

**Has the BASEBALL been changed?**

**Test report  
on page 134**

# POPULAR MECHANICS

OCTOBER, 1961

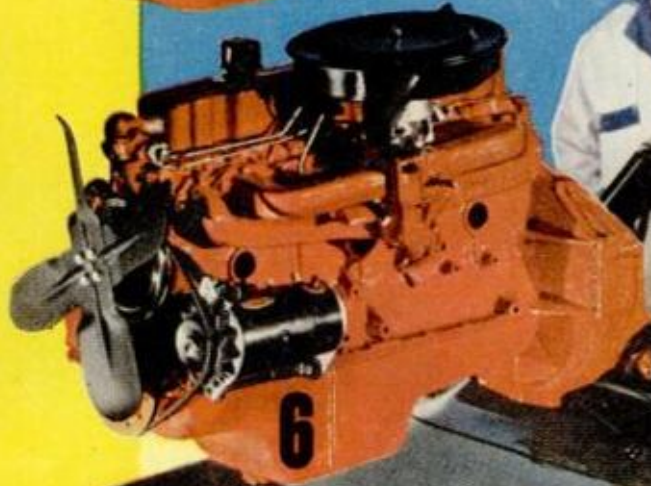
35 CENTS

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the surprising  
'62s!**

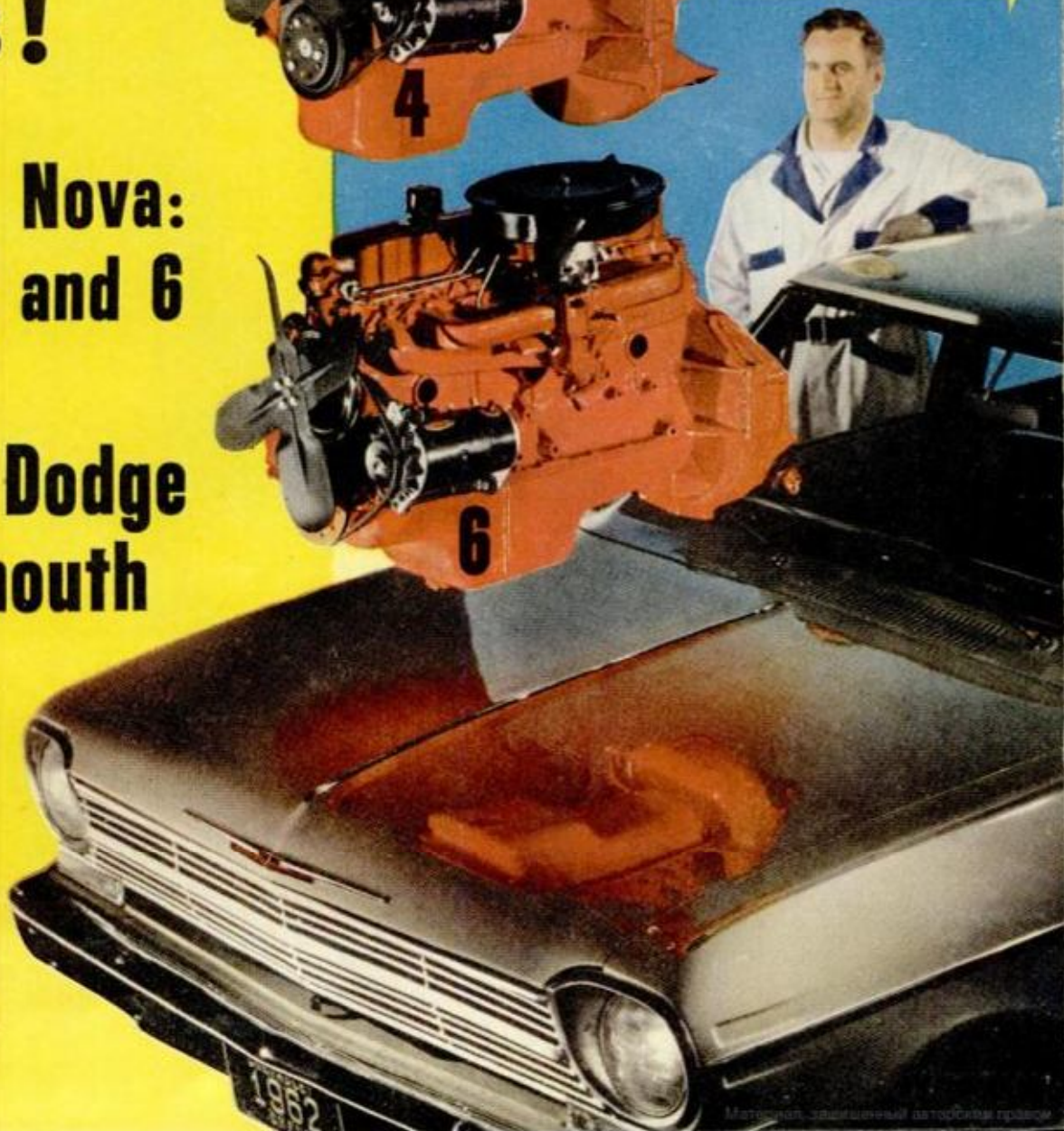


**FIRST V6  
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**New-size Dodge  
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**24  
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# PUSH- BUTTON BOATING IS HERE !



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*(In Canada: Peterborough, Ontario) A Div. of Outboard Marine Corp.*



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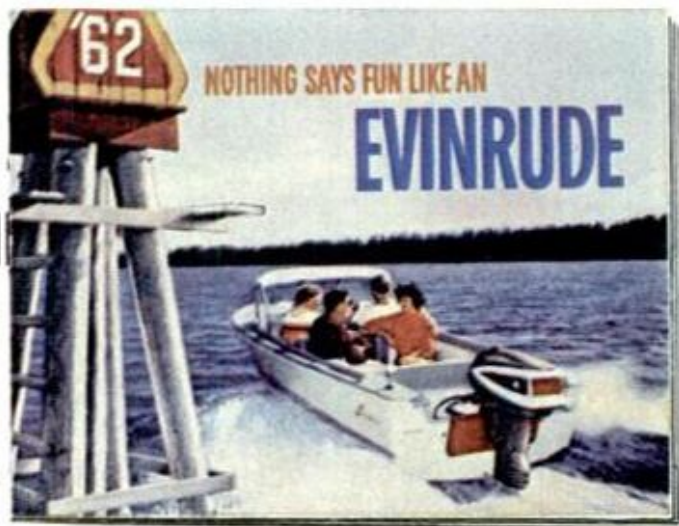


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## 24-PAGE PREVIEW OF WHAT BOATING PROMISES YOU IN 1962!

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# Simple cures for oil-glutton cars

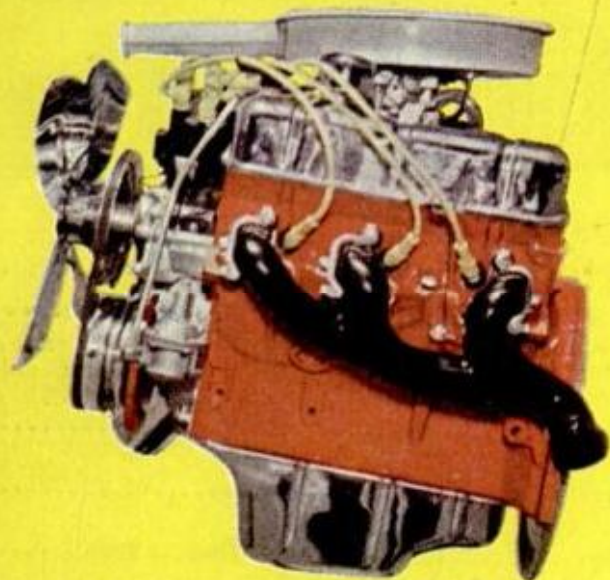
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Look at some of the highest paid men in business. They have developed the basic abilities that always pay off . . . the ability to handle people . . . to speak and write effectively . . . to create ideas and "sell" them to others . . . to organize their time efficiently and achieve more. They have learned to understand business procedures . . . how to keep well informed . . . to win important new friends wherever they go. And they are just naturally sought

after whenever a responsible job is to be done.

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**STOP WHEN YOU LIKE**

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**Dept. 1-PM-0, Garden City, New York**

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OCTOBER 1961

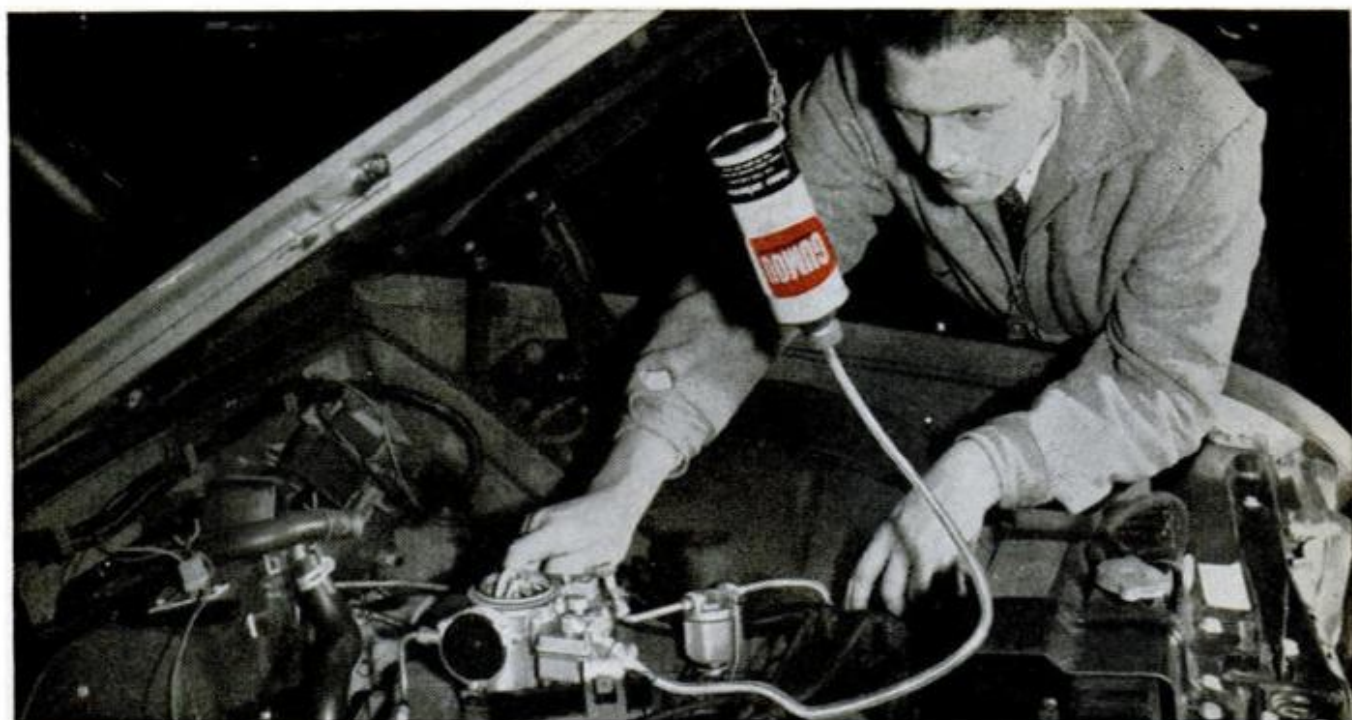
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## CLEAN CARBURETORS RIGHT ON-THE-ENGINE

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Stop engine stalling, hard starts, rough idling and gas waste caused by a dirty carburetor. Now you can clean carburetors the professional way and at the lowest cost with GUMOUT and the easy-to-use CLEAN-OUT KIT. Simply hook up the kit, turn on the engine and GUMOUT goes to work. It takes just a few minutes. Clean your carburetor

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### GUMOUT

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**TRANSPORT-100 TRUCK TIRE**





# POPULAR MECHANICS®

OCTOBER 1961  
VOL. 116 NO. 4

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## Next Month . . .

First road test of the controversial new Wankel rotary combustion engine. Also, don't miss "The Key to Lower-Cost Appliance Repairing" and "Five-Minute Portable Car Wash" you can build. And if you want a head start on Christmas, watch for articles on silk screening your own cards and 15 fun-to-make gifts and decorations.

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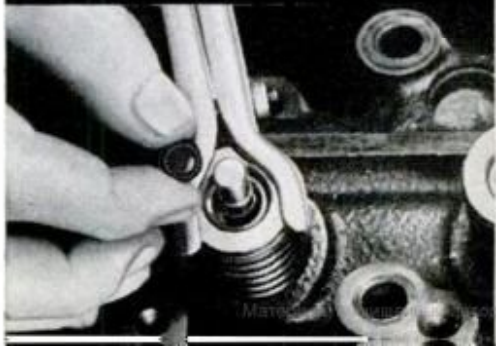


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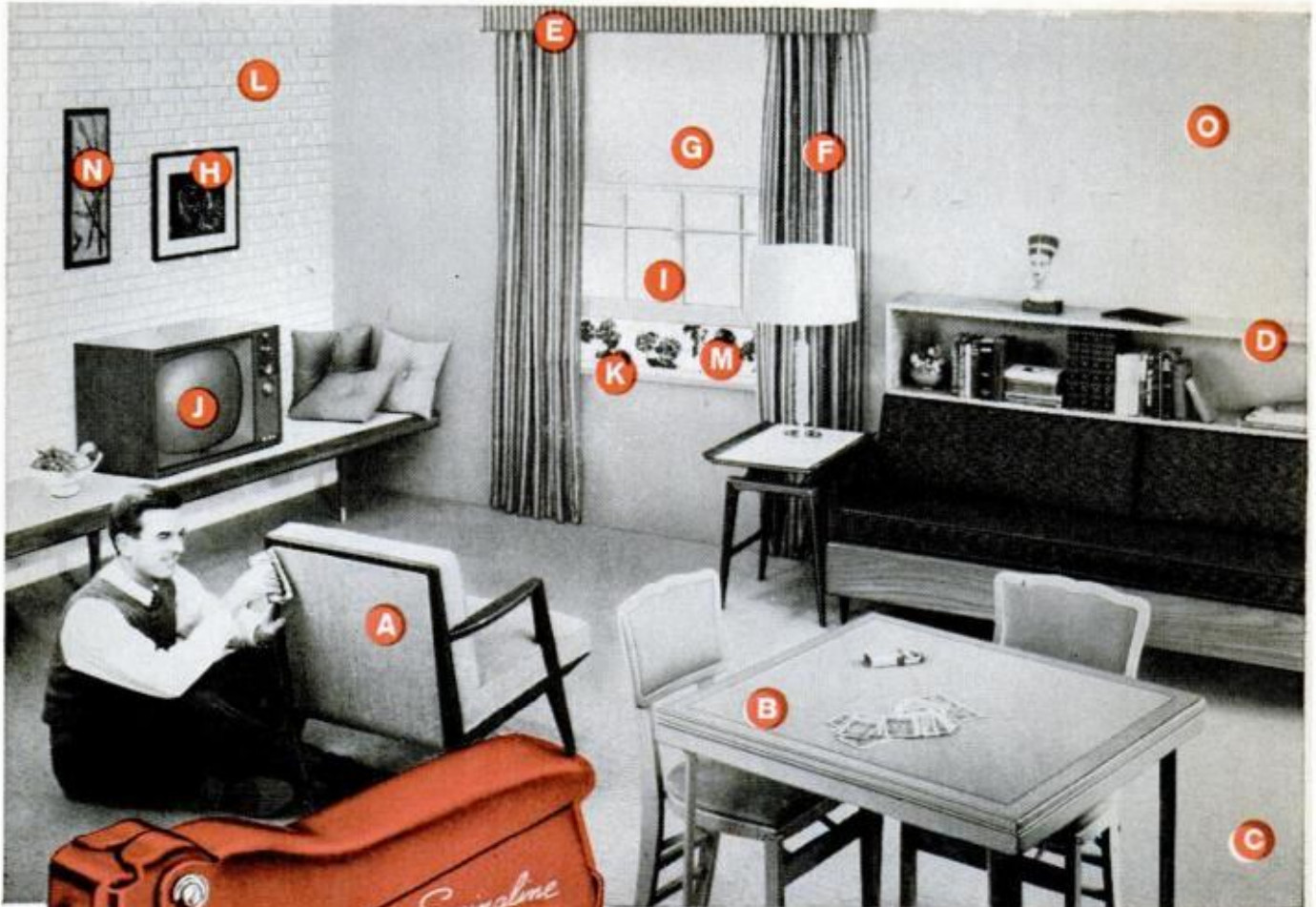
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A SWINGLINE staple gun makes *immediately possible*—and *easy*—all those time consuming, hard-to-do chores both inside

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Now a great new power mate for the Special's aluminum V-8



# the Buick Special will have a V-6 engine

*Yes, a V-6 engine is possible.*  *Yes, the dream of car engineers has been fulfilled.*  *Yes, it took Buick engineering leadership and ingenuity to produce the only V-6 in any U.S. car.* 

Ever since the V-8 was invented and virtually swept straight eights out of existence, car makers have hunted a way to give the "six" a "V" block. Such a "V"-block six, like the V-8, would mean smoother and greater go with savings on service and gas. Because, in 1962, American cars finally see realization of the V-6 dream, this will always be a red letter year in automotive history. And because Buick is the only U.S. car to bring it to you, Buick has again proved that when better automobiles are built, Buick will build them.

**Vital Statistics:** This great new running mate for the Buick Special's aluminum V-8 gives you 135 h.p., 215 foot pounds of torque, 198 cu. in. of displacement, 2-barrel carburetor and a 8.8 to 1 compression ratio that thrives on regular gas. Outside of one or two

foreign cars, such as the costly Grand Prix Ferraris which this year are sweeping all races, it's the only V-6 car in the world.

The Special V-6 brings you these revolutionary advantages: The V-smooth, V-lively go of big cars with gas economy that challenges the compacts. 140 to 179 pounds less weight than in-line sixes of comparable power. Has the shortest, toughest, most rigid block and crankshaft in any American 6-cylinder car.

Best of all, you can have the V-6 in any standard model you want—dashing new Special convertibles, sedans, station wagons. Starting September 27 at your Buick Dealer's you can try the new V-6 and aluminum V-8 in the Buick Special—the happy-medium size car.



BUICK MOTOR DIVISION—GENERAL MOTORS CORPORATION





# OVER THE EDITOR'S DESK

## One-Man Doodlebug?

Really liked your June articles on air-planes, especially the one on the Back-Yard Eagles. Wish PM would publish plans on a little one-man doodlebug a man could build in his back yard.

Memphis, Tenn.

LEE DAVIS, JR.

PM has published plans for gliders and heavier-than-air planes, but not recently. Jimmy Doolittle, for one, built his first plane from PM's plans. And if enough of you readers want plans for a modern-day doodlebug, we'll see to it that the plans are published.

## Beat the Wright Brothers?



I have stored in my barn the remains of a helicopter (powered by foot pedals) that actually lifted a man in the air before the Wright brothers flew. I have notarized statements from Thomas Ingoldsby and his sister (children of the inventor) about this thing raising them three or four feet in the air many times before the Wrights flew. They are still alive and their story may be checked. I intend to rebuild it as soon as I get a little money.

Council Bluffs, Iowa.

TOM KILLMON

If you succeed in rewriting some aviation history, let us know, Tom.

## Good Sons, Good Workmen

As a 30-year reader of PM, I think your April article, *The Thousand Wonders of a Child*, is one of your finest.

My two sons were continuously underfoot when I worked at home but, as a complete do-it-yourself man, I always showed them how to do things they wanted to do.

The result is a pleasure. Both sons are now grown and each is a good workman and a good son, and the fun we had will live on.

Midland, Tex.

GRADY M. WIKE

## Wrong-Way Beaut

Enjoy your fine magazine but I sadly state you have committed an error in the July article, *See Yourself Three Ways*. Intrigued by the project, I made an experimental picture. The directions stated that strip #1 of photo A be glued to strip #14 of photo C. If this were done, either photo A or C would come out backwards. The directions should be #1 of A to #1 of C. After correcting, I used pictures of three different Swiss houses on my good picture and the finished product was a beaut!

Kearny, N. J.

STUART KERESTAN

Count us as chagrined, sheepish and grateful for your eagle eye, Stu. Particularly one editor who is visiting his oculist for a brushup course in A's and C's.

## Low-Down Cars

You should bring your cars over here for testing during the winter months when we have snow. We run the taxi service here and these new cars can't get very far in the snow—they are all built too low. Give me the good old Model-A Ford and we can go anywhere on the roads here.

Libby, Montana

MRS. CARL STORBAKKEN

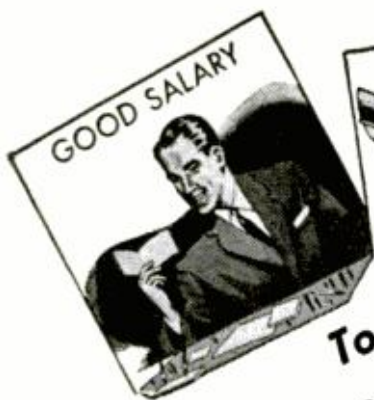
We let owners from all over the United States do our testing for us, Reader Storbakken. And those that live in God's Country areas like yours agree with you, as their comments in the Owner's Reports have indicated. So do we when it comes to the Model A. It was hard to beat that nine-inch clearance, and the exalted view of the road the Model A gave you.

## Out in the Open

May I compliment you on the July article *Do You Have the Safety Glass You Paid For?* The controversial subject of tempered versus laminated glass has been quite important to professional glass jobbers and dealers. As chairman of the Automotive Glass Committee of the Flat Glass Jobbers Association, I have been most interested in

(Continued to page 10)





To the man who wants to enjoy  
an **ACCOUNTANT'S CAREER**



If you're that person, here's something that will interest you. Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—an excellent salary, job security, etc.

An accountant's duties are interesting, varied and of real worth to his employers. He has standing!

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they can be!

Why not, like so many before you, investigate LaSalle's Problem Method of training for an accounting position?

Just suppose you were permitted to work in an accounting firm under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems become complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method. You cover accounting from Basic Accounting right

through advanced accounting and Certified Public Accountant Training.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success does come to the person who is really trained. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle trained men and women have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

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If Accounting and its many opportunities interest you, check the accounting course in the coupon below. Send it to us today, and by return first class mail, full information will be forwarded promptly. Perhaps another plan of training is of more immediate value to you. Simply check the course, mail the coupon, and full details will be in your hands soon, so that you may seriously and thoroughly investigate your opportunities for the future with the help of LaSalle training. **MAIL THE COUPON NOW.**

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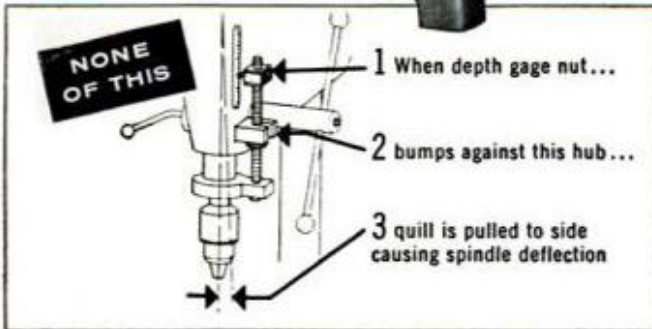
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your presentation. The A.S.A. code and the laws of the various states should be revised and brought up to date.

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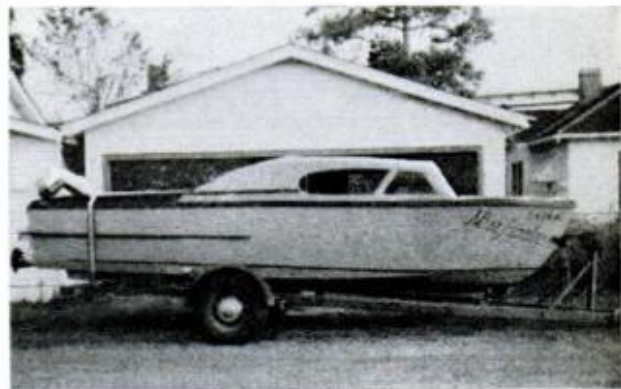
Philadelphia, Pa.

HAROLD PERILSTEIN

### Hook in the Bottom?

I, too, am a lucky owner of a *Sea Knight* built from your 1957 plans. I left the transom full size and extended the hull length two feet, using a motor mount support and two watertight wells on either side. I did this because I feared the reduced transom size in our open, rough coastal waters.

Using an Evinrude 50-horsepower V-4, after building the hull with a slight hook



in the bottom, I get speeds of 25-30 m.p.h. (25-26 m.p.h. with up to six adults and four children aboard). Your plans were very comprehensive and the step-by-step construction method is superb.

New Orleans, La.

CLEMENT BOZZELLE

*That hook didn't hurt the speed much, Clem. Thanks for the complete report.*

### 50-Mile-Per-Gallon Fun

Read with interest about the 80-m.p.g. bike with 2½-horsepower engine, in the July PM Editor's Desk column. We need more projects like this. I once fixed an Austin Bantam car to run 50 m.p.g. on kerosene or fuel oil costing less than 10 cents per gallon. I drove 20,000 miles from Alaska to Mexico and back in three months. Total cost of everything for me and the car was less than \$200. I've never had so much fun in the same length of time since then at any price. Yes, we want more projects like these.

Fort Lauderdale, Fla.

T. F. CHEANEY

*You'll get them, Reader Cheaney, even if PM's workshop has to start smelling like a gasoline station.*

*The Editors*

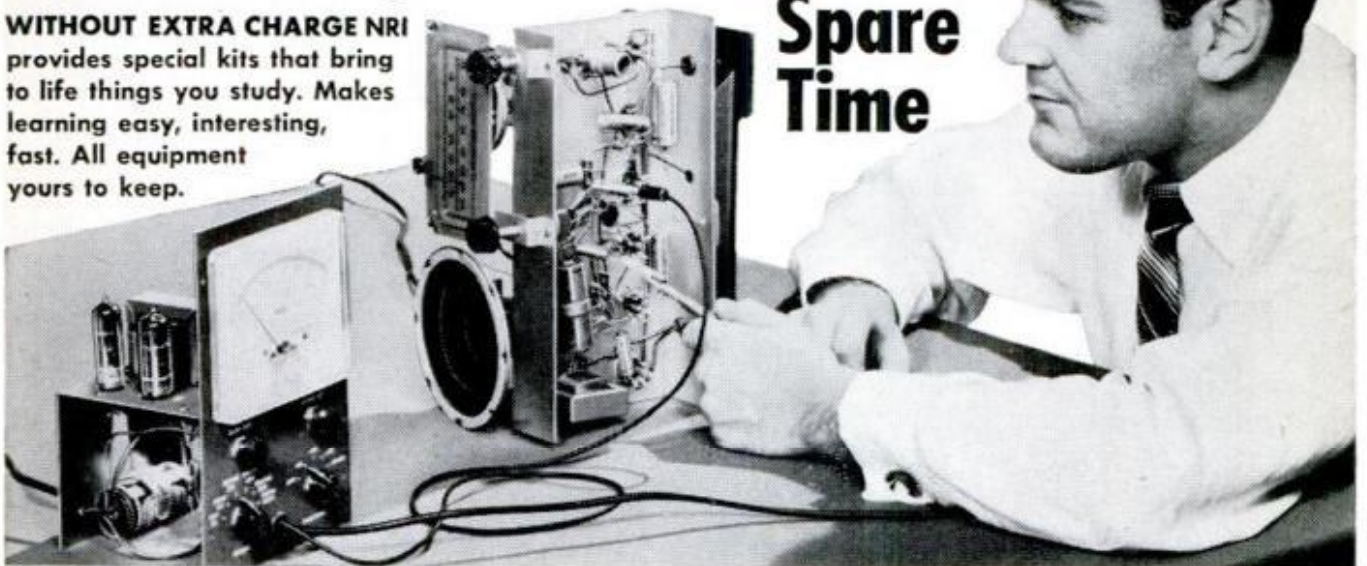
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**J. M. SMITH**  
President

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I was working in a textile factory trying to make ends meet. Now I own one of the most modern service shops in this section. **ARGIE C. TAYLOR**, Glasgow, Ky.

After graduating I was a shipboard radio operator. Now I am chief engineer at Station WARA.

**JOE DUCKWORTH**, Fort Worth, Texas.

NRI was a wonderful foundation. **RAYMOND D. ARNOLD**, Attleboro, Mass.

Thanks to NRI I am in a top position with the Federal Aviation Agency in the Navoids Electronic Section. **LEONARD BLOOM**, Newton Centre, Mass.

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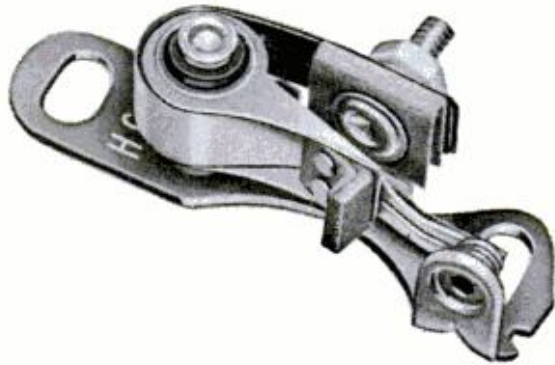
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C-7

## ITEMS FROM ALL OUTDOORS

They said it couldn't be done—that the outboard motor had gone about as far as possible in power and bulk. The resultant gap between the 75 to 80-horsepower outboards and the hundred-plus horsepower inboards was being filled by inboard-outdrive rigs. But all of a sudden Carl Kiekhaefer and his Mercury outboard engineers, who have always led the faction supporting outboard propulsion, came out this month with a real gap-filler—the big black brute on page 125. And maybe the most remarkable thing about the motor is the fact that its size and weight are not significantly greater than the stock Merc 800, twenty horses smaller in power. It looks like a real powerhouse.

✓ ✓ ✓

Two shotgun developments available in time for the '61 hunting season: First is the new Mossberg 12-gauge pump shotgun, a good-looking, all-new slide action scattergun with a lot of nice features like a choice of six interchangeable barrels and a built-in recoil pad. More important, it has a new top-mounted "slide" safety which sits under the shooter's right thumb where I've always thought a safety belonged. It's easy to see, reach, and operate up there, and it's a great idea.

The other is a safety device, too. The Williams Gun Sight Co., of Davison, Mich., has developed a shotgun safety lock that positively locks the Winchester Models 12 and 50 button-type safety. It's a little aluminum doughnut that fits over the cylindrical safety slide, then locks in place with a set screw. It goes on and off easily, but when it's on, it's on for sure, and can't be knocked off or mistaken. It sells for \$1.25.

✓ ✓ ✓

Another new safety device—this one for boaters—is the Res-Q-Matic automatic distress signal transmitter. It's a five-inch-diameter, 20-inch tube with a built-in power source. Pull out the telescoping antenna and it automatically broadcasts a distress signal on 2182 Kilocycles, the international distress frequency. It'll do that while floating, if necessary. The manufacturer is Aquatronic Industries, 5950 Bowcroft St., Los Angeles 16.

*Dick Kiekhaefer*

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## SIDELIGHTS ON AVIATION

**Sky Diving**, which is mushrooming into a major sport, may soon have to be regulated.

N. E. Halaby, Federal Aviation Agency administrator (who has done some sky diving), says the sport should be encouraged but the public and the airways should also be protected. Five years ago, he noted, there were only 238 jumps just for the fun of it. In 1960 there were an estimated 40,000, and by 1970 there could be as many as 250,000.

Under civil air regulations, only the pilot of the plane which drops the chutist is responsible for safety. Halaby would like to make each parachutist responsible.

Shatterproof wheels are being fitted on the B-58 Hustler, the Air Force's supersonic bomber, to protect the plane in case of tire blowouts on takeoffs and landings.

The aluminum alloy wheels, about 1-inch wide and 15 inches in diameter, are mounted between each pair of 22-inch rubber tires. In tests, the tires were deliberately blown on takeoff and the plane continued down the runway on the metal wheels, reaching 258 m.p.h. before final liftoff. Landings were made on the wheels at speeds of about 160 m.p.h.

Flight-deck communications will be made easier by a new system developed for British aircraft carriers. Previously, aircraft noise and ear protectors worn by crew members had hampered voice contact between the flight-control center and the deck crews working near the aircraft.

With the new system, the signals are fed into a magnetic coupling loop encircling the flight deck. Individual crew members carry a receiver that picks up the audio signals, then amplifies and feeds them into an earphone built into the ear protector.

Astronauts may return from long journeys a gamey group. The problems of space travel include a lot of little ones—no smoking, no shaving, no bathing and no brushing of teeth are among them.

Smoking would strain the space ship's air-purification system. Toothpaste would cause too great a foaming problem for the water recycling system. Shaving soap would harm a spaceship's bacterial-digestion system, and electric razors would create whisker fragments that would float in the weightless state. Bathing would require too much water from limited facilities.


*Kevin V. Brown*



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# SIDELIGHTS FROM THE PENTAGON

By William R. Kreh

**Stuffed Dogs** are making parachute jumping safer and more accurate for Army paratroopers at Fort Rucker, Alabama. They use them to calculate wind forces since, in a jump from 1200 feet, a strong wind can blow a parachutist as much as 1000 yards away from his target. A toy French poodle, which weighs two pounds, falls and drifts in a 24-inch-diameter parachute at the same rate as a paratrooper in a full-size chute. Fifi, as the soldiers call these dogs, precedes the troopers on all their jumps.

**Science on the rocks.** The Navy may use a ship as a floating science station in the Arctic by freezing it in the ice and letting it drift for three years.

**No missile gap here.** E. H. Blythe, a rancher in Paso Robles, California, got a bonus recently when he bought a missile transporter from military surplus. He opened the tank and found a Nike Ajax ground-to-air missile inside. Demolition experts rushed to the scene but found the weapon unarmed and harmless. Now the Army's trying to find out who slipped up and left the Nike in the transporter.

**A three-year-old boy** has helped make life easier for Navy pilots at Midway Island in the Pacific. It used to be that on dark and rainy nights the pilots couldn't see the signals of the ground crew guiding them on the runways after landing. The standard Navy signal wands just weren't bright enough. Then one night, Lt. F. L. Bottenberg saw his son, Billy, playing with a flashlight by shining it through a plastic drinking cup. An idea was born. After trying a variety of different sizes and colors of plastic cups and bottles, the lieutenant found that a white plastic clothes sprinkling bottle attached to the end of a flashlight glowed brighter and more distinct than the Navy wands. Now the Navy's thinking of revising its standard wands to pattern them after those being used at Midway Island.

**Superaccurate aerial maps,** made by a new method called analytic aero-triangulation, promise to make aerial surveys three to four times more precise than at present. In recent tests of the new method by the Air Force, photos taken from 20,000 feet

had errors of only three feet in actual ground measurement. Errors of 10 to 12 feet have been considered normal.

**A buoyant mattress** made of plastic-coated foam, that can also be used as a small life raft, is being tested by the Navy.

**An ultrafast movie camera** that takes simultaneous black-and-white and color pictures of explosions in 1.5-millionth-of-a-second exposures has been developed by the Navy at its Ordnance Laboratory in White Oak, Md.

**Radar big-game hunting techniques** are being used by professional polar-bear hunters along the Bering Sea in the Arctic. They scout their game with airplanes and, when they spot a bear, they climb high enough to be tracked by the radar of the nearest station of the Distant Early Warning (DEW) Line. They get the operator to "fix" their position. Then later, when they take their client out to shoot the bear, they can find precisely the same spot on the ice.

**Obsolete submarines as bomb shelters?** The idea would be to modify them slightly and bury them underground. Navy engineers think it might be a good idea. A submarine pressure hull is a strong and durable structure and the underwater craft are naturally designed to accommodate a number of men under restricted conditions.

**Nuclear-damage assessments** in fractions of seconds can be given by an interservice center that has been set up in the Pentagon. The \$5,500,000 installation will be used during peacetime to examine the military forces and economic resources of the U.S. and its allies—and of potential enemies—to see just how vulnerable they are to atomic attack. During war the center would assess damage from nuclear attack, as well as inventory a nation's remaining resources to continue the war effort.

**High-voltage kicks** may be taken out of hovering helicopters by a new device being tested by the Army. It seems that copters—like airplanes—become charged with static electricity as they move through the atmosphere. But the copters move too slowly for the static dischargers used by regular aircraft to be effective. As a result, several thousands of volts can hit a ground crew member reaching up to load or unload a hovering helicopter. The device being tested is a lightweight gadget that allows a copter pilot to flip a switch and eliminate the high charge. ★ ★ ★





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# BULLETINS FROM THE WORLD OF SCIENCE

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Eggs in Cider? That's a new way of preparing them for breakfast. They are dropped in a glass of apple cider to form a drink, called Tren. According to the New York State College of Agriculture, the drink will satisfy a large percentage of a person's morning nutritional needs.

"The drink is intended especially for people who don't want to take the time to cook eggs first thing in the morning," says Prof. Robert Baker of Cornell U. "The flavor resembles that of sweet cider."

Left hand or right hand? "If at any time between 18 months and five years your child shows a definite preference for his left hand, forcing him to make a change can cause an emotional disturbance, says Dr. Kurt Rawitt, a psychiatrist.

This can lead to awkwardness, poor muscle coordination, slowness in thinking, delayed speech and difficulties in writing.

Synthesizing of luciferin has been achieved by scientists at Johns Hopkins University. Luciferin is the strange substance that reacts with oxygen and enzymes to give the firefly its eerie glow.

This step toward producing cold, highly efficient chemical light (the firefly converts 95 percent of its energy into light, compared to the electric bulb which converts only 3 percent of its energy to light) was aided by Baltimore children who during the past 12 years collected 8 million fireflies for scientific analysis.

*James Biery*





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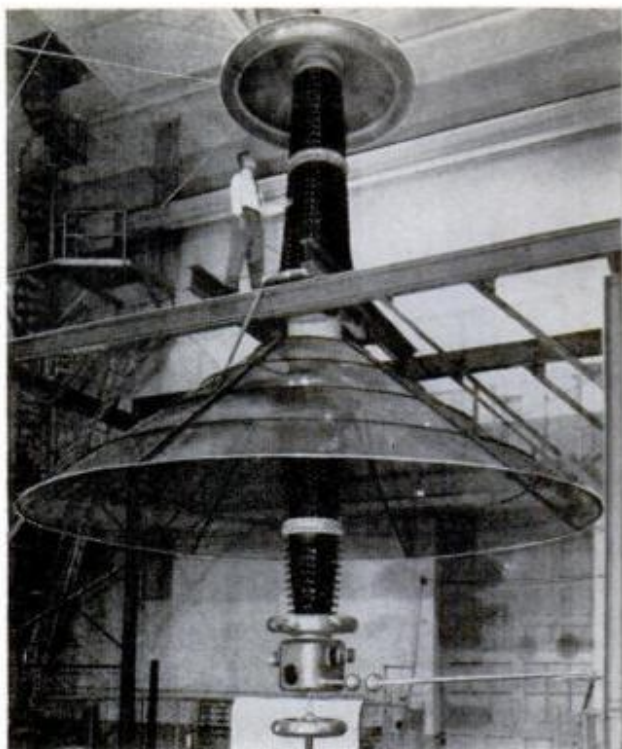
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One of the biggest problems in the inventing business is that, once you have a device perfected and patented, you're only starting to work. You still must find someone to make and sell the thing in most cases, and sometimes that's harder than inventing. Here are two PM reader-inventors with good-looking, patented devices but no manufacturer:

Paul Parker, of Route 1, Box 233, Bossier City, La., has a patent pending on a do-it-yourself kit for installing running water inside a refrigerator. Once installed, the device supplies unlimited ice water from a cold-storage tank, and provides a handy water source for filling ice-cube trays, thereby eliminating the usual sink-to-refrigerator juggling job. Any handyman can install it without defacing the refrigerator.



Willard B. Anker, of the U.S. Information Agency, 330 Independence Ave., SW, Washington 25, D.C., has his patent on an auxiliary automobile gas tank which fits inside the regular tank. The flexible plastic unit expands when filled, and keeps several gallons of fuel isolated from the regular supply. If you run out of gas, you just pull a "rip cord" at the filler cap. The cord opens a valve, releasing the reserve supply into the tank. The tank can be filled in the usual manner; the reserve tank does not change the accuracy of the fuel gauge.



You wouldn't think there could be any improvements on anything as purely functional as a baseball bat, but Dr. Joseph Fleischer, of Olin Mathieson Chemical Corp., New Haven, Conn., has obtained a patent on a bat with an improved handle for a better grip. The method is an old one—the handle is simply "checkered," or scored with shallow V-grooves, in the same way that a rifle or shotgun stock is checkered to give the shooter a firmer grip. Dr. Fleischer was probably inspired by the automatic checkering machines used on gunstocks in his company's Winchester-Western Division; he reports that the same machines can be adapted to work on baseball bats, too. Originally a research chemist, the doctor already holds about 20 patents, but this is his first in baseball. ★ ★ ★



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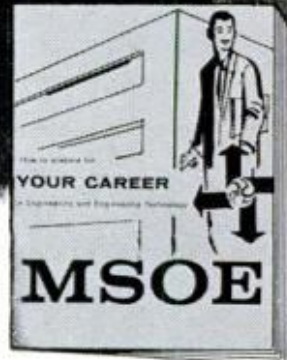
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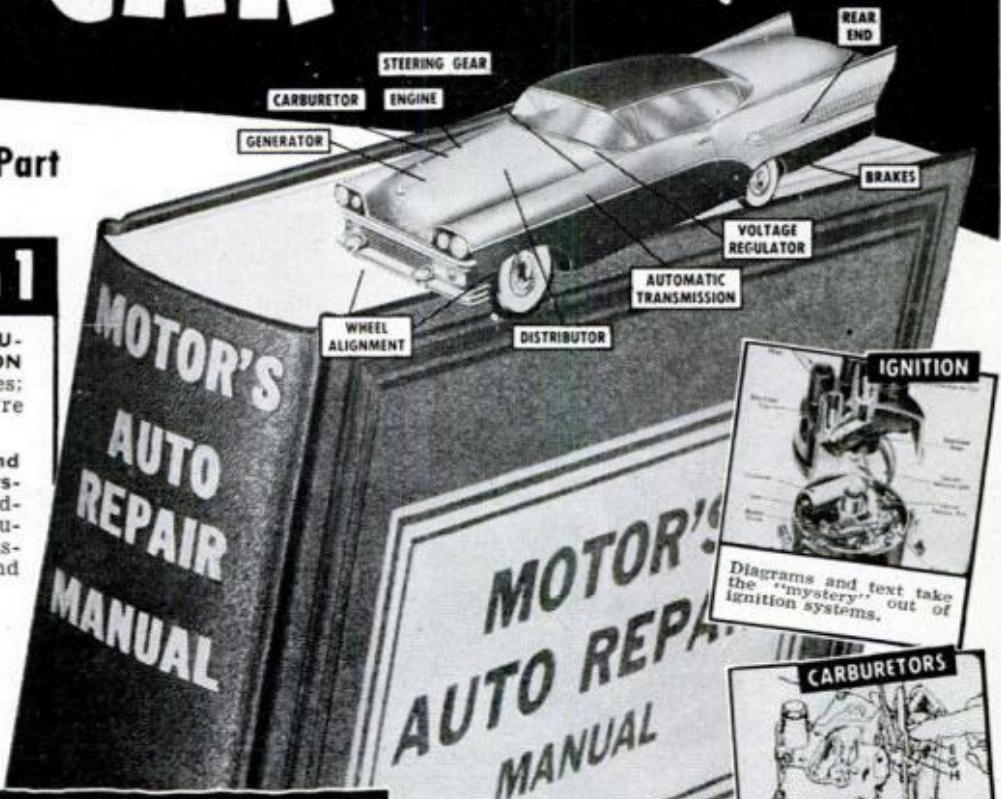
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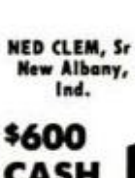
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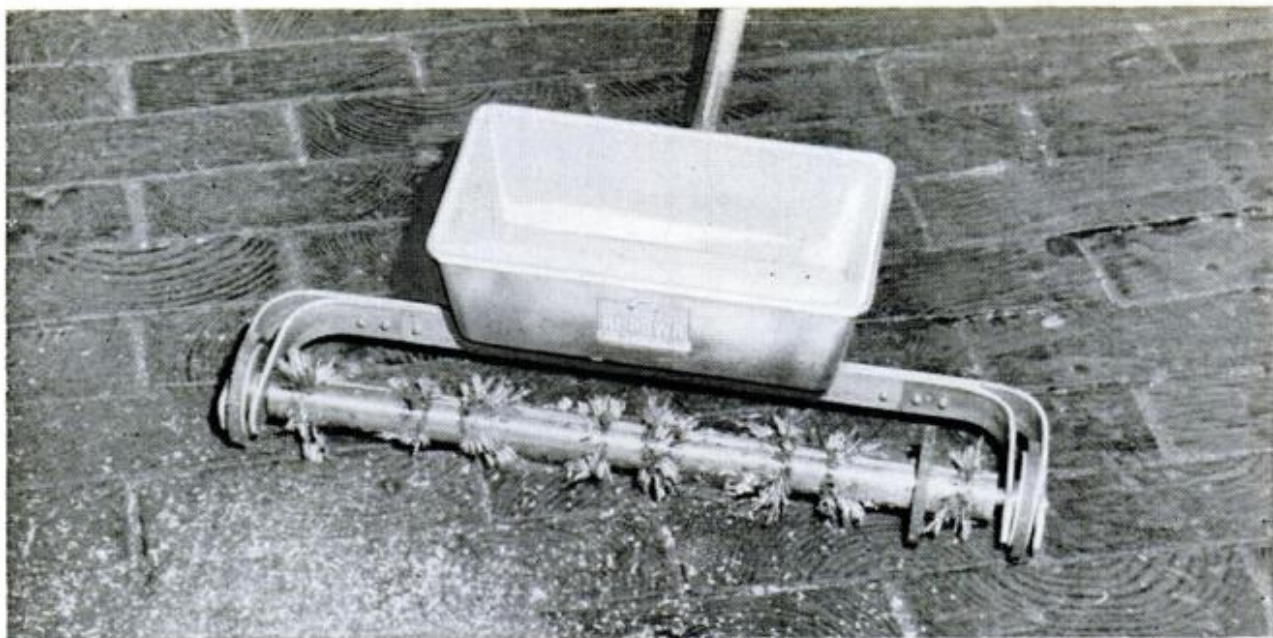
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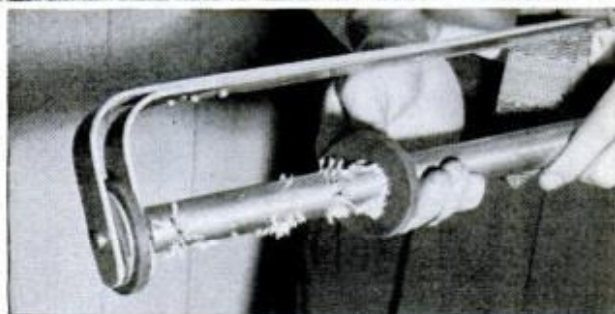






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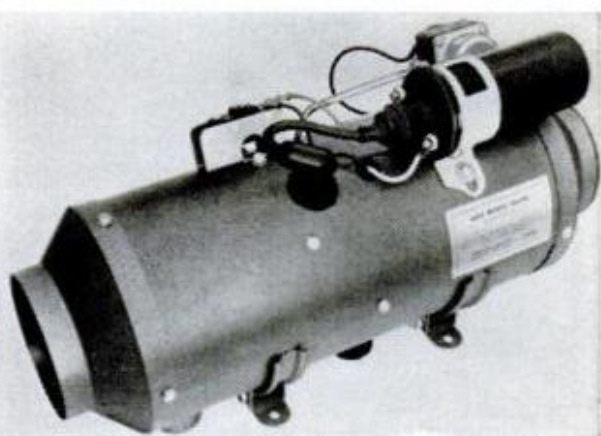


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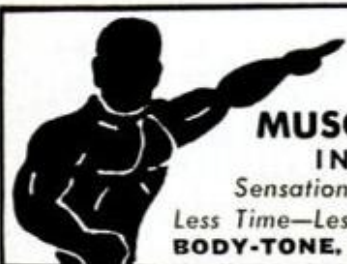
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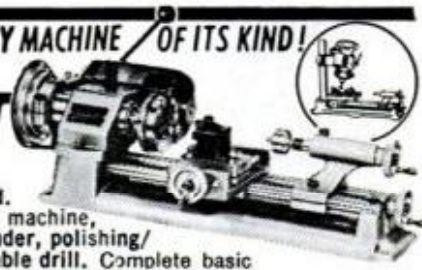
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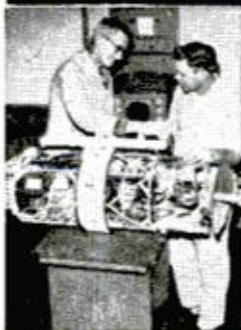
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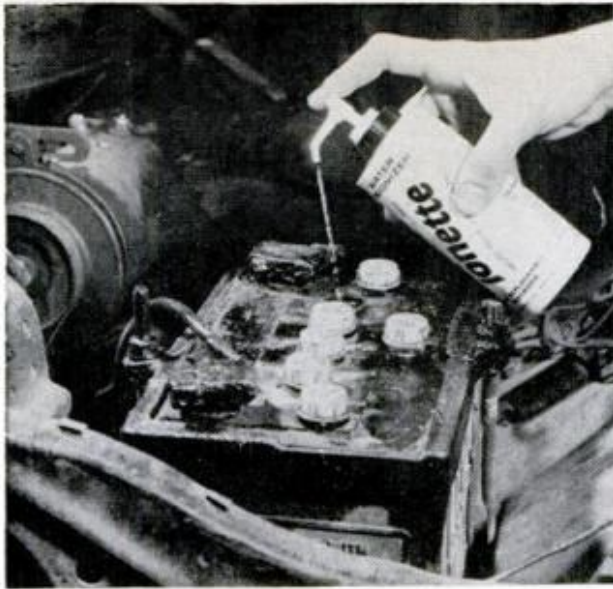
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The Post Office has divided 106 cities into postal delivery zones to speed mail delivery. Be sure to include zone number when writing to these cities; be sure to include *your* zone number in *your* return address — after the city, before the state.

OCTOBER 1961

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BUSINESS**



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**HELP SUPPLY DEMAND IN YOUR AREA!** Just about every kind of business (drug, department stores, hardware, liquor stores, gas stations, theaters, jewelers, mortuaries, auto dealers, florists, beauty shops, real estate, etc.) can use Screen Printed things to increase business.

**SOME \$100 JOBS USE LESS THAN \$10 WORTH OF MATERIALS.** ...you pocket the difference for your labor and know-how. **\$400.00 A WEEK EARNINGS POSSIBLE?** Yes, some earn less, but Mr. J. T. Anderson reports he earns over \$400.00 a week printing Greeting Cards certain times of year. Get your share Now. Mail Coupon Today!

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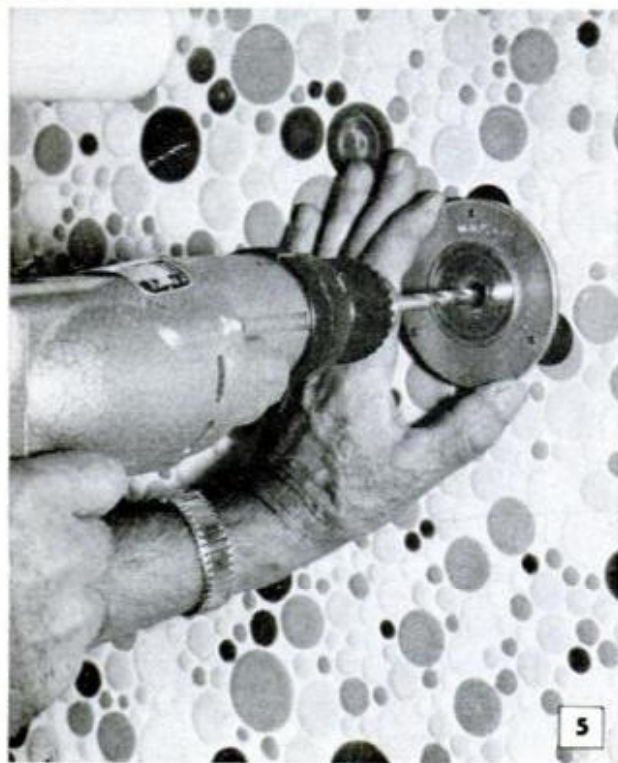
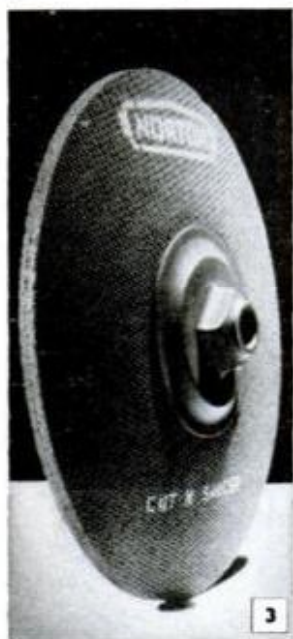
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# SHOPPING FOR TOOLS



**1. PORTABLE ELECTRIC** power pack supplies 250 to 500 watts a.c. power (110 volts), depending on model used. Power unit is useful at camps, in the field and isolated places lacking house current. A flick of the switch converts unit for recharging 6 and 12-volt batteries from any 110-volt outlet. Electric Storage Battery Co., Box 6266, Cleveland 1, Ohio

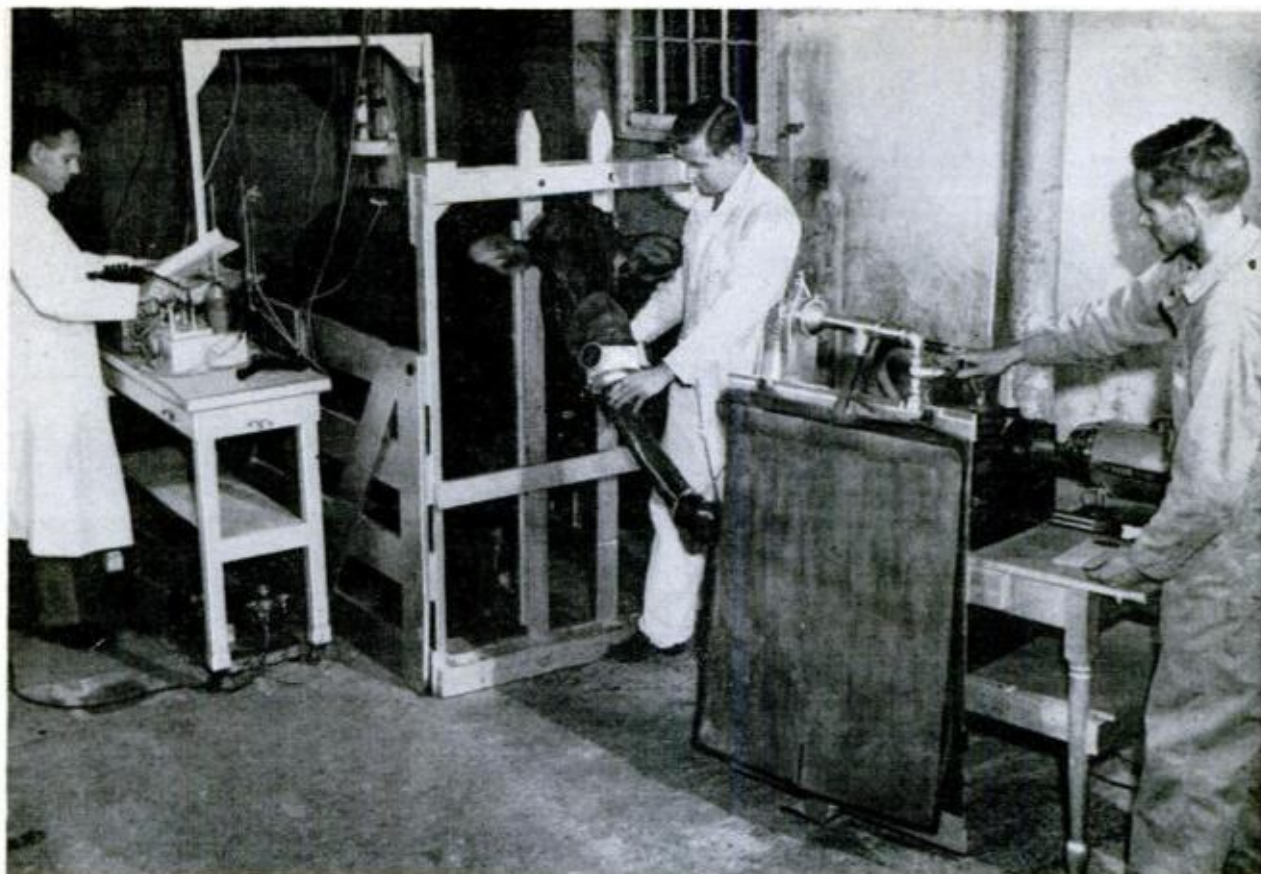
**2. TORQUE ADAPTER** converts electric drill to power driver for tightening screws, bolts and nuts. Slip clutch cuts power to bit when the proper torque is reached—avoids damaging work surfaces. Adapter fits 1/4-in. drills. Included in the set is a drive socket, 2 slotted bits and 2 Phillips bits. \$12.45. Curtis Industries, 1128 E. 222nd, Cleveland, Ohio

**3. REINFORCED GRINDING WHEEL** combines advantages of saucer-shaped wheel with conveniences of throw-away mount. Designed for weld grinding and light snagging, saucer wheel permits operator to work at closer angle with better control. Available in 7 and 9-in. sizes and priced about same as regular reinforced wheels. Norton Co., Worcester 6, Mass.

**4. MANUAL IMPACT WRENCH** has wide variety of uses for tightening and loosening those stubborn nuts and bolts. When tool is under load, powerful spring is wound and released each time hand moves 30 deg. Tool is said to cause virtually no shock at handle. Negligible maintenance. Marquette Div., Curtiss-Wright Corp., 1145 Galewood Drive, Cleveland, Ohio

**5. DRILL GUIDES** insure accuracy and save time by centering holes instantly—start and finish a hole in same operation. Said to hold firm on any type surface. It's easy to enlarge hole that has been drilled too small. Plates are furnished in 11 sizes: 3/16 to 1 1/2 in. Priced at \$14.50. Morey Products Co., 1129 Vermont Ave., N.W., Washington 5, D.C.





**CHAMBER HEAT** rises to 105 degrees F. Meter measures cow's respiratory volume—a clue to heat tolerance

## Their Goal: Cows That Stay Contented in Hot Weather

Scientists of the U.S. Department of Agriculture are developing cows that keep giving milk no matter how hot the weather.

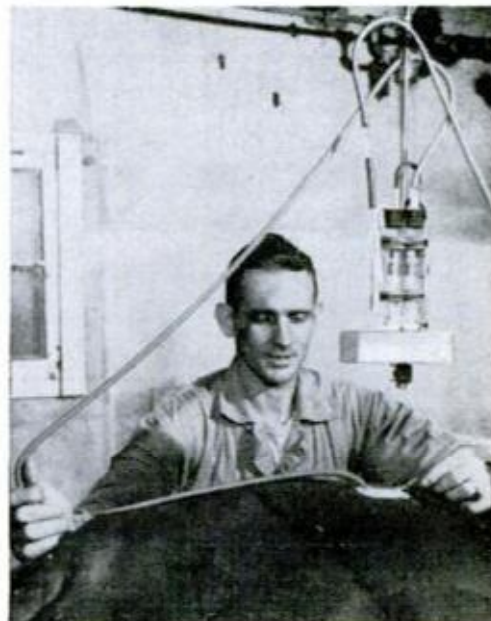
For 10 years they've been perfecting equipment and measuring the breathing rate and sweating rate of various breeds and cross-breeds. These cooling functions are vital, since cool cows give more milk.

A promising—though not always predictable—cross is that between heat-tolerant Red Sindhi bulls and milk-producing Jersey cows.

Research and breeding continues at federal stations in Beltsville, Md., Jennerette, La., and Tifton, Ga., plus an additional six state stations.

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**MOISTURE MEASURER** has proven that Brahman cows, like other kinds, do sweat





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The dispenser has two circles of buttons—one for dollars, the other for dimes. The checker punches a button and one stamp (for a 10-cent purchase) pops out. If she pushes the \$10 button, 100 stamps unroll.

Electrically operated, the dispenser costs about \$100, and is available on lease from Stamp Dispensers, Inc., 30 N. LaSalle St., Chicago.

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# POPULAR SHOPPING

## Popular Mechanics Product Shopping Guide

Here it is—PM's new shop-by-mail section! It will be your product guide to greater values. Watch for it, shop from it every month.

worth  
writing  
for...

**Hunting tips** are offered in two little free 16-page booklets titled "How to Get Your Duck" and "How to Bag the Upland Flyers." The latter has 4-color reproductions of the game birds. Write the Federal Cartridge Corp., Anoka, Minn.

**Home sanitation** would be a critical problem facing all families in the event of a national disaster. A booklet from the Office of Civil and Defense Mobilization explains how to keep water and food untainted, and describes other sanitary measures. Send 15¢ for "Emergency Sanitation at Home" to the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

**Redwood ideas** for your garden—planters, tables, fences, and sunshades—are contained in a free 16-page booklet. Lots of ideas as well as construction pointers are included in "Garden Redwood." Write to California Redwood Association, 576 Sacramento St., San Francisco 11, Calif.

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#### bronze BAR ACCESSORIES

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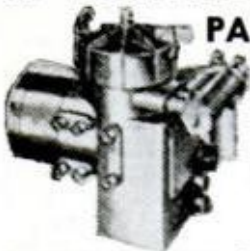
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**Boat hull care** is the subject of a 24-page booklet that will help keep you grounded sailors busy this winter. Titled "Boat Paintenance," it contains many helpful ideas on preparing and painting wood, metal, and fiberglass boats. Send 25¢ to Baltimore Copper Paint Co., 501 Key Highway, Baltimore 30, Md.

**Good fences** make good neighbors, or so the old saying goes. Twelve attractive fence designs and instructions on how to build them are available in a free folder. Also has suggestions for anchoring posts and finishing fences. Write for "Fence Designs," The Douglas Fir Plywood Association, Tacoma 2, Wash.

**Photography** around the water can often be difficult due to unusual exposure conditions. "How to Shoot Better Photos on the Water" discusses the problems and offers advice from an expert. Its price is 10¢ from Daystrom, Inc., Weston Instruments Div., 614 Frelinghuysen Ave., Newark, N.J.

**A sun deck** can be an attractive and distinctive way to get outdoor living space. The materials needed and general construction hints for several projects are contained in the booklet "Sundeck Ideas." Write to Western Pine Association, Yeon Bldg., Portland 4, Ore.



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**Covering a boat** with fiberglass requires a certain knack. A 16-page booklet that tells you how to do it is available free. It shows how to prepare the surface, measure your covering requirements, and apply the coating. Ask for "How to Cover Your Boat with Fiberglass" from the Owens - Corning Fiberglass Corp., 598 Madison Ave., New York 22, N.Y.

**Tips on using shellac** are contained in a free 18-page booklet titled "Shellac, How to Use It." Its application on old and new floors, walls and woodwork, and furniture is discussed. Also covers instructions and a table for thinning shellac. Write the Shellac Information Bureau, 425 Park Ave., New York 22, N.Y.

**Paintbrushes**—choosing and using them—that's the subject of a free 16-page booklet titled "Ask the Expert." Presented in comic-book form, the booklet

also explains proper brush cleaning and care. Available from the Polychemicals Department, E. I. Du Pont de Nemours & Co., Wilmington 8, Del.

**Two large maps** (28" by 32") show locations of all national parks and monuments. On the back are descriptions of each area plus information on facilities and special activities. Revised 1961. Send for "Eastern United States" and "Western United States," each 20¢, to Superintendent of Documents, Government Printing Office, Washington 25, D.C.

**Preventing rust** on metal surfaces around the home and farm should be a regular maintenance job. Information and instructions for the selection and application of rust-preventive coatings are presented in detail in "101 Rust Stopping Tips." Free from Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill.

**Finishing wood floors**—old or new—is the subject of a 24-page booklet. Well illustrated with photographs and drawings, "How to Finish Wood Floors" takes you step-by-step through sanding, staining, and finishing. Send 10¢ to Pierce & Stevens Chemical Corp., 710 Ohio St., Buffalo 3, N.Y.

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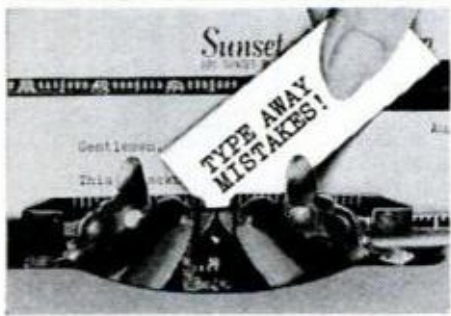
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Dust particles raised by microscopic meteorites which constantly pelt the moon acquire a positive charge and are then repelled or bounced along by the electron layer.

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OCTOBER 1961

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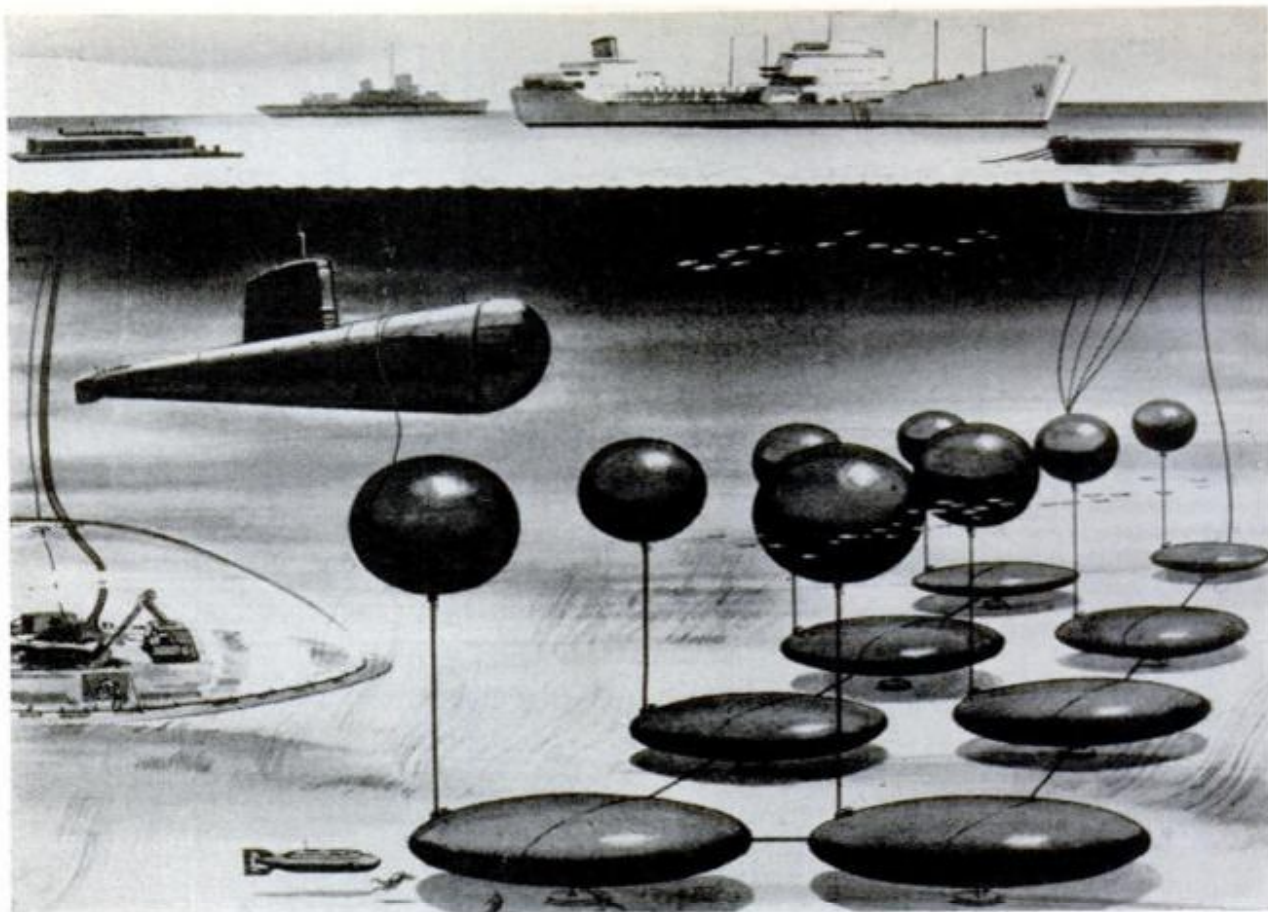
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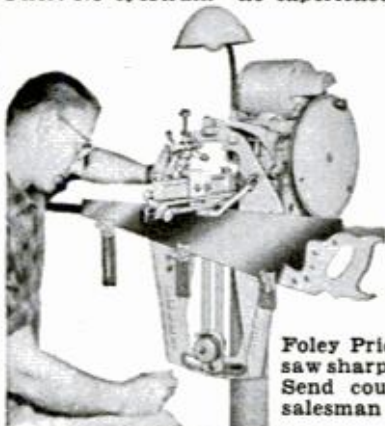


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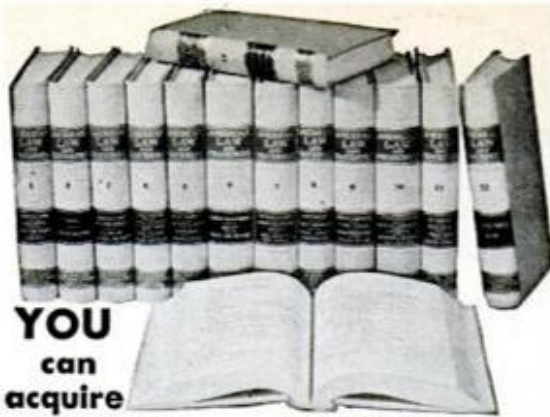
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**WORK Like a millionaire. \$400-\$1000 monthly plus apartment, managing a motel. Learn at home. Free booklet. Motel Managers Training School, PM-H, 612 S. Serrano, Los Angeles 5.**

## MONEYMAKING OPPORTUNITIES

**CLIP This ad, mail with name, address for free trial box of home needs, cosmetics, details of easy plan that gives you lamps, toasters, good money spare time. Write Blair, Dept. 31ET, Lynchburg, Va.**

**MAKE Big easy profits creating costume jewelry at home in spare time! Quick, easy to make easier to sell! Details free! Don-Bar, 2934 W. Fullerton, Dept. L-201, Chicago 47, Illinois.**

**CASH at once—in profitable lettershop operation. Business-getting manual "Mimeographing Dollars" tells how. New machines available. Write: Mimeographing Dollars, 1012-C Center Street, Evanston, Wyoming.**

**MAKE \$5,000 Yearly sparetime raising mink, chinchillas, nutria, etc. Free booklet reveals proved plans. Write: Furs, 588 Mt. Pleasant Road, Toronto 1, Canada.**

**FREE! Amazing new book of money making opportunities and mail order bargains. Write today! Dept. P.M. P.O. Box 1123, Chicago 80, Illinois.**

**SIMPLE, Pleasant mailorder nets \$12,000 year. Write: Simon, Box 87-PL1, Pelham, N. Y.**

**AMATEUR Artists! Turn your art ability into money. Hamilton, Box 4-D, Astoria 5, N. Y.**

**PRACTICAL Mail order. Start small. Money-maker, 722-2 East Silver Spring, Milwaukee 17, Wisconsin.**

**"RESEARCH." Good income or career by mail. Manual \$2. Guaranteed. Free details. MacKenzie's, 3240AM Southport Ave., Chicago 13, Ill.**

**INCREASE Your income. Unlimited possibilities to road of wealth. Sensational facts revealed. Mail order—real estate. \$1.50 booklet. 100% satisfaction guaranteed. Natu-Rex, 12250-8th, Yucaipa 1, California.**

**MANUFACTURE Beautiful, lightweight vases, patio stones, wall panels, artistic room dividers, etc., with new foam-crete plastic. Amazingly fast, easy, money-making system. Complete formulas and instructions only \$3.00. Or free details. Plasticon Company, Box 105, Grove City, Penna.**

**"FORTUNES In Formulas." 900 pages \$3.95. Bertholf's, 739-P, Sylvania Avenue, Toledo 12, Ohio.**

**FREE. 200 Ways to make money by mail. Arch, 614 West Twelfth, Gastonia 1, N. C.**

**EARN \$100.00 Easily with any handsaw. Write: Laughlan Specialties, 1929 West 44th Ave., Vancouver 13, B. C., Canada.**

**BIG Money building patios, terraces, barbecues, fences, walks, awnings, gates. Easy to follow plans. 144 pages. \$2.85 postpaid. Frontier, Box 3624, Wichita, Kansas.**

**MEN — Women! Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders brings in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-2-L, 1512 Jarvis, Chicago 26, Ill.**

**MAKE Money sharpening saws, tools, knives, scissors, clippers, surgical instruments, etc. Grinding outfits low as \$34.95. Manual furnished. Write Treyco, N. Tonawanda, 15, N. J.**

**WANT More money from your job? Learn the secret of getting raises. Know your rights. \$1.00. Professional Business Service, Brookfield, Conn.**

**MAKE \$1000 In your sparetime. 75 successful ways for \$1.00. Russco, Box 19251, New Orleans, La.**

**PROMOTE Patented product nationally. Write: Box 1296, Denver 1, Colo.**

**EASY To start rubber stamp business at home in spare time. Make up to \$9.80 an hour without experience. Facts free. Write Roberts, 1512 Jarvis, Room CR-2-L, Chicago 26.**

**CIGARETTES—Make 20 plain or filter-tips for 9¢. Facts free. Moberly, Box 4012, Owensboro, Kentucky.**

**MINK Raising information free. Complete. Lake Superior Mink Farm, Superior, E.E. Wisconsin.**

**VENDING Machines. No selling. Operate a route of coin machines and earn amazing profits. 32-page catalogue free. Parkway Machine Corporation, Dept. #26, 715 Ensor Street, Baltimore 2, Maryland.**

**EARN Money evenings copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.**

**YOUR Own, easy-to-start, home mail-order business, sparetime. Fascinating; profitable! Information free. Alfano, 19-PM Pine, Closter, N. J.**

**BIG Money raising fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.**

**READ "Progressive Mailtrade," the magazine that tells how to make money by mail. Quarter brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.**

**AMAZING Successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, MP-528, 333 North Michigan, Chicago 1.**

**LEARN The secrets of repairing junk batteries, generators, starters, profitable, easy, at home. Free particulars. Batteryman, 3465 Forrest, Santa Clara, Calif.**

**\$25-\$50 WEEKLY Possible, re-writing news items, jokes, poems, recipes, for publishers. Some worth \$10 each. Details free. Service, 81-D, Knickerbocker Station, N.Y.C.**

**PROFITABLE Mailorder business started easily. Our easy to understand, instructive manuscripts teach how. Details free. Easco, Box 323-A, Grand Rapids 1, Mich.**

**LEARN Plastics fabrication for extra income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-3, Portland 12, Oregon.**

**WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests, rules. Sample magazine 25¢. General Contests, 1609 1/2 East 5th Duluth 12, Minnesota.**

**125,000 BARGAINS, Exotic gifts, television, advertising specialties, newest products in direct single item importing. 475 worldwide firms, classified—\$1.00. Henderson, 2620 Rio Vista, Tampa 3, Florida.**



"HOW To Win Contests" manual may bring you riches! Contains successful formula professional winners use. Guaranteed. \$5 postpaid, or request free literature. Paragon Enterprises, 11 Mott St., DT-4P, New York 13, N. Y.

OFFICE Work—home, sparetime. Refundable moneymaking instructions 50¢. Interstate, 37-1 Besch, Albany 9, N. Y.

GETTING Dollars in your mail. Send 10¢ for eye opening literature. Donovan, 79-PM Greenbelt, Levittown, New York.

PUZZLE Contests! Cash prizes! Details free! Spence, Box 11569, St. Petersburg, Fla.

MAIL Catalogs! Highly profitable! Sample, instructions, 10¢. Lewis Bartlett, Richland, Georgia.

\$50 DAY Spare time live bait business. Send \$1.00, complete set up, details. D. C. Breeder Farms, R-39 Gladstone Ave., Toronto 3, Ont., Canada.

### EXPORT — IMPORT

JAPAN: Direct mail-order 26 page catalogue: dolls, novelties, business information, manufacturers' names, addresses, \$1.00; Japan's Trade Directory, 3000 companies, \$3.00. Send cash. Clarence Yamagata, 814 Toginbiru, Marunouchi, Tokyo.

IMPORT-Export. List of overseas sources \$1.00. Lewis, Fairchild, Wis.

RECEIVE Catalogs! Offers! From 100 foreign exporters without contacting them. Importico, Enka, North Carolina.

### SCIENCE & CHEMISTRY

AMAZING New book of science experiments, formulas, and catalogue of laboratory supplies. Only 35¢. National Scientific Co., 13 S. Park Avenue, Dept. PM-10, Lombard, Illinois.

SPECTROSCOPE For quick analysis \$3.00. Kuttington, 875 Arastradero, Palo Alto, Calif.

COMPLETE Chemistry catalog 25¢. Laboratory Sales, Box 161-A, Brighton, Mass.

232 PAGE Catalog \$2.00. Laboratory Materials, 7313 Vincennes, Chicago, Ill.

SCIENCE Treasure chest. Do hundreds of experiments. Order No. 70,342-CZ—\$5.00 postpaid. Request free Catalog—CZ. Edmond Scientific Co., Barrington, New Jersey.

NEW Concept of atomic structure. Nuclear theory challenged. 30 pages, 25 cents ppd. C. F. Kraft, 4809 Columbia Road, Annandale, Virginia.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25¢. Dept. M-50. Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 25¢. Tracey Laboratories, Evanston, Illinois.

UNUSUAL Chemistry books, courses, kits! Rare chemicals, cheap! Catalog 25¢. NSC, Box 11133, Palo Alto, Calif.

ROCKET Test equipment for safe static firings. Catalog 25¢. Rocket Development Corporation (formerly C-W Products), 445 East Second South, Salt Lake City, Utah.

ROCKET Supplies, kits, parts, engines, chemicals. New illustrated catalog 25¢. Central Rocket Company, Box 89-P, Waupaca, Wis.

### FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Amazing big catalog, 10¢. Kemixal, Park Ridge, Ill.

FORMULAS For latest money-making discoveries. New! Good! Valuable literature free! Miller, Chemist, 1517-D, Tampa, Florida.

LATE, Modern manufacturing formulas. List free. Moon Chemical, Martville, New York.

MOTOR Oil reclaiming manual. \$1.00. Holcomb, Box 681, Pampa, Texas.

MODERN Formulas. Satisfaction guaranteed! Jack, Chemist, Box 25157, Los Angeles 25, California.

### PLASTICS

CELLULOID Attractive scrap assortment. \$6.00 postpaid. Box 333, Kearny, New Jersey.

REPAIR False teeth in minutes!! Super Polylox plastic repair kit \$1.00. Grant Laboratory, Haas Bldg., Los Angeles 14, California.

NOW! Vacuum forming plastic machines and supplies. Details. Burr, 330 East Center, Kalamazoo, Mich.

NEW Liquid casting plastic, clear, colors. Embed real flowers, butterflies, photos, coins. Send 25¢ for two handbooks "How to Cast Liquid Plastics" and "How to Make Extra Money at Home." Castolite, Dept. L-101, Woodstock, Illinois.

SEND Only \$1.00 for new Castacraft Instruction Manual on plastics for casting, embedding, molding and jewelry or 25¢ for catalog only. Castacraft Corporation, Dept. M-1061, P.O. Box 555, Palo Alto, California.

BARGAIN Plexiglas prices. 1/8", \$1.13; 1/4", \$1.62 square foot. Reductions for quantity orders. Details 15¢. Plastic Shop, 2025 Nevada, Butte, Montana.

BOXES, Plastic. 200 sizes. Free list. Althor, 170 Bay 23 Street, Brooklyn, N. Y.

### AGENTS WANTED

MEN-Women agents: Sensational new moneymakers — beautifully hand-painted, plastic personalized photo enlargements, compacts, rings, bracelets, lockets, etc. Simply take orders pocket 40% commission. We deliver and collect. Sales outfit free. Novelco, 3343 North Ave., Chicago 47.

AGENTS — 300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 1217-D West Newport, Chicago.

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WILL You test new items in your home? Surprisingly big pay. Latest conveniences for home, car. Send no money. Just your name. Kristee 86, Akron, Ohio.

BE The Popular Mechanics representative in your neighborhood and earn big profits in your spare time. Write Popular Mechanics, Room 10-A, 250 West 55th St., New York 19, N. Y.

NEW! Wonderful new sign maker kit. Makes signs, showcards, banners, streamers in colors in seconds. No skill. A child can make a professional looking sign in seconds. Send \$1.00 for sample signs (your name on one). Complete instructions. Refundable on first order. Variety Advertising Company, Dept. 14B, 1219 Douglas Street, Alton, Illinois.

MAKE Most extra cash with world's biggest line Christmas cards, gifts. Introduce friends, neighbors to over 150 Christmas, everyday box assortments, 600 big money-makers. Pocket up to 50% profit plus big cash bonus. Free giant color catalog; samples on approval. Arrow Greetings, 513 Fourth Ave. S., Dept. 83-F, Minneapolis, Minn.

MAKE Money selling new readyknot tie. Plastic hook. Free catalog. Philip's Neckwear, 22 West 22nd, New York.

MAKE Big money selling new invention. Instant electric water heater eliminates hot water tanks. No installation cost. Amazing demonstration brings instant sales. Tremendous market. Full or part time. Landam Products Corp., Box 44, Great Neck, N. Y.

BIG Profits selling chamois to service stations, car lots. Steady repeat business. Free details. Inka Industries, 1606-H Roberts, Houston 3, Texas.

MAKE Your spare time profit time! Over 800 money-makers! Gifts for men, women, children, the home! Distinctive greeting cards, stationery, toys, novelties, jewelry, cosmetics, gadgets at prices for every pocketbook. No minimum order. Make up to 92% profit! Write today for exciting details, colorful catalog. Greetings Unlimited, 1-412 Park Square, St. Paul 1, Minn.

REAL Diamond rings. Nationally advertised. Sell direct. Make big middleman's profit. No investment. Experience unnecessary. Free catalog, details. Gleamlight, 111-B9 North Columbus, Mount Vernon, N. Y.

WANTED Fire extinguisher salesman. Huge profits. Out-o-matic, 1737G East 31st, Denver 5, Colorado.

AGENTS And part time salesmen needed. National Patent Brokers, 6757 JerLes Drive, Milford, Ohio.

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TRANSISTOR Radios. Big profit season ahead. Write Flor'enz, 439 Race St., Cincinnati 2, Ohio.

FREE Sample. Beautiful curios! Sell on sight! Apartado 9036, Mexico City.

START Your own business, selling the "World's Most Usable Bible." Sales quick, easy, and profitable. Extra bonuses; free insurance; other benefits. Write International Book Company, Department M, Box 118, Wichita 1, Kansas.

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YOUR Own business—Used suits \$1.50; overcoats 65¢; mackinaws 35¢; shoes 12 1/2¢; ladies' coats 30¢; dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 2109-AA Roosevelt Road, Chicago 8, Ill.

MAKE Up to \$50.00 a day soliciting delinquent accounts. Terrific commissions. Write today. National Credit, 304Y Pickwick Bldg., Kansas City 6, Mo.

RUN A spare-time greeting card and gift shop at home. Show friends samples of our new 1961 Christmas and all occasion greeting cards and gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 5, Ferndale, Mich.

BIG Profits. Stamp social security plates, key protectors. Sample 50¢. Catalog free. General Products, 11 No. Pearl St., Albany 7, N. Y.

YOUR Ad in this space will get some good agents for you. Yes, I'll prove it. Write for Folder "A" right now. F. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

MAKE Profitable men's-women's wear. Sample free. Sunmade, Brockton 64, Mass.

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NYLON Hosiery. Guaranteed first quality. Self or dark seams, \$5.00 dozen; Seamless, \$7.00 dozen. Popular shades. Winston Specialties, Dept. 1, P.O. Box 5163, Chicago 80, Illinois.

CLOSEOUTS Below wholesale for agents. Discounts, auctioneers. Bulletins 25¢ year. Closeout Center, 3931 Washington, Boston 31, Mass.

DISCOUNT Catalog, general merchandise. 25¢, refundable. Chapman's Gifts, 1802 Barth, Flint, Michigan.

100,000 PRODUCTS Wholesale! Terrific bargains! United Wholesalers, 1265-M Broadway, New York 1, N. Y.

BUY Christmas gifts at wholesale prices. Details 10¢. General Agency, Box 613, Alexandria, Va.

MILLIONS Of items wholesale. Details free. Write: BBBK, 1218 16th, Golden, Colo.

SPECIAL List of 50 top wholesalers who issue free wholesale catalogs. Send only \$3.00. J & A Wholesale Supply, Box 302, College Station, New York City 30.



**TEAR** Gas pens \$3.75. Not sold to minors. Calumet Tear Gas, 8826 Commercial, Chicago 17.

**TREMENDOUS** Wholesale buys! Big catalog! Postcard! Spartan, 1236-M Wilona, Chicago 40.

**LOWEST** Wholesale prices! Name brands! Appliances, cameras, watches! The PX, Vandalia, Ohio.

**100 FREE** Wholesale catalogs! Complete directory, \$1.00. (Refundable). Parmelee's Supply, Marshfield, Wisconsin.

**FREE!** Name brands catalog! Your own high profit business. Sell name brands, full or part time. No inventory, no investment. More than 2,000 name brand items; lowest wholesale prices. Watches, jewelry, cameras, hi-fi, stereo radios-phonos, appliances, housewares, hardware, power tools, luggage, musical instruments, garden equipment, sporting goods, toys, many others. 8 floors of name brands. Million dollar inventory. Orders shipped complete in 24 hours! Send for free, beautifully illustrated catalog now! Separate wholesale price list. H. B. Davis Corp., Dept. PM, 145 W. 15 St., New York 11, N. Y.

**2,000 PAGES** Wholesale catalogs! Write: Mosaser, Box 47-B, Newark, Ohio.

**BUY** Below wholesale! Thousands of nationally advertised products. Drugs, clothing, housewares, cameras, jewelry, hardware, sporting goods, etc. Postcard brings price list showing actual factory cost. Buy-Rite, 310 Main, Bennington 2, Vermont.

**NEW Deluxe** multicolor below wholesale catalog, automobile catalog, and others. Housewares, appliances, refrigerators, freezers, washers, dryers, television, radios, furniture, clothing, luggage, binoculars, phonographs, recorders, cameras, projectors, tools, typewriters, watches, jewelry. Name brands. Huge discounts to 70%. Postcard: Selbyco, Decatur 15, Ill.

**WORLD'S** Largest wholesale supply. Buy from 679 American, European, Japanese wholesalers. Tailor-made suits from Hongkong. 123 dropship catalogs. Rockbottom prices. Free details. International Buyers, 216-M Jackson, Chicago 6, Illinois.

**WHOLESALE:** 850,000 items. Supply source directory 25¢. Idealer, Park Ridge, Illinois.

**USED** And new watches \$2 up. Free list. Southern Watches, 5-PM So. Wabash, Chicago 3.

**ELECTRIC** Guitars, amplifiers, wholesale. Free catalog. Carvin PMW, Covina, Calif.

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**THE** Department store for specialty salesmen offers a lifetime opportunity to represent a million dollar company in your territory. Write for File #23, giving complete information. Wm. H. Wood & Co., 424 North Third Street, Burlington, Iowa.

**WILL** You wear new suits, sports coats without one penny cost and agree to show them to friends? You can make up to \$40.00 in a day even in spare time, without canvassing. Stone-Field, 532 South Throop St., Dept. D-926, Chicago 7, Ill.

**AMAZING** Opportunity. New low priced fire alarm protects homes, farms, offices, factories, etc. No wiring—hangs like picture. Pays up to \$1,100 a month. Free kit. Merlite (Alarm Div.), 114 E. 32nd St., Dept. P-66K, New York 16, N. Y.

**SENSATIONAL** New longer-burning light bulb. Amazing free replacement guarantee—never again buy light bulbs. No competition. Multi-million dollar market yours alone. Make small fortune even spare time. Incredibly quick sales. Free sales kit. Merlite (Bulb Div.), 114 E. 32nd, Dept. C-74K, New York 16.

**NEW** Bathroom deodorizer. Hangs on wall. Banishes odors bathroom, kitchen. Lightning seller. Samples sent on trial. Kristee 49, Akron, Ohio.

**MAKE** Big money taking orders for Stark dwarf fruit trees. Everybody can now grow giant size apples, peaches, pears in their yards. Also shade trees, shrubs, vines, roses, etc. Outfit free. Stark Bros., Desk 30102, Louisiana, Mo.

**GET** New shirt outfit free! Make \$90 weekly on 5 average orders a day. Famous quality made-to-measure dress and sport shirts, \$4.50 up, sell fast to all men. No experience needed. Full or part time. Write: Packard Shirt Co., Dept. 426, Terre Haute, Ind.

**MAKE** Extra money—Big cash commissions plus premium for you and your customers. Sell advertising book matches. Sensational new tenor-glamour girls, hillbillies; dozens others. All sizes. Quick daily sales; big repeat business. Free master kit makes selling easy. No experience necessary. Superior Match, Dept. M-1061, 7530 Greenwood, Chicago 19.

**ANYONE** Can sell famous Hoover uniforms for beauty shops, waitresses, nurses, doctors, others. Miracle fabrics—nylon, dacron, wash 'n wear cottons. Exclusive styles, top quality. Big income, real future. Equipment free. Hoover, Dept. M-100, New York 11, N. Y.

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**SENSATIONAL** Patented new auto alarm. Ingenious mechanical mechanism. Fabulous profits. Sell fast. Demonstrator \$4.45 postpaid. Gregory, 2440 Euclid Ave., Cleveland 15, Ohio.

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**SUNNY** California. Jobs galore. Want ads \$2.00. Allan's, Box 1575, Altadena, Calif.

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**RESUME** Preparation guide. Complete. \$2.00. Planatrol, Box 353, Ft. Wayne, Indiana.

**FOREIGN** Employment. Now open. World wide. Four books in one, merchant marines, aviation, civil service, all this for only \$3.00 airmail. Send money order to International Employment, P.O. Box 115, Boston 27, Mass.

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**CHOICE** U.S. and overseas jobs. All trades. Firms, addresses, hiring, procedures, pay scales, benefits. For info, write: World Wide, Dept. 16, 155 N. Franklin St., Hempstead, N. Y.

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**FREE** Information — U.S.A. overseas jobs, high pay. Transportation. Futures, Dept. M, 215 West 34th Street, New York City 1.

**FOREIGN** Jobs—Latin America, Alaska, Canada, up to \$1500 monthly. Up-to-date 1961 foreign service directory gives complete information; hot list of firms hiring for military and civilian construction, aircraft, oil, exporters-importers, mining. How-when-where to apply. 13th successful year. \$1.00. Global Reports, Box 5201, Inglewood, Calif.

**DIRECTORY** Reports. Construction, aviation, shipping, oilfields, government, manufacturing, trucking, etc. Foreign-stateside. Helpful information plus job-getting tips on preparing application letters. Unconditional money-back guarantee of satisfaction. Act today. Only \$2.00 (\$2.25 airmail). (C.O.D.'s accepted). Research Services, Meramec Building, St. Louis 5-PM, Missouri.

**HIGH** Paying foreign employment now open. Construction, aviation, Civil Service, Merchant Marines, jobs on ships, thousands of jobs open right now. Travel to Far East, Europe, South America. This is your chance to earn big money. Do not delay. Write for free information to: International Employment Information Center, Boston 27, Mass.



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**FOREIGN** Employment information. Work overseas. Travel, adventure. Europe, Africa, Asia, Canada, Alaska. Earn as much as \$1,600 monthly. Construction men, truck drivers, clerks, teachers, professionals, etc. Fabulous opportunities. Most complete information, application blanks, etc. Sent by return mail same day received. Send \$2.00 to Dept. PM, Foreign Bureau, P.O. Box 512, New Orleans, Louisiana.

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**USED** Correspondence courses and books sold and rented. Money back guarantee. Catalog free. (Courses bought.) Lee Mountain, Pisgah, Alabama.

**BE** A Real Estate Broker. Insure security for yourself and your family. Study at home. Prepare for state examination. GI approved. Write for free book today. Weaver School of Real Estate, 2018 P Grand, Kansas City, Missouri.

**HIGH** School diploma at home. Licensed teachers. Approved materials. Southern States Academy, Station E-16, Atlanta, Ga.

**WANT** A diesel job? Higher pay? Advancement? We can help you qualify! Complete diesel, tractor and heavy equipment and Cummins Diesel Engine Shop-method home-training courses available. Write today. Interstate Training Service, Dept. B-3, Portland 12, Ore.

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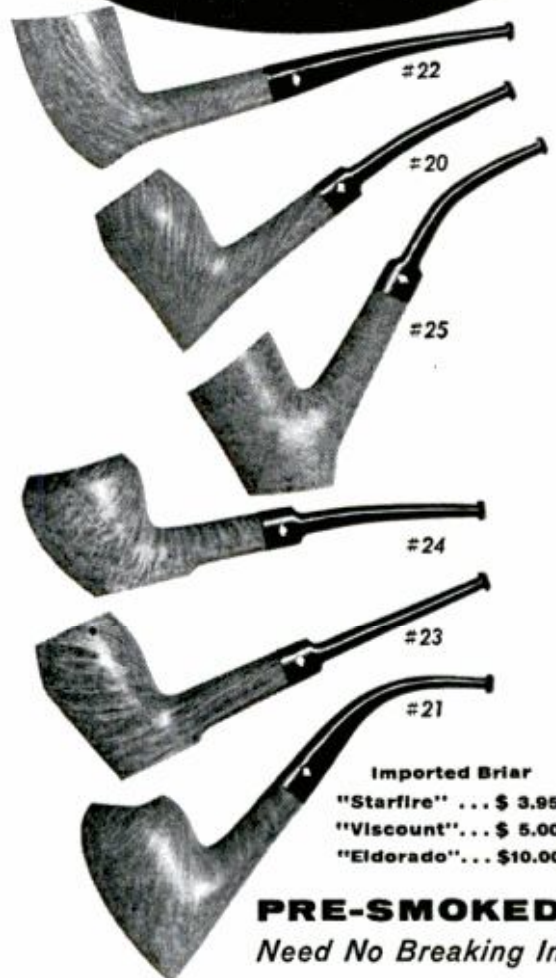
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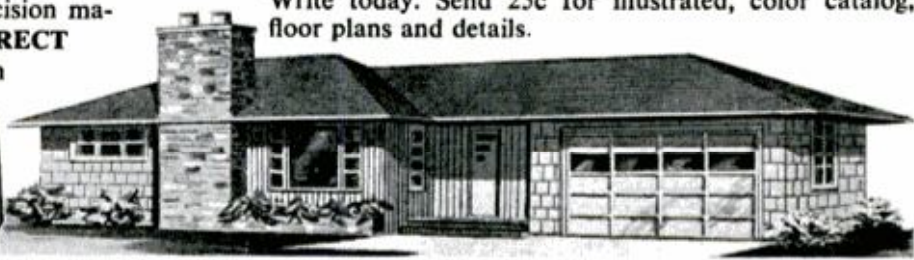
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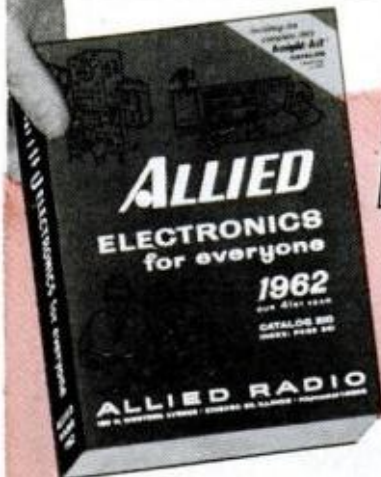
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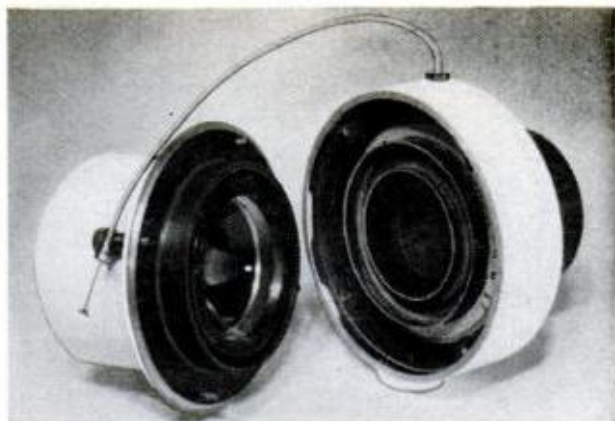
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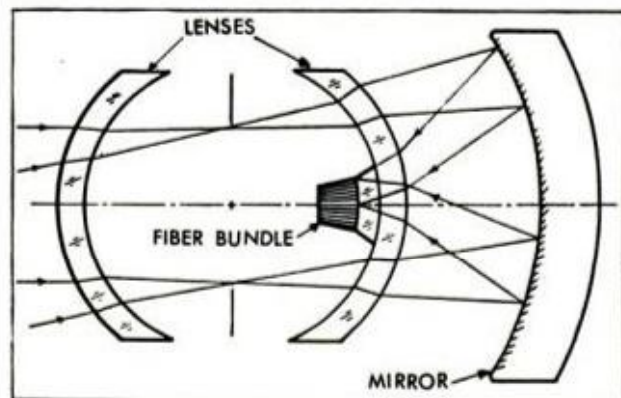
FILM GOES between lenses in contact with fiber bundle. Below, a shot by moonlight at one second



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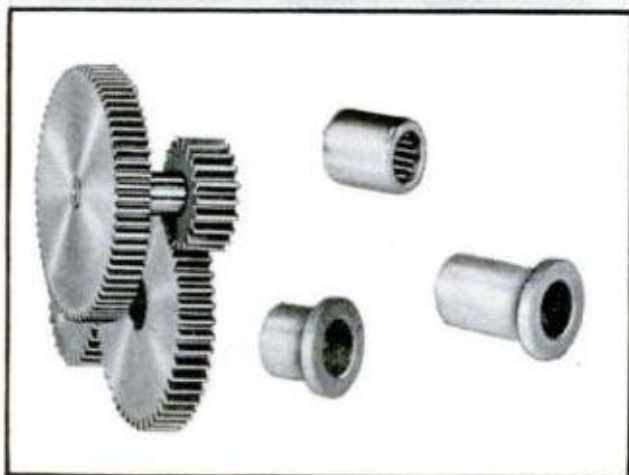
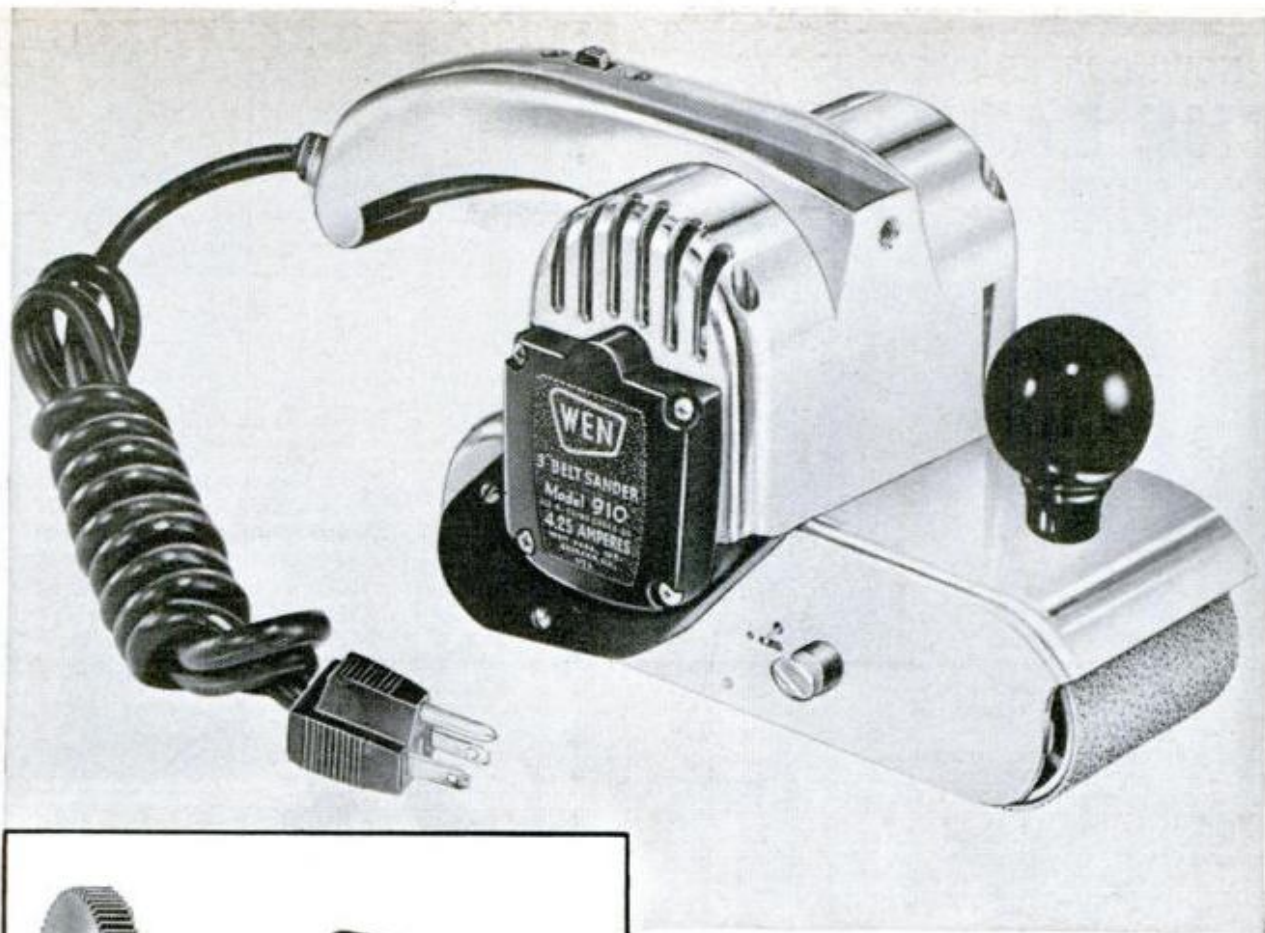
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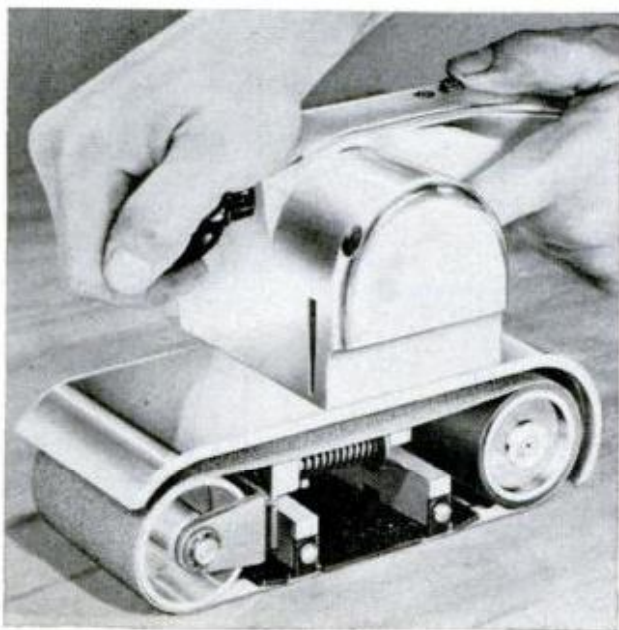


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## One-Hand Belt Sander

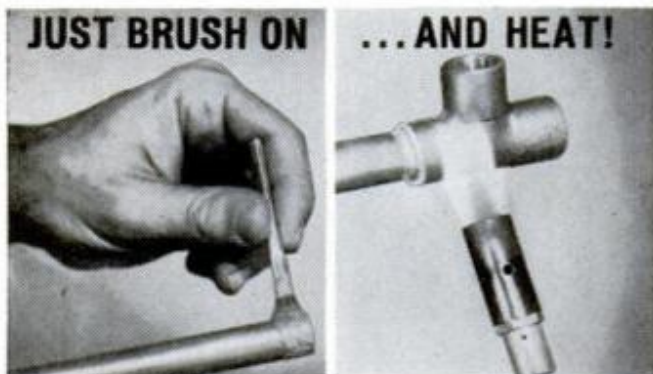
SURE ENOUGH, it's fitted with handles for two hands, but this belt sander is so light and close-coupled that you'll find yourself operating it with one hand most, if not all, the time. It has one flush side, lower photo, so that you can work within a fraction of an inch of a vertical surface. Universal  $4\frac{1}{4}$ -amp. motor drives a 3 x 18-in. belt at 850 surface feet per minute—plenty of power to handle coarse-grade belts on heavy duty sanding jobs such as removing paint and varnish or leveling a surface by knocking off the high spots. Just the thing for working on a vertical surface as it's net weight is only seven pounds. You can smooth drywall joints all day without feeling like taking the next few days off.

Sander has several unusual features such as a specially designed forced ventilation system that not only keeps the motor cool but directs a continuous flow of air over both the belt and the work. All-gear drive from motor to belt-driving drum—no belts or chains. Moving parts operate on oversize sleeve and precision roller bearings which are permanently lubricated. Over-all size of sander,  $5\frac{3}{4}$  in. high,  $5\frac{1}{2}$  in. wide and  $10\frac{1}{2}$  in. long. Price with cord and three belts is only \$44.95 from Wen Products, Inc., 5810 Northwest Highway, Chicago 31, Ill.



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**THE EASY WAY!**

**SWIF SOLDER**



Make perfect leak-proof sweat joints every time with Hercules SWIF Solder, the real 50/50 tin-lead solder pre-mixed with flux in easy-to-use paste form. Save time and money, too. Just brush on, join, and heat for neat, strong joints. SWIF solders all common metals (except aluminum) and works with a torch, soldering iron, or soldering gun. This grade available in economical 4 oz., 1/2 lb., 1 lb., and 3 lb. cans at your plumbing supply or hardware dealer. See for yourself how easy any soldering job is when you use SWIF. WRITE FOR FREE TRIAL SAMPLE and a do-it-yourself soldering folder.



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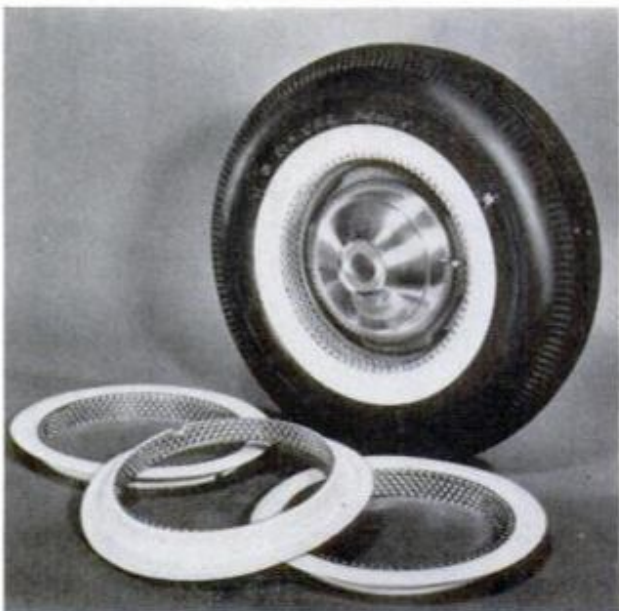
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Made of white rubber and stainless steel, wheel rings are designed to be used with standard black tires to give them the appearance of whitewalls.

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Information not listed on articles in this issue often is given in the WHERE-TO-FIND-IT list, available at no cost from the SERVICE BUREAU, POPULAR MECHANICS, 200 E. Ontario, Chicago 11, Ill.

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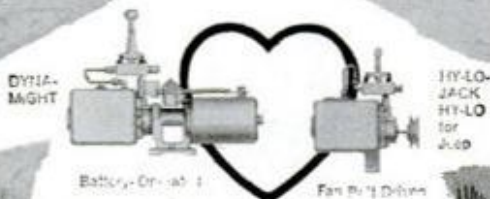
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The heart of the job is Monarch!

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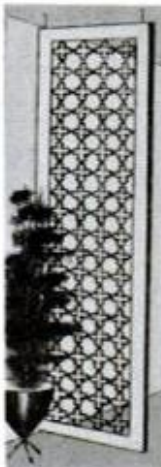
## MODERNIZE YOUR HOME with decorative "Ply-Grilles"™

make beautiful room dividers

Give your home a refreshing touch of originality . . . create a dining area, hide a kitchen, partition a foyer. Skilled labor not required! It's easy to make dividers, screens, luminous ceilings, many interesting wall and furniture treatments! Room Dividers, 17 1/2" wide, usable from 6'3" to 8'6" high, knocked down, \$14.00. Completely assembled \$20.00. Open stock on grilles and moldings.

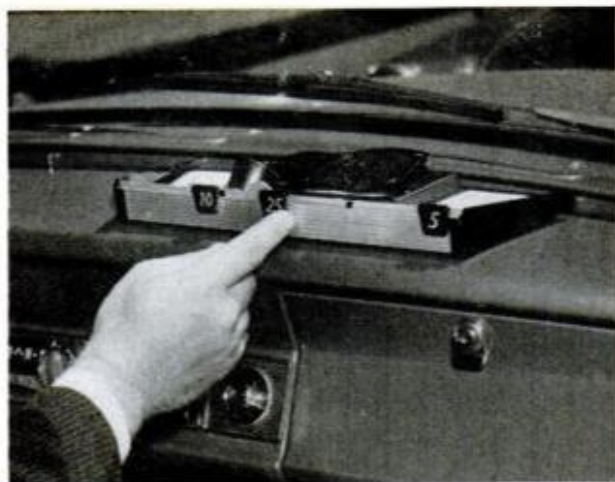
Order Size by Number	Grille Sizes	Single Double		
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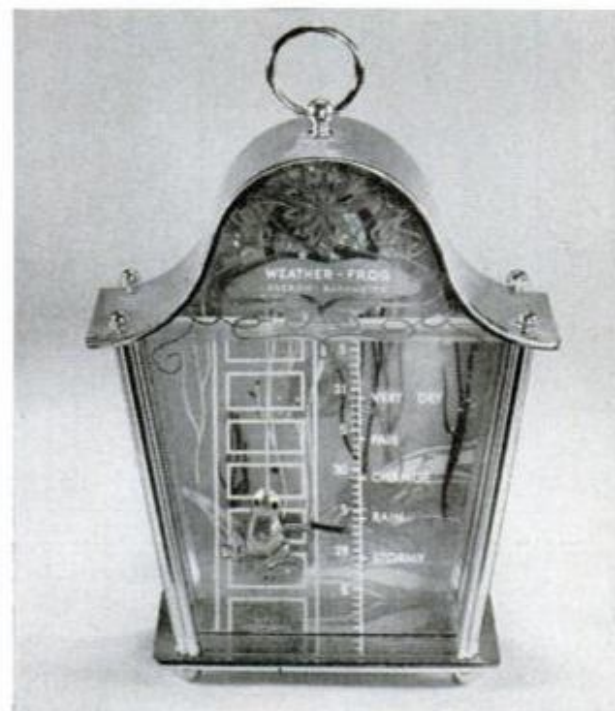


## Easy Touch for Tollway

Coins for paying highway tolls are available at the touch of a finger when they're kept in a new magnetic dashboard tray. The tray also holds such miscellaneous items as sun glasses.

The driver simply slides a button to the left. This action raises the desired coin from a slot in which coins are stored.

The tray, which is magnetically secured to any dashboard with an adapter plate, is sold for \$3.95 by Tollmatic, Inc., 102 Metropolitan Ave., Forest Hills 75, N.Y.



## Frog Is Weather Watcher

Weather predictions, up to 48 hours in advance, are indicated by a frog that "climbs" up and down a ladder. The German barometer is sold by Lawrence Lavigne, 35 Shady Lane, Northboro, Mass. for \$9.95.





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- \* STAY SOFT
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work gloves  
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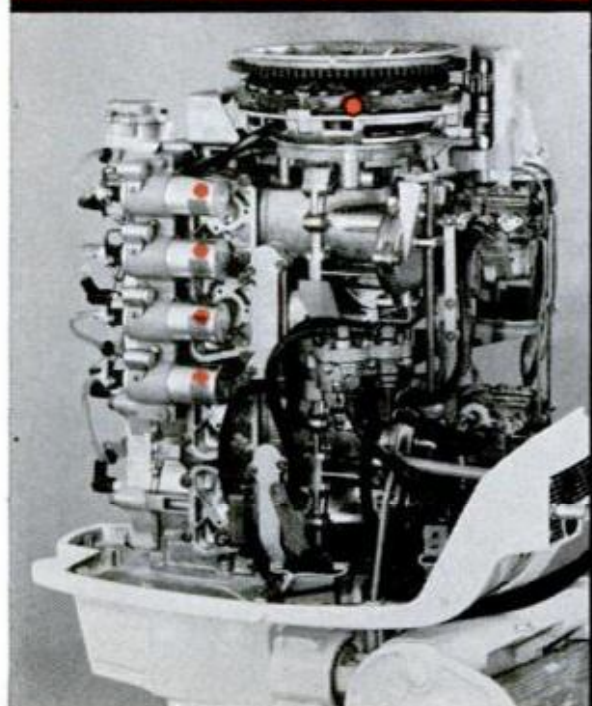
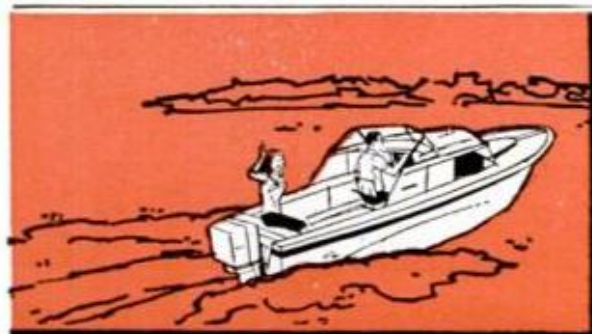
My Daddy says it's easy to paint a basement with a **HYDE Spray Painter**

It's easy to spray-paint basement walls, floors, outside of houses, boats, swimming pools, equipment, fences, shutters, outdoor furniture with the Hyde Spray Painter. A Low Pressure System, sprays all paints right from manufacturer's quart paint can. Gun fastens to exhaust outlet of canister or tank-type vacuum cleaner or Hyde Electric Air Blower. Spray Painter retails for \$12.95. Steel carrying case with Spray Painter and Hyde Electric Air Blower, complete for \$73.40. See Hyde's complete selection of Putty Knives, Wall Scrapers, Paint Scrapers and other Take It Off—Put It On Paint Tools in paint, hardware, building supply and lumber yard stores. Write for Free Pocket Catalog and How-To Book.

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"ELECTRI - *Shark* SYSTEM"

- **Constant Current alternator-generator**  
*Plenty of power for your boating accessories! West Bend's "CC" alternator starts to charge the battery the instant your engine turns over. Delivers full 20 amps. Battery will remain fully charged while operating lights, horn, pump, radio and appliances. Automotive-type regulator.*
- **Direct battery ignition**  
*Lightning-action spark for fast, reliable starts! West Bend's 12-volt system has independent ignition for each cylinder. Delivers powerful spark for instantaneous combustion. Smooths out idling, low-speed performance. Safe, dependable; can operate even on one cylinder.*



Dept. 144a

*Shark* **OUTBOARD MOTORS**

**THE WEST BEND COMPANY**  
HARTFORD, WISCONSIN      BARRIE, ONTARIO

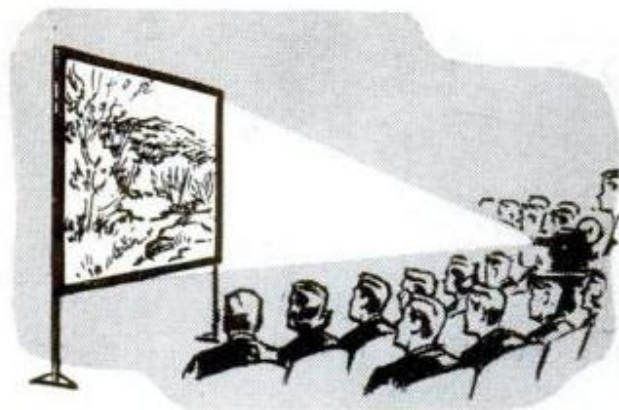




### Climatic Suit Heats or Cools

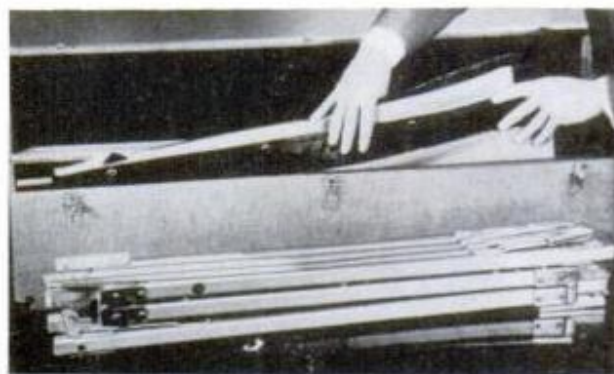
Developed for the Navy, a self-contained air-conditioned suit keeps the wearer comfortable while outside temperatures vary from 40 degrees below zero to 135 above.

Heart of the suit is a thermoelectric unit which is fitted into the back. It can heat or cool simply by passing a current of electricity through it. Power is supplied by a battery pack attached to the front of the suit. Only moving parts are two small fans to circulate the air.



### Big Screen in a Small Package

There's no problem carrying a movie-projection screen when it breaks down into a toolbox-sized package. A new fast-folding model has all the features of the familiar roll screens plus some new ones, but a 10½ by 14-foot model goes into a box small enough to fit in the trunk of a car. The screen, either front or rear projection type, snaps taut over the folding framework. Sizes range from 43 by 58 inches to 10½ by 14 feet. Made by Commercial Picture Equipment, Inc., Chicago 16 Ill.





dries in minutes . . .

**Seymour's new  
spray  
aluminum  
enamel**



made with pigments

from **ALCOA**

Push-button aluminum painting is fun—and it's certainly catching on! For example, Seymour of Sycamore, Inc., (one of the original manufacturers of aluminum paint in spray cans) has a new vinyl alkyd spray enamel, made with Alcoa® Aluminum Pigments. Seymour reports smoother, dust-free paint jobs because of the quick dry . . . to touch in ten minutes. Spray paints of this type are ideal for indoor or outdoor use.

Try aluminum enamel in spray cans and you'll say it's no trick now to refinish those hard-to-paint

"treasures." Everything takes on new life and sparkle with spray aluminum enamel—lamps, trays, baskets, frames, garden furniture and tools, appliances, vases, dingy attics, home shop areas. Dealers everywhere have these aluminum enamels or can get them for you.

*Alcoa does not make paint*, but Alcoa Aluminum Pigments are used in most high-quality spray enamels. Available also in conventional-size containers. Write today for Alcoa's informative booklet, *Painting With Aluminum*. Use the coupon.

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## Electronic Balloting

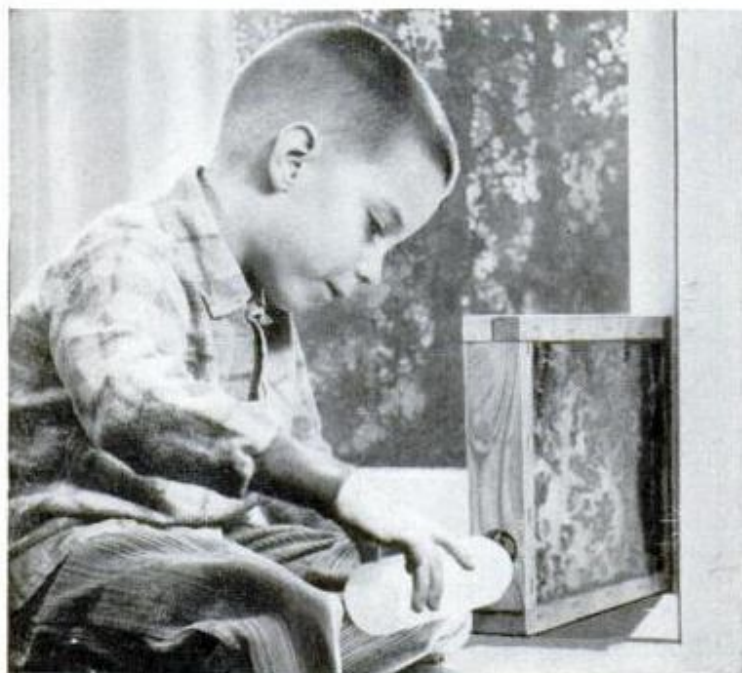
Some 480 candidates and special issues can be listed on a new 150-pound electronic voting machine.

When a voter prepares to cast his ballot, he is handed a punched card. The card tells the voter's party preference and his qualifications. When dropped into a box on an official's desk, the card activates the machine.

A metal curtain opens, revealing ballot panels with selector keys in neutral position. The voter then moves the keys vertically into position beside the names of favored candidates. Only one key is provided for each vote, and votes are not recorded until the voter presses a switch that records all of his selections.

Separate counters for each candidate provide his total tally when the polls close.

The machine is built by Seiscor of Tulsa, Okla.



## Honeybee Hive for Home

Miniature honeybee hives, complete with queen bee and 400 worker bees, can be purchased and installed in the home. The bees make real honey which can be eaten.

The hive kit includes, besides the bees, a bee feeder, instructions for installing the hive and feeding the bees, plus assorted literature which tells the story of honeybees.

The hive, which sits on the sill, has a special entrance spout that fits under the window, giving the bees access to the outdoors.

The hive kit sells for \$4.95. It is made by the A. I. Root Co. of Medina, Ohio.



## Scooter Truck

When a scooter is called on for hauling loads, it becomes the "tractor" end of a truck. Vespa, of Augsburg, Germany, converts its famous product into a three-wheeled tractor hooked up to a lightweight trailer for light hauling chores.

The scooter-tractor has a 5.8-horsepower engine and a top speed of about 40 miles per hour. Maximum pay load is about 900 pounds.





# Tempest '62 is here!

Fancy mover! Gas-saving 4-cylinder engine delivers Pontiac-brand performance in horsepowers ranging from 110 to 140. Extra-cost: 4-barrel, 166 h.p. "four" or 185 h.p. V-8. Automatic trans or 4-speed floor shift • Independent springing front and rear. Each 15" wheel moves up and down independently of the opposite wheel. Rides flat and level. • Only American car with a front engine/rear transmission. Biting traction on bricks or mud. • **Plush new series—the Le Mans (Luh-mahnz)—makes the scene this year in Convertible and Coupe models. Sports-type bucket seats, full carpeting. Take one out.**

PONTIAC MOTOR DIVISION • GENERAL MOTORS CORPORATION

## The gas-saving "4" with Pontiac Punch!

Drive America's only front engine/rear transmission car  
. . . it's balanced like none of the others!



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RESEARCH MAKES THE DIFFERENCE\*

# SONY®



## NEW STEREO TAPE DECK

Now, for less than the cost of a good record changer, you can add a versatile new dimension to your hi fi system. ■ The Sony 262-D tape deck has a 4 track stereo erase head and 4 track stereo record/playback head. Heads are wired to six output and input facilities for connection of external electronics to play and record four track stereo. This is the same quality mechanism used in the most expensive Sony Superscope tape recorders.

# \$89<sup>50</sup>

### NOW AVAILABLE!

Complete your 262-D stereo system: the long-awaited Sony SRA-2 stereo recording amplifier provides instant connection to the Sony 262-D stereo tape deck for complete 4-track stereophonic and monophonic recording. Track selector switch, record safety interlock, microphone and radio inputs. No modifications necessary. \$89.50.

■ For literature or nearest dealer, write: Superscope, Inc., Dept. 9, Sun Valley, Calif.

\*TM

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**\$34<sup>95</sup>** PREPAID  
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Dept., A, 228 E. MAIN ST., RICHMOND, IND.



"John made it from an old table."





### Automatic Home Tutor

Multiple choice questions are answered with a stylus on an electrically operated home tutor. Cards are inserted to line up with contact points, presenting a different pattern for each set of questions. An automatic counter records each wrong answer. Autoscore is made by Astra Corp., New London, Conn.

### Different Chemical Basis For Life Claimed Possible

Recent preparation, for the first time, of silicon compounds that are the exact counterparts of carbon compounds have led some scientists to believe that life forms based on silicon instead of carbon are possible elsewhere in the universe.

Carbon is the chemical basis of earth life. All known living substances on earth contain both simple and complex carbon compounds.

The chemical and physical properties of life-essential carbon and its compounds are more similar to the properties of silicon than of any other element, and using the newly prepared silicon compounds the scientists hope that, by comparing the two, they can discover how and why carbon and silicon are similar. At present, knowledge of silicon compounds is 150 years behind the study of carbons.

The silicon studies were made by six members of the University of Pennsylvania chemistry department.



... the pliable PERMANENT patch that's stronger than the surface itself. To wipe away cracks FOREVER just wipe on TUFF-KOTE, apply Glass Fabric and coat. Invisible when painted ... no chipping, no filling, no mess ... don't I hear your mother calling?

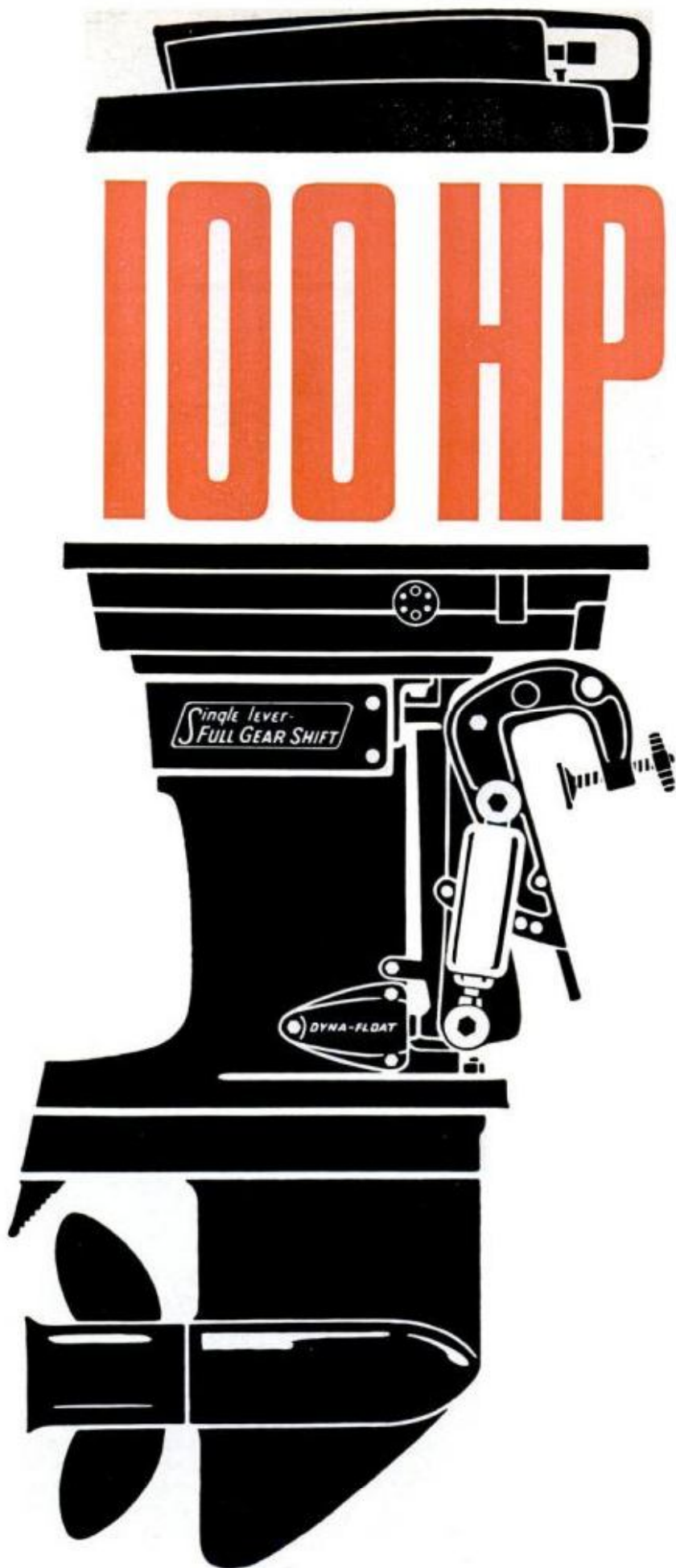


TUFF-KOTE repairs everything, inside or out. At all better paint and hardware stores. Write for your free do-it-yourself booklet and maintenance catalog.



**TUFF-KOTE COMPANY**  
218 Seminary Ave. • Woodstock, Illinois





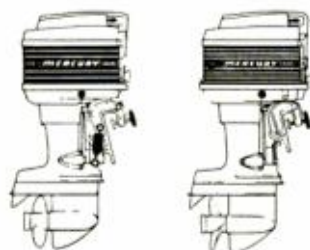


**THE 100 HP PHANTOM . . .** Mercury's newest for 1962—the most powerful outboard motor ever built, yet lighter than most 75's. A new milestone in boating progress, Mercury does it again with a new high in horsepower, a new low in weight. Known as the Merc 1000, it's a full 90 cubic inches and all new from flywheel to prop . . . new power plant with new combustion chamber, new water pump, new gears, new props . . . to hold the extra power. This magnificent power plant is equal to any task. Whether on a big cruiser, runabout or houseboat, the Merc 1000 will give performance that cannot be equaled by other motors . . . and with power to spare! It's for the man who wants the finest outboard motor that money can buy

at any price • But that's not all of for 1962. There's the Merc 850 . . . *Dome* combustion chamber for the throttle and cleaner, quieter motor made by a competitor. And,

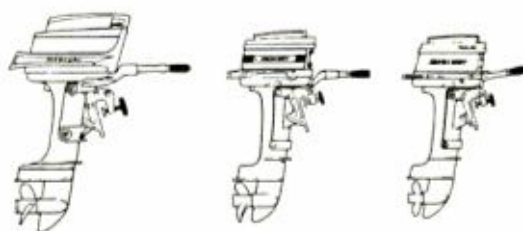


Mercury's news in 6-cylinder engines 85 hp, with Mercury's new *Power-smoother* idle, quicker response to operation. It outperforms any for versatility you can't beat, see



the new 50 hp Merc 500 . . . and the new attractively-priced Merc 450 . . . 45 hp . . . 4-cylinder in-line engines, streamlined from powerhead to new Jet-Prop exhaust. • Mercury's new Glide-Angle 2-cylinder motors include the Merc 250 . . . 25 hp

. . . a light, handsome work horse for fishing, hunting . . . even skiing. Then there's the entirely new Merc 110 . . . 9.8 hp . . . in a 55-pound package . . . 20% lighter than other 10's and



even lighter than competitors' 5½'s. The new 6 hp Merc 60, smallest member of the family, will plane two people in a 14-ft. aluminum boat . . . weighs only 49½ pounds.

• All the new 1962 Mercurys have standard-equipment features that you *can't even buy as extras* on other outboard motors. See them right away at your MERCURY DEALER'S. He'll show you how 1962 Mercurys give you . . . more **RUN** for your money!



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# Spotlight on the NEW RENAULT R4

## A Gallic "Model A"

By Don Dinwiddie



**ROCKY**, off-the-road side trips blew a tire, but otherwise failed to faze the R4. Sign calling attention to narrow roads, dangerous turns was not kidding about our Languedoc test-drive route in France's Midi

**W**HETHER THE United States can qualify as one of the underdeveloped countries for which this car was supposed to be designed, we'll have to wait and see.

We hope it does, for there are many farm folk and country-cruising sportsmen in the U. S. who would enjoy booting the Renault R4 across some rough landscape.

In fact, our 180-mile French trip in this tough lightweight brought back mellow memories of younger-day camping jaunts we made in a 1931 Model-A Ford, over narrow, back-country Virginia roads and up into some fair-sized hills called the Blue Ridge Mountains. In those days, at least, this area of the Blue Ridge (north of Crozet, Virginia) had few roads but its full share of rocks and woods.

The Languedoc area country, in the Midi or South of France west of the Rhone River, has its own one-and-one-half-lane country roads, rocky terrain and horse-shoe turns through the lower portion of the Massif Central mountain ranges.

When you unleash a half-dozen crazy American journalists in such country—in the type of tailgating, brake-spurning road race our group had with each other—you

learn a lot about a car's characteristics.

This R4 responded to the challenge with a willingness which was reminiscent of the Model-A Ford at its best. The R4 has, indeed, many of the Model A's good qualities.

There's generous ground clearance (7.9 inches) and a lack of senseless overhang which might catch in the mountain gulleys. The length is trim (142 inches) and the beam is slim (58 inches); this makes steering between trees and boulders easier.

And, there's a 4-cylinder, liquid-cooled engine, 3-speed manual shift, and 4.12 rear-axle ratio which combine to do a job efficiently and economically, but not always with a minimum of mechanical back talk.

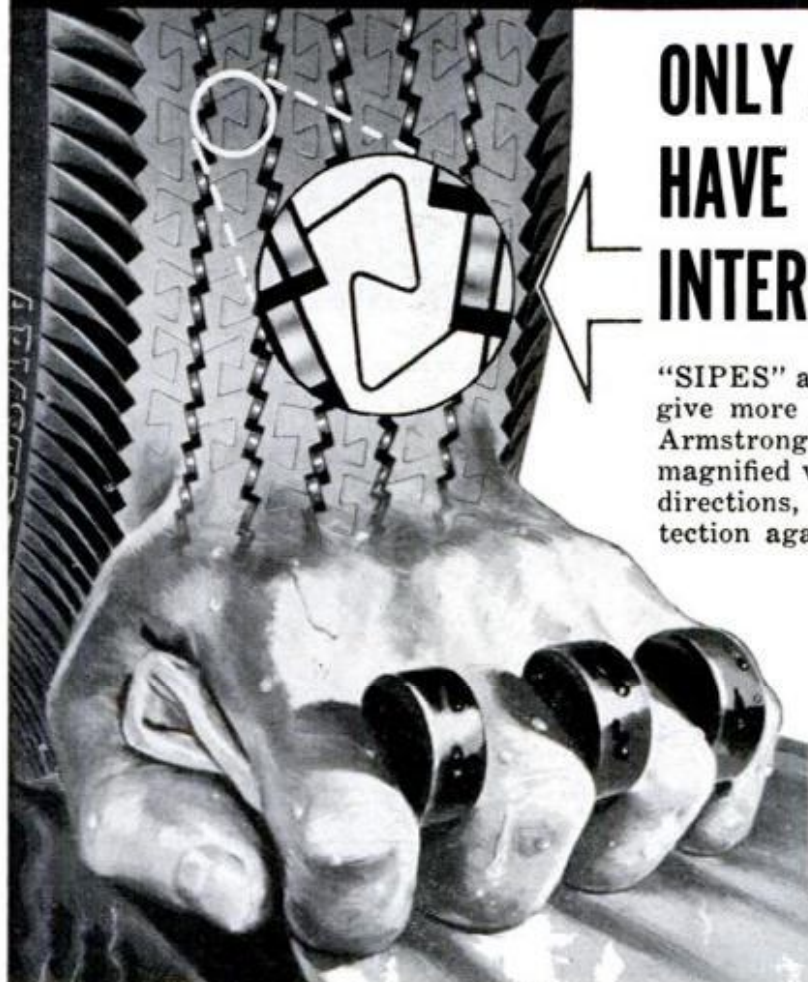
These are some pleasant attributes which the R4 and the old Model A share in varying degree (see table). But there the comparison ends.

The R4 weighs in at 1256.6 pounds—over 1000 pounds lighter than the Model A. Couple this with a modest 26.5-horsepower engine (versus the Model A's 40 hp.) and you can understand why the Renault R4 will deliver at least 15 more miles per gallon than the old A in its heyday.

(Continued to page 100)



# TIRE FACTS THAT CAN SAVE YOUR LIFE



## ONLY ARMSTRONG TIRES HAVE PATENTED INTERLOCKING SIPES

"SIPES" are the slots put in a tire's tread to give more gripping edges, to stop skidding. Armstrong's interlocking, S-shape siping (see magnified view at left) provides grip in ALL directions, gives you sharply improved protection against both forward and side skids.

AND UNLIKE tires which have siping just cut into the tread, Armstrong siping is *molded* in, deeply. Long after the mileage that wears away the shallow siping of ordinary tires, Armstrong siping continues to give you full protection. Safeguard your car against deadly skids . . . compare, and see how Armstrong gives you far more siping than other leading tires.

## ONLY ARMSTRONG TIRES HAVE PATENTED SAFETY DISCS

*—Grip the road to  
stop deadly skids  
as no other  
tires can!*

AS **\$10**<sup>95</sup>  
LOW  
AS (6.70x15) plus tax and  
your recappable tire

OCTOBER 1961

### ARMSTRONG TIRES



#### TREAD STAYS OPEN

Like fist above with discs between fingers, tread CAN'T squeeze shut. Hundreds of Armstrong Safety Discs hold tread's gripping edges open, always ready to "bite."

### ORDINARY TIRES



#### TREAD CAN CLOSE

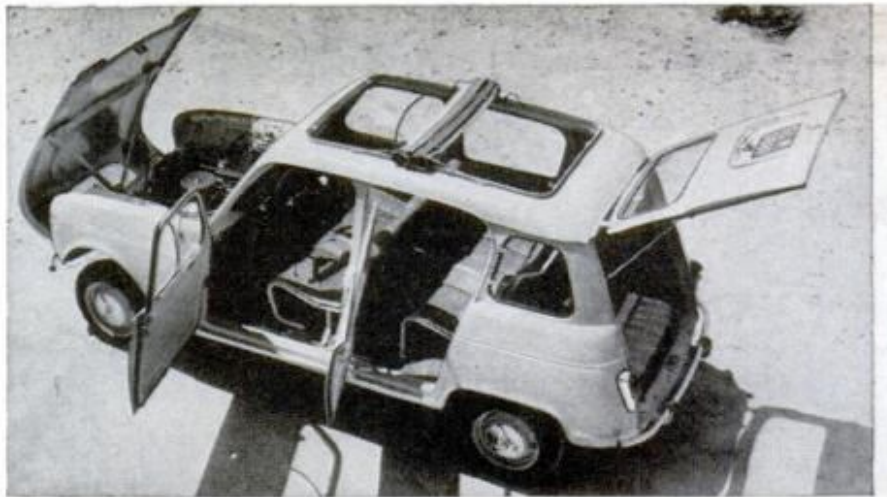
Without discs, tread CAN squeeze shut, like fist above. Tire's gripping edges are pushed together, lose their grip. Even brand new tires can go smooth like this . . . and you skid!

**ARMSTRONG RUBBER COMPANY**

Home Office, West Haven, Conn.



**R4 OPENED** up for inspection. Optional fabric roof rolls from either end toward the center. Another version of the R4 will have rear door which splits horizontally in the middle, with a window in the top half of it



The over-all fuel mileage obtained on our 180-mile acceleration derby was 34 m.p.g. That was playing the gears instead of the brakes, to keep up maximum speed on the curves. More sensible driving would add several miles to those gallons, but then, we never heard of an American who took a trip to France for the purpose of being sensible. Be that as it may, the R4 should obviously give you several more miles per gallon than either its big brother, the Renault Dauphine or that well-known German miser, the Volkswagen.

The R4's light weight helps on acceleration, too, and this is where its 26.5 hp. power plant needs all the help it can get. Our 0-30 m.p.h. times averaged 7.5 seconds, certainly modest by American performance standards, but close to what the more powerful VW and Dauphine can do. From standstill to 60 m.p.h. was one of those eventual things (37-39 seconds) where every bit of tailwind helped. The same was true of top speed, which can reach 65-70 m.p.h. if you are patient. The Renault organization plans, in fact, to use a "hotter" engine when and if they decide to bring the R4 into the United States.

On handling, we had few complaints. The R4 eats curves with some facility, perhaps in part due to a front wheel drive that tends to pull you around. The ride is no lullaby, but quite comfortable for the weight of the car, thanks to independent wheel-springing which uses long, adjustable torsion bars and hydraulic telescoping shocks all around. There's also an antiroll torsion bar in the front.

You get a surprising amount of insulation from road throb out of the austere looking bench-type seats. These consist of a small layer of synthetic foam overlaid on a spring fabric and rubber base, and suspended from tubular framing.

They certainly don't look plush, but they do the job well and can be adjusted fore and aft by unlocking the framing. They also

COMPARING THE:	Renault R4	Renault Dauphine	Volkswagen	Model-A Ford
Weight	1256.6	1397	1631	2275
Length	142.1	155	160.2	155
Width	58.5	60.0	60.6	68
Height	60.3	57.0	59.0	64
Ground Clearance	7.9	6.0	6.0	9
Turning Diameter	28	30	36	34
Horsepower	26.5	32	40	40

proved to be relatively cool—an important plus for people who insist on driving under the Texas-hot sun of France's Midi.

Some of the "maintenance-free" kick which we are experiencing in the United States seems to be rubbing off on European car manufacturers. Renault contributes to the trend by introducing a cooling system on the R4 which is a permanently sealed circuit containing an anti-freeze mixture suitable for temperatures down to minus 33° F. As the engine temperature rises, the liquid in the radiator expands, and some of it is forced into an expansion tank. When the vehicle stops and cools, the liquid contracts and is drawn back into the radiator.


Renault officials would like to know whether there is a market for a car like this in the United States. Much depends, of course, on the price, and the nearest we could get to an estimate was a cautiously whispered \$1250 to \$1350 in the U.S., perhaps somewhat under this in France.

Did we forget to mention, by the way, that this R4 did not spring, full-blown, out of the mind of some Regie Renault designer? It is actually a replacement for the 4CV, whose famous, if slightly mashed-down looking contours, have been around for a long time. The improvement is immense.



**you get A**ct**ion with**



AC SPARK PLUS  THE ELECTRONICS DIVISION OF GENERAL MOTORS

## **Extend your engine's life with modern lubricants and AC Triple-Trapper Filter A**ct**ion**

Today's motor oils are built to give long-lasting protection to modern high compression engines. They have detergents and additives that prevent hard carbon formation, reduce rust and corrosion, inhibit oxidation and work in many other ways to give engines better performance, greater fuel and oil mileage and longer life.

To insure continuing effective lubrication, you need a modern oil filter—an AC Triple-Trapper Oil Filter—to remove the abrasive contaminants that get into your oil. These wear precision parts

and help build power-robbing sludge.

AC Triple-Trapper Oil Filters stop particles as small as 1/15 the diameter of a human hair, and they trap the contaminants that form engine-damaging sludge. Most important, *they allow full flow of the detergents and additives that give modern oils their superior protective qualities.* You'll keep your engine clean and powerful by the regular use of premium oil and AC Triple-Trapper Oil Filters. Ask for the best filtering action you can buy, ask for AC.

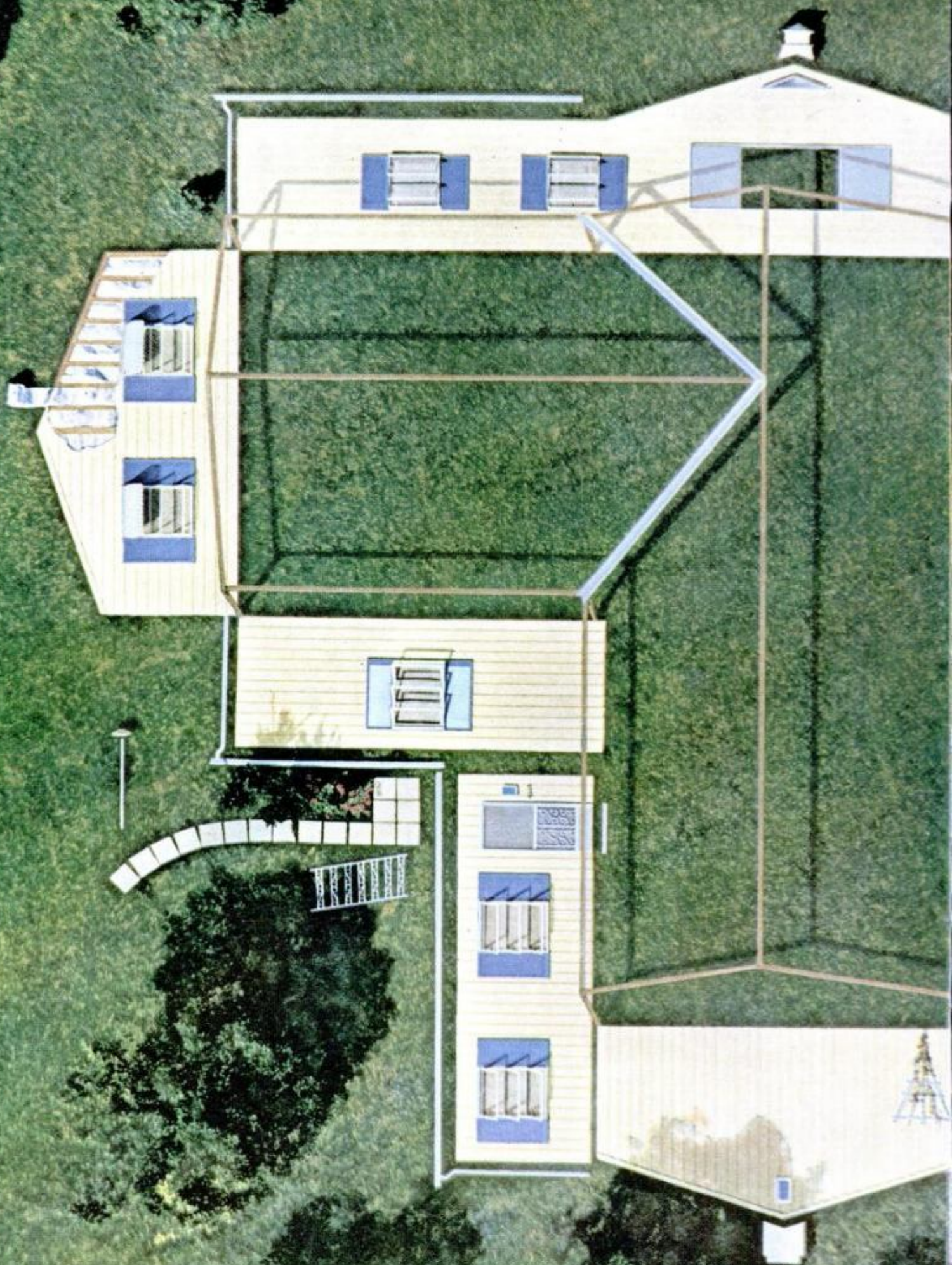


**TRIPLE-TRAPPER OIL FILTERS**

OCTOBER 1961

100A







# ALUMINUM MAKES A LOT OF HOUSE CARE-FREE

A strange way to look at a house? You're right—but it's the best way to see how much there is to take care of year after year. We spread out a typical house to show you all the area that does not need constant maintenance if it's all Alcoa® Aluminum. The more you use, the more sunny Saturdays you call your own. Here's why:

**ALUMINUM GROWS ITS OWN PROTECTIVE SKIN!** Illustrated below is the oxide "armor" always present on aluminum—a protective skin that fights back against corrosion, rust and that weathered look.

**ALUMINUM HEALS ITSELF!** No matter how much punishment, Alcoa Aluminum keeps on taking care of itself. Scratch it and new protective skin re-forms instantly! Keeps the metal as Care-free as the day it was made.

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**ALUMINUM ASKS SO LITTLE OF YOU!** Your home can have lasting beauty, Care-free beauty. Over the years, Alcoa Aluminum can save you hundreds of hours of repainting, scraping and fix-up—thousands of dollars of costly upkeep.

**FREE BOOKLET!** Learn more ways Alcoa Aluminum can work for you around the house in a colorful, 32-page booklet. Send your name and address to Aluminum Company of America, K-1846 Alcoa Building, Pittsburgh 19, Pa.



Less than a thousandth of an inch thick, this clear, natural oxide skin keeps aluminum Care-free year after year.



**ALCOA ALUMINUM**

ALUMINUM COMPANY OF AMERICA

100C





**Remember how great  
cigarettes used to  
taste? Luckies still do**

**Change to Luckies and get some taste for a change**

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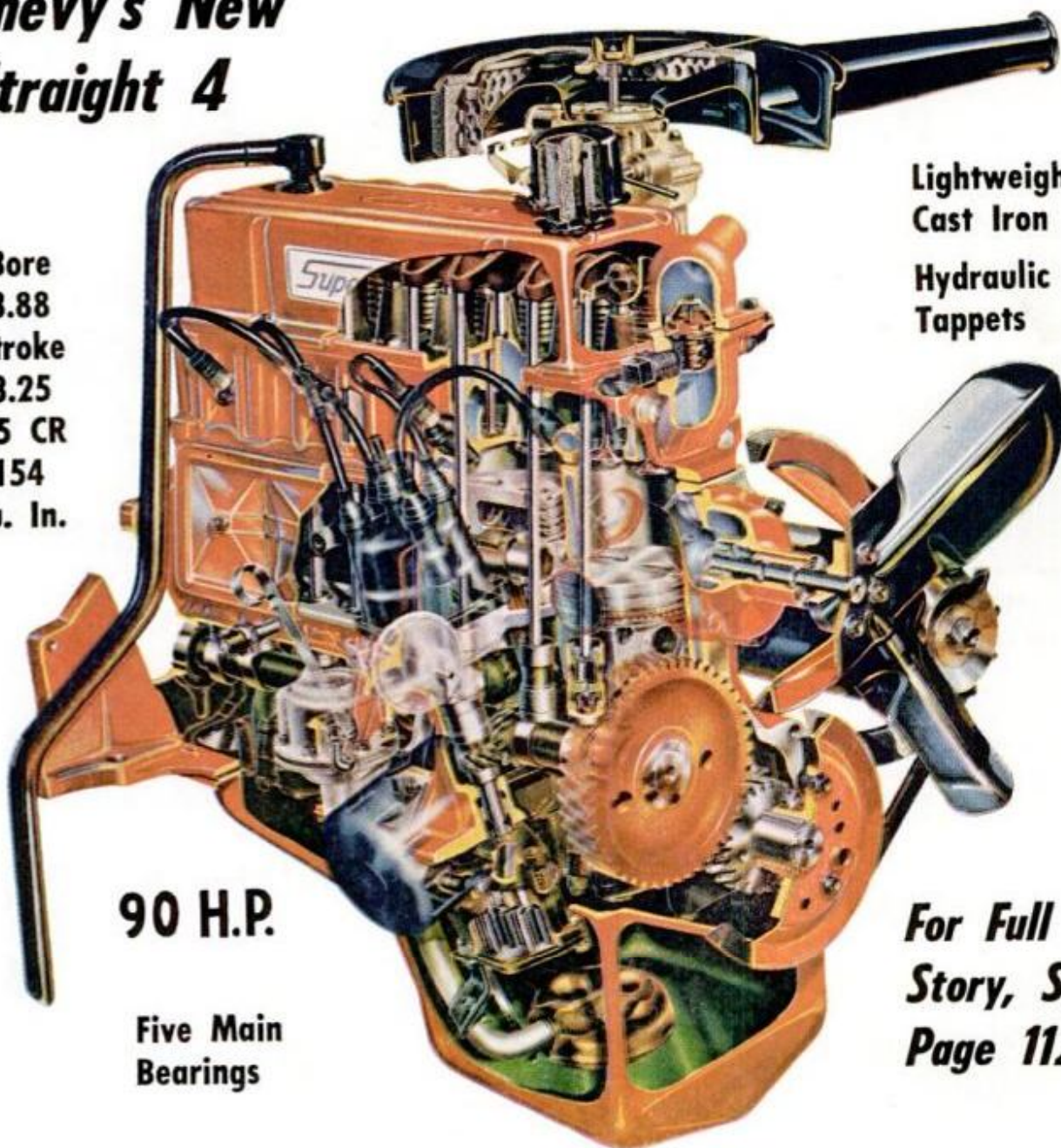
The Chevy II Nova 400 convertible in action

# COLORCADE of the '62s

## *Chevy's New Straight 4*

**Bore**  
3.88  
**Stroke**  
3.25  
**8.5 CR**  
154  
**Cu. In.**

**Lightweight  
Cast Iron  
Hydraulic  
Tappets**



**90 H.P.**

**Five Main  
Bearings**

**For Full  
Story, See  
Page 112**



**PONTIAC TEMPEST** has a new grille treatment, hood panel and rear molding. A convertible has been added to the line. Further details on page 118



**ROUND TAIL LAMPS** replace familiar cat's eyes on restyled '62 Comet. More on page 119



**FORD GALAXIE'S** smoothed-off rear end keeps traditional bull's-eye lamps. Details, page 115





**HANDSOME** new die-cast grille graces front of '62 Rambler American, unchanged in body style. Custom models have 125-hp. engine. For more details, see page 120



**STUDEBAKER'S** Gran Turismo Hawk, below, has new roof, is entirely restyled, see page 124



**OLDSMOBILE 98**, above, has twin tail lamps on "squared-off" rear panel. More on page 122

**WIDE-TRACK** Pontiac Bonneville sports a new grille, trim and roof line, see page 121







**MERCURY MONTEREY** takes to the air in suspension test. Roof line is flatter, windshield lower than on '61s. More details on page 121

**NEW DODGE DART,** right, has unit body that's 7 inches shorter, 4½ inches narrower. For details see page 116



**OLDS F-85** has added a convertible to the line for '62 and has restyled the grille and side trim. Convertible will be available with manual top. For details see page 120

**THUNDERBIRD** for '62 retains basic '61 sheet metal unchanged but has a new grille, restyled tail lamps and new rear ornamentation. For further details see page 124







**THIS STYLISH WAGON** with simulated wood paneling is the '62 Falcon Squire. More about Falcon on page 118

**A BRAND-NEW LOOK** for the all new, smaller-than-'61 Plymouth. More on page 117







**THE SIGNET**, crown jewel among '62 Valiants, is a two-door hardtop with bucket seats. Other Valiants featured on page 118



**FINLESS CHRYSLER** for '62 has new rear quarter styling and new grille. Above, the new "300" hardtop. More on page 122

**RAMBLER** also drops its fins for '62 in favor of sculptured rear deck. Also note changed roof line. More on page 120





**IT TAKES A LOT** to load the trunk of Buick's '62 Electra 225 hardtop. Roof line is new as are side panels and rear deck. Further details on page 122



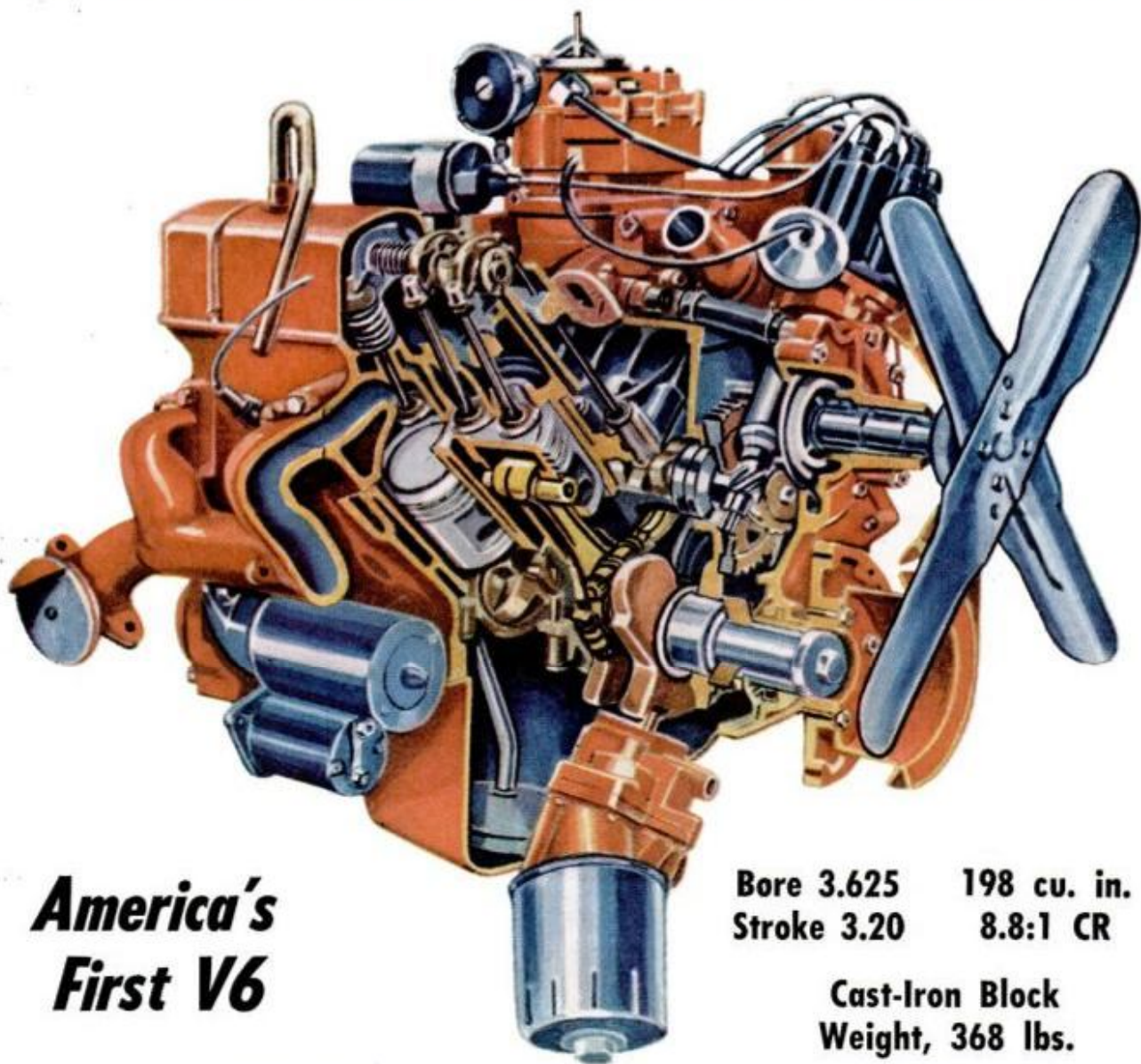
**CHEVROLETS** have been extensively restyled for '62. Note new roof line on Impala hardtop above. More on page 115

**THE '62 OLDSMOBILE** appears to have a grille within a grille. Starfire, below, has broad aluminum trim. More on page 122





# *PM's 1000-Mile Road*



***America's  
First V6***

**Bore 3.625    198 cu. in.  
Stroke 3.20    8.8:1 CR**

**Cast-Iron Block  
Weight, 368 lbs.**



**1962 Buick Special convertible will  
have manual top, economy price tag**



# Test of Buick's New V-6

After 1100-plus miles on both stick and automatic '62 Specials, PM finds Buick's new cast-iron V6 an exceptionally able and thrifty performer—the best compact engine yet

By Jim Whipple

WHEN BUICK test engineer Ralph Dean pulled up in front of the Durant Hotel in Flint that warm July morning, no one noticed that he was driving a 1962 Buick Special. And if they had, not one in a hundred would ever have guessed that America's first passenger car V6 was mounted snugly beneath the sleek hood.

We piled suitcases, tape recorder and Kent-Moore fuel meter into the Special's trunk and climbed in to begin the very first road test of the new V6 made by anyone other than Buick engineers.

As we slid the seat back for a more comfortable driving position, we noticed that it went farther back than the 1961 Special's front seat. So much so in fact that our 6-foot 3-inch frame was instantly more comfortably postured and positioned behind the wheel. Yet my 5-foot 7-inch wife noticed no cramped knees in the back seat.



**RALPH DEAN**, Buick Test Engineer watches oil check. Attendant never noticed V6

We asked Ralph Dean about this. He told us that the rear seat cushion had been moved back into the body some inch and a half on the '62 Special, without requiring any changes to the body shell structure or encroaching on the back seat width.

We moved the control lever of the

## COMPARATIVE ECONOMY

Miles per Gallon at Constant Miles per Hour

Make and Year	30 m.p.h.	40 m.p.h.	50 m.p.h.	60 m.p.h.	70 m.p.h.	Over-all Test Mileage
'61 Comet Six 170 cu. in. Automatic trans.	29.0	27.5	24.5	21.0	18.0	19.8
'61 Tempest Four 194 cu. in. Manual trans.	27.0	26.5	23.5	21.8	17.6	16.8
'61 Olds F-85 V8, 215 cu. in. Automatic trans.	24.7	22.6	20.5	18.1	15.8	16.4
'62 Buick Special V6, 198 cu. in. Automatic trans.	27.8	26.8	23.8	20.6	17.5	19.3
Manual trans.	N.A.					23.25
'61 Corvair Six 145 cu. in. Automatic trans.	34.8	31.32	30.5	27.5	22.1	22.2
'61 Ford V8 292 cu. in. Automatic trans.	24.55	23.4	22.0	19.4	17.06	16.8

## COMPARATIVE PERFORMANCE

Acceleration: Miles per hour in seconds	Dodge Lancer Six 225 cu. in. Automatic trans.	Pontiac Tempest Four, 194 cu. in. Manual trans.	Olds F-85 V8, 215 cu. in. Automatic trans.	Buick Special V8, 215 cu. in. Automatic trans.	Buick Special V6, 198 cu. in. Automatic trans.
0-60	13.7	15.7	12.5	12.0	13.6
50-70	9.8	9.5	8.7	7.0	8.2





**FLINT BELLHOP** loads '62 Special with luggage for 8:30 a.m. start



**WE STOPPED** for this picture a few miles south of famed Mackinaw Straits bridge at 3 p.m.

Buick's Dual Path automatic transmission into neutral and turned the key. The V6 started instantly and it revved up so smoothly that we couldn't help comparing it with another V6, the one especially designed for light duty and medium GMC trucks. The GMC truck V6 is a very heavy 60-degree job, whereas the Special V6 is smaller, lighter and has a 90-degree V configuration.

But both engines have in common a smoother feel and sound with less accompanying vibration than any of the inline 6s in production today.

The difference between the V6 and the Special's 155-horsepower V8 was noticeable to us, because we had prepared for this road test by driving a Special V8 immediately prior to the trip.

As we rolled easily through the heavy Flint traffic, we couldn't help noticing what an effective power team the Special's automatic transmission made with the new V6. The V6 with automatic can be told from the aluminum V8 Special only at speeds below 30 m.p.h., and then when you're in drive-range operating slowly on part throttle.

**WE WARMED UP** the V6 by the shores of Lake Superior near Munising, Mich. at 8:45 on cool, damp Sunday morning



At the outskirts of Flint we pulled into a gas station and then supervised the careful topping up of the gas tank. While we were at it, we asked the attendant to check the oil and the crankcase. And we found it necessary to top that up, too, with half a quart. The attendant never noticed the V6 even though he plunged his hand down among the three spark plug leads to get the dipstick on the engine's left side.

Leaving Flint we traveled highway No. 10 to Saginaw. The itinerary of our two-day trip was a swing up through the Upper Peninsula of Michigan and the return to Flint the next day. The object was to put lots of miles behind us and check out the performance and economy of the V6, in a typical family-loaded sedan, on many different types of highways and under as many different traffic conditions as possible, still keeping out of the large cities.

In the heavy, but fast moving traffic from Flint to Saginaw and Bay City we did a lot of accelerating and decelerating between 30 and 60 m.p.h. The power came on so smoothly and quickly that we couldn't help wondering how much credit for this per-





**TOP OF THE LINE** is the '62 Special convertible available in standard (manual top) version with V6 or V8 engine

formance was due to the excellent Dual Path transmission and how much to the V6 itself. We decided immediately to check out a manual transmission version of the V6 which would, we felt, be the acid test of its smooth performance.

After leaving Bay City, we headed up Route 23 past Saginaw Bay to Standish, and we cut in on Highway 76 through Roscommon up to Grayling where we picked up Highway 27 to take us on up to the famed five-mile Mackinaw bridge across the Straits into the upper peninsula.

After a short lunch stop, we piled out on the road, joining an almost endless line of cars headed for the Straits. About every fourth car was pulling either a boat or camping trailer on this narrowish two-lane black-top road. In order to make time we had to cut out and pass cars and trucks.

In the beginning of the game we used kick-down acceleration of the automatic transmission to blast our way around the slower cars at around 40 m.p.h. and sweep up to 60 to get back into line before a curve or an oncoming car.

Ralph and I had estimated that our payload was in the neighborhood of 650 pounds which, added to a car weight of about 2800 pounds, gave us an overall weight of almost 3500 pounds. However, the 198-cubic-inch V6 took care of its task without a murmur.

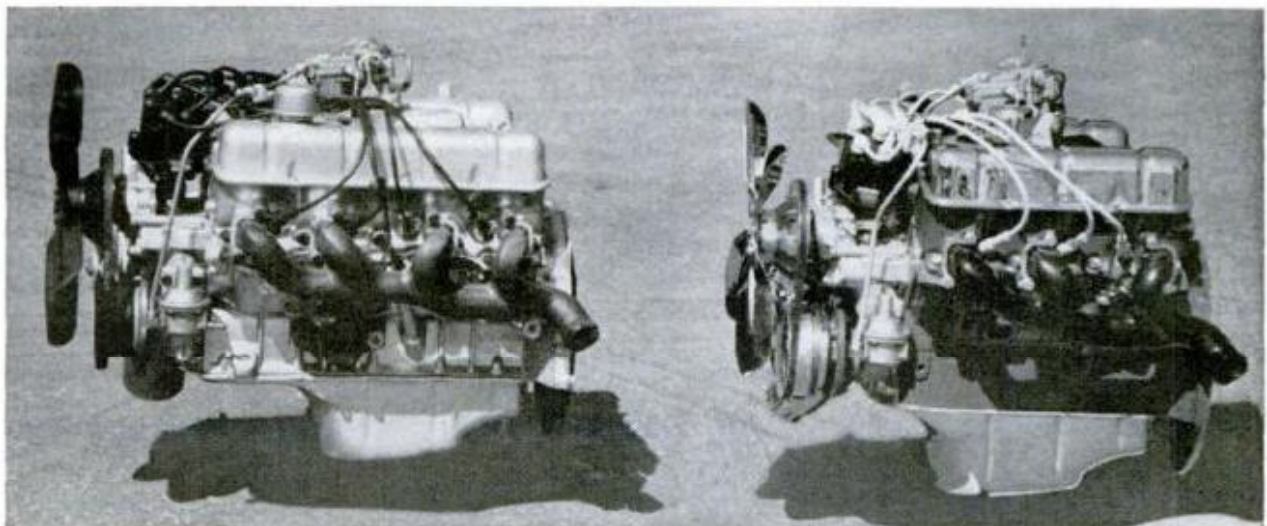
Although I was leaning pretty heavily on the throttle pedal in these passing maneuvers I never felt that the car was logy, sluggish, or underpowered. The speedometer read well over 22,000 miles, but Ralph told me that the engine was relatively new, having been placed in the car approximately 900 miles back.

From the quick response and over-all performance of the engine there was no doubt that it was properly broken in.

After I'd swung out and passed what seemed to be my hundredth boat trailer, we found ourselves at the big Mackinaw Bridge and crossing the Straits. The bridge is so long that a driver making repeated trips back and forth over it would surely qualify for sea duty.

Once on the Upper Peninsula we set out  
(Continued to page 258)

**TAKE YOUR CHOICE** of either 155-hp. aluminum V8 (left) weighing 322 lb. or cast iron 135-hp. V6 (right) weighing 368 lb.







**CLEAN-LINED** Chevy II four-cylinder sedan is rated at 90 hp. It cruises at 70 m.p.h., will top 80 flat out

## Chevy II

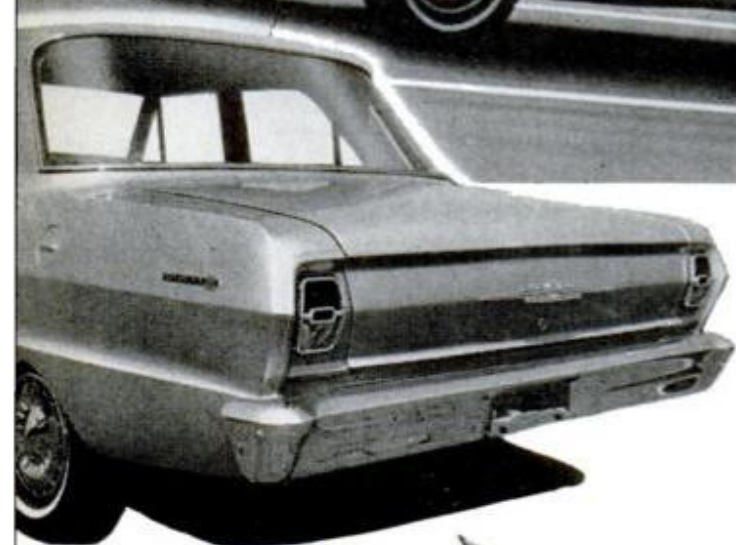
**N**EW FROM ITS two-ply tires to its flat roof pan, Chevrolet Division's new compact takes a new name—Chevy II. This car, which comes in complete line of two and four-door sedans, four-door wagon, two-door hardtop and a convertible, is intended as a basic family car. It is definitely a roomier car than Corvair, although not much larger.

Chevy II sedans have two to three inches more hip and shoulder room, higher seats and more entrance room. Chevy II is 4 inches wider, 3.5 inches higher, 3 inches longer over-all (183 vs. 180 inches) and has a 2-inch longer wheelbase (110 vs. 108 inches) than Corvair.

On the other side of the coin, the new car is definitely a compact compared to the big Chevrolet (now limited to Bel Air and Impala series) with its 119-inch wheelbase

**SEPARATE** front frame structure of Chevy II (above) bolts onto main unit body at cowl. Front fenders themselves bolt onto this front unit as do grille, lights and bumpers

**CHEVY II's** Nova 400 convertible (left) has a money-saving, spring-balanced top. Sedan (below) has 59-inch-wide rear seat, good headroom







**FRONT-MOUNTED** engine-transmission requires a moderate tunnel in front compartment, but legroom's good



**CHEVY II's** 13-inch spare sits forward in 13.3-cubic-foot trunk, leaving usable space unobstructed

and 209-inch over-all length. Chevy II is a bit roomier inside than some of the compacts with which it competes.

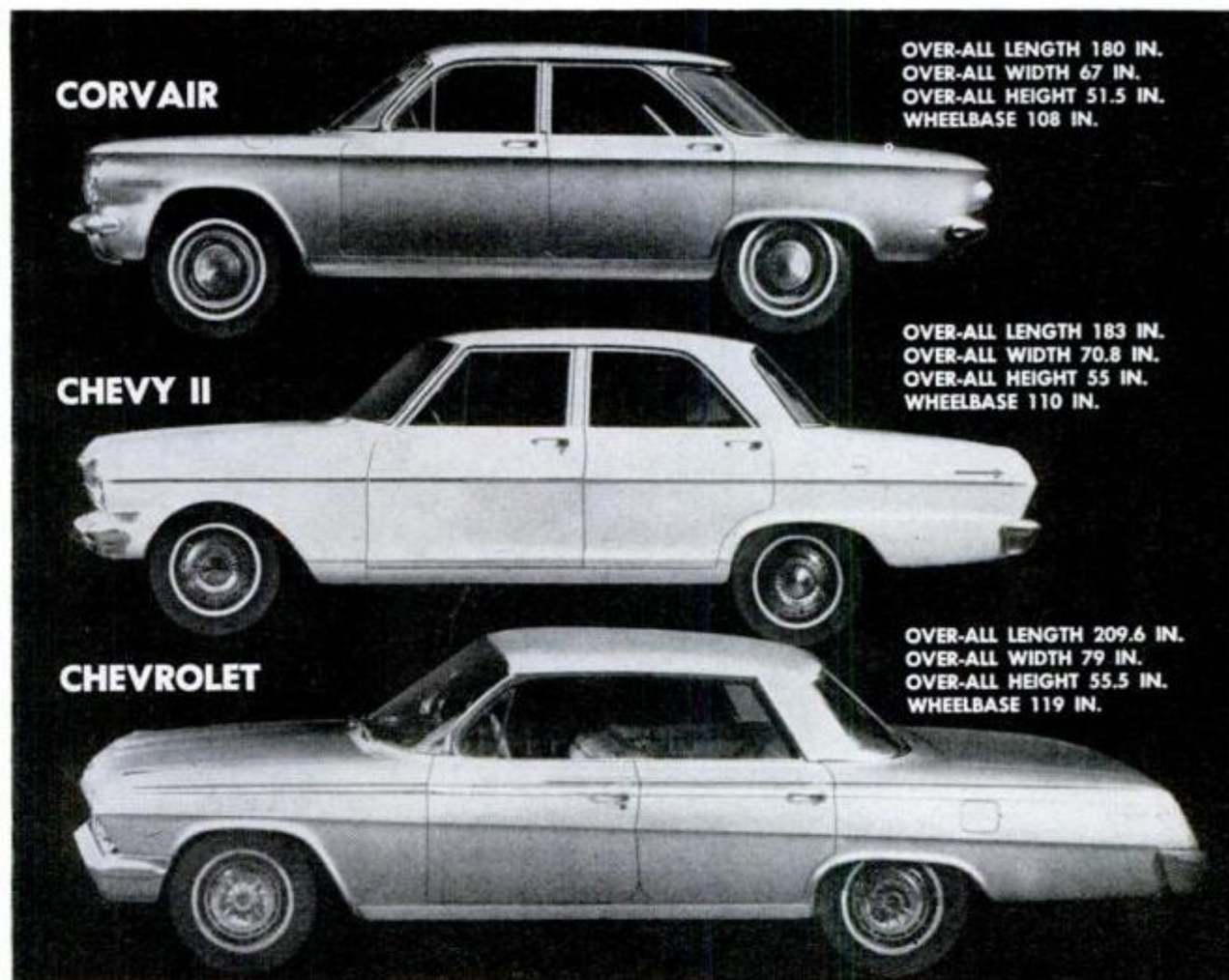
The new car pays the penalty of greater weight for its extra room, however. Compared to Corvair's six-cylinder sedan (curb weight) Chevy II's four-cylinder-engined sedan weighs 175 pounds more (2545 vs. 2370). The six-cylinder option adds an additional 100 lb. to Chevy II.

The four-cylinder engine displaces 154

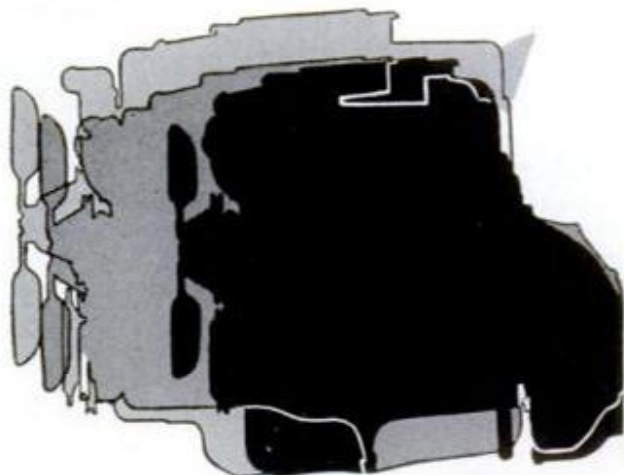
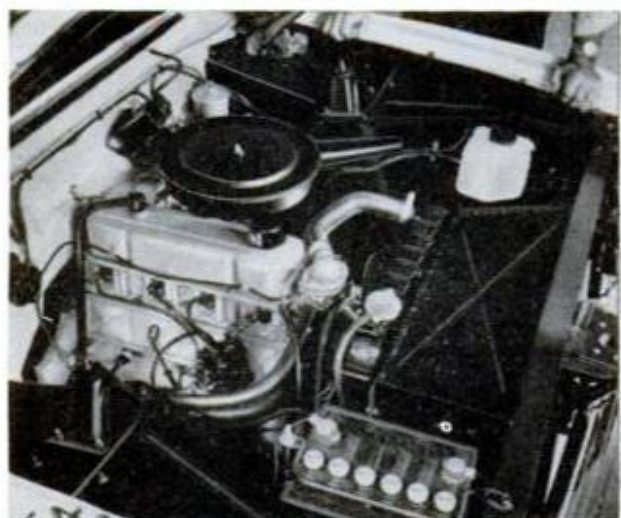
cubic inches, having a bore and stroke of 3.88 x 3.25 inches. The Six has a bore and stroke of 3.56 x 3.25 for a total displacement of 194 cubic inches. Compression ratio is 8.5 to 1 for both engines. The four is rated at 90 horsepower, the Six at 120.

With either engine, the buyer may option three-speed manual synchromesh transmission with column shift or a new lightweight version of Powerglide automatic. Chevrolet's Positraction, limited-slip differential

**COMPARISON** shows Chevy II is not much longer than Corvair, but has interior nearly as large as Chevrolet's





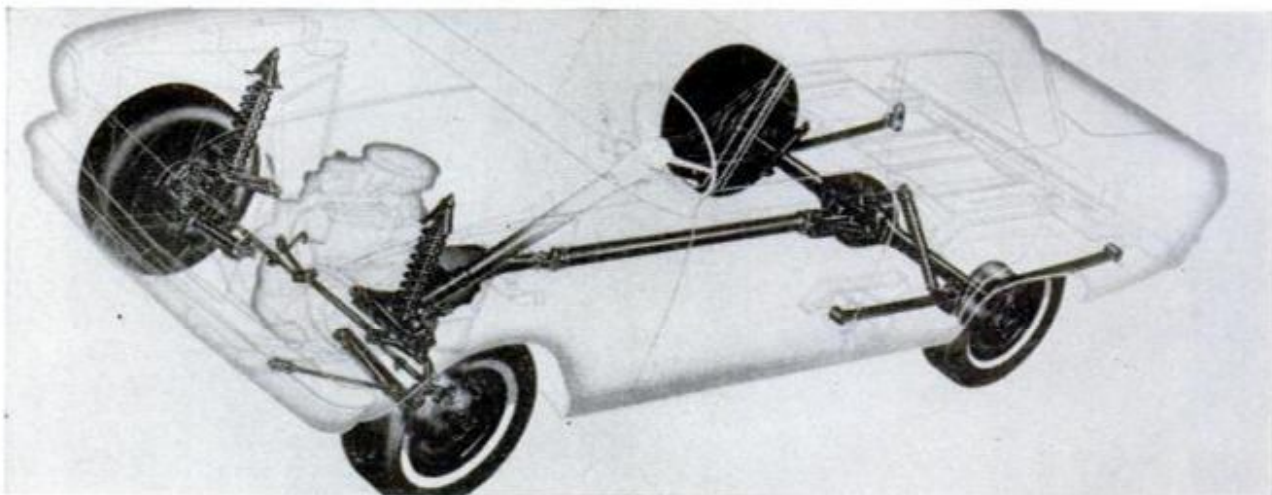


**SOLID SILHOUETTE** (above) compares Chevy II's Four (below left) with its 120-hp. Six (darker outline and at left) and Chevrolet's Six (lightest outline)

is available as an optional extra with either engine or transmission combination on all models. Standard rear axle ratios are; 3.36 to 1 on four-cylinder coupes and sedans with manual transmission, 3.08 to 1 on four-cylinder automatics, six-cylinder sedans and coupes.

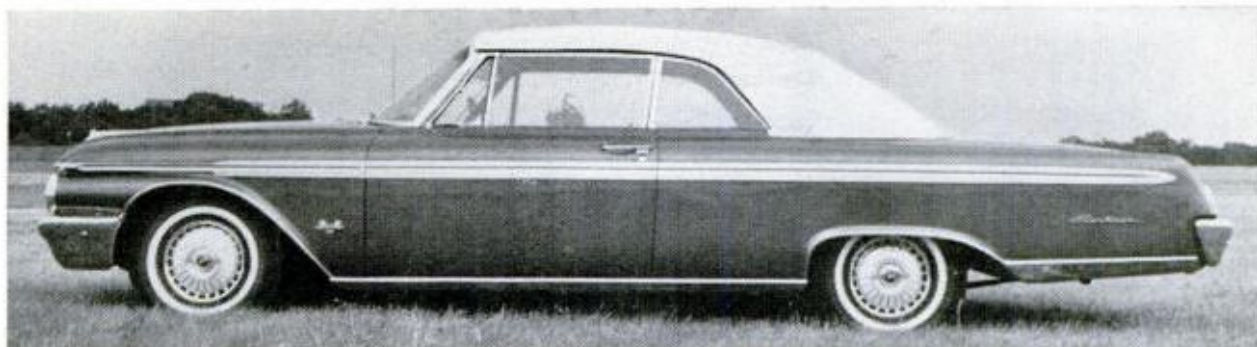
Chevy II is a unitized car, in line with current practice for compacts, but it has  
(Continued to page 262)

**PHANTOM VIEW** of Chevy II shows front suspension with coils, rear with new single-leaf springs





## FORD



IN ADDITION to its new grille, side panels, rear deck and trim, the '62 Galaxie has a new roof line and shallower windshield. Wheelbase and over-all length remain at 119 and 209 inches respectively. (The '62 Fairlane is a totally new and smaller car which will be described in the November issue of PM.) All Galaxie models have the Thunderbird roof and rear quarter. Engine choices are: the 223-cubic-inch Six of 135 hp.; 292-cu.-in. V8 of 175 hp.; 352-cu.-in. V8 of 220 hp. and 390-cu.-in. V8 in 300, 375 and 401 hp. versions.



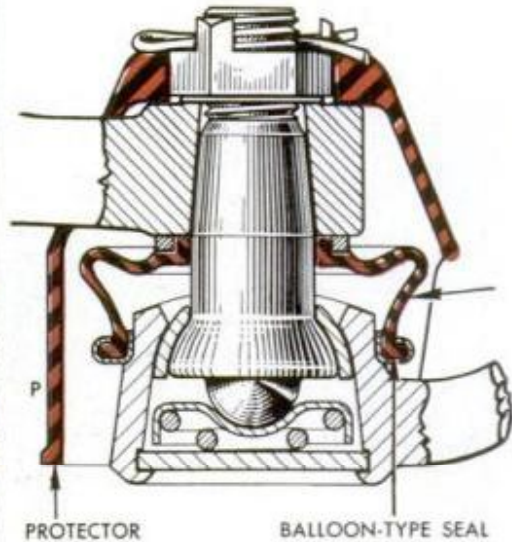
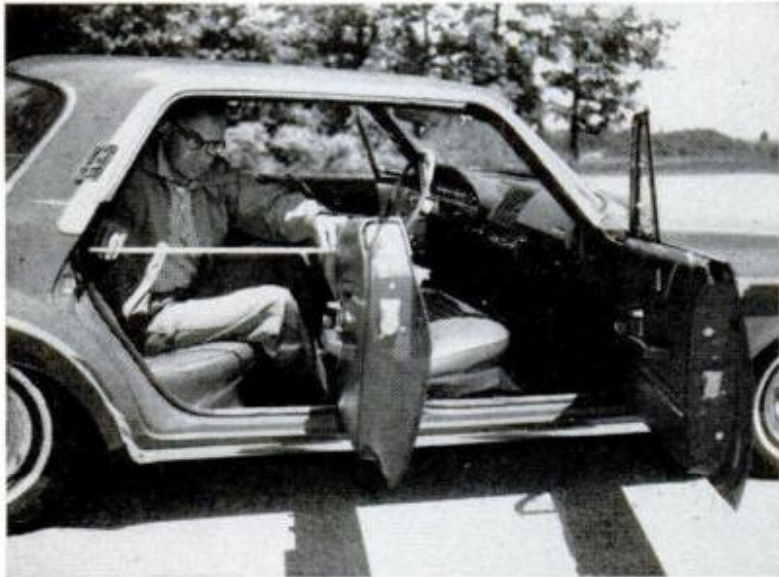
## CHEVROLET



BASIC DIMENSIONS of 119-inch wheelbase and 209-inch over-all length are unchanged from '61, but the '62 Chevrolet has new styling on front and rear fenders and rear deck. Sedans have dropped the "visor" of past year and have adopted roof and rear window styling of the four-door hardtop. Added to the familiar 236-cubic-inch Six and 283-cu.-in. V8 are two high performance V8s: a 327-cu.-in. V8 (an enlarged version of the 283) and a 409-cu.-in. V8 version of the former 348 engine.







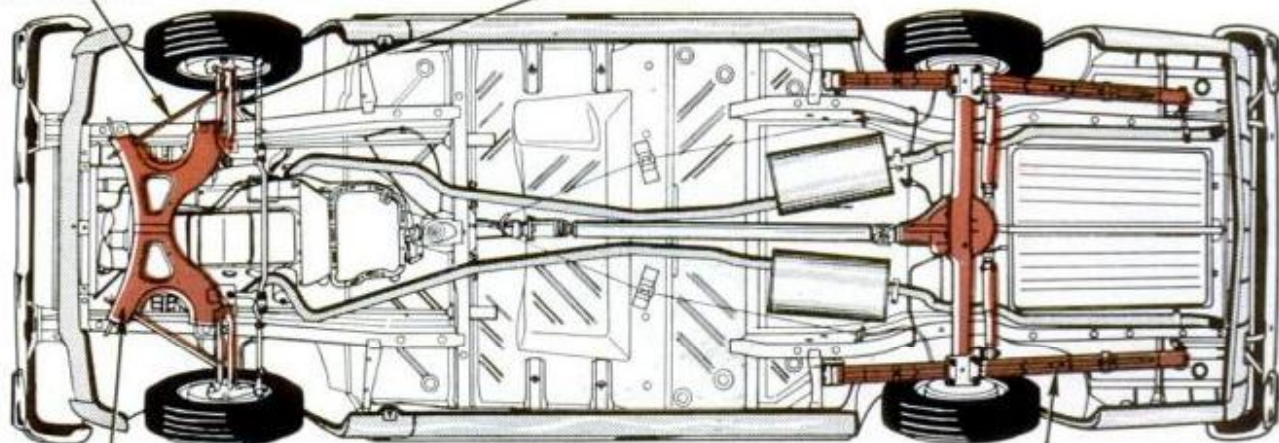
**SCULPTURED STYLING** and "continental" look of '62 Dart give it Lancer-Valiant flavor, top. New body, above left, has interior dimensions similar to larger '61 model. Tie-rod end, right, has lube sealed in

**MORE THAN 200** pounds has been cut from the weight of the 1962 Dodge Dart by reducing the length 7.4 and the width 2.2 inches. Wheelbase is down from 118 to 116. Completely unitized body no longer has front stub frame. Only bolt-on frame part is K-shaped front suspension member which supports torsion bars, control arms and steering linkage. A new automatic transmission for V8 models is 60 pounds lighter and more compact, which lowers front floor hump. Parking brake now acts—

as an emergency brake should—on rear-wheels instead of drive shaft. Brakes are now the self-energizing type with automatic adjustment. A new, lightweight starter has greater power due to 3.5 to 1 reduction gearing. All 10 points on front suspension and steering linkage have sealed-in lube designed for 32,000-mile service intervals. Dart engine options are: 225-cubic-inch, 145-hp. Six; 230 hp., 318-cu.in. V8 with a power package of 260 hp.; 361-cu.-in. V8 of 305 hp.

TRAILING STRUT

LOWER CONTROL ARM



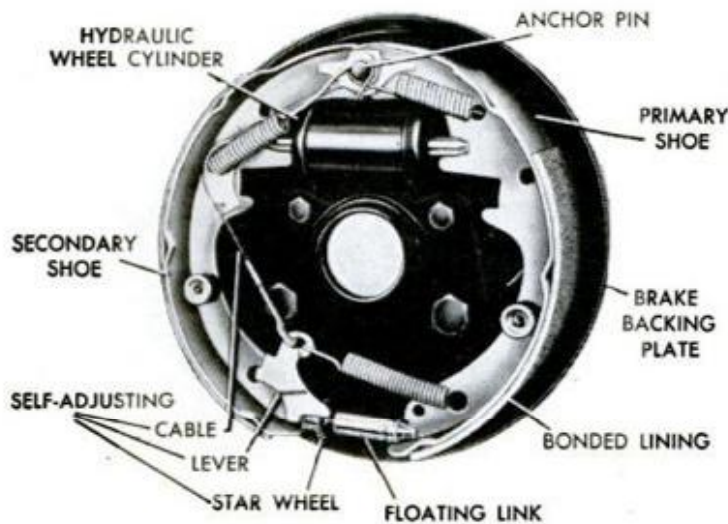
FRONT SUSPENSION CROSS MEMBER

MULTILEAF SPRINGS





**PLYMOUTH**



**FURY HARDTOP** on 116-inch wheelbase, top, is 200 lb. lighter than 1961 counterpart. Plymouths have new servo action self-adjusting, brakes, left, and a very functional instrument grouping plus new manual shift

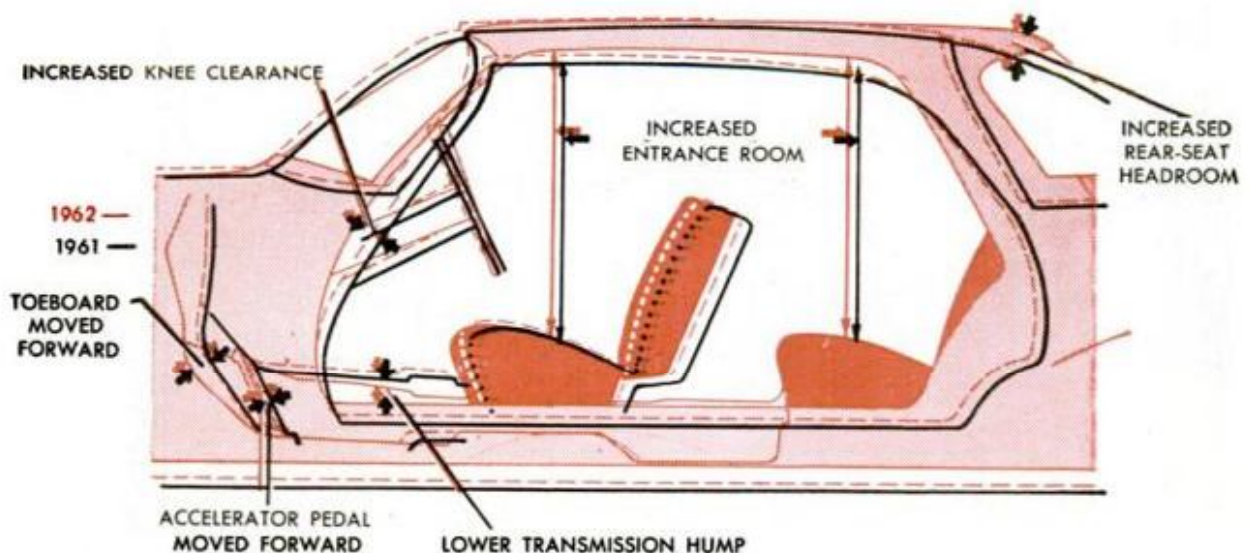
**PLYMOUTH'S** all-new unitized body for 1962 is five inches narrower and seven inches shorter with a wheelbase of 116 inches compared to 118 for the 1961 car.

In drawing below, shaded area represents 1962 body while dotted lines outline the '61 structure. Note improvement in front seat legroom and lower tunnel.

Bolt-on front stub frame has been eliminated, but torsion-bar front suspension remains unchanged except for new support

cross member. All suspension and steering linkage joints have sealed-in lubrication. Ball joints require refill every 32,000 miles.

A new three-speed automatic transmission on V8 models is 60 lb. lighter due to its more compact design and aluminum case. New car is approximately 200 pounds lighter than last year's. Body sills are galvanized to improve rust resistance. Engine options are 225-cubic-inch Six, 318 and 361-cubic-inch V8s.

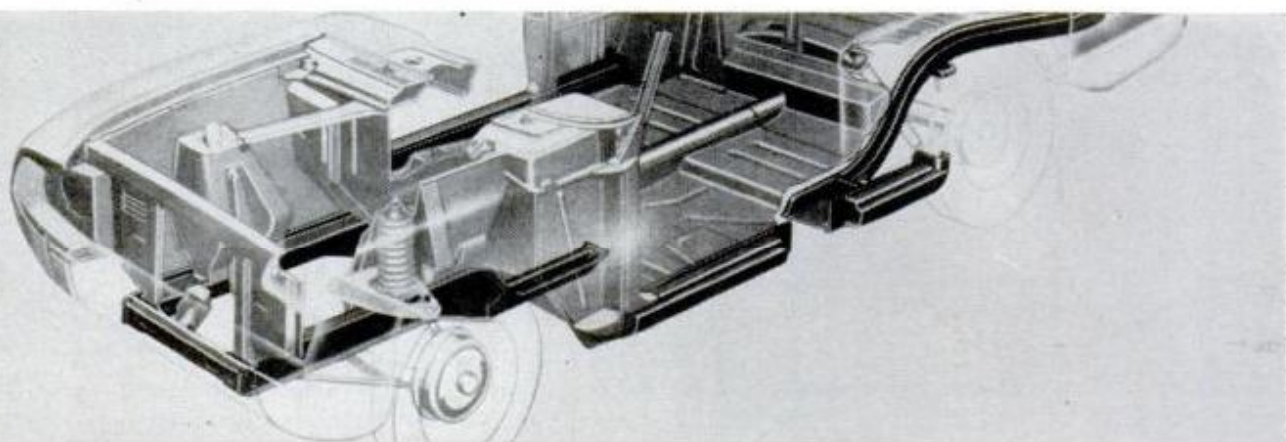






**VALIANT** Though unchanged in basic design and structure from the '61 model, the new Valiant (above) brings with it many refinements—the sealed-in 32,000-mile lubrication, new starter, manual shift on the steering column, bonded brake linings, new engine

mounts, galvanized body sills and softer suspension. Aluminum cylinder blocks, standard on the 225-cubic-inch, 145-hp. engine, weigh 45 pounds less than the 170-cu.-in., 101-hp. engine. Another 50 pounds is saved by lighter batteries and new steering gear.



**FALCON** A new bumper, grille, parking lamps, tail lamps and slight changes in the fenders have altered the appearance of the '62 Falcon (left). Rocker panels and some other structural parts are galvanized for corrosion protection (above). In addition to new pistons and a vibration damper, Falcon has a new carburetor and leaf-type mount at rear of the engine for better isolation of noise.

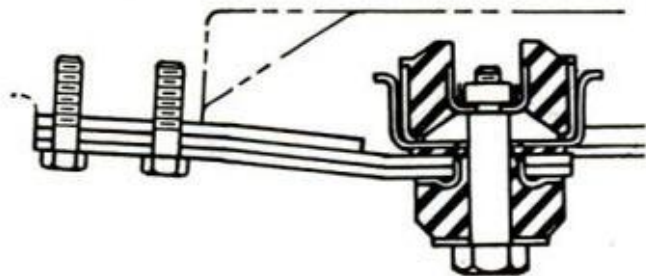
**TEMPEST** Addition of a convertible coupe (below) and a restyled grille are the biggest changes in Tempest for 1962. Both the two door sports coupe and the convertible are available in

Le Mans versions with bucket seats and special interior trim. A four-speed manual transmission is optional as well as the 215-cubic-inch aluminum V8 rated at 185 hp. Suspension action has been softened.





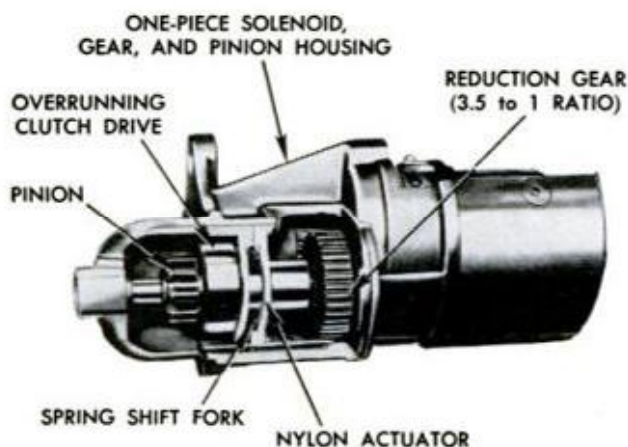
## COMET



CHANGES IN grille and rear body have given Comet a surface new look for '62, though body-chassis dimensions are the same. Many improvements have been made in the sound-deadening "package" throughout the car. The rear mount for both the



85 and the 101-horsepower engines is a dual rubber insulator combined with a three-leaf steel spring (drawing, left). The crankshaft has a vibration dampener for smoother driveline and the carburetor has been redesigned to up fuel mileage.



**LANCER** For '62, the Lancer line sports two and four-door sedans and a wagon, all in standard and deluxe series, plus a luxury-trimmed two-door hardtop with bucket seats—the Gran Turismo. A new grille is the big styling change. Lancer also sheds 45 pounds with a lighter starter

(left), aluminum steering gear and new suspension components. In '62, all 225-cubic-inch engines have aluminum blocks. New engine mounts give better vibration isolation, Neoprene seals are used in suspension and steering linkage and sealed-in lubricants are good for 32,000 miles.

**CORVAIR** Corvair has undergone no major changes in either body-chassis elements or in engine for '62. Trim on the front and rear panels has been changed slightly. Engine remains at 145-cubic-inches displacement for the six air-cooled cylinders. As on the 1961 models

there are two power plant versions—an 8 to 1 compression ratio with 80 hp. and cool short-duration valve timing, and a 98 hp. variation with 9 to 1 compression and hot valve timing. Four-speed manual transmission is available with either engine as is Positraction limited-slip differential.







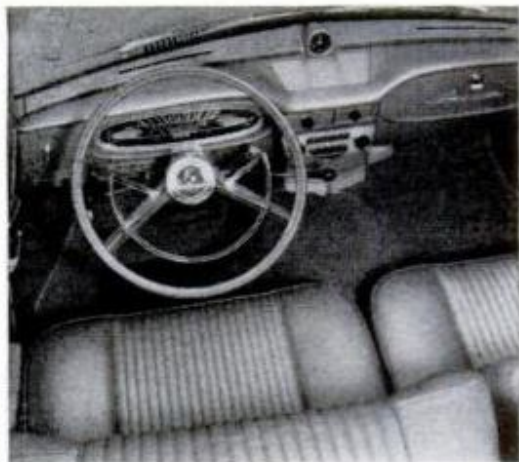
**OLDS F-85** With the exception of its hood, grille and tail lamps, the '62 F-85's styling remains essentially unchanged. Olds engineers have moved the rear seat cushions back into the body to increase legroom by about two

inches. Transmission action has been smoothed out by addition of a pressure-compensated shift pattern. In addition to the four-door sedan, four-door wagon and the club coupe, there's the 185-hp. Cutlass sports coupe and a new convertible.



**LARK** Larks have been restyled for '61 with all new rear sheet metal, new hood and grille (above). The line has been split into two sizes: 109-inch wheelbase, 184-inch over-all for the new luxury Daytona series, convertible and hardtop

(and same models in Regal series), and the Deluxe two-door sedan. The four-door sedans and wagons in Regal and Deluxe series are on a 113-inch wheelbase and measure 188 inches over-all. A new location for the spare tire increases trunk space.



**RAMBLER AMERICAN** A new die-cast grille of elegant simplicity alters the appearance of the Rambler American—and is the sole styling change for '62. The lineup consists of two and four-door sedans and wagons and bucket-seated convertible

(above). Engine option is the overhead-valve 125-hp. Six. The 90-hp. side-valve Six is standard on the Deluxe and Super models. Separate hydraulic master cylinders for front and rear brakes are a new safety feature which will be standard on all models for 1962.



**PONTIAC** Pontiac's '62 models include: a 120-inch-wheelbase Catalina, 211.6 inches over-all, and the Star Chief and Bonneville (right), 218 inches over-all on 123-inch wheelbase. A one-car series, the Grand Prix, is a two-door hardtop on Catalina chassis with special grille and 303-hp., 389-cu.-in. V8. Lubrication interval on all—35,000 miles.



## MERCURY

Mercury's '62 styling includes a new grille, and redesigned roof line extending four inches further over the windshield. Tail lamps are faired into the rear fenders, like rocket tubes. Wheelbase remains the same at 120 inches and the cushion-link suspension system, initiated last year, which permits wheels to give rearwards for greater

shock absorption, is continued in '62 models. Ball joints have been revised to take up wear while molybdenum disulfide grease is sealed into all suspension and steering lubrication points, allowing 30,000 miles of driving between grease jobs. Engine choices include 138-horsepower Six, and 175, 220 and 300-horsepower V8s.



**RAMBLER** Both Rambler Classic and Ambassador now share an identical unit-construction body on a 108-inch wheelbase. Formerly, Ambassador shared Classic's body, but on a 117-inch wheelbase. Classic has an aluminum-block, 127-hp. six-cylinder engine only. Ambas-

sador has a 250-hp. 327-cu.-in. V8. Both have same new front-end treatment, but are differently trimmed at the rear. New roof pan increases headroom. Manually operated air pump tilts right front seat. Last-minute change replaces side trim on prototype above with single aluminum band.





## OLDSMOBILE

Oldsmobile's new combustion chamber ups efficiency to six percent on its 394-cu.-in. engine. On the 88, with two-barrel carburetor, this engine develops 280 hp. On super 88

and 98, using four-barrel carburetor, it develops 330 hp. Front, rear and roof line of hardtops, are all changed. Starfire coupe and convertible have bucket seats.



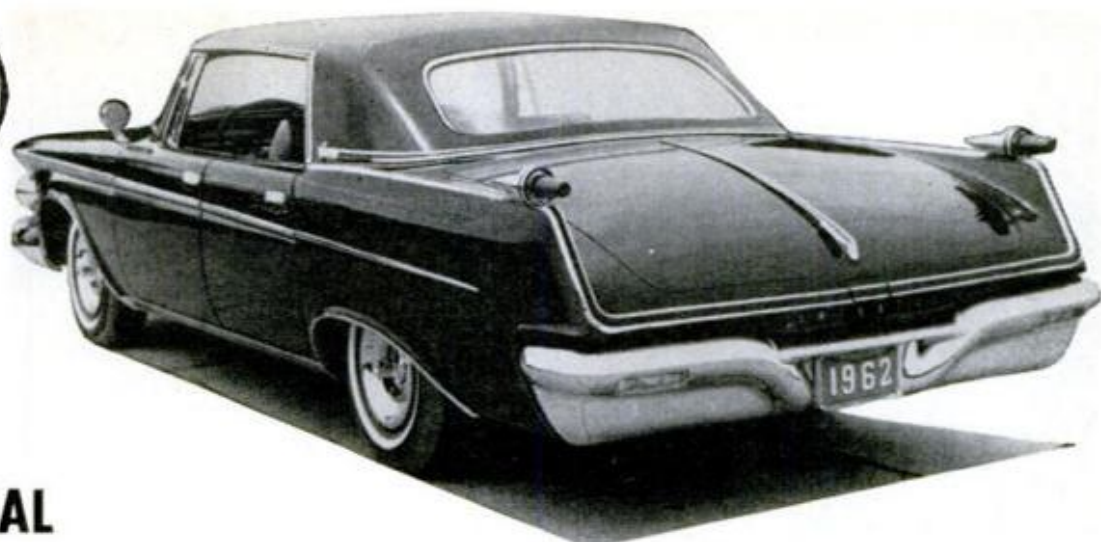
**BUICK** Extensive body-design changes on '62 Buicks includes hardtops with roofs patterned after the contours of a fabric convertible top. Wheelbases remain the same—123 for LeSabre and Invicta and 126 for the Electra. All share the same 401-cu.-in. engine which develops 280 hp. on LeSabre and, with four-barrel carburetor, 325 hp. on the Invicta and Electra. Roomy trunk of the Electra is shown on page 107.

**CHRYSLER** A "300" line with two and four-door hardtops and convertible on a 122-inch wheelbase, replaces the Windsor for 1962. Other models are the price-leading Newport 122-inch wheelbase and the New Yorker with 126-

inch wheelbase. The super-powered semi-sports "300 H" series will be a convertible and a hardtop on 122-inch wheelbase with leather-covered bucket seats for four. Fuse block for most circuits is conveniently located in the glove compartment (inset).







## IMPERIAL

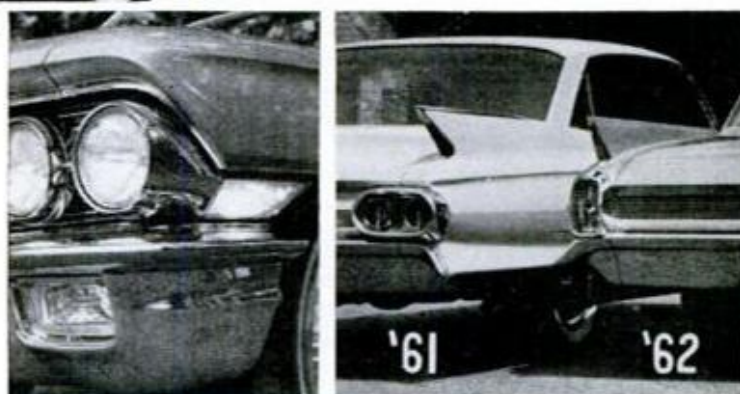
RESTYLING of roof and rear-quarter panels has produced a cleaner look. Radiator ornament (inset) is new. Biggest mechanical change is a new, more compact auto-

matic transmission, 60 pounds lighter than previous TorqueFlite. It permits lower front passenger-compartment tunnel. Chassis lube is needed once in 32,000 miles.



## CADILLAC

CONSIDERABLE refinement of line has given the '62 Cadillac a trimmer elegance. Fins are smaller (far right) as is the grille pattern. A novel cornering lamp above front bumper tips lights up (right) when wheels are turned and the headlamps are on. Braking has dual master cylinders for safety.



## LINCOLN

LINCOLN CONTINENTAL has a restyled grille on an unchanged unit body which gives the car a simpler, more attractive head-on appearance. There are two models: a four-door sedan and a four door convertible. Convertible top bows are new, giving a flatter roof line. Raised steering wheel gives more room in the driver's seat. Chassis lube lasts 32,000 miles.







**CORVETTE** Big news on the '62 Corvette is the larger version of the previous 283-cubic-inch engine. New power plant has bore and stroke of 4.00 x 3.25 inches, displacement of 327 cubic inches, compression ratio of 10.25 to 1 (or 11.25 to 1 for special camshaft). Fish-gill trim has been added to dummy slot on side panel. New engine enables Corvette to accelerate from 0-60 m.p.h. in 6 seconds.



**THUNDERBIRD** A newly contoured grille, bumper and headlamp housing area, plus new tail lamps has altered the appearance of the '62 Thunderbird which is available in hardtop and convertible models. Two front bucket seats and semibucket rear seat are arranged

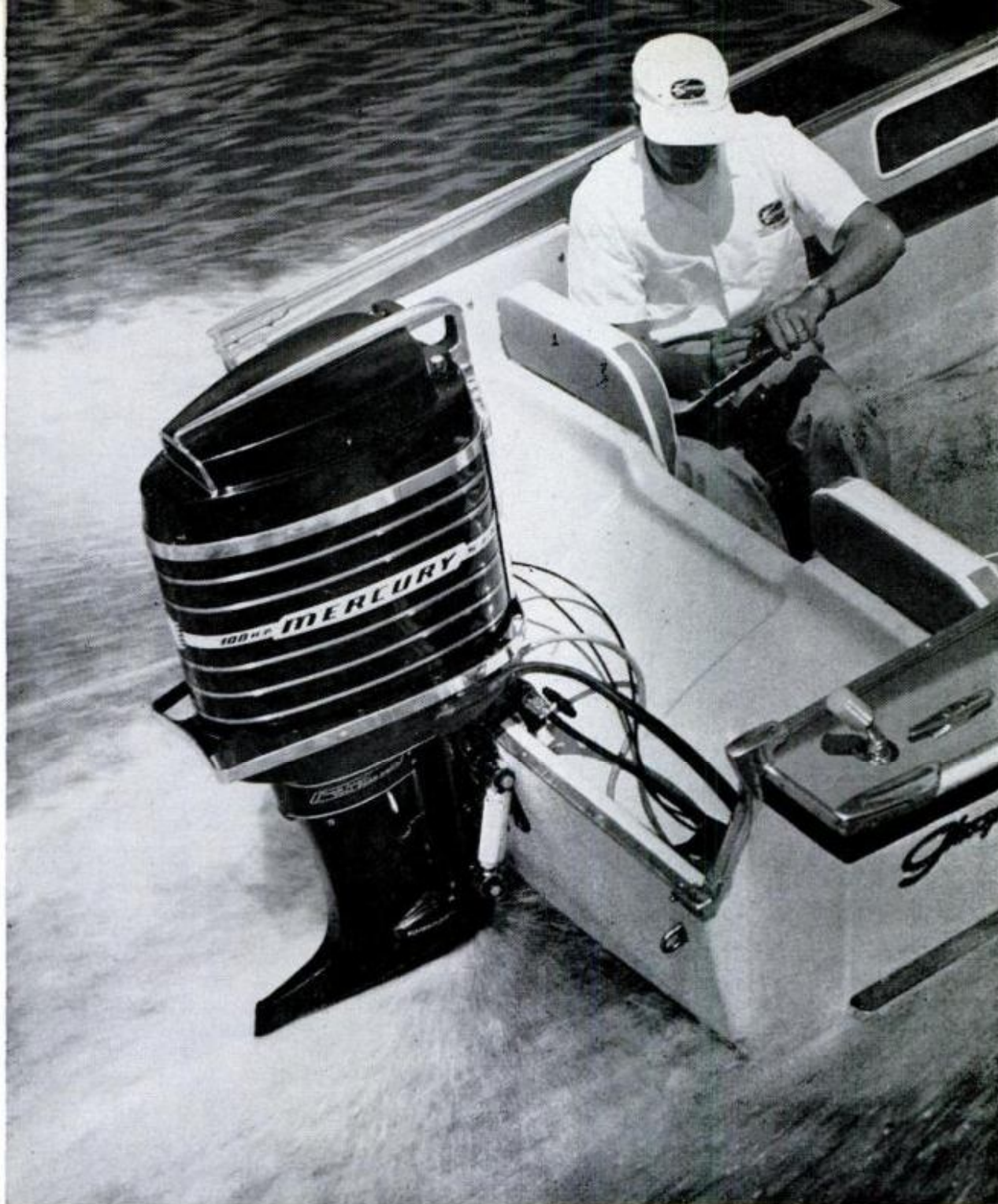
around a central console which holds the heater controls. Engine is Ford's 390-cubic-inch four-barrel V8 rated at 300 hp. New models added at last minute are Landau coupe with vinyl-covered top and Sports Roadster which has special cockpit cover that closes over entire rear seat area.

**HAWK** An entirely new appearance was created for the '62 Studebaker Hawk, known as the "Gran Turismo," but it's on unchanged 120-inch-wheel-base chassis and basic body shell. A new top with T-Birdish rear window and no

door posts has converted the Hawk from coupe to hardtop. Rear fenders have been de-finned and there's a new, finer-mesh grille and scoopless hood line. Interior has bucket seats and walnut-grained aircraft-type instrument panel (left below).







## Outboard Preview for '62

A HUNDRED HORSES, packed under the distinctive black hood of the new Merc 1000, lead the list of outboard motor developments for the 1962 season. The Kiekhaefer Corporation's line leader, while a 20-horse increase over last year's biggest motor, is no larger than the older 80-horse model though it is an entirely new motor. Stressing the same principle—more power without more bulk—is their other new motor, the Merc 110, a 9.8-horsepower fishing motor which weighs only 55 pounds. That's 30 big pounds lighter than any other 10-horse motor. Other Mercury motors round out the line at 85, 60, 50, 45, 25, and 6 horsepower.

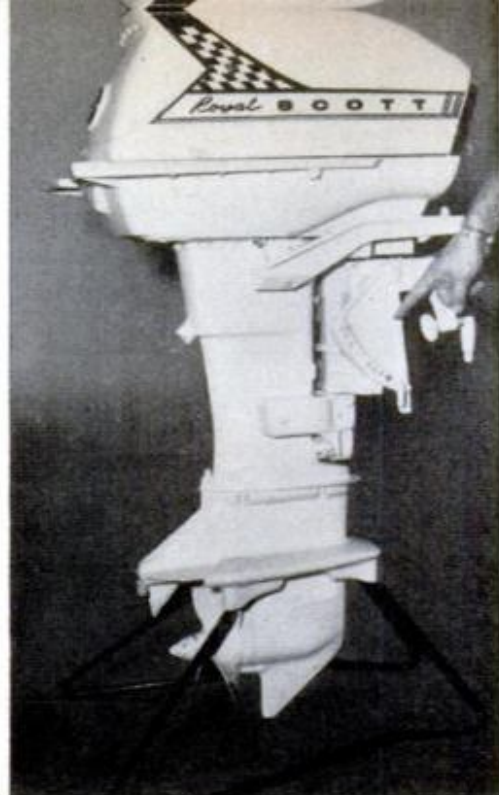
TURN THE PAGE FOR MORE '62 OUTBOARDS





**JOHNSON MOTORS'** big news items for '62 are an all-new 28-horsepower motor, bridging the gap between their existing 18 and 40-horse models, and a new single-lever Electromatic Drive control unit (inset) which connects to an electrically-powered automatic shifting system. Another new feature, available on the 75-horsepower models, is an electrically-powered motor lift, available also in kit form for previous 75-horsepower motors

**EVINRUDE MOTORS'** new remote control unit (inset below) is a push-button, single-lever outfit which gives instant shifting through all three positions without moving the throttle lever. You can set the throttle and punch forward and reverse for precision low-speed maneuvering. Also new is the 28-horse mid-range motor, below, big enough for skiing speeds, but small enough for cost and fuel economy—it's priced well under \$500



**SCOTT's** newest development (above) is an adjustable power tilt device which lets the operator lift the motor to a preset shallow-water angle with the push of a latch button. It's powered by the motor itself. Out of shallow water, a touch of the lever lets it return to its original position. It'll be standard on their 75.2 and 43.7-horse models. **WEST BEND** motors will remain the same for the '62 season, except for a boost in horsepower from 2 to 3½ on their smallest model, the "Shrimp." They'll be marketing their inboard-outdrive unit late this fall. **GALE** motors will remain the same, but with restyling of their line to match their 40 and 60-horse Sovereign motors





# **We asked a simple question...**

IN ALL THE MILLIONS of words written about our race with the Russians into space, we could find no direct answer to the most basic question of all:

**If** the Russians are using the same rocket fuels that we use, and **if** the size of their boosters is their only advantage, then why haven't we been able to simply scale up our smaller rocket within a relatively short time—months, instead of years?

We knew there was a logical answer to this question, but we also knew it had never been clearly explained to the citizens who must pay for the elaborate programs now underway. We asked the question of an expert. His reply opened a new field of inquiry

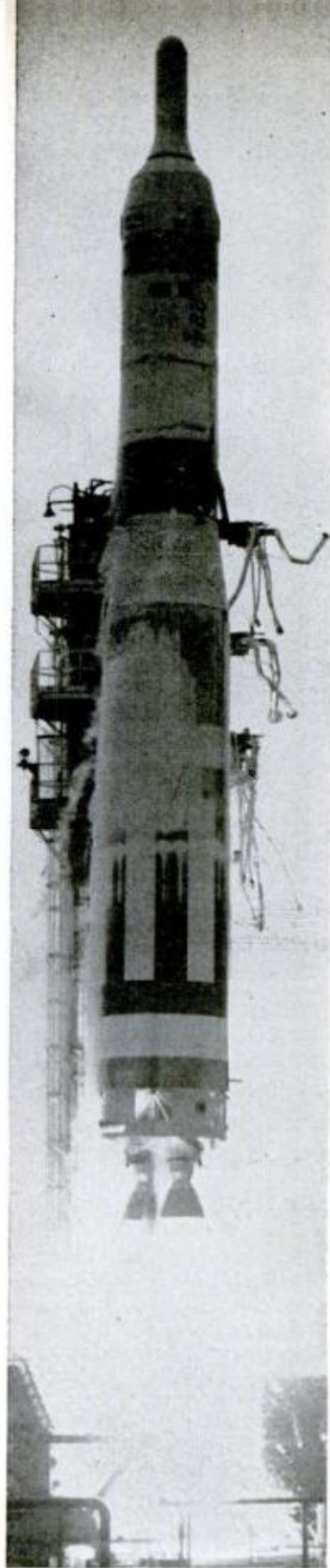
## **About Those Big Boosters**

that could best be answered by another authority. In unraveling the answer to a simple question, we found ourselves using one man's answer as a lever to learn more information from another authority.

We learned some surprising facts never before fully explained to the public—and unearthed some conflicting opinions about the race into space. One man says we're diluting our efforts by including everybody's pet project. Another gives us one big chance to leapfrog the Russians, a chance that may come very soon. Still another says we're building our rockets upside down!

On the following pages you'll meet the experts — and their answers.

# **...and received some startling answers...**







DR. JAMES B. EDSON, the Senior Civilian Missiles Advisor to the U. S. Army Intelligence

*"The Russians gather together in one team the best men available and charge them with a great responsibility. In the U.S., 50 firms each hire one of the best men and put him to work on a proposal for government consideration. This dilutes the effort greatly."*

(Interviews were conducted in Washington, D. C., by S. David Pursglove)

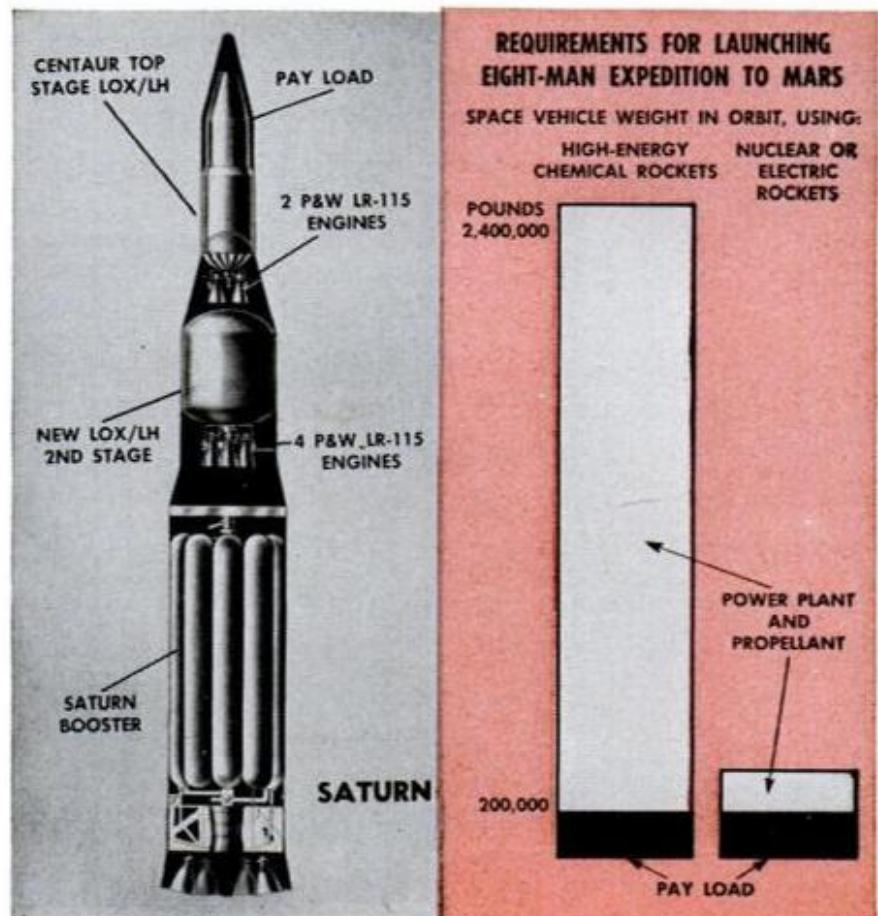
**Question:** *If size is the key to the Russians' successes, why can't we simply scale up our present boosters?*

**ESCHER:** You can scale up. But in doing so, you run into trouble. Besides the lead time needed to develop the bigger hardware (such as bigger pumps and tanks) you run into unknowns. For example, in bigger boosters, combustion instability, about which we know little, plays an important role. Combustion pressure oscillates and destroys the cooling capability and you burn out your engine in almost an instant. You have to solve this specific problem before you can successfully test each engine to give you the data for the next step in development.

*If we succeeded in scaling up our present rockets, would we "catch up"?*

**RITCHEY:** The Russians started out with two or three times the thrust we have now. If we scale up by a factor of three, they're going to scale up by a factor of three. They started ahead and are going to remain ahead in the large liquid-booster field.

**SATURN**, the first breakthrough into nonmilitary, big space boosters, will, in its first arrangement (shown right), develop 1,500,000 pounds of thrust — more than any present U.S.S.R. rocket. All three stages burn liquid oxygen and liquid hydrogen. Future models of Saturn, for encircling the moon, will develop 3,000,000 pounds of thrust. Chart, far right, shows the advantage that development of other fuels will give in weight and load capacity





*"We could have beaten them to an unmanned satellite by a year, to man in space by two years and we still might beat them to the moon, if we concentrate our resources and quit trying to serve up something for everyone."*

*What about solids?*

**RITCHEY:** Solids are easy to scale up, probably to thrusts that would give us a load-lifting capability at least 10 times what the Russians have.

*Do we know whether Russia's big boosters are liquids or solids?*

**RITCHEY:** So far as I know, they are using liquid boosters.

**ANFUSO:** Clustered liquids like our Saturn.

**ESCHER:** The present Russian hardware is most likely a logical extension of the work that was left off at Peenemunde in Germany at the end of World War II. We have at Huntsville the people who did the work. We know that they left in early development a potential single-thrust chamber, 440,000-pound-thrust engine. If you consider a switch from the German alcohol and water propellant combination to the present kerosene and liquid oxygen combination that we and probably the Russians have been using—you can envision a powerful liquid propellant booster.

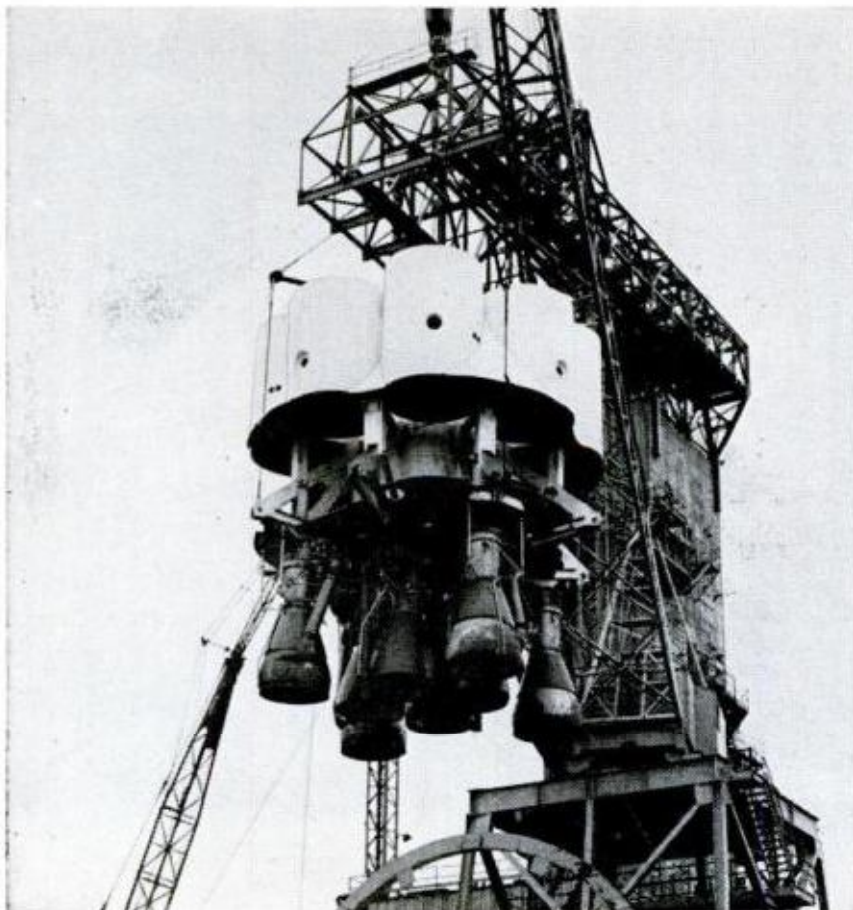
*Is Atlas our major space booster right now?*

**RANDALL:** Correct. Used as a space project booster, it develops about 368,000 pounds of thrust.

*The Russian booster used for the Gagarin and Titov*



**MAJ. GEN. JOHN B. MEDARIS,** formerly the commander of the U. S. Army Missile Command



**EIGHT CHAMBERS,** each channeling 188,000 pounds of thrust, form the H-1 Saturn booster, basic power unit for the U.S.'s next step beyond military missiles into space. This engine, a precursor to a more powerful basic booster for the Saturn, was tested and redesigned every inch of the way. It is hoped this technique—of proving out components—will allow the U.S. to get ahead of Russia in space race. Russia does not prove out all parts thoroughly as we do





**CONGRESSMAN V. L. ANFUSO,** (N.Y.), Senior Member, Committee on Science and Astronautics

*"We'll never catch up with liquids. They're too far ahead. We can only do it with solids, where we're ahead in the state of the art. We can pass them."*

orbital shot each developed about 800,000 pounds of thrust?

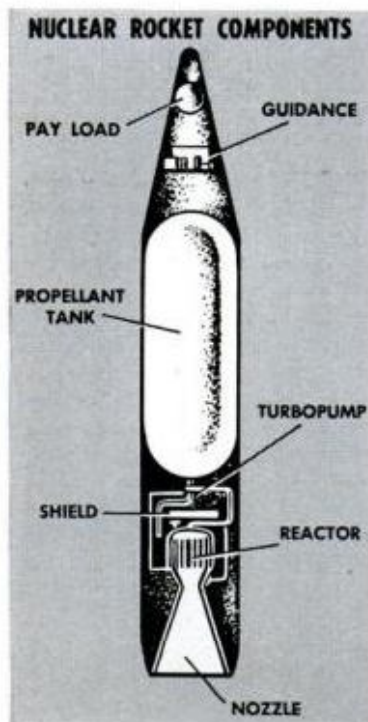
**ESCHER:** The rocket the Germans left at Peenemunde develops around 440,000 pounds. You can envision two of these rockets developing 800,000 pounds of thrust. Our Titan rocket uses a pair of engines in this way.

*If the Germans were developing a 440,000-pound-thrust engine, why haven't we—using the same German scientists—been able to reach this thrust in 16 years, while the Russians may have doubled it?*

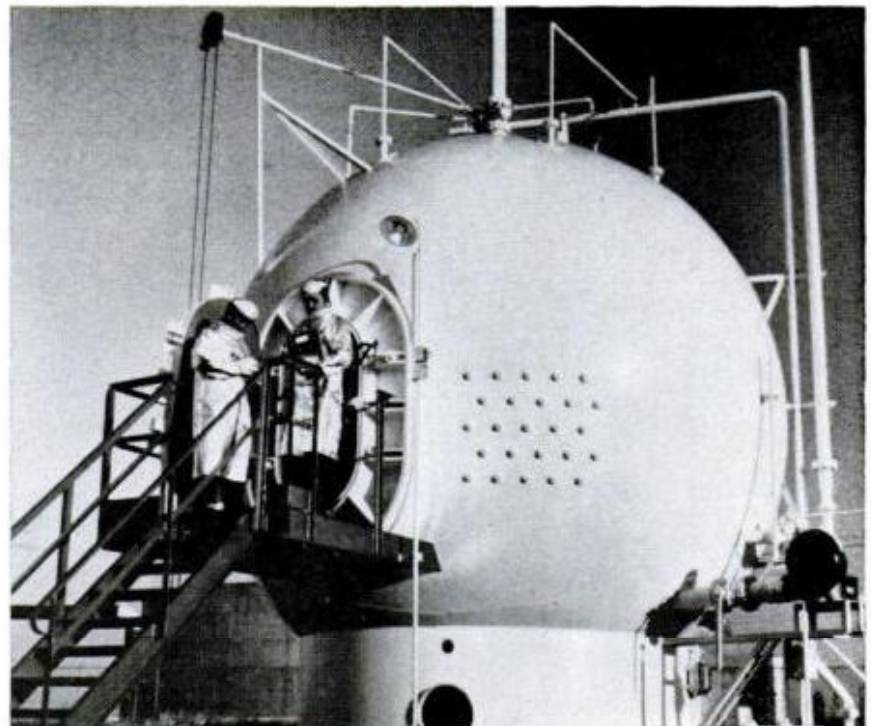
**ESCHER:** The Russians immediately started following through on the Peenemunde work. We did not. The only modern rocket being fired in this country in the late 40s was the Viking—a 20,000-pound-thrust vehicle. In 1954-55, the Russians were reportedly testing a 264,000-pound kerosene-liquid oxygen engine. We were still working with the 75,000-pound Redstone. The Russian government officially required a large rocket long before our government did. Here, nobody was willing to foot the bill for a big project until we got a "requirement."

**RANDALL:** We did a lot of planning on a large rocket engine after World War II and prior to 1954, but it did not seem practical to develop the large engines necessary to carry the large, heavy warheads of that time.

**MEDARIS:** We failed to recognize that the conquest of space provided a great natural gimmick for international advertising of our abilities.



**NUCLEAR ROCKET** may be a workhorse in space in a decade



**SOLID FUELS** developed at Esso Research Co. get a first firing, in two-pound batches, in this sphere which is lined with a heavy steel mesh



*"There are no fundamental problems in scaling up solids almost indefinitely, probably to thrusts that would give us a load-lifting capability at least 10 times what the Russians have."*

*Then it's not a matter of Russia's German scientists being better than our German scientists?*

**EDSON:** There should be no mistake. We got the better scientists—the professionals; they got the technicians.

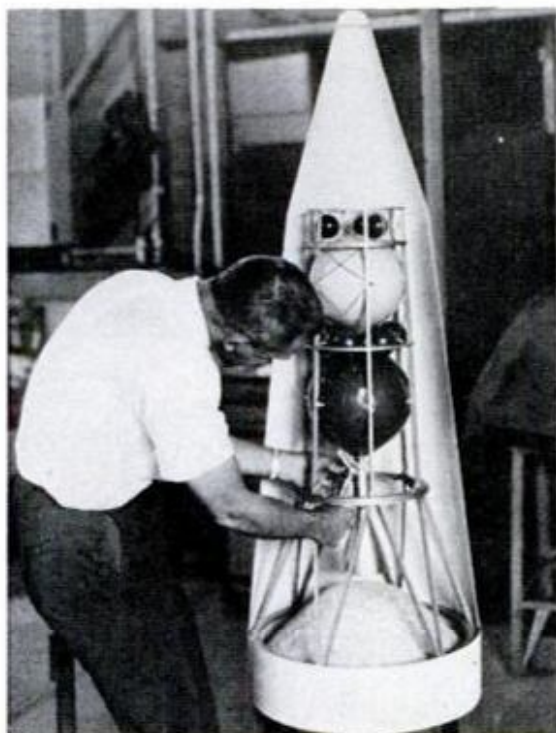
*Can we get going faster by moving into solid propellants?*

**ESCHER:** The solid potential is indeed real, but I think it tends to be a little over-sold by solid propellant developers. The propulsion package is only part of any rocket story. You can talk about "big bottles," that you bolt together and you've got yourself a big rocket and it's not that simple. Look at our Minuteman—it has three solid rockets, one by Thiokol, one by Hercules and one by Aerojet. Now, if that's all there is to a missile, why did Boeing spend so much time and money integrating this into a working vehicle? There are control systems, auxiliary systems, structural problems and ground support factors. Add all these problems and you come up with something as big as developing a liquid rocket and solving its problems.

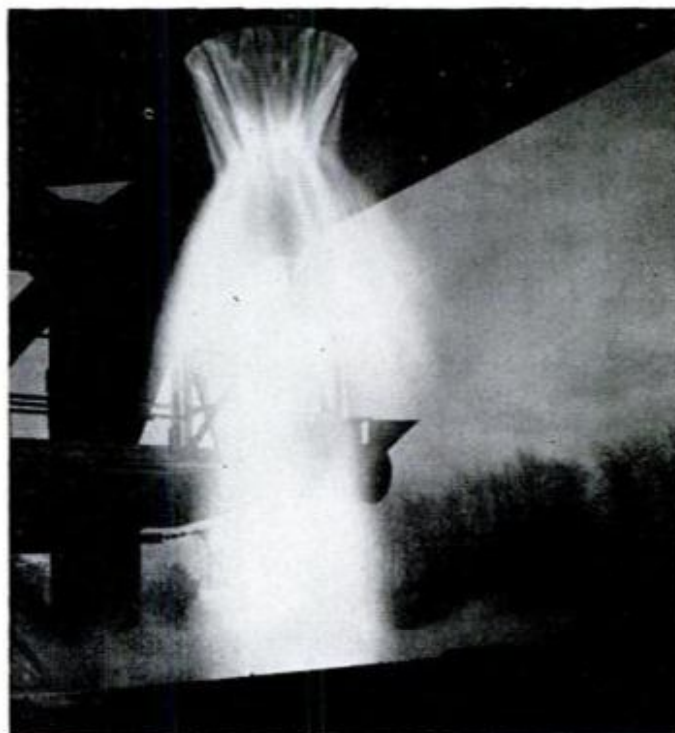
**RITCHEY:** Basically, while you might encounter some garden variety engineering problems such as transportation, there are no fundamental problems involved in scaling up solids almost indefinitely to thrusts much higher than any we are getting today. Solid propellants with high thrust-to-weight ratio should be used as big boosters for takeoff. Liquids, with a higher specific impulse but with lower thrust-to-weight ratio, can work very effectively as you get far-



**DR. HAROLD W. RITCHEY** of Thiokol Chemical Corp.; president of the American Rocket Society



**NEW DESIGN:** Jet Propulsion Lab built this model of a liquid fuel rocket for test by NASA



**NEW SHAPE:** GE says its funnel-shaped engine can be scaled to high thrust levels. Most engines are bell shaped



*"There comes a point in time as the enemy builds his striking capability that there is not so much a change in system as there is a change in concept."*

ther out. Presently, we seem to be building our space vehicles upside down—putting the liquids on the bottom and the solids on top—because we had the big liquids to begin with and know how to ignite solids in the upper stages. We need to learn how to use liquids as upper stages, to start them and separate them into stages; and we need to learn how to build big solids for the lower portions of our space vehicles.

What do "higher specific impulse" and "lower thrust-to-weight" really mean?

ESCHER: Specific impulse is a direct measure of the exhaust velocity—the amount of thrust received for the amount of propellant used per second. Some people look at it as sort of a measure of fuel economy. Thrust-to-weight ratio is a measure of the amount of thrust—oomph, if you wish—that you get from a rocket compared with its weight. It's the lift-off thrust in pounds divided by the lift-off weight of the vehicle. When we set up a rocket on a computer and look at what we should do to improve it, the computer invariably calls for a lower thrust-to-weight ratio. Why is this? Well, in increasing the ratio, you are just adding fuel. If increasing thrust means adding weight, you had better look at it again.

How would the weights of comparably sized liquid and solid boosters compare?

ESCHER: The solid would outweigh the same size liquid booster because of greater fuel density, not because of a lot of "air space" inside the liquid frame as is often assumed. Probably the liquid rocket uses interior space more efficiently—you must not forget that a large part of the solid engine is a large burning hole running the length of the engine.

How would you compare solids and liquids as to power?

ESCHER: Theoretically, you can make either as powerful as you wish—up to certain natural limits that aren't involved here. A major advantage of liquids right now is their higher performance as measured by specific impulse. Present solids offer 220-240 seconds. RP (modified kerosene) and liquid oxygen gives 250 seconds. Newer liquids such as hydrogen and oxygen give 350 seconds. However, there may come a breakthrough in solids that will increase their performance. The chief disadvantage of liquids is the complexity of their use—the complicated rockets with piping, pumps, meters, valves, tanks and so forth. Solids, of course, are very simple.

RITCHEY: Solid propellant rockets with a specific impulse of 250 seconds can develop thrust-to-weight ratios of over 100, if required.

(Continued to page 252)

*"We lacked a requirement to extend the German work and build a large rocket; the Russian scientists had such a requirement from their government."*



MAJ. RICHARD C. RANDALL,  
Asst. Chief, Ballistic Missiles Div.,  
Air Force Systems Command

WILLIAM J. D. ESCHER, Technical  
advisor to the National Aeronautics  
and Space Administration







# SCIENCE OVERSEAS

By William Kreh

**Boxing is bad** for the brain, conclude researchers who studied 50 boxers from Ceylon. Thirty, including some who had boxed in the Olympics, had disordered activity in their brain waves, as measured by the electroencephalograph. Further, 17 gave a history of at least one knockout; 6 complained of persistent headaches, and 11 showed loss or impairment of memory.

**Ever drive forward while looking backward?** East German scientist Manfred von Ardenne proposes that we all do—in cars equipped with some unusual safety devices he's developed.

Basic feature of his accidentproof car is a spongelike, easy-breaking plastic. A four-inch layer would fit between body and upholstery; two layers would be placed between the passengers' backs (they would ride backward) and front of car. The driver, also facing backward, would study the road on a 210-degree-angle TV screen; an infrared filter on the camera would help him see through fog. If the car hit anything, layers of the plastic would automatically shoot up between passengers and windows.

"If you hit something hard it will crumble," says von Ardenne. "Then all you have to do is to replace the plastic, which is cheap." A car so equipped, he says, could be driven against a brick wall at 60 miles per hour without danger to occupants.

**Russian rumor:** There are recurring reports that the USSR has developed a "phantom warplane," presumably a nuclear bomber, which can cruise for 90 days nonstop at 2500 miles per hour.

**Roadside aircraft service stations?** The French have selected more than 150 sites for them near large cities. They will provide fuel and mechanical services, and will be places where businessmen can park their planes and switch to automobiles for local travel.

**Mosquitoes died for love** in Canada this summer. Health inspector Norman Whitaker, of Pembroke, Ontario, lured male mosquitoes to their deaths by enticing them to enter a fog of poisonous spray. The bait was a recording of a female's mating call.

Whitaker got the call by putting a male and female in a cage backed with speakers

and amplifiers, and amplifying the female's sound.

**The British** are considering making railroad coaches out of plastic. They would cost 60 percent more than steel ones initially, but the transport commission says the savings in fuel and maintenance would more than make up for it.

**Contrary to some theories**, many animals are not color blind, says Dr. Gerti Duecker, a zoologist at Muenster University, West Germany. Her studies show that the horse, stag, sheep, and giraffe can perceive colors.

Most apes and monkeys, she says, resemble man in their ability to see colors, the baboon being especially perceptive. Some monkeys are weak on red, but the chimpanzee can distinguish all colors man can.

Dr. Duecker is not sure about cats and dogs. **They** may be color blind.

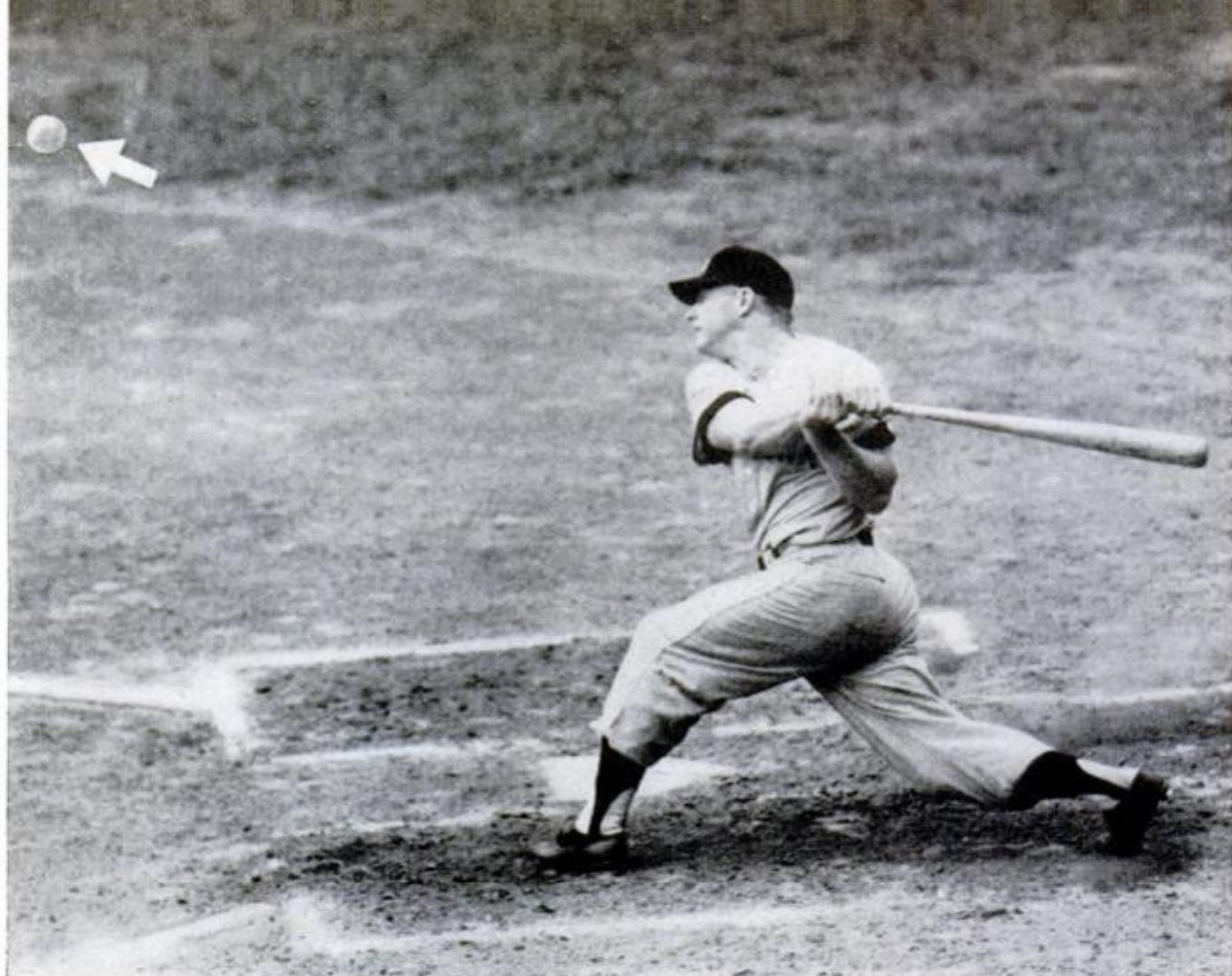
**A 1680-ton freighter** has voyaged from Clyde, Scotland, to Lake Victoria, East Africa, inside 1500 packing crates. The motorship Victoria, a twin-engined diesel that carries 500 passengers and 225 tons of cargo was built at Clyde, then taken apart and crated. Parts of the ship were numbered and colored—green for starboard, red for port—to help workman assemble the floating jigsaw puzzle.

**Rockets for export** are manufactured by the Japanese. The Argentine government reportedly is interested in buying five two-stage rockets, developed at the University of Tokyo, to be used for recording atmospheric pressures, temperatures, winds, sun rays and other phenomena of the upper atmosphere. Sales price for five rockets: \$19,000,000.

**How do you rip up** a street outside a hospital without disturbing the patients? Here's how they did it in London beside St. George's hospital.

Two workmen quietly bored two 14-inch holes in the pavement and inserted in each a six-ounce charge of dynamite. They covered the holes with thick rubber blankets, and laid on heavy planks. The charge was touched off. There was a muffled "thwunk," the pavement cracked, and boards flew. Not a single patient complained.



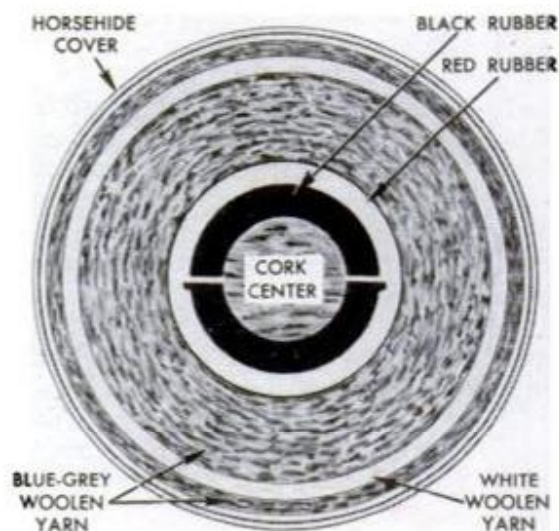
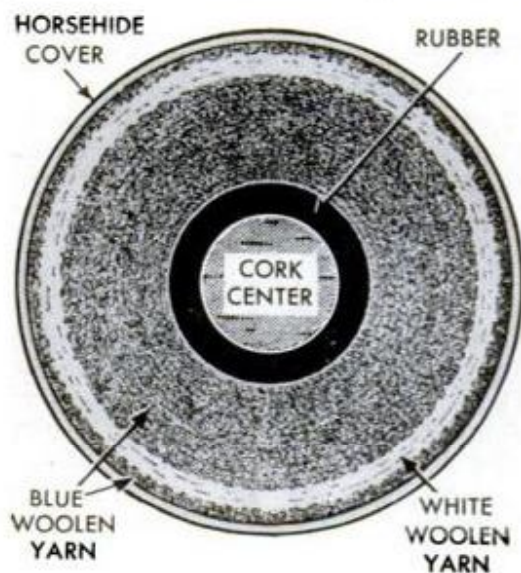


YANKEES' MICKEY MANTLE, swinging for the fence. Does a lively baseball make it easier for him?

# Has the Baseball

1911-1925 major league baseball featured a cork core inside a single layer of rubber. The blue-grey Australian wool yarn was adopted beginning in 1921

1926-1961 ball shows "cushioned cork" center — a double rubber layer which helps keep cork round; layer of cotton yarn was added under horsehide cover







**1930** Reach ball, cut the same way, showed the same layered structure. Cork core seemed denser; double rubber layers less uniform. White wool yarn had some rubber cement; none evident in other balls. Core of this ball was somewhat deformed out of round. It could not be established whether it had ever been hit or not, though it seemed unlikely that any blow would have jarred the entire core out of shape

**1961** Reach (American League) ball, sliced on bandsaw in PM shop, matches official diagram nicely; layers of cork, rubber, yarn and horsehide can be easily seen. Black streak running diagonally through both cut balls were caused by the saw blade going through the black rubber layer. After cutting, tension began pushing windings out of cover; within a few hours they had pushed the core out about half an inch

# Really Been Changed?

## Part I of a PM Test Report on the "Rabbit Baseball"

**T**HE MIDSUMMER MEETING of the National Base-Ball League made a thorough study of "the excessively heavy batting of the last few years, and of the present season particularly, and the exact status of the so-called 'lively ball'."

The manufacturer of the league baseball testified, and a Columbia University scientist reported on tests and analyses of new and old balls. They convinced the league officials that there had been no significant change that would account for the surge in players' hitting.

Sound familiar? Sure. You've been reading similar copy all summer. But that meeting didn't take place this year.

*It was held in the summer of 1925.*

The "rabbit baseball" controversy is one of the oldest in the history of sports. And this year, with Roger Maris and Mickey

Mantle hitting home runs in tandem for the Yankees and, at this writing, looking almost certain to break Babe Ruth's record of 60 home runs in a season, the argument is on again, hotter than ever: Are today's hitters swinging at a livelier baseball than The Babe hit back in 1927 when he set his record? Has the ball been "juiced up" for more and longer hits?

Every time the hitters have a good year and a Jimmy Foxx or Hank Greenberg or Hack Wilson—or somebody—threatens to hit more than 60, players and managers and hot-stove-league experts line up to explain to the press that the ball is livelier, and therefore easier to loft out of the park. By midsummer of this year, such distinguished baseball people as Dizzy Dean, Al Lopez, manager of the Chicago White Sox, and George Selkirk, former Yankee and



**Material Weights From Three Major League Balls**

Component material	1961 wt.	1930 wt.	1927 wt.
Horsehide	16.05 g	18.23 g	15.27 g
Cotton yarn	6.03	6.46	5.72
Outer grey wool	19.10	15.80	88.85
White wool	19.21	20.94	None
Inner grey wool	57.15	63.79	None
Red rubber	12.89	10.42	8.89
Black rubber	10.07	11.68	11.64
Cork	3.46	1.92	5.93
Total weight:	143.96 g	149.24 g	136.30 g
Total wt., oz.	5.0386	5.2234	4.7705

Ruth teammate, have come forward with that explanation.

And 1961 looks like a real vintage year for the home run. It seems likely that the 1960 mark of 2127 homers for the season will go by the board. In 1925, when the National League became alarmed at "the excessively heavy hitting," there were only 1267 round-trippers, and Babe Ruth, having a bad year, only hit 25. (He picked up to 47 the next year, hitting the new cushioned-cork-center ball, then in 1927 hit his 60, starting the rabbit ball arguments all over again.) The 1961 season appears to be a record-breaker for the arguments, too.

The editors of *Popular Mechanics*, having always enjoyed a reputation for doing things instead of talking about them, have launched a program of scientific tests which we hope may settle that argument once and for all. We have gathered baseballs from several periods of baseball history, with permission from the owners to perform sur-

**WEIGHING** a measured length of cotton yarn on an analytical balance, Armour Research technician checks weight and length of yarn used in ball



**Component Material Tensile Tests**

	1961 ball	1930 ball	1927 ball
Cotton Yarn			
Elasticity (in.)	.069	.055	.073
Breaking strength (lbs.)	1.18	.82	2.53
Outer Grey Wool Yarn			
Elasticity (in.)	.26	.15	.178
Breaking strength (lbs.)	4.53	4.04	3.17
White Wool Yarn			
Elasticity (in.)	.33	.14	None
Breaking strength (lbs.)	7.56	4.84	None
Inner Grey Wool Yarn			
Elasticity (in.)	.37	.22	None
Breaking strength (lbs.)	5.52	7.72	None

gery if necessary. We have requested the best—and most independent—research facility we know—Armour Research Foundation at Illinois Institute of Technology—to make the study so we can report the findings to you.

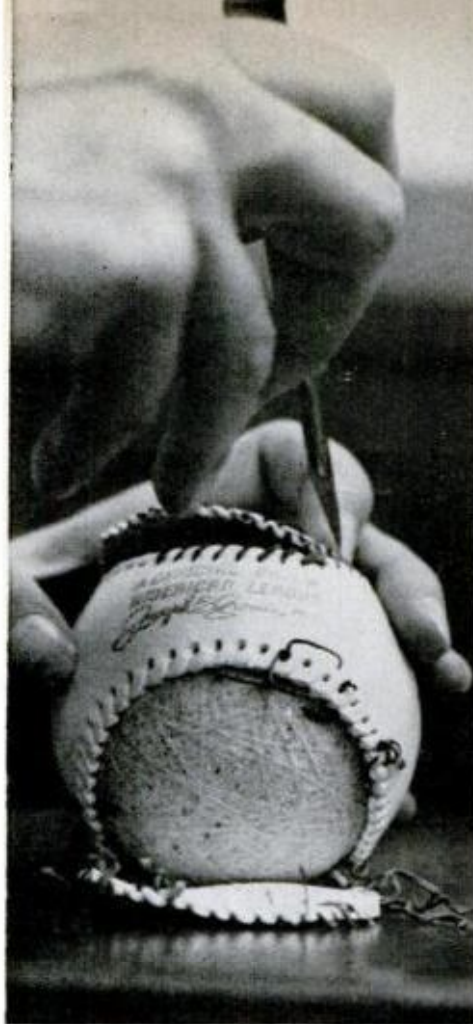
A few of the preliminary analyses are already in. They definitely show marked differences in the component materials in three of our samples — authentic major league game balls from 1927, 1930 and 1961 (see tables). This, in spite of the fact that all of these balls are supposed to be made the same.

The main purpose of these early tests was to determine whether the normal aging of a baseball over the years would produce such chemical deterioration in its materials that there would be no point in testing its physical properties — what it would do when it was hit — against those of a new baseball. In the opinion of Dr. Caroline Miller, research chemist with Armour Re-

**DR. CAROLINE MILLER**, ARF research chemist, checks chemical structure of component parts of ball, using infra-red microscope for analysis of samples







1961 Reach ball goes under the knife as a research technician begins dissection by cutting thread



DR. MILLER and an assistant set up for a test of the breaking strength of winding fibers. Test, on the "Instron," will show the relative strength of fibers taken from both old and new baseballs

search Foundation, who conducted the tests, the deterioration of materials in the sample balls was not so severe as to make physical testing meaningless. Dr. Miller is an expert on aging effects in polymers. Here are a few observations from the preliminary tests—all that could be completed in time for this issue.

The 1927 ball tested was quite different from the 1930 and 1961 balls. It weighed almost a quarter ounce less than the officially specified five-ounce minimum weight. The cork composition core was much heavier and more dense than that of the 1961 ball, and was more impregnated with a rubber-like material. Later tests may indicate whether this effects the ball's "liveliness."

The black rubber layer over the core had no characteristic red "washer" between the halves, and the red rubber layer had been molded from two halves of markedly different color.

The wool yarn inside the 1927 ball was a coarse, very dark-blue-grey, two-ply yarn, all one grade from the core to the cotton. In spite of its age, the cotton yarn in the 1927 ball was slightly more elastic and had a greater breaking strength than that in either the 1930 or 1961 balls.

The 1930 ball also showed a difference in the cork core—it was lighter, smaller and less flexible than either the 1927 or 1961 cores, less round than either, and the composition seemed to be made up of much smaller cork particles.

The 1930 black rubber layer was thicker than that of the 1961 ball, making up for the smaller size of the cork core. The outer, red, rubber layer showed substantial oxidation and deep marks from the windings permanently set into the rubber.

The white wool yarn layer in the 1930 ball was impregnated with a resinous material which Dr. Miller believed could be an aged version of the same rubber latex cement used on the cotton yarn. The white wool layer held together like a little half shell when the ball was pulled apart after sawing. No rubber cement was found in any other wool layer in the other balls, and none has apparently ever been specified. The blue-grey wool in the 1930 sample was coarser and heavier in appearance than in its 1961 counterpart; the inner wool yarn showed almost  $2\frac{1}{4}$  pounds more breaking strength than the 1961 yarn.

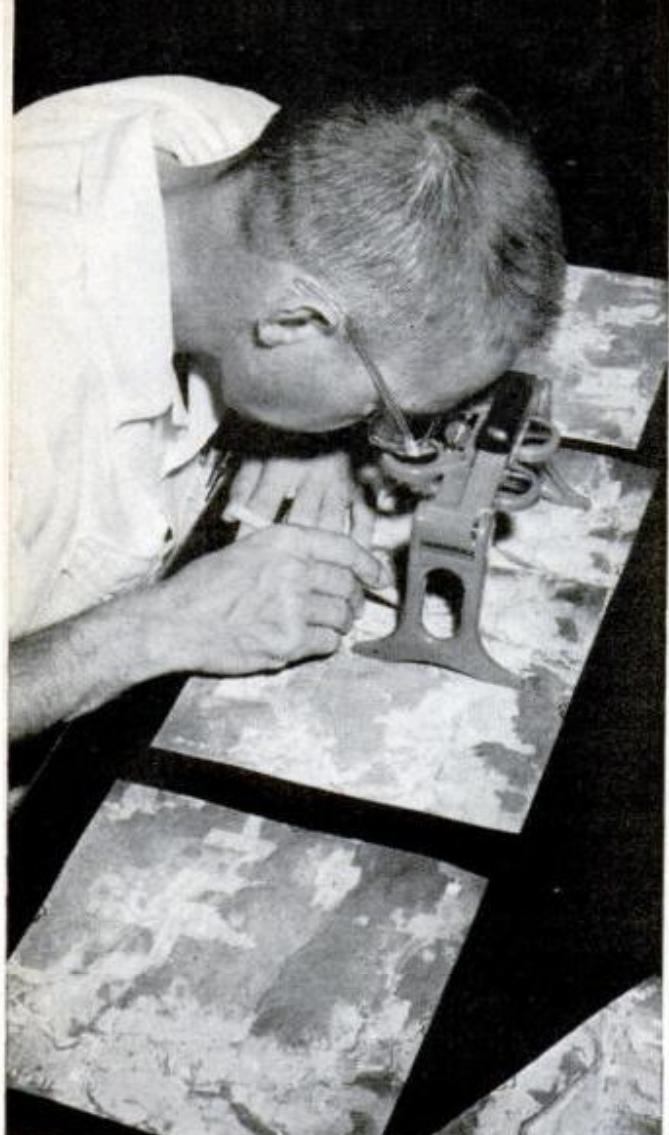
The elongation-at-break measurements indicate a substantial "relaxation" of the

(Continued to page 264)



# Science Digs Up a Treasure Map

By Bernhard A. Roth

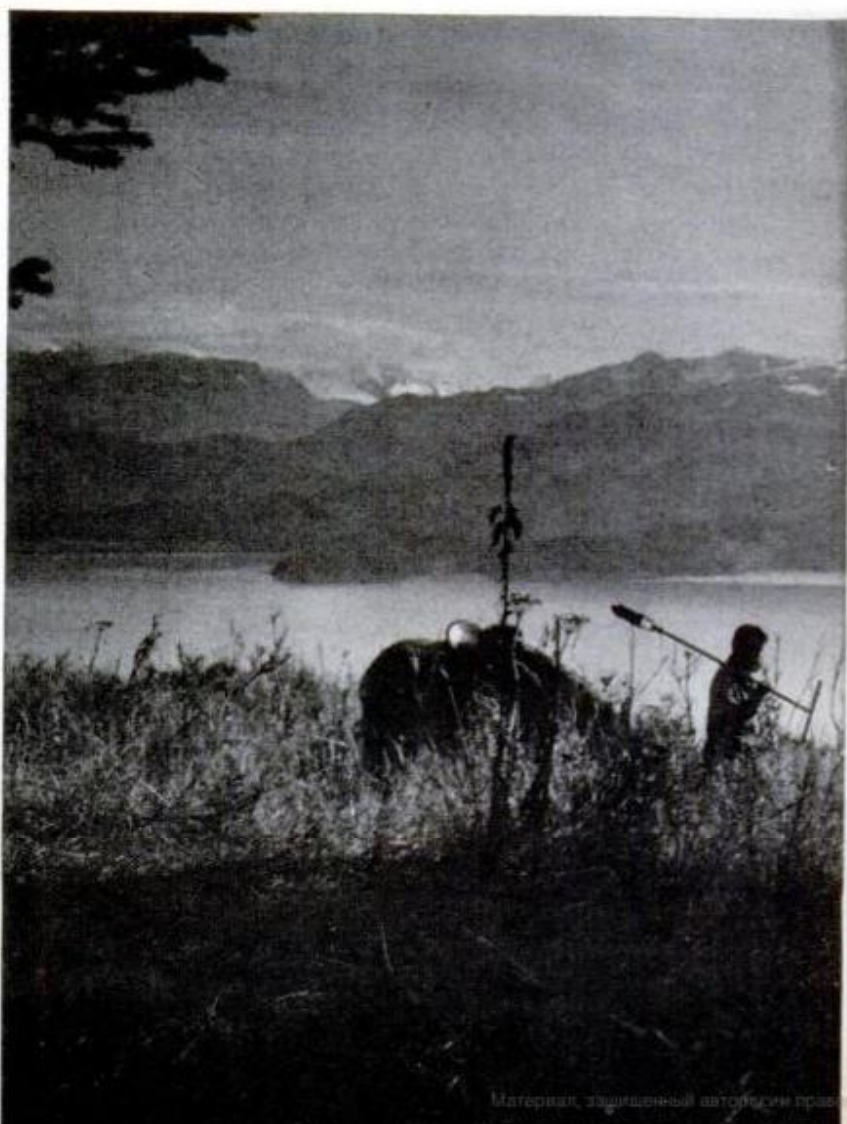


**AERIAL PHOTOS**, under stereoscope, show rock outcroppings, land contours and vegetation

**MAGNIFIER** reveals structure of the soil—a factor in determining the best potential use of the area



**PACK TRAIN** on Alaskan soils survey crosses hills above Kachemack Bay on Kenai Peninsula





**A** VERMONT ROAD CONTRACTOR, in need of road-building materials, asked the Soil Conservation Service about sources of earth fill.

Scanning his maps, the local SCS man quickly located a good gravel bed 12 miles nearer the construction site than anything the contractor knew about. The information on the map led to a profit of \$7000 for the farmer who owned the land, saved the contractor a long haul—and the digging improved the channel of a nearby stream so that it no longer overflowed during flood season.

Another example of the earth's "merchandise" that is traceable by soils maps is glauconite, an almost-pure form of fertilizer. Deposits found along the Atlantic coastal plain are being marketed now for \$25 a ton. Surveys show that there are layers hundreds of feet thick in the Chesapeake Bay area.

These are just two of scores of instances in which soil maps—compiled from samples dug from the earth—have proved to be real "treasure maps." Airport builders, housing developers, factory builders, city planners, fossil collectors, archeologists, farmers—all have profitably used soils reports.

Sometimes, though, the soil scientist is consulted too late.

A New England soil surveyor, Louis Dondero, was checking earth profiles in a series of holes along a newly built roadway. When the contractor asked what he was doing, Dondero explained that he was completing an earlier survey of the area.

"You mean you know where gravel is located along here?" exclaimed the contractor.

"Certainly," said Dondero, "here's a map I made five years ago."

The contractor spluttered. He had wasted several days having the area probed with a costly, powered back-hoe.

Already more than a third of the nation's two billion acres of land have been spaded and augered—and the results traced onto aerial photos which are compiled into soil maps.

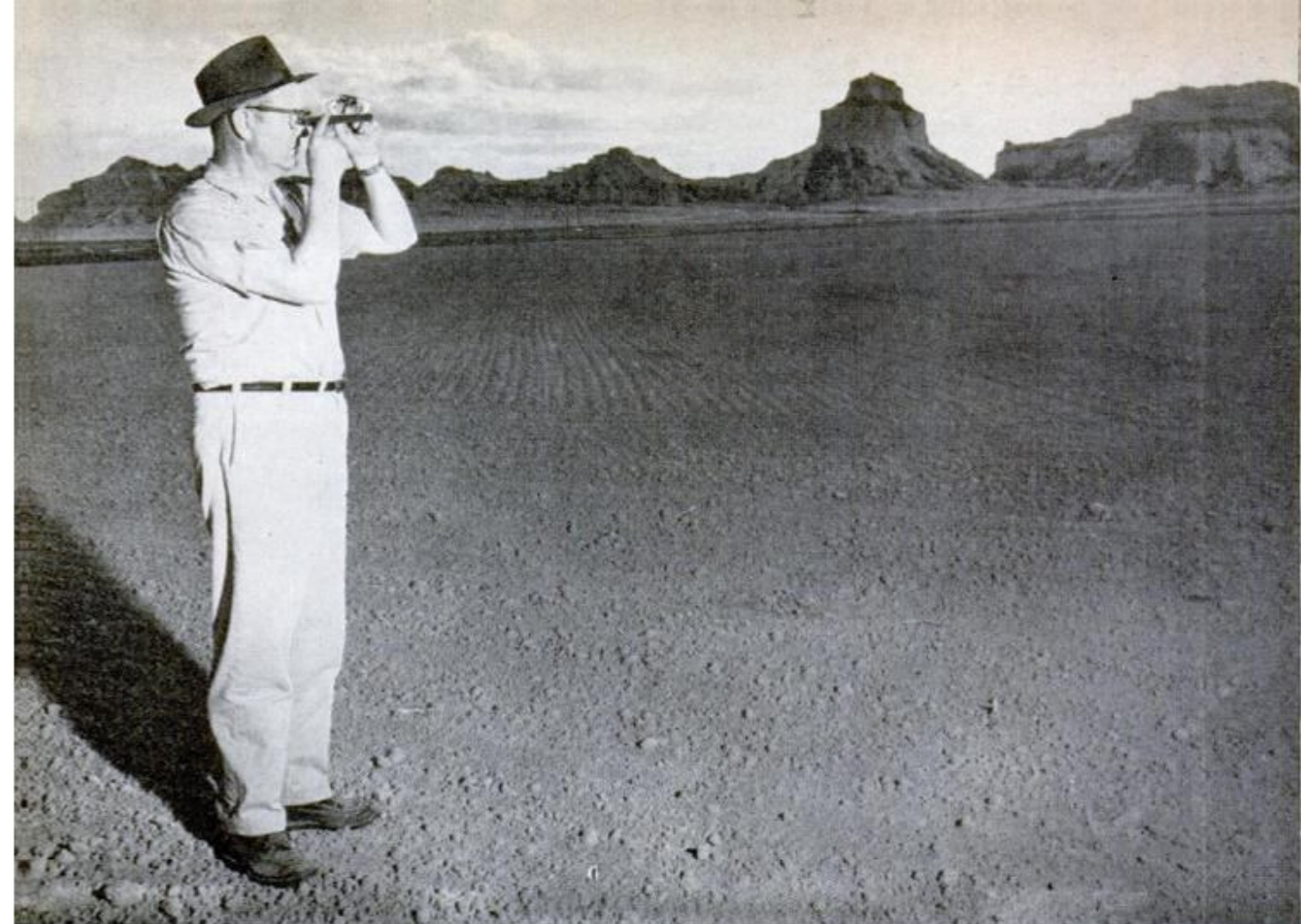
Samples collected by the hardy soil scientists are classified as to color, depth, stoniness, texture, moisture content, area, odor and sometimes taste. Pieced together, these tiny parts will some day give a complete portrait of the soil resources of the U.S.

People, it seems, are universally suspicious of any stranger seen digging—and this is where soil-scientists' diplomacy is most often needed.

One such diplomatic incident occurred in the career of Constantin Nikiforoff. The scientist is of Russian origin and sports a







**HAND LEVEL** enables soil scientist to measure the percent of slope in a field in Scotts Bluff County, Neb. Dome rock in the background was a landmark for thousands of early travelers crossing the country. Below, "cliff" left when construction crews excavated for roadway enables scientist to study rock layers in Wyoming. Such exposures of rock give soils men clues to the genesis of soils in various areas of the country







**BULK DENSITY** samples show the difference in compaction between methods of small-grain seedbed preparation. Below, metal frame is fitted around an exposed soil profile face preparatory to its removal



needle-pointed moustache. To catch up on his survey of the Oregon Palouse country, he ventured forth one Sunday. While he dug a six-foot pit, his wife dozed in the family car some distance away.

Oregon townsfolk on their way to church took in the scene with a gasp. Constantin had finished studying the soil profile and was filling in a last shovelful of earth when the armed posse arrived. Constantin tried to explain. He was advised to shut up and start digging. And dig, feverishly, he did. When the full six feet of earth were exposed, Nikiforoff hoped they were satisfied.

"No, we're not!" growled his guards. "Show us where that little hole goes." They pointed to an exploratory auger hole the scientist had made at the bottom of the pit. Warily, Constantin dug down another three feet. Then, only, did the posse relax, grunt their apologies, and leave him to refill his diggings for the second time.

Being suspected of stealthy grave digging is only one of a long string of misidentifications that soils men often cope with.

Surveyor Tom Longwell was traversing the mountain moonshine section of Tennessee. He spotted a small field on an aerial photo, took a compass bearing, and headed up a steep draw. Halfway up, he was confronted by a grizzled native cradling a rifle in his arms.

"Whar d'yuh think yuh goin'?"

Longwell gulped. "Why--er--to the field up yonder, so's I can look at the soil type."

"What if yuh don't go up thar?"

"Well, the inspectors might go up there and find a mistake in my mapping."

"Young feller," returned the mountaineer, "just don't bother to go up thar, and I'll keep the inspectors out, too."

Soils men grow hardened to being taken for powerline post-hole diggers, foreign saboteurs in wartime, highway right-of-way engineers and just plain interlopers.

Why the work of soil scientists is so little known is best explained by officials of the U. S. Department of Agriculture's technical agency, the Soil Conservation Service. SCS has charge of the survey and employs most soil scientists.

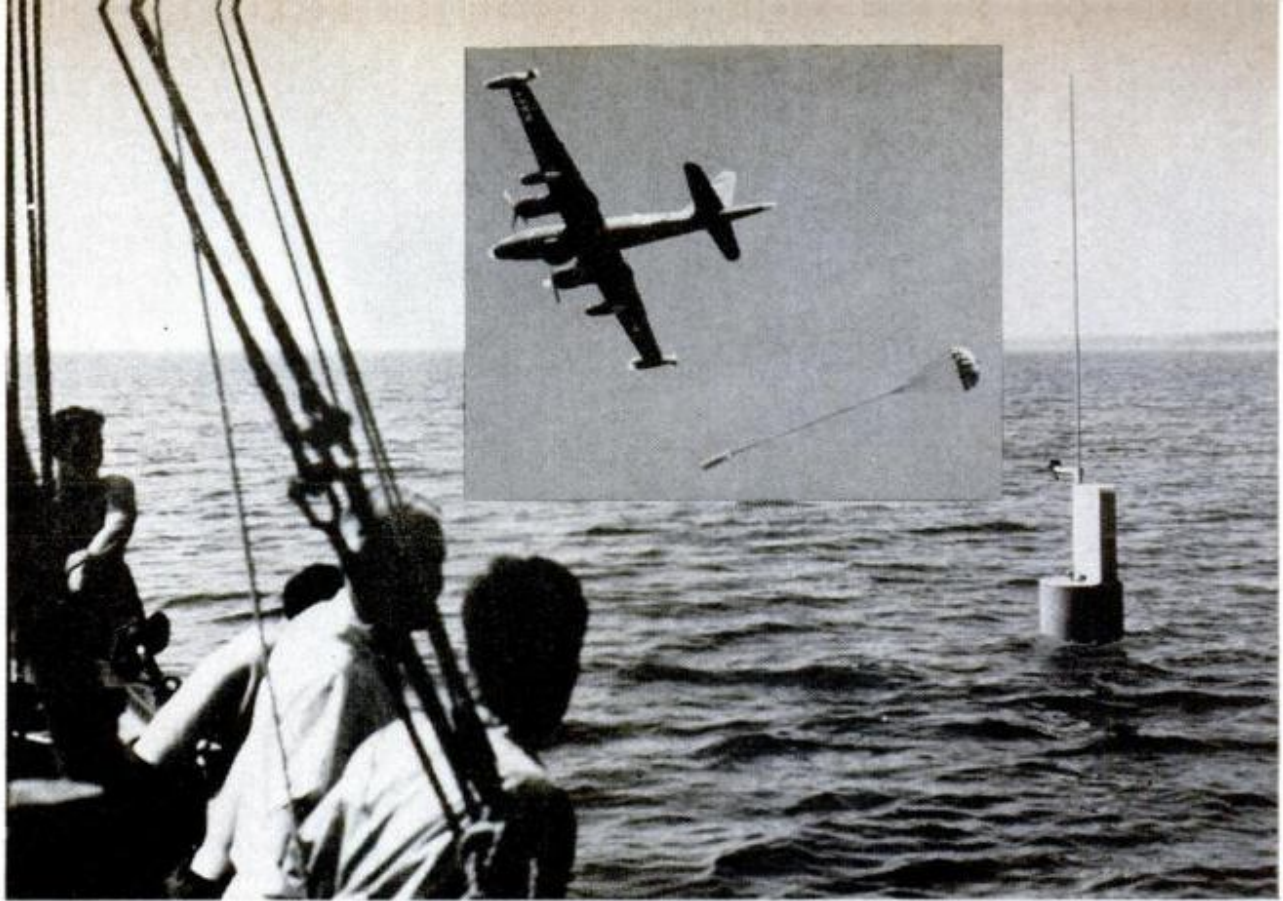
Soil scientists have been mystery men, says SCS, because a mere few hundred of them have been at large during much of the survey's 60-year career.

The tiny band of specialists has been widely scattered across the American landscape. Even today, SCS has barely 1200 in action soil mapping the 50 states.

When the food and fiber market slumped following World War II, thousands of farmers suddenly realized that soils information had dollars and cents value. They could

(Continued to page 250)





PARACHUTED BUOY extends on impact with ocean. Buoy at right faces wind for accurate directional readings

## Navy Is Taking the Surprise Out of Hurricane Attacks

Bobbing in the ocean, small unmanned weather stations are spying out hurricanes and warning the U.S. Navy when to expect an attack.

An average of eight hurricanes a year do millions of dollars worth of damage to the U.S. But the loss of life from these sea-spawned furies has, since 1955 and the in-

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## Scaled-Down Starfighter Drums Up Recruits

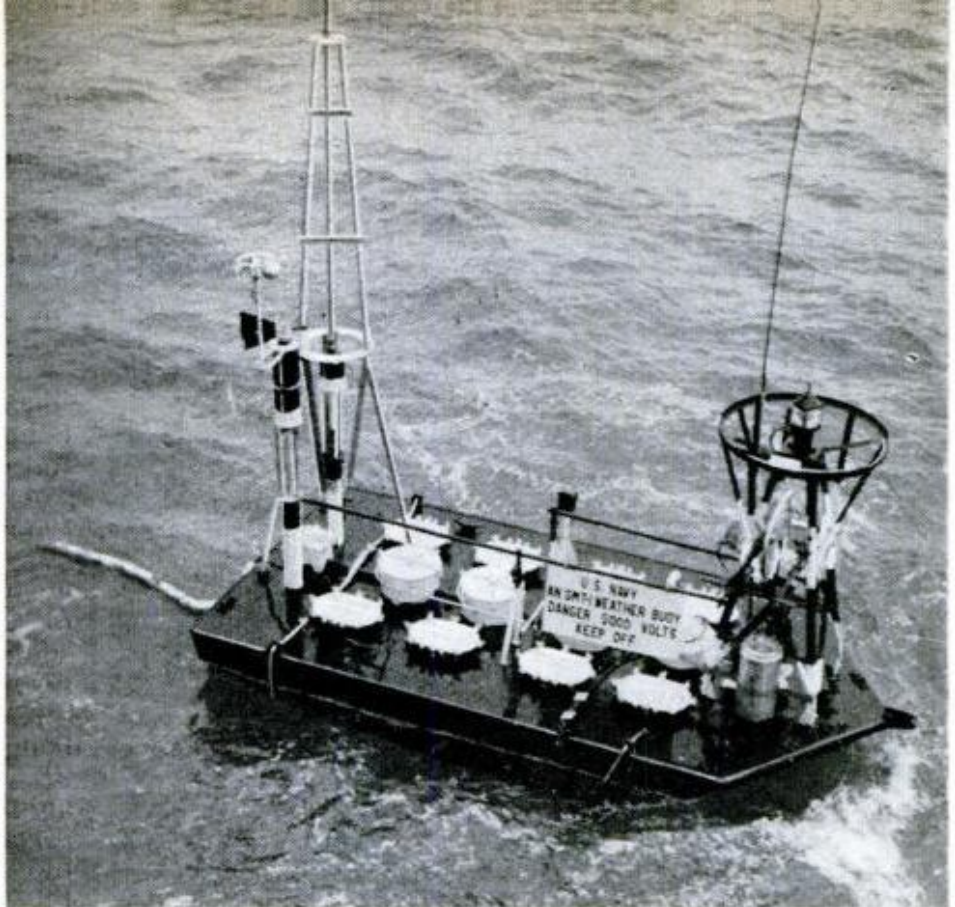
Built by members of an Air Force ROTC unit at the University of Colorado, a scaled-down F-104 is used in parades to attract recruits. Measuring 14 feet long with a wingspan of six feet, the plane has

a plywood frame covered with aluminum.

A 6.3-horsepower motor drives the rear wheels through a chain and sprocket, giving the plane a taxiing speed of 15 m.p.h. It can support a 200-pound "pilot."







**EXPENDABLE**, buoy is dropped in path of potential hurricane. Boat sends coded weather report six times daily

production of the monitoring buoys, been greatly reduced.

The buoys include the 350-pound variety that transmits 800 miles; the free-floating transobuoy that sends four three-minute messages a day, 4000 miles, for six months,

and an automatic weather-reporting boat that is 20 feet long and rides at anchor in 11,000 feet of water in the Gulf of Mexico, reporting to the Miami hurricane center.

These instruments report on barometric pressure, temperature, and speed of wind.

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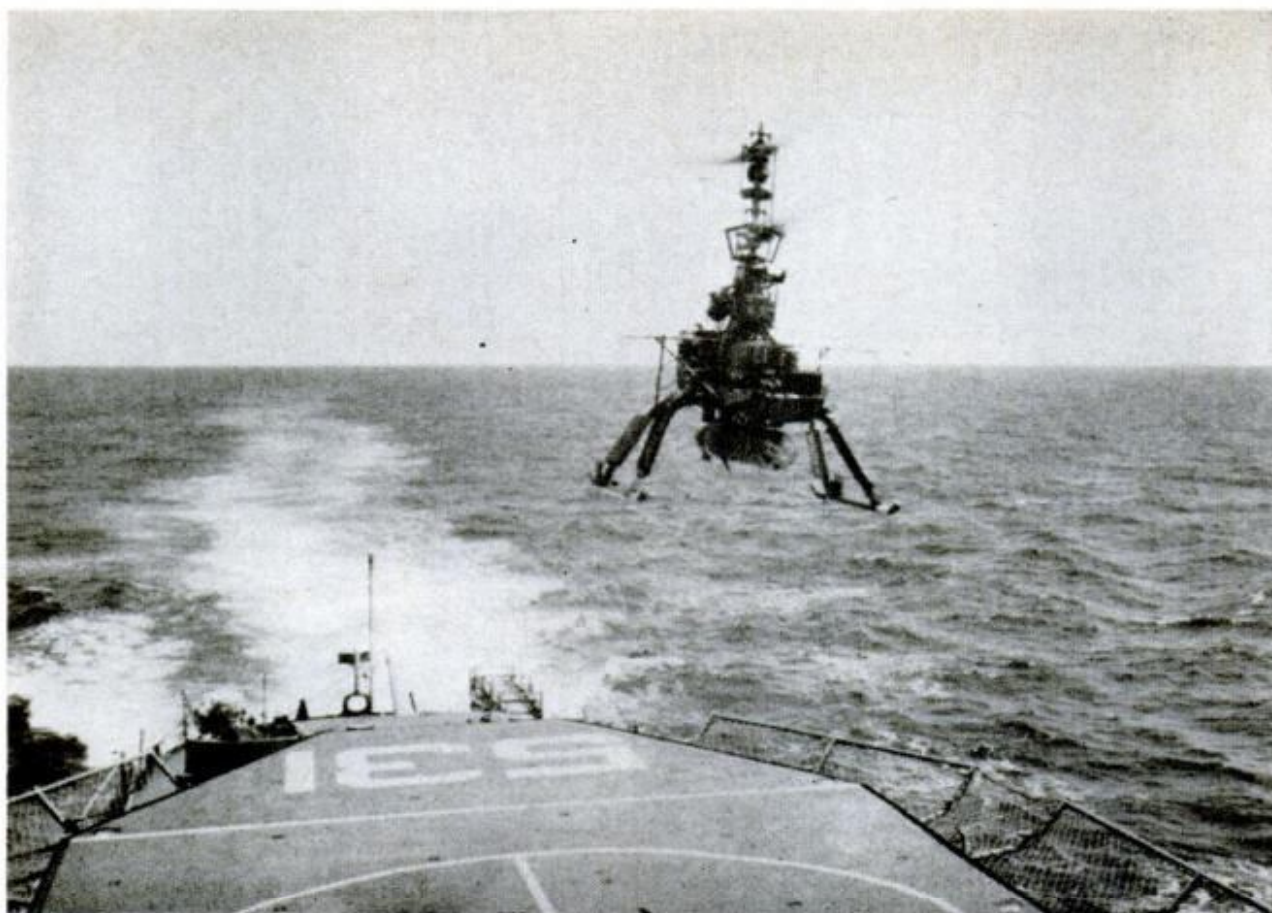
## Painted Highway Helps Keep Driver on Right Side of Road

Only the driver's side of a test road near Buffalo, N.Y., appears illuminated although both lanes receive the same amount of light. The strip has been painted by Cornell University engineers at such a shallow

angle that the paint clings only to one side of the road's minute valleys and ridges. It clearly shows the driver his lane. The paint improves the reflecting quality of asphalt at least three times.





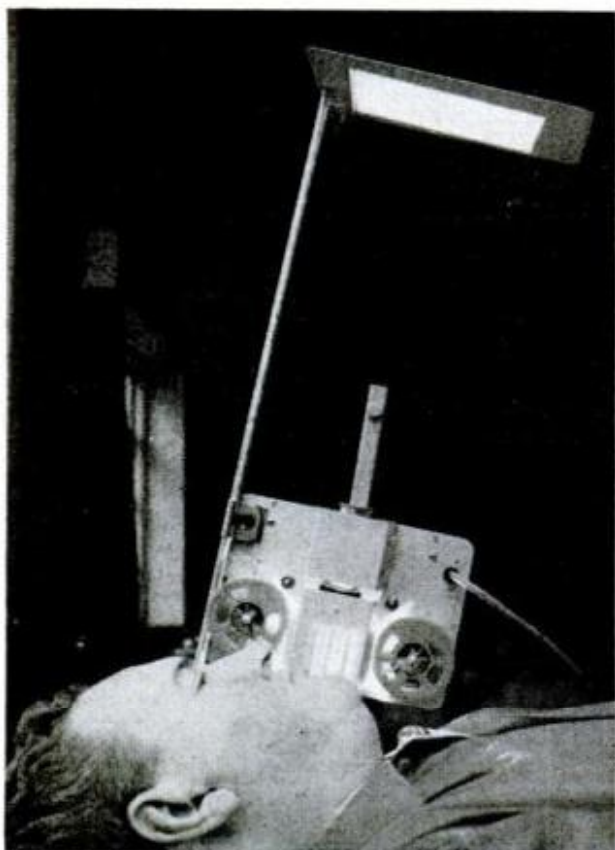


## Pilotless Helicopter Is a Submarine Killer

Remotely controlled, an unmanned drone helicopter can take off from the deck of a destroyer in any weather, fly to an area where sonar gear has detected an enemy submarine, hover until instructed to drop

its homing torpedo, then fly back for re-arming—without risking a pilot.

First tests of DASH (for drone antisubmarine helicopter) were made at the Naval Air Test Center, Patuxent River, Md.



## Projector for Paralytics

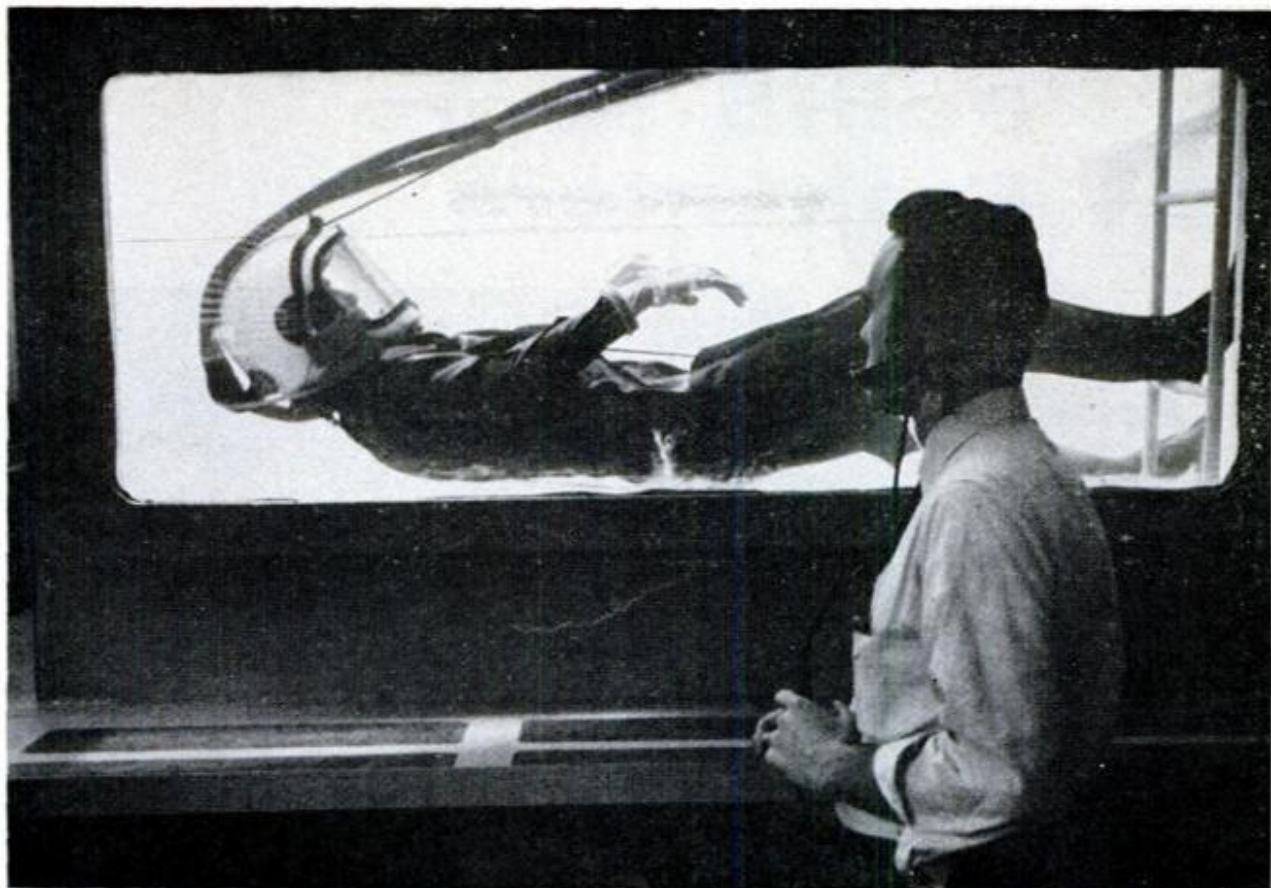
Operated by a very slight pressure on two remote-control buttons, a projector allows polio and other paralysis victims to read books which are projected on a small screen positioned above the patient.

The books have been shot on microfilm, page by page, and the two buttons can "turn" the pages forward or back. Some paralytic cases are so severe, it becomes a strain on the patient to turn the pages of an ordinary book. The new projector requires only two fingers to operate it.

Introduced by Britain's polio-research fund under the patronage of Prince Philip, the projectors, when in full production, are expected to cost no more than \$100. At present there are four prototype machines in operation. A central library of books on microfilm will give the patients an almost unlimited choice of reading material.

The projectors are also flexible enough to allow those patients who can sit up to read the books from that position. The screen is set up vertically at the patient's normal eye level.





## It's Like Living in a Fishbowl for Pilots in Space Tests

Submerged in a tank from 6 to 24 hours, Air Force pilots are serving as subjects for tests on the effects of weightlessness.

Possible physiological deterioration and psychological effects are studied by sub-

mitting the pilots to a battery of tests before and after submersion and at six-hour intervals. In water, normal weight sensation is altered, and the conditions approximate those of outer space.

## Kids' Canaveral

Accompanied by a satisfying "boom," a new air-compression toy rocket launcher sends a nose cone hurtling into a trajectory of up to 250 feet.

The toy uses no chemicals or fuel, but operates on air compression alone.

The miniature Atlas rocket is composed of two tubes that telescope and a nose cone with a soft plastic tip. The larger (bottom) tube is called the rocket chamber, and the smaller (upper) tube is the compression chamber. The nose cone fits on top of the latter tube.

When the compression tube is pulled out to full length and suddenly forced back into the rocket chamber, compression is built up and the nose cone blasts off.

The manufacturer has invented several games that can be played with the toy rockets—including one similar to baseball. Instructions for the games are included with the rockets.

The toy Atlas is a product of Top Flite Model Co., Inc., 2635 South Wabash Ave., Chicago, Ill. It sells for \$2.98.





# Crackdown on Bomb-Scare Pranksters



**ON THE STREET**, a Brooklyn policeman listens for ticking from box left on subway. It was not a bomb



**AT THE DOCKS**, coast guardsmen search for luggage said to contain dynamite caps. Tip was unfunny joke

**A**N AMERICAN AIRLINES JET was circling Los Angeles International Airport recently when a stewardess asked a passenger to put his suitcase under his seat. "I don't think I'd better," he said. "There's a bomb inside."

A search of the plane, however, revealed the man was one of a macabre breed of pranksters who have preyed on airlines in recent months by starting phony bomb scares. His remark constituted a false report of a bomb in a public place, laying him

open for a fine of \$1000 and/or a year in a federal prison. Had he actually carried explosives aboard the plane intending to destroy property, he would have been subject to as much as 20 years in prison and a \$10,000 fine. Had he caused a blast killing someone, he could have been sentenced to death.

Alarmed by the increase in false bomb reports, the Federal Bureau of Investigation has launched a crackdown on bomb-scare pranksters which, in the first four



*Popular Mechanics has rendered a valuable service to its readers in pointing out the serious problems in bomb hoax threats. It is the duty of every citizen to assist law-enforcement agencies in eradicating these senseless and lawless acts.*

**JOHN EDGAR HOOVER**, Director  
Federal Bureau of Investigation



**"I know where there's a bomb," comes the whispered tip over the phone. Men and equipment converge on the spot in minutes to handle the bomb—or nab the vicious prankster**

**By Charles Remsberg**



..... **and Tragedy**

**IN THE AIR**, an explosion, perhaps caused by bomb, wrecked this National Airlines plane bound south from New York on Jan. 6, 1960. It crashed near Wilmington, Del. Everyone aboard—29 passengers, 5 crewmen—died

months of its existence, netted 25 offenders. Still, false reports continue to plague not only airlines but theaters, subway stations, schools, office buildings, libraries, railroad depots, bus terminals, post offices and churches. According to Chief J. Edgar Hoover, such hoaxes have "no sane motivations" and often are the product of "warped minds which are without mercy or reason." And the scares are not infrequent. The Chicago police department, for example, received more than 200 bomb reports by telephone in 1960, none of which proved authentic, and in a recent four-year period FBI agents investigated 1000 false reports involving transportation companies alone.

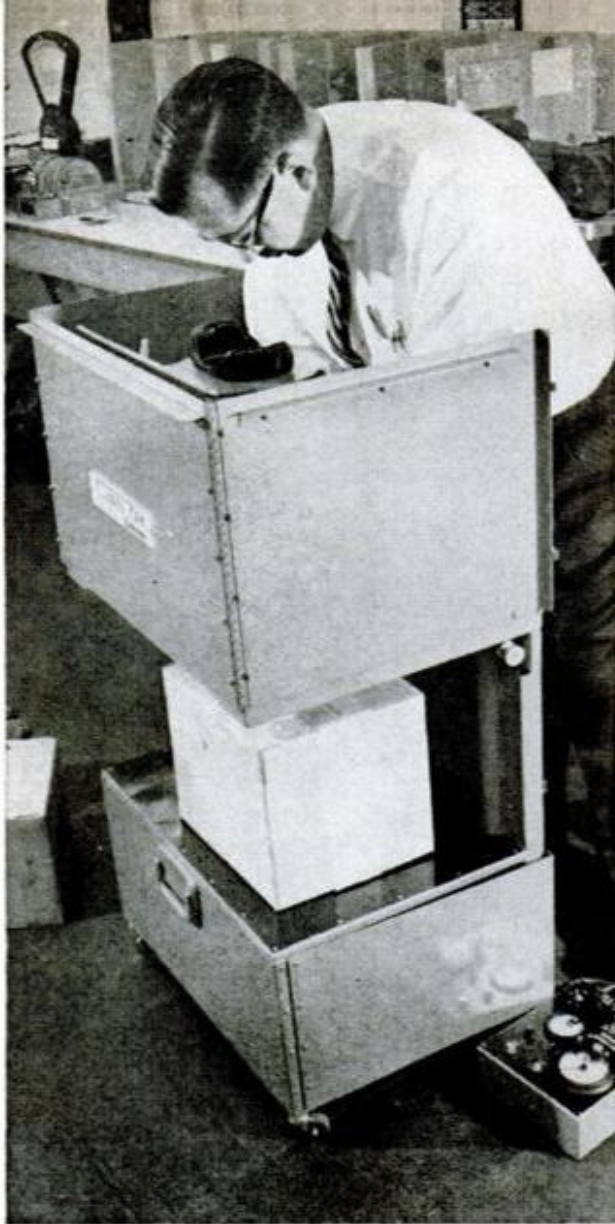
What the warped jokers may not realize is that each phony call can cost thousands of dollars in wasted manpower and lost time, not to mention the dangers of anxiety and panic. Consider the inconvenience and expense when one anonymous telephoner whispered to a Capital Airlines clerk at Chicago's Midway Airport, "There's a bomb aboard one of your planes!"

At that time, three Capital planes were scheduled to take off and three others were waiting to land; there was no clue suggesting which one might be bearing a lethal package.

In accordance with uniform bomb threat procedures drafted by the Chicago department of aviation, an intricate search system swung into operation. Notified in quick succession were the control tower, and a number of legal and governmental agencies. As each dispatched men to the scene, the tower directed the planes to runways designated for bomb emergencies. Meanwhile, Capital employes assembled stairs, carts, and other equipment necessary to unload passengers and baggage.

Once passengers and cargo had been removed, bomb-squad detectives, and airline security men divided their forces. Some searched sections of the plane open to passengers and others examined luggage, which had been sent to a building reserved for that purpose. Postal authorities and Express Agency employes combed through





## Sometimes They Find Them . . .

mail and air express, occasionally unwrapping large items. In this instance—as in most bomb reports—the search failed to unearth any suspicious device.

This process, which can take up to four hours, is repeated every time a bomb scare erupts at a Chicago airport. Similar procedures are followed in other cities with heavy air traffic and frequent bomb hoaxes. All are costly and potentially hazardous.

A greater danger looms when a bomb or, more likely, a suspicious package is located. Then a dramatic operation unfolds, involving either a skilled police department bomb squad or an Army Ordnance detachment.

Here is how the expert, well-equipped New York City bomb squad handles such a situation. If an object, thought to be a bomb, is located at LaGuardia Field, for example, the squad cordons off an area within a 100-yard radius of the item. A detective then approaches it for a close look. He wears a weird costume of armor which includes a steel face shield, a bullet-proof vest of interlocking steel plates cov-

ered with green nylon, and asbestos gloves. As he faces the bomb, he will be working alone since two members of the bomb crew do not examine a suspicious object at the same time. (This rule was laid down after two detectives were killed in a bomb blast at the New York World's Fair of 1940.)

### One of Three Types

The bomb most likely will be one of three varieties. The crudest type is made of dynamite rigged with a time fuse and involves no intricate mechanism. If it has not detonated by the time the bomb squad arrives, the fuse undoubtedly has gone out, and the detective's only task will be to separate fuse from explosives. A second type is electronically detonated through a cable connected to a battery at some distant point and requires an individual to activate it. If this individual has fled or been captured by the time the squad arrives, the detective will not find this type bomb particularly dangerous.

What he does fear, however, is the third





**PORTABLE X RAY** at far left, an experimental model, has promise for spotting bombs carried in luggage. At left is steel net bag in which New York police place bombs to be carried to detonation area

**HOT STUFF!** Detectives (above) wearing protective clothing, carry out bag containing two-inch-pipe bomb. It was found in locker in New York's Pennsylvania Railroad station—a spot favored by mad bombers

**TOUGH TRUCK** (right) with body of steel mesh and steel doors, is employed by New York Police Emergency Service to carry bombs to lab or isolated detonation spot. Army trucks carry bombs in bed of sand



## **Then Disposal Is the Problem . . .**

variety — the complicated, self-contained unit, many forms of which operate on a clock mechanism. It was such a device that caused the most famous of airplane explosions in 1955 when Jack Gilbert Graham blew up a United Air Lines flight out of Denver in hopes of collecting life insurance on his mother.

### **Using a Glass Knife**

When a package thought to contain this type bomb is found, the detective is spectacularly careful. If he decides to probe inside the package before moving it, he does so with a glass knife: a metal one might short-circuit some bombs. If the container of the suspicious object is a suitcase, he cuts through the side, since flipping a catch might detonate explosives.

If he fears the package is too delicate to tamper with, he may place it in a metal tank and saturate it with lubricating oil or water, which often will stop a clock-driven bomb. Then, lowering a stethoscopic microphone into the liquid, he examines the

package. If he hears ticking he backs away about 200 feet and listens through an extension cord, if there is no ticking, the package is removed from the tank and scanned with a portable fluoroscope.

If the detective still believes the package may contain a bomb, he turns it over to a two-man disposal crew, clad in armor matching his. Gently they place the object inside a specially made steel-net bag which hangs from the center of a long steel pole. Shouldering the rod, they walk steadily to the department's bomb disposal truck, which is constructed of heavy steel mesh. Here they cradle the package in an oil-filled container, and move it to the center of the truck through a system of pulleys controlled from the cab. Cables on other pulleys lower a steel door into place, sealing the questionable item securely inside the truck to lessen the hazard of moving through city traffic to a disposal area.

In most communities, the removal of bombs or suspicious packages falls to Army Ordnance teams, since few police depart-





## The Big Search Goes on . . .

**TENSION IN TIMES SQUARE** mounts as police test object found in wastebasket. Harmless, it did look like bomb

ments have the equipment or know-how to assure safety. For transportation purposes, a team may place the item in a container which then is covered with sand in the rear of a truck to restrict fragmentation in case of explosion. In some unpopulated area—a city dump or a pasture—small charges of explosives are placed around the package and detonated remotely. In a few cases, when a package appears easy to dismantle, it may be opened for study purposes.

Six to eight hours sometimes elapse from the time a bomb report is received by an airline until a suspicious package is professionally located, examined and destroyed.

Twenty men or more may have been involved in the total operation.

Statistically, the search and destruction precautions may seem excessive. Airplane bombing and attempted bombing are as rare as scares are frequent. Since 1938, bombs have wrecked passenger liners only three times in this country and in only one other crash has bombing been suspected. But the potential for disaster is omnipresent because of a perplexing lack of safeguards. Unfortunately it is as easy for a psychopath to smuggle a bomb aboard as it is for a crackpot to turn in a false report.

(Continued to page 248)



## It Flies—A Little

Designed as a way to commute and beat the traffic, the Simcopter is the work of mechanical engineer David Dobbins. Part Simca automobile and part homemade helicopter, the unique vehicle includes, besides the tiny foreign car, an aircraft engine for the rotor.

Still experimental, the Simcopter has made one flight—four feet up for five seconds.



## Prefab Dome Shelter

Meant for campers and sportsmen, a dome shelter can be assembled by two inexperienced men.

It weighs 450 pounds and is 22 feet in diameter and 12½ feet high. Its triangular panels consist of rigid foam plastic bonded between sheets of heavy, water-resistant kraft paper. They are bolted together at the camp site.

Each shelter has a hinged double door, window openings and ceiling vents. Several color choices are offered the buyer.

The Geospace is listed at \$345 by Geospace Dome Shelters, 800 N. Lindbergh, St. Louis 66, Mo.



## Casualties Radio for Help

Radios allow "casualties" in Army maneuvers to send SOS messages to direct rescuers.

Evacuation teams, mounted in armored personnel carriers, search for simulated casualties in varied terrains in both daylight and darkness. During one phase, the casualties are equipped with radio-beam emitters. The evacuation teams have receivers tuned to the same frequency and, by tone volume, can home-in on the signal.

In another phase, the casualties are equipped with belt radios, through which they attempt to "talk in" the rescue teams to their positions. The teams also carry infrared binoculars for use during night maneuvers, allowing them to see in total darkness.

The tests are designed to determine whether electronic devices can be used in forward areas without interference with normal tactical communications.

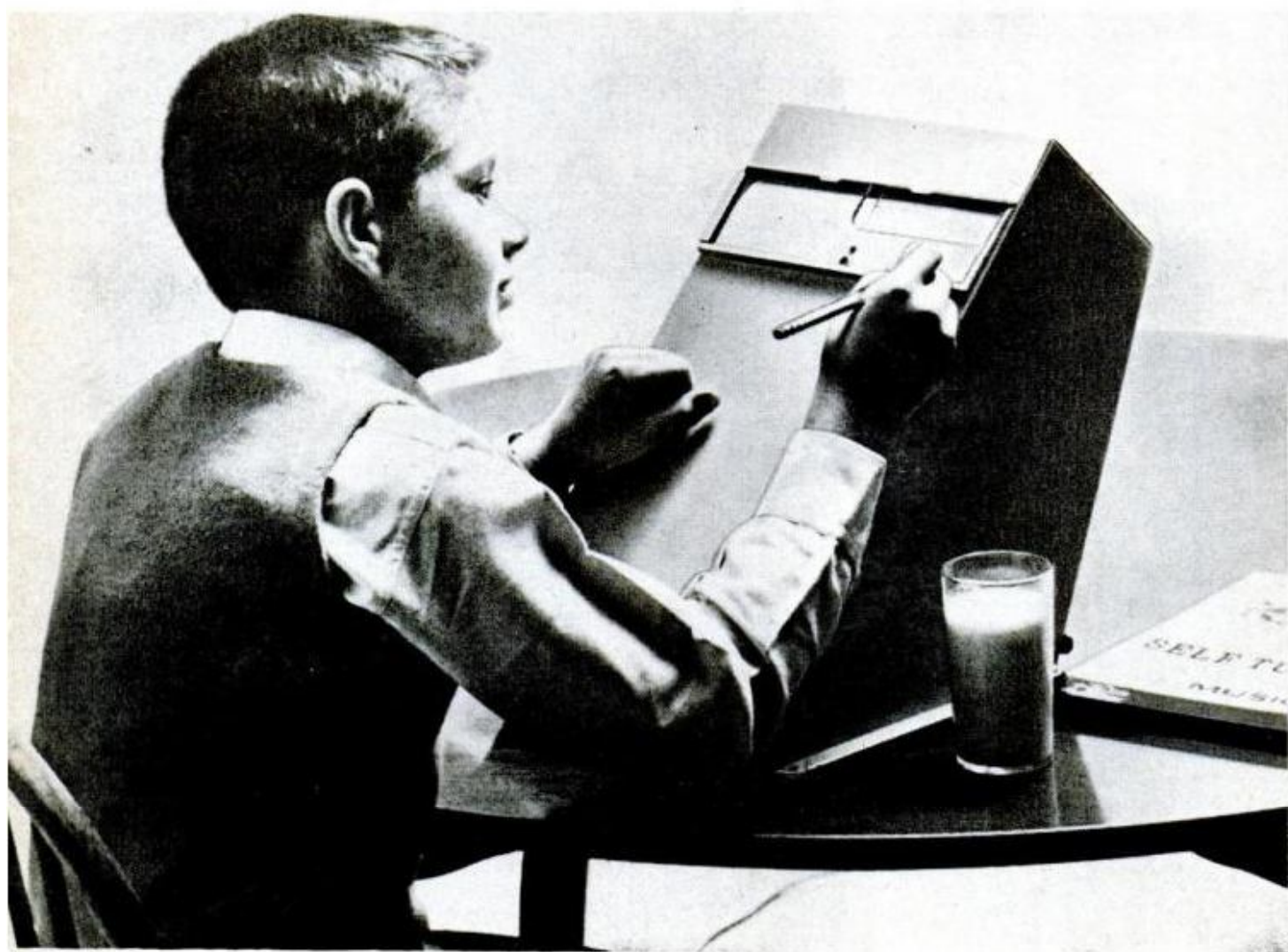




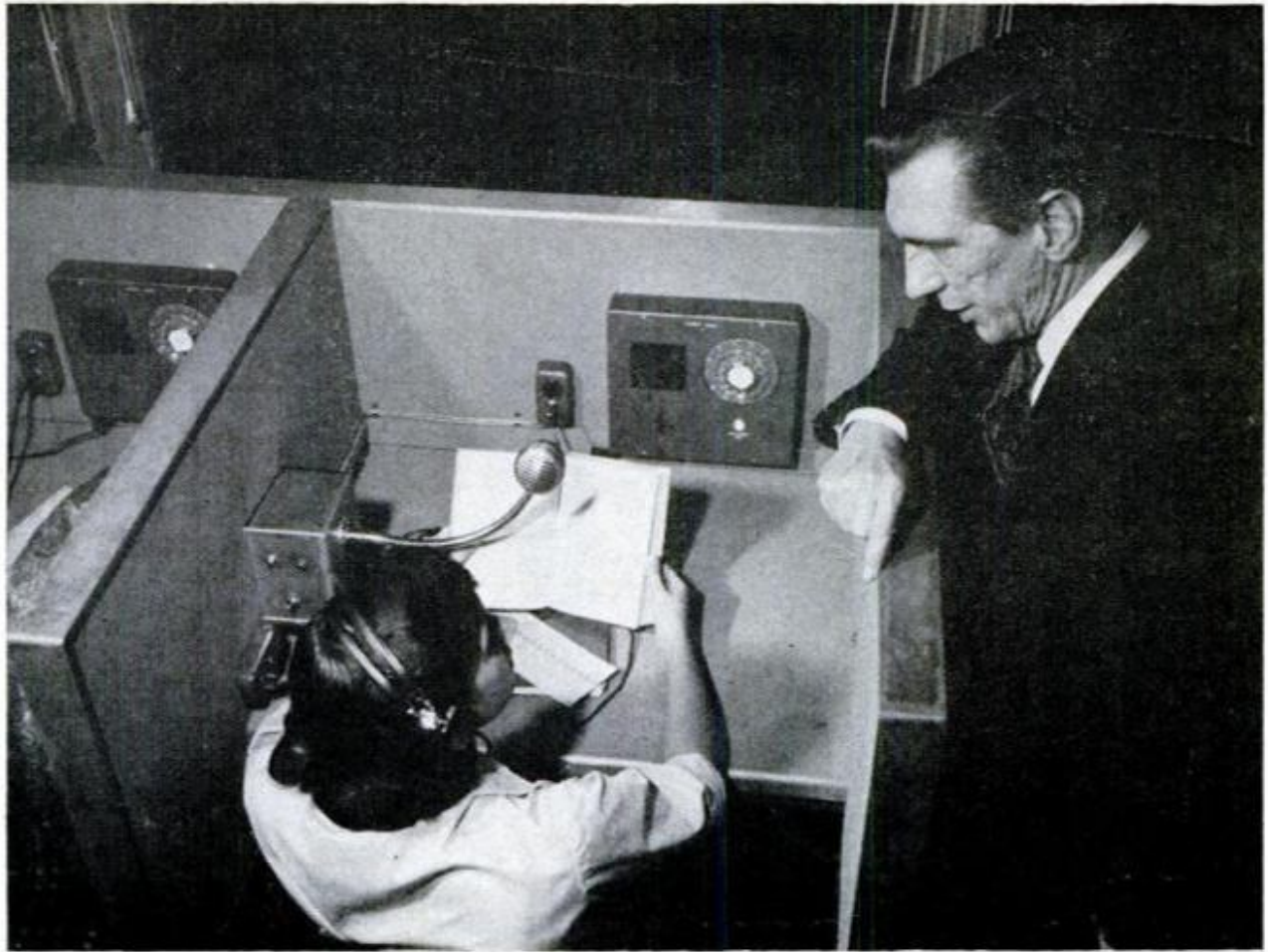
# ***Will Robots Teach Your Children?***

**Educators themselves are taking a good second look at "programmed learning." Surprisingly, they foresee a revolution in mass education**

*By Joseph N. Bell*







**MUSICAL SCALES** or Spanish language can be taught by programs on machines. Boy, left, bones up on his music lesson, learning it in small, concise doses. Girl, above, listens to Spanish lesson at U of Michigan

**E**DUCATION IN AMERICA today is timorously facing a mechanical revolution. The catalyst is a device unfortunately labeled the "teaching machine."

At the moment, it comes in widely variegated sizes and shapes. It is not new, but educators and textbook manufacturers who have long regarded the teaching machine as a gadget are taking a second, serious look at it. A rash of experimental machine teaching is appearing in schools all over the nation. Early results indicate an exciting educational potential.

For example:

- Last year, a group of Roanoke, Va., eighth graders studied ninth-grade algebra without a teacher, textbook or homework—using only machines. They completed a full year's work in one semester. Then, after being away from the subject for several months, they were given a test which showed an average retention of more than 90 percent of the material. Some 40 percent of the machine-taught students surpassed the average score on an algebra examination made by ninth graders who had studied the subject for a full year.
- Eighth and ninth-grade students in general science at Whitehall Junior High School near Pittsburgh have just com-

pleted a course of machine instruction—developed by science teachers Howard Phillips and Arthur Jeffries. Says teacher Phillips: "Test results have been high. The most noticeable improvements in learning have been with the average and below average students."

- In Clinton, N.Y., logic students at Hamilton College have experienced in the past two years a rise in the class average of about 20 points and a reduction in failures almost to zero as a direct result of machine teaching. Dr. John Blyth, professor of philosophy at Hamilton, says: "We wasted no class time on routine checking or drill or unprepared students. We knew in advance who had done work on the program and who had not. There was a great increase in interest and improvement in morale."

- At the University of Michigan this spring, three students were taught to speak Spanish fluently entirely by machine in about half the time required by traditional methods. "Someday soon," says F. Rand Morton, director of the University of Michigan Language Laboratory, "all language learning may be accomplished along similar lines."

These examples are typical, and they



(from page 1)

Your answer was: I have no idea.

Well, let's see if we can explain a little more fully.

Some of the numbers in our number system are the products of other numbers. The number 15, for example, is the product of the numbers 3 and 5. The numbers 5 and 3 are called "factors" of 15. That is,  $5 \times 3 = 15$ . The numbers 5 and 3 are called "factors" of 15.

Now there are some numbers that are the product of the same number used a certain number of times. The number 16, for instance, is the product of the number 4 used as a factor twice,  $4 \times 4 = 16$ . This number 16 can be written in the form  $b^n$ , where  $b$  is called the base and  $n$  is called the exponent. The number that is used as a factor and tells the number of times the base is to be used as a factor is called the base. The number 16 written in the form  $b^n$  would be  $4^2$ , and  $4^2$  means "4 as a factor twice", or

$$4^2 = 4 \times 4 = 16.$$

Now, the question on page 1 stated that the base,  $b$ , of the expression  $b^n$  is 2 and the exponent,  $n$ , is 3. If we substitute these values in the expression  $b^n$ , we have

$$2^3 = 2 \times 2 \times 2 = 8.$$

$2^3$ , of course, means that 2 is to be used as a factor 3 times.

$$2^3 = 2 \times 2 \times 2 = 8.$$



## Branching, or multiple-choice method . . .

illustrate two prime advantages of teaching machines:

—the student using them actively participates in his own instruction, and may advance as rapidly as his interest, motivation and intelligence permit.

—the learner applies absorbed information instantly in answering a question, and then has the immediate satisfaction of knowing if he was right. This speeds learning by offering what psychologists call "immediate positive reinforcement" or reward.

Actually, the term "teaching machine" is misleading. The machine is merely a conveyance for presenting "programmed learning" which is the instructional material that goes into the machine. Thus machine teaching can progress and expand beyond the experimental stage only as sound programming materials become available.

This is presently the biggest hitch in machine teaching. Programs take a great deal of time to prepare. They must be done with great skill and knowledge. They must be

thoroughly tested to eliminate questions that are useless or misleading. The material must be presented with absolute clarity and simplicity.

All this takes time, money and, presumably, some unanimity of thought as to what constitutes sound programming. Yet today there are many shades of opinion that converge generally into two different approaches to the problem of programming. One approach is the *linear* or constructed response; the other is the *branching* or multiple choice.

Main proponent of the linear approach is Dr. Frederic Skinner, Harvard behavioral psychologist. Dr. Skinner would have his students write out the answer to each question, making it as easy as possible for them to perceive the correct answer. The programming—which is offered in small, concise steps—makes it quite clear what answer is wanted, and sometimes broad hints are offered. Every effort is exerted to bring the student through the linear programmed material in errorless fashion.



Sample Portion of Programmed Course in Psychology  
(Linear Method)

The stimulus which elicits a knee jerk is the delivered by the so-called "stimulus object" or hammer.

In the knee jerk reflex, we call the rubber hammer the (1) \_\_\_\_\_ and the tap on the knee the (2) \_\_\_\_\_

t--

tap

(1) s-----o-----  
(2) s-----

(1) stimulus object  
(2) stimulus

s-----

stimulus



## And the linear, or constructed response

In contrast, the branching or multiple-choice system programs longer segments of information followed by multiple-choice questions. If the student selects the right answer, he moves on to the next segment of information. If he is wrong, he is taken down an alternate path which provides an explanation of his error and leads him back to the mainstream of instruction. Father of this alternate method is psychologist Norman A. Crowder of U.S. Industries' Western Design and Electronics Division in Santa Barbara, Calif.

Linear teaching machines resemble a portable phonograph with windows in a hinged top. The programmed material is on a roll or an accordion-folded paper inside. The question appears in one window, with space for the written answer provided in another. The correct answer is covered in a portion of the answer window, and can be exposed by the student after he has written his own answer. Either punching the answer or pulling a simple lever or crank after an answer slot is exposed will move the stu-

dent on to the next question. He can't turn the machine back to correct a wrong answer; hence a teacher can tell from looking at the printed roll how many questions were incorrectly answered.

The originator of the modern teaching machine was an Ohio State University psychologist named Dr. Sidney Pressey, who developed an automatic correcting machine in the early 1920s. Dr. Pressey discovered that as his students used the machine to correct papers, they also assimilated the information they were correcting. This, essentially, is the basis of programmed-learning material today. But no great fuss was made over Dr. Pressey's discovery, and he used his machine in comparative obscurity for many years—until 1954, when Dr. Skinner began the "conditioning" experiments at Harvard (which included by the way teaching a pair of pigeons to play Ping-pong).

Warren D. Sheplar, director of instruction at the Whitehall schools, points out: "Up to this time, most textbooks used in





**SIXTH-GRADE** students at Calabash Elementary School, Woodland Hills, Calif., are learning spelling with programs on Rheem Califone Corp. Didak 501 machines. Experimental programs are usually college-sponsored

the public schools have been developed by the professional educator, who has a limited knowledge of behavioral science. We in education have realized this weakness and have asked the behavioral psychologist to be a member of our team in cooperatively developing programmed learning—the psychologist giving his skill to the process of learning and the professional educator to the organization and kind of content the student should learn.”

The result is an increasingly psychological approach that uses the principle of “praise and reward” to increase learning speed substantially. It also raises some profound questions. What happens to the teacher in a machine-oriented educational atmosphere? Does he or she become—as some psychologists have implied—simply a glorified baby sitter? What does machine teaching do to critical thinking on the part of the students? Do all subjects lend themselves to machine teaching? Are there any philosophical dangers inherent in the use of machine teaching?

#### **Are Teachers Important?**

At a conference of the American Association of School Administrators in March, the consensus of feeling was that the teacher would become more—not less—important in an educational system using teaching machines. John R. Everett, Chancellor of New York City’s Board of Higher Education, pointed out that teachers—provided with classes to which facts are presented at a much greater speed by machines—must have a broader, deeper knowledge of the programmed subject. This will put a premium on teachers skilled in critical and analytical thinking—teachers

who can *teach* rather than merely impart information.

Allen Calvin of Hollins College, which supervised the Roanoke experiment, underscored the necessity for winning teachers over to the use of machines. He cited experiments showing that, while excellent progress was noted under a sympathetic teacher, results were better with no teacher at all than with a hostile teacher.

Most students who have been taught with machines seem to find the experience stimulating. As one student at Whitehall Junior High commented: “I’m learning more science this way than I do by reading my science book.” A second noted: “You have to work harder, but you can do better.” At the conclusion of the Roanoke experiment, only 16 percent of the students preferred a return to regular instruction. One Roanoke youngster said: “In regular class you learn something and forget it and have to learn it again. Here, you learn it the first time.”

Professor Hans Weber, who has been using machines to teach a German class at Dartmouth, reports that only five of his 41 students felt that the time spent on the machines should be decreased. His students, however, insisted on class discussion to provide intellectual stimulus and student-teacher contact. A variation of this same thought—that machines alone cannot do the job—was underlined by another high-school student. He put it this way: “It’s easier to learn science using the machine, but it gets tiresome if used too many days in a row.”

At the present time, teaching machines are not in regular use in any elementary or high school on any other than a strictly ex-





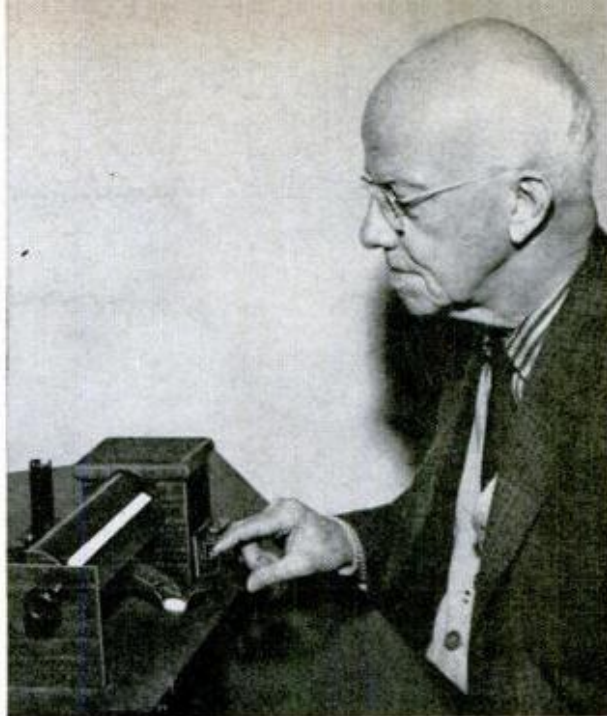
**INDUSTRIAL USE** of machines is shown at Hughes Aircraft Co., where assembler listens in, learns job

perimental basis. Several dozen of these experiments scattered about the country, are sponsored generally by college research grants. More machines are being used in such colleges and universities as Dartmouth, Harvard, Oberlin, UCLA, Indiana, Ohio State, Arizona, Illinois, Michigan, Pittsburgh and Southern California. But even at this level, machines are still decidedly in the research stage.

#### **Immature Machines?**

Some educators feel, in fact, that substantial refinements are necessary before programmed teaching can really get off the ground. P. Kenneth Komoski, a pioneer in programmed teaching and now president of the Center for Programmed Instruction in New York City, recently advised school boards in New York against the purchase of existing machines. "Any large scale adoption of the rather immature machines which are now on the market," he said, "may well mean that schools will inadvertently place restrictions on many teachers who at present are just beginning to understand what programming is. The machines will eventually become a valuable adjunct to teaching, but they must first be adaptable enough to meet the requirement of any program which teachers can create."

It seems very clear, however, that expansion is going to take place very quickly in spite of the fact that a number of profound problems remain. One question in particular kept nagging at me as I talked with the people who are propagating machine teaching. The problem was articulated by teaching-machine expert Hugh Anderson, who told me: "Sometimes I feel we have no real idea of the power implicit



**INNOVATOR** of machines was Dr. Sidney Pressey, a psychologist who devised a machine to grade tests

in the programming technique. My wife was going through a programmed sequence the other day in which the word 'response' was sought repeatedly as the correct terminology in answering a series of questions. She wanted to say 'answer' instead. She resisted for awhile, but soon she was automatically supplying the correct word so she could move on to the next point. Thus the programming had already shaped her behavior pattern.

The concept of shaping behavior underlies all programmed teaching, and the psychologists are having a romp in fields once reserved purely for educators. If psychologists pre-empt the position of the educators, some classic educational patterns of solid and lasting values may be endangered. As long as the machines are used for strictly quantitative teaching—arithmetic, say, and some aspects of language—few will question their substantial value. But what of essentially qualitative subjects—literature and art, for example?

Says Anderson: "Programmed teaching can be usefully applied in *any* learning area. The biggest immediate field will be in industry—not just in motor skills but in all kinds of learning. Military uses will continue to grow, too, as the automation of our armed forces increases. It will probably take from four to five years for programmed learning to become solidly established in public education, but I have no doubt that it will."

Few will dispute the value of teaching machines in the armed forces and industry. The Air Force is making growing use of them to instruct technicians in subjects ranging from aircraft mechanics to guided

(Continued to page 246)





## Toy Road With Intersection

Equivalent to a switch on a toy railroad track, a T-type roadway intersection for a miniature auto track enables the cars to get off the straightaway and change directions. It also allows an unlimited number of arrangements for track or highway systems.

The intersection measures 11 by 14 inches and is sold with sets or separately for \$5 by the A. C. Gilbert Co., Erector Square, New Haven, Conn.

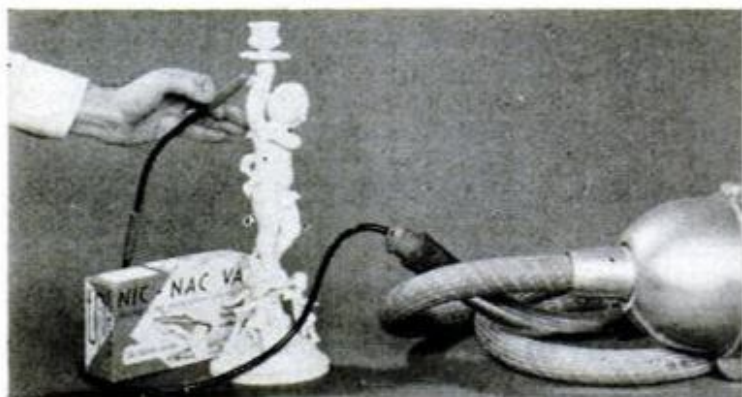


## Bed Converts to a Chair

Without nurse or patient straining a muscle, a person lying flat on his back on a special hospital bed may be easily brought to an upright position for transfer to a wheelchair or for walking. Springs, mattress and linens swing out and convert to a chair.

The unit, called the MacDonald Converter, has removable arm rests to give support for the in-or-out-of-bed movement, and to provide the convenience of a chaise lounge when the patient is in bed.

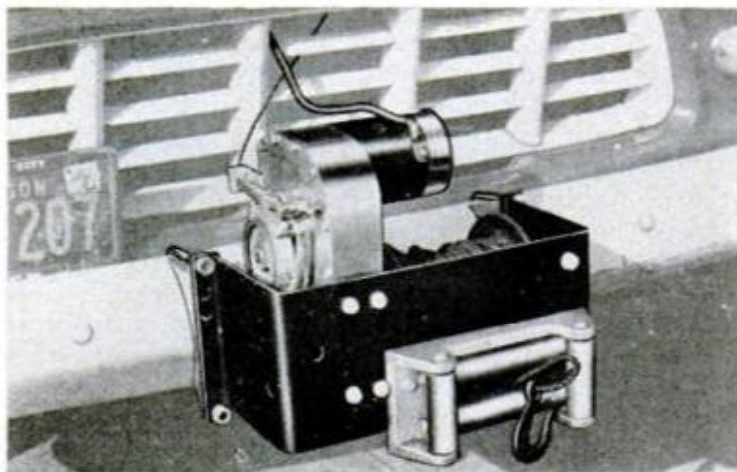
The converter attaches to hand-operated and powered beds.



## Tool Cleans Tiny Things

Attached to a big vacuum cleaner, a tiny tool helps clean small objects, crevices and grillwork. Typical uses are for cleaning books, picture frames, models and figurines.

With brush removed, its end, only  $\frac{3}{16}$  of an inch in diameter, cleans even smaller crevices. Made by Industro-Motive Corp., Clawson, Mich., Nic-Nac Vac costs \$2.



## Bolt-On Electric Winch

Power from the battery of the carrying vehicle operates a new bolt-on electric winch. With a load limit of 6000 pounds, the winch will pull at angles up to 180 degrees.

The price of \$260 includes a mounting kit and all controls but not the cable. The estimated cost of installation is \$25, and the unit can easily be transferred to another vehicle.

It is made by the Belleview Manufacturing Co., Portland, Ore.

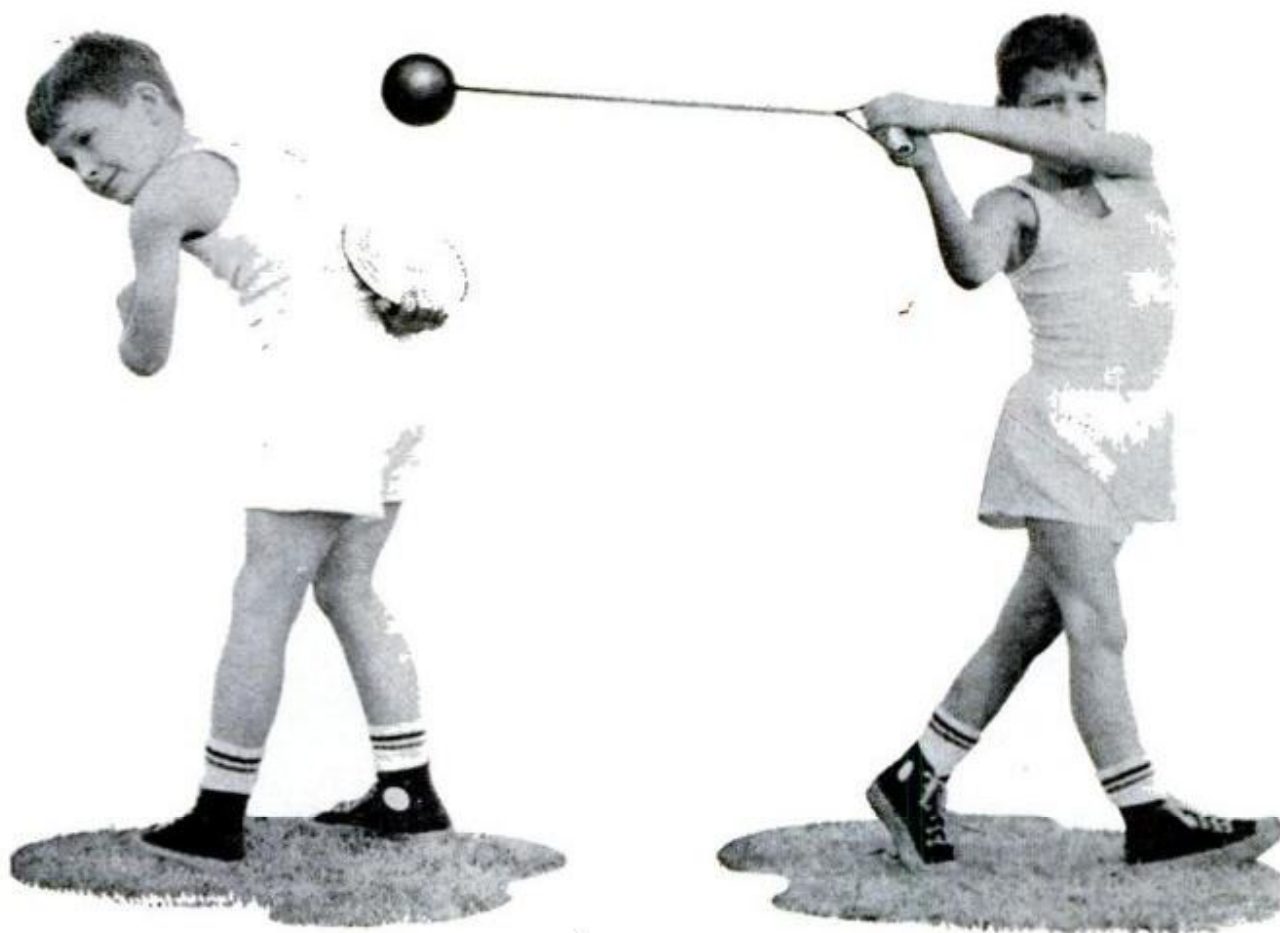




## Junior Decathlon Outfit Trains Athletes for '70 Olympics

Kids of any age can play at—and learn—track and field sports with a junior decathlon outfit. The equipment includes a high jump set, javelin (with safety tip), high and low hurdles, relay baton, discus, shot and throwing hammer (adjustably

weighted with sand), and a tape measure, measuring twine, and instruction booklet with rules and records. Everything adjusts for size. The All-American Track and Field Set sells for \$6.95, from Kusan, Inc., 3206 Belmont Blvd., Nashville, Tenn.





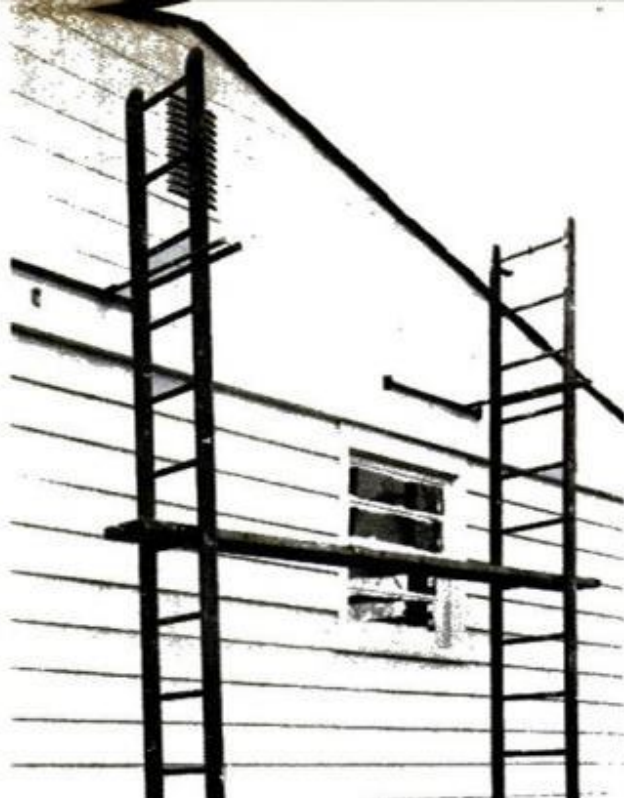


### A Gallon Per Swing

One person can pump 30 gallons of liquid a minute with a new, self-priming, lever-action emergency pump that has for its only moving part a flexible diaphragm.

It will lift fluids 25 feet and pump a gallon with each suction stroke of the handle. Intake and discharge fittings are threaded for quick connection to suction hose, plastic or iron pipe with standard couplings.

Made by the Edson Corp., New Bedford, Mass.; prices start at \$79.



### Quick Scaffold

Two ladders and a length of plank become a versatile, stable scaffold with the addition of a set of new ladder supports.

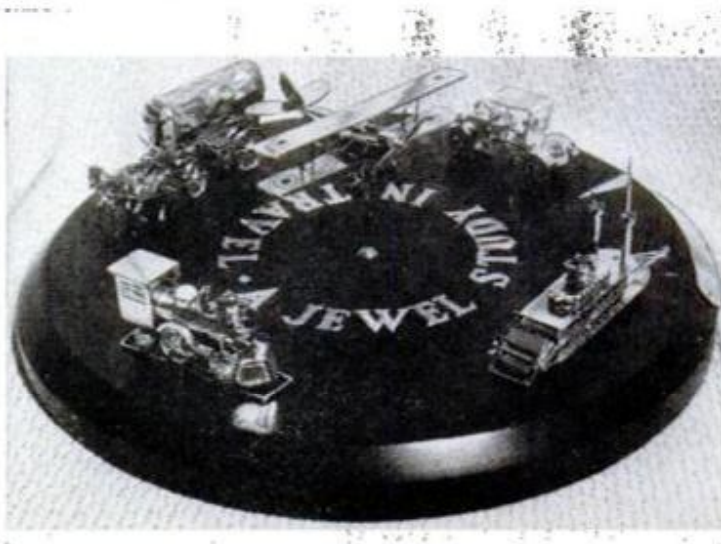
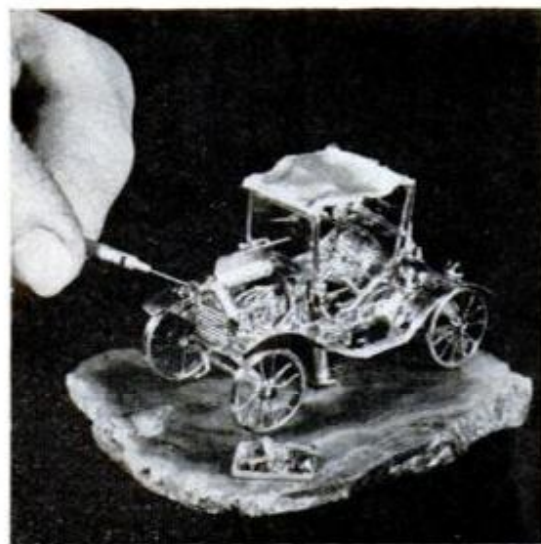
With the brackets clamped on the ladders, the ladders are raised in the usual way. The user then climbs the ladder, fastens the folded bracket to the wall, climbs down and swings the ladder out into position. The supports are made by the Hoitsma Adjustable Scaffold Bracket Co., 261 E. 23rd St., Paterson 4, N. J.

### Diamonds and Gold—That's What Model T's Made of

There is a tiny Model-T Ford in Coral Gables, Fla., that is for sale for \$2600. The three-inch-long car is made of gold and palladium, and is set with diamonds, rubies and sapphires. The hood raises to disclose a white-gold engine and fan.

This is one of several models created by

M. A. Fillmore, a jeweler who has combined skill in working precious metals with an interest in means of transportation. He has, for example, sculpted gold-palladium-jeweled reproductions of five early models of American modes of travel—car, ship, wagon, train, and plane.







### New Push for Old-Timer

Mechanization has probably arrived too late for the "penny-farthing" bicycle to make a big comeback, though a Leeds, England, man finds that a motorized museum piece is quite handy for getting around town. Owner of the gas-engined vehicle is Rowland Winn, a service station operator who has a museum of old cars and bicycles.



### Footsteps on the Ceiling

Air Force scientists walked on the ceiling during recent weightlessness tests demonstrating new space shoes.

The shoes' soles and the strips on the ceiling are made of a commercially developed clothing fastener (Velcro) which is covered with thousands of tiny hooks. When pressed together a tight seal is formed.

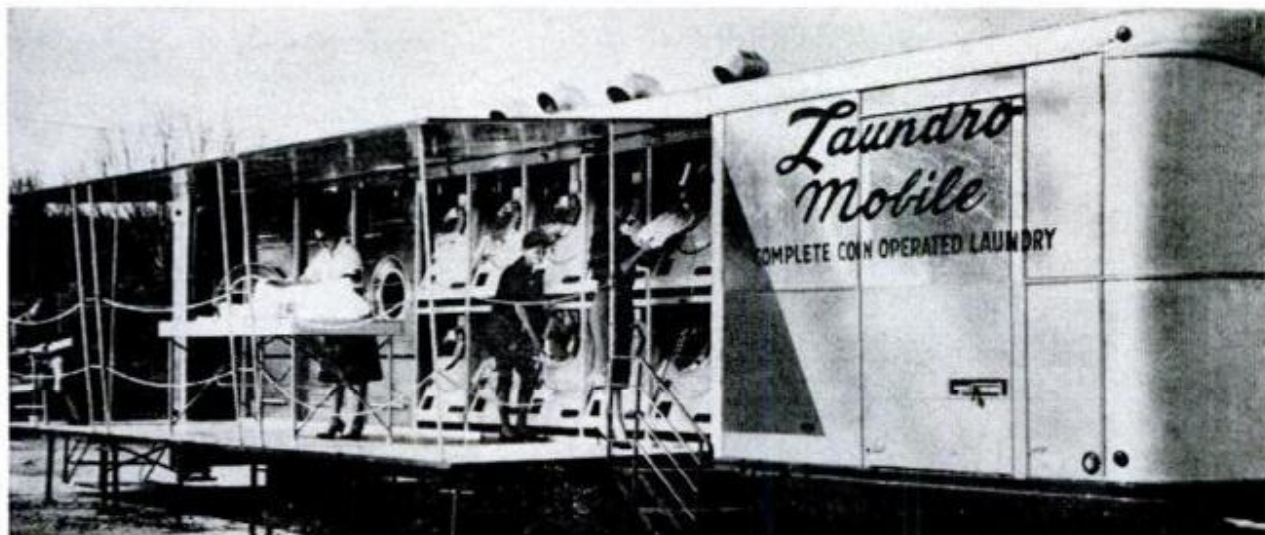
### Coin-Operated Laundry Takes to the Road

Already an urban institution and a center for exchange of neighborhood gossip, the coin-operated laundry is now ready to roll to any spot where people gather—military installations, summer camps, schools, or building sites.

Louis R. Sherman, San Antonio, Tex., operator of a laundry supply company, has put together a Laundromobile. It's a 40-

foot trailer that houses 20 washers, six stainless-steel dryers, water softeners, water-storage tanks, recirculating water pump, change maker and, of course, dispensers of his firm's detergents and other products.

The unit can be set up for business—or taken down—within a half hour. It has its own power and heating equipment, and is pulled by an ordinary truck tractor.





# WHAT'S NEW FOR Your Home



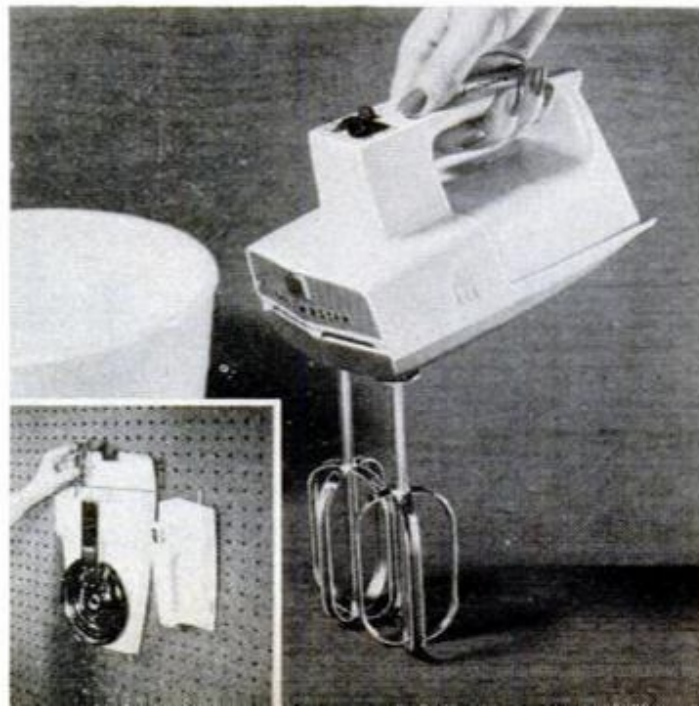
**FLOOR WASHER-DRYER** uses household water power to do both its jobs. Clean water flows from faucet to floor through 20-foot tube and cellulose sponge in washer head. A simple twist of the pump sets up a venturi action that "vacuums" up the dirty water and empties it into sink. Aqua-Vac is made by Siph-O Products Corp., 549A Tremont St., Boston 16, Mass.

**BLACK ON ONE SIDE**, this aluminum foil cuts cooking time in half because the dark surface absorbs infrared rays. A large potato, for example, bakes in 35 minutes. A package of 14 sheets in assorted sizes (24 by 24, 12 by 18 and 12 by 12) sells for \$1.95. Jet Chef, the black-one-side foil, is available through B. F. Gladding & Co., South Otselic, N. Y.



**ON OR OFF AUTOMATICALLY** goes the appliance (or tool) plugged into a built-in timer. It can be set for any interval up to 12 hours. There are two standard outlets plus one for appliance that is to be turned on and another for appliance to be turned off. The Appliance Minder, which sells for \$19.95, is a product of M. H. Rhodes, Inc., Hartford, Conn.

**LIGHTWEIGHT PORTABLE MIXER** has a stand—also lightweight—that quickly folds flat for storage in a drawer or on a wall (inset). Both units have key-hole slots for wall-hanging. Compartments in the base of the stand hold the cord and beaters. The mixer with stand and bowl sells for \$29.95. Manufacturer is Toastmaster Div., McGraw-Edison Co., Elgin, Ill.







**PORTABLE GREENHOUSE** enables gardeners to practice hobby all year. The electric, thermostatically controlled enclosure maintains temperature and humidity for growing plants, herbs and flowers. The deluxe model (shown) costs \$21.95; a lower-domed model, \$14.95. Product of Westinghouse Corp., Pittsburgh, Pa.

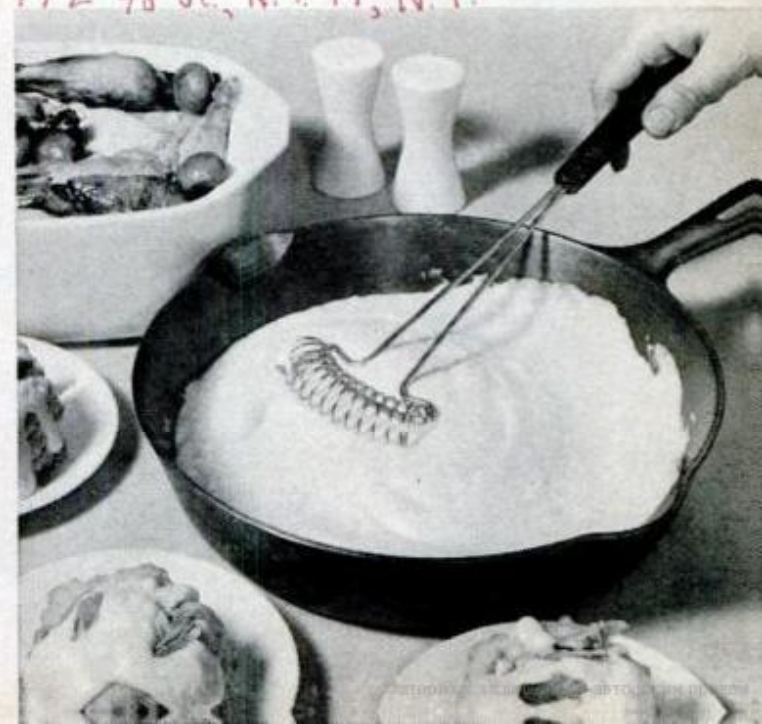


**CART** for carrying logs to the fireplace is attractively finished to serve also as a wood basket inside the house. Frame and basket are made of steel. Fyre-Kart in four styles ranges in price from \$11.95 to \$24.95. The two-wheeled cart is made by Meteor Enterprises, 5356 Riverton Ave., North Hollywood, Calif.

**JOTTING NOTES AT NIGHT**—when a name or appointment is suddenly remembered—is easily done on an illuminated memo pad. Light glows through translucent plastic under paper. Another light in side of case is flashlight. Bedside Secretary is sold for \$4.95 by Hollis Co., Dept. BS-1133 Broadway, New York 10



**ADJUSTING** to varied contours with light pressure on the handle, the Mix-Stir enables a cook to mix and blend food in curved, flat or even warped pans. The stainless-steel coil is cleaned by swishing in suds. Priced at \$1.98, the mixer is available from Top Industries, Inc., 6 Boulder Ct., So. Norwalk, Conn. 17 E 48 St., N.Y. 17, N.Y.







## Hoods for Sub Escapes

Two Navy officers recently set a record for escape from a submerged submarine (318 feet), using newly developed hoods.

The hoods consist of a standard life jacket with a rubberized head covering. A transparent plastic face section allows the wearer to see. Relief valves on the collar permit expanding air from the jacket to fill the hood and allow normal breathing.

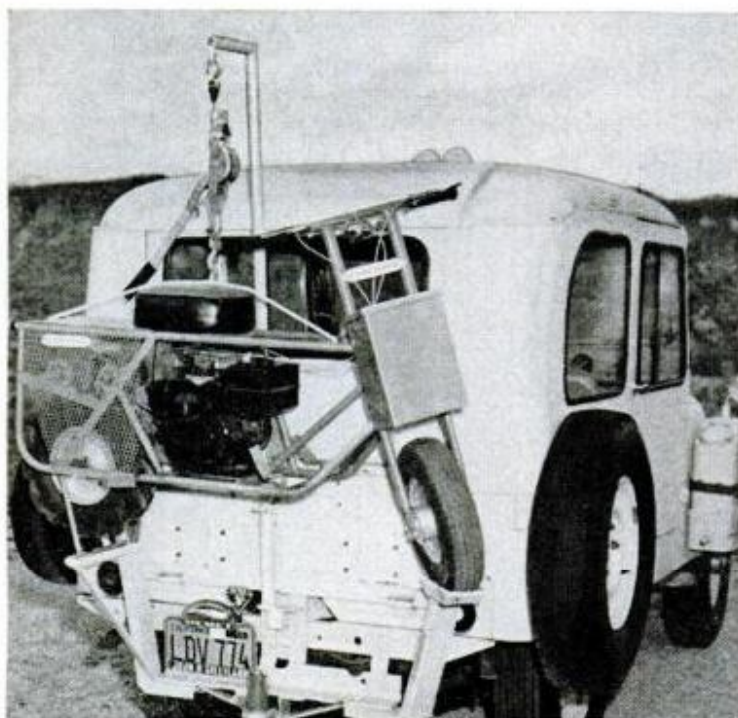


## New Talking Strip

Sound has been placed on film strips, giving still-picture projections the same advantage as sound motion pictures.

Called Soundstrip by its creator, the Kalart Company of Plainville, Conn., the system uses a rotating light beam to scan an optically recorded sound track. Unlike movie film, however, which runs the sound track alongside the frames being projected, Soundstrip alternates the frame to be projected with its sound message, which is recorded on the next frame. While the image is on the screen, the scanner is focused on the sound frame.

The special projector can handle a 20-minute program, or about 25 feet of standard 35-mm. film. It can interrupt the program for additional comments from the operator.



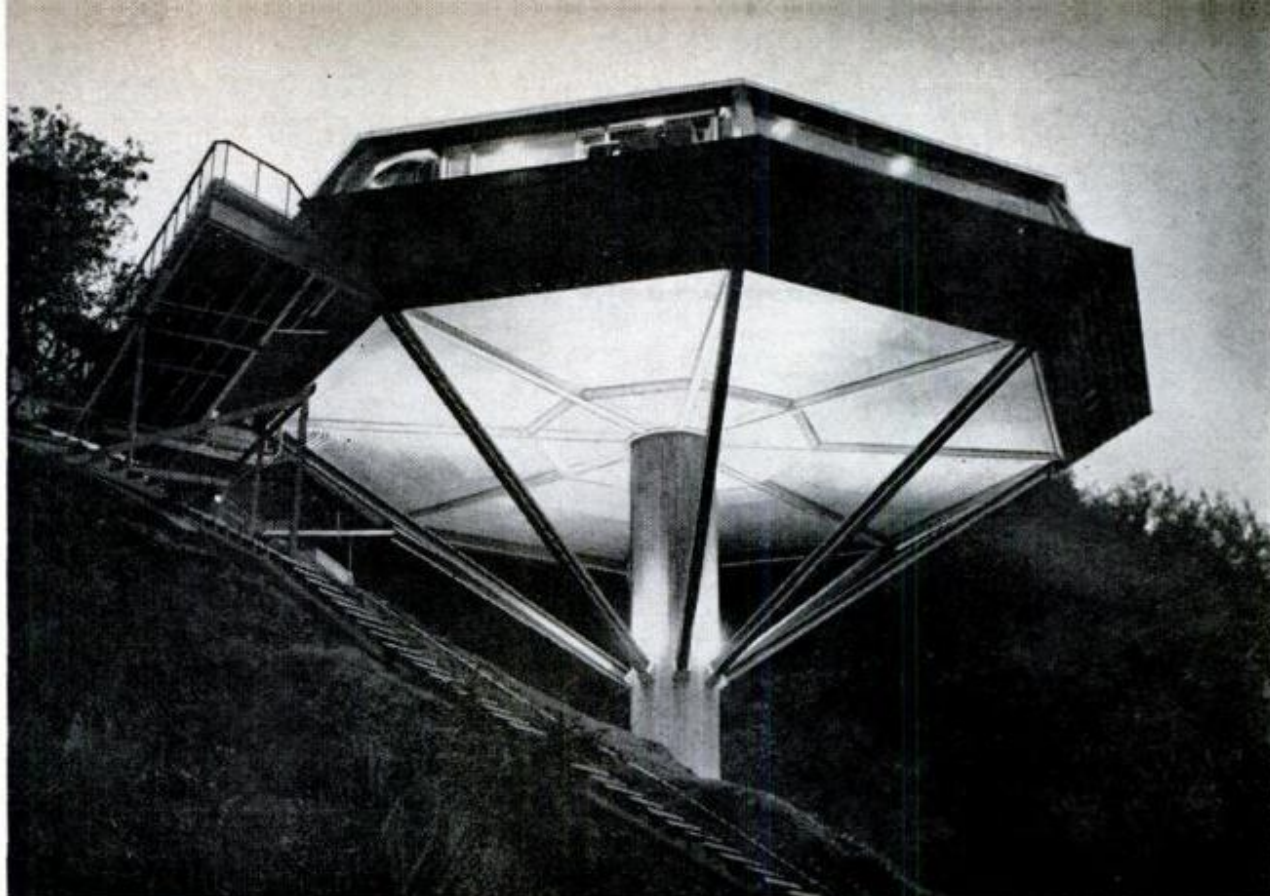
## Hitchhiker

When the terrain is impassable for four wheels, there's always a two-wheeler ready to take over in this piggyback arrangement.

Key to the setup is a hand-powered winch from which the motor scooter hangs. It has a hand lever that's pumped up and down much like a car jack; this causes the two-wheeled Tote Gote to be raised into place by a pulley. Another lever reverses the pulley, allowing the two-wheeler to be lowered slowly to the ground.

The "crane" for the pulley and brackets for the wheels were made by Grant Replogle of Hemet, Calif. The 1½-ton-capacity Power Pull is a product of American Gage and Manufacturing Co., Dayton, Ohio, and sells for \$35.





### Fourth-Floor Home—With Three Floors Missing

Built to demonstrate the effectiveness of new plastic and chemical adhesives and sealants, the Chemosphere House is a 60-foot octagon perched atop a 30-foot-high, five-foot-thick concrete column buried in a Hollywood hillside. The new materials

solved problems in bonding concrete and steel in the footing, cantilevered beams and roof as well as serving many more ordinary uses. Architect John Lautner and owner-builder John Malin provided a four-seat cable car for access from the road.

### Wire Mesh Foils Woodpeckers

Many a southern woodpecker, his bill aching, has now sworn off telephone poles for good.

They had had it good for years as harassed utility companies tried one expedient after the other to fend off attacks, but to no avail. The onslaught of the woodpecker had reached the point where poles with a normal life expectancy of 30 to 35 years, when placed in heavily-forested regions, were being rat-tat-tat-tatted to pieces in three to five years.

No more. When a pole goes in today, it is wrapped with a wire mesh from the top down to a point 12 feet above the ground.

The wire, a one-half inch, 19-gauge mesh is heavily galvanized.

And so, quiet has descended over the crossarms of the southern utility pole.

☞ Sunspots, which recently disrupted short-wave radio, are great funnel-shaped vortices in the outer layers of the sun. The whirlpools emit streams of electrified particles, moving 1000 miles a second, that upset the earth's magnetic field and play havoc with global communications.





(see MARCH 62, p. 10)

# STORMY FIGURE on the WEATHER FRONT

By Thomas E. Stimson, Jr.

Irving P. Krick says he can forecast the specific weather for months—and even years—in advance. His results have been so remarkable that he's in a running battle with the Weather Bureau. You can test him yourself with the October weather maps on pages 168 and 169.

LAST DECEMBER the committee in charge of President Kennedy's inauguration needed a forecast of the weather. Committee members consulted Dr. Irving P. Krick. He told them, "Washington will be cold on January 20, with no precipitation. It will be a day between periods of stormy weather. Snow will likely accompany the storm periods before inauguration but will not upset your plans."

When I visited Dr. Krick at his headquarters in Denver recently, I commented that it had snowed on the day before but not on Inauguration Day itself. His prediction was correct, but hadn't he taken a big chance so far ahead?

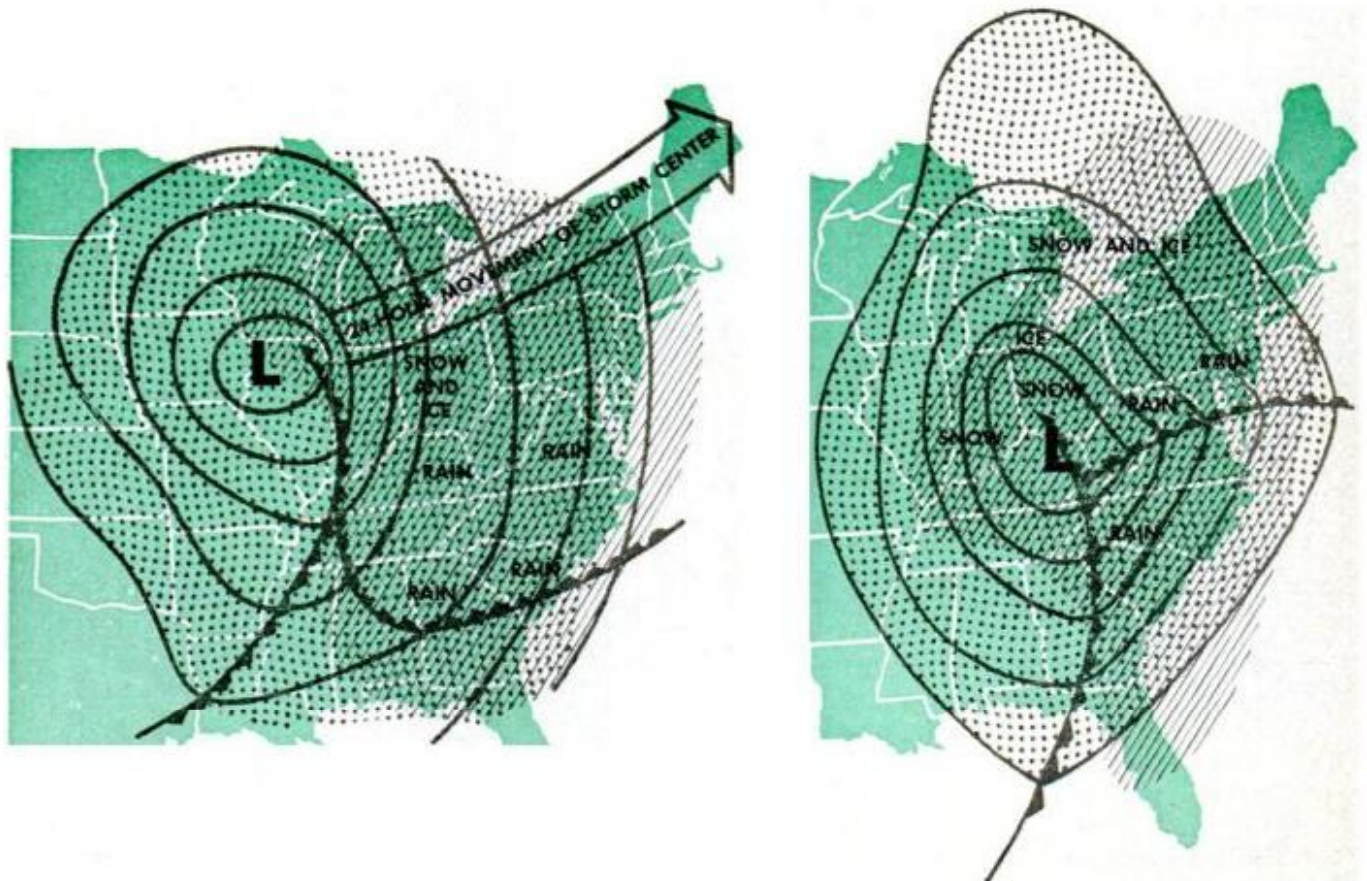
"Not at all," he said. "We could have made the forecast several years earlier. In fact, if you'd like to know what the weather will be at the next inauguration I'll tell you now."

He flipped through some charts, penciled some lines on a map and made a few calculations. "The weather in Washington, D.C., on January 20, 1965, will be fair with unseasonably high temperatures," he told me. "Highest temperature of the day will be in the 50s, in contrast to the cold, windy weather of this past inauguration."

Dr. Krick says that he and his staff can

**CORRECT FORECAST** brings smile to Dr. Irving Krick, right. Below, forecast made a year in advance and actual weather on February 25, 1961

**He predicted this a year ahead . . . and this happened**



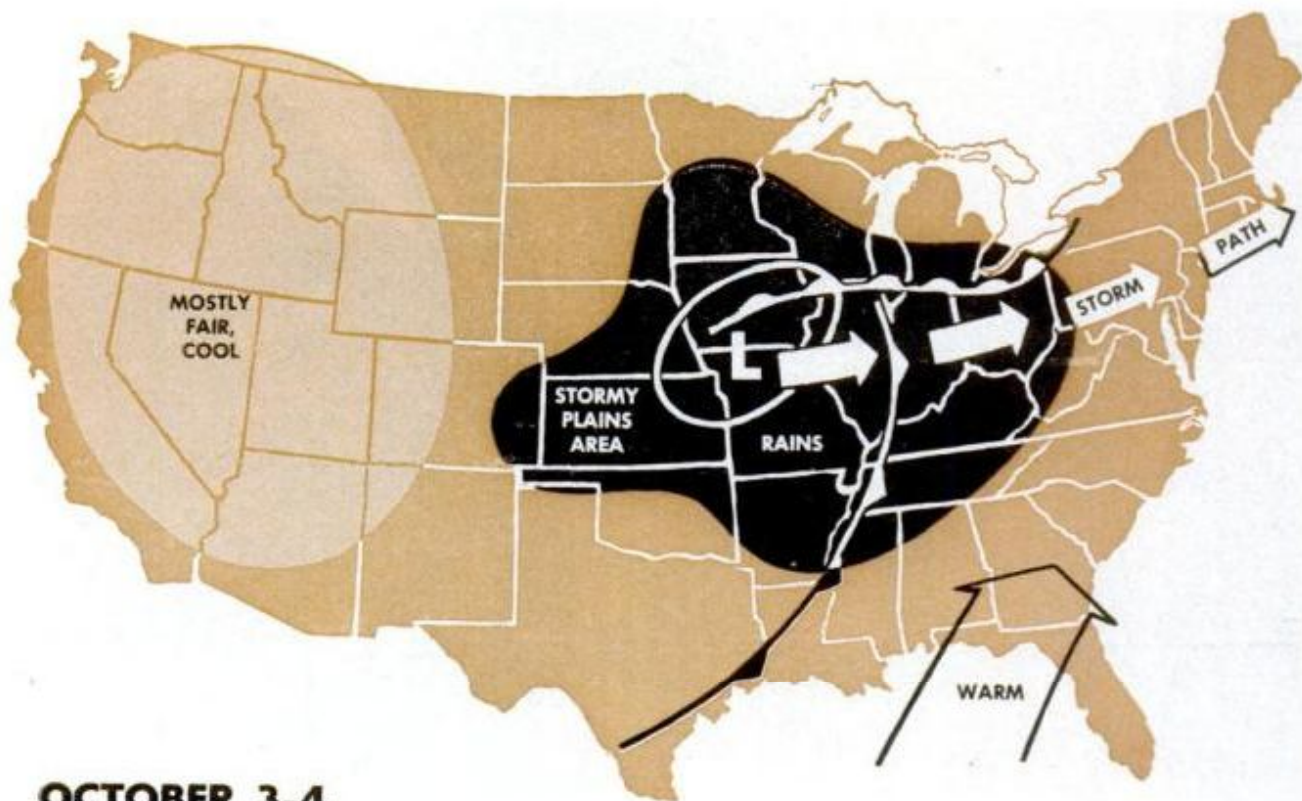




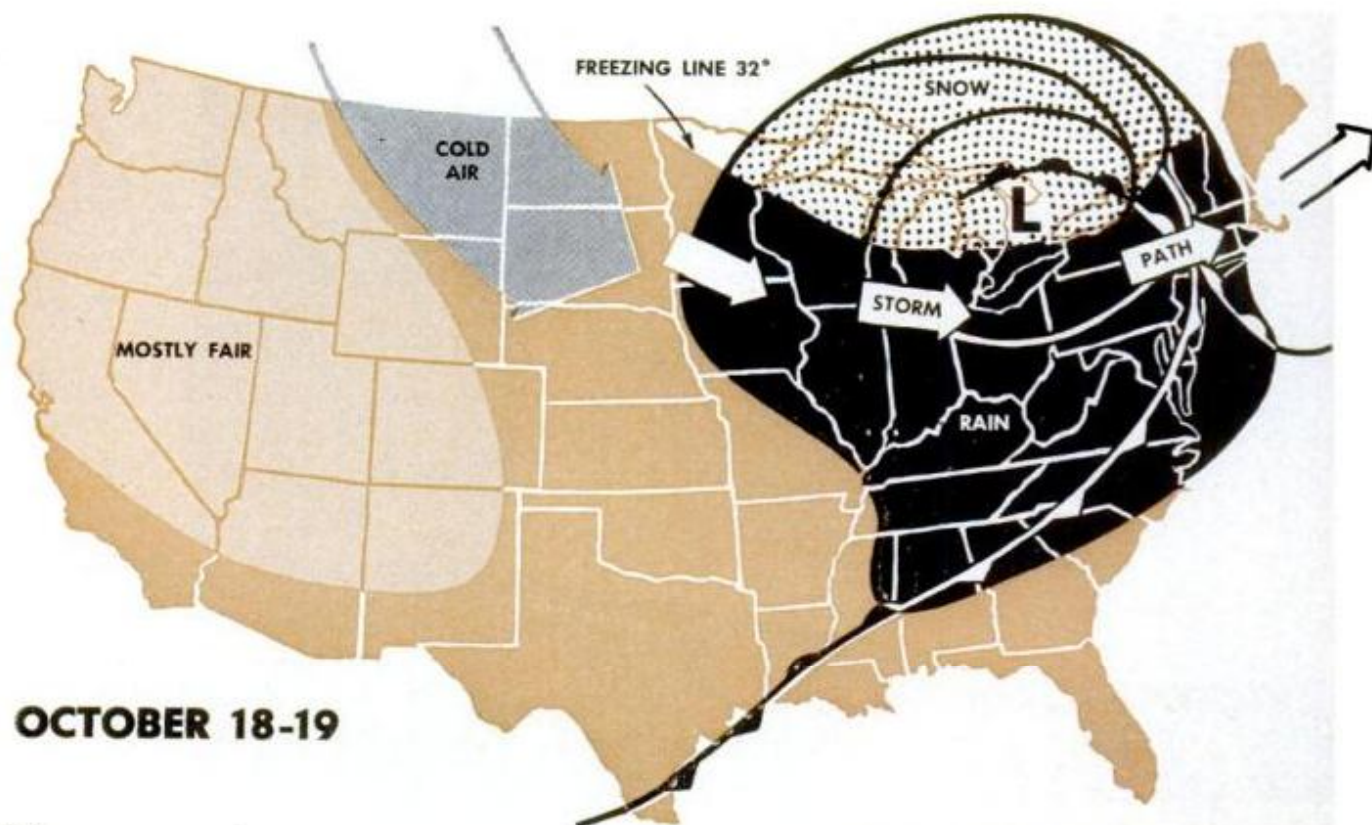
OCTOBER 1961



Check these predictions.....



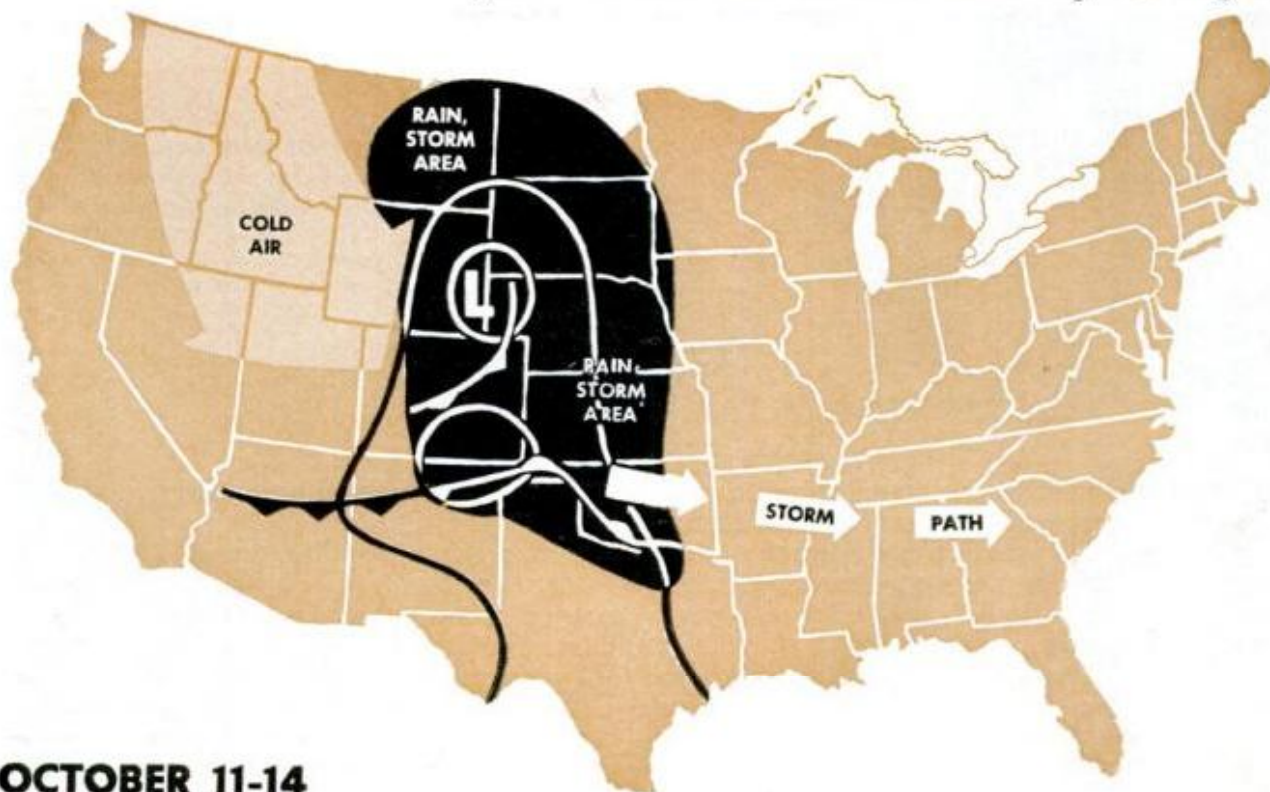
**OCTOBER 3-4**



**OCTOBER 18-19**



..... On June 5, four forecast maps were drawn for Popular Mechanics from data compiled six years ago. Watch your weather to see if they're right



**OCTOBER 11-14**

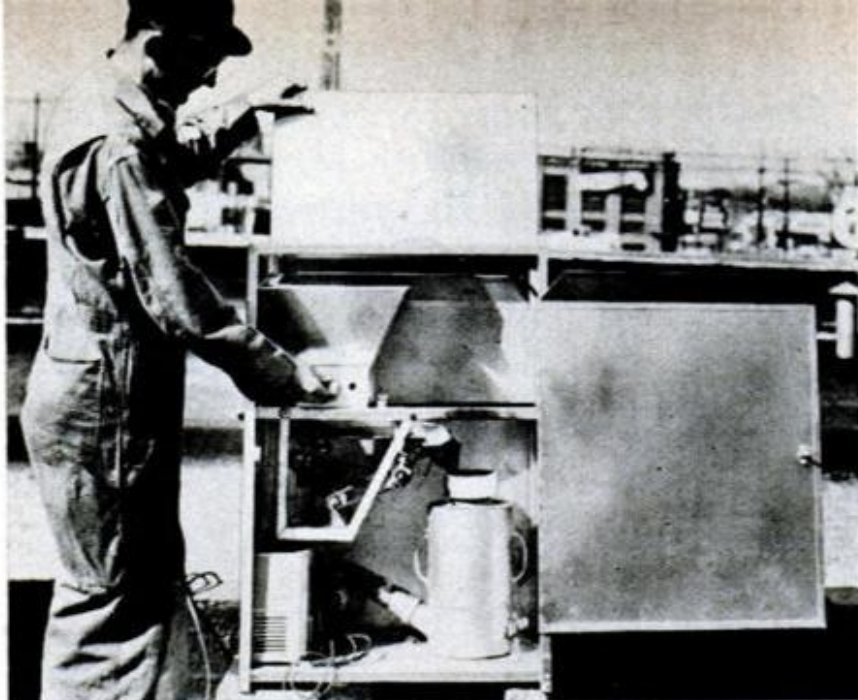


**OCTOBER 20-22**

OCTOBER 1961

169





**SILVER-IODIDE** generator is basic weather modifier. Pellets of silver iodide dropped into furnace produce fumes (minute silver-iodide crystals) that are blown into atmosphere. Crystals, swept into rainclouds, are nuclei for moisture and cause an increase in the amount of rainfall

**USE OF GENERATORS** is scheduled by weather-modification staff. Location of each generator is marked on map, right. Generators in uninhabited areas are remotely controlled by radio

foretell the weather for any day in the next 25 years over much of the Northern Hemisphere with 85 percent accuracy. He adds that within a few more years he'll be able to forecast the daily weather to the year 2000, anywhere in the world.

He says he can prevent tornadoes and has already done so. He says that with our present knowledge we can steer hurricanes away from populated areas or prevent their formation. And that without spending a cent on more research we can prevent regional droughts or greatly reduce their severity.

Who is Dr. Krick, anyway?

For one thing he is head of Irving P. Krick Associates, Inc., an international weather-engineering concern that grosses more than \$1,000,000 a year from selling long-range weather forecasts and from modifying the weather.

For another thing he is the central figure in a bitter controversy. Many meteorologists stoutly support his forecasting method and its results. His customers, including foreign governments and large corporations, say that nowhere else can they get forecasts as accurate as his.

But some other meteorologists as well as government Weather Bureau officials say that accurate long-range forecasting is impossible at present. Some say that Krick's claims for producing more rain where needed, for preventing disastrous hailstorms and for creating more snow at ski resorts (and mostly during the night so as not to inconvenience the eager skiers) are absurd.

One professional society hardly veiled its language in denouncing Krick's methods as "quackery." Meanwhile, he says, the society steadfastly refused to examine the evidence. It has been said that he merely

writes farmers' almanacs with the aid of an electronic computer.

Today Krick is fighting mad.

"Big business can't gamble on the weather and many of our hundreds of forecast clients are big industrial concerns," he says. "Our services are expensive and yet these clients stay with us year after year. They can't afford to stop. Some clients even ask us not to sell the same information to their competitors. The accuracy of our ultra-long-range forecasting has been demonstrated hundreds of times.

"Yet our own government Weather Bureau and some university researchers would have you believe that \$60,000,000 to \$100,000,000 must be spent on research just to learn if long-range forecasting is possible. This is a professional scandal. It is an outrage on the taxpayer. The United States could easily lose the race for weather control in the space age while the 'learners' feeding off government research money try to catch up with the 'doers' who have done their learning without tax dollars."

Dr. Krick thinks that much of the animosity directed against him is because his relatively small private company has the audacity to outdo a government agency.

The controversy seems to go back to the early 30s when the two principal schools of meteorology in the U.S. began working along diverging lines. Dr. Krick was professor of meteorology at the California Institute of Technology and had begun to develop a theory of forecasting based on how the atmosphere reacts to the energy that it receives from space.

Meanwhile meteorologists at the Massachusetts Institute of Technology were devoting their attention to air-mass analysis. The two ideas had little in common, and some pretty strong opinions were ex-





pressed. "This latter school of thought has not developed long-range forecasts that are commercially useful but nevertheless it dominates the scientific work of the U.S. Weather Bureau," Dr. Krick says.

There was no hint of this controversy when I visited his quiet Denver weather headquarters. A staff of close to 50 people occupy the two-story building. In one soundproofed room a battery of teletypes was recording current weather-from stations across the country. Other machines were duplicating wirephoto weather maps of the Northern Hemisphere.

In another room a technician stood by a map that covered the whole wall, plotting the locations of silver-iodide generators that would be installed around a farming area to wring additional rainfall from the clouds.

One central room, the "information center," had charts suspended around three sides of a big booth. This was the pay-off area where today's actual weather could be compared to the forecast that had been made several years before.

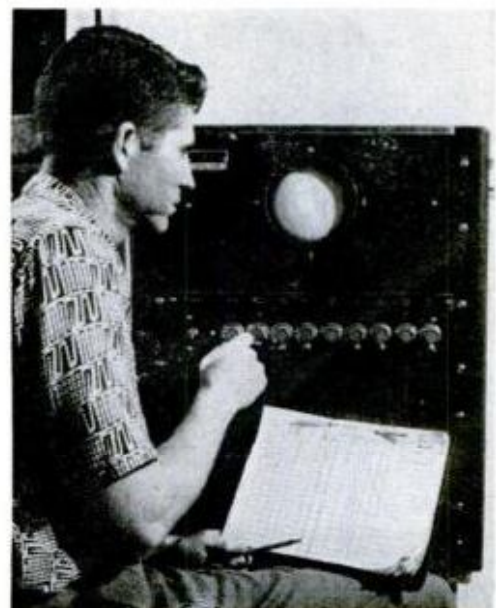
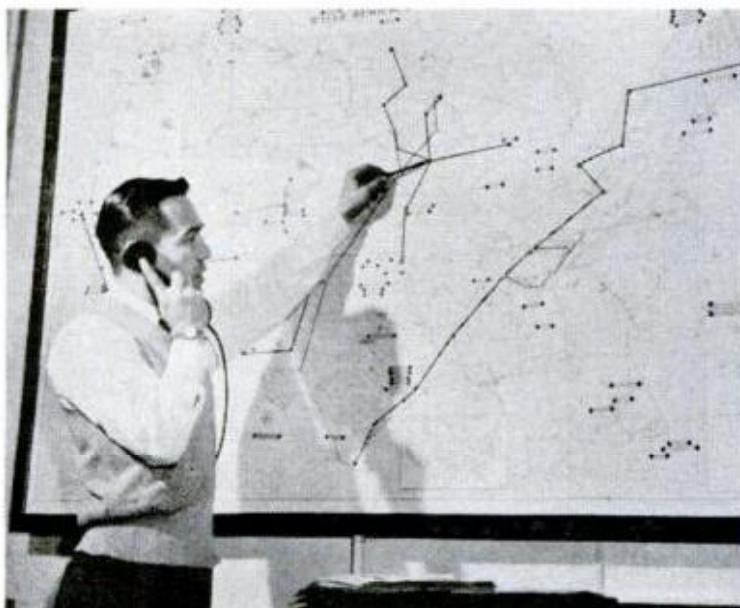
At my request the meteorologist in charge pulled down today's weather map and the early forecast and laid them side by side. They looked almost identical.

"Look," I said, "I'm flying to Los Angeles this afternoon. Base your estimate on the 1957 forecast and tell me what the weather will be when I land."

"That's easy," he said. "You've been having clear weather on the coast but you won't have it tonight. By the time you land you'll be in low clouds and fog." I made a mental bet on that, for the Los Angeles

(Continued to page 240)

**METEOROLOGIST**, left, tells engineering contractor by phone what days rain will fall next week. At right, spherics machine spots lightning strikes which in turn reveal the locations and paths of thunderstorms







## Animals Are Shocked

Hot from West Germany comes a do-it-yourself electrocution kit that shocks moles, muskrats, mice, wild rabbits right out of their burrows—if not their skins—so the homeowner can destroy them.

The operator sticks two steel electrodes into the animal's lair. They are attached to a transformer which increases power of a 12-volt battery to 360 volts. Short electrical impulses, harmless to humans, chase out the animals.



## Italian Turbocopter

Jets of compressed air at the blade tips turn the main rotor of a new Fiat turbine-powered helicopter. The basic gas-turbine engine supplies hot air to drive a power turbine that in turn drives a compressor which supplies the air to the blade tips.

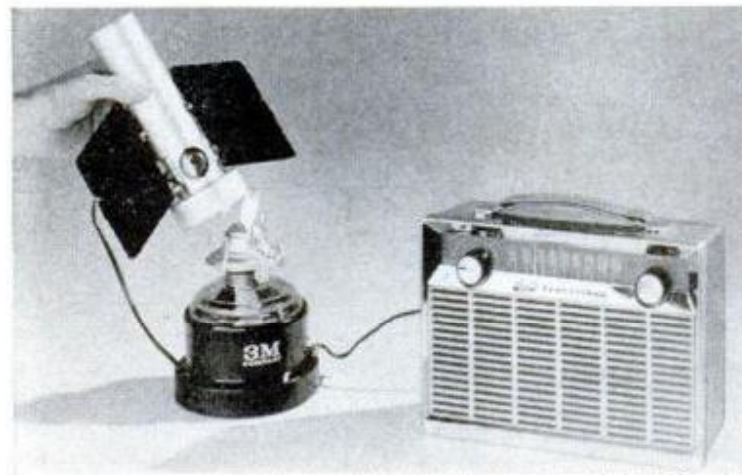
The cabin has dual controls and room for seven persons. It can function as a civil transport or as a military evacuation vehicle with room for two litters.



## Withstands 4600° Heat

Composed of more than 90 percent water, a unique material has been developed for possible use in space-vehicle walls to protect occupants from the heat of re-entry.

Resembling a cross between a piece of wet felt and a fine-grained cellulose sponge, Chance Vought's Thermosorb has been subjected to temperatures up to 4600 degrees from acetylene torches. Among other possible uses may be fire walls and fire-fighting equipment.

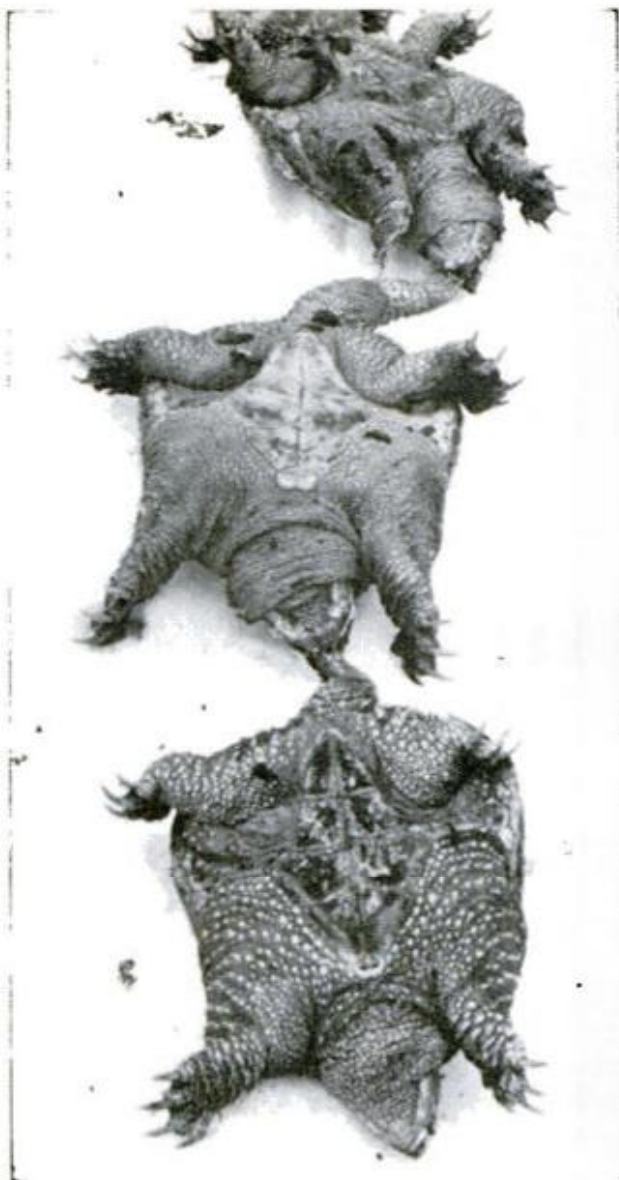


## Radio Runs on Heat

Eliminating the need for batteries as a power source in portable radios, a new thermoelectric generator will produce enough current to operate a three to nine-volt transistor radio. Intended primarily for use in remote areas or in fallout shelters, the heat unit will also provide a low level of light and heat at the same time.

The generator, developed by Minnesota Mining and Manufacturing Co., will provide power in one minute and run 24 hours on a pint of fuel.





## Snap-On Safari

WHEN AN East Moline, Ill., hunter is through hunting turtles for the day, he doesn't worry about how he is going to carry the snappers home. He puts a turtle tail near a turtle mouth and, *snap*, he builds a string ready for traveling.

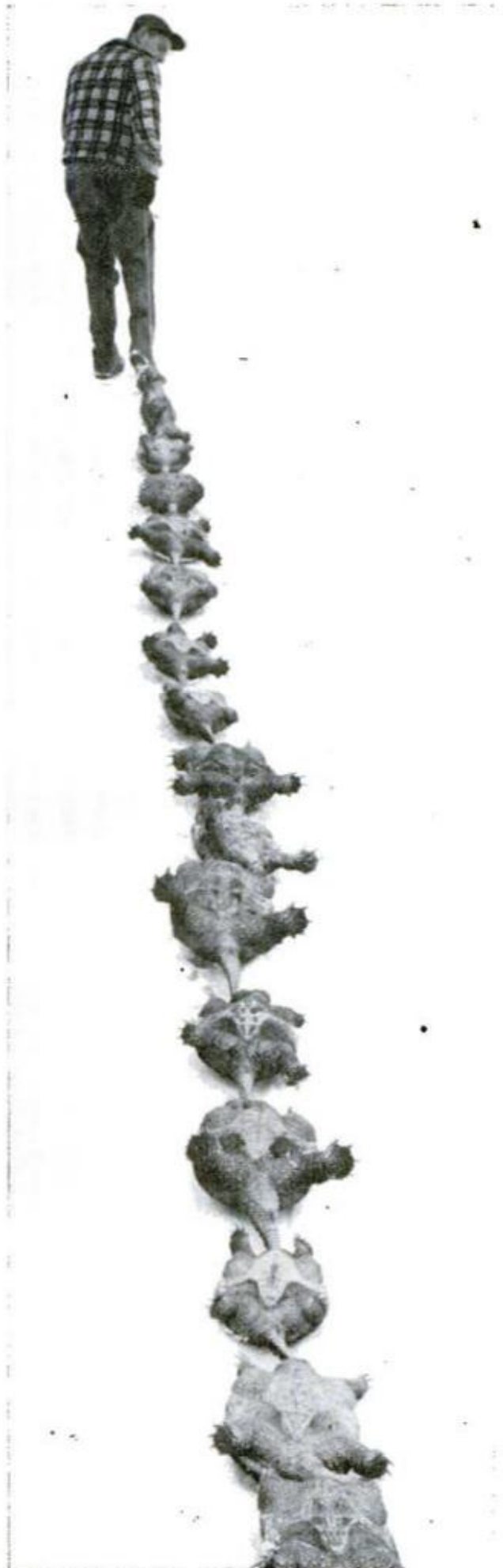
"It's the best way to get them home," says Tom Frazer. "They'll bite anything that gets near their mouths—including each other."

Frazer hunts in fall and winter in Mississippi swamps and backwaters.

"Basically, a good turtle hunter needs only three things," he says. "A turtle hook, an axe, and a good pair of walking legs."

When Frazer finds a likely spot, he chops a one-foot hole in the ice, then uses the hook (a seven-foot rod, blunt on one end) to probe the bottom.

"When you hit a turtle, it'll feel something like a pumpkin," says Tom. He uses the hooked end of the rod to get them out.





# RADIO TV HI-FI

**ELECTRONICS**

## Adapting Your Stereo for Twin-Channel FM Multiplex

By Byron G. Wels



AVAILABLE WITH A MODERN WOODEN CASE, the Fisher multiplex adapter (right) features two pilot lamps. Left is Power On indicator and right, Stereo Beacon which lights when receiving stereophonic program material

**N**OW, IF YOU add a multiplex adapter to your stereo system, you can tune almost any FM station at almost any time and—at long last—receive true stereo broadcasts!

While the process is indeed called “multiplexing,” the commercial manufacturers have settled on the term “Stereo FM.”

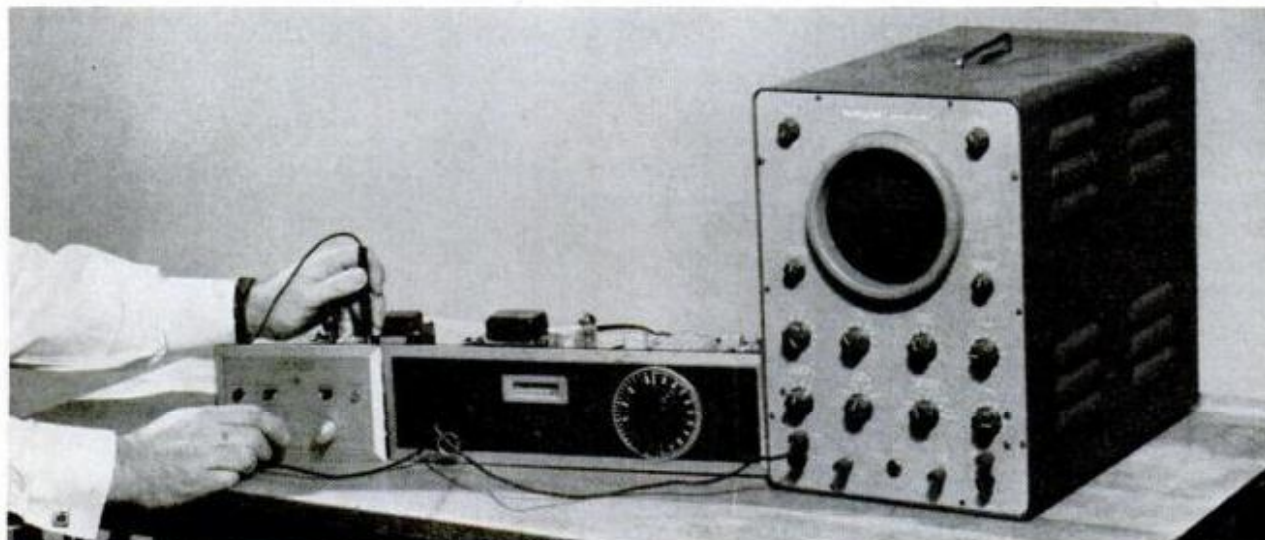
Most of us can remember fumbling around with two table radios to receive the early experimental stereo broadcasts some time ago. Usually, one was an FM set and

one was an AM set—and, as a stereo blend, somehow the twain never met very well. The inherent shortcomings of AM—with its noise, drift and narrow band width—were all too apparent.

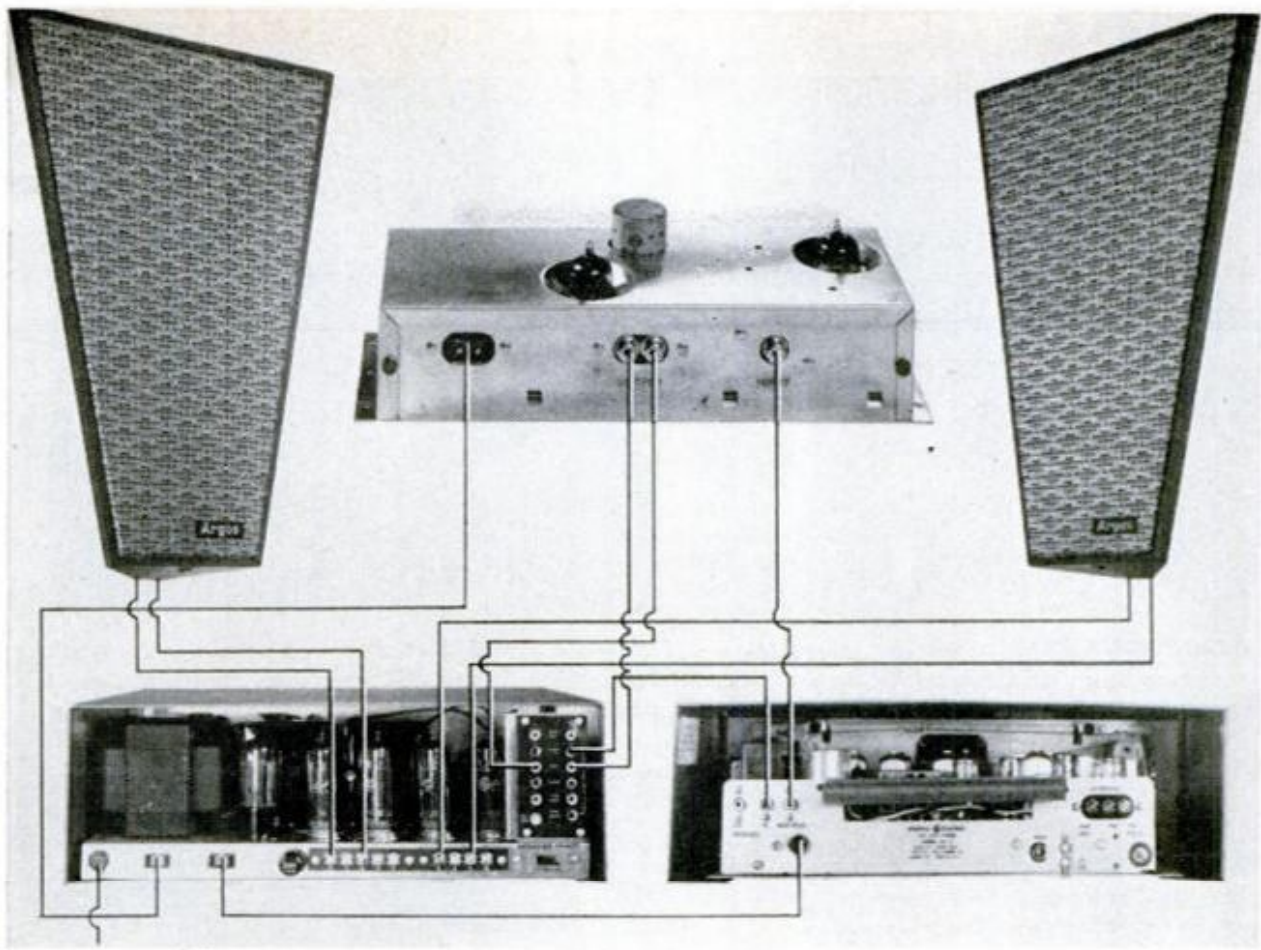
Later on, many of us tried to get closer to the stereo ideal by using the FM audio portion of our TV set as one channel and an FM radio as the other. This was better, but again the narrow band width of TV audio restricted the sound quality.

The multiplex adapter you select must

**CHECKING THE EQUIPMENT ON THE PM TEST BENCH** to see that the adapter met manufacturer's specs. A separation of 20 db between channels is required and the Scott, below, bettered the requirements easily







**COMPLETE STEREO RADIO SYSTEM** is shown above. Follow wiring diagram for any system, checking manufacturer's data for slight changes. Adapter (center) is GE type, works with all narrow-band systems

match the tuner you have. If your tuner is a wide-band type, your adapter must be wide-band. If you have a narrow-band tuner, get a narrow-band multiplex adapter.

If you have any question about the type of tuner you have, consult the instruction book that came with the tuner, or write the manufacturer. Be sure to give the model number, as some manufacturers produce both types, or have produced one and changed to another!

Installation of the adapter is merely a matter of interconnecting units with prefabricated plug-in cords. All tuners have output jacks, and these are usually labeled as either "output" or more specifically in some cases, "Multiplex output," "FM output," or "AM output" in FM-AM tuners. Connect the FM or multiplex output, to the input jack on the multiplex adapter. Connect the AM output (if there is one) to the extra or accessory input on the amplifier system. Connect the output of the multiplex unit to the left and right tuner inputs on the amplifier system.

Finish the installation by connecting the a.c. line cord of the multiplex adapter into the switched a.c. receptacle on the back of your FM tuner, to make sure that the adapter will be on only when the tuner is.

If the multiplex adapter you use is to be hidden away with no controls to adjust, as on the GE type, mount the adapter behind a panel of the stereo system where it will not be seen. Other types have decorative panels, and are meant to be installed in a "through-the-panel installation." This permits you to operate the various controls.

Stereo records have a channel separation of 20 db. As much of the broadcast stereo material will be from records, an adapter must at least have 20 db channel separation or the received material will not be as good as the original record. Records with better than 20 db separation will need adapters with better separation! Of the three units we examined, all met the manufacturers rated specifications, and two of them exceeded the declared specs. However, while some units boast greater separation than others, there is no point in polishing the stars out of the sky! The usual stereo material to be broadcast will be recorded, and there is little point in having more separation than found on records.

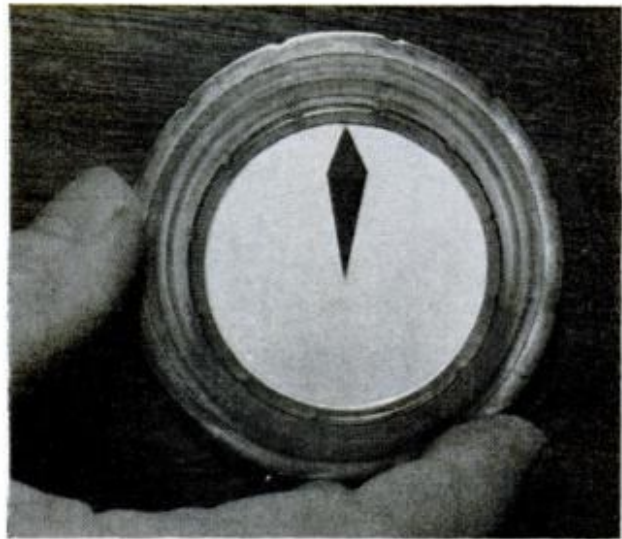
If you do *not* have an adapter, you will still be able to receive, monophonically any stereo transmissions that are made. The F. C. C. has guaranteed that by selecting this system. ★ ★ ★



# KINKS

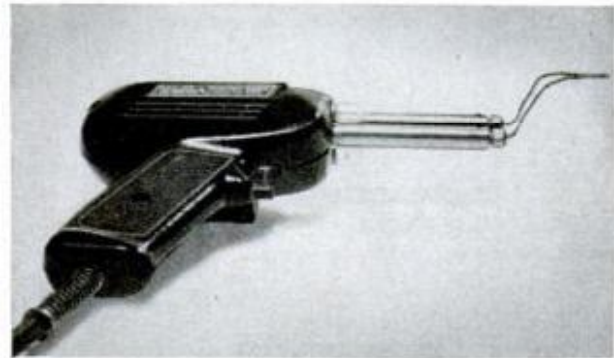


**OLD TECHNICIAN'S TRICK** works for young technicians too. Breathe on tube, rub briskly on short hairs at nape of neck. Missing numbers can then be read



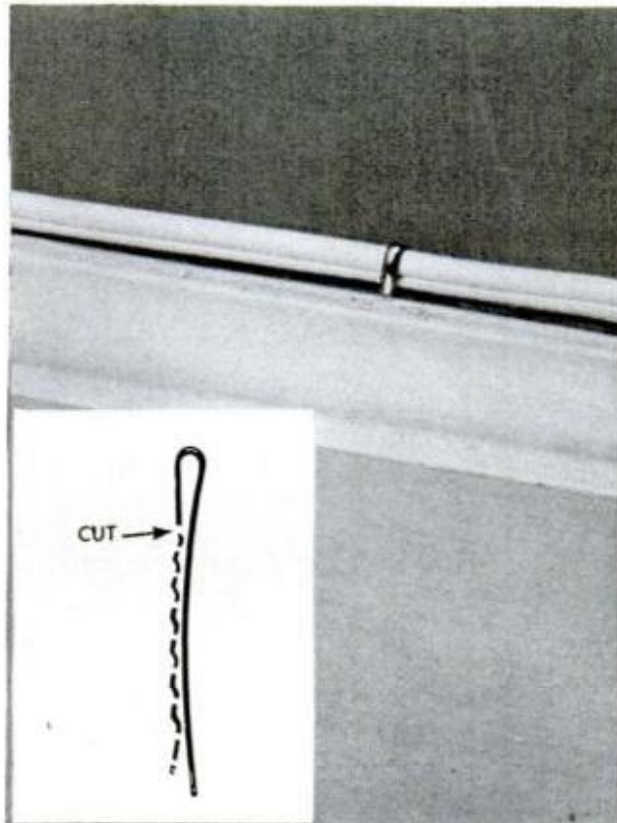
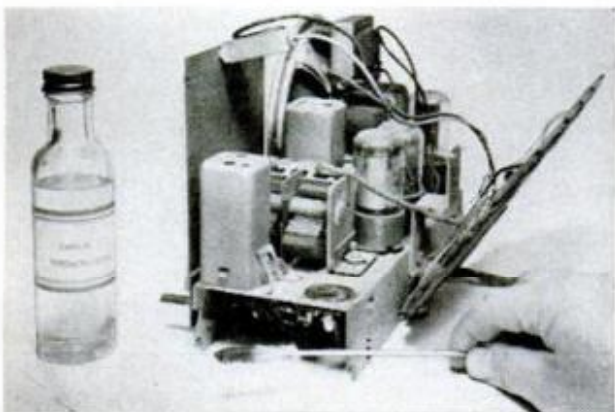
**MISSING NUMBERS** on old TV dials cause lots of grief. Paste white paper disk over dial, then paste on a black pointer. This helps orient dial, aids tuning

**TO SOLDER** hard-to-reach places, replace soldering gun tip with bent wire. While wire will not last as long as standard tip, it bends easily to any shape, can be formed in seconds with finger pressure. Avoids scorched wires and parts near joint



**WOMAN'S BOBBY PIN** solves another problem in a home. Cut where indicated, push wire into loop and press the other leg of hairpin into space between wall and baseboard. Hairpins every few inches hold wire off floor, make neat installations

**CARBON TETRACHLORIDE** or tri-chlorethylene used carefully with a swab will remove accumulated dirt, grease and dust from radio sets that have been used in kitchen. Grease build-up can cut efficiency, even render set unplayable. Clean up periodically







WEAR IN POCKET. Inset shows clip mounting method



USE AS BOOK MARK. Hear the radio while you read

## Paper-Clip Radio

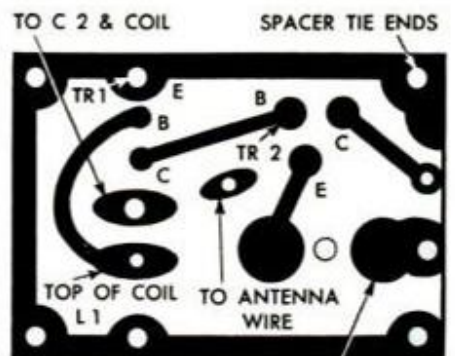
A LARGE X-type paper clip is the foundation of this radio. The two printed circuit boards serve as chassis and container. The bottom section holds the paper clip to the unit and the top section is the printed wiring board. Batteries are mounted on top as part of printed wiring connects them to the circuit.

The antenna coil L1 and capacitor C1 are first soldered into place. After the wiring is complete the units can be fastened together. Place the two boards edge-wise in a vise, and using number 14 wire, solder at the corners. Solder the paper clip to the bottom printed board.

A small alligator clip fastened to a flexible wire is the On-Off switch. A small washer and bolt holds the two small batteries on the top board. The flexible antenna wire with a small alligator clip fastens to any object that is antenna pickup material. If your local stations are on the high band, use a 120-mfd ceramic disk condenser for C1. The lower band is covered with a 330 mfd. capacity condenser.—Homer L. Davidson



1 1/4" x 1 3/4"

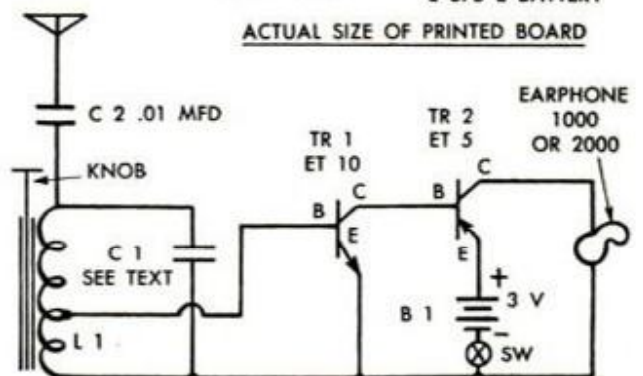


TOP BOARD NEG. TERM OF ONE E 675 E BATTERY

ACTUAL SIZE OF PRINTED BOARD

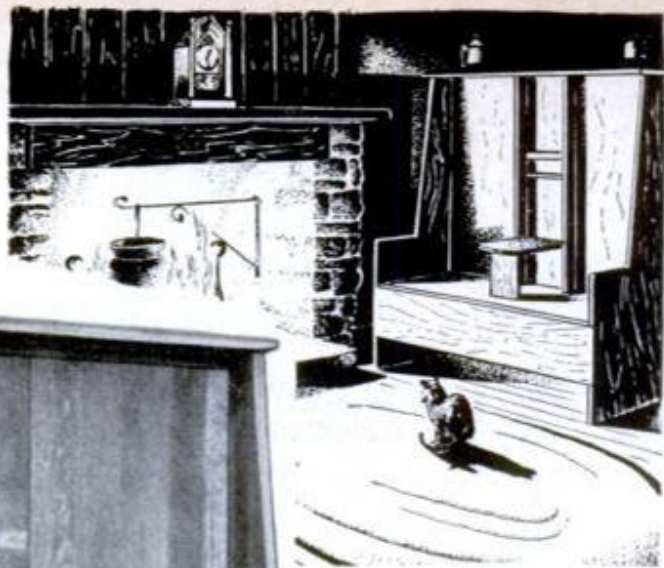
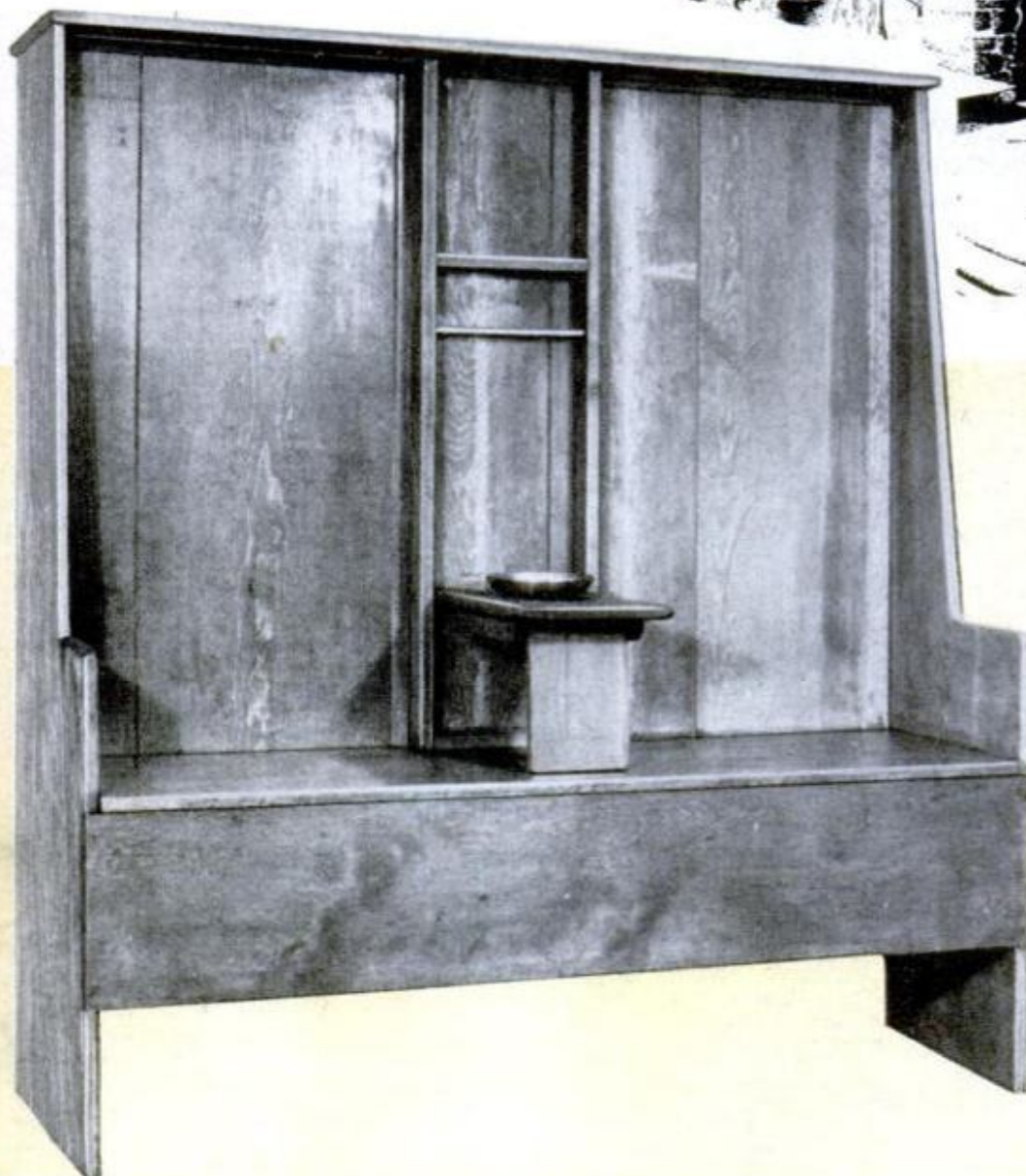
### PARTS LIST

C1 — 120 Mfd. High band	Cat. No.
330 Mfd. Low band	CA-35
C2 — .01 Mfd. Condenser	CA-45
L1 — Superex coil L1	CA-85
TR1 — ET10 Tungsol transistor or GE2N170	MS-299
TR2 — ET5 Tungsol transistor or GE2N107	
B1 — E675E Eveready Mercury cells or E630 Eveready Mercury cells	
Switch — Miniature alligator clip	MS842
Earphone — 1000 ohms or 2000 ohms or equivalent	MS260
Printed board — Lafayette (cut to size)	MS513
Printed board pen marker	MS728
Etchant solution	MS729
Paper clip — Large X type	
These can be found in Lafayette Electronics Catalog #610	





X189



## EARLY AMERICAN SETTLE

LIKE THE HUGE, open-hearth fireplace with its ponderous, hand-hewn fireboard and swinging crane, the fireside settle was an indispensable part of the furnishings of early American homes. Much of the warmth and charm of this early piece is due to the simplicity of the design and the bold use of wide pine boards in its construction.

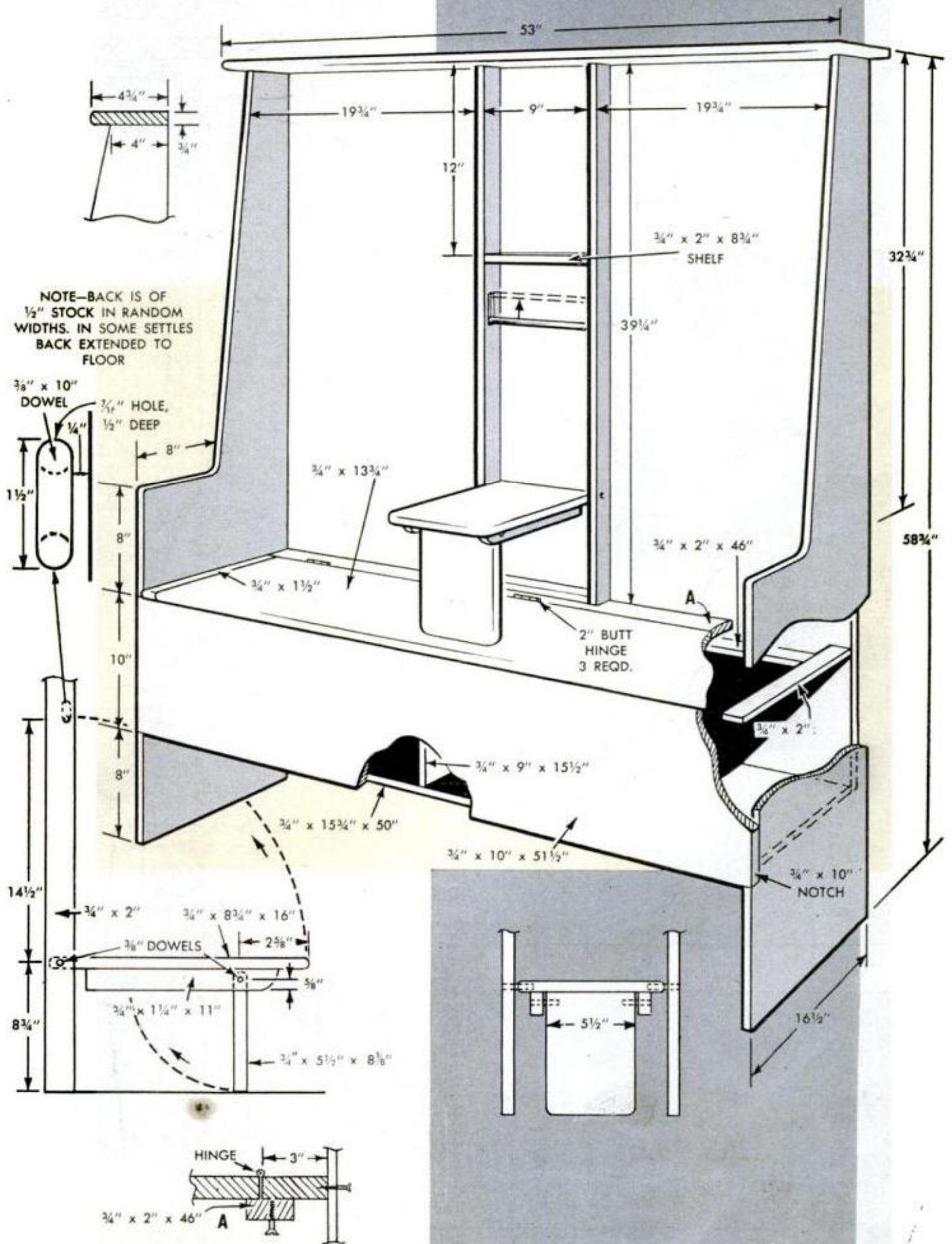
Although some parts of the original were made from single boards more than 16 in. wide, you probably will have to build up stock to the required widths by doweling

and edge-gluing two or more pieces. In doing this, select pieces having similar textures, colors and grain patterns.

The design is so simple that the assembly is little more involved than building a box having a lid but even so, careful workmanship will pay off. Make square cuts and join parts with glue and nails. Round the corners and edges when sanding. Finish with a reddish-brown stain, shellac and wax. Rub down the shellac coat with fine steel wool.—Patrick K. Snook



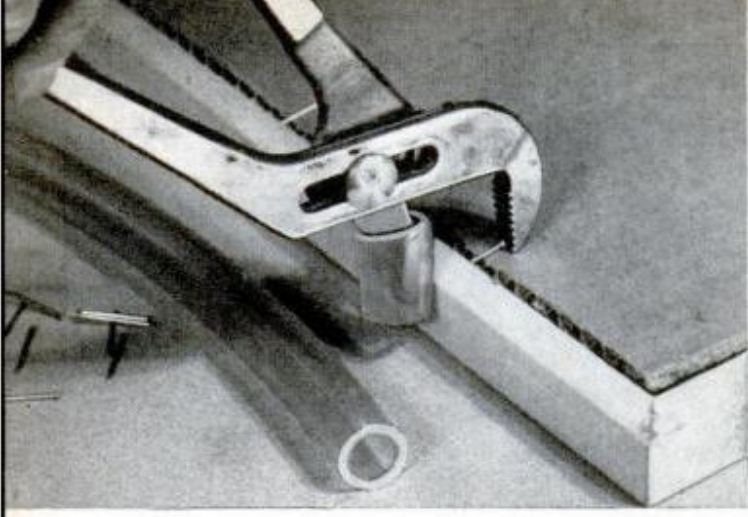
**FOLDING CANDLE SHELF** is held in upright position by sliding dowel, ends of which are supported in slots as detailed. When sanding, round all corners and exposed edges





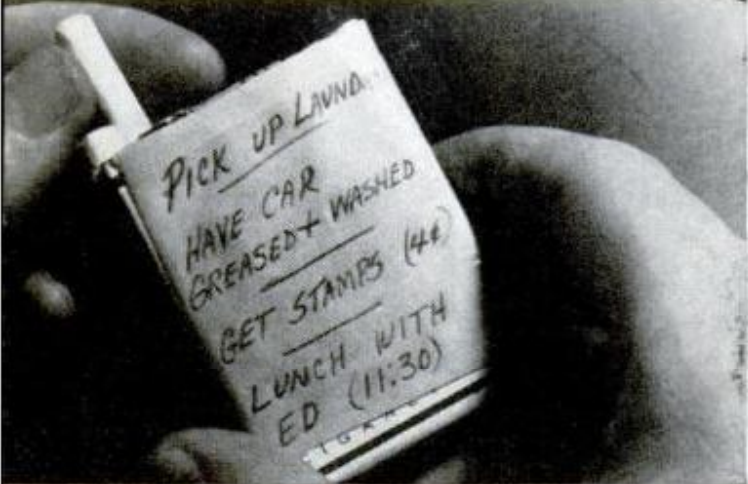
## QUICK AND EASY

### Brad Setter



Pliers of the slip-joint type are just the thing to set those brads you use to secure the backing in a picture frame. Slip a piece of hose over the lower jaw, or wrap with tape, then place the pliers with the padded jaw against the frame. Catch the head of the brad with the other jaw and press into the wood. Brad is driven straight in without bending or splitting the frame.—*Bil Toman*

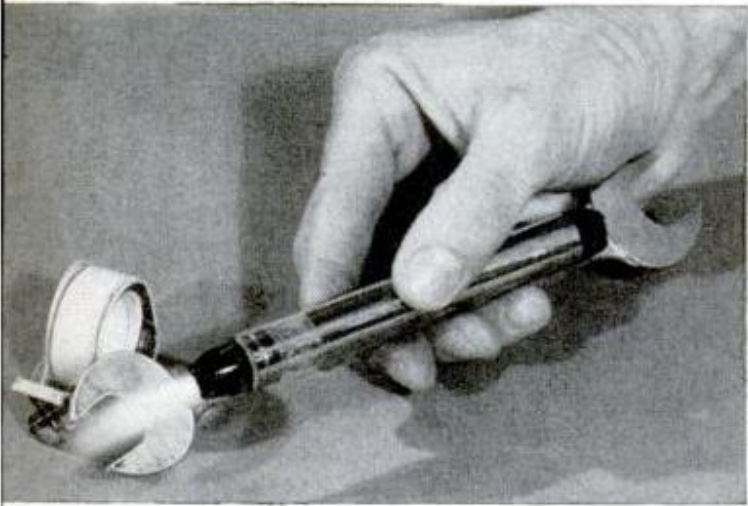
### Daily Reminder



Your pack of cigarettes is the most reliable reminder pad you carry. Why? Because you can't miss seeing any notation on it each time you pause for a smoke. Lunch appointments, things to do or to buy jotted on a piece of paper and slipped under the cellophane wrapping keep you posted throughout the day.—*Wayne Floyd*

Save scraps of cork tile, also sheet cork, to pad sandpaper blocks. Cork also can be used as pads on clamp jaws to prevent damage to finished parts of wood.

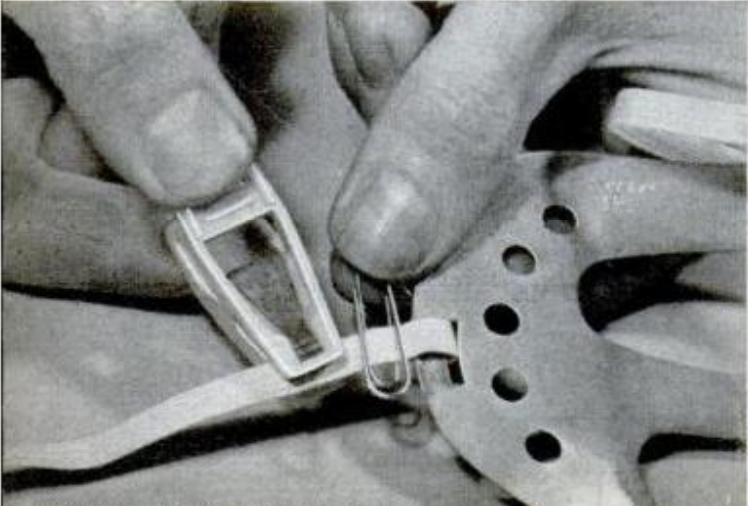
### Light the Way



Getting an end wrench onto a nut in a place that's hard to reach is bad enough when you can see, but if you have to work in semidarkness, the job can get pretty trying. In case you hadn't thought of it, a pencil flashlight taped to the wrench can work wonders. It provides all the light you need just where it's needed.—*Ken Patterson*

Bundle several small tools and wrap with plastic tape. The wrapping will prevent loss of tools and the bundle will take less space in the tool kit.

### Gluing Elastic Band



When replacing worn elastic bands of the type having the ends looped through eyes, such as the head band on a respirator, the free ends should be glued to the standing parts rather than fastened with thread, which may loosen. Coat about  $\frac{1}{2}$  in. of each end of the band with glue, pass the ends through the eyes and loop the band back on itself. Clamp the joint with a spring clothespin or a paper clip. Allow the glue to dry before removing the clamps. Don't use adhesives containing solvents.

—*Walter E. Burton*

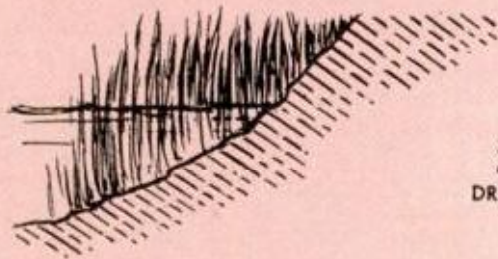
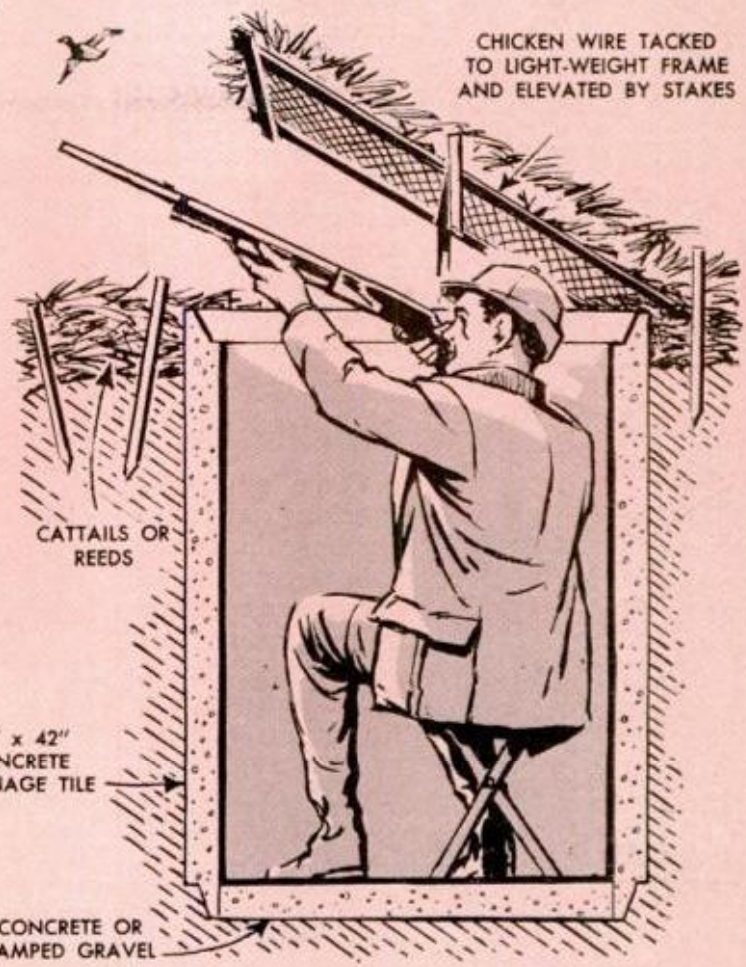




# DUCK BLIND

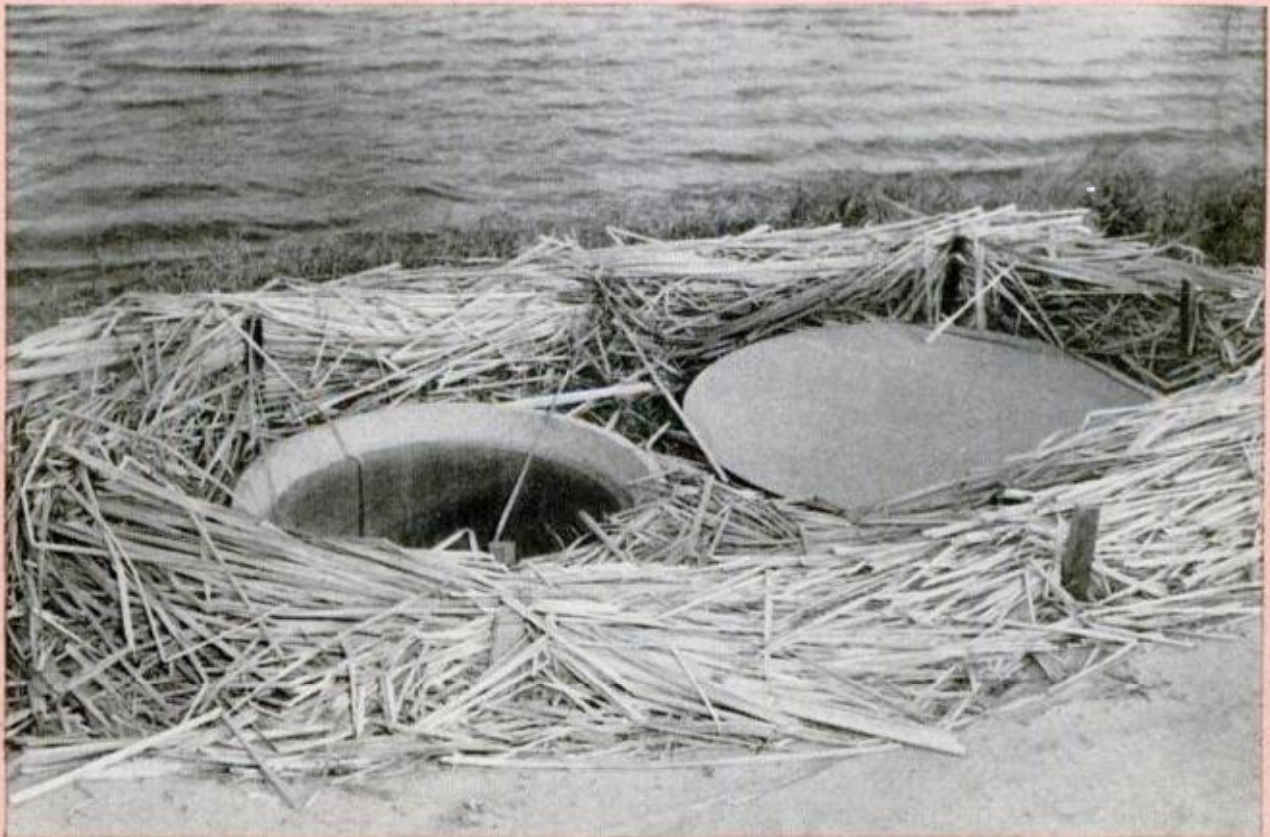
CHICKEN WIRE TACKED TO LIGHT-WEIGHT FRAME AND ELEVATED BY STAKES

A COLD WIND slants a drizzle across the marsh and you're waiting, waiting for those wary greenheads to drop in to the decoys. They're out of handy gun range and they take their time. That's when you'll be glad you're sheltered in this pillbox blind. It keeps you out of the weather, out of sight, and gives you a 180-degree gun swing, which is about all any wildfowler can ask. Everything you need to know about building the blind is detailed at the right, all, that is, except the digging to sink that tile

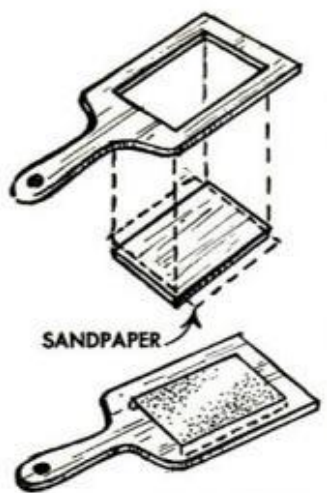


By Hi Sibley

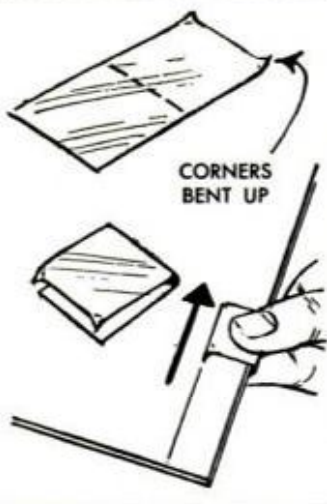
HERE'S A PAIR of blinds without overhead canopies of reeds. Place hardboard covers over them when not in use







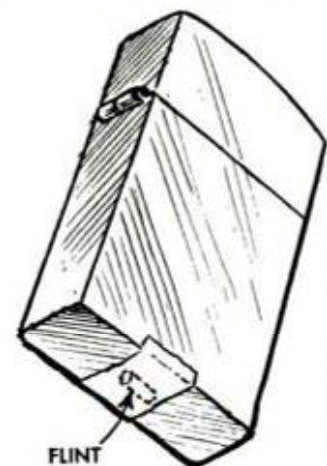
**Sanding Pad**  
This handled pad is helpful when hand-sanding small parts. Cut it from  $\frac{1}{2}$ -in. plywood and saw out a center section. Cut the sandpaper slightly wider than the opening. Place the sheet on the cutout and force the handled frame down over it.



**Metal Scriber**  
One simple marking gauge for scribing lines near the edges of metal sheets can be made from a strip of the sheet metal itself. Just bend down corners of the strip, fold as shown and slip over the edge of the sheet.



**Peg Holder**  
The perfect holder for tent pegs can be made from the top of an old hunting boot. Cut the top from the boot just above the counter, slip the pegs inside and tighten the laces. It's neat, compact and convenient.



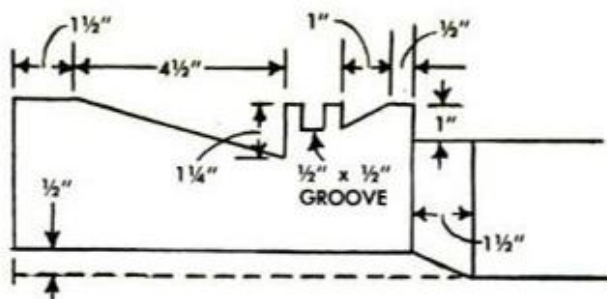
**Spare Flint**  
No matches, no lighter flint, no smoke. A bad situation if you're a long way from a tobacconist without a spare flint or matches. But you can always tape a spare to the bottom of the lighter. Do it now, while you think of it.

# SAW-CARVED

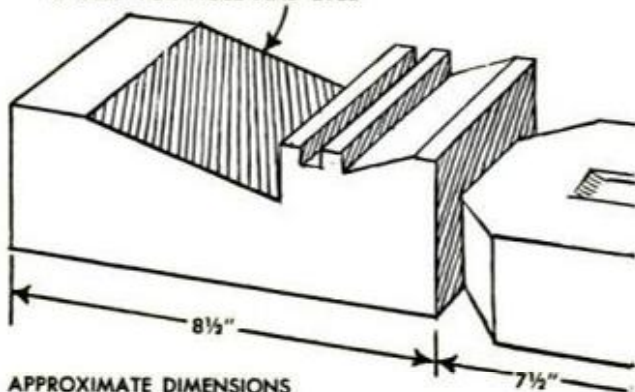


**MOST OF THE CUTS** are made with a dado head. Notice in the illustration above the way the outline for the figure is drawn on one face of the wood block

**DIMENSIONS** for saw cuts are shown below. The blind hole in the base holds a dowel to support figure in a planter or outdoors in the yard or the patio



USE HANDSAW TO MAKE ANGLE CUT FOR FACE. WEDGE-SHAPED SCRAP IS USED FOR NOSE AND EYES



APPROXIMATE DIMENSIONS FOR CARVING TIKI GOD



# TIKI GOD

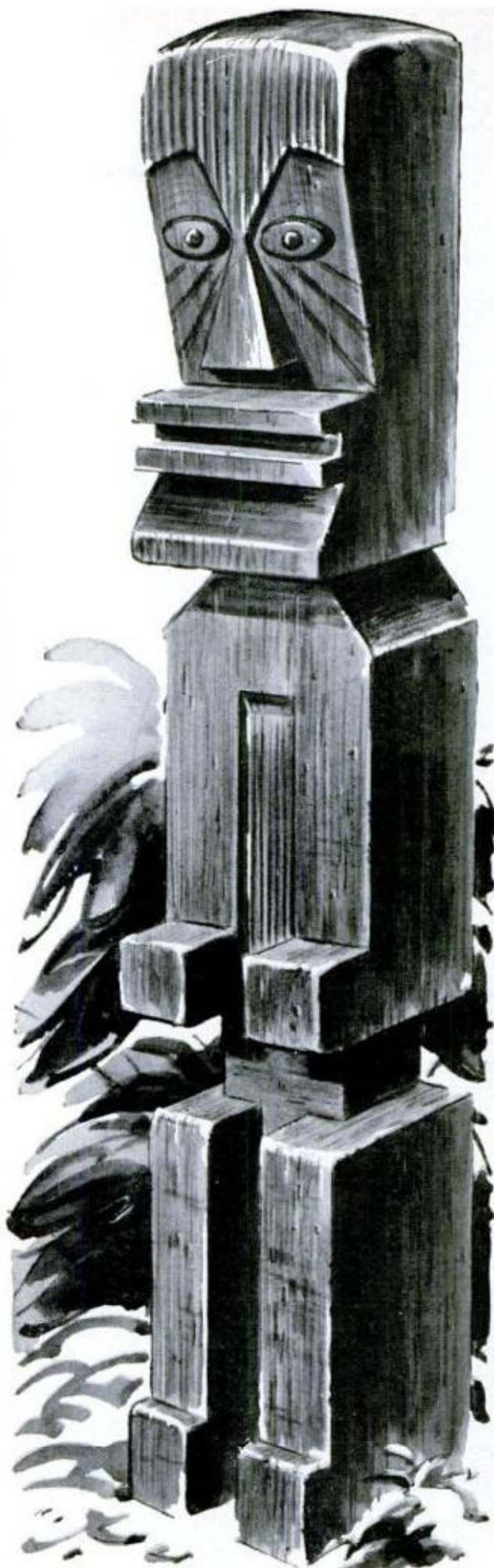
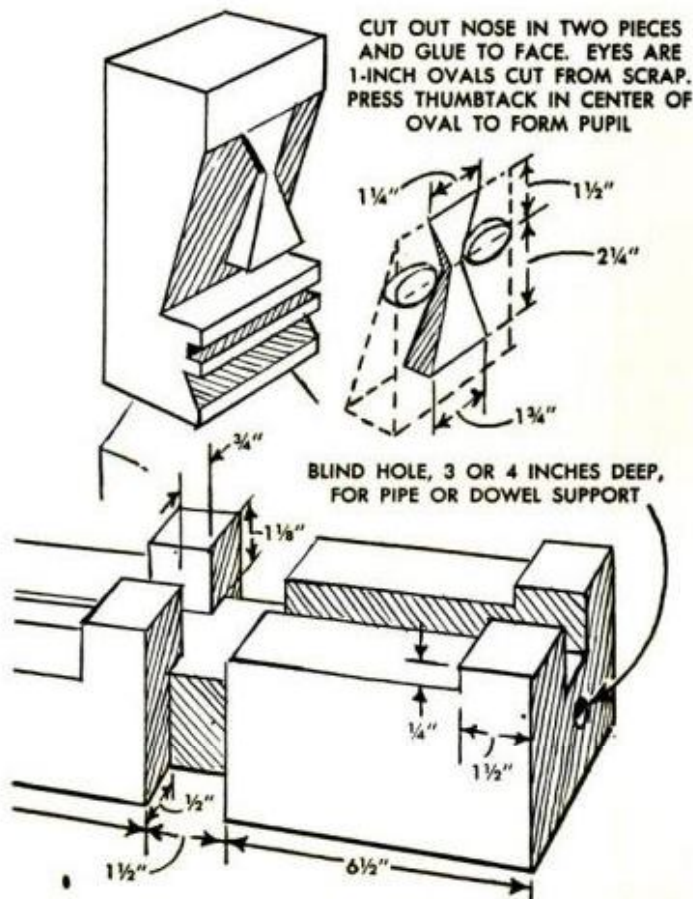
TYPICAL OF PRIMITIVE South-Sea island art is this eye-catching Tiki God that is "carved" on a circular saw. Placed in an indoor tropical planter the figure adds an appropriate decorator accent.

To make the Tiki, saw off a 24-in. length of knot-free 4x4 stock. Sketch the outline of the figure on one surface according to the dimensions given in the drawing below. The angular cut forming the face should be made with a hand saw, saving the wedge for the nose and eyes.

With a circular saw, make the other cuts according to dimensions given, using a dado head for all cuts except the angular ones of the chin and neck. If a dado head is not available, make a series of saw cuts and with a chisel remove the stock between.

When all cuts are completed, set the blade so the teeth extend just above the table surface. Then roughen the uncut flat surfaces by working back and forth across the blade. Cut and glue nose and eyes to facial plane, round off the corners and work over smooth surfaces with a knife blade to simulate the hand-carved effect. The original Tiki was primed and painted flat black. Dark wood stains also can be used with striking effect.

—Frank Stephany and Ray Buenger







## SHOPPING CART

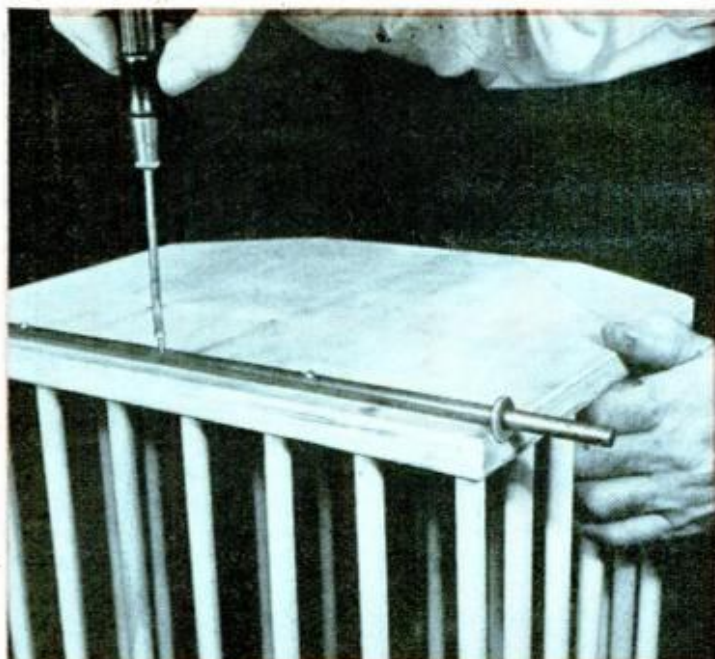
NO NEED TO WAIT for the family car to make your weekly trip to the corner grocery. This handy shopping cart will solve the problem of toting bags of heavy groceries when hoofing it is your only mode of transportation at the moment. Fitted with rubber-tired wheels it rolls along easily.

With all the materials at hand, including the wheels and axle, you can put this cart together in one evening. Everything you need to know to make it is pictured and detailed on the opposite page. You'll need 25 dowels  $\frac{1}{2}$  in. in diameter and 24 in. long, two small pieces of  $\frac{3}{4}$ -in. plywood, a couple of pieces of hardwood for the handles, an axle and two rubber-tired wheels and maybe some paint or varnish. Cut the corners off the two pieces of plywood of the overall size given and on one of the pieces draw a line 1 in. in from the edges. Cutting on this line will give you the open, one-piece frame which forms the top of the basket. Center a line around this frame and mark at 2-in. intervals. Do the same with the lower frame which forms the bottom of the basket, making sure the line is

located the same distance in from the edge as the line on the upper frame. Then place the upper frame on the lower piece and drill small holes through and part way into the lower piece, locating the holes on the spacings. That lays off both pieces with pilot holes for drilling the  $\frac{1}{2}$ -in. blind holes to a depth of  $\frac{1}{2}$  in. in both pieces. Coat the inside of each of the blind holes in both pieces with glue. Force the dowels into the holes in the lower piece. Then tap the top frame into place over the dowel ends making sure the dowels seat to full depth.

Allow the glue to dry, then turn the basket upside down and drill a  $\frac{3}{4}$ -in. blind hole near the forward edge for the dowel leg. Screw and bolt the handle bars in place and add the handle which is made from a 9-in. length of  $\frac{3}{4}$ -in. dowel. Attach the axle and wheels, then sand all parts and round over the edges of the top and bottom of the basket. Apply a sealer to the wooden parts, allow it to dry, sand lightly and finish with two coats of enamel, varnish, or a new spatter finish in color of your own choice. ★ ★ ★

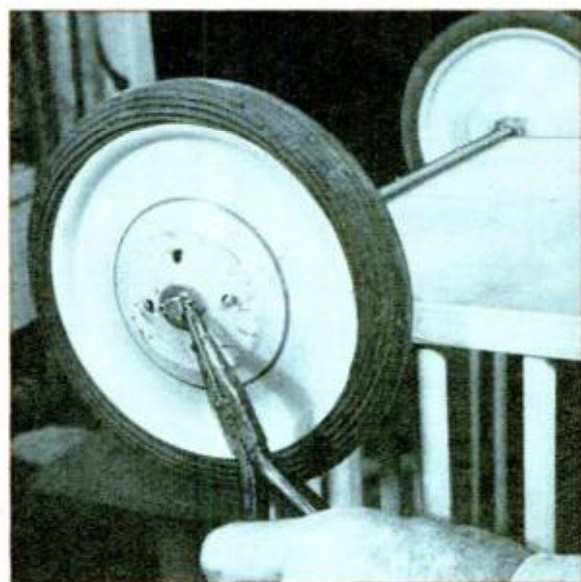
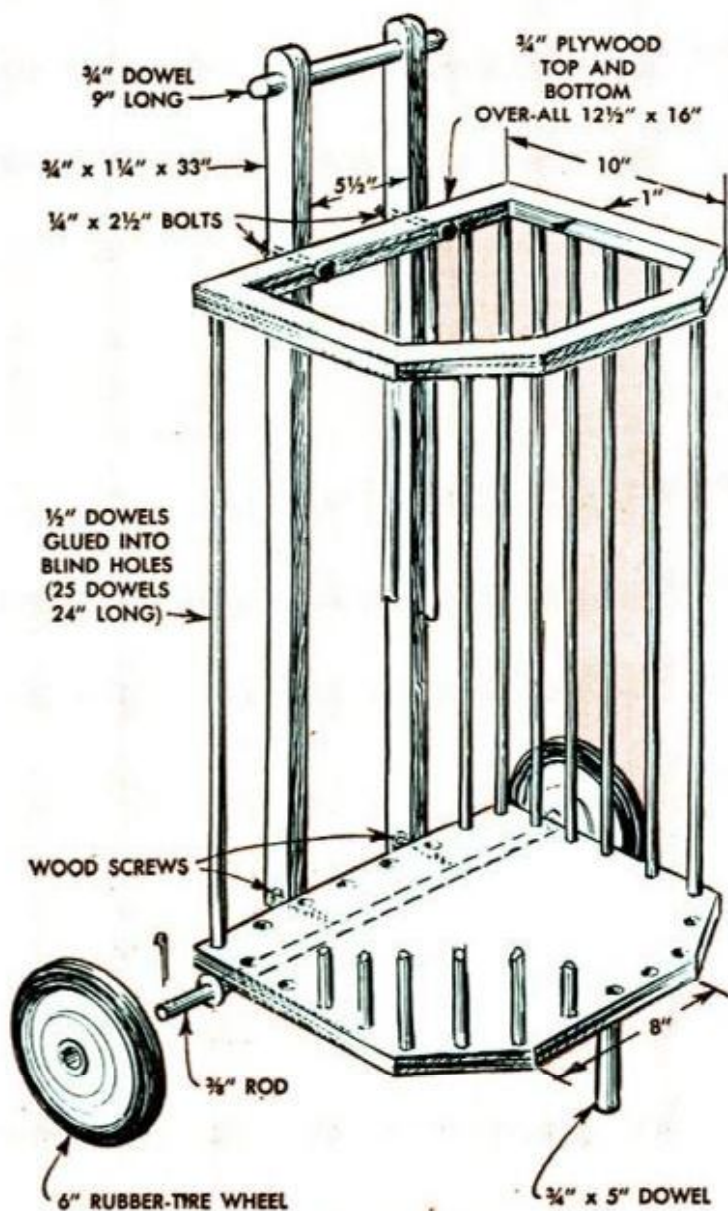




**AXLE IS DRILLED** transversely to take 3 small screws. It's located about 1 in. in from the back edge of the bottom



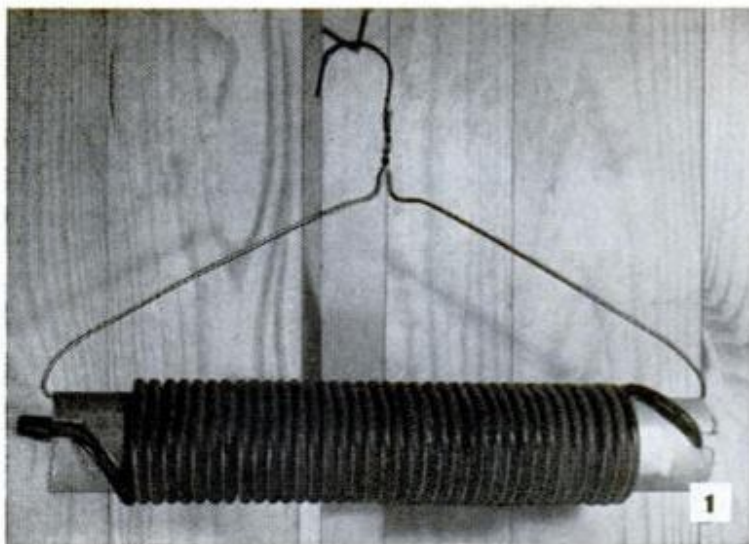
**HARDWOOD HANDLE BARS** are bolted to top frame but lower ends are held with screws



**WHEELS, above,** are held on axles with washers and cotter pins. Below, short length of dowel provides foot on which cart stands vertically







**1. EXTENSION CORDS** can be stored on a handy reel made from a 2-in.-dia. mailing tube and a wire coat hanger. Simply cut the hanger at the center, insert the ends into the tube. Notches in ends of the tube hold the cord and keep plugs from dangling

**2. PLASTIC BAGS** used as inner linings for kitchen canisters keep moisture away from the contents and also prevent substances like brown sugar from hardening. Twist the top of the bag before closing the canister

**3. VENETIAN-BLIND CORDS** always receive hardest wear near the point where they are attached to the bottom slat, but this section can be reinforced by wrapping it with adhesive tape. The latter will be concealed by the wide tape supporting the slats

**4. HANDY CUTTING BOARD** made from a discarded table-tennis paddle is just the right size for cutting greens and vegetables for salads. When not in use, it can be hung over the sink or stored in any small kitchen drawer located near the work area

**5. MODELMAKING** often involves the accurate application of small spots of glue, and a simple tool for this intricate work can be made from a darning needle and a small cork. Break the eye of the needle to form a fork and press the point into the cork

**6. PICTURE HANGER** made from a paper clip is strong enough to hang small pictures in light frames. Use masking or cellophane tape to attach the paper clip to the picture, making sure that the tape is long enough to hold the clip firmly in place

**7. HOLDING TINY BRADS** upright while starting them in place is always a difficult trick, but if the brad is held between the teeth of a rattail comb the job can be performed quicker, more accurately and with a lot less risk to your fingers

**8. COAT HANGERS** which are always being accidentally knocked off the closet rod are more likely to stay put if a short length of rubber tubing is slipped onto the end of each hook. The projecting rubber tubing will act as a flexible latch

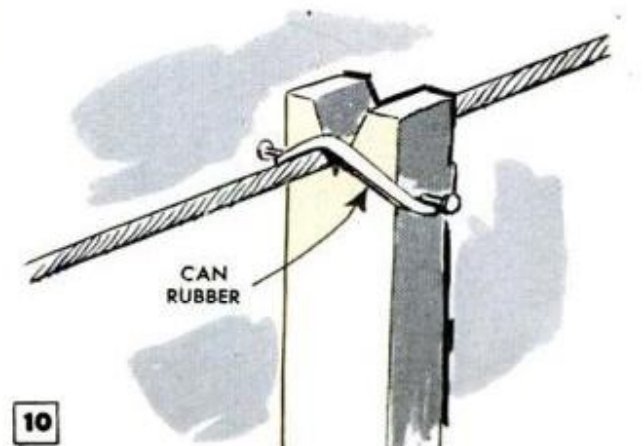
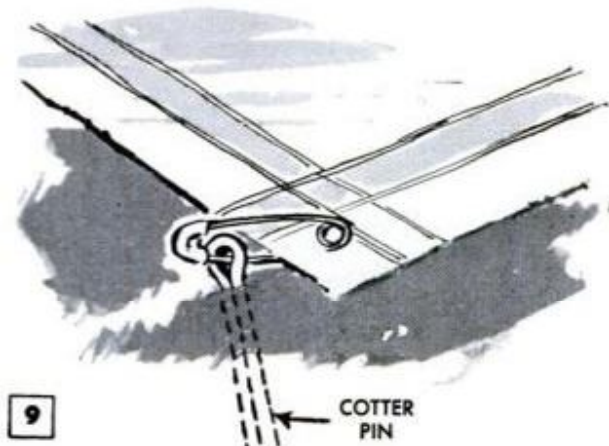
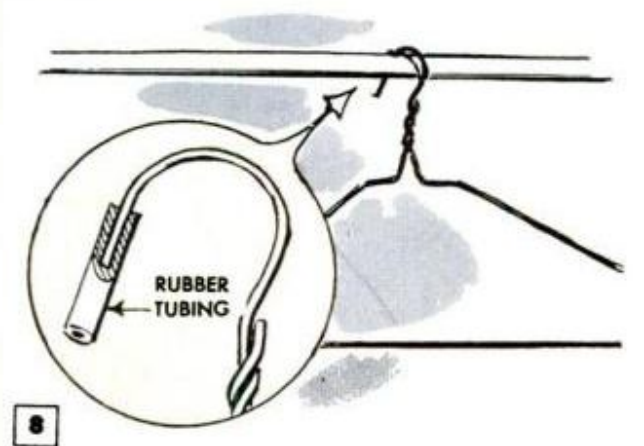
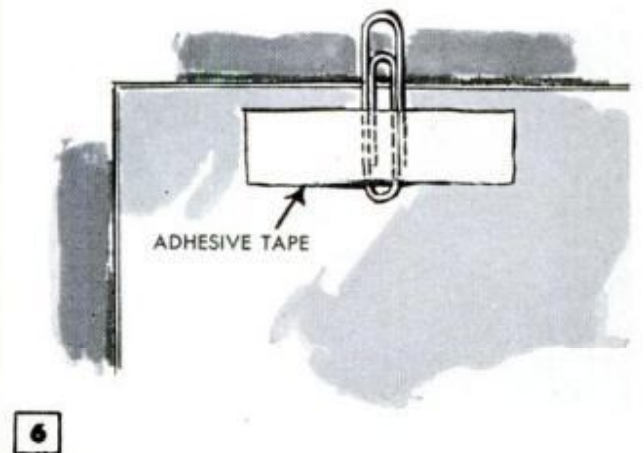
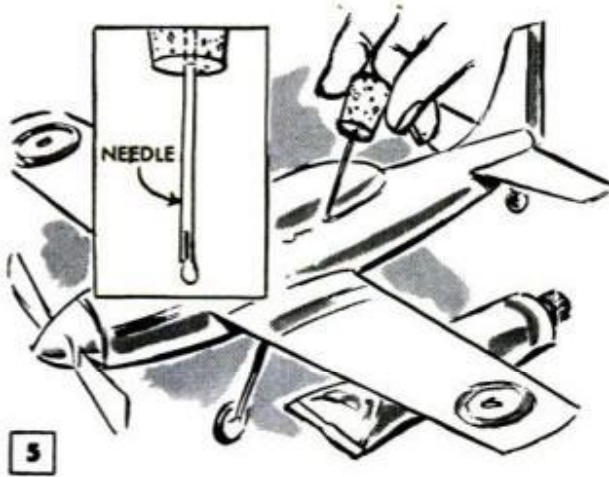
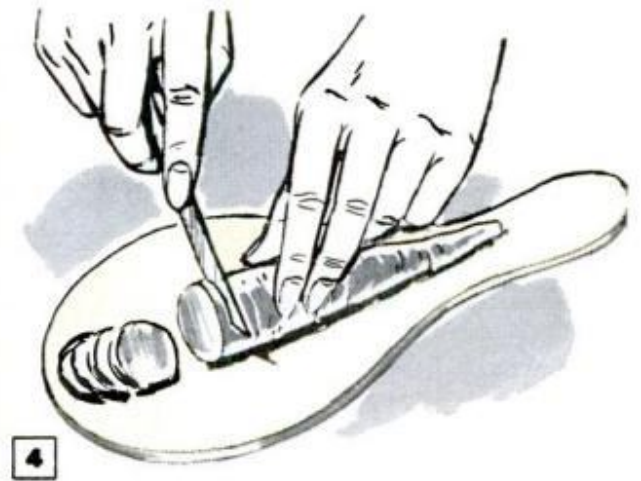
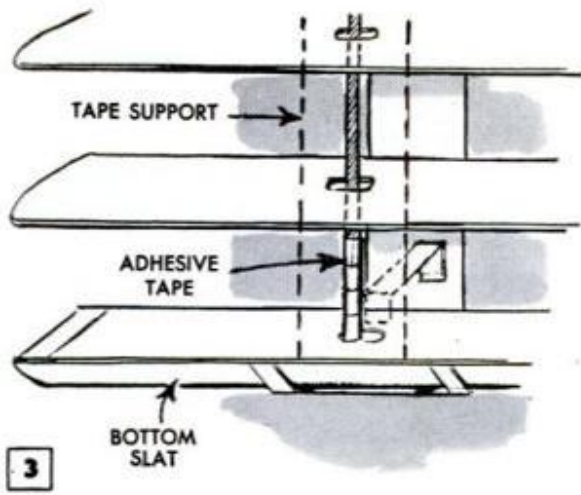
**9. PICNIC LUNCHEON CLOTHS** won't be blown away in the first gentle breeze if you anchor each corner to the ground with a large cotter pin which is attached to the cloth with a safety pin. The pins can be attached to the cloth before it's packed

**10. SLIPPING CLOTHESLINE PROPS** will no longer be a wash-day problem if you drive a small nail into each side of the prop, just below the notch, and stretch an ordinary jar rubber or rubber band over the clothes line from one nail to the other

# Solving HOME PROBLEMS











# SANTA COMES EARLY

If you like to make things for Christmas, you won't want to miss the big 27-page craft feature in the November issue. Presented a month ahead, you'll have plenty of time to make any of the many unusual gifts, toys and decorations we have picked to help make your Christmas a merry one.

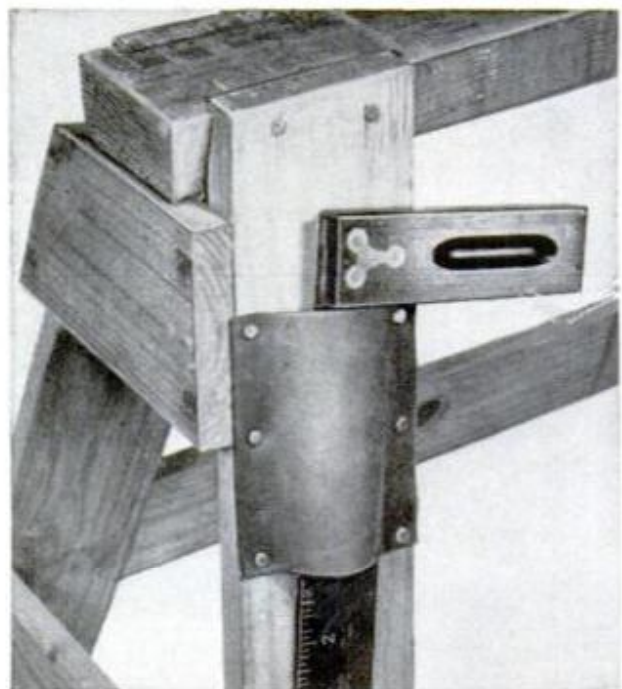


## Lazy Man's Ball Return

Tired of chasing the ball when practicing free throws? Play it smart and rig up this lazy-man's ball return. It's nothing more than a 4-ft. panel of plywood placed beneath the basket and braced at a 55-deg. angle. Bricks hold it in place.—*Jon Finley*

## Square Pocket

Install a pocket on two opposite legs of your sawhorse and you'll have handy holders for a try square. Tack down one edge of a rectangular piece cut from an old inner tube. Then tack the other side to form a bulge in the rubber—*Bil Toman*





## QUICK AND EASY

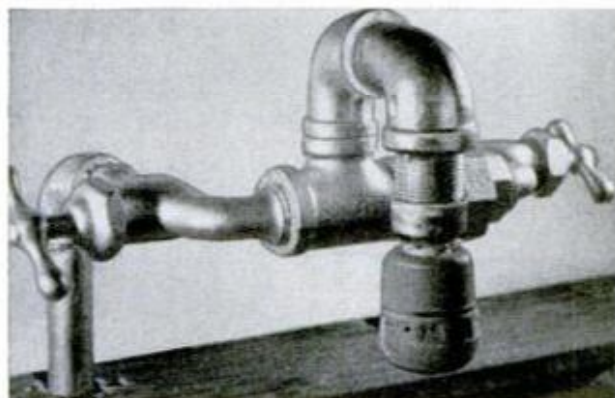
### Tote for Wet Paintings

At the end of a day of field work artists and art students who work in oils often encounter the problem of how to carry safely one or more unfinished paintings, either to the car or back to the studio. Of course, a minor smear or two is easily set to rights with a few strokes of the brush, but a scrape or scratch across the whole face of the work may damage it irreparably. One simple solution is to groove two strips of pine, making the grooves about  $\frac{1}{4}$  to  $\frac{3}{8}$  in. deep and wide enough to take the edges of the canvases, either canvas-textured board or canvas fabric on frames. Space the grooves from  $\frac{1}{4}$  to  $\frac{1}{2}$  in. apart, edge to edge. Then simply place the grooved strips over the ends of the boards as pictured—the boards with the wet faces in, of course—and snap two heavy rubber bands around the whole thing.



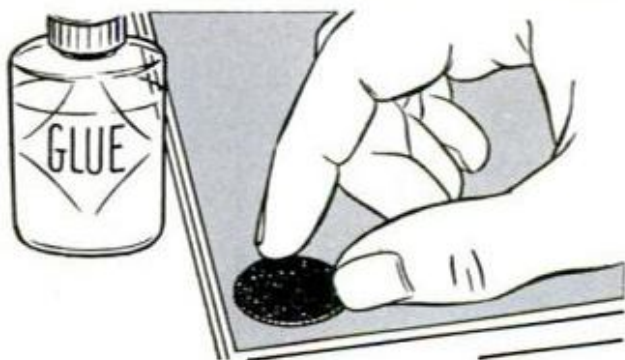
### Utility Mixing Faucet

Wherever there are hot-and-cold pipe stubs an improvised mixing faucet can be quickly assembled with two wall faucets, a  $\frac{3}{4}$ -in. tee, a 45-degree elbow, a street el, a  $\frac{3}{4}$ -in. union, two close nipples, a hose-to-faucet fitting and a rubber non-splash nozzle. The photo shows how you assemble these parts with the faucets given a one-quarter turn from the vertical, normal position.—Stanley H. Covington, Sr.



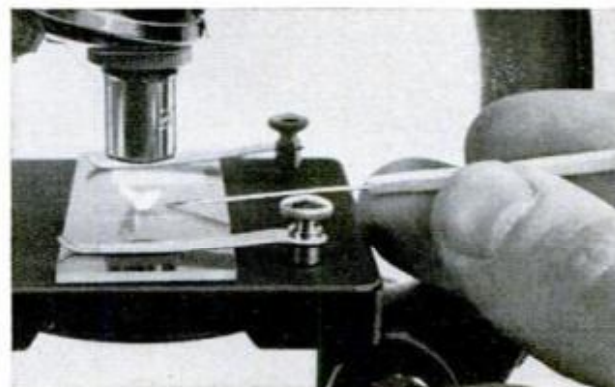
### Padded Picture Frames

Those unsightly marks left on walls by picture frames, mirrors and bulletin boards can be prevented simply by gluing felt pads to the back corners of the frame. The pads are disks or small squares cut from upholstery felt or an old hat. These are glued near the corners of the frame as indicated in the detail, close to the edges but not so close that they can be seen when the picture is hung.—H. Hanscom

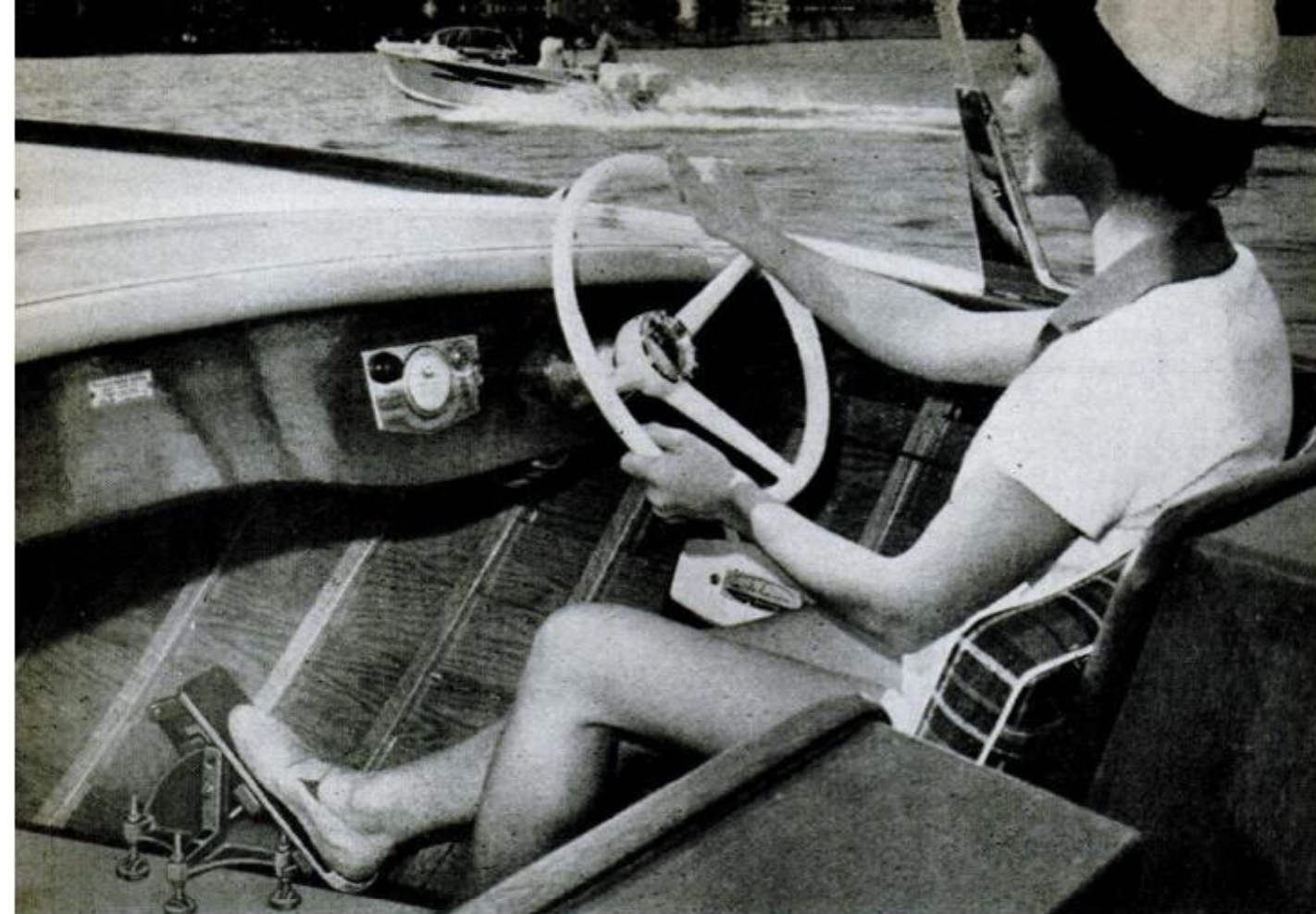


### Needle for Microscope Stage

If you happen to lose or misplace the needle that came with the dissecting set for your microscope, you can make a suitable substitute quickly by using an ordinary small sewing needle and a wooden match stick. Cut off the head of the match, then use the point of the needle to make a tiny hole in one end of the match stick. Place the point of the needle on a block of hardwood and press the match stick down over the eye end.—J. R. Noonan







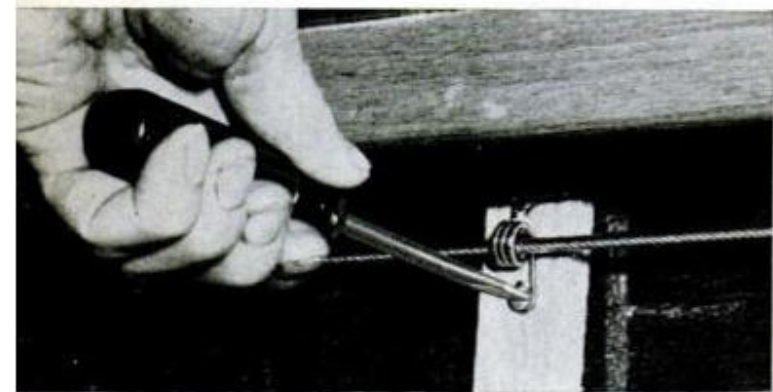
1. CAR-TYPE FOOT THROTTLE (Tempo) appeals to female boaters but is less positive than the lever type

## Remote Controls for Outboards

By Earl Wobeck

REMOTE STEERING, throttle and shift controls serve as long tentacles, so to speak, for the modern outboard boat skipper, permitting him to start, stop and maneuver with little effort while comfortably seated at the helm. Motor-attached steering handles, long the only means of controlling speed, gear shift and steering functions of all sizes of motors, have gradually been replaced by remote-operated controls linked to the motor by cables of various types. The cost of such equipment is small, especially when you consider that for a few dollars big-ship, bridge-deck type of remote control can be had on a vessel as small as a 12-ft. runabout. While the equipment required for the latter is utter simplicity when compared to that of an ocean liner, the principle is the same.

Most small-boat remote controls on the market will do the job for which they are designed, but to do it well, the control must be matched to the rig (boat and motor) and installed correctly. Knowing what is available, how the controls function, their limi-



2. TILLER-ROPE GUIDE screwed to frame holds cable in place under gunwale, prevents it from snagging

3. KNURLED NUT on shift cable end fitting permits installer to adjust it to exact length required





tations and capabilities will enable the skipper to select controls which are best suited for his "ship" and afford maximum boating fun.

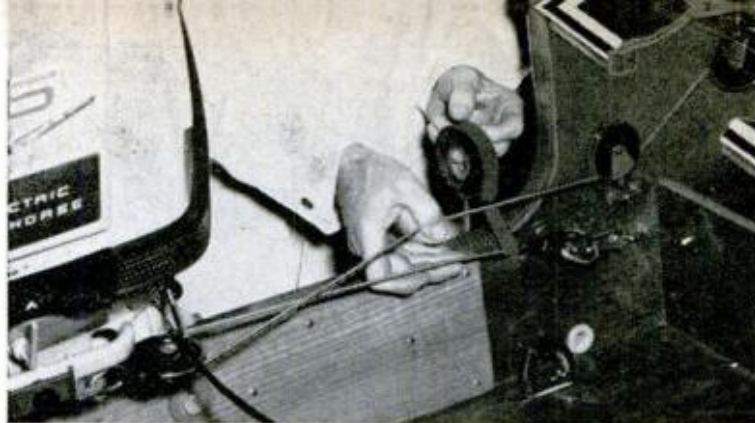
Basic to the function of all remote throttle and shift controls, and some steering systems, is sheathed or encased cable as detailed in Fig. 11. The working member or cable proper has end fittings for connecting one end of it to a short control lever on the motor (Fig. 3) and the other end to the appropriate lever on the remote control box mounted near the helm, Fig. 10. The cable is not attached directly to the control-box lever, but rather to a nylon or metal gear rack instead, which is actuated by gear teeth on the internal end of the lever as in Fig. 9. Use of nylon for all moving parts makes lubrication unnecessary. The fixed, sheath part of the cable system is fastened in place at both ends and mounted by means of clips under the gunwales.

The trend in control boxes now is toward single-lever units, on which one lever operates throttle and shift in the same movement. Dual cables connecting the control unit to the motor are required, the same as the earlier model two-lever units. In the latter case separate levers operate shift and throttle controls. Compact design, simple operation and other refinements of single-lever controls are fast making them the popular choice over two-lever units. In most cases, cable from a two-lever system can be used for single-lever controls, simply by changing the end fittings.

#### Single-Lever Control

All single-lever controls are for single-motor installations, although most units can be bolted together side-by-side for control of twin motors in the same manner as is customary for two-lever controls. Recent improvements include: throttle idle adjustment located right on the control box; tension adjustment to individual preference, or to suit running conditions; and a lever lift-up position at neutral (separate switch for this function is provided on some models) which prevents accidental gear shifting, an excellent safety feature. In the latter position, some controls permit full throttle advance, a good feature when tuning up, or when running in neutral to charge batteries, power bilge pump or other equipment powered directly by the motor or by its electrical generating system.

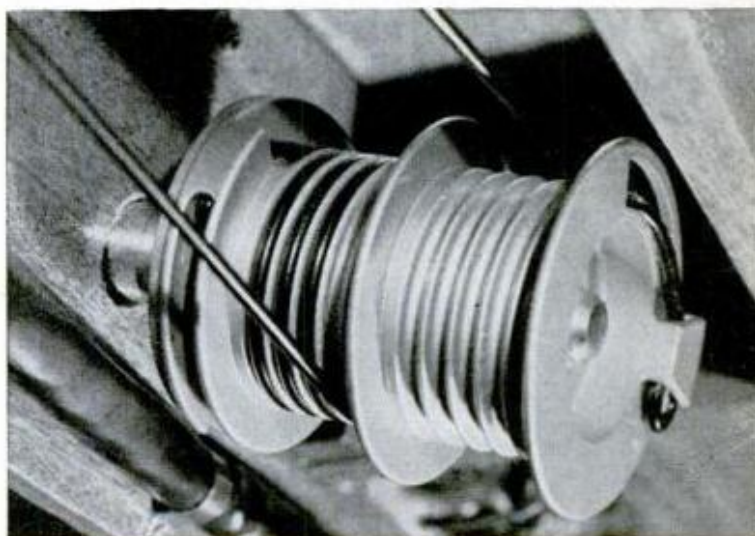
In addition to the standard mechanical single lever controls, there are the dash-mounted car type, Fig. 10, and an electrically actuated control which permits the operator to shift from forward-to-neutral-



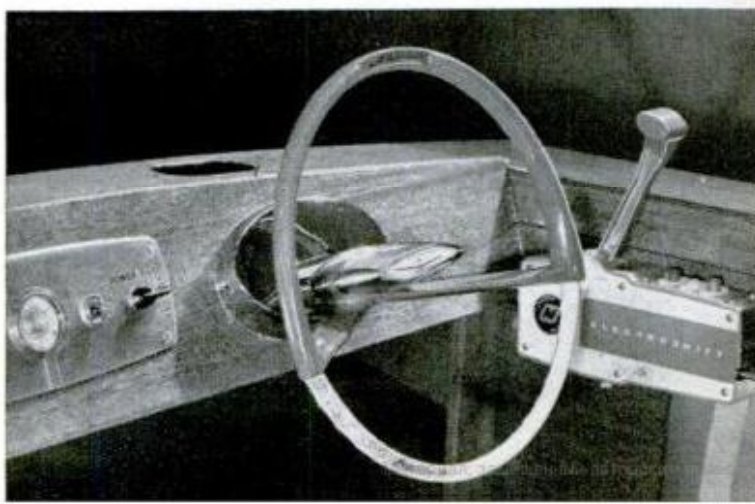
4. CABLE END does not slip, or foul adjacent pulley when it is wrapped tightly with electrical tape



5. TIE BAR linking twins together, is set to toe out motors slightly to minimize torque on steering



6. GROOVED DRUM, OMC (Outboard Marine Corp.) cable-pulley steerer improvement, stops cable binding

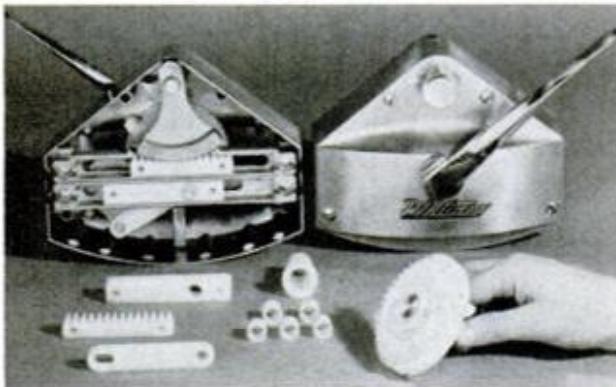


7. OMC ELECTRIC remote control unit has throttle lever, forward, neutral and reverse push buttons





**8. THROTTLE-SHIFT** unit must be positioned parallel with cables, with adequate clearance for lever



**9. MOVING PARTS** of husky control unit shown above are made of nylon, which requires no lubrication

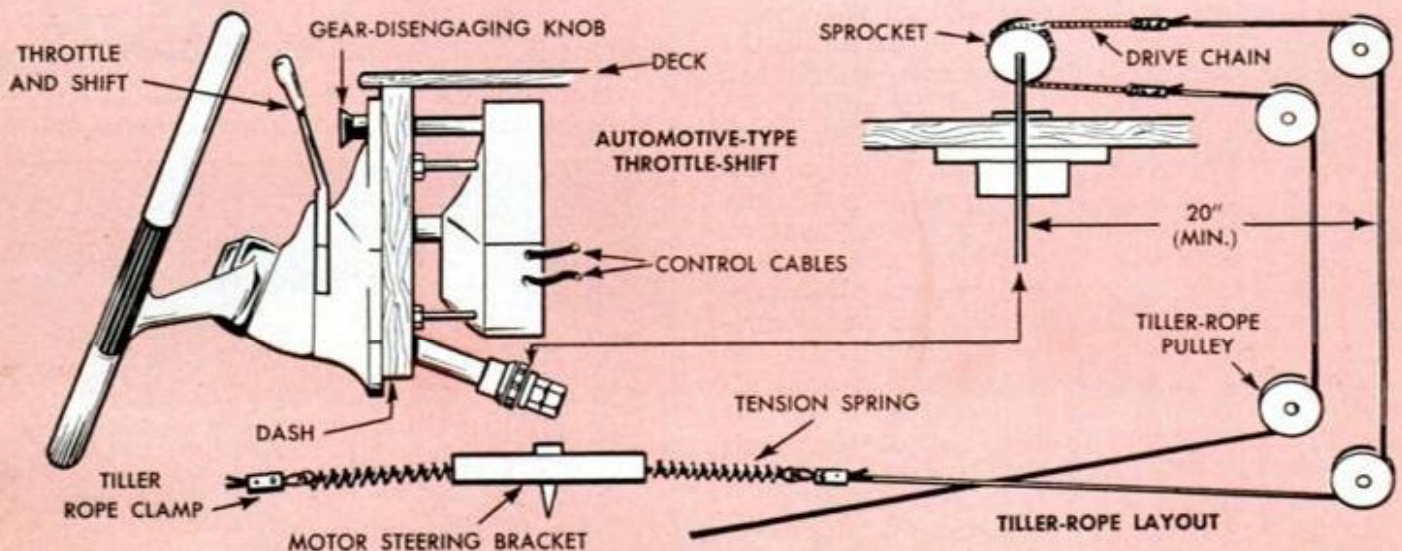


to-reverse by pushing the buttons at the top of the unit, Fig. 7. The single lever of the latter is for acceleration only. One manufacturer of a dash-mounted control separates the throttle function from that of shift through adaptation of an automotive-type accelerator which is mounted on the floor of the boat as in Fig. 1. While the latter duplicates a control arrangement with which most everyone is very familiar, it does result in a less positive action when decelerating. It also requires the operator to be seated while the boat is under way, an inconvenience when docking or maneuvering in tight quarters, during which a standing position enables him to see areas obscured by a high bow and topsides. However, the unit is designed primarily for use in small, high-powered craft with low freeboard, in which case the operator has no boat-handling problems while in a seated position. Also, throttle action is easier due to short cable runs. The unit also permits the skipper to use both hands for steering, a good safety and convenience feature. For the person who is unfamiliar with boat handling, the familiar car-type action of the shift and throttle units allows full attention to be given to learning other important boat-handling deals.

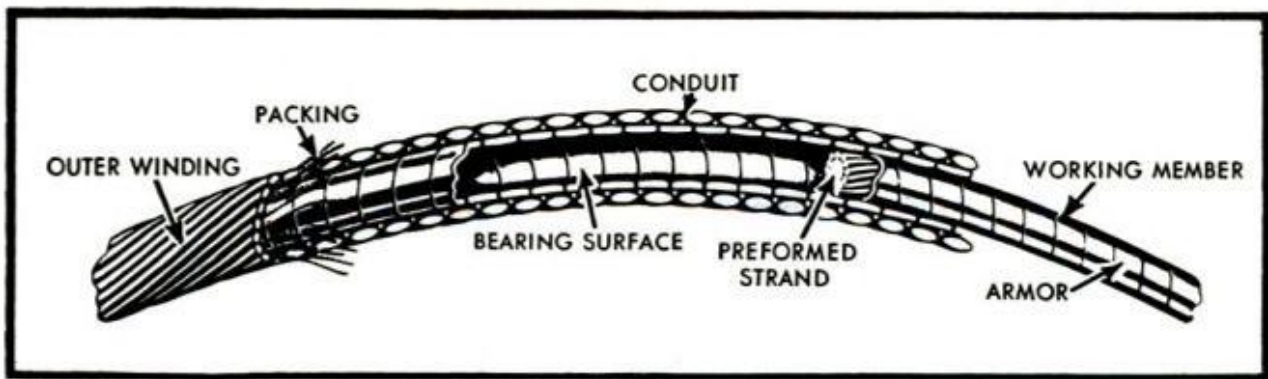
### Steering Systems

The cable-and-pulley steering system, though still quite popular, gradually is being replaced by push-pull cable systems utilizing cable of the type mentioned previously. Advantages of the latter system are, a more compact installation requiring less custom fitting in a boat; cable is more stable dimensionally (minimum amount of stretch when stresses are applied); and it is an easier operating system, especially for boats equipped with large motors (50 hp. and up). While push-pull cable steer-

**10. REMOTE CONTROL** unit (Whitney) shown at left and below, features automotive-type throttle-shift and cable-pulley steering combined with chain drive







**11. PRINCIPAL PARTS** of push-pull type cable are detailed above. Working member requires lubrication

ing systems usually are not power assisted, the action is somewhat like power steering.

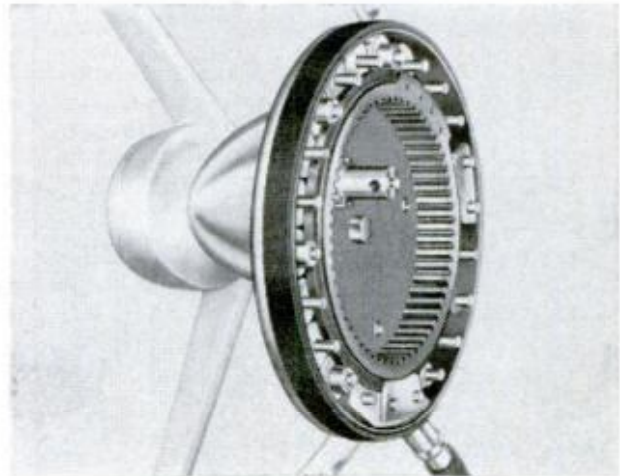
Improvements in pulley-and-cable systems still make them a good choice for small-to-medium-size boats and motors. Standardization of pulley-sheave diameter at 2 in. places less stress at bends in the system and makes it work more easily; high-tensile strength, steel cores and tough plastic sheathing minimize stretch while retaining desired flexibility; and cable drums on steering wheels have been improved to give more positive response in conditions of maximum stress, as when steering against the torque of large twin motors, or when driving in rough water. One such hybrid steering drum is shown in Fig. 6. The deep grooves prevent turns of tiller cable from climbing over one another, which makes a system hard steering, noisy and subject to early failure from abnormal wear. Another improved type is shown in Fig. 10, which substitutes a sprocket for the usual steering drum. A length of drive chain, equal to "lock-to-lock" revolutions of the wheel, links tiller-rope cable to the steering wheel. This system offers the advantage of positive linking of cable to steerer. Possible trouble sources may be in link failure or in cable-clamp slippage since there are twice as many end clamps in this system as compared to a normal cable-pulley installation.

### Push-Pull Cable

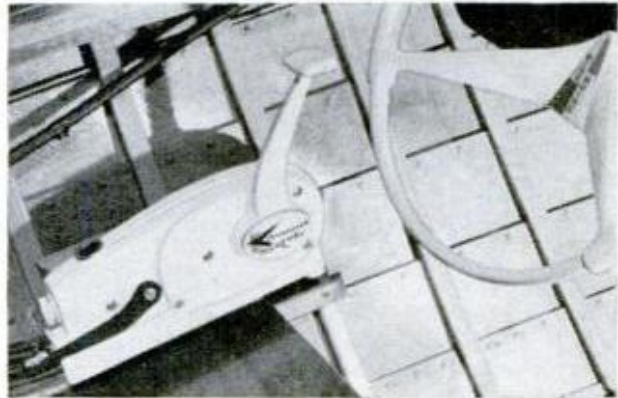
The cable of almost all push-pull or enclosed-cable steering systems is very much alike in design. Construction is similar to cable used for throttle and shift controls, except that it is considerably heavier, and provision of grease-gun fittings, Fig. 15, is the rule. Most shift control cable must be disassembled when lubricated. Construction detail shown in Fig. 11, is that of steering cable. Note the multilayered conduit (sheath) and working member.

Primary differences between the various makes of enclosed cable steerers is in the

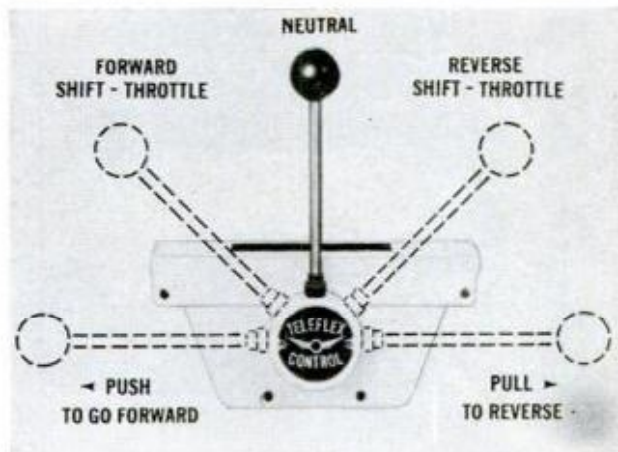
**14. AUTOMATIC** lever stop at neutral is safety feature of Teleflex control, shown at right, permitting a change of speed and direction by "feel" alone



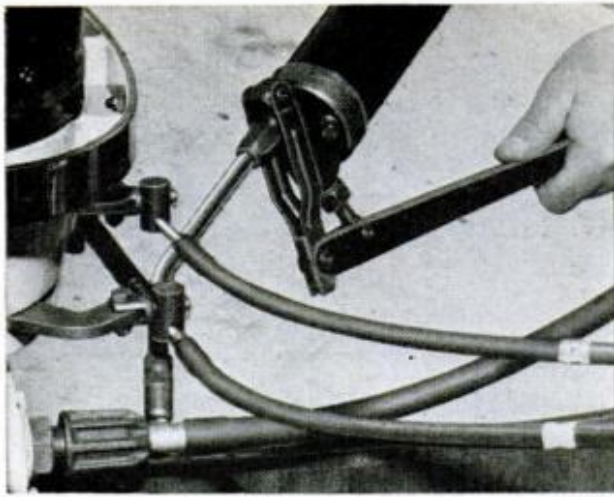
**12. PINION** and ring gears of SteerMaster steerer, above, provide direct connection to steering cable



**13. QUICKSILVER** single-lever control has choke button, neutral lockout lever and ignition switch



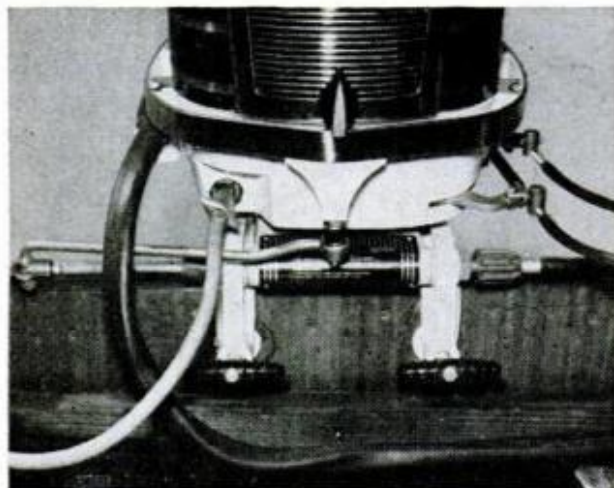




**15. GREASE FITTINGS** on push-pull steering cable make it easy for owner to keep system lubricated



**16. SUPER RIDE GUIDE** steerer, above, is designed for large motors. Double gear racks actuated by a common pinion, and port and starb'd cables provide easy operating, backlash-free closed-circuit system. Below, neat routing and attachment of remote-control cables to motor make for trouble-free service

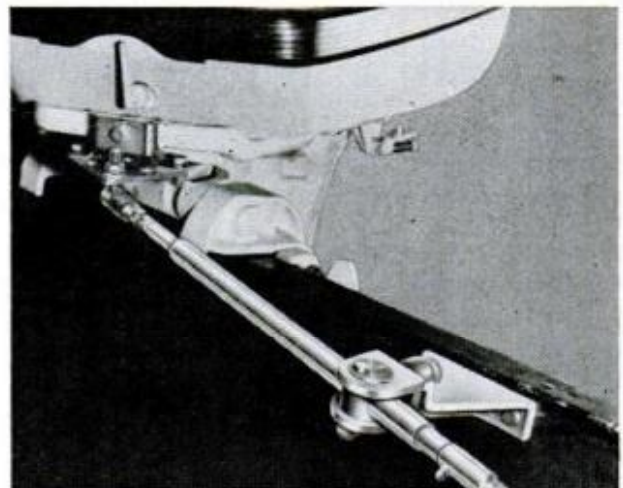


method of connecting or linking the cable to the steering-wheel shaft. One popular make uses a pinion gear and rack assembly, with the latter housed in an enclosed tube and the gear mounted on the end of the steering-wheel shaft, Fig. 16. This makes a neat installation, even when two gear racks are used in a "closed-circuit" steerer such as the one pictured. In the latter system two cables are used, one which is attached to the port gear rack at one end and to the port side of the motor steering bracket at the other end. The other cable is attached and mounted on the starb'd side in the same manner. Normally, only one gear rack and one cable are used, the latter being pulled to steer or turn in one direction and pushed when the steerer is turned in the opposite direction. When used on a large, powerful rig (boat and motors), the cable sometimes compresses or jams in the sheath on the push direction of turn, causing backlash in the system. The closed circuit, double-cable system avoids this, due to the fact that steering in both port and starb'd directions is accomplished by a pull force. The unit is designed so that the second cable-and-gear-rack assembly may be added to the original single cable system at any time with a kit available from the manufacturer's dealers.

Another popular type of push-pull cable steerer is pictured in Fig. 12. This model, too, has a pinion gear mounted at the end of the steering shaft but in place of a gear rack it has a ring gear which actuates the pinion gear. The ring gear is held in place by numerous roller bearings which engage a groove on its circumference. The bearings support the ring gear in a kind of free-floating action, minimizing friction. The steerer end of the cable is securely attached to the ring gear. Safety stops on the latter prevent oversteering in either direction. A

(Continued to page 236)

**17. TRANSVERSE** type of push-pull cable-steering arm is used for most single-motor installations





## WORKSHOP HELPERS

### Wedges Clamp Miters

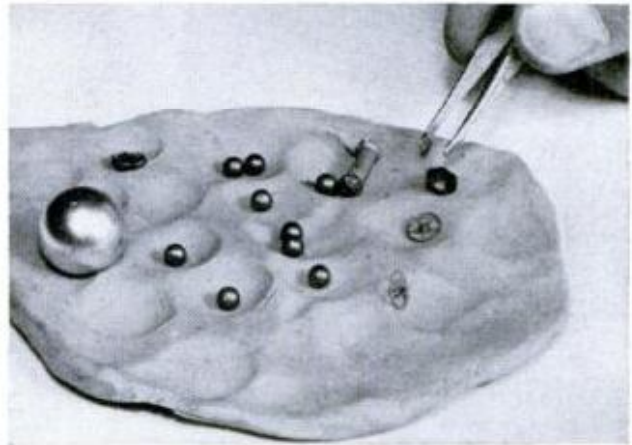
Utilizing pairs of slide-past wedges and a simple frame of strips attached to the bench top you can clamp the joints of any mitered frame perfectly. Attach two of the strips to the bench top (or any flat surface) at right angles, then assemble the mitered frame with one corner in the right angle formed by the two strips. Saw two pairs of wedges with long tapers, then place the two remaining strips of the clamping frame in place on the bench in the position illustrated, allowing space between each strip and the adjacent side of the mitered frame for the wedges. Screw the clamping strips in position. Then spread glue in the joints of the mitered frame, reassemble in the clamping frame, place the wedges in position and tighten them by stages until all four mitered joints are tight.

—G. E. Hendrickson



### Ball-of-Clay Tray

Small, easily lost parts can be kept in order on a divided tray made by kneading a lump of modeling clay pie-crust flat and indenting with the thumb to form compartments, or pockets. Anything that rolls or is so tiny that it would be difficult to see on the bench top or in an ordinary tray is easily kept track of when placed on this novel parts tray. Modeling clay in various degrees of plasticity is readily available from art-supply stores and hobby shops and if you keep it in a closed container when not in use, it will remain plastic.—Bil Toman



## COMING UP NEXT...

**Solar Motor.** Place this tiny motor in the sun or in the light from a 60 or 100-watt bulb and it starts and runs at high speed. What makes it go? It's driven by solar cells which convert light to electricity. You'll have fun assembling it. Complete details are in November **PM**.

**Car Washer.** Do you put off washing your car just because you dread the job? Then you'll be waiting for November **PM** which will tell you how to build a simple drive-through washer that practically automates the work. Gets the grime and traffic film off and down the drain in minutes.

**Viewer for 35-mm. Slides.** You use your regular 35-mm. projector to pop pictures into a small viewing box which folds for carrying. Mirrors reflect the image to a viewing screen which gives you a TV-like picture in daylight. No screen setting-up; no shade pulling. Rest of the story comes in next month's **PM**.

**Foot-Operated Bellows for Workshop.** You won't use a foot bellows often but when you need one there's no substitute. It's controlled compressed air ranging from a whisper in a Bunsen burner to a blast that will send chips across the room. Make one from plans in the November **PM**.



# MR. DO-IT AND BUNGLE

YA KNOW, BUNGLE— IT'S A DOGGONE SHAME THE WAY YOU PUT IN SO MUCH SACK TIME WITH YOUR PLACE SO IN NEED OF REPAIRS...

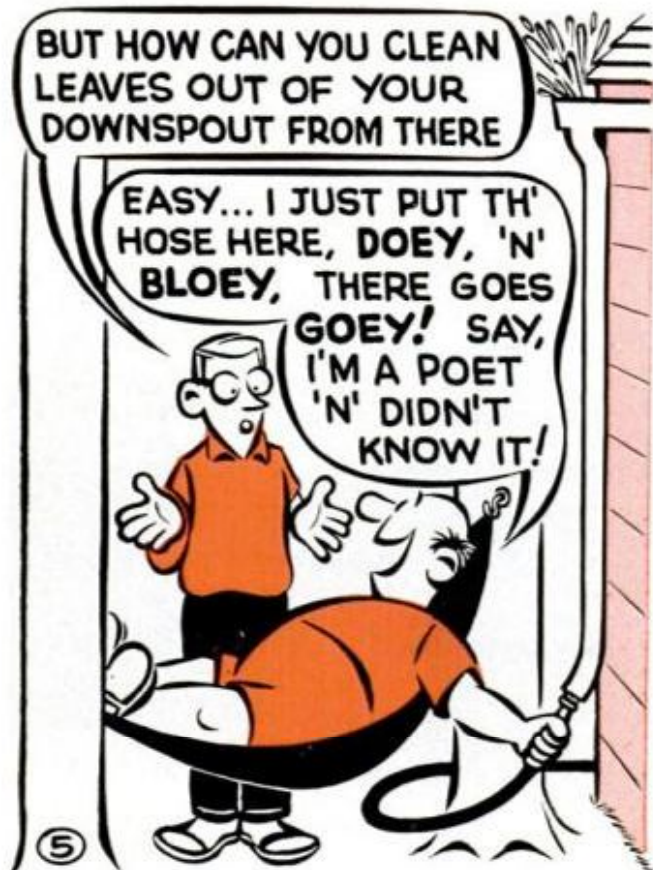


TODAY WOULD BE A GOOD TIME TO GIVE YOUR GUTTERS A YEARLY CHECKUP— HERE I'LL GRAB MY LADDER AND SHOW YOU



BUT HOW CAN YOU CLEAN LEAVES OUT OF YOUR DOWNSPOUT FROM THERE

EASY... I JUST PUT TH' HOSE HERE, DOEY, 'N' BLOEY, THERE GOES GOEY! SAY, I'M A POET 'N' DIDN'T KNOW IT!



VERY FUNNY... BUT CAN YOU CHECK FOR LOW SPOTS NEAR THE HOUSE THAT SHOULD BE FILLED SO THE WATER WILL DRAIN AWAY?

WHY SURE... WATCH... IT'S CALLED "PUTTERING AROUND THE HOUSE" HA HA... YA GET IT, DOEY?

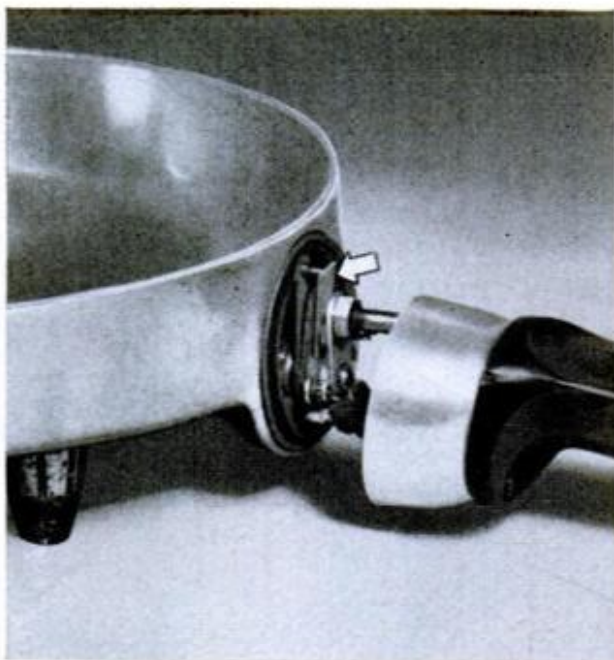




**Keeping out of the gutter at the bowling alley is fine but not at home. Periodic cleaning, painting and repair of gutters and downspouts saves early replacement**







**1. REMOVING HANDLE** from older-type fry pans exposes points and arm of thermostat. Be careful not to damage parts or bend arm when cleaning the points

**2. GASKET** between handle and pan should always be replaced when handle is removed for any reason. Be sure handle seats properly when it is reassembled



PRESENT-DAY household appliances are so very nearly trouble-free that one plugs them daily into electrical outlets without a thought about performance. But sometimes, after long use, a unit will fail to work and when this happens you can save money by making the repair yourself. This is the first of a series to be presented on how to fix modern household appliances.

Sticking controls usually are the cause of failure of electrically-operated units. An electric fry pan is typical. If the handle gasket has deteriorated, cooking fats and possibly water may find their way into the handle compartment housing the controls. This can cause rapid pitting of the contact points.

Operation of the thermostat in different makes and models of fry pans is much the same, the mechanisms varying only in general design and relative position of the parts.

First, remove the handle as in Fig. 3, exposing the wiring and thermostat. Be careful not to cause any damage. On older pans not having detachable controls you'll see something like that shown in Fig. 1, the arrow indicating the points and arm of the thermostat. Pass a strip of heavy paper or thin cardboard between the points to clear away any tiny tip of carbon that may have formed on the face of one or both the points. This carbon deposit, of pin-head size, can cause faulty, unreliable operation of the thermostat and usually it is removed by one or two passes of the cardboard strip. Examine the points closely for pits. If any show,



# Appliance Fix-It File

pass a folded strip of fine sandpaper (8/0 grade) between the points. Work carefully so that you do not distort or alter the shape of the points or bend the thermostat arm. If the points are deeply pitted and so badly corroded that they will not clean up easily, then it's best to replace the whole control unit. Otherwise, clean the unit thoroughly. A small pinch of cotton twisted onto the end of a toothpick and dipped in a solvent (carbon tetrachloride) is just the thing for this. Be careful not to get solvent on the insulation. Then reassemble, replacing the gasket, Fig. 2, with a new one.

On older pans having molded handles it is not possible to remove and replace the wiring. If the insulation is frayed or otherwise badly worn, it is advisable to replace the handle with its wiring.

Nearly all late-model pans are made with detachable control units which helps to make them more nearly trouble-free. But after long use the contacts can become corroded and possibly pitted. The units are easily detached and disassembled as in Figs. 3 and 4. In the unit pictured in Fig. 5, the projecting cylinder, indicated by the arrow, contains a gas which expands when heated. This expansion actuates a plunger which forces the contact points apart in the same manner as does the bimetallic strip on older models. When dismantling the newer control units use extreme care not to bend or displace any of the operating parts. Always follow manufacturer's instructions for cleaning the pan.

—John Pennington



**3. YOU'LL NEED** a Phillips screwdriver to remove screws in most fry-pan handles. Be especially careful



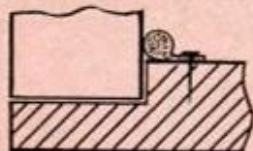
**4. LATE-MODEL** fry pans have removable control units. These are even more easily serviced than older types

**5. NEW THERMOSTAT** control is gas-filled cylinder rather than bimetallic strip. See arrow in photo

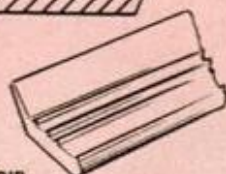
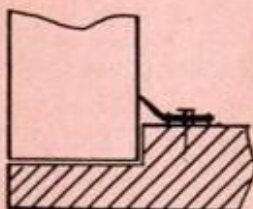




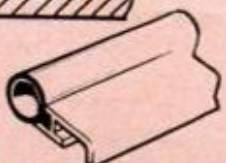
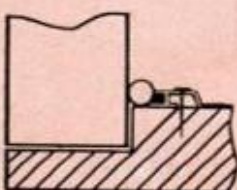
1 SURFACE-MOUNTED SEALS



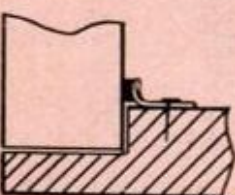
NEOPRENE ROLL



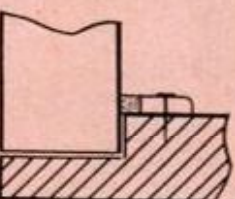
VINYL STRIP



VINYL AND ALUMINUM

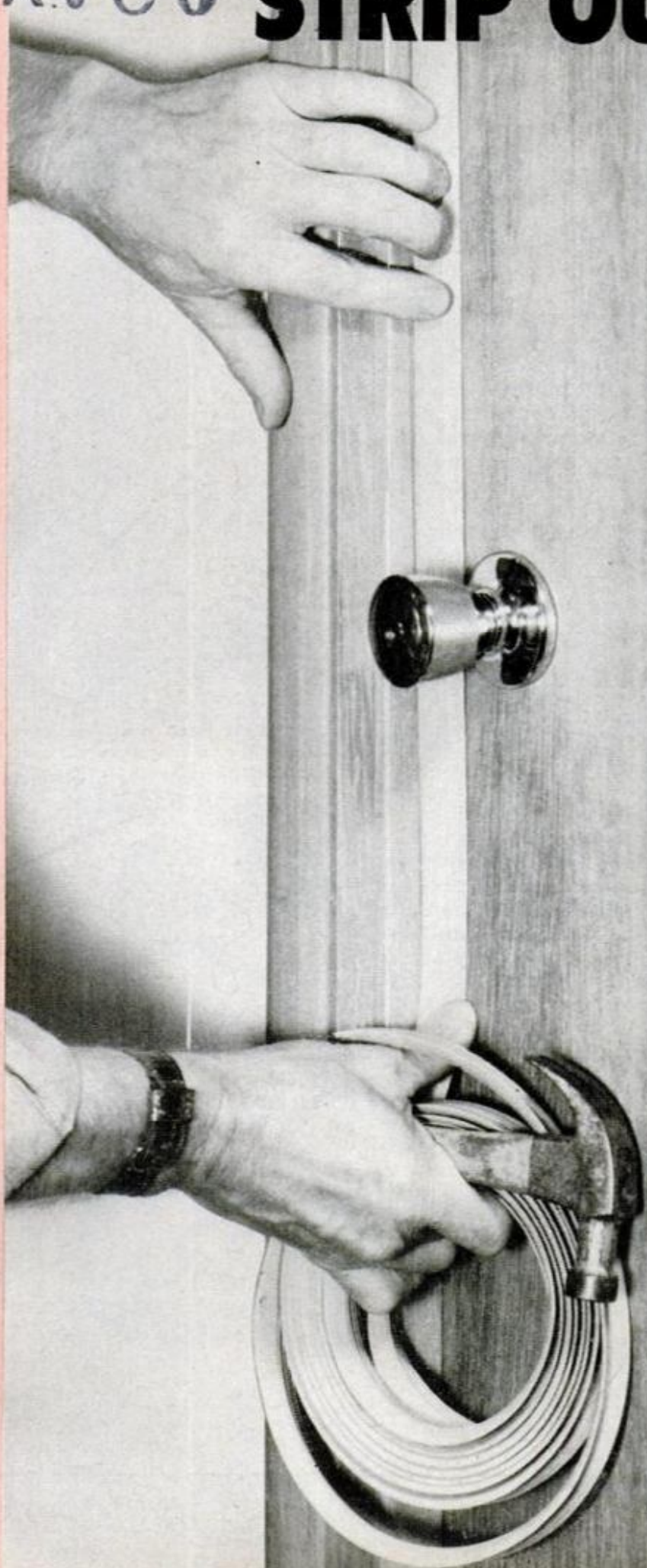


METAL AND FABRIC



WOOD AND FOAM

X780 **STRIP OUT**





# THE WEATHER



Cracks can let a lot of winter into your home. Keep it out with weatherstripping

By Paul Corey

255 CAVEDALE ROAD, SONOMA, CALIF.

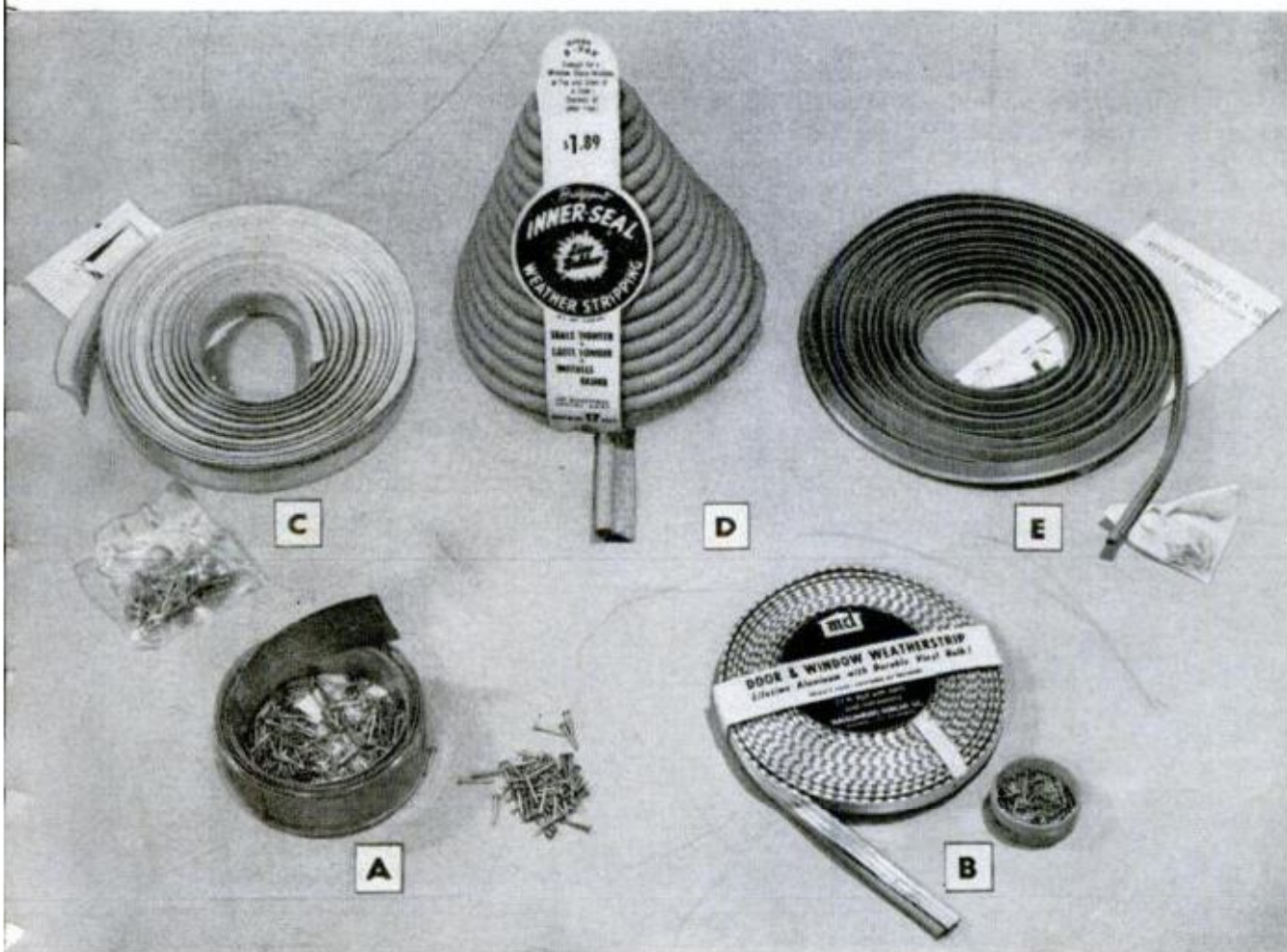
THERE'S A crack around every window and door in your home. It is possible to measure heat loss through just one of these openings, to say nothing of the many drafts and cold zones set up by air leaks at each of the windows and doors. Weatherstripping the cracks not only keeps out cold; it excludes dirt and tempers sound as well.

Nearly all of the old standby weather seals such as wool and cotton felt, hair felt, cord and fabric and some spring-metal strips, are still available in nearly any length you want. Surface-mounted types of weather strips, some old and some new, are shown in Fig. 1. Then there are the kits which are coming into more widespread use as they enable you to purchase a complete package consisting of the strip, or seal,

plus suitable fasteners. The kits come in sizes to fit most any standard door or window and they save you the time and bother of making close measurements of each door and window unit. Typical kits are pictured in Fig. 2. Some weather strips are of the surface-mounted, or visible, type, Fig. 1, while others are of the concealed type, as detailed in Fig. 3.

Taking the kits in Fig. 2 as examples of both the surface-mounted and concealed types, Figs. 1 and 3, kit A is a concealed spring strip of metal designed for use on both doors and windows. Kit B is an aluminum-and-vinyl surface-mounted strip. Kit C is a shaped vinyl strip shown being surface-mounted in the photo at the right of Fig. 1. Kit D is a neoprene and sponge-rub-

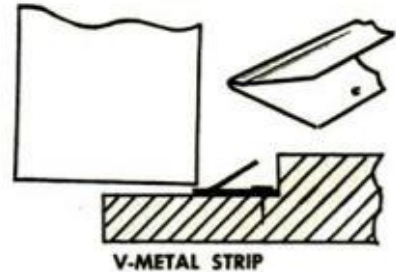
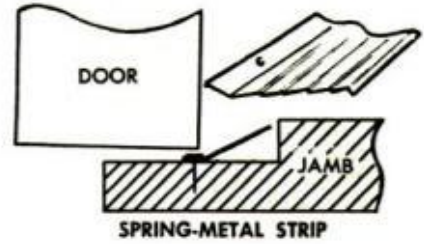
**2. WEATHERSTRIPPING KITS** for use on both doors and windows are available in several forms. Here are five kits which are typical of those supplied. One, kit A, is a spring-metal strip which is an old standby







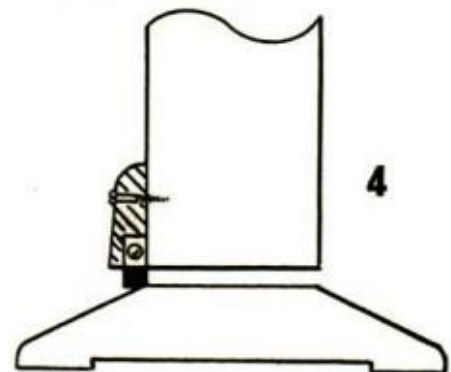
### 3 CONCEALED WEATHERSTRIPPING



ber strip for surface mounting as in the top detail, Fig. 1. Kit E is a vinyl strip which is surface-mounted as in the second detail, Fig. 1. The spring-metal strip, kit A, Fig. 2, is supplied with a special strike-plate strip which is installed as in Fig. 7. This strip prevents air and dirt from leaking in around the strike plate of the door lock. The spring-metal strip is applied in the door-jamb rabbet where it is concealed as in the top detail in Fig. 3. This strip also can be used in double-hung sashes. Two other types of concealed strips are detailed in Fig. 3, one being metal, the other a foam strip with an adhesive backing for quick, easy application. The V-metal strip, Fig. 3,

can be used in window sashes, but the foam strip is intended only for door application. The first two are attached with special nails which are furnished with the kit.

There's plenty of protection available to homeowners against drafts at the bottom of outside doors. Figs. 4, 6 and 8 detail examples of door-bottom weatherstripping to keep out rain, snow, sleet and that cold, cold winter wind. Those shown in the open and closed positions in Figs. 4 and 6 are of the self-sealing type, that is, when the door is opened the seal retracts mechanically so that it will clear carpeting. When the door is closed a plunger on the door unit contacts a striker on the jamb as in Fig. 4, the





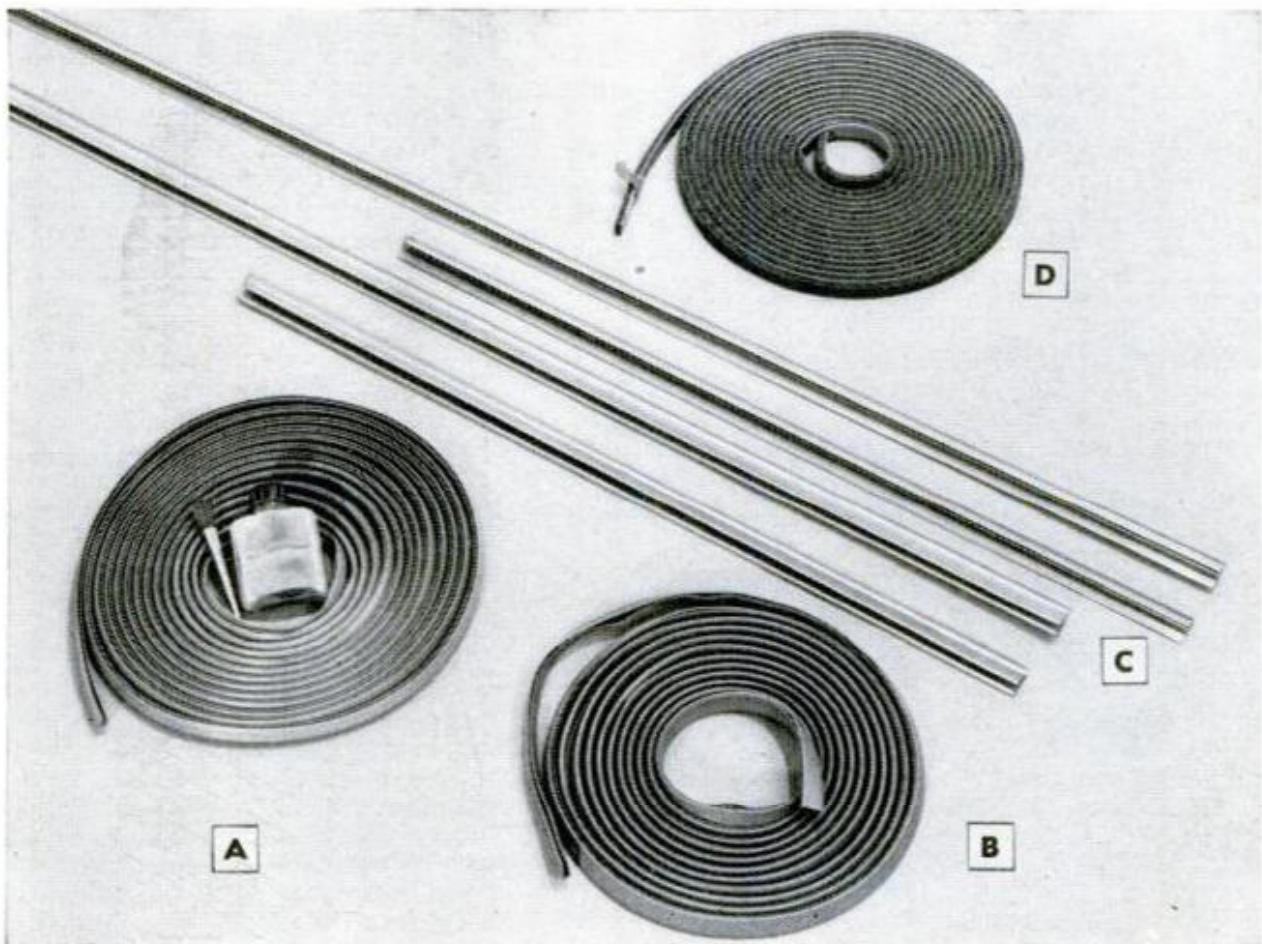
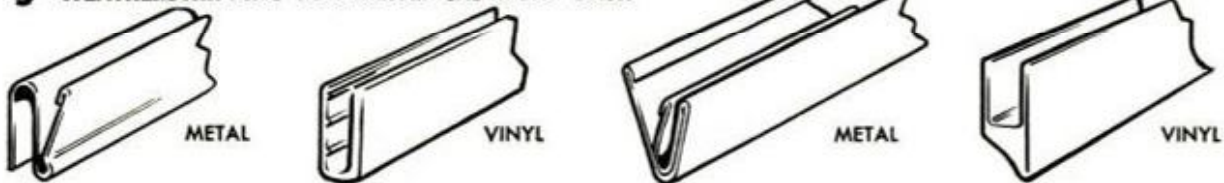
photo, forcing the seal downward into close contact with the threshold. On the type shown in Fig. 6, the seal contacts a stop on the jamb as the door is closed, forcing a vinyl strip into close contact with the threshold. Both types of strips are attached to the outside of the door. Another type, Fig. 8, is designed with a vinyl wiper strip having four ribs which contact the threshold when the door is closed, forming a weather and draftproof seal. The strip is L-shaped, extends along the bottom of the door and incorporates a drip cap to prevent rain from being driven under the door.

Weatherstripping casements call for special seals of a U-shape. In the photo, Fig. 5, kit A is a vinyl sheath which fits tightly over the edge of the casement frame and is held in place with an adhesive which you get with the kit. Kit B consists of a vinyl strip which is applied without an adhesive. The inside surfaces of the U-shaped material are provided with a series of spaced ribs, Fig. 5, second detail from the left, that grip the edge of the casement frame and hold the strip firmly in place. Kit D consists

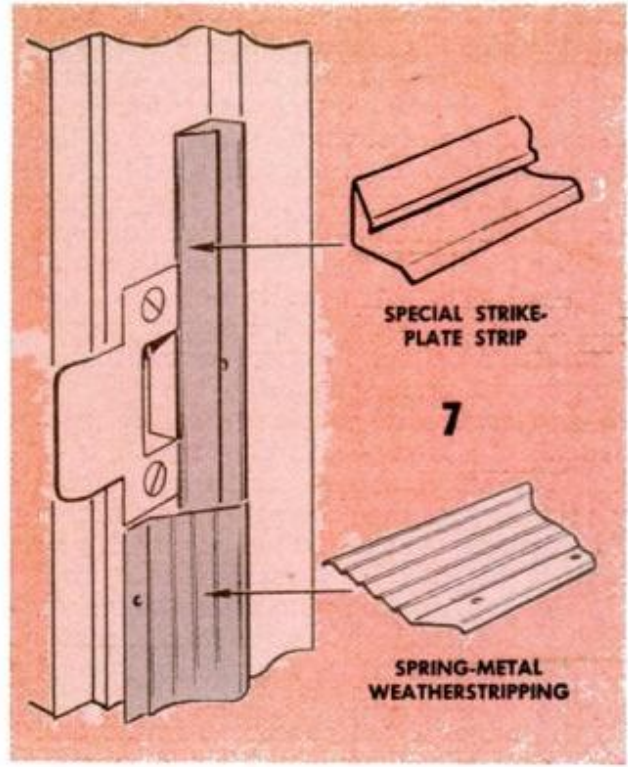


**METAL CASEMENT SASH** require special U-shaped strips, a number of types of which are available in both metal and vinyl, as in Fig. 5 and photo below

### 5 WEATHERSTRIPPING FOR METAL CASEMENT SASH







**SPRING-METAL WEATHERSTRIPPING**, see Fig. 2, is easily cut with small tin snips and can be installed on windows as above, or on doors. When installed on a door a special strike-plate strip is used as in Fig. 7

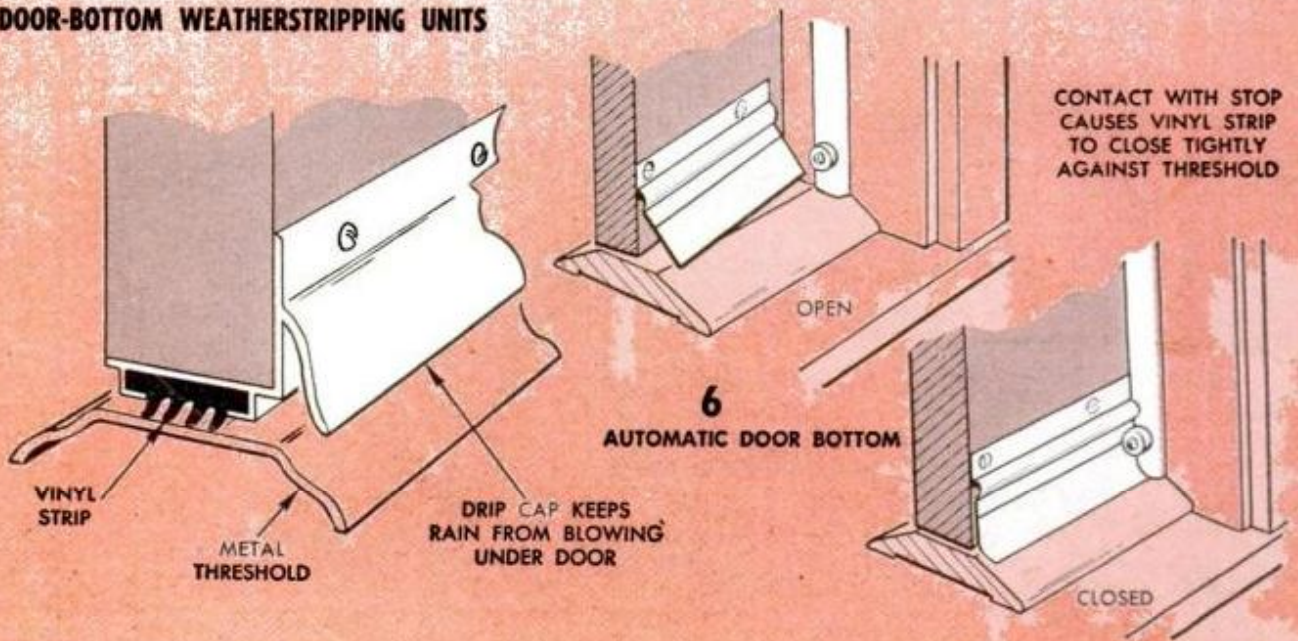
of a foam strip with a special adhesive backing protected by a paper strip which is peeled off as the strip is applied to the casement frame. Kit C consists of four metal seals, the two top members being intended for application to the hinge side and bottom of the casement while the two lower members are for application to the top and lock side. These types of casement seals are shown in the first and third details from the left in Fig. 5.

Your overhead garage door also is included in the parade of weatherstripping kits. Three types are pictured in Fig. 10 and

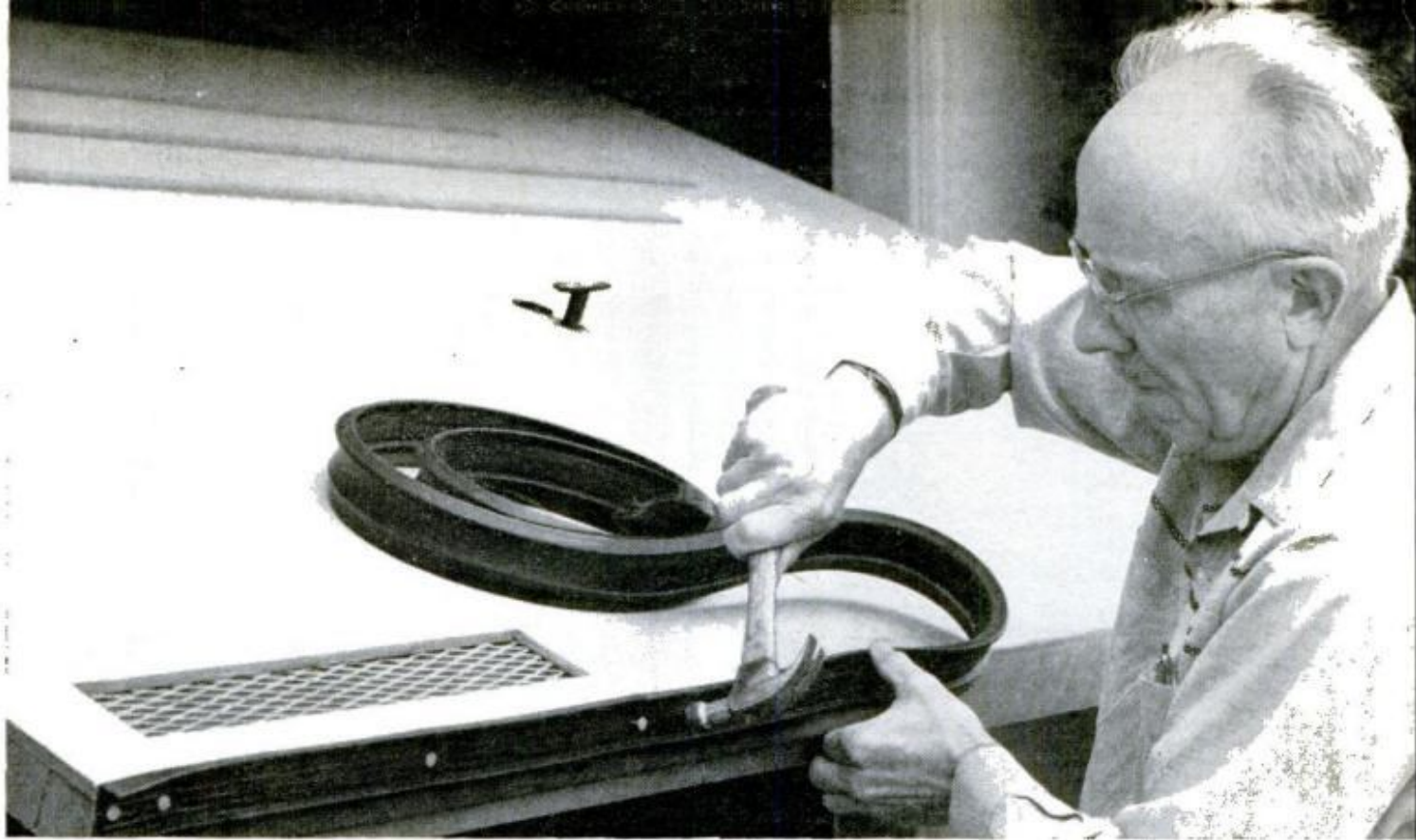
methods of installation are detailed in Fig. 9. In Fig. 10, kit A is a spring-metal strip molded in sponge rubber and it can be installed in any one of three ways as detailed at A in Fig. 9. Kit B is a cushion-type strip with a bead for aligning the strip when attaching to the door. Kit C is another door-bottom seal which is attached to the door as in the photo above Fig. 9. See also details B and C, Fig. 9.

Mainly, the purpose of weather seals for the garage door is to prevent leakage of air, rain, snow and sleet under the door. If the door closes directly onto the concrete floor

## 8 DOOR-BOTTOM WEATHERSTRIPPING UNITS

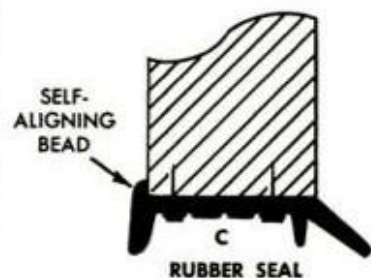
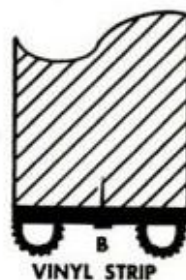






**OVERHEAD GARAGE DOORS** don't always fit tightly at the bottom to keep out rain, snow and dirt. There's weatherstripping made especially for attachment to bottom of door to form an air and watertight seal

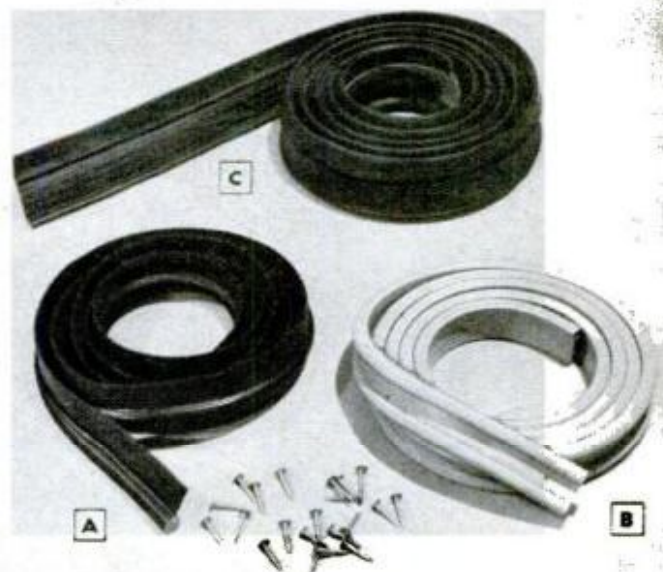
### 9 OVERHEAD GARAGE-DOOR SEALS



or approach, it is almost impossible to fit it tightly to the slight irregularities of the surface. The resulting crack can let in a lot of water during a driving rainstorm in summer and admit a sizeable snowdrift in winter, unless, of course, you weatherstrip the door with one of the new weatherstripping kits as is being done in the photo above.

When attaching either the surface-mounted or concealed types of weatherstripping it's important to use the recommended fasteners spaced according to recommendations of the manufacturers, and to make sure that the strip, or seal is straight. Any curves, short bends or kinks in the strip are certain to affect its efficiency in keeping out cold, dirt and sound. Special care should be taken with those strips which are all-metal, as for example the V-metal strip in Fig. 3 and the casement strips in Fig. 5. If these strips are bent, kinked or dented either before or during installation, it is difficult, if not impossible, to reshape them to the original form. Defective strips just won't give a perfect seal against the weather. ★ ★ ★

**PICTURED BELOW** are three common types of garage-door seals. The strip A is installed on the edge of the door as in detail A, Fig. 9 above. Strips B and C are installed as in details B and C above





## Adjustable Anchor Line Keeps Decoy Set in Formation



A sudden gust of wind can scatter a set of wooden decoys unless each bird is securely anchored. To make anchor lines adjustable drill  $\frac{1}{4}$ -in. holes at an angle near the ends of the flat on the bottom of the bird. Drive in  $\frac{1}{4}$ -in. dowels so ends project 1 in. Drive a screw eye at the midpoint. Tie the end of the line to the screw eye and wrap several turns around the dowels. Measure off the length of line needed to reach the lake bottom, pass it through the screw eye and attach a sinker.

## Funny Chain Faces With Discarded Necklace



Youngsters will have fun galore drawing funny faces with this aid to cartooning. Just sketch the general shape of a head and then use an old chain link necklace to shape the profile from the lower part of the forehead to a point below the chin. Insert the necklace through holes in the card and ease it into position with a pencil. There's no end to the funny profiles that can be formed.

—Barbara Nicholson

## Two-Gallon Can Fills in as Novel Bird Cafeteria



Deep snow and a severe cold snap give nonmigratory birds a bad time. In an emergency you can open an extra cafeteria in minutes by cutting and bending the sides of a 1 or 2-gal. can outward as illustrated to form a combined shelter and feed hopper. Cover cut edges of the hopper with rubber tubing to form perches. Mount the feeder on a post about 6 ft. above ground, bracing it with a couple of shelf brackets as indicated. Feed seed mixtures, suet and bread crumbs.

—Victor J. Lamoy



# SHOP TOOL in a BOTTLE

**T**HERE ARE few portable tools that can do so many jobs with so few accessories as a propane torch. It's a one-hand-size tool, a household appliance, a service-kit workhorse few homeowners, craftsmen, plumbers and electricians do without. It's 2300 degrees of heat concentrated at the end of a burner tip no larger than your little finger. The fuel cylinder gives about 15 hours normal service.

Take Figs 1 through 18 as examples of what you can do in and around your home, to say nothing of the home-shop applications if you're a crafter or model-maker. Note in Fig. 5 the size of the cylinder and the bend in the tube between the valve and burner. The bend is at just the right angle to give you all the advantages of a pistol grip in aiming the flame at the point where it is to work,



**4. REPLACEMENT** floor tiles drop easily into place and take floor contours when heated with torch



**1. OLD PAINT** is softened almost instantly by furnace-hot flame from a propane torch. Follow up with scraper

**2. TORCH** thaws frozen hydrants or water pipes. Use pencil flame and direct it at point where water is frozen in pipe



**3. GUTTER LEAKS** are easily stopped by flowing solder over pinpoint openings at joints. Surface must be thoroughly cleaned







**5. JOINTS** in copper tubing are soldered in a jiffy with the torch. First, make sure the joining parts are thoroughly clean and the metal bright. Then flux the joint, or use a rosin-core solder, and bring parts to soldering heat. Hold torch so that flame spreads and wraps around tubing. Withdraw heat when solder melts



**6. COMPLETE KIT** for soldering copper plumbing, including an igniter, tubing cutter and flaring tool. A heavy-duty torch tip is included for this type soldering



**7. BURN OUT** troublesome ant colonies that infest your lawn. One or two passes of hot flame gets rid of them—permanently

**8. LIGHT A BLAZE** in your fireplace without using up a box of matches, fanning with newspaper or frantically pumping bellows





**9. THAW** dangerous ice patches, above, in seconds. Right, a torch kit made up with igniter, two torch tips and soldering tip is useful in any household

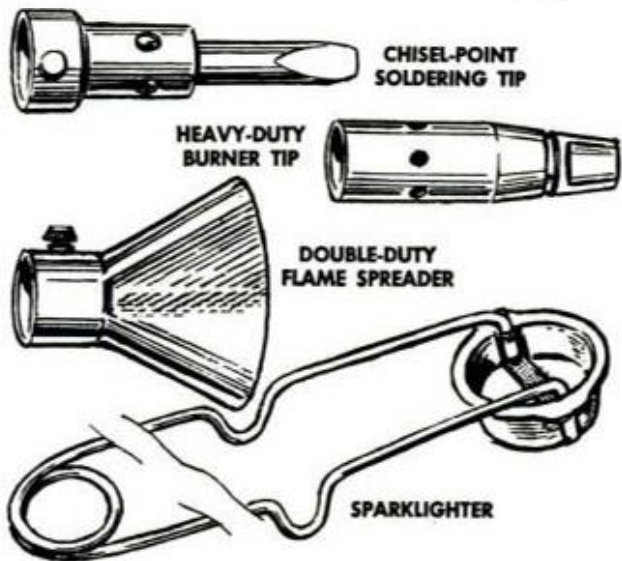
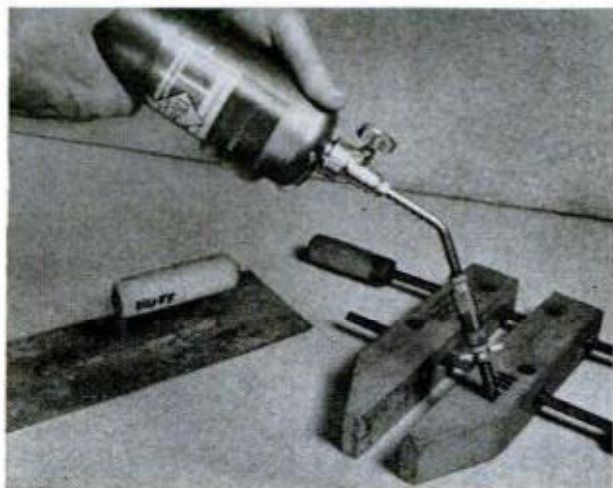
making the torch a precision tool always under one-hand control. You can direct the flame down, Figs. 4, 9, and 13, or straight ahead as in Figs. 1, 2, 14, 16 and 17, or straight up, above your head as in Fig. 6. And in none of these working stances is the hand holding the torch forced to assume a cramped, tiring position. That's because of the size and balance of the fuel cylinder and also because of that bend you see in the burner tube.

Some torches are made with an S-shaped bend in the burner tube and come with a smaller fuel cylinder, or tank, Fig. 17, for added convenience in handling where the work point is difficult to reach. Of course, such a torch is just as efficient as any other on common jobs.

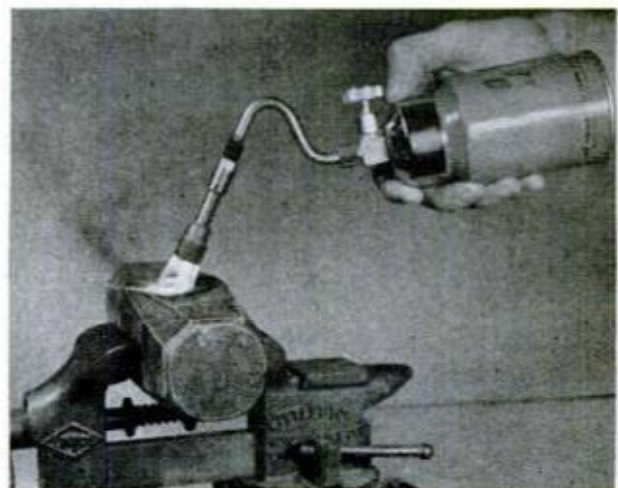
Then there are torch kits, Figs. 7 and 10, in which the torch is supplied with a number of accessories suitable for soldering, plumbing, brazing, paint scraping, etc.

**10. COMMON TORCH TIPS** and igniter, or spark-lighter, right, are included in your propane-torch kit

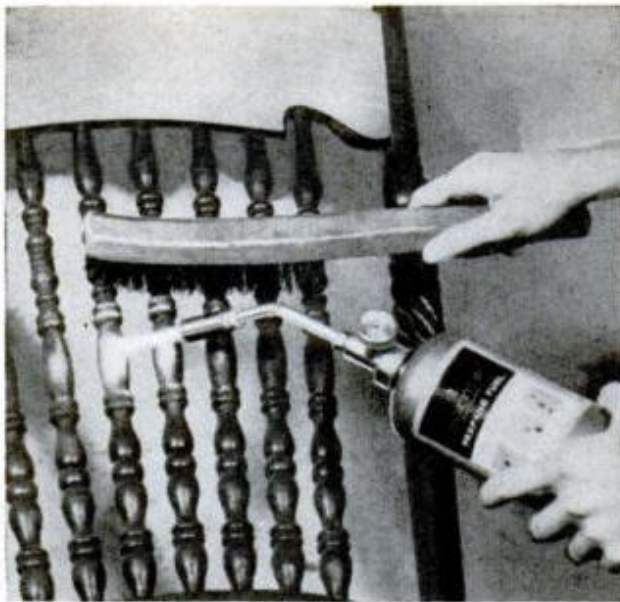
**11. CHISEL-POINT** soldering tip gets hot enough to brand initials on wooden clamp jaws, projects etc.



**12. HERE'S A FAST WAY** to remove that part of broken handle that sticks in head of hammer or sledge







**13. HEAT FROM TORCH** will not only soften aged varnish, it also can be used to put an attractive finish on old wood. Keep flame moving to prevent charring



**14. IF YOU HAVE** trouble lighting charcoal briquettes, try your propane torch. You'll find it the fastest "match" you ever used. No paper or kindling is needed



**16. OLD PUTTY** can be softened in a single, slow pass of torch flame. Move flame just fast enough to prevent charring wood. Remove putty while still soft

**17. REMOVE A STUBBORN** pipe fitting by heating with torch, using the flame spreader, Fig. 11. Heat expands fitting to the point where it will let go easily



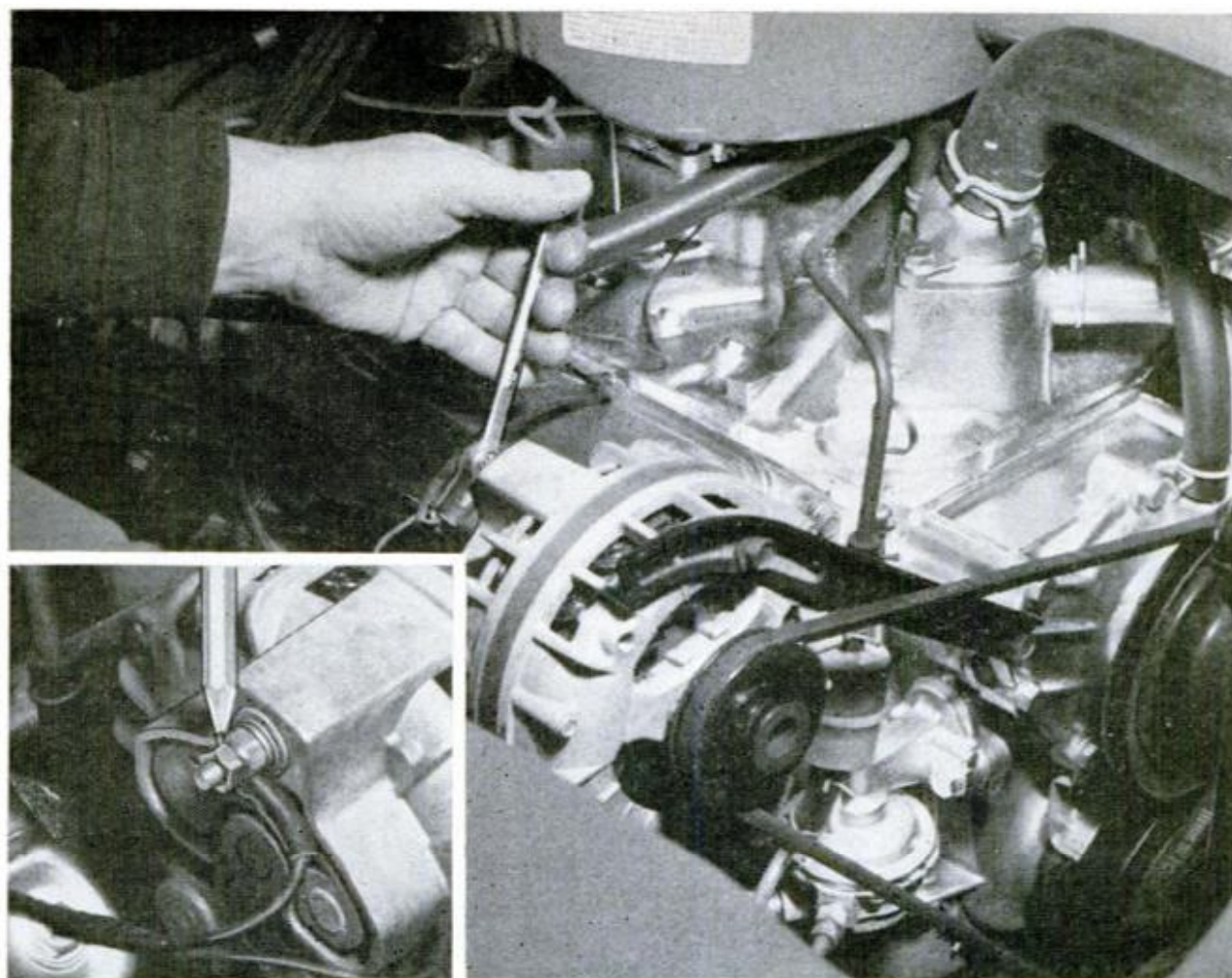
The torch and accessories are packed in a neat metal case with a sturdy handle and latch. In addition to the utility tip supplied with the torch, several other special-purpose tips are available, Fig. 11, also an igniter, or sparklighter. The spreader is handy where you need a wide, spreading flame, Figs. 1 and 18, and for light soldering you can't beat the chisel-point tip. The igniter is sure-fire and saves striking matches.

Finally there are the precautions to be taken. Fire is fire, and 2300 degrees of it can ignite any nearby flammable materials instantly. Be sure to follow in all details the operating instructions that come with the torch and kits.—*Jerry Parker*

**18. LABORATORY GLASS TUBING** can be bent into almost any desired shape if you heat it slowly with spreader flame tip. Protect hands! That glass is hot!







## Tape Prevents Accidental Grounding of Alternator

On early production models of Chrysler cars equipped with alternators the output stud (shown in the inset above) was not provided with a boot or insulator. This stud is hot at all times, making it possible to accidentally ground the alternator and wiring harness and seriously damage both.

This can be prevented simply by wrapping the stud with plastic electrician's tape. Clean the stud and then tighten both nuts as pictured. Then wrap with the tape, making sure as you wrap that the entire terminal is covered with at least two thicknesses to assure effective insulation.—Herb Carrier

## Auto Snack Table

Make use of the air rights over that hump in the floor of your car with this snack table. It's formed by contour-cutting one end of a short length of 1 x 12 stock to fit over the hump, the projections forming legs that rest on the floor. The third short leg rests on top of the hump and is cut from  $\frac{3}{4}$ -in. dowel to a length that will permit the table top to stand level. The top can be 12 to 14 in. wide and of a length that will permit it to fit between the seats. Cut round openings in the top for tumblers and fit sides about 2 or 3 in. high.

—Webster P. Taylor







BATTERY



LAMPS



TIRES



POINTS



SPARK PLUGS



WIPER BLADES



RADIATOR CHEMICALS



LUBRICATION

**GROOMING** both inside and outside of your car frequently by washing and waxing and cleaning the upholstery will make it worth more at trade-in time despite the "book-value" rating



# CAR CARE PAYS OFF

By Vernon Volland

Executive Director Good Car-Keeping Institute

**A**CCORDING TO recent industry research, only 25 percent of the car owners today take reasonably good care of their cars. Twenty-five percent simply haven't got the money, or the inclination, to do so. A whopping 50 percent have the money, could if they would, but simply don't have the desire to take care of their cars. They think that it doesn't pay, that it isn't fashionable, and that there is no social stigma attached to neglecting their cars' mechanical condition and appearance—"even the best people do it."

What basic assumptions are held by this 50 percent that could care but don't? These three false impressions are some of them:

1. It doesn't pay to take care of your car. The horsetrading nature of new-car selling tends to discourage the consumer about the value of his used-car trade-in. The "book value" system works in favor of the dealer, especially over the consumer with the "hots-to-buy" (a perfect description of all of us when the new car fever hits). The fact is that a good, five-year-old used car regularly brings as much as \$300 more at dealers' auctions. Most dealers readily admit that they allow more for good used cars on trade-in. Often, a new-car salesman will say, "Your used car is only worth the 'book value,' but we'll give you a little better discount on the list price." How else can he





TAIL PIPE AND MUFFLER



SHOCK ABSORBERS



BRAKE FLUID



get the credit for doing you a favor? It may not pay you to take care of your car, but you can bet it pays somebody . . . it could be you.

2. Mechanical malfunction and parts failure is a negligible cause of automobile accidents. Automobile-accident statistics are tabulated by police departments, safety agencies and insurance companies to show a single cause—not related to mechanical malfunction or parts failure. For example, "too fast for conditions" is popular. It's like heart failure—it covers almost all situations, tends to dispose of the question and seems to place the blame on conditions—not the driver, not the car, just conditions. Approaching a busy intersection at five miles per hour without any brakes is too fast for conditions.

Exceeding the speed limit is shown as the single cause of most accidents. Something else must happen to turn exceeding the speed limit into an accident. Driving on

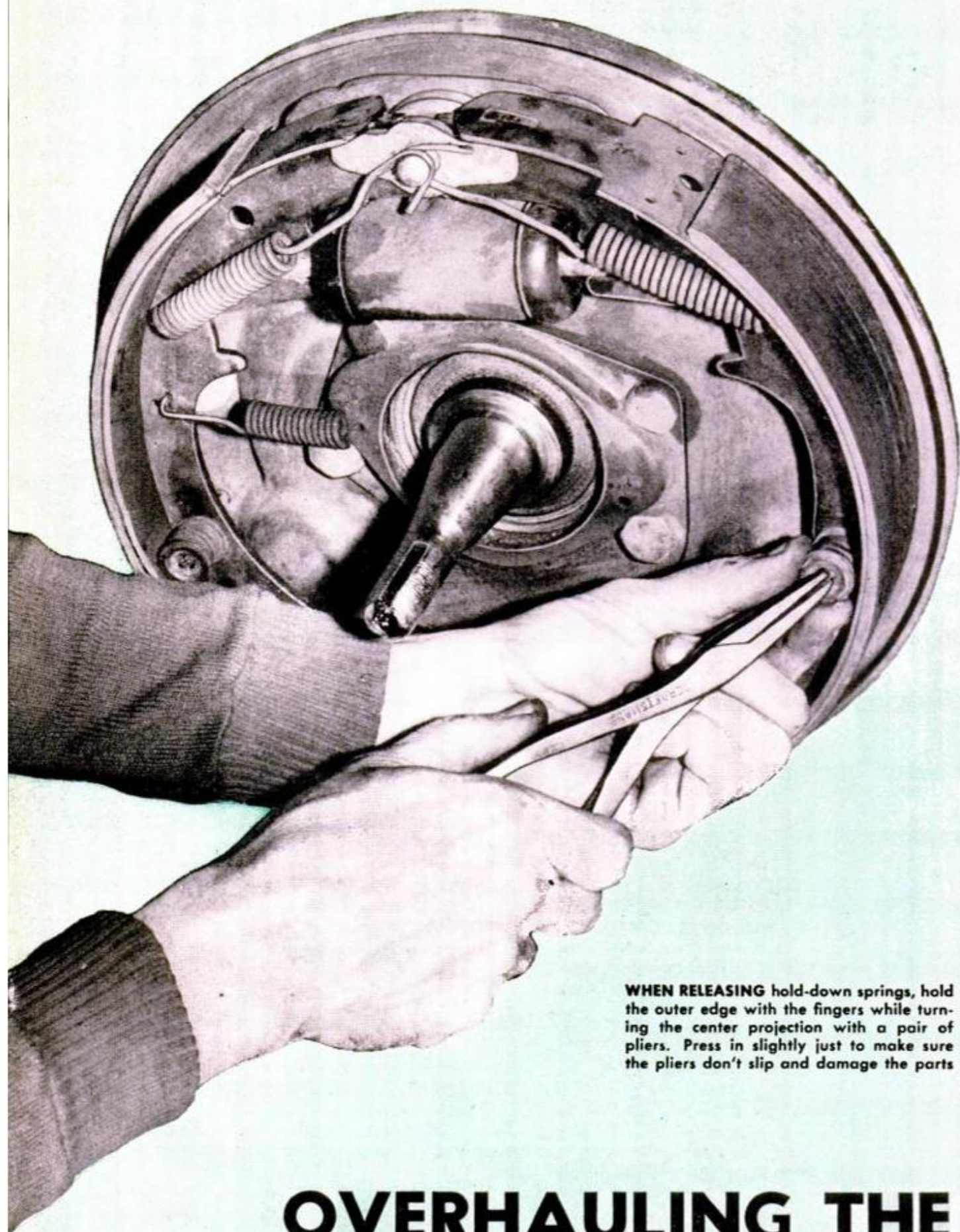
the wrong side of the road is listed as the cause of many accidents. This language hides the accident contributing nature of a car passing without enough power-to-pass, or quite good enough brakes to drop back into line. Both weak functions would be hard to determine from a wrecked car, as would any other half-working condition. The authorities say that 95 percent of the wrecked cars show no signs of mechanical failure. An accident is caused by the combination of the driver—with his abilities and his condition; the car—its condition and its limitations; and the environment (which is everything outside of the driver and the car). All of these factors are continually changing.

3. Each auto part wears out independently and it, and only it, should be fixed—and then only after it has failed. This thinking is a reflection of a self-centered our brand, our product competitive approach which industry suppliers must use in marketing their products. Every person connected with a company, top executives, advertising and public relations departments, sales departments and individual sales people, must view an automobile as that which is a prospect for our company's product, to such an extent that in their view a car is seldom considered as having any other parts. These same people must consider all sales, service and retail outlets as places established for the sole purpose of selling their brand and their product.

### Related Parts Wear

There is a functional relationship in the wear of automotive parts that is costly to ignore. For example, a worn tire could mean that your car needs oil changes more often than the average. Also, worn shock absorbers could be a warning that your battery could go dead at any time (they have about the same life span, so do brakes and mufflers). The driver should view his car, and his personal driving habits, as a whole operating unit rather than as a collection of unrelated conditions and parts. Wear in one part is usually symptomatic of wear in another seemingly remote part of the whole system. The wear of a tire is directly related to the wheel alignment, to the shock absorbers and brakes, etc. The driving that is toughest on these parts—the short haul and stop-and-go driving often referred to as brake-and-pedal driving—is also toughest on oil and batteries and mufflers. Short-haul driving also means, in many cases, that a driver is constantly getting in and out of his car causing more than average wear on the upholstery and floor mats. ★ ★ ★

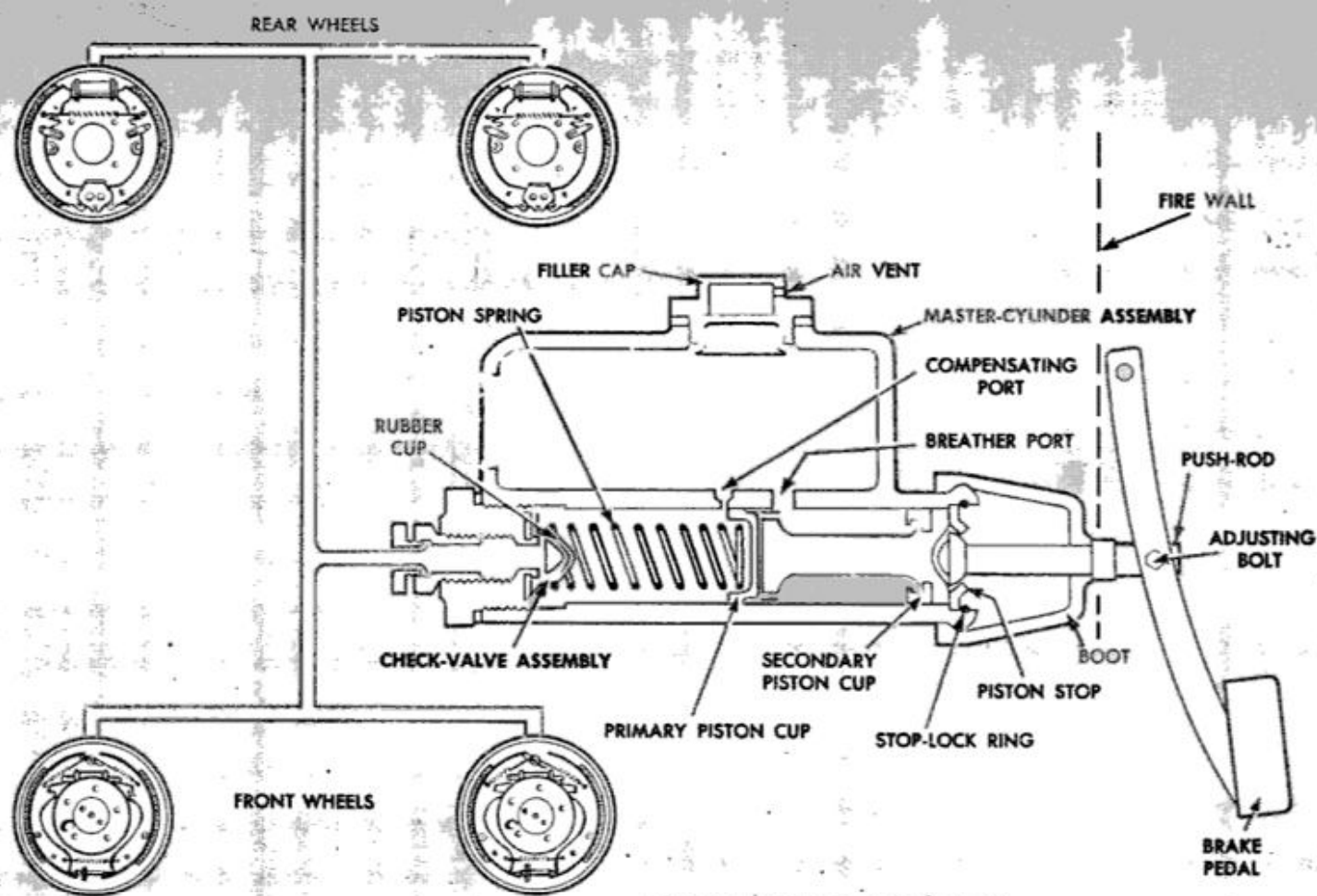




**WHEN RELEASING** hold-down springs, hold the outer edge with the fingers while turning the center projection with a pair of pliers. Press in slightly just to make sure the pliers don't slip and damage the parts

# OVERHAULING THE





**DIAGRAM OF HYDRAULIC SYSTEM**

*By William J. Hector*

**S**UDDEN, unexpected failure of car brakes in a tight place is something no driver likes to think about. But it can happen to anyone, in any car, new or old. The only way to assure yourself that it won't happen to you is to check and service those brakes regularly and overhaul them when long wear makes this step necessary.

Two things to remember: If a loss of pressure occurs anywhere in the hydraulic braking system every part will be affected, and, any symptom of trouble is generally an indication that a complete overhaul of the system will be necessary. Note the general listing of symptoms in the table.

Tools and materials you'll need for the job are listed in another table on a following page. The first step in the actual brake overhaul is a thorough cleaning of each unit of the system. Scrupulous cleanliness is essential throughout the whole operation. Jack up one wheel at a time and place car stands or squared timbers under the rear axles and the front-wheel geometry. Don't trust jacks when you have to get under a car. Dust and clean the brake

#### **Symptoms of Hydraulic System Defects**

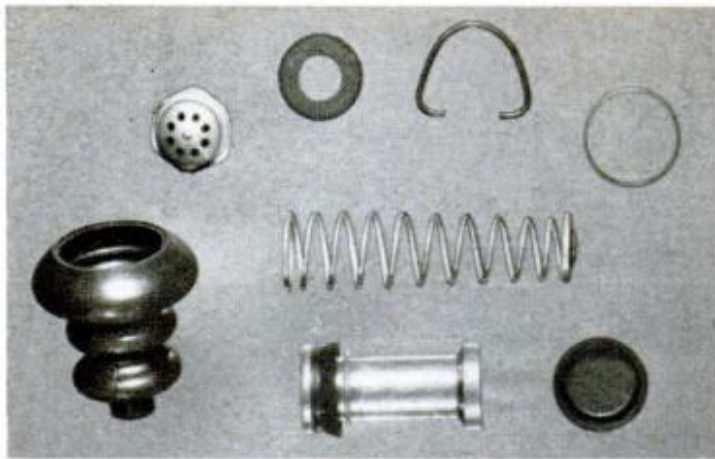
- Dripping brake fluid on back of brake plate, also on wheel and tire
- Pedal goes to floor board, but pressure can be built up by pumping pedal
- Fluid in brake cylinder behind rubber cup
- Brakes fade when making emergency stop
- Brakes drag, or do not release completely
- Spongy pedal
- Brakes lock

plates, bleeder fittings and hydraulic lines. Clean the master cylinder. On later-model cars having the master cylinder under the hood, the cylinder should be cleaned before raising the car.

Now seat a helper in the car to work the brake pedal while you check all hydraulic lines under full-pedal pressure. Look for swelling of the lines and any evidence of leaks while the lines are under full-pedal pressure. Don't mistake a normal stiffening of the lines for swelling at any point

# HYDRAULIC SYSTEM





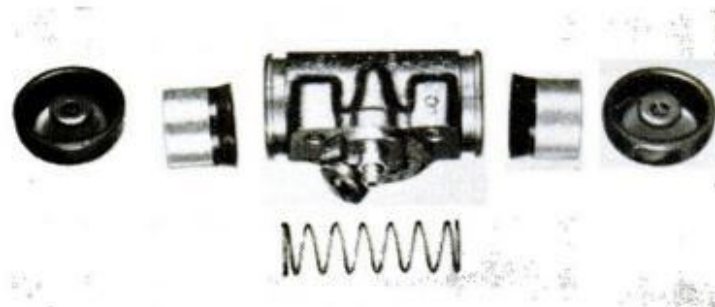
**TYPICAL OVERHAUL KITS** for master cylinder and wheel cylinder. Photos show what you get

along the length. If neither of these defects show up in the test, then it usually is permissible to check the parts off as okay.

Next, remove the wheels and drums. Remove the shoe-retracting and hold-down springs and remove the shoes as units. Then disconnect the hydraulic line from the wheel cylinder and cover the fitting to prevent entrance of dust or dirt. Release the capscrews holding the wheel cylinder to the brake plate. Repeat the same steps on the remaining three wheels.

Wash your hands to remove any trace of greasy grime you may have picked up while carrying out the previous steps. Then disassemble the brake cylinders in turn and examine the bores by holding in front of a bright light. Remove any ridges of accumulated material with a stiff-bristle brush dipped in pure alcohol. Rinse in alcohol and if any roughness remains, try removing with fine steel wool or crocus cloth. Or use a special cylinder hone driven by a portable drill as in one of the illustrations. After honing or abrading with wool or crocus cloth check the fit of the piston in the cylinder. If the clearance is more than .003 on a feeler gauge, the cylinder should be replaced.

Now, remove the master cylinder and disassemble it. You'll end up with the parts you see pictured at the left above, which incidentally is an overhaul kit. Also note the diagram of the system on a preced-



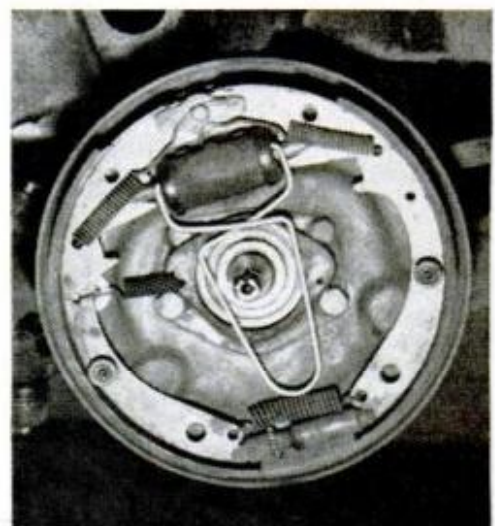
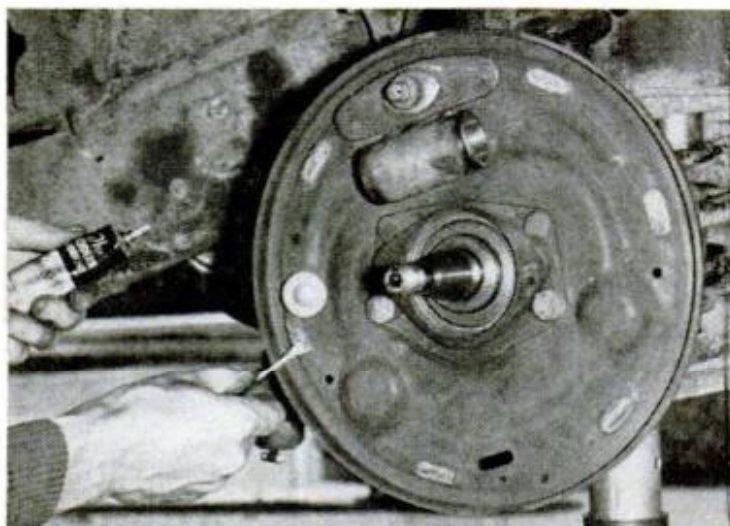
### TOOLS

- Brake cylinder hone (optional)
- Brake spring tool (Chrysler or Bendix)
- Tool assortment as described in brake adjustment articles in preceding issues (see July, August, September PM, 1961)
- Assortment of box and wrenches

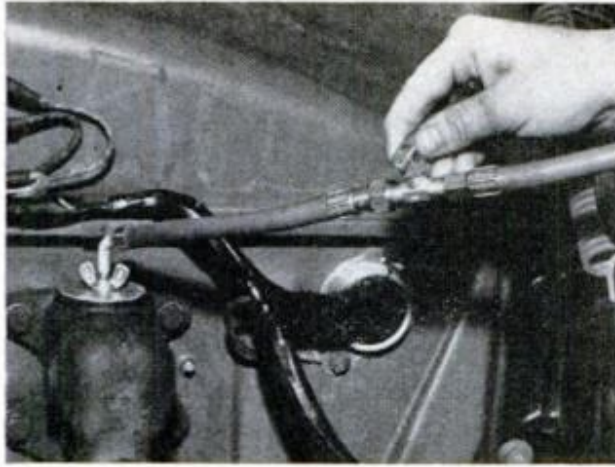
### MATERIALS

- Brake fluid (heavy duty)
- Pure alcohol
- Crocus cloth, or fine steel wool
- Overhaul kit for master cylinder
- Overhaul kit for wheel cylinder
- Bleeder hose
- Bleeder jar

**APPLY LUBRICANT**, left, to the brake-shoe ledges, or platforms, whenever the brake shoes are removed. Parts must be thoroughly cleaned. Right, be sure to have the cylinder clamp in place before removing cylinder







**AUTOMATIC REFILLER** saves time, eliminates possibility of emptying the master cylinder while bleeding



**BLEEDER HOSE** must always be immersed in liquid. Be sure no windblown dust enters jar containing fluid

ing page. This unit requires a very careful check, part by part, and if you don't feel quite up to it, or if you feel that any element of safety is involved, then you can replace it with a new or rebuilt unit. Otherwise, clean all the parts with a solvent such as alcohol, then wipe out the cylinder and examine the bore closely with a light as described above. Here you look for roughness and possibly pitting. Run through with

a cylinder hone a couple of times, wipe out and then give the bore another look. If it appears clean, check with a .003 feeler gauge with the piston in place. If the gauge clears, replace the unit.

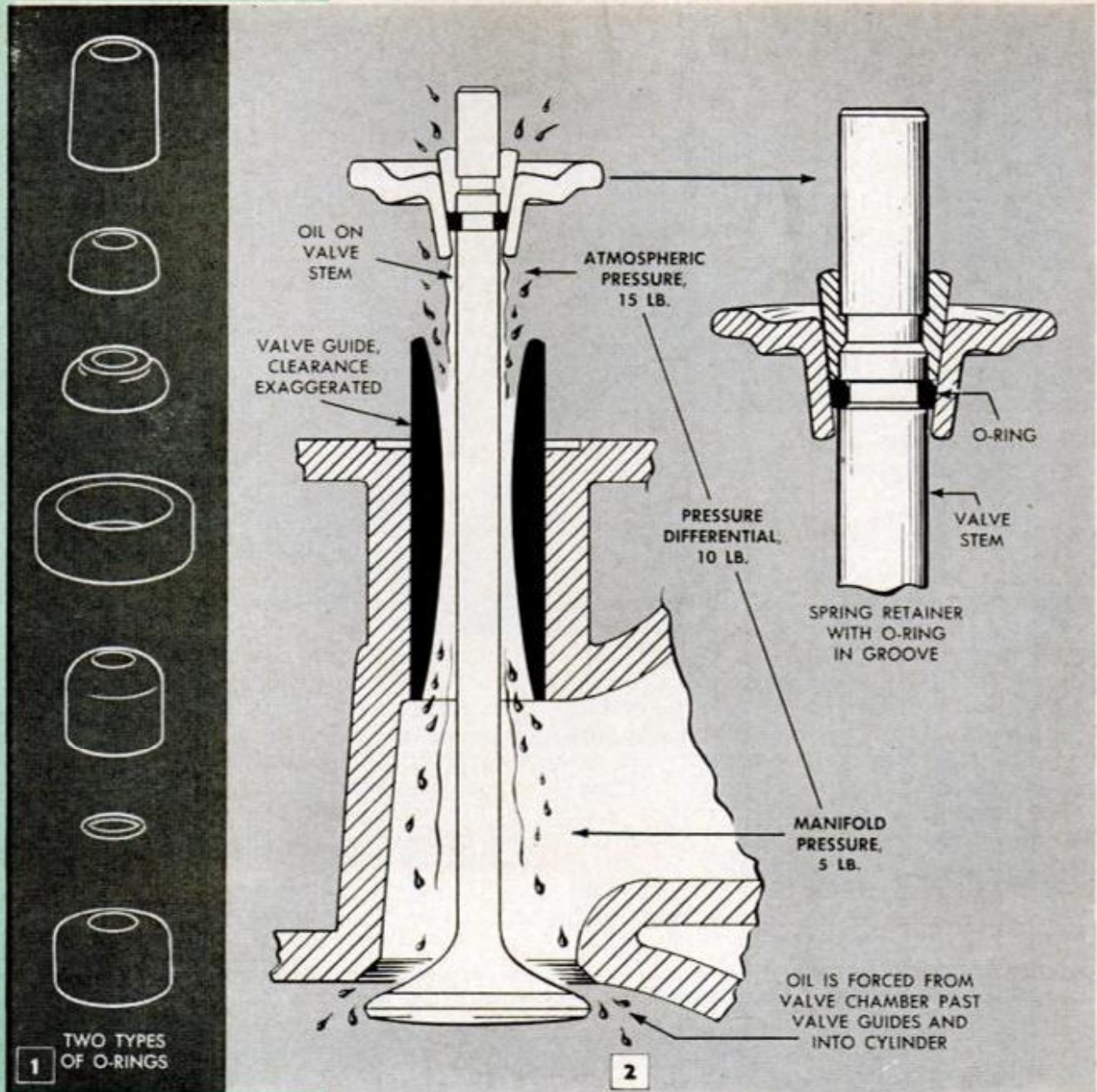
Otherwise you give the parts of the original cylinder a final cleaning and flushing, reassemble and replace on the car. Before replacing the boot take time to examine it

(Continued to page 234)

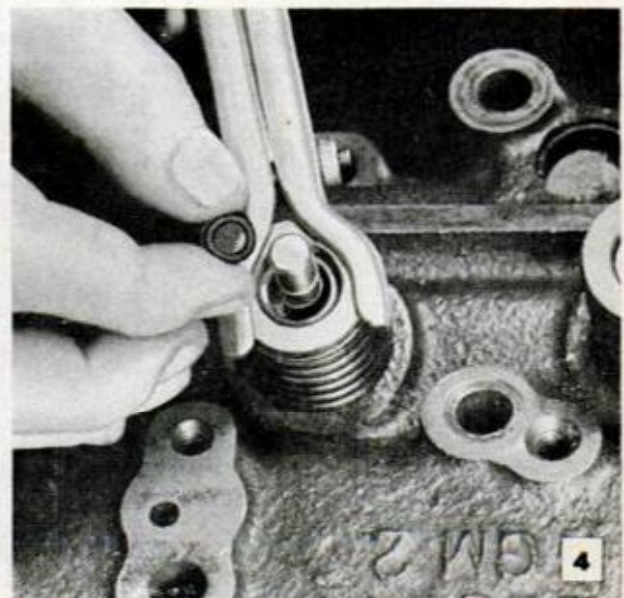
**HONING WHEEL CYLINDERS** and master cylinder gives smooth, clean bores. Be sure to remove any dust or abrasive left from honing. Check bores with feeler after honing. If more than .003 oversize, replace parts







**OIL LOSS** through valve guides is graphically shown in the diagram above. Note variation in pressures. Below, left, on some cars it is necessary to machine valve guides. Right, installing O-ring on stem





# What's Happening to My Oil?

**When owners of low-mileage cars ask this question alert servicemen can come up with the right answer.**

**By John Krill**

**W**HEN L-HEAD ENGINES were standard in nearly all popular cars there was no mystery about the causes of high oil consumption. Servicemen simply checked for a cracked block or a crankcase leak and finding neither, they pulled the head and installed new rings. And generally that took care of the trouble.

Now, nearly all cars come with engines of the overhead-valve type and speeds and compression ratios have gone up and up. A low-mileage car may suddenly show a tendency to abnormally high oil consumption, greatly puzzling its owner and posing a diagnostic problem for the serviceman. Generally, car owners will be familiar with the common causes of excessive oil consumption such as a broken or porous diaphragm on the vacuum booster, a defective crankcase ventilator, head-gasket leak, worn rings, scored cylinder walls, cracked blocks, and so on, but not every one will think of the possibility of large amounts of oil entering the cylinders through the valve guides. Here's where the sharp serviceman can save the owner money.

Look at Fig. 2, which has been greatly exaggerated for purposes of illustrating how oil gets by the valve stems. Note the pressure differential of 10 lb. between the

atmospheric pressure in the valve cover and that in the manifold. Experiments have shown these values to be close approximations and also that oil losses past the valve stems can go as high as 60 percent of any excess oil used by a V-8 engine that shows comparatively little wear.

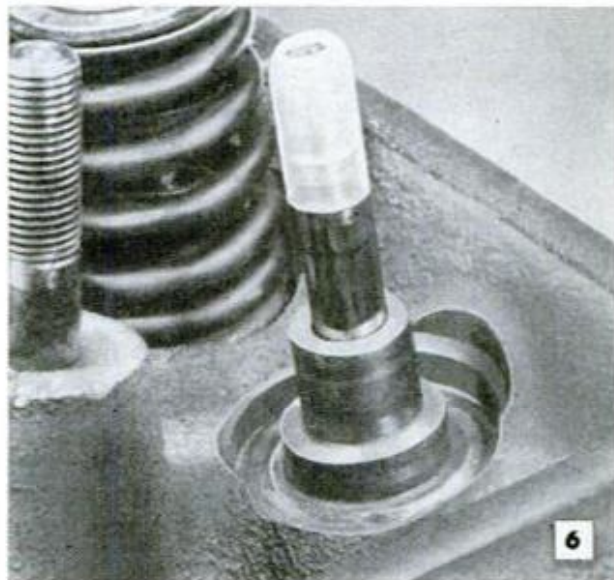
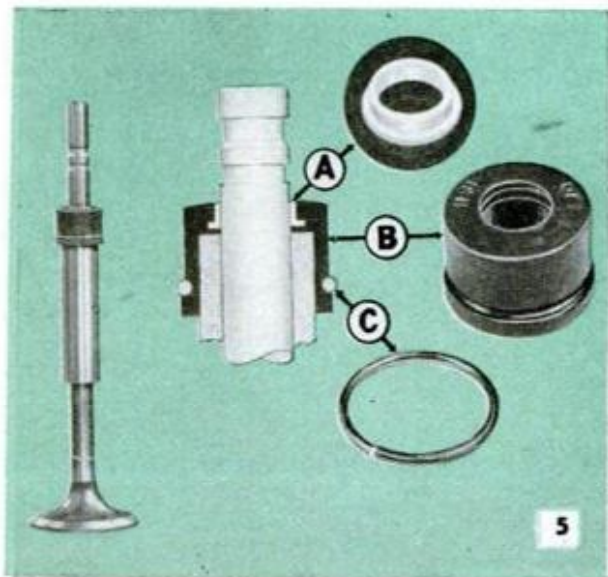
Rather than limit the amount of oil supplied to the valve chambers as a remedial measure, oil seals supplied in kits have been developed to prevent oil loss past the valve guides. These seals perform the double duty of reducing the amount of oil reaching the stems and guides, yet permitting sufficient lubrication to prevent excessive wear of the stems and possible sticking of the valves. Fig. 1 shows two types of oil seals, or shedders, one a simple O-ring, others in several variations of the umbrella type. Fig. 2 shows in cross section how the O-ring is positioned on the valve stem.

Installation is comparatively simple to carry out as you'll see in Figs. 3 through 11. Fig. 5 shows a typical installation, utilizing three types of seals, A, B and C. In practice seals are installed on both the intake and exhaust valves as experimentation has shown that the exhaust-valve stems also pass oil.

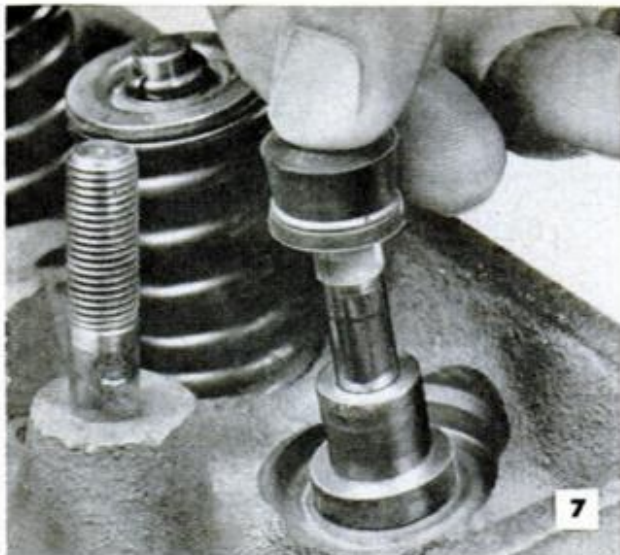
It's not necessary to pull the heads to in-

**TYPICAL INSTALLATION**, utilizing three types of oil seals, A, B, and C on valve stem. Note also various types of seals in Fig. 1. Seals are supplied in kits

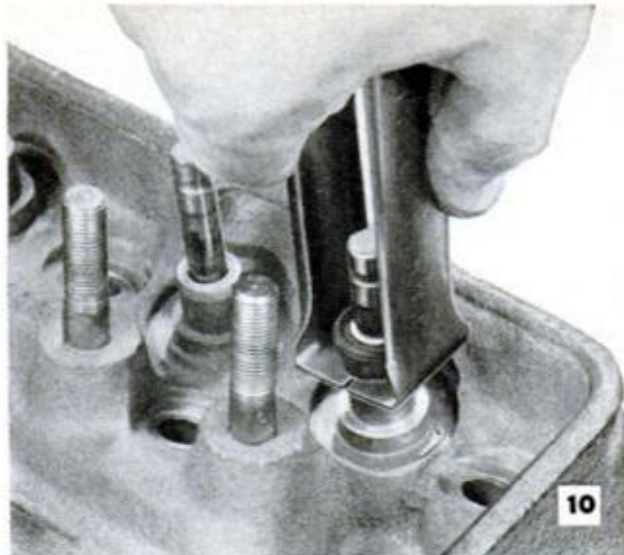
**PLASTIC CAP** is pressed over end of valve stem after removing retainer, lock and spring, and after O-ring has been installed as in Fig. 4. Cap comes in the kit



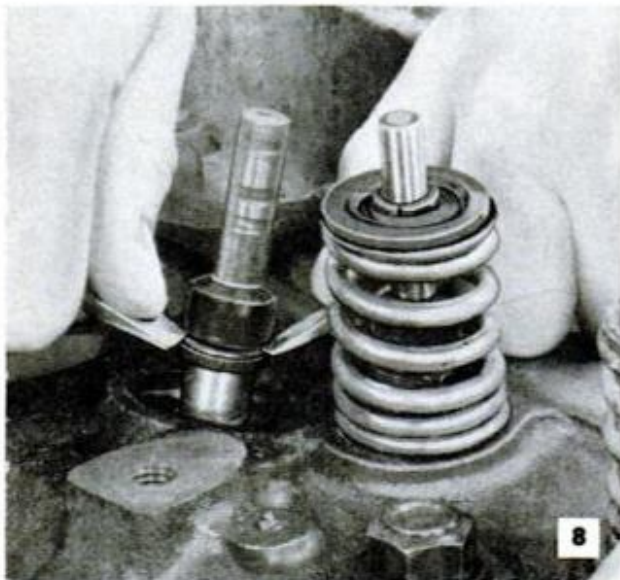




**UMBRELLA-TYPE SEAL** goes down over cap and onto valve stem. Be careful not to dislodge O-ring under cap

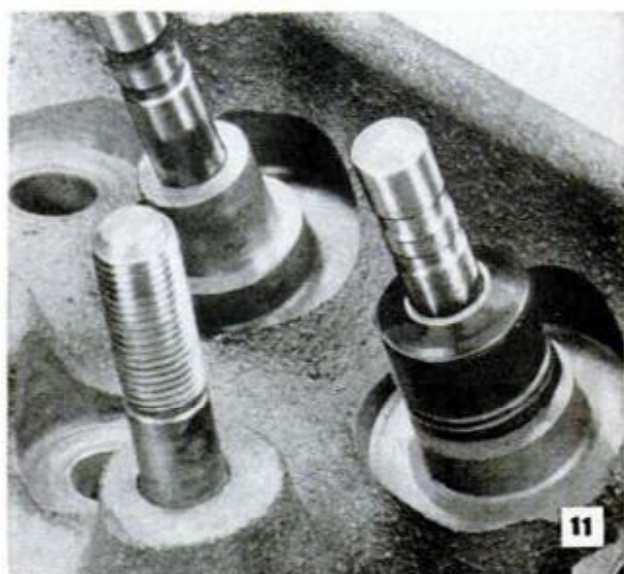


**SPECIAL TOOL** is available for seating the umbrella ring, or seal, which includes retainer, C, in Fig. 5



**IF SEATING TOOL IS** not available you can use bits of two medium sized screwdrivers. Avoid damaging seal

**PLASTIC CAP** is removed after seal has been pushed down over it and seated. Note retainer on the seal



**COMPLETED SEAL** before lock, spring, and spring retainer have been replaced. Note machined guide

stall seals. Just remove the valve cores and use air pressure to prevent the valves from dropping into the cylinders. Depress the valve spring, remove the locks and fit the O-ring as in Fig. 4. Slip the plastic cap (it comes with the kit) over the valve stem as in Fig. 6. Place a drop of light oil on the cap, then push the valve seal over the cap as in Fig. 7. Push it all the way down as in Fig. 9, then use the special tool to seat it as in Fig. 10. Lacking this tool, use two screwdriver bits as in Fig. 8, but be especially careful not to damage the seal or dislodge the O-ring on the valve stem. Fig. 11 shows the completed job before installation of the springs, retainers and locks. On some cars it will be necessary to machine the valve guides with the special tool, Fig. 3. This cutting tool is driven by a 1/2-in. portable drill. Be sure that all metal chips are removed before parts are replaced.

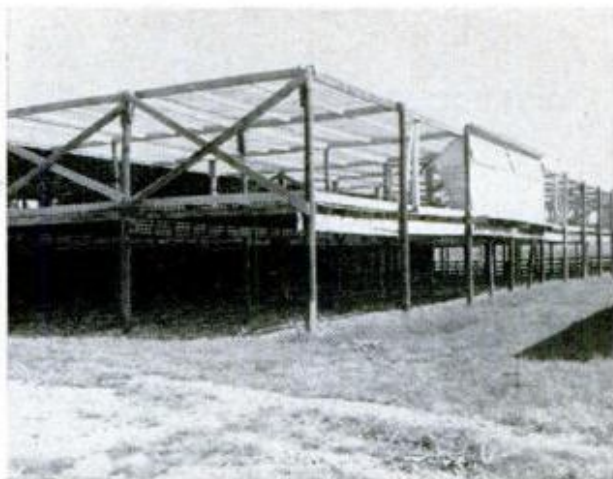
★ ★ ★



## FARM TIMESAVERS

### Sun Porches for Turkeys

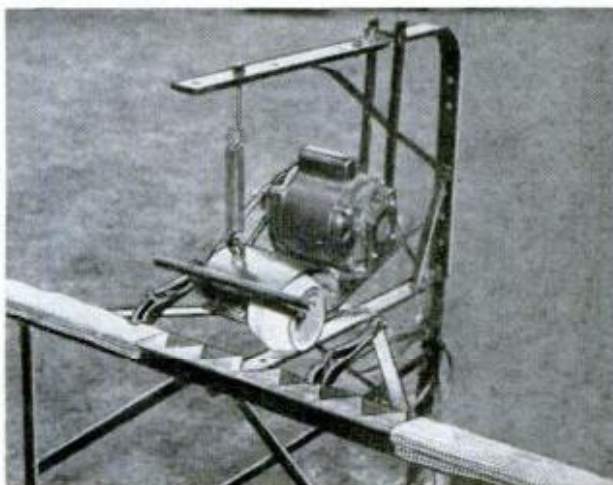
These elevated, wire-enclosed sun porches for young turkeys provide sufficient clearance under the wire floors to drive in a tractor-mounted scoop for the purpose of cleaning the area periodically, thus promoting sanitation and preventing the spread of disease. Large self-feeders are placed along the outside walls of the porches to provide a continuous supply of dry mashes and supplements. Feeders are filled by auger from self unloaders.



### Floating Sickle Grinder

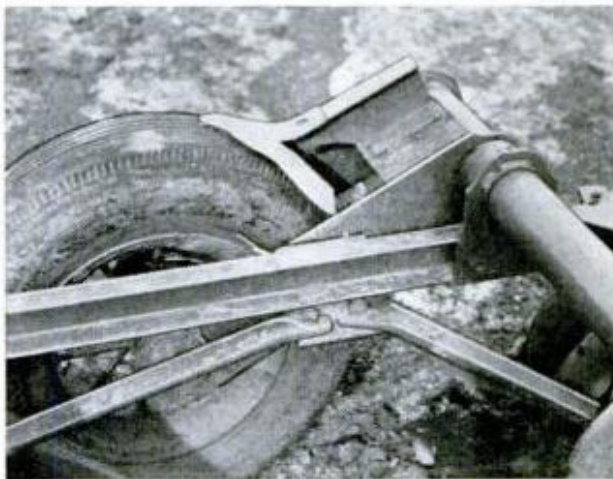
This sickle grinder works much like a cutoff saw, the motor and grinding head being pivoted as a unit on an overarm. The sickle wheel is spring supported, permitting the operator to apply controlled pressure. Locking pliers are used to clamp the sickle bar in position on the long, channel-steel support. The welded steel stand, of which the overarm forms the back leg, stands firmly on its three legs anywhere, on the ground or on an uneven floor. Welded-in braces give the stand the necessary rigidity. Hardware cloth forms a guard over the sharpened portion of the sickle.

—A. M. Wettach



### Transport Wheel Scraper

To prevent trash and heavy soils from sticking to the tires of transport wheels on tractor-drawn implements, one farmer mounts a wide cultivator sweep just above the tire tread. The sweep is bolted to a bracket which is welded to the implement frame. Then the point and wings of the sweep are bent down so that they just clear the tire tread. The sweep keeps the tire clear under the most difficult field conditions. Wheel cleaner is especially useful on plows and disk harrows.—Stan Mathews

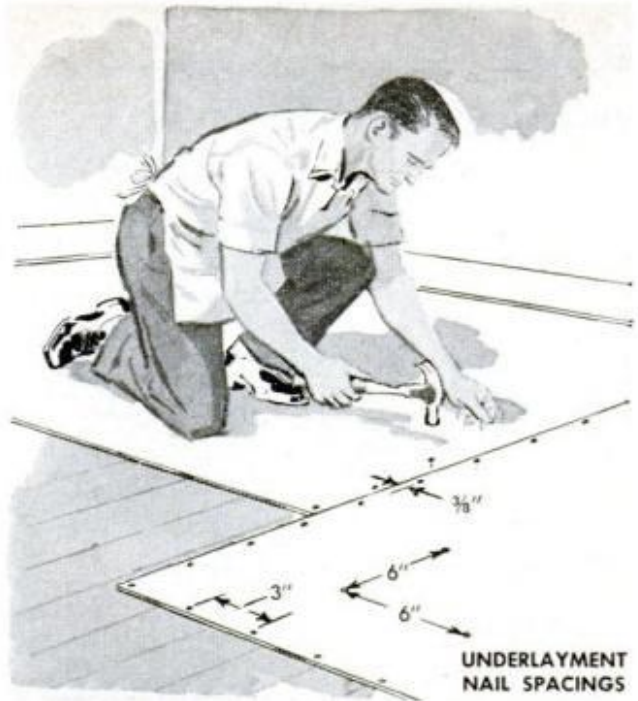
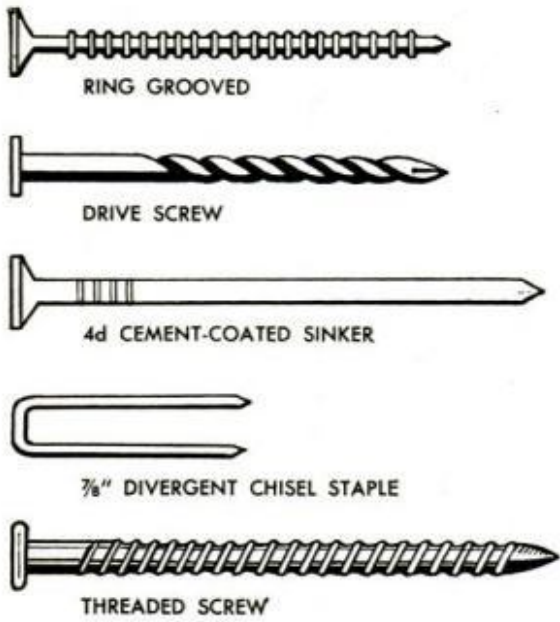


### Folding Forage Racks

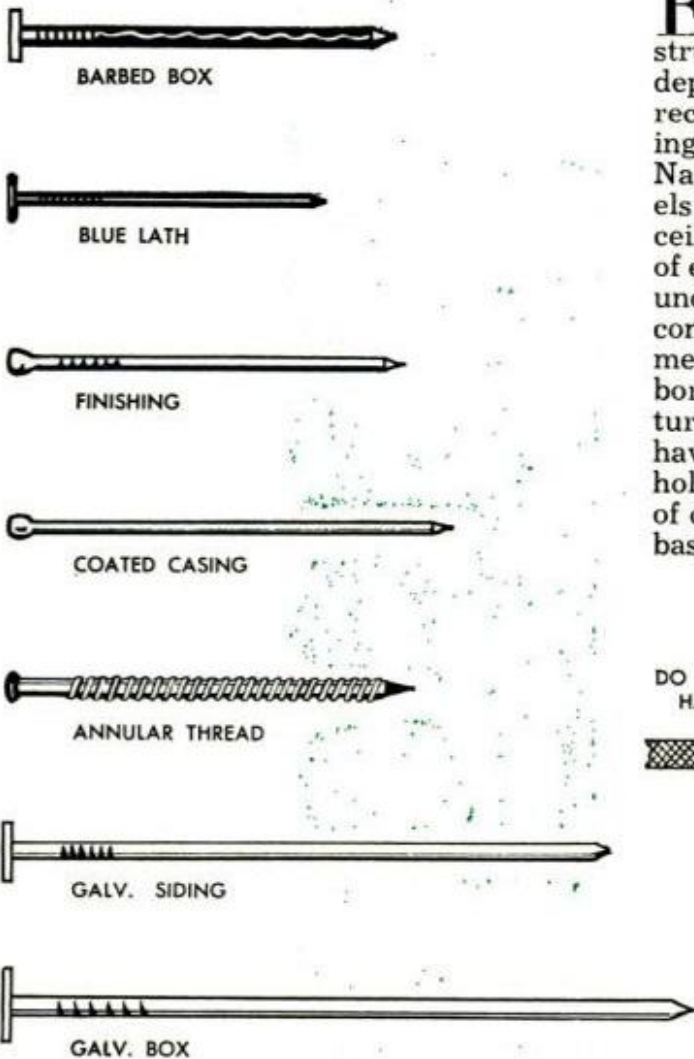
Forage racks that fold flat against the board fence save space and prevent waste in small feedlots. The fence forms the back of these folding racks, each section of which is made by nailing spaced 1 x 4s to horizontal 1 x 8 cleats, each 8 to 10 ft. long. The sections are hinged to the fence and are supported in the open position by spreader chains, the free ends of which are attached to hooks of the type used to support a clothesline. Hooks are attached to the fence with screws or clinch nails.





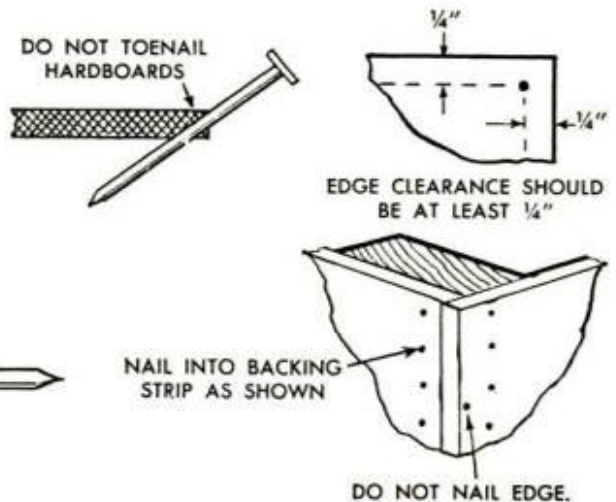


# THERE'S A RIGHT WAY



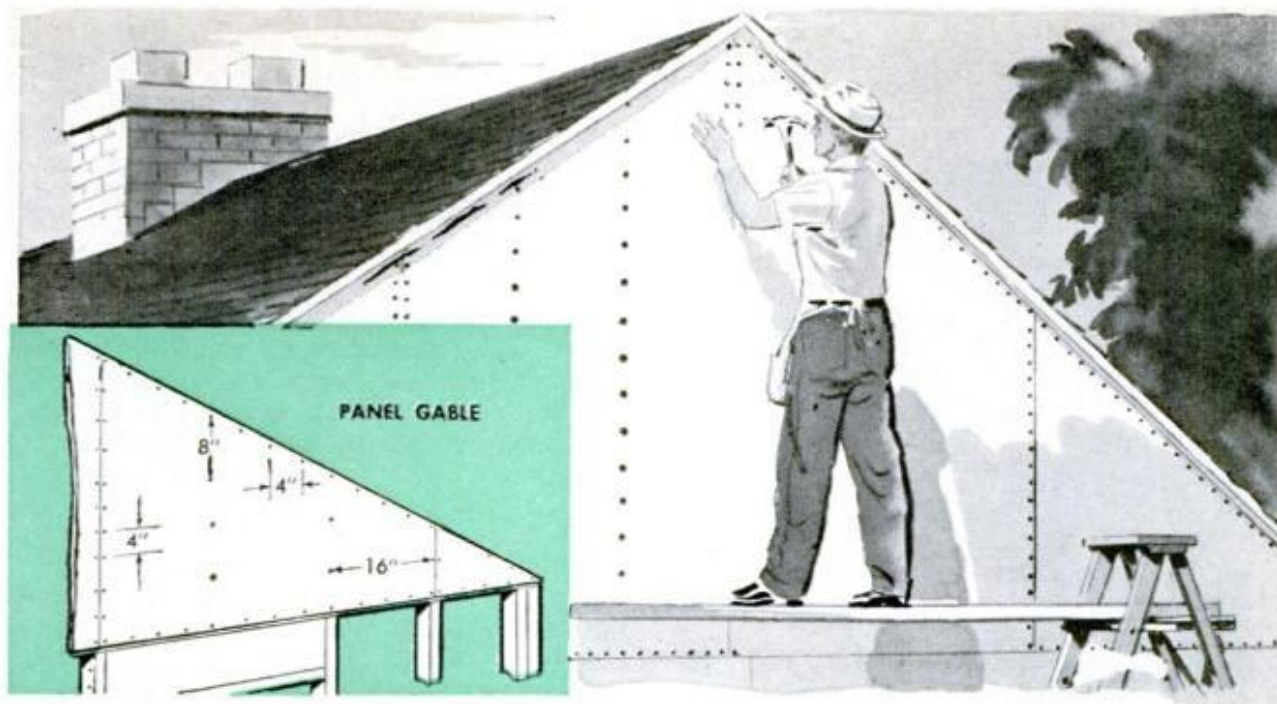
NAILS

**E**ASIEST, fastest and most economical way to fasten hardboard in home construction projects is with nails. Best results depend on their proper spacing, using nails recommended for the project and following the advice of hardboard manufacturers. Nails may be used to apply hardboard panels to exterior walls, interior walls and ceilings, to attach gable ends, the underside of eaves, wainscots and soffits, also to fasten underlayment and components of built-in construction. Nails and spacing recommended for various jobs results in lower labor and material costs with greatest structural stability. Those specified for the job have been selected for their exceptional holding power to resist the outward thrust of contraction and expansion of the nailing base.



POPULAR MECHANICS





# TO NAIL HARDBOARD

Before you apply hardboard check these recommendations: Joints and edges of hardboard panels should have sound, continuous backing and be of a good grade of wood, whether studs, sheathing or furring strips.

Nails must be driven at right angles to the surface, never toenailed, for maximum holding power and should penetrate into the backing at least 1 in. or the full thickness of the wood.

Don't try to nail into the edge of a hardboard panel when two meet on an outside corner because the thickness won't hold the nail. Instead use wood framing, or a nailing strip, in this corner and nail into this.

Always nail center of panel first and make sure it is straight, plumb and properly placed before nailing outward to the

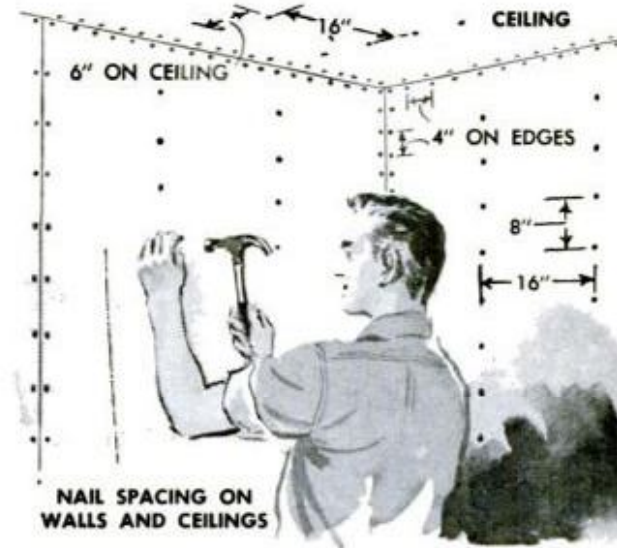
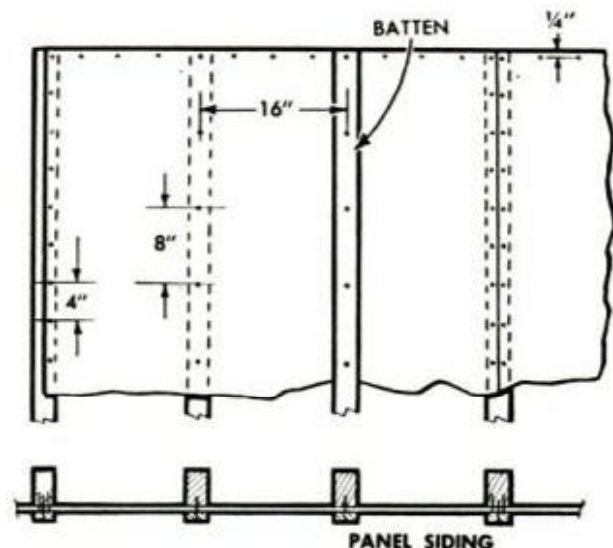
edges. Pull nails that bend when driving.

Nails can be driven within  $\frac{1}{4}$  in. of the edge of the panel because hardboard will not splinter, crack or split.

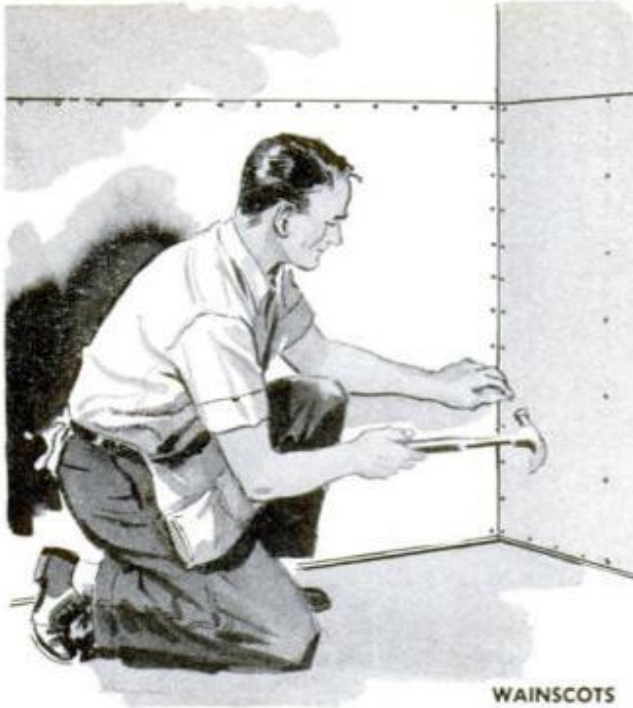
Panels  $\frac{3}{16}$  in. to  $\frac{5}{16}$  in. thick should be nailed on 16-in. centers but the thinner  $\frac{1}{8}$ -in. material needs to be supported on 12 in. on centers unless applied over a solid backing. Nail length depends on thickness of the hardboard panel and also the thickness of nailing backing.

Nail heads exposed to the weather should be puttied or coated with an anticorrosive metal primer to avoid rust-staining of paint. The same will apply to any other metal used in the assembly that is likely to rust.

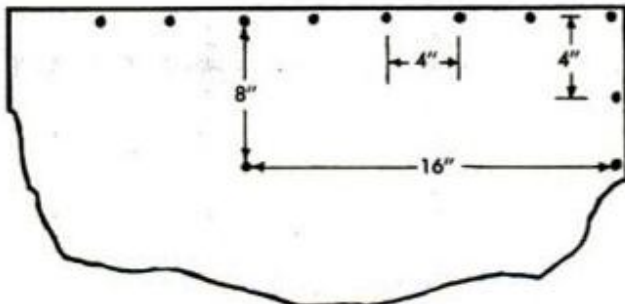
Following are the nails and their spacings recommended for various projects: Interior wall and wainscot panels are nailed



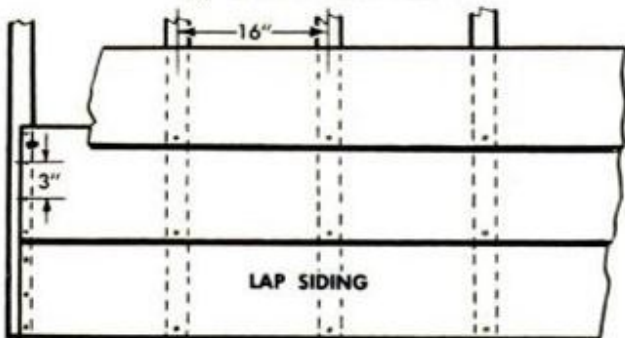




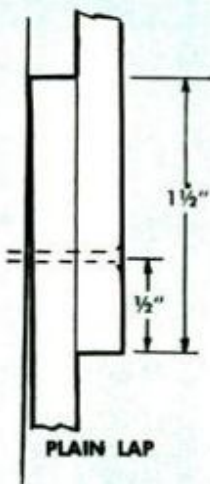
WAINSCOTS



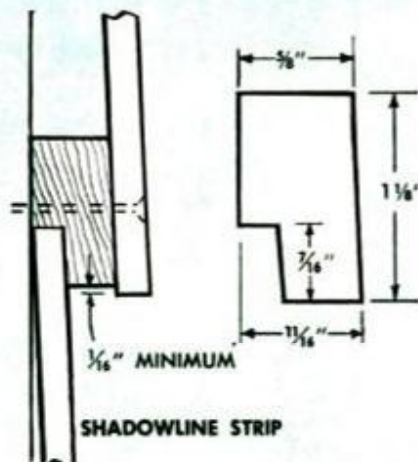
$\frac{3}{16}$ " OR  $\frac{1}{4}$ " HARDBOARD



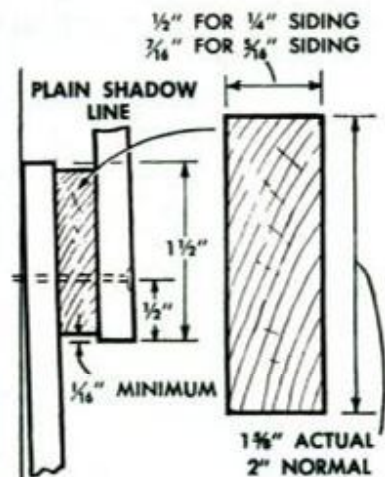
LAP SIDING



PLAIN LAP



SHADOWLINE STRIP



$\frac{1}{2}$ " FOR  $\frac{1}{4}$ " SIDING  
 $\frac{3}{8}$ " FOR  $\frac{3}{8}$ " SIDING

PLAIN SHADOW LINE

$\frac{1}{16}$ " MINIMUM

$1\frac{1}{8}$ " ACTUAL  
2" NORMAL

on at 4-in. spacings around the edges and 8-in. spacings on intermediate supports. Nails recommended include casing, finishing, box, 18-ga. brads or ring-grooved nails.

Ceiling and soffit panels are nailed on 4-in. spacings around the edges and 6-in. spacings on intermediate supports. Use the same nails as recommended for wall paneling.

Underlayment hardboard panels are nailed on 3-in. spacings around the edges,  $\frac{3}{8}$  in. in from each edge and on 6-in. spacings in both directions across the surface. A gap of about  $\frac{1}{32}$  in. should be left between the edges of the panels. Nails for underlayment should be  $1\frac{1}{4}$ -in. drive screw or barbed box type.

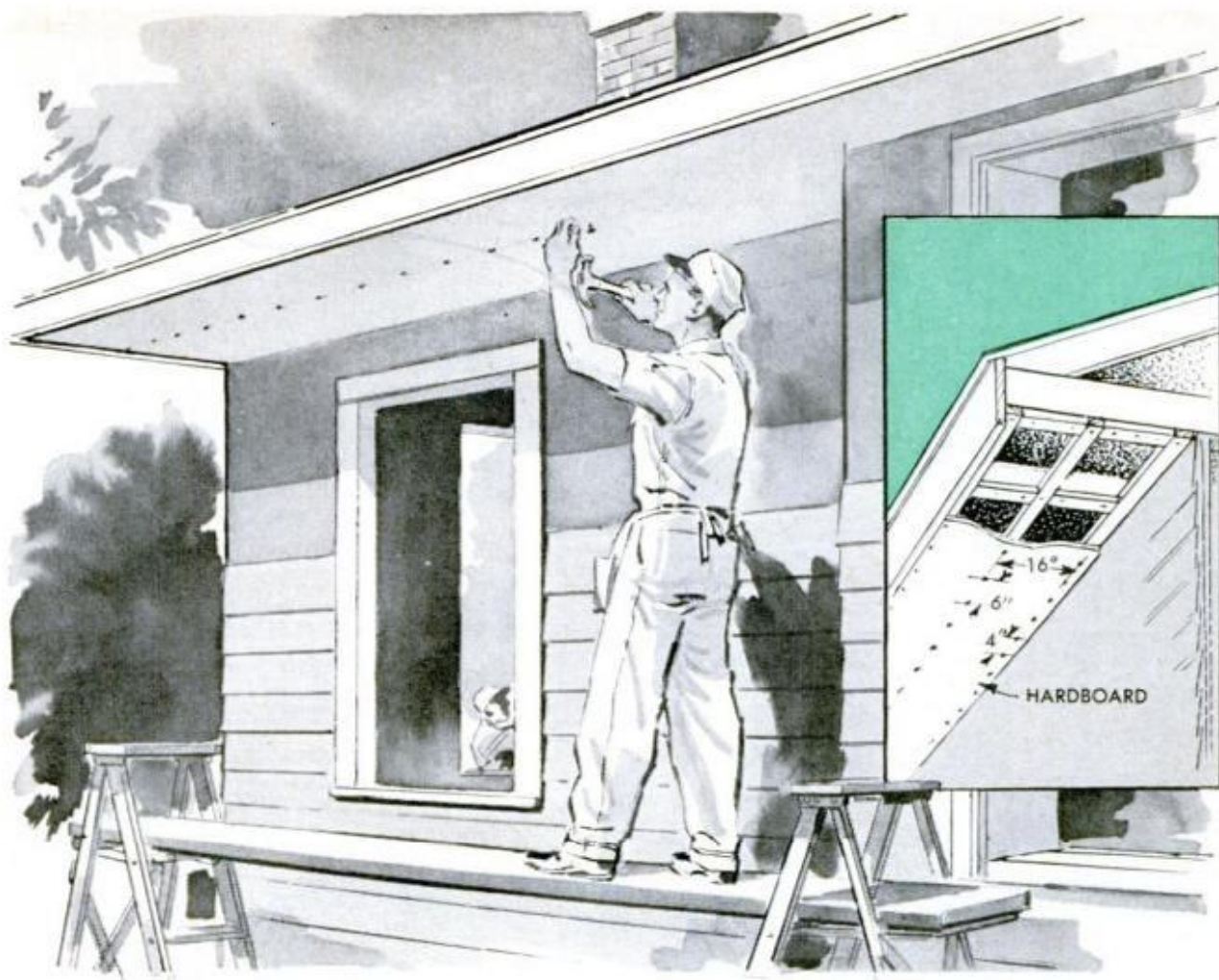
Tempered hardboard used for finished floors is nailed on 4-in. spacings around the edges and 12-in. spacings on intermediate supports, using  $1\frac{1}{4}$ -in. coated casing nails.

Hardboard panel siding is nailed every 4 in. along the edges and every 8 in. on intermediate supports. The same applies to gable ends. Outside soffits are nailed on 4 and 6-in. spacings. A continuous nailing base should be provided for all edges and, if the soffit is wider than 16 in., it should be backed by one or more lengthwise stringers on 16-in. spacings. One stringer is sufficient for soffits up to 32 in. in width. Galvanized siding or box nails  $2\frac{1}{4}$  in. long are recommended for this type of exterior hardboard application.

Hardboard lap siding is attached with one nail driven 16 in. on centers along the bottom of the panel. Siding is attached with  $2\frac{1}{2}$ -in. galvanized siding or box nails except that 3-in. nails should be used through shadow-line strips.

When using hardboard for concrete forms it is nailed on 4-in. spacings at the edges and on 8-in. to 12-in. spacings on intermediate supports, depending on the width or depth of the form. Coated casing nails  $1\frac{1}{4}$  in. long are specified for this work.

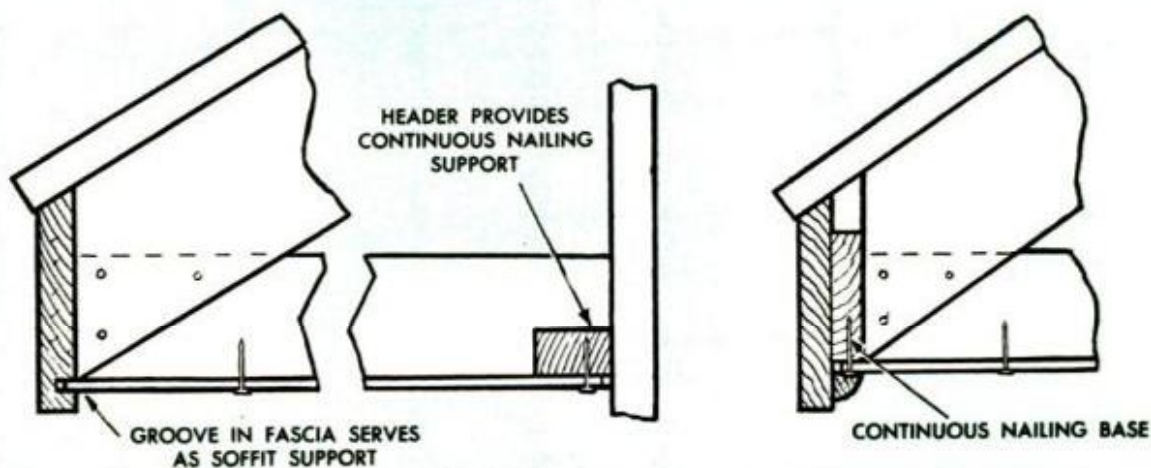




Flat-headed nails of recommended shank design are best for exterior applications because of their additional holding power. On interior installations nails may be set below the panel surface and the recesses filled with putty or plastic wood after the prime coat is applied.

Use much the same care when handling hardboard as you do when installing plywood. Hardboard does not splinter, neither does it chip like wood, but if you drop a panel edgewise on a 2 x 4 lying on the floor or drag the panel edgewise over a

threshold it is sure to be damaged. Scores, digs or scratches will show under several coats of paint and such damage is especially difficult to repair. Keep lines of nails the specified distances from the edges, or even a little more if the nailing base will permit. Drive the nails straight so that you don't risk breaking the flat head off when seating it flush with the surface. If hardboard panels must be stacked for a time, place the stack on a flat surface, never on sawhorses or on 2 x 4s or other narrow supports. Keep the panels dry. ★ ★ ★

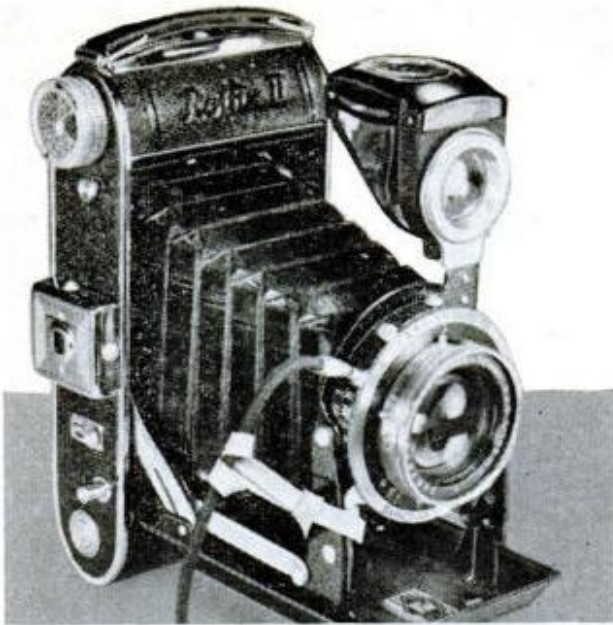




## FOR CAMERA BUGS

### Cable-Release Tether

Don't let your cable release get away from you. On most cameras they will work loose and if unnoticed, will drop off and get lost. Your best bet is to double-fasten it to the camera with a rubber band. Simply loop one end around one of the lens brackets and pass the free end of the band through the loop. After this, double the second loop over itself, forming two loops, and insert the cable through them. Now screw the release into the shutter and relax because should it work loose you will always find it dangling securely from the camera.



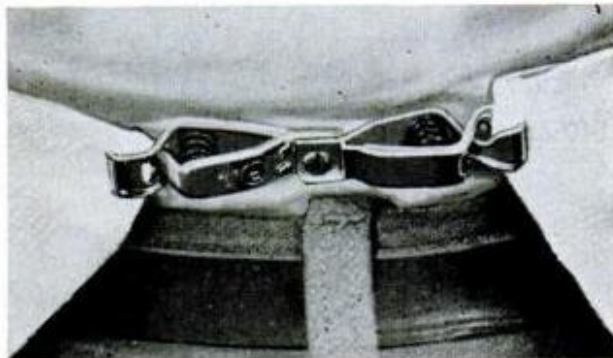
### Click Stops On Lens

Setting the aperture on some enlarger lenses is less difficult in a darkened room if you add click stops to the iris diaphragm. This is easily done by forming a metal band to clamp to the lens ring, letting the ends extend to provide a handle, and filing notches in the edge to align exactly with the aperture calibrations. The click pawl is formed from a piece of clock spring.



### Clips Tie Towel Apron

Alligator clips used for making temporary electrical connections will let you make an apron from a darkroom towel. Remove the terminal screw from one and use the other screw to join the two clips end to end. Now the double-end clip can be used to clip the ends of a towel behind your back, forming an apron for wiping the hands or a roller squeegee. Apron is quickly removed—with a pinch.



### Repeat Performance

If you use a spring-wound timer in your darkroom, you can avoid having to turn the light on to set it by simply fitting the knob with a reset arm. This will be helpful when developing film in trays and you find you have forgotten to set the timer before removing the film from the holders. To make the reset arm bend a piece of coathanger wire L-shape and insert it in a pressfit hole drilled in the end of the timer setting knob, positioning the arm so that it aligns with the minute hand. Thus the arm will serve as a stop which automatically sets the minute hand for the desired interval when the timer is manually set and the arm contacts the shelf or table on which it sits. The arm must be positioned in the knob to suit the particular processing interval.





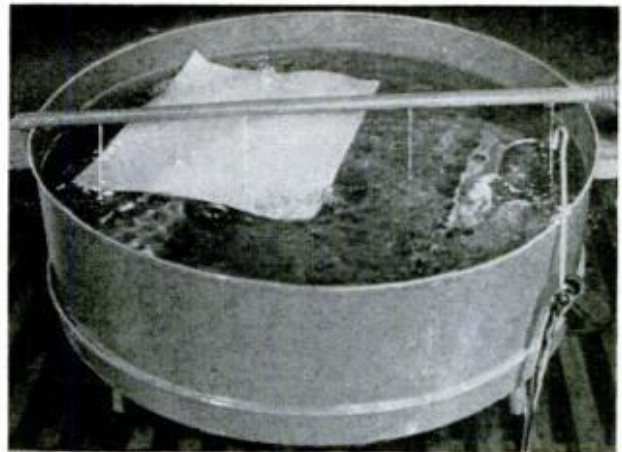
# Budget Print Washer

YOU'VE PLANNED to replace that beat-up, rusted-out garbage can for some time. Okay, do it now, but save the lid. It provides the concave bottom for this efficient photo-print washer, a circulating type that keeps a dozen or more 8 x 10 prints swimming just below the surface of the water, washing out all traces of hypo in the minimum of time.

Here's how you make use of the lid: First, you remove the metal handle and drill a  $\frac{3}{4}$ -in. hole at the center. Solder a  $\frac{3}{4}$ -in. copper elbow over the hole, then solder a female hose fitting to the open end of the elbow to take a short length of hose, one end of which is supported by a hook as detailed below.

Next, you cut and fit a galv.-metal strip inside the inverted can lid. Solder to the lid all the way around to make a waterproof joint. Solder a female hose coupling to one end of a length of copper tubing and crimp and solder the opposite end. Drill four  $\frac{1}{32}$ -in. holes into the wall of the tube as in the upper right-hand detail. Solder the tube across the center of the tray as indicated. Finally solder four 3-in. lengths of tubing to the bottom of the washer to serve as legs.

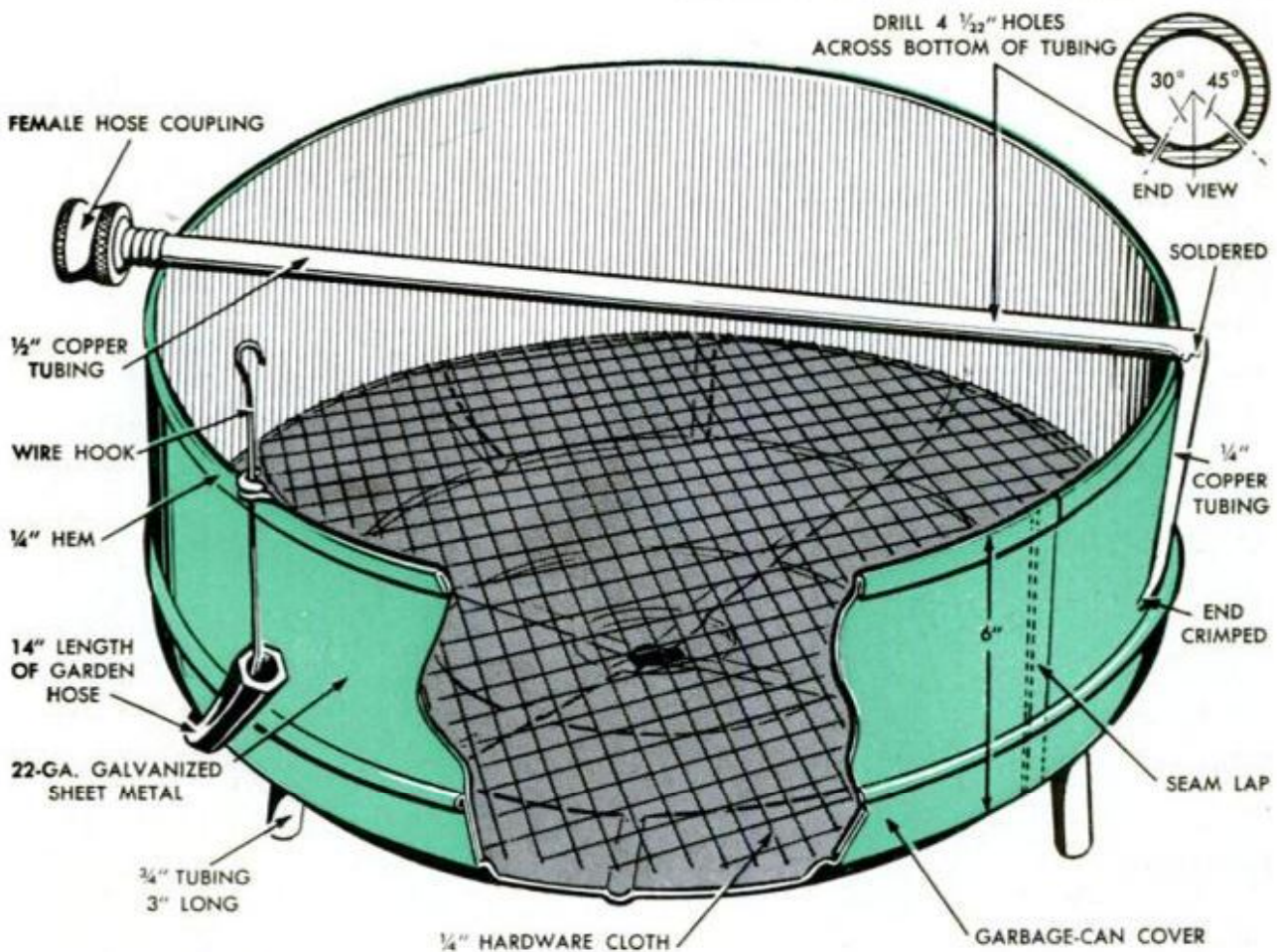
—Rolf F. Schell



PRINTS ARE submerged by overhead streams of water



COPPER-TUBE LEGS are soldered to bottom of washer







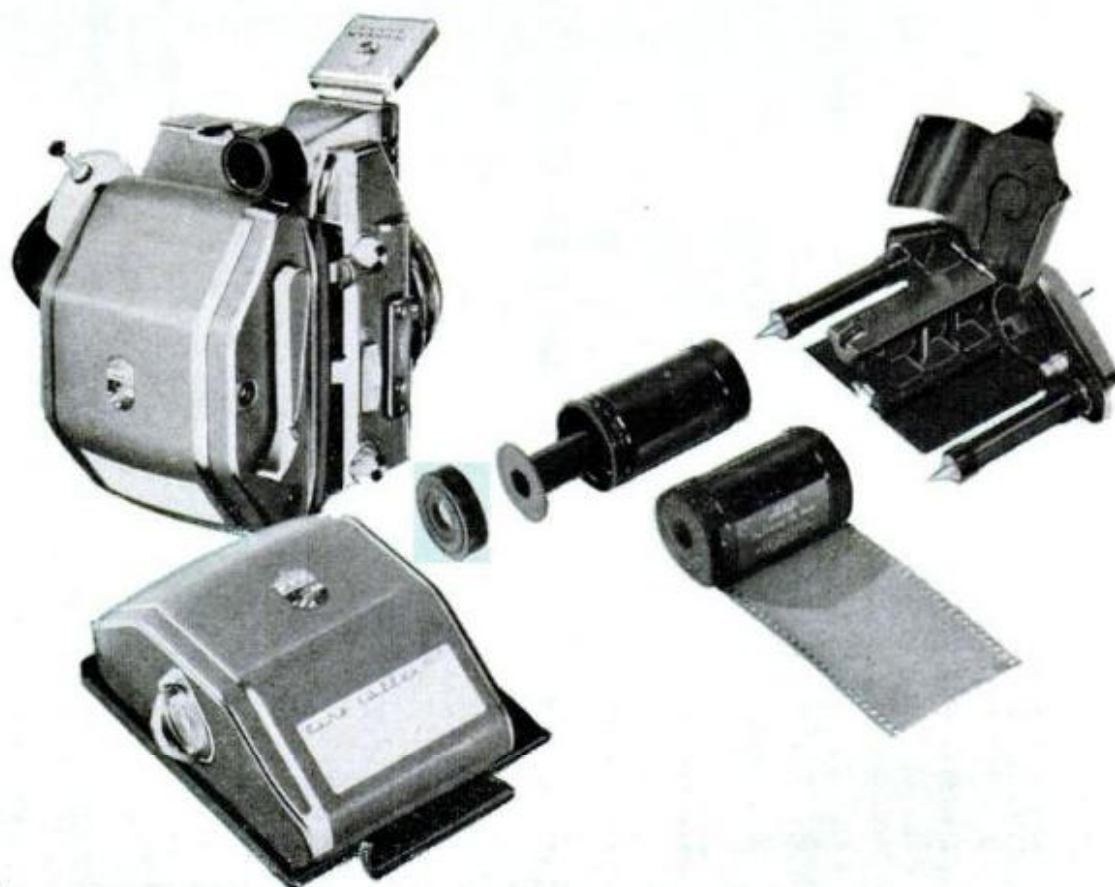
## FOR SHUTTERBUGS

**ELECTRIC-EYE 35-mm. CAMERA** with push-button operation automatically adjusts to changing light conditions. Shutter locks automatically and signals to prevent under or overexposure. Has f:1.9 five-element lens with speeds from 1 to 1/500 sec. Priced at \$119.50. Scopus, Inc., 404 Park Ave., S., New York 16, N. Y.



**AUTOMATIC LIGHT METER** registers light value and matching combinations of exposure time at the touch of a button. Speeds range from 1/1000 to 8 sec.; apertures from f:1.4 to f:32; ASA values from 10 to 2000. Also has f-stop scale for the 16-f.p.s. speed of movie cameras. Made by Agfa Inc., New York, N. Y.

**ADAPTER HOLDS 70 mm. FILM** for more than 50 rapid-sequence exposures with one loading. Fits 4x5 cameras with Graflok backs and all Linhof cameras. Film cartridges can be inserted or removed in daylight. Available in two models, each priced at \$194.50. Kling Photo Corp., 257 Park Ave., S., New York 10, N. Y.





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We'll take your old circular electric saw, any make, in trade. Just buy Black & Decker's #830 8" Heavy-Duty Saw at regular price, for years of satisfaction with extra-hard use. And, get B&D's \$24.95 U-3 1/4" Deluxe Drill FREE. That means your old electric circular saw, in any condition, is worth the full \$24.95 that a U-3 Drill would cost. It's an honest, even swap—no if's, and's or maybe's.



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You'll get maximum power, easiest handling, truest cutting with Black & Decker's 8" Heavy-Duty Saw. Cuts to 3 13/16" at 90°, 2 9/32" at 45°. This #830 handles the roughest jobs. Quick action locking levers give fast, positive depth adjustment. Heavy-duty fan keeps saw cool through long hours of the toughest cutting.

When you buy your new B&D Heavy-Duty Saw, you'll get a coupon in the box. Simply take or send your old saw together with the coupon to your nearest B&D Service Branch for your free U-3 1/4" Deluxe Drill!

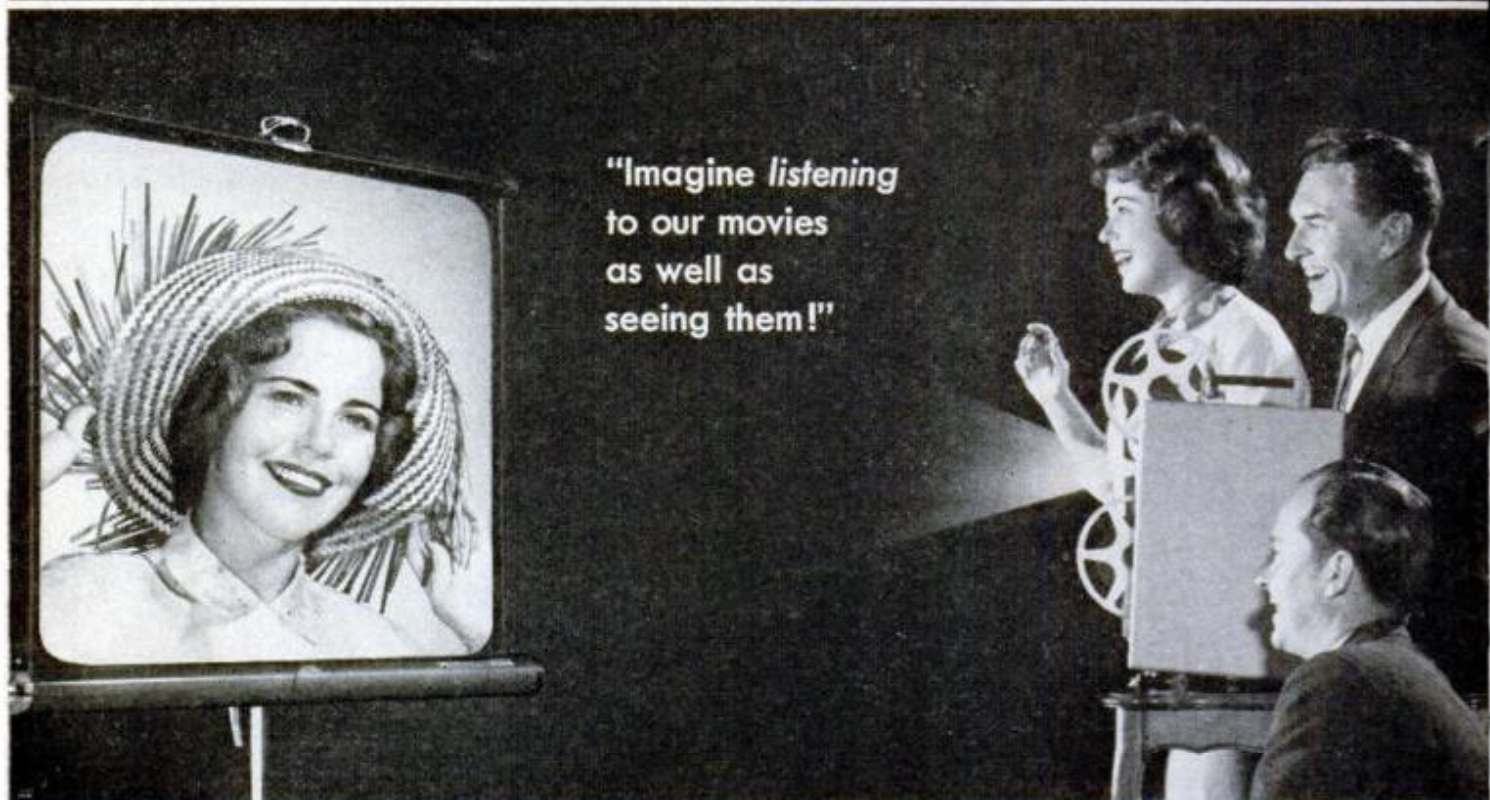


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# New Ideas in Photography



"Imagine listening to our movies as well as seeing them!"

YOU WON'T BELIEVE IT till you hear it—the rich, clear-as-a-bell sound of the Kodak Sound 8 Projector!

## Make your 8mm movies come alive with sound!

Now you can add rich, stirring sound to your 8mm movies—new or old. And you can use your present camera.

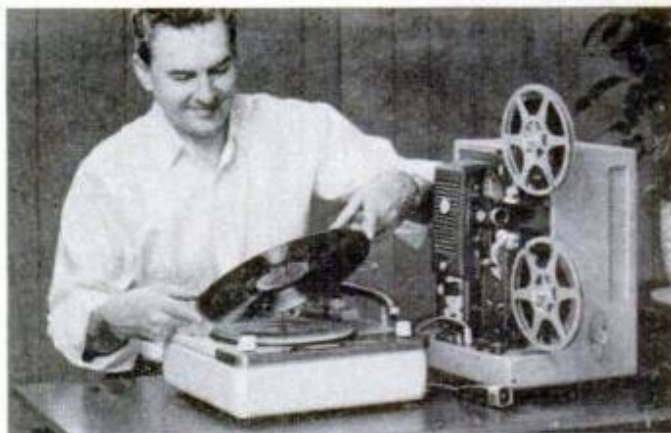
All this is made possible by Kodak's discovery of a way to put quality magnetic sound on narrow 8mm film—and by the Kodak Sound 8 Projector, which both records and plays back the sound.

You simply take your processed film to your dealer. Ask him to have a magnetic stripe, such as Kodak Sonotrack Coating, applied to the film edge.

As you project the "striped" film through your Sound 8 Projector, talk into the mike to record voice commentary. For music and sound effects, hook in your record player or tape recorder.

You can play back your new sound movie instantly. To improve any sections of sound, just reverse the film and re-record; erasure of previous sound is automatic.

Kodak Sound 8 Projector, with microphone and built-in speaker, is less than \$350. See your dealer for exact retail price. Many dealers offer terms as low as 10% down.



**RECORD RIGHT ON THE FILM**—voices or "live" sound effects through mike, music from your record player or tape recorder. Play back through projector's built-in speaker, through your present hi-fi equipment—or through both!

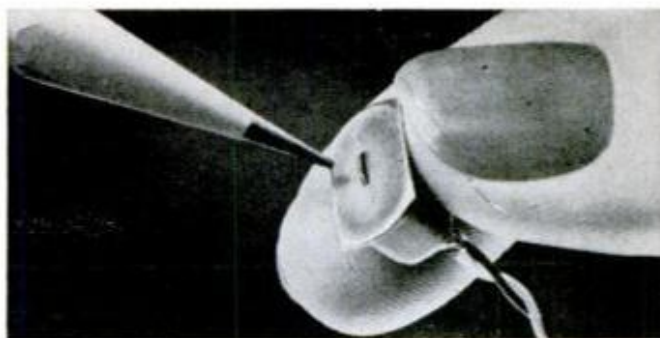


# from Kodak



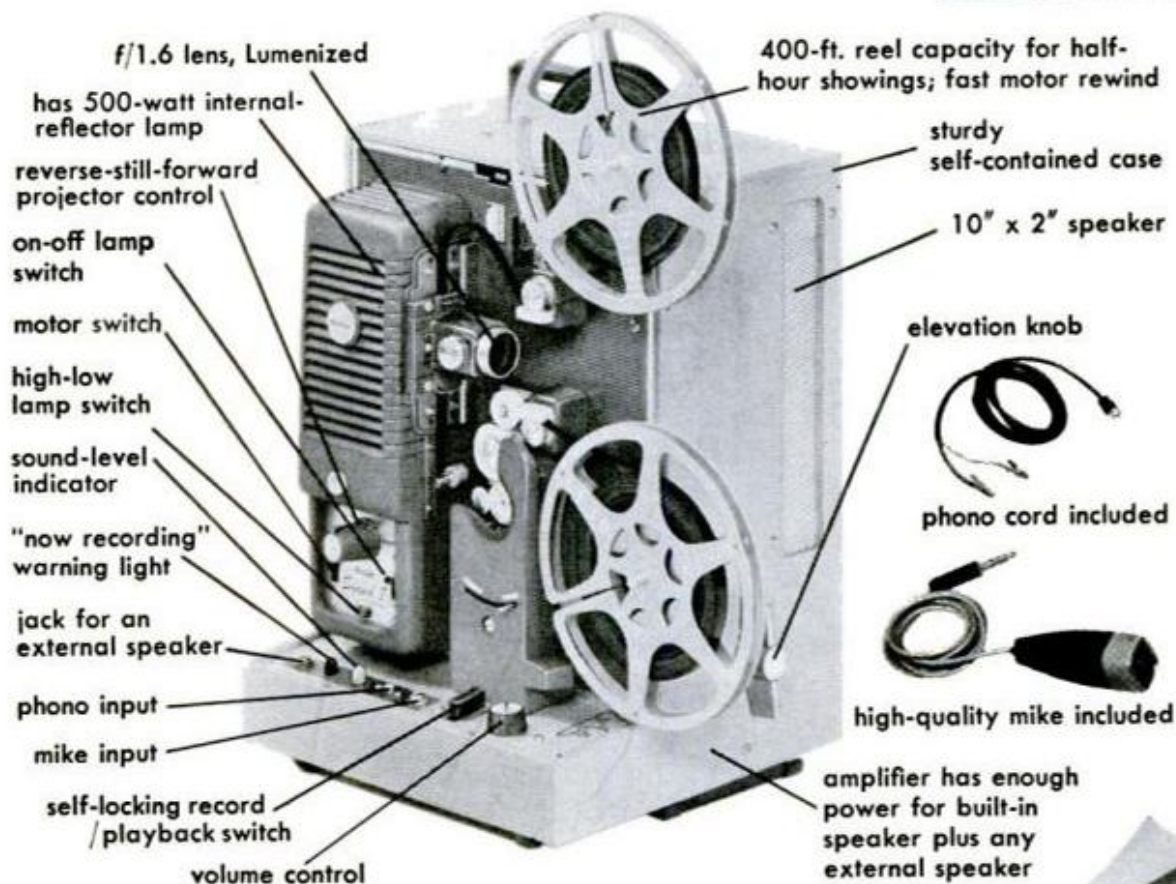
**LONG-PLAY (33 $\frac{1}{3}$ ) RECORD OF BACKGROUND MUSIC** and special sound effects comes with your Kodak Sound 8 Projector. These high-fidelity musical selections are adaptable to just about every situation you're likely to capture on film. Thirteen common sound effects are also included.

(Below) **TWO FINE INSTRUMENTS IN ONE:** the Kodak Sound 8 is a top-quality 8mm projector that gives you sharp, clear movies up to 5 feet wide. It also is a fine sound system with frequency response 70 to 7,500 cycles. Projector will never need oiling.



**SOUND PICKUP HEAD** is only 2/100" wide. It would wear away fast if made of the usual magnetic alloy. Kodak head is made of new, incredibly hard Alfenol alloy, is virtually wearproof. Will record for countless hours without loss in sound quality.

**PROFESSIONAL** 8mm sound films are now available for sale or rent... and many more are coming. The Kodak Sound 8 Projector runs at 24 frames per second for professional films, and at 16 fps for most personal films.



*Price is subject to change without notice.*

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TRADEMARK



# CLINIC FOR HOMEMAKERS

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—editors of Popular Mechanics invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.

## Painting Brick House

**Q**—My home has walls of common brick and the walls are not at all attractive. Not only that, when it rains hard these bricks seem to absorb a lot of water. I've thought I should have the exterior walls painted but I don't know what kind of paint to use or how to prepare the walls. The house is full two-story with chimneys at both ends. There's a center entrance and shutters on all windows in front. Can you tell me how to prepare the surface, what paint to use and how best to apply it?—D.L., Pa.

**A**—We hesitate to recommend painting brick, even common brick. Once the brickwork is painted, that's it. You live with it for the time you are in the house, whether you continue to like it or not. And, there's the repainting job which must be done periodically at a considerable cost if you contract the job; at a lesser cost if you do the work yourself. If, as you say, the brickwork is in good condition, we are inclined to suggest that you leave well enough alone. Or at least suggest strongly that you consider all the factors involved before you decide whether or not to paint. If you still feel that painting is desirable, then select a masonry paint in the color desired and apply according to the manufacturer's instructions. If, as you have said, the brickwork is in good condition and no pointing of the mortar joints is necessary, then the application of



the paint is usually a simple procedure. If you select any color other than white it is well to keep in mind that most all masonry paints come in pastel colors and that some colors will have the effect of changing the appearance of the house and affecting to some extent visual impressions of its size.

## Cold-Air Returns

**Q**—We have hot-air heating and last winter one room in my five-room home did not heat well during the cold weather. There is no cold-air register in this room, the nearest one being about 6 feet from the door in a short hallway. Although the door to this room is always open, it still does not get its fair share of heat, even when there's a good, hot fire in the furnace. Can you tell me what is wrong and how to fix it?—W.K., Ky.



**A**—Unfortunately, you give us very little information. We'll have to assume, for example, that you have a hand-fired, gravity-type, warm-air heating system, that perhaps the room is exposed, say, on the northwest corner of the house, that it is farthest from the kitchen and that it has one warm-air register somewhere on the walls or in the floor. Making deductions from what you say that's about as far as we can go. Assuming that some of these guesses are right, a common cause of insufficient heat to a single room is simply a lack of adequate cold-air returns to the furnace. Because of this deficiency cold air is not drawn from this one room. The circulation within the whole house is insufficient to keep cold and warm air moving. As a rule under these conditions installation of additional cold air returns will result in a more uniform distribution of heat. In your home it would seem from the meager description you give us that it would be advisable to install an additional cold-air return in the cold room. Just where in the room we cannot tell you as we have no idea how the five rooms are arranged or where the furnace is in relation to the cold room. ★ ★ ★



# GET SET FOR THE FALL AND WINTER JOBS

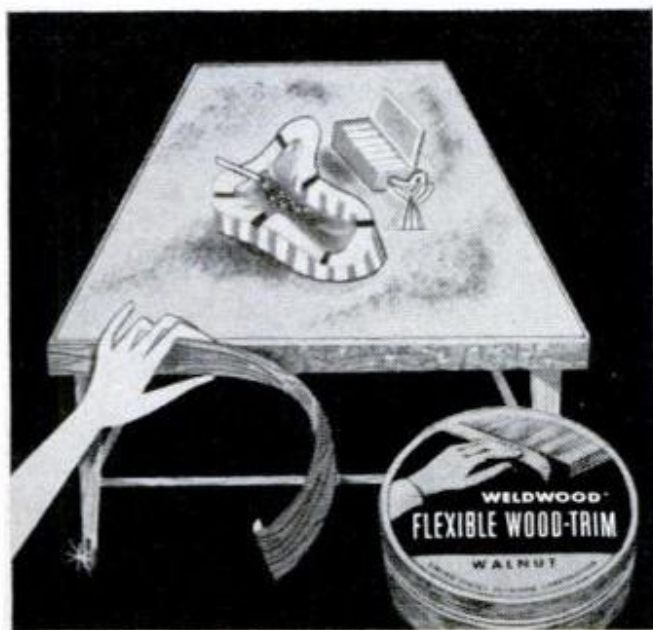
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Fix and Finish Shelf  
in your workshop



**FINISH DOORS** with Weldwood Satinlac®. A complete finish—it seals, primes, finishes! Assures a glowing, soft-sheen luster. Brings out the wood's natural beauty without "plate-glass" shine.



**MEND A DRAWER** with Weldwood Presto-Set® Glue. Quick, clean, dries fast, won't stain. Bonds paper, wood, cloth, china. In handy bellows-action squeeze bottle with spreader top. From 39¢.



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Save time and trouble. Keep the Weldwood® adhesives and finishes you'll need this fall and winter on your workshop shelf—and you're ready for almost any job when it arises. For a starter, you might get these products for this year's inside-the-house projects: Weldwood Satinlac, Presto-Set and Plastic Resin Glues, Wood-Trim, Firzite, and Putty Stiks®. You'll find them at your local lumber yard, or paint and hardware stores.



*Products of United States Plywood*



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Write for booklet "How to Use Hand Tools." It's FREE. Address Dept. PM-10.

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

## Overhauling the Hydraulic System

(Continued from page 217)

closely, inside and out. If it shows any sign of cracking—and it may in time—replace it.

Taking the wheel cylinders one by one, wet the bore with brake fluid, dip the parts in brake fluid and reassemble in the proper order. Reclean the threads on the brake lines and coat with brake fluid—never, never use oil!—and thread onto the cylinders. Then replace the cylinders on the brake plates, making sure you return each cylinder to its original position. You'll have to use the cylinder clamps in this operation. Finally, replace the brake shoes, drums and wheels and you're back where you started with a thoroughly cleaned system.

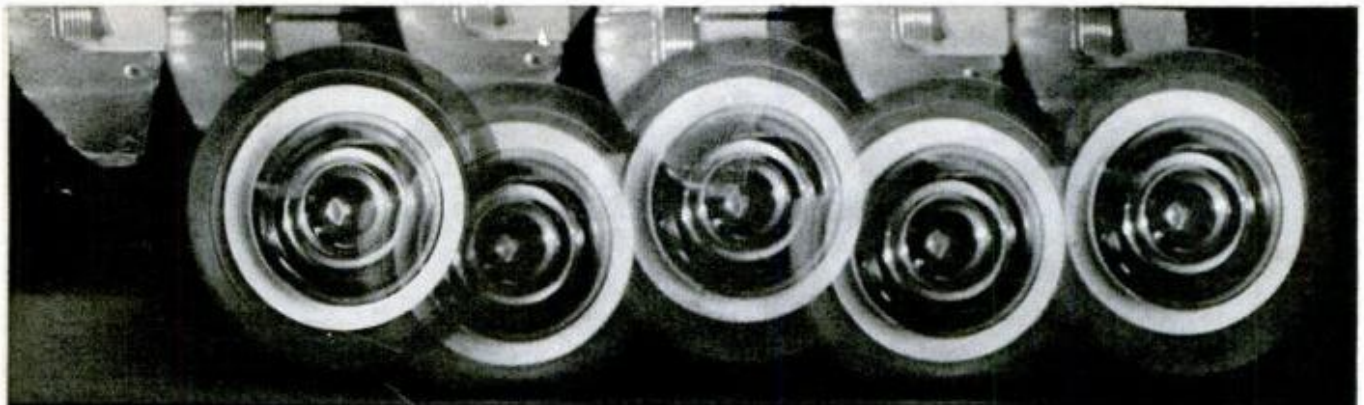
Before starting the bleeding operation adjust the free travel of the brake pedal with the locknut or eccentric-bolt adjustment to give about  $\frac{3}{16}$  to  $\frac{7}{16}$  in. free travel. This makes sure the compensating port (see the diagram on page 215) is clear when the pedal is released.

### Bleeding the Brakes

In bleeding take the brake units in order beginning with the rear wheels, as these usually have the longest lines. When bleeding brakes on Chrysler cars, each of the two cylinders in the front-wheel brakes must be bled. Back the adjusting cams all the way off, attach the bleeder hose to a valve and immerse the other end in the jar which has been partly filled with new brake fluid. Fill the master cylinder very nearly to the top with new brake fluid, then have your helper press the brake pedal in or down as far as it will go. While the pedal is down, release the bleeder valve on the wheel cylinder  $\frac{1}{4}$  to  $\frac{1}{2}$  turn, allowing fluid to flow. Then close the valve and instruct the helper to release the pedal slowly. After every second or third push-and-release sequence of the brake pedal, check the master cylinder, adding fluid to keep the level very nearly at full. Otherwise you may have to repeat the bleeding operation. Continue the same procedure on the three remaining brake units. When you finish with the four units the brake pedal should have the same firm, sure feel as that on a new car. Finally, the master cylinder should be filled with fluid to within about  $\frac{1}{2}$  in. of the top.

If, when you have finished bleeding all four brake units and have readjusted the cams, the pedal still appears to have more than the allowable free travel, recheck the brake adjustment on all wheels. Generally a slight adjustment of one or more of the units will correct pedal travel to a point within the allowable limits. ★ ★ ★





When your wheels are off the road...

you can't  
control  
your car!



You bet your life on your shock absorbers. Bouncing wheels are a sign of worn shock absorbers . . . and potential danger. When shocks wear out, steering becomes erratic and your car will sway badly on curves. **Monro-Matic®** shock absorbers do far more than just cushion your ride. They hold your wheels firmly on the road—even when you hit a sizeable bump or rut—to stabilize your car and prevent loss of control. *Play it safe.* If your present shocks have seen more than 20,000 miles service, replace them with **Monro-Matic** shock absorbers for the ultimate in control, comfort and safety. *60-day free ride plan guarantees you complete satisfaction.*



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## Remote Controls for Outboards

(Continued from page 194)

"steady course" adjustment prevents the boat from wandering off course when the wheel is unattended. Installation is easy and compact, requiring little behind-dash space. The cable end which attaches to the motor is fitted with a simple swivel-mounted tiller sleeve that is bolted to the transom as shown in Fig. 17 (single motor installation). Twin motors are linked together into the steering system by means of a tie rod or tie bar as in Fig. 5.

### Installation Tips

Remote controls which are installed correctly will give long, trouble-free service, provided the equipment is adequate for the rig and is not abused. As in the manufacture of any other product, the price you pay usually is predicated upon quality of construction and the useful features it has. Examine a control unit carefully before buying it, checking on its action, care taken in machining and assembling the parts, material from which the latter are made (throttle and shift levers should be made of steel alloy, not a cast metal that breaks easily). Some units are designed and constructed for heavy-duty service, others for lighter rigs or for only intermittent use. Note the manufacturer's recommendations and check with your dealer to make sure the control will perform reliably on your type and size of boat. Push-pull cable, whether used for steering or motor controls, should be fitted with grease-gun fittings so that it can be lubricated regularly with ease. Pulleys used for a cable-and-pulley system should not be less than 2 in. in diameter, especially if they are installed on a rig having power in excess of 50 hp. Test strength of the cable or tiller rope used should be equal to the size of motor it must steer.

### Steering Wheels

Most boats come equipped with a steering wheel or steerer. If you wish to install a different type, first make sure there is ample clearance back of the dash for the steering drum, or other mechanical movable parts in the case of push-pull cable steerers. The same dash shaft hole usually can be used for assembling the steerer on the dash. Wheel mounting brackets come in various angles, giving the skipper a choice of a vertically positioned wheel, or one set at a wide selection of angles depending upon the angle of dash board and angle of mounting bracket.

While installation instructions included with remote control units usually are quite

complete and detailed, here are some important points which should not be overlooked. First of all, the cable used (throttle and shift) must be the correct length and run as straight as possible, with the exception of the two points at which cable flexibility is desired. A slight curve near the control box is necessary in mounting some units to allow for cable flexing when operating the neutral throttle control. At the afterend, cables must have ample opportunity for flexing as the motor executes turns from right to left. Cable curves must be gradual and the ends that connect to engine levers must be adjusted to the extent that the various positions on the control box (forward, neutral, reverse and throttle advance) are synchronized with the corresponding ones on the motor or motors.

### Control Mounting

Most of the outboard boats have a control mounting pad or block by the helm fastened to the inside of the boat. If your boat does not have one, a block can be purchased or made up from plywood and through-bolted to the boat, preferably across one or more ribs, or other manner of reinforcement in the case of fiberglass or metal hulls. The bottom of the control box should be located about 1 in. above the top of the seat cushion, although length of control levers will affect this somewhat. More important, there must be sufficient clearance for the levers and your hand for full forward, reverse and throttle advance.

For correct cable length, measure from the control box location, along the side of the boat to the stern, and then to the center of the transom. Add 1 ft. to the latter if both throttle and shift levers on the motor are located on the same side. Add 2 ft. to the cable measurement for any motor control lever located on the far side. When determining cable length for twin motors, measure to the center of the mounted motor and add 1 ft. in each case. Order cables to the nearest foot beyond the required length, never shorter. Installation of throttle and shift cable normally should start at the control box. The same applies to installation of steering cable. When connecting the cables at the motor, be sure control-box levers and motor levers are in neutral position. For test shifting, pull starter rope to insure full engagement of motor shift dogs.

### Laying Out Cable Run

For a smooth-functioning cable and pulley steering system, it is important that the cable (tiller rope) be maintained in a tight

(Continued to page 238)



SPLIT RUN

# There's only one soap to clean hands like these—LAVA!



## Lava —gets the tough dirt around knuckles and nails



Whether you tune up a Ferrari or tear down a lawn mower, you still get greasy, dirty hands. Only one answer to this problem—Lava, the hand soap. Lava clobbers dirt wherever it turns up . . . hidden under fingernails, trapped around knuckles, or ground into callouses. No other soap, powder, or cleanser gives you so much heavy dirt-loosening lather with a special

scrubbing compound. Lava digs out stubborn dirt, scrubs it loose, and washes it away.

So stock up on Lava next time you're at the store and keep plenty around the house. That's Lava—the only leading soap made especially for hands. Best soap to get a man's hands clean—bar none!



SPLIT RUN





WITH THE POWERFUL PROTECTION OF

# Master LAMINATED Padlocks



Keep your workshop supplies safe from thieves . . . keep dangerous tools away from children . . . with world-famous MASTER Padlocks! Get the original laminated case construction and genuine pin tumbler locking mechanism for unmatched security.

\$1.25 to \$4.00, in a variety of sizes, at hardware stores and locksmiths everywhere.

**Master Lock Company**  
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condition. While the use of tension or tightener springs at the secured ends of the cable, Fig. 10, help to achieve this end, they cannot make a good steering system out of a bad installation job. When laying out the cable runs, eliminate any possible sources of rubbing or binding. In some cases it will be necessary to use extra pulleys to route the cable from the motor to the gunwale under the side deck as in Fig. 4. In the latter photo, note that the cable is kept below the upper edge of the transom by the additional pulley, making a neater installation and eliminating a possible source of a line or other gear fouling the cable. Note also, that the secured cable end is taped neatly with electrical tape after clamping it, to prevent the splice from becoming undone in the event the clamp slips, and to avoid snagging. Long runs of cable should be supported with guides as in Fig. 2. These prevent the cable from sagging and fouling on other equipment or the hull. As a point of safety, eye straps used for securing pulleys in place should be bolted to the hull, not screwed. The best of steering installations require adjusting and tightening periodically. Don't forget this important follow-up detail. ★★★

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**Got Those Coffee-Pot Blues?** Has that friendly electric perker of yours lost its perk? See the simple, step-by-step information on how to fix it up as good as new, in the November issue of Popular Mechanics.

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## **Interceptor Satellites To Patrol the Skies**

Space satellites capable of intercepting, identifying and destroying hostile satellites are being planned by the U. S. Air Force Ballistic Missile Division. The USAF plan is called, unofficially, Project Saint, for satellite intercept.

Saint would work like this:

The alien satellite would be tracked, then a Saint satellite, launched by an Atlas Agena-B rocket, would be blasted up just ahead of it. The interceptor would lock on the target by radar at a distance of perhaps 50 miles. It would close with the foreign satellite, maneuvering under auxiliary rocket power, and would inspect it by TV, optical, infrared and other sensing equipment. Findings would be relayed to the ground station for analysis. Then the decision would be made on whether to trigger a weapon on Saint and destroy the other satellite.



# What **STANLEY** means on cutting tools

Stanley always means quality. It also means exciting developments . . . new tools . . . better tools. Just look at this new kind of plane, for example . . .



Now offered as a Stanley Special Value with an 89¢ sanding blade free. Only **\$3.79 complete**. Other Stanley "Surform" tools from \$1.59.

It's a Stanley "Surform" Plane—light as a feather! 450 razor-sharp, non-clogging teeth speed cutting time. The body is lightweight aluminum. Yet this miracle speed forming tool zips through materials slick and quick . . . wood, composition board, asphalt tile, sheet rock, aluminum and other soft metals . . . the fastest tool you can lay hands on!

## OTHER DEPENDABLE CUTTING TOOLS FROM THE TOOL BOX OF THE WORLD



No. 99

Stanley Knife—Push button projects and retracts blade from handle to 2 cutting positions. Contoured, sure-grip handle. Furnished with 4 blades (8 sharp cutting edges). Only **\$1.50 each**.



No. H1252

Stanley-Handyman Chisel with heat-treated tool steel blade, carefully beveled. Two-tone, tough plastic handle. 4 sizes in handy kit . . . a special value at **\$6.49**.



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Stanley Bench Plane. A professional tool for accurate cutting and fitting. Perfectly balanced. Fully adjustable blade. Fast, clean-cutting action. **\$11.00**.

You get what you pay for in tools! If you lose tools, are careless with them in your work—get cheap ones. If you value good help for your hands . . . if you are proud of your work—buy Stanley Tools.

# STANLEY

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Stanley Tools • A Division of The Stanley Works  
New Britain, Connecticut



## On the Weather Front

(Continued from page 171)

weather had been clear for weeks. But he was right, after all. We went through a thick layer of low clouds just before the plane sat down.

Dr. Krick's forecast customers are just as varied, say, as the weather itself. An ice-cream manufacturer needs to know the earliest practical date in the spring for opening his retail stores. A brewery and a suntan lotion concern both key their advertising schedules to the long-range forecasts of hot weather, for that's when their products sell the best. Advertising that appears on a cold week end would be wasted.

Manufacturers of antifreeze, snow tires and snow chains need to know when the first real winter weather will begin in the fall. They plan their distribution and advertising accordingly.

Big cotton growers buy the forecasts to decide which varieties to plant, and for protection against the bugs. An early spring brings out the boll weevils ahead of time but if the Krick forecast shows that the early warm weather will be followed by a cold snap there's no need to buy insecticides. The cold will kill the insects.

The future weather is important information in the winter vegetable markets. Lettuce buyers, for instance, have an advantage if they know ahead of time whether Texas lettuce or lettuce from Arizona or California will mature first.

### "Cosmic Meteorology"

Dr. Krick calls his forecasting technique "cosmic meteorology." He says it is applicable to any planetary atmosphere in the solar system.

"The earth's atmosphere is an elastic medium that responds to the gravitational pull of the sun and to the sun's heating effects," he explains. "Each of these forces creates pressure waves in the atmosphere that travel in a systematic way. New waves are always being formed on the old ones, producing complicated interference patterns.

"A high barometric pressure at ground level indicates that the atmosphere overhead is piled up in a big wave crest. A low barometer indicates a trough overhead.

"Fortunately, day-by-day records of barometric pressures plus the observed weather over much of the Northern Hemisphere are available all the way back into the last century. These give us a historical picture of wave patterns that are keyed to the kinds of weather that occurred.

"To make a forecast for, say, June 7, 1970, we use a high-speed electronic com-

puter to project the wave patterns to that date. This provides a pressure pattern from which the forecast itself can be made. I've over-simplified this explanation but it does tell the basis of our method."

Some critics complain that Dr. Krick merely looks into the past to predict the future. He retorts that natural laws haven't changed, that the atmosphere reveals its future evolutions only by studies of what it has done. He adds that it is ridiculous to try to project the future weather from current data alone.

The Weather Bureau, he says, does an excellent job of observing and reporting the weather but has a poor record in forecasting. Based on a Weather Bureau document issued early this year, he points out that the Bureau's "30-day outlooks" have proved to be only 10 percent better than forecasting "no change" as far as regional temperatures are concerned, only one percent better for precipitation. Dr. Krick declares, "Often these outlooks are just the opposite of our own forecasts and the opposite of what actually occurs."

This doesn't mean that the Krick method has been infallible. It is still being refined. There have been periods in which the forecasts swung away from the actual progress of the weather and on these occasions Dr. Krick and his staff have sought out the reasons and made corrections.

### Sees Greater Accuracy

Dr. Krick is positive that his present claim of 85-percent accuracy in his forecasts will be raised higher and higher in the future. The more records he compiles the better the view he can have of the future. When the weather satellites go to work regularly they, too, will contribute to the accuracy of forecasting.

Weather modification, like forecasting, is another subject on which Dr. Krick and some government officials have differing views.

The basic technique for modifying the weather consists of releasing enormous swarms of minute silver-iodide crystals from generators that usually are located on the ground. Swept up into the rainclouds by the wind, the crystals serve as ice nuclei on which moisture gathers, ultimately adding to the rain or snow a storm would produce without seeding.

From 10 to 50 percent more precipitation than would have fallen naturally can be obtained this way. And, when skillfully handled, the technique can be used for various meteorological "tricks."

One such trick is to suppress hail by

(Continued to page 242)



# !NEWS!

## **FORD MOTOR COMPANY SWITCHES TO AUTOLITE**

Autolite Spark Plugs are now specified for original equipment installation on every vehicle that rolls off Ford Motor Company assembly lines. And they are strongly recommended by Ford Motor Company engineers for replacement use in all units now in service. Why does Ford Motor Company, like so many other manufacturers, specify Autolite? One of the main reasons is the way Autolite Power Tip actually cleans itself while you drive. See pictures below.



In each Autolite Power Tip spark plug the electrode or firing tip is longer than usual. This tip is made of a special heat resistant alloy. Now, watch what happens.

But the firing tip on an Autolite Power Tip spark plug extends deeper into your engine. Deposits are immersed in the searing heat of the exploding gasoline.



As you drive, lead and other harmful, fouling deposits start to accumulate on the firing tip. If allowed to remain, they will eventually short out and kill the plug.

With a Power Tip, each time your engine fires, the deposits are actually burned away. Your spark plugs stay clean, so that your mileage and power stay at their peak.



**AUTOLITE SPARK PLUGS**  
*Clean themselves while you drive*





time for  
an oil  
change?

change  
to..



**KENDALL**  
MOTOR OILS



**For the economy  
of quality**

All Kendall Motor Oils will do for you is keep your motor running smoother, quieter and longer with less need of repair. Millions of motorists have found that a change to Kendall quality was a happy change indeed.

**REFINED FROM THE CREAM OF  
PENNSYLVANIA CRUDE OIL**

*Kendall Refining Company  
Bradford, Penna.*

seeding the clouds so completely that the hailstones don't have a chance to grow to large size. A graphic demonstration is provided in Alberta where the Krick organization "protects" 750,000 acres of wheat during the growing season. Hailstones the size of golf balls may ruin much of the wheat in the surrounding region during a typical summer storm and yet the hailstones that fall inside the protected area are fewer in number and smaller or softer than those outside.

Dr. Krick says that hail suppression inside the protected area is from 50 to 90 percent complete. He says that the wheat growers estimate that damage to crops has been reduced from a previous average of \$2,500,000 per year to no more than a quarter of a million dollars per year.

### Squelches Tornadoes

Another way of tricking the weather is to seed the cloud systems at times when conditions are ripe for tornadoes, causing the energy that is being released by the clouds to spread out laterally and harmlessly instead of collecting into a destructive force. More than once, while seeding areas in the Midwest to stimulate rainfall, Dr. Krick has observed that tornadoes have occurred on either side of the seeded area but never inside the area itself.

As far as hurricanes are concerned, he feels that we can create the conditions that are necessary for producing hurricanes or, on the contrary, for inhibiting their development. Most certainly, he says, we can steer one away from its predicted course, diverting it out to sea if it appears to be threatening a populated area.

The technique involves large-scale seeding operations and would be expensive, and yet the cost would be only a fraction of the damage a hurricane can do.

Until now the main use of weather modification techniques has been to augment rainfall.

"Some government officials and university researchers have brainwashed the public into believing that rain augmentation has not been proved and that many millions of dollars must still be spent on research," Dr. Krick says. "Yet our own records on scores of projects in many parts of the world definitely show its value.

"I feel that the whole problem of water resources can be completely licked. You can't build enough storage dams to hold the water that could be provided every year in the form of added rain and snow. The only challenge that is left is to distribute the water that cloud seeding could provide. In

(Continued to page 244)



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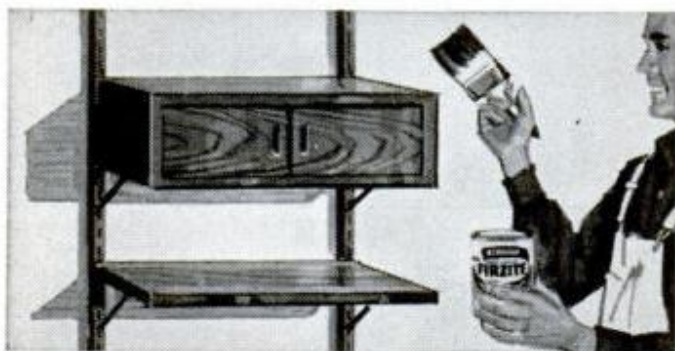
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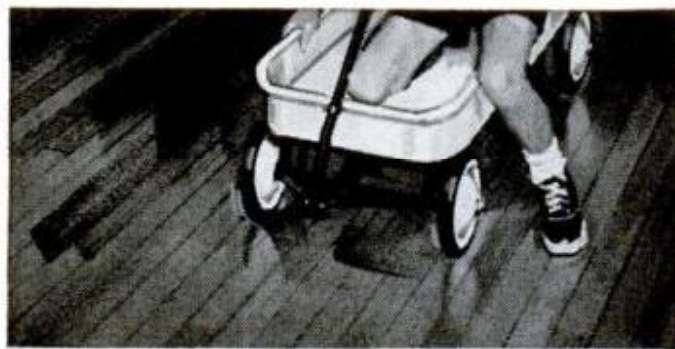
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view of this, expensive studies of sea water conversion could be a waste of public money if carried to an extreme."

As a single current example, Dr. Krick cites the case of orchardists in western Colorado who last February were faced with the prospect of a dry summer. The snowpack on their Grand Mesa watershed was less than a third of normal, as little as 27 percent on one snow course.

Dr. Krick's organization was called in, ground generators were placed at strategic spots and within six weeks the snowpack was increased 75 to 80 percent of normal. Meanwhile the surrounding areas had reached only 50 to 60 percent of normal.

By May 1 the snowpack of Grand Mesa was normal and yet the relationship to the surrounding areas remained the same.

"Agriculture gets back \$100 for every dollar it spends on weather modification," Dr. Krick says. "Hydroelectric power companies get a direct return of \$10 for every dollar spent, not counting the many downstream benefits."

California is experiencing a serious drought, a condition that Dr. Krick foresaw and warned his clients against several years ago. He says that the drought would not have occurred, at least as severely, if it had been fought ahead of time. He explains that a regional drought feeds on itself and tends to get worse, that the way to combat it is to maintain as heavy a precipitation as possible by seeding the rainclouds as soon as forecasts indicate that dry years are approaching.

Some of the statements that Dr. Krick makes in this article are pretty strong and he has made them deliberately. He wants to bring the dispute between himself and some other weathermen out into the open. It's about time, he thinks, for the public to know the facts about forecasts and weather modification as he sees them.

"I don't believe the truth can be shrugged off indefinitely," he says. ★ ★ ★

### QUOTE:

Said RALPH SAWYER, Vice-President of the University of Michigan, in discussing the growing volume of professional papers in the field of physics:

*"The situation has gotten so bad that in some areas scientists have decided to run the risk of doing over again research which has already been done since it will take less time to do the work than to find out whether it has been done.*

*"If we can't do something about this situation, the physicists will soon be buried in a flood of their own paper."*



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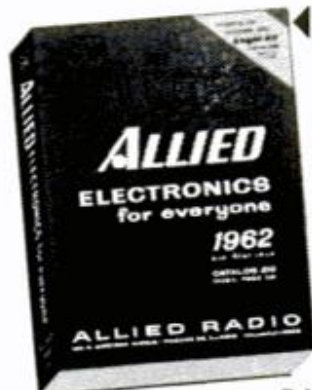
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**WORLD'S  
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## Will Robots Teach Your Children

(Continued from page 157)

missiles. Machines (psycho-motor self-instructional devices) are proving remarkably effective teachers of such motor skills and typing or punch-press operation. Hughes Aircraft uses more than 500 machines on its assembly lines to instruct workers, and reports that they have reduced rejects by a "substantial amount". The assembler wears an ear plug and receives both audio and visual help on the part he is assembling as he works.

The case for using machines to teach motor skills is indeed a strong one. But some psychologists are flexing their muscles more aggressively in relation to the effect teaching machines will have on public-school teachers. One asserted: "The teacher's function will be custodial—to keep children out of their mother's hair." Dr. Skinner has written: "The simple truth is that as a mere reinforcing mechanism, the teacher is out of date."

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Such comments are scarcely likely to develop a warm feeling among flesh-and-blood teachers toward machine teaching. Yet there is surprisingly little militant resistance to the machines—only vague discomfort and warnings that:

—we not willy-nilly adopt the teaching machines as an economy, teacher-saving measure before good programming is available;

—many of the things we live by—values, feelings, convictions—cannot be precisely programmed;

—in the most exciting areas of learning, there are only new questions and modulations of feelings and ideas. Yet the machines will not tolerate doubt or a modulated response.

Beyond these warning signs and the unbridled eagerness of some psychologists to sharpen their clinical teeth on the considerable raw meat of public education, the programmed instruction of the teaching machines may have much of value to offer in this fast-moving age. But we should take positive steps to be certain that the people preparing the potent programmed material are both competent and properly motivated themselves. ★ ★ ★



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### Supersensitive Sonar Picks Up Subs at 30 Miles

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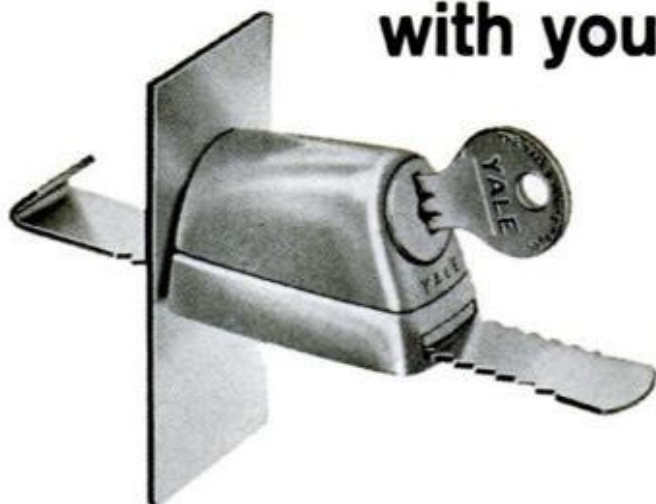
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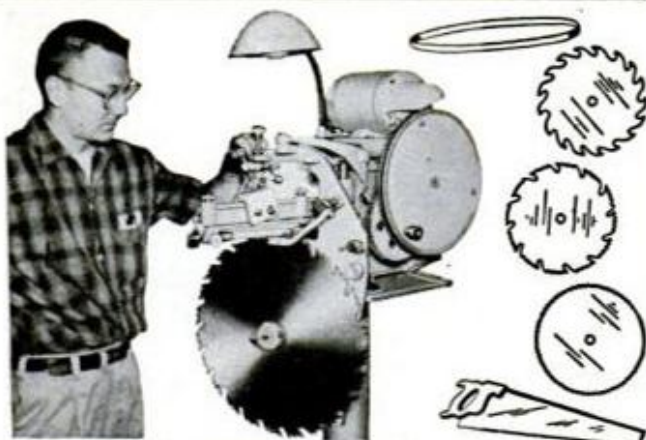
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## Bomb-Scare Pranksters

(Continued from page 150)

Catching the crackpot is tough work but it's being done. In a note to airline employes, the FBI advised persons receiving threats to engage the caller in conversation and take notes, paying attention to "accents, background noises and any indication that the caller is a juvenile, intoxicated, mentally unbalanced or unusually familiar with the operation and scheduling of the particular airline involved."

Following these instructions clerks have, in some instances, helped federal agents to arrest an offender while he was still on the phone—even though it takes up to three minutes to trace a call, while a prankster is able to deliver his macabre joke in a few seconds.

In the case of a bomb smuggler, admittedly a criminal difficult to catch, there have emerged plans and a device which may put an end to his insane practice. Airlines, for example, might request that baggage be checked for searching at a given time before a flight; luggage not submitted

**CHRISTMAS CARDS**—make them yourself from instructions in Booklet 203, only 25c from Popular Mechanics Service Bureau, Room 527, 200 E. Ontario, Chicago 11, Ill.

could follow on another plane. An alternative to this plan would be to hold periodic spot checks, the mere existence of which might discourage criminals from trying to plant a bomb in luggage. It has also been suggested that flight insurance be limited so that a saboteur or his family would not stand to reap great financial gains from a disaster.

### Will Luggage X Rays Work?

X raying travelers' luggage would be a sure check on what they were taking aboard a plane, and the Westinghouse Laboratory has disclosed a working model of a device that possibly could do this job. It can send an X-ray beam through a suitcase and reveal the contents in sharp detail, an achievement impossible with present equipment.

A practiced inspector, using the device (it would cost about \$30,000), may be able to detect any suspicious objects in a bag within six seconds.

"Passengers would be thoroughly protected against bombers," a Westinghouse engineer predicts. If federal authorities agree, the device probably will be refined and marketed. ★ ★ ★



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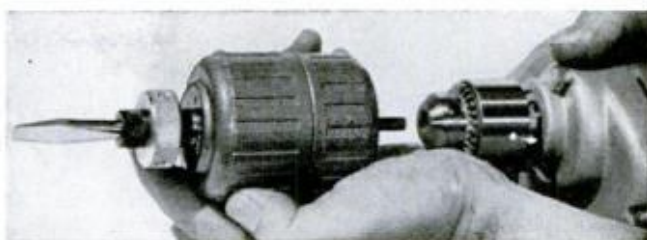
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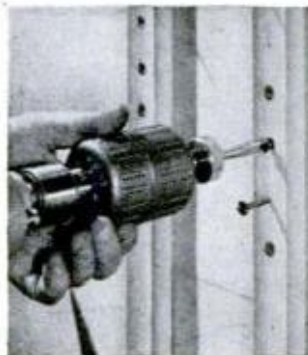


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## Science Digs Up a Treasure Map

(Continued from page 141)

cut costs and boost income with maps that told them the best crop use for their soils. Flood-control project engineers saw the prospect of better designs based on maps that revealed the exact condition of watershed lands.

Meanwhile, factories asked for survey help in locating soils for adequate, inexpensive building sites, safe from floods and landslides. Airports sought guidance for solid, runway soils. Housing developers looked to soil science as an aid in locating well-drained lots and soils safe for sewage disposal. Pipeline companies required advice on rights-of-way in soil where rusting would be kept to a minimum. Highway engineers sought facts as to soil cutting and filling anticipated along proposed routes. Even cemetery developers turned to soil experts for sites where excavation could be simplified and grass might grow properly.

### Speed Up Survey

To speed up survey work to its current rate—about 50 million acres mapped per year—SCS turned a coaxing eye on the nation's high schools and colleges. The "Men Wanted" sign was hung out—and still is displayed.

The soil scientist needs a thorough academic grounding in the scientific talents involved. Constantly, he must call upon his background in geology, geomorphology, mineralogy, chemistry and plant physiology in order to catalog properly the almost infinite number of soil variations.

Aside from bookish leanings, soils men have to be the sort who are content slapping mosquitoes and dodging brown bears on Kodiak Island; or equally happy pulling an auger in a peaceful Pennsylvania pasture. They need to welcome a familiarity with thousands of soil-types—gained only by walking thousands of miles to get acquainted with them.

Finally, they should not mind working alone and must be willing to put up with being chased by bulls and dogs.

But they may strenuously object to being shot at by hunters.

"In fact," advises Frank Viera, soil surveyor in wooded New Hampshire, "I recommend keeping out of the coverts during big game season."

It was a crisp November day in the Lake Winnepesaukee region when a fusillade of bullets begin singing over Frank's head where he was augering in a patch of spruce and fir. Frank hit the dirt. When the barrage died down, he set up a noisy hallooing and worked his way behind the firing line.

There stood two red-hatted hunters, rifles cocked and ready.

"You nearly blew me out of the county," offered Frank, waving his equipment. "I'm mapping soils over there."

"Yeah?" replied one of the pair with a casual grin. "We thought you were a deer from the noise you were making. We're 'sound-shooters,' see?—Say, you don't know where any bucks are yarded up around here, do you?"

If there is one feature common to all soil scientists, it is the nearly personal bond between them and their all-metal companions, the soil augers. Scientists regard the ever-present tool-of-their-trade with that mixture of respect, fondness and hatred that combat soldiers reserve for their rifles.

Like all who trouble to poke beneath the hide of this ancient planet, soil scientists run into items they're not looking for. Off-beat findings and collections would make a museum. Nearly every soils man has uncovered his share of Indian artifacts.

Besides Indian relics, Northeast scientists are forever augering up Colonial coins, musket and cannon balls, and beaded gewgaws of the fur-trading days. Along the eroding Atlantic Coast, surveyors commonly encounter sharks' teeth and whale skeletons buried by the ages.

### Discovery in Massachusetts

They get quite bone conscious. This led to an important discovery in Massachusetts a few years ago. An odd-looking bone turned up in a Berkshire County field. The finder was a soils man who had been punching around for a good place to build a pond. He was curious enough to turn the fossil over to a Harvard professor. University experts identified it as part of a prehistoric horse's skeleton. It was the first proof that Ol' Dobbin's forebears had roamed North America, even before the modern horse was brought in from Europe.

And anthropologists checking Indian history in New York's Mohawk valley were stumped until a soil scientist turned up a strange arrowhead in the course of his day's work. It led to discovery of a missing link in a series of Indian village sites dating back 3000 years.

If ever a soils man worries about the future of his task, he has only to give the globe a twirl. Surveys have hardly scratched the planet's surface. Billions of acres in unmapped jungle, field and mountain await the auger. Today, at least 50 foreign countries are prepared to welcome American soil scientists willing to pack their augers overseas. They could just about write their own ticket, too. ★ ★ ★



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## About Those Big Boosters

(Continued from page 132)

*Cracking is a problem even in small solid rockets. Wouldn't this be more of a problem in large solids?*

**RITCHEY:** No. The things that cause cracking are dimensionless—a small rocket is just as likely to crack as a large rocket.

*Isn't safety a major factor in choosing between liquids and solids—that is, when something goes wrong in a liquid system there is a warning, like a pressure drop, that lets you activate the escape system, but a solid system can just quit without warning?*

**ESCHER:** Several warnings are given by a liquid system that you don't get now from a solid. However, I'm sure this could be overcome.

*Which fuel and which structure is more expensive?*

**ESCHER:** Both are very expensive. The liquid structure is complex and sophisticated. However, more powerful and larger solids are calling for heavier casings made of more expensive materials. On cost, disregarding all other factors such as ease and cheapness of use and looking only at cost of fuel as supplied by the manufacturer, the solid propellant is more expensive.

### Should We Switch Fuels?

*Is it a question of making a bigger engine to use present fuels or can we catch up by switching fuels, say using hydrogen and oxygen or hydrogen and fluorine in the booster?*

**ESCHER:** There is a gain. But recall that you are now talking about the lion's share of the propellant—the biggest part by far goes in the booster. Hydrogen is expensive and fluorine is expensive. Both are difficult to handle and you get into a tremendous safety problem. To go into these fuels, you must have to be sold on gaining a nominal advantage—it might be 30 or 40 percent of payload. Our tendency is to start with these fuels in upper stages where they really pay off in the favorable vacuum environment of space, then work down as we learn more about them. The same thing happens in the solids business—the fiberglass-case rockets now being flown in upper stages are being talked about now for lower stages. For example, the Polaris A-3 configuration.

*Have we investigated all the possibilities of better fuels to the point that we know we are using the best liquids available?*

**ESCHER:** Yes. All chemical combinations can be studied on paper or by computer to show their maximum potential performance. We have selected several high per-

formance systems including hydrogen, fluorine and others for further development. Some are going into use soon—Saturn upper stages will be hydrogen fueled. Soon we hope to use fluorine. In the meantime, the RP-liquid oxygen combination is the best available for the money and the uses to which it will be put.

*Are the Russians using more advanced fuels or are they just building larger boosters?*

**MEDARIS:** Nothing they have done so far indicates they are using any "exotic" or very advanced propulsion systems. Just bigger boosters.

### Russian Additives

**ANFUSO:** We don't know for sure, but there's a good guess that they are beefing them up. Probably using some sort of additives with conventional fuels.

**ESCHER:** You often hear the terms, "super fuel" or "boron fuel" or what have you. I don't think such a fuel would be needed for the type of loads the Russians are lifting into orbit.

*A Czechoslovakian source stated that Lunik III, which pictured the reverse side of the moon, used a boron additive.*

**RITCHEY:** They claim to have used super fuels on one of the Luniks, a "fuel unknown in the U.S." I doubt that it's unknown in this country. It could be that they use a combination like the fluorides, the hydrazines or the lithium hydrides or something of this kind that we don't have too much experience with.

**ESCHER:** It could be possible. However, it sounds very expensive. I do not think the Russians were or are in a position to have to run the reliability risk and financial expense such as we might choose to take on if we wanted to really "push" one of our vehicles to the limit for a "plus" payoff.

*One rumor making the rounds is that the Russians are tying ramjets to the sides of boosters?*

**RANDALL:** The booster would have to be at considerable altitudes and speed before the ramjet efficiency would begin to pay off. With the air becoming thin, it would not be long before the air-breathing ramjet would no longer be effective.

**ESCHER:** We also hear about using auxiliary solid propellant boosters, which is more logical.

*Have we used auxiliary solids?*

**ESCHER:** No, not to my knowledge with launch vehicles.

*How would they be used?*

**ESCHER:** This might be one or two or three solid rockets strapped to the large

(Continued to page 254)





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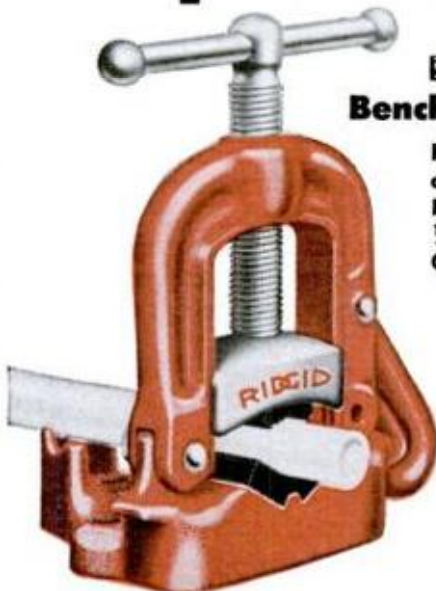


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booster, to pick up the payload a little bit. You are not going to leapfrog anybody's capability this way. What you are going to do is give yourself a plus factor of 25-30 percent at the most to assist at takeoff. In other words, if Saturn is right on the edge of being capable of doing a particular job, this technique might put it well into the capability area.

*A French newspaper reports the Russians are launching rockets by first getting them up to speed on a powered sled running in tracks that extend down one mountain and up the side of another, before the rocket's own engines are ignited. Anything to this?*

ESCHER: Our studies show it to be impractical.

### **Obsession With Miniaturization?**

*Do you think that our obsession with miniaturization, especially following the 1954 thermonuclear breakthrough when we realized nuclear weapons could be made small and not require large missiles for delivery, might be part of the fault here?*

MEDARIS: Certainly it is part of the series of events that led to the present situation. Here it is hard to tell whether the chicken or the egg came first. In military missiles, especially those used for tactical purposes, miniaturization is a tremendous virtue because of the mobility needed. On the other hand, a great deal of miniaturization devoted to space *has been forced upon us*, by reason of our not having the capability of lifting bigger objects.

*Why are the Russians beating us in space, especially man-in-space?*

MEDARIS: For years people, Russians included, have recognized the natural sequence of important events in the chronology of space conquest: man in space, man in orbit, men in orbit, space rendezvous to allow resupply of manned space station, man to moon, then an outpost on the moon. The Russians obviously concentrated on these steps as being most important in furthering their thesis that Communism represents the winning side for the future. We could have beaten them to an unmanned satellite by a year, to man in space by at least two years, and we still might be able to beat them to the moon if we get on with it. But we have to understand the importance of the effort, concentrate our resources and quit trying to serve up something for everyone.

EDSON: On this point, Dr. Edson (many of whose remarks must be described indirectly rather than quoted) points out an important difference in the Russian way of doing things. The Russians gather together in one team the very best men available in the entire nation and charge them with a

great responsibility. In the U.S., 50 firms each hire one of the best men and put him to work on a proposal for government consideration. This dilutes the effort greatly.

*You think we might have diluted our space effort by bringing in too many people with too many projects?*

### **Piece of Cake for Everybody**

MEDARIS: Unquestionably we have too many projects. We were dragged into space as half-hearted participants in what people felt was a crack-brained scheme to extend the explorations of the Geophysical Year beyond Earth's atmosphere. Not having been first in the field, we have been reluctant to admit its importance in the vital struggle for the hearts and minds of people around the world. But once "space" ceased to be a dirty word, all the special pleaders climbed on board and we tried to provide a piece of cake for every latecomer to the party. As a result, we have a diversity of so-called space programs that is truly awesome to tabulate.

*What are some of the projects you would drop?*

MEDARIS: Rather than dropping projects, what we are talking about is consolidating projects and efforts. A number of things we are doing would advance faster if they were put together. But everything we are doing right now could be done more easily if we had concentrated maximum resources on developing the larger booster.

### **Shepard Tranquilizer**

*Were the Shepard and Grissom flights important in terms of the over-all space race?*

MEDARIS: The historic significance to the United States goes without question. On the other hand, the perfection and *apparent* ease with which the flights were achieved, and the tremendous publicity given them, have the effect of giant tranquilizers on the great mass of an American public always eager to return to the comfortable couch of national egotism. Person after person noted that we weren't behind at all!

ANFUSO: We'll never catch up with liquids. They're too far ahead. We can only do it with solids. Here's where we are ahead in the state of the art. We can pass them.

*Pass them?*

ANFUSO: Yes. Make a big—a major—step that jumps right past them.

*You have introduced a bill that would do this?*

ANFUSO: Yes. It would have us spend more money on a large solid-propellant booster. It would partly equalize our solid and liquid programs.

(Continued to page 256)



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*Would it help to accelerate our training of scientists and engineers?*

EDSON: On this point, Dr. Edson noted that the pace of a program is set by a handful of highly talented, superbly trained individuals, not by large volumes of engineers.

*What about moving into nuclear propulsion as a means of catching up?*

MEDARIS: My concern is that they may do that before we do.

ESCHER: Early nuclear rockets would be upper stages rather than boosters. They would begin operating when the vehicle is in space. The question is how big a bite you can take off with the first development—what is the size of the first nuclear engine? Maybe we just can't get a big engine, maybe we have to go with an engine that's a little smaller. In the present race, if that's what it amounts to, I don't think there is enough time to do anything toward getting an immediate pay-off.

*Are we ahead of the Russians in any respect?*

MEDARIS: In numbers of projects, varieties of approach and ability to pack a lot into a small space, we have easily outdistanced all possible competitors. This would be comforting were it not for the fact that reliability can be more easily achieved with less complication and expense, but more weight. The availability of a spare to be switched on at once if the primary encounters trouble is perhaps the easiest single method of converting a large percentage of failures into successes.

### Tomorrow's Rockets

*There will probably be a lot of people scooting around in space 10 years from now. What will propel them?*

RITCHEY: In general, the chemical propellants we know today will be used in most of the boosters 10 years from now. We could have nuclear-powered rockets with hydrogen working fuel as an upper stage.

MEDARIS: It depends on the missions, of course. I don't think the lift-off mechanisms—boosters and so forth—to get things off Earth and out of its atmosphere will be vastly different from the approaches available today. The optimum puts nuclear power at least on the second stages. Then, for longer range missions in outer space, we must develop the ion engine and similar low-thrust, long-life devices that presently are considered very far advanced.

ESCHER: When you start storing high-energy propellants in space, you have the problem of how long they will stay stored, especially under thermal radiation. If it

turns out that we can't store, say hydrogen, for a long time, this may force us to stay with lower-energy storable combinations such as hydrazine or nitrogen tetroxide. If we can store in space, I see all liquids moving toward higher energies. We will always find the solid propellant rocket with us. It will find many uses.

*Do you envision a breakthrough that will let us leapfrog the Russians in the space race?*

MEDARIS: It's very questionable. Both nations have penetrated far enough into the potentials that the lines of advance from here are fairly well understood.

### Russia Behind on Solid Rockets

RITCHEY: As far as load-lifting capability with solids is concerned, this is one place where we really have the technology in the country to leapfrog the Russians. I don't think that their solid-rocket industry is anywhere near as advanced as ours.

EDSON: Dr. Edson believes there is one area where we have a chance to catch the Russians—they might have an important, time-consuming failure. The Russians probably still have to make the big step from using military missiles adapted to scientific work to really big rockets especially developed for large space projects. This is the step equivalent to going from the military Atlas to the huge civilian Saturn as our basic space booster.

"If they are to keep up the pace of their program and their present prestige, they must accomplish the change before too long," says Dr. Edson.

Here's the way Russians probably will do it: Their best intellects will brainstorm the vehicle. It will be developed on paper to the last detail. Then it will be built. Very few of the major subsystems will be tested as well as we would test them—this permits a much faster program.

In the U.S., every piece of the Saturn is being tested many times over.

### Big Red Bird May Fail

When the big untested Russian bird is fired, there is a reasonably good chance it will fail. Dr. Edson knows no secrets here, merely points out engineering experience in rocketry. If it fails, the Russians will have to start from almost the very beginning on developing a new rocket. If the U.S. Saturn fails—and this is unlikely after so much testing—our engineers will know what went wrong and in what areas to re-design.

If the Russian rocket fails and ours does not, we might pick up as much as two or three years on them. If both fail, our second rocket will be ready to go much sooner than theirs. ★ ★ ★



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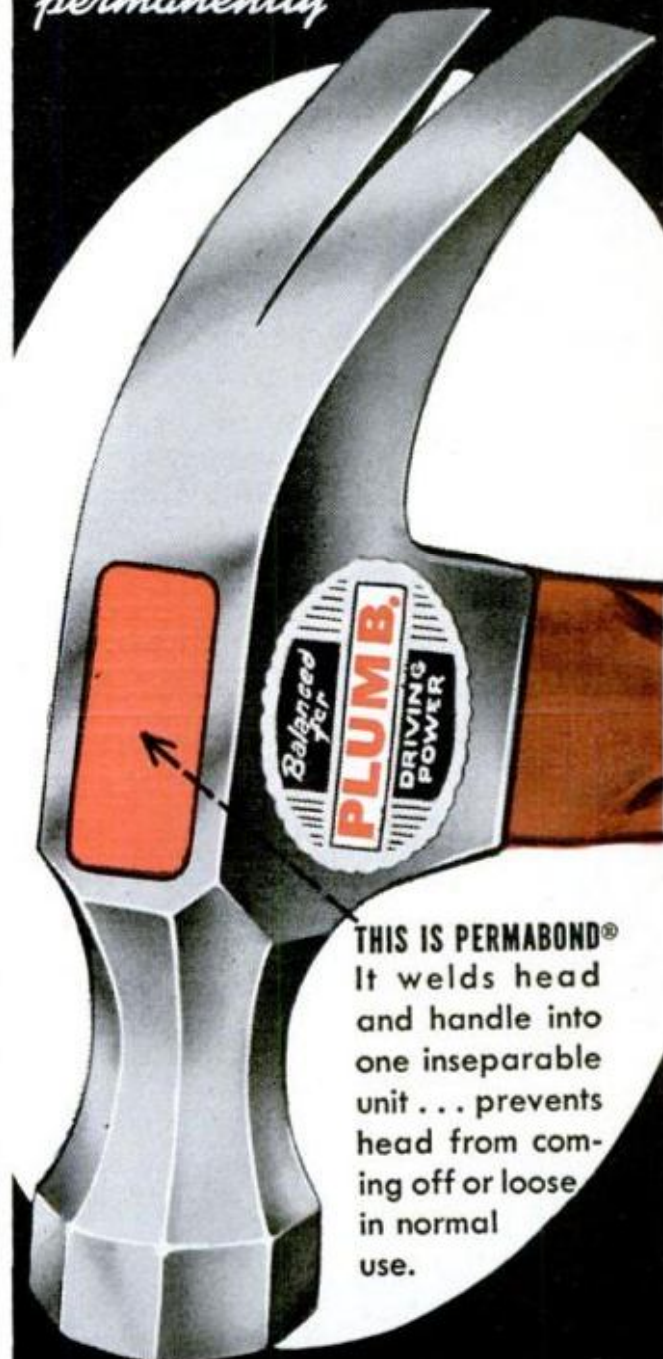
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## Road Test of Buick's New V-6

(Continued from page 111)

on highway No. 2 heading toward Sault St. Marie. At Rudyard we stopped for gas and put in 12.3 gallons to fill up. Clocked against the day's run, fuel mileage thus far figured out to 19 to 20 miles per gallon. As we headed on up toward "the Soo" on the smooth macadam road I noted what seemed to be either a muffler, exhaust system or drive-line resonance at between 30 and 45-48 m.p.h. Ralph remarked that the engineers at Buick were still, as he put it, "playing around with" the mounting of the exhaust system to tune out any possibility of noise.

We stopped in Sault St. Marie for a look at the famous Soo Locks between Lake Michigan and Lake Superior. The Special sat out in the hot sun, but after we got back to it, there was no hesitation in starting. Nor, for that matter, at any time during the trip, was there a sign of vapor lock or carburetor percolation.

We swung almost due west from the Soo across the Peninsula, bypassing Newbury to Munising, where we pulled into a lake-side motel for the night.

The day's drive had been an easy and pleasant 438 miles. Through some almost deserted stretches of flatlands between Newbury and Minising we pushed the V6 Special to higher speeds.

### Plenty of Snap

Pleasant and comfortable cruising speed for the V6 Special seems to be about 75 m.p.h. At this speed the engine is as smooth as an electric motor and there is still plenty of acceleration up into the high 80's.

The next morning we topped off the fuel tank and installed the fuel consumption meter. After the engine was thoroughly warm we found some flat stretches and pulled constant-speed fuel-consumption tests. (See page 109). The V6's scores were similar to a number of other compacts with a lot less able performance.

Near Traverse City, we halted the Special again, not for gas, but at a fruit stand where we picked up two boxes of cherries. Soon we were spinning along down the road leaving an evenly spaced trail of cherry stones behind us.

An unusually level stretch of smooth concrete prompted us to try some simple acceleration runs. After four runs each way, 0-60 acceleration, with my wife and Ralph Dean being out of the car, averaged 13.6 seconds in drive-range all the way. 0-50 averaged out to 10.7 seconds.



We stopped in Traverse City for a third refueling and oil check. Once again a filling station attendant fumbled over the V6 under the hood, but never noticed what it was.

From Traverse City we headed inland towards Cadillac on Route 131. We ran into winding roads over hilly country not unlike some of the roads you find in Vermont or Connecticut. Here again we used the throttle unsparingly, accelerating the car as much as we felt like, turning corners and cresting hills at the fastest comfortable speeds from 50 to 65 m.p.h.

At Cadillac, we picked up Route 115 down through Clare toward the center of the state on our return to Saginaw. From here on the highway flattened and straightened out, and we started leaning on the throttle again, getting up to speeds of 70-75.

The last stretch between Clare and Saginaw until we picked up Route 23 proved to be as thick a bumper-to-bumper Sunday traffic situation as we've seen in a long time. We were averaging perhaps 40 m.p.h., closely packed and unable to pass, with frequent acceleration and deceleration.

We ploughed through Sunday-night traffic in Saginaw, picked up Route 23—and rolled at the legal 65 to Flint.

#### Fuel Mileage: 19.3

Before winding up the trip and taking our leave of the Special and Ralph Dean, we carefully topped up the fuel tank for the last time, and computed the over-all tank mileage for the 901-mile trip.

It turned out to be 19.3 miles per gallon. This is worthy performance, considering the amount of acceleration and high-speed running and the average load in the car.

Ralph felt that the Special could do much better and would—after the carburetion engineers finished calibrating the carburetor to tailor it more closely to the V6.

After our drive in the automatic transmission Special V6 I concluded that if the expected price differential of \$100 to \$150 between the V8-equipped Special and the base V6 materializes, the average family buyer will find himself hard put to justify the extra money asked for the V8, as I believe the V6 gives much more than "just satisfactory" performance. I never felt that the 135-horsepower engine with its 205 pounds-feet of torque wasn't delivering all the power and all the performance that we needed, and delivering it smoothly and quickly, without fuss, vibration or excessive noise.

The chassis of the Special complements the V6 engine nicely and gives a comfort-

(Continued to page 260)

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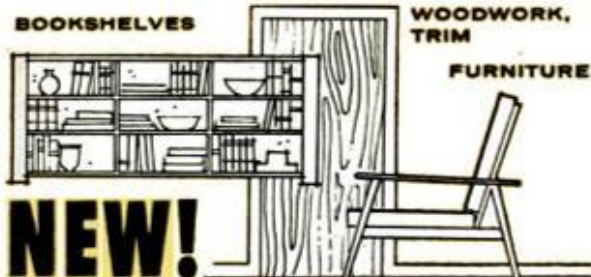
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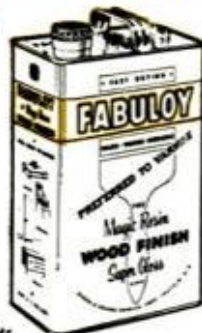
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able, vibration-free and very stable ride. With the added plus of crisp, foolproof handling, the likes of which you seldom find in a standard passenger car, we concluded that the Special V6 will out-haul and out-perform all other 6 and 4-cylinder compacts with the possible exception of the 145-horsepower Valiant and Lancer 6s.

### Stick-Shift Test

To double-check on the V6, I came back to Flint for a day in a Special V6 with standard transmission. Like the first car tested, the stick shift V6 was a sedan with power steering. This second sedan was a demonstrator that had been set up for the board of directors of General Motors Corp. — no less — and was well nigh perfect. I noticed only one fault, a resonance period at around 56 to 63 m.p.h.

Ralph Dean, who chaperoned us once again, felt that this was a drive-shaft problem which has not quite been worked out on the early prototype standard transmission 6s. In the stick-shift car we left Flint and made a wide swing west to Battle Creek, on up to Grand Rapids, then, back over a different highway network through Owasso to Flint.

The first part of this trip took us through a number of little towns on rather crowded Route 27 where our speeds ranged between 50-65 m.p.h.

We wiggled our way through the traffic of Battle Creek and turned up Route 37 and headed for the outskirts of Grand Rapids. Here the pace quickened to 60-65 m.p.h., then slowed down into the 50s until we had reached Route 21, which led us almost straight back across the state to Flint.

Here, on a straight and little-traveled road we were able to pull the cork on the V6 and cruise at around 70 m.p.h. The total mileage for this day's run was 266 miles and the carefully calibrated and topped-off fuel tank mileage came out to a very commendable 23.25.

The performance of the stick-shift V6 is excellent. The car hauls up smoothly in high gear from anything over 20 m.p.h. and will creep smoothly and pleasantly through traffic in second gear down to a little bit below 10 miles per hour. Acceleration enables the car to reach a brisk 65 in second gear without noticeable strain.

To wrap it all up, I found the V6 a definitely superior engine that seems lighter, more compact and more efficient than inline sixes of comparable displacement. I wouldn't be surprised if the cast-iron V6 became the preferred engine for compact, economical family cars. ★★★



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EXCESS INVENTORY  
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## ARMY AC GENERATOR

• Item #626. Brand new, original crate, all ball bearing DeLuxe heavy duty 115-v 3,000 to 4,000-w, 60-c generator, 1,200 rpm. With voltage control and voltmeter panel, etc.

• Drive with tractor, old auto engine, etc. Ready to use.

Great emergency unit for farm, etc. Size 21"x14"x20". Wt. 260 lbs. **\$139.50 FOB**

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- \$275 1-cyl. 1500-w 115-v Air/c. **\$182.50**
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- \$2250 4-cyl. 10KW 115/230-v w/c. **\$599.50**

## BATTERY REMOTE CONTROL WINCH

• Item #322. Powerful Govt. DC hoist with "up-down-off" push-button control switch, 20' cable. • 35' 4000-lb. hi-strength super-flexible steel cable on self leveling pre-grooved high-strength 5"x8" drum. Winch rating 1000-lbs. on 12-v, 1500 lbs. on 24-v. Fine for boats, loading docks, trucks, jeeps, garages, farms, etc. Easy to install. Electric automatic locking brake. Works off any car-truck 12-v battery. Wt. 90 lbs. Size 12"x14"x8". **\$68.25 FOB**



## Contractors Level-Transit

• Item #823. Leading make transit with tripod and case. Used by leading builders, schools, etc. 18-X scope, high accuracy, use as level or transit. **\$77.59 FOB**



## HYDRAULIC SPEED REDUCER

• Item #1304. 1 hp variable speed hydraulic transmission. Variable speed 0 to 350 rpm. Instantly reversible. Ideal for lathes, midget cars, etc. Roller bearings, and complete with 3-phase 220-v AC ball bearing motor. Size 21"x9"x20". Wt. 200 lbs. Shaft fitted with pulley (specify diameter desired). Govt. cost over \$900. **\$89.50 FOB**



## HYDRAULIC PUMP and CYLINDER OUTFIT

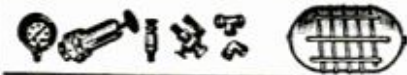
• Item #923. Govt. hydraulic hand pump, reservoir and powerful 2 1/2" bore 7" stroke cylinder with locking ratchet and hose. Pump will handle pressure to 5 ton. Cyl. size 14" extends to 21". Make arbor press, body jack, contractor tool, etc. Wt. 55 lbs. Govt. cost over \$75. SALE. **\$27.95 FOB**



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### LOUDSPEAKING DIAL TELEPHONE

• Item #740. Consists of special colored dial phone, desk loudspeaker, and 110-v AC amplifier unit. Speaker and phone set on desk—amplifier under desk. Connects to any dial phone line. • Talk and listen loud and clear without touching handset. Wonderful on long distance or local calls. Executives can monitor on loudspeaker other conversations on same line. Furnished in jade green or beige. Very attractive and modern. Wt. 25 lbs. **\$59.50 FOB**



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The "TROJAN" comes complete—ready to weld • Ideal for making repairs, hardsurfacing tools, brazing, soldering, cutting and burning holes • Plug-in receptacles provide nine graduated current control steps • Produces excellent results in small repair, sheet metal and hobby shops, garages, plumbing and heating contractors, light factory production and maintenance • Meets REA requirements • Ask for data sheet A-520-G.

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Household Tackling!

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## Chevy II

(Continued from page 114)

one unique departure from the conventional, fully-unitized job—body and frame elements forward of the cowl are a sub-unit unto themselves.

This forward unit carries front suspension, forward engine mounts and radiator. The grille, bumper, single headlamps and both front fenders bolt onto the welded forward unit which is itself butted against the main body-frame structural members and bolted snugly in place. This simplifies assembly and aids repair in case of front end damage.

The front suspension is a departure from current Chevrolet practice in that the coil springs are mounted high in the unitary substructure above the upper control arm. Braking torque and bump shock are absorbed by rubber-bushed trailing links running from the forward ends of the frame members to the outer ends of the lower control arms.

Chevy II's rear suspension is conventional in principle (Hotchkiss), with semi-elliptic leaf springs taking the braking and driving loads. But it's also unique in that springs have but a single leaf which varies both in width and thickness. These springs offer advantages of uniform stressing throughout and the elimination of hard-to-control interleaf friction.

Brakes are standard Bendix servo-action type with optional power assist. Steering is recirculating ball gear with linkage mounted behind the axle. Power steering of the link-boost type is optional. Steering wheel requires 4¾ turns from full right to full left lock on all models. ★ ★ ★

## Man-in-Space Stations Are Nearing Completion

Seventeen electronically equipped stations designed to monitor the orbiting flight of the first Project Mercury astronaut are nearing completion around the world.

The stations will receive information from the space capsule and its passenger. Data on speed, altitude, flight angle, temperatures inside capsule, the astronaut's breathing rate, pulse beat and some 90 other points will be automatically transmitted from the stations to the Goddard Space Flight Center, Washington, D. C.

Three stations are located in the U. S. The rest are scattered over Africa, Australia, Mexico, and islands in the Atlantic and Pacific Oceans.

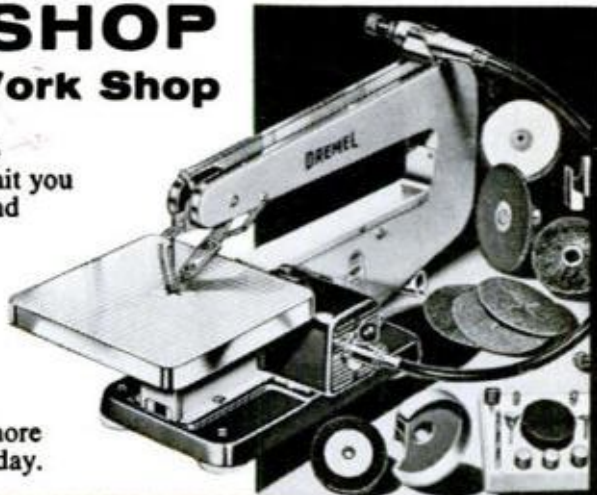
The stations will pick up and transmit data as the capsule passes over each in turn.



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## Complete All-Family Power Work Shop

Dremel Moto-Shop is the first real multi-purpose workshop designed for the whole family. In one compact, portable unit you have a jig saw, disc sander, buffing wheel, bench grinder, and a flexible shaft machine. 5 power tools in 1 unit that do 1,001 jobs. For the kids it provides hours of constructive, creative recreation. It's invaluable to Dad, and even Mom, for hobby work and home maintenance. Moto-Shop is not a toy, but a professional-quality power tool with a ball bearing rotary motor. It's super-safe; cuts 3/4" wood, metal, plastics, etc.; sets up anywhere, can be carried from room to room. Outperforms heavier, more expensive jig saws. See your power tool or hobby dealer today.



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FLEXIBLE SHAFT

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**Model 571** (jig saw with disc sander)...**\$33.95**  
**Model 572** (all attachments shown)...**\$49.95**

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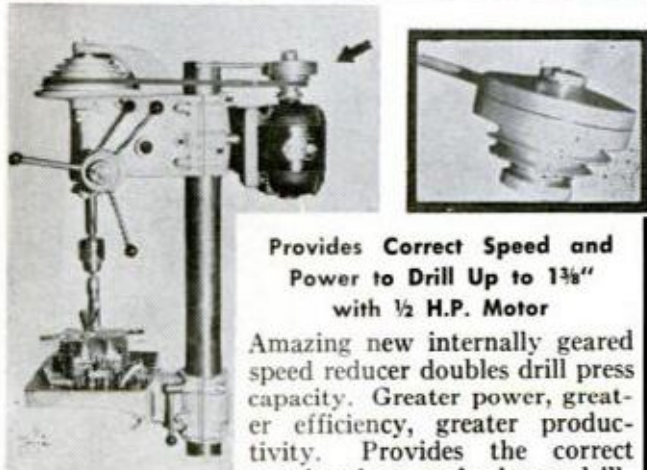
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with just one tool**

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Just turn the dial and you're set to go with this new Irwin Expansive bit. No hunting for the size you need. Fits all hand bit braces. Clean, fast, accurate boring action from  $\frac{7}{8}$ " to 3"—35 standard hole sizes in all!

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the original solid  
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screw drivers  
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**Has the Baseball Been Changed?**

(Continued from page 137)

wool in older balls. The effect on the liveliness of the old balls would be difficult to predict from these preliminary tests.

The rubber cement used to bond the final cotton layer appeared in all three balls but in different quantities for each. It was heaviest on the 1961 ball. The horse-hide leather covers, while showing the effects of age more than any other component part, appeared to have been the same on all three balls.

The marked differences in cork, blue wool and white wool layers prompted Dr. Miller to label our 1930 ball "clearly different—a chemical maverick."

**Size Standard Since 1872**

The major league baseball as we know it today was standardized at its present size and weight in 1872 in Division 1.12 of the Baseball Rules, after years of wildly varying sizes, mostly because the balls were homemade. In '72 the ball was fixed at nine to nine and a quarter inches in circumference; five to five and a quarter ounces in weight. In '76, the year the National League was founded, the firm of A. G. Spalding & Bros., Inc., of Chicopee, Mass., began making the league's official ball. In 1901 the American League began, also with the Spalding ball, though it bore the trademark name Reach. Spalding and Reach baseballs are supposed to be identical except for the labels.

The earliest baseballs were made of wool yarn wrapped around a rubber core of about an ounce in weight. A horsehide cover was hand-stitched over the wrapped ball. The best home run season on record for the oldest ball was 27, hit by Ned Williamson for Chicago in 1884. It was a banner year if anyone hit 20 homers; it only happened twice between 1876 and 1911. In 1911, a cork center was added to the ball, but nothing startling happened until 1919, when a pitcher-outfielder named George Herman Ruth, playing for Boston, broke Williamson's 35-year-old record by hitting 29 homers. In 1920, after being sold to the New York Yankees, Ruth hit 54, then 59 in 1921, and the home run was established as baseball's greatest drawing card. Also in 1921, Spalding switched to Australian wool for the yarn windings in their big-league baseball.

In 1925, too late for the regular season but in time for the world series, the Spalding cushion-cork center baseball, with two layers of rubber around a cork core, ap-

(Continued to page 266)



**WAR SURPLUS AND OTHER BARGAINS SAVE UP TO 90%**



**FRESH WATER SYSTEM PUMP** — For boats, campers & trailers. Output 10 to 200 gal. an hr. Variable rheostat controls output. 1/2" pipe thread into bronze impeller housing. 12 V.D.C. Radio noise filter. 5.2 amp. draw. Explosion-proof const. Shpg. wt. 11 lbs. Complete with mounting instructions & wiring diagram. Approx. GOVT. COST, \$200. NEW. \$10.95.

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Manufactured for govt. antarctic expeditions for jeeps and half-tracks. Heating unit puts out over 20,000 B.T.U.'s. Late recirculating type. Burns any type gas. 12 volt system. Fuel consumption extremely low, 1 gal. per 8 hrs. Terrific for trucks, etc. With service & installation manuals & many components. Approx. GOVT. COST \$550. Shpg. wt. 50 lbs. NEW. \$39.95. Limited quantity. Also available in 6 volts. \$39.95.



**ELECTRIC STORAGE BATTERY WINCH**

Fully reversible with heavy-duty, 2-way drum switch. Heavy-duty motor, 150 to 1 reduction. Drum will handle 60 ft. of 1/4" cable. Can be operated manually by hand crank. Use on 6, 12, 24, 32 V. battery. Lift cap. 2000 lbs. plus. Complete with mounting flange, safety locking brake and leads. Ready to install & operate. Dim: 17" long x 9" wide x 7" high. For jeeps, trailers, boats, trucks, etc. Approx. GOVT. COST \$400. NEW. \$49.50.



**HYDRAULIC KIT**

consisting of 2 heavy-duty 7/8" double-acting cylinders and 1 hydraulic hand pump 1500 PSI. Great for building hydraulic press, car jacks. Approximate GOVT. COST \$200. NEW. Only \$10.95.

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peared on the scene. The manufacturer pronounced it "the absolutely perfect baseball," and warranted it to last through an entire ball game.

That's a brief rundown on the changes made in baseballs which are a matter of official record. Have there been others? Well, one representative of the manufacturer flatly states: "There hasn't been any change in the manufacture of the big-league baseballs since 1926. . . . The ball is not wound tighter. It's the same winding, the same yarn, the same cotton, same hides and the same handstitching that they've used for the last 35 years."

One exception is usually made—and accepted—to that statement. The ball suffered during World War II, when European cork and Malayan rubber became difficult or impossible to obtain. Substitute materials were used—even some rubber golf ball cores were built into a few thousand balls, though it isn't certain that they were used on big-league balls. After the war, the ball quickly returned to its standard specifications, with a subsequent surge in hitting in 1947. But of course some drafted sluggers were returning to the plate about then, too.

#### Too Many Conflicting Statements

There were reports that the ball was livened around 1929. Many experts thought the 1930 and 1931 ball was livelier, and season batting and home run figures seem to bear out the claim. In Street and Smith's 1954 Baseball Yearbook, George Dawson, a Spalding vice-president, wrote: "There were changes in the ball after 1928. The nature of these may be imagined from the batting and home-run statistics. The historians say the ball was juiced up considerably in 1930 and 1931. Be that as it may, there have been no alterations in the last nine years."

Mr. Dawson also mentioned that the stitches, once raised quite high, had been kept quite close to the hide "for the last dozen years, at least." In April of 1931, *Popular Mechanics* carried a mention of a change—the cover leather was being made heavier and the stitches were to be raised instead of countersunk. These could be the high stitches that had been changed in the mid-thirties, according to Mr. Dawson. The stitching on a baseball could make a big difference to a pitcher by allowing him a better grip on the ball. Better pitching should mean fewer long-ball hits.

After you read enough conflicting opinions of that sort, you begin to wonder who to believe. So *PM's* editors, with the help of cooperative newspaper sports depart-

ments, began rounding up old baseballs—the age and source of which could be established—with an eye toward a testing program. They ranged in vintage from 1909 to brand-new Reach balls graciously donated by the Chicago White Sox from their supply.

You have already seen the preliminary findings on three of these baseballs. There were definite differences. But are they such that their effect on the ball's performance would be less than the effects possible within the manufacturer's quarter-inch, quarter-ounce tolerances? As these words go to press, further tests are being made and a special "batting" machine is being built which will impact old and new baseballs with a batting surface as nearly equivalent to batting conditions found in an actual Major League game as it is possible to simulate. This should provide a far more worthwhile measure of the ball's resilience and behavior than the conventional type of "bounce," "drop" or perhaps even "ram impact" test.

By next month, we will bring you the next "chapter" on our findings. It will be interesting. See you then?

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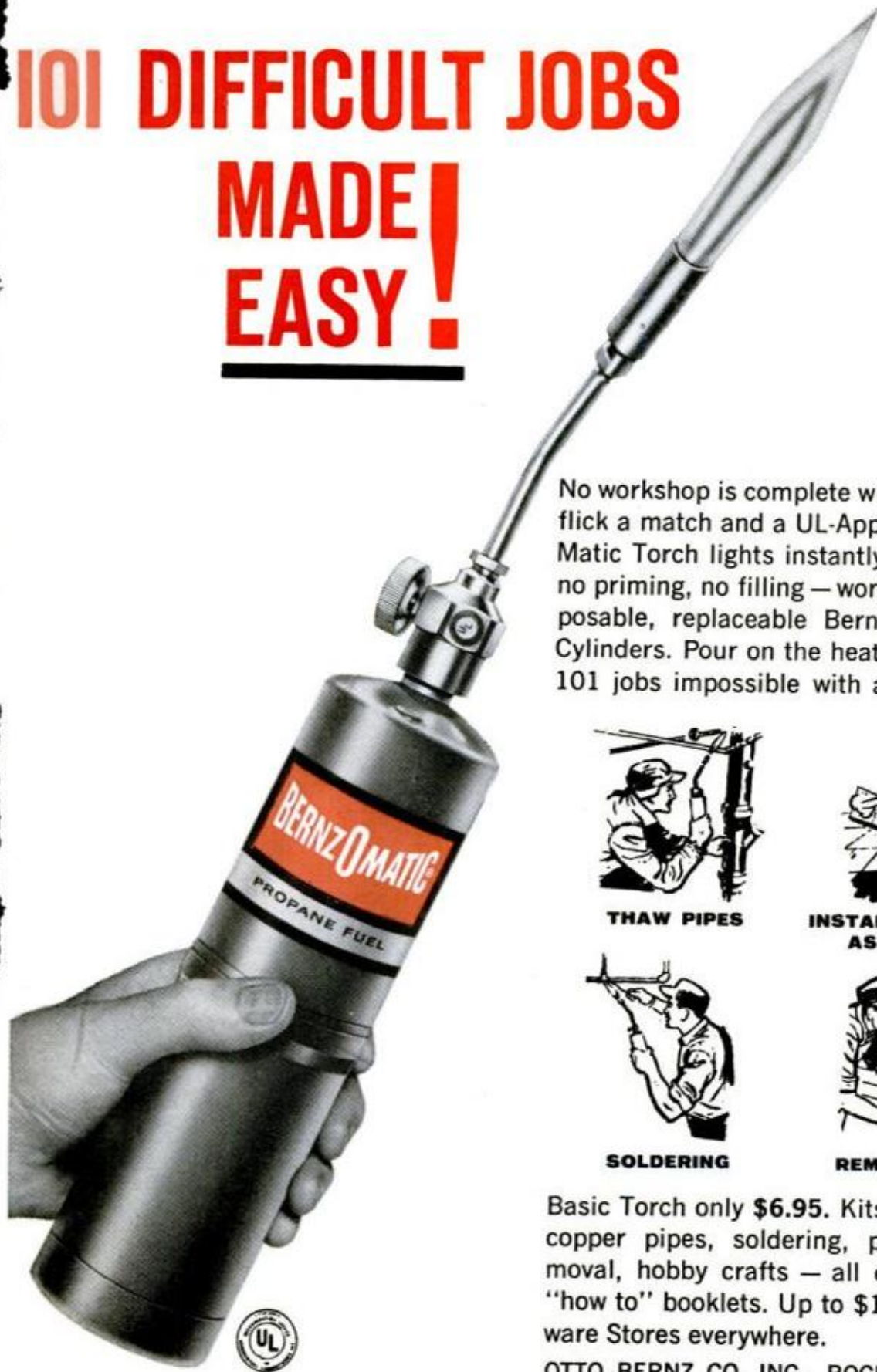
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#### Computer Could Guide Rocket Ship Repairs

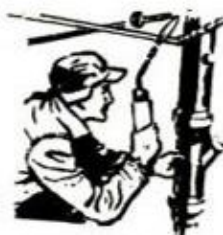
Since there are no service stations in space, the problem of repairing a rocket ship, should it break down, is a provoking one. Halim Ozkaptan, psychologist at Republic Aviation Corp., suggests that when the time comes for travel through space there be established maintenance centers on earth built around computers. If a ship gets into trouble, the symptoms can be radioed to the center and data fed into the computer. The computer will already have stored in it data pertinent to the operation of the spaceship, its systems and subsystems. With this type of information, the computer can make its diagnoses, which will be radioed to men in the ship. Such trouble-shooting work is the most time-consuming part of making repairs, says Ozkaptan, and computers could be of great help in spotting the trouble when time is at a premium.



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