

ALL ABOUT CHOOSING HOUSE PAINTS

# POPULAR MECHANICS

JULY 1964  
35 CENTS

## HOW PROS MAKE RACERS OUT OF STOCK CARS

**Arnold Palmer  
Plays Arnold Palmer  
With Modern Versus  
Vintage Golf Clubs**

## SKIN DIVING

- New Adventures
- New Equipment

**WHAT THE  
1965 CARS  
WILL BE LIKE**





# Chesterfield People:

They like a mild smoke, but just don't like filters. (How about you?)



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James S. Thompson, optical physicist, California



Richard N. Pudge, mining engineer, Nevada



If you like a mild smoke, but don't like filters, try today's Chesterfield King—mildest-tasting Chesterfield in 51 years. Vintage tobaccos—grown mild, aged mild, blended mild. Made to taste even milder through longer length. They satisfy!

**CHESTERFIELD KING** tastes great...yet it smokes so mild!





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Look at the record: more than 80% of the Indianapolis meets since 1922 have been won by PC-equipped cars. More major USAC events and NASCAR competitions are won by drivers using Perfect Circle

rings than any other piston ring brand.

What's the difference between PC "racing" rings and those you can buy? Nothing. They are *identical*, from the specially-selected metals to the solid chrome surface. They are *identical* in design and manufacture, in the long life, fit and dependability that assures new-car power and economy.

Here's another engine tip: to prevent costly oil loss through valve guides, always install Perfect Circle Valve Seals, or have them installed, when you re-ring.



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This One



2N78-FG2-NUUT





## If you won't buy a good drill—borrow one!

"A ten-dollar drill makes the same size holes as a better drill—why should I pay more?"

That notion has cost a lot of men a good deal of disappointment. If the truth be told, it's wiser to rent a quality drill—or even borrow one from a neighbor—than gamble good money on a "bargain" drill that comes apart at the seams under rough service.

If you're seriously considering buying a drill, it's worth taking the next few minutes to know what makes a good drill worth a few dollars more. For comparison's sake, we'll use the Skil Model 503 quarter-inch drill.

### Most Important: The Motor

More than any other single feature, the motor is the key to the quality of a drill... determines whether it will stand up when the going gets stubborn. Working with soft wood isn't much of a problem, even for cheap drills. But in dense woods or materials like steel or masonry, a cheap drill will tend to peter out—and perhaps burn out.

To prevent any such misfortune, the Skil Model 503 is equipped with what is termed a "Super Burnout Protected Motor." That means its windings are coated with

a special high heat resistant resin that prevents overheating. It's an extra production step that costs more to perform—but the life of your drill could depend on it.

### Industrial-Quality Parts

Inside the Skil 503 drill are parts—shafts, gears, bearings—made to the same standards—in fact, on the same equipment—as Skil professional drills. Assembly and quality control, too, are every bit as exact as for Skil industrial 1/4" models costing \$65. The Skil 503 is a precision tool, not a stripped-down version made to meet minimum standards.

Even the housing on a Skil Model 503 is something special. It's made of a costly lightweight aluminum alloy that makes the drill easy to work with, but ready for more abuse than you'll ever give it.

### Don't Slight Service

When a Skil 1/4" drill leaves our plant it carries a lifetime guarantee against defects in material or workmanship. And we back up this guarantee with one of the most extensive nationwide networks of factory authorized serv-

ice centers in the field. Unlike most cheap drills, a Model 503 can be serviced anywhere in a matter of hours or a couple of days. (We know of instances—not too rare—where owners of other makes have waited a month or more while the tool is in repair.)

### Think About This

Those are the facts—the rest is up to you. You can buy a cheap drill for something like five or six bucks less than a Skil Model 503. The question is, are you saving five dollars or throwing away ten?

Skil drills are sold by prestige department stores, hardware and lumber dealers everywhere. (By the way—you won't find them dumped on a shelf in plastic bags.)

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**SKIL**  
POWER TOOLS



# MG CAR CLUB INTERNATIONAL 1000 RALLY FINISH



## HIS TURN



## HER TURN

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Mark it "His" or "Hers"—the MG Sports Sedan is happily versatile. Its spacious interior (made possible by our transverse-mounted engine) is

amply comfortable for five passengers and luggage. Front-wheel drive, combined with liquid suspension, gives a shock-proof ride on the roughest roads...and the handling and stability you need at high speed and on slick surfaces.

In competition, this car has an indomitable heart: the time-tested MG engine. Dual carburetion...4-speed stick shift...crunchproof synchromesh gearbox...speeds in excess of 80 mph. Visibility is wide as all outdoors, and you can count on up to 30 miles per gallon or more. Big Lockheed disc brakes in front stop it straight and sure, without fade.

Turn to the price, and you'll find it's only \$1898. For this you get two cars in one elegant package...sports car and family sedan...which makes comparisons meaningless. But make them anyway and you'll see our point.

MG SPORTS SEDAN

**\$1898<sup>00</sup>\***

\*Suggested retail price New York P.O.E. includes: turn signal; windscreen washer; spare wheel; tool kit; ash tray light (heater and grille guard optional).



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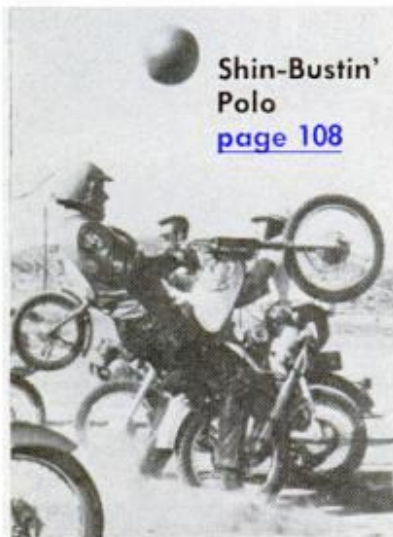
# POPULAR MECHANICS®

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

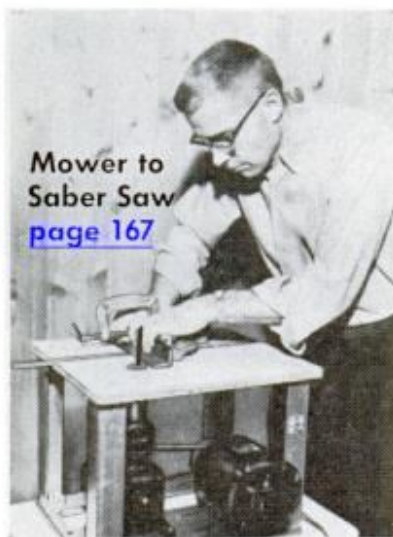
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**NEXT MONTH**—Major deSeversky's ion-propelled aircraft rides soundlessly, hovers eerily and looks like a parasol. It's fully reported in August PM, along with the computer that plays checkers with champs, a rundown on the fun you can have behind a boat, plus a fascinating stint behind the wheel of tomorrow's way-out automobile

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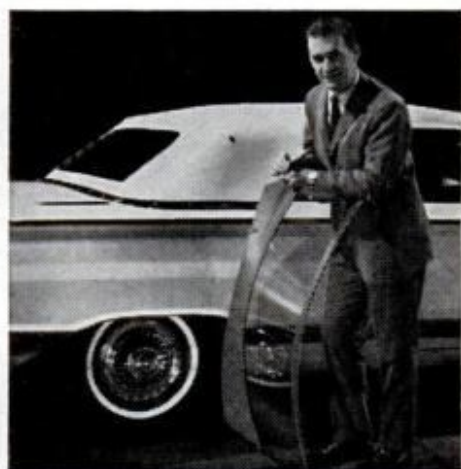


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to end unsightly ballooning at turnpike speeds. Super-tough 5-ply top fabrics with heat-sealed seams and soil-resistant vinyl topcoating.

While pliant tempered glass is a Ford-built exclusive, it is bound to set an industry trend just as other of our firsts have done—fully synchronized three-speed transmissions, ultra-light engines, swing-away steering wheels, the Thunderbird roof line, to name just a few. And you can count on more innovations, more proof of engineering excellence in the months and years ahead—first from Ford Motor Company.

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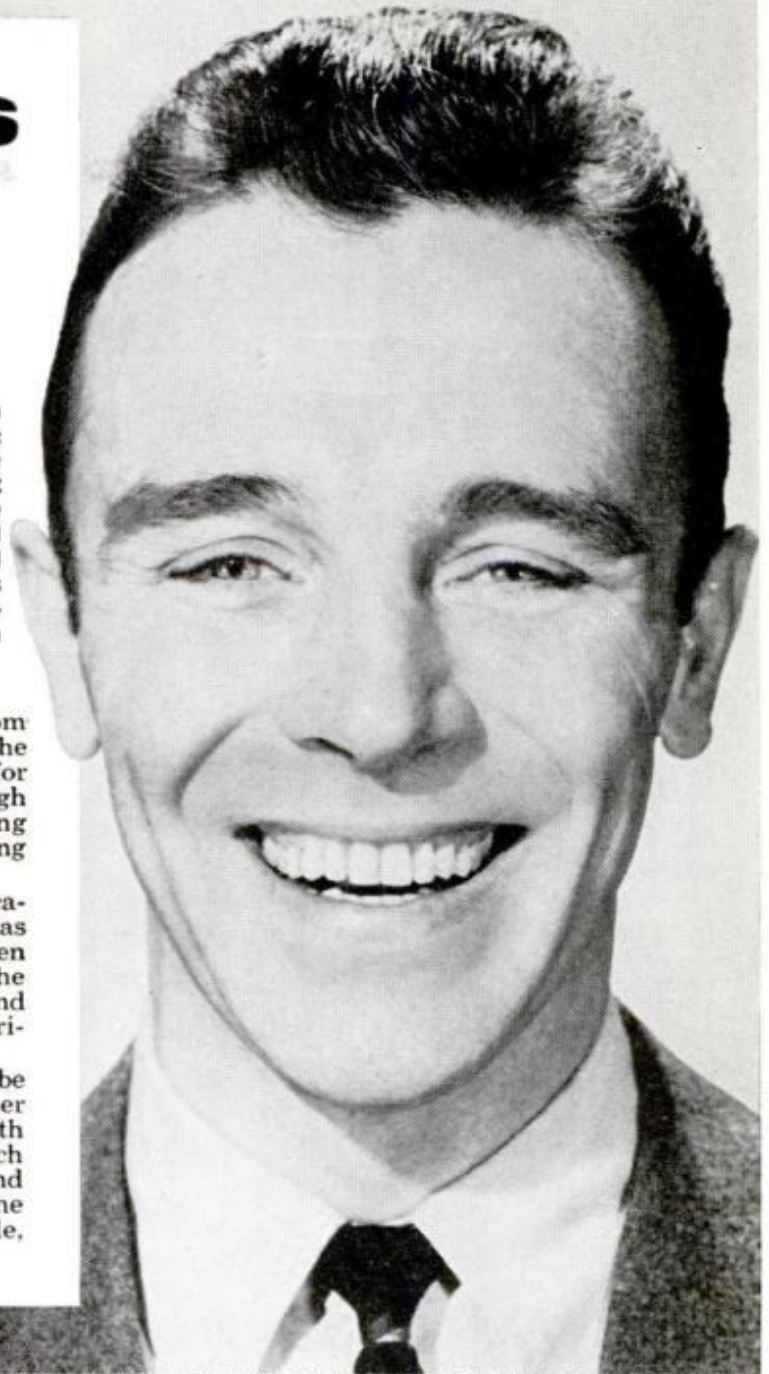
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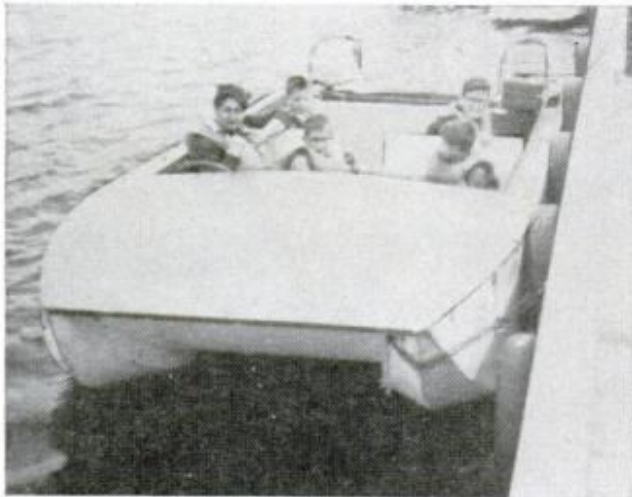
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# Over the Editor's Desk

## Pop-Cat Crafter

I built the *Pop-Cat* (page 162, March 1961 *PM*) during the winter of 1961-62.



As yet, none of your readers have indicated that they did the same.

Here's a picture of the effort.  
N. Edmonton, Alberta      **JOE POLLOCK**

*Your effort looks great. You really aren't alone, though; other readers have built it. Yours is the first photo we've received, though.*

## Classic Clique

Robert Woolson has a nice basic design for the *Sidewalk Classic* (page 146, November 1963 *PM*) that allows one to build with that "stuff" which collects over the



years as well as to add personal touches. What this picture doesn't show is the hundreds of children waiting their turn. Incidentally, the car radio works.  
Burlington, Mass.      **DAVID H. ALDEN**

The car I built is eight inches longer than your plans call for, and it has a deeper leather-cushioned seat.

This car is unique in that it is driven by a two-horsepower gas engine through



a "transmission" (forward-reverse mechanism from the rollers of a wringer-type washing machine). Its drive terminates in a covered-chain drive to the wheel. Clutch action is provided by a motor shaft centrifugal clutch, and shifting is done with a lever on the floor ahead of the seat.

With a 9:1 reduction, the car gives six to seven m.p.h.—with plenty of torque for uphill climbs.

North Tonawanda, N.Y.      **JOHN R. LILLIS**

## Good Digging

Tremendous article on Biblical archeology in your April issue (*They're Digging Up Bible Stories*, page 110). Combination of text, artwork, maps and photos couldn't be better for newcomers to the subject.

Hillsdale, N.Y.      **W. H. HUNTER,**  
Pastor

## Not in Tune

Your article *Buy a Piano You'll Keep on Enjoying* (page 124, February *PM*) is loaded with mistakes and misleading information.

What, pray tell, is a "complete tuning"? I question the author's ability to get the discoloration out of ivories that are badly yellowed. And several places you spelled "bass" as "base." Base is in baseball; bass is the musical term.

Tempe, Ariz.      **WARREN WESLER**

*Right you are about "bass"—and we told our sports-minded copy editor that it's spelled the same way as the fish, which probably only confused him more. As for*

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



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Patternmaking  
Practical Millwrighting  
Reading Shop Blueprints  
Rigging  
Tool Engineering Techn'y  
Toolmaking  
Welding Engineering  
Technology  
Welding Processes

## STEAM AND DIESEL POWER

Boiler Inspector  
Industrial Building Engineer  
Power Plant Engineering  
Stationary Diesel Engines  
Stationary Fireman  
Stationary Steam Engineering

## TEXTILES

Carding  
Carding and Spinning  
Cotton Manufacturing

## Dyeing & Finishing

Loom Fixing  
Spinning  
Textile Designing  
Textile Engineering  
Technology  
Textile Mill Supervisor  
Warping and Weaving  
Wool Manufacturing

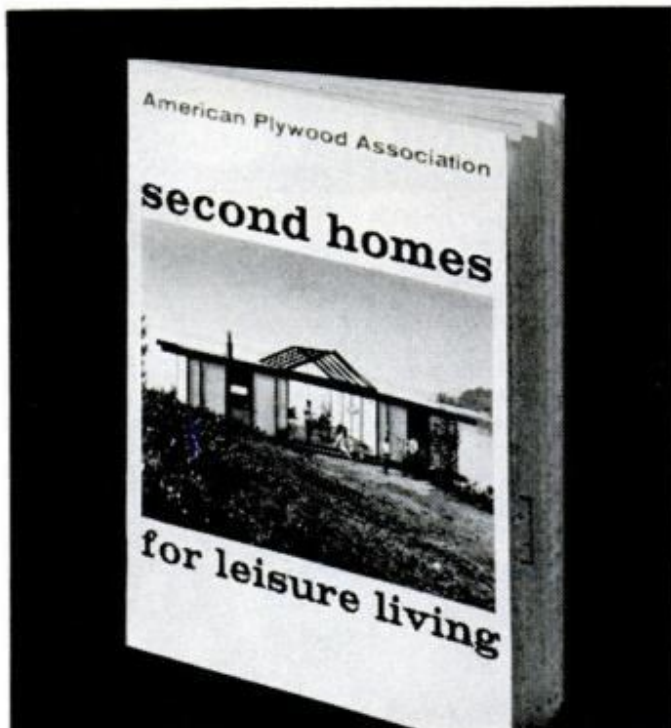
## TRAFFIC

Motor Traffic Management  
Railway Rate Clerk  
Traffic Management

## TV-RADIO-ELECTRONICS

Communications Techn'y  
Electronic Fundamentals  
Electronic Fundamentals (Programed)  
Electronic Fundamentals with Electr. Equip. Tr'n'g  
Electronic Instrumentation & Servo Fundamentals  
Electronic Principles for Automation  
Electronics and Applied Calculus  
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First Class Radiotelephone License  
Fundamentals of Electronic Computers  
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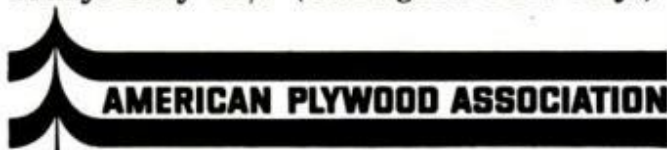




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## Over the Editor's Desk

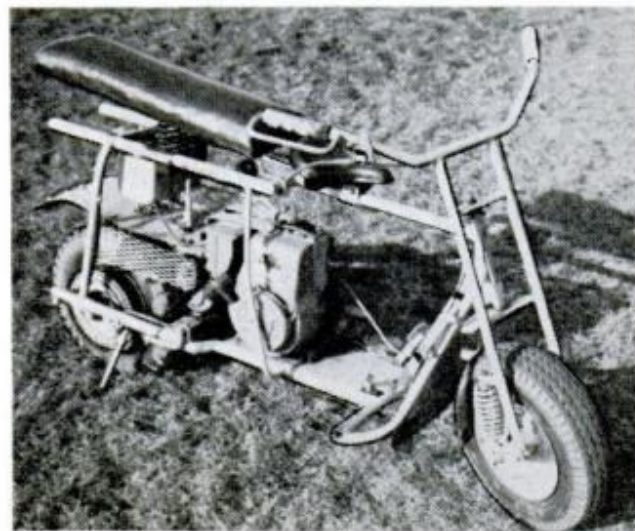
(Continued from page 8)

the other two criticisms, Author Jay Earl says that a "complete tuning brings a piano into proper tonal relationships at proper pitch, A-440." With an old piano, he continues, this may require several extra tunings to re-establish pitch. And some can be tuned only in the center register.

And the author adds that, indeed, ivory keys can be made white again after they've yellowed. They should be scraped with an ivory scraper and polished by rubbing with whiting and alcohol.

### Skinny Scooter

Here's a photo of my slim version of your *Fat-Tire Scooter* (page 151, April 1963 PM, designed to use a wide Terra-



Tire on its rear wheel). I have added a sprung front wheel, plus a transmission from a scrapped Cushman scooter. I am using a belt drive between the motor and transmission, incorporating a clutch of my own design and a chain drive between the transmission and rear wheel.

My gearing ratios allow a speed of approximately 30 m.p.h. in high and 12 m.p.h. in low.

I enjoyed building this project very much. Thank you for presenting the article in your magazine.

Warren, Mich.

JACK GOODRICH

### It's Archie's Boat

In your May *Over the Editor's Desk*, my letter about the PM Jet erroneously made it appear that I had built the boat. It was built by Archie Aldropp.

Langlois, Ore.

AL BROWN

Sorry, Al. You were so enthusiastic about it we were sure you had built it.

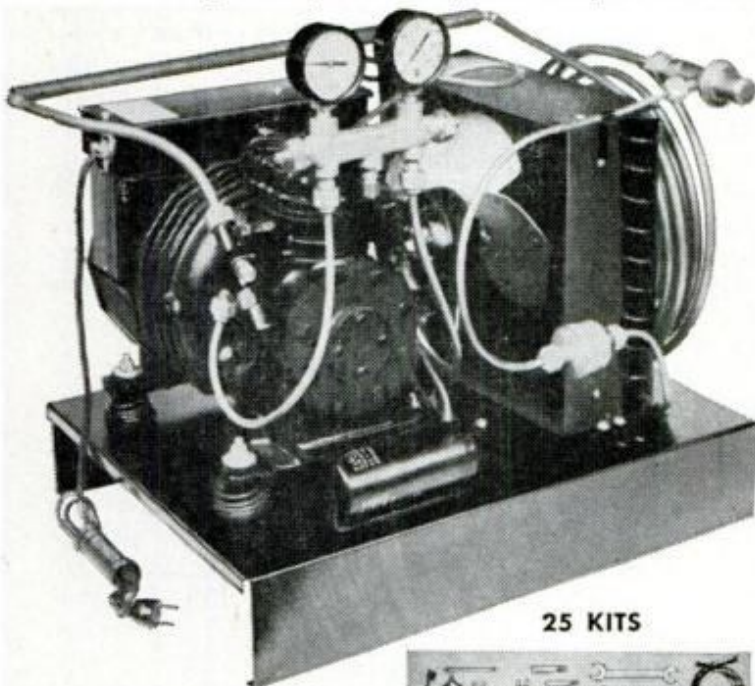
*The Editor*

POPULAR MECHANICS



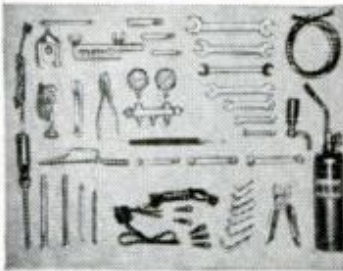
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# INVENTORS' CORNER

By Joseph H. Kraus

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

**How long** does it take for a patent to be issued, anxiously asks Mathias Riester of Newton, N.J.

From 1½ to 2½ years, depending on the subject of the invention. As reported in the April 28, 1964, issue of the *Official Gazette of the U.S. Patent Office*, the oldest new application awaiting action as of February 29, 1964, was March 8, 1962; while the date of the oldest amended application awaiting action is March 20, 1962. More than 300,000 applications are pending or awaiting action.

**Top secret** is the technique employed by C. J. Fox of Maitland, Florida, with his idea for bathroom toilets. Can he obtain all of the patents in this field so that he might examine each to determine if he has anything really patentable?

Yes, you can obtain all patents in print for 25 cents each, directly from the U.S. Patent Office, Washington 25, D.C. But you should know the divisions into which your invention might fall. They could be 35(IV) or 58(III) or others, depending on what you have in mind. The Patent Office sends out 26,000 copies of patents each working day. Your best bet is to search the records in the Search Room of the Patent Office in Washington. Also, send 20 cents in coin or money order to the Government Printing Office for "How to Obtain Information From Patents." This lists some 300 libraries throughout the U.S., where you can find the *Official Gazette* and similar publications. You also could check with your nearest Field Office, U.S. Department of Commerce. Some day you must trust someone. You might start with a registered patent attorney right now and save yourself some money and maybe a lot of worry.

**Toys and game ideas** should be submitted to whom, inquires Dennis H. Gibson of Pensacola, Florida. One toy manufacturer

informed him that his idea had merit but was beyond their toy age limit and differed from their production.

First study your potential market, next have the records searched, then file for a patent; finally try to sell it to a manufacturer whose productions are directed toward that market, or one likely to expand into it. A good way to locate potential manufacturers is to examine trade publications in this field such as *Toys and Novelties*; *Toy Trade Journal*; *Playthings*; *Craft, Model and Hobby Industry*; etc. The four headquarters in New York, N.Y.

**Nonskidding spectacles** is the problem which Dr. W. R. Shank of Syracuse, Indiana, is attempting to lick. Might his ideas be patented?

Sometimes it is possible to protect a new use for an older product. Whether or not this could be done for the liquid which you mentioned might best be discussed with a patent attorney. However, I know hundreds of people who do not have the trouble you point out. Also, soft pads with pressure adhesive for application to eyeglass pads are available in many drugstores. You should look into these before investing in a patent.

## NEW PATENTS

**A high-speed surgical drill**, powered by a tiny gas turbine, is said to be capable of cutting through bone without creating heat. It weighs six ounces, is the size of a large fountain pen and can rotate a bit at 100,000 r.p.m. Patent 3,128,079 was awarded to Morton S. De Groff of Bryan, Ohio.

**Scuba divers** who hate to swim can ride in a one-man sea sled, according to patent 3,131,664, granted to George W. McInvale of Irving, Tex. Made of fiberglass, the sled uses a hydrogen-oxygen fuel cell to produce electricity and a ballast-tank system to dive and ascend.

**An auto seat** of adjustable firmness has won patent 3,128,125 for Raymond Loewy, the industrial designer. Air tubes are molded inside the foam rubber of the seat cushion and back. By changing the pressure in the tubes, the driver can make the seat as hard or soft as he likes.

**A thin steel wire** may make it easier to keep track of migrating salmon. Color-coded or carrying information magnetically, the wire is implanted in the fish's head. At processing houses, tagged and untagged fish are separated electronically,

(Please turn to page 14)



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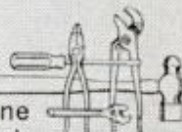
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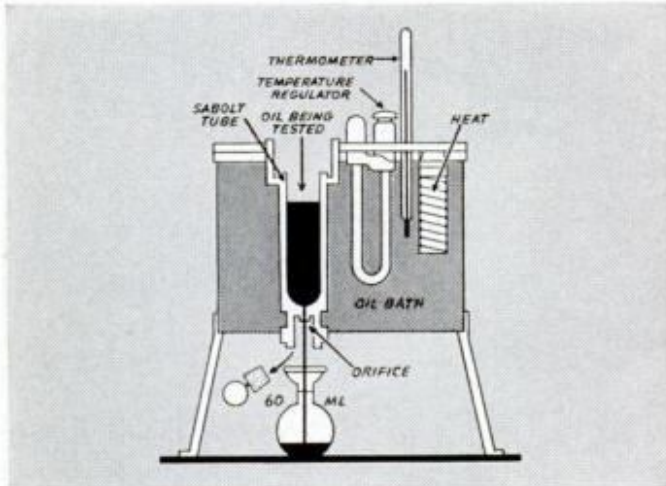
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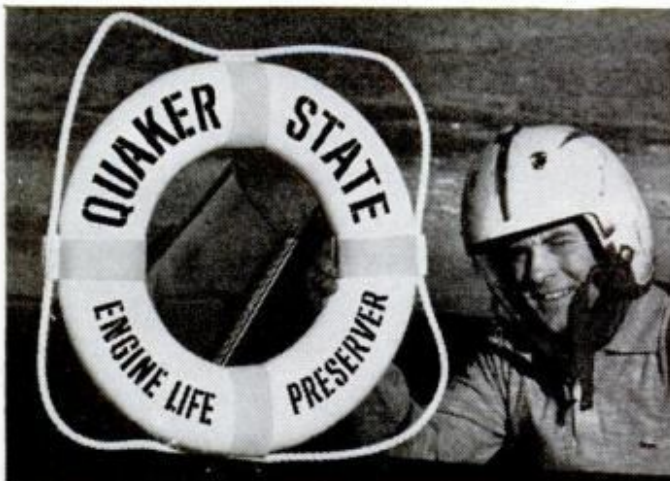




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What is the instrument in use?*



*What does this symbol stand for?*

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QUAKER STATE OIL REFINING CORP., OIL CITY, PA.

## Inventors' Corner

(Continued from page 12)

and the wires extracted for study. Patent 3,128,744 to Keith B. Jefferts and Peter K. Bergman, both of Seattle, Wash.

Heat build-ups in craft traveling faster than sound can be reduced by a water-cooled ball in place of the usual nose cone. That's the idea behind patent 3,128,964, awarded to John P. Le Bel of Los Angeles. The ball is held in the nose cavity by magnets and is rotated by an internal motor. As it rotates, it's cooled by a flow of water from within the cavity.

Location of a sinking ship or plane can be signaled by an exploding beacon. After the device fills with water, current from a voltaic battery breaks the water down into oxygen and hydrogen. Gas collects and is exploded by a spark, and then the cycle starts again. Patent 3,129,403 went to James Harter of Washington, D.C.

Heart defects may be easier to detect with an electronic stethoscope that can filter out unwanted sounds and amplify those the doctor desires to hear. Patent 3,132,208 to Donald Dymski, Eggertsville, N.Y., and Joseph Solomon, Lockport, N.Y.

A flexible armored vest won patent 3,130,414 for Theodore L. Bailey of Natick, Mass., and Edward R. Barron of Framingham, Mass. It's made of layers of plastic textile material and metal plates, and is said to provide protection equal to that of steel plates of the same weight.

A radar "eye" in the shape of a ball instead of a saucer receives and focuses microwave beams in the same way that the human eye receives and focuses light. It doesn't rotate and can receive different frequencies from different directions at the same time. Patent 3,133,285 went to Thomas J. Jordan of Ballston Lake, N.Y., and Henry T. Plant of Rotterdam, N.Y.

A person trapped in a car can smash his way out with a new tool—a metal bar with a hardened point at one end. A rigid collar near the point prevents the user's hand from sliding forward as he shatters the tempered window glass, according to patent 3,130,884, awarded to James T. Lintz of Fombell, Pa.

A hot-air stall for drying the body after a shower would eliminate the need for towels in hotels. It won patent 3,128,161 for Marie-Antoinette Hudon of New York, New York.



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The Model BT-162 will perform the services specified below in addition to many other tasks too numerous to mention:

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- Insure maximum gas economy and quiet engine running. Read the exact RPM while the engine is in neutral position. Then adjust the carburetor in conformity with the car manufacturer's recommendations.
- To locate a "miss" you need only disconnect or "short" the spark plugs one at a time with the Model BT-162 switched to the Tachometer position.
- Cars with automatic transmissions function efficiently only if the fluid pressures are correctly maintained and since manufacturer's instructions always refer to RPM, the Model BT-162 (or an equivalent tachometer) is required to properly service automatic transmissions.

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**Some dumb drivers** may be that way because of exhaust fumes. Tests by a German scientist show that rats lose mental ability after repeated exposure to carbon monoxide in concentrations about the same as is found in the air of many large cities. Possible explanation for the brain damage: Monoxide poisons the red blood cells that carry oxygen—and nerve tissues are heavy consumers of oxygen.

**Other rats** had even graver problems. They were the rodents used to test a new raticide developed by a Pennsylvania drug firm, McNeil Laboratories. Though the chemical is lethal to rats, it's said to be harmless for cats, dogs, sheep, cows, rabbits, chickens, ducks and turkeys. These critters showed no ill effects even though given doses 20 to 200 times more powerful than that needed to kill a rat.

Why is only the rat affected? "That's something we're still investigating," an official at McNeil told *PM*. "But we do know that the chemical causes cardiovascular abnormalities in rats. After the poison is ingested, the animal's extremities begin to blanch. Death occurs anywhere from within 15 minutes up to several hours."

**Measuring radioactivity** in the upper air is old stuff. Now the Japanese are measuring it in the ocean deeps. It's done with a six-foot metal cylinder full of instruments that is lowered as far down as 12,000 feet.

**Flying by stars** in the night of Arctic winter, Canadian geophysicists have completed the last two million square miles of a magnetic map of their country. An airborne magnetometer has measured the strength and direction of the earth's magnetic field along 310,000 miles of flight crisscrossing the country.

**Toy ships** are helping to keep the Suez Canal in shape. They are built on a 1-to-40 scale and towed at carefully measured speeds through a model canal of the same scale. Gauges register the force of the

little waves. Thus, the canal laboratory can predict for real vessels of different sizes and shapes the forces of the waves they will make at different speeds.

To keep bank damage within acceptable limits, the laboratory recommends holding the average tanker to eight m.p.h. Because of back pressure from the banks, a ship must put out twice the horsepower required at sea to maintain a given speed.

**A nonfogging mirror**—it just won't get steamy—is under development by a British aviation company. It's a thin sheet of plastic, like cellophane, silvered behind with an extremely thin layer of aluminum. The plastic is stretched taut on a frame and mounted to leave about a sixteenth of an inch space between plastic and backing board. Openings into this space let air move freely in and out behind the mirror. Thus, both sides of the mirror are always at room temperature, with no cold surface to condense moisture.

**The Smithsonian observatory's** satellite tracking station at Woomera, Australia, reports that it has made 20,000 successful photos of satellite passages since the beginning of the Space Age in 1957. The Australian station is one of 12 established by the observatory during the International Geophysical Year for the optical tracking of artificial satellites. At the beginning of that period, computer programs and record logs had been planned to handle only a few hundred passages. Today, every station in the network has made more than 10,000 successful photos of satellite passages.

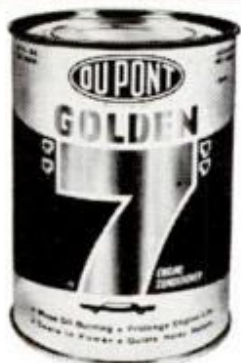
**Fast trains**—routinely doing 150 m.p.h.—can get along all right on present-day roadbeds, according to British Railway Board studies. But the engineer of a 150-m.p.h. train needs two miles advance warning of an obstruction. So the Railway Board is laying out a 3600-foot stretch of track in Scotland to test a type of "guided" radar. The radar signal would follow a conductor (a wire) set up beside the track. The signal would be led around curves and would stay close enough to the track not to return echoes from all over the countryside. The echo would, the developers hope, warn infallibly of anything on the track several miles ahead of the train.

**Bits of wire, nails** and the like often find their way into cattle feed and hence into bossy's alimentary canal, where they can cause serious damage. German scientists have developed a small metal cage with smooth sides and a magnet fixed in its

(Please turn to page 18)



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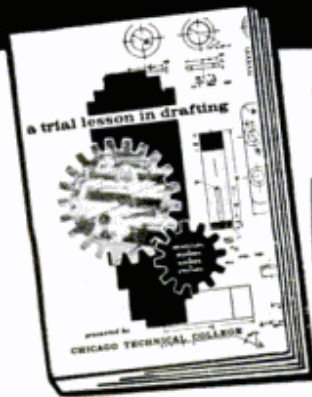
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17



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## Science Worldwide

(Continued from page 16)

center. Thrust down the cow's gullet, the device settles in one of her four stomachs and traps every stray bit of iron that comes along.

What once was only a lab curiosity now is the lightest structural metal alloy on the market. Known as magnesium-lithium (mag-lith, for short), the metal is 50 percent lighter than aluminum and 25 percent lighter than standard magnesium alloys. Mag-lith is easily worked and is especially useful where low temperatures and low stress requirements prevail.

A "swiss cheese" breakwater is making little waves out of big ones on the St. Lawrence River at Baie Comeau, Que. Holes in the new breakwater, which doubles as a wharf, make it able to absorb vast amounts of storm-wave energy. When a wave surges against the perforated wall, water flows through the holes and into a chamber. As the wave recedes, the water spills out through the holes and creates a calming action against the next approaching wave. On a solid-faced breakwater, wave action results in a vertical run-up almost twice the wave height. It's estimated that the perforated wall reduces the run-up by as much as 80 percent.

Incidence of 10 infectious diseases—most of them once regarded as "killers"—declined sharply in the decade ending in 1963, according to the Health Insurance Institute. Analysis of provisional figures (for '63) issued by the U.S. Public Health Service reveals that the most dramatic change occurred with polio. In 1953, there were 35,592 cases as compared to 431 reported in 1963. Diphtheria went from 3255 cases in 1953 to only 294 in 1963; typhoid from 2252 cases to 525 in 1963.

Other diseases on the decline include measles, encephalitis, brucellosis, meningococcal infections, tularemia, tetanus and typhus fever. But one on the upswing is hepatitis. From 33,700 cases reported in 1953, it went to 42,836 in 1963.

Viscous water, thickened by addition of an organic chemical, turns out to be a help in fighting forest fires. The chemical causes molecules to cling together, making the water 200 times as viscous (gluey) as the stuff that comes out of your tap. It clings to leaves and branches, keeping the tree wet longer. Curiously, the gluey quality is evidenced only when the water is in drops or in film. When the water is

(Please turn to page 20)



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## Science Worldwide

(Continued from page 18)

in volume, as in tanks or hoses, the viscosity almost vanishes and the water pumps and flows easily.

An automatic typewriter which runs on compressed air has been developed in Switzerland. Instead of the usual electronic circuits, a pneumatic circuit "reads" the instructions from a pattern of holes.

They're going to put the wind to work in India. Scientists are using automatic wind-recording instruments to locate the best possible sites for giant windmills to be erected to generate electricity for the country's underdeveloped regions. More than 200 smaller windmills are being built to pump water, thresh grain, grind corn and cut fodder on some of India's farmlands.

The sea turtle does not, as many people think, weep while laying its eggs. The "tears" are a normal, salt-secreting function.

"Measles" has broken out in the microfilm sections of some libraries. Spots have appeared on processed negative film, and scientists can't explain how they got there, how much of a threat they pose or what can be done about them. Government agencies, which spend vast sums yearly in microfilming records, are particularly concerned. Manufacturers are investigating.

Sticky-fingered doughnut eaters may become a thing of the past, thanks to a Marine inventor. Maj. Albert L. Protz has perfected a doughnut on a stick and has patented the idea. It's been tried before, he says, but no one has ever found a way to make the doughnut cling to the stick without falling apart. A special deep-frying machine he perfected has provided the answer.

March of progress. The plastic revolution has hit the U.S. Army Band—and in a big way. The musical organization has replaced all its big brass sousaphones with new plastic ones. The plastic's sound quality is just as good, musicians say, and relieved tuba players are quick to point out the plastic instruments weigh only 19 pounds, exactly half what the brass ones do. That's a big difference when you're marching a long way.

*John F. Pearson*  
Science Editor

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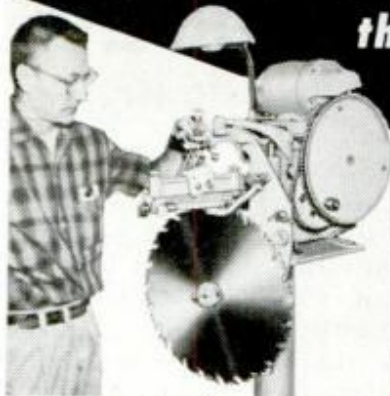


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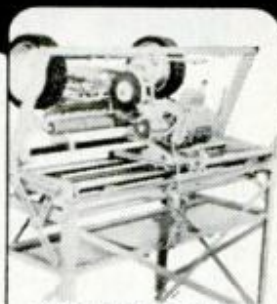
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## Sidelights from the SERVICES

By William R. Kreh

**Medium brown, please.** The Navy is testing a new bread toaster for use aboard ship. Completely automatic, it will brown up to six loaves of bread—240 slices of toast—in eight minutes. A cook merely puts in the six loaves of bread, sets the machine for the number of pieces of toast he wants and flips a switch. The machine does all the rest.

**Plastic pillow.** You can kick it like a football and not damage its contents. You can put an egg inside of it, drop it from a two-story building and find the egg unbroken. Or, you can use it to transport delicate Minuteman missile parts. Called the Tuffy Air Lock, it's a protective package now being used by the Air Force. Looking like a plastic pillow, it's 15 by 18 inches and filled with foam rubber and air. Once it's been inflated, fragile electronic parts can be suspended between the foam rubber and air, using the air-cushion principle.

**Jingle-jangle gone.** An ex-GI, remembering the trouble his Army buddies had keeping their dog tags from jingling when they moved around, is mass-producing and selling rubber rings moulded to fit around the tags and keep them quiet.

**Space-age organ.** A portable electronic organ for Army chaplains to use in the field has been developed by Army engineers. The fully-transistorized organ will replace the pedal-pumped model used since World War II. It has a four-octave keyboard, a built-in public address system and can be operated from a self-contained power pack, any military vehicle battery or any conventional electric power source. Weighing only 85 pounds, it folds into a case measuring three feet by one foot by one foot.

**Hinged homes.** A house that folds up is being studied for possible use by the Air Force which wants something it can move easily when personnel are transferred or as bases are shifted from one place to another. The house is an average-sized three-bedroom home which measures 30 by 45 feet. When it's to be moved, it is simply folded up into a neat bundle, 10 by 45 feet, and loaded onto a trailer. To ready the house for shipment, the end walls are

folded in, the floor is folded up lengthwise and the roof becomes two flaps which come down. Interior wall partitions are taken down and stored in the living room. About 100 of these portable houses are now being tested by the Air Force.

**Lightweight Loran.** A hand-carried electronic guidance system for "battlefield navigation" of men, planes and tanks is being studied by the Army and Air Force. It is claimed that the system would keep men or vehicles from getting lost—in night, fog, jungle or terrain that is featureless or uncharted. The system belongs to the Coast Guard's family of Loran aids to navigation. Called Loran-D, it is a short-range and low-powered version of Loran C. There's no difference except for size and power. Loran C provides highly precise military navigation for ships and planes over millions of square miles of the Arctic, North Atlantic and North Pacific Oceans. The "D" type uses a receiver weighing less than 20 pounds that can be carried by a platoon leader, tank, helicopter or any other vehicle at or near the front. It is so sensitive that the receiver can fix its position within an accuracy of 60 feet. By comparison, celestial navigation gives a position accurate to within about a mile.

**Ground hardener.** Army is studying the possibility of using a liquid sprayed from a helicopter to make landing sites for vertical-take-off-and-landing (VTOL) aircraft. A 'copter would spray a spot with material that hardens quickly, possibly epoxy resin, and VTOL aircraft could then land without their downward jets eroding the soil beneath them.

**Strange cargo.** Navy helicopter pilots in Maine did a double-take when their flight orders came through recently. Their job was to airlift two dozen caribou from Newfoundland to Maine's Mount Katahdin. Maine authorities swapped 400 grouse for the 24 Newfoundland animals to help replenish the fast-disappearing caribou herd on Mount Katahdin. Each beast was felled with a dart-shaped tranquilizer pellet, placed in a wooden cradle with legs trussed, blanketed in canvas and carried to its new home in a sling hung beneath the helicopter.

**Tiny tuner.** A radio receiver with variable tuning that's smaller than half of a sugar cube has been developed by the Army. Previous receivers of this size have been fixed tuned, that is, capable of receiving only one frequency. The new one has variable tuning in the 5-to-20 megacycle range.



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6



**P-47 Thunderbolts** were probably the most durable of World War II fighters and, unlike most old soldiers, they apparently aren't ever going to fade away.

A group of former P-47 pilots in the New York area recently held their second annual reunion, and have vowed to meet each year until "the last man has cut his engine on the hardstand." Their only purpose is to perpetuate the memory of the plane they affectionately call the Jug. Can any other plane make that statement?

The group meets in the Wings Club in the Biltmore Hotel in New York City and is anxious to hear from other P-47 pilots living in other parts of the country.

**Air safety** gets a going-over every time a plane crashes, with opponents decrying its dangers and proponents quoting statistics showing it's still one of the safest means of transportation.

A hearty boost for the optimists comes from the Air Force's Military Air Transport Service (MATS) which probably

keeps more aircraft in the air around the world than any other organization anywhere. It delivers troops and cargo to all corners of the globe in huge C-118s, C-124s, C-130s and C-135s and, now, none of them are carrying any parachutes for the crew.

MATS says that, based on its safety record (one accident per 300,000 flying hours), and the reliability of the performers and maintenance of its aircraft, chutes are "unrealistic."

Meanwhile, back at the airport, specifically Dulles International Airport, Washington, D.C., the Federal Aviation Agency has been testing a bomb-detecting device that could automatically and simply spot a piece of luggage that was carrying explosives. Based on detection of radiation from the explosive, the device can trigger an alarm. This could prevent deliberate destruction of airliners by dynamiting.

Also, after the recent crash in California apparently caused when the pilot and copilot were shot by a passenger, the FAA ordered that the door to the cockpit be locked at all times while the plane is in the air. This rule goes into effect in August.

*Kevin V. Brown*  
Aviation Editor

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# CLINIC FOR HOMEOWNERS

**Q** I have a room finished in knotty-pine paneling. It's quite old and is stained and begrimed from long use. I tried washing a small area with detergent but after drying the surface was spotty and streaked. Originally the boards may have been waxed. I don't know. Is there any practical way of refinishing?—Y.L., Calif.

**A** You may have to go back to clear wood in order to get a satisfactory finish, but first try washing the paneling with soft, soapy water, using a sponge or soft cloth wrung out very nearly dry. The thicker grime and any discolorations probably will yield to light rubbing with fine steel wool. Cover only a small area and allow to dry. If the results are satisfactory, proceed to treat the walls in this same fashion. Cover a small area and then rinse off the soapy residue with clean water. If the final result, viewed after the walls are thoroughly dry, suits you then the walls may be rewaxed. On the other hand, if this procedure does not produce satisfactory results, you may have to go over the walls with fine steel wool dipped in turpentine to remove all the old wax, exposing the bare wood. Remember that turpentine is flammable and that the fumes are toxic in a closed room. Have all windows and doors open.

**Q** Part of the front of my brick home is faced with stone. The individual stones are flat, averaging about 2-½ in. thick, and are laid on edge. A portion of this wall appears to be bulging outward and the mortar is loose in the joints. I'm afraid this bulge is going to loosen completely and fall off. What can I do?—W.L., Ill.

**A** If we can judge correctly at such long range the entire wall of stone, or at least that portion of it that has loosened, is going to have to be removed and relaid in new mortar. It might be a good idea to immediately number the stones consecutively with a lumber crayon or chalk so that they can be relaid in order should a portion of the wall topple before a repair can be made. This possibility may be remote but marking beforehand may be advisable. Relaying the stones is not a difficult job,



but if you don't feel up to it then, of course, you should engage a mason. When relaying the stones should be tied to the wall with metal masonry ties nailed to the wall, the free ends set into the masonry joints. Also, it's a common practice to back-fill behind each stone with new mortar as the wall is laid up. If the back-fill is laid against wood sheathing small headed nails should be driven into the wood back of each stone to anchor the mortar. Care must be taken to see that joint is mortar-filled to prevent water leaking behind the stones. Also, the joints must be pointed and brushed or otherwise tooled to match the originals.

**Q** In my new home all the plumbing lines are copper tubing. Lately we've noticed that the water has a rather objectional odor and taste. Don't know but think this is due to electrolysis, active at some point in my home as other nearby homes using the same water have no such trouble. What do you think?—H.M., Ga.

**A** Although there are many causes of objectionable odors and tastes in water, in your case this could be due to electrolysis, as you suggest. We wonder right away if a "copper-to-steel" (insulating) coupling is installed at that point where the copper tubing has been connected to steel pipe. Unless such a coupling is installed the metals generally become "active" almost immediately.

**Q** My basement floor is rather rough in some spots. I'd like to tile the floor but don't know just what to do about the rough areas. These appear not to have been properly trowled and finished at the time the floor was poured. I've been told that asphalt tile will break up if laid over these rough spots. Is there some way they can be smoothed?—T.S., Iowa

**A** You do not mention the size of the affected areas or describe the nature of the roughness. If, for example, the roughness is that of poured concrete before trowelling, then it may be necessary to level these areas with a concrete patcher. If on the other hand, the areas are relatively small and have been smoothed but not finish-troweled, then it may be possible to level the surface sufficiently by chipping down any high spots with a chisel. Either way—it's up to you to judge which of the two methods to use—the affected areas must be smoothed as otherwise the tile may break up, as you have been advised. As a rule only asphalt tiles should be laid on a basement floor.

JULY 1964



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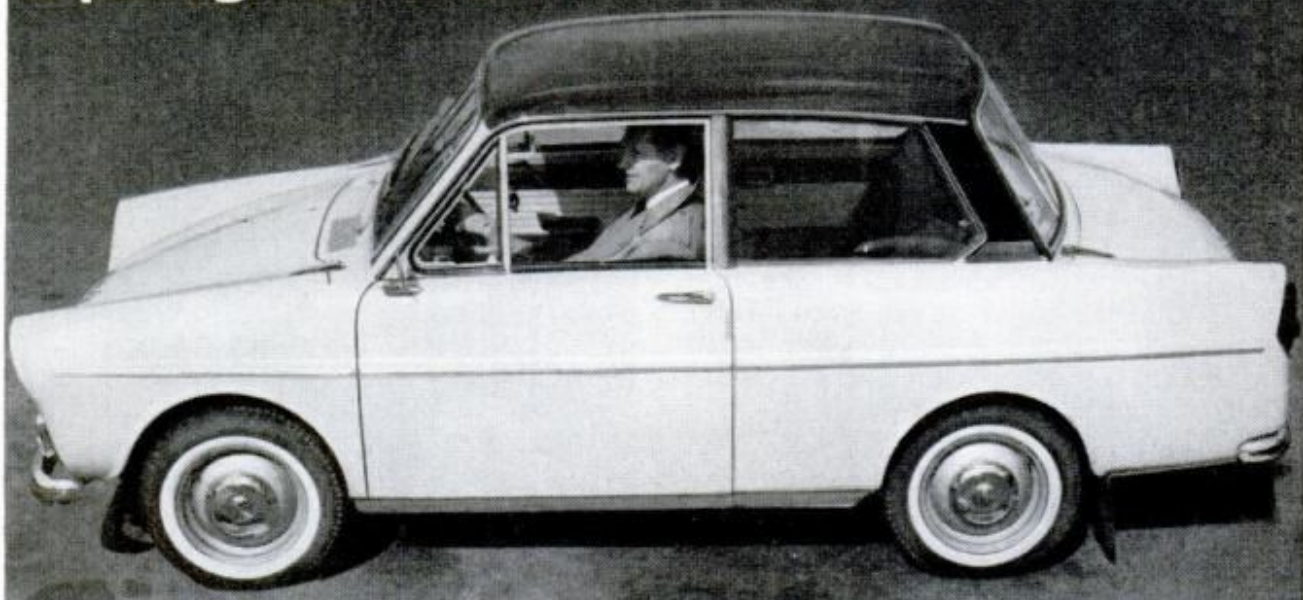


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## Spotlight on the



# Two-cylinder belt-driven daffodil

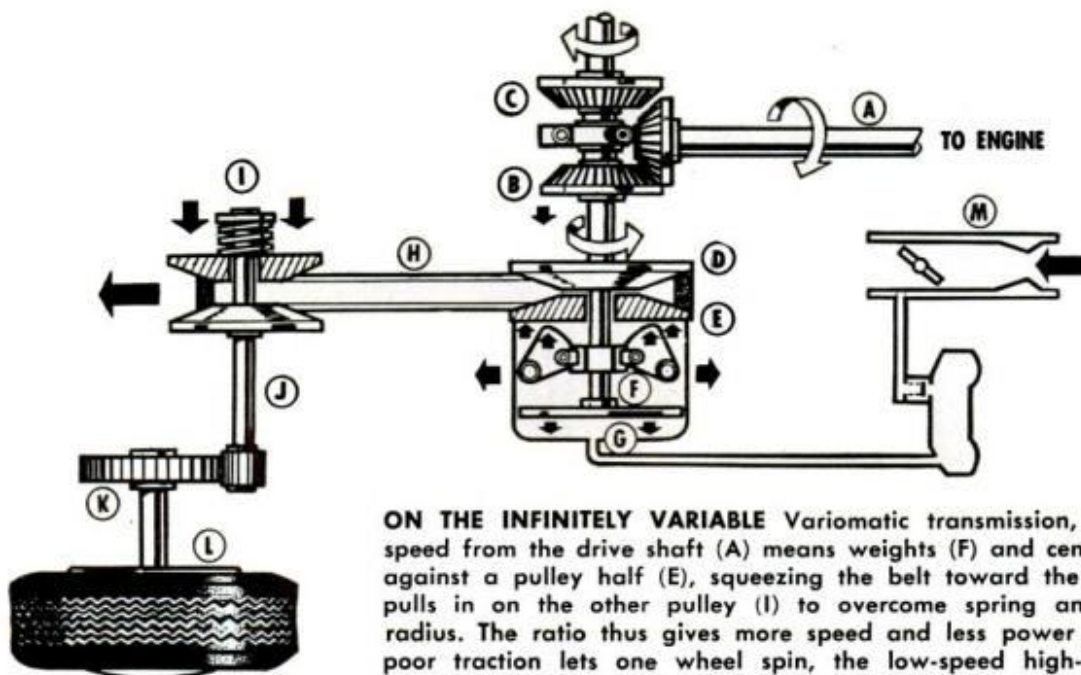
By Ed Nelson

**T**HE U.S. AUTO INDUSTRY may be the world's greatest—but the only car we have with a truly stepless automatic transmission is an import from little Holland. Standard equipment, it even includes a limited-slip-differential effect that feeds most power to the drive wheel with the most traction.

That action is basic to the belt-powered

Variomatic transmission from Daf, the Netherlands auto builder. Daf's car, a little two-cylinder buggy, has been available here—in limited numbers—since the early '50s. But with only 20 rated horsepower, it never commanded much attention. Now power has been boosted 50 percent—to about 30. And Dafs are in short supply

[\(Please turn to page 30\)](#)



**ON THE INFINITELY VARIABLE** Variomatic transmission, increasing engine speed from the drive shaft (A) means weights (F) and centrifugal force push against a pulley half (E), squeezing the belt toward the rim. Belt (H) thus pulls in on the other pulley (I) to overcome spring and reduce effective radius. The ratio thus gives more speed and less power to rear wheels. If poor traction lets one wheel spin, the low-speed high-power ratio takes effect at the other wheel. At cruising speed, slack at throttle (M) increases the vacuum against piston (G) for even more speed—giving an overdrive effect. Sliding shaft (B-C) provides for choice of Reverse or Forward motion.



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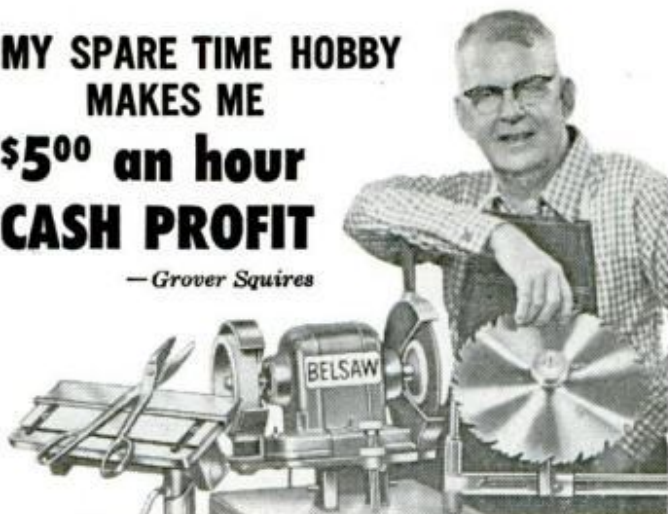
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## Spotlight on the Daffodil

(Continued from page 28)

Daf's name is taken from the initials of the Van Doorne Automobile Factory. And it was the factory's idea to tag the top trim line of the current version the "Daffodil." It has some of the characteristics of a little flower, too. It's light—in pounds as well as power. And it's docile, will never snarl back at you. Subconsciously, I kept waiting to feel a shift point—but there isn't any. Nor was there belt slipping.

Daf is more practical than pretty, however. You might find the drooping nose odd to look at, but the view of the road is excellent. You feel you could step through the windshield and right onto the pavement. Yet the fenders stand up well within view so you know where you are.

Certainly there isn't room for you to stroll around inside the car. Floor space for the driver's feet is scant. But in a car that's two feet shorter over-all than a VW, there's far more interior space than I expected. And headroom is generous, both front and rear, thanks to a relatively straight roof line. Even rear-seat knee room isn't bad, assuming you don't plan any coast-to-coast trips. Only an ad man, however, could suggest the Daf has room for more than four full-grown adults.

Seats are fully as comfortable as those in any economy import—better than most. And they're higher off the floor than many. That helps a six-footer avoid cramped legs.

The floor-mounted stick has only two operating positions, Forward and Reverse. Simple, even for women drivers. And the Daf's 30½-foot turning circle, with precise rack-and-pinion steering and midget wheelbase, will let it into parking spots hardly big enough for anything else but an Isetta—or a Lambretta.

Even though it's comparatively tiny and has a compression ratio of only 7.1:1, the air-cooled mill gives you respectable en-

gine braking, since the car's curb weight is only 1470 pounds. Four effective drum brakes have 68 square inches of lining—about 46 per thousand pounds of car. (Rambler's American has almost 54 per thousand.)

With the spare tucked behind the left-rear fender well, trunk space is unobstructed and impressive. Since the tires are only 5.20x12s, that's easier for Daf than for domestic manufacturers; even so, U.S. car builders would do well to try the same scheme more often.

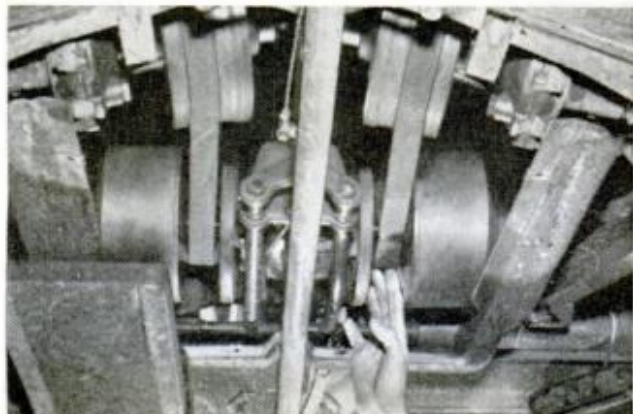
The Daf's little, horizontally opposed cylinders kick over promptly but I had to make liberal use of the manual choke, even on mildly chilly mornings.

The engine's 45.5 cubic inches displacement can't, of course, give you jackrabbit starts or thundering throughway power. But the Variomatic transmission gears down smoothly and easily in traffic so you can keep up with the crowd as it hops from light to light. In its lowest range, the belt drive gets down to a ratio of 16.4:1. Performance is fully adequate around town. You'd be content with it even on a parkway or for trips to the next town if you don't insist on darting around everyone else on the road. For cruising economy, the ratio goes to 3.9:1 over-all. My gas mileage, almost all in city traffic, was 27.1 m.p.g.

Nobody in his right mind would suggest the Daf for a long vacation trip, even though you can get close to the advertised top speed of 70 m.p.h.—eventually. The 81-inch wheelbase is, of course, prone to a lot of pitching to and fro on some rough road surfaces.

As this is written, a new Daf 750 is a rare thing, even at the importer's headquarters. P.O.E. prices begin at \$1320 for the Standard Daf and go only to \$1550 for the Daffodil. The only differences are in trim—not "essential trim" items, either. The comfortable seats, for example, are standard through all models. ★★★

**WE WATCHED A DAF** mechanic, without rushing, change both belts on a Daffodil in 10 minutes



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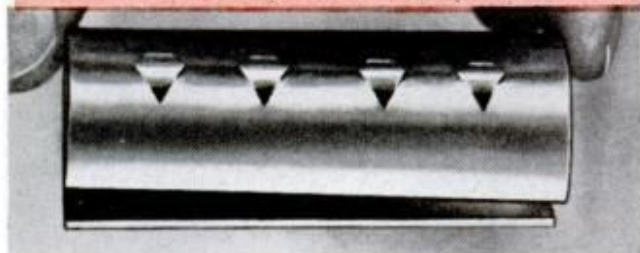
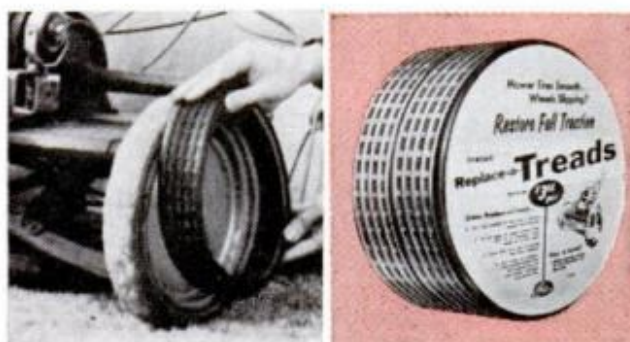
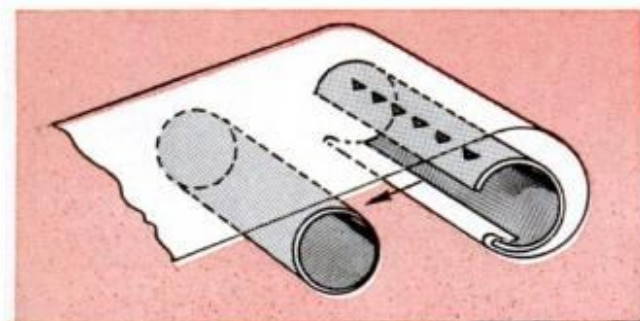
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**TO REPAIR WEBBING** on your lawn furniture, all you need is a pair of shears and some P-1 Clips. Manufacturer says job takes 20 minutes. You cut the webbing to length, wrap it around a clip and snap it onto the tubular framework. Cost 12 for \$1. Queen Products, 1234 Rowan Street, Louisville 3, Ky.



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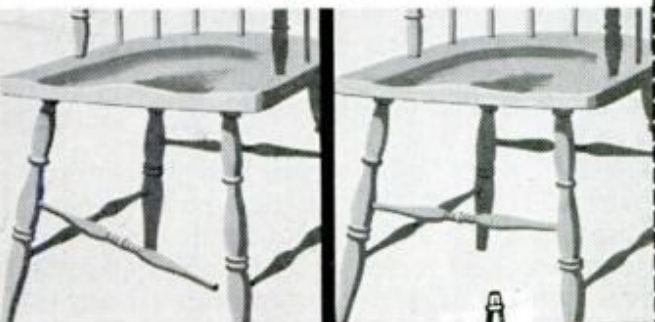
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By Jim Whipple



## Are Transmissions the Key to Mobile Run Success? Coming: Better Radial-Ply Tires with Glass Cords

Mercury Comets recently completed an event some call the world's toughest—a 3189-mile "destruction derby" known as the East African Safari.

The Safari, one of the five major international rallies counting toward the world championship, covers Kenya, Uganda and Tanganyika "roads" ranging downward in quality from passable dirt to cow path trails and stream beds. A Comet driver, Kim Manderville, described one stretch this way: "Water action over the centuries has gouged holes so large that a car can drop out of sight. I saw a Peugeot completely enveloped in one."

Six Comet Caliente two-door hardtops with V8 engines and four-speed manual transmissions were entered. Two placed in 18th and 20th place. All of them finished, although a bridge washout delayed several Comets and other competitors so long that allowed time ran out for that section and they were disqualified. Two four-cylinder English Ford Cortinas finished first and second.

Mechanically, the Comets were beefed up with heavy-duty-everything by performance specialist Fran Hernandez.

Their drivelines proved unshatterable and their one weak spot turned out to be shock absorbers. As one Comet driver put it, "I heard a loud pop after we'd passed the Kenya-Uganda border, and then the rear end started "kangarooing" all around. The only thing to do was to find a torch and weld the mountings back on the chassis."

The only other mechanical problem of note was a malfunctioning of ignition breaker points on one Comet.

What did it all prove? Well, not much that the average U. S. motorist ever needs to know. But it teaches a manufacturer what needs to be built into a car to make it better able to take such uncontrolled punishment—such items as unbendable wheel rims and unbreakable shock absorber mounts, for example.

These can then be packaged into heavy duty kits suitable for buyers who expect to give their cars a bad time on "bad" roads. There are such people, you know. Men like the rural mail carriers in many

mountain states, oil-field workers or cabbies in small farm-surrounded towns.

Back home in the USA, the considerably less exciting Mobilgas Economy Run was proving entirely different things about U.S. automobiles.

As always, the cars were completely stock, being purchased at random by USAC officials. The one we drove from coast to coast this year was a full-size Dodge Six, and we won second place in Class E, behind a Plymouth Six.

Rambler American's over-all and class win, 27.83 miles per gallon, was predictable. It's a light car which uses the industry's smallest carburetor and most economical axle ratio (2.7 to 1).

Of greater interest, perhaps, was the showing of some medium-sized cars with weights of over 3000 pounds. The Buick Special V6 got 25.29 miles per gallon from a 225-cubic-inch engine. The Plymouth Six and our Dodge Six both got over 25 miles per gallon from 225 cubic inches. And both weighed 3300 pounds. Even more impressive were the Buick Special V8 and LeSabre, which share the same 300-cubic-inch V8. The curb weights of these cars are 3360 and 3870 pounds and they turned in 23.74 and 21.6 miles per gallon respectively.

What most of these cars had in common over their competitors was a winning combination of lighter weight (in only one or two cases were weights about even), and more efficient automatic transmissions. Never underestimate the ability of a transmission to give you good—or-poor—fuel economy.

Firestone and Owens-Corning Fiberglas have announced new tires with glass fiber cords and radial plies. The cords are placed directly across the tire body from bead to bead, instead of at an angle.

Corning's Dr. Alfred Marzocchi reports that these radial tires will give greater fuel economy, longer tread life, quicker steering response and better cornering.

He also claims that the glass fiber cord will not have some of the objectionable characteristics of the rayon and steel cords now used, particularly the stretching of rayon and the ride harshness of steel cord.





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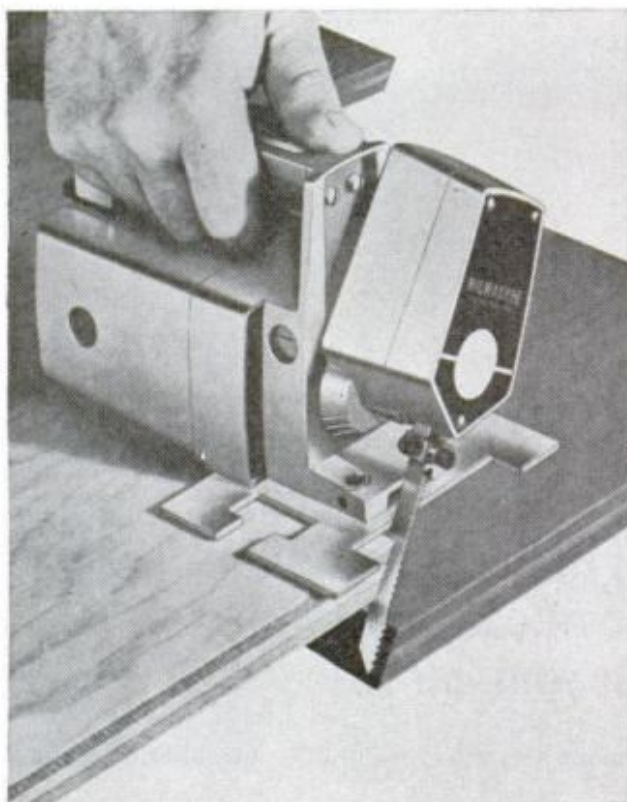


# Shopping for Tools

**WITH THE L3-X STAPLER**, you can fasten ceiling tile directly to gypsumboard or rock lath. Lets you drive a second staple over the first. The second one spreads its prongs outward, giving extra holding power. Takes 12 sizes of staple. Price, \$15.50. Markwell Manufacturing Co., 424 W. 33 Street, N. Y. 1, N. Y.

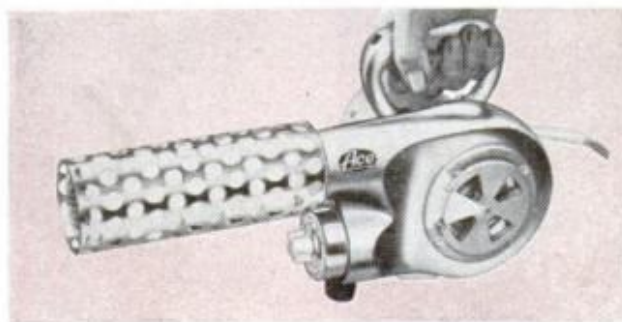


**SAWZITT MODEL 6250** is a ¼-hp. saber saw that has a pivoting head. The saw remains upright even when making 45-deg. miter cuts. Weighs only 5 lbs., gives 3500 ¾-in. strokes per min. Sells for \$69.50 with 11 blades and combination circle and rip guide. From Milwaukee Electric, W. State St., Milwaukee 8, Wisc.

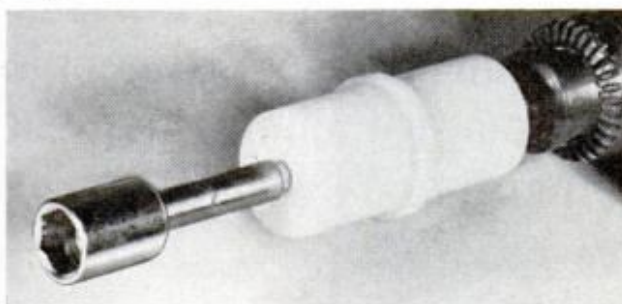


**EVEN THE FRAILEST HOUSEWIFE** can drive masonry fasteners with the Shur-Set. You place a fastener in the tool's mouth, press the mouth against the wall and strike a couple of times with a hammer. Fastener said to hold 200 lbs. Costs \$3.95. Ramset Division of Olin, 460 Park Avenue, New York 22, New York

**HEAT WITHOUT FLAME:** The Ace Model E-3 electric blow torch can deliver up to 1000 deg. F., with no flame. Operates on 115 volts a.c. Temperature is regulated by an air intake valve. The insulated nozzle is cool enough to touch during operation. Costs \$150. Ace-Sycamore Inc., 448 DeKalb Ave., Sycamore, Ill.



**CONVERT YOUR ELECTRIC DRILL** to a power socket wrench with the No. 4441 Power Nut Driver. Comes complete with five basic sockets—¼-in., ⅜, 1/32, 3/8 and 7/16. Drives both square and hexagon-head bolts. Retail price is \$2. Coastal Abrasive and Tool Company, Inc., 42-33 Northern Blvd., L.I. City 1, N.Y.





**FLASH NEWS!**

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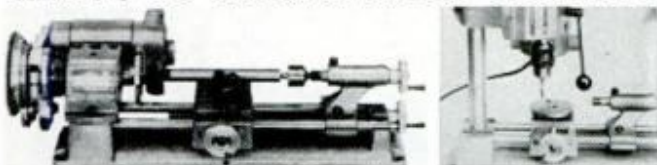


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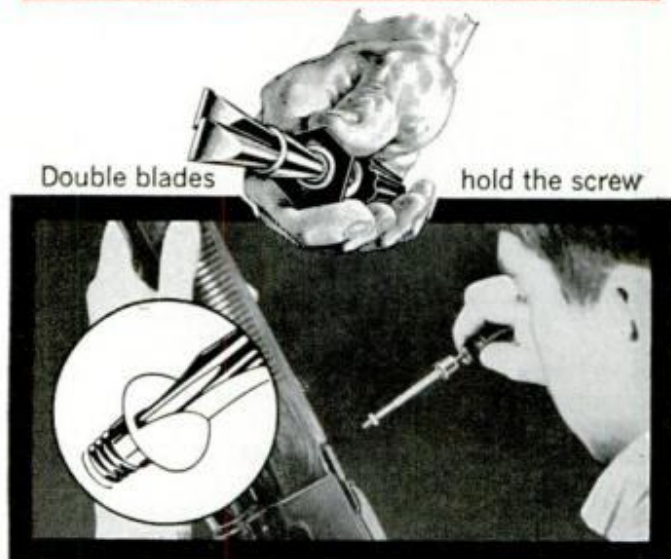
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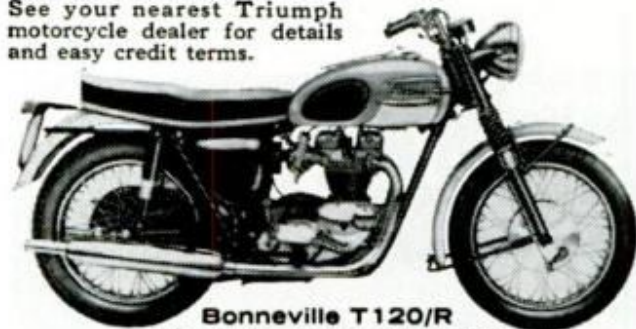
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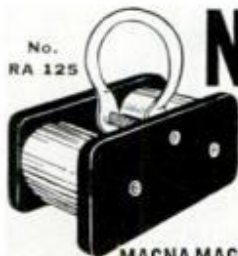
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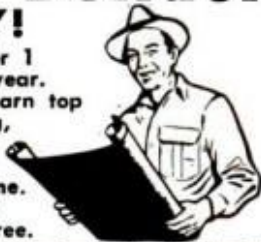
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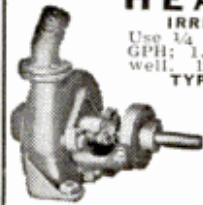
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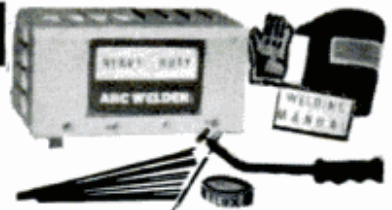
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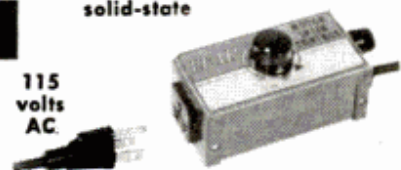
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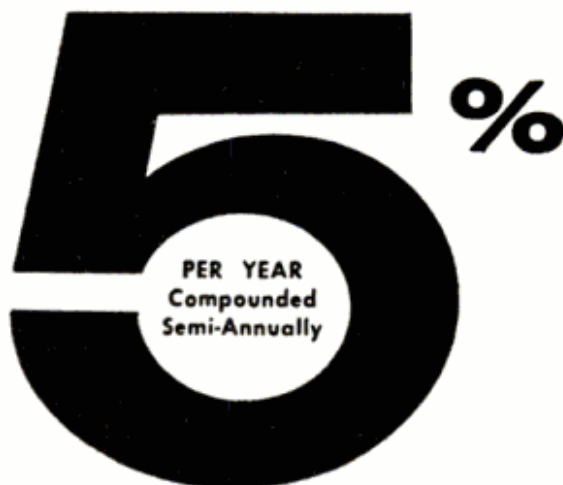
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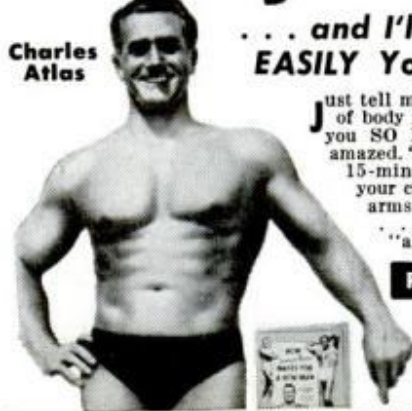
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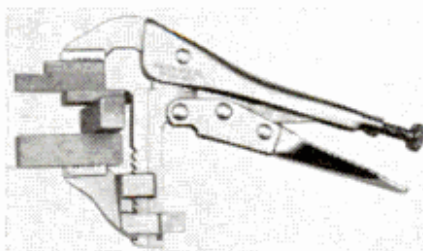
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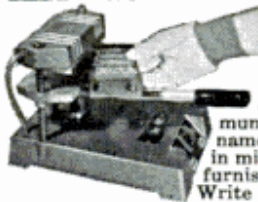
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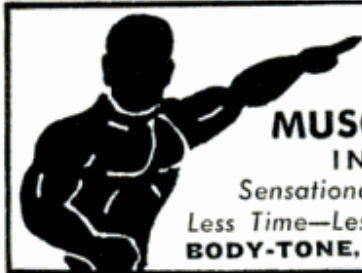
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NEW YORK World's Fair, 1964, exclusive set 100 35mm. 2"x2" color slides, \$14.99 plus 28¢ postage. Biggest selection high quality slides available anywhere. Catalog free. Blackhawk Films, 423 Eastin-Phelan Bldg., Davenport, Iowa 52805.

## BUSINESS OPPORTUNITIES

OPERATE Profitable laminating business. Write JSSCO, 2623-P Columbus, New Orleans, Louisiana 70119.

MAIL Order Merchandise that sells-repeats. Generous profits. Orders drop shipped. New offer sent each month for one year. Literature imprinted in your name. Details free. General Enterprises, Box 303, Island Park, New York.

MAILORDER Baby Merchandise. Drop-shipped. Your own catalogs. Literature free. Arcoa, Box 61, Forest Hills 75, New York.

BAKE New greaseless doughnuts in kitchen. Stores buy output. Start spare time. Profit 29¢ dozen. Small appliance. Free recipes. Montgomery, 3605 South 15th, Minneapolis 7, Minnesota.

HIGH Income franchised business. No capital needed. Midwest, Box 38, Mt. Prospect, Illinois.

SPARETIME Income. Companies offering opportunities, \$1.00. Meredith Atkins, Calhoun, Illinois.

MAKE \$32 From 49¢ piece vinyl. Free details. 1834-PM Edgeland, Louisville, Ky. 40204.

YOUR Own auto parts business! No investment. Full or spare time. Profit opportunities kit free. C. B. S., Tarentum 25, Pennsylvania.

FREE "Franchise Profit Letter" tells how unique NFR service is helping thousands seeking profitable businesses. Write today. National Franchise Reports, W-528, 333 North Michigan, Chicago 1.

FREE Copy money-making mail order newsletter. Address Newsletter, 3207-PM Southern Hills, Springfield, Missouri 65804.

76 MILLION Prospects! Immediate profits! Selling Champion, AC, Autolite spark plugs. Precision reconditioned, silvery-plated, guaranteed 10,000 miles. Up to 308% profit. Free samples, details. Indy 500 Spark Plug Co., 4620 Braeswood, Houston, Texas 77035.

\$70.00 WEEKLY—home, spare time. Simplified mail bookkeeping. Immediate income, easy. Auditax, 34741a, Los Angeles 34.

MAKE \$46 From square foot plywood: jigsaw necessary. Free details. Woodart, Bridgewater, Mass.

HOW And where to raise capital. Details free. Financial, Box 785-PM, Springfield, Missouri 65801.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

PIANO Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning, Box 327, Shenandoah Station, Miami, Florida 33145. (Founded 1935).

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Quarter brings sample and special offer. Mailtrade, P.O. Box 357, Sheboygan, Wis. 53082.

EARN Money raising fishworms for us! Write: Oakhaven—38, Cedar Hill, Texas.

COPUBLISH "Mail Sale Advertiser," leading mailorder paper. Copy and details 25¢. Vanroy Shirk, Lebanon, Pa. 17042.



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

**\$400.00 MONTHLY** Raising giant fishworms. Soilless method. Charlie Morgan, Bushnell, Florida.

**PLASTERCRAFT** Molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

**WORLD'S Largest** wholesale supply. Buy from 679 American, European, Japanese wholesalers. Tailormade suits from Hongkong. 123 dropship catalogs. Rock-bottom prices. Free details. International Buyers, 216-MM Jackson, Chicago 6, Ill.

**WANT To make big money at home?** \$10.00 profit in an hour possible with invisible mending. Make tears, holes disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 1585 Howard, Chicago 26, Ill.

**BUY Direct** from factories. Appliances, cameras, watches! Free details! Cam Co., 436 P.M. Bloomfield Ave., Verona, N. J.

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

**LIQUID Molding rubber,** free information. Chaney's, 5415-A San Jose Blvd., Jacksonville 7, Fla.

**SELL Champion, AC, Autolite** spark plugs. Reconditioned, electroplated, guaranteed 10,000 miles. 100% profit. Free sample. Lee Plugs, 1608-A Roberts, Houston 3, Texas.

**OPERATE Home mailorder business.** Vosacek Printing, 4444AI Ute, San Diego, 17, Calif.

**RAISE Rabbits** on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

**PROFITABLE Catalog mailorder business!** Vikari's, 468-PM, Third Avenue, Salt Lake City, Utah 84103.

**MILLIONAIRE Possible!** Fabulous offer free! Universal, Box 675, San Antonio 6, Texas.

**HUGE Profits!** Mail order importing. Free information. ITIS-P7, Box 454, Hollywood, Calif. 90028.

**DOLLS! Dolls! Dolls!** We teach you to make, repair, dress and sell. Study at home. Earn while learning. Free booklet. Doll Hospital School, Studio MC-74, 11826 San Vicente Blvd., Los Angeles 49, Calif.

**MANAGE Motel or resort.** Men, women, couples can make high salary plus apartment. Pick your own location with our employment assistance. Learn at home. Free Booklet. Motel Managers Training School, Dept. PMC-74, 612 So. Serrano, Los Angeles 5, Calif.

**LEARN Landscaping** and the growing of plants. Start a profitable business part or full time. Free information without obligation. Lifetime Career Schools, Dept. MC-74, 11826 San Vicente Blvd., Los Angeles, Calif. 90049.

**EVERYBODY Needs vitamins.** You can profit. Write: Research, South Whitley, Indiana.

**AMAZING Manufacturing opportunity.** Free list of manufacturing formulas. Presler Oil Company, Fostoria 16, Ohio.

**\$34.70 TWO Hours** manufacturing concrete products. No selling. Castings #3, Box 1721, Rapid City, South Dakota.

**SELL Books** by mail. 400% profit. Royal, Box 450-X, Cleveland 27, Ohio.

**EARN \$10,000** Selling books by mail. Box 51-BY, Des Plaines, Ill.

**PLASTICS—Cash in now** with my new home producers "no-selling" plan. I supply everything—even financing! NPC, Box 2321-A, Los Angeles 23.

**MAIL Baby catalogs** to new mothers for big profits! Details, catalog 25¢. Volz-PM, Ypsilanti, Michigan.

**MAKE \$50.00 day** demonstrating improved double-gloss stay new car polishes. Also hand cleaners, polish cloths. Write: Norman Wiggs & Co., 1406 E. 52nd St., Los Angeles 11, Calif.

**SPARE Time earnings.** With your table-saw, bandsaw or jigsaw. Write: Workshop, A3800 Harney, Vancouver, Washington 98660.

**SELL Advertising book matches.** Write us today; we put you in business by return mail, handling complete line ad book matches in demand by every business right in your town! No investment; everything furnished free! Top commissions daily! Superior Match, Dept. MX-764, 7530 S. Greenwood, Chicago 19, Ill.

**IMMEDIATE Profits** with no capital or experience. Take orders for all magazine subscriptions. Friends and neighbors are your prospects. Write now for complete, free kit. McGregor Magazine Agency, Dept. CB5, Mount Morris, Illinois.

**INVESTIGATE Fires, storm damage, accidents** for insurance companies. Pays up to \$1,000 a month, part or full time. No college necessary. Car furnished; expense paid. We train you at home in spare time. Keep present job until ready to switch. Pick your location. Men badly needed now. Full information free. Write Liberty School, Dept. C-51, 1139 W. Park, Libertyville, Illinois.

**OWN Your own Western Auto store.** Over 4,000 now operating. Minimum investment \$14,000. Free training. No retail experience necessary. For complete details write C. M. Wilson, Room 951, Western Auto, 2107 Grand, Kansas City, Missouri. (Indicate geographical area preferred.)

**MILLIONAIRE Possible,** fantastic sales pyramid. Sample \$2.50, details free. Liquid Glass Auto Polish, 745 E. Baseline, San Dimas, California.

**IMPORT-Export opportunity,** profitable world-wide, mail-order business from home, without capital; or travel abroad. We ship proven plan, for no risk examination. Experience unnecessary. Free details. Mellinger, Dept. M707, Los Angeles 25.

**"HOW To Establish Your Own Successful Mail Order Business,"** new information packed, 24 page booklet free. Direct Mail Guides, Inc., PM-C7, 4227 Herschel Building, Dallas, Texas.

**SECRETS! Secrets!** Mail order success revealed by internationally famous expert who discovered how to make home business fortunes. Beginners: Get free copy "How to Make Money in Mail Order." Discloses free advertising, profitable products, everything! No obligation. Write Malico, 1554 Sepulveda, Dept. M707, Los Angeles 25.

**MAKE Extra money—show friends, neighbors—Gifts, Stationery, Christmas—All Occasion Cards.** Experience unnecessary. Salable Samples on approval. Free Catalog. Free Name Imprinted Christmas Card Album. Hedenkamp, 361 Broadway, Dept. PM-88, New York.

**FLOCK-Print technicians** earn profits—Experts guide you—Screen Process Printing. Spray Flocking. Earn profits in fascinating industry or your own profitable home-business. Revealing samples, Career Fact Book. "50 New Home-Business Ideas" Booklet—All Free! Flock-Print School, 6816-AZS West Romaine, Los Angeles 38, Calif.

**RAISE, Sell dogs.** Big market. Interesting business. Profitable. Free details. Aven, Box 925-P, Jacksonville 1, Florida.

**BELOW Wholesale.** 400,000 items. Free lists. Dean's, Box 40-PM, Elberton, Georgia.

**FREE Book "990 Successful, Little-Known Businesses."** Work home! Plymouth 772G, Brooklyn 4, New York.

**FREE Facts—on how to operate a profitable local meat market.** Write: Darrow, 2504-P Indian Trail, Traverse City, Mich. 49684.

**MAILORDER Miracles** can be yours! Get started right. Rush 25¢ for literature. (Refundable). F. M. Burns Co., 640 So. Minahan, Napa, Calif.

**PUBLISH Local journal.** We print, you retain 100% advertising profits. Details \$2.00 (refundable). "Bargainads," 5 Bairdston, Georgetown, Ontario.

**MAILORDER Highly profitable** learned from professionals. Free information. Hicks' 838 West Tharpe, PM7 Tallahassee, Florida.

**PROFITABLE Mail order business.** Be independent. Details free. Ideal, Box 357-DD, Valley Stream, N.Y.

**INTERNATIONAL Mailorder business** made easy. Complete setup service, not just instructions. Hermes, 152 West 42, New York City 10036.

**DISCOVER The secrets of mail-order.** How to make money. Beginners: How to test for an automatic success. Details free. San Juan Sales Co., P.O. Box 1049, Dept. M1, Durango, Colo.

**FREE, 20-page "Mailorder Beginners Bulletin."** Neil H. Tasker, Shamokin, Pennsylvania.

**SMALLEST Advertisement,** biggest profit. Operate renter-check system from home. Edburg, 1804 Lakeshore, Austin, Texas.

**FREE Catalog.** 1001 Money-making plans, formulas, ideas. 25¢ to \$25.00. Charles Company, 42-Av, Norwood, Ohio.

**\$200.00 WEEK** with your telephone. Complete instructions \$3.00. Day's, Box 526, Alameda, California 94502.

**400,000 BARGAINS** below wholesale! Some free. Liquidations, job lots. Free details. Bargainhunters Opportunities, Box 730-A, Holland, Michigan.

**EARN Money** in your spare-time shoe business. Get cash, free shoes, big prizes. No investment. Ask for free kit. Chester, Dept. 819, Brockton, Mass.

**YOU Can make a fortune** buying and selling Government Surplus! New policies make buying easy for individuals. Complete information \$1.00. Nationwide Surplus, Box 1942-A, Grand Rapids, Michigan.

**START Part time** and you will soon go full time. Profitable business free details. BMC, P.O. Box 121, Gardena, California 90247.

**AMAZINGLY Profitable business** selling books by mail! Free catalogue. Amendt, Box 4562-MC, Whittier, California.

**LEARN Sewing machine** repairing. To \$125 weekly. Sparetime. Supplies. Add to present business. Write today! Taylor Service, Box 484, Cupertino, Calif.

**BECOME Tax consultant.** Graduates earn \$1,000-\$3,000 every tax season preparing returns evenings. State approved. National Tax Training School, Monsey O-2, N.Y.

**BIG Money.** Learn electric appliance repairing at home in your spare time. How automatic washer-dryers, refrigerators, and all kinds of appliances work, how to find what's wrong, using the Christy electronic trouble tracer, how to fix them. We show you how to get business, what to charge, how to buy parts wholesale. Make \$5-6 per hour by operating your own fix-it shop in your kitchen or basement. No previous experience or training required. Enroll now—pay later from earnings. Send for free book. Christy Trades School, 3214 W. Lawrence Ave., Dept. A-5803, Chicago 60625.

**TREMENDOUS Profits** in mail order selling. Details free. MM, Box 1156, South Miami, Florida.

**OWN Your Company—initial investment** can be returned within one year. Unique 25¢ car wash business with no personnel. Coin operated. No inventory worries. Simple records. Good income. No labor cost. Make money while you sleep! Write U Du Car Wash Inc., Suite 307, 3435 Broadway, Kansas City, Missouri.



**GET** Into custom upholstery. Turn old furniture into big money spare time. Re-upholster chairs, divans like new. Make custom slip covers, drapes. No experience required. We supply everything. Write for big free illustrated book on easy home instruction and how we start you in big money home business. Modern Upholstery Institute, Dept. U296, Fallbrook, Calif.

**INVENTIONS.** New product ideas for manufacturers. Write us product types of interest to you. Kessler Sales, Dept. C-57-1B, Invention Brokers, Fremont, Ohio.

**DISTRIBUTE** New air-operated vacuum cleaner to service stations. Protected territory. Inka Industries, 2409-M Crocker, Houston 6, Texas.

**OPERATE** Real estate, insurance agency. Pass state examination. Free details. Nationwide, 28 East Jackson Blvd., Suite 1204AA, Chicago 4, Illinois.

**CO-DISTRIBUTORS** Wanted. Details and sample magazine 50¢. Marcedo, 731 Casita Way, Los Altos, Calif. Send 50¢ now.

**REPAIR** Hydraulic jacks. Details free. Write: Hydraulic Parts Supply, 3000 Mountain, El Paso, Texas.

**RAISE** Cash to make money with. We show you how. Free proof. Counselor, Box 331, Harlingen 17, Texas.

**BOOKKEEPERS.** Accountants. Operate a bookkeeping service. Part or full time. Amazing simplified system. Wonderful money-making opportunities. Complete information free. National Bookkeeping Service, Suite 307, 3435 Broadway, Kansas City 11, Mo.

**YOUR Own Business!** It takes talent to equal the \$1000 a week earnings of the successful mail order operators. If the challenge is to your liking we can supply the best and latest in scientific business methods used by the modern "Soldier of Fortune" in the mail order field. Send \$2.7 day money back guarantee. K. C. Research & Services, Dept. 5, P.O. Box 1423, Kansas City, Mo. 64141.

## MONEYMAKING OPPORTUNITIES

**ATTRACTIVE** Mail offers. Free literature. Eaton's, 708PM Gold, Centralia, Wash. 98531.

**MAKE** Money doing research, survey, sparetime. Send 25 cents for details. Dodson, 115 S. Forth, Nyssa, Oregon.

**START** Your own home mailorder business, sparetime! Easy: Fascinating, profitable! Alfano, 19-PM Pine, Closter, New Jersey.

**FREE** Report: 609 unusual, successful businesses. Box 122-PZ, Wheeling, Illinois.

**TESTED** Proven Mailorder methods. Literature free. Arco, Box 61, Forest Hills 75, N.Y.

**PAINT** Signs for yourself—others! Easy with our letter patterns, supplies. Also "Raised Letters." Paulow, Crystal Falls, Michigan 49920.

**JEWELRY** From Hawaii will make you money. Details free. Chandler's, Wailuku, Hawaii, Dept. 37.

**LEARN** How to invest in new U.S. coins. Make 20% to 300% profit yearly, without risk! Guerinet, 154 Masseth Street, Rochester 6, New York.

**LEARN** The secrets of repairing junk batteries. "Fabulous Profits" at home. Details. Batteryman, Prunedale P.O., Salinas, California.

**CIGARETTES.** Make 20 plain or filter-  
tip for 9¢. Factory-fresh pipe tobaccos. Mild tropical flavored Philippine cigars. Facts free. Moberly, Box 4027, Owensboro, Kentucky.

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

**EARN** \$240.00 a month at home, spare time, doing only two \$5.00 invisible mending jobs a day. Big money paid for service that makes cuts, tears disappear from fabrics. Steady demand. Details free. Fabricon, 1532 Howard, Chicago 26, Ill.

**BAKE** New greaseless doughnuts in kitchen. Sell stores. Free recipes. Melvin, 3605 South 15th, Minneapolis 7, Minn.

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

**LIQUID** Rubber, molds, plastercraft kits, hobby supplies. Sample and catalog 10¢. Wooley Company, Box 29-B, Peoria, Illinois.

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

**MAKE** It big! Sell mailorder manuals. Tremendous market. Profits up to 495%. Free details and sample circulars. Rutward Publications, 125 Bryant, Columbia Station, Ohio.

**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-HH, Chicago 26.

**EARN** \$1000.00 month operating Book-keeping Tax Service. Details free. Universal Bookkeeping, Box 664, Springfield, Missouri.

**BECOME** A Notary Public! Win extra income, prestige, business contacts. Details free. Stationers Exchange, P.O. Box 617, Kilgore, Texas 75662.

**BOOKKEEPING** System. Substantial profit selling Start Service. Kern, Box 263, North Hollywood, California.

**ABC's** Of window trimming. Free information. Box 557, Whittier, Calif.

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

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

**IT'S** True. It's free. Successful mail order our way. Just write. Worldwide, Box 4026, Station H, Columbus, Ohio.

**ZIP-GRIP** Clothesline needs no clothes pins. Terrific moneymaking opportunity. Free details. Zip-Grip, Bloomsburg, Pa.

**TREMENDOUS** Profits from new coins! Free details. Hickman, Box 4108-H, Memphis 4, Tennessee.

**ARTISTIC** Interiors. Cast tile, brick, stone, plaques. Changeable letter signs. Wholesale catalog. Duchess, 1005 First Ave., Des Plaines, Ill. 60016.

**DROP-SHIP** Your way to a mailorder fortune. Publication \$2.00. Payne, 1024 Lydick, Fort Worth, Texas.

**MAKE** Money in mail-order. Details free. Pacific, Box 292, San Gabriel, Calif. 91778.

**NET** \$7.00 Hourly using muriatic acid. Absolutely proven, detailed plan—\$1.00. Valchemco, Box 382, Orem, Utah.

**MAKE** Money writing short paragraphs! No tedious study! I tell you what to write, where and how to sell, and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C27-U, 6216 Clark, Chicago 26.

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**WANTA** Win a contest? We'll help! Puzzles, prizes, pointers and particulars. Send buck for year's trial subscription. Spence, Box 11569, St. Petersburg, Fla. 33733.

**SUCCESSFULLY** Learn photo oil coloring. Expert home training for good income by mail. Free booklet. Hollywood Enterprises, 1023P, N. Hyperion, Hollywood, Calif. 90029.

**INVESTIGATORS** Earn big incomes. Learn this exciting business. Free details. T. F. Trader, 210 Fifth Ave., New York 10, N.Y.

**RAISE** Venture capital. Simplified methods. Tested sources. National Counselor Reports, Harlingen 5, Texas.

**WORLD'S** Greatest Collection "Money-Making Ideas." \$1.00. Phelps, 133 Pacific Bldg., Salem, Oregon.

**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 bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-2-HH, 1512 Jarvis, Chicago 26, Ill.

**"PROFITABLE"** Home work guide 35¢. Humphreys, 3210 Purcell, Grand Prairie, Texas 75050.

## PROFITABLE OCCUPATIONS

**PROFITABLE,** Home work guide 35¢. Humphreys, 3210 Purcell, Grand Prairie, Texas 75050.

**PHOTOGRAPHS** And color slides wanted. To \$500.00 each. Information write Interphoto, Box 74607, Hollywood 90004.

**BECOME** Independent with your own franchise business. Thousands earning handsome incomes. Request interesting facts today. National Franchise Reports, PM-528, 333 North Michigan, Chicago 1.

**CHROME** Plating. Instructions, equipment and supplies. Platers' Supply, P.O. Box 565, Lugo Station, Los Angeles, Calif.

**RAISE** Pheasants on \$100 week plan. Little capital and space can make you independent. Free details. Great Central System, Columbus 1, Kansas.

**BAKE** New greaseless doughnuts in kitchen. Sell stores. Free recipes. Michael, 3605 South 15th, Minneapolis 7, Minn.

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

**EARN** \$240.00 A month at home, spare time, doing only two \$5.00 invisible mending jobs a day. Big money paid for service that makes cuts, tears disappear from fabrics. Steady demand. Details free. Fabricon, 1586 Howard, Chicago 26, Ill.

**SHARPEN** Scissors, pinkers, clippers. Inexpensive machines, supplies. Blackhaws, Sheldahl, Iowa.

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

**NEW** Amazing portable 49¢ meal. Direct selling dealers—wholesalers wanted. Enclose \$1 for three meals. Comidex Corporation, New Canaan 9, Connecticut.

**FREE** Report: "609 unusual, successful businesses." Box 122-PA, Wheeling, Illinois.

**CEILING** Tiles. New way to fix acoustical tiles to bare joists without strapping. Earn extra \$100.00 a week in your spare time. Send \$2.00 for 100 sample clips and full instructions. Summit-Seal, Box 4796, Richmond, Va. 23229.

**LEARN** Civil and criminal investigation at home. Earn steady, good pay. State age. Institute Applied Science, 1920 Sunnyside, Dept. 16B, Chicago 40, Illinois.



**INVESTIGATE Accidents.** Earn \$750 to \$1,000 monthly. Men urgently needed. Car furnished. Expenses paid. No selling. No college education necessary. Pick own job location. Investigate full time. Or earn \$8.44 hour spare time. Write for Free Literature. No obligation. Universal, CPM-7, 6801 Hillcrest, Dallas 5, Texas.

**FREE Book "990 Successful, Little-Known Businesses."** Work home! Plymouth 77G, Brooklyn 4, New York.

**BETTER Yourself!** Become a professional accident investigator earning up to \$1,000 monthly operating own business. Or, as insurance company Investigator with car furnished, expenses paid. Simplified home training in spare time. College unnecessary. Insurance investigators urgently needed. Free employment help. Free booklet. No obligation. United Schools, 628C, 1626 Glendale, Orlando, Florida.

**"66 PROFIT Making Tips"** for home mail profits: Request free details. Mертmann, 209 Herkimer, N. Bellmore, N.Y.

**MAKE Money** writing short paragraphs. Information free. Barrett, Dept. C27-UA, 6216 No. Clark, Chicago 26.

**MONEY:** Become finance broker part or full time. Ra-Mar, P.O. Box 482 Desk 3, Oklahoma City, Oklahoma.

**WHOLESALE Magazine subscriptions.** Highest commissions! Bonus! Box 151WA, Freshmeadows, N.Y. 11365.

**BIGGER Profits,** more repeats, more money selling quality teargas devices. Randim, 7024 Wisconsin, Bethesda, Maryland.

**MONEY—Become a finance broker** full or part time. Ra-Mar, Box 482, Desk #3, Oklahoma City, Okla.

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**MAKE Tremendous spare time income,** as much as \$100 a week, selling highest quality gifts, novelties and greeting cards. Write for samples on approval. Robinson Cards, Dept. 501, Clinton, Mass.

**RAISE Rabbits** for us on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

**PRINTING.** Advertising salesmen—Excellent moneymaking sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Ralco, XL, Boston 19, Mass.

**YOUR Own business—Used suits \$1.50;** overcoats 65¢; mackinaws 35¢; shoes 12½¢; ladies' coats 30¢; dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 2109-AA Roosevelt Road, Chicago 8, Ill.

**ESTABLISH Your own business.** Low prices on used clothing, shoes, household goods. Unlimited profits. Free catalog. Northwestern Distributors, 2129 No. Western Avenue, Chicago 47, Illinois.

**RUN Spare time greeting card-gift shop** at home! Show friends samples of new 1964 Christmas. All-occasion greeting cards, gifts! Take orders. Earn to 100% profit. No experience needed. Try without cost! Special fund raising plans for organizations. Rush name for samples on approval. Regal Greetings, Dept. 173C, Ferndale, Michigan.

**MEN! Women! 60% profit on cosmetics.** Famous nationally advertised Hollywood Cosmetics pay 60%. Make \$25 day up. Hire others. For free samples, details, write Studio Girl, Glendale, California, Dept. 23J46.

**MAKE Extra Money—show friends, neighbors—Gifts, Stationery, Christmas—All Occasion Cards.** Experience unnecessary. Salable Samples on approval. Free Catalog. Free Name Imprinted Christmas Card Album. Hedenkamp, 361 Broadway, Dept. PM-88, New York.

**SALESMEN Make big profits** selling "do-it-yourself" sign kits to merchants. Information free. Signmakers, Inc., Dept. PM4, Box 6626, Denver 16, Colorado.

**DOES A \$10,000 a year shoe business** sound good to you? Absolutely no investment required. Write for full details. Chester Shoes, Dept. 818, Brockton, Mass.

**MAKE Big money** soliciting delinquent accounts. Prospects everywhere. Terrific commissions. General Finance Co., Dept. SG-73 Pickwick Bldg., Kansas City, Mo. 64106.

**"FREE Dealer Price List"** wigs, hair pieces, supplies. Home of the Shur-Lee Wigs, P.O. Box 3823, Sarasota, Fla.

**AMAZING Christmas card profits!** Make 75¢ on \$1.25 assortment; \$75.00 on 100. Extra bonuses, 230 new, easy money-makers. 50 Name-Imprinted Christmas Cards and beautiful \$1.25 everlasting rose arrangement free with approval assortment. Creative, 4401 Cermak, Dept. AD-AA, Chicago 23.

**BE The Popular Mechanics representative** in your neighborhood and earn big profits in your spare time. Write Popular Mechanics, Room 7A, 250 West 55th St., New York 19, N.Y.

## SALESMEN—DISTRIBUTORS

**DISTRIBUTORS Wanted** for established toy business. Literature on request. Richard Holley, 3579-15A, Parsippany, New Jersey.

**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 32nd, Dept. C-74Y, New York 16.

**\$1,000.00 A Month** for making dramatic 3-second demonstration of amazing lightweight Presto Fire Extinguisher. New chemical used by airforce, snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free kit. Merlite, 114 E. 32nd, Dept. P-66Y, New York 16.

**SELL 60 sec. tubeless tire repair.** Free samples. Details. PM Box 15092, Tampa, Fla.

**IF You're interested in making money** in selling, see the hundreds of exceptional opportunities in Salesmen's Opportunity Magazine. Send name for your copy, absolutely free. Tell us what you're selling now. Opportunity, 848 N. Dearborn, Dept. 17, Chicago 10, Illinois.

**EARN Big commissions** full or part time. Show America's largest line low priced business printing and advertising specialties. Big free sales kit samples hundreds items used daily by business people. Build profitable repeat business. Start right now. National Press, Dept. 8, North Chicago, Illinois.

**SELL Advertising book matches.** Write us today, we put you in business by return mail; handling complete line ad book matches in demand by every business right in your town! No investment; everything furnished free! Top commissions daily! Superior Match, Dept. M-764, 7530 S. Greenwood, Chicago 19, Illinois.

**MAKE Extra money** selling advertising matchbooks. Free catalog and sales outfit. Matchcorp, Dept. PM-74, Chicago 32.

**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 Bro's, Desk 30175, Louisiana, Missouri.

**DISTRIBUTORS Wanted** for razor blades. Buhl, Box 34, Princeton, Florida.

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**ENGINEER** Evaluates design, construction, utility appearance, marketability of patented, unpatented inventions. Whitehurst, 27 School, Boston, Massachusetts 02108.

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**INVENTIONS** Wanted. Patented; unpatented. Tremendous manufacturers lists. Global Marketing Service, 2420G 77th, Oakland 5, California.

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**INVENTIONS** Needed immediately for manufacturers. For additional information write Kessler Corporation, C-57-IW, Fremont, Ohio.

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## By Leonard Seiden

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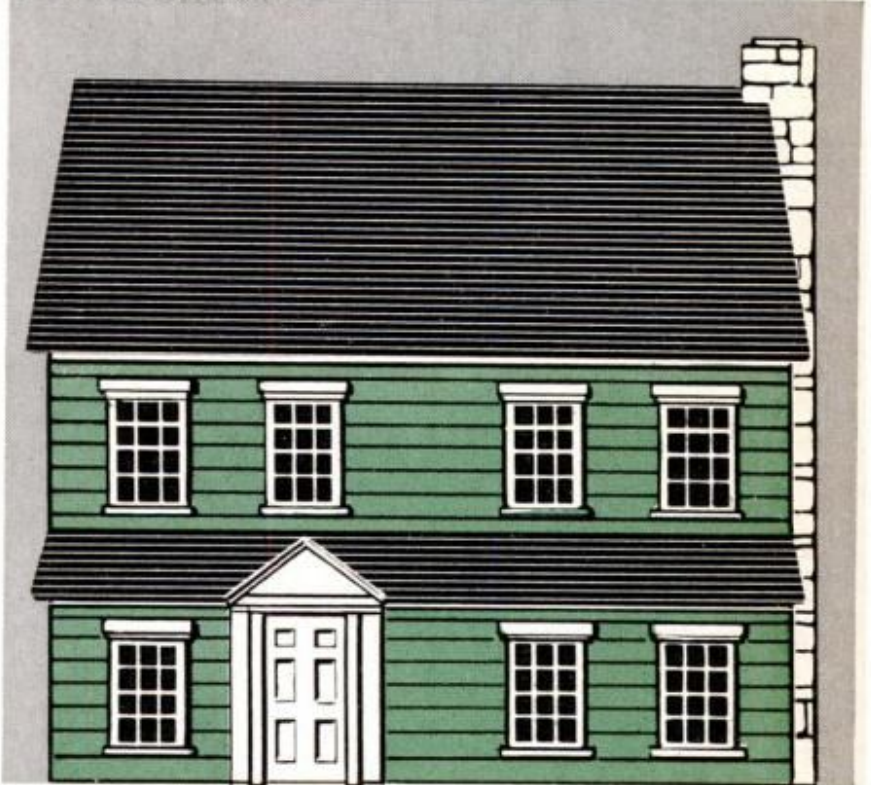
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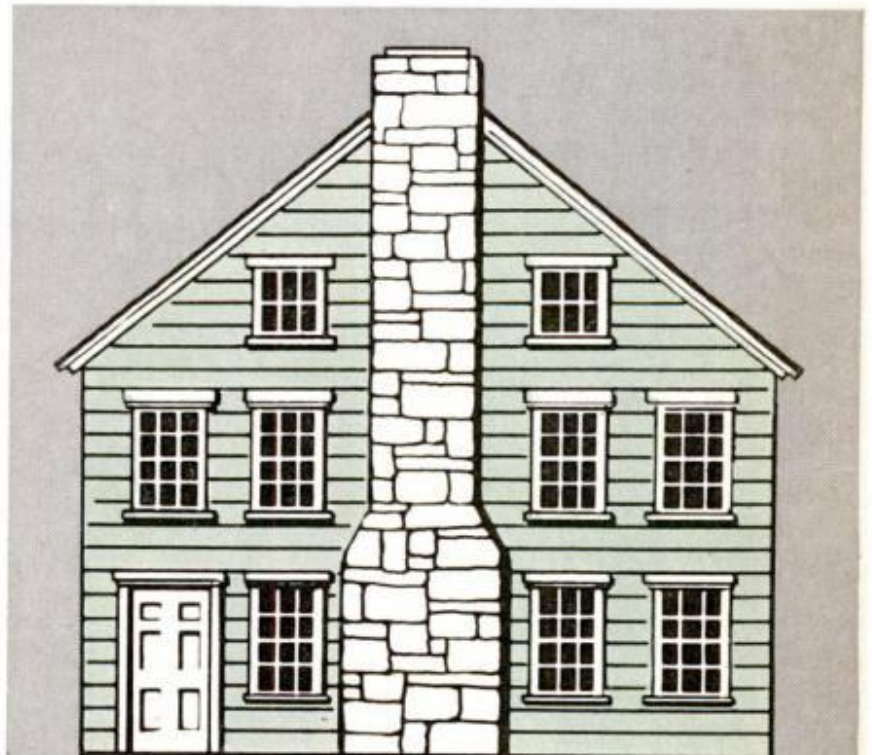
More years to the gallon

JULY 1964

(A dramatization.)



Bill's house.

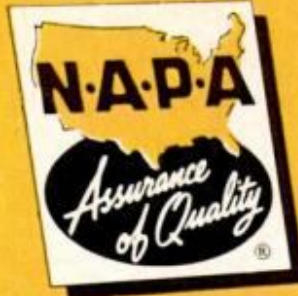


Jim's house.

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# How Pros Make Racers Out of Stock Cars

By Jim Whipple

Photos by Don Hunter

**FIREBALL ROBERTS** gets a new right front tire in Atlanta 500 race for Grand National stockers. Constant left hand turns strain the right front tire and wear it faster

*How stock is a stock racer? How is a passenger car made to resist the fierce 170 m.p.h. pounding which kindles grease and melts inner tubes?*

**W**HAT DOES IT TAKE to turn a two-door hardtop into a fire breathing, 170-m.p.h. Grand National Race car? To find out, *PM* went to the Charlotte, N.C. plant of Holman & Moody, who have "set up" most of the big Ford Galaxies that have worked the NASCAR circuits for the past three years.

"Just how 'stock' is a stock car?" was the first question we asked of H&M's organizer, John Holman.

"They're a lot more stock than people think," Holman replied. "Most of the power in that 426 (cubic inch) engine is built right in at the factory. What we do is make sure that it delivers its maximum potential and keeps on doing it hour after hour on the track."

Holman pointed out that the addition of non-stock parts, such as the oil cooler, is not so much to alter drastically the car that you can buy in the showroom and drive to the supermarket, but to enable the car to go racing.

"The engine is a good example," said Holman's partner,



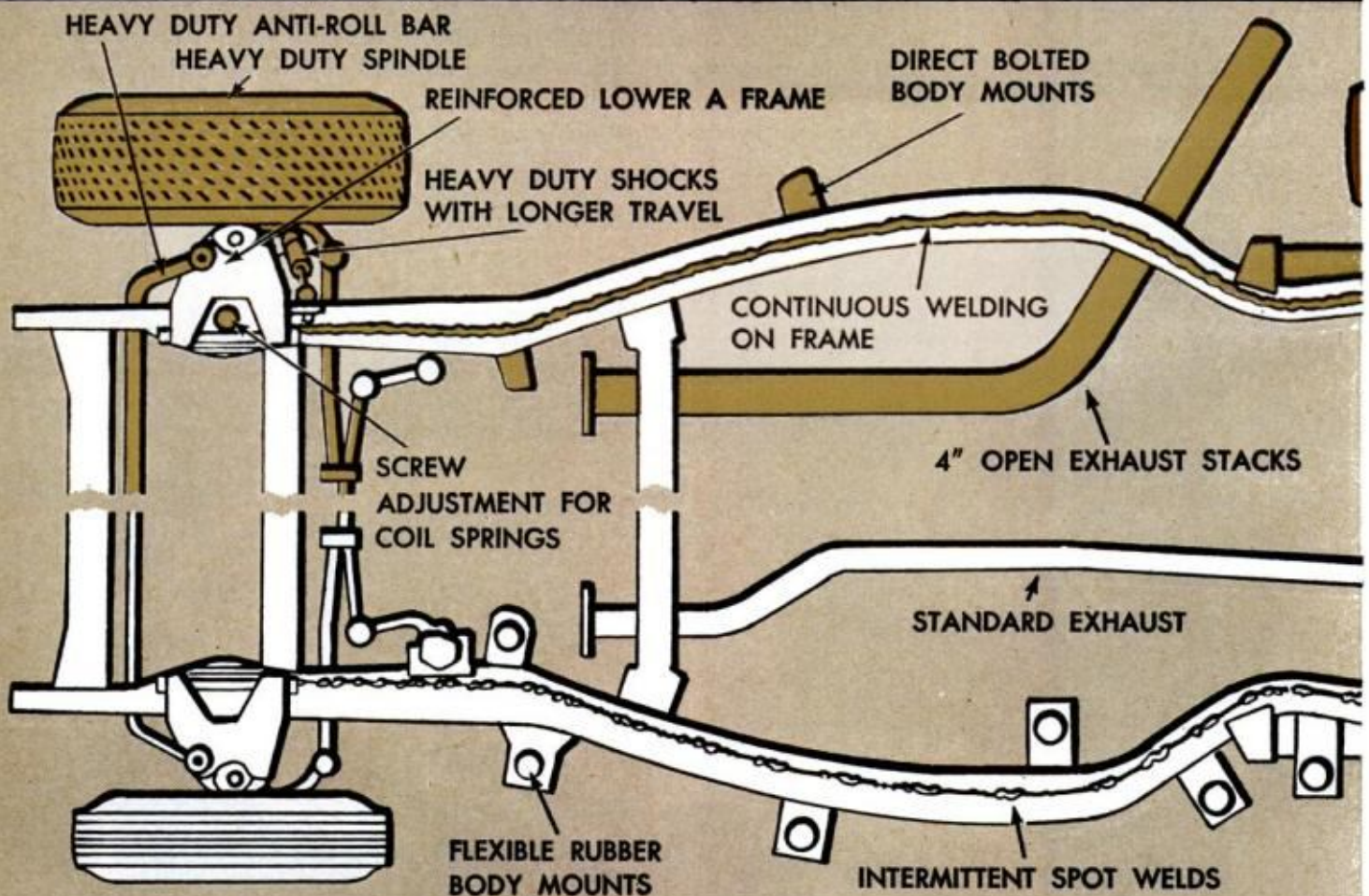




**PLASTIC BAG** follows every contour of combustion chamber. Water needed to fill from calibrated tube shows its capacity in cubic centimeters



**SCREW** in front spring pocket bears on upper end of coil via a plate. Turning screw in or out increases or decreases spring rate, tunes chassis



**HEAVY DUTY ANTI-ROLL BAR**  
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**HEAVY DUTY SHOCKS WITH LONGER TRAVEL**

**CONTINUOUS WELDING ON FRAME**

**SCREW ADJUSTMENT FOR COIL SPRINGS**

**4" OPEN EXHAUST STACKS**

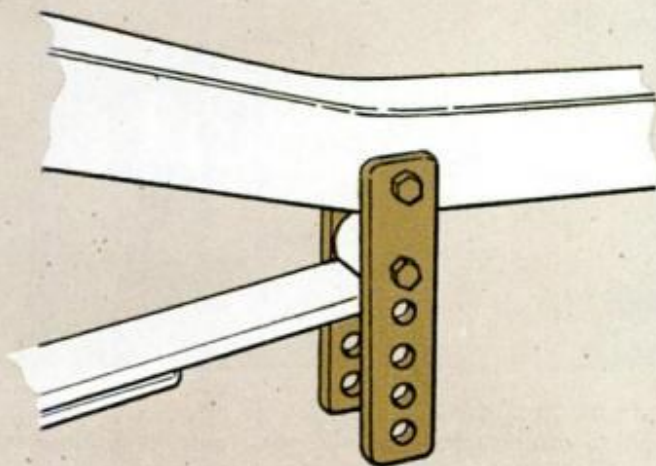
**STANDARD EXHAUST**

**FLEXIBLE RUBBER BODY MOUNTS**

**INTERMITTENT SPOT WELDS**

**TWO HALVES** of a Ford stock car chassis with the "Before" or strictly "stock" version at the bottom. Upper half shows modifications made by Holman & Moody to improve handling and make the car safer and strong enough to last





**CHASSIS TUNING** is facilitated by this multiple hole rear spring hanger which permits car to be raised on one side for stability on banked tracks

OVERSIZE 15 x 8.50 WHEEL AND 8.50 RACING TIRE

ADJUSTABLE REAR SPRING SHACKLE

FULL-FLOATING AXLE  
HEAVY DUTY HUBS  
HEAVY DUTY SHOCKS  
WITH LONGER TRAVEL

SEMI-FLOATING AXLE,  
STANDARD 7.50 x 14 TIRE



**BRAKE DRUMS** are drilled out to allow cooling air to flow through. Before NASCAR permitted this, brake heat in short track races melted inner tubes

Ralph Moody. "NASCAR permits almost no modification; it races just about the way it comes from the crate. About all we do is 'blueprint' it."

Blueprinting an engine, as practiced by H&M, means that it is torn down and brought to exact engineering specifications.

"What we do," said Moody, "is to turn production into perfection."

In bringing one of the big V8s up to racing form, H&M experts balance all pistons and connecting rods to within a fraction of a gram. Pistons are 'sized' to give uniform clearance in cylinder bores. Crankshaft balance is checked. All bearings are carefully fitted for uniform clearance.

Incidentally, racing engines are fitted on the "loose" side to keep friction as low as possible and to permit a greater volume of oil to pass between bearing surfaces and remove the heat generated at continuous engine racing speeds of 6000 to 7000 r.p.m.

At the upper end, the mating surfaces of block "decks" and cylinder heads are milled flat to within .005 inch. This is done to provide an absolutely leakproof seal to prevent gases from passing out between combustion chambers in the head and the cylinder bores.

To insure an even more perfectly balanced engine, H&M technicians "CC" the combustion chambers. CC-ing consists of inverting the cylinder heads (with valves and plugs in place) on a bench so that the mating surface is absolutely level. Then a thin, soft plastic bag is placed in the com-



bustion chamber so that it clings to every contour of the cast iron chamber. Water is then let into the bag from a calibrated tube until the water level reaches the very top of the combustion chamber cavity. If the capacity of the cavity does not 'take' the number of cubic centimeters of fluid specified by the engine builder, it is enlarged by careful grinding.

After "CC-ing," all combustion chambers are maximum in permissible capacity and the engine runs more smoothly because of the equal size of fuel charges.

Valves and valve gear are carefully fitted and balanced but remain stock in every respect. Ford-supplied solid valve lifters are used. Any polishing or enlarging of valve ports is prohibited. So is the grinding away of any mismatching of manifold to cylinder head flanges. Naturally, H&M attempts to mate manifolds and heads to minimize interference with gas flow.

Exhaust manifolds are fabricated from steel tubing in the form of individual header pipes which flow together and lead into the giant exhaust stacks.

### Special Pan Baffling

The carburetor is a stock Ford four-barrel. A larger oil pan is fitted with special baffles to keep centrifugal force from pulling oil away from the pump intake when the car is cornering at high speed.

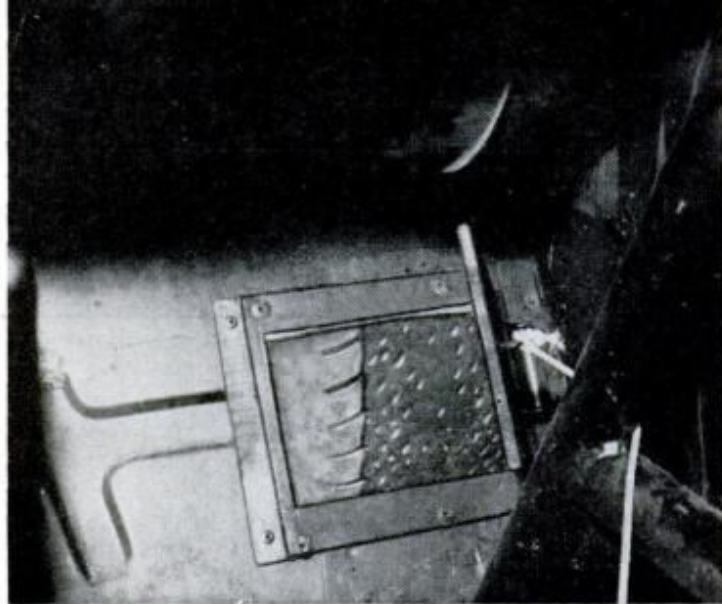
Oil capacity, including the Cessna aircraft cooler tucked away next to the over-size radiator, is increased from five to eight quarts to aid in cooling. The oil pump is stock but pressure is increased to deal with the greater clearances and bearing loads.

Engine blueprinting at H&M also includes careful balancing of clutch and flywheel.

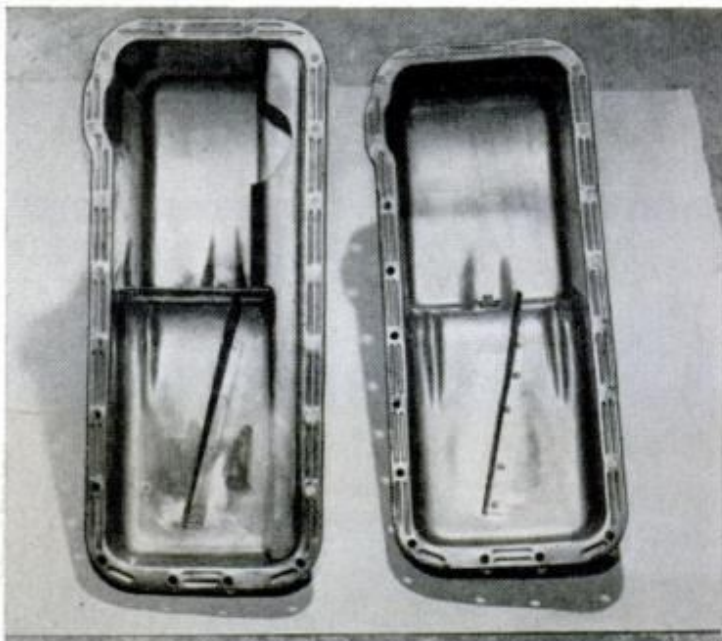
When an H&M treated engine, placed on the dynamometer, has a rating not over 450 horsepower at 5500 r.p.m. or 485 at 6000, the engine is rejected for racing.

Mounted in the car the engine gets an extra boost at high speeds on the track due to the ram air that crowds down the cowl-top grille and then forward into the giant air cleaner shroud. At 160 m.p.h. the air pressure will raise a column of water in a pressure gauge six inches and it is, in effect, a form of supercharging. In a race these engines turn up well over 500 horsepower.

With this kind of power on tap the problems begin to pile up for the men who set up the Grand National cars. These problems fall roughly into three categories: 1) Safety, 2) Handling and 3) Reliability.



**TRAP DOOR** in toeboard opens when driver pulls lanyard to inspect condition of right front tire during race. Thus he can tell when to pit for a new shoe



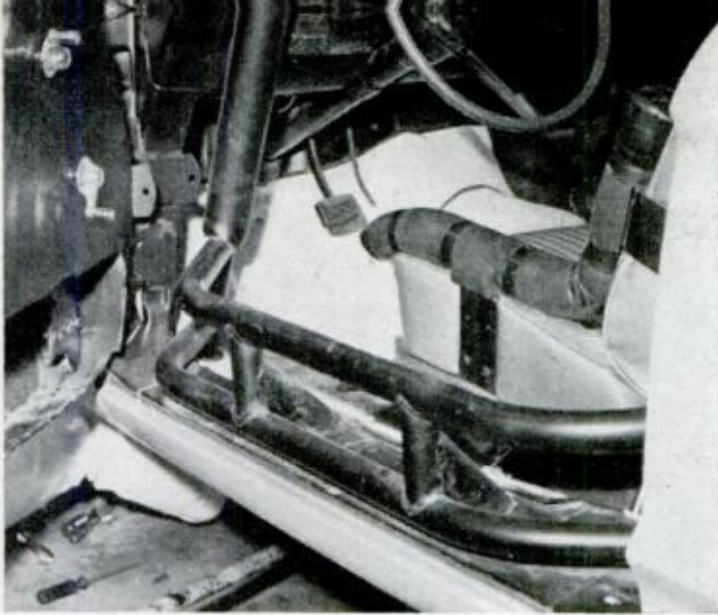
**BIGGER SUMP**, left, holds extra oil, keeps it cooler. Special baffles keep oil from surging away from pump intake and "starving" engine when car is in turns

On the first count NASCAR's president Bill France tolerates no compromise. All potential danger spots are backstopped as soon as they are discovered.

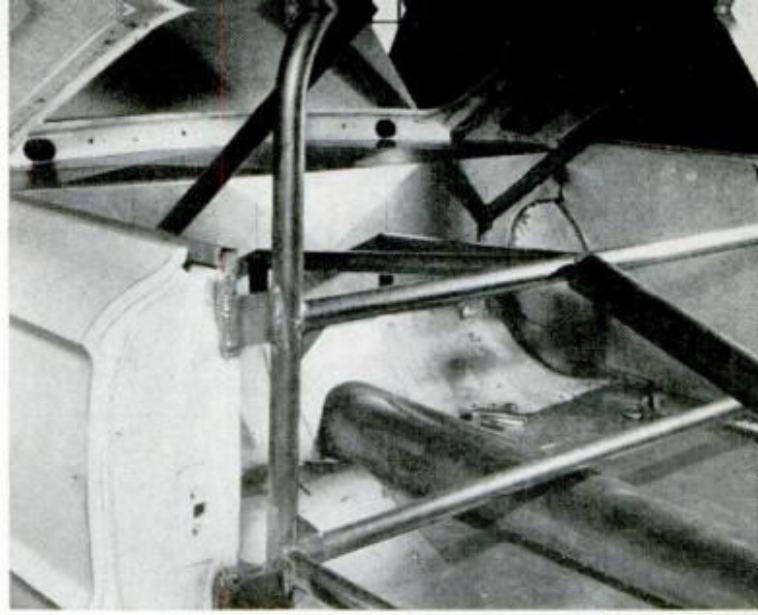
An example is the rollover cage, a life-saving structure of steel pipes surrounding the drivers inside the car bodies. Cage protection was great for rollover and end-over-end crashes, but no additional protection was thought to be needed on the driver's left side. After all, weren't there frame rails and body structures, reasoned the car builders?

Then in one race, a car took a heavy impact right in the left hand door. The driver, belted securely in his bucket seat, had his hip broken as the other car's





**DRIVER SAFETY** is top consideration of NASCAR officials who decreed addition of crash bars at left door sill. This protects driver in event of side impact



**ROLL CAGE** protects driver on all sides, is actually a frame within the body. It is fastened to car's frame and branched both in trunk and cowl structure



**RAM AIR** comes down through the ventilation slots but instead of cooling driver it is ducted through firewall into shroud around giant air cleaner. At 160 m.p.h. this air pressure will raise water in a gauge six inches

bumper crumpled through the door sheet metal.

Now all cars running the NASCAR circuit have two protective side rails welded into the roll cage, and the lefthand door paneling is hollowed out to clear them.

#### **Nothing to Shatter or Burn**

Other modifications in the interest of safety include welding the entire length of the frame flanges to increase strength over the factory's intermittent welds, removing all the side window glass as well as all upholstery headliners and door panels, etc., thus eliminating anything that might shatter or burn.

As an additional precaution, all steering

and front suspension parts are Magna-fluxed to check for possible microscopic flaws.

NASCAR's Bill France feels strongly that the Grand National Racers should be kept as close to what the factory delivers as possible, but in the interests of keeping the cars going out on the track, he welcomes modifications which make sense.

#### **Air Scoops for Brake Drums**

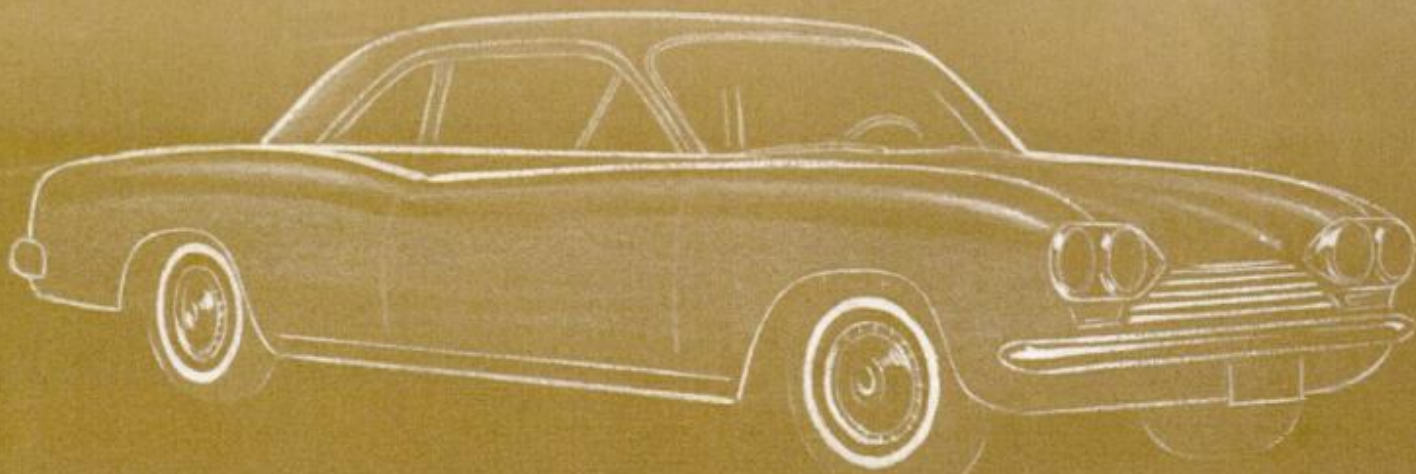
A prime example of such a modification is the addition of air scoops on the brake backing plates to direct cooling air inside the drums.

Ralph Moody explained that in spite of

[\(Please turn to page 188\)](#)



# What the 1965 Cars



1965 CORVAIR will have longer, softer and less boxy shape with touches of Corvette Sting Ray lines, Chevelle and Buick Riviera. Only the platform chassis and engine transaxle unit will be relatively unchanged for 1965

*A restyling splurge, better brakes and transmissions, round-shouldered tires—these are some goodies waiting behind Detroit's 1965 chrome curtain*

**P**ONTIAC BORROWS a transmission from Ford. Ford, in return, borrows a characteristic styling theme from recent Pontiacs.

In short, the pot's boiling, and 1965 promises to be an energetic new model year in Detroit.

Add in a new Corvair that looks like the offspring of a Chevelle-Corvette marriage—new round-shouldered, low profile tires that will allow a trend back to 15-inch wheels—add more disk brakes, a smaller variety of better automatic transmissions, a sprinkling of new engines—add all these together and you begin to get a fair notion of what next year's cars will be like.

The big trend, though, will be in stem-to-stern restyling. More major body changes will be made in U.S. automobiles for 1965 than have been made in any model year in the last decade. Here, according to the best information we can obtain from Detroit's insiders, is how these changes shape up:

Corvair will no longer look like a

slightly misshapen cake of soap. It will also lose the "rim" effect that now runs completely around the body at the belt line. Instead, the 1965 Corvair will resemble a blend of Chevelle and Corvette—somewhat miniaturized, of course—with perhaps a few cousinly touches from Buick Riviera. The result? More of a sports car look to compete with Ford's fast-selling Mustang.

Corvair is also slated for a big-windowed "fastback" hardtop but it will probably not reach the market until the Spring of 1965.

The basic engine-in-the-rear chassis and flat air-cooled Six engine Corvair uses will be virtually unchanged

**Chevrolet, Buick, Oldsmobile, Pontiac, Cadillac.** You can expect Chevrolet to be a larger version of Chevelle with more rounding of the edges, a more pronounced Bunky Knudsen dip-and-rise at the rear door, and a tapered trunk instead of Chevelle's flat "transom" stern.

In fact, look for more curve or "tumble-home" in the side panels of most of the full-sized GM cars. This will give them a mildly barrel-sided look in place of the flat or slab-sided appearance of the '64 cars. More of the curved glass introduced on GM's 1964 intermediates will add to the curved side emphasis.

Chevrolet apparently will keep its characteristic double and triple taillights. But the raised chrome eyebrows over the 1964



# Will Be Like



**FASTBACK HARDTOP** is in the works for Ford's Mustang. This will work out somewhat like Plymouth's new Barracuda with a huge canopy of glass, tinted for glare and heat protection, sweeping from above rear seat to rear of body

Chevy headlamps will be replaced by a straight line a la Chevelle.

Front ends as well as rear decks of the full-size GM cars will be less angular at the corners. There will be a noticeable slope up towards the passenger compartment of both hood and deck lids. Pontiac will have a longer rear quarter and different character lines in the side sheet metal. Oldsmobile will reduce its heavily creased and sculptured metal in favor of a smooth-sided look tapering up to a sleekly tasteful knife-edge belt line.

General Motors will have a new "B" body to fit on the frames of full-size Chevrolets, Pontiacs, Oldsmobiles and Buicks, while their "C" body (with longer rear quarter paneling) will be used on the Olds 98, Buick Electra 225 and Cadillac.

The GM "A" bodies, which were new last year on Chevelle, Tempest, Olds F-85 and Buick Special, will get what is primarily a face-lifting of hoods, grilles and trim details. Chevy II, however, will have major facial surgery, but retain its two-piece unit body for the fourth year.

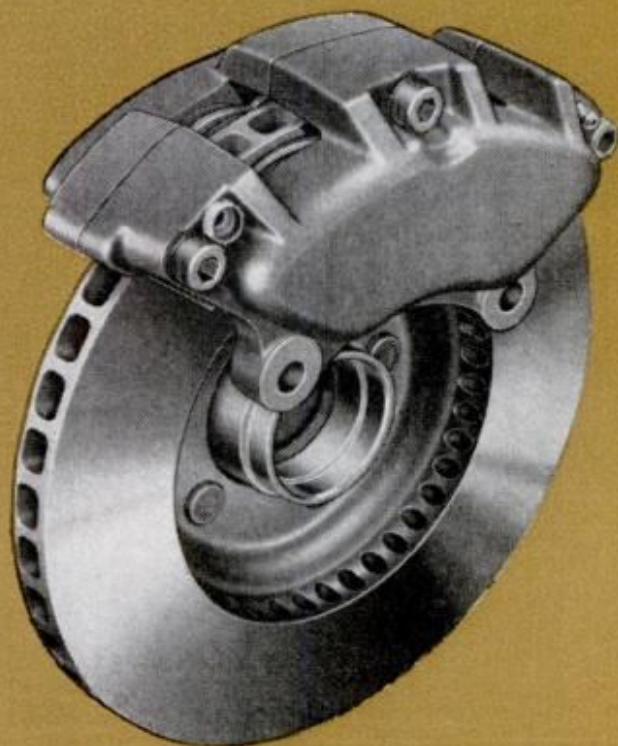
## Goodby to X-Frames?

Cadillac, Buick and Chevrolet may go to the perimeter type frame now used by Olds and Pontiac, in place of the present X-type frames which take up too much room under the body floor. Perimeter frames have a wide rectangular box section under the passenger compartment

with smaller rectangles between the wheels at the front and rear. They permit maximum space between the side rails so that larger floor pan areas may be dropped down for added footroom and narrower door sills.

**Ford, Mercury and Lincoln.** While GM seems to be moving toward curved lines and softer edges, Ford seems to be moving toward the slab-sided, angular cornered

**DISK BRAKE**, like this from Bendix with ventilated rubbing disks for cooling and dual pairs of hydraulic cylinders, may be options on the Ambassador line







**FORD GALAXIES** for 1965 will tend to have a crisp-cornered, slab-sided look reminiscent of some GM full-sized cars. The headlamps will be grouped in an "over-under" arrangement a la Pontiac (and, before that, Lincoln)

shapes GM seems to have favored in recent years.

At first glance, the impression that Ford styling is chasing GM styling seems to be emphasized by the fact that next year's Galaxie will have vertically paired headlamps like this year's Pontiac. Then you remember the vertically stacked headlamps on a Lincoln of some year's ago, and the sharp-lined T-bird rear greenhouse panel that helped restart all this angular emphasis. So the styling chase—if there is one—becomes circular.

Mercury will lose the jutting centerline on its grille, as well as the heavy-nosed look to the front end which this line tended to emphasize.

Underneath the skins, Ford and Merc will abandon their continuous-side-rail "coke bottle" frames and go to full perimeter type framing. The main side rails will run outside the passenger space, with

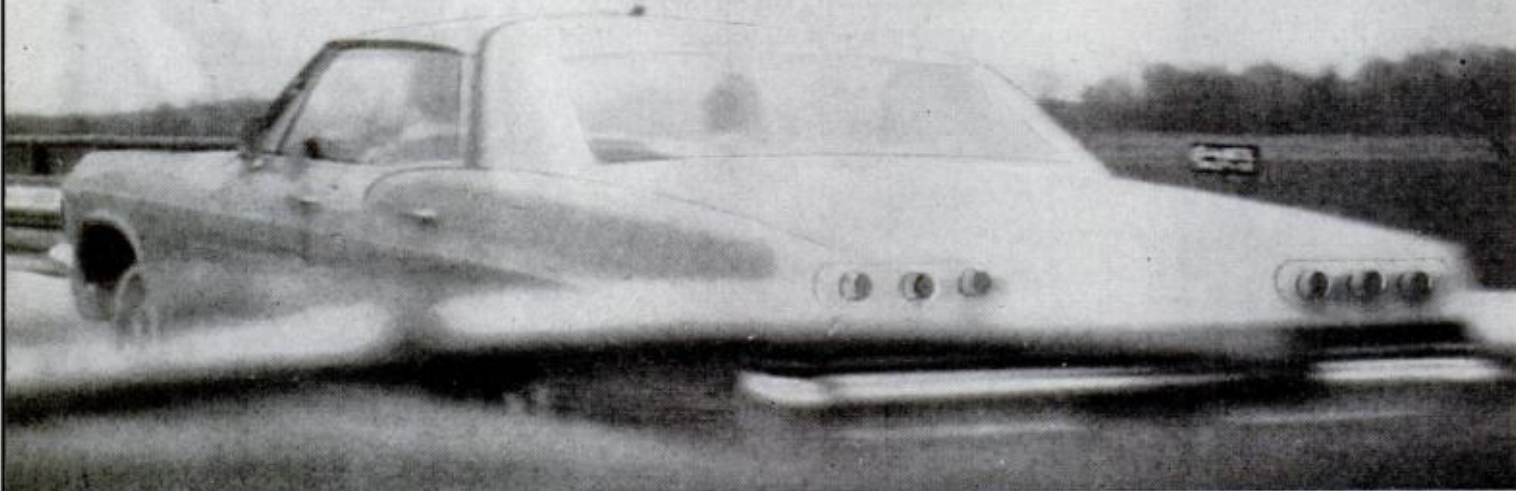
lateral torque boxes to tie side rails with front and rear suspension carriers. Ford's current coke bottle frame is only semi-perimeter. It allows deep footwells in the back seat, but side rails curve in under the front floor and prevent the use of a deep seat cushion for maximum comfort.

The floor pan on the new body shell for Galaxie and Mercury will take advantage of the new perimeter frame by giving more seat height without raising overall car height.

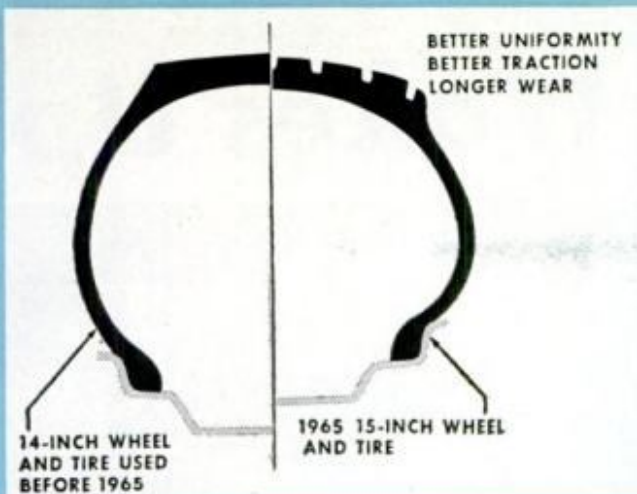
Falcon and Comet will get face lift restyling and Lincoln Continental will have an "identification" re-do of its front end.

**Plymouth, Dodge, Chrysler.** The dominant styling theme of 1965 Chryslers and the full-sized Plymouths and Dodges will be a tapered or modified wedge look, involving an upslope of trunk and rear deck. Although profiles may be somewhat similar to GM cars, the windshield and rear

## ARE THESE '65 CHEVROLETS?







**TIRE SIZES** will change on full-sized cars as Detroit and Akron team up on low-profile shoe and switch back to 15-inch wheels, keeping same car height

window slopes on the GM models will be more pronounced.

The regular Plymouths and Dodges will have a new body shell on a 117-in. wheelbase but they will not have the curved side glass that GM and American Motors look on with such favor. A new C-body shell for Dodge 880 and big Chrysler models may or may not feature curved glass, however. Its wheelbase will be in the 121 to 123 in. range. A brand new Plymouth model, the Satellite, may also use this wheelbase. It is designed to compete with middle-price lines such as the Dodge 880.

Chrysler Imperial will continue to have its own body.

**Rambler, Classic and Ambassador.** The American will have identification changes in its grille and trim, and the Classic will have more substantial changes in its front end and rear panels.

The Ambassador will definitely acquire

a bigger and less Rambler-type look for 1965. Its wheelbase will stretch from 112 to 116 inches and its over-all length go from 190 to over 200 inches. Although all American Motors models will have the same doors and door frames as they had this year, the Ambassador will have different sheet metal below the belt line all around the car. Its interior and exterior trim will be much more elaborate.

A new fastback model, perhaps to be called the Sceptre and probably designed along the lines of AM's Tarpon dream car (p. 89, April '64 PM), may or may not be ready for Fall introduction. It may be confined to the restyled Ambassador line to give it a rousing send-off.

### Revolution in Tire Design

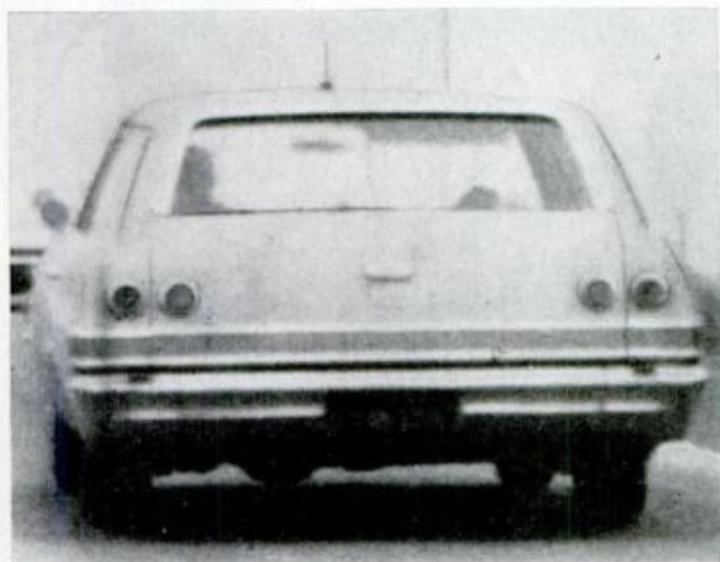
The most sweeping change in 1965 cars involves the use of a new low-profile tire that will have a section height of only about 82 percent of the section width, instead of the 88 to 90 percent relationship on present tires.

The shoulders will be rounded for minimum squeal and maximum wet traction on turns.

Although the new tires will be available in both 14- and 15-inch wheel sizes, many car makers will go up from 14 to 15 inches anyway, because the over-all diameter of the low-profile tire will be no greater with the one-inch larger wheel.

The larger wheel eases brake cooling problems and will make it easier to adapt disk brakes, since the capacity here depends heavily on disk diameter. The new low-profile tires have 30 to 70 pounds

*(Please turn to page 181)*



Bernard Dahl thought so when he saw them tooling along the Indiana Toll Road on April 30, 1964. He could be right—the taillights and bumpers are distinctly Chevy, and the more rounded edges, rear window slope and kickup of fender line at the rear door fit the 1965 Chevrolet rumors.

Mr. Dahl first noticed a 1964 Chevrolet with Michigan plates passing him, because it had a short antenna taped so that it stuck up above the roof. Then these two cars, with similar antenna rigs, passed him. The men inside were monitoring test equipment.

Dahl speeded up, passed the cars and, at the next plaza, got his camera from his trunk. He preset it for his wife Jennie Lou, and got back on the toll road in time for her to make these photos, just before the cars turned off at the La-Porte exit which happens to make connections with the Detroit Expressway.



# Dream Car Wakes Up



**FORD'S DREAM STATION WAGON**, the Aurora, has a lounge-like central area with swivel passenger seat. Ribbed section above driver is a polarizing roof that varies gradually from transparent to opaque at his command



**REAR ROMPER ROOM** in the Aurora is luxuriously padded and includes its own radio and toy storage lockers. Remote control sliding glass panel can be operated from up front to screen harried parents from shrieking youngsters. The high-rise tailgate will clear heads of the unwary while they board



**A DOZEN LITTLE**, one-inch sealed beams replace ordinary headlights. Half are used in the city. You'd be less handicapped if a pebble put out one lamp. The soft glow of electro-luminescent license plate panel is repeated within spear moldings that stretch the length of the car along each sculptured side



They're Bracing for  
California's Overdue

# EARTHQUAKE

*Now they're rushing to find ways to predict exactly when and where it will take place*

By Thomas Stimson

CALIFORNIA IS DIGGING IN today for the major earthquake that scientists say is bound to happen. The seismologists think the shake may center in the vicinity of Los Angeles, the most heavily populated part of the West. They expect that it will be more catastrophic than the recent Alaskan quake because of the greater







density of people and structures!

The earth will heave, and the people will be thrown to the ground. Cars on the high speed freeways will crash. Tall buildings will sway back and forth, some showering javelinlike splinters of glass.

Fires will break out, while broken water mains will impede the fire fighters. Dams in the foothills could give way, releasing enormous floods. After-shocks will continue for weeks or months.

Some of these things are going to happen; some others may not.

The threat is so grave that when Alaska's big quake occurred in March, teams of engineers and public officials flew north to study the damage.

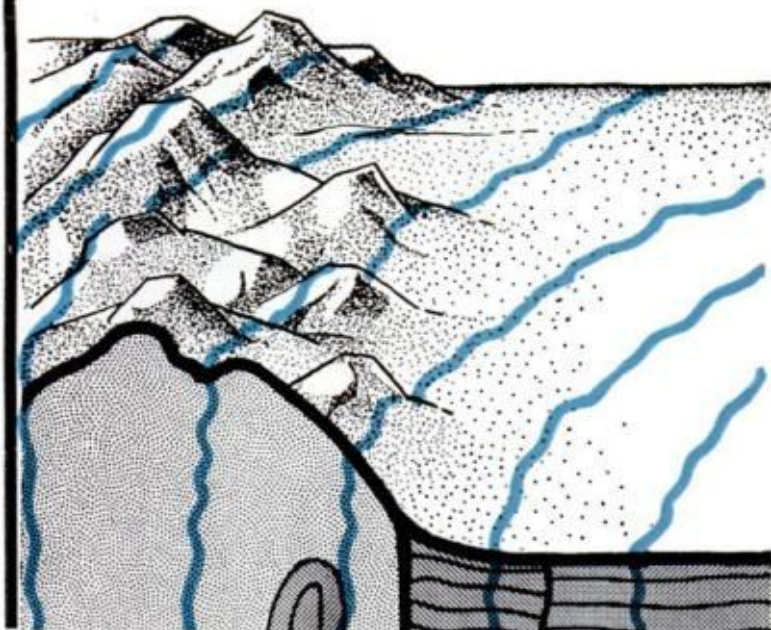
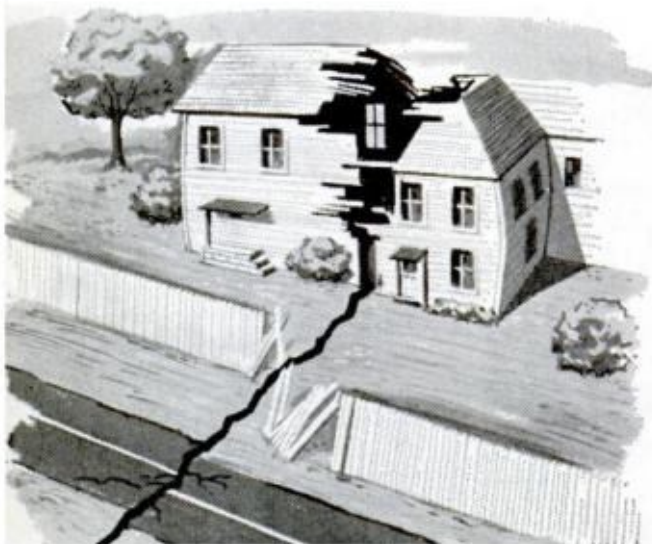
California is criss-crossed by a maze of earthquake faults and each is a threat, but it is the great San Andreas fault that attracts the most attention. This major rift comes ashore from the Pacific Ocean north of San Francisco, traverses the San Francisco peninsula and then angles southeasterly to the Mexican border.

All of California west of the fault, containing much of the state's population, is slowly drifting toward the northwest. This movement creates a shearing strain that eventually causes abrupt, sudden adjustments at the fault line.

Fortunately, only a portion of the San Andreas lets go at any one time. The

**MAJOR FAULTS** in California's earthquake country are shown by blue lines. San Andreas is largest. Blue dots show where major earthquakes have occurred

**HOMES SPLIT** in two by quake are blessings in disguise. Offsets in structure and fences provide valuable clues in measuring displacement





stress builds up locally, then relieves itself. San Francisco may possibly be immune for some time because of the 15 to 20-foot slippage along the fault that occurred during the 1906 quake.

Southward, in the area of Hollister, at least some of the strain is being relieved by movement along the fault itself, but the slow adjustment may or may not insure against a disastrous quake there.

Very conveniently for scientists, the concrete floor of a winery spans the fault line, and the floor (and the rest of the building) is being pulled apart by the earth movement. A creep recorder and a seismometer have been installed at the winery to measure the movements.

The area of the greatest hazard along the San Andreas seems to be in the vicinity of Los Angeles. Here there has been no "adjustment" for 107 years, and it's estimated that a great quake occurs at about 100-year intervals. In the last big quake, in 1857, a circular corral that spanned the fault was converted into an open S-shaped fence by the horizontal dislocation of the ground. The rupture extended for at least 100 miles and the shake was felt as far away as Mexico.

Engineers of the U.S. Coast and Geodetic Survey, measuring across the fault zone from a number of miles on each side, find that the northwest creep of the coastal

block is about two inches per year. The distortion along the fault near Los Angeles (as close as 33 miles from the heart of the city) now measures almost 18 feet, and this is roughly the extent of the corrective movement that has been found to occur on the fault in a large quake.

The obvious suggestion is that another such event is not far off. Some scientists, in fact, regard it as "overdue."

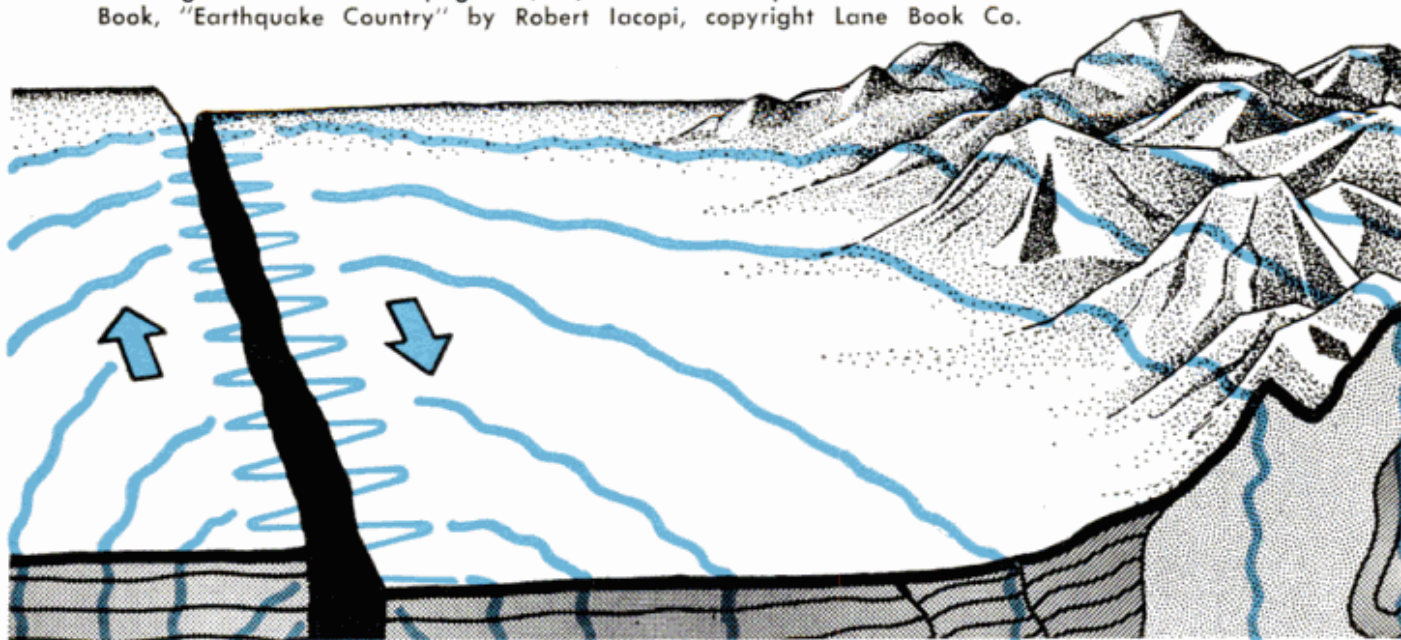
Caltech's famed Dr. Charles F. Richter says that predicting the location of the next quake is hardly more than guesswork, then adds:

"My own choice, in order of likelihood, would be repetition of the 1857 quake (southern California), repetition of the 1906 quake (central California), an earthquake along the San Andreas connecting those two sectors, an earthquake on the Owens Valley fault equal to that of 1872, or an earthquake on some other fault."

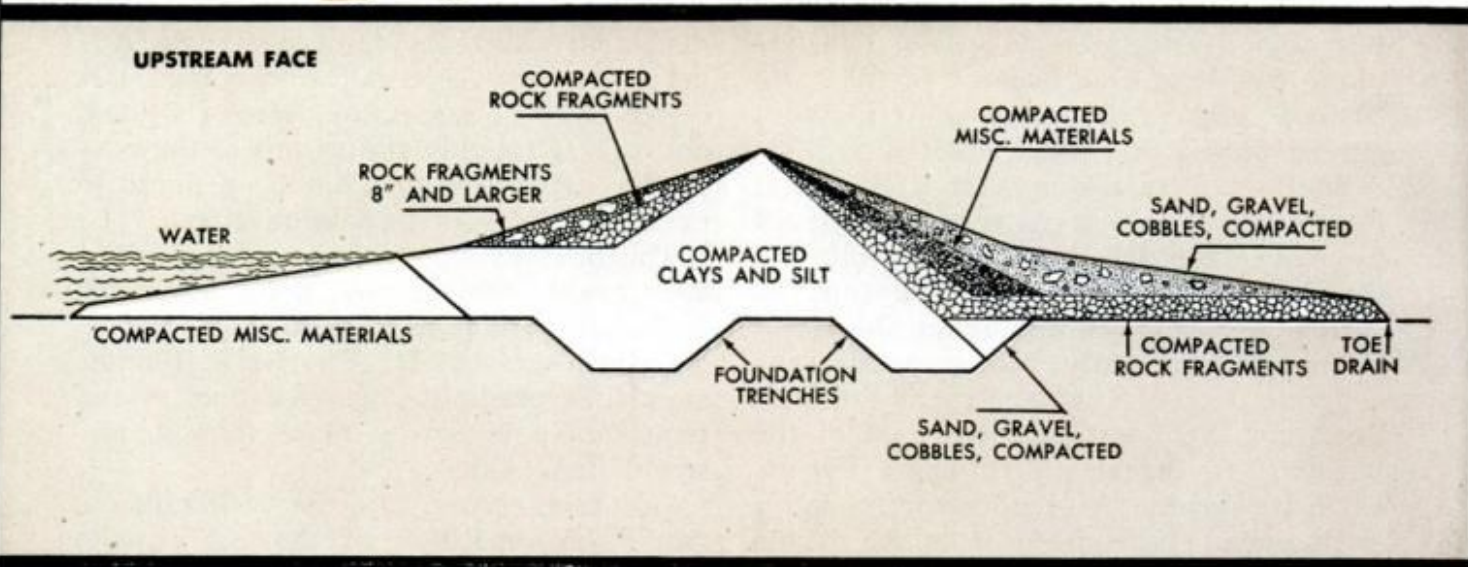
Living under this sword of Damocles, California (and southern California in particular) has been trying to make itself as earthquake resistant as possible. Many school buildings have been rebuilt for greater safety. In Los Angeles and a few other cities, most projecting cornices and other "gingerbread" that could crash to the street have been removed. Parapets and firewalls on the tops of buildings have been removed or strengthened from the

**EARTH SHIFTS** along horizontal surface line, but shift runs deep into earth vertically. Shock waves are sent out, causing variety of surface damage up to 100 miles from the basic shift, especially in areas where soil is soft

Drawings at the bottom of pages 76, 77, 78 and 79 adapted from the Sunset Book, "Earthquake Country" by Robert Jacopi, copyright Lane Book Co.







**EARTHQUAKE-PROOF DAM**, now under construction in central California, features dense construction materials along centerline with larger aggregates packed in layers on top, making it "self healing" if ruptured by quake

rear, as these notoriously shake to pieces and fall on pedestrians.

Until a few years ago all structures in Los Angeles were limited to a height of 13 stories, then structural engineers convinced the city that steel-frame buildings upwards of 20 stories tall are relatively safe. They are designed to sway with the quake instead of stiffly resisting it.

San Francisco and some other cities have a special problem because some of their large structures, now 40 or 50 years old, were erected before modern engineering techniques were perfected. San Francisco now insists, whenever one of the old structures is to be extensively remodeled, that it also be strengthened and tied together to better resist a big temblor.

It's impractical to build tall "earthquake-proof" structures because few could afford them. The engineering compromise is to design buildings that are "resistant" to quakes. California officials define the ideal as "a building that holds its occupants safely during a major quake and that suffers only non-structural damage."

Actually, the intensity with which a structure is shaken depends more on the kind of ground it rests upon than on its precise distance from a quake's epicenter. Solid rock is the best foundation. Filled ground or sand or alluvium, especially when waterlogged, behave like jelly, and buildings on such soils can be severely damaged even by a minor earthquake.

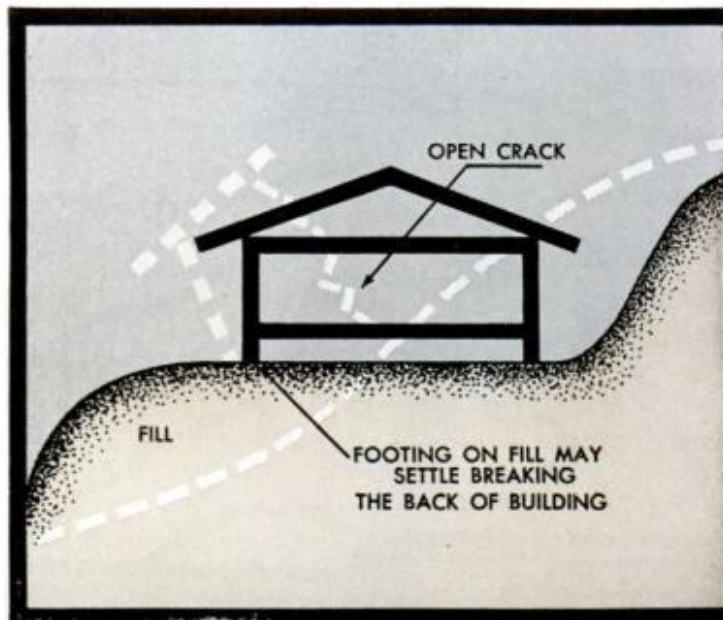
The truth is that foundation conditions can change within a few feet, and a quake

that does serious damage to structures on one side of a street may do little damage on the other side where the soil happens to be more stable. This was noticeable in the 1964 Alaskan quake.

There is talk in Anchorage today of converting the most unstable areas of that city into parks, and zoning the rest of the city for light or heavy construction depending on the soil. Russia has mapped much of its territory into risk zones, depending in part on the nature of the soil, and construction must conform to specifications for the zone involved.

The Los Angeles area has been similarly mapped and today the UCLA Earth-

**HILLSIDE HOMES** have special problem. Fill, if not well compacted, may settle during quake, taking home with it or breaking structure into pieces







**MAGNETIC FIELDS** in subsurface rocks change and indicate changes in subsurface stress. Quakes may be predicted by measuring changes with magnetometer



**SHOCK WAVES** in subsurface soils vary depending on materials. Speed can be measured with geophone which picks up shock waves generated by sledge

quake Engineering Laboratory is doing research that may lead to a precise formula for determining the relative safety of any building site.

If this can be done, the stringency of building codes would be increased or decreased for any particular parcel of land, depending on how its surface and subsurface strata react during a quake.

The big fire that followed the quake did most of the damage to San Francisco in 1906, and that city has taken extraordinary precautions against ever letting another fire get out of control.

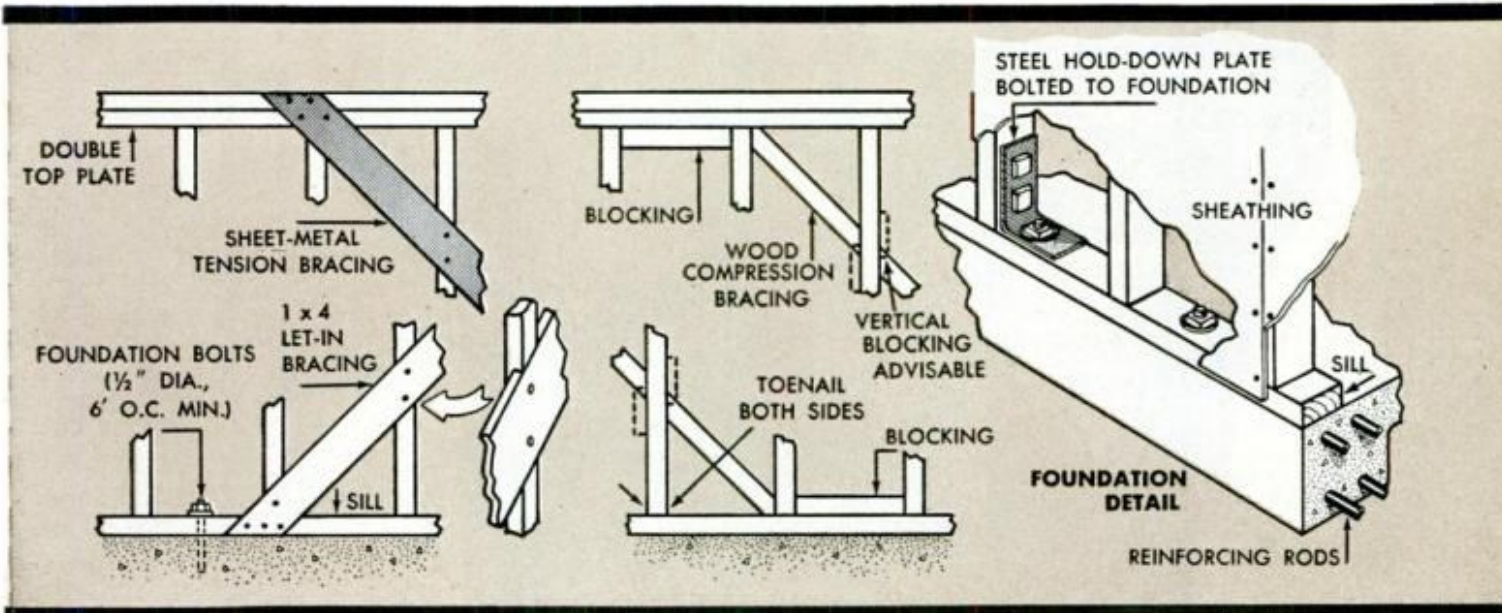
The city has a separate auxiliary water-supply system that includes 100,000-gal-

lon underground cisterns at street intersections every four blocks throughout the downtown area. Fire-department pumps can lower a suction line into a manhole at any of these locations and get on-the-spot water. The auxiliary system also includes a network of high strength pipe that carries water at 150 pounds per square inch, delivered to its own special hydrants from its own separate reservoirs. Too, big pumping stations on the waterfront can pump sea water into the system from two different locations.

All big engineering projects in California have to be designed with a major

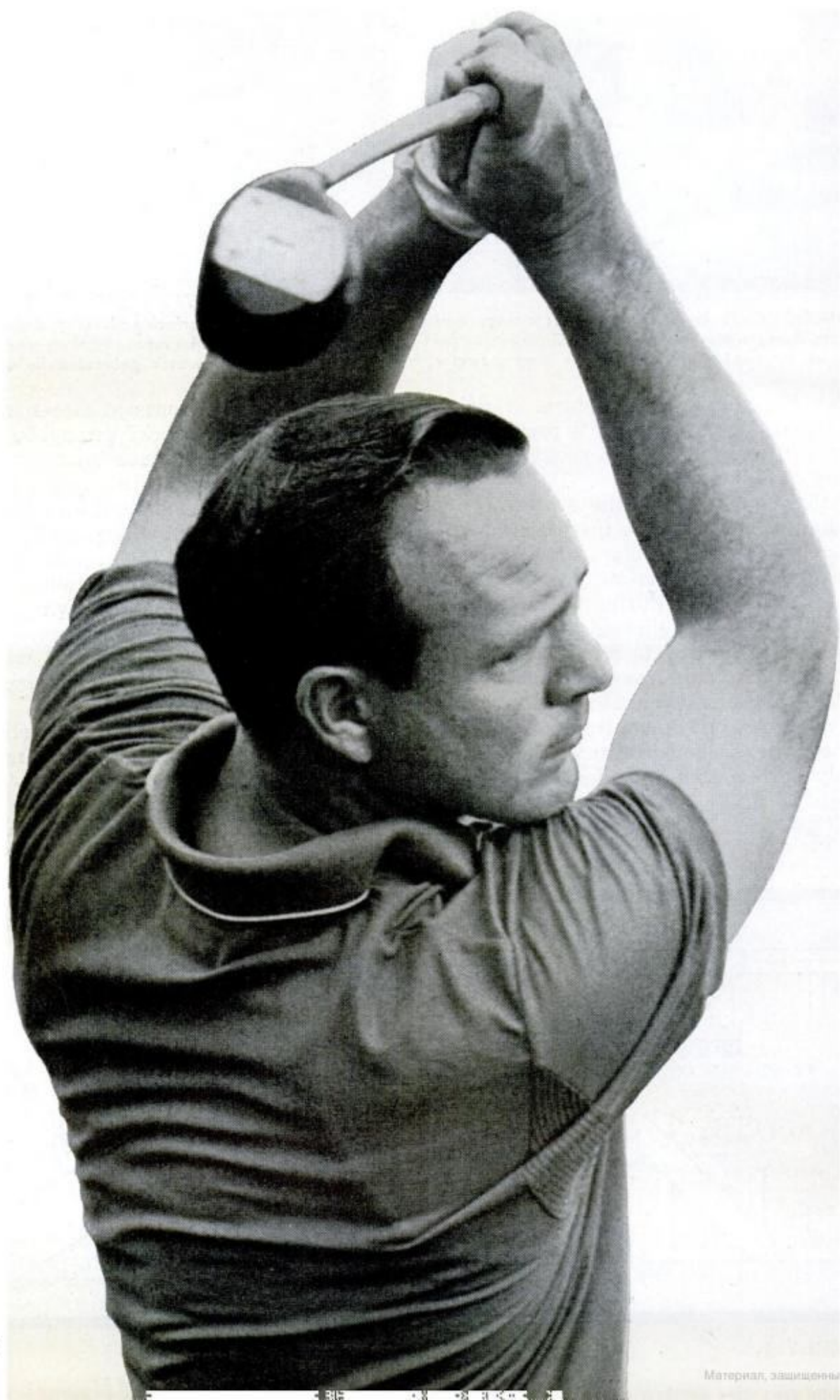
[\(Please turn to page 184\)](#)

**EARTHQUAKE RESISTANCE** can be built into homes with special construction techniques, sills bolted to foundation, studs toe-nailed to sill, X or V cross-bracing in opposing pairs, and plywood sheathing with hold-down plates





# *Arnold Palmer Plays*





# Arnold Palmer

*In a schizophrenic round of golf, an all-time great pro tests his modern steel-shafted clubs against hickories like those used 30 years ago*

By Arnold Palmer as told to Pack Bryan

I EXPECTED that playing a round of golf with the old style hickory-shafted clubs after 30 years of using the steel shafts would be like trying to fly an old Curtis Jenny after 3000 hours in a jet. The difference was not that great, but I'm glad I was born 30 years too late.

The story began when *Popular Mechanics* asked me to play a round of golf with the old clubs to compare them with the modern professional equipment I personally designed for the Arnold Palmer Company. I have been experimenting with club designs for years down in my workshop, and the new clubs incorporated all my favorite ideas. It seemed obvious to me that they would be unquestionably better.

**TWO SETS** of clubs confused Palmer at times. Concentrating too much on unfamiliar hickories, he lost his concentration on shots with his own clubs

But how much better? And in what ways were the old-timers really bad? The more I thought about it the more intrigued I became with the idea of an all-out "battle of clubs."

After we had decided to go ahead with the project, I did some research into the old style hickory-shafted clubs.

Scotland is the home of golf, and, as might be expected, all the best early golf clubs came from that country. Iron clubheads were hand forged of mild steel and woods laboriously turned one at a time.

The shafts were turned on a lathe from carefully dried hickory, selected for weight, straightness of grain and flexibility. After the so-called blank was

**HICKORY CLUBS** "really sling the ball," Palmer said after the round. Extreme whip action forced him to slow down his swing and bothered his control



JULY 1964



81

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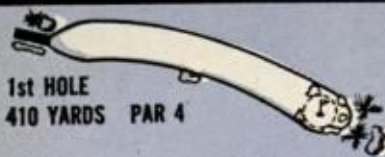
**TYPICAL SWING** with his own clubs shows Palmer, here shooting from the tee, with full, powerful arc and high follow-through, every muscle participating

turned, it was again allowed to "age" until the clubmaker selected it for a certain clubhead. Working with a plane, a file and sandpaper, he would draw on his years of experience to fit the club to the player. By varying the amount of stock that he took from the shaft (while still keeping it round), he could alter both its weight and flexibility. The player who wanted a heavy but flexible shaft would find that his was thicker with more of a curve than the man who wanted a light, stiff shaft.

Keeping the old clubs in the right condition was always the big problem, though. One former pro says, "When I first started, we had to "pop" them often (rub with linseed oil and shellac) or they'd warp and dry quickly, shattering into splinters whenever even a good pass was made at the ball." If that happened, the golfer would begin again, hopefully swinging clubs by the dozen until he found an approximate match.

Actually, there were no real "matched" sets in the early days. A player could buy a set of clubs but their matching meant only that they were all made by the same clubmaker and all (hopefully) had the same approximate weight and flexibility. But after a few months, weather would take its toll and the oil and shellac used to preserve the wooden shafts would begin to dry out. Then, each club took on a different temperament.

After playing with the clubs for a while, the golfer would find that he liked, say,



**1st HOLE**  
410 YARDS PAR 4

- |                               |                                    |
|-------------------------------|------------------------------------|
| <b>Hickories</b>              |                                    |
| 1. Driver, left, 250 yards    | 1. Driver, straight, 260 yards     |
| 2. 2-iron, over green         | 2. 3-iron, over green, near tree   |
| 3. Niblick, six feet from pin | 3. Chipping wedge, 8 feet past pin |
| 4. Putter, in                 | 4. Putter, past cup                |
|                               | 5. Putter, in                      |

PAR 4

BOGIE 5

*Didn't slow down my swing with hickories, and went off to left. Distance good. Didn't have feel of niblick for accuracy, but chipped within 6 feet. Bogied with my clubs.*

- Hickories**
1. Driver, hook 230 yards into rough
  2. Brassie, short
  3. Niblick, past cup
  4. Putter, close
  5. Putter, in

PAR 5

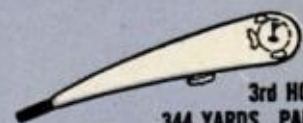
*Still didn't slow down enough with hickory driver and hooked into rough. But I was getting feel of clubs and found I didn't have to change stance or grip. Felt better with my own clubs.*



**2nd HOLE**  
585 YARDS PAR 5

- Steel**
1. Driver, 300 yards straight
  2. Iron, short near trap
  3. Chipping wedge, 9 feet past cup
  4. Putter, in

BIRDIE 4



**3rd HOLE**  
344 YARDS PAR 4

- |                            |                                    |
|----------------------------|------------------------------------|
| <b>Hickories</b>           | <b>Steel</b>                       |
| 1. Driver, slight hook     | 1. Driver, slight hook             |
| 2. Niblick, over green     | 2. Chipping wedge, 2 feet from cup |
| 3. Niblick, within 15 feet | 3. Putter, in                      |
| 4. Putter, past cup        |                                    |
| 5. Putter, in              |                                    |

BOGIE 5

BIRDIE 3

*Hooked third straight time with hickory. Good distance but poor control. Would have liked a chipping wedge for this hole with hickories, but used niblick twice for bogie.*





**SAND TRAP** was another problem with hickories. Set had no sand wedge, so Palmer used niblick with poor results. He scooped ball and it overran green



**FAIRWAY SHOTS** were tossups between steel-shafts and hickories, except for accuracy. Palmer had no confidence where the hickory shot was going to land

five of the clubs in his set, but couldn't get used to the "feel" of the other two. Then he'd begin the search—swinging and comparing, swinging and comparing—until he found replacements that he liked. By contrast, my own clubs are matched so that every club balances at the same point on the shaft, assuming a uniform "shield" throughout the set. And by adapting the firmness of each shaft to the weight of its head, we are able to give every club the same flex characteristic. Precise measurements have replaced the old-timer's hunch.

Weather affected the old clubs, too. On a damp day, the clubs had a completely

different feel than they did on dry days. On a damp day, you could slug the ball a little harder, while on a dry day you just had to baby certain shots for fear of shattering your shaft.

In the late 20s and early 30s the tubular steel shaft had been perfected and put into production, but they didn't take over the golf world by storm.

You just can't change the thinking of several hundred thousand golfers overnight. In fact, as late as 1939 one big manufacturer was advertising that his steel-shaft clubs were the only ones "with the shape and feel of hickory." The change-

- |                                   |                                |
|-----------------------------------|--------------------------------|
| <b>Hickories</b>                  | <b>Steel</b>                   |
| 1. Hooked spade mashie into trap  | 1. 7-iron, over green          |
| 2. Niblick, across green to apron | 2. Chipping wedge to 18 inches |
| 3. Putter, short                  | 3. Putter, in                  |
| 4. Putter, in                     |                                |

**BOGIE 4**

**PAR 3**

*This short hole proved I was not getting control over hickories. Their lightness and flexibility didn't give me the right feel. It was raining and chip from trap took too much of ball; it crossed green.*

**4th HOLE**  
**128 YARDS PAR 3**



**5th HOLE**  
**422 YARDS PAR 4**

- |   |                                 |
|---|---------------------------------|
| <b>Hickories</b>                              | <b>Steel</b>                    |
| 1. Brassie, 270 yards straight                | 1. Driver, 260 yards in rough   |
| 2. Mashie niblick, on green, 40 feet from cup | 2. 7-iron into trap             |
| 3. Putter, 4 inches from cup                  | 3. Sand wedge, 10 feet from cup |
| 4. Putter, in                                 | 4. Putter, past cup             |
|   | 5. Putter, in                   |

**PAR 4**

**BOGIE 5**

*Remembering the brassie out of the rough on the 2nd hole tempted me to try it off the tee here. The hickory driver just didn't feel right. The brassie was equivalent to 2½ wood, and I outdrove my own driver with it.*

- |                             |                                   |
|-----------------------------|-----------------------------------|
| <b>Hickories</b>            | <b>Steel</b>                      |
| 1. Brassie, hook, 260 yards | 1. Driver, straight, 270 yards    |
| 2. 5-iron, on green         | 2. 6-iron, on green, 14 feet away |
| 3. Putter, short            | 3. Putter, to 9 in.               |
| 4. Putter, in               | 4. Putter, in                     |

**PAR 4**

**PAR 4**

*Here my own clubs began to work for me. I had been concentrating too much on hickories. The hickory 5-iron was coming along, too. A nice club, with little of the torque of the other clubs.*

**6th HOLE**  
**408 YARDS PAR 4**





over was inevitable, however, and one by one the club makers and the golfers made it.

The courses changed, too. As the boys watching the record books and keeping the greens saw the scores begin to dip downward as a result of the steel shafts, they tightened up the rules and began their never-ending struggle to keep their courses as challenging and still as beautiful as possible. Some greenskeepers today literally spend as much time working on their roughs as the old greensmen used to spend on their greens and fairways.

Compare courses as they were in 1925 to what they are now, and you find many efforts have been made to minimize the advantages of the steel club. Let's look at a few examples.

The steel shafted club should hit the same golf ball farther. Fine—so that string of bunkers that ran across the fairway 210 yards out in 1925 (the average drive for the better golfer in those days) is now out at 250 to 265 yards, erasing the distance advantage the steel shaft gave for getting past the bunkers.

Sand traps were not nearly as deep, nor as wide, nor did they ring the greens on most courses as they do now. The old golfer who needed a long, but inaccurate, iron shot and then a short, accurate punch to the green can now reach it with a moderately accurate mid-iron, so they've made it tougher on him and demanded even more accuracy.

Roughs were not as demanding, nor as ardently nurtured as they are today. Again, in the old days, the prudent golfer would chip directly back to the fairway and then reach for the green. Today's golfer, with stronger shafts and low-numbered irons of great accuracy, will often elect to go right for the green. Now the greenskeeper lets the grass in the rough grow a little longer, so its long blades can reach up and grab the club head, slowing it or turning it just enough to impair the shot.

In the old days, the pros continually reminded their students, particularly the stronger and more enthusiastic swingers, to let the club hit the ball. "Swing easy, don't try to kill it."

My dad (and I think luckily for me) realized that the game would undergo a big change, one that might not be felt for a long while, but one that would put the advantage on the side of the player who had the power. So, when I first started winging a ball, he encouraged me to give it all I had. I've been told that, even when I was five years old, my feet would leave the ground as I connected with the ball.

The steel shaft gave us two main qualities that let us develop this concept of power hitting. The first was its reliability—we no longer had to fear that a shaft might break right in the middle of a crucial round, so we could give every shot all we had.

The other was consistency—forging techniques had perfected matched heads,

**7th HOLE**  
197 YARDS PAR 3



- |                     |                                |
|---------------------|--------------------------------|
| <b>Hickories</b>    | <b>Steel</b>                   |
| 1. 2-iron, on green | 1. 2-iron, past green          |
| 2. Putter, past cup | 2. Chipping wedge, 6 feet past |
| 3. Putter, in       | 3. Putter, past cup            |
|                     | 4. Putter, in                  |

PAR 3

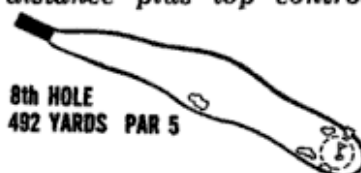
BOGIE 4

*I used one of the numbered hickories, and it worked well. It was embarrassing, scoring better than with my own clubs. It was the switching back and forth that did it, spoiling my concentration. Some pros still use a hickory putter, but I dislike the blade.*

- Hickories**
1. Brassie, 290 yards, straight
  2. 2-iron, left on apron
  3. Niblick, six inches from cup
  4. Putter, in

BIRDIE 4

*The one-iron from the rough with my own club tells the whole story. I had confidence in it that I didn't have with any of the hickories. I couldn't have made it with a hickory. I needed distance plus top control.*

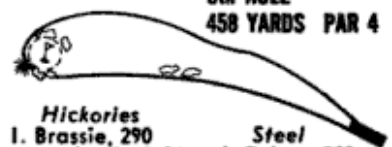


**8th HOLE**  
492 YARDS PAR 5

- Steel**
1. Driver, 280 yards near rough
  2. 1-iron, right of pin, on green
  3. Putter, past cup
  4. Putter, in

BIRDIE 4

**9th HOLE**  
458 YARDS PAR 4



- |                                  |                                 |
|----------------------------------|---------------------------------|
| <b>Hickories</b>                 | <b>Steel</b>                    |
| 1. Brassie, 290 yards, straight  | 1. Driver, 292 yards straight   |
| 2. 3-iron, short in trap         | 2. 4-iron, left, in trap        |
| 3. Niblick, on, 40 feet past cup | 3. Sand wedge, 25 feet past cup |
| 4. Putter, 4 feet past cup       | 3. Putter, in                   |
| 5. Putter, rimmed cup            |                                 |
| 6. Putter, in                    |                                 |

DOUBLE BOGIE 6 PAR 4  
TOTALS: Hickories: 39  
Steel: 36

*For my second hickory shot I would have liked a 4-iron, but we improvised and used a 3-iron and landed in trap. And see what that hickory putter did!*



**BERT DARGIE** made hickory shafts for *PM's* clubs used by Arnold Palmer. He planed shafts until just right, then fitted them to individual club heads with single pin. In the old days, all shafts were handmade by expert craftsmen



but even the most closely matched set of heads relied on the ability and patience of the clubmaker to find and prepare a set of hickory shafts to go with them. Technology gave us the matched and graduated steel shafts which forgive us many of our sins. But even most of these scientifically engineered instruments are not perfection by a long way. That's why, for years, I spent endless hours filing, sawing, weighting, balancing and re-balancing hundreds of the best available steel-shafted clubs. I was determined to have a set of perfect clubs even if I had to make them myself. Eventually, that's exactly what I did. My Arnold Palmer golf clubs are the result, and they are as close to perfectly matched clubs as a set of clubs ever will be, I'm convinced. To make them just the way I wanted them, I had to set up my own company, where we can keep a sharp eye on quality control. We have limited their sale through pro shops only, since they are engineered for serious golfers. But for any average golfer, the new clubs can overcome those minor errors that creep into his swing after a short layoff. The first holes on an early Saturday round are often not quite so difficult when a good, well-matched set of clubs is along to ease the burden. The golfer can concentrate on hitting the ball, knowing that his regular swing will fit the shot.

Again, swinging one of the low-numbered irons for distance used to be a problem, and shots with these clubs are still

an anathema to many golfers. With properly matched clubs, the swing that makes the 5-iron such a deadly scorer for Mr. Average should not need much adjustment to be just as successful with a 2-iron.

#### **New Shafts for Old Hickories**

I was quite pleased and surprised to see the hickory clubs that *Popular Mechanics* assembled for me for the round. In the early days of golf in this country, there were only seven clubs used in most tournaments—Francis Ouimet used that many when he won the Open in 1913. But those seven clubs were often assembled over a period of years, as each golfer put together his own "right" combination. To give me a chance to attempt the same thing in a short space of time, *PM's* editors had found almost three dozen irons and nine woods and had them all reshafted. I had my pick of them for the round.

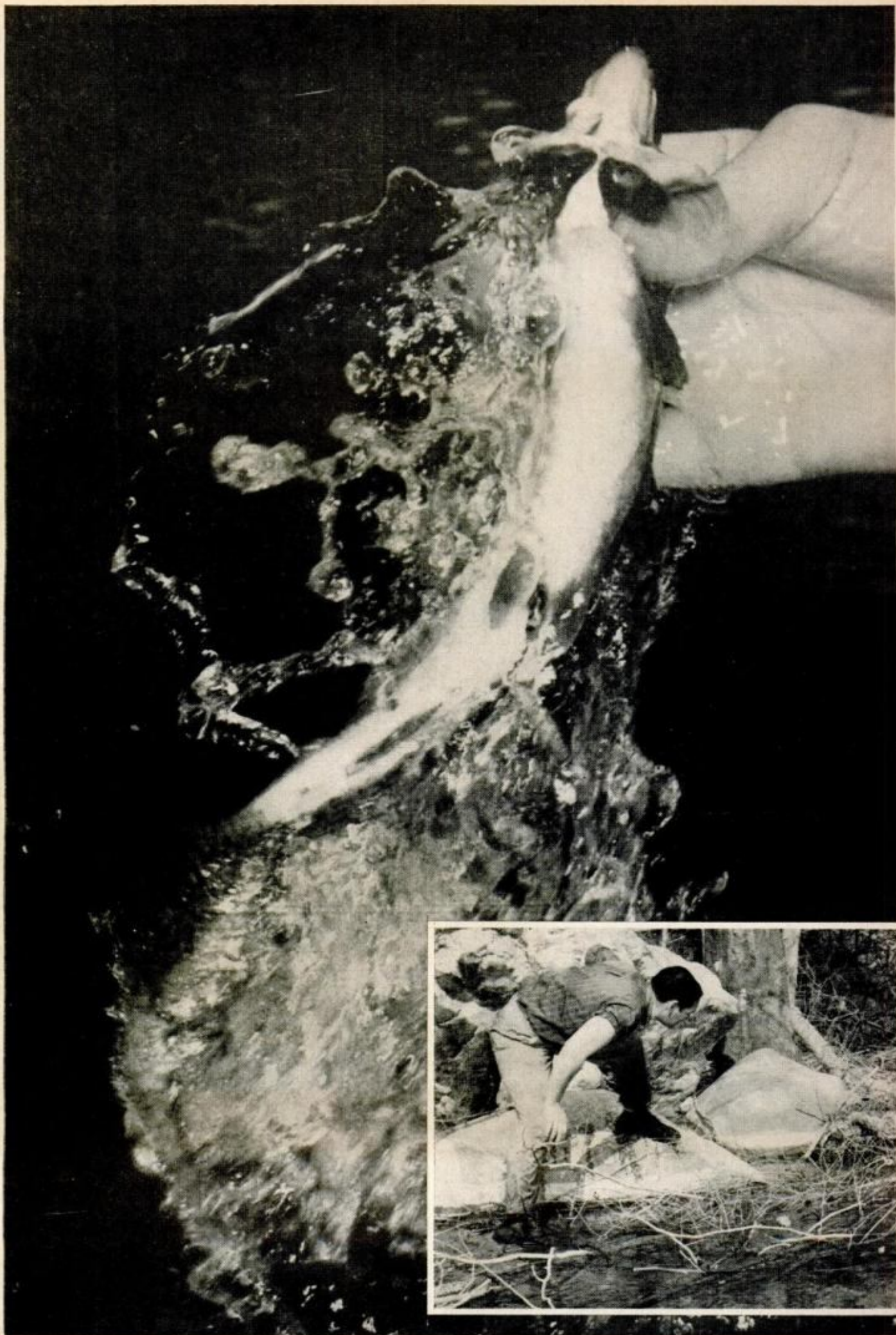
*(Editor: We assembled the clubs by placing newspaper ads and collecting well over five dozen clubs in various stages of repair.*

*It was a wild assortment ranging from drugstore branded souvenirs to hand-made "special" clubs that belong in a golf museum. The ones we finally selected had warped shafts, rusty heads, and ragged and rotten leather grips. Varnish on the heads of the woods had long since turned white, and rust covered all but those few of the irons that were chrome or stainless steel.*

*A single pin through the neck of the*

[\(Please turn to page 186\)](#)







# One-Handed There's a Catch to Fishing

*Fly casters can be artists, but the best take a back seat when "noodlers" are on the scene*

By James Joseph

"YOU GOT TO HAVE THE FEEL," the grizzled old Arkansas backwater hand said.

"Maybe they're born with it. I don't know. But when one of them boys snakes his hand down under a rock and freezes like he's dead, it's just a matter of time afore he's gonna whip up a fish. Now some places they're called ticklers, and I've heard 'em called guddlers, but down here they're noodlers."

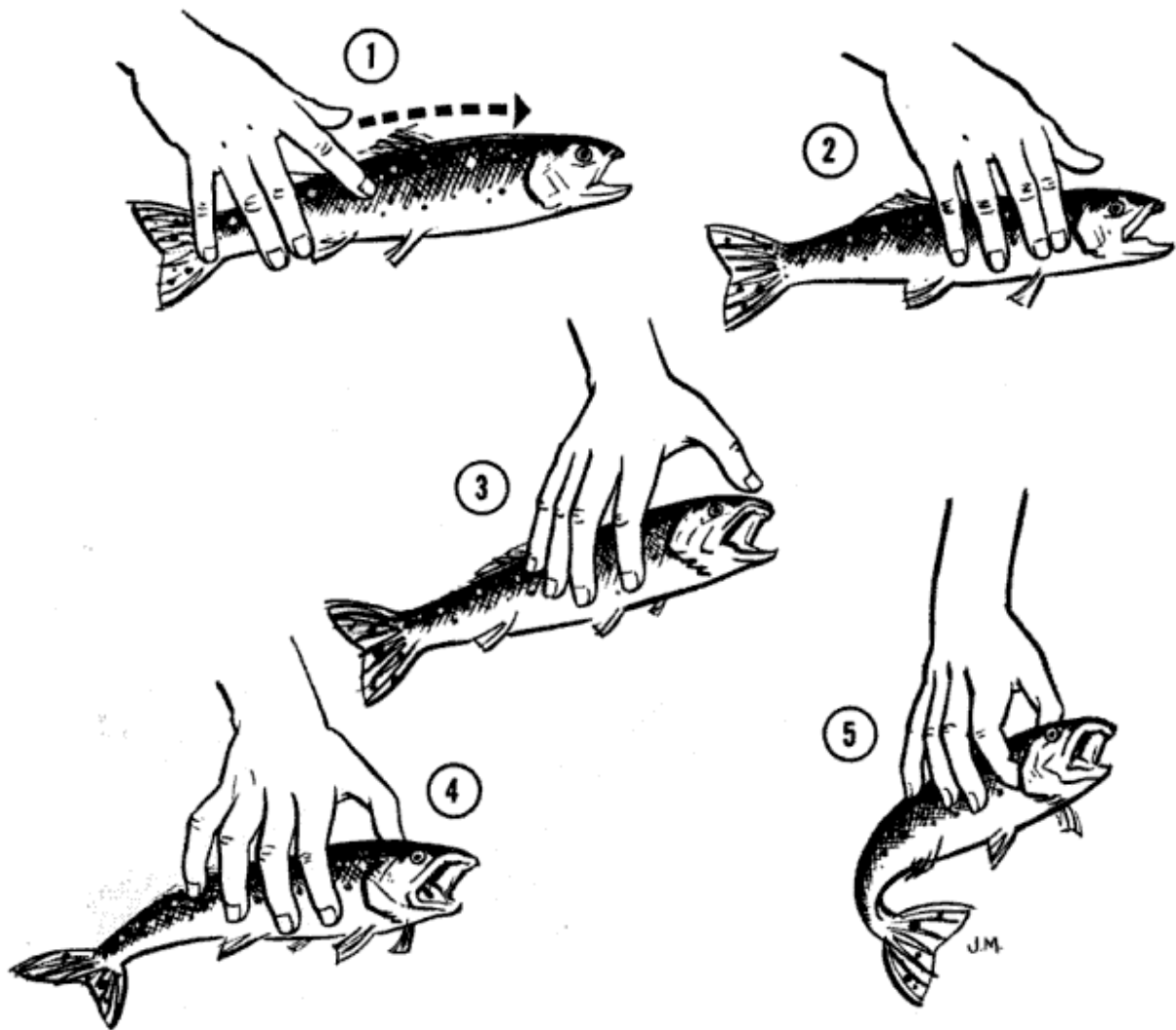
And when a noodler goes fishing, the only equipment he packs are his bare hands—and an uncanny "feel" for fish.

With infinite patience the noodler slips his hand into a deep pool near the bank of a stream where, during the day's heat, fish are likely to lurk. He holds it there motionless, getting used to the cold water, his eyes closed so he can think into the pool. His surgeon-sensitive fingers can actually feel the backwash of an imperceptibly moving tail. The hand glides slowly in toward the quarry, then holds and waits. The hand is alive, its fanned fingers sensing every eddy and ripple. Perhaps the current will drift the fish against his fingers and

**WHIPPING A FISH OUT** by hand (left) is the art of the noodler who scorns rod and reel. Stalking the banks of a stream (below left), the noodler looks for holes under rocks, logs or the stream bank where the fish will hide out when the sun is high, seeking the cool shade. Spread out on a rock (center), he braces with left hand and slips the right hand slowly into the pool. Fifteen minutes later, from sensing the fish to finding the gills, he snaps his arm back (right) and brings in a pan-sized brook trout







**AFTER THE TEDIOUS** period of holding the hand motionless until he "feels" the fish, the noodler goes in for the catch, moving his hand about one inch per minute. With fingers fanned out he starts at the tail (1) with thumb and forefinger poised over fish's back. He inches the hand forward until thumb and forefinger are poised near the gills (2) and he can feel them opening and closing (3) He carefully judges the rhythm of the breathing (4) and as gills open he plunges thumb and forefinger in (5) to catch the fish

he'll be able to tell the species and how it lies in the water. The tail moves again and he feels the ripple.

Ever so slowly, now, the hand moves in. There is the slightest contact of a fingertip, and the noodler knows he's after a trout. The hand is curved over the top of the fish, thumb and forefinger ready to pinch. It moves slowly along the flank of the motionless fish until thumb and forefinger can sense the opening and closing movement of the gills. By now he knows pretty well the size of the fish, and he waits with the fingers poised. The gills open, then close. Open. Close. He times the rhythm. The gills open and the thumb and forefinger plunge in and clamp together. With the fingers in the gills the fish is hooked. In a single, lunging movement the arm whips up out of the water and the

trout is flung to the bank.

This is noodling, a fishing sport that goes back in history to the ancient Macedonians, was a way of life for many tribes of American Indians and is still practiced by the Lengua Indians of South and Central America.

In the U.S. noodlers are most active in Arkansas and Indiana, the Pacific Northwest, and throughout the South. It's not often, however, that you catch a noodler in the act. This is an art that is handed down through families, and is as closely guarded by its practitioners as a missile secret. And in some states noodling is illegal.

One of America's legendary angling authorities, Edward Ringwood Hewitt, was a skilled tickler, and his method is still unique. Feeling a fat trout lurking be-

(Please turn to page 191)

POPULAR MECHANICS

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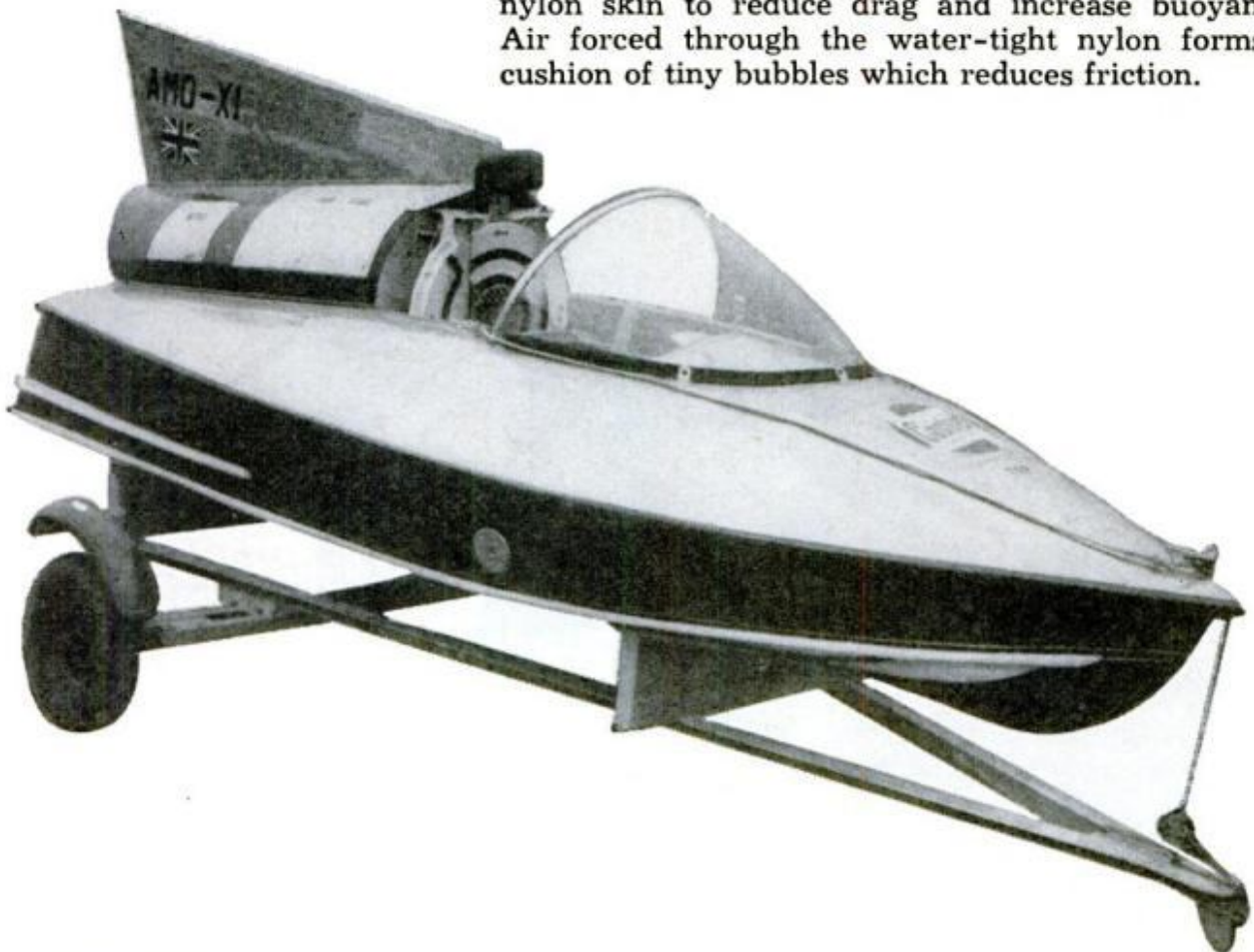


### **Tape & TV Show at Home**

It's no longer a dream. Recently the Fairchild/Winston Research Corp. of Los Angeles demonstrated a tape recorder that puts TV pictures on ordinary magnetic tape. Picture quality is quite good, as the photos to the left show. The top photo was taken of a "live" sitting of a *PM* editor before a TV camera. The bottom view is the same scene a few moments later, this time a tape playback. Expected price of the tape machine, for any TV receiver, is \$350.—*Larry Steckler*

### **British Bubble-Skimmer Hits 60 Knots**

Powered by a 1500-pound-thrust jet and a car engine, a British experimental speedboat uses an outer nylon skin to reduce drag and increase buoyancy. Air forced through the water-tight nylon forms a cushion of tiny bubbles which reduces friction.





A Nationwide Survey  
On the Buick Riviera  
Based on 1,686,910  
Owner-Driven Miles

# Riviera Style Delights, Poor Assembly Irks

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

**I**'VE HAD FIVE CADILLACS since 1955 and I wouldn't trade my Riviera—with its prestige and beauty and size—for another Cad," an Oklahoma widow told *PM* in the Riviera owners report.

A Tennessee nuclear engineer agrees about the car's beauty, and raves about ride. He calls it "the best looking car ever built. But," he complains, "Buick's quality control on body and trim is . . . fantastically poor for a car so expensive."

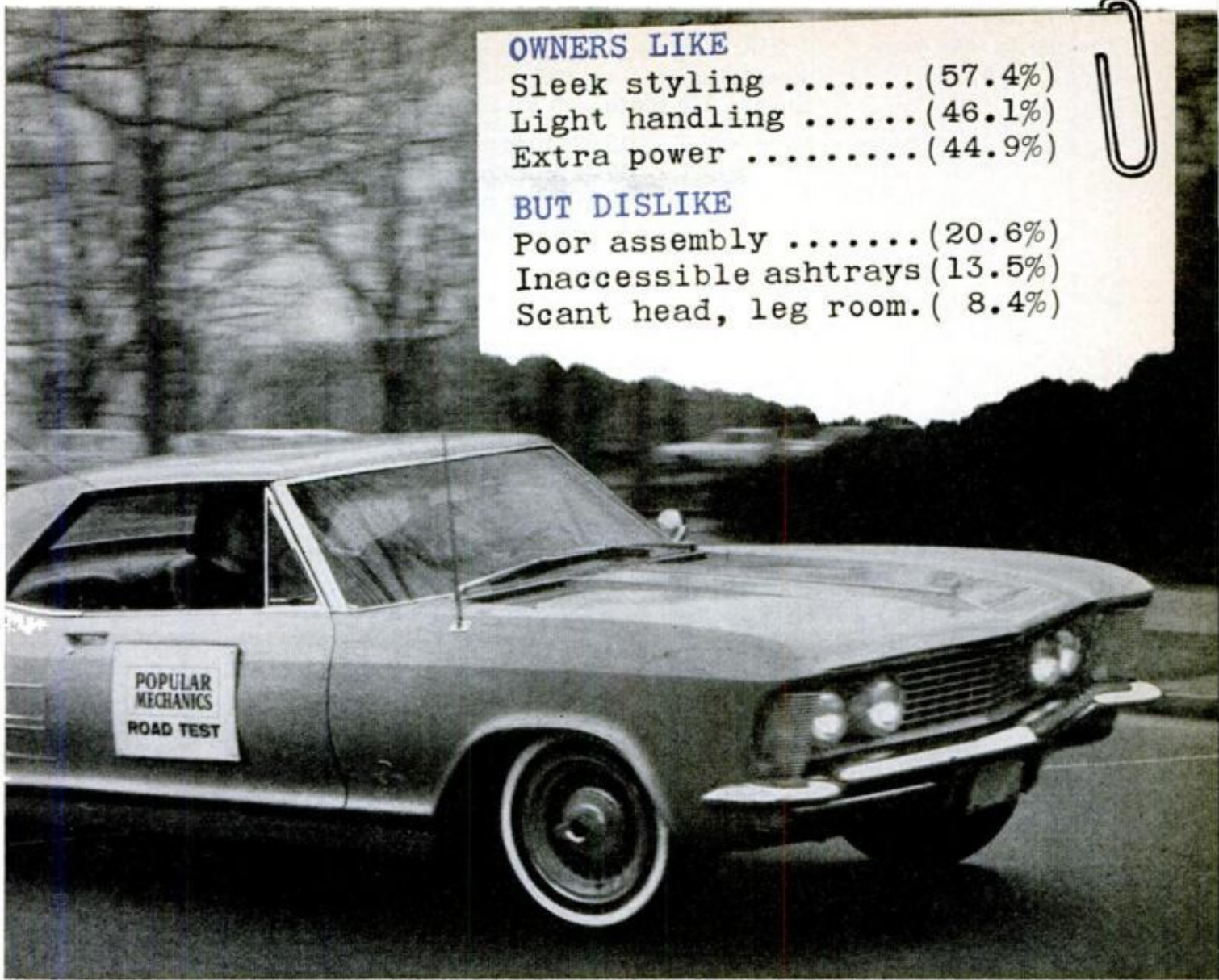
A California carpenter is happy with mechanical design, too, but reported the "interior is terrible. Panels misaligned, scratched and marred; accessories poorly installed; it looks like a reject inside—hood and deck lids poorly aligned; paint



**SNAP THE WHEEL** over and the Riviera leans heavily, but power steering lets you corner sharply—one source of handling raves by Riviera owners

**EXIT** from the Riviera's rear seat calls for some gymnastics, but owners were more concerned with the deep, soft upholstery. Several, however, wanted room for three in back





#### OWNERS LIKE

Sleek styling ..... (57.4%)  
Light handling ..... (46.1%)  
Extra power ..... (44.9%)

#### BUT DISLIKE

Poor assembly ..... (20.6%)  
Inaccessible ashtrays (13.5%)  
Scant head, leg room. ( 8.4%)

spotty or thin or bare in places; nicks and scratches from assembly operations were not taken care of.”

Sleek continental styling excited 57.4 percent of Riviera buyers. But assembly details sparked complaints from more than 20 percent of the owners we surveyed. Specific mechanical troubles affecting operation were few, however, and the carpenter—and 80.6 percent of his fellow Riviera owners—said they’d buy Riviera again.

Aside from the assembly squawks and petty annoyances such as out-of-reach ashtrays, owners were generally happy with their Rivieras—enough so that 71.9 percent rated them Excellent over-all. Only a tiny two percent placed them in the Fair and Poor categories. The slide-smooth luxury car ride impressed many owners.

From Ohio, a construction superintendent said, “We drove 4000 miles on vacation and could drive more miles per day because we didn’t get as tired in this car. It’s by far the most comfortable auto we’ve ever driven, and everywhere we got admiring comments on the style.”

Riviera owners have relatively few illusions about fuel economy; 56.5 percent said they were getting about what they expected, in most reports that averaged about 9-10 miles per

*Riviera is softly sprung and smooth riding on class A roads ← but on crowned rolling blacktop it needs more shock control*



**At this rate it's cheaper to take taxis** →

gallon in town, 13-14 on long trips, and 11-12 over-all.

The electric fuel meter and fifth-wheel speedometer were hooked up to our test car for a series of steady-speed fuel checks. Here are our Riviera results:

18.02 miles per gallon at 30 m.p.h.  
17.41 miles per gallon at 40 m.p.h.  
16.21 miles per gallon at 50 m.p.h.  
15.14 miles per gallon at 60 m.p.h.  
13.78 miles per gallon at 70 m.p.h.

Over-all mileage, including city traffic driving, was 12.25 m.p.g.

On performance, the Riviera sparkled. Zero to 60 m.p.h. time was 7.9 second, 40-60 was 4.6 and 50-70 m.p.h. was 5.2 seconds. Time for standing quarter-mile was 16.0 seconds with an 82 m.p.h. terminal speed.

*Here are samples of the first five Riviera qualities cheered most, in order of the number of owner comments on them:*

"Simplicity and clean design."—Michigan manufacturing representative.

"It does not eek and ooze all over with chrome."—California electrical engineer.

"Excellent handling in city, on freeway or on mountain curves."—California pilot.

"Its quick response makes it a pleasure to drive."—Illinois homemaker.

"It has the speed when you need it in an emergency."—Pennsylvania foreman.

"The car is really comfortable on long trips."—Louisiana well-drilling contractor.

"I like its smoothness when moving."—Indiana manager.

"Riviera is softly sprung; it rides and looks like the expensive car it is."—California accountant.

*Here are the five noisiest objections mentioned most often by PM's panel of Riviera owners:*

"Assembly workmanship poor; there were scratches on the inside, small flaws and scratches on the outside, and a shock absorber was disconnected."—Missouri marine engineer.

"Accessories did not operate. Also, the air conditioner doesn't work."—New York physician.

"The floor carpet fits poorly; I received the wrong speedometer; the window glass came out."—California engineer.

"The rear coil springs had to be resealed because they were rubbing against the frame."—Ohio fireman.

"At delivery, the wrong fuses were in the radio; the air vents rattled and longer screws had to be put in; the defroster did not work; a collar on the drive shaft came loose and had to be reassembled."—Massachusetts housewife.

"You have to be a sharpshooter to find the ashtray with your cigaret while you're driving."—New York salesman.

"The position and size of the ashtray is no good for a pipe or cigar smoker."—New York administrative assistant.

"Insufficient head and legroom in the front seat; probably same is true in the rear seat."—New York chemist.

"I would like to get the same gas mileage enjoyed by Cadillac owners."—California salesman.

"Fuel consumption is very poor in my opinion and prestige is no excuse for an inefficient machine."—California pilot.

"Small rear window makes visibility poor as you back

**Basically he's right, but there's still a touch of juke box in that grille!** →

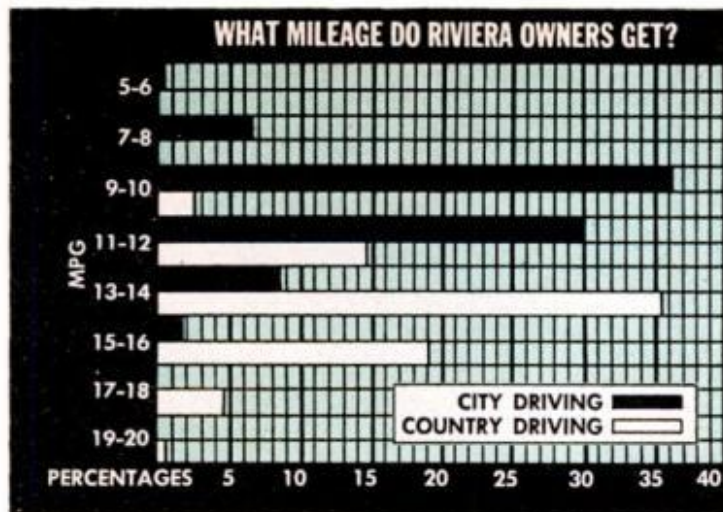
**Steering at 3.5 turns of the wheel is quick as most, and that new three-speed torque converter plus 425-cubic-inch V8 really hauls the mail** →

**He's right. It would be almost easier to flick ashes in your trouser cuff while doing a handstand** →

**We got back there, and it's true. The power seat doesn't move back far enough for a long-legged driver, either** →

[\(Please turn to page 187\)](#)





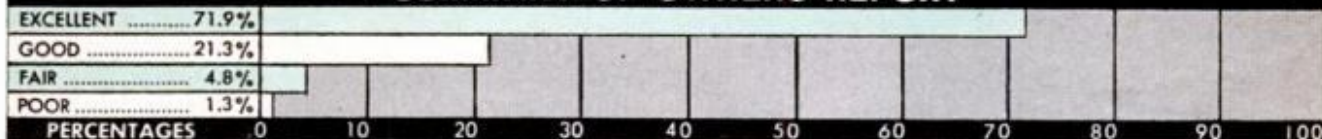
**MOST RIVIERA OWNERS** (29.7%) reported over-all fuel consumption of 11-12 m.p.g. In town, 9-10 m.p.g. was more common and on long trips, 13-14 m.p.g.

**TRUNK SPACE** in the Riviera displeased some 6.8 percent of the owners, though some 57 percent liked the sporty styling of which the trunk lines are a part

**HEADROOM** was a bit snug, even for our 5'6" model. Owners complained, too. Several also pointed out that the large central console in front required drivers to leave the car on the side exposed to traffic. Luxurious interior, however, was a favorite feature for many



### SUMMARY OF OWNERS REPORT

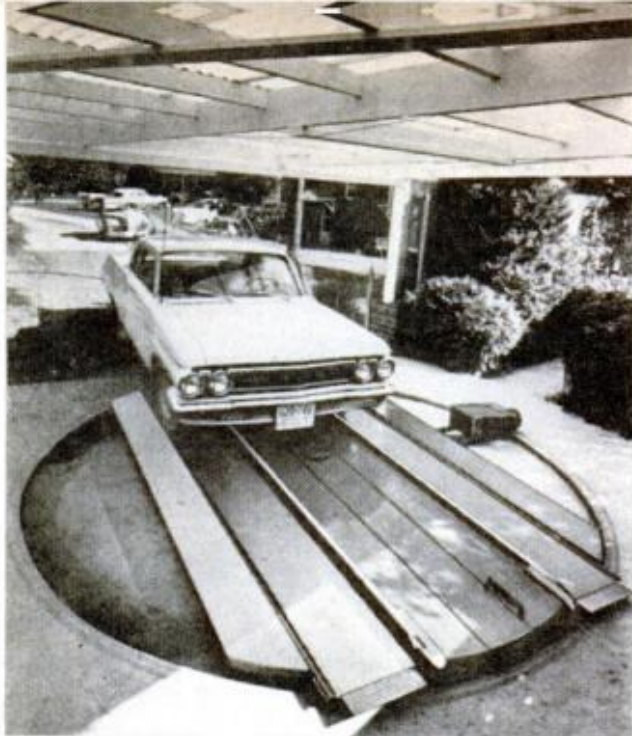


<b>Mileage experience</b>	
As expected	56.5%
Better	14.5
Not as good	24.2
<b>Best-liked features</b>	
Styling	57.4
Ease of handling	46.1
Power, performance	44.9
Comfort	20.0
Smoothness of ride	19.0
Roadability	17.1
Transmission	8.1
Quietness	6.2
<b>Specific complaints</b>	
Poor factory assembly	20.6
Ash tray	13.5
Head and legroom	8.4
Gas consumption	8.0
Poor rear visibility	7.1
Trunk space	6.8
Paint and finish	6.8
Oil consumption	6.8
<b>Had mechanical trouble?</b>	
Have had	36.1
Have not had	63.9
<b>Mechanical trouble was:</b>	
Carburetor	3.5
Oil leaks	3.2
Rough idle	2.9
Heater and defroster	2.3
Transmission	2.3
Water leaks	1.6

<b>Best-liked exterior feature</b>	
Over-all appearance and styling	35.4%
Simple, clean lines	17.1
Front end styling	12.5
Headlights and parking lights	5.2
Side view	2.9
Grille	2.3
Size	2.3
<b>Least-liked exterior feature</b>	
Rear window	6.8
Rear end style	6.5
Poor rear visibility	3.5
Taillights	2.9
Paint and finish	2.6
<b>Best-liked interior feature</b>	
Bucket seats	31.6
Console	9.7
Tilt steering wheel	6.5
Comfort	6.1
Trim	4.2
<b>Least-liked interior feature</b>	
Ash tray	22.9
Head and legroom	8.7
Rear bucket seats	7.1
Console	6.8
Idiot lights	2.9
<b>Decision on Riviera influenced by</b>	
Styling	66.8
Performance	16.8
Buick name and reputation	15.5
Ease of handling	9.7
Size	9.0

<b>Other full-size car considered, if any</b>	
None considered	37.7%
Oldsmobile	16.1
Thunderbird	15.8
Pontiac	12.9
Cadillac	11.9
Other Buick	11.6
<b>Family's other car, if any</b>	
Riviera only car	37.8
Chevrolet	12.3
Other Buick	9.0
Special	5.8
Cadillac	5.5
<b>Make of car traded in</b>	
Full-size Buick	30.3
Thunderbird	8.7
Oldsmobile	8.4
1963 Riviera	6.1
Chevrolet	5.5
Pontiac	5.2
Special	3.5
Cadillac	2.3
<b>Dealer service</b>	
Excellent	55.5
Average	31.9
Poor	11.3
<b>Would you buy from him again?</b>	
Would	64.5
Would not	12.6
<b>Would you buy another Riviera?</b>	
Would	80.6
Would not	11.0



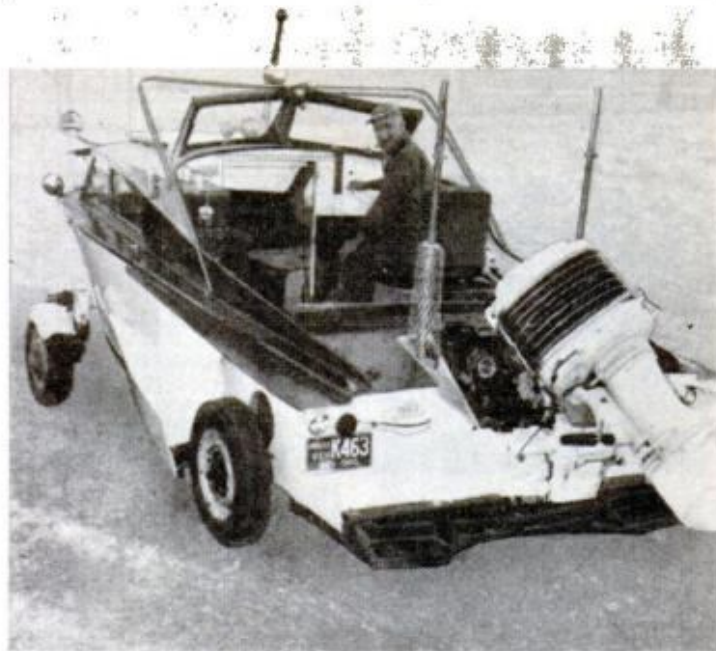


### Homemade Turn-Around

Backing along the driveway is a thing of the past for George Beattie, Alexandria, Va. For \$350 in materials he built a powered turntable that stops automatically after turning his car around.

Treads like those from a grease rack, structural steel, 2-by-12-inch planks, and concrete were Beattie's building materials. The base includes a drain system.

Drive—forward or reverse—is from a 1/3-hp. 110-volt motor mounted with the gear box (from an aircraft starter) near the edge of the table. Finally Beattie put a 20-foot-square carport over the table for his standard-size car. The switchbox (for clockwise-counterclockwise and on-off controls) is on a walkway lamp post.



### Who Needs Water?

Using parts from a 1961 VW, an Ohio boater turned his seven-year-old home-made 20-foot cruiser into a "boat-car." For highway cruising, the hybrid craft uses a supercharged VW motor which can push it to 50 m.p.h. After launching, the wheels are cranked up snug to the hull and the owner switches to an 85-hp. outboard. It's licensed as a house trailer.

### Plastic Room Keeps Germs Out

Hospital patients who are highly susceptible to germs are isolated in tentlike "plastic rooms" in a California hospital. Arm vents to which rubber gloves are attached allow for patient care. Air pressure inside the plastic keeps out bacteria.





# New Adventures for Skin Divers

*Stalking man-eaters bare-handed, cavorting with giant whales—it's surfside suicide*

By Jack Speirs

**S**WIMMING CAREFULLY and slowly, the skin diver slipped up on the recess in the rock where he could see the protruding head of a vicious moray eel. Instead of avoiding the killer, the diver was stalking it. When he was close enough he slipped his hand into the hole below the eel's line of vision. In a sudden flurry of movement, the diver grasped the eel, jerked it from its lair, and a battle to the death was on — with the odds about even.

This is just one of the latest innovations in the skin diver's concept of "fun," and when he tires of this he can fish underwater with rod and reel, ride whales, or play



**HITCHING A RIDE** on the fluke of a giant gray whale can be dangerous, but to the skin divers who risk being swatted like flies, it's their idea of underwater fun



a game that sounds like a bundle of laughs called "pulling the shark's tail."

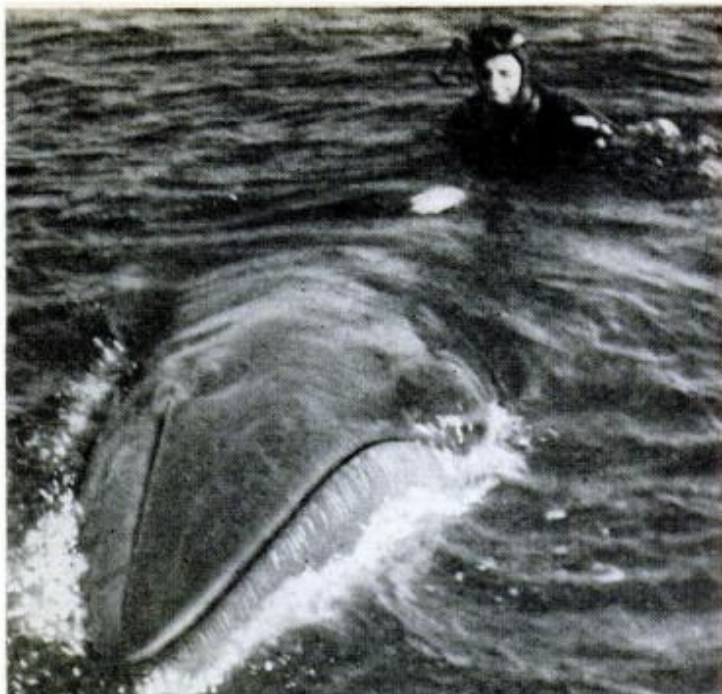
Fishing underwater with rod and reel may not sound like much, but if you've hooked a good-sized shark or a short-tempered barracuda, and you're down in his element with only mask, fins and snorkel, you need taut nerves to match your line. You can use scuba gear, but the real buffs sniff at this unless you're after something really big. It's more exciting to have to come to the surface for air and still keep the shark on the hook.

But even scuba gear can add problems. One 200-pound Californian hooked a 10-pound barracuda and was towed part way around Catalina Island. The added buoyancy of the gear made him weightless, and the weightlessness made him helpless. It ended when the 'cuda finally tired of pulling.

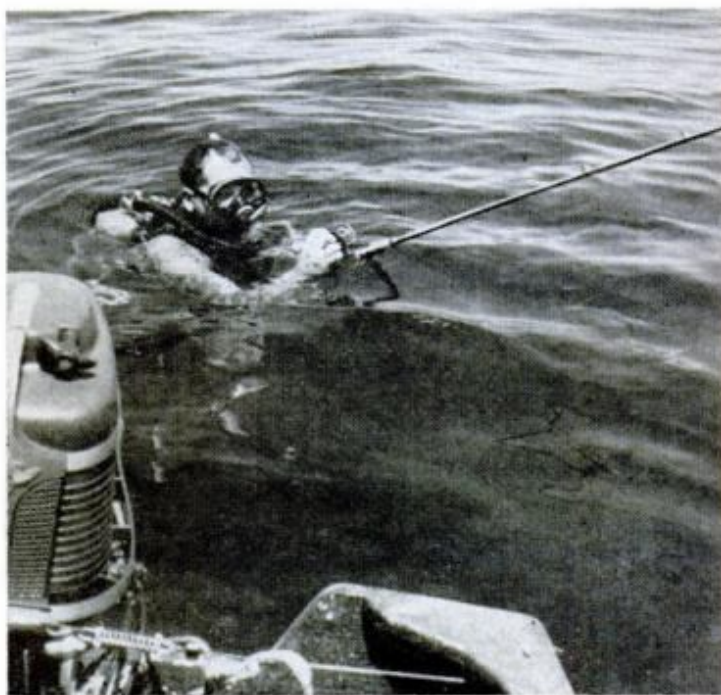
Californian Jerry Huth, who started the sport, describes shark fishing underwater as "touchy." He explains, "You've got to handle a shark like a cat. You hold a cat's tail and he'll try to pull away, but if you give it a real tug he'll turn and come back biting and scratching. It's the same with a shark. You have to keep just the right pressure on the line so the shark keeps trying to pull away. Too much pressure and you might suddenly become the bait."

Pulling a moray eel from its hole requires steel nerves and a stealthy hand. Resembling a large snake, the moray is as lethal as a cobra. In order to breathe the moray keeps its head out of its hole, the mouth opening and closing to force air through its gills, small round holes on either side of the neck. When the diver slips in to grab the eel he faces two problems. If the hand is slower than the eye the eel gets the hand, and if the initial grab is successful, the eel can contract its body and be impossible to pull from the hole, and the diver then has to get his hand out of the hole without losing it. Once he has the moray, the diver can suffocate it by closing the gill holes with his fingers, but the common procedure is to swim to the surface, throw the eel as far as possible and head for the boat.

Shark baiting or "pulling the shark's tail" is a simple game. The diver swims around until he sights a shark, then he just swims over and takes hold of the shark's tail. The shark is then supposed to swim off, towing the diver after him. This sport is practiced with the smaller species



**FINDING A DOZING WHALE**, a diver climbs aboard and prepares for wild ride when the beast awakes and decides to get rid of the thing on its back



**CASTING FROM THE SURFACE**, a diver with rod and reel, and equipped with scuba gear, is fishing for a large shark that will give him an underwater battle

of shark such as the dog shark or the sand shark that will not attack a man. When they are provoked, of course, they act like any other shark.

"It's really a lot of fun," one practitioner explained. "The shark will give you a really exhilarating ride. The only difficult part is when you let go."

In the event the shark has not enjoyed the game and decides to attack, the diver

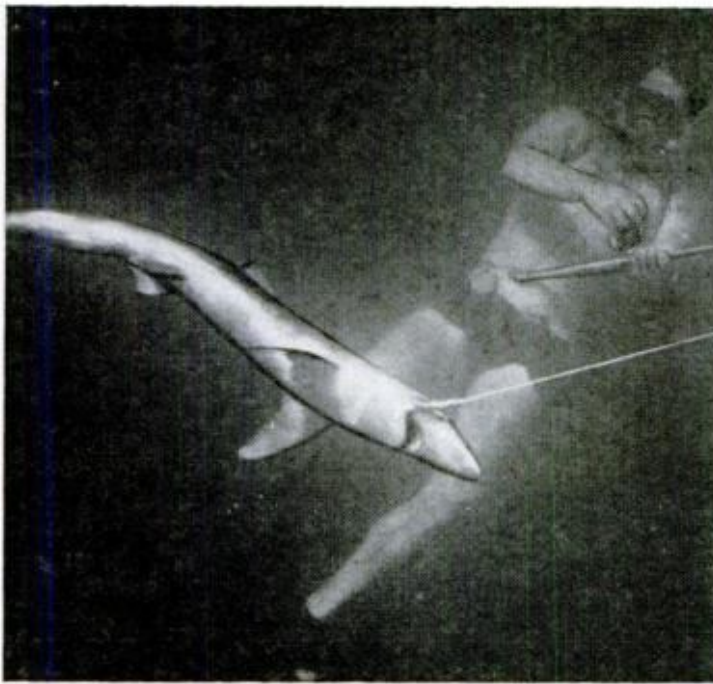




**WRESTLING** a lethal moray eel after it has been pulled from its lair is a no-odds battle to the death that calls for muscle and steel nerves



**SHARK BAITING** consists of grabbing a shark by the tail and hanging on for an exhilarating ride. The only difficult part is when the diver lets go



**DIVING DOWN** when the shark is hooked, the diver fights him in his own element, carefully keeping just enough taut line to keep the shark running



**MISCALCULATION** in this sport can mean sudden amputation, and diver must reel in his quarry before the air runs out or cut the line and let him loose

is equipped with a knife, and the party turns into a brawl. And the diver doesn't always come out in one piece.

Riding whales is the newest sport on the Pacific Coast where the great herds of giant gray whales make an annual southern migration.

It began when a group of diver-photographers infiltrated a herd in search of pictures and discovered a whale with its fluke

tangled in a large net. They found that they could climb up on the whale's back, and after they freed the whale they were given a ride that was "like riding through the water on a steam locomotive."

This single report was enough to stir the red blood of scuba divers, so nowadays the whale migration has them out in force looking for a free ride—and risking the crushing blow of a well-aimed fluke. ★ ★ ★



*Two-man submarines, gas-powered spear guns, contact lenses, self-contained underwater cameras—they're all part of the . . .*

# New Look

By Ross Olney

**I**N THE BEGINNING man emerged from the sea," says Capt. Jacques-Yves Cousteau, famed French undersea explorer, "and you will see the day when he will return there to live."

An extreme view? Perhaps. But the makers of scuba equipment are doing all they can to hasten that day's arrival. Result is an array of new devices to gladden the hearts of divers everywhere.

For example, a captain in the Office of Naval Research has patented two new safety devices that will appeal to anyone who has youngsters or novices along. One is an automatic life vest inflator. If the wearer falls overboard, a chemical wafer dissolves, activating the CO<sub>2</sub> inflator. Expected price: about \$5. The other device prevents a diver from going too deep. You preset it for desired maximum depth. When the diver reaches that depth, whether conscious or unconscious, his weight belt drops off and up he comes. Expected price is about \$25.

Voit Rubber Div. of American Machine & Foundry is marketing a new square regulator called the Dolphin (\$89.50). It's reported to be snag-proof and to allow easier breathing. Surge-proof pressure ports are on the back.

For underwater hunting or self defense, you can arm yourself with a lethal gun that shoots a self-propelled steel shaft. This dart will penetrate 3/4-inch plywood at 30 feet and is accurate up to 35 feet. Due to its hefty recoil, the manufacturer, Englis Engineering Company of California, suggests you use both hands for firing.

Sub-surface photography is easier with two new cameras that don't need bulky watertight housings. The Nikonos is a precision 35-mm. still job made by Nikon. The Autosub 8 is an 8-mm. movie camera from Scubapro. Both can be used in the water or out, and should cost around \$200 with accessories.

If you're the kind who likes to be noticed, even under water, Voit's flamboyant



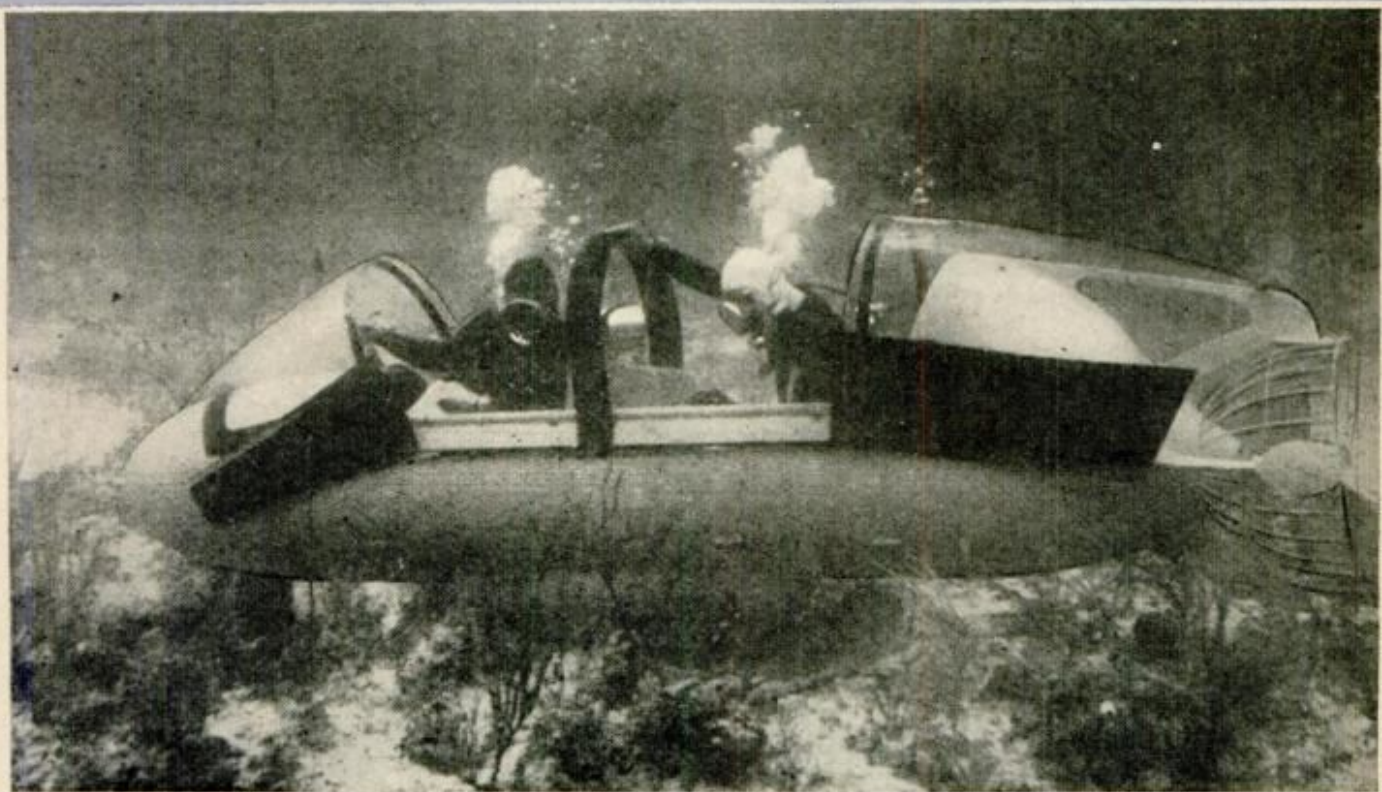
**DESIGNED** for easy handling in rough surf, Del Wren's diver's float has storage racks for spear guns, a fish well, and ample area for the diver to rest

**HELMET** with full face mask is a diving intercom with headphones and microphone from Jetronis. Reflector on top is a directional unit for navigation





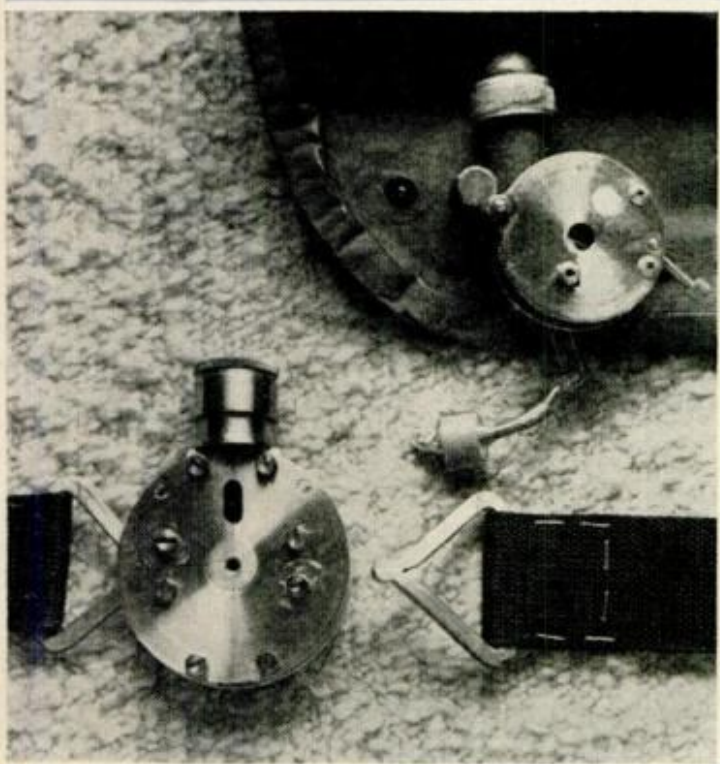
# for the Wet World



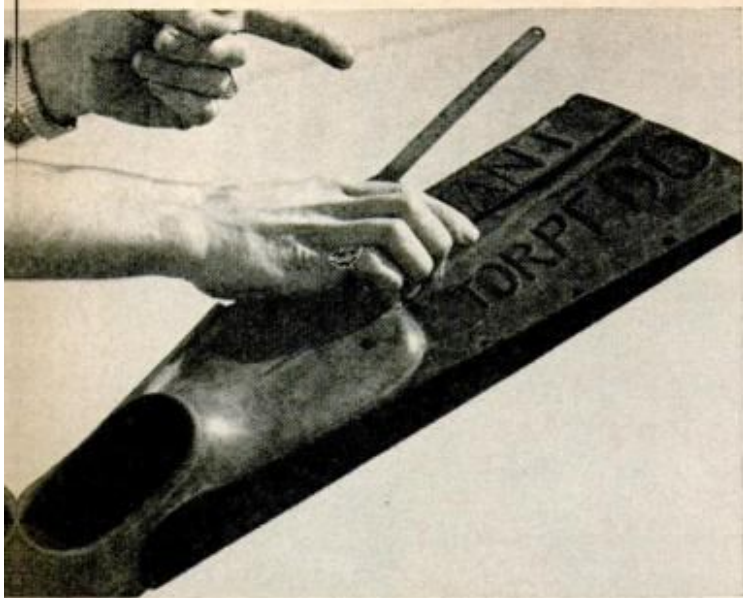
**TWO-MAN SUBMARINE** (Scubapro) with open hull is equipped with buoyancy tank, dives to a depth of 100 feet. Twelve feet long and made of fiberglass and reinforced aluminum, it will do 3 knots under water on 1.8-hp. motor

**SAFETY DEVICES:** Unit at top of photo inflates life vest automatically if wearer falls in water. Device on weight belt drops belt at pre-determined depth

**BREATHING MOUTHPIECE** is built into this Scubapro mask that will also keep the face completely dry, and is ideal for use with intercom system. Price: \$50







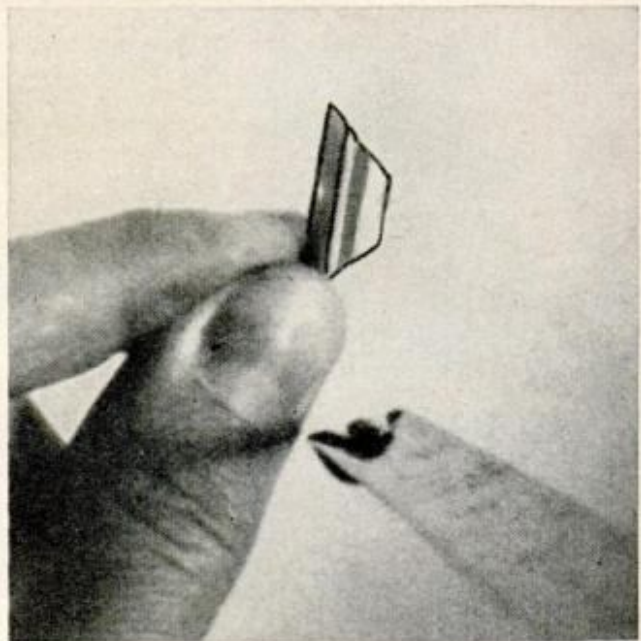
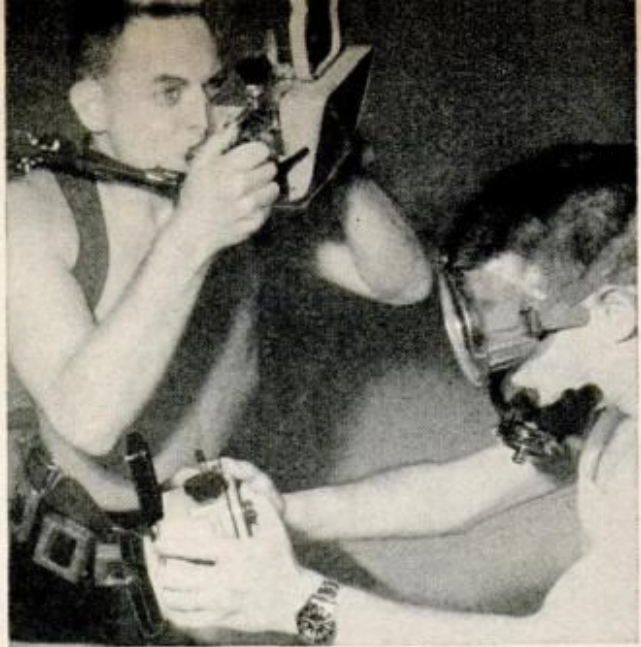
**INSERTING** spring steel the full length of White Stag flipper gives it added rigidity and will offer greater speed and power to a swimmer with strong legs

ColorGuard wet suits are just the thing. (They're also a practical safeguard.) Nylon backed for durability, they cost \$66.50 in standard sizes.

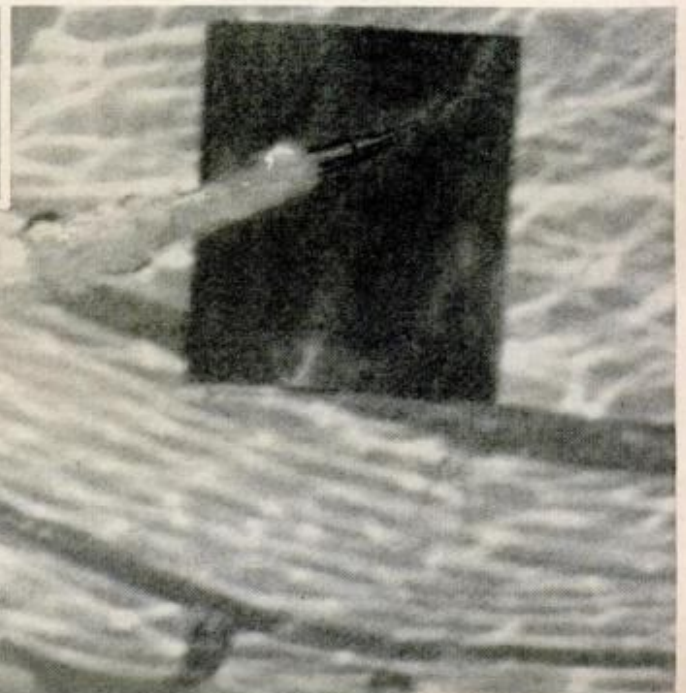
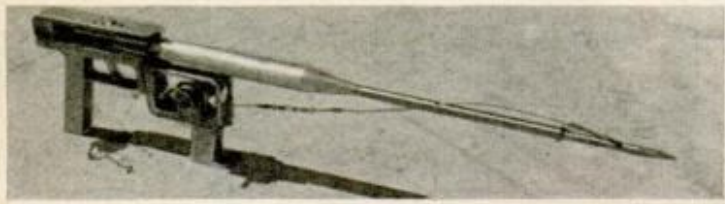
Speaking of wet suits, White Stag's new ones feature seams that are both glued and stitched for extra holding power. This company also offers steel-reinforced flippers said to give extra speed in the water. They retail for \$17.95 a pair.

Optometrists Alan H. Grant and Edward L. Beckman have designed a set of underwater contact lenses. They're not cheap

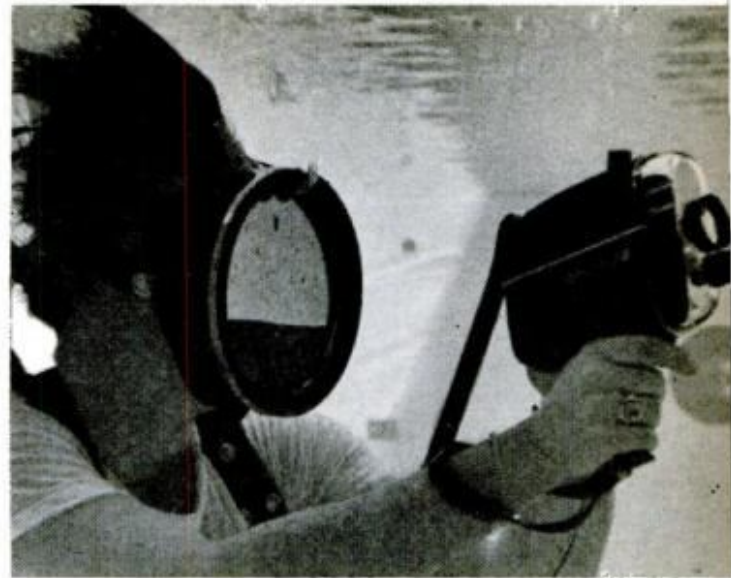
**POWERED** by a CO<sub>2</sub> cartridge, the shaft of a new spear gun will penetrate 3/4-inch plywood at 30 feet. A reel on the gun is used to play and land the fish



**CONTACT LENSES**, on diver (above) and shown close up (below), have been tested at 300-foot depth. Eliminating the mask, they more than double field of vision







**SELF-CONTAINED** underwater cameras take pictures without cumbersome and expensive housings. The 35-mm (left) is a Japanese model with interchangeable lenses. The 8-mm movie camera (right) features electric eye control

(about \$175 plus \$25 for fitting) and they can take getting used to. But some divers swear by them. They're claimed not to fog and to float if lost.

The Bendix Watercom makes it possible to converse while under the surface. It attaches to your air tank, with a mike strapped around your throat. Through a companion boat model, which has a transducer and hydrophone hanging in the water, a diver can talk to other divers or the boat at ranges up to 100 yards. A diaphragm acts on the water much like your

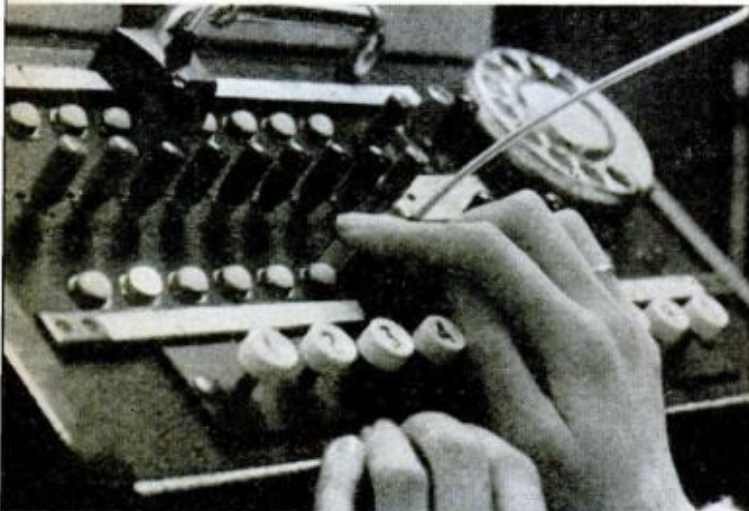
vocal chords act on the air. Jetronics Industries' Aquavex Mark II Swimmie Talkie (about \$800) is a similar unit built into a helmet.

There are still more submarine delights, but not enough space to show them all. Among them are a pressurized "Mummy Bag" used to float a diver threatened with the bends to a decompression chamber, a combination life raft and diver station that becomes a gear-toting bag when deflated, and an LP record of underwater sounds for those who'd rather stay home. ★★★

**EQUIPPED** with a special attachment for underwater observation, the Aqua Jet will haul two divers at speeds up to 25 m.p.h. Made of fiberglass and powered by an inboard engine, it is steered by movements of legs and body







### Switchboard for the Blind

Using a photoelectric cell that she pushes along a rail, a blind operator can locate incoming calls on an experimental British telephone switchboard. A light on the board causes the cell to set off a sound signal. The operator makes notes in Braille.



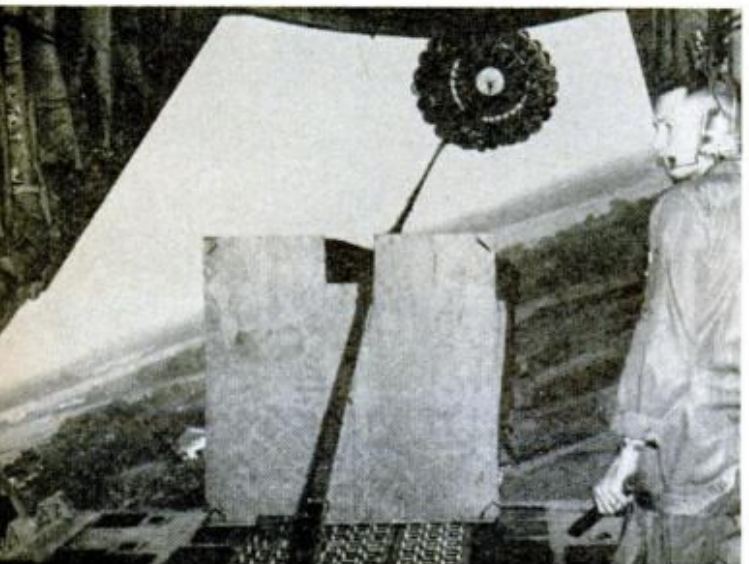
### Modern Art—Take as Directed

Critics of modern art who are pained by abstractions may take heart with a new art form in England. A doctor's wife is using sample pills and capsules to produce collages with such therapeutic titles as: "Apple a Day" and "Bouquet for the Matron."

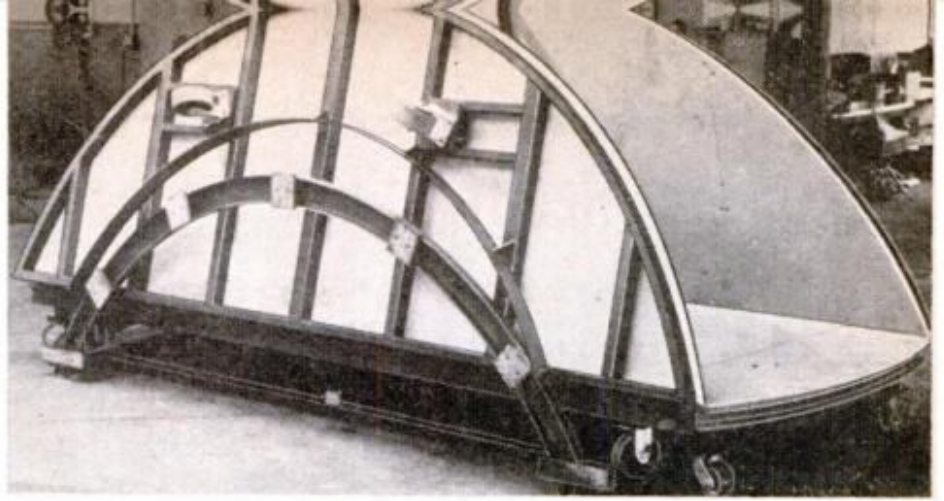
### New Low-Level Parachute Drops Are Most Accurate Yet

Flying less than 200 feet above the ground and using special parachutes to yank cargo from the plane, Air Force pilots are dropping supplies with pinpoint

accuracy in target areas 40-by-20 feet. Called PLAD (for parachute low-altitude delivery), the system could be used in places where helicopters are vulnerable.







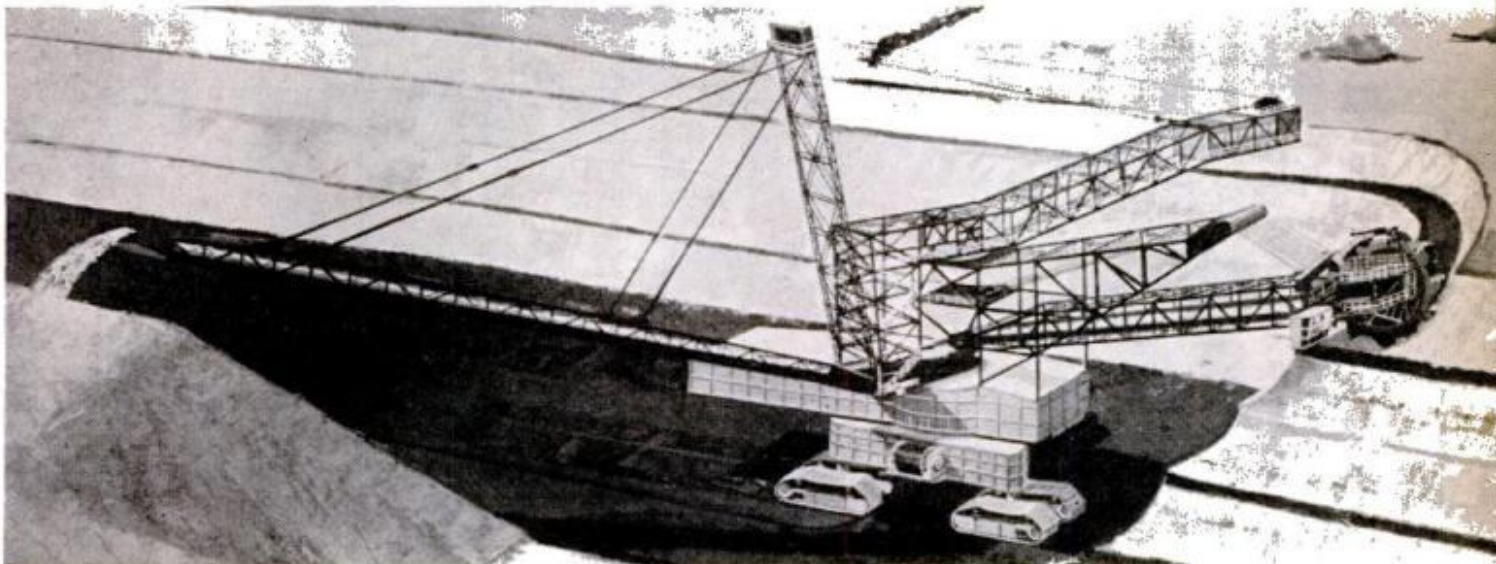
### One-Piece Portable Turntable

Requiring no assembly, a one-piece turntable can be transported to the display location and set up in minutes. When folded, it rolls on a set of wheels. When unfolded another set of wheels roll on a circular rail, lifting the first set off the ground. Called Port-a-Fold, it is manufactured by Macton Machinery Co., Stamford, Conn.

### Mechanical Giant to Inhabit the Coal Fields

The whirling jaws of this gigantic "mining wheel" will soon be strip mining lignite coal in North Dakota. Longer than a football field and higher than a 10-story

building, the monster is being made in Germany for Truax-Traer Coal Co. Eighty railroad cars will be used to haul the machine to the mine.





# Rickover's Reactor: Self-Perpetuating Power

*Latest "heresy" of our atom sub admiral is a practical reactor that produces more fuel than it burns, while generating power for people*

**B**LUNT-SPEAKING and crusty, the little admiral was filling a familiar role—telling a congressional committee the facts of atomic life with a characteristic salting of sarcasm.

This time, Rhode Island's Senator John Pastore, chairman of the Joint Committee on Atomic Energy, was on the receiving end of acid-tongued Hyman Rickover's wit.

"When the time comes that you don't have any electricity in your home," he snapped, "your wife will raise hell. She'll say, 'I don't care about the cost. I want my electric lights.'"

As usual, Adm. Rickover was looking into the future—this time, to the day when fossil fuels will be exhausted. In an attempt to breathe new life into the nation's lagging atomic energy program, the naval gadfly who bedeviled a reluctant service

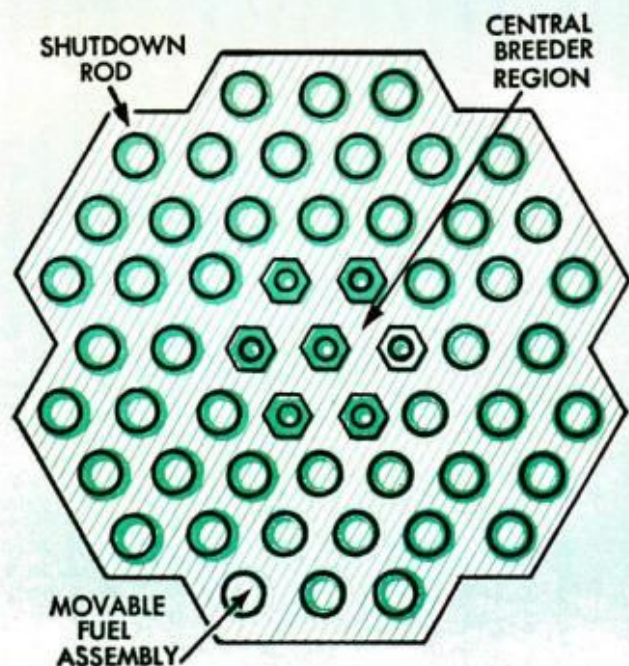
into building atomic submarines years before the experts said it was possible, was trying to prod the legislators into new efforts in the nuclear energy field.

As a result, new concepts in atomic reactors are in the works.

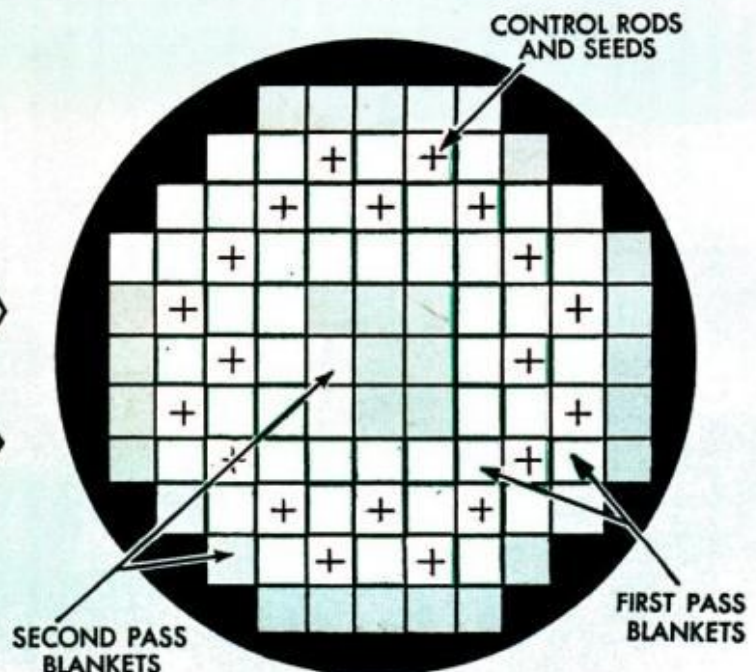
The most exciting of four nuclear reactors proposed at a recent symposium held by the Atomic Energy Commission, the Rickover reactor combines two concepts in one. Known also as the "seed-blanket" or Large Power Reactor (LPR), it will not only produce relatively cheap power, but it will also produce more fuel than it consumes.

The so-called "breeder reactor" (see *A-Power: Creeping Giant*, page 100, June 1963 *PM*) has been heralded as the reactor of the future. Adm. Rickover's proposals make that future look a lot closer.

**RICKOVER-TYPE** reactor core has seven breeder seeds and blankets in center as breeder study unit. Other fuel elements produce cheap electric power

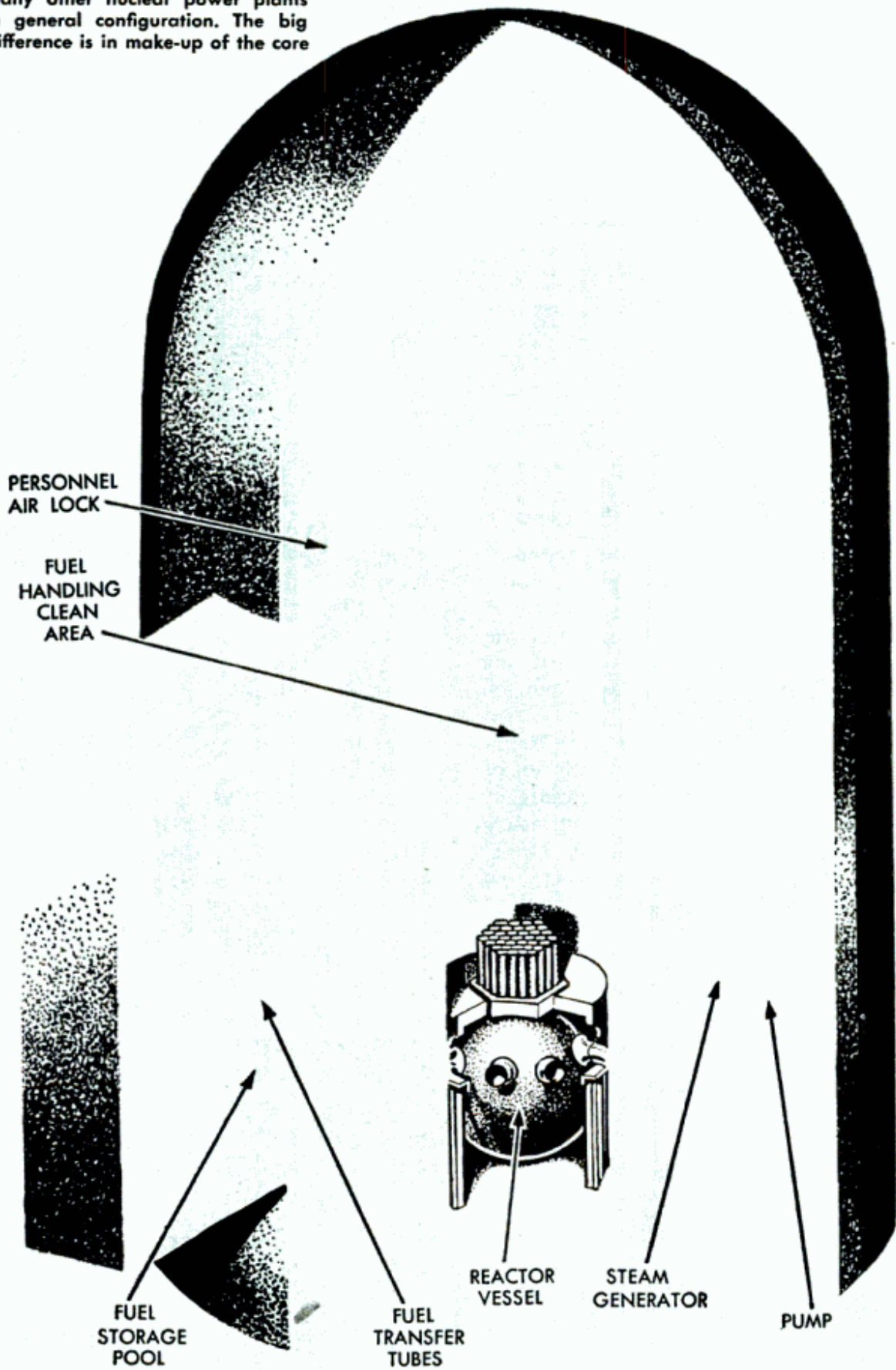


**SHIPPINGPORT** core has ring of seeds and control rods (+), with fuel-breeding blanket of thorium inside and outside the ring. Some neutrons escape

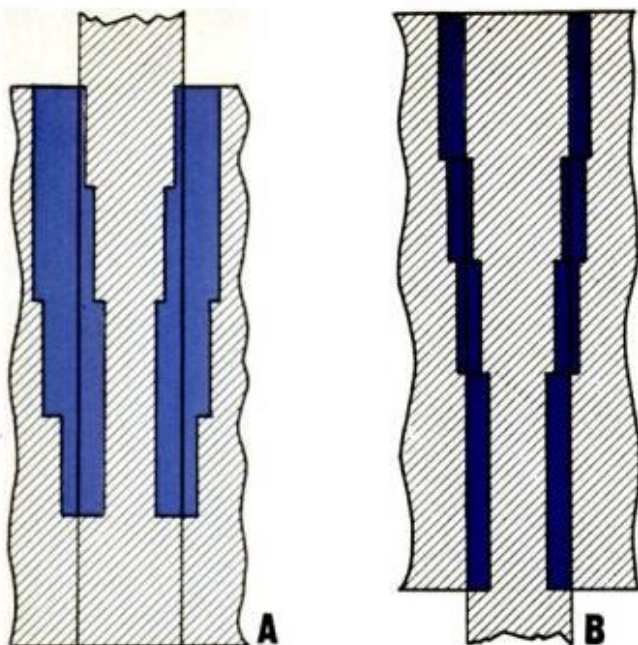




LPR REACTOR plant, shown here in cutaway sketch, would resemble many other nuclear power plants in general configuration. The big difference is in make-up of the core







**TELESCOPING** fuel in new Rickover reactor eliminates control rods (A) shows fuel position at low reactivity of core; (B) is position at high reactivity

In most reactors to date, the radioactive "core" is in center of a massive cylinder. Fissioning atoms between fuel elements are slowed or speeded up by means of cadmium rods that slide in and out of the core. Cadmium soaks up flying neutrons like a blotter soaks ink. The system works, but it wastes a lot of fuel.

The core of the 500,000-kilowatt Rickover reactor, however, will be made up of what the admiral calls "little islands of reactivity" or more than 100 miniature reactors. Each will be an enriched "seed" of uranium surrounded by a blanket of thorium. At the center of the core will be a group of seven special core assemblies for breeding atomic fuel. The remaining

seeds will produce usable electricity.

Fissioning in the seed produces power—and excess neutrons. These pass into the blanket where they are absorbed by the non-fissionable thorium which becomes, under bombardment, fissionable U-233.

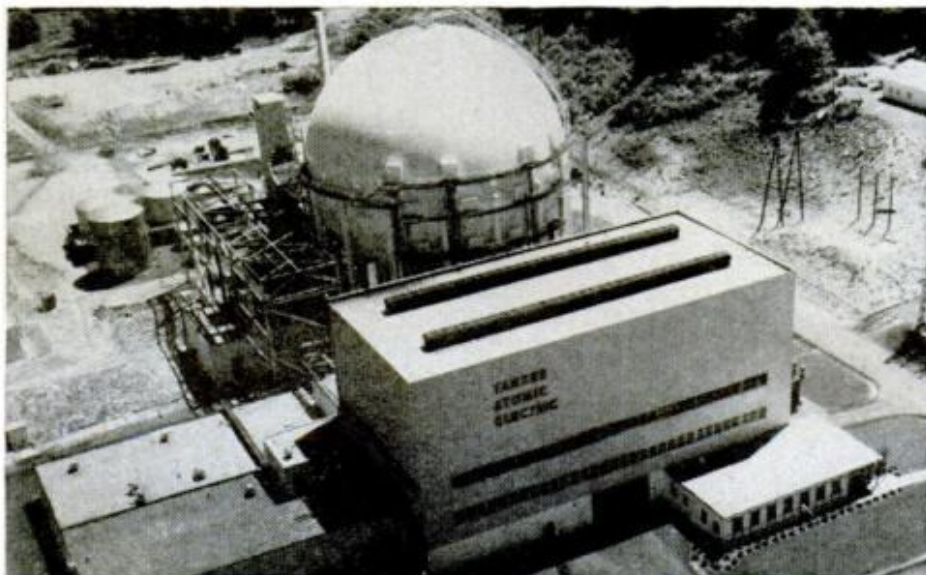
Control will not be exercised by conventional cadmium control rods. Instead, the fuel rods themselves control their own critical mass. They are made like telescopes. The central barrel, or tube, of uranium moves up or down inside a larger sheath of the same material. This of course alters the thickness of the seed. Thus, when the center is lowered, the seed region grows thinner; this increases the leakage of neutrons, reducing reactivity.

But when the center of the core is raised into place, the seed region becomes thicker, increasing reactivity for power production. A tremendous advantage of this development is that it eliminates the usual poison by-products left in the soaked-up control rods of the usual reactor.

Operating as an economical power producer, the LPR will theoretically be able to go 10 years without refueling. As a breeder reactor, it could function three to four years without refueling.

Chances are that Adm. Rickover will get his reactor, probably to be built in California. Power would be used to pump water from Northern California to parched areas in the southern part of the state.

Present practical uses for reactors, however, are not important to the admiral. Except for military reactors, he says, the U.S. should not at present build *any* reactor "with the idea of anything else but learning from it." ★★★



**YANKEE** atomic power plant is a cousin to the Rickover concept, and stems from Shippingport experiments. It is the largest pressurized water reactor built until now



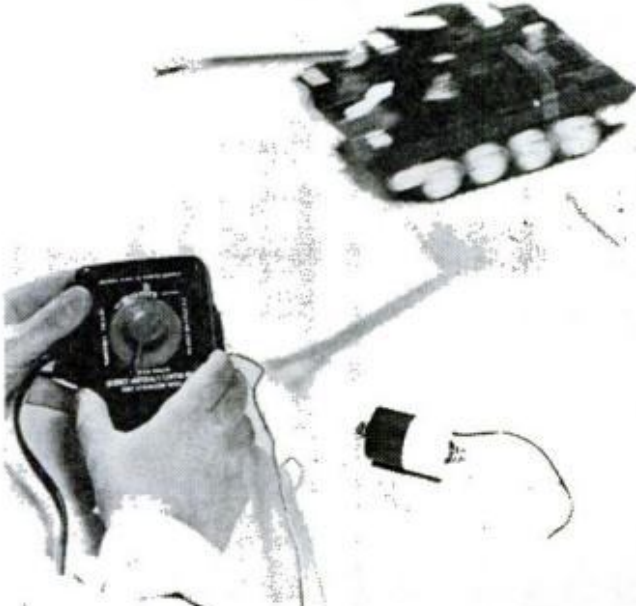


### Two New Leg-Powered "Inboards"

Featuring twin adjustable cockpits, each with its own set of pedals, a new 12-foot fiberglass paddle-wheeled boat can be driven from either seat. Rudder handle is between seats. It sells for \$795, while a smaller 6-foot model (inset) is priced at \$199. They're from Nevil Enterprises, Inc., Suite 318, Savoy-Hilton, 58th & 5th, New York, N.Y.

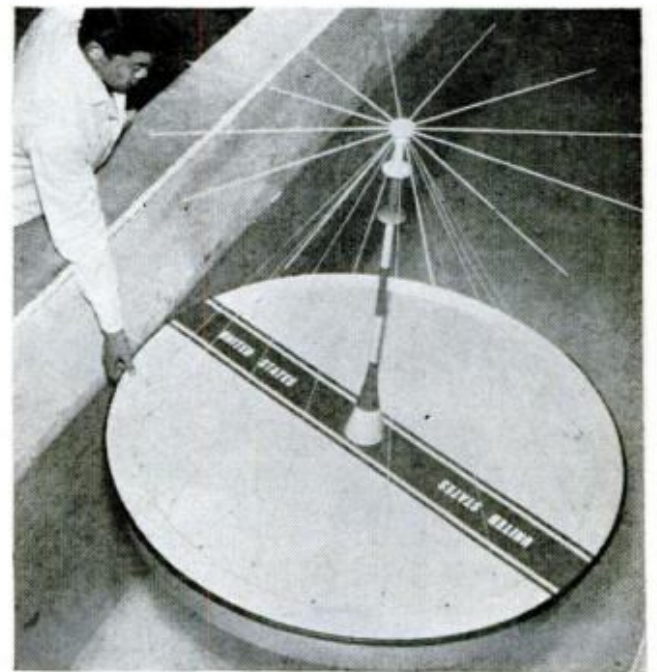
### No More Batteries

Slip two Magic Cell contactors into the toy, plug in the power supply and you won't ever need batteries. Developed by Science Material Center, New York, N. Y., the \$10 power unit converts 110-volt house current to the level of two D-cell batteries.



### Electronic Water Saucer

This year, a large version of this  $\frac{1}{10}$ -scale telemetering buoy will be checking the ocean off Florida and California. Built by Convair Division of General Dynamics, the buoy will measure water temperature, current direction and light transmission.





# Shin-Bustin' Polo

By Bob Grant and John Boykin

MAYBE THEY SHOULD call it soclo or poccer because it's really part soccer and part polo.

It's played like soccer only from mounts—namely motorcycles. The shins take a beating, because the players propel the ball primarily by kicking. Heads, shoulders, hands and even handlebars and front wheels are also thrown into the fray at times. The only restrictions are no catching the ball, picking it up or throwing it. It has to be hit.

Cycle polo, unknown a short time ago, is catching on. It's played, five players to a side, on a field 80 by 120 yards in 10-minute quarters, with a five-minute break between quarters for rest and repairs. Surprisingly, however, few repairs are needed.

The players usually strip all road gear from their cycles—fenders, mirrors, etc.—to prevent injuries, and the skeleton machines stand the action admirably. Any size bike is allowed, although 80-cc high-torque machines are most popular.



**PLAYERS' SHINS** are protected by heavy boots and leather pants, but in heavy action they get a good going over, and skinned shins are common

**FREE BALL** starts scramble. Toughest maneuver is swinging cycle around when player is facing wrong way as action starts in the other direction



POPULAR MECHANICS

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**PLAY BALL!** Referee throws ball into center of opposing teams and one man guns his engine too much trying to get at it, rearing back on his hind wheel. Falls are frequent, but cycles and cyclists are both rugged

**THRILLING ACTION** is best when cyclist gets ball under control and heads toward opponents' goal, leaving wake of sprawled players and motorcycles

**A SCORE!** Cyclist drills ball through goal posts, scoring points the same way they do in soccer or polo. Game lasts 40 minutes, with three timeouts





# Clobbering Communism With WET NOODLES

*Expelled from Red China, this priest built a secret weapon—the fabulous noodle machine*

By Stuart James

WHEN THE REDS expelled Monsignor John Romaniello from the Chinese village where he had served as a missionary for 22 years, they started the Catholic priest on a one-man campaign against communism that is now known in Hong Kong as "Romy's Noodle War."

Returning to China in 1957 after a six-year exile, Father Romaniello was made director of the Catholic Relief Services with the task of feeding the throng of refugees—nearly 100,000 a day—who escape over the border to Hong Kong. This assignment was complicated by the knowledge that of the \$15,000,000 worth of surplus food being sent annually from the U.S., most of it was finding its way into the black market and eventually on to Communist China. It was Romaniello's job to stop it.

A small, bespectacled man with thinning white hair and a wry sense of humor to complement a well of explosive energy, Father Romaniello went straight to the root of the problem.

"I didn't think a cloak and dagger would go well with a Roman collar," he says, "but I had to see what was going on. I kept a watch on a bakery that was a known exchange for the black market. One after another I saw people arrive with five pound bags of surplus wheat flour and leave with a small bag of noodles.

"I followed one woman back to her home, a small space beneath a staircase where she had to cook for her family on a tiny one-burner stove. The problem was so obvious it was embarrassing not to have realized it immediately. The Chinese simply did not know what to do with wheat flour, corn meal and powdered milk, which was the bulk of the surplus food. With noodles and a few vegetables they can cook a meal in a single pan."

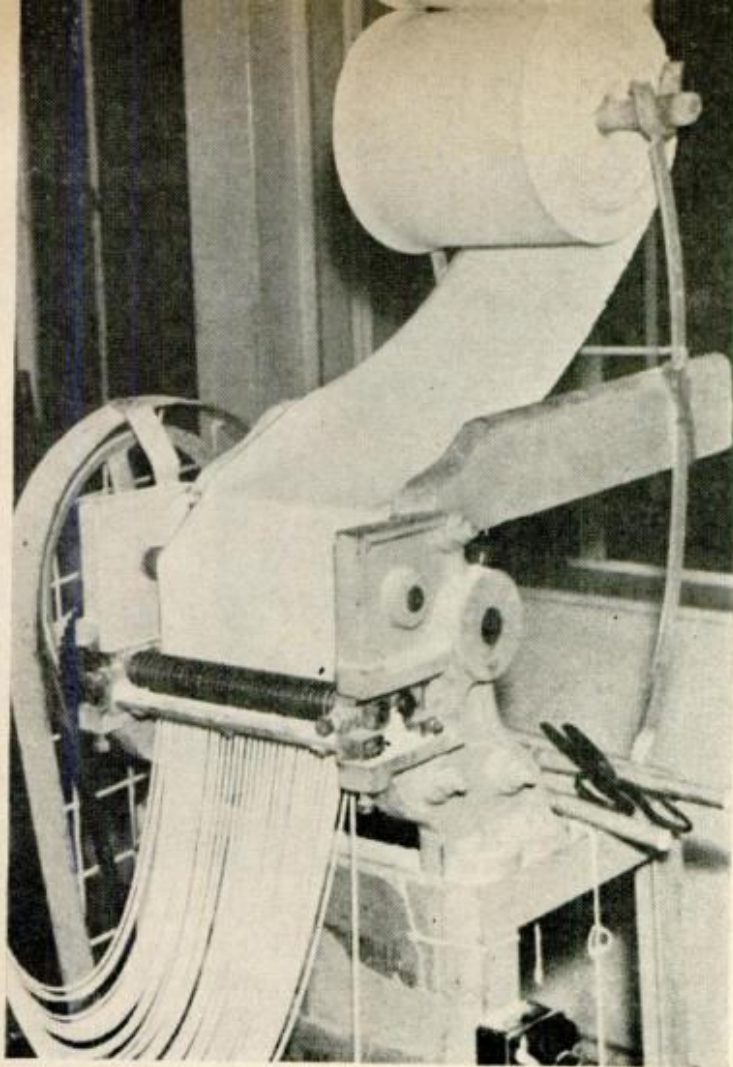
Father Romaniello's next stop was the hut of a noodle maker, where he studied the operation of an old wooden, hand-cranked contraption. A paste of flour and water was put into a hopper and forced through a slit in the bottom to come out a thin sheet of dough that was sliced into strips. A helper cut the strips into three-foot lengths, and they were hung over a rope to dry in the sun.

"When I left there I knew that I was going into the noodle business," Father Romaniello said. "It was the first time I'd



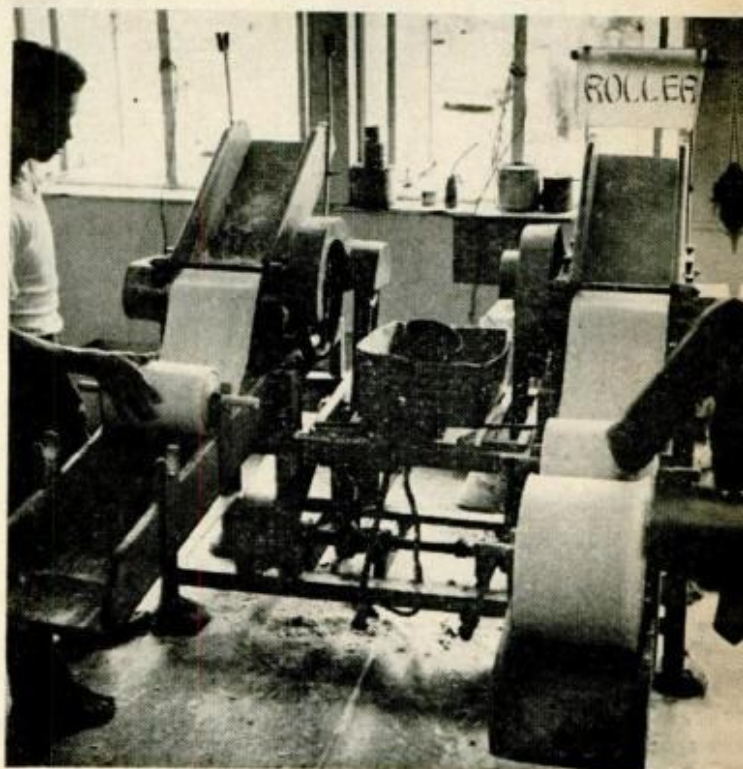
**FATHER ROMANIELLO'S NOODLES** solved the problem of cooking surplus food (from the U.S.) for Hong Kong's refugees who must live in any tiny corner



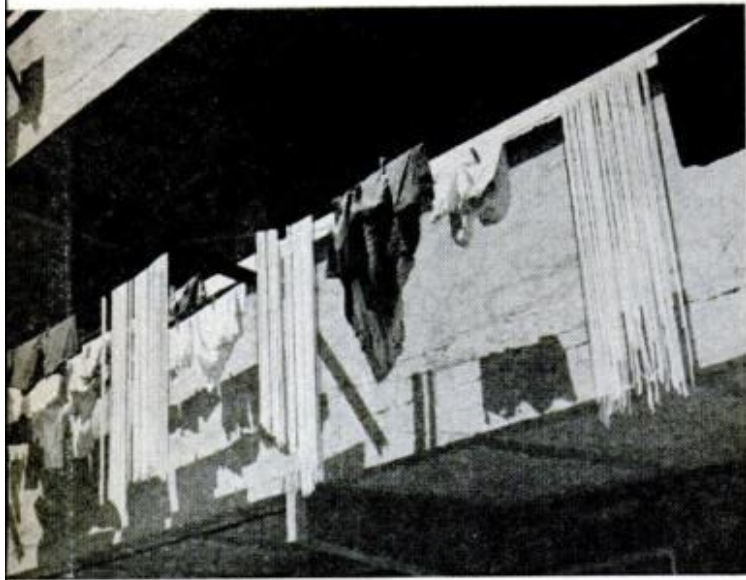


**SLICING MACHINE** that cuts dough into noodles (left), a modern adaptation of an ancient wooden machine, was built from scrap metal and secondhand parts

**MAJOR PROBLEM** was to mix a dough from surplus food that would roll out into wide strips that are turned on spools and transferred to slicing machine







**HANGING** from clotheslines on the balconies of refugee housing, long strands of Romy's noodles dry in the sun, soon to be transferred to cooking pots

**PARENTS WORK** long hours for a meager living, and refugee children line up to receive the family quota of noodles, a gift from the people of the U.S.



ever seen a noodle machine, but I knew we could make a better one. That machine turned out 50 pounds on a good day, and we'd have to do much better."

He called in Father Michael McKeirnan, whose hobby was tinkering with machinery, and together they spent a full week studying the operation of the hand-cranked machine and working on an improved design. Since there was no money for hand-tooled parts, they went begging for scrap metal, fashioning their design to fit what they could find.

"It never occurred to either of us that a high-speed noodle machine was already in existence, and we could have had one sent from the U.S. There we were, a couple of old fools, reinventing the noodle machine."

The project almost died in its infancy when a member of the Relief Mission questioned the possibility of combining wheat flour, corn meal and powdered milk into a paste that would hold together.

Dismayed, but undaunted, Father Romaniello took the problem to another Hong Kong priest, Father Howard Trube.

Father Trube took to his kitchen with the zeal of a research chemist, and Father Romaniello returned to his coveralls and a borrowed welding torch.

The machine was finally completed. It worked perfectly, but the final product was a dismal failure.

"It was a disappointing time," Father Romaniello says. "We'd mix a batch and

run it through the machine. If it managed to roll out nicely it would crumble when it was dry. But we had to keep trying."

At the end of six weeks Father Trube hit the right mixture; 75 percent wheat flour, 20 percent softened corn meal and five percent milk.

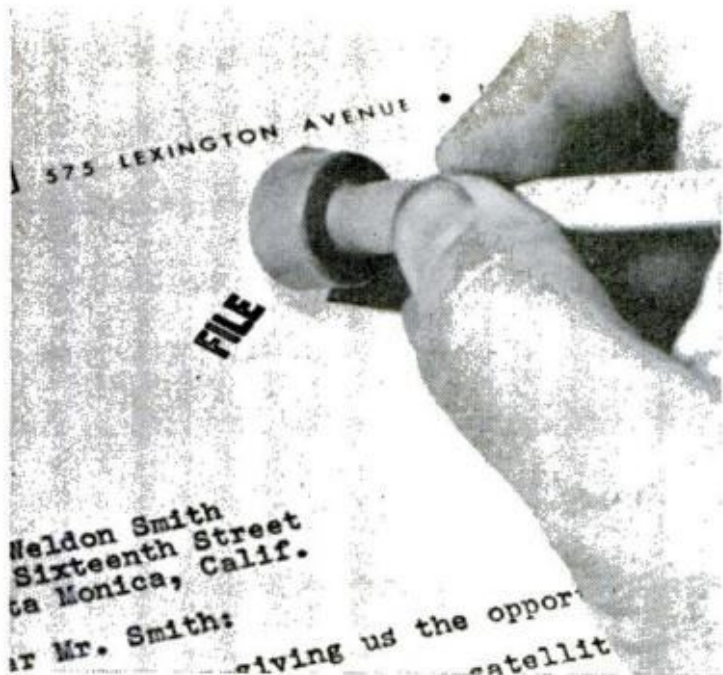
"And then we had noodles," Father Romaniello exclaimed. "We ran around shouting at each other. It was a wonderful time."

The first electrically operated machine was set up in a room of a mission school, and in October, 1957, began turning out 500 pounds of noodles a day. They were packaged in five pound bags bearing the slogan, *Donated by the People of the United States*, and distributed.

The demand was overwhelming. A second machine was built and pressed into 24-hour operation. Father Romaniello, now known as the "Pasta Padre," went on a crusade to raise money for more machines. By 1959 there were 90 machines in operation in Hong Kong, and today Romy's noodles are being made in Saigon, Korea, Macao and Taiwan.

Recently touring the U.S. to raise funds for more noodle machines, Father Romaniello was asked about the reaction of the Reds on his closing one avenue of the communist black market. "Well," he mused, "that's rather difficult to judge. Let's just say that nowadays they're very antipasta." ★★★





### Stamp Needs No Pad

It fits on the end of a pencil and it can make up to 30,000 impressions without an ink pad. Called "Perma-Stamp" it has a stamping element made of a microporous plastic in which a specially formulated ink has been incorporated. The pressure of stamping releases the ink.

The plastic, Porelon, was developed by S. C. Johnson & Son, Racine, Wis.

### Do-It-Yourself Sculpture from a Kit

First came number painting—and now there's a plastic sculpture kit to do life studies without art training!

Body parts are fitted together in any pose the "artist" desires, and pedestals come in four sizes. The model parts, dotted



### Sort of a Pup Tent

After his shampoo, today's pampered pooch has a hair dryer all his own. It comes in three sizes and attaches to a ladies' hair dryer. Warm air is pumped between two layers of material; the inside layer is filled with small holes through which the air gently filters in and around the dog. It sells for \$7.95 from Postcraft Co., 625 West Rillito, Tucson, Arizona.





# Model Airmada

*Miniature planes—replicas and originals—fill the skies when these aircraft modelers meet*

By Jack Kemmerer

**I**F THE WRIGHT BROTHERS are the fathers of aviation, then Alphonse Penaud is surely one of its godfathers. Who's he, you say? Well, 30 years before Orville and Wilbur got their plane off the ground at Kitty Hawk—for a grand total of 12 seconds—Penaud kept one aloft for 26 minutes.

The big difference was that Penaud didn't go with it. His plane is generally credited with being the first model airplane. It had a wooden propeller and was powered by a rubber band.

The Wright brothers were knowledgeable enough to predict most of the advances that would be made in manned aircraft, but Penaud could hardly have foreseen what his little plaything started. In the United States alone there are more than 20,000 active modelers engaged in miniature aeronautics. They fly midget replicas of large land aircraft, amphibians and even helicopters, powered by conventional reciprocating engines or jets, and controlled by radio or wire, or completely free flying. Some of them are works of art—and labors of love.

The peak of the model year is the nationals, a championship meet where regional winners compete against others in their class. The basic breakdown is between radio and wire-controlled models, although there are special classes for scale models and





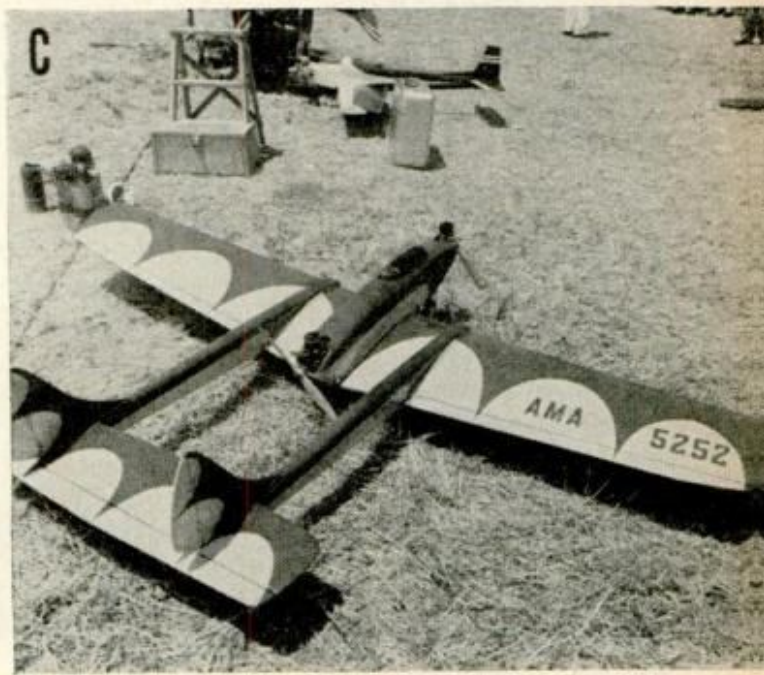
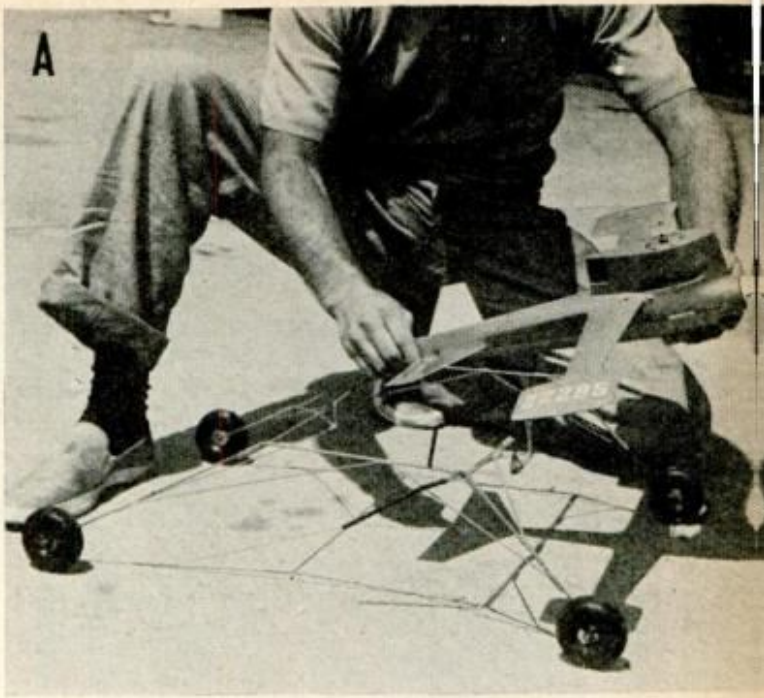


**DOGFIGHT MODELS** are most exciting at meets. Each plane, manipulated by wires from below, tries to cut crepe-paper streamer from tail of other plane. Frequently, however, the planes collide

**A. WHEELLESS MODEL** uses dolly for take-off, flying away from it when it reaches proper speed. Eliminating the landing gear cuts down drag. This model, guided by wires, gets 170 m.p.h.

**B. WATER-RISING** model takes off and flies free without any physical or electronic connection with its "pilot." Free-flying models are judged on their take-offs and their performance while in the air

**C. UNUSUAL MODEL** has both pusher and puller engines and, with six-foot wingspread, is one of largest models in meet. It weighs 13 pounds. Radio-controlled, it can fly on either engine or both







**CARRIER MODEL**, tailhook down, flies in for arrested landing, just as its big brothers do on an actual aircraft carrier. Arresting wires catch tailhook

novelty designs that always appear.

The radio-controlled models are probably the most popular—and expensive. Some rigs cost the maker—not counting his labor—up to \$1000 to build. They range from single-channel sets that control only the rudder or engine speed, to 10 and 12-channel sets that also control ailerons, elevators, trim and even wheels.

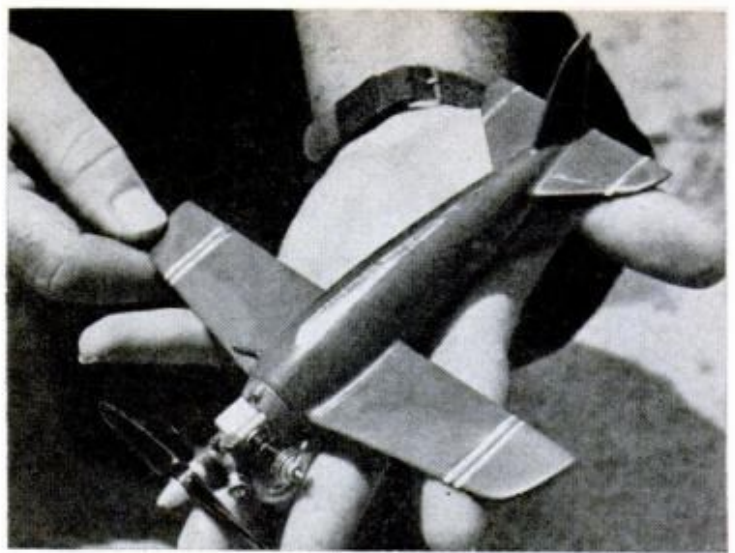
The wire-controlled models fly circular paths at the end of one or two wires. Manipulating the wires controls the model's maneuvers, just like a flying puppet.

Where speed attracts some, craftsmanship attracts others, and scale models of top-line aircraft are often things of beauty. Here the judging is based, not on flight characteristics, but on faithful reproduction of the original.

Another category, and an exciting one, is the combat planes. These are built for dogfights. Trailing streamers, which their opponents try to cut, the models dive and swoop at each other until, more often than not, they both crash to the ground.

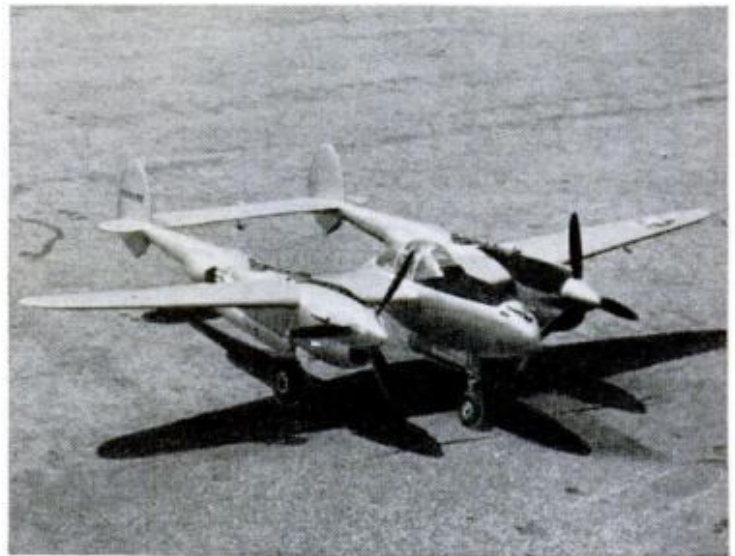
Special categories include carrier-landing models complete with tailhook to catch the arresting wires, free-flying models which have no physical or electronic connection with the ground and amphibians.

All of which is a long way from Alphonse Penaud's rubber-band aircraft. ★★★



**SMALLEST MODEL**, weighing just 2½ ounces, has six-inch wingspan and three-inch prop. Under full power (27,000 r.p.m.), it flies more than 80 m.p.h.

**SCALE MODEL** of World War II P-38 won first place in its class at 1963 nationals. Scale models are judged on faithfulness to the originals in detail



**SCALE MODEL** of airliner takes off to prove its ability to fly. It is still scored on genuineness of construction, but nonflying models don't score







**UNIQUE JET** has only one wing and elevator. By eliminating wing, maker reduces drag and increases speed. This model got up to 160 m.p.h. in flight



**STANDARD JET** has full wing and elevator. Jet engine is 21½ inches long and sells at \$39.95. Fuselage is metal. Jet takes off without landing gear

**UNIQUE HELICOPTER** takes off while maker flattens himself to pavement to get out of way. Helicopters are most difficult class, since they are hard to get off ground. Most models are originals with individual innovations

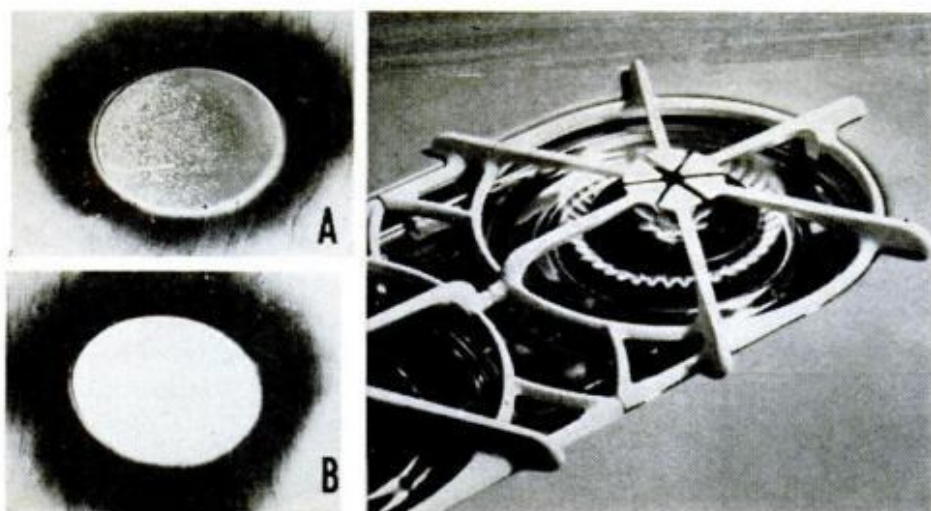




# New for Your Home

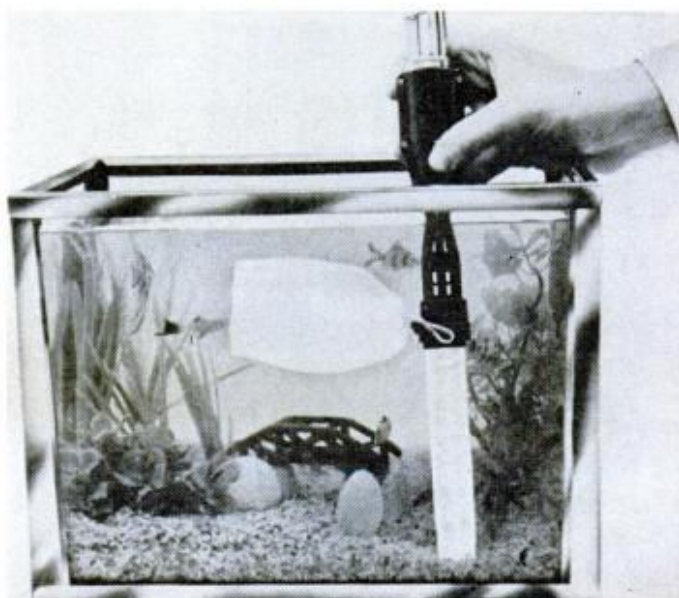
**HAND-OPERATED WASHER** does two pounds of clothes in a minute. Portable (ideal for campers), it weighs seven pounds, stands 18 in. high, 12 in. wide. To operate, put clothes, detergent and boiling water into globe and turn handle; pressure inside forces suds through fibers. \$30.00; Translid, 7 Southampton Place, London, W.C. 1, England.

**HIGH-TEMPERATURE ENAMEL** coats "hot" items from exhaust systems to stove grills, and won't burn off or discolor, even at 1200°. Spot flame test shows standard enamel flaking (A), VHT enamel unharmed (B). Spray or liquid enamel in white and colors dries in 15 minutes, cleans like china. Speriex Corp., 1927 Pontius, L.A. 25, Calif.



**RIP REPAIR TAPE** keeps rips from spreading, makes permanent repair. Clear tape adheres to upholstery, glass and metals, is also weather, grease and detergent-proof. A roll one inch by ten feet costs \$1.50 from the Wesrep Corp., 2022 S. Sepulveda Blvd., Los Angeles 25, Calif.

**AQUARIUM VACUUM CLEANER** sucks dirt and debris from water and gravel into a disposable cloth bag; cleaned water returns to tank. Powered by one C battery, the unit services up to 10-gallon-sized tanks. Price: \$3.98 from Wil-Nes Products, 87 Route 17, Maywood, N.J.







**PREHUNG FOLDING DOOR** units of impact-resistant polymer can be installed in 10 minutes complete with trim, using a ruler, screwdriver and level. Snap-on moulding (shown) attaches with slight pressure at outer edge of trim, snaps into place. Homeshield 2 and 4-door units are by American Screen Products, Chatsworth, Ill.



**BUGGY ROCKER** rocks baby to sleep while mother does housework. Item hangs over handle of any pram, plugs into household socket and starts a gentle, silent rocking action. The rocker is available from P. Courtney Ltd., 9 Perry St., Belfast, Ireland. Price is about nine dollars.

**BARBECUE-BRAZIER** hides beneath a cocktail table. Brass anodized aluminum top (35 inches across) opens to reveal a 28-in. grill which rests on a black weather-resistant heavy steel base. Closed, unit is table. \$49.95; Hi-Craft Metal Products, 2643 E. 124th St., Compton, Calif.





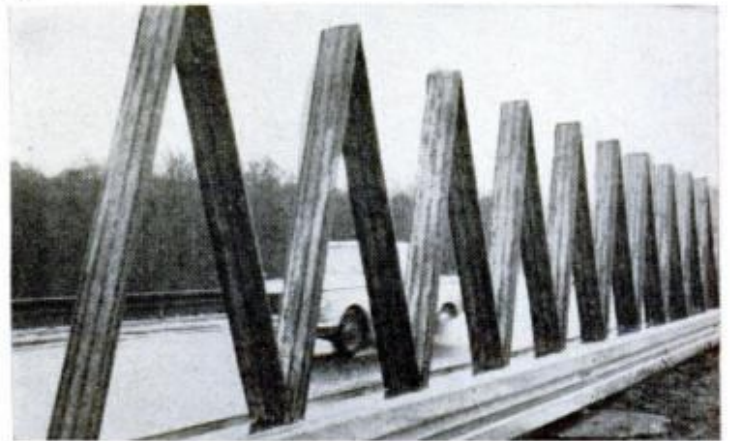


## High Hops

They're not in their second childhood. They're perched on 15-foot stilts so they can stride about the hopfields of Kent in England to string nets of wire from poles. Later in the year the nets will be used to support the hop plants.

## Highway Dazzle Guard

A sheet-metal curtain of tepee-like sections is being installed down the center of the Autobahn in West Germany. The scheme protects drivers from the glare of oncoming headlights. First installations are at curves.

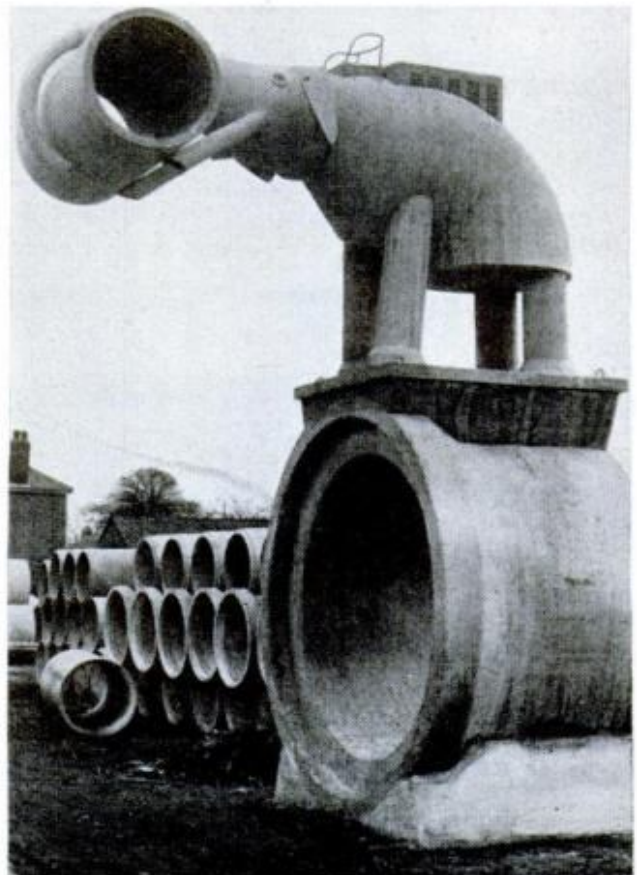


## Sub for Tourists

Recently launched in Switzerland is a submarine believed to be the world's first free-diving passenger-carrying craft. It will carry visitors to the 1964 Swiss Exhibition underwater to depths of 1000 feet. Designer was Dr. Jacques Piccard.

## Pachyderm of Pipes

Residents of Camberley in Surrey, England have been seeing pipe elephants. To publicize its product, a building supply yard built an elephant of concrete pipe that stands 25 feet high. It's at the yard entrance as an attraction for passersby.







By Steven J. Howard

# ALL ABOUT HOUSE PAINTS

What you should know in order to choose  
the right paint for a lasting job

**I** DON'T MIND THE WORK involved in painting the outside of my house," a friend of ours moaned recently, "but you have to be an analytical chemist to pick out the right paint to use."

He had a point. If you set out, as we did, to cut through the mist enveloping the subject of exterior house paint, you'll come face-to-face with claims, counter-claims, confusion and contradiction.

We first went to the paint manufacturers for information. They differed among themselves on many things, even to the

point of taking opposing views as to what a specific type of paint will and won't do.

Example: "Latex will solve *any* moisture problem," some told us. "Absolutely not," others said.

So, we went, incognito, to the paint dealers, but found matters as bad. These people seemed, generally, to be caught in a web of confusion, we concluded, emanating from above at the manufacturer's level. Their one pat argument when faced with questions they couldn't answer was, "The paint I sell is the finest and will





**PEELING (OR FLAKING)** usually results from improper surface preparation. Must be scraped off  
do everything you want.”

Even professional painters we talked to couldn't answer all our questions about paint, although some of their basic comments seemed refreshingly candid. As one of them after our discussion put it: “The paint be damned. As long as you use any good quality stuff it should hold up, provided you take care of any problems, prep the surface correctly, and apply the paint properly.”

Asked what constituted “quality,” or proper “prepping” or application, the pro painters were vague in their answers. So were paint dealers.

When paint dealers told us that the products they sold were the best, we'd ask why. Most turned the paint can around to the back and pointed, with very obvious pride, to the formula, emphasizing that it contained “so much of this chemical and so much of that.”

#### Same but Different

But listen to what one candid East Brunswick, N. J. dealer said:

“Two brands of the *same* type of paint—exterior latex, for example—are about as different as two recipes of meatballs and spaghetti. One dish might have more pepper than the other, and the other might use a thicker spaghetti. But, basically, the two are still meatballs and spaghetti.

“With exterior latex paint, one might have 70.4 percent of vinyl emulsion and 17.0 percent of titanium dioxide, while the other might contain 68.3 percent of vinyl emulsion and 19.1 percent of titanium dioxide. Basically, though, the two are still exterior latex.”

This raises the question of how a layman can secure valuable information from the paint formula on the back of a paint can and what is different about two cans of the same type paint but of different brands, except, the price?

A paint chemist we spoke to was outspoken in his criticism of the paint formula analyzation method. His contentions were backed up by other chemists, so we know he didn't have any bone to pick.

“I, as an experienced person, can't tell the contents of paint or judge its suitability to various conditions by reading the label on a can,” he said. “How is the layman supposed to?”

According to this chemist, who for obvious reasons wishes to remain anonymous, “analysis data on paint cans are put there by manufacturers just to comply with the law.

“Our *true* paint formula, and those of other companies, is proprietary information,” he explained. “No company is going to reveal this formula to the competition by plastering it on the can. So, we use double-talk to disguise the true chemical content of the product—double-talk, mind you, that complies with lawful requirements, but which actually says nothing.”

#### Picking the Right Paint

“Fine,” we said, “but how does a man select a paint? How does he pick from the many brands of latex, for example? After all, latex as with any type of paint, is produced by umpteen manufacturers and ranges in price from \$3 a gallon to \$10 a gallon.”

“Taking things in logical order,” the chemist said, “I would first select a specific type of paint for my needs and desires according to its generic name printed on the front of the can, and not its formula on the back. I'd then pick a brand with a good rep at a price I can afford to pay.”

We thought we had at least hit partial pay-dirt with this statement. After all, how many different types of exterior paints, epitomized by generic names, could there be? We stopped counting at 15, but were soon set straight by two



professional painters we talked to. "Basically," they said, "there are only five different types of exterior house paint. The reason there seems to be more is because each manufacturer wants to give his product distinction for sales purposes. You can find out the true type by overlooking the highfalutin trade name. Somewhere on every can it tells you whether the product is latex paint, white lead, cedar shake paint, regular house paint or a trim paint."

### Basically Similar

"What about so-called acrylic paint," you might ask at this point. "I thought it was the latest development."

Let's remember what we said about meatballs and spaghetti. Acrylic and latex paint are basically similar. Both are rubber-base paints. The only apparent difference between them is that acrylic paint contains some acetic acid which gives a bit harder finish—regular latex doesn't. They do the same things and are intended for the same purpose. One paint sold is, as a matter of fact, even called "acrylic latex" paint.

From what we've seen, it's a sales grabber so several companies use acrylic instead of latex on the can or combine the two.

"Our company has made 15 different variations of latex paint in the past five years," a spokesman for a leading paint producer said. "Acrylic is just one variation and happens in any industry when a basic product is developed. You begin 'pushing it' to reach the maximum in refinement, although the basic product remains the same."

The main point of argument surrounding latex paint is its effectiveness in overcoming a moisture problem. One dealer, touting his particular brand of paint, guaranteed that it would solve "nine-tenths of all moisture problems."

We caught him short by asking what's the tenth problem it wouldn't solve.

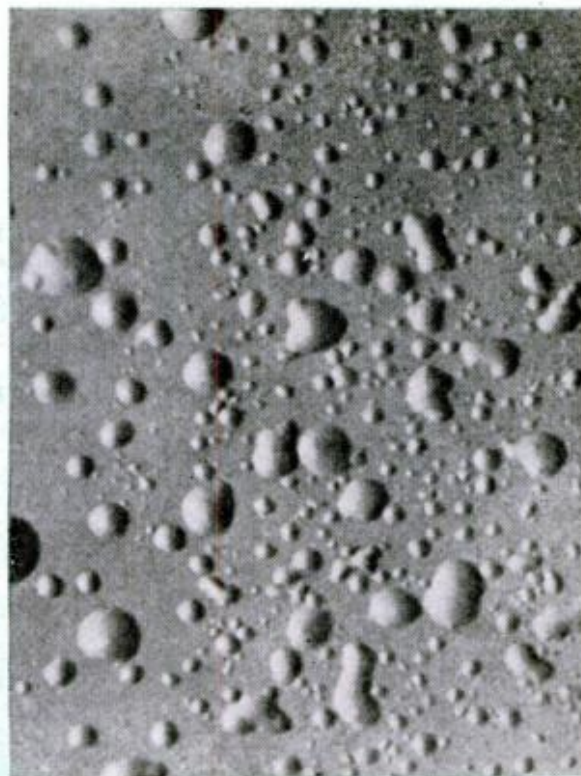
### Bubbles in the Paint

Another dealer gave us the following argument:

"When you put latex paint on a surface you'll see little bubbles. These bubbles prove that the paint is actually drawing moisture out of the wood."

Maybe. All we know is that when we apply an oil-base paint we get the same "little bubbles," and we know the oil isn't drawing moisture out of the wood.

It is true, however, that latex paint



HERE'S WHAT BLISTERING looks like. It's caused by moisture getting beneath paint and lifting it

is better able to resist moisture in and on wood than other types of paint. But, from what we've seen, no latex paint to date will correct a serious *moisture problem*.

We visited several development homes near Lakewood, N. J., for example, where there had been complaints of paint blistering and peeling due to excessive moisture and condensation in the house. Some people had repainted with latex without first relieving an internal moisture problem. Blistering and peeling recurred anywhere from four to six months after the paint had been applied.

### No Waiting

Latex paint is a porous product that gives a flat finish. The permeability of the paint allows a reasonable amount of moisture in and on the wood to seep out as vapor and thus prevent moisture damage that could occur with an oil-base paint, which provides a firm coat film and allows little means for moisture to escape. You can apply latex in the early morning when there's dew on the house, for example, and not wait for it to dry as you would have to do in applying an oil-base paint.

But wherever wood is wet because of a moisture problem, our conclusion is that the latex paint bond will eventually





**ADVANCE STAGE OF CRACKING** where deep cracks in paint extend down to the bare wood

be destroyed, just as with any other paint, and the paint will fail. You have to correct the moisture problem before the paint's put on.

Latex paint should never be used directly on top of another paint that isn't latex. Other paints have an oil base, and oil and water-base products don't mix. The oily surface beneath could make the latex coating slide, establishing a crawling condition.

### Switching Over

If you wish to convert to latex and now have an oil-base product on your house, first apply a primer bonding agent (primer-sealer paint) over the old paint. This sets up a protective barrier between latex and oil-base paints, but knocks another advertising claim in the head—the claim that latex is a *one coat* paint. Only when you're applying latex over latex *might* this be true, and even this is debatable.

Another factor you'd better be aware of when applying latex over an old surface is this matter of chalking. The chalking of the old paint—and most paints chalk to a degree, even so-called chalk-resistant paints—when coupled

with the porosity of the latex often permits the chalk to penetrate up through the latex and spot the new coating.

Remove as much old chalk as possible by wire brushing and washing. Of course, even then you cannot be completely sure that the old paint beneath won't start chalking again. The only sure way to eliminate chalk spotting when using latex is to apply a primer and at least one coat of the new paint. Whatever happened to the one-coat latex theory?

### Advantages of Latex

"What are the advantages of using latex, then?" you might ask. The answer was pretty well summed up by professional painter Jerry Heiht.

"Latex is an easy paint to apply and easy to clean off brushes and anywhere you drip. While it's still wet, all you have to do is wash it away with water. You don't necessarily have to worry about the time of day you paint either, since some dew and moisture on the wood isn't going to hurt anything. It dries faster, also minimizes the problem of trapping gnats on a sticky surface.

"Because of this convenience and ease of application, which for my money are the *only* things latex guarantees, I like to use it where I'm painting bare wood or where I'm painting over an old latex coat. "I try to convince my customers that have an oil-base paint already on the house to continue with oil base. In the long run, the chance of failure is minimized."

The second major type of paint on the market is called, simply, regular house paint. It has no specific designation, such as latex, but contains a high titanium content. It's a glossy oil-base paint that offers a wide range of color choices, has good color retention qualities, is highly durable, offers good hiding power and remains uniformly clean throughout the life of the finish.

### Tougher to Apply

The disadvantages of regular house paint are opposite to the advantages of latex. It's tougher to apply in that it doesn't spread as uniformly, it doesn't clean up as easily, and if the wood is wet from the elements and you paint over it, that moisture can't escape through the paint but will, instead, cause blistering. And, of course, it's like flypaper to gnats.

Regular house paint (titanium) could



have another disadvantage when you go to paint over it. The old film must not be permitted to build up to a great thickness over the years or cross-grain cracking can occur. When this happens, the entire paint thickness usually has to be removed down to bare wood.

A third type of paint is white lead, which was the old stand-by for years and is the forerunner of titanium paint. It contains a preponderance of lead although it can contain in lesser amounts other pigment chemicals, such as titanium and zinc. It has an oil base, is a glossy, highly reflective paint, is extremely durable and offers good color retention qualities when mixed with oil-base tints.

### Collects Dirt Faster

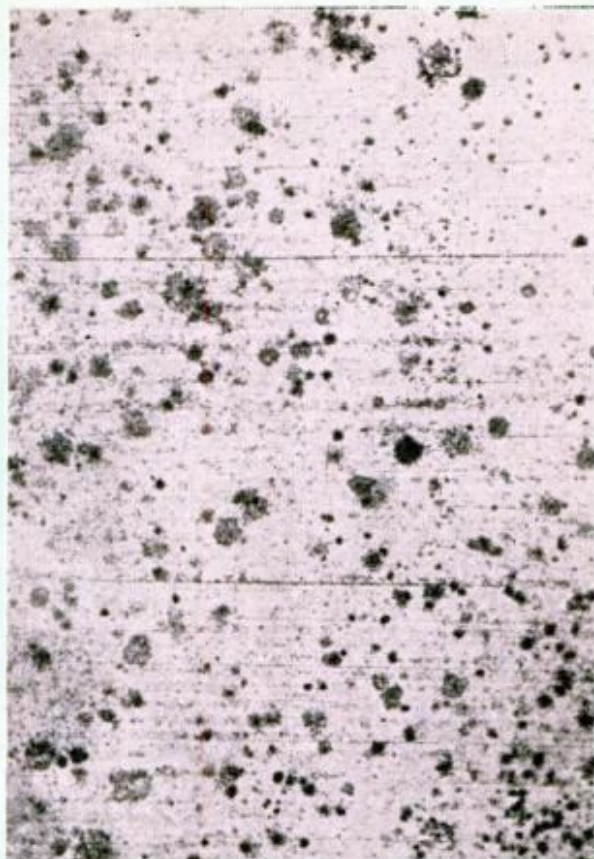
The disadvantages of white lead can be summed up as follows: it has a lower opacity (hiding power) than titanium and latex; it has an off-white color that doesn't compare with the intense brilliant whiteness of the others, if you want to paint your house white; it collects more dirt and retains it longer than most other paints; and it discolors readily when hit by airborne chemicals that are floating in the air from industrial sites.

You can, by the way, apply an oil-base titanium house paint over an old oil-base white lead paint surface, or vice versa. But, as explained before, you shouldn't put rubber-base latex paint over an old oil-base paint surface without first applying a primer sealer.

*Shake* paint has been developed for one reason—to help stop the natural bleeding action of cedar, redwood or any natural-colored wood used as siding on a house. The openings in the wood allow water to seep beneath and react upon the underneath surface of the siding, which is usually rarely treated with paint or primer before it's installed. What occurs is the same thing that would happen if you put a block of unpainted cedar or redwood in a bucket of water—the natural soluble color (sap) of the wood comes off, staining the water.

### Shakes Must Be Sealed

If you have cedar shakes or a natural wood on your house and wish to paint them instead of staining them, you can stop this problem by first applying a coat of stain sealer which seals in most of the sap. Then, finish with a coat of



**THIS IS WHAT MILDEW** looks like in advance stage. Spots are often mistaken for dirt. One sure test—dirt will wash off, mildew deposits won't

**HERE'S WHAT CHECKERING** (also called alligatoring in advanced stage) looks like. Caused by cheap paint or insufficient drying time between coats





## FIVE BASIC HOUSE PAINTS

Paint Type	Finish It Provides	Advantages	Disadvantages
Latex	Flat	<ul style="list-style-type: none"> <li>• Resists moisture better than other types</li> <li>• Easy to apply</li> <li>• Easier to clean off brushes and places where it drips</li> <li>• Quick drying and, consequently, keeps insects from sticking to surface</li> <li>• Can paint with it most times of day</li> </ul>	<ul style="list-style-type: none"> <li>• Can't use it on top of oil painted surface unless primer is first applied</li> <li>• Has tendency to permit chalking surface beneath to permeate through pores</li> </ul>
Regular House Paint (titanium)	Glossy	<ul style="list-style-type: none"> <li>• Good color retention</li> <li>• Highly durable</li> <li>• Good hiding power</li> <li>• Remains uniformly clean throughout life of finish</li> </ul>	<ul style="list-style-type: none"> <li>• Tougher to apply than latex</li> <li>• Hard to cleaning off brushes and wherever it might drip</li> <li>• Can't paint over moist wood and, therefore, you're limited to the time of day you can paint</li> <li>• Takes several days to dry</li> </ul>
White Lead Paint	Glossy	<ul style="list-style-type: none"> <li>• Extremely durable</li> <li>• Good color retention qualities</li> </ul>	<ul style="list-style-type: none"> <li>• Lower hiding power than others</li> <li>• Collects dirt and retains it longer than other types</li> <li>• Discolors when hit by airborne chemicals</li> <li>• Can't paint over moist wood and, therefore, you're limited to the time of day you can paint</li> <li>• Takes several days to dry</li> </ul>
Cedar Shake Paint	Flat	<ul style="list-style-type: none"> <li>• Stops natural bleeding action of cedar, redwood and other natural colored woods</li> <li>• Durable</li> </ul>	<ul style="list-style-type: none"> <li>• Should only be used on natural wood since it will provide too dull a finish on others</li> <li>• Fades faster than others</li> <li>• Takes several days to dry</li> <li>• Harder to clean brushes and drippings</li> </ul>
Trim Paint	Highly reflective	<ul style="list-style-type: none"> <li>• Used for trim only</li> </ul>	<ul style="list-style-type: none"> <li>• Cannot be used on over-all house surface because of poor elastic qualities</li> </ul>

CHART ABOVE gives in capsule form relative values of the five basic types of exterior house paint. Use it to select a certain paint, then go back into article where characteristics of each particular paint are discussed at length, both pro and con

the shake paint (two coats are generally recommended). This paint is designed to absorb any remaining sap that runs off past the sealer, stopping any bleeding action.

Shakes or natural wood that have been treated with creosote presents another problem. The normal application of shake paint and primer seal won't stop creosote bleeding. The only effective way to put a stop to this is to treat the wood with a clear sealer or aluminum paint prime, and paint over it with two coats of shake paint.

The last paint type is *trim* paint which is used, naturally, to paint a home's trim. It's a hard enamel reflective gloss paint with an alkyd base that doesn't chalk. It should never be used on the rest of the house since it does not expand and contract in accordance with temperature variations and will eventually crack.

### Get What You Pay For?

When we began to ask questions concerning the differences between a specific type of paint (latex, white lead, titanium, etc.) made by two different manufacturers and having two different prices, we started running into one of our biggest headaches. Most everyone seemed to clam up, except for making statements that were too general for any intelligent person to accept.

"Sure, the paint we make is high in price," one statement went, "but you get what you pay for."

"Hogwash," the opposing camp said. "We can afford to sell our paint at a lower price, not because it's inferior, but because our overhead is lower."

We have to admit here that much of what we conclude is our own conjecture, which is based on investigation and some observations of those people in the trade—specifically, the professional painter. We *cannot* tell you that brand X selling for \$8.95 is a better paint than brand Y selling for \$6.95, however, because the manufacturers simply refuse to tell us what went into their paints to substantiate the statement that theirs is better.

### National Brands Higher

We noticed that, generally, the brands of national manufacturers tend to sell for a somewhat higher price than those of local companies. There are several logical reasons for this.

"I've found," painter Heiht told us,



"that national manufacturers guarantee their products to a greater degree than local companies. This is done, I imagine, to establish a national image of good will and reliability in a very competitive business.

"The local company has to compete, too. He can't compete with a national manufacturer on a guarantee basis—he doesn't have the force needed to roam the field and examine paint jobs, as would most national manufacturers if you sent in a complaint. He can't compete in advertising or sales promotion. About the only way in which he can compete is by undercutting price."

Does this mean that there is no difference between a cheap and expensive paint? No, it does not.

There is quite a difference in quality between a paint selling for \$3 a gallon and one selling for \$8.

"The guts just aren't there with a \$3 paint," another painter told us. "It's the same as a suit of clothes that sells for \$25 and one selling for \$100. They're both made of cloth, but the expensive one uses a higher quality cloth backed by strength elements. It wears better, looks better and lasts longer.

"Paint is the same. A \$3 paint just doesn't have the content to provide the hiding power and wearability of an \$8 paint."

### Localized Brands Sell for Less

We step into a gray area, however, when we begin to compare two paints that differ in price by only a few cents or, at most, a dollar or two.

Differences in makeup? There probably are some, but whether it's worth the few cents more you will have to pay is a decision only you can make. We can't give you the reasons except to repeat that the less expensive paint is almost always offered by a localized firm while the more expensive is marketed by national firms. It's your decision as to whether you want to pay for the guarantee and the product of a national company.

When we asked the question as to how long a good paint job should last, we again ran into controversy. Opinions ran from as low as 3 to 5 years to as high as 6 to 10 years. The opinions, we concluded, were based on individual experience which, in turn, were based on local conditions affecting the paint. What we're saying is that there are too many variables in each case to come up

with a hard and fast rule as to how long paint will last—variables such as the inherent problems in a house, whether a house is located in an industrial area or in the country, whether the area is a wet or dry region, whether the house is located near a body of salt water, and so forth.

"In surveys we conducted," a president of a paint association told us, "of the paint jobs applied by the home owner that failed long before they should, 90 percent of them did so for these reasons: failure to recognize and correct a paint problem, failure to prepare a surface properly, and improper application of the paint. The main difference between homeowner and professional painter is that the homeowner doesn't take the time to examine his problems. He just proceeds to slap paint on."

### Solve Paint Problems First

There are several major types of paint problems other than the ones we've already mentioned that you can encounter. Before you so much as pick up a paint brush, you should examine your house for these, find the causes and apply the correct fix. Here they are—

- *Blistering.* This is caused, as we have indicated, by moisture getting beneath the paint and shoving it upwards. The question you're going to have to resolve is why the moisture is there to begin with.

Check around windows first. If blistering is localized here, it means that the caulking has probably failed and water is penetrating beneath the paint surface and raising it. Before repainting the house, scrape the blisters to allow water to drip out and evaporate and the area to dry, and do a thorough re-caulking job.

Perhaps the major cause of blistering paint in these modern times is improper household ventilation. You can spot this if blisters aren't localized around windows or gutters, but appear over the paint surface. Moisture from appliances (dishwashers, clothes driers, automatic washers, or what have you), moisture from showers, bathtubs and sinks, and even moisture from the human body can build up a tremendous amount of wetness inside the house. Unless this wetness has some way of venting off, it can penetrate internal walls to the outside siding and cause paint failure.

As we've indicated before, latex paint





**CALKING BEFORE REPAINTING** is the best insurance that water won't seep below paint and lift it

will help to a degree because it is a "breathing" paint. But where the moisture content is too high, this won't do much good.

### Checking Moisture Content

There's a sure way of telling before you paint whether a surface is holding too much water to accept paint properly. It's with a moisture meter. Your paint dealer probably has one that he can lend or rent you.

To use it, just stick the probes of the meter into the wood. Normal moisture content is around 12 percent. If you get a reading of this or lower, then it is safe to paint with any type of paint. If the reading is higher than this, you'd better be cautious. Latex paint can be applied safely up to around 15 percent, but oil-base paint shouldn't be applied to a surface that shows a reading of more than 13 percent.

The best way to combat an internal moisture problem is to provide enough venting. Tiny vent louvers can be placed in the walls of your home, especially just above grade level, to dissipate moisture to the outside.

- **Chalking.** Chalking is normal. It's the way in which paint ages. The surface becomes powdery and if you rub your hand over it, you'll get a chalky substance on your fingers.

### Fast or Slow Chalking

Depending on the paint you use, chalking can become apparent a year after a house is painted or so slowly that you can hardly detect it. A paint that chalks freely might be desirable to you since rain, in washing the chalk off the house, washes dirt and soot away with it.

However, there is such a thing as a chalk-retardant paint (the can will be marked so). This should be used if you desire a longer-lasting paint job. The paint won't stay as clean, however, as a free chalking product.

Chalking should never be permitted to go far enough to cause paint to wear off and expose bare wood. If it does, repainting will be that much more difficult, since paint that's intact forms a good undercoat to which a new coat can adhere.

Abnormal chalking is when chalking occurs too soon after a house is painted. This might result from applying too thin a coat to begin with, or because rain, fog, or dew affected the paint before it dried.

Another common cause of abnormal chalking is applying one coat of paint over too porous a surface, particularly over a very old coat. When you do this, part of the new paint's binder is absorbed rapidly by the wood. This upsets the paint's balance, and its ability to chalk normally is retarded.

### Two Coats Advisable

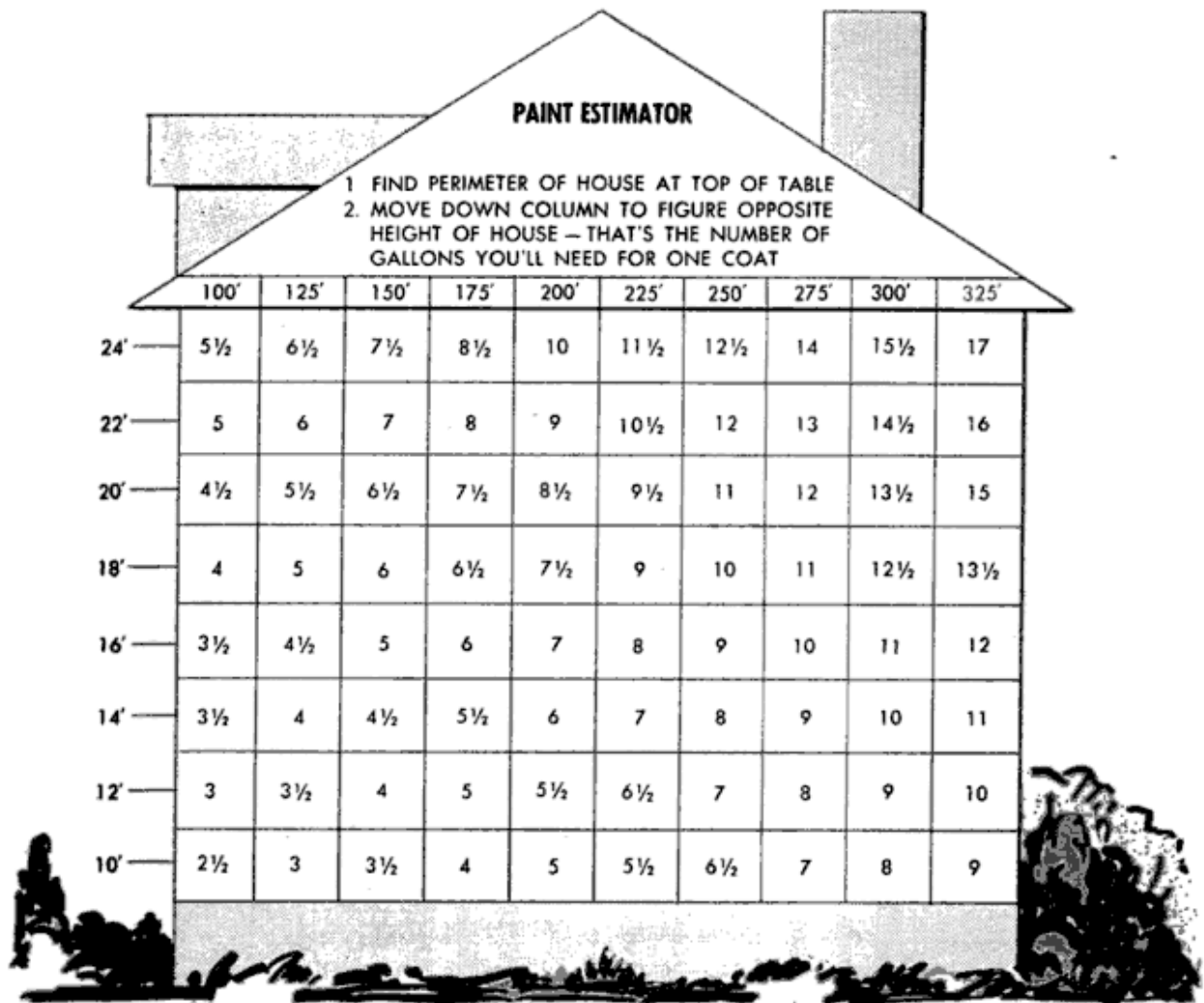
Furthermore, the chalk from the old surface has nowhere to go but outward through the new paint surface. Since a greater portion of the new paint is absorbed, only a thin film is left on the surface, permitting old chalk to penetrate faster.

For example, suppose you decided to use a charcoal gray paint over an old white surface. Gray has good hiding powers, and you're deceived since it covers the white paint perfectly with one coat.

But white is made to chalk. When you incorporate the chalk of the white with the chalking powers of the gray, and the gray's balance is upset because much of it is readily absorbed by the porous surface below, it results soon after in a blotchy, spotty effect.

This is probably the best reason for always considering the application of two coats of paint.





Courtesy New Jersey Zinc Co.

**Checking and Alligatoring.** When paints begin to check, tiny cracks appear in the surface. It indicates that you either used an inferior grade of paint (one of those \$3 a gallon types that probably didn't have sufficient binder in it) or you didn't allow enough drying time to lapse before applying a second or third coat.

Minor checking can be ignored for a time. Don't, however, let it get to a point where paint begins to flake off. If you do, the work involved in repainting will become that much tougher, since a greater amount of sanding and scraping will be required.

#### As the Name Implies

Alligatoring is an advanced form of checking. The paint surface becomes interlaced with cracked lines over large areas. The condition may begin as small checks, but the breaks get wider as the top coat contracts and exposes the undercoat. The paint begins to look, literally, like an alligator's skin.

Causes of alligatoring include insuf-

ficient drying time between coats or too much thinner in the paint. Other causes are application of one type of paint over another (latex over oil base or vice versa or oil base over trim paint), the use of paint over a resinous surface, and painting over a greasy area.

The alligatored paint should be removed before repainting to prevent a recurrence.

**Cracking.** This is characterized by deep cracks in the paint that extend all the way down to bare wood, causing the paint film to curl up at the cracked edges. It's caused by several things.

First, excess moisture on the surface when the paint was applied could lead to blistering and peeling, ending up eventually as deep cracks. Furthermore, if the type of wood used in the home's construction was a moist (unseasoned) wood, such as yellow pine, it could cause oil-base paint to slip and crack apart. If this is the case, you should remove all the oil-base paint and repaint with a primer and latex which is better able to withstand this type of





**MOISTURE METER** set to prescribed percentage tells beforehand if too much moisture is present

wood moisture in the wood involved.

If an inferior paint were used to coat the house when it was new, cracking can be expected. This type of paint usually doesn't have enough oil in it, which results in poor elasticity. Without expansion and contraction qualities, a paint will crack.

#### Still Other Causes

Another cause that leads to cracking is insufficient mixing of paint before application and inadequate brushing of paint over the surface. Improperly brushed paint causes globs in localized areas. When this happens, oil and solids accumulate in one spot, dry, and eventually begin to curl back.

Cracked paint must be removed from the area and bare wood exposed before repainting.

As we explained before, cross-grain cracking can occur from a build-up of too much paint over the years.

**Crawling.** If paint draws itself up into drops or globules soon after being applied, that's a crawling condition. Most likely, the paint was put on in cold or foggy weather, or it was applied to a greasy surface.

Crawling can also happen if there's too much oil in the finish coat, if paint

is applied to a waxy surface such as that left by paint remover, or if different types of paint (oil and rubber base) are intermixed one over the other.

To prevent crawling, paint only under good climatic conditions (a clear, dry day with the temperature above 50 degrees F). Make sure the undercoat is moderately dry and hard. If you must paint over a greasy surface, rub the surface with turpentine and steel wool and then apply a bonding seal primer before putting on the finish coat.

**Fading.** Fading is color failure and, eventually, all paints fade. When they do, it's time to repaint if for no other reason than appearance sake.

Fading over an entire house can be a problem with homes located near bodies of salt water. It can also affect only one side of a home which is subjected to a variety of heavy weather conditions, such as alternate poundings by battering rain and snow followed by a good dose of intense sun. Lastly, fading can be made to occur quicker by using cheaper (\$3) paint than if more expensive types are employed, because of the poorer color pigmentation of the former.

#### No Remedy for Fading

There is now no known cure for a fading condition. High quality paints last longer (how much longer depends on locality and conditions), but they, too, will eventually fade. We understand from manufacturers that they eventually hope to diminish fading problems with an advanced form of latex paint now undergoing research.

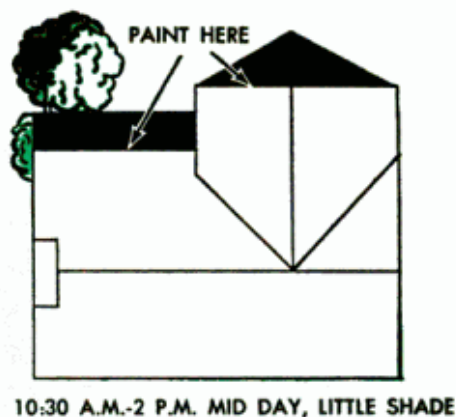
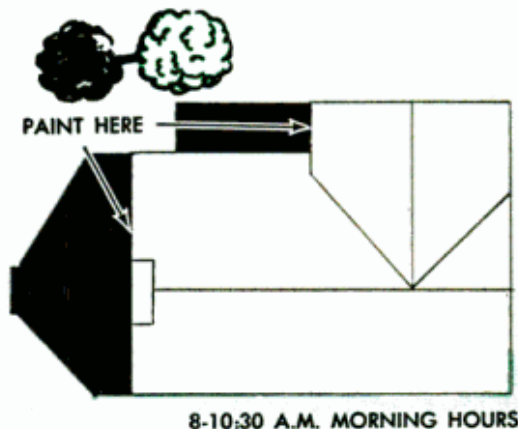
**Mildew and Sulfide Discoloration.** Rusty or sooty deposits on paint could indicate a mildew condition. Although people believe this is most common with homes located in persistently damp areas—and it is—mildew is more widespread than generally thought. It can happen anywhere.

Suppose, for example, you live in a predominately sunny area, but your home is substantially landscaped with shrubs, preventing sun from reaching certain spots. These spots are prime candidates for a mildew condition.

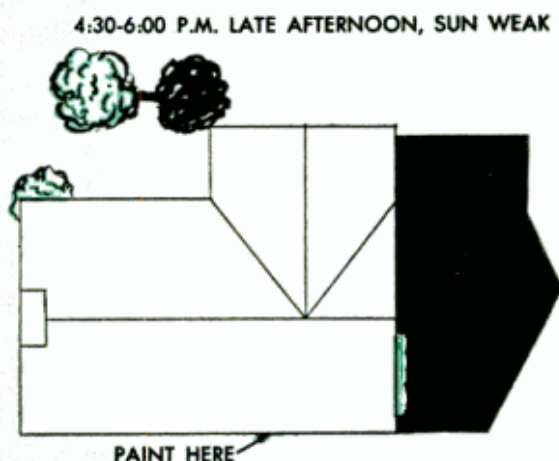
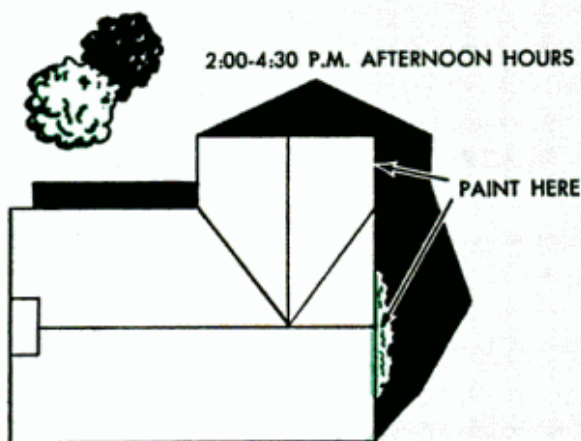
Mildew is often mistaken for dirt deposits or sulfide discoloration, and vice versa. But there is a way to pinpoint exactly what the rusty, dirty deposit is.

Wash the spot with water and a strong detergent. If it's dirt, it'll wash off—mildew and sulfide discoloration won't.





**FOLLOW THE SUN AROUND THE HOUSE SO YOU'RE ALWAYS PAINTING IN THE SHADE**



If the spot remains, test for mildew by washing the area with household liquid bleach, used full strength. If mildew is present, the liquid will bleach it, but it won't affect sulfide discoloration. As a final test, wipe the area with hydrogen peroxide, which bleaches sulfide but not mildew.

Household bleach, by the way, can yellow an area. If it does and you're not going to repaint at this time, the yellow stain can be eliminated by rubbing with stannous chloride solution, which you can buy in a drugstore.

#### **Mildew Can Be Scrubbed**

The presence of mildew does not necessarily mean you have to repaint. The fungus can often be eliminated by scrubbing it with a solution of trisodium phosphate and household ammonia mixed in water, after which the area should be thoroughly rinsed. Trisodium phosphate is available in paint stores and is mixed according to instructions on the package.

In cases where mildew cannot be eliminated, the house should be repainted. To prevent the condition from

recurring, you can buy a prepared fungicide (usually a phenyl mercuric compound) to add to the paint, according to the instructions on the package. Your paint dealer carries this. The altered paint should be used for both the prime and finish coats.

If you don't want to mess with mixing, there are fungus-resistant paints on the market that are already prepared. They are labeled fume and mildew resistant and help prevent not only mildew, but also sulfide discoloration.

Sometimes mildew can be prevented by simply getting some sun on a spot. Maybe just a simple rearrangement of one or two shrubs will do the trick.

On the subject of sulfide discoloration, many people believe that this condition is only prevalent in industrial areas. It's true that these are the primary regions where this type of failure occurs, but sulfide discoloration can happen in other than industrialized locations where chemical vapors are carried in the air.

As we have already discussed under mildew, you can often get rid of dirt, short of repainting, by washing the



house down with detergent and water. However, this should be done soon after a dirt discolored spot is noticed. If dirt remains for too long a time, it becomes deeply embedded in the paint, making it tougher to wash off.

The maximum in dirt retardation is achieved by using a free-chalking, self-cleaning white paint. This type chalks more rapidly than regular paint, thus enabling quicker wash-off of dirt. However, at the expense of cleanliness, as we've already pointed out, you lose paint retention time, and it becomes necessary to repaint more often.

Discoloration by metal can result when water rusts or corrodes copper or steel surfaces attached to the house, such as siding nails, mailboxes, or what have you. One way to offset this is to make sure the metal is freed of rust by rubbing down to bare metal and then treating it.

### Prime Siding Nails

Copper surfaces can be coated with paint or varnish. Iron or steel fixtures can be treated with anti-corrosive paint. Pay particular attention to siding nails when painting the house. If you cover these with primer seal and the same house paint you're using, there's little chance of them rusting and streaking the side of the house.

*Peeling.* Paint can begin to peel if old paint is in poor condition and you fail to scrape off all loose flakes before repainting. New paint won't adhere properly to a surface such as this and begins to peel shortly after application.

Other causes of peeling are applying paint to a greasy, oily or moist surface; applying paint to a hard, dense and smooth area such as knots which should be treated with sealer; and applying paint over so many other coats that the weight of these coats loosens the new paint and starts it peeling.

*Wrinkling.* This is what happens when paint assumes a rough, wrinkled texture. It most always results from applying too thick a coat of paint, not brushing it out sufficiently. You should never, in other words, try to make one coat do the work of two. The surface of the paint can dry first, leaving soft paint beneath. This leads to wrinkling.

It could also occur if paint is applied to a cold surface. In this case, you'll get surface drying only. The sun will dry the top film first, leaving the underneath soft.

### No, Not Yet

"Can I start painting yet?" you're probably muttering by now.

Sorry, no. Throughout this article we've touched on the importance of proper surface preparation. If your old coat of paint is intact and no damage is apparent, there is only a minimum of preparation. If, however, damage is fairly extensive, the preparation will be also.

Not to belabor the points, here are the most important facts to consider in getting a home ready to receive paint:

- Remove blistered, flaked or peeled paint with a wire brush and scraper. Follow this with sandpaper or steel wool to smooth down rough edges. Then, wipe dust from the patched up areas with a rag or a clean brush.

- If it becomes necessary to remove paint from the entire house for reasons stated previously, think twice about doing the job yourself. Most professionals use a blow torch for this but it can be dangerous in the hands of an amateur and, besides, local ordinances may prohibit its use. Liquid paint removers can also be used, but it's a tedious and time-consuming job.

- Use calk, calk and more calk. A paint dealer, who hires out his paint work, told us that last year he had his own house painted by a pro. "He used 32 tubes of calk," the dealer said. "This was more important to me than the actual application of paint, since it assured that I wouldn't have paint damage as a result of rain and moisture creeping beneath the paint."

- If siding nails have popped, reset them below the surface with a nail set and then cover them with wood putty.

- Remove wooden screen doors, and windows, shutters and other attachments. Clean and repaint them off the house. It makes your work easier.

- Make sure the paint is well mixed before applying it. Although it might have been agitated at the paint store, you had better "box" it just to be sure. To box paint, pour off most of the top liquid into a clean can. Stir the remaining pigment in the original can with a wooden paddle until it's smooth. Then, gradually add the liquid from the second can, stirring constantly as you do to get a uniform mixture. After all the paint is back in one bucket, pour it back and forth between the two cans several times to mix it thoroughly.



This method actually does a better mixing job in less time than laborious hand stirring with a paddle.

### With Brush in Hand

Now, Mr. Houseowner, you can start to paint, but even this takes some consideration. To make your work easy and safe and to make sure the paint is applied properly, consider these major points—

- Never paint unless the outdoor temperature is above 50 degrees F. But you don't have to abide by that old bug-a-boo that says you shouldn't paint in the summer because the temperature is too hot. You can paint on the hottest day, as long as you follow one precaution and can personally take the heat.

- This precaution is to follow the sun around. By doing this—that is, painting in the shade—you prevent heat from drying paint too quickly. Don't precede the sun. In other words, a good layer of paint is one that gets progressively dry from top to bottom.

- Avoid painting when it's misty, foggy or immediately after a heavy rain. Although you might be using latex, why invite trouble?

- Paint from the top down. Paint with the grain of the wood and work in toward the wet paint, using wide firm strokes.

- It's generally recommended that you paint all the siding first and then the trim. This is not always practical, however, so don't be held firm by this rule. There are times, for example, when you will be working on a high peak and it's best to tackle both siding and trim at the same time while the ladder is in position.

- Never stop painting in the middle of a strip. If you have to call a halt, finish at a corner so there will be no lap marks. This is particularly true with oil-base, regular, and white lead paint; not so important with latex.

- Don't take chances on a ladder. If you have to stretch to reach a spot, don't. Shift the ladder. The few seconds you spend doing it doesn't mean a thing when considered in the over-all time you spend painting—and it might save you a broken arm or leg.

The last question on a painter's mind is usually, "How much paint will I need?" The diagram and method of computing shown on page 128 will answer this for you. ★★



**DON'T SLIGHT** on the preparation of the surface in your eagerness to get started. Wire brush areas where the paint has peeled or blistered

### NOW IS THE TIME

When's the best time to paint your house? Soon, now. In fact, if you start preparing the surface this month or next, you'll be all set for the painting days the pros prefer: late summer or early fall, when the temperature is in the 70s. It won't pay to start out with a cheap brush. You'll be far ahead if you invest in a good quality brush. A 3½ or 4-in. siding brush with 4-in.-long bristles (while expensive) will make all the difference in the world when cutting-in at windows, brushing-out an even coat and making you paint like a pro. Pick a 1¼-in. sash and trim brush for windows. One with an angular tip for tight places will make sash work go twice as fast. A dusting brush is a handy thing to have too. Don't work out of the can in which the paint comes. Buy yourself a regular metal paint bucket and a few cardboard liners. Its smooth rim lets you slap the brush against the side and the bucket won't be so heavy it's a hazard on a ladder.



# KID-POWERED

Designed by Robert Woolson

Prepared by W. Clyde Lamme





**D**UBBED a "squaris wheel" by its designer because of its square wheel, this pint-size version of its big brother, the ferris wheel, brings safe carnival fun to the backyard.

Braced to make it as sturdy as can be, the wheel is designed so that each time around, every rider gives the wheel a backward push with his feet. There's no danger of falling out of the bucket seats since riders are held in with a safety bar. Wheel locks prevent the toy from being used when mom or dad can't be around to supervise getting on and off.

Notice first in the pull-apart view of the wheel and stand on page 136 that assembly of parts at points B through E is detailed on page 137. Note secondly that the base, A-frames and the wheel spider are made mainly from 2 x 4s. For these parts it's very important that you obtain clear, straight stock. There must be no knots, no weakening blemishes, no crooked pieces, as otherwise you've got trouble. The wheel must run true after assembly, the A-frames must stand plumb with the base leveled. The stand, which consists of the base and A-frame, must be set up and leveled on a solid foundation, made either by pouring a couple of narrow concrete slabs on a tamped-gravel fill or two rows of concrete blocks placed on a tamped gravel fill. Then you level the structure by shimming up the low corners. Wooden shingles are just the thing for shimming. Although standard 2 x 4s are held to quite close sectional sizes, you may occasionally find some variations in widths and thicknesses. Usually it's a good idea to check before cutting stock as any appreciable variation might affect some of the dimensions given.

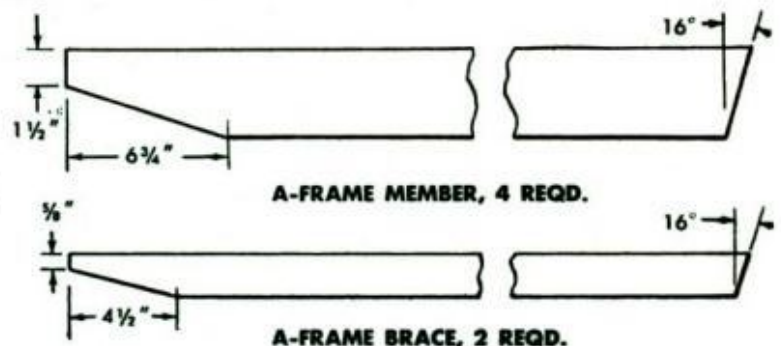
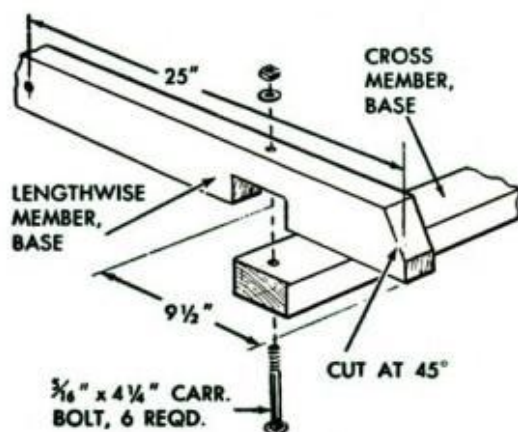
After you have a proper foundation, make the base which consists of two lengthwise members and three cross members, the latter mortised the full thickness into the lengthwise members and joined with bolts. No glue is used in the entire



**PIVOTED WHEEL LOCKS** are provided as a safeguard against use when ferris wheel is unattended by adults

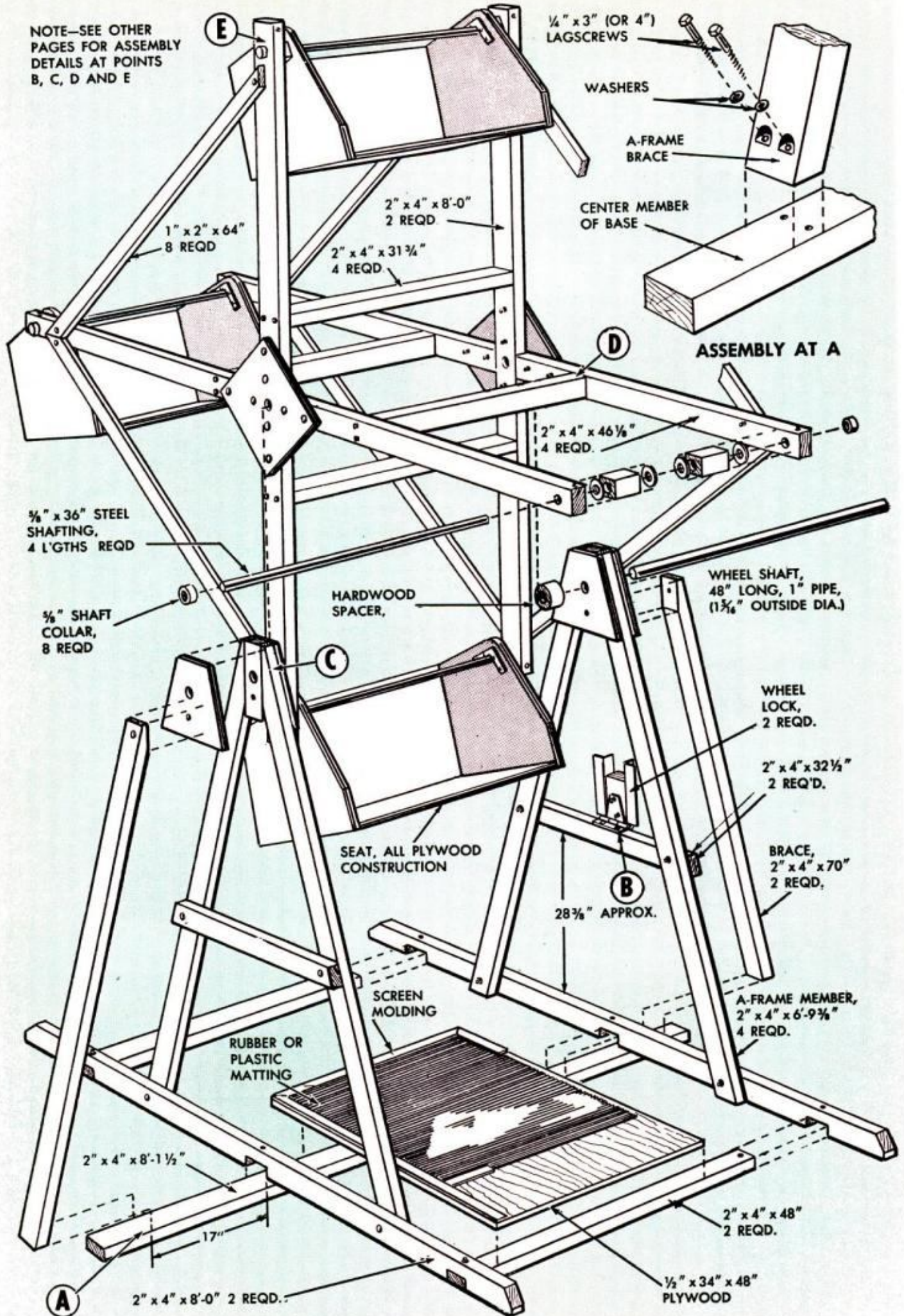
assembly: only bolts and lagscrews. Next, you make the A-frames, joining at the top ends first as shown in one of the pulled-apart assemblies on page 137. When cutting the top ends of the A-frame members, or legs, lay out according to the detail and saw outside the line in the waste. This permits planing the cut surface to a smooth fit against the filler. The hole pattern on the inside and outside plywood gussets is identical except for the upper  $\frac{1}{4}$ -in. hole in each outside gusset. This hole takes the bent end of the pin, the lower end of which passes through a cross hole drilled near each end of the wheel shaft, preventing the latter from turning, also from working out of place. The shaft holes in both inside and outside gussets should be carefully located, but location of the bolt holes is not critical; just locate them uniform distances from the edges. To assure register of all bolt and shaft holes, drill the shaft holes first through

(Text continued on page 138)

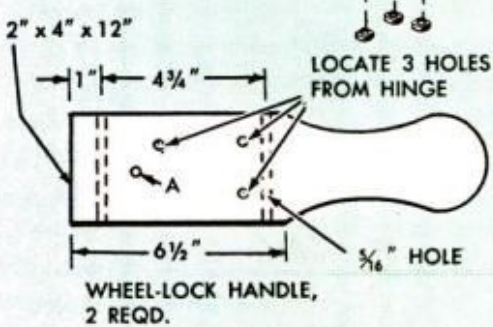
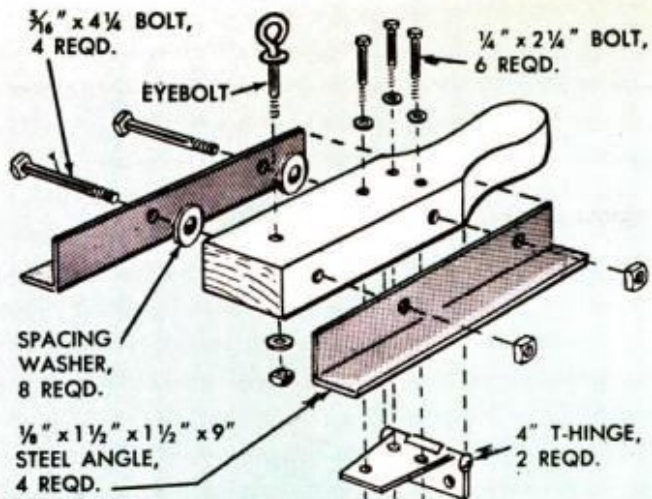




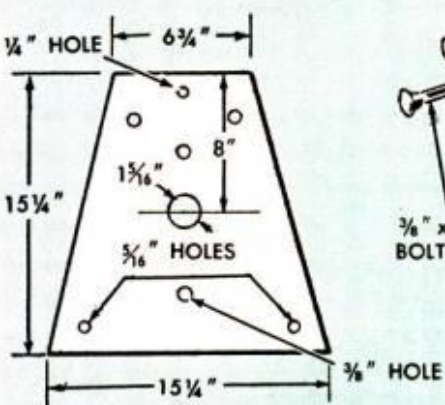
NOTE—SEE OTHER PAGES FOR ASSEMBLY DETAILS AT POINTS B, C, D AND E



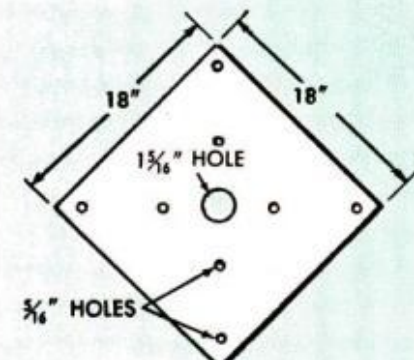




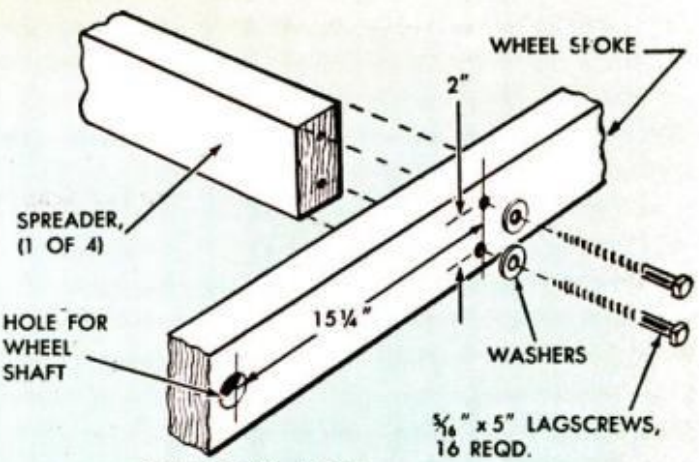
**ASSEMBLY AT B**



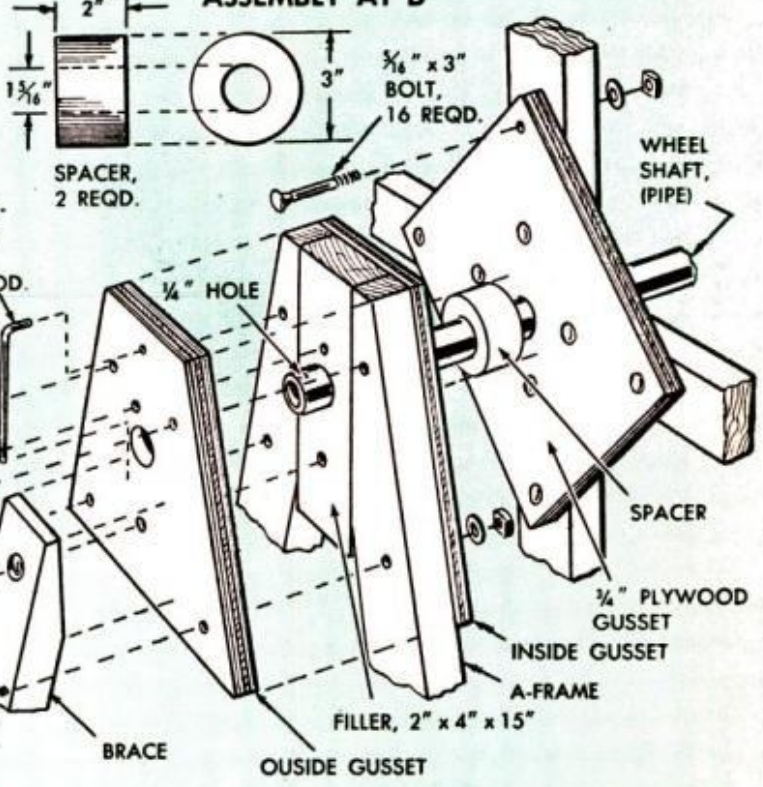
OUTSIDE GUSSET, A-FRAME,  $\frac{3}{4}$ " PLYWOOD  
 INSIDE GUSSET SAME SIZE EXCEPT  $\frac{1}{2}$ " PLYWOOD  
 2 REQD. OF EACH



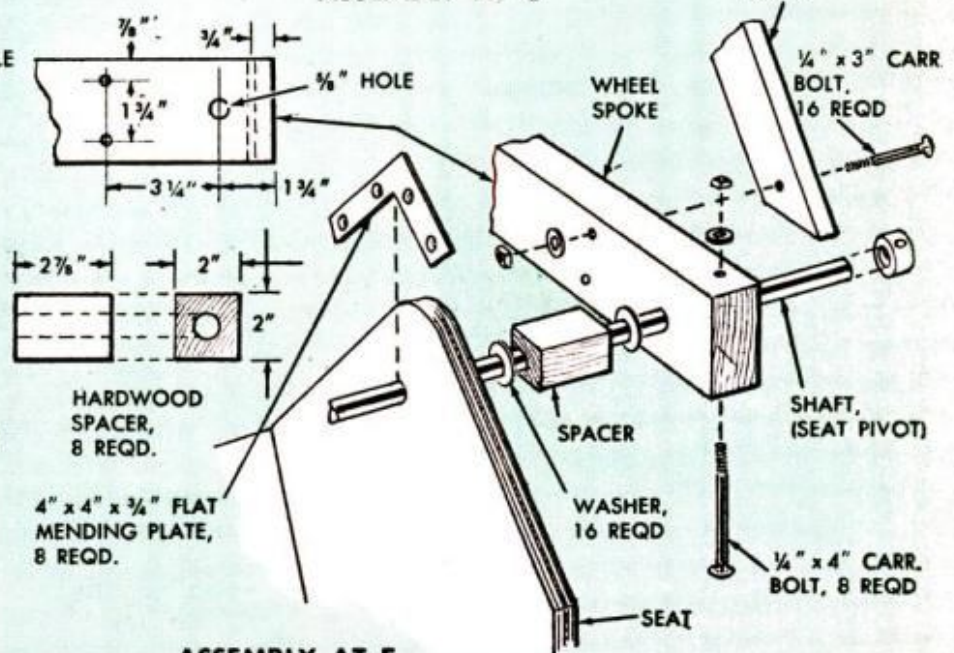
**WHEEL GUSSET,  $\frac{3}{4}$ " PLYWOOD, 2 REQD.**



**ASSEMBLY AT D**

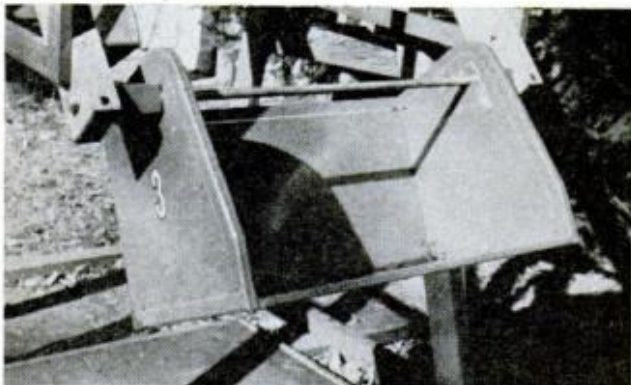
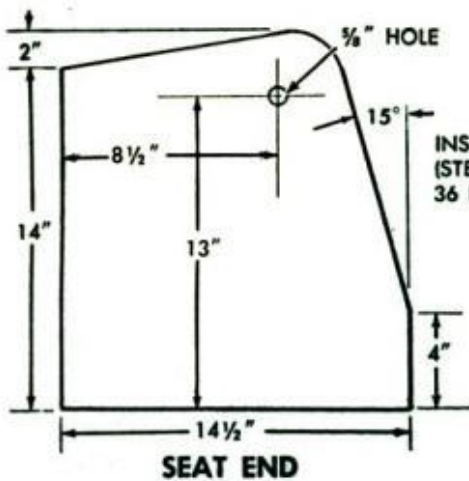


**ASSEMBLY AT C**



**ASSEMBLY AT E**





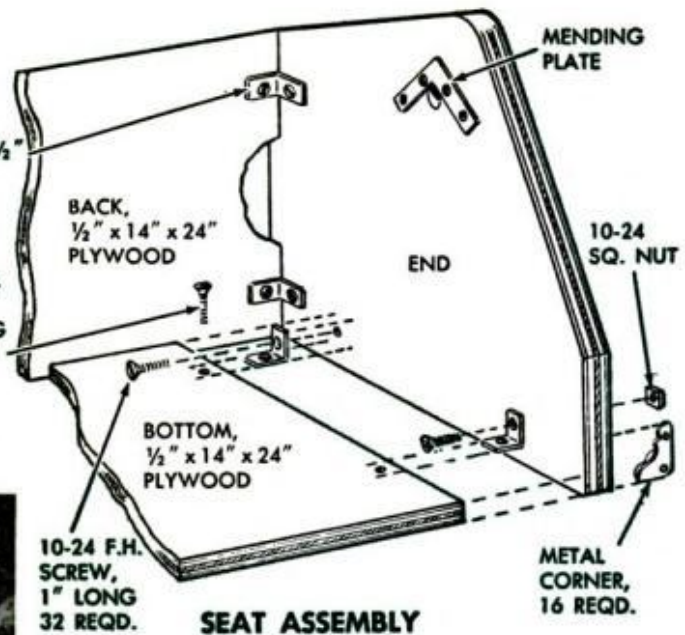
**SHAFTS ON WHICH** balanced bucket seats pivot also serve as safety bars. Riders must crawl in under to enter seats. Mending plates save wear at shaft holes

both gussets and the filler piece, then insert the shaft, clamp the parts together and drill through all three thicknesses. Remember to check beforehand the diameter of the pipe which is used as a wheel shaft.

### Next Comes the Stand

With the top ends of the A-frames joined, bolt the legs to the base, plumb with a level and brace temporarily until you can install the permanent braces. The lower ends of the latter are joined to the center cross member of the base with lag-screws, the washered heads seating in pockets cut into the wide face of the brace with a chisel and gouge as indicated in the assembly view, A. The carriage-bolt heads at the top ends of the braces are seated in shallow counterbores, the large diameter of the latter being slightly larger than the bolt head. Tighten the bolts before releasing the temporary braces. Then check again for plumb.

Next, make the wheel spiders, noting that in the pulled-apart view on page 137 each consists of three members jointed at the center to a plywood gusset, making four equally spaced spokes of equal length. Note also that there is a spacer between each wheel gusset and the inside gusset at the top end of each A-frame. These spacers



can be band-sawed round as detailed or they can be squares center-drilled to a free fit on the wheel shaft. Assemble the wheel spiders on the shaft with the spacers in position, making sure that both turn freely. Then locate and drill the holes for the lagscrews which hold the four spreaders as in the detail, D. It's important to cut the ends of the spreaders square and all pieces to exact length. Drill a 1/4-in. hole edgewise near the end of each spoke, insert, and tighten, a carriage bolt in each of the holes to prevent the spoke ends from splitting. Then drill the 5/8-in. holes in the spokes for the shafts on which the seats pivot. The 1 x 2 wheel-spider braces are installed later.

### Now the Seats

Assembly of the seats, sizes of the parts and the method of pivoting each seat are shown at the top of this page. Cut four bottoms and four backs to the sizes given from 1/2-in. plywood, then eight end pieces from 3/4-in. plywood to the size given. Smooth all cut edges with sandpaper and then round them slightly. Be sure there are no splinters. Then note that the backs and bottoms are butt-joined to the ends with steel inside "corner irons" as they are often referred to, nine corners being required for each seat. The ninth corner is attached to the bottom and back at the center of the seat. Precise spacing of the corners at the ends is not important; just equalize the spacing.

The method of pivoting the seats is shown in the assembly, E. Spacers and two washers are placed between the ends

(Text continued on page 182)

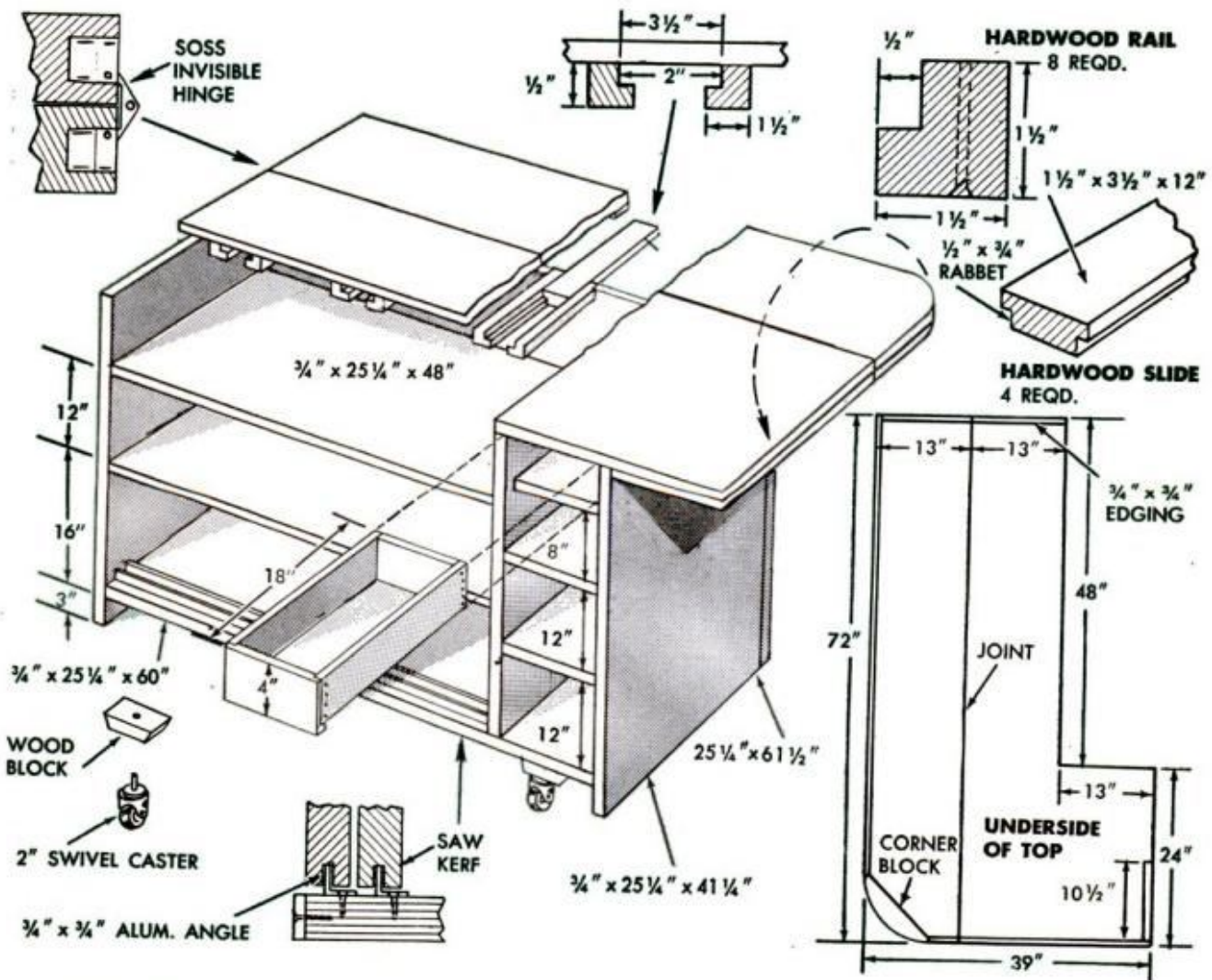


# ROLLING PATIO BAR

SURE TO LEND a touch of elegance to your patio parties, this handsome beverage center is made almost entirely of  $\frac{3}{4}$ -in. plywood. For convenience, the wide overhanging counter is hinged to fold over on itself, allowing you to wheel the unit through any 28-in. door. Sliding wood bars support the top when it's flipped over.

Sliding doors for the bottom compartment are slotted top and bottom to ride on aluminum-angle rails. As for the single drawer, use  $\frac{1}{2}$ -in. stock for the back and sides,  $\frac{3}{4}$ -in. for the front and  $\frac{1}{8}$ -in. tempered hardboard set in dadoes for the bottom.

The counter top of the original was covered with decorative plastic laminate. Band the built-up edges first, then cover the top, using contact cement to bond it. If desired, you may line the entire upper compartment with plastic laminate.—Hi Sibley







## Anchors for Breezy Picnics

Going on a picnic? Be prepared for those sudden breezes that blow the picnic cloth askew. Clip an ordinary spring-type clothespin to each corner of the cloth. Then push an 8d box nail through the hole in the spring and into the ground. The same stunt is effective for securing a plastic ground sheet on camping trips. If you prefer, a stiff piece of wire may be substituted for the nail.—*Victor H. Lamoy*

Next time you have to put together a child's toy made of stamped tin, such as a fort, doll house or car, use a thimble on your index finger. This will protect against cuts from sharp edges and enable you to exert considerable pressure when bending down the sharp little tabs that hold the parts of the toy together.

## Ice Cream Containers Keep Brushes and Water Handy



Ice cream, cheese and other dairy products are often packed in quart-size plastic containers. Artists can put a couple of these empty containers to good use by nesting them together with a small jar between to support the inner container. A full assortment of brushes can be accommodated in the gap between (as shown at left), while the inner container may be used to hold water for rinsing brushes and mixing colors.—*Jack Eisner*

Dried seeds can be used to produce novel and interesting designs by simply pasting them on a paper or wood surface. For protection, apply several thin coats of white shellac over the seeds. Shellac, incidentally, makes a fine adhesive.

## Hinged Guard Keeps Tots from Crawling through Open Window



A guard that will prevent small children from crawling through an open window can be made from 1 x 2 stock hinged to vertical strips about 18 in. long. The hinges are attached above the strips at one end and below at the other so that the unit may be folded for placement in the window. The guard is fitted into the sash tracks and held by both the window stops and the pressure of the lowered window sash.—*G. E. Hendrickson*

Have a bunch of worn bed sheets? Before you discard them, tear off the selvages. These are much stronger than ordinary twine and are perfect for tying up bundles of newspapers and magazines. They are also ideal for gardening chores like staking up tomato vines. Keep a supply of selvages handy for just such use.



# Scuba Sea-Tow

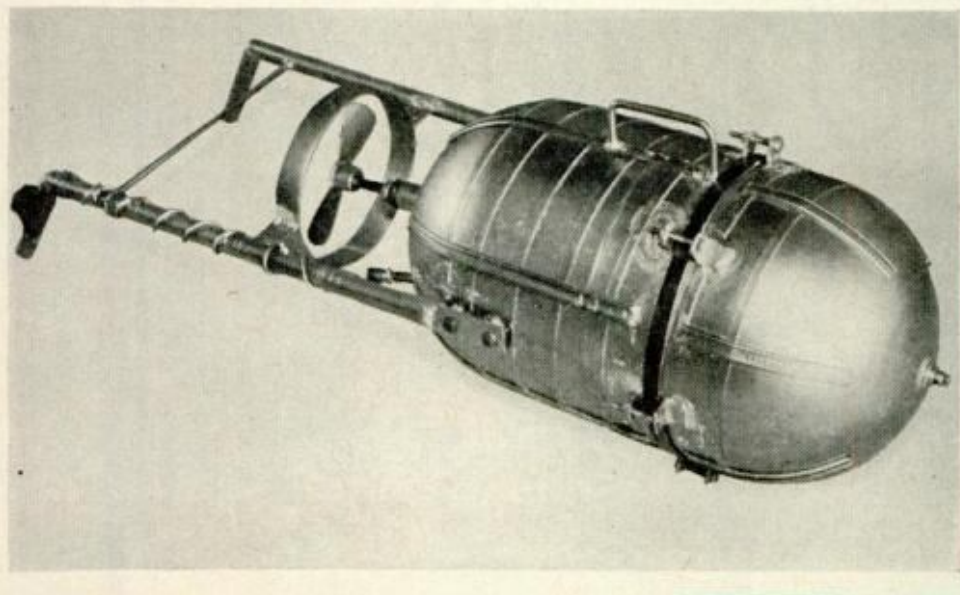
Hitch a ride from this home-built underwater towing device to go farther with less effort

By Richard Hanson

**C**OSTING LESS THAN \$25, this simple sub-tow is basically just a 12 x 24-in. stainless-steel aircraft oxygen tank containing a  $\frac{1}{8}$ -hp. motor and a 12-v. battery. No machining is required. You can assemble the whole thing with common tools, plus a small amount of welding.

The sea-tow will run for several hours on a single charge, and has a speed of 2-3 m.p.h. which can be increased or decreased by varying the pitch of the home-made prop. To keep costs down, many common materials are used in the construction. For instance, handles are made from 1-in. conduit, an automobile horn button serves as the switch and the stuffing box is assembled from easily obtainable plumbing fittings.

Begin by cutting the end off the tank, using either a hacksaw or a saber saw with a metal-cutting blade. Grind off the bands about  $\frac{3}{4}$ -in. back from both sides of the cut, so that you can install the two iron

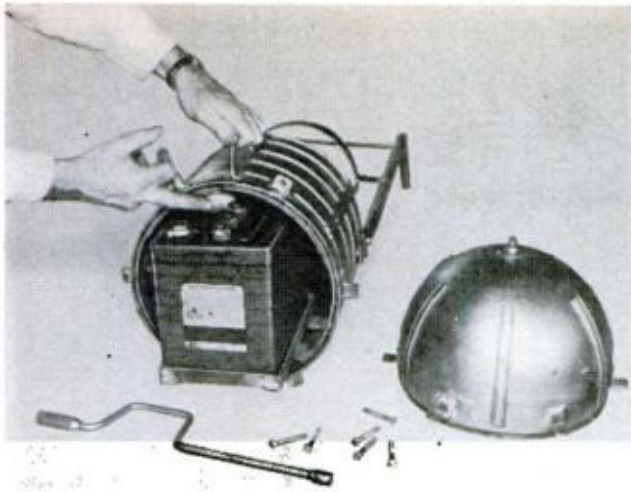


**SURPLUS OXYGEN TANK** and a  $\frac{1}{8}$ -hp. motor, which is also available through surplus outlets, are the main components of the sea-tow. Powered by a 12-v. battery, it will run for hours on a single charge

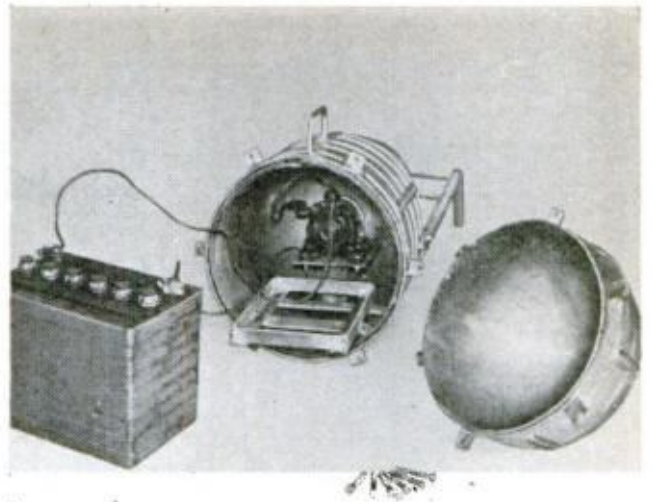








**SHEET OF RUBBER** mounted over battery prevents accidentally bumping terminals on hull during removal. Carrying handle is made from  $\frac{3}{8}$ -in. stock



**PLACE SPACERS** under the motor if this is necessary to achieve correct alignment. Locate the battery tray as close as possible to the  $\frac{1}{8}$ -in. motor base

bands which form a grooved seat for the end cap. Next, pour liquid rubber into this groove to act as a gasket.

Place the battery base as close as possible to the motor base. To prevent the terminals from touching the tank when removing the battery, cut a small sheet of rubber from a discarded innertube and use adhesive to mount this on the inside of the tank over the terminals. If it's an automobile battery, secure all wires to terminals with small hose clamps, and be sure to use spill-proof caps. Ideally, the battery should weigh about 40 lbs., since this will allow you to add extra ballast to balance the unit for easier guiding.

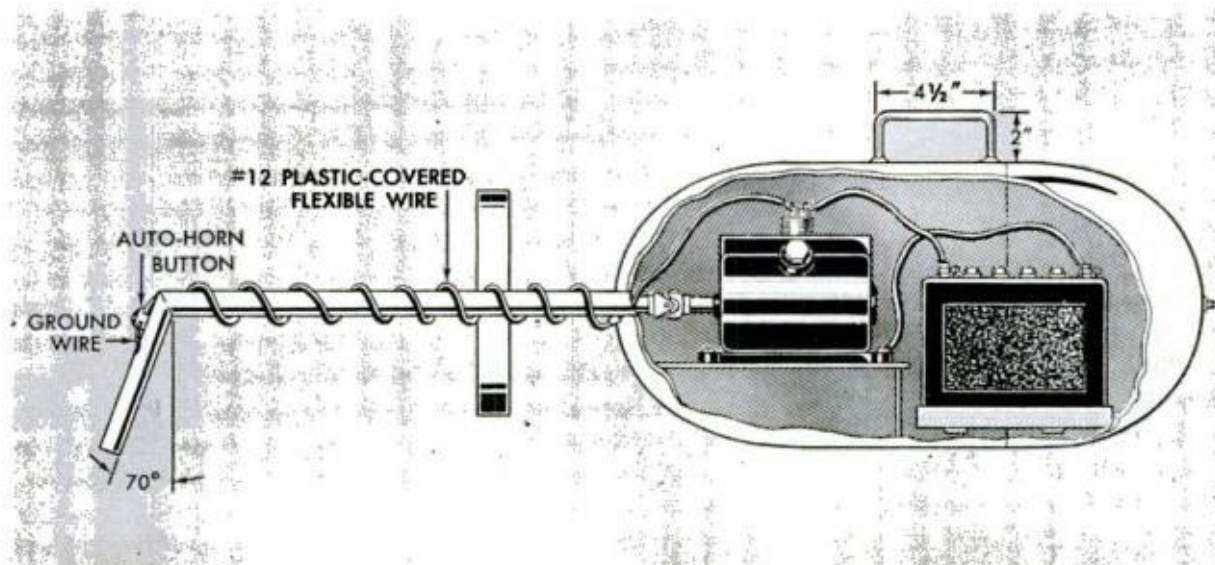
The horn-button switch should be mounted on two  $\frac{3}{16}$ -in. nuts welded to the handle. Run one wire up around the handle and through the  $\frac{1}{8}$ -in. pipe to a motor terminal, then seal this through-hull fitting by filling with liquid rubber. A short length of wire from the other switch terminal should be grounded to the handle

at the switch base. Cover the switch and handle with a loosely wound layer of plastic electrical tape, and brush several coats of liquid rubber over this taped section to make the switch watertight yet operable.

A word of precaution about operating this unit. When charging or discharging, a battery produces hydrogen gas. This is highly explosive, so double-check all hull connections to make sure that everything is sealed tightly and don't smoke near the unit when it is opened after use. It is also wise to wait about an hour before installing the battery after charging.

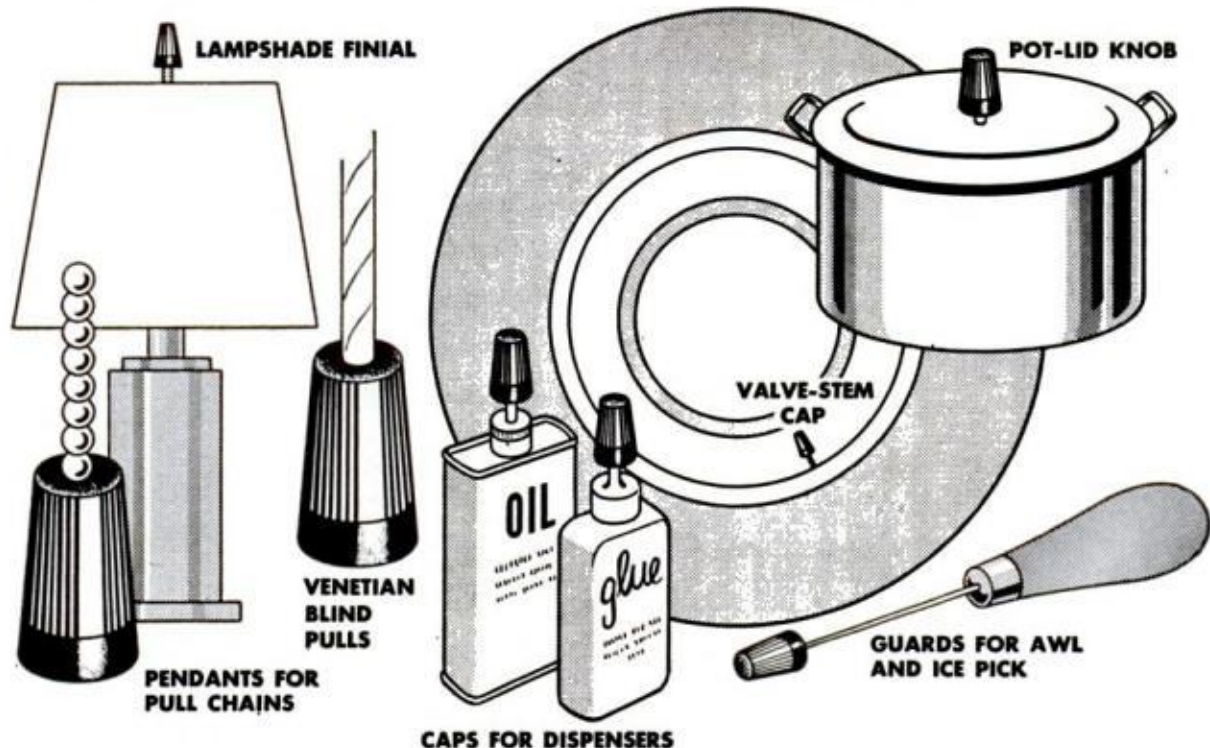
The finish you give your sea tow is a matter of personal taste. However, if you want to make it easily visible, try spraying the exterior with one or two coats of a metallic brass finish.

If you are driving some distance to your diving site and your tow battery is down, connect it to your automobile charging system. ★★★





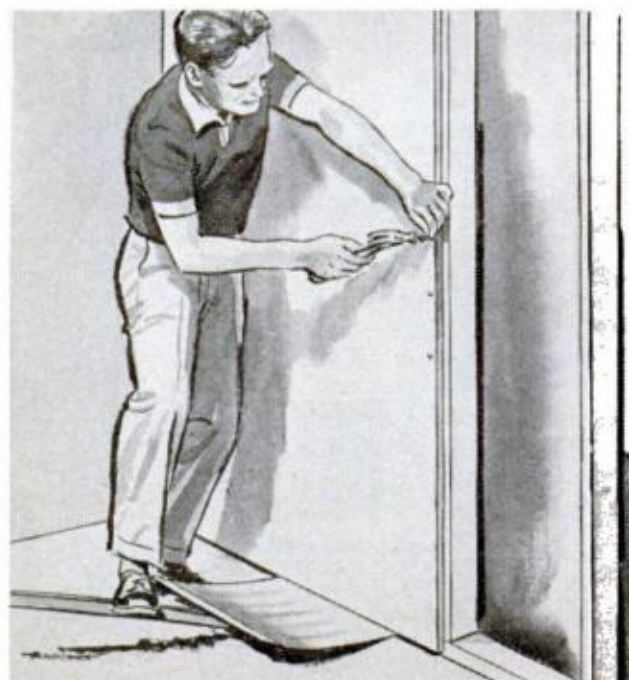
# Extra Uses for Solderless Connectors



**SOLDERLESS CONNECTORS** need not be used just for joining wires. As you can see here, there are numerous other practical uses to which these neat little screw-on caps can be put. In some of the examples you simply screw them on, others require drilling a hole in the end and backing out the threaded metal insert. You can get solderless connectors in different sizes, from tiny ones to big ones, to suit a variety of uses including those shown above.—*Joseph Braunstein*

## Shovel Lifts Wall Panels

The curved blade of a snow shovel makes a dandy pry bar to hike a heavy sheet of plasterboard tight against the ceiling for nailing. Slide it under and step on the handle.—*G. E. Hendrickson*



## On the Level for Sure

Combine level and straightedge into one handy tool for plumbing door jambs. By wiring the level to the board, you make both a lot easier to hold and you can be sure the level won't wander away.







**PAPER GRABBER** clamp built into the Deluxe Enlarger Easel proved a great convenience when tested by PM editors. It opens when you lift the frame, closes when you start to lower the frame. Comes in two models—8x10 (\$5.88) and 11x14 (\$6.99). From Spiratone, Inc., 135-06 Northern Blvd., Flushing, N.Y.

**FAST MOVIE FILMS:** Anscochrome D/100, D/200 and T/100 16-mm films are fast enough to let you shoot movies by available light. The first two are balanced for daylight, the third for 3200K photofloods. ASA speeds are 100, 200 and 100, respectively. Priced from \$8.60. Ansco Photo Products, Binghamton, N.Y.

**SUBMINIATURE CAMERA** is the first 16-mm still camera with a CdS electric eye. This pocket-sized instrument has a 25-mm f:2.8 lens with two-zone focusing. Synchronized for flash at 1/30 sec. Other shutter speeds are 1/50 and 1/200. Sells for under \$90. Minolta Corp., 200 Park Ave. South, N.Y. 3, N.Y.

**ZOOM LENS MOVIE CAMERA** gives 9-mm to 27-mm focal lengths, permitting wide-angle, normal and telephoto shots. Called the Escort 8 Zoom, it features automatic exposure control for film speeds of 10 to 40 ASA, and is equipped with a built-in Type-A filter. Under \$100. Eastman Kodak Co., Rochester 4, N.Y.

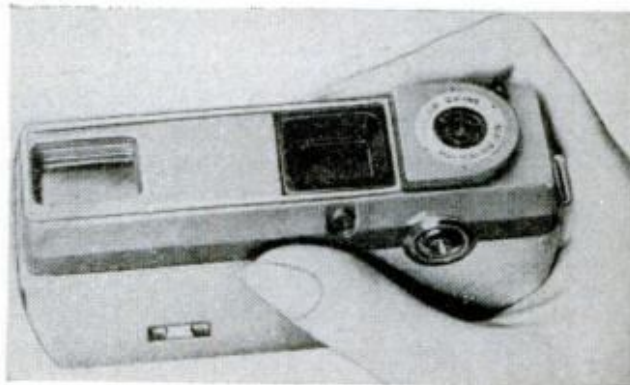
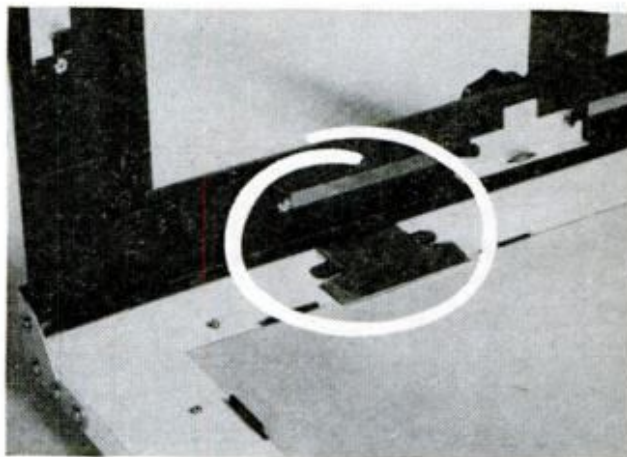


JULY 1964

## New for Camera Buffs

By Arthur J. Maher

← **MOST CONVENIENT** cadmium sulphide exposure meter marketed so far is the Bewi Super CdS. It has only one scale, instead of the usual high-low scales, and no pushbuttons. Reads both incident and reflected light and operates with one hand. About \$49.50. Burleigh Brooks Inc., 420 Grand Ave., Englewood, N.J.

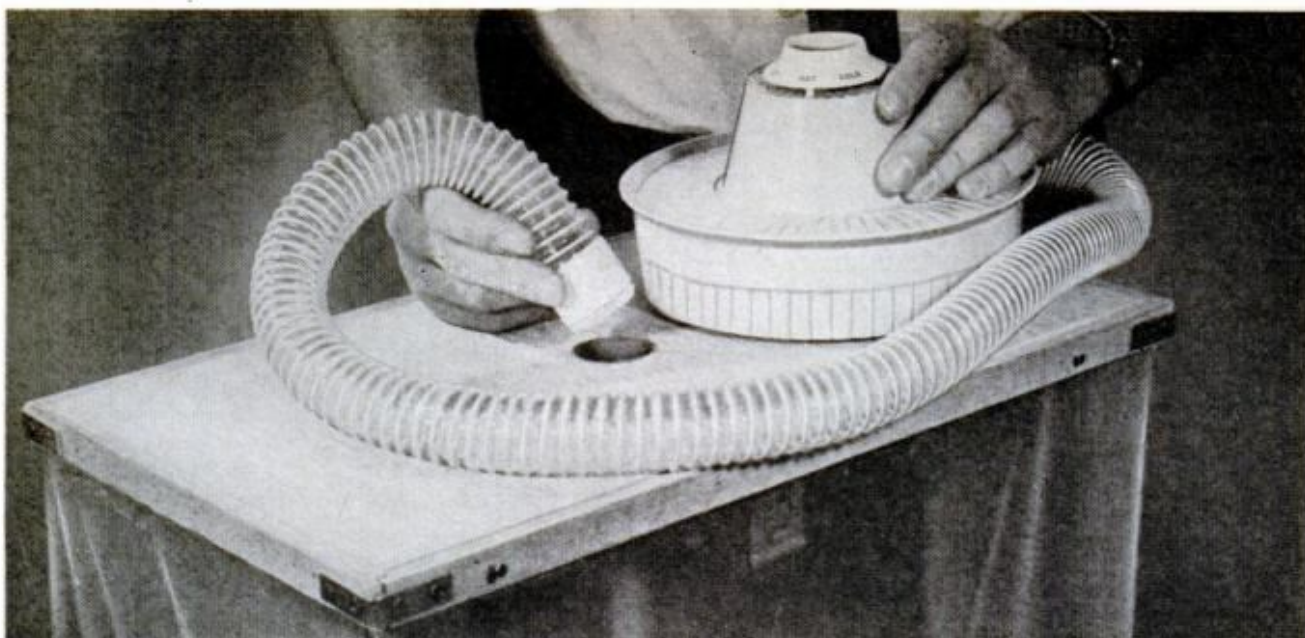


**LOOK MA, NO CORD:** Put the Grafsonic receiver on your automatic slide or filmstrip projector and hold the transmitter in your hand. Stand anywhere up to 40 ft. away, press a button and the picture changes. Set retails for under \$40, and will fit many projectors. Graflex, Incorporated, Rochester 3, N.Y.



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# Hair Dryer Powers Film Dryer

By Ken Patterson



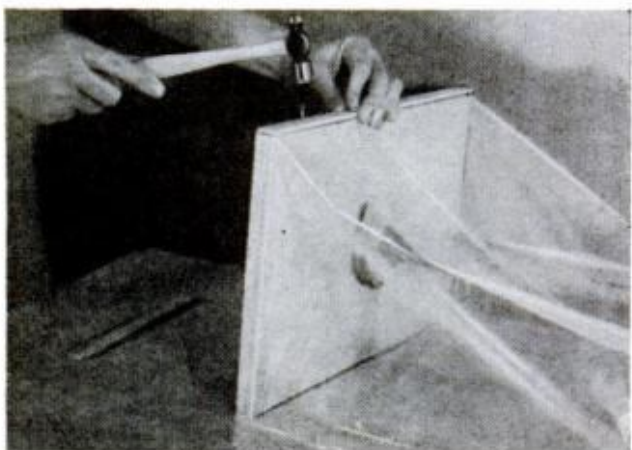
**THE TOP** of the dryer is surrounded by a frame made of doubled  $\frac{1}{4}$  x  $\frac{3}{4}$ -in. strips. The plastic sheeting is held between the strips. Note corner brace



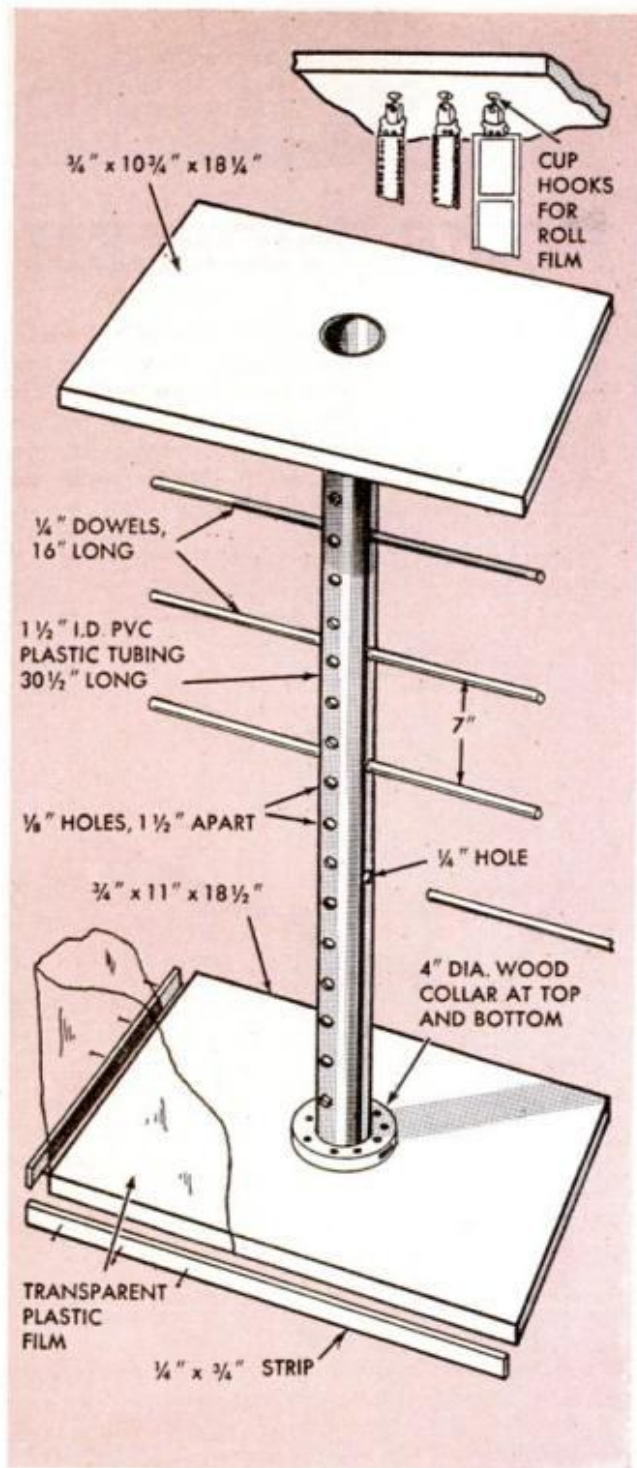
**RIGID PVC TUBING** obtainable at a plumbing shop is wedge fit through holes drilled in base and top. Collars of  $\frac{3}{4}$ -in. plywood provide added support

**PLASTIC SHEETING** is fastened to the four sides of the dryer's base with  $\frac{1}{4}$  x  $\frac{3}{4}$ -in. wooden strips. The nails should be spaced approximately 3 in. apart

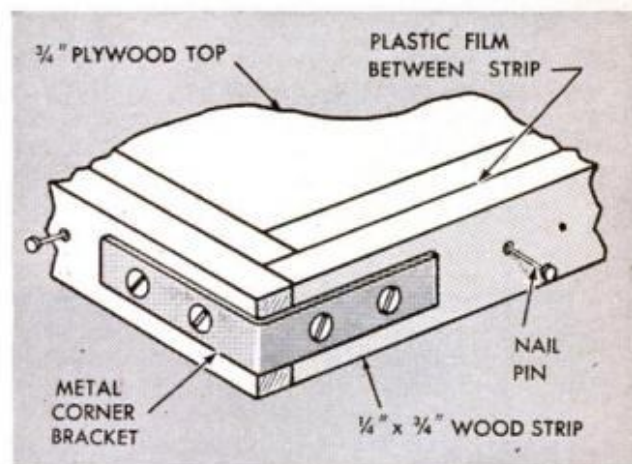
**DUST PROBLEM** is solved by placing a piece of facial tissue over the end of the hair dryer hose. This will filter out any dust particles present in the air





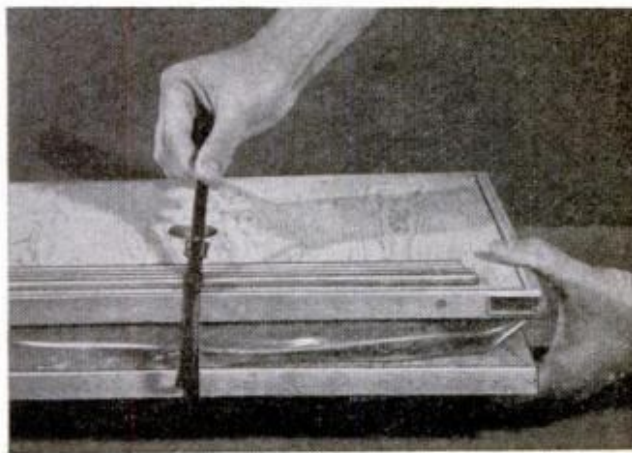
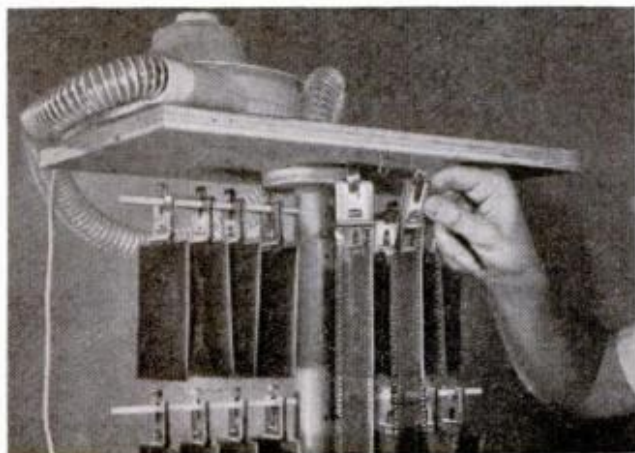


**AFTER HANGING** the film, the plastic cover is lifted into place and the upper frame is held with nail pins inserted in two holes drilled in long sides of top

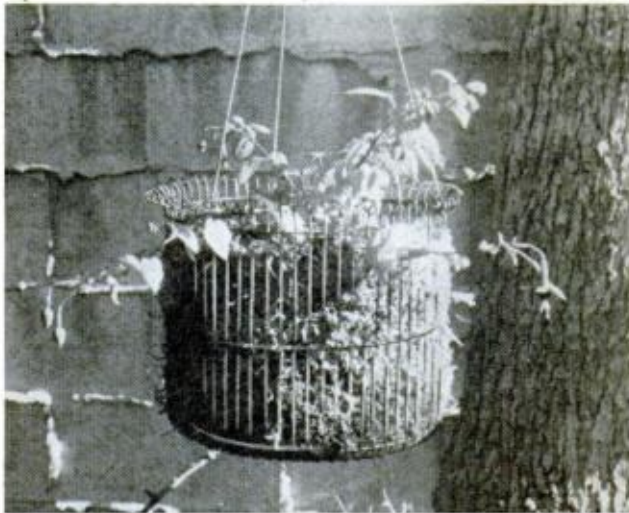


**SPRING TYPE** clips hung on cup hooks accommodate 12 rolls. Other clips strung on dowels provide room for drying up to forty 4 x 5 in. sheets of cut film

**FOR STORAGE**, remove the tube and fold the sheet of plastic between the base and top pieces. A leather strap may be used to secure the dismantled dryer





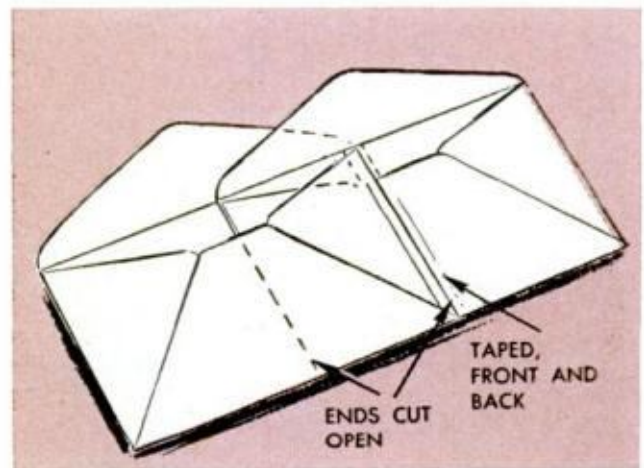


**BIRD CAGE** can be converted into a hanging basket for plants by removing the bottom, inverting the cage and curling the wire ribs back on themselves with needle-nosed pliers to form ornamental loops

# Solving

## HOME PROBLEMS

**CUT FLOWERS** will last longer if you add a teaspoon of antibacterial compound to each pint of vase water. The compound, Physohex, is used by doctors for scrubbing up before operations and may be purchased at any drug store. An extra advantage—this germ killer makes it unnecessary to change water daily



**WHEN YOU NEED** a long envelope and one isn't available, you can make one by slitting the ends of two short envelopes, sliding one into the other as shown above and sealing joint with cellophane tape

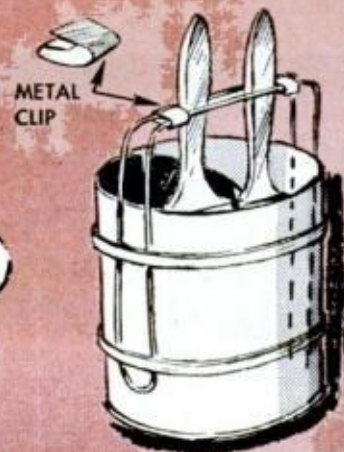
**WHEN WORKING** to close dimension you need a fine flat point on the pencil for accurate scribing. Cement an emery board to the handle of your try square and you'll have a handy means of renewing that point



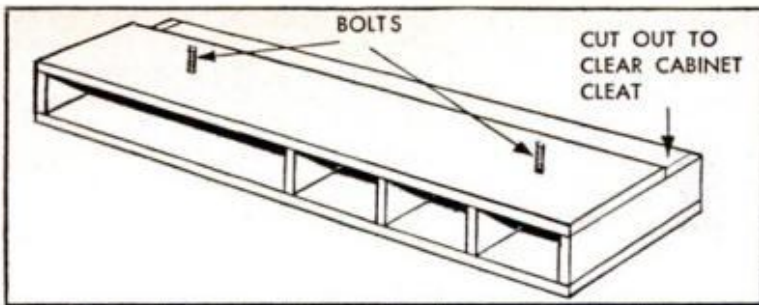
**AFTER HAVING** two new hoses stolen from his lawn while being used for late-evening sprinkling, a crafty homeowner taped the next hose he purchased with friction tape so that it looked leaky. He hasn't lost one since



**BRUSH HOLDER** is made by folding a length of coathanger wire double and slipping two 1/4-in. tubing spacers over it. Flatten spacers and spread wires between them, then bend ends and attach to can with rubber bands

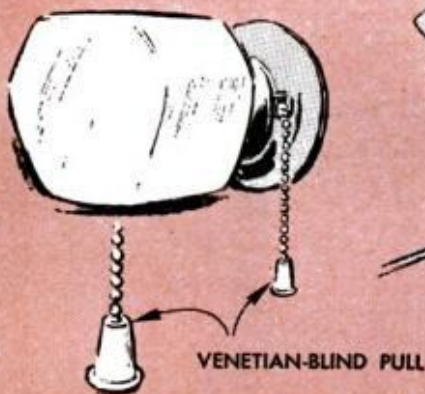






**PIGEONHOLE RACK** for mounting under hanging cabinet in the kitchen will turn the counter below into a kitchen desk. Make it from ½-in. plywood, as detailed above, and nail small facing strips over the exposed edges. Locate the partitions to provide separate compartments for telephone book, note pad, bills, unanswered correspondence, etc. To save trouble, paint unit to match cabinet before you bolt it in position

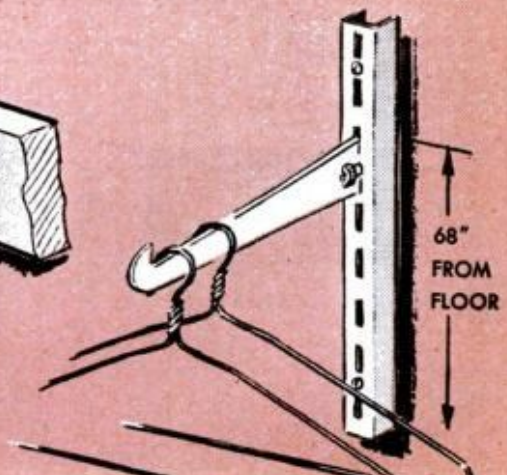
**IF YOU HAVE TO** replace the pull cords on your venetian blinds, save those plastic pendants. You'll find that they're just the things for use with pull cords of ceiling fixtures, both easy to grasp and good looking



**ADJUSTABLE CLOTHESLINE** presents no problem when it begins to sag. To make it, simply tie one end of a regular line to short lengths of small chain. Slip a link over a large screw hook, before anchoring the other end



**CLOTHES CADDY** for the laundry room is just a standard used for hanging bookshelves and a 12-in. shelf bracket. Mount a short length of this standard on the wall near the ironing board about 68 in. above floor





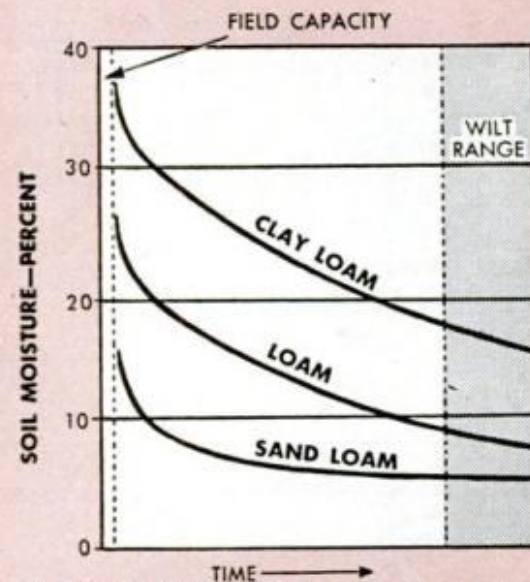
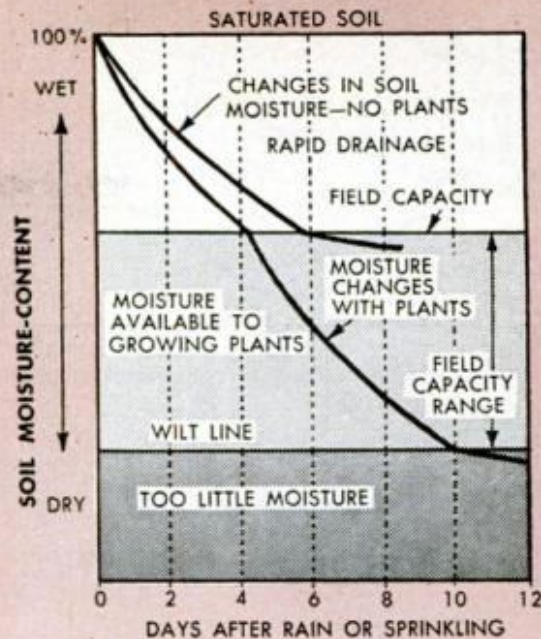
where the arm hesitates at the end of each cycle. Likewise, so-called square sprinklers lay down a nearly square pattern of water coverage, but the amount isn't evenly distributed over the area.

How much water a sprinkler lays on a lawn in a given time also varies with water pressure at the tap, size of hose and sprinkler design. All these factors are important, but let's see how your lawn or garden soil affects water usage.

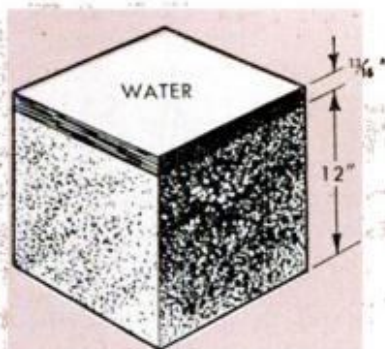
**Soil is composed** of various mixtures of clay, sand and humus. How much water your soil can hold and how often your lawn should be watered depends on how these three materials are mixed. When saturated, clay soil stores more water than a sandy soil, even though the spaces between grains of sand are larger. This is because water adheres to the outside of soil grains. Clay is made up of many more small particles and therefore provides more area to which water will cling.

But soils also contain humus, which is partially decomposed organic material. Unlike clay or sand, humus soaks up moisture like a sponge. The drawing below shows graphically the different amounts of water stored in a cubic foot of soil when saturated. Loam (also called "black dirt" or topsoil) contains roughly equal parts of sand, clay and organic matter and is the best all-around soil for either lawn or gardens.

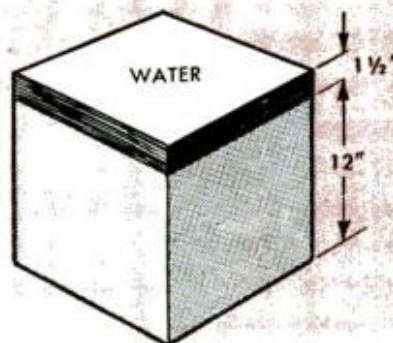
**How much water** a soil holds is only part of the story. If soil were to remain saturated with water, as in a swamp or bog, grass and most garden plants would die. When water drains out, evaporates or transpires through leaves, air fills the spaces in the soil left by the water. Sandy soils drain fast, clay soils drain slowly or not at all if clay forms a hardpan under the surface. Again, loam, with its mixture of sand and clay, works best along with the humus to soak up water. A fairly deep layer of loam allows roots to grow deep and to draw water from a larger volume of soil. Deep-rooted grass stays green over



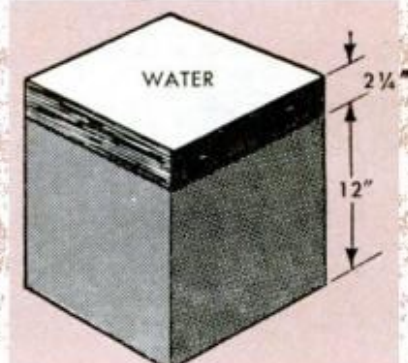
**MOISTURE PROFILE**, top, shows rate at which wet soil dries. In bottom table, note that while clay drains slowly its wilt line is higher since moisture sticks more tightly to small particles and isn't available to plants



**CUBIC FOOT OF SANDY LOAM**



**CUBIC FOOT OF LOAM**

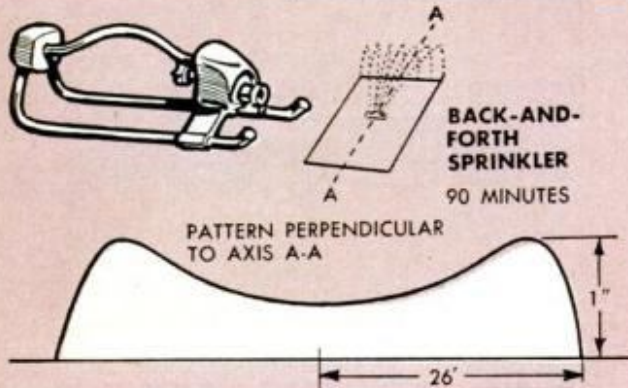


**CUBIC FOOT OF CLAY**

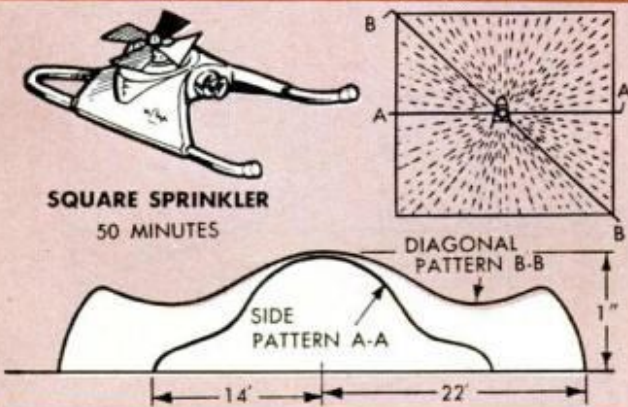




**TWO-NOZZLE  
CIRCULAR SPRINKLER**  
91 MINUTES

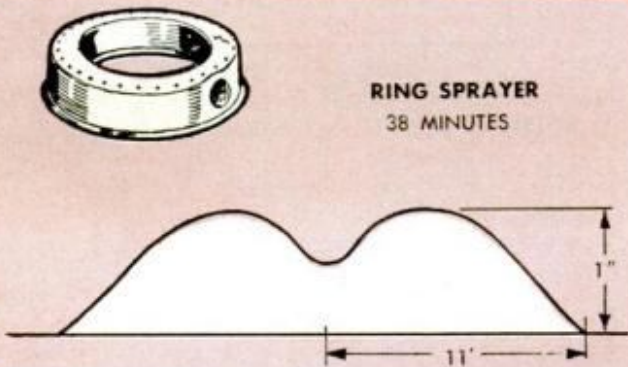


**BACK-AND-FORTH  
SPRINKLER**  
90 MINUTES  
PATTERN PERPENDICULAR  
TO AXIS A-A

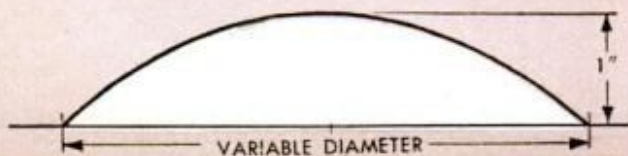


**SQUARE SPRINKLER**  
50 MINUTES

**RING SPRAYER**  
38 MINUTES



**CIRCULAR  
"SPITTER"  
SPRINKLER**  
2 1/2 HOURS



VARIABLE DIAMETER

long periods with little or no rainfall.

The type of soil you have will affect sprinkling procedures. Sandy soils drain readily, so you'll have to water them more frequently. Clayey soils, on the other hand, soak up water slowly. Sprinkling them too fast wastes water, because it simply runs off or collects in puddles in low spots. A good mixture of sand, clay and humus allows water to soak in gradually and holds it long enough for grass and plants to use before it can drain out.






Soils that are compacted won't allow water to penetrate easily. Also, the lack of air spaces keeps grass from growing quickly and prevents fertilizer from working down to the root zone. When this happens, you need to loosen the soil.

**How much water** should you put on a lawn? One rule of thumb calls for a weekly watering with 1 in. of water. In most areas, this will replace water used by grass plus the water that drains into the subsoil or evaporates from the surface. If you apply this in frequent short sprinkling periods, however, it won't replace the deep-down moisture that drains out of good soils. As a result roots will tend to spread near the surface, and when hot weather comes, the lawn with no deep root growth simply browns out. Also, keeping the top two or three inches saturated by frequent watering leads to mold and encourages growth of surface weeds.

Thorough watering once a week rather than sprinkling daily or every two days will encourage deep root growth. Frequent, light sprinklings may replace the water lost by evaporation in only the top 2 or 3 in. of soil. The capillary attraction of the topsoil keeps the water from draining on through. The water in the top two or three inches of soil then quickly evaporates without replenishing the water in the lower layers. The drawing on p. 151 shows how much water is needed to saturate a cubic foot of various kinds of soil.

**An ideal sprinkling plan** calls for imitating rain at a rate that is just equal to or less than the maximum infiltration rate of the soil. Normally, supplying the equivalent of 1 in. of moisture at this rate evenly over the soil will replenish water in the lower soil. As the excess water drains down, air replaces the water in the pores of the soil. After a few days, the top layer of soil is dry and roots, always searching for water, grow downward to the water that still remains in the deeper layers. The grass stays green as long as available moisture remains at the deep root depth. After about a week, soil moisture in the upper 12 to 15 in. of soil is depleted through drainage or transpiration. Then it's time to water thoroughly again.



HOSE SIZE (INSIDE DIA.)	GAL. PER MINUTE (50-FT. HOSE)	50' x 100' LOT TIME REQUIRED FOR 1" OF WATER
 3/8"	5.0	10 HOURS—22 MIN.
 1/2"	7.3	7 HOURS—7 MIN.
 5/8"	10.4	5 HOURS
 3/4"	17.0	3 HOURS—3 MIN.
 7/8"	27.5	1 HOUR—53 MIN.

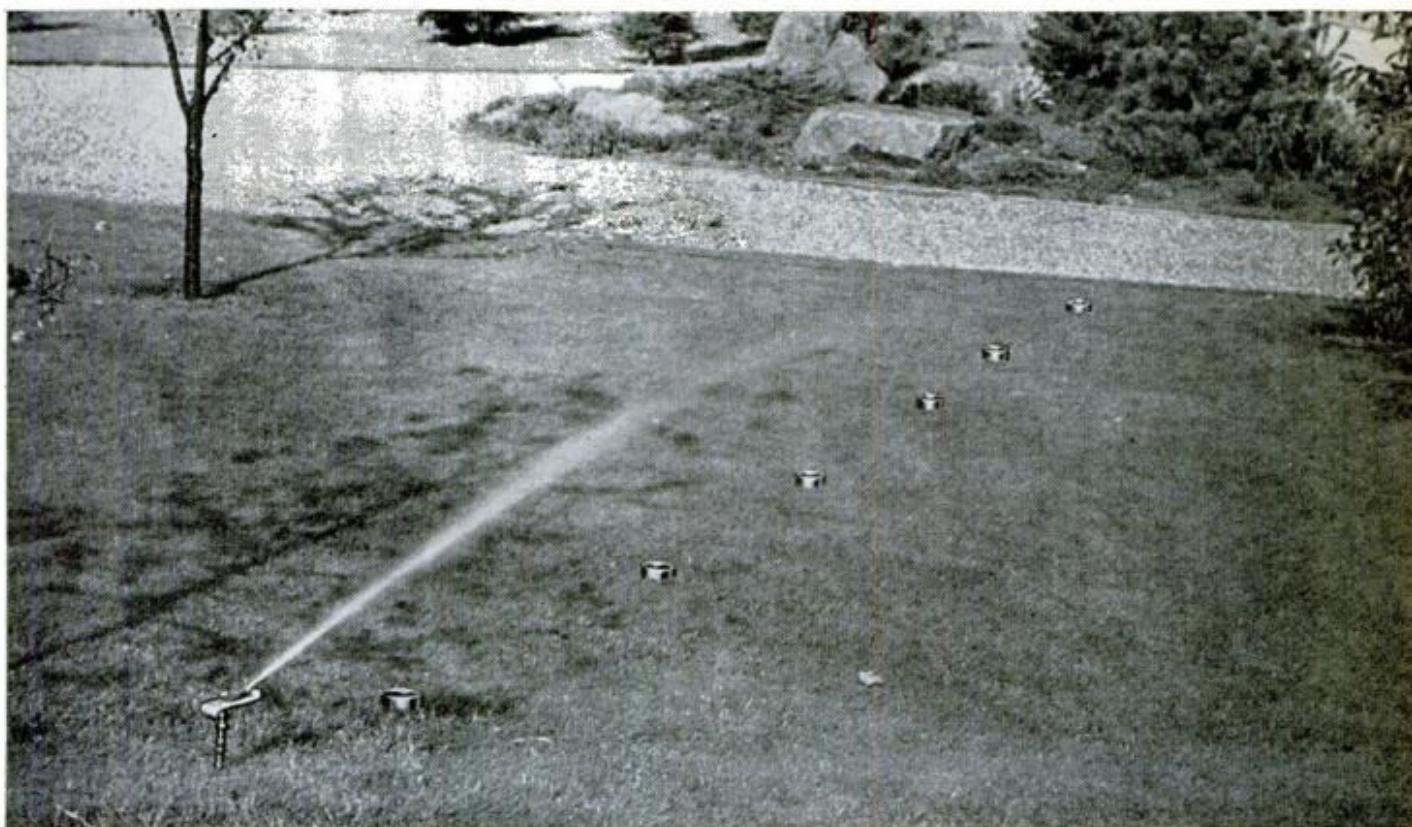
The first indication of too little moisture on lawn grasses is a lack of resilience in the blades of grass—when you step on the grass, it no longer springs back. This is the time to begin sprinkling. But laying on an even one inch of water calls for some planning and an understanding of the different kinds of sprinklers, water rates and hose sizes. Let's consider sprinklers first.

Circular sprinklers vary in design, but, regardless of the type, they all cover a circular pattern. Unless some plan for overlapping the pattern of each sprinkler is established, you'll have more water in

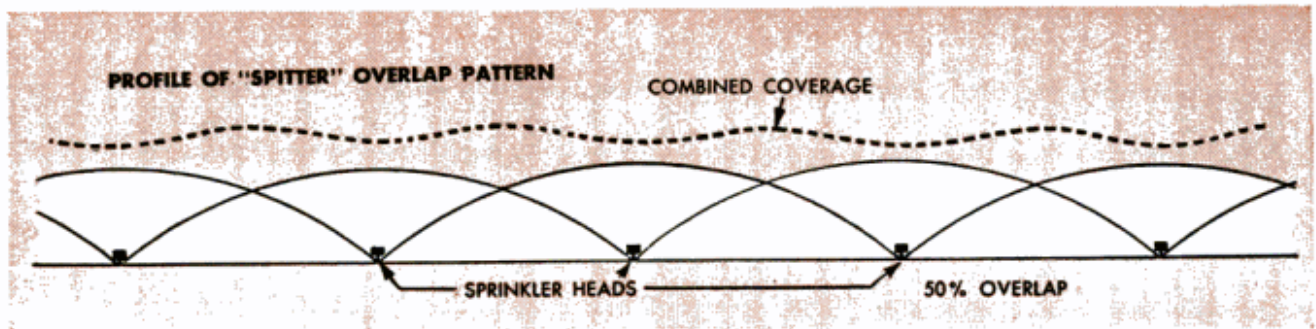
some places than in others. The drawings on p. 154 indicate the most desirable overlap pattern for circular sprinklers. Here, more water is applied close to the center with a gradual tapering off in the rate of application. By overlapping the patterns about half, you cover the area almost evenly.

**Rotating sprinklers** with two spray heads can be adjusted to fit the pattern for heavier applications near the center with an overlap at the edges. Spitters can also be adjusted to supply water in this same pattern. Fixed rings, on the other hand, are neither adjustable nor do they

**CAN TEST** of rotating sprinkler requires only a single row of cans, since coverage is measured on diameter







fit the desirable overlap pattern.

If circular sprinklers are built into a permanently installed underground system, the heads should be located for an overlap at the edges. Adjustment of the heads should then be checked to make sure the lawn areas between the heads are getting sufficient moisture. Along edges of patios or walks, small fixed spray heads can be located to fill in corners.

Oscillating, or back-and-forth, sprinklers are one of the most popular portable types. These spread the water in a rectangular pattern. This coverage isn't even, however, for more water falls at the outer edges of the pattern where the spray arm dwells for a few seconds before reversing its action. Here again, an overlap of about half can spread water more evenly.

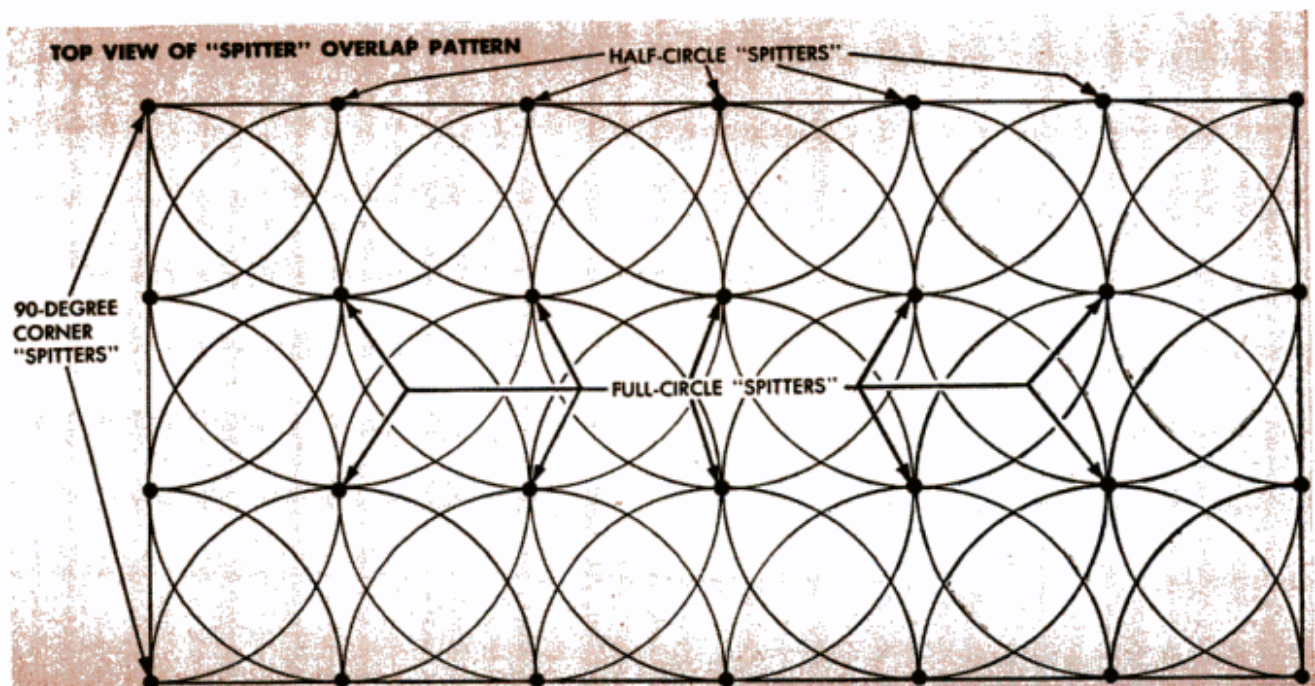
If you keep the sprinkler operating long enough to lay down one inch of water at the center where coverage is least, you waste the water that falls in the outer areas. Much of this excess water merely runs off the surface and down a street gutter. Planning overlap patterns and timing the watering will make the best use of sprinkling water.

Various other types and brands of portable and underground sprinkler heads also

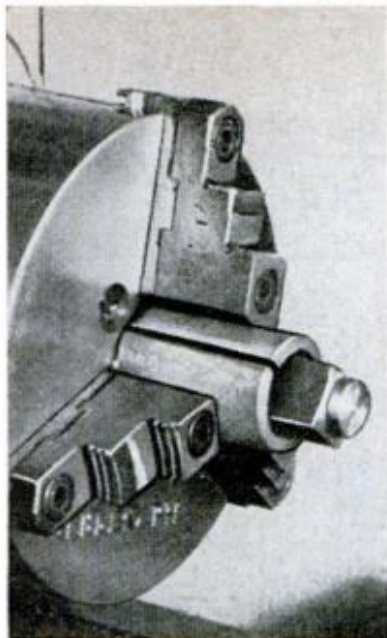
apply water in rectangular patterns. Some of those we tested worked better than others, but all actually covered the corners of the rectangular areas. However, in stretching the normal spray pattern to reach corners, less water was applied near the center on some or midway between the center and the corners on others. Depending on the actual pattern of the sprinkler, these rectangular-type sprinklers are less adaptable to overlapping than are the circular or the back-and-forth sprinklers.

Another popular type of sprinkler is the soaker or sprinkler hose. These flat sections of plastic hose contain tiny holes that lay down a pattern of water along each side of the hose. Two problems were noted during tests of these hoses. First, the spray from the tiny holes is very fine and tends to mist. As a result, any wind disturbs the normal pattern and considerable evaporation occurs during sprinkling on hot, dry days. Tests in Arizona indicated that as much as 20 percent of the misty spray evaporated before it reached the ground during dry conditions. Second, the water coverage was uneven, with most of the water reaching the ground near the hose.

(Please turn to page 180)







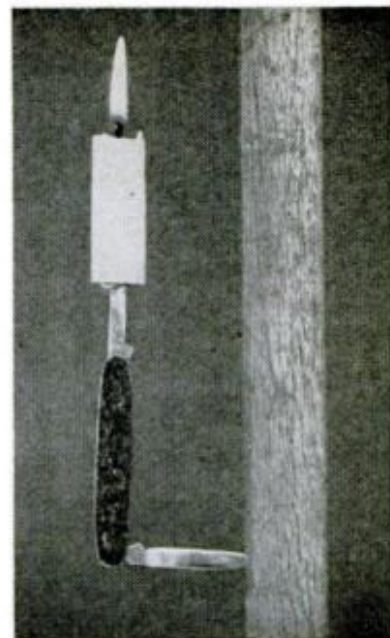
### Chuckin' a Square

Your universal lathe chuck will accept square stock if a sleeve is made from tubing. Slit the tubing with a hacksaw, insert the work and chuck the sleeve so the jaws compress the slit.



### Bright Idea

This old farm bell serves as an outside light for the back yard. A light socket is mounted inside the bell which is painted aluminum for good reflection. A 3-in. pipe supports the unit.



### Candleholder

Next time you're out camping and have need for a candleholder, try using an ordinary pocket-knife. All you have to do is run one blade into the candle and the other blade into the tentpole.

## Simple Midseason Tune-up for Your Boat—Scrub Down the Hull

If your boat doesn't seem to have the lively response that it did at the beginning of the season, chances are that the bottom is due for a thorough cleaning. Haul it out and give the bottom a good scrubbing to put the zing back in performance. If you're

a trailer boater, rinse down the hull with fresh water after each outing and you'll seldom have to scrub. Finally, to squeeze the last bit of speed from a fiberglass hull, wax the bottom to a high gloss. Check with your dealer for the right wax.

### **NEXT MONTH IN SHOP AND CRAFTS**

- ★ **BUILD A QUALITY GUITAR FOR \$20.** For only \$5 more you can buy a cheap discount guitar, but if you're interested in a quality instrument, you won't want to miss this well-illustrated construction article in the August *PM*. It includes complete plans and instructions for building a guitar you'll be proud to own. You'll read all about it next month
- ★ **PERSONALIZE YOUR BOAT.** No matter what kind of boat you own, chances are that it lacks a number of convenience features which would make your particular brand of boating a lot more fun. Next month's issue of *PM* includes a special article reporting on low-cost commercial accessories and simple built-ins that will take the clutter out of your cockpit
- ★ **HOW TO BUILD A STAIR LIFT.** It's a chair that climbs the stairs. Just push the lever and a battery-powered boat-trailer winch draws the chair up a double track mounted on the stairs; reverse the lever and the winch slowly unreels, permitting the chair to glide gently back down the stairs. A blessing for invalids or the elderly, it's detailed in the August *PM*
- ★ **EARLY SWISS WOODEN-WHEEL CLOCK.** A fascinating conversation piece, this 15th century clock has only four wooden wheels and uses a rocker arm in place of a pendulum. All the works are completely visible. This is an absorbing wood-working project for the jigsaw enthusiast or hand-tool craftsman, so be sure to pick up a copy of the August issue of *PM*





# Cool Tips for HOT STARTS

Vapor lock and percolation can stall your summer trips—unless you know what to do for both problems, and how to tell which is which

By Morton J. Schultz

"GOOD STORY in January's *PM*," drawled the service manager, as we sat over coffee in the garage office. While I tried to think back, I murmured "Thanks," then figured he was referring to my Saturday Mechanic article titled *Hot Tips for Cold Starts*. Since that one had brought yelps from a few sources whose toes we'd stepped on, I was glad for this pro's opinion: Bob's been top mechanic in our town for 30 years.

But I couldn't bask long. "Now, what are you guys going to say about summertime starts?" Bob demanded.

"What's the problem?" I wanted to know. "What with summertime gas and modern engine design, vapor lock and percolation are as scarce as Maxwells."

Bob tilted his head, wrinkled up his

eyes and gave a stare. I figured I'd said the wrong thing.

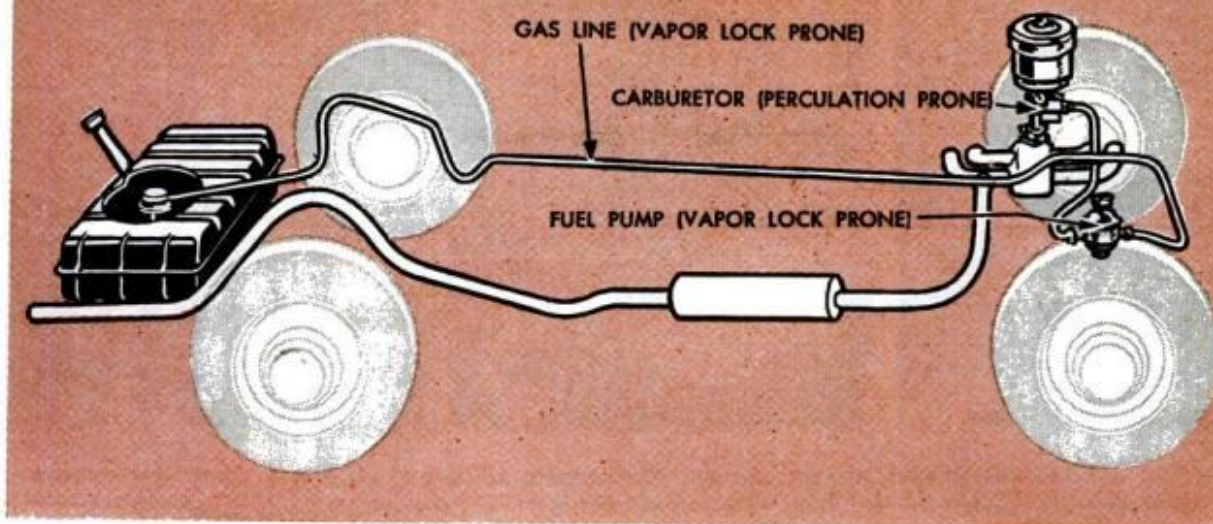
"Last Sunday was the first really warm day of the summer—remember?" he said patiently. "Well, first thing Monday morning I had 12 customers waiting for me, here. Of these, seven complained of every type of problem in the book from bad plugs and coil to clogged gas filters. The complaints were different, but the symptom was the same. All of them said they had experienced some sort of stalling or no-start the day before.

"Well," he went on, his voice growing more emphatic, "I checked each of these cars and found absolutely nothing wrong with them. What's your guess?"

"Vapor lock and percolation?" I asked sheepishly.



## WHICH PROBLEM WHERE?



"Now you're on the beam," he said.

The "beam" led me to check back through *PM's Auto Clinic* file, next day, for a stack of readers' letters written during the summer. Some indicated the usual summer bug-a-boo, overheating, plus a variety of other things. But a goodly amount told of hard restarting problems when the car had either stalled or had been run, stopped and then cranked with the engine still warm. Placed on a scale, this stack of letters would just about balance the volume of mail we get on *winter* no-start.

The number of vapor lock and percolation problems in these letters was especially surprising. We checked with other shop men to determine whether such problems were on the increase, or were limited to a few particular models.

One of these mechanics made a mighty revealing statement:

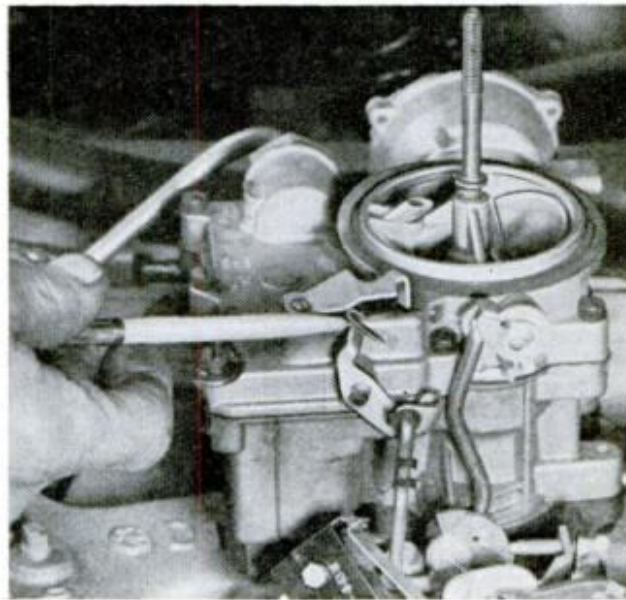
"I've never had as many percolation or vapor-lock complaints as in the last few years—and I've been working on cars since before anti-percolation devices and advanced fuels were developed. I think there are two explanations:

"One—modern cars, especially those with air conditioning, generate more heat under the hood. Two—perhaps most important—there's a growing sense of false security on the part of the driving public.

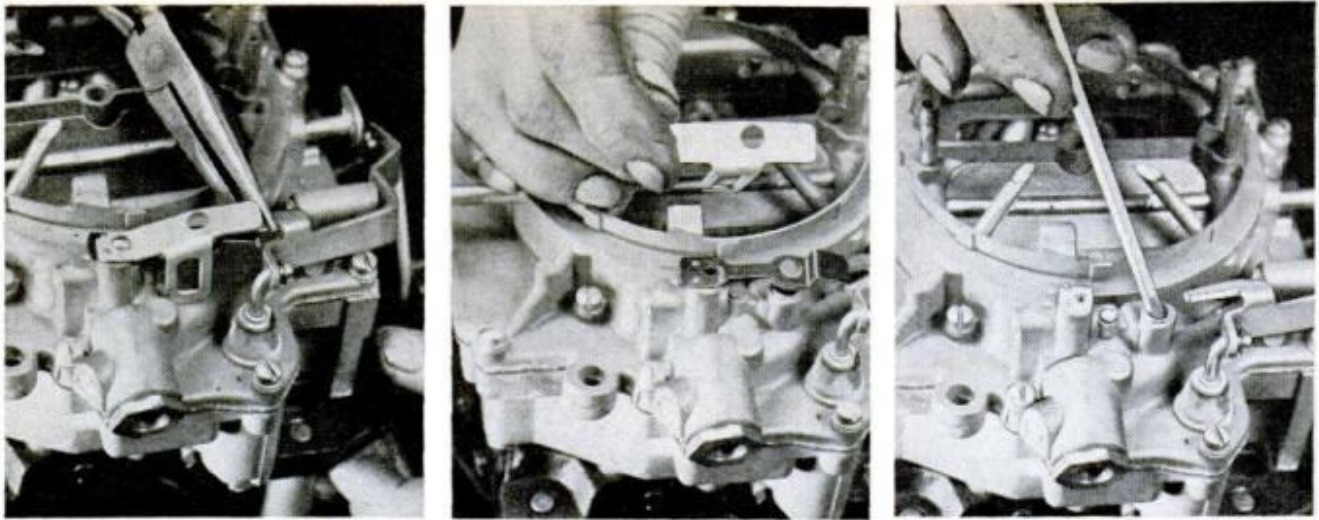
"In the past," he continued, "a knowledgeable driver knew that vapor lock and percolation were part of hot-weather driving, so if either condition *did* develop, he knew what to do. Today, this know-how's forgotten. Now, the driver's likely to blame the fuel pump, fuel filter, ignition system or what have you.

"Sure," this mechanic admitted, "the trouble could lie in these other places, but

**STRONG ODOR OF GAS** when you lift off the carburetor air cleaner (left) means your problem is percolation. Late-model cars have venting device to prevent this. The pointer at right shows where the device is located on a Rochester two-barrel carb. It's spring loaded, works by foot pressure on the accelerator





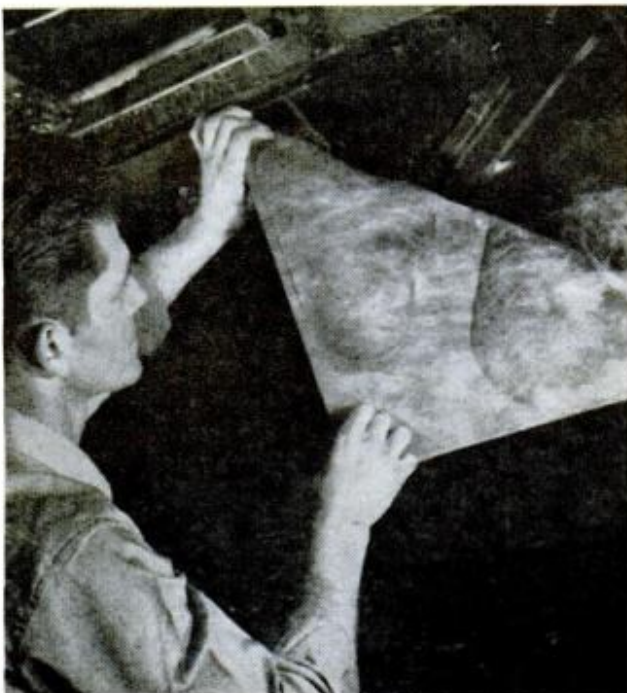


**CHECK ANTI-PERCOLATION DEVICE** for malfunction: With engine idling and no pressure on accelerator, use ruler to check clearance between vent hole and spring. Readjust as required by bending spring tang (left) down to reduce clearance, up to increase it. To replace the spring that's lost tension, remove top cover (center). While spring is removed, check vent hole (right). If it is clogged, carburetor pressure can't escape

it seldom does. So, the driver's stumped and comes to us. *That's* the result of modern carburetion and fuel developments."

Of course, even this mechanic readily acknowledges that these modern developments have reduced the amount of vapor lock and percolation occurrences. But other mechanics we interviewed backed up his view that vapor lock and percolation *complaints* (not occurrences) are on the rise. We believe this is due to the fact that today's driver considers these problems as rare as (please pass the crow) Maxwells. So education's in order to keep the average motorist cool in the face of hot-start problems. What he learns may save him

**LOW HOOD-LINE** can contribute to percolation problem by preventing full heat dissipation. You can't change body design, but you can remove any fiberglass pad under the hood to allow better air circulation



a needless mechanic's bill.

The first point to clear up is that vapor lock and percolation *aren't* the same thing, though the symptoms are similar. Depending on its blend, gasoline can begin to boil at a temperature of from about 80 to 100 degrees. When this happens, either percolation or vapor lock can result. It depends on *where* the boiling action takes place, whether the resulting condition is vapor lock or percolation.

Vapor lock is the vaporization or boiling of gasoline anywhere in the car's fuel system *before* that gas reaches the carburetor. The air bubbles or vapor created by the boiling action prevent, partially or completely, the supply of an adequate amount of fuel to the carburetor. Naturally, with an insufficient amount of gas or no gas at all, the engine will begin to chug-chug along or will stop running entirely.

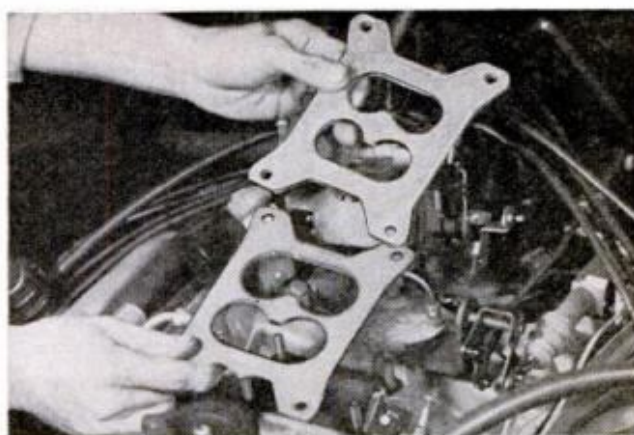
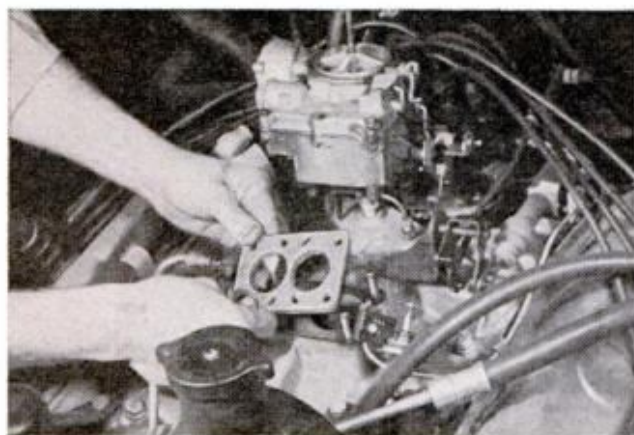
Percolation, on the other hand, is confined only to the carburetor. Everything might be in top shape throughout the rest of the fuel system until gas reaches the carburetor. Here, however, the carburetor itself might be hot enough to boil and vaporize the fuel. Not only does your engine tend to run hotter in summer, but there's that sun beating on the hood.

As the carburetor bowl gets hotter and hotter, the fuel it contains begins to boil. If the temperature reaches a point just over the boiling point of gas, the fuel begins to vaporize and these fumes move up the bowl nozzle into the air-horn.

Being heavier than air, the vapors fill the air-horn and bleed past the throttle valve into the manifold. If the temperature gets to a high enough pitch, bubbles of gasoline actually rise in the nozzle and overflow into the air-horn, much like boiling water bubbles up and over the spout



## INSULATING THE CARBURETOR FROM HEAT



**RAISE THE CARBURETOR** away from manifold heat by placing a batch of carb-to-manifold gaskets under it. That extra inch being stacked on the two-barrel job at left may lower temperature below fuel's boiling point. Some manufacturers make fiber blocks of varying thickness for this purpose. The two at right are for a four-barrel carb; the thicker upper one requires changing the regular mounting bolts for longer ones

of a coffee pot. Whatever the case, vapor or bubbles, a condition similar to engine flooding takes place.

In short, then, when vapor lock occurs, your engine doesn't get sufficient gas. When percolation occurs, it appears to get too much, in the form of vapor and/or gas bubbles.

As we've already indicated, the consequences of a vapor lock or percolation condition are similar to those caused by other malfunctions. Indeed, your woes might not be the result of vapor lock or percolation at all, but a failure in the ignition system, a bad fuel pump or a clogged fuel filter. We'll assume, however, that your ignition has been properly tuned, and you know your fuel pump is OK and your fuel filter is clean.

We'll also assume that you've just completed a run of several miles, the engine is well warmed up, you've stopped for a bite to eat, you go to start the car, but it won't kick over. Or, you're driving along on a hot day and suddenly the car starts to buck and roll, eventually stalling, and won't start again.

Your first tip-off as to whether your problem is vapor lock or percolation is the way it happened. Percolation occurs most often after a hot, slow drive. Under these circumstances, the carburetor gets little air circulating around it. On a fast drive, there's plenty of air blowing through the engine compartment. Vapor lock, on the other hand, can occur under fast or slow driving conditions. So if you were tooling along the turnpike before the stall, you're pretty safe to rule out percolation. But if you've been bumper-to-bumper in beach traffic, you can't be sure.

At least, not until you lift the hood and take off the carburetor air cleaner. A

strong odor of gas fumes says your trouble is percolation. In some cases, if vapor has built up to a really great pitch, you might see a cloud wafting off into the air. A constant odor of gasoline in the car during the summer might also denote a percolation condition.

As our mechanic agreed, percolation problems aren't as common today as they were in the past because of some built-in safeguards. Gasoline, for example, is different from summer to winter. Gas supplied to service stations during the winter is blended with so-called light ends, which makes it more volatile for easy starting.

If winter fuels were used during the summer, they would boil at a much lower temperature because of this lower volatility point. Thus, oil companies have developed a summer-time fuel containing additives to make gas less volatile.

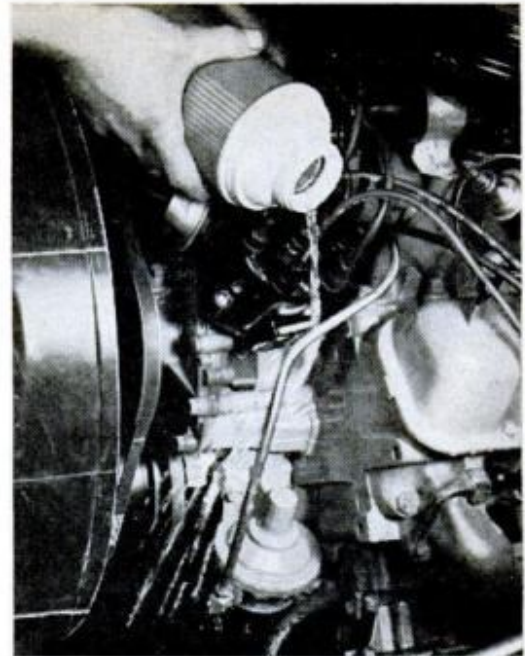
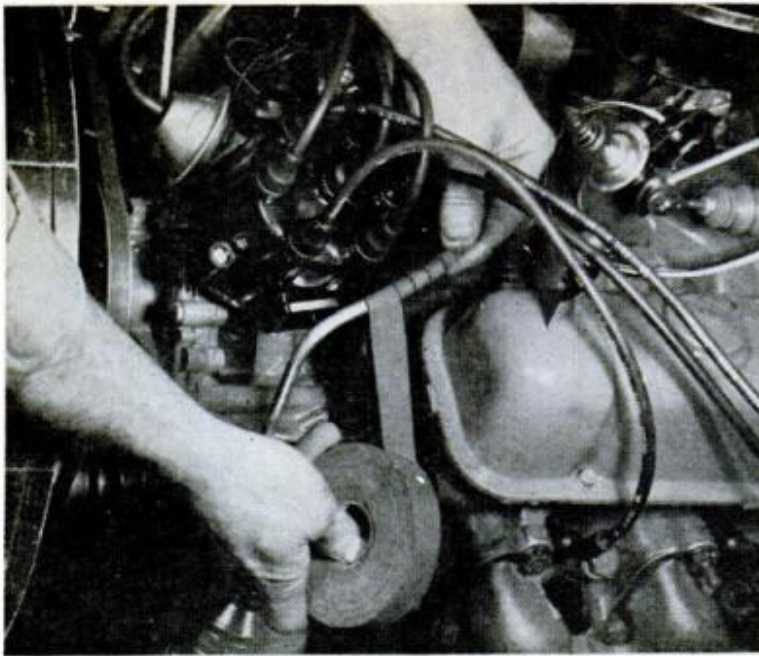
California Oil Co. told us for example, that its regular winter fuel is designed to burn at 90 degrees and the summer-time equivalent is designed to burn at 96 degrees. High-test gas made by Calso has a range of 88 degrees in the winter and 95 degrees in the summer.

This, though, doesn't mean that summer gas couldn't percolate if the temperature were high enough. Besides, you might live in a part of the country where the volatility of fuel supplied by oil companies is constant throughout the year. This is a possibility in cooler, northern climates. Yet even Minnesota and Montana are often seared by hot spells.

The construction of a modern-day carburetor also provides a safeguard against percolation. Each has some type of venting arrangement which, if not clogged or out of whack, permits vapor to escape.

Venting systems differ from carburetor





**COOL OFF THE FUEL LINE** if vapor lock is the problem. Maybe line runs too near heat source such as manifold, exhaust pipe or engine block hot spot. If so, insulate these areas with asbestos tape (left). For on-the-road use when car won't start after a stall, carry thermos of cold water to pour over fuel lines and pump (right)

to carburetor, though all work on much the same principle. The most common term for such a system is "anti-percolation device." The spring-loaded type shown on page 158 is typical. As you drive along at highway speed, your foot on the gas pedal exerts enough pressure to keep a cam pressing against a flat spring that caps a vent hole. Once you get in traffic, though (where the chances of percolation increase), the lesser amount of foot pressure on the accelerator—or no pressure at all when you stop for a light—permits the spring to pop up. Any pressure that has built up in the carburetor can then escape through the vent.

Being mechanical, it's possible for this anti-percolation device to get out of adjustment or for the spring to lose tension. It's also possible on some carburetors for the vent hole to become clogged.

At the first sign of percolation, this device should be checked in accordance with the specification for your carburetor. This specification tells how much clearance there should be between the spring and the vent hole when the tension is off (usually  $\frac{1}{32}$  of an inch). Adjustments can usually be made without removing the carburetor from the car (see page 158).

If the spring won't cover the hole when you step on the accelerator, it has lost tension and should be replaced. This entire assembly can be bought at a supply house or from a dealer who stocks your type of carburetor.

There is another mechanical part of a car that could lead to percolation if it's inoperative—the manifold heat-control valve. If the valve is stuck in the closed

position, too much heat will react on the fuel after it passes through the carburetor. This excess heat causes the fuel to vaporize excessively and gives rise to a percolation condition. So, if your car has a manifold heat control valve, make sure it's working and well lubricated.

Now, if the anti-percolation device and manifold heat-control valve are in good shape, you should seldom experience percolation. If you do, your best bet is to try to cool off your carburetor. This may involve stripping off the hood pad, as shown on page 158, or inserting thicker gaskets between carb and manifold, page 159.

If percolation persists you might want to investigate the availability of a new fan with more blades on it. The more blades on a fan, the more air it generates to circulate throughout the engine compartment. This also helps to prevent vapor lock.

Vapor lock is a sneaky and potentially dangerous summer-time occurrence. Sneaky because it hits when you least expect it, and potentially dangerous because it could happen in traffic, with cars whizzing all around you.

Let's suppose you're driving along without a care, but deep within the fuel system devious things are taking place. Maybe the design of the fuel line runs it too close to a manifold. Little by little, the gas going through that line is becoming heated.

Eventually, little gas and much vapor is passing on to the carburetor. Suddenly, you feel a loss of power, the car starts backfiring and the engine cuts out. Or, there's no warning at all—the engine just ups and quits, and won't restart.

(Please turn to page 190)



# AUTO CLINIC

**Q** My Falcon is idling rough. Yet when I pull out the choke, it starts to run smooth. I've had the carburetor checked, but the cause hasn't been found. Can you help?—M.P., Calif.

**A** Your problem has cropped up before with Falcon. Although there could be several general causes, the inherent one is a leak through the vacuum line that runs from the intake manifold to the transmission. If this line develops the smallest hole, vacuum will be lost and rough idle will result. You eliminate the condition when you pull out the choke because the rich mixture provided the cylinders overcomes the loss of vacuum. Have this line replaced even if there's no visible damage.

**Q** What can be done with a 1961 Rambler stick shift, that jumps out of gear everytime I hit a rough road? My mechanic wants to rip the transmission apart, but before I let myself in for this expense, I want to eliminate all possible external causes. Any ideas?—G.G.W., Oregon.

**A** I'd inspect the transmission's check selector, which is an external part on the left side of that gear case. There's usually little clearance between this selector and the left rear motor mount. The selector could be hitting the mount on a rough road, causing it to tilt and the transmission to pop out of gear. Grind the selector down a bit to provide more clearance. If this doesn't help, then transmission work is indicated.

**Q** My 1959 Chevrolet Nomad station wagon leaks gas from the tank when I make a right or left turn. It happens with the tank full. I've tried vented, non-vented and anti-surge gas caps, but to no avail. My family and I are drunk on gas fumes.—R.J.B., Fla.

**A** So are other Chevy station wagon owners because of that straight-pipe gas nozzle. If gas gets up into the pipe and the vehicle's tipped ever so slightly, as it would be on a turn, out comes the gas. Some people have solved the problem by trying one gas cap after another until they find the one that seals the tank. You haven't been this lucky. I can't tell you what cap to try

because the kind that's effective differs from car to car. You might try bending the lips of the cap you now have to make a better seal. But the best precaution is to see that the gas station man doesn't get too exuberant when filling the tank. Stop him as soon as the tank is filled. It means additional gas stops, but it'll keep everybody in the wagon on the wagon!

**Q** Why has my Volkswagen been so hard to start since the 300-mile tuneup? The engine will always catch immediately after I turn it off after a run. But if I let it set for a period of time, it requires considerable cranking. My mechanic has checked the obvious reasons, but to no avail.—H.W., Okla.

**A** I believe the key to your problem lies in your words "300-mile tune-up," since the cause of hard starting in your case is a non-obvious one. At this time, the dealer changed the oil. In so doing, he had to add  $\frac{1}{4}$  of a quart to the air cleaner. It's probable that the air cleaner was tightened too much when he reinstalled it. This has been known to happen with the VW. When it does, the carburetor throat is forced closed, interfering with the choke butterfly and causing hard starting.

## Monthly Service Tip

1962 and 1963 Plymouth and Valiant owners who encounter poor engine performance or spark knock after their cars have been tuned up should take them back to the dealer. It's possible that the outer section of the indicator damper is rotating on the rubber damper, mislocating the timing mark in relation to the crankshaft. Chrysler Service Bulletin 63-84 (May 17, 1963) tells the dealer how to test for this. If the timing marks are incorrect, he should install a new damper. Just make sure it's the right one. On 1963 cars, damper part number 2269076 should be used. For 1962 engines, it's 2205859.

## At Your Service

Although only questions of broad general interest can be answered in print, we don't ignore the private, special problem. If your car is acting up, your inquiry will bring an individual reply—a free diagnosis—whether we print your letter or not. Address Auto Clinic, Popular Mechanics Magazine, 575 Lexington Ave., New York 22, New York.



# Free-Flight

By Roy L. Clough, Jr.

## PARASOL PLANE

It may look like a flying dinner plate, but this way-out model is actually a rugged performer that will draw a big hand at any flying site

ONE OF THE MOST unusual designs in the history of aircraft is the pancake wing, a weird-looking bird which actually has a number of features to recommend it.

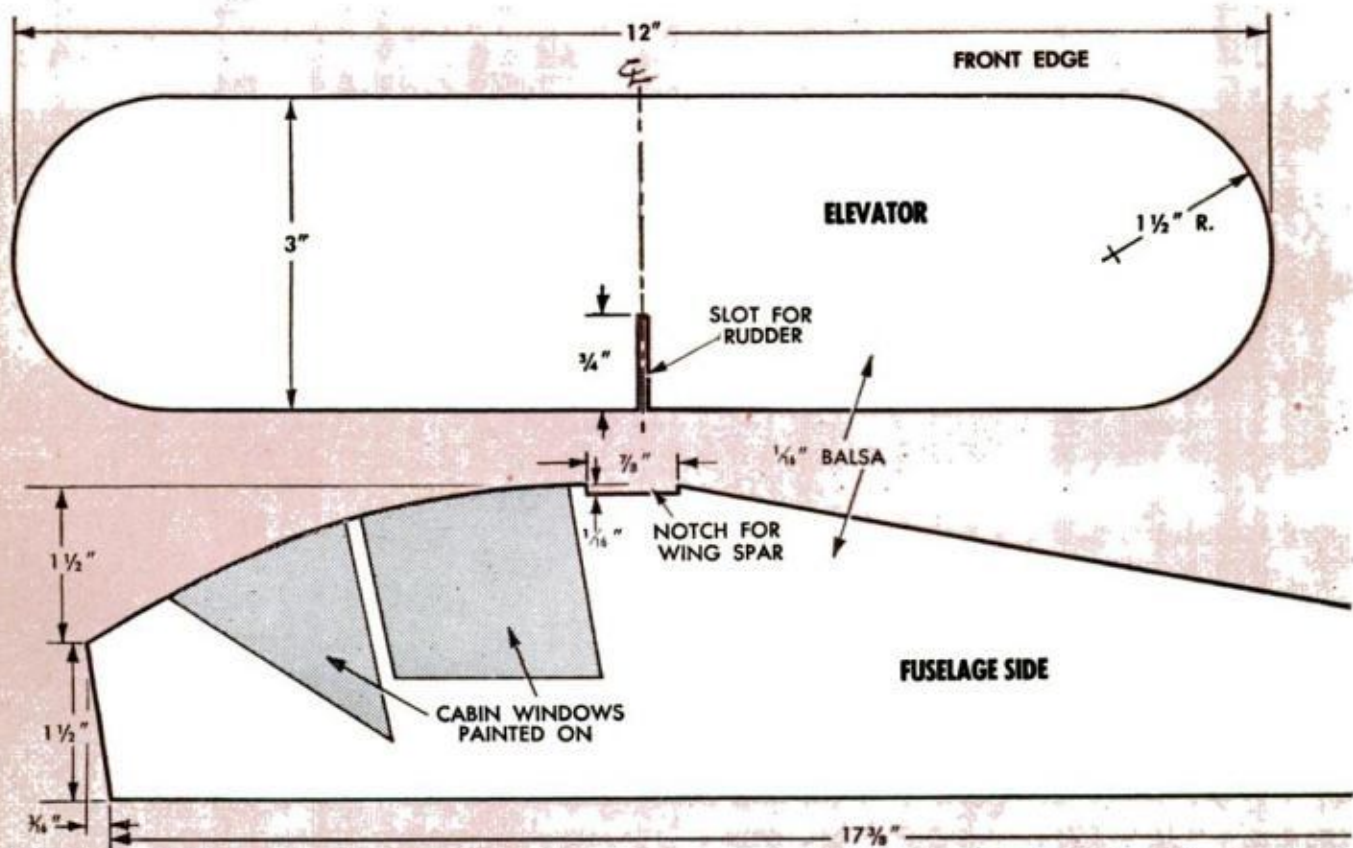
A circular wing presents little drag at low angles of attack, making it fine for high-speed cruising. At high angles of attack the wing develops a great amount of lift and drag, perfect characteristics for low-speed landings. The sharply curved leading edge is an effective substitute for stabilizing dihedral angle.

As an extra feature on this model, "eyebrow" slots have been added to permit climbing at steep angles without stalling. Construction begins with the fuselage.

Cut out the two sides and cement them together along the top edges, starting at the tail end and working as far forward as the strut. Insert the bulkheads and the wing strut, then add the cabin roof cut from  $\frac{1}{16}$ -in. balsa sheet mounted cross-grain. Note that the firewall must be shaped to fit the contour at the top.

When the cement is dry, install the elevator and cover the bottom of the fuselage with balsa sheet laid cross-grain. Slip the rudder into place and capstrip the top fuselage joint with a strip of  $\frac{1}{16}$ -in. balsa sanded to the proper contour.

Make up the wing outline from two layers of scrap  $\frac{1}{8}$ -in. balsa sheet. The joints in the bottom layer may be located at ran-





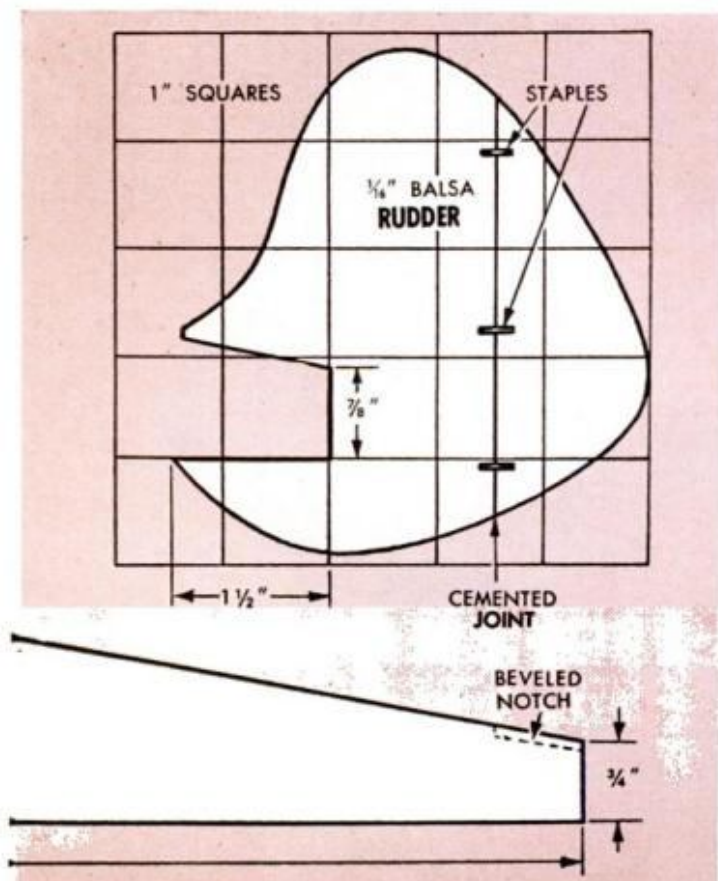
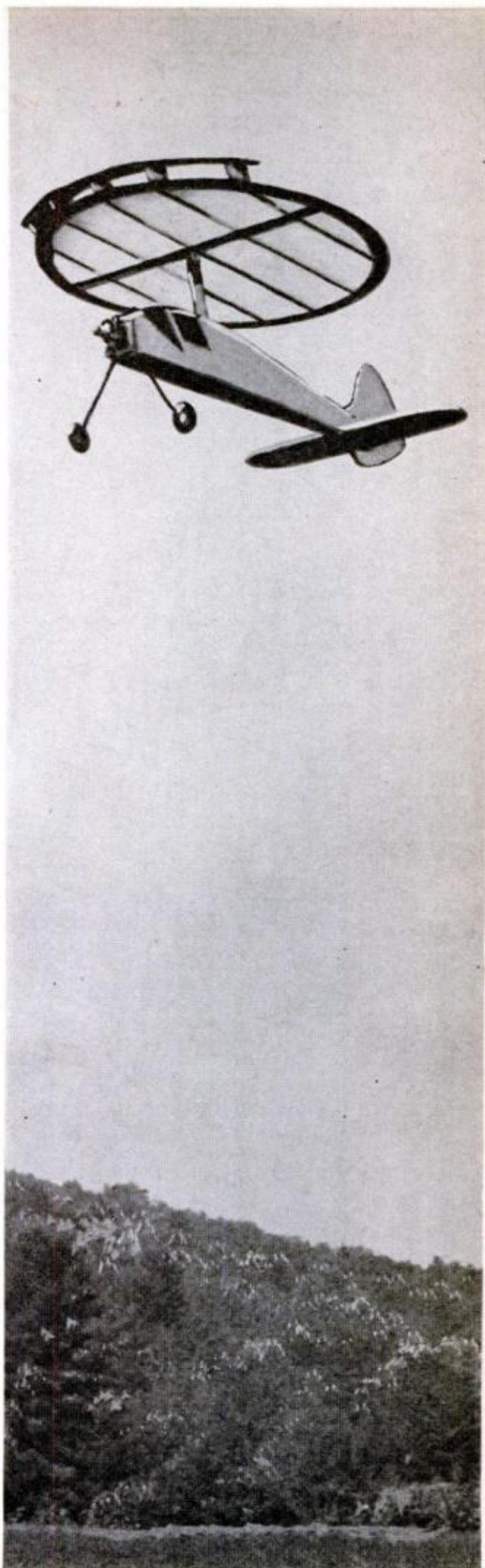
dom, provided they are lapped with solid balsa in the second layer. Sand this outline to shape before installing the spar and ribs. Next, make the wing brackets and attach them to the underside of the spar with cement and two 2-56 bolts.

Cover the wings with lightweight gas-model tissue, applying it in strips between the ribs in the upper surface, then spray this lightly with water to shrink it and pin the wing to a flat rigid surface to prevent warping during drying. When dry, coat the covered wing with a couple of thin coats of butyrate dope.

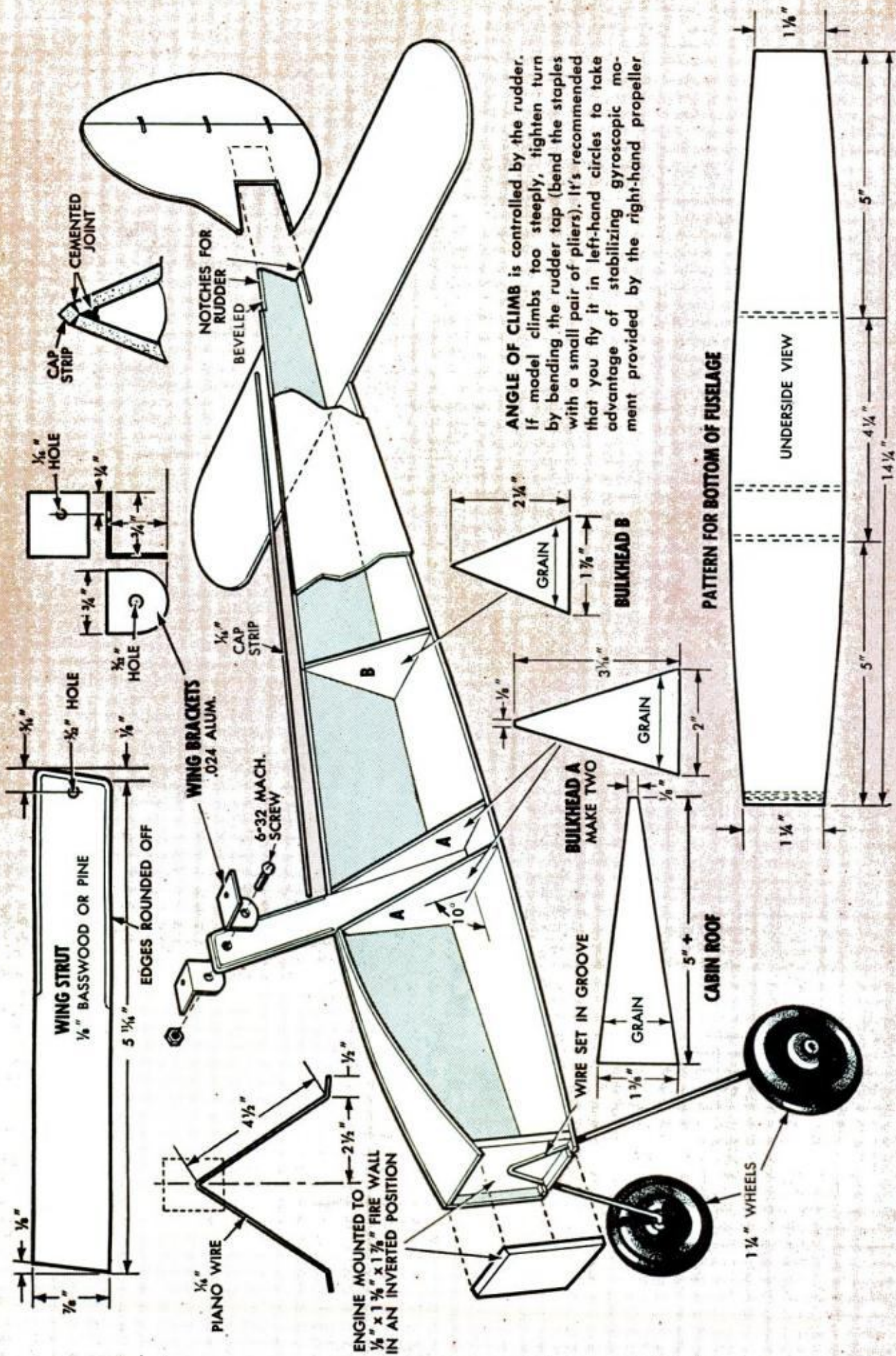
The top piece forming the eyebrow slot is cut from  $\frac{1}{16}$ -in. sheet balsa and supported on flow separators cemented to the top of the wing. Note that the contour of the wing ribs changes from the center outward. When the eyebrow top is cemented to the separators, the result will be a down twist at the outer ends. This assists in producing the desired airflow condition over the center—a sound design practice which prevents the model from tipping.

Attach the wing to the strut with brackets and a 6-32 bolt, then add the decorations and give the whole fuselage a coat of clear butyrate.

To discover the best wing angle, glide the model over long grass until you achieve a smooth, flat glide, then tighten the bolt. Finally, start the motor and test-fly the model to find the rudder adjustment which yields the proper angle of climb. ★★★

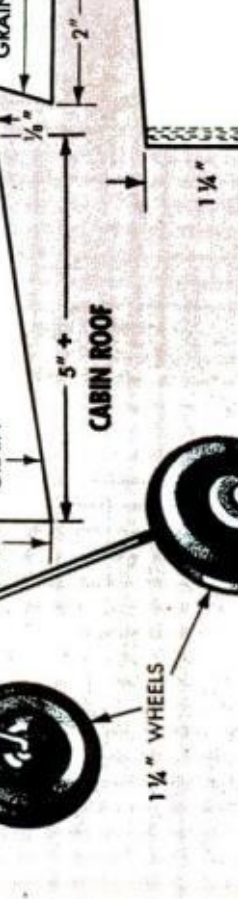
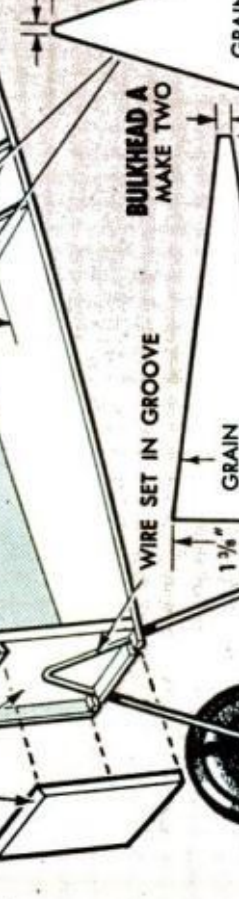
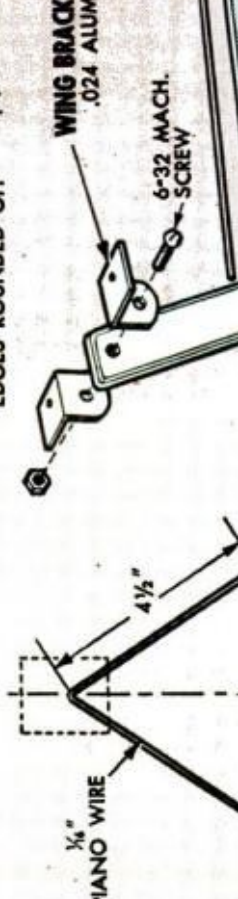
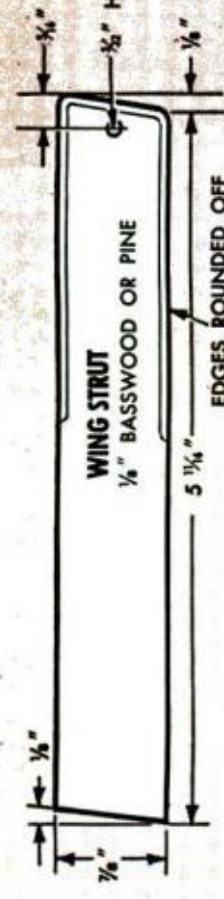




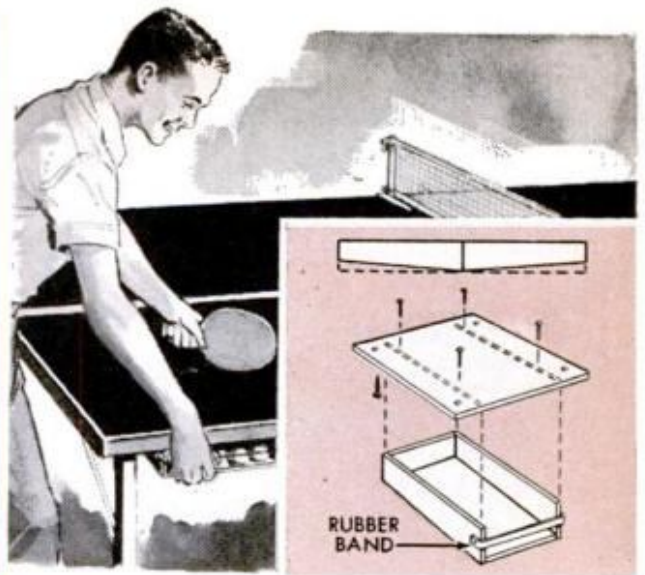
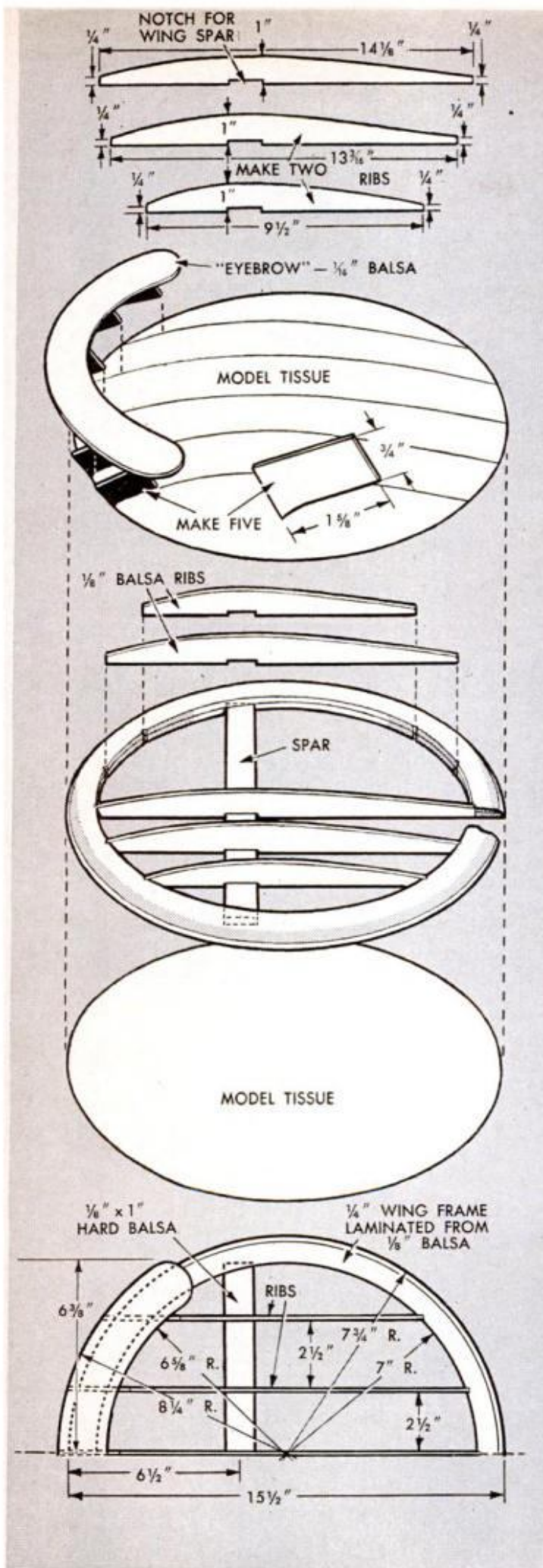


**ANGLE OF CLIMB** is controlled by the rudder. If model climbs too steeply, tighten turn by bending the rudder tap (bend the staples with a small pair of pliers). It's recommended that you fly it in left-hand circles to take advantage of stabilizing gyroscopic moment provided by the right-hand propeller

**PATTERN FOR BOTTOM OF FUSELAGE**





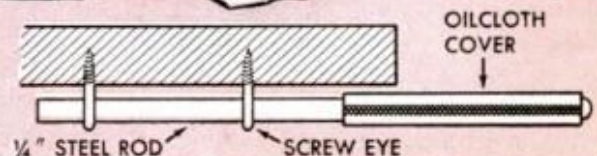


### Table Tennis Ball Dispenser

Extra table-tennis balls can be kept close at hand if they are stored in a box that is screwed to the underside of the table top. The box is made of plywood and has a slanting bottom so that the balls always roll to the front. A large rubber band tacked across the front permits the balls to be removed when needed.—Victor H. Lamoy

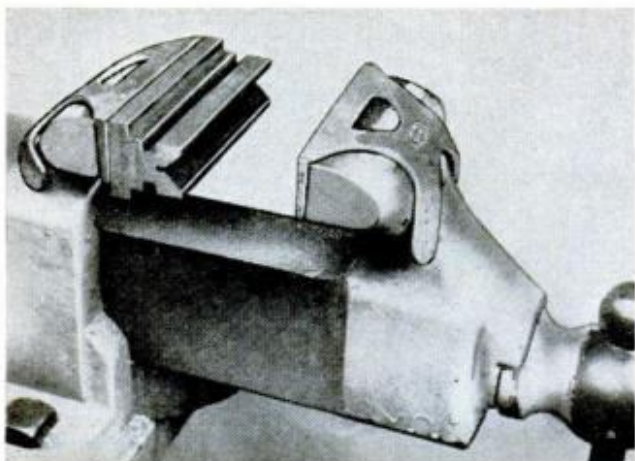
### Sliding Tray Catches Chips

You'll be able to clean up your shop in a jiffy if you install a chip catcher under the vise. It is made by bending a steel rod into a U-shape and fitting it with a sleeve of oilcloth to form a tray. The rod slides into screw eyes driven into the underside of the bench, making it easy to clean the catcher and to push it back under.

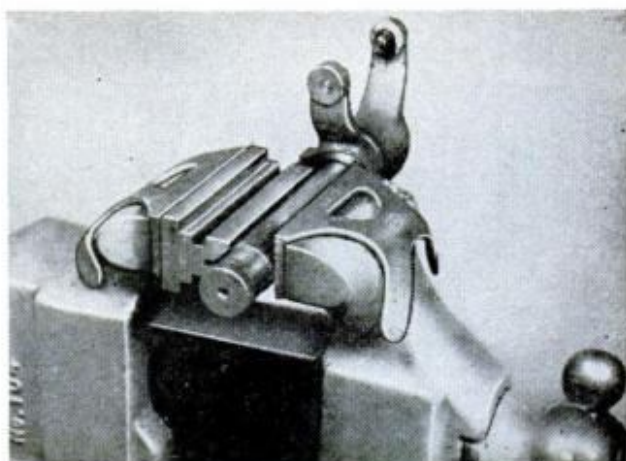




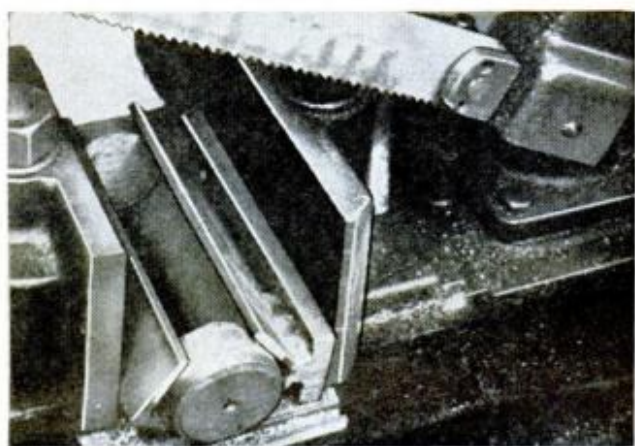
## Three Clamping Stunts for Round Stock



In a bench-vise, it's quite a trick to grip a piece of finished cylindrical stock between standard jaw faces. But with a clip-on pair of soft brass protective jaws, you've the means for providing a secure clamp for round stock. You don't alter



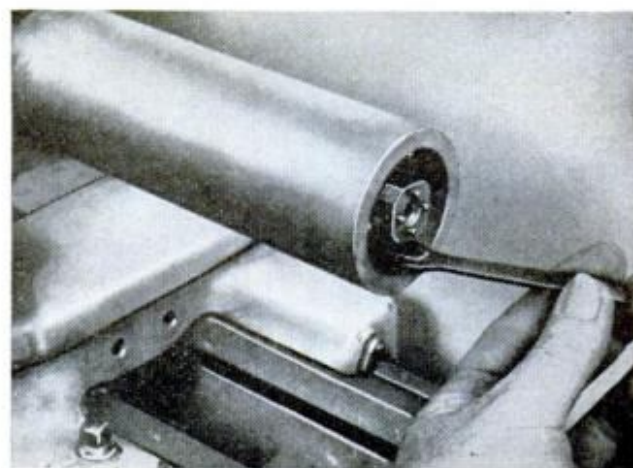
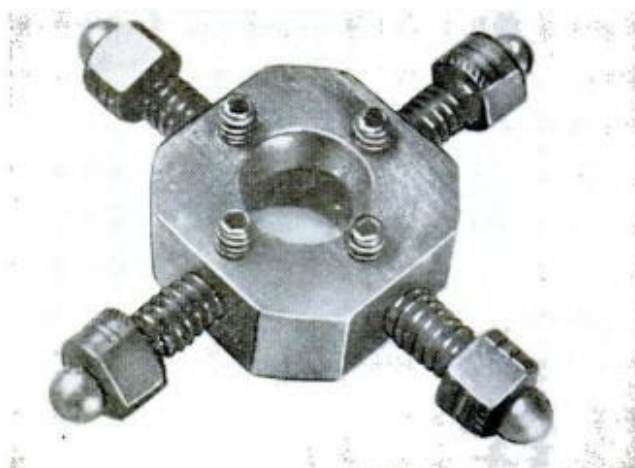
one of the brass jaws at all. But you attach a standard V-block to the other one with two flathead machine screws turned into tapped holes at the back. When you tighten the jaws, the V-block cradles the stock firmly against the plain face.



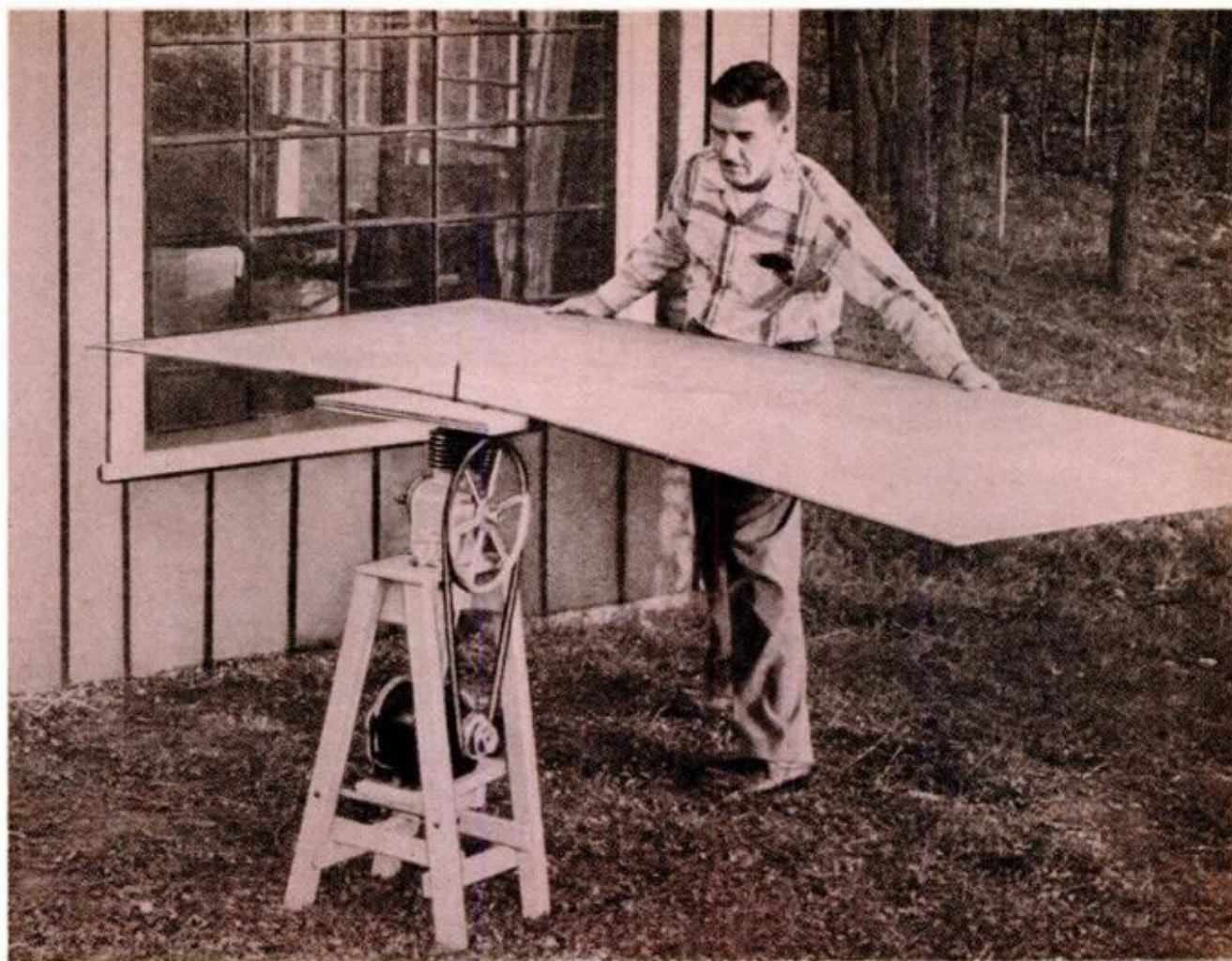
In a power hacksaw, it's almost impossible to tighten the vise enough to hold a short scrap of round stock. The uneven pressure on the jaws causes them to pivot and release the work; you may even break the blade. When you must cut such pieces (as for washers or spacers), improvise a long V-block by welding angle iron to a piece of flat stock. Seat this in the vise with a matching angle against the opposite face. Find a scrap of round stock of about the same diameter as the piece to be cut and use it to space out the rear end of the two angles as the jaws are tightened.

In a metal lathe, large-diameter tubular stock presents problems. They're all solved, though, if you make this clever adjustable spider. The body has a 60-degree cupped hole to nest the lathe center. The four arms are Allen-head cap screws with a ball bearing brazed into the socket to

seat against the inner wall of the tubing. The heads are flatted on opposite sides so the arms can be extended against the tubing with an open-end wrench (below). Set screws lock the arms in position. Drop a soft copper plug into each set-screw hole first, to protect the arm threads.





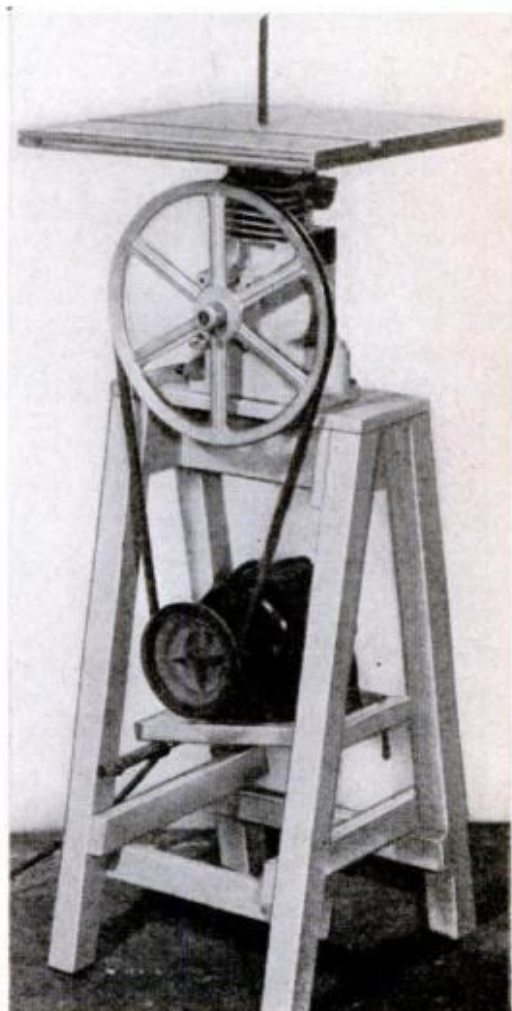


# 2 SHOP-MADE SABER SAWS

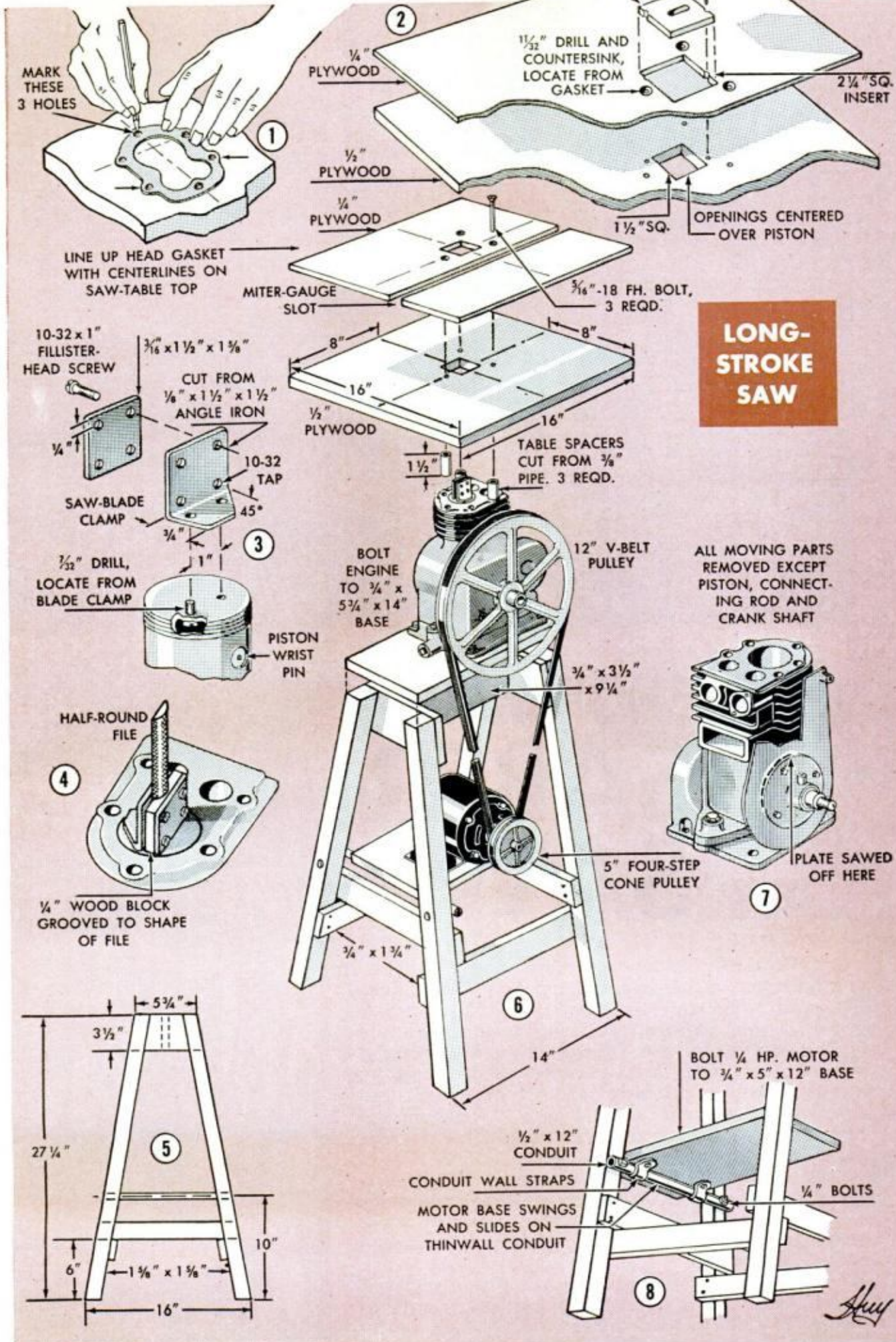
**Y**OUR CHOICE between these two table-model saber saws will depend partly on what jobs you want to do, and partly on which type of power cylinder you can scrounge from the junkyard.

The long-stroke saw shown here is built around a vertical-cylinder lawn mower piston. Clamp an ordinary power hacksaw blade in its chuck and you can zip through a 2 x 4 as if it were cheese; the saw will also power a husky handfile—not just those tiny jigsaw types.

The other saw (detailed on pages 170-171) is built around a piston-type refrigerator compressor—preferably a ¼ hp. size. These usually have about a 1-in. stroke. Since there's no attached stand, this machine can be lugged to the work site more easily than the mower-piston rig, but you'll have to set it on a low bench or crate to bring its table to work height.

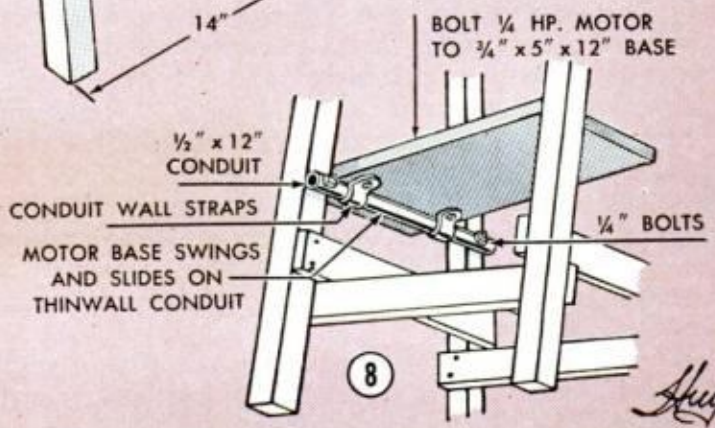
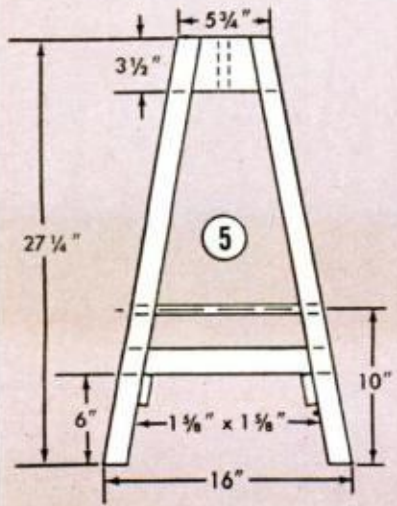
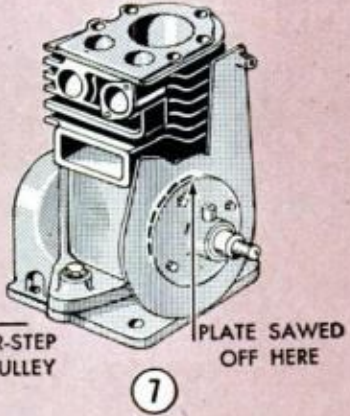






**LONG-STROKE SAW**

ALL MOVING PARTS REMOVED EXCEPT PISTON, CONNECTING ROD AND CRANK SHAFT





The piston in each machine is driven by an electric motor. And the absence of an overhead arm gives either one unlimited capacity for cutting large panels.

Art Youngquist of Fennville, Mich., collected his parts for the long-stroke saw for around \$5. He got an old lawn-mower engine from a repair shop for the junk-metal price of a few cents a pound. You'll want one from a reel-type mower, such as a Model 6 or 8 Briggs and Stratton. A rotary-mower engine would work, of course, but you'd have to make a bracket to hold the cylinder vertical. You don't need an engine in running condition, as long as the piston moves up and down when you turn the crank shaft. You discard all other parts anyway, then take off the back plate so you can saw around the outside of the retaining bolts, Fig. 7. Remove the connecting-rod cap and push the piston out from the top of the cylinder, after filing a mark on the cap so you can replace it in the same position. Remove the rod by driving out the wrist pin. Bolt the angle part of the blade clamp, Fig. 3, through the piston top so the angle will be on the crankshaft-pulley side when assembled to the engine, Fig. 6. That makes it easier to reach the clamp with a screwdriver through the under-table space.

Periodic oiling through the holes being drilled in the photos at right will keep the bearings lubricated. Apply SAE #20 oil from an oil can—don't pour any in the crankcase. Put a few drops on the cylinder walls each time you oil the bearings.

If you want a miter-gauge slot in the saw table, just space two pieces of plywood (or hardboard) on the 1/2-in. sub-table, as shown in Fig. 2, joining the layers with glue and #6 x 5/8-in. FH screws. When you need a rip fence, simply clamp on a 1x2. The most accurate way to locate the mounting bolt holes and blade opening is to use the old head gasket as a template, Fig. 1. You'll probably want a set of table inserts—one for each size and shape of file you'll use. Blades should be at least 1/16 in. thick to prevent whipping. You can use 6-in. commercial saber-saw blades or discarded industrial power hacksaw blades. When mounting in the clamp, place pieces of cardboard between blade and clamp faces. This also applies to flat files. For round or half-round files, you'll need wood cradle blocks to fit each size, as shown in Fig. 4. Always mount blades or files so they'll cut on the down stroke.

The pivoting motor mount, detailed in Fig. 8, also slides from side to side so that whatever step of the cone pulley you are using can be centered under the crankshaft pulley. Use the fastest speed for sawing, the slowest for filing.



**POWER FILING** with plain hand files (you don't even have to remove the handle!) saves tedious handwork

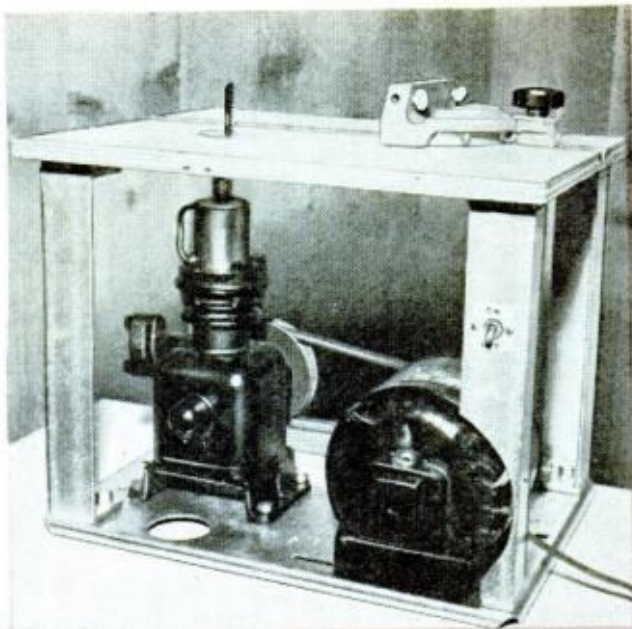


**DRILL FIRST OIL HOLE** at slight angle through to inner edge of crankshaft bearing opposite flywheel

**SECOND HOLE** goes through lower wall of cylinder on flywheel side, to lubricate connecting rod bearing





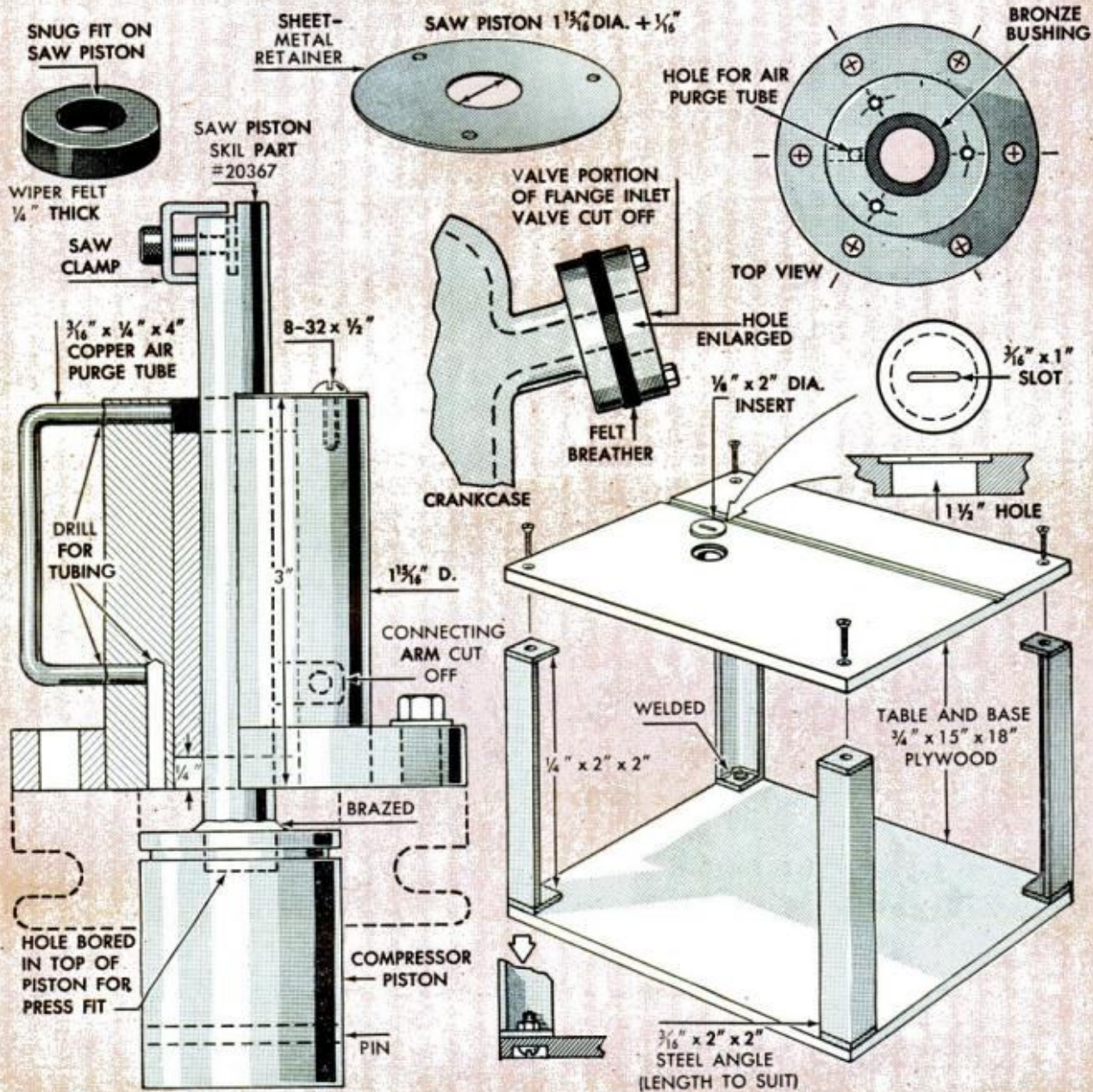


## SHORT-STROKE SAW

As in the case of the other saw, the first step is finding a piston—this time from a compressor. Try an appliance dealer or refrigerator repair shop. The defect that scrapped the unit will rarely affect its use in the power saw shown on these pages. You'll also need a salvaged appliance motor (either rotation) and a set of drive pulleys to turn the compressor shaft 900-1000 r.p.m. (the compressor's original pulley is often too large). You'll save time if you buy a piston and chuck, sold as replacement parts for any make saber saw. Designer F. H. Riedel of Cloquet, Minn. used parts for a No. 700 Reciprosaw.

Disassemble the compressor by discard-

**STEEL BASE** that came with compressor was used as base, required cut-away leg to clear motor





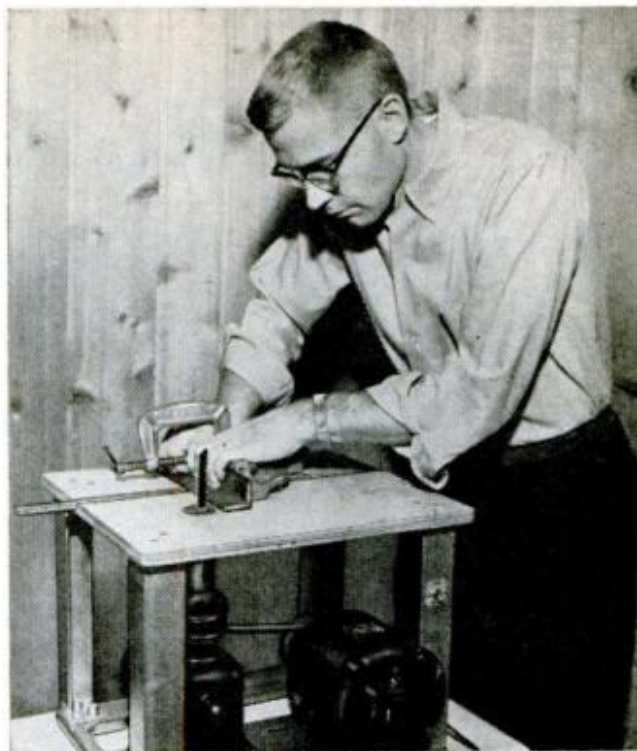
ing the head. Remove the intermediate valve plate (if any) and gas intake valve block. Drain the oil, then remove drive pulley, bearing, crankshaft, rod and piston. Carefully remove any piston rings. Clean these parts and the inside of the compressor, then apply a light coat of oil to all machined surfaces to prevent rusting while the unit is disassembled.

Cut the connecting arm from the purchased saw piston. When you silver-solder this piston into the compressor piston, set the chuck screw parallel to the big piston's wrist pin; apply minimum uniform heat to avoid major warpage. (If any results, you can dress the big piston's high spots with a fine file and emery cloth. Precision isn't critical, as the piston now serves only to link the crank rod and the saw piston.)

More critical is the bushing assembly you must make for the saw piston. If your compressor has a valve plate, use it for a bolting flange; if not, make an equivalent from mild steel. The core bushing should be  $\frac{1}{2}$  in. shorter than its housing, whatever the length of the latter. Replace the compressor piston ring or rings, and reassemble piston, rod, pin, crankshaft and bearing in the compressor body.

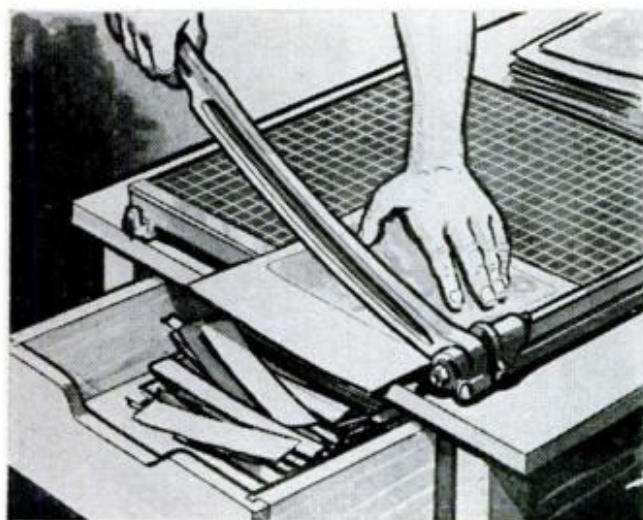
Remove the saw clamp and lower the bushing assembly over the saw piston, fastening it with the original head bolts. Rotate the crankshaft during the final tightening; any binding indicates minute axial misalignment of the two pistons. This can be corrected by shimming between the flange and the top of the cylinder head.

The compressor piston draws air through the enlarged breather inlet and forces it up the purge tube and out past the wiper ring, discouraging entry of waste particles. This felt ring should be saturated with light oil. Before you fasten the felt breather disk in place (it has holes for the flange bolts only), fill the crankcase with SAE 30 oil to a level  $\frac{1}{4}$ " above the bottom of the crank at bottom dead center.



**MITER-GAUGE GROOVE** is spaced so gauge clears blade. Cut with dado head or passes on table saw

Bolt the saw on its base and turn the chuck to the top of its 1-in. stroke. To find the over-all length of the legs, measure the height from the chuck top down to the top of the base, add  $\frac{5}{8}$  in. and subtract from this sum the thickness of the table top. After bolting the legs to either the steel base which came with the compressor or to one of plywood, chuck a short pointed piece of hacksaw blade and lower the piston to the bottom of its stroke. Set the top in place and raise the saw blade in several light tapping strokes against the underside to mark the location of the blade hole. Transfer this mark to the top face by drilling through with a small bit. Then, with an expansion bit, cut a 2-in.-dia. hole,  $\frac{1}{8}$ " deep; reset the bit for a  $1\frac{1}{2}$ -in. hole and bore through. This creates a seat for the brass or hardboard insert. ★★



### Litter Trap for Paper Trimmer

Scraps of paper littering the floor around a paper cutter not only look messy but add to the work of cleanup. You can solve this problem by catching the scraps as they are trimmed. Just mount the cutter over a drawer which can serve as a pull-out scrap bin.—Glen F. Stillwell

You can make an efficient and low-cost sanding block for use on curved surfaces by gluing together two or more thicknesses of rubber rug padding. This flexible block will equalize sanding pressure, preventing the unevenness of hand sanding.



# \$5 Conversion Puts AM Radio On Marine Band

*Add four parts to your AM radio and put everything between 1600 and 3600 kc at your fingertips*

By Arthur Kennedy

NO ONE HAS TO TELL a fisherman, boatman or just plain radio eavesdropper how much is going on in the 1600 kc-3600 kc marine and shortwave band.

There are marine radiotelephone conversations from big ships and little boats, international broadcasts, marine and aviation coastal weather reports and forecasts, time signals, police calls, amateur radio and more. So how would you like such a band added to your AM radio for practically nothing?

First remove from your set the backboard that the ferrite antenna is attached to. Unsolder the two wires that connect this antenna to the radio. One of these wires goes to the set's ground. The other goes to a lug on the stator of the tuning capacitor. Tag each lead—one "ground," the other "tuning capacitor."

Mount a d.p.d.t. slide switch under the hot end of the antenna. Then drill a 1/4-inch hole right alongside the slide switch. Push a Miller type 4408-rf. coil into this hole and fasten it into place with a locking nut. Now drill a 1/8-inch hole directly above the coil.

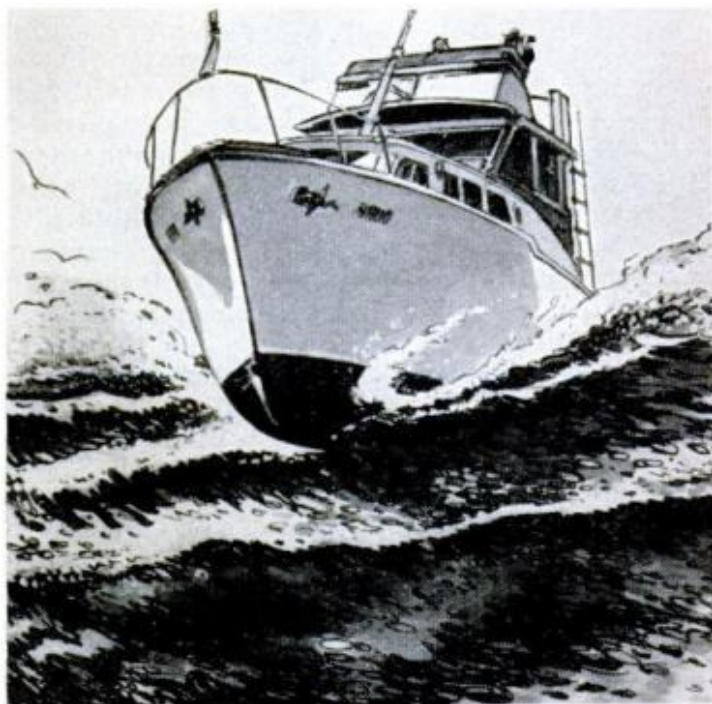
Next drill another 1/4-inch hole 3/4-inch below the coil you just mounted. Push another Miller 4408 coil in and fasten it.

Connect the "ground" lead from the antenna to one terminal on each of the coils. Solder a short length of hook-up wire to the "ground" end of the antenna. Strip the loose end of this wire and tag it "ground."

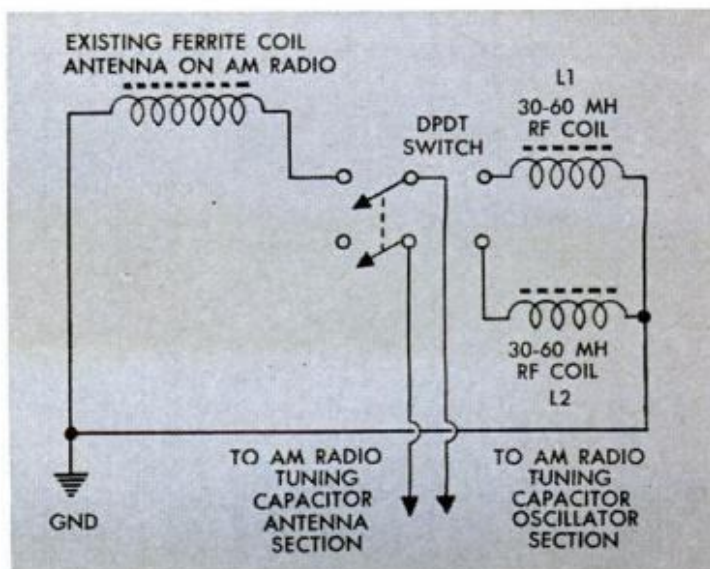
Connect the remaining lead from the antenna (the one you earlier tagged "tuning capacitor") to the top terminal of the slide switch nearest it. Solder a short

length of hook-up wire to the remaining terminal of the top coil and connect it to the empty top terminal of the switch. To this same terminal solder one lead of a 250-mfd ceramic disk capacitor. Solder a 10-foot length of plastic-covered hook-up wire to the other lead of this capacitor. Push it through the 1/8-inch hole in the backboard and coil it up to keep it out of the way while you complete the wiring.

Solder a short length of hook-up wire to the center bottom terminal of the switch. Strip the free end and tag it "oscillator." Connect a short length of wire between the remaining terminal on the bottom coil and the bottom terminal on the slide switch nearest it.



**SIMPLE SCHEMATIC** shows the added parts and new wiring that make your set a marine radio receiver. Only requirement: radio must have a ferrite antenna





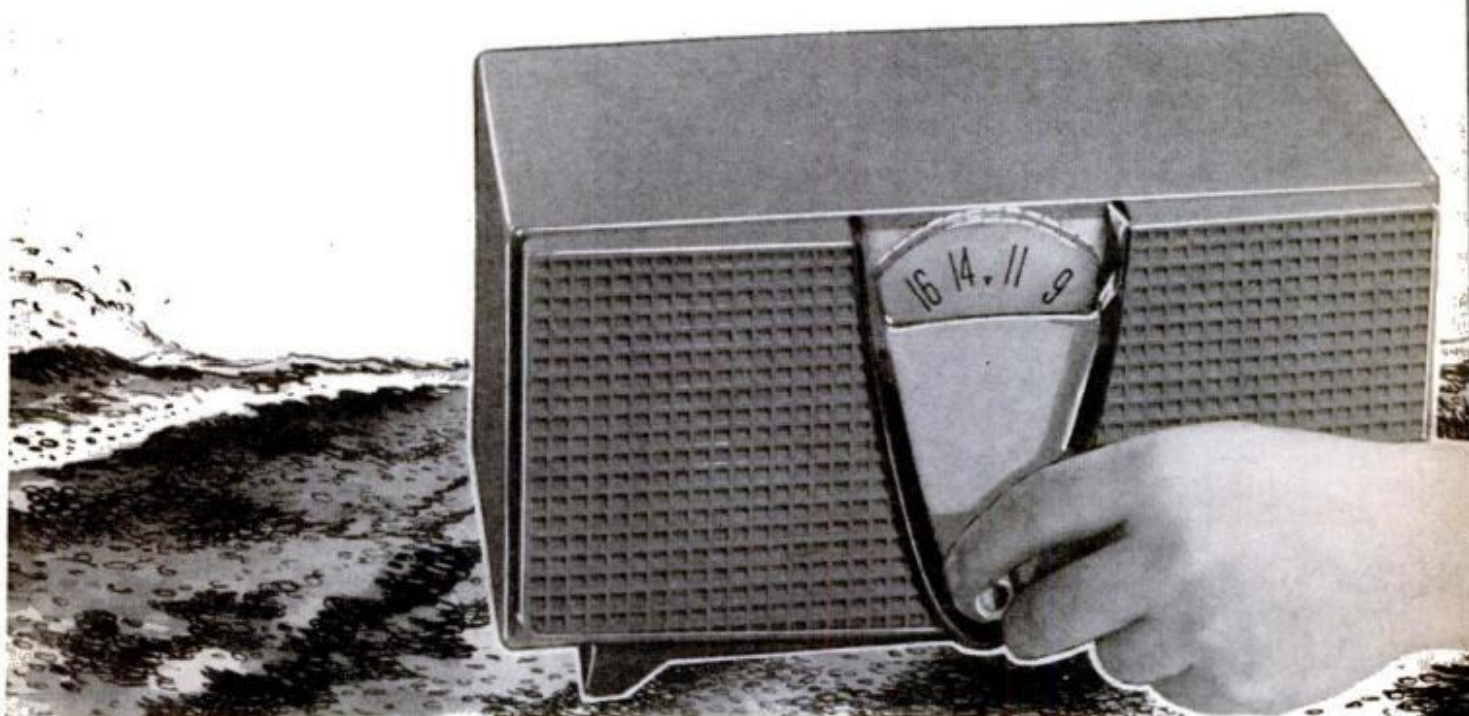
Solder the wire tagged "set ground" to the lug from which you first removed it. Solder the wire tagged "tuning capacitor" to the lug on the tuning capacitor from which you had removed it. Solder the wire tagged "oscillator" to the lug on the stator on the other half of the tuning capacitor (the oscillator section).

Replace the backboard on the radio and you are finished. You now have an AM radio that will receive *both* regular broadcasts and shortwave by just pushing the slide switch and using the same dial to tune both bands. To get a good signal on the shortwave band, uncoil the antenna wire and run it vertically as high as you are able.

Push the slide switch into the AM position. This will connect the regular antenna to the radio. Turn the set on. Your radio should bring your favorite local broadcast programs in as loud and clearly as usual.

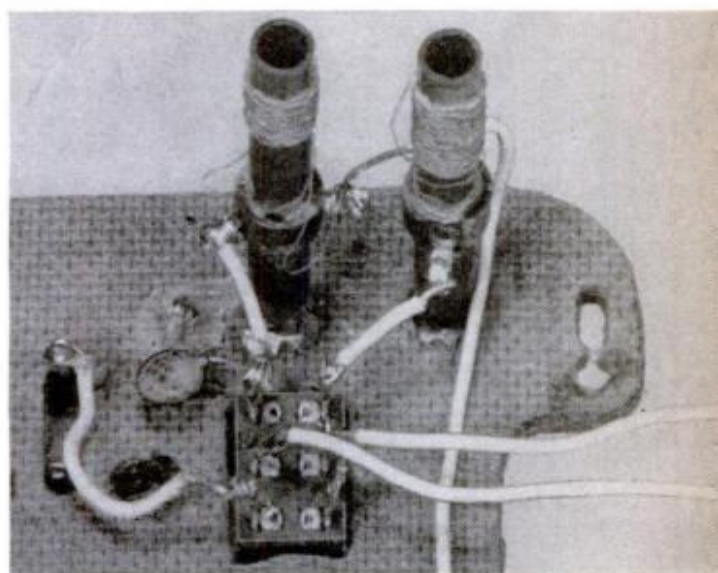
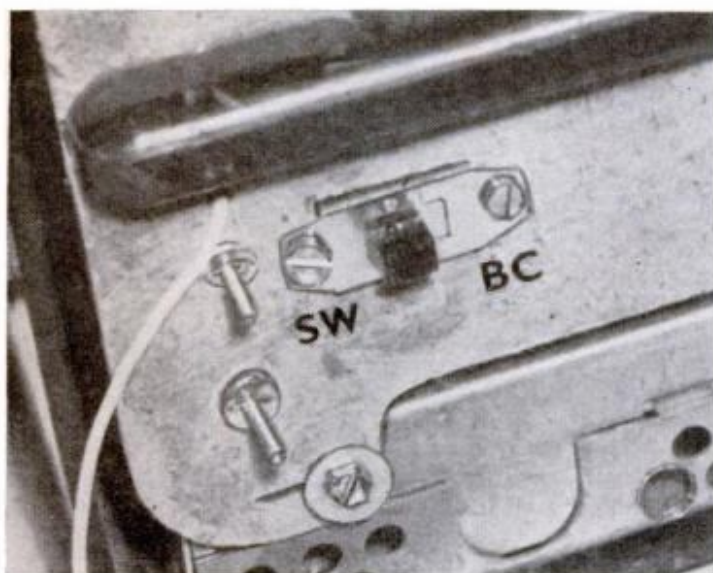
Push the slide switch into the shortwave position and turn the tuning dial to 550 kc. You may, of course, still receive some broadcast station. Slowly turn the slug in the bottom coil. As you turn it you will cover a portion of the regular broadcast band. Adjust the slug until a station normally heard at about 1540 kc. is tuned in.

Now slowly turn the tuning dial. Tuning is sharp so use a careful hand. The band is alive at all hours so you won't want for a signal. Happy listening. ★★★



**ONLY THIS SLIDE SWITCH** and two-coil tuning adjustment screws can be seen when conversion is complete. Flip switch to right for AM, left for marine

**ON REVERSE SIDE** of radio backboard you can see the added coils and switch. Parts placement may vary slightly to suit particular receiver's backboard





# Get More Battery

*Rechargeable batteries plus a matching charger can put an end to your battery problems*

By Thomas W. Sikes

**I**F YOU SCOUT AROUND your home, you are likely to find several toys which aren't being used because they require frequent battery replacement. But you don't have to discard these expensive toys if you use rechargeable batteries and the battery charger described here.

I recommend using the Burgess CD-12. This battery is somewhat smaller than a

**SLIP** two nickel cadmium batteries into a homemade holder and you're ready to insert them into the battery compartment of your child's favorite toy

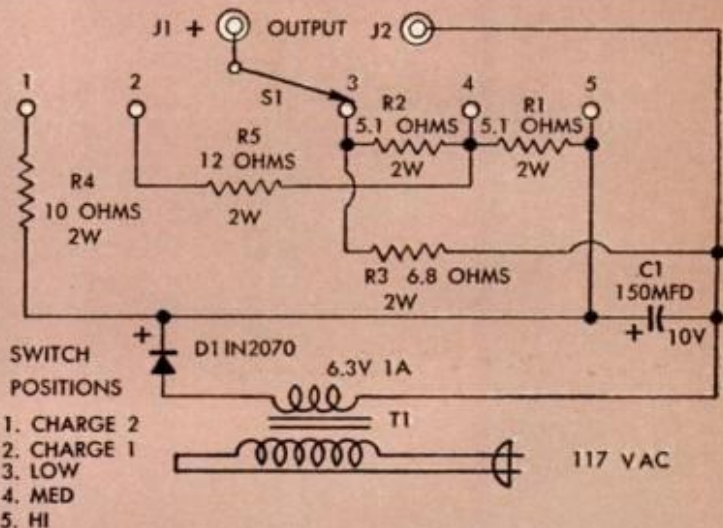
**CHARGER UNIT** can be used either to recharge the nickel cadmium batteries or to power the battery toys direct

**CHARGER CIRCUIT** is fairly simple. Be sure diode polarity is carefully observed or you may damage batteries



## PARTS LIST

- C1—150 MFD, 10 volts, electrolytic capacitor
  - D1—1N2070 (Texas Instruments)
  - J1—Banana jack, red
  - J2—Banana jack, black
  - R1, R2—5.1 ohms, 2 watts, 5% resistors
  - R3—6.8 ohms, 2 watts, 10% resistor
  - R4—10 ohms, 2 watts, 10% resistor
  - R5—12 ohms, 2 watts, 10% resistor
  - S1—1 pole, 5 position, rotary switch (Mal-lory 3215J)
  - T1—Filament transformer (Lafayette MC-358)
- Case, 2 $\frac{3}{4}$  x 2 $\frac{1}{8}$  x 1 $\frac{5}{8}$  inches





# Life for Less Money

size-C cell, and you will have to build a little adapter so it will fit into the battery compartment of the toy. The adapter shown is made from  $\frac{1}{4}$ -inch plywood and scrap copper. Cut the metal into strips  $\frac{1}{4}$ -inch wide to form the end contacts. A bracket made from  $\frac{1}{2}$ -inch strips holds the batteries in place.

Begin construction following the pictorial diagram. Cut the transformer primary leads (black) down to  $1\frac{1}{2}$  inches, strip the insulation and solder to the power cord leads. Now cut the secondary leads (green) to  $1\frac{1}{2}$  inches. Then complete the wiring following the pictorial and schematic diagrams. Any place that wiring happens to run close to the chassis, use lengths of insulating spaghetti to protect

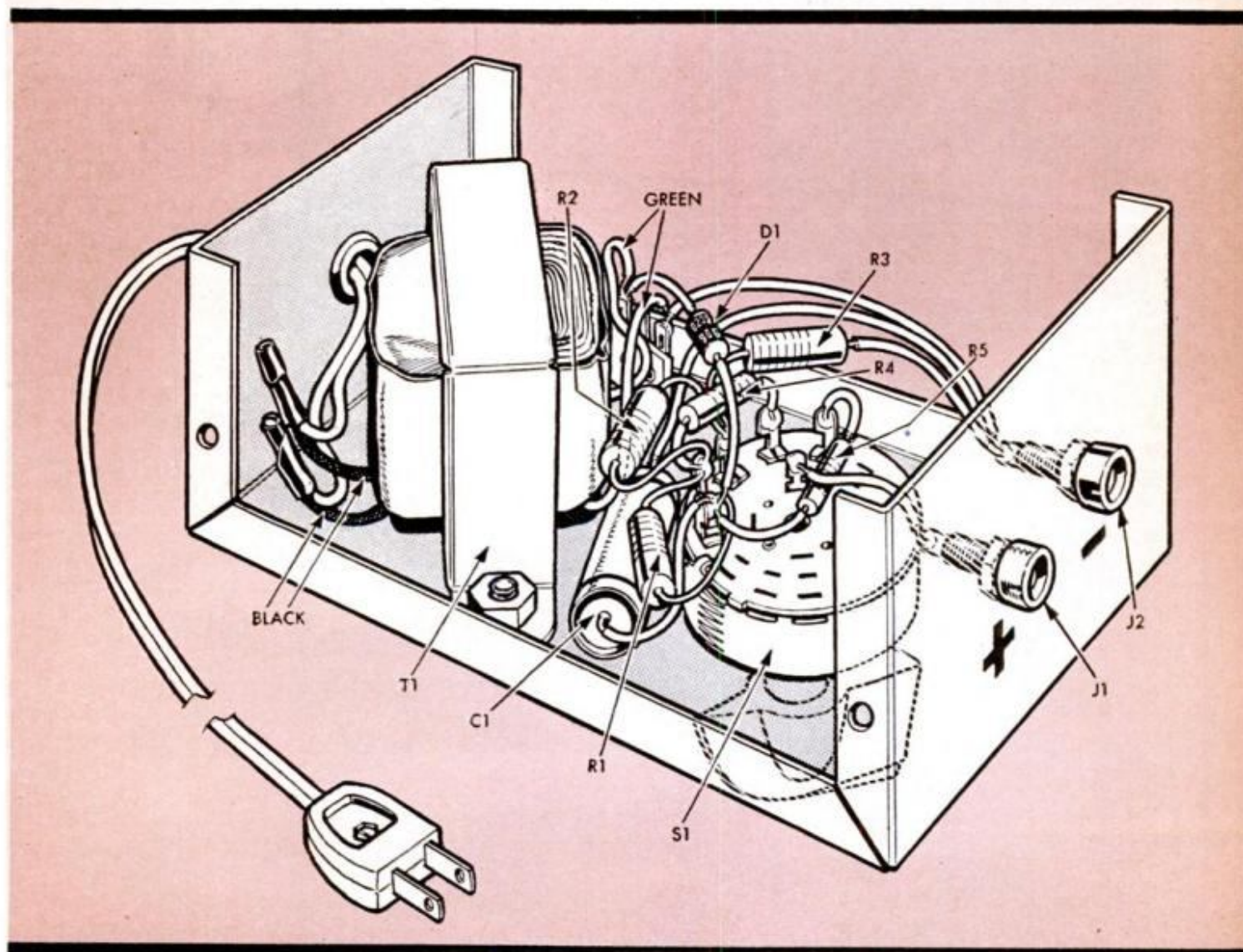
against short circuits in the unit's system.

To charge a single cell set the charger to *Charge 1* and connect the red lead from J1 to the positive battery terminal and the black lead from J2 to the negative battery terminal. To charge two cells in series, switch to *Charge 2*. Note: *Never charge nickel cadmium batteries in parallel.*

A battery is fully charged when its voltage reads 1.4 volts. It will normally take 12 hours to recharge a battery.

The charger-power supply can also be used to power toys direct. Simply connect the charger to the toy and turn it on. Start with the power supply switch in the *low* position and switch up in voltage until the toy operates normally. And all the time enjoy the money you save. ★★★

**PICTORIAL DIAGRAM** shows all wiring in the charger-power unit. Whenever bare leads get too close to each other or to the case of the unit, use lengths of insulating spaghetti to protect against expensive short circuits





# New in Electronics

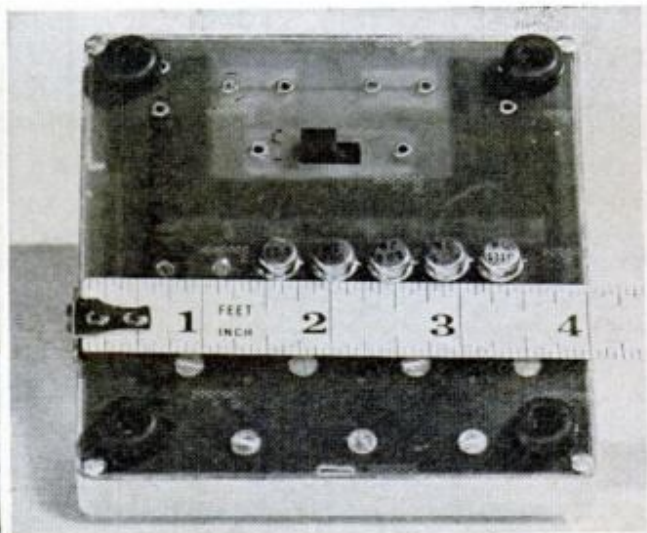


**CUT DOWN ON BATTERY CHANGES** for your transistor radio. The LP Pak adapter makes it possible for you to substitute six D-cell flashlight batteries for the miniature 9-volt battery used in many sets. If the 9-volt battery gave 50 hours of listening, the D-cells should give you 1000 hours of use before they have to be replaced. \$2.50 from LP Pak, P.O. Box 2005, York, Pa.

**FOR HIGH-FIDELITY TV SOUND**, you have to take it off the sound detector. With the Stratford Model Hi-Fi TV Adapter you just slip a special shield over the tube. Then connect the adapter's output lead to your hi-fi amplifier. You get full frequency sound the audio section and speaker in your TV just isn't capable of delivering. \$35.75, Trutone Electronics Inc., Van Nuys, Calif.



**POCKET-SIZE CHORD ORGAN** is an example of what microscopic integrated circuits can do. Five special microcircuits (below right) contain all the circuitry on tiny silicon wafers only 50 thousandths of an inch square. The organ is experimental and not for sale. It has an 8-note keyboard and three stops. The device was built by Motorola Semiconductor Products Inc., Phoenix, Ariz.





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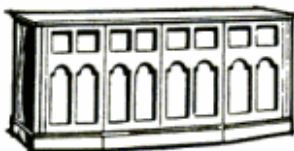
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**2ND PRIZE**

RCA Victor  
"Corinthian"  
Entertainment Center  
with TV, HI-FI and  
AM-FM



**3RD PRIZE**

Complete Workshop  
of Skil Quality  
Portable Power Tools



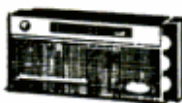
**4TH PRIZE**

Modern  
Admiral 11"  
"Playmate"  
Portable TV



**5TH PRIZE**

Gulton  
Ever-Play  
AM-FM  
Rechargeable Portable



**6TH TO 30TH PRIZES**

Remington Lektronic II  
Cordless Shavers  
(Men's or Women's)



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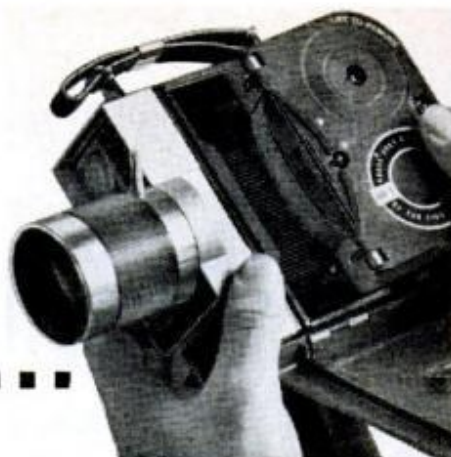
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KODAK Electric 8 Zoom Camera, with  $f/1.6$  focusing lens, hand and neck straps, cassette and pistol grip, less than \$160.

**KODAK Electric 8 Automatic Camera...** same features as above model, but with fixed-focus  $f/1.6$  lens, cassette and hand strap, less than \$80. See them both at your Kodak dealer's.



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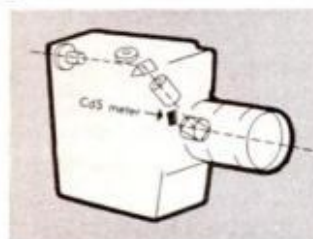
Zoom from this . . .

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Zoom range from 6.5mm to 52mm enlarges subjects 8 times.

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## Sprinkler Patterns

(Continued from page 154)

coverage was uneven, with most of the water reaching the ground near the hose. These sprayer hoses do have a useful purpose, however, in reaching small areas or in filling in along sidewalks.

**How do you** determine the sprinkling pattern of your own sprinkler or one you may be considering buying? Different brands of sprinklers of the same general type varied somewhat in our tests, even though the general patterns were similar. Also, test data for one sprinkler under certain conditions might not match a similar sprinkler on your own lawn. Pressure differences, the size of hose or underground pipe used, wind and lawn slope—all affect how much water actually falls on certain areas of your lawn. The best way to determine efficiency is to make your own “can test.”

Collect about twelve No. ½ cans (the size most often used for packing tuna fish). Set these cans out in a grid pattern around the sprinkler about 2 to 4 ft. apart. Pick a day with very little wind, then set the sprinkler going. When about one inch of water has collected in the can getting the most water, shut off the sprinkler. By measuring the water in the cans, you can get a picture of your sprinkler's pattern. Actually plotting the profile of water coverage on graph paper, using a large vertical scale for water depth and a small scale for distance, helps you to plan an overlap pattern.

**Many factors affect** how much water actually flows through a sprinkler—water pressure, pipe size from the street main, hose size and length and sprinkler design. A ¾-in. hose, for example, although only twice the diameter of a ⅜-in. hose, carries more than five times as much water. With a tap pressure of 50 p.s.i. (lb. per sq. in.), the bar graph on p. 153 shows the time required to cover a 50 x 100-ft. lot with one inch of water. So, if watering restrictions in your town limit the time you can sprinkle, you can put more water on your lawn in two hours with a ¾-in. I.D. hose than with a smaller one. Where time is a factor, use a big hose.

You must also consider the pressure loss in a sprinkler. Also, not all outside taps supply water at 50 p.s.i. and pressure may vary considerably at different hours of the day. To get the most out of your sprinkling, you may want to go one step farther than the can test. With your sprinkler and hose assembled, check the flow rate by catching the water in a bucket of known capacity. Keep track of how long it takes to fill the bucket, and you can use simple

arithmetic to convert this into a flow rate in gal./min. The next step is to determine how many gallons and then how many minutes are needed to cover your lawn with one inch of water.

As shown below, 1 in. of water over 1 sq. ft. of lawn requires .62 gallons.

$$\frac{1 \text{ sq. ft.}}{12} \left( \frac{7.48 \text{ gal./cu. ft.}}{1} \right) = .623 \text{ gals./sq. ft. for 1 in. coverage}$$

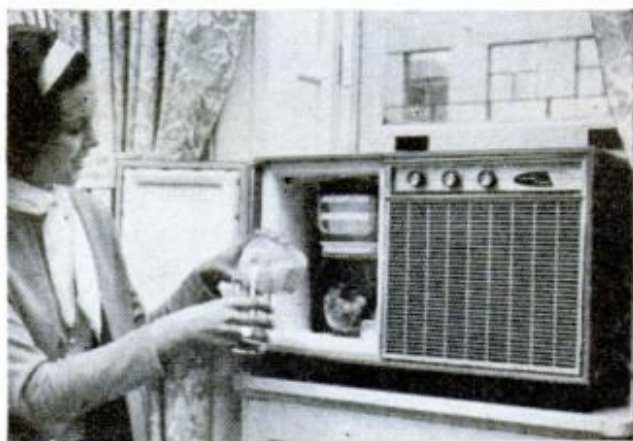
A lawn area 10 x 10 ft. would thus require 62 gal. if applied evenly. A ½-in. hose 50 ft. long supplies water at about 10 gals./min. Covering the 100 sq. ft. would then require about 6 min.

You only need to make these calculations once for each flow, and the water you save will make the time well-spent. Check the flow rate at various times throughout the day to allow for water pressure differences. But remember that during dry spells when your neighbors are also watering, water pressure goes down. Watering time should be increased during heavy use periods.

Wind also affects water coverage. Sloping lawns must be sprinkled more slowly; otherwise, the water runs off the surface down the slope before the surface can soak it up. And remember that on any lawn the sprinkling rate must be held to the infiltration rate.

By checking your sprinkler, plotting its water pattern and allowing for an overlap, you can have the greenest lawn in your neighborhood all summer—and at the least cost. ★★

## Ice Cubes from Conditioner



You can get ice cubes or a cooling drink from a new window air conditioner now on the market—a combination conditioner-refrigerator unit. Available in models that provide up to 8000 B.T.U.s of cooling power, it has 722 cubic inches of refrigerator space, with two ice cube trays. Cooler and conditioner sub-units operate together or separately. It's made by Emerson Radio, Inc., Jersey City, N.J. and sells for \$279.



## What the '65 Cars Will Be Like

(Continued from page 73)

higher load ratings for equivalent sizes, which means that they can take intermittent overloading with less heat build-up. Some sizes you can expect to see in these new tires are: 6.85x14; 7.75x14; 7.35x15; 7.75x15; 8.15x15; 8.45x15; 8.85x15. Thus, a typical change next year would be a new 7.75x14 or 15 replacing a 7.50x14.

### More Disk Brakes

Thunderbird will encourage the trend toward disk brakes by offering some new ones, designed by Kelsey-Hayes, as an option for the front wheels only. (And you might as well expect them to be in the parts books as options for the Ford Galaxies and big Mercs, in time for the racing season.)

These new brakes will have ventilated disks with radial cooling passages cast into the iron disks between the rubbing surfaces. The calipers will have four hydraulic cylinders and segmented friction pads.

A new Bendix disk brake of similar design is rumored for Ambassador, Rambler and perhaps the big Chrysler cars as an optional item. These are not, by the way, the same disk brakes which were adapted for Falcons and Studebakers.

### 1965 Transmission Changes

Someone will really have to switch the pitch over at Pontiac next year, when it comes to talking transmissions. The report is that Pontiac has added an all-synchromesh, three-speed manual transmission to the line of four-speed stick and automatics used on their big cars and Tempests. And the chuckle comes when you learn the source of the new all-synchromesh box. It's Ford.

Pontiac thinks (and more power to them) that self-shifting drivers desire a crunch-proof low gear without having to pay the premium of a four-speed box. Hence the purchase of these slick new boxes from Ford.

General Motors will clean up its 1965 automatic transmission picture by replacing the Hydra-Matic in larger Oldsmobile and Pontiac lines with the new three-speed plus torque converter job introduced on bigger Buicks and some Cadillacs.

Smaller GM cars such as Pontiac Catalina, Olds Jetstar and Buick LeSabre will use the other new GM automatic which has torque converter, two-speed gearing and a "switch-the-pitch" stator in the converter, to multiply power for passing or takeoff.

A simpler version of this transmission

will be continued in Chevelle and Tempest.

Powerglide may still be used on Chevrolets, Chevy IIs and Corvairs, but eventually it will be phased out in favor of the other two automatic transmissions.

### More New Engines

Ford will have a modern Six to replace the reliable but somewhat hefty 223-cu.-in. straight Six that's been around for many years. The new Six, a "big brother" to the family of thin-wall, cast-iron Sixes used on Falcon and Fairlane, will have 240-cu.-in. displacement and be rated at about 150 horsepower. This will top off the line of Ford-built Sixes starting with the Falcon 144 and moving up through the 170 and the 200 cubic inches used on both Falcon and Fairlanes.

Like the other engines, the new Six will feature seven main bearings and ball joint rocker arms. Many parts will be shared with current Sixes, which makes the new engine a relatively cheap addition for Ford.

American Motors' big news on engines has already taken place with the running change introduction of a new, lightweight 232-cu.-in. Six of 145 horsepower (p. 32, May '64 PM).

Oldsmobile will get a new 425-cu.-in. V8 for its larger 88 and 98 series. It will replace the present 394-cu.-in. V8.

Although it will have a new cylinder block, new head casting and many new internal parts, this engine will be machined on present lines and have the same bore center span, crank-to-cam span, lifter bores, head studs and the like. But thin-wall casting will save at least 50 pounds. The new engine will be cheaper to build, partly because it will share many parts and tooling with the new 330-cubic-inch engine used on the Jetstar 88.

### Pulling the Tempest's Teeth

An engine hassle is rumored over at GM as a result of a top management decision to compel Pontiac's general manager Pete Estes to take the optional 389-cu.-in. V8 out of the Tempest line and come back down to the 326-cu.-in. V8. This would bring the power and performance in line with the 300 to 330-cu.-in. V8s of Chevelle, F-85 and Buick Special.

It seems that the 389-cu.-in. GTO Tempest is too close to an all-out performance job—not in keeping with GM's official "We-don't-build-race-cars" philosophy. But the 389-cu.-in. GTO has sold lots of Tempests, so the pressure is building up between sales managers on the firing line and the policy makers on Mahogany Row. The issue is still in doubt and it could go either way by introduction time. ★★★



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## Kid Powered Squaris Wheel

(Continued from page 138)

of the seat and the wheel spokes as indicated. The shaft on which each seat pivots is held in place by shaft collars, one at each end. A steel mending plate is placed over the shaft at each end of the seat as shown. These plates serve as metal-to-metal bearings and when screwed in place they also prevent any possibility of the plywood end piece splitting. In one seat detail metal corners of the type used on suitcases and machinist's tool boxes are suggested. These are essentially ornamental and can be attached to all four corners of each seat, to the two back corners only or may be omitted entirely if desired. At this stage the wheel braces, of 1 x 2 stock, and the platform of plywood covered partially with corrugated rubber or plastic matting can be installed.

To finish the job you need two wheel locks, one on each A-frame and attached to the A-frame cross member. One of the two units is shown in the assembly, B. The units are duplicates with one exception which is the installation of an eyebolt in one or the other of the locks. The eyebolt permits locking one unit in the down position with a conventional bike lock, thus preventing the wheel from turning. The hole for the eyebolt is drilled in one handle in approximately the position shown at A in the assembly, B.

### Use Outdoor Plywood

As the wheel will be exposed to weathering all plywood parts should be of the grade known as "outdoor plywood". Plywood parts should have the exposed edges filled with wood putty or other suitable filler and should be primed and painted in the color of your choice. On the original wheel plywood parts and the 1 x 2 wheel braces were painted a bright red with gold striping. All other parts were coated with a sealer and finished in the natural color with spar varnish.

In operating the wheel you will have riders of varying ages and weights. To balance the wheel when it's fully loaded, two riders to a seat, you have at hand several 5 lb. lead bars, or ingots, of the type used by plumbers. You release the wheel locks, hold the wheel steady and admit two riders, remembering to instruct the youngsters to duck under the shaft on which the seat is pivoted, the shaft thus serving as a safety bar. Swing the wheel a quarter turn and admit two more riders. Continue this procedure with the remaining two seats. Then balance the wheel with the weights, placing these in the "lighter" seats. ★★★



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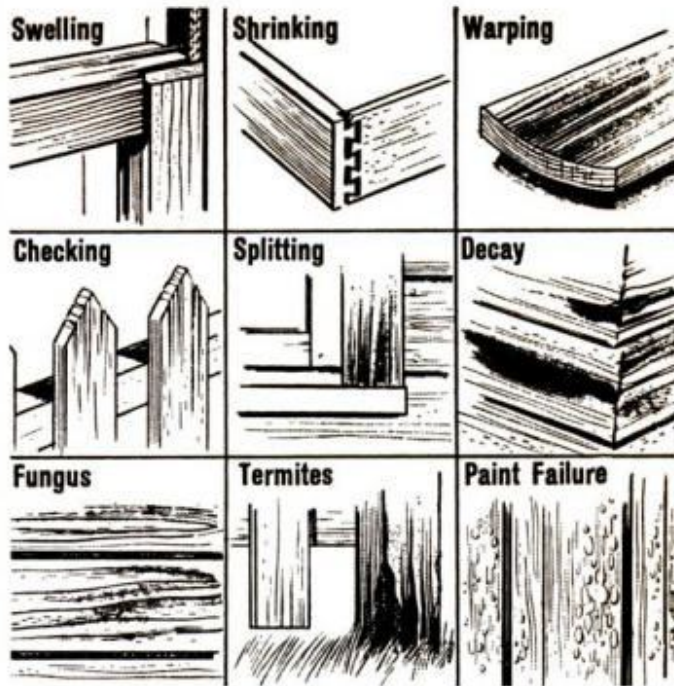


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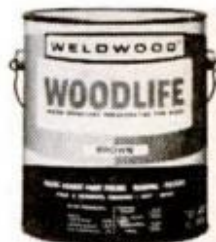
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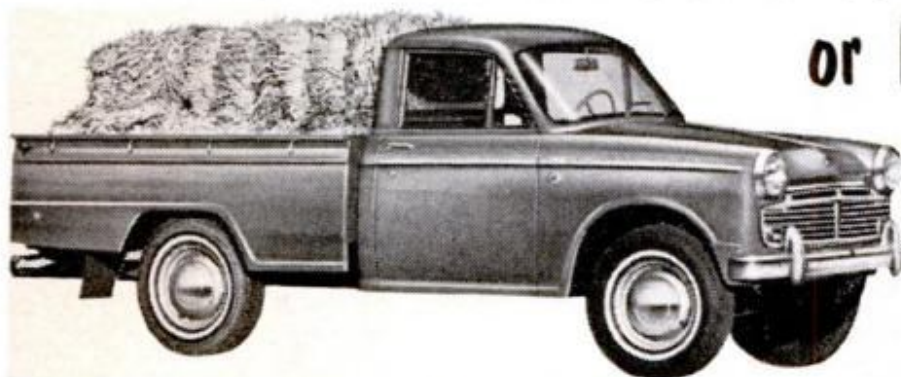


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## California's Coming Earthquake

(Continued from page 79)

shake in mind. Aqueducts have gates at frequent intervals so that a portion damaged in a quake can be blocked off and repaired rapidly.

In running a pilot tunnel through part of the Tehachapi Mountains for the aqueduct that is to carry Feather River water to southern California, state engineers suddenly found that they were in the Garlock fault zone, a main offshoot of the San Andreas. The solid rock ended abruptly in a zone of moist, crushed rock. The engineers drilled ahead, supporting the roof with 8x8 timbers, then found the timbers smashed and crushed over a week-end. The zone extends for at least 500 feet and now the engineers are designing an expensive steel-rib tunnel, with heavy steel lagging joining each rib, and that will be lined with concrete, to carry the water through this unstable area.

### Radiation Ogre

People in the Bodega Bay area north of San Francisco are protesting against plans to build a big nuclear powerplant there. It's pointed out that the site is close to the San Andreas fault and that atomic poison might be spewed over the whole area if the plant should be shattered.

Farther south, Stanford University is building a \$114 million, two-mile long linear electron accelerator (an atom smasher) within 3000 feet of the San Andreas fault, which slants across the campus. Other sites as far as 25 miles away were found to be less suitable. The accelerator is to be contained in a monolithic concrete tunnel at the bottom of a trench and will be buried under 25 feet of earth.

Because of its proximity to the fault zone the tunnel is designed as a hollow beam (with plenty of steel) and is intended to bend in a quake instead of breaking at an angle. This would allow realignment of the accelerator, which must be kept straight to within plus or minus a quarter of an inch over its 10,000 feet of length.

Stanford's traditional sandstone buildings, most of which were damaged in the 1906 quake and then superficially repaired, are undergoing reconstruction now. One by one, their interior wooden floors and bracing are being replaced with steel frames and reinforced concrete floors. Each exterior stone is being tied to the new frame or to a reinforced concrete inner wall. The multi-million dollar project has a special dividend: The original high ceilings permit four floors to be installed in what were once three.

Emergency instructions that are posted inside all buildings at Stanford contain the warning: "Stand in a doorway or get under a table during an earthquake. Don't attempt to go outside." This warning could well be posted in every building in the state. Even an interior doorway is a haven from falling plaster or structural members, and people who flee outside are apt to be struck by heavy debris falling from the building itself.

Insurance adjustors are quarreling over the reasons why the Baldwin Hills dam in Los Angeles failed last fall, though most geologists attribute the failure to slow earth movements with a possible assist by subsidence in a nearby oil field.

California has more than 1000 dams and many of them are upstream from centers of population. How they will behave during a major earthquake is a very good question indeed. They represent all types, from earth or rock fills to concrete arches, from timbered cribs to concrete gravity dams. A few are almost a century old, and half were built before passage of the state law that requires state engineering approval of site, specifications and construction. As a consequence, Harold Brown, state dam safety engineer, now requires careful inspection at least once a year of all structures that hold back water.

A few dams have been ordered out of service. Others have been strengthened or completely rebuilt. If there's a question of the safety of a concrete arch dam, for example, hundreds or thousands of yards of rock are compacted against its downstream face. The original dam becomes a mere concrete facing.

In the 1925 Santa Barbara earthquake the earthen Sheffield dam failed, but fortunately it was above an untenanted area. Ironically, the 40-foot tall earth-fill San Andreas dam near San Francisco was twisted in 1906 but did not fail. In the 1952 Tehachapi quake a number of dams were damaged, but none failed.

### Earthquake Forecasting

Scientists know that earthquakes are bound to occur, but none has come up with a more precise forecasting method than the one devised by Stanford's late Dr. Bailey Willis. "The longer it has been since the last quake," he said, "the sooner it will be to the next."

There's hope that this "state of the art" may be improved eventually. Japan (which is seismically very active) hopes to develop a method of prediction based on various factors including the occurrence of foreshocks. Russia is studying the large scale tilting of the earth which has been suggested as occurring months



before a big quake.

In California, state engineers want to drill a mile-deep hole into the San Andreas fault zone, and install at the bottom a sensitive rock microphone that picks up the snapping and popping of rocks under strain. (See *He Makes Accidents Obsolete*, August 1963 PM). The device is used now in tunnels and mines to warn of impending rock falls. The engineers think the rock in the fault zone may become noisier as the strain approaches the breaking point, and that with experience they might judge when an earthquake is imminent.

The Coast and Geodetic Survey plans to establish a string of such laboratories running the length of the San Andreas fault. The first would be located near Hollister. Recordings of the noise at various sound levels would be made on megatape for about 15 seconds out of every 15 minutes. Analysis might lead to methods of listening for earthquakes.

### Laser Measuring Rod

Also precise measurements of any earth movement would be accomplished more accurately than ever by using lasers. A laser would be set up on one side of the fault line. A beam of high-intensity light from it would be focused on a line parallel with the fault to a mirror 3000-4000 feet away and reflected back into a measuring device. Another beam from the laser would be aimed at another mirror exactly the same distance away, but across the fault line and perpendicular to the first beam. The slightest movement of the earth on either side of the fault could then be detected instantly and analyzed.

In California also, Sheldon Breiner, geophysicist with Varian Associates of Palo Alto, is using recently-developed supersensitive magnetometers to study local changes in magnetic fields that are caused by rocks under stress. Breiner's studies confirm in a general way the belief that there is a relationship between changes in the magnetic fields of rocks below the surface and the occurrence of quakes. He and his group have detected abrupt shifts in magnetic intensity a few hours and a few minutes before actual earth movements.

Although the geophysicist says that earthquake prediction is not one of his immediate goals, some of his associates think the method may lead within 10 years to an accurate way of foretelling the location and intensity of a quake weeks in advance.

But that's all in the future. The only prediction that seismologists can make right now is: "The next big earthquake in California is on its way!" ★ ★ ★

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## Arnold Palmer

*Continued from page 85*

*iron head held it to the shaft, and once this pin had been located and punched out it was a simple task to remove the old shaft. The head was then cleaned with steel wool, emery cloth and, in some cases, a short soaking in muriatic acid.*

*We let a professional club maker, Bert Dargie, remove the wood heads from their shafts. As it turned out, he had to pull an almost-forgotten trick out of his hat and steam the heads off!*

*Equipped with two barrels of blanks turned for us by the C. F. Work Company, he rebuilt the assortment we sent him.*

*Each shaft was carefully fitted to its head, cut to the proper length, and then a delicate curve painstakingly planed into its length.*

*Following the final shaping, the shafts were sanded, given a few coats of spar varnish and allowed to dry. Then the new grips, made of leather treated to keep a tacky feel, were applied.*

*With the wood heads, Dargie followed the same practice, first having removed all of the old varnish and filler from them.*

### The Round

The course selected for the round was La Gorce Country Club, one of the oldest in Miami Beach, Florida.

My first impression after swinging a few of the hickory-shafted clubs was that they were extremely light. I hadn't really expected to see the clubs in such good shape, either.

I went through all the assembled clubs, picking out those which I thought would most likely fit my swing. With an armload of clubs we headed for the practice tee. I always warm up before a round, and for this round I began with my own clubs, starting with the nine iron and working up gradually to the low numbers and then through the woods. I like to hit five or six balls with each club I select, gradually getting the muscles loosened up and renewing the "feel" that is so important.

Once I'd warmed up, I attempted to repeat the process with the hickory shaft clubs, beginning with the niblick, going to a spade mashie, then a mashie niblick, another spade mashie with less loft, and then three of the first irons to be manufactured with numbers rather than names—a 5, a 3 and a 2. I should perhaps have picked others with the more traditional nomenclature stamped on them, but I liked the feel of those numbered clubs. By then, I was getting anxious to get out onto the course and see what I could do with them in comparison with my own. (The box

gives a hole by hole description of my double round.)

### The Nineteenth Hole

When it was over, I had a renewed appreciation of players like Ouimet, Bobby Jones and Walter Hagen. They had problems that we don't have today.

I can appreciate now why the old pros told their students to swing easy. The hickory shafts have so much whip to them that swinging hard and fast, like I do, will only get you into trouble with them.

Because of the whip, and the torque, you can get plenty of distance with them but you can't control them. I just didn't feel I knew where the ball was going to land. The torque—get an old hickory and hold the ends in either hand and twist it; you can't do that with a steel shaft—also twisted the clubhead during the downswing. That's one more thing to control.

Well, what did we prove? My answer is, "Nothing!" We didn't expect to. We knew when we started that modern golf clubs would be better than the old ones.

For our nine holes, the difference was 3 strokes—let's say 6 for eighteen holes. With some practice with these clubs and some better work with the putter, I believe I could reduce that to about 4 strokes. If you look at the records, the differences in tournament scores from the '20s to the '60s average about the same—from about 300 down to 284—or 4 strokes per round.

The average player wouldn't have noticed as much difference in the clubs as I did, but I play every day and practice many hours. Much of that practice is devoted to developing a feel for each shot in the bag and learning to sense exactly what the club will do every time I swing it. I can notice the slightest change in the weight of a club. Even a few thousandths of an inch change in the thickness of the grip can change the feel of a club for me.

For the average golfer, whose swing is not as well-tuned through constant practice, the hickory clubs offer too much chance for error. What would feel like a good shot during the downstroke and at the moment of impact could well be a bad slice or a yardage-gaining hook, but he'd never be sure what caused the difference.

A perfectly matched set like my own enables the golfer to "fly blind" on occasion. Even with a tricky shot, he doesn't have to adjust the swing because the club helps him swing properly so his shots must be better, no matter how tough.

So if our experiment proved anything about golf, it's that today's equipment is better for both of us, the pro and the amateur. ★★★



## Owners Report—Buick Riviera

(Continued from page 92)

up.”—Colorado homemaker.

### **But it sure is stylish!**

“Blind spot in rear makes it difficult to park.”—New York dentist.

*Back to the bright side for numbers six through ten of “best-liked” features:*

“It holds the road well at all speeds.”—New Jersey naval officer.

“The transmission’s smoothness appeals to me.”—California engineer.

*It is the best all-around automatic transmission made although its longevity has yet to be established by owners.*

“Quiet and luxurious with very good performance.”—Florida engineer.

“The interior is the best I’ve ever had in a car.”—New York engineer.

“I like the wood-like paneling and upholstery.”—Ohio restaurant operator.

“Like the compact luxury.”—Ohio grinder.

### **Smaller inside, too!**

“I like its size—smaller than most of the big cars in its class.”—Indiana teacher.

“A real quality car without the bulk of a battleship.”—Illinois grocer.

*Less numerous complaints touched on an assortment of annoyances. Here, in the order of their frequency, are gripes six through ten.*

“Position of spare tire in trunk is poor.”—Rhode Island branch manager.

“My Riviera needs more trunk height; I can’t stand a full bag of groceries in the trunk, especially at the rear.”—Pennsylvania purchasing director.

*If you need bread and butter practicality, keep away from caviar wagons.*

“The metal finishing and paint job is lousy. Has too many permanent waves.”—Ohio mechanic.

“Oil consumption excessive—14 quarts in 5000 miles.”—Michigan insurance agent.

“My car has a ‘lumpy’ idle.”—Retired Californian.

“My car has never run smoothly to date. Four trips to the service department have failed to get the engine properly adjusted.”—New York Air Force officer.

“Divided back seat wastes space in the middle.”—Maryland teacher.

“I would like room for three in the back seat.”—Illinois teacher.

*The engineer could do it. But can you imagine a Riviera with high wheels, a flat deck and running boards?*

*Here are the last of the bravos—numbering 11 through 16.*

“The brakes are the best I have used

on a Detroit car.”—New Mexico surgeon.

“The most comfortable bucket seats I have found.”—Arizona professor.

“Cruise control is one of the better options of highway driving.”—Texas salesman.

“The car gets compliments no matter where I happen to be.”—Texas engineer.

“It’s solidly built and has no rattles.”—California merchant.

“The quality of engineering and workmanship impressed me most.”—Indiana service station owner.

*The big question remains; why are some Rivieras assembled properly and others not? Buick management should be looking for the answer.*

*On the debit side, owner comments 11 through 16 wrap up the 1964 Riviera’s owners report:*

“I have had trouble with the carburetor and a leaking rear end.”—Missouri brewery foreman.

“I seem to be losing oil through gasket leakage and the dealer is having trouble correcting it.”—New York manager.

“Not enough heat on passenger side. Most comes out on driver’s side.”—California retail merchant.

“It will not start after standing 24 or more hours. The gas drains out of the carburetor and you have to run the starter for a few seconds.”—Florida retiree.

“Window noises are evident as well as wind noises.”—New Mexico manufacturer’s representative.

“I’d like better control of console rattles.”—Indiana retiree.

*That winds up the reports from owners from all over America, who have rolled up a total of 1,686,910 miles on their 1964 Buick Rivieras.*

★ ★ ★

## Coal Is “New” Railroad Fuel

The coal-fired locomotive may be making a comeback. A coal-burning gas turbine-electric power plant similar in principle to aircraft jet engines is now undergoing tests on the Union Pacific Railroad. The U.P. already has nearly 50 gas turbine-electric locomotives, but these are oil fired.

Crusher and pulverizer units in the locomotive reduce coal to a near-liquid state. It is then pumped into a stream of compressed air and ignited in combustors. Power output turns electric generators instead of exerting a thrust effect as in a true jet engine.

If successful, the railroad will put to use its abundant coal reserves. The chief difficulty so far has been in designing efficient ash separation equipment to draw off abrasive, noncombustible ash residues.



## Racers Out of Stock Cars

(Continued from page 69)

heavy duty linings, brakes become the weakest link in the whole car. This was particularly true on the half mile tracks.

### Melted Tubes and Burning Grease

In these events Moody said the drums and linings got so hot that the excess heat traveled through the wheels and melted the inner tubes, causing the tires to lose air and sidelining the cars. Inner tubes are used to prevent loss of air which would leave if the tire bead and rim were tubeless.

Differentials are another example of necessity being the mother of modification. Here, the heat of tooth friction in the differential gears was literally boiling the grease and bringing it to kindling temperature so that fires were breaking out when cars made pit stops. To beat this problem, H&M installed a power steering pump at the differential housing to circulate the lubricant up into a Cessna aircraft oil cooler in the trunk. Heat is removed from the cooler by ducting air and adding an electric heater blower.

### Rear Axle Changes

As shipped from the factory, the stock car axles are of semi-floating type in which the inner wheel bearing is on the axle housing or tube while the outer end is supported by the driving shaft which, in turn, bears on a smaller bearing just inside the outer end of the tube. In this set-up, common on most cars today, the axle shaft is subjected to the stresses of supporting part of the car's weight as well as conducting drive power to the wheels.

In racing, such axles were snapping under the strain. So H&M devised a full-floating modification, involving a heavy duty hub supporting the car via two large bearings on the outside of the axle tube. Thus the axle shaft functions only to transmit driving torque to the wheel.

Modifications to improve handling are the work of Ralph Moody and the result of years of experience at trackside and behind the steering wheel of high-powered stock cars in competition.

Starting at the track surface are the huge 8.20 inch by 15 tires known as "Gumballs" with tire pressures of 40 pounds rear and 50 on the front. These are mounted on special wheels fabricated by H&M.

### Unicycle Cornering

Racing at speeds which approach three miles a minute poses very special problems for a car's suspension, though. Said Moody, "On tracks like Daytona all the

weight of the car comes on the right front wheel and the car tends to become a unicycle. We estimate roughly 4000 lbs. (the equivalent of the entire car's weight at rest) bears down on that one wheel."

To keep this force from flattening the suspension, Moody uses an ingenious adjusting screw working through the top of the "pocket" which houses the front springs. To set the car up for cornering conditions of a given track or tailor it to a driver's taste, you merely lift the hood and work the screw with a ratchet wrench to increase (or decrease) the spring rate at that particular corner of the car.

H&M has done much the same on the rear of the car. Here the rear spring shackle has a series of five holes to move the eyebolt to; this provides a built-in "jacking up" bias which helps fight the centrifugal force on a banked track.

The rear spring is a design worked out by Moody with a few wide thick leaves for better torque control (torque reaction rods are not permitted by NASCAR) and solid contact with the special spring seat fabricated onto the axle. After developing this spring, Moody sent it to Ford, which now manufactures it in limited quantities.

The entire steering geometry is changed for different tracks to modify handling characteristics according to a formula learned through long experience and kept quite confidential by the racing managers.

The transmission is Ford's new heavy duty four-speed synchromesh with its several choices of ratios to permit tailoring the gear combinations to the requirements of racing on various tracks.

### Shift Oil Getting Too Hot

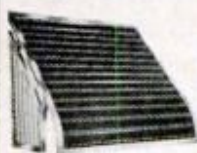
John Holman noted that they were getting close to the margin on heating of transmission oil and would probably be petitioning NASCAR for addition of an oil circulating pump and coolant similar to that used on the rear axle.

This is a perfect example of the slow evolution of a stock automobile to a "stock" racing car under the watchful eye of NASCAR's Bill France. Changes are made which alter the car from its original "street" condition, but the body, chassis, suspension and engine are still quite similar to the car assembled from standard factory parts. What also helps keep to the spirit of stock is the fact that many of these parts are in production, items such as the special rear springs, the full floating rear axle, the heavy duty clutch plates, and the 3-inch wide Lincoln shoes which were used at Riverside.

It all bolsters John Holman's original statement that "these Grand Nationals of ours are more stock than you think." ★★ ★



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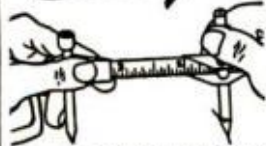
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## Cool Tips for Hot Starts

(Continued from page 160)

Six-cylinder Fords, especially 1961 models, were noted for vapor lock because the fuel line ran over the top and across the engine, coming close to the manifold. Asbestos wrapping, shown on page 160, has helped in this case, so it should prove valuable in others.

But if your fuel lines don't seem to be receiving too much heat, check the fuel pump. Heat concentrated on this part—from a manifold pipe above it, for example—could be causing gas to vaporize as it passes through the pump. This is not a common occurrence in late-model cars. Most manufacturers have separated the pump from any heat-giving source. Some have placed the manifold on one side of the engine block and the fuel pump on the other. Others have put a deflection shield on top of the pump to divert heat if that part is near a heat generator.

However, if you do suspect the fuel pump, you can fabricate your own deflection shield from aluminum or sheet metal to isolate the pump from the heat source. Attach it to any convenient location, such as to the manifold bolts themselves, between the pump and the heat source.

If your car remains vapor-lock prone despite your efforts, make a habit of carrying a thermos of cold water on hot trips. Give the fuel lines and pump a shower. Might as well splash the carburetor, too, in the event of a percolation condition.

Any car hit by vapor lock or percolation will eventually re-start, of course, if you let it cool down for several minutes. But why risk even this inconvenience if you can help it? Here are a few more tips:

- Make sure that the cooling system is operating efficiently and at the lowest possible temperature. Undue heat can be generated from this system if it's clogged.

- Make sure the fan belt is in good condition and properly adjusted.

- Consider the use of a low-temperature (150 to 160 degree) thermostat in the summer to provide a greater circulation of water throughout the cooling system and, consequently, less heat.

- Insure that a pressure-type gas tank cap, if your car is so equipped, is operating properly. Make sure the vent holes are open by blowing through the cap or playing air from an air pressure hose onto it. This vent lets off excess vapor pressure built up in the fuel system because of heat. If your car isn't equipped with such a cap, you might consider getting one, though it probably won't do much good. Tanks with non-vented caps are vented internally, but an extra vent won't hurt. ★★★



## One-Handed Fishing

(Continued from page 88)

neath a log or rock, he'd gently massage its flanks, being careful never to touch a fin, which invariably "woke" the fish from its tickled trance. When the trout was perfectly quiet, Hewitt cupped one hand over its snout, the other around the tail, and gently lifted it out—all but unconscious.

Although the terms are interchangeable in many places, the true tickler differs from the noodler in that he goes in toward the gills from the bottom of the fish and gently strokes the underbelly until the fish is literally put to sleep before he makes his lunge for the gills.

Noodling is not an easy sport to learn, but if the novice has great patience and is willing to spend several years dipping his hand under rocks in cold water, he can become adept.

### Anglers Get Hooked

Forty-one-year-old Kenneth J. McCredie, who learned the sport from his father in Michigan, says that once an angler learns to noodle he'll never go back to a rod and reel. "A hand-angler will always take more and bigger fish," McCredie says. "And he can take his pick. Brush a fish with your fingertips and you can tell whether it's trout, bass or catfish."

When McCredie stalks the stream bank he keeps to the sunny side where the fish will be more likely to be seeking the shade of a recessed hole, and where his shadow will not be cast to frighten the fish. The best times for noodling are at the heat of the day, roughly an hour before and after noon, when fish are holed up. This is the opposite of best conditions for rod and reel.

One question all skeptics ask about noodling is: "Why don't the fish dart away at the first contact?" Sometimes they do, but if the contact is deft enough and the fish is not too skittish, the touch must seem like a bit of floating debris, and the fish holds.

"You won't get them all," McCredie explains. "It takes about ten minutes to get your hand from the tail to the gills, and a lot of things can happen. Or the fish can just decide to take off on its own."

Really adventurous noodlers go after the huge channel catfish, sword-nosed gar and the muskelunge, which is the fresh water cousin to the barracuda.

"You got to be strong and careful for this," says a noodler in Arkansas. "A big cat can pull you into the water and a muskie could cut you to ribbons."

Ready to roll up your sleeves and give noodling a try? Remember, the key is patience—and then more patience. ★★

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## SMALL WONDER

Evinrude's new bantam size Sportwin has a two-way stretch. 1. It snuggles down behind your transom for a good reason.

You can tie into a tail-walking muskie or tarpon and play your line around the stern with little chance of fouling it on the motor. It's hardly more than transom high—8½ inches lower than last year's Sportwin.

It's only 34" from top to skeg. Tucks neatly into compact car

trunks (steering handle folds down for stowing). By trimming its height, we also lopped 10 pounds off its weight.

2. But don't let its bantam size fool you. It packs a real punch—9½ horsepower.

The shorter the distance between the power and the prop the better. Its short, rigid drive shaft delivers engine torque with high efficiency. Planes fishing boats at a 20-mile clip.

It sounds even smaller than it looks. But quietness and smoothness can't be specified like size or weight. You have to hear and feel it.

In this case you should.

It's worth a trip to your Evinrude dealer. Look him up in the Yellow Pages.

Catalog free. Write Evinrude Motors, 4183 N. 27th St., Milwaukee, Wis. 53216.

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What's it got? Tough, two-piece, reinforced, cast aluminum housing. King-size shoe for lateral stability. Simple, fast bevel and depth adjustments. Rip fence included free. Over-size fan and dust ejector to keep sawdust away from

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