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# POPULAR MECHANICS

JUNE, 1961 — 35 CENTS

Latest designs from the wacky  
world of experimental aircraft —

## **BACK-YARD EAGLES**

— page 112



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**THE 12 MOST SIGNIFICANT  
AIRCRAFT OF ALL TIME**

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## **HOW TO HANDLE A SMALL BOAT IN ROUGH WATER**





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cigarettes  
used to taste?  
Luckies  
still do**



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

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# POPULAR MECHANICS®

JUNE 1961

VOL. 115 NO. 6

INTERNATIONAL EDITIONS • SPANISH: Mexico-Caribbean, Southern Hemisphere • FRENCH

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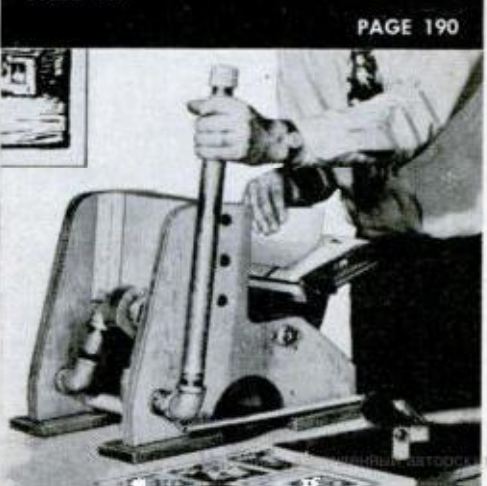
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Set up a Weldwood Wood Finishes shelf in your workshop



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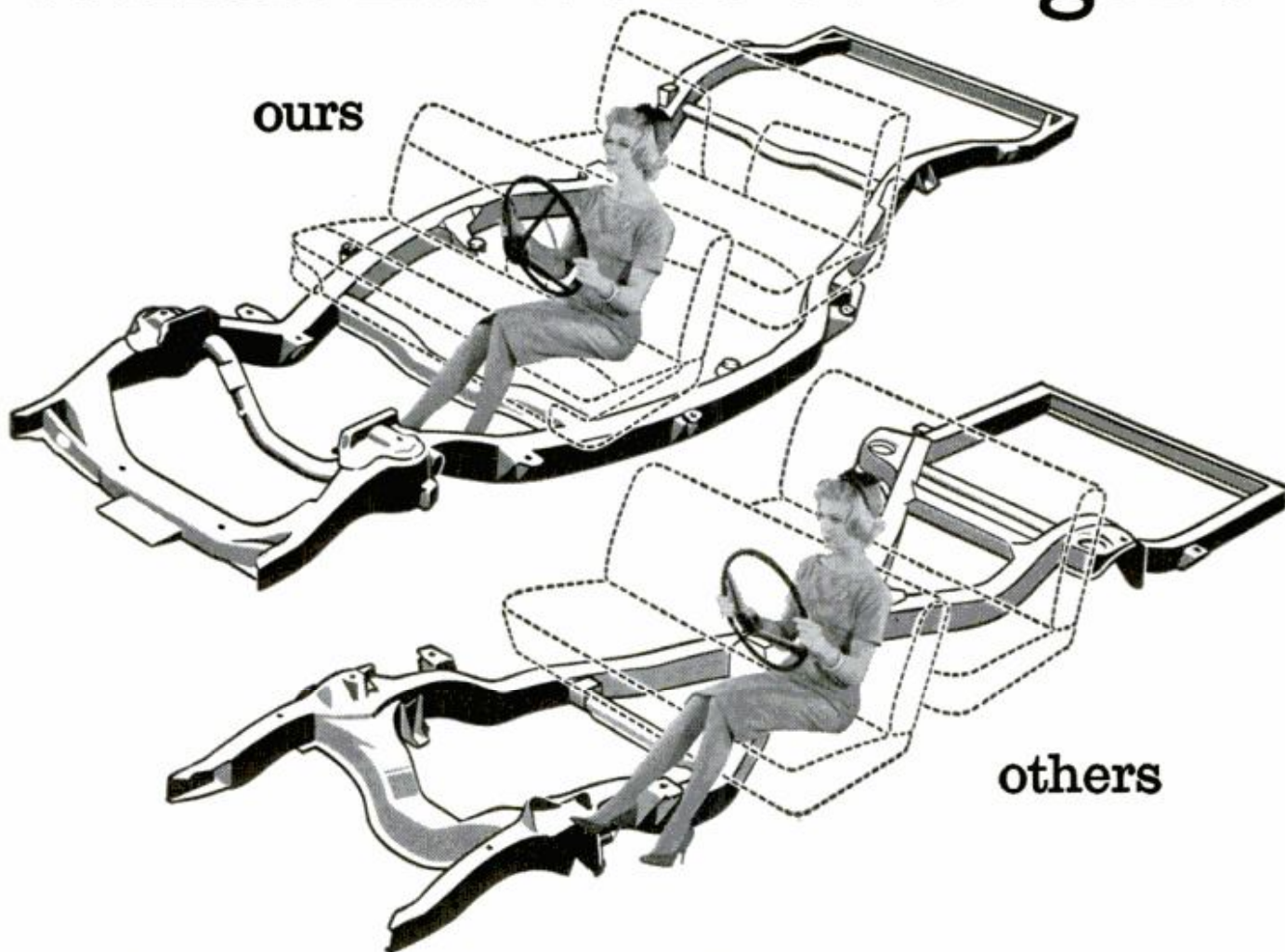
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POPULAR MECHANICS

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# Which frame is stronger?



**Guardrail construction in the 1961 Ford Family of Fine Cars has greater rigidity, offers the strength of strong side rails.**

## *Ford Motor Company builds better bodies*

- Millions of car frames are shaped like an "X." Weak in the middle, they lack the strength of strong side rails. Guardrail frames in Ford and Mercury curve out. They are strong in the middle. Guard rails also protect passengers in the unitized bodies of Falcon, Thunderbird, Comet and Lincoln Continental.

- In the Ford Family of Fine Cars, the most vulnerable underbody parts are galvanized, zinc-

coated to protect them against rust and corrosion.

- Doors in our cars are stronger. They are reinforced with steel beams. This means they are more rigid and therefore close tighter and quieter, reducing the likelihood of developing squeaks and rattles.

- One reason for the unusually quiet ride in the Ford Family of Fine Cars is the soundproofed floors. Where other cars have only two layers of sound insulation, our cars have three layers of sound insulation. Each layer

eliminates a different range of sound from rumbles to squeaks. As a result, very little noise gets through to the passenger compartment.

*These are 4 of the many reasons we think you will find (upon comparing our cars with other cars) that Ford Motor Company builds better bodies.*



*American Road, Dearborn, Michigan*

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## OVER THE EDITOR'S DESK



### Laughing at an Airline

Just finished reading, enjoying and laughing at your April article, *Is This the World's Worst Airline?* It was particularly interesting to me because my husband is an airline pilot.

Such a laugh-provoking article could do a tremendous amount of good in the grim fight against Communist influence. There is nothing more disconcerting than to be made to look ridiculous.

Who knows how many Americans would get a lift from realizing that the Russians aren't really as unbeatable as they seem after some of their outer space firsts?

Woodland Hills, Calif. Mrs. Lee B. Quilici

*For those of you who missed the article, it detailed in a pilot's words the amazing story of Russia's pride and joy—the Aero-flot airline, and its slipshod methods of operation.*

### Changed Windshield



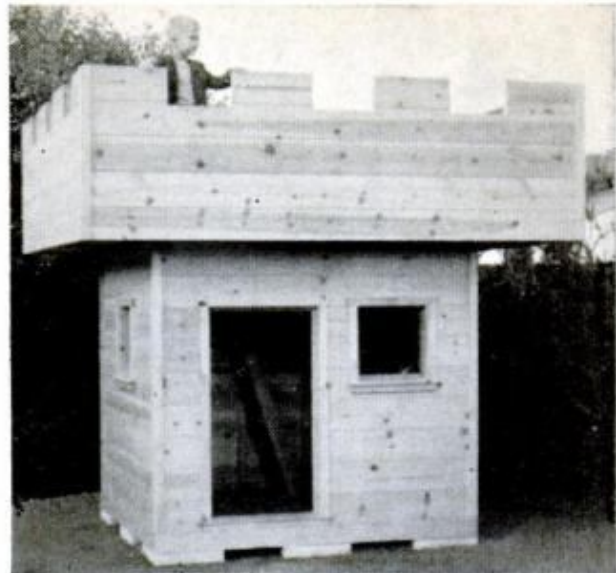
Instead of the plastic windshield called for in your plans for *Sea Knight* (May, 1957), I built a mahogany frame flying bridge windshield on this version. I believe it improves the appearance. We have used this boat on Lake Erie, the Ohio River and Lake Cumberland, Ky., and are pleased with its performance. Thank you for the plans.

Dayton, Ohio

Lowell E. Simmons

### Quickly Disassembled Fort

Shown on this "fort" built from your March, 1960, plans is my grandson, Tommy Stillwell. But I didn't build the fort—Tommy's other grandfather, Harold Behrens—did. In Los Angeles, the materials cost \$183 but this includes an improvement in the design, using 45-degree cut uprights on the corners so that the fort could be



bolted together and disassembled quickly.  
Manhattan Beach  
Glen F. Stillwell  
Calif.

### Kit Versus Hand-Crafted Models

At a County Fair display for arts and crafts of 13 to 16-year-olds, someone entered a plastic airplane kit he had constructed and won first prize. Certainly his display was more accurately detailed than the handmade articles of his competitors—but not due to *his* skill and patience. What incentive does a boy or girl have when they see their handmade models put in competition with a kit premade to the last detail?

Easily assembled plastic models have a place but let's keep them with the proper age groups (6 to 10) and away from hand-crafted models.

Blasdell, N. Y.

Reon G. Wadsworth

*How do you other PM readers feel about this question?*

### Miniature Bull-Horns

Some years ago my two sons brought me a set of miniature bull-horns (a variety of tropical American acacia) to make into Boy Scout neckerchief slides. Today we

(Continued to page 10)





# THIS FREE SAMPLE LESSON

will prove that you can become an expert

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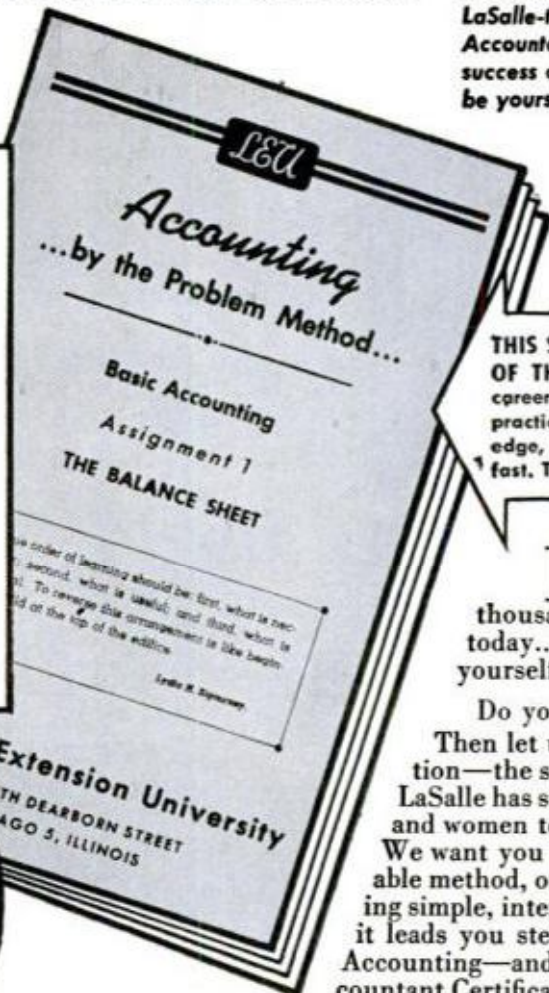


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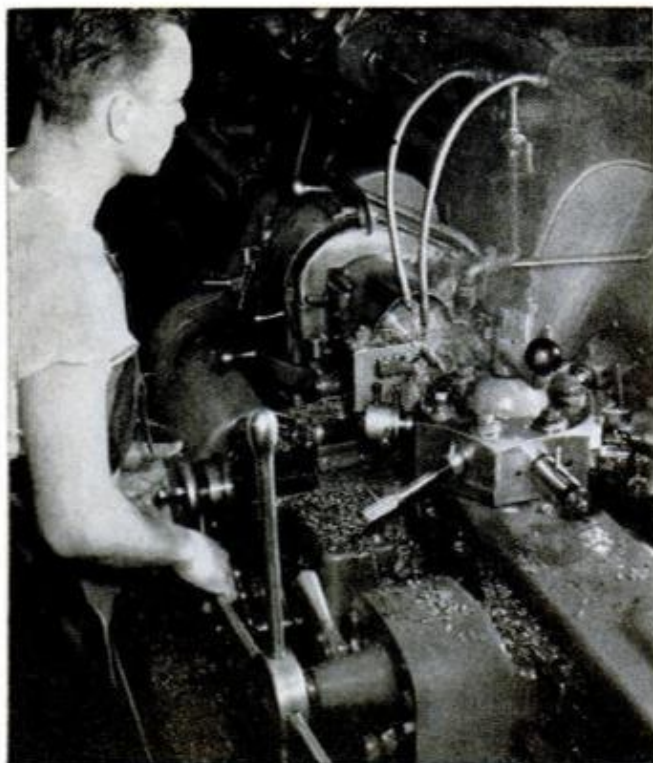
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have 20 trees in our back yard, five years old and 10-12 feet high, each of which is a regular horn manufacturing plant. There are 13 distinct types of horn, one of which is 8 $\frac{1}{2}$  inches tip to tip.

Fort Myers, Fla.

Edward A. Illsche

### We Put Out the Milkman

I own a small dairy and was very put out when I read your suggestion that readers use milk bottles for photo solutions. A glass milk bottle is a convenience for customers and they cost 11 $\frac{7}{10}$ c apiece. A dairy has a tremendous loss in bottles without a magazine telling readers to use them.

Hartford, Wis.

Harold A. Christianson

*Point well taken, Harold. We should have added the suggestion that a bottle be purchased from the milkman unless it is sold by a store on a nonreturn basis.*

### Space-Age Kite



As we go to press, Ryan Aeronautical Co. announces that they have a new NASA contract to develop the Flex Wing glider shown above. Its aerodynamic design makes it ideally suited for the recovery of the huge Saturn rocket booster which will be fired this year.

Eagle-eyed PM readers will spot the similarity between the Flex Wing and the cleverly balanced airfoil Flexkite shown on pages 140 and 141 of this issue.

Which suggests to us that the next time you tell your space-minded youngster to go fly a kite, you may be doing him a big favor. . .

*The Editors*

POPULAR MECHANICS

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This story actually happened. The man's name has been changed and this is not his photograph, but the facts are true.

## "Your name is on the list"



Doug Mott was not surprised. The recession was on and the assembly line where he worked was almost at a standstill.

And then, strangely, the boss began to smile. "You know how the Engineering Department sends us blueprints and then we have to send them back for revision because they just aren't practical to produce?" Doug nodded . . . wondering. "That's waste . . . and we can't allow it to continue. That's why we thought that if we had a man who knew assembly and production — and drafting, too — he could act as liaison man between engineering and production. You know production, Doug . . . and you're studying drafting with I. C. S. You've got a *new* job. Congratulations!"

Doug Mott now heads a drafting room. But he will never forget the day his name was on the list to be laid off.

Good times or bad, I. C. S. training sets a man off from his fellows, puts him on the road to promotion. You can start on that road by filling out the coupon *now!*

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Blueprints</li> </ul> <p><b>ART</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Commercial Art</li> <li><input type="checkbox"/> Magazine Illus.</li> <li><input type="checkbox"/> Sign Painting and Design'g</li> <li><input type="checkbox"/> Sketching and Painting</li> </ul> <p><b>AUTOMOTIVE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Automobile</li> <li><input type="checkbox"/> Auto Body Rebuilding and Refinishing</li> <li><input type="checkbox"/> Auto Engine Tuneup</li> <li><input type="checkbox"/> Auto Electrical Technician</li> <li><input type="checkbox"/> Diesel Engines</li> </ul> | <p><b>AVIATION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aero-Engineering Technology</li> <li><input type="checkbox"/> Aviation Engine Mech.</li> <li><input type="checkbox"/> Reading Aircraft Blueprints</li> </ul> <p><b>BUSINESS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Accounting</li> <li><input type="checkbox"/> Advertising</li> <li><input type="checkbox"/> Bookkeeping and Cost Accounting</li> <li><input type="checkbox"/> Business Administration</li> <li><input type="checkbox"/> Business Management</li> <li><input type="checkbox"/> Clerk Typist</li> <li><input type="checkbox"/> Creative Salesmanship</li> <li><input type="checkbox"/> Managing a Small Business</li> <li><input type="checkbox"/> Professional Secretary</li> <li><input type="checkbox"/> Public Accounting</li> <li><input type="checkbox"/> Purchasing Agent</li> <li><input type="checkbox"/> Real Estate Salesmanship</li> <li><input type="checkbox"/> Salesmanship</li> <li><input type="checkbox"/> Salesmanship and Management</li> <li><input type="checkbox"/> Traffic Management</li> </ul> <p><b>CHEMICAL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Analytical Chemistry</li> <li><input type="checkbox"/> Chemical Engineering</li> <li><input type="checkbox"/> Chem. Lab. Technician</li> <li><input type="checkbox"/> General Chemistry</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Oil Field Technology</li> <li><input type="checkbox"/> Pulp and Paper Making</li> </ul> <p><b>CIVIL ENGINEERING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Civil Engineering</li> <li><input type="checkbox"/> Construction Engineering</li> <li><input type="checkbox"/> Highway Engineering</li> <li><input type="checkbox"/> Professional Engineer (Civil)</li> <li><input type="checkbox"/> Reading Struc. Blueprints</li> <li><input type="checkbox"/> Sanitary Engineer</li> <li><input type="checkbox"/> Sewage Plant Operator</li> <li><input type="checkbox"/> Structural Engineering</li> <li><input type="checkbox"/> Surveying and Mapping</li> <li><input type="checkbox"/> Water Works Operator</li> </ul> <p><b>DRAFTING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aircraft Drafting</li> <li><input type="checkbox"/> Architectural Drafting</li> <li><input type="checkbox"/> Drafting &amp; Machine Design</li> <li><input type="checkbox"/> Electrical Drafting</li> <li><input type="checkbox"/> Electrical Engineer Drafting</li> <li><input type="checkbox"/> Industrial Piping Drafting</li> <li><input type="checkbox"/> Mechanical Drafting</li> <li><input type="checkbox"/> Sheet Metal Drafting</li> </ul> <p><b>ELECTRICAL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Electrical Appliance Servicing</li> <li><input type="checkbox"/> Electrical Engineering</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Electric Motor Repairman</li> <li><input type="checkbox"/> Elec. Engr. Technician</li> <li><input type="checkbox"/> Elec. Light and Power</li> <li><input type="checkbox"/> Practical Electrician</li> <li><input type="checkbox"/> Practical Lineman</li> <li><input type="checkbox"/> Professional Engineer</li> </ul> <p><b>HIGH SCHOOL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Good English</li> <li><input type="checkbox"/> High School Diploma</li> <li><input type="checkbox"/> High School General</li> <li><input type="checkbox"/> H. S. College Prep. (Eng'g &amp; Science)</li> <li><input type="checkbox"/> High School Math</li> <li><input type="checkbox"/> High School Science</li> <li><input type="checkbox"/> Short Story Writing</li> </ul> <p><b>LEADERSHIP</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Industrial Foremanship</li> <li><input type="checkbox"/> Industrial Supervision</li> <li><input type="checkbox"/> Personnel-Labor Relations</li> <li><input type="checkbox"/> Supervision</li> </ul> <p><b>MECHANICAL and SHOP</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Diesel Engines</li> <li><input type="checkbox"/> Gas-Elec. Welding</li> <li><input type="checkbox"/> Heating and Air Conditioning</li> <li><input type="checkbox"/> Industrial Engineering</li> <li><input type="checkbox"/> Industrial Instrumentation</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Industrial Safety</li> <li><input type="checkbox"/> Machine Shop Practice</li> <li><input type="checkbox"/> Mechanical Engineering</li> <li><input type="checkbox"/> Plumbing and Heating</li> <li><input type="checkbox"/> Professional Engineer</li> <li><input type="checkbox"/> Quality Control</li> <li><input type="checkbox"/> Reading Shop Blueprints</li> <li><input type="checkbox"/> Refrigeration and Air Conditioning</li> <li><input type="checkbox"/> Tool Design <input type="checkbox"/> Tool Making</li> </ul> <p><b>RADIO, TELEVISION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> General Electronics Tech.</li> <li><input type="checkbox"/> Industrial Electronics</li> <li><input type="checkbox"/> Practical Radio-TV Eng'g</li> <li><input type="checkbox"/> Radio-TV Servicing</li> <li><input type="checkbox"/> TV Technician</li> </ul> <p><b>RAILROAD</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> General Railroad</li> </ul> <p><b>STEAM and DIESEL POWER</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Combustion Engineering</li> <li><input type="checkbox"/> Power Plant Engineer</li> <li><input type="checkbox"/> Stationary Diesel Engr.</li> <li><input type="checkbox"/> Stationary Steam Engines</li> </ul> <p><b>TEXTILE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> General</li> </ul> |
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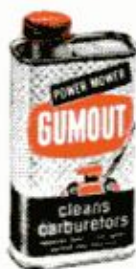
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## SIDELIGHTS FROM THE PENTAGON



By William R. Kreh

PROJECT KISS is a current Navy program which stands, not for the old social pastime, but for the new slogan, "Keep It Simple, Stupid!" It's a reminder that simple design of weapons systems increases reliability and cuts costs.

The man who remarked that transistor radios are getting so small you're liable to get one caught between your teeth was right. In electronic dental experiments at Brooke Air Force Base in Texas, technicians are putting tiny transmitters in false teeth to study relationships in eating, wear and grinding of teeth.

Everybody wants to get into the act. Now Navy Frogmen are helping out with the space program. Members of an underwater demolition unit were first put into a whirling centrifuge to test their basic ability to withstand G-forces. Then they were put in a tank of water for 18 hours to simulate weightlessness of space flights. Lastly they were put back into the centrifuge where it was found their resistance had been lowered by one G from the first time. The purpose was to learn the effect of the sudden thrust of gravity on re-entry after a long, weightless space flight.

The Army's Redstone Arsenal in Alabama has a new \$3,500,000 torture chamber for guided missiles. In the big, special building, a missile can be shaken, vibrated, spun, balanced, measured and weighed. It can be exposed to temperatures ranging from 80 degrees below zero to 180 degrees above. It can also be subjected to X rays, fungus growths, ultraviolet light, drenching rain, salt spray, sand and dust storms, or high-altitude conditions and steam baths.

A modern piece of Army equipment went on an errand of mercy recently.

Eleven-year-old Pat Bilbrey, a partially deaf 4-H boy, lost his new hearing aid while on a field trip. After a day of searching by dozens of school chums with no success, two Army men stepped in with a mine detector and found it within 30 minutes.

The Navy suspects that some of Russia's so-called hydrographic expeditions are actually laying short-range radio beacons on the ocean floor. With them, their missile

(Continued to page 14)



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### Many students earn spare time cash during their training

Because CTI training is so practical, many students earn extra money by installing and servicing air conditioning and refrigerating equipment. Some work evenings and Saturdays for local dealers; others set up service routes which include restaurants, motels, supermarkets, taverns, etc. You can earn money in spare time as you learn!

### These men are making good—You can, too

"I'm in the refrigeration business for myself now. I earn nearly double what I used to. During my training, I made enough to pay my tuition."—*Alfred Helm, Ky.*... "I've started a business and it's a success."—*Otto Degner, Canada*... "I am in business for myself. I am building a nice trade doing service work."—*Paulie Waters, Tex.*... "I applied for a job to install air conditioners in autos and got it."—*Richard Vinet, La.*... "Your refrigeration training helped me get repair jobs after only twelve of your lessons."—*Frank Green, W. Va.*



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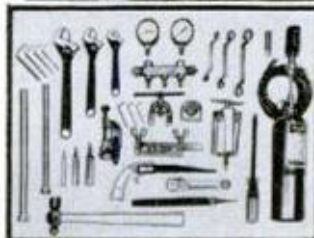
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submarines could take up launch positions using information they transmitted.

**A surplus Army searchlight is helping build Navy submarines.**

The General Dynamics Corp. is using one of the old-fashioned searchlights as a solar furnace. The 60-inch searchlight, once part of an anti-aircraft battery, reflects the sun's rays to a focal point with a temperature of 6500 degrees F. The furnace is used to find the melting points of submarine metals.

**The Air National Guard is transforming 30 noisy C-119 "flying boxcars" into quiet "flying hospital wards."** Heavy padding on walls, ceilings and floors, plus double-paneled windows, have reduced vibration and noise inside the huge ships to a hum.

**An Air Force civilian employee at Bolling Air Force Base in Washington, D. C., Irvin Hershowitz, has invented a device which allows blind persons to operate telephone switchboards.** The gadget uses a photoelectric cell which sounds a buzzer when held next to a lighted bulb on the switchboard.

Hershowitz has been blind since birth.

**The fire which damaged the aircraft carrier USS Constellation was a blessing in disguise in one respect.**

It gave the Navy a chance to test out a new chemical cleaner it has been developing. As a result, nearly 90 percent of the fire-blackened and water-damaged electronic gear was reinstalled as soon as it was cleaned. The cleaner, which is a mixture of alcohol, water and chemicals, is result of experiments which started 17 years ago with attempts to salvage equipment sunk at Pearl Harbor.

**The Navy will drop a few "bombs" during the hurricane season.** Called windsondes, the devices will help plot wind direction and speeds at different altitudes.

When the wind strikes the four vanes of the bombs and rotate them, a radio will signal the force and direction. This helps plot the course of developing hurricanes while they're still in their breeding grounds.

**"Will someone please chase that stupid seal off the runway!"**

It's probably the first time in aviation history such a message ever crackled over the radio from a plane to control tower. Lt. James Weeks was on his first flight in the Antarctic. With a seal on the runway, he couldn't land. One of the ground crew finally took off in a Snow-Cat and, after 15 minutes of maneuvering sent the maverick seal on its way. ★ ★ ★



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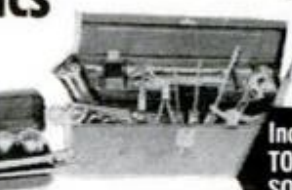
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N310



# SIDELIGHTS ON AVIATION



POPULAR MECHANICS readers may recognize the work of artist Robert Korta in the paintings of the 12 Most Significant Aircraft beginning on page 97 of this issue. Korta also did the paintings for the "Eight Memorable Days in the History of Speed" in the February, 1957 issue of PM, and for the "Heroic Years of the Automobile" in the January, 1959 issue.

Researching the 12 significant aircraft may have been his toughest job to date. In addition to meticulous accuracy in the structural details of historic aircraft, Korta was forced to bone up on such mundane intelligence as what style clothing women were wearing in 1919 (for the Junkers Ju-13) and 1930 (for the Taylor-Piper Cub).

Automobile buffs may have noticed another obscure, but accurate, detail. The car that escorted the XR-4 on its history-making cross-country trip was a 1941 four-door Ford. Korta did his research for this in PM's annual auto issue for that year.



One of the dividends of doing a feature such as the 12 Most Significant Aircraft is the interesting people you meet. After Alfred V. Verville heard that one of the airplanes he designed had been selected, he paid a special visit to PM's offices.

Verville, like many others who spent a lifetime in aviation, feels that no recounting of aviation history could be complete without some mention of Gen. Billy Mitchell, an authentic American genius.

Tales of Gen. Mitchell's clairvoyance in predicting the growth of air power, of predicting World War II, even to the extent of predicting the Japanese attack on Pearl Harbor, are well known. But Verville added still another tale. He witnessed it.

As a technical advisor, he accompanied Mitchell on a trip to Europe. In Germany, Mitchell astounded his staff, and Verville, by speculating that makers of aircraft engines were wrong, that they should be looking for a different principle than the four-cycle principle of automobile engines.

"I'll bet," he said, "that some long-haired German scientist, stuck away in some ramshackle laboratory, who probably doesn't even know what day it is, is working on such an engine right now."

They found such a scientist, and he freely predicted that future airplanes would be powered by turbine engines (jets), would burn coal oil (kerosene) and would fly 700 miles per hour or better. He also predicted that some day the air would be filled with flying rockets (missiles) that would burn liquid air (oxygen) and alcohol.

Verville thought so little of the incident that he didn't even get the German's name, but Mitchell absorbed every word "like a child with a new toy."

Germany eventually flew the first jet (in 1939) and rained V-2s on London during World War II. But the most amazing part of Verville's tale is that it happened in 1922.

Mitchell, when he came home, couldn't get anyone to believe him. Instead, three years later he was court-martialed—a true prophet without honor in his own time.

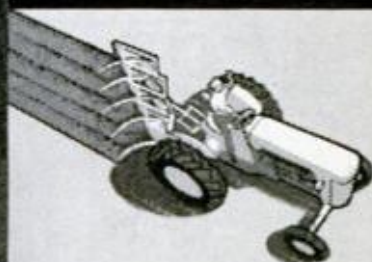
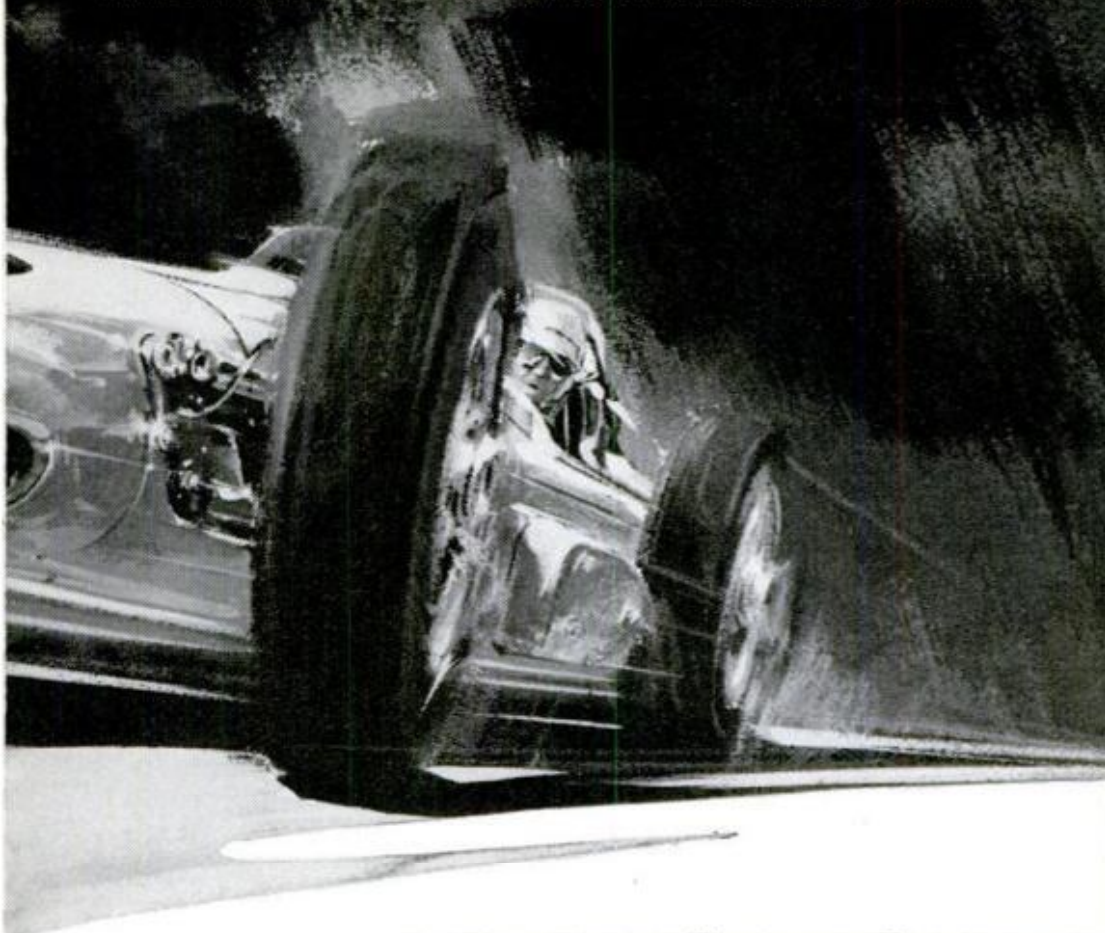
*Kevin V. Brown*

ALFRED VERVILLE (left), designer of Verville-Sperry Racer, chats with PM's aviation editor, Kevin Brown





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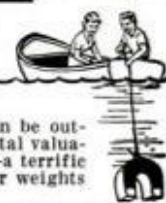
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# BULLETINS FROM THE WORLD OF SCIENCE

Happy marriages of the future may be based on a couple's reactions to the shapeless forms of the Rorschach ink-blot test.

Two doctors reported to the Eastern Psychological Association that if couples tend to see a similar number of scenes in terms of human movement (as opposed to inanimate objects), chances are good their marriage will be a happy one.

Blame grandpa if coffee keeps you awake. After studying coffee-drinking students at Stanford University School of Medicine, researchers believe a genetic factor might be involved in caffeine insomnia. If this is true, it might also indicate that heredity is a factor in addiction to drugs and alcohol.

They also note that coffee does not influence dreams, and that, while it may keep some people awake for a while and disturb the soundness of their sleep, it apparently does not make the sleep less refreshing.

Rubless rubber, slippery to the touch yet elastic, has been developed through chemical treatment at Quantum, Inc., a Connecticut research lab.

By reducing friction, this rubber is expected to extend the life of many seals such as those around shafts in washing machines and power tools.

There's more to hanging a picture straight than meets the eye.

Charles Curran, a psychology student at the University of Michigan, has completed a study that concludes people tend to rely on visual clues, such as a doorway or ceiling, to let them know which way is up when they are standing. They depend on the effect of gravity on their middle ears and muscles when they are leaning.

So don't block your vision or lean when you put up a picture, says Curran. Best way: settle back in a comfortable wing-back overstuffed chair and use both eyes.

Space capsules, splashing into oceans on their return flight, in the future will extend two 12-foot-diameter loops for easy pickup by a hook attached with 50 feet of nylon rope to an airplane. Capsule and retrieval unit, according to U. S. Navy engineers, can be located easily by radar and visual sighting.

(Continued to page 20)



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The rain in Spain (and other places) first falls gently on the plain (and elsewhere) in the form of large, luscious drops because winds in rain clouds sort out the drops to the proper size before it starts raining.

University of Michigan scientists A. Nelson Dingle and Kenneth R. Hardy say updrafts within the clouds continually lift the lighter drops. After colliding with enough other droplets a drop becomes so heavy it can fall through the updraft.



**Astronauts on journeys** of three or so years may get oxygen from their own breath, if research at Battelle Memorial Institute, Columbus, Ohio, pans out.

Scientists there have developed a device to convert carbon dioxide to water vapor—it and hydrogen are passed over a heated catalyst of steel wool and iron oxide pellets—and solid carbon. The carbon will be ejected every two or three days while the water will be fed to an electrolytic cell where it will be broken down into oxygen and hydrogen. The hydrogen will be used to react with more carbon dioxide.



You may grow your own atomic mutations with a new seed kit. The Edmund Scientific Co., Barrington, N. J., sells eight packets, four of which have been irradi-

ated with atomic testing materials—gamma rays. The irradiated seeds produce strange-shaped flowers and vegetables, or alter normal sizes and colors. The seeds are safe, will grow indoors or out.



**Teen-age boys** who found the fossil remains of a gliding reptile in the Palisades above the Hudson River, have loaned it to the American Museum of Natural History. There it is creating quite a stir among scientists, who believe it may be 175,000,000 years old.



**Delayed bulletin:** Dr. Lyle B. Borst, of Columbia University, has discovered that one reason Spartan soldiers were feared in ancient Greece may have been because they had steel weapons. He recently tested metal fragments long regarded as Spartan iron money and found them to be of high-quality steel, stronger even than some modern structural steel. Spartan's enemies carried soft iron or bronze weapons.

*James Biery*

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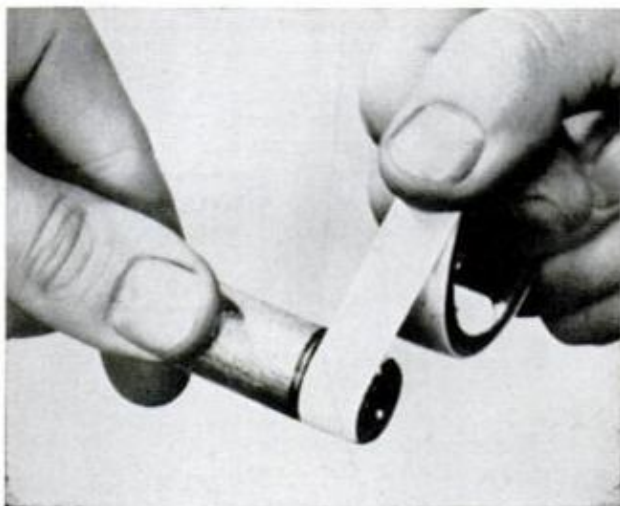
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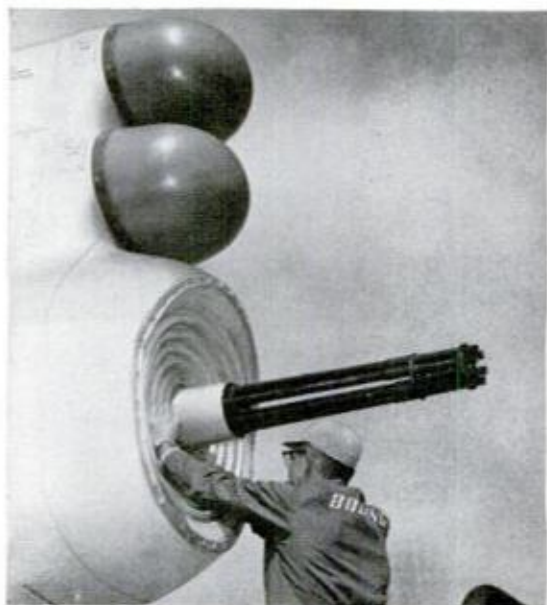
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**Most popular indoor sport** in this country, no matter what the bowling people say, is beating the tax collector out of any money that's not rightfully his. One easy way to get a few tax dollars back is to get a refund on the tax money you paid on gasoline for a boat or any other nonhighway vehicle. You can get back two cents a gallon from the Federal tax, and some or all of your state tax, seven cents in some states.

The list of states and refunding procedures is too long for this column, but you can get the dope in the Tax Refund Bulletin published by the Small Craft Division of Mobil Oil Co., 150 E. 42nd St., New York 17. The eight-page pamphlet lists the state and federal provisions for refunds with addresses of refund offices, form numbers and notes on variations between state laws. If you have nine cents a gallon coming to you for a season's running on a six-gallon-an-hour outboard, it could run into a nice piece of change if you'll take the trouble to keep a record and file your claim.

Speaking of seasons, it's itchy time again, and the whine of the lady mosquito is heard in most parts of our land. But if your bug repellent doesn't work, or you're bitten by any poisonous or blood-sucking insect, you can stop the pain and irritation with a new chemical called "Stingo," which neutralizes the acids in insect venom. It's made by Southwest Products, Inc., of San Antonio, Tex., and will be in stores this season in pocket-size plastic bottles.

There's good news, even for unbitten fishermen, in an improvement of a familiar product. The Garcia Abu Reflex, a popular heavy-blade spinner, is sporting a new twist in its wire frame where the hook is attached to the weighted body; a new heart-shaped wire loop lets the treble hook drop below the lure's center of gravity, where it acts as a stabilizing keel. They say it won't twist your line even when used for trolling, and that sounds good. No change in the lure or its price; just an improvement, compliments of the manufacturer. Now, there's a switch.

*Dick Kiepatnik*

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700/16-6	8.71	640/15	4.31
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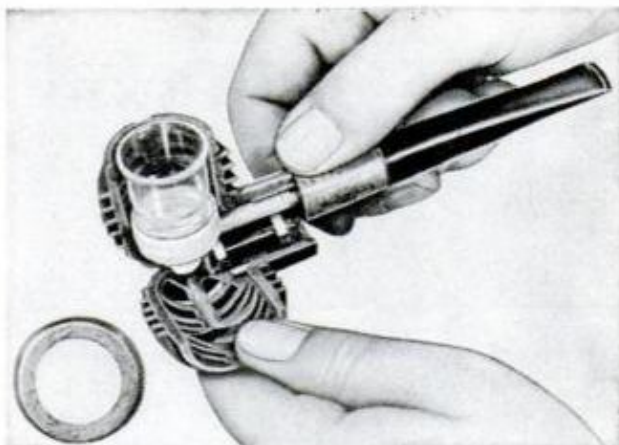
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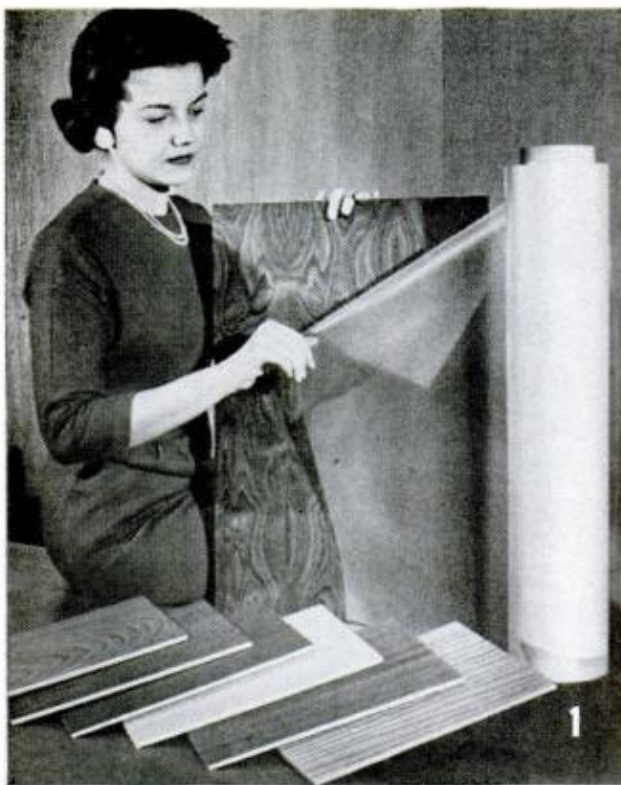
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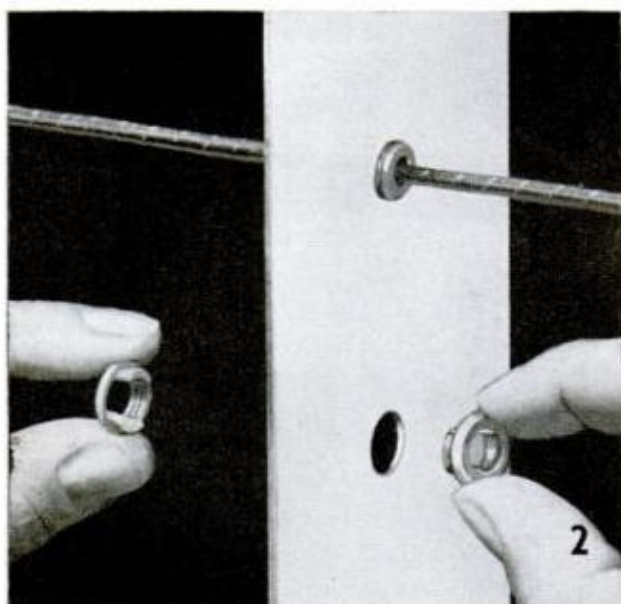


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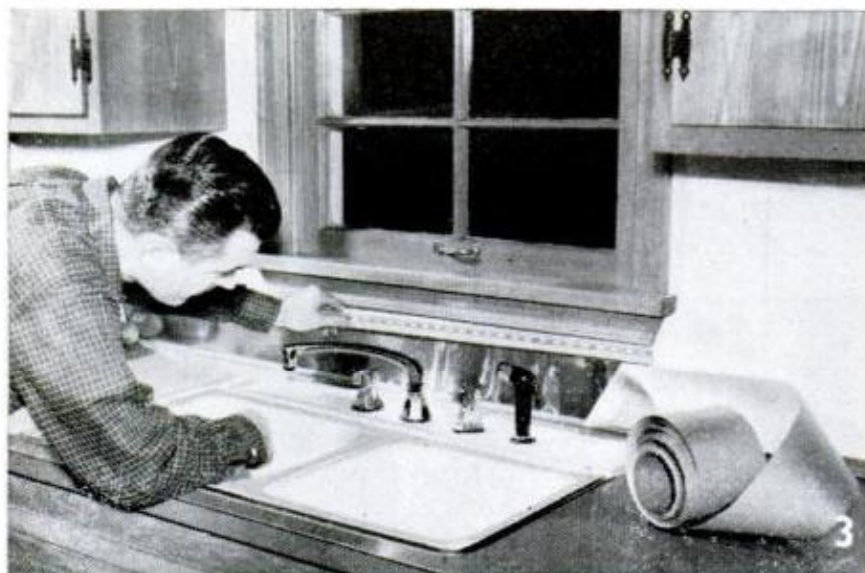
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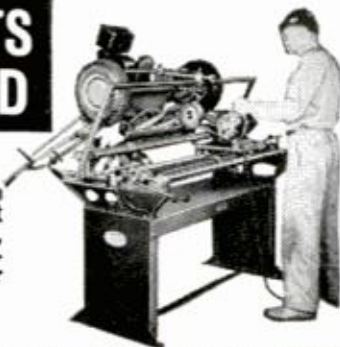
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## Plumbers and Pipefitters—

# AMONG THE HIGHEST PAID IN THE BUILDING TRADE

by B. Richard

Construction workers rank high in pay as compared to workers in other industries. Plumbers and pipefitters are among the highest paid of *all* workers in the construction field—a 1958 survey of 52 large cities showed that the hourly rate of plumbers and pipefitters surpassed the rate of all other construction workers.

This survey showed \$3.70 as the average hourly wage for plumbers and the wage for pipefitters was \$3.71. It's fairly safe to assume that this average hourly rate has increased since 1958; and, when you consider that plumbers and pipefitters are less effected by seasonal layoffs and by layoffs caused by bad weather than are other construction workers, you can easily see that these occupations offer excellent income opportunities for those who have the ability and desire to take the training necessary for this field.

Not only are there top income opportunities, the number of plumbers and pipefitters needed in coming years is expected to increase significantly. One of the important reasons for this expected increase is this country's growing population which will bring about a demand for more housing. It has been predicted that a 40-50 percent increase in construction activity will take place in coming years.

Added to this important fact is the increased use of plumbing in today's new home construction. More than one bathroom is commonplace in new homes, and special plumbing facilities are also usually included for washers, garbage disposals and other appliances. This means that, not only will there be many more homes under construction, but plumbing will be increasingly used and plumbers will spend more time on each home. Therefore, more plumbers and pipefitters will be needed to make up for this extra effort.

In industry, too, plumbing is assuming a more important role. The increased use of refrigeration and air conditioning calls for more pipe work; and the petroleum and

chemical industries, heavy users of plumbing in their manufacturing process, are expected to expand their facilities substantially in the 1960's.

For all these reasons, plumbing and pipefitting offer solid career opportunities for men who have the knowledge and training that is needed. Many men in this field have received their training informally by working for several years as helpers and by learning from experienced craftsmen, supplementing this on-the-job training with trade school and correspondence courses.

Ordinarily, an apprenticeship program is recommended as providing the best all-round training. This usually is a five-year program and applicants are often required to take aptitude tests to determine whether or not they have the mechanical ability to be successful. The equivalent of a high school education is desirable and special emphasis is placed on courses in mathematics, physics and chemistry. In preparing for the apprenticeship program, correspondence or trade school training is of special value in helping applicants meet the entrance requirements.

Apprentices start at about 50 percent of the pay of a qualified plumber or pipefitter and pay increases regularly until the final period of training, when apprentices receive 95 percent of the wages of a qualified plumber. Training is received in all aspects of the trade including the handling of tools, machines and equipment; how to install waste, vent and water pipes; how to install heating, air-conditioning and powerplant piping systems; welding, soldering and general repair work.

Classroom work is also provided to teach apprentices such subjects as drafting, blueprint reading and local building laws and regulations.

Special consideration is often given to apprentices with previous training or experience, and it is sometimes possible for them to receive advanced rating and pay. Trade school courses and correspondence school instruction can sometimes provide the



training necessary for an advanced rating in the apprenticeship program.

In some localities, a journeyman's license is required for plumbers and an examination is a prerequisite for obtaining such a license. The examination tests applicants on knowledge of the local building codes as well as testing all-round knowledge of the trade. This emphasis on testing points out the value of thorough training and education.

Preparation to become a journeyman pipefitter or plumber is time consuming and demanding, but the rewards are great. These skilled craftsmen make a vital contribution to the growth of America—a contribution so important that experienced plumbers and pipefitters have ample opportunity to expand their responsibilities and incomes.

Many go into business for themselves with the idea of becoming plumbing and pipefitting contractors, employing other workers and bidding on large-scale construction projects. Others working for large companies take over supervisory positions with increased income potential.

Virtually every community in every part of the country needs skilled and qualified plumbers and, for this reason, job opportunities are not restricted to any particular area. As might be expected, plumbers who specialize in steam and hotwater heating systems are employed in greatest numbers in large cities, and the same is true of pipefitters who specialize in installation of heating lines and steam fitting systems in industrial and commercial establishments.

Substantial income, increased job openings, steady employment and ample chance for added responsibility and income all add up to a unique opportunity in this field. For career information on other important fields write Popular Mechanics, Department SFA, 200 East Ontario St., Chicago 11, Illinois.



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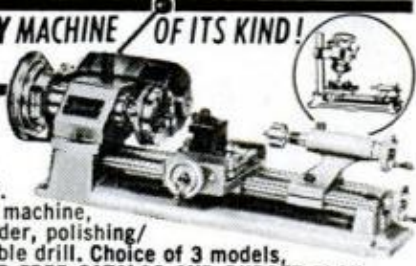


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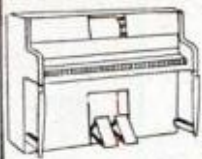
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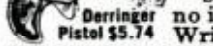
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We passed on a yell for help back in April from the National Inventors Council, which is involved in the immensely difficult job of getting you to invent things for the government. Now we have an invitation from Postmaster General J. Edward Day, who would like to have five devices to help his department attack the fantastic mechanical problems of moving 65 billion pieces of mail each year. Here are his five big needs:

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5. A mailbox that will stack letters as they are dropped in.

And Postmaster General Day promises big returns for the successful inventor, since he has 36,000 post offices as potential customers, plus thousands of private businesses who already want methods of pre-processing their own mail to assure better postal service.

Best-looking patent idea across the desk this month is Winifred Wilson's combination dining table and dishwasher, which won patent number 2,971,519. The device eliminates the familiar five operations in dish-handling: setting the table, clearing away used dishes, washing the dishes, drying them and storing them until the next meal. All this built right into a dining table with an individual compartment for each place setting. Each diner takes out his own equipment, then puts it back after use; the housewife pushes a button and forgets them until it's time for the next meal, when they'll be ready.

The long arm of the law will be more effective with a nightstick invented by Samuel Voll, who has patent number 2,966,621 for a club with a built-in electric shocker similar to those used on recalcitrant cattle. The current source is built into the club, and it can also be used as a flashlight or signalling device.

Copies of the original patents may be ordered for 25 cents each from the Commissioner of Patents, Dept. of Commerce, Washington 25, D. C.



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**MARKETS Everywhere.** Make artistic concrete birdbaths, pottery. Best coloring. Home workshop. Hundred varieties. Free pictures. Hollywood Cementcraft, 8527-S Wonderland, Hollywood 46, California.

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**MAILORDER.** Beginners plans. Free information. Armstrong's, 154 Darrington S.W., Washington 24, D. C.

**SIMPLIFIED "Bookkeeping System"** for mailorder beginners. \$1.00. Neil H. Tasker, Shamokin, Pennsylvania.

**OPERATE Profitable mail order business.** Write W. D. Books, Box 116-P, Cincinnati 11, Ohio.

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

**MAKE Money distributing profitable mailorder publication.** Antique Shopper, Middle Village 79, New York.

**AMAZING Profits in home mimeographing!** We've retired. Now showing others. Paradise, Lanok Harbor, N. J.

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

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**MANUFACTURE Beautiful, lightweight vases, patio stones, wall panels, artistic room dividers, etc., with new foam-crete plastic.** Amazingly fast, easy, money-making system. Complete formulas and instructions only \$2.00. Or free details. Plasticon Company, Box 105, Grove City, Penna.

**LET Us show you how you can have much greater financial security, even on average salary!** Seven simple steps show exactly how! Experience unnecessary. No public contact. Send \$1.00 (refundable) for "Your Key to Financial Security." Columbia Enterprises, 45-09-PM Broadway, Long Island City 3, New York.

**NATURAL Molding rubber, extra thick.** Free samples. W. Wooley, 2801-A Latrobe, Peoria, Illinois.

**FREE Report: "609 Unusual, Successful Businesses."** Box 1001-PMD, Evanston, Illinois.

**NEW Snow cone machines.** All prices. Box 7803, Dallas, Texas.

**EARN \$3 Hourly, spare, full time,** looking up information at your local library. Details free. Service, 81C, Knickerbocker Station, N.Y.C.

**CASH From sawdust, tin-cans, newspapers.** Over 200 methods. Instructions \$1.00. Charles Company, 42-GPG, Norwood, Ohio.

**REPAIR Sewing machines.** Parts, supplies. Write FAF, 618 Elmwood, Buffalo 22, N. Y.

**FIGURINES, Plaques, liquid rubber, plastercraft supplies.** Sample, details free. Illustrated catalog 25 cents, refundable. Lavin Novelties, Box 296S, Leavittsburg, Ohio.

**BIG Money.** Exotic imports sell on sight. Free details! Davis Imports, 1204-G Anaheim, California.

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**I Want a man who wants a business of his own.** I will train you, supply the equipment, help finance you, start you rolling. This is not a risky get-rich-quick scheme. It is a legitimate business, an exclusive protected franchise, proved successful by hundreds throughout the country. Send name, address and phone number to Marion Wade, 2117 North Wayne, Dept. 57M, Chicago 14, Illinois.

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**SUCCEED! Only sure method: read and learn.** Latest official Harvard Business School reading list, \$1. Business Institute, 20 Southmountain, Millburn, New Jersey.

**FREE Book "990 Successful, Little-Known Businesses."** Work home! Plymouth-472R, Brooklyn 4, New York.

**LIQUID Molding rubber, free sample.** Shellcraft supplies. Chaney's, 1907-A East Road, Jacksonville 16, Fla.

**EARN Money sharpening saws, scissors, dental tools.** Free manual, new models. Treyco, North Tonawanda, New York.

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**WANTED: Home producers, to be subcontractors.** Cast plastic products for manufacturers in our clearing house service. Thousands of easily made items required. Cash in at home, without previous experience. Plastic Service Associates, Dept. 6-PM, East Boston 28, Massachusetts.

**DRIED Mushrooms \$4.00 pound** for large canning company. Receiving warehouse in United States. Growers wanted on contract, everything supplied. Mushroom Salt Co., No. 651, Calgary, Alberta, Canada.

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**53 MONEY Making ideas.** A treasury of profitable ideas and opportunities of proved success. 25¢. Clark, Box 40, New York 12, New York.

**FREE, Newsletter reporting unusual money-making ideas.** File E, Box 76254, Los Angeles 5.

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

**FREE, Money-making plans.** Work home. Post, 1425-W 32nd, Indianapolis 23, Ind.

**CAN You crank a crank? Then you can earn mimeographing dollars.** Home mimeographers, lettershops. Write: Mimeographing Dollars, 1012-M Center Street, Evanston, Wyoming.

**FORTUNES In formulas, 10,000 trade secrets, 882 pages.** Send \$3.95. Berthoff's, 739 Sylvania Avenue, Desk K, Toledo 12, Ohio.

**OFFICE Work—home, sparetime.** Refundable money-making instructions 50¢. Interstate, 37-A Besch, Albany 9, N. Y.

**SPARETIME Home mailorder business opportunities!** Trotta, 2036-P 66th, Brooklyn 4, N. Y.

**GOLD In your backyard!** Turn weeds into dollars. \$1.00 tells all. Profits, Box 282, Urbana, Ohio.

**BECOME Refrigeration washing machine serviceman.** Manuals \$2.00, \$3.00. Details free. Kay, 55 New Lots Ave., Brooklyn 12, N. Y.

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**TREE-Mushroom pioneers!** Spawn, instructions, \$1.00. Ohga, PMTR-280, Sigakokusatu, Japan.

**BIG Profit! Learn to operate auto and iron salvage yard.** Wirtz, Box 806, Mason City, Iowa.

**BABY Shoe plating, bronze and colored pearl.** Free booklets. Kiktaivi Company, Box 5036, Inglewood, California.

**NEW: Build fountains, waterfalls, parts supplied.** Details. Priplata, Pasadena 3, Calif.

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**MAILORDER** Business your ambition? Our manuscripts reveal inside secrets. Details free. Easco, 611-A Eastern, S. E. Grand Rapids 6, Michigan.

**WIN** Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests, rules. Sample magazine 25¢. General Contests, 1609½ East 5th, Duluth 12, Minnesota.

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**EASY** To earn extra money! Free 100 page catalog. Tandy Leather Company, Box 791-B40, Fort Worth, Texas.

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

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

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

**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-D, 1512 Jarvis, Chicago 26, Ill.

**FABULOUS** Franchise profits available. For current franchise review information, write Franchise Newsletter, F3, 9 S. Clinton, Chicago 6.

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**MONTHLY** Puzzle contests; news, books, assistance! Spence, Box 11569, St. Petersburg, Fla.

**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-D, Chicago 26.

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

**UNUSUAL** Newsletter reporting exciting moneymaking ideas. Includes franchise reports, overseas opportunities, unique business plans. Free from File E, Box 76254, Los Angeles 5.

**PIANO** Tuning. Home study course. Diploma granted. American School of Tuning, Box 707, Gilroy, Calif.

**To \$6,000 Yearly.** "23 Sparetime Jobs." Discloses new methods, tips, leads. No investment. \$1.00 pays all. Guaranteed. Cambridge, Box 252, Hartsdale, N. Y.

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

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

**DIRECTORIES!** World-wide exporters, drop-shippers. Particulars free. Tech Publications, Box 821, Logan, W. Va.

**YOUR** Portrait hand-painted in Japan by noted Japanese artists! Amazingly low prices! For sweetheart, etc. Details. David Teel, Importer, 217 Christopher, Clovis, N. M.

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**AMAZING** New book of science experiments, formulas, and catalogue of laboratory supplies. Only 35¢. National Scientific Co., 13 S. Park Avenue, Dept. PM-6, Lombard, Illinois.

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**10" SLIDE** Rule with 28 page instruction book, \$1.00. Colen, 7731 Yates, Chicago 49-PM.

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

**232 PAGE** Catalog \$2.00. Laboratory Materials, 7319 Vincennes, Chicago, Ill.

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

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

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**ANY** Formula. Satisfaction guaranteed! Jack, Chemist, P.O. Box 25157, Los Angeles 25, California.

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

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**PLEXIGLAS**, Square foot cost, 1/16", \$1.25; 1/8", \$1.45; 3/16", \$1.80; 1/4", \$2.15. Add 15% for postage. Plast-o-matic Co., 1413 Summit Ave., Union City, N. J.

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

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

**PLEXIGLAS**—1/4", \$1.25 sq. ft. Sheets, rods, tubings; fabricating, models made. Catalog 15¢. Plastic Shop, 2025 Nevada, Butte, Montana.

**PLASTICS** For casting, molding, embedding and jewelry. Send 25¢ for catalog. Castacraft Corp., Dept. M-661, P.O. Box 555, Palo Alto, Calif.

**PLASTIC** Embedding for fun and profit, no oven. Make beautiful jewelry, decorative panels, science specimen, castings. Catalog 25¢. Natcol Plastics, Box 444, Yucaipa 3, Calif.

**PLEXIGLAS**—Send for price list. Technical Storeroom, P.O. Box 7711, Orlando, Florida.

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**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.

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



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

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

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

**FREE List** reliable drop-shippers wanting agents. Kohler Agency, Box 655, Opa-Locka, Florida.

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**10 PEARL Necklaces** only \$1.00. All 17 inch necklaces beautiful sim pearls, retail price up to 75¢ each. Free catalog with hundreds of bargains, jewelry, watches and novelties. Send \$1.00 for your 10 necklaces and your free catalog. Cosmos, Dept. P28, New York 35.

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**DO You need products** for your mail-order business? Just \$2 brings hundreds of names and addresses of manufacturers, wholesalers and jobbers, capable of supplying you with items of your choice. Buyers Source, Dept. 2PW, 3702 Aurora, Indianapolis 27, Indiana.

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

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

**HEALTH Products catalog** 25¢. Min. P.O. Box 1308, Chicago 90, Ill.

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

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

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

**HANDMADE Western boots.** Free catalog. Ysleta Boots, Ysleta Station M, El Paso, Texas.

**DIRECT From importer.** Catalog 25¢. Refundable. Imports, 828 Fullerton, Chicago 14.

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**WHOLESALE Catalogue!** Appliances, cameras, watches. Associated Distributors, Box 1481-B, Denver 1, Colo.

**BREAK Store codes.** Learn to read wholesale cost from price tags. Details \$1. Saco Industries, 624 So. Michigan, Chicago 5, Ill.

**GOLF Equipment wholesale.** Free price list. Crystal Golf Sales, Crystal, Mich.

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**SENSATIONAL Patented auto device,** fabulous profits, sells fast. Write Gregory, 316 Marion Building, Cleveland 13, Ohio.

**MAKE Extra money** selling advertising matchbooks. Free catalog and sales outfit. Matchcorp, Dept. PM-61, Chicago 32.

**MAKE Extra money—Big cash commissions** plus premium for you and your customers. Sell advertising book matches. Sensational new tenorrama glamour girls, hillbillies; dozens others. All sizes. Quick daily sales; big repeat business. Free master kit makes selling easy. No experience necessary. Superior Match, Dept. M-661, 7530 Greenwood, Chicago 19.

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**WILL You wear new suits, sport coats** without one penny cost and agree to show them to friends? You can make up to \$40.00 in a day even in spare time, without canvassing. Progress Tailoring Co., 500 South Throop St., Dept. X-326, Chicago 7, Illinois.

**FREE: Your lifetime Social Security** plate in golden brass, wallet size, undestructible. If you want engraved name and Social Security number include 75¢ for engraving, retail price \$1.50. Use sample card to take orders for friends, etc., and make big profit with each order. Free details with your sample card. Cosmos, New York 35, Dept. S26.

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

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**BIG Profits** selling underwriters approved plastic electrical and cloth adhesive tapes. Protected territories. Free details. Oakmont Tape, 165 East Ontario, Chicago 11, Illinois.

**MAKE Up to \$50.00 a day** soliciting delinquent accounts. Terrific commissions. Write today. General Finance, 304V Pickwick Bldg., Kansas City 6, Mo.

**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.

**OUTDOOR Advertising pennants, spinners,** etc. 100% distributors profit. High salesmen's commission. Write: Radder Products, Box 31, Colvin Station, Syracuse 5, New York.

**EARN Big commission full or part time.** Build profitable business of your own selling America's largest line low priced business printing. 360 page catalog samples hundreds of items used daily by business people. Imprinted ball pens low as \$8.95 for 100. Big full color catalog low priced advertising specialties included. Free sales kit. National Press, Dept. 8, North Chicago, Illinois.

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**FOREIGN Employment.** Construction and other work projects. If interested in overseas work with good pay, write Foreign Service Bureau, Dept. PM, Bradenton Beach, Florida.

**INTERESTED In Hongkong.** Highly paid jobs, trade enquiries. Box 104, Boundary Court, Kowloon, Hongkong.

**U.S.A., Foreign jobs** to \$1600 monthly. Construction, clerical, supervisory. Skilled, unskilled. Free transportation. Complete information plus projects listings. Only \$2.00. "Helm's International Reports," Dept. P.M., Box 397, Odon, Ind.

**HAWAII Sunday classified ads** \$1.00. Sebastian, 1322 Kinau St., Honolulu.

**AUSTRALIA—Brightest opportunities** on earth in your lifetime. Job information \$2. Box 234, Toronto 18, Canada.

**EXCLUSIVE Employment information.** Thousands of job openings. All trades. Top wages. Benefits. Travel expenses paid. Nationwide-worldwide, Box 12, Detroit 13, Mich.

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**CHOICE U.S. and overseas jobs.** All trades. Firms, addresses, hiring, procedures, pay scales, benefits. For info, write: World Wide, Dept. B12, 149 N. Franklin St., Hempstead, N. Y.

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**JOBS On ships,** \$100 weekly beginners. Paid vacations. Sick benefits. Information free. Flagship, Box 111-M, Brooklyn 17, New York.

**(CALIFORNIA) Electronic now offering** all types of jobs. Complete information. Send \$1.00 to Electronics, Box 454, Torrance, California.

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**FLORIDA Positions,** agencies resume application helps \$1.00. E. Bryan, 3904 Seminary Ave., Richmond, Va.

**MERCHANT Marine jobs.** Men and women. Top wages. Travel. Captain, Box 501-P, Reading, Massachusetts.

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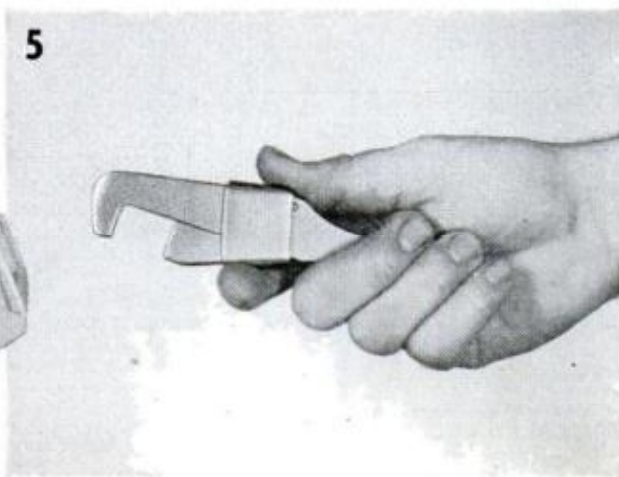
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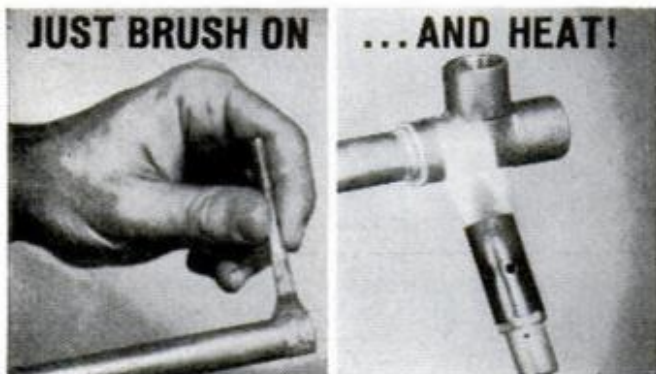
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**A QUIZ ON NAVIGATION**

By Samuel Cabot, Jr.

HERE ARE twenty questions dealing with navigation. Check the answers that you think are right; then turn to page 60 and see how you fared.

- The airport at Retidence, Texas is due south-south-west of Muleshoe Field. What's the correct **compass course** in degrees?
  - 225°
  - 202 1/2°
  - 22 1/2°
  - 270°
- On the chart of Chesapeake Bay, Thimble Shoal Lighthouse is marked as "Occ. W." "W" means white, but what does "Occ." mean?
  - On correct course
  - Occidental
  - Occulting
  - Off correct course
- What is **parallax**?
  - Mariner's nickname for the Equator, because all latitude lines are parallel to it.
  - A navigating instrument consisting of two adjustable parallel rules.
  - One of two bright stars in the constellation Gemini (Castor and Parallax), often used for star sights.
  - An adjustment applied to moon sights to correct for the difference between the observer's location and the center of the earth.
- The **magnetic north pole** is located:
  - In Hudson Bay.
  - On Prince of Wales Island.
  - Near Thule, Greenland.
  - In the same place as the North Pole (or north of Pt. Barrow).
- How far away is the horizon (on open ocean) if your eyes are 12 feet above the surface?
  - 12 miles
  - 16 miles
  - 8 miles
  - 4 miles
- As you approach a harbor in heavy fog, a red **nun buoy** looms up directly ahead. What should you do?
  - Leave it to starboard.
  - Leave it to port.
  - Stay well clear of it—at least a cable's length away, if possible.
  - Tie up to it and wait for the fog to lift.

(Continued to page 58)





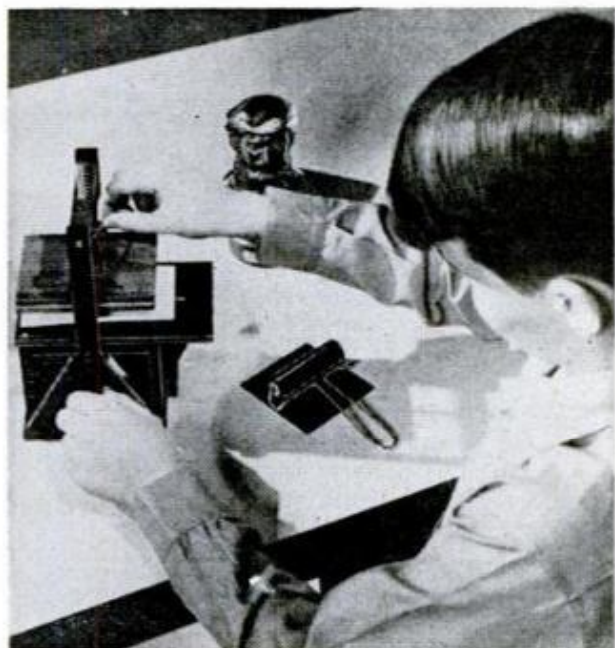
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7. Just how far is a **cable's length**, anyway?
  - a. 120 feet      b. 240 feet      c. 720 feet
  - d. The length of your vessel's anchor line, whatever that may be.
8. In navigational charts, what **method of projection** is commonly used?
  - a. Mercator      c. Gnomonic
  - b. Polyconic      d. Lambert
9. What famous author took his **nom-de-plume** from the cry of a leadsmen taking soundings?
  - a. Lewis Carroll      c. Mark Twain
  - b. Saki      d. O. Henry
10. **Declination** means:
  - a. Compass error caused by nearby metal objects.
  - b. The falling of the tide.
  - c. Difference between magnetic north and true north.
  - d. Refusal of a ship to answer its helm.
11. Which of the following is **not** equal to a **nautical mile**?
  - a. One minute of longitude.
  - b. One minute of latitude.
  - c. 1.15 statute miles.
  - d. 6080 feet.
12. What is meant by **rhumb line**?
  - a. Weighted cord used for sounding.
  - b. Nickname for the New York & Puerto Rico Steamship Co.
  - c. The Tropic of Cancer.
  - d. A curved line on the earth's surface that cuts each meridian obliquely at the same angle.
13. A Coast Guard mid-channel buoy, marked with black and white vertical stripes, should be **what shape**?
  - a. Can      c. Nun
  - b. Spar      d. Any of those
14. The ancients so admired a certain lighthouse that they called it one of the **Seven Wonders** of the World. Where was it?
  - a. Rome      c. Rhodes
  - b. Halicarnassus      d. Alexandria

(Continued to page 60)



# HOLE THROUGH THE BOTTOM OF THE SEA

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15. The development of what instrument  
made it possible for mariners to deter-  
mine **longitude** accurately?

- a. The chronometer c. The alidade  
b. The astrolabe d. The sundial

16. The mariners memory trick "CEEC"  
means:

- a. Come East, Enter Channel.  
b. Correct Easterly Errors Clockwise.  
c. Correct Every Error Clockwise.  
d. Course Eastward, Expect Correction.

17. What is the **night signal** equivalent of  
the single red pennant for a small-craft  
weather warning?

- a. White light between red lights.  
b. White light over red light.  
c. Two red lights.  
d. Red light over white light.

18. A method of determining position by the  
difference in time of reception of sig-  
nals broadcast simultaneously by wide-  
ly separated stations is called:

- a. Loran c. Sonar  
b. Radar d. Radiosonde

19. A **white top** on a red-and-black un-  
lighted buoy means:

- a. New buoy in an old channel system.  
b. Permissible to moor to this buoy.  
c. Buoy is easier to find by searchlight.  
d. Buoy can be passed to either star-  
board or port.

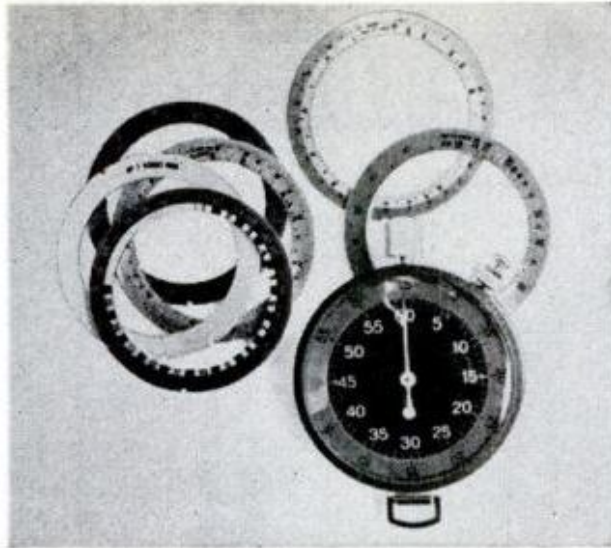
20. **Azimuth** means:

- a. An ancient navigating instrument.  
b. A 10th century Arab mariner, inven-  
tor of the compass.  
c. A magnetic alloy containing bis-  
muth, used for compass needles.  
d. An arc of the horizon indicating the  
distance of a star from due north.

## ANSWERS TO NAVIGATION QUIZ

- |       |       |
|-------|-------|
| 1. b  | 11. a |
| 2. c  | 12. d |
| 3. d  | 13. d |
| 4. b  | 14. d |
| 5. d  | 15. a |
| 6. a  | 16. b |
| 7. a  | 17. d |
| 8. a  | 18. a |
| 9. c  | 19. c |
| 10. c | 20. d |

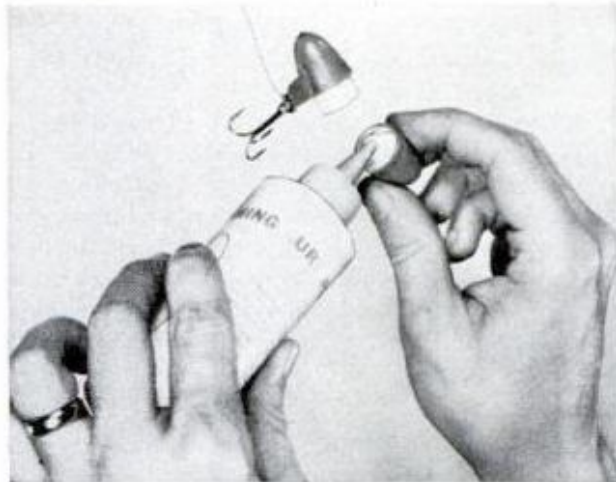




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## HOLE THROUGH THE BOTTOM OF THE SEA?

How American scientists are beginning to probe through the earth's crust in a searching-out of earth's history. The story is in the July issue.

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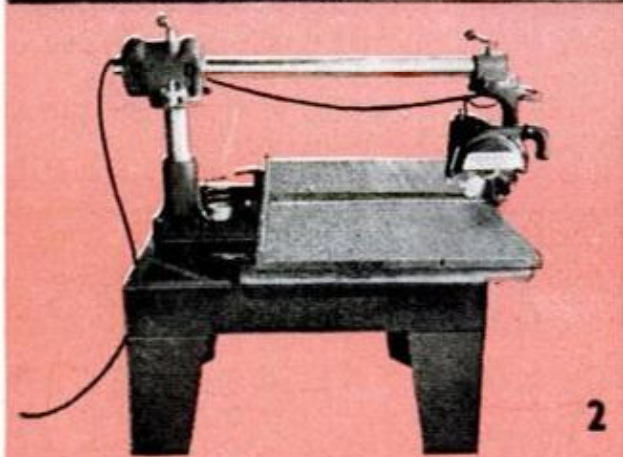
City, Town .....

State .....

Phone..... Dept. P



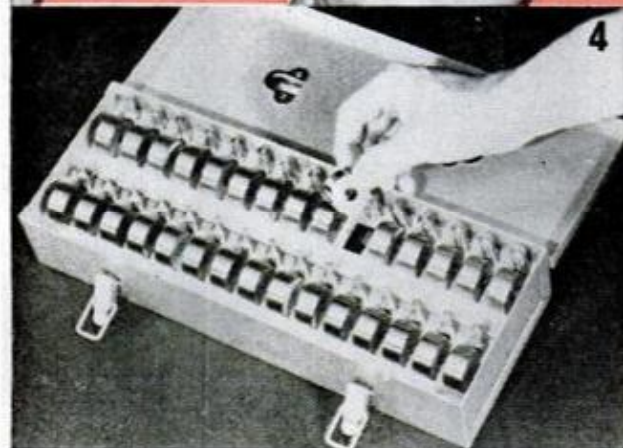
# SHOPPING FOR TOOLS



2



3



4

**1. MEDIUM-DUTY BELT GRINDER** is powerful enough to handle most grinding jobs and yet its compact, intermediate size makes it ideal for use where space is limited. Powered with a 3-hp. or 5-hp. motor, it has a 90-in. abrasive belt over an 8-in. contact wheel. Accessories adapt it as a floor stand, swing-frame or lathe-mounted unit. Grinding & Polishing Machinery Corp., 2530 Winthrop, Indianapolis 5, Ind.

**2. HIGH-SPEED SAW** designed for cabinet and furniture making features a long cutoff of 26 $\frac{1}{4}$  in., ripping up to 31 $\frac{1}{4}$  in. and up to 2 $\frac{1}{2}$ -in.-thick laminations for general cabinet work. The high-speed cuts do not require jointing or sanding. Has an adjustable saw guard and steel antikickback device. Converts to a shaper, boring machine, router or grinder. Available from Siegler Corp., 610 S. Harvard, Los Angeles, Calif.

**3. SPLIT-HEAD HAMMER** has nylon faces that are easily rotated for even wear, replaced when worn or interchanged with rawhide faces. The two-piece head clamps together when a nut around the handle is tightened, holding the two faces in a viselike grip. Tough, soft-faced end bells are gentle on installations which are easily damaged. Available in five sizes. Made by Garland Mfg. Co., Saco, Me.

**4. PUNCH AND DIE SETS** most commonly used are available at lower cost in two time-saving assortments, each varying in sizes and increments. Made from high-quality, hardened tool steel for use in all hand or power punch presses with the aid of adapters. Increases production by reducing down time. Sold in steel compartmented chests. O'Neil-Irwin Mfg. Co., 779 Eighth Ave., Lake City, Minn.



Now for **Schick Injector Users**, an edge so smooth you won't believe there's a blade in the razor!



## ANNOUNCING A NEW DIMENSION IN SHAVING COMFORT—THE NEW SCHICK INJECTOR BLADE WITH KRONA EDGE!

### METAL MAGIC!

Radical new blade assures clean, close shaves with almost incredible ease and comfort. So smooth, your first impression is—*your razor has no blade at all!*

The only way to appreciate Krona Edge is to try it. The Krona Edge is designed expressly to fit the Schick Injector Razor—don't accept imitations. Krona Edge comes

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Now a frank word of explanation!

Production of Krona Edge is extremely complex. With the tremendous demand for this sensational new injector blade, it's just possible *your* store may run out. If this is the case, we're so anxious for you to experience the comfort of a Krona Edge shave, we'll send you a

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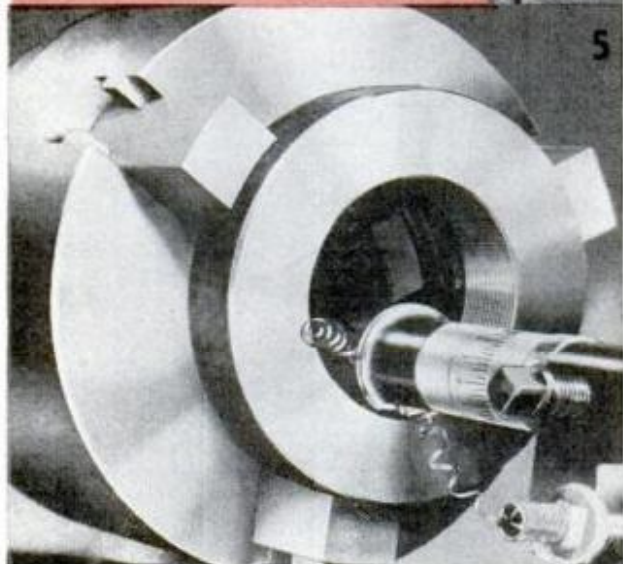
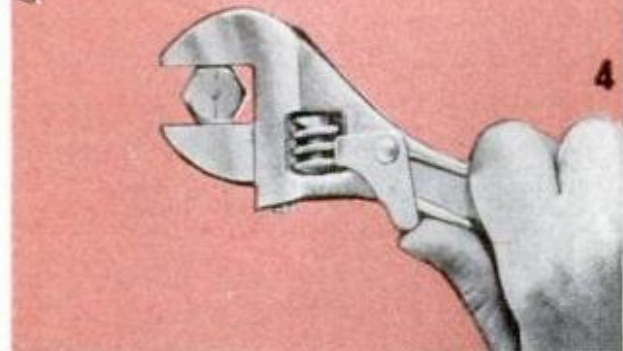
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# SHOPPING FOR TOOLS



**1. PNEUMATIC WIRE CUTTER** is a revolutionary tool, designed for volume production, that cuts as quickly as the actuating lever can be depressed and released. Efficiency of operators is increased because of fatigue reduction. The tool weighs only 6½ oz. and is equipped with an 8-ft. air line. Utica Drop Forge & Tool Div., Kelsey-Hayes Co., Utica 4, N. Y.

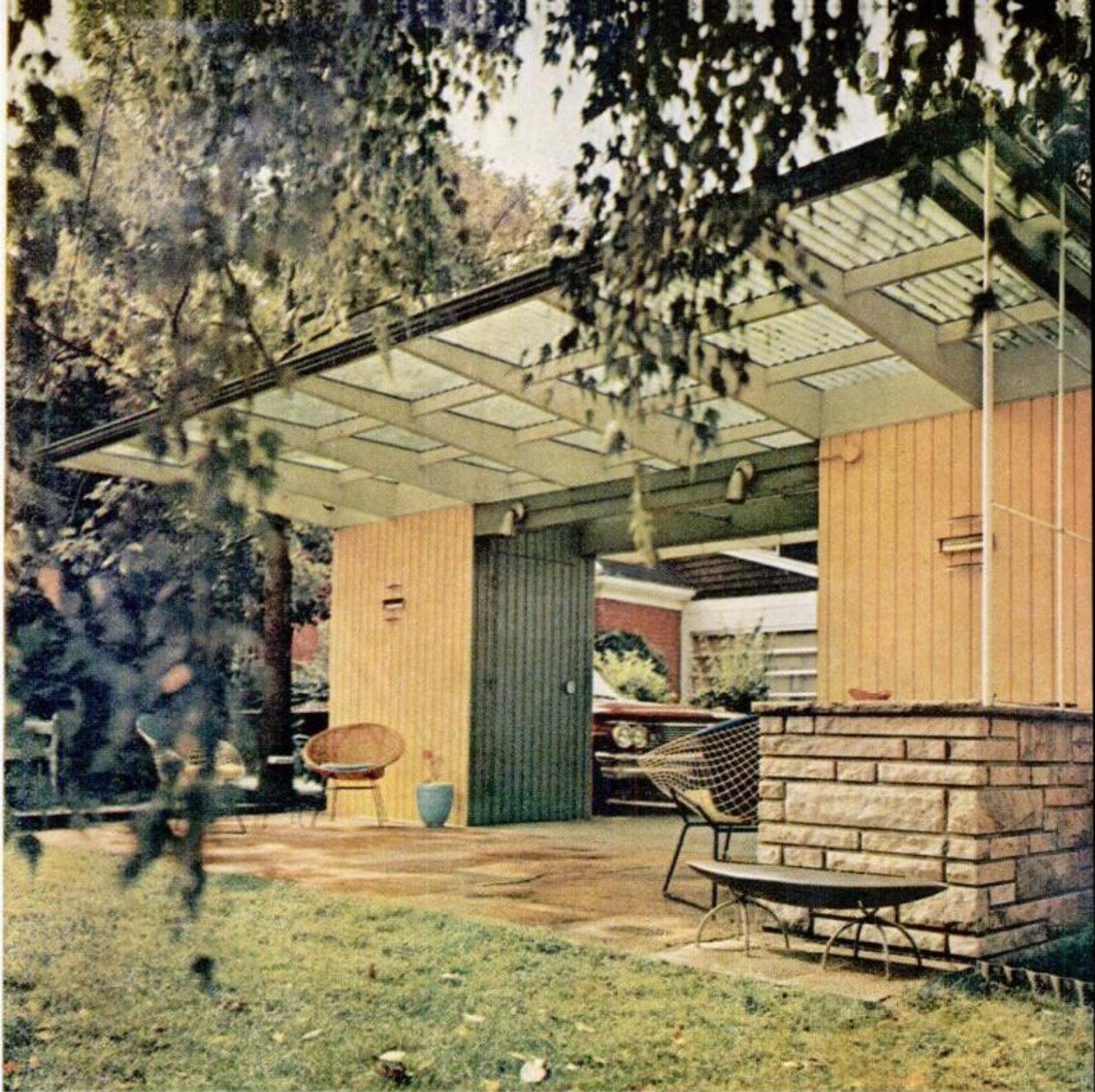
**2. BRAKE PISTON CLAMPS** will hold the pistons under compression when the brake shoes are removed. This holds fluid in the cylinder and prevents air from getting into the system. Their special design permits use on rounded end of cylinder in total contact brakes. Made of sturdy, spring steel. K-D Mfg. Co., 526 N. Plum St., Lancaster, Pa.

**3. BANDSAW BLADE** made of double carbide special alloy cuts 50 percent faster than carbon bands. This new blade will stand higher speeds and cut a wider range of metals, including tough alloy steels, on standard bandsaw machines. Faster cutting speeds lower cutoff costs and longer blade life reduces down time for changing. The L. S. Starrett Co., Athol, Mass.

**4. ADJUSTABLE WRENCH** can be set for any width and the jaws locked with a flick of the thumb. Once the locking device is set there is no slipping or resetting which means it will take less time to do the job and no rounded corners or skinned knuckles. Sizes from 4 in. to 12 in. Utica Drop Forge & Tool Div., Kelsey-Hayes Co., Utica 4, N. Y.

**5. IMPROVED THREAD CUTTING** tools use hardened disks with a segment of the periphery cut out. The lower corner of this open space is sharpened and does the cutting. The disk is designed with a negative profile to machine the entire thread shape, resulting in accurate profiles without a burring operation. Acme Tool Corp., 71 W. Broadway, New York 7, N. Y.





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**ALSYNITE**  
TRANSLUCENT PANELS



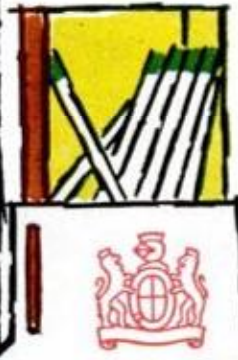
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This wonderful outdoor living room is built of Alsynite — the versatile translucent building panel you can use in so many ways. You'll find it's surprisingly easy to handle, for it combines light weight with unusual strength. Reinforced with millions of glass fibers, Alsynite is shatterproof, requires a minimum of structural supports. Alsynite transmits only soft diffused light — eliminates glare. And since it requires no special handling or tools, it lends itself to a range of projects — fencing, patio and carport covers, interior dividers. A variety of colors, sizes and textures in corrugations or flat panels—backed by Alsynite's 10-year guarantee and the resources of RCI, a great name in chemicals. Look for it at your dealer's, listed in the Yellow Pages under plastic products — and for your free folder, write Alsynite, San Diego 9, California, Dept. PM-661.



Taste PALL MALL...so

GOOD!  
GOOD!  
GOOD!



You can light  
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Outstanding...and they are Mild!



HERE'S WHY SMOKE "TRAVELED" THROUGH FINE TOBACCO TASTES BEST

- 1 You get Pall Mall's famous length of the finest tobaccos money can buy.
- 2 Pall Mall's famous length travels and gentles the smoke naturally . . .
- 3 Travels it over, under, around and through Pall Mall's fine tobaccos — and makes it mild!

Enjoy satisfying flavor...so friendly to your taste!



# How to Handle a Small Boat in Rough Water

THERE YOU ARE, out on the water, minding your own business, when the wind comes up sharply or a storm sneaks in. Or you change course and discover that the fresh wind that's been following you is kicking up a good chop when you're going against it. Suddenly you realize that the once-friendly water has turned into an enemy that's determined to get in there with you. You're faced with the problem of driving the boat somewhere that the rising wind and waves don't want you to go.

The first step toward getting out of trouble is to decide whether to try for





## BEFORE THE STORM HITS . . .

**IF YOU'RE IN FOR A ROUGH RIDE**, batten down. Close tackle boxes, brace or tie down loose equipment and oars to keep from losing them, and get everything on the bottom of the boat (right). If you have a wearable life preserver, put it on. If you're using a floating cushion (center right), tie it to your belt; if you go overboard, it'll go with you. If you don't have life preservers, untie your shoes and loosen any heavy clothing and get ready to swim if you must. You can rig a brace so you'll have a steady hand on the tiller even though you're bounced around; a short length of rope or a stringer, tied to a port oarlock, makes a good cross brace. Hold on with your right hand and lean back against the line



your home dock or to head for a safe shore. If you're downwind from home, that's the logical way to go if the waves aren't so big that you can't get through at all. In anything but the roughest water you can "tack" across the waves and make some diagonal headway, or you can beat your way to a protected lee shore line and work your way around it.

The old rule of heading into a blow holds true in most cases—almost any boat will ride over the waves if you take them dead ahead and maintain control of your

boat. If it's too rough, or your motor won't make headway against it, you must turn and run before the wind, timing your speed to the speed of the waves to keep from either overrunning a crest ahead or having a wave come in over your stern. Again, you can usually make some diagonal progress by "tacking" across the waves once you've learned to time the crests and regulate your speed.

But remember your fuel supply. It won't last indefinitely, so don't start any long runs with a chance of running out of gas

**KEEP YOUR WEIGHT AS LOW AS POSSIBLE.** Get the load—and yourself—off the seats and on the bottom. Sit up against a seat for a good back brace. The passenger stays low to give the skipper a clear view ahead, stands by to bail if necessary, and keeps an eye on the load, especially the fuel tank. It can bounce around and disconnect itself or kink a fuel line and kill the motor, so brace it or sit on it







on the way. Without power your troubles double. If you're trying to ride it out, make your fuel last—run at cruise throttle.

The size and frequency of wave crests will vary greatly with the size of a body of water, its depth, the wind direction, and the tides or currents that act against the wind. Unfortunately, it's usually roughest in shallow water, especially toward a downwind shore; you could be better off to stay in deep water until you're ready to go ashore. Long, smooth waves with a lot of time between crests will give you

time to maneuver between them and still take the crest easily. A short, tough chop is worse, and a diffused chop, with more than one wave pattern to reckon with, is worst of all. You can tell by the feel of your boat if they're getting too big for you: it'll try to dig in at the bow as you come down off a crest, or pitch violently as you go up and over, or your motor will roar as the lower unit comes out of the water. These are the danger signs; when it gets that rough, turn and run with the storm until you can work your way to safety. ➔

**KEEP THE BOAT TRIMMED** to meet the waves. By shifting the position of the passenger and the cargo, you can keep the bow higher for running into the wind, or the stern high to keep a following wave from swamping the boat. Running diagonally through waves, get the weight on the downwind side to present as much freeboard as possible to oncoming waves. But don't tip the boat so far that a sudden wave could capsize you







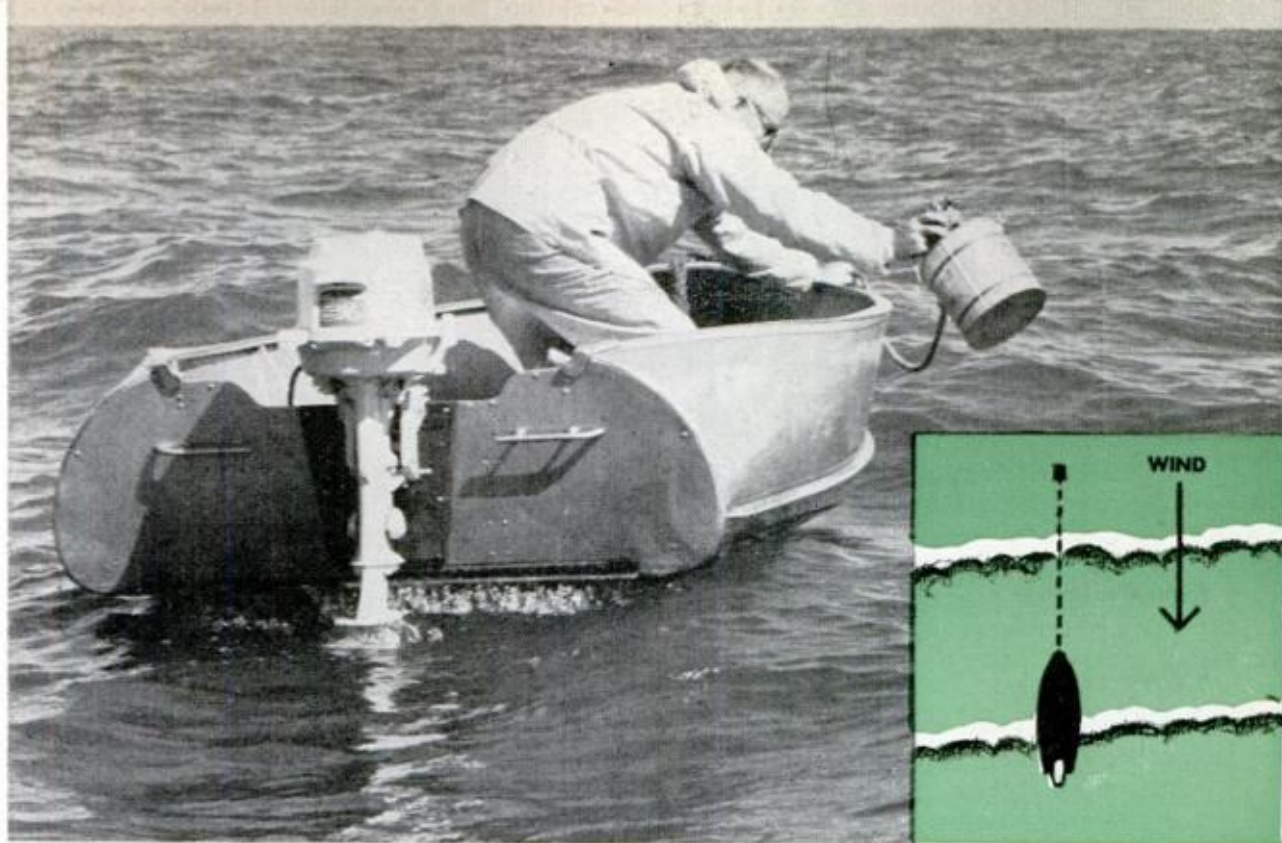
**SOMETIMES YOU CAN** beat a diagonal course through waves too high to take any way but on your bow. Watch the interval between crests until you've learned the timing, then make your lateral time between crests, turning back into the wind in time to take each wave dead ahead. It's tricky, but it works

## YOU CAN GET THERE THROUGH IT . . .

**TURNING AROUND** or changing course is another trick that takes some timing. As you pass through a crest, put the tiller hard over (warn your crew to brace themselves) and make your turn in the quiet water of the trough. As you come about, pick up speed before the next crest hits. This works for docking, too







**IF YOU LOSE YOUR POWER**, most important thing is to keep your bow into the oncoming waves. Grab the oars and keep the boat headed upwind while you rig a sea anchor—anything that can be dragged on the end of a line tied to the bow. A minnow pail, jacket or almost any light, bulky object will do the job

**OR, IF YOU CAN'T MAKE IT . . .**

**IN A PINCH**, get ashore any place you can. Ideally, run in to a beach downwind, timing your speed to the speed of the waves so you come in riding a crest. As you hit bottom, tilt the motor up, get out fast, pull the boat ashore as far as possible and turn it around so the waves won't come in over the transom and motor







By Jim Whipple



## Electric drive could obsolete today's transmissions Chevrolet switching to single-leaf rear springs in '62

Electric transmission and drive train for your car the day after tomorrow? Maybe not so far fetched as it seems. Recently the **Reo (Truck) Division of White Motor Company** cooperated with Jack & Heintz in development of an electric drive system for the familiar 6x6 Army cargo truck now known as the M-24.

Clutch, transmission, driveshafts, differentials and axles are superseded by an engine-driven alternator that powers individual brushless induction motors integrated with each wheel. Engine-alternator power is multiplied into wheel torque by a series of silicone-controlled rectifiers which change the frequency of the current. The system permits the gasoline (or diesel) engine to run at the most efficient speed.

Now, here's the amazing part. This system is 1500 lb. lighter than the mechanical drive train which it replaces! The alternator which supplies the current weighs only 225 lb., a weight quite competitive with large passenger car automatic transmissions, and this for a 10-ton truck!

Application of this system to a passenger car would seem within the realm of possibility, and the benefits from a car-sized electric drive stagger the imagination: four-wheel drive with positive traction, fully independent wheel suspension, lighter weight, completely flat floor, even steering assist through application of added power to "outside" wheels when cornering!

A surer development for the immediate future however, is **Chevrolet's** switch back to leaf springs at the rear of one of their 1962 line (not Corvair). Not only will the new springs slated to replace current coils be leaves, they will be single leaves.

Reason for trend away from coil springs, used on **Chevy** since 1958, is principally one of cost. The coil setup requires four links with bushings, mounting brackets, etc.

**Chevy**, and others, went to coils in the first place because they give a softer ride than conventional multileaf springs, and eliminate the need for inserts of one kind and another to control interleaf friction.

Single leaf springs have equally soft action, and, of course, no interleaf friction. They are also lighter than the multileaf

jobs, so will benefit the ride by eliminating some unsprung weight.

You can bet that **Ford** and **Chrysler** will be switching to single leaf springs soon, as the advantages are compelling. The single-leaf idea, like so many engineering advances, has been around a long time. Cost of the tricky rolling process kept it from production for years. It was about ready in the early 1950's, but was sidetracked by development of air suspension — remember that?

Incidentally, the new single-leaf springs will be slated for **Chevy's** upcoming "semi-compact," a car sized between **Corvair** and the "full-sized" **Chevy**.

**Bucket seats** have blossomed out all over. Like the hula hoops that swept the country a few years ago, everybody's got one. The rush started with **Corvair's Monza** last year and now they're almost universally available. Latest bucket jobs are **Rambler, Olds F-85** and **Starfire, Buick Special, Tempest, Falcon Futura** and **Comet S-22**.

Individual seats with encircling backs and cushions contoured to position your "seat" have been around since the fringe-on-top days, but the recent revival was sparked by **Chevy's Corvette**, itself triggered by the rising interest in the bucket-seated imports of the mid-Fifties.

From the **Way-Out-Rumor-Department** comes word of a V-6 under development at **GM's** aluminum engine foundry in Flint. If this is targeted for production, it could be used in any of **GM's** medium compacts.

Or possibly **Chevy** is contemplating "bending" the flat, opposed **Corvair** engine into a "Vee" so that it can be fitted between the front wheels. One thing is sure—the V-6 is a highly practical engine. It saves space and weight over the in-line sixes and runs more smoothly in the bargain. If you've driven **GM's** light V-6 trucks, you'll know what we mean.

This column was premature in predicting that **Chrysler** products would retain the battery-saving alternator, as an exclusive. (PM March 1961). The **Autolite Company** is marketing an alternator, (compact and lightweight like **Chrysler's**), which will be seen on a number of 1962 models. ★ ★ ★





**AUTO-AIRPLANE** has detachable wings and tail assembly. On the road, these can be hauled behind the cab, or left behind and the cab used as a two-seat compact car. The car can do 60 miles an hour and the plane 100



## Wings Detach, Airplane Becomes Car in Five Minutes

Stormy weather need not detain pilots who fly car-planes. They can land on the nearest highway, detach the wings and drive away with the wings and tail assembly hooked on behind as a trailer.

The Aerocar, distributed by Aerocar International of Fort Worth, Tex., is powered by a 143-horsepower engine which drives a pusher propeller. The car will seat two passengers comfortably,

## Fire-Starting Pills

Starting a charcoal fire is a quick job with an innocent-looking white wafer the size of a seltzer tablet which you can hold in your hand for lighting, but which produces a 500-degree flame within 10 seconds. The flame lasts for 10 minutes.

The chemical tablets are safe enough to carry in your pocket; 15 of them come in a package smaller than a pack of cigarettes. Two of the wafers will start an average charcoal fire in 15 minutes, but can be safely extinguished if necessary. Available for \$1 a pack from Simpli-Fire, 1737 N. Western Ave., Los Angeles 27.





POPULAR MECHANICS

**OWNERS REPORT**

A NATIONWIDE SURVEY

BASED ON 1,745,989 OWNER-DRIVEN MILES



TEMPEST'S HANDLING CHARACTERISTICS prove it a quick and nimble car. Equal balance is somewhat offset by the heavy iron engine and rear wheel camber. Rear tends to "break away" on slick or loose road surfaces

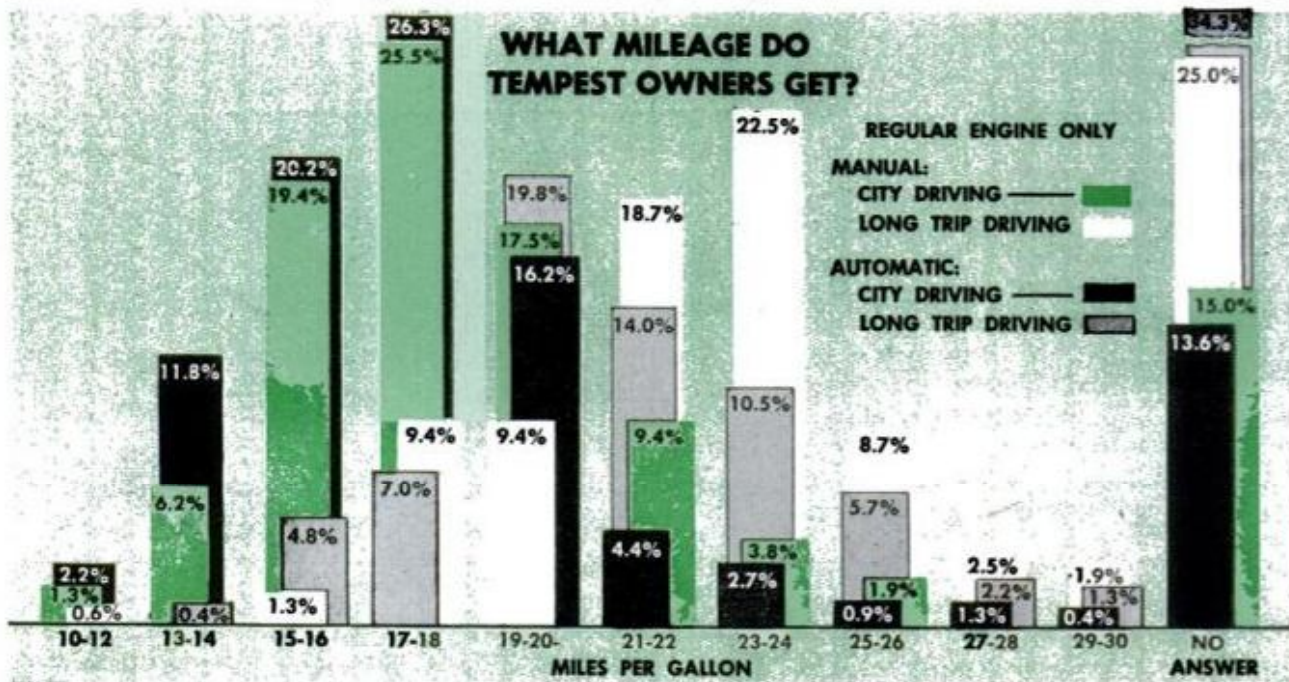
**WHAT TEMPEST OWNERS LIKE**

- Maneuverability
- Power Punch
- All-Around Roominess
- Clean Styling

**WHAT THEY DON'T LIKE**

- Low Gas Economy
- No Parking Gear
- Excessive Vibration
- Transmission Woes

TEMPEST OWNERS expected greater fuel economy with the four-cylinder engine. Graph shows that average falls between 17 and 18 miles per gallon, manual shift, city driving—between 21 and 23 m.p.g. on long trips





# Owners Rate Likeable New Tempest a Qualified Success

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

**S**ELDOM HAS A NEW CAR created as much of a stir as the Pontiac Tempest. Although a late entry into the compact arena, it seemed to have a ready-made following awaiting the simplicity and economy potential of a sturdy, four-cylinder engine plus the improved ride and handling that can result from independent rear suspension and rear-mounted transmission. Sales proved this as Tempest took off in the face of a general car-buying slump.

To find out how a "big" compact with simple lines, sophisticated engineering and a near-the-bottom price suited U.S. motoring tastes, *PM* polled a large group of owners.

A great majority of owners appreciated such Pontiac design objectives as comfort, roominess, ease of driving, economy and low price. And they said so.

But every silver lining must have its clouds; and Tempest is no exception. Disappointment of some owners with production flaws is reflected in the acceptance figures. Of all owners who replied, 67.1 percent felt that the Tempest was Excellent, 27.3 percent said the Tempest was Average and 5.6 percent gave it a Poor rating.

This would seem to indicate that the Tempest is a qualified success when compared for example with the rating of the new Buick Special which shares the same basic body with the Pontiac compact (*PM*, March 1961).

The Special received an 85.4 Excellent percentage, an Average rating of only 12.5 percent and a Poor percentage of just 2.1 percent.

Most Tempest-owner disappointment stemmed from clutch, transmission problems followed by complaints of exces-

*Pontiac is right, there seems to be a groundswell of public desire for a return to simplicity of four cylinders, stick shifts and unwrapped windshields, and the Tempest fits right in—it's a sort of streamlined, wide-track Model A.*

*Many owners who rated their Tempests Excellent did so in spite of annoying faults. Others gave car an Average rating due to just one production-line "bug." But almost all owners felt that the car had a lot to like.*

**"MADE-TO-ORDER" HUMP** in the road gave us a chance to try out Tempest's independent front suspension which proved to be adequate to handle this car's relatively light weight with considerable comfort







**THOUGH STICK SHIFT** falls to hand, some owners found shift "throws" a bit long



**TEMPEST'S LUGGAGE COMPARTMENT** is fairly roomy and wide but the spare tire placed flat on the floor usurps valuable space

**Over-all mileage on PM's test car was 16.8 m.p.g. for vigorous driving in city and fast driving on open roads. It reflects the big four's greater consumption in stop-and-go traffic.** →

**He's right, Tempest has a good ride on almost all road surfaces and handles well without need for power steering. Its weight distribution is closer to 50-50 (sedan with four-cylinder engine) than most other compacts.** →

sive engine or driveline vibration and topped off with poor fuel economy.

This last point would seem to be as much a result of over optimistic advertising and early publicity as of engine thirst on the highway. PM's fuel meter showed the test car, a sedan with manual shift and 110-horsepower four-cylinder engine, to be satisfactorily economical at constant speeds.

- 27.0 miles per gallon at 30 m.p.h.
- 26.5 miles per gallon at 40 m.p.h.
- 23.5 miles per gallon at 50 m.p.h.
- 21.8 miles per gallon at 60 m.p.h.
- 17.6 miles per gallon at 70 m.p.h.

(Figures are compensated for speedometer and odometer error.)

*But, to get at the heart of the matter, here in the order of frequency of mention are owner statements illustrating the six best-liked features of the Tempest.*

"It responds quickly to every command and executes each with greatest of ease. I never realized before what true balance could mean in riding and driving pleasure."—New Jersey salesman.

"I was looking for driving comfort and economical transportation in a compact, and I believe this Tempest is my answer."—Georgia auditor.

"This car is a pleasure to drive and maneuvers nicely on narrow highways."—Iowa farmer.

"I drove 200 miles in one of the worst blizzards I ever experienced and my Tempest handled beautifully."—Massachusetts engineer.

"It steers, holds the road and handles like a heavier car."—Minnesota welder.

"Rides well and is no problem to park."—Tennessee basketball coach.

"On long trips, this car is very comfortable due to the independent suspension of the rear wheels."—New Jersey expediter.

"Individual wheel suspension takes the bumps easily."—Michigan teacher.





**THOUGH IT MAY APPEAR** a bit busy, Tempest's engine compartment makes routine servicing very easy



**EVEN LONG-LEGGED** six footers won't find too much to complain about concerning rear seat compartment

"Excellent horsepower to total weight ratio."—Michigan machinist.

"This four cylinder engine has good pickup."—New Jersey fireman.

"Engine gives plenty of smooth-running power and pep in city driving."—Tennessee merchant.

"The sculptured lines along the sides and the grille give this a clean, smart look."—New Jersey salesman.

"We think the over-all appearance, interior and exterior, is exceptional for a compact."—Wisconsin collection manager.

"A 'just right'-sized car and wagon with plain, clean, smart lines that are most sensible and practical."—New York bulldozer operator.

"I am a tall person and I appreciate the comfort and leg-room, plus the economy and big-car look built into this compact car."—Virginia serviceman.

"The Tempest makes more use of its body space than most cars—has more room than a 1961 Chevrolet Impala."—Ohio technician.

"Tempest's seats are nice and wide and I like the smaller floor hump."—Ohio druggist.

"Gone is the tunnel from the floor."—New Hampshire state official.

"My new Tempest is easy to get in and out of and has plenty of back-seat and foot room."—W. Virginia retiree.

"With the transmission in the rear there is all kinds of leg-room in front seat area."—Maryland service man.

"Rides like a big car, handles like a baby, eats like a pony instead of a horse. They out did themselves and all the rest in building this car."—N. Carolina merchant.

"I have not kept record of gas mileage but I know it is exceptional—I'd say 30 miles per gallon anyway on regular gas."—New York retiree.

"Costs less to run."—Ohio laborer.

"Gas mileage is good. Economical to run."—Ohio salesman.

*The other side of the picture includes a few complaints. Here they are, numbers one through six in order of frequency of mention.*

"It seems this car likes gas stations. Why couldn't the

**This is especially true with manual transmission.**

← **Tempest really hauls the mail when you floor it in second gear. Very few owners felt that Tempest was under-powered in its role as a family car.**

**Tempest's roomy, three-passenger front seat, with almost non-existent transmission bulge**

← **is a great selling point for the transaxle, and especially valuable on a compact car where leg-room is at a premium.**

**You'd have to drive in your stocking feet to squeeze that kind of mileage out of a Tempest. In Mobilgas Economy run, top Tempest scored just over 25 miles per gallon.**



**Fewer cylinders won't get you more mileage if the engine's cubic displacement is greater and the car weighs more than its many-cylindered competitors.** →

**We were amazed at the numbers of people who miss the time-saving transmission parking pawl, especially with Tempest's easy-to-apply pedal-type parking brake.** →

dealer give me an idea of the mileage to expect when I bought the car?"—Massachusetts restaurant owner.

"Gas mileage is very bad. After having been told I would average 25 m.p.g. over-all, I am only getting 14.5 m.p.g. over-all."—Iowa tabulator.

"I am happy with 18 m.p.g. but it seems to me a four-cylinder car should do a little better."—New Jersey sign painter.

"It does provide good transportation but is far short of the highly-touted advertising promises of economy and performance."—Wisconsin social worker.

"The fantastic gas mileage reported in some magazines was a big factor in my choosing this car. However, the Tempest has fallen far short of the 22-23 m.p.g. over-all which these magazines talked about."—Pennsylvania photographer.

"The four-cylinder engine requires premium fuel—taking the car out of the economy class."—Illinois salesman.

"There's no parking position in the transmission. This is very bad."—Virginia serviceman.

"Have to depend solely on brakes in parked position."—Maryland electrician.

"I think it should have a parking position on the automatic transmission and I think the lever and position indicator dial are in the wrong places."—Ohio machinist.

"Where's the parking gear on this transmission?"—Ohio salesman.

"Too much vibration in the drive shaft. Too many different noises in the power train—chirps, throbs etc."—Michigan foreman.

"Rods knock underneath the car on rough roads and when idling. I set the idle speed up to stop this and the dealer keeps setting it back."—Tennessee electrician.

(Continued to page 246)

## SUMMARY OF OWNERS REPORT:

EXCELLENT 69.1%    AVERAGE 25.6%    POOR 5.3%



### Satisfied manual economy?

Yes, satisfied ..... 61.8%  
No, not satisfied ..... 38.3%

### Satisfied automatic economy?

Yes, satisfied ..... 65.0%  
No, not satisfied ..... 35.0%

### Satisfied V-8 engine economy?

Yes, satisfied ..... 40.0%  
No, not satisfied ..... 60.0%

### Best-liked features

Handling ease ..... 73.7%  
Riding comfort ..... 33.2%  
Power, performance ..... 31.5%  
Styling ..... 28.6%  
Roominess ..... 21.8%  
Economy ..... 19.8%  
Compact size ..... 14.1%  
Easy to park ..... 11.9%  
Roadability ..... 11.2%  
Steering ..... 10.7%  
Traction on snow, ice ..... 8.7%

### Most-frequent complaints

Poor gas economy ..... 19.6%  
No parking brake on auto, trans. .... 5.7%  
Excessive vibration ..... 5.5%  
Transmission ..... 5.5%  
Inferior paint job ..... 4.7%  
Clutch troubles ..... 3.5%  
Heater, defroster ..... 3.5%  
Lack of gauges ..... 3.2%

### Had mechanical trouble?

No, no trouble ..... 55.8%  
Some trouble ..... 35.5%  
Considerable trouble ..... 8.7%

### What was trouble?

Clutch malfunctions ..... 18.9%  
Automatic transmission ..... 6.2%  
Radiator ..... 5.5%

### Best-liked exterior features

Simple, clean styling ..... 16.9%  
Front end ..... 9.9%  
15-inch wheels ..... 9.0%  
Absence of frills ..... 8.7%  
Grille ..... 7.7%

### Least-liked exterior features

Bumpers ..... 11.9%  
Rear end ..... 11.7%  
Door locks ..... 3.7%  
Large windshield ..... 3.2%

### Best-liked interior features

Upholstery ..... 17.1%  
Instrument panel ..... 16.9%  
Comfortable seats ..... 12.1%  
Reduced trans. hump ..... 10.4%

### Considered another compact?

58.6%  
Falcon ..... 26.3%  
Corvair ..... 20.8%  
Comet ..... 19.5%  
F-85 ..... 16.1%  
Buick Special ..... 10.6%

### Tempest only car in family?

Yes, it is ..... 58.1%  
No it is not ..... 41.9%

### Make of other car

Pontiac, other G.M. make ..... 30.3%  
Ford, other Ford Co. make ..... 6.5%  
Chrysler Corp. make ..... 4.0%  
Other U.S. make ..... 3.7%  
Import ..... 4.0%

### How is dealer service?

Excellent ..... 61.6%  
Average ..... 30.6%  
Poor ..... 7.8%

### Would buy from him again?

Yes, would buy again ..... 63.0%  
No, would not buy again ..... 9.9%  
No answer, don't know ..... 27.1%

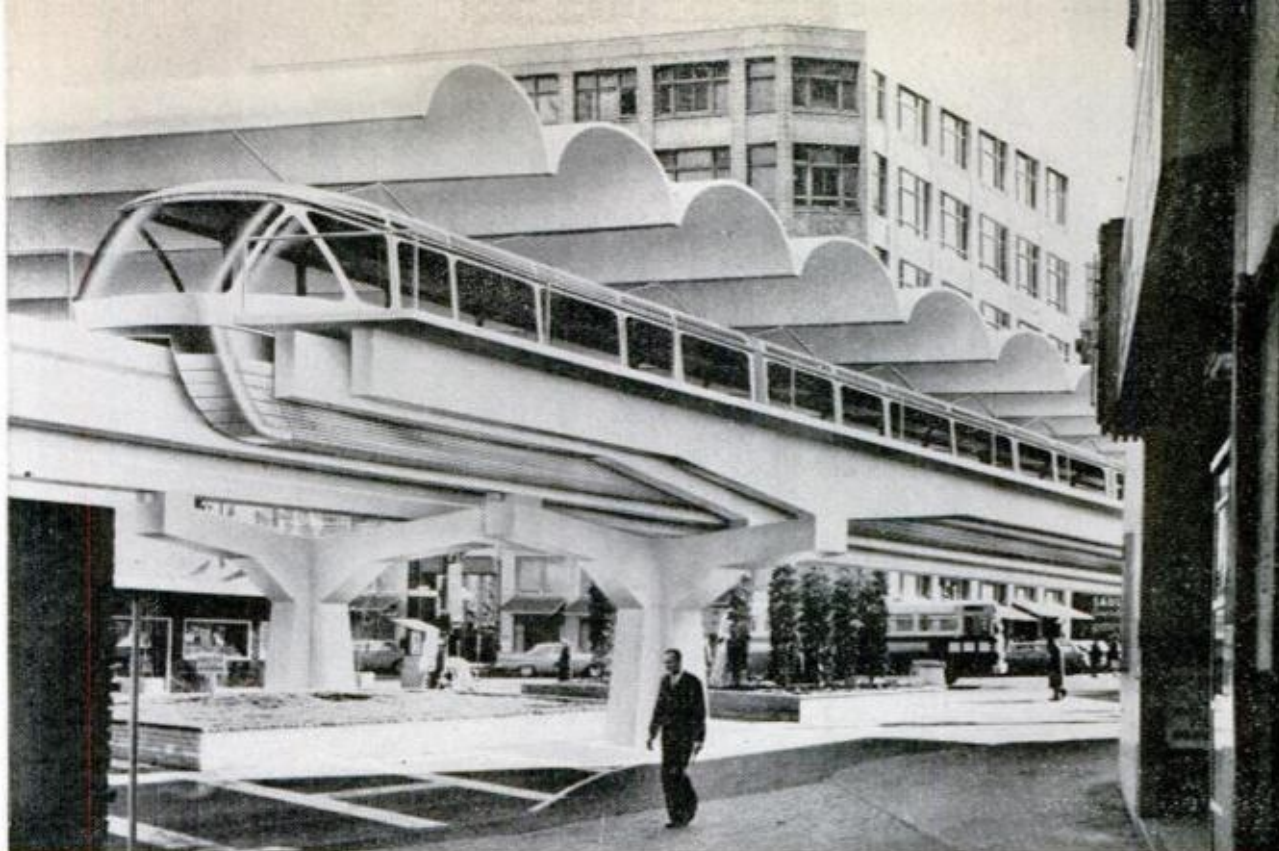
### Make of car traded in

Pontiac ..... 28.8%  
Other G.M. make ..... 25.3%  
Ford ..... 9.2%  
Other Ford make ..... 3.5%  
Plymouth ..... 5.2%  
Other Chrysler make ..... 3.2%  
Other U.S. make ..... 5.0%  
Import ..... 7.2%

### Would buy another Tempest?

Yes, would buy ..... 21.1%  
No, would not buy ..... 30.1%  
Undecided, don't know ..... 48.8%





## Monorail Trains Will Carry Visitors to Space-Age Fair

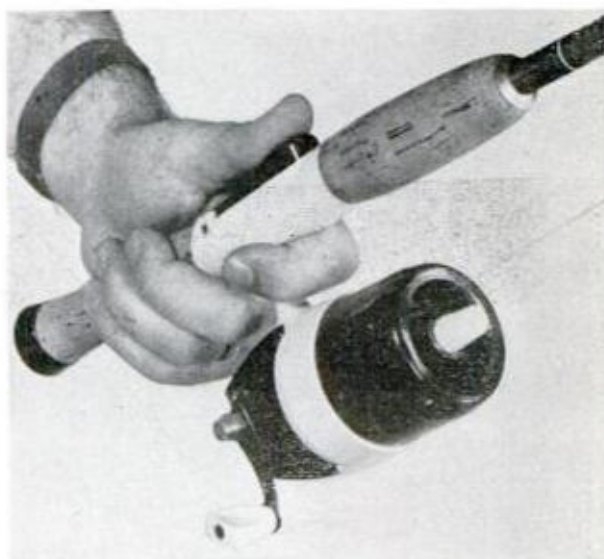
Four-car, high-speed monorail trains will carry 10,000 passengers an hour from downtown Seattle, Wash., to the site of the Century 21 Exposition nearby. The elec-

trically powered trains and their unusual track structure, shown in the drawing, are now under construction for service at the space-age world's fair, opening in 1962.

## Push-Button Spinning Reel

First merger of the convenience of the spin-casting reel and the efficiency of the more-difficult open-faced spinning reel, a new built-in reel is operated during the cast by a thumb control button that's built into—or through—the rod handle.

There's no need to handle the line at all; you depress the button to prepare for the cast, release it to allow the line to pay out, then depress again to stop the line. The line pickup is automatic when you start the retrieve. The Bronson 63 reel comes built into its own 6½-foot rod, already filled with monofilament line. Another feature is a "unitized" drag. Price is \$32.95; made by Bronson Reel Co.



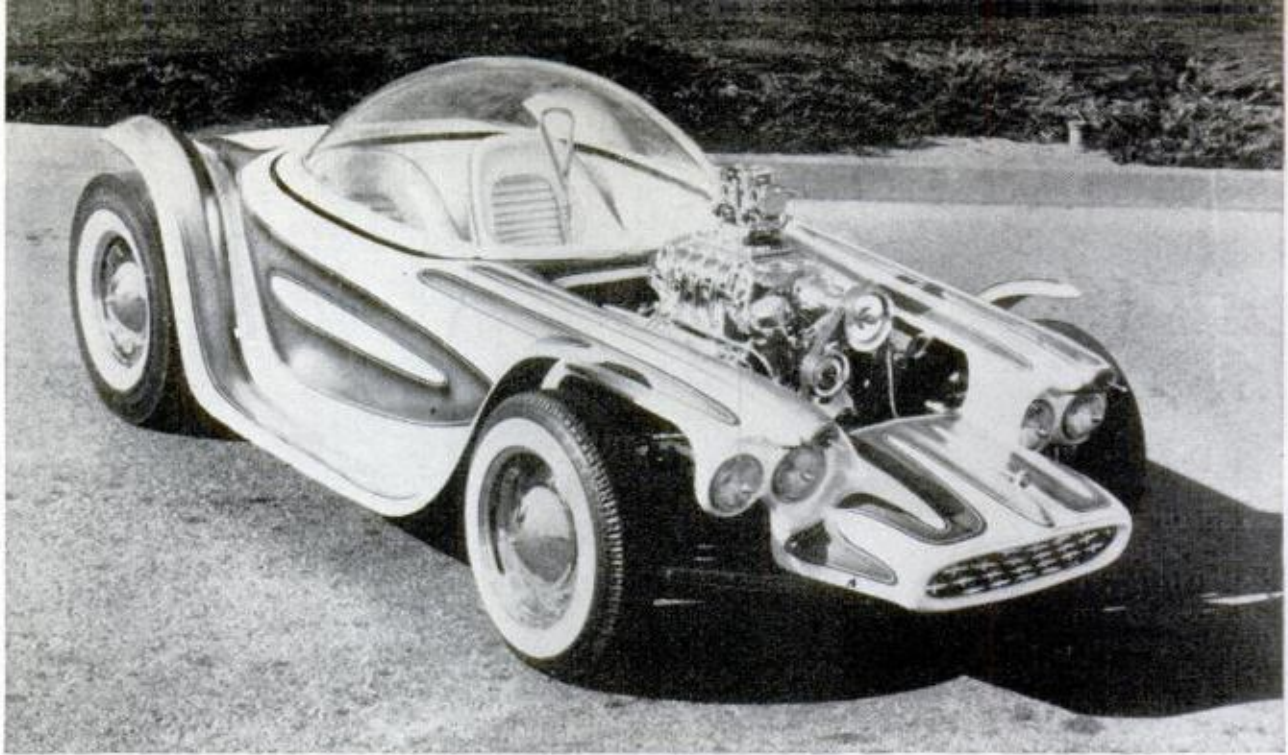
## Pocket-Sized Translator

Over 145 commonly used expressions are at the finger tips of a traveler who carries a language translation guide. At the turn of a knob, he brings into the viewing panel an expression in English along with its foreign pronunciation and spelling. The guide is available in German, French, Italian, Spanish, Swedish and Yiddish.

The plastic-cased unit, about the size of a pack of cigarettes, is made by Byrd Plastics, Inc., 12th and Byrd Drive, Erie, Pa. It sells for \$5.







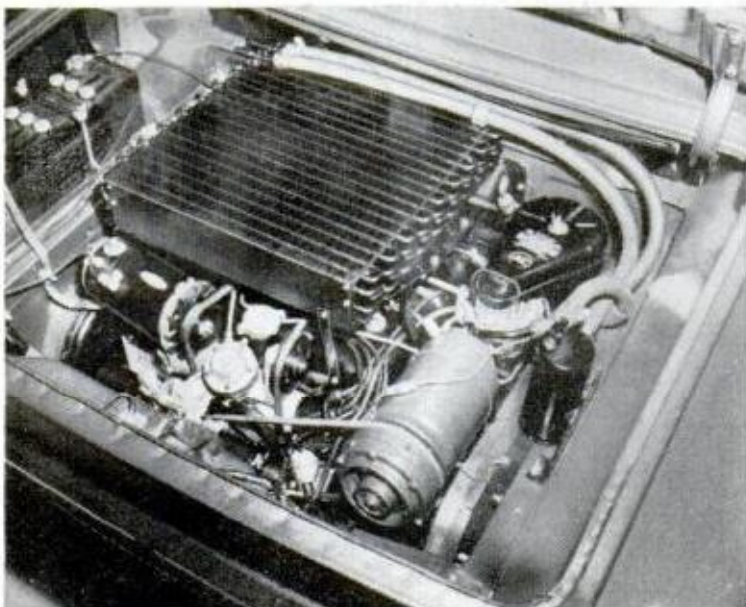
## Bubble-Domed Roadster Is Radio Controlled

Built on the frame of a 1950 Oldsmobile, this bubble-domed custom roadster is radio controlled. It may also be guided by a driver operating the lever that can be seen inside the dome.

Dubbed the Beatnik Bandit, the car was hand built by Ed Roth of Maywood, Calif.

The body is formed from fiberglass, and the engine is an Oldsmobile power plant. The dome is plexiglass.

The lever at the driver's seat takes the place of the conventional steering wheel, brake pedals and accelerator; it controls all three functions.



## Corvair Air Conditioner

Factory designed and installed, the first air conditioner made especially for rear-engine cars was recently unveiled by Chevrolet for use on the Corvair.

Its condenser mounts horizontally over the engine fan and its compressor is driven by separate belt and pulley. The oil dipstick and filler cap remain accessible for normal servicing. However, the spare tire must be moved to the front luggage compartment.

In the passenger area, the evaporator and blower are mounted under the dash to leave footroom unimpaired. Of the three air outlets, the center one has adjustable louvers to direct air flow. Controls are mounted under the radio.

☐ Paleontologists can read the temperatures of oceans as they were thousands of years ago. They measure the amount of oxygen 18, an isotope, in fossil shells. It varies according to chilliness or warmth of sea at any given time.

☐ Most chemical elements are metals. Only 20 of 103 identified elements are definitely nonmetallic.

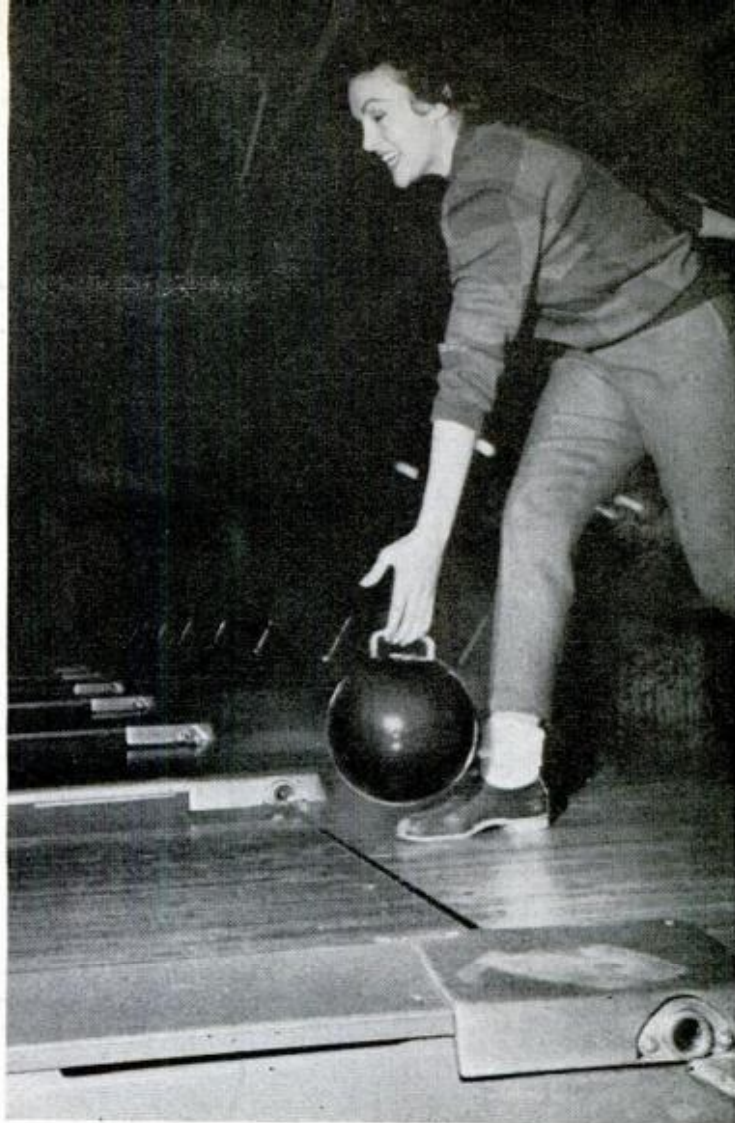




## With a Handle, Yet

First new development in bowling since the automatic pin setter is a bowling ball with a handle. It is identical to the standard ball except that it has a retracting handle instead of finger holes.

In use, the bowler picks the spring-loaded handle out of its recess and holds the ball just like a suitcase. In the delivery, the handle snaps back into its recess before the ball reaches the alley. The handle gives an easier grip and better control, especially to new bowlers. Made by Natural Grip, Inc., 20 E. Delaware, Chicago, Ill.

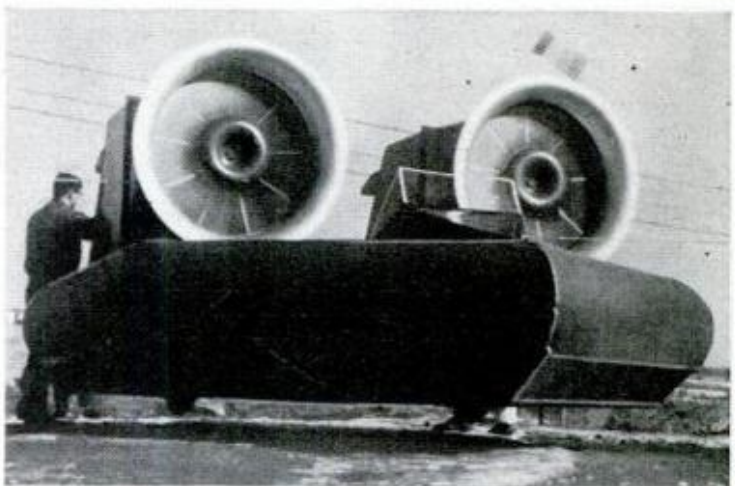


## Air Car Powered by Turbines

Delivered to the Marine Corps, a ground-effect machine is believed to be the first ever powered by gas-turbine engines.

About 22 feet long and 12 feet wide, the machine is capable of lifting twice its gross weight of 1800 pounds and traveling at speeds up to 30 miles per hour.

Control is achieved through deflection of the air stream from the engines by multiple vanes in the nozzles around the bottom of the machine. Manufacturer is National Research Associates.



## Sparkling Conversation

Voices travel on reflected sunlight between the transmitter of a solar phone, left, and the receiver. The youngster's voice causes the mirror to vibrate which makes the reflected light pulsate. A photoelectric cell in the receiver converts the pulsations to electrical impulses which are heard as sounds through the earphones.

The solar phone is made by Hearever Co., Castro Valley, Calif.





Born in Russia in 1889, Vladimir K. Zworykin has traced through the years a bright path in electronic research. He became a U.S. citizen in 1924. He has received numerous awards and, since 1954, he has been an honorary vice-president of R.C.A. Laboratories



## My Most Exciting Moment

SELECTING THE BRIGHTEST or most stimulating experience in a long career is a task comparable to that of selecting the most significant single frame in a feature-length motion-picture film. Except in those rare instances when a Newton experiences a flash of genius at the drop of an apple, or when a Hillary stands for the first time at the summit of the world, our greatest moments are likely to become evident only in retrospect, gaining their special significance within the context of other events before and after.

Out of many such moments which come to mind over a 50-year span, my choice is an event which was almost casual at the time and has become truly exciting only in association with all that has followed. It is a moment of discovery, but one in which my role was that of the discovered rather than the discoverer.

The place was the Institute of Technology at St. Petersburg, Russia; the year was 1910. The setting is important to an appreciation of the event, for in that era and that environment a pattern of rigid formality prevailed in the relationship between student and faculty.

I had arrived at the Institute with a happy thirst for advanced technical knowledge. The required courses left time for anyone so inclined to devote after-hours to exploring new types of experimental equipment which many of us, including myself, saw for the first time as students at the Institute. It was my keen interest in one such device—a novel type of vacuum system—which led in my third undergraduate year to a chance meeting and an opportunity of inexpressible value.

My preoccupation with the new vacuum machine after class hours drew the attention of a shy, middle-aged assistant professor who dropped in from time to time to inspect our work. Over a period of weeks he watched my efforts, gradually extending both his friendship and his guidance. Then, one unforgettable day, he disclosed that he was undertaking something new in his own basement laboratory at the Institute—a series of experiments in which he required the help of a young assistant. Would I consider joining him to work after classes each day? I most assuredly would—and did.

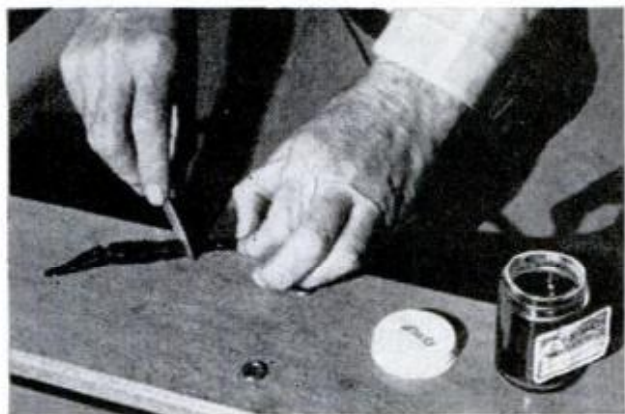
The professor's name was Boris Rosing. Only after I had accepted his offer did I discover the exact nature of his private experiments. He had conceived of a new approach to the problem, then virtually unknown, of picking up images by electronic means for transmission to distant points. Through the door which he opened at that moment of invitation, I stepped with him into a new and challenging field, following a path that led ultimately to the iconoscope and to the birth of modern electronic television.



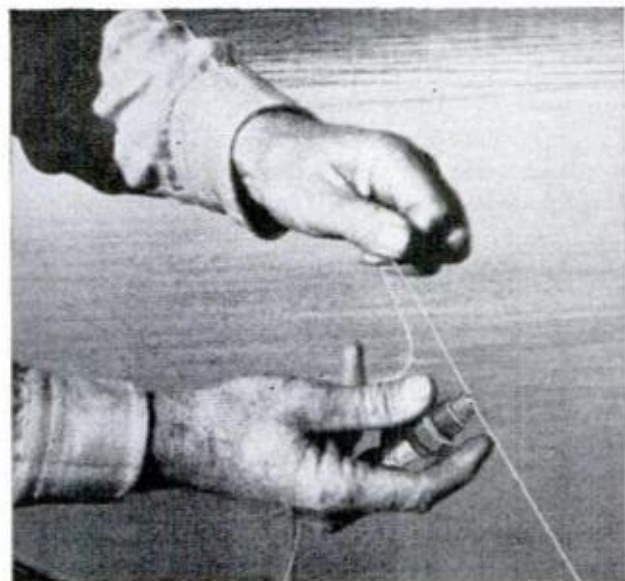
# Four for the Fisherman

LAST MONTH *PM* took you fishing with Harold Ensley of Kansas City, the world's champion fresh-water sport fisherman. While they fished, Ensley showed *PM's* photographer some tackle tricks that we hadn't seen before. There wasn't room for them in that issue, but we saved a set of four for this month, and here they are . . .

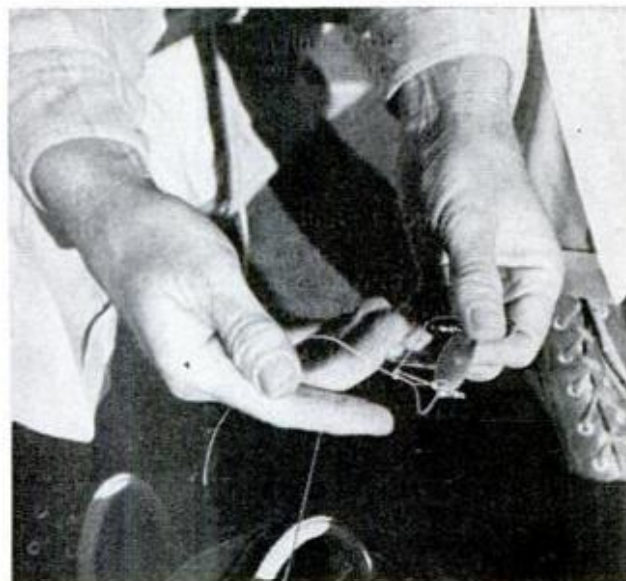
▶ **PLAYING THE "OZARK BANJO"** recovers a lot of deep-snagged lures. Move the boat over the snag, then stretch the line up as tight as possible and let it snap back. Snap works the hook down — and free



**YOU GET DOUBLE** the action from a pork-rind eel by adding a few more crosswise cuts than the manufacturer did. Lay the eel rind-side down and slice clear through the soft meat every quarter inch, leaving the tough rind for a hinge. One manufacturer liked this idea so well that he's doubled the cuts in his product



**FREE LURE RETRIEVERS** are available in any service station. Slip an old spark plug over your line by sliding the line between the electrodes. Pull your line tight, then let the plug slide down and bump the snagged lure loose. If the plug comes back with the lure, fine. If it doesn't, who cares?



**ENSLEY'S "PRIVATE KNOT"** is a dandy for heavy monofilament line. It's simply a cinch knot, made by threading the free end through the eye, wrapping it around itself and back through the eye loop—but he doubles the line first as shown. The line won't break at the eye as it does with ordinary knots

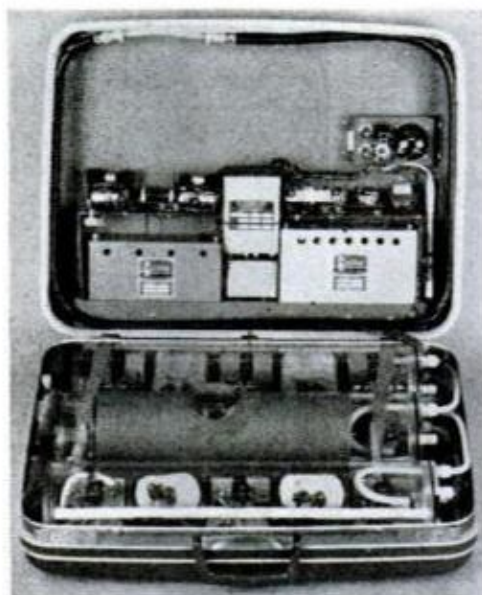




### Portable X-Ray for Battlefields

So compact it can be carried in a suitcase, a diagnostic field X-ray unit can be used in division areas by the U.S. Army. Previously a unit weighing 1000 pounds was used at supporting field hospitals immediately to the rear of the division.

The 85-pound condensed version could locate foreign bodies in wounds, diagnose fractures and examine internal organs without moving the patient.

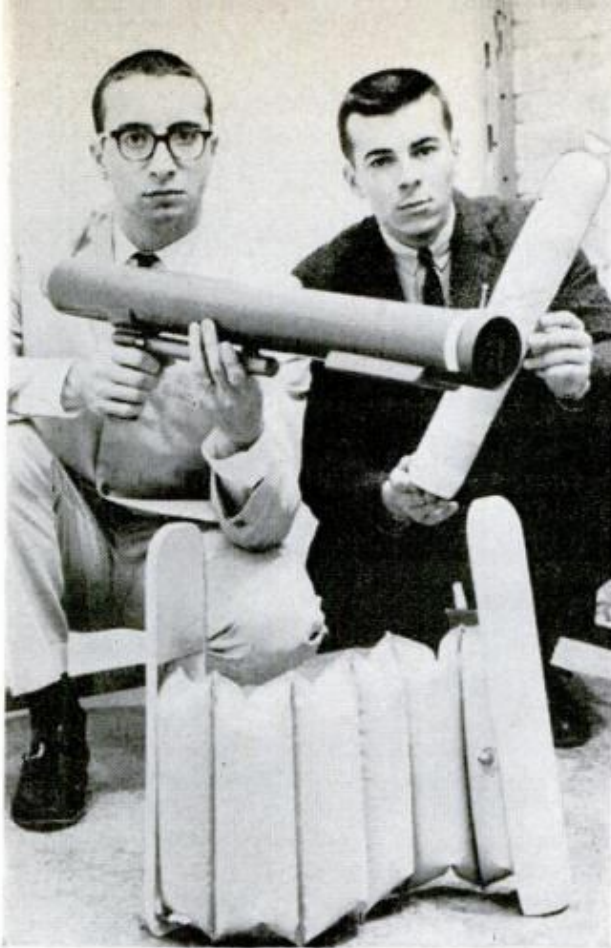


### Outboards Drive 40-Footer

Outboard power moves into big time on the 40-foot Elco cabin cruiser of Henry Verrier, Coventry, R. I. Verrier replaced the two 135-horsepower inboard engines in his 11-year-old boat with dual Johnson 75s. He was surprised to learn that their 150 horses moved the 11,000-pound boat five miles per hour faster than the old inboards.







## Bazooka Launcher Fires Lifesaving Missile

Lifeguards can get help to a swimmer in trouble in a hurry with a unique rescue "missile" which won a student design award from Alcoa.

Designed by Marshall Corrazza, left above, and Thomas Dulin, the aluminum bazookalike launcher uses a CO<sub>2</sub> cylinder

to fire the rescue missile, which inflates on contact with the water to make a life preserver capable of supporting two people for as long as eight hours. Another CO<sub>2</sub> cartridge inflates the sectioned plastic envelope. It gives much better distance and accuracy than hand-thrown life rings.

## Mobile Ready Rooms for Pilots

Ground-support equipment for Navy pilots at remote bases is contained in two trailers which can be set up and joined by four men within 10 hours.

One trailer is furnished as a dressing room and the other as a briefing room. An enclosed walkway connects them.

The dressing room contains storage lockers, toilet and shower facilities, drinking water, hot-water heater and special storage stalls for pilot pressure suits. The suits can be ventilated by connecting a hose to an air-conditioning unit.

The briefing and alert room contains 16 swivel-and-tilt pilot seats fitted with special writing arms for note taking. A closed-circuit television set provides the latest weather and alert information. Chalk and display boards can be used by briefing officers. Pilots wearing the pressure suits can plug them into the air-conditioning system through outlets located beside each seat, as shown.

The trailers were developed by Grumman Aircraft Engineering Corp.







**NOW IT'S** A sea-going sports car and this one takes to the water like a bug-eyed turtle. There's no elaborate launching process involved either—just shift to prop drive and the Amphicar is set to sail



## **PM Spotlights the**

**By Guerrino F. Amati**

**O**FF THE ROAD, down the ramp and into the water—and we weren't riding an Army Duck either. That is, not exactly.

To startled spectators, the rig under us looked like a cross between a sports convertible, and a snappy 14-foot speed boat. To tell the truth, it was both these rolled up into one neat little package—the Amphicar.

Powered by a Triumph four-cylinder engine of 43 horsepower, the Amphicar uses a standard clutch and four-speed synchro-

mesh transmission driving through the differential. The engine is mounted in the rear of the hull and “faces” toward the rear of the car.

Its power takeoff shaft continues forward to a transfer gear case containing reverse, neutral and forward gear positions. From this point the drive separates via two shafts running back to the twin propellers located in concave “wells” in the hull on either side of the engine. Driving gear permits use of

**IF PASSENGERS** look unconcerned it's because those doors are sealed watertight with double gaskets







**BACK UP** the ramp with the props and rear wheels going simultaneously. Brakes are standard shoe-type hydraulics which can't be waterproofed—this prohibits salt-water use without constant flushing out

# Amphicar

props and wheels simultaneously for added power in scrambling up onto the beach.

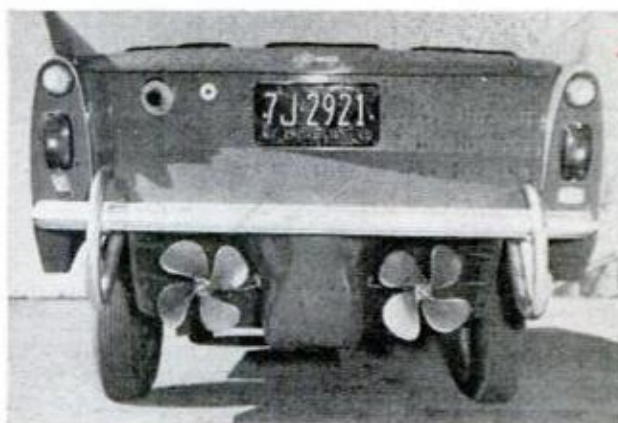
The doors are made completely leakproof by means of double rubber gaskets, and there are additional safety latches—in case someone decides to take a walk. Windows are roll-up type and the top, of course, is a fabric convertible.

Optional equipment includes an electric bailing pump to cope with splash or a wet emergency. Standard equipment—a heater and U. S. Coast Guard navigational lights.

**What's it like to "sail?"** Maneuverability is better than you'd think. The front wheels take the place of rudders, deflecting the water stream to either side as you turn the steering wheel. In water, speed is about eight knots. Land speed, about 75 m.p.h.

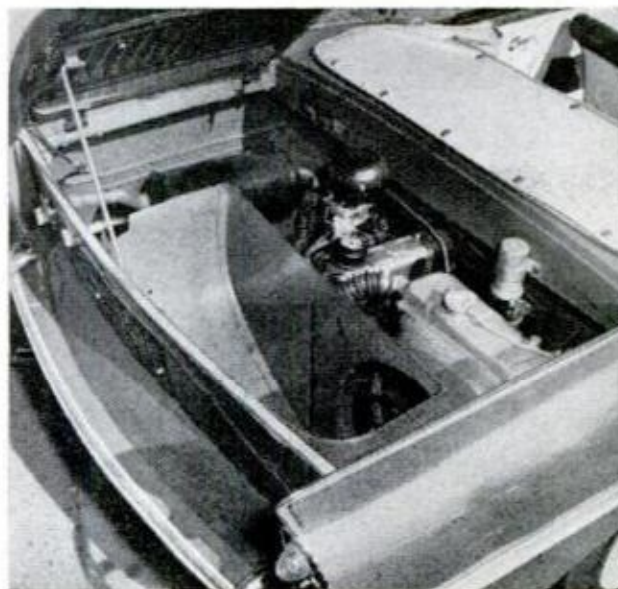
The car is roomy, holding four or five average-sized adults and there's no roll, even if someone stands up. Freeboard from the water line is about 14 inches with two or three passengers aboard. However, a real choppy sea would be dangerous as it might send water down the engine louvers.

The Amphicar rides along on an 83-inch wheelbase and because its springs are necessarily small, the ride is a bit choppy on rough roads. All in all, it is a remarkable design, and though it loses a bit both as car and as boat because of its inherent compromises, it can be one whale of a lot of fun—on land or lake. ★ ★ ★

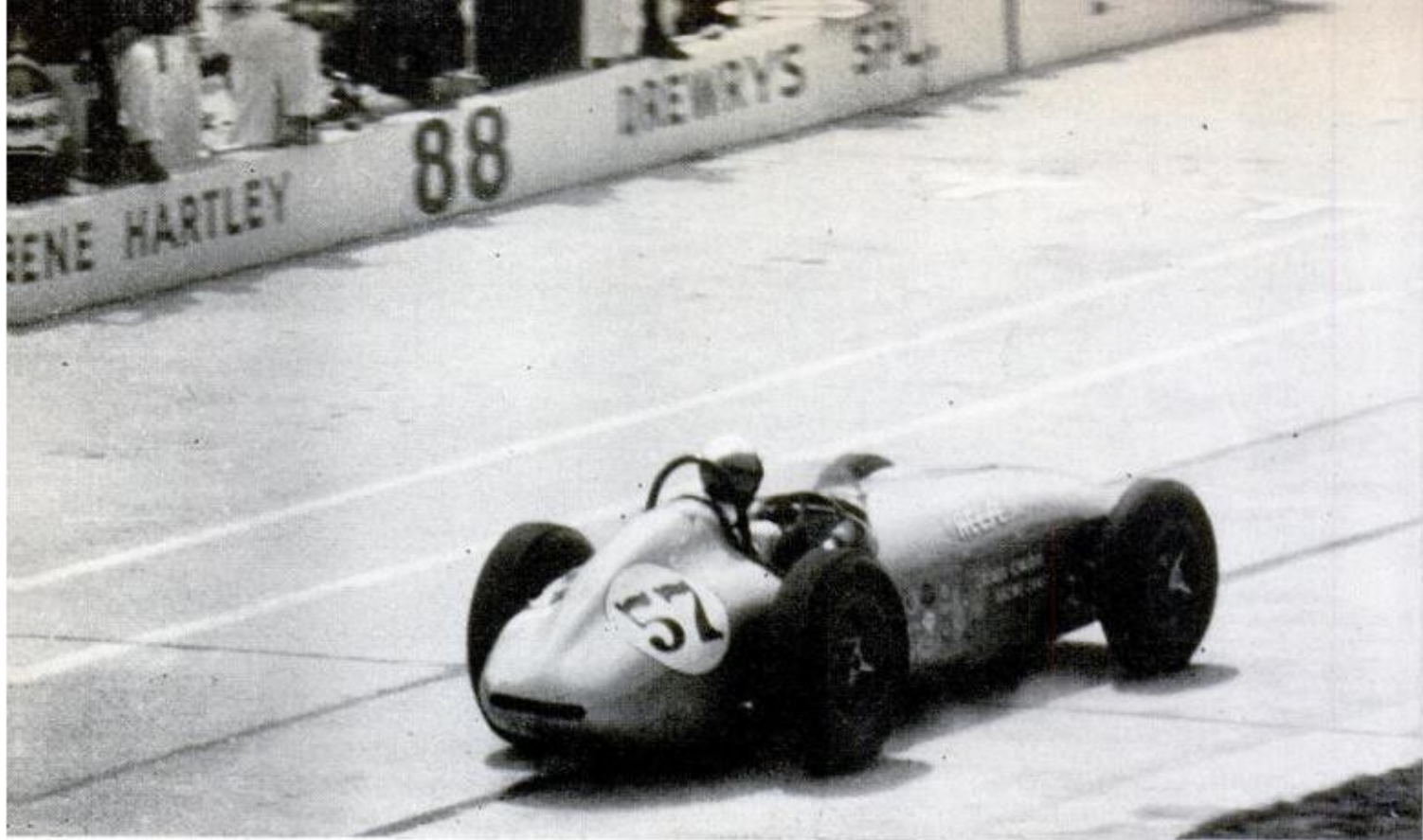


**HIGH UP** and tucked under the "hull," twin props ride clear of the road so there's no chance of dragging

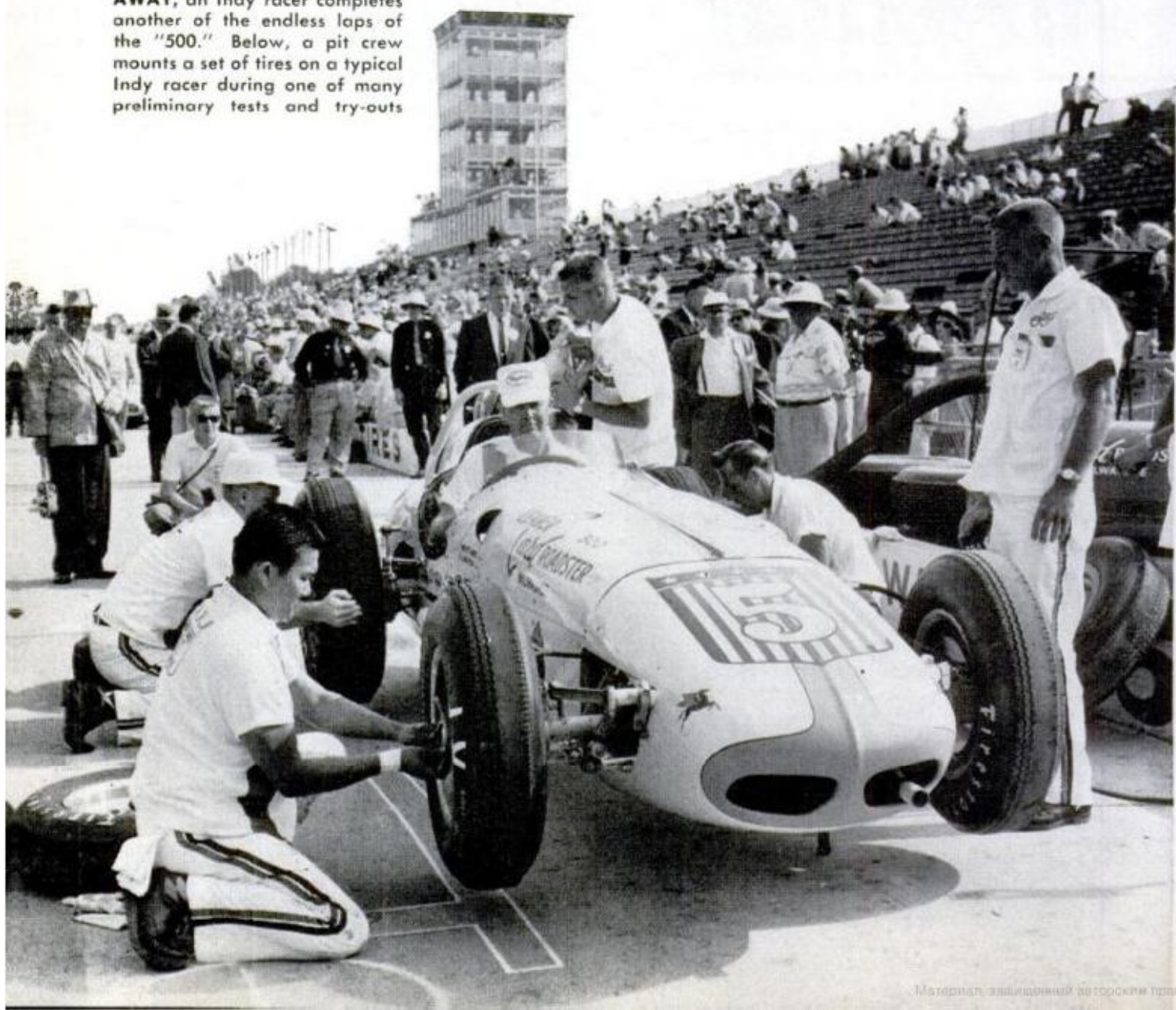
**WATER-COOLED ENGINE** draws air through radiator, forces it back up through louvers in the rear deck







**ROARING DOWN STRAIGHT-AWAY,** an Indy racer completes another of the endless laps of the "500." Below, a pit crew mounts a set of tires on a typical Indy racer during one of many preliminary tests and try-outs





# Tire Tailor for the Indy 500

By Jim Whipple

**F**IVE HUNDRED MILES in just over three hours. That's what 33 determined drivers attempt on the sun-baked oval of Indianapolis' famous "brickyard" each Memorial Day.

The winning driver will have to average close to 140 miles-per-hour on the 2½-mile track, which means he'll accelerate to over 180 m.p.h. in the straights and brake down to about 133 m.p.h. before clawing his way through the curves in a controlled drift.

In an afternoon full of uncertainties, the most predictable items involved in that endless left turn called the Indianapolis "500," are the racing tires.

Oil lines may fail, engines seize up, and axles snap, but rarely if ever, does a tire blow, in spite of internal air temperatures hot enough to boil water.

Tires wear, of course, as the hours of scuffing, sliding and braking on the sizzling asphalt and brick pavement take their toll of tread. So much so, in fact, that tires have to be changed twice during the race.

What makes an Indianapolis "500" tire able to take such punishment at more than double the speed of today's fastest turn-pike drivers?

To find out, we went to Akron, Ohio for a visit to the Racing Department at Firestone Tire and Rubber Co. This seemed to be the logical place to go, as Firestone has

been virtually the sole supplier to Indianapolis racers for the past 38 years.

The first thing we learned is that there is nothing "outer space" about the Indy tires. To untrained eyes, yours and mine that is, they look just like any first line 7.60 x 16 (front) or 8.00 x 18 (rear) shoes.

And they are made on exactly the same principle as the tires on your own car. They are molded of rubber around cords of nylon yarn and reinforced with wire strands at the beads.

But here the resemblance ends. The Indy "500" tires are made with the loving care that a master tailor would lavish on a suit destined for a Wall Street magnate or a movie star.

It takes a skilled workman about 8 to 10 minutes to build a first-line production tire from component parts of cord-ply, tread and bead rings.

The same process on an Indy race tire occupies the attention of a master tire-maker such as Henry D. Streib who takes as long as he needs to achieve the most perfectly constructed tire possible—usually about an hour and fifteen minutes.

Master race-tire builders, like Henry, average over 30 years of tire-making experience. The room in which they work seems more like a Swiss watch factory than part of a giant tire plant.

However, there's more than craftsman-

**1. BUILD-UP OF THE TIRE** begins as "tire tailor" measures sheet of cord ply for the body of the racing tire



**2. "TAILOR" LAYS ON** thick tread strip of natural rubber over six ply body of tire on revolving drum







**3. "GREEN" TIRE** just off building drum goes into forming machine, with rubber doughnut tube inside



**4. AFTER FORMING MACHINE** has pressed the soft "green" tire around the doughnut, it is ready for curing

ship alone in the making of an Indy tire.

The entire racing program is backed up with continuous research and engineering. Each tire is branded with an individual number and a careful record is kept of when it was built, when it was raced, and which car and driver used it. Thus the wear, life and performance of each tire can be recorded in a master data file.

The Indy tire starts with careful blending of crude natural rubber with carbon and other ingredients in a giant dough blender called a Banbury machine. After mixing, the uncured rubber is rolled out into strips of various thicknesses.

Natural rubber currently is used in race tires rather than synthetic because of better dimensional stability under the high heat generated at racing speeds.

The tires are six ply, with each ply made

up of hundreds of nylon cords sandwiched between two thin sheets of rubber. This ply sandwich is pressed between a series of rollers called calenders so that the cords are permanently embedded in rubber.

Before they meet the rubber, these nylon cords have to be carefully prestretched in a giant machine so that they will not "give" more than a predictable few hundredths of an inch during a race.

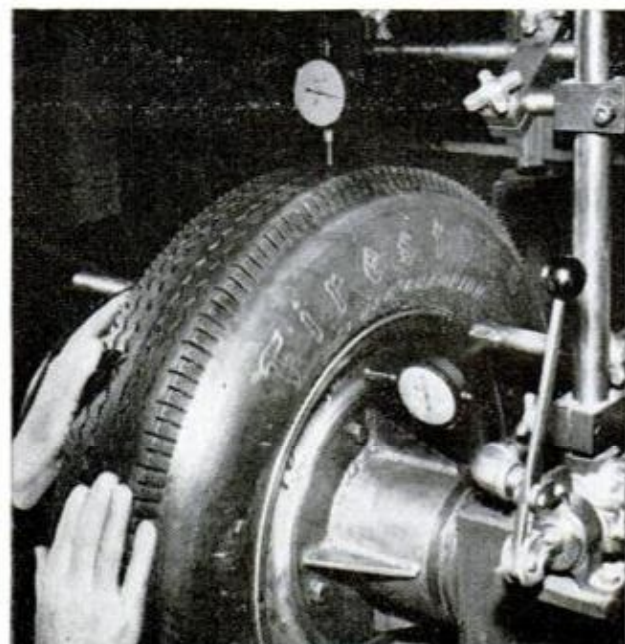
Up to this point the tire making has involved skillful production of raw materials; now comes the critical part of the entire process, the build-up of the individual tire by hand. This is the tailoring operation where skill and experience like Henry D. Streib's pays off.

Henry builds tires on a collapsible steel roller about the size of a small oil drum around which the sheet plies are snugly

**5. FINISHED TIRE** comes out of curing machine after baking for 1 hour and 20 minutes at 350 degrees F.



**6. INSPECTION** of finished tire includes gauge check to determine roundness within tolerance of .05 inch







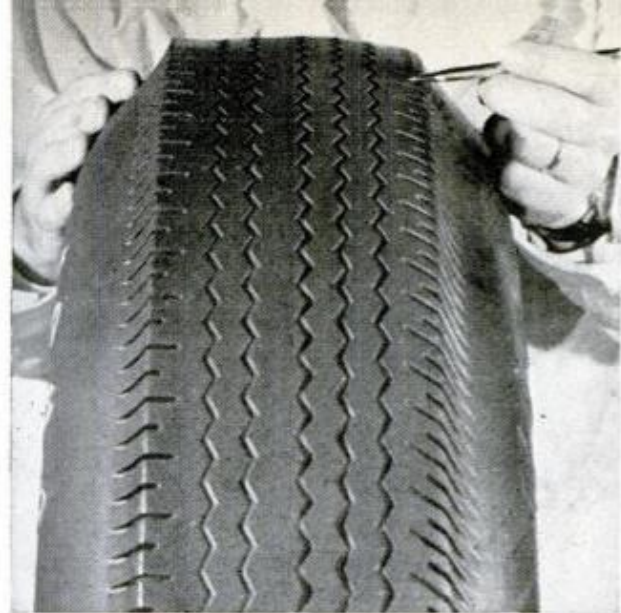
**7. STATIC BALANCING** of the finished tire with special spirit level checks possibility of heavy spots

wrapped with alternate layers set at opposing angles to one another.

As he wraps the plies, Henry adds the beads which are made of several strands of thin, copper-plated steel wire wrapped in narrow strips of cord ply.

#### **Applying the Camelback**

After building six plies and the beads the builder lays on the "Camelback" or thick solid rubber strip which is to form the tread. This tread rubber is blended to provide greater resistance to abrasive wear than the rubber in the body of the tires.



**8. INSPECTION SHOWS** contour designed to compensate for uneven wear caused by constant left turns

Next, the drum is collapsed and the "green" tire sleeve is moved over to the forming machine where it is pressed around a doughnut-shaped rubber air bag. This shapes the tire into approximately its finished form.

Up to this time, all the rubber in the tire has been in a basically plastic state, with the corded plies themselves behaving much like household friction tape.

The next operation is the curing. Rubber is a thermo-setting material which turns from a plastic to an elastic solid state

(Continued to page 252)

### **SCIENTIFIC TEST RUNS MAY IMPROVE NEXT YEAR'S TIRES . . .**

**AFTER THE COLOR** and excitement of the Indy "500" come the carefully programmed tire-test runs, using the tire builder's own car. This engineer is taking a reading of the internal temperature of the tire's tread rubber



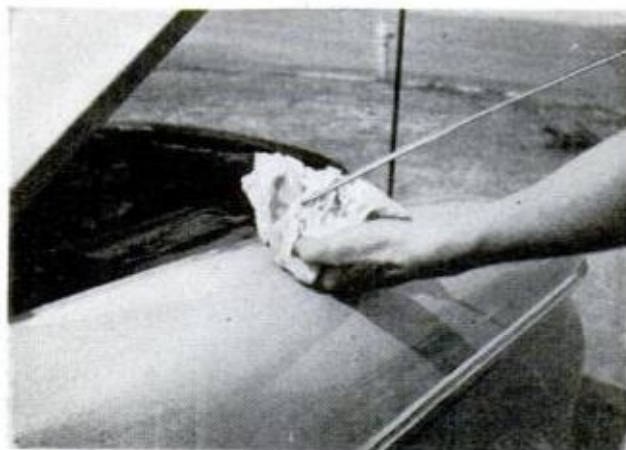


# Facts and Myths About When to Change Oil



TO EXTEND THE EFFECTIVE LIFE of your engine, change oil when it gets contaminated and "worn out"

**Confused by conflicting advice? Here are the positive results from a controlled experiment . . .**



**DON'T BE A DIPSTICK ANALYST.** Oil may look clean here but crankcase may be full of corrosive acids





**WHEN SHOULD** you change oil? Twenty-five years ago, when life and engines were a lot simpler, the stock answer was "Every 1000 miles."

This was what the man at the corner filling station told you. Chances are you followed his advice, unless you were one of those stubborn individualists who felt that oil was "just as slippery" at 2000 or 3000 miles. Such "over 1000-milers" usually governed their change interval by a pet figure such as 2000 or 3000 miles. Or, they simply changed at a convenient time when the oil looked "too dirty."

Today, however, all is compounded confusion. There are conflicting recommendations in the owner's manuals, ranging from 500 to 4000 miles. The advent of multi-

viscosity oils, and the controversy over detergent versus nondetergent oils has everyone bewildered.

Bring up the subject in a group discussion and you'll hear just as many answers as there are men standing around.

Someone will say "I change oil every 1000 miles in winter, every 2000 miles in summer."

He'll promptly be countered by another who says, "You're wasting your money. Today's oils are so good, all you need to do is keep them clean. Just change your filter every 5000 miles and switch to a lighter oil when winter comes."

A third will chime in with, "I change oil with the filter every 4000 miles." And so it goes.

## ARE CARS THIS DIFFERENT?

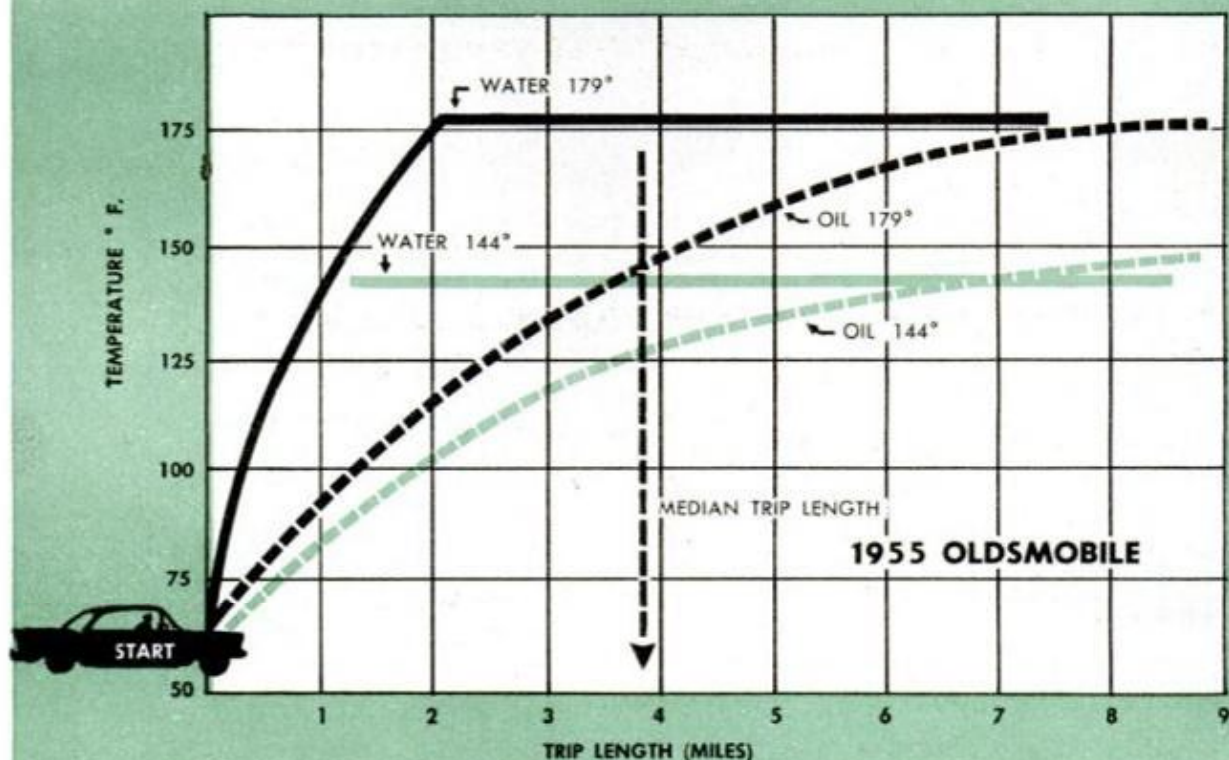
Manufacturers Recommend This Wide Range of Oil-Change Intervals for 1961 Models

<b>BUICK</b>	Long-trip driving	2000-3000 miles
	*Short-run, low-speed driving	Every 1000 miles
<b>CADILLAC</b>	Summer	Every 60 days or 4000 miles
	Winter	Every 30 days or 4000 miles
	Dusty or extreme conditions	Every 500 miles
<b>CHEVROLET</b>	Long-trip driving	Every 4000 miles
	Short-run, low-speed driving	Every 1000 miles
	Summer short-run driving	Every two months
	Dusty or extreme conditions	Every 30 days
<b>FORD</b>	Good climatic conditions	Every four months or every 4000 miles
	Short-run, low-speed driving or dusty, extreme conditions	"More frequently"
<b>CHRYSLER</b>	Long-trip driving	Every 2000 miles or every 60 days
	Dusty, extreme conditions, low-speed, short-run driving and general "hard use"	"More frequently"
<b>OLDSMOBILE</b>	Short-run, low-speed driving	Every 90 days
	Long-trip driving	Every 3500-4000 miles
	In general, depending on car and owner-dealer "understanding"	Between 1000-4000 miles
<b>AMERICAN MOTORS</b>		Every 1000-2000 miles
<b>STUDEBAKER- PACKARD</b>		Every 2500-3000 miles
<b>PONTIAC</b>	Long-trip driving "favorable" conditions	Every 4000 miles
	Summer, short-run, low-speed driving	Every two months
	Winter, short-run, low-speed driving	Every 30 days
	Dusty, extreme conditions	Every 1000 miles or every 30 days

\*Short-run, low-speed driving is here defined as trips of less than ten miles, under 35 m.p.h.



## EFFECT OF TRIP LENGTH ON TEMPERATURE AVERAGE CITY DRIVING



USE OF A HIGH-TEMPERATURE THERMOSTAT in the cooling system helps extend engine life by allowing the engine, and hence the oil, to warm up faster. This prevents condensation of blow-by gases into corrosive acids. Black lines on graph above show that oil reaches temperature high enough to stop condensation at 179 degrees F. on trip of seven miles. With a 144-degree thermostat (green lines) oil never reaches optimum temperature. In either case, a median trip of 3.8 miles, typical for most U.S. motorists, isn't long enough to warm oil sufficiently to prevent vapor condensation

As a matter of fact, they may all be right—the way your car is used is just as important a yardstick in determining when to replace oil as are either time or mileage.

To understand how different use-patterns shorten or lengthen the effective life of a crankcase full of oil, let's look at the proven causes of engine wear.

First, when there is not enough of an oil film between moving parts, the resulting metal-to-metal friction produces rapid wear. An insufficient oil film can be caused by a "thick" (or cold) oil that won't flow into closely fitted bearings, by sludge that blocks oil passages and prevents oil from reaching bearings, and by unburned gasoline that leaks down past the pistons and dilutes the lubricating oil film.

Second, abrasive wear starts when grit enters the engine lubrication system via the crankcase ventilation system and with air drawn into the combustion chambers.

Third, acids that cause corrosive wear are formed when your car's engine runs for

short periods of time and doesn't get a chance to warm up sufficiently. Under these conditions, acid-laden gases blow by the piston rings from the hot combustion chambers to the cooler crankcase and condense into liquid. This liquid is then carried by the oil to the bearing surfaces where it commences its corrosive wear, or to the cylinders where it forms ring-sticking varnish. These acids also combine with the oil and abrasive dirt to form sludge.

Auto manufacturers have sought to eliminate these acid-laden vapors by purging them via the crankcase ventilation system. This draws air into the engine by vacuum action of the air stream passing over the end of the outlet tube beneath the engine.

Unfortunately, this system is most effective when it is least needed, i.e., when the car is running constantly at highway speeds. This is precisely the time when the engine's crankcase is warmest and condensation does not take place.

This explains in part why the engine of





**MECHANIC BEGINS ENGINE REMOVAL** on Long Beach, Calif., police car. A uniform oil-change program more than doubled the mileage interval between major engine overhauls on the entire fleet of city-owned cars

a traveling salesman's car, which is driven hard and fast, often lasts longer than that of the suburban housewife who drives slowly and often on shorter trips and never really warms up the engine.

Much abrasive-material wear can be eliminated by a good, full-flow oil filter that is changed every 4000 miles, or more frequently if the car is run in dusty areas.

But the other causes of wear—oil dilution, clogging sludge, accumulation of corrosive varnish-forming by-product acids, and oxidation or actual "wearing out" of the lubricating qualities of the oil—can only be prevented by replacing the oil before these factors can change it from a beneficial lubricant to an instrument of destruction.

The question remains—after how many miles and/or months should you change oil?

#### **Proof From Long Beach**

To settle the matter once and for all, this writer examined the case history of a 1200-car fleet owned and operated by the city of Long Beach, Calif.

Some 400 of these cars, stock V-8s, were police cars, most of which were driven around the clock by three separate crews. Others were sedans operated by various municipal service departments, and there were several hundred pickup trucks.

The cars were being driven around the

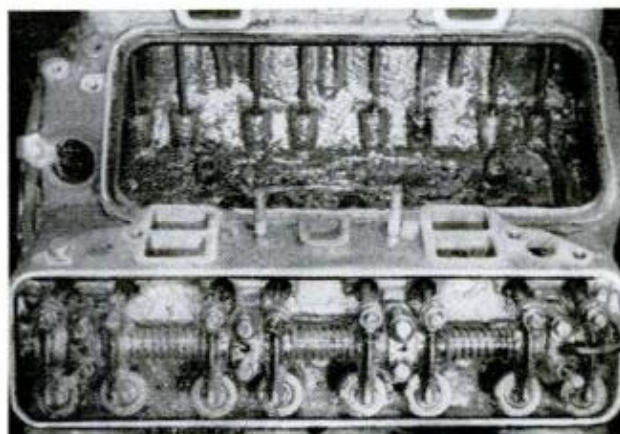
suburbs, mainly on short runs with frequent stops, long periods of idling and only occasional bursts of speed of more than 35 miles per hour. These short runs averaged 3.8 miles between periods of engine shutoff.

In other words, they were being given the typical "suburban housewife" treatment. Oil changes averaged one every 3000 miles and many cars went as far as 6000 miles without a change.

For five years engine repairs had been made whenever needed, and there was no established policy governing oil changes. It was not until engine-repair costs began to skyrocket that Vern Chevront, an

(Continued to page 244)

**SLUDGE-GLUTTED ROCKER GALLERIES** in engine of this police car are result of infrequent oil changes







**FIRST ACTION** photos of the Flying Scott show, top to bottom, level ride as it comes up on a plane; boarding ladder and walk-through foredeck. Windshield tilts up. Whole package fits on custom trailer

## Outboard "Package" Boat

A **DISAPPEARING TOP**, tilt-up windshield and walk-through foredeck with fold-out boarding ladder are some of the features you can see on this new Flying Scott fiberglass runabout.

Less obvious is the fact that this is the first production model boat engineered specifically for a particular motor. The two come as a package deal—you get the motor already installed, much as you do in a car. A matching trailer is also available as an optional, extra-cost part of the package.

The sleek hull—just over 17 feet long with a 7-foot, 4-inch beam—matches Scott's 75.2-horsepower motor. The motor, in turn, has a propeller specially selected for the hull. The company guarantees a minimum top speed over 30 miles per hour for the boat with two adults aboard. They also claim a level ride at all speeds with no "mush" as the hull comes up to plane, and a design which minimizes skidding and cavitation on turns, and is polished for speed.

Geared steering is used. Controls and instruments include: a tachometer, speedometer and fuel gauge. The starting panel and light switches are built into an automotive-type dash panel.

The boat also has built-in ski lockers, fold-down seats, built-in fuel tanks and battery storage. Price of the boat, complete with motor, is \$2995.



21 pages on the fascinating past and present of powered flight—with a few hints of the future

# POPULAR MECHANICS' SPECIAL SALUTE TO AVIATION

## The 12 Most Significant Aircraft

From the Wright brothers to jets, there have been turning points when the design or performance of one aircraft changed the course of aviation. At the request of *Popular Mechanics*, a distinguished panel of experts (see page 105) selected 12 of these aircraft as the most significant of all time. Full-color paintings of each with their stories begin on page 97.



## Jets Join the Business Fleet

Relatively unnoticed, one of the most robust revolutions in aviation history has been taking place above our heads. Private aircraft, owned and flown for business or pleasure, now outnumber—not only commercial airliners—but the United States and Russian air forces combined. And Mr. Executive is flying the jets, too. The story begins on page 107.



## Back-yard Eagles

Aviation would have been poorer, and its progress slower, if it had not been for the intrepid amateur, the eternal experimenter who ignored the rules and tried to build something different. And the experimenters are still at it. The plane of the future might very well come from a do-it-yourself group such as that described in the article beginning on page 112.





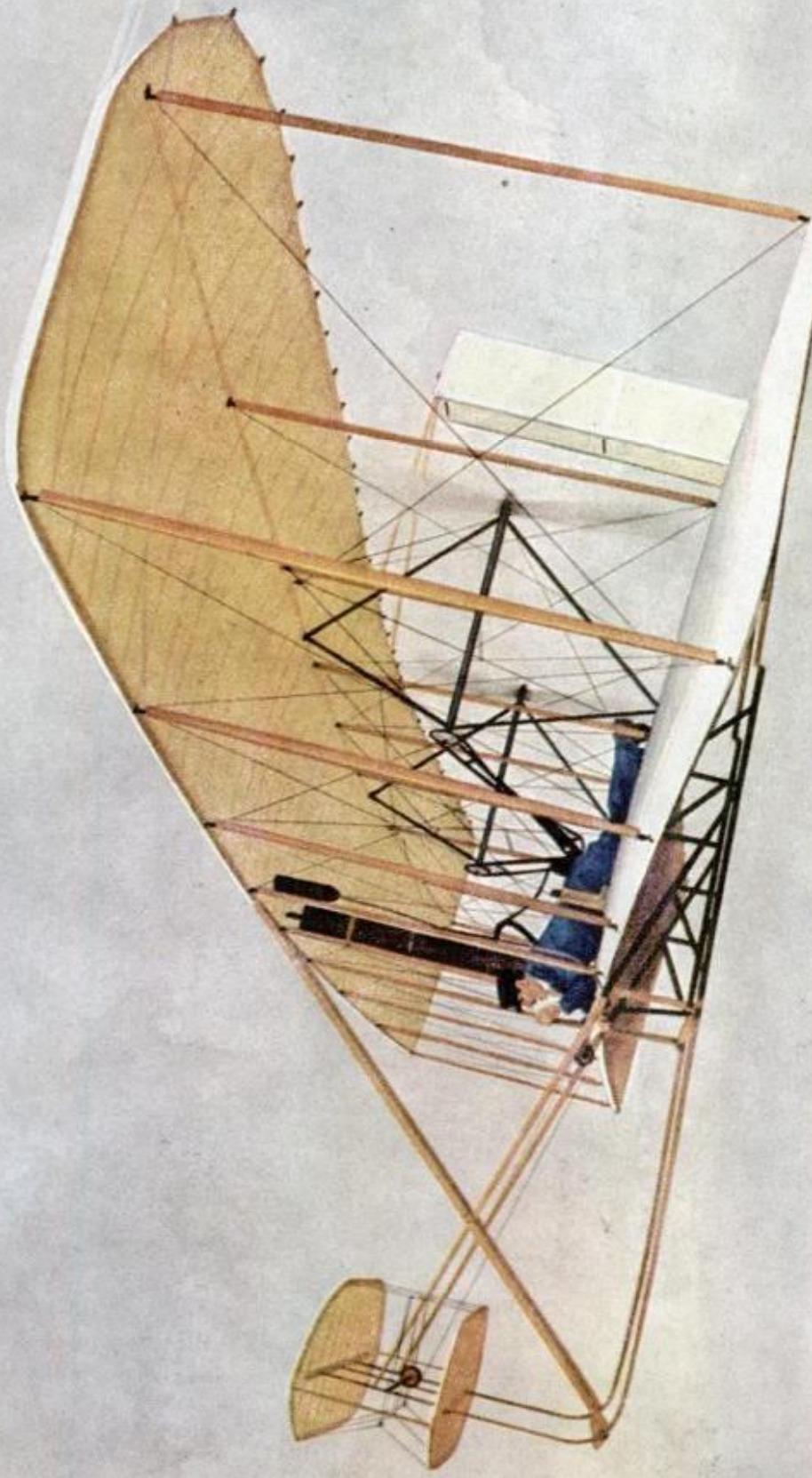
# The Twelve Most Significant Aircraft of all Time

First man flew, then he flew faster, further and higher. He flew where no man had ever been before, nor ever could go without machines with wings. It took men of extraordinary vision, exceptional courage and infinite faith to build and fly these machines. In the brief span of one lifetime, they developed aviation from a flight that covered only 120 feet to those that cross the oceans daily in aircraft whose wings are wider than that first flight. Each barrier they met was only something to be broken and, as each barrier fell, aviation moved inexorably forward. Many men devoted their lives, and some their deaths, to break these barriers, and many significant aircraft were built to help them do it. The 12 aircraft pictured here, however, are the most significant of all.

## *A Portfolio of Planes that Changed Aviation History*

*Paintings by Robert C. Korfa*





**“Kitty Hawk Flyer” (1903)**  
This was the beginning. Near windswept Kill Devil Hill in North Carolina, two bicycle makers from Dayton, Ohio, made history’s first successful powered and controlled human flight in a heavier-than-air machine. With this machine, aviation was born

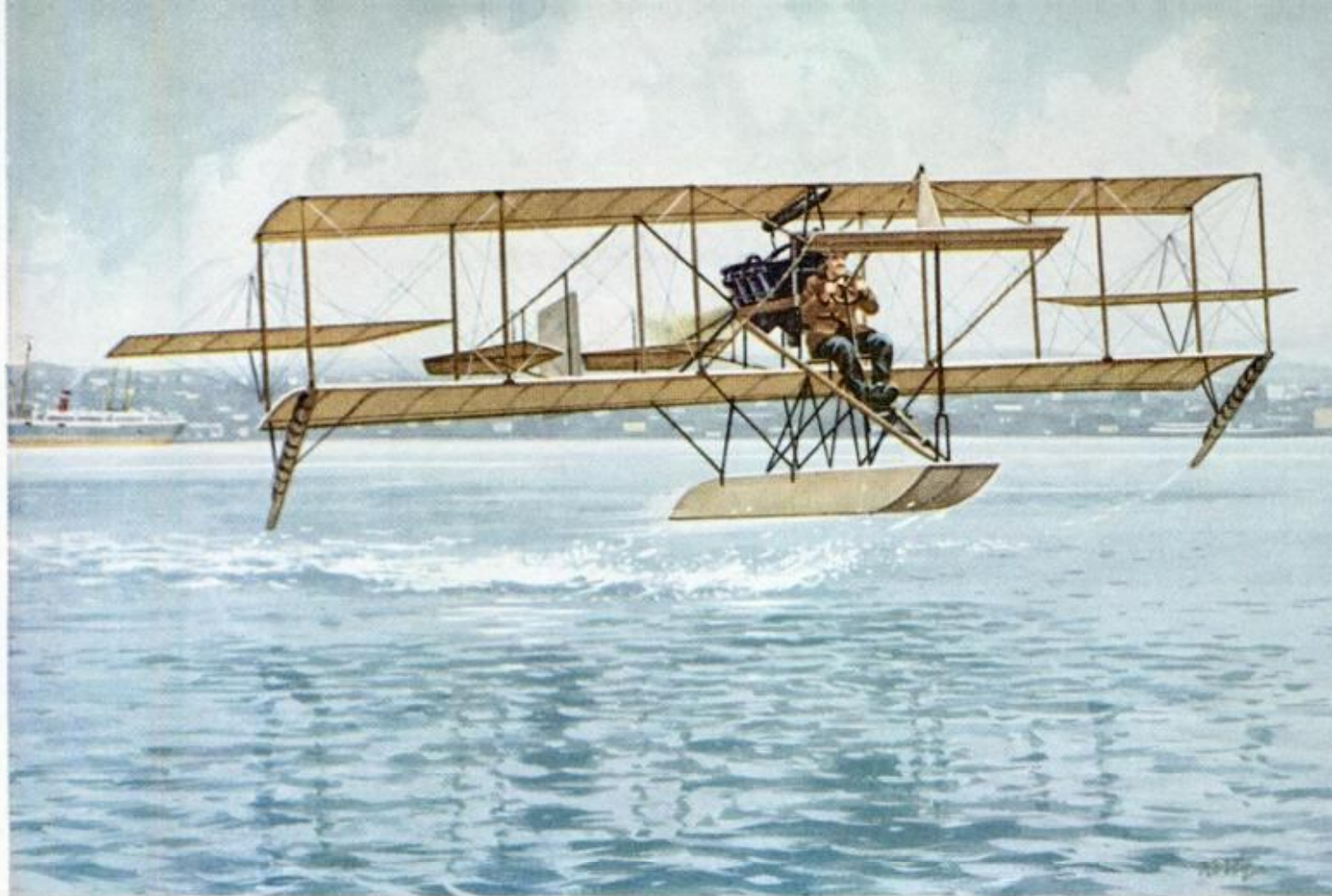


## **Bleriot Monoplane (1909)**

Basic airplane design and use were set by a Frenchman, Louis Bleriot, who put his engine in front, tail assembly in back, then flew his single-wing creation to Dover, England, in the first practical flight, crossing a large body of water and linking two nations

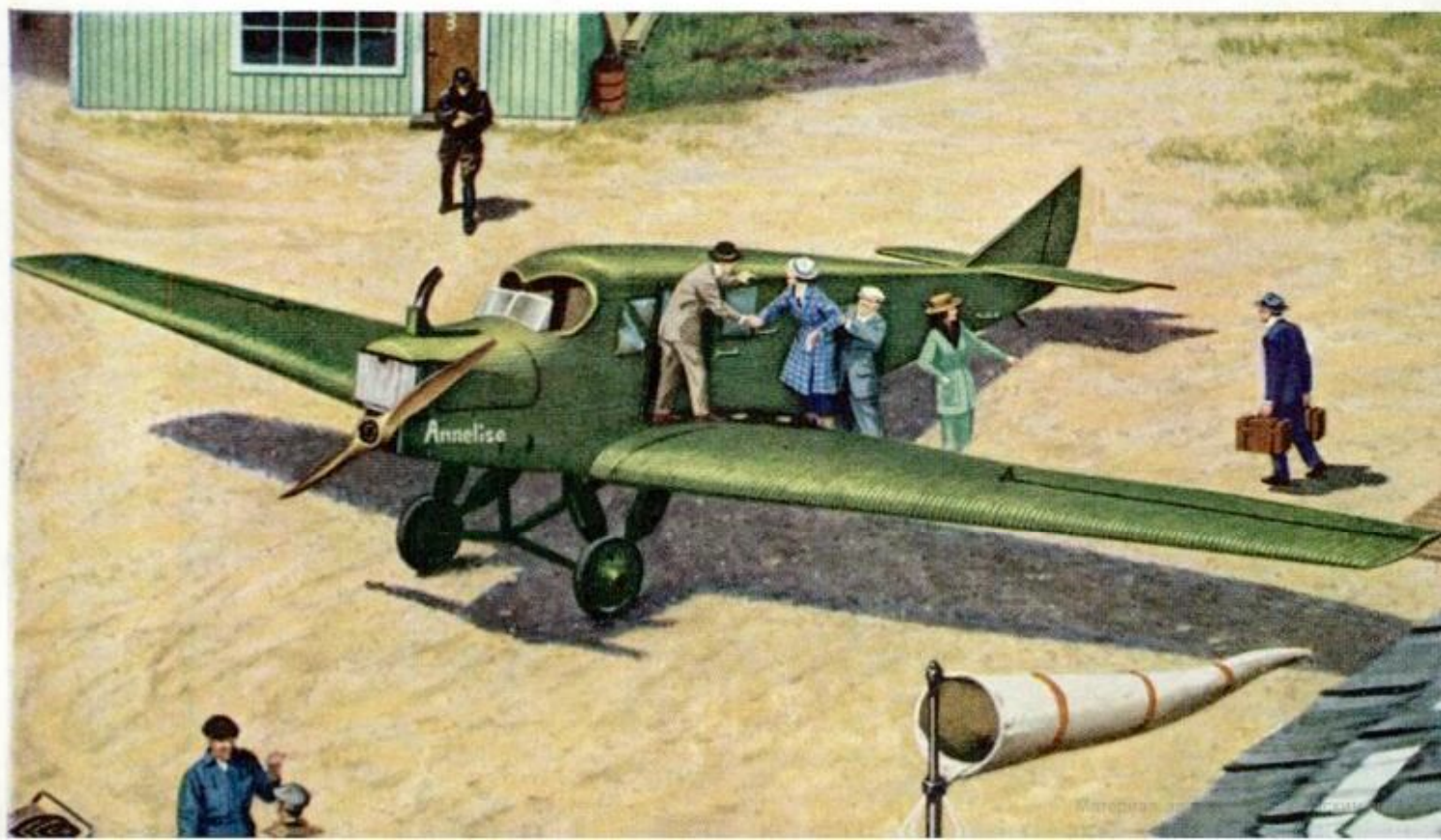




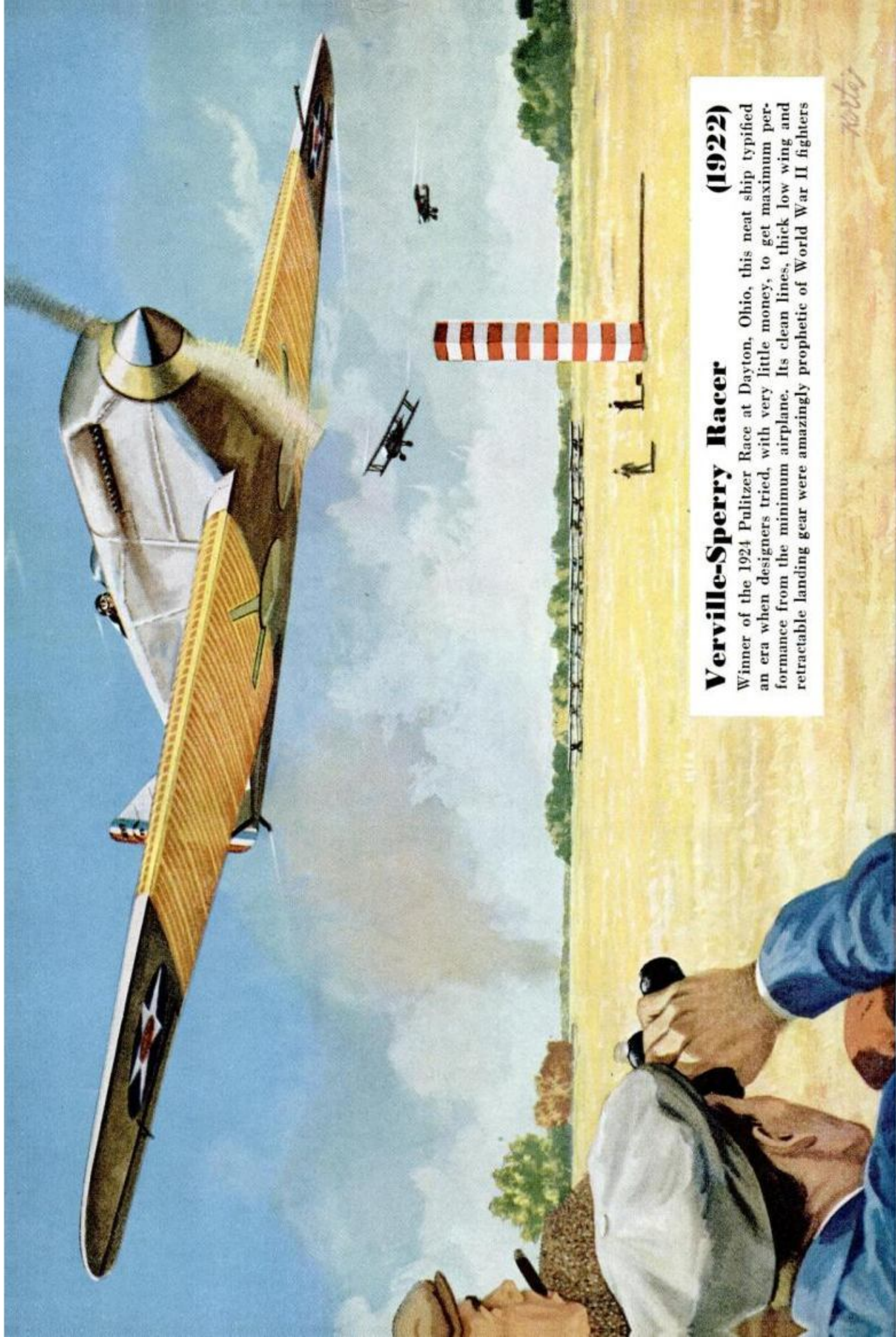


**Curtiss Hydroaeroplane (1911)** Not the first seaplane, but the first successful one, Glen Curtiss' pusher was produced in quantity and became the direct ancestor of all flying boats. The initial flight tests by Curtiss in San Diego Bay freed aviation forever from restrictions of land-locked airfields

**Junkers Ju-13 (1919)** Known as the JL-6 in the United States, this German-made airmail pioneer was the first all-metal transport and incorporated an internally braced low wing and an enclosed cabin for passengers. Airliners have since grown bigger and flown faster, but nothing essential has been added since the Ju-13







## **Verville-Sperry Racer (1922)**

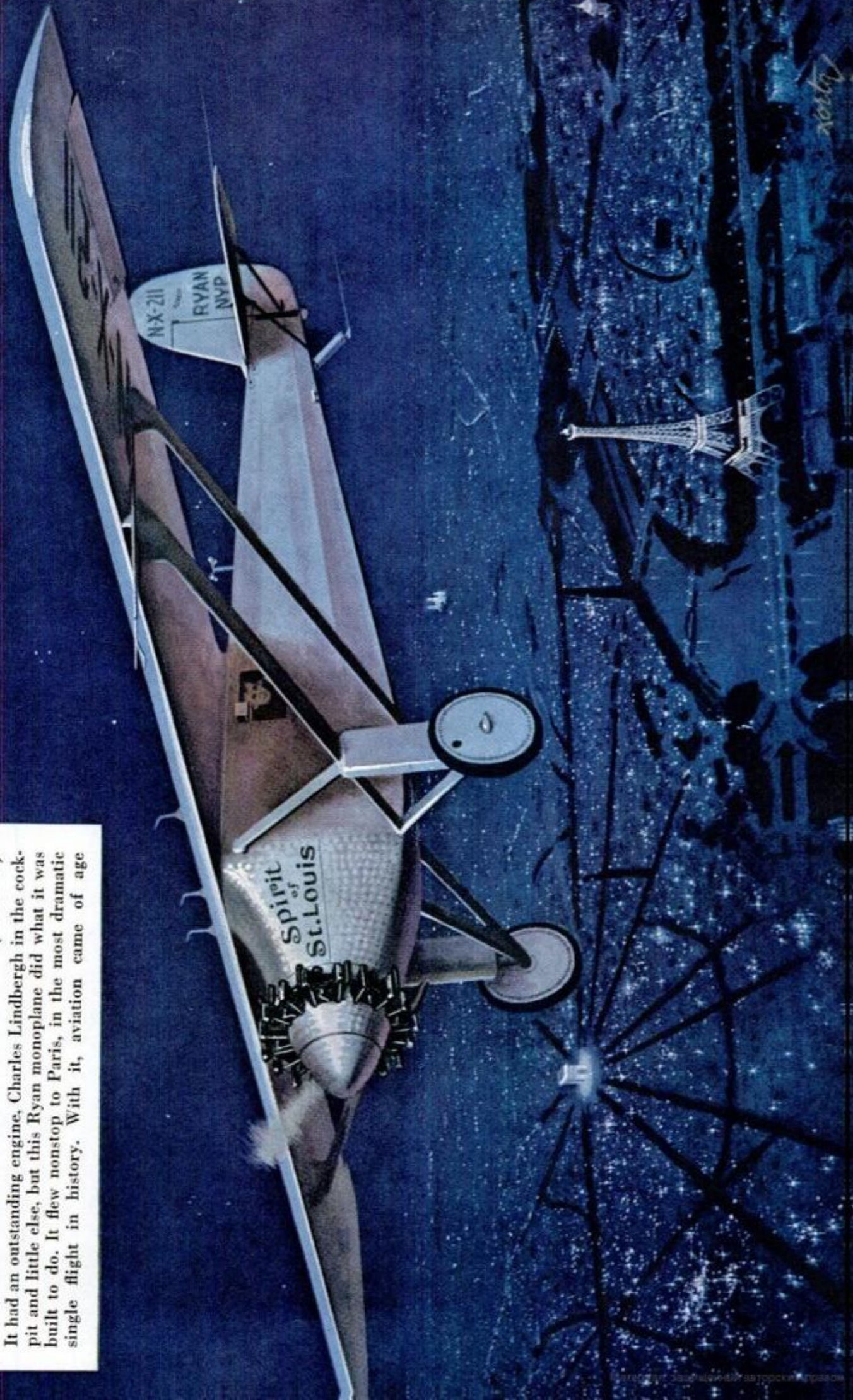
Winner of the 1924 Pulitzer Race at Dayton, Ohio, this neat ship typified an era when designers tried, with very little money, to get maximum performance from the minimum airplane. Its clean lines, thick low wing and retractable landing gear were amazingly prophetic of World War II fighters

*Wortz*



## “Spirit of St. Louis” (1927)

It had an outstanding engine, Charles Lindbergh in the cockpit and little else, but this Ryan monoplane did what it was built to do. It flew nonstop to Paris, in the most dramatic single flight in history. With it, aviation came of age







**Taylor-Piper Cub (1930)** Low-priced, easy-to-fly, the Cub popularized private flying. Other light planes were built before and after, but none with the Cub's extreme longevity using the same basic design. Originated by C. G. Taylor and continued by William T. Piper, more than 30,000 have been sold

**Douglas DC-3 (1935)** The first airliner to pay its own way, the "Gooney Bird" became the workhorse of the air (flying medical supplies to stricken areas as early as the 1937 Ohio River floods) and a World War II transport of almost unbelievable durability. Still flying, it's probably the finest single airplane ever built







**Sikorsky XR-4 (1942)** The first practical helicopter, the XR-4 introduced an era of hovering aircraft. It dramatized its reliability in an historic 1942 flight from Connecticut to Ohio. When its escort car with the large yellow dot paused for traffic lights, the XR-4 astonished pedestrians below by pausing, too

**Bell X-1 (1947)** Until October, 1947, no plane had flown faster than the speed of its own sound. Then Capt. Charles Yeager stuck the needle nose of the specially built X-1 through the sound barrier and proved that new designs could overcome the unique aerodynamic forces involved and that flight beyond the barrier was possible







**De Havilland "Comet" (1952)** The first jet transport, this British-made pioneer was plagued with early failures that made it as significant in defeat as in victory, introducing new engineering concepts that are now widely practiced and that remade the Comet into a highly dependable aircraft

**Boeing 707 (1959)** Twice as big as the Comet, the 707 brought jet travel near its ultimate potential, ushering in a new era in air transportation. So big that airports—such as New York's Idlewild—were remade to accommodate it, and so fast that man could fly overseas for lunch and return home in time for dinner







**POPULAR MECHANICS'** panel, which met in Washington, D.C., included (left to right, seated) Grover Loening, aircraft consultant, Gen. James Doolittle of Space Technology Laboratories, Dr. Jerome Hunsaker of Massachusetts Institute of Technology and (standing, right) Dr. John Victory, former executive secretary of NASA. Paul Garber (standing, left) is head curator of the National Air Museum which supplied background data

## How the "Significant Twelve" Were Chosen

**T**O SELECT THE 12 most significant aircraft, *Popular Mechanics* invited four experts who have been intimately associated with aviation to serve as panelists.

Jimmy Doolittle, who built his first do-it-yourself plane in 1910 (from plans published in *Popular Mechanics*), was an Army and civilian racing pilot who flew many of the aircraft considered by the panel, and a war hero who won the Congressional Medal of Honor for the 1942 raid on Tokyo and later commanded the 8th, 12th and 15th Air Forces. He is now board chairman of Space Technology Laboratories.

Dr. Jerome Hunsaker, designer of the famed airship Shenandoah and the NC-4 flying boat, the first airplane to cross the Atlantic (1919), was chairman for 15 years of the National Advisory Committee on Aeronautics (NACA). He is now professor emeritus of the aeronautical-engineering department of Massachusetts Institute of Technology, after 18 years as its head.

Grover Loening, aircraft inventor, designer and builder, and holder of numerous airplane patents, operated his own aircraft company for more than two decades. Now an aircraft consultant, he was the first engineer employed by the Wright Brothers Company.

Dr. John Victory was the first employee of NACA when it was formed in 1915 and served continuously with it, and its successor NASA (National Aeronautics and Space Administration), until he retired last year as executive secretary.

The panel was assisted by the National Air Museum, a division of the Smithsonian Institution, which supplied background information on all the aircraft discussed and also on the various periods of aviation history. It also assisted materially in insuring the accuracy of the 12 paintings, supplying photographs and other technical detail.

In selecting the significant twelve, the panel considered technical importance, his-

**FOR REPRINTS:** A complete set of the 12 Significant Aircraft is available reprinted in full color as long as the supply lasts, printed on one side only and suitable for framing. Send 25 cents to Service Bureau, Department 12S, Popular Mechanics, 200 E. Ontario st., Chicago 11, Illinois



torical accomplishment, biographical association, economic effect, chronological placement and general impact.

Some readers might note the absence of combat planes. The explanation is simple. The twelve aircraft were chosen on the basis of their significance to aviation, not warfare.

A few of the 12 made the list almost without comment, notably the "Kitty Hawk Flyer," the "Spirit of St. Louis" and the DC-3. The others had tougher going.

Some of the planes that almost made it included the Curtiss JN-4 ("Flying Jenny"), the Fokker and Ford-Stout Trimotors, the Lockheed "Vega," the Boeing B-17 (the first successful four-engine airplane) and several commercial airliners.

Here is additional background on the significant twelve and the paintings:

**"KITTY HAWK FLYER"**—Although its first flight covered only 120 feet (less than the wingspan of the 707), it was, in Orville Wright's words, "the first in the history of the world in which a machine carrying a man had raised itself by its own power into the air in full flight, had sailed forward without reduction of speed and had finally landed at a point as high as that from which it started." The painting shows the moment of takeoff, Orville at the controls and brother Wilbur (blue suit) alongside.

**BLERIOT MONOPLANE**—Designed, built and flown by Louis Bleriot, who was part daredevil and part genius, it was, technically, the first "tractor" plane—one that is pulled, not pushed, through the air. The intrepid Bleriot crossed the English Channel with his leg in a cast, because of a broken leg suffered in a previous crash, in the first international flight, the first to cross a large body of water and the first to fly between two large land masses.

**CURTISS HYDROAEROPLANE**—Henri Fabre of France was the first to try a seaplane—it took off from water, but could not land on it. Curtiss, in fact, pat-

terned his first floats after Fabre's, but eventually evolved his own as shown.

**JUNKERS Ju-13**—Good enough to be imported to the United States for airmail service, the Ju-13 remains one of the most underrated aircraft of all time. Engine problems led to an early death, but it set standards for airliners still unborn and in 1921 set an endurance record of 26 hours.

**VERVILLE-SPERRY RACER**—Ordered by Gen. Billy Mitchell who, in characteristic fashion, demanded "tomorrow's plane today, and I don't want any d---d squirrel cages" this advanced racer without spars and guy wires was designed and built within four months in time to fly in the 1922 Pulitzer Race. It lost, but two years later, with a new engine, it won. It had many admirable competitors during this era, notably the Curtiss Army and Navy racers, the British Supermarine series which led to the World War II "Spitfire," and the Italian Macchi which still holds the world record for seaplanes (440 m.p.h.). But the racer designed by Alfred Verville (see page 16) and built by Sperry Aircraft Co. represents as well as any of them an era which advanced the cause of aviation and thrilled a generation of wide-eyed fans. In the painting of the 1924 Pulitzer race, won by Lt. H. H. Mills in the Verville-Sperry at an average of 215 m.p.h., the dust cloud in the left background marks the fatal crash of Capt. Bert Skeel whose plane disintegrated in the initial speed dive toward the field.

**"SPIRIT OF ST. LOUIS"**—Awkward to handle and almost impossible to see from, this plane made the second most significant flight in history. What the Wright brothers started, Lindbergh made everyone—but everyone!—aware of. As he circled Paris about 10 p.m. French time, he had taken aviation out of the barnstorming era and made its great potential recognized. Le Bourget field, where he landed minutes

(Continued to page 242)

**AVIATION'S FUTURE** may ride on the stubby wings of the X-15, the "thirteenth" most significant aircraft





# Jets Join the Business Fleet



LATEST JET designed with businessman in mind is North American's swift Sabreliner

By Alfred Balk

A SWEPT-WING TWIN JET strained at its brakes, then rolled forward, gathered speed and streaked upward off the runway. At 400 miles an hour it began a shallow ascent. Then, angling sharply it climbed a mile a minute to the clear, thin air of 30,000 feet, leveled off, and cruised effortlessly eastward at 500 miles an hour on its mission—transporting a half-dozen businessmen to an important meeting.

A gray-flannel dream? Far from it. This speedster, the Lockheed JetStar, is flying today. So are others. Nearly three years ago, in fact, Henry H. Timken, Jr., of Timken Roller Bearing Co. became the nation's first jet-propelled businessman, with a four-place 410-mile-an-hour Morane-Saulnier 760 marketed by Beech Aircraft.

The jet age, already revolutionizing military and airline operations, now has ar-

MR. EXECUTIVE can relax in the lounge as he travels or catch up on work with his business associates







**POPULAR AERO COMMANDER** is product of Aero Design & Engineering Co., pioneer in development of business aircraft



**HARDY PIPER CUB** (see page 102) has gone almost everywhere, done almost everything. This one is equipped with tandem wheels for rough-field landings

**VERSATILE BEECHCRAFT BONANZA**, among others, allows flights to construction sites because of short takeoff ability







**NEW TURBOPROP**, Grumman Gulfstream, was first propjet designed specifically for business-flying market. It can carry up to 19 passengers at a cruising speed of 370 m.p.h. and a maximum altitude of 36,000 feet



**FUTURE IMPORT**, scheduled for introduction to U.S. in 1962, is Dassault 415, economical French turboprop

rived for a fleet which in America outnumbered them both — our business air force. Four jets designed for business flying had been announced by the end of 1960: the North American Sabreliner, McDonnell 119, and the JetStar and Morane-Saulnier. Six turboprops also were unveiled: the Grumman Gulfstream, Fairchild F-27, Convair 540, a new Beech and, for select clients, the Lockheed Electra and Vickers Viscount.

Our corporate fleet, 28,000 aircraft, now exceeds the size of the U.S. and Russian air forces combined. In 10 years, says the Federal Aviation Agency, it will be three times today's total. Its flying time, now far more than all our airlines, may nearly double over last year's six million hours.

Years ago, executive planes, like yachts, usually were labeled "VIP" only. Even today few buy them as board chairmen's toys. U. S. Steel may have three Viscounts, Reynolds Metals a DC-6B, and oilman John Meacham a Convair with a \$90,000 interior (including TV). But most craft belong to small or medium-size firms, and even then plush planes tend to be justified for something more than income-tax write-off — business advantage.

The Arabian-American Oil Co., for example, is said to have a \$6,000,000 aviation budget and a stable of nearly two dozen airplanes. But they're not for joy rides for King Saud or Aramco executives. From two Convairs or nine DC-3s to assorted smaller craft, Aramco, finds planes indispensable for moving engineering units, fly-

ing important suppliers or customers, patrolling pipelines, and dozens of other jobs. In a recent year Aramco clocked more passenger miles than all but the 15 largest U.S. airlines. It figures it could never have opened up many of its desert oilfields or attracted employees' families there without corporate wings—nor could it maintain them today.

**Instant Runways.** Wherever mountain, desert, jungle or island activity is part of a firm's business, the airplane can be the difference between success and failure. A few years ago, uranium executive Garth Thornburg of Thornburg Brothers put 50,000 rugged miles a year on his car and still couldn't keep abreast of company operations. Now it's 5000 — but he thinks nothing of flying 300 to 500 miles a day in the company plane before beginning work. One contractor, T. M. Page of Monrovia, Calif., flies his Beechcraft direct to the scene of big projects, then circles while an earthmover creates landing space—an "instant runway."

Business, however, is airplane-happy for more than such special situations as these. With America's commercial growth, especially since World War II, have come built-in advantages of having air transportation at around-the-clock command.

One-third of our plants built since 1940 are away from major urban areas. Many branches are some distance from a commercial airfield. Further, scheduled airlines serve less than 600 of our 6000 airports





**LOCKHEED JETSTAR**, another recent jet addition to business fleet, is in 600-m.p.h. class. It can fly 1700 miles nonstop or, with additional wing tanks, more than 3000 miles. There is also a four-engine model



**FRENCH JET**, Morane-Saulnier 760, became first turbojet to join U.S. business fleet when it was imported by Beech Aircraft Corp. M-S 760, a four-place pressurized aircraft, is capable of speeds above 400 miles an hour

—and of these main fields, many are inconveniently located, perhaps an hour or more from downtown or a customer's office. Add to this the high cost of executives' time, the quickening tempo and expansion of business, and an increasing need for even salesmen or engineers to get around quickly.

To busy men airplanes offer dozens of short cuts. Executives of Colonial Stores, Inc., of Atlanta can maintain close contact with 300 supermarkets in six states, thanks to their own aircraft. Weyerhaeuser Timber Co. sends forest managers on reconnaissance of timber in its own plane. In Idaho, potato baron R. J. Simplot has three planes to supervise his farms and ranches. The prefabricated home division of Gen-

eral Industries, Fort Wayne, Ind., uses three planes to locate development sites, spot drainage defects after rainstorms, fly mortgage-company representatives to developments, or help clinch property sales.

For petroleum firms, corporate aircraft regularly get geologists, engineers, equipment or top executives from one end of a pipeline to another, to oil exploration fields, or other sites in their far-flung operations. A recent census of Phillips' fleet showed a Convair, two DC-3s, a Lodestar, three B-26s and smaller craft. Ohio Oil Co., long an aviation booster, had some two dozen planes at last report. Shell, which bought a tri-motor Fokker in 1928, now has such

[\(Text continued on page 232\)](#)





**DESPITE JETS**, helicopters still occupy large role in business flying because of unique ability to take off and land on roofs or lawns. Turboprop Fairchild F-27 (below) has carved niche with both industry and airlines





# Back-yard Eagles

**Oregon's aircraft experimenters ignored the rules, defied the government and built planes to suit themselves. And most of them fly**

**AIRCRAFT EXPERIMENTERS** may have world's most understanding wives. Jack Devine and son, David, 11, take over dining room of Oregon home, while ever patient Mrs. Devine is shunted off to living room



**By Leverett G. Richards**

**W**HEN THE FIRST real flying saucers are built, chances are that Oregonians will build them.

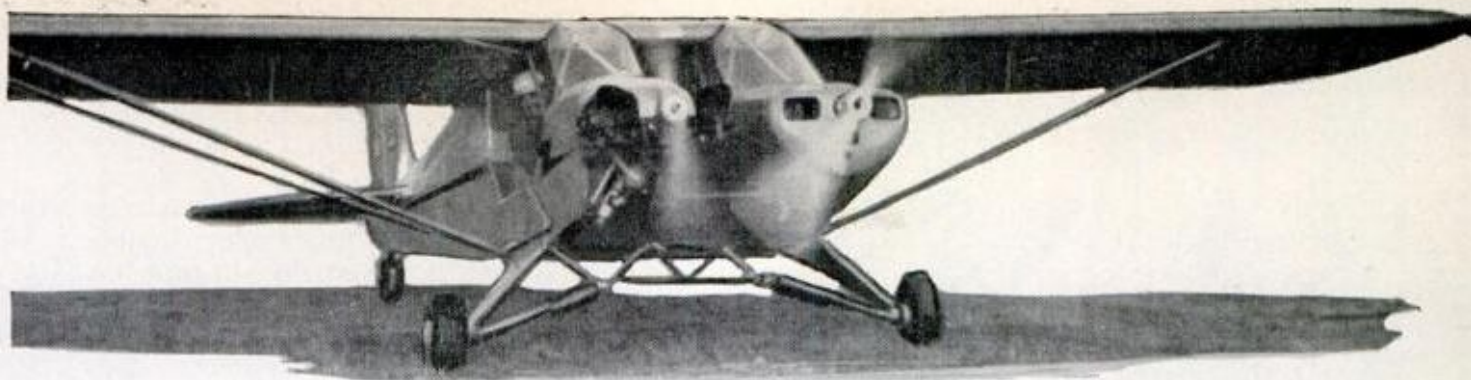
For Oregon is possibly the do-it-yourself capital of the aviation world, the favorite eyrie of the back-yard eagle, the traditional citadel of aerial independence, the leader in the current revival of homebuilt aircraft.

As a matter of fact, Oregon's Edisons-of-the-Airways did try flying saucers about 20 years ago, 10 years before the saucers hit the hysterical headlines. They didn't work.

But this failure was the exception. The "eyeball engineering" of these American dreamers contributed substantially to the progress of aviation in the good old days of iron men and wooden ships. Their inventions and innovations helped to win World War II. They are







**DOUBLE CUB** (see cover) allows one instructor to handle three pupils at once. Conventional monoplane (below) was rebuilt from biplane. Maker Bob Nelson of Redmond calls it, appropriately, a "half Nelson"







**TWO CHIROPRACTORS**, Drs. Wayne Gustafson and Charles Stober of Portland, built this hybrid autogyro

still contributing greatly to the progress—and the romance—of flying. What started as a Yankee hobby and blossomed into a states-rights' rebellion against federal regulation, has now become big business.

Take Angus McKinnon, for instance. He started pattering around with a twin-engined Widgeon amphibian in the pasture of his farm on the brink of a canyon of the Sandy River at the foot of Mt. Hood, 20 miles east of Portland, trying to improve its performance so he could commute to his river contracting jobs.

He succeeded so well he quit the contracting business and turned his back-yard hobby into a multimillion-dollar industry. The redesigned twin-engined amphibian proved so popular that he gravelled a 2600-foot landing strip in his pasture, built a combination hangar and factory in his front yard and put 16 men to work building his new Super-Widgeons. To date he has built 60 and sold kits for construction of 14 more.

McKinnon, who has been flying since he was knee-high to an open cockpit, this spring came up with a new answer to a pilot's prayer—the Golden Goose. She's a four-headed baby with the speed and lines of a spawning salmon.

She will get off the water before the throttles are fully opened, climb easily to 25,000 feet and cruise 200 miles an hour with eight passengers or a ton and a half of freight. The McKinnon Goose is prob-

ably the only plane in the world capable of landing and taking off on any lake in the world, even Titicaca in Peru at 18,000 feet.

Secret of her performance lies in her design and her four 340-hp. Lycoming supercharged engines which crowd the wings. She's possibly the only four-engined commercial seaplane in the world—in fact the only four-engined executive aircraft designed as such, and the only four-engined aircraft licensed for a single pilot.

The Golden Goose utilizes the hull of the old twin-engined Grumann Goose, but is 75-percent new and required all the engineering and flight testing of a new commercial airliner. This runs into money, nearly a million dollars, for a plane which will sell for about \$350,000—a far cry from the backyard beauties whose piano wire construction and shirt-cuff engineering seldom runs much over a thousand or two.

### Fun Is in the Making

You find these homebuilt jobs all over Oregon—in barns, garages and basements. These fly boys keep the carburetor in the kitchen, the wings in the cellar and the ailerons in the living room. The fun lies in the building and rebuilding. The flying is often incidental.

The back-yard buffs claim more people have more fun flying with their own wings in Oregon than anywhere. Darrell DeLong of Eugene, president of chapter 31 of the Experimental Aircraft Association, estimates his members have about 20 homebuilts continually under construction.

Another 20 or 25 pilots have succumbed to the growing temptation to build their own gyroplanes.

A recent catalogue of about 250 homebuilt experimental aircraft throughout the nation listed 28 designed, built and based in Oregon. California and Washington are next in numbers of "originals."

Oregon's ascendancy is no accident. It all began with Silas Christofferson and John Conner Burkhart, Oregon's pioneer plane builders. Burkhart appears to be the first Oregon "pilot" to build his own aircraft—at Albany in April, 1910.

Christofferson, however, is recognized as the father of flying in Oregon. He started building his first engine and airplane with the aid of Burkhart that same year and made his first flight in 1911. Oregon's budding aviators held their first "aviation meet" in the baseball park on Vaughan Street in Portland that same year.

Fame first came to Oregon June 11, 1912, when Si, in a Curtiss-type pusher plane he designed and built himself, took off from the roof of the Multnomah Hotel in downtown Portland after a run of about 150 feet

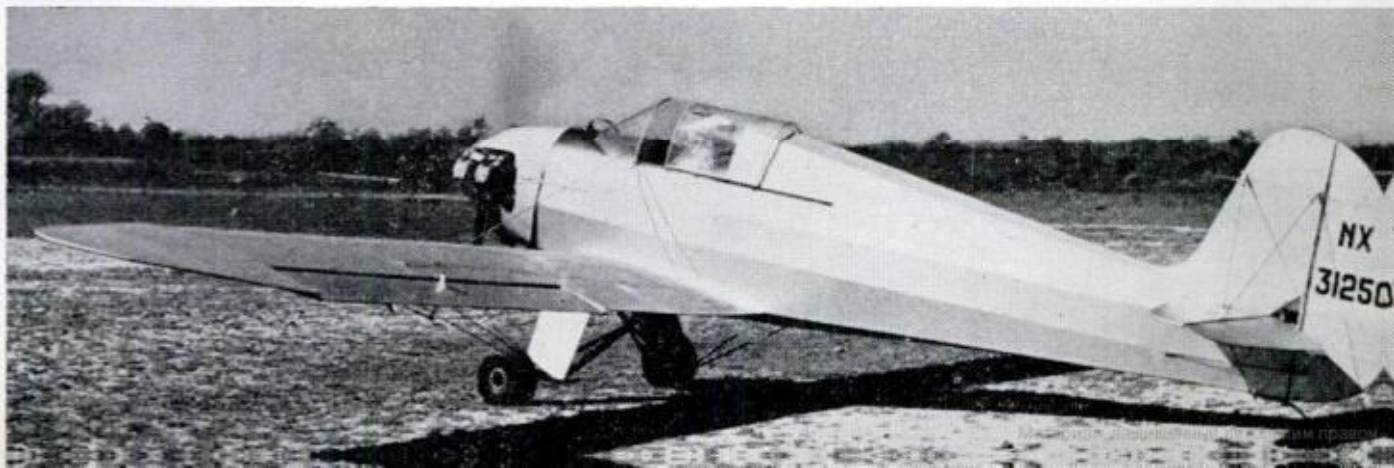




**CHAPTER PRESIDENT**, Darrell DeLong of Eugene, flies plane originally built in 1930. Stored in owners basement until 1948, DeLong bought it, rebuilt it, then installed newer, more powerful engine in it



**MOST AMBITIOUS** of Oregon's homebuilts is this four-engine executive amphibian, shown flying past Mt. Hood at about 11,000 feet. It's licensed to fly with single pilot. GeeBee (below) helped rekindle interest in experimental aircraft when it flew cross-country to Washington, D.C. after World War II







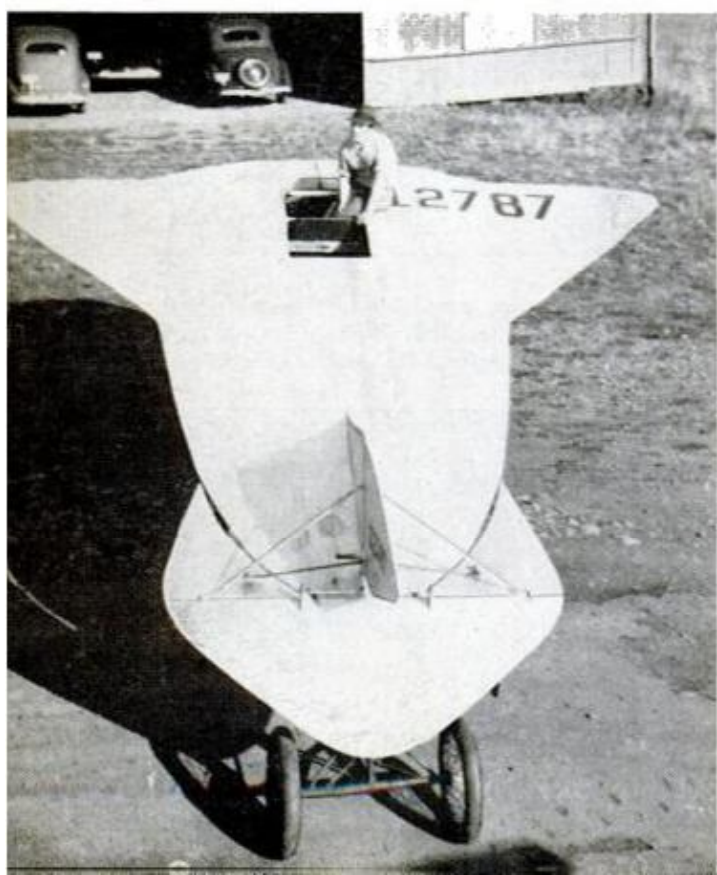
**AIRCRAFT MECHANIC** Cliff Krum, who maintains fleet for U.S. Forest Service, built this high-wing monoplane

on an inclined platform. It was successful.

Si was more than a stunt flier. He was an inventor and a prophet of the air age. He set altitude, speed and distance records, contributed many improvements to aircraft design—and tried to convince the Army of the need for an air force, without success.

He was finally killed experimenting with a new aileron control system October 31, 1916, at Redwood City, Calif. But the seeds he sowed have borne fruit.

**FLYING SAUCERS** were preceded by this outlandish Oregon creation which failed to get off ground in 1937



By 1926 the state legislature officially recognized and encouraged this flurry of wings with a state law that required reasonable inspection of all aircraft, but encouraged ingenuity and invention. Oregon, the only state in the West with such a law, became the refuge and defender of these homebuilt mavericks of the airways.

Charlie Bernard's cow pasture airport on a hillside at Beaverton, 10 miles west of  
(Continued to page 228)

**GEORGE BOGARDUS**, who flew his GeeBee to Washington, became first president of revived Oregonians





## Golf Carts Go Compact

Compacts enter the golf-cart field with a new single-seater.

Mounted on three wheels for easy balance on uneven fairways, it's powered by a heavy-duty 3½-horsepower gasoline engine with an automotive-type transmission. The cart weighs only about 175 pounds and can be stored in about half the space required for most golf carts.

The Springfield Golf Car is made by Quick Co., Springfield, Ohio.



## Campers' Water Heater

Keeping a supply of hot water around a camp can be a tricky and bothersome job, but a new outfit works just like a home water heater and keeps five gallons of hot water on tap anywhere there's a fire.

A five-gallon collapsible bucket holds the water, which circulates over the fire through a U-shaped tube. Circulation is maintained by convection currents. For storage, the fire shield folds into a case which holds both the bucket and the fire tube. Another fire tube style is available for use with any type camp stove.

The manufacturer is Northwest Tube and Metal Fabricators, Portland, Ore.



## Illinois' Ear on Space

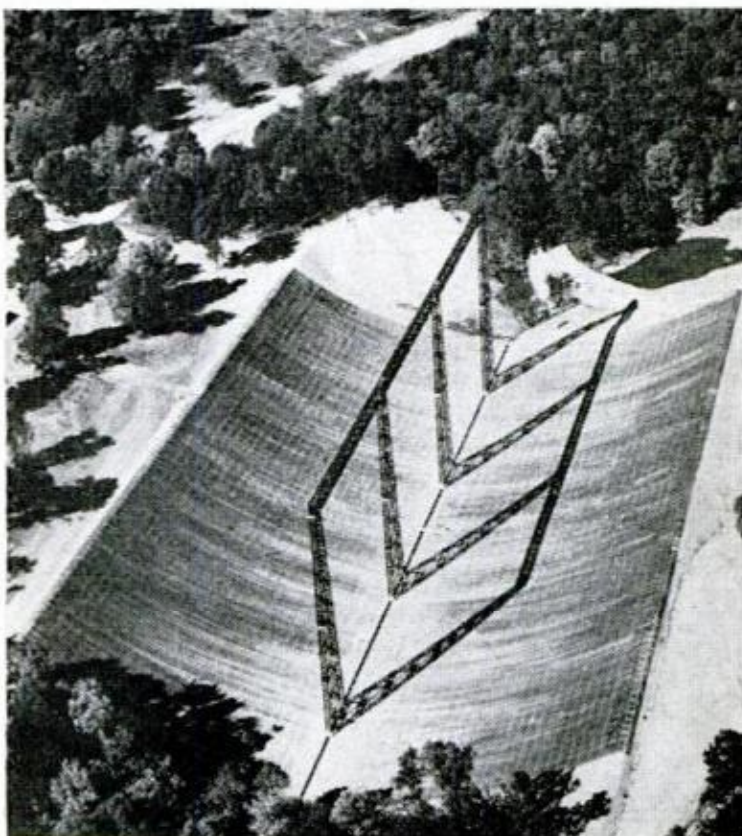
In a ravine that's been shaped to form a parabolic dish stand the towers of the University of Illinois radio telescope five miles south-east of Danville.

The dish, a radio "mirror" 600 feet long and 500 feet wide, concentrates signals from space on receiving elements supported by towers 165 feet high.

The radio telescope, financed by the Office of Naval Research, will be used to tune in signals from the stars.

☐ Dandelion roots and chicory are blended with soya beans and rye to produce a coffee substitute which is manufactured in Canada and sold there and in the U.S.

☐ Every second, the sun sends out a million times more energy than is stored in all the earth's coal, petroleum and natural gas fields.



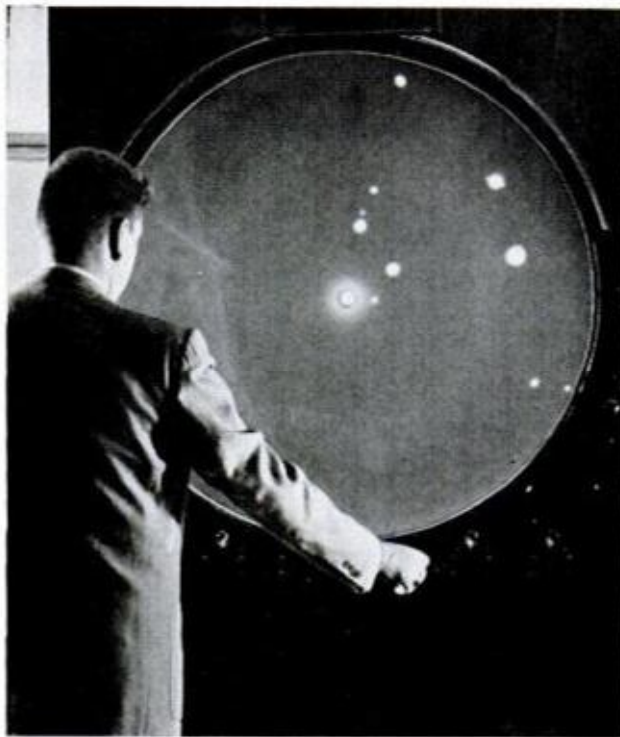
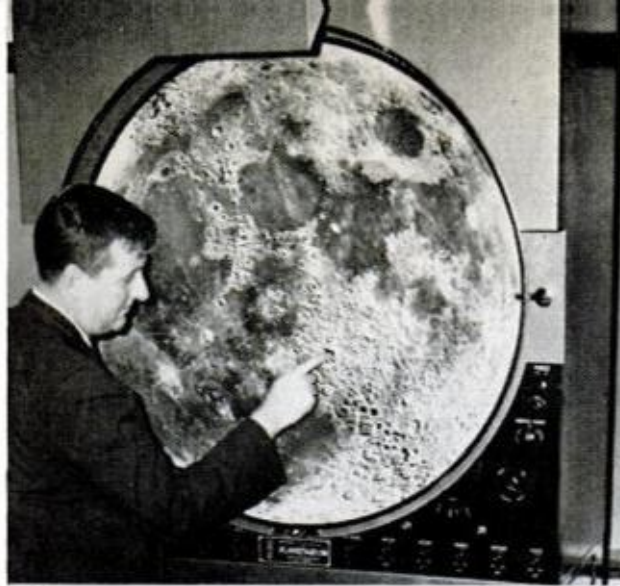
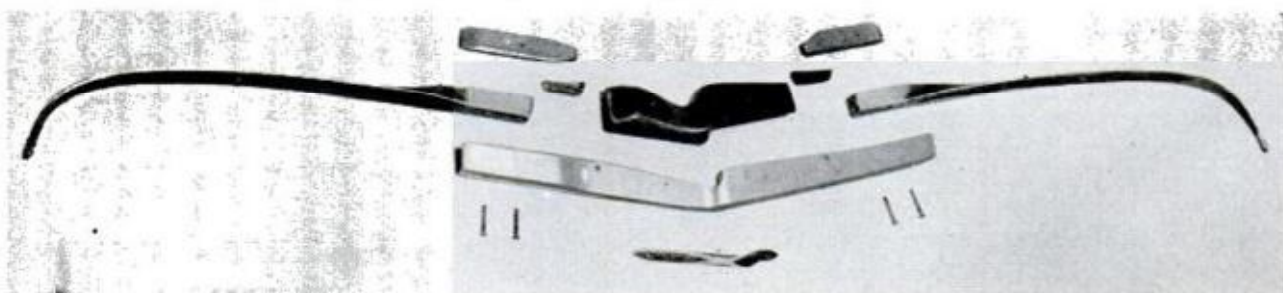




## Component Bow

Though superior in many respects, fibreglas bows present some problems in matching the bow to an individual and in modifying the grip to his needs. One solution is a component bow demonstrated above by champion Carole Meinhart.

The bow incorporates separate fibreglas limbs and wooden grip parts fitted to an aluminum center frame, below. There is an almost infinite combination of sizes, draw weights and grip patterns, and a bonus in complete takedown. It's made by the Chessman Archery Co., Ellsworth, Mich.

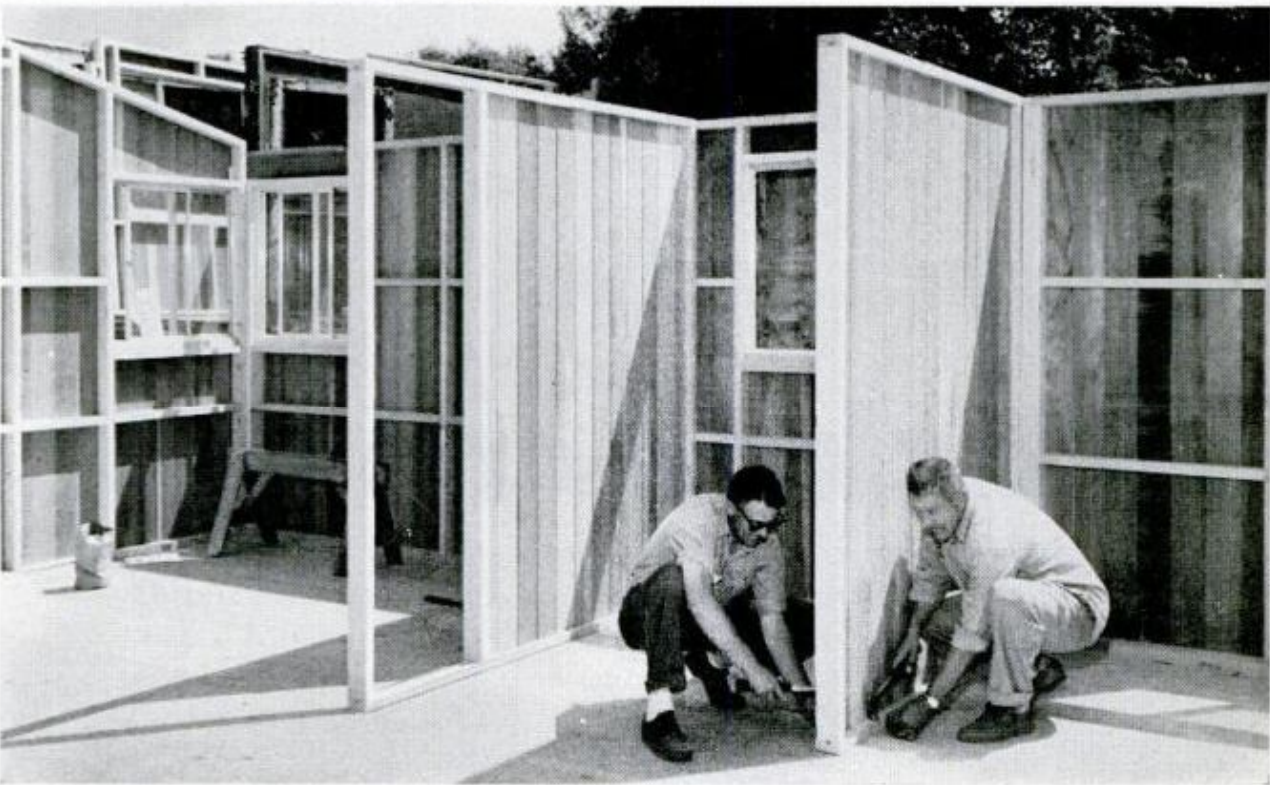
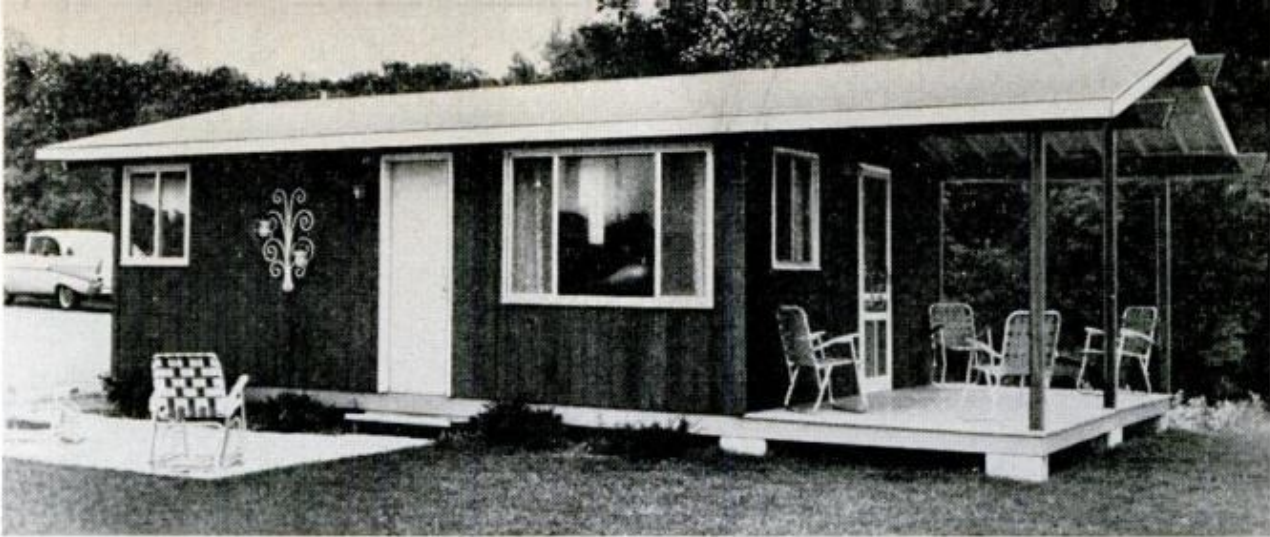


## Screen Shows Night Sky

Observers of a new instrument installed at New York's Hayden Planetarium can study the sky with the ease of watching television. They see movements of planets around the sun, apparent motion of stars as seen from earth, telescopic views of the moon and other celestial objects, as well as problems in navigational astronomy and space exploration by artificial satellites.

The instrument, called a Musser Copernican Planetarium, displays these actions on a screen four feet in diameter by rear projection onto the screen.





## Summer Cottage Can Be Erected in a Day

Manufactured for quick erection, a vacation cottage can be assembled by the owner from components delivered to the site—or a dealer can put it up in a day.

The home comes in two sizes, 512 square feet and 640 square feet. Each has a living room and kitchen, two bedrooms, bath and

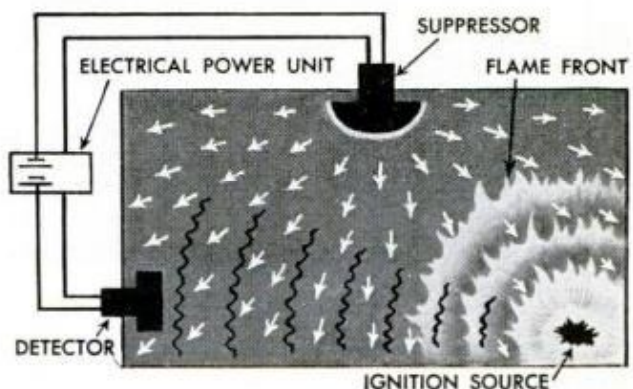
an 8 by 16-foot covered porch at one end.

The exterior is tongue-and-groove redwood siding, and the windows are aluminum. Framing is Douglas fir or hemlock.

The Forestaire cottage is manufactured by Harnischfeger Homes, Inc., Port Washington, Wis.

## System Detects and Suppresses Explosions

Detecting an explosion at the moment of its inception, an industrial-plant protection system snuffs out the blast before it can become destructive. Based upon a British World War II development designed to prevent explosions in aircraft fuel tanks, the Fenwell explosion protection system senses either the initial pressure build-up or first flash of flame. Then it envelopes the explosion with a liquid suppressant, opens a path to the atmosphere for controlled relief of pressure and isolates or blocks off other plant areas from the explosion.

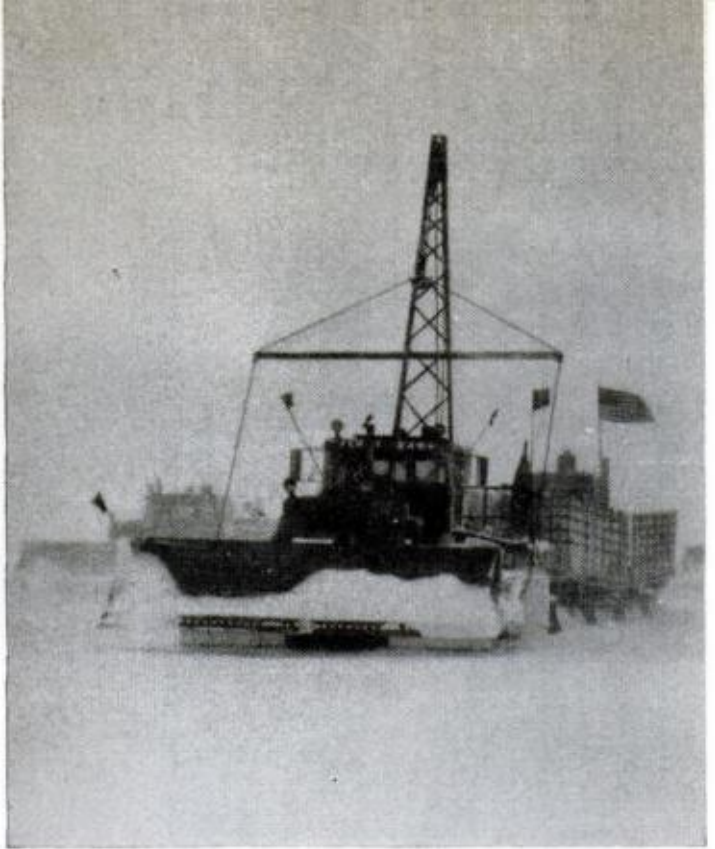






**TRACTOR TRAINS** load up at fuel caches established and flagged by ski planes before traverse begins

**HOWLING BLIZZARD** envelopes Seabee party of tractors and sleds carrying buildings enroute to Byrd Base



# Tracks Across the

*Dodging among crevasses that sometimes swallow tractors, scientists search out answers to Antarctica's mysteries*

**B**EARDED, FROSTBITTEN scientists during the past five years have been prying the lid from Antarctica's frozen vault of secrets.

Each summer season (between October and March) their trains of vehicles leave bases scattered across a five-million-square-mile ice sheet studded with unnamed mountains and glaciers to explore areas never before seen by man. Their mission is to probe the greatest icecap in the world, to search desolate mountain ranges for secrets of Earth's beginnings, and to investigate mysteries this huge continent clutches in a laboratory of frozen time.

Here, at the bottom of the world, temperatures range from freezing to 124 degrees below zero. Sunsets and sunrises last 24 hours every day for weeks on end, and during the six-month night, the sky glows with auroral color and light.

Often, weird phenomena confound the senses. During whiteouts, when light bounces back and forth between an overcast sky and the snow surface, eliminating all shadows, a man walking beside you in a

**CORING CAT** is newest snow vehicle for glaciologists. It is equipped to drill into ice and take samples







# Polar Continent

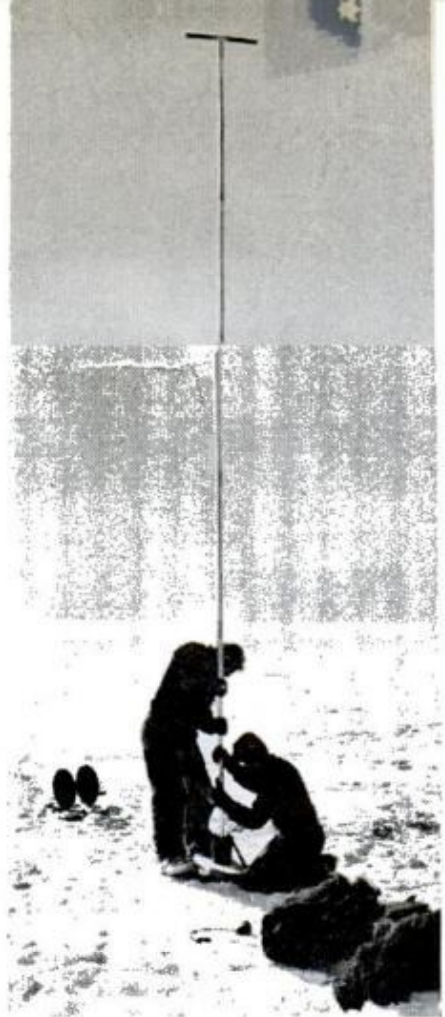
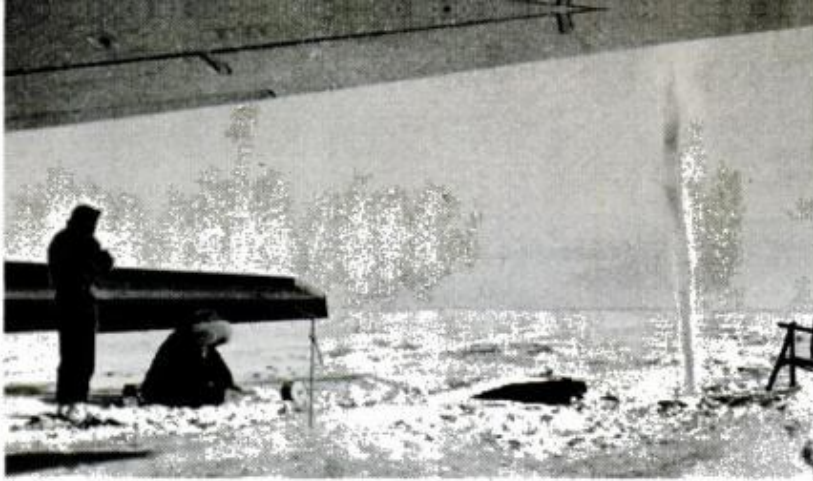
*By Richard F. Dempewolff*



JUNE 1961

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**SCIENTISTS** sound depths of the two-mile-thick icecap with seismic shots, upper left, and pull deep cores. A hole is drilled at right for the charge exploding above and, at left, a core is laid out for study

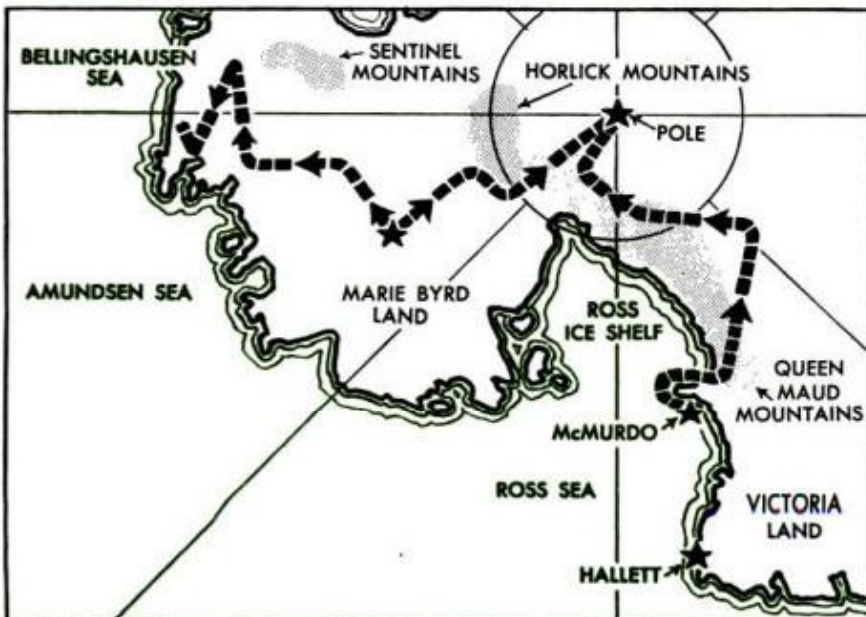
white windproof suit may disappear before your eyes—as completely as though he no longer existed. Eerily, the sound of his breathing or his voice floats to your ears through apparently empty space.

Out on the endless snow deserts, invisible cosmic storms may black-out radio contact with a vehicle half a mile from camp, while

the frequencies boom with taxicab dispatchers in Seattle or Boston.

On almost any clear day in McMurdo Sound, range after range of desolate mountain peaks in the distance stand on the shimmering pedestals of their own reflections from layers of warm air hugging the snow. Gleaming crosses encircled by rings

**TRAIL ROUTES** are on map. For trip north of Byrd, 100 air re-supply points were needed. John Sandman, a New Zealander restoring huts in memory of pioneer explorers, holds mummified remains of dog found at Cape Evans







**PENGUINS** take their ease on sea ice, but they, too, are under scientific scrutiny from the men in tractors. Scientists are curious about their homing ability. Penguins have made it back from points 2000 miles away

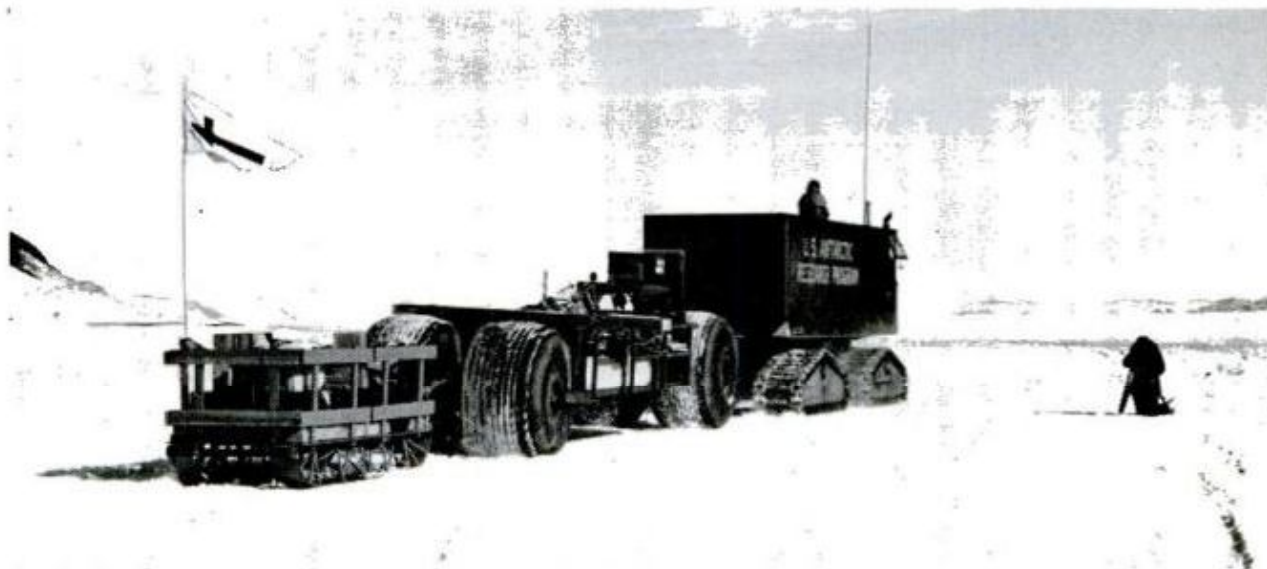
of light often frame the sun. And, not infrequently, two or even three distinct suns may glare from the polar sky.

Through territory cluttered with such unfamiliar phenomena, slashed with crevasses treacherously concealed by snow bridges, and plagued by endless blizzards that howl through jagged, lifeless mountain

passes two miles above sea level, hardy scientists make their 1000 to 2000-mile summer traverses.

Most American trail parties in Antarctica are sponsored by the United States Antarctic Research Program (USARP), with grants provided by the National Science Foundation. Every October, scores of sci-

**UNIVERSITY** of Wisconsin party begins a 1400-mile traverse from McMurdo to the Pole. It carried out seismic and other measurements of elevation and thickness of ice. Each wagon tire holds 500 gallons of fuel







**THIN ICE!** Drivers guide 35-ton tractors across thin sea ice with reins—just in case one falls through



**SCOUT SKIS** ahead of party in crevasse area to seek out danger spots. Detector, foreground, works sometimes, but men must see for themselves. South Polar go-buggy, right, is the Pole-Cat. It was new this year

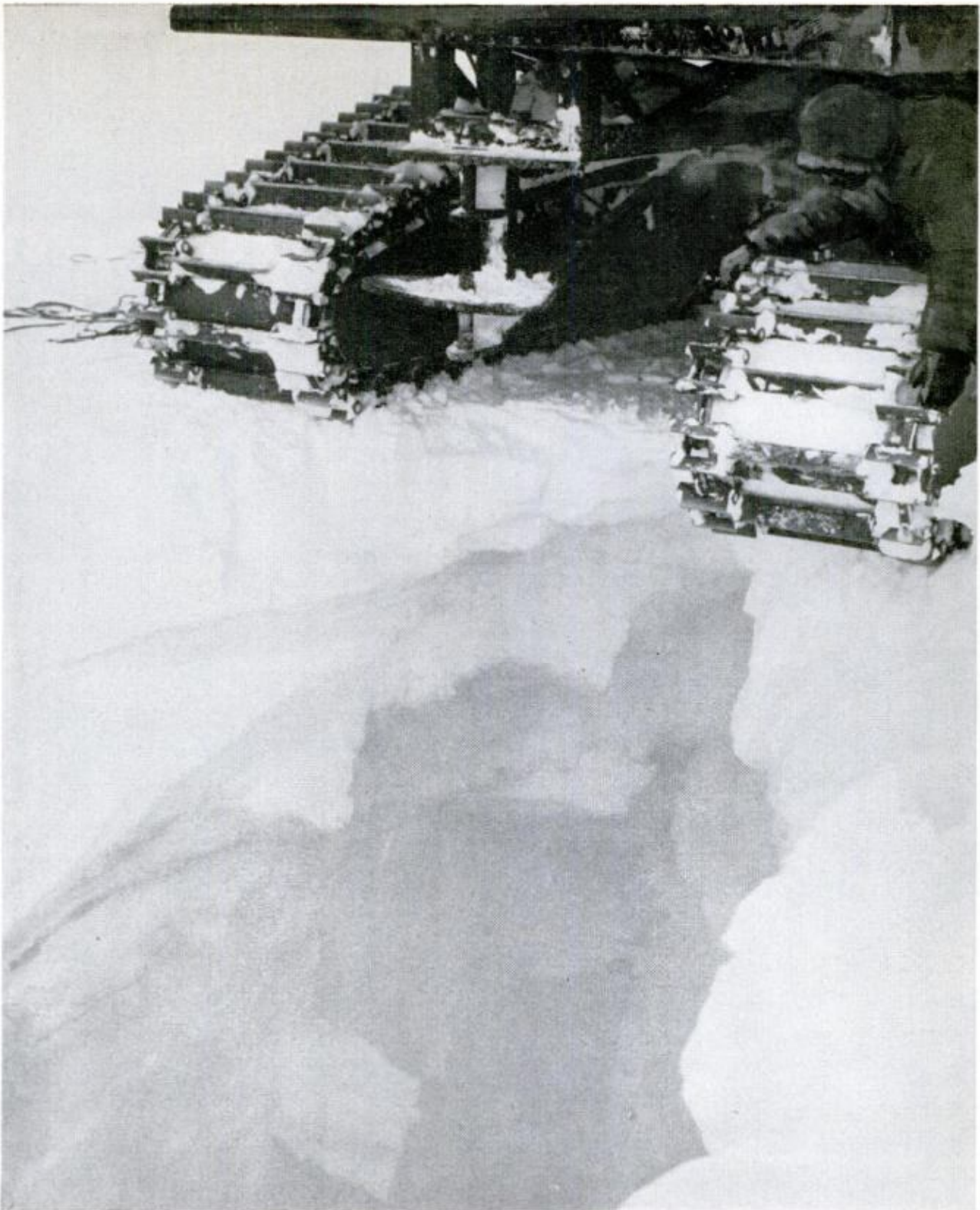
entists pour south to the ice from American universities receiving the grants.

This season, 800 miles out on the icecap at our base in Marie Byrd Land, I tramped around behind seismologist Perry Parks and traverse engineer George Widich while they prepared the Sno-Cats and sleds that rumbled out across the snow desert in December. Led by Dr. Charles Bentley of Wisconsin University, the six-man team drove three Sno-Cats towing sled trains

of supplies, zigzagging northward to the unexplored Bellingshausen coast. Another Byrd traverse, hauling building supplies on giant steel sleds behind 35-ton D-8 tractors, clanked southward past the desolate Horlick Mountains, to the South Pole.

From our McMurdo Sound Base, a scientific group, under Dr. Charles Swithinbank of the University of Michigan, fanned out across the ice shelf in Sno-Cats, Weasels, and snappy little Pole-Cats, faintly rem-





**CLOSE CALL.** Traverse engineer Jack Long peers down deep crevasse that almost swallowed up his tractor

iniscent of big-eyed fuzzy caterpillars. They hauled an array of equipment for ice studies. For work on glaciers flowing down through mountain passes bordering the ice shelf, the men broke out motorized toboggans with spiked grouser tracks that sent them scooting through tight places among the jagged rock walls.

But the really ambitious trail party was a 1400-mile McMurdo Sound-South Pole caravan led by Dr. Albert Crary, USARP's

rugged chief field scientist. The eight-man team crawled out of McMurdo on December 10 in one of the most unusual polar vehicle trains ever to grind across the high ice. Prime movers were three diesel-engined Tucker Sno-Cats, two of them 12-ton black monsters 25 feet long, 8 feet wide and 11 feet high. One, a rolling laboratory, carried seismic, gravity and magnetic equipment. The other was a glaciological unit.

(Continued to page 220)





# Dramatic 36-Hour Ordeal— Sub Saves a Frogman

By William R. Kreh

**T**HE SUBMARINE USS *Redfish* rode anchor on the choppy surface of the Pacific off Cape San Martin on the California coast.

Down in his cabin the submarine's skipper was faced with a life-or-death situation. On a nearby bunk a young marine lay dying. He had writhed in agony, gone into convulsions and was now unconscious.

He was dying of decompression sickness—more commonly known as “the bends.” One of his lungs had collapsed.

There was a chance he could be saved. It was a slim one, involving a treatment never tried before. It could be dangerous. At least one of the sub's crew would have to risk his life. And the idea might not even work.

It was up to the skipper, Lt. Comdr. Charles H. Lowry, Jr., to make the decision. If it worked, it might save a life; if it didn't. . . .

It had all started the day before, Sept. 19, 1960. The *Redfish* had been on a routine amphibious training exercise off the California coast. She had been working with a team of Marine frogmen from a Navy surface vessel, the transport USS *Cook*. That night the submarine was ejecting the Marine frogmen through





her escape hatch from about 60 feet beneath the surface.

One of the marines, Corp. David Merwin, 25, of Ridgewood, N.J., was "safety man" for the operation. Clad in a skin-diving outfit, Merwin stayed atop the sub, checking each man as he emerged from the hatch and ascended slowly to the surface.

He had been at his post for several minutes when suddenly he became nauseous and dizzy. He panicked a little and rose quickly to the

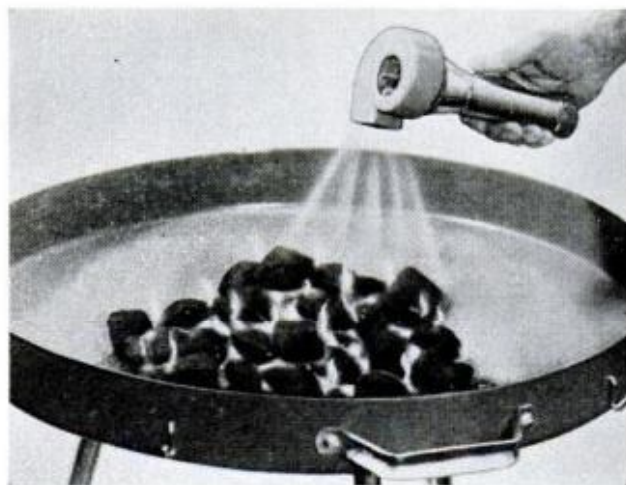
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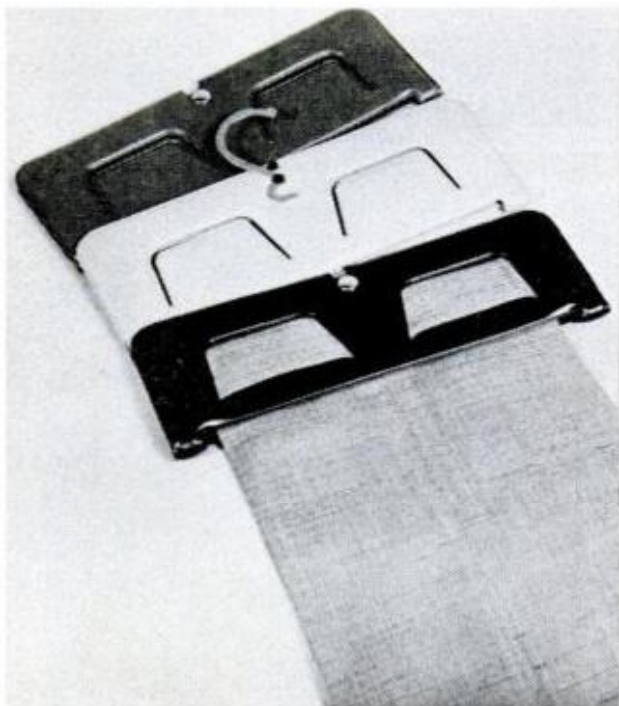


**AIR COOLER** in a console cabinet can be placed anywhere in room. The cooler has three-speed operation, separate water-pump motor and an automatic thermostat. Made by Metalaire Products Div., McGraw-Edison Co., Phoenix, Ariz., the cooler sells for \$89.95

# WHAT'S NEW FOR Your Home

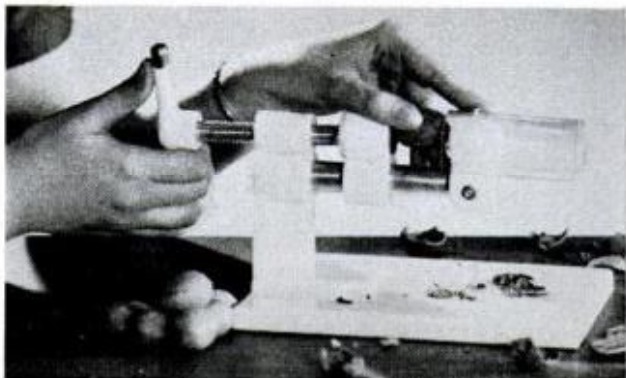


**BARBECUE FIRES** quickly spring to life under a flashlight-sized blower. Powered by two batteries, the unit has a small motor and fan at one end encased in plastic. Barrel is chrome-plated metal. Made by Harris-Dean, Waterloo, Iowa, the blower costs \$4.95

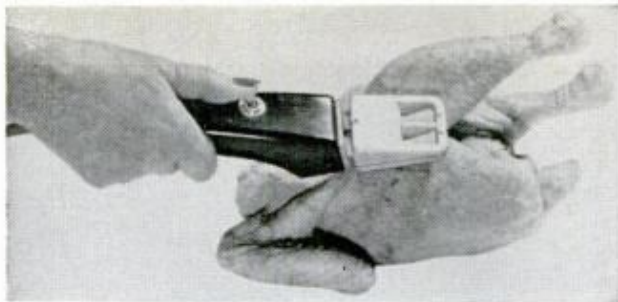


**TROUSERS HANGER** slips over cuffs and leaves no marks. Compact enough to fit easily into luggage, the hanger is made of leather-textured vinyl and is available in six colors. The trousers hanger can be purchased from Oxford Sales, Cleveland, Ohio, for \$1

**NUTCRACKER**, designed to leave meats whole, shells nuts as screw handle is turned. A shield slides over shelling area and directs broken shells downward. The plastic and aluminum nutcracker, made by Teague Mfg. Co., Teague, Tex., sells for \$5.95







**POULTRY SINGEING** is a 60-second job with an electric tool that removes pinfeathers and other such stubble. An on-off switch is located on the handle. It's sold for \$9.95 by Sinj-It, Wildwood, N. J.

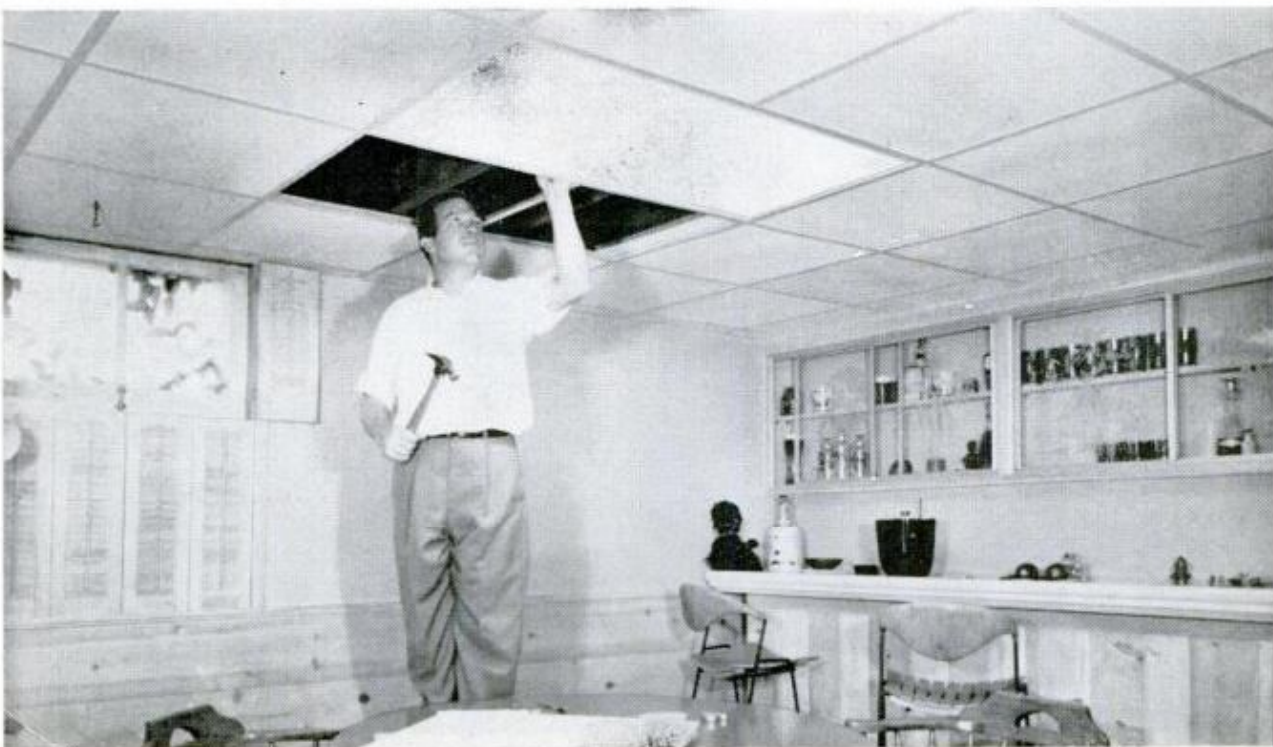


**CLAM OPENER** speeds the job of getting quahogs and cherrystones ready for the chowder. It's made by Clam Ram, Winchester Center, Conn.; price is \$3.95



**GAS-FIRED GRILL** uses drippings falling on hot ceramic "coals" to impart charcoal flavor to food. Cost: \$159.95. Made by Gaslite, Illinois, Inc., Argo, Ill.

**SUSPENDED ACOUSTICAL CEILING** is held in place by aluminum gridwork that hangs from existing ceiling. Acoustical tiles then drop into grid's modules. An Alcoa product; available from Montgomery Ward & Co.







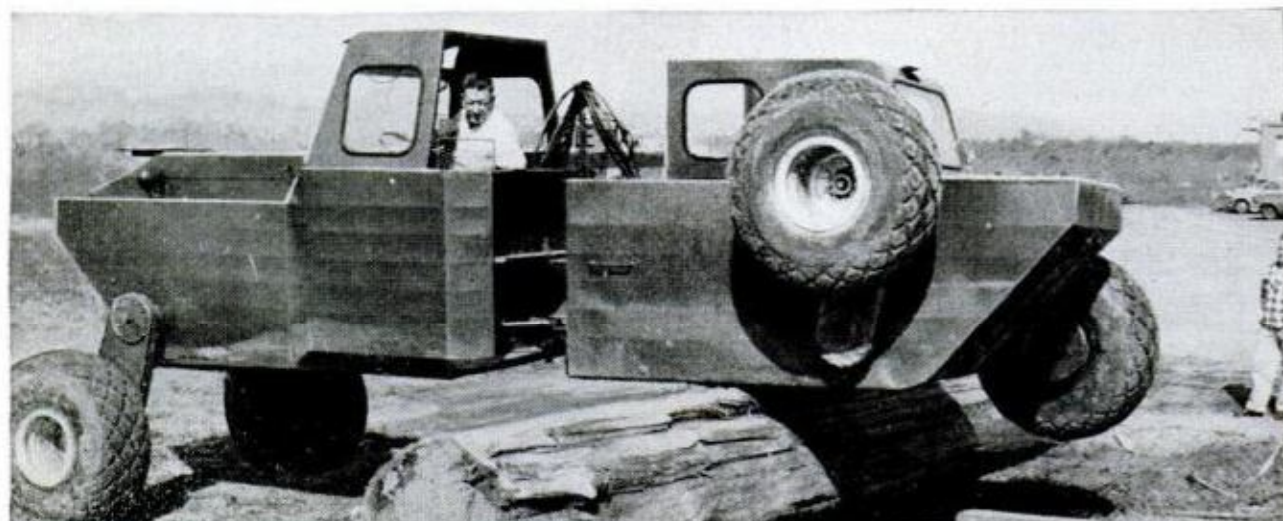
## You Can Take It for a Walk

Walking comes as easily to a new amphibious vehicle as does more conventional travel over roads, fields or water.

Each of its four wheels is powered by a chain drive and is set at the end of a leg that pivots through a full circle. Thus, when the machine comes to an embankment, the operator runs the nose against the bank, orbits the front wheels to the top, drives forward until the rear wheels reach the bank and then repeats the process.

When the vehicle is floating, a propeller at the rear drives it.

The Go-Devil is made by Wagner Tractors, Inc., 4615 N.E. 80th Ave, Portland, Ore.





## Stiff-Necked Radar Sees All, Tells All

Resembling a giant outdoor movie screen, a new radar structure contains nearly 9000 tiny radar antennas that allow it to cover a wide expanse of space and track hundreds of targets simultaneously without turning its "head" or antenna.

The permanently anchored Cyclops is known as ESAR (for electronically steerable array radar). It contains no moving parts, but shifts from target to target electronically. The first model was installed near Baltimore, Md., at the radio division of the Bendix Corp. which built it for the Air Force's Air Development Center and Advanced Research Projects Agency.

It will track missiles fired from the National Aeronautics and Space Administration's launching site at Wallops Island, Va., and also keep watch on air traffic in the congested Baltimore-Washington, D.C., area. Eventually, however, ESAR units are expected to extend their mission into space and keep track of thousands of satellites and other space vehicles.



## Flying Volkswagen!

It's really a helicopter with a cardboard front. As a publicity stunt, a Volkswagen dealer in Karlsruhe, Germany, mounted facsimiles of the well-known Volkswagen silhouette on the sides of a helicopter and flew it around town to advertise his business. It looked real from a distance.



## One-Armed Rifleman

When Walford Brown of Northville, Mich., lost the use of his left arm, he was afraid he would have to give up his favorite sport, deer hunting. But occupational therapists at the University of Michigan worked out a harness device for him that lets him carry and operate his deer rifle with his right arm only.

The harness holds a broad, rigid belt around Mr. Brown's waist, which in turn supports the swinging steel arm that holds the rifle to his shoulder.



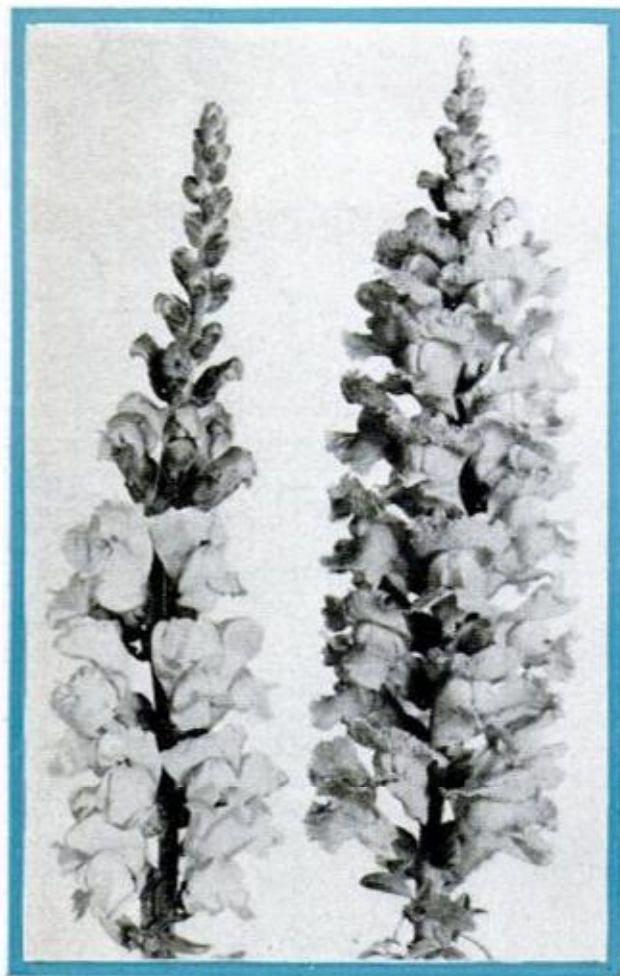


For the amateur  
gardener--

# New Plants on Order

By A. B. Kennerly

**COLCHICINE** breeding makes Tetra Snapdragon, right, bigger and more colorful than its untreated relative



**AGRONOMIST** John Long of Texas A. & M. inspects a test pot of St. Augustine grass treated with colchicine

**A** DRUG FROM A PLANT so old it was first mentioned in medical texts as early as 1550 B.C. is creating a revolution in plant breeding. And today, after more than 20 years in the laboratories of scientists, the chemical, colchicine, has entered into the experimentations of serious amateur gardeners.

The amateurs are inspired by such successes among professional growers as the Cinderellalike transformation of the black-eyed Susan, a common wild flower, into the Gloriosa Double Daisy, an All-American winner for 1961.

The strange property which colchicine exerts on a plant is that of doubling the number of chromosomes, the carriers of hereditary characteristics. The result is that each cell has twice the usual number of chromosomes which in turn may produce anything from the best to the worst of the plant's family traits. You can't predict the outcome.

Results amateurs get from using colchicine will depend on the amount of time and attention to details they are willing to give. It's a good idea to read a book or two to learn something about plant genetics. Select seed of plants that will germinate in two to four days and apply the colchicine. Or if the seeds are slow to germinate, wait til they germinate and apply it to the tips.





**WILD COTTON** crossed with domestic upland plants yielded a bigger, stronger, more insect-resistant plant with stronger fibers. One new variety of cotton has been developed in the Texas A. & M. experiments

*A GRAM*

It is best to use a weak solution at first, about a 0.2 percent solution of the colchicine powder mixed in water. John Long, agronomist for Texas A. & M. College, uses a solution of 2 grams ( $\frac{1}{8}$  teaspoon) to a quart of water. Colchicine costs from \$4 to \$6 an ounce, and you can order it from most any pharmaceutical supply house. However, you won't need more than a few drops of solution at a time.

**Caution:** Avoid rubbing colchicine solution in the eyes, and wash your hands after each time you use it.

Cotton was one of the early plants to gain from colchicine research at Texas A. & M. College. With colchicine, wild cotton varieties could be crossed with American upland cottons. Brazos cotton, a high performing variety for Texas, was derived from three Asiatic and American species.

New flowers have been the special target of such breeders and seed growers as the Burpee Company. Chief result among the ornamentals has been larger flowers, and these have been attained among snapdragons, phlox and marigolds. It is with flowers that amateurs can make the most progress.

Geneticists at the Burpee Company developed the Tetra Marigold with colchicine in 1940. This Tetra Marigold (tetraploid—here shortened to tetra—is the scientific

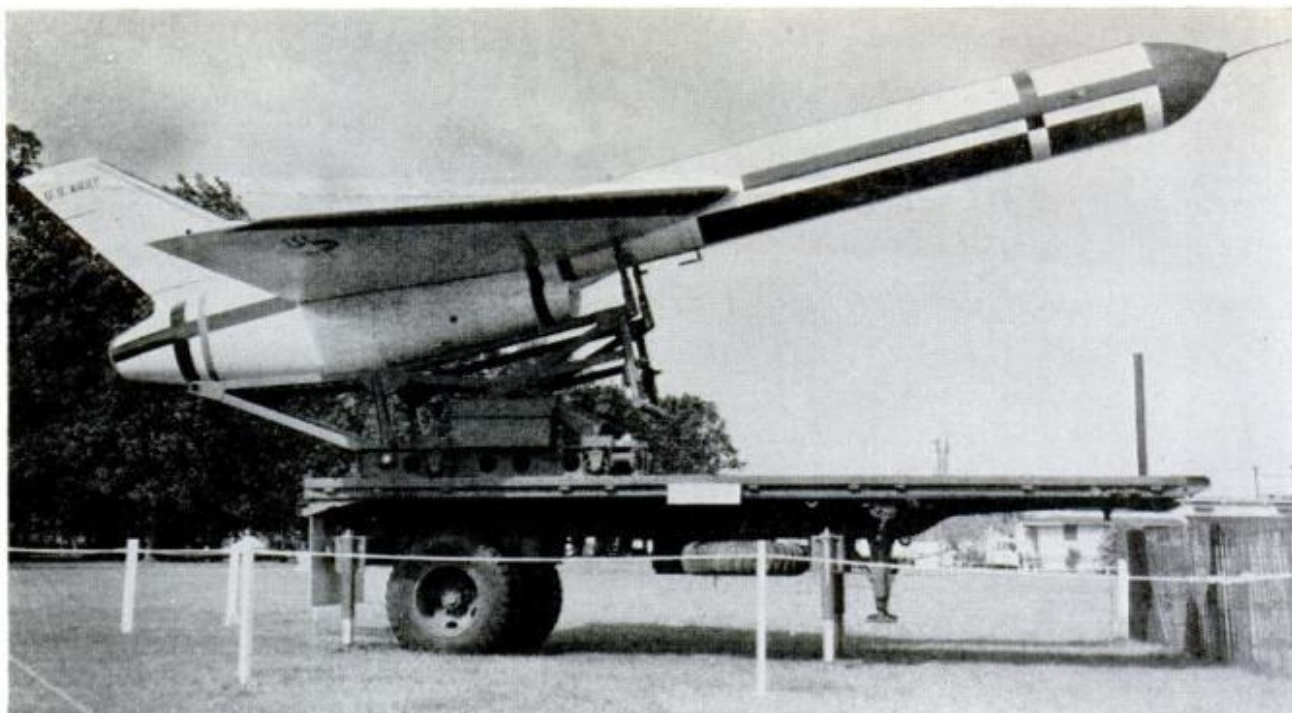
(Continued to page 236)



**SNAPDRAGON** blossoms, above, treated and untreated; below, colchicine application on growing seedlings





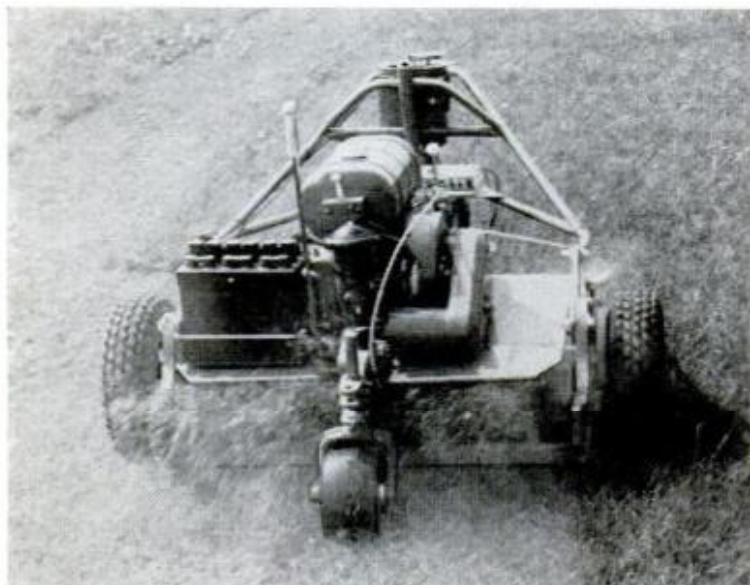
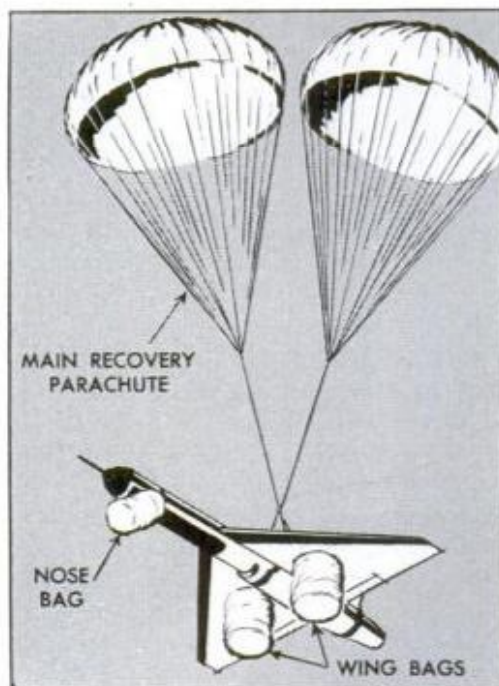


## Drone Spy Recovered by Parachutes

Powered by a turbojet engine, an unmanned short-range missile will fly over enemy territory and relay photographic, radar and infrared data to front-line Army commanders. It will then return and parachute safely into a preselected open area.

The missile operates under all weather conditions, day or night, and cannot be fooled by camouflage nor jammed by enemy radio. It is preprogrammed before takeoff for its entire mission and return, hence needs no radio communication during flight.

By providing instantaneous information about the enemy, the SD-5 (for spy-drone) enables field commanders to monitor enemy movements and acquire target data for firing tactical missiles against troops or strongholds. It can be programmed to remain over enemy territory to report on whether these tactical missiles hit their targets. Besides transmitting in flight, it can store information which can be recovered when the missile returns.

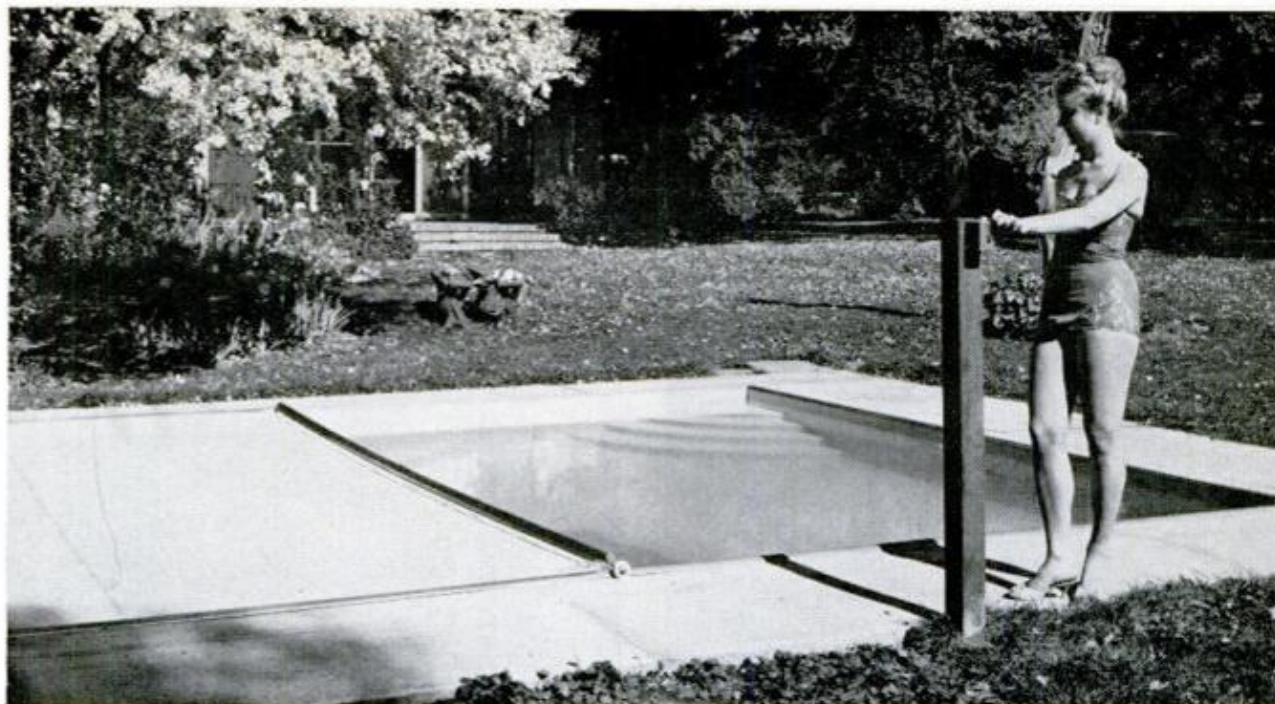


## Solo Lawn Mower

Going about its business while the owner relaxes somewhere else, an automatic, electronically guided lawn mower follows a pattern of low-voltage electrical wire imbedded in the sod. A wire probe at the front senses and follows the current, which can lead the mower around obstacles and even back to a storage area when it's finished.

A safety-sensing unit shuts it off if it encounters any unscheduled objects like kids and dogs in its path. The guidance system was worked out as an experiment at the DeVry Technical Institute in Chicago.





### Pool Cover Slips Into Place Under Own Power

Push-button control is a feature of an electrically powered pool cover that keeps out dirt, leaves and wandering children. The fabric is nylon-reinforced laminated

plastic, and the rollers move in aluminum channels. Made by Patio-Pool Cover Co., 9553 S. State St., Sandy, Utah, the cover, installed, sells for \$350 and up.

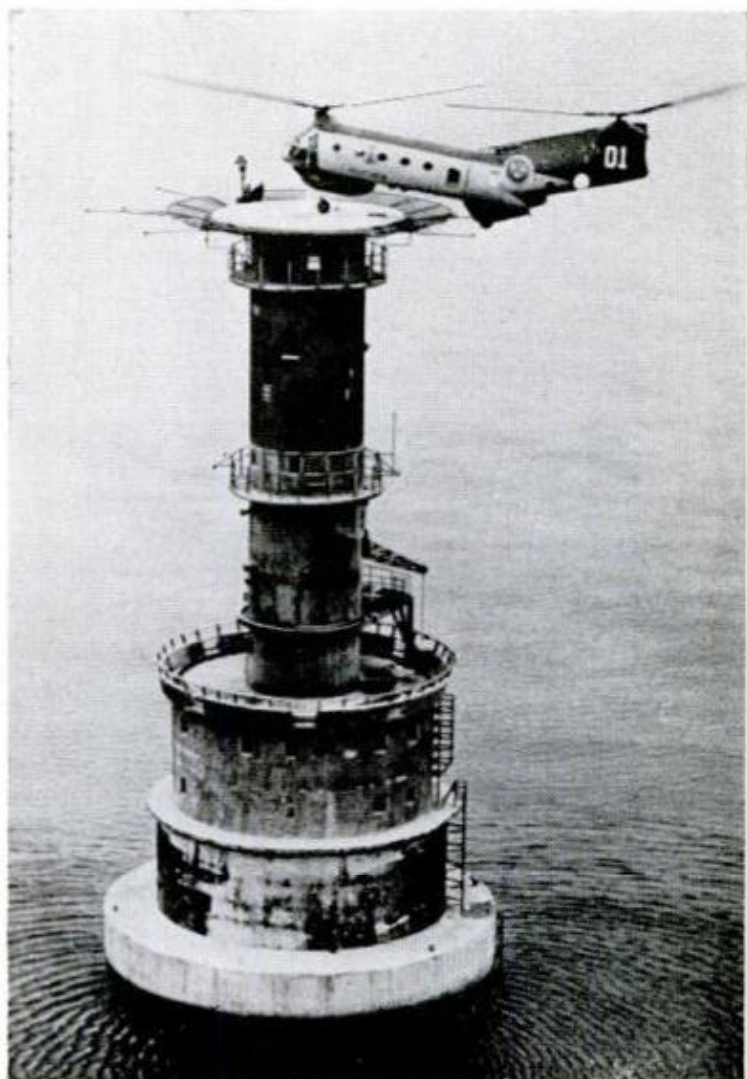
### Helicopters Service Swedish Lighthouses

Dozens of flat-headed Swedish lighthouses dot the Baltic Sea area and are usually serviced by boats. But when the boats can't make it or the water gets rough, American-made Boeing-Vertol 44s fly in food, mail and supplies for the isolated occupants.

Too big to actually sit down on top of the 150-foot towers, the helicopters usually just rest the front nose wheel on the tower top until supplies are unloaded. Meanwhile the remainder of the fuselage hovers over the sea.

### Students Breed Fireflies

Members of a Japanese high-school science club, who have already successfully raised 100,000 fireflies, are going into firefly production on a large scale. They discovered that fireflies would nest in an inverted flowerpot and that pond snails and mollusks make a suitable diet. So now students of Togane High School are raising the fireflies for sale in gauze-covered cages for use as garden lanterns, and for agricultural use in devouring field and garden pests.







**MOTORIZED BUNKS** for children's room, above. Below, a vibrator chair and the motorized ash conveyor

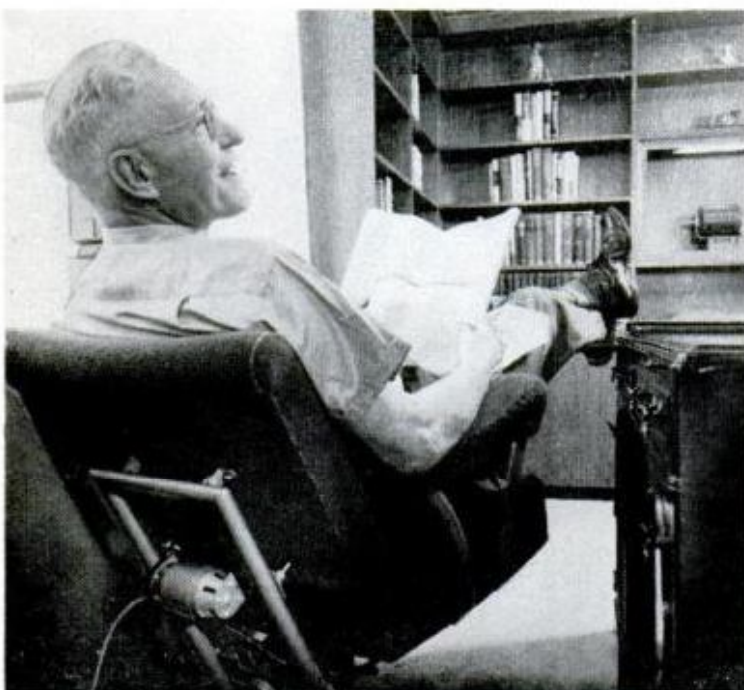
## HOUSE FULL OF MOTORS

**MOST MODERN HOMES** have a lot of electric motors—often up to 30. But the residence of Lisle Hodell in Fort Wayne, Ind., puts them all to shame with more than 100 fractional-horsepower motors applied to everything from conventional appliance jobs to running the garden fountain.

Mr. Hodell, general manager of the GE General Purpose Motors Division in Fort Wayne, makes a hobby out of his livelihood, putting his motors to work everywhere he can and setting a new record for home automation. There are motorized folding bunk beds in one room; powered

draw-draperies in another; a centralized vacuum system keeps the home clean; even the ashes from the fireplace are carried to the flower beds by a motor-driven conveyor. For exercise, he has a powered exercising machine in the bath; for more relaxed workouts there's a vibrator built into Hodell's desk chair. On the desk, there's an electric pencil sharpener and eraser.

Outside, besides the fountain, there's a portable evaporative cooler which sprays an aromatic insecticide to keep mosquitoes away, and a motor-driven trap for any bugs who get past the spray.







# SCIENCE OVERSEAS

By William Kreh

**TIDAL EBB AND FLOW** will provide electrical power for France. Engineers are building a chain of 32 turbo-generators across the estuary of the Rance River in St. Malo that will make the conversion. Each unit will produce 60 million kilowatt hours of electricity a year.

**Star-gazing salmon** may use fixes as they navigate on their migrations. Canada's Fisheries Research Board says experiments in Nanaimo, British Columbia, show the fish follow definite routes in clear weather but travel in random directions under artificial covering or overcast skies.

**Sweden's latest export** to South America is a lulu. The Sandviken Jernverk steel mills are shipping out scientifically designed, stainless-steel false teeth for cows whose natural ones wear out on raspy pampas grass.

**Moon road maps** may be produced by international cooperation of another sort. Great Britain is providing optical and photo equipment designed to take extraclear pictures for use with a French telescope at Pic-du-Midi, a scientific station high in the Pyrenees. The U.S. is processing the film and putting the maps together at the Air Force's Aeronautical Chart Information Center, St. Louis, Mo.

The finished map will be a circle nearly 12 feet in diameter.

**Giraffes may help** future space travelers. Russian scientists want to learn how the animal's heart is able to pump blood all the way to its brain, because when a man takes off in a rocket, the burst of speed will force blood into whichever end of his body is pointing down. If his feet are pointing down, the heart won't be able to pump blood to the brain. Since the giraffe handles the blood-pumping problem with ease, the Russians believe it will give clues to how strong a heart system man will need, and how to develop it, for rocket acceleration.

They also are using pigs and bears in space vehicle tests. A pig's neck is much like a human's, as is a bear's pelvic bone.

**Metal molybdenum**, ingested with foods grown in soil rich in the metal, prevents cavities in teeth, a New Zealand study suggests.

Residents of Napier have fewer cavities than those of the nearby town of Hastings although they have common milk and water supplies. The different factor in their diet is the crops grown for food. Napier grows its crops in a former lagoon that has higher amounts of molybdenum, titanium and aluminum than soil used for crop-growing by Hastings.

**Tiros II helped** prevent cyclone damage down under, a report from Australia indicates. The weather bureau got warning of a coming storm in time to take precautionary measures, thanks to photos sent from the weather satellite.

**Artificial waterfalls** produced by an atomic power plant in the Andes Mountains will produce vast amounts of electricity for Peru.

The plant will be built 13,000 feet above sea level, on the shores of Lake Titicaca. It will pump water from the lake through a mountain pass 2000 feet higher so the water will cascade three miles down the steep mountain slopes. Conventional hydro-electric plants will be spaced at intervals on the mountain.

The atomic plant will generate 100,000 kilowatts; the hydroelectric plants will turn out one million kilowatts.

**The oldest shipwreck** ever discovered may have been found by University of Pennsylvania scientists off the Turkish coast near Cape Gelidonia. It dates from the 13th century B.C.

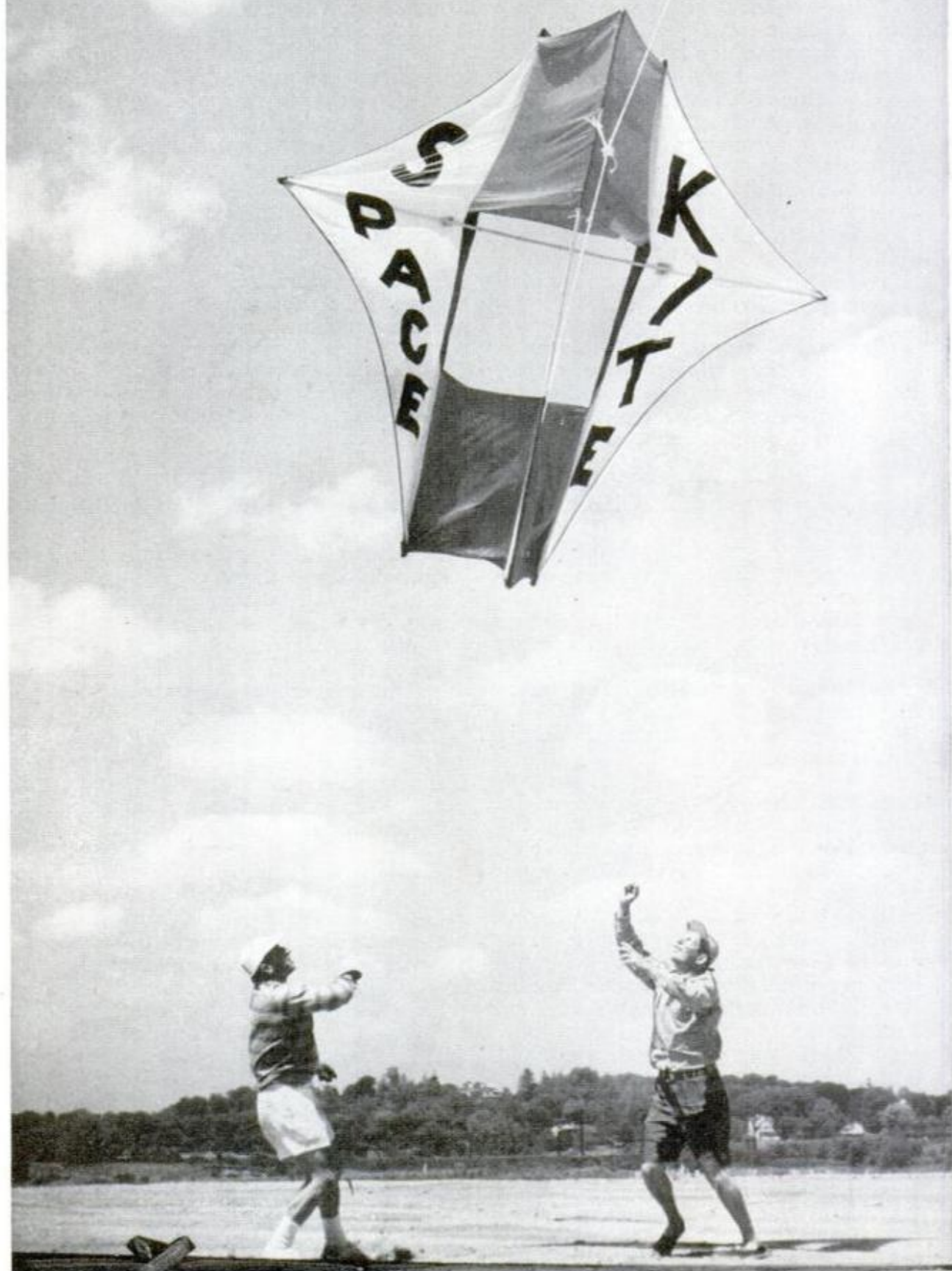
**Oxide bricks** and other industrial products will be turned out by an industrial solar furnace located at Mont-Louis, near Perpignan, France. Temperature inside the furnace reaches over 5400 degrees F.

The French have rigged a nearby hotel with a solar heating system that provides 80 percent of all hot water needed for cooking, washing and heating. Ten miles away, a second furnace is being readied for operation in 1962. It will provide 500 metric tons of products a year at half the price it costs to make the same things in steel plants.

**How fast** is a snail's pace? The Royal Ontario, Canada, Museum of Zoology pegs it at 6½ inches a minute. A snail would need a week to go a mile.



# *I Fly Kites With the Champ*







**WILL YOLEN** tugs on his space kite, wrapping line around body to keep it taut



**FRONT LAWN** on Sunday afternoon resembles debris after Fourth of July picnic. Yolen (sitting) and friends assemble kites

***My dad has airlifted a midget above Central Park and battled Indian kites that fight with razor-sharp claws. Here's his story. You'll find instructions for building some of his spectacular kites on page 142***

**By Jane Yolen**



**BRAZILIAN FALCON**, or Papaguyo, has four-foot wings which flap with the wind

**T**HREE THOUSAND men, women and children milled around Compo Beach on the north shore of Long Island Sound in Westport, Conn., on a windy March day last year. They were there to watch the launching of the world's largest kite—144 square feet of sail cloth and framing. The man behind the keg-size reel and mile-long washline leash for the huge rig was Will Yolen, a compact (5-foot, 5-inch) variety of public-relations executive. He also happens to be America's top kite expert and, incidentally, my father.

Dad was a pioneer in the use of fishing rods and reels for working kites, and is a firm devotee of kiting's newest "nonrigid" devices. He is notorious for never leaving well enough alone when it comes to kites. His most recent experiments have involved gigantic affairs made of nylon and 12-foot bamboo poles, like the one that made its debut at Compo that day. It was such a mass of fabric and timber that the only outfit capable of making it properly for him was a New Haven company noted for

**SPACE KITE** was originally designed by French in World War I to hoist flares, or men, over enemy lines for observation missions. Yolen's version has 144 square feet of sail surface





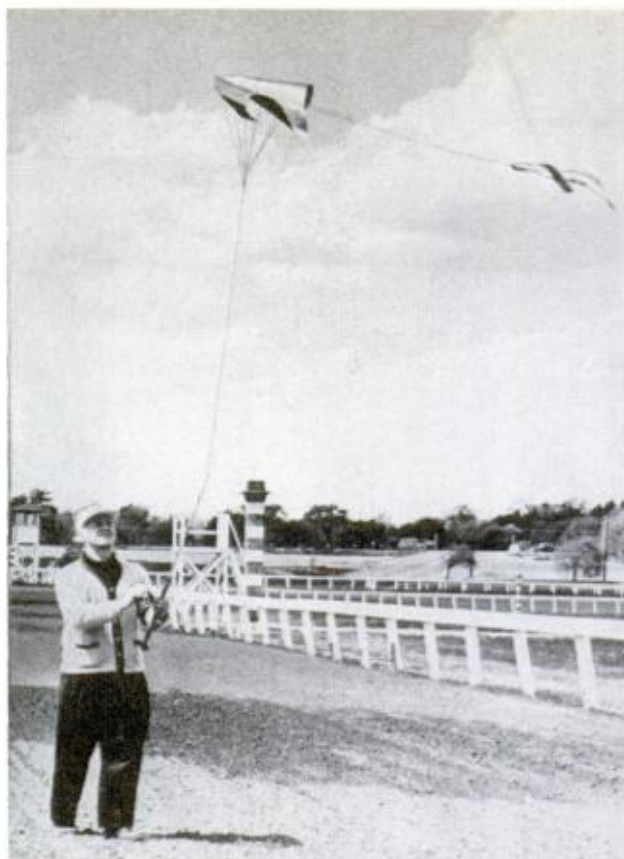
**NEWEST KITE** is nonrigid Flexkite, made of flexible plastic. Its inventor, Dr. Francis Rogallo, is at left

the sails it creates for ocean-going yachts.

Even the police were on hand for the Westport launching. Although kite flying is actually outlawed in Westport because of an old edict which states that it scares the horses, the police were there only to control the record crowd.

This kind of commotion about kiting is nothing new in our family. My father has been making kite news for years, amid the jeers and insults as well as the admiring

**FIGHTING KITE** from India, made of bamboo and rice paper, uses razor-blade edges to slash other kites



**NONRIGID KITE** is reeled in by carefully rigged and balanced shroud lines. Tail keeps it facing wind

praise of onlookers. Nothing bothers him anymore. Not long ago, he was arrested in New York's Central Park for trying to loft a midget on a large kite. The burly policeman who stopped him was in a near hysterical frenzy. "Mister," he bellowed, "you ain't flyin' no midget on no kite in Central Park on my beat!" The upshot was that he was thrown out of Central Park—kite and all. Later we moved to Connecticut.

On another occasion, one of his babies

**CHINESE KITE** was used to rescue emperor from tower jail in 15th century. Yolen shows how it was done







**FLYING SHAPE** of Flexkite is demonstrated by Yolen. As shroud lines gather, kite assumes proper angle

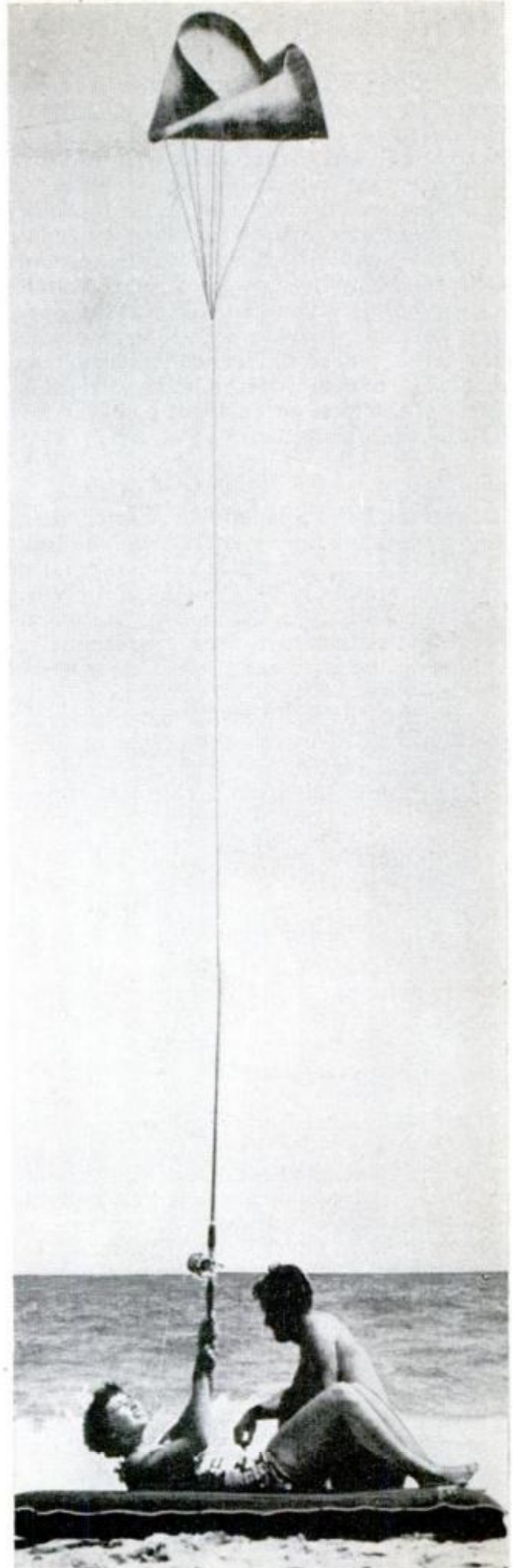
picked up a stiff breeze, lifting him and three other team members 100 yards out into Long Island Sound, dragging the whole crew into the drink. "That's why you need six men to handle the big one," he explains. "If I were to fly it alone, it would hoist me clear across Long Island to Gander, following a great circle course more or less."

The fact is that my father readily admits — with practically no encouragement — to being the Western Hemisphere kite-flying champion. He is the captain of a six-man United States team that beat a field of international kite flyers in Nassau last year. Following their victory, he and the team organized a group that is endeavoring to put kite-flying in the Olympic games. Dad has flown kites competitively all over the United States, as well as in Europe and the Near East. His most recent international bout was staged against the Eastern Hemisphere's champion, the Maharajah of Bharatpur, on the lawn of the prince's jungle hunting palace in India last spring.

For years, the cellar of our family home has harbored the finest collection of kites in the world. It is bigger and more complete than the collection in the Smithsonian Institution in Washington, D.C., according to my father, whom I never dispute.

(Continued to page 238)

**BEACH SAILING** with nonrigid kite on fishing pole may become popular. Reel ratchet keeps it in tow



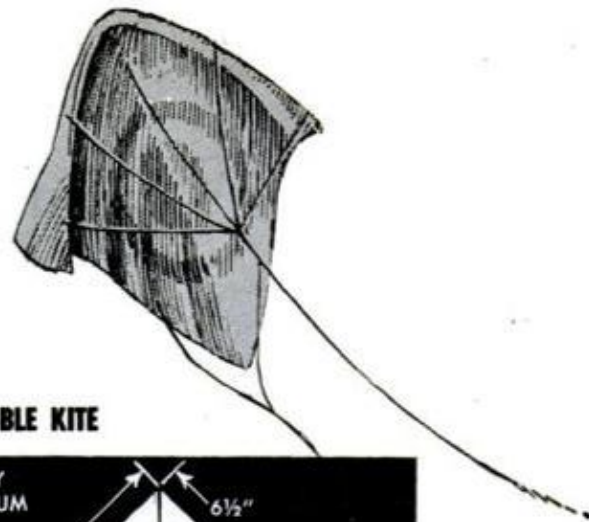
TURN PAGE FOR KITE PLANS



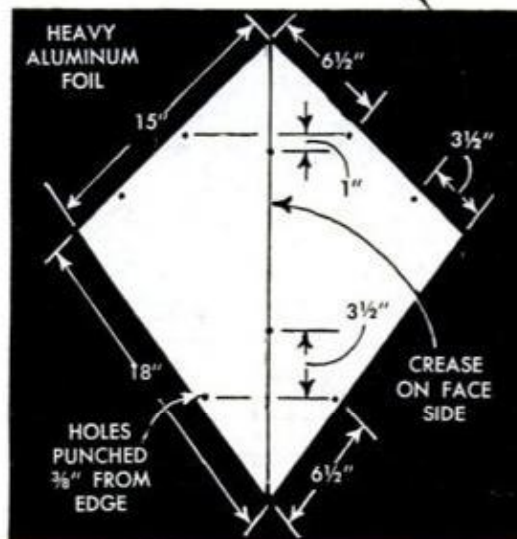


## THREE HIGH FLIERS

**1. Flexible Kite.** As simple a kite as you could hope to make, this one consists of a single piece of acetate or aluminum foil which is lofted at the end of a fly rod. In a stiff breeze it billows like a parachute, and a 5-ft. balancing tail with three 15-in. foil streamers tied to the end keeps it heading into the wind. Cut the foil to the size and shape indicated, punch the shroudline holes at the points given and fold the foil down the center to provide a sharp crease when the foil is placed flat. The converging six-leg bridle of braided fishline, knotted on the back of the kite, extends out from the face of the kite about 12 in.



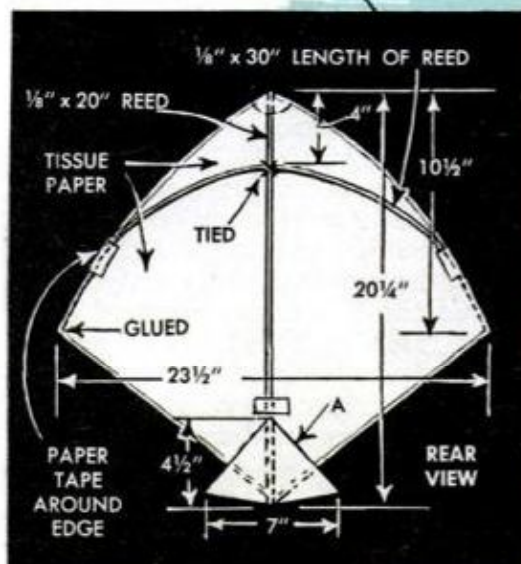
**1 FLEXIBLE KITE**



**2. Fighter Kite.** Shaped like an arrowhead and measuring nearly 2 ft. across, the India fighter kite flies with a rapid oscillating (jerky) motion. The drawing details the kite from the rear. As shown, the framework consists of two reed ribs lashed together in the form of a cross. One is bound to the other with thread at a point 4 in. down from the top. Tabs of paper affix the vertical reed to a covering of rice or tissue paper which is first cut to the shape shown and hemmed all around by folding over the edge 1/8 in. and gluing. The horizontal reed is curved to suit the width of the kite and is held to the paper covering with tape and glue. Finally, the tissue-paper tail, A, is added. This is made double thick by gluing a single thickness to each side of the kite. A toothpick rib is inserted between the two layers of paper along the outer edges at the sides. An adjustable two-leg bridle is attached to the vertical reed.

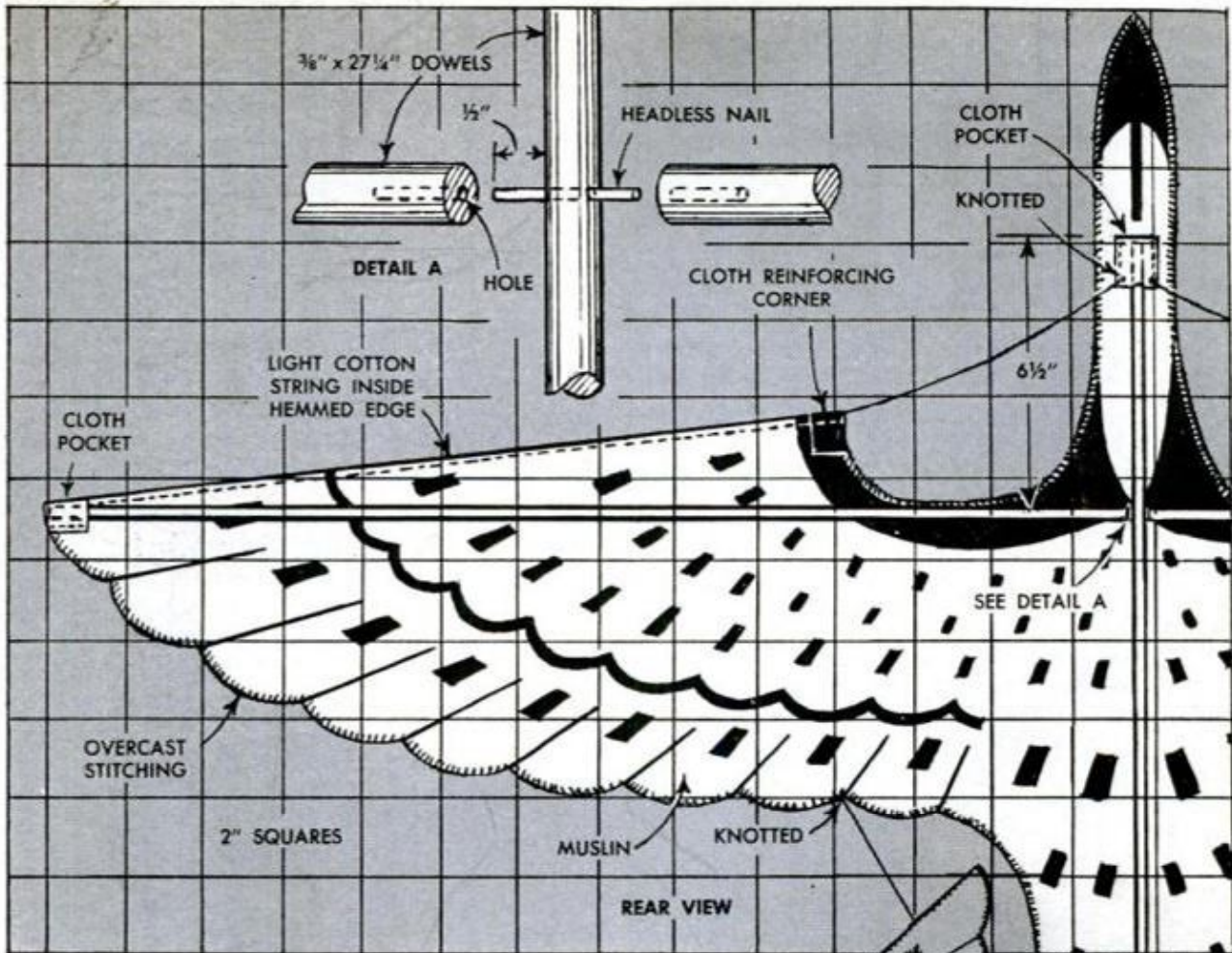


**2 FIGHTER KITE**

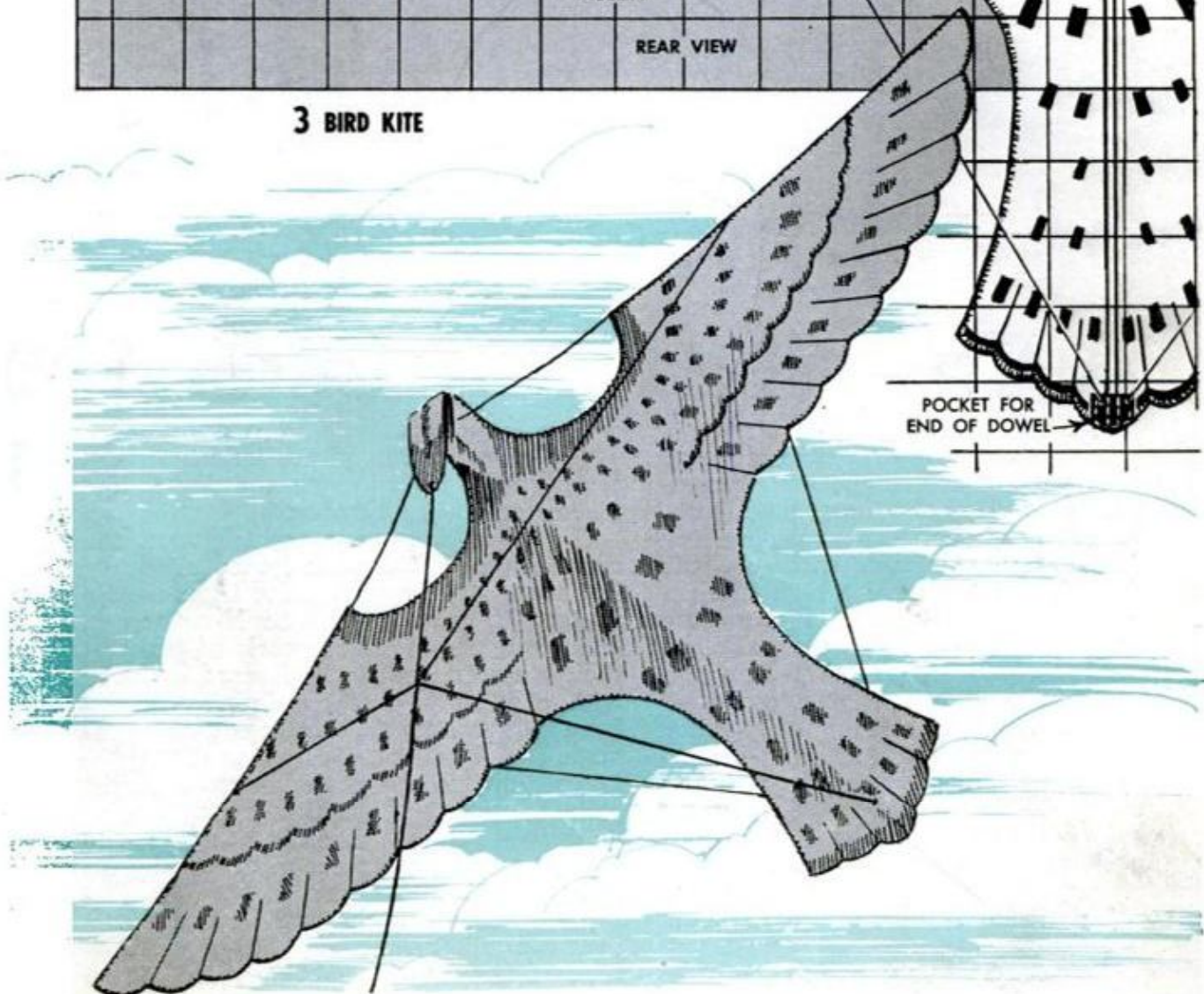


**3. Bird Kite.** Resembling a Falcon in flight this fascinating kite literally flies like a bird in that dowel wing spars are pivoted on a central shaft which permits the wings to flap in a realistic manner with varying air currents. First make a paper pattern from the squared drawing, trace it on muslin and cut out. Form a hem along the leading edge of each wing and overcast all other edges of the fabric by hand to prevent fraying. Then sew on pockets for spars at the points shown. Detail A shows how the wing spars are pivoted. Holes in the ends of the dowels are made oversize to fit freely over a headless nail forced crosswise through the vertical dowel. Cotton string is run through the wing hems, and the bridle is rigged as shown in the front view of the kite, attaching and knotting the various shroudlines at the points indicated. ★ ★ ★





3 BIRD KITE





# X751

## SHOP NOTES AND CRAFTS

*Mosaic-tile top enhances beauty of this elegant three-drawer jewel case*

*By John Burroughs*



## A Case for Her Trinkets

**O**NE LOOK at this attractive jewelry case with its colorful ceramic-tile inlaid top and the lady of the house will have the craftsman of the house busy making one. The case is a boxlike enclosure, the top, bottom and sides of which are assembled from  $\frac{3}{4}$  x 10-in. solid mahogany dimensioned as shown in the drawing. The back is  $\frac{3}{8}$ -in. plywood. If 10-in.-wide mahogany is not available, pieces of narrower stock are doweled and edge-glued together as in Fig. 1. Drawers are made of  $\frac{1}{2}$ -in. mahogany with  $\frac{1}{8}$ -in. hardboard bottoms.

Run the  $\frac{3}{8}$ -in.-sq. rabbets in the front and back edges of your 10-in. stock before cutting it up in pieces. The rabbeting can be done on a table saw or with a portable router. Note that the rabbet at the back is cut along the inside edge of the material, whereas at the front it is cut along the outer

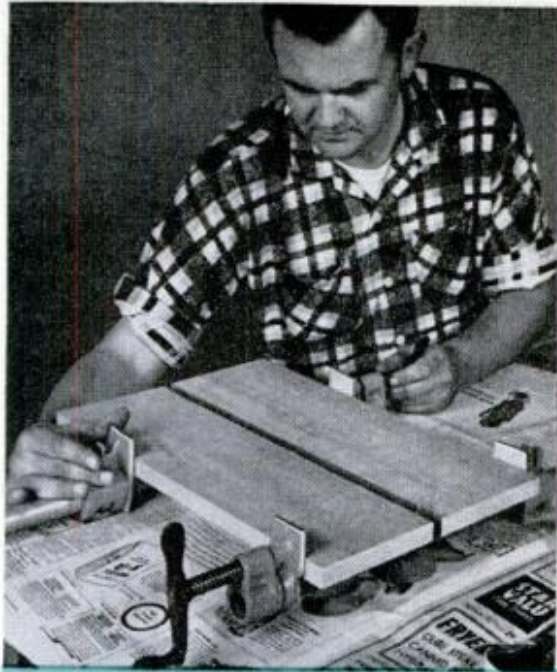
edge. Now miter the pieces for length, cut the plywood back to size and dry fit the pieces for a test assembly.

The  $\frac{1}{4}$ -in.-deep recess which takes the ceramic mosaic flush with the top, also must be made before assembly. A portable router, Fig. 2, fitted with a circle-cutting attachment, makes quick work of this, although the recess can be formed by hand with a chisel. Three overlapping circles form the recess. A decorative edging is first made around the recess outline with a  $\frac{1}{4}$ -in. core bit, using the circle-cutting guide.

Before gluing the pieces together, drawer guides ( $\frac{1}{4}$  x  $\frac{1}{2}$ -in. oak strips) are glued to the sides and spaced according to the dimensions given.

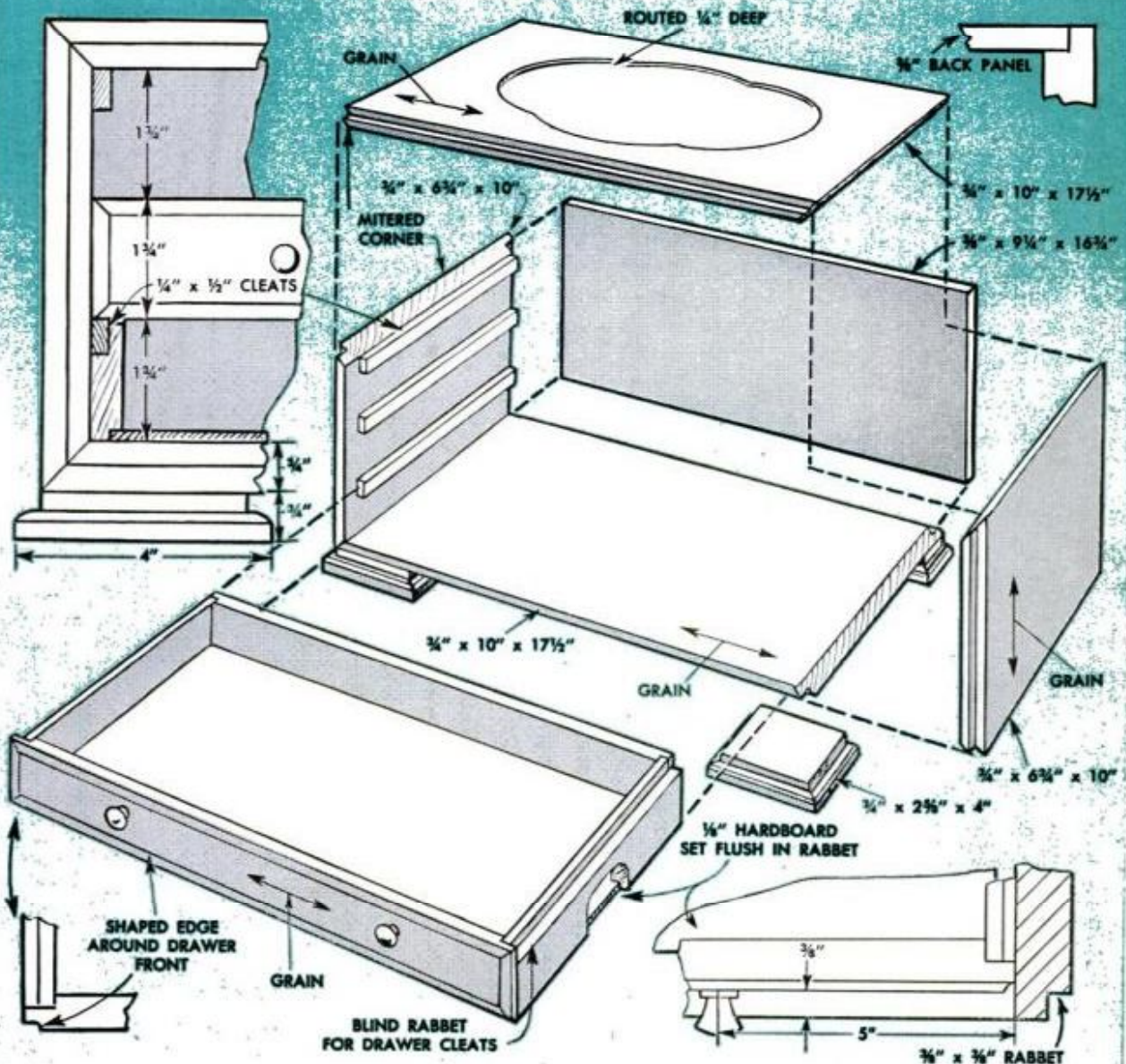
The best way to clamp the mitered corners is to glue temporary clamping blocks to each surface along the joint. These





1. WHEN NECESSARY, two pieces are edge-glued to make up the required 10-in. width

2. CLEATS SECURE mahogany top to workbench while routing out  $\frac{1}{4}$ -in.-deep depression for the tile mosaic







**3. RED STAIN** is rubbed well into mahogany grain prior to giving case three coats of spar varnish



**4. FELT LINING** glued on inside surfaces of drawer, is held in place with straight pins until glue sets

blocks, or ears, are triangular in shape and are glued in place with paper between so they later can be popped off with a chisel without marring the surface. Use water-soluble, hide glue to glue the blocks so the hardened glue can be later sponged from the surface grain with a wet cloth after the blocks are removed. The glue blocks permit C-clamps to be applied across the joints to draw them up.

Making the three identical drawers is an easy table-saw job. Fronts, sides and backs are cut to provide a sliding fit in the case; the 1 $\frac{3}{4}$ -in. depth given may have to be adjusted slightly to suit the over-all height of the case opening. Note from the details that rabbets are cut in the drawer side members, and that a cove or bevel is shaped around the drawer fronts with a router or drill press. It also can be done on your table saw fitted with a molding head.

Note that the drawer fronts actually set

in  $\frac{3}{8}$  in., the depth of the rabbeted edges of the case. The feet for the case may be built up from two pieces of  $\frac{3}{8}$ -in. stock or cut from  $\frac{3}{4}$ -in.-thick blocks. In the latter case, the four sides are rabbeted and the edges rounded. Use glue and screws to attach the feet and position the shouldered edges even with the corners of the case.

Deep-red oil stain was rubbed into the grain of the original, Fig. 3, followed by three coats of thinned spar varnish. No filler was used. This resulted in a slightly textured rather than a glass-smooth finish. The drawers are lined with cardboard-backed felt glued in place as in Fig. 4.

The tile mosaic is arranged according to your pattern cemented in place in the recess and then grouted with cement mortar. The grout is kept damp for several days with wet cloths to avoid cracking, then brushed with silicone sealer when dry as in Fig. 5, to complete the case. ★ ★ ★

**5. SILICONE SEALER** brushed on tile and grout after latter is dry, below left, keeps tile bright looking longer. Right, photo shows how some of the tile must be shaped in order to work out particular mosaic design

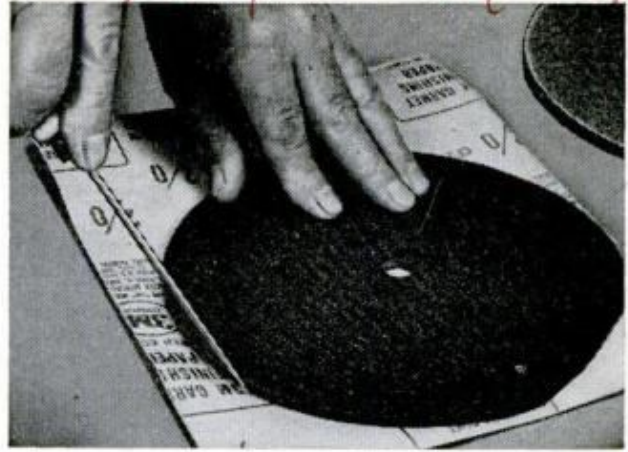




## QUICK AND EASY

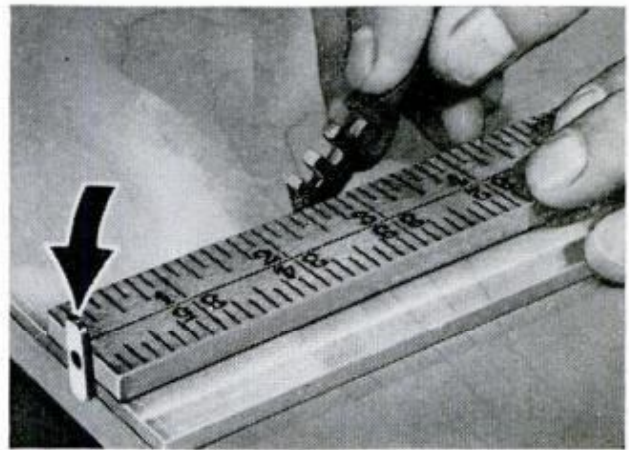
### Tear-Out Sanding Disks

Cutting sanding disks from regular size sheets with tin shears or a razor blade rarely produces the neat job a craftsman likes to see. A better way is to place the sheet grit side down and place the sanding disk on top of it. Then perforate the paper all the way around the edge of the disk, using an ice pick or a sharp scribe and making perforations not more than  $\frac{1}{8}$  in. apart. Tear off the corners of the sheet.



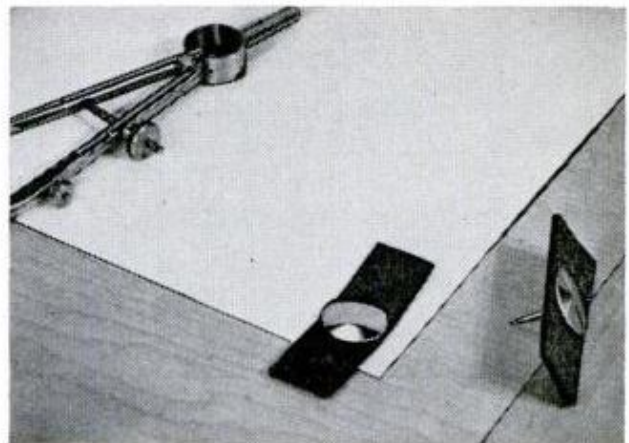
### End Hook on Yardstick

A turn-button screwed to the end of a yardstick helps to anchor the end of the stick when using it as a straightedge for cutting glass. It also assures you of a correct reading when measuring lumber for cutting or when taking a measurement from a point out of convenient reach. The button is cut from brass or aluminum to a width and length not exceeding the sectional size of the yardstick and is center-drilled for a nail or small screw which serves as a pivot. Tighten the screw so the turn-button will turn with a friction fit.



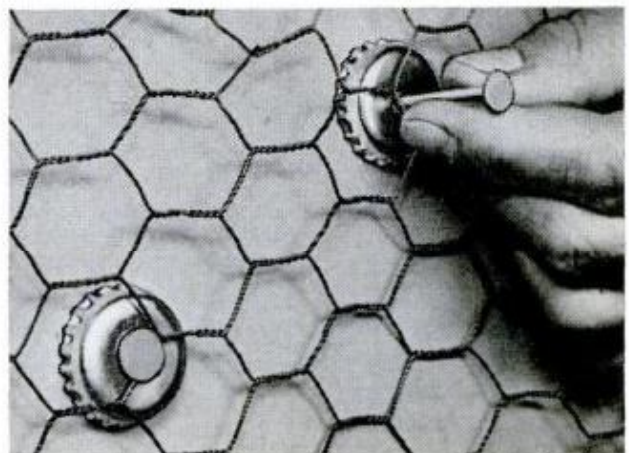
### Lift-Tabs for Thumbtacks

Removing thumbtacks from a drawing board is hard on the thumbnail, even for those who are endowed with sturdy nails. You can avoid this disagreeable job simply by impaling a small felt tab on each tack as shown at the left. Thumbtacks then are removed easily by lifting them free by means of the tabs. Tabs cut from an old felt hat are best for this, although strips of masking tape folded back on the adhesive side also may be used. Make tabs about 1 in. long for easy grasping.



### Bottle Caps Space Metal Lath

When you use chicken wire or regular metal lath as an anchor for a stucco or cement-plaster patch, you'll find that bottle caps make better spacers than wood lath. Cut the wire to size to fit the recess, slip a cap under a corner of the wire and drive a roofing nail through the center of the cap. Space the caps 3 to 12 in. apart, depending on the size of the patch. Note that the cap is located at one edge of each individual mesh so that when the nail is driven home the large head will catch one of the mesh wires and hold securely.





# ROOMETTE

**Just the thing to create an entranceway at the front door. Wedges between floor and ceiling**

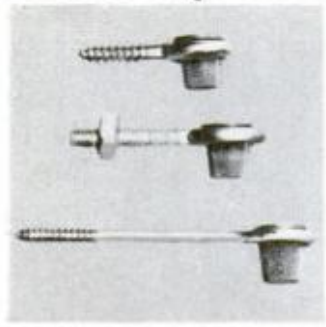
*By A. and B. Joslyn*

## Countersink Stop



Uniform countersinking in wood is easily done by placing a small washer over the drilled hole, then running the countersink down until it contacts the washer, which serves as a stop.

## Plastic-Cap Grommet



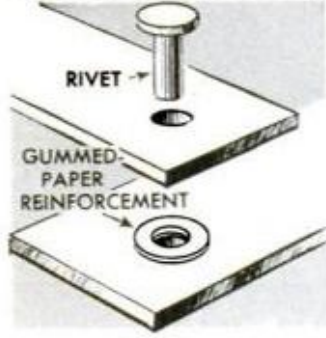
In a pinch you can make serviceable insulating grommets simply by drilling out the end of a plastic toothpaste-tube cap and forcing it into a screweye or eyebolt.

## Double-Duty Bits



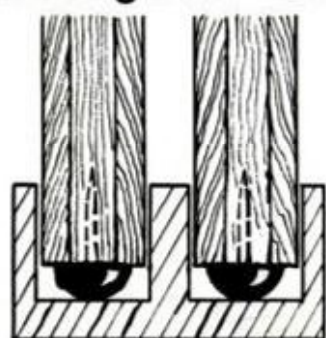
By grinding the squared end of an auger bit down to a diameter of 1/4 in. you can use the bit in a hand drill for work that requires clean holes to a given depth and diameter.

## Smooth-Working Pivot



To assure a smooth-working pivot when joining the members with a rivet, just place a single gummed-paper reinforcement between the members before peening.

## Sliding-Door Glides



Roundheaded upholstery nails make excellent glides for doors that slide in grooved wooden tracks. When installing, tap the nails lightly to avoid flattening the heads.

WHEN EVERYTHING ELSE fails to fill in that final decorator touch in a problem room, a divider usually will give you just the right degree of separation or accent needed.

This novel divider is designed to fit a 7 1/2-ft. ceiling but also can be adapted to an 8-ft. ceiling. It consists of two pressure poles, each assembled from materials named and dimensioned in the detail on the opposite page, and twenty disks of sheet aluminum held in place with thirty-eight pieces of two-link chain. Four equally spaced holes are drilled near the edge of each disk to take the chain links. Also, equally spaced pairs of holes are drilled in line along the length of the long section of each pole. The holes in each pair are spaced about 1/2 in. apart so that you can open a link of chain and "thread" one end through each pair of holes.

### Paint Parts First

After the links are in place in each pole section, cover each link with masking tape, spray both pole sections with a metal primer and follow with one or two spray coats of flat-black enamel. The telescoping tubes at the ends of the long sections are fitted with crutch tips and then primed and spray painted with gold enamel.

The 3/4-in. nuts, which are conduit connectors, are drilled and tapped for set-screws. These serve as collars which are located at the top and bottom ends of scoping members. It may be necessary to file down the threads in the connectors slightly to assure an easy fit over the tubes.

If the 3/4 x 44-in. wood pole is not available locally, use two 22-in. lengths of 3/4-in. dowel. Plug the lower end of the upper telescoping tube with a tight-fitting wooden plug to make sure the end of the compression spring is not forced into the tube.

All the disks are primed, three are painted gold, one orange and sixteen flat black. Eight of the black disks are then decorated on both sides with gold Rineglas transfers. The center detail on the opposite page shows how the disks are mounted with the link chain.



# DIVIDER

PLASTIC TRANSFER



3/4" DIA. x 18" ALUMINUM TUBE

6" COMPRESSION SPRING

3/4" DIA. x 44" WOOD POLE

LINK CHAIN

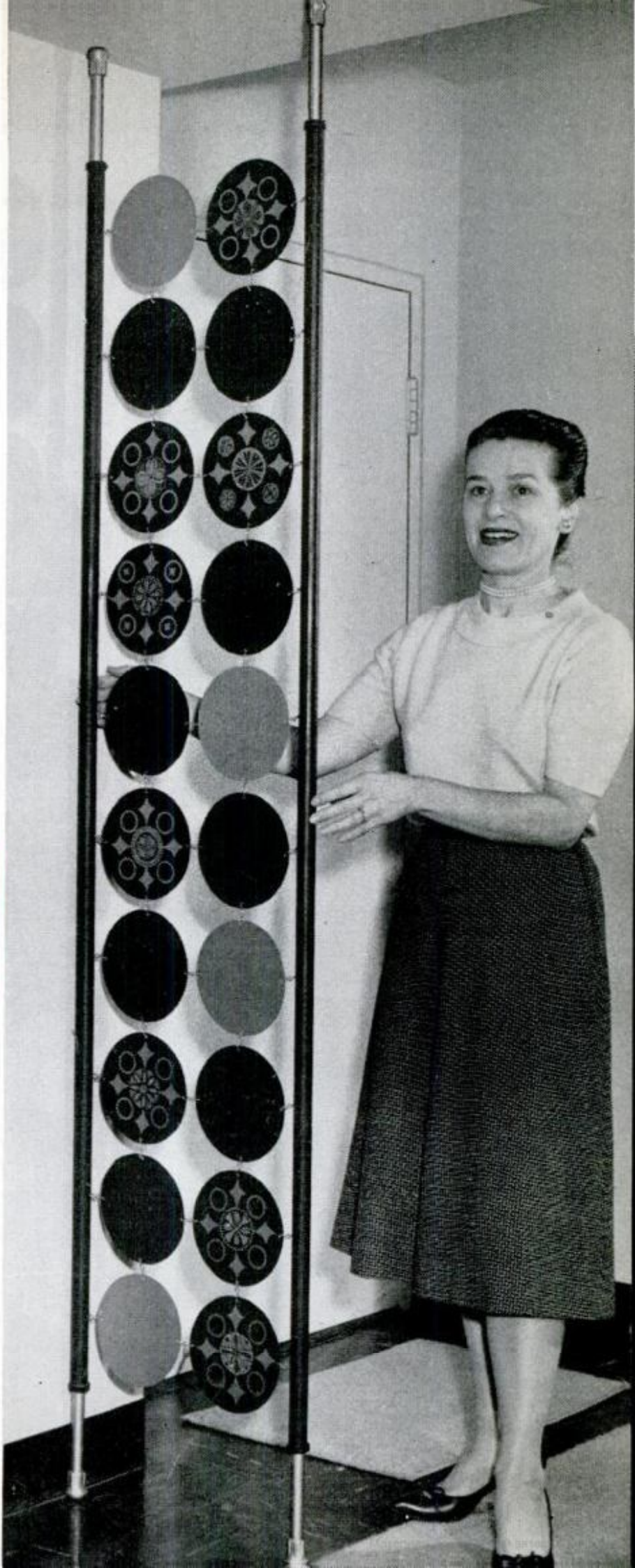
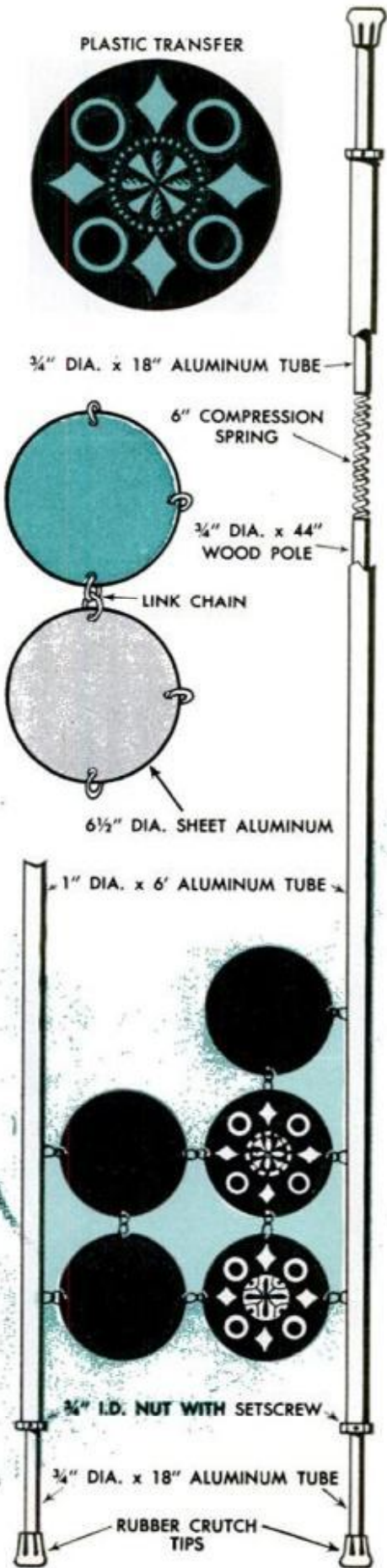
6 1/2" DIA. SHEET ALUMINUM

1" DIA. x 6' ALUMINUM TUBE

3/4" I.D. NUT WITH SETSCREW

3/4" DIA. x 18" ALUMINUM TUBE

RUBBER CRUTCH TIPS



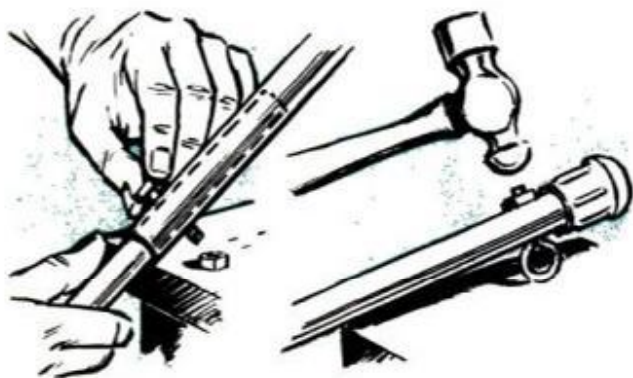




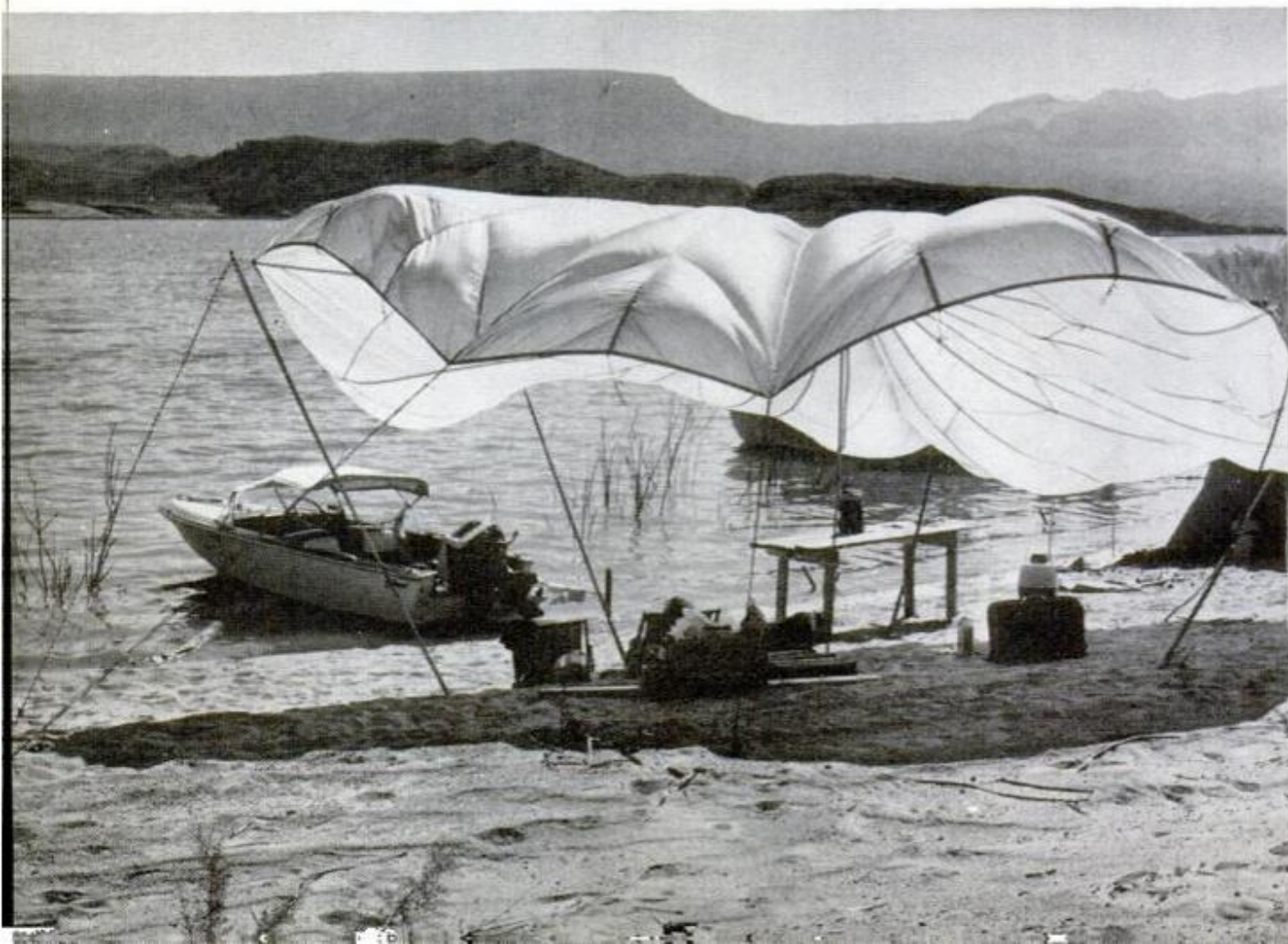
▲ **SUPPORTING POLES** are braced to stakes like a tent by tying ropes to eyebolts in poles and looping ends over notched stakes

**TELESCOPING POLES** are extended and locked by cross bolts. Rope eyebolts in upper ends are peened. Crutch tips cap ends

**THE PERFECT** beach umbrella—any gentle lake breeze will billow the lightweight parachute into a king-size beach cabana



# Sunbrellas







## From Surplus Parachutes

**S**UMMERTIME calls for sunshine and carefree outdoor living. But you'll also want a shady place for just relaxing and enjoying the fun of being good and lazy on a bright summer afternoon.

For shade where you want it, whether on a picnic, at the beach, or in your backyard, one of the best buys is at your military surplus store where you can pick up a used parachute. It's lightweight, strong and packs into small space. Most of those now available are colorful cargo chutes, discarded by the military for various reasons. Flaws are so minute that only stringent inspections make them obsolete.

Standard size is about 24 ft. in diameter, and prices run from \$6 to \$10. To provide the most shade, get the chute high off the ground. This is easily done by using ½ or ¾-in. aluminum tubing or thin-wall conduit as poles and bracing them with ropes tied to tent stakes. Eight or ten 14-ft. cords are sufficient. Most surplus stores cut the shroud lines from the parachutes when they are unpacked and sell them separately. These lines are just right for bracing the poles.—V. Lee Oertle

**Obsolete cargo chutes in surplus stores find new use as take-it-with-you sunshades**

**TO ERECT CHUTE** in strong wind, tie center cord to stake before lifting the poles and staking guy ropes







**Concrete flagstones hand-troweled on the spot let you lay your patio on the installment plan**

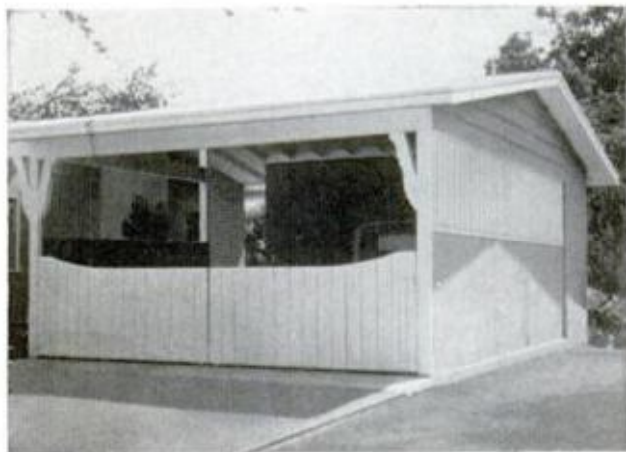
## Add - A - Stone PATIO

For an inexpensive patio, one that is convenient to lay piecemeal in your spare time, try concrete flagstones. You can start with a small area and extend it as far as you like, mixing one block at a time or a dozen, depending on how spry you feel and how much time you have.

First, level the area using a long 2 x 4 straightedge with a carpenter's level placed on top. Shave off any high spots fill in low spots and then cover with a 2-in. layer of

sand. For a one-stone batch, mix five shovelfuls of sand (or sand and gravel), one of cement and small amount of dry coloring. This will form a stone about 2 in. thick and 18 in. square.

Dry mix the sand, cement and coloring, then add water. Make the mix stiff so it will stay in place when you trowel it to an irregular shape. Make V-joints between stones, and be sure to maintain a slight pitch to the patio as you go.—Steve Lowell



### Carport Privacy

If your carport serves as your patio, you'll feel less like fish in a bowl if half doors are fitted across the entrance. Shielding you from street traffic as well as the neighbors' view, the half doors will provide family privacy yet still maintain the open airiness of a patio-carport. In addition to the privacy advantage, half doors also will serve to convert a semi-enclosed carport to a king-size play pen where tykes can be safely corralled when put out to play. Note how "dip" across top of doors relieves plainness.



## WORKSHOP HELPERS

### Cutting Dowels Square

It's no simple trick to cut a dowel square even though you use a dovetail saw and work very carefully. Ordinarily it makes little difference whether the ends are exactly square, but if you are cutting a number of dowels to length and you need square cuts at one or both ends, then it will pay well to make the jig illustrated. Center a ripping cut in a 1 x 6 to a depth of about 6 in. Then obtain a strip of  $\frac{1}{16}$ -in. aluminum about 8 in. long, bend at a 30-degree angle and attach to the 1 x 6 in approximately the position shown, making sure it's square with the rip-sawed slot. Then you're ready to cut dowels. Saw right into the aluminum; it won't dull the saw teeth.

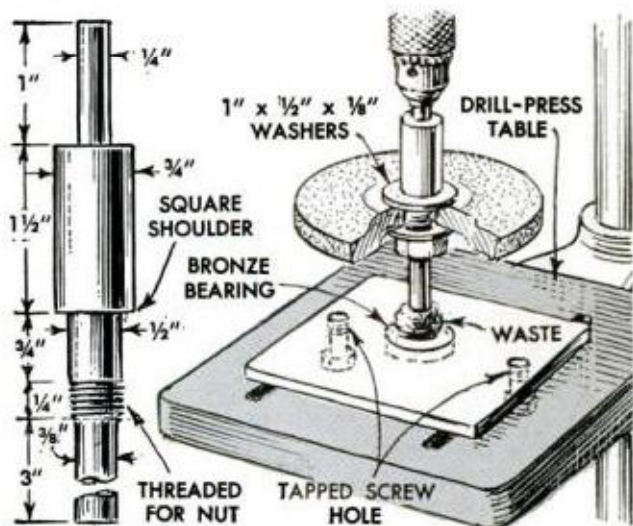
—Donald Spichuk



### Drill Press Grinds Away

Very fine tool grinding and honing can be done on a drill press by working on the side of the wheel. All you need are a suitable arbor to mount the wheel and a bearing to carry the lower end of the arbor. Making the arbor is a simple lathe job, using as the workpiece a 6 $\frac{1}{2}$ -in. length of  $\frac{3}{4}$ -in. steel shafting. Shoulder it down and thread as dimensioned. Then center a  $\frac{3}{8}$ -in. bronze bushing in a  $\frac{3}{16}$ -in. steel plate. Drill and tap the plate for two capscrews which hold it on the drill-press table. When you make the setup, wrap a piece of waste around the lower end of the arbor above the bushing to protect it from dust.

—E. R. Haan



### Hook Your Apron Strings

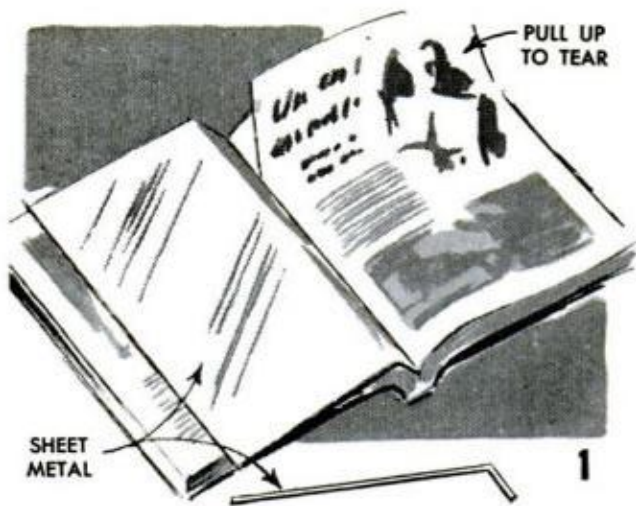
Instead of tying your shop apron strings in a bow which could end up in a knot, why not form a couple of small hooks from coat-hanger wire and tie near the ends of the strings? Much faster, more comfortable and the hooks will never "untie" if you shape them right. Of course, you will have to take a careful measurement to determine the position of the hooks on the strings so that the apron will fit comfortably, not too tight and not too loose.

—Robert L. Sargisson

**Corrugated fasteners** will drive easier if you coat the sharpened edge with paraffin or beeswax. To prevent upsetting or bending of the driven edge use a mending plate or any piece of flat steel as a driver, striking the plate with the hammer.







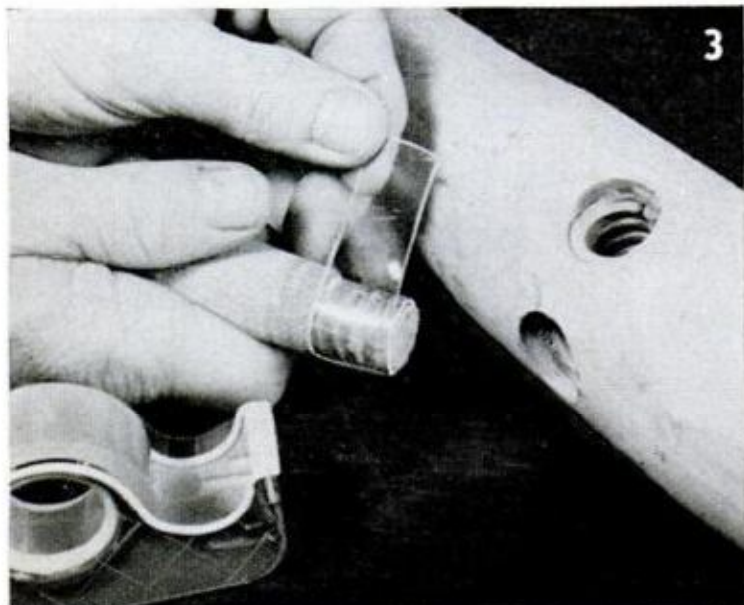
**1. TEAR SHIELD** makes easy job of removing magazine pages that are filed for later reference. Shield is square of 1/16-in. sheet metal (steel, brass, or aluminum) which has 1-in. flange formed along one side to provide cutting edge at center of binding



**2. IF YOU WANT** to get fancy in crimping the edge of a two-crust pie, scout up an old fashioned door key of the type used with rim and mortise-type locks. The flat pierced end of the key will produce decorative scallops when pressed in the dough

# Solving HOME PROBLEMS

**3. WHEN THE THREADS** on the end of a screw-in handle of a floor broom become worn so they no longer hold, cellophane tape often will make the handle fit tight again. Simply remove the handle and wrap several turns of tape around the threads. The layers of tape serve to build up diameter of the threaded end



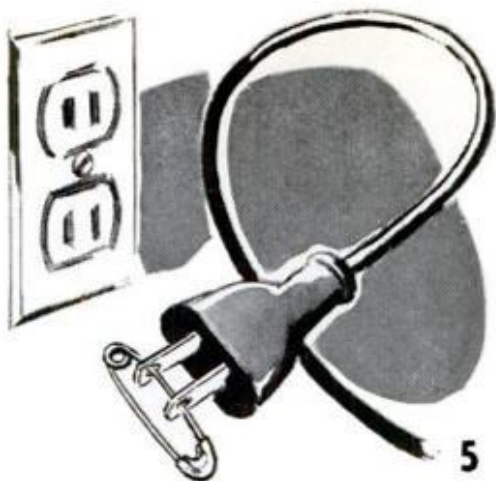
154

**4. LARGE BRANCHES** of shrubbery sometimes have an annoying habit of riding up the blades of pruning shears. This can be avoided by filing notches along one blade, making them deep enough to nick the edge



POPULAR MECHANICS





5

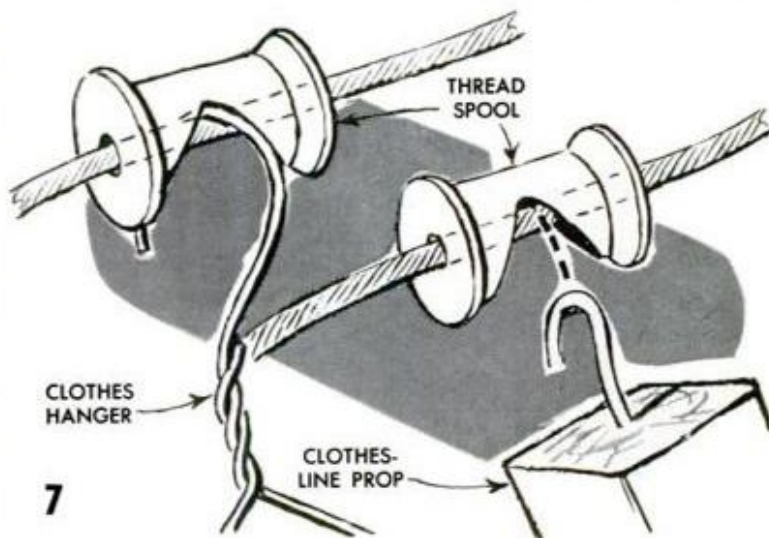
**5. SAFETY HINT** for preventing inquisitive tykes from plugging in and operating household appliances and power tools left unattended, is to fasten large safety pin in holes in ends of plug prongs as shown

**6. NEAT WAY** of storing newspapers for disposal later, is to place them in shopping bag hung on hook in broom closet or hallway. Stored thusly, a supply of common wrapping paper also is kept on hand



6

**7. ANCHOR** that prevents clothes hanger or clothesline prop from slipping off line is thread spool with vee notched in it. When threaded on line and hook is inserted between spool and line, hook jams in place



7

**8. VACUUM-BOTTLE** cork can't come loose and leak contents or lose temperature rapidly if cork is slotted to take piece of string, both ends of which are held taut by threads of cap screwed over them

**9. POWER CORD** of motorized barbecue spit is less likely to be disconnected accidentally from extension if both cords are stapled to ground with clothespins driven next to end connectors as pictured



8

STRING



9





TILT-BED catamaran trailer permits easy one-man launching and retrieving of Pop-Cat without wetting feet

# BUILD PM's POP-CAT

By Earl Wobeck

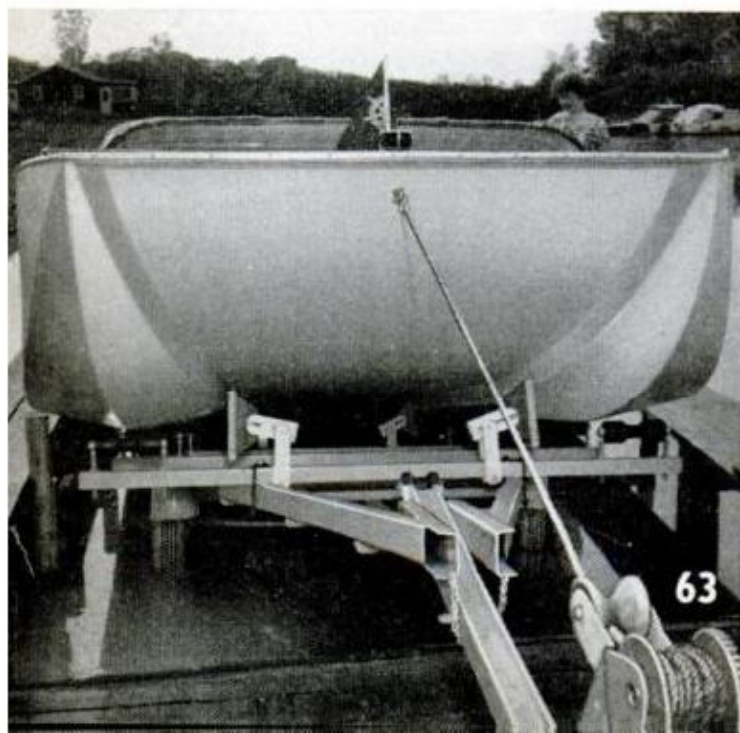
Conclusion

**P**OP-CAT, like any wooden boat, will be easier to keep in top shape and have a longer life span if it is given a protective skin of fiberglass. This is the next step which completes the boat, except for painting the interior and installation of accessories, hardware and motors. A list of these items as used on our boat is included with this, the final installment.

All exterior surfaces of the prototype boat were covered with 9-oz. fiberglass cloth

(see Material List, Part I). The wing deck is covered first, followed by port and starb'd hulls, or sponsons, topside planking, transom, side decks, coaming and fore deck last. First, rough-cut each of the fiberglass cloths to the length and shape required to cover each part of the hull, starting with the three cloths needed for the bottom. Cloths should be one piece from transom to bow, overlapping each other and onto the transom and topside planking by about 3 in. Each of the cloths then is rolled up on a mailing tube or straight board so that the weave is not distorted by handling. Label each cloth so there is no time wasted in selecting the right one later. Once the resin is activated (hardener mixed with it) you must work fast in order to get it on the surface, roll on the cloth, and work out wrinkles and air pockets before the resin jells (hardens).

Jell time for most polyester resins (type usually used for glassing wooden hulls) applied in an atmosphere of 80 to 90 deg. is about 20 min. from the time the hardener is added. A working temperature of 65 to 75-deg. F. usually will give a jell time of 40 to 60 min. About 70 deg. is an ideal temperature, which gives you ample time to complete each of the application steps. Most important, it permits you to wait until the primer coat of resin becomes tacky before

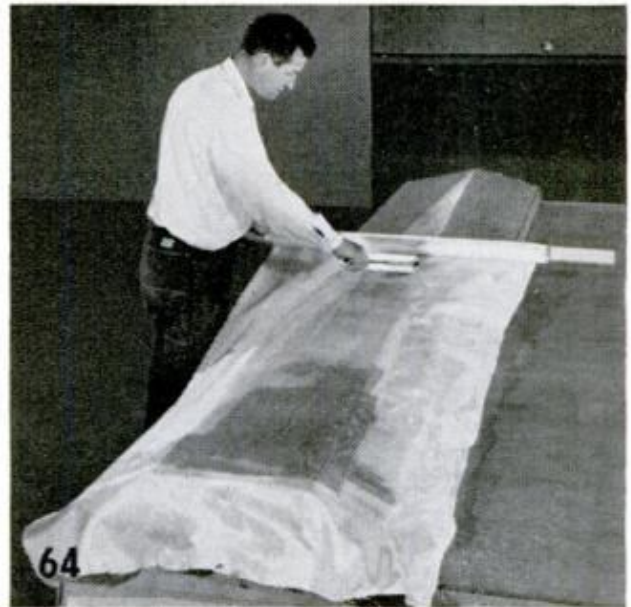




unrolling the cloth on it. The cloth will remain in place better on a tacky surface than on a liquid surface film. At temperatures in excess of 80 deg. the cloth must go on immediately after the activated resin is applied since it will not remain in a tacky condition long enough to get the cloth on and smoothed out. Hardening usually will occur only a few minutes after the resin becomes tacky.

Jell time can be lengthened by reducing the amount of hardener used to activate the resin. About 20 percent less is recommended for temperatures above 80 deg. Jell time also can be extended by keeping the resin in a cool place until applied. In most cases it is best to follow the manufacturers' recommendations, checking out the mixing proportions by making small test samples before proceeding with a full-size batch.

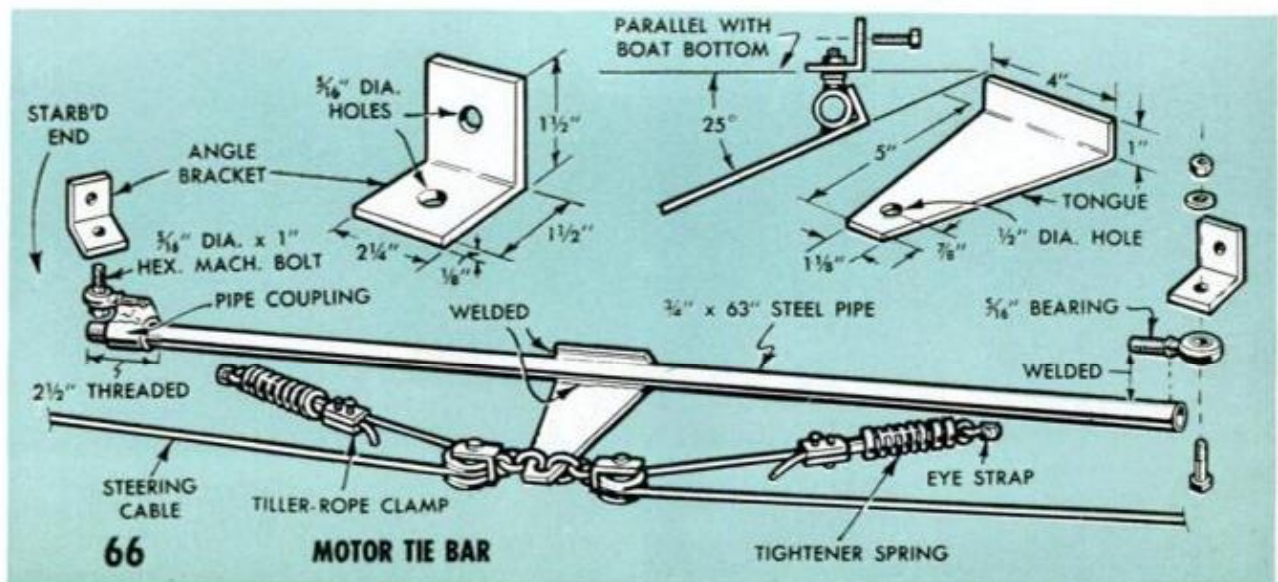
When ready to start glassing, activate the resin and spread it on the hull (wing deck is first), using a 7-in. paint roller with a mohair cover. An inexpensive 2-in. pig-bristle brush or a rubber squeegee may be used for corners. After coating the entire area to be covered by the first cloth, overlapping adjacent areas a few inches, look it over for dull spots where resin has soaked in, leaving the surface dry. Apply a second coat to these spots while waiting for the resin to become tacky. Then, starting at the transom, roll the cloth forward with one hand while smoothing it with the paint roller held in the other one as in Fig. 64. The cloth should overlap adjacent areas by about 3 in. Large wrinkles and bubbles should be worked toward the edges of the cloth as it is unrolled. When the entire piece of cloth is down, go over it again with the roller, this time working out even the tiniest of air bubbles. Use the brush, squeegee, or finger to work the cloth into corners, Fig. 65. Note that in the latter photo a plank was placed on top of the previously glassed wing deck



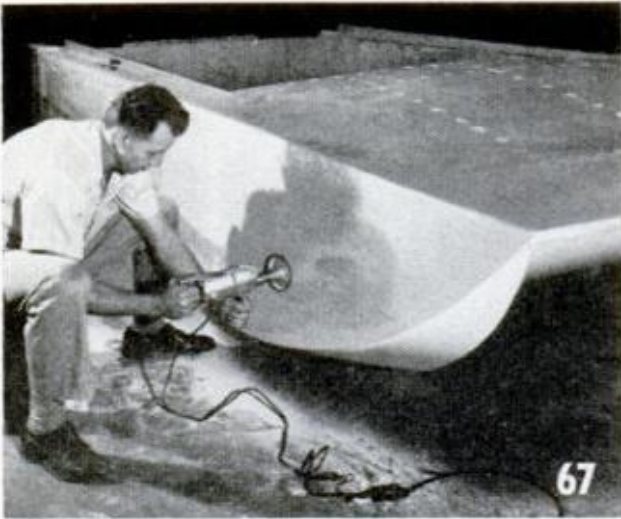
**FIBERGLAS CLOTH** is unrolled on resin-coated hull from tube, while wrinkles are worked out with roller



**PLANK PLACED ON** glassed wing deck prevents grit from being worked into it while working on chines



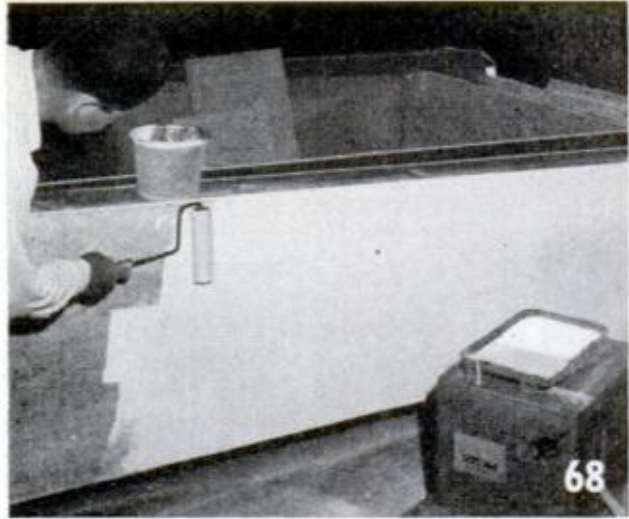




to avoid grinding grit into it with the shoes while working on the inner chines.

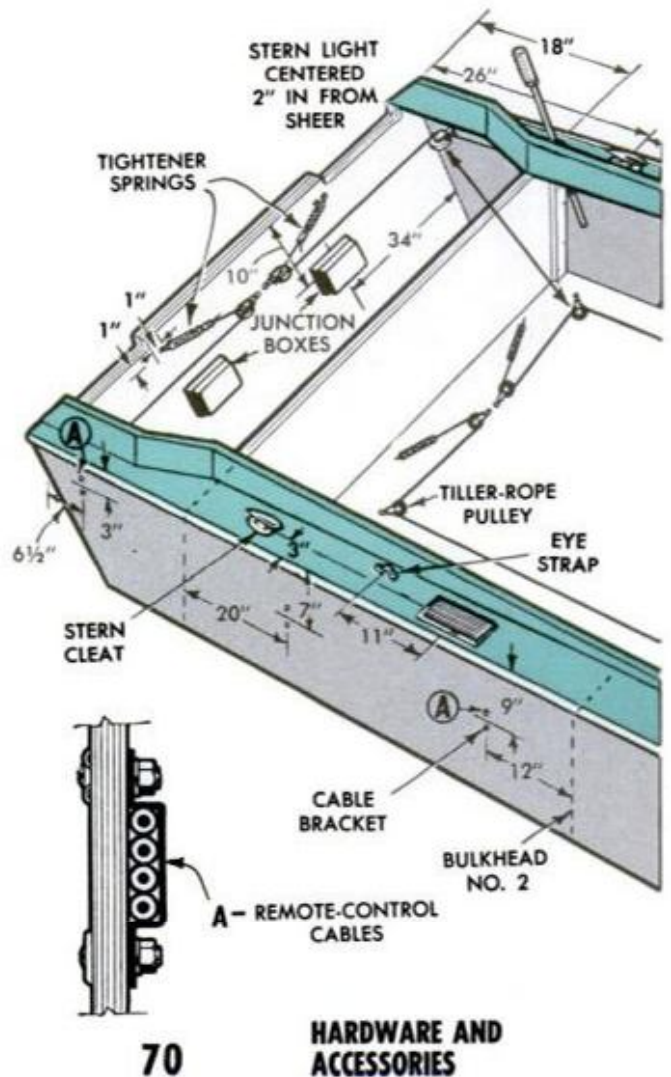
The curved surfaces at the bow require special attention to get the cloth to hug the planking. After working the cloth flat to the bottom planking (no overlaps), cuts are made into the sides about 12 in. apart so that the excess can be overlapped and the cloth made to lie flat, Fig. 69. On the in-board side, the cuts extend from the cloth

**AFTER WORKING** wrinkles and bubbles out of fiberglass cloth on bottom planking of bow, below, inboard edge of cloth is cut back to chine in several places and excess is overlapped on itself and wing deck



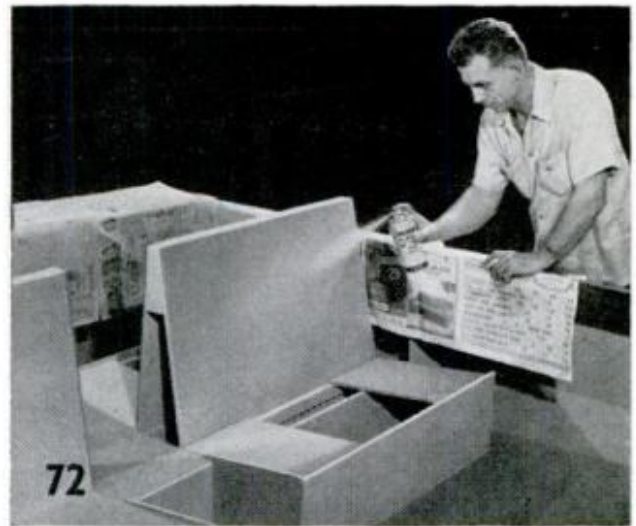
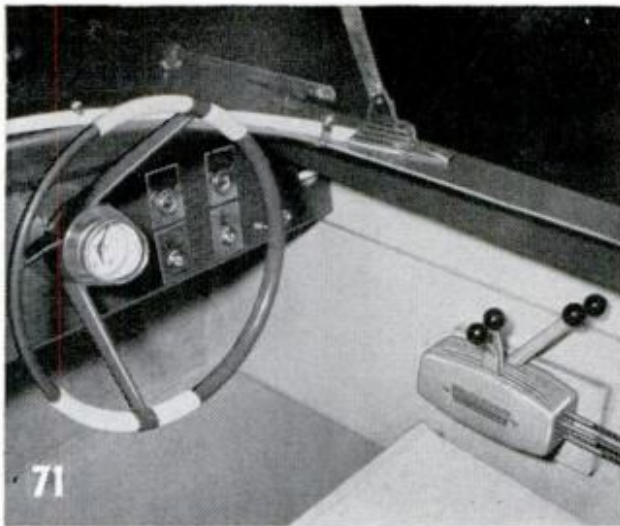
edge to the corner formed by the chine and wing deck. Outward, they extend from the cloth edge to the chine. All of the excess cloth is overlapped onto adjacent areas.

After the entire cloth is imbedded in the base coat of resin, it is given a second coat of resin, making sure that no bubbles or resin-starved spots remain. These will appear as white areas. Following this, the rest of the hull bottom is covered, after which



**HARDWARE AND ACCESSORIES**

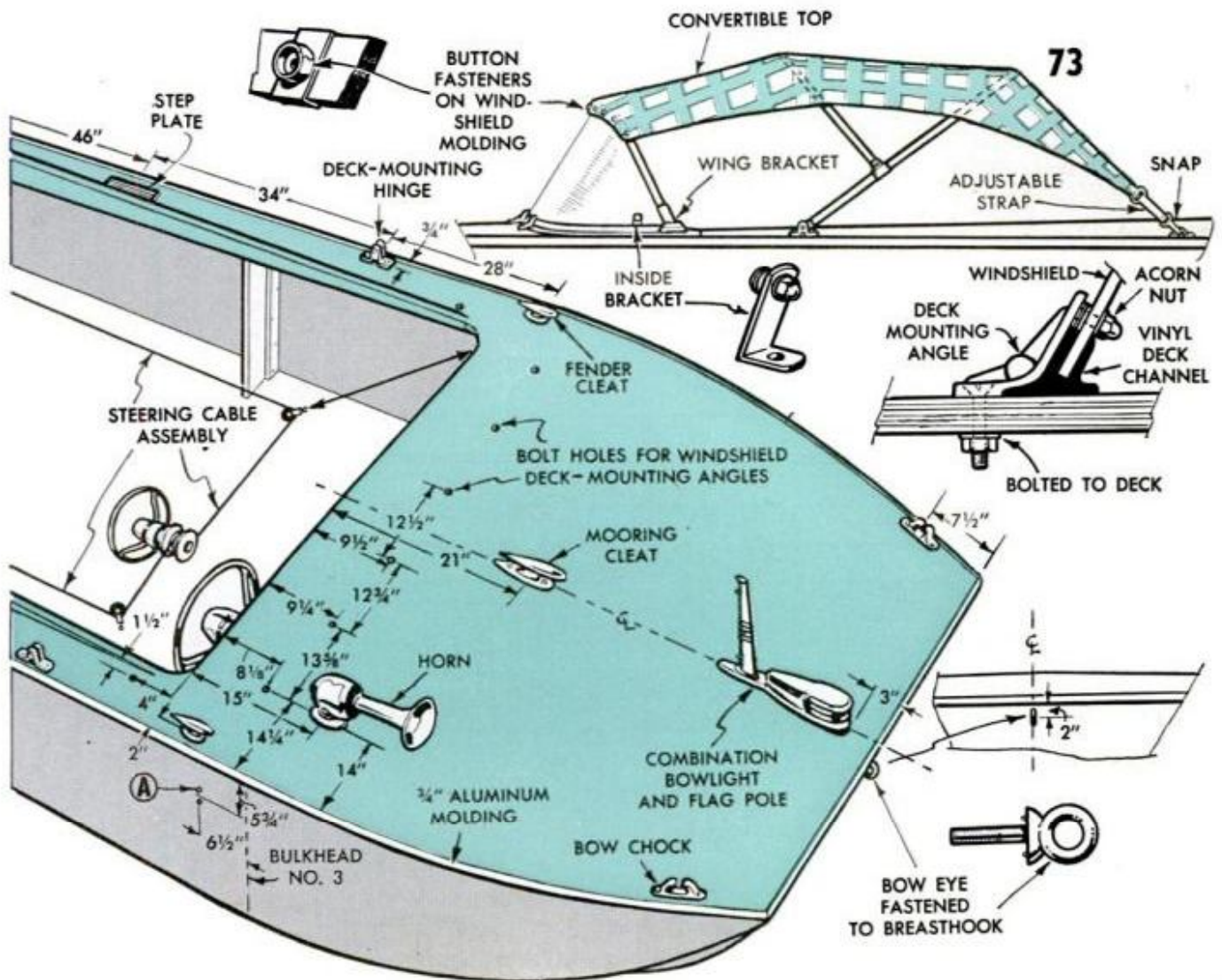




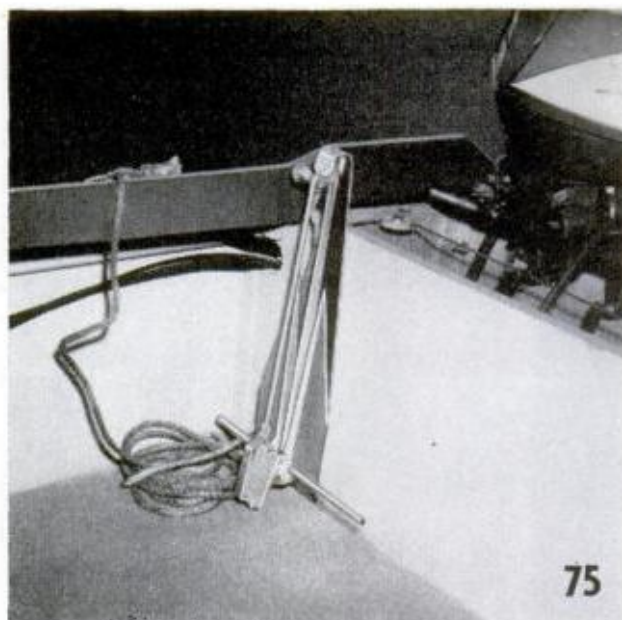
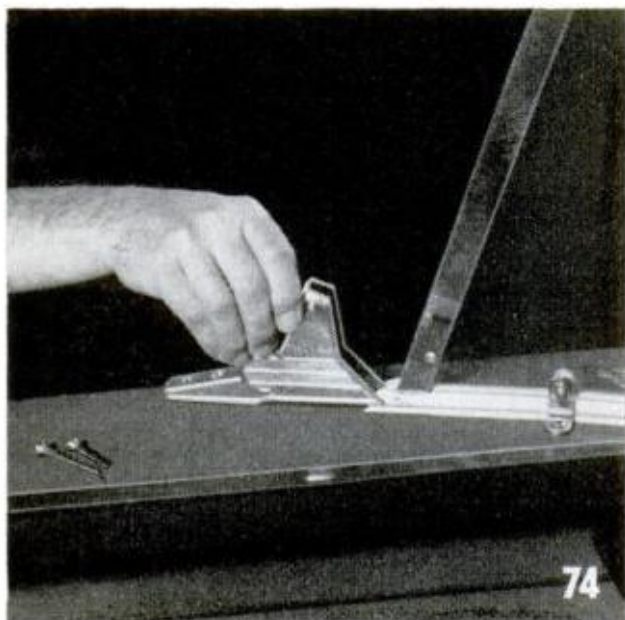
rough edges and cloth overlaps are sanded smooth preparatory to applying the final, color coats of resin. The smoothing job goes quickly when a power sander is used, either orbital or disk type, as in Fig. 67. Silicon-carbide, No. 30 abrasive, is best for this.

From three to four color coats are applied next, completing the bottom. One ounce of resin coloring paste (white in the case of the prototype boat) is mixed with each

quart of resin before activating it. If work is interrupted between coats and the surface becomes hard, a light sanding with 60-grit paper is necessary to assure a good bond with the next resin coat. Color coats in this case are carried only to the outer chines since the topsides are yet (next) to be covered with fiberglass cloth. When ready for this, the hull is turned upright again and prepared for glassing. Prepara-







tion, again, means filling all depressions and holes flush with surfacing compound. The sequence for glassing the remainder of the hull has already been given. The procedure is the same as for the bottom, except that a better job of feathering overlaps must be done since these surfaces are in full view. Note that the boat has been blocked up a few inches off the floor, Fig. 68, making it easier to work the topsides.

Colored resin coats produce a dull finish. To obtain a purer white on the topsides and forward part of the wing deck which is exposed to view, three coats of epoxy paint were applied on these surfaces. The same number of coats of red epoxy paint were applied on the decks and coamings. This produces good-looking, easy to maintain surfaces with good resistance to fading.

The cockpit and seats are easy to paint. For a treatment that produces an attractive appearance, apply a finish coat of multi-color paint over two (background) base

coats of marine paint. The latter should be a semigloss paint, which in our case had to be tinted with lampblack to obtain the desired shade of gray. This type of paint usually is available only in white. At this writing, no marine grade of multicolor paint is known to be available for consumer application, therefore the marine paint base coats are necessary for good results. Although some multicolor paint manufacturers recommend their product for paint-roller application, best results and a minimum of mess are produced when it is applied from a spray can, Fig. 72. When spraying, be sure to mask the dash and decks to avoid getting overspray on them.

Pop-Cat requires the usual layout of hardware and accessories to make it operable, a list of which is given on page 160. Locations for mounting the deck hardware are given in Fig. 70. While two widely spaced bow eyes were installed originally in the prototype, it was found that one eye

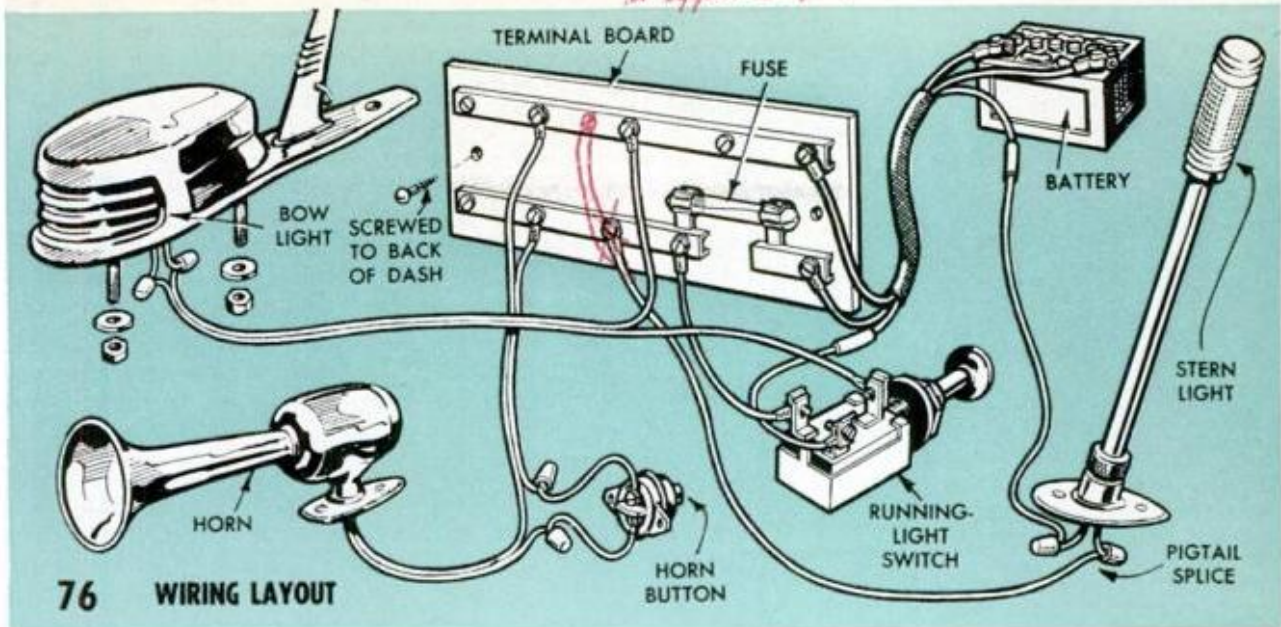
## HARDWARE AND ACCESSORIES

(All exposed metal, chrome-plated brass, or stainless steel)

- |  |   |
|--|---|
| 1 pc. 8½" solid-base cleat: mooring cleat                            | 1 pc. 18" x 84" curved windshield with wing brackets, Water Bonnet Marine Products Corp., Orlando, Fla. |
| 4 pcs. 3½" solid-base cleat: stern and fender cleats                 | 1 pc. SQ 5, 18" x 84" x 56" convertible top, Water Bonnet   |
| 1 pr. 4" bow chocks  | 1 pc. 12' control cable   |
| 3 pcs. ¾" x 4" bow eyes  | 1 pc. 13' control cable   |
| 2 pcs. 3½" x 8¾" step plate with white tread                         | 1 pc. 17' control cable   |
| 2 pcs. 7/8" x 1¾" boat drainers: sumps                               | 1 pc. 18' control cable   |
| 2 pcs. 7/8" x 2½" boat drainers: transom                             | 2 pc. throttle and shift control box  |
| 1 pc. 24" adjustable pole light: stern light                         | 1 pc. ¾" x 63" steel pipe: tie bar  |
| 1 pc. combination bow light with flag pole                           | 2 pcs. 5/16" dia. Heim-Unabal bearings: tie bar   |
| 1 pc. runabout steerer, 90-deg., red and white                       | 1 pc. 1/8" x 4" x 6" flat steel: tie bar  |
| 1 pc. electric wiring kit, large                                     | 1 pc. 1/8" x 2¼" x 6" flat steel: tie bar   |
| 1 pc. 3/16" x 45' plastic-covered tiller rope                        | 4 pcs. 5/16" x 1" hex. mach. bolt: tie bar  |
| 6 pcs. swivel eye tiller rope blocks with straps, 7/16" x 2½" sheave | 1 pc. 5-H high tensil Danforth anchor with holder   |
| 2 pcs. steering rope tighteners, 5" normal length                    | 6 pcs. 2" x 15" x 15" U.S.C.G.-approved snap-on seat cushions, Style-Crafters, Inc., Greenville, S. C.  |
| 2 pcs. tiller rope clamps for 3/16" rope                             | 6 pcs. 2" x 15" x 20" U.S.C.G.-approved snap-on seat cushions, Style-Crafters, Inc.                     |
| 2 pcs. ¾" x 20' aluminum rub rail (or, 4-10' lengths)                |   |
| 1 pc. 12-v. single horn and button                                   |   |



*lead should be connected  
to upper strip of terminal board*

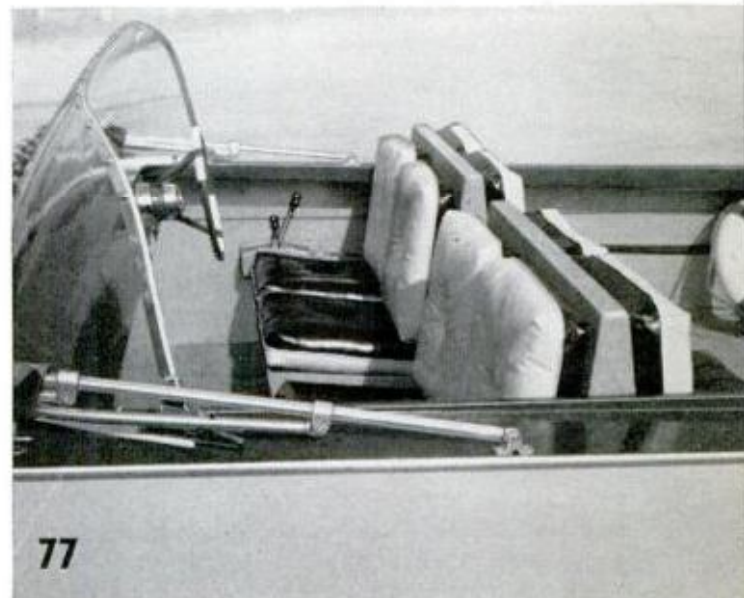


located at the center of the bow resulted in easier loading and no damaging strain on the part, even at maximum winch pull. This change may be noted in Figs. 63 and 70. Locations for the steering wheel mounting hole and through-holes in the bulkheads for tiller rope and remote-control cables were given in Part III. The locations for the windshield deck-mounting angles, apply only to the windshield model listed in the story, which is the only stock model of the required width known to be available. Care must be taken when fastening the mounting angles and brackets to the deck, detailed in Fig. 73. All of the mounting angles must be tightened evenly, working from the center of the windshield outward to the tips. Wing brackets, which dress up the tips, are installed last, Fig. 74.

All cleats are through-bolted to the deck and a supporting beam underneath. For safety, all tiller-rope pulleys are through-bolted to the inside of the hull. Chrome-plated, countersunk washers are used under the heads of these bolts, which go on the outside of the planking. Locations of the pulley eye straps and remote control cable brackets, are indicated by the letter "A" on the starb'd side of the hull. These locations are the same for the tiller-rope pulleys that go on the port side.

The 5-lb. Danforth anchor carried on Pop-Cat is mounted out of the way on a bracket screwed to the motor-well bulkhead, Fig. 75. The bracket, which has an instant-release feature, is available from the manufacturer of the anchor.

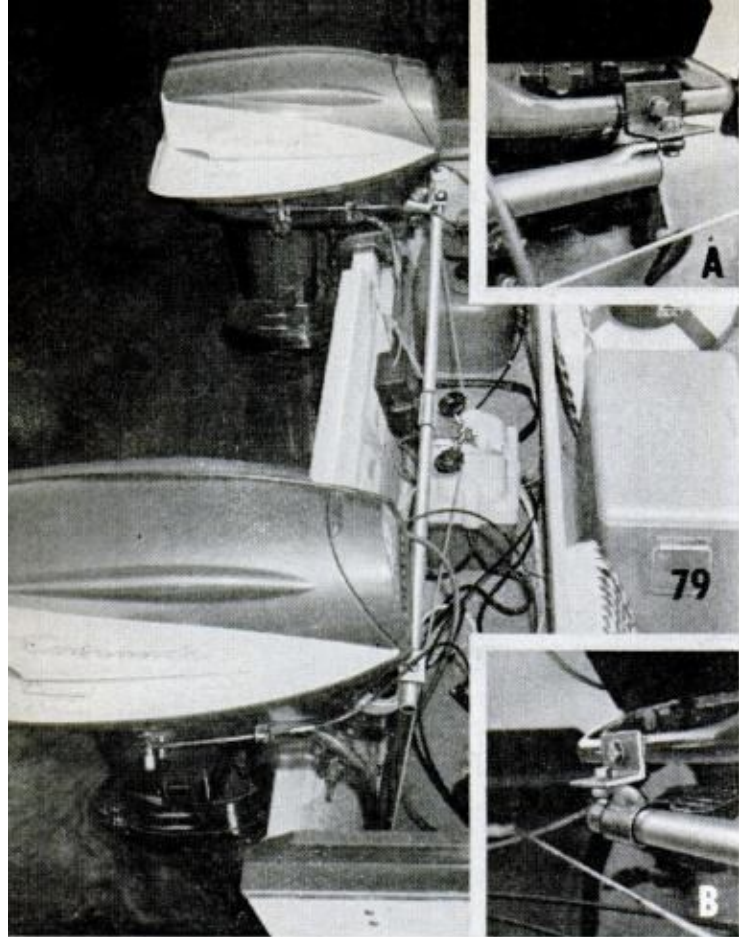
Wiring for the electrical equipment is easily installed when a kit, such as is available at most marine-supply stores, is used. The wiring layout shown in Fig. 76 was installed in the prototype boat from such a kit. Complete instructions for connecting



**ALTERNATE SEAT-CUSHION** arrangements available are kapok-filled patio cushions unattached to seats as above, or snap-fastened seat cushions, below, that have straps on underside and are approved preservers







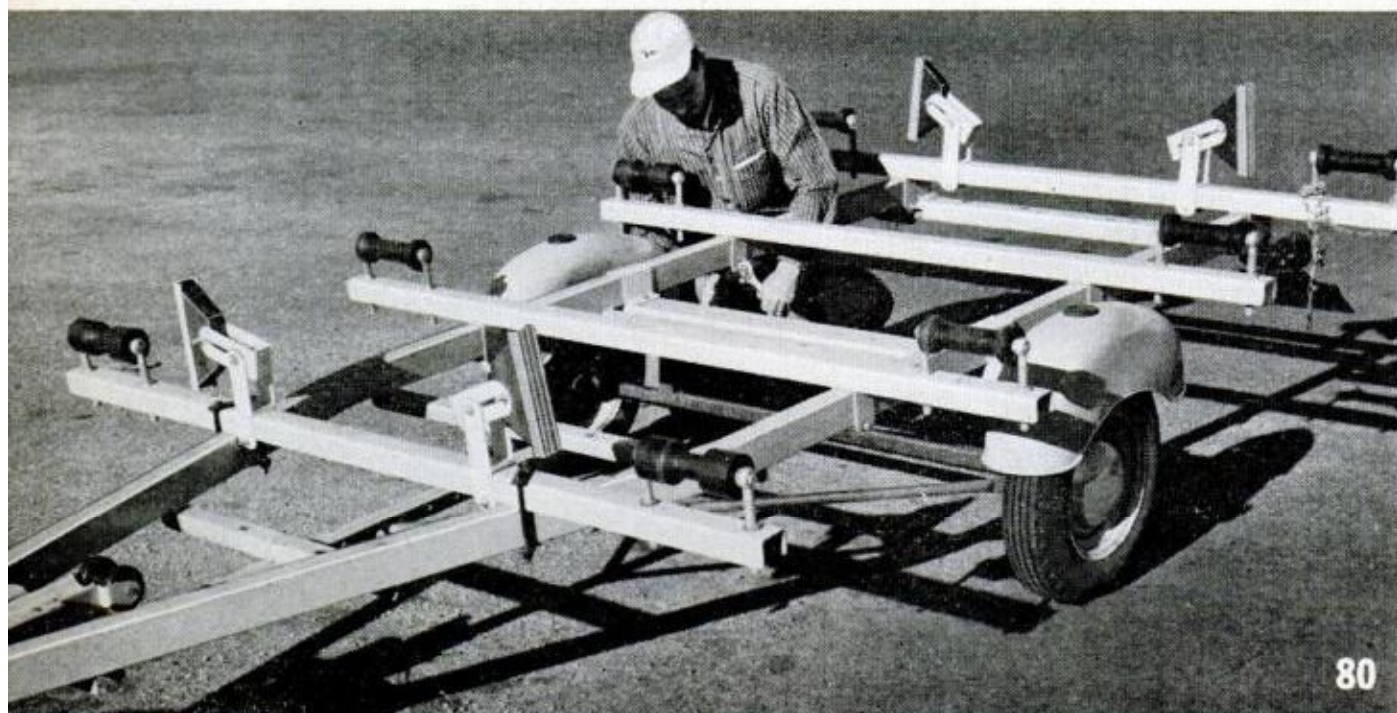
each electrical accessory to the terminal board come with each kit, including a two or three-way light switch. To simplify this installation, all connections are made and circuits tested before the terminal board is screwed to the back of the dash.

Upholstering for the seats, discussed briefly in Part III, may take the form of permanently attached upholstering material, or of removable cushions as pictured in Figs. 77 and 78. The ones shown in Fig. 78 (not available when prototype was completed) are much better than fixed uphol-

stering, or the cushions shown in Fig. 77, since they may be removed for cleaning and serve as life preservers as well. These cushions come with snap-on fasteners, located on a front or top flap, which button on snap studs that are screwed to the boat seats. This provision keeps the cushions neatly in place, yet permits quick removal for use as life preservers. They are U.S. C.G. approved for the latter purpose, and as such have strap arm loops attached to the underside. The patio cushions are not approved life preservers and should not be used for this purpose.

While the prototype model of Pop-Cat was powered with twin 40 hp. motors, any combination in twins or singles may be used up to 160 hp. Motors must be long-shaft models, mounted at the center of the transom in the case of singles, or centered on the sponsons in the case of twins. To accommodate single power, the transom must be cut down at the center as it is at the ends. For proper planing, a minimum total horsepower of 60 to 75 hp. should be used, either in singles or twins. Twins offer the advantages of higher speed, better control in tight turns and rough water with minimum cavitation under these conditions, and a built-in safety factor if one of the motors fail (see "How Many Outboards," *PM*, March 1961). Disadvantages of twins are higher initial cost for motors and controls, more weight and higher fuel cost. For normal use, a power range of 80 to 120 hp. in a twin installation is recommended.

For twin installations, it will not be possible to buy a tie bar of sufficient length to link the two motors together for remote steering. A really sturdy one can be made





for a few dollars from a length of steel pipe, a few pieces of flat steel and two end bearings as shown in Fig. 66. Designed by Evinrude engineers especially for Pop-Cat, this tie bar is better than most commercially-made ones. The same tie bar may be used for push-pull cable types of steering installations, wherein only one cable extends from steering wheel drum to tie bar. (A special feature on remote controls, will appear in *PM* soon.)

When connecting the tie bar to the motors (they should be on the boat), Fig. 79, be sure they are centered on the sponsons and turned so that the shrouds are parallel with one another before the angle brackets at the ends are bolted to the motor steering brackets, details A and B, Fig. 79. The pipe coupling on the starb'd end permits minor adjustment of tie-bar length between brackets. This should be 63 in., the distance between centers of motors.

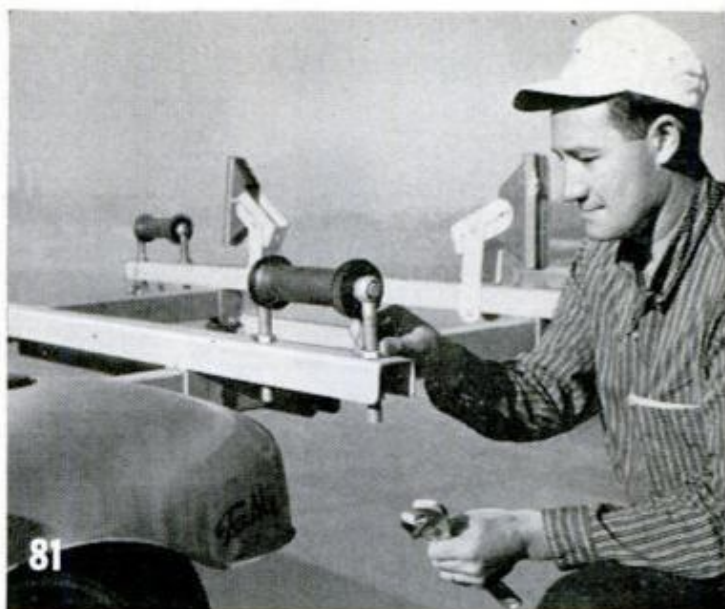
After prefitting the tie-bar assembly, it is removed and given an undercoat of rust-preventive paint, followed by two coats of engine enamel sprayed on in a color to match the darkest color on the motor. This little touch results in a smart-looking job of rigging.

### Remote Controls

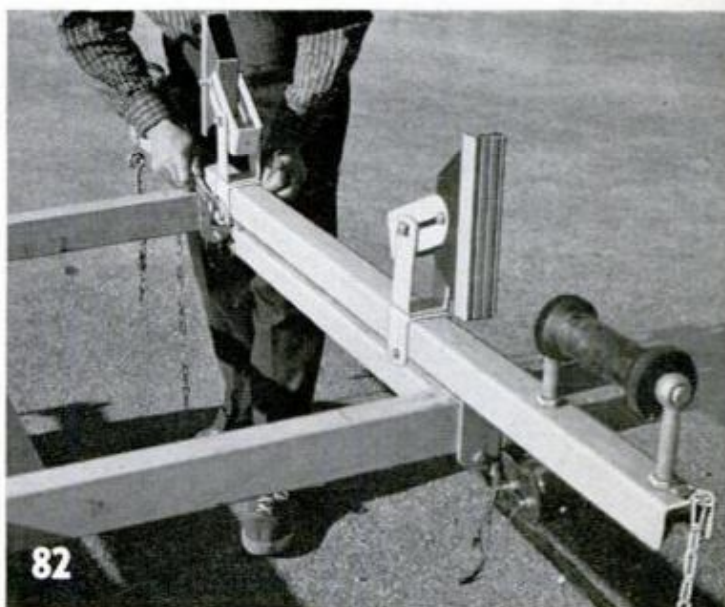
If you install the throttle and shift remote controls yourself, be sure to order lengths that are long enough to permit large-radius loops in the motor well (the sizes listed are for the runabout model). The loops are necessary to provide slack when turning the motors and to prevent the core (movable) wire from binding in its nonmovable casing. The latter usually occurs when sharp bends are made in the cable, making the controls difficult to operate and causing excessive wear on all moving parts of the control assembly. The mounting block for the dual control boxes, Fig. 71, is located low enough to accommodate most makes of controls, with ample clearance under the side deck for levers.

A few of the trailer manufacturers make models for catamarans, and some make conversion kits for installation on A-frame trailers. The model used for the prototype boat was provided by Tee-Nee Trailer Co., Youngstown, Ohio, and will be available to builders of Pop-Cat. Most production models are not wide enough to accommodate boats as wide as Pop-Cat. The trailer pictured has a capacity of 1300 lb., is a tilt-frame type and has been fitted with the manufacturer's catamaran conversion kit. The latter consists of four additional keel rollers, 2 extra cradles and four 79-in.-long steel channels. The latter are clamped to

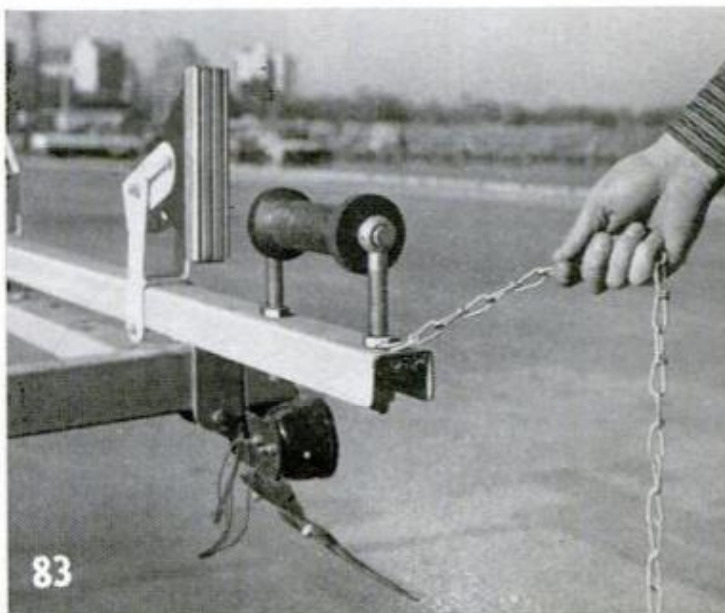
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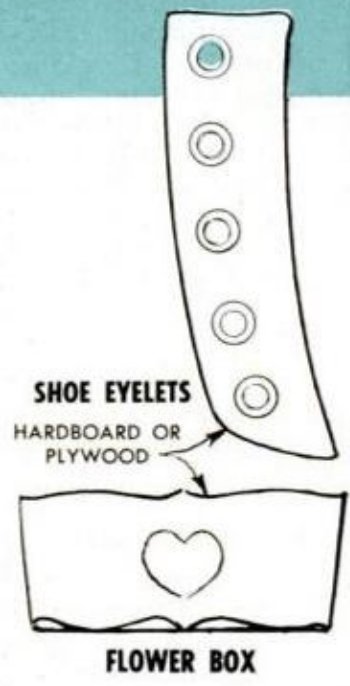
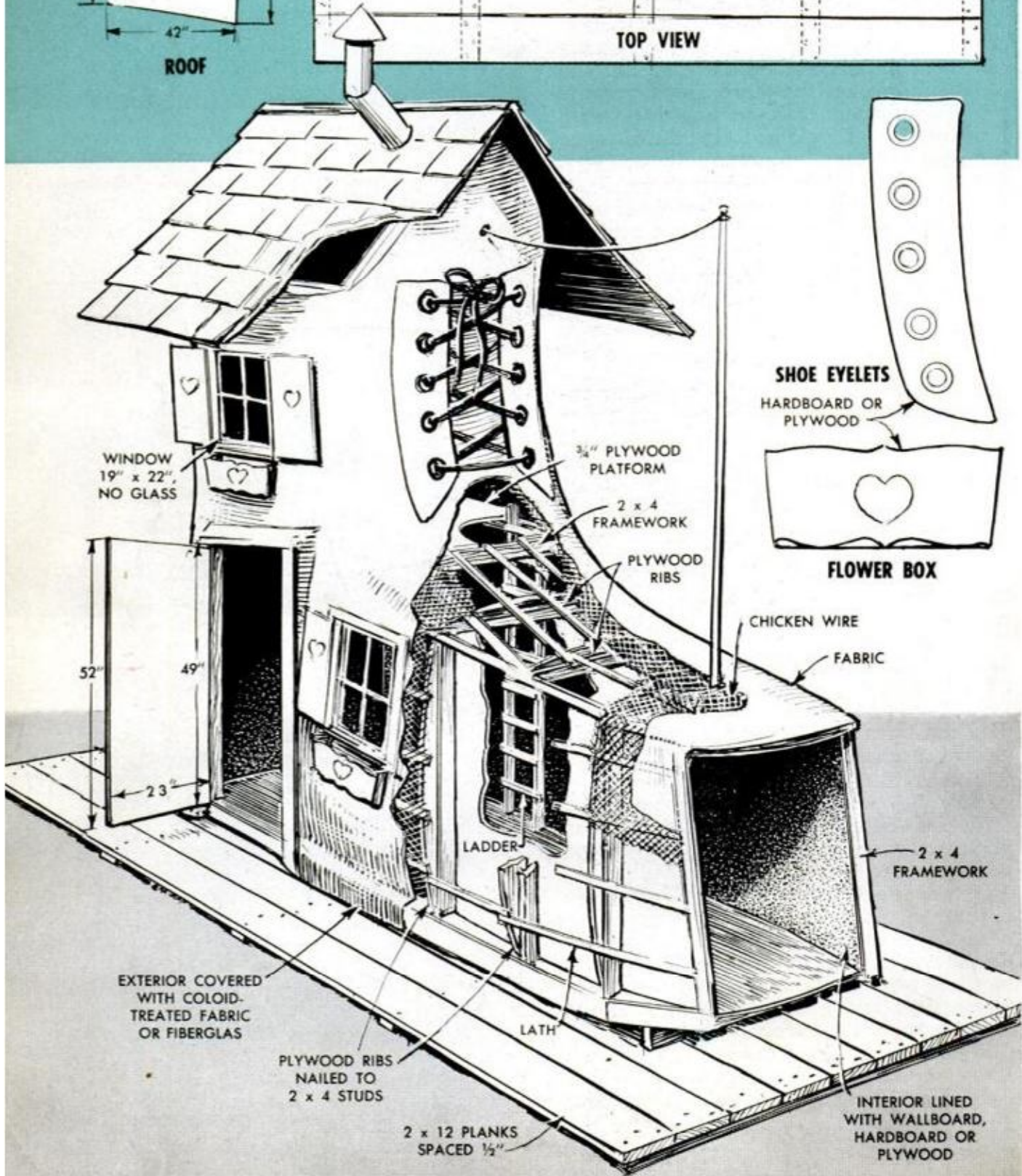
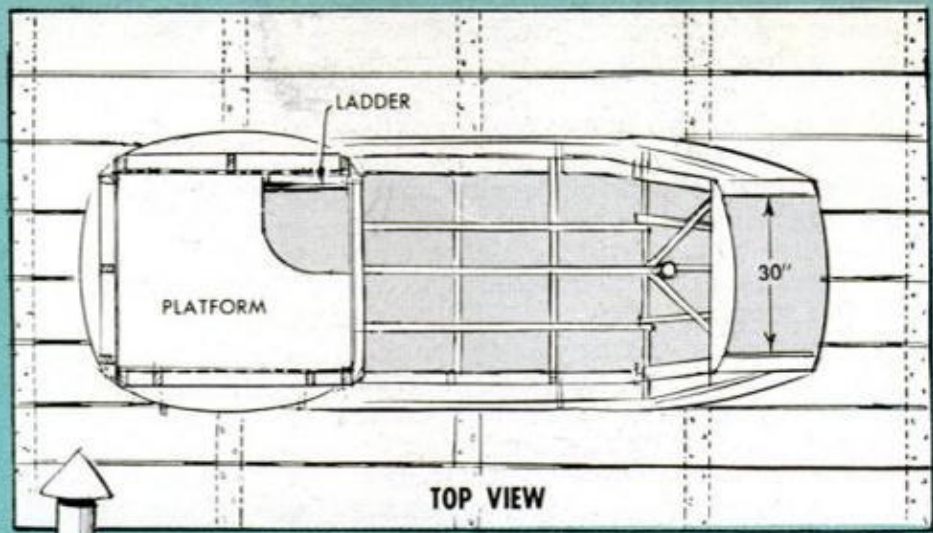
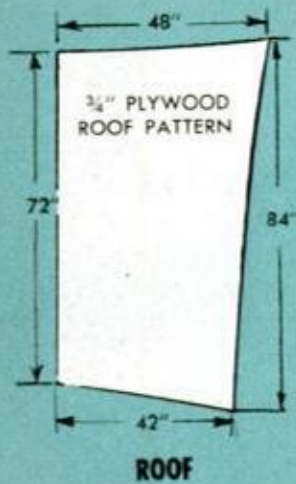
KEEL ROLLERS, Fig. 81, are all adjusted to same height. Cradles, Fig. 82, are set to clear sponsons



TIE-DOWN CHAIN, below, that fastens to 2 x 4 hold-down placed across boat, is bolted to recr channel









# X492

Shop Projects 1961



## Fairyland Playhouse

**T**O LIVELY imaginations this novel playhouse is a fairy story made real, the "Old Woman Who Lived in a Shoe" brought to life.

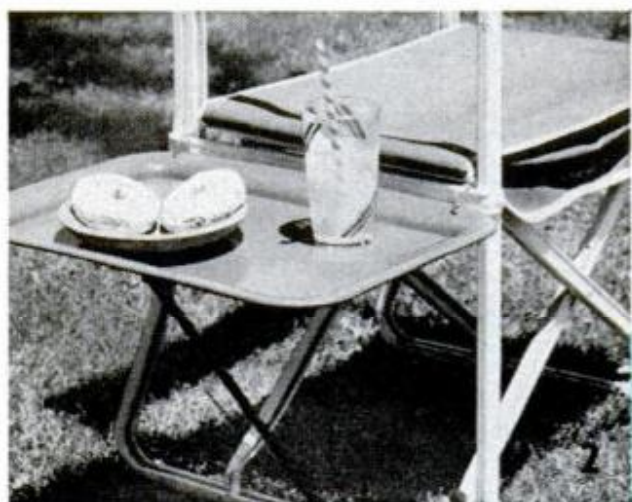
As a playhouse it has everything. The body of the shoe forms a long room—cave to the kids—and there's a door, windows without glass and a loft reached by a ladder through an opening in the plywood floor. Construction begins with a platform which serves as a foundation. On this you build a rough 2 x 4 framework. Contours of the shoe are obtained by nailing plywood ribs and ordinary lath or lattice strips to the rough frame. The plywood ribs are cut with one edge curved, the radii varying with the degree of curvature desired. Finally, chicken wire is stapled over the whole thing to

form a foundation for a weatherproof covering of either Celastic or fiberglass, whichever you use. As the covering goes on flaps for the laces are formed. Note that these have five eyelets each, made by gluing hardboard or plywood rings to the fabric flaps. Lacing is  $\frac{3}{8}$  or  $\frac{1}{2}$ -in. hemp rope. After the covering material of either type has been applied, finish with an undercoater and two coats of outside paint in the color desired. The original shoe was painted a bright yellow with brown for the shoe sole and eyelets. Windows, shutters and door were painted green. The roof consists of wood shingles laid over  $\frac{3}{4}$ -in. plywood and then painted a bright red. Artificial flowers or real plants can be placed in the window boxes.—Rodman W. Shutt





**1. COVER OF PICNIC BASKET** can become a handy serving table if you take the time to provide a detachable support, or leg, to hold the cover in a level position when open. Locate the center of the cover at a point about 1½ in. from the edge and drill a 5/16-in. hole approximately three quarters of the way through the thin stock. Be careful when drilling not to split the material. Then trim the end of a 3/8-dowel to a tight fit in the hole and cut to a length that will support the basket cover in level position

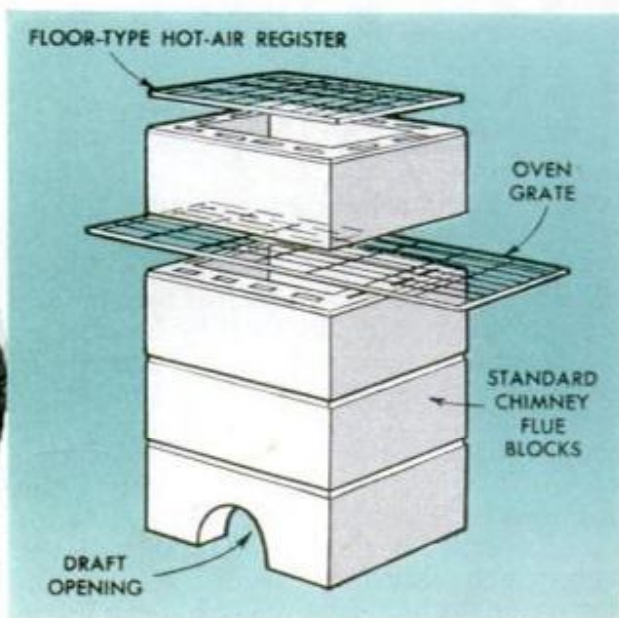


**2. HOST AND GUEST** alike will appreciate the convenience of this outdoor snack tray which is attached to a folding metal chair. Tray is hinged to chair rail with two loose-leaf ledger rings. One end of each ring is passed through small hole drilled in rim of tray. Rings are then snapped around chair rail. Tray is supported in level position by bracket hinged to bottom. Lower end of bracket is set into the channel of the horizontal section of the chair leg

## COOKOUT



**3. FOUR SQUARE FLUE BLOCKS**, an oven grate and the cast-iron grill from a warm-air floor register make this fast-starting charcoal broiler. Stack as detailed below, using a pipe block as the first one. Then come two square flue blocks and the oven grate, or a piece of welded wire fabric, topped off by top block and grill. Unit is neat, durable and just right height



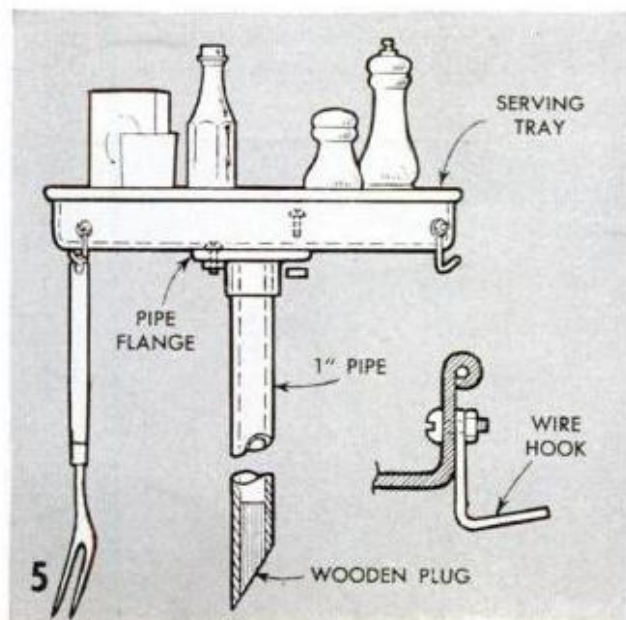




**4. SAVING IN CHARCOAL** is effected simply by snuffing out the live coals after you've finished broiling steaks at each cookout. Just have a garbage can lid handy and when you've finished with the fire, lift out the wire grill and place can lid over live coals

## HINTS

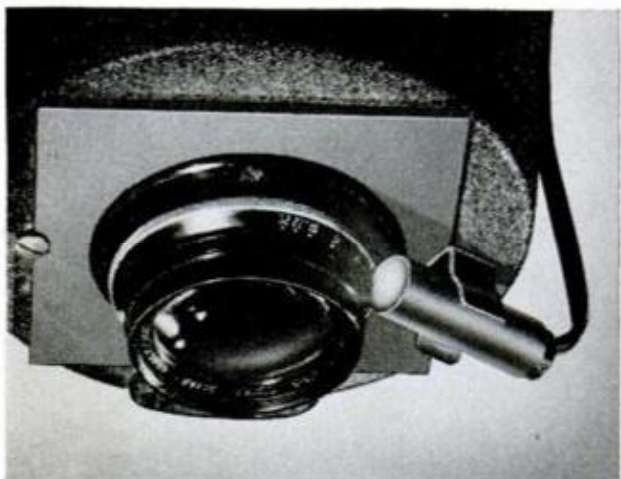
**5. COOKOUT CHEF'S HELPER** keeps seasoners and sauces, barbeque utensils always at hand. It consists of a round metal tray supported by a 30 or 32-in. length of pipe. Plain end of pipe is closed with wooden plug and cut at 30-degree angle so it can be pushed into ground easily. Tray is attached to pipe flange which is screwed onto threaded end of pipe



**6. JUMP SEATS** for small-fry "free loaders" are easily added at the ends of the standard wooden frame picnic table. Place 2 x 6s edgewise under the table, cutting them long enough to support two seats at ends. Nail to the X-legs and toenail to regular seat supports. Then cut two short lengths from a 1 x 12 board and nail to projecting ends as in illustration







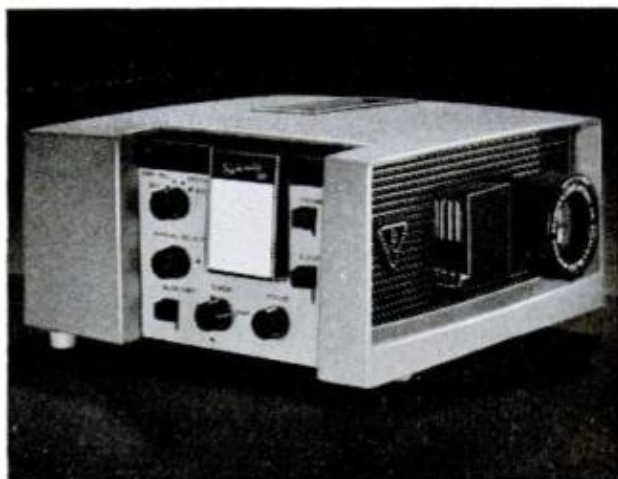
# NEW FOR SHUTTERBUGS

**CONTRAST RATIO VIEWER** is a lightweight, compact camera aid designed to eliminate the guesswork of figuring out lighting ratios. Left-hand portrait of girl shows how the eyes normally see a subject without a filter. Right-hand portrait shows the shadow details through the contrast viewer, just as the film normally records shadow details. Filter sells for \$2.95. Bausch & Lomb, Rochester 2, N. Y.

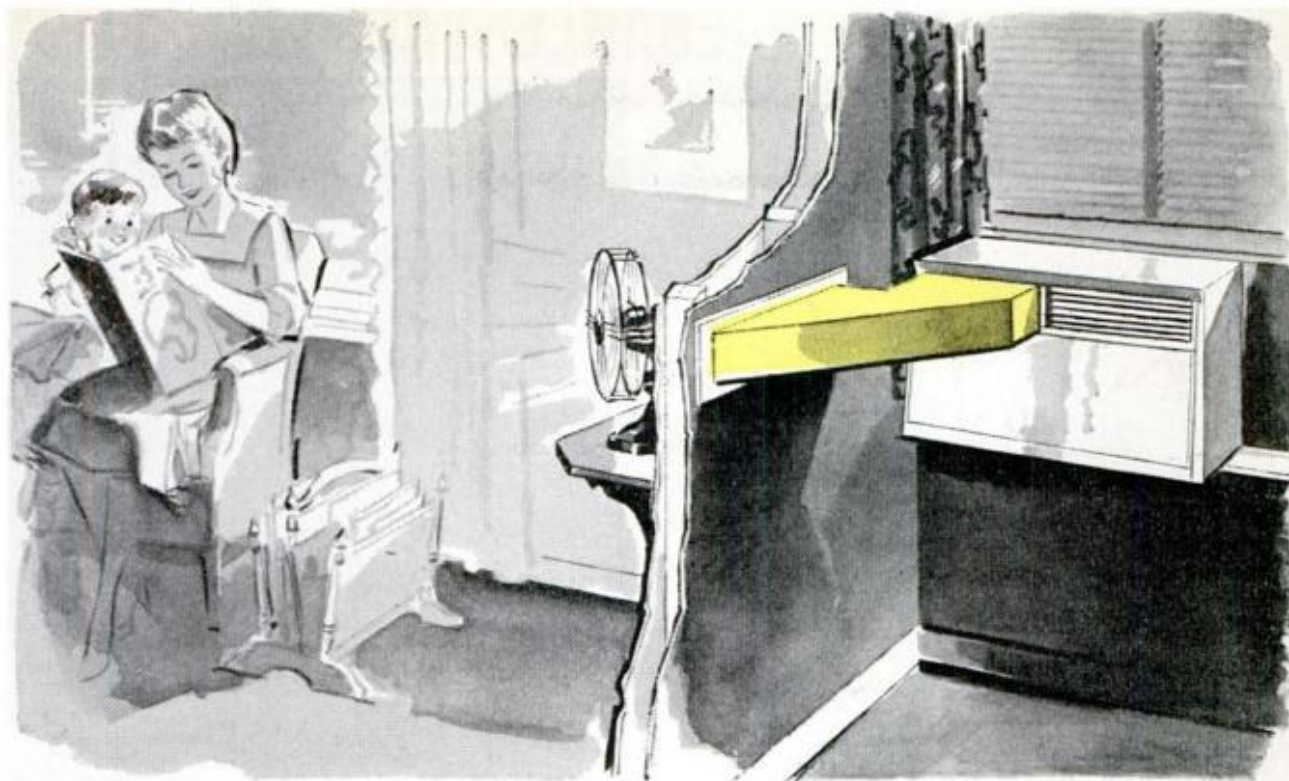
**PHOTO-LITE FLASHER** features a push-button momentary contact switch to turn floodlight on and off. Unit has a gooseneck reflector with a clamp-on device for attaching light to tripod. With it you can save on photofloods and obtain more natural expressions. Unit sells for \$4. Manufactured by Pacific Laboratories, 12808 Vence Blvd., Los Angeles 66, Calif.

**TIRED OF GUESSING** about the f-stops on your enlarging lens? Now you can get a miniature Stop-Lite darkroom lamp to illuminate the stop openings on your enlarging lens. Complete with 8-ft. line cord, mounting clip and mounting hardware, lamp sells for \$2.95. Unit is made by Lester C. Hehn-Engineering, 30 Manorhaven Blvd., Port Washington, N. Y.

**BALOMATIC 655** fully automatic 2 x 2 slide projector permits single-slide editing, remote forward and reverse operation with automatic time cycling in one compact model. Slide changing, either forward or reverse sequence, is done with one-button control that can be operated 15 ft. away from projector. Price: \$119.50. Bausch & Lomb, Rochester 2, N. Y.







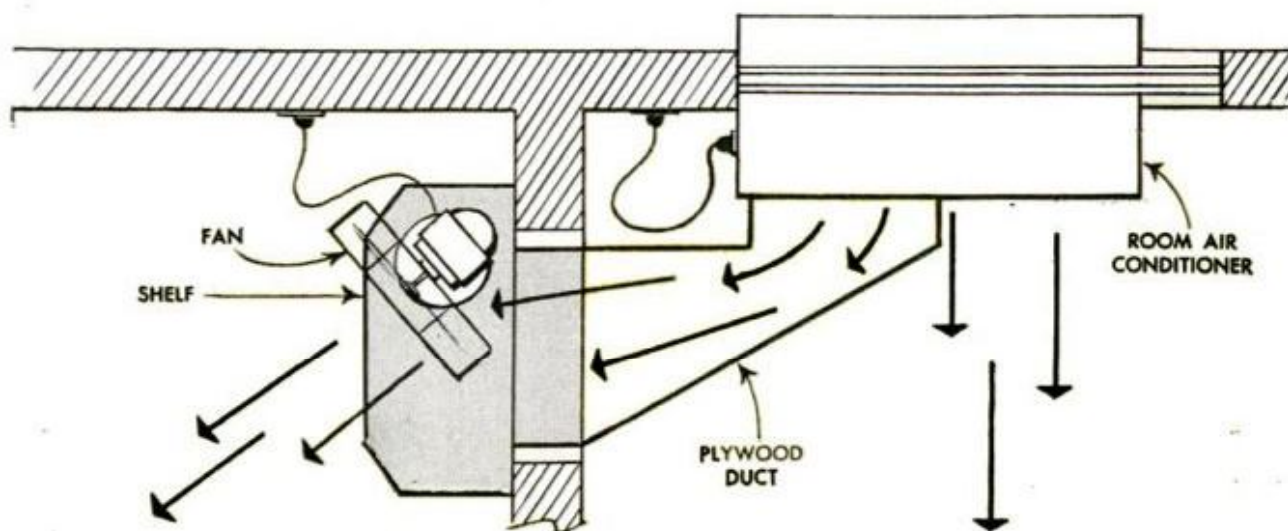
## Borrow From Your Window Air Conditioner

WISH you could put a bedroom air conditioner to work during the day cooling an adjoining room? One homeowner did and you can too if your air conditioner is mounted in a window which is close to the dividing wall. The diagram shows how half the output of the air conditioner is diverted by a plywood duct through an opening cut in the wall. A fan placed on a shelf hung below the duct opening helps circulate the cool air throughout the room. With the duct designed to be inserted in the wall opening, it is a simple matter to remove it when the full output of the conditioner is desired for the bedroom alone. Since the fan shelf is merely hung in position, it can be removed and a piece of furniture placed

in front of the opening to hide it from view.

In cutting the duct opening in the wall you should try to locate it so that it falls between studs. This may not always be possible since it is best to keep the duct as short as you can to make it less conspicuous and objectionable. Thus, you may find it necessary to saw through a stud. The opening is made slightly larger than the duct and trim is applied around it on both sides of the wall. If you wish, a metal grill can be installed over the opening, under the trim. The duct itself is nailed together from pieces of  $\frac{1}{4}$ -in. plywood. The easiest and quickest way to obtain an exact fit is to make a cardboard pattern.

—Hartwell J. Kennard





# PROTECT YOUR VALUABLE VACATION FILM



EVER RETURN from a long vacation only to find many of your most valuable transparencies fogged or completely off color? Heat, humidity and age all contribute to the deterioration of photographic film, particularly color film. And it's just when most of us are on vacation that heat and humidity are at a peak. The age problem is solved by carrying only fresh film. But the problem of excess heat and humidity calls for special attention.

## Keep in Sealed Wrapper

Film should be left in its sealed foil wrapping until you're ready to load the camera. On a trip, the extra unexposed rolls should be stored in a cool part of the car. A portable ice box is the best place to keep sealed film while traveling. Avoid storing film in the glove compartment during the heat of the day. It's better to carry the film with you than to leave it in a closed car for several hours on a hot day. Color film deteriorates rapidly when stored in a place that

**OUTSIDE CONTAINER** must be sealed to exclude all exterior moisture and make drying material effective



**SILICA GEL** is placed in the storage can to absorb the excess moisture once the container is sealed

heats up excessively. If you must leave film in a closed car, park the car in the shade.

Once the film has been removed from the camera, especially color film, it should be processed as soon as possible. If practical, send the film off by airmail while on your trip. When traveling through hot, damp climates, particularly in or near the tropics, and it is not practical to mail the film immediately, use coffee cans or similar containers for storing exposed film. To each can add silica gel, which looks like coarse sand but is extremely porous and readily absorbs water from the air. In tightly sealed containers silica gel will remove the excess humidity and retard deterioration.

## Good Indefinitely

Silica gel may be used over and over again by simply placing it in an oven and drying it out. You can buy silica gel in convenient containers having color indicators from Hunt Sales Co., 216 Westshire Road, Baltimore, Md. As moisture is absorbed by the silica gel, the indicator turns from blue to pink. Once the color spot shows a strong pink, the container should be placed in an oven until the color again changes to blue. Then put the silica gel in an air-tight container. After the gel has cooled, the film can be placed with it.

Every time film is added to the container, the latter should be resealed with tape. Whenever you have a few rolls left over from a trip, place the sealed rolls in a refrigerator or freezer. To keep the cardboard containers in good condition, wrap them in plastic or aluminum foil. By keeping film in cold storage it is usable for several months after the expiration date.



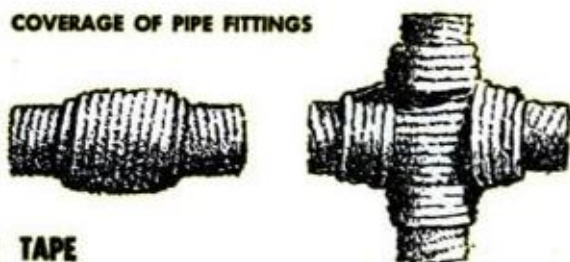
# X198 B



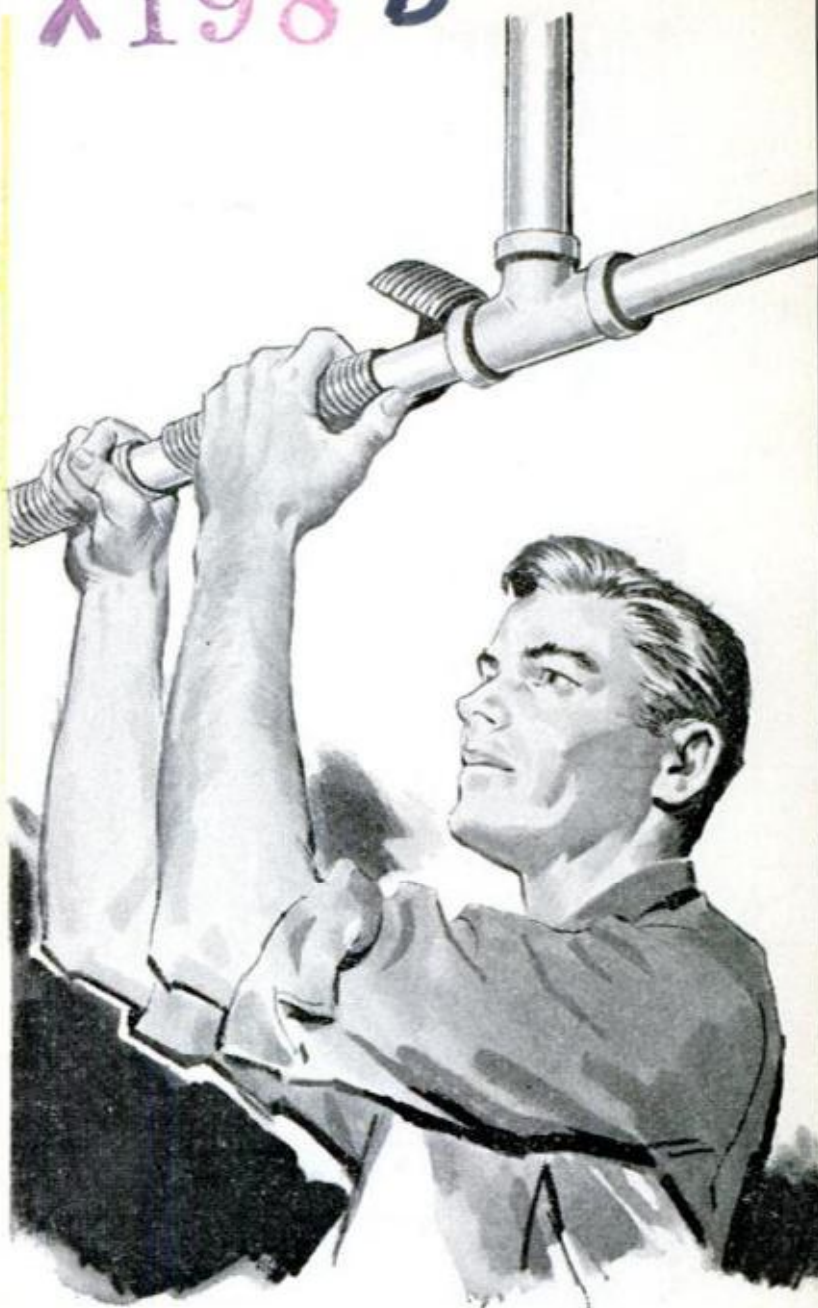
APPROX. COVERAGE OF 1 ROLL ON PIPE AND COPPER TUBING UP TO 1"

SIZE	3/8"	1/2"	3/4"	1"
FT. OF PIPE		10	8	6.5
FT. OF TUBING	18.5	15	12.5	10.7

COVERAGE OF PIPE FITTINGS



1 TAPE



## STOP THAT DRIP!

Condensation drip from cold pipes can damage basement furniture, rust workshop machines and produce wet, slippery floors

By E. R. Haan

**R**IGHT NOW, before the hot, humid days of summer, is the time to prevent condensation drip from cold-water pipes. This can be done only when the pipes are dry, not after they are wet. Modern pipe coverings applied now will prevent condensation from forming, stop the drip permanently.

For maximum effectiveness these coverings do three things, namely: (1) Prevent moist air from contacting cold pipes. (2) Prevent the coldness of pipes from reach-

ing the outer surface of the covering and permit condensation here. (3) Prevent moist air from permeating the covering material and condensing inside of it. Coverings that meet these requirements consist of adequate insulation completely enclosing the pipe line, including all fittings, where it is exposed to warm, humid air, and also have an effective vapor barrier either enclosing the insulation or combined with it. Besides stopping condensation drip, a good pipe covering has the added

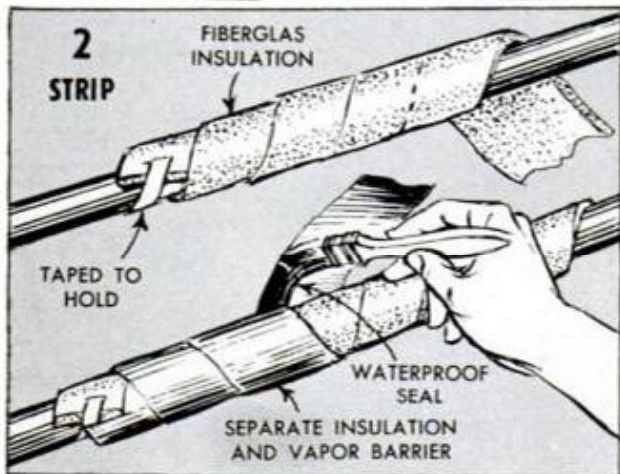




advantage of preventing cold water from being heated by surrounding air so that it must be left running for some time to obtain cool water.

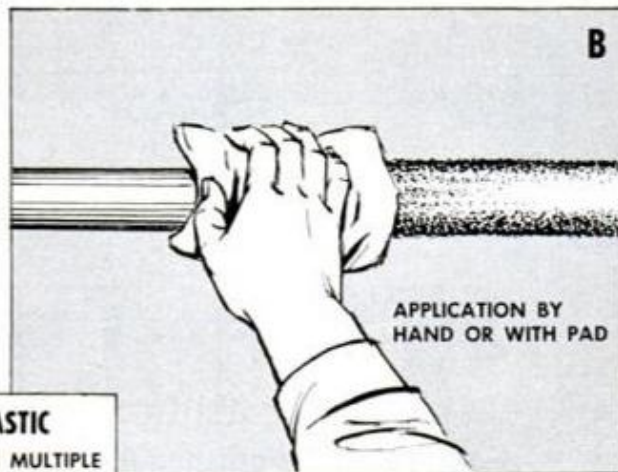
**Adequate Insulation.** The efficiency and the wall thickness of insulation must be such that there will be a minimum transfer of cold from the pipe to the outer surface and thus prevent condensation from forming. Thickness of insulation varies with the type of insulation as well as with the difference of temperature between the pipe and the air surrounding it, and with the relative humidity. The greater the temperature difference and percentage of humidity present, the more insulation is required, up to the point of diminishing effect.

Effectiveness of a vapor barrier is its ability to prevent the penetration of moist

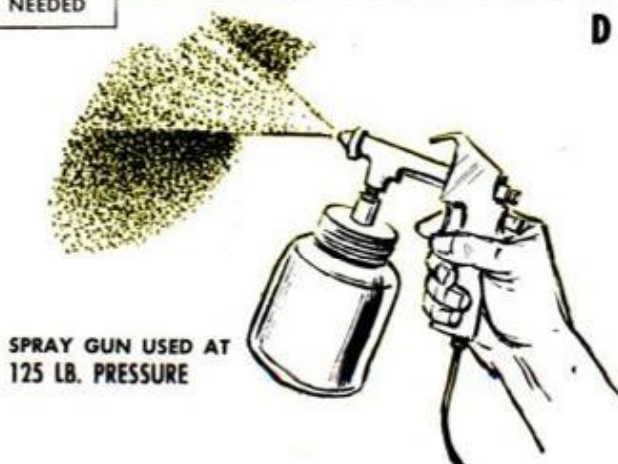
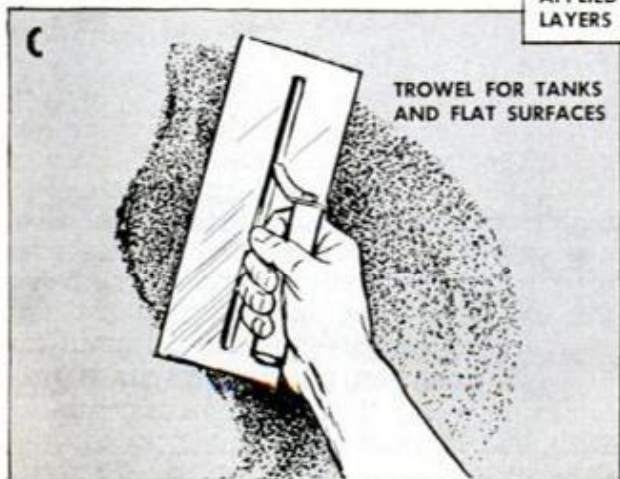


HUMIDITY CHART FOR ONE BRAND OF ANTI-DRIP MASTIC

TEMPERATURE DIFFERENCES BETWEEN PIPE AND AIR (FAHR.)	THICKNESS OF COATING					RELATIVE HUMIDITIES WHEN SWEATING OCCURS AT TEMPERATURE DIFFERENCES GIVEN AT LEFT
	1/4"	3/8"	1/2"	3/4"	1"	
10	77	80	82	85	88	
20	63	67	70	75	80	
30	52	56	59	67	72	
40	42	46	50	57	67	
50	33	38	43	50	60	
60	26	32	36	44	54	



**3 MASTIC**  
APPLIED IN MULTIPLE LAYERS AS NEEDED





air. A vapor barrier must be continuous and unbroken for maximum effectiveness. Any leakage of moist air into the insulation, as may be the case with an improperly applied or a damaged vapor-barrier covering, or one that is inefficient, permits moisture to accumulate in an absorbent insulation and defeat its purpose.

**Basic Types.** Choice of pipe coverings depends largely on whether you want protection for minimum or average conditions of humidity and temperature, or whether you want complete protection for extreme conditions. There are three basic types of antidrip pipe coverings, namely: (1) Flexible strip or tape that can be wrapped on pipe. (2) Mastic applied with brush, trowel, hand, or spray. (3) Prefabricated jackets, either flexible or rigid, made to fit steel pipe and copper tubing of various sizes.

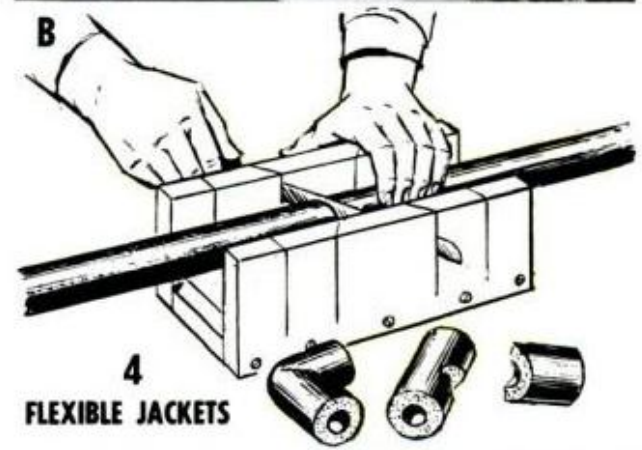
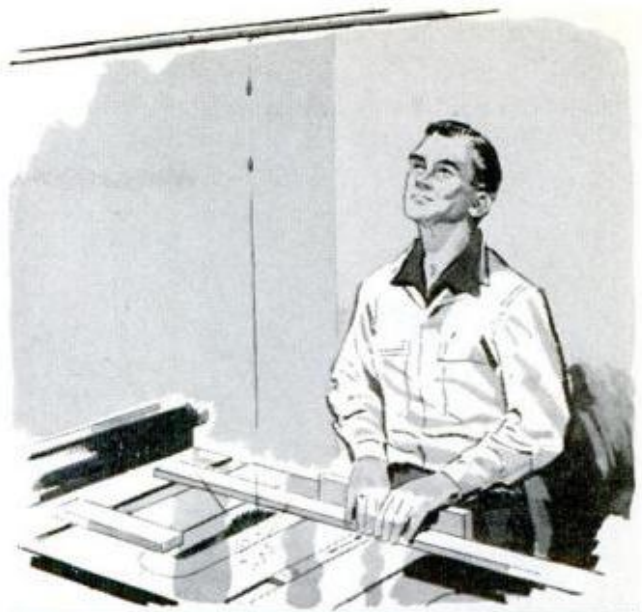
Multiple layers of the first two types increase the insulating effectiveness. You can start out with the minimum recommended application and add subsequent layers until adequate protection is obtained. Jackets come in varying wall thicknesses. Many manufacturers give tables or charts in their literature showing the limits of protection obtained from various wall thicknesses under different temperature and humidity conditions—a great aid in deciding what thickness to use.

NOMINAL WALL THICKNESS NEEDED TO PREVENT CONDENSATION												
MIN. PIPE TEMP. F.	80° F. AIR TEMP.				85° F. AIR TEMP.				90° F. AIR TEMP.			
	RELATIVE HUMIDITY				RELATIVE HUMIDITY				RELATIVE HUMIDITY			
	50%	60%	70%	80%	50%	60%	70%	80%	50%	60%	70%	80%
50	A	A	A	B	A	A	A	B	A	A	B	C
40	A	A	B	C	A	A	B	C	A	A	B	C

(NOTE—A, B & C are 1/8", 1/4" & 3/8" wall thicknesses respectively)

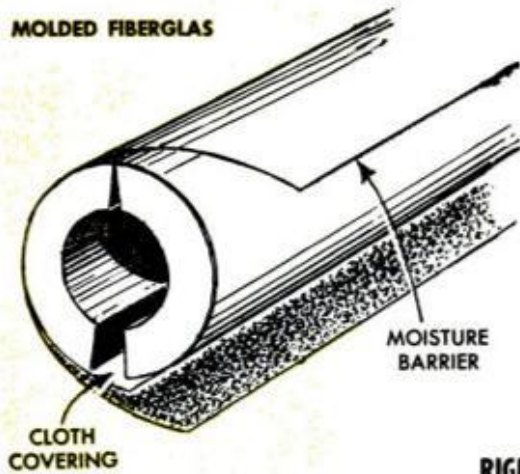
**Tape and Strip Coverings.** Pliable, cork-bodied tape, which is both an insulator and an effective vapor barrier and therefore does not need a separate vapor-barrier overwrap, is shown in Fig. 1. It is applied spirally around clean, dry pipes after which the edges of the tape are pushed together to form a leakproof joint. Tackiness of the material before it dries assures good joint union by pressure and facilitates applying the material neatly to pipe fittings as shown in the lower details. The accompanying table gives the approximate coverage of this tape on various sizes of steel pipe and copper tubing up to 1 in. One wrapping usually is sufficient for average conditions of temperature and humidity. Additional layers can be added for more severe conditions. To paint this material water-emulsion paint is used.

Fig. 2 shows an antidrip pipe covering consisting of a strip of fiberglass insulation,

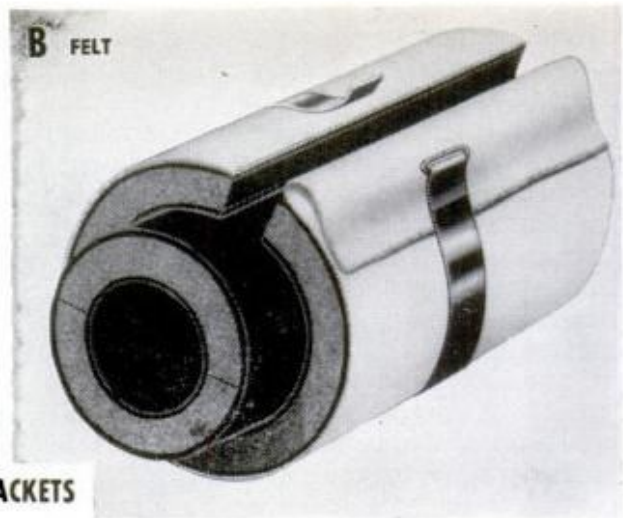




**A MOLDED FIBERGLAS**

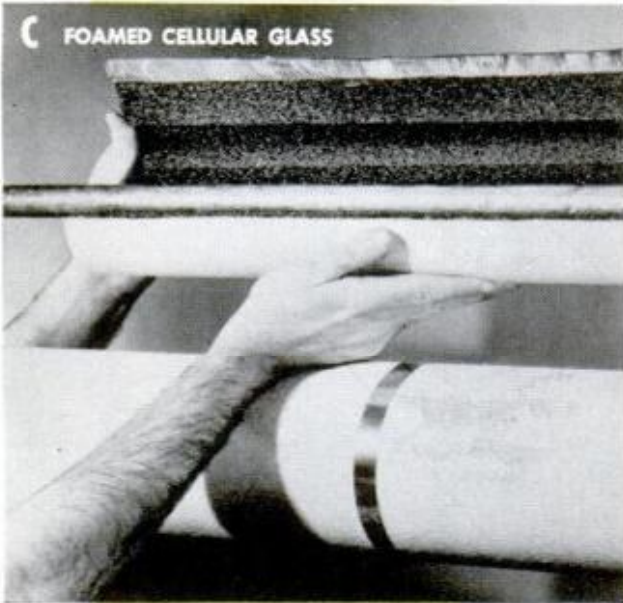


**B FELT**



**RIGID JACKETS**

**C FOAMED CELLULAR GLASS**



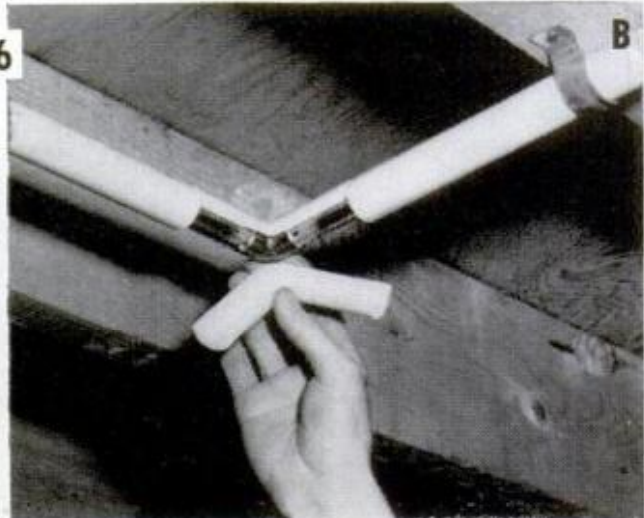
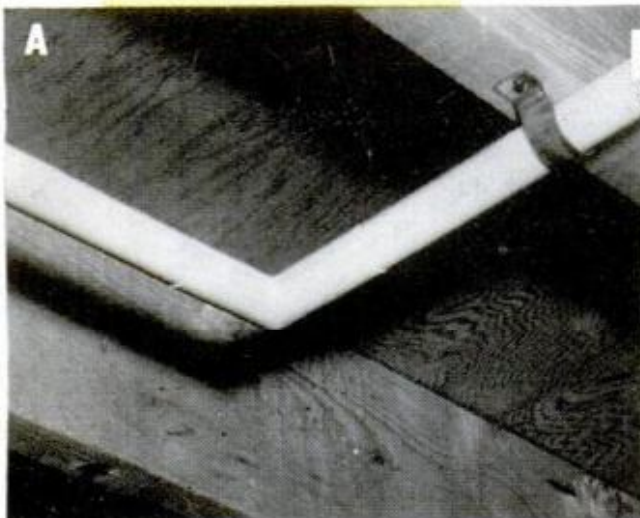
and a strip of impregnated, creped, kraft paper which serves as a vapor barrier. The insulation is wrapped spirally around the pipe, being overlapped one half of its width to produce a double thickness. A soft and easily compressible wrapping of this kind must remain fairly loose or its insulating value will be materially reduced. The vapor-barrier strip is wound over the insulation. Being creped it can stretch to permit neat application. However, a vapor barrier so overlapped is susceptible to eventual penetration of moist air at the joint unless the overlapping edges are sealed with waterproof cement or mastic, assuming that the material itself is effective as a vapor barrier.

**Mastic Coatings.** Applied as shown in Fig. 3, A, B, C and D, some mastic coatings serve the double purpose of insulation and vapor barrier. They are convenient to use not only on cold pipes but also on water-storage tanks and water softeners as well as ducts, basement walls and metal roofing. These mastics are of heavy consistency and are applied more like plaster than like paint. Shrinkage upon drying may occur with some, which results in a reduced

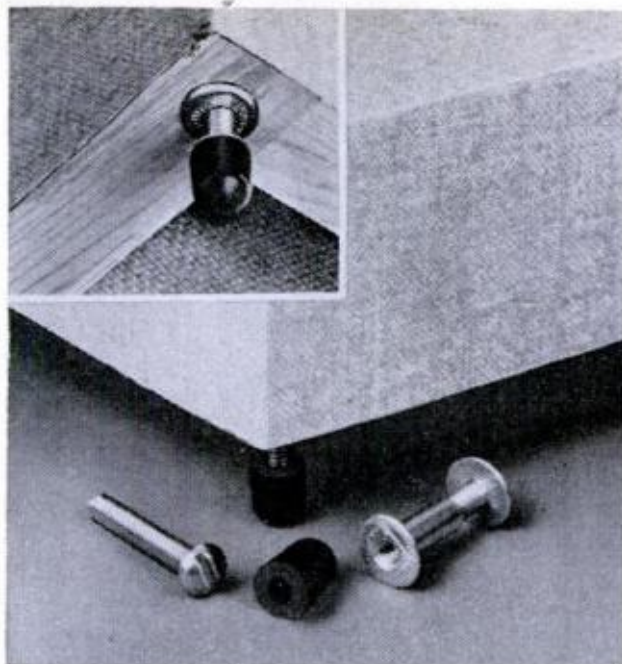
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**WALL THICKNESS CHART**

HUMIDITY	TEMPERATURE DIFFERENCE BETWEEN PIPE & AIR	
	50° F.	60° F.
UP TO 70	1"	1"
70 TO 80	1½"	2"
80 TO 85	2"	2½"



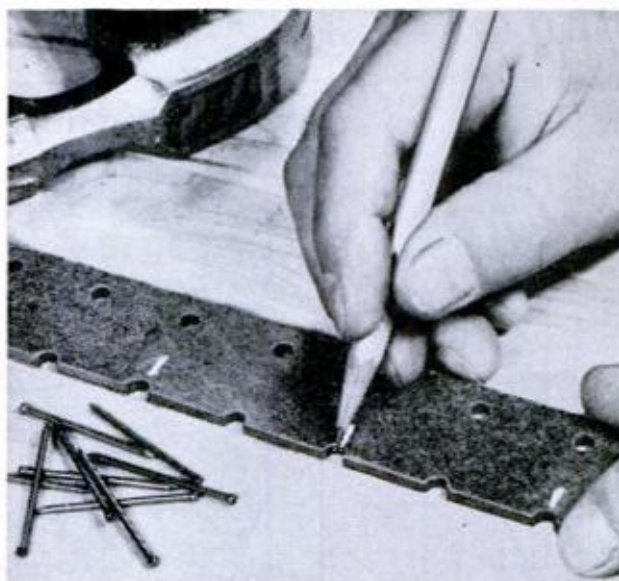




## Leveling Up

Record players, sensitive scales, old clocks and small tables are easily fitted with leveling screws adapted from Chicago Screw Posts. Just remove the screws which regularly come with the posts and substitute 8-32 screws about  $1\frac{1}{4}$  in. long. Cut the heads off the screws and force small rubber feet over the ends as pictured. Then drill slightly undersized holes in the frame, base, or leg of the piece to be supported and drive in the flanged threaded sleeve which is a part of the screw post. Turn in the rubber-tipped screw, then level up by turning the screws in or out. Use a level to check the setting.—Art Trauffer

## QUICK AND EASY



## Measuring Up

If you check the center-to-center distance of the holes in perforated hardboard, you'll find that they are exactly equidistant. Rip a 1 x 48-in. strip, cutting through the center of the holes, and you've got the perfect spacer for a line of screw holes or a handy measuring stick for rough work. Sand the cut edge smooth and apply a coat of shellac or enamel as a preservative. If you have long lines of screw holes to space 1, 2, 4 or 6 in., marking the desired spacings with a white pencil or a touch of contrasting paint will aid in spacing the holes quickly. Or, just strike a line along the edge.

—Bil Toman

## COMING UP NEXT . . .

**Tips On Flying Stick Planes.** A stick plane isn't much to look at, but if you know its flying potential you can almost literally fly it right out of the box it comes in. Next month a stick-plane pilot tells how to get greater performance from your balsa plane kit.

**How To Equip a Boat for Skiing.** As a beginning water skier one can be quite a splashy show, that is, until one masters the initial tricks. Then the sport takes on all the grace and ease of a swallow's flight. Next month **PM** takes you water skiing, tells how to equip your boat for ski towing.

**Saturday Mechanic.** It makes no difference whether you fix your own car on Saturday, Tuesday or Friday the 13th. The important thing is to know how, and the way to start learning is to pick up the July issue of **PM**. In it begins a new feature series that opens your car up like a book.

**Tumbling Machine.** No, it isn't an exerciser or an indoor gym. It's a polisher—a motor-driven affair that puts a mirror-bright finish on small metal parts by tumbling them in a paint-can drum. You can build it from odds and ends by following the details in the July issue.



# MR. DO-IT AND BUNGLE



(GOOD STUFF HERE) — YA KNOW, DOEY, SHE COULD HAVE CALLED A PROFESSIONAL, BUT SHE'S GOT CONFIDENCE IN ME. JUST LIKE SHE SAYS "WHEN THERE'S REPAIRS TO BE DONE — OL' BUNG'S TH' ONE"

POPULAR MECHANICS	POPULAR MECHANICS
<b>If there is a constant flow in bowl:</b>	<b>If there is a constant flow in tank:</b>
1. Replace worn Stopper.	1. If flow stops when you raise Float Ball, bend Rod slightly to lower it.
2. Clean valve seat with emery paper.	2. Check Float Ball. Replace if waterlogged.
3. Adjust Guide Rod so that Stopper seats squarely.	3. If flow persists, Ballcock is probably faulty. Replace it.

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**Knowing how a flush tank works and what to do to stop a trickle in the toilet bowl or constant flow in the tank can save you a steep plumber's bill**







## Are Your Lights Showing?

**Before you pass judgement on the driver of a "one-eyed" car you pass on the road, make sure that both of your own headlights are on. One of yours could be out also**

*By Paul Krait*

**M**ODERN CARS can have as many as 20 or 30 lights. Because you see many of these lights when you operate the car, you know immediately when they are not working. These lights would include those that go on when you open a door, turn on the radio, lift the trunk lid or even turn on the main light switch to check one of the gauges on the instrument panel. Headlights, parking lights, taillights and stop lights are another matter. You cannot see these from the driver's seat. In most cases the broad pattern cast by a single headlight disguises the fact that one of the headlights is not on. There is one stunt for a quick check of headlights: When you drive up to your garage door, get close enough so that the lights show two distinct spots of light on the door. If there is just one spot, get out of the car and double check. Try both high and low beams, or both sets of lights if you have four. If a garage door is not available, an occasional walk around the car is required. If you have a slight traffic mishap, or even bang

**FIRST STEP** in changing sealed-beam bulb is to turn out the screw, or screws, holding trim in the eyebrow





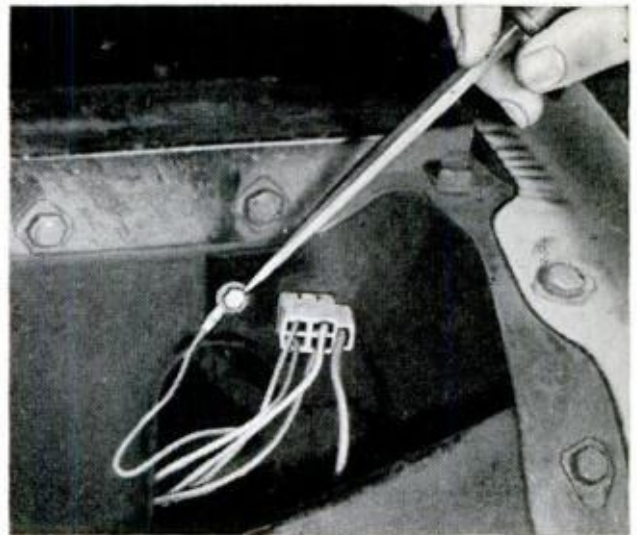
into the edge of the garage door, check the lights nearest the point of impact immediately; they may have been knocked out of commission. Age of a car should not be considered; next time you are driving note the 1960 and 1961 cars with faulty lights.

If one beam is out on a single sealed beam, it must be replaced. Where dual headlights are used, only the faulty lamp need be replaced. If all headlights work, but one is dim, check for a poor ground connection. Location of ground connections vary, but usually all that is required to correct a poor ground is to loosen a screw or bolt and retighten it. This breaks loose rust and corrosion allowing contact to be made on clean metal.

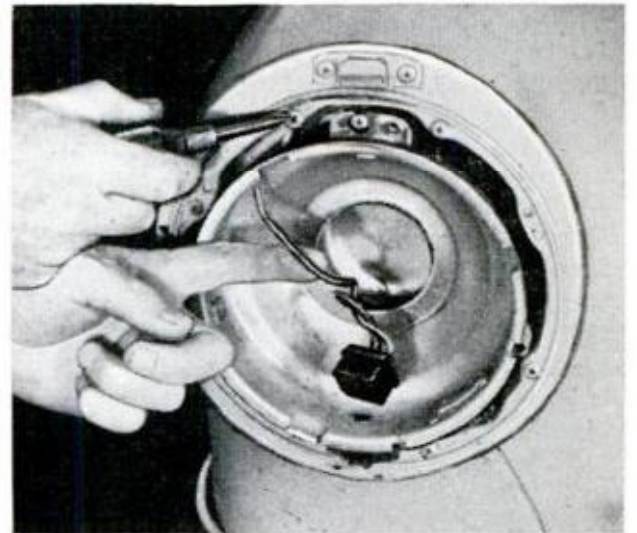
If both headlights—or all four—seem equally dim when the engine is idling, but brighten as engine speed is increased, check the battery cables. Remove and clean the cable clamps and the battery posts, then loosen and retighten the connectors on the opposite ends of the cables. If this does not cause the lights to brighten considerably, one of the cables is bad and should be checked by a serviceman with a voltmeter.

To replace a sealed-beam headlight, first remove the trim ring. The methods of removing the rings on various cars vary only in that some types have more screws than others. Next, remove the sealed-beam lamp. On some cars the lamp may be held by an inner rim, on others a spring may be used on one side, with a clip on the other. When the lamp is loose, disconnect the socket. Reverse the operation to replace with a new sealed-beam lamp.

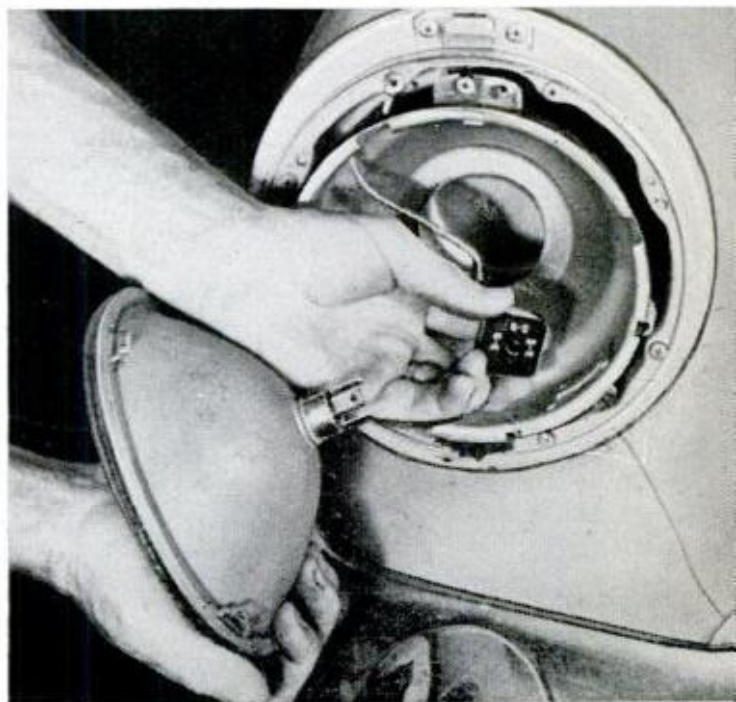
**HEADLIGHT RIM** on '57 Buick is held by one screw in recess at bottom, two more inside rim next to lamp



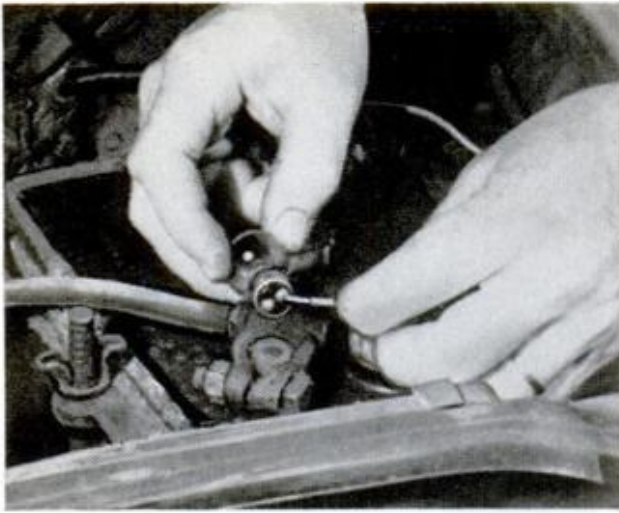
**GROUND WIRE** for Buick, above, is attached to radiator support. Below, ground wire is led through headlight cell and attached to the fender with a screw



**UNPLUG UNIT** from connector, which takes 3 prongs of bulb. Two are for high-low beams, third for ground





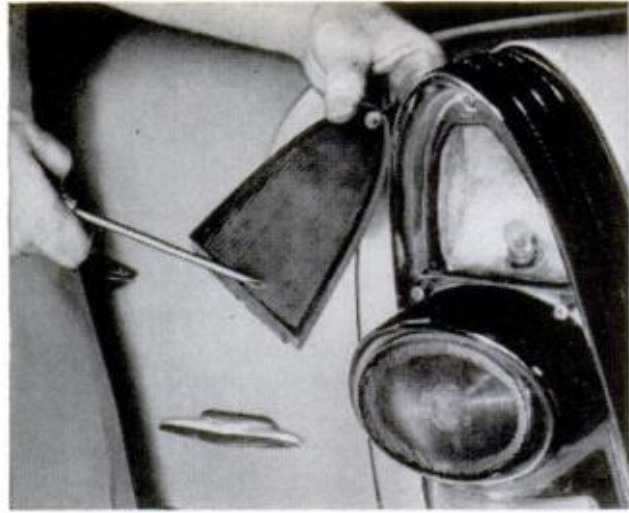
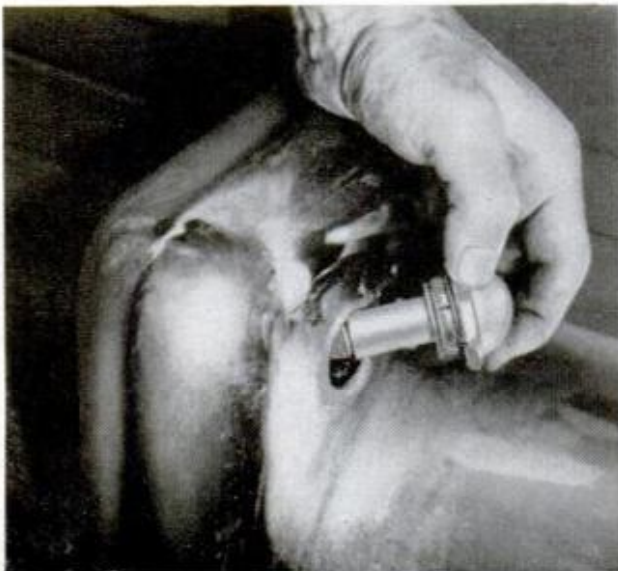


**TEST BULBS** by placing side of socket on battery ground post. Touch contacts with wire from other post

After checking and replacing headlights, turn the light switch to "park" position. If one or both parking lamps are dim, remove the trim rings and clean them and the openings in the body to restore a good ground. Front turn indicators generally use a filament in the same bulbs as the parking lamps, so check them at the same time as the parking lamps. Usually when a front or rear bulb, or filament, burns out, neither lamp will burn and the indicator light on the instrument panel also will not light. A simple test for the bulbs is to hold the side of the base on the ground post of the battery while a wire from the "hot" post of the battery is touched to the terminals on the bottom of the bulb. Both filaments should light. A poor ground also will prevent indicator lights from working. Cleaning up the parking lights may cause the indicators to work again.

After correcting the front lights, move to

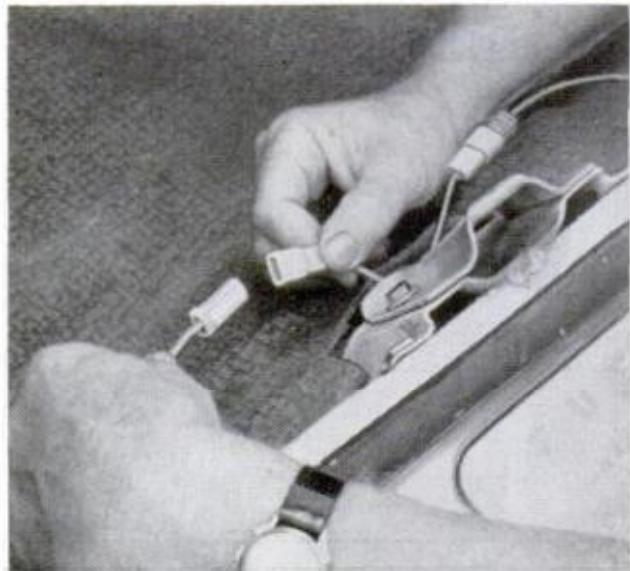
**FINGERS HOLD** license lights which are located in bumpers on some cars. Abrade to assure good ground



**THREE SCREWS** hold this taillight lens in place. One passes directly through lens. Stoplight lens is below

the back of the car. With the light switch on, both taillights should be lighted. Have someone step on the brake pedal to check the stop lights. If one stop light goes on, but the taillight on the opposite side of the car goes out, you have ground trouble. Remove the lenses from both taillights and clean the reflector edges and shells, and the body openings to provide good ground connections. As with headlights, trim rings on taillights are attached in several ways. Some are removed from outside. On other models, the trim stays in place and the bulb is removed from inside the trunk. Fingers, or lugs, on the reflectors hold the assembly in place, the same method sometimes being used for license-plate lights in the rear bumper. If a light at the rear of the car does not work even when the bulb is okay, look for a loose connector. Some are under the fender, bumper or inside the trunk under the carpet.

**CONNECTORS** under fenders, bumpers, inside trunk under rug can become disconnected. Check to see





Dome lights and courtesy lights are actuated by switches on the door frames. These are normally-on units that are kept off when the edge of the door presses against them. These switches sometimes stick in the "off" position and must be worked loose, then lubricated with powdered graphite. If such a switch goes bad, it can be replaced on some cars by prying it out, disconnecting the wires and installing the new switch. Other types of door switches are held by a nut. To remove this type, the nut is loosened, then the switch is removed from the back side of the door post, after removing the inner paneling.

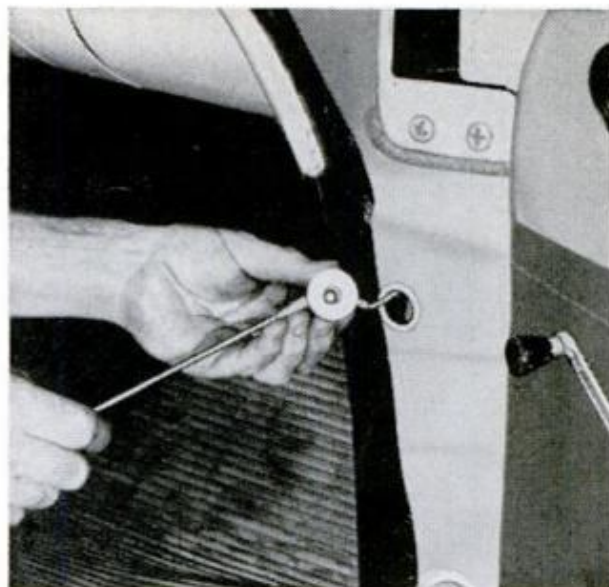
If your radio suddenly stops working, it might be a blown fuse. These usually are line fuses. A half twist disconnects the fitting in which the fuse is located. If a light on the instrument panel goes out, it must be removed and replaced from behind the panel. A word of warning here: If your car has a 12-volt system, use extreme caution when working under the instrument panel. On 6-volt systems if you short a wire, there are a few sparks and possibly a blown fuse. On a 12-volt system if you cross a wire or ground one, the complete wiring under the panel can go up in smoke in an instant. If you must work under the panel, disconnect both battery cables. Be sure no wires are shorted before reconnecting the cables.

#### Fuses Protect Wiring

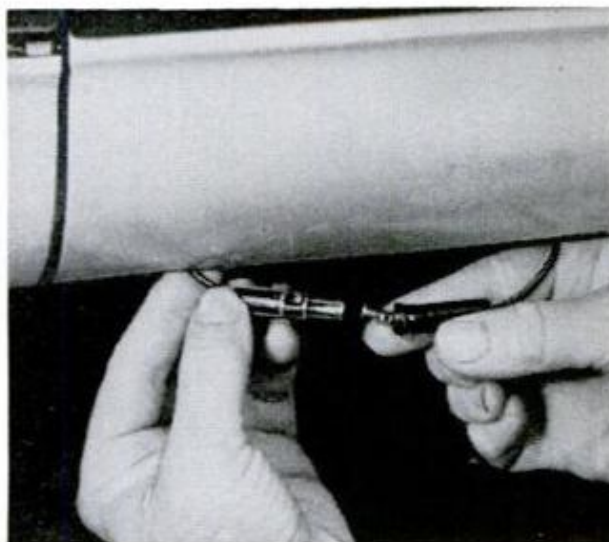
All lights except the headlights and taillights of a car are protected by fuses. Generally, most of the fuses are located in one place on a fuse block. Because the location of the fuse block, as well as line and other fuses for some lights varies considerably from one car to another, it is suggested that any motorist who wants to work on his car obtain a service manual. They sometimes can be obtained from auto dealers, definitely can be purchased from the service department of the manufacturer of your car. The few dollars the manual costs is more than repaid the first time you work on your car. There is a section in these manuals that tell you how to trouble shoot lighting problems, all the way from checking the switch for the backup lights, to how to adjust the automatic-canceling switch for the turn-indicator lights.

Head and taillights on a car are protected by a circuit breaker. This unit breaks the circuit when there is an overload or short circuit, but does it for just a moment, then restores the circuit. Although the constant blinking of the lights is most disconcerting, it is not nearly as frightening as though the headlights suddenly went out and stayed out. An experienced mechanic can work

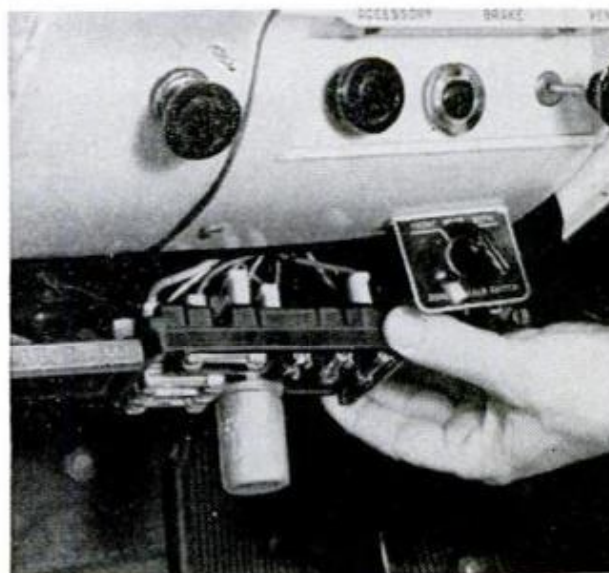
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**DOOR SWITCHES** are of normally-on type and are held in off position by closed door. Complete switch is replaced when it fails to turn off lights

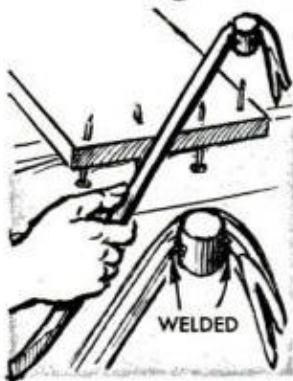


**LINE FUSES**, above, are used for accessories such as radio. To release fuse give connector half twist. Below, fuse blocks usually are found under instrument panel. Play it safe and disconnect battery cables



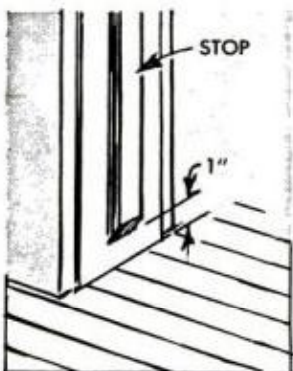


## Unnailing Used Boards



Wreckers who salvage lumber have the problem of pulling the nails. One way to speed up this tedious job is to weld a 1 x 1-in. piece of round steel in the bend of the wrecking bar to serve as a nail starter. — E. M. Rand

## Dustless Door Stop



Cutting inside door stops about 1 in. short and at an angle prevents dust from collecting and makes cleaning easier. Just one pass of the broom or cleaner nozzle does the cleaning job for the week.

—John J. Bahr

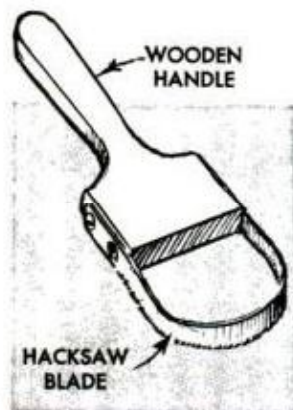
## Packaged Ice Cake



Water frozen in 1/2-gal. milk cartons makes a long-lasting ice cake for your picnic chest. As the ice melts slowly water remains in the carton, permitting foods to be placed in the bottom of the chest without becoming water-soaked.

—Lynn Fuller

## Garden Row Weeder

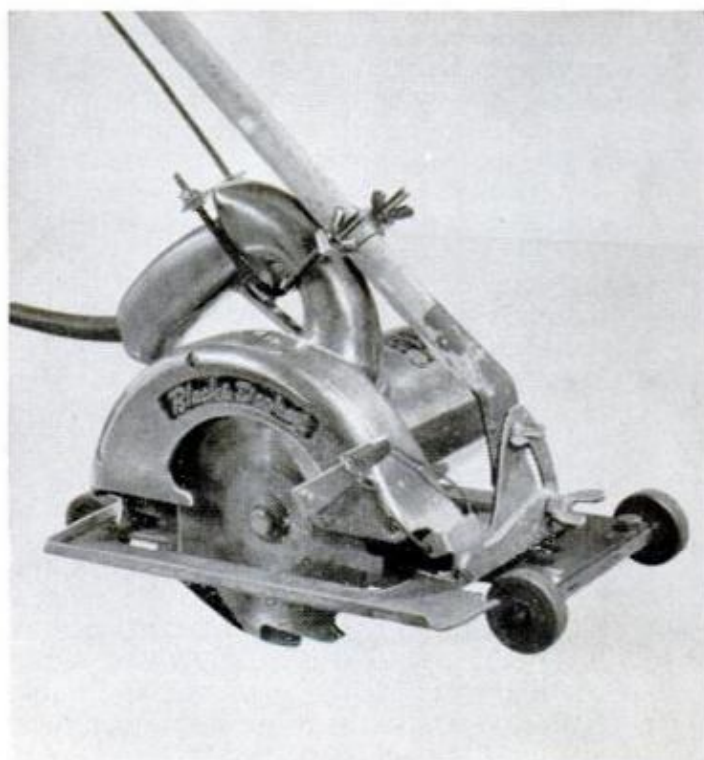
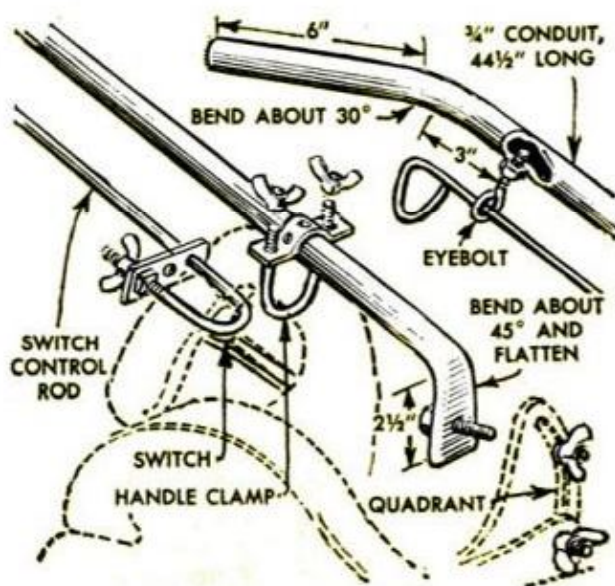


An old paintbrush handle, or one jigsawed to similar shape, a discarded hacksaw blade and four screws make this handy garden weeder. It's just the thing for working close to tiny plants and between closely-spaced rows in small gardens—Ken Murray

# SAWDUST

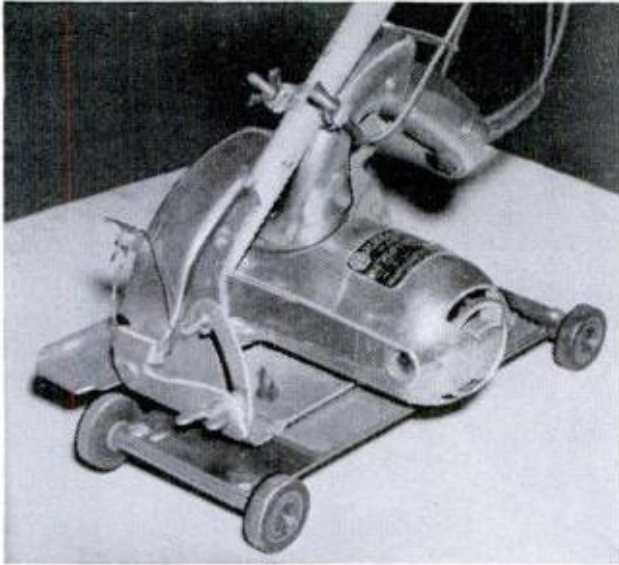
## Dolly Permits Portable Saw To Pinch-Hit as Lawn Edger

ANY PORTABLE electric saw in the popular blade sizes can be converted to lawn edging by making the dolly pictured below and detailed on the opposite page. Attach the improvised stand-up handle and the dolly and you have a speedy lawn edger. Remove handle and dolly and change the blade and use again as a portable saw. Only general over-all dimensions are given for the dolly as you have to make it to fit the saw in hand. Dolly wheels are given as 1 3/4 in. in diameter but you may have to use



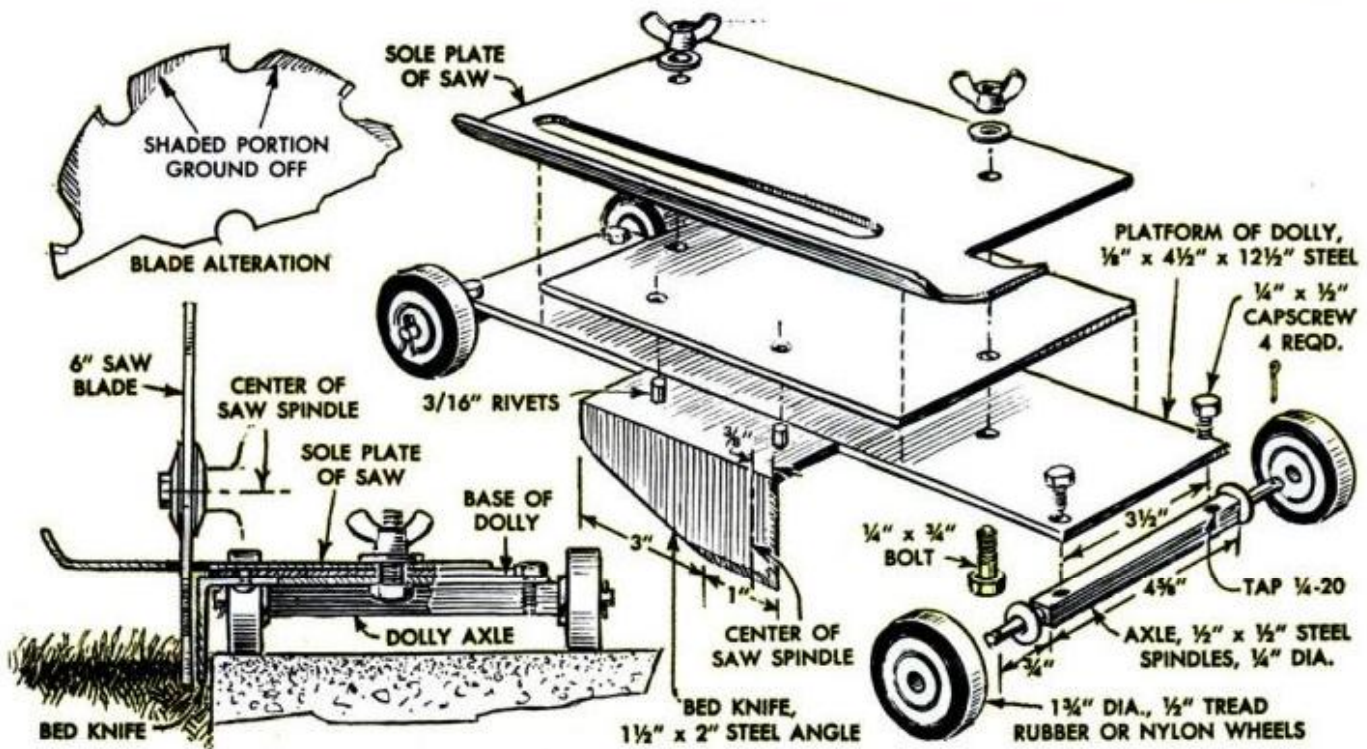


# TO TURF

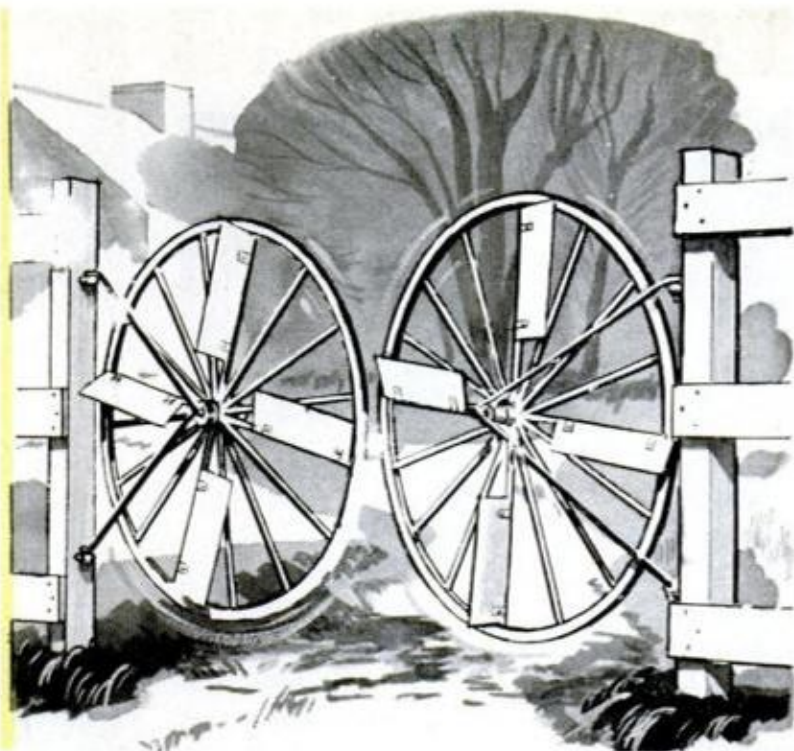
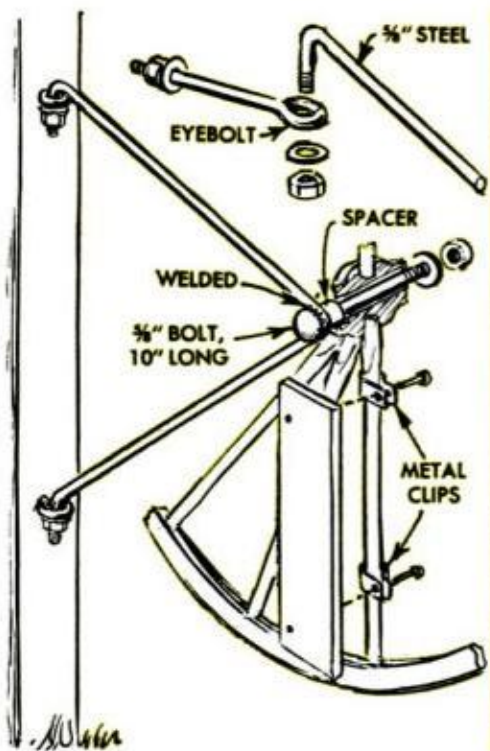


slightly larger or smaller wheels to suit your saw. Roller-skate wheels usually are just the right size.

A dulled blade that fits your saw, or a used carbide-tipped blade, is altered as in one of the details. Clearance between blade and bed knife should be about  $\frac{1}{8}$  in. or slightly less. The bed knife is made from a 4-in. length of steel angle, the size of the webs being determined by the diameter of the blade. The angle is riveted to the top platform plate of the dolly. Bolts for attaching the dolly to the saw sole plate are drilled through the sole plate and both platform plates as indicated. Handle and switch control rod must be adapted to the saw you use.—Glen T. Price







## Twinmills Are Eye-Catching Farm Gate

Probably everything has been done with discarded buggy wheels as yard decorators, except to make them turn again. But here's a pair serving as a double gate and they're fitted with wind vanes so that they turn when a breeze is blowing. All you do is weld a spindle to an A-shaped bracket as in the detail and then mount the bracket on the gatepost with heavy eyebolts. Of course, you have to take careful measurements of the diameter of the wheels and the width of the gateway so that you

know how to make brackets of the correct size. The vanes are rectangular pieces of  $\frac{3}{8}$ -in. plywood, about 6 x 18 in. and they're mounted on the spokes at an angle of about 30 degrees with the plane of the wheel, using metal clips as in the detail. Sand the felloes and spokes and clean off rust. Paint wheels and brackets in a bright color such as orange, or paint all-white. Use a locknut on each spindle when mounting and set all the vanes at the same angle.

—David A. Cronhardt

## Half Sawbuck for Handsawing Cordwood to Length



Bucking cordwood lengths from long poles on an ordinary sawbuck is difficult and often hazardous because of the problem of holding the pole in the horizontal position for making the first cut or two. To make this job less tiring, build a half buck like that illustrated and you'll find the job goes a lot easier. With the half buck you make all but the last cut with one end of the pole supported on the ground. The unit should be sturdy and braced so that it won't wobble or tilt. If available, make it of hardwood and assemble with heavy screws.

—Ann Zawistowski

**Before you give up trying to start a balky power lawn mower, remove the plug and close the electrode gap to about .010. This lowers resistance in the ignition circuit and usually permits the plug to fire.**



## FARM TIMESAVERS

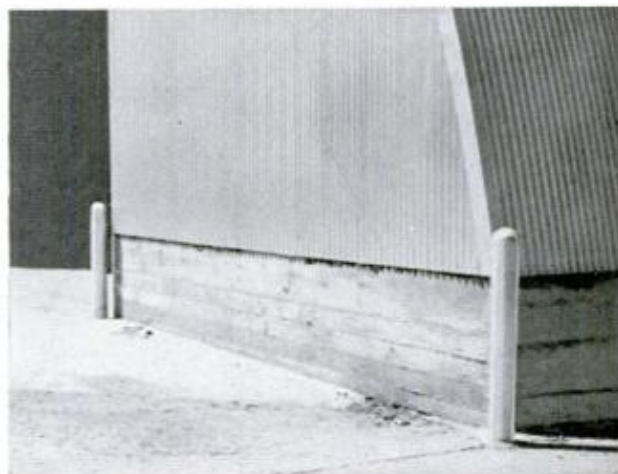
### Portable Watering Tank

No need to elevate this watering tank to reach and fill field waterers by gravity. It's fitted with an engine-driven centrifugal pump that can boost water into any field tank or waterer or over the fence into a tank or trough in case it's unhandy to make a long round trip inside the lot. As will be seen from the photo, the tank is trailer mounted at the normal load height and can be tractor drawn at road speeds because of its oversize rubber tires.



### Fenders Guard Building

Accidentally hook the corner of a farm outbuilding with heavy tractor-drawn equipment and you may very nearly wreck the structure before you can stop. It all depends on how short you cut the corner and how fast you're going. One farmer protects the corners of his machine shed with guard posts, or fenders, made by sinking short lengths of old well casing and filling with concrete. Placed close to the corners of the building the posts minimize any damage that may result from short turns with heavy equipment.



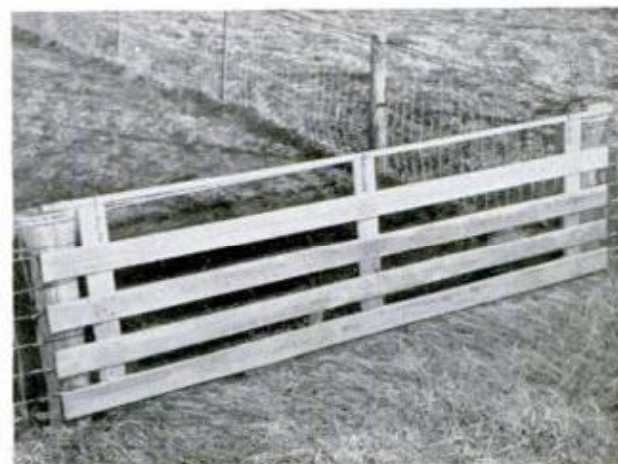
### Counterbalancing Truck Bumper

The front bumper you see in the photo weighs about 700 lb. It serves as a counterbalancing weight for a lift, or boom, mounted on the bed of the truck. It's made from sheet metal shaped to the contour of the original bumper and welded at the corners and along the joint where the bottom joins the sides and ends. Heavy supports are welded to the truck frame. Then the whole thing is filled with reinforced concrete and a sheet-metal cover is fitted and welded on. If desired, heavy hooks can be welded to the bumper for tow chains or ropes.



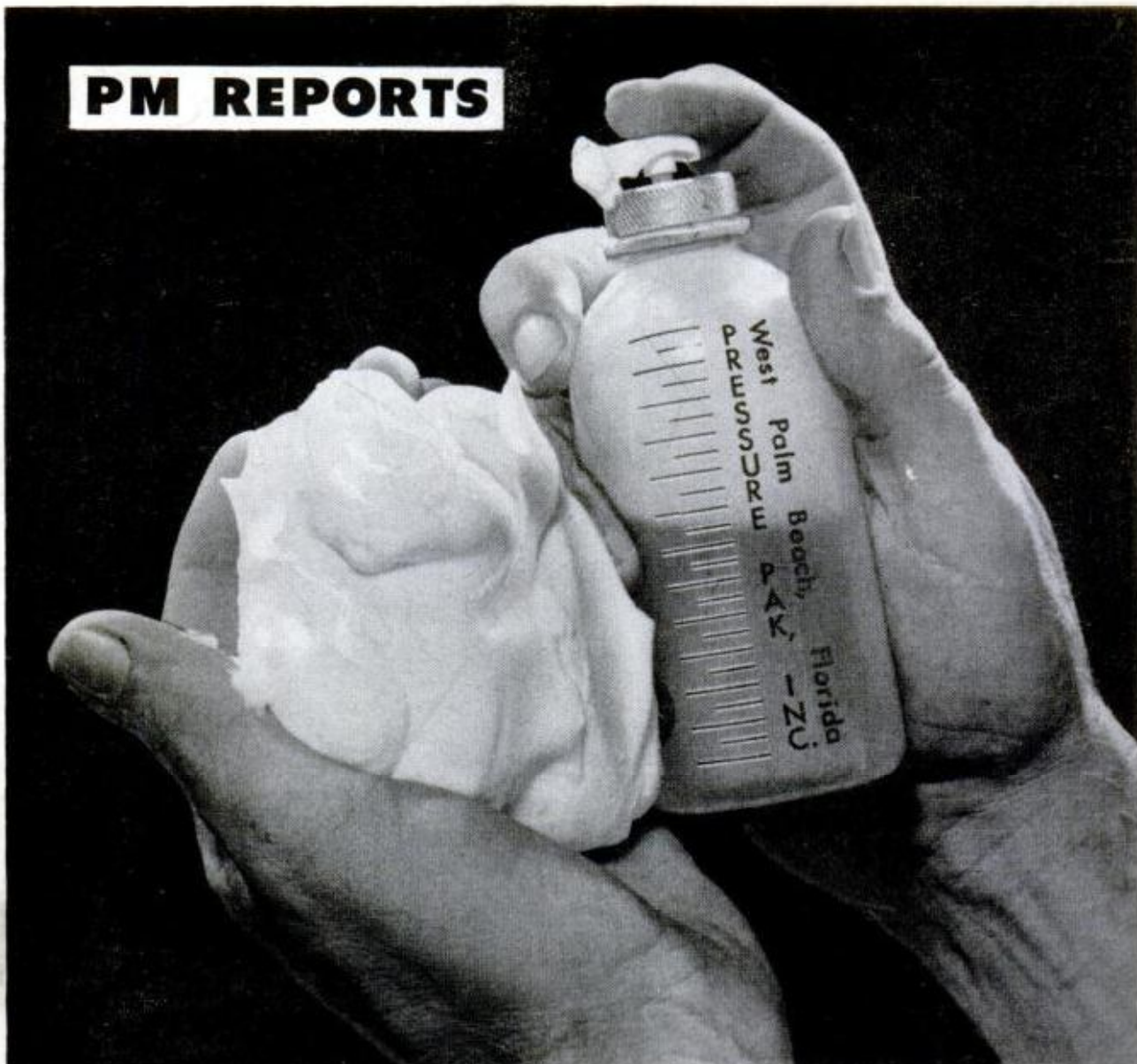
### Flood Gate Rolls With Punch

To prevent trash from forming a jam and taking out a section of line fence at the lower end of a grassed waterway, one farmer built a swinging flood gate across the waterway which operates automatically. It's hinged at the top instead of at one end so that it floats on the crest of the flood upward and outward as the water rises and then lowers automatically as the water recedes. The gate is always dependably closed against livestock when the waterway is dry. It's hinged from a length of pipe which spans the gateposts.—A. M. Wettach





## PM REPORTS



# LOAD YOUR OWN AEROSOLS



**N**OW THERE'S something new. If you'd like to experiment a bit, become a lay scientist — and who wouldn't? — you can now formulate special aerosol sprays and fill your own push-button containers with a kit made by Pressure Pak, Inc. This kit, priced at \$37.50, can bring all the fascinations of practical aerosol packaging right smack into your own hobby shop.

There are two basic aerosol systems. The first utilizes a fluorinated hydro-carbon-type propellant. In this system, typified by products such as insecticides, the propellant and product become a homogeneous mixture and develop a steady pressure within the can. This pressure forces the contents up through the dip tube, valve and into the atmosphere. Here the propellant vaporizes, leaving only the product particles suspended in air. The constant pressure necessary for this action is gen-



erated inside the can, until a specific gauge pressure is developed, normally in the vicinity of 38 lb. per sq. in. As the product is discharged, additional amounts of propellant vaporize within the can, thus maintaining a constant pressure, until the last of the product is finally discharged.

For example, a full 16-oz. aerosol container normally has 38 lb. per sq. in. gauge pressure. After all but an ounce of the product has been discharged, a fluorinated hydro-carbon propellant will still maintain normal pressure. This characteristic is of extreme importance since falling pressure would leave part of the contents of the container undischarged and result in undesirable spray characteristics.

The need for an undiminishing pressure in this system is the reason that compressed air is missing from the list of propellants used. Not only does air contain moisture that would tend to corrode metal containers, but instead of maintaining a constant pressure, it would rapidly fall off to that of the atmosphere.

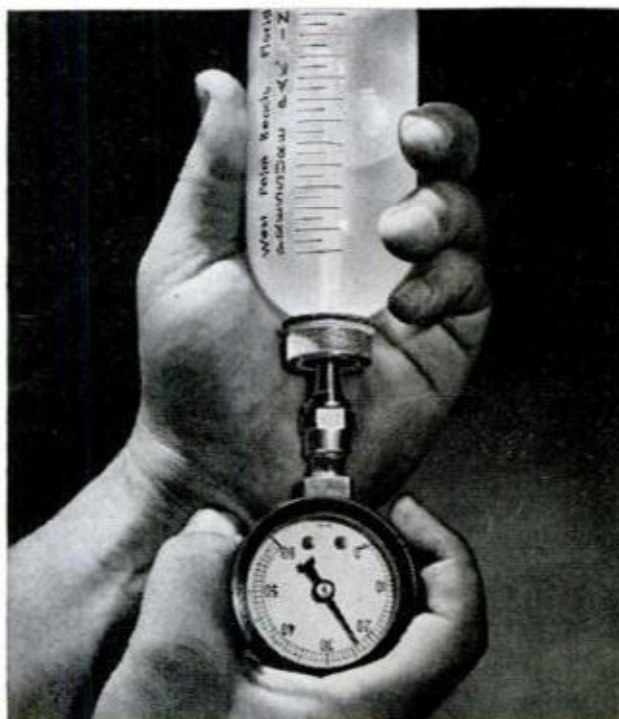
#### Independent Propellants

The second system employs an inert gas such as nitrogen which is introduced through the valve into the container at approximately 100 lb. per sq. in. In this case the propellant does not mix with the product, but exerts a head pressure on its surface which forces the product up through the dip tube. Aerosol toothpaste is an example of the use of this system. Since nitrogen is a pure gas, the pressure within the can will drop in proportion to the amount of product discharged. Therefore, in order to insure complete discharge of the product high initial pressure is required. In addition to nitrogen, other propellants used in this system are: carbon dioxide, nitrous oxide, butane, isobutane, propane, and inert gases.

The aerosol industry has, in the past, used two methods for filling aerosols. The cold-fill technique is based on the principle of lowering the temperature of both the propellant and the product to a sub-zero temperature at which the propellant is liquified, and then introducing them into the uncapped can. The valve is then crimped in place and the temperature allowed to rise to normal. As this takes place, the required pressure develops within the can. Under the pressure-filling method, the valve is crimped in place after the can has been filled with product to the correct level. The propellant is then introduced through the valve under pressure until a specific formulation is reached, and with the fitting of the valve tip, the product is then ready for application.



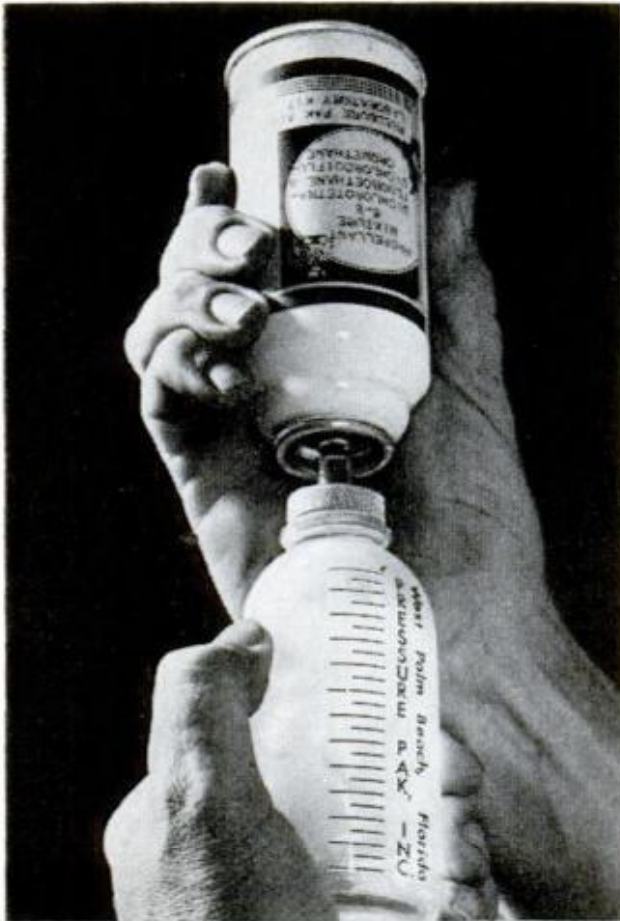
**SCREW CAP AND VALVE** permits repeated use of components in filling formulations in shop or laboratory



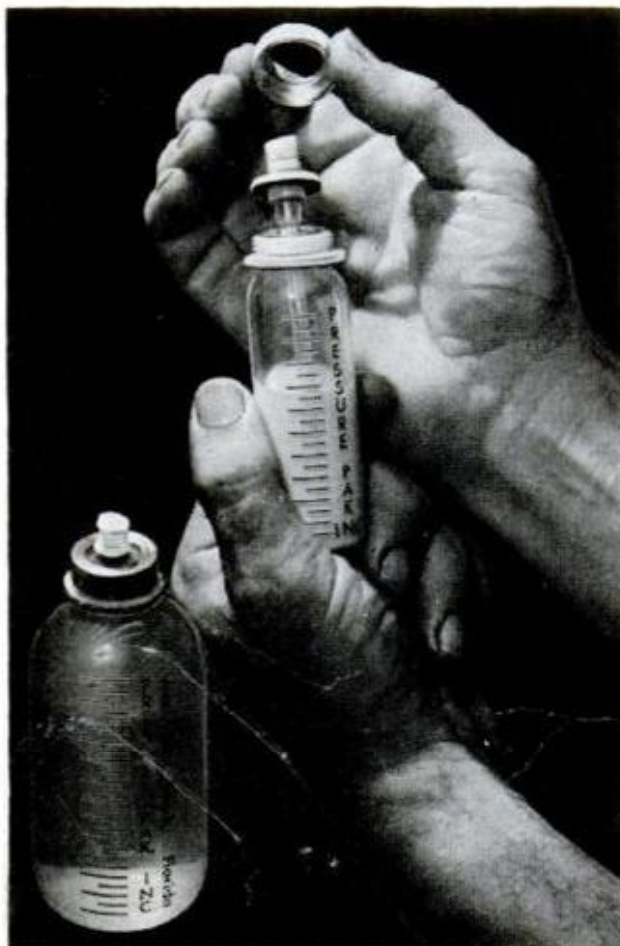
**PRESSURE CHECK**, above is made with pressure valve supplied with kit. Below, window-cleaner is high-pressure spray. Compare with the foam lather, page 186







**GASSING OF FORMULATION** with propellant is a simple hand operation. Below, split-ring collar placed over lip on container is tightened to form leakproof seal



Of the two filling methods, pressure filling is far better suited to laboratory use because of the lower cost and the fact that refrigeration is not necessary. Suitable formulations for laboratory experimentation by hobbyists are found in all categories of aerosol products with the exception of foods. Some of the fields covered in the manual included with the kit are: household products, paints, personal products, pet products and insecticides.

Household products are typified by window cleaners. An ideal formulation for a household window cleaner consists of 5 percent wetting agent (alkyl aryl polyether alcohol), .02 percent silicone fluid, 14 percent isopropyl alcohol and 2 percent propellant No. 12 (dichlorodifluoromethane) and 2 percent No. 114 (dichlorotetrafluoroethane). The balance of the formulation consists of water. A mechanical break-up ball, or button, must be included in the container with this formulation because of the low pressure used, and a lined valve cup must be employed in order to withstand corrosion from the water. If a metallic container is used rather than the glass container provided in the laboratory kit, the container will also require special lining. Other household formulations that may be made with the kit include such items as oven cleaners, room deodorants, dust-mop treatments, furniture polish, mildew preventives and many others.

### Spray Paints

Probably of most interest to hobbyists are paint formulations. These include enamels, lacquers, and acrylic paints. A typical aerosol formulation for an aluminum paint can be prepared quickly from a standard paint product. Add 25 percent methylene chloride to 35 percent standard aluminum paint placed in one of the kit's graduated aerosol bottles. After a paint valve is in place, the bottle is closed with the Pressure Pak valve coupling. The container is then charged with 40 percent propellant No. 12. When the paint tip is fitted the formulation is ready for spraying.

An excellent clear acrylic spray contains 10 percent acrylic resin, 25 percent xylene, and 25 percent toluene. The 40 percent balance consists of propellant No. 12. Such an acrylic may be used for the waterproofing of paper, leather, auto ignitions, and the creation of protective films for metals.

Insecticides fall into two general classifications. Space sprays, primarily designed for flying insects, and residual sprays designed for use against crawling insects. Generally these insecticides consist of five

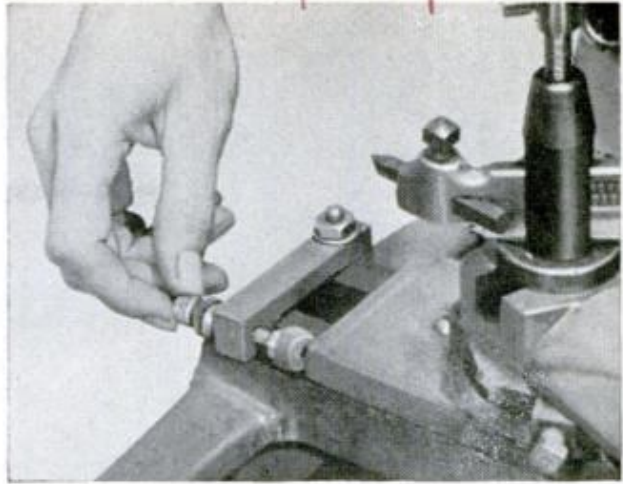
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## SHOP SHORT CUTS

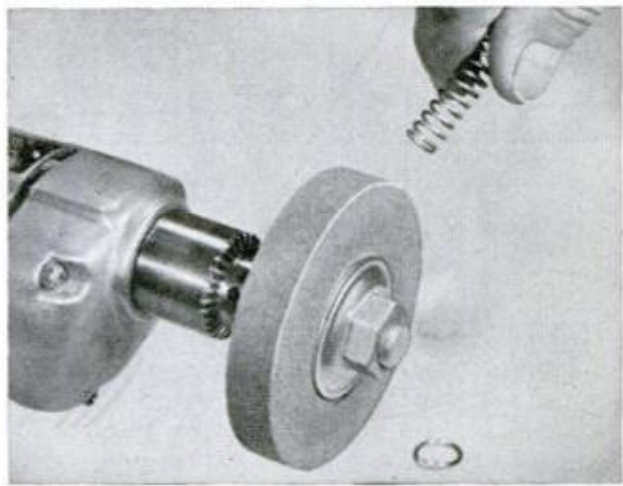
### Reducing Backlash

Any appreciable backlash in a crossfeed screw can cause trouble when making very light, finishing cuts. On nearly all lathes a fuller ball turned onto the adjusting screw on the stop attachment provides a means of maintaining tension on the cross-feed screw. This will prevent the tool from digging in on a finishing cut due to backlash in the thread. In use the stop attachment is positioned so that the fuller ball bears against the cross slide.—R. Hanscom



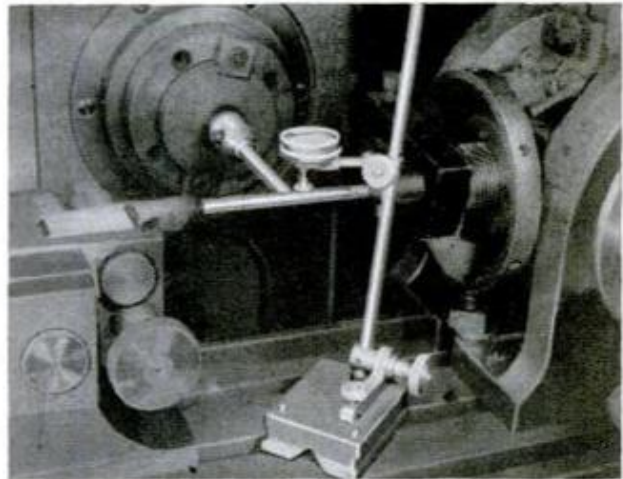
### Snap Rings From Springs

Break or lose a snap retaining ring on a lawn mower, lawn sweeper or shop equipment and it may take some time to obtain a replacement. But you can make a snap ring in a jiffy. Just grind a single coil from a coil spring of the right diameter and there's your snap ring. It will work until you can get a regular replacement. Be especially careful when cutting through the spring coils with the edge of the grinding wheel to avoid overheating and drawing the temper of the steel, which would make the ring useless.—Bil Toman



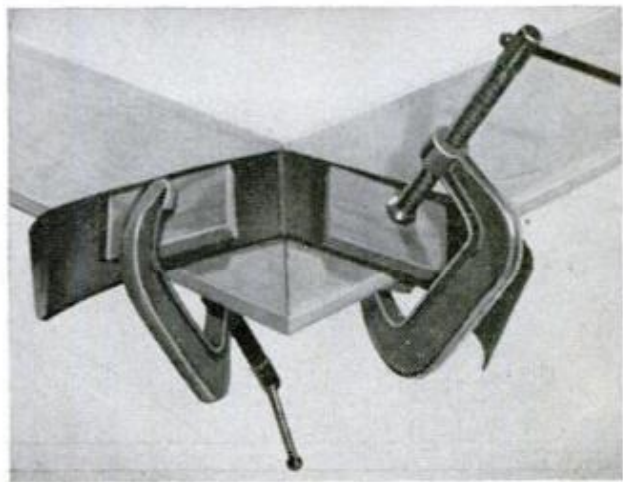
### Centering Dividing Head

Remember this kink when you are called upon to align the axis of a dividing head with the milling machine spindle in the vertical plane. Seat a mandrel between the dividing-head centers and grip a short length of drill rod of the same diameter in a standard end-mill adapter. Mount a dial indicator on a surface gauge and place it on the table of the machine. Traverse the indicator along the mandrel and the drill rod. Adjust the milling-machine knee until the indicator gives the same reading on the mandrel and rod.—H. J. Gerber



### Clamping Hopper Joint

Before you conclude there's no practical way to clamp a compound miter, or hopper, joint give the method pictured a try. Cut a strip from inner tube about 3 in. wide and clamp to one piece, using blocks under the clamp pads to prevent marring the stock. Then position the two members, stretch the rubber strip tightly across the joint and place the second clamp and protecting blocks. Then fold the two members back to back, spread the glue and return to the original position. Hold the parts in place on a level surface with blocks or weights until the glue dries.







# Linoleum-Block Press

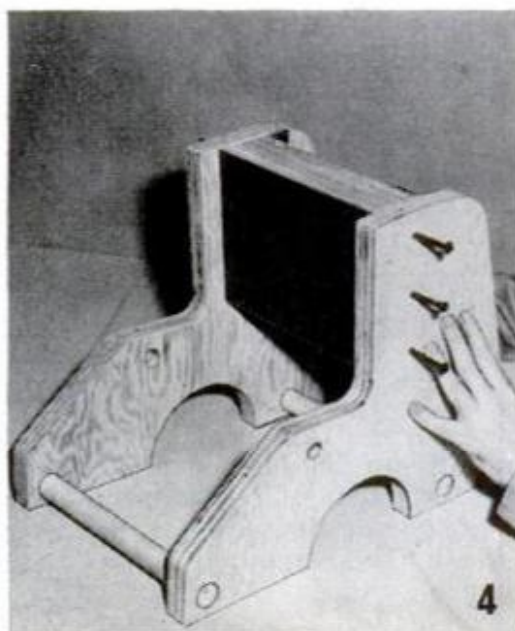
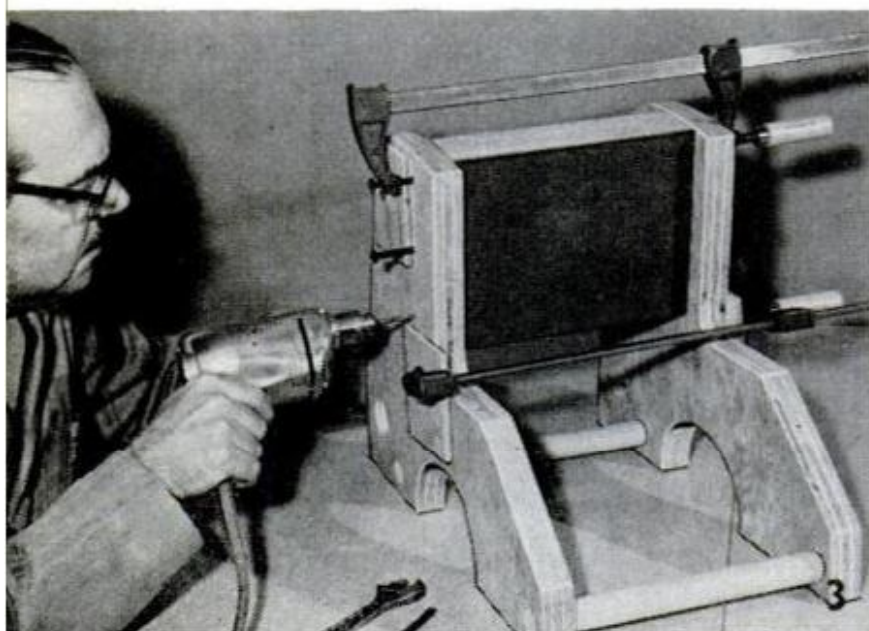
By Manly Bannister **X400** Part I

**W**ITH THIS PRESS in your hobby shop you can design and print personalized greeting cards from linoleum blocks, make multiblock color prints, illustrations and bookplates. While you're having fun doing this you can look ahead to printing from wood blocks and zinc engravings. Or, provide yourself with a 5 x 8 chase for the lockup and you can print from any type of your choosing.

The press is fairly simple to build and the important thing to strive for in its construction is a rigid, close-fitting assembly in which there is no rack or end-play. To accomplish this, the side frames, bed, and platen carrier are built from plywood and

solid oak and the operating crank and side lever are assembled from standard pipe fittings. Figs. 1 through 8 give you a good idea of the assembly of the side frames and bed. The side frames are detailed in Fig. 16 and are cut from 1 $\frac{1}{8}$ -in. plywood. If this thickness in plywood is not readily available, then build up to the required thickness by sandwiching  $\frac{3}{4}$  and  $\frac{3}{8}$ -in. plywood and gluing under pressure. You can use hardwood-faced plywood or ordinary fir plywood, but if you use the latter, purchase the grade known as "good two sides" and try to pick pieces with the smallest openings, or voids, in the cores.

When laying out the pattern from Fig. 16,

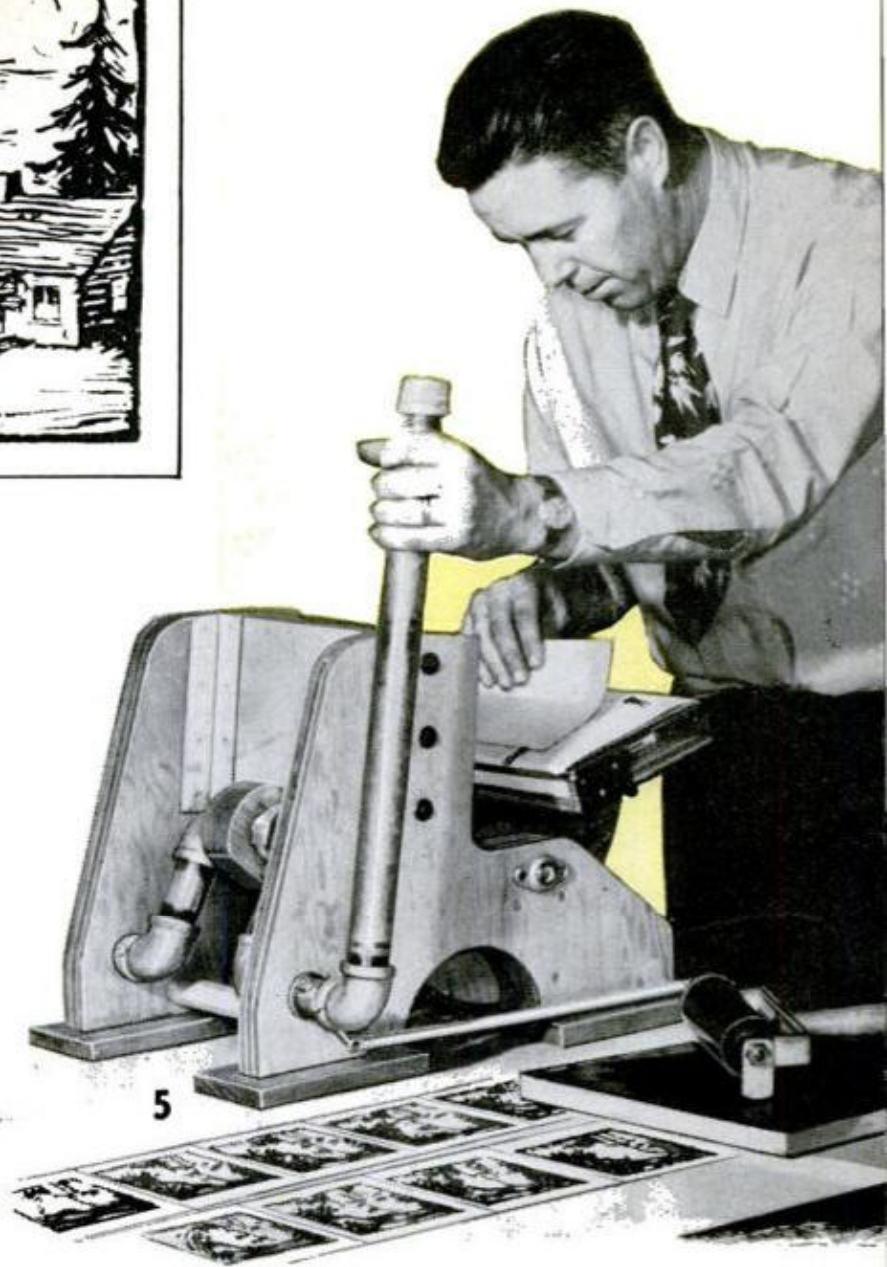




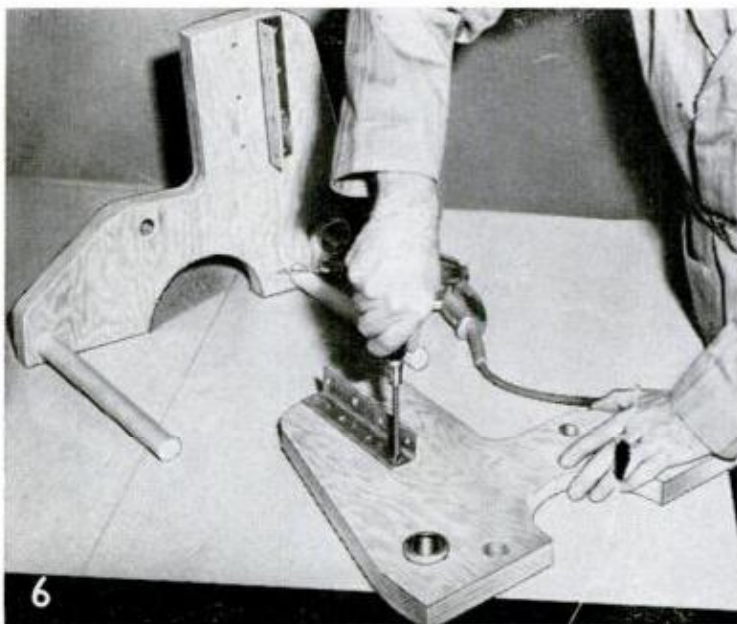


note that the inclination of the forward edge of the side frame is not given. Lay this off approximately 7 degrees from the vertical and keep outside the pattern line when sawing to contour. It may be necessary to make some adjustment here later. After sawing to contour as in Fig. 1, fill any voids in the plywood edges with wood putty and then smooth the edges and round the corners slightly using medium-grade sandpaper.

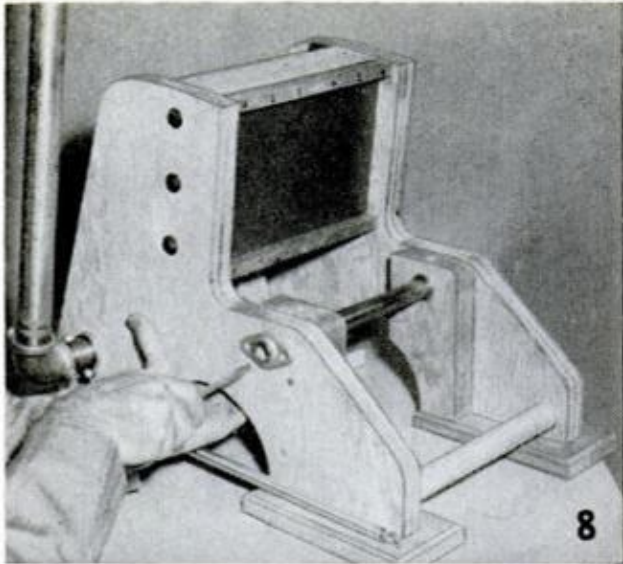
The next step is to drill the hole for the crankshaft bushing in each side frame, using a circle cutter as in Fig. 2. Center the hole  $2\frac{1}{2}$  in. up from the bottom edge and 2 in. in from the back edge. The bushing is shown in place in Fig. 16. It is cut from a 1-in. pipe coupling so be sure to bore the hole to a diameter just under that of the rough coupling (it is machined later) so that the hole will take the bushing in a tight, drive fit. Check the setting of the circle cutter on a piece of waste.



**COMPLETED PRESS** is pictured above at work. The photos below and on the opposite show how some of the principal parts are made and assembled. Press is made from materials readily available anywhere, mainly plywood, hardboard and pipe fittings





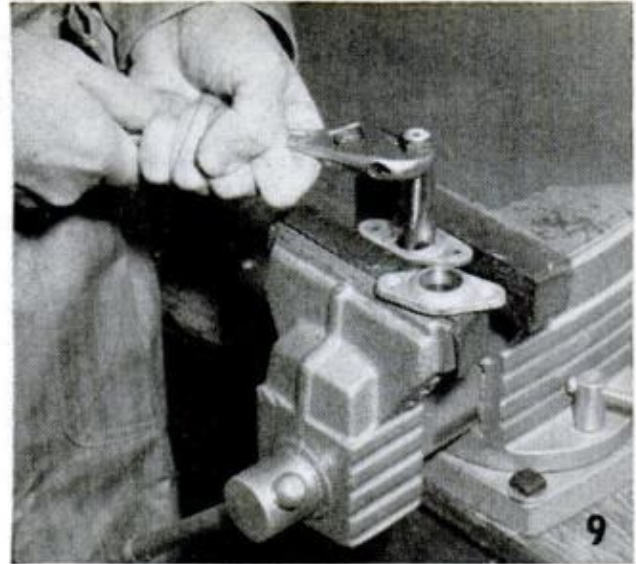


**ASSEMBLY OF FRAMES**, bed, crank and platen-rocker pivot which must be rigidly supported at both ends

Use much the same procedure in boring the holes for the 1-in. dowels which serve as cross frames in the assembly, Figs. 3 and 4. Do not insert the dowels at this stage as other parts must be completed and in place before this is done.

Next, note the details of the crank, Figs. 13, 15 and 18. This is built up as in Fig. 13, using five 1 x 3-in. nipples, five 90-degree elbows and two pipe couplings which supply the bushings and collars, Fig. 13. Three of the nipples are machined, Fig. 11, to provide bearing surfaces, one serving as the pin for the connecting link, Fig. 12, and the other two as extensions of the crankshaft. The two collars are cut from the couplings, which then are machined to a drive fit in the holes in the side frames. Before insertion, they are bored out to take

**WHEN ASSEMBLING** operating handle, parts should be drawn up tightly and checked for alignment



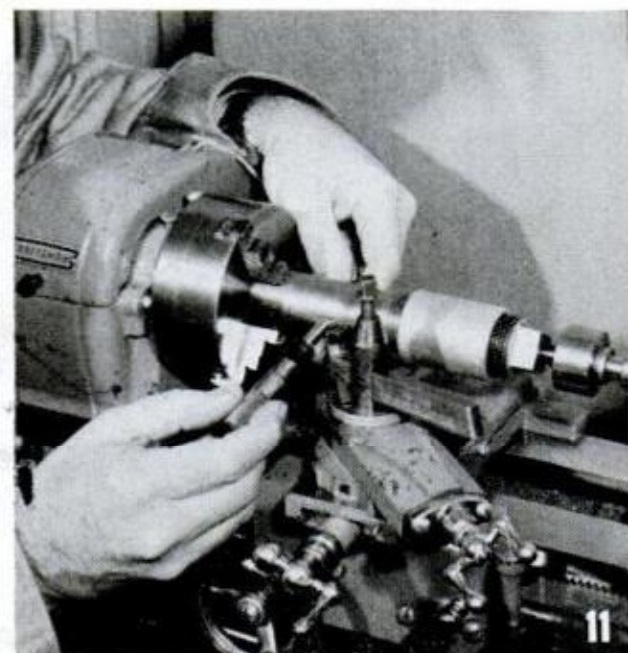
**WASTE NUTS** are tapped to take threaded ends of rocker pivot which is machined from  $\frac{1}{2}$  x 12-in. nipple

the machined nipples which are a part of the crankshaft. Both collars are drilled and tapped for setscrews. Also note that all five elbows Figs. 13 and 17, are drilled and tapped on one flange for setscrews.

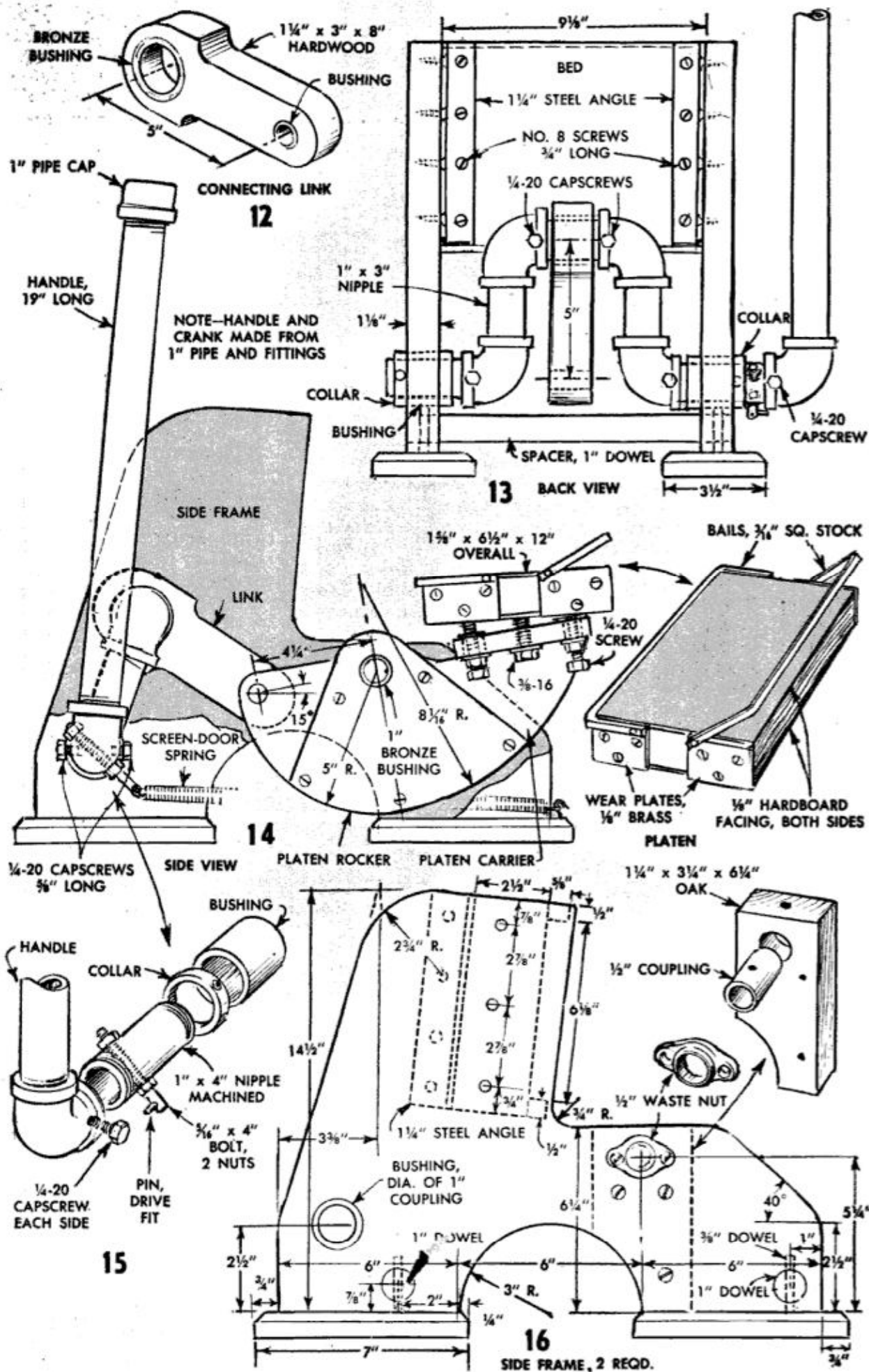
Make a trial assembly of the crank, without the handle, drawing all joints equally tight. Check for squareness and center-to-center distances. These should be reasonably close with all parts tight but due to the allowable variations in the manufacture of pipe fittings it may be necessary to back off one or two of the parts to attain close alignment of the bearing extensions and the crank pin. But if the parts align reasonably close when tight, you will be able to make a permanent assembly.

Figs. 14 and 15, also Fig. 10, show the assembly of the handle. Note that the

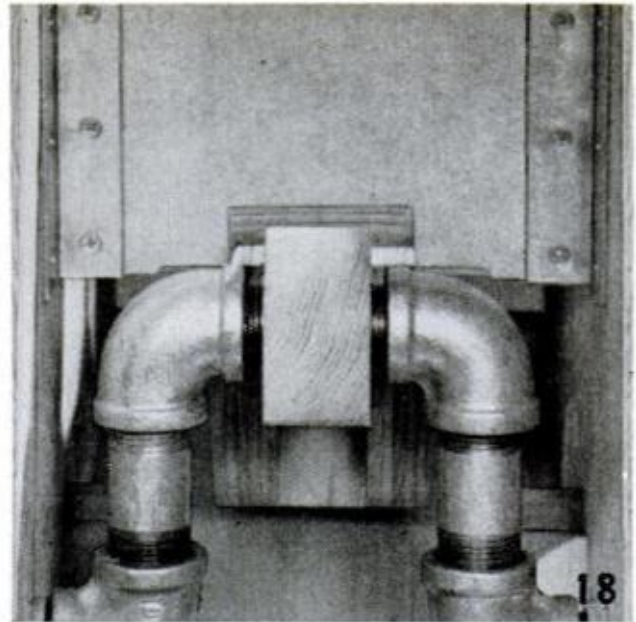
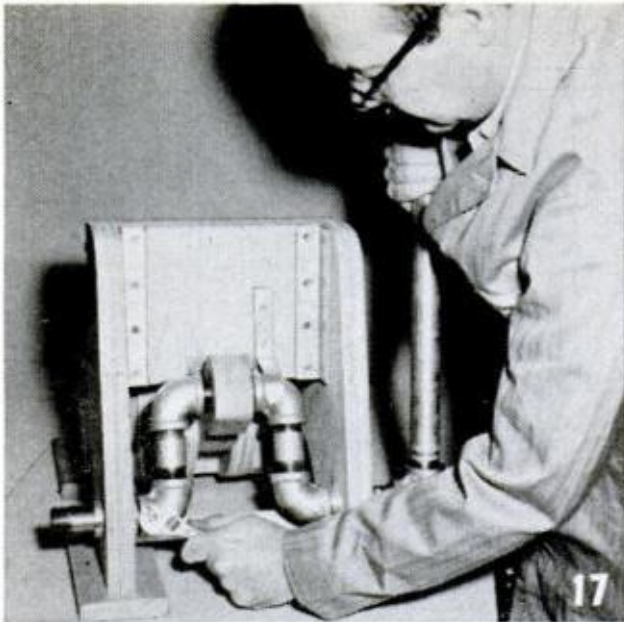
**MACHINE NIPPLES** with this setup, chucking the nipple and then using coupling and a pipe plug as carrier











elbow carrying the handle is double-set-screwed to the crankshaft extension and that the extension carries a transverse pin, or stud, which anchors one end of the return spring, Fig. 14.

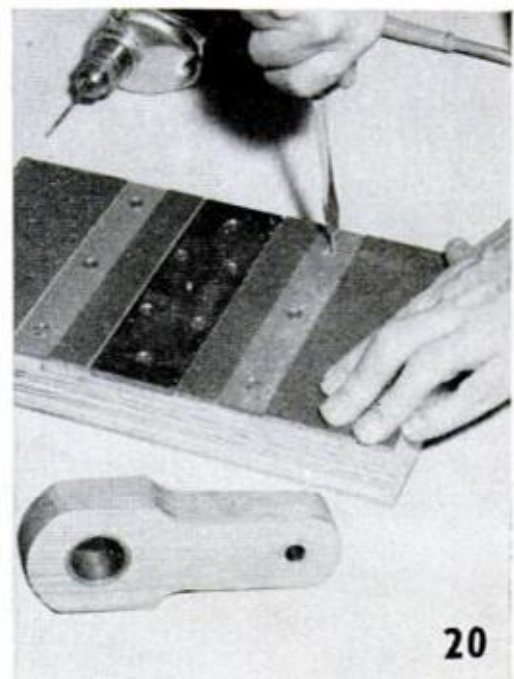
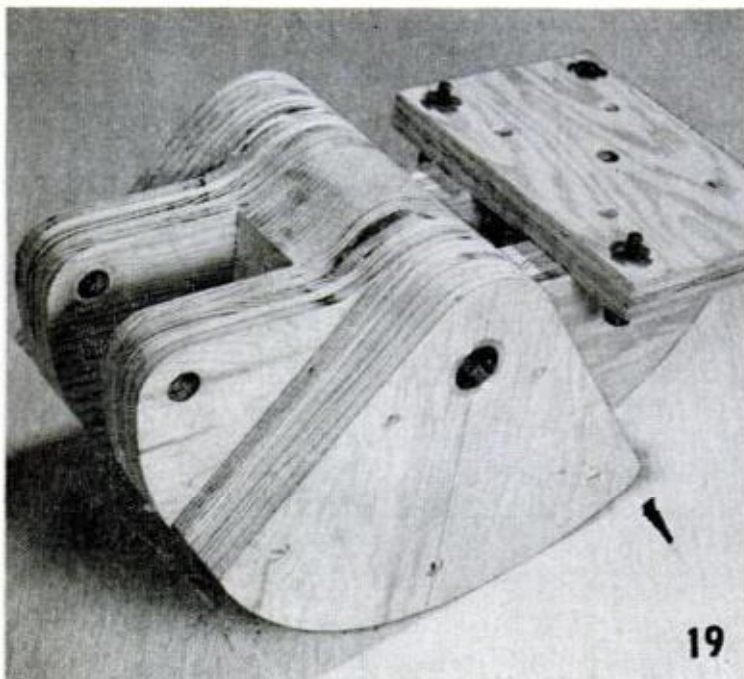
The bed, Figs. 13 and 16, consists of two thicknesses of  $1\frac{1}{8}$ -in. plywood cut to  $7\frac{1}{4} \times 9\frac{1}{8}$  in. and two pieces of  $\frac{1}{8}$ -in. hardboard of the same size. Sandwich the two pieces of plywood with the hardboard facing pieces, one on each side, and glue together under pressure. Plane the width to about  $7\frac{1}{8}$  in. and locate between the side members as indicated by the dotted lines in Fig. 16. Locate so that the front face is about  $\frac{7}{8}$  in. from the inclined front edges of the side frames. The bed is screwed to steel angles attached to the side frames, Figs. 6 and 13, and is also lagscrewed to the side frames as in Figs. 3 and 4. Do not glue in place after fitting. Additional details on

construction of these parts will be covered in Part II.

Next to be made and attached to the side-frames are the waste nuts, the  $\frac{1}{2}$ -in. couplings and the supporting blocks, Fig. 16. The pivot, or fulcrum shaft, carrying the platen rocker is a  $\frac{1}{2} \times 12$ -in. nipple. These parts are shown in position in Fig. 8 and the completed rocker with platen adjusting plate is pictured in Fig. 19. The waste nuts are tapped, Fig. 9, to take the threaded ends of the fulcrum shaft which is machined smooth. The couplings are bored out to a slip fit over the shaft and are machined to a drive fit in holes in the support blocks, Figs. 8 and 16.

The platen rocker is carried on two bronze bushings of 1 in. outside diameter, Fig. 14. The bushings are bored out to a close fit over the  $\frac{1}{2}$ -in. fulcrum shaft.

(To be continued)





# FISHING HINTS

## When Fish Gulp It Down

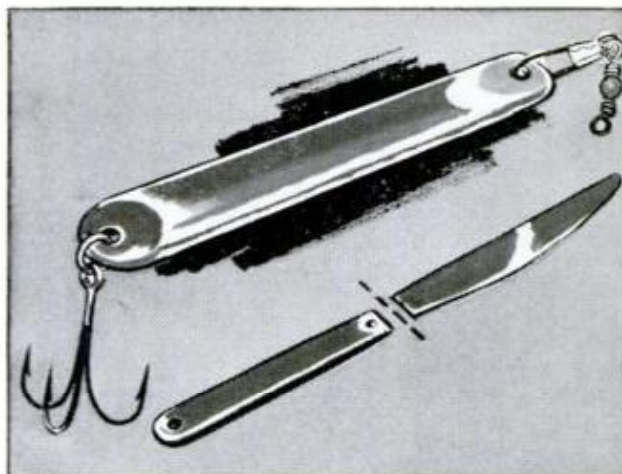
The fish won't like this, but you'll be glad you remembered it when some lunker swallows the hook. A beverage-can opener has the perfect hook remover right on one end of it. Just slip the eye of the hook through the opening as detailed, then slide the end of the opener down into the bend of the hook.—H. E. Newkirk



## Table-Knife Spinner

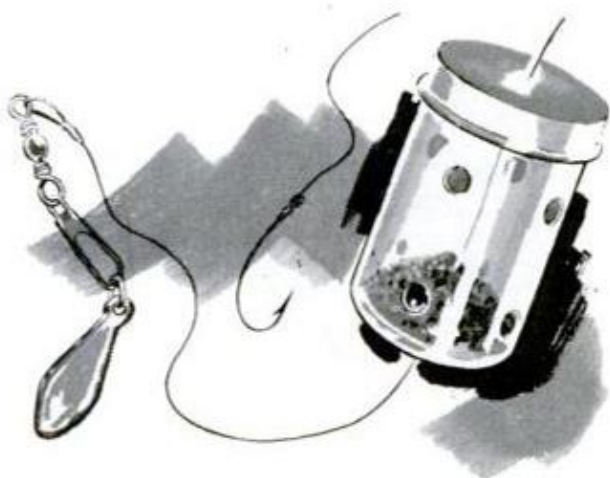
This you have to see. That's right, it's the handle of a stainless-steel table knife made into a fishing lure with a few strokes of a hacksaw, about that many with a file and the drilling of a couple of 1/8-in. holes, one for the gang hook and one for the swivel. Select a knife with a solid handle, cut off the handle and then file the ends flat, filing from one side only to form off-center "fins" which cause the lure to spin in a most realistic fashion when you reel it in from a long cast. One might even hope it's irresistible.

—Leon I. Reissman



## Chumming Bait Container

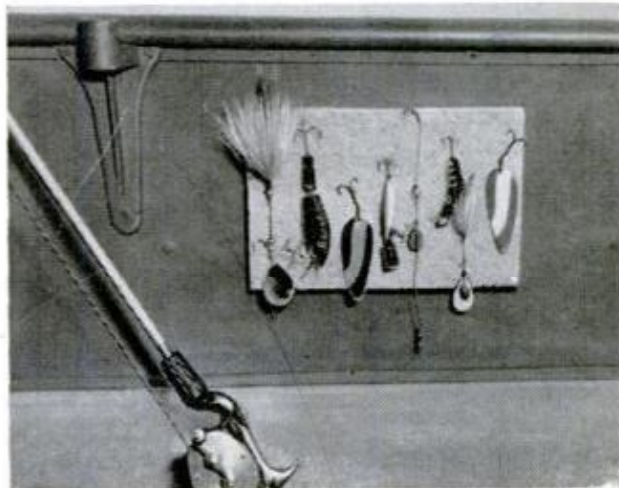
Okay, so it won't bring fish finning up from the farthest fathom. But you can be sure it will encourage those nearby to gather 'round for a feast and, you hope, get hooked. It's a chum pot adapted from a plastic pill box which is made to order for the purpose. Center a small hole through the top and bottom, then drill several 1/4-in. holes through the body of the box in a random pattern. Thread the line through the holes in the top and bottom, slide down to the hooks, fill with chumming bait—prepared cat food is excellent—and you're set for an hour or more.



## Lure Caddy in Boat

If it wasn't for those lethal hooks, storing fishing lures would be no problem. But every fisherman remembers the painful, slow-healing scratches and digs inflicted by hooks when hustling lures out of a tackle box. Even two fishermen and two lures in a single boat are too many, unless, of course, they've taken the precaution of hooking the lures into a piece of cellulose sponge and sticking this to the side of the boat with contact cement. Soft insulating board will serve the same purpose. Only then is there complete safety in numbers.

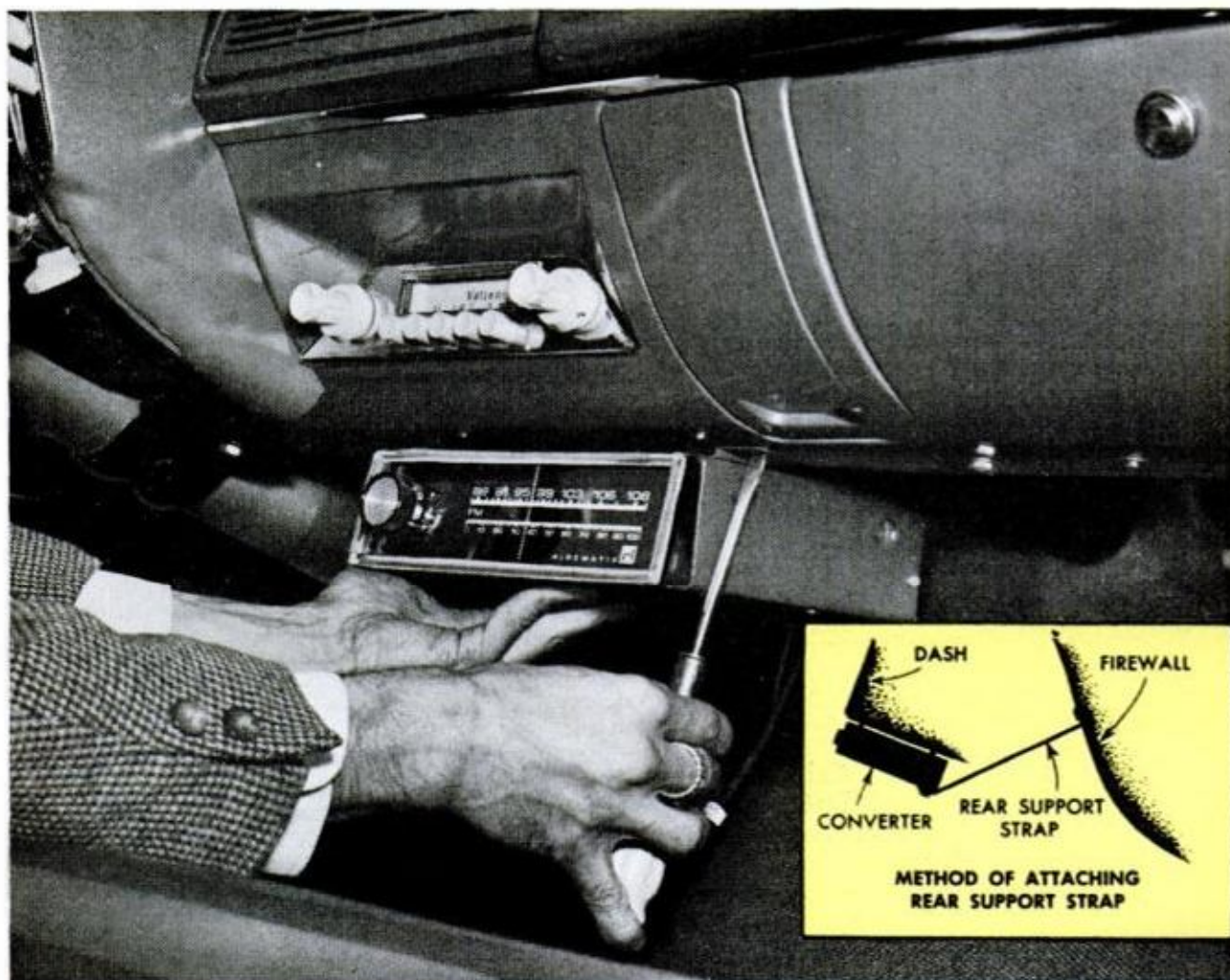
—Wayne Judy





# RADIO TV HI-FI

ELECTRONICS



ADD AN FM CONVERTER to your car radio and enjoy better programming, fewer commercials and static-free reception. Car radio can still function for AM. Above, installing the FM converter under the dash

## Converting Your Car Radio To AM-FM

By Leonard Fish

**M**ORE AND MORE American motorists are realizing the benefits of FM in the car. Better programming and fewer commercials, obvious advantages, are only a small part of the reason.

The automobile, with its spark plugs, generators, relays and contactors is a notorious producer of static. Static is a sharp increase in amplitude, with no noticeable effect on frequency. Standard car radios are AM (Amplitude Modulation) receivers and as the AM receiver depends on changes in amplitude to operate, these crashes,

fizzles and spittings come out of the loudspeaker. FM (Frequency Modulation) receivers are totally oblivious to these amplitude changes. As static can not affect the frequency, FM is a "natural" for static-free reception in cars.

To install an FM converter in your car, use the mounting bracket supplied with the converter as a drilling template. Hold the bracket under the dash and carefully mark the required mounting holes. Feel behind the dash to be sure no wiring or components will interfere, then drill holes.



Find a screw head, nut or bolt which is located high in the center of the firewall. If the screw or nut can be removed without damaging some other part of the car, use this to attach the rear support strap as shown in the diagram. If not, drill a hole in the firewall and insert a screw. Again, make sure you don't interfere with any existing components on the other side of the firewall before attempting to drill.

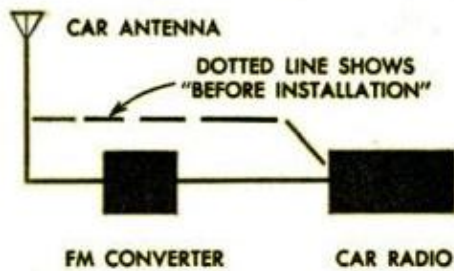
After attaching the rear support strap, mount the bracket to the FM converter using the sheet metal screws provided. Holding the converter with one hand, attach the protruding tabs of the bracket to the dash, using the sheet metal screws provided with the converter. Locate the small mounting hole under the rear side of the converter. Line this up with one of the holes in the rear support strap. Using another sheet metal screw, pull the support strap tight and attach its free end to the back of the converter.

**Making the Hookup.** Trace the coaxial wire from the car's antenna to where it plugs into the car radio. Disconnect this wire from the car radio by gently tugging.

Connect the coaxial plug at the end of this wire into the coaxial jack at the side of the converter. You will notice two wires coming from the rear of the converter. One of these (B) is fitted with the same type of plug as was just inserted into the converter. Insert this plug into the car radio antenna jack. The other wire from the converter (A) terminates in a ring lug and may be interrupted by a fuse.

To make sure your converter will shut off when the ignition switch is off, locate a source of battery voltage which will not be "ON" unless your ignition is on. Possible places are the cold side of the ignition switch itself, the heater or turn signals. Attach the small ring lug at the end of the wire to the voltage source. This completes the internal installation of the unit. Now adjust the antenna to a length of 30 inches.

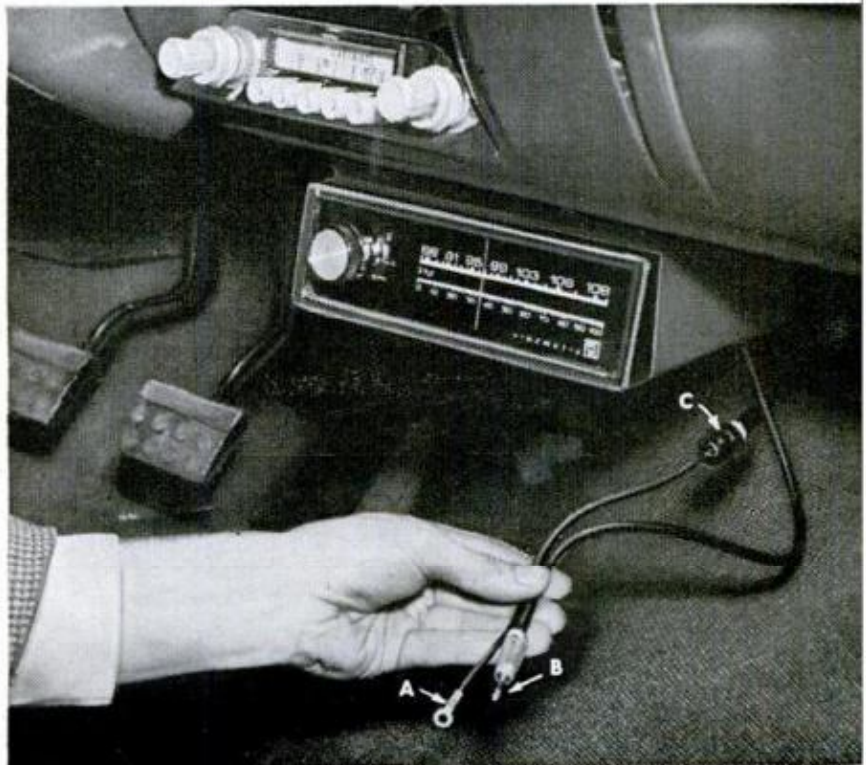
Should you desire to operate the radio as an ordinary AM unit, switch the converter to OFF. This automatically connects the antenna directly to the car radio. To hear FM stations, turn both units on and tune the AM radio to about 900 kc. Then tune the FM stations with the converter. ★ ★ ★



LEFT, DOTTED LINE shows the original AM radio installation. Solid line shows FM converter added to the antenna circuit

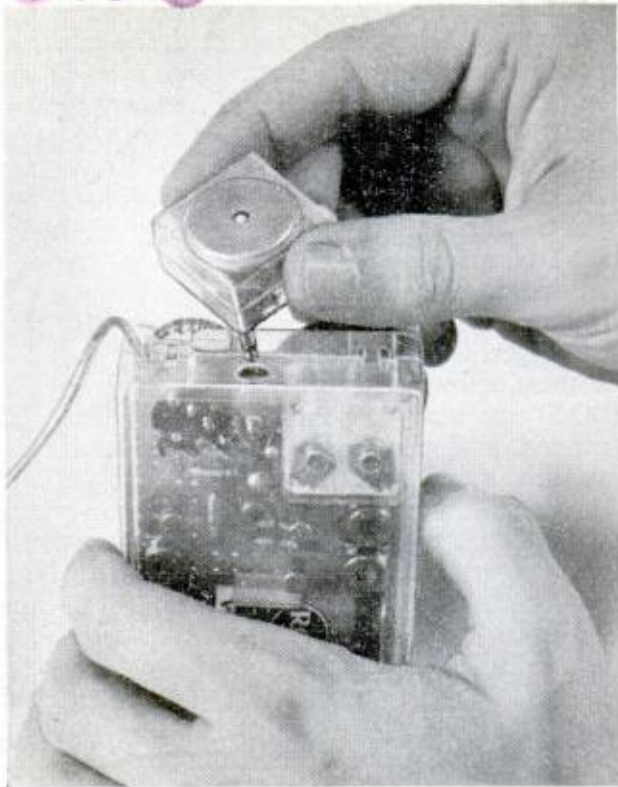
BELOW LEFT, for FM reception, set antenna length at 30 inches. Add scribe marks for resetting if antenna is moved

BELOW, A INDICATES ring terminal for connection to battery, B is the coaxial plug to the car radio, C indicates fuse





# X525



**PLUG MICROPHONE IN SOCKET** and the transistor radio becomes hearing aid; omit mike if not needed



**PLACED INCONSPICUOUSLY** in a coat pocket, unit outperforms most hearing aids OR transistor radio sets

# Hearing-Aid Radio

By Phillip de la Rosa

**T**HIS SUPERHET RECEIVER provides maximum sensitivity, even inside of buildings. The unit can be built for approximately \$20 and construction is not a wireman's nightmare.

Follow the schematic diagram and observe the suggested parts layout in the photograph. While parts placement is not critical, keep all leads as short as possible.

Note the small microphone unit that plugs into the top of the receiver. This

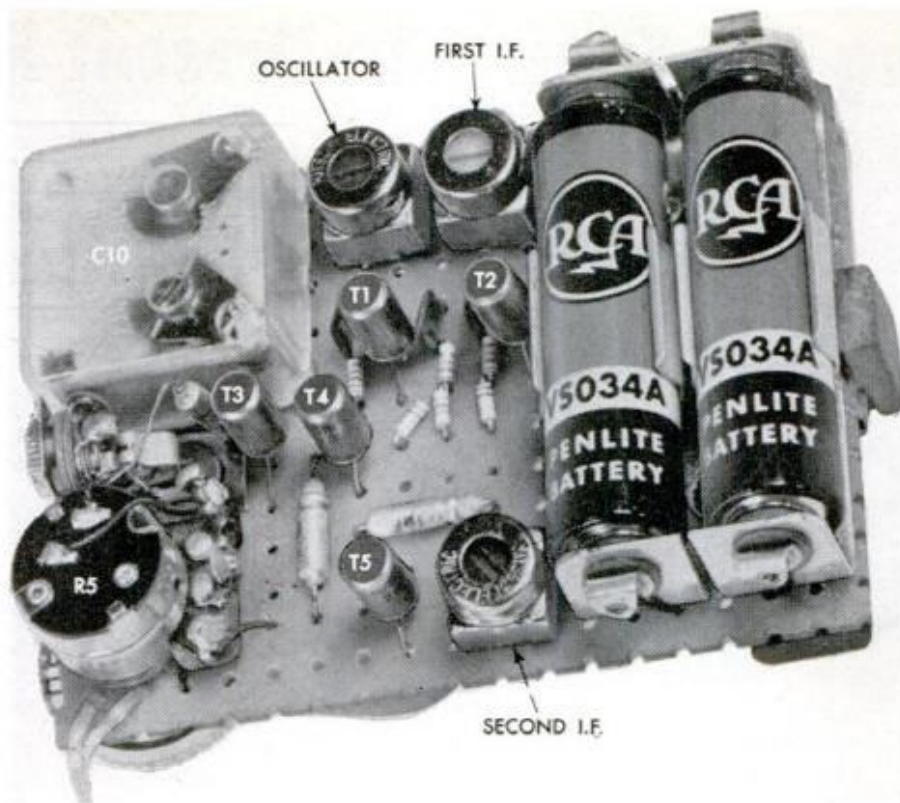
optional feature will permit the radio to be used as a high-gain hearing aid. To restore the unit to its radio function, simply unplug the microphone. If you do not wish to incorporate the microphone, omit resistor R4, capacitor C6 and the socket for the mike.

After building the unit, check all wiring carefully and insert the batteries. Tune in a local station and align the IF's for maximum volume.

## PARTS FOR HEARING-AID RADIO

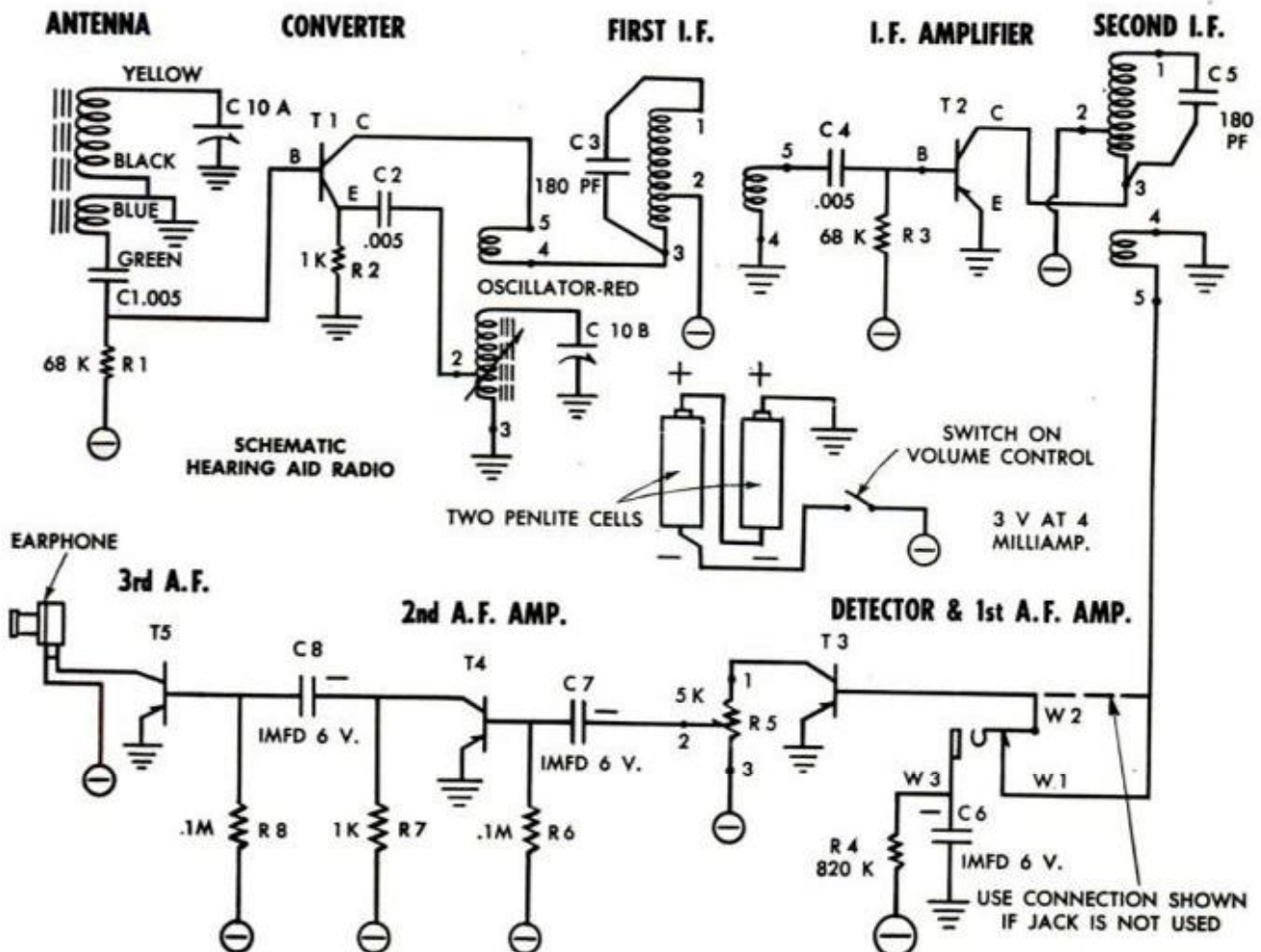
Quantity	Lafayette Stock No.	Item	Schematic Part No.	Quantity	Lafayette Stock No.	Item	Schematic Part No.
2	C-601	180 PF capacitor	C3, C5	1	KN-25	knob and screw	tuning knob
4	C-611	.005 mfd. capacitor	C1, C2	1	PA-74	microphone	
2	RS-24	resistor, 1/10 watt 1000 ohm	C4, C9 R2, R7	1	MS-450	transistor coil and tuning cap. kit	tuning cap.—C10 osc and i.f. trans. antenna
2	RS-24	68K ohm	R1, R3	2	BA-155	penlight cells RCA VS 034A	
2	RS-24	100K ohm	R6, R8	1	MS-304	board, phenolic	
1	RS-24	820K ohm	R4	1	MS-159	case, plastic	
1	VC-48	volume control w/switch and knob 5000 ohms	R5	1	AR-51	phone	
3	CG-125	capacitor, 1 mfd at 6 volt	C6, C7, C8	1	WR-20	wire, phono arm, type 1102-2	hook-up wire to house microphone and plug mounting bracket for jack
2	SP-151	transistor, type 2S52	T1, T2	1	—	case, plastic	
3	SP-154	transistor, type 2S44	T3, T4, T5	1	—	strip, stiff metal	
1	MS-370	plug and jack	connector				





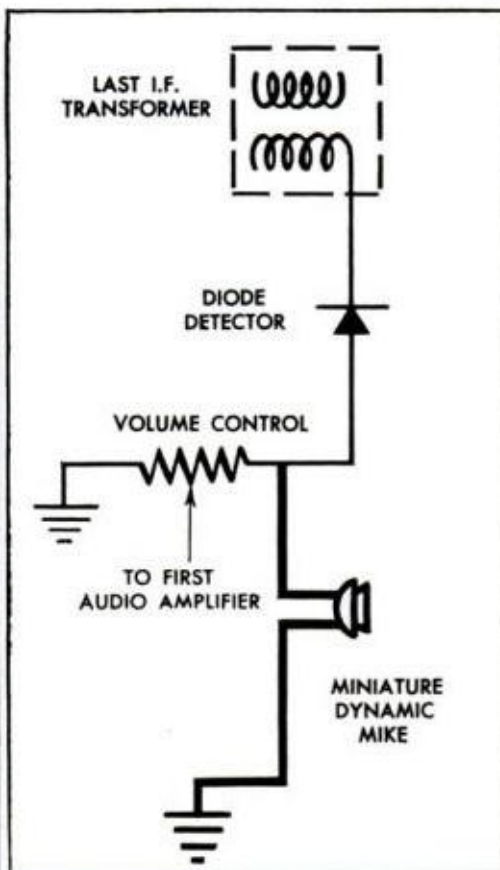
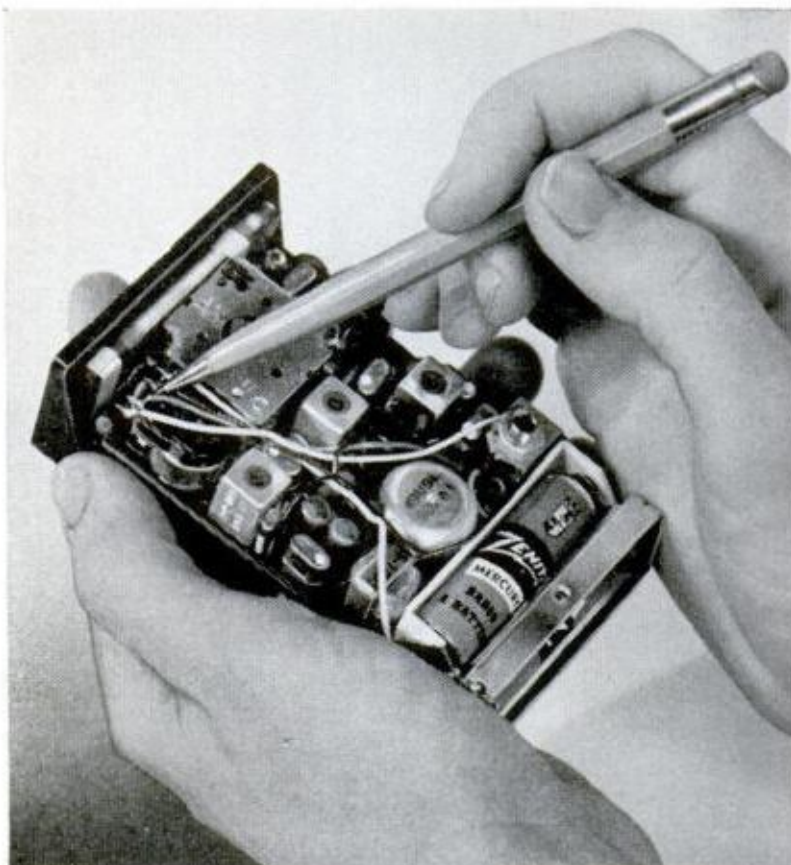
ALL PARTS ARE MOUNTED on perforated Bakelite board. Component wiring is done on reverse side. Use short leads wherever possible. Finished radio is finally mounted in plastic box with holes for all controls

STUDY SCHEMATIC DIAGRAM BELOW and relate to parts layout shown above. Set is actually easy to build





# Hearing Aid From Your Present Radio?



**PENCIL INDICATES** volume control. Bold lines at right show wiring for microphone. Use dynamic mike only

ANY GOOD QUALITY transistor radio can be modified to serve as a hearing aid. Drill a small hole in the case of the radio, taking care not to damage the radio parts inside. Feed the two wire leads of a small dynamic microphone element through the hole and attach the mike unit to the radio with household cement. Both wires are soldered to the volume control potentiometer. One goes to the terminal that normally receives the radio signal, the other to the ground side. These can be easily identified by the schematic diagram of the transistor radio or by tracing the circuit from the potentiometer lugs.

To operate as a radio, just turn the unit on and tune in a station. To use the unit purely as a hearing aid, tune the radio to a place where no station is heard. The sensitivity is such that you may have to reduce the volume when the unit is used as a hearing aid. But when the user wants a radio program, room conversation can still be heard over the radio.

A hard-of-hearing friend of ours found another application for this unit. Periodically, during ball games which coincided with board (bored?) meetings, he would liven things up by announcing the latest scores!—Byron G. Wels



## Portable Tape Recorder Ideal for Business Man

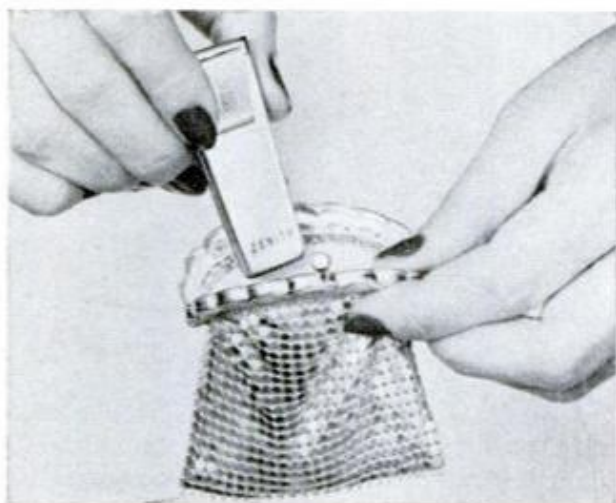
Compact portable tape recorders meet the needs of today's business man for making a continuous record of meetings, interviews or simply for general dictation. Using half-mil tape, up to 45 minutes of recording time can be obtained on a three-inch reel. Features include a locking device to prevent unintentional placement of control switch in "RECORD," saving valuable recorded tapes.—\$79.95, Lafayette Radio Co., 165-08 Liberty Ave., Jamaica, N. Y.



# Electro News

By Byron G. Wels

K2AVB/9-18B2540



**HEARING AIDS** continue to shrink. Zenith's new Envoy, for example, weighs one ounce complete with battery (a miniature mercury type). It can be concealed under a man's tie, using a matching tie-clip, or in a woman's tiny change purse (see photo). It is 57% smaller than any hearing aid Zenith had previously produced.

Seeing is given a unique assist by a GE closed-circuit television system recently installed for a bridge tender at a Chicago drawbridge. Previous blind spots are eliminated by a wide-angle camera lens TV camera in a weatherproof housing equipped with window wiper, heater and defroster to keep protective glass clear.

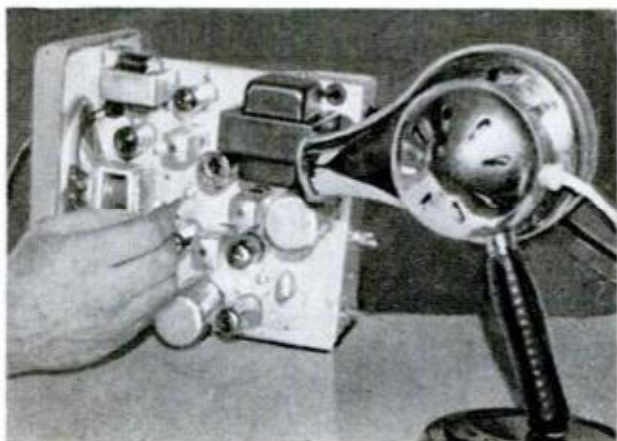
Designed for use in locating and retrieving missile nose cones, SARAH is a miniature Search Rescue and Homing beacon

system. So sharp has SARAH been in its nose-finding chores that the same system has now been adopted by NATO forces for locating "dunked" flyers and in Canada for military and civilian air-sea rescue.

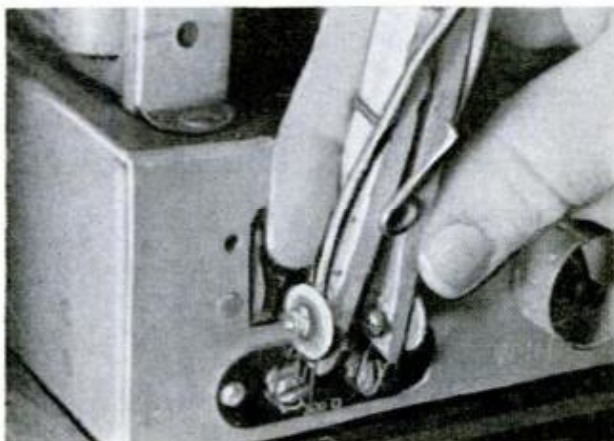
When hundreds of the nation's radio hams head for the hills at once, there's a reason. That's what is scheduled to happen about June 24, when the annual Field Day takes place. For 24 hours amateur radio operators will wring out their skills and emergency equipment rigs in a competitive test of communication under field conditions. Points are awarded for the number of contacts made by each group or club or individual participants in the 24-hour period. Contest rules require that signal reports be exchanged, and each station must identify its radio league section and give the number of its contact on the air. Records, called "logs," are kept of each contact, showing the call letters of the station worked, as well as times, frequencies and locations. Additional points are given for more distant contacts made at lower powers.

Last year only seven or eight percent of the total number of licensed hams took advantage of this opportunity to test their skills. Any ham can join in the fun, so why not get on the air this year? Even if you don't win, you'll provide some contacts (and points) for the other fellows. For more information on Field Day and the local participating ham clubs in your area, write to the American Radio Relay League, West Hartford, Conn.

**ELECTRIC HAIR DRYER** tests chassis components. While many tubes perform well "in the open," they frequently turn bad when exposed to ovenlike cabinets. Hot air from dryer simulates cabinet heat



**QUICK CONNECT AND DISCONNECT** facilitates testing TV and FM sets. Modify spring-type clothespin by hooking twin lead to small bolts, extend heavier hook at bottom. Allows rapid contact, prevents shorts

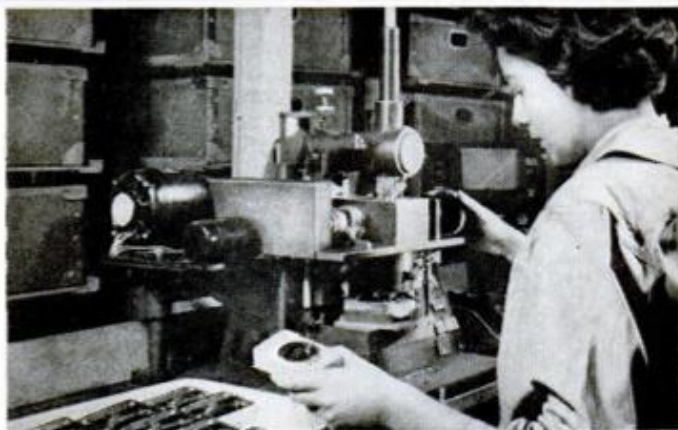




# New Ideas in Photography



**BROWNIE 8 MOVIE CAMERA,  $f/2.7$ ,** outperformed cameras that cost much more.



**ELECTRONIC CONTROL** is used to "zero" lens into exact setting for clearest, sharpest movies.



**SINGLE-UNIT** precision body assures dependable performance—costs more per ounce than metal.



**ELECTRONIC FRAME-COUNTER** checks film travel—assures movies that move at correct speed.

## Kodak creates low-cost movie camera that outperforms its price

Quality 8mm movies—from a camera that costs less than \$27? Sounds impossible—but it's a fact!

In side-by-side tests, Kodak's Brownie 8 Movie Camera,  $f/2.7$ , outperformed movie cameras that cost much more. Movies were sharper, clearer, steadier.

The secret? Modern materials, modern skills.

First, Kodak engineers created a new camera mechanism—with fewer moving parts—that does a better job than older, complex mechanisms. Rugged, too; less likely to get out of adjustment.

Next, they selected a wide array of modern

man-made materials, each to do a superior job. The Brownie 8 Movie Camera actually has 27 non-metallic parts. They cost more than metal, ounce for ounce, but they permit precision fabrication without the penalty of high assembly cost.

And finally, the engineers devised a mechanized assembly system, with electronic setups that maintain precise inspection and high performance standards.

Examine a Brownie 8 Movie Camera. It will give you up to 40 average-length scenes on each roll of 8mm film. Best of all—for less than \$27—it will bring you the thrill of your own top-quality movies!



# from Kodak

## New automatic cameras solve old problems of summer action

Two Kodak automatic 35mm cameras are bringing new freedom to summertime picture-taking—where action is fast and conditions change quickly.

The Kodak Motormatic 35 Camera and Kodak Retina Automatic III Camera not only set the exposure for you automatically—they also let you select fast shutter speeds to handle fast action. And the Motormatic 35 Camera even advances the film for you—keeps you always ready for the next shot!

Fast action is only one summer problem—when picturing sports or frolicking kids, for example. Variable light is another—as when clouds are passing across the sun. And going from sun into shade is a third.

### Fast shutters . . . electric eyes

The Kodak Motormatic 35 and Retina Automatic III Cameras handle all these situations easily. On the Kodak Motormatic 35 Camera, you can set the shutter up to 1/250—on the Kodak Retina Automatic III Camera, all the way to 1/500 second.

And each camera has an electric eye which reads the light continuously. When you press the shutter release, your lens instantly sets to the right opening.

### Manual setting, too

If you wish, you can set either camera manually. The Kodak Retina Automatic III Camera also has a precision lens-coupled rangefinder for measuring distance. And the Kodak Motormatic 35 Camera has a special linkage for flash shots—as you change focus, the lens opening automatically adjusts for correct flash exposure.

Examine these remarkable ultra-modern cameras. One is just right for *your* kind of summer picture-taking.

See your dealer for exact retail prices. Many dealers offer terms as low as 10% down.

**EASTMAN KODAK COMPANY, Rochester 4, N. Y.**

See Kodak's "The Ed Sullivan Show" and "The Adventures of Ozzie and Harriet"



Electric eye sets lens for you

Flash link makes indoor shots easy

Motor drive winds film automatically

**KODAK MOTORMATIC 35 CAMERA** can take 10 shots in 10 seconds! After each shot, a tiny spring motor swiftly advances the film, cocks the shutter. Fast  $f/2.8$  lens. Fully automatic lens setting. Full manual control. With this camera, you can keep your eye glued on the action, ready for the best shots, no matter how fast they come. For flash pictures 5 to 25 feet from subject, setting focus automatically sets correct lens opening. Less than \$110.



Electric eye sets lens for you

Rangefinder for precise focusing

Manual control for special uses

**KODAK RETINA AUTOMATIC III CAMERA** has superb Retina Xenar  $f/2.8$  Lens. Fully automatic exposure setting, with override for manual control. Fast single-stroke film wind. Coupled rangefinder. Depth-of-field scale. ASA film settings from 10 to 1250. Shutter release locks if light is too dim or too bright. Less than \$130.

### Now—snap fast action in color!

This weekend, start exploring the new picture possibilities opened by Kodak's ultra-fast 35mm color film, *Kodak High Speed Ektachrome*. With a sizzling daylight index of 160, it lets you take action shots in color that once were out of the question. Lets you get greater depth of field. Permits many indoor available-light shots with the camera *handheld*. Try it!

Prices subject to change without notice.

**Kodak**  
TRADEMARK





**STOPS**  
COLD WATER PIPE  
**SWEATING**  
IN ONE EASY APPLICATION



Protects costly appliances, power tools, lawn equipment, etc.—from sweating pipe damage.

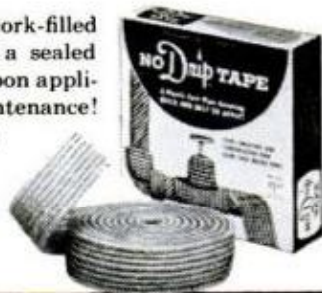
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Converts waste basement space into useful storage, work and play areas.



NoDrip Tape is a pliable, cork-filled 8-strand tape that forms a sealed pipe jacket immediately upon application. Absolutely no maintenance! At your favorite hardware or building supply store.

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## CLINIC FOR HOMEMAKERS



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—editors of Popular Mechanics invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.

### Tight Storm Sash

*Q—I know that this is not the time to think about storm sash, but my problem is fitting the storms tightly as you have suggested in order to prevent condensation. I want to do something about this before it's time to put them up again. Just how do you fit storm sashes tightly so that they do not leak air?—W.T., N. Dak.*

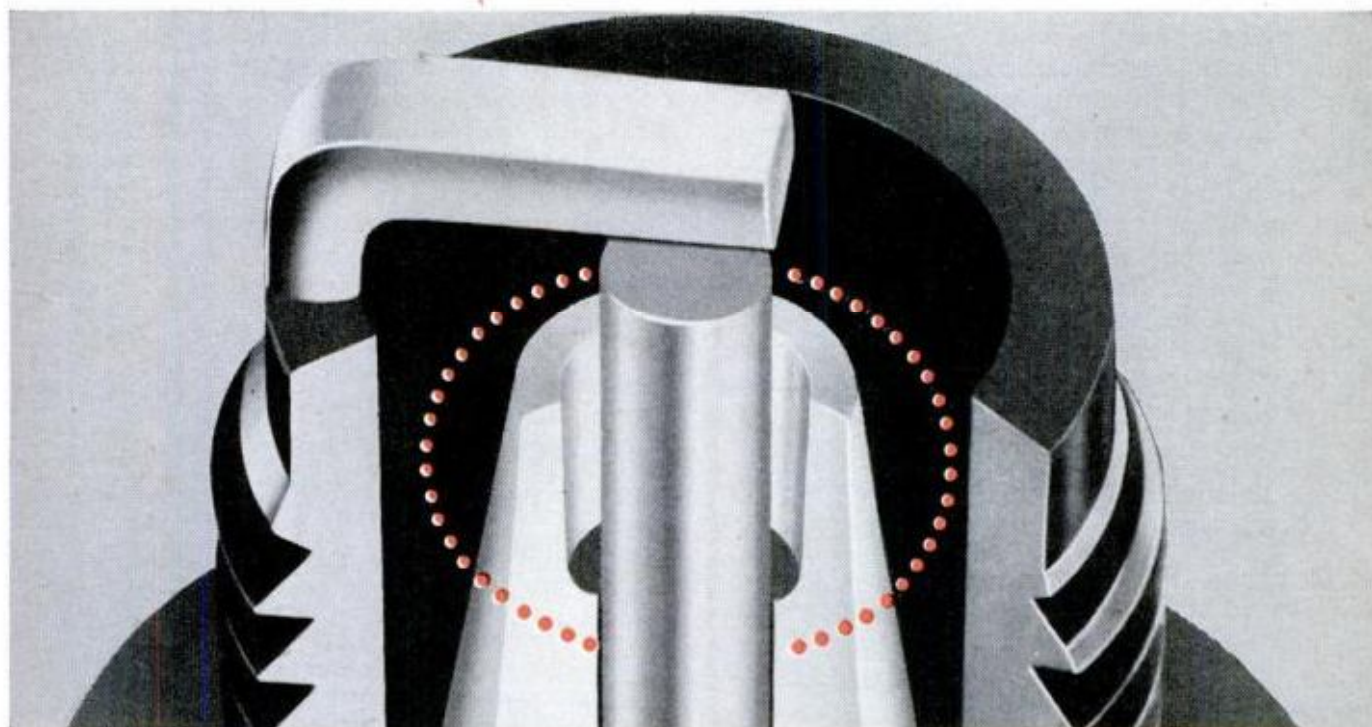


*A—We assume, of course, that you are referring to sashes with wooden frames. There are several ways of sealing storm sashes to prevent leakage of cold air into the space between the outer and inner sash. But this is not always the solution to the condensation problem. If air leaks through the inner sashes, moisture may condense on the outer sash. Neither of the sashes can be made completely airtight so the ideal solution is to produce a condition whereby air leakage through both the inner and outer sashes is slowed down, as it were, and the temperature equalized at some point between the sashes. If this condition can be brought about, condensate will not form on either sash. What you do toward sealing the storms depends on the condition of the window frames. If these are old, have been*

(Continued to page 206)



exclusive  
AC "hot tip"  
insulator



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and sure-firing power at all speeds

AC Fire-Ring Spark Plugs offer extra miles of sure-firing power.

AC's Hot Tip insulator, uniquely designed and of near-diamond hardness, provides a thin, recessed tip that *heats faster* to burn away harmful deposits. This self-cleaning action means full-firing power at

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# DON'T SPOIL YOUR NEXT PAINT JOB BEFORE YOU BEGIN

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Why spoil your next paint job by getting an inferior brush? Du Pont has established a quality mark which is your guarantee that brushes are filled 100% with tapered **TYNEX**® nylon filament . . . a filling material made for quality paintbrushes. Properly made brushes of tapered **TYNEX** give you these advantages: smooth, even flow of paint . . . easy "cutting" into corners . . . easier cleaning. You'll find that well-made brushes of 100% tapered **TYNEX** work well with any finish, and are recommended for use with water-emulsion paints. That's because natural bristles can absorb 15% of their weight in water and swell as much as 25% becoming bushy and difficult to use.

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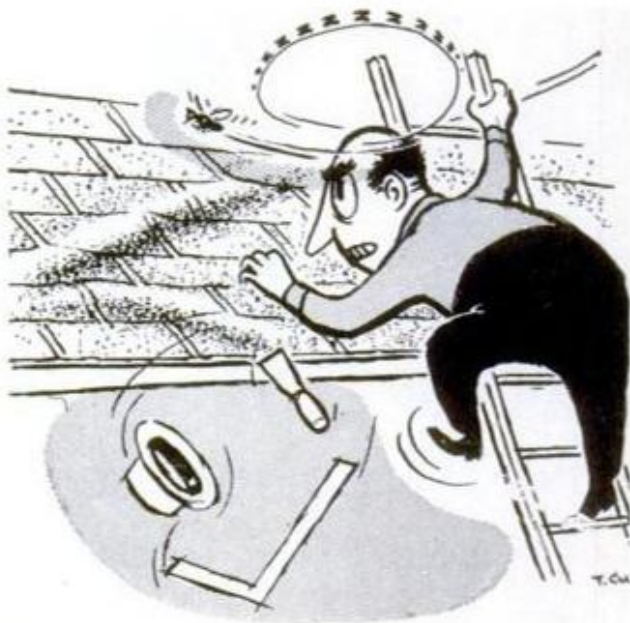
Better Things for Better Living . . . through Chemistry

painted numerous times and if drips or sags of paint have hardened in the rabbet formed by the casing and stop, this uneven surface makes it difficult to obtain a close fit of the sash without a sealing strip of felt or spring-type bronze weather strip. Usually a strip of  $\frac{1}{16}$  x  $\frac{1}{2}$ -in. felt stapled or glued to the inner face of the sash frame at the outer edge will form a fairly effective seal if you use turn buttons to seat the sash tightly. When this is done the inner sashes should be weather stripped.

## Shingles Buckle

**Q**—I have built my own home and of course I did the roofing job myself. Now, less than a year later, the composition shingles have buckled in several places on both sides of the gable roof. Shingles are of the kind having precemented tabs, which are not raised, but the unsightly rippled appearance of the roof bothers me. What must I do to correct this, re-lay the roof, or what?

—R.H., Del.



**A**—We wouldn't think about re-laying the shingles—yet. It is quite likely that shrinkage of the roof framing and possibly the roof boards is the cause of the buckling. You may also have insufficient ventilation in the attic space. This can result in a moisture condition that causes the roof boards to swell and shrink alternately as moisture and temperature vary. If, on the other hand, the buckling is caused by shrinkage of materials that were wet or in which the moisture content was high at the time of installation, this condition will stabilize in time and as the shingles age they will tend to flatten. So, we'd wait awhile before tak-

(Continued to page 208)



# TIRE FACTS THAT CAN SAVE YOUR LIFE



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stop deadly skids  
as no other  
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Like fist above with discs between fingers, tread CAN'T squeeze shut. Hundreds of Armstrong Safety Discs hold tread's gripping edges open, always ready to "bite."

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**ARMSTRONG RUBBER COMPANY**

Home Office, West Haven, Conn.



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**Kills** more

lawn weeds  
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weed killer!



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If you can't identify the weeds in your lawn by name, stop worrying about special weed control formulas. Get Weedone! New Weedone with Silvex kills chickweed, henbit and prostrate spurge, plus dandelion, plantain and more than 100 other weeds and woody plants. You save labor, save time because Weedone does the job requiring two or more ordinary weed killers. It actually costs you less than many ordinary weed killers!

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### EASY TO APPLY—LIQUID OR DRY!

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## WEEDONE

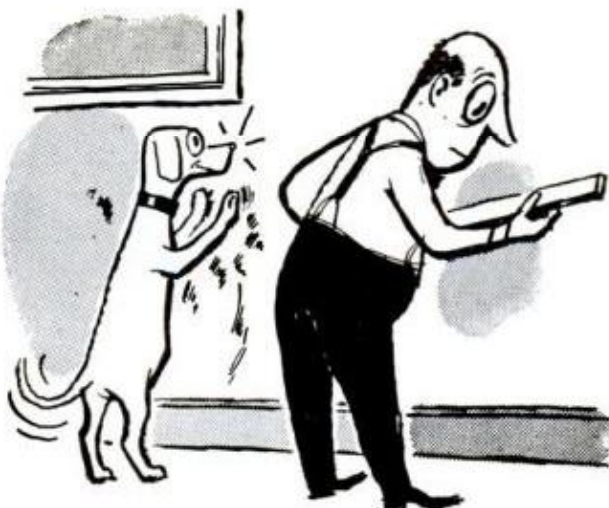
Amchem and Weedone are registered trademarks of **AMCHEM PRODUCTS, INC.** (Formerly American Chemical Paint Co.) **AMBLER, PA.** • Niles, Calif. • St. Joseph, Mo.

ing any steps to correct the condition. In the meantime it might be advisable to check the areas of the louvers or roof ventilators, if any. One rule for determining the louver areas required is to provide 1 sq. ft. of free louver area for each 100 sq. ft. of attic floor space.

## Plaster Patch Shows

*Q—Before redecorating a room I patched an area of about 1 sq. ft. on one wall. I tried to smooth this patch very carefully and although I am not a plasterer, it looked okay to me when finished smooth. Now after painting two coats the patch still shows quite plainly both in the daytime and at night when lights are on. Also, the paint seems to have changed color slightly on the patched area. What did I do wrong?*

—N.H., Mass.



*A—We don't know, but we'll venture a guess. Usually there are two common reasons for plaster patched areas showing under the paint. Even though it may appear so, the plaster in the patch may not be precisely flush with the surrounding surface. Or, you may have painted the patch without sizing or applying an undercoater as the first coat of finishing material. Judging from your description, the latter would seem to be the most likely cause. Of course, there could be other causes but they are less likely. If the patched area can be checked with a straightedge and proved to be level and exactly flush with the surrounding plaster, then there is little use in sanding the surface. However, we do think it would be worthwhile to refinish the entire wall, first by applying an undercoater and following with two finish coats of paint in the color you desire. We wouldn't attempt to spot-finish the patch as this is seldom entirely satisfactory.* ★ ★ ★





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These cool, handsome Lee Tropics lead a double life. Thanks to “Dacron”<sup>\*</sup> polyester fiber they resist wrinkles, always keep their well-pressed look even after 18 holes of golf or a long day's work. 44% lighter than ordinary work pants, yet extra rugged and durable, these slacks are automatic wash 'n wear. Handsome Flint Gray and Airborne Tan. Get a pair of these smart, all-purpose Lee Tropics today. Lee Tropics are tailored for lasting good looks, real comfort! If Lee Tropics are not available at your favorite store write:

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# Lee

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## Sub Saves a Frogman

(Continued from page 127)

surface—too quickly. He was given permission to return to the transport Cook until he felt better.

His fellow Marines found him the next day twisting in agony in his bunk. Searing pain shot through his arms, legs and stomach. He was having trouble breathing. By noon he went into convulsions.

A radio call went flashing to the *Redfish*, lying at anchor nearby. It looked like Merwin had the bends. Could the sub help?

Lt. Comdr. Lowry lost no time. He weighed anchor and the sub knifed through the water to the transport's side and took aboard the gasping, pain-wracked victim.

### 25 Minutes to Live

A *Redfish* hospital corpsmen, John E. Smith, 32, of Crescent City, Calif., quickly examined the now unconscious Marine. It looked like the bends all right. And the corporal's right lung was collapsed, possibly caused by an air bubble that had escaped from his lung into his chest cavity during his dive the night before. When he'd surfaced, this bubble might have expanded, causing the lung to collapse.

"He's got about 25 minutes to live unless we do something quick," Smith reported.

There was only one way to save his life. Get him under heavy pressure in a hurry to compress the air bubble in his chest and the nitrogen bubbles in his bloodstream. Then the pressure would have to be slowly decreased, allowing his body to absorb the bubbles gradually.

The normal way to do this would be in a recompression chamber. But the nearest chamber was 160 miles away in San Francisco. There wasn't time to get him there.

Commander Lowry did some quick thinking. The submarine's escape trunk might be the answer. Maybe it could serve as a makeshift recompression chamber.

This escape trunk is an air lock through which underwater swimmers can be released. The pressure within it can be regulated. But it's not very big—only three feet in diameter and a little more than five feet high. And someone would have to stay in the chamber with the victim.

Lowry did some quick figuring. It'd take at least 36 hours in the trunk—a whole day and a half—before the Marine would be out of danger.

And there was another hitch. The escape trunk wasn't built to hold high pressures while the submarine was on the surface. If they pumped pressure in there and the hatch blew, the sudden change in pressure would probably kill both men instantly.

The only solution would be to take the sub down deep where the tremendous pressure of the sea would help keep the outer hatch tightly sealed.

But it would be at least 17 hours before the pressure in the trunk could be decreased enough so that the hatch would hold while the sub was on the surface. The *Redfish's* batteries were partly depleted and the fouled interior air of previous plunges hadn't been cleared out completely. It'd get pretty sticky for the crew during those 17 hours before they could surface for fresh air.

He looked again at the Marine.

"We'll try it," he announced firmly.

"I'll stay with him, sir," spoke up Donald Raymond, 25, of Imperial Beach, Calif. Raymond was a qualified diver himself and had experience in working in recompression chambers.

### Get Set for 36 Hours

Skipper Lowry headed the *Redfish* to sea. Merwin was placed in the escape trunk and Raymond squeezed in with him. The crew jammed in a sleeping bag, a medical kit and enough sandwiches and water for two days.

The hatch was slammed shut at 1:22 p.m.

The *Redfish* dove to 165 feet. Her motors were turned off and she hovered silently in the depths. The air pumps were started and life-giving pressure began hissing into the escape hatch. It was slowly brought to 80 pounds per square inch.

Inside the chamber, the six-foot, 185-pound Merwin was lying on his side, knees tucked up under his chest. Raymond, also a six-footer, couldn't stand up. He sat on a valve wheel halfway up the side of the trunk, lowered his head and braced his feet on pipes along the wall. This was the basic position he would have to keep for the next 36 hours.

The Marine showed almost immediate relief as the pressure built up within the cramped chamber. He began to breathe more easily. After 70 minutes he regained consciousness. Looking up at Raymond he smiled feebly.

"I feel fine," he murmured. "Let's get out of here."

Raymond grinned back and told him to lie still. There was still a long, tedious wait.

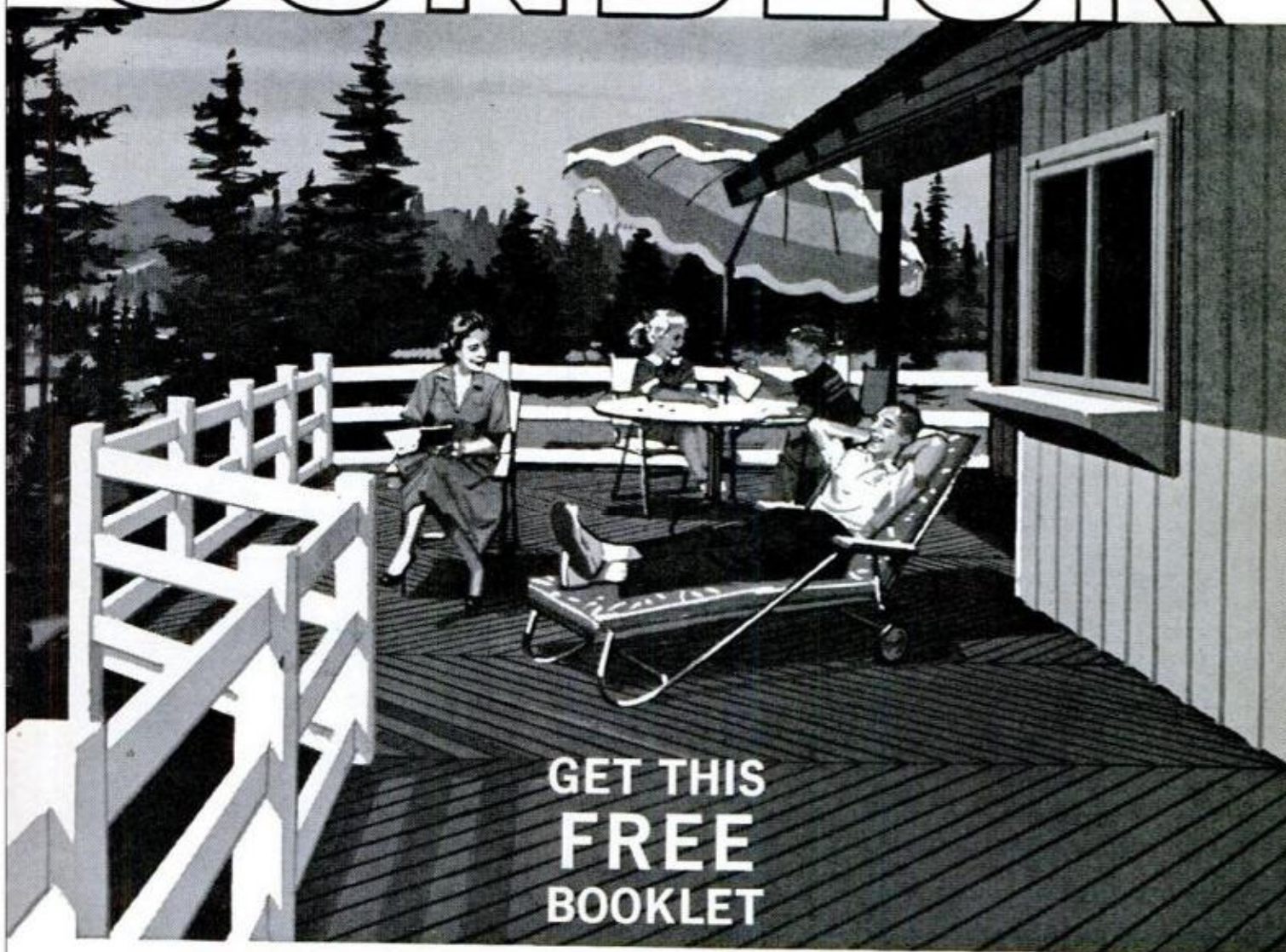
Back in his cabin, Commander Lowry had his worries. His batteries were low. They couldn't be recharged without coming to the surface. And the air would start getting stale soon. To save the batteries, he shut off all the electrical equipment he could spare. To conserve oxygen he ordered all of the 90-man crew except those

(Continued to page 212)



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on key duties to get into their bunks and breathe easy.

Lowry leveled the *Redfish* off at 150 feet, started his engines, and headed toward San Francisco, 160 miles away, at the agonizingly slow speed of 2.7 knots (a little more than 3 miles per hour).

Torpedoman Neil E. Hutchins, Boat-swain's Mate Jack Perkins and Corpsman Smith worked silently, using a stopwatch and decompression tables, to lower the pressure in the chamber. Hutchins stayed on the phone to Raymond inside the trunk, relaying information on how the patient was doing. Merwin was asleep. Raymond was getting drowsy. They started telling jokes to keep him awake.

### Sub Has to Surface

The hours dragged by as the sub inched her way toward San Francisco. The air within the submarine was stale and the crew was finding it hard to breathe, even while lying still in their bunks.

Finally after 16 hours submerged, Commander Lowry felt he couldn't keep the *Redfish* down any longer. The pressure inside the trunk had been reduced to 17½ pounds per square inch by then. (Air pressure at sea level is 14.7 pounds per square inch.) Would the hatches hold this pressure when the sub surfaced? It was a gamble he had to take. He ordered the sub up.

All hands literally held their breath as the sub broke the surface. The trunk's pressure gauge was watched closely. If the needle began dipping, it meant the pressure was escaping from inside the trunk. If that happened, they'd have to go back under for at least another hour.

"It's holding!"

The shout went through the sub. The gamble had paid off. The pressure was holding firm.

Fresh air came flowing into the sub's ventilation system. It was 6 a.m. There were still 20 hours to go in Merwin's treatment. Using her diesel engines now, the *Redfish* continued toward San Francisco, slicing through the waves on the choppy surface. Now she was making 14 knots.

The swells ran heavy and the sub began to pitch and roll. Now a new worry faced the two men in the escape trunk.

"I think I'm going to be sick," Merwin mumbled.

Raymond pleaded with him. "We've still got almost a day to spend in here. If you get sick I will too."

Somehow the Marine managed to control his stomach.

It took the *Redfish* another eight hours to reach San Francisco. But when it headed through the Golden Gate and docked at

Hunters Point Naval Shipyard, there were still about 12 hours to go for Merwin and Raymond in their cramped quarters.

Now another decision had to be made. There was a regular recompression chamber located on a barge tied up nearby. They could take a chance on rushing the two men out of the sub and into the barge's chamber and hope there'd be no ill effects.

But it was decided to keep Merwin where he was rather than risk the transfer.

They kept dropping the pressure slowly within the escape trunk as more hours dragged by.

### Hatch Seal Breaks

Then suddenly at 1:39 a.m.—after 36 hours and 17 minutes of constant pressure—one of the hatch seals gave way. The pressure began leaking out. It was a slow leak, but much too fast as far as Merwin's condition was concerned. He'd nearly recovered completely. Now he was in danger again. They had to get him out of there and into the barge's chamber quickly. A Navy doctor said that if he could get back under pressure within three minutes, there'd be no great harm done.

The Navy men wasted no time. They hustled Merwin out of the escape hatch, off the *Redfish*, onto the barge and into the new chamber in exactly two minutes and seven seconds.

After a few more hours of decreasing pressure, the Marine was finally brought out and taken to nearby Oakland Naval Hospital. He was kept under close observation, but no ill effects could be found, no scars on his lungs nor damage to his heart.

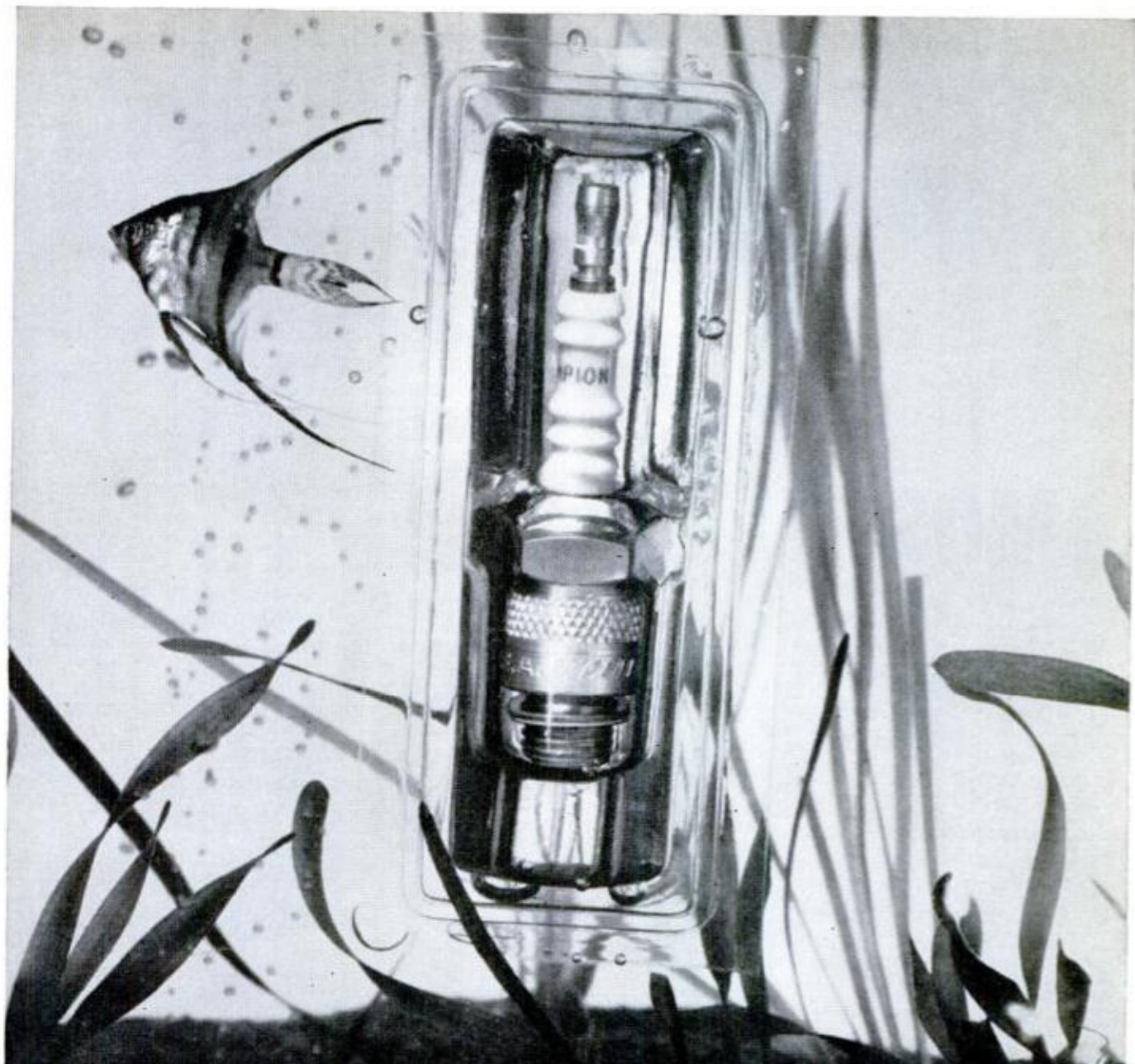
And thanks to a quick-thinking submarine skipper and a dauntless Navy medic who crouched on a brass valve wheel for 36 hours, Corporal David Merwin, who'd been as close to death as a man can get, walked out of the hospital a few days later, ready and willing to dive again. ★ ★ ★

### QUOTE:

*"There is for each of us a spiritual domain and an ultimate good in pure thought. But man has survived because of a capacity also for ideas that find their final expression in physical terms—in action, in the experiments of the scientist, in the constructions of the engineer, in the creations of the artist and the architect. The power of logical analysis to abstract immensely complicated physical situations constitutes one of the supreme achievements of the human mind, but when abstraction becomes an end in itself, science and art invite sterility."*

—JULIUS A. STRATTON, President,  
Massachusetts Institute of Technology





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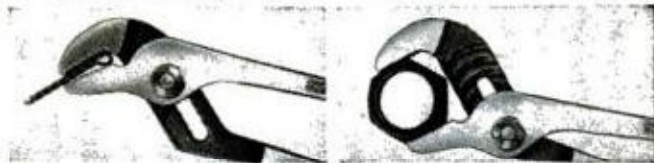
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**CHAMPION DEPARTMENT TOOL COMPANY**  
HEARVILLE 1, PENNSYLVANIA

## Are Your Lights Showing?

(Continued from page 181)

on the circuit breaker if it needs repair, but this kind of work is not recommended for the average home mechanic. The tripping of the circuit breaker generally means there is an overload or dead short somewhere in the circuit that must be corrected. A good mechanic can find the trouble with a voltmeter, in a reasonably short time. In most cases similar troubles will occur in similar models and makes of cars and the mechanic will check these situations first.

A glance at the wiring diagram of your car in the service manual will show that there are many more lights than described here. There is not sufficient space to describe them all. Just keep in mind that lights mean safety, comfort and convenience. Missing lights may get you a warning, or a ticket from the police. However, maintaining your lights is just courtesy and common sense. When you need any lights, turn on the headlights; never drive with parking lights. ★ ★ ★

## Stop That Drip!

(Continued from page 174)

thickness. One gallon, applied  $\frac{1}{4}$  in. thick, generally covers from 5 to 6 sq. ft. of surface, which must be clean and dry.

The table in Fig. 3 gives the limits of effectiveness of various thicknesses of one product. For brushing this a stiff-bristle brush such as a whiskbroom is best. This is soaked in water and shaken out before loading it with mastic. If necessary, some mastics can be thinned with water, but only about 2 oz. per gal. On severely rusted and pitted pipes a special primer is used. The mastic is applied to surfaces having temperatures not less than 50 deg. F., nor more than 100 deg. F. After drying, the material can withstand temperatures ranging from sub zero to 150 deg. F.

For cold-water pipes of sizes found in most homes, a coating  $\frac{3}{8}$  in. thick usually is sufficient. The coating is applied in two or three separate applications, each being allowed to dry before applying the next. When dry, the mastic can be painted with water-base paint.

**Tubular Jackets.** Prefabricated antidrip jackets cost a little more than the coverings already discussed, but generally are designed to meet more severe conditions. Fig. 4 shows a flexible, foamed-plastic jacket available in  $\frac{3}{8}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$ -in. thicknesses, and in 6-ft. lengths. Recommended wall thicknesses to prevent condensation are given in the accompanying table. The



closed cellular structure of this material provides both insulation and a vapor barrier. For application to existing pipes the tube is slit lengthwise as shown, detail A. Unslit lengths are slipped on pipes and tubing being installed. A special adhesive, applied when hot, is used to seal the slits and butting ends, detail C. Matching jackets for the pipe fittings are made from the tubing by miter-cutting it and cementing the pieces together when installing them. The material can be painted, preferably with a flexible paint offered by the manufacturer.

Rigid antidrip pipe jackets, such as shown in Fig. 5, are made of various insulating materials. These usually come in 3-ft. lengths split in half lengthwise and hinged together with a covering material. When installed, the half sections are usually held together with bands, after joints have been sealed.

#### Comes in Foamed Glass

Detail C shows a foamed-glass jacket. The material is of cellular structure serving both as insulation and vapor barrier. The exterior covering is fire-retardant. It has a high compressive strength which protects it from being crushed easily. It comes in 1 and 1½-in. wall thicknesses, and in 24-in. lengths for iron pipe and copper tubing as used in home water systems. Two-piece prefabricated covers of the same material are available for all standard fittings.

Detail A shows a jacket of ½-in. molded glass fiber available in 3-ft. sections. This is enclosed in a moisture barrier of aluminum foil covered with heavy, white, kraft paper. When installing, the joints of the vapor barrier are sealed with a special cement.

Detail B shows a two-layer jacket, each layer consisting of multiple wrappings of insulating felt. Water-resistant felt is provided on the inner and outer surface of each layer. The jackets come in 3-ft. lengths and have an outer covering of canvas. The chart shows wall thicknesses of one product which are recommended for various temperature and humidity conditions. For more severe conditions an additional moisture seal of mastic is brushed on.

Fig. 6 pictures a preinsulated copper tubing for use in new construction and also for replacement of plumbing in older homes. It comes covered with a foamed plastic and is installed in the same way as standard copper tubing except that where joints are made the covering is cut, detail B, and after soldering the bared portion is covered, detail A, with a plastic fitting. These are available for covering couplings, elbows and Tees. ★ ★ ★

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# power drill like it before: **DISSTON 1/4" DIRK!**

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**3. YOU CAN SNEAK IT INTO CORNERS.** It's the only drill with an offset motor and a recessed Jacobs chuck. This gives the working end the slimmest profile available. You can also work between joists and get closer to floors and ceilings. (Note bit clearance required by conventional drills.)

Look for the new Disston Dirk 1/4-inch drill in your local hardware store. It's priced at \$30.00, only a nickel more than the next best drill. When you see it and try it, you'll want to buy it. The Dirk, made in Danville, Virginia, is another fine product from Disston, master toolmaker since 1840.

**PORTER**

**DISSTON DIVISION  
H. K. PORTER COMPANY, INC.**



## Load Your Own Aerosols

(Continued from page 188)

component parts. These are the toxicants, synergists (chemical substances which increase the killing power of the toxicants, but actually have no insecticidal properties of their own), a knock-down agent, solvents, and propellants. A high grade nontoxic insecticide could be formulated with 5 percent pyrethrins, 4 percent piperonyl butoxide, 10.5 percent 1,1,1, trichloroethane, 85 percent propellant No. 12 (dichlorodifluoromethane), and propellant No. 11 (dichloromonofluoromethane) in a 50-50 mixture. An excellent residual insecticide which is highly effective against ants, roaches and other crawling insects would contain 5 percent (0,0 - diethyl 0- (2-isopropyl) - (4-methyl-6-pyrimidinyl) phosphorothioate, pyrethrins, piperonyl butoxide, solvent, and propellants.

Among the most popular aerosols today are personal products. Of these, hair lacquer ranks first. Most quality hair lacquers contain a substance known as PVP (polyvinyl-pyrrolidone). PVP has many unique properties which enable one to formulate a superior hair spray that is easily removed, has long durability, and is very simple to apply.

Another widely used aerosol product is shaving cream. Foam products such as shaving cream are rather economical to formulate since they contain only very small proportions of propellant. The propellant concentration used with shaving creams varies from 5 to 15 percent and the pressure within the can may be as low as 15 lb. per sq. in.

A special propellant arrangement must be utilized for shaving cream or lather. Propellant No. 114 (dichlorotetrafluoroethane) has certain water-soluble and emulsifiable properties that some other propellants do not have, and for this reason is used with foam-type products such as shaving cream. It is generally used in combination with propellant No. 12 (dichlorodifluoromethane). Neither of these two propellants will hydrolyze (chemical decomposition) in water to any great extent and therefore do not form reaction products which might normally be corrosive such as would be the case if propellant No. 11 were used. In the presence of water, propellant No. 11 would form hydrochloric acid, which would attack the container, valve and product. Elastic, spongy, firm, heavy, wet and dry characteristics of a foam product may be obtained by changes in the formulation. ★ ★ ★



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## Tracks Across the Polar Continent

(Continued from page 125)

Behind each came a Rollagon wagon—a large platform piled with four tons of supplies, slung between four massive rubber tires. Each bulging tire contained 500 gallons of diesel fuel that would be replaced with air as the diesels consumed the oil reserves.

Spiderlike arms of an electric crevasse detector stretched out ahead of the smaller lead Cat to warn the train of the icecap's greatest common hazard—the long, wide cracks that score its surface and can swallow entire trail parties.

The new, giant Cats, with shoe-box-shaped bodies riding high on four 11-foot endless track pontoons, were specially designed for travel on the rough surface of Antarctica's two-mile-high icecap. Boasting a full-fledged stand-up galley and built-in sleeping accommodations, they come as close to making Antarctic trail work comfortable as anything can come.

Riding over drifts in the buslike cab of one of these \$80,000 monsters is like sailing a short cruiser on a choppy sea. During a run on the barrier south of McMurdo, Jack Long and Ralph Ash, Crary's traverse engineers, gave me a first hand introduction to the big Cats as we rocked and surged gently over the sastrugi.

### No Luxury Cruise

"The engine operates efficiently up to 13,000 feet of altitude," Jack explained. "And it's got built-in preheaters for easy starts in deep subzero cold. The big pontoons and a rubber torsion bar under the seat give it this nice seasick ride—a big improvement over the jarring bounce of conventional Cats."

Underway, after a year of preparation, the Pole traverse chugged southward across almost totally unexplored country, averaging about 20 miles a day. Along the way, the train stopped every six to nine nautical miles to make gravity, magnetic and glaciological studies. Seismic soundings were made to determine the depth of the icecap. The men made geological studies in mountainous areas at the head of the Skelton Glacier and in the Queen Maud Range.

Life on the icecap is far from a luxury cruise. Most traverse parties travel cold. Fuel is too precious to use up warming bodies. Temperatures in the vehicles during stopovers equal outdoor readings—from 20 below to 70 below zero.

First to go by the board are shaving and bathing. Not that it is never done. Some men insist that beards collect hoar frost

(Continued to page 222)





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and conduct cold to the skin faster. Others claim they provide insulation. Bathing, besides being a nuisance in a place where you melt every drop of water you use, involves a Spartan will. One scientist, who couldn't stand himself anymore, actually stripped and stood in a bucket out on the Victoria Land Plateau at 30 below zero, and poured melted snow over himself while the photographers went wild. It was that much of an event.

Most meals on the trail are eaten with gloves, but once in a while the mess Cat is warmed up for a treat. Then, everything left on the deck freezes solid, and at head height you roast.

If camping has problems, getting a Cat train underway again is fraught with headaches. Batteries, drained at the stop to prevent freezing, must be filled. Blowtorches are used to warm engines. Nine times out of ten, batteries from all the prime movers must be hooked up to provide enough power to start the first one.

"This is one nuisance the new Cats spare us," Long points out. "They're equipped with 30,000 BTU space heaters so we can leave the water in the batteries. And the preheaters have done away with blowtorch duty."

## Dice Cups, Booby Traps

Once the engines are turning, sleds must be jolted loose. Parked runners freeze to the surface as solidly as though welded. The sled has a sliding bar yoke, enabling the Cat driver to back into it, yank it forward, slam back again. And so forth. Loose things inside the Cat, including people, fly back and forth like dice in a cup. If the yoke doesn't break, and everyone's teeth are still in place, the sleds eventually jar free and the show is on the road.

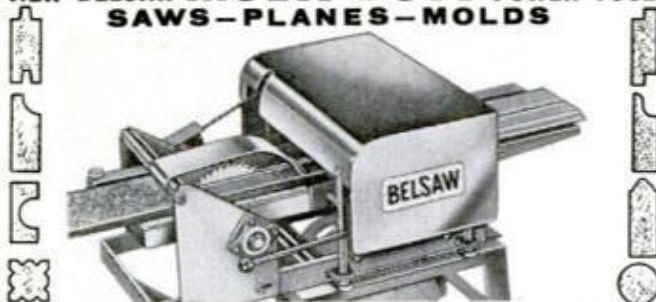
All trail parties share a complete distrust of the Antarctic continent itself. Biggest ogres of the icecap are great crevasses that may run 50 to 100 feet wide for dozens of miles. Most are nearly invisible, since drifting snow has bridged them over with a thin layer of fused crystals. Usually, these treacherous booby traps come in vast clusters, covering hundreds of square miles of icecap.

When a trail party enters a known crevasse area, morale drops to the level of the temperature. Men become sullen and silent; conversation is apt to be short and testy. Out front, the crevasse detector unit moves slowly. An electrical field set up around the steel dishes is supported by the dielectricity of solid ice or snow. As soon as a dish crosses a pocket in the ice, the field is broken and the change instantly

(Continued to page 224)



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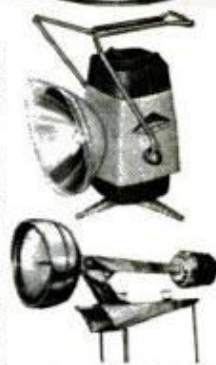
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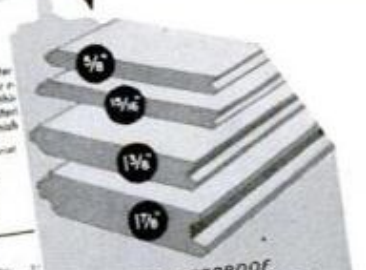
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registers on a meter in the cab. But, sometimes, a crevasse pinches off under the lead dish. Then it won't register.

Jack Long was rumbling along in fine shape one day, leaving a crevasse area at the mouth of a glacier. "I felt the rear sled bump," he recalls. "I was about to get out and look, when suddenly the Cat crunched beneath me and dropped a foot. When I crept out, the sled front was hanging over a yawning abyss 150 feet deep, supported only by the trailer hitch and its own rear runners. The same snow bridge had broken under the Cat—we were riding right up the middle of this thing, and it was big enough to swallow the whole train. Luckily, the big Cat's tracks were wide enough to find support on each side of the bridge—but one false move and the sled was going to drop 50 feet and drag everything with it."

The tractors are equipped with A-frames on front, for hoisting. Long and Ash moved this to the back and used it to hold up the front end of the unhitched sled. The second Cat was moved alongside the sled and used its A-frame to lift the entire sled clear. "Then I drove forward, straddling the crevasse until it pinched off," Jack explains.

Not all crevasse-trapped trail parties are that lucky. Last year, on a New Zealand traverse headed for the Victoria Plateau, a Sno-Cat plunged into a 100-foot-deep crevasse. One man died instantly; another broke his back and a third smashed his jaw and several ribs.

### Planes to the Rescue

Occasionally, a traverse gets itself into a maze of crevasses and can't get out. When that happens, aerial reconnaissance is requested from the McMurdo air strip. VX-6 aircraft fly out over the region and direct the trail party to safe ground. From the air, crevasses show up distinctly in clear weather due to the difference in color and texture of the snow bridges concealing them.

Last year, a nine-man Victoria Land traverse was guided through a two-mile stretch of impassable crevasses by two men who planted flagged bamboo poles along a safe route from a hovering helicopter. The chopper was directed along areas of solid snow by an R4D Skytrain circling high above it.

The Navy's VX-6 Antarctic squadron has played a heavy role in helping to make our trail parties successful. Before a traverse sets out, the scientific leader sits down with VX-6 experts to determine how much food, fuel and other material the trail party will need. Usually it is more than the sled train can pack. So planes fly out over the route establishing food and fuel caches. Some are air dropped. Long, flagged bamboo poles,

weighted with spearlike tips, are dropped around the cache to make it easy to spot. Usually, the entire route is reconned so that the traverse leader knows what he has to contend with in the way of rough going. And sometimes, instead of using ground vehicles, a traverse may be air-lifted from place to place.

One of the few comforting things that a modern south polar trail party knows is that no matter what happens, the VX-6 magic carpet will come to the rescue with spare parts—or evacuation if necessary.

Keeping his vehicles going when trails are rugged and blizzards howl at 50 below, is the unenviable job of the traverse engineer. Skin freezes to metal, welding torches refuse to weld, parts snap in the brutal cold.

"On maintenance stops," Jack Long explains, "we just dig a trench in the snow and drive over it. A Nelson heater melts ice in the bearings, and we force the water out with a grease gun. This happens every 400 miles. One man can do a Cat in a day. The one thing you can't fight is bad weather. Engines choke with blowing snow and heaters conk out. You can't see flags through the windshield, and morale is shot. You can stand cold, but when the wind climbs over 30 knots, nothing works including people. Drifts can cover sleds and Cats in a few hours. You dig out with shovels."

### When Things Go Wrong

Changing an engine or taking down a transmission under such conditions becomes a superhuman feat. But it is done. In one miserable stretch of 400 miles, Jack recalls a series of breakdowns that would send the average service station mechanic to bed in tears.

"Nine tie rods broke," he says. "Three in one morning. A rear tie rod on the lead vehicle took two days to fix. Then a transfer case went; followed by two universals, one of which tore out a transmission. We fought the diesels day and night. By the second week, we had cannibalized three vehicles to make one work. It ran for half an hour and snapped a tie rod. We finally made it to McMurdo after replacing another universal and another transmission."

In spite of the hazards, no traverse has yet failed to get home—albeit not always 100 percent intact. But the men who are out there probing the white wilderness on foot, and grinding across the snow deserts in straining vehicles are the ones who, like the foot soldiers in a war, are making the real inroads.

They are pulling back the veil from a continent that was all mystery just a few years ago. ★ ★ ★





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## Build PM's Pop-Cat

(Continued from page 163)

the A-frame members after removing the original keel rollers and cradles, Fig. 80. The channels are spaced about 3 ft. apart, with the rear one back as far as possible. The conversion is a simple job, taking about two hours to complete.

After the channels are tightened in place, the keel rollers are mounted on them (originals and extras) and all are adjusted to the same height, about 1½ in. above the frame, Fig. 81. Then the cradles are placed on the front and rear channels and positioned so as to provide an easy fit between sponsons, after which they are tightened loosely in place as in Fig. 82. When the boat is loaded for the first time, the cradles are adjusted to fit snugly against the planking on the inner chines and then tightened down hard. Stern tie-down chains are bolted to the outer ends of the rear channel as shown in Fig. 83, after which they are connected to eyebolts installed near the ends of a padded 2 x 4 placed across the coamings of the boat directly above. The eyebolts are the same ones that come with the chain and have wing nuts for easy tightening down of the 2 x 4 crossbar. This tie-down, together with a safety chain bolted to the front channel and then hooked to the bow eye on the boat, prevents it from moving forward or backward when sudden stops are made. The cradles prevent sideways movement.

### Tandem Rig for Cabin Version

This trailer rig is adequate for the run-about model of Pop-Cat if travel is limited to short trips over good roads. For more rigorous trailing, or for the heavier, cabin version, an 1800 to 2000-lb.-capacity tandem trailer should be used, such as Tee-Nee's model OB-1800A. The latter recommendation also applies to runabout models with power in excess of 80 hp. and boats carrying a lot of heavy equipment.

To load your Pop-Cat on the trailer from the ground or garage floor, simply apply a heavy coat of liquid soap on a few smooth boards and place them under the sponsons. Then hitch the trailer to your car, back it up under the bows (trailer bed tilted down in back) and winch the cat on. Another method is to raise the boat up on blocks high enough to permit the trailer to be backed under it, removing the blocks in front as the boat is transferred to the trailer. Before shoving off down the highway, be sure all tiedowns are securely fastened, trailer lights connected and hitch is properly connected and locked. This completes another PM boating project. Bon Voyage!

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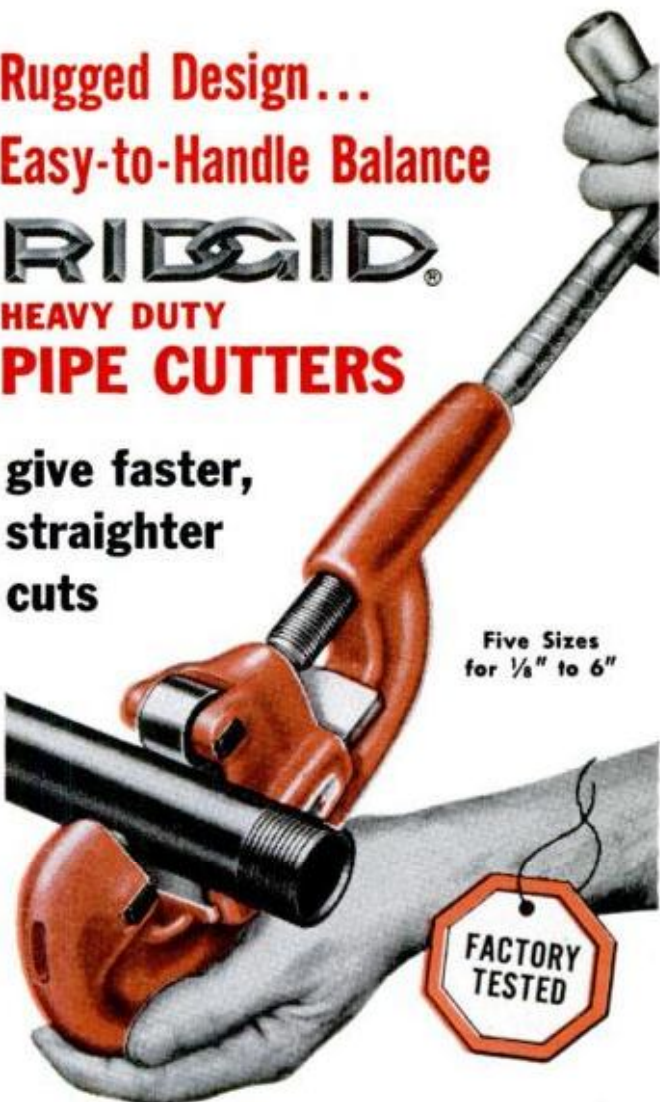


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## Back-yard Eagles

(Continued from page 116)



**SUPER WIDGEON** is direct ancestor of four-engine Golden Goose. It is powered by twin 260-horsepower engines

Portland, had by this time become the Alamo of the independents of aviation. Under the encouraging eye of Walt Rupert, field instructor, about 50 more-or-less original designs took shape and flew here.

Rupert himself designed and built three planes along the lines of the Heath Parasol, powered by 40-hp. Salmson motors, which won him the national amateur award for "best plane and pilot" in 1938.

Harold Briggs, in 1936, set an unofficial world's altitude record of 21,750 feet in a plane of his own design and construction.

In the early days of the war George Yates, spurred by patriotism, designed and built the famous "geodetic" aircraft entirely of Oregon spruce, woven like a basket in a criss-cross design that later influenced the design of the twin-engined wooden British Mosquito bomber.

Lee Eyerly of Salem built a half-dozen conventional high-winged monoplanes, one, two and three-seaters, powered by engines from 60 to 100 hp. And then there was the "Whifflehen," an Eyerly original with tricycle gear, a bathtub body and overhead throttles for the pusher engine.

These were the heydays of amateur aviation in Oregon when scores of pilots built their own Student Princes, the first federally certified plane in Oregon.

Then came the act of 1938 establishing the Civil Aeronautics Administration. CAA inspectors tried to force every builder to obtain a federal airworthiness certificate. This would be a death blow to the amateur. The stress analyses, engineering and flight tests for certification were like those required for commercial airliners. Oregon defied Uncle Sam.

"We've proved our planes safe by flying them for 10 years," the embattled pilots de-

clared. They continued to fly their "originals," in Oregon's airspace, carefully avoiding Uncle Sam's airways. The fame of "Oregon's Outlaws" spread.

Federal charges were filed against Harold Wagner, Donald C. Wray, Hal Inman, Gene Pulcifer and Paul K. Ryan. The pilots fought back.

Then came the war. Some 75 independent Oregon eagles, including the defendants, with 50 planes of their own formed the first volunteer U.S. air-defense squadron.

The case against them was finally dismissed. These Oregonians are still flying—and still experimenting.

Wagner, now co-owner of the Mixermobile Co., and partner in Henry Troh's Sky-park in Portland, recently built himself a "Piper Bomber," from two Cubs. The twin-engined, double-fuselaged eagle has the speed, stability and reliability of two Cubs. The propellers overlap, but were staggered by extending one of the shafts.

Art Whitaker, dean of commercial aviation in Oregon, patented his famous tandem-wheel landing gear for rough terrain.

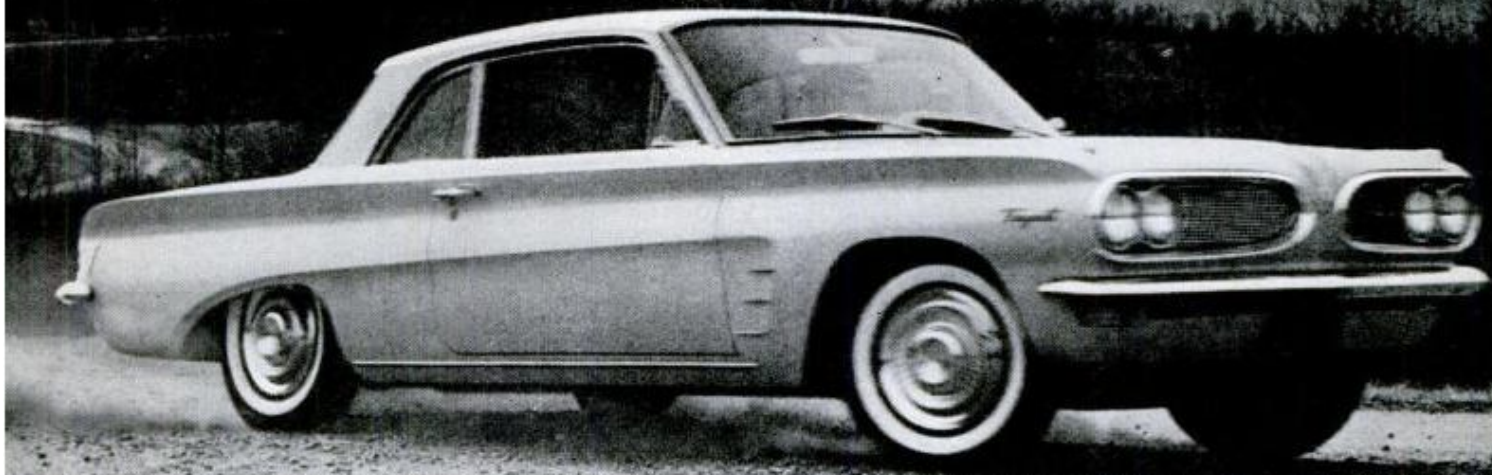
R. W. "Swede" Ralston and E. J. Ball of Hillsboro, who built and rebuilt many an amateur airplane, were the first to fit the Cub with tricycle gear, now standard.

As soon as the war ended and restrictions on private flying were lifted, "Oregon's Outlaws" were right back in there fighting for the freedom of the airways, the right to exercise their American ingenuity in the design and construction of their own planes.

In 1946 the independent airmen of the Oregon Airmens Association had formed the American Airmens Association to make the issue a national one. George Bogardus, old-time pilot, mechanic and aeronautical

(Continued to page 230)





## *Pontiac's new Tempest coupe is here!*

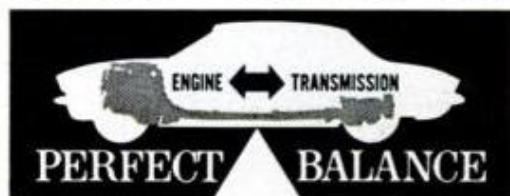
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engineer, was elected president and instructed to carry the fight to the capital.

Next year, 1947, he made history by crossing the country in 27 hours in his own Wimpy monoplane, the "GeeBee." This was the first such flight of a homebuilt experimental aircraft.

The GeeBee's performance cinched the cause of the back-yard eagles. The CAA (now Federal Aviation Agency) engineers decided existing regulations could be interpreted to permit such experimental back-yard planes without further legal action. Standards were set up for inspection of such aircraft by FAA inspectors during construction.

They are restricted to an area within 50 miles of their home fields for the first 50 hours of flight, until they have proved their airworthiness. Then the area can be extended at the discretion of the inspectors. Homebuilders are encouraged to consult these trained aeronautical engineers for advice early in the design stage to prevent costly, and possibly dangerous errors.

### Homebuilt Boom Started

Now the homebuilts are booming across the nation, thanks to the descendants of Si Christofferson and Conner Burkhart.

Oregon is also the home of the oldest Aeronca aircraft in the world, probably the oldest factory-built light plane now flying. The engine and the parts of this C-2 Aeronca, were bought, reconditioned and assembled by R. C. (Bob) Cansdale, pioneer pilot, whose hobby is in the nature of a "postman's holiday."

He flies the latest, hottest F-27 Fairchild turboprop airliner for West Coast Airlines five days a week, then relaxes in his tiny, open C-2 on weekends.

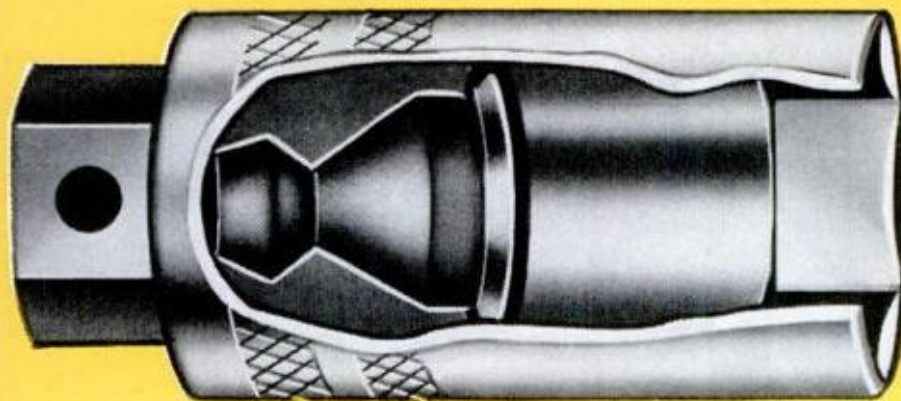
Cansdale bases his C-2 at Pearson Airpark, across the Columbia River in Vancouver, Wash. This oldest airport in the West is also the home of the first flying saucer.

This wingless, tailless oval-shaped product of the imagination of bridge-tenders Marvin and Lyle Joy, was built in Jack Bacon's shop at Pearson Airport and got off the ground, briefly, in July, 1937.

Sid Monastes, an unlicensed pilot, test hopped the Flying Saucer again in April 23, 1938, but crashed through a fence and nosed over in a cornfield without ever getting off the ground.

Powered by two nine-cylindered 38-hp. French radial engines slung under the flap-jack fuselage, the design was intended to be stable like a pendulum, foolproof and aerodynamically efficient. It wasn't. But this was the only flop out of scores of Oregon homebuilt successes. ★ ★ ★





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



### Jaguar Offers Fast Production-Model Sportster

Jaguar's new 150-mile-an-hour XK-E boasts a 3.8-liter engine with twin overhead cams, aluminum cylinder head and three carburetors. Designed for wider public appeal than former models, the car has

interchangeable hard and soft tops, adjustable steering wheel and roll-up windows. The stressed-steel body allows the XK-E to be 600 pounds lighter than former models. Price is under \$6000, port of entry.





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## Jets Join the Business Fleet

(Continued from page 111)



**VAN NUYS AIRPORT**, one of the exclusive businessman's airports, built runway over 4-lane highway

varied airplane operations that Shell Aviation Corp. has been set up.

When demands are particularly heavy, it's not uncommon for firms to operate their own short-haul airline service. Ford Motor Co. has several regular runs between plants. Several years ago Garrett Corp. inaugurated round-trip DC-3 flights daily between Los Angeles and Phoenix. Alabama Textile Products Corp., whose main plant at Andalusia, Ala., is off both air and rail lines, flies staff members and customers there or to five other plants in the South.

Usually, rather than substituting for airlines, such operations supplement them. Company planes tend to be slower than airliners, so for long trips they're used as feeders to the nearest main airline terminal. Phillips, for instance, reports that along with its own service, employees fly more than a million airline miles a month on company business. Radio Materials Corp. bought a light helicopter mainly for shuttling 130 miles from its plant to airline connections or offices in Chicago.

**Smaller Fry Greatest Users.** Of America's 100 largest corporations, at least 90 now own airplanes. Yet it is the smaller fry which use planes most intensively. Doctors, ranchers, contractors and others who can't send assistants to do their work are becoming increasingly dependent on their own planes. Many are their own pilots.

Dr. Ted Alexander, who has clinics in Wichita Falls, Kans., and Spur, Tex., flies his own Piper Apache from one to the other—and, like other doctors, has stretcher



space for ambulance service. Judge B. Rey Schauer of the California Supreme Court travels between Los Angeles, Sacramento and San Francisco in his own light plane. With ease, cowboy star Gene Autry, formerly a military pilot, and now a baseball magnate, has met such "impossible" schedules with his own plane as a 4200-mile 32-city tour in 32 days.

Even when a business can't afford its own plane, more and more it's apt to charter, lease or rent one. Many firms also enter into cooperative agreements for planes. At Newport, R. I., 14 companies share three small twin-engine craft retained from an independent operator. One intriguing venture has teamed National Life Insurance Co. with Rock of Ages Monument Corp.

Many firms, especially those with delicate stockholder relations, shun publicity about their planes, lest there be blind accusations of "extravagance." But most feel there's not only utility but prestige and promotional value in being progressive and successful enough to own aircraft. If customers are wooed in part by an air jaunt to a fishing lodge or the Notre Dame-Oklahoma game, it's considered worthwhile.

**What About Crashes?** Periodically, headlines tell of a business plane crash. Despite operating under all conditions, however, business aviation's safety record is generally good. Fatalities now are about 0.7 per million passenger miles, compared to 2.7 for passenger cars. The passenger fatality rate is 1.12 per 100,000 flying hours, compared to 3.78 for the airlines.

Business pilots, themselves men in gray flannel suits, usually have military or airline flying experience. They're paid up to \$15,000 a year plus fringe benefits.

New maintenance and modification centers make servicing convenient anywhere in the nation. Skymotive has a new \$1,000,000 terminal at O'Hare Field, Chicago, including conference rooms, lounges and private offices for pilots. At Montauk, Long Island, two years ago a Sea and Sky Portel was opened for business pilots.

Van Nuys, Calif., Airport, a 460-acre facility operated by the City of Los Angeles solely for business flying, probably is king of such centers. Larger than Chicago's Midway or New York's LaGuardia, it's the base for some 600 business planes.

**When Will the Boom End?** "There seems to be no limit to the number and variety of aircraft that business can use in the future," says William C. Wold of New York, whose firm bearing his name is one of the largest multiengine airplane brokerage firms. "We're setting up purchase plans unheard of a few years ago."

(Continued to page 234)

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Operating by infrared radiation and using no chemicals, the new Ditto Masterfax will make copies from any typed, printed or drawn matter with no special preparation. The unit is the first single machine which produces masters for the Ditto direct process duplicators, masters for offset duplicators, facsimile copies and a tough plastic coating to protect papers. Masterfax operates anywhere, from a 110-volt outlet.

One survey showed only 10 percent of companies which can profitably use their own planes now do so, particularly smaller craft. More used planes are becoming available as airlines upgrade to jets. Also the selection of new planes is increasing regularly. Cessna, the leading maker of civilian light planes, plans to increase its present 12-plane line to 15 by 1964.

In the jet field, Beech scooped the market by importing the Morane-Saulnier from France in 1955, then arranging for commercial delivery beginning in 1958. Powered by two Turbomeca Marbore II engines, the \$210,000 Morane cruises at 25,000 feet, with a range of 1000 miles.

North American also has developed a medium-price jet, the 500-mile-an-hour Sabreliner, whose twin GE J-85 engines take it as high as 41,000 feet, with a range of 1500 miles. Carrying a probable price of nearly \$300,000, the Sabreliner's commercial future hinges on Air Force contracts.

Volume production of Lockheed's Jet-Star and McDonnell Aircraft's 119, both in the 10-passenger, 600-mile-an-hour jet class (costing approximately \$1,000,000) also awaits Air Force contract decisions. Lockheed, however, had 30 orders last winter and 10 JetStars in production. Low interior noise levels, lack of vibration, economy on long hops and safety—the JetStar has taken off and climbed to 20,000 feet on one engine—apparently make the jets worth their \$1,000,000 tag to many.

### New Turboprops

In the turboprop category, Fairchild has introduced the 16-passenger, high-wing, pressurized F-27 Friendship, powered by two Rolls Royce Dart engines. Its 280-mile-an-hour speed, ceiling of 28,900 feet, and range of 2250 miles have already attracted prominent customers, despite a price of some \$750,000. Grumman also has entered the turboprop market with the \$900,000 Gulfstream, also powered by twin Rolls Royces, a 12-passenger ship with a speed of 350 and ceiling of 25,000.

Last year Beech announced plans for a new twin-engine turboprop in the 400-mile-an-hour speed class, with a price of under \$500,000. Convair's twin-engine 240 series also is available convertible to a turboprop version, model 540, with a speed of 325 miles an hour. Vickers' Viscount (330 miles an hour) and Lockheed's Electra (420 miles an hour), both four-engine turboprops, also are available for business use. All three are in the \$1,000,000 class.

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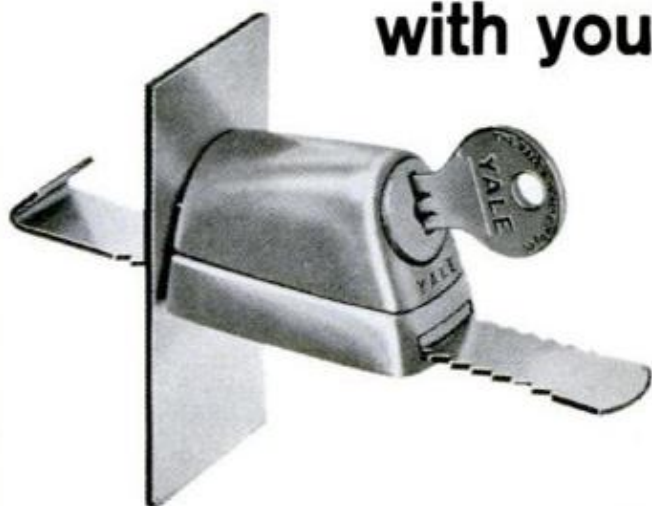
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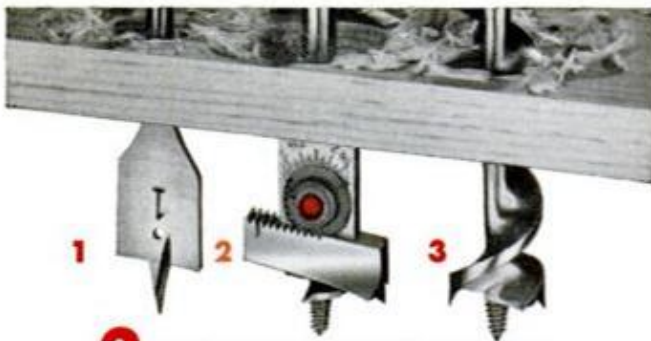
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## New Plants on Order

(Continued from page 133)

term for plants with doubled chromosomes) had unusually large flowers and strong stems. This was a great improvement over other marigolds at the time it was introduced. Burpee breeders continued to experiment with colchicine, and in 1946 introduced the Tetra Snaps, a glorious mixture of the largest-flowered of all snapdragons. Next to appear will be new colors in zinnias, in addition to those already introduced through the use of the magic drug.

Flower breeders found that when the number of chromosomes is doubled, desirable changes sometimes occur—such as strong stems, darker green foliage and larger flowers, sometimes attractively ruffled.

Experiments at Texas A. & M. College reveal some good possibilities that better grain sorghums can be obtained by using colchicine to cross wild sorghums with sorghum hybrids.

Japanese breeders have been unusually successful with watermelons. An outcome of their work has been seedless melons; that is, what seeds they have are small and very soft. Yields have been doubled in some trials, and these watermelons have been on the Japanese market since 1949. Japanese breeders have also been successful in breeding larger sugar beets and radishes by using colchicine. Sweden has released some improved varieties of clover, rye, turnips, dill and spinach.

John Long, agronomist at Texas A. & M. College is conducting experiments with St. Augustine grass. If trials are successful, it may be possible to grow it on lawns further north than the traditional region along the warm Gulf Coast.

As these large-scale experiments and commercial developments prove, colchicine can yield spectacular results. You can be sure of one thing when you try it: Good or bad, you'll get *changes* in plants. ★ ★ ★

## Polaroid Pack Makes Negative And Print in 15 Seconds

Polaroid negatives, as well as prints, can now be produced in 15 seconds with a new 4 by 5 film pack. Previously, Polaroid film packs made only prints, not negatives.

The new negatives are fine grained and can be used to make huge enlargements. Before use, they are washed (in room light) to remove the developing chemicals, then dried. They can be washed in plain water, but it is preferable to use an acid hardener bath first to harden the emulsion. The Type 55 P/N (for positive-negative) film has an ASA rating of 100 for daylight.



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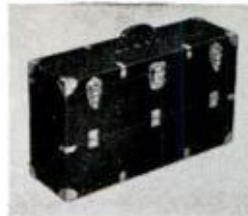
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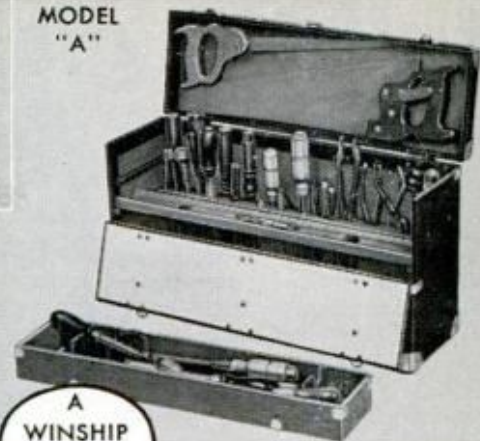
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## I Fly Kites With the Champ

(Continued from page 141)

Actually, our cellar ceiling looks like a backstage rigged for a 12-act puppet show. It is a jungle of colored fabric, delicate rice paper, sticks and spars, and networks of tangled string. Among the more curious wonders are the Brazilian falcon kites, or "Papaguyos," Japanese fish kites, diamond-shaped Indian "fighting kites," Chinese dragon kites, frameless nonrigid kites, and parachute kites—to name a few.

Dad was one of the pioneers in the use of a fishing rod and reel as a handy tool for lofting and controlling kites. "I'm too old to put up a kite by running with it," he explains. "And this is a great system for middle-aged guys who wind easily." Watching him whip a kite around on the end of a fly-line, skimming the ground until it catches a breeze and soars aloft, is as satisfying as watching a good fly fisherman at work. "It's the same idea," he says.

### Simple and Effective

The system is simple and effective. Any fly rod or casting rod will do, with an ordinary reel (not a spinning reel)—the size depending on the size of kite. The highly flexible tip section of the rod is removed, and the kite's lead string is hooked to an ordinary lure swivel on the end of the fishing line. By pointing the rod downwind and flipping the kite from side to side, Dad can literally "cast" his kite into the air and play it skyward, using his thumb as a brake on the reel drum, much as a fisherman.

You can't associate with Will Yolen for long without soon learning that kiting is more than merely lofting a rhomboid-shaped piece of tissue paper in a March wind. There are kites . . . and kites; some simple, some complex and ingenious. But one of the most fascinating is the Brazilian "Falcon." It is a creation of sturdy fabric, shaped like a big bird. It has a wingspan of some eight feet. Wood dowel wing spars are hinged to the central framing shaft, so that the wings adjust themselves in up or down position to varying air currents, giving it a remarkably birdlike appearance in flight. In Brazilian contests, fishhooks are fastened to its wing tips. Expert kite flyers maneuver them in long, swooping dives, skimming the ground so that the fishhooks pick up rags or bits of paper.

Probably the most unlikely looking kites are the Chinese fish and dragon varieties. Instead of presenting a single plane, or a combination of flat planes, to the wind, they are constructed in tubular form. Some of the dragons, resembling gaudily painted

(Continued to page 240)



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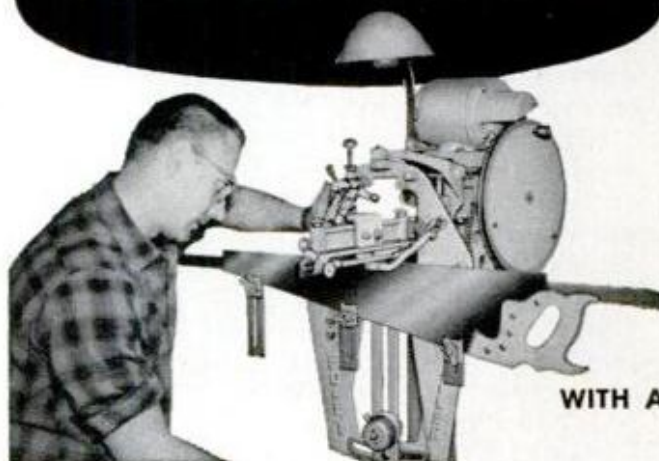
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tissue-paper fire hose, may reach 30 feet in length. An odd thing about these kites is that they are usually flown on the lead line of conventional kites. The hollow fish or dragon is strung by a ring on the line of an already lofted conventional kite. Then, a combination of wind pressure and expert juggling of the lead line can make the "fish" or "dragon" slowly crawl up the string.

In most nations of the world, kiting competition involves only seeing who can get his kite highest and keep it there longest. But, in India, my father ran into a more aggressive form of the sport. Indians have what they call "fighting kites." They are shield-shaped affairs, measuring about two feet across, constructed of rice paper glued to a delicate frame of thin bamboo wands. The odd little kite flies with a rapidly oscillating motion that has a sinister purpose. Around the rim of the frame, Indians may attach razor blades. The idea is for an expert to maneuver his kite right up to a competitor's sail and slash it to ribbons. Even more subtle is the Indian practice of using a line impregnated with ground glass. With this, the Indian can cross a competitor's line and, as his kite oscillates, it will saw the other fellow's line in two. "The idea," says Dad, "is that if he can do this, he gets to keep your kite."

In addition to Ben Franklin's electrical experiments, Science has often used kites. Dr. Alexander Wilson flew an 18th-century weather missile consisting of a thermometer and a kite. Alexander Graham Bell pioneered heavier-than-air flight with giant tetrahedral kites. And the first successful trans-Atlantic radio signal was received on an antenna flown by a kite.

Although Dad is fascinated by the history and variations of kiting, he is most enthusiastic about a kite on whose nonrigid sail may rest the future of flight. The unusual Flexkite, as it is called, first came to my father's attention 10 years ago in Virginia when he met its inventor, Dr. Francis Rogallo, one of the 1961 men of science who explore the unknown on the tail of a kite. As chief engineer in the wind tunnels at Langley Air Force Base in Virginia, he conceived the "nonrigid" kite in an attempt to build an almost indestructible flying object. Traditional kites, snapped their fragile ribs against the walls of buildings or had their cloth sides ripped by the winds. To avoid this attrition, Rogallo designed a kite consisting of a simple, flat square polyester film, almost impossible to tear. Even though the material it is made of is only two to five thousandths of an inch thick, it has a tensile strength roughly one-third that of steel. Gathered by strategically-placed shroud-lines, the Flexkite forms a shape reminis-

cent of the paper planes children glide across the classroom. Unlike traditional kites which wobble their way into the air, the flexible kite billows out like a spinaker in a stiff breeze, and becomes a cleverly balanced air foil that can be guided through controlled maneuvers by manipulating the line on the ground.

**The future of air flight?** The nonrigid Flexkite was created to demonstrate an aspect of flight neglected in airplane design—the importance of flexibility to maneuverability of aircraft, particularly in view of today's speed demands.

In five or ten years, Dr. Rogallo has hypothesized, men may be flying in high-powered flexible planes, planes that could crash without being destroyed. Furthermore, although the rigid flying vehicle has been able to fly through the sound barrier, it has not been able to overcome the so-called "thermal" barrier. Rigid vehicles attaining maximum superspeeds destroy themselves by self-generated fire. However, the nonrigid vehicle, theoretically, would adapt itself to every aerodynamic situation and successfully pass through the "thermal" barrier as an orbital re-entry vehicle.

Paradoxically, kites have been used not only as instruments of peace, but in war as well. "Five thousand years ago," according to the Western Hemisphere's kite champ (my Dad), "a Chinese emperor, imprisoned in an enemy's castle tower, escaped on a huge kite that a friend sailed up to his window."

A Korean General, centuries ago, sent a lantern up on a kite, to inspire his superstitious troops. British observers in the Boer War, and Union spies during the Civil War, were sent aloft on kites for espionage missions. During World War II, this German Weser Fluezenwerk organization used 200 one-seater kites as flying periscopes for submarine duty. With a 12-foot wing spread, they were manned by so-called volunteers, who scanned the ocean for Allied convoys. In an emergency, cords of the kite were frequently cut, consigning the hapless pilot to the sea.

A history full of such colorful anecdotes has made kite flying a revered if somewhat forgotten sport, business and deadly game. And new interest in kites is cropping up everywhere. A record 35-million kite sales were recorded last year.

It is not too large a leap from the meditative sport of kite flying to the theoretical science of kite flying. From the simple kite have come new discoveries for both war and peace. The air and airwaves are ours, in fact, because of the magic of a colorful toy. Has science pulled man up by his bootstraps—or his kitestrings? ★ ★ ★



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## The "Significant Twelve"

(Continued from page 106)

later, is at the upper right of the painting. **TAYLOR-PIPER CUB**—The original E-2 model shown in the painting had a 37-hp. engine, a cruising speed of 50 m.p.h. and a range of about 200 miles. Mostly, though, it gave Mom and Dad a chance to do what they had only read about previously—fly. It was also a shot-in-the-arm to an industry of private-aircraft builders.

**DOUGLAS DC-3**—The first airliner that could make money just hauling passengers, the DC-3 freed airlines from government subsidies. Originally conceived as a luxury sleeper for American Airlines, it was found that, by removing the berths, 21 passengers could be accommodated. As the wartime C-47, however, it hauled as many as 74 people, including Lt. Gen. Jimmy Doolittle on his way back from Tokyo.

**SIKORSKY XR-4**—Thomas Edison was the first to predict that, sooner or later, an aircraft would be built that could "go straight up, straight down, frontwards, backwards and sideways, or stand still in mid-air." Many men tried it—notably the Spaniard, Juan de La Cierva, who invented the autogyro—but Igor Sikorsky produced the first truly practical hovering aircraft. His XR-4 with its cyclic-pitch control was as significant in this field as the "Kitty Hawk Flyer" was to airplanes.

**BELL X-1**—Most publicity photos of this rocket ship show it painted white. On the day it broke the sound barrier, however, it was orange-colored, contrasting with the deep-blue sky at 60,000 feet where it made history going up at a 60-degree angle. The mother ship is a B-29.

**De HAVILLAND "COMET"**—Shown entering Honk Kong harbor in the painting, the "Comet" is the plane that introduced jet travel around the world. Its early structural defects led to an engineering breakthrough in the field of static testing.

**BOEING 707**—The first of the "big three" jets, which include the Douglas DC-8 and the Convair 880, the 707 was actually developed from the Air Force's B-52 bomber. Like the DC-3, it's an airliner that can pay its own way flying passengers.

**NORTH AMERICAN X-15**—The panel's choice for the "thirteenth" most significant aircraft. At the time the panel met, the X-15 had not yet set the new world speed and altitude marks, but the potential was there. The panel felt that, as aeronautics merges with astronautics, the X-15 will lead the way, flying higher and faster than anything previously. The significant twelve are the present and past. The X-15 is the future. ★ ★ ★



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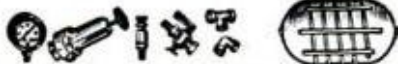


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## When to Change Oil

(Continued from page 93)

experienced maintenance supervisor, was put in charge of the garage.

The cars, he found, had to be given major repairs and complete overhauls every 25,000 to 30,000 miles—a ridiculously short period.

A close look at the dismantled engines revealed frozen rings, fouled valves, rocker galleries so full of sludge that not even the addition of fresh oil was doing any good, and the crankcases and filters completely glutted.

### Pinpointing the Culprit

To pinpoint conclusively the irregular, high-mileage oil changes as the culprit, a series of tests were run on the cars by engineers of an oil company.

Under normal service conditions, the cars were run with special thermometers in the crankcase. Oil temperatures then were automatically recorded on a 24-hour graph. In every case, oil temperature rose to and stayed at or close to the 170 degrees required to effectively check most condensation of blow-by gases.

It should be noted, however, that the high average temperature of the air in Southern California has a lot to do with keeping

crankcase temperatures high and preventing condensation. A car operated in the Midwest with its long, cold winters would undoubtedly have more combustion by-product acids in the crankcase than those of the city of Long Beach, even though operating patterns might be identical.

Laboratory test samples from the crankcases, however, showed extremely heavy sludge content, grit, and an eight percent gasoline content.

It is significant that an eight percent gasoline dilution is enough to cut the oil's viscosity by 50 percent. This lowering of viscosity, or thinning of the oil, provided less lubrication at pressure points such as bearings and cylinders, thus increasing friction and rate of wear.

This dilution was due to engine wear, principally worn rings and valves. These were worn mainly because of poor lubrication, and having eliminated the other possible causes, this led right back to the need for periodic oil changes.

After 3000 or 4000 miles of driving, the cars were simply exhausting the oil's capacity to do its job. Taking into account the normal oxidation or "break down" that took place in the oil over a given time, plus the loss of the cleansing capacity provided by the oil's chemical additives, it was evi-

new

# Water Demon

Sprinkler and portable base with threaded hose connection, \$5.95



Sprinkler only, with 1/2" pipe thread for permanent installation, \$4.50

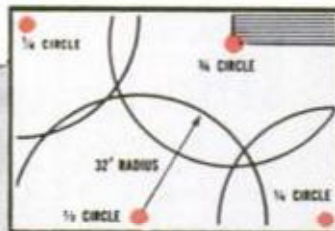
Dealer inquiries invited.

## AUTOMATIC SPRINKLER WATERS EVENLY, ANY AREA, ANY SHAPE, LAWN OR GARDEN

You can set WATER DEMON to water any part of a 64-foot circle. Under its own water power it sends a gentle, uniform spray back and forth, low to the ground, not easily blown away. Adjustable diffuser gives you finer spray or shorter distance as desired. All parts are brass or non-corroding materials. ONE YEAR GUARANTEE.



It works like a demon!



Write for free literature. Or order with cash or money order. Parcel Post collect. Add sales tax if required.

WESTERN BRASS WORKS, 1440 N. Spring Street, Los Angeles 12, California



dent that the oil was bound to "wear out" and become contaminated with impurities. The hard use to which the cars were being put only hastened the process.

On the basis of these findings, a rigid program of oil changes was instituted and every car was pulled in for a change every 1000 miles. At every other oil change (2000 miles), a new filter was installed. Oil used was SAE 20 high detergent.

### Doubling the Overhaul Gap

Results were excellent and conclusive. Instead of 25,000 to 30,000-mile overhauls, the cars now run well with 50,000 to 60,000 miles between major engine repairs. It is also very interesting to note that prior to the controlled oil change program, when the 8 percent dilution reduced oil viscosity by 50 percent, practical life of the engine was half that of properly lubricated cars.

The difference in operating costs of a car given 1000-mile oil changes amounts to between \$12 and \$16 per year more than that of a car whose oil is changed every 3000 miles. By doubling the interval between major overhauls, Chevront has saved the city \$300 per car per year.

The Long Beach fleet experience dealt with cars which were run on short trips

with a lot of stops and much idling. This is exactly the kind of driving to which the majority of privately-owned cars are being subjected.

As a matter of fact, the average police car's day involves about two hours' total idling and the remaining six hours are spent at city-traffic speeds of five to thirty-five miles per hour. Your car's average day comes fairly close to this routine, and though you may switch the engine off instead of idling, the low-speed, three-to-four-mile runs **do** make up the major portion of your driving.

Thus it becomes fairly evident that anyone interested in extending the efficient life of his car might well heed the recommendations of the American Petroleum Institute—an oil change every 30 days in winter, every 60 days in other seasons, with never more than 2000 miles between changes.

Even then, cars driven in the city should certainly get an oil change every 1000 miles. If a city administration using taxpayers' money can save \$300 per car per year on maintenance costs, then the driver who pays for repairs out of his own pocket should certainly take heed.

—Joseph H. Wherry

new

# PONY PUMP

**IS THE ONLY  
SELF-PRIMING 110V PUMP  
IN THIS SIZE AND  
PRICE RANGE**



110-volt A.C. finished in green. Pony Pump also available in 6, 12, 24, 32-volt D.C., each different color-coded.



Be sure it's a "Proven Pump"

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PROVEN PUMPS DIV., WESTERN BRASS WORKS, 1440 N. Spring St., Los Angeles 12, Calif.

THIS 5½-LB., 6" x 4" WORKHORSE will pump up to 250 GPH, raise water 20 feet, perform endless jobs for plumbers, farmers, campers, gardeners, boats, trailers, industrial plants. Its only movable part is a replaceable, durable, oil and solvent resistant impeller. 1/12 HP motor has automatic thermal overload cut-off switch, 6-ft., 3-conductor electrical cord. Shaft is stainless steel. Body is chrome plated cast brass. Ports are ¾" outside threaded for garden hose, with ⅜" inside pipe thread. **WRITTEN GUARANTEE WITH EVERY PUMP.**

**\$29<sup>50</sup>** F.O.B. LOS ANGELES  
Dealer inquiries invited.



Plumber's Time-saver



Flooded Basements



Many Industrial Uses



Big Help on Farms



## Owners Report on the Tempest

(Continued from page 76)

"There is pronounced drive-shaft vibration approaching 50 m.p.h. and up."—Pennsylvania salesman.

"I don't like the "floating motor" arrangement—the fan went through the radiator twice in a short time."—Minnesota technician.

"Has an annoying four-cylinder vibration at idle speed."—Ohio attorney.

**Vibration at low r.p.m. is the nature of the beast. Pontiac engineers have done an excellent job of smothering vibration of four cylinders over such a wide speed range.**

"Automatic transmission does not shift smoothly in cold weather until you've driven nearly five miles."—Wisconsin machinist.

"Very poor quality paint on the dash."—Virginia oyster cultivator.

"Outside paint is a bit thin in places."—Tennessee resort manager.

"The throwout bearing on the clutch has been giving me trouble for the last 5000 miles. I have returned it to the dealer four times so far and it's going back again tomorrow."—Massachusetts carpenter.

"Just can't keep a throwout bearing in the clutch."—Wisconsin contractor.

"Have had considerable trouble with the clutch, it's stiff and noisy."—Connecticut physician.

**The clutch proves to be a real problem for many Tempest owners. Trouble appears to stem from a bad batch of bearings or a combination of vibration from engine and drive shaft.**

Now, here are some additional best-liked features, ranking from seven through twelve in the order of mention.

"Excellent size and roadability."—Ohio executive.

"I thought it would be extremely difficult to get used to a car of this size after driving a big one for years. To my surprise, Tempest is an entirely new concept in driving—much more fun and exciting to drive."—Ohio printer.

**We pretty much agree. With stick shift and husky four-banger engine we found Tempest a real ball to drive on back country roads. It brings back "Model A" fun for middle-aged desk jockeys.**

"The car is small, but not too small."—New Hampshire machinist.

"Tempest is so easy to park."—Virginia realtor.

"Takes the hills and curves like a big car."—New Jersey secretary.

"Very good on curves and holds the road very well."—Ohio truck driver.

"Precise, easy, manual steering."—Massachusetts physician.

"Steering and handling excellent."—Minnesota salesman.

**Yes, under most conditions.**

"I live up in the snow country and find it handles fine on ice and snow."—Wisconsin clerk.

"Was pleasantly surprised at how it ploughed through ice, snow and mud. I wasn't stuck once this winter."—Michigan printer.

**Here's where moving the transmission to the rear payed off. It gets the weight back where you need it, like putting a bag of sand in the trunk.**

"I like to see where I'm going and the Tempest gives me good visibility all around."—New York retiree.

"I also like the instrument panel because when you are out of oil or low on water it shows up red and tells you what is wrong."—Iowa housewife.

**There are two sides to this question. Ladies like lighted warning signs because they can't translate gauge readings. Most men don't. Best bet would be both dials and panic lights, but that's costly.**

Back to the gripe column, here are some representative complaints covering items seven through thirteen in order of frequency.

"Heater heats only center of the car—left foot is always cold."—Wisconsin pressman.

"The lights on the dash panel only show trouble after it has happened and don't give prior warning. Need regular gauges."—Pennsylvania secretary.

"Prefer gauges to flashing lights."—Georgia milkman.

"Lack of headroom. I have trouble if I wear a hat—and I'm only 5'-8" tall."—Michigan auditor.

"Front seat could be deeper to give more thigh support."—Wisconsin salesman.

"To many small troubles—knobs fall off, lights burn out, when delivered and the front tires rub when turning short."—Michigan bookkeeper.

"Transmission fluid leaked out, shift lever fell off, am using second set of tires in rear, radiator leaks, carburetor gasket blew, exhaust manifold leaks, etc., etc., etc."—S. Carolina radio executive.

**Some days you just can't win!**

"Road rumble and piston slap noises at 50 to 60 m.p.h."—Ohio service manager.

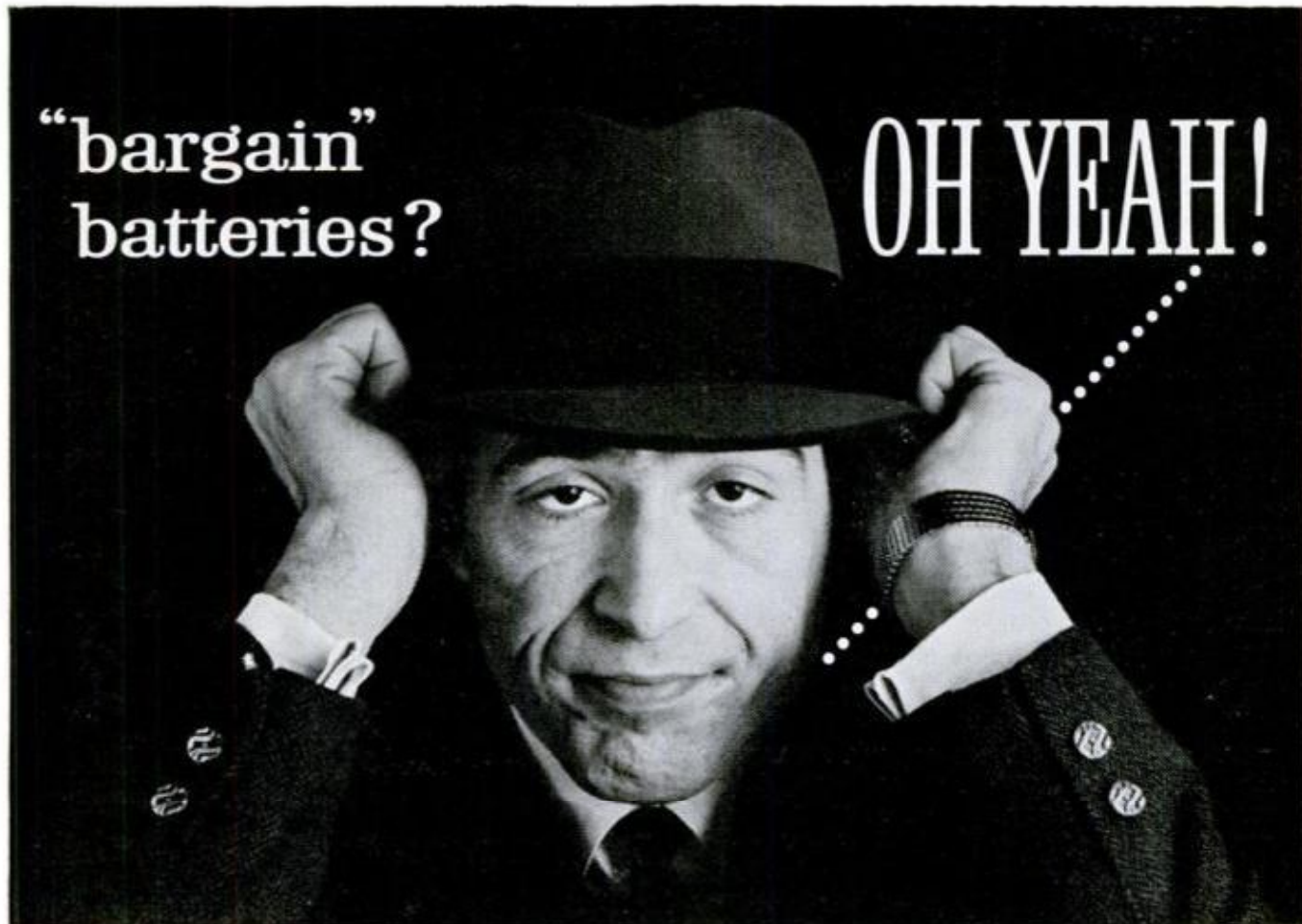
"Poor workmanship on the body."—Utah government official.

(Continued to page 248)



"bargain"  
batteries?

OH YEAH!



Why try to get by with a "bargain" battery. Save time, money and trouble with a dependable Delco DC-12 Dry Charge! You can figure this one out fast. What does it cost you to be late for work? A couple of hours missed because of a bad battery adds up to inconvenience . . . and money. You'll avoid such trouble with a sure-starting Delco Dry Charge Battery.

**ALL THE POWER YOU PAY FOR . . . DELCO!**

A Delco DC-12 stays bone dry . . . can't lose any "zing" on the shelf! When you buy it, the dealer adds the fluid that activates it with 100% fresh starting power . . . plus the reserve power required for modern automotive electrical equipment.

**YOUR BEST QUALITY BUY . . . DELCO DC-12!**

*Extra fluid capacity*—Less refilling, less danger of damage from low fluid level. *Hard rubber case*—Stronger, also resists heat distortion. *Microporous rubber separators*—More current flows between plates, means peak power at all temperatures. Ask your dealer about these and many other Delco quality features.

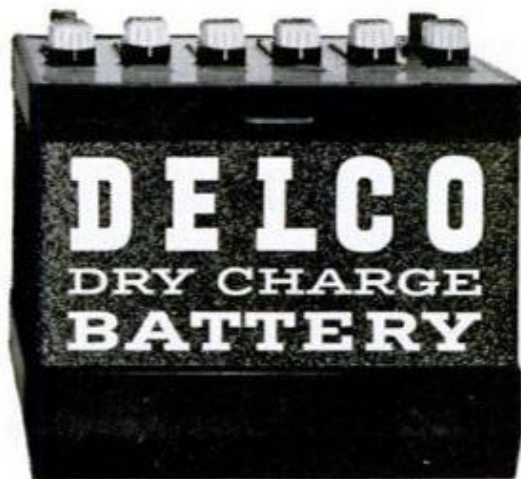
**A DEALER NEAR YOU . . . DELCO!**

He's a *local* businessman who appreciates your service business, wants to keep it. Automotive service is not just a sideline with him . . . it's his

*specialty!* He knows your driving needs, can recommend the right Delco Battery for your car.

**BE SURE . . . REPLACE WITH DELCO!**

For dependable starting in any weather, replace with 100% fresh Delco. It's "Designers' Choice" for new GM cars, survey-proved as "Drivers' Choice" for replacement, too. When it's time to replace your old battery, make sure you get a Delco DC-12!



**DELCO . . . "A GOOD NAME FOR GOOD SERVICE!"**

Another reliable  
General Motors product,  
distributed nationally through





"Nicely roadable except for over-steer in hard turns."—New York accountant.

"Tremendous handling at all speeds, except for dangerous over-steer on hard turns."—Ohio salesman.

"Violent over-steer in hard turns."—New York accountant.

**This is penalty paid for relatively heavy, slow-steering front end combined with the characteristic rear wheel steering action of "swing axle" independent rear suspension.**

"On snowy, icy roads car 'fishtails' very much and easily."—Maryland clergyman.

"Body rumbles on a long trip make my ears ring."—Iowa farmer.

"I am annoyed by the strange 'tree-frog' sound, apparently near the base of the steering post (its pitch is about treble-F). Dealer's service department claims it can't hear it."—Texas editor.

**What next? Should mechanics carry tuning forks in their tool kits?**

"Low gear is not synchromesh—at slow speed second gear is not enough, so most of the time I have to stop dead to get low gear."—New Jersey insurance agent.

**Synchromesh low would be a great idea on all U.S. manual transmissions, but would cost a few dollars more. Manufacturers have felt that stick-shift buyers were penny pinchers so have kept it off.**

*And here are the final complimentary comments in order of mention, numbers thirteen through twenty.*

"Good general, over-all roadability—particularly in city driving."—Ohio mechanic.

"You get a big-car ride in a small car."—N. Carolina draftsman.

"Nice tight body construction, good paint and love that leather interior."—S. Carolina printer.

**Tempest's body is solid and upholstery is nice, but it ain't leather at \$2167.00!**

"Body is very tight—almost completely free of rattles. All four doors shut tight."—Iowa radio operator.

"The interior has the look of good quality."—Florida telephone man.

"Workmanship on this car is tops. I've had no mechanical trouble—not even a rattle."—Minnesota farmer.

"I'd say they hadn't skimmed on the interior trim—this is a nice interior design and fine styling."—Maryland engineer.

"I like the way the car is balanced, with the transmission in the rear."—Iowa plant manager.

"What I like about the Tempest is the way it is balanced."—New York mechanic.

"It is well balanced and sufficiently heavy so that it stays on the road in heavy winds."—Ohio social worker.

**We found this to be true. Tempest has good directional stability on smooth, straight roads.**

"Brakes are excellent and I have a nice feeling of control over the vehicle."—Nebraska executive.

"Tempest has a fine set of brakes—quick acting and positive."—Wisconsin dairy inspector.

"I like the location of the parts of the engine, making it possible for a man to do his own maintenance."—Michigan mechanic.

"I like very much the accessibility of all parts—makes for easy servicing."—New York earth mover.

"The fifteen-inch wheels give me more clearance than other makes of light cars."—Michigan supervisor.

"The fifteen-inch wheels make the car handle better."—Nebraska farmer.

"This floor stick shift is so easy to use."—Ohio assembly man.

**And so much fun, too!**

*For the final short list of complaints, here are items fourteen through twentyone.*

"The car bounces too much on bumpy roads. Should have more road clearance."—Connecticut grinder.

"The car is too light for handling on bumpy roads."—Michigan butcher.

**It's not the lack of weight that's bothering the butcher, but some characteristics of Tempest's suspension design.**

"Seating posture becomes uncomfortable after little more than an hour's driving."—Illinois music director.

"My gas pedal keeps sticking on swivel linkage."—Minnesota service station manager.

"Poor gas linkage. Freezing ice and snow cause pedal to stick."—Maryland steel worker.

"The speedometer does not operate right in near-zero weather."—Ohio tool maker.

"Gasoline gauge is deceiving—shows full when brakes are applied, empty when going uphill."—Minnesota retailer.

"The drive shaft is a little noisy."—California sheet-metal worker.

**Yes it is, but the noise in PM's two test cars was not obnoxious. More insulation around the support bearings could be the answer.**

"Low-slung gas tank appears too prominent from the rear."—Georgia postmaster.

"Poor bumpers, not low enough."—Wisconsin optometrist.

**True of Tempest and several other cars. Designers forgot that compact cars still need protection from "full-sized" bumpers.**

*There you have the Pontiac Tempest as its owners see it; a car with a lot to like which sometimes gets to its owner with some unhappy characteristics.* ★ ★ ★



G-1 150-250 amp Recond \$19.50 Good \$12.95  
 R-1 300 amp G.E. Recond \$24.50 Good \$16.95

Accessories Kit For Arc Welder for above generators has helmet, gloves, elect. holder, volt reg. rheostat, volt-meter, Gr. Clamp, including switch & R. C. relay \$17.50 with G-1 Gen. \$27.50  
 Kit With G-1 160-250 Amp Gen. plus 30' cable & reactor coil \$36.45

Multi-Weld<sup>®</sup>, D.C. Arc Welding Kit Complete with G.E. R-1, 300-350 amp gen, incl. accessory kit reactor coil w/solenoid control \$47.50

AC-DC WELDER KIT #511 G.E. Generator. Makes 1250 Watts AC light plant and 200 amp. DC welder and battery charger. Includes all items listed in accessories kit. AC-DC generator & instr. \$38.50

V Belt Pulley Kit fits all gen. has 2 B. bearing blocks, 2 H.S. bearings, 3 V pulley shaft 3/4"x8" & coupling \$17.50

Dual Power Battery Motors Kit for cart, winch etc. fully reversible. Runs on 24-12 V DC has 2 motors each 1/4 H.P. 23 3/4" bore, 9 1/4" stroke; 4 way control valve; tank; filter; hose & fittings—\$75.40 value \$49.95; with 3"x10 1/2" cyl. \$56.50

**HYDRAULIC CYLINDERS**  
 Navy Duty 2000 P.S.I. air-oil

Bore	Stroke	D. Shaft	Long	Double Action
1 1/2"	4 1/2"	1 1/8"	10"	3 1/2 lbs. \$ 3.95
1 3/8"	2 5/8"	1"	3 3/8"	11 lbs. \$12.95
1 1/2"	8 1/2"	3/4"	13"	8 lbs. \$ 7.95
2 3/8"	10"	3/4"	19"	7 lbs. \$10.95
2 3/8"	13"-18"	1 1/4"	30"	11 lbs. \$17.50
3 1/2"	8"	1"	20"	12 lbs. \$16.85
3 3/4"	16"	1 3/8"	24"	30 lbs. \$34.75
4"	18 1/2"	1 5/8"	30"	30 lbs. \$36.50
4 1/2"	4 3/4"	1 3/8"	16 1/2"	17 lbs. \$18.50
4 7/8"	8"	2"	22"	35 lbs. \$32.50

Hyd Accumulators 3000 P.S.I. 50 Cu. in. 11"x 3 1/2"—6 lbs \$8.95. 100 Cu. in. 21"x3 3/4"—13 lb \$12.95. 200 Cu. in. 36"x3 1/2"—15 lb \$14.50

NEW HYDRAULIC PUMP-MOTOR SYSTEM KIT Offers fluid drive of varying power, consist of 2 new Vickers p.d.s. pumps ea. .410 cu. in. rev. 3750 RPM 1000 PSI 375 GPH where one pump is belt driven as motor, 1 four way c. valve with variable speed control, reservoir, filter, gauge, hose & fittings. Value \$98.10. \$57.50

HYDRAULIC HEAVY DUTY LIFT KIT, Has 1 Stratopower hyd. pump .450 cu. in. 1400 PSI. drive from engine or power take-off; 1 D A cyl. 2 3/4" bore, 9 1/4" stroke; 4 way control valve; tank; filter; hose & fittings—\$75.40 value \$49.95; with 3"x10 1/2" cyl. \$56.50

24-12V. D.C. Electric Hydraulic Lift Kit. Ideal for operating light blades, plows, etc. which require lifting, turning, push & pull. Has 24-12VDC. reversible motor, D.C. reversible electric pump, rated 1000PSI, 1 D.A. cylinder 2 3/4" bore x 7" stroke, 1" shaft, oil reservoir, reversing switch. Max. lift. cap. 900 lbs. 3 Way solenoid valve, hose & fittings. Size 15"x10"x10". Wt 40 lb \$49.50

Big Vacuum/Air Pump Outfit. Bendix 4 vane, reversible 17 CFM at 2250 RPM. 7 1/2" suction, 18" HG pressure max. Includes tank, suction gauge, hose & pump mount ready for driving with belt or pulley (requires 1 1/2 HP). Size 16"x12"x8". Wt. 30 lbs. O. C. \$135.00 kit price \$47.50

NEW HYDRAULIC SYSTEM KIT #400 K heavy duty Power driven, rated 16,000 lbs. lift. Consists of 2 D.A. hyd cylinders 3 1/2" bore x 2 1/8" stroke ea. rated 8000 lbs. with 1000 PSI, 1 four way hyd control valve with built in relief = 821, 1 Vickers hyd pump 375 GPH 1000 PSI 3750 RPM, filter, gauge 2000 PSI, hose & fittings. Value \$169.95 \$79.95

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For LIGHT DUTY Household Tacking!



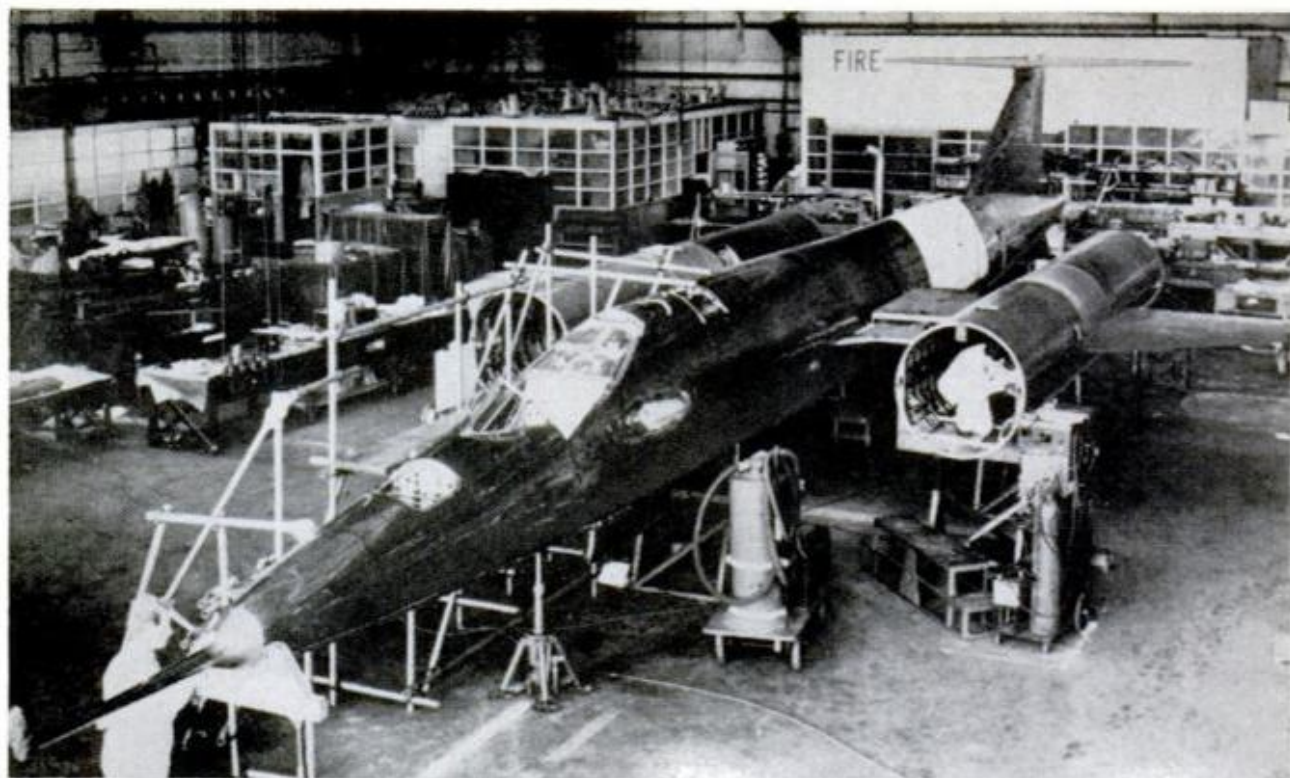
Light . . . compact . . . easy to operate. Ideal for housewife for making valances, lining shelves and closets, tacking curtain tie-backs, etc. Uses 1/4" and 3/16" staples.

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## Mach-3 Stainless-Steel Jet

Designed to break aviation's heat barrier, the new British-made T-188 will fly at speeds of more than 1500 miles per hour. Unlike rocket-propelled aircraft (such as the X-15) which fly faster but are launched from "mother ships," the T-188 will take off under its own turbojet power from conventional runways.

Capable of withstanding temperatures of more than 200 degrees C., this Bristol ship is constructed of welded stainless steel, made by a process of rolling sheet metal into tapered skin thickness. Steel was chosen to meet the extreme conditions.

## Reflective Road Markers Light Motorists' Way

Driving through rain, fog and darkness may soon become less arduous as a result of a new lane-marking system developed by American Marietta Company of Chicago.

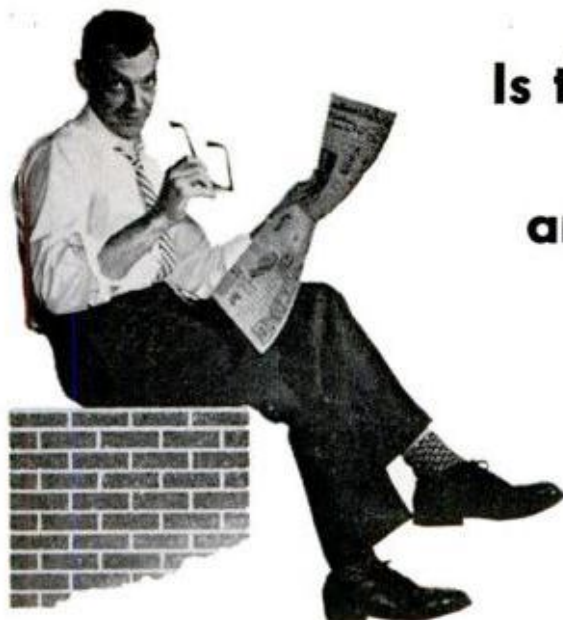
The nucleus of the system is a four-inch plastic disk bonded to the road surface. Tiny glass beads are equally dispersed throughout the disks to make them brilliantly reflective when exposed to auto headlights. Made with a low profile to allow rain water to drain off, the markers remain visible under conditions which make conventional stripes disappear. The disks are high enough to produce a bumping sound under car wheels should a driver inadvertently cross over from his lane, without offering impact hazard which would endanger driver control.

## Recommends Eye Examinations For Preschool Children

All children should have a complete eye examination before school age to detect any bad habits or abnormalities before they become too severe to correct, according to Dr. Owen C. Dickson of the University of California medical school.

If a child's "controlling eye" is on the side opposite the hand he uses, symptoms of poor visual imagery and memory, reversals in reading and writing patterns and mirror writing may occur. These can be relieved, if detected, by corrective glasses or by limiting hand actions to the corresponding hand. Other defects, such as tumors which require immediate attention, may become so pronounced by the age of five that any corrective measures taken may have no effect.





## Is the top of your chimney the warmest place around your house?

*Stack temperatures are cut as much as  
200 degrees by this new Iron Fireman  
CUSTOM Mark II oil firing with  
VoluMetric Combustion*

Saves fuel? Of course! When you stop that much heat from blowing into the sky you've *got* to save fuel . . . lots of it.

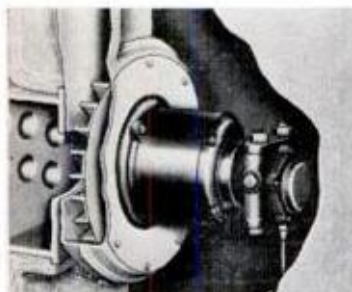
### **Saves fuel, eliminates smoke and soot, substantially cuts service costs**

Mr. Francis Woodworth, Center Junction, Iowa, tells us: "This is the furnace that cut my fuel bill in half. It operates without smoke, soot or odor. The service expense so far is nil." Hundreds of such letters report fuel savings of 18 to 50 per cent. How is this accomplished? First, VoluMetric Combustion not only reduces stack temperatures, but it practically *stops standby loss* (furnace heat lost through the chimney during "off" periods when the burner is stopped), which is the most serious waste of all. Second, the moment the burner starts, it transfers

heat into the system at the full maximum rate. No "warm-up" period; no delay while refractory heats. CUSTOM Mark II heating systems respond more quickly and shut off more quickly. Third, it burns fuel completely—no residue of smoke or soot, even when starting in a cold firebox. You prevent this waste, and also cut service troubles to almost nothing, because soot causes about 90 per cent of service calls due to coated heating surfaces, fouled electrodes, carboned oil nozzles.

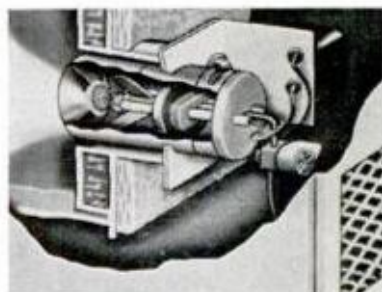
*Mail coupon for further information, sent free.*

### **HERE'S THE SECRET OF VOLUMETRIC COMBUSTION**



Natural chimney draft is erratic, undependable. The Combustion Flow fan (left) creates its own draft. *No chimney draft is needed*—simply a vent pipe through the roof (local codes permitting).

At the start of the firing cycle the fuel and air injector (right) supplies excess air to insure *complete* combustion. As the furnace warms up the air supply is diminished. A natural draft burner cannot make this critical adjustment and therefore starts with an air-starved, smoky flame. (Fifty or more starts a day).



CUSTOM Mark II fuel economy is due partly to its smokeless, sootless flame (smoke and soot are unburned fuel), and partly to its sealed combustion chamber which prevents the loss of furnace heat through the chimney or vent after the burner turns

off. No other firing system has ever eliminated this serious standby loss. Iron Fireman CUSTOM Mark II oil firing is available in a wide range of sizes for warm air, steam or hot water heating in homes or small commercial installations.

**CUSTOM Mark II heating — white glove clean**



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HEATING AND AIR CONDITIONING  
ELECTRONIC EQUIPMENT  
CONTROL INSTRUMENTS  
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(Continued from page 89)

through application of heat. The soft, "green" tires are placed into the steel curing molds which give the casing its final shape and impress the tread design.

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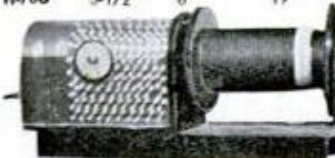


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# AN OPEN LETTER

■ On April 13 the well known Autolite lines of spark plugs and batteries were purchased by Ford Motor Company. These products will continue to be available to all motorists as conveniently as before. The Ford Motor Company is proud to announce this addition, which makes their present line of automotive parts the most complete and versatile they have ever offered. If you own a car you will no doubt be interested in some of the unique advantages these products have to offer. They are listed below.

**IS THERE A REAL DIFFERENCE IN SPARK PLUGS?** One of the most important things about a spark plug is something you can't see. The way the steel shell is sealed to the insulator. A proper seal here is essential to prevent the compression in your engine from leaking out through the spark plug itself. To prevent this kind of leakage, all modern aircraft spark plugs are heat sealed



under tremendous pressure. So are all racing plugs, and the spark plugs the armed forces buy for severe service. Yet, in spite of this important evidence as to the effectiveness of heat sealing, more than half the automobile spark plugs sold in this country still use a powder seal. Autolite heat-seals every spark plug it makes. That is why Autolite Spark Plugs will not leak under the most severe driving conditions. This

added protection against leakage is just one good reason to put them in your car.

**ON CUTTING THE COST OF CITY DRIVING.** City traffic is murder on spark plugs. They get fouled with carbon fast. Lose efficiency, waste gas. That's why Autolite engineers spent five years developing a new kind of spark plug that cleans itself while you drive. It's called an Autolite Power Tip. Here's how it works. The main difference lies in the firing tip. It is longer than



# TO EVERY CAR OWNER FROM AUTOLITE. NEW MEMBER OF THE *Ford Motor Company.*

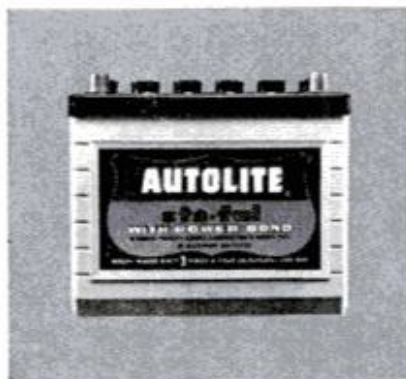
usual. It extends deeper into the exploding gasoline in your engine. As you drive, fouling carbon is actually burned off the firing tip by each explosion. If you've had trouble with fouled spark plugs, next time give Power Tip a try. They're made for all cars with overhead valve engines. And that includes more than 90% of the cars on the road today.

**THE CASE FOR THE NON-THIRSTY BATTERY.** If you're sure your service attendant checks your battery every time you get gas, perhaps you don't need an Autolite sta-ful® battery. If you're not sure, read on. Low water level is one of the best and fastest ways to kill a battery, any battery. Because when the plates in your battery get dry, the power-producing paste on the plates cracks and falls off. When enough of this paste collects at the bottom of the battery case, it shorts out the

cell and the battery goes dead. That's why we make Autolite sta-full batteries. Our sta-ful batteries have up to three times as much water above the plates as ordinary batteries. They give you up to three times the protection against drying out and premature battery failure. Men: Even if you're sure you have the battery checked, are you sure your wife does? Why not play it safe with Autolite sta-ful. The battery that normally needs checking, filling only three times a year. They cost no more than ordinary batteries.

■ Whatever make of car you drive, next time you need service remember the name Autolite. Be sure to look for Autolite Spark Plugs, heat sealed to prevent compression leakage, and the Autolite sta-ful battery, with up to three times

the extra liquid reserve of ordinary batteries. Both new members of Ford Motor Company.



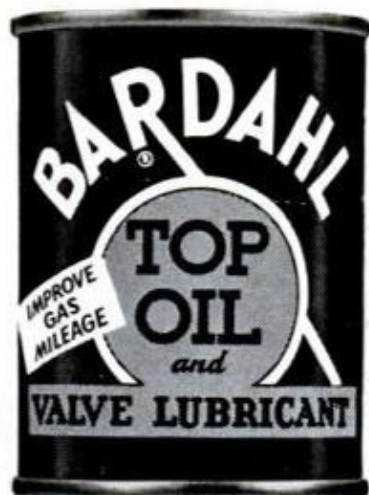




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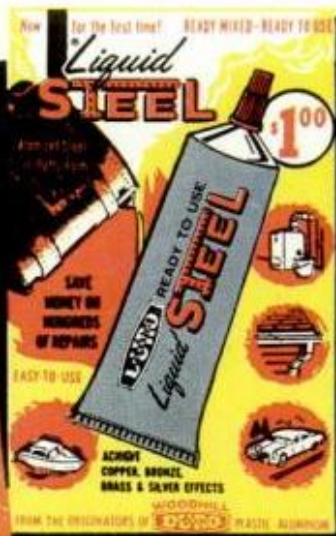
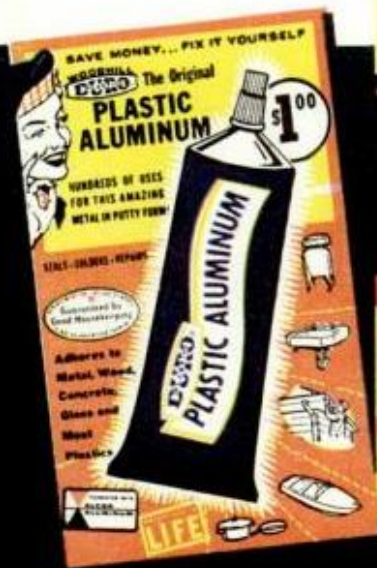
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