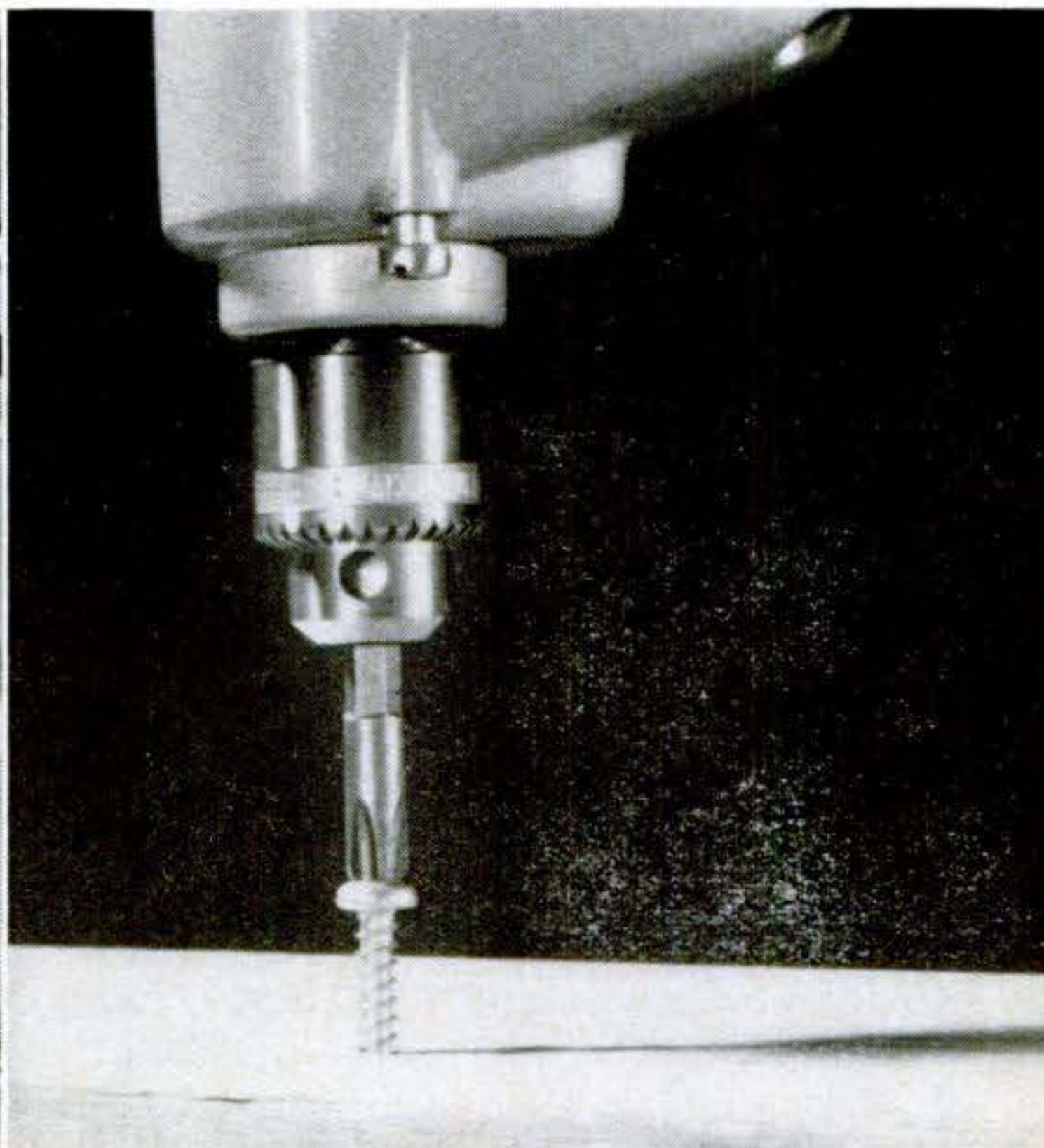
What can it do? The new Drive-R-Drill will perform all of the many and varied

Continued

Two important uses for a reversing drill



As a power wrench: A set of drive sockets ranging over common sizes up to about $\frac{7}{16}$ " should equip you for many assembly and repair jobs.



As a screwdriver: You can remove screws as well as drive them. A set of a slot-type and Phillips bits will set you up for any kind of screw application.

Details of the three new Skil reversing Drive-R-Drills



$\frac{1}{4}$ " drill (Model 596)

No-load speed: 0 to 2,000 r.p.m.; the motor: 2.5-amp, 115-volt, super-burnout protected; the switch: trigger, spring-loaded with locking button, for AC only; equipment: geared key

chuck, three-wire cord, three-prong plug; weight: three pounds; price: \$29.95.

$\frac{3}{8}$ " drill (Model 597)

No-load speed: 0 to 1,000 r.p.m.; the motor: three-amp, 115-volt, super-burnout protected; the switch: trigger, spring-loaded with locking button, for AC only; equipment: removable side handle, geared key chuck, three-wire cord, three-prong plug; weight: $3\frac{1}{4}$ pounds; price: \$36.95.

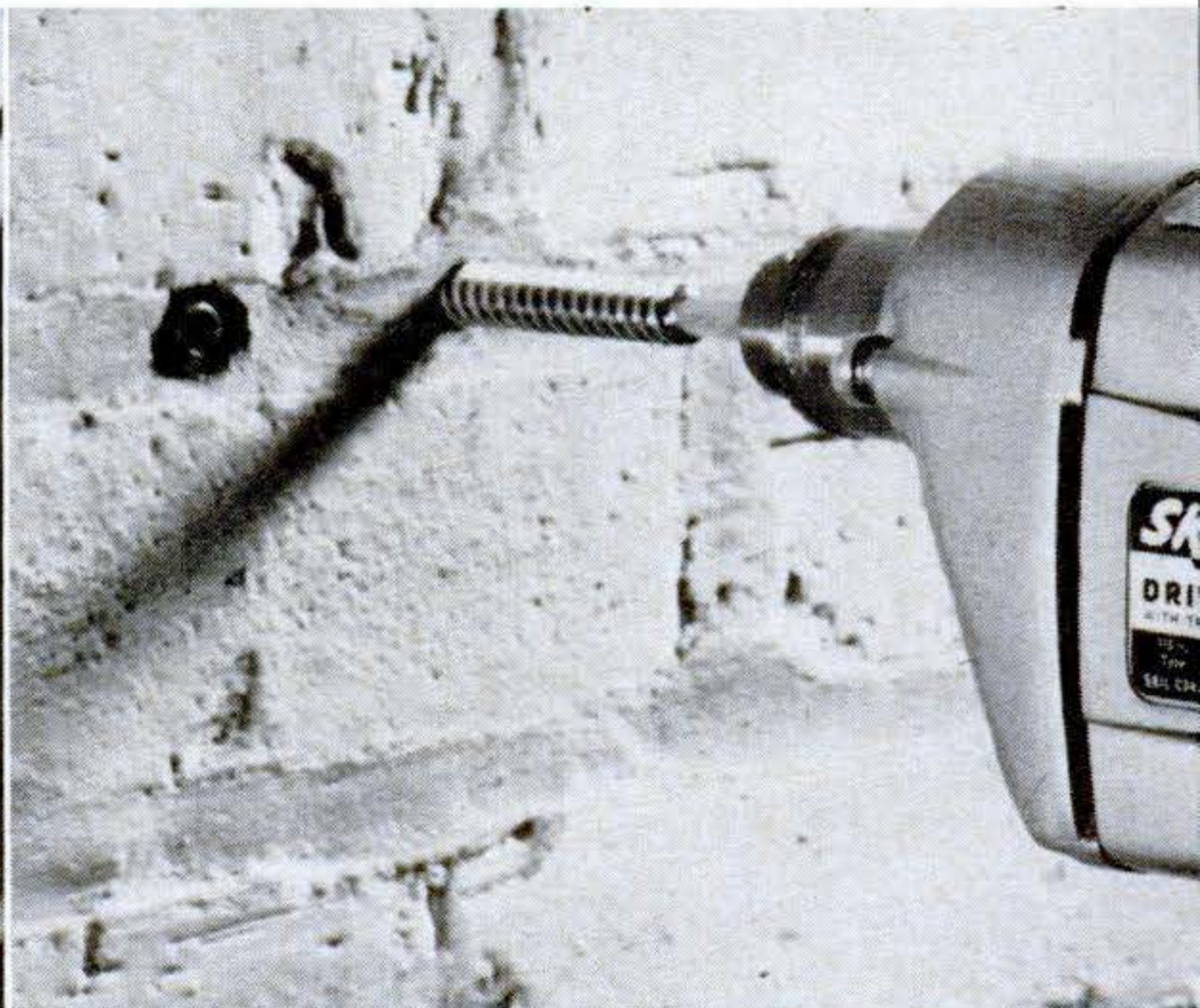
$\frac{1}{2}$ " drill (Model 598)

No-load speed: 0 to 750 r.p.m.; the motor: three-amp, 115-volt, super-burnout protected; the switch: trigger, spring-loaded with locking button, for AC only; equipment: removable side handle, geared key chuck, three-wire cord, three-prong plug; weight: $3\frac{1}{2}$ pounds; price: \$39.95.

Speed control on an electric drill gives you a big



Drilling ordinary steel: Turn slowly, start without a punch mark. Stop trigger at about midrange.



Drilling masonry: Chuck a carbide bit in drill. For best speed, pull trigger about a third of the way.

tasks that electric drills have been doing for years. With the slower forward speeds, it will perform many of these common tasks much better because you can suit the speed to the job. Top speed remains best for drilling holes in wood, especially with spade bits.

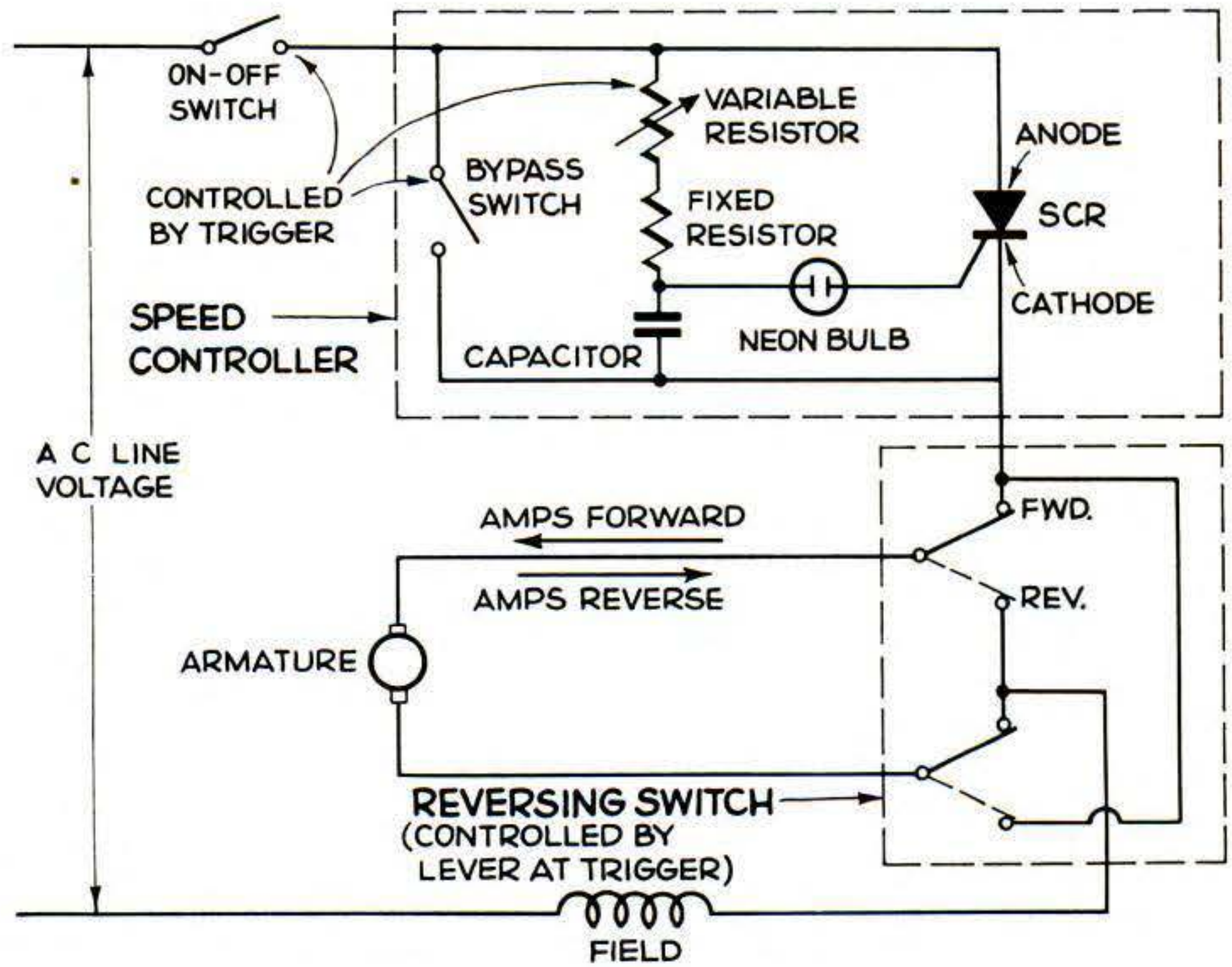
But the concept of a tool that also drives with equal facility in the opposite direc-

tion is so fresh and new that not even the maker is entirely sure of how many unexpected uses it may find—in addition to its obvious uses as a power screwdriver and power wrench or nut-runner.

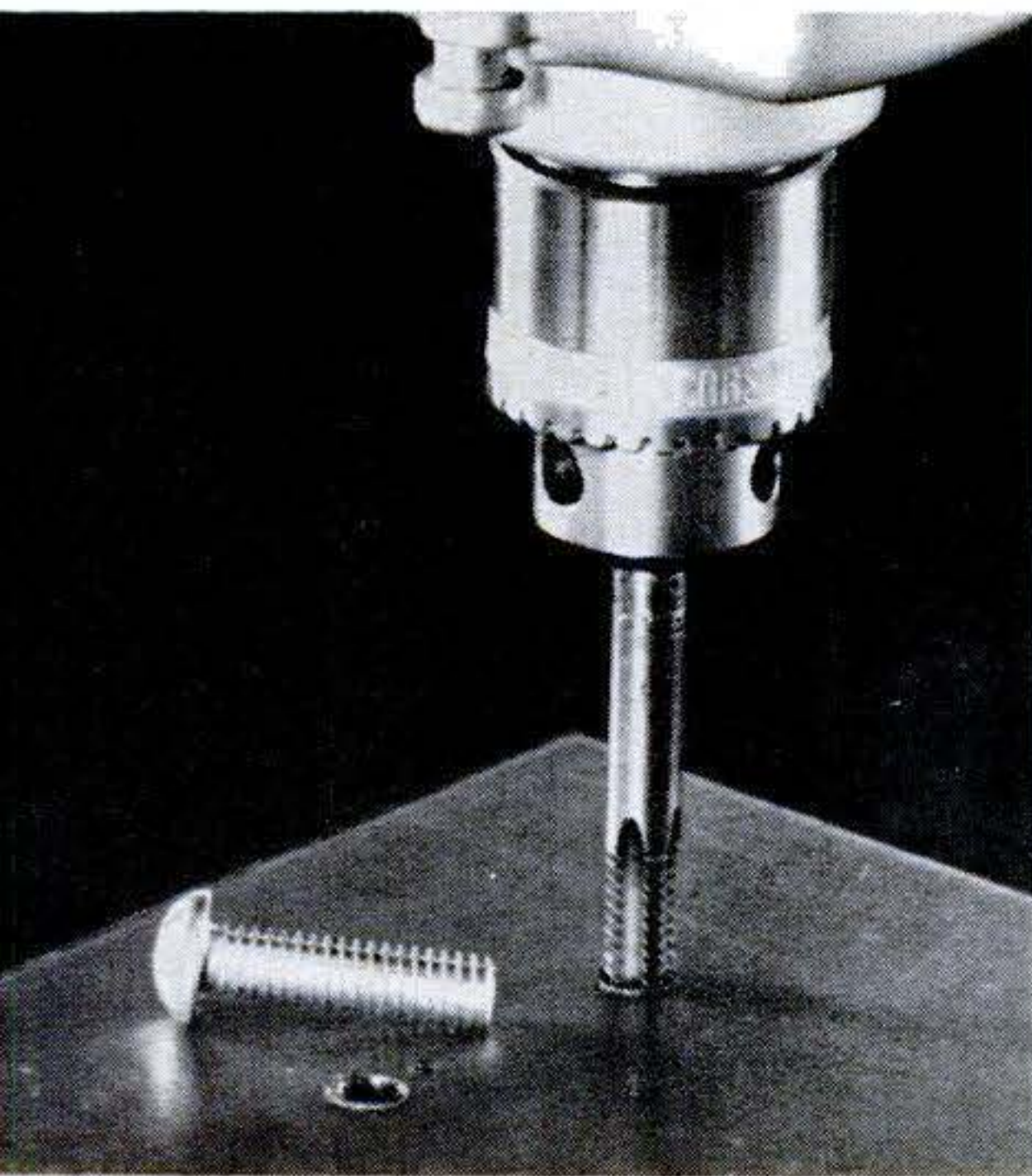
As all who have used a Skil TSC (for trigger-speed control) eventually discover, you suit the drilling speed to the job you're doing through fingertip control, much as

How the new drill switches its direction of rotation

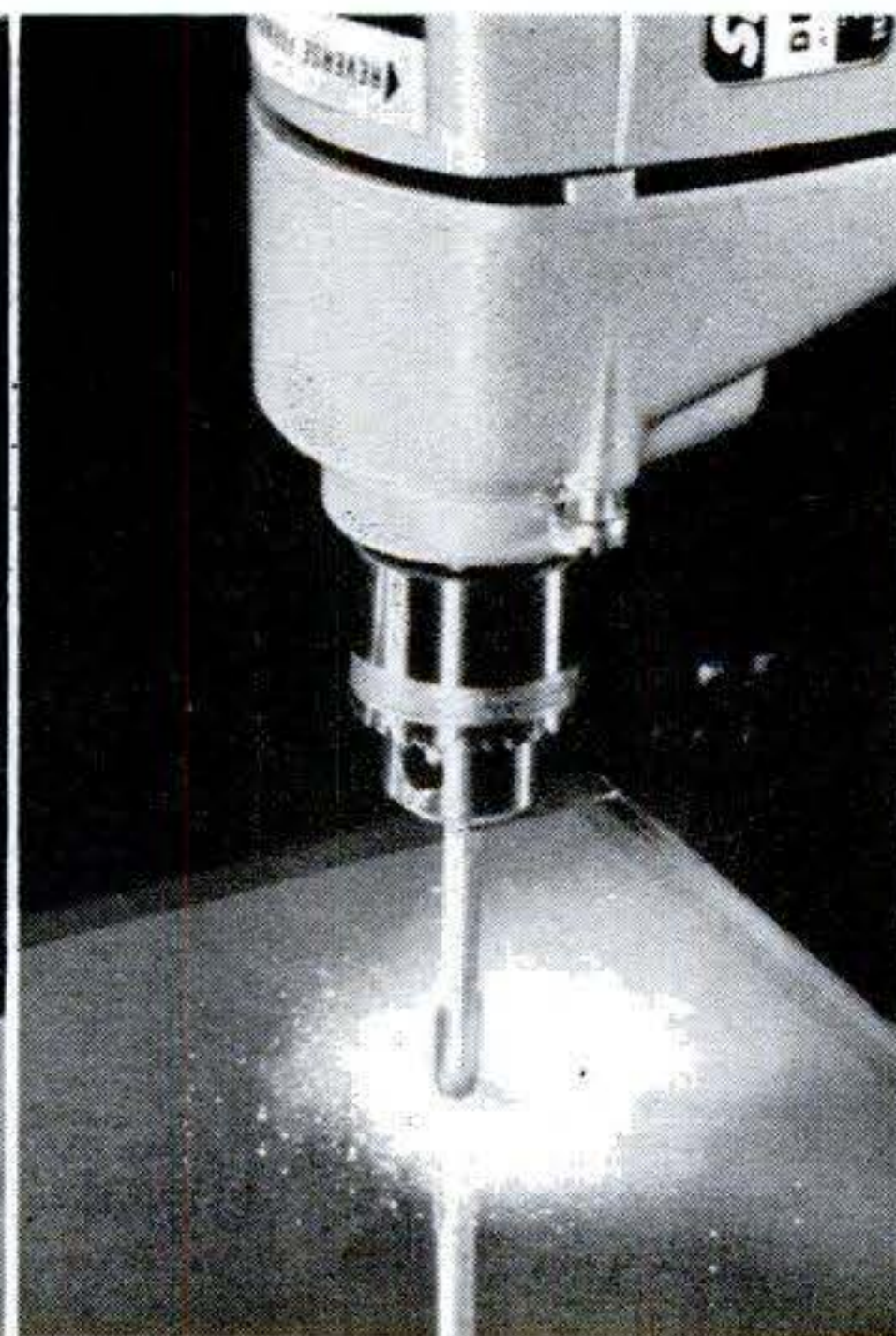
Speed is varied in these drills by use of a silicon-controlled rectifier (SCR) and the same trigger control that Skil introduced a year and a half ago. The lever at the trigger that reverses drill rotation works as a double-pole, double-throw switch. It's simply a fast means of reversing connections between the armature and field windings of a series motor to cause the armature to rotate in the opposite direction.



advantage when you work on different materials



Tapping metal: Start the tap as slowly as possible and be careful to barely depress the trigger.



Drilling glass: Skil has a special bit for this job. Start slowly, pull trigger only fourth of its travel.



Removing paint: A slow speed helps keep heat from softening the paint and clogging the disk.

you sense car performance in your accelerator foot. A silicon-controlled rectifier hook-up provides speed variation.

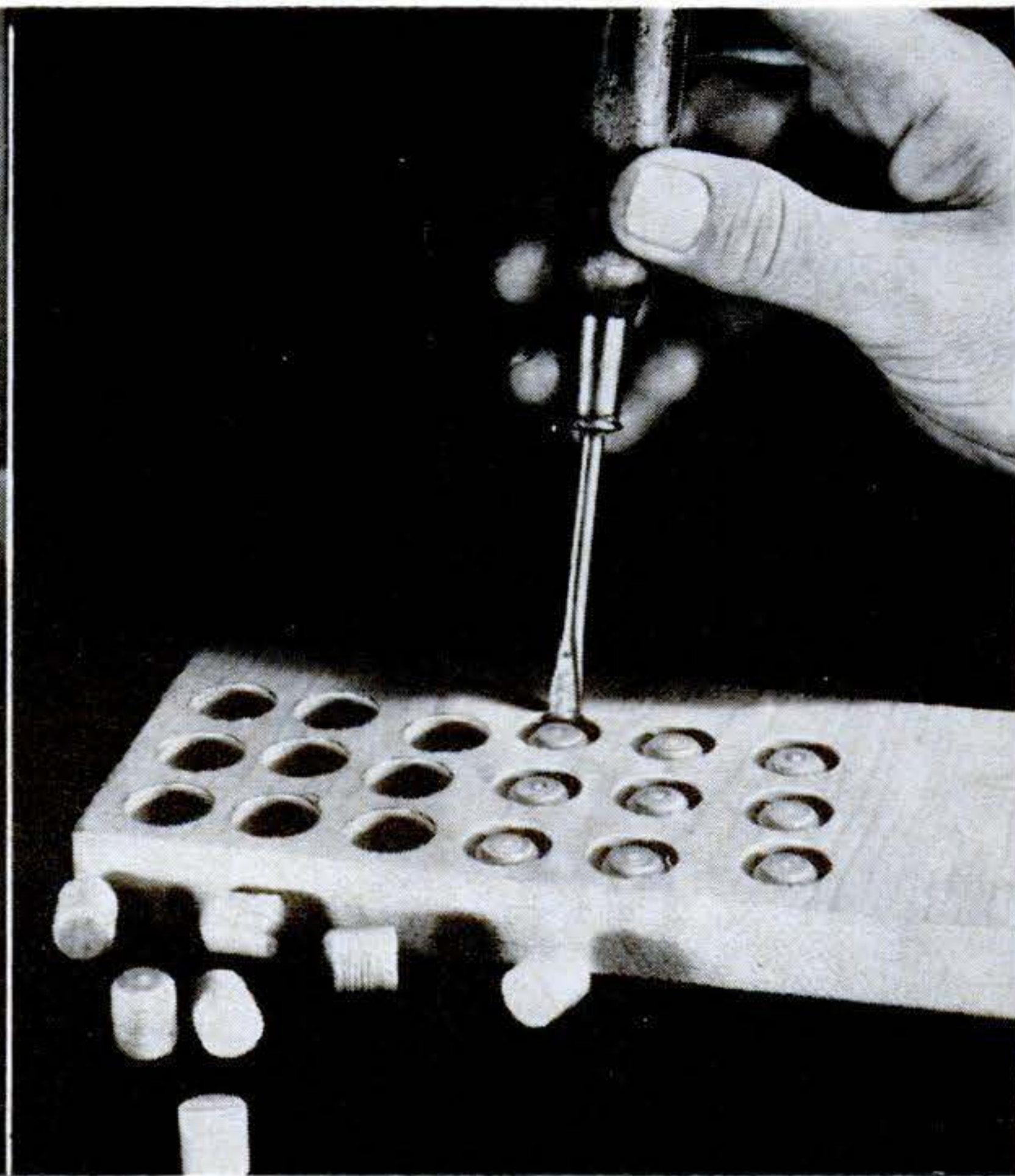
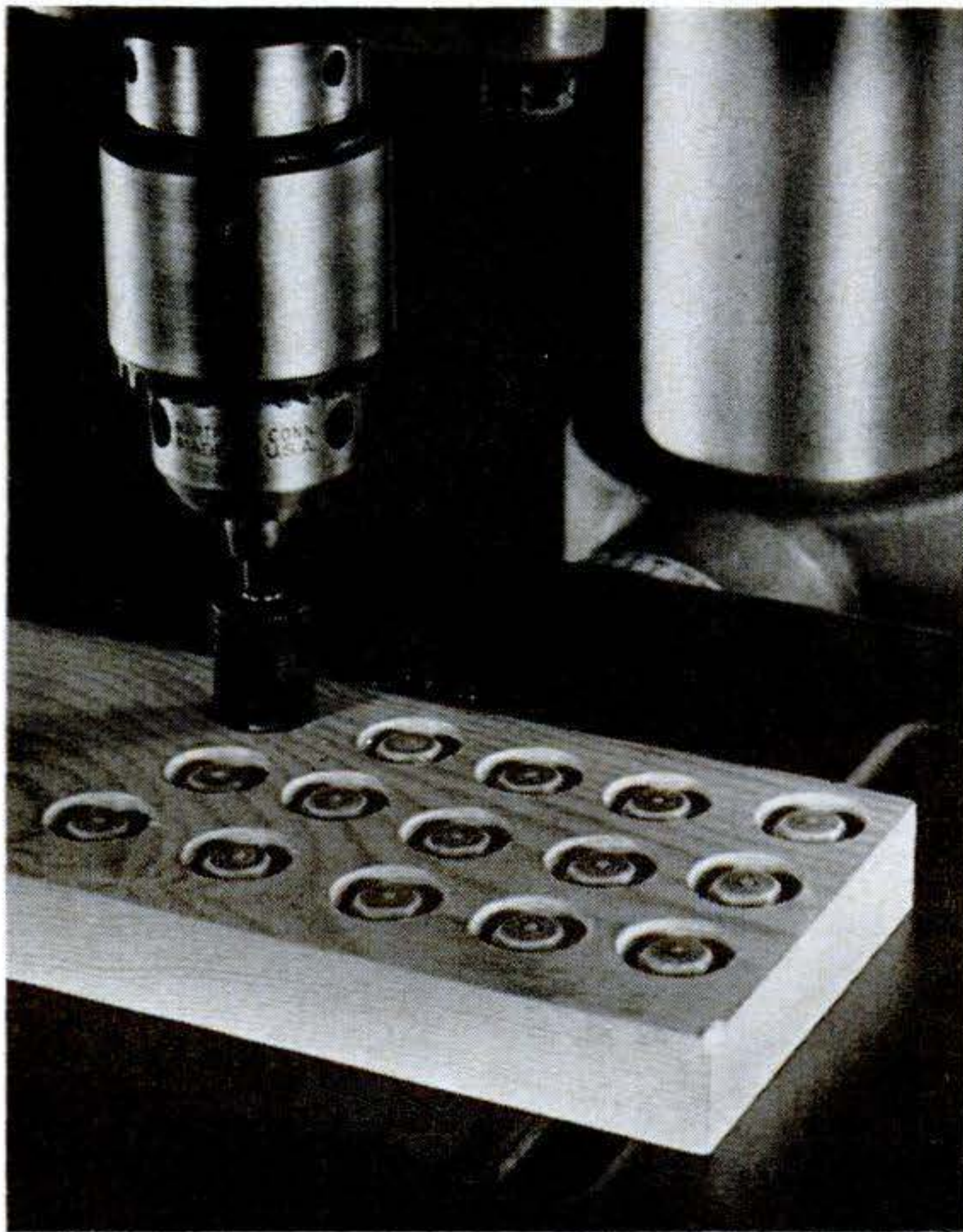
The secret of reversing. How is that reversing done? You know, if you have ever rewired a series motor so it will turn in an opposite direction. It's done by transposing the connections to the armature. The reversing lever simply lets you switch the

connections back and forth when you wish.

The Skil Corp. offers special accessories so that buyers can get full use from the speed ranges of the two-directional drill. These include a set of sockets for nut-running, socket adapters, a selection of slot and Phillips-type screwdriver bits, tap sets, carbide bits, a special bit for drilling glass, a dial saw, and grinding wheels. **PS**

Get Acquainted

Two types of plug cutters you can buy are shown here. Stanley's (left) cuts to a depth of $\frac{5}{8}$ " and is used mostly to make plugs to conceal screwheads. Rockwell's (right) cuts plugs up to 2" long.



The Stanley plug cutter chamfers the plug it cuts

Chamfered ends make it easy to insert the plugs in the counterbored holes, and give room for excess glue. The cutter goes through thin stock. On thick stock you cut to full depth, then snap the plugs

free with a screwdriver. You insert the plug with the broken end out and sand it flush with the adjacent surfaces. If you want the plug to project above the surface, position it with the chamfered end up.

with **PLUG CUTTERS**

This little-known tool turns some ticklish woodworking jobs into simple, easy operations

By R. J. DE CRISTOFORO

Here's a handy drill-press accessory that's been around a long time, although a lot of people are still not familiar with it. It does some jobs no other tool can do, and it does them fast and easy.

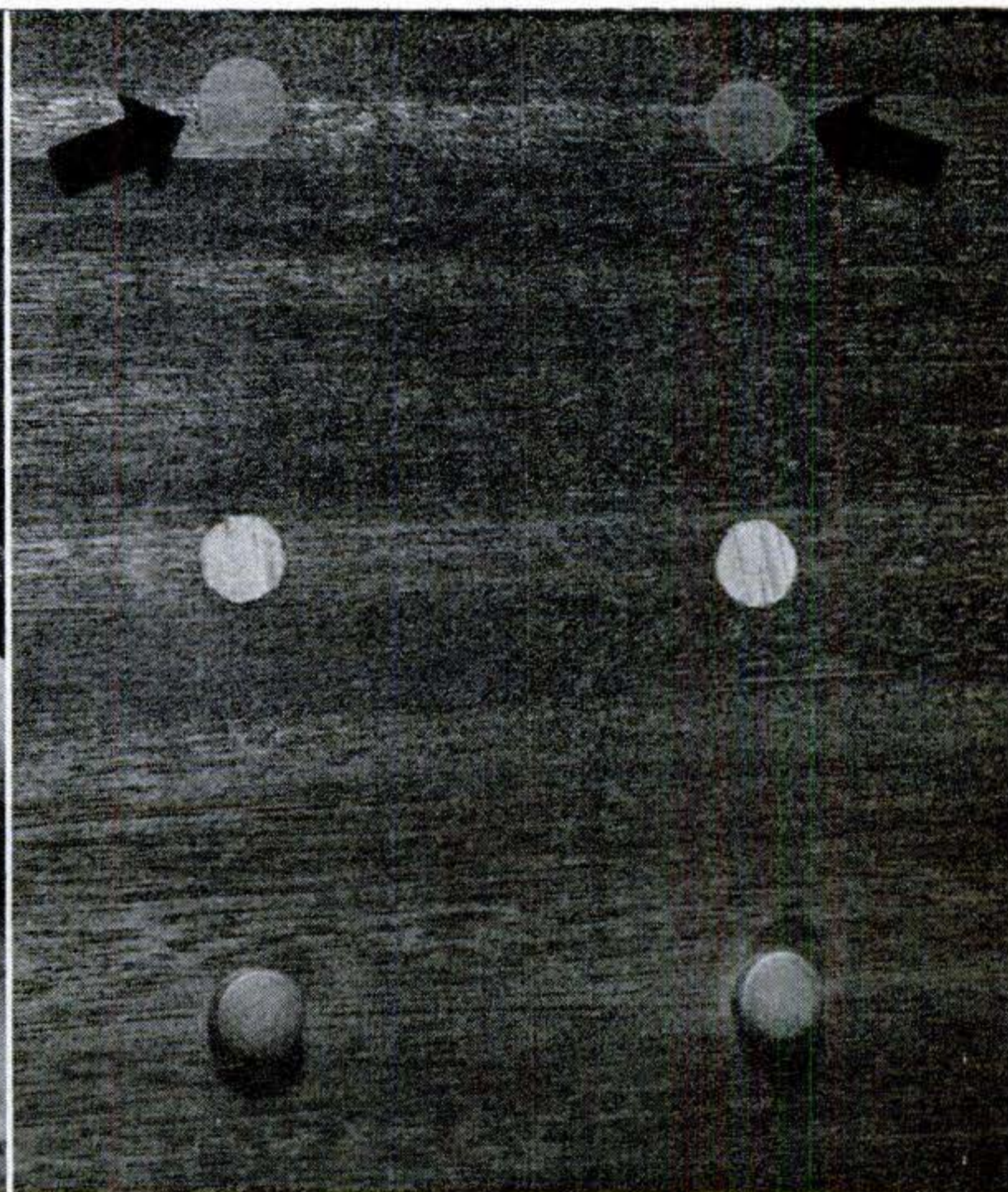
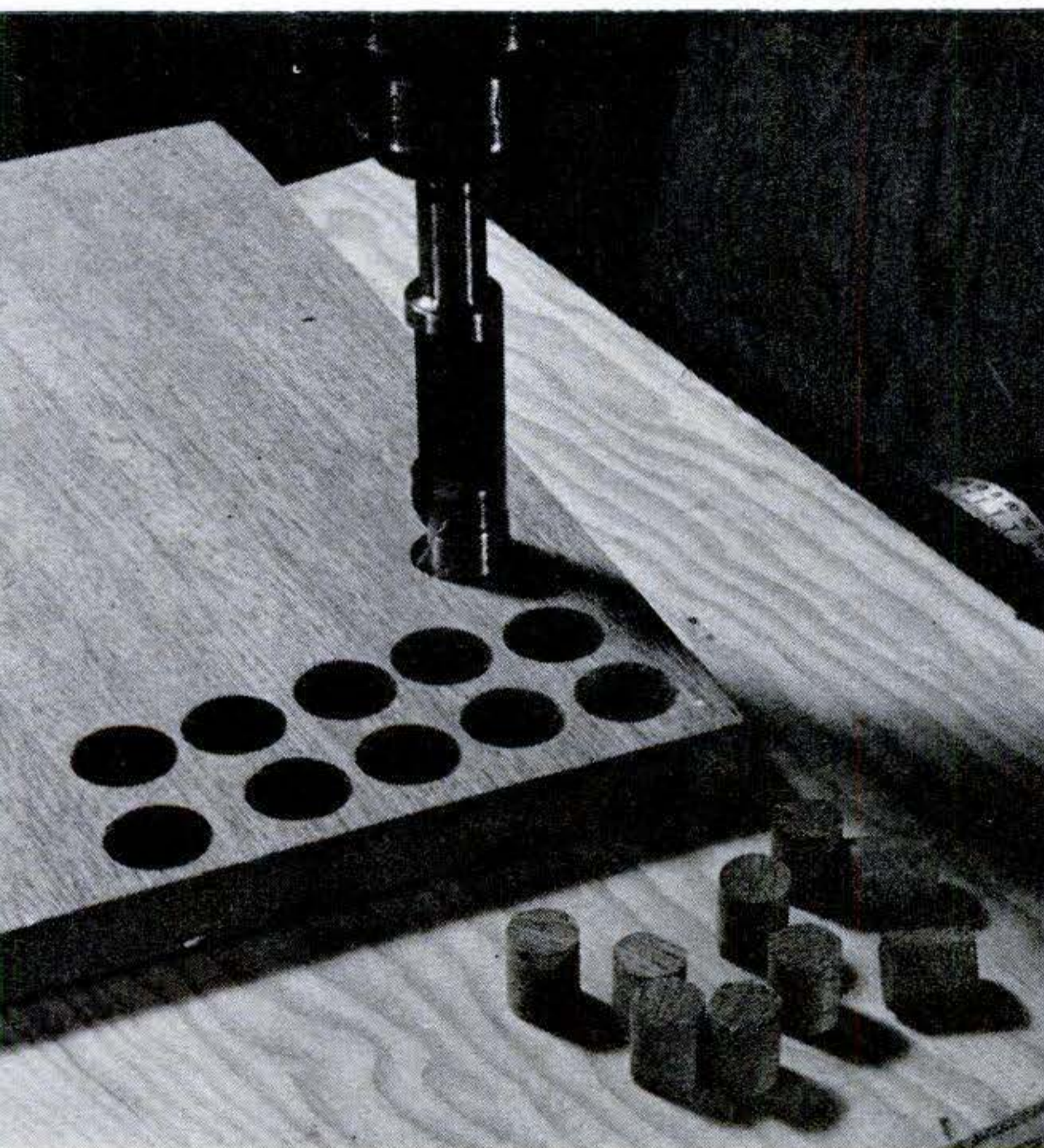
Ever try to conceal a screw hole or nail hole with a plug cut from a length of dowel? If you have, you know that the results are often less than satisfactory. Dowel you buy in a local hardware store is not always accurate, and you can't find

it in all kinds of wood. Even if you could, it would be expecting too much to have the grain match the wood with which you're working.

A plug cutter is the solution to this little headache. You can make plugs from the same material you're working with and match the grain so closely you'd have to look hard to find the plug.

The cutters also make dowels. Length is limited usually to about 2", but this is long enough for dowel joints. You can use small pieces of scrap lumber as stock. Since hardwood dowels are not cheap, this helps justify the cost of the cutter.

The Stanley cutter costs about \$1.50 and has a 1/4" shank. It comes in sizes to cut 3/8", 1/2", and 5/8" plugs. The Rockwell cutter comes in sizes to cut plugs 3/8" to 1" in diameter. Prices run from \$7.50 to \$12. It cuts plugs up to 2" long.

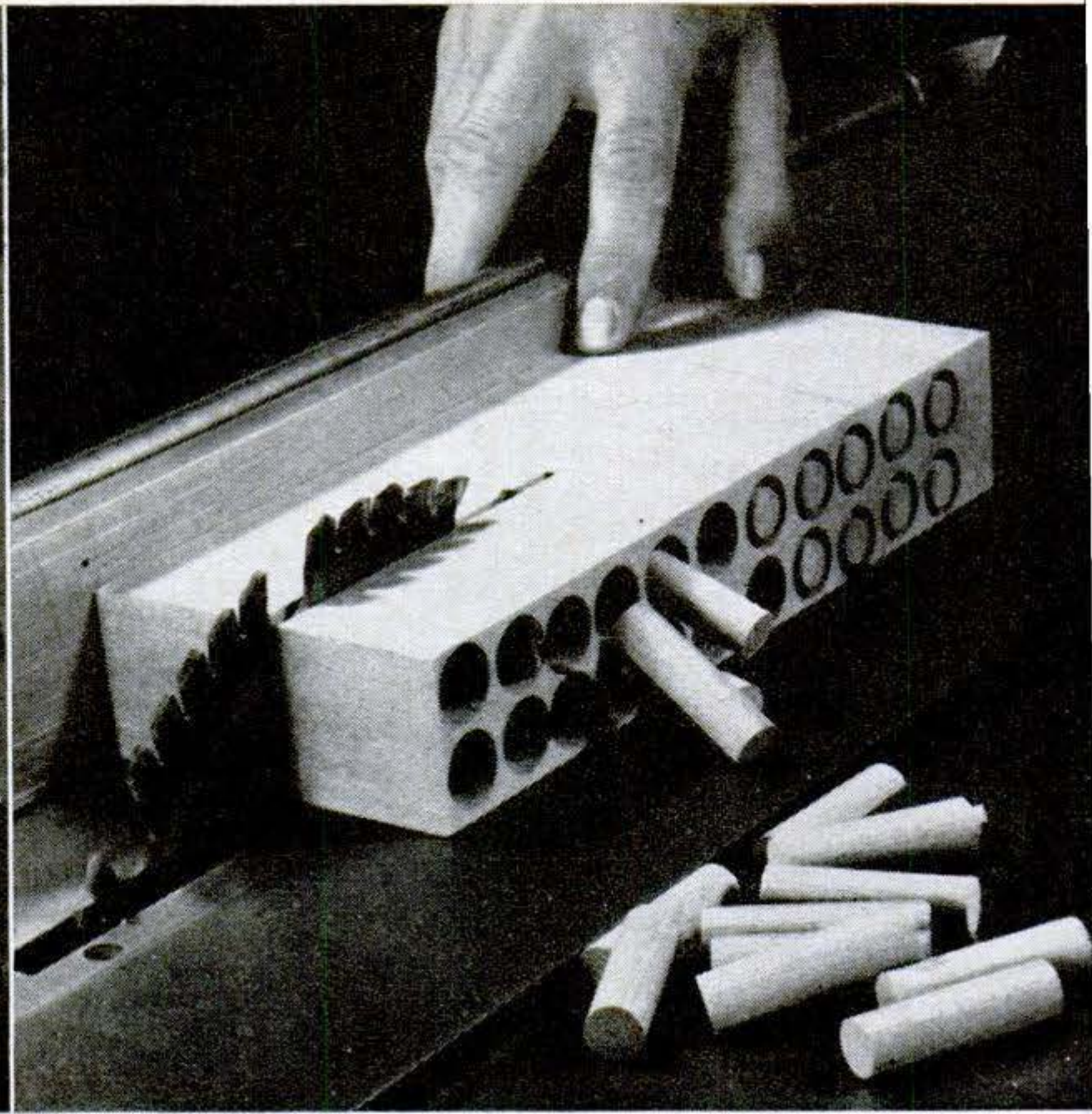
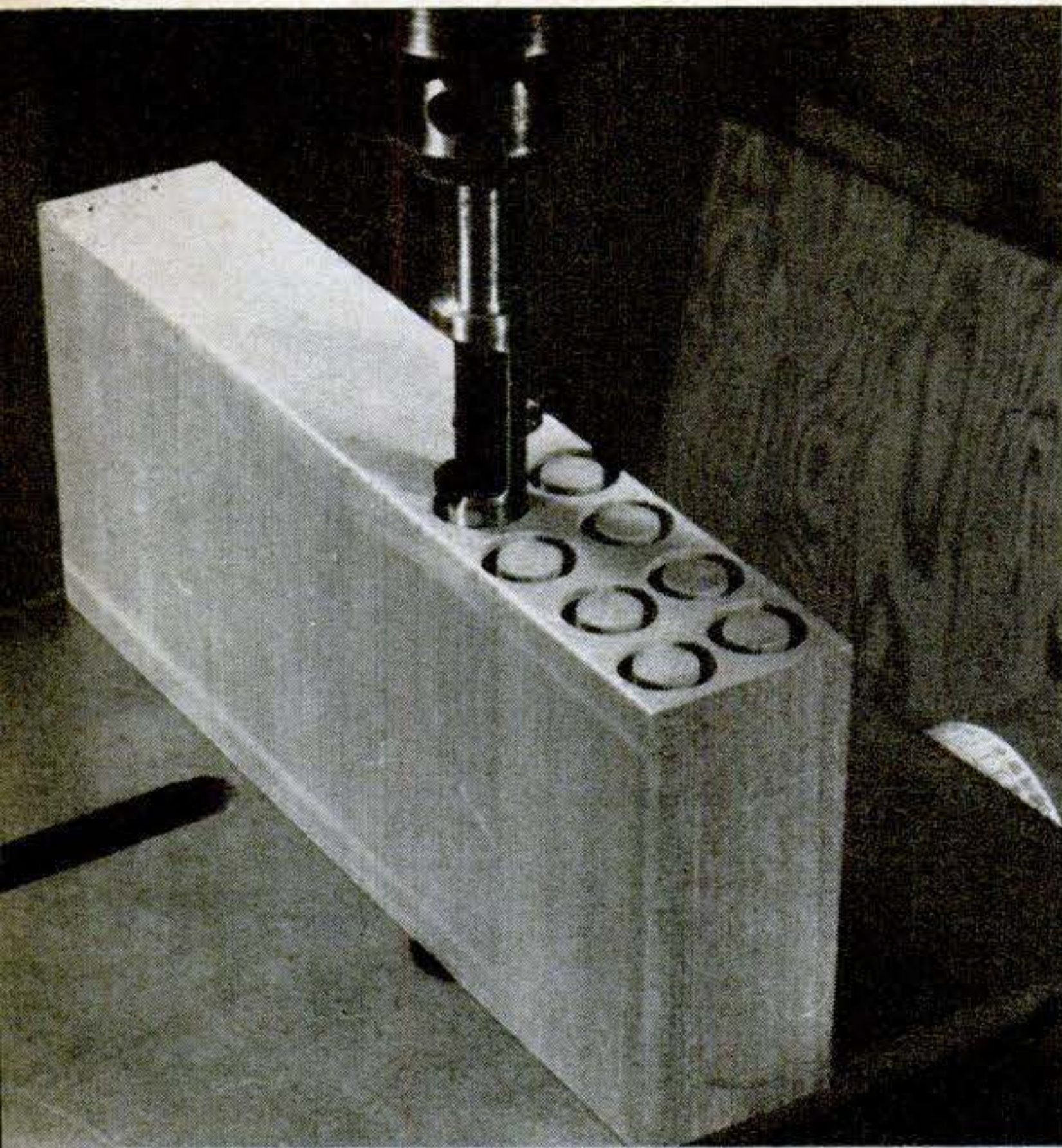


Some of the jobs plugs do: conceal screws, decorate

Crossgrain plugs cut from same material as the project are not easily seen when used to fill screw holes. Select stock thickness so that the plug will stick up just a bit above the surface. Sand it flush.

Plugs from the same material (arrows) are barely visible. Get design detail by making them from a contrasting wood (center). Let them project (bottom) for Early American effect. *Continued*

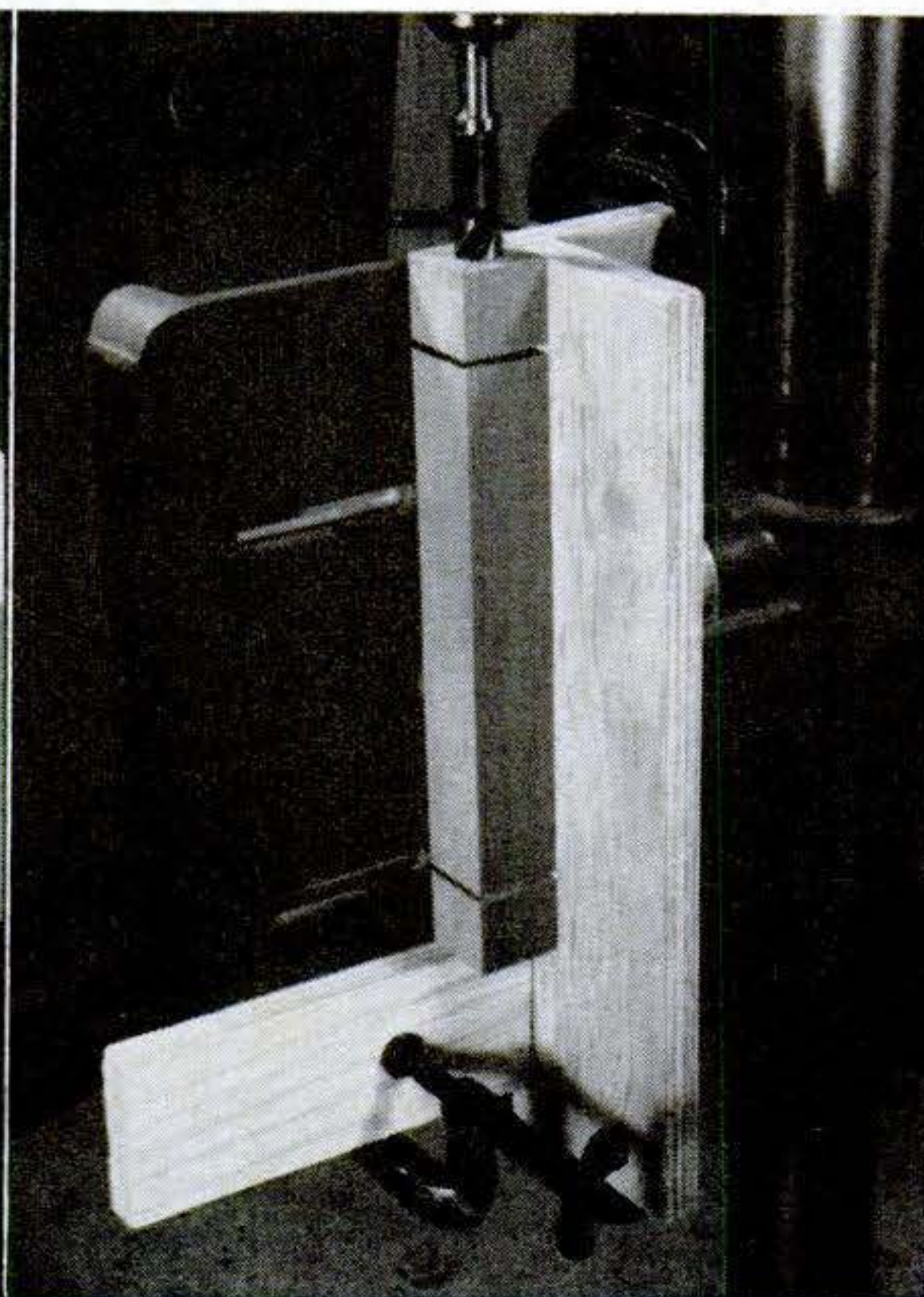
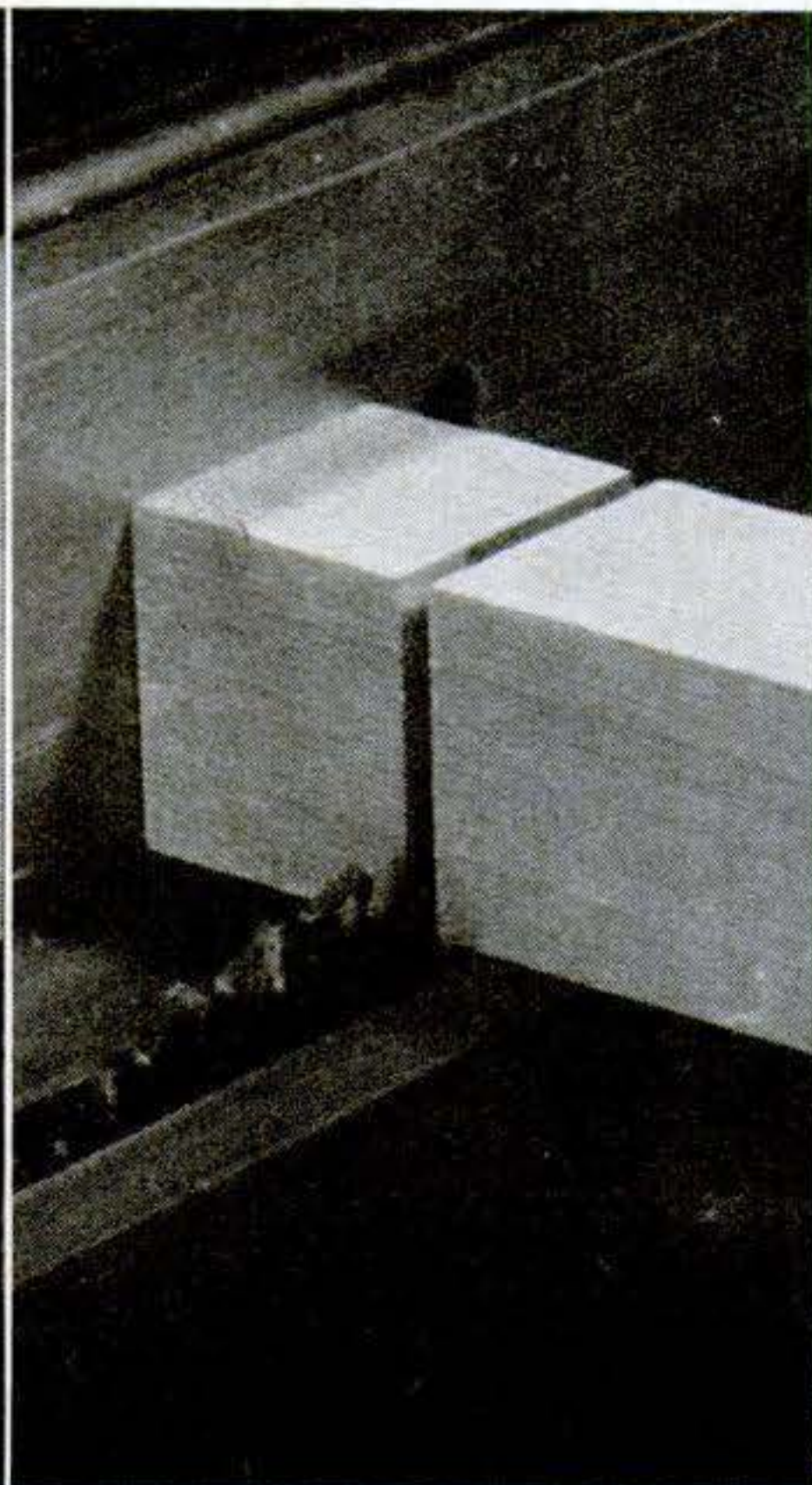
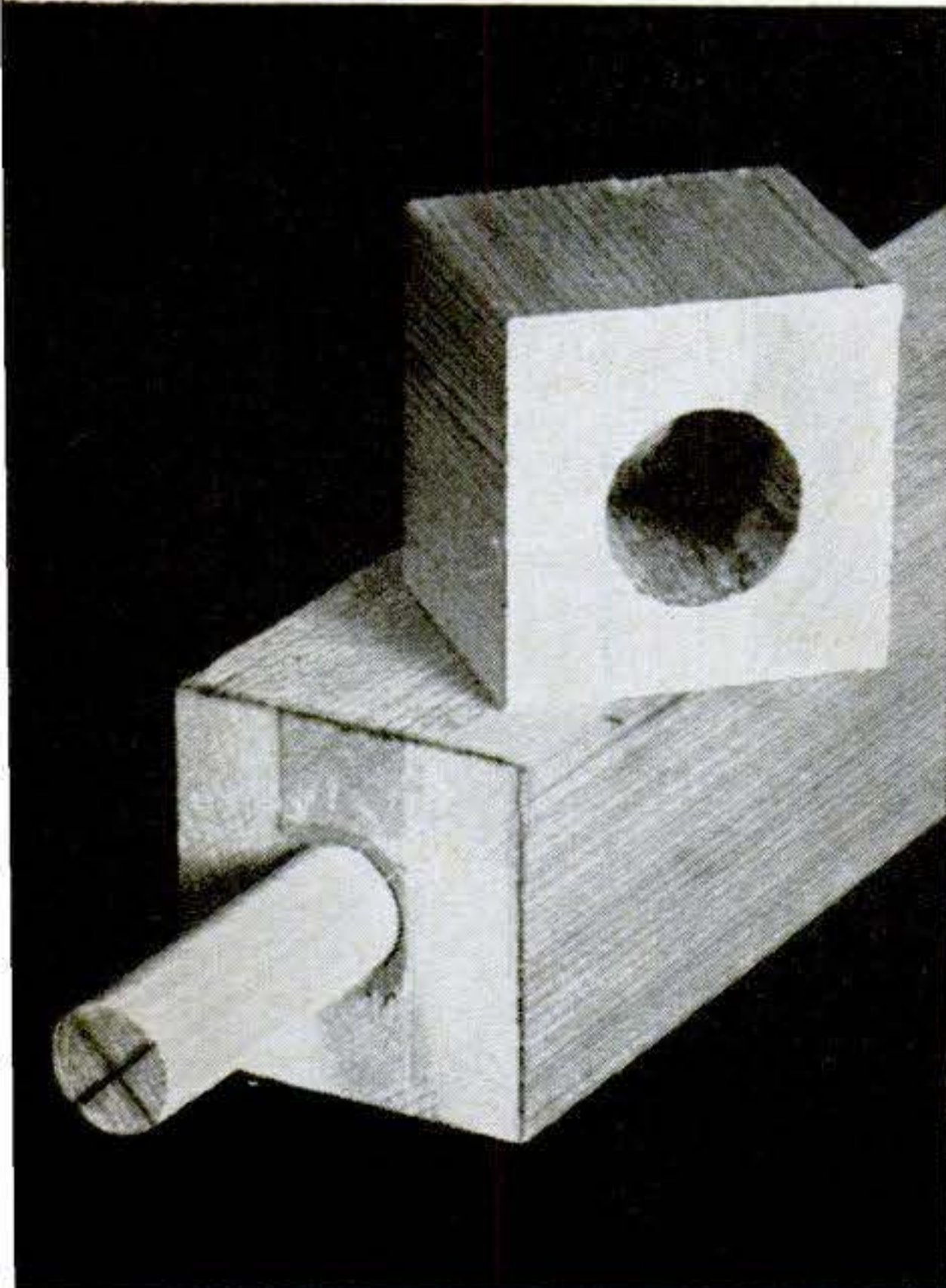
Save money by making your own dowels from scrap wood



Short dowels are cut in the end grain of the wood. To prevent burning the wood, use a speed of between 1,200 and 1,800 r.p.m., feed slowly, and retract cutter frequently. Stop nuts control depth.

Free the dowels by sawing, as above. The length of the dowels is determined by this cut. Don't saw with the dowels between the fence and the blade, since loose dowels might bind the blade.

Round tenons are easy to make, fit drill holes just right



Round tenons are made with a plug cutter. You can make them on either round or square stock, using the setup shown. Round tenons fit drilled holes. This makes it easy as there are no mortises to chisel.

First make shoulder cuts on each side. Cut depth depends on the size of the stock. Make it deep enough to clear the plug-cutter kerf. On round stock, rotate stock over the saw blade.

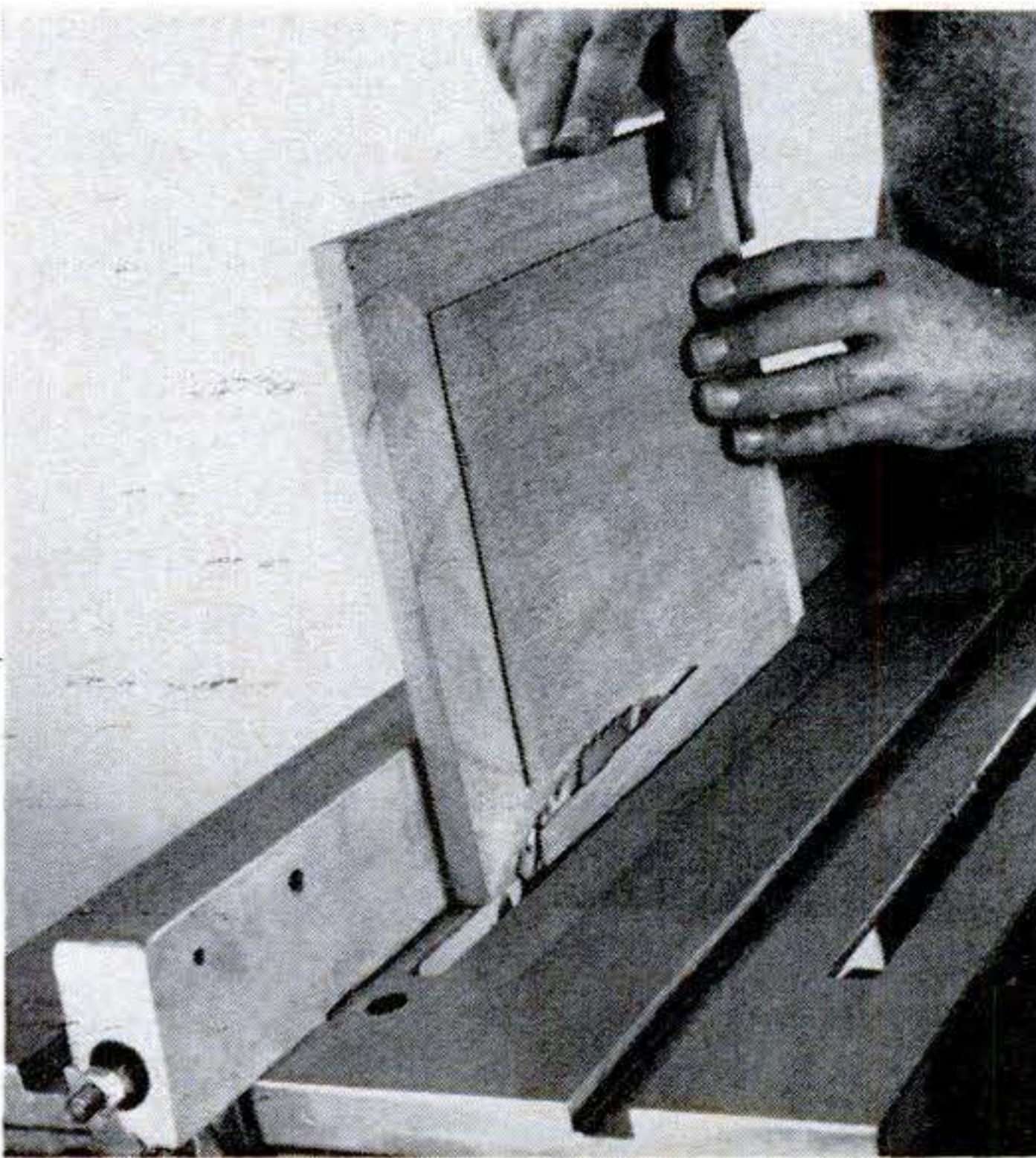
Finish the job with the plug cutter. Use an L-shaped guide to align the work on the drill-press table with center of the spindle. Rest work on a scrap block to be sure that all the cuts are alike. **PS**



Sand perfect circles on your table saw

You can use your table saw to sand true disks of almost any size. Replace the saw blade with a sanding disk and clamp a plywood bed to the table. Mark the center of your circular piece and place it on the plywood bed. Then, pressing it firmly against the sanding disk, drive a nail or wood screw through the center to act as a pivot. Rotate the work opposite to the direction of the sander. Loosen the clamps and tap the bed toward the disk as the work progresses.

WAYNE M. JUDY
International Falls, Minn.



Make raised paneling on a table saw

A panel edge treatment usually done with a molding cutter can be done with two cuts on the table saw. Make the first one with a 10-degree arbor tilt and a 1/4" blade projection as shown above. Then put the panel face down on the table and make a light rip cut to square the edges of the raised surface with the face of the panel.

R. J. DE CRISTOFORO, Los Altos Hills, Calif.



Get stepping-stones from a tree trunk

Need some stepping-stones for your yard? If so, look to a logger or someone taking down a tree. With a chain saw, cut 4"-thick slices from the trunk of a tree and recess them an inch or so in the ground. Elm, being tough and long-lasting, is particularly good for this. To make them last longer, saturate the slices with wood preservative.

GROVER BRINKMAN, Okawville, Ill.

IMPROVING YOUR HOME WIRING

THIS MONTH: That new gee-whiz hardware!

By **GEORGE DANIELS**

Most of us are familiar with the regular wiring devices around the house — the everyday wall switches and outlets. But what can the special wiring hardware and gadgets do? Probably more than you're ready to believe.

Let's say you're driving home from a vacation in the sunny South. Up North, your closed-up house is cold and shivery with its heat set just high enough to keep things from freezing. You stop at a roadside booth and telephone to your empty house. You let the phone keep on ringing — 17 times. Nobody answers, but you have just turned up your home thermostat to 70 degrees. In your basement 100 miles away, the oil burner goes into action. Your homecoming will be warm and cheery.

A few hours later you pull into your driveway. You could swear that, in the beam of the car's headlights, you saw an upstairs curtain move. To walk in on an armed intruder could be fatal. You take a cigarette-size whistle from your pocket and blow a quick, coded signal too high pitched for human ears to detect. Inside the house a moment later your TV comes to life full volume with the Late, Late Show, and your hi-fi blares forth with a cannonade from the 1812 Overture. If there's a burglar in the place, he'll run screaming to the hills. Then you enter your front door, clap your hands twice, and everything goes silent but the oil burner.

Something out of a James Bond tale? Not at all. Just a few Sonuswitches hooked to your wiring. Made by the Sonus Corp. (Cambridge, Mass.), the price is \$39.95 for the TV and hi-fi version, which can start assorted appliances, a little more for the furnace operator.

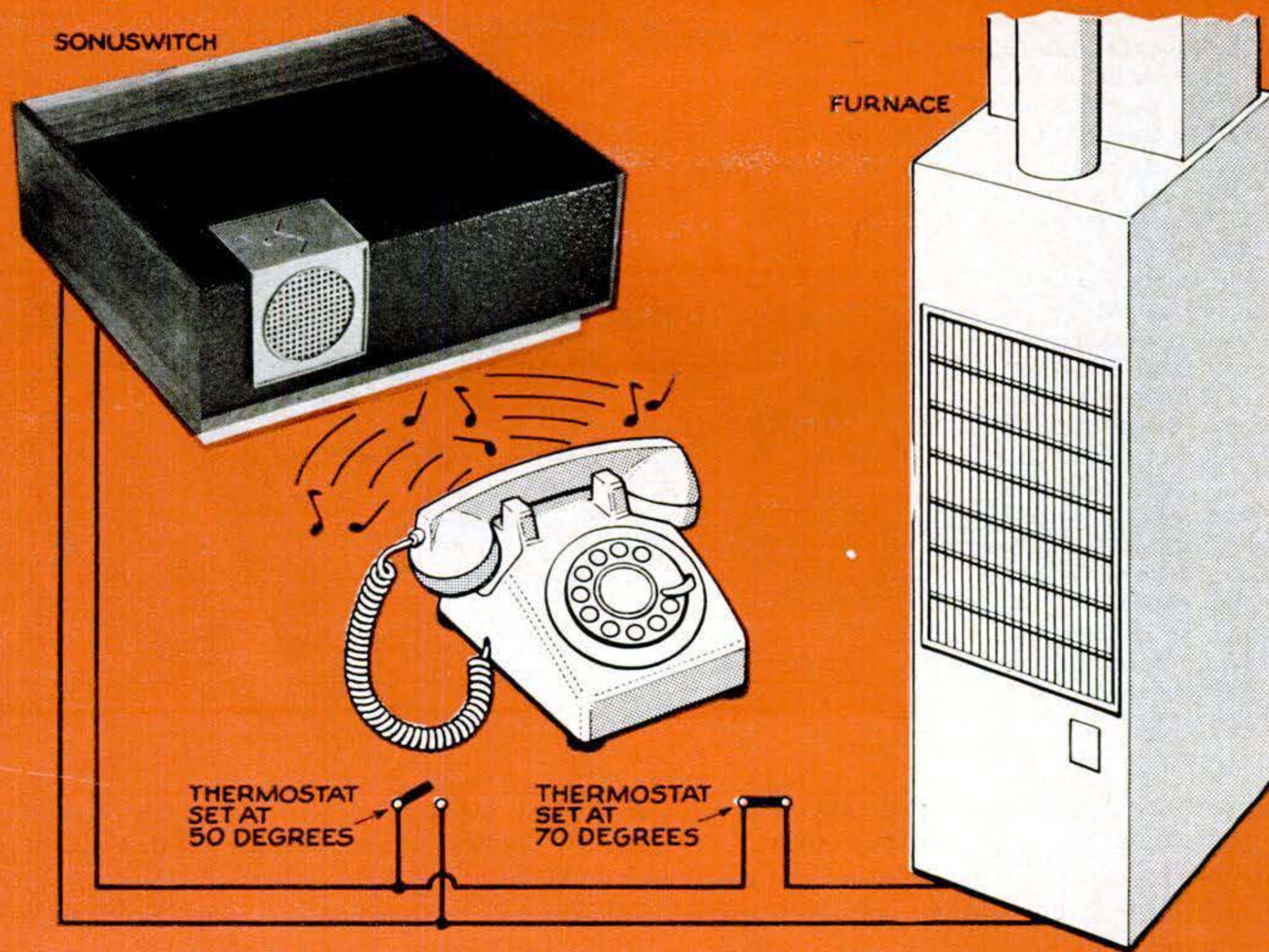
The appliance type answers only to sound

signals in the 14- to 18-kc. range when repeated within half a second. So it ignores radio and TV programs and conversation. The furnace unit hears only the telephone bell, and pays no attention unless the bell rings the exact number of times for which you have preset the switch. Wrong numbers and telephone salesmen can't bother it, and you can foolproof it further by linking it to a stock-model time switch so it listens only during hours you select. You have a choice of simple plug-in models for most appliance uses, direct-wired forms for oil burners and heavy equipment.

Simpler special items can also perform surprising tricks. The new Plugmold G-6000 Multi-Outlet raceway, for example, can do electrical jobs in kitchen and workshop never done before. It mounts on the wall like a molding and can carry more circuits than most houses have to offer, at both 115- and 230-volt levels. It takes single, double, and quadruple outlet receptacles, and has its own circuit breakers. Overload a circuit inadvertently and you just go to the wall of the kitchen or workshop and reset the circuit breaker. To rearrange your outlet locations, snap off the cover, shift the outlets where you like, and pop the cover back on. It's made by the Wiremold Co. (Hartford, Conn.).

Are you the forgetful type? There are special electrical innovations ready to make up for your failing. For those with the habit of leaving such things as soldering irons plugged in when they shouldn't be, Slater Electric (Glen Cove, N.Y.) offers a grounded receptacle with a signal light that flashes on as soon as a cord plug is inserted, and stays on until the plug is pulled out. It fits a standard outlet box and costs little more than an ordinary receptacle. Just shut off the juice at the main switch, disconnect your old outlet, and connect this one in the same way.

How you can turn up the heat at home when you're away



Sonuswitch turns anything electrical on and off by sound commands. It's preset to respond to a hand-clap, dog whistle, or telephone ring, depending on the model. The one shown turns up the heat when it gets a phone signal. To do the trick, you add an extra thermostat. Set one at 50 degrees, the other at 70. When the switch inside the Sonuswitch is open,

the thermostat set at 50 degrees will control the heat in the house. When a phone signal closes the Sonuswitch contacts, current flows through it to the second thermostat set at 70, whether the thermostat set at 50 is open or closed. This puts the 70-degree thermostat in control of the furnace. Naturally, the thermostats may be set at any desired temperatures.

Those distant lights. If you frequently leave the attic light going for a week or two before you discover you neglected to turn it off, there's a cure for that, too. Sierra Electric (Gardena, Calif.) makes a line of lighted-handle toggle switches that shine brightly while they're in ON position. They glare at you to remind you a remote light, or appliance, is turned on. And they don't go out until you turn the switch off. They're available in six signal-light colors, so you'll know just what it is you forgot to turn off.

They can't be used, however, in a switch loop where only the two black wires enter the switch box. That bright light requires a connection to the white neutral wire, so the switch has two brass terminals (as usual) plus one chrome one. If this requires snaking an extra cable into the wall, and you chip the

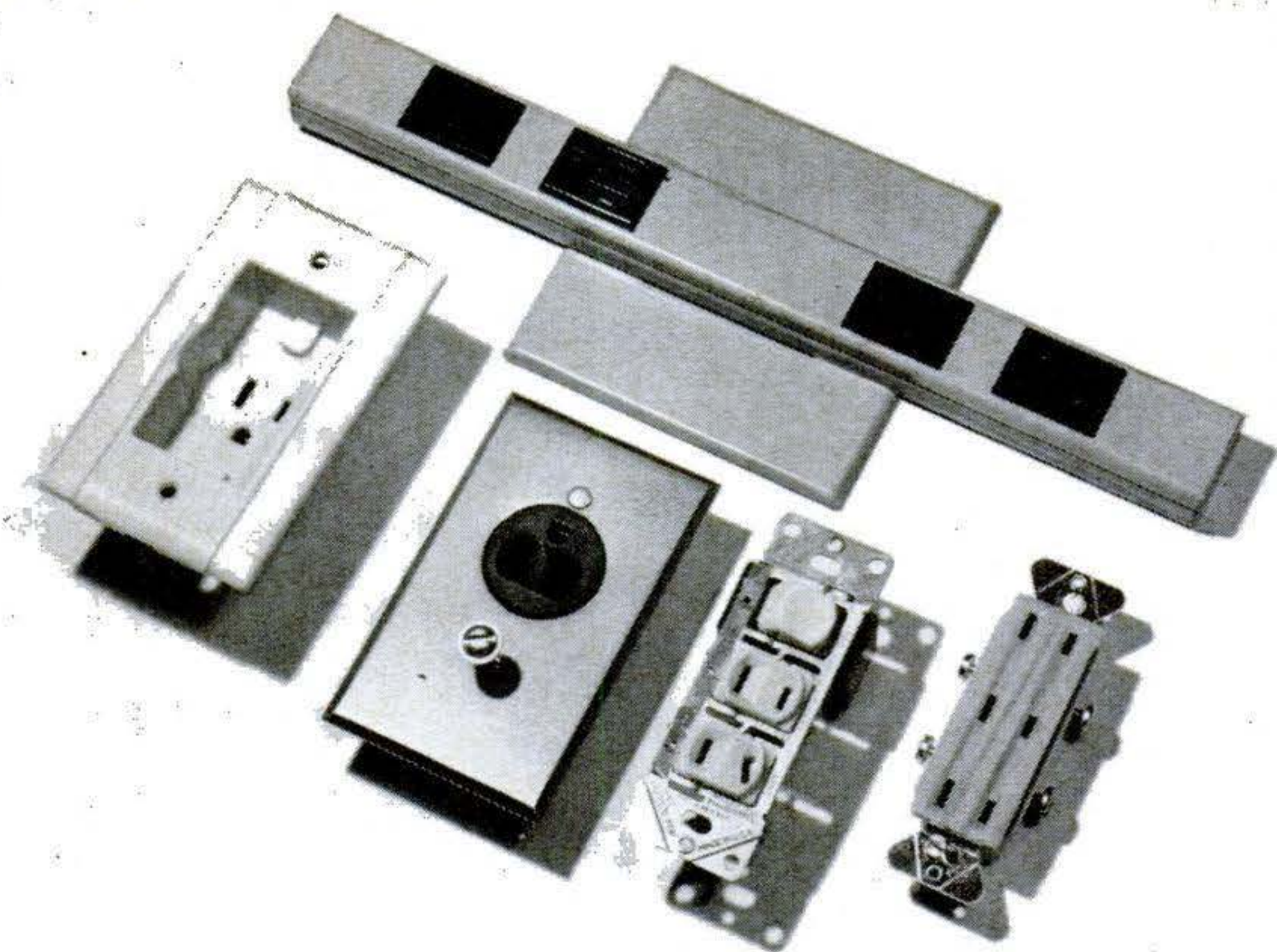
wallboard around the box in the course of the job, don't worry. The same company makes a jumbo-size cover plate to hide your bungling.

Groping in the dark? The soft-glowing switches, designed for easy finding in the dark, glow when the light they control is *out*. And they're *out* when their controlled light is *on*. Like standard switches, they have only two terminals, both brass. So the current that makes them glow actually reaches them through the filament of the bulb or the wiring of the appliance they control—even though the bulb or appliance is turned off at the glow switch. The very tiny amount of current required by the glow lamp in the switch makes this trick possible. And it adds a very useful function to the switch: If the

Continued

Outlets that do special jobs

Special-purpose receptacles that fit standard outlet boxes include the cluster of four grounded outlets (top of photo at right). Made by Wiremold, it can be extended for additional outlets. In lower row, left to right: a receptacle, made by many manufacturers, that lets you mount a clock flush against the wall and cover the outlet; Pass & Seymour's fan outlet with heavy bolt for mounting a fan; outlet that takes any combination of three devices — switch, grounded or ungrounded outlet, polarized outlets, night lights, etc.; triplex outlet, made by Sierra, that gives you three outlets instead of the usual two.



bulb it controls is burned out, the switch stops glowing. If you can't see the controlled light from the switch location, as in the case of an attic or detached garage, you are tipped off in advance so you can take along a flashlight and a replacement bulb.

If you need a combination of switches and lights or outlets, you can use interchangeable devices of the Despard type. Any three can be mounted in a strap bracket that fits a standard box. Cover plates are available to match.

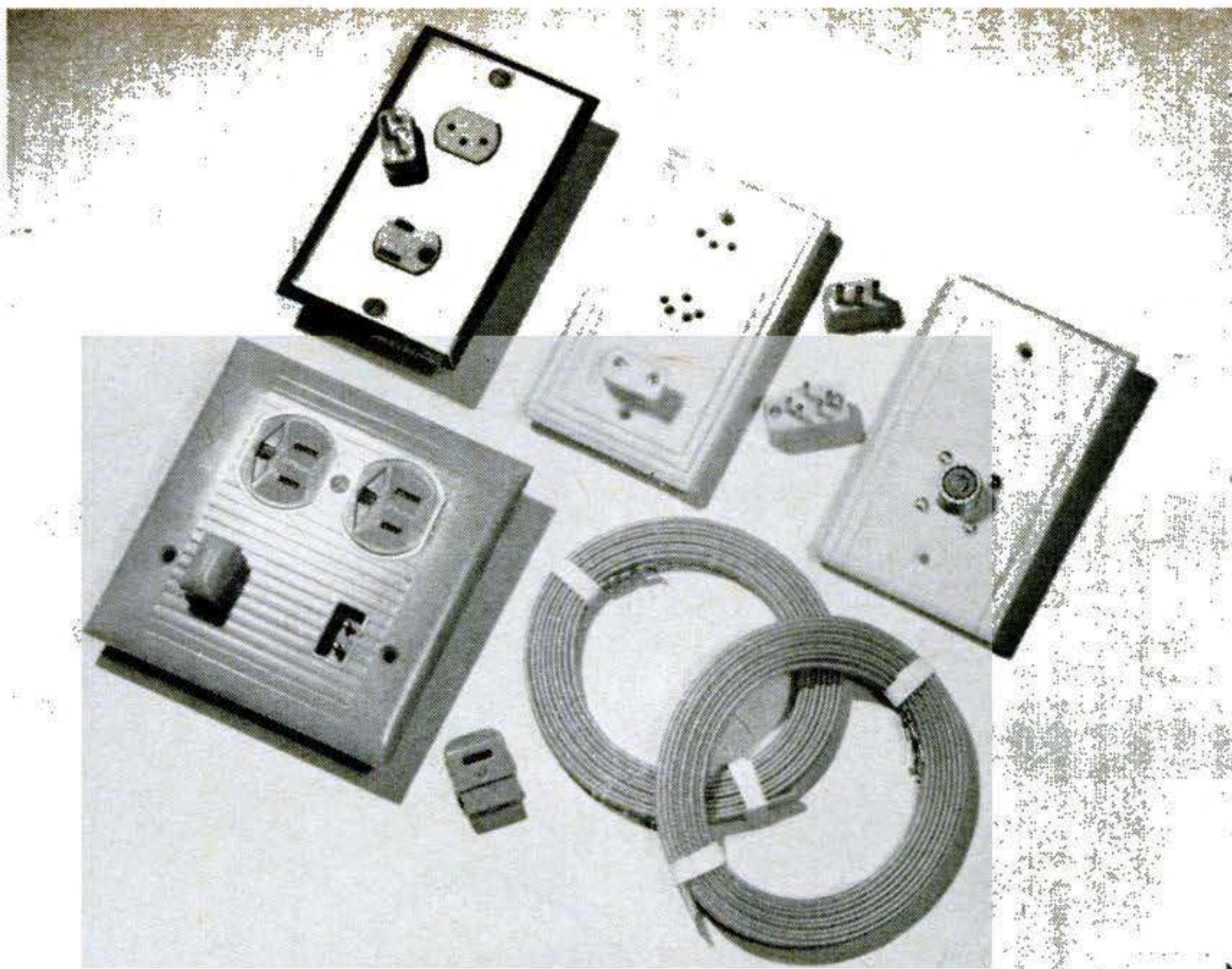
Need more outlets? If so, you never had it better. Today, you can add one extra outlet by merely swapping a duplex receptacle in the room for one of the more modern triplex type. Just pull your main switch, disconnect the old receptacle, and connect a new one in the same manner. You can also buy one of GE's four-outlet receptacles. Or you can use Wiremold's new foot-long raceway cluster of four grounded outlets. This last attaches to any outlet box (replacing the existing receptacle) with an adapting cover plate. Its special advantage is that you can extend the cluster as far as you want, all around the room if necessary, to add new outlets wherever you want them. All the raceway parts fit together in kit style to take inside or outside corner bands.

One of the newest outlet innovations is a twin-lighted duplex made by Harvey Hubbel, Inc. (Bridgeport, Conn.). This has break-out

tabs between the outlets so they can be electrically separated and connected to different circuits. The lights then do more than merely tell you where the outlets are in the dark, as might be handy during slide projection. If you have one side of each duplex wired to a switch, and the other wired constantly live, a glance at the outlet lights tells you which side of the duplex is on.

The same company markets an outlet that keeps tool and appliance cords from pulling out of receptacles in the midst of a job. To lick the nuisance, you replace your offending outlets with a Twist-Tite outlet. Insert the standard cord plug, give it a partial turn, and it's held with a vise-like grip. You can still pull it out, but it takes muscle. Turn it back to its original position and it comes out easily.

To hang your electric clock on the wall, you need only install an outlet box at the location you pick, and fit it with an electric-clock outlet. This provides a recess for the cord plug and a hook to support the clock. And some do more. Sierra Electric's universal outlet lets you tuck in the cord from your washing machine or other appliance so it can be pushed snug against the wall. And Pass & Seymour's fan outlet is fitted with a hanger belt husky enough to support anything you're likely to hang on the wall. A special heavy-gauge metal strap, integral with the outlet, holds it to the box.



Special outlets for hi-fi and TV

These come in combinations that let you move your equipment to any room in the house. A combination grounded-outlet and TV-antenna unit (made by Pass & Seymour) is shown at top left. A metal partition in the box keeps the two types of wiring separated. At top center is an outlet for a TV antenna, antenna rotating control (five holes), and FM antenna. The plugs won't fit in the wrong outlet or wrong position. For TV or hi-fi use, you can get a coaxial-cable outlet (top right). A grounded duplex outlet with antenna outlets for TV and FM is shown at lower left. Coils of antenna wire (lower right) come with it.

TV, anyone? For hi-fi enthusiasts and TV watchers special outlets are marketed that often display enough little holes to appear termite-ridden. But each group of holes accepts the contact pins of a matching plug, and rejects all others. Allied Radio (Chicago) and others, offer combinations that let you tote your portable TV from room to room while utilizing everything needed to pull in your pet channels in far-out fringe locations. Any 115-volt outlet takes the power-cord plug. A special one takes the antenna plug — or a combination outlet takes both the antenna and control plug for the antenna rotator. Carry the control unit with you and rotate the antenna from any room.

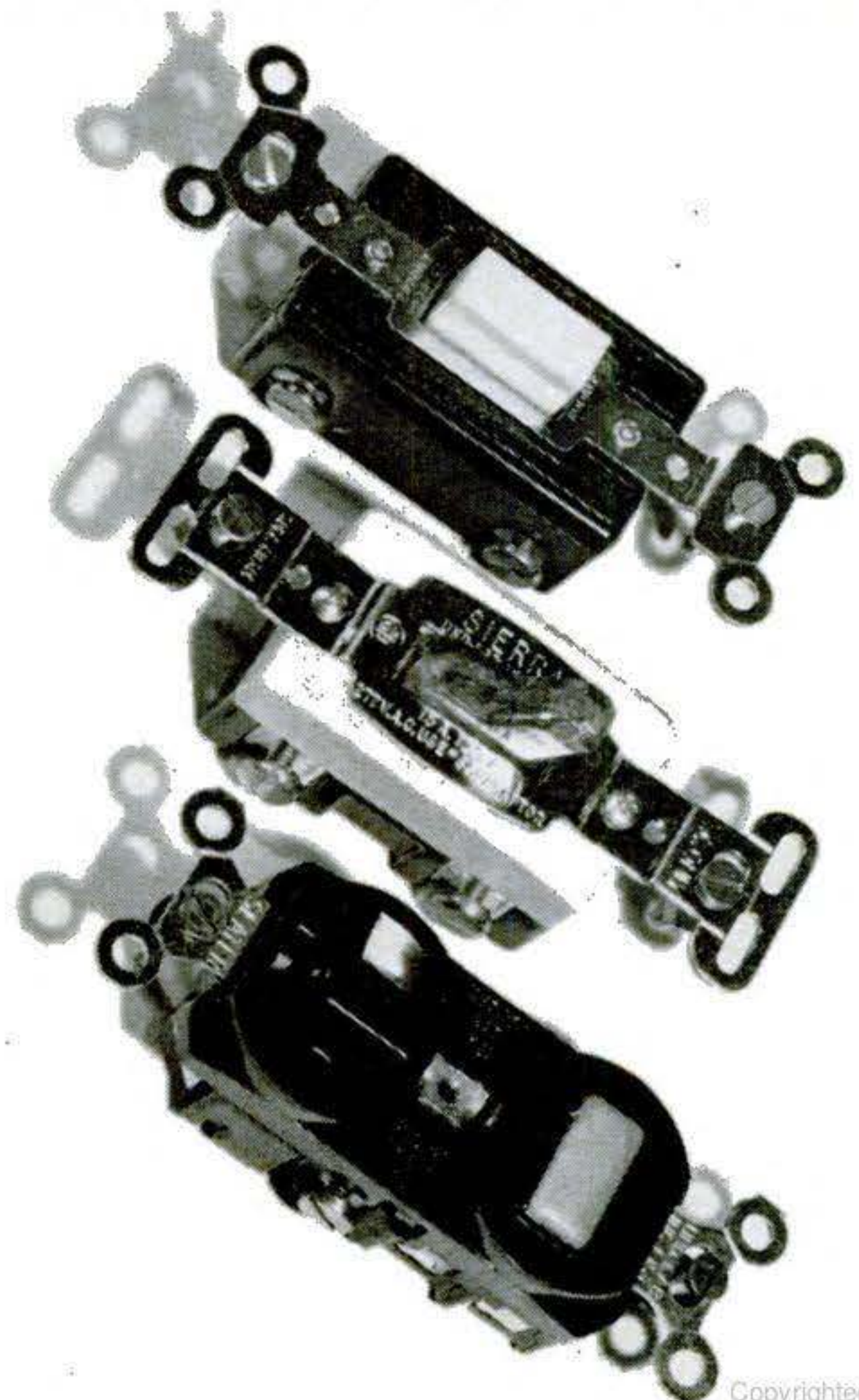
Except for the 115-volt cord, the outlets need not be mounted on standard wiring boxes. But for convenience, it's sometimes handier. So, to keep low-voltage and antenna wiring separated from house wiring, Sierra Electric provides metal partitions to divide standard outlet boxes.

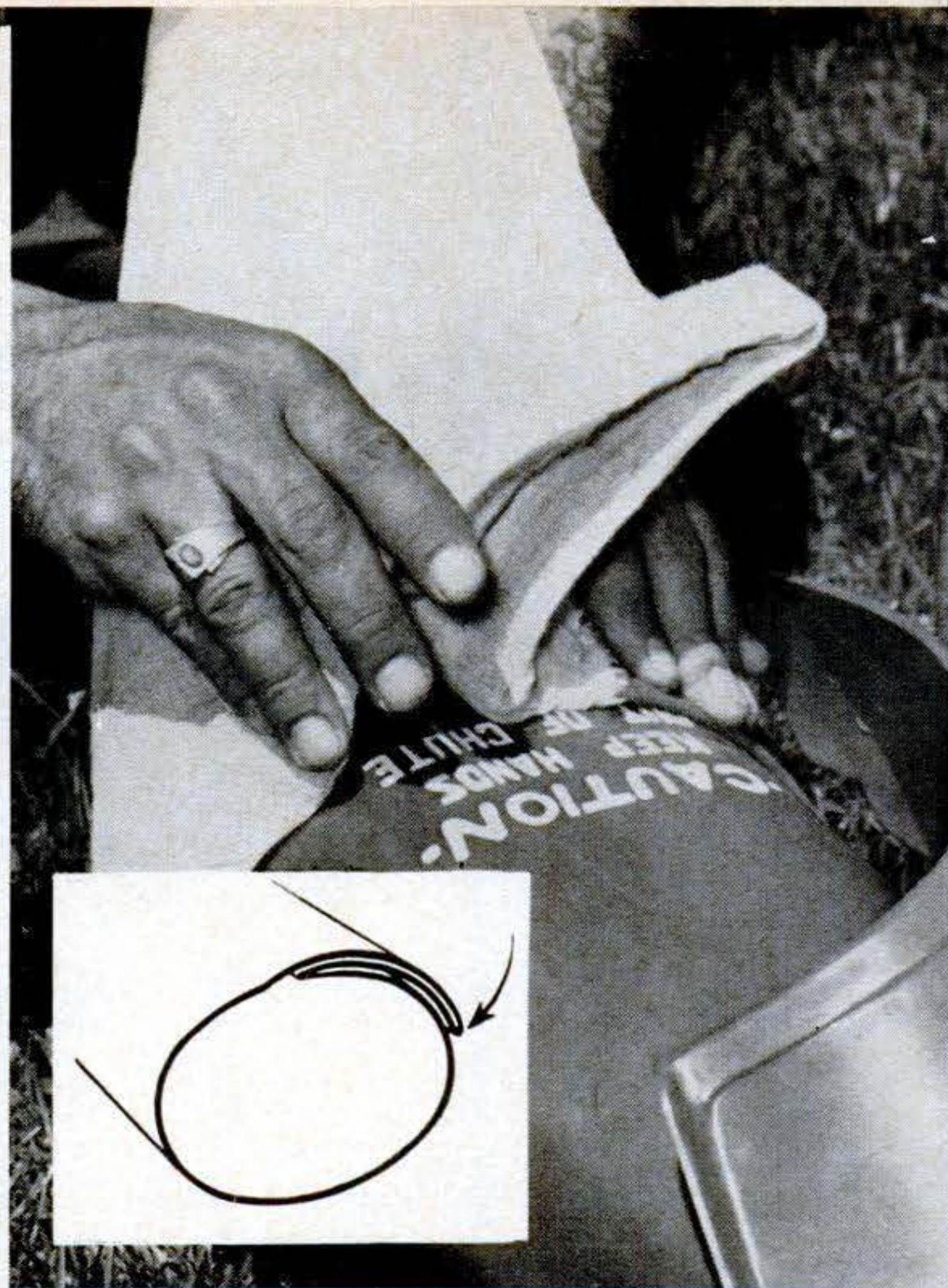
For special safety features, you can find an outlet to suit almost any situation. To keep sawdust, metal chips and filings, or moisture out of electrical parts, Pass & Seymour mounts a fabric-reinforced Neoprene gasket just inside the slots of its special 6207 receptacle. Razor-fine slits in the gasket close tightly when no plug is in the outlet, sealing out moisture and foreign matter. But they spread open easily when a plug is inserted. If you

[\[Continued on page 212\]](#)

These light up as a reminder

Built-in lights to let you know that current is turned on or off are handy for switches that control remote lights in attic, basement, or garage. The Rodale touch-button switch (top) glows when the light it controls is off. This makes it visible in the dark. One model controls two sets of lights. The Sierra pilot-light switch (center) lights brightly when the switch is in the on position. Slater makes a signal-light receptacle (bottom) that glows when anything is plugged into the outlet. It's a good reminder to disconnect your soldering iron or other appliances that should be turned off when you leave the room.





Grass bags that are tough enough to stop any object the blade throws are a major safety factor, and the big news is ease of attachment. Jacobsen mowers hold a bag erect on a steel hoop that hooks easily on the chute. The arrow above indicates ground-

hugging skirt, another safety feature. Toro uses a flip-spring collar that snugs quickly around a long extension neck, as shown above. So vital are bags to safety that most manufacturers have simplified their use, now include them as standard equipment.



Industry's seal of safety on the new machine designs promises injury-free mowing

By JACKSON HAND

Some 80,000 lawn-mowing accidents occur in the U.S. each year. So you'll agree that it's sensible to consider safety when you buy a mower. The manufacturers see it the same way. This year, for the first time, they're turning out mowers under a

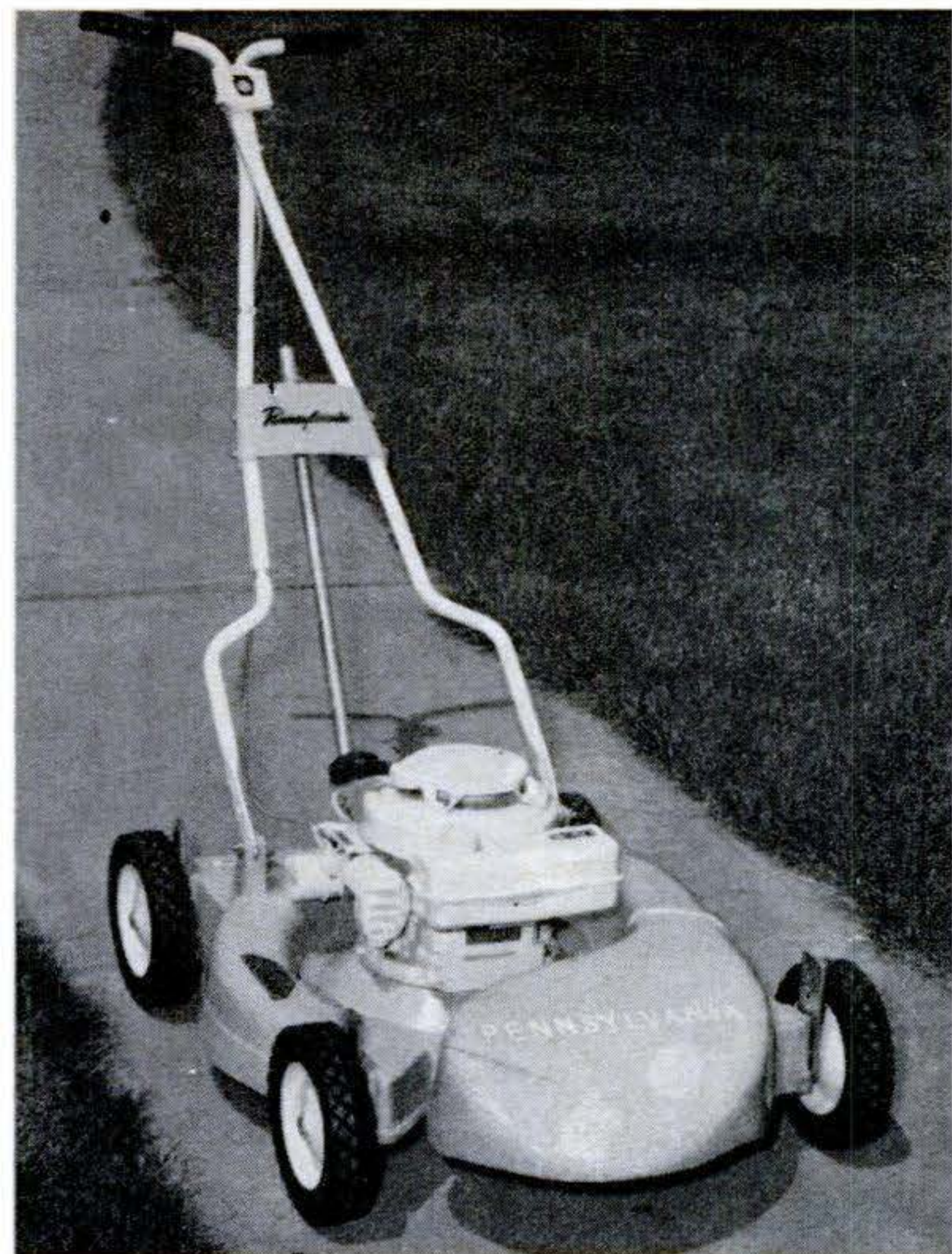
Why the New

self-imposed safety code as part of a broad program to reduce accidents.

The new standards are rigid. Only manufacturers who comply fully may use the triangular safety seal of the Outdoor Power Equipment Institute on their products. From now on, when you buy a mower, that seal should be your first guidepost. Some makers have gone beyond code requirements to make their products even safer.

The blade of a rotary mower and objects thrown by the blade are the two greatest sources of injury. This year, accidents from either cause will require considerable carelessness. The code requires:

- A smaller opening on the grass discharge chute, and a chute so designed that an object struck by the blade cannot be thrown upward or toward the operator.
- A housing skirt that comes an eighth



Chute has been eliminated on Pennsylvania mowers to prevent all chance of injury from objects the blade ejects. Clippings recirculate inside the special-design housing until, chopped fine, they fall invisibly into the cut grass. Several other manufacturers also have



chuteless mowers; some have chute covers that you can replace with a bagging attachment. Bolens uses a bolt-on plate (arrow). It confines clippings till they fall out behind. Anything the blade hits bounces around and falls harmlessly to the ground.

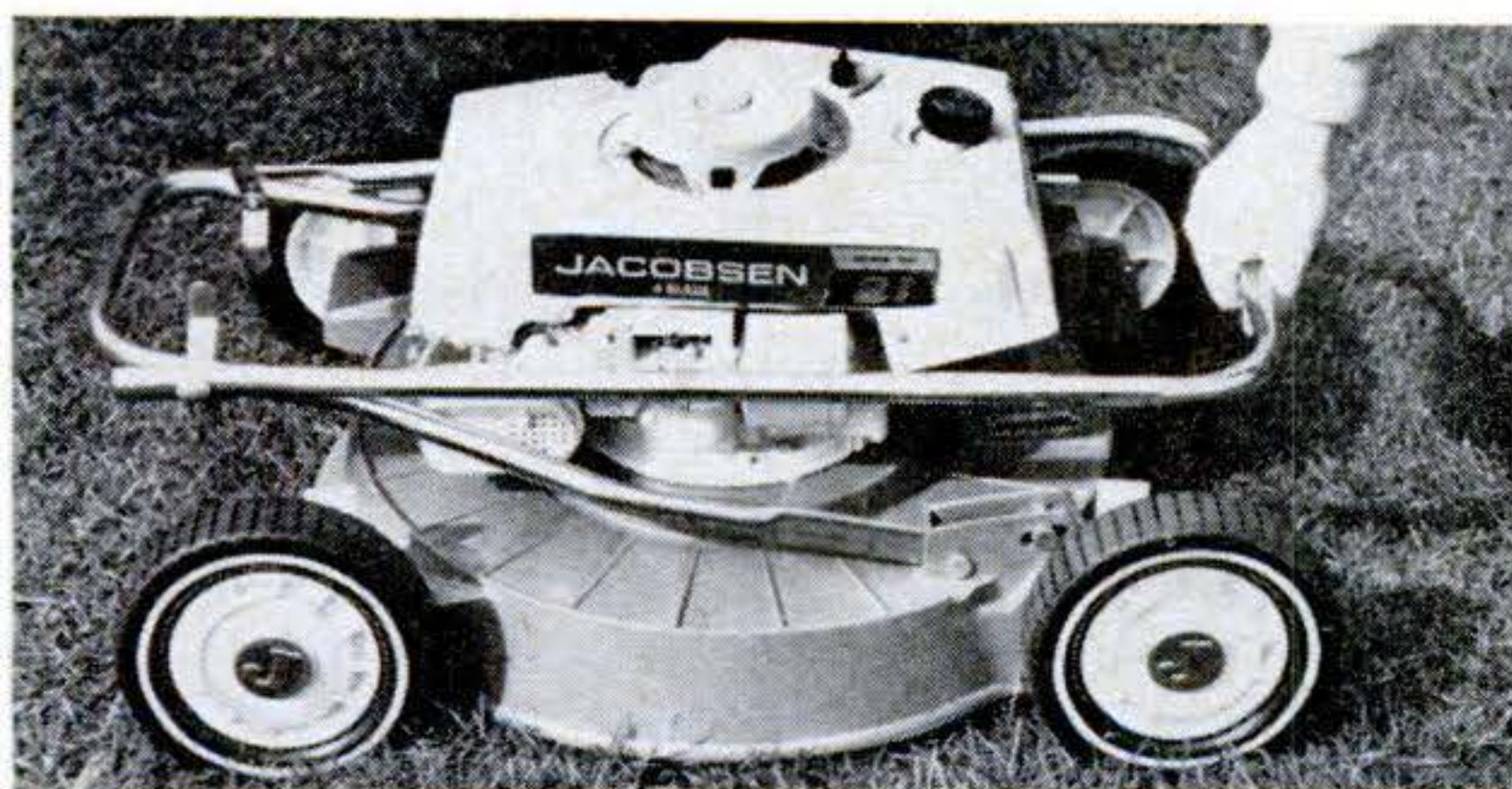
Power Mowers Are Safer

of an inch below the blade. If the blade is the type that's adjustable up and down on the shaft, the restriction applies with the blade at the lowest position.

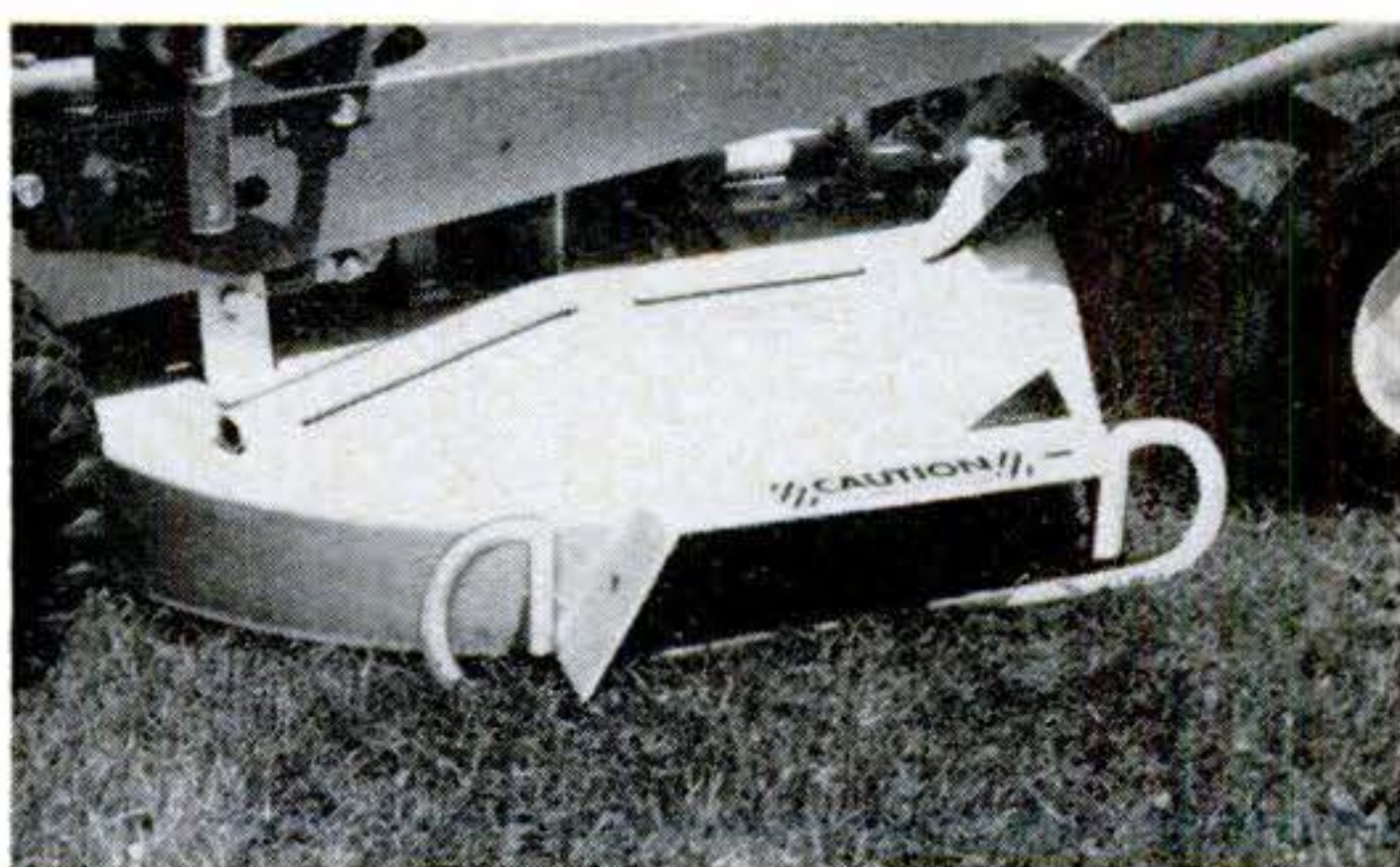
- Stronger material for housings.

- A blade-tip speed that does not exceed 21,000 feet per minute. (This is to reduce the projectile speed of objects thrown by the blade, also to reduce centrifugal strain on the blade.)

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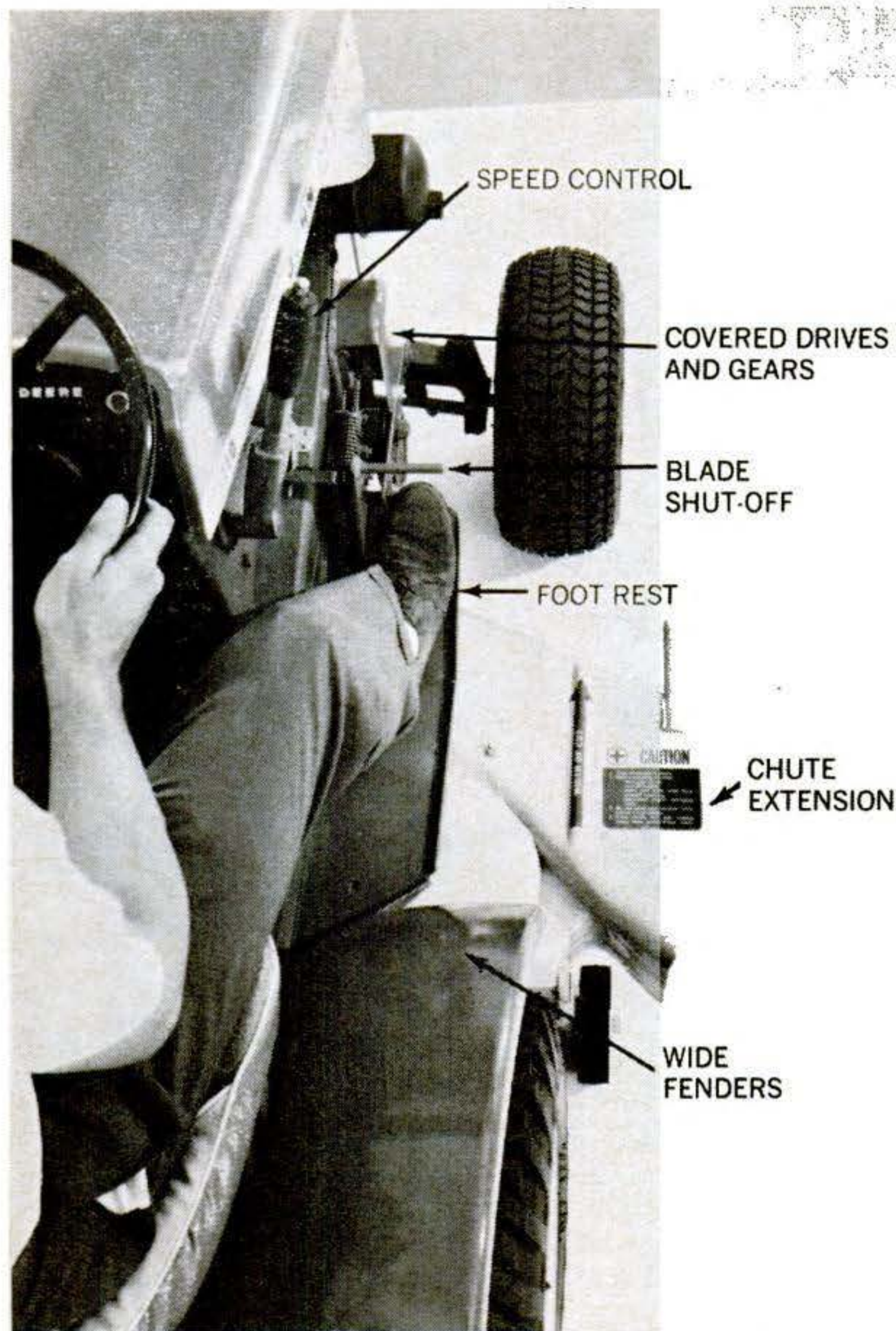


A handle must be long, to be safe. But this creates storage problems, so Jacobsen designed a handle that folds. You spin two wingnuts to set it up again.



Large chutes must have a welded bar across the bottom. On riders, the chute must extend 5" beyond the blade tip, at least 3" on walking-model mowers.

A whole flock of controls that contribute to mower safety have been



Safety standards for mowers are also being adopted by tractor manufacturers when their rigs are used to drive mowing attachments. As this John Deere shows, good basic design in a tractor covers most of the safety features you look for in a riding mower.

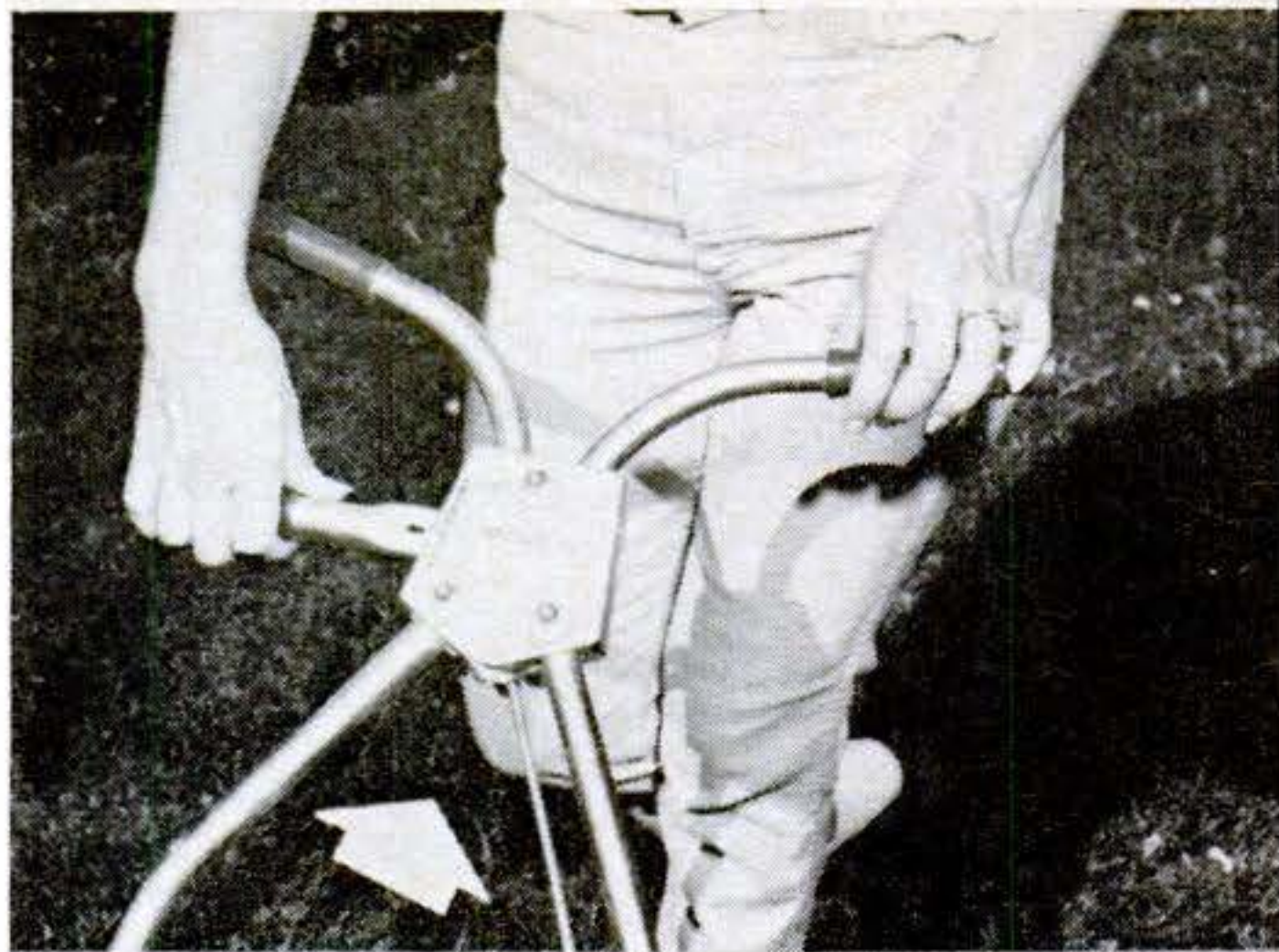
- Blades so made as to reduce the chance of shattering on impact.

- A handle with a stop to prevent it from swinging up. (The reason for this: the frequency of accidents in the past caused when the handle gets above center and goes up under forward pressure, allowing the machine to stall and the operator to step under the housing.)

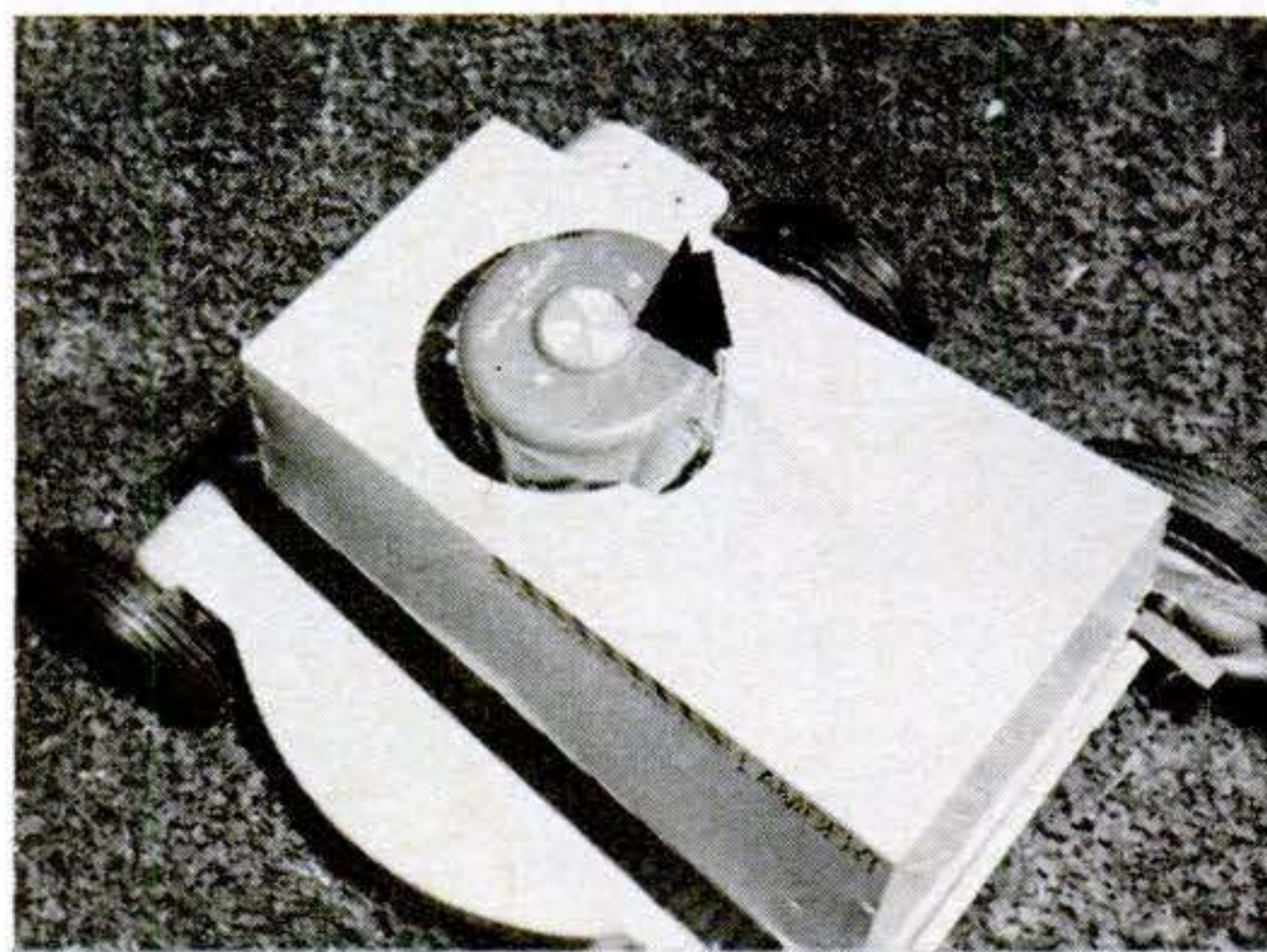
- Covers over belts, chains, and gears.

- A low profile, wide track, and long enough wheelbase on riding mowers for stability on uneven ground. (The Reo Lawn Skiff is a good example.) The new code specifies that a mower must not topple when tilted 20 degrees to the side, 30 to the rear, or 40 to the front.

- Wheel brakes on riders, unless motor drag can be used to brake the machine.



Control of cutting height is improved on many models this year to eliminate a hazard and make adjustment easier. On this Lambert electric, one lever located on the handle sets all wheels.



Electrics are so quiet you don't know they're running unless they are equipped with an indicator. This battery-powered model has a disk that spins when the blade spins. An essential feature for electrics is an automatic brake to stop blade quickly.

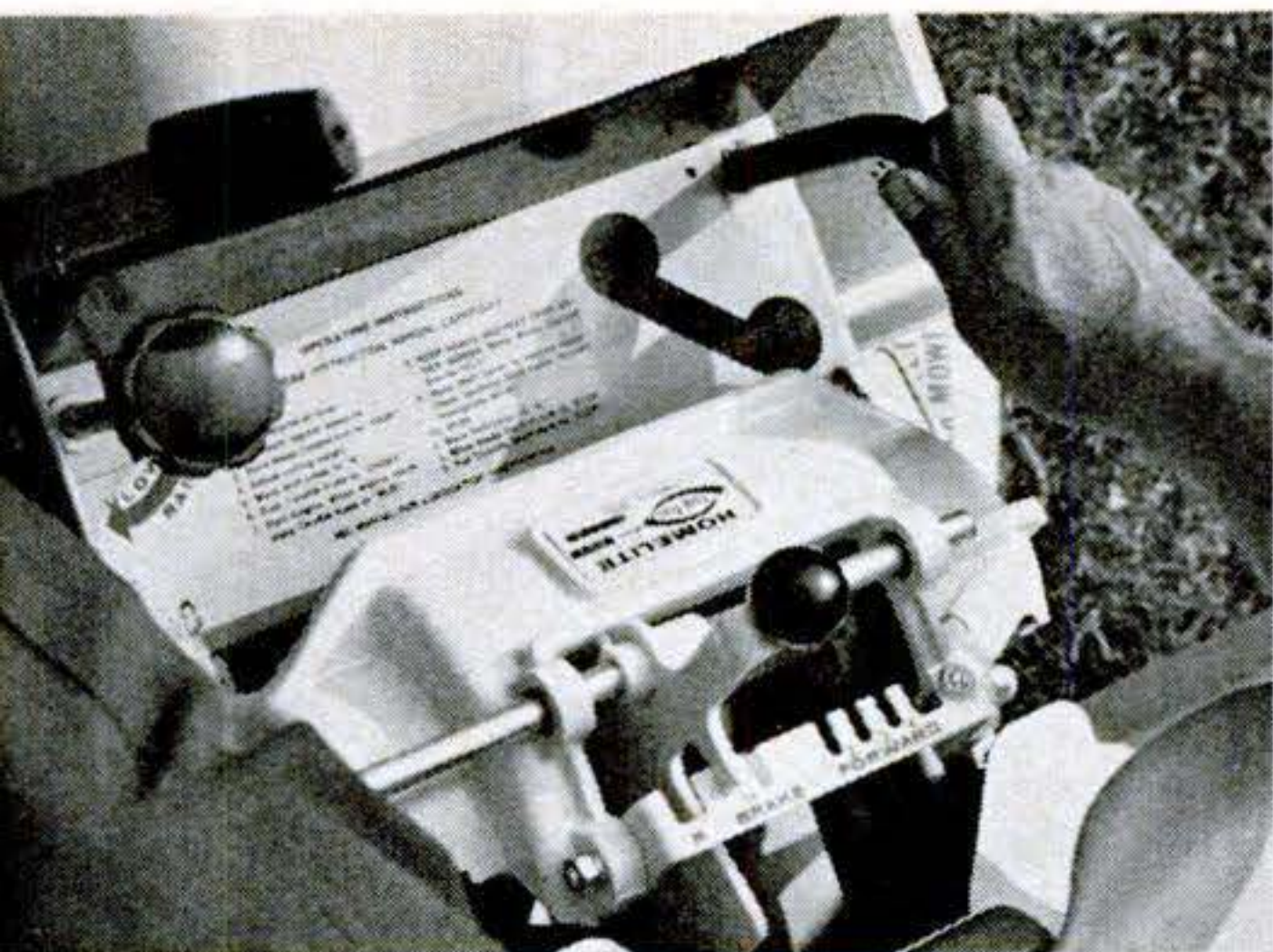
The new mowers are subject to tough torture to prove they meet these requirements before they receive the safety seal. But there are other safety features you should check out.

Grass bag catches missiles, too. Many makers now recommend bags at all times to protect you against flying objects.

To cut down trips to empty the bag (the nuisance causing many to ignore bagging), some mowers have multicutter blades to chew up the grass into shorter lengths and so pack more into the bag. Some also get greater grass-packing ability by designing the housing to hold the clippings through several rotations of the blade, each rotation chopping up the clippings more before they escape into the bag.

More riding mowers this year have rear-

redesigned to make them so handy that you can't avoid using them



The more controls in reach when seated, the safer you'll be. This Home-lite lets you select forward speeds, brake, and reverse, and raise, lower, or shut off blade, all with one console.



Fairly big riders need quick and easy height adjustment so blade can be lifted clear of ground (arrow) when you cross driveways and other areas where there may be stones or debris that could cause injury. This Ariens also has a blade shut-off lever.

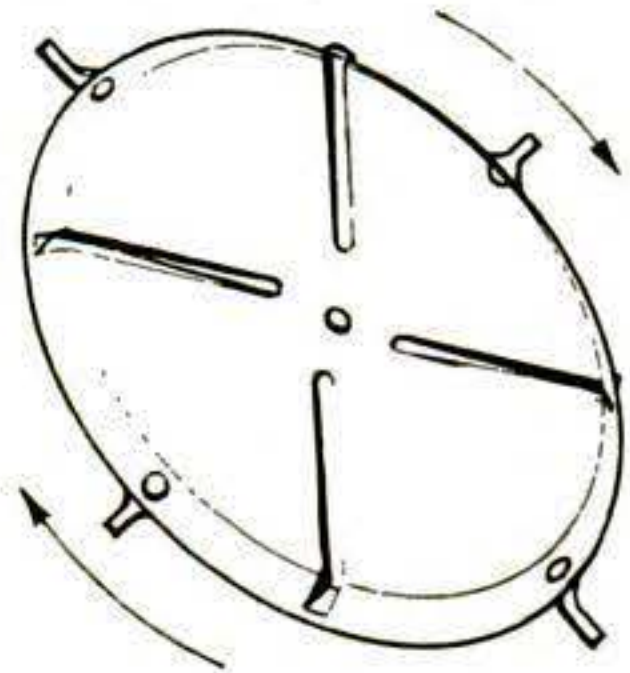


Rear-mounted motor on this Ariens not only provides efficient drive linkage to the wheels, but improves visibility ahead of the mower. You can spot debris before you hit it, and you never lean dangerously overboard trying to see where you're going.

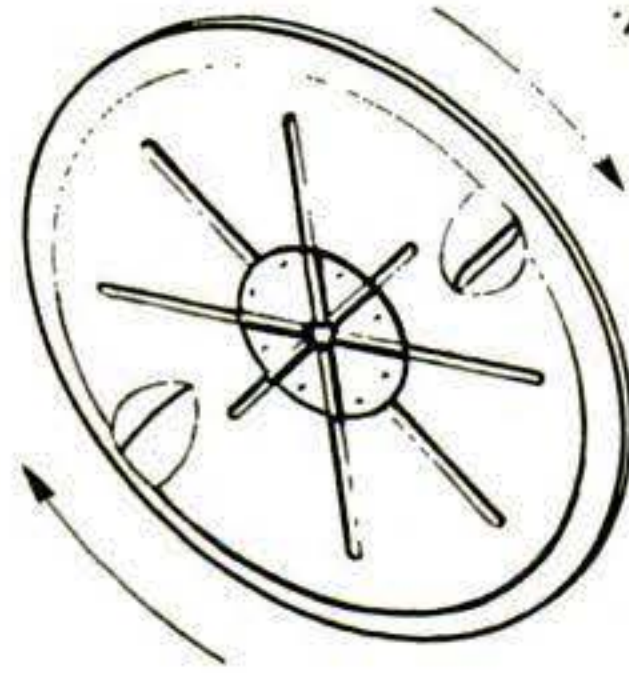
New designs make blades safer for you to use



S-shaped blade cuts the grass with a slicing action, and strikes any hard object a glancing blow with the curved edge. Thus, nothing is thrown by the blade with dangerous velocity.

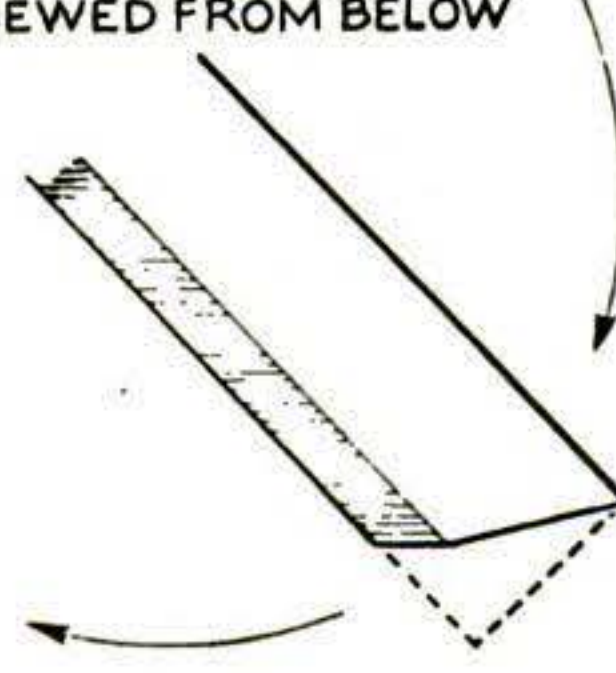


Fiberglass disk has four small cutters of stainless steel pivoted at edge to swing back if they strike any hard object. Centrifugal force extends them firmly enough to cut grass.



Stamped-steel disk has opposing slits with metal cupped downward for cutting edges and cupped upward on other side of slit so an up-draft of air helps hold grass for an even cut.

ALL VIEWED FROM BELOW

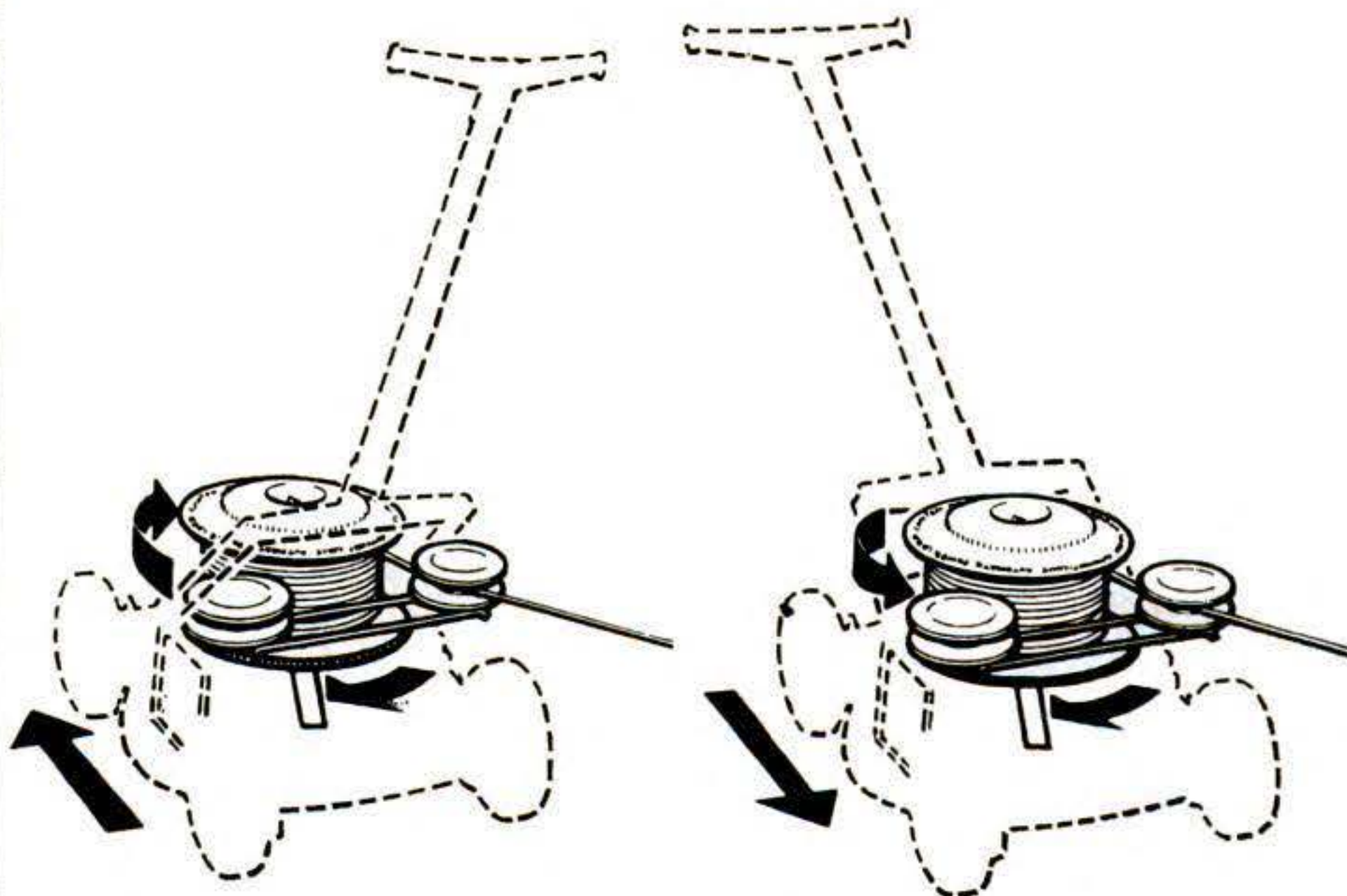


Angled end of this cutter bar strikes any object with glancing blow, thus cannot propel it with force. Spinning at high speed, unsharpened end would be first to strike your foot, too.

Plug-in electrics grow safer and handier with take-up cord reel



The cord reel is mounted on top of the new Sunbeam electric spindle, and just enough tension is maintained via equal-and-opposite reaction to roll it up



as you move toward the source of electricity. As you move away, tension overcomes this reaction. Note that this mower also has a safety grass bag.

discharge housings. Reo is one. Clippings fall behind the machine. Anything the blade hits must bounce around between the housings, rear axle, gearbox, and so on, before it can get out. By that time, it has slowed down and is harmless. Bolens has an optional side or rear discharge.

One maker (Toro) puts a microswitch under the seat; if you stand up while the blade is engaged, the switch shuts off.

Deadman controls. As engineered in two lines (Jacobsen and Lawn Boy), a slight forward pressure or twist on the handle is

required. Take away this pressure and the handle flops rearward, shutting off the drive mechanism. The design requires no work—no actual pushing. But it does require that someone be at the controls to make the mower advance. It cannot run away and mow down a hedge or child.

Deadman control of the forward drive is an absolute must for riding mowers. The machine should be unable to move forward without you on the seat, with your feet where they belong.

Going up! Height adjustments have evolved from clumsy bolt-and-wrench systems (still around on some otherwise pretty sophisticated machines) to height dials or levers that raise and lower all four wheels at once. Another system utilizes dials at each wheel, safely above the housing.

On any large-size rider, you are wiser and safer to have some sort of powered rotor-raising mechanism. This may be hydraulic, as in most large rigs (Deere, I-H, Simplicity, etc.) and many suburban-size mowers (Reo, for one). The reason is that you often travel on areas that should not be mowed, or through turf that should be cut high. On-the-fly changes with non-automatic equipment are dangerous.

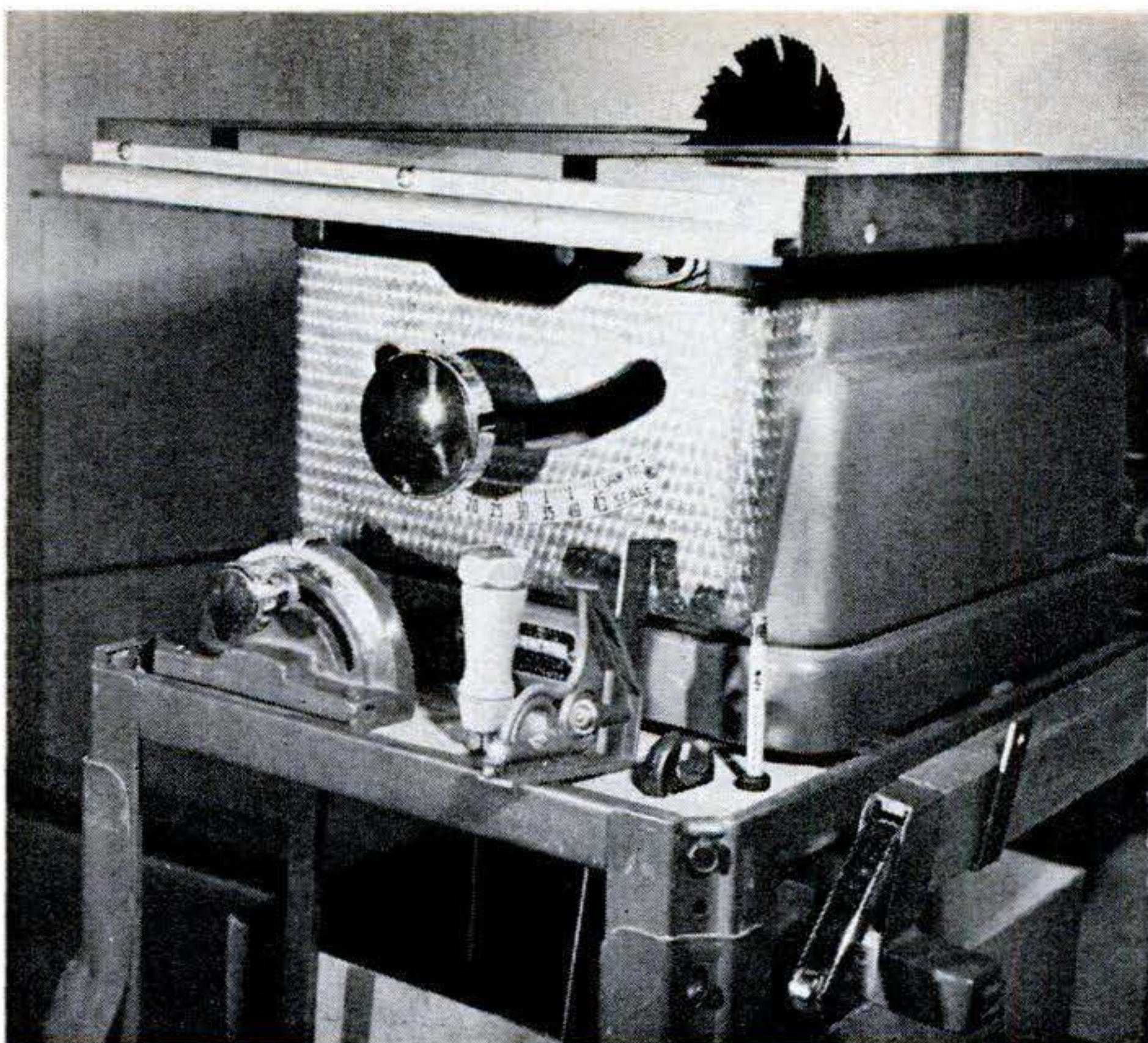
The controls not only make things safer, but they encourage adjustment to the proper cutting height under varying conditions, as required for the best lawn care.

And away you go—safely. New starting

[Continued on page 214]



Biggest safety feature of any mower is intelligent operation. If you mow when there are friends around, keep the grass bag in place, as this Lawn Boy user is doing. This year, manufacturers include safety tips in their instruction books. Study them well and let them be your safety guide every time you mow.



SHORT CUTS AND TIPS

FROM PS READERS

Keep accessories handy with a shelf on your saw

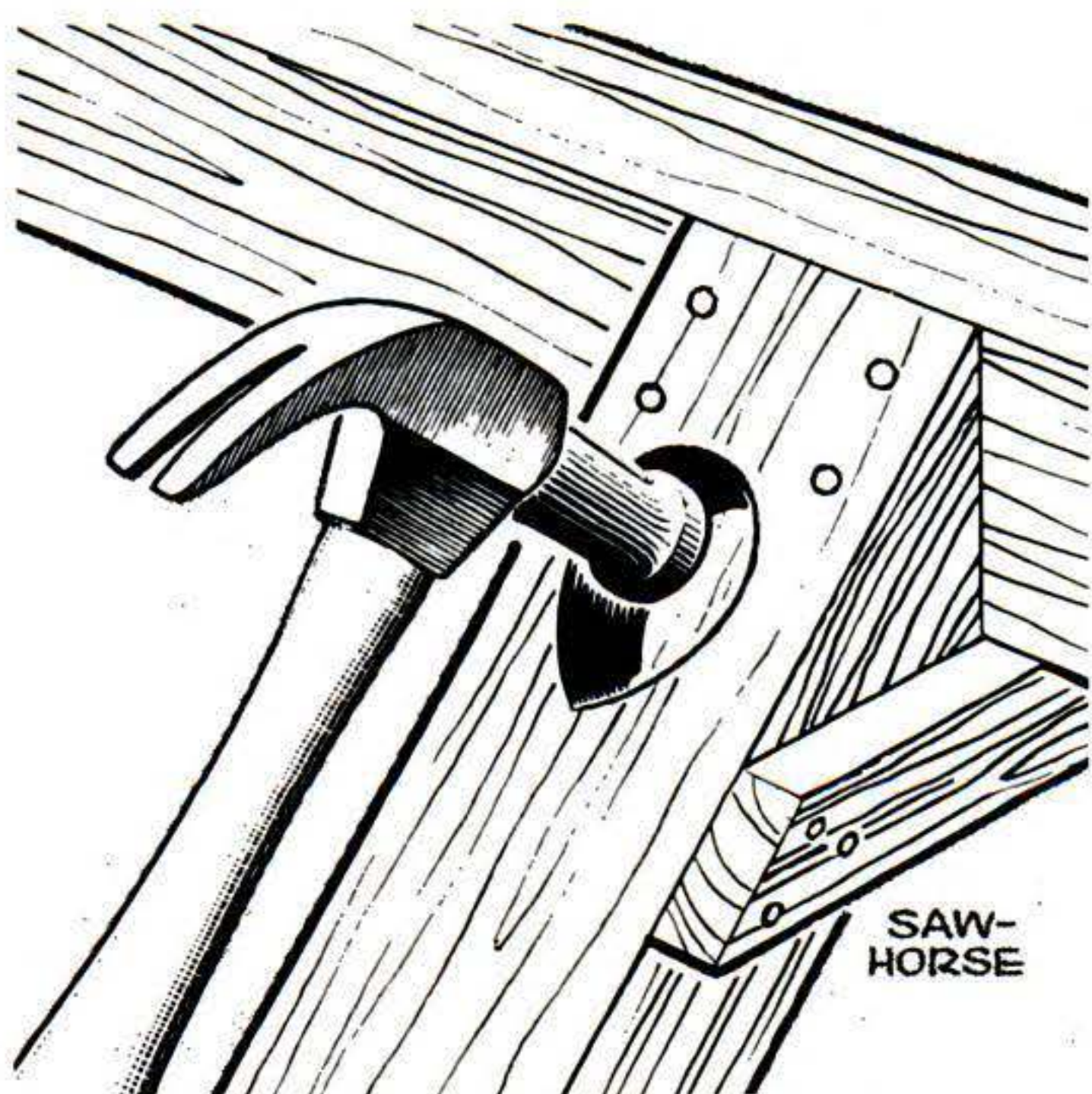
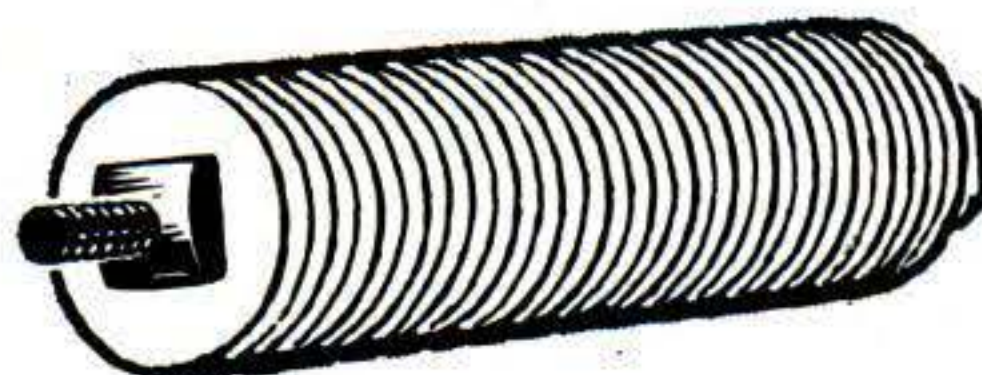
If you're tired of walking to the workbench every time you need an accessory for your table saw, see if there is room on the stand for a board to fit the tools you need. Also, you can bolt a pair of angle brackets along the side of the stand to hold the rip fence when it's not in use. Everything will be handy when needed.

D. E. ANDERSON
Sunnyvale, Calif.

Quick and easy way to paint washers

When I needed to paint the edges of a lot of washers, I put them on a bolt and tightened the nut. This way I painted the whole bunch with a few strokes of the brush.

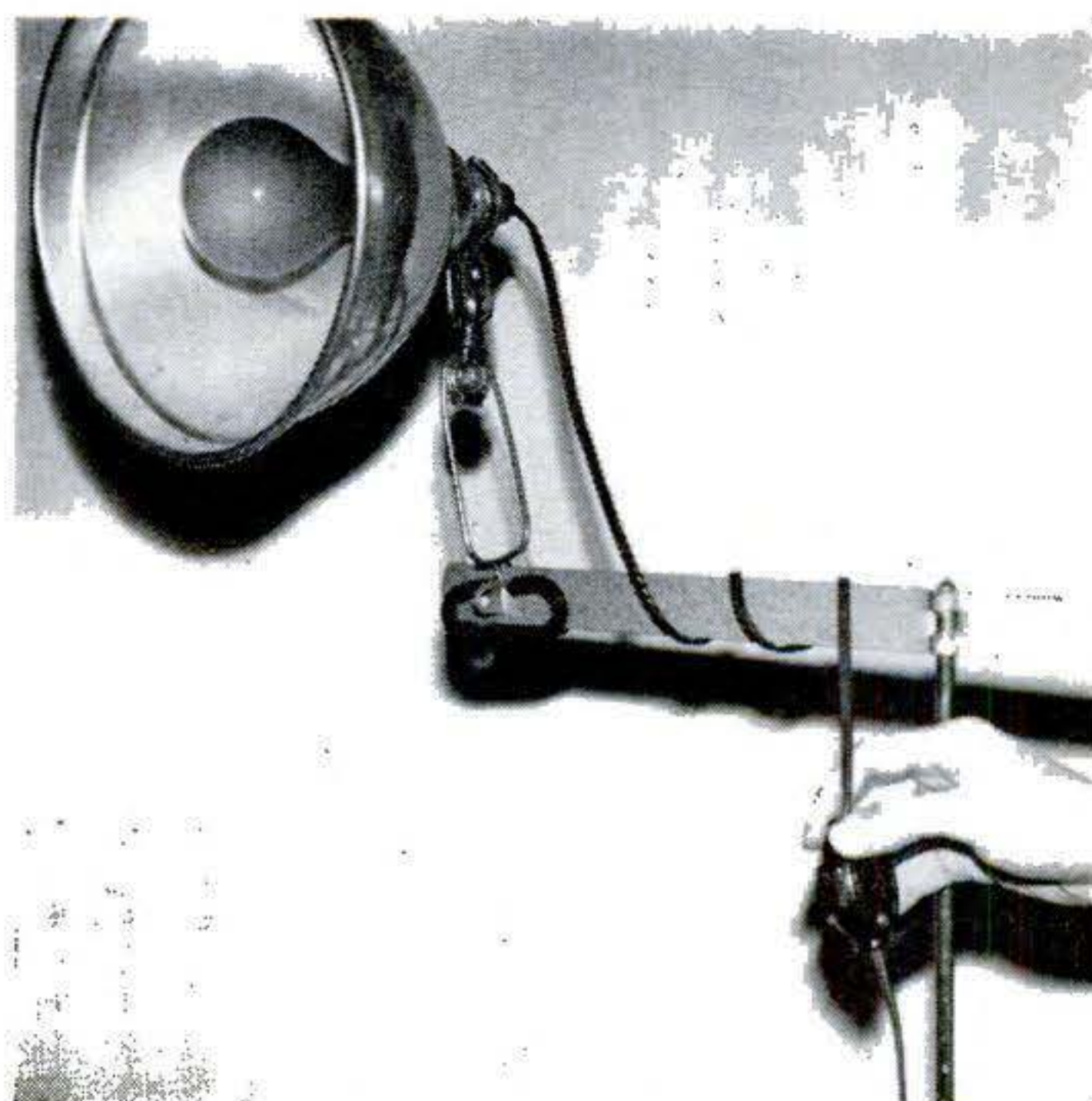
BOB TOM, Indiana, Pa.



V notch holds hammer on sawhorse

Keep track of your hammer when you're working over a sawhorse by chocking it in a notch cut into one of the legs, as shown above. Make it by drilling a hole big enough to take the hammer face, and then form the V with a rasp or a keyhole saw.

DANIEL BOUSHA, Jackson, Mich.



Looped cord protects clamp-on reflector

Clamp-on photoflood units won't fall to the floor and get damaged if you wrap their cords around the arm of the lamp stand several times, as in the photo above. For an extra-secure anchor, clamp the reflector over some of the looped wire.

H. HANSCOM, Elmhurst, Ill.



A BOAT FOR \$12?...you can

By **GEORGE DANIELS**

Here's a little 58-pound boat you can tuck in a car trunk for a quick trip to your favorite fishing spot or let the kids use for water sport. The smallest kicker you can buy will push her along at a breezy pace. With a little larger engine, she'll plane faster than many boats with twice the power. She rows easily, too, with one or two adults aboard. And since you can build her from scratch in a single day for less than \$12, she's hard to resist.

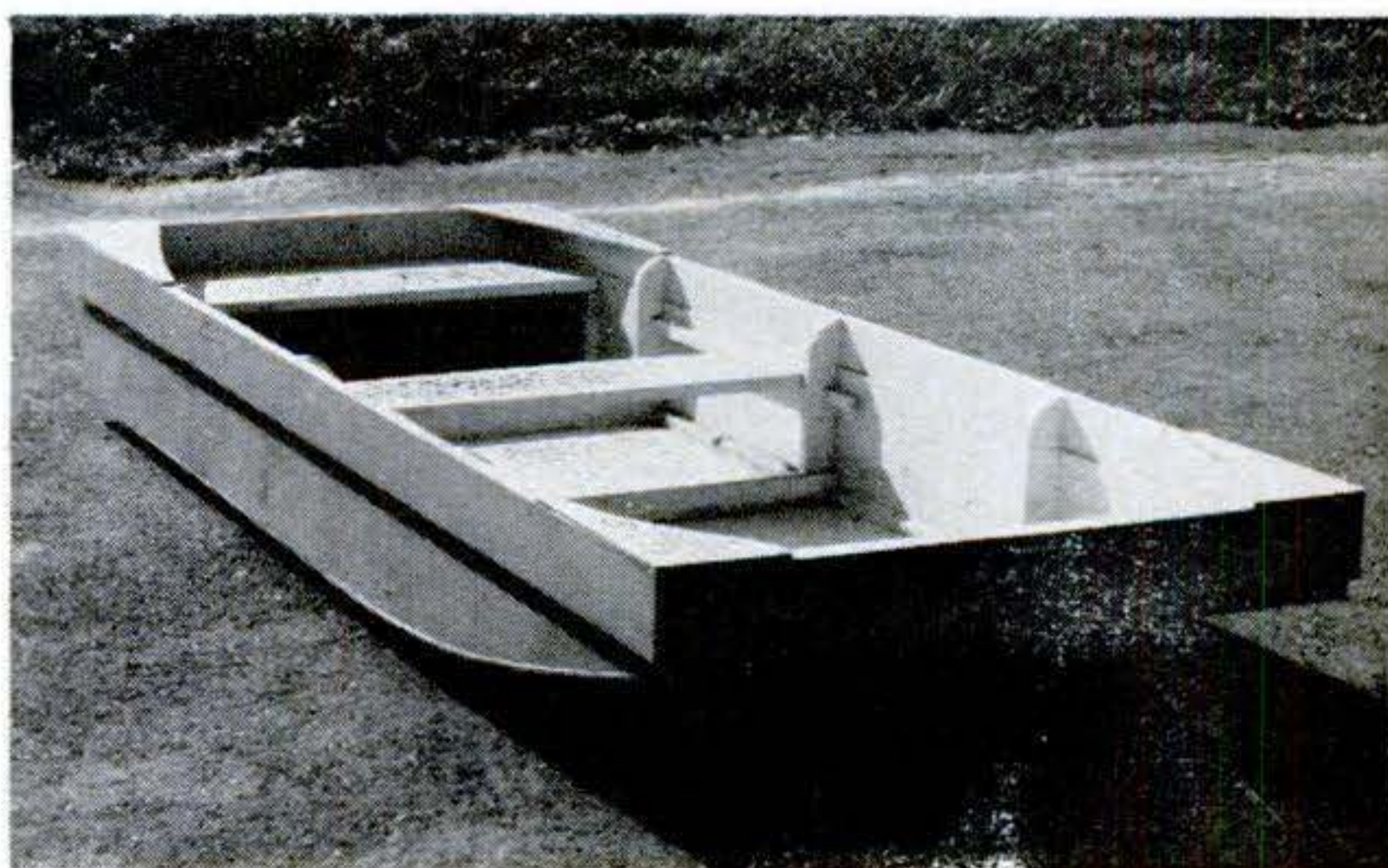
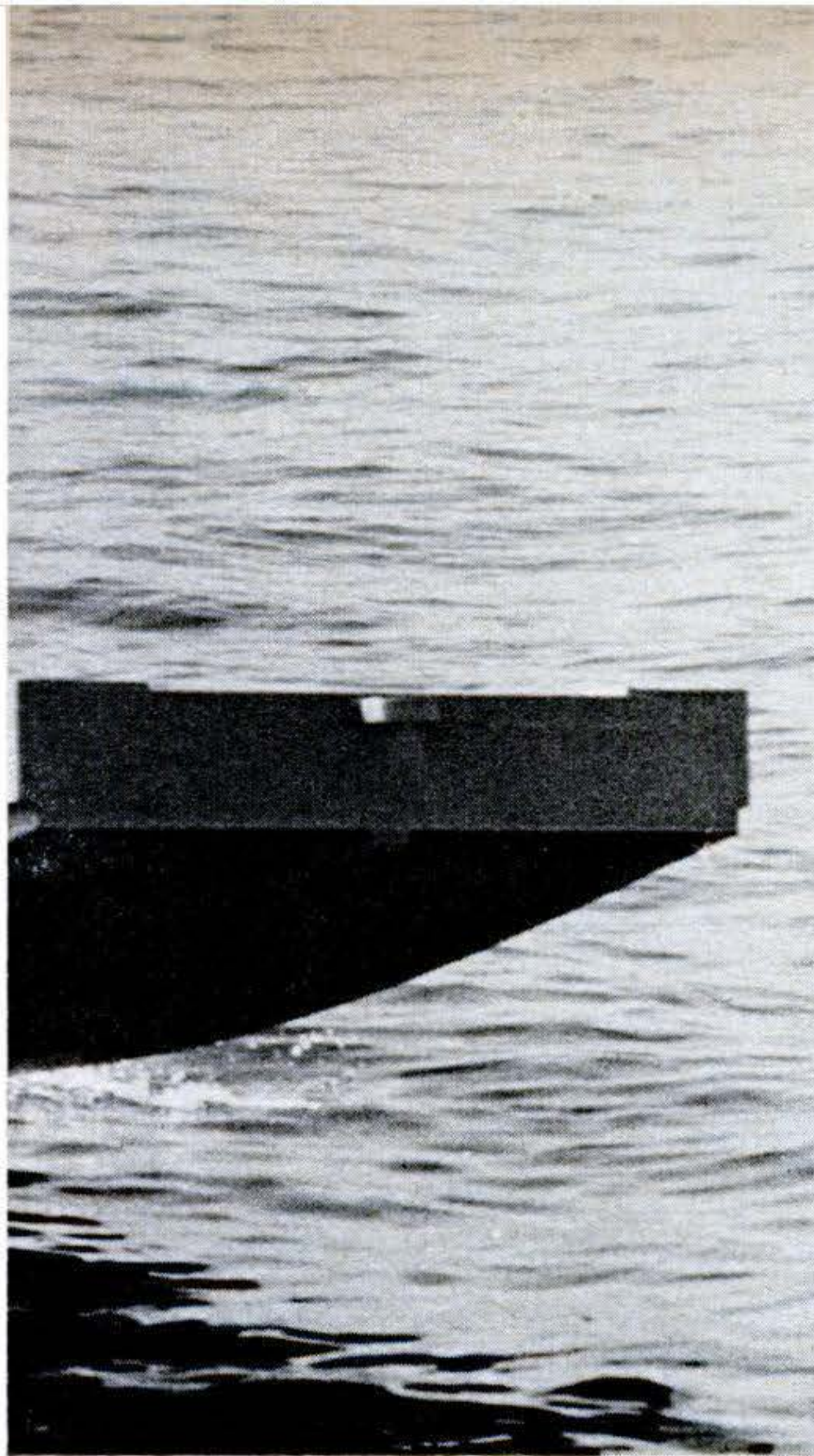
The hull is little more than a plywood box with the bottom upswept at one end. But the flat bottom gives stability against turning over, and lift for planing. The hull is resin-bonded to keep seams permanently watertight without caulking.

All you need is one four-by-eight sheet of $\frac{1}{4}$ " exterior plywood and about \$4.75

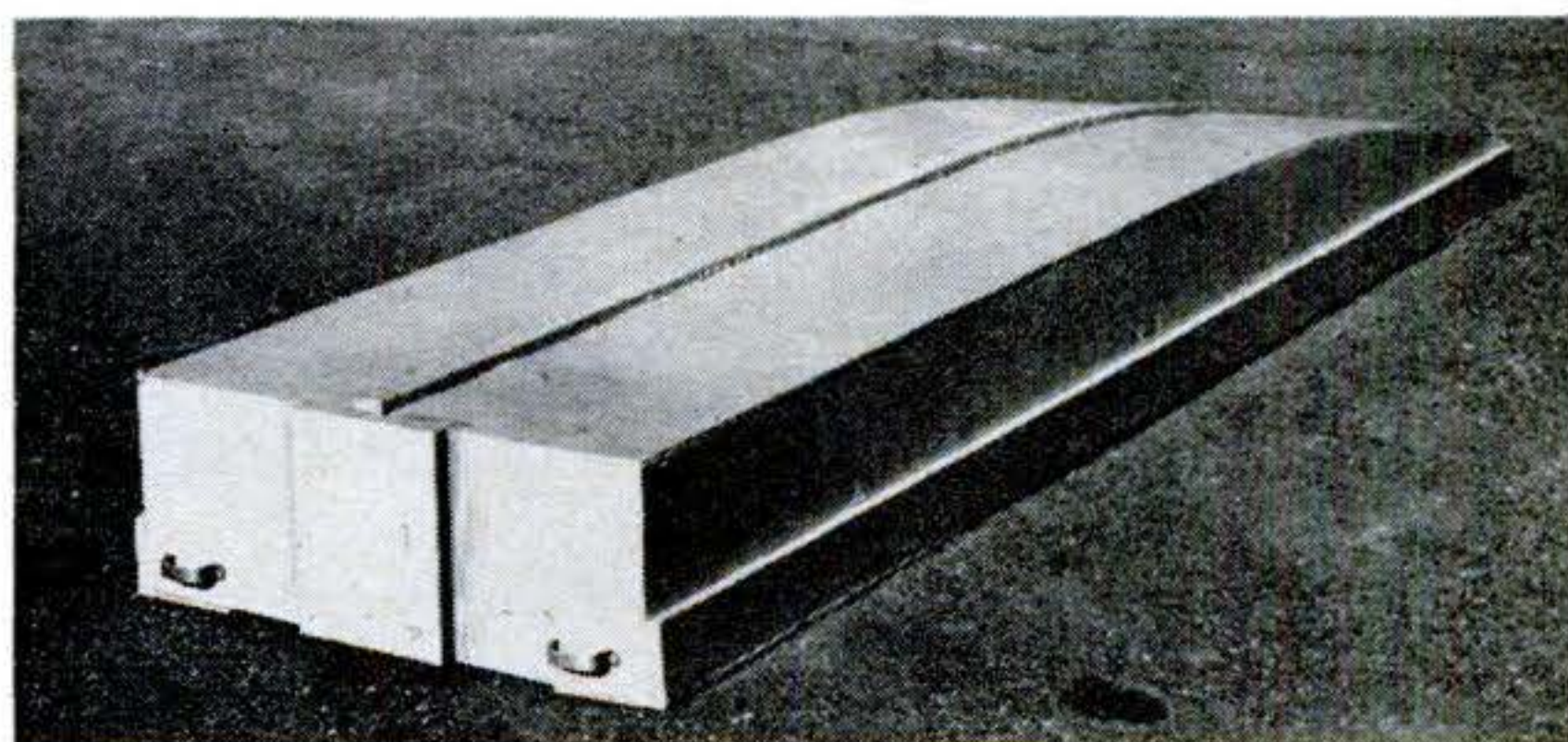
worth of pine stock. You cut the plywood as shown in the drawing. Lay out the parts so the best side of the plywood will be on the outside of the hull.

The bow curve. You get the upcurve of the bow by bending one of the chine strips to form a natural curve. Tack the strip temporarily along the bottom of the side panel, putting the last nail 30" from the bow end. Bend the free end until its lower edge is $5\frac{3}{4}$ " up from the bottom edge of the plywood. Draw a pencil line under it. Remove the strip, tack the two plywood side panels together temporarily, and cut the upcurve on both at once. Also, at the same time, cut the transom angle on the rear end.

Nail and glue the chines along the lower edges of the side panels, using 1" copper nails (driven through the plywood) and two-part resorcinol glue like Elmer's boat glue. Follow instructions on the glue can and coat both surfaces. Place the angle-cut



Only 8' long and 32" wide, this boat can carry two people. It's easy to row; a small outboard makes it fly.



Flat bottom with upswEEP at the bow end makes it stable and gives it the ability to plane fast with little power.

build it

chine ends just $\frac{3}{4}$ " in from the transom ends. After the chine is in place, saw it off back from the bow end exactly the thickness of the bow piece.

Mount the transom and bow pieces between the sides. Cut these $\frac{1}{2}$ " less than the width of the plywood bottom, as the bottom will overlap the sides. Use the bottom itself as a guide since it may be slightly smaller than the dimensions given because of the saw kerf. It's a good idea to seal the end grain on the transom and bow with two coats of glue, allowing about 10 minutes between coats. Plane the bottom edges of the transom and bow pieces to make them flush with the sides.

The bottom goes on after this. Line it up dry first, using a few partly driven brads to hold it for checking. Have a helper hold the plywood down at the transom



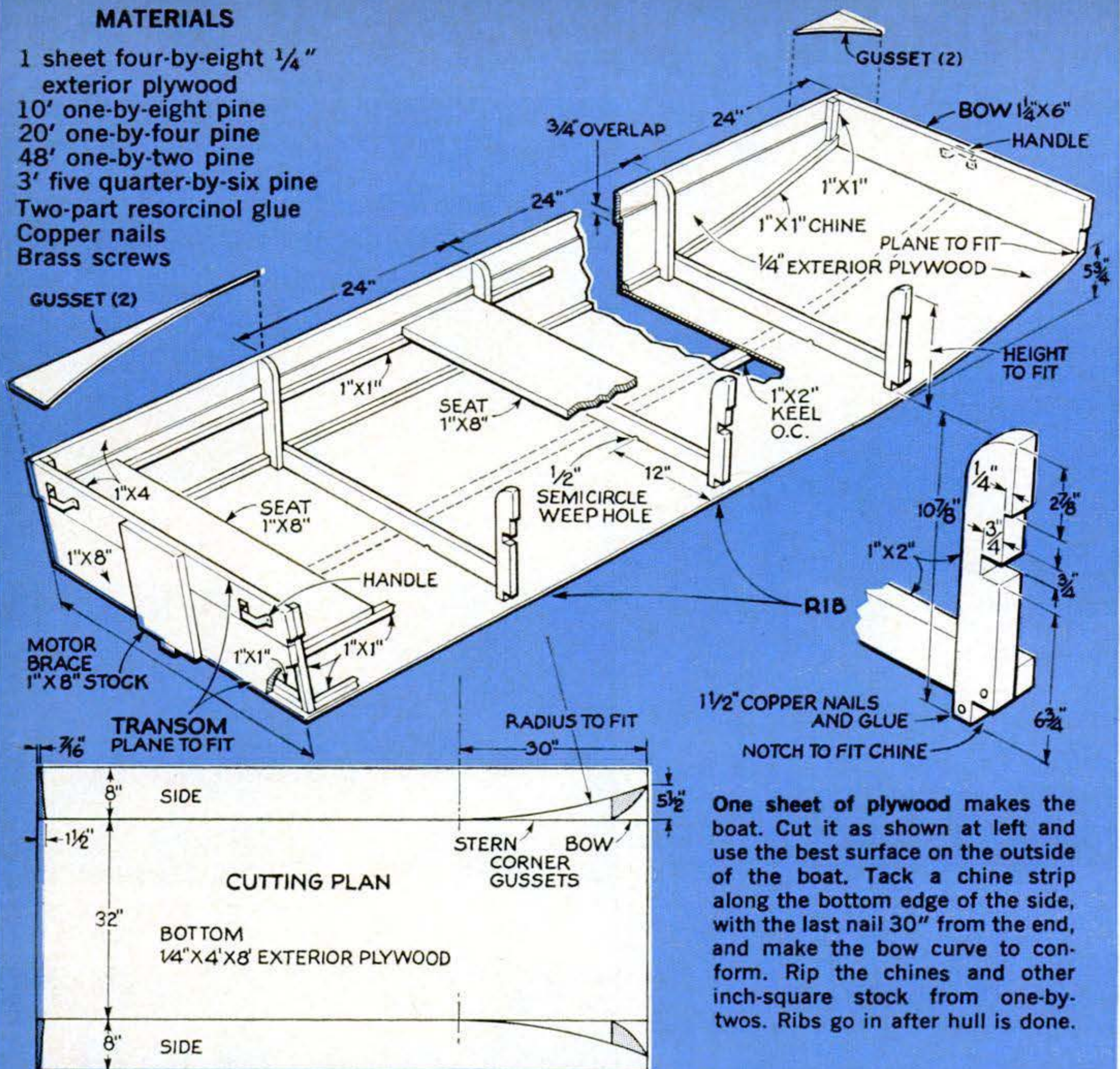
Weight: only 58 pounds, which makes it easy for these two young boys to carry it around. You can haul it in a car trunk.

while you bend it down to see if it fits. Then pull the brads and glue-coat all meeting surfaces. Use two or three $\frac{3}{4}$ " No. 6 flathead brass screws (in addition to copper nails at 4" spacing) to hold down the transom edge. Drive copper nails at 6" intervals along the sides and into the chines. A helper or a couple of C clamps can hold the bottom against the bow piece as you screw down the bow end of the plywood.

Continued

MATERIALS

1 sheet four-by-eight $\frac{1}{4}$ " exterior plywood
 10' one-by-eight pine
 20' one-by-four pine
 48' one-by-two pine
 3' five quarter-by-six pine
 Two-part resorcinol glue
 Copper nails
 Brass screws



One sheet of plywood makes the boat. Cut it as shown at left and use the best surface on the outside of the boat. Tack a chine strip along the bottom edge of the side, with the last nail 30" from the end, and make the bow curve to conform. Rip the chines and other inch-square stock from one-by-twos. Ribs go in after hull is done.

Glue and nails. With the bottom in place, check the seams for firm contact. Squeezed-out glue tells you the seam is tight. Where there's no squeeze-out, drive in an extra nail or two. A little care here gives you a permanently watertight boat that never needs caulking. Plane the front of the bottom flush with the bow piece.

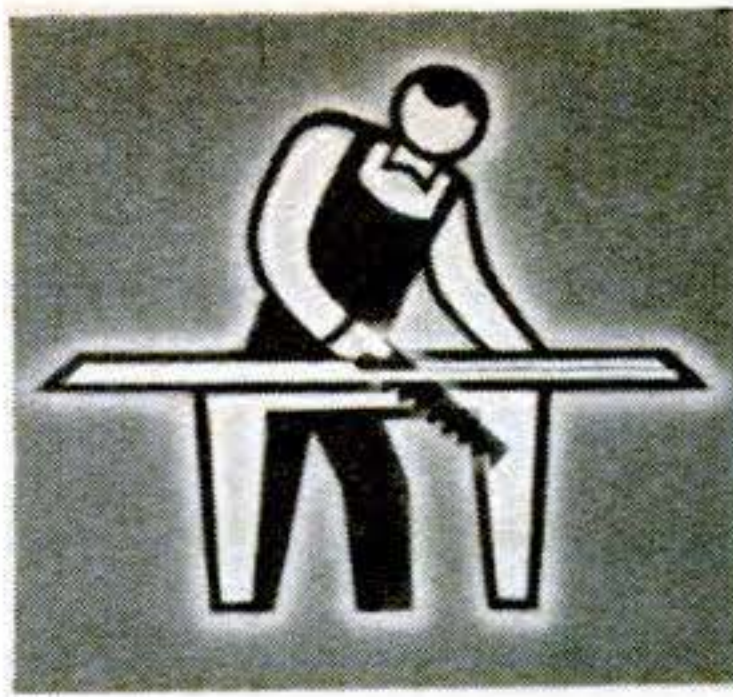
Turn the boat over and mount the vertical corner pieces with nails and glue. Trim off the tops just 3" above the upper edges of the plywood sides. Let the one-by-four upper side strips overlap the plywood $\frac{3}{4}$ ", and join the seams with nails. Edge-glue the one-by-four piece across the top of the transom.

Cut and fit the ribs. Mount them in the hull with glue and nails. Attach the seat supports at the same time. Put on the keel

strip with glue, nails, and $1\frac{1}{2}$ " No. 8 flathead brass screws into the transom, ribs, and bow piece. Mark the rib locations on the bottom in advance so the screws won't miss the ribs. Drive some nails down through the bottom into the keel.

It's a good idea to wipe off excess glue as you go along. Then you can smooth down any irregularities in the plywood edges with a plane or open-coat sandpaper. Finish with two coats of quick-drying marine paint.

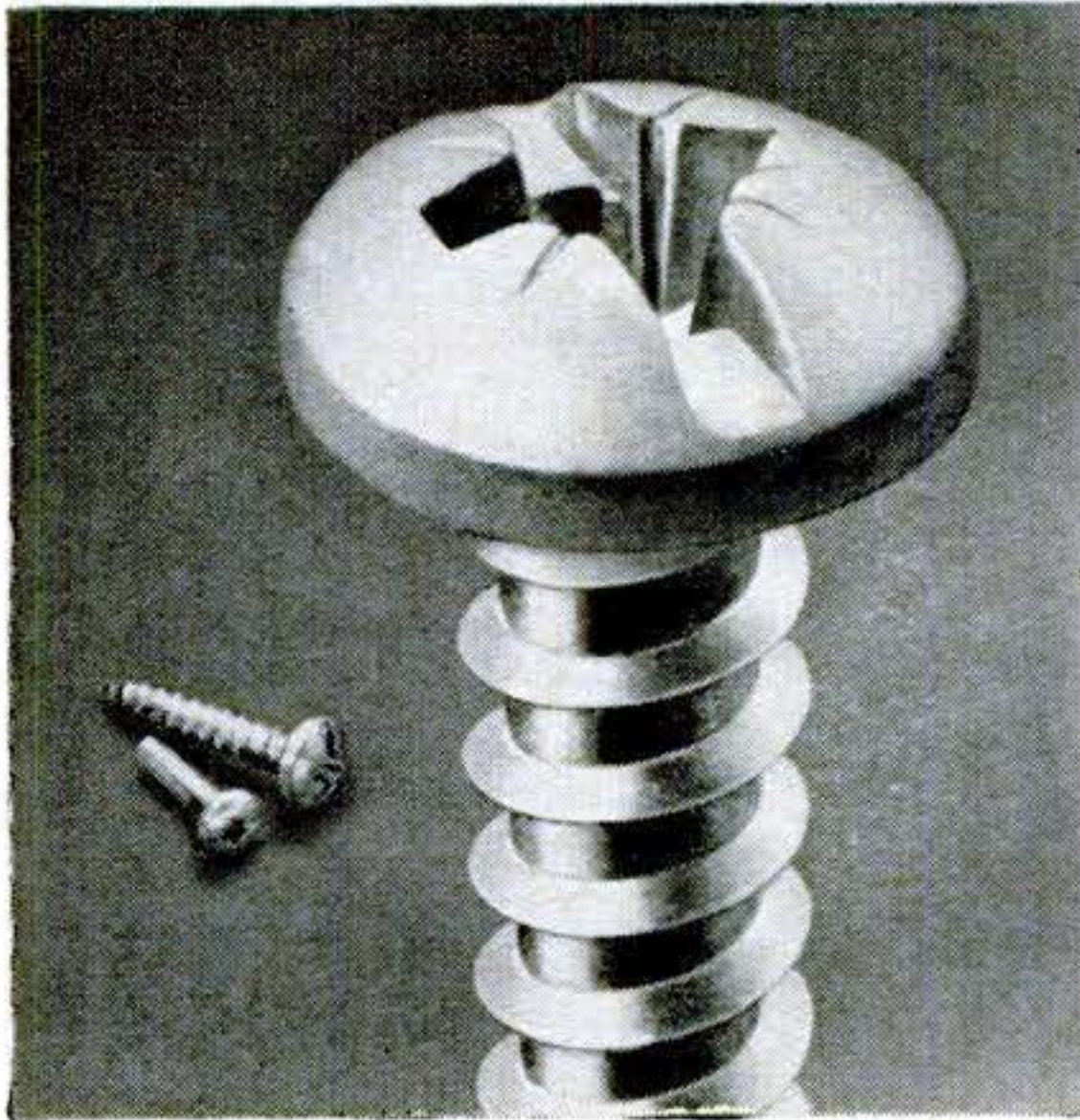
When the paint dries, your boat is ready for launching. A hint: Do not nail the seats in place until you've given the boat a trial run. You can then shift your position in the boat to match the trim to the motor you're using. Get the feel of the boat before trying high-speed maneuvers. **PS**



Shop Talk

By ROBERT P. STEVENSON

Now here's a screw with a head that will fit all kinds of screwdrivers



A new kind of screw makes a lot of sense. For tightening or adjusting, the head takes either a slotted or a Phillips screwdriver. Used for production-line assembly, it accepts a powered Pozidriver in a special recess—a patented design of the Phillips International Company. The driving walls in this recess are vertical. This, and a slight undercut, are said to improve engagement of powered driving bits as torque increases. The Tri-Drive screws (machine or tapping) are a product of the Russell, Burd-sall & Ward Bolt and Nut Co., Port Chester, N.Y.

Need to know what moldings you can buy?

A fine bit of reference material came to me a few days ago—a four-page booklet that illustrates the shapes of wood moldings commonly available across the U.S. You can all get one. It's free. Write to Western Wood Moulding Producers, Skyline Building, Portland, Ore. 97221 . . . And speaking of booklets, you may want to know that Sears, Roebuck now offers a \$2 manual to help owners make repairs on their Kenmore automatic washers.

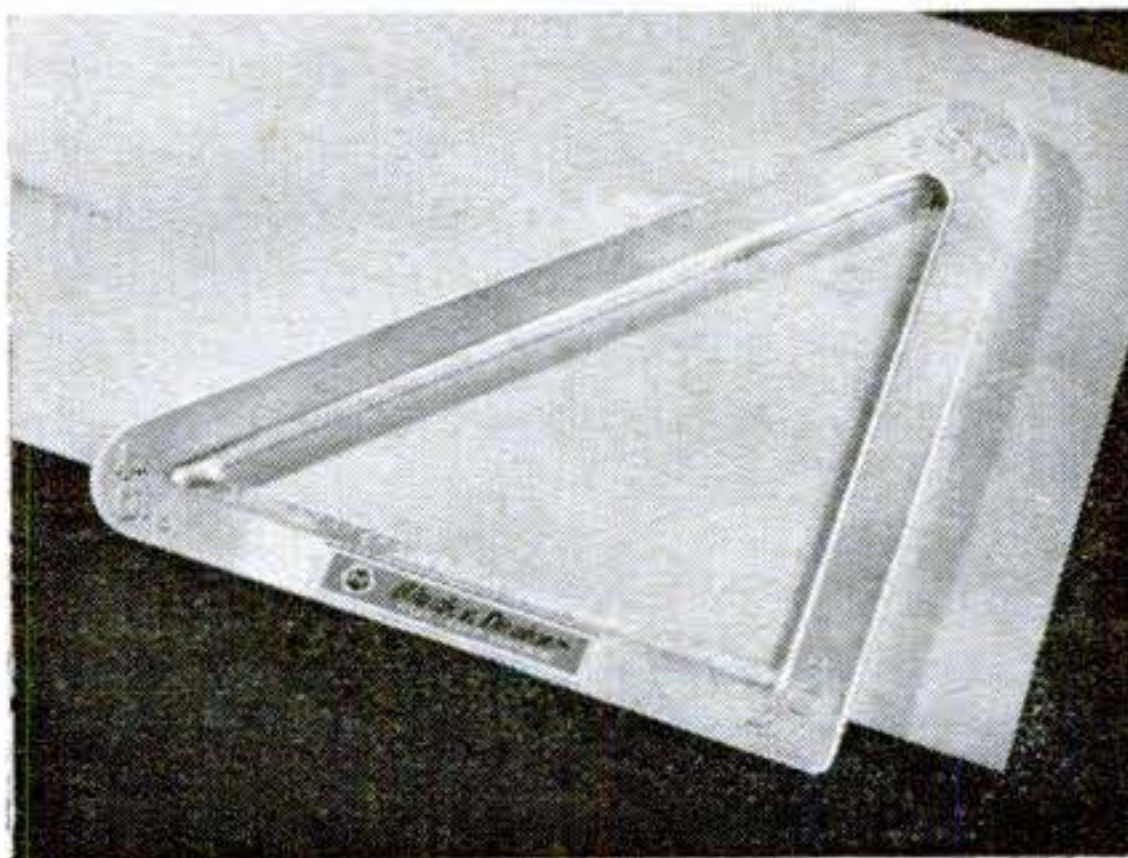
Safety glasses can be in style—and safe too. Take a look at these



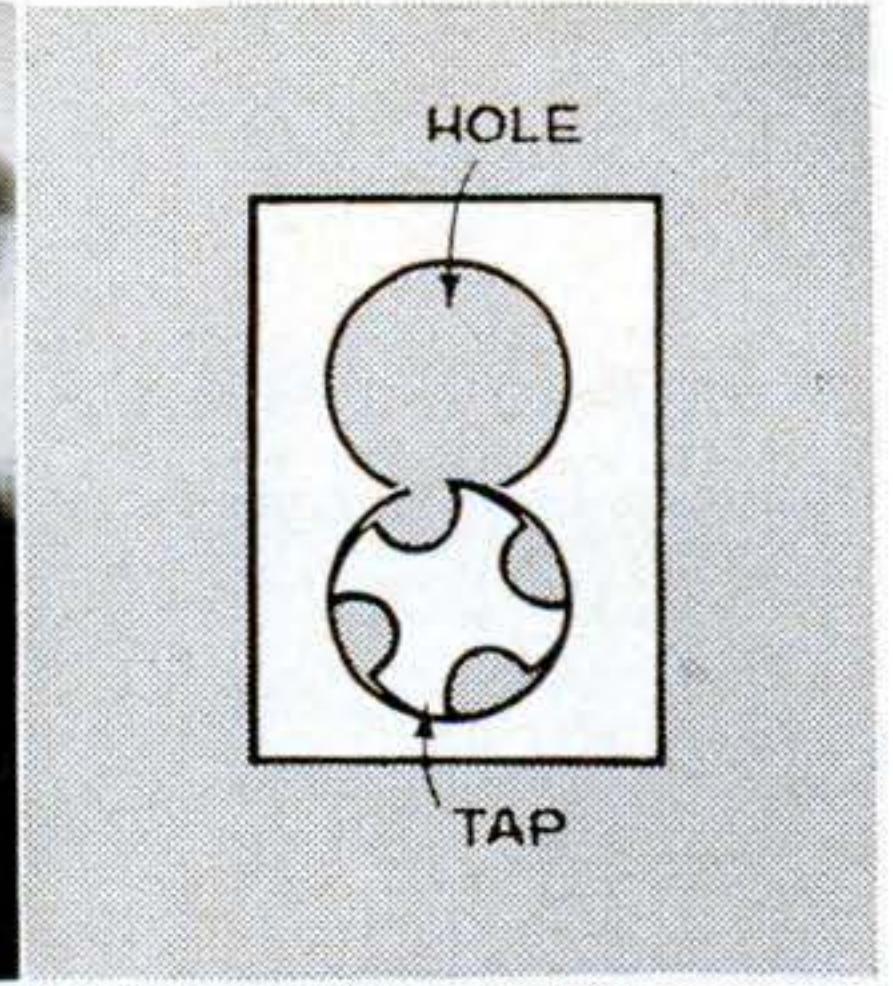
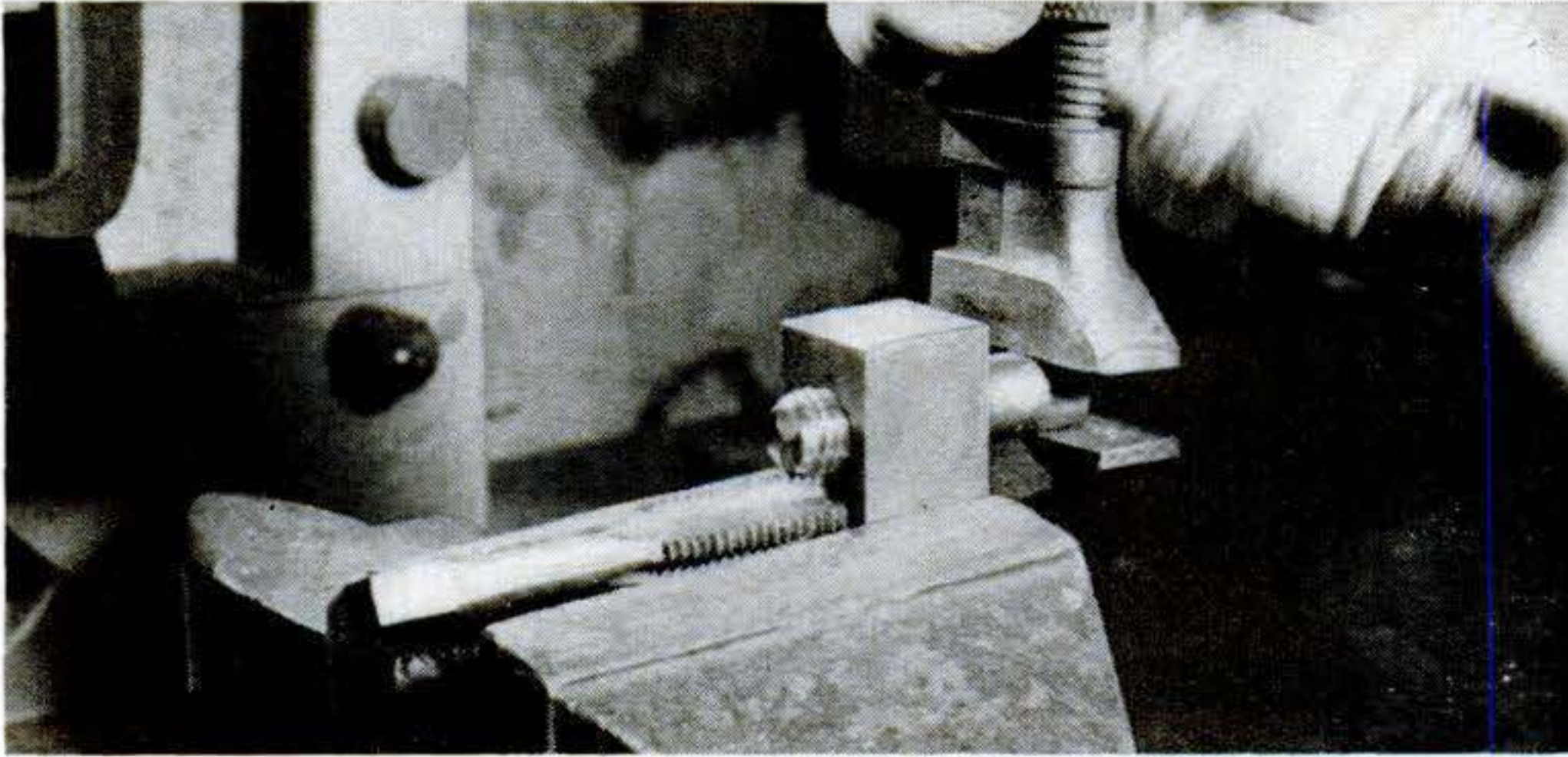
New safety glasses introduced by General Scientific Equipment Co., Philadelphia, combine smart styling and light weight with all government safety requirements. You can wear them alone or over other glasses. They're \$10 a dozen, clear or green lens, for use in industrial plants where regulations specify protection for workers and visitors. A pair of such glasses ought to be included in standard equipment on hand in home workshops, too.

Report on three tools you ought to know about

You need only one hand to operate new clamping pliers from Channellock, Inc., Meadville, Pa. A jaw operator you pull back with your fingers opens the new Griplock to fit the work. Let go, and the jaws close to just the right position for clamping. A fingertip lever releases the grip. The 10" tool comes with straight or curved jaws. Price: \$4.90 . . . You get a burnout-protected motor, helical gears, antifriction bearings, easy-to-use depth and level controls, sawdust-ejection system, bind-free lower guard, and a variable-torque clutch in Skil's new Model 574 portable circular saw. Price: \$39.95, with a 7¼" hard-tooth combination blade, blade wrench, and three-wire cord and plug . . . A new accessory that I intend to keep close to all my portable tools is Black & Decker's aluminum cut-off guide, shown at left. It provides exact 45- or 90-degree cuts with any type of portable saw—circular, saber, or jig. You can use it as a router guide, too. B & D also makes an all-angle adjustable cut-off guide. Either tool is \$3.99.



Short Cuts for Machinists



An easy way to cut left-hand threads with a right-hand tap

You don't need a lathe or a left-hand die to cut a male left-hand thread. Do it this way: For a $\frac{3}{8}$ " rod, drill a $\frac{3}{8}$ " hole in a piece of steel. Then drill a $\frac{5}{16}$ " hole beside it so that the edges of the two holes touch. Tap the $\frac{5}{16}$ " hole part way with a right-hand $\frac{3}{8}$ " tap. Leave the tap in the hole with a land protruding into the $\frac{3}{8}$ " hole.

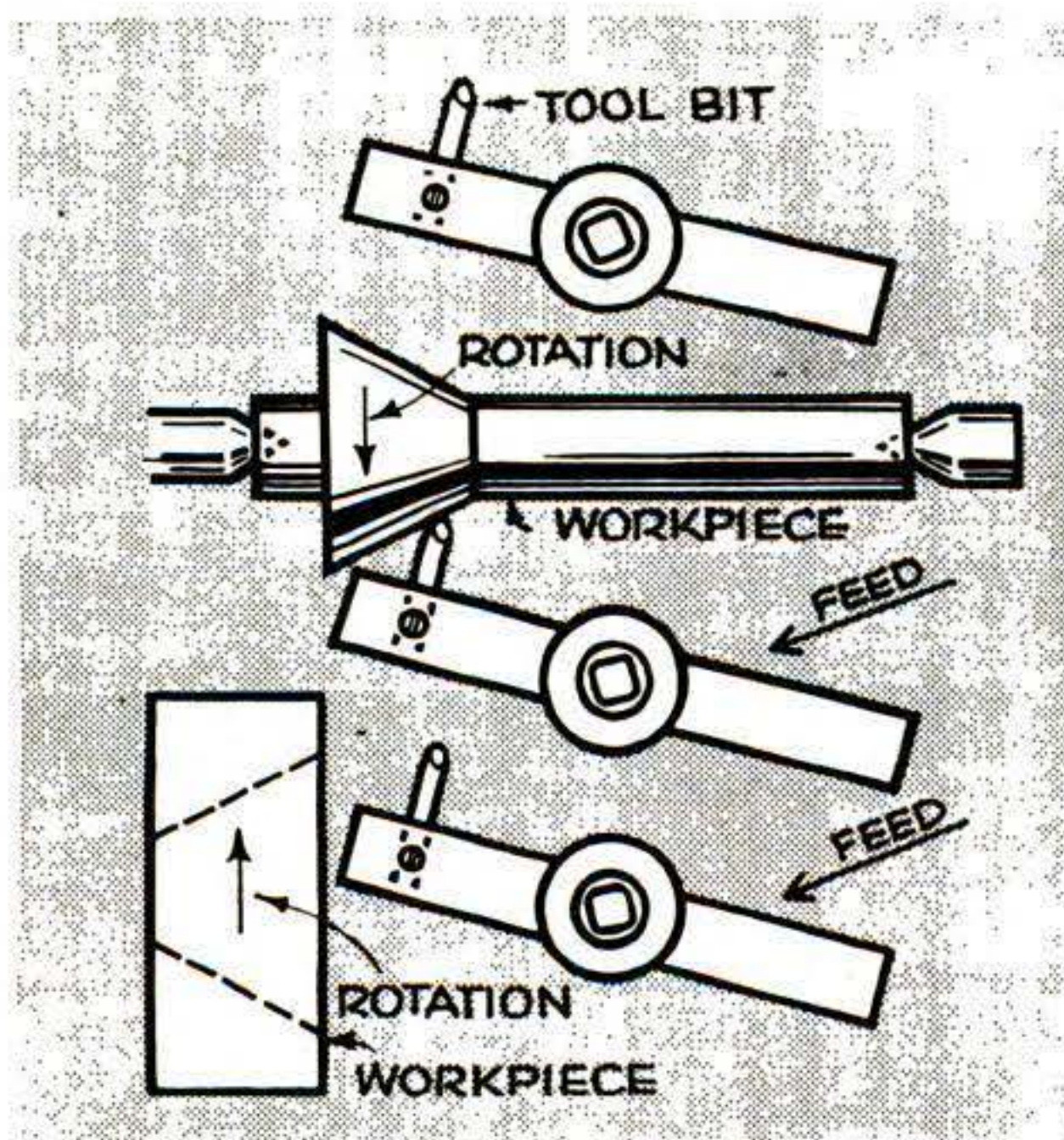
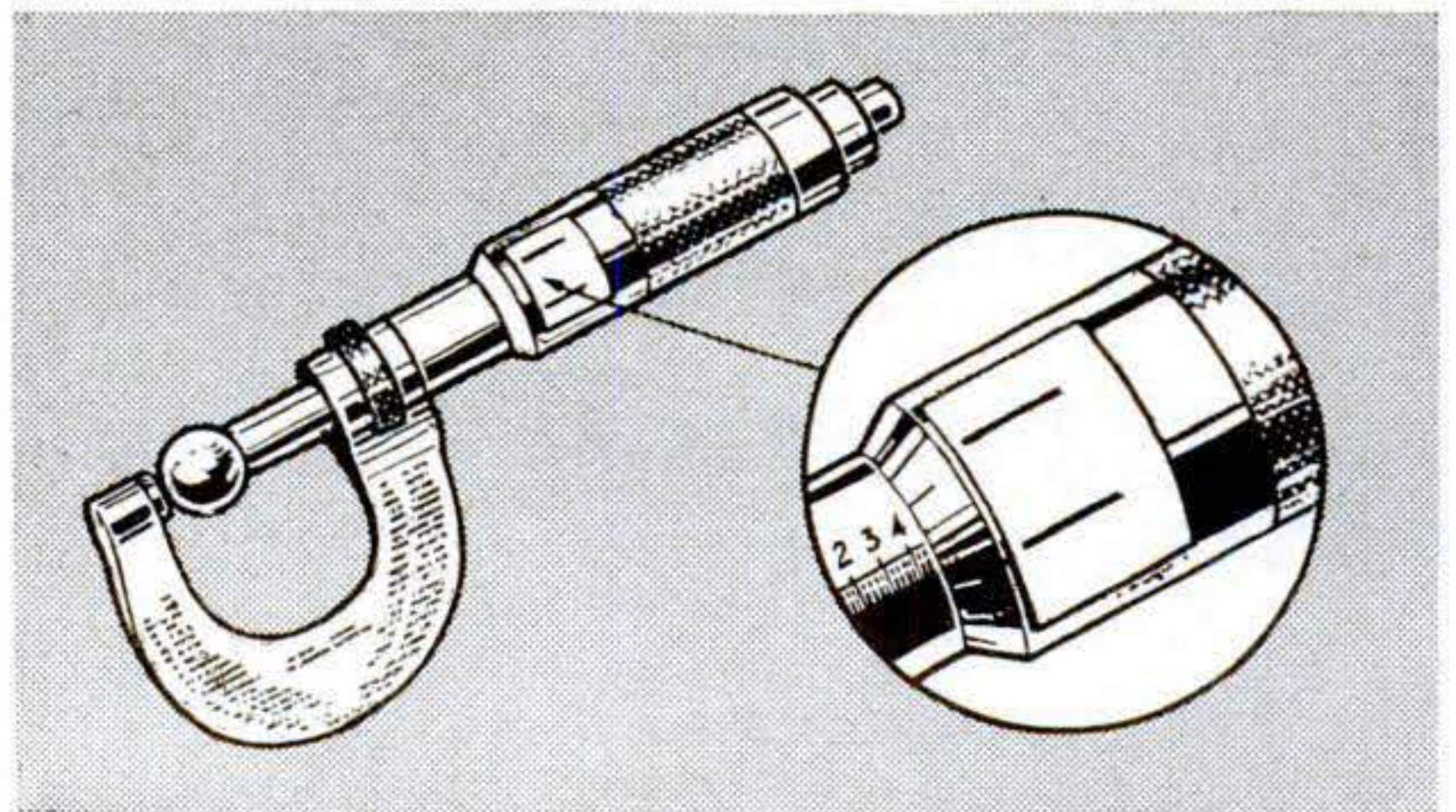
Put the rod in the $\frac{3}{8}$ " hole from the opposite side. Turn it to the left to get a left-hand thread. If the threads cut oversize, run the tap in farther. It will crowd into the $\frac{3}{8}$ " hole and cut deeper. It's best to first cut the rod a bit oversize, then bring it down to size with a second cut.

JAMES W. CARR, Oil City, Pa.

Speed up mike measurements

When I have a lot of pieces of the same size to measure, I speed up the job in this way: I put a small patch of masking tape on the thimble of my micrometer opposite the desired reading. I then mark off the tolerance range on the masking tape. A quick glance shows me if the piece is within the tolerance limits. Pull the tape off when the job's done.

A. R. TANNER, Poughkeepsie, N.Y.



Making matching male and female tapers

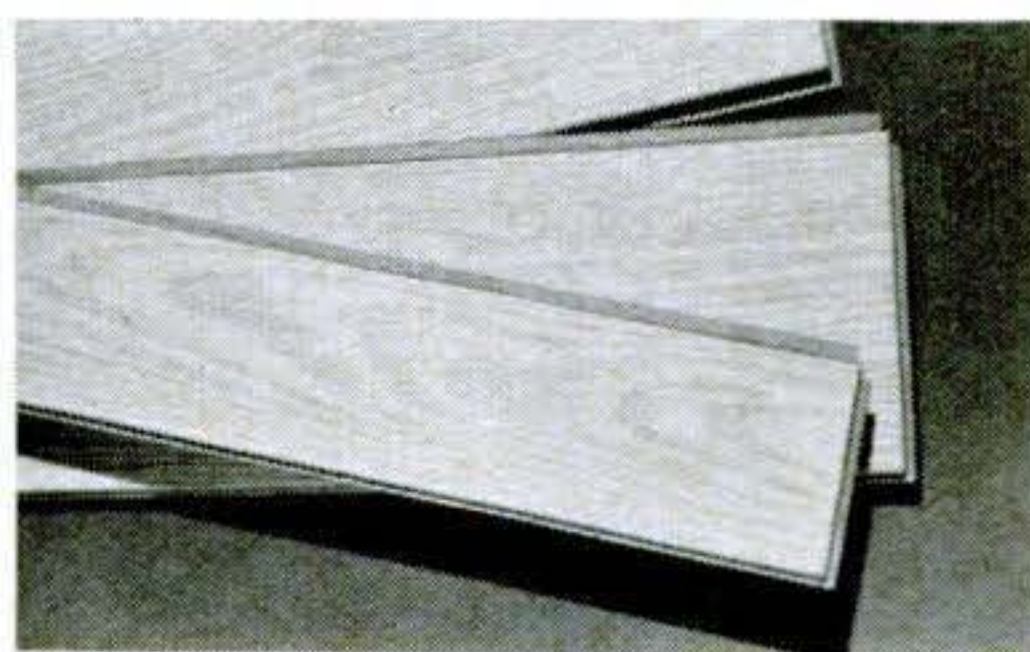
Here's a simple way to handle the tricky job of machining matching male and female tapers. Mount the boring bar in the tool post with the tool bit set at center height and ground for turning—not boring. Set the compound rest for the required taper. You then turn the male taper with the lathe running forward and feed from right to left. Use the same setup and bore the female taper with the lathe running backward as shown in the drawing at left. On a lathe that has a threaded spindle, be sure to set the chuck tightly, and take light cuts to avoid backing the chuck off the spindle.

L. W. SMITH, Washington, D.C.



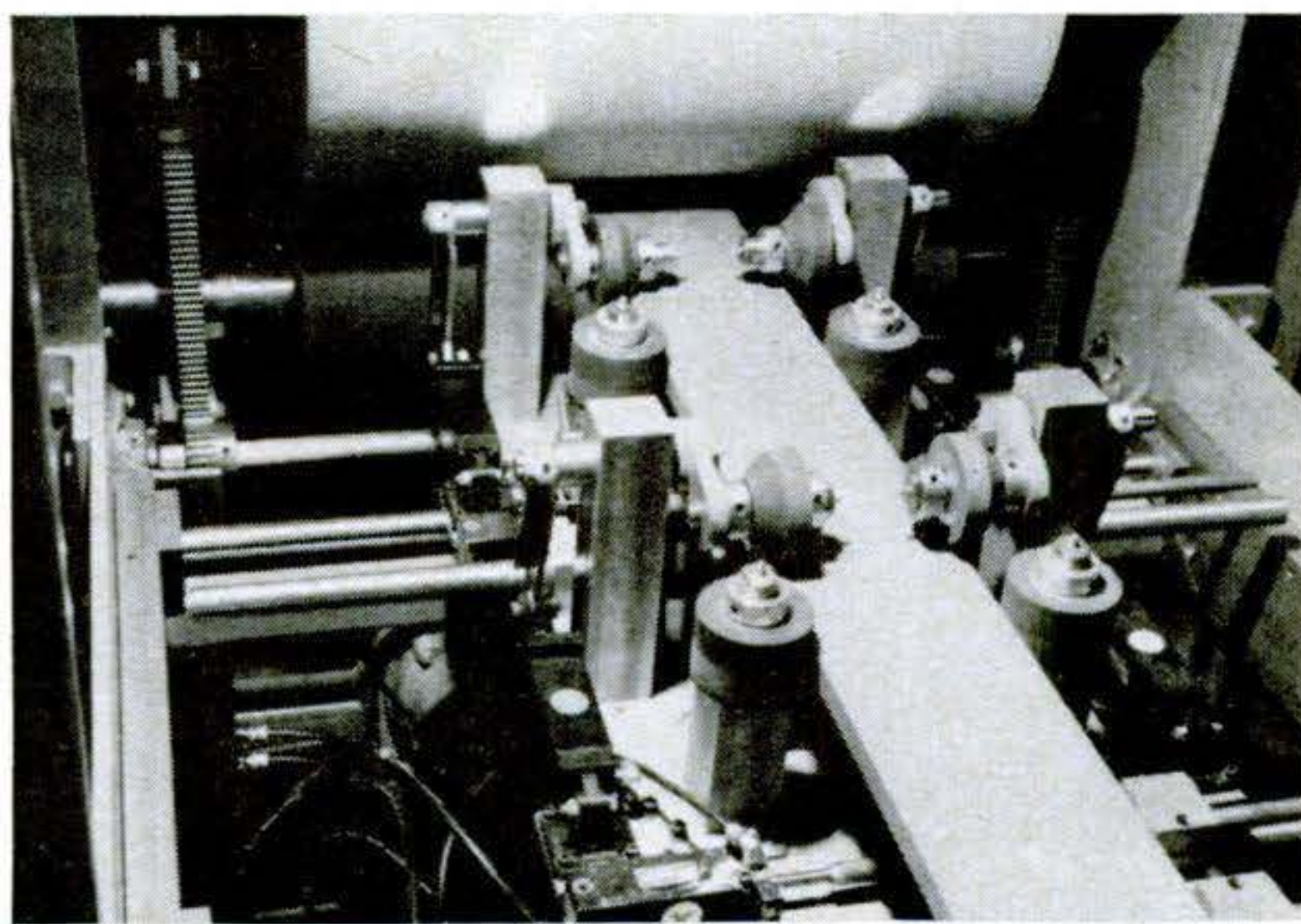
New ceiling board has rough-hewn wood texture

New, deeply embossed wood-grain ceiling board gives rooms an Early American flavor. It comes in $5\frac{3}{8}$ ", $6\frac{3}{16}$ ", and $8\frac{3}{16}$ " widths for random effect. The boards, each 48" long, have tongue-and-groove edges like those of ordinary ceiling tile. You can cement them to an existing ceiling or staple them to furring strips. Wood Grain board is made by Armstrong Cork with a two-color finish—beige in the graining and a washable white topcoat.



Cast-iron pipe fits between studs

Hubless drain, waste, and vent pipe, and fittings, make joints compact enough to fit 3" pipe in a two-by-four wall. Called CI No-Hub joints, they go together with neoprene sleeves and stainless-steel clamps. This makes assembly a fast job. And there's no waste since you can use the cutoffs. You can buy it in 2", 3", and 4" sizes from most plumbing suppliers.



New lumber overlay keeps splinters down and paint on

Vulcanized cellulose-fiber sheet now being bonded to the face sides of lumber provides a superior surface for paint. It's said to more than double paint life in most applications. Called Forbon, the overlay is abrasion-resistant, withstands extreme temperature and humidity changes, and eliminates splinters. Lumber covered with it cuts like ordinary stock. Using continuous-roll laminators such as the one above, the Wood Products Div. of Potlatch Forests, Inc., is putting Forbon on siding, soffit and fascia boards, plywood, and dimension lumber.

You Can Make

Save money by buying cheaper, sheathing-grade lumber and milling it on your own saw



Your Own Paneling

By RICHARD DAY

You can spend \$140 to buy one-inch-thick paneling for an average-size room, but you can make the paneling yourself from sheathing-grade lumber for half that. You'll need a radial or table saw to do the edge-milling.

Select the lumber from a dealer who keeps his sheathing stock indoors, clean and dry. No. 2 spruce, fir, or white pine is excellent; so is No. 1, but it costs more. Make sure the boards have one clean, relatively undamaged face, and are not too warped to push through the saw. In V-joint paneling, damage within an inch of

the edge won't hurt—this much will be trimmed away in cutting the V joints.

You can use one-by-four, one-by-six, or wider boards. Use one width, alternate widths, or some of each size installed at random. When milled, a one-by-four will cover $3\frac{1}{4}$ " of wall; a one-by-six, $5\frac{1}{4}$ ". Succeeding widths, when installed, cover about $\frac{1}{4}$ " less than the nominal width.

Unless you want beveled end-joints in the wall, buy the boards long enough to reach from floor to ceiling. Choose the cleanest, best-looking side for the face. Make this decision before you cut the V

Continued

Some of the types of paneling you can make on a saw



PLAIN



DOUBLE V



GROOVED



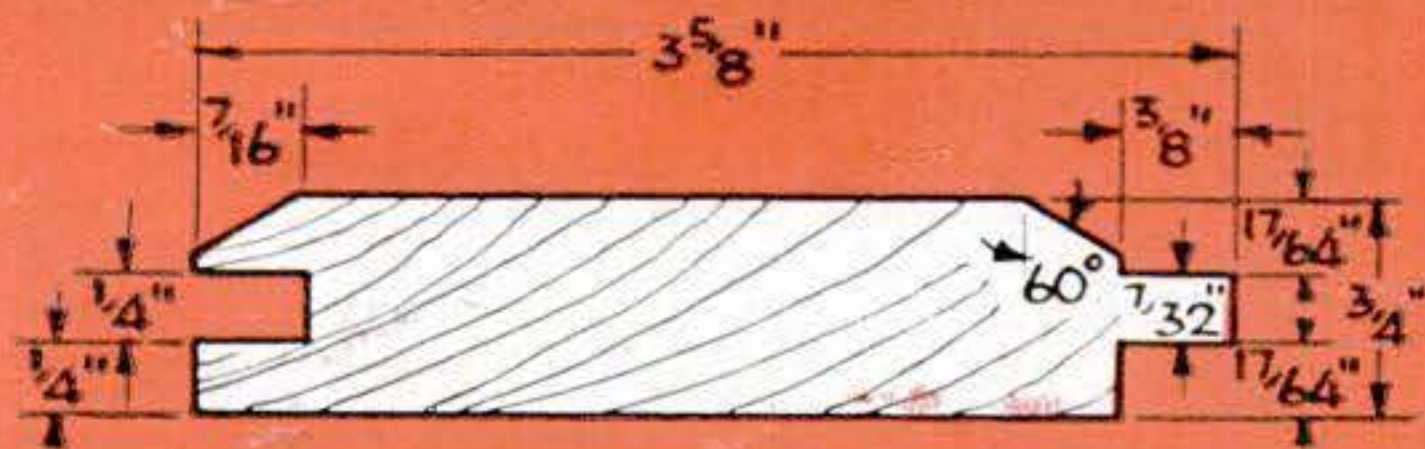
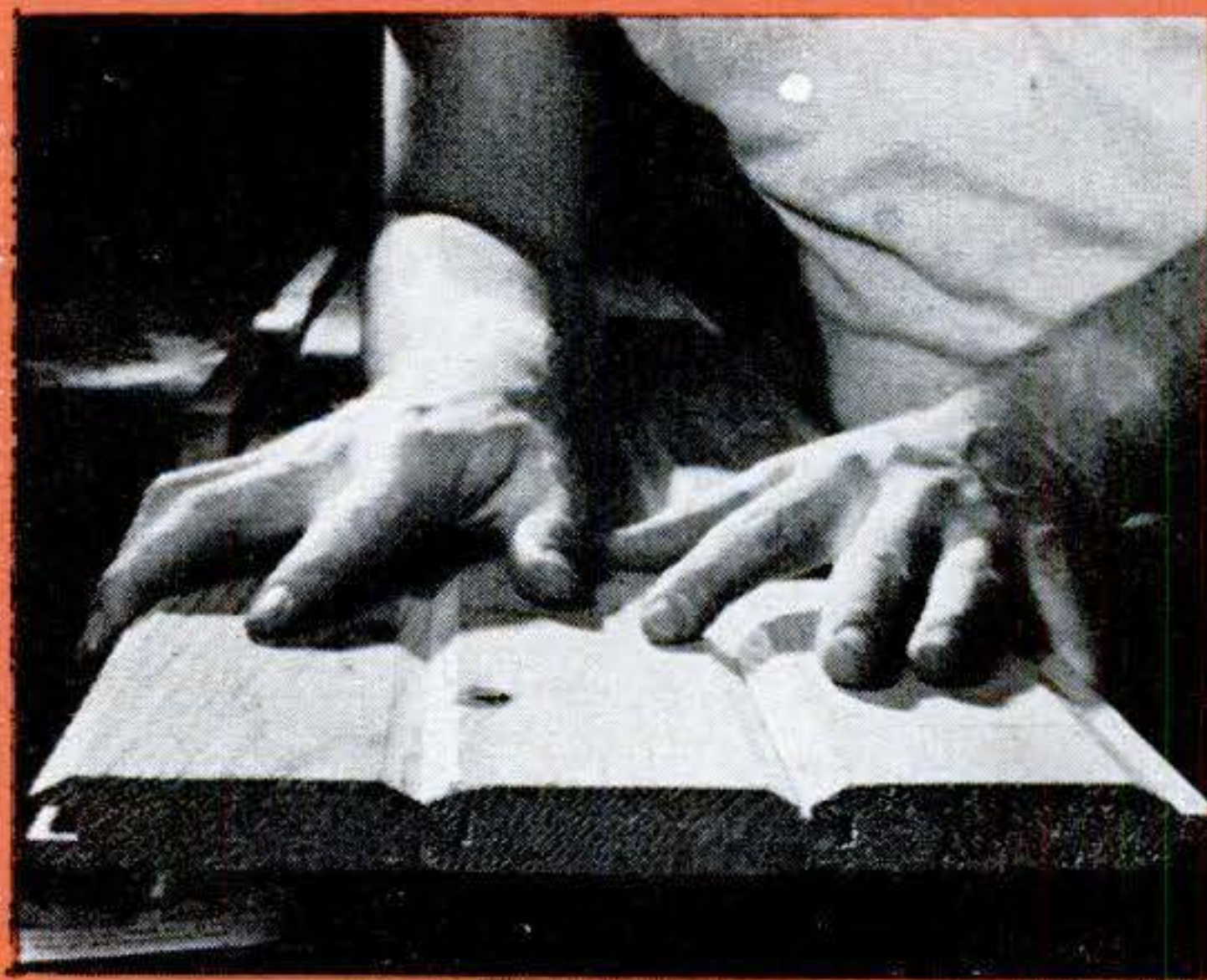
CENTER-GOUGE



EDGE-GOUGE



SPLINED



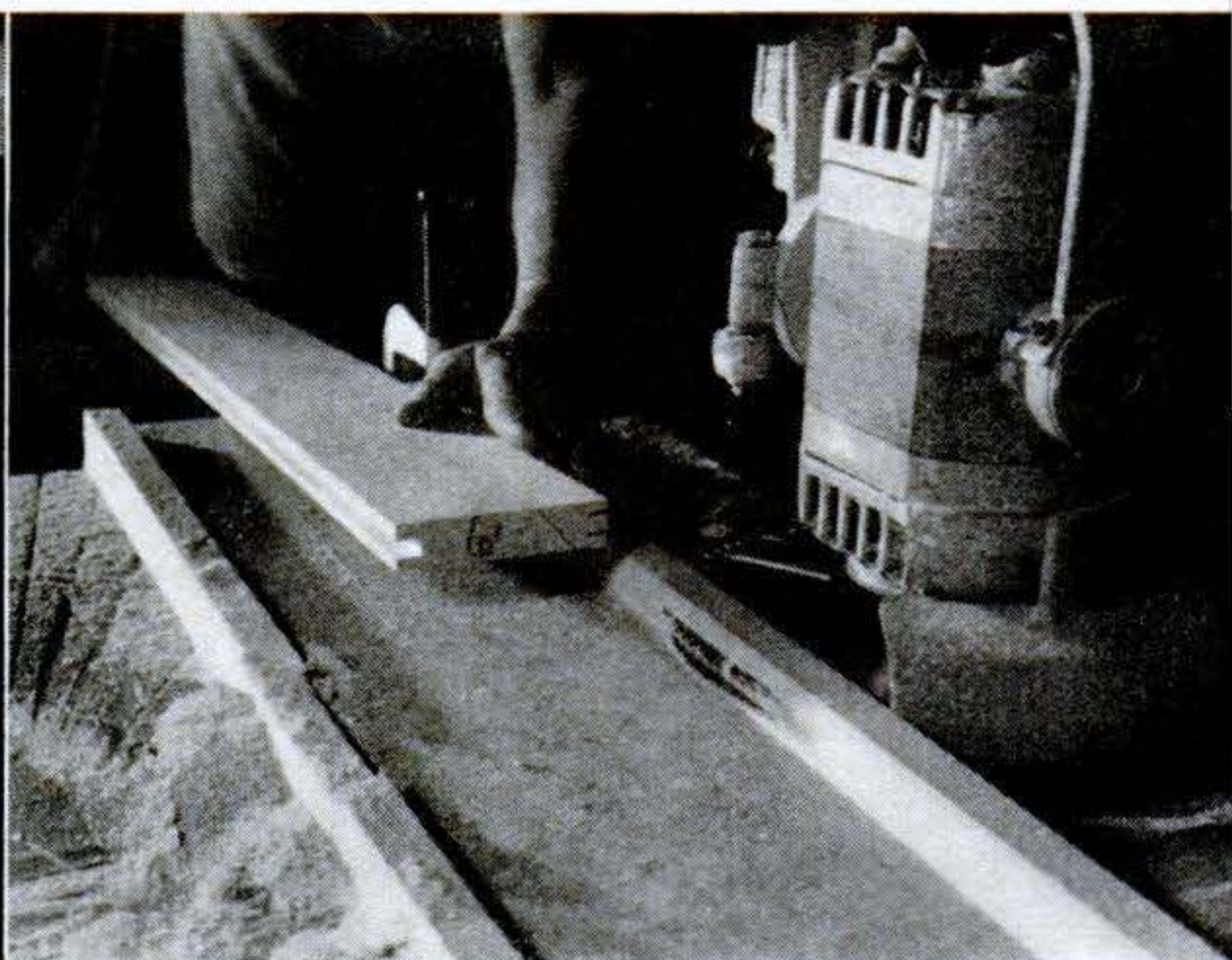
Some panel shapes you can make yourself on a saw are shown above. Plain paneling is made by cutting a tongue and groove on each board. The center V of the Double V is cut in two passes. A dado is used to cut the Grooved paneling. The Gouged type is cut by passing the wood diagonally across the blade. For splined paneling, you dado both edges of the board and insert $\frac{1}{4}$ " hardboard or plywood strips.

Profile of one-by-fours milled into V-groove paneling by method described here can be seen above. Tongue is a bit narrower and shorter than groove. This ensures a tight joint. Overall width is the only dimension that changes for wider boards.

Here's how you make it.....



Cut grooves in the center of one edge with a dado. You'll have to change the setup for a table saw.



Tongues are made in one pass if you use two saw blades separated by washers to get right width.



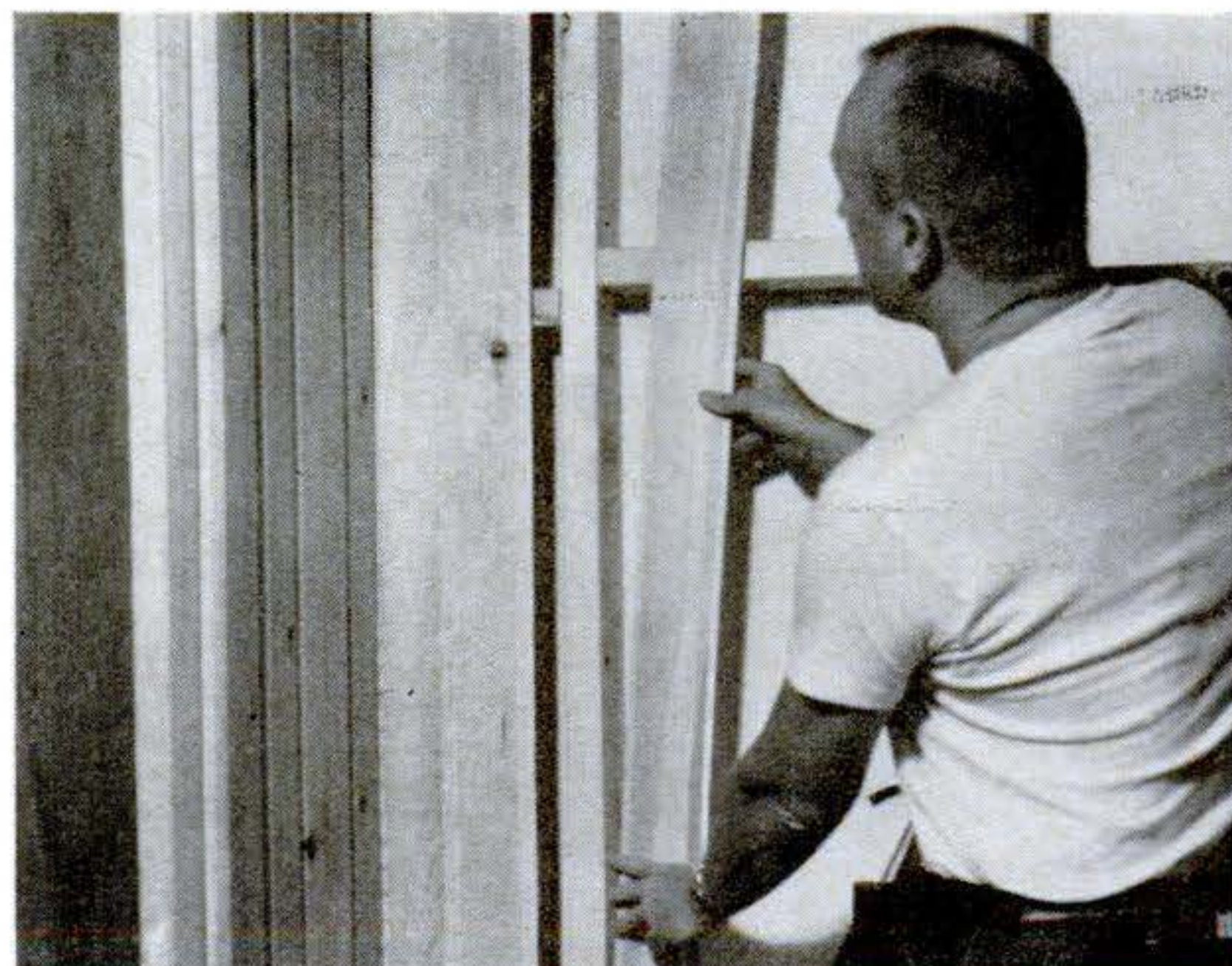
Sheathing-grade lumber that is wet must be air-dried before milling. Store indoors with strips between the boards so air circulates freely over each piece.

joints. By then you will have had a chance to inspect each board as it passed through the saw.

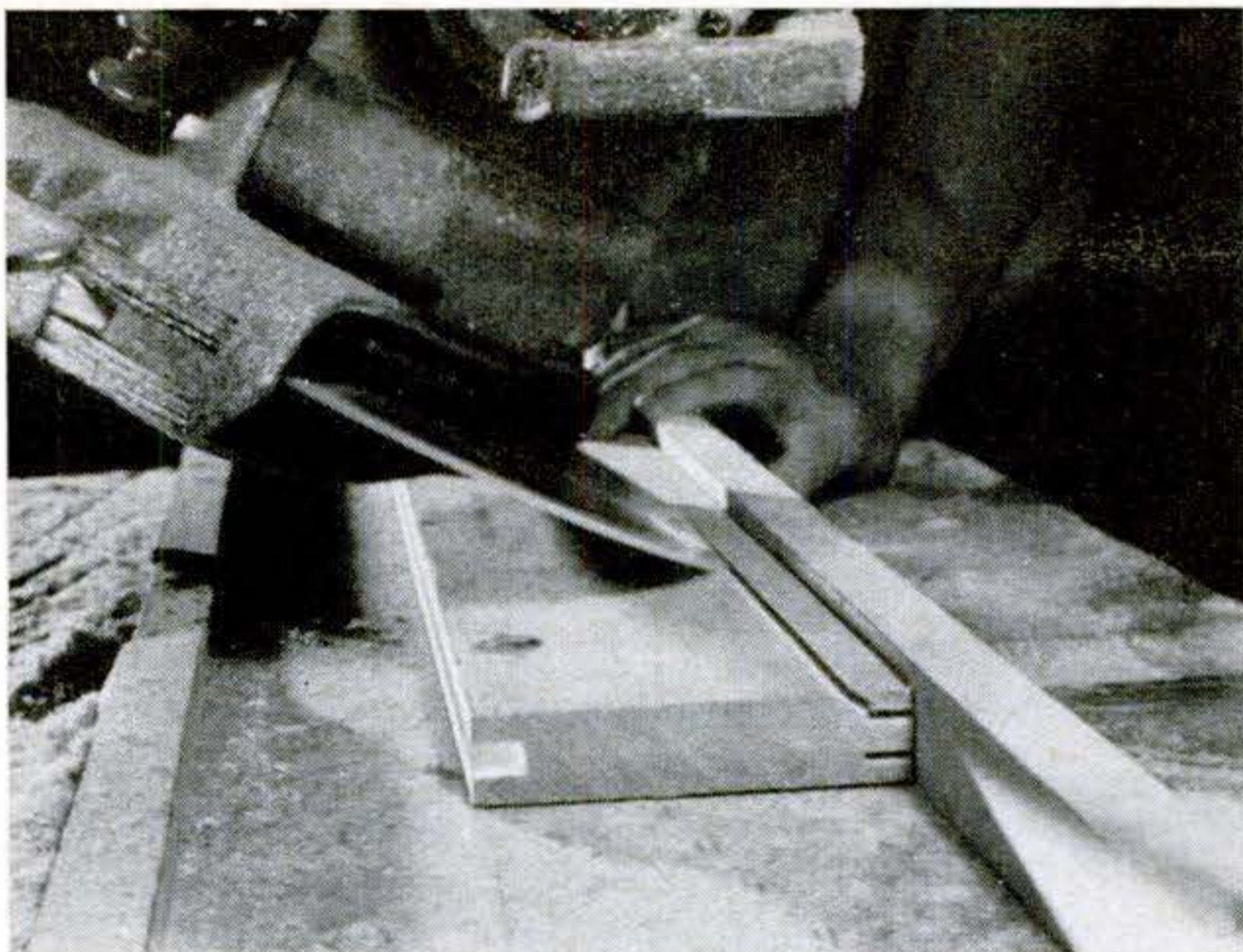
The five cuts. The photos show you how to set up a radial saw. But a table saw will do the job just as well. Just change the setups accordingly.

Not necessary, but helpful, is a hollow-ground blade and a dado-blade set. Without the hollow-ground blade, a rough surface will be left on the exposed V joint.

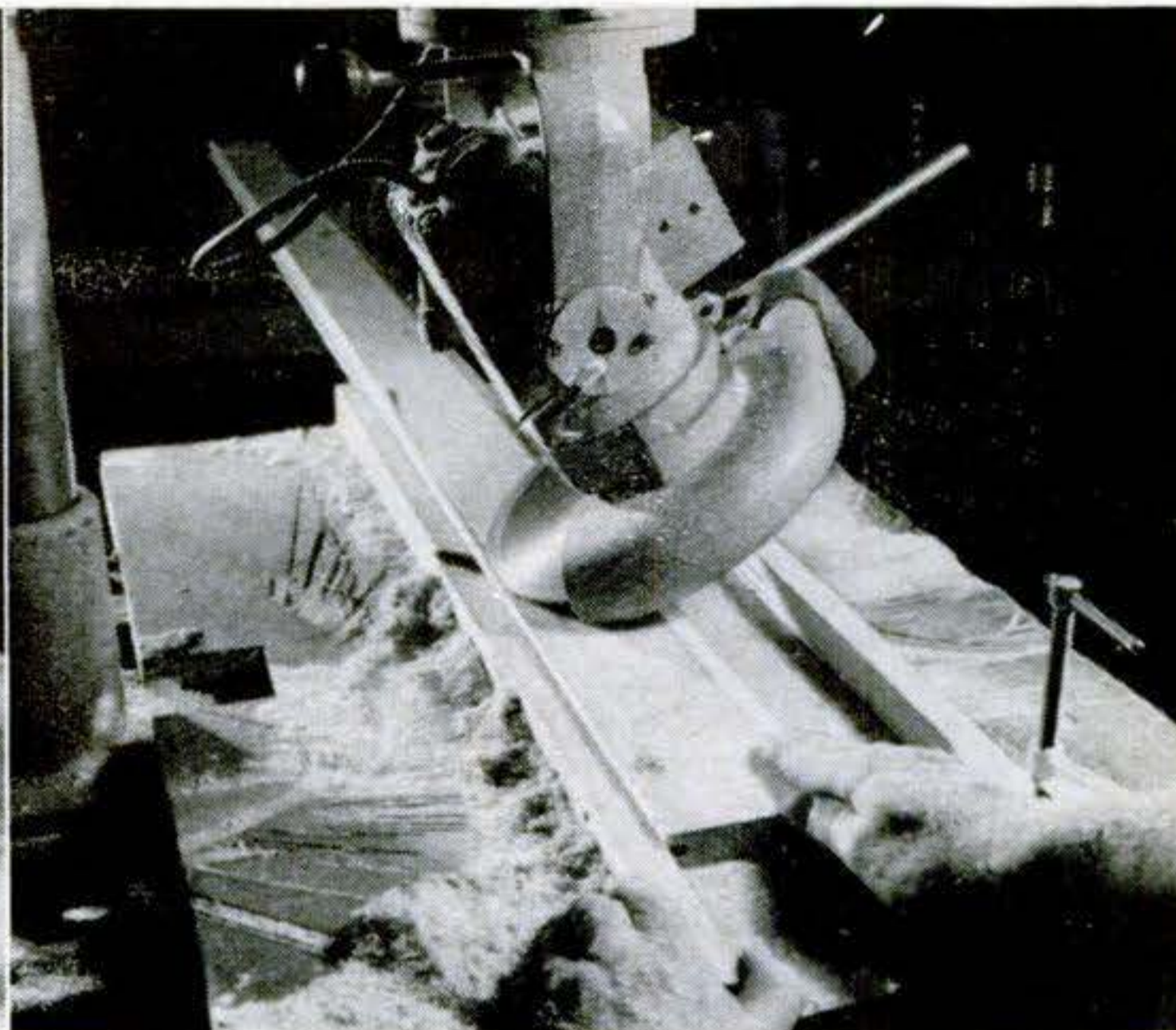
This is the way you put it up.....



Paneling is nailed to firestops between the studs. Start the groove of each piece in the tongue of the previously installed one and slip them together.



First V joint is cut with the saw 60 degrees from the vertical. Strip below tongue is cut off square.



Final V joint is cut with the blade tilted toward the fence so the wood won't be damaged if it slips.

The roughness can be left on, or sanded smooth. Without a dado blade you'll need to make several passes to cut grooves.

Lots of the appeal of your homemade paneling will be the honest, handcrafted look that distinguishes it from lumberyard paneling. So no meticulous care is needed in feeding the boards through the saw.

Above all, don't let the repeated feeding operation become so automatic that you forget to keep your hands out of danger.

Use a stick at the ends of passes to keep the boards tight to the guides and into the blade. It helps to have someone to pull the boards on through for you.

The finishing touches. For a satin-smooth, blemishfree finish, machine-sand each face before installation. Use a medium paper that cuts well without leaving objectionable scratches. The paneling can be given a natural finish, or it can be stained or painted. Take your choice. **PS**



Warped or tight-fitting paneling may need a little help to make snug joints. Use a scrap piece over the tongue and pound it tight. Hold and nail.



Start sixpenny finishing nails in the tongue and drive them at an angle through the solid wood behind it. The groove of the next piece covers nails.

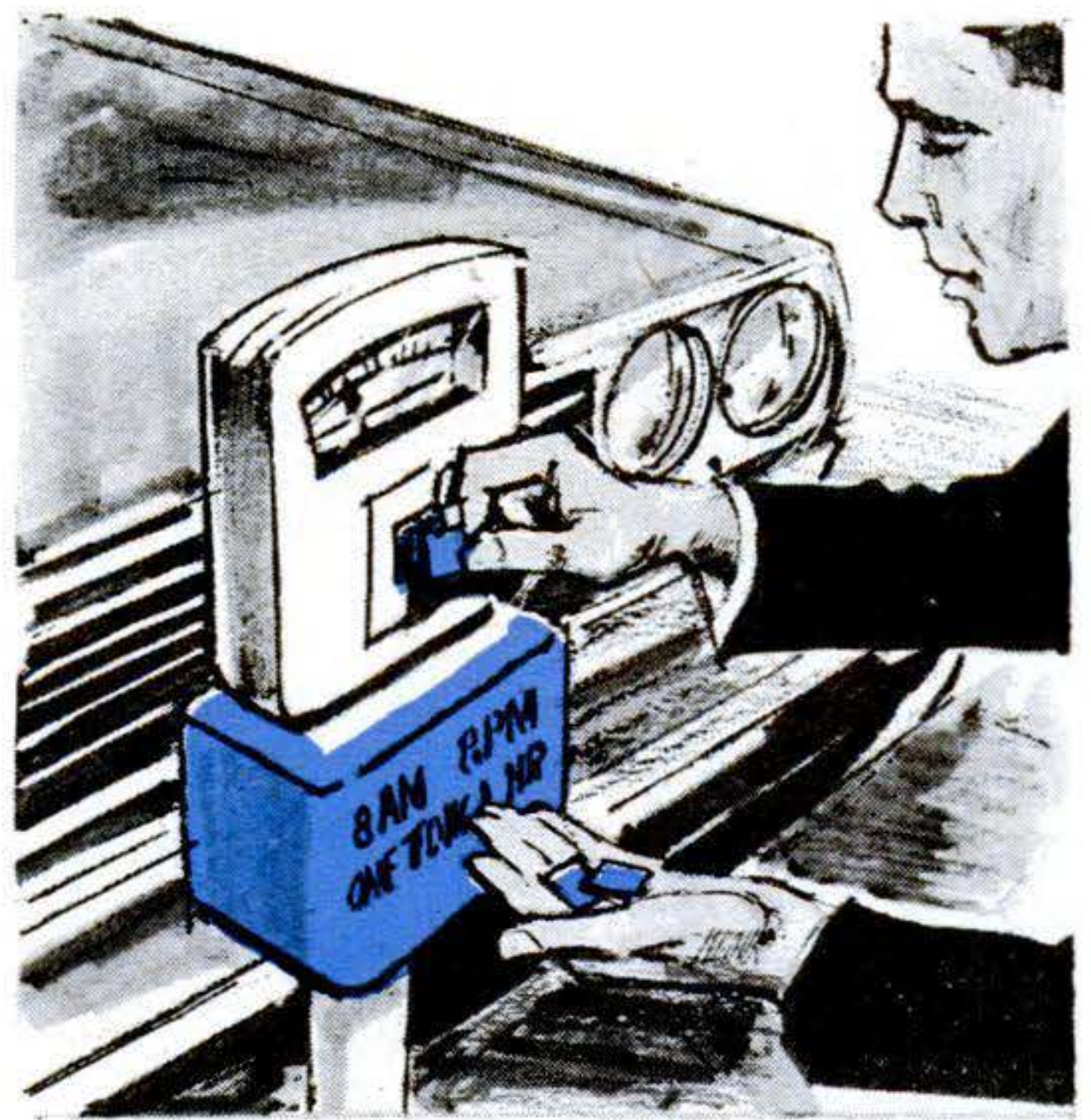


New Ideas from the Inventors

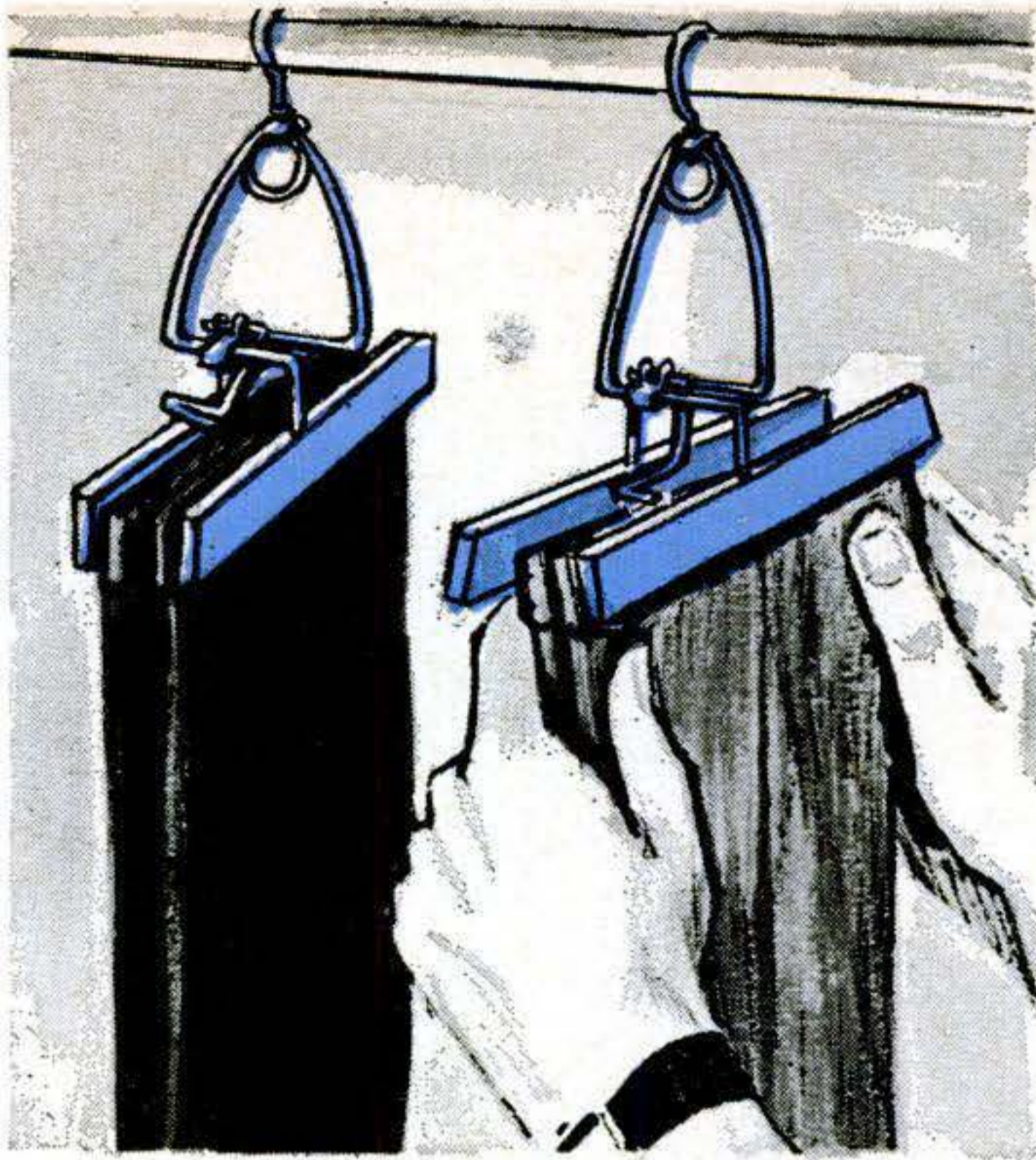
Adhesive "legs" aid spacemen. Astronauts may soon be able to maneuver on the outside of orbiting spacecraft by using a recently patented Air Force rig that would stack adhesive pads in the tips of cane-like "legs." To walk, a spaceman would switch on heat at the tips to soften the bottom pads and bond them to a craft's skin. To move, he'd trigger a blade to slice a pad free and let the next one move down into position.



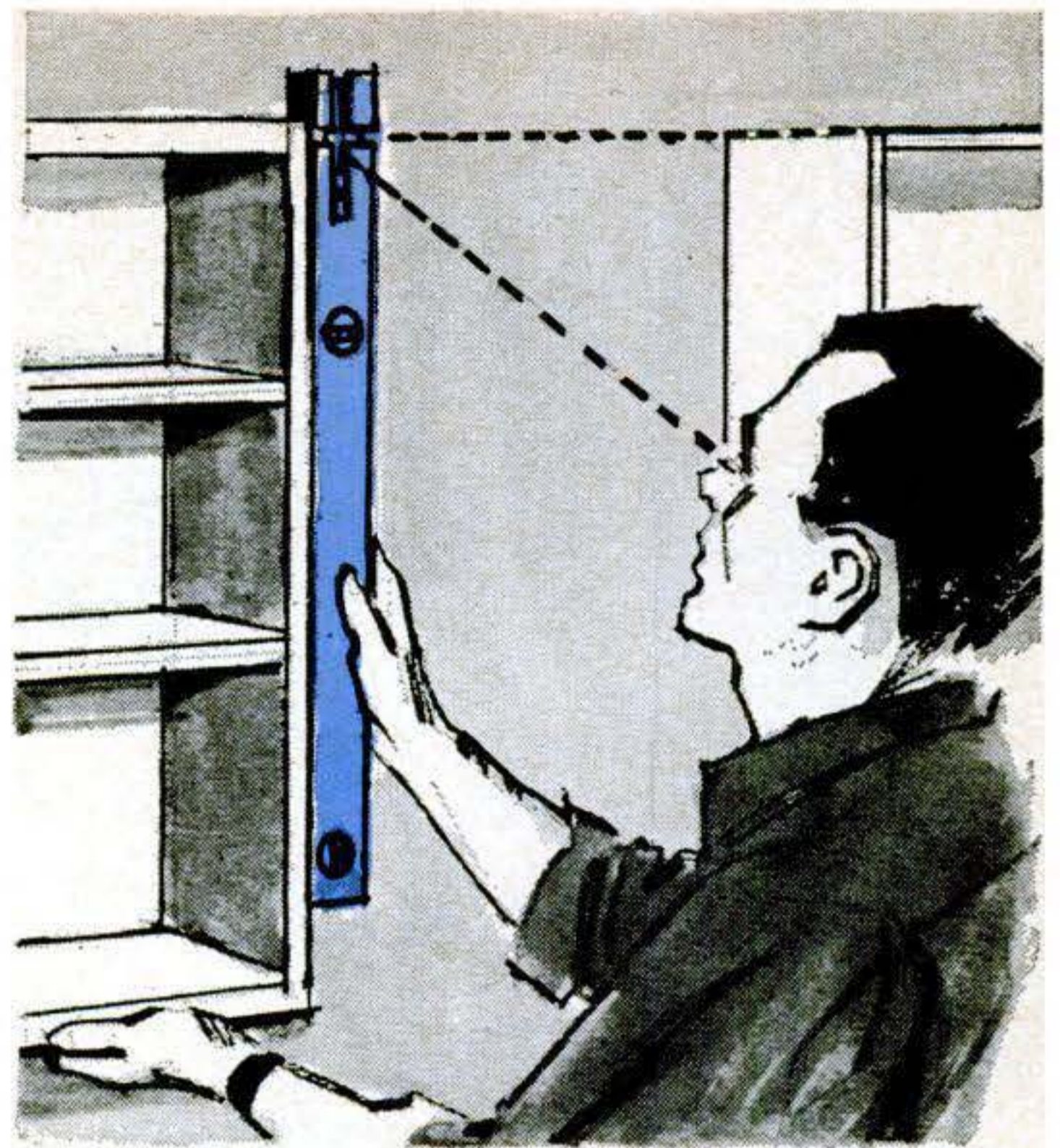
Typing light warns paper ends. Lights on this electric typewriter would signal when a sheet was nearing the end, and again when it was running out. They'd prevent a typist from writing too far down on the page. The paper would interrupt electrical contact between two small metal feed rollers and a metal band around the roller. As a sheet ran out, the contacts would close each of the light circuits in turn.



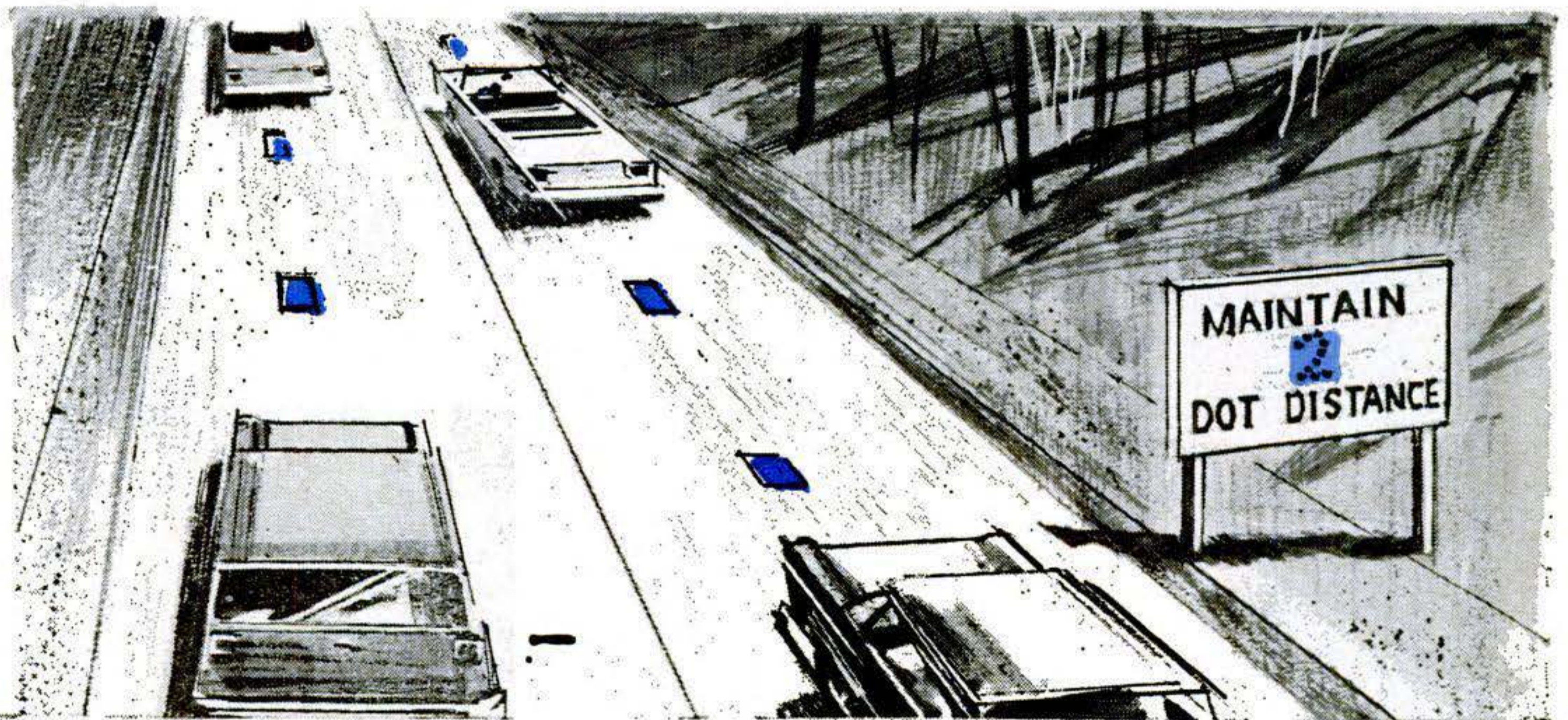
Parking meter dissolves tokens. A liquid solvent in the bottom of this parking meter would melt down special tokens used to operate the timing mechanism. The system would protect meters against damage by thieves—and loss of revenue—by making the loot valueless. Tokens might be sold in service stations. Soluble tokens might also be used in outdoor phones to reduce the number put out of order by thieves.



Snap latch closes hanger. Instead of wrestling this hanger onto the ends of your trousers, you'd just cock a spring latch to hold the padded, wooden jaws open. You would then grip the trousers evenly with two hands and lift them into place. Pressing the cuff ends against a bent-wire trigger would release the latch and spring the jaws tightly shut on the cuffs.



Level lines up your work. Optical sights on this spirit level would let you align a cabinet, or other object, with a distant point while you leveled it vertically and horizontally. Two beveled, cross-haired reflecting prisms would be set into right-angled grooves in the level. They would let you sight on reflected lines or points above, below, or to either side.

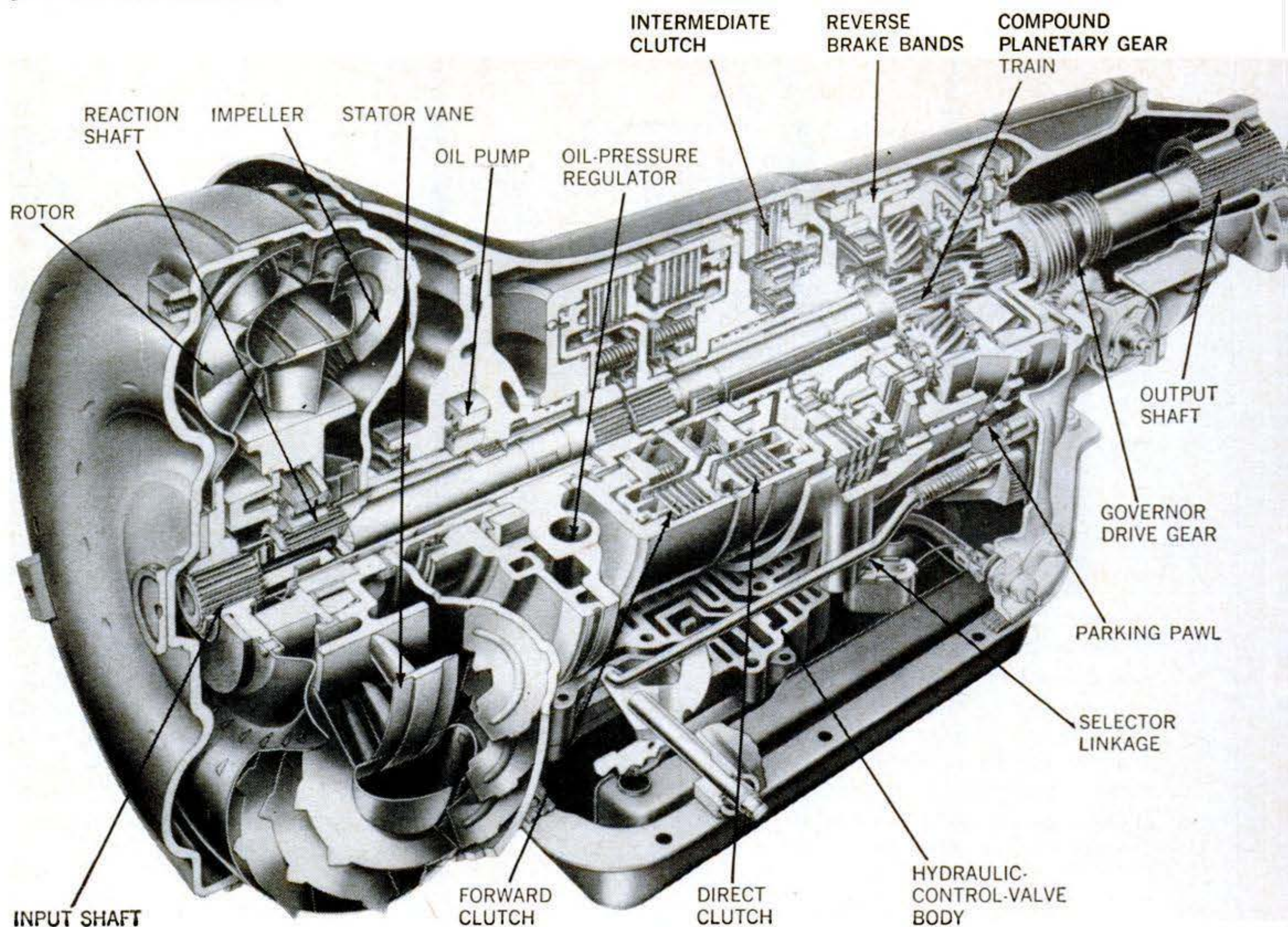


Road dots mark car headway. Safe distances between cars might be maintained—or varied for different driving conditions—by a system of mathematically spaced dots on the pavement.

Dot spacing could be varied to prevent bunching on hills or curves and to merge lanes smoothly. Drivers could maintain safe speeds just by keeping a given number of dots in view.

The following patents have been issued on these inventions: Space legs—No. 3,199,626 to P. N. Van Schaik and C. B. May, Dayton, Ohio; Typing lights—No. 3,091,221 to William J. Ashworth, New Albany, Miss.; Parking meter—No. 3,153,469 to Hector R. McPherson, Vancouver, B.C., Can.; Spring hanger—No. 3,152,737 to Dafford D. Cates, Pomona, Calif.; Sighting level—

No. 3,167,864 to Edward H. Lange, Elgin, Ill.; Road dots—No. 3,188,927 to Allan M. Woods, Garden City, N.Y. Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington, D.C. 20231, at 50 cents each. To write to an inventor, if the address above is insufficient, address him (by name and patent number) in care of the Commissioner of Patents.



Who said the simple way is the best way? Modern automatic transmissions are incredibly complex.

Transmission repair-and-maintenance experts are skilled specialists developing a whole new science.

Get More Life Out of YOUR AUTOMATIC

Learn the little-known secrets about the ills of your box and how to prevent them

If your car has an automatic transmission, as 75 percent do today, you can add thousands of miles to its life with a little care—and save \$50 to \$400 in repair bills.

Some of that care has to do with the way you drive. According to Lee Myles, one of the nation's most respected transmission experts, some drivers damage perfectly

good transmissions within 8,000 miles. "In fact," says Myles, "we've even seen them ruined in 90 minutes."

Other care-taking tips involve a dozen little-known warning signs such as a change in the appearance of the transmission fluid, strange sounds, and the curious phenomenon known in the trade as "a.m. sickness" (and to engineers as "drainback").

Well handled, your transmission should go 50,000-70,000 miles before overhaul, in heavy traffic, and perhaps another 25,000-50,000 miles under lighter traffic conditions. But many drivers don't get anywhere near that because they don't under-



Eyes up! With the bottom pan of the transmission removed, technician Fred Hertel, of Lee Myles, care-

fully adjusts the brake bands. Many cars need band adjustment periodically. Average cost: \$3 to \$5.

TRANSMISSION

By E. D. FALES JR.

stand that a transmission, while tough, is also sensitive. It's out of sight; it gets ignored and mistreated.

Today, it is almost impossible to find a new transmission for many older cars, and an overhaul can cost from \$140 to \$350. That's why you need to know about driving practices that can hurt your transmission, how to anticipate trouble, and what to look for when trouble starts.

All U.S. automatic transmissions consist of a fluid torque converter or fluid coupling plus planetary gears to provide additional torque. The old-type HydraMatic was the last to use a fluid coupling—since 1964 all

Continued



Taste test: Texaco engineer Ben Wanderman gives author Ed Fales a taste of transmission fluid. Color, smell, and taste tell if fluid is damaging transmission.

Chemical breakdown of the fluid can cause malfunctions in all areas



One source of trouble is the governor unit. Pencil points to the speed-sensitive weight that controls the oil pressure. It must be free to slide in and out. Dirty or overheated oil will make it erratic.



Planetary gearset and output shaft of a dismantled automatic transmission are examined by two Lee Myles technicians. The bands are at center of table, the clutches in the lower right-hand corner.

U.S.-built auto transmissions have had torque converters.

A number of small but common driver errors can hurt transmissions. Samples:

- Leaving a car in Park without the brake on. Somebody pushes it a foot or two to squeeze into a parking slot, the parking pawl snaps—and you have a \$10 to \$50 job.

- Habitual downshifting for braking at traffic lights. Sure, the unit can take it for a while, but the wear and tear aren't worth it. "Brakes come a lot cheaper," says Myles.

Seven things that really hurt

According to Myles, who has a chain of service centers in several states, these are the big damage makers:

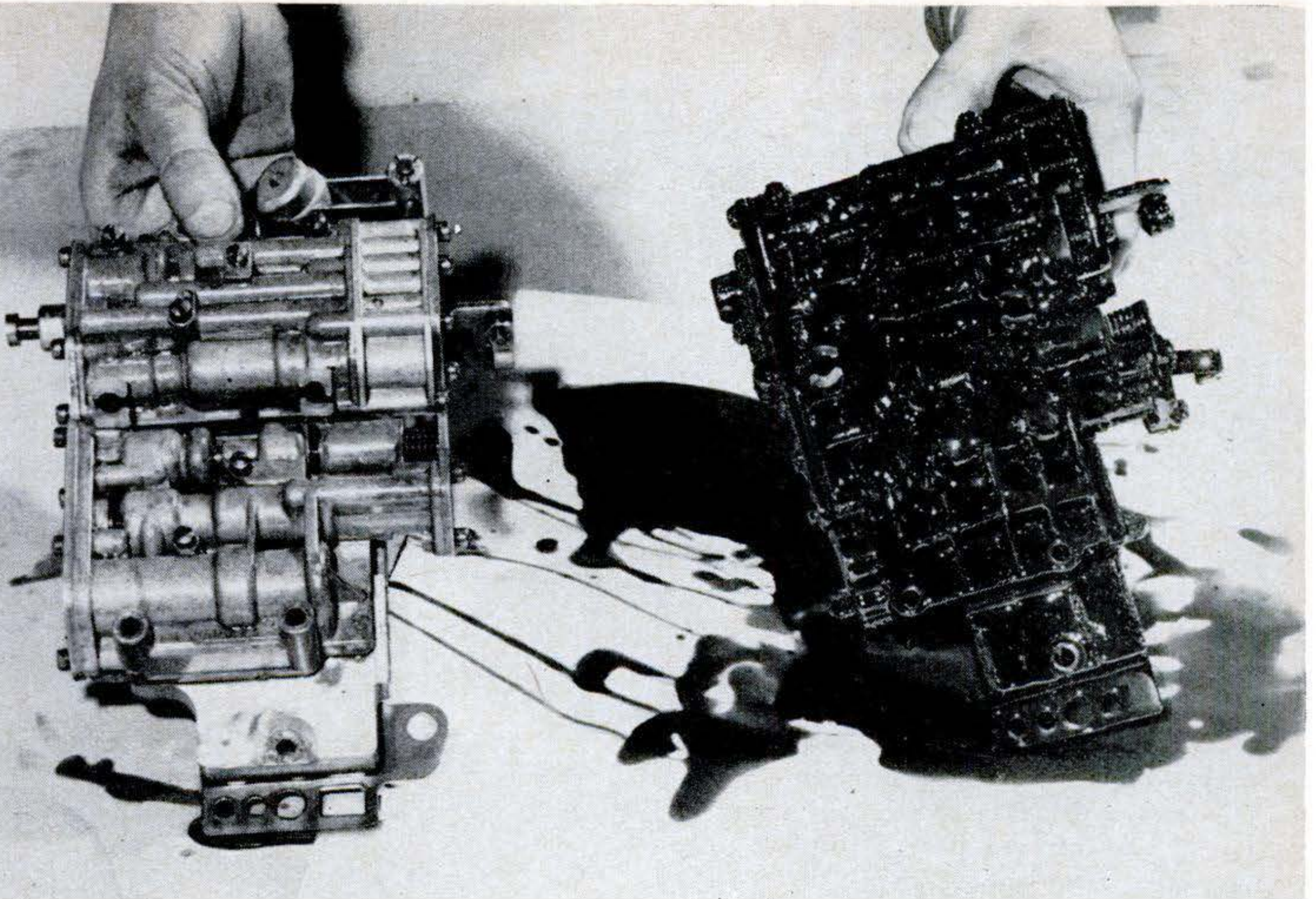
Fast idling. Far too many cars today idle at 800-1,000 r.p.m. when they should be idling at 475-525. This causes harsh band and clutch engagement, creates wear, snaps shafts, wears bands, and even breaks planetary gears.

Staying in Drive in stop-and-go traffic. When cars are stopped bumper-to-bumper, this is murder. With today's big engines, heat builds up and transmission oil oxidizes. Once oil breakdown starts, mechanical damage follows with incredible rapidity. Myles' engineers figure that three 30-minute heat-building stop-and-go trips can damage your transmission for life.

In stop-go driving, always shift to Neutral after you stop. Some experts say a minute is all it takes to overheat the fluid if the "box" is already hot from traffic. When your car stops, the transmission's cooling system just doesn't work as it should. An overheated transmission is a sick transmission.

Blast-off starts. An occasional heavy-foot "performance start" may be okay. But you pay for it. Every such start builds stress, shortens life. Habitual blast-off can destroy bands and gears, hurt the many friction-clutch disks, even hurt the vital torus wheels—the many-bladed, turbine-like wheels in

of an automatic transmission—governor, gears, valves, control unit



The "brain" of an automatic transmission—the control unit—contains network of hydraulic channels and valves. Dirty or broken-down fluid clogs passages, makes valves stick. Unit at right has a bad

case of contaminated fluid. Overheating makes the fluid thicken and break down, and dirt makes matters worse. At left is a cleaned control unit that will be used in a reconditioned transmission.

your torque converter or the fluid coupling.

Jump starts. Even worse are the noisy starts some clods like to make by shifting to Neutral, gunning the engine, then slamming the transmission into Drive. "We've seen an inexperienced kid ruin his dad's \$500 transmission in 15 minutes," Myles technicians say.

You may think you don't make jump starts. But we all do when we get in a hurry, start a cold engine, then go—still revving high on the choke. You also do it when you back out of your driveway, see a pack of cars coming fast, and flip into Drive to get away from them. When backing, use the brakes and make a full stop. Police and taxi drivers make lots of jump starts—and sometimes need transmission overhauls twice a year as a result.

Failure to test-drive your transmission after an accident. Myles has found that many costly transmission breakdowns occur needlessly, from one to three months after an accident. Reason: When body repairs

are made, no one thinks to check the transmission. Even a rear-bumper collision can trigger trouble in your transmission. It does this by shock and misalignment.

"After any collision," Myles says, "check that no transmission mounts have been damaged. Check the engine mounts, too, because misalignment builds stress."

Also, after a collision, test-drive your transmission for bent linkage (which upsets the shift points), for new sounds (caused by bent or damaged parts), and for any roughness or new "feel" in all forward speeds and reverse. If you aren't thoroughly acquainted with your transmission, have this done by a transmission expert.

Letting untrained gas jockeys check your transmission oil. Don't! Let them check engine oil, but always get out and look at the transmission dipstick with the attendant. Reason: The unskilled mechanic reads only the fluid level, experts say, when he should be reading also the color and smell.

[\[Continued on page 208\]](#)

Repairing Window Shades

By PHIL McCAFFERTY

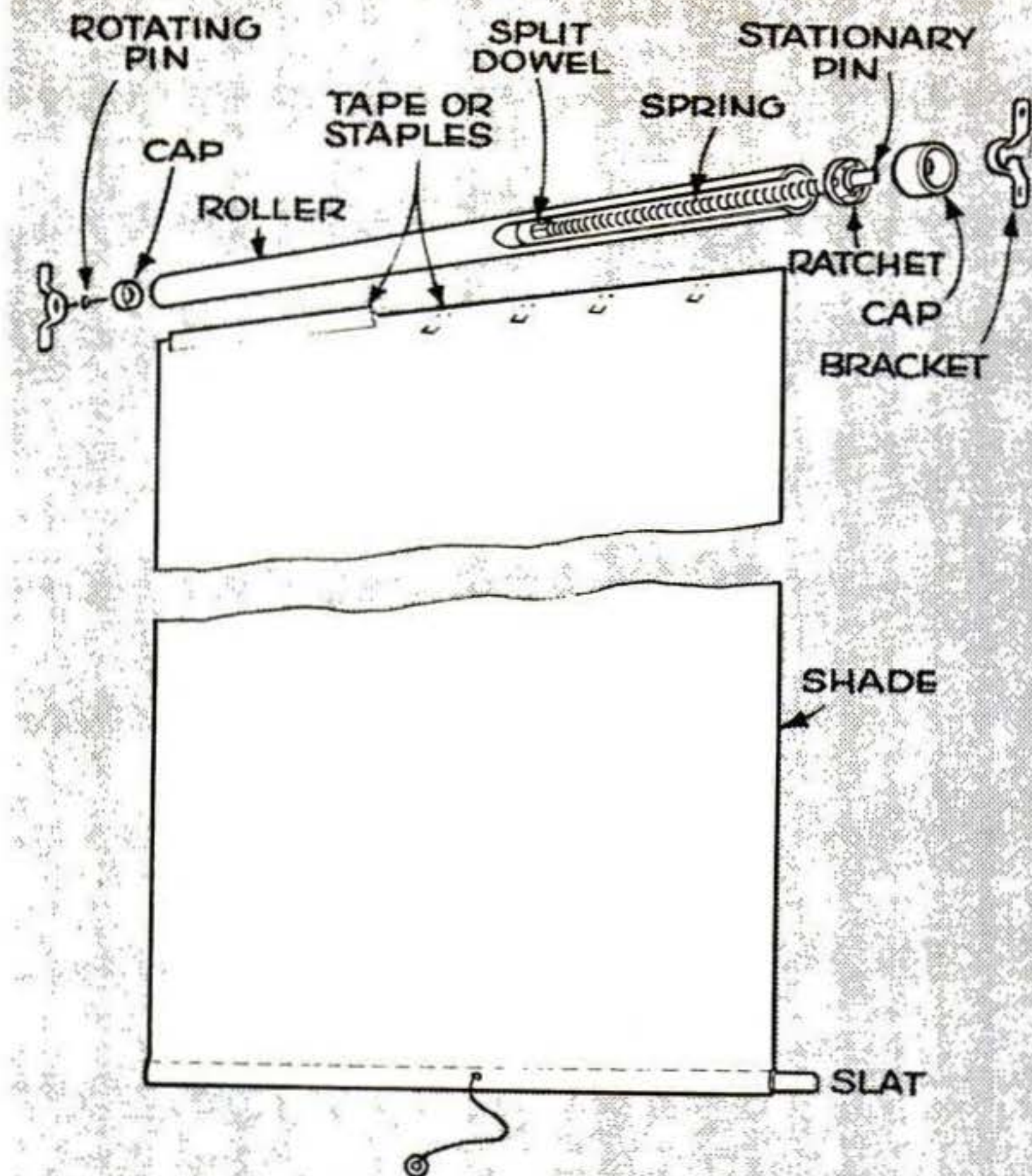
You can fix or replace any part of a window shade. It's no problem—spare shades and salvaged rollers are handy sources of replacement parts. You can get new parts at department stores.

The shade itself—the paper or cloth material—should be at least 8" longer than the window is high. The unrolled surplus keeps the roller end of the material from tearing at the fastenings, and also permits you to trim the shade bottom and sew in a new slat hem if necessary.

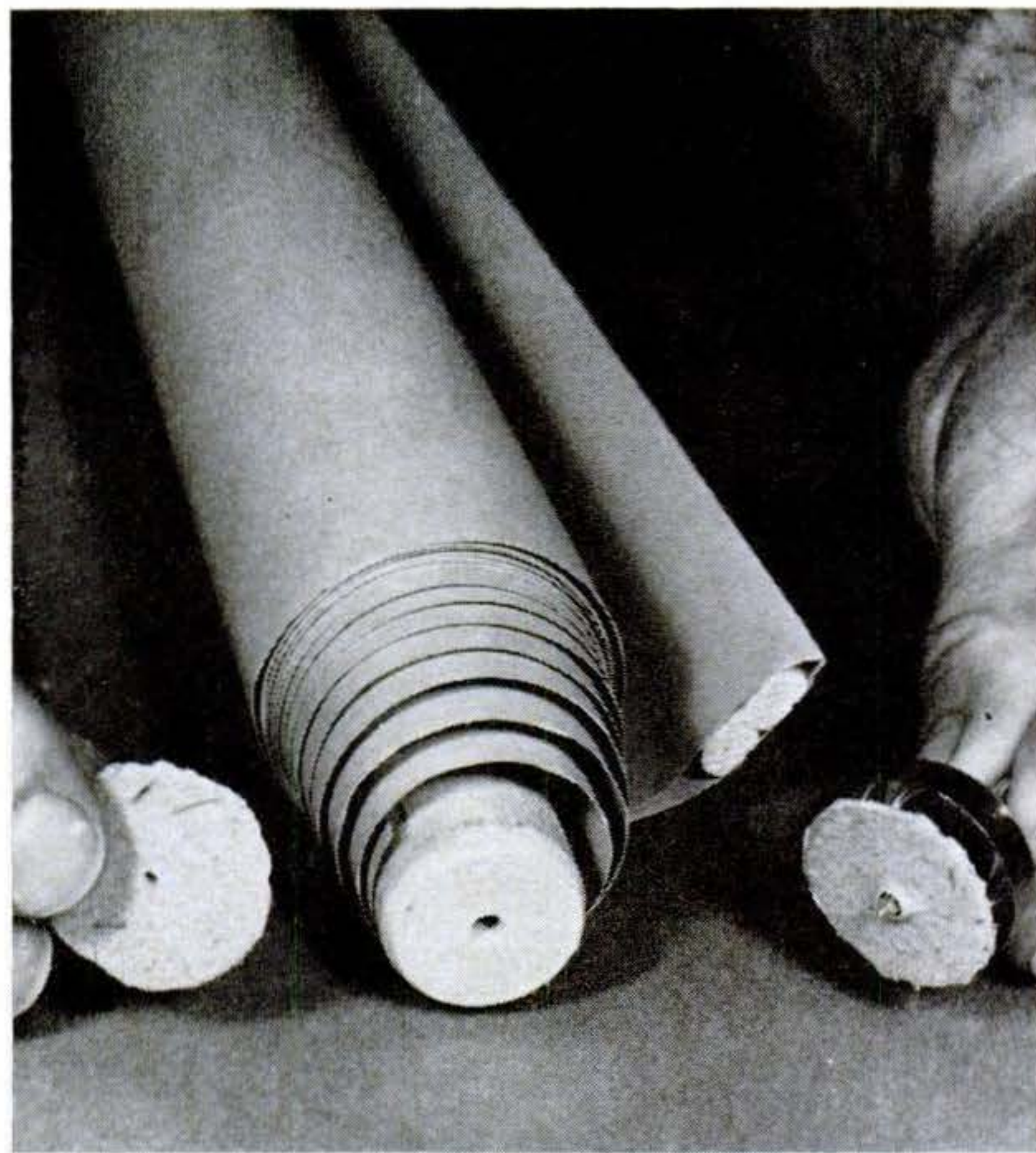
The correct pin-to-pin width of a window-shade-roller assembly for inside frame mounting is the inside frame width, minus $\frac{1}{8}$ ".

TROUBLE-SHOOTING GUIDE

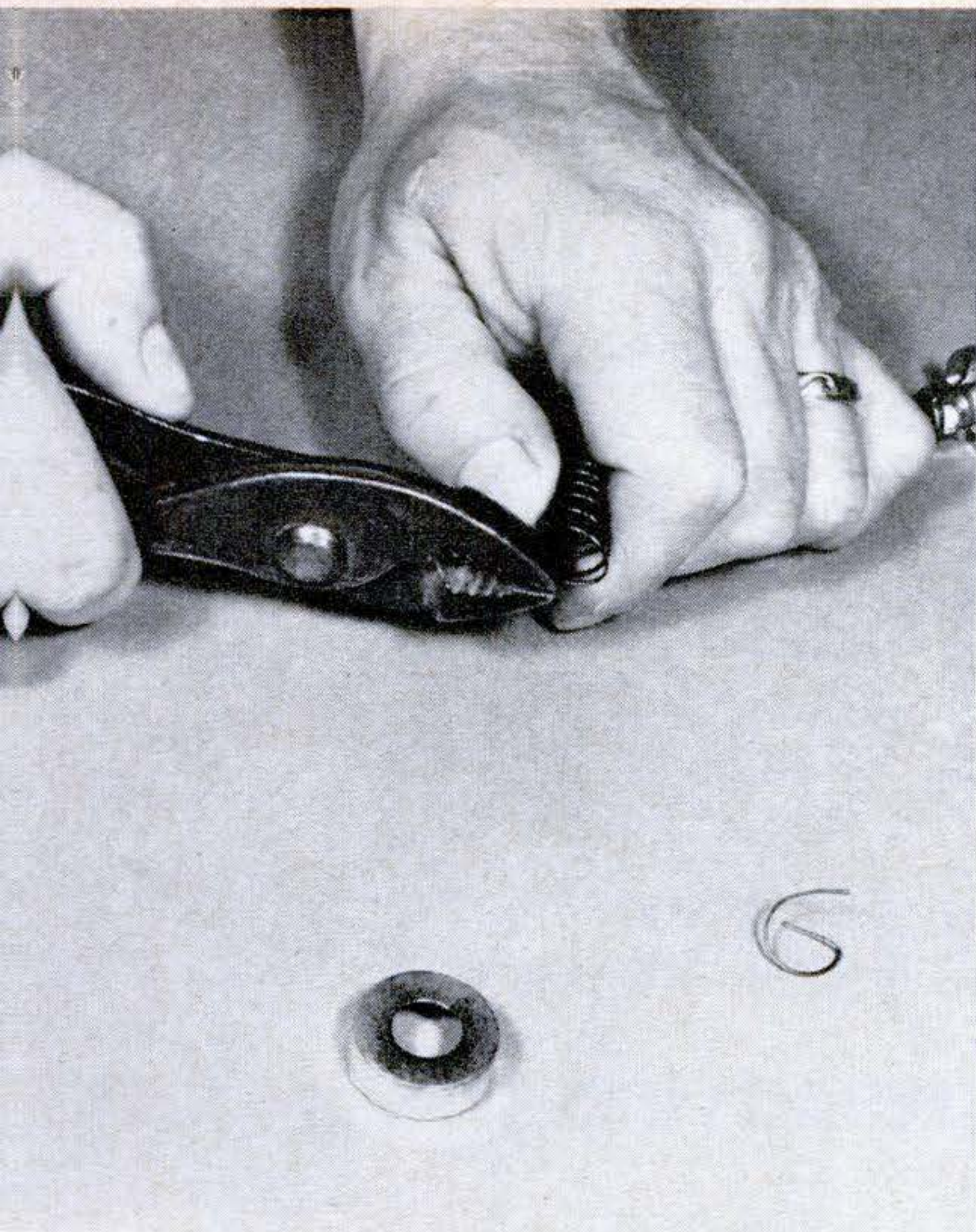
TROUBLE	CAUSE	REMEDY
Winds up without provocation	Spring too tight	Roll to top, remove from brackets, unroll halfway by hand, replace
Won't roll up completely, lacks pep	Spring too loose	Pull down all the way, remove from brackets, roll up halfway by hand, replace
Tension good, but shade won't catch and hold where desired	Ratchet pawls stuck	Lubricate with light oil or graphite
No tension	Spring broken	Re-form end and replace, or replace entire roller
Wobbles	Rotating pin bent or roller end not square	Straighten pin or sand roller end square
Pulls crooked	Brackets not level or shade not straight on roller	Level brackets, re-mount shade on roller



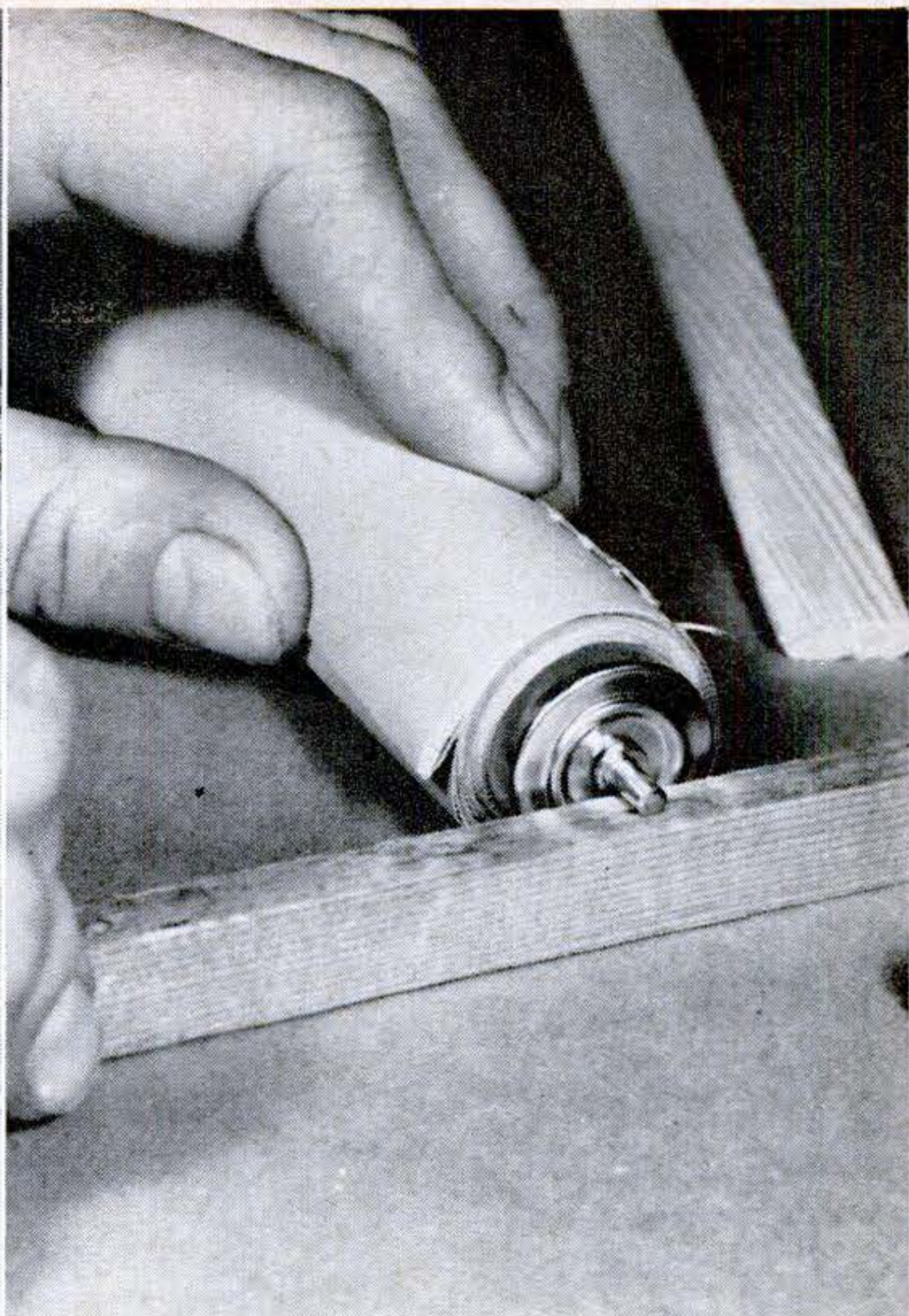
Window-shade parts are simple and few. They're all shown in the drawing above. A good idea is to store extra roller assemblies so you can salvage parts.



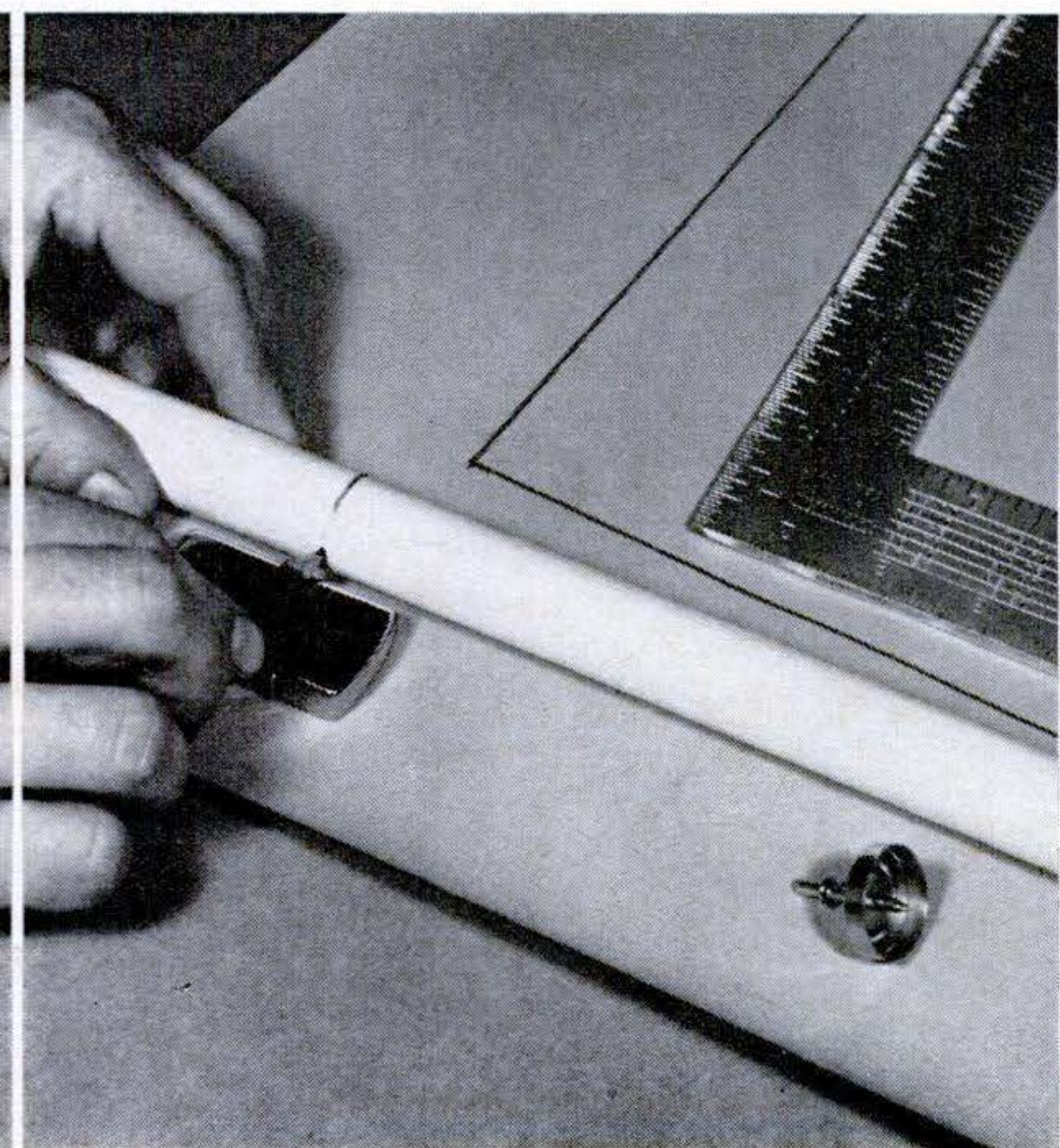
Short shade rollers can be lengthened. Simply put cardboard shims under the rotating-pin end cap. Another solution: Put blocks under the brackets.



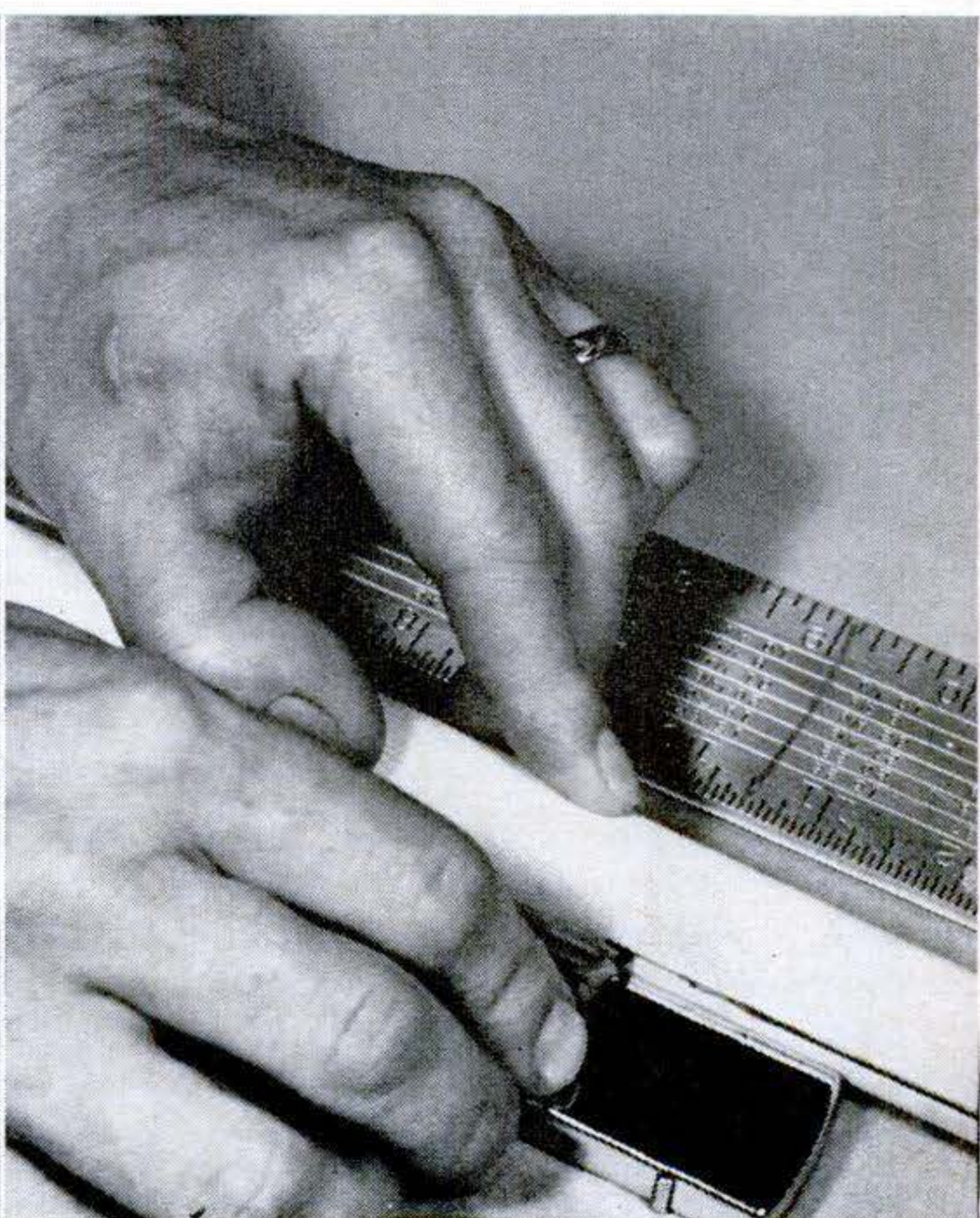
Spring breaks near the inside end can be fixed with pliers. Reshape the remaining end to match what broke off. Other breaks aren't worth fixing.



Bent pins make the roller wobble. You can find the high spot by rolling the shade along a flat surface. Then straighten the pins with pliers.



Cut down shades and rollers to fit narrower windows. Scribe a line around the rotating end of the roller to get a square end. Use a square to trim the shade.



Attach shades straight: Pencil a line on the roller as shown. Staple the shade end along the line. Check shade end with a square and trim if necessary.

BEGINNING—A NEW KNOW-HOW SERIES

Applying an attractive and durable finish to wood has always required skill and craftsmanship. Most of the old finishing methods took time, patience, and the know-how that comes from long experience. Secrets often were passed from father to son.

In recent years, this situation has changed considerably. Many new finishing products have come out of the labs. These sometimes require new application techniques, often less

skill. This month, POPULAR SCIENCE begins a month-by-month survey of both old and new wood-finishing methods. You'll learn about a separate aspect of the subject each month. For the latest information on finishing (and refinishing) wood in all its forms, be sure you get every installment of this important new series.

The article this month deals with a finish you apply over the old. Next month we'll discuss the newest paint and varnish removers.

BEST FINISHES FOR WOOD:

GLAZING...

the expensive look

the easy way

By JACKSON HAND

The paint dealer lifted down the package, grinned, and remarked, "This stuff has brought more junk out of the attic and put it on display in the living room than any idea the paint people ever had before."

The package held an "antiquing" kit typical of those marketed by several paint makers. The products inside are designed to give new life to old furniture. The objective is to impart an attractive look of age, do it without sweat, and do it fast.

"The thing people like most about it," the paint dealer continued, "is how kindergarten-simple it is to do." He opened the kit and spread out the contents:

- A can of semigloss enamel.
- A can of antiquing liquid.
- A throw-away paintbrush.
- A brush for antiquing liquid.
- A wad of steel wool.
- A length of cheesecloth.
- Sandpaper in three grades.

Antiquing kits are popular for an economic reason, too. The enamel and antiquing glaze

convert old or unfinished furniture into pieces perfectly at home in playrooms, bedrooms—even the living room. But it's important to note that this kind of finish is not for really fine furniture—or for use on real antiques.

The system takes advantage of an old wood-finishing trick called "glazing." The result is so striking that people who couldn't paint a doghouse respectably are picking up compliments for their work.

How it's done. You brush or spray on a coat of a base color (no need to remove what's there). The color is usually a bit more brilliant than you'd normally like, but it tones down later. You don't have to worry about the quality of your brushwork.

When the base coat is dry, you dab on a coating of the "antiquing" medium, which is nothing more than a thin mixture of pigment with a varnishlike vehicle. It is, in fact, the standard glaze of both artist and furniture finisher. Neatness doesn't count—just be sure you cover the entire surface.

Finally, you wipe off *most* of the glaze. You can do this selectively, in pursuit of the most attractive result, but there is no standard of excellence—no right or wrong. You do

Continued



Three major steps give wood a glazed finish—applying the base color, applying the glaze, and finally wiping away most of the glaze, as above. If you wish, you can buy everything you need as individual items, but it's simpler to use a kit such as the one pictured at right. In wiping away the glaze, the objective is to simulate normal wear from long use. So wipe the stuff from the edges of flat areas and from the high spots of carvings, turnings, and moldings, leaving quite a bit in the low spots.





Applying a glazed finish to wood is an easy do-it-yourself job

Smoothness of application isn't important with the base coat; in fact, a sloppy job—short of sags and skips—often looks more antique. Use a satin-finish enamel or one of the base coats that come in the kits.

it in a way that gives the effect *you* want.

To get the appearance of age, the glaze color is usually in the dark-brown family, ranging from black-brown to green-brown,

Wait for the base coat to dry, then dab on the glazing liquid. Uniformity is of no consequence, but avoid skips. Any old brush will do—or use a rag. Start wiping when the glaze begins to dull over.

with ochres, umbers, siennas, and similar colors predominating. If the finish will be subjected to hard wear or severe washing, you topcoat it with a good varnish. That's all there is to it.

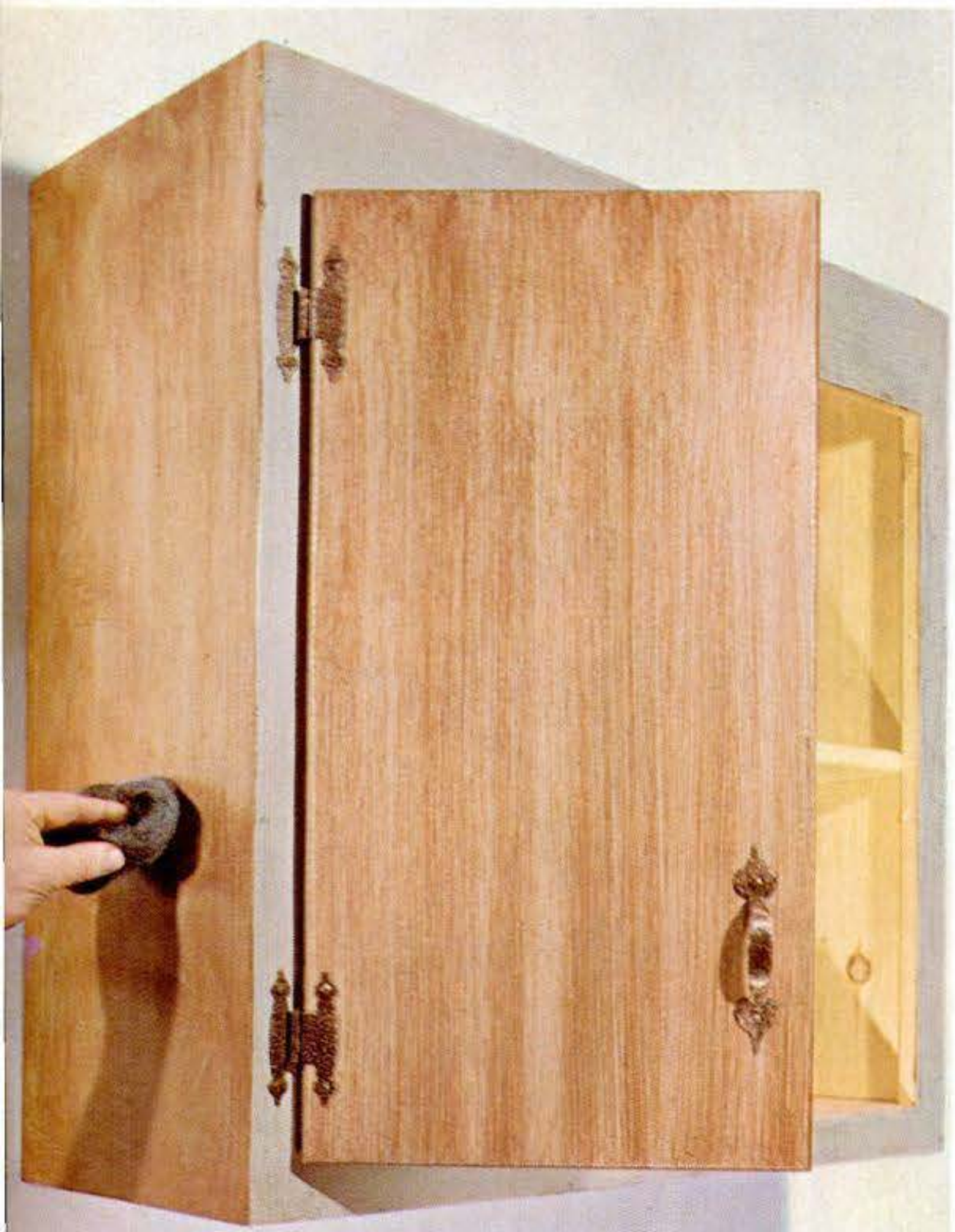
If you buy a kit, you'll get adequate instructions with it, but a few tips from personal experience may be helpful.

Preparing the surface. You gain nothing by removing the old finish if it is sound. Blemishes, cracks, and crazing typical of old varnishes and enamels often pick up the glaze and become pluses in the finish. But get rid of ugly scratches that are finish-deep or other blemishes that won't stand being highlighted. Remove all the finish or spot-sand the blemish away.

Drawer pulls and other hardware on a piece of old furniture may be out of key with a glazed finish and need replacement. Anticipate this, as was done with the oak chest (now blue) in the photograph. After removing old knobs, plug the holes with wood putty or other filler, and sand them flush.

Any old finish is dirty. Wash it with a detergent, or use a product like "Wilbond" or "Liquid Sandpaper." If the old finish is a high-gloss one, sanding will produce enough tooth for the new enamel to stick to.

In putting on the base coat and glaze, remember that all you're after is color coverage. Use spray or brush. Some of the colors in spray cans come in semigloss. You can use them if you're not kit-minded. If you need two coats, use fine sandpaper lightly between



If you want a wood-grain effect—on painted cabinets or woodwork—you can buy special glazing kits to do the job. The kitchen cabinet above is an example. Wiping with steel wool produces a wood-grain look.



In the low areas of carvings, leave enough glaze to produce the desired emphasis without a grimy appearance. A small medical swab or toothpick wrapped with cotton is a convenient tool for this. Experiment on both checked and smooth surfaces with stippling, streaking the wood with a brush.

The older a picture frame, the better it antiques. Often, carvings and built-up shaping are of plaster of paris, which checks crosswise. If you use a spray-can product for the base coat, let it dry well. Then wipe the glaze soon after it is applied to avoid the chance that the glaze might soften the base coat.

coats to knock off the high spots and give tooth for the next coat.

Use judgment in deciding on the character and quality of the base coat needed. A piece of furniture that is beat up or fairly undistinguished will do just as well treated to a slapdash brush job.

Working with glaze. About all that is important with the glaze is wetting. You'll wipe off so much that smoothness of coverage is uncritical. But, if you do not wet the entire surface, the wiping tends to be smeary over uncoated areas.

The wiping off is the point at which you become particular. The way you wipe away the glaze determines the final result. It con-

trols the degree of "antiquing" and the tone of the final color. A garish orange, for example, becomes a tasteful pomegranate under a glazing of deep umber. A bilious green turns into an ochre-olive. The *more* glaze you leave on, the greater the toning down. You can create textures in the finish, too, by the way you wipe it.

Naturally, you'll wipe away glaze in the way that produces the effect you like, but there are a few tricks that may help till you get your own experience.

1) Wipe hardest on high spots—corners, edges, knobs, moldings. Eye the piece as a whole, and wipe to give the effect of wear

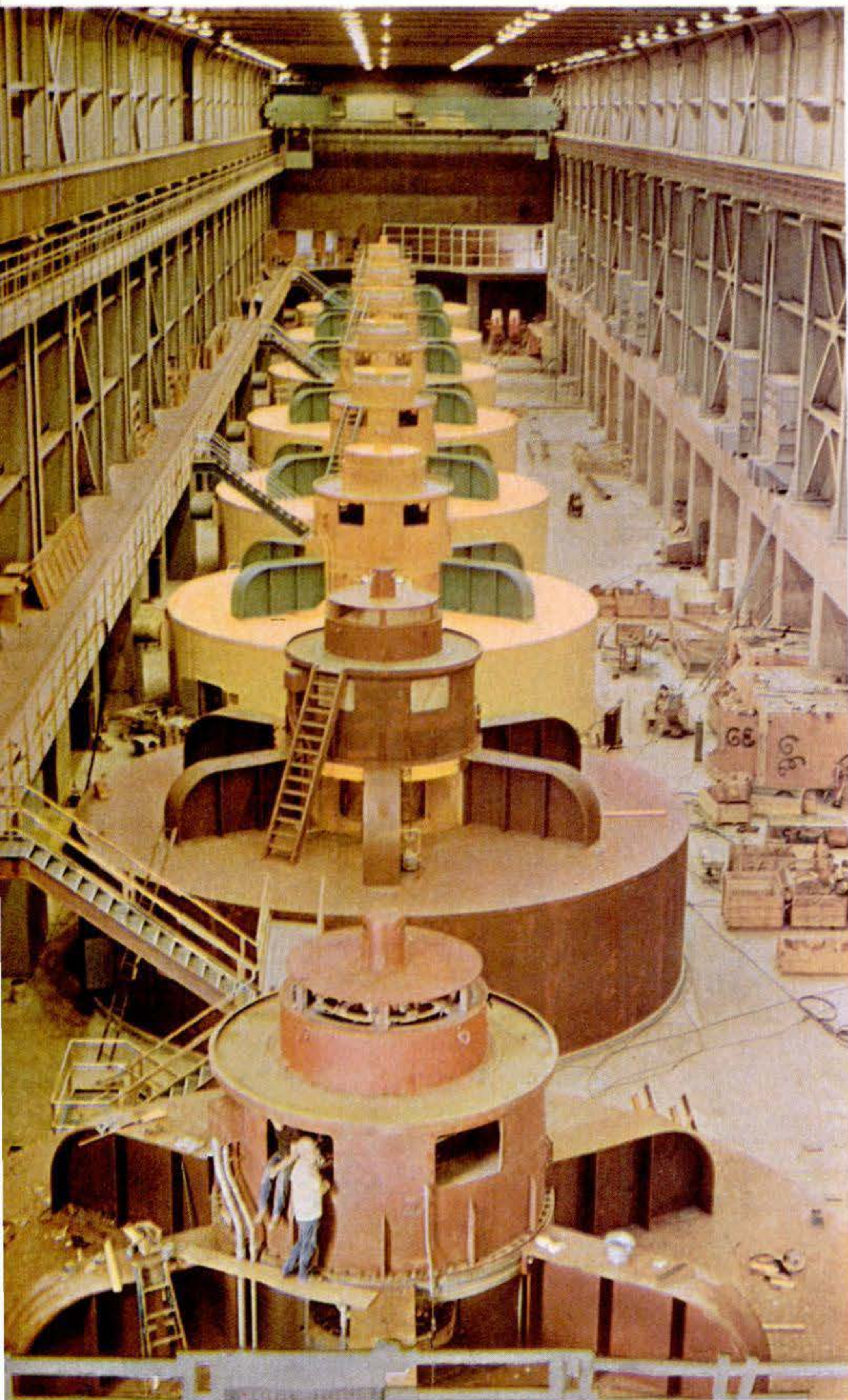
[\[Continued on page 202\]](#)

The technique of glazing yields dramatic results on old furniture

There's a wide range of colors for the undercoating. To show how glazing can stretch your furniture budget, the author bought the items below (left) at a second-hand store, hauled them home, and went

to work with several glazing kits. A few days later the photographer came by and recorded the results that you see below at right—acceptable furniture at a very low cost compared to new items.





Another generator to transform the headlong rush of the Colorado to electric power is installed at Glen Canyon power plant. Each unit is rated at 13.8 kilovolts, revolves at 150 r.p.m., weighs 475 tons.

Colorado power system and calculates its performance, then returns command decisions to every unit. It performs this amazingly complex operation in exactly one-fourth of a second.

Every few minutes, the computer performs the even more complex job of checking the

24-hour units. The final step is to feed the figures to the computer.

Perhaps the story of the pushbutton river is best told by one picture near the beginning of this article. In the entire 1,400 miles of river, dams, power stations, and control centers, only one manual valve remains. **PS**

“ground rules” it has been using to control the power system—to assess and double-check its own performance. Finally, that remaining three-fourths of every second is used for other chores—logging operational data from all elements of the system, for example.

The computer wastes no time. Between its telling a typewriter to type a character, and the typing of that character, it may add up 3,300 six-digit numbers.

The data and orders to and from the computer that flow back and forth over the four-state microwave network (Arizona, Utah, Colorado, New Mexico), control generators, sluice gates, valves, and other electromechanical equipment, placing control of the Colorado squarely on the shoulders of those who monitor the computer.

Controlling a computer.

The wide-reaching decisions on how much water should be used for what are made at periodic meetings of river-control hydrologists, irrigation-control supervisors, and power-production supervisors.

Based on forecasts for the Colorado's expected flow, the experts set guidelines for the total amount of water that can be used for all needs. Irrigation and power planners then base their scheduling on this figure, breaking it down to

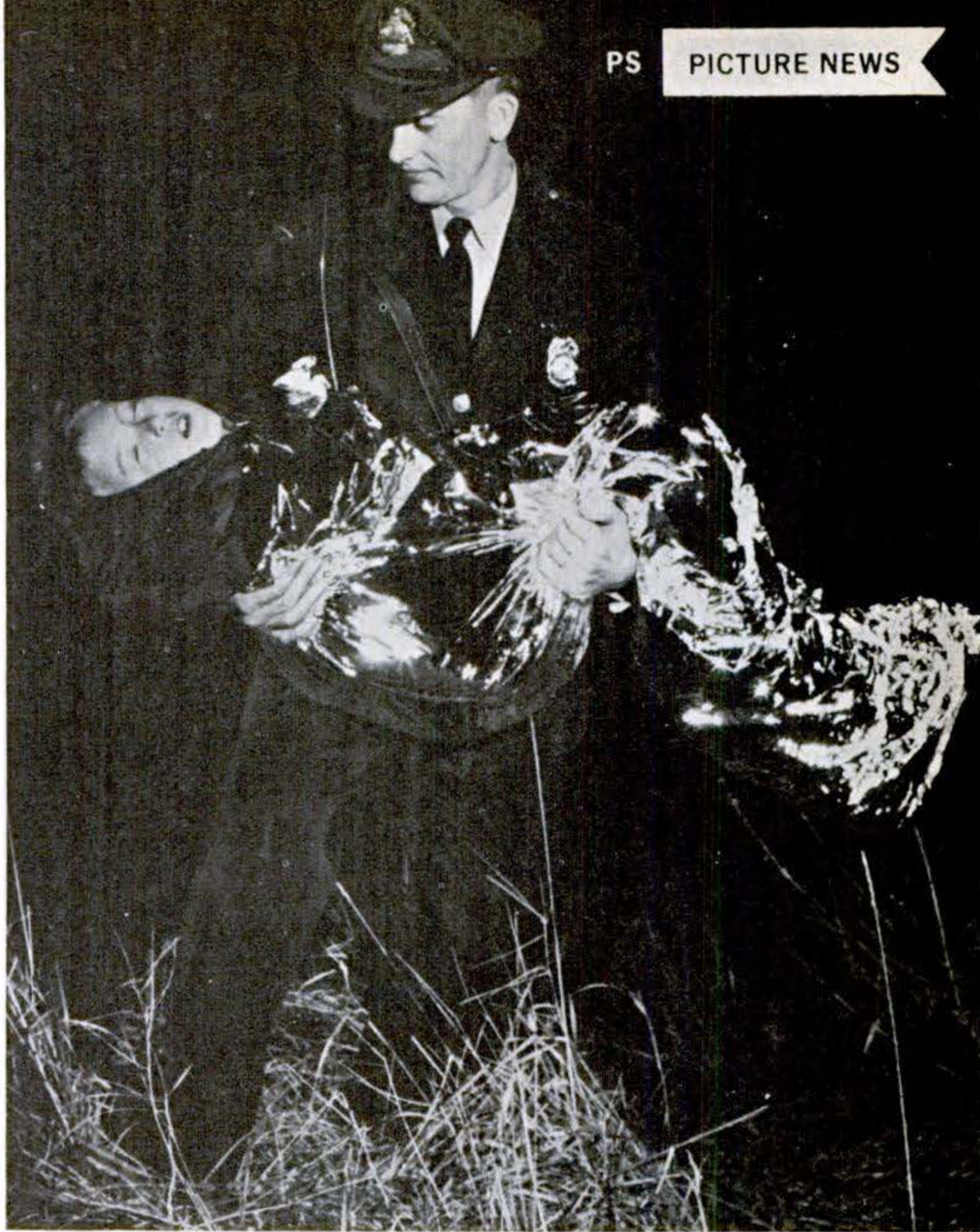


Iodine lubricates titanium one-lunger

Built of space-age metals, this little gasoline engine is lubricated by a material that has iodine as its key ingredient.

Titanium piston rings and a titanium piston slide readily on a stainless-steel cylinder liner with the help of GE's new lubricant; with ordinary lubricants they would have a tendency to seize.

Iodine-based lubricants are expected to widen the use of new hard-to-lubricate metals.



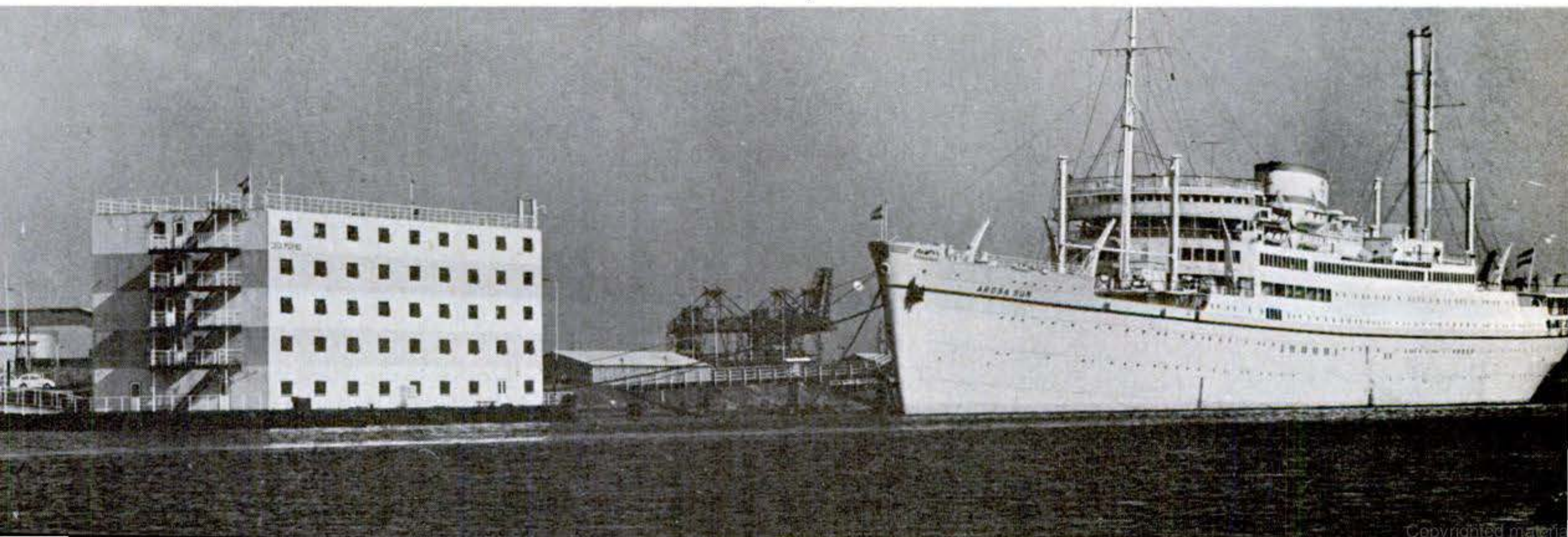
Superinsulated blanket keeps victim warm in rescue

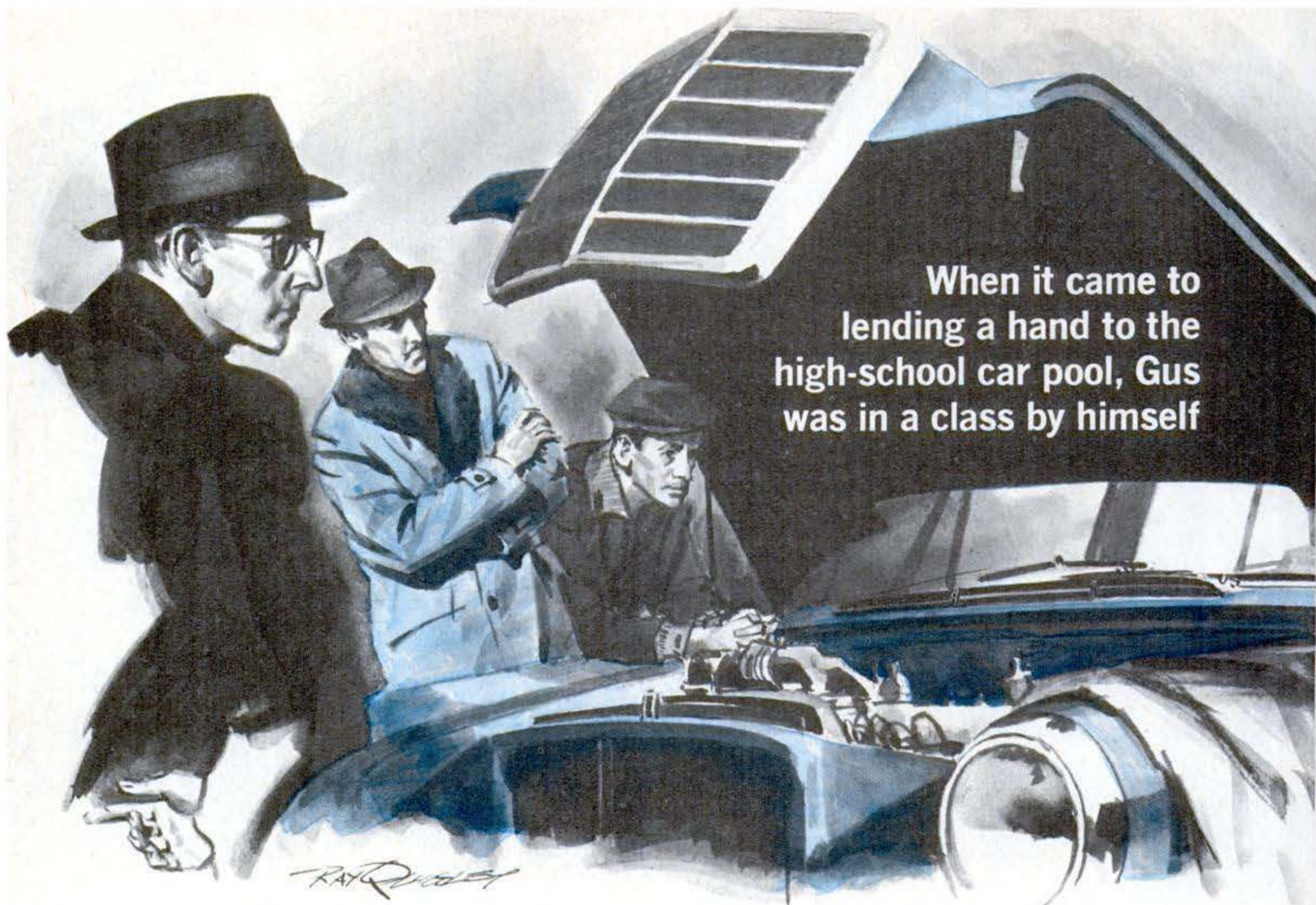
A tissue-thin, featherweight blanket made of aluminized plastic that can be folded to handkerchief size and carried in a shirt pocket provides insulation that will keep a rescued person warm even in snow, rain, hail, and freezing temperatures. The rescue blanket, made by National Research Corp., Cambridge, Mass., was developed from superinsulation used in spacecraft.

Waterfront mill has floating dormitory

When housing became critical at its plant site near Amsterdam, the Netherlands Blast Furnace Co. constructed the floating Casa Marina (below,

left) and anchored it on the North Sea Canal nearby. The shallow-draft barge has 61 four-man rooms on five floors. Its lower deck includes a kitchen, dining room, lounge, bar, and a recreation room for television.





When it came to lending a hand to the high-school car pool, Gus was in a class by himself

Gus Gives the Teacher a Passing Grade

By MARTIN BUNN

Gus Wilson stepped from the brilliant morning sunshine into the somewhat dimmer reaches of the Model Garage and stood still for a moment to let his eyes adapt. The morning was so pleasant he'd taken his time getting to work and Stan Hicks, his assistant, had already opened shop.

A flash of chrome and a slightly different hood shape caught Gus's eye and he walked down to a Mercedes-Benz sedan parked in the middle of the shop. The car, a four-cylinder Model 190, was not new, but it was obviously well cared for. There was a large cardboard sign on the windshield: "Do not start engine! Do not push in gear!"

Stan came out of the office holding a large and steaming crockery mug. "Coffee's ready, Gus." He pointed towards the Mercedes.

"Some young fellow brought it in on the end of a towrope. He seemed pretty much disturbed and said to just, please, leave it alone and he'd come back and see you as soon as he could."

Gus headed for the office and the coffee-pot. The wait for the owner was a brief one. As Stan had said, he was a young man, rather soft-spoken, and clearly upset. His name, he said, was Jim Bailey, and he was the mechanical-arts teacher over at the local high school.

"Here's the situation, Mr. Wilson," he said. "Three other teachers and I formed a pool to buy a car to drive to school. We all live in the same neighborhood. They teach English, Latin, and Music. They keep saying my class is a waste of time because kids can't learn enough to actually fix anything—these days, anyway."

Gus raised his eyebrows. "Why not? Lots



Gus wheeled up the ignition analyzer. "I'm a little busy right now," he said. "Step up and be my guest."

of good professional mechanics started in manual training or a mechanical-arts class. Besides, what's that got to do with the Mercedes?"

Bailey looked a little sheepish. "Well, I was the mechanical-minded one and I sort of persuaded them that we'd get good gas mileage if we bought this car, and that it was durable; and since the price was right we'd have a real bargain."

Gus put down his coffee cup and reached for his pipe. "So what's wrong with that?"

The young teacher grinned weakly. "Well, I told them that since there wasn't a Mercedes dealer within 40 miles, I'd take care of the mechanical work myself. I even bragged a little that if I couldn't take care of a little four-cylinder car I'd better quit trying to teach kids how to care for big eight-cylinder jobs."

Gus chuckled. "And now you've got trou-

ble and you're out on a limb. It can't be too bad. What did you do?"

Bailey glanced at his watch. "Got to get back—next class in 20 minutes. Actually, Mr. Wilson, all I did was change oil. I got up early this morning to do it. After putting in the new oil, I started the engine to back out of the garage and I noticed I didn't have any oil pressure."

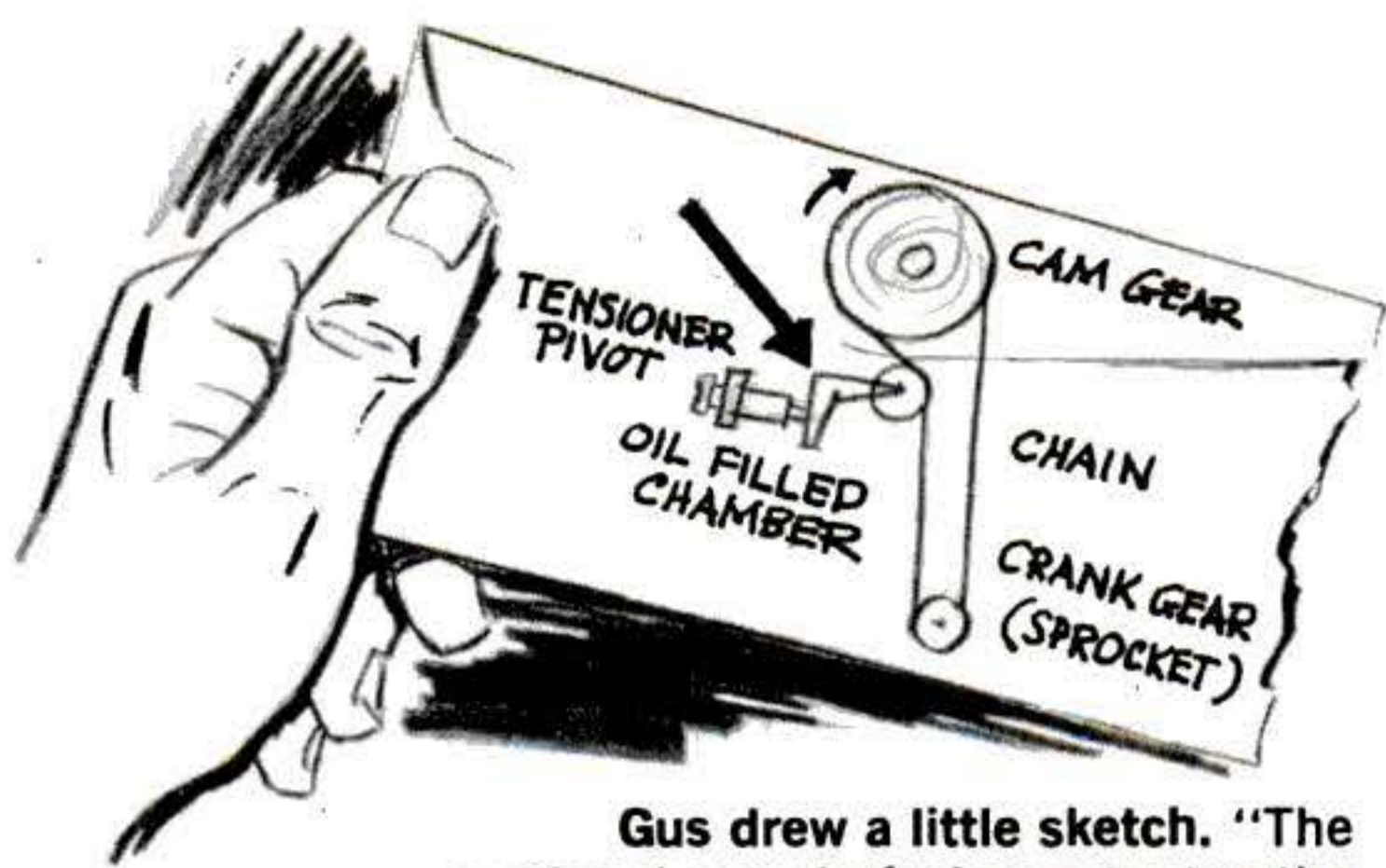
"What did you do then?" asked Gus.

"Oh, I shut off the engine right away," said Bailey. "I was afraid I might score the cylinders or burn out the bearings."

Gus shook his head. "You probably didn't if you only ran it a few seconds."

Bailey looked glum. "I don't know. I'm afraid it's something bad. I lifted the hood and tried turning the crankshaft pulley with a little bar. She's blocked solid."

Continued



Gus drew a little sketch. "The overhead camshaft that actuates the valves on a Mercedes is chain-driven . . ."

Shortly before closing time, the snub-nosed Mercedes rolled back into the Model Garage. Bailey didn't seem quite so worried this time, but it was apparent that all was still not well. He listened to the story of the air-locked oil. Then Gus told him that what he'd felt blocking rotation was the pistons striking the valves because he'd been turning it backwards.

Stan evidently couldn't quite accept this. "Why wouldn't the pistons hit the valves any other time?" he asked.

Gus drew a little sketch on an envelope. "The overhead camshaft that actuates the valves on a Mercedes is chain-driven. The side of the chain that is pulling is always taut, like the top side of a bicycle chain when you're pumping. The back side is slack, like the bottom of a sloppy bicycle chain. An oil-filled chain tensioner rides against it to keep the chain in snug running contact with the sprockets.

"Mr. Bailey's tensioner is a little leaky and bled down some of its oil overnight. It didn't really pump up again in the few seconds' running before the lack of oil pressure scared him. Then, when he turned the engine, he turned it backwards; the slack side of the chain became the pulling side, and the crank throws were out of time with the camshaft by the amount of slack in the chain. Even a gentle contact between a piston and a valve is frightening when you expect an engine to turn freely. It's happened to me several times on a Mercedes and that's why I wasn't concerned about this one."

Bailey grinned. "I'd better get a new chain tensioner, right?"

"It's a good idea," said Gus.

As Bailey was about to leave he hesitated. "Actually," he said, "the fellows got after me a bit on the way home tonight. The car runs fine most of the time, but every now and then it starts to buck. Tonight it bucked and then died. I coasted out of traffic, looked over the distributor cap and rotor for cracks and such, put it back together, and it ran okay."

Gus reached through the window and yanked the hood latch. "Was the distributor dirty inside?" he asked.

Bailey grimaced. "After what I tell my students? No, sir, take a look. I rebuilt that distributor myself."

Gus had to admit that the little reddish-colored cap and the gleaming parts within looked like jewelry. He tore a piece of paper into a narrow strip and worked it between the points. The paper showed a trace of black

Continued

"You mean it won't turn at all?" said Gus. Bailey gestured towards the car. "Try it. You can turn it okay part of a revolution and then she hits. I guess I'll just have to ask you to fix it. Right now, I've got to get to class." The worried teacher started for the door.

"Give me a minute of your time," said Gus, slipping into the car. He depressed the clutch and pushed the starter button. Nothing happened.

"Oh," recalled Bailey, "I disconnected the starter so nobody would turn it over accidentally and do more damage."

Gus tugged the hood-release handle. "Put the cable back on the battery."

Bailey connected and tightened the battery. Gus hit the button and the engine hummed smoothly into life. He let in the clutch, jumped the car across the garage floor, and braked hard. With the engine still running, he slid from the seat, slapped the astonished teacher on the back, and laughed.

"Okay, you can drive to school now—there's nothing much wrong with your car. But come back later."

Stan had been a silent listener to the proceedings. "That took nerve," he said.

Gus was looking over the work schedule for the day, and merely grunted.

Stan went on: "I can understand how he might have had an air lock in the oil-pump pickup dome so he didn't build up oil pressure after the change; and I can see how a quick stop and start would slosh the oil in the pan enough to clear the air bubble; but I don't understand why he felt a solid lock when he turned the crankshaft by hand and yet you started it without trouble."

Gus went on with his paperwork. "You're right about the air lock that kept the pump from priming," he said. "When Bailey comes back, I'll tell you about the crankshaft block."



SPORT

'66 MerCruiser...most carefree stern drive ever built

MerCruiser's dependability is part of the fun. It takes you way out fast to where the line yankers are, helps you chase 'em down and bring 'em in, then brings you back. And it will do this day after day, year after year. That's the kind of dependable performance you'd expect from the world's most popular stern drive. Only MerCruiser has sure-going features like sturdy, one-piece lower unit; special impact protection; Super Flow cooling system and efficient Jet-Prop exhaust. Ruggedness is continually tested and proven at our Lake X, Florida, where MerCruisers ram through hyacinths and silt and over logs and sandbars to assure the strength of the stern drive unit. Then we

take the MerCruisers to Florida's west coast for testing under all salt water conditions. Each MerCruiser prototype churns through thousands of torture hours so we'll catch any problem before you do. No wonder MerCruiser is the most dependable stern drive you can buy—and far and away the world's best seller. See your MerCruiser dealer!

60, 110, 120, 150, 170, 225, 310-hp gasoline; 60-hp diesel



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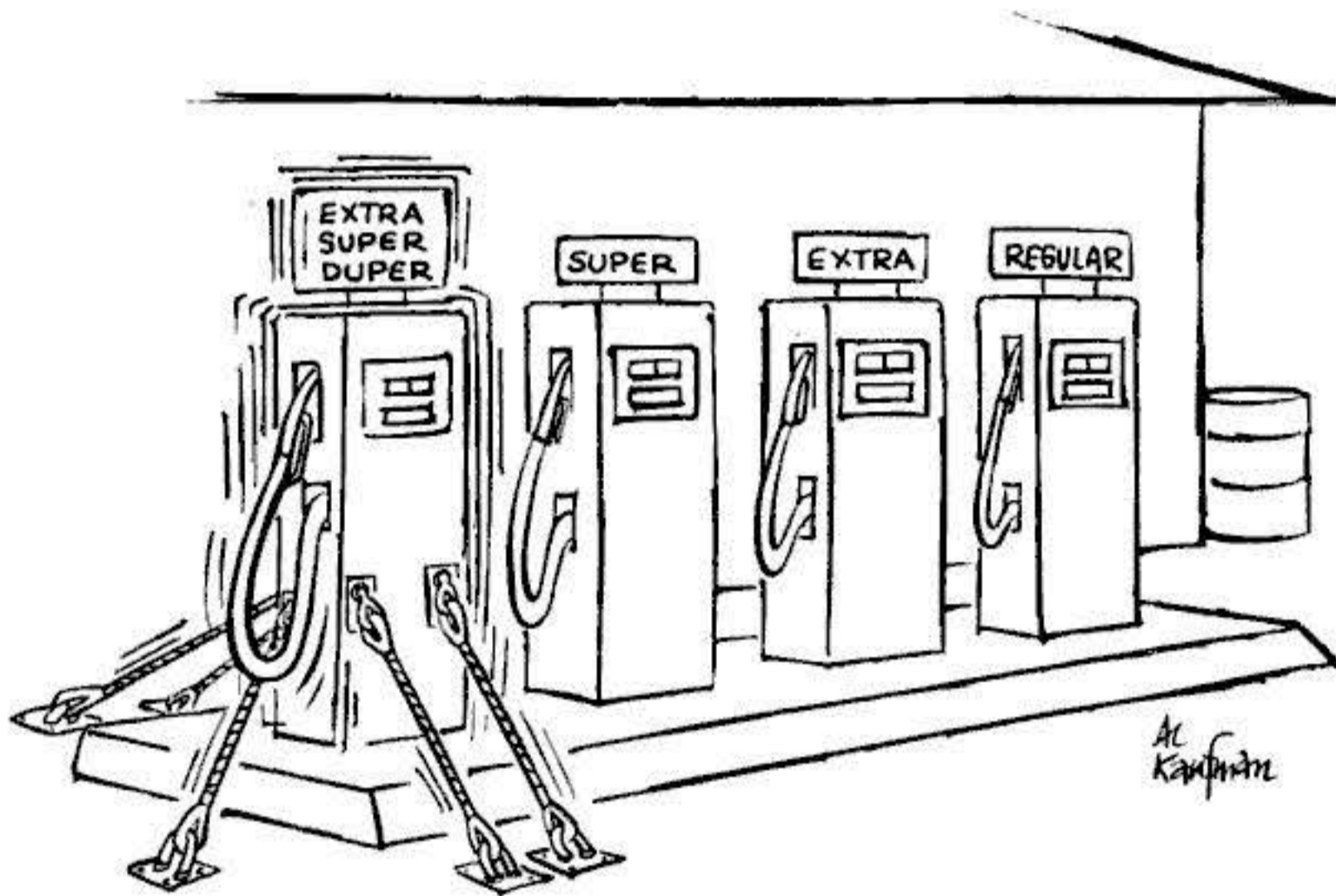
as he released it from between the contact surfaces.

"What did you lubricate the advance mechanism with?" he asked.

Bailey fished in the trunk a minute and produced a tube. "This white lubricant that I use for almost all my fine work. Those advance parts are really slick and I just put a tiny smear on them."

Stan caught it right away. "I remember when we tried to use the same lubricant," he said. "It has a metal additive and seems to vaporize a bit when the engine gets hot. After a while an almost invisible film shorts out the rotor."

Gus ran the tip of his finger up the underface of the rotor. "As the rotor spins, it acts as a centrifuge and a thin conductive film works out toward the contact tip," he said.



"Eventually, it provides a flashover path between the contact and the shaft."

Bailey was chagrined. "Then, when I wiped the rotor to look for cracks, I removed the invisible film enough for the car to run. I'll wash out the distributor with cleaning solvent and blow it dry at the school shop. Next time I'll stick to approved distributor lubricants."

Two nights later, the Mercedes pulled in again. One cylinder sounded as though it was missing badly. Three men got out of the car with Bailey. From his expression, he'd been given a rough time on his choice of car and his mechanical skills. Gus felt sorry for him as he related his further troubles.

"After I cleaned the distributor," Bailey explained, "I got my friends here to go in with me on a new set of plugs. It doesn't stop anymore, but now we've got a steady miss."

Gus took a quick look at the plugs. They were correct for the model and compression ratio of the car. Hoping that Bailey could come through, Gus wheeled up a cathode-ray ignition analyzer with a considerable flourish, tossed a protective blanket on the fender, and gestured openly in invitation.

"I'm a little busy, right now," he said, "but step up and be my guest on the scope."

Bailey picked up the wire leads. He handed one to a member of his group.

"Here, Bob, lend a hand," he said.

"What do I do with it?" asked Bob.

"Plug it in the wall socket," said Bailey dryly. He then quickly snapped the pickups on the engine and hit the starter. A green trace raced across the scope face and settled down to a rough, four-pip pattern. Bailey watched, stopped the engine, interchanged two wires on cap and plugs, and started the engine again. He let it run about 30 seconds. His friends watched in fascination.

"What's going on, Bailey?" asked one.

Bailey looked up and grinned. "For you, Latin teacher—*veni; vidi; vici.*" He tugged a plastic object from the end of a plug wire. "I came; I saw; I conquered. Tomorrow you eggheads are shelling out for some new spark-plug resistor connectors."

He reconnected the plug wire by twisting the conductor around the plug cap and started the engine.

"The rhythm certainly looks better, now," said the music teacher.

"From here on, let it be *semper fidelis* every morning," added the Latin teacher.

Bob assumed a dramatic manner. "Frankly, Bailey, your practical skills have always amazed us, but we feel our goading has driven you to new heights, as exemplified by your concert with this fabulously complex, green-eyed machine. The engine suddenly runs well."

Gus had been fairly sure the scope was understandable to the teacher from his reading, if not from experience. He'd also been sure the device would impress the others.

"Bad resistor connector?" he asked, winking at Bailey.

Bailey could also be an actor. He winked back. "Yeah, high KVs on number four. You run into it now and then on these foreign ignition systems."



This is what mountain country looks like to a tuned car.

What makes a car a car is styling, performance, ride and handling. Only when they're all tuned together is the car a Buick. Like this '66 Skylark Gran Sport.

As a matter of fact, it's what miserable traffic looks like to the tuned car. And twisty, winding roads. And a "ROAD UNDER CONSTRUCTION," too. For the tuned car makes a habit of making unwelcome sights disappear.

Which makes the tuned car a most welcome sight indeed.

The Skylark Gran Sport—one of the tuned cars. The Skylark GS in the picture is, like every tuned car, a beautiful blend of styling, performance, ride and handling. Which means it rides as smoothly as it performs. (A suspension designed specifically for the GS sees to the ride. A 325-hp Wildcat V-8 sees to the performing.) And it handles as briskly and responsively as you'd expect a car that looks like this to handle. (Alas, some cars don't live up to the way they look. The tuned car always does.)

How the tuned car works its wonders. If you're intent on making mountains evaporate, you've got to get out of the test lab, we say. So we do a lot of our product develop-

ment out in the real world, on real roads, where real people drive.

All this means you aren't likely to run into a driving situation that we haven't already seen. And *that* means the tuned car is tuned to your kind of driving.

Tuned safety equipment, even. Built and blended into every Buick are padded sun visors and a padded dash. Two-speed electric wipers and windshield washers. A shatter resistant mirror inside and a rear-view mirror outside. Back-up lights. And seat belts all around, which we exhort you—nay, plead with you—to buckle on. (Is there nothing we won't do to make sure you're in fit shape to come back for more Buicks? Nothing.)

How to turn your country into tuned car country. The only thing standing between you and the tuned car is your Buick dealer. And an easier obstacle to surmount you've never met.

Unless you count mountains.

Wouldn't you really rather have a Buick?

1966 Buick. The tuned car.

NEW a 1966 **International[®] pickup** **with everything you need**

To find all the improvements we offer in the new INTERNATIONAL pickups, you should take a look at the outside, inside and underside.

Start with the shiny new grille. It's as clean and uncluttered as the rest of the body. And there's a whole new choice of bright body colors.

Inside you can get trim as fancy as an automobile's. Extras like a padded dash and door

panels. Simulated wood grain instrument panel. Acoustical headliner. Padded dual sun visors. Colorful new upholstery with arm-chair cushion comfort. Nylon carpet on the floor.

Under the hood there's new insulation, new engine quietness. Balanced drive line reduces vibration. Improved clutch linkage lessens pedal effort.

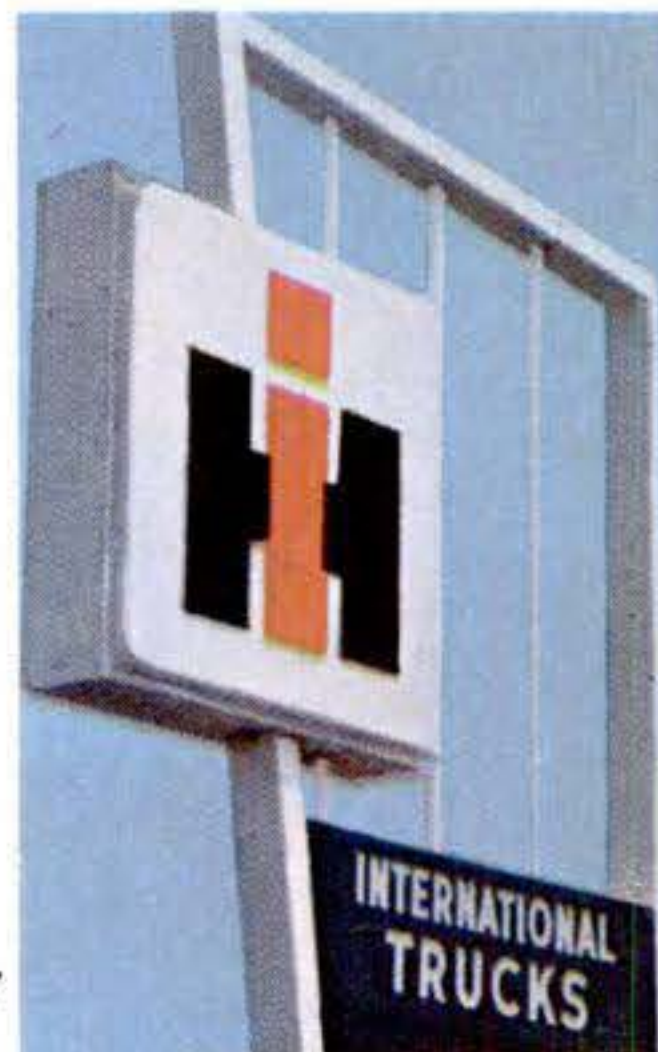
All this is available in addition to INTERNATIONAL



and here's where to find it

features like husky power plants. Frames, axles and suspensions that are packed with muscle. Zinc-coated cabs that fight corrosion so well. All-steel boxes that won't rot, warp or splinter.

Pick the pickup you need—from 40 models—at an INTERNATIONAL Dealer or Branch, listed in the Yellow Pages. Do it now. Make a deal today that means savings right from the start.

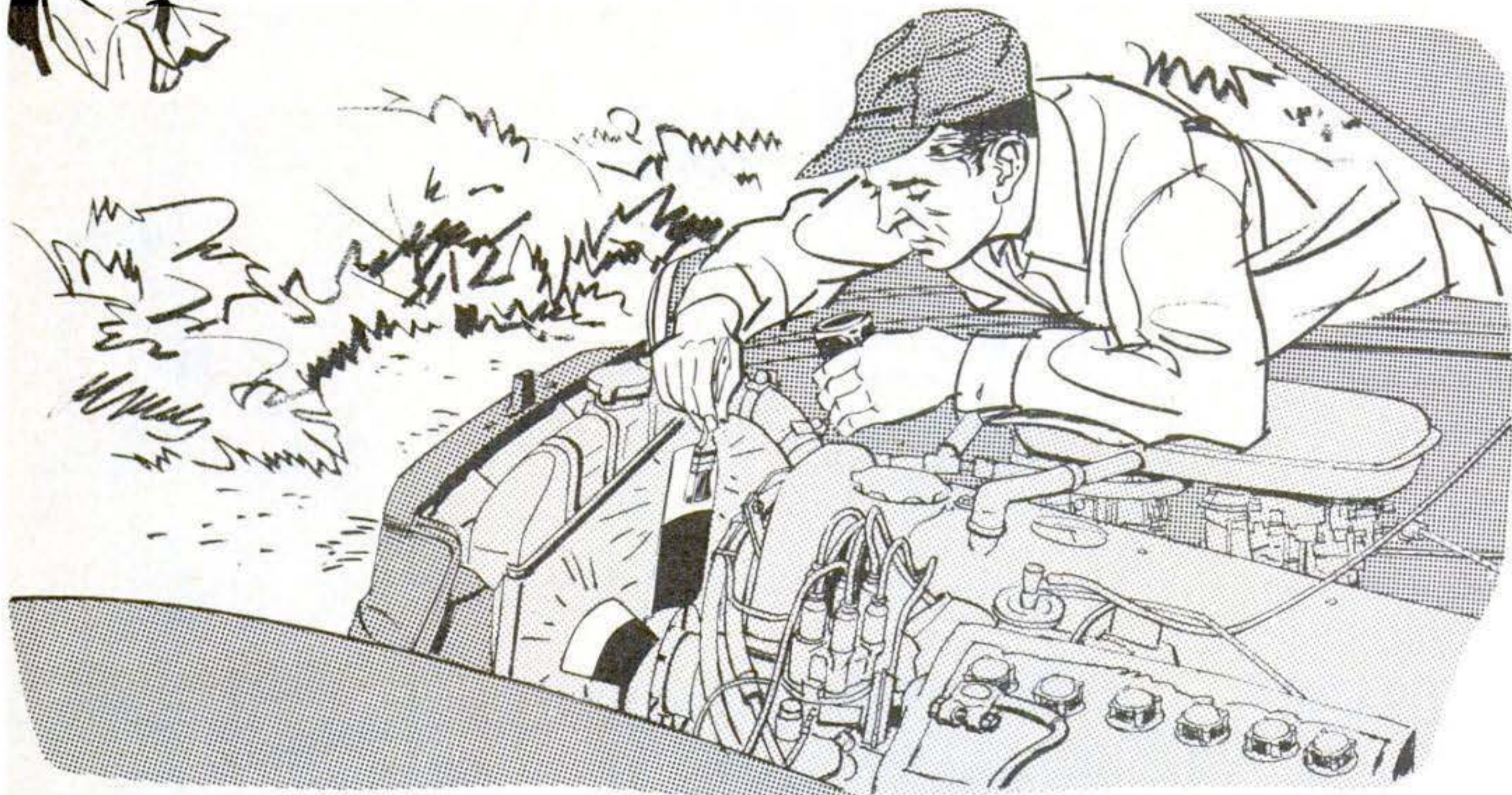


INTERNATIONAL HARVESTER COMPANY
CHICAGO, ILLINOIS



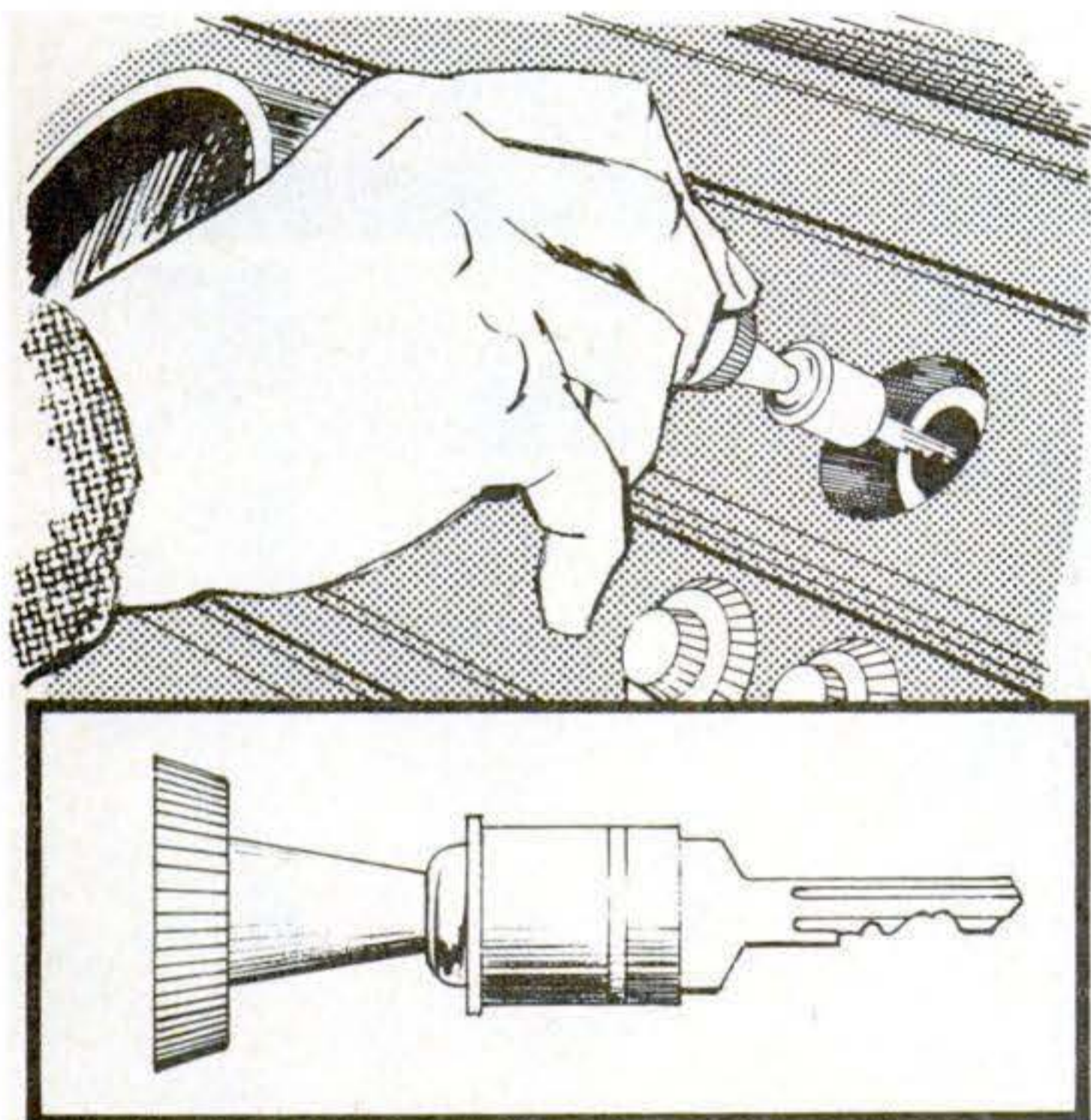


Hints from the Model Garage



Working under the hood of a car while the engine is running — as it must for some checkup and repair operations — can be dangerous. Absorbed in your work, you can forget to keep your fingers out of the way of the revolving fan —

especially if it is a dull, dark color. The solution: Paint the fan-blade tips with a fluorescent paint like Day-Glo. The highly visible bright orange-red will make it safer to work around that running engine.



Need a good spot for the spare key? Take the guts out of the cigarette lighter, fill it with epoxy glue and stick the key handle into it. Disconnect the wires to the lighter and remove the back of the socket. The knob now keeps the key handy, but still looks like a lighter — fooling potential thieves but keeping the key handy.



Coolant containing antifreeze, drained and stored in a bucket or a can during a repair job, ends up with a film of oil over it. Remove this film before refilling the radiator by placing a sheet of newspaper on the coolant surface — it will readily absorb the oil. A discarded desk blotter will do the job nicely, too.

Continued



Yardbirds, revolt!

Break the hot weekend habit!



New FORD 4-SEASON lawn and garden tractor

lets you enjoy yourself on weekends, enjoy your family.

Why push, pull, dig, strain and sweat? With a new Ford eight or ten hp lawn and garden tractor, you can do a better job of caring for your grounds—sitting down. And you'll have plenty of time and energy left for other weekend activities.

This rugged new Ford is a year-round worker. Lawn and garden chores to snow removal. You'll find it at your Ford tractor dealer's. He knows tractors. He sells and services Ford tractors to farms and industry. Look him up in the Yellow Pages under "Tractors." Or, fill out and mail the coupon.

Ford Tractor Division
2500 E. Maple Rd.
Birmingham, Michigan 48012

Send me color booklet about the new Ford eight and ten hp lawn and garden tractor and quick-attach tools. Send address of nearest Ford tractor dealer, too.

NAME: _____

ADDRESS: _____

CITY: _____

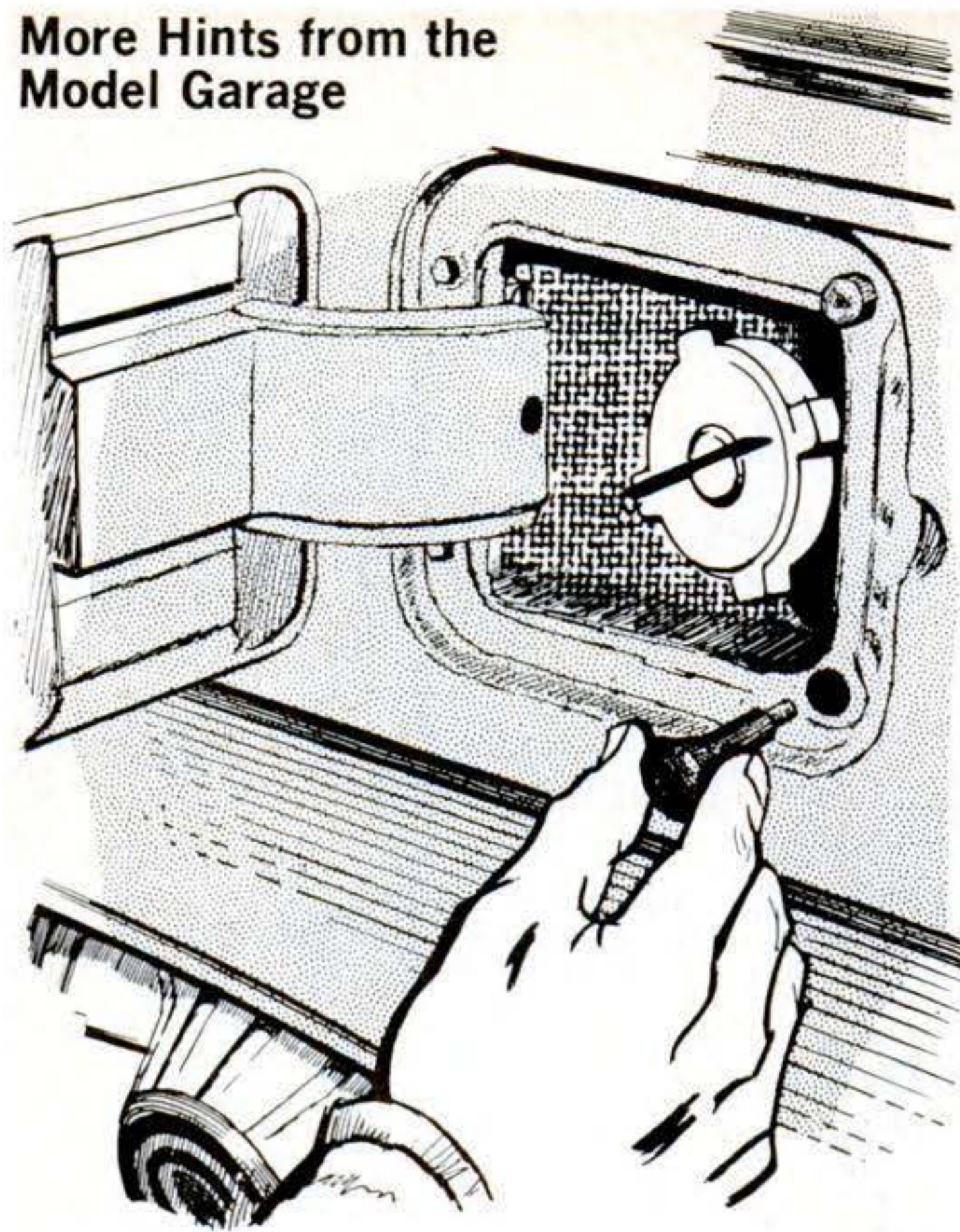
STATE _____ ZIP CODE _____

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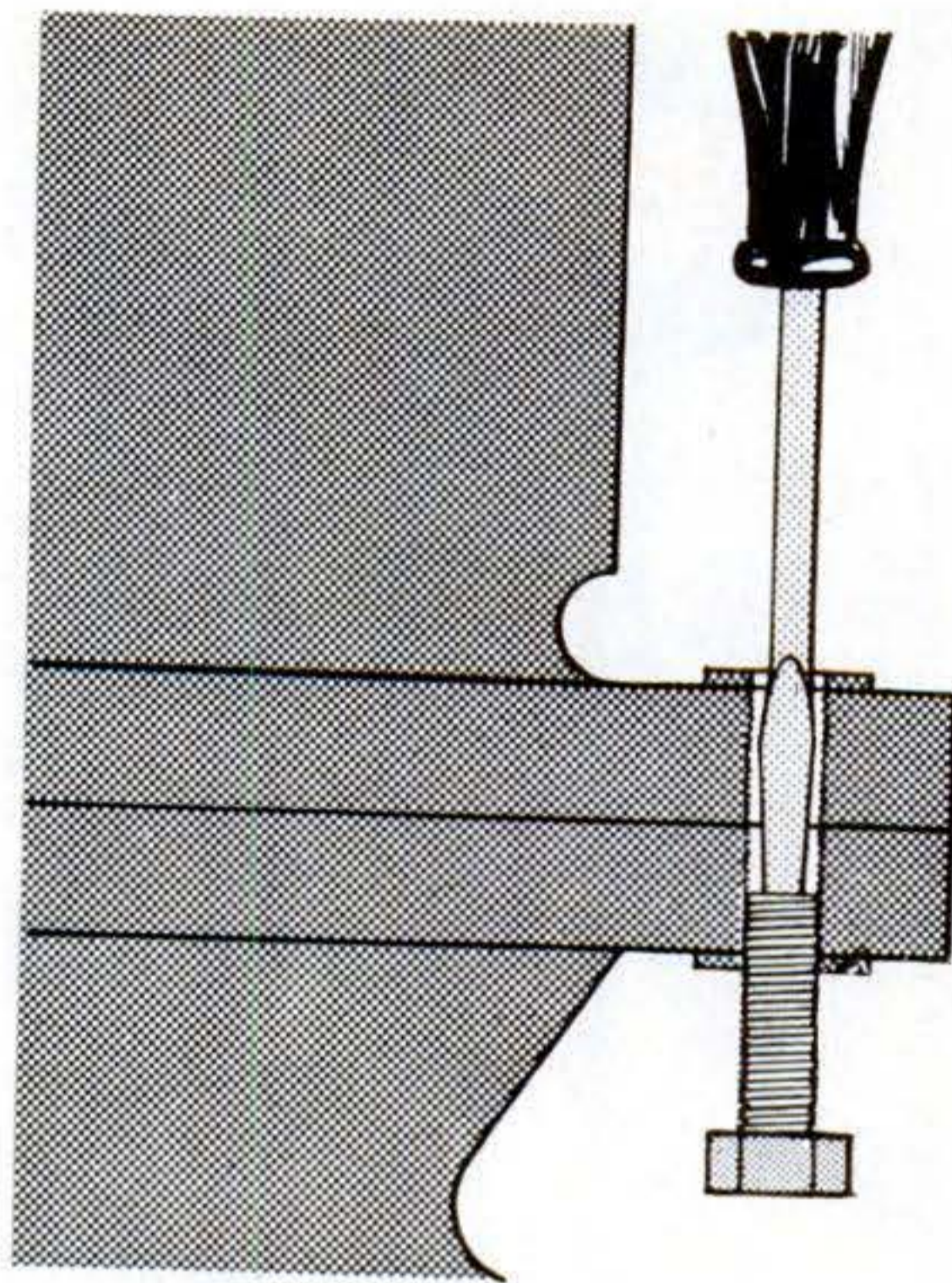
FORD



More Hints from the Model Garage



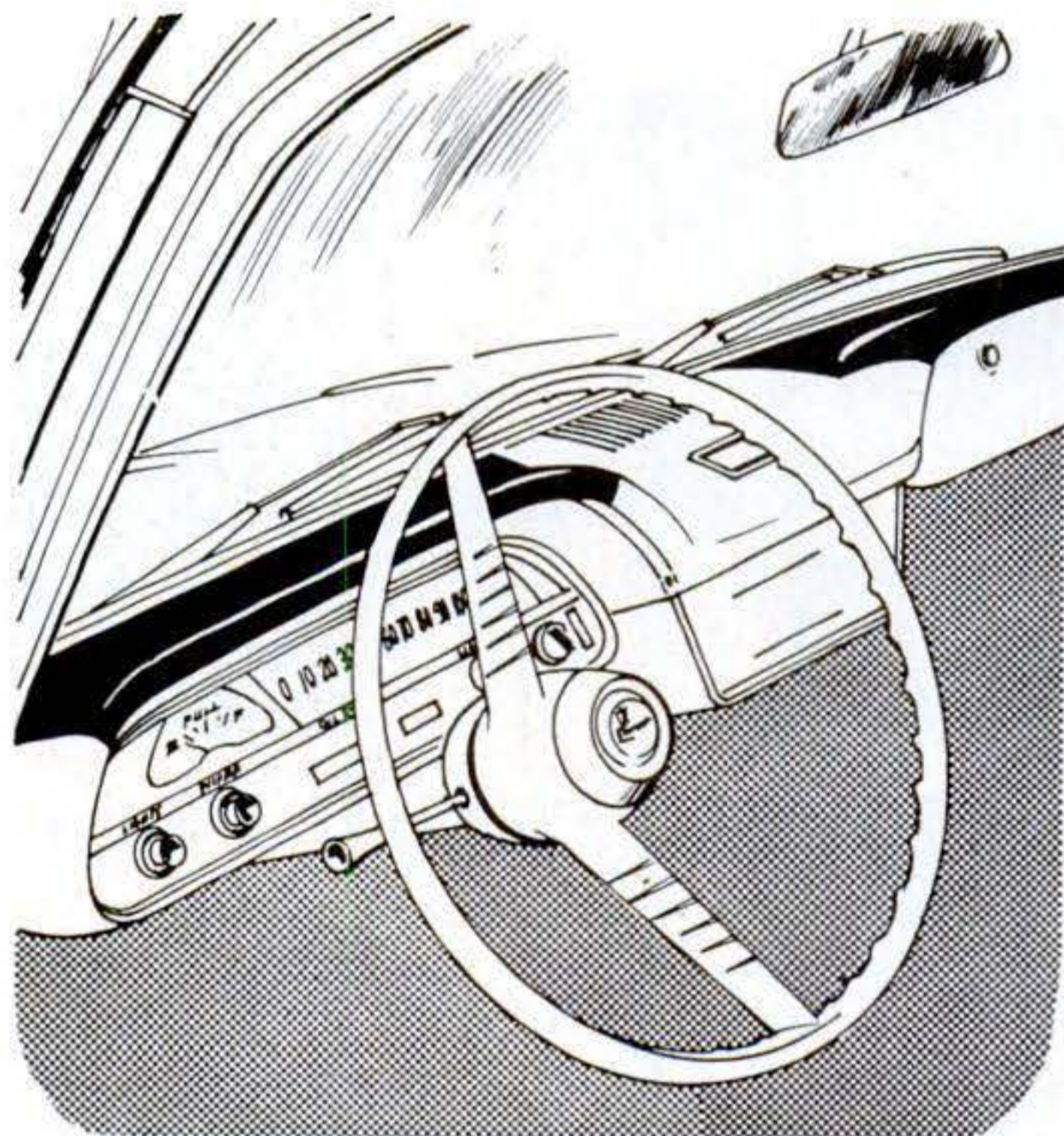
Those small rubber bump plugs on the fender trapdoors covering gas-filler caps often get lost. For a long-lasting replacement job, try this trick: Fit medium-size, tapered tubeless-tire plugs into the holes. Dip the plugs in oil and pull them into place.



Carburetor bolts inserted from below sometimes cannot be reached with a wrench. But they can be easily loosened or tightened from the top with a screwdriver if the bolt ends have a slot in them. For the final tightening, use a wrench on the screwdriver handle.



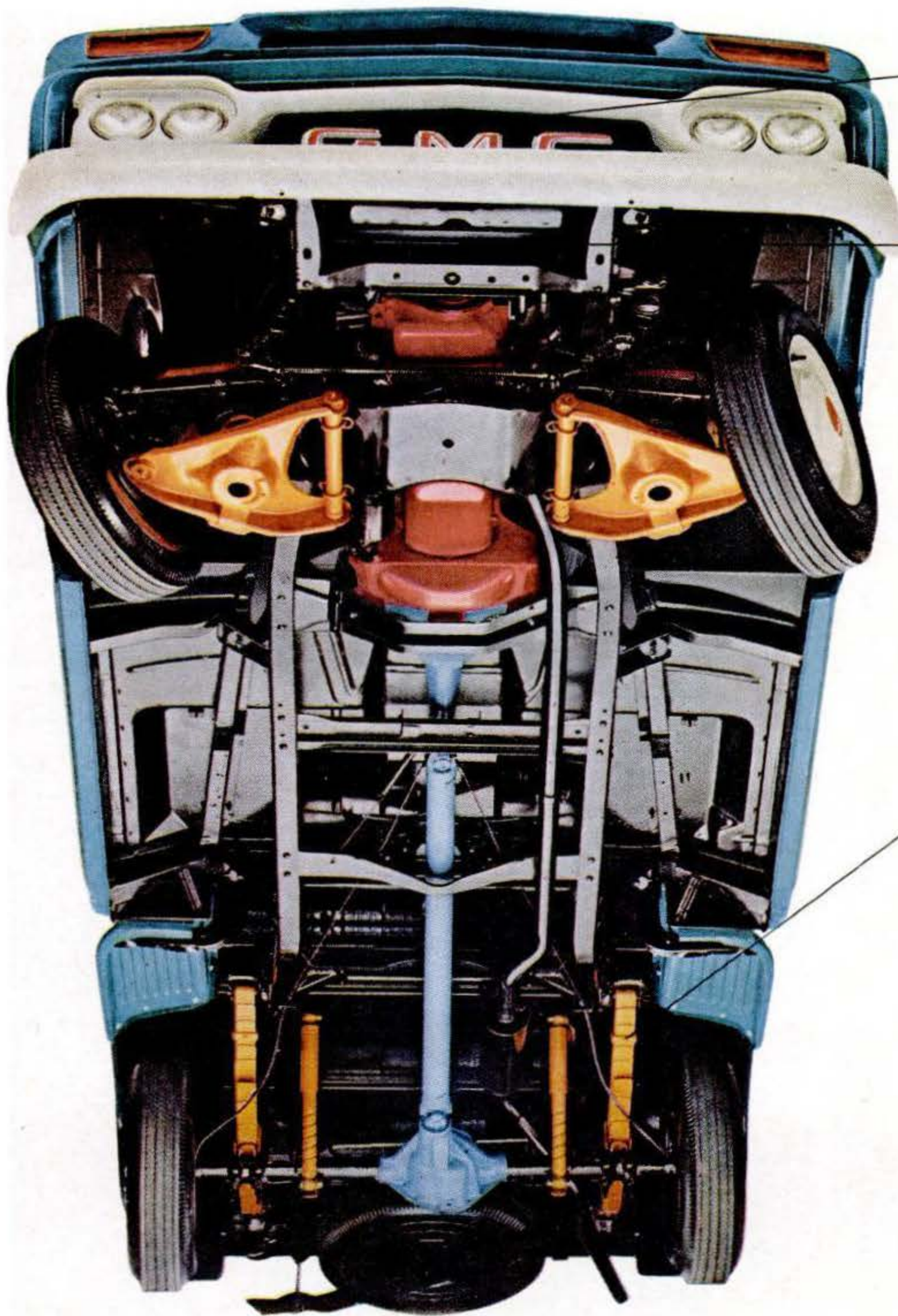
You won't forget the setting for your ignition points any more if you punch the specifications on a piece of "Dymo" tape and stick it on the coil where they can easily be read. Other reminders can be made up and stuck in proper places in the garage as well as in the car.



Sunlight reflections of the instrument panel in the windshield bothering you? Here's an effective remedy: Put a coating of flat black enamel on top of the dash. Mark off a symmetrical area with masking tape, and cover it with the reflection-absorbing paint.

What happens when you find out how much more muscle we build into a GMC pickup for only \$49* more than others?

You get converted.



That GMC nameplate stands for this. "Built, sold and serviced by truck people"—men who know how to give you a lot more truck for your money.

The heart of this beautiful brute—GMC's I-6 engine. More power this year—155 h.p. Also, it has more torque, more cooling and lubricating capacity than most competitive engines.

Right away a GMC stands out. Most other pickups have only two headlamps. A GMC has four.

The roof of the cab has two walls of steel and a thick pad of insulation. Call that security. Call it longer-lasting, too.

The loadbed floor is made of wood. Unlike metal, it's quiet. Won't rust or corrode. And it's strong and long-lasting.

The combination of independent front coil spring suspension and progressive leaf rear springs gives a smooth ride, even with maximum loads.

*Based on manufacturers' suggested retail prices, the GMC I-6 model pictured above is never priced more than \$49 over comparable competitive base models. Often the difference is less.

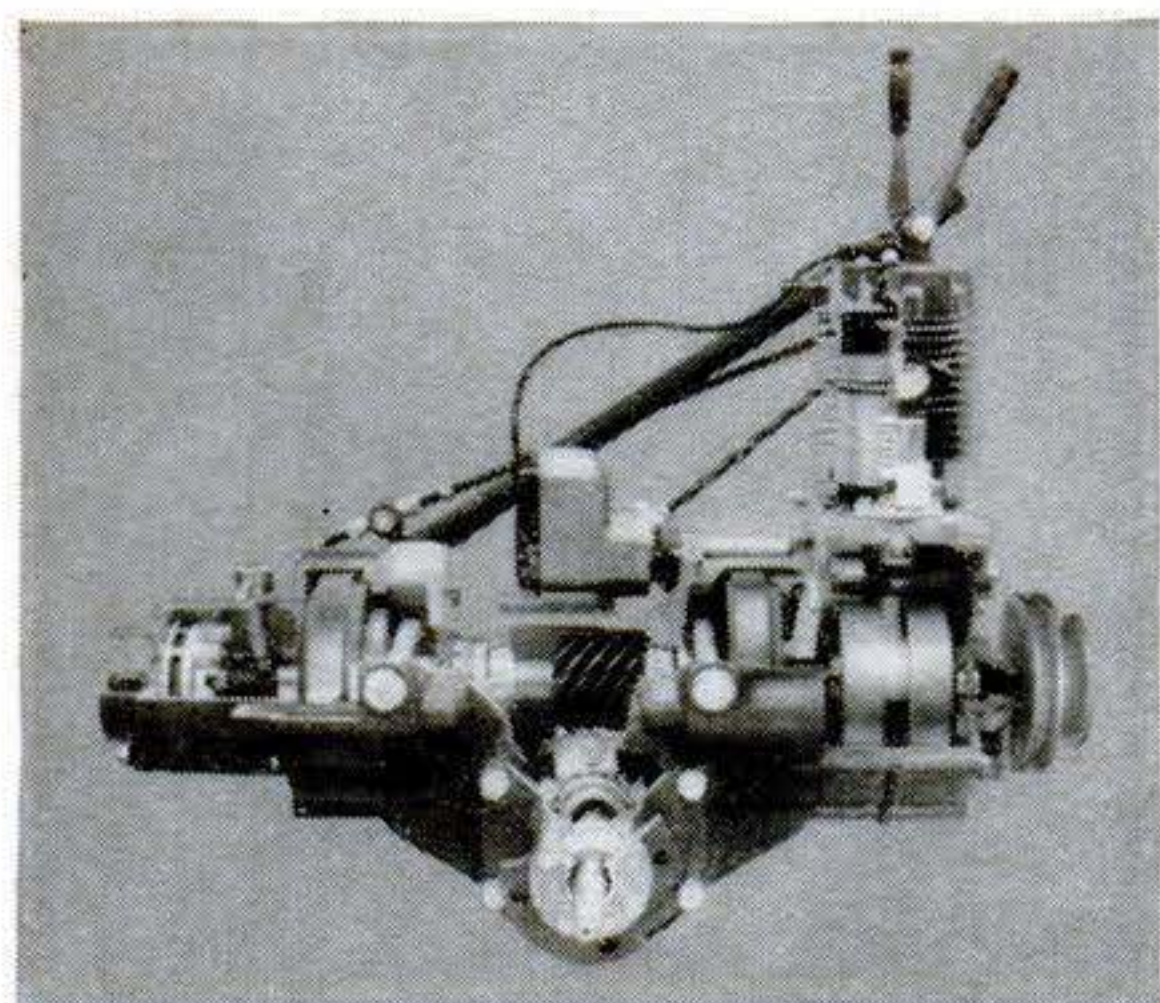


**Look
under
the
hood**

**...and
you'll
get a GRAVELY**



Gravelly Super Tractor
with Rider



Gravelly-designed, Gravelly-built with all-gear engine-to-attachment drive, plus automotive-type all-gear transmission.

Before you buy any tractor, take a good, under-the-hood look at the Gravelly. See why Gravelly owners, for over 40 years, have had a fierce love for this sturdy master of lawn and garden care.

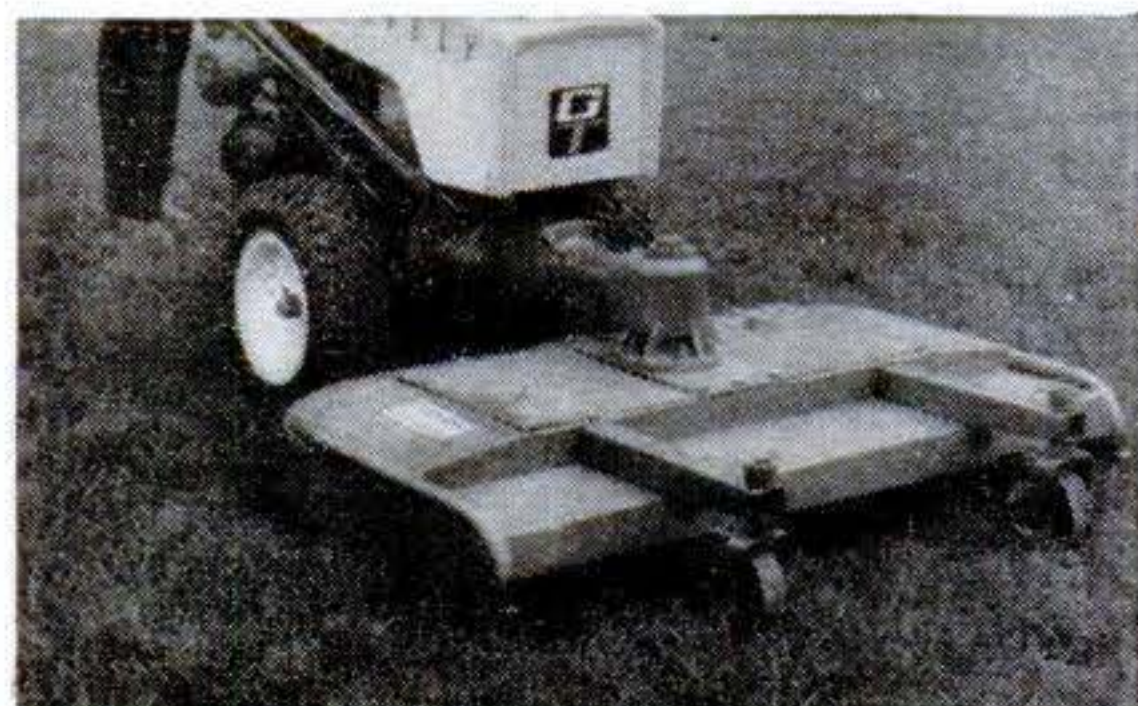
Spark this high-torque Gravelly engine to life, with any of the 39 attachments, and you're on your way to mow, plow, move snow, haul, or do any lawn or garden chore in an easy hurry. And you change power attachments quickly with only four bolts.

Gravelly is famous for safety, maneuverability, versatility, and long life. Ride or walk with instant control; no clutching, four forward speeds, four reverse. See your local Gravelly Dealer. Or, enjoy our free catalog. Write Now! Gravelly, 5003 Gravelly Lane, Dunbar, West Virginia 25064.

GRAVELLY
TRACTOR DIVISION
Studebaker
CORPORATION



Rotary Cultivator, for gardening.



40" Rotary, one of five mowing attachments.

Bonanzas on the Way to the Moon

[Continued from page 107]

beans from one raising rice or corn. Moreover, you can distinguish a healthy crop from one affected by drought, or beset by stem rust or fungus. This method employs a series of films of different spectral sensitivity; and a battery of "remote sensors," simultaneously viewing the same spot on the earth's surface in different wavelengths of visible or infrared light. There is no reason to doubt that the technique, pioneered in airplane flights, could be used just as effectively from orbit.

Collecting crop data over the whole globe will need to be done continuously. Not only do plants change their appearance in growing; some weather-favored areas may be due for an exceptional yield, while other regions suffer from drought or floods. Only by keeping constant track of a given region will it be possible to come up with a realistic forecast for the current season's crop. To make such a continuous global survey with airplanes would run up an exorbitant fuel bill. To do it from orbit, year after year, really makes economic sense.

Once such a global survey exists, it can be used for other purposes as well. Systematic prospecting for oil and mineral deposits will become possible. A watch can be kept on volcanoes and other geologically unstable areas of the earth's surface, with an eye towards predicting eruptions or earthquakes. Systems can be provided to warn ships of icebergs, and thinly populated areas of forest fires. Observations of snow-fall can give better forecasts for the water management of storage lakes, hydro plants, and irrigation systems.

Oceanography is another customer. Great possibilities await continuous global measurements of such phenomena as sea state, ice movements, water temperature, salinity (determined from orbit by polarimetry), and ocean-water coloration. (Green streaks indicate high plankton content and ability to support a greater fish population.)

National security. Since we have no plans ever to place nuclear bombardment missiles in orbit, Saturn-Apollo is unlikely to add to our national deterrent power. But, just as we can observe crops, storms, snow, and ice movements at sea, it stands to reason that we can also keep a watchful eye on things of military importance.

Undoubtedly, one of the greatest sources of danger in the world today is the Com-

munist regions' secretiveness and their aversion to any kind of mutual-inspection scheme, because it often compels Western statesmen to depend upon educated guesses or assumptions rather than factual knowledge. Better information of what goes on, in their walled-off portions of the globe, will benefit our national security—and make this planet a safer place in the nuclear age.

Fundamental knowledge. Probably the most important truth man has learned, in the 10,000 years of his conscious history, is that it has paid him to satisfy his curiosity. The substance of what we call civilization—the house we live in, the clothes we wear, the ideas we pursue, the work we do, the car we drive, the books we read—can all be traced back to the simple fact that at some time someone was curious about something. Observing the universe from the vantage point of outer space—unobstructed by an atmosphere that blurs the stars' images and absorbs most of their radiation—is one of the best bets for man to enhance vastly his understanding of nature. It is up there that he may find the ultimate answer to what makes the universe tick.

Engineering and managing know-how. Putting a man on the moon and bringing him back alive not only calls into play a host of scientific and engineering talents; it requires a refined approach to what is called systems analysis—the art of predicting what a change in performance or defect, in one part or area, will do to other parts, other areas, and the whole system.

Entirely new management methods, too, have had to be developed. They enable the Apollo-Saturn managers to take prompt corrective action when something goes wrong in the complex machinery of an effort involving thousands of companies, hundreds of thousands of people, and hundreds of millions of dollars—and the entire, intimately interwoven program is in danger of falling out of step.

Many of these new managing techniques can be used to great advantage in fields as unrelated to space as high-speed interurban transit, and causes and remedies for air and water pollution. They can even be adapted to human relations problems, such as racial unrest and juvenile delinquency.

So, in blazing a trail to the moon, we are opening bypaths whose exploration promises rich rewards to come. **PS**

Glazing . . . The Expensive Look the Easy Way

[Continued from page 185]

and use. Where normal use might have worn the finish thin, wipe hard.

2) Wipe least in depressions—carvings, low spots in turnings, grooves, moldings.

3) Wipe at the center of a large area, such as a tabletop, drawer front, chest end. Try to blend the glaze from light at the middle to fairly heavy along the edges.

4) Spend a little time on intricate carvings and turnings; you can add to their decorative quality by spot-wiping highlights with the end of your finger, and by using cotton on a stick to sharpen crevices.

5) For accentuation of the grain, wipe across the grain or cracks with a thin pad of cloth, so some glaze remains in fine cracks.

6) A wad of Turkish toweling, wiped in parallel strokes, leaves a subtle striping of glaze. You can get stippling effects by using a sponge, wadded newspaper, or the stiff end of a stippling brush. Stroking with a stiff brush creates "grain."

7) Taking off glaze is easier than replacing it, so don't go too far. Later—even next day—take a fresh look. If you want to remove more glaze here and there, you can

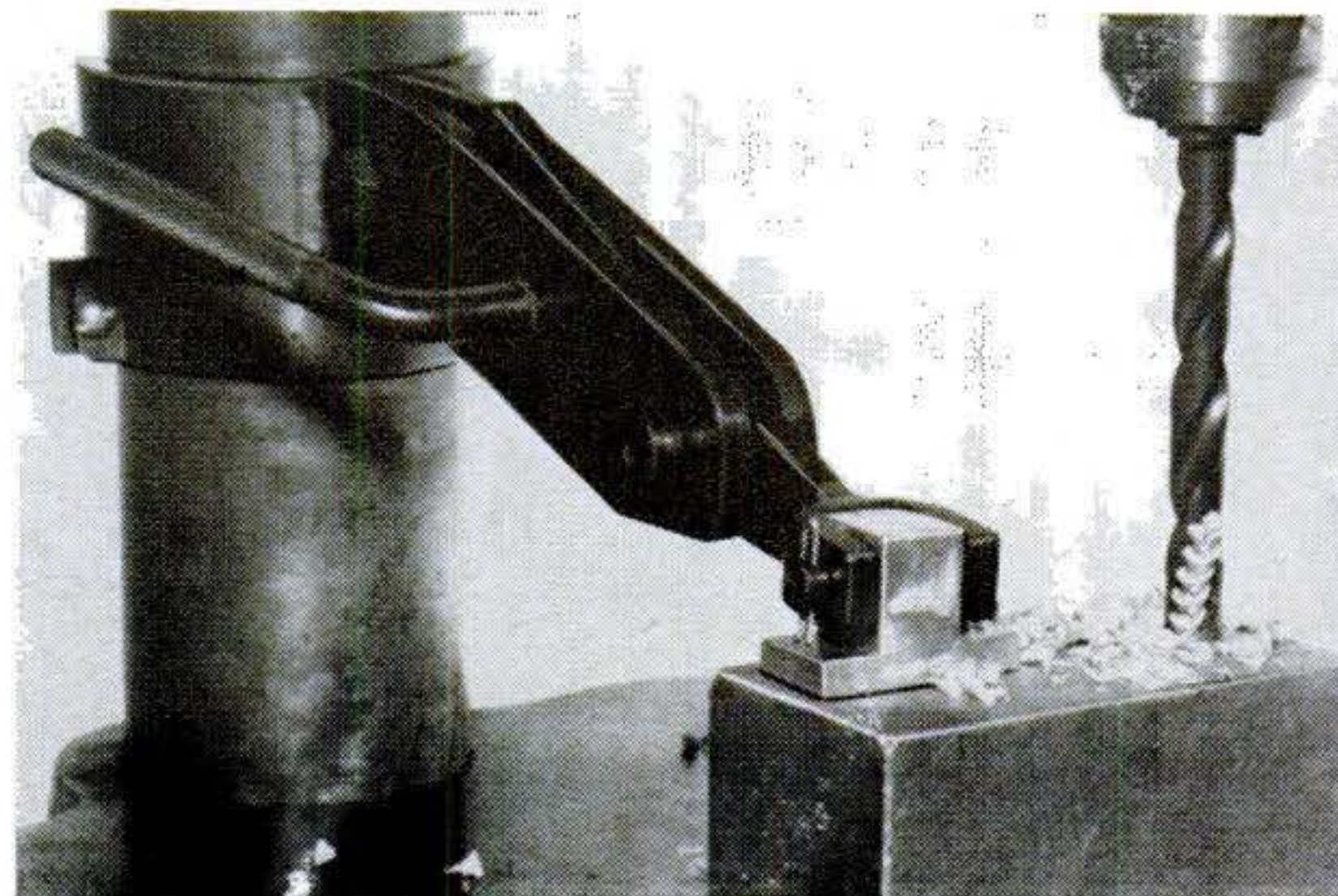
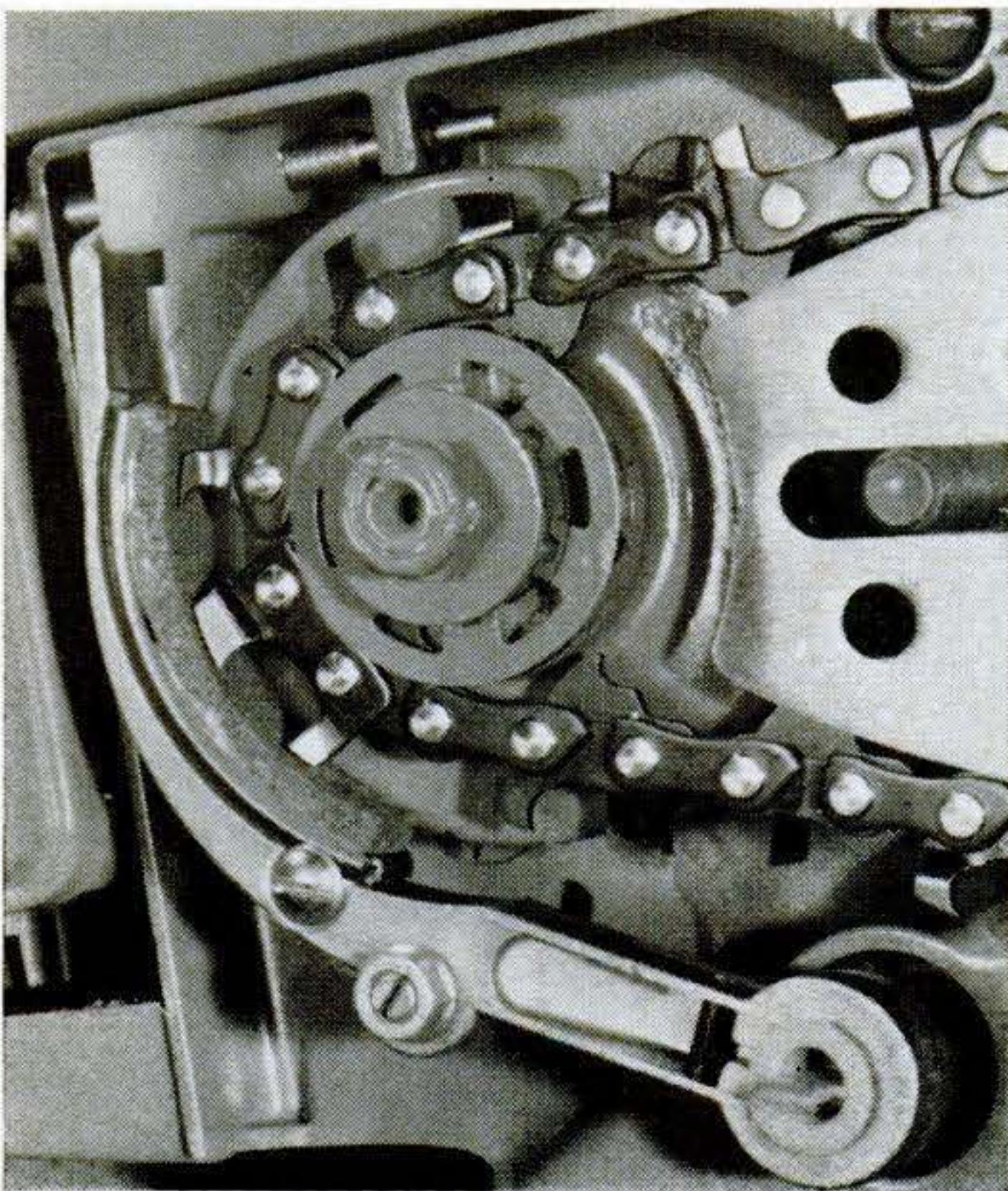
New chain saw features a built-in quickie sharpener



It takes only a few seconds to sharpen the new Sears direct-drive chain saw. There's a grindstone built into it right next to the drive sprocket. Inserting a lever in a slot near the handle moves the stone forward until it bears against the cutters. You do this while the saw is running. Time: five to 15 seconds. You don't have to disassemble the saw, place the chain in a vise, and hand-sharpen each tooth. The company says the new saw reduces maintenance time by 80 percent, cuts wood faster, and has a 23-percent longer service life. The 5½-hp. model sells for \$179.95, the seven-hp. model for \$216.95. You can get one at Sears retail stores, or order by mail.

Hold-down clamp for drill press

A turn of a lever locks the clamp below to the drill-press column and at the same time puts holding pressure on the work. It slides up and down to the height you want, and the holding arm adjusts to three different lengths. Called the Cam-Lock, it fits drill presses with a 2¼"-diameter column. Price is \$19.95. Welch Drill Bushing Co., 1630 Flower St., Glendale, Calif., makes the hold-down device.



Glazing . . . The Expensive Look the Easy Way

do it quickly with very fine sandpaper or fine steel wool. Take it all off with turpentine if you want to start over.

8) If you topcoat with a durable varnish, wait two or three days for the glaze to harden. Test a spot to see if the varnish softens the glaze (in some cases, it may). You'll find that the clear urethane-type varnishes affect the color of the glaze very little, and provide a surface that withstands rough usage. Pick a semigloss or a flat urethane unless there is some reason for the final finish to be glossy.

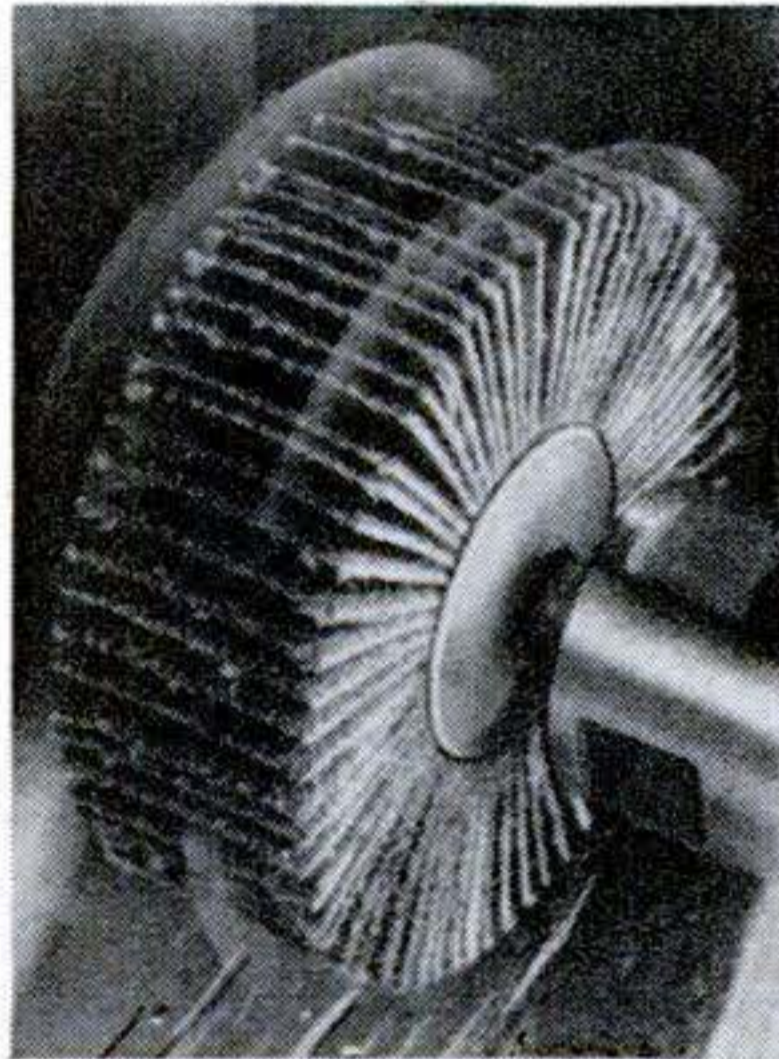
Building your own kits. Some paint dealers stock semigloss enamels just for overglaz-

ing, and some have "glazing inks" in small containers. You can also put together your own ingredients. Buy a good grade of satin-finish enamel. Pick up a tube or two of pigments plus a small can of a clear resin sealer like Rez or Firzite. Then mix.

Use colors in oil if you can find them. If you must use the more common universal colorants, give them an hour or two after mixing (occasionally stirring), for the liquid to evaporate. It will not take long, for it is a volatile methyl alcohol in most cases. If you do not let it evaporate, it may soften the base coat. PS

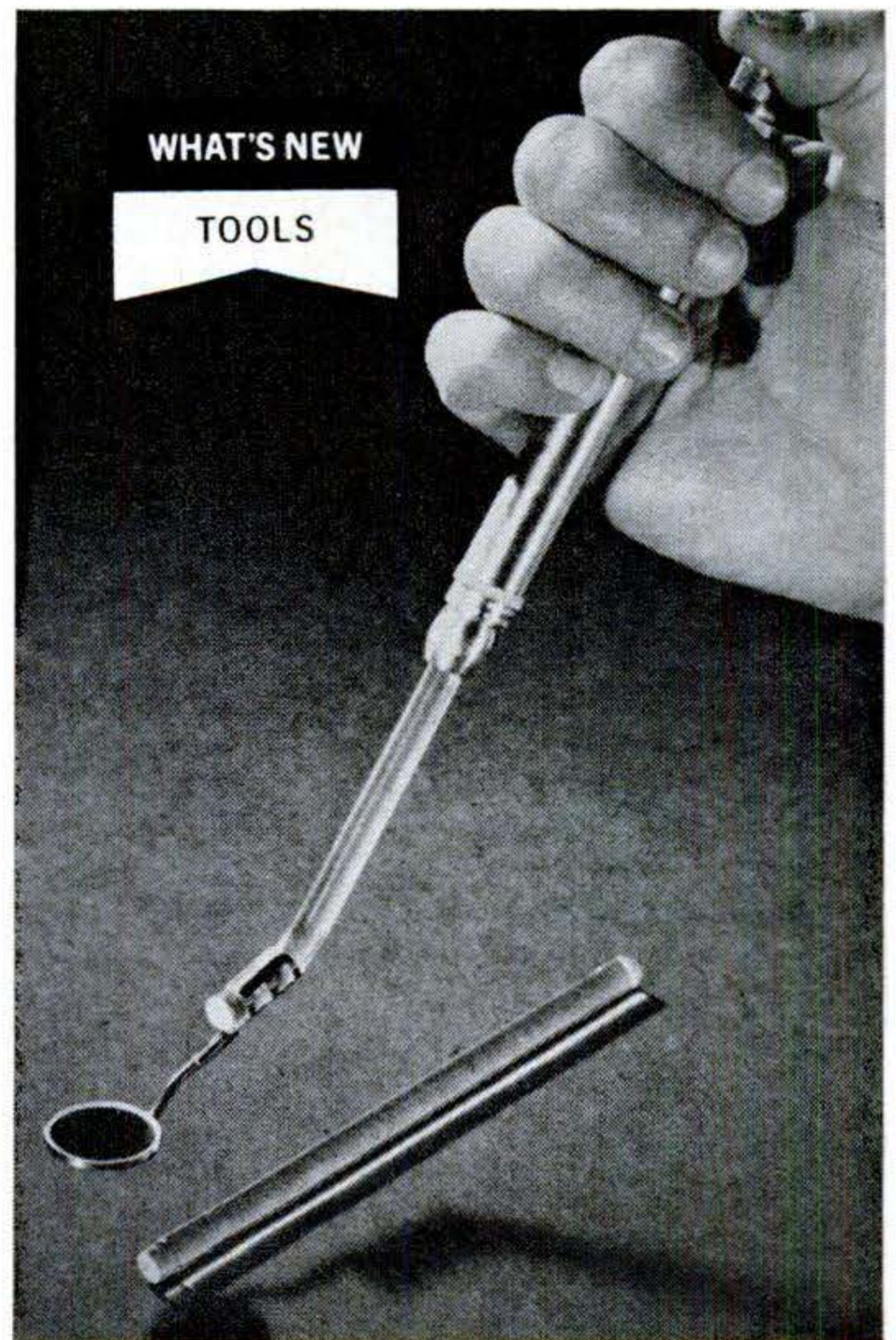
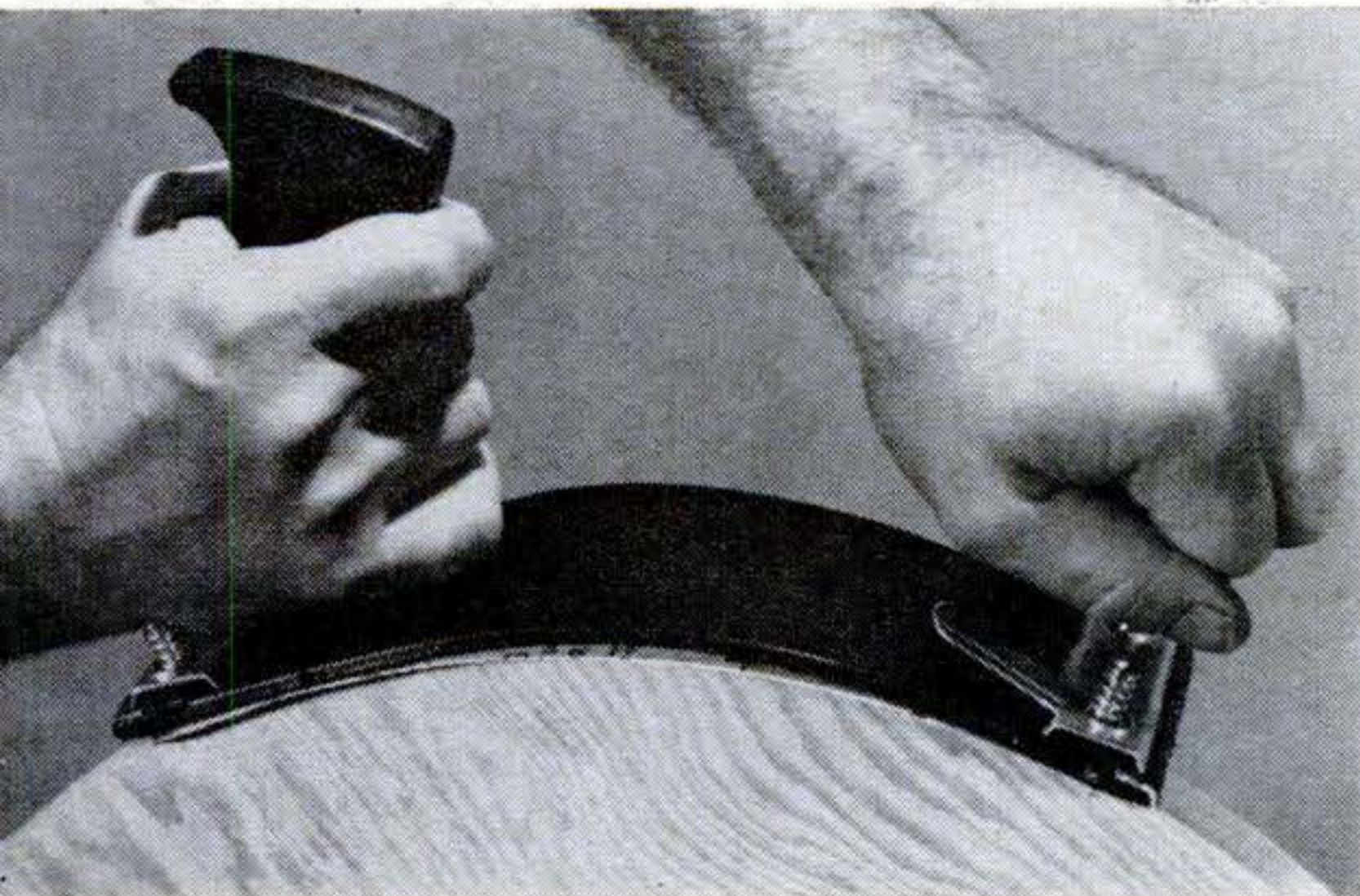
Flap blades abrade as they spin

These flaps of aluminum oxide cloth come mounted on a ¼" steel shank to fit your portable electric drill. Grit sizes range from 50 to 400, wheel diameters from 1½" to 3", face widths from ¼" to 1½". Superior Rotary Tools, 613 Shiloh Dr., Dayton 45415, makes them.



Sander bends to fit curved surfaces

There are no flat spots left when you sand a curved surface with the new Flex-Sander (below). That makes it fine for sanding boats. It works on flat surfaces, too. A standard sheet of sandpaper makes three 3"-by-11" strips for it. Tiny ridges on the underside keep the sandpaper from slipping and retard clogging. It's made by Top Line Div., Oatey Co., 4700 W. 160th St., Cleveland 44135.

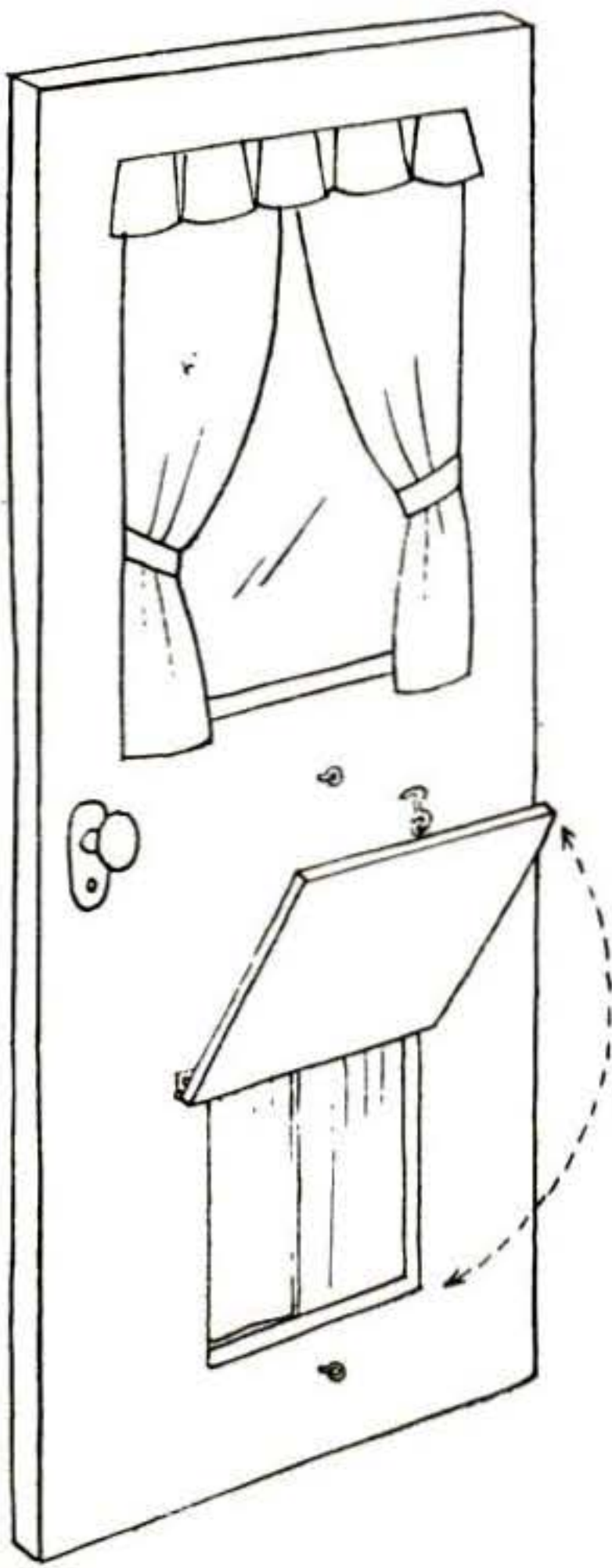
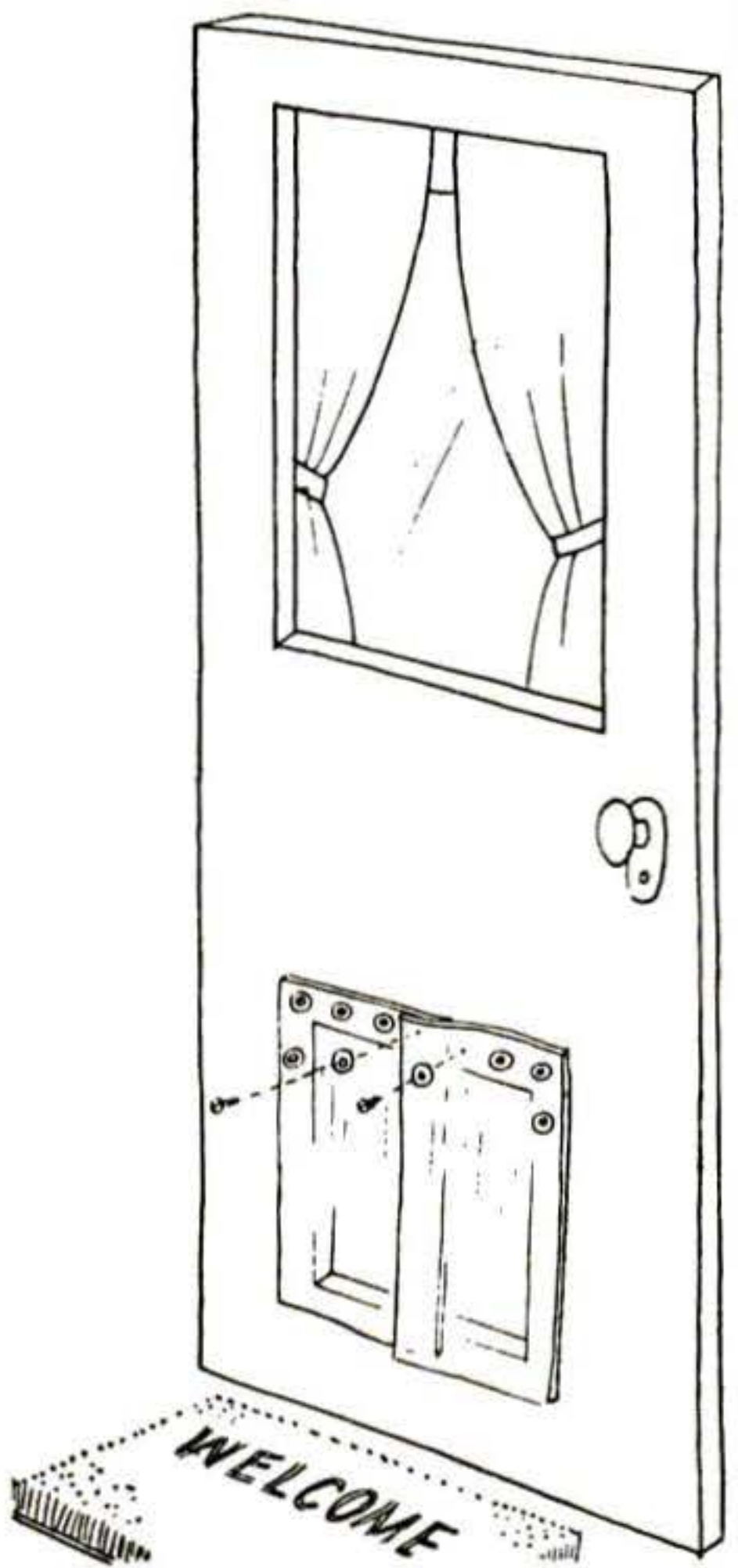
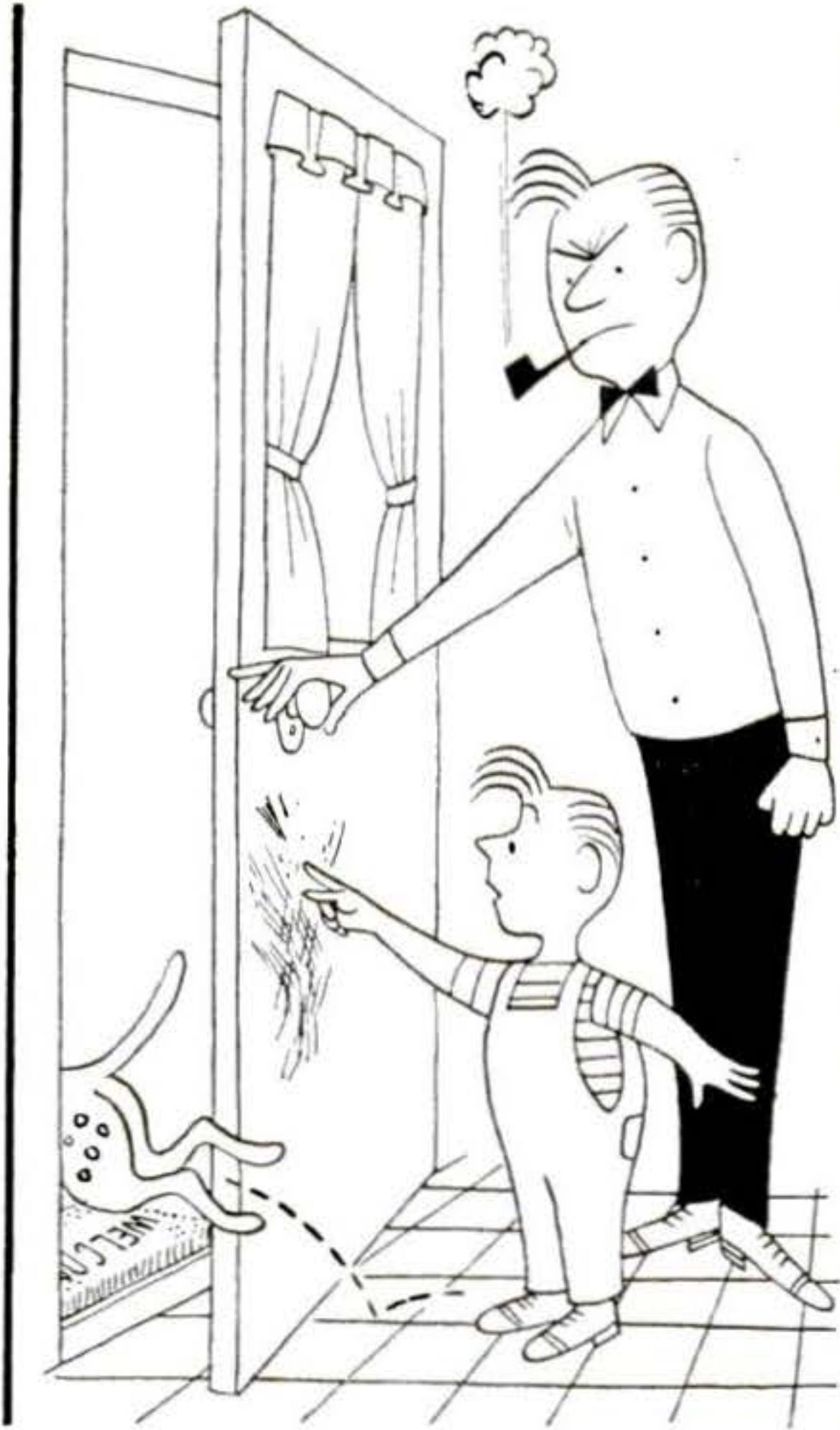


Light for exploring hard-to-reach spots

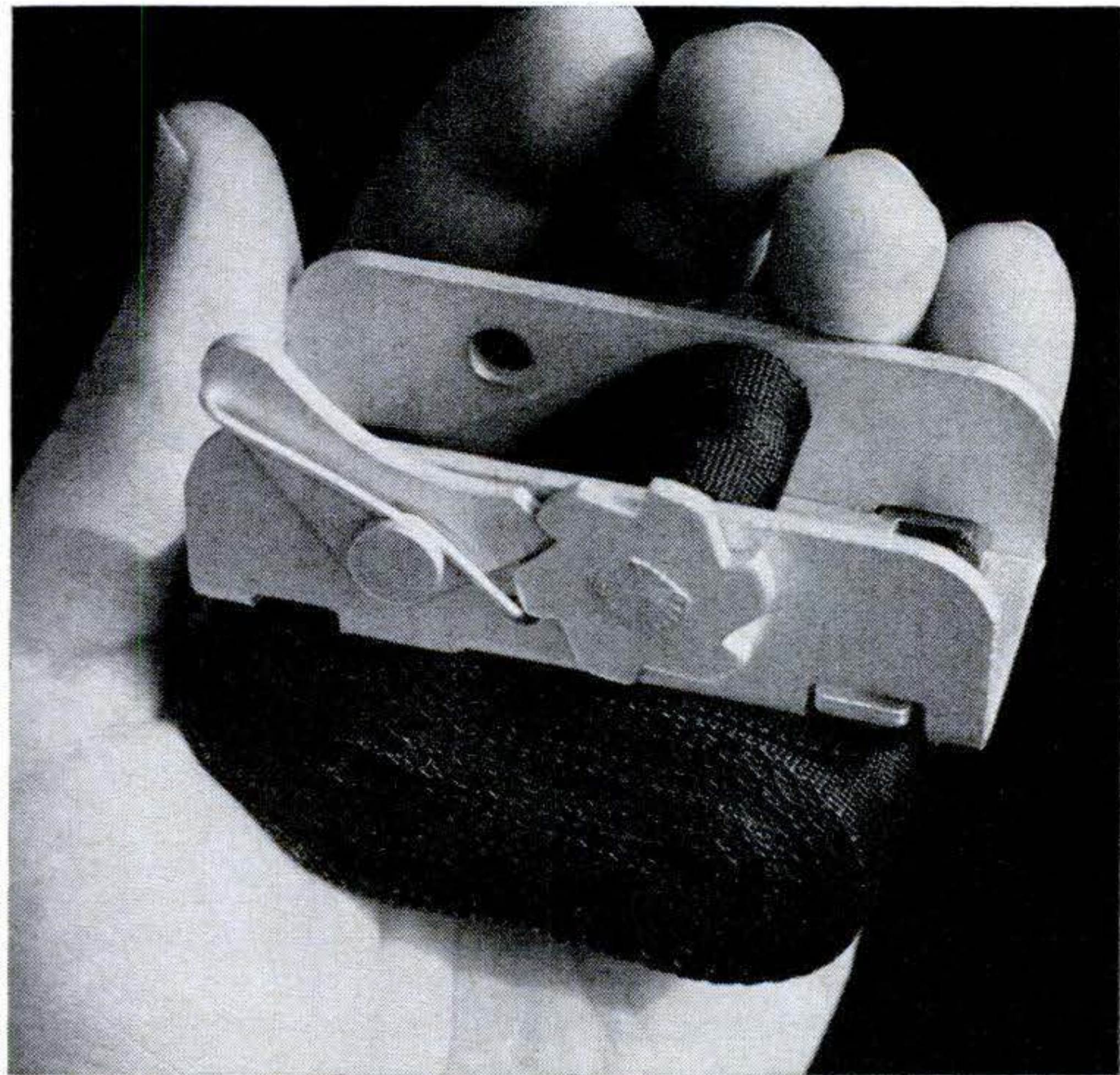
The handy tool above makes it easy to inspect areas too small to get your head in. It's fine for working on your radio, TV, household appliances, or car. The two-cell penlight clips onto a plastic rod that conducts the light to the mirror at the end. The rod conducts 92 percent of the bulb's light and even bends it around corners. Called Conduct-A-Lite, it comes in a kit with one straight and one curved light conductor. The kit sells for \$4.95. You order it from Yates Mfg. Co., 340 W. Huron St., Chicago 60620.

Wordless Workshop

By ROY DOTY

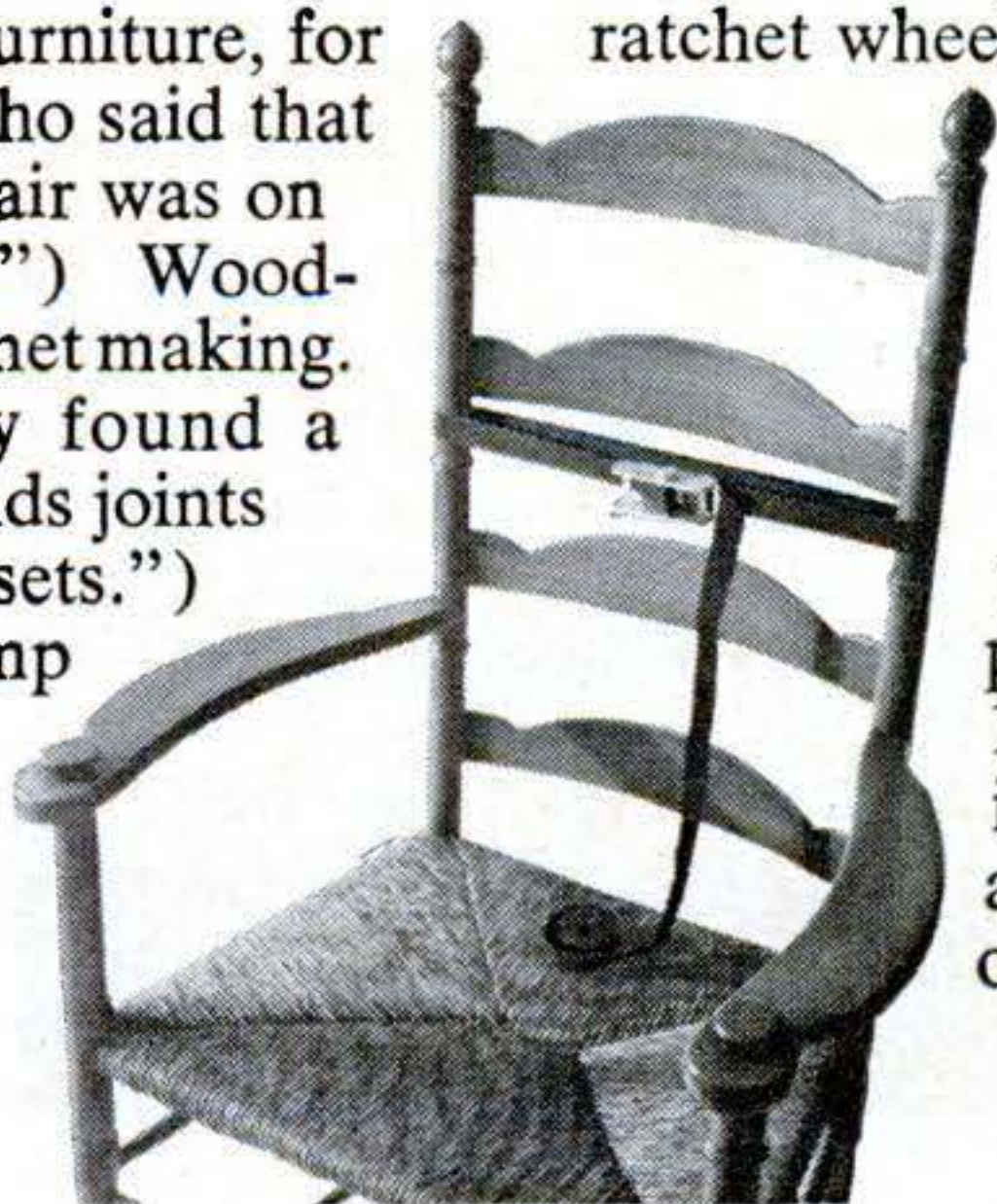


Could this useless-looking web clamp be Stanley's most versatile tool?

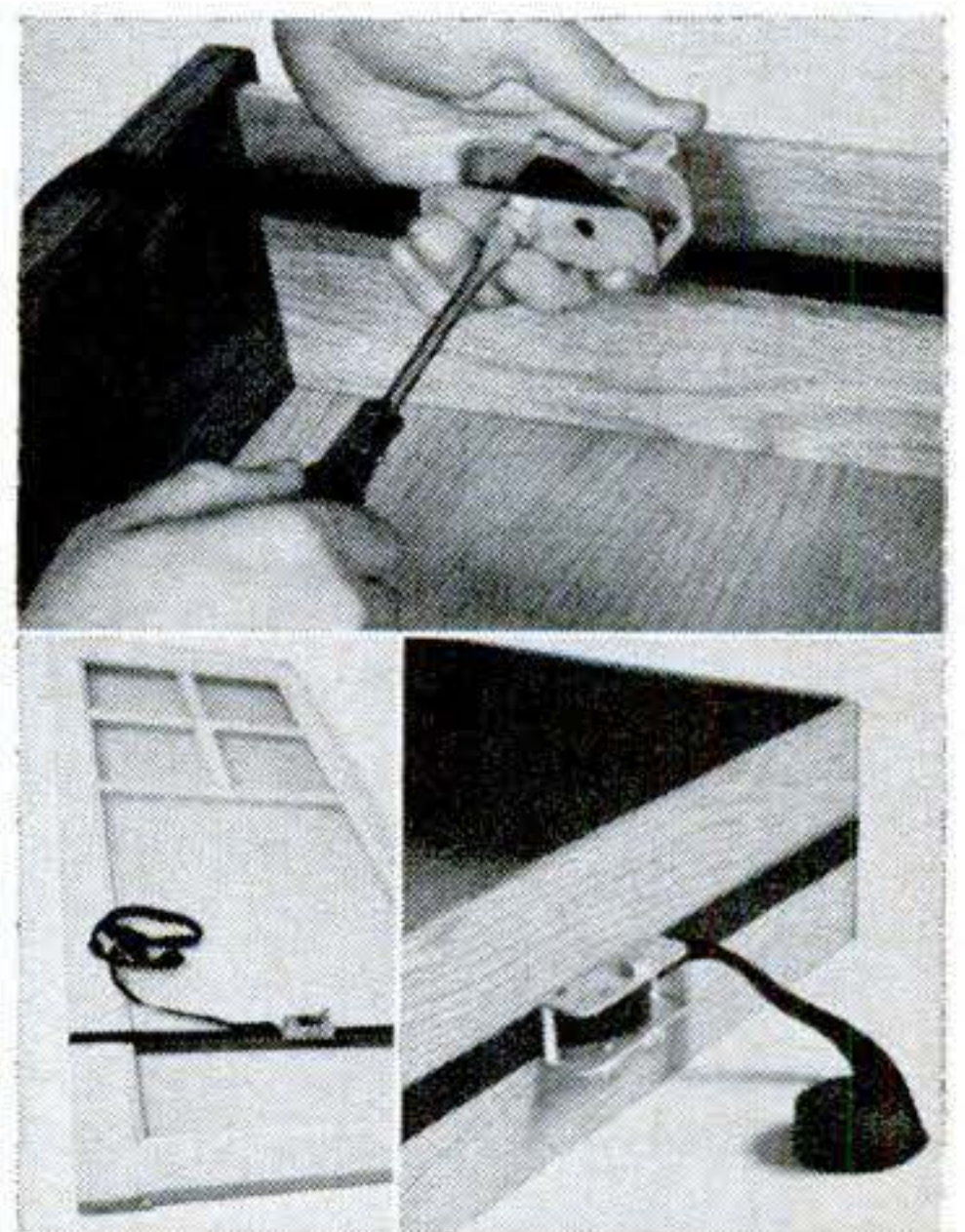


Could be. Say it isn't and you'll get an argument from a lot of men using it to do a lot of things.

Repairing furniture, for instance. ("Who said that ladderback chair was on its last legs?") Woodworking. Cabinet making. ("I've finally found a gadget that holds joints while the glue sets.") This is the clamp that puts sure, steady tension wherever it's needed.



Give the credit to ratchet action. You tighten the clamp with a turn of a screw driver or wrench. Then the ratchet wheel takes over for you, keeping the webbing at just the right pressure. The nylon webbing tests up to 600 pounds! And it's 12 feet long so it takes on just about any shape or size.



You'll find this inexpensive web clamp doing the job of a whole drawerful of the conventional kind. Versatility? Meet the champ — the Stanley clamp. Stanley Tools, Division of The Stanley Works, New Britain, Connecticut.

STANLEY

helps you do things right

Home Appliances: How Smart Can They Get?

[Continued from page 99]

and a T-bone steak can be ready to eat in three minutes instead of 15.

The microwave ovens make use of a vacuum-tube oscillator called a magnetron, which directs high-energy electrons into the food where they generate heat. The oven itself remains cool, as does the food container, so food can be cooked right on the serving dishes.

Programed cooking is yet another development in ovens. Waste King's Universal Chef models, for example, use two separate thermostats, a clock, timers, and other controls that allow delayed two-temperature cooking, or the defrosting of food before it is cooked. Finally, the oven keeps the food warm until it is served. And Frigidaire ranges automatically tenderize budget roasts as well as cook and mind meals.

The air-cushion icebox. Ever strain your back trying to move a heavy refrigerator around the kitchen? If the Frigidaire Division of General Motors has its way, it will never happen again. Borrowing an idea from the new ground-effect machines (hovercraft), the engineers designed an airlift pad that can be installed on any of the company's 32-inch-wide refrigerators. Air pressure to operate the lifting pad, known as "Ride-Aire," is supplied by hooking your vacuum cleaner's blower hose to a concealed connection at the bottom of the unit. Fully loaded, it can be moved about with a push of your fingertips.

Other new developments in refrigerators over recent years are frostfree designs (generally using a fan to circulate cold air and prevent frost build-up), automatic ice-cube makers, and side-by-side refrigerator-freezer designs (Kelvinator, Admiral, Westinghouse). Then there's GE's new breakfront unit—an illuminated countertop with built-in electrical outlet, with an eye-level refrigerator above, roll-out freezer below.

The cordless vacuum cleaner. Already on the market is a revolutionary little appliance that should do much to ease household cleaning. The Kenmore Cordless Vac, sold by Sears, Roebuck, uses an eight-volt DC motor rated at 30 watts, and can run on its eight-cell Ni-Cad battery pack for 20 minutes without recharging. When recharging is necessary, the cleaner is simply placed on a floor-stand charger unit connected to a nearby outlet.

The stream of small appliances—both bat-

tery- and AC-operated—has grown to a river, and today there is literally an appliance for everything. Some seemed a bit improbable when they first came along—the electric can opener and the electric toothbrush, for example—but they have found almost universal acceptance. Now coming onto the market are such things as electric hairbrushes, manicure sets, fire starters, pencil sharpeners—you name it.

Computerized clothes dryers. The first dryer with electronic "brains" was introduced by the Maytag Company in 1960; today, this feature is becoming widely accepted. In these dryers, a sensing device—Maytag uses coils of wire wound on three baffles in the dryer drum—conducts a small electric current which is shorted to ground as long as the clothes are damp. As the clothes become dryer, however, the same current lights a small neon lamp. The bulb activates a photocell that causes a relay to close and shut off the dryer.

Among other interesting mechanical innovations is one by Norge: a control setting that keeps the dryer stationary while warm or room-temperature air blows through the drum. A rack fits inside the dryer, and can be used for drying dishes or photographic negatives, for cooling freshly cooked food or defrosting frozen food. Norge claims their dryers have even been used for drying the family pet after a bath.

Transistorized washing machines. Thanks to the transistor and silicon-controlled rectifier, variable-speed washing machines and other appliances are now possible. The first transistorized washer was recently announced by Hotpoint, and others are undergoing testing by such firms as Whirlpool.

Even with more conventional machines, however, top-of-the-line models offer more sophisticated timers, controls, and devices than ever before. In these models—Ward's Signature, the Philco Custom Imperial, and Maytag's Custom Deluxe, for example—you have up to 12 different cycles, water-level control, two- and three-speed motors, out-of-balance switches and so on.

What does the future hold? According to the prophets, many more appliances—right at points of need. Air will be conditioned for purity, temperature, humidity. Cleaning will be largely automatic. And machines will clean and recondition clothes, store and cook food, and do the dishes. PS

Disston

"Diss-Chrome" Circular Saw Blades
have an edge on them all



"Diss-Chrome"® circular saw blades make any home workshop project easier. Cuts are cleaner and faster; work goes together neater.

There is a Disston "Diss-Chrome" blade style for any kind of cut—rip, cut-off, combination, planer, flooring and a special plywood blade. All popular sizes available with universal arbors for use with most bench or portable saws. Each

blade is hardened, tempered and chrome-plated to provide extra long life. Blades are individually packaged.

Add to your ability with Disston "Diss-Chrome" blades. Your hardware dealer stocks them and will help you select the right blade for your job. Or write: Hardware and Industrial Products Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh, Pa. 15219.

Look for this new Disston Saw Blade Center at your dealers. It contains a full line of Disston quality circular saw blades, hack frames and blades. If your dealer doesn't have the blade center, ask him to order one for your convenience.



PORTER **HARDWARE AND INDUSTRIAL PRODUCTS DIVISION**
H. K. PORTER COMPANY, INC.

BOND STREET

The Pipe Tobacco That Stays Lit!

Bond Street keeps burning because of its Old English cut—a combination of flakes for even-burning and cubes for slower-burning. You'll like its aroma of fine domestic and imported tobaccos, too.

Secrets of Ideal Puffing



Easy does it—the hard puff is harsh on the tongue. A short, easy draw is best. And don't blow through your pipe to keep it lit. It can cause hot spots.

Like a good wife, a pipe is a friend and companion for life.
HERMAN MELVILLE



A product of Philip Morris Inc.

More Life from Your Automatic Box

[Continued from page 179]

Some well-meaning attendants misread today's dipsticks, which are calibrated in pints (no longer in quarts). Finally, they sometimes also give you the wrong oil—without knowing it.

Allowing car to be towed forward. This damages many transmissions. Even though your owner's manual may say it is all right to tow your car "up to 45 m.p.h."—don't take the chance if the distance is more than a few blocks. Insist on having the car towed backward (rolling on the front wheels); or else make sure that the drive shaft is disconnected. One reason: Even though the towman may shift the selector to Neutral, the transmission may be in Drive, due to damaged linkage.

Trouble signs you should look for

A change in oil color from red to yellow—or brown—is usually the first sign of trouble (clear green may be okay).

A change in oil smell from pungent and sharp to a burned-rubber odor.

Varnish on the dipstick.

Low oil level. Most cars need no more than a pint in 10,000 miles.

Rough shifting.

New noises. All transmissions make certain mild sounds that are okay—like the whining that some do in Neutral. The thing to investigate is any *new* noise in your car.

- A clicking may be your oil-pressure regulator pleading for more oil.

- A buzzing may also be a sound of oil starvation. If the oil level is okay, a filter screen may be clogged. Most can be reached through the bottom pan. Metallic screens can be washed for about \$6. A filter-type cartridge can be replaced for perhaps \$10-\$15.

- Chirruping on corners also is a call for oil. A harsher squawking, on the other hand, may mean low oil pressure due to a bad pump, worn shafts, or hardened seals. This sound comes from slipping clutch faces or bands, usually both.

- Grating or rumbling noises in gear can mean that your planetary gear train, the indirect gears, or needle thrust bearings are damaged.

- A loud whine in top (Drive) above 25 m.p.h. in yesteryear's HydraMatic is a signal that the rear pump needs replacing.

But it takes an expert to identify these

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More Life from Your Automatic Box sounds—using the manuals issued with the various transmissions.

Not all “underneath” sounds come from transmissions. Myles told me of cases in which whole transmissions have been removed in error—even by experienced mechanics—when the “sound clue” was actually from a loose generator or a fan belt slipping at 40 m.p.h. The sound of a worn speedometer cable, easily repaired for \$3.50, can be confused with the clicking of a faulty pump—a \$25-\$75 job.

The “won’t-go” symptoms

That a.m. sickness. If your car won’t move for a few seconds in the morning when you switch on the engine, it may be due to ruined, thickened oil. Or perhaps transmission oil is draining away at night from the torus wheels in your torque converter. It may take 30 seconds to pump oil back into the torus casing.

This is a common complaint. It probably means worn shafts and bushings, hardened and leaking rubber seals (possibly an \$80-\$100 job).

Won’t go in Drive. You back out of the driveway, shift to Drive, and nothing happens. This can have several causes. First suspect: loss of oil, a broken (or maladjusted) front band (or sprag clutch), bent or improperly adjusted linkage. (Linkage is often disturbed during engine or carburetor repairs and not readjusted properly.)

Failure to move in any range even when you race the engine. Probable cause: loss of oil—possibly a broken seal or cracked torus cover. You *may* be able to get home by pouring in more oil. But if it runs out again you may burn out the transmission in a mile or two. Best bet: Get a tow (on the front wheels).

Won’t move in Reverse. Check linkage, reverse band. It could also be low oil pressure or servo-unit failure. If the selector lever won’t go into Reverse, the trouble could be the linkage, or a stuck “reverse-blocker” piston (which keeps you from engaging “R” while moving forward), or a sticky governor valve.

Slippage and “engine flare-up.” Perhaps the most common symptom is slip: The engine races; the car lags, won’t accelerate as it should. This can mean a worn-out pump, hydraulic-valve failure, or oil leaking through a servo or control piston seal.

Continued

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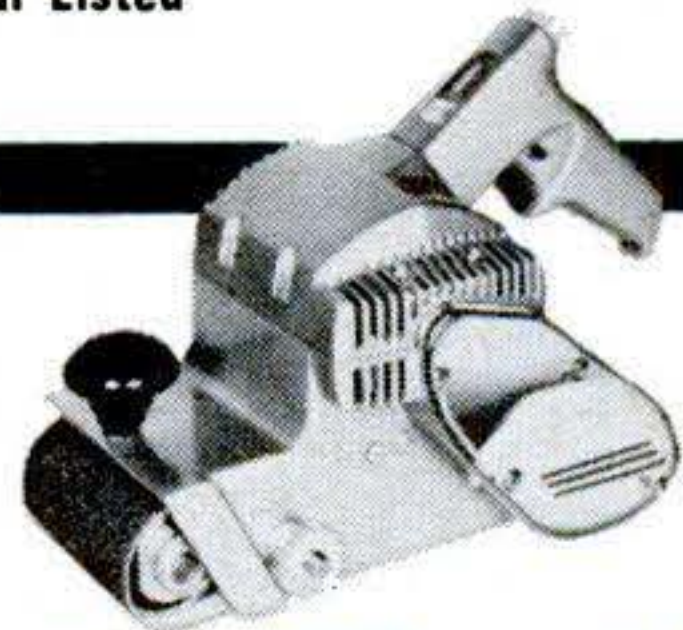
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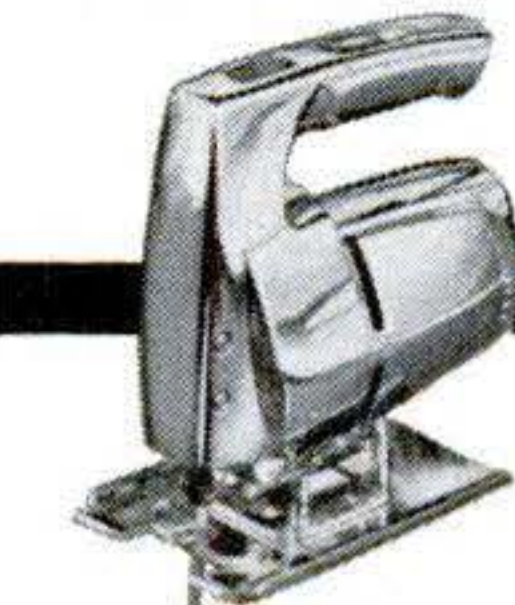
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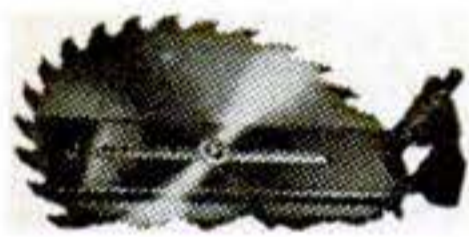
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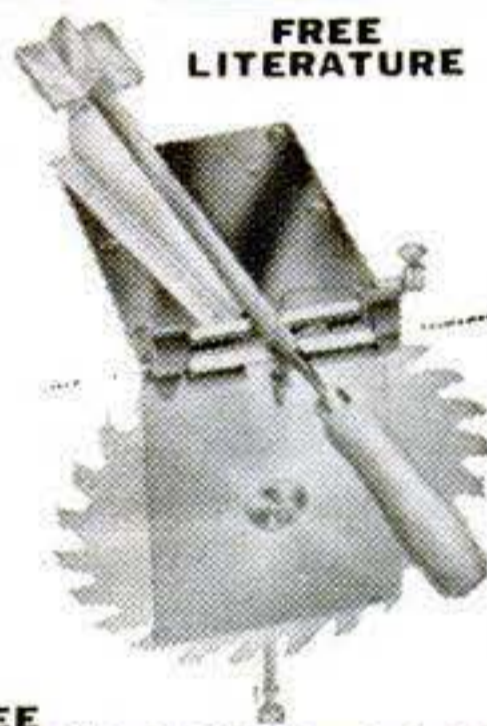
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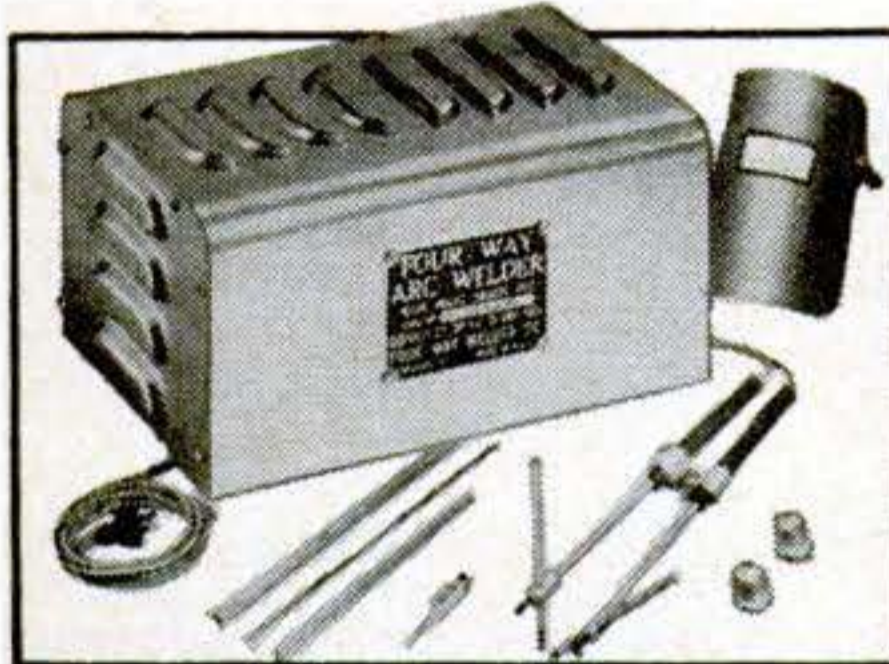
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More Life from Your Automatic Box

Luckily, however, slip can be merely a sign that a band needs adjustment (\$3-\$5). Bands are internal brakes that lock up certain gearsets and shafts and leave others free to turn. Bands are usually reached by removing the bottom pan. Don't ignore slip! It causes overheating.

Band adjustment is needed periodically on some cars. It is not a job for an amateur—careful calibration is necessary.

Car won't shift at proper speed levels. Instead of going into Drive at 18-22 m.p.h. on light throttle, it may make a late shift—say, at 30-35. This can be due to faulty linkage adjustment, a defective governor, or sticky valves in the oil-control assembly. If the passing gear won't engage on kick-down, the usual cause is a maladjusted linkage, especially if you have just had engine repairs. Another cause: screws left untightened in the oil-control "brain" (valve box).

It would be pleasant to tell you that any owner reasonably handy with tools can make transmission repairs. But the honest truth is that you would be unwise to attempt it unless you are an A-1 mechanic. If you do attempt it, be sure you have the manual and the special tools needed.

What should repairs cost?

Work that can be done without removing the transmission is usually quite cheap—often less than \$10—but is usually limited to oil changing, inspection, a bit of cleaning, and band adjustment.

To replace a unit usually costs \$20-\$35. After that, parts-and-labor costs add up alarmingly. A new pump, for example, might cost \$35, plus labor. And while making this repair it might be foolish not to replace hardened seals (another \$25 for parts) and other worn elements.

Your best bet is to deal with an honest, expert shop that has a name to protect, and have a thorough discussion with the mechanics. Honest mechanics often *do* find additional repairs needed. Lee Myles feels so strongly about this that, when his men find evidence that extra work is needed, they are often told to send a free taxi to bring the customer in to see for himself.

Myles also has found that many repair jobs just aren't needed. The trouble is often found to be not with the transmission, but with the engine. Myles turns away as unnecessary one job in five. **PS**

Popular Science's 9-in-1 Troubleshooter

[Continued from page 140]

(ground). The circuits will work with either a six-volt or 12-volt ignition system without any modification. Note: Reverse the test-lead connections for use with a positive-ground ignition system.

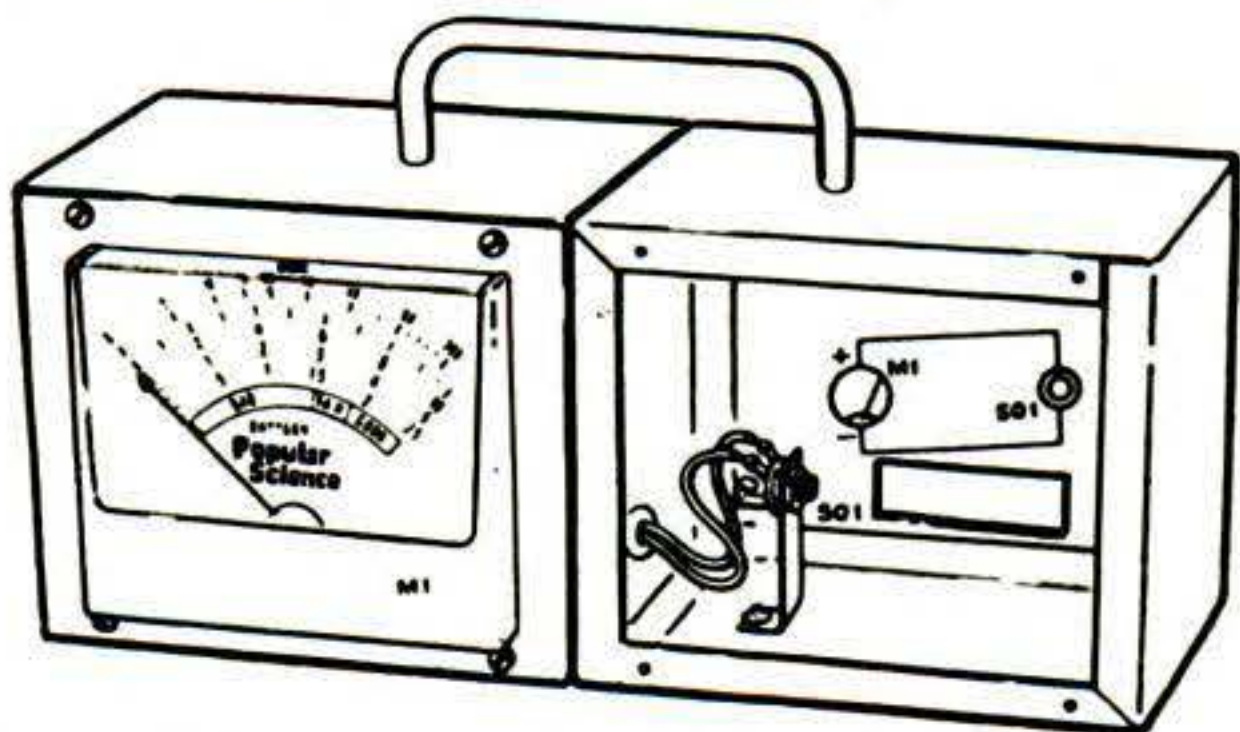
To find the dwell angle, when you use the dwell meter, take the reading on the 0-10 scale, and multiply by the appropriate conversion factor listed below.

NO. OF CYLINDERS	MULTIPLY BY
4	9
6	6
8	4.5

DC volt-ammeter module. Be sure to place fiber insulating washers on the shafts of the seven input jacks when you install them—double-check that they are completely insulated from the metal panel.

Wire the various precision multiplier and

The universal meter housing



Make it by bolting together two 5"-by-6"-by-4" aluminum "utility" cases. Cut extra right-hand front panels for the various modules from sheet aluminum. M1 is a Simpson Wide-Vue, model 1329, 0-1-milliampere DC panel meter. S01 is a standard phone jack—mount it on an insulated angle bracket. See pages 114-117 of February PS for more information.

shunt resistors directly to the input jacks and function switch S3.

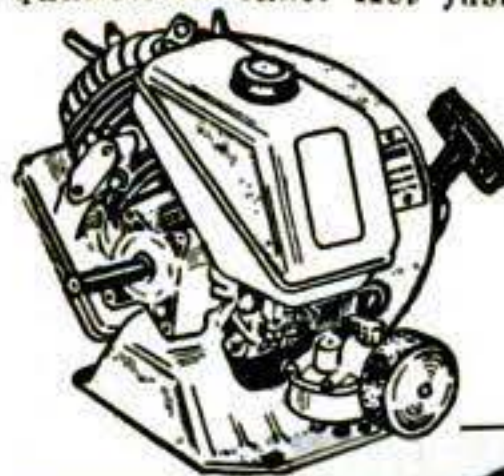
Make test leads from two 4' lengths—one red and one black—of rubber-insulated high-voltage (5,000 volts) test-lead cable. Connect a banana plug to one end of each cable, and a test prod to the other.

To take a DC-voltage or current measurement, plug the positive (red) test lead into the appropriate input jack, and turn switch S3 to the corresponding position.

Next month: Build an AC ammeter and a storage-battery cell tester. P 5

Briggs & Stratton — Clinton New Gas Engine Sale

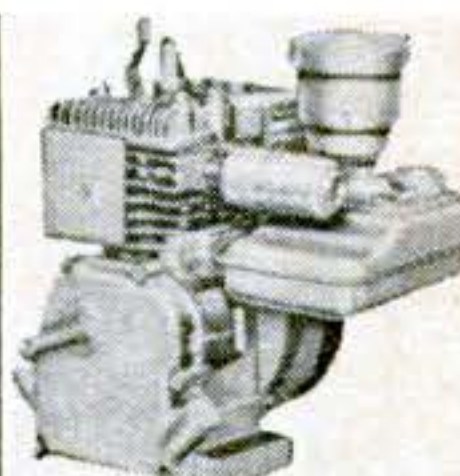
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2 for ... \$58.90
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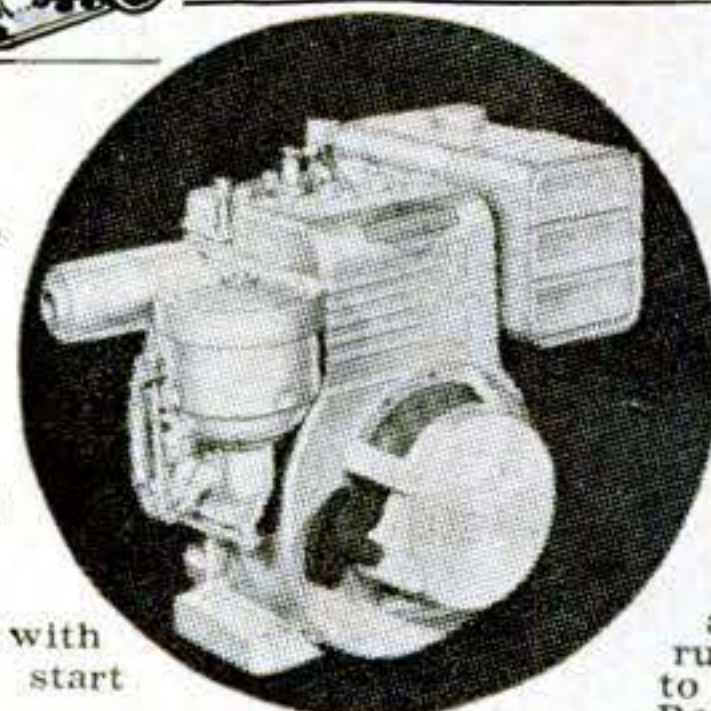
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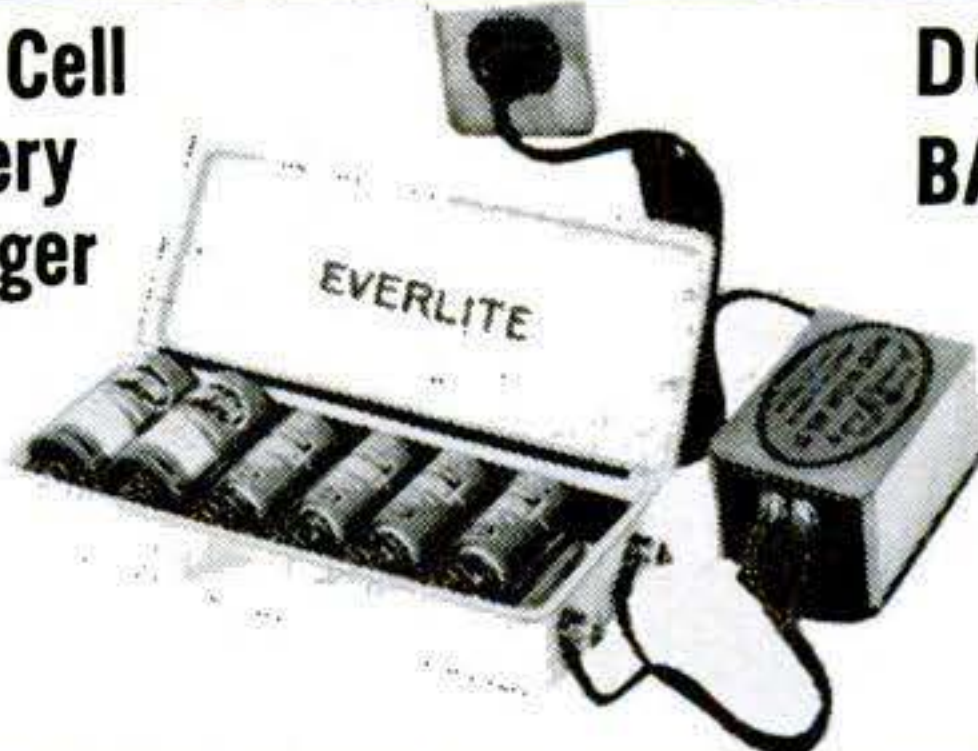
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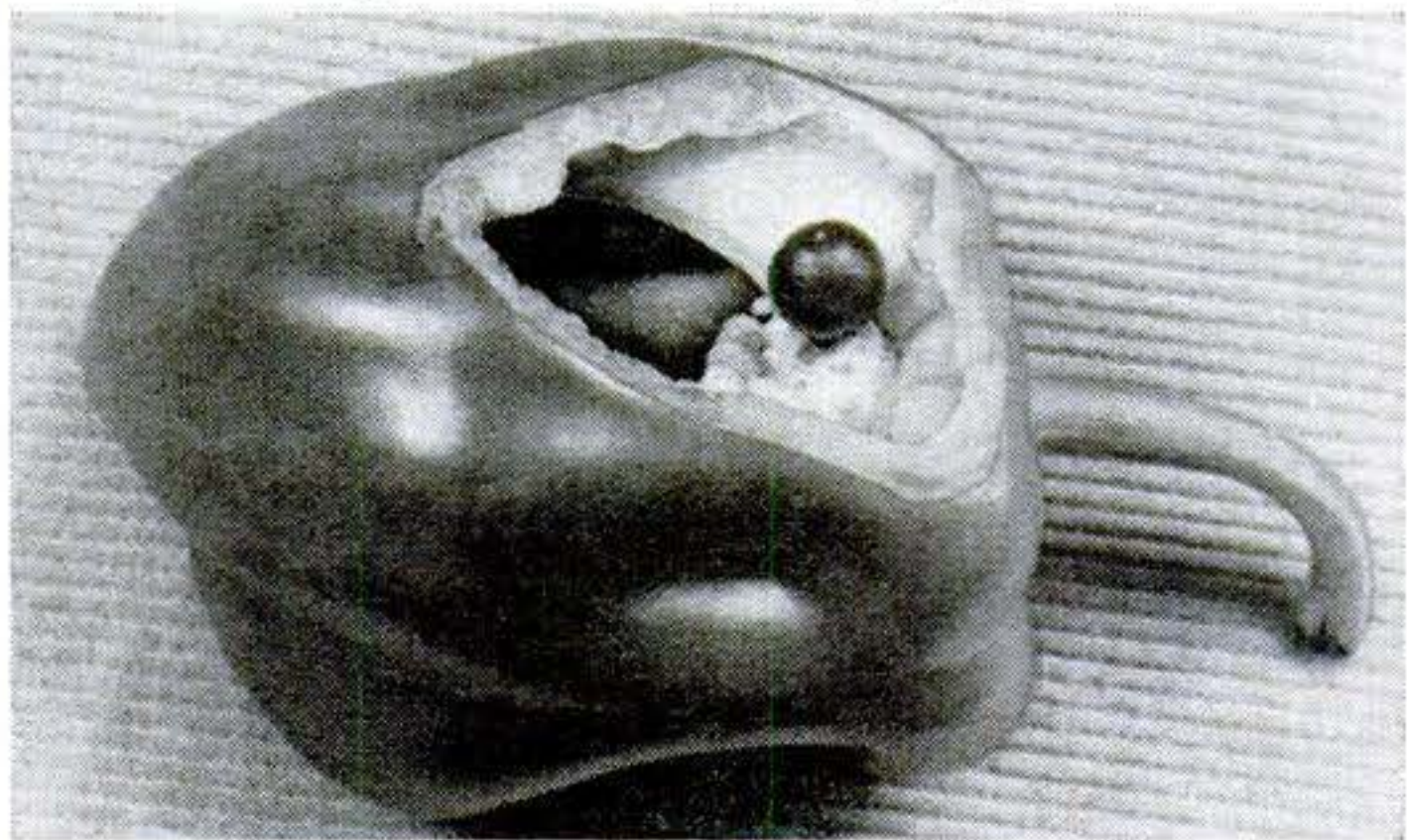
[Continued from page 157]

have a weatherproof patio outlet in an exposed area or a shop outlet in the work-dust zone you can replace it with one of these.

If you have small fry. Youngsters of crawling age often court lethal disaster by pushing hairpins or other oddments into receptacle slots. You can save the day through a wide choice of kidproofing measures. Snapit offers a simple answer in the form of an all-plastic plug. Push it into a receptacle and it requires adult finger strength to remove it. While it's there, other items can't get in. The same manufacturer also offers a safety cover plate that replaces any standard one. A spring-loaded internal gate keeps the outlet slots closed. To put a plug into the outlet, you have to push a serrated slider button to open the gate, and hold it open while the plug is inserted. This two-hand job requires know-how, and youngsters aren't likely to work it out. GE has a similar safety arrangement that rotates. A safety outlet made by Hubbel remains open, ready for a plug to be inserted. But if anything is inserted into one slot only (the usual procedure of crawling children) current to that slot is automatically cut off.

Special electrical safety hardware isn't limited to the inside of your house, either. If you're worried that the little boy across the road might tumble into your pool when you're not watching, you can get an electric Pool Sitter. As soon as he hits the water, its underwater hydrophone will pick up the sounds of splashing and gurgling, and set off signal shrieks like a police whistle. P 5

Cherries grow inside a pepper



A window cut in this pepper shows a couple of cherries growing healthily. How come? University of Wisconsin plant scientists transplanted cherry seeds inside a pepper pod at an early stage to learn more about growth substances (hormones) needed in developing better fruits and stronger fibers—such as cotton.

PS Tests Three Low-Price Luxury Cars

[Continued from page 94]

factory test reports, would match those of the Mercury.

Performance and economy. With 10 hp. less than the Chrysler and 15 less than the Mercury, the Buick came remarkably close to its rivals on acceleration. The Buick V-8 has smaller displacement but a four-barrel carburetor. The 340-cu.-in. unit is a development of the 300-cu.-in. cast-iron mill that replaced the aluminum V-8 two years ago. Its fuel economy is excellent. This LeSabre came out with an overall average of 16.88 m.p.g., which some sixes cannot match. The average includes performance testing, track and traffic driving, and a lot of 65-70-m.p.h. highway cruising.

While the Mercury was pretty thirsty no matter how and where we drove it, the Chrysler used gasoline at highly variable rates. Chrysler apparently sets its carburetors to take advantage of steady speeds with small throttle openings in a way that has not been equalled by Ford or GM.

A number of improvements in the '66 Mercury 390-cu.-in. V-8 have not changed its fuel economy. Redesigned manifolds and ports have raised power output and improved response. A new heat-riser valve has shortened warm-up. A higher-lift camshaft, longer valve overlap, and new valve springs improve breathing. Even the air cleaner has less restriction than last year's.

I was surprised that the Mercury, with this revamped engine pulling a lower-g geared axle in a car of roughly the same weight, could not beat the Chrysler on acceleration. All cars were in proper tune. Perhaps it's just that the latest version of the Merc-O-Matic is less efficient than both the tough-and-tried TorqueFlite (Chrysler) and the highly versatile Super Turbine 400 (Buick).

The three automatic transmissions might as well be identical as far as the driver is concerned. They have similar shift patterns, enabling you to hold low range up to 55 m.p.h. and intermediate up to about 80. Automatic shifts are smoothest on the Buick. Response to manual downshifts is best on the Chrysler. All responded equally well to kickdown at any speed.

Parking. The Buick, shortest overall, has the shortest turn radius. The Chrysler has the best view for nosing into a narrow space. For reversing, the Mercury's rear fenders are the best guides. **PS**

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Why the New Power Mowers Are Safer

[Continued from page 162]

mechanisms require you to stand behind a mower (Yard-Man and others) to start it. Look into easy-pull starting (Lawn Boy), unless you pick a wind-up starter, which is safe because you don't jerk on a line and perhaps roll the mower over your foot. The big rigs should have electric starting for safety and convenience.

Because it is so easy to push any light, well-made mower, some people question the need for a self-propelled mower that you walk behind. They say it is much less safe than a you-push-it, and if your lawn is too big to handle with a nonpowered mower you'd best leapfrog the walk-behind self-propelled style and get a rider. The riding mower, well designed, is safest of all, they contend.

Showroom safety checks. Many of the safety features of a good lawn mower are simple tricks to keep you from doing dumb things in the yard. Check for these when buying:

Pull the handle of the mower up against your stomach, then swing your foot out toward the housing. The handle should be long enough so you can't kick the machine. This means you would find it hard to pull the mower back over your foot.

Try to shove your toe under the housing of a machine standing on the dealer's floor. You shouldn't be able to.

Look at the opening of the chute. The safest mowers have a bar welded across the opening, flush with the bottom of the skirt. Another good feature is a hinged flap that lowers the angle of discharge. (Toro has a plastic overflap of this kind, and Locke has a hinged metal grid.)

Look for the "windrow" attachment many mowers have. It's effective against flying objects.

Is there a gauge to tell you when to fuel up, so you can do it before you start the engine? A frequent cause of injury is flare-up of gasoline spilled on a hot manifold.

To keep you from sticking your hand into a moving blade after the power is turned off, some engines (Clinton, for one) have an automatic brake that stops the spin almost instantly.

To encourage safe cleaning methods, at least two makers (Toro and Jacobsen) have a hole in the deck through which you squirt water from a garden hose, while the mower is running. Driven by the blade,

the water blasts grass out of the housing.

Turn the machine over to look for more safety ideas. Extra overhang in back will reduce chances of pulling the mower over your foot. Deliberately placed baffles in the chute will let airborne grass dodge around them, but a heavy object bounces off two or three surfaces, then falls to the ground. Sunbeam has this feature.

A disengaging clutch for the blade, so you can turn off the blade without shutting down the engine, is good safety. It's found on Yard-Man, which has the blade on a separate, belt-driven spindle.

Special blades for safety. Several rotary blades of special design offer advantages in safety without loss in efficiency.

A disk blade (P. M. Eng. & Mfg. Co., Ridgway, Pa.) is a rugged fiberglass molding with four stainless-steel "bladelets" pivot-mounted at the edge. Damage to a shod toe shoved into this blade would be minimal. Air-moving baffles and reinforcement corrugations are engineered into the disk. P. M. produces the Whispering Jet mower using this blade, and also sells it as a replacement for other mowers.

Another disk (M-P Corp., 6466 Chene St., Detroit) is of stamped steel. Its edge is rolled over so that it cannot "bat" anything, and would only abrade a foot or finger that might come in contact with it. The cutting edge is ground on one edge of a slit cut in the disk. Some of the new mowers use this blade. It is also available as a replacement.

A unique S-shaped blade, picked up by Toro, for one, is like a pair of reversed sickles with the outside edges sharpened instead of the inside. It cuts grass with a slicing, shearing effect, which makes it particularly good in very fine and very stiff weedy grass. You might like to try one (Phillips Dist. Co., 11349 Flamingo Lane, Dallas) as a replacement blade.

A similar glancing-blow effect is produced by a straight blade which has its ends cut at an angle (Atlantic Refining Co., Dallas). Since it is most often the extreme end of a fast-whirling blade that strikes objects, the angle reduces impact.

A specially designed self-cleaning blade that has caught on with Sears, Roebuck is a double unit. Above the cutting blade is a cleaner blade, mounted at right angles, to keep the housing free of grass. PS

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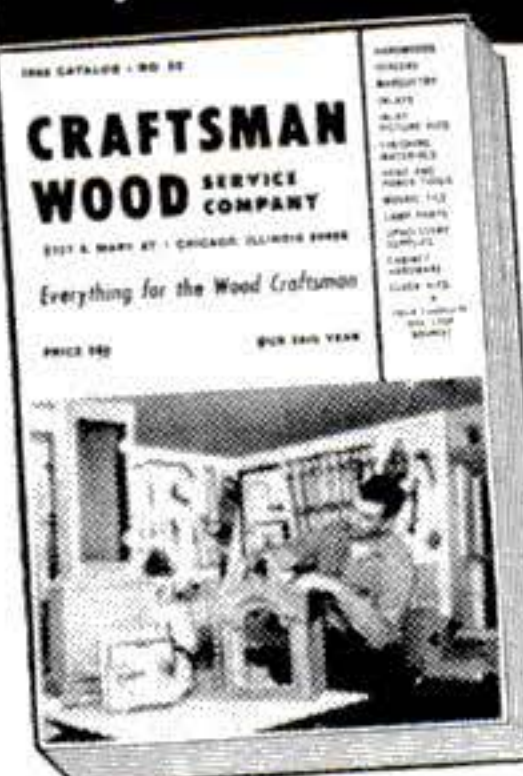
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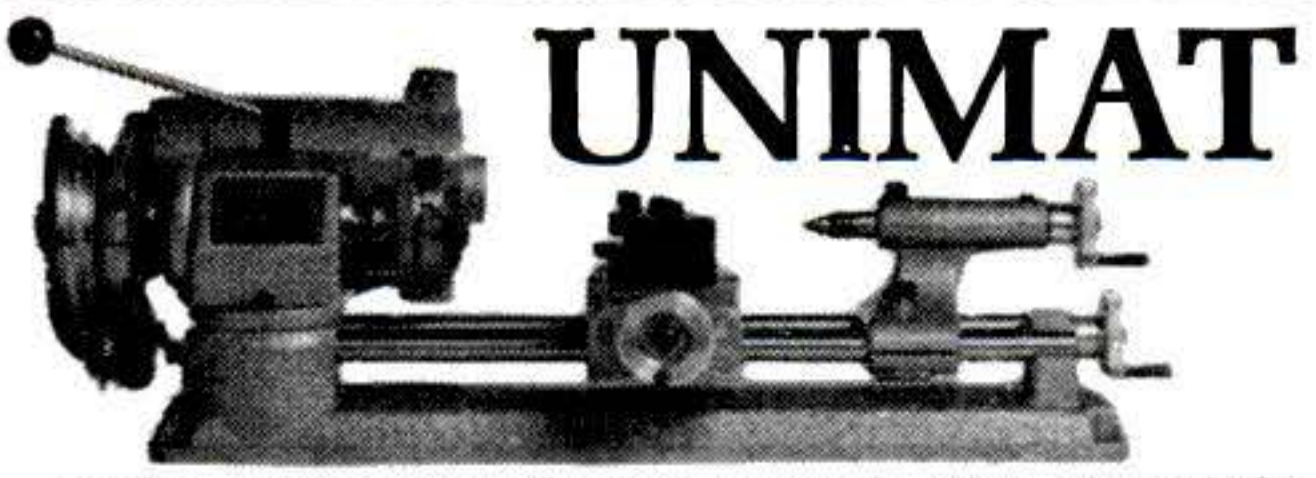


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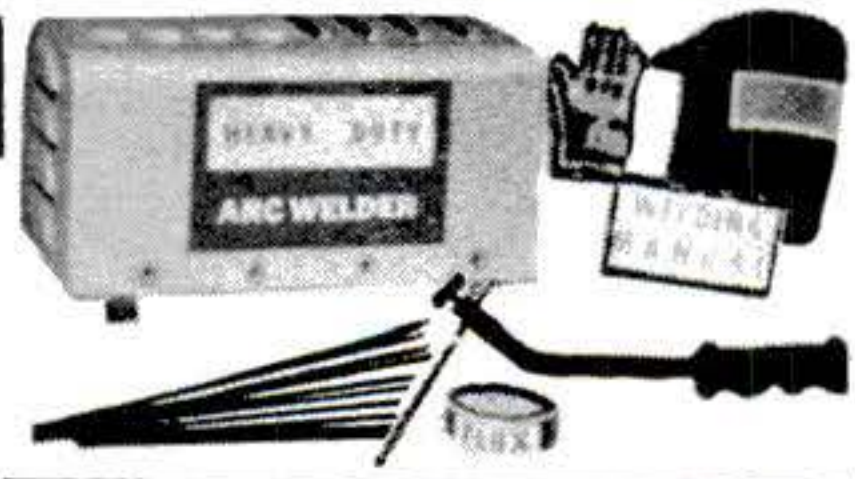
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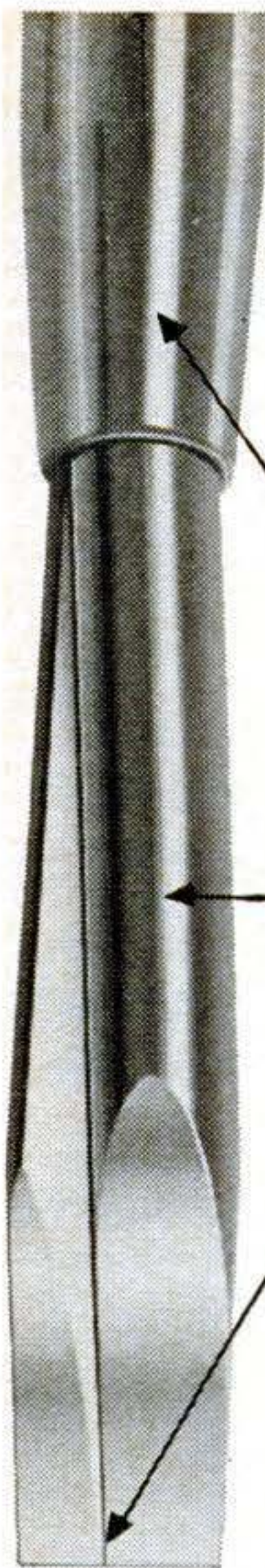
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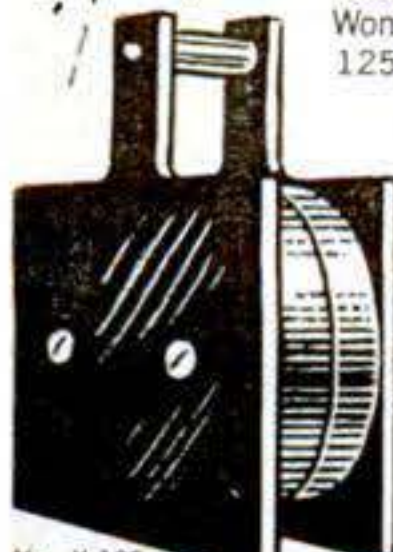
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Are Your Tires Safe Enough?

[Continued from page 112]

turers were represented. Tires of others could have had different characteristics.

The secret files. One thing could settle the two-ply/four-ply controversy—access to adjustment records of the tire manufacturers. Unfortunately, adjustment figures, for competitive reasons, are secret.

But some companies will talk in general terms. Goodyear states that two-plys give no more, and sometimes less, trouble than four-plys. Firestone goes further.

"Our adjustment records show," says Corey, "that our experience has been a little better with two-plys than with four-plys. We particularly get fewer impact adjustments from two-plys."

Only one of the country's 14 tire makers—who, for obvious reasons, prefers not to be named—gives a different account.

"Frankly," says a spokesman, "it was adjustments on two-ply tires that forced us out of them. We thought we were making as good a two-ply as could be made. But they just didn't stand up as well."

How does the evidence add up? Unfortunately, somewhat inconclusively:

1. Two-ply tires have certain engineering advantages. They run cooler, ride softer, and give better traction and gas mileage.

2. As measured by burst tests, two-plys generally have less carcass strength than four-plys. However, there is little hard evidence that this affects performance.

3. Limited evidence indicates that two-ply tires are more sensitive to underinflation. The tire companies deny this. Their account of their adjustment experience tends to support them.

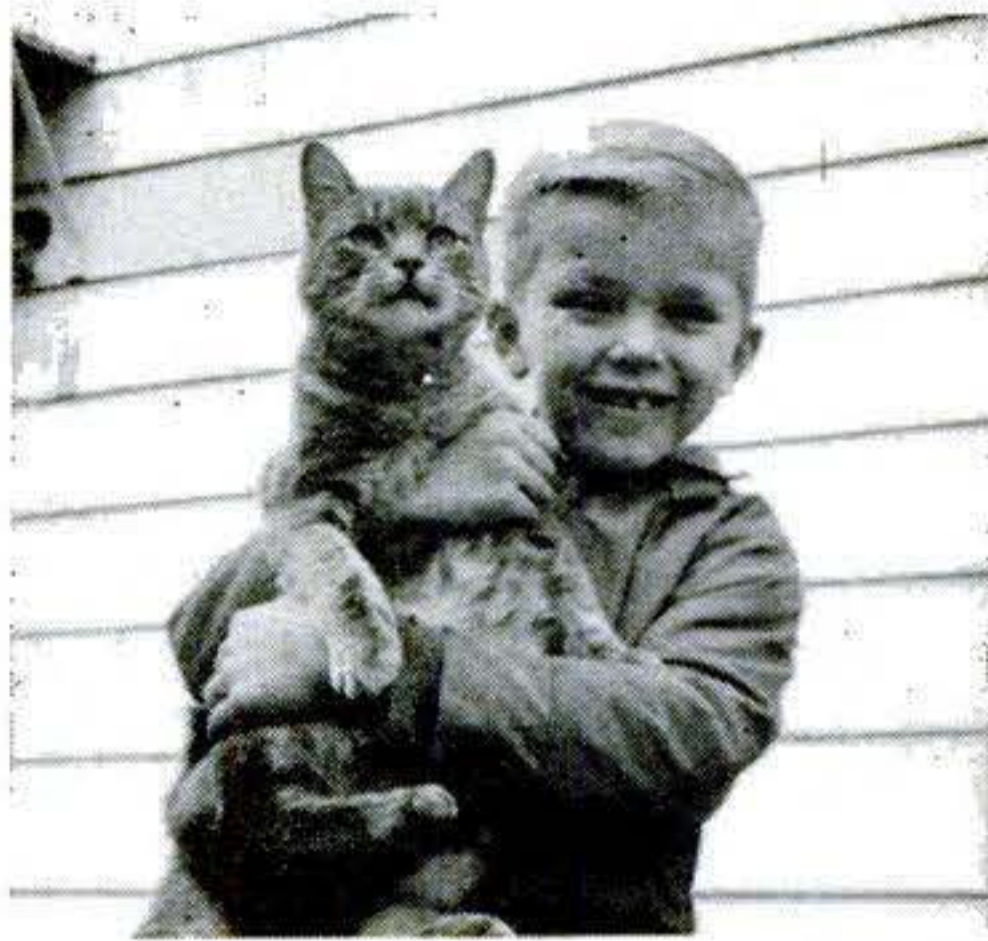
4. For *all* tires, underinflation may be more dangerous than commonly thought. The moral is: *Keep your tire pressures up to recommendation.* Overload is more common than is realized. Instruction books and in some cases windshield stickers on 1966 cars are specifying that pressure should be increased for a full load—say, six persons and baggage. A normal load, for which the generally recommended 24 pounds is adequate, is usually calculated on the basis of three to five persons and no baggage.

The swing toward two-ply tires isn't likely to be stopped. Detroit prefers them. More than nine out of every 10 cars coming off the assembly lines wear two-layer shoes. Even the replacement market is coming around toward more two-plys. **PS**

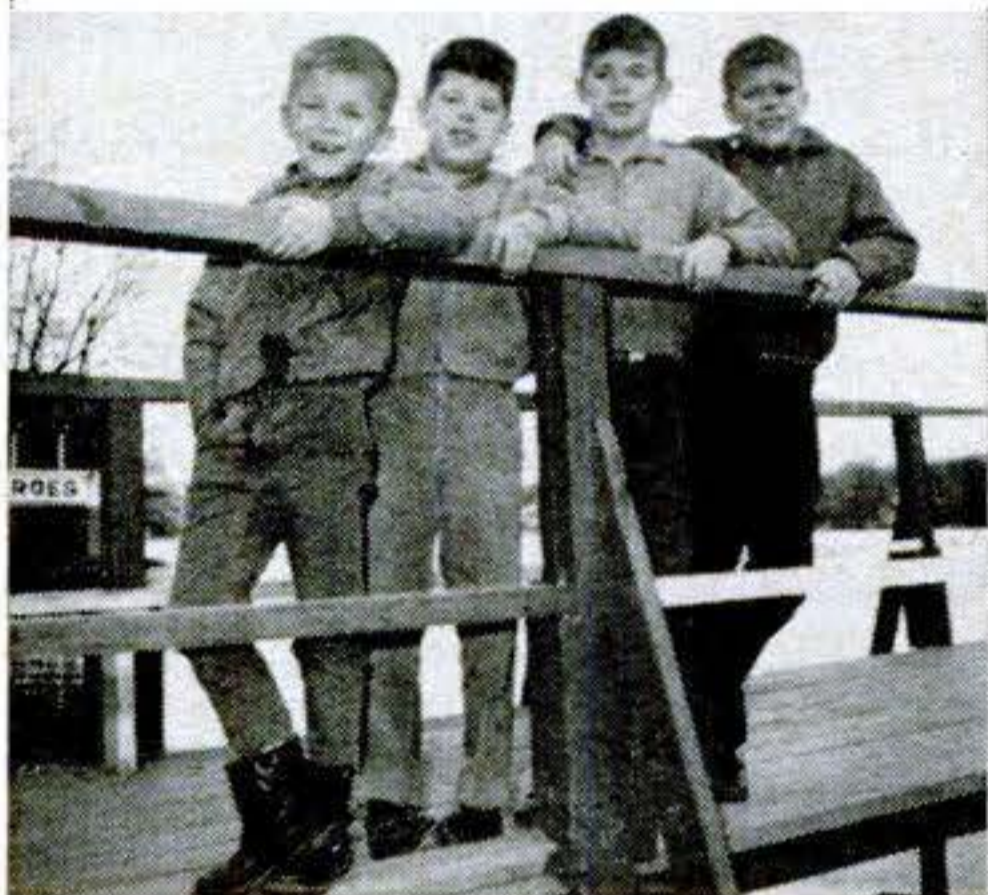
5 Picture Spoilers . . . and What to Do
[Continued from page 114]

in until you can see their faces clearly; if it's a scenic shot, concentrate on the most important elements. Ask yourself: "Is there anything in the scene that will spoil the picture?"—and get it out of there. **PS**

Camera shake is minimized if you shoot faster. Here shutter speed was 1/250 second, against 1/25 for shot on page 114.



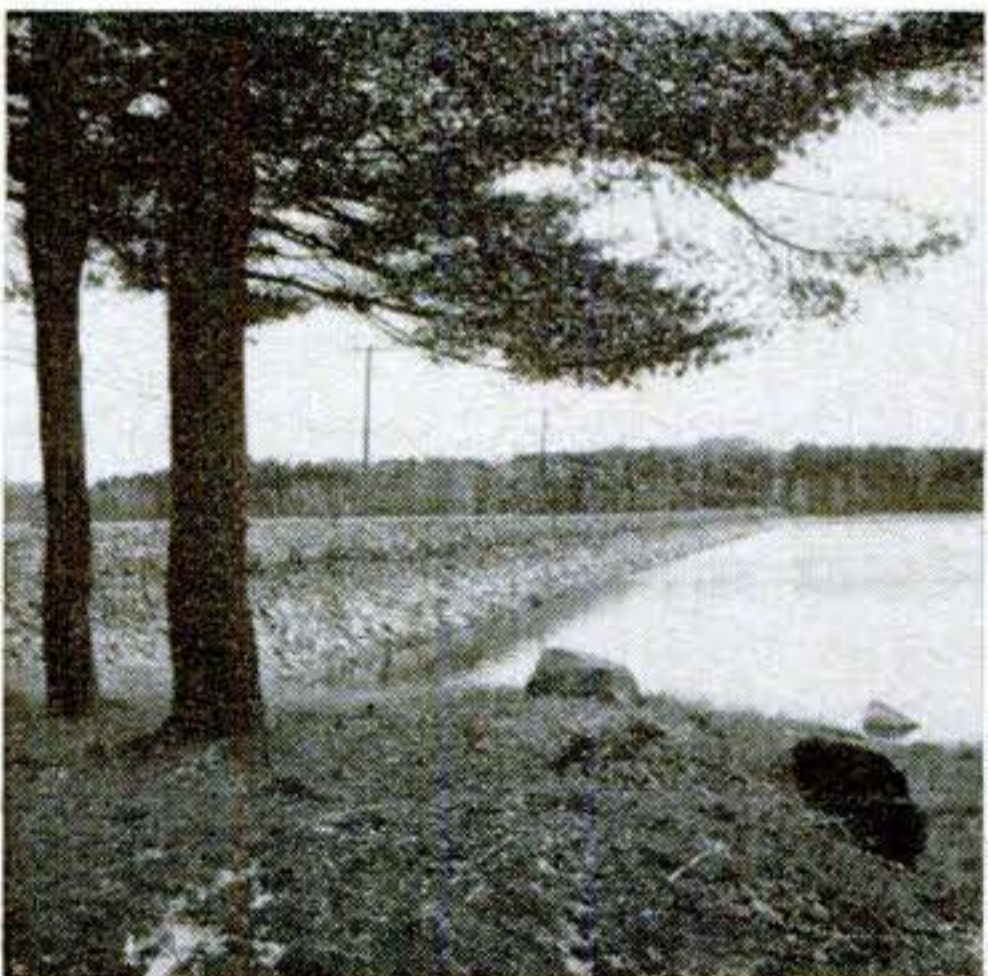
Too far away? Not this time. Photographer moved in until he could see all the faces clearly in his viewfinder.



Background interference was avoided here by having the subject lean against the tree instead of posing in front of it.



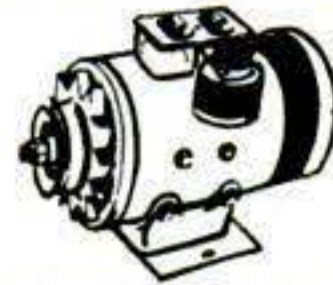
Including too much? Not here. Photographer got closer to concentrate on dam, with only enough of foreground and trees to form a frame.



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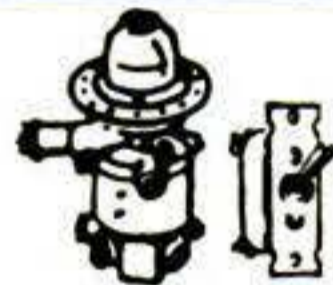
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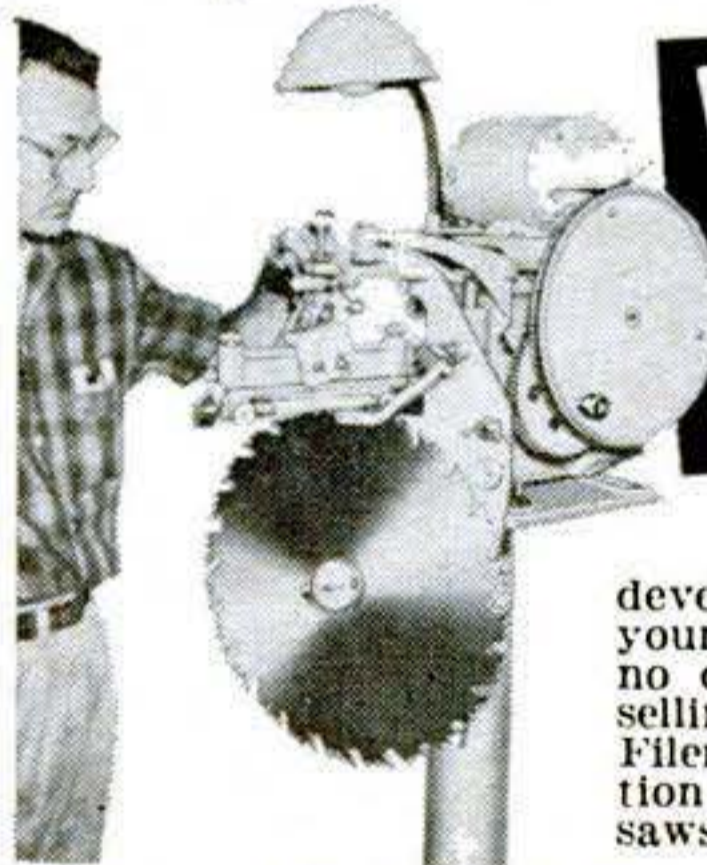


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How an Expert Rigs an Outboard for Rough Water

[Continued from page 128]

as you can get it; that is, it should if you're going to race in the ocean or operate at high speed in rough water."

The pedestal in his boat nearly backs him into the motor well, but it's there for good reason: Boats behave in a sea somewhat like a pendulum, with the axis well aft in the boat. Motion is exaggerated forward, but reduced aft. "Steer from well forward, and you could be tossed out of a boat in a sea that you could almost ignore if steering from near the stern," says Weiler.

He uses twin, flexible-cable steering rather than a single cable with a tie bar connecting the engines. "Blow the wrong engine," he explains, "and you can't tilt it up out of the water and run on the other one if you have single cable and a tie bar." His engines steer by independent push-pull cables, hooked up to a single steering wheel.

Weiler uses an aircraft compass, as do most ocean racers. "They're the only compasses steady enough for us," he says.

He considers tachometers and a good speedometer essential. "They tell you more than just what you're getting out of your engines and propellers. I can troubleshoot engine problems while running. Anyone can, when he acquires the knack. You can spot fuel problems, ignition trouble, prop slippage, spark-plug fouling—from tachs."

His fuel system, too, is geared to ocean running. He doesn't use conventional outboard fuel hoses, with priming-bulb pumps in the line. If the boat leaps out of the water, pulling the props into the air and letting the engines over-rev, the conventional lines and bulbs simply collapse from the heavy extra suction.

He mounted primer-filters in the splash well, within reach of the steering station. His fuel lines are clear-plastic hose through which fuel flow is visible. He can tell at a glance if there's water or dirt in the gas, or if one engine isn't getting enough. And if an engine fuel pump fails, he can pump fuel by hand.

"I once finished a race that way," he says. "I pumped fuel through a primer-filter for the last hour."

His 240-gallon fuel tank, an integral part of his self-bailing hull, has a seven-inch-wide fill cap. The large opening permits fast fueling and mixes oil directly into the fuel stream.

Location of fuel tanks depends largely on the individual boat and the trim problems created by steering-station location, crew weight, and other factors. Weiler feels they should be aft of amidships or even at the stern of a pleasure boat. It tends to make the boat stern heavy—as most private outboards are. This is good in calm water. It boosts the bow, reduces wetted surface and friction, and promotes speed. But it's bad in rough water, where you want the bow down to cut a path for you through those seas. Some boat owners set the bow down when necessary by shifting weight forward. Weiler does it with trim tabs.

Trim tabs have been around for some years, but Weiler designed his own. He locks them in one of two positions (up or down) by way of Morse cable controls, with levers alongside the steering wheel.

They're simply made: One is aluminum, the other an experimental fiberglass unit with no hinge. Weiler delved into his own background in plastics engineering to design the hingeless unit. The secret is flexible resin where it is attached to the transom. He thinks the resin joint will outlast a metal hinge.

Keeping in go condition. The veteran outboard ocean racer also offers a few suggestions on operation and maintenance.

He sprays virtually everything—including the engine powerheads, control linkages, spark-plug covers, and boat hardware—with a corrosion inhibitor.

He keeps close tabs on his spark plugs—constantly cleans and regaps them. He feels the average outboarder doesn't pay proper attention to the plugs, and says fishermen who troll a lot should be particularly mindful of potential plug and point problems.

He recommends high speeds with two-cycle outboards, which were designed to work best at high r.p.m. "Anyone who runs at idling or dead-slow speeds," he advises, "should wind his engine up now and then to burn off carbon accumulation. He'll be avoiding potential pre-ignition problems and even the possibility of a blown cylinder."

Such care, along with painstaking assembly on an outboard rig, assures you maximum enjoyment from a capable boat. Outfit yours Weiler-style, and she'll carry you through any kind of water. **PS**



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Coins & Currency	26
Contests	46
Detectives	47
Do-It-Yourself	66
Dogs, Birds, Hamsters & Pets	17
Earthworms, Crickets, Frogs	18
Educational & Instruction	45
Electric Trains	64B
Electrical Supplies & Equipment	7
Employment Information	42
Engines, Motors, Etc.	10
Farms, Other Real Estate	19
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For Inventors	60
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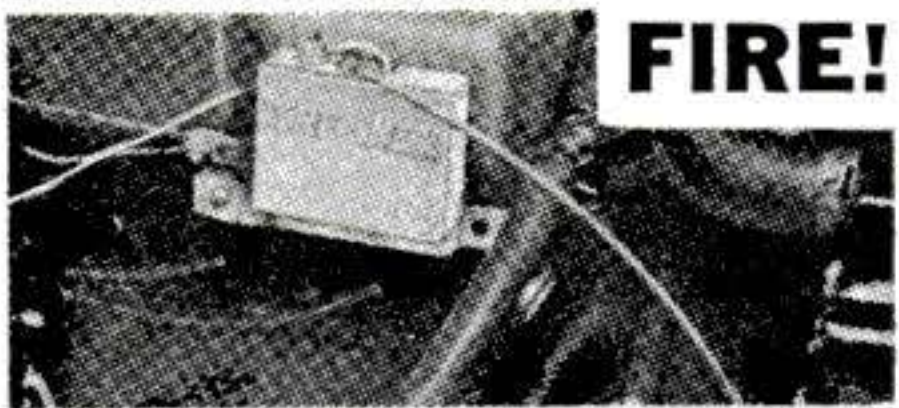
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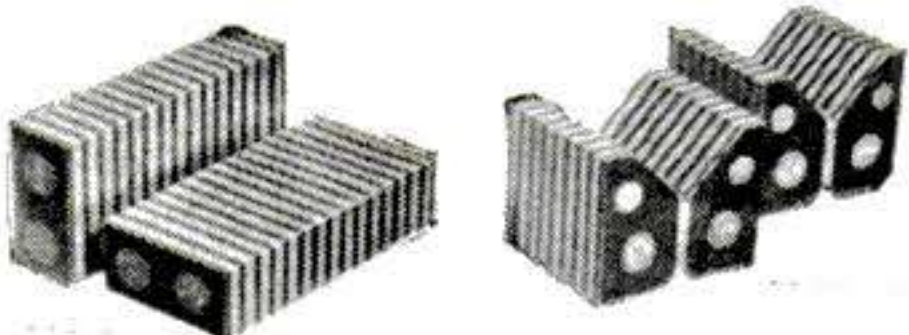
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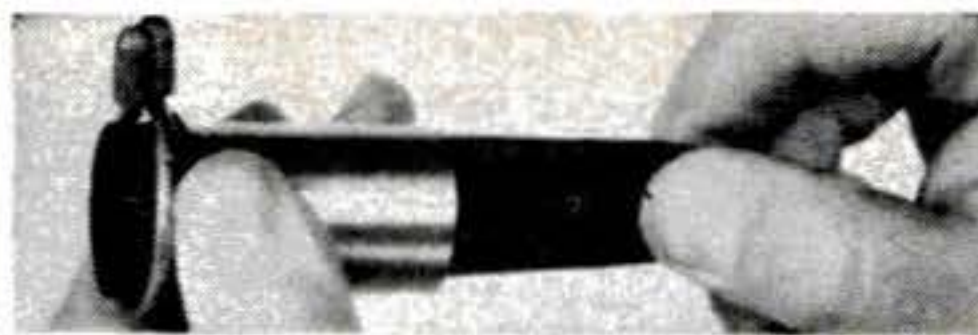
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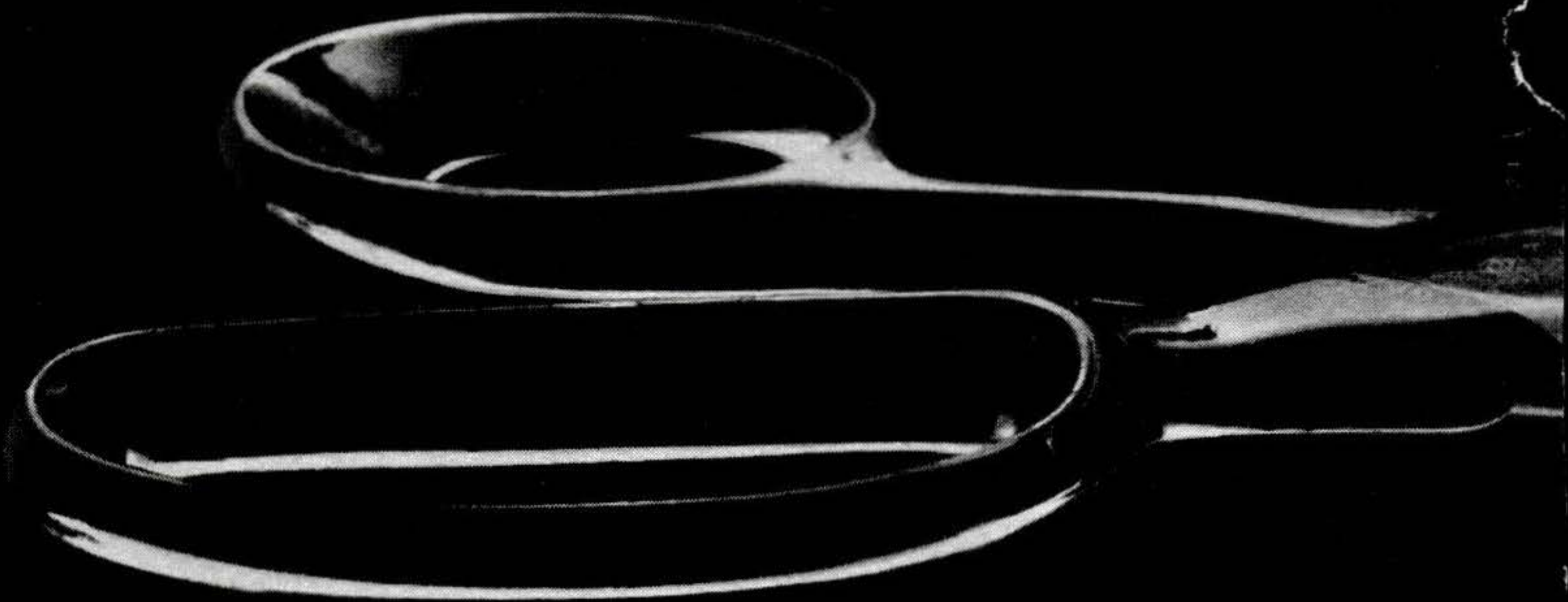
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Electronic Equipment Training
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Systems Servicing
Industrial Electronics
Industrial Electronics Engineering
Practical Radio-TV Engineering
Practical Telephony
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Telephony, Electronics and
Radio Communications
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TV Technician

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Industrial Metallurgy
Lathe Operator
Machine Shop Inspection
Machine Shop Practice
Machine Shop Practice & Toolmaking
Metallurgical Engineering
Technology
Milling Machine Operator
Patternmaking
Practical Millwrighting
Reading Shop Prints
Rigging Tool Grinder
Toolmaking Turret Lathe Operator
Welding Engineering Technology
Welding Processes

12. MANUFACTURING ENGINEER

Plan production. Supervise plant layouts, including automated equipment. Earnings range from \$5,000/yr. to \$10,000/yr.

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Industrial Instrumentation
Machine Design
Mechanical Engineering
Quality Control
Safety Engineering Technology
Tool Design Value Analysis

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Oil Field Technology
Petroleum Production
Petroleum Refinery Operator
Pipeline Engineering

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Engineering
Mathematics and Physics for
Technicians
Mathematics and Physics for
Engineering
Modern Elementary Statistics

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Be a plumber of this always-ready, steady-employment building trade. Earnings range from \$5,000/yr. to \$10,000/yr.

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Air Conditioning Maintenance
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Domestic Refrigeration Heating
Heating & Air Conditioning
with Drawing

Plumbing Plumbing & Heating
Plumbing & Heating Contractor
Practical Plumbing Refrigeration
Refrigeration & Air Conditioning
Steam Fitting

16. PROFESSIONAL ENGINEER

After meeting the requirements of the laws in your state, earn a license with accompanying status and authority. Earnings range from \$5,000/yr. to \$10,000/yr.

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Chemical Civil
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Meet new people every day. Establish long-term buying contracts. Many companies select top management from the sales force. Earnings range from \$5,000/yr. to \$10,000/yr.

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Sales Management Salesmanship
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Be a key staff member of the administrative team. Both men and women fill this vital role today. Earnings range from \$4,000/yr. to \$7,000/yr.

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Legal Secretary Medical Secretary
Professional Secretary Shorthand
Stenographic Typewriting

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Operate industrial power plants. Chances often open for Chief Engineer. Earnings range from \$4,000/yr. to \$7,000/yr.

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Power Plant Engineering
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Stationary Fireman
Stationary Steam Engineering

20. SUPERVISOR

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Personnel-Labor Relations
Supervision

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Cotton Manufacturing
Dyeing & Finishing
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Textile Mill Supervisor
Textile Technology
Warping and Weaving
Wool Manufacturing

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Motor Traffic Management
Traffic Management

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Practical English
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