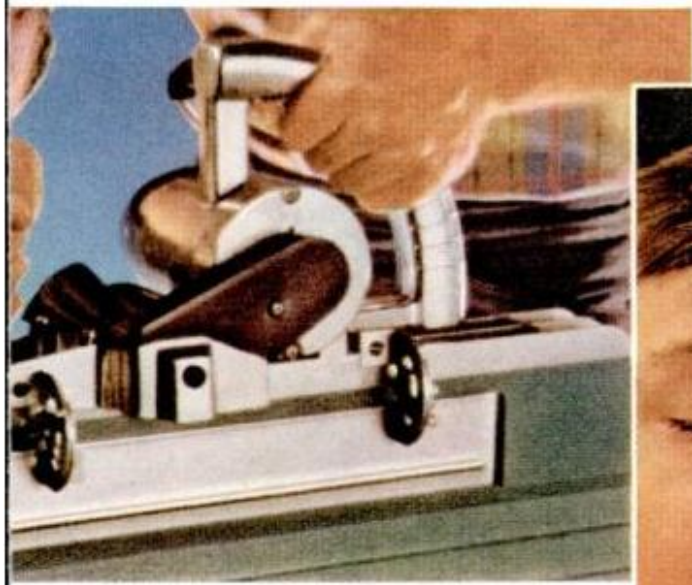


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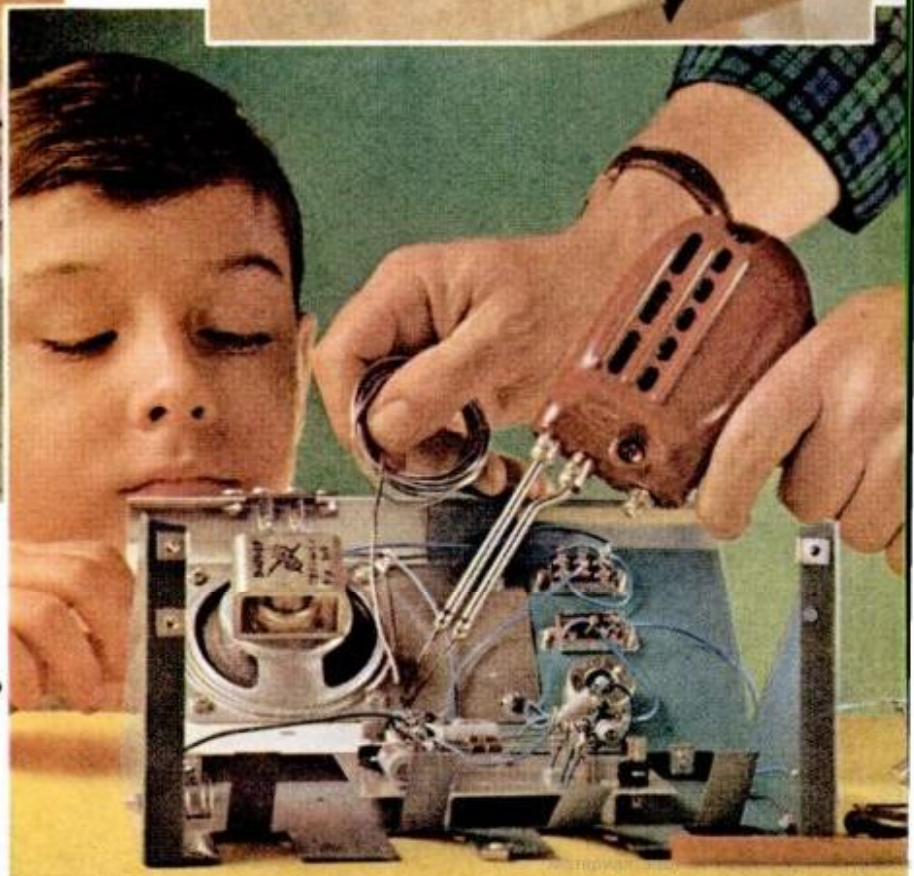


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Nothing on the market to equal this sander at a price even close. Sands coarse or smooth surface. Almost dustless, weighs only 7 lbs. Open on one side for flush work. Belt turns at 850 Surface Ft. per Min. Includes 3 belts, coarse, medium, fine. Model 910. **\$44.95**

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Gets into hard-to-reach places. Makes flush wall and floor cut-outs. UL "Industrially Rated," 1/2 HP motor. Seven blades included to cut any material from 6" logs to delicate patterns to heavy gauge metal and pipe. Model 920. **\$44.95**



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First ever priced. Eliminates sticking windows, does cabinet work. Great and surface plane to 45°. Model 930.

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Special Issue

- **The Plane With Teeth in its Wings**

—it cruises “no hands” at 26 miles an hour, turns at thirty without losing altitude and finally “lands on a silver dollar”

- **What a Junket on a Junk is Like**

—a modern sailor takes you cruising under collapsible sails and stormproof lines on the stoutest marine design since the ark

- **How to Bruise-Proof a Playground**

—a hatful of tricks includes slings for swings, short-fall planning and soft, comfortable paddings like tanbark underneath

- **The Varmint Gun That Went to War**

—amazing story of the .22 caliber AR-15 that is giving the military's famous, established 30-caliber M-14 a run for its life

- **Can Your Brake Fluid Kill You?**

—not if it's legal. But brakes still fail due to bootleg fluids. Here are the tests that will enable you to spot them . . .

- **Stretch the Life of Your Camping Gear**

—these simple tips involving talcum, oil and tape at stow-away time can add years to the life of your outdoor equipment

MOTOR COMPANY

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SOAKS UP ROAD SHOCK. Exclusive Ford-built Cushion Recoil action moves back as well as up for a smoother ride. Conventional suspensions limit wheel movement to up-and-down motion.



The challenge given Ford engineers was to design suspensions that would permit wheels virtually to roll with the punches. The solution? Exclusive Cushion Recoil suspension action in all new Ford-built cars gives cushioning action in a fore-and-aft plane as well as vertical. This two-way action smoothes jolts, helps keep thumps and bumps from reaching the body and helps Ford-built bodies stay quieter, last longer. Engineering excellence gives you other big benefits in Ford-built cars. Bodies are rigidized to be quieter and super strong—with reinforced roof, extra-strength body members and tighter welded construction. Service-saving features like self-adjusting brakes and extended major chassis lubrication intervals reduce your car cares. These are just a few of the engineering achievements behind Ford Motor Company's success in bringing you cars that last longer, need less care and keep their value better.

Result: "Cushion Recoil" provides a dramatically smoother ride in new Ford-built cars



Assignment: design a suspension that "paves" its own way!

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New Model 75
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gives you the long reach and clear view of a soldering "pencil"—yet delivers the heat of a 100 watt device . . . just twice its 50 watt rating. This tremendous efficiency comes from the first commercial use of a new metal developed for use in "red hot" missile motors. With the Pistol's comfortable grip and tapered tip, you'll solder faster and more accurately than ever. Instant heat . . . quick to cool. \$4.95

*NEW ATR REGULATES TEMPERATURE
FOR HIGHEST EFFICIENCY

Automatic Thermal Regulation gives this tool the greatest efficiency of any soldering device ever. The Pistol draws only enough current to maintain maximum heat in the tip. A surge of 50 watts brings tip to working temperature in seconds . . . then only 30 watts are needed under normal soldering conditions. When the tip is placed against an unusually large cold mass, ATR again triggers more watts until the mass is properly heated . . . then regulates back to its amazing 30 watt efficiency. No double triggers or tricky switches with ATR—exclusively in the new WEN Model 75 Soldering Pistol.

Wen has a thing about making the best tools for your money. Take for example the Electric Belt Sander. It sells for under \$50. Yet it's the only sander, unless you go into the three figures, that's dustfree. No vacuum bag either.

The 3/8-inch power drill has a manually operated two speed shift and sells for \$29.95. Other tool manufacturers have equivalent drills with an automatic two speed shift for two and three times that amount. The Wen manual gear shift takes you less than 30 seconds to change. Hardly an inconvenience—particularly when you think of the money saved.

The Wen Electric Plane demonstrates our success in bringing you new, exciting products for less. The plane is a fully integrated professional power tool that sells for under \$50. Others cost \$125 and up.

All Wen tools are lean on tricky parts, heavy on power. The Zipp Saw and the All Saw are examples of power tools produced through fresh thinking in mechanical design and engineering—that's why they outsell all other sabre saws.

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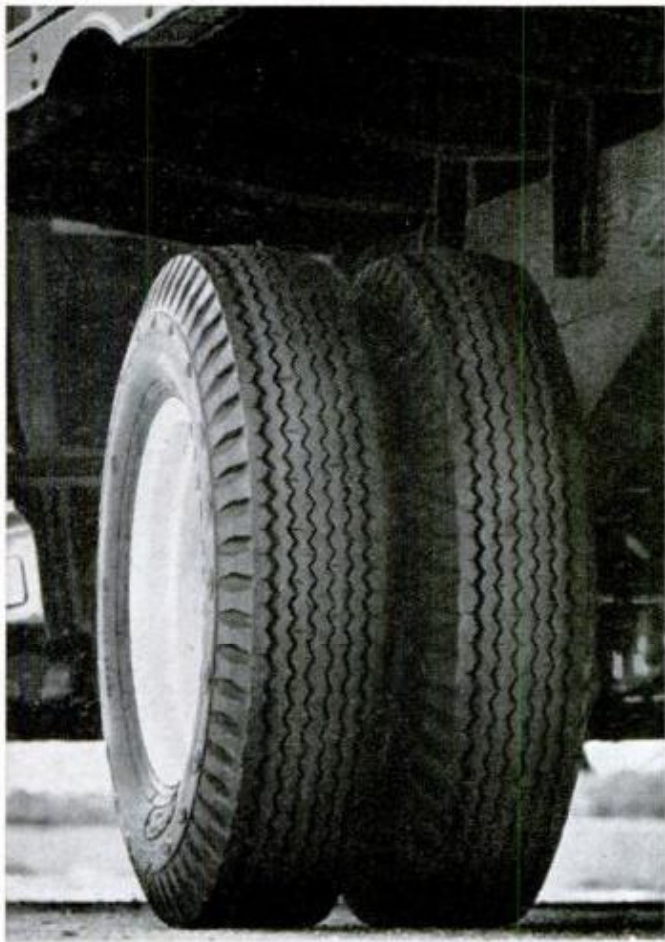


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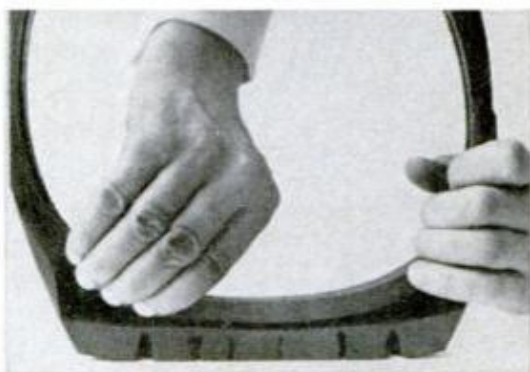
Never before a truck tire with so many mileage-stretching features!



1 Puts more rubber on the road. New Super Hi-Miler continuous ribs give you a solid footing. No squirmy little tread elements that chip or scuff away. Wider tread, too, reduces rate of wear.

TUFSYN

3 The new tough synthetic rubber, exclusive with Goodyear, adds extra durability for extra thousands of miles! Never in Goodyear tire history has there been a synthetic rubber so rugged.



4 Less friction in flexing. Super Hi-Miler dual-compounded treads are far tougher on the outside, more resilient on the inside. Less heat; longer wear!

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2 Eliminates groove cracks and tears. Exclusive "expansion chambers" in Super Hi-Miler grooves soak up the shocks and strains of rolling over curbs, hitting chuck-holes . . . help to compensate for normal tire growth.



7 Dissipates heat as you drive. New shoulder design has extra-large cooling surfaces that work like fins on an air-cooled engine.

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NO. 3

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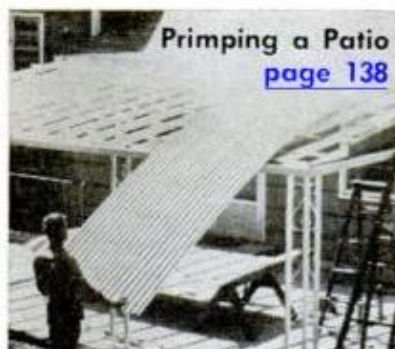
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NEXT MONTH—PM Parades Detroit's new cars. Read about Chevy's new middle-size Chevelle, Rambler's spanking new American, radical changes in Tempest, Buick Special, F-85. All this plus a ride with TAC's "top gun," an eyepener on medical machines and a hatful of shop projects to brighten your leisure hours

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DISSTON DIVISION

H. K. PORTER COMPANY, INC.

Over the Editor's Desk

Echoes of Silent Spring

Your June issue had the best article on spray that I have seen.

Anamosa, Iowa MAX A. WORTMAN

It was with much interest that we read your article.

Seems it is time our sleeping nation stirred itself to realize what's going on in regard to chemicals.

Keep writing—we appreciate such articles more than we can say.

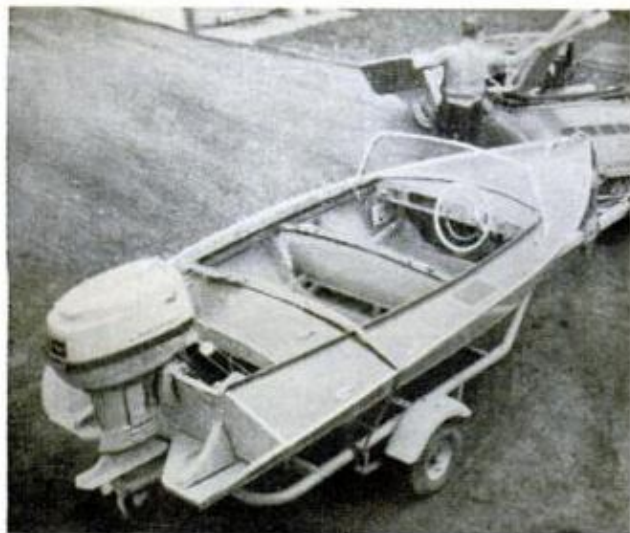
Amarillo, Tex. JUNE NEEL

I would like to commend you for the article, *And Was It a Silent Spring?* (page 85, June PM). This type of information will help to develop a public awareness of the seriousness of the pesticide problem.

Phoenix, Ariz. GERALD D. WELLS

Beefed-Up 38

I deviated from the basic plan of the PM-38 (page 140, August 1962 PM) to allow for a 40-horsepower motor and to accommodate four or five adults. I included an extra seat and added an after-deck, plus an after-plane to improve lift



on get-away while pulling skiers. Through experience, I've found this speeds up the planing action and reduces drag.

It responds to the wheel and comes about very well, planes fast and holds course excellently. It also keeps on plane at very low speeds which makes cruising very pleasant.

I've received a great deal of pleasure plus slivers building this craft, but it's worth the cost and labor put into it.

Weston, Ont. J. A. SAINSBURY

Spoke in Bell-Like Tones

If you've ever wondered whether springs can be built into wheels, here's an 80-year-old buggy that proves they can.

The Canadian-built buggy has truly springy spokes, but if you'll look closely



you'll see that transverse leaf springs were included as well.

The wheels ring like bells because each circle resounds like a tuning fork. And to add to the fun, they are first-class mud and gravel scoops.

Guelph, Ont. ROSS E. WILSON

Can you imagine a freeway full of loud-pealing spokes during rush hour?

Fat-Tire Finder

I live in Denver and have need for a good motor bike like your *Fat-Tire Scooter* (page 151, April PM).

Everything about it seems simple except the rear tire. I have checked every surplus store and tire dealer in our area, and none seems to have this type tire.

The dealer where I usually get my tires has already had about 200 calls on this particular tire.

Denver, Colo. GENE VERDOORN

The Terra-Tire that we used on the rear of the scooter is a product of Goodyear Tire & Rubber Co., Akron, Ohio. Its code number is 303-211-200. The front tire is coded 210-205-055—and Goodyear also has wheels for both front and rear.

New Recipe for Pudding

I have used variations of *Newspaper Pudding* (page 12, May PM) with good success. However, if Mr. Brey will add to his washtub of water a commercial fertilizer formula 10-20-10 (or one even higher in nitrogen) in the proportion of 1¼ ounces to each gallon of water, I think he will be pleased with the results.

(Please turn to page 8)



**Do you
feel lost
in the
shuffle?**

Here's the way to be
picked for a better job
and bigger pay

Do you feel you're going unnoticed by your employer—being passed up for the promotion you want? Have you ever applied for a fine new job elsewhere, only to feel you're a blur in a sea of applicants?

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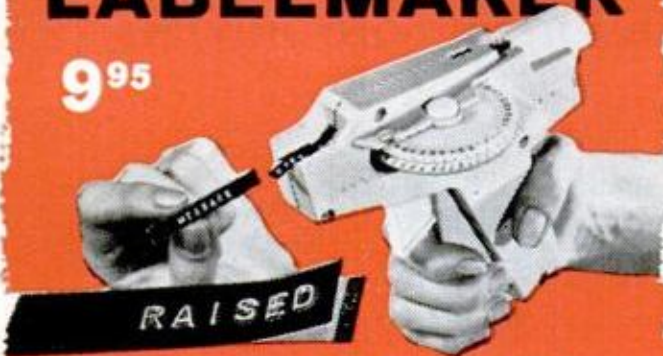
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Over the Editor's Desk

(Continued from page 6)

This solution is weak enough to avoid the danger of "burning," yet will provide food for the plant which, coupled with the moist condition of the soil resulting from the mulch, produces luxurious growth.

Gravette, Ark.

A. R. TAYLOR

Sand Skimmer

I built this beach buggy from a '48 Chevy. The car was too long, so I shortened the frame and driveshaft 3½ feet.



It was rewelded under the driver's seat. The gas tank is from an old oil drum.

The only thing I did not do was make the top which is heavy canvas.

This letter comes from a fan of your magazine.

Orlando, Fla.

RAYMOND ROLLINS

Stashed in Idaho

I started collecting *PM* in 1910. These magazines, with other papers totaling 17 large steel drums, have been given to the University of Idaho. These will be opened during the year 2010 (provided there are any around to open them).

Seattle, Wash.

BILL CHENEY

We'll try to make it for the opening—and bring along some copies of our July, 2010 issue.

To Be on CB

I thought the Shopping Guide, *Two-Way CB Radios* (page 92, July *PM*), was a very nice article.

I'd like to know how old you have to be to have a license for a CB radio, where you apply for a license and where you take the test.

York, Pa.

J. DAVID ALLEN

In order to get a license, you must be a citizen of the U. S. and 18 years of age. Apply for the license at any district office of the Federal Communications Commission or write direct to the FCC, Washing-

(Please turn to page 10)

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SPINNING
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Textile Engineering Technology
Textile Mill Supervisor
Warping and Weaving
Wool Manufacturing

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Railway Rate Clerk
Traffic Management

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Electronic Fundamentals
Electronic Fundamentals (Programmed)
Electronic Fundamentals with Elec. Equip. Tr'n'g
Electronic Instrumentation & Servo Fundamentals
Electronic Principles for Automation
Electronics and Applied Calculus
Electronics Technician
First Class Radiotelephone License
Fundamentals of Electronic Computers
General Electronics
General Electronics with Electronic Equip. Tr'n'g
Hi-Fi Stereo and Sound Systems Servicing
Industrial Electronics
Industrial Electronics Engineering
Industrial Electronics Engineering Technician
Practical Radio-TV Eng'r'g
Practical Telephony
Principles of Radio-Electronic Telemetry
Principles of Semiconductor-Transistor Circuits
Radio Servicing with Radio Equipment Training
Radio & TV Servicing
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Personnel-Labor Relations
Supervision

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Mathematics and Physics for Engineering
Modern Elementary Statistics

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Industrial Engineering
Industrial Instrumentation
Machine Design
Mechanical Engineering
Quality Control
Safety Engineering
Technology
Tool Design

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Pulp Making
Pulp & Paper Engineering
Pulp & Paper Making

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Motive Power Fundamentals
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Over the Editor's Desk

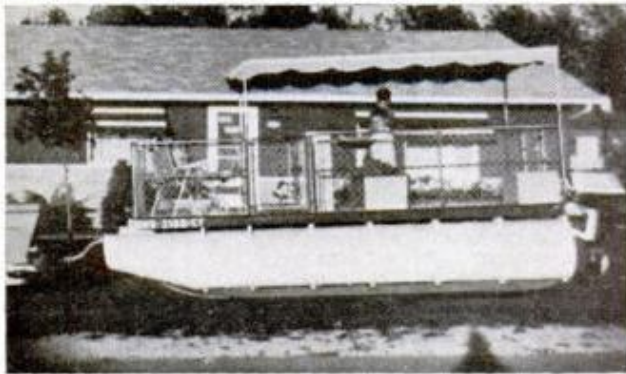
(Continued from page 8)

ton 25, D.C.; request form 505. There is no test; just complete form 505 and mail it to the FCC, Gettysburg, Pa.

Pontoon Boat with Landing Gear

I made this pontoon boat from your plans (page 158, March 1959 PM).

It is not exactly like your design as I added some of my own ideas. This one cannot be taken apart for hauling, for it is



built on wheels that I raise up when the boat is in the water. It's nice for fishing and also our three children certainly do enjoy riding in it. Sheboygan, Wis.

RAY HAMEISTER

Crayfish Chaser

I have also had a crayfish problem in my lawn (*Editor's Desk*, page 10, June PM). I tried a 72-percent chlordane spray mixed according to directions on the bottle. I put the liquid in each hole with a baster, and had good results.

No more crayfish.

Troy, Mich.

HENRY E. LABELLE

Any other suggestions from you readers?

Patient Sailor

I have patiently waited through excellent plans for rowboats, steamboats, motorboats, ski boats, speedboats, houseboats, rum boats, gunboats and aircraft carriers.

Now how about something for us sailing enthusiasts? Say, an 18 or 20-foot sloop or catamaran with overnight accommodations.

Atmore, Ala.

C. CLARK HALE

Noting a trend away from recreational aircraft carriers, we've been giving the sailboat some thought. How many other patient sailors are waiting for an over-nighter with sails?

The Editors

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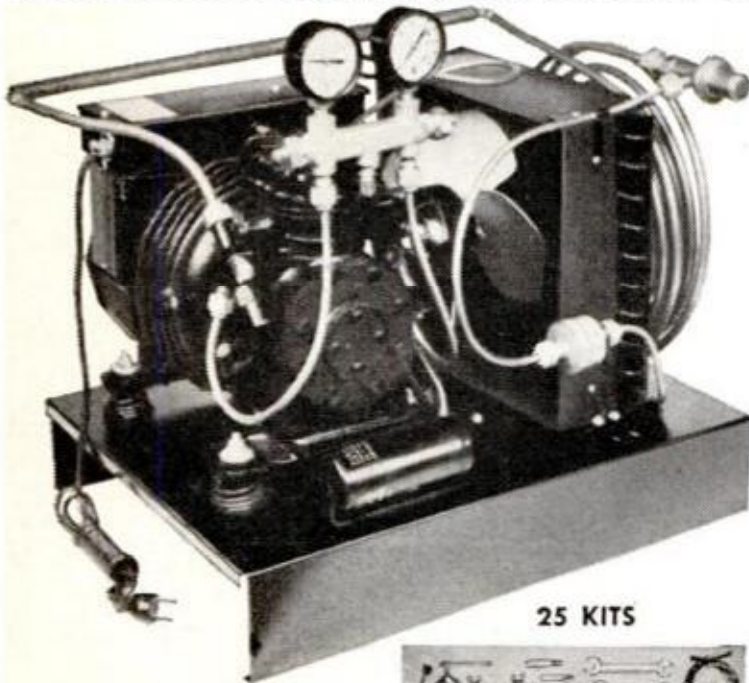
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Above—This is how your heavy-duty refrigeration system will appear after it is built. All parts are new and late model. A work project accompanies each kit. Right—You also get mechanic's tools, including wrenches and flaring tubes; also gauges, propane torch.



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In addition to easy, illustrated lessons, CTI sends 25 kits of parts and tools to build a complete, operating refrigeration system. As you assemble your unit, you get practical experience and gain confidence. You become familiar with parts and their functions. You develop skill in using tools. On completing training, you can convert your system into an air conditioner, freezer or refrigerator (from plans we provide). CTI makes home your training center.

Many earn money while learning

Since the CTI course includes training with real equipment, many students start service work soon after enrolling. They go out on their own, or get a part-time job with a local dealer. Some arrange with food stores, taverns, restaurants, etc., to handle maintenance. Numerous students pay part or all of their tuition through spare-time earnings.



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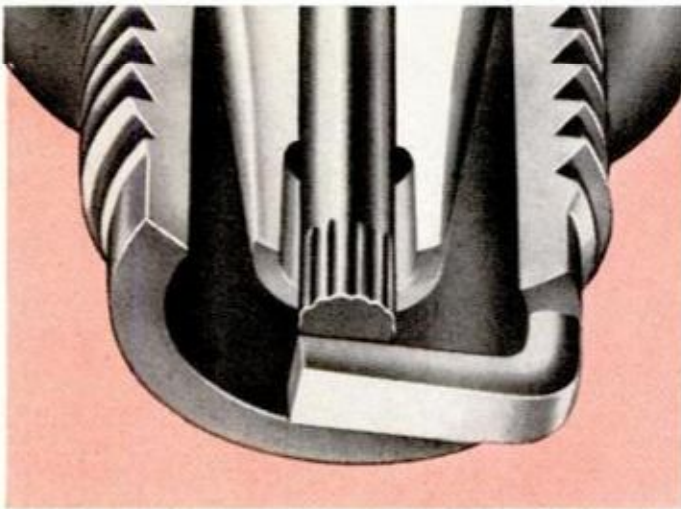
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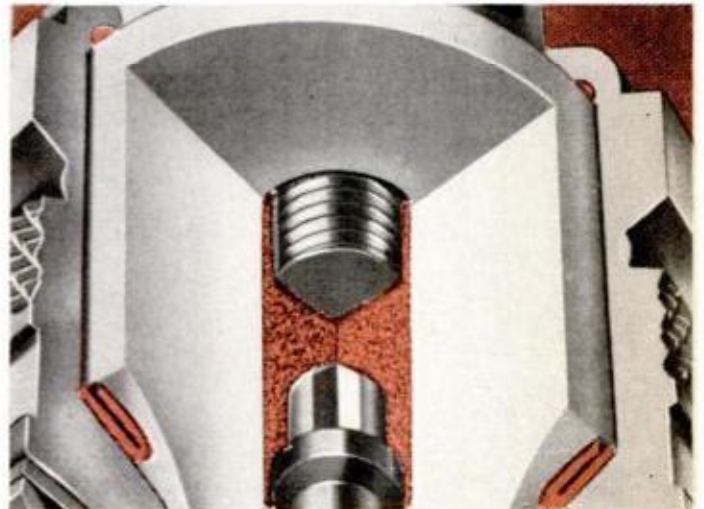
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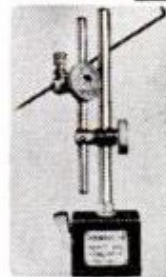
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A slice of America's past recently moved into new quarters when the Smithsonian Institution in Washington moved most of its exhibits out of the old red brick building familiar to generations of tourists into a new \$36 million pink marble museum across the street on Constitution Avenue. In the new quarters, one of its primary historical treasures, the Star Spangled Banner that flew "through the rockets' red glare," will finally be unfurled and hung from a ceiling. Heretofore, it has been kept furled in a glass case.

Backgammon B.C. A 2000-year-old backgammon board, complete with playing pieces has been excavated in Ephesus in Western Turkey. It is believed to date to the Hittite civilization.

We may "see" color in waves, say Researchers at Goodyear Aerospace Corporation. Color vision, they point out, is carried by an electric circuit in the nervous system that reacts differently to individual colors. Each color perceived, they say, causes electrical impulses to set off distinctively shaped wave forms in specialized cells in the eye. These impulses go to a network of nerve cells that identify the wave forms and relay the data to the brain, where it is interpreted as visual color.

Big pushes don't always come from big pushers. A small hydraulic jack that can exert five tons of pressure regardless of the position in which it is used has been developed by a British firm. The seven-pound instrument, only five inches high retracted, can also be used underwater.

Substitute blood is among a new group of gee whiz developments claimed by the Russians. They say 30 percent of the blood content of the body could be replaced by the substance, known as polyvinylpyrrolidone, without ill effects.

Abundant water in space may be assured from human waste. A plastic mem-

brane filter, developed for use in spacecraft, removes not only bacteria and salts of body wastes, but also the tiniest viruses from water. Developed by Aerojet-General, the membrane can also stop detergents, which, because they are almost indestructible, threaten our water supply with chemical contamination.

One million people are added to the U.S. population every 135 days, says the Census Bureau. It forecasts a population of 200 million by 1967 and a quarter billion by 1980. Within a few years the rate of population growth may go still higher due to the big crop of girls born in the post-war years reaching the child-bearing age.

Brain tissues survive hunger the longest. Experiments on rats by a scientist in West Germany show that under extreme conditions of hunger, the cells of the brain remain unaffected long after other body tissues show damage from lack of food.

Shaving doesn't thicken hair or make it grow faster; that's just a layman's illusion, or so says dermatologist Dr. Howard T. Behrman of New York. He says that hair, particularly light hair, is somewhat darker and thicker at the base than at the tips. When shaved, it seems to come back coarsened and thicker, but when it attains full growth, no change is noticeable.

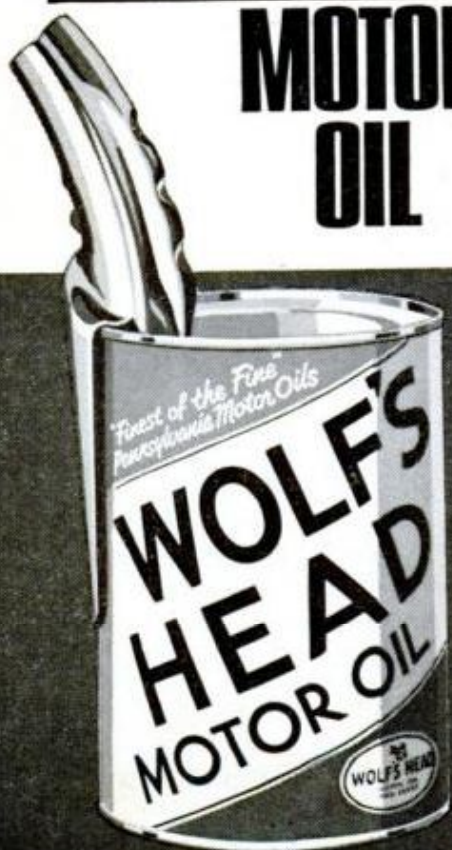
Ulcers in the cow barn are providing a new headache for farmers. Like a human caught up in the rat race for status and material prosperity, bossy is succumbing to ulcers brought on by overwork—due to the demands for ever-higher milk production. According to the New York State Veterinary College, ulcers cause their bovine victims to have "off days" and can even result in sudden death.

No bristles in missiles. Astronauts won't need a toothbrush on long space journeys. Instead, they'll use a tablet containing a mouthwash, toothpaste and vitamins. Popped into the mouth, it foams up and has a grittiness which permits the user to brush his teeth with his tongue. When the teeth are clean, the foam is swallowed because it also has nutritional value.

Can you be an astronaut? A nationwide call for volunteers has been made by the National Aeronautics and Space Administration. But two qualifications will keep most space enthusiasts grounded: Among other things, candidates must have a degree in the engineering or physical sci-

(Please turn to page 16)

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Science Worldwide

(Continued from page 15)

ences; they must also have logged 1000 hours as a jet pilot, or have experimental flight test status through the armed forces, NASA or the aircraft industry.

An atomic hothouse has been put into operation at Japan's Kyoto University. It uses radioactivity to measure and record the growth and change inside various plants. Scientists hope it will reveal exactly what causes a plant to grow.

Hottest stuff in the universe, observed to date, is hydrogen plasma. It is many times hotter than the sun. An invisible "bottle," the walls of which will be lines of magnetic force, is now being built by General Dynamics to contain the 400-million-degree ionized hydrogen. Trapped in the magnetic container, the plasma will be "squeezed" in a new effort to generate unlimited quantities of electric power.

Computer-designed women are on the way. The average American woman measures 34.6, 25.3, 35.7, in the usual order. That's the word from, of all things, an electronic computer. A lingerie firm fed the machine 30 million bust, waist and hip measurements culled from customers' orders through the years; in seconds it came up with the average measurements.

Rabies has decreased sharply among domestic animals in the past quarter century but has shown a marked increase in wild animals, says the American Veterinary Medical Association. In 1946, there were more than 8000 cases of rabies in dogs; by 1961, the incidence was less than 600. Skunks now lead wild animals in number of cases reported, with foxes and bats also high on the list.

Beware of "Pearly Gates!" That's the name of a variety of morning glory seeds—another is "Heavenly Blue"—that is said to be in demand by drug addicts. The seeds are reported to contain hallucination-causing compounds similar to LSD-25, the use of which can result in mental breakdown and even death.

Migraine relief may be in the cards for some sufferers via a new drug that seems to prevent headaches in some victims, and reduce the number and severity of the attacks in others. Sansert, the drug's name, seems to have only mild side effects, according to Columbia University neurologist Dr. Melvin D. Yahr, but should be avoided

(Please turn to page 20)

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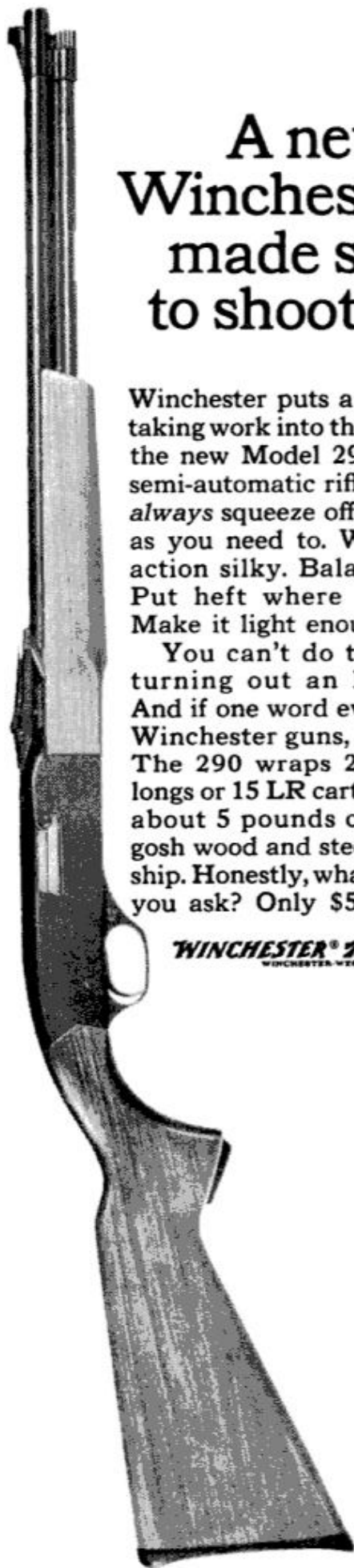
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Science Worldwide

(Continued from page 16)

by pregnant women and patients with hardening of the arteries or peripheral vascular diseases. The drug achieves its effect by acting on serotonin, a naturally-occurring substance in the body, to change the size of blood vessels in the head, Dr. Yahr told PM.

Thoughts through space may be science fiction, but reports are that the Russians are devoting more and more scientific effort in an attempt to master the phenomenon of mental telepathy. The word is that they'll try to harness it for practical uses such as guiding spacecraft or communicating with submarines.

Gas "bearings" replace ball bearings in a new all-ceramic navigational gyroscope developed by Northrop Corporation. The gyro wheel rides on a super-thin cushion of gas, which is force-fed from spiral grooves at both ends of the wheel. Friction-free gas gyros offer much greater reliability and longer life; ball-bearing gyros seldom last more than 2000 hours.

A robot fireman has been perfected by a British professor. The gadget, running on wheels and powered from batteries, steers itself about, detecting fire by means of photo-cells which cause the machine to home on infrared radiation. When it gets near a flame, the robot douses it with a fire extinguisher it carries.

You're rising and falling all the time with the tides, believe it or not. Earth tides, brought about by the pull of the sun and moon are similar to ocean tides. They cause the earth's crust to rise and fall once every 12 hours. The vast crustal upheaval causes the earth's surface to rise as much as nine inches near the Equator. Columbia University scientists are now setting up a network of gravity stations to study the phenomenon.

Tiros has classroom help. Some sixth graders are giving the \$4.5 million weather satellite a helping hand. The Weather Bureau found it difficult to identify cloud formations televised from Tiros, so 12-year-olds in Washington are sketching from the ground the same clouds that Tiros is televising from 450 miles up. If the experiment works, the bureau hopes to enlist the aid of science students across the nation.

John P. McNeel
Science Editor

POPULAR MECHANICS



Have you ever said to yourself...

"There must be a better way to make a living"

Well, there is! There's a better way... a happier way... a way to bigger income. And, a way in which a man can take real pride. Let's take a minute to paint a dream. Then if that dream fits your hopes. I'll show you how to make your dream into a reality—quickly—without risking your present job.

By Grant Mauk

First, let me introduce myself. I'm president of an Internationally famous company. Our name is known to millions throughout the U.S., Canada, Europe, South America, even in Africa. It has become famous partly through National advertising, but principally through the services given by men we have put into business for themselves under our Co-operative Plan.

These men were drawn from all walks of life. They were farmers, mechanics, truckers. They were office workers, retail clerks, house-to-house salesmen. They were professional men, railroad men, college graduates, teachers. Some had had only a grade school education.

They were young men who had worked for others for a few years; men retired or just about to retire; men of middle age who had family responsibilities. For years they had yearned to start independent businesses. But they didn't dare risk giving up their jobs and missing their pay checks—even for a few weeks. We showed them how to start their own businesses in spare time. Then, when their spare time profits approached or equalled their regular pay, they could quit their jobs with safety and give all their time to building their businesses still bigger.

Today, throughout the world there are many hundreds of such men that my company has put in business. They own their businesses outright. They are their own bosses. They "call the shots" on vacations, hours of work, hours of play and recreation.

Some of them run "one man" businesses. Based on the rates in our National Price Guide, they can make \$9.00 gross profit an hour on servicing they do themselves. A gross income of \$10,000 and upwards the first year is not too much to expect from a one unit operation—with no shop, no store, no rent, no inventory, and no equipment except that which we furnish.

Ward Whitbeck wrote "I have made as much as \$225 in one day." L. Lawson says: "In September, working alone, jobs totaled \$1,475.00." L. Canaday wrote: "\$1,571.00 in a single month." And G. Byers reported, "On one institutional job my charge was \$2,416.00—total expenses, \$814.00."

Other men have built organizations with from two to five men working for them. The owner merely writes up the orders, keeps the books, and does the banking. This increases the profit opportunity as the owner can make \$6.00 an hour on every hour his employees work—even after paying them a good hourly wage. Ed Kramsky wrote, "In my second year I now have two assistants, a nice home, and real security for my family." E.

Davis reported "Gross income increased \$17,660 this year." Carl Smith wrote, "Earned \$650.00 in one week. Our volume is getting bigger all the time." And Michael Lyons made the statement, "First calendar year \$40,000 gross income. Without headquarters constant help it would never have been possible."

What is this booming business? What does it take to get into it? Let me answer: We train, equip, and help finance men in one of the fastest growing service businesses known. We provide them with a Franchise which permits them to operate under our trade name—under our International Trade Marks, and our copyrights—using our methods, and our sales program. Each man benefits from a big national advertising campaign.

What do these men do? They perform six unique and urgently needed services in the homes of their customers. These are services that are needed and wanted by far more homes than we are now able to service. We haven't scratched the surface.

Your basic service is a better, safer, and more efficient way to clean carpets, rugs, and upholstered furniture—right on the spot—and do it in such a way that it is dry and ready for use the same day. No scrubbing with heavy machines. No soaking with gallons of water. No driving dirt down into the fibers. Instead a simple application of a quick drying aerated foam—and instant removal!

Five other services add to your income. With portable power equipment you spray furniture and carpets with a product that retards soiling. You remove stubborn spots like magic. You spray another liquid to make fabrics flame resistant. You mend small damages such as cigarette burns and moth holes, often saving the owner the price of new furnishings. And finally, you deep spray any fabric with a moth killing liquid on which you can give a company backed guarantee for six full years.

Women are so pleased with the results—as compared with old fashioned machine scrubbing—that one of those dealers got 17 orders as a result of just one job.

You will require a car, a willingness to work, and the ambition to become truly independent. Honesty and a good standing in your community are prerequisites.

If you can meet these requirements, you may be selected to own and operate a Duraclean Dealership in your area. We supply all the equipment you need, and all the materials. We teach you the techniques that any man can learn. And, we give you a definite Program of Promotion that brings business to your door and phone calls requesting quotations.

What does it take to get into it? A few hundred dollars is all you need to start. If you are selected it means that we have so much confidence in your success that we are willing to finance you for more than two-thirds of the total cost. You can pay the balance out of the profits over a 30 month period.

Then, as owner of a business, you have the opportunity to make more money than you could hope to make on any job. You are also building a business with a cash value should you wish to sell.

When an arm injury made it necessary for Al Svitak to sell after operating his dealership only 17 months, he sold to a prospect supplied by Duraclean at a price 50% above his original investment. G. F. Monroe—after 12 months sold his Texas Dealership for ten times his cost. Leo Lubel, after 30 months, sold for \$7,116.00 over cost. When our Dealers want to sell, we help them find buyers.

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Mail the coupon or a postcard today. Don't pass this by without a serious investigation. It's great and it's growing. Grow with it!

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PRESIDENT
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Dear Mr. Mauk: I accept your invitation. Please mail—postage prepaid—complete information with all facts, figures, descriptions and pictures by which I can judge the value of a Duraclean Franchise to me. It is understood that everything is free, that I am under no obligation whatever, and that no salesman will call to bother me. Also tell me about your finance plan by which you will finance my business for more than two-thirds of the cost.

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Tune in on the Inventors

A famous invention which has reaped millions of dollars worth of publicity and gained much prestige for Uncle Sam finally got a patent recently. The Project Mercury space capsule was granted patent 3,093,346 for its seven inventors, Maxime A. Faget, Andre J. Meyer, Jr., Jerome B. Hammack and Caldwell C. Johnson, Jr., all of Newport News, Va.; Robert G. Chilton, Seaford, Va., and Willard S. Blanchard, Jr. and Alan B. Kehlet of Hampton, Va.

✓ ✓ ✓
Sunken ships could be raised by injecting plastic foam into the hull to restore buoyancy, according to patent 3,091,205 granted to William Watson of Marblehead, Mass. Once the ship has been drydocked, the foam could be cut up and removed.

✓ ✓ ✓
Students may soon learn to type with a musical typewriter which teaches the subject by ear instead of touch. Of special interest to the blind, the instrument's keys are set to the musical scale. Patent 3,093,911 went to Harry R. and Emma A. Hagelstein of New York City.

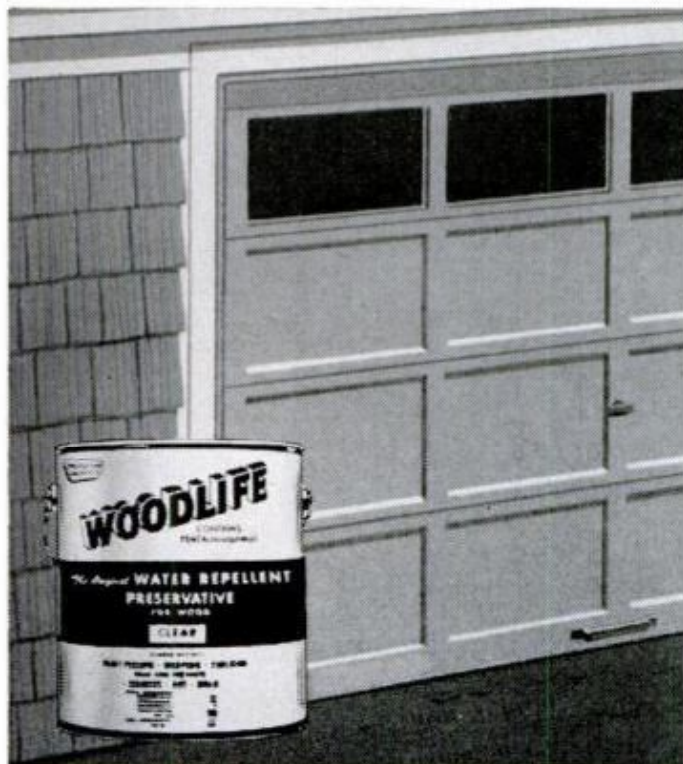
✓ ✓ ✓
Twist dancers may soon be able to get an extra twist with a special "spinner" attachment for their shoes. Invented by Jimmie McCorkle, Amarillo, Tex., it was granted patent 3,091,043.

✓ ✓ ✓
To help inventors market their products, a group in New Orleans, La., is planning to publish an inventors' directory. The volume, which will index inventors by name and specialty, will be distributed to manufacturers, libraries and government agencies. Inventors will pay a small fee for each listing. Publishers are Associated Ideas, Inc., Box 2351, New Orleans, La.

✓ ✓ ✓
An inventor recently accomplished a much rarer feat than marketing a successful patent—he beat the U.S. Internal Revenue Service in Tax Court. Aeronautical engineer Roland Chilton of Glen Rock, N.J., reported income from inventions for the years 1953-57 as capital gains, at a much lower tax rate than that for straight income. He had received royalty payments of 2½ percent on patents he had assigned his employers (two aircraft companies), which for one year amounted to more than \$168,000. The IRS claimed the payments were income; the court disagreed.

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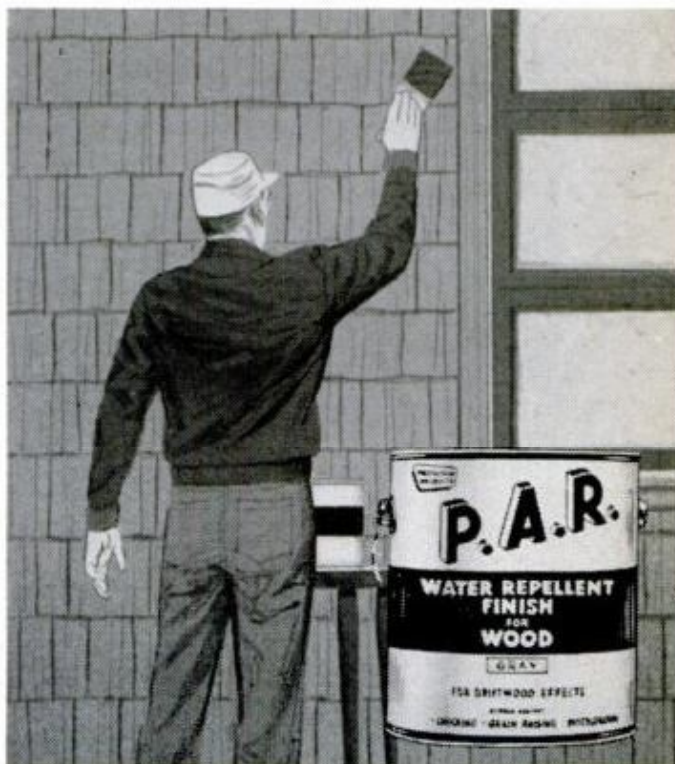


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The Tire with the Built-In Chains

By Ed Nelson

TIRES WITH A TREAD studded with hard, scabbling pins—the sort of equipment that helped Bo Ljungfeldt take a Falcon Sprint to a class win over Alpine ice in the Monte Carlo rally (*PM* June '63, p. 28)—will soon be available to U.S. motorists.

At first these “tires with the built-in chains” will be costly. But if super control on the slickest, iciest surface is what you want, they can be the answer. *PM* tried one version of Scason Safety Stud tires on a glassy smooth skating rink and found performance impressive. The feel of control is so strong it's almost eerie. Throwing a stud-tired car into a skid was nearly impossible.

We used two front-drive SAABs, one wearing Pirelli Centurato tires and one equipped with studs set in snow tires. Under panic braking from 20 m.p.h., the Pirellis stopped the car in 51 feet. The studded tires did in in 23. We averaged

several runs to insure reliable results.

In a tug of war with a Chevrolet weighing nearly twice as much as the SAAB, we couldn't pull the Chevy backward—but the Chevy couldn't budge the stud-tired little SAAB, either. The spinning Safety Stud tires chewed down about half an inch into the ice as we tried.

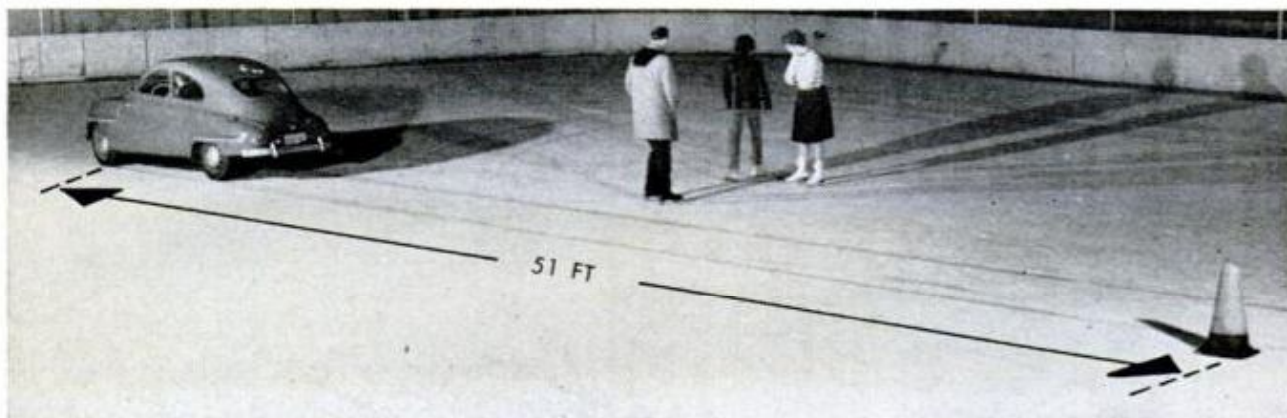
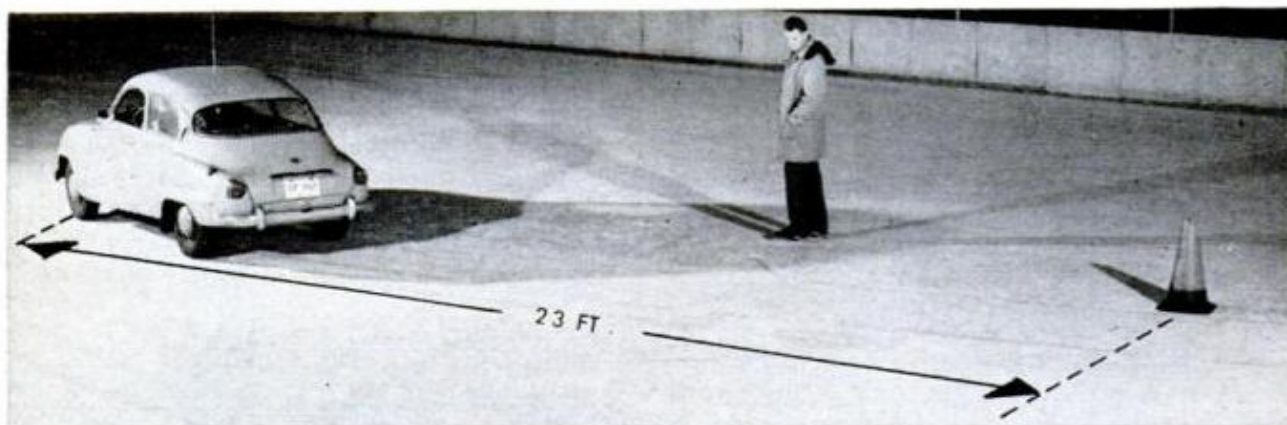
Our test was with a version that had a sharp-edged plastic flange at the stud base. With a newer, ribbed, cylindrical design just announced, Scason claims stopping distances are reduced another 20 to 30 per cent.

Tire studs of one sort or another have been tried since 1906. These from a Stockholm manufacturer may be the final answer to winter driving worries.

The cylindrical tungsten carbide studs, harder than steel, are about an eighth of an inch thick. They're jacketed with ribbed, light blue Delrin plastic and set

[\(Please turn to page 26\)](#)

WE HIT THE BRAKES HARD just as the car passed the pylon on closed-off skating rink. Studded tires brought the car to a stop in an average 23 feet



WE SLID TO A STOP on regular tires, but it took an average of 51 feet from about 20 miles per hour on the icy surface. Brakes were applied at pylon

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"Speaking of sports, there's a new indoor pastime I'd been introduced to recently that has me wondering where it's been all my life. Until I was lucky enough to have outfitted the basement of my new home with a set of American Machine power tools, I had no idea how much fun it could be to make things out of wood—nor how easy it can really be. I'm constantly amazed with the accuracy, speed and ease with which I can now make useful and beautiful things for the house, for the kids—and for my own pleasure and convenience. I don't know how they do it, but the remarkably low cost of these professional quality tools has taken nothing away from their ability to do a job."

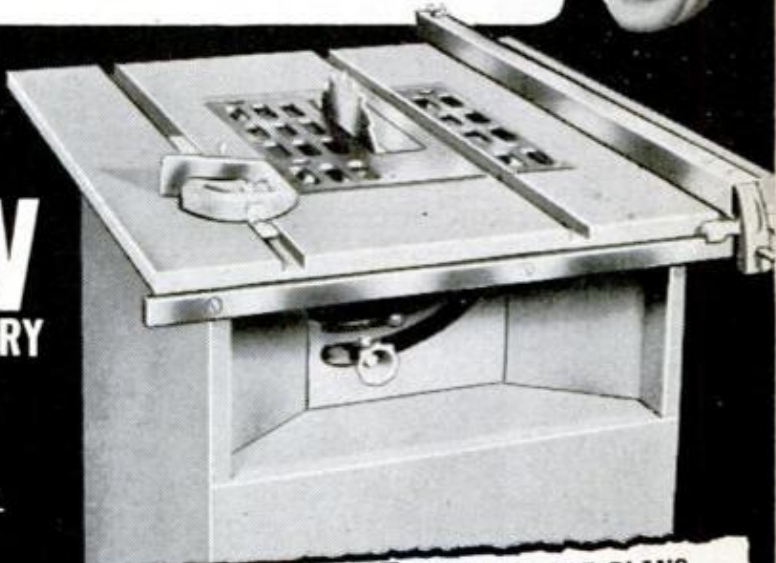


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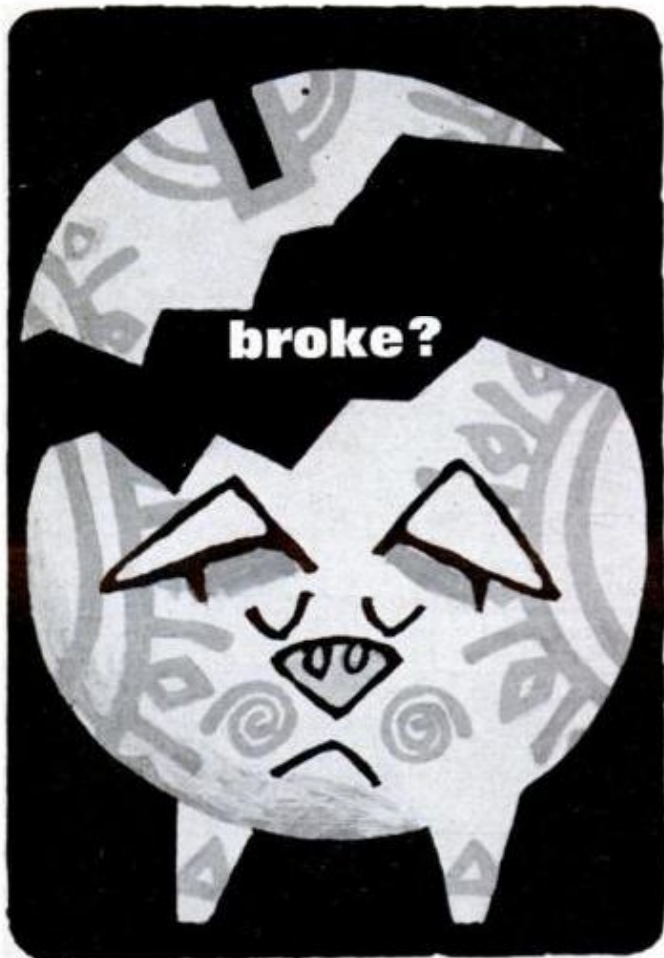


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Safety-Stud Tires

(Continued from page 24)

directly into tread rubber—up to 200 in each tire for a 4000-pound car. They're to cost about 8½ cents apiece plus about a penny each for installation.

The tungsten carbide is compounded for a wear rate close to rubber's and better than steel's. The pins normally are flush with tread surface, but when the tread is squeezed due to stopping, starting, or side forces, the studs are squeezed out about 0.04 to 0.06 inches and claw into the road. The slippery Delrin jacket prevents heat build-up from friction as tread rubber flexes around the stud. The ribs anchor the studs into the tire.

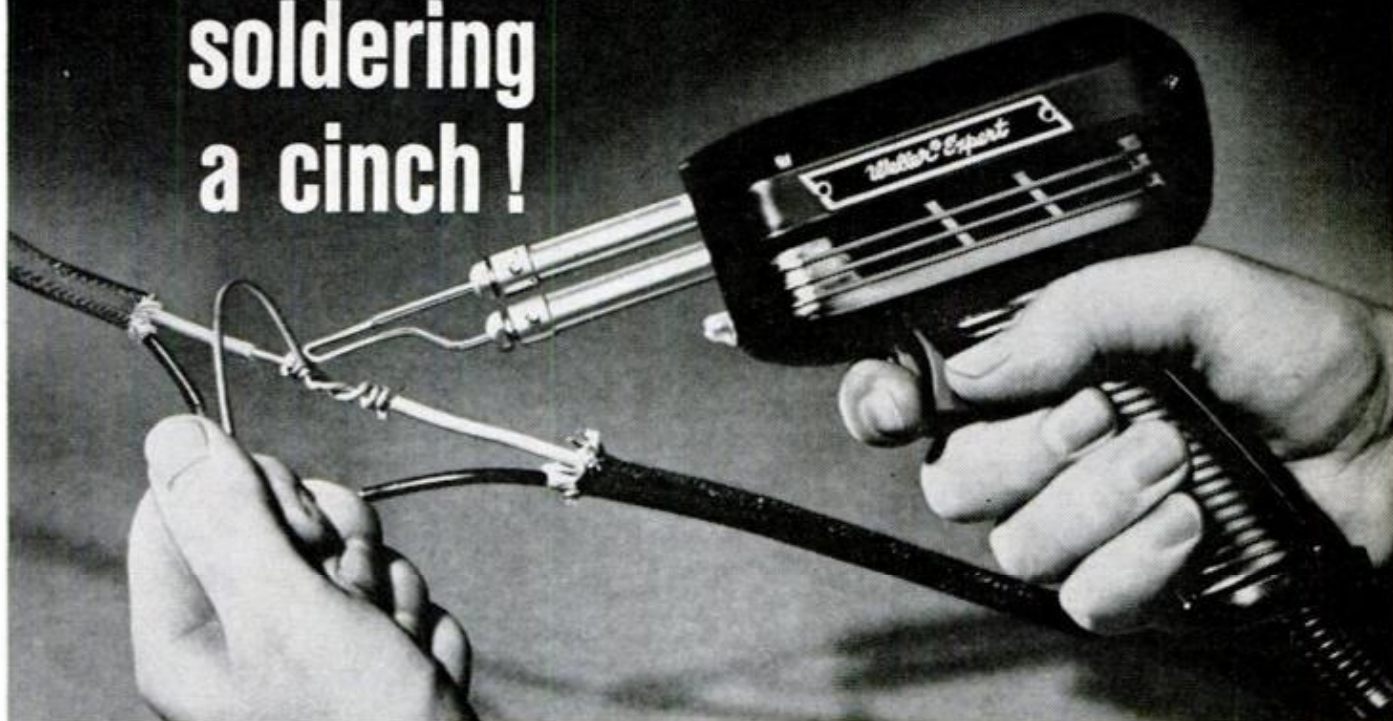
A Scason dealer probably will prefer to set studs in a new tire (one he sells himself, ideally) or in a new tread he can apply to older tires. But if your own tires are new enough to have all their tread and plenty of under-tread depth, and if the sipes (divisions in the tread pattern) aren't too close together he could insert them in the tires you now have. Practically every new tire of "original equipment quality" and full tread depth meets the requirements, says Scason.

Probably emergency vehicles, ice racers, and long-distance drivers will be the first in the snow belt to go for the tire with the built-in chains. But others who value sure-footed control on the slickest surface will follow close behind. ★★★

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27



Sidelights from the SERVICES

By William R. Kreh

Yanking Yanks out of low-flying airplanes may be a new way of delivering troops to a battlefield. The Army and Air Force are experimenting with a new aerial-delivery technique that has troopers sitting backwards on large pallets, encased in a tough cover material much like a capsule. The pallets will be snatched from heights up to 35 feet at speeds from 115 to 150 m.p.h.

It'll work like this: A transport plane, its cargo ramp open, makes a low fly-by. From the plane trails a hook attached to the pallet inside the open cargo ramp at the rear of the aircraft. The hook engages a steel cable on the ground and pulls the pallet from the plane. The pallet falls to earth and is cushioned by two energy absorbers. Then the pallet slides about 100 feet. Tactical Air Command officials, hailing the new delivery method as a "major breakthrough in Army support," say the yank is "as smooth and gentle as a person feels riding in an express elevator."

An old Navy tradition had to go by the boards when the USS *Wright* was constructed. The custom of placing a coin under the masts of ships being built couldn't be followed with this command communications ship because her masts, loaded with radar and electronics equipment, were precisely machined to meet certain balance requirements. But the tradition—believed to date back to Roman Empire days—wasn't completely ignored. Crew members put nice flat dollar bills under each of her masts.

Autos that never need greasing may be the result of space vehicle research. Navy lubricant specialists report a 500-percent increase in the life of bearing assemblies using a new lubricating system. Designed to keep machinery working without care in space, the system uses a combination of molybdenum surfaces and lubricants made of metallic sulfides.

In Spring, a young gull's fancy likely turns to thoughts of buoys. Harried Coast Guard engineers have spent years trying to keep sea gulls off their light buoys. They now think they've won a limited victory. Their latest de-gulling device consists of a small tepee-like arrangement of

metal rods a few inches long. They're spaced evenly around the edge of the light. Tops of the rods are gathered in a point, like a tepee top, over the center of the light. A gull is discouraged from sitting on the edge of the light because its wings get entangled in the rods. And since each of the rods slant at about a 45-degree angle, it's not too easy for the birds to keep their balance while perched atop one of them.

Talk about quick changes! The Air Force is building a test chamber for space-flight experiments where it will be possible to produce a temperature change from 50 below zero to 500 above in four minutes, a wind velocity from two to 100 miles an hour, and an altitude range from sea level to 10,000 feet.

Trap shooters make more accurate riflemen, Army tests have shown. The experiments proved that in quick-fire shooting methods, such as those used in guerilla warfare, soldiers who had experience in trap-shooting proved better shots than those who had never fired at a clay pigeon.

An old scrub bucket has found a place of honor in the space age at Wright-Patterson Air Force Base, Ohio. Scientists there found that when signals from two weather satellites, too faint to be useful, were fed into the scrub bucket by placing a speaker over the bucket's mouth, the tone became audible throughout the test facility. The makeshift resonator now has its place in a room jammed with costly communications equipment.

A flying machine shop has been developed by Army engineers to make quick repairs on helicopters. The shop, complete with tools, is contained in a 4000-pound box which can be carried anywhere while slung under an Army helicopter. It's designed for use in places like Viet Nam where lack of roads often makes it impossible for conventional repair vans to get to the site of a temporary helicopter base.

A joint U.S. and British underwater missile range is slated for construction in a 100-mile-long sheltered water area east of Andros Island in the Bahamas. The range, called AUTEK for Atlantic Underwater Test and Evaluation Center, is expected to be in operation by 1965, testing torpedoes, missiles, sonar, communications and other underwater devices. Facilities will include a network of scientific instruments on the bottom and suspended at various depths. A land base on Andros supporting the range will include oceanographic and weapons laboratories.



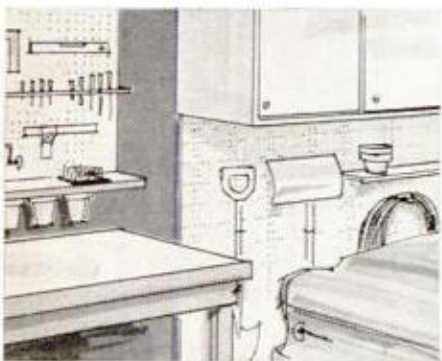
1. Fences of distinctive design



2. Wall desk with optional chalkboard front



3. Remodeled attic



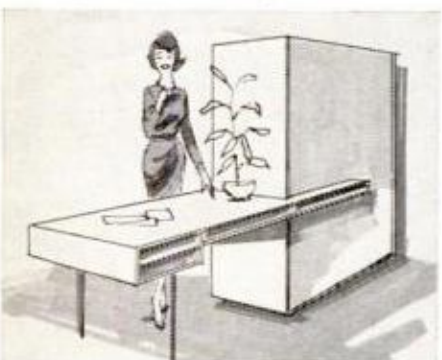
4. Garage interior remodeling



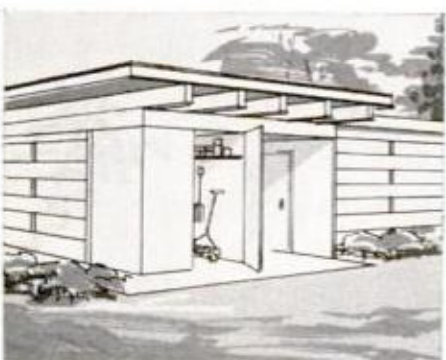
5. Picnic table and benches, lawn chair



6. The sportsrobe



7. Room divider with desk and wardrobe



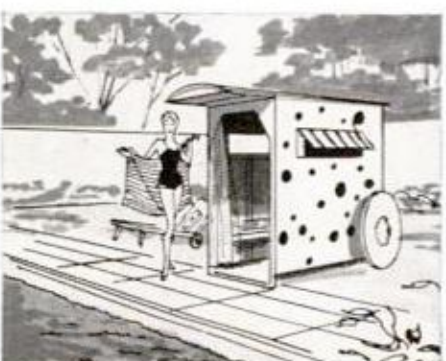
8. Woven carport wall with tool room



9. Playhouse plan for children



10. Home entertainment center
Family leisure hi-fi center



11. Roll-away cabana



12. Outdoor living room

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Items from All Outdoors

What if lightning strikes your aluminum frame tent while you're out camping? This question from a reader sent us straight to a tent manufacturer whose representative said that to his knowledge it had never happened, but it was certainly a possibility. *PM's* Electronics Editor adds that an aluminum tent frame is as vulnerable to lightning as a TV aerial, but says that if struck, the frame would simply melt. To be safe, however, you need only to ground the tent by hammering a six-foot steel rod into the earth and running a wire to it from the tent frame.

Archery calls for skill and gristle—and lots of both. It has always held high interest for us, so we were glad to get into the field with Fred Bear's new Tamerlane bow. This is a fancy looking affair, designed to resemble the weapons carried by the archers of Genghis Khan. The consensus of opinion around *PM* was that it is a bit too frilly, but was admittedly a piece of

beautiful workmanship. It is a high-priced bow (\$125), designed primarily for tournament archery. We used it for field archery and its performance was astounding. The balance is perfect and when the arrow is loosed there is hardly a tremor of movement from the bow. We took two rabbits, one on the dead run; and nailed a woodchuck at about 80 yards—something we've never achieved with a regular bow.

Boat storage time is coming around, and along with it the problem of keeping moisture from hard-to-reach areas. This can be solved by filling small cloth bags with calcium chloride (bought at most hardware stores), and scattering them around the inside of the hull. The chemical absorbs moisture and keeps hull dry.

Comfortable worms make happier bait and improve a fisherman's chances of success. This is the claim of the manufacturer of Worm Cooler, a 12 by 18-inch cellulose sponge, one-quarter-inch thick, that is soaked in water and placed over worms to keep them cool and lively. It's made by Piney Woods Bait Farm, Boyceville, Wis.

STUART JAMES

Outdoors Editor



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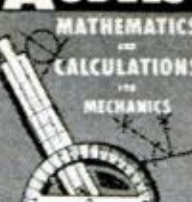
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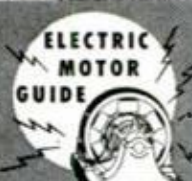
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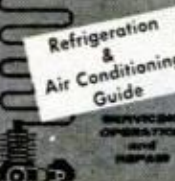
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Sidelights on

AVIATION

Flying may still be for the birds.

Fatal crashes caused by birds may force aviation planners either to change some routes or the structure of new aircraft. Jets, and the coming of supersonic planes, have aggravated the problem. They can suck the birds into the engines or, because they fly so much faster, can suffer critical damage to the control surfaces.

Wildlife agencies have listed certain coastal areas which, during certain seasons, are dense with flocks of birds and should be avoided by regularly scheduled airlines, and governmental agencies are conducting tests to see whether structural changes in airline fleets are necessary.



Automatic landings may start next month when 20 French Caravelles are equipped with a 50-pound electronic device that uses a radio altimeter which operates a vertical-velocity sensing instrument. It will enable the jetliner to land automatically within 25 feet of the center of the runway.

The Sud Aviation Co. of France, manufacturers of the Caravelle, conducted tests during which more than 1000 "hands off" landings were made successfully. The Lear Siegler Co. of the United States made the landing device, although none of the Caravelles operated by airlines in this country have announced plans to use it.



Interservice rivalry, a sometime blessing and a sometime nuisance, has extended to whether it's worthwhile using guns on helicopters. The Marines claim that they aren't worth a, well, a darn, while the Army insists they're dandy.

Now comes the General Electric Co. with a small Gatling gun with six barrels that fires cartridges up to a rate of 6000 shots per minute. It weighs less than 250 pounds when fully loaded, and is designed for helicopters and other light aircraft in counterinsurgency action.



Flexwings are now being tested to replace parachutes in dropping cargo to remote sites. In 130 drops, a high degree of reliability was established. Cargo up to 5000 pounds is contemplated using these U-shaped cloth wings.

Kevin V. Brown
Aviation Editor



This man is a "security risk"!

Age, 29. Married. Two children. High school education. Active in local lodge, church, veterans' organization. Employed by large manufacturing concern. Earns \$95 a week.

SOUNDS like an Average Joe. And he is. Too average! He's got a job. It pays fairly well. He's satisfied.

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By Jim Whipple



1964 Fords Get More Power and a New Automatic. Room and Vision Upped on New Dodge, Plymouth

NOW IT CAN BE TOLD. Two major automakers, Ford and Chrysler have lifted the lid on information on their 1964 models which are to appear in showrooms next month. But they will not, on pain of removal from the proving grounds, permit us to print any picture 'till October.

Starting at the low end of the line we find **Falcon** with brand new sheet metal surrounding the same basic unit body and frame on a 109.5-inch wheelbase.

But, you'll find it hard to recognize the '64 **Falcon** as the budget plain-Jane of recent years. The new job reminds us of a plump little school girl suddenly appearing in her first starched and pleated party dress. The little doll is almost elegant.

THE BIG CHANGES run more than skin deep, too, we found out on the test track. There's power aplenty for buyers who option the 260-cubic inch V8 which made its debut on the 1963½ **Sprint** hardtops. Ford has wisely decided to beef up V8-equipped **Falcons** with heavier body side rails, heavy-duty front and rear suspension and, most important of all, larger brakes—up from 9 to 10-inch drum diameter.

With this engine (and the 170-cubic-inch six) you can have a four-speed floor shift plus three-speed and automatic.

Some small but highly significant changes on suspension (one Ford engineer terms them "tremendous trifles") have reduced friction in front ball joints and pivots, while new inserts in wider rear springs, plus an "all temperature" shock absorber fluid, has smoothed out the ride to such a degree that we felt it was no longer **Falcon**. In fact, the four-door sedan with 164-horsepower V8 and power steering, rode and handled like a **Fairlane**.

Evidently, **Ford** has made up its corporate mind about **Fairlane** for '64. The car is now pegged as a fairly plush intermediate, whereas, when introduced in '62, the car was not sure whether it was going to be an enlarged **Falcon** emphasizing austerity, or a "poor man's" **Galaxie**. The word on the '64 **Fairlane** is performance.

The base **Fairlane** V8 engine is now the 260 cubic-inch V8 rated at 164 horsepower. Next up the line is the 289 cubic inch V8 in regular grade fuel version developing

195 horsepower. Finally—and as if they were looking over their collective shoulders at Chevrolet's new **Chevelle** and its "283" V8—Ford engineers offer a real charger. It's an 11-to-1 compression version of the 289 with solid valve lifters, special cam, and 271 horsepower.

This bomb comes with four-speed synchro stick only.

Best news for most **Fairlane** fans we think is a brand new automatic transmission with three-forward gear ratios (plus torque converter) instead of two. Available with either of the two V8s, it will improve hill-climbing and passing at less than full throttle.

The big Fords (119-inch wheelbase, 205-inch overall length) are called **Custom 300**, **Galaxie 500**, and **Galaxie 500XL**. All lines and all models are completely sheathed in new sheet metal, although the "fastback" two-door hardtop roofline is a carry over.

Styling is neither individual nor imitative but generally pleasing in the "well-rounded rectangular" tradition of General Motors. There's noticeably less of the "four-door **Thunderbird**" look, but **Ford's** "trademark," the soup plate-sized tail lamp, remains. Big power options are two 427 cubic-inch V8s, one with a single carb, the other with two, four-barrel carburetors. Horsepower ratings are 410 and 425.

The Galaxie chassis has received little attention, perhaps because Ford feels that the ride may be both well-controlled and soft enough to suit most people, since it was virtually redone for '63. Although we prefer firmer shock control and less body roll in cornering, the **Galaxie** ride and handling represents a good compromise.

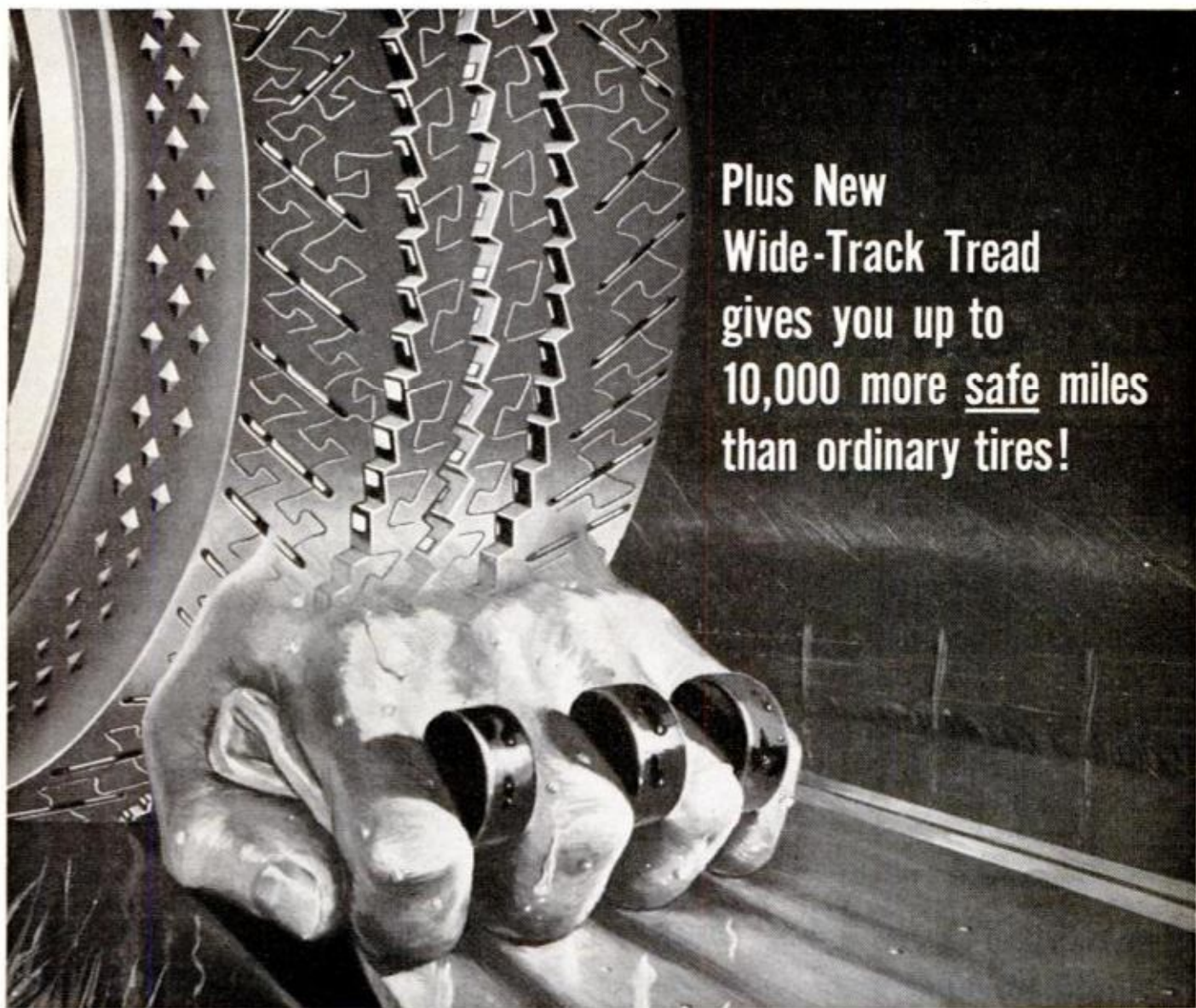
In the Ford Motor Company's styling arena, **Thunderbird** wins the Gold Medal and takes no leaf from anyone else's style book save perhaps its own. Many of its crisp lines seem to remind observers of a happy blending of the best of the '58 through '60 series 'Birds with the styling of '61 through '63 models. The interiors are 'way out, a cross between the Mercury capsule and an Oriental throne room.

One real innovation on the closed 'Birds is an air exhaust vent of thin louvers just below the back window to get air out of

(Please turn to page 36)

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(Continued from page 34)

the car without opening the windows.

Over at Chrysler Corporation, the 1964 Imperial gets the full treatment with a new and more different body than anything that's been seen since 1957.

There's quite frankly a lot of Lincoln Continental in the crisp, flat panels. There's even a very strong hint of the dummy tire bulge in the trunk lid that graced the now classic Continental of '55-'56. The chassis, frame, and power plant remain basically unchanged.

At the other end of the scale, Valiant has been given a neat new grille and a changed instrument panel. And, for "play-as-you-go" types, there's a four-speed, stick-on-the-floor, fully-synchronized manual transmission. With the 225-cubic-inch, 145-horsepower engine, this box makes for lively living. In a slightly heavier Dart sedan which shares Valiant machinery and ratios, PM cranked out a corrected 0-60 acceleration run in a shade less than 11 seconds, while the quarter mile was clocked in a respectable 18.6.

Plymouth retains its 116-inch wheelbase, but gets the complete redo of much of the body including a new sedan and two-door hard-top roofs, and a new cowl and windshield which drops the lower edge of the glass and flattens the also new hood panel, thus giving better vision for short drivers.

The windshield slopes less which puts corner post and top of glass two inches further forward for better headroom. In the chassis the biggest change is a two-inch increase in rear tread. We drove it and we noted that the ride is smooth and there seems a noticeable reduction in cornering roll, especially on the wagon. Sixes' comp ratio is up from 8.2 to 8.4.

Dodge shares the major body changes with Plymouth but maintains its longer, (119 vs. 116 inch) chassis and, of course has distinctive sheet metal below the window line. In spite of (or perhaps because of) body changes which have increased headroom and ease of entrance, both two and four-door Dodges were found to be shake free on gravel roads.

Plymouth, Valiant, Dodge and Dart will have a new four-speed manual box, not the Warner T-10, but Chrysler's own.

Sporting types can have this four-on-the-floor job on Chrysler 300 and 300K series cars as well, while Newport buyers get the choice of three-speed automatic or three speed manual, and New Yorkers are limited to automatic only. All series Chryslers are on a 122-inch wheelbase unit body. Changes for '64 are trim items plus a new grille and more rear glass.

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WHAT IT DOES—HOW IT BENEFITS

When installed with a proper tune-up, which it will help last indefinitely, the system can provide an approximate 15% to 30% increase in power, acceleration, and top speed . . . 10% to 15% increase in gas mileage . . . cut spark plug and oil changes over half!

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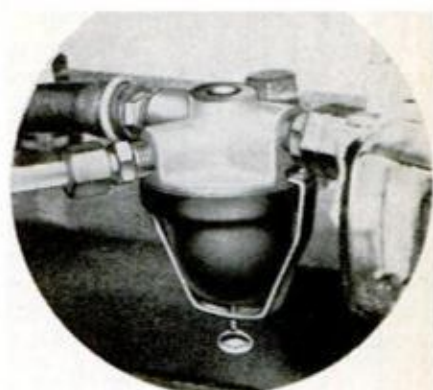
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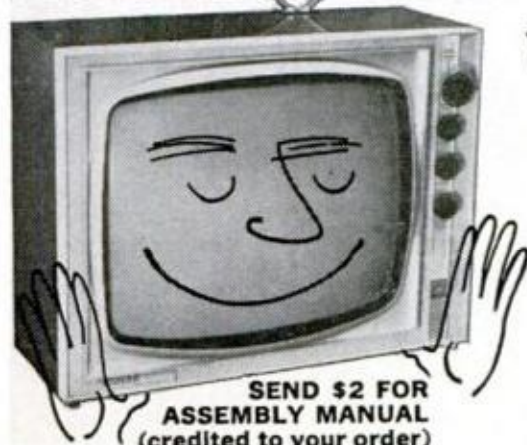
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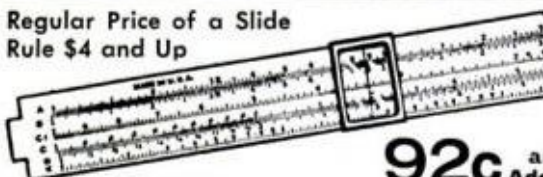


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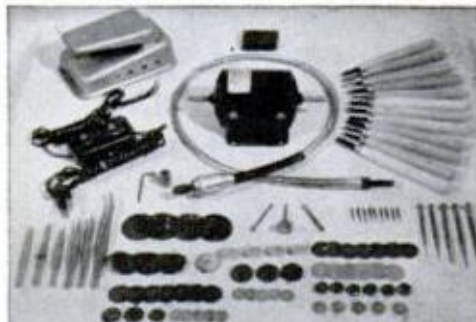
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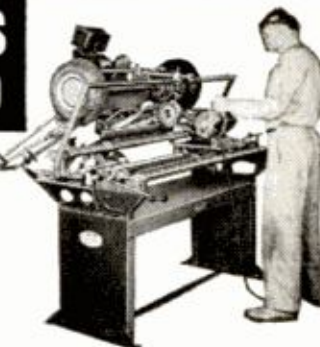
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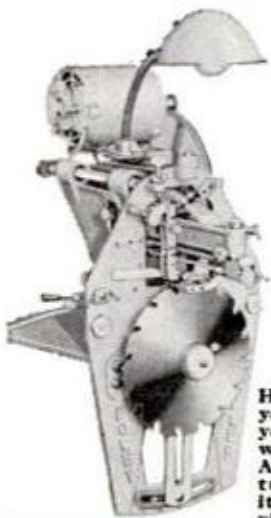
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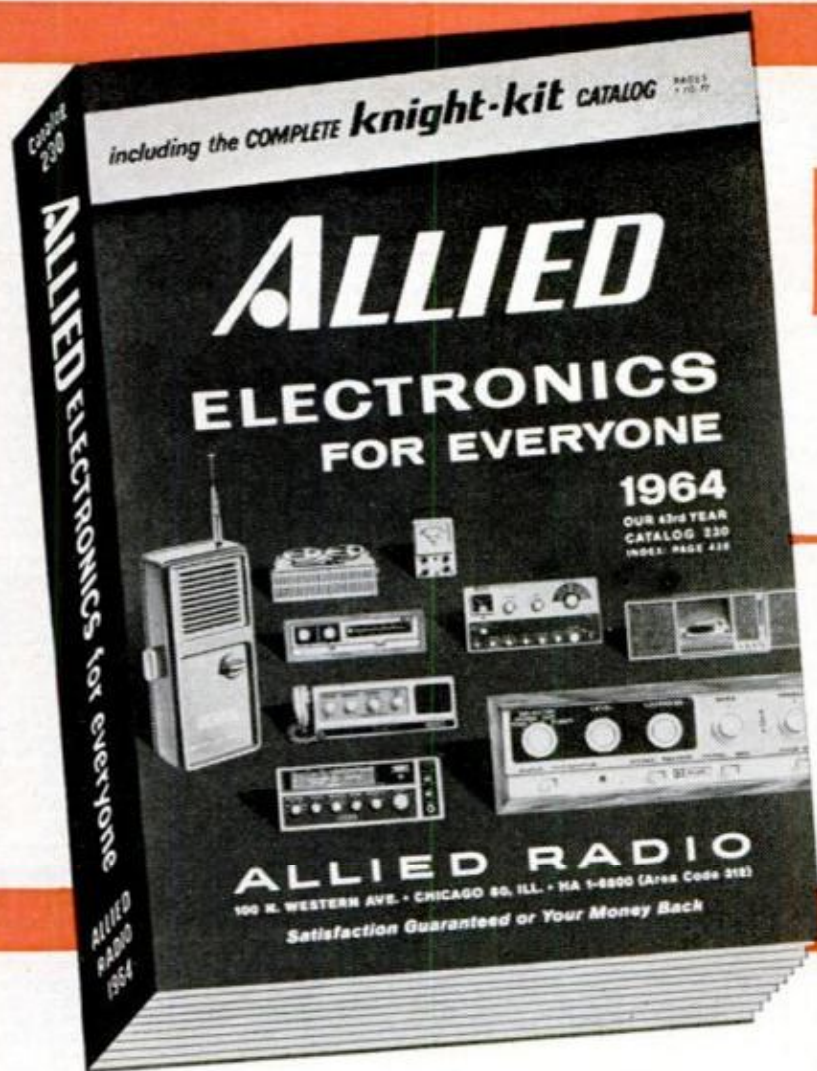
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PROFITABLE Catalog mailorder business! Vikari's, 468-PM, Third Avenue, Salt Lake City 3, Utah.

\$10.00 PER Hour refilling propane hand torches! Write: McCarthy, 2232 Wisconsin, Washington, D.C. 20007.

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

MODERN Mailorder methods provide excellent second income. Details: Mark-Jonas, Box 570PM, North Bergen, New Jersey.

LIQUID Rubber, plaques, figurines, plastercraft supplies. Sample, details free. Lavin Novelities, Box 296-K, Leavittsburg, Ohio.

FISHING Lures. New, patented. You assemble, sell direct or to dealers. Joe Martin Lures, Box 841, Burbank, Calif.

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\$400.00 IN week easy. Sing Sing Bug Chair. Oak Park 37, Michigan.

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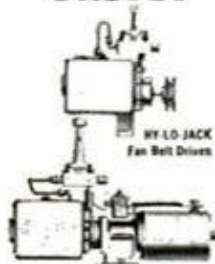
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Cooks or Illuminates



Performing double duty for campers, a five-pound one-burner LP-gas stove can be converted to a lantern by simply removing the burner plate and replacing it with a lantern head.

Operating off a refillable five-gallon gas cylinder, the unit will burn about 200 hours as a lantern and about 120 hours as a stove. With an extra base and "Y" hose fitting, both units will operate simultaneously. Made by Turner Corp., Sycamore, Ill., the unit sells for \$35.95.

Squashed Magnetic Field

Earth's magnetic field has a new shape—somewhat like the front end of a blunt bullet—or at least a revised shape has been assigned to it on the basis of data sent back by two Explorer satellites. The new concept shows the magnetic field pressed in closer to the earth in the direction of the sun, about 10 earth radii or 39,630 miles away, but streaming out away from the earth on the side opposite the sun to at least 16.5 earth radii.

The field's new dimensions were doped out by three scientists at the University of Iowa, one of whom was Dr. James Van Allen, discoverer of the Van Allen radiation belt. The earth's magnetic field acts like a giant bar magnet which traps streams of atomic particles flowing out from the sun.

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You Can Make This Birdbath for a Song

By Hi Sibley

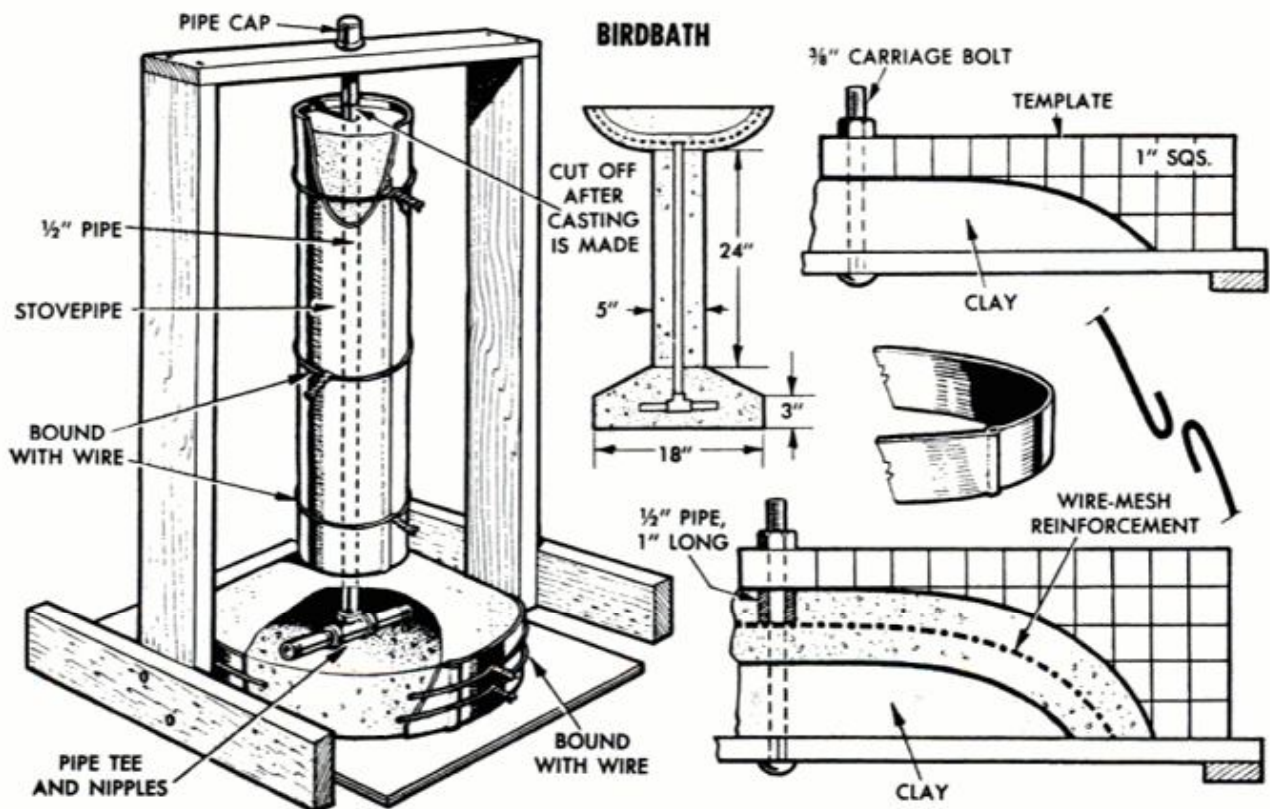


THE FORM for the base is a piece of sheet metal. A stovepipe with its edges unfastened except for a temporary wire binding, serves to form the column. The templates are of pine and are pivoted on a bolt. Each template is used separately. The smaller one shapes the clay and the other forms the concrete

BIRDS of a feather will flock to this welcome oasis during the hot, dry days ahead and they'll thank you for making it with a song.

Though casting the bowl itself would seem to require professional skill, the ingenious form shown in the drawing makes it simple for the do-it-yourselfer. It consists of two templates that may be pivoted on a carriage bolt. The templates are used individually. The smaller one shapes the clay into a convex pattern. The template is then removed and the larger one attached to the bolt. This template is rotated to form the outer shape of the bowl and produce a uniform thickness.

The conical base is poured first, using a sheet metal form. A pipe tee and nipples anchor the length of pipe that reinforces the column, which is poured after the base has set. The stovepipe used as a form for the column is unfastened at its edges and is held together with wire. A suitable mix for the birdbath is one part cement to two parts each of sand and gravel. The concrete must be kept moist for several days.



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Drainage-Line Camera

A self-propelled flash camera for exploring the interiors of drainage pipes can examine great lengths of sewer system for clogging or broken tiles without necessitating excavation. Still in the experimental stage, the camera was developed by Hollis Sholl of the U.S. Department of Agriculture Research Service at Brawley, Calif.

The camera unit consists of a 35-mm. camera and electronic flash installed in a clear plastic tube about three inches in diameter and 16 inches long. The tube is mounted on two wide wheels, one at each end. A small, reversible, battery-operated motor geared to the rear wheel moves the tube through the tile line. The unit is controlled from a master panel above ground, enabling the operator to move the camera forward or backward, tripping the shutter at will.

The camera will save farmers the expense of digging up entire drainage lines to find clogged areas.



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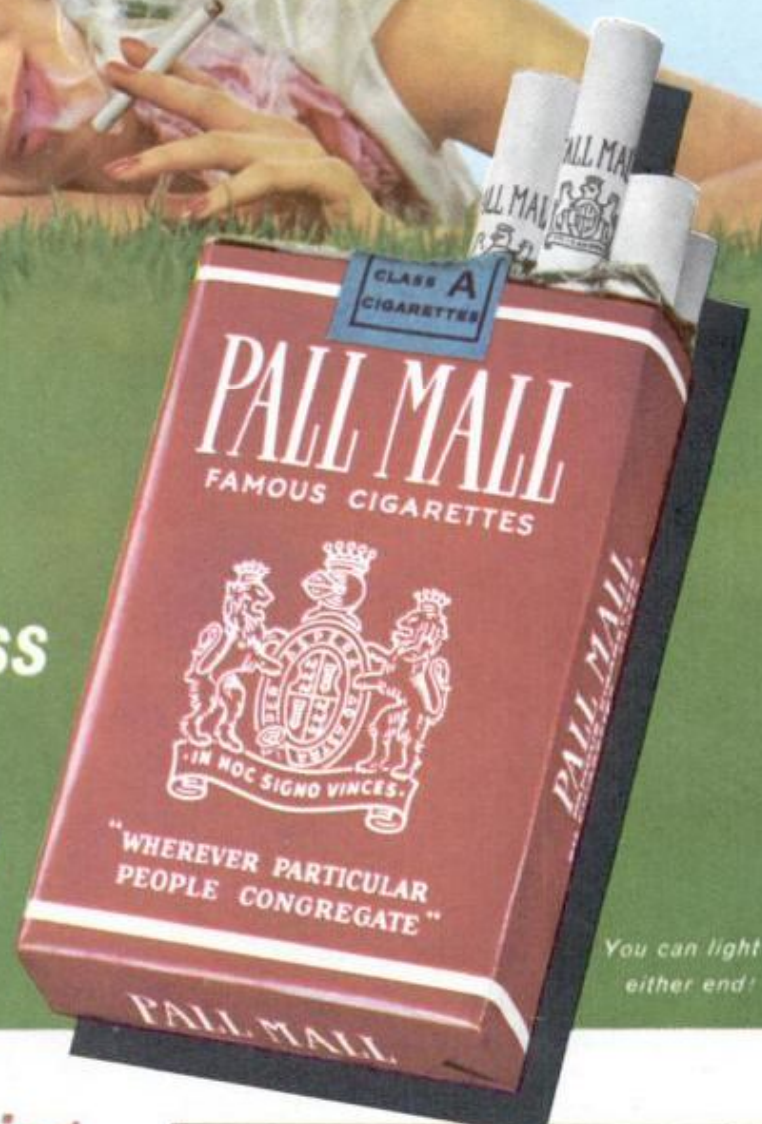
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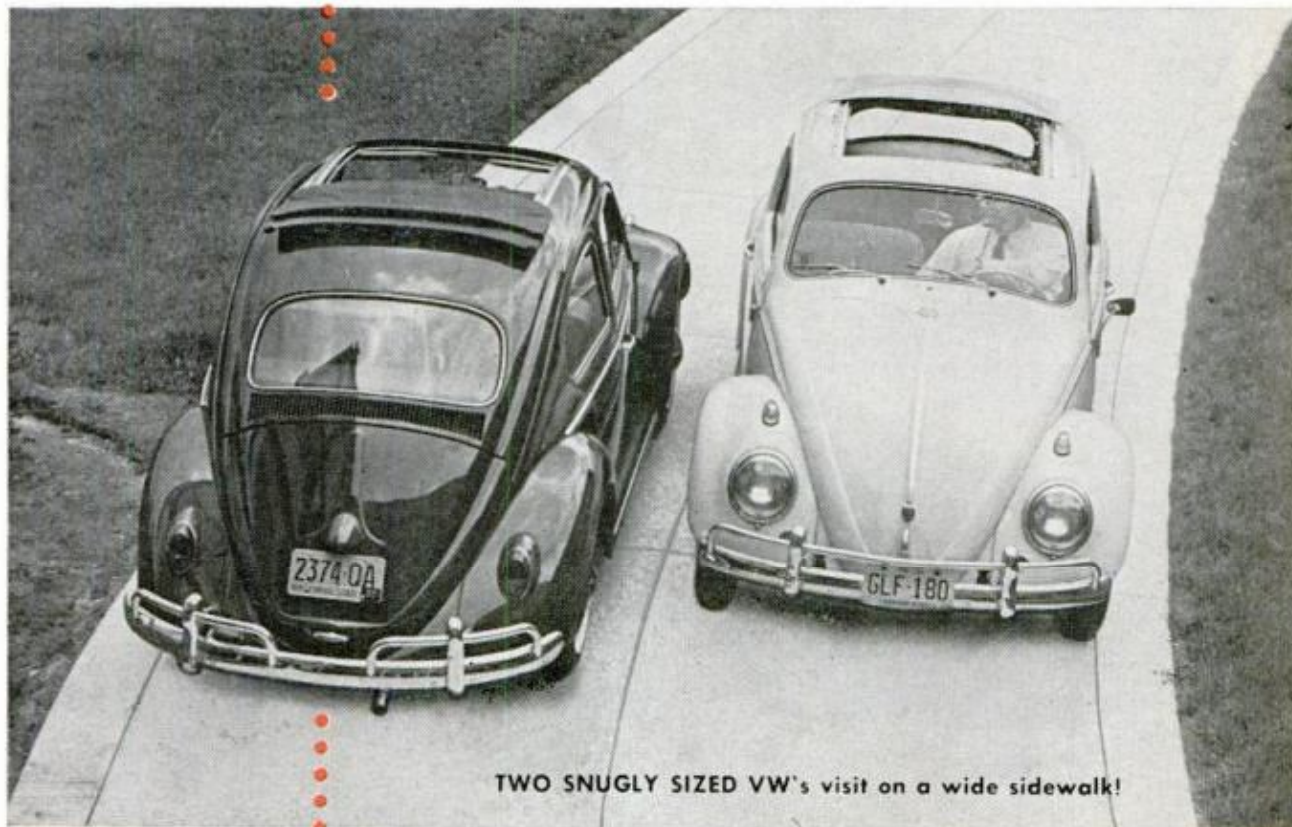
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Though unchanged in shape since PM's '54 report, the famed bug has a new engine and other improvements. So we resurveyed VW owners in order to determine . .



TWO SNUGLY SIZED VW's visit on a wide sidewalk!

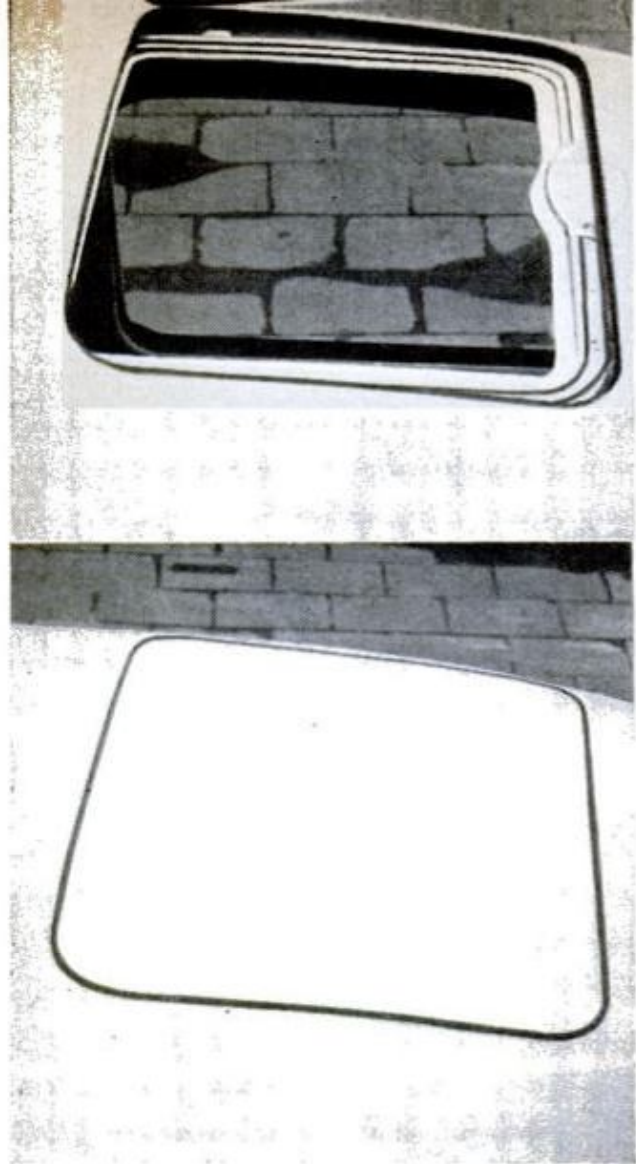
HOW OWNERS RATE THEIR VOLKSWAGENS *NOW!*

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

VOLKSWAGEN comes as close to being a legend in its own time as any car since the Model T Ford. Certainly no single, relatively unchanged automotive design has captured the interest of so many and held their loyalty for so long.

From a trickle of a few hundred brought into the U.S. from Germany by returning servicemen 12 or 13 years ago, Volkswagens are now imported and sold at a rate of nearly 250,000 units per year (if you include the bus-shaped Transporters). This puts VW in 10th place in American sales. And as of July 1st, a grand total of nearly 1,150,000 VWs have been sold in this country.

One remarkable fact is that, through most of VWs early sales growth from a trickle to a torrent, there was little or no national



WARM SUN and cool air via the snug plastic sunroof (a \$90 extra), above left, is welcomed by many VW owners who want more interior ventilation. Big change for 1964 VWs will be the sliding-metal sunroof panel, right. Although the opening will be smaller than on the '63 models, roof should last longer

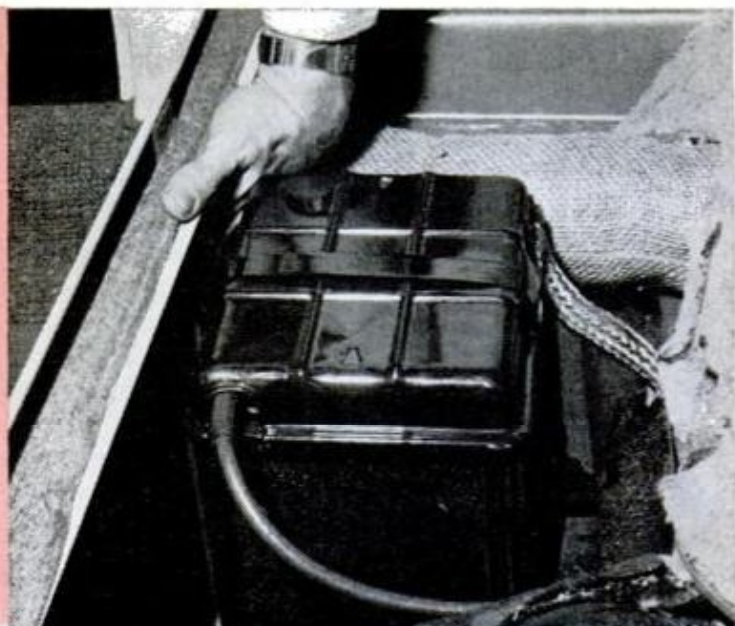
BATTERY IS BURIED in a "crawl space" beneath the rear seat. In addition to cushion, a metal cover must be lifted by loosening an almost inaccessible wire clamp. A small point perhaps, but annoying to 5.3 percent of all owners

Owners Like

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 Cross-wind wandering (10.2%)
 Hot-air-only defroster (9.4%)



advertising of it. Word-of-mouth endorsement from owners turned curious bystanders into interested prospects. Thus, the VW car sold the owner who, in turn sold the VW.

And are the VW owners still the car's best salesmen today? Is their devotion to the economy, performance and quality control of their little bug as fierce as it ever was?

One answer shows up in a comparison of the responses owners have made to three successive surveys we have made in 1954, 1959 and today. Here are the owners' general opinions and ratings over the years:

← Have you ever met a VW owner who wouldn't talk about his favorite car?

Volkswagens Through the Years
(as owners have rated them in PM's Reports)

Over-all	1954	1959	1963
Excellent	88%	94%	82.8%
Good	11%	Not asked	15.2%
Average	0%	3.6%	Not asked
Fair	Not asked	Not asked	1.7%
Poor	1%	2.4%	0.3%

	1954	1959	1963
Best-liked features	1. Economy 2. Handling	Economy Handling	Economy Handling
Least-liked features	1. Poor vision 2. Sluggish pickup	Heating system Low power	Heating system Cross-wind wander

Because of improvements in PM's rating classifications over the years, a completely direct comparison on general quality ratings is not possible. For example, the higher "excellent" rating in 1959 is due in part to the fact that no "good" category was provided that year, so the owner was compelled to choose between "average" and "excellent."

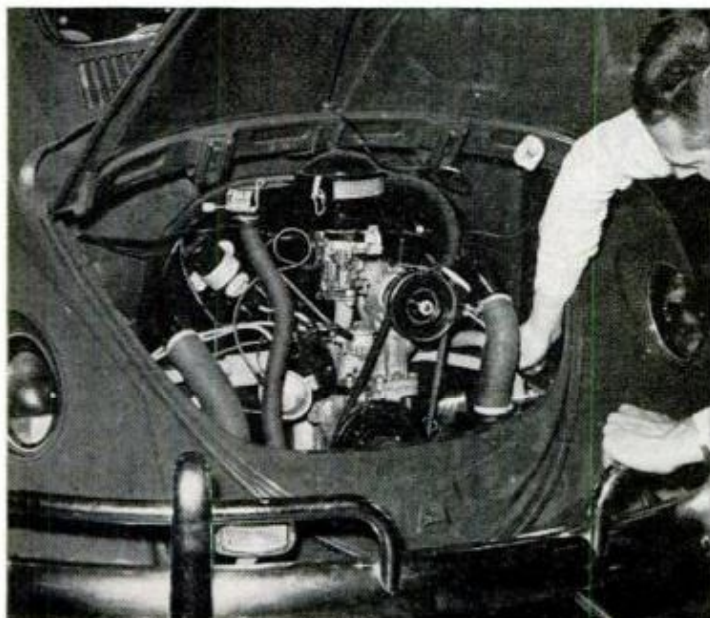
But the general consistency of high ratings and of best-liked features indicates that VW owners know what they've bought and why they have bought it, even today.

The following remarks, filled in voluntarily on the margins of several 1963 questionnaires, illustrate generally how VW

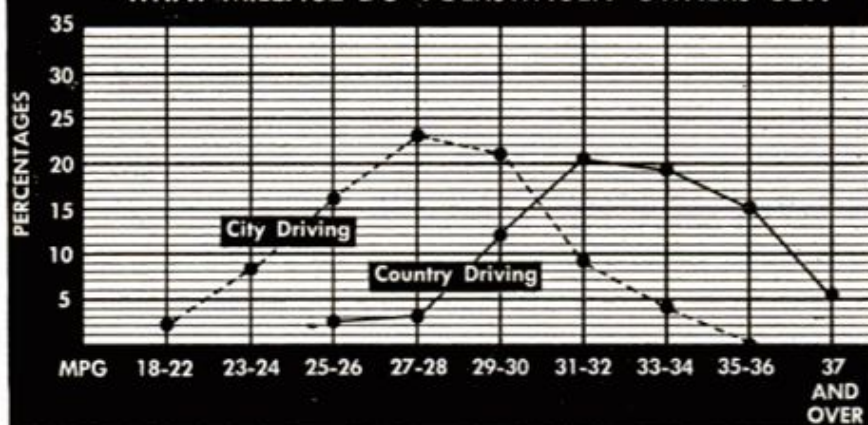
← That 82.8 Excellent percentage exceeds the next best car reported under PM's latest rating system—the Cadillac —by 6.6 percent

AIR-COOLED ENGINE is reached by lifting hood. But some owners complained bumpers can be sprung in, preventing hood from raising. Others wanted a lock

TIRE CHANGING isn't too often a problem for VW owners, as lightly stressed 5:50 x 15-inchers wear longer. Changing is made safer by plug-in jack



WHAT MILEAGE DO VOLKSWAGEN OWNERS GET?



FUEL MILEAGE of average VW owner seems spectacularly high in comparison to larger cars. More powerful (40-hp.) engine has lowered mileage since '54, but the owners remain delighted with 27 to 33 m.p.g.

Unfortunately he's →
among the minority of
auto buyers who realize
you can't have your
cake and eat it too

For this man it makes →
better sense to buy
a small car that fits his
transportation needs
90 percent of the time,
rather than spend extra
money for power
usable only 10
percent of the time

Walking would be about →
the only way you could
beat his cost per mile
on the basis of
two riders

The car has yet to be →
built that doesn't need
a good service
organization behind it

It seems to be a →
veritable piggy bank
on wheels

Here's the payoff; →
significant savings for
the budget-minded
person who takes taxis
only when it rains

owners feel about their 1963 Volkswagens today:

An electronics technician from Michigan said, "Over-all, I'm extremely pleased with my VW. Accepting the limitations of room and power inherent in the design of an economy car, it was all I had hoped for and more."

From an engineer in Ohio comes the comment, "Of course, the big improvement would be increasing rear seat and luggage space, but still retaining the type of body construction and workmanship. This is a well-known complaint and we realized it when buying the car with the feeling that these features are not used often and are outweighed by good features."

A spray painter from New York sums up his feelings this way, "The Volkswagen takes a while to get used to, but I find that the longer I drive it, the better I like it, and the more fun I get out of driving it."

A Minnesota meat packer tells of low cost of ownership. "I put 49,000 miles on my '57 VW and traded for a '60 model for \$600. After three full years and 51,000 miles I traded the '60 on a '63 for \$800. Only expenses on the '57 and '60 were for points and plugs. I used only the original tires on both cars."

All is not perfection however, and from a California psychiatrist comes this complaint, "I'm not happy with the service department; they are careless and only do what they have to do. They can't seem to take care of the little things. This is my chief complaint, but you can't blame the makers for that!"

A California student sums up the general owner feeling as follows, "Obviously, the VW is not perfect; perhaps it's not as good as advertised, but it is better than anything anybody has come up with yet in terms of dollars, and I'm sure it will continue to be."

On the VW owners specific list of praiseworthy features, here are the five items most often mentioned, in the order of their frequency:

"I wanted a brand new car that I could afford and small depreciation. It's highly economical on gas, oil and has very little mechanical failure."—New York student.

"Economical in every respect, including insurance rates."—Wyoming college counselor.

"We can drive twice as much as before for the same money, which is very nice for retired people."—California retiree.

"I drive from 30,000 to 35,000 miles a year; tires show very

little wear when I trade in my cars."—Arizona insurance agent.

"It's so easy to handle it must have been manufactured exclusively for the female sex."—Pennsylvania yarn shop owner.

"Like VW's ease of handling, especially in city driving. It corners better than any other car I have driven."—Illinois bookkeeper.

"It handles well in traffic and also on rough roads."—Florida airman.

"It's a car, not a pleasure barge; I can feel driving and feel that I am in control of the car."—Pennsylvania public health administrator.

"Parking is so much easier and there are more spaces your size available."—New Jersey telephone worker.

"Workmanship is much better than U.S. compacts."—North Carolina principal.

"I like the finished workmanship in every little detail."—Pennsylvania telephone worker.

"Everything about the car works properly . . . no rattles or mechanical difficulties."—Arkansas civil servant.

"Rides like a big car, yet handles like a little one."—Kansas truck driver.

"It is more comfortable than I expected it to be."—Utah electronics technician.

Every bed of roses has its thorns. Here, in the order of their frequency, are the five shortcomings mentioned most often by VW owners:

"The heater was no good—had to install an extra gas heater."—Colorado social worker.

"When car is standing still, there is no heat circulation."—Michigan secretary.

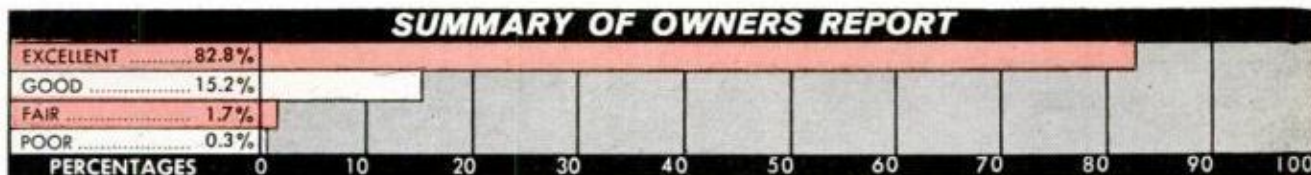
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← **VW puts less weight on 15-inch tires which means longer wear. From 45,000 to 55,000 miles is common**

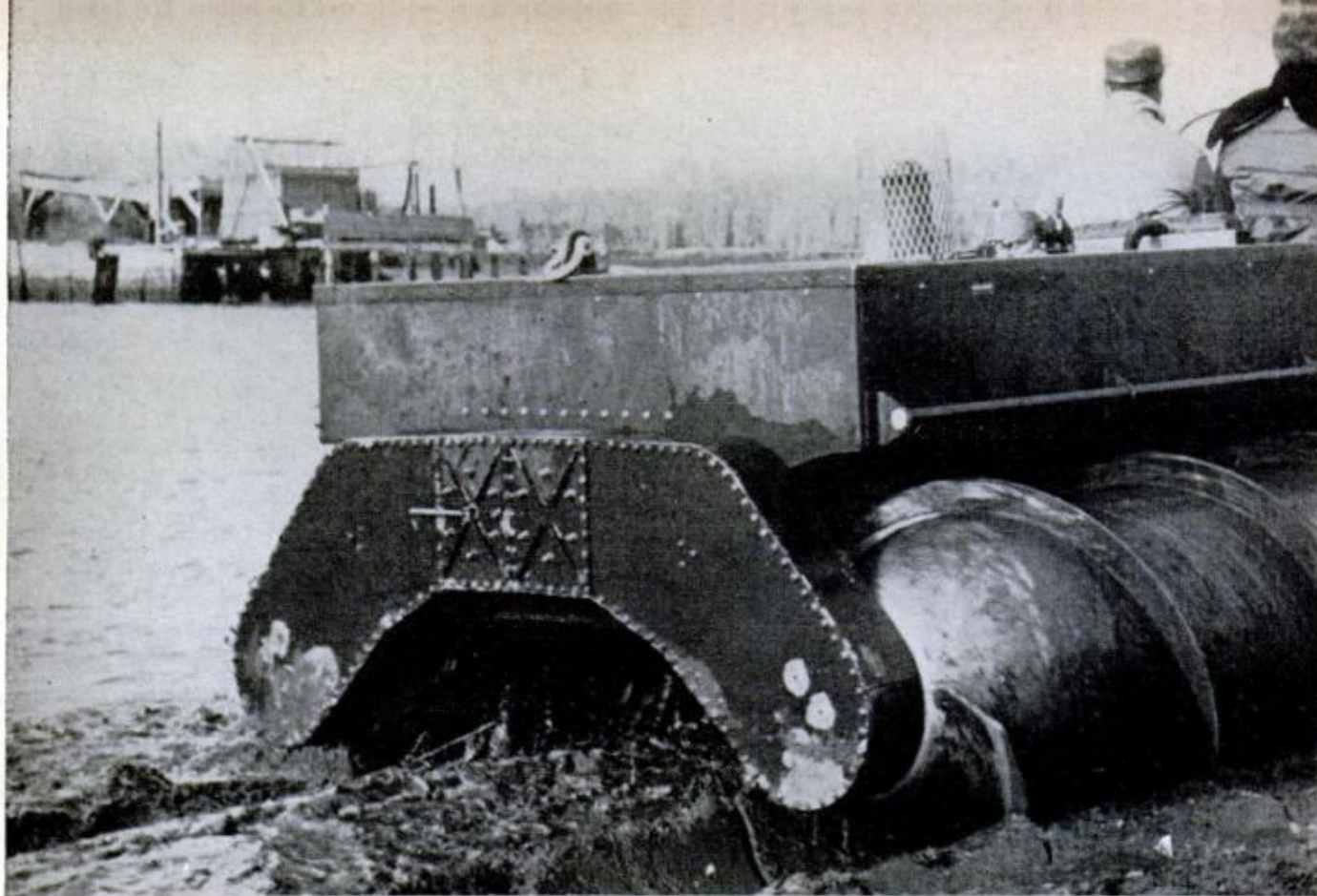
← **The careless rapture of driving into (rather than backing into) a parallel parking space should not be missed**

← **Having just one or two models and not making major changes in them for 20 years is in great part responsible for Volkswagen's high quality at low cost**

← **We've heard reports to the effect that for '64 VW dealers will be stocking a tailor-made gasoline heater at about \$50 extra**



SUMMARY OF OWNERS REPORT		
Category	Percentage	Percentage
Fuel mileage experience		
About as expected	64.0%	
Better than expected	23.2	
Not as good	12.7	
Best-liked features		
Economy, gas mileage	63.2	
Handling ease	61.6	
Ease of parking	19.9	
Quality and workmanship	14.1	
Riding comfort	13.6	
Solid, sturdy, durable	11.4	
Trouble-free, low maintenance	10.8	
Reliable and dependable	9.4	
Performance	7.5	
Unchanging styling	7.2	
Specific complaints		
Heating system	16.1	
Wind gusts affect steering	10.2	
Defroster	9.4	
Underpowered	9.1	
Insufficient ventilation	7.4	
Rear window doesn't open	6.3	
Windshield wipers	5.8	
Inconvenient battery location	5.3	
Poor dealer service, high cost	4.4	
Mechanical trouble, if any		
No trouble	74.2	
Directional signals	3.0	
Brakes	2.2	
Carburetor	1.9	
Steering damper	1.9	
Horn	1.9	
Best-liked exterior style features		
Paint finish	27.1%	
Low, sloping hood	5.5	
Sunroof	5.5	
Simple, functional shape	4.2	
Easy to wash and keep clean	3.6	
Least-liked exterior style features		
Weak bumpers	7.8	
Inadequate luggage space	7.8	
Door locks	5.3	
Outside mirror's mounting	3.3	
No lock for engine	3.0	
Best-liked interior style features		
Leatherette upholstery	19.9	
Comfortable seats	12.7	
Bucket seats	11.4	
Adjustable seats	8.0	
Least-liked interior style features		
Inadequate leg room (rear)	6.1	
No driver's-side arm rest	4.7	
Idiot lights	3.9	
Dome lights short-lived	3.3	
Decision to buy VW most influenced by:		
Economy and gas mileage	70.6	
Initial price	26.6	
Trade-in value	17.7	
Reports from friends, owners	16.9	
Reliability and dependability	13.6	
Low maintenance cost	13.0	
Easy handling	10.8	
Distinctive appearance	8.9	
Different import considered, if any		
No others considered	71.7%	
Renault	11.1	
Volvo	3.9	
MG	2.8	
Compact make considered, if any		
None considered	53.2	
Corvaire	18.8	
Falcon	11.6	
Chevy II	5.5	
Rambler	4.7	
How is dealer service?		
Excellent	58.2	
Average	35.4	
Poor	6.4	
Would you buy from him again?		
Yes, would buy	69.2	
No, would not buy	9.4	
No, answer, undecided	21.4	
Make of car traded in:		
No trade	36.6	
Volkswagen	18.5	
Chevrolet	9.1	
Other General Motors makes	5.0	
Ford	6.1	
Other Ford Motor Co. makes	1.6	
Plymouth	3.0	
Other Chrysler Corp. makes	1.6	
Would you buy another Volkswagen?		
Yes, would buy	89.2	
No, would not buy	3.3	
Undecided, don't know	7.5	



Marsh Buggy Spins Along over Almost Anything

Long, rotating drums and their spiral blades send this experimental marsh buggy through anything from open water to beaches, bogs, earthworks, deep snow—

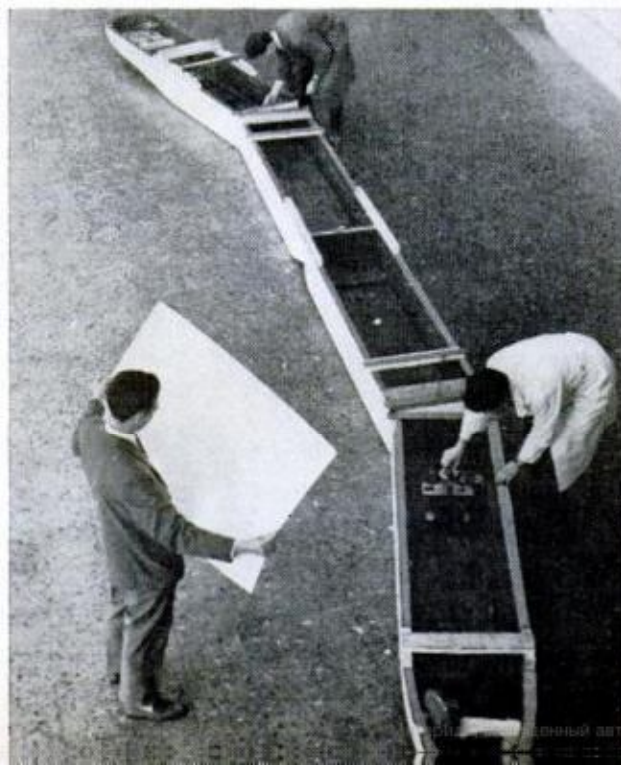
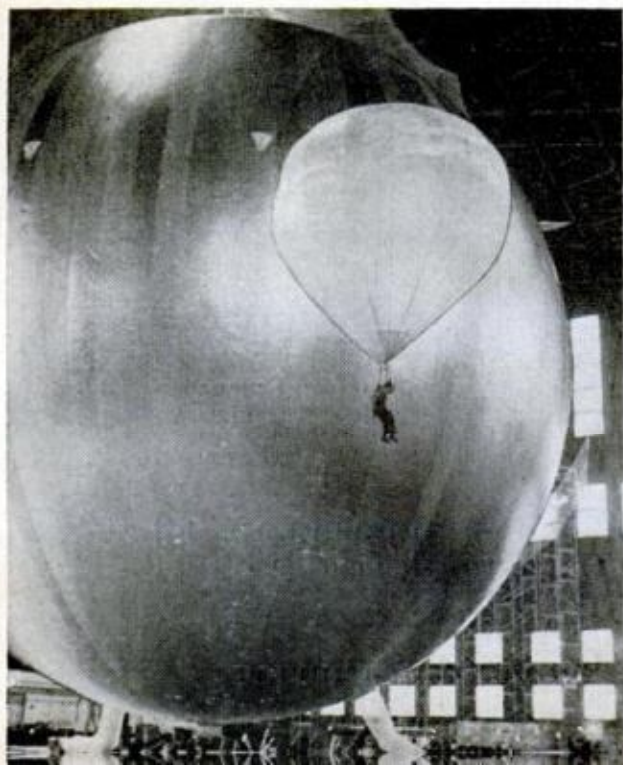
even occasionally hard roads according to Chrysler Corp. Developed by Chrysler for the Defense Department, it's powered by a 225-cubic-inch Slant Six gasoline engine.

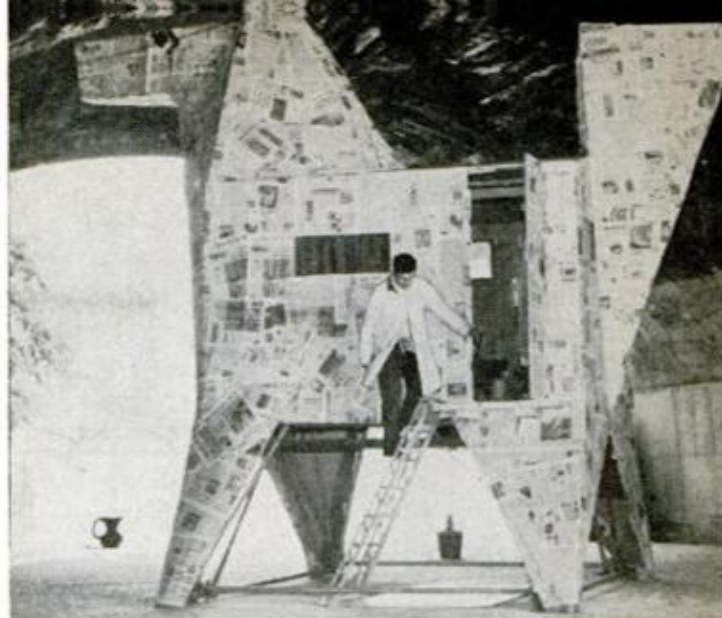
Hangar Flying

A technician rides small helium-filled balloon as he checks Echo II satellite before its launching into orbit. The huge balloon, 135-feet in diameter, was easily housed at Lakehurst Naval Air Station.

Swivel-Hipped River Boat

Model of a jointed ore boat which separates into four sections is now being tested in West Germany. Such a design would make it possible to transport larger cargoes on Europe's twisting canals and rivers.





Takes a Heap o' Newspaper

Made of metal tubing, wood and newspaper, a "Trojan Horse" was built under a bridge in Paris as a temporary dwelling by a Greek artist. Inside the unique house is a 12 by 16-foot room.

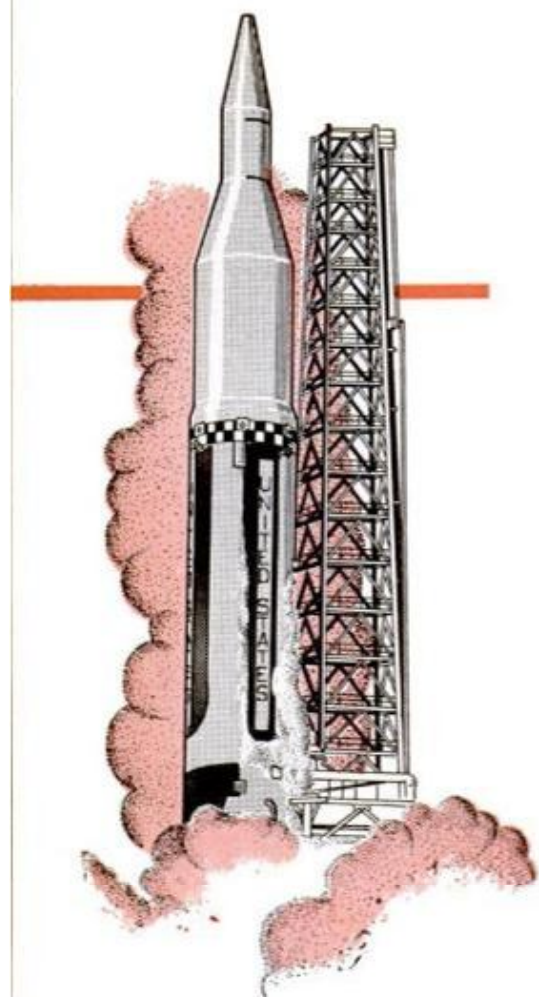
Penguin Is Hatched

The one-lung Penguin amphibian does 4 m.p.h. in the water and 31 on the road, driven by a two-cycle engine. It's manufactured by Pengor Ltd., Ottawa, Can.

Bed in a Brief Case

Unfolded from a brief case, an arm and head rest can give train passengers a chance to snooze on medium-long hops. The sit-up bed, invented by a West German, attaches to a train's baggage rack.





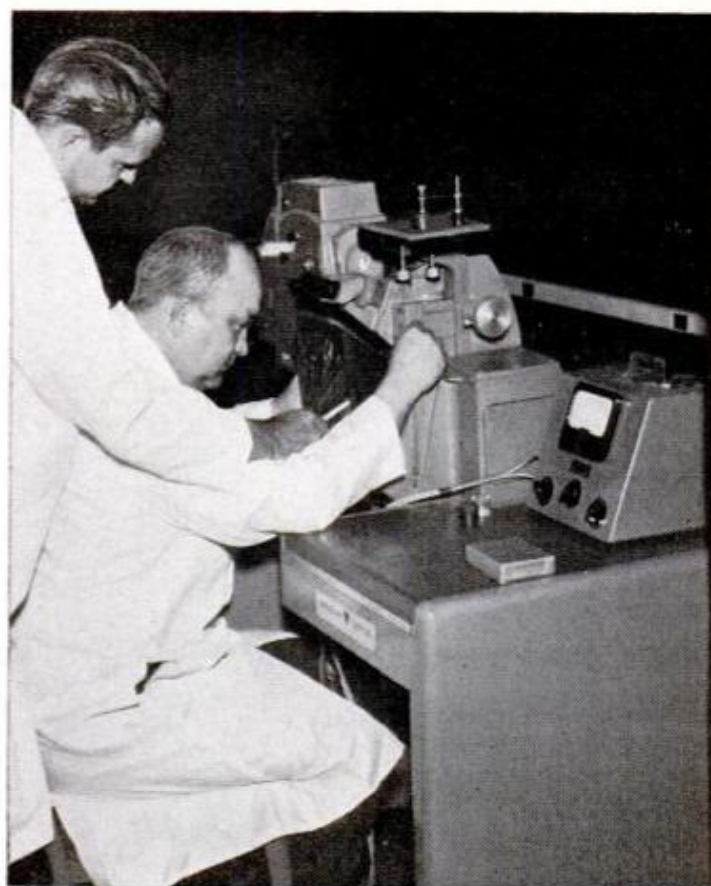
Cosmic Clinic

Space coroners autopsy giant booster remains; rocket doctors peel the paunch from the launch; surgeons in sterile garb probe the Saturn's complex plumbing in our mighty effort to put men safely on the moon

By Clifford B. Hicks



FAULTY EXHAUST DUCT of a rocket arrives at the morgue, and is carefully unpacked by "Doc" Rollin Wagner (right), head of the small group of "space coroners," and one of his assistants, Robert Manzell



METALLOGRAPHERS ANALYZE a section of a weld area in the faulty exhaust duct with a spectrograph capable of examining the crystal structure of the metal. The results are microscopically photographed

for the Moon Rocket

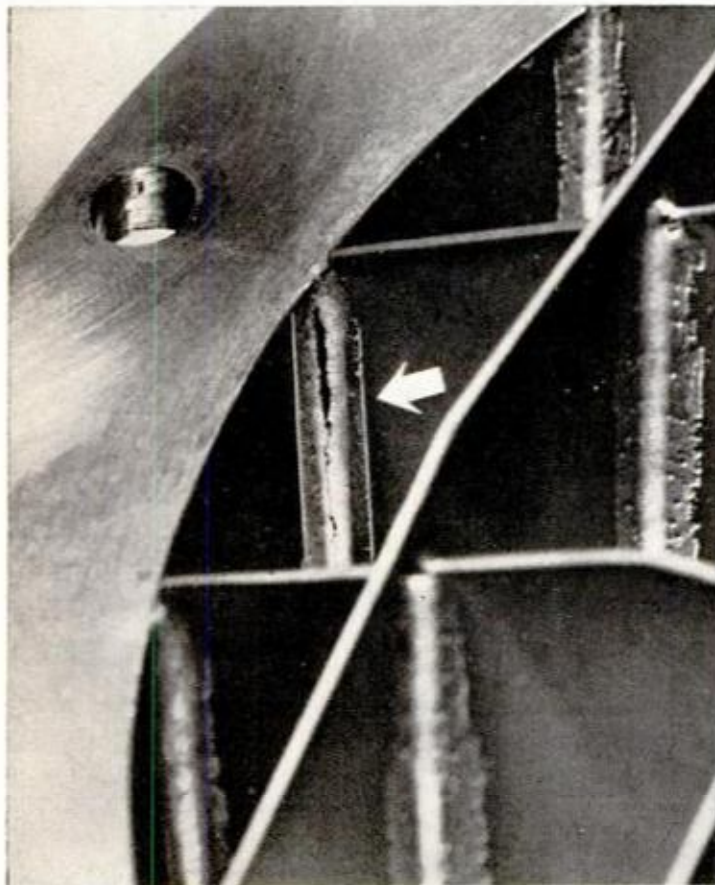
IT TAKES MORE than intrepid astronauts to reach the moon. It also takes what is probably the widest range of diverse and odd-ball talents ever assembled for any scientific project.

Sometime this decade, when three Americans climb into the peak of their huge rocket and thunder off toward Earth's barren satellite, they will be atop not only a mighty missile, but a pyramid of the efforts of unique scientists as well.

The eyes of the world will be on the moon men, but the unusual scientists left behind will be the real keystone of the incredible effort. Already these men are

hard at work on the moonshot. And their talents are as remarkable as their mission. On the team to develop the Saturn booster for space travel are:

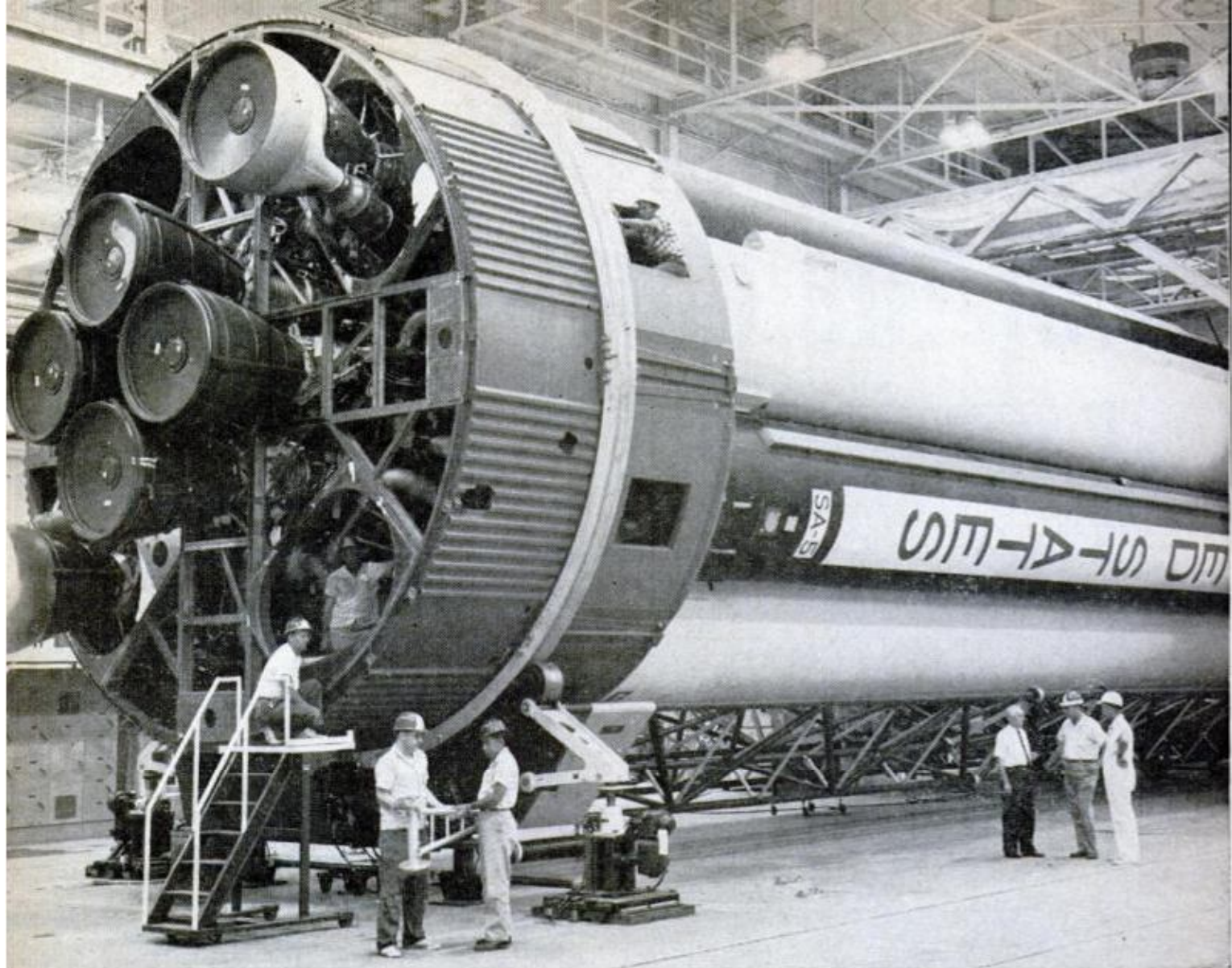
- **Space coroners**, who perform autopsies on the internal organs of huge boosters.
- **Scientific Vic Tannys**, who operate a rocket-reducing salon to melt away unwanted pounds of mechanical fat.
- **Rocket surgeons**, who operate in a room much more sterile than the cleanest of hospital surgeries.
- **Tailors**, who turn out form-fitting suits 165 feet long.
- **Buyers**, who rival department-store



LIKE A NEEDLE IN A HAYSTACK, this crack in a brazed joint was discovered after many tests and many hundreds of man-hours of intense effort. One such flaw could wreck an expensive rocket launching



COMPLETE PHOTOGRAPHIC EVIDENCE of a material failure is presented at completion of tests. This will result in new welding techniques for this particular part, and help perfect future microscopic inspections



SATURN (TYPE IB) ROCKET will carry a dummy Apollo spacecraft on the first probe of the moon. The unsung work of the "space coroners" will be a vital factor in the delicate margin between ultimate success or failure of the shot

experts in their search for such strange items as diapers, dental mirrors, men's underwear, castor oil and empty beer cans.

The focal point of all these unique efforts is a Saturn rocket booster taking shape at the Marshall Space Flight Center in Huntsville, Ala. Just one stage of the final vehicle is an incredible 82 feet long, and when fully fueled it weighs very nearly an incredible 1,000,000 pounds.

Looking at that monster, you have the sudden feeling for the first time that the space world is *not* all publicity releases and news headlines; that, without any doubt, astronauts soon will be headed on their long arc toward the moon—and beyond to our solar system's planets.

Within a radius of three miles of this mammoth skyrocket are the men with the way-out occupations. Each has staked a claim to a small part of the Saturn program, and the entire program will succeed or fail on the basis of each small part.

"Doc" Rollin Wagner, who is responsible for tracking down the cause of failure of small parts, is the "chief space coroner" at Huntsville. His work gave him his nickname. Wagner, a tall, slender man who looks more like a professional basketball player than a key scientist, supervises the pathological examination of the innards of a faulty rocket to see what made it fail during a static test, or in an actual test launching from Cape Canaveral. During a static test firing, for example, a network of sensing instruments takes more than 1000 different measurements of propellant flow rates, temperatures and vibration levels. Even the smallest hint of trouble will send "Doc" and his crew of coroners into a long and thorough inquest.

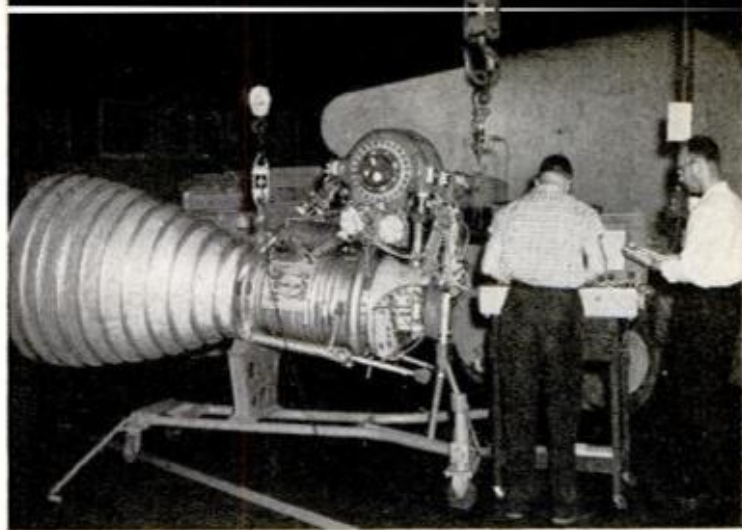
As Doc says with a grin, looking around his laboratory and its personnel, "The failures end here."

Recently, an aluminum bolt, quite ordi-

[\(Please turn to page 220\)](#)



MEASURING Methods Section engineers use modern ultra-sensitive electronic load cells to measure and determine the total weight, center of gravity and the inertial characteristics of the entire space vehicle before the launching

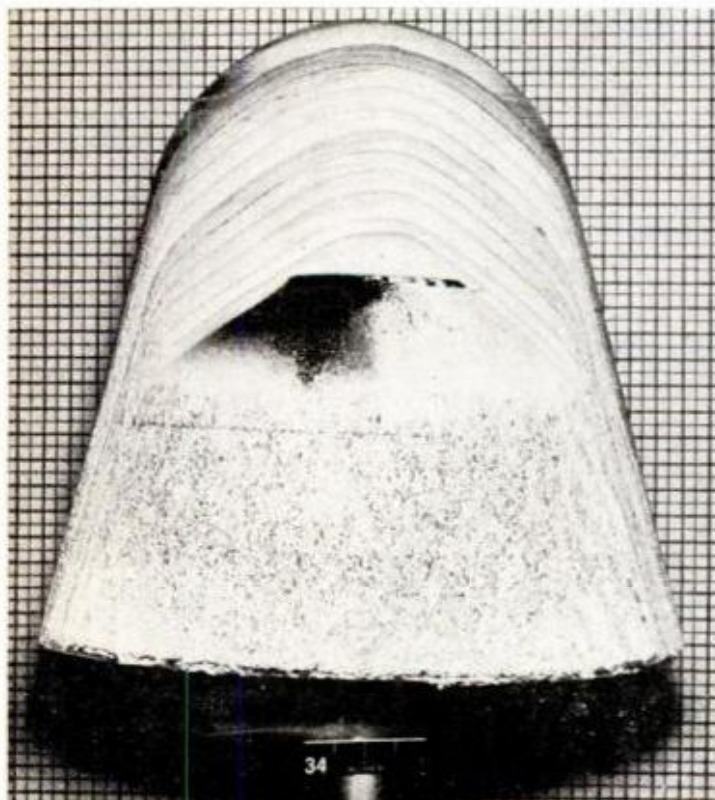


SMALL ROCKET components are assembled inside a sterile air-inflated plastic bubble in an effort to keep them free of germs. Complex of valves for big rockets is so delicate that dust could clog openings, causing failure

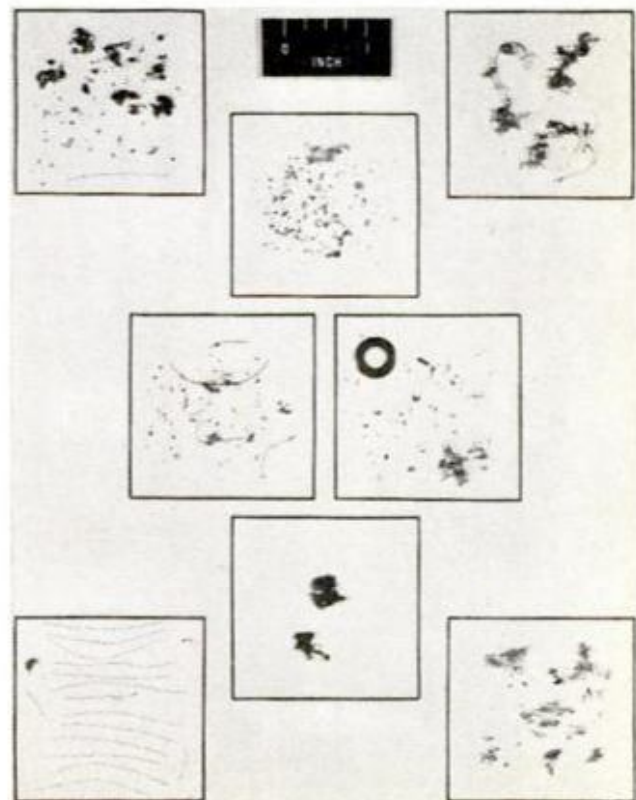


SAMPLE NOSE CONE is tested under typical atmosphere re-entry conditions. Photographs of a cone gradually melting predict possible material failures

DESPITE INTENSE EFFORTS at cleanliness, foreign matter manages to creep into the boosters. This "garbage" was photographed on inside of LOX tank



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Bruise-Proofing Your Playground

Softer surfaces and imaginative equipment with no moving parts are taking the hurts out of play

By Morton J. Golding

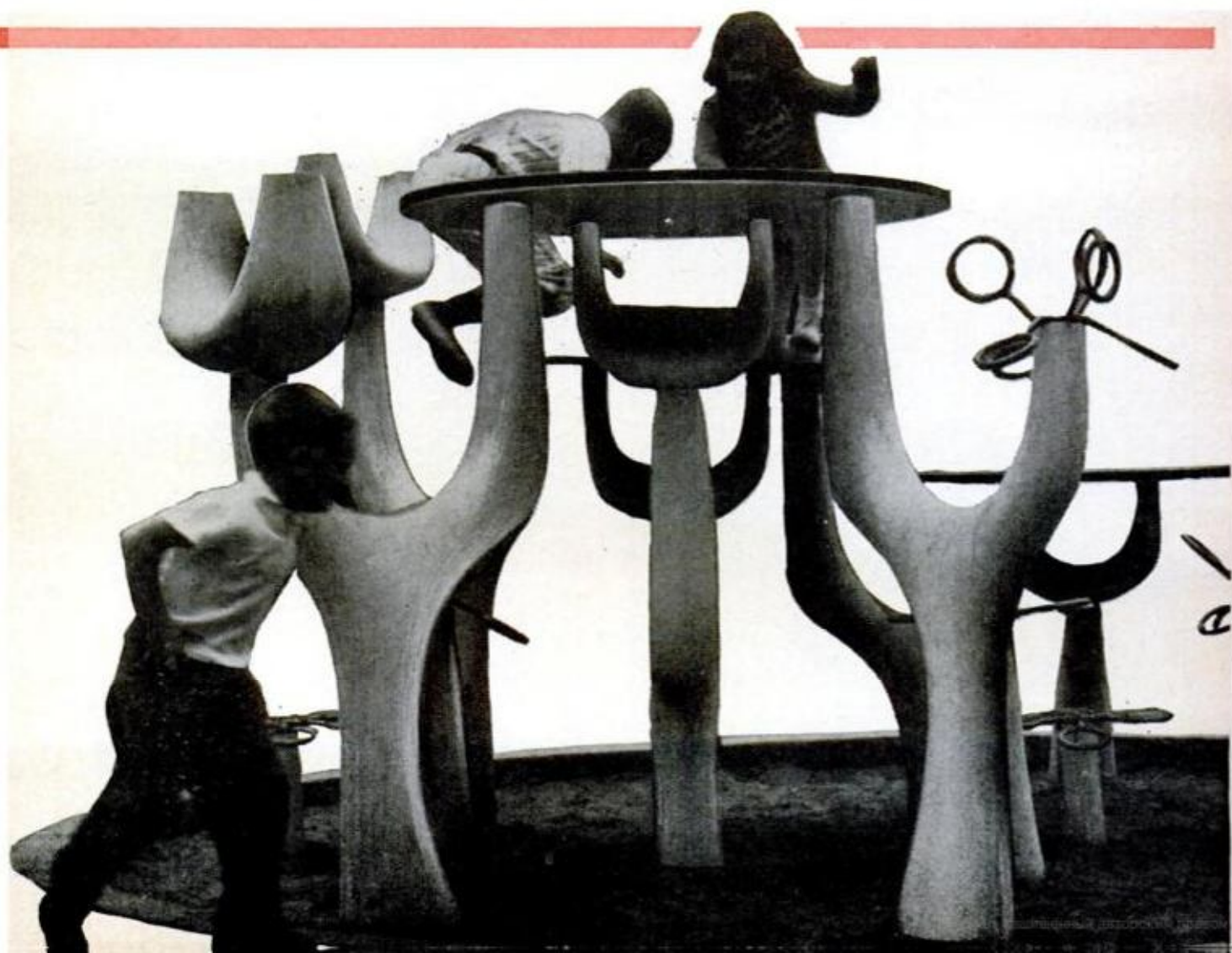
TWO SIX-YEAR-OLD BOYS are using the seesaw on a public playground. Without warning, one jumps off, unbalancing the seesaw and dropping the other boy with a hard, sudden jar. Result: Two broken ankles.

In another playground, a child decides to climb to the top of a slide. Just as he nears his goal, he suddenly slips, falling back onto the concrete surface. He gets

off lightly, ending up with only a fractured arm. It could have been much worse.

In a suburban development, a pair of four-year-olds are playing on back-yard swings. One gets down and wanders in front of the child who is still swinging. The heavy corner of the swing strikes him behind the ear and death is instantaneous.

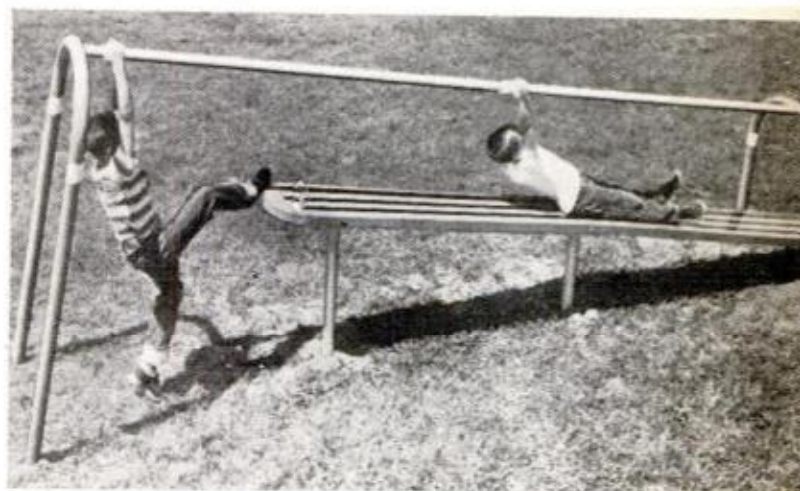
Three different situations in three separate areas. But they all point to one glar-



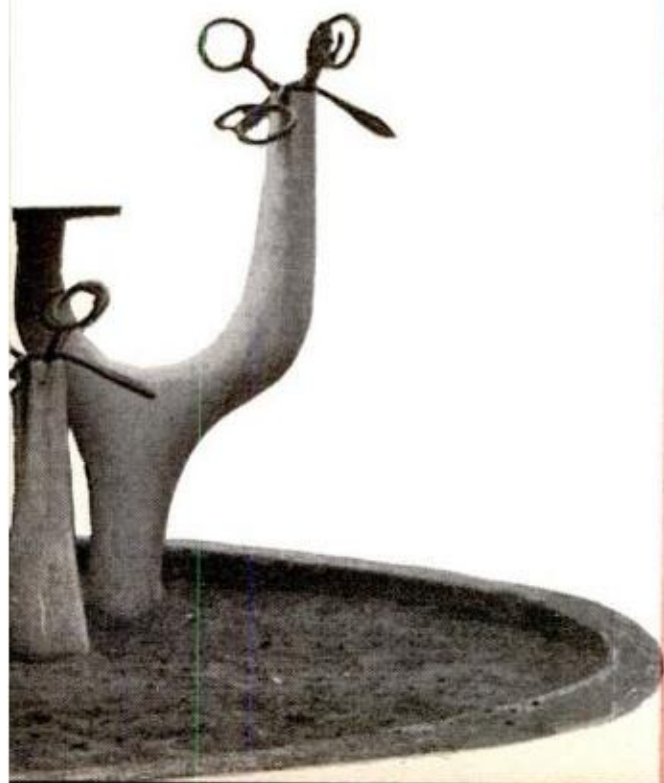
FREE-FORM "HEXAPOD" is for climbing, straddling, or crawling under. Smoothly rounded and stationary, it offers no place to pinch fingers or cut heads—and falls off the low structure aren't dangerous. It is made by Creative Playthings, Princeton, N.J.



SLIDING BOARD is another nonmoving piece that has no injury-producing parts. It's low to the ground, so it's easily reached by youngsters and falls aren't serious. The board is in a junior obstacle course made by Miracle Equipment Co., Grinnell, Iowa



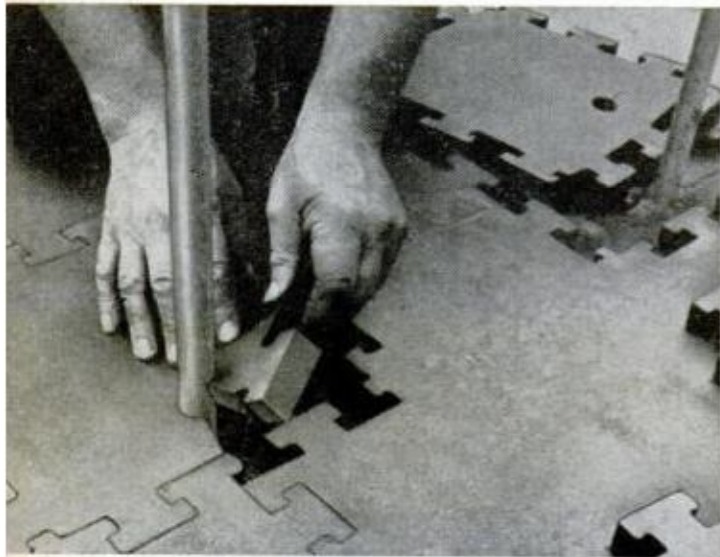
ATTRACTIVE ABSTRACT ART that's pleasing to look at and a challenge to a child's imagination are these slingshot shapes set on a soft play surface that'll absorb the shock of falls. Manufacturer is the Playground Corporation of America, New York City



SUPPORTING STRUCTURE of this "giraffe" swing is beyond collision distance, and the sling seats offer no hard edges to crack tiny heads. The swing was designed by experts at Long Beach (Calif.) State College and custom-made for Long Beach Recreation Department as part of its "adventure play" series of playground equipment



LOTS OF CLIMBING here, but not too high and always over a sandy landing spot. The Monkey Cage is a product of Playground Corporation of America



INTERLOCKING BLOCKS that go together somewhat like a jigsaw puzzle provide all-weather resilient surface. Manufacturer: Mitchell Rubber Co., Los Angeles



FIRE ENGINE that doesn't move gives imaginative kids the feel of the real thing plus lots of exercise climbing its ladder. It's made by Creative Playthings

ing fact: A child's playground can be decorated with danger.

A report by Dr. Gerald J. Hase on school accidents in New York State showed that 65 percent of them took place on playgrounds and in gyms. The State of Kansas reported nearly 1400 playground injuries for the year 1956-57. Texas, in 1958, had more than 6000 accidents involving playground equipment.

There have been comparatively few studies which pin down the kinds of injuries that are most apt to take place on playgrounds and what children are most vulnerable to them. But those that have been made point to definite conclusions.

- **Boys are more likely** to get hurt than girls. A study based on data from Oakland, Calif., showed that almost three times as many boys as girls received injuries, even though there were not quite twice as many boys using recreation facilities.

- **Younger children** are especially susceptible to playground injuries, according to the Oakland study; it indicated that elementary playgrounds have the largest percentage of accidents. An accident survey taken in Milwaukee, Wis., from 1955 through 1959 showed that children five years old and younger accounted for between 40 and 50.9 percent of all accidents taking place on the city's swings.

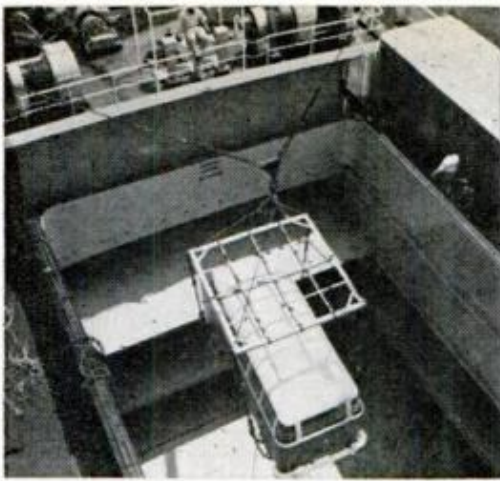
- **Face and head injuries** are most prevalent among children. Head injuries accounted for 56 percent of all hurts reported by Dr. Hase, with arms and hands next at 23 percent; legs and feet were third at 17 percent. Other playground studies have shown similar unhappy results.

What Can Be Done?

If playgrounds and back-yard play equipment are dangerous for our children, what can we do about it?

Two extreme answers are possible. One is to keep children away from playgrounds altogether, but that's like throwing out the baby with the bath water. Most physical education experts believe that kids need to be challenged. Both public and back-yard playgrounds are first-rate arenas in which a child can toughen his body and develop his dexterity and agility. As George D. Butler, research director for the National Recreation Association told me, "It is important not to take the adventure out of play."

The other extreme, to forget about the [\(Please turn to page 230\)](#)



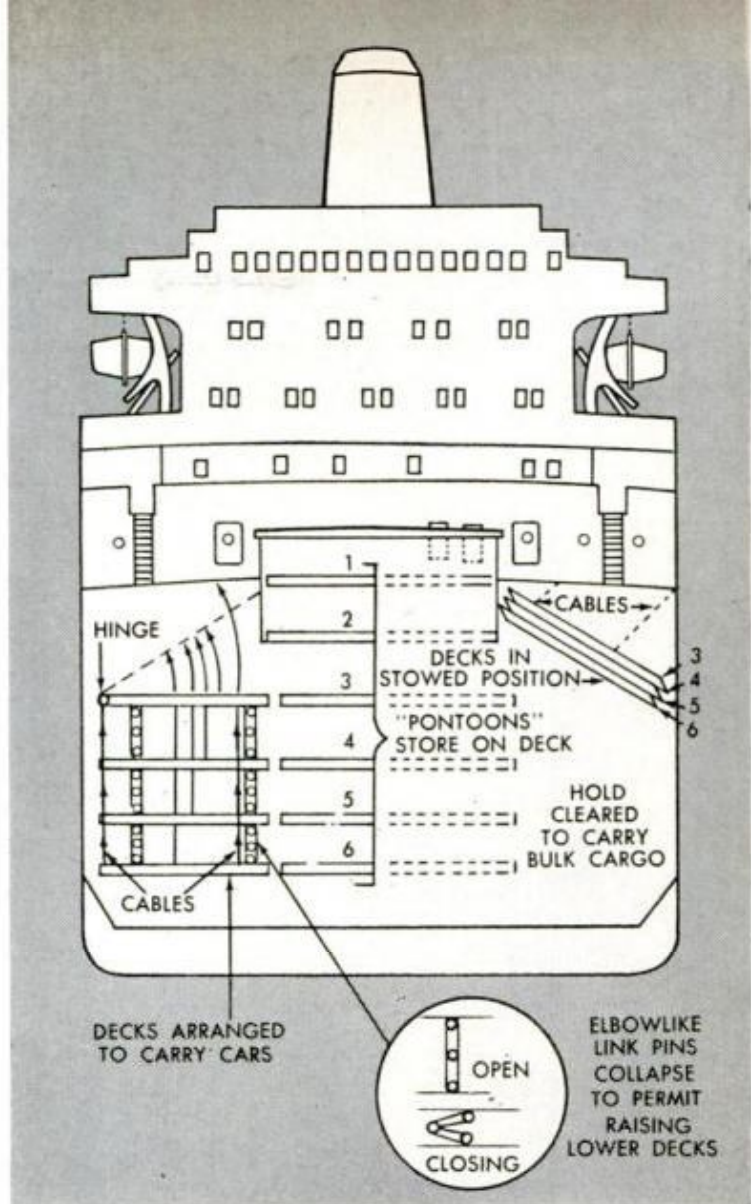
Convertible Cargo Ship

Carrying cars one way and bulk cargo on the return trip, the *Johann Schulte* uses hoistable decks that can be stowed away.

On its maiden voyage, the transport delivered 1688 Volkswagens to an East Coast port, stowed its decks and took on a cargo of coal.

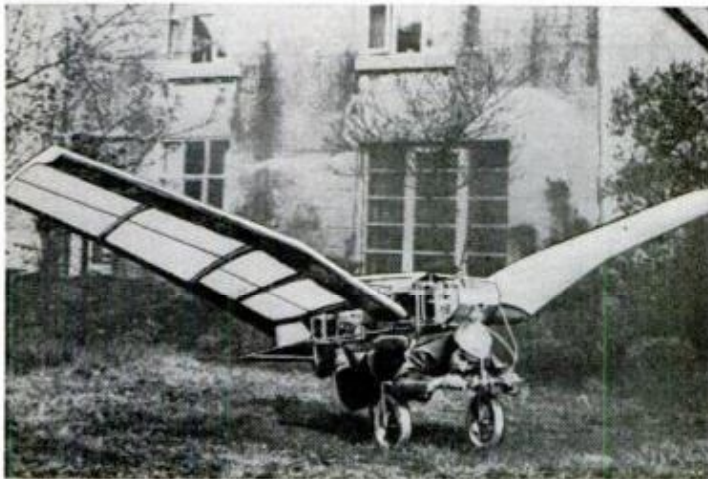
It has a capacity of 1750 cars, trucks and station wagons, and a bulk-cargo capacity of 21,000 tons of grain or coal.

The ship's car-carrying capacity is greater than most commercial storage garages. It is the tenth ship designed specifically to carry Volkswagens.



Flies like a Bird

Designed to flap its wings up and down, forward and backward, a home-made airplane will imitate the movements of birds in an attempt to become the first man-powered aircraft to fly a mile-long course. It will compete for a £5000 prize offered by an English philanthropist.



SEPTEMBER 1963

Inflatable Outboard

An outboard motor mounted on a bracket can be used to propel an inflatable English dinghy. Ranging from 8 to 12 feet in length, the dinghies are inflated with hand or foot bellows or with CO₂ bottles. They're available from Yankee Marine Co., Inc., Cambridge 38, Mass.

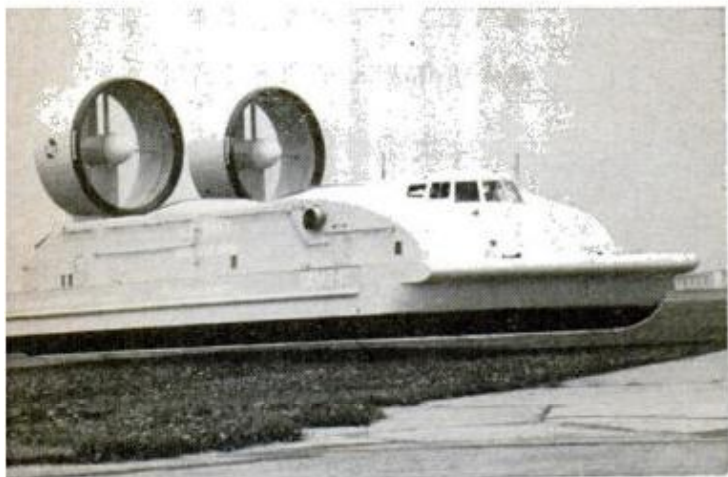


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Speedy Ride on Air

Recently launched on Lake Erie, the 22½-ton SKMR-1 (Hydroskimmer) is capable of cruising at 82 miles per hour in four to five-foot waves. Shown hovering several inches above the ground in early lift-off tests, the 65-foot craft is a prototype for anti-submarine warfare vessels.

Built by Bell Aerosystems Company for the Navy, it is said to be the largest air-cushion vehicle ever built in the U.S.



Four-Passenger Scooter

Designed for easy carrying on planes, boats or campers, a lightweight, three-wheel scooter can be set up or collapsed into two small packages within a minute without tools.

It weighs 70 pounds, but can carry up to 600 pounds, including four people. Its 7½-hp. engine gets up to 60 miles to the gallon. Price.: \$395, from Port-O-Car Co., 705 Vesta St., Inglewood, Calif.



Plywood Mountain

Learning the elementary skills of mountain climbing, school children in Kent, England, practice holds and techniques on a portable wooden device called an "instant mountain."

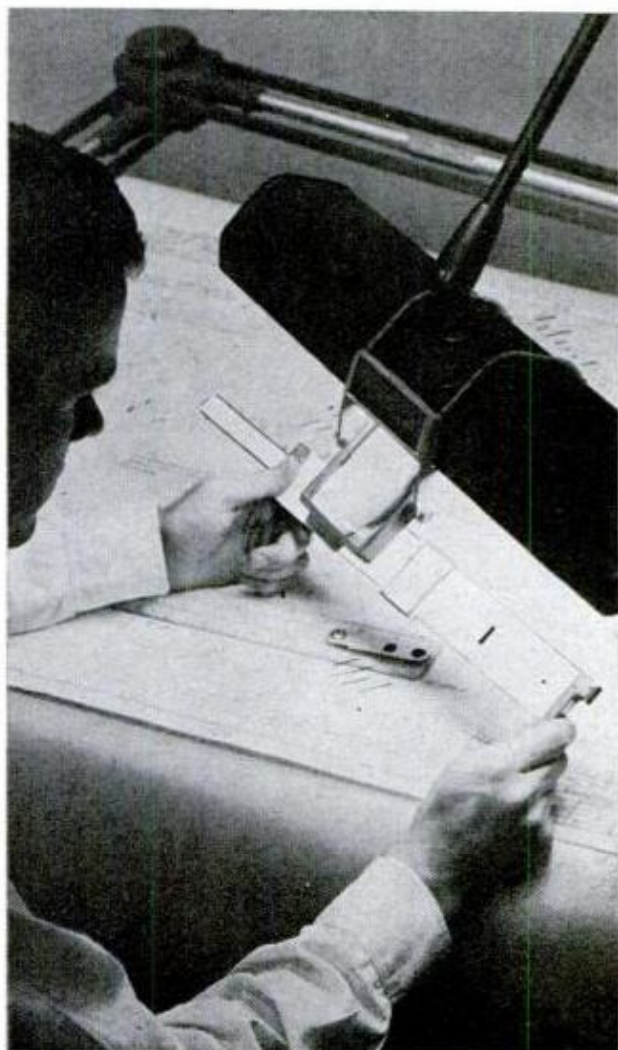
Made of plywood and stringers, the 20-foot climbing board can be dismantled into two sections and is easily carried by four men. Blocks of wood in various shapes and sizes duplicating hand and footholds found on real mountains are attached to the plywood surface. A separation between the two sections simulates a rock shelf, and the surface of the upper section is divided to simulate a crevice for practicing counter-pressure holds.



Fold-Up Helicopter

Collapsed, a new one-man helicopter can be transported or stored in a covered trailer measuring about 12 by 3 by 3 feet. It can be put together and ready to fly in five minutes.

Made by the Dornier Co. of Munich, one of the old German plane makers, it features turbine power which feeds compressed air to nozzles in the rotor tips, driving them by recoil action, counteracting torque.



Railcycle

Riding on four wheels that match the standard British rails, a pedal cycle can carry a passenger in its sidecar or railway equipment for repairs or maintenance. It is demonstrated by its maker, Richard Pashley of W. R. Pashley, Ltd.

Snap-On Magnifier

For precision reading or handwork, a magnifier with a two-power lens of optical-quality plexiglass snaps onto a desk lamp for convenient illumination and easy viewing. Made by Haas Corporation, Mendon, Mich., it is priced at \$4.95.

Takeoff At 30

Wren cruises—hands off—at 26 m.p.h., turns at 30 without losing altitude and finally “lands on a silver dollar”

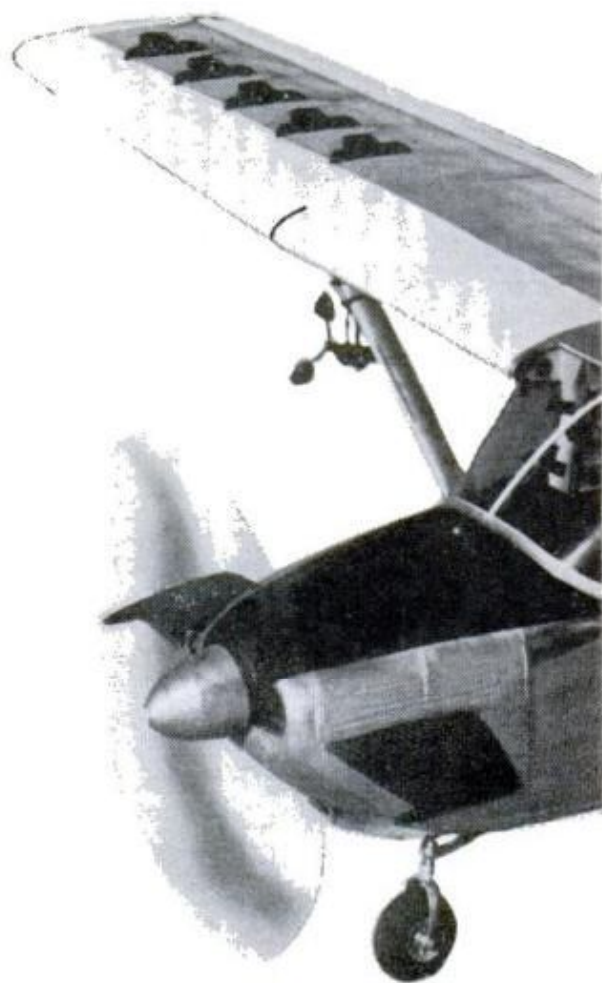
By Kevin Brown

THE EASIEST THING to report about the remarkable Wren is that everything they say about it is true. Its specifications sound like a press agent's puff, but, in a flight lasting more than an hour, *PM* found that none are exaggerated.

The Wren takes off at 30 miles per hour, sometimes with less than 150 feet of roll.

It climbs at 50 m.p.h. or less and is 1000 feet up before it reaches the end of the runway.

It flies straight and level—hands off—anywhere from 26 m.p.h. to 160 m.p.h.—a ratio of 6-to-1.

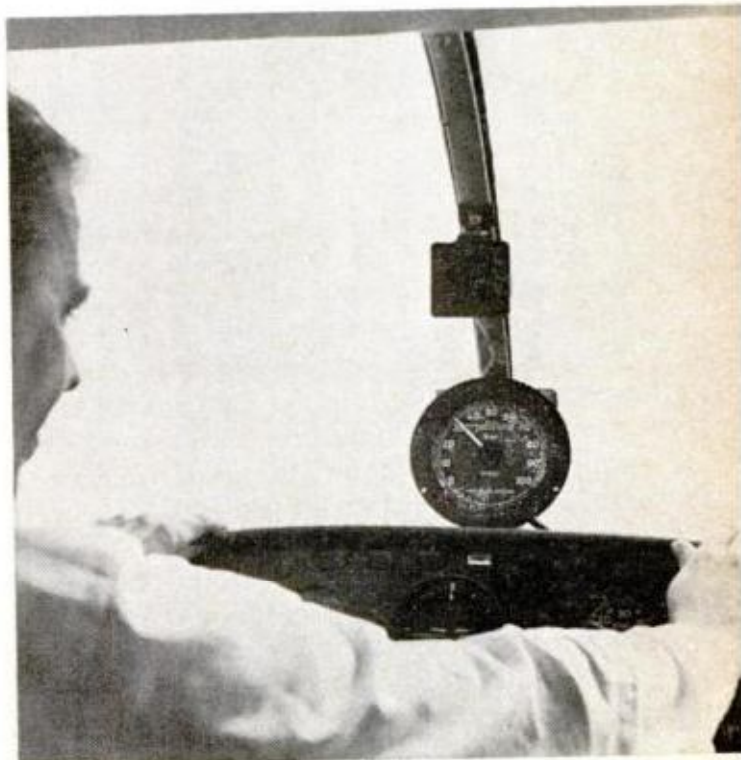


NEW WREN, a made-over Cessna 182, includes forward canard for pitch control, "teeth" on upper wing for control in low-speed turns, huge double flaps and a drooped leading edge on the high wing



TAKEOFF AT 30 M.P.H. can be done consistently in Wren by using full 40-degree flaps. The flaps, double slotted, have eight panels and run full span

HANDS-OFF flying at close to 30 m.p.h. Try that in your own light plane! Speed gauge, added to normal cockpit instruments, works from an anemometer





WREN LANDS just about where you want it. At Meacham field in Fort Worth, it touched down at edge of runway, braked to stop, turned into first taxi strip

It can cruise for extended periods—without engine overheating—at speeds as low as 50 m.p.h.

It can make completely controlled turns at 30 m.p.h. without losing altitude.

It's hard to stall but easy to recover.

It makes its final approach at close to 30 m.p.h. and lands, if not on a dime, at least on a silver dollar, and it rolls to a stop from 100 to 200 feet further on, depending on wind and the pilot.

It is, all in all, a highly unusual airplane.

Its makers, the newly formed Wren Aircraft Corp. of Fort Worth, Tex., call it HTOL, for "helicopter takeoff or landing." They claim it can operate from any area large enough to accommodate a helicopter. Others will probably put it in the STOL category, for "short takeoff or landing."

Its ability to get in and out of small areas, however, is only part of its story. Other aircraft, including STOLs and helicopters, can do this. Its unique feature is its ability to maneuver and maintain level, controlled flight at remarkably low speeds—as low as 30 m.p.h., the speed limit on most city streets—without sacrificing much of its maximum speed.

It's this ability that should suit it for a wide variety of utility operations, especially patrolling, surveillance and bush opera-

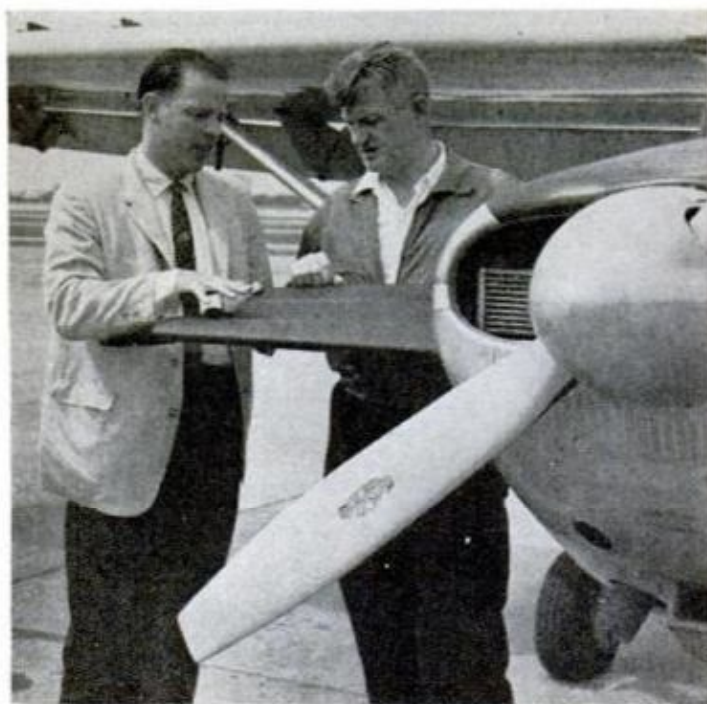
tions where landing away from an airport is necessary.

The Wren is actually a mongrel, made from a standard Cessna 180 or 182 with four major modifications: The addition of a forward canard, and a made-over wing that includes an augmented leading edge up front, vortex generators on top and double flaps in the rear. And there are no special controls for any of it. From inside the cockpit, the Wren operates like any other airplane.

The canard, or nose control, is called the ULS (for ultra-low speed) control system. It gives the Wren the appearance of wearing a bristly mustache. It operates in conjunction with the elevator in the tail assembly—in fact, it is directly connected by a push-rod linkage. As the elevator pitches the tail up or down, the ULS pitches the nose down or up. Its chief effectiveness is at low speeds when the large flaps block out the elevator, and the prop blast gives it sufficient air stream to react against.

The augmented leading edge, which is no more than a cuff of metal wrapped around the original wing edge, blunts and droops the edge, increasing its stall resistance over the original Cessna wing from a 16 to a 28-degree angle of attack. The blunt edge makes it easier for the air to break around the edge at low speeds

JAMES ROBERTSON, Wren's designer, explains nose control to *PM's* aviation editor. At low speeds, prop blast enables it to control pitch of airplane



and the droop, in effect, drops the edge to meet the airstream head-on at high angles of attack.

The vortex generators or spoilers, called "Wren's teeth" by the makers, counteract yaw tendencies in low-speed banks. Only one set of "teeth" operate at a time, and only at low speeds, without any extra control from the cockpit. Geared to the ailerons, the teeth turn into the airstream only on the low-wing side to keep the nose from yawing toward the high-wing side. They operate only at low speeds—and remain feathered at high speeds—because it is only at low speeds that the ailerons are deflected enough to bring them into play. In slow turns, the aileron on the high-wing side is deflected downward, creating a drag and tending to pull the nose toward it. Meanwhile, when the aileron on the down-wing side is deflected upward, it brings its spoilers into play, creating a balancing drag and allowing the nose to fly straight through the turn. The teeth on the high-wing side stay feathered throughout the turn.

The double flaps, while not new, are perhaps more effective on the Wren. Other STOLs have them, but controlling the plane at low speeds is sometimes a problem. The ULS control and the Wren's teeth help overcome this. While these two modifications are essentially for control

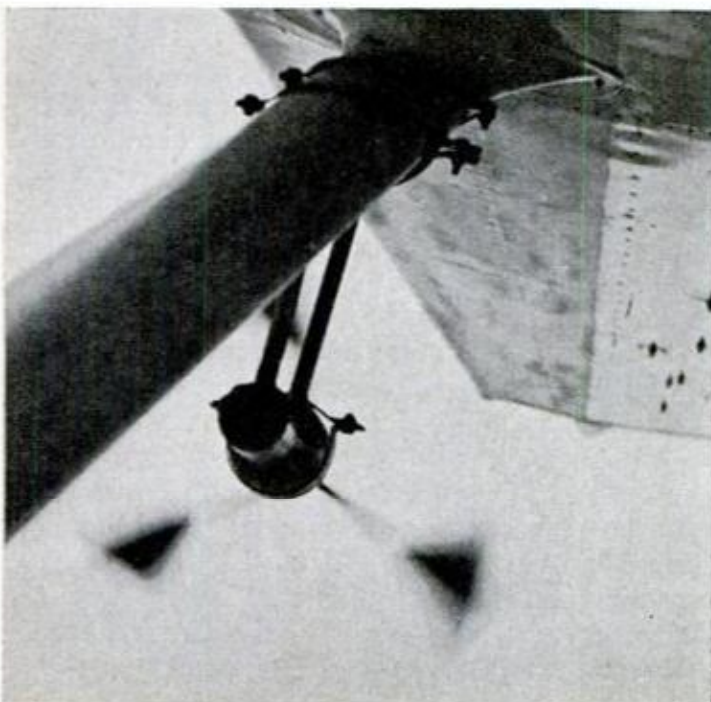
at low speeds, the flaps are definitely what brings the Wren down to these slow speeds. They consist of four panels on each wing, mounted in pairs and running the full span of the wing. The second panel of each outside pair acts as an aileron. Or, to put it another way, each aileron doubles as a flap. The whole set can be locked at 10, 20 and 40-degree angles, and the makers claim that, at any position, low-speed buffeting is impossible.

This combination of modifications is the work of James Robertson, an aeronautical engineer who admits to 37 and looks younger. He came by his aviation background honestly. His father was Major Bill Robertson, who operated an airline out of St. Louis after World War I and included on his roster a young pilot named Charles Lindbergh. James, after college and Navy flight training, almost immediately became involved in vertical and short-takeoff-or-landing aircraft, working with other companies before forming his own. The Wren is his fourth design, and is essentially a simplified version of his Skyshark (*PM*, August, 1962) which could fly at 20 m.p.h. and proved out the nose control. Robertson has full patents pending on the ULS system and partial patents on the Wren's teeth.

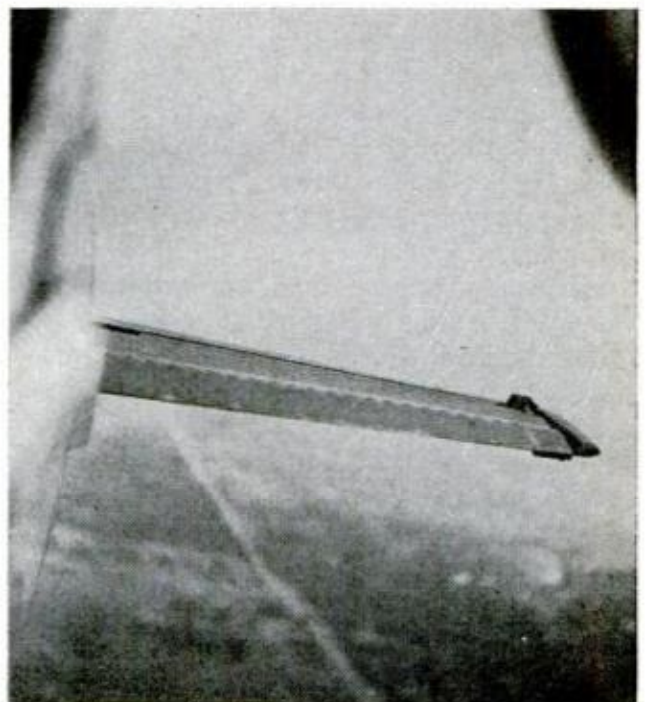
He was our host during *PM*'s test of the

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THREE-CUP ANEMOMETER spins freely from underside of right wing, sending true air-speed reading to instrument in cockpit. It's most useful at low speeds



NOSE CONTROL, like anemometer at left, was photographed by leaning out window with camera while flying along, straight and level, at about 30 m.p.h.





Make Sure Your Brake Fluid Won't Kill You

Phantom failure hides sales of now-illegal brake fluids, but there are ways to protect yourself from their danger

By S. David Pursglove

THE BRAKES work fine, reports a state trooper as he depresses the pedal of a car involved in a fatal accident.

But he's wrong—and had the driver lived, he could tell the trooper how his frantic pumping of the brake pedal brought absolutely no response moments before the collision.

No one knows how often this story is repeated each year because “phantom failure” of brakes fades away a few minutes after the car is stopped.

Failure occurs when substandard brake fluid boils and vaporizes in the heat generated by the brakes of the car—a temperature that may be as high as 300 degrees F. in a modern automobile.

Instead of working against a noncompressible fluid that transmits energy to the brakes, the brake piston just pushes uselessly against a cushion of compressible

vapor. Afterwards, when the brakes cool, the vapor returns to its fluid state—and the brakes are “working” again.

A Federal law went into effect in March to regulate the quality of brake fluid. But you can still buy dangerous, substandard fluid, which, in some cases, may be the carelessly reprocessed drippings from junkyard wrecks.

I bought a can (photo, above and at right) for less than 30 cents in Maryland.

“I wouldn't use that in my brakes,” confided the auto-supply store clerk. “Just use it to wash out the system.”

That was a bum steer, even though it was a half-hearted attempt to be honest. Small amounts of substandard fluid left in a system will drastically reduce the quality of the best fluids that are poured in afterward. The Society of Automotive Engineers reports that a very small quan-

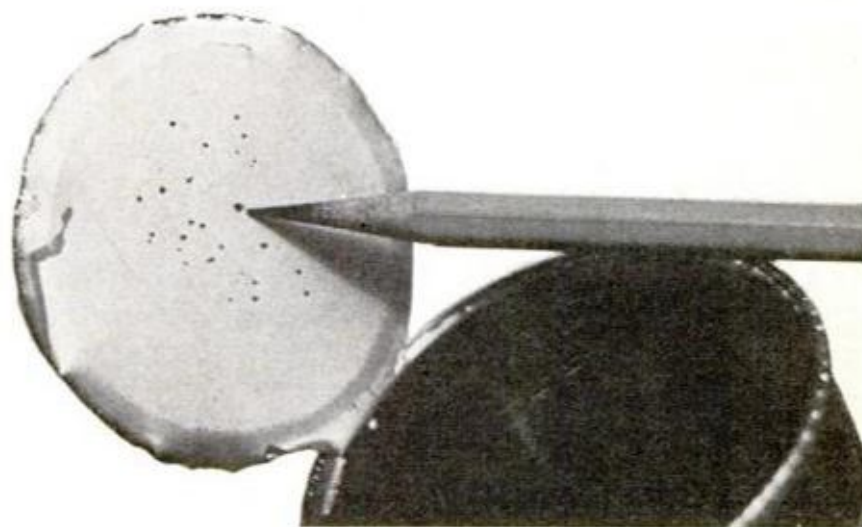


AFTER YOU'VE LOOKED DOWN ITS THROAT, step two in protecting yourself from substandard brake fluid is looking for corrosion on the can itself. The area around the threads of the cap is a likely spot



HERE ARE THE WARNING SIGNS: Spots of corrosion like those on this can of fluid—a 30-cent "Special"—warn you to beware. If corrosion signs aren't clear, check for rust flakes in the fluid itself

FLAKES OF RUST settle to the bottom of the can and betray a fluid's instability. We cut the bottom out of this can to show them. Even if contamination isn't this widespread, it should warn you away from buying fluid that may fail when you most need reliable brakes



tivity of a substandard fluid can lower the all-important boiling point of a high-quality, heavy-duty fluid as much as 80 degrees F.

The new Federal law was inspired by a Chrysler Corp. study made in 1960. Engineers found that 28 percent of the fluids offered in the Detroit area were below then-recognized standards.

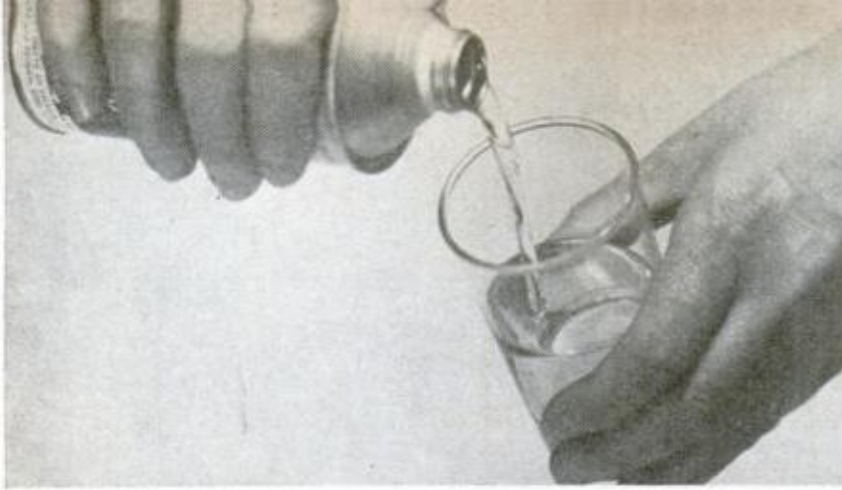
As I learned, you can still buy these dangerous fluids. Only extensive laboratory tests can guarantee that a fluid is up to snuff. But chemists at the National Bureau of Standards—charged with specifying what is safe and legal—suggest three on-the-spot checks that will warn you of danger even before you leave the auto-supply store.

Dangerous Fluids Still Sold

1. *Look at it.* The first rule in buying

replacement fluid (original-equipment fluid is reliable) is simple: "Reject it if it doesn't look good." In strong light, look down into the can. You should be able to see the bottom through water-clear fluid. Beware of any foreign matter. Dirt or grit calls for immediate rejection, but you're also looking for waxy specks or wooly material that indicates the fluid is unstable, maybe corrosive. It could break down in the presence of air or vaporize as your brake system heats up. And it could eat away at the system itself.

2. *Look at the can.* Some kinds of instability aren't signaled by wooly particles, but any corrosion or rust on the can itself is a dead giveaway. The best place to look is around the threads of the cap. If corrosion spots aren't clear, watch for their by-products—rust flakes—when you look toward the bottom of the can.



"POUR IT." Those are the brief instructions for step three in your check out of brake fluid. Even if very cold, it should pour so like water you can hardly tell the difference. Avoid it if it's syrupy

Even the selfish motorist planning to dump his car soon and let the next guy face brake-system corrosion had better watch out for signs like this. A rust-marked can and the low-grade materials it indicates mean the fluid might fail on the day it's put into his system.

3. *Then pour it.* Quality fluid isn't as "white" as water, but it's clear and flows like water, even at low temperatures. (It will probably be light yellow or pale orange, like weak tea.) Its viscosity is so close to water's that you'll hardly be able to tell the difference as it's poured from the can into a glass.

A more accurate home test for low-temperature viscosity needn't be difficult, either: Carefully clock the time it takes a can of fluid to drain out through a nail hole punched in a corner of the bottom. Then dry and refill the can with water and clock the drain time again. Even when well chilled, brake fluid should run out practi-

cally as fast as water. If it flows like pancake syrup, throw it out. You were stung.

I couldn't find a can of substandard brake fluid in the District of Columbia; along with 27 of the states, D.C. has had legal brake fluid standards for some time. That's when I went to neighboring Maryland and got one for about 30 cents. (An amazing "bargain" can be your first warning. You may save a dollar—and it may cost you only your life.)

Legal Boiling Point

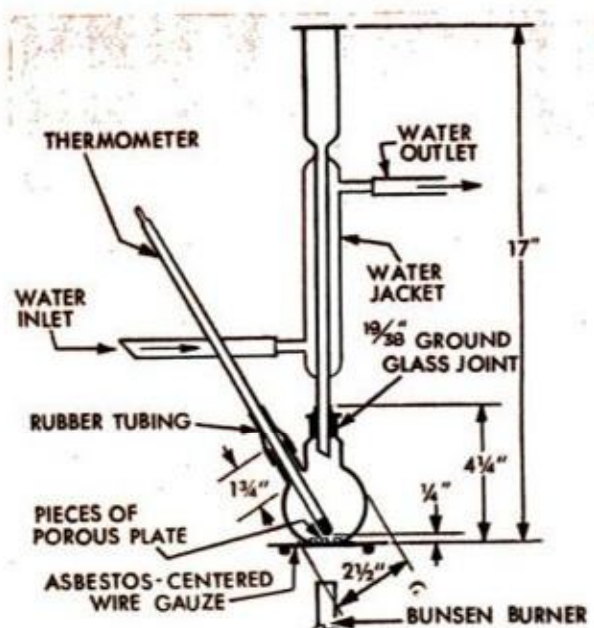
The law now requires that SAE type 70 R 1 fluid boil at no lower than 302 degrees F. and that type 70 R 3 boil at no lower than 374 degrees. Modern car brakes can generate temperatures well above 300 degrees in restraining heavier, faster vehicles, while solid-disk wheels, lower car bodies, wider wheel rims, and shrouded fender skirts work to keep cool air from

[\(Please turn to page 216\)](#)

CRACKING, BLISTERING, OR DETERIORATION of rubber brake-fluid cups means rejection in technical test



ACCURATE BOILING-POINT DETERMINATION requires a lab set-up like this one specified by SAE



POPULAR MECHANICS



One-Track Coaster

A monorail roller coaster, said to be the only such ride in the world, is a new attraction at New York's Freedomland. Wheels on the sides and top of the laminated-wood rail hold cars steady.

Kit Makes It Dump

Light carriers (up to one ton) can be converted to dump-truck duty with a new install-it-yourself hoist kit. Two models, which fit all makes are available; Buck-eye Machine Works, Grove City, Ohio.



Zooms from 15 to 60 Power

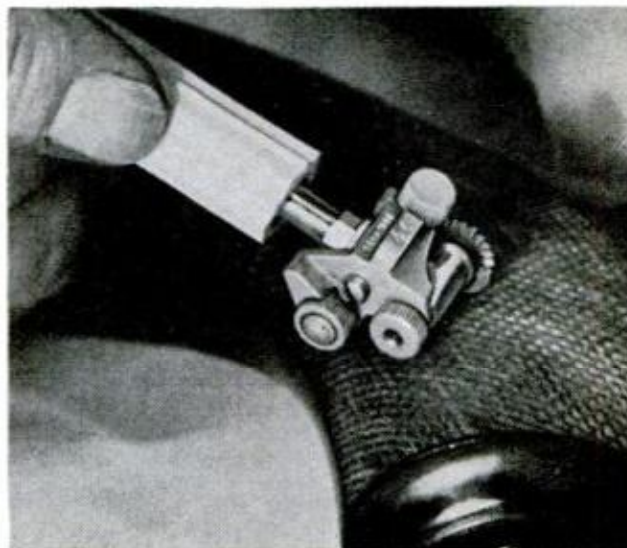
Turning a power ring (arrow) zooms the magnification of a new telescope anywhere from 15 times to 60 times. The Balscope Zoom 60 has an internal cam arrangement that alters the spacing of the lens elements, keeping focus constant. Price is \$150; Bausch & Lomb, Inc., Rochester 2, N.Y.



Quick Stock Checker

Taking hours of work out of checkering rifle stocks, a power tool cuts designs as easily as drawing them on with a pen.

The tool has a small flexible shaft and handpiece with a tiny high-speed cutting wheel mounted on a right-angle drive. An adjustable guide controls spacing and depth of the checkering grooves. The tool was invented by Joe Bartolat, Tacoma, Wash.



Junket on a



Chinese Junk

What's the latest in U.S. pleasure sailing? It's a 1000-year-old design with collapsible sails and stormproof lines

By C. P. Gilmore

THE MOST EXOTIC THING in boating these days is a weird windjammer that looks like a cross between a lifeboat and a Chinese pagoda and has eyes painted on its bow.

With a towering stern and forward-leaning mast, it seems to be running downhill. The sail is first cousin to a Venetian blind, and the rudder—roughly the size and shape of a barn door—has holes in it. The tangle of lines used to control the sails is as intricate looking as a Chinese puzzle.

And that's exactly what it is. The vessel is a Chinese junk. As I found out recently on my first junk-et, every one of the crazy features has a sound reason behind it. The junk may be, in fact—in spite of its bizarre appearance—the most successful marine design since the Ark.

I began my junking education one clear, crisp Saturday. Arthur Peltz, a New York advertising man and avid junkee, had invited me to cruise with him on Long Island Sound. The wind was clipping across the water at 18 knots, fanning froth off the tops of the waves as I stepped aboard Art's 30-foot Hong Kong hot rod. We left the dock under outboard power and headed for open water. Our craft, as is the case with many smaller models, had a well under the high stern into which one or two outboards fit easily.

The junk, Art told me as we headed out, is the refined product of 5000 years of trial and error. Chinese shipwrights, in fact, decided centuries ago that the various junks (there are many kinds) were absolutely perfect and



stopped working on them. As a result, junks haven't changed in any important way for 2000 years. And from what I could see, they may not need any changes.

First thing I noticed was that the low bow stayed dry. As the vessel pitched forward, I expected to see spray come flying over the cabin. It didn't, and I went forward to see why. Since the cabin is built out to the sides of the hull to give more inside room, you go forward on catwalks which extend over the water.

Floats Like a Cork

Forward, I watched the bow head down into each trough; then, just as it seemed ready to slice into the next wave, it suddenly rose, and bobbed to the top of each wave like a cork.

The hull, Art explained, is built with a sharp prow. But it broadens rapidly into a wide, buoyant bottom. That's why we didn't take on water.

But why the kookie design—low bow and high stern—in the first place? Answer: when the Chinese sailor runs into a storm at sea, he drops the Venetian-blind sail, goes below, and naps until the weather gets better. With its low bow and high stern, the junk performs much like a weather vane in rough seas, heads directly into the wind automatically and

SAILS ON A JUNK are rigged so that each batten on the "Venetian blind" automatically adjusts to the slightest stress. Reefing the sail when a storm hits unexpectedly is easy. When ropes are released, it flops down and the battens fold it out of the way



keeps itself from taking the seas broadside.

The junk's apparent flimsy construction (everywhere but in the hull, where it is massive) has fooled more than one western sailor. The sails for example, are usually old, frayed, and full of holes. As every good sailor knows, the first fair breeze should rip such sails to shreds. Why not in China? That Chinese puzzle of lines is the secret, I learned.

Nobody could have designed such a sail and rigging—for fear of being laughed at. It had to come about by trial and error. Each batten—the Venetian-blindlike bamboo slats lashed across the sail every few feet—is attached to a line that is woven through a complicated system of blocks and sliding fittings. The complex tangle adjusts the stress on each batten so delicately that very little strain is put on any single part of the sail. Shift the sail around, or tie the main line wherever you wish, and the intricate network of lines automatically and instantly readjusts itself to redistribute the stress evenly over the whole surface of the fabric.

That Chinese sail, by the way, is designed for tricky China Seas weather—where storms are violent and sudden.

Sail Reefs Itself

The junk's Venetian-blind sail reefs itself. Just let it flop down, and the battens every few feet fold it neatly out of the way. One man can reef and handle the rudder at the same time.

That rudder has an odd quirk, too. It's designed to fall apart. Since it hangs down well below the vessel's bottom, it's vulnerable. Run across a sand bar, for example, and the rudder digs in. A regular rudder would be torn off. But on a junk, two blocks set in the stern hold the rudder shaft. They're fastened with wooden pins set at an angle. They'll hold against a steady strain. But a sudden shock knocks them out, releases the rudder.

"We ran across a sand bar in Stamford, Conn., harbor once," said Art. "All at once the tiller came flying up in the air. It scared hell out of everybody, but didn't hurt anything."

Why is the rudder three or four times as big as seems necessary? And why does it hang down where it can get into trouble? Chinese logic again. The junk is designed to sail. But it hasn't any keel. And without a keel to keep from being pushed

sideways, you can't tack into the wind. So the Chinese developed a huge, barn-door rudder and a daggerboard—a long heavy plank dropped through a slot in the deck. Together, deep in the water, they make an effective keel.

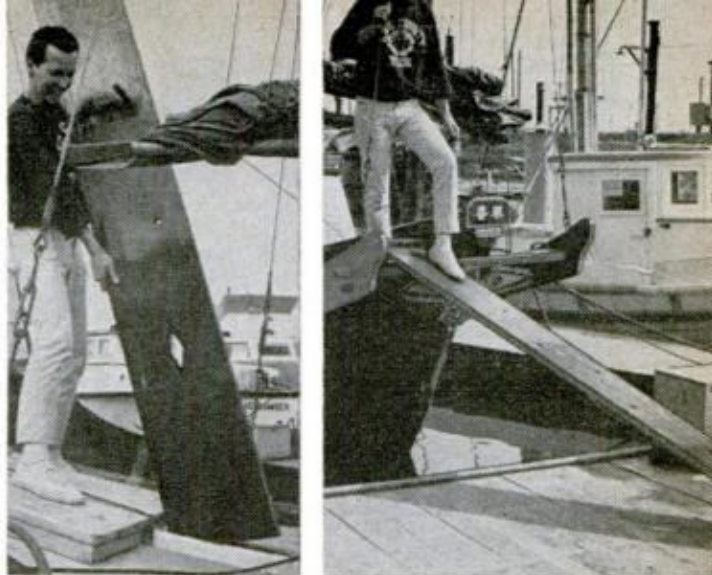
Why not simply design a boat with a keel in the first place? "Let me demonstrate," said Art. He turned around and headed for a stretch of beach, lifted the daggerboard, hoisted the rudder by a small chain lift. We slid up on the beach.

Not Many Docks

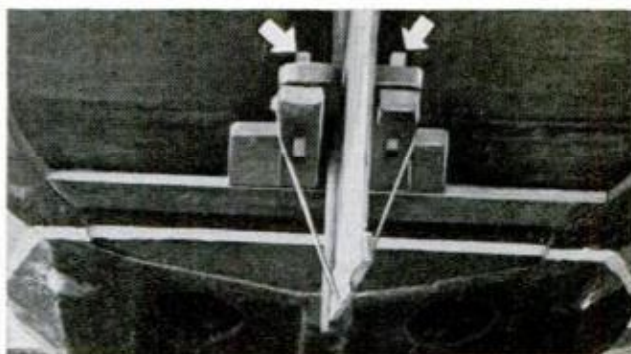
"There aren't many docks in the Far East," he explained. "These boats are made for beaching." Art walked forward, lifted the daggerboard completely out of its socket. "You probably thought that the catshead (the square frame which sticks out over the bow) was for decoration. Well, the Chinese don't put anything on a boat without a purpose."

He put the daggerboard down on the catshead, shoved it forward until one end touched the beach. It was a perfect gangplank. We walked ashore with dry feet.

Ashore, I took off my shoes and waded around to the stern to have a better look at the rudder. It was full of diamond-shaped holes. At first I thought they were

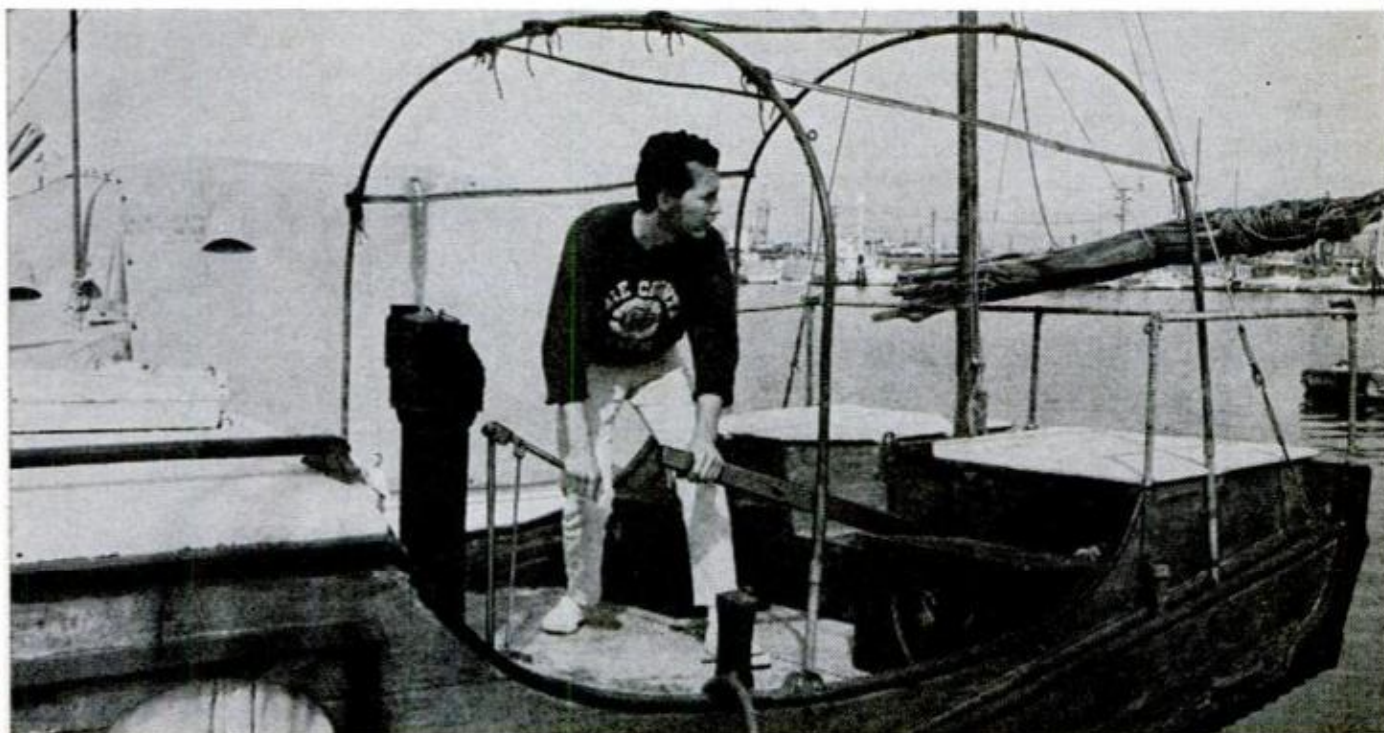


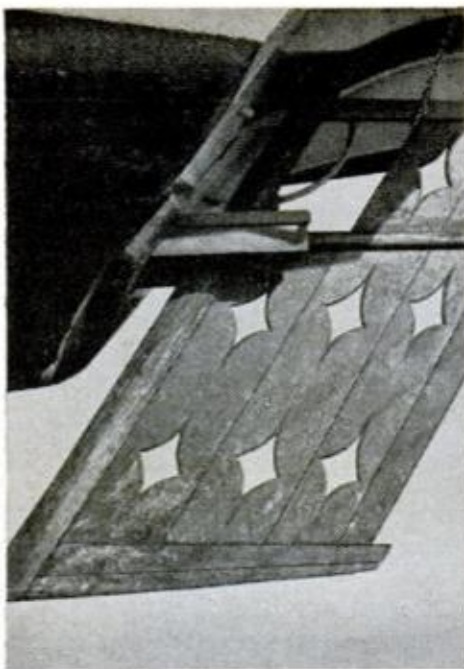
WHEN THE DAGGERBOARD, which serves as a keel in deep water, is removed, it is placed on the "cats-head" at the bow and used as a gangplank. Because a junk is both home and workshop to the Chinese, every item in its design has a practical purpose



MANY JUNKS IN THE U.S. are equipped with diesels for auxiliary power. Backing away from the dock, (below) the helmsman handles both rudder and the engine throttle. The auxiliary is also a handy item in extremely rough weather when sails are reefed

JUNKS HAVE A RUDDER that is designed to fall apart. The wooden shear pins (shown above) hold everything in place during roughest weather, but if the rudder should hit something solid, the pins break, releasing the rudder and preventing serious damage





HOLES IN THE RUDDER of the junk (above) are not for decoration. Long before the science of hydrostatics was known, the Chinese had learned that a rudder with perforations was much easier to handle in any weather, and was as effective as a solid rudder

for decoration. Nothing so frivolous. Chinese junk designers may not know much about hydrostatics, but they've found over the centuries that a rudder with holes has just as much control and is much easier to handle than one which doesn't. Modern hydraulic theory backs them up. Engineering analysis of the water flow shows that the holes actually help the rudder do its job more efficiently.

Junks, for all their oddness, are catching on around the U. S. You'll see them along both Atlantic and Pacific coasts, and on dozens of lakes, rivers, and streams in between. Three or four have settled into home port in the vicinity of Minnesota's famous Lake Minnetonka. Another docks in Colorado's Grand Lake. Several ply the Mississippi regularly, and one sails Lake Erie. Neiman-Marcus, the Dallas department store, featured junks last year as Christmas presents for those who had everything else.

Junkees are enthusiastic about their craft for several reasons:

- Junks have an enormous amount of usable room. While there are variations, one 31-foot model has a 12 by 17-foot main cabin in which a six-footer can stand without bashing in his head.

- With their fancy enamel work, strange profiles, and oddly shaped sails, usually

WHEN JUNK IS UNDER WAY (below), special rigging is used to lash the rudder down. This is like automatic pilot in an aircraft. Variations in course are adjusted by slight changes in the ropes



blood red (with real oxblood for weather-proofing), they're exotic.

- Nothing else afloat offers so much for so little money. For \$3700 F.O.B., New York, you can get a 30-footer with hand bilge pump, anchor, opium lamp, hibachi, dishes, chopsticks for six, bamboo place mats, water tank, foul-weather gear, a Chinese compass, parasols, murals inside and out, and the small, porcelain god of the boat whose job it is to look after everyone on board. It goes for about \$2000 in Hong Kong, and you can sail it home yourself. You wouldn't be the first to do it.

Sailed from Hong Kong

An English sailor named Brian Platt, for example, had a 32-foot junk built in Hong Kong, fitted her out for extended cruising, christened her the *High Tea*, and set sail on May 7, 1959. The only real trouble on his 4000-mile odyssey across the Pacific came from underestimating the junk's subtle design.

Ten days out of Japan—Platt's first stop—the top of the *High Tea's* mast snapped. A fishing boat towed him back to port for repairs. He spliced the mast, set out again. Halfway across the Pacific, the mast went again.

Platt dragged the wreckage aboard and

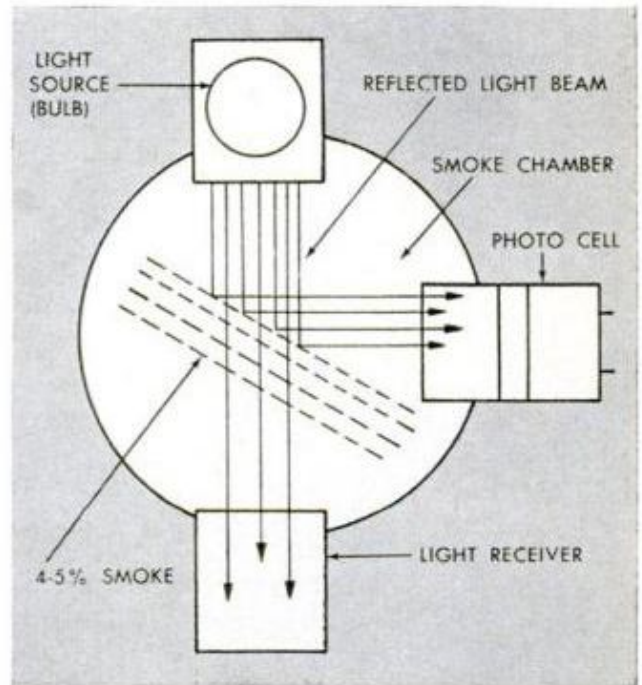
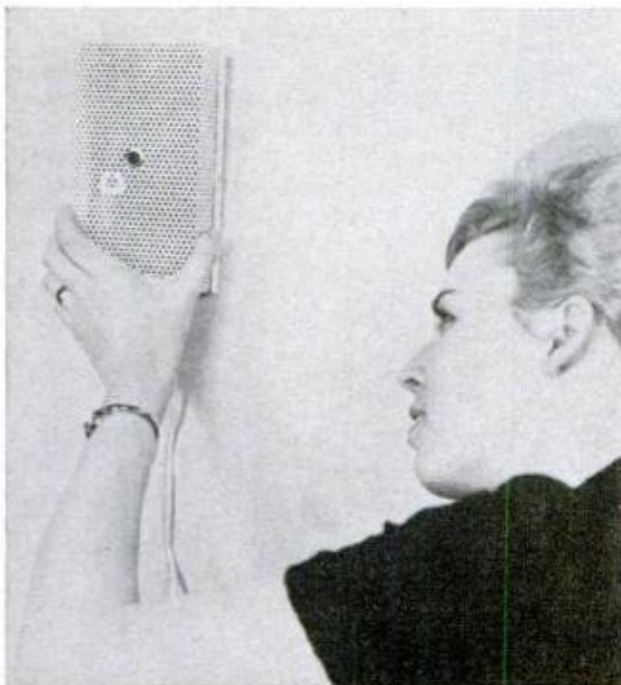
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Helicopter Sprouts Wings for Extra Lift

Without any loss of hovering ability, wings on a standard helicopter give it extra lift to carry large pay loads by making running takeoffs and landings.

The wings, 25 feet wide, were placed on a Bell Helicopter Co. model 47 helicopter,

and wing tanks holding 15 gallons of fuel were attached to each wing tip. Flaps and ailerons are controllable from the cockpit, and an elevator and rudder have been installed in the tail. All operate the same as in a conventional airplane.



Fire Alarm Detects Both Smoke and Heat

Believed to be the first fire alarm sensitive to smoke as well as heat, the "Life Saver" contains a circular chamber which has a light bulb, a light receiver and a special photo cell. In clear air, the light reaches the light catcher. When smoke,

dense enough for a 4 to 5-percent obscuration, enters the chamber, the light is reflected from it into the photo cell, which triggers the alarm. Priced at \$49.95, it's made by Fire Alarm Thermostat Corp., 119 W. 23rd St., New York 11, N.Y.

The Gun



FAVORITE WEAPON of the U.S. Special Forces in South Viet Nam, the AR-15 is a fast-firing (750 rounds per min.) machine rifle with a unique sight that makes a convenient carrying handle

FIRING AT FULL AUTOMATIC (below), the .223-caliber AR-15 shows almost no recoil, while the .308-caliber M-14 (background) raises its muzzle about a foot at the end of a four-round burst



That Broke the

RED-TAPE BARRIER

In a baptism of jungle warfare fire, this light, small-bore powerhouse of an automatic rifle won its spurs in competition with the famed M-14

By Ken Warner

CCROSS THE NON-KICKING precision of a good, low-caliber varmint rifle with the surge of power felt when you tickle the trigger of a Browning Automatic Rifle on a bipod, and what you get is the Armalite AR-15—one of the most-wanted military rifles around.

Five years ago the Army tested this weapon and turned it down. At that point it looked like another dead prototype rifle. Then the fighting in South Viet Nam opened a market for a rifle that would fit the small stature of the Viet Nameese, and was adaptable to the "brush-fire" tactics of guerrilla warfare. The Armalite went into battle and proved itself without official sanction.

The U.S. Army had to recognize it. The

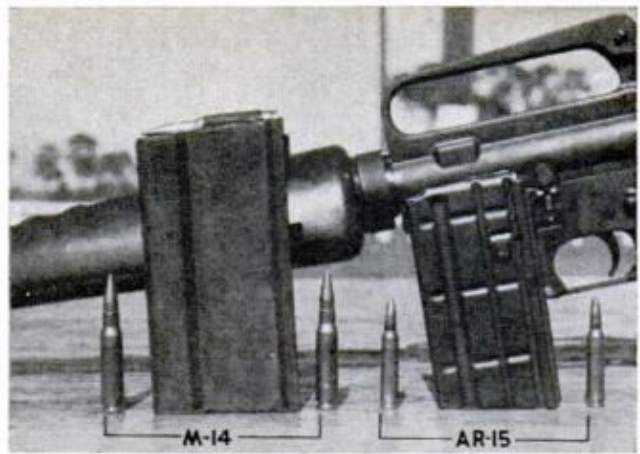
Air Force adopted it first, and the Army has ordered 85,000 for 1964. Today there are strong indications that the AR-15 will replace the highly rated M-14 as the Army's standard shoulder weapon.

The M-14 is more accurate, but there is more to rough-and-ready shooting than ultra precision accuracy or smashing power. The best weapon for the expert rifleman is not necessarily the best weapon for an army.

I shot a police model AR-15 three years ago. It was equipped with bipod and a scope sight. The target was an old Hudson auto at 100 yards. Pressing off one shot at a time, I hit with unerring accuracy. I flipped the lever on the left side of the gun to full-auto, and changed my target



UNIQUE HINGED TRIGGER GUARD on the AR-15 can open to allow rifleman to shoot while wearing gloves



CARTRIDGES FOR THE AR-15 are high-powered steel jacket .22s, about two-thirds the size of the .308

to a two-gallon oil can on the ground next to the car. I squeezed the trigger and six rounds went off in one smooth burst. The scope barely rose off the target.

When I checked the can, I had made five hits—amazing for a full-auto rifle. On the automobile the bullets holed the target without apparent effort, including bumper bosses, wheels and glass. Many rounds penetrated from trunk to firewall.

The next time I shot the AR-15 was on a range, with an M-14 handy for comparison. I liked the M-14, but I couldn't hold it on target at full-auto. In fact, I very

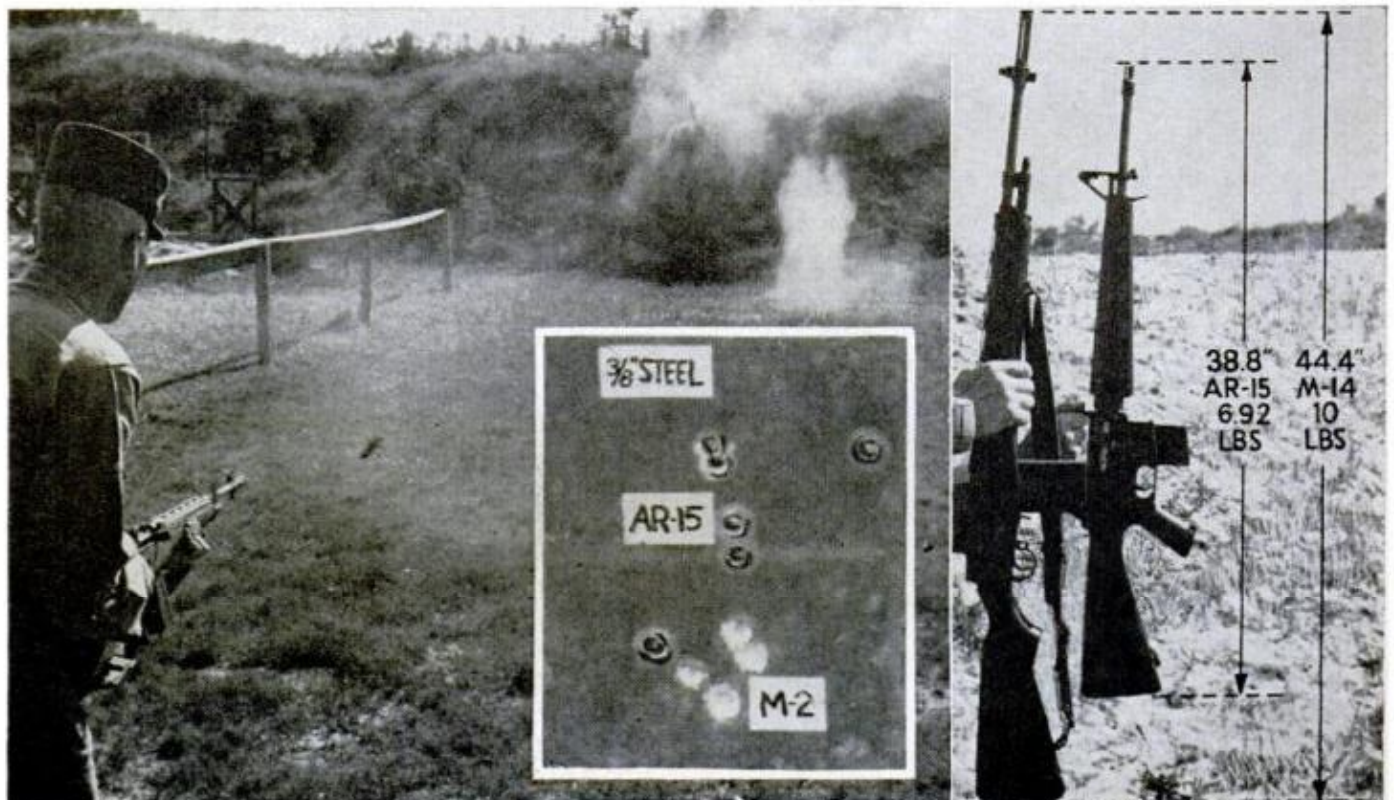
nearly let a burst get away over the back-stop. But the AR-15's entire burst clustered where the gun was aimed.

Main advantage of the AR-15 is its light weight—6.92 pounds, as against 10 pounds for the M-14. The lack of recoil makes it more accurate for fast, short-range firing, a vital factor in guerrilla fighting.

The AR-15 shoots a .223 caliber, 55-grain bullet with a muzzle velocity of 3185 feet per second. The M-14 shoots a 150-grain .308 caliber bullet with a muzzle velocity of 2750 feet per second. Both cartridges

[\(Please turn to page 210\)](#)

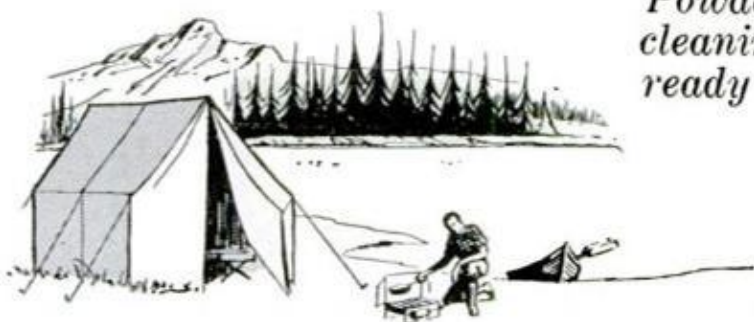
FIVE-AND-A-HALF INCHES SHORTER than the M-14, the AR-15 is shot from hip, delivers punched pattern that compares favorably to M-2 carbine (inset)



Pamper Your Camp Gear

It Will Pay Off Next Spring

Powder, oil, paint, tape and cleaning keep your camp gear ready for instant summer use



By Bob and Wilma Knox

LIKE THOUSANDS of other camping enthusiasts we have a small fortune invested in tents, sleeping bags, picnic jugs, iceboxes, camp stoves and lanterns. And like most other campers we never gave much thought to proper maintenance and storage for our equipment.

We learned the advantages of pampering our gear on the first trip one spring when we pulled into a favorite spot in the high country, tired, cold and hungry. It was a long struggle to get the tent up because two of the sectional poles were bent and wouldn't fit together. When we unrolled the sleeping bags, we noticed some down sifting out of a tear in one of them. Thoughts of a hot meal kept us going while we squared camp away and got out the stove—and here was the pay-off in our long list of camp misfortunes that night: The stove wouldn't light.

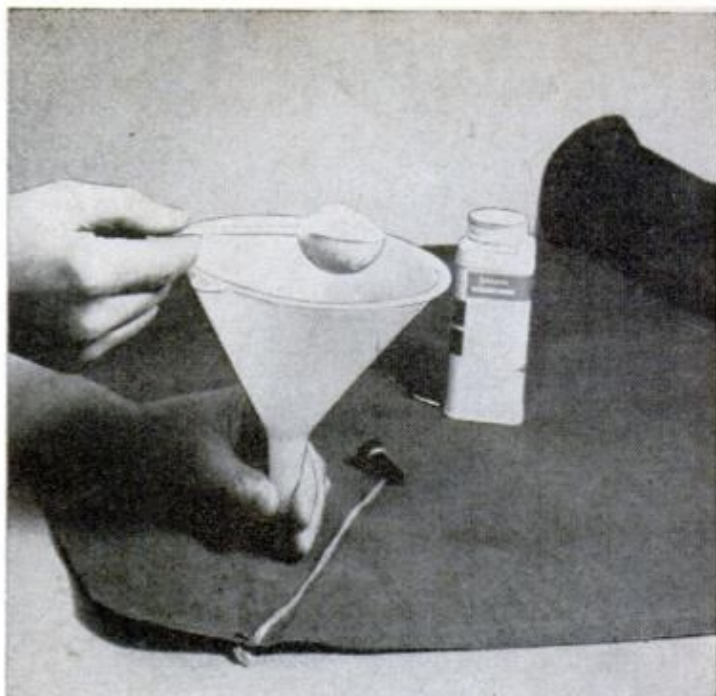
Going to bed hungry and disgusted gave us the incentive to learn proper methods

BEFORE STORING camp lantern, apply oil to leather washer on pressure pump to keep it from shrinking





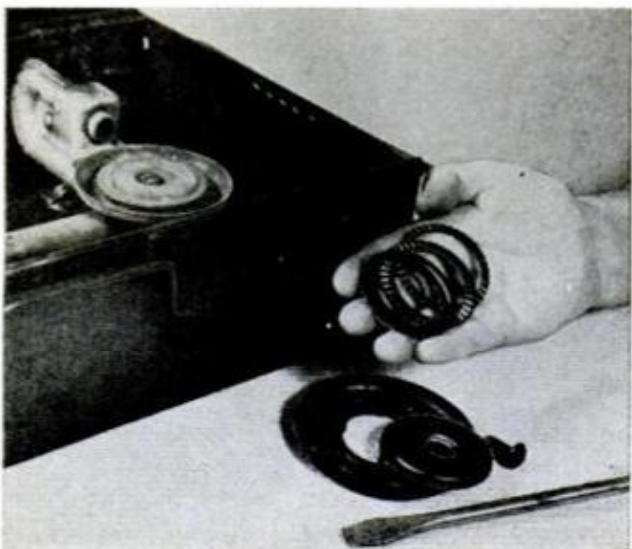
AIR MATTRESSES will keep their elasticity over a long storage period if they are slightly inflated and then rolled loosely to prevent any creasing



WHERE SPACE IS LIMITED and air mattress must be rolled tight or stored flat, a tablespoon of talcum on the inside will keep the sides from sticking

of maintaining and storing camp gear. We asked the advice of manufacturers of all kinds of camping equipment. Their answers boiled down to one simple rule: It's important to store your equipment in a cool, dry place—but far more important is what you do with it *before* you store it away. Months of storage for camp items, put away soiled and uncared for, may be harder on them than the months they are in use. Following a simple, before-storage maintenance list pays big dividends in enjoyable outings and protection for your equipment investment.

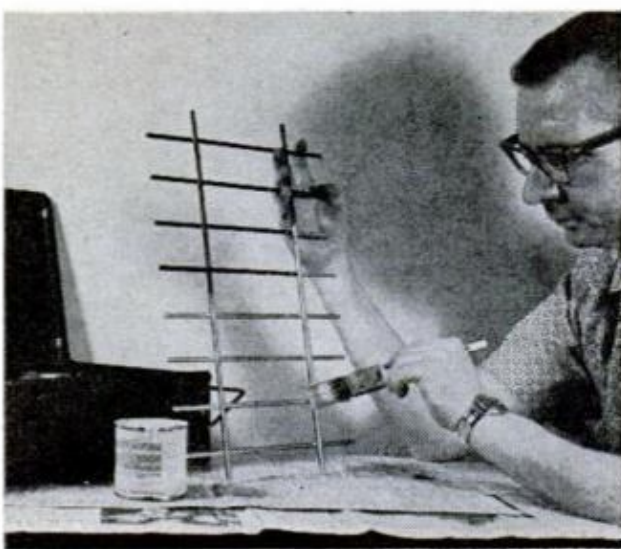
CAMP STOVE BURNER units should be disassembled and thoroughly cleaned. Parts should then be coated liberally with petroleum jelly to prevent rusting



Start with your tent. This is one of the most expensive items a camper buys and as such it merits a spot at the top of the list. Turn it wrongside out and give it a thorough brushing with a fairly stiff brush after you come in off that last trip. Sand in the floor seams, or thorns and twigs caught in threads of the fabric will wear and weaken the sturdiest of materials.

Examine the tent for dirt spots that won't come out with brushing. These should be removed with mild soap and warm water or, if particularly stubborn, with cleaning fluid. Next, make any neces-

WIRE GRATING of the gasoline camp stove will have a longer life if it is given a coat of petroleum jelly or aluminum paint. It burns off with use





SLEEPING BAG STORAGE is simplified by draping the bag over a trouser hanger, covering with plastic garment bag, and hanging it in a dry, dark closet



WHEN FOLDING TENT for storage, crease it in a different place each time. This gives the surface equal wear and helps prevent strain along the folds

sary repairs, using adhesive mending tape for small tears and sew-on patches for larger holes.

If your tent has been used for several seasons, or if you've spotted it with soap and water or cleaning fluid, it should be re-coated with water repellent. If this is done *before* storage, the tent should be thoroughly aired and dried before folding to prevent any possibility of spontaneous combustion.

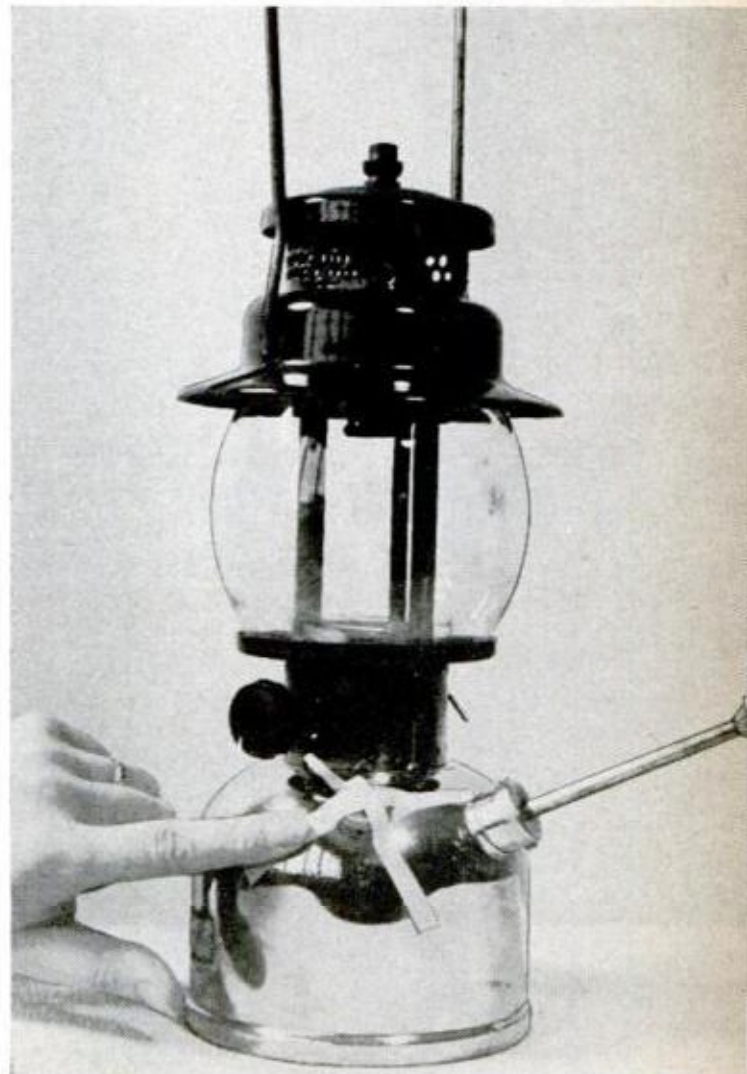
When folding your tent for storage, fold it in a different place each time—a good procedure whenever you take it down. This gives the surface equal wear and helps prevent strain along creases.

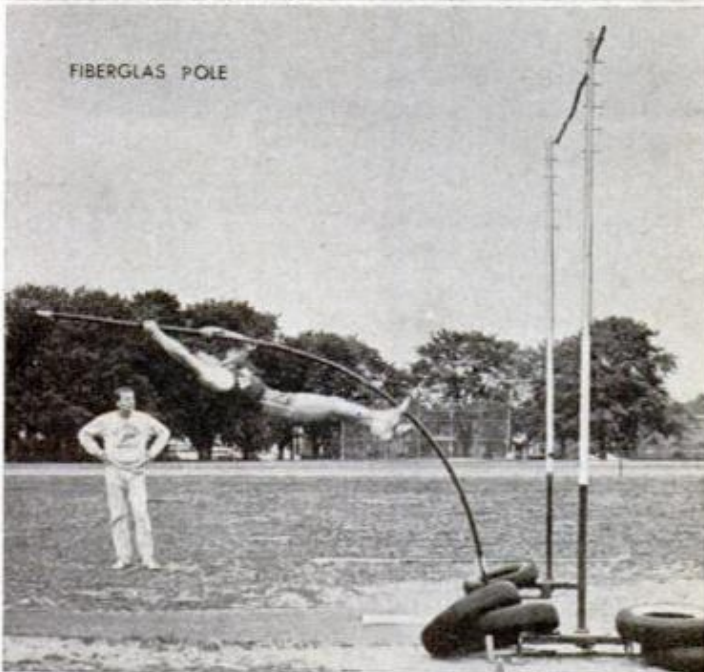
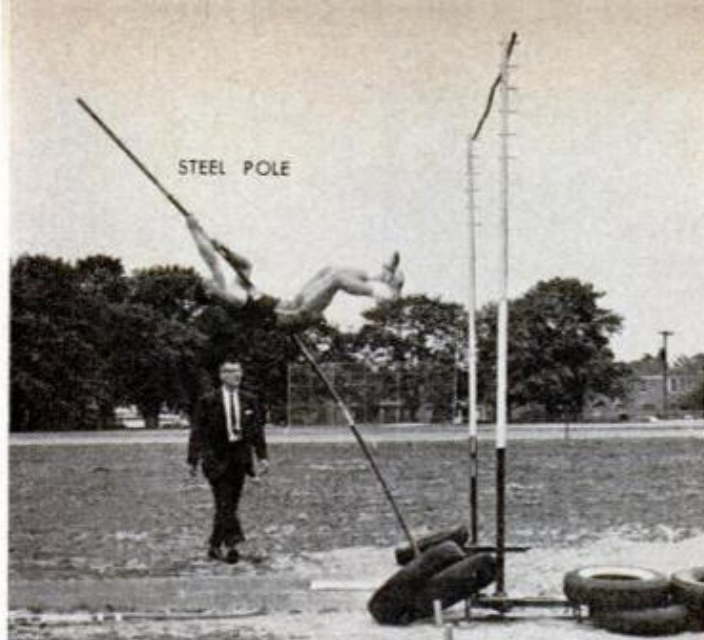
Don't forget the metal poles. These are usually treated to prevent corrosion, but they can be kept in better working order if cleaned and rubbed lightly with petroleum jelly or oil. This is particularly important before a long period of storage. Finally, be sure to store your tent and poles separately; metal flanges and points can puncture the fabric if rolled inside.

Tents will take a certain amount of abuse but sleeping bags, particularly down-filled ones, really *need* pampering. Manufacturers say the first rule in preserving a down bag's life is to keep it so clean it will seldom need dry cleaning or washing. When down becomes soiled it actually loses its loft (fluffiness) and consequently

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

AFTER CLEANING, the gasoline lantern should be stored empty, with valves and caps open. Attach cap to the tank with adhesive tape for safe keeping





LAUNCHING with steel pole (actually aluminum alloy), vaulter swings body up by strength of arms. With fiberglass pole, he uses weight to get maximum bend

The 16 Extra Inches

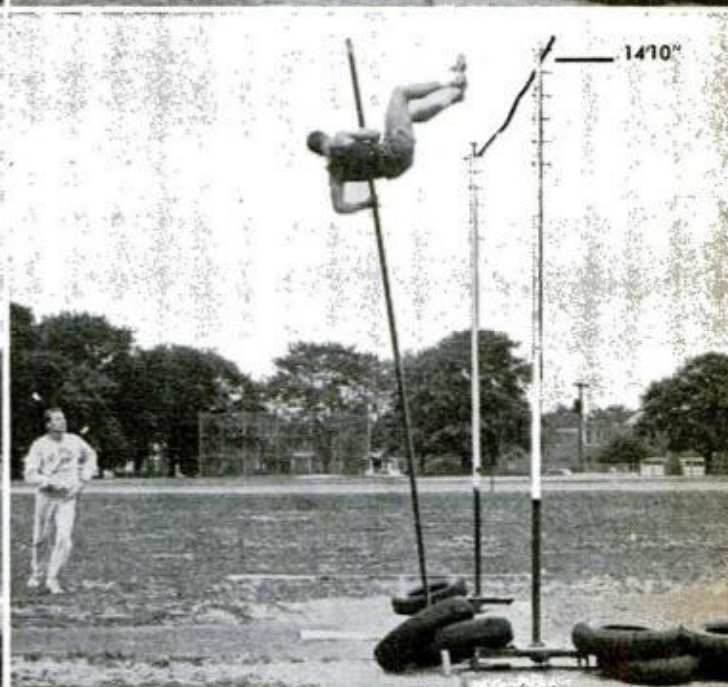
Vaulters are setting new records on glass poles. The method is different, and some maintain that it's a separate sport

THOSE LIVELY FIBERGLAS POLES are giving vaulters a good 16-inch advantage over steel-pole users, a recent PM test proved. But not everybody is happy about it.

It began at the 1961 Milrose Games when the Marine Corps' John Uelses catapulted to a world's record of 16 feet, $\frac{1}{4}$ inch, with a fiberglass pole. A furor resulted, and although officials accepted the pole and all top vaulters have since adopted it, the rumble of "foul play" persists.

Principle behind the pole is the utilization of the tremendous tensile strength of

POPULAR MECHANICS



APPROACHING THE BAR with steel pole, vaulter twists and kicks legs high for clearance. With fiberglass pole, he merely rides the upright snap of the pole

GOING OVER the top with steel pole, vaulter snaps his body, using the pole for leverage. With fiberglass, he simply rides out the catapulting action

in Fiberglas

a single glass fiber. Wound spirally into a pole, each fiber of glass is surrounded by plastic that acts as a restraining agent to keep the glass short of fracture point, while maintaining the elasticity or "snapping power."

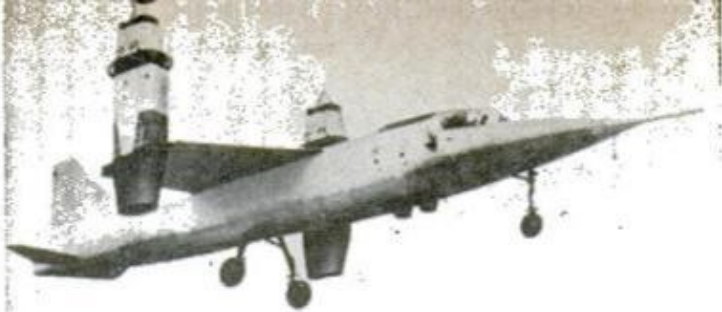
In a four-hour test at St. John's University, *PM* had vaulter Chuck Barr use both steel and fiberglass poles. His difference, at maximum height with both poles, was 16 inches better with the fiberglass.

Fiberglass is extremely light, allowing the vaulter a hand-hold two feet higher on the pole (giving him more pole for vault-

ing) and more speed in his approach, which increases the bend when he rides his full weight on the pole for greater catapulting action. The steel pole is basically a lever, depending solely on the strength and agility of the vaulter.

Main drawbacks to fiberglass are: (1) A slight breeze will waver the end of the pole, making it difficult to place; (2) It breaks more easily, and has a tendency to throw the vaulter clear of the pit.

A number of experts are now advocating keeping the steel pole and making it a separate field event.—*Stuart James*



Tri-Nation VTOL

Made in West Germany, the newest VTOL (for vertical takeoff or landing) aircraft to get off the ground is sponsored jointly by France, England and Germany. The VJ-101 has six jet engines, two at each wingtip, which swivel for vertical or forward flight, and two in the fuselage.



Rubber Tires on Subways

Eliminating the grind of the daily grind through the Paris Metro (subway), the regulation steel wheels are being replaced with rubber tires on some of the runs. In the trial-run picture, below, horizontal guide wheels can be seen just before and after the rubber-tired wheels.

Truck Rolls Its Own

For impassable areas where roads do not exist, a truck has been developed by the British that unrolls a flexible track ahead of it as it moves along. The roadway, on a roller atop the truck, can be laid at the rate of 55 yards in 11 seconds. The truck is shown in a demonstration.





Sailing Sidecar

Ready for land or water travel, an amphibious motorcycle sidecar is also a small inboard runabout. Made in England, it fits on a frame attached to the motorcycle and is easily unfastened and lifted into the water with handles at each end of the hull.

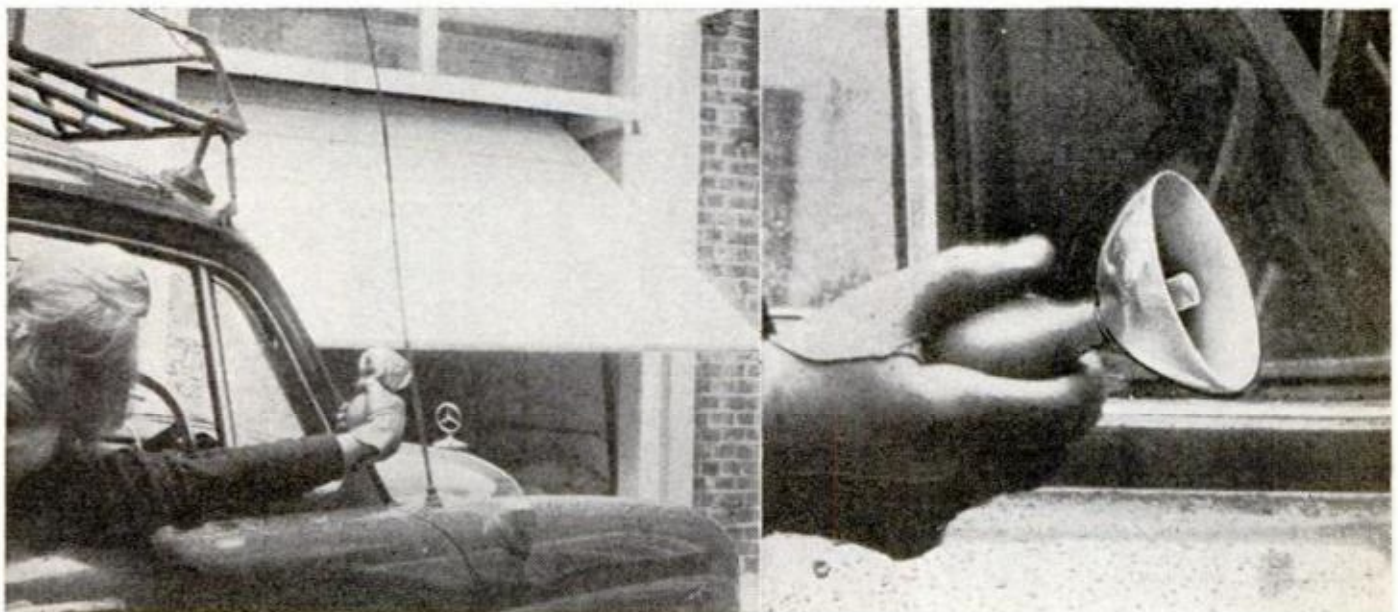
Just Give a Little Whistle—and the Door Opens

It takes only a scarcely audible whistle to swing open the garage door in a London, England, home.

The driver, approaching the garage, holds a hand-bulb high-frequency whistle out a car window and directs the sound toward the garage door.

A "sonic switch" picks up the sound waves and, in turn, activates a standard door-lifting mechanism.

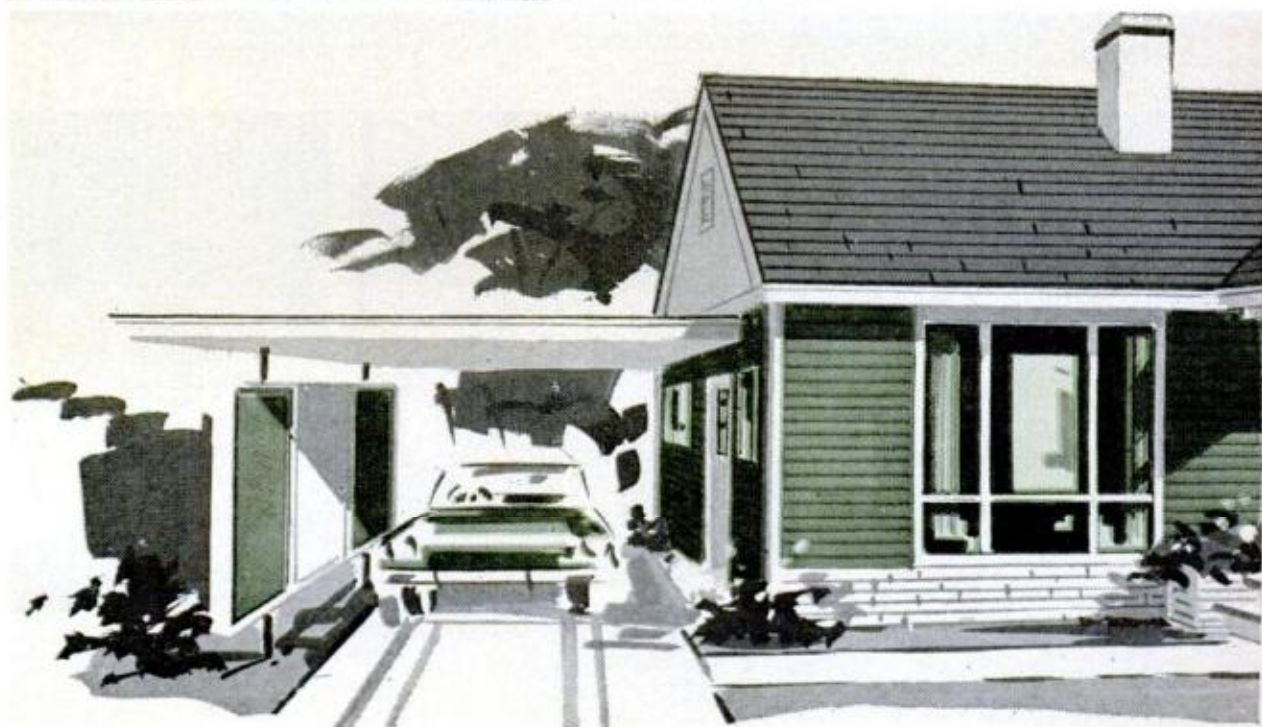
The sound-operated door is the latest refinement in an electric gadget-filled house that Mrs. Elizabeth Wilmot has been four years completing.



Why Live in a CARBON COPY?

Even the most attractive home can look drab if surrounded by identical houses. But, with these ideas, you can transform any look-alike house into a truly distinctive home of your own

Development Bungalow Converts into...



YOUR HOUSE doesn't have to look like your neighbor's, any more than you have to drive the same car he does, or wear the same clothes.

And yet, to look at the face of America, dotted with look-alike row and development houses, you would almost think we were a nation of carbon copiers. We aren't. It's just that few of us have the funds to insist on a personalized home design when we start house hunting.

Not that such homes as the familiar Cape Cod and the ubiquitous modern split-level don't provide comfortable shelter at a fairly comfortable price. They do. But their attractiveness fades when they are grouped alongside others of the same design.

Fortunately, you don't have to live in such a carbon-copy home indefinitely. It can be transformed into some truly distinctive living, as the sketches on this and the following pages indicate. They were developed by noted architect William J. Ward to serve as a source lode of ideas. Try them for size or as departure points for your own concepts.

an Inviting Contemporary

LONG, LOW SILHOUETTE replaces original boxy shape. Extending front gable 8 to 10 feet shelters the entry and provides welcome sunshade for living room. Opened-up glass areas with floor-to-ceiling windows admit more light to interior.

Added louver vent in the front gable airs out the attic, makes the house cooler in summer while helping to prevent moisture problems in winter. Use of one siding material gives front a more harmonious look; narrow strips make house look bigger, more low-slung. A new con-

crete front patio under gable should extend 3 to 5 feet beyond new roof. Planter at edge of patio slab adds distinctive touch. Estimated materials cost: around \$2000, perhaps even including carport. (Note: materials prices can vary widely from one area to the next.)

Structural changes should be at a minimum, as roof extension ties-in readily with existing gable. To lower cost, owner could apply new siding himself, in most cases right over the old siding. Also, patio, carport, planter and/or the roof extension could be omitted if necessary.



Story-and-a-Half Modern Transforms into...

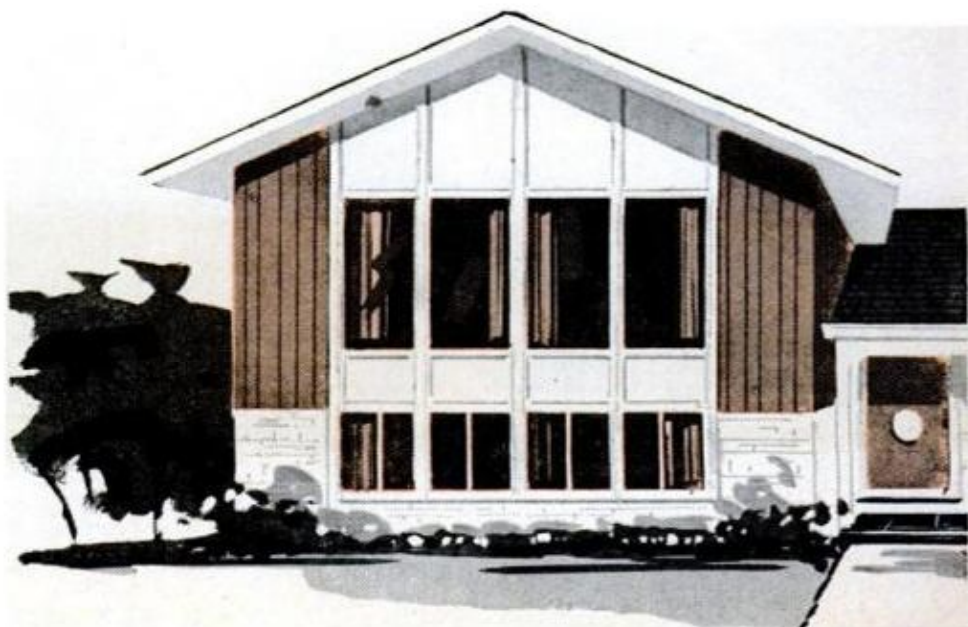


BRICK VENEER, applied to the front only in this remodeling, hides a miscellany of old sidings. (The foundation must be widened, but existing stone facing peels off readily.) Front steps are removed, plot re-graded slightly. Entry is now taller, wider, has double doors. Formal doors on both house and garage are actually flush doors with applied molding. Flat pilasters,

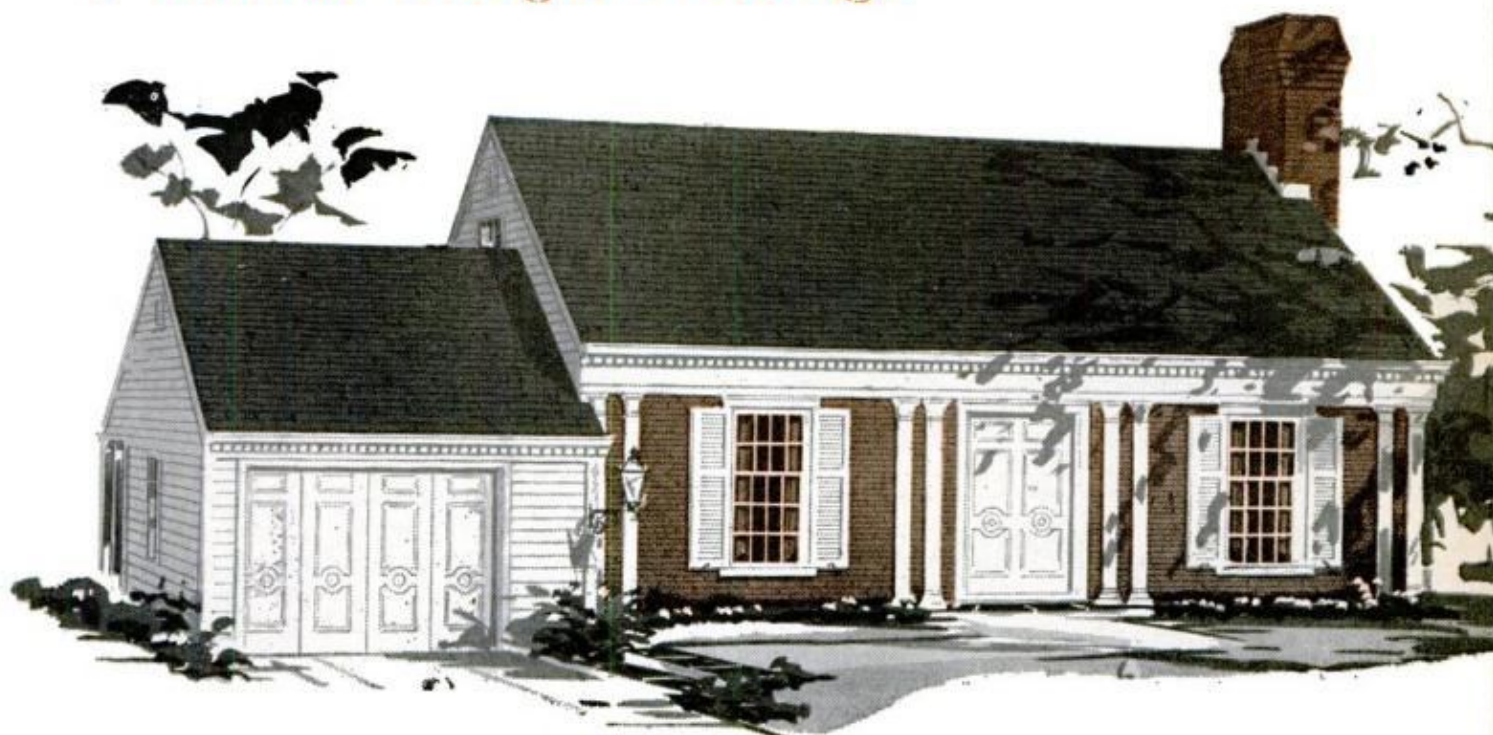
about three inches thick, go over the brick.

Colonial double-hung windows (8 over 12) replace random mixture of sizes and styles. Fireplace and chimney are optional, but desirable in this treatment. Low picket fence and dentilling on fascia are important finishing touches. Estimated cost of \$3500 to \$4000 includes labor for the brick veneer and chimney.

Split Level Modern ...



a Formal Georgian Cottage



Converts to Rural Contemporary

EXISTING GARAGE moves forward here, creating a new family room at rear. Cupola on roof adds warm New England touch while providing ventilation. On bedroom wing, the greatly enlarged, bold glass areas brighten the interior while giving exterior a dramatic vertical accent.

In main wing, an attractive bay replaces original strip of double-hung windows. A slate or flagstone walkway now connects front entry with garage. Roof has been carried forward to cover walkway and to make the house appear

closer to the ground. Bedroom wing can be brought forward to meet the new roof line, as shown, but this step is not essential.

The entire house is re-covered with natural stone or split concrete block and vertical-grooved siding—preferably cypress or cedar. Extensive structural changes, most of which might be best done professionally, plus an estimated \$10,000 materials cost, make this an expensive conversion. However, a good part of this cost should be recoverable in added resale value.



Two-Story Box Becomes a Portsmouth . . .



MINOR CHANGES can effect striking transformation, as this job shows. Simple step of removing front porch and dormer alleviates cluttered, gaping façade. Living-room windows give way to attractive box bay which adds character, admits more light. Corner pilasters go on as easily as corner boards and add stature, height, dignity.

Widow's walk could be merely implied by an ornamental railing, but Santa Claus would prefer real one to help him get into the chimney. Chimney is enlarged with sheet-metal falsework around existing brick. New windows, doors, shutters on front need only minor structural changes. Screened garden house (often called Williamsburg gazebo) and covered breezeway make the house appear less boxy. Siding is repainted.

Changes to house alone should run about \$2000 for materials. Optional gazebo and breezeway, an additional \$1500 to \$2000.

Cape Cod Becomes an Early American . . .



Dutch Style Home

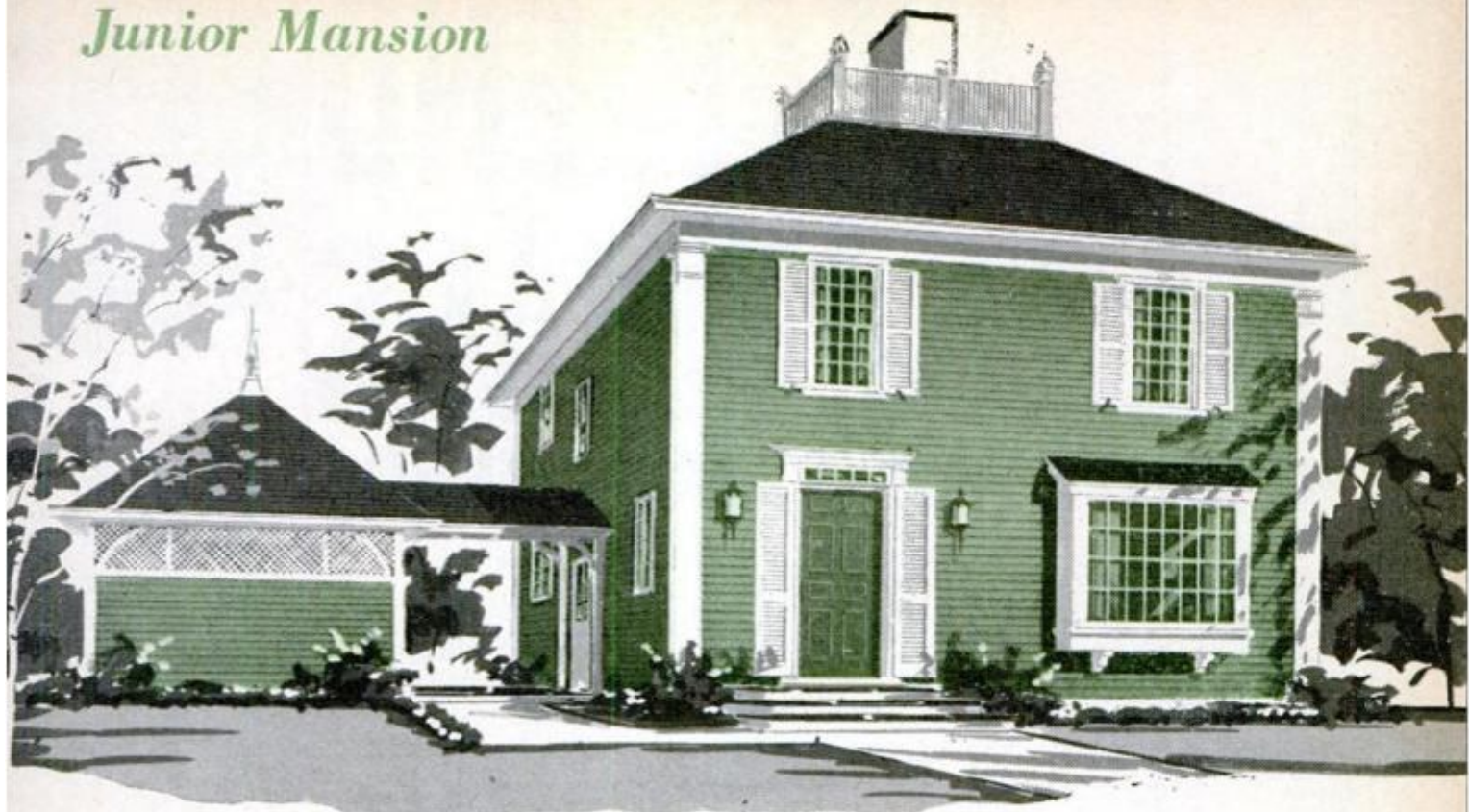
ORIGINAL HOUSE in this case was a good, but common design. Jutting dormers were removed in front, shed dormers added in rear to increase light and usable headroom upstairs.

Side porch is replaced by covered way leading to new garage with storage room or studio upstairs. This way can be left open as breezeway or enclosed to become a storage room or laundry. Roof is extended 2½ feet front and rear for sun protection simply by tying-in with existing rafters. Windows are made deeper by shortening the cripples, putting in new trimmers, retaining original headers.

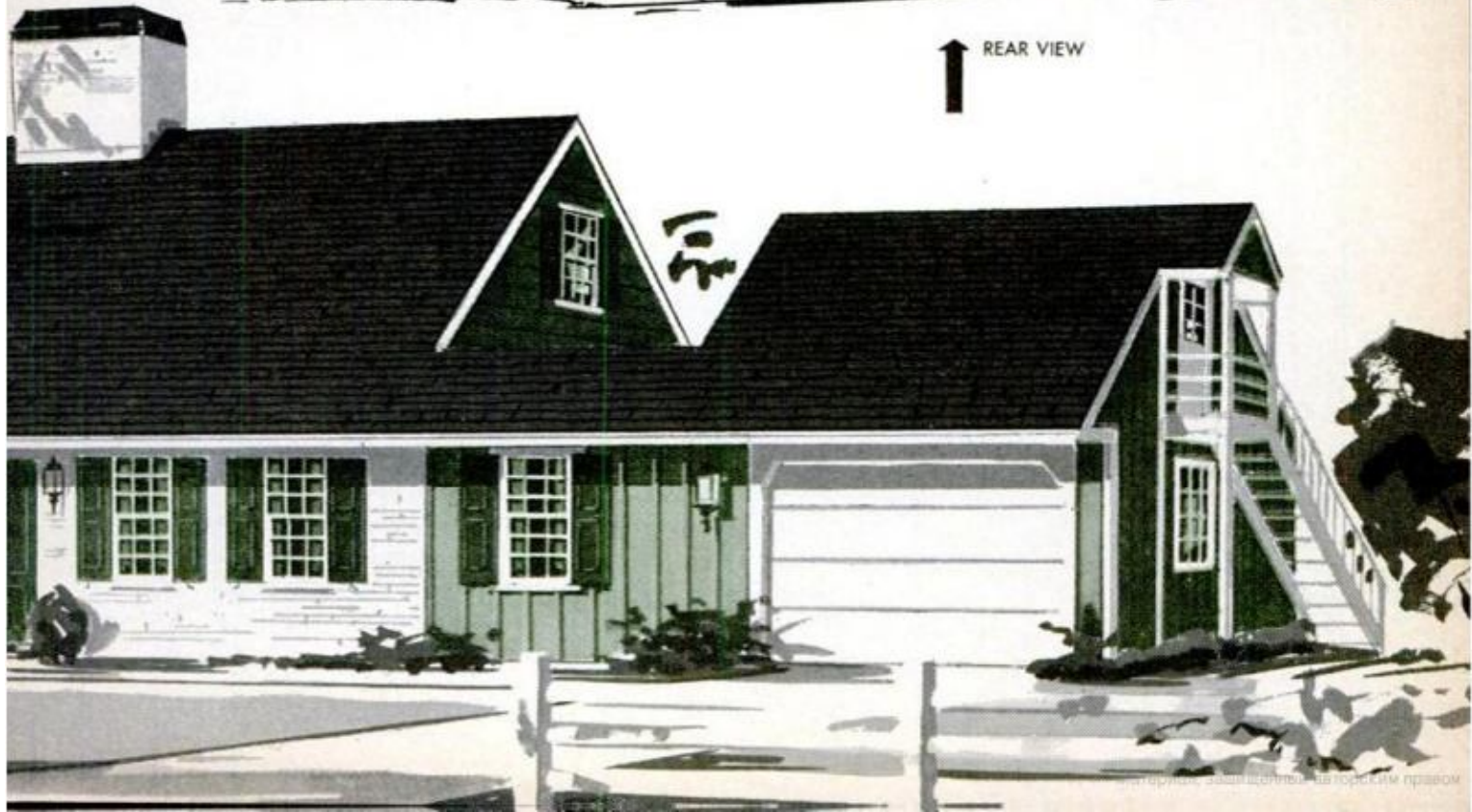
New brick veneer covers wood clapboards on front. Picket fence should be removed or replaced by more informal rail type shown in rendering. Materials cost should range upwards from about \$6000.



Junior Mansion



↑ REAR VIEW



21 WEEK-END SPECIALS FOR HOME REMODELERS

You don't have to make a career out of redoing your home. Sometimes it's the small but much-needed projects like these that make the big difference in comfortable living

TRANSFORM YOUR HOME IN TWO DAYS? Not quite, but the extra time that these week-end projects might take, can add a lot of livability to a home.

Like all remodeling jobs, the projects on the following 13 pages were designed to solve specific problems. Most of these—storage space, privacy, sleeping arrangements for guests—are common problems found in almost every home. However, the novel solutions shown here have three things in common—ingenuity, simplicity and low cost.

For instance, take a look at the “bare-faced entryway” on the opposite page. The problem here was an entrance opening directly into the living room, a relatively common situation. The owner of this house wanted to screen off this entrance from the living room to form an entrance hall where guests could remove their wraps before entering the room.

He could have accomplished this in a dozen different ways—adding a regular plastered partition, a closet partition, a bookcase-room divider, a floor-to-ceiling screen—but instead of choosing any of these common solutions he constructed a door-height translucent screen, installed it with overhead beams which give the illusion of a ceiling and continued it along the door wall behind the couch. As you can see from the photo, the result is a modern entrance hall which looks like it was a part of the original design of the house.

This entryway project illustrates two of the most important rules of remodeling—*don't be afraid to be different, and plan your project to fit in with the surroundings.*

Almost any of these projects can be modified to match your decorating scheme. The sliding louvered screens on p. 126 may look starkly modern in the photo, but if you stain them maple or cherry and add a scrolled cornice they will blend easily into an Early American setting.

Now take a look at these 21 projects and start planning your own week-end special.



SUDDEN GUESTS can be invited to stay over when you have these convenient pull-out couch-beds in the family room. And this well-organized wall built-in keeps your books, record player, etc., in inviting order. You'll find all of the construction details on this project on page 129. It was developed by Georgia Fielden, A.I.D., of Colorado Springs, Colo.

BARE-FACED ENTRANCE becomes an attractive entryway when you screen it off from the living room with this translucent room divider which doesn't shut out all the light. Designed by Manny Shein of Chicago, Ill., the plans for this tasteful unit are on page 129





CLUTTERED VANITY yields to convenient order when you organize it with these slide-away storage shelves. Pinch hitting as a medicine chest for a fixed-mirror vanity, the pull-out shelves work like vertical drawers on smooth roller-bearing tracks. See page 130 for all of the building details

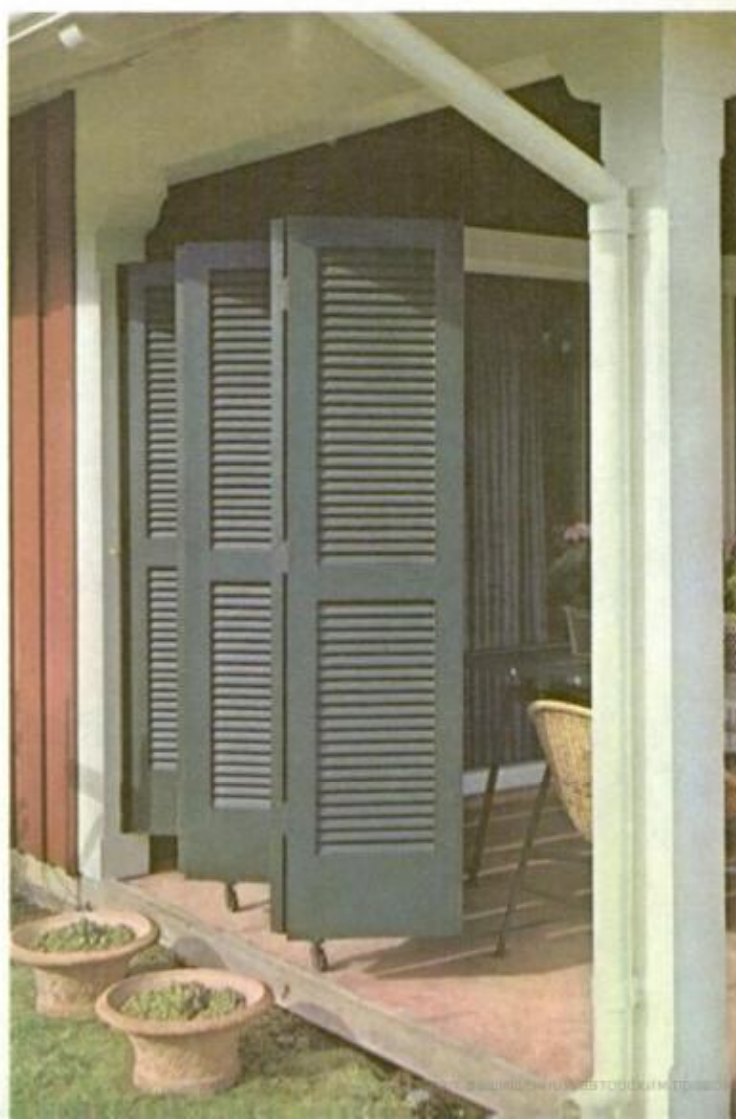
POP-EYED PICTURE windows lose their glaring ability when covered by floor-to-ceiling screen. Three fixed-louver panels let in the light, slide open sidewise to provide window access. John Galbraith, A.I.A., developed this plan for Mrs. Helen Rickabaugh of San Gabriel, Calif. Details on page 130





KITCHENS STOP STARING at you while you eat if you add these colorful divider panels which slide up and down. Plans for the sliding panels are on page 131. The design was developed by Henry Francis, A.I.D., for Dr. Peter Labowski, Colorado Springs, Colo.

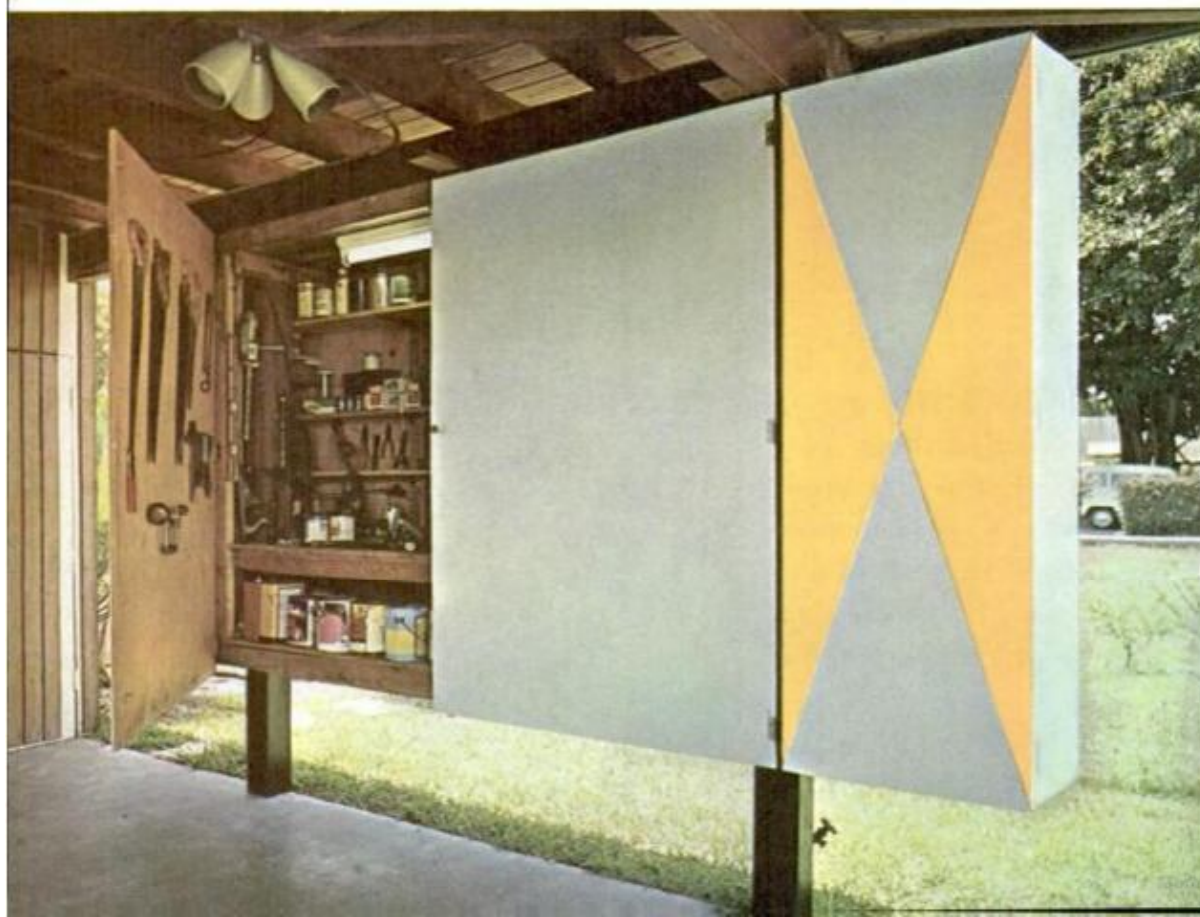
ROLL THE WIND AND GLARE off of your porch with this adjustable privacy screen. The accordion arrangement of hinged shutters on coasters was designed for Dr. E. N. Chapman, Colorado Springs, Colo., by Bunts and Kelsey, A.I.A. Details are on page 131

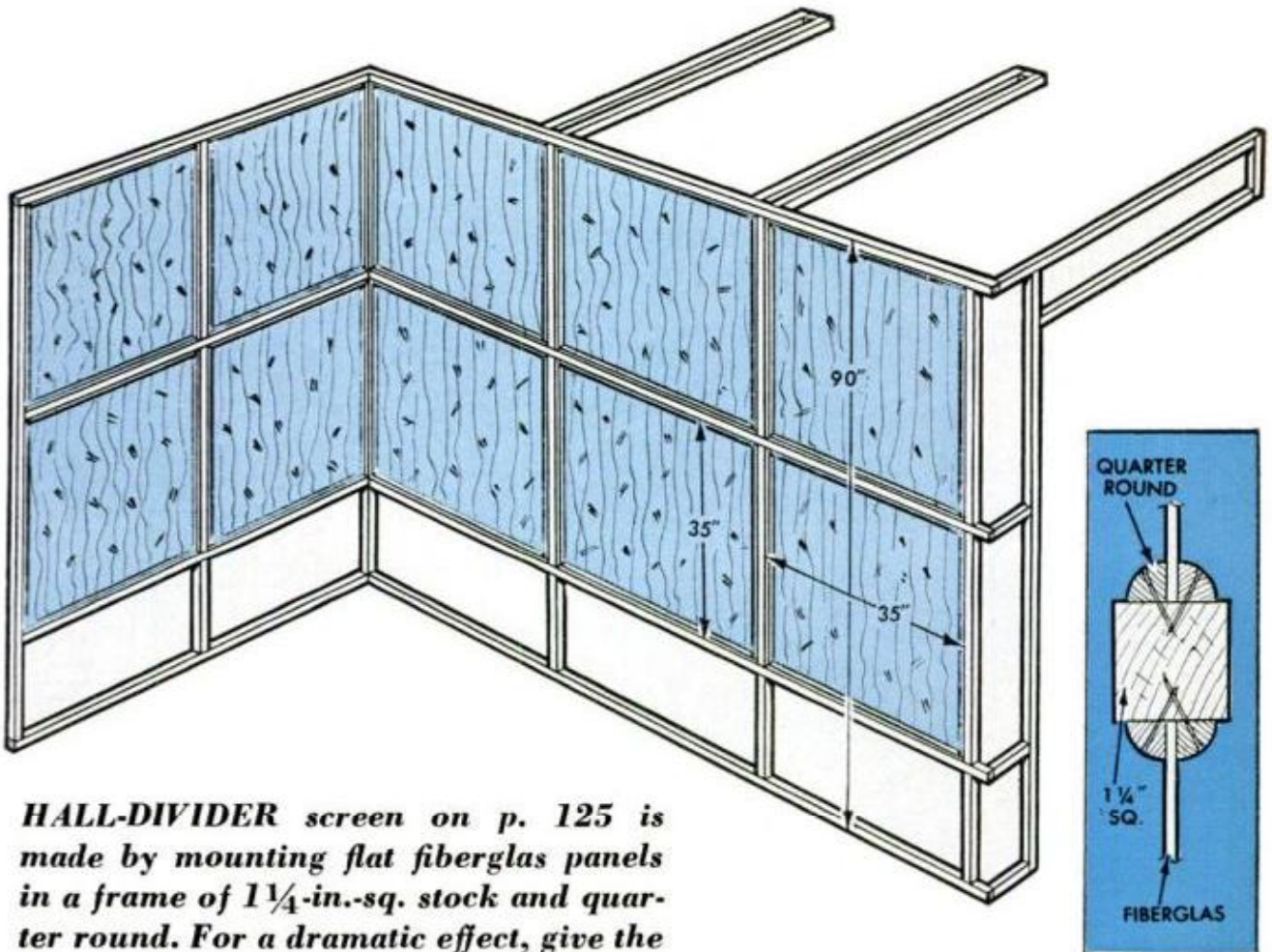
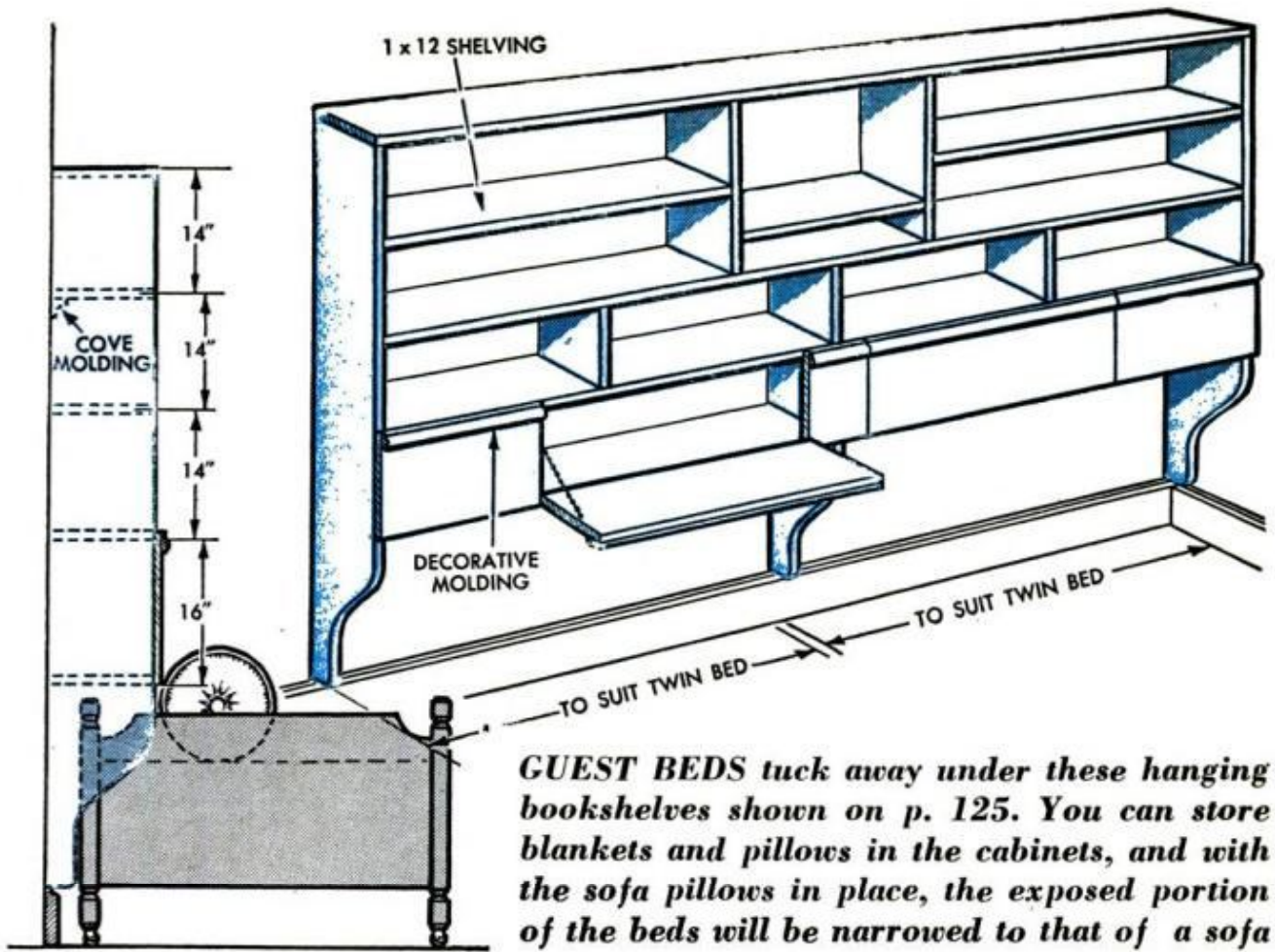


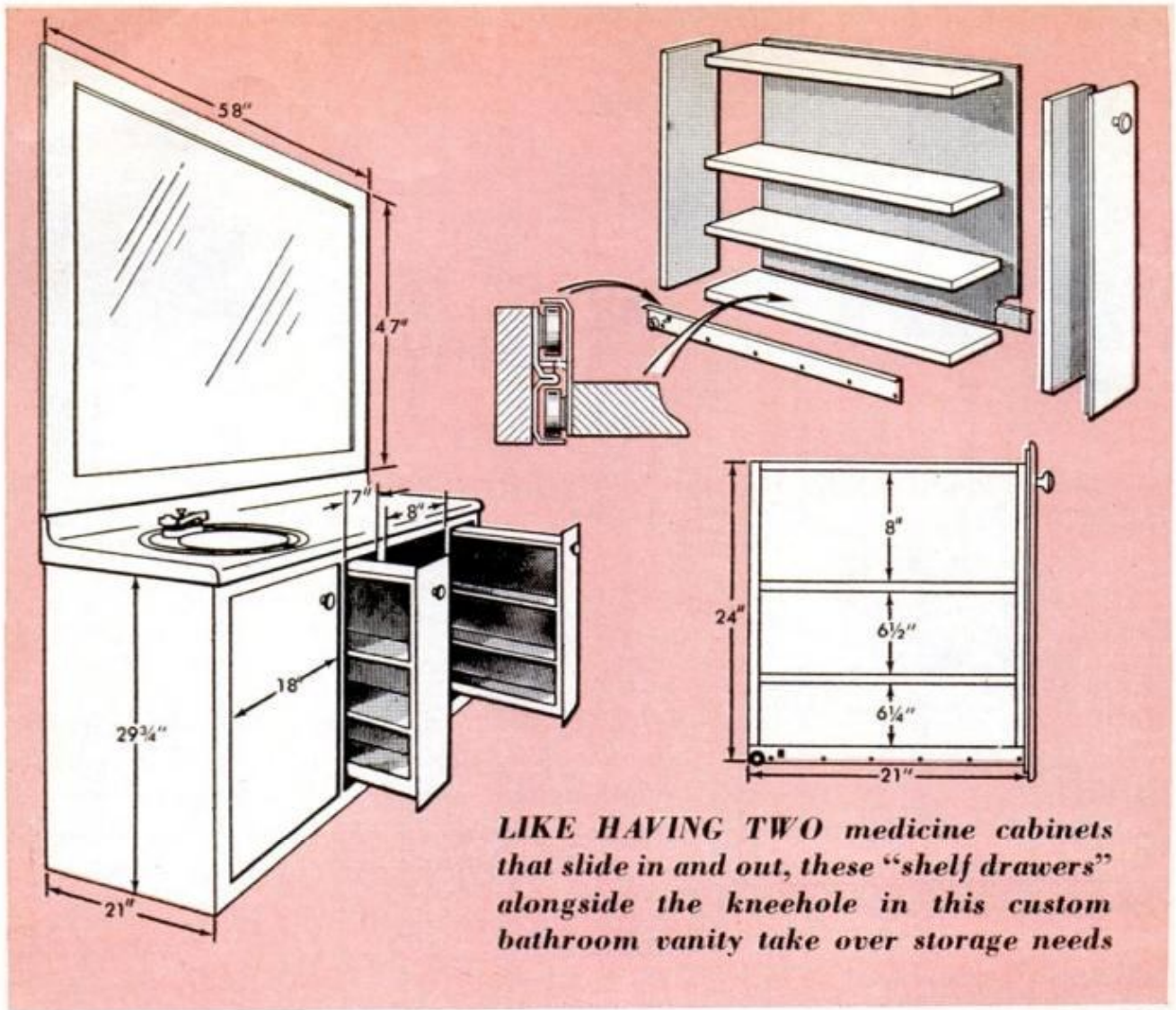


SPACE-WASTING CARD TABLE setups tuck away out of sight but ready for a quick draw when you have this conveniently hollow room divider. Construction plans are on page 132. William McConnell designed this attractive and useful space-saving arrangement especially for the home of Norman Clippinger, Jr., Covina, Calif.

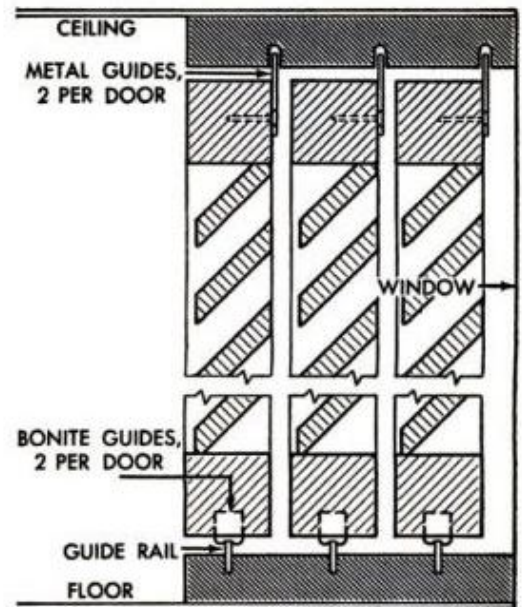
LAZY CARPORTS can be made to share the load with this under-roof built-in storage wall for tools and garden and household supplies. It is a feature of the Charles K. Lonsdale home in Miami, Fla. Framed with 2 x 4's and faced with exterior plywood, it's an easy week-end project. You'll find building plans on page 132



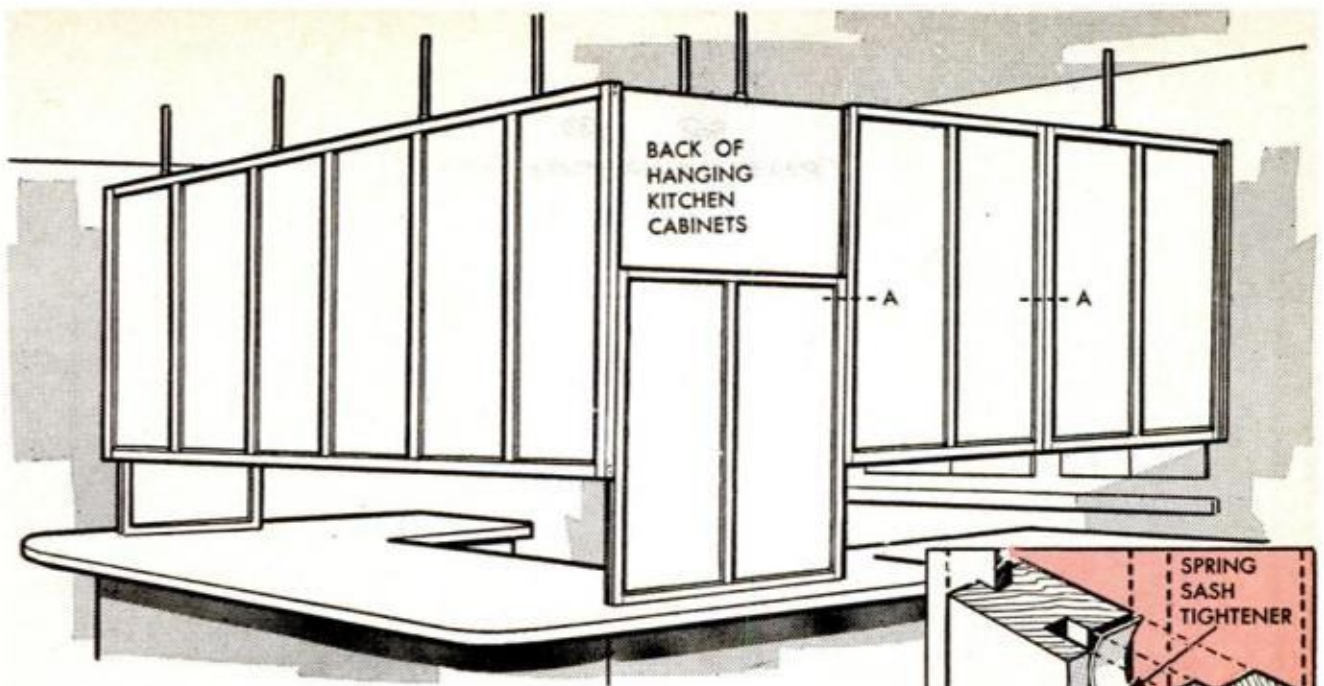




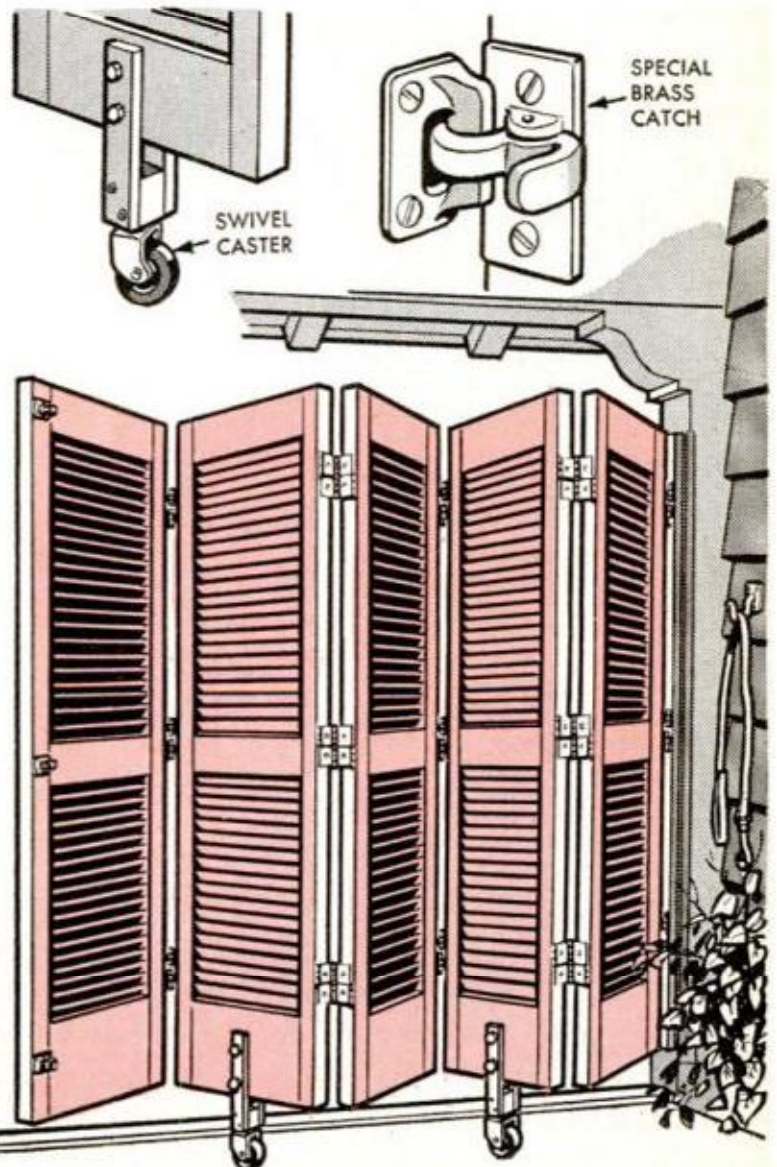
WHERE ROOMS HAVE a wide cove molding at the ceiling, small windows acquire architectural importance and a sense of unity when same molding is used for window cornices



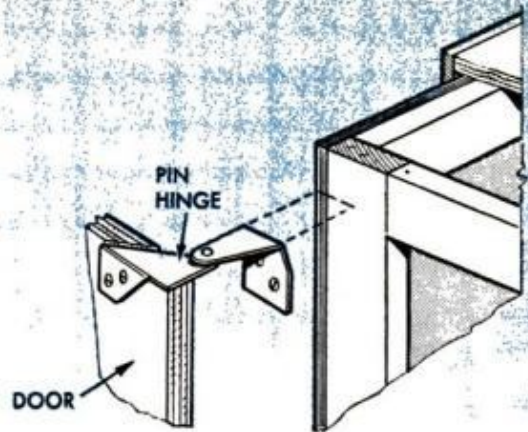
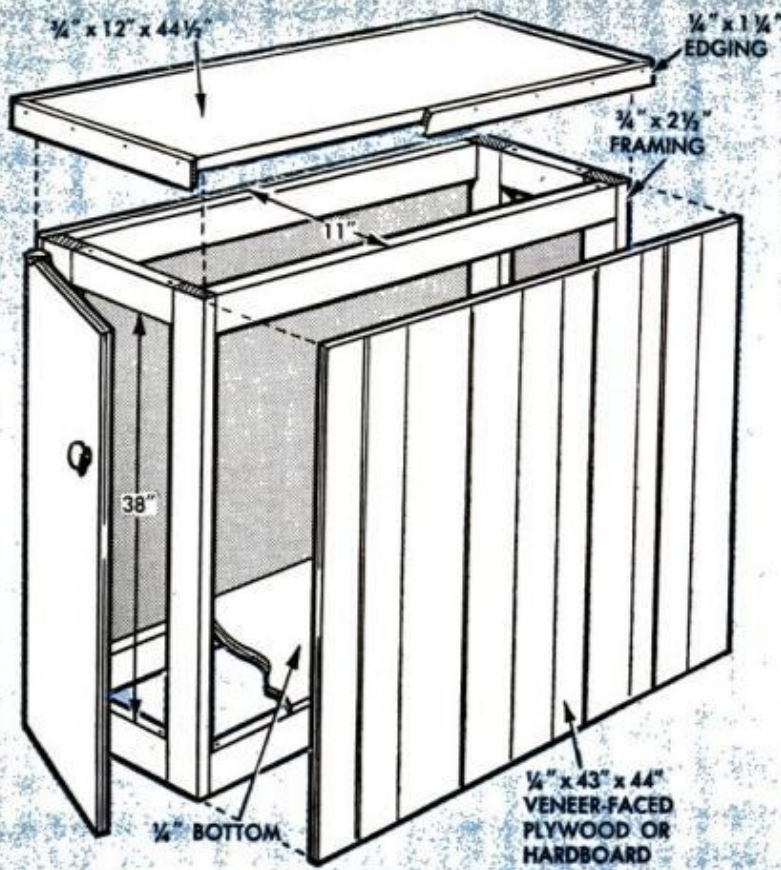
HERE IS HOW the floor-to-ceiling window screens pictured on page 126 slide past one another. Screens ride on continuous flat-metal rails



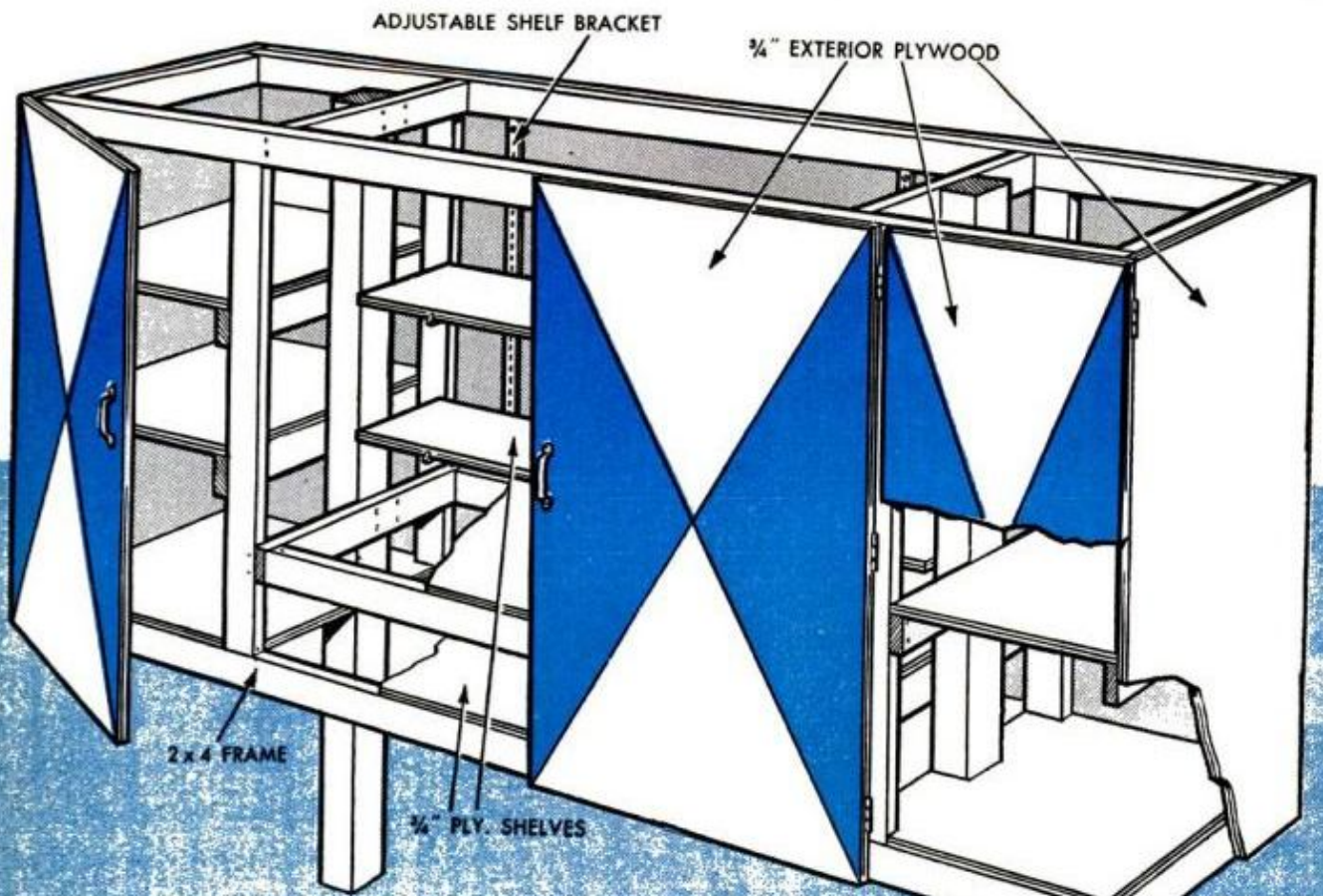
KITCHEN CLUTTER behind island snack bar is blocked from view of dining area by pull-down panels. Side rails of panels are grooved to slide on full length T-tracks fastened to the backs of hanging cabinets. Standard flat-spring window tighteners are used to provide a friction fit so panels will stay up when raised. Colorful pictures clipped from magazine food articles are attached to the panels with varnish and then protected with a coat of varnish



ACCORDION SCREEN, consisting of five stock louver panels hinged together alternately and then to a corner of a patio porch, will close off the area to sun, wind and view while dining or relaxing. Raised off the floor by stilted casters, the screen still admits gentle breezes when closed. Three special catches engage slots in post to keep screen shut. Screen folds back and is kept secure by dog leash

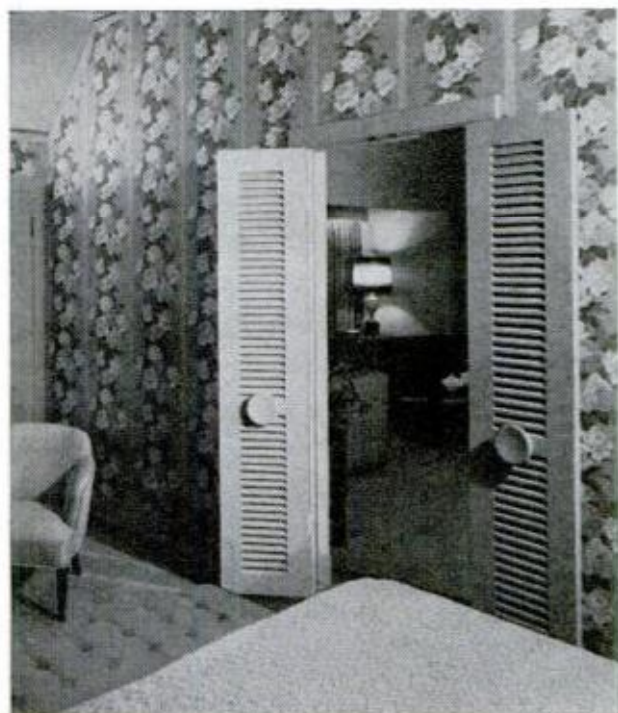


MORE THAN JUST a room divider, this one is hollow so you can store a cardtable and chair set in it. It's built around an inner framework of 1 x 2s which may be faced on each side with hardwood-faced plywood or prefinished hardboard. The plywood top has a hardwood edging



DOUBLE THE UTILITY of your open carport by building a weatherproof cabinet around the supporting posts. Makes up for lack of storage found in a garage, helps close it in. Basically, the cabinet consists of a simple plywood-covered framework of 2 x 4s

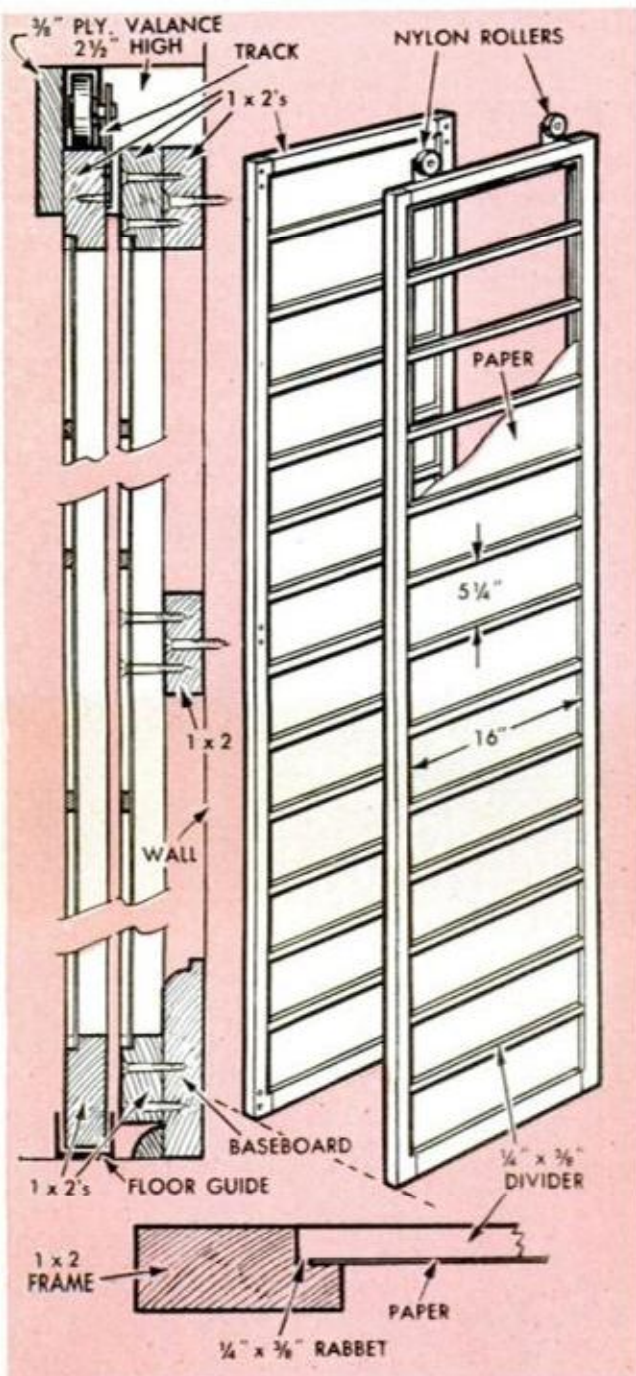
STRADDLING a low paneled wall 28 in. high, this king-size eating counter which measures 44 x 72 in., can accommodate as many as seven. An 18 x 72-in. piece of plywood was first centered and attached to the top of the stud wall and braced on each side with metal shelf brackets spaced 6 in. apart. Then the plywood counter itself was attached to the plywood base piece with glue and screws driven up from below, and plastic laminate was added



WHEN YOU'RE PINCHED for space in a small room, consider replacing that full-width door with two narrow louvered doors. These will require less clearance to open and close, allowing you to locate furniture nearer the door. And apart from saving space, such doors will dress up an otherwise dull room

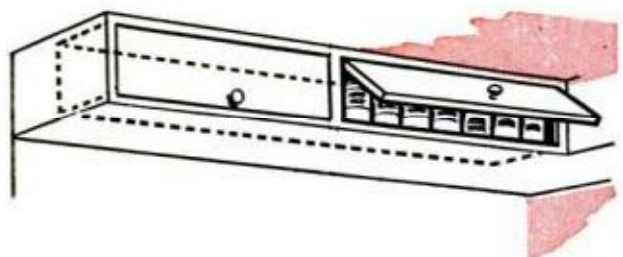
KITCHEN DESK is flanked by shallow louver-door cabinets to provide handy place to park kitchen appliances. Typical cabinet joinery prevails. Plywood top is made extra thick by edging of 1 x 2, after which top and edging are covered with bright-colored plastic laminate



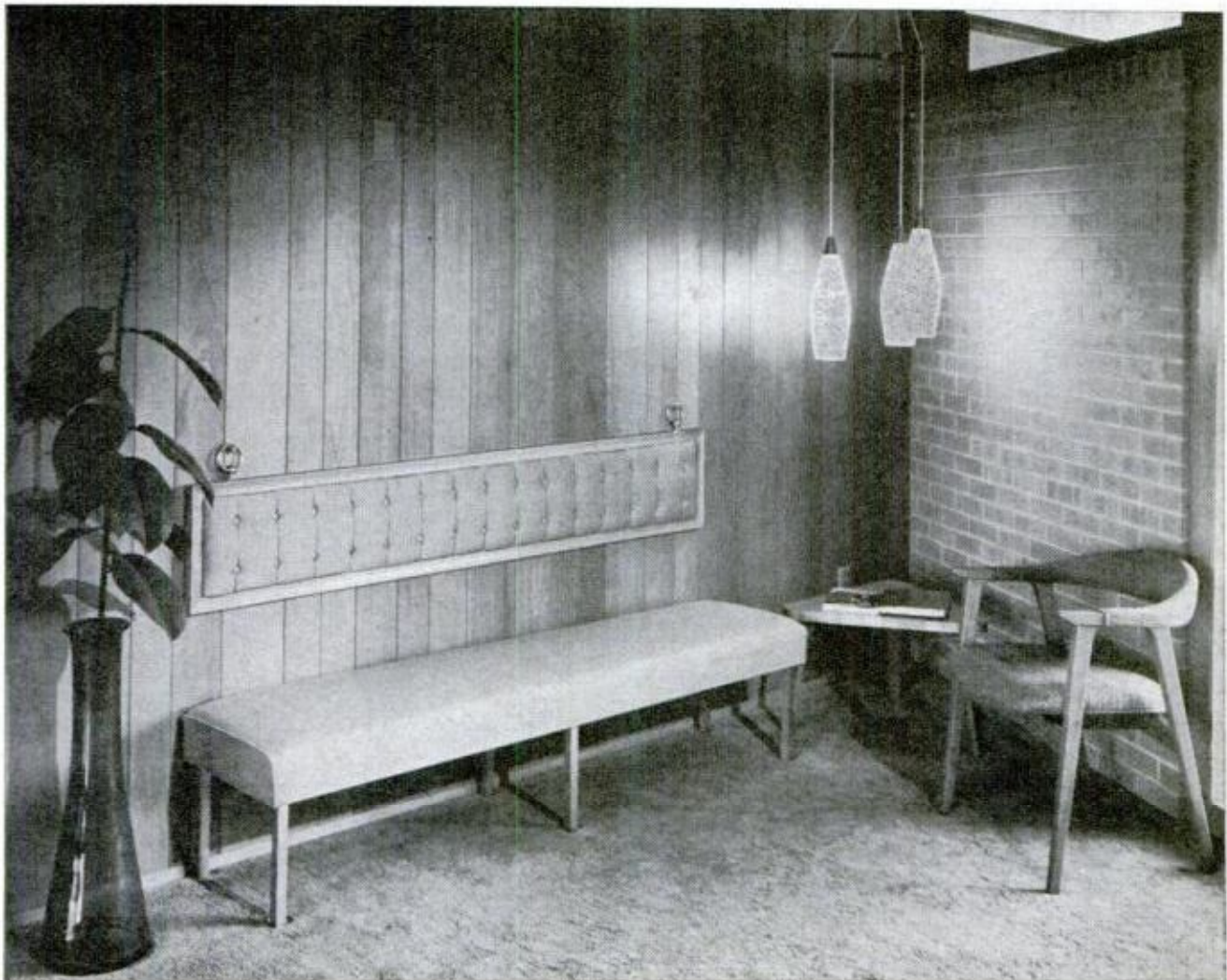
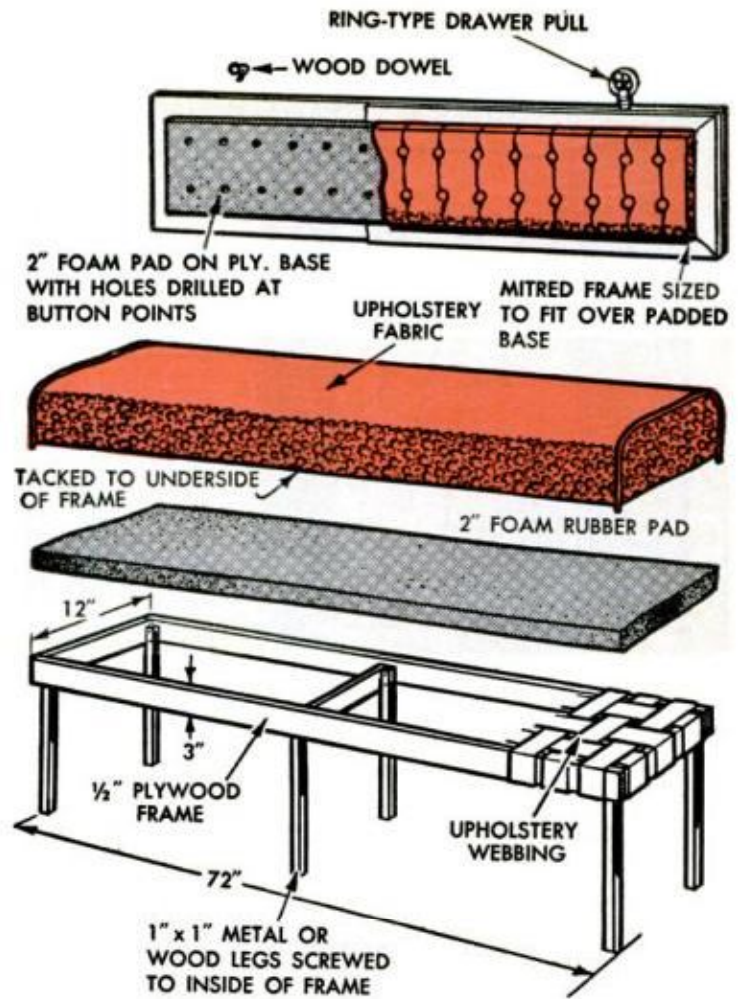


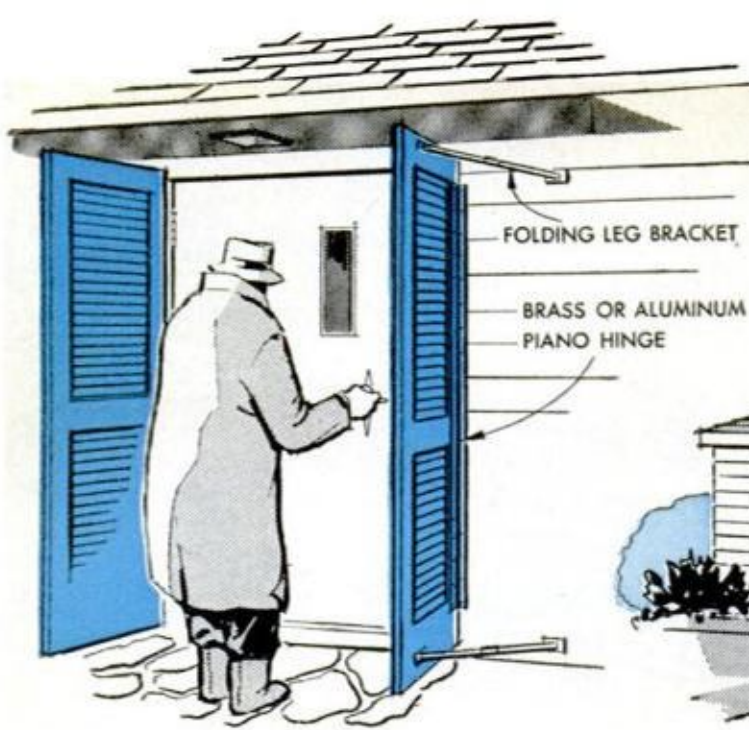
SLIDING SHOJI SCREENS dramatize a small window. Outside panels are stationary; sliding inside panels roll on nylon wheels over a steel track hidden behind plywood valance. Make all panels the same, rabbeting 1 x 2 outside framing to hold the white drafting paper and cross strips. After frame is assembled and finished, cut paper to fit inside rabbet and glue it in place. When glue has dried, finish divider strips and nail them to frame

WASTE STORAGE SPACE in kitchen soffit can easily be turned into a shallow box cabinet for holding canned goods. Make the cabinet one can deep to fit an opening cut in the face of the soffit and nail it to the soffit framing

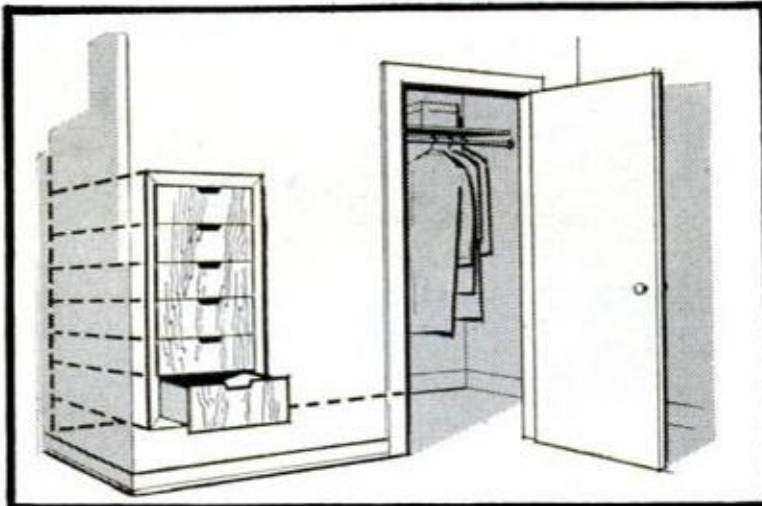
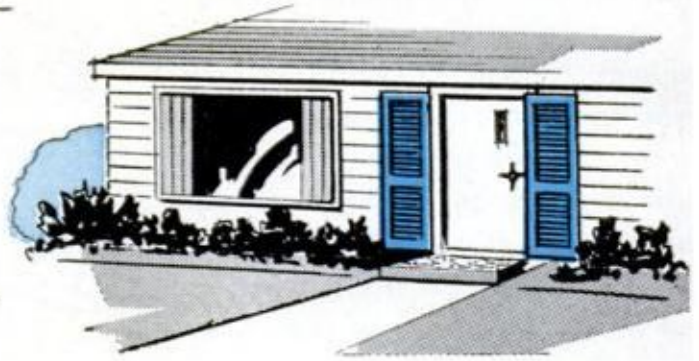


ENTRY HALL TOO SMALL for a normal-width bench? This slim hall bench, designed by Georgia Fielden, A.I.D. requires only 12 in. of space and uses a wall-hung backrest. Base is standard upholstery construction—wooden frame, upholstery webbing and foam-rubber pad covered with upholstery cloth. For simpler back cushion, just mount rubber pad on ½-in. plywood panel and cover it with upholstery cloth, omitting the tufting and framing





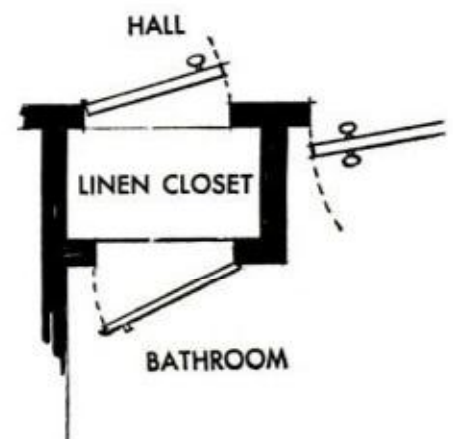
WINTER WIND-BREAK is simply a pair of shutters mounted with aluminum piano hinge and heavy-duty folding leg brackets. They fold flat against the house in mild summer weather, swing out at right angles for winter protection

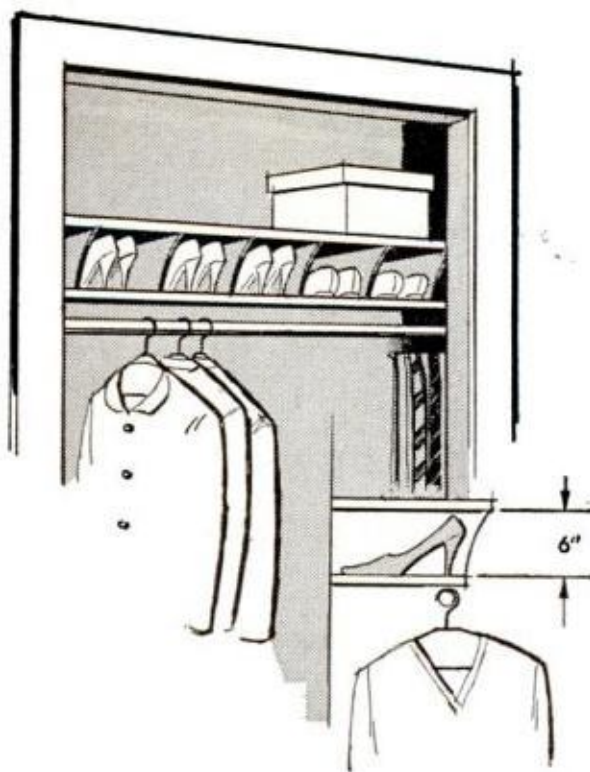


BUILT-IN DRAWERS reclaim that inaccessible space in deep closets. Before opening the wall, make sure that you won't run into heating ducts, plumbing or wiring. Knock-down drawers available from mail-order houses work well here

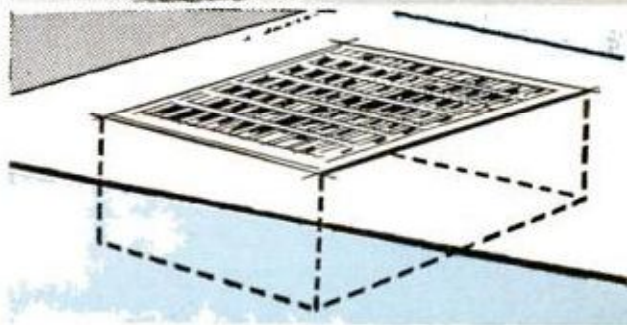
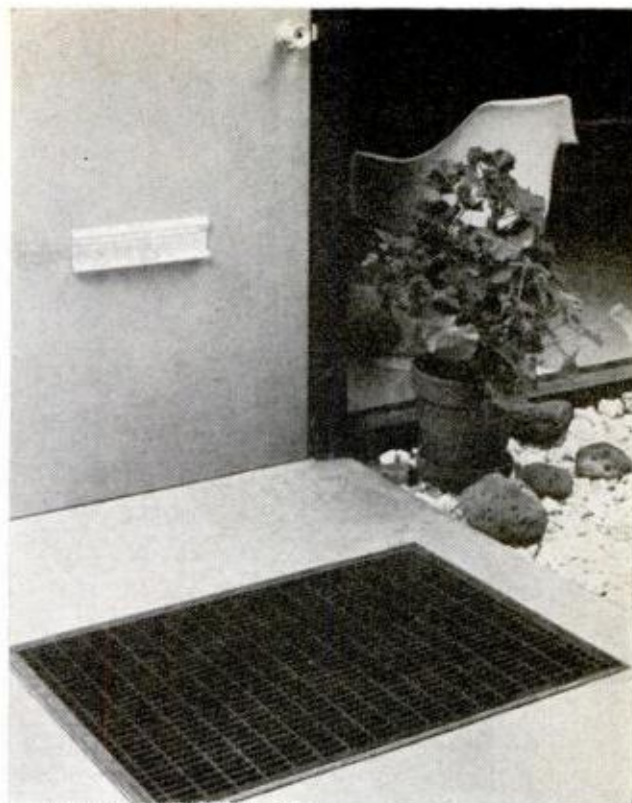


TWO-WAY LINEN CLOSET is an easy conversion when closet forms a part of the bathroom wall. Just cut a rectangular opening between studs, frame with 1-in. lumber and finish with trim to match that used around the bathroom door

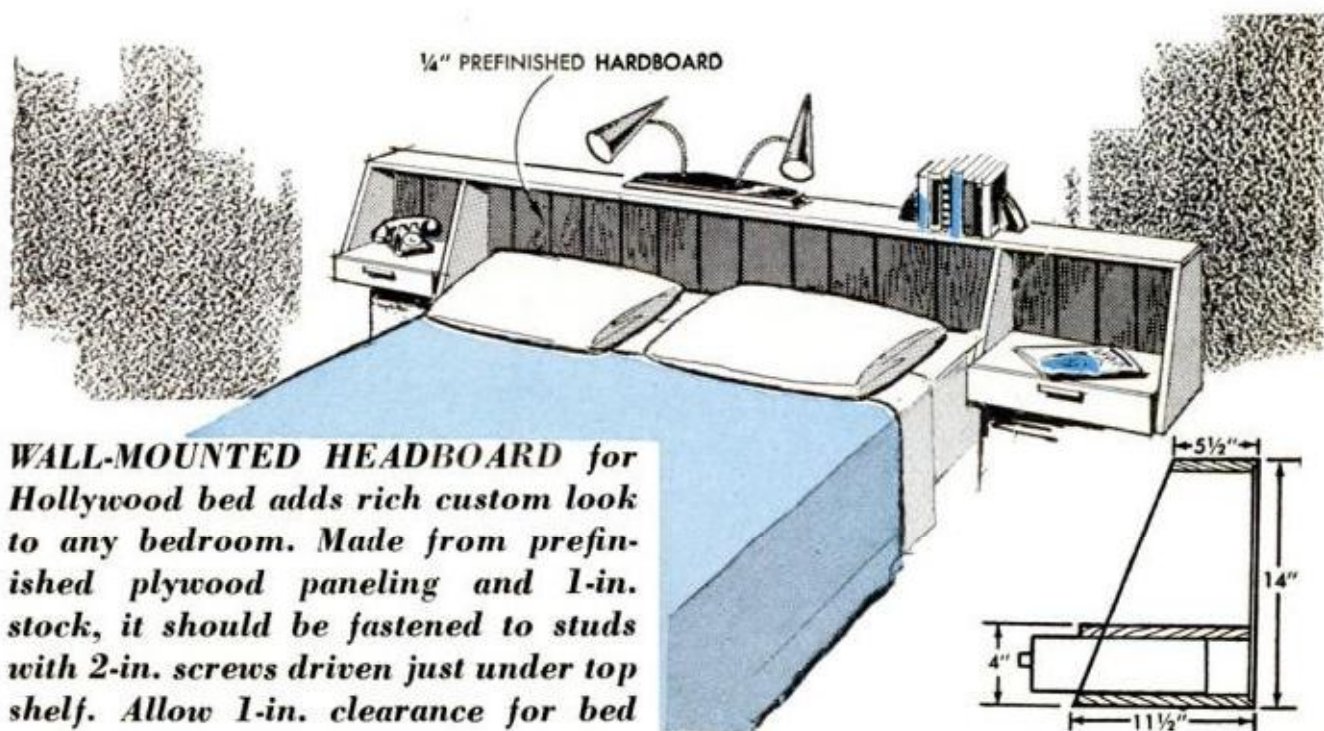




CLEAR UP CLUTTER on closet floors by adding a shoe shelf with individual compartments for each pair. Lower pole enough to allow mounting extra shelf 6 in. below existing shelf, then cut shoe shelf and dividers from $\frac{1}{2}$ -in. plywood and nail in place. For a special touch in milady's closet, line each compartment with pieces of carpet or felt to protect shoes. If present shelf is too low, add the new shelf above it



FOOT-SCRAPER GRATE over shallow pit is a great idea if you're adding a new stoop. Grate lifts out to clean pit



WALL-MOUNTED HEADBOARD for Hollywood bed adds rich custom look to any bedroom. Made from prefinished plywood paneling and 1-in. stock, it should be fastened to studs with 2-in. screws driven just under top shelf. Allow 1-in. clearance for bed

Latest Ways to

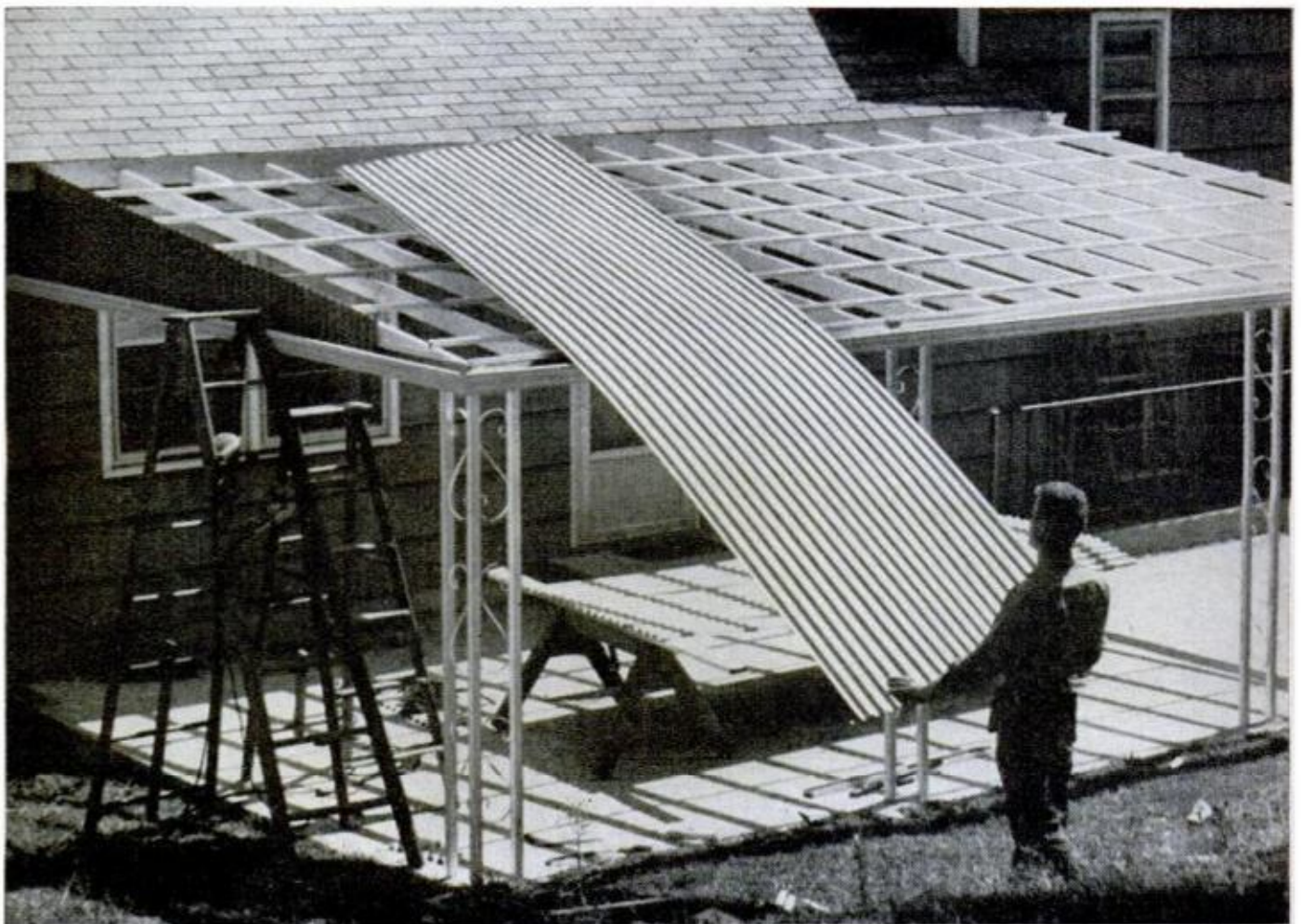
Modernize Your Home

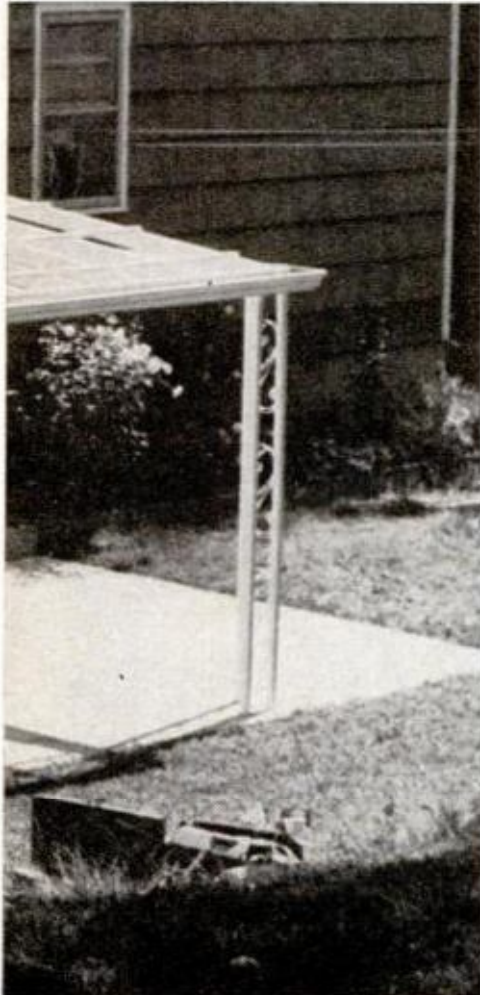
New materials include two dent-resistant plastic sidings, ceramic tile flooring that goes down like vinyl and wear-resistant gutter liners

SELECTING THE RIGHT MATERIALS for a remodeling job is no longer just a matter of walking into a lumberyard and ordering the same tried-and-true products you would have used, say, ten years ago. Manufacturers are working hard on research, and hardly a day goes by without at least one new material being announced. In other words, by using good, old XYZ siding, you can still do a fine job. But maybe one of those new plastic sidings will go on just as easily, and also save you a lot of future maintenance work.

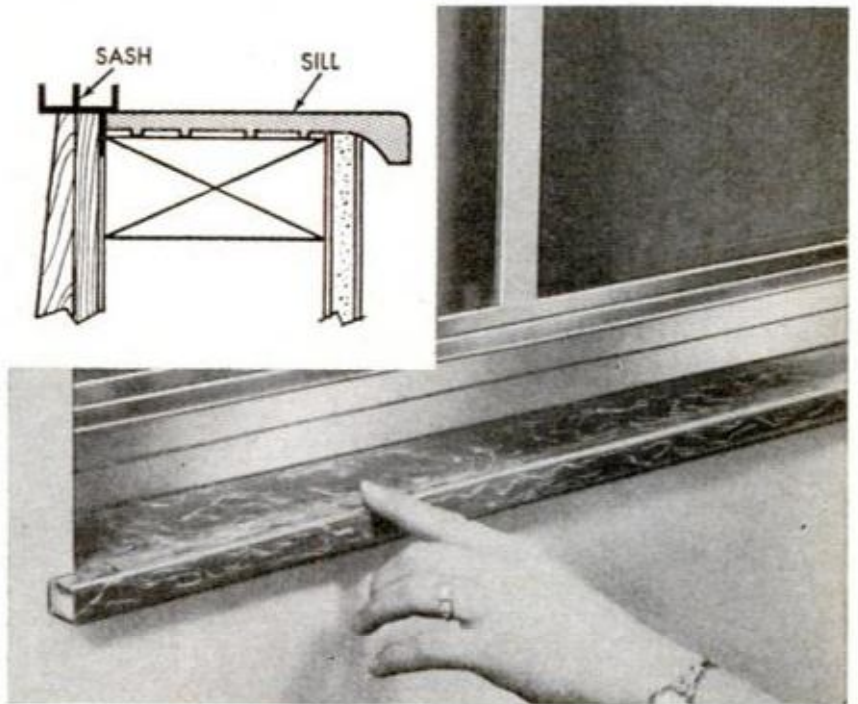
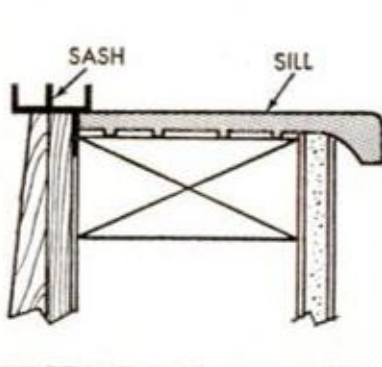
On these pages, you'll see a number of other up-to-date products which can do the job faster, better or at less cost.

FOR PATIO COVERS, these vinyl panels from Barrett Div. of Allied Chemical come in opaque as well as translucent colors. Said to weather more attractively than some similar materials. In 4-foot width, lengths up to 20 feet

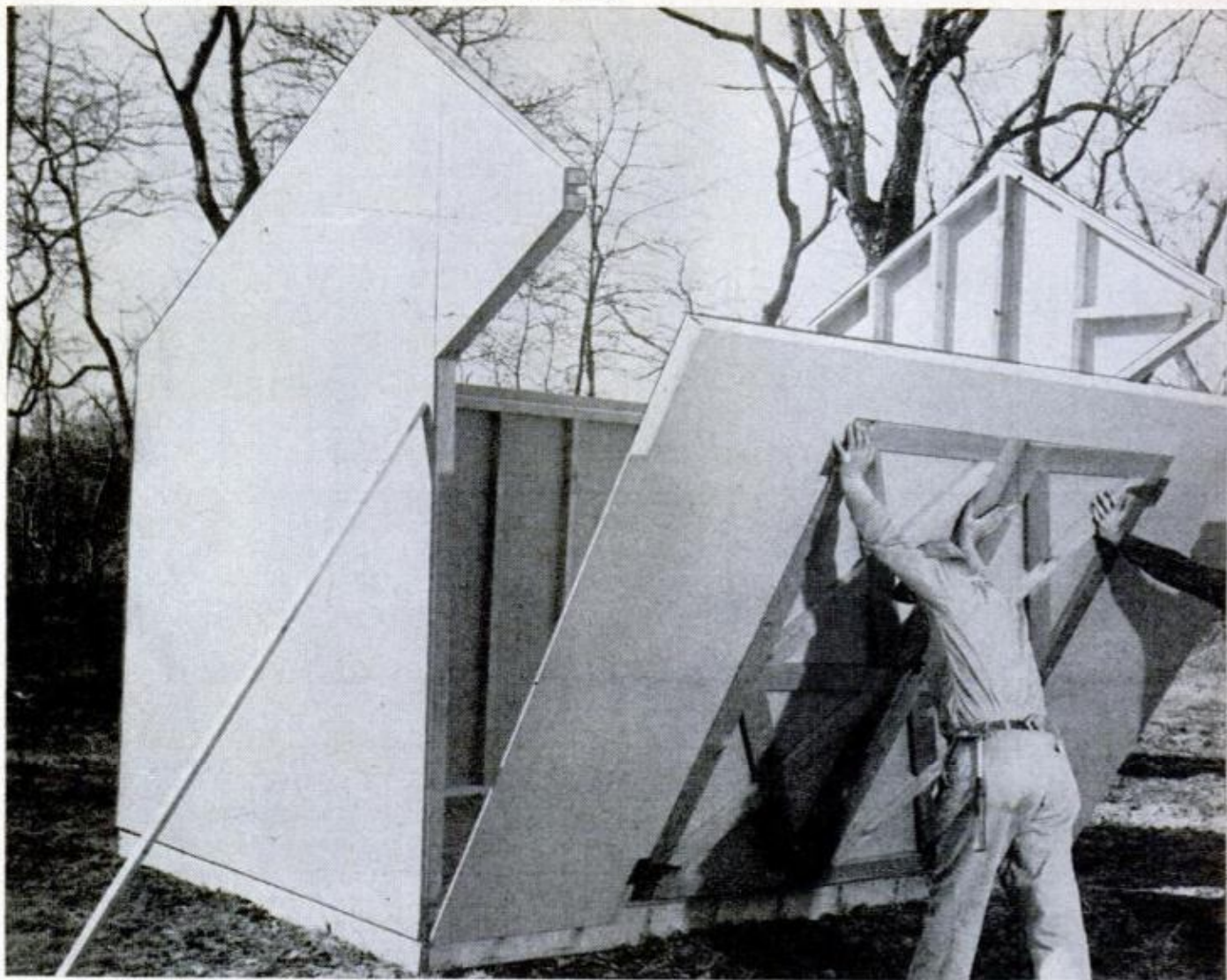




PLASTIC SIDING from Monsanto is made of extruded polyvinyl chloride. Won't rust, rot or corrode, and is easily cleaned due to its smooth surface. A unique feature is its two-step application—you nail a special moisture-resistant fiber board onto the house, then snap the plastic strip over it. Left, premolded caps go over the corners and trim



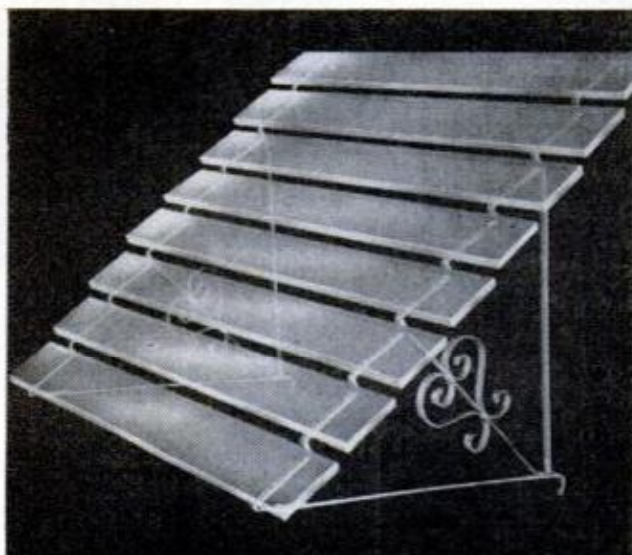
MOLDED FIBERGLAS-REINFORCED WINDOWSILL, tradenamed Perma-dall, resembles marble. Won't shrink, rot, crack or peel. Termite proof. Installed with a mastic-like adhesive supplied by the manufacturer, Woodall Ind. Cleans easily, resists fading. Costs 60 cents a lineal foot



BARN BOARD is an economical (about \$50 per 1000 square feet) utility siding that's ideal for farm buildings, cabins, other low-cost structures. Comes with red, green or white prime coat that you needn't paint immediately. Matching nails available. Made by Homasote in 4 by 8, 10, 12 and 14-foot sheets

BY USING STANDARD ROOFING MATERIALS with this prefabricated aluminum patio enclosure, you can visually tie it to your home more readily than with all-metal or metal-and-plastic types. Wepco

DO-IT-YOURSELF AWNING BRACKETS avoid the tacked-on look common to rigid awnings. Sterling Factories supplies the brackets (\$9.20 a pair); you add any material that blends with home's exterior





REAL CERAMIC TILE floors can now be laid with the ease of composition flooring. Stylon Corp's Vinylbond is made of ceramic tiles embedded in vinyl. Requires almost no maintenance. Retail for about \$1.35 per square foot



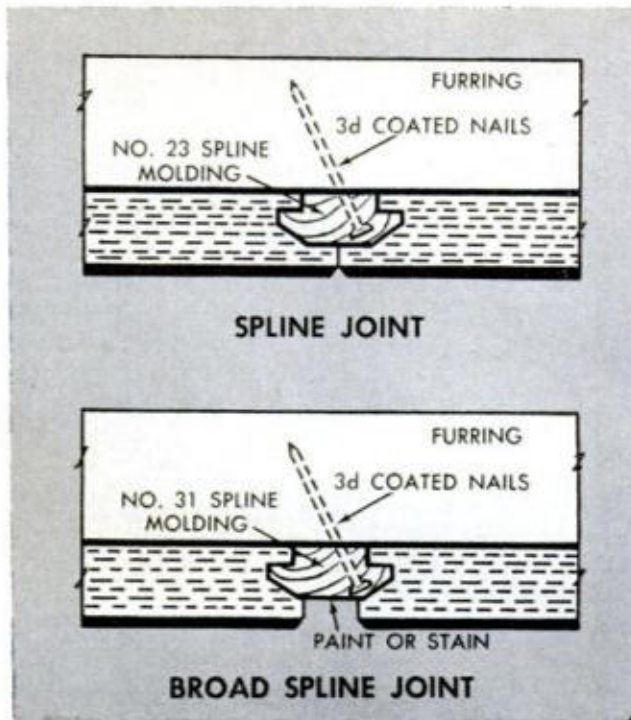
CEILING TILE for bathroom, kitchen or other humid area is easily cleaned, as it's factory coated with a liquid plastic that's less likely to peel than other coatings. Costs about 45 cents a square foot. National Gypsum calls the product Acousticrylic



BLOCK "BUCK" windows, for concrete block walls, give a good moisture seal without a mortar sill or calking at the jambs. Because of their modular sizes, they fit right into a block wall. The head of each window forms a channel for the wood header plate. Kewanee Mfg. Company



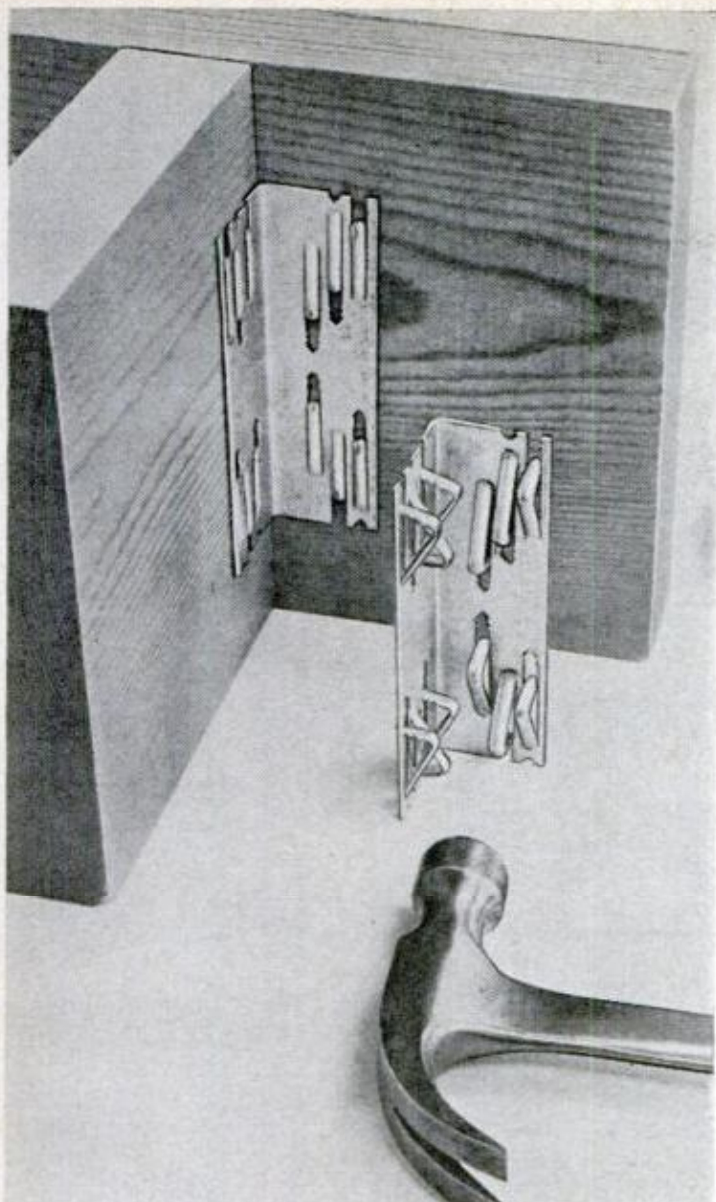
Latest Ways to Modernize Your Home



FORMICA'S V.I.P. PANELS come in a wide variety of colors, wood grains. They're held to furring strips by wood splines that give a nail-free surface accented by either V-grooved or ribbed joints (see drawings). Special moldings, corner strips supplied. Cost: about \$1.50 to \$1.75 a square foot, in place

ANOTHER PLASTIC SIDING, made of polyvinyl chloride, has been introduced by Dura-Lok Div. of Acorn Chemical Co. It's applied in same manner as metal sidings, using pre-punched nail holes. This weather-resistant, dent-proof material is said never to need painting because the color (white, light green or light grey) runs through its entire thickness. Cuts with ordinary saws

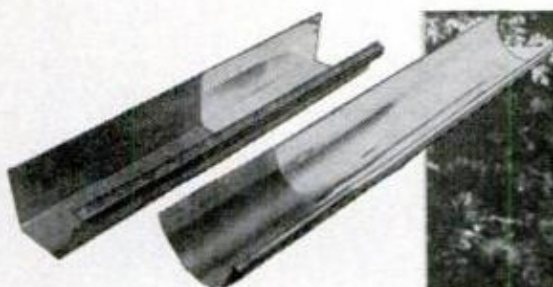




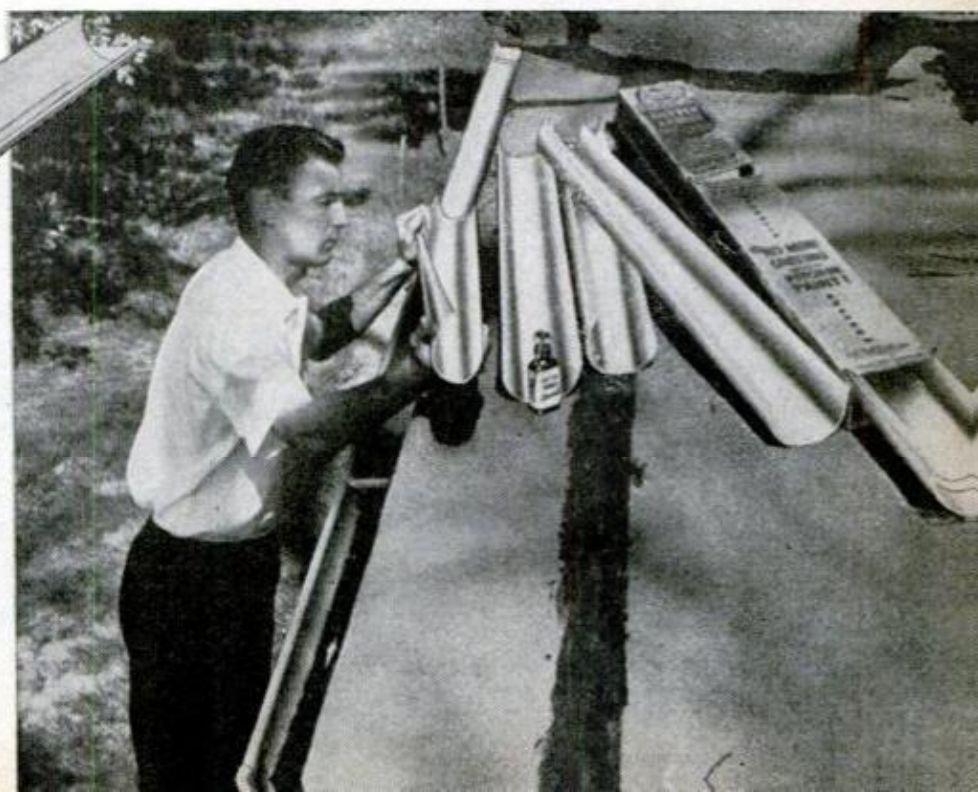
TO SPEED FRAMING JOBS, try these hardened-steel, zinc-coated joist fasteners from Panel-Clip Co. You merely hold them in place and drive in the prongs with a hammer. More convenient than nail-type anchors. Okayed by FHA for up to a 2 by 10 at full span



BALSAM WOOL TUX-IN INSULATION requires little or no fastening, as you merely tuck it between framing members. Goes in even after plumbing and conduit have been installed. Pre-slit for tearing into desired width. Made by Wood Conversion Company



PROLONG GUTTER LIFE by lining them with these aluminum Gutter Armor strips. They're applied with waterproof adhesive, in shapes which conform to inside contour of any wood or metal gutter. Can be cut with household scissors, provided your wife isn't looking. Cost \$6.95 for a kit of eight 4-ft. strips and necessary adhesive. Imagineers, Incorporated



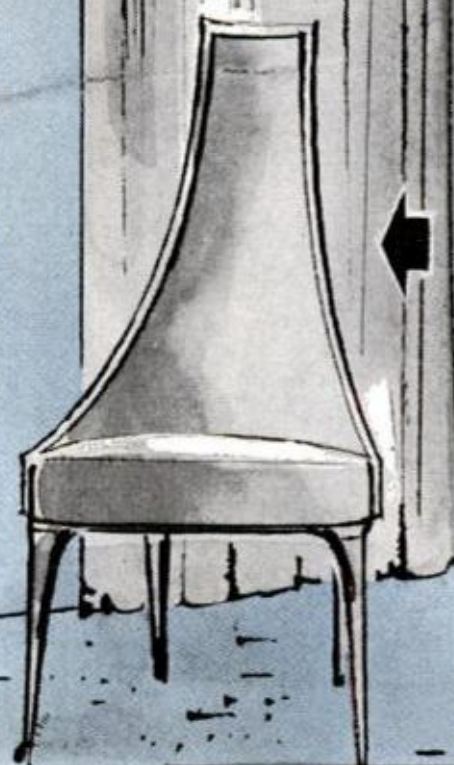
PANEL DOOR DECOR



WHO SAID doors were meant to be used only as doors? Quite to the contrary, stock panel doors don't have to swing at all to be useful. For example, you can take three 3-panel doors, hinge them together so they will stand by themselves, insert colorful prints in the ready-made frames formed by the inset panels and you'll have a display screen art lovers will rave about.

You can use panel doors to create a

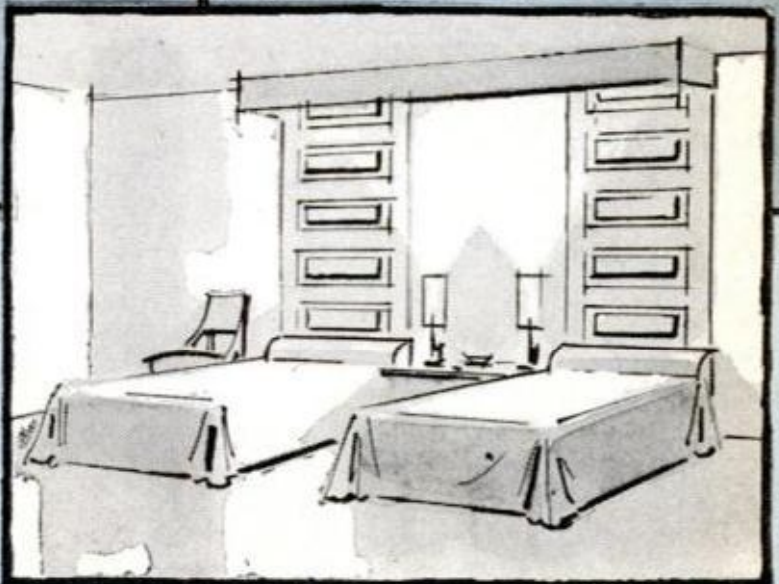
focal point of interest in a living room by mounting them on the wall to form a decorator backdrop for a modern sofa. Again, pictures may be framed within some of the panels and a couple of pin-up lamps hung in the others. Here, since standard 6 ft. 8-in. doors are less than room height, the doors are mounted midway between floor and ceiling, letting the sofa hide the space at the bottom.



IF YOU USE extra tall doors known as seven-eleven (7'-11"), they can be mounted floor to ceiling. Otherwise, standard six-eight doors are mounted mid-way between ceiling and floor

IN GROUPS OF THREE, or as many as you wish, ready-made panel doors permit you to make this decorator screen in nothing flat. Add just four hinges, nine prints, then paint and it's done

TWO DOORS, separated by a dressing table and wall mirror, form ready-made headboards for hollywood beds. Cornice across top fitted with tubular lights ties the whole affair together



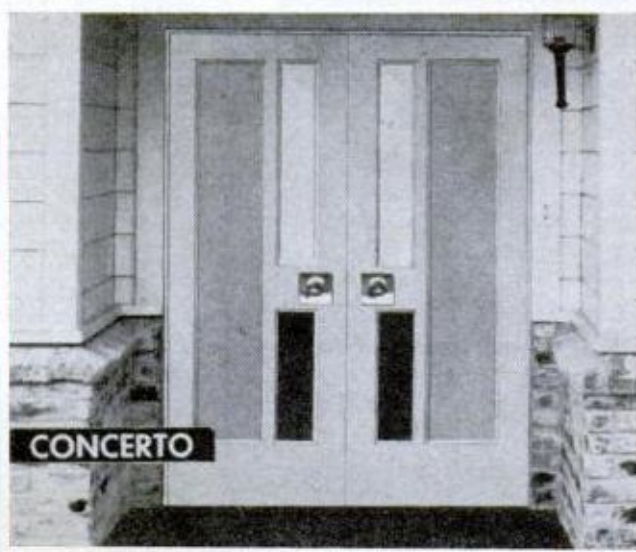
Panel doors of smooth ponderosa pine can also be used to serve as king-size headboards for hollywood twin beds. Single doors, with a mirror between, are mounted directly on the wall behind each bed and "tied" together at the top with a cornice fitted with fluorescent lights. A night table between the beds completes the ensemble.

TREAT
YOUR
HOME
TO A
NEW
DOOR

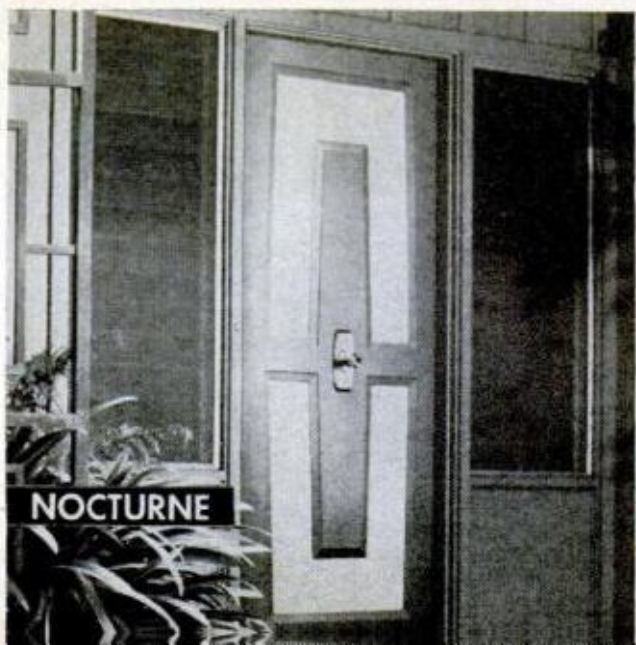
HALLMARK



SONATA



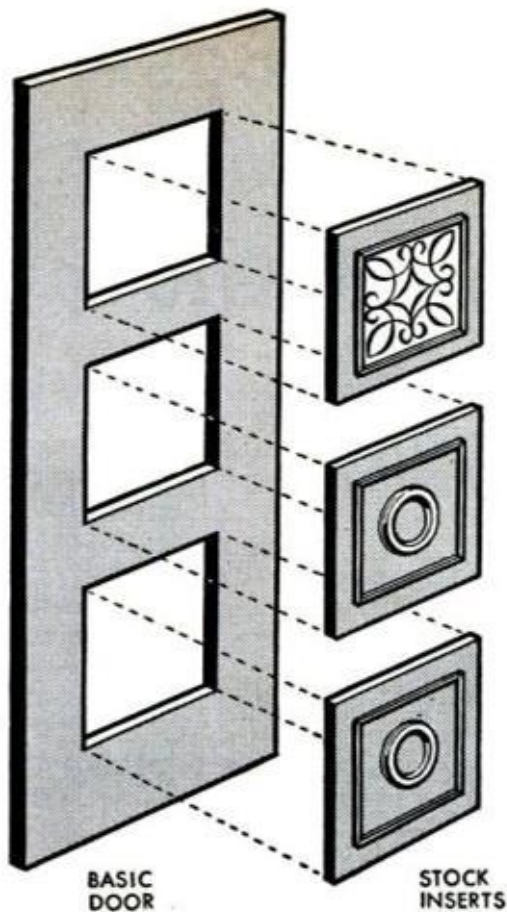
CONCERTO



NOCTURNE



STACCATO



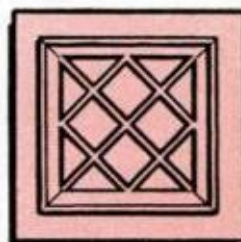
BASIC
DOOR

STOCK
INSERTS

WHEN PAINTED in brilliant hues and in combinations of contrasting colors, the inserts create a highly distinctive door



IS YOUR HOME wearing the same old door? Like a new Easter chapeau, a smart new door can give your home a whale of a pick-me-up. Too often the entrance door is just a door, a hinged panel that lets people in and keeps things out and looks pretty much like the door you see on every other house.



Only recently have doors really taken on individuality to set them apart from the commonplace. The grouping at the left, called the Symphonic family of doors, is a good example of what Simpson has done to give entrance doors a lasting impression.

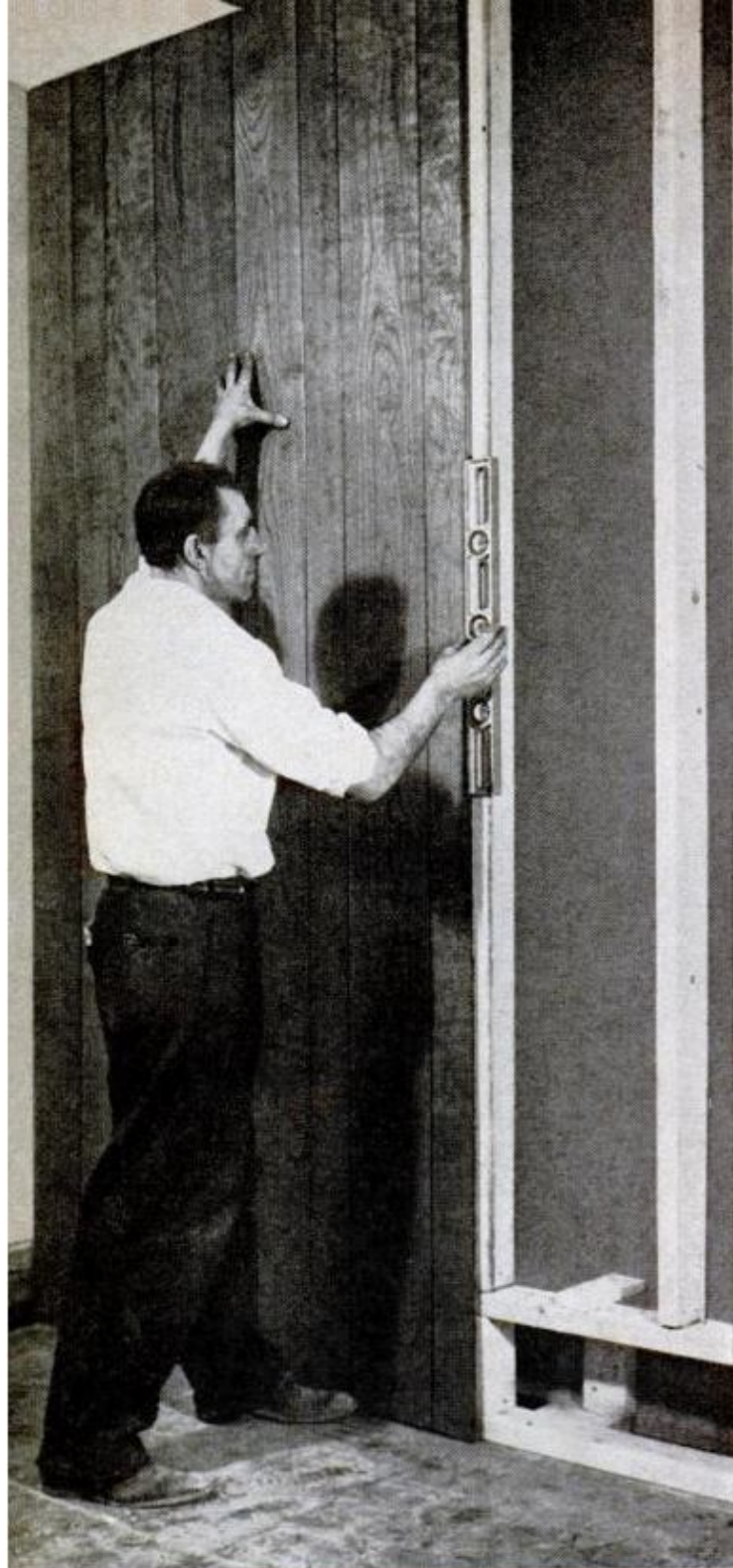
With Morgan's made-to-order door (above), there's little chance of two doors being alike in that the buyer can preselect his own custom door from some 1500 possible variations of 12 basic inserts. Matched or used in combination, the inserts are factory installed according to order.

Claimed to be warp- and frost-free, Ever-Strait doors by Pease (right) have a plastic-foam core and a wood perimeter, fully encased in a covering of steel. Zinc-coated and bonderized to prevent rusting, the doors come with weatherstrip which has a flexible magnet encased in vinyl, making it cling to the metal door to provide a positive weather seal.



Building Basics

Every Man Should Know

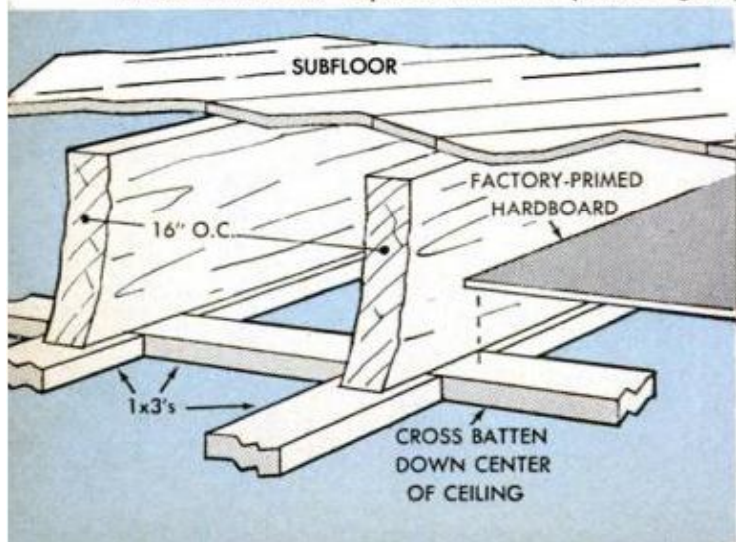


WHEN A REMODELING JOB calls for framing—or even simple furring to install ceiling or wall panels—many homeowners feel out of their depth and turn to professional help. Yet few building techniques are so simple and standardized. Most framing—for erecting partition walls, enclosing understairs space or creating built-in cabinets, for example—is done with the familiar 2x4. Unless you're boxing in a duct or other obstruction, as at the base of the wall shown here, partition framing involves only a sole plate spiked to the floor, a top plate fastened to the ceiling (or joists) and studs toenailed between—usually 16 inches on center. The only trick is to keep the studs exactly vertical and parallel, and this can be accomplished with a level or plumb line. This is especially important when the partition is to be faced with standard 16-in.-wide panels, as at left, since the panels are centered on the studs.

The principal thing to remember when framing door or window openings—or when enlarging existing ones (pages 150-151)—is that you've cut away studs that normally help carry the wall load. The purpose of the horizontal member (header) at the top of the opening is to redistribute the load toward each side, where the header is supported by a trimmer—the inner half of a doubled stud. The width of the header depends on the opening it must span. A doubled 2x4 is heavy enough for a 4-ft. opening; a doubled 2x6 for a 6-ft. opening; and a doubled 2x8 for up to

BATTEN AND LOOSE-HARDBOARD-PANEL CEILING

QUICK COVER for exposed basement joists or garage rafters permits easy access to pipes and wiring above



NO-FURRING, NO-STAPLING ACOUSTICAL CEILING

an 8-ft. span. Built-up headers are always set on edge and spaced apart with lath shims to match the stud width.

In framing basement or attic partitions, the low ceiling often makes a dropped header unnecessary. In these cases, the trimmers continue up to the top plate. Door trimmers usually run down to the floor, inside the gap in the sole plate.

Furring strips, like studs, are commonly spaced 16 in. on center, but may be applied vertically or horizontally, depending on the type of finish wall they are to receive. Furring is most often 1x2 softwood strips, though 1x3s are also used.

An unusual example of ceiling furring is the batten application, below left. One batten is nailed at right angles to the joists (or rafters) at their center point, and runs the full length of the room. Short battens, fastened to the bottom edge of each joist, form lips on which the cut-to-size hardboard panels rest. Batt or blanket insulation could be stapled between the joists before the panels are tipped into place.

There's a commercial system that works on a similar suspended-panel principle, but involves a "floating" aluminum grid on wire hangers. Though it isn't intended for areas of low headroom, it's ideal where a lowered ceiling is desired, or for concealing exposed pipes or cracked plaster. A choice of slip-in panels is available—either acoustical or translucent.

Another novel ceiling treatment, shown at right, avoids furring and grids altogether. The wallboard layer also increases the ceiling's sound-deadening properties. After applying the tile, as shown, put off installation of any cove molding for several days to give the adhesive time to set. And remember it's easier to paint molding strips *before* installation, setting the nail-heads and touching up with a paint stick.

On the following pages, other basic procedures are outlined, including door and window remodeling and finishing a basement. The latter requires much framing and furring. Ideally, the inside surface of below-grade walls should be coated with asphalt (or other waterproofing) and a plastic vapor barrier before furring strips are applied. If you then lath for plaster, the furring provides an air space that helps insulate and avoids dampness.

Kit-installed pocket doors (next page) are most easily framed into new partition walls, like the one shown on the blueprint, page 153. Often it's quicker to nail a partition together flat on the floor, then raise it in place. But be certain to cut the studs over $\frac{3}{4}$ " short for ceiling clearance. You can then drive a 1x4 strip under the sole plate to wedge the top plate against the ceiling (or joists).



BIG WALLBOARD PANELS cover joists fast, can be handled by one man with the aid of T-braces made by nailing 2x2s together. Long edges should be centered on stud, nailed every 6 inches



HEAVY-BODY ADHESIVE is placed in walnut-sized dabs on $2\frac{1}{2}$ -in.-dia. spots primed at corners of tile (right foreground). Special cement eliminates stapling required with light, slow-bond types

STARTING FROM CORNER, each tile is placed $\frac{1}{2}$ in. from final position and pressed within $\frac{1}{8}$ in. of ceiling. Then tile is moved until its tongues engage grooves of already-placed adjacent tiles



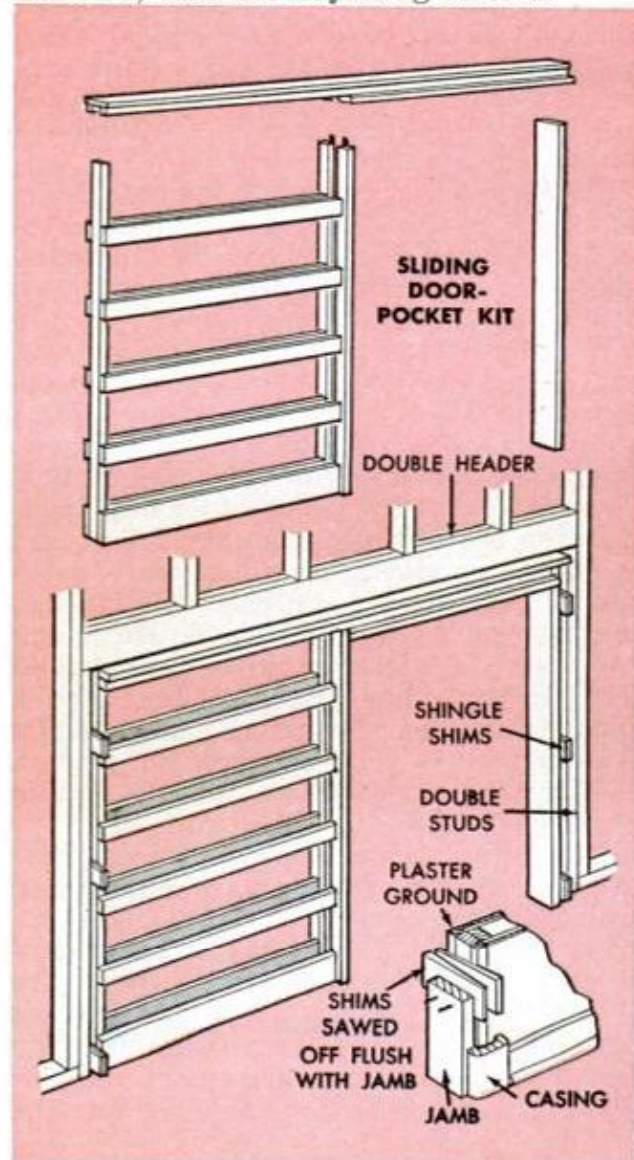
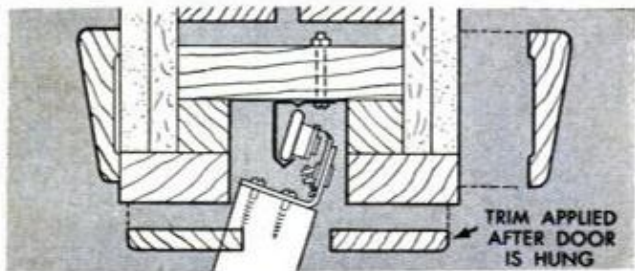
POCKET SLIDING DOORS



ONLY ONE TYPE of door makes sense in the corner arrangement at left: track-riding panels that tuck back into the hollow partition walls. Hinged doors, here, would only create congestion and steal space—and they'd probably have to be mounted so they would bang together.

Pocket-door kits differ; they range from \$9 to \$16 and may include the pocket assembly, upper and side jamb, top track, bottom guide and roller hardware—but rarely the door itself. You can cut an opening for a kit in an existing wall, framing it like an ordinary doorway.

Tack the rear of the pocket to the inside trimmer with pairs of shingle shims inserted in the joint as shown below. After plumbing the pocket by tapping on these tapered shims, nail through each pair and trim off excess. At the opposite side of the opening, plumb the face jamb the same way. Attach the two hangers to the top edge of the door, and hang the panel by tipping it until the rollers seat in the track. To level, turn the adjusting screws.



ENLARGING AN OPENING? To disturb as little of the finish wall as possible, try to utilize two sides of the existing opening, cutting from A to B (see below).

Chop small access holes to the studs at the top of the upper header and the bottom of the lower. Trim off the studs by boring holes and severing the web between with a chisel. Hammer and pry the old headers free. It may be a tight squeeze to nail the right end of the lower header to the first uncut stud inside the wall.

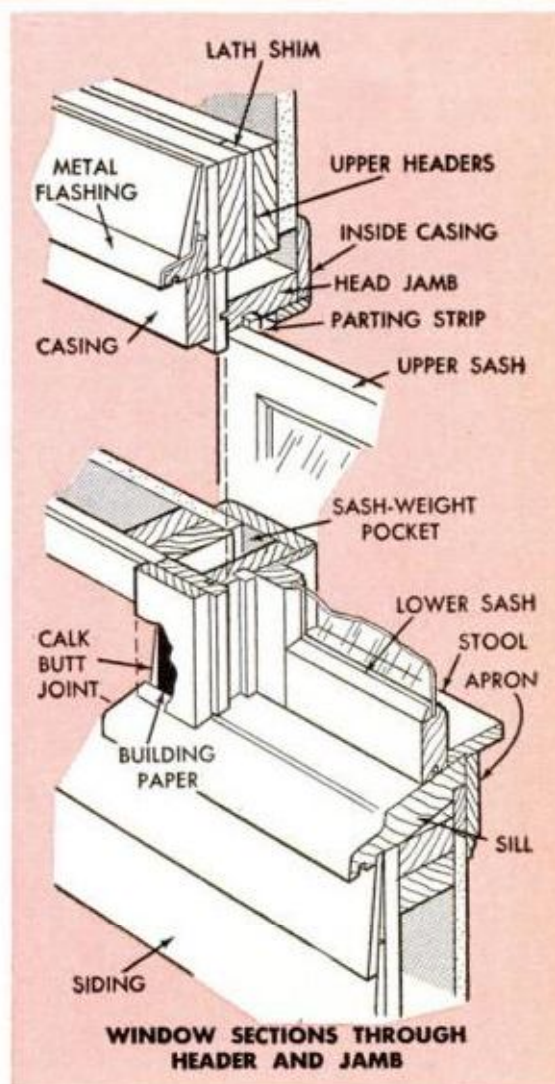
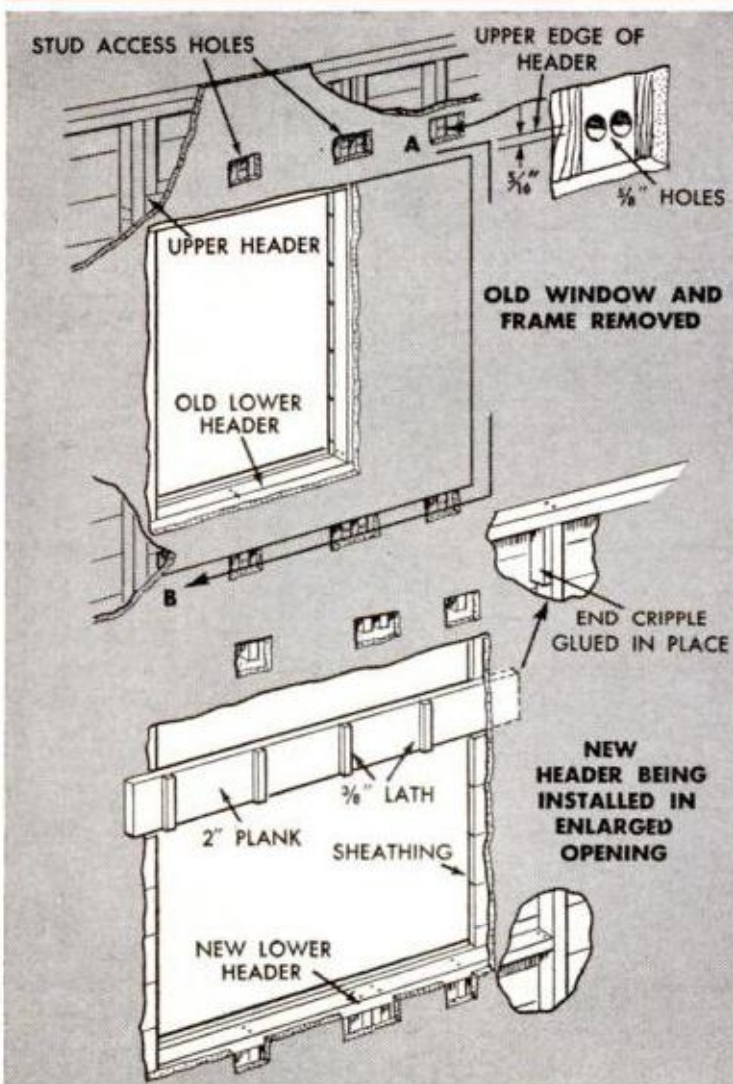
Insert only half of the upper header at first, with spacer-lath attached. Tap the second plank in beside it and spike the two together; then drive this assembly up against the cripples, prop both ends with a trimmer, and toenail the cripples to the header through the access holes. Prepare these holes for patching by driving large-headed nails into studs and headers, letting them project $\frac{1}{4}$ in.

The cut-away of a double-hung window, right, shows how a framed opening is finished. Trim back the exterior siding for a tight butt joint against the casing. Pry up the siding for a strip of building paper to bridge the joint.

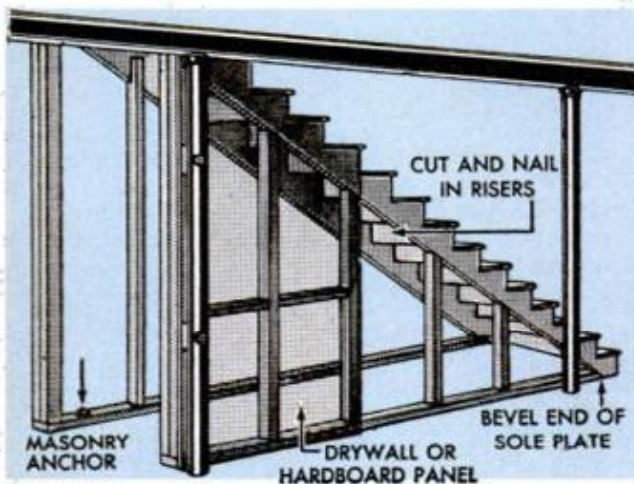
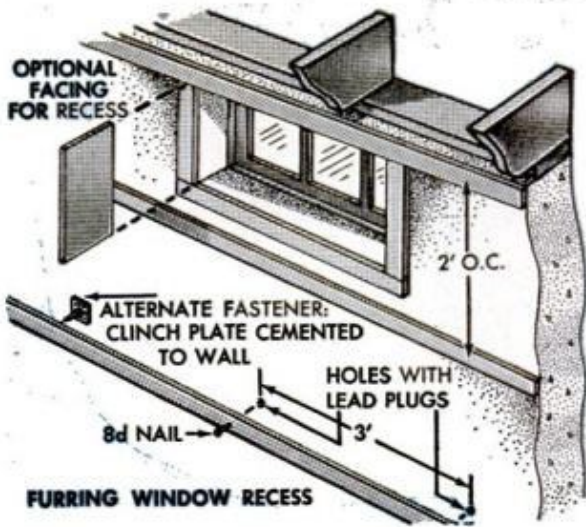


ENLARGING EXISTING OPENINGS—whether for a pocket door or a bigger window—is quickly done with a cut-off wheel in electric handsaw. Slice through both sides before you chop away plaster and lath

REPLACING SMALL WINDOW WITH LARGER ONE



WASTE SPACE BONANZA



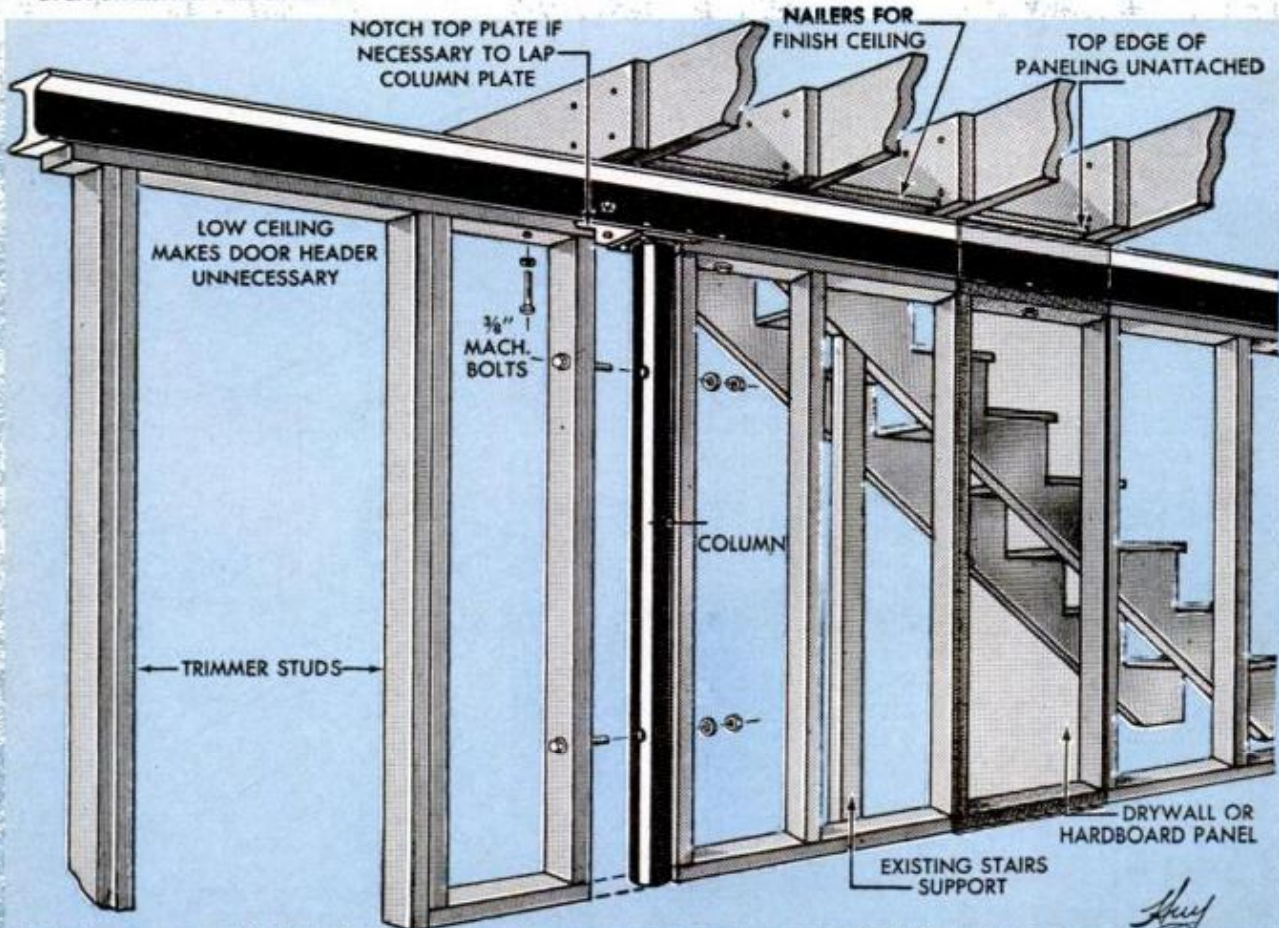
OPEN STAIRWAY TREATMENT

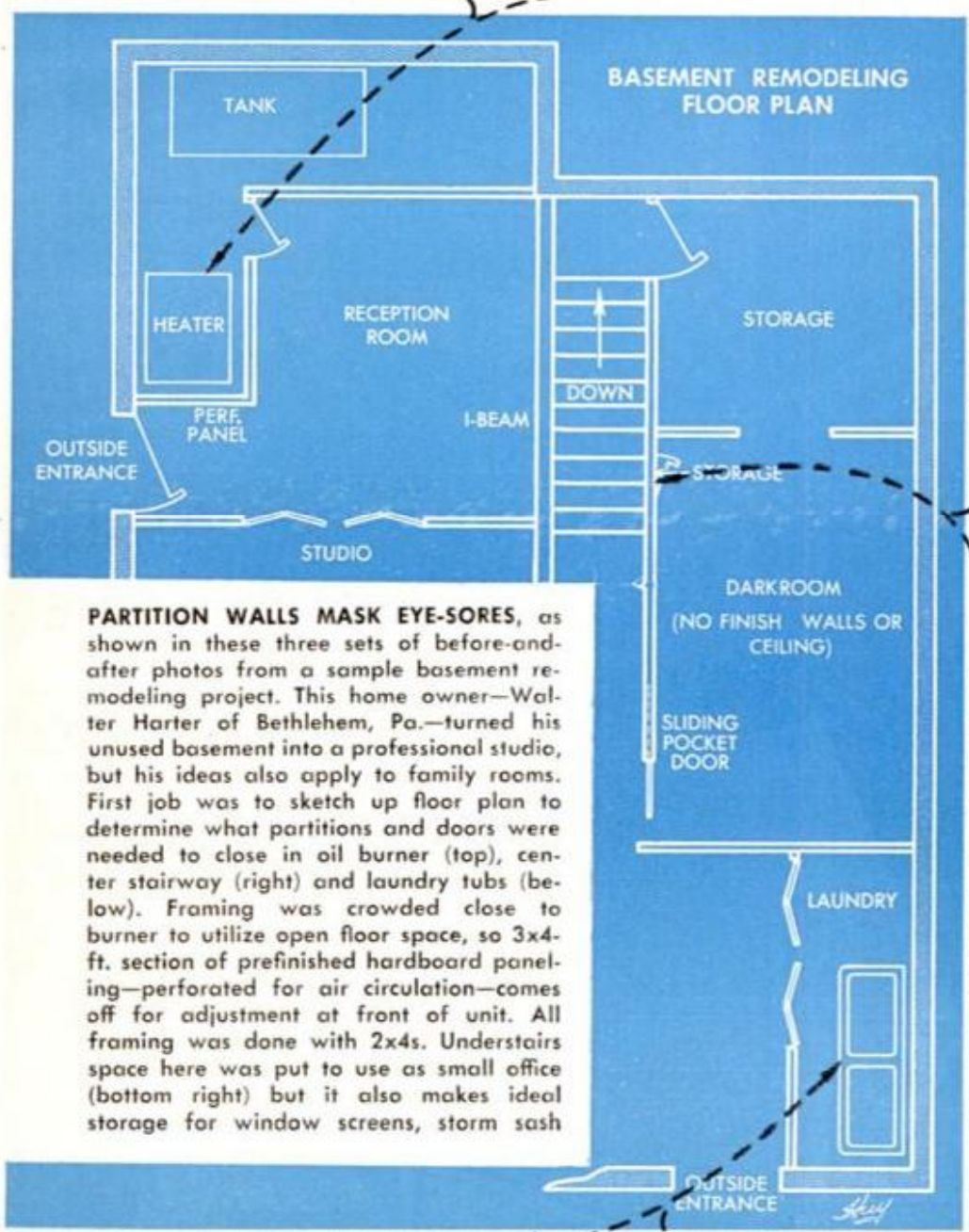
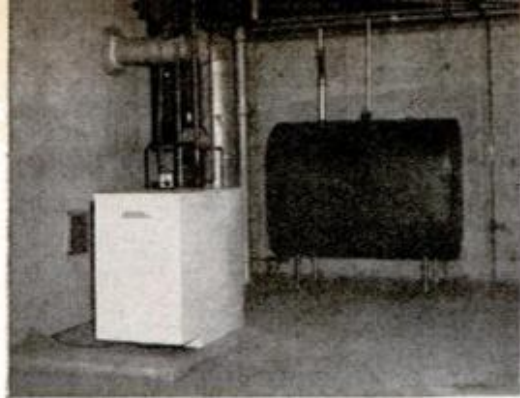
THE FIRST AREA most homeowners turn to when pinched for living space is the basement. But an unfinished cellar looks like a formidable chore because of those cold masonry walls and other eyesores that must be screened from view.

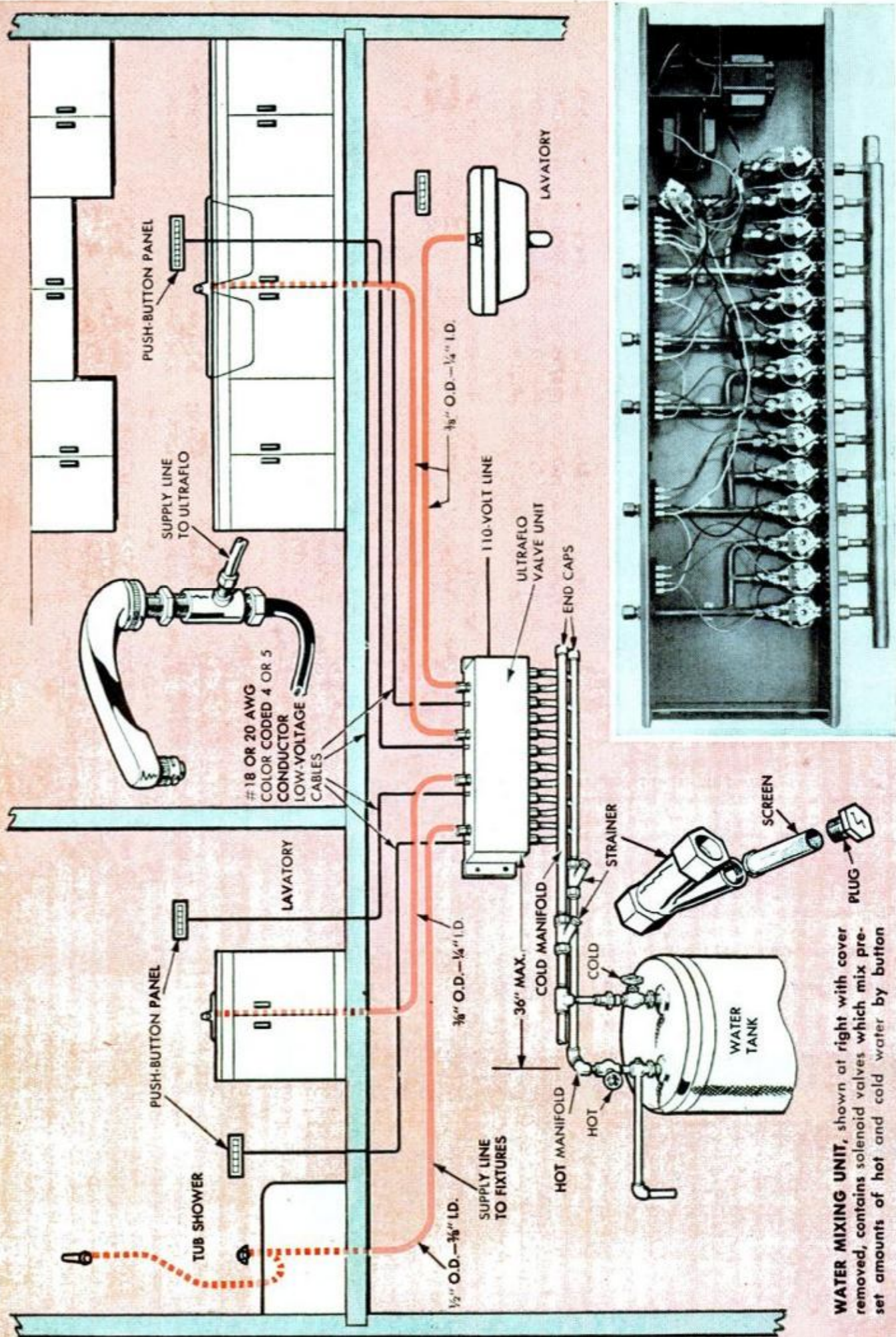
To panel the walls, however, you need only drill holes for nail anchors that let you attach furring strips. It's still quicker, if the concrete is sound, to use masonry nails, or clinch plates. Applied horizontally—as for plank paneling—furring can be more widely spaced than usual (top).

And even the usual clobbered-up basement stairway will take on a respectable look if you nail risers between the treads and enclose the area beneath. If the stairs are hopeless, you can conceal them behind a floor-to-ceiling partition, as shown below, perhaps incorporating an I-beam and lolly column into the new wall. Or trim the panels to the step outline (left) to avoid the necessity of a top plate. You may still be able to tie into the lolly column—bolting through spacer blocks if necessary—to add rigidity to the rear door frame.

WALLED-OFF TREATMENT







WATER MIXING UNIT, shown at right with cover removed, contains solenoid valves which mix pre-set amounts of hot and cold water by button



Automation Comes to Plumbing

HERE'S A NEW PLUMBING system that delivers hot, warm or cold water at the touch of a button. No waiting for the water to reach the desired temperature, no trial-and-error manipulation of the faucets. In fact, no faucets at all.

The system, which is called Ultraflo, was introduced recently by The Tappan Co., 250 Wayne St., Mansfield, Ohio. Instead of faucets, it employs a panel of buttons installed next to the kitchen sink, bath tub, shower and lavatory (see photo, above). When a button is pushed, it activates one or more solenoid valves mounted in a factory-assembled unit near the water heater (see opposite page). These valves mix preset amounts of hot and cold water to achieve the temperature called for at the tap. The presetting is done with an ordinary screwdriver.

Besides convenience, this system, says the manufacturer, offers a number of advantages. These include:

- Less piping. Each tap requires a single run of $\frac{1}{2}$ or $\frac{3}{8}$ -in. copper tubing instead of the usual double run.
- Less waste of water and fuel. With

elimination of trial-and-error temperature adjustment, and less standing water due to the single pipe, the home owner saves many gallons of water a month—much of it hot water. The resulting fuel savings, says Tappan, can run as high as \$3 to \$5 a month.

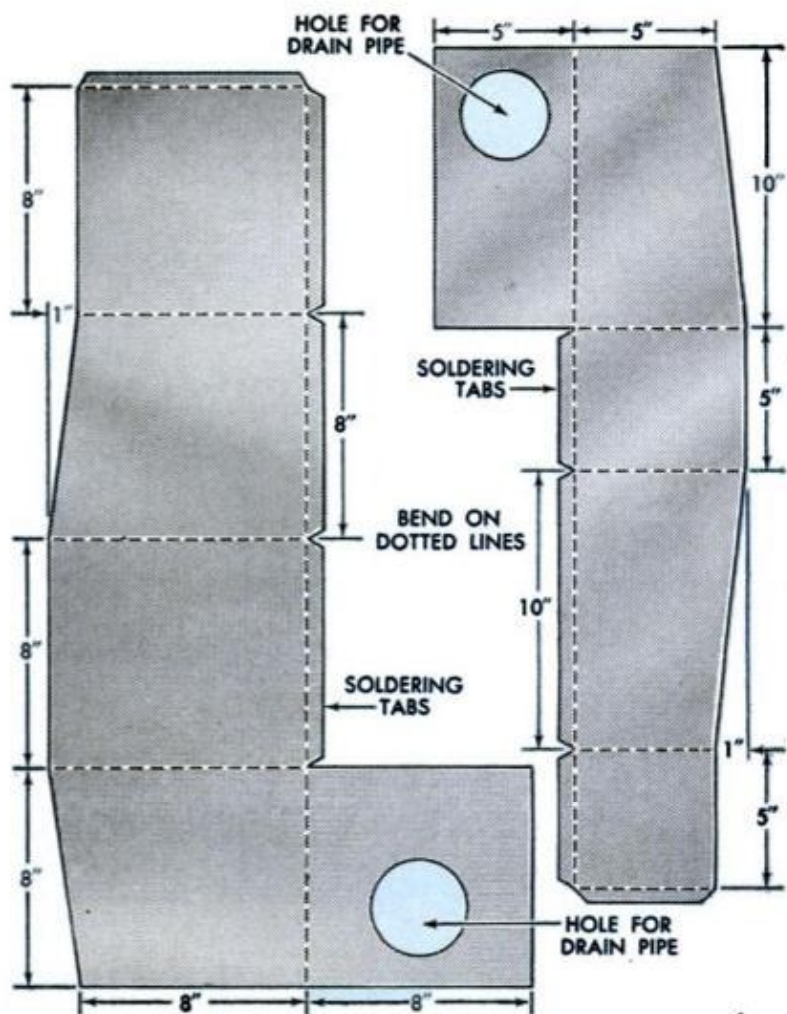
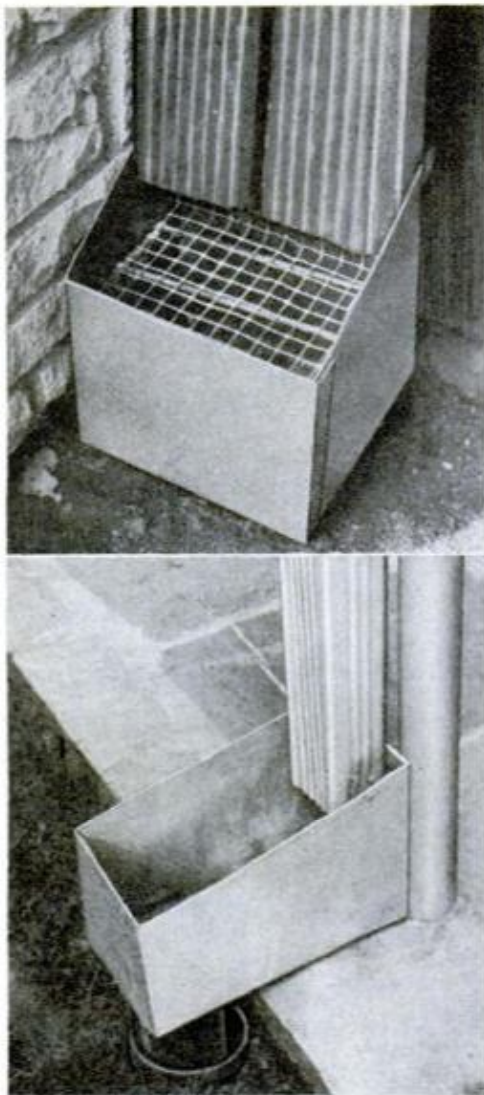
- No faucet washers to replace.
- No faucet drip.
- No standing pressure in the pipes.

This minimizes water damage to the house, as there is less likelihood of leaks developing inside the walls or under the floors. Also, if the pipes should freeze in winter, they won't burst.

But what about cost? In new construction, the installed cost of an Ultraflo system should run from 5 to 15 percent higher than conventional plumbing, depending on labor costs in your area.

At present, the system doesn't work with laundry tubs, toilets and outdoor faucets. However, the company expects to extend it to those installations. Also, it needn't be connected to automatic washers or dishwashers, as those appliances have their own solenoids built in.

Downspout Catch Baskets Save Climbing to Clean



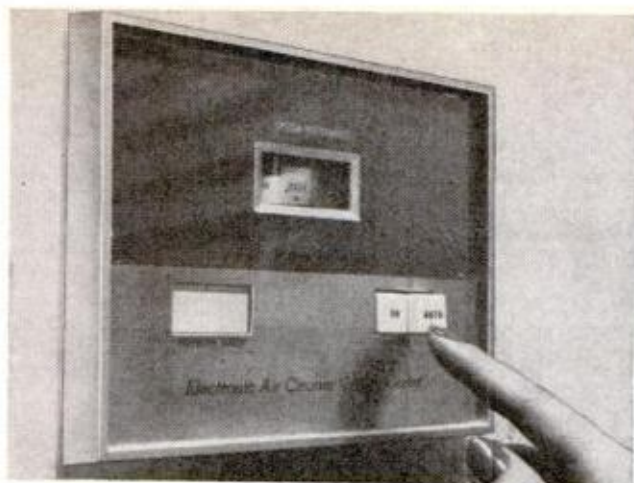
When the leaves start falling, regular wire strainers in your gutters are about as useful as a wooden nickel. But without them, the leaves and debris will clog the drain tile and you'll be in real trouble. To avoid the nuisance of getting out a ladder periodically to clear the leaves from around the strainers, I brought the strainers down to earth, in the form of

catch baskets under the downspouts. Now after a rain I merely lift out the strainer insert, dump what has collected, and the job's done. Water runs from the baskets into the drain tile through short pipe extensions soldered to the bottoms. I made the baskets from sheet copper, and fitted pieces of $\frac{1}{2}$ -in. hardware cloth in them to catch the leaves.—*Oswald F. Quist*



Garbage-Can Caddy

Besides lugging them out for the collector, the big problem with garbage cans is keeping dogs out of them. J. F. Aderhold of Shelbyville, Tenn. solved both problems with this novel wheelbarrow cart. Welded from pipe and angle iron, the cart supports two cans which are held by their handles on a rotating center post. If a dog attempts to climb up on a can while the cart is parked at the curb, the can merely spins around without upsetting. The cans are cradled in semicircular brackets welded to the center post and are easily lifted off.—*Wayne Floyd*

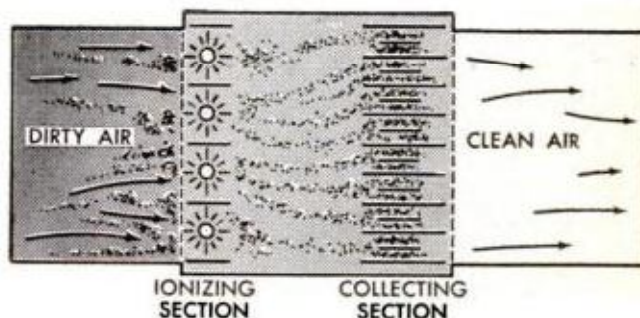


Electronic Cleaner

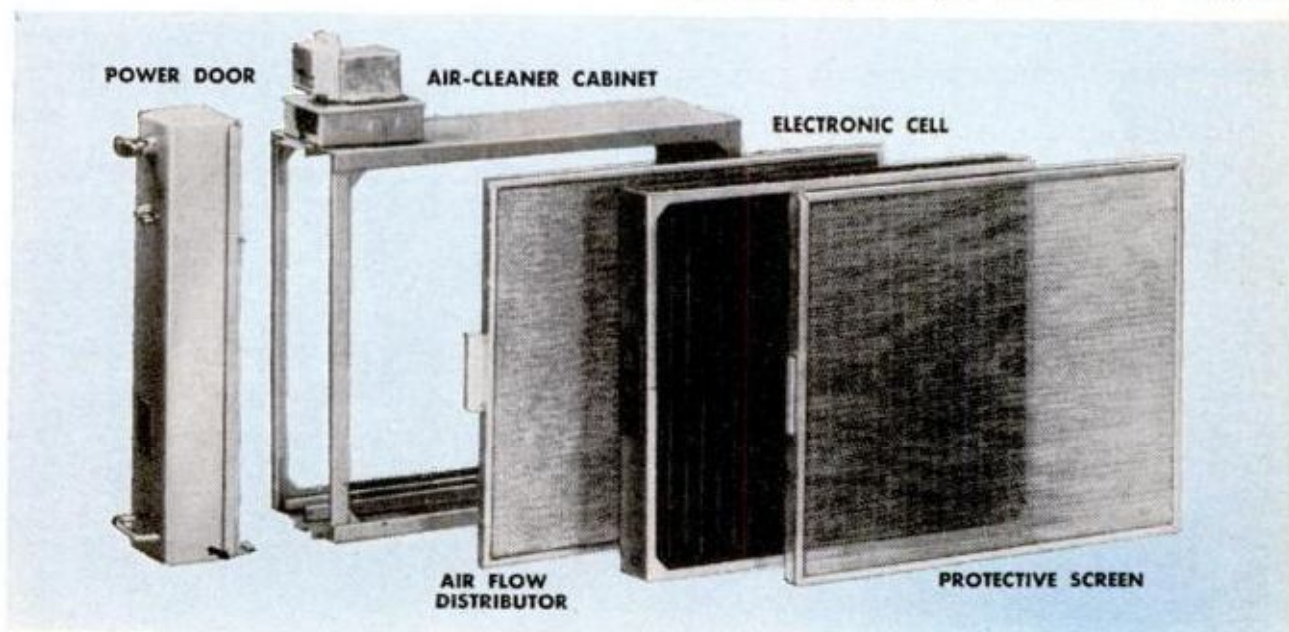
EVERY HOUSEWIFE has dreamed of a home free of dust and dirt. Now at least a part of her dream can come true with Honeywell's new electronic air cleaner which traps, electrostatically, as much as 90 percent of the microscopic particles of airborne dust which constantly circulate throughout the house. The result is less household dusting, fewer cleaning and decorating bills and greater comfort to those who suffer from allergies aggravated by minute air-borne particles.

Available through local dealers, the air cleaner fits in the return air duct just ahead of the fan compartment and can be installed with only minor alterations to the ductwork in all types of existing forced-air heating and cooling systems.

A wall-mounted control panel provides at-a-glance information on the unit's operation and indicates when the filter screen needs to be removed and washed. Under normal conditions, the electronic cell requires cleaning only about once every 2 to 4 months.



HOW IT WORKS: Airborne dust carried through the heating or cooling ductwork is given a powerful electrical charge when it passes through the ionizing section of the two-stage cleaning cell. Then in passing into the collecting section, the dust particles enter a strong electrical field which hurls them against a series of charged metal plates where they stay until you wash them off the plates



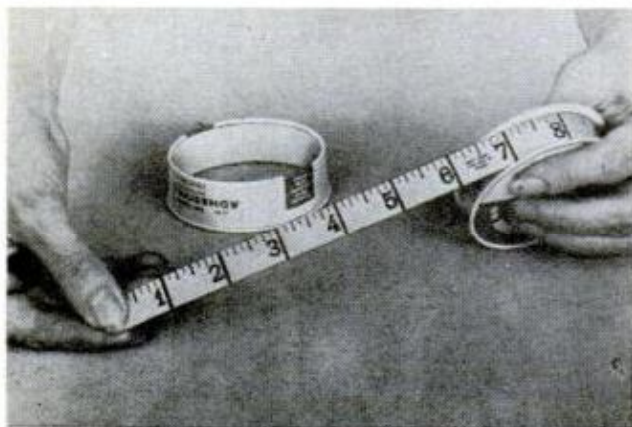


TO TRANSFER FEATHERS from one pillow ticking to another, cut a 6-in. slit in the corner of the old ticking and sew it inside the new ticking. Then you can shake feathers into new ticking without any escaping



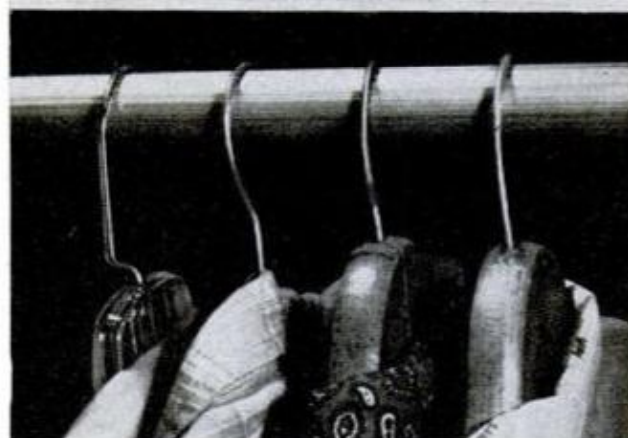
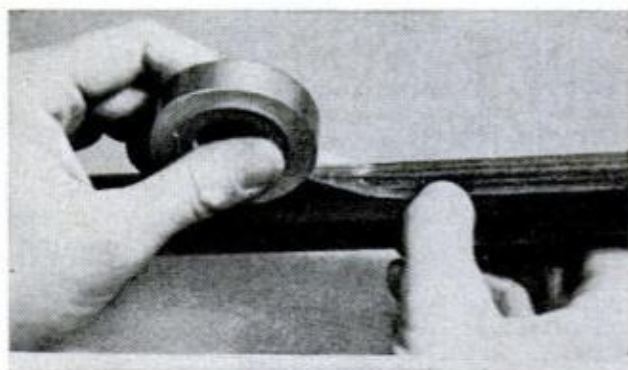
QUICKIE TOY DESK for pre-schoolers can be made by screwing a heavy cardboard carton to a piece of plywood. For extra strength, add wood supports inside. Be sure to sand the edges to avoid splinters

TAPE HOLDER in which adhesive tape is sold makes a handy spool for cloth measuring tape. Snap-on metal cover for the spool will prevent tape from unwinding, keep it clean and make it easier to use



Solving HOME PROBLEMS

PLASTIC SLEEVE for closet pole allows hangers to slide noiselessly along metal pole, protects finish on wood pole. Cut it from ribbed polyethylene plastic, allowing a 1/2-in. overlap, and fasten with tape



NEED AN EXTRA MIRROR in the bathroom? Try mounting one on the lower sash of your bathroom window. Such a mirror can be adjusted to proper height by sliding sash. Sunlight provides illumination



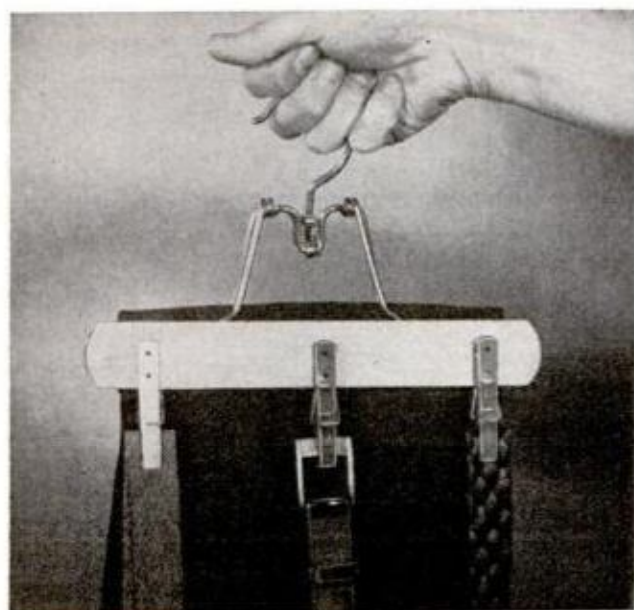


TIRED OF HUNTING for paper and pencil every time you have to write a note to the milkman? Mount a small blackboard and chalk holder near the back door and you can jot down your milk order on it

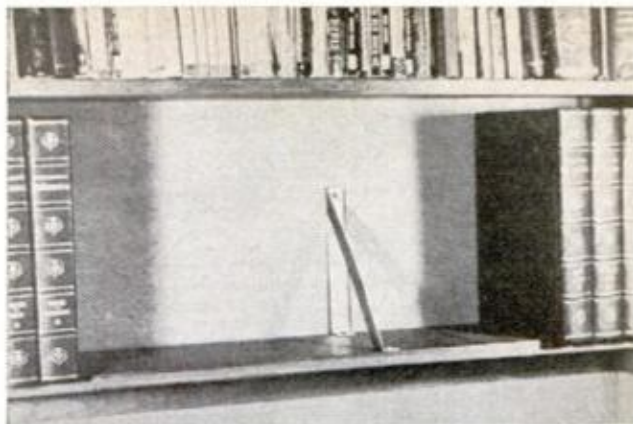


IF YOU LOSE the cap to a plastic glue bottle, a slip-on pencil eraser makes an excellent substitute since it fits the spout exactly. In addition to protecting the contents of the bottle, this substitute cap can be used to spread the glue once you have applied it. Give it a try the next time you are gluing

DOUBLE THE CAPACITY of wooden trouser hangers by fastening three plastic clothespins to each side with small screws. These hold belts and ties neatly. In an emergency, they'll even support a pair of slacks



SEPTEMBER 1963



HIDDEN HANGERS for "floating" bookshelves disappear completely when books are in place. Made of light sheet metal, these paper-thin brackets should be spaced no more than 2 ft. apart along the shelf

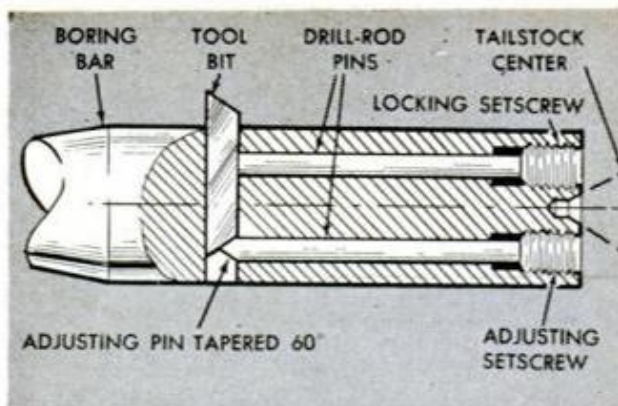


NAIL CARRIER is a minutes-only project which can be made by cutting a handle grip in a 1 x 8 board and nailing a number of 1-lb. coffee cans on each side. For smaller nails, you might substitute No. 2 cans

WEAK POINT in most coffee makers is pin assembly—when this wears out, the whole base must be replaced. To lengthen its life, leave a short cord plugged into base and plug extension cord into it

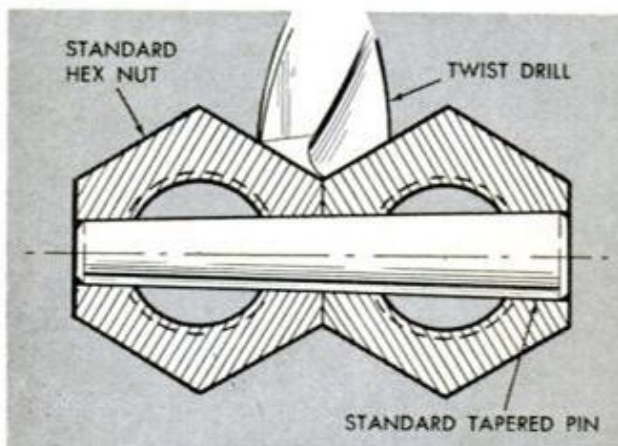


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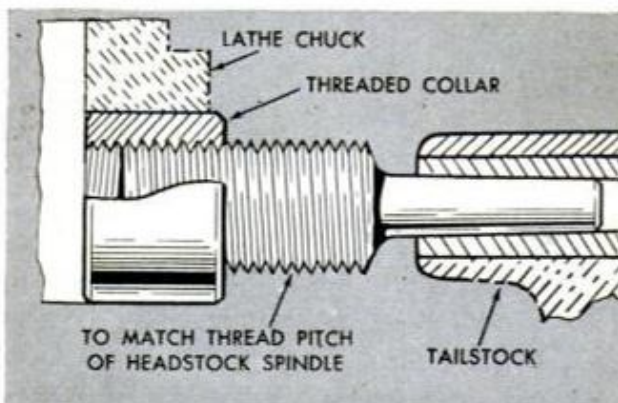
Between-Centers Boring Bar

For accurate, chatter-free cuts machinists generally prefer to use a between-centers boring bar with an adjustable fly cutter. Here's one that's easily made on the lathe on which it is to be used. It's made to be driven by the Morse taper in the headstock, the work being mounted on the carriage.—D. F. Kimberling



Twin-Nut Drill Gauge

A drill gauge of sufficient accuracy for average shop work can be made by joining two hex nuts facet-to-facet with a taper pin. Nuts selected should be unplated and of a uniform size (they vary even in the same thread sizes) without nicks or burrs. Locate and clamp in a drill vise and drill through edgewise. Ream the hole for a standard taper pin. Drive the pin in moderately tight. The adjacent facets of the nuts can be filed to a drill-grinding angle of 118 deg.—F. L. Rush

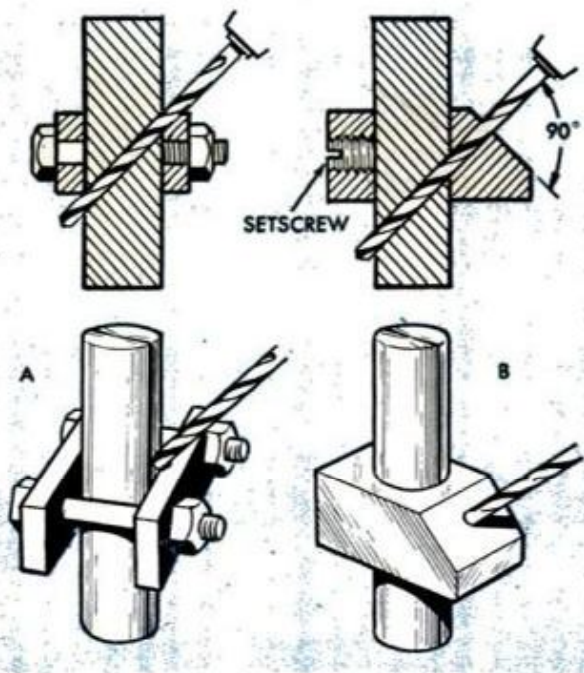


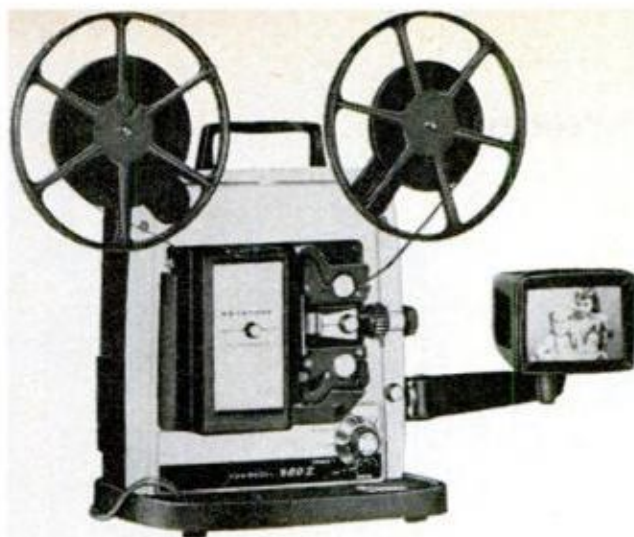
Safe Chuck Handling

This "mandrel" permits safe removal and replacement of lathe chucks. Turn and thread the mandrel and collar, making the threads of the same pitch but twice the length of those on the spindle. To replace the chuck, clamp it onto the mandrel collar and insert the tapered end of the mandrel into the tailstock sleeve. Move the latter up until the chuck threads just engage those on the spindle nose. Run the chuck onto the spindle.

Angular Twist-Drilling

You just can't start a twist drill at a steep angle without risking inaccuracies and possible breakage, unless, of course, you take time to make a simple clamp-on jig. Two types are detailed, either one of which is an aid in starting a hole at an angle on round work. The first, detail A, consists of two steel bars, one being notched on one edge at an angle approximating that at which the hole is to be drilled. The notch "cradles" the drill point until the latter is cutting the full diameter. The second starting jig, detail B, is drilled to slip over the work. It can be fixed at any point with a setscrew. A flat is ground or milled on one end perpendicular to the angle at which the hole is to be drilled. The jig is then drilled at 90 degrees to the flat, using the same drill bit which is to be used to drill the hole in the work.—C. W. Woodson

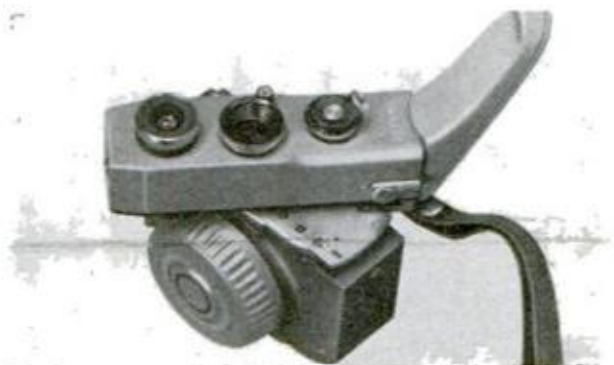




New for Shutterbugs

SELF-THREADING 8-MM PROJECTOR winds film through its entire projection system and onto the take-up reel in six seconds. Its lamp is said to be brighter, yet cooler than conventional 500-W type. Special control knob varies film speed by means of a rheostat. F:1.5 zoom lens fills an average-size screen at any distance from 11 to 20 ft. Designated Model K-980ZV, the machine sells for under \$125. Keystone Camera Co., Hallet Square, Boston, Mass.

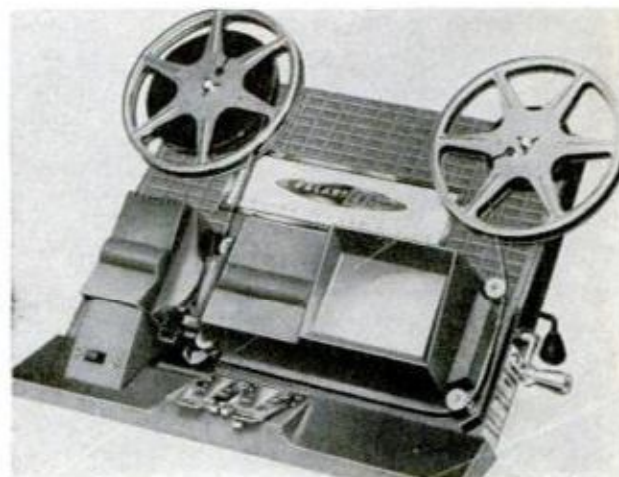
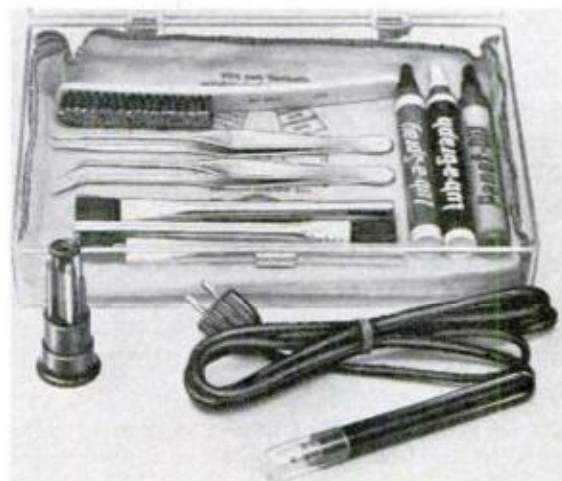
ONE OF THE HANDIEST 8-mm cameras we've used is the Dualmatic-50, primarily because it shoots 50 ft. of film without rethreading. After you shoot the first 25 ft., you merely turn the entire back of the camera 180 deg. and continue shooting. Other features are: convenient, non-retracting motor wind knob; F:1.8 fixed focus lens; automatic exposure control with very sensitive CdS cell. Sells for under \$60. Sekonic Inc., 460 Park Ave. So., N.Y. 16, N.Y.

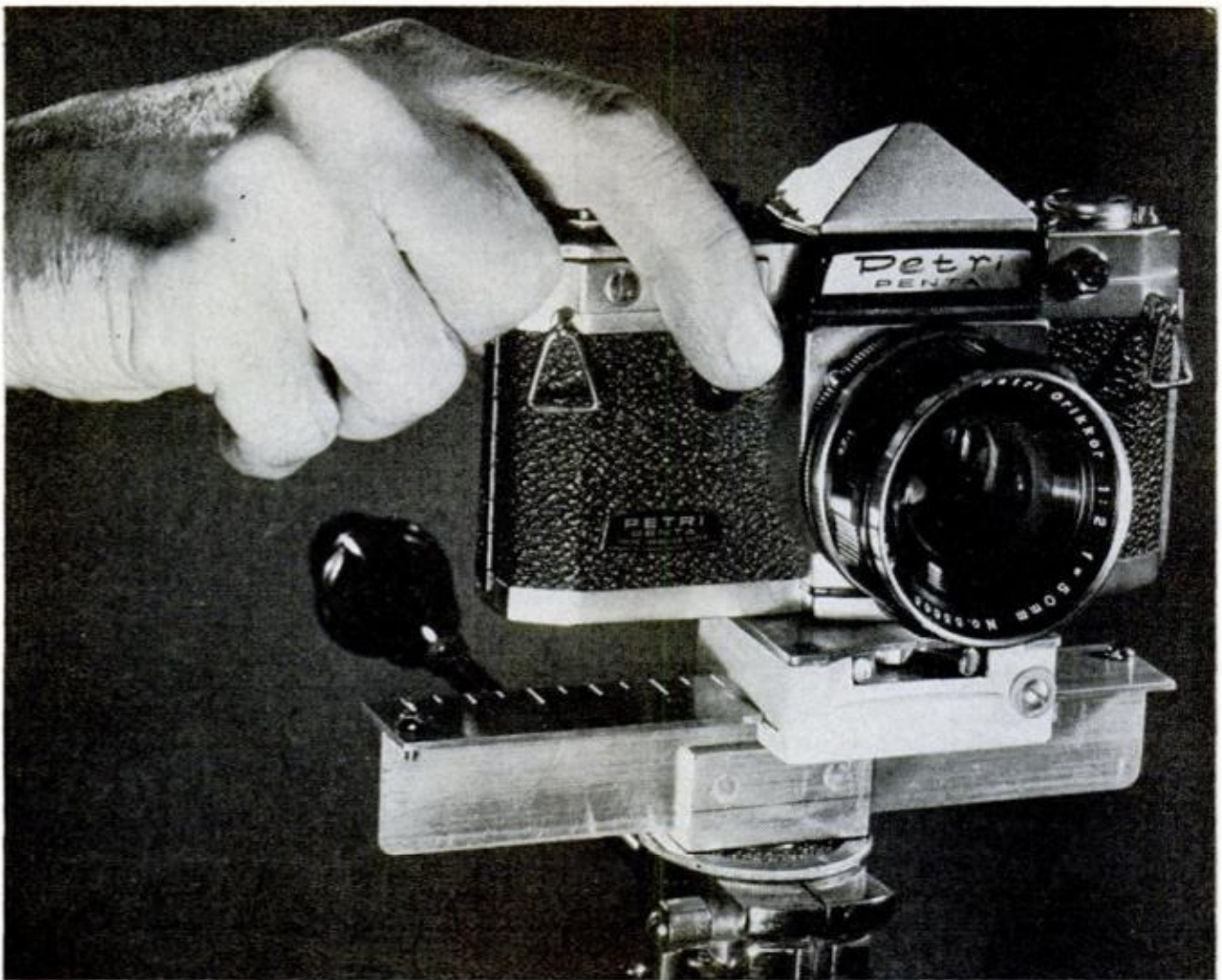


DIAFINE DEVELOPER uses two baths instead of the usual one. However, it can simplify time and temperature control, as it is said to require one developing time (about 2 min. per bath) for all films, at any temperature from 65 to 85 deg. F. Also, it gives increased ASA ratings. (While the manufacturer claims 2400 ASA for Tri-X, 200 for Panatomic-X, it's best to experiment to find exact figures which work for you. Also, for best results prepare solutions with distilled water.) Price is \$3. Baumann Photo-Chemical, 125 W. Hubbard, Chicago, Ill.

"APPRENTICE TINKER" kit contains screwdrivers, brushes, lubricants, tweezers, an inspection lamp and a polishing cloth—the basic equipment needed for cleaning your cameras and performing minor tightening and repair jobs. Price of \$10.35 (prepaid) is slightly lower than total cost of individual items. National Camera Supply, Box 174, Englewood, Colo.

UPDATED VERSION of Kalart 8-mm editor-viewer is designated Model EV-8 Mark II. It has a fine-ground glass screen which gives a 2x2-7/8-in. image, and is hooded and recessed for easy viewing. A time-saving feature is a built-in marker which puts a soft dimple at the frame to be cut. Retail for \$34.50, with splicer. The Kalart Co., Inc., Plainville, Conn.

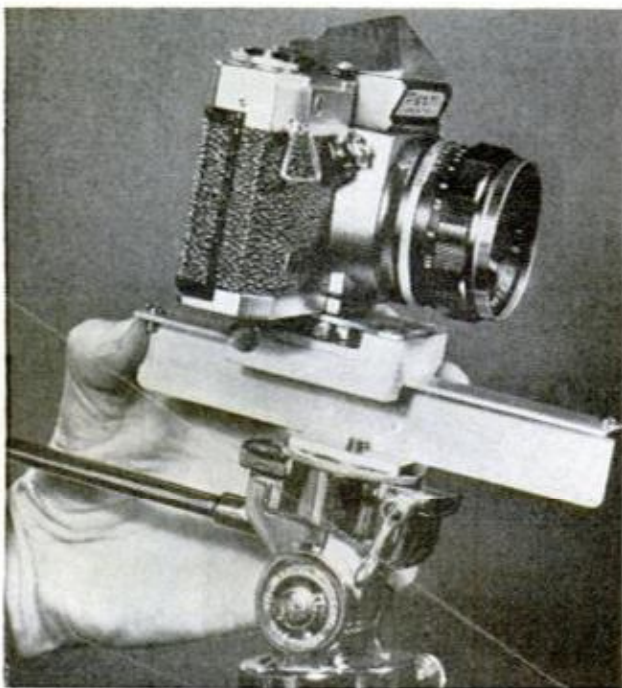




STEREO is a snap. Just slide camera sideways $2\frac{1}{2}$ in. after first exposure and then take a second shot

SLIDING CAMERA MOUNT

For precision results in stereo photography and close-up work, run your camera on a rail



HOW MANY TIMES have you fussed and fumed when shooting close-ups because you had no easy way to make tiny changes in the camera-to-subject distance? This sliding mount is intended for just such work. There's a fringe benefit too—if you turn the camera so that it is parallel to the track you can take stereo photos of non-moving subjects. All you do is make an exposure with the camera at one end of the track. After that, slide the camera sideways about $2\frac{1}{2}$ inches and take the second picture.

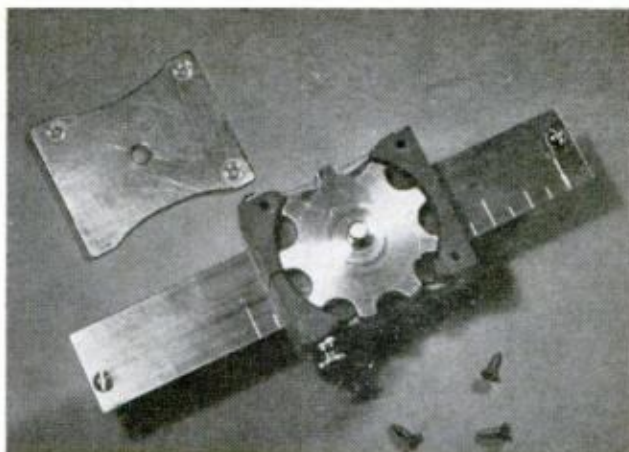
The camera is attached to a block which slides along a T-shaped aluminum track. A suitable length for the track is $6\frac{1}{2}$ in., but if greater travel is needed the length may be increased. An aluminum angle

FOR CLOSE UP WORK turn the camera at a 90 deg. angle to the track. A 6-32 bolt at either end of the track acts as a stop to limit amount of block travel

riveted to the center of the track and tapped $\frac{1}{4}$ -20 makes it possible to attach the unit to a standard tripod screw. The aluminum required is available at most hardware stores.

The block has a T-slot cut in the bottom to allow it to slide along the track. A choice of material is possible; either maple or aluminum may be used. If maple is chosen, the slot should be cut parallel to the grain. The top of the block is recessed to accommodate a locking wheel which incorporates a screw to fit the camera's tripod socket. A saw slot extending half the length of the block permits the T-slot to be squeezed together by a 6-32 bolt and knurled nut. This locks the block firmly in position on the track. A flat strip of thin aluminum should be inserted between each edge of the track and the T-slot in the block. These strips serve a double purpose: they reduce play between the block and track and also act as bearing surfaces. Their ends are bent flat against the block so they will slide with it.

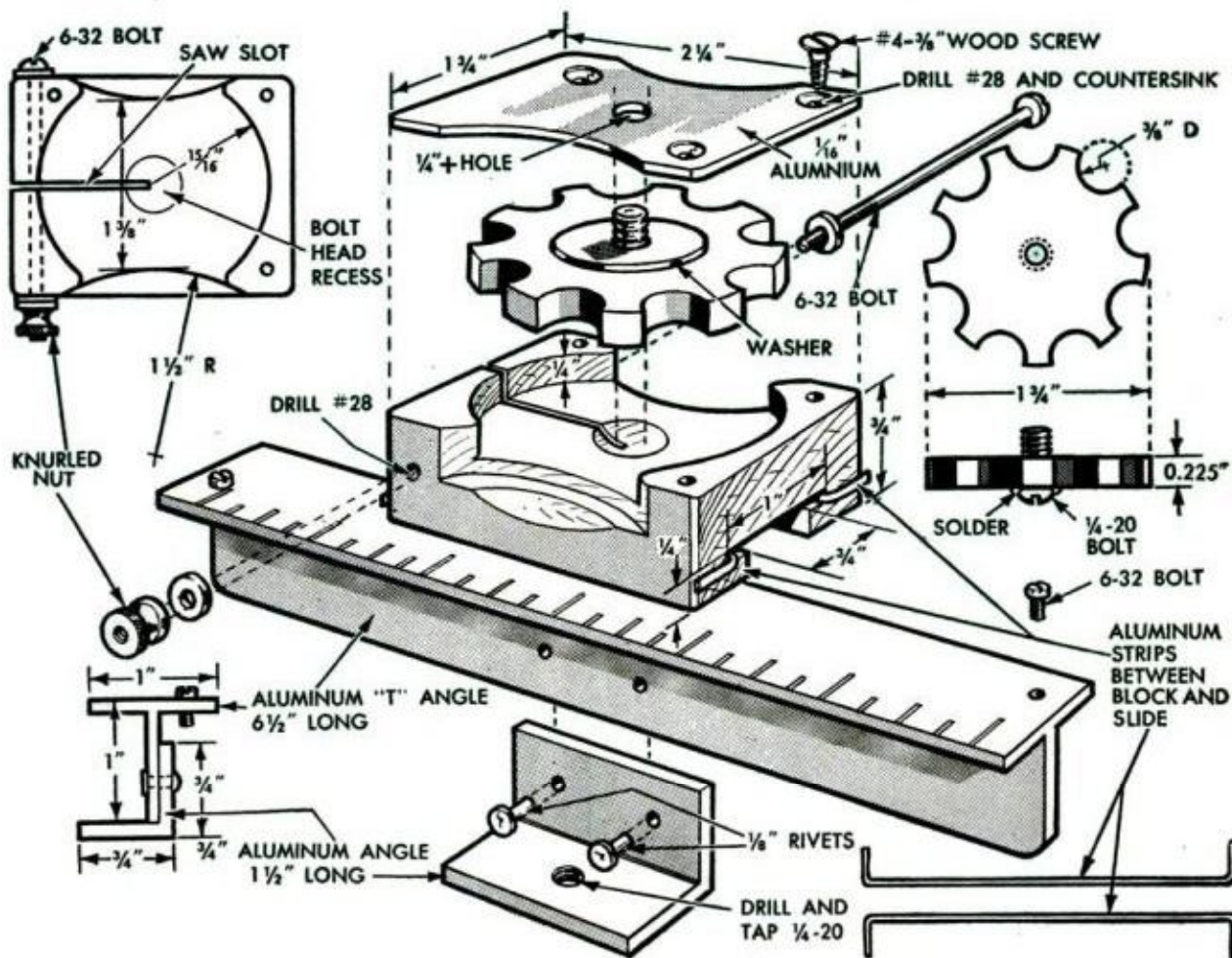
For the locking wheel, aluminum or brass is best. The notches are made by drilling $\frac{3}{8}$ -in. holes around the circumference of a $1\frac{3}{4}$ -in. circle and sawing through the webs that remain between the holes. The wheel is completed by soldering a $\frac{1}{4}$ -20 bolt in a tapped center hole.



TOP VIEW of camera slide with the aluminum cover plate removed shows the assembly of block and wheel

An aluminum plate is attached with screws to the top of the block. This plate is a retainer for the locking wheel and a support area for the camera. Only one screw should be used in the portion of the plate over the split end of the block so that the locking action will not be hampered. Both the block and the plate must be cut away until the locking wheel can be manipulated easily with the fingers.

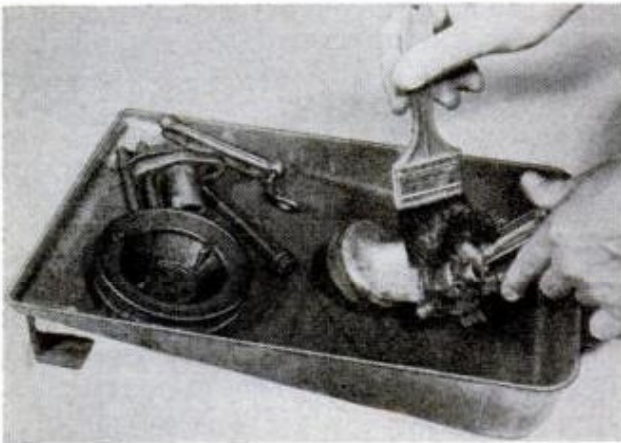
The slide is sturdy enough for use with twin-lens reflex cameras. If stereo work is anticipated, a scale should be engraved on the track.—Walter E. Burton





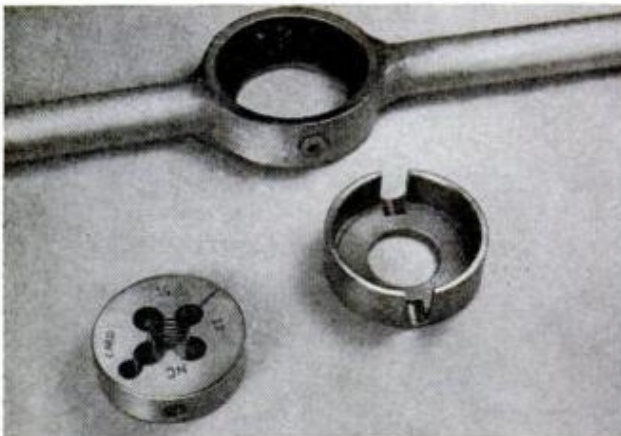
Sheep-Shear Sharpener

Putting a keen edge on sheep-shear blades is easy with this power sharpener. It has a steel base to which a bracket supporting the motor is bolted. The jackshaft is $\frac{5}{8}$ -in. shafting encased in a $1\frac{1}{2}$ -in. pipe nipple with a coupling screwed on each end. Both couplings are machined to accept bearings. The lower coupling is welded to a $\frac{1}{4}$ -in. steel plate bolted to the base. The disk is a scrap casting machined to a smooth surface with a lip around the edge. Diameter of the disk shaft is 1 in. and the housing is a 2-in. pipe. The disk speed is 54 r.p.m. Valve grinding compound applied to the disk makes it possible to sharpen a pair of blades in approximately 15 minutes.—Deal Merrill



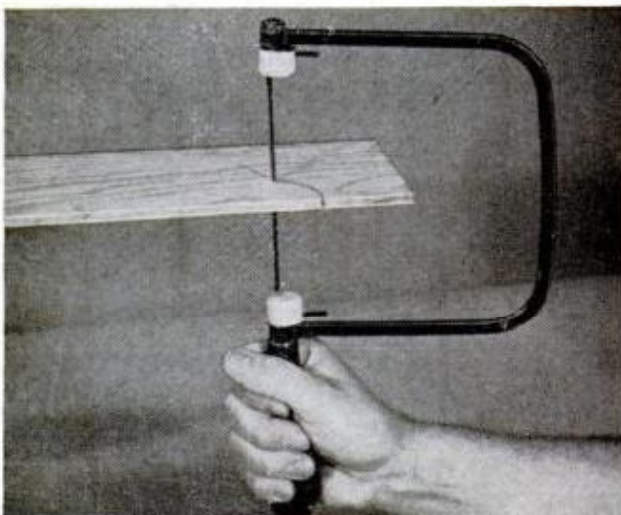
Paint Tray Cleans Parts

Your paint-roller tray will earn its keep between paint jobs if you put it to work when cleaning small parts. The tray is well suited to such a job because of its slanted bottom. The parts to be cleaned should be immersed in the tray in either a detergent or a commercial parts cleaner. After dirt and grease have been brushed out, move the parts to the high end of the tray so they can dry. Be sure to clean the tray before using it for painting.



Die Stock Does Double Duty

My toolbox contains a number of adjustable button dies having a variety of outside diameters. In order to avoid purchasing additional die stocks to fit each of the die sizes, I made adapter collars like the one shown. These make it possible to hold two different size dies in any one stock. The adapters are slotted so that the set-screw in the die stock can bear against the die and prevent rotating.—H. J. Gerber



Coping-Saw Bumpers

Following a curving line with a coping-saw is tricky business. But if you become too intent on the cutting you're apt to damage the surface of the work by bumping it with the saw frame. To avoid this, pad the jaws of the saw with plastic furniture glides. A small slot cut in each glide will hold it firmly in place on the coping-saw blade. No inconvenience is involved as the glides may be easily removed when it becomes necessary to change the blade. Plastic furniture glides are readily obtainable at hardware or department stores.—Ken Patterson



PM Tests New Router With 3-size Chuck

JUST RELEASED to the market as we go to press are two additions to the Millers Falls portable tool line. The $\frac{7}{8}$ -hp. 7800 and the $1\frac{1}{4}$ -hp. 7900 routers—both engineered for heavy-duty use and powered by motors specifically designed for routing—join Millers' light-duty model.

The new machines are look-alikes in lightweight aluminum-alloy housings. Both feature a momentary-contact, double-pole trigger switch mounted in an adjustable pistol-grip handle. At the top of the handle, a three-pole receptacle provides a handy means for disconnecting the motor. The 7800 retails for \$74.50; the 7900 is priced \$10 higher.

PM previewed the top-power model in its editorial workshop and found the pistol grip and T-shaped knob makes for precision maneuvering, while the power trigger provides quick cutting control. The spindle lock speeds up cutter change, and a feature that's exclusive on the 7900 adds great versatility: Three replaceable chuck collets adapt the router for bits with $\frac{1}{4}$ ", $\frac{3}{8}$ " and $\frac{1}{2}$ " shanks.





Two-In-One **CAMPER BOAT**

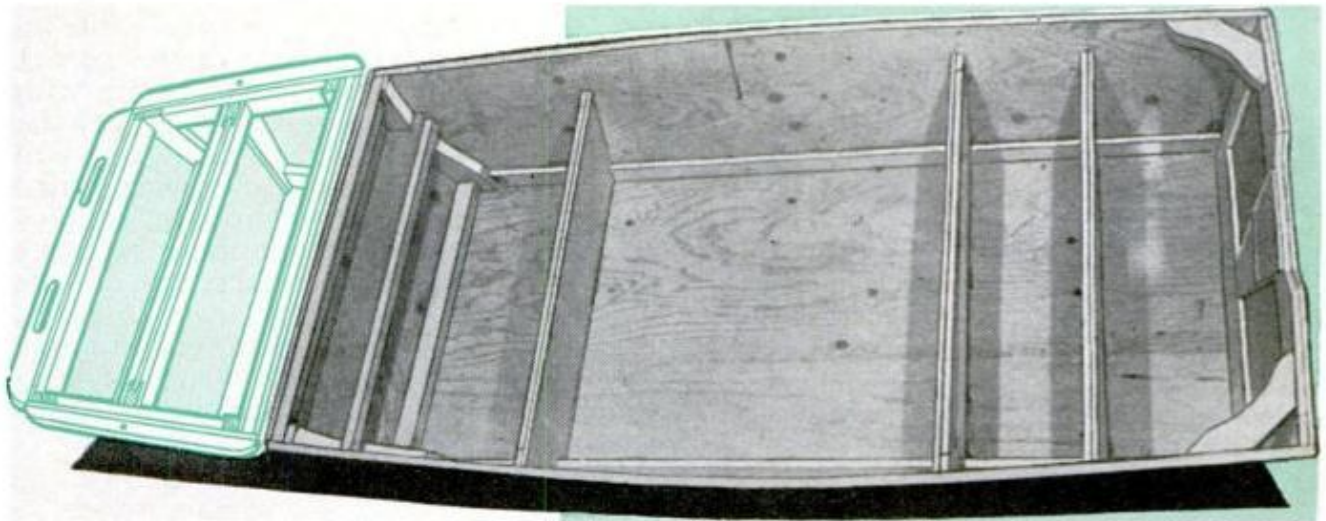
Designed by William Jackson

Designed with camping in mind, this sturdy John boat is actually a small fishing pram with a roomy camp chest bolted on the bow

Stow gear in the locker
ASHORE

Use the 8-ft. pram for
FISHING





By Arthur Mikesell
Boating Editor

WHY THE SPLIT PERSONALITY? Well, that bolt-on bow locker is actually a sturdy camp chest which can be packed at home, attached to the pram at the launch site, then removed again when you reach camp.

Double-galvanized, annular-ring boat nails are used throughout. These cost much less than comparable screws and also make the fabricating job easier without sacrificing strength. Assuming that you plan to fiberglass the boat, all joints are both glued and nailed. If not, use calking compound at all through-hull fastenings and planking joints. In any case, be sure to use calking when mounting the bottom battens since these would be attached after fiberglassing the hull.

Begin by assembling the transom. Cut

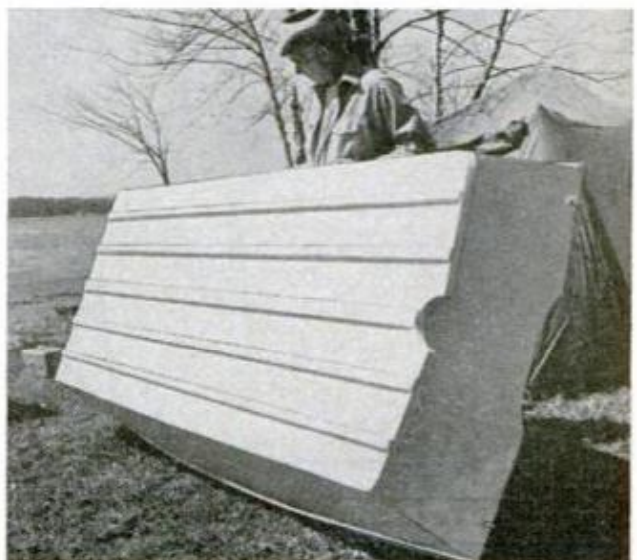
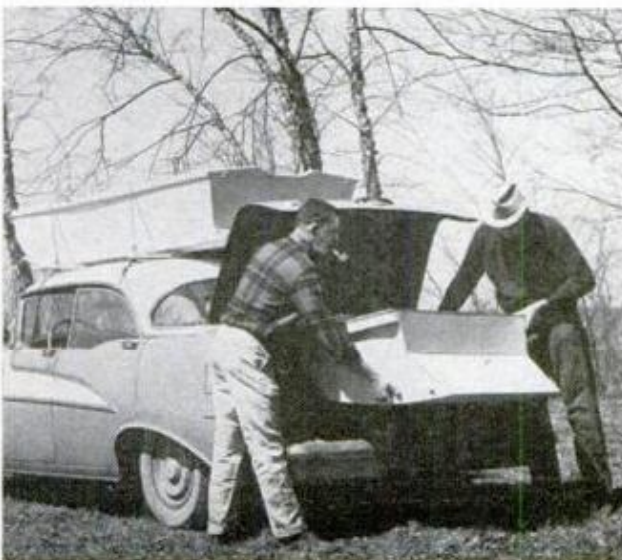
and mount the inside framing on the plywood, glue-coating all contacting surfaces and spacing the 1¼-in. nails 3 in. apart. (The 1 x 4 framing on the aft surface of the transom should be mounted after you have planked the bottom.) Once the glue has cured, bevel the bottom edge 15 deg.

Next, make up the temporary building frame and the bulkhead frame which forms the bow of the pram. Since the latter must mate snugly with the rear bulkhead of the bow locker, we recommend that you build the two together. When completed, clamp them together, check the fit and then drill holes through the side frames for the two connecting plates.

The fairing operation is a little unusual since this boat isn't framed in the normal way. To determine the proper bevels for

TWO-MAN PRAM is light and easy to car-top. You can carry the bow-locker/camp-chest in the car's trunk

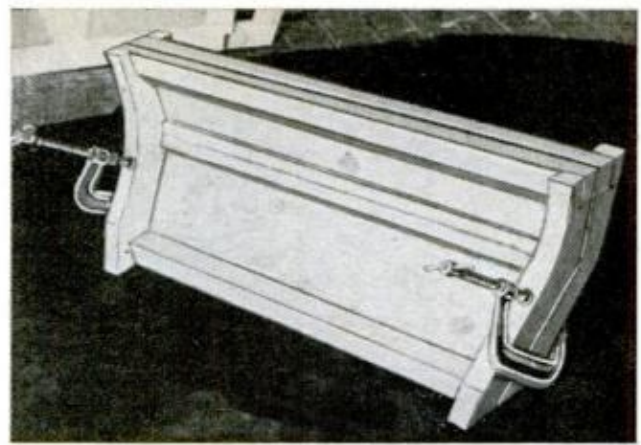
HEAVY BOTTOM BATTENS on the outside protect plywood planking, act as exterior framing for the pram



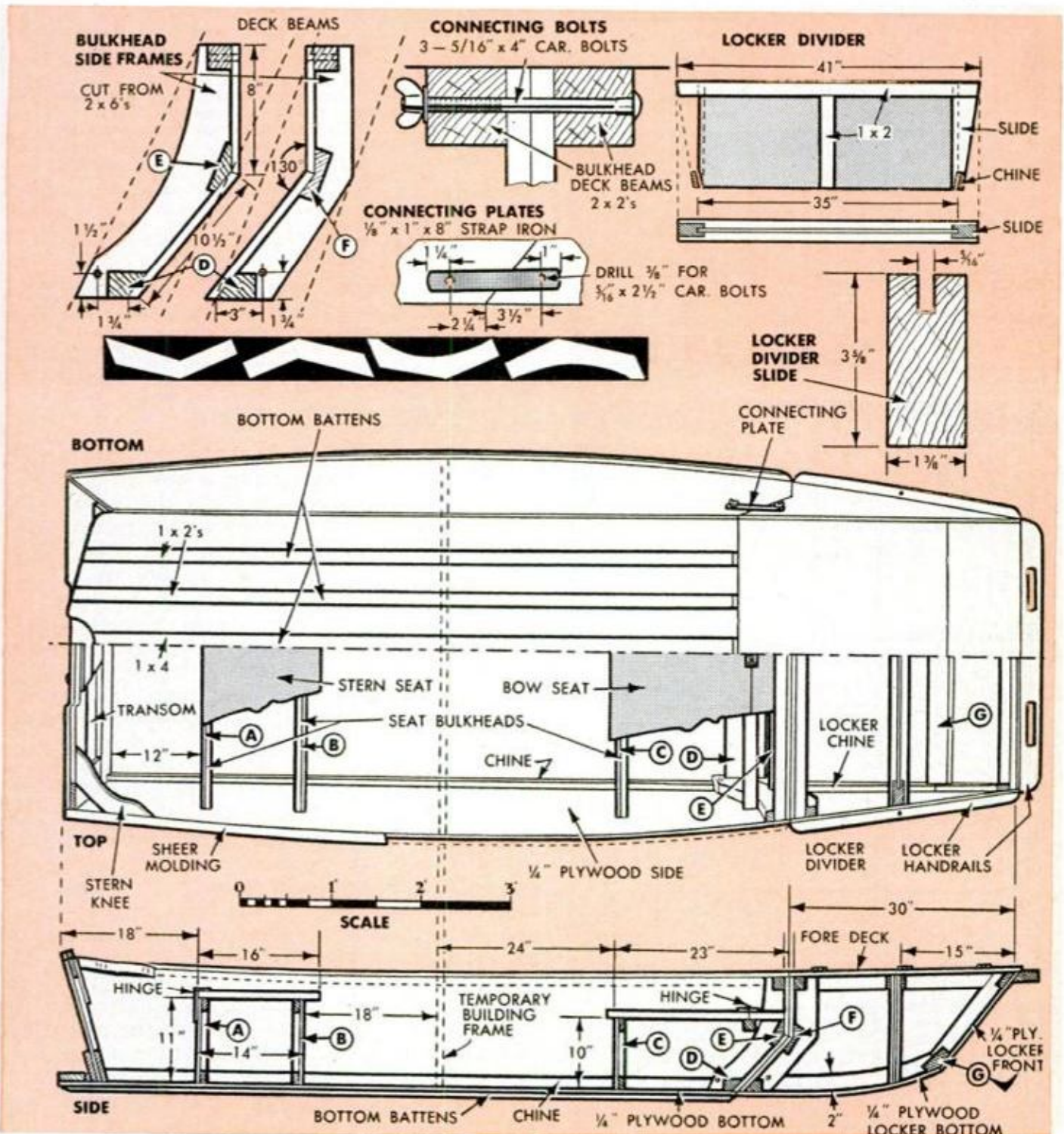
som, check the fit and sand the bevels until you have a perfect joint. Finally, coat all contacting surfaces with glue and attach the plywood with 1¼-in. nails.

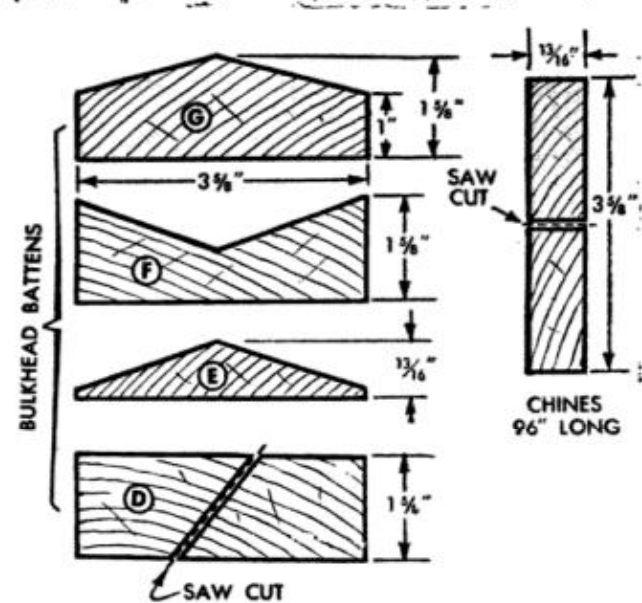
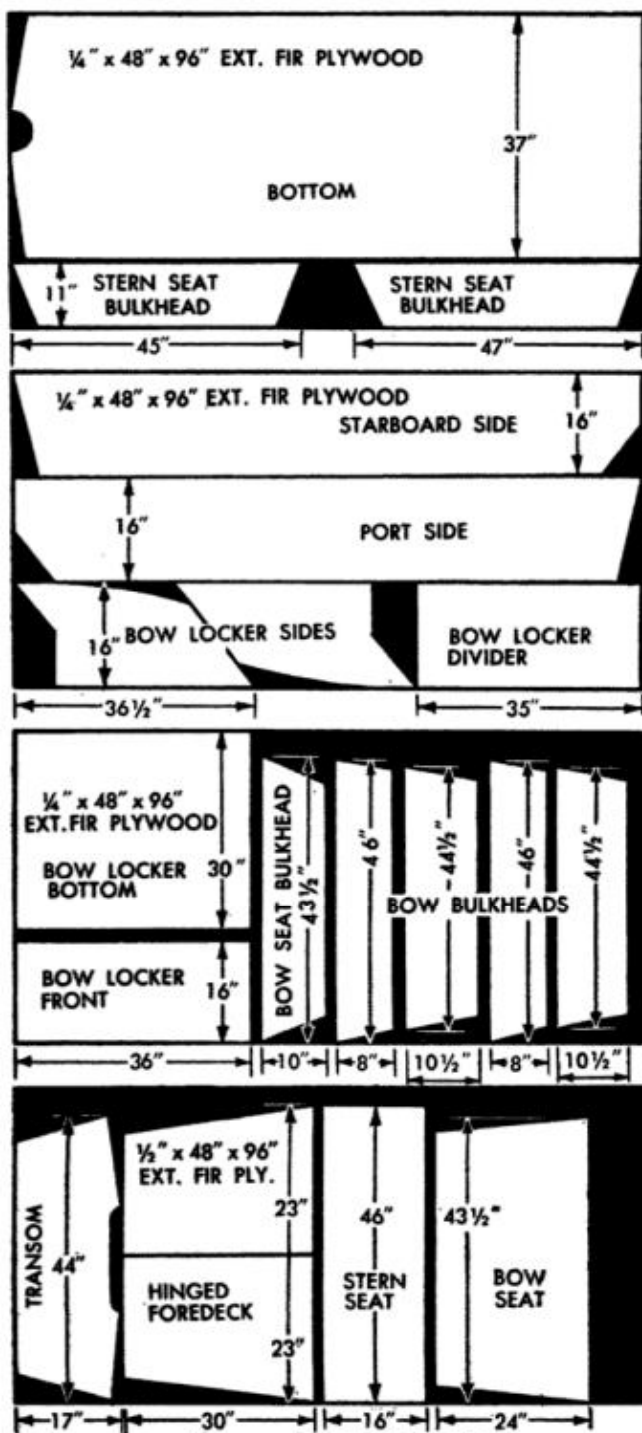
The chine and sheer curves should run smoothly from the transom to the fore end of the bow locker, so before you fair the pram's bow bulkhead you'll have to frame the locker and clamp this framing to the pram. When you have marked the proper bevels, remove the clamps and fair the bow bulkhead and locker frame. After fairing, secure the side planking.

Since the locker forms a separate part of the boat, you might take time out here to finish it up before going ahead with the rest of the hull. In spite of its odd



CRITICAL JOINT between bow bulkhead of pram and rear bulkhead of locker must be perfect fit. To avoid error, fabricate both bulkheads in one operation





MATERIALS LIST

LUMBER (All clear fir)

1 pc. 1 x 10 x 1'	Transom framing
2 pcs. 1 x 4 x 8'	Transom framing
1 pc. 1 x 4 x 8'	Temporary building frame
1 pc. 1 x 4 x 8'	Chines (cut lengthwise)
2 pcs. 1 x 4 x 8'	Seat framing (cut lengthwise)
1 pc. 1 x 4 x 8'	Center bottom batten
2 pcs. 1 x 4 x 8'	Bottom battens (cut lengthwise)
1 pc. 1 x 4 x 8'	Sheer molding (cut lengthwise)
1 pc. 1 x 4 x 6'	Locker framing (cut lengthwise)
1 pc. 1 x 4 x 4'	Locker chines
1 pc. 1 x 4 x 4'	Bow framing (E)
1 pc. 2 x 4 x 8'	Locker framing (F & G)
1 pc. 2 x 4 x 6'	Locker handrails
1 pc. 2 x 4 x 6'	Transom knees, locker slides
1 pc. 2 x 6 x 6'	Bulkhead side frames

PLYWOOD (Fir, exterior, grade AB or better)

3 pcs. 1/4\" x 4\" x 8'	Hull planking, seat bulkheads
1 pc. 1/2\" x 4\" x 8'	Seats, foredeck & transom

FASTENINGS*

1/2 lb. 1 in. boat nails	Plywood to chines, sheer and molding (#5211A)
1/2 lb. 1 1/4 in. boat nails	Plywood to chines, seat, transom and bulkhead (#5212A)
1/4 lb. 1 3/4 in. boat nails	Bottom battens to seat, transom and bulkhead (#5214A)
2 doz. 2 1/2 in. boat nails	Transom knees, 2 x 2 bulkhead and locker framing (#5217A)
3 5/16\" x 4\" mach. bolts	Through bulkhead deck beams to attach locker
4 5/16\" x 2 1/2\" Car. bolts	Through bulkhead framing and connecting plates

* If boat nails aren't available in your area, you may order them by mail from the W. H. Maze Co., Peru, Ill., using the catalogue numbers listed above. Cadmium-plated 2 1/2\" No. 8 flatheaded screws may be substituted for the large 2 1/2\" boat nails listed above.

PLANS AVAILABLE

If you decide to build this boat, we recommend that you make cutting patterns for the different members, using the grid method to scale up the drawings included here. To assure accuracy and simplify this procedure, you may obtain enlargements of these drawings on four 22\" x 30\" sheets by sending \$3.50 to Popular Mechanics Blueprint Dept., 740 N. Rush St., Chicago 11, Ill.

shape, the locker is simply a box with a center-hinged lift-off top. Make the handrails by cutting a 2 x 4 lengthwise; mount them by driving nails from inside.

Next, mount the chine battens with their edges extending slightly below the bottom edge of the side planking so that they may be faired to fit flush against the bottom planking. After fairing these battens, mount the bottom planking.

To complete the hull, make up the three seat frames and install them by driving nails from the outside through the planking. Once the stern knees have been installed, the hull will be adequately braced and you can remove the building frame. Install the 1/2-in. plywood seat tops with galvanized hinges—any type will work, but piano hinges give the best appearance—then shape the sheer moldings and mount them using 1-in. nails.

Before painting or fiberglassing the hull, extend the connecting-plate holes in the bulkhead side frame through the side planking and seal the bolts with epoxy.

Finally, mount the bottom battens by driving nails through the planking into the framing. ★★★

New on the Market



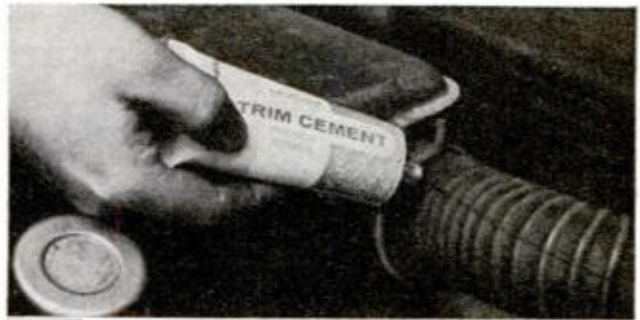
INDUSTRIAL-TYPE HAND TRUCK can save you time and energy. You don't have to muscle the load off, as a pedal-actuated bar does the job for you. Also, the truck itself is lighter than many other models, due to its tubular metal construction. Costs \$35.00. Crain Cutter, 2125 Ronald St., Santa Clara, Calif.

STURDY GARDEN CART can be pulled by hand or hitched to a garden tractor or mower. Its tilt-up body, which is made of heavy-gauge ribbed steel, has a 6½-cu. ft., quarter-ton capacity. Semipneumatic wheels have self-lubricating bearings. Priced at \$98, F.O.B. Newton, Ia. Winpower Mfg. Co., Newton, Ia.



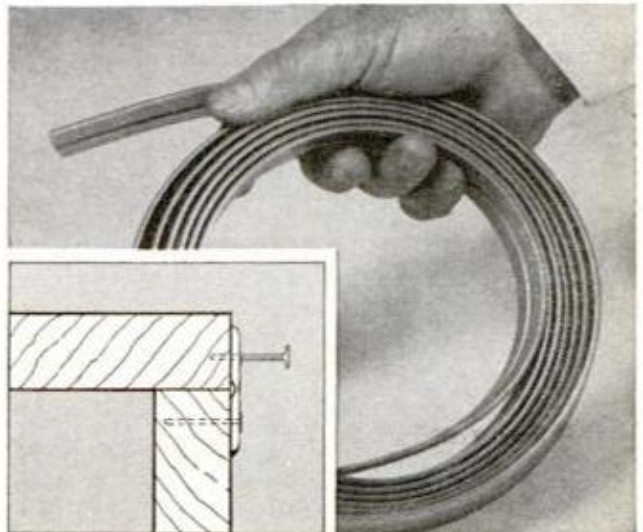
SEPTEMBER 1963

VERSATILE CEMENT does many jobs for the auto enthusiast. Seals radiator hoses, anchors floor and trunk mats, bonds weather stripping and insulation, mends convertible tops. Also good for minor household repair jobs like resetting floor tile and securing door knobs. Price is 75¢ a tube. Devcon, Danver, Mass.



INJECTO-LUBE GREASE GUN eliminates a lot of the mess usually associated with lubricating home appliances, lawn mowers, outboard motors, power tools—any machine with standard Zerk grease fittings. Sold already charged for 79¢ and is thrown away when empty. From The E. T. Rugg Co., Newark, Ohio

PLASTIC HINGES come in a roll. You merely cut them to length and nail, screw or staple them in place. Ideal for use on boats, or wherever a non-corrosive hinge is needed. Made in 1¼, 1½ and 2-in. sizes. Prices range from \$36 to \$60 for 100-ft. rolls. C. E. Shepherd Co., 7110 Avenue C, Houston 11, Tex.



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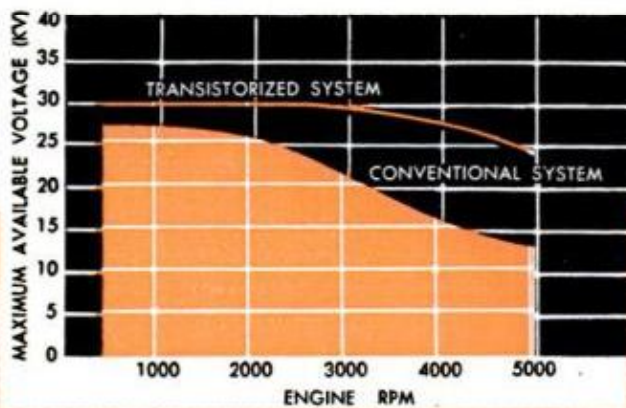
TRANSISTORIZED IGNITION

By Morton J. Schultz

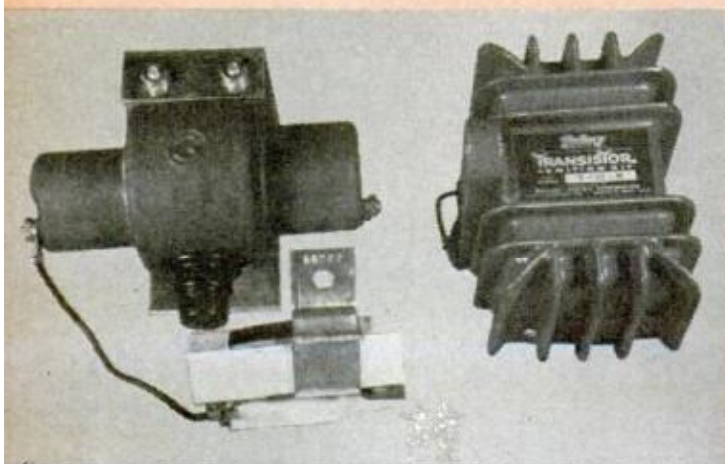
The low-down on the hottest innovation under the hood . . . how to install and trouble-shoot the various kit systems—and what each does for you

THE TALK of the auto industry at the beginning of this year was alternators. In the coming year, transistorized ignition will probably grab the spotlight. And rightly so, for when a real improvement comes down the pike, it *should* cause a stir.

Transistorized ignition is just what the



MAJOR COMPONENTS of transistorized ignition system made by Mallory Electric Corporation (below) are typical of kits available for converting any model or year of automobile. The coil is at the left, the transistor package at the right. In foreground is ballast resistor needed on 12- but not 6-volt cars



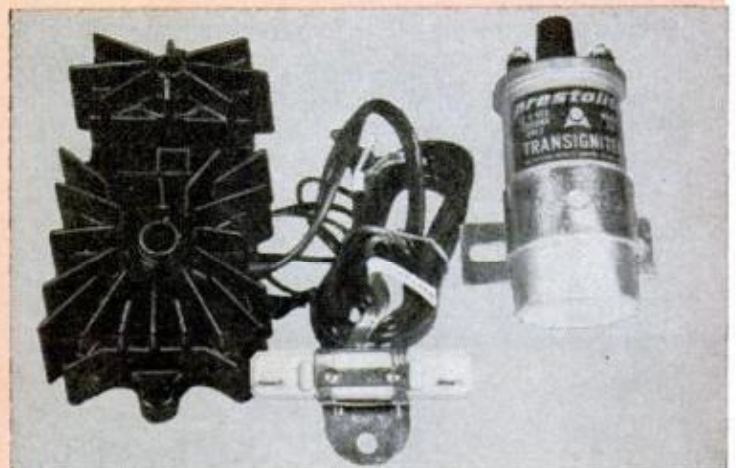
name implies. Electronic components—transistors, resistors and the like—are placed in the ignition system to take over work formerly done by breaker points, condensers and direct-current coils.

These electronic components offer several distinct advantages you don't find in a conventional ignition system. For one, a greater amount of current is available to fire the plugs; for another, malfunctions by distributor breaker points are all but eliminated; for still another, the troublesome condenser is taken out of the system

KITS YOU CAN INSTALL

AT HIGH SPEEDS, conventional ignition systems can't deliver enough voltage to fire spark plugs efficiently because available voltage drops rapidly as engine passes 2000 r.p.m. This can cause misfire, late timing, fuel waste. Transistorized ignition, however, maintains an almost constant voltage at all speeds

A DIFFERENT KIT—at least 12 electrical parts manufacturers offer kits in one of the three systems—is shown directly below (and in the installation photos on page 175). This is the package offered by Prestolite Div. of Electric Autolite Co. Transistor is at left, coil at right, 12-volt ballast in foreground



in most cases, never to be a problem again.

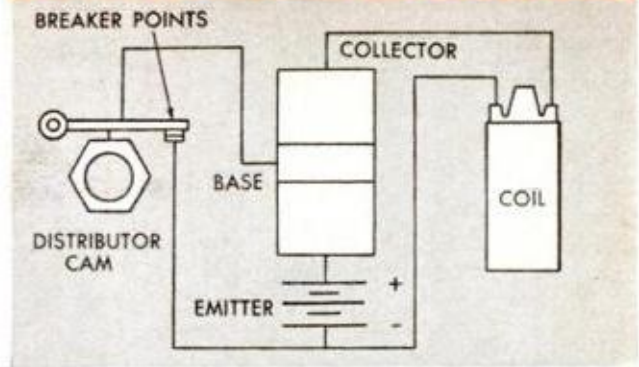
Up until now, transistorized ignition has not been used as standard equipment on any American-made car. However, it is optional equipment on Ford's line of 1963 heavy-duty trucks and in 1963 Pontiacs, except for the Tempest.

As of this writing, no word has been forthcoming from Detroit concerning the role of transistorized ignition in the 1964 cars, although indications seem to be that it will be offered as optional equipment in an increasing number of models. It appears that transistorized ignition will go the same route as alternators—first appearing as a fairly-costly option, but eventually becoming standard equipment as a broadening market lowers the unit cost.

This does not mean you have to wait for Detroit economics to adjust to reality. Independent automotive electrical parts manufacturers have been offering packaged transistorized ignition kits to the public for some time. These kits, which are easily installed on any model and year of automobile, cost from \$30 to \$100, depending on the type and the sophistication. All manufacturers are producing kits for both 6- and 12-volt, negative and positive charging systems.

You may contend that you can buy a lot of conventional breaker points and spark plugs for your car for \$30 to \$100,

1. REGULAR TRANSISTOR SYSTEM



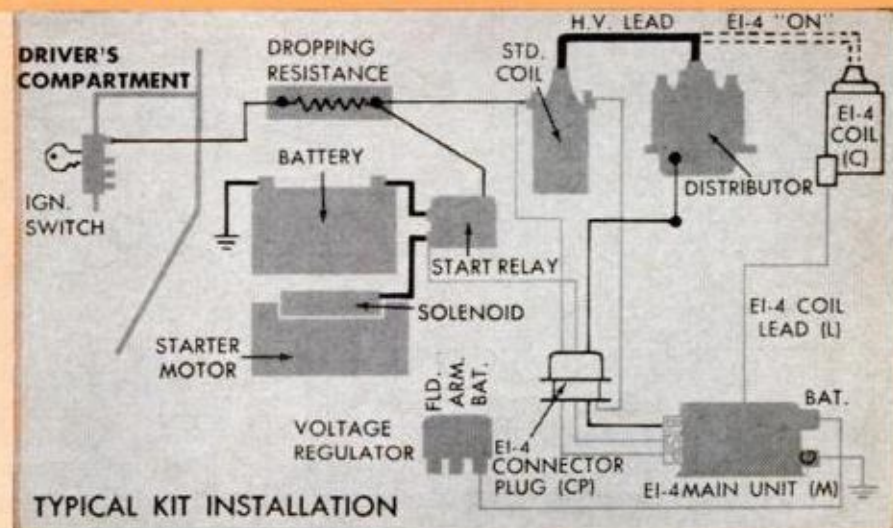
SIMPLEST OF THREE SYSTEMS is best demonstration of how transistor works. It's a relay with no moving parts, composed of three sections: collector, base and emitter. Current entering base from points is weak, flows simultaneously through collector and emitter circuits setting up chain reaction which builds up strong current to send to coil. Conventional ignition puts points and coil in same circuit, limiting current it can pass without point damage. System above can use hotter coil for higher voltage

and so you can. However, as we've said, transistorized ignition offers many advantages which conventional ignition does not. Let's have a look at them to help you decide whether it's worth your investment.

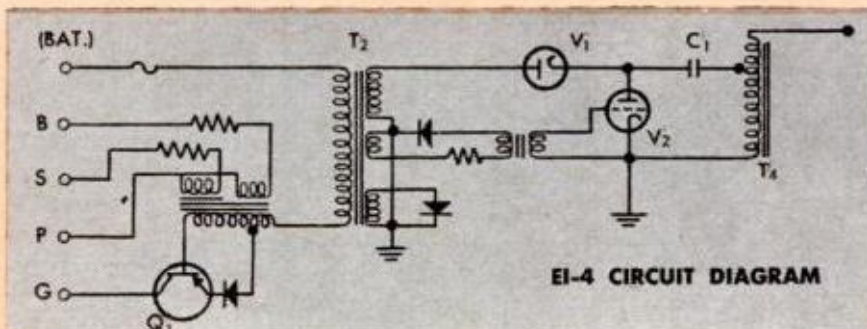
Transistorized ignition was bound to happen. The character of the basic conven-

II. CAPACITOR-DISCHARGE SYSTEM

SCHEMATIC DIAGRAM of EI-4 system, manufactured by Motion, Inc., a subsidiary of Tung-Sol Electric. All parts of conventional ignition system are kept in the circuit. Simply by reversing position of connector plug (CP), you can switch from transistor ignition to conventional type or vice versa. This gives you a "spare" ignition system in case of on-the-road emergency



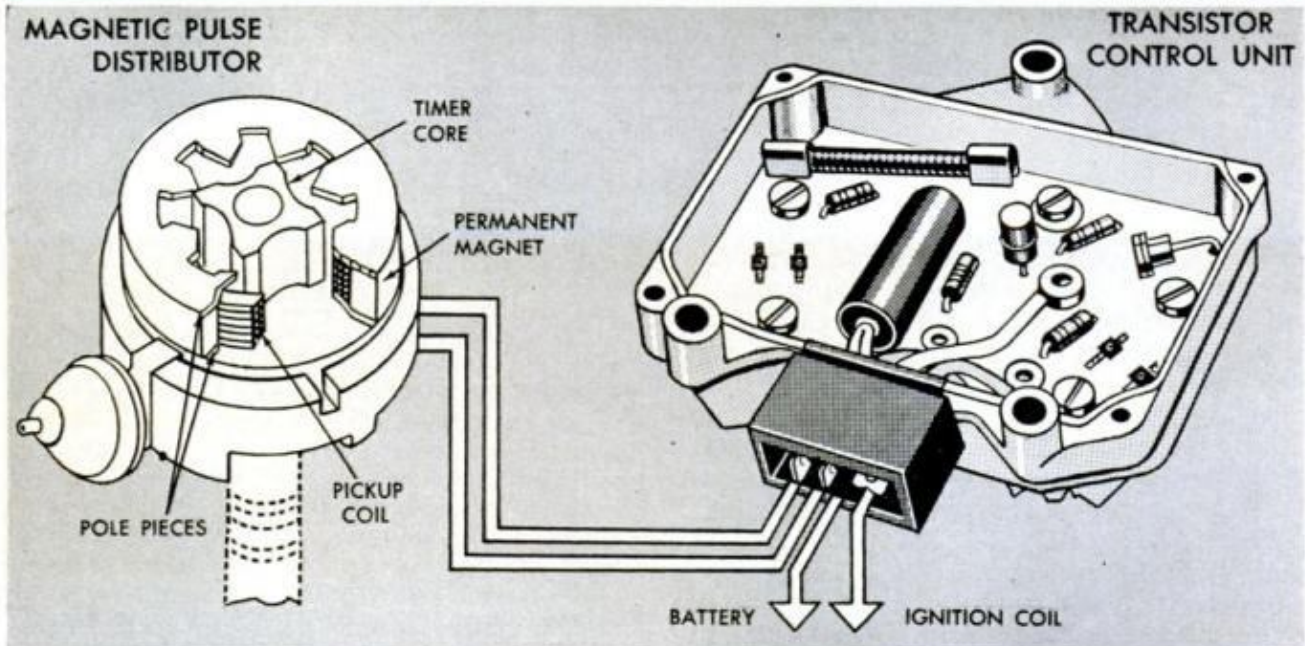
TYPICAL KIT INSTALLATION



EI-4 CIRCUIT DIAGRAM

WIRING DIAGRAM of same system shows that circuit to left of transformer (T_2) is same as most regular transistor systems. But added components—transformer, rectifier (V_1), capacitor (C_1) and thyatron (V_2)—build up greater surge of current that permits firing of badly-fouled or widely-gapped plugs

III. MAGNETIC PULSE DISTRIBUTOR SYSTEM



TWO MAJOR PARTS are magnetic pulse distributor, left (note absence of conventional breaker points), and transistor control unit, right. Such systems are made by Delco-Remy, Motorola, and Holly Carburetor Co.

tional ignition system has not been altered in the last 50 years, despite the fact that engines have undergone a tremendous change. True, some modifications have taken place, but they have not kept pace with the increasing speeds of engines, the mounting compression ratios and higher engine temperatures.

Tests show that conventional ignition has reached the peak of its performance. With the present coil and condenser system in the average family car, one can expect no more than a 300 to 400-spark output per second from the ignition system. Several cars on the road today are capable of reaching this limit. When that happens, there's an ignition breakdown.

Laboratory and road tests with transistorized ignitions show that the maximum output of sparks from many systems is about 530 per second. In other words, with transistorized ignition, an engine is capable of hitting about 8000 revolutions per minute without experiencing an ignition breakdown. What this means to you is that with transistorized ignition you have plenty of ignition to fire your plugs, no matter what your speed.

In short, then, transistorized ignition came about for two important reasons:

- The distributor breaker points used in conventional systems cannot long tolerate the high voltage and current needed to fire the spark plugs in modern engines.

- Conventional ignition can't deliver enough voltage to fire spark plugs efficiently at high speeds (chart, page 172).

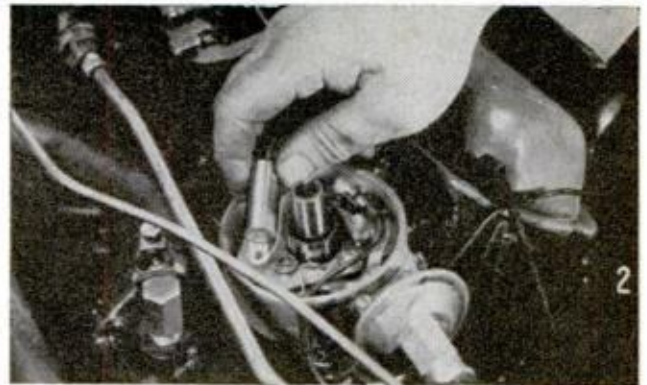
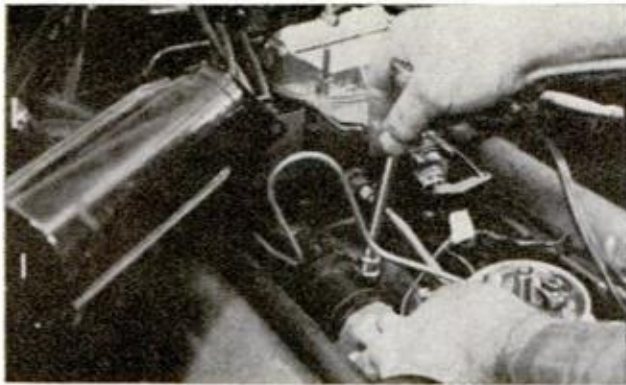
The electronic transistor used in transistorized ignition takes over the role of the distributor breaker points used in conventional ignition systems. As you know from your own experience, breaker points deteriorate under high currents, with the result that you are replacing them at least once every 10,000 miles. As a matter of fact, the most important part of any tune up job is replacement of the points.

In conventional ignition systems, full primary current must pass through the breaker points. This causes erosion and formation of non-conducting blue oxide on the contact surfaces of the points. Thus, the flow of current through the points is reduced, and so is the amount of voltage delivered to the plugs. The result is slow starting and poor engine performance.

Transistorized ignition eliminates "bluing" and eroding of points. Over 90 percent of the current flow is handled by a power transistor, with breaker points in most systems used only to switch the transistor on and off. This small amount of current—less than 10 percent—cannot cause breaker points to pit and burn. Manufacturers have reported that breaker points have lasted a minimum of 60,000 miles on transistor-ignition test cars.

Spark plugs collect carbon, lead and other additive deposits on their ceramic insulators. These provide a low resistance path (or shunt) from the plug's center electrode to ground. In cars with conventional ignition systems, which have a relatively slow buildup of voltage, this leads to non-firing or slow firing of the plugs.

CONVERT YOUR PRESENT CAR IN LESS THAN AN HOUR



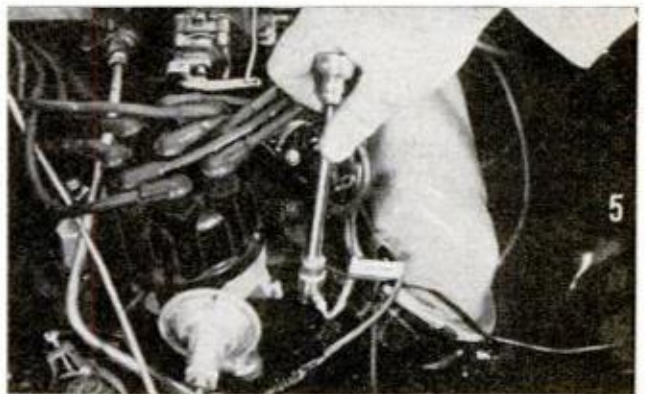
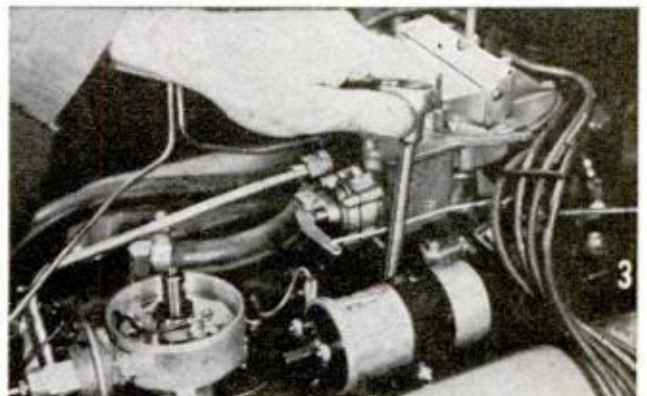
1. REMOVE AND DISCARD conventional ignition coil after disconnecting the battery ground cable

2. INSIDE DISTRIBUTOR, remove unneeded condenser

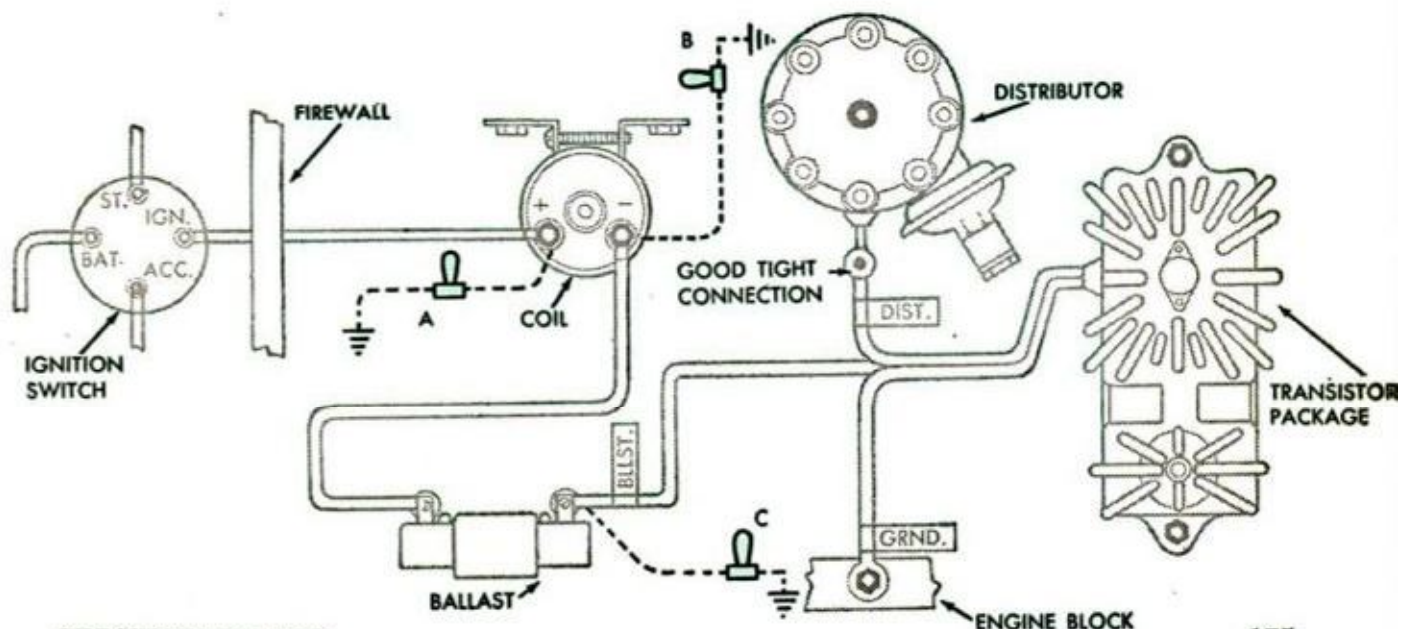
3. INSTALL NEW COIL, but don't connect leads yet. Check breaker point gap; reset or replace points if necessary and set plug gaps to car manual's specs

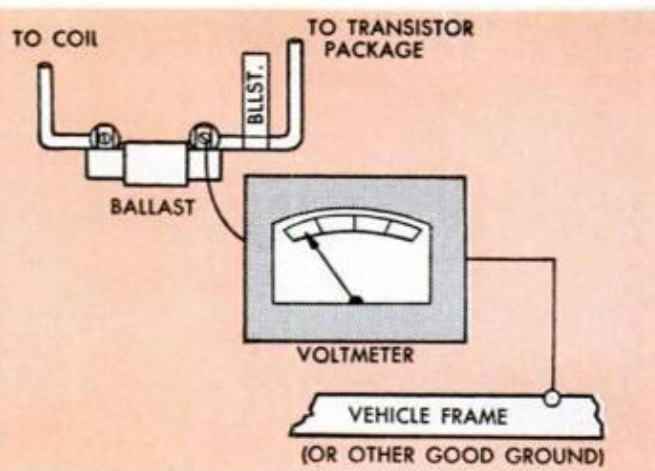
4. MOUNT TRANSISTOR PACKAGE where it will get steady flow of air and mount ballast resistor (12-volt cars only) nearby. Hook up coil and transistor

5. CONNECT GROUND of transistor to engine block



COMPLETED INSTALLATION for 12-volt car is diagrammed below (wiring instructions for system you buy may differ). Dotted dark lines indicate three positions of test light used for trouble-shooting this system





TO CHECK OUT YOUR INSTALLATION—or to troubleshoot the system, later—hook up a voltmeter with one lead to ground and other to ballast terminal where lead from transistor package connects. If car is negative grounded, negative lead of voltmeter goes to ground; on positive-grounded car, ground positive lead

Theoretically, such a problem could exist with transistorized ignition as well. Plug voltage in conventional ignition systems reaches a firing value in about 70 microseconds. (A microsecond is one-millionth of a second. Regular 60-cycle house current, for example, is rated at 16,666 microseconds.) In general, plugs used with transistorized systems fire in a range of from 70 to 200 microseconds.

However, with transistorized ignition, the important fact is that plugs seldom foul. The more voltage that is available at the plugs, the less the chance of fouling, since voltage acts as a cleaning agent. And transistor ignition provides more voltage.

According to several manufacturers' test reports, spark plug life in cars using transistorized ignition have increased from two to seven times over what would be considered normal in conventional systems, with the average life of plugs being 50,000 miles.

There are three major types of transistorized ignition systems: the regular system, the capacitor-discharge system, and the magnetic pulse distributor system.

Most transistorized ignition systems consist of a distributor without a condenser (the same distributor you have in your car now, with the condenser removed); a high voltage coil (not the one in your car); a ceramic ballast (or resistor) for 12-volt ignition systems to limit the current through the coil (not needed for 6-volt systems); and a transistor package made up of a specially-designed power transistor enclosed in a heat-dissipating die cast or extruded aluminum heat sink.

● In a **regular transistorized ignition system**, the transistor takes over the role of the distributor breaker points, with the points used only as an on-off switching

device for the transistor. The transistor handles all the primary current passing through the ignition coil. Thus, breaker points handle only $\frac{2}{10}$ to $\frac{8}{10}$ of an ampere, depending on the make of system, as compared to the 4 or 5 amperes they would handle in a conventional system.

● A variation of the regular transistorized ignition system is the **capacitor-discharge system**. Its major value lies in the fact that it has the ability to fire even badly fouled or wide-gapped spark plugs.

The capacitor-discharge system is a regular transistorized ignition system with additions that step up the voltage through a transformer, transfer that voltage through a rectifier, and store the voltage in a capacitor.

Upon starting the car—during the first engine revolution—the circuit begins to function when the breaker points open. When this happens, current flows through the primary of a transformer (T_2 in the diagram on page 173) and builds up a magnetic field in the transformer core.

When the breaker points close, the current flow through the primary is stopped and the magnetic field collapses, inducing a high voltage in the transformer secondary. The voltage is transferred through a rectifier (V_1) to a capacitor (C_1), where it is stored until the breaker points open again. When they do, the current flowing through the primary of the transformer, in addition to building the magnetic field in the transformer coil, produces a voltage on the secondary. Part of this secondary is applied to the grid of a thyatron (V_2), causing it to conduct. The energy previously stored in the capacitor is then discharged through the thyatron to the spark plugs through a coil (T_4).

● The third type of transistorized ignition—the **magnetic pulse distributor system**—

is a unique modification. It uses a magnetic pulse distributor that does away entirely with the mechanical breaker points.

Externally, the magnetic distributor resembles any standard distributor. Inside, however, it is quite different. Instead of the familiar cam and breaker plate assembly, the unit has a rotating iron timer core and a magnetic pickup assembly, as shown on page 174.

The iron timer core has a number of equally spaced projections (or vanes) and is attached to, and rotates with, the distributor's main shaft. The transistor control unit has three transistors, a Zener diode which protects against voltage variations, a condenser and five small resistors.

The magnetic pulse distributor provides a "triggering" pulse or signal for the transistor control unit. A magnetic field through the internal teeth of the upper and lower pole pieces is produced by a permanent magnet located between the teeth.

As the projections of the iron timer core on the distributor shaft pass near the pole teeth when the shaft rotates, the magnetic field alternately builds up and collapses. Thus, a voltage pulse is induced in the pickup coil each time a projection of the iron core passes a pole tooth.

Each voltage pulse is conducted to the transistor control unit where it "turns on" a triggering transistor, causing it to "turn off" a switching transistor. This action stops current flow through the ignition coil primary winding, causing the coil to fire the spark plug. The switching transistor then automatically returns to an "on" condition, permitting coil current to build up for the next firing.

As was said before, transistorized ignition is easy to install. It should take less than an hour to do the job—and no special equipment, aside from an electric drill for mounting the transistor package and ballast resistor.

The installation procedure shown in the photos and diagram on page 175 is for Prestolite's Transigniter kit. It's representative, but you should follow the instructions packaged with *your* kit, as there are variations from manufacturer to manufacturer.

Take care where you mount the transistor package. Most systems use germanium transistors rated to resist up to 170 degrees F. ambient temperature. In moderate climates (northeast or northwest U.S.) it's safe to mount the package under the hood. In hotter climates, underhood temperature often exceeds 170 degrees F., especially when the car stops after a long run. If the temperature goes too high, it could destroy the tran-

(Please turn to page 198)

Q A friend and I both find we must crank our six-cylinder '59 Larks awfully long to start them when the engines are warm, especially in hot weather. What's up?—**L.D.H., Missouri**

A Maybe gas is percolating from the accelerator-pump discharge nozzle when the engine is shut down after a long run. Result: engine flooding. Studebaker suggests installation of a new accelerator pump plunger that's ball-vented to prevent percolation. Their part number is 1549786. They also recommend replacement of the metering rod with one (1549787) that helps vent gas vapor into the carburetor bowl. Till you get the parts, try holding the accelerator pedal down one-third when cranking a warm engine.

Q The heater case's damper door on my 1961 Comet has developed a rattle. Can I silence it?—**A.J.R., Penna.**

A Easily. Install a push-on nut (Mercury part no. 372927-S2) at the bottom of the door shaft.

Q The spark plugs in my 1960 Plymouth seem to foul excessively. Can I correct this condition?—**T.F.L., Florida**

A Your car's equipped with a ram charge manifold; your problem is probably due to a wrong type of thermostatic spring in the manifold heat-control valve. Early production engines that year were equipped with a seven-coil spring; Plymouth now recommends a four-coil (part no. 2128933). The new spring permits better vaporization of the fuel at low engine speeds, which cuts down plug fouling. Faulty manifold heat control is treated in full in next month's Saturday Mechanic article.

As a service to the readers of Popular Mechanics in solving problems relating to their cars or to driving in general, you are invited to submit your question for answering either through this column or by mail. Address Auto Clinic, Popular Mechanics Magazine, 575 Lexington Avenue, New York 22, New York.

FARM TIMESAVERS

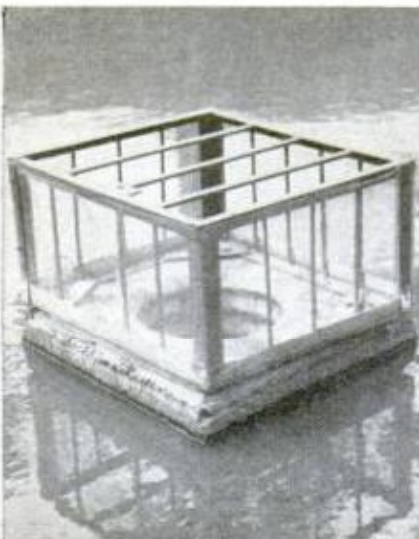


Big Switch

This portable switch with its 100-ft. cable takes 220-volt current almost anywhere about the farm buildings where it's needed, saving time and steps. Whole thing is mounted on a two-wheeled barrow for quick, easy portability.

Fish Saver

This all-steel, all-welded screen over the farm-pond drop outlet keeps fish and trash from going down the drain. Legs of the frame are set in concrete. Frame is covered with hardware cloth or other screening.



Built to Last

To replace an all-wood livestock loading chute, one farmer built this welded all-steel loader and added a couple of car wheels. He used chain fencing, steel plates, angles and channels in its construction for maximum durability.

Water on Tap

Individual automatic watering units mounted on milk cans make handy single-pen waterers for the farrowing house. The units can be filled in minutes from a hose, saving a great deal of time and wasted water.



Carrier Stall

Unprotected litter carriers get rusty, coated with sleet and snow in winter, making them difficult to operate. One dairyman parked his carrier in a cover on stilts to keep things in working order and reduce frequent maintenance.

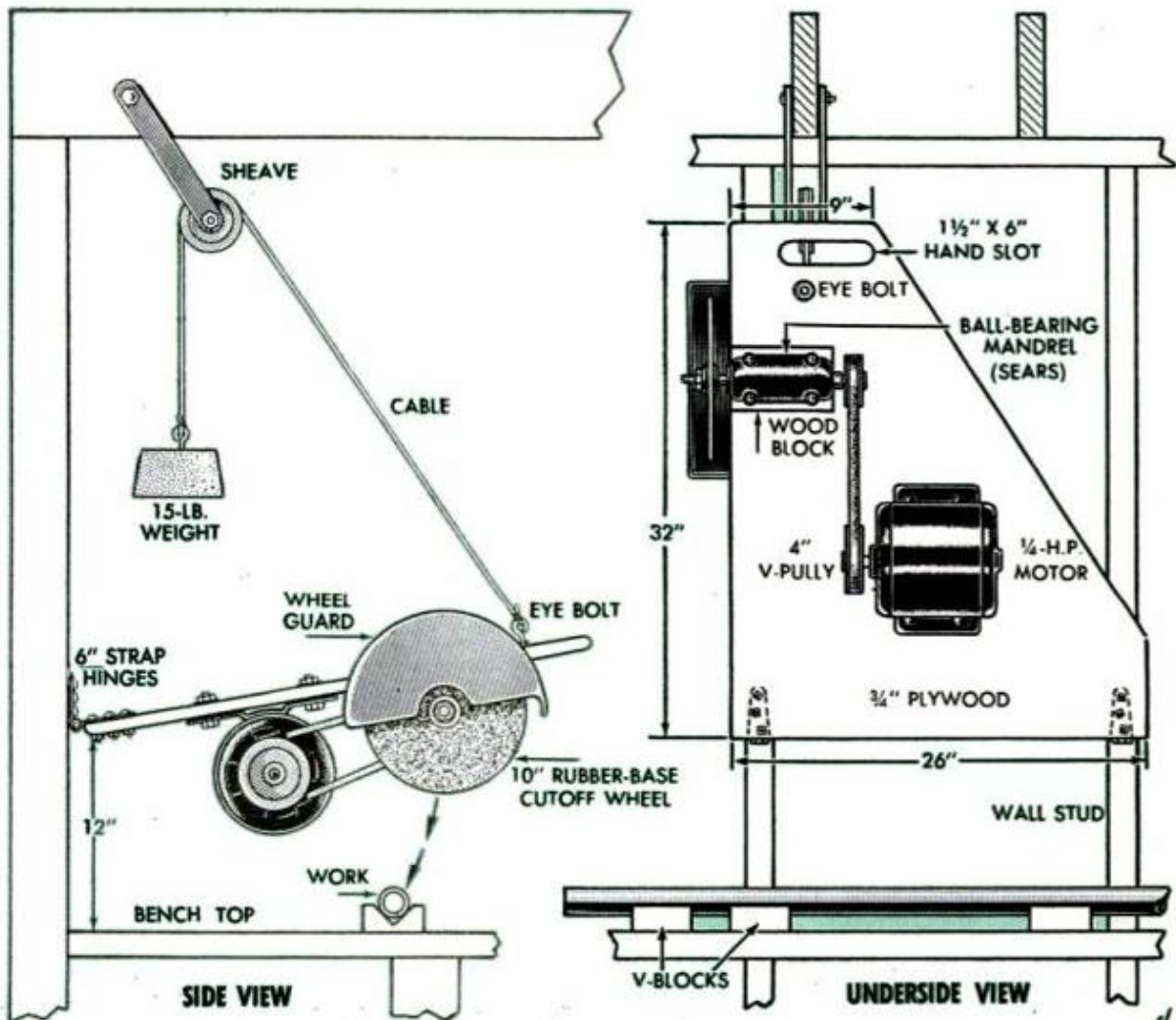
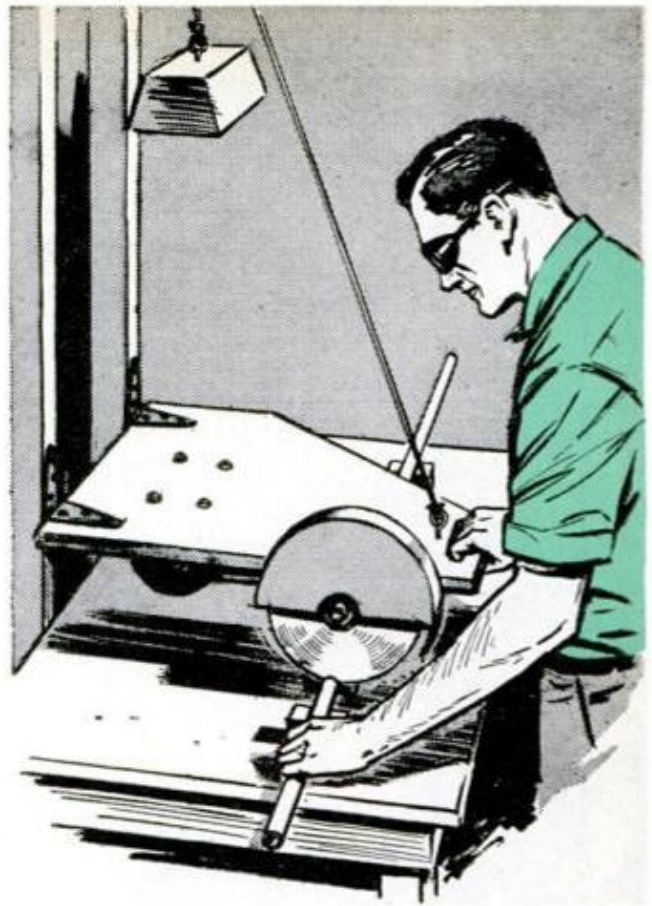
Salt Box

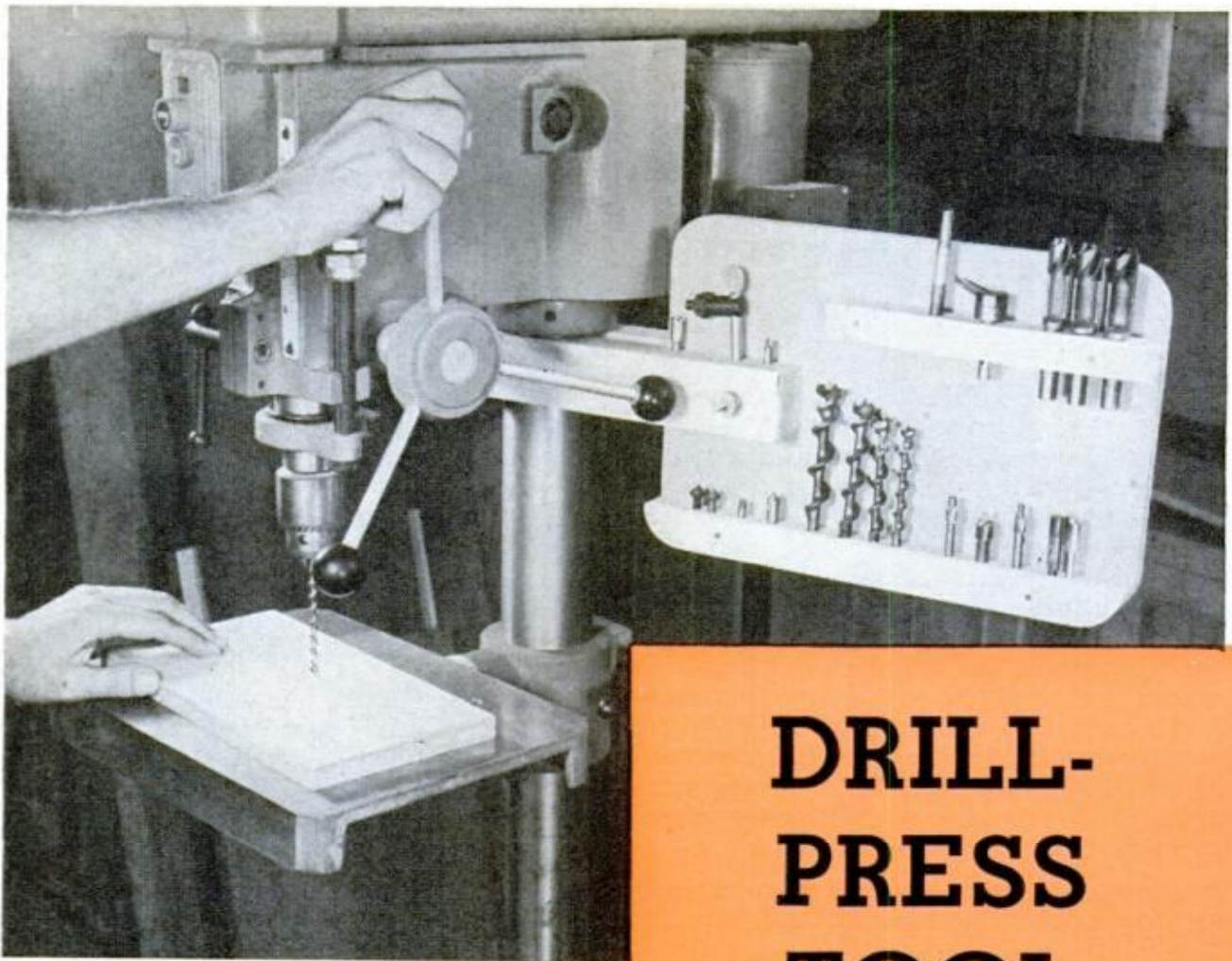
This mineral and salt feeder is mounted in the fence line between posts to serve two pasture or feed lots. Edge-lapped roof boards, with one side hinged, protect contents from rain and snow and allow easy refill.



LOW-COST SWING CUT-OFF

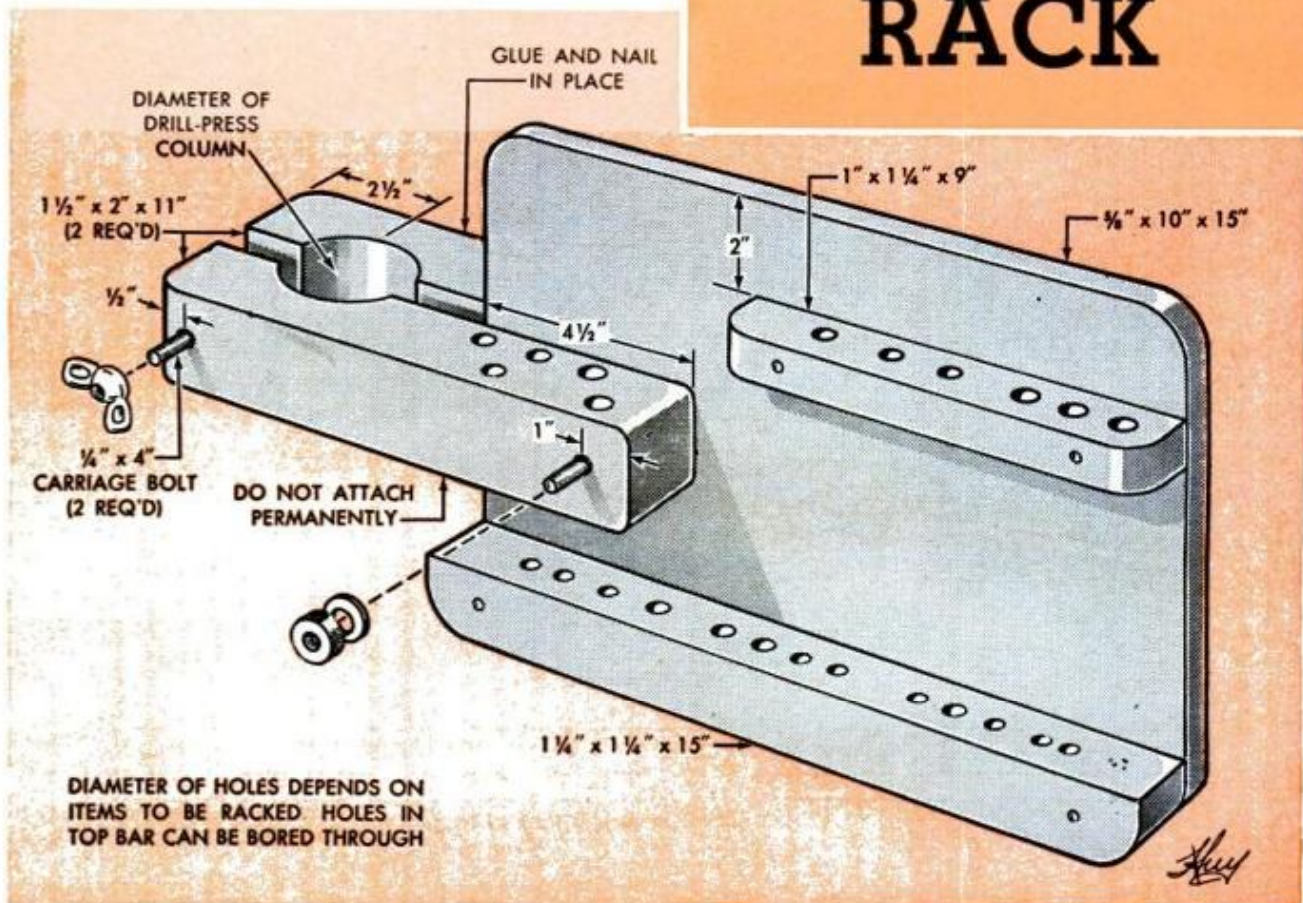
FACED WITH THE JOB of cutting some 1½-in. tubing to precise length, I built this swing cut-off. It can be used to cut a variety of materials including iron pipe and bar stock. If you have a spare motor in your shop and a well-stocked scrap box, the total cost should not exceed \$10. A plywood platform hinged to the studs and counter-balanced by a 15-lb. weight supports the motor and mandrel. Because high speeds are involved, a ball-bearing mandrel is required. A motor rated at ¼-hp. is hefty enough to drive the 10-in. cut-off wheel. One word of caution—flying particles of abrasive thrown off by the wheel make goggles a *must*.—C. G. Johnson





By R. J. DeCristoforo

DRILL-PRESS PRESS TOOL RACK



THE DRILL PRESS is one of the most versatile power tools to be found in the average workshop. The many jobs that the drill press is called upon to perform results in a large accumulation of cutting tools and accessories. Keeping these near at hand is easy with this column-mounted rack. A bit, reamer or other tool may be selected without stepping away from the machine.

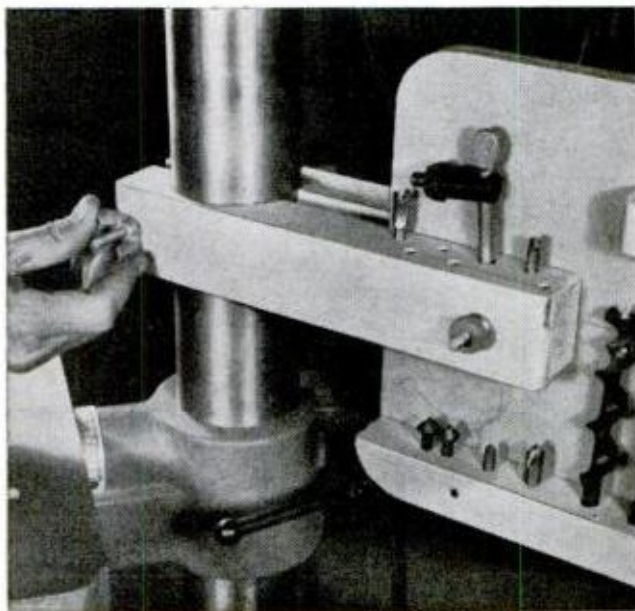
The dimensions as given are suitable for any bench or floor-model drill press. The only variables are the size of the semi-circular cuts in the arms and the layout of the tool holder strips.

The diameter of your drill press column will determine the size of the cuts to be made in the arms. Ideally the cuts should be made with a large-size rotary saw, but a bandsaw or even a jigsaw may be used. Lacking these, deep V-cuts can be made on a table saw.

The tool-holder strips can be sized and drilled to suit your own requirements. A careful planning job will make it possible to accommodate a great variety of accessories. In addition to the usual standard assortment of drills and countersinks, the strips should provide space for special purpose tools that may be used from time to time. Extra holes of various diameters will serve this need.

The arms are formed by clamping the two pieces together with a scrap of $\frac{5}{8}$ -in. material between them. Make the column hole and the bolt holes before separating the pieces. That way you'll be sure of perfect alignment. If you are using a bandsaw or table saw, each arm will, of course, have to be cut separately. After a thorough sanding, the parts are ready for assembly and finishing. ★★ ★

THE WING NUT should be only hand tight so that the rack may be re-positioned easily when desired



SEPTEMBER 1963



This Horse Folds

Avoid the burden of carrying an extra sawhorse on outdoor jobs by bolting a sharpened stake to each end of a 4-in. board. When driven into the ground, the stakes support the board at a convenient height. When not in use the horse folds.

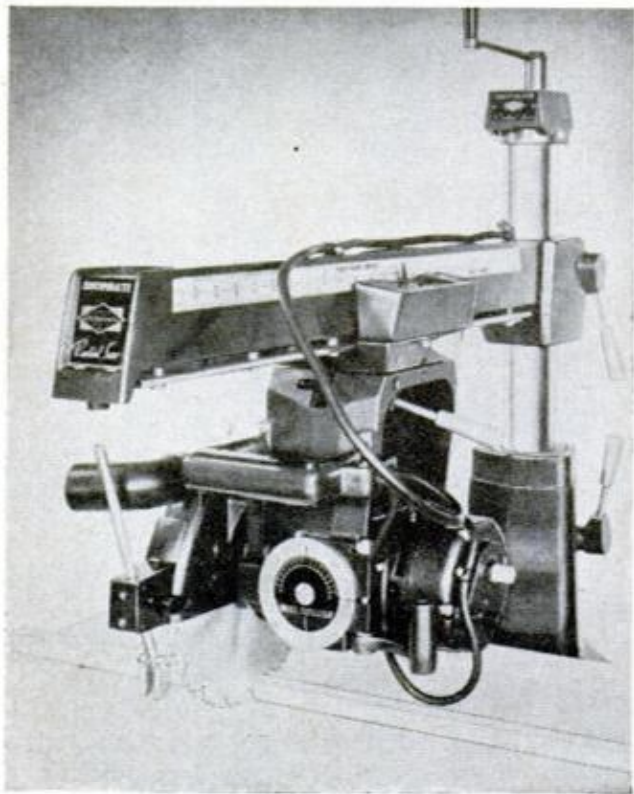
Rod Boosts Truck Capacity

The capacity of a hand truck used for carrying bulky cartons can be increased by the addition of a steel rod bent as shown. The ends of the rod are bent out at a 90-deg. angle for insertion in holes drilled in handles.—G. E. Hendrickson



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New Radial Saw Has 3 Speeds

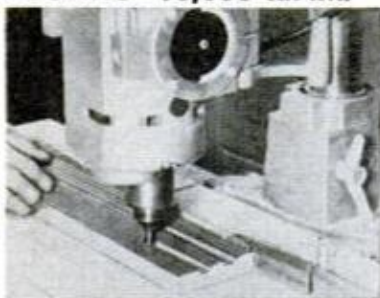


In view of the radial-arm saw's popularity with both professional and amateur wood workers, it was almost inevitable that someone would market such a saw with variable speeds. The someone who's done it is Portable Electric Tools, Inc., whose Shopmate Model 5100 offers three speeds—3450, 5000 and 10,000 r.p.m.

This feature doesn't necessarily only permit the saw to perform more operations, but to perform its operations more efficiently. Thus, when routing at 10,000 r.p.m., the machine will do a cleaner job, with less chipping, than it would at 5000. At 5000 r.p.m., it's traveling at the right speed for cross cutting, ripping and cutting moulding. And at 3450 r.p.m., it does a good job of buffing without scorching the work or taking off the finish.

The saw's other features include: a motor of over 2 hp.; a spindle for each speed to prevent use of a blade or attachment at the wrong r.p.m.; and a safety lock which must be opened with a key before the motor can be turned on. Price is \$189.50.

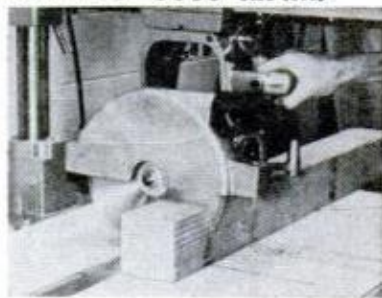
ROUTING—10,000 R.P.M.



BUFFING—3450 R.P.M.



CUTTING—5000 R.P.M.



NEXT MONTH IN SHOP AND CRAFTS

INSTANT SIGNS. Lettering is normally the toughest part of sign painting, but it's a breeze if you use *PM's* Project-A-Plan approach. Next month, you'll find three complete alphabets with matching designs which can be blown up to any size with your slide projector. The same technique works with any available alphabet, so if you want to make professional looking signs and posters in half the time, pick up *PM's* October issue.

TRICK OR TREAT. There's no trick to making the many novel Halloween costumes featured in the October *PM*, and it's definitely a treat to see your youngster walk off with best-costume prize. All the frightening favorites, from the wicked witch and headless horseman to a space-age Martian monster and a way-out cuckoo clock. See the October issue.

ZONE HEATING. Do you shiver in the recreation room while your wife is sweltering in the kitchen? If your heating system seems to be unbalanced, the answer may be zone heating for your home. You don't have to overheat one area in order to keep the temperature in another part of the house above freezing—just divide the house into different heating zones and channel the heat where it's needed. Find out how in next month's *PM*.

POWERED RASPS AND FILES. Got an electric hedge trimmer or saber saw? In the October issue, *PM* shows you how to make a simple bolt-on rasping or filing attachment for either of these tools. It's a low-cost project using readily obtainable materials, and you don't have to make any alterations in the tool itself.



Shopping for tools

CALIPUTER is a combination slide rule, vernier caliper for inside and outside diameters, and depth gauge. Standard model reads to .001 in. Mark II HO is calibrated in feet and inches for HO model railroad scale. Made of stainless steel. Costs \$9.95. Amtronix, Inc., Box 44, Chula Vista, Calif.

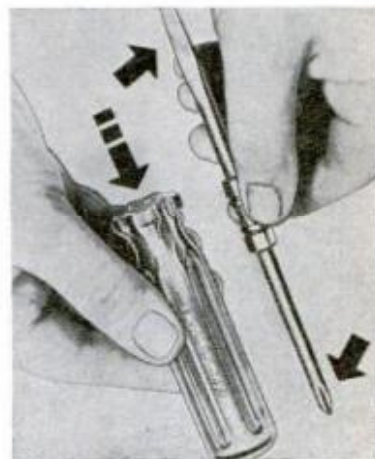
AUTOMATIC PAINT ROLLER is said to speed work considerably while doing away with need for dipping the roller. Paint is fed from a pressure tank; flow is regulated by a pushbutton. Costs \$59.95. Douglas James, Box 2062, Santa Ana, Calif.



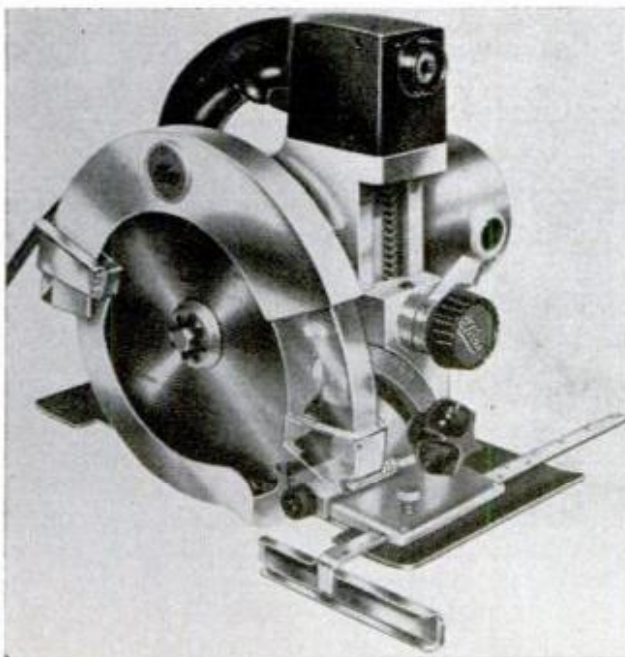
MODEL K-D 850 piston ring compressor can be used horizontally or vertically. Comes with 6 bands, for pistons from 2 $\frac{7}{8}$ to 4 $\frac{3}{8}$ in., plus a pair of pliers. Special band offered for slant-top engines. Price: \$12.55. K-D Tool Co., Lancaster, Pa.



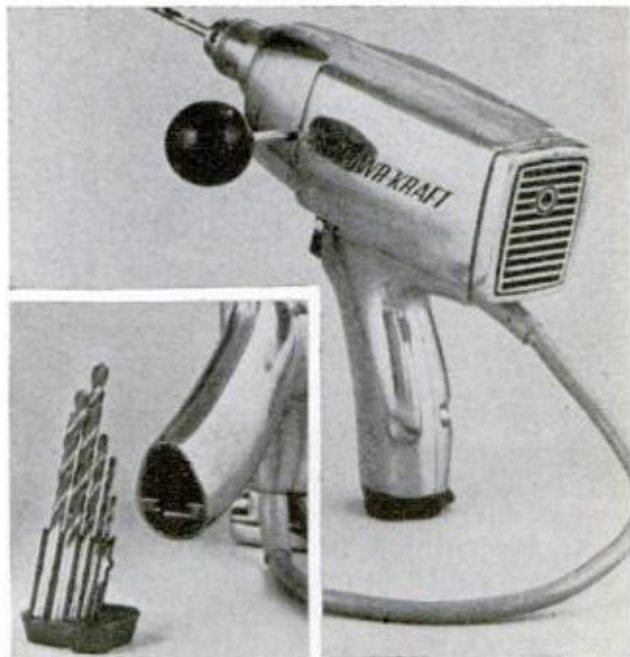
DOUBLE SCREWDRIVER has a regular $\frac{1}{4}$ -in. blade on one end of its shaft, a No. 2 Phillips point on the other. Sold with a special tool that's said to speed positioning of coil springs. Price: \$1.98. Vaco Prods., 317 E. Ontario Street, Chicago, Ill.



E-700 AND E-701 HAND POWER SAWS require no grounding, as all current-carrying parts are insulated from outer housings. Equipped with circuit breakers and reset buttons to prevent damage from overloading. Made in 7 $\frac{1}{4}$ and 8 $\frac{1}{4}$ -in. sizes, at \$140 and up. Thor Power Tool Co., 175 N. State St., Aurora, Ill.



NOVEL POWR-KRAFT ELECTRIC DRILL comes in $\frac{1}{4}$ -, $\frac{3}{8}$ -, and $\frac{1}{2}$ -in. models. Handle located in the center gives better balance, and is hollow, to hold up to 10 bits. Auxiliary handle goes on either side or in back. Sells for \$21.88 and up. Write Montgomery Ward, 619 West Chicago Avenue, Chicago 7, Ill.



When
Autumn
Leaves
Fall . . .
Be Ready
With This

MOBILE LEAF BURNER

By Manly Banister

YOU'LL BE ESPECIALLY GLAD to have this mobile leaf burner around next autumn, but it won't stand idle the rest of the year. When not being used for yard work, it makes a fine roll-away trash burner that dumps ashes from the bottom with a flip of a lever.

The 30-gal. steel drum is 31 in. high and has an inside diameter of 18 in., giving the burner a capacity of almost 3 bushels above the 7-in.-deep ash pit.

Wheels for the pilot model were salvaged from an old hand lawn mower and have the advantage of being an exact fit for the $\frac{15}{16}$ -in. dia. of $\frac{3}{4}$ -in. thinwall conduit used for the axle. If you decide to use regular 10-in. utility wheels with $\frac{1}{2}$ -in. bearings, substitute $\frac{1}{2}$ -in. steel rod.

All joints in the carriage and ash-dumping mechanism should be brazed with a bronze brazing rod (Oxweld 25M, or similar). In building the pilot model, a Prest-O-Lite air-acetylene torch with



a #4 burning tip was used. Of course, if welding equipment is available, the joints may be welded.

The first step is to cut a 10-in.-wide opening in the bottom of the drum to accommodate the ash-dumping doors. (Save the cut-out piece to use as a pattern for the ash doors.)

Next, install the grate. This is composed of 10 lengths of $\frac{1}{4}$ -in. steel welding rod—five installed crosswise to the opening and five parallel to it. While you should braze or weld the rods at each crossing to make a solid unit, it isn't necessary to braze the grate to the drum.

Now, with the drum upside down, drill $\frac{5}{16}$ -in. holes every 2 in. around the under surface of the rolling flange. Then lay out and drill the pattern of $\frac{1}{2}$ -in. holes on each side of the drum.

Make the ash doors from 14-ga. ungalvanized sheet metal, using the cutout from the drum bottom as a pattern. The doors should swing 90 deg. in the opening provided. First, determine the amount to



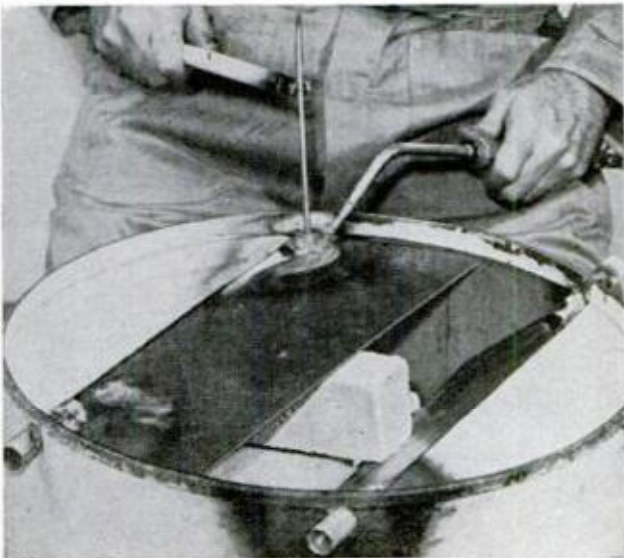
ASH-DUMPING DOORS fit into a 10-in.-wide opening sawed out of the bottom of the 30-gal. drum. Orient cutout so drum seam will be at the rear of burner

be ground from the shoulders for clearance by trial. Locate the pivot holes in the base of the drum. Drill these out to $\frac{1}{2}$ -in. dia., then file them with a round file to $\frac{3}{4}$ -in dia. to fit the pivots of $\frac{1}{2}$ -in. thin-wall conduit.

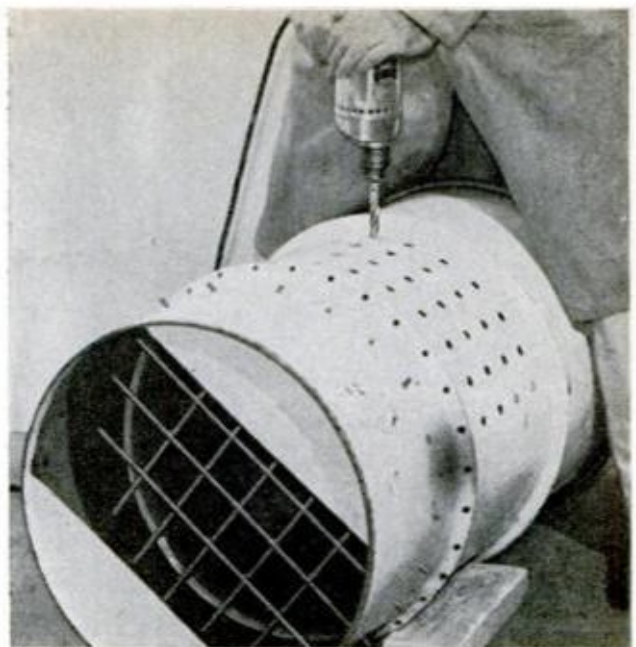
The door pivots are of two different lengths. Slit the two shorter ones with a hacksaw, braze them to their respective doors and install the doors in the drum to check for ease of opening and closing. If necessary, correct the fit by grinding or filing, then prop the doors in a horizontal position, slit the longer pivots and install in the drum, brazing them to the doors.

All strap-iron requirements of the construction can be met with one 36-in. length of $\frac{1}{8}$ -in. x $1\frac{1}{2}$ -in. strap. Make the

WHEN BRAZING the ash doors to their $\frac{1}{2}$ -in. conduit pivots, support them horizontally on insulation bricks piled on the grate. These won't conduct heat



SEPTEMBER 1963



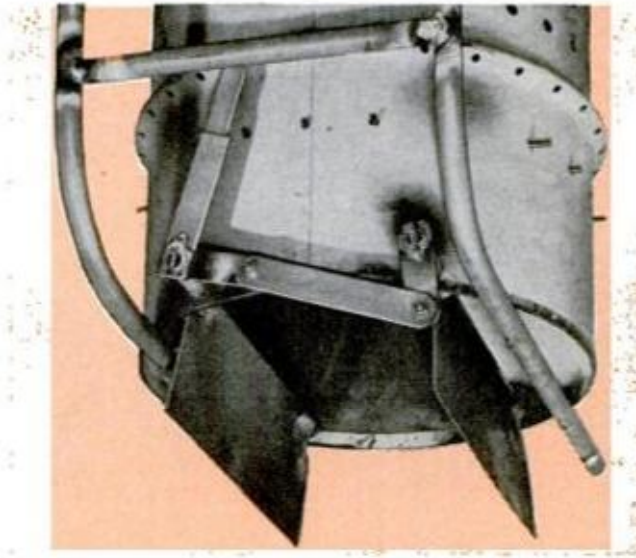
DRAFT HOLES in the side of the drum should be drilled with a $\frac{1}{2}$ -in bit in a $\frac{3}{8}$ -in. slow-speed drill. To locate them, tape a paper pattern over the drum

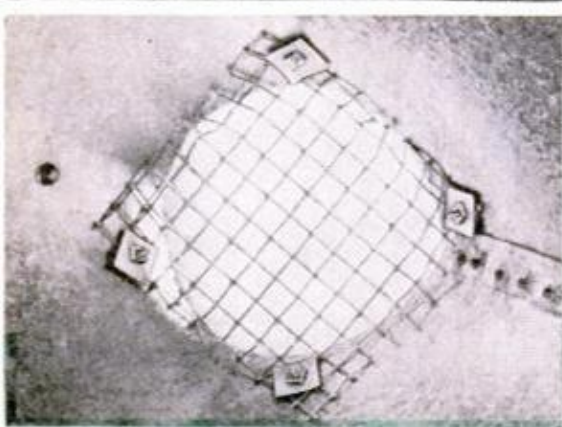
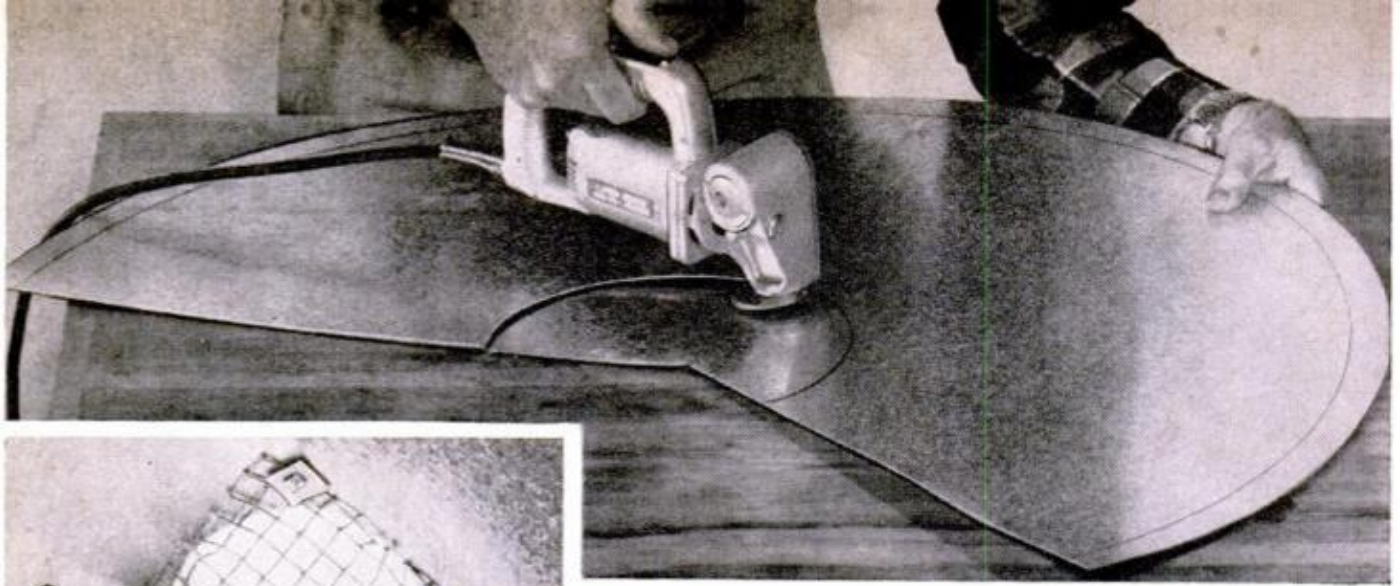
ash-dumping mechanism as detailed on p. 187. Braze or weld the levers to the door pivots with the drum on its side and the doors open. You'll find it easier to position and hold the levers in place if you mount the linking bar and run the nuts up tight. Braze a short length of $\frac{1}{4}$ -in. steel welding rod into each joint to strengthen it.

Also, braze the fulcrum pins in the levers before the unit is mounted, and drill these for cotter pins to prevent losing nuts.

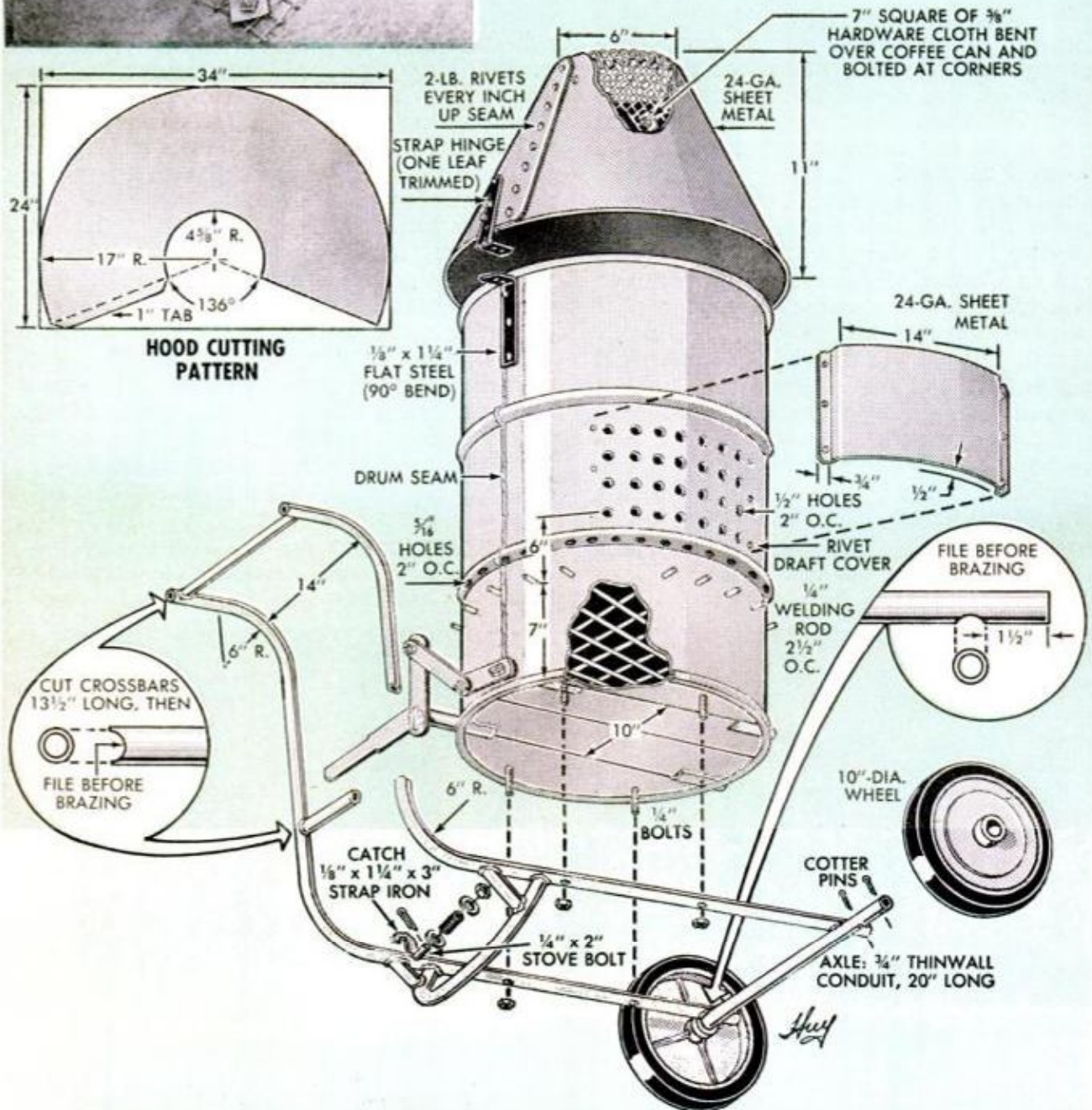
To make the carriage, you'll use most of two 10-ft. lengths of $\frac{3}{4}$ -in. thin-wall conduit. Bend the side members of the frame before cutting to length so as to have plenty of leverage. A standard $\frac{3}{4}$ -in. conduit el-bender, which has a 6-in. ra-

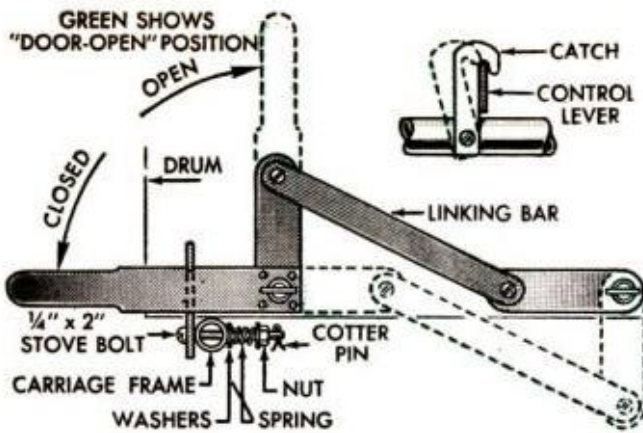
LEVERS CONTROLLING the ash-dumping mechanism are brazed to the door pivots and connected by a linking bar. Note cotter pins in the linking bar pivots





CONICAL HOOD for the burner is cut from 24-ga. sheet metal using the pattern below. Hardware-cloth screen over the opening traps hot ashes, keeps them from flying out the top of the burner when caught in the updraft from the fire





dium, is the best tool for making these bends. (If you don't own an el-bender, you can rent one from your local hardware store.) Cut the first side frame 20½ in. from the second bend, then bend the other frame and cut it to length. Check these frames for congruency.

Mount the bent frames on the drum bottom 14 in. apart, center-to-center, using ¼-in. machine bolts with lock washers under both head and nut. Install these bolts as close to the side of the drum as practical. Cut the crossbars 13½ in. long to allow ¼ in. on each end for fitting.

To install the handle, turn the drum upside down and squeeze the side members of the frame to the handle with a bar clamp. Then braze the handle in place. Install, clamp and braze the crossbar in the same manner.

Next, mark and file the side members of the carriage, and braze the axle in place. The wheels can be positioned and retained on the axle with shaft collars. If you are using ¾-in. conduit for an axle, make shaft collars by cutting slices from standard ¾-in. pipe coupling. Face them with a file and fit with setscrews.

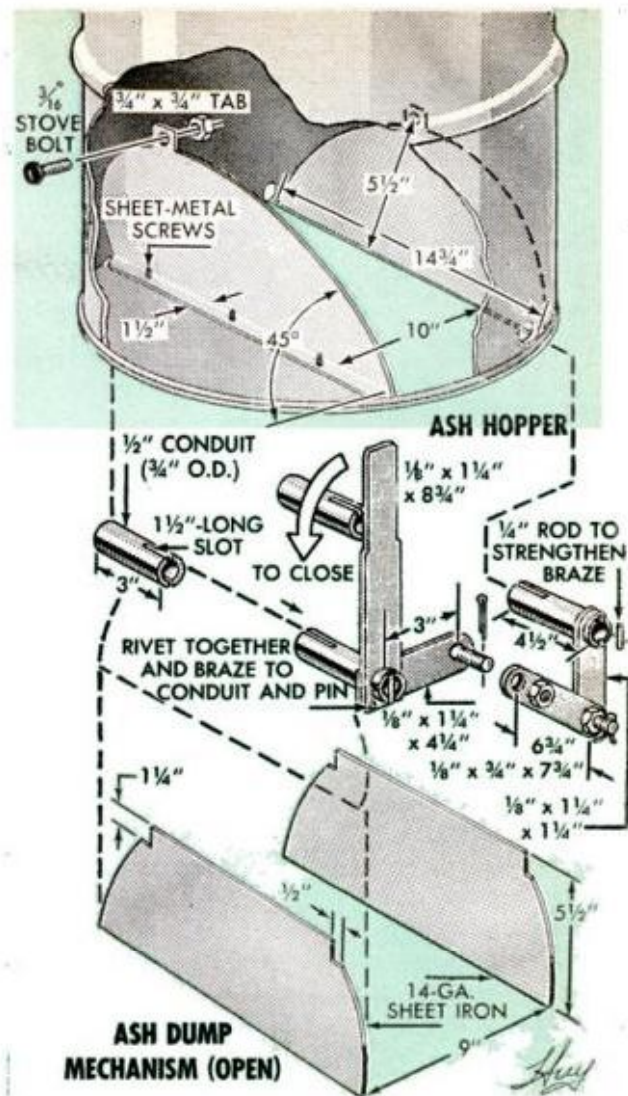
With the wheels mounted, turn the unit right side up and block up the back of the drum until it is level. Bend the rear support from ¾-in. thin wall, starting the second bend where the first leaves off. Fitting this support and its Y-braces is a matter of trial-and-error. When the parts fit correctly, braze them together.

Now turn the unit upside down again and install the ash-hopper inserts. These are 24-ga., sheet-metal plates mounted at a 45-deg. angle to facilitate dumping ashes. Their outline is an elongated arc like that of the end of an oval.

Make a cardboard pattern first and try it for size. When you arrive at an outline that fits, transfer it to sheet metal and cut

[\(Please turn to page 196\)](#)

BURNER MAY BE USED anywhere on your lawn without damaging grass. When 7-in. ash dump in bottom is full, just wheel it to the trash heap and dump it



Shock-Avoider Switch Box

Two switches, four lamps and six outlets are all it takes to prevent a dangerous accidental short

By Frank P. Fritz

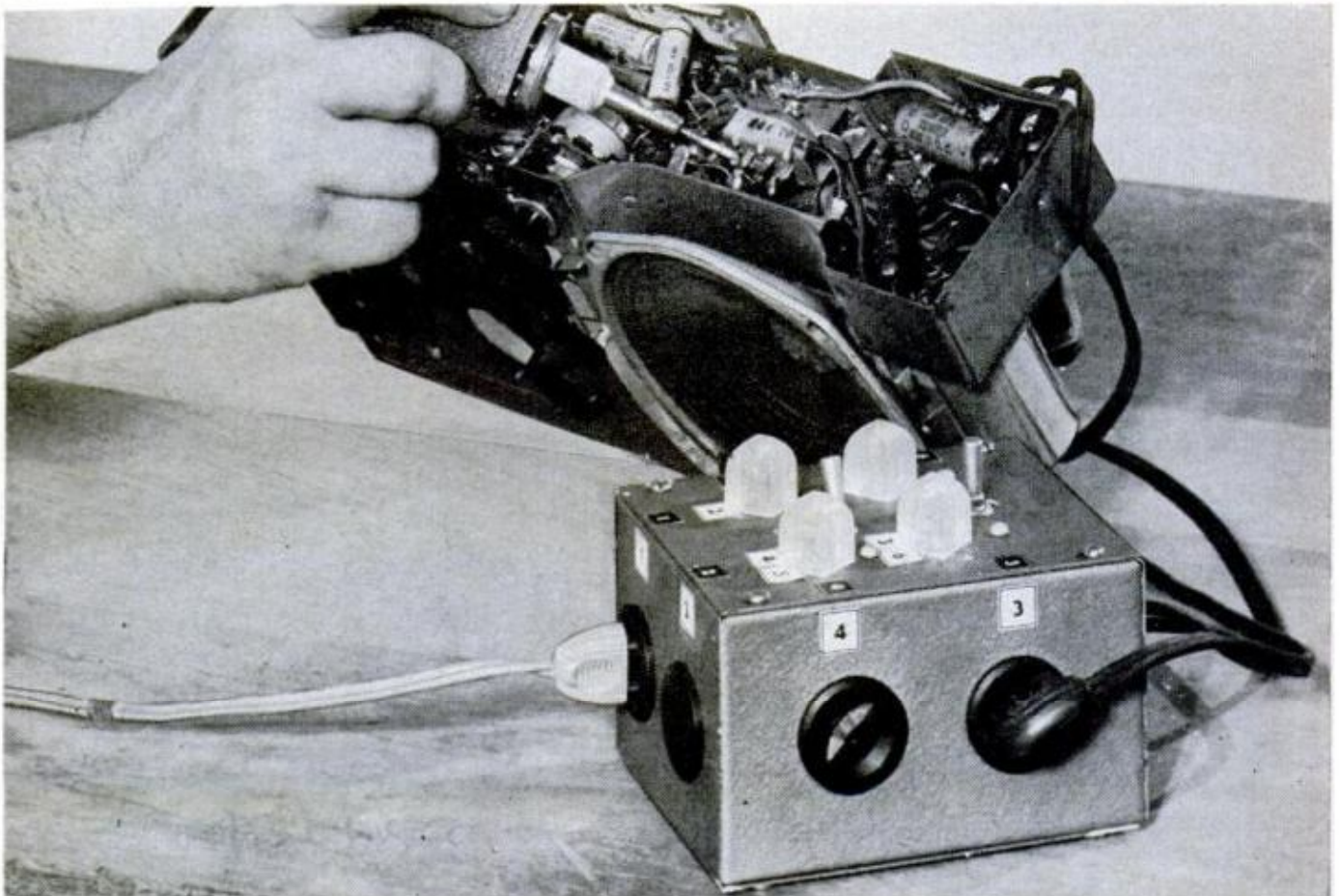
WHEN WORKING on a piece of electronic equipment, it's all too easy to poke a soldering iron, test-instrument probe or unwary finger into the innards of a set that is still turned on. The results can be expensive if you burn out a meter, painful if you burn a finger and fatal if you get too good a grip on line voltage.

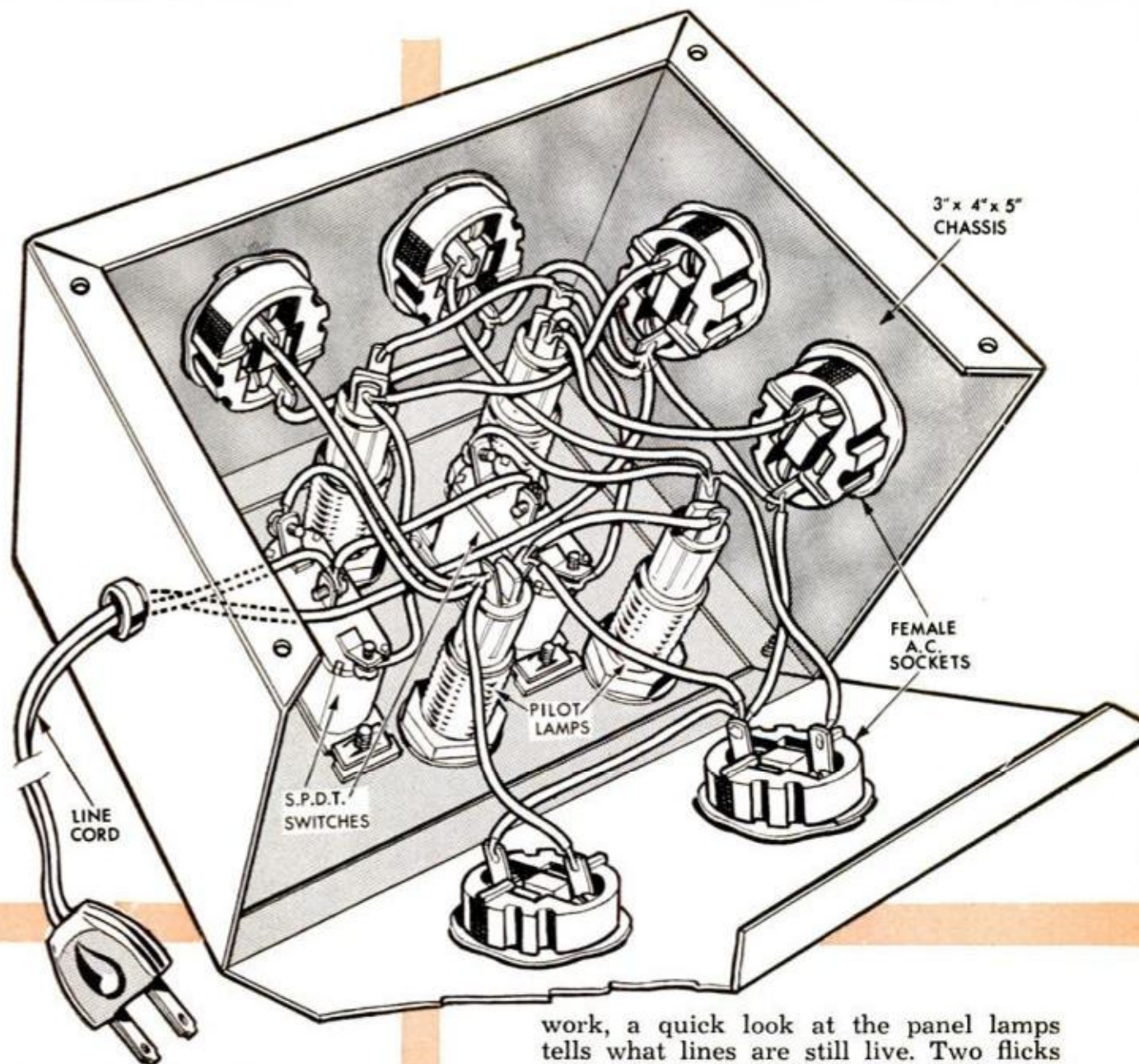
After the first time (cost me \$27 to get the ohmmeter working again), I decided to do something about it and designed and built the shock-avoider box described here. The cost is under \$8, and it pays for itself as soon as you start to put it to work.

Assembly is easy. First mount all the sockets and pilot lamps. Drill pilot-lamp mounting holes with a 1/2-inch bit. You'll need a chassis punch for the a.c. sockets. Then wire everything together following the pictorial diagram.

The box has six outlets, and by setting a couple of toggle switches you can turn on one, two, three or four of them at the same time. Panel indicator lights warn that the power is on and show which outlets are hot. But most important is that by putting the plug of the radio you are troubleshooting into one outlet and the tester and soldering gun into the matching pair of outlets, you make it impossible to use the soldering gun or tester when the radio is on. For when you turn on the radio, the other instruments are turned off. And when you turn on the troubleshooting gear, the radio is turned off.

Since its assembly, the shock-avoider box has proven extremely useful during assembly of electronic kits and in checking out wiring in the work in progress. Best of all, at the end of an evening's





PICTORIAL DIAGRAM above shows the layout and wiring of the shock-avoider switch box. Follow it carefully, and you'll find the box is just as easy to assemble as the diagram makes it appear to be

IN ACTUAL USE the neon-lamp indicators show which outlets are on and which are off. The switching arrangement insures that the radio is off when the soldering iron is on. No burned fingers with this setup

work, a quick look at the panel lamps tells what lines are still live. Two flicks of the two toggle switches and all six outlets are turned off. There are no line cords to hunt down and disconnect from a wall outlet. When you're ready to start work the following night, just flip the toggle switches back on again.

On the hi-fi enthusiast's bench where several electronic instruments are used, the box is even more useful. There might be connected at one time an audio vtm.-signal generator, soldering gun and series tester as well as the equipment being tested. With the box you can switch off the hi-fi unit without turning off anything else, yet not have to try to locate the on-off switch on the equipment itself. ★ ★ ★

PARTS LIST

- 1—Aluminum case, 4 x 5 x 3 inches
- 6—Chassis mounting a.c. sockets (Amphenol 61-F)
- 4—Neon lamp assemblies (Drake 105 Postlite)
- 2—Toggle switches, s.p.d.t. center off (Cutler-Hammer 7140-K6)
- 1—Line cord, 8 feet long
- 1—Male a.c. plug



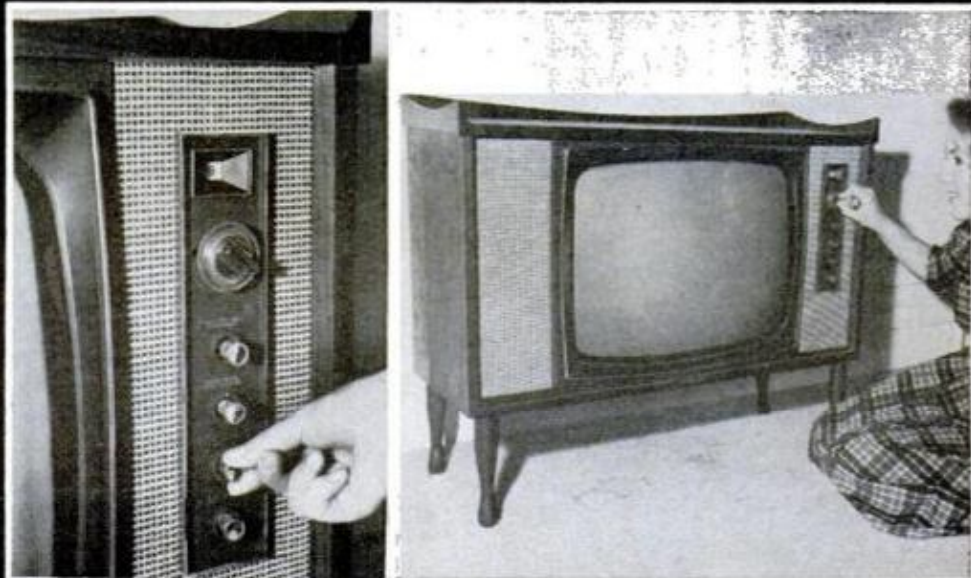
New in Electronics

YOU CAN'T BREAK this needle no matter how much you bend, flick, twist or knock it. The Sono-Flex will automatically spring back into the proper playing position. The secret is a special rubber link that connects the needle to the phono cartridge. The new needle is available as a replacement for 11 existing cartridges. Sonotone Corp., Elmsford, N. Y.

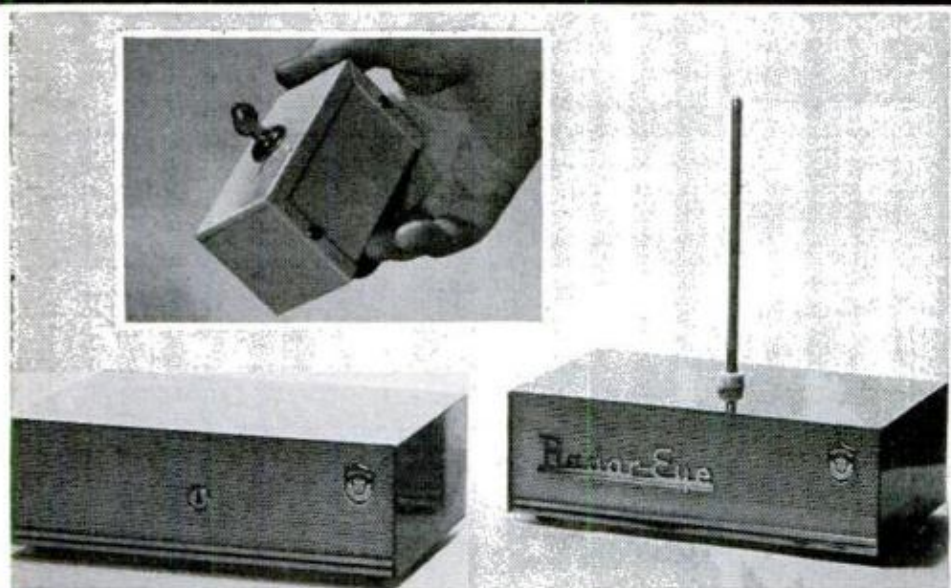


BASIC TEST INSTRUMENT for any electronic workbench is a vacuum-tube voltmeter. The IM-13 measures a.c. and d.c. voltages as well as resistance. It has a gimbal bracket that makes for easy bench, shelf or wall mounting. \$32.95, Heath Co., Benton Harbor, Michigan

CANADIAN TV RECEIVERS offer top-circuit features to viewers. Picture sharpness can be varied from soft to extra sharp with front panel control. Bass-treble control is also provided and cabinets are solid wood. Electrohome, 1 Park Ave., New York 16, N.Y.

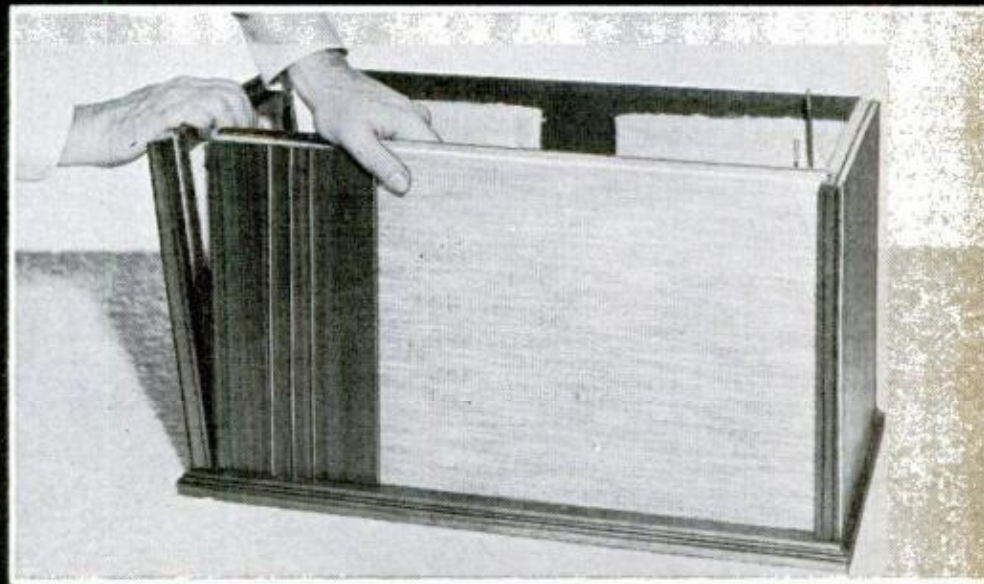


MINIATURE PIANOS are transistor radios in disguise. They go well on coffee-tables or night-tables. \$49.95 each. Branvold, 5718 Troost Ave., N. Hollywood, Calif.



RADAR-EYE TRAPS INTRUDERS with radio waves. A person moving around within 30 feet of the portable unit sets off the alarm. You can take set along on trips to protect valuables, too. Remote turnoff available. About \$300. Pinkerton Electro-Security Corp., Webster, Mass.

INSTANT SPEAKERS are yours with new Coronet prefinished enclosure kits. They go together in 20 minutes — without tools — giving 8-inch speaker in a ducted-port cabinet. Interlocking insulated joints seal the cabinet. \$39 to \$54. Electro-Voice, Inc., Buchanan, Mich.



Multiply Radio Battery Life

Batteries last 5 to 10 times longer with a simple recharger you can adapt to your set

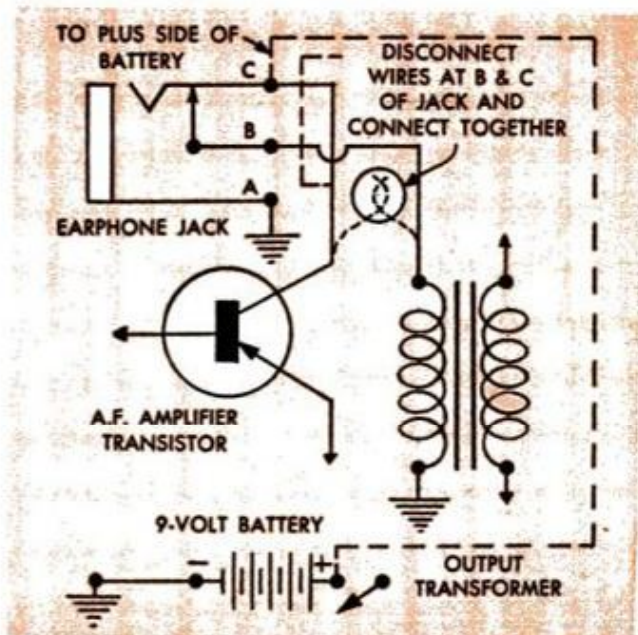
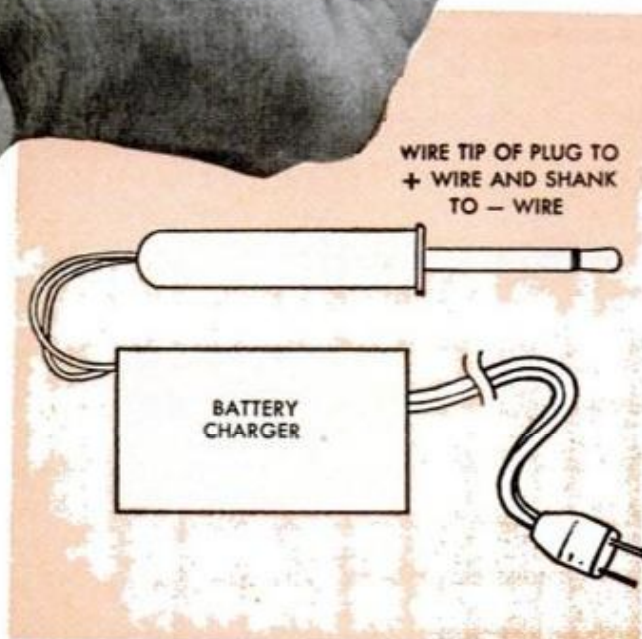
By Frank Greenwald

TRANSISTOR RADIOS are portable, handy—and battery eaters if operated continuously. Many of the sets use little 9-volt batteries that have a fairly short life to start with. These sets can be rewired so you can plug in a recharger to rejuvenate a worn battery or to use the set directly off the 115-volt line.

The only changes made are in wiring the earphone jack (below right). Then pick out a little 9-volt recharger (you can get one from most of the electronic mail-order houses). Attach a miniature phone jack to the recharger output leads (below left) and you're all set to take advantage of longer battery life.

To recharge the battery, plug the charger into the nearest wall outlet, and the miniature jack into the radio. It's simple, neat and a moneysaver.

ONCE THE RADIO HAS BEEN MODIFIED, the recharger plugs into what used to be its earphone jack (left). The only change at the recharger is to add a miniature phone plug to its output (bottom left). Wiring changes in the transistor radio are in the schematic (bottom right)



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CLINIC FOR HOMEOWNERS

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Q My two-car garage is built on a slab. One corner has cracked diagonally and settled away from the sill, leaving an opening of perhaps $\frac{3}{4}$ in. The cracked-away portion measures roughly 2 x 2 x 3 ft. I'm puzzled as to how best to repair this defect. Can you outline a procedure?—G.H., Ga.

A If we can judge correctly from your description, it should be possible to remove the broken off portion of the slab and replace it with new concrete. Break it up with a sledge into pieces that are easily handled, remove them and tamp the original fill, if any. Add new gravel fill to bring the fill up to the original level, tamping thoroughly as you add new material. Then build a simple form to hold the new concrete in place until it sets. Use a prepared concrete mix and keep the edge of the old concrete wet as you pour the new in place. Bring the new concrete up to the level of the original floor and trowel smooth. Allow to set, then dampen burlap sacks and lay them over the patch, keeping them moist for a week or more.

Q I'm building an addition to my older home and I want to use diagonal ship-lap sheathing to give the walls maximum wind resistance. My contractor suggests use of a single 1 x 4 or 1 x 6 brace, placing two at each corner and cutting them into the studs flush on the room side. He says this is considerably cheaper than my plan. Is he right?—W.W., Okla.

A It's difficult for us to say at such long range and without knowing more about the size of the addition and other factors that may be involved. But we'd be inclined to agree with your contractor, although there can be little doubt about the strength of a framed wall sheathed in the manner you wish. Your contractor has undoubtedly planned the job at a minimum figure and he is correct in saying that the corner braces are cheaper and, assuming that there are no other special governing factors, very nearly as effective as a diagonal sheathing. There is, of course, considerable waste when cutting diagonal sheathing to length. But if you wish to go to the additional expense then diagonal sheathing is our first choice.

Q I'm planning a new home and I'd like your opinion on what type of windows to install, wood, steel or aluminum. I like aluminum sashes, with casements, but I've heard so much for and against, I'm lost. What type windows should I install?—H.E., Tenn.

A We'd be inclined to regard this not as a problem, but rather a matter of choice. Window sashes deteriorate with time and neglect, just as do other parts of a structure. This is true of all three types, wood, steel and aluminum. Steel and aluminum sashes, with or without casements or vents, are of a light, airy design that's especially attractive when viewed from inside or outside and particularly effective in homes of more modern design. The wooden sashes are especially desirable in homes of traditional architectural lines. We'd be inclined to choose on this basis, remembering the while that windows, like all other parts of the structure, must be properly installed and maintained.

Q My new home has just been finished and the lot graded. Now my problem is what to do about seeding a new lawn—now or next spring. It has seemed to me that it would be best to wait until spring, allowing the freshly graded soil to settle. But I'm told that, as the lot is fairly level, the seeding can be done now. Which should I do?—D.O., Ky.

A You should have a reasonable chance of getting a good catch of new grass if the area is seeded immediately and the seedlings protected with a light mulch of wheat, rye or other coarse straw. There is, of course, a definite advantage in waiting until the new grading settles, in your case until spring, but this can be offset, to some extent at least, by rolling the new grading before making a fall seeding. Never roll grading when the soil is wet. After rolling, the surface should be raked to loosen the top inch or so of soil, a plant food applied and raked into the loosened soil and then the area can be seeded, again rolled lightly and mulched with straw. The straw should be spread lightly and uniformly—just enough to prevent the soil from washing or puddling in low spots.

As a service to Popular Mechanics readers in solving the hundreds of problems pertaining to a home—inside or out—you are invited to present your problems to The Home Clinic Editor for his helpful advice. Address your questions to The Home Clinic Editor, Popular Mechanics Magazine, 575 Lexington Ave., New York 22, N.Y.

SEPTEMBER 1963

Skilled Machinists

Prefer
South
Bend

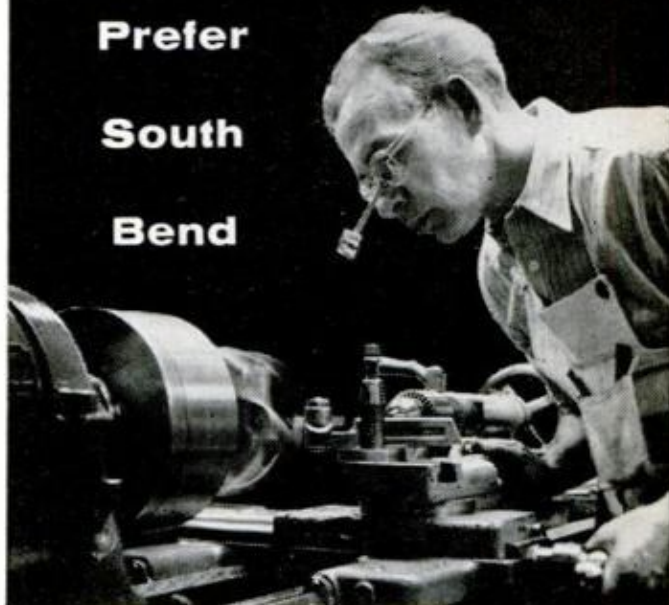


Photo from Learcal Division, Lear, Inc., Los Angeles

The day of the precise craftsman is not past. You should see how some of the nation's finest workmen go about doing their jobs with painstaking accuracy.

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For good ring jobs the easy way, just ask for Sealed Power KromeX with Stainless Steel oil rings. It's that easy. Sealed Power Corp., Muskegon, Mich.

Sealed Power Stainless Steel
oil rings stop oil pumping

Mobile Leaf Burner

(Continued from page 187)

it out, remembering to leave a $\frac{3}{4}$ -in. x $\frac{3}{4}$ -in. tab at the top for bolting to the sidewall of the drum. Leave a $1\frac{1}{2}$ -in. wide tab across the bottom and bend it over at a 45-deg. angle. Fasten these hopper inserts with $\frac{3}{16}$ -in. stove bolts through the side of the drum and three sheet-metal screws through the drum bottom.

Next, lay out a pattern for the conical hood on a piece of 24-ga. sheet metal and cut it out. If a sheet-metal-forming machine is not available, you can form the cone easily by hand. Just clamp the edge opposite the riveting tab to the edge of a table, roll the tab side over until the tab overlaps the opposite edge, and clamp the two ends together with a pair of clamping pliers. Adjust the small end of the cone to the correct overlap and clamp it.

Rivet the overlap every inch, drilling each hole and riveting it before going on to the next. You can either use 2-lb. tinned rivets and a rivet set, or small roundhead machine screws, tightening the nuts and then peening over the ends.

Attach the hood to the drum with a strap hinge, one leaf of which has been cut off and mounted on a piece of bent strap iron which is bolted to the drum. Mount a barndoor pull on the hood opposite the hinge.

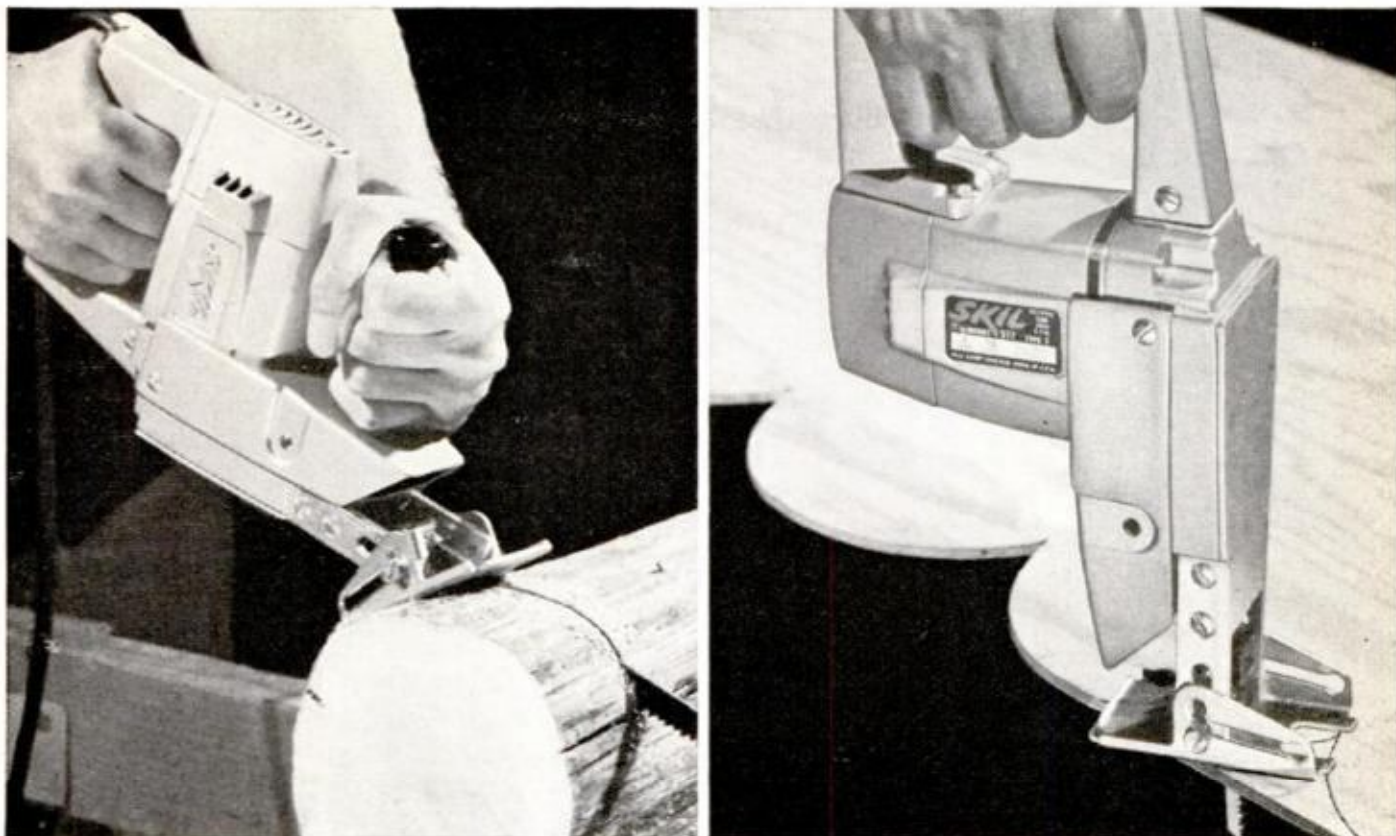
To keep hot ashes from flying out of the top, install a screen of $\frac{5}{8}$ -in.-mesh hardware cloth in the hood. Form this screen over a coffee can so that it fits inside the top of the hood, cutting the wires where they buckle. Install the screen with $\frac{3}{16}$ -in. stove bolts, using 1-in. squares of sheet metal for washer inside.

The final step is to install the draft cover. Lay out the sheet metal and bend the end tabs first. Just clamp the tab between a board and the edge of a table and bend it by hand. Hammer the bend with a mallet to sharpen it, then move the tab out to the second mark and bend it in the opposite direction to a 45-deg. angle.

To make the draft cover fit properly, give it a radius bend before installing. Then attach it to the drum with $\frac{3}{16}$ -in. stove bolts.

The notched catch which holds the ash-dump lever in place is mounted on the outside of the side frame. Drill a $\frac{3}{16}$ -in. hole through the conduit and strap-iron catch for a $\frac{1}{4}$ -in. x 2-in. stove bolt, then mount the catch using a compression spring between two washers to hold the catch tight to the frame while allowing it to be turned back when necessary. Install a cotter pin in the end of the bolt to keep the nut from working off. ★★★

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Transistorized Ignition

(Continued from page 177)

sistors. If in doubt, mount the transistor package in the driving compartment, on the firewall under the dash.

If you have air conditioning in your car, this too could cause a problem. With the air conditioner heating the air beneath the hood, the temperature could reach or exceed 170. Here again it's safer to bring the transistors inside. You needn't bring in the ballast as well—this resists high temperatures.

All leads from the transistor package are color-coded for easy identification. If you're not using a ballast (you don't need it in a 6-volt system) the ballast lead goes directly to the coil.

After installation, the system should be checked out. The following procedure for Prestolite's 12-volt Transigniter is, again, representative, but you should follow the test instructions for your particular kit.

After connecting a voltmeter as shown on page 176, turn on the ignition switch and open and close the distributor breaker points by hand. With the points closed, the voltmeter should read about two volts. With them open, the voltmeter should show full battery voltage (9-12 volts).

If you don't get these readings, perform a light-bulb test to pinpoint the defective component or trouble area. The test connections are indicated on the wiring diagram, page 175.

Use a No. 51 test bulb for 6-volt systems or a No. 57 bulb for 12-volt systems. These are available at automotive stores.

Make the first connection (A) at the ignition coil positive terminal (for negative-grounded cars) or the ignition coil negative terminal (for positive-grounded cars). One end of the test bulb is connected to the coil and one to ground.

Turn the ignition switch on. The light should glow brightly. If not, there is an open circuit between the coil and the battery—probably in the ignition switch or in the cables.

Now, connect the test light to the other side of the coil—that is, the coil negative terminal of negative grounded cars or the coil positive terminal of positive grounded cars (B). With the ignition on, open the breaker points by hand. The light should glow brightly. If not, the coil has an open primary winding and should be replaced.

Finally, connect the test light to the transistor package terminal of the ballast and to ground (C). Again, with the ignition on, open the distributor points. The light should glow brightly. With the points closed, the light should be very dim.

If the light does not glow at all with the

contact points open, the ballast is defective and should be replaced. If the light is dim with the contact points open or is bright with the contacts closed, the transistor package is at fault.

After the transistorized ignition is installed, it is a good idea for you to have the contact points reset after about 1500 to 2000 miles of driving. During this time, the rubbing block on the point arm will have burnished and fit itself properly to the cam lobes. After this second adjustment of the points, the points will maintain their clearance.

It's impractical to describe troubleshooting over and above the test procedures just outlined. First of all, each manufacturer has his own specific procedures that must be followed so the system won't be damaged. Secondly, the test equipment needed for minute testing is specialized, and it wouldn't pay you to buy it. Finally, these systems have proved to be so reliable and trouble-free that damage is rare.

Some Final Cautions

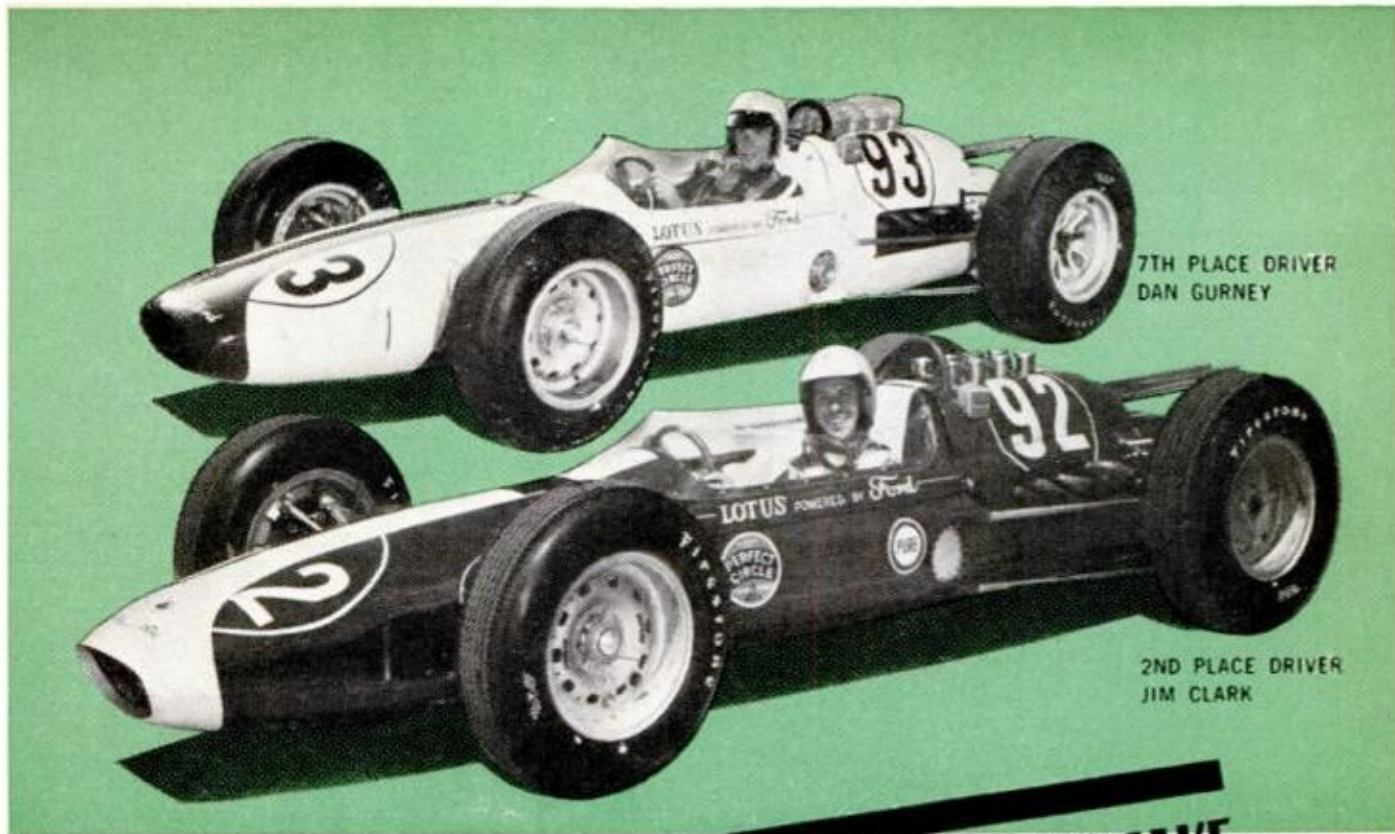
Two points need stressing, however. Transistorized ignition is not like conventional ignition—you shouldn't go poking around inside with an ice pick or screwdriver. Never, at any time, short out or jump the terminals of a transistorized ignition system. To do so will surely result in a complete burn-out of the system.

And never attempt to use guesswork in checking out the system. If you have no information available or the right test equipment is not on hand, it is best to let an expert handle the job. After all, this is an expensive system.

To add credence to the claim that transistorized ignition is virtually trouble-free, we asked manufacturers how long their systems will last. There were no concrete answers—not because the manufacturers have anything to hide, but because these systems seem to last "forever."

One manufacturer, for example, reported that he got 122,000 miles from his test ignition system. (When these people test systems, they test them to fail.) He claimed he had to remove the system from the test vehicle at the end of this time—not because the system went bad, but because the car's engine gave out.

One final point: as with any new product, there seems to be an abundance of systems on the market bearing unfamiliar names. In some cases, these may be priced less than other systems. However, you seldom go wrong by buying a product from a known and reputable manufacturer, such as those mentioned in our captions. As trite as it may sound, you get what you pay for. ★★★



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DAN GURNEY

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Competition in the Indianapolis "500" is as tough as it comes. That's why the designers of Ford's Fairlane V-8 high-powered engine were uncompromising in every detail. To get maximum power and endurance, they installed Perfect Circle chrome piston rings, valve seals and cylinder sleeves especially designed for Ford's sensational engine.

A look at the record shows that more than 80% of the Indianapolis winners since 1922 (including Parnelli Jones, 1963 winner) have used Perfect Circle piston rings!

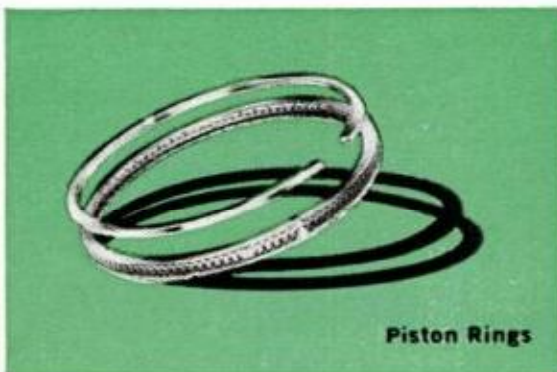
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Cylinder Sleeves



Piston Rings



Valve Seals

Junket on a Chinese Junk

(Continued from page 106)

lashed it down, set the *High Tea's* course with the foresail and the mizzen (the small sails fore and aft). The mast had snapped in exactly the same way it had before, but at a different point. "After the first break, I had unfortunately located a structural fault which led me to believe that I had found the cause of failure. After my second break, I began to realize the true cause. Basically, it came from my misguided attempt to improve the Chinese rig. Thinking to strengthen the masts, I had gone too far and destroyed their flexibility."

Platt kept heading for the U. S. with the two small masts until one day a few weeks later when the foremast snapped. Same trouble. Since it had broken at the base, he managed to get the broken stub out and re-mount the remainder, then limp through the final 500 miles. On Christmas morning, 1959, he crossed the mouth of Humboldt Bay on the California coast.

Platt ended up a staunch junk booster. He wouldn't want to make the trip again in a conventional small boat, he says. But in a junk—anytime.

Most Are Hong Kong Models

Most junks now in the U. S.—whether they made the trip from China by sail or in the hold of a freighter—are Hong Kong harbor models. But this design is only one of thousands which have evolved over the centuries. The junk is both home and job to the Chinese junkman—he lives on it and earns his living with it, fishing or hauling cargo. So he's given its design some thought. In each bay, inlet, cove, river and lake, therefore, there has evolved a boat perfectly tailored to fit the typical local weather, harborage, cargo and tides it will encounter.

Sometimes, junk designs are influenced by other than purely nautical factors. Several hundred years ago, an emperor imposed a tariff based on the width of the boat at the main mast. Chinese shipwrights quickly put together fleets of junks normal in every way, except that the sides dipped sharply inward at the mast. Customs officials thought it was a fine joke, measured the junks at their slim waists and charged them lower tariff.

One of the Weirdest

Undoubtedly one of the weirdest water craft ever built is the "crooked stern" junk, designed to navigate the inhospitable Kungt'anho River winding into the mountains above Chungking. In 200 miles,

there are 71 major rapids. This 100-foot-long craft's stern suddenly swoops around to the starboard, until what would normally be the stern port corner is lined up in dead center.

From this offset corner is suspended a giant sweep—a massive steering oar made of two or more logs lashed together. It is 100 feet long—as long as the ship itself—but so nicely balanced that the head junkman perched on a shaky amidships platform 30 feet above the water, controls it easily. But even the giant steering oar doesn't give enough control for navigating rapids. So the Chinese mount another sweep—almost as big as the main one—on the other twisted corner. Another crewman here almost doubles the amount of control available. Yet because of the crooked stern, the sweeps are unable to foul each other. The junk has a turning power not approached in any other boat design.

This is one of the few junks without sails. It is tugged up the river by pure manpower—16 trackers on shore hauling on ropes. These crooked sterners travel in convoys of eight, so that all 128 trackers can tug each of the ships in turn through the rapids. The 200 miles up the river takes three to four months. Coming back downstream—with the current—they make it in one day flat. For the downhill trip, the junkmen install still another sweep in the bow manned by six to eight men to give even more maneuverability.

What cargo is worth the trouble the junkmen go through to get it up river? For the most part, salt. Each junk carries 175 packets, weighing 175 catties each, as the Chinese put it. That works out in English to a load of 20 tons per junk.

When Is a Junk a Junk?

With all of its variations, some controversy arises from time to time as to just what is and is not a junk. And in general, the answer is that a junk is a boat with little or no keel, a rudder that hangs substantially below the hull, and has sails (except for a few special types) with battens. If a junk gets small enough, it's called a sampan.

Where do you draw the line? There have been squabbles over this one, too. To settle the matter, one Chinese scholar some centuries ago wrote that a junk is any vessel capable of accommodating a water buffalo athwartships.

A water buffalo, by the way, is one of the few accessories which isn't standard equipment on the junks brought into the U. S. these days. If you want to find out whether you own a junk or a sampan, you'll have to supply your own. ★★★

Takeoff at 30

(Continued from page 97)

Wren in the wide-open spaces of Texas.

We flew from Love Field at Dallas to Meacham Field at Fort Worth, practicing the takeoffs and landings there and the aerial maneuvers in between. Apart from the amazing performance of the Wren itself, the most surprising thing was the reaction of the tower personnel and the pilots of other planes.

Before one takeoff, Robertson asked the tower if we could make a 360-degree turn and come back in and land—just like that, all in one motion. When the tower okayed it, we asked if they knew the plane that well. He chuckled.

"They didn't at first," he said, "but they do now."

Full Circle on Approach

Coming in for one landing, another plane was on the runway, so the tower told us to make a 360-degree turn right there—on final approach. Any other plane would be ordered to go around and re-enter the traffic pattern.

On almost all the landings, we would plop down at the edge of the runway, roll 100 feet or so, then turn and taxi over alongside the planes waiting for takeoff. Some of the pilots in the waiting planes, especially transient airliners, were wide-eyed with incredulity at such goings on. Most planes roll halfway down the runway before turning off. It's like landing on the taxi strip—sideways.

Our tests began with a series of takeoffs and landings. As mentioned, the Wren has standard controls, and its cockpit, too, is standard with only two additions, an angle-of-attack indicator and a special air-speed indicator.

The angle-of-attack indicator, we found, was of no significant value. It operates from a vane attached beneath the left wing. The same kind of vane is found on Air Force jets. The cockpit gauge has an indicator which shows the angle of attack, at any angle, expanding the function of the stall-warning light found in most light planes. It is primarily to warn of stalls, but veteran pilots, we're sure, will ignore it, claiming if you can't feel a stall coming on, the indicator will help you only while you're learning. After that, it's useless.

The extra air-speed indicator, however, is a worthwhile addition, and could easily be recommended for low-speed flying in any light plane. It works directly off an anemometer, the same kind used by weather stations to measure wind velocity. Mounted beneath the right wing, its three cups catch the wind and translate it into

air speed on the cockpit dial. The dial reads from zero to 200 m.p.h., but is most useful at the low-speed readings when the normal air-speed indicator becomes inaccurate. The anemometer, which gives direct readings without any atmospheric or altitude corrections, is accurate to within 1½ m.p.h., the Wren people claim.

For takeoffs, we usually started at the back edge of the runway, mostly so we'd have a standard starting point for measurements. The Wren will make a normal takeoff roll, with flaps up, using as much of the runway as necessary, but for test purposes we made only short takeoffs.

Flaps were placed in the full-down position, or 40 degrees. They work hard, requiring a goodly amount of muscle power. And small wonder. The standard floor stick, which would ordinarily lower only two flaps, is now required to lower eight of them. Each notch up means the flaps are going down 10, 20 or 40 degrees, and it gets harder with each notch. The Wren may need a flap booster of some kind in later models.

When lined up in takeoff position, we held the brakes, revved the engine until the brakes began slipping, then let go. All of the takeoff rolls were over and under 150 feet, with none over 200 feet. The air speed picks up immediately, and when the indicator hits 30 m.p.h. the nose is rolled up and the plane flies off the ground in a steady climb with no dip back toward the runway. Air speed picks up to 50 m.p.h. and, on at least one straight-ahead takeoff, we were above 1000 feet before reaching the end of the runway.

Takeoff Never Exceeds 300 Feet

The takeoffs, of course, were impressive, but they were made under ideal conditions from a paved runway. The plane's makers claim, however, that the takeoff roll will not exceed 300 feet under any conditions, and that it can clear a 50-foot obstacle in 500 feet. We had no chance to check rough-field operations, so it remains to be seen whether these figures would stand up under an unlimited number of conditions. We would hesitate, for instance, to land or take off the Wren from heliports located on tops of tall buildings. However, for a standard airplane, it's the best we've seen at short-field operation.

In the air, at normal speeds, the Wren behaves like an ordinary airplane. Its powerful, 230-hp. engine gives you positive acceleration and indicated speeds close to 160 m.p.h. Robertson claims that with the extra equipment on the Wren it loses only 6 m.p.h. The Cessna 182, for instance, has a rated maximum of 167

(Please turn to page 204)

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Takeoff at 30

(Continued from page 203)

miles per hour with the same engine.

But the high-speed test only shows that the Wren flies like any other airplane. It's at low speeds that it flies like no other airplane. So we slowed it down, dropped flaps all the way (and in the air the flaps really work hard) and flew at speeds we had never flown before.

It's like breaking the sound barrier backwards.

No plane we had ever been in got much below 50 or 60 m.p.h. except in stalls or on final approach and landing. We flew the Wren, and maneuvered it between 30 and 35 m.p.h. It's weird!

Having nothing else to compare the experience to, we are forced into some subjective reactions. The Wren does fly and handle at these speeds, but the controls become mushy and we were inclined to overcontrol it. Now, is this our own inexperience at this kind of flying, or will all flying at these ultra-low speeds be mushy? Or has the Wren really perfected low-speed control yet? In an hour's flight, no definite conclusion can be reached, but we were left with the distinct impression that the Wren, if it isn't perfect just yet, is on the right track.

No Fear of Stalling

There was no concern at any time that it would stall out of any of the maneuvers, and there was a constant feeling that if we had more time with it we could overcome the tendency to over-control. Robertson, certainly, had no problem.

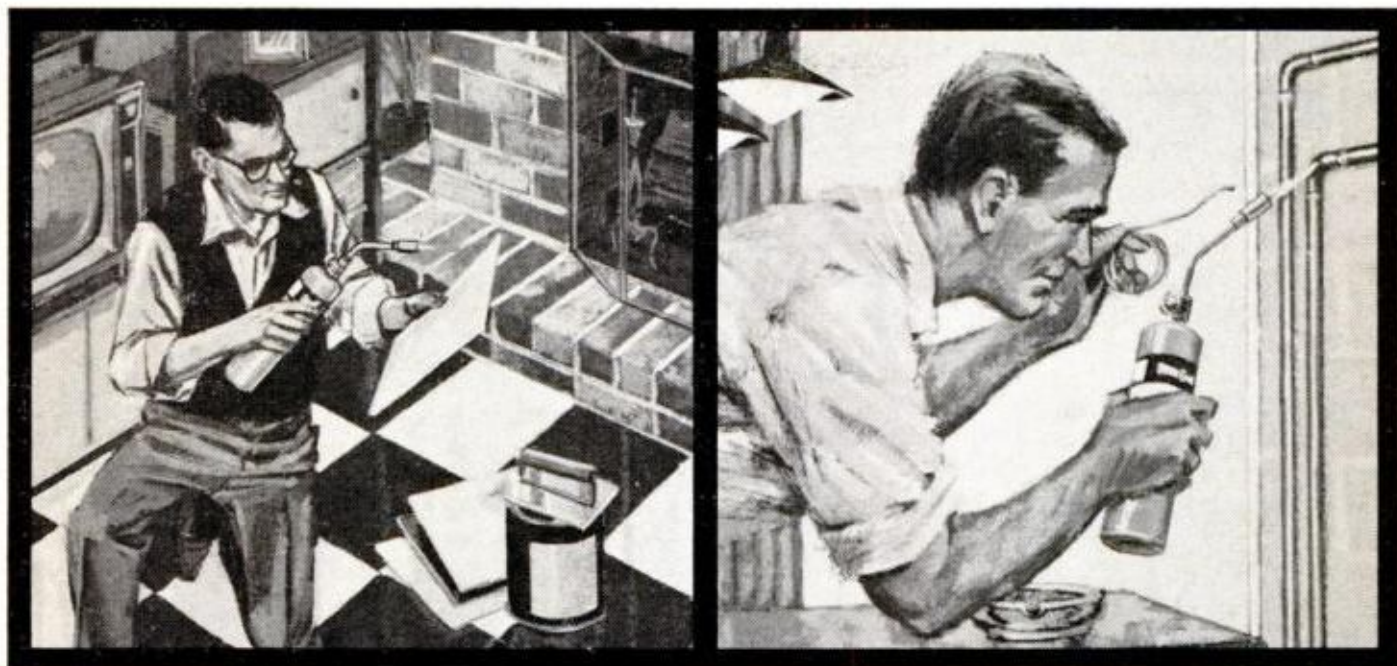
In fact, while we climbed into the back seat to get a picture of it, he slowed it down close to 30 m.p.h., trimmed it up, then took his hands off the controls altogether. And it went right on flying, straight and level. No sweat.

For more pictures, he suggested we open a window. And, for the uninitiated, may we point out that you just don't open windows of cabin aircraft while flying. Well, we did, stuck the camera and our head out into the 30-m.p.h. breeze, focused and shot pictures of both the nose control and the anemometer.

Back at the controls again, we tried some power-on stalls. They're quite gentle, with plenty of warning. To recover, we just let go of the wheel, and it flew its own way out. With power off, the plane doesn't stall technically, but it sinks pretty fast, and there's no future in that. However, below its minimum speed—something like 24 m.p.h.—the Wren again proves its maker's claim, that it's a docile airplane with

(Please turn to page 206)

Do 101 fix-up jobs from cellar to roof



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Takeoff at 30

(Continued from page 204)

no dangerous tricks. It wants to fly. The turns are probably the hardest things to get used to, next to the landings. We tried some around 30 m.p.h. and it's like standing it on one wing and pivoting right there. The high-wing Cessna already gives excellent visibility, but turning on a dime—almost hovering—should make it ideal for patrol, search and surveillance.

Lands Like Carrier Plane

The landings, always the most critical part of flight for any pilot, are all but unbelievable in the Wren. Flying at altitude at 30 m.p.h. can't give you the same sensation as approaching the ground at these speeds. The tendency is to give it more throttle or nose it down to pick up speed, but after a few tries we forced ourselves to do it. The touch down, let's face it, is quite hard, about the way Navy planes plop down on the deck of a carrier—with about as much roll. The trick is to bring it in with power—it won't stall without power—flare out, let it plop down then dump the flaps immediately after touchdown, because the plane is still floating and won't become "heavy" with flaps down. Since you're using power, it's fairly easy to pick your touchdown spot. The brakes can go on almost immediately, too, because the plane is now down around 20 m.p.h. Our landing rolls were all close to 100 feet, and all less than the takeoff rolls.

All in all, a remarkable performance.

The Wren, when it goes into production, will retail at \$29,950—a pretty sizable boost over the original list of about \$16,000 for the Cessnas. Among those who might consider it worthwhile, however, are highway, forest and pipeline patrols, construction companies, bush pilots, missionaries, oil-well operators, ranchers, aerial sprayers, aerial photographers and cartographers, some business executives and even the military services.

Popular Mechanics' opinion is that we'll probably be seeing more of the plane with the teeth in its wing and the mustache in its nose. ★★★

Organic Detergent

A new household cleaning product, an organic detergent, won't cause detergent pollution of the water supply and is said to be completely "digestible" in septic tanks and sewage disposal systems. Called L.O.C. (Liquid Organic Compound), it's non-poisonous, can be used on floors, dishes and for general household cleaning. L.O.C. is made by Amway Sales Corp., Ada, Mich.

If you could find a house paint that stayed on without cracking, scaling, or blistering, held its color with hardly any change and kept your house looking fresh and bright for years, wouldn't you use it?

Sure you would. That's why lots of shrewd homeowners are repainting with Dutch Boy Latex House Paint. Think of all the trouble it saves. To start with, it's easier to handle. Being a latex paint it brushes out smoothly, with very little effort. Goes over almost any surface—wood, stucco, brick, even galvanized iron. And Dutch Boy Latex House Paint breathes—allows moisture to escape, yet seals out the weather. That means many of the blistering and peeling problems caused by trapped interior moisture are eliminated. Another point: you don't have to wait for the weather. (Paint right after a rainstorm if you like.) You can stop when you like, start again, and stop again, without leaving lapmarks. And in two hours you have a bright, weathertight surface that stays looking that way for years. In fact, Dutch Boy Latex House Paint retains its color so well you can come back and touch it up years afterwards and not see the difference. Think what that means in maintenance. To keep your house looking fresh and bright all you do is touch up the worn spots when they need it. In short, you may never have to paint your entire house at one time again. When you're all finished, brushes, equipment, and people all clean up with soapy water. Best of all, Dutch Boy Latex House Paint costs no more than any other good paint. So, next time you're thinking of painting, why consider anything else?



A product of National Lead Company.

Pamper Your Camp Gear

(Continued from page 113)

its warmth. But repeated cleaning or washing harms down fibers. The answer is a cotton liner which protects the bag and can be removed for washing.

Eventually, though, your sleeping bag will get dirty. If you decide to have it dry-cleaned, make sure you take it to an establishment that handles such items as down comforters and pillows.

Down Bags Need Extra Care

Down bags can also be washed, but this is a job requiring time, care and patience. Don't use detergents as they have an oil-removing action that injures down. Instead, use a mild, pure soap and warm water. Stubborn spots on the casing can be treated with a solution of one-part household ammonia and four parts of water. Because of its size and bulk, one of the best places to wash a sleeping bag is in the family bathtub. After thorough rinsing, a clean towel will help to remove some of the moisture and will speed drying.

Drying is at best a slow process. It can be done in a commercial dryer at low heat, but the recommended method is putting the bag outdoors in a breeze. Throughout the drying, the down must be fluffed often.

Besides care in cleaning, down bags need care in repairs. Before storage they should be checked carefully for any rips or holes. These should be sewed or patched promptly. Moths won't attack the material normally used for covering, but they do like down and will find holes no matter how small. For the same reason wool liners should never be left inside sleeping bags while they are stored.

Down also deteriorates from oxidation. Vacuum-packed bags have been stored for several years by the Army and retained most of their original loft, while bags left out in the air and light for a similar period would deteriorate. The best bet for yours is to put it loosely in a large plastic bag, or even a box with lid, and store it away from heat and light. When we had less space we kept our sleeping bags in large plastic clothes sacks hung over clothes hangers in a dark closet.

Synthetic-filled bags require about the same care as down bags in cleaning, repairs and storage. They can be dry-cleaned by a reputable cleaner. Some can be washed in your home machine (check the label for instructions), but take care to use a low temperature and speed, and a low temperature later in the dryer.

The sleeping bag's companion, the air mattress, also takes some care in maintenance and storage. Did you ever squeeze

the air out of a mattress and wonder about the white powder that comes out the vent? This is talcum powder put in your mattress to keep the sides from sticking together. If you plan to store your mattress flat or rolled, check to make sure it has been talcum treated. The best storage method is to keep the mattress slightly inflated, but this requires plenty of room.

By comparison with other camping equipment, insulated jugs and chests require little maintenance and preparation for storage. Just clean with water and a light soda solution, and dry thoroughly. Then open the spigot, unscrew the cap or prop the lid open to allow air circulation. This insures a clean container when camping time rolls around again.

One of the most startling things we found in our search for camping equipment storage hints is that white gasoline used for stoves and lanterns can "spoil." For this reason, and because full tanks are storage hazards, pressure-type gasoline stoves and lanterns should have their tanks emptied. Otherwise, fuel tubes and generators can be clogged with residues. Remove tank caps and open valves wide to allow air circulation. Just to be on the safe side we dispose of any extra supply of gas we have on hand and start over completely fresh in the spring.

Even the wire grate of your stove can be given a longer life by brushing with petroleum jelly or coating with aluminum paint before putting the stove away. The jelly or paint will burn off on the next use. Fall is the time, too—as we remembered in our supper-less camp—to check all working parts and replace defective ones.

Care of a gasoline lantern is essentially the same as for a stove. Make sure the tank is empty, valves and caps open. Check operating parts, and replace if needed. Pump leathers of both lantern and stove should be protected from shrinking by applying a good grade of household oil.

Once the before-storage maintenance is completed, you come to that last step: finding a "cool, dry, dark place" for storage. Usually this isn't much of a problem for homeowners, but apartment dwellers often have to be more ingenious. We solved our problem by using our tightly-built pickup camper unit as a storage closet for our camping gear in the off-season.

Basement lockers frequently provide space in apartment houses, or you may be able to use part of a large clothes closet.

But no matter what type of space you set aside, remember the most important step in storing your equipment comes *before* storage. Clean, well-maintained camp gear is twice as much fun to use and you'll find it lasts twice as long. ★★★



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Gun That Broke Barriers

(Continued from page 110)

are identical in general shape. But the .223 is half the size of the .308. The AR-15 gun itself is about five inches shorter than the M-14. Both weapons are gas operated, and both have peep/blade sights, although the AR-15's sight is mounted on a raised bridge atop the gun, providing a built-in handle.

A far cry from the common .22 rimfire, the AR-15's .223 cartridge is actually what sportsmen call a "varmint" round. It looks like a scaled-down .30 caliber, and is effective on very small targets at long ranges. The slug also has a tumbling action and increases its killing power by "exploding," when it strikes a hard object such as bone.

The new AR-15 was born in 1956 when the Armalite Division of the Fairchild Engine and Airplane Corp., joined the competition to supply the Army with a replacement for the old semi-automatic M-1. That gun was a .30-caliber machine rifle, designated AR-10. It did well in tests, but the Army decided on its own T-44 adaption of the basic Garand design, which became the M-14.

In 1957 the Continental Army Command, working on new ideas and tactics, asked manufacturers to develop a .22-cal-

iber lightweight rifle to fit the .222-Magnum cartridge that Remington had developed for varmint shooting.

Armalite responded with a scaled-down version of the AR-10, which they labeled AR-15. It, too, was turned down when the Army decided that the performance of the .22s was not sufficiently good to make a change from the proven .30-caliber system. Undaunted, Fairchild licensed the Colt Firearms Co. to produce the rifle, and it was given a new lease on life.

Siege Gun

Colt first promoted the rifle in the U. S., mainly to the Air Force and to police departments and prison guard organizations. The police who bought it used it as a siege gun or roadblock weapon.

The Air Force finally tested the AR-15 thoroughly at Lackland Air Force Base in 1960. Their results were unequivocal, and the AR-15 was finally recognized. The Air Force recommended that it become the standard shoulder rifle of the Air Force.

Colt now went overseas with the AR-15. By late 1961, a quantity of the new guns had been issued to South Viet Nameese forces as a sort of test.

At the much-publicized embattled village of Binh Hung, south of Saigon and

(Please turn to page 212)



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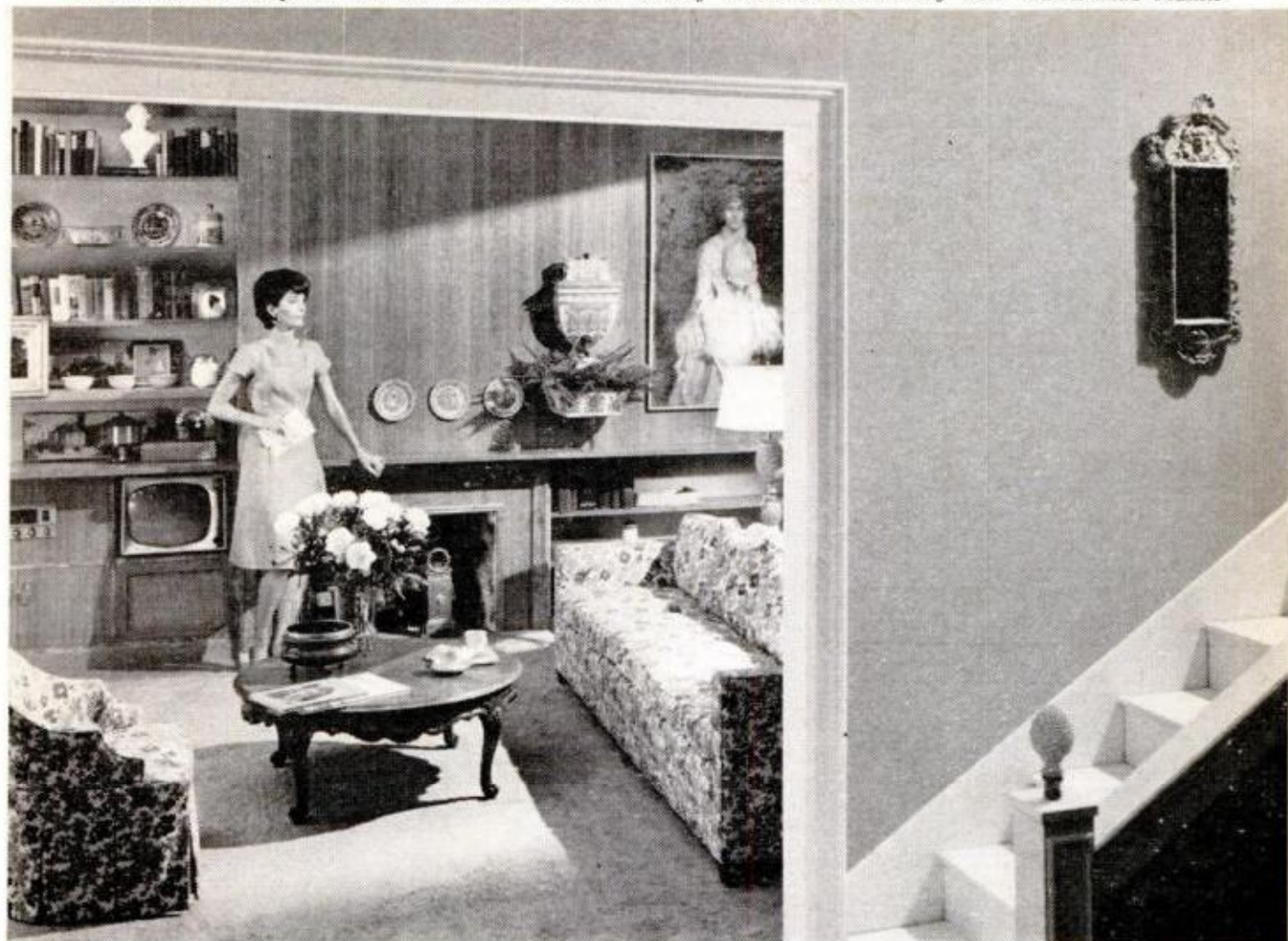
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Gun That Broke Barriers

(Continued from page 210)

near the Gulf of Siam, the AR-15 replaced the BAR and the M-1 as the favorite weapon of the battle-tough villagers.

Binh Hung is the creation of a soldier-priest, the Rev. Nguyen Loc Hoa. Father Hoa, an ex-officer in the Chinese Nationalist army, led 375 settlers from South China to Binh Hung after his government fell to the Communists. At Binh Hung, they found not peace, but the Viet Cong, the communist guerrilla forces. Father Hoa built his own army, scrounging haphazard armament where he could.

About this time the Binh Hung Self Defense Corps got their hands on a supply of AR-15s. They proved to be just the ticket for Binh Hung's war. Pounds lighter than any comparable weapon, the high rate of fire and easily-directed accuracy gave good results both against the hit-and-run Viet Cong ambushes and in perimeter defense of the village during assaults.

Later, when our own Special Forces troops got to work in South Viet Nam, a significant number of them chose to use the AR-15. These highly-trained, free-wheeling and independently-operating specialists get a lot of leeway from the

Army. Among their many skills, each is a qualified weapons expert—not just a good shot, but capable of using anybody's weapon, captured or issued.

They carry whatever guns they like. Some use carbines, some like sawed-off shotguns or sub-machine guns. It's up to each to make up his own mind.

That bit of current history explains why the U. S. Army is budgeting now for the purchase of AR-15 rifles. The little gun proved itself in battle more or less on its own hook. The troops want them, and the man on the front line is difficult to ignore.

The Air Force, on the other hand, always liked the AR-15. They bought it and helped to keep it alive. For them it is a prime weapon. It's suited to and used by Air Commando troops and by Strike Command forces, as well as for routine guard duty and air base defense.

The future of the AR-15 is assured. Whether or not it will replace the M-14 is still an unanswered question. The M-14, with its standardized 7.62, NATO caliber (.308), has not yet replaced the M-1. A total of 1,120,600 M-14s have been manufactured or are on order. This is not enough to meet the requirements of the Army's 16 divisions for replacement rifles,

(Please turn to page 214)



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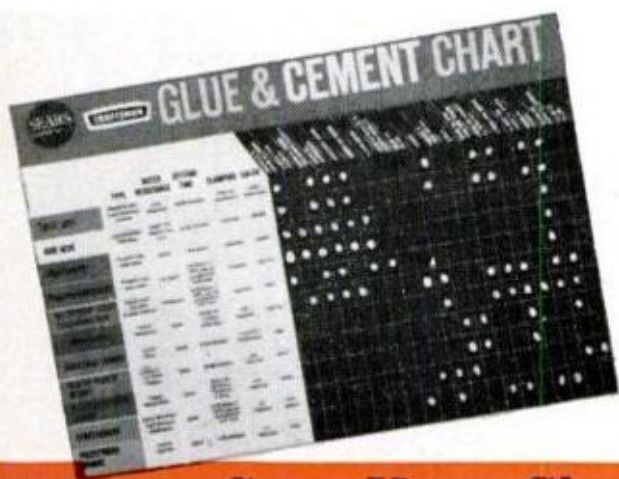
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Gun That Broke Barriers

(Continued from page 212)

the Reserve forces and the National Guard. As yet, however, no decision has been reached on orders for additional M-14s in 1964.

All this does not mean that the M-14 is not a good rifle. It is, in fact, a superior military rifle. In the U. S. tradition, it is hard-hitting and extremely accurate, and unlike the tradition, it has a soft recoil—less than a 20-gauge shotgun and infinitely more comfortable than the M-1. In full-automatic fire, as a light machine gun, it's still accurate and controllable, and it hits hard at the target.

Big Gun, Little Weight

The only trouble with the M-14 is that it is too much rifle. An AR-15-armed soldier can carry his rifle and 100 rounds of ammunition—with three pounds of weight on his belt, not in his hands—for the same total load an M-14-equipped man carries in a loaded gun alone. Three pounds is 80 rounds of AR-15 .223 ammo, packed in aluminum 20-round magazines.

Finally, though the M-14 is ballistically superior, the AR-15 is good enough. The M-14 hits harder, but how hard must you hit a man? Viet Nam users of the AR-15 say "As hard as the AR-15 does."

And that is the final word. This is the gun that fought its own battle and won it shooting bullets, not words, and producing dead enemies, not press releases. For the AR-15, battle was the payoff. ★★★

Living Insecticide

A new "live" insecticide that's said to be deadly on bugs but safe for humans, live-stock and wildlife will soon be available. Thuricide 90T differs from the conventional insecticide in that it kills bugs through infection and disease rather than poisons. It contains germ spores that are held in liquid suspension until swallowed by an insect. The spores first paralyze the bug's digestive tract and then kill it through a massive infection.

Thuricide has been certified as safe by the Food and Drug Administration and is licensed for use on alfalfa, artichokes, broccoli, cabbage, cauliflower, celery, lettuce, melons, potatoes, tomatoes and other crops, including forest trees. It may be sprayed on any of the approved food crops right up to harvest time.

Marketed by Stauffer Chemical Co., Thuricide is one of the types of bug control advocated by Rachel Carson in her book *Silent Spring*. (See *And Was It a Silent Spring?* in June, 1963, *PM*.)

How to pick the right glue for every job

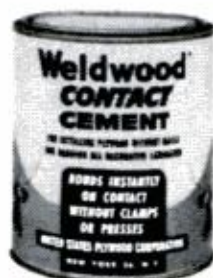
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Don't Let Brake Fluid Kill You

(Continued from page 100)

washing around the brake area. Often the master cylinder is located right next to the engine itself. Yet most substandard brake fluids boil at less than 300 degrees.

This characteristic is responsible for the so-called "phantom failure." "Because of phantom failure," says Congressman Kenneth Roberts, chairman of the House Health and Safety Committee, "brake failure doesn't show up in accident statistics as often as it should." He blames misleading figures for the failure of many states to pass tough, effective brake-fluid laws.

Precisely establishing the boiling point of your brake fluid sample is difficult, but the checks we've listed can identify other shortcomings that will warn you away from dangerous products.

U.S. manufacturers generally didn't oppose the new standards set in the Federal law. Most asked only for clarification. After passage, however, some began to pressure officials to ignore enforcement on export fluids. They wrote to the Secretary of Commerce, telephoned other officials with their stories that U.S. safety standards aren't necessary for foreigners and that cut-rate competitors make it too hard to sell safe fluid abroad.

But in Chile, for example, where heavy ore trucks grind for miles down steep grades to the sea, maintaining brake-fluid level is especially difficult. With the heavy braking and extreme heat, there often is little fluid left at the end of the trip. *PM* found that it's standard procedure there to top off the brake system before every trip back up to the mine. And even so, brake failures aren't rare.

One federal official told *Popular Mechanics*, "It was a real eye-opener to me that otherwise reputable firms are so concerned with price. . . . Of course they realize that if the product is good it will last and they'll lose a repeat market."

The Commerce Department answered the high-pressure pitches with an article in its magazine "International Commerce," urging U.S. businessmen to sell reliable products overseas. They could compete, the department suggested, based on safety or the longer life they made possible for brake systems.

Government Testing

Brake fluid bought for government vehicles is tested at the Army Coating and Chemical Laboratory, Aberdeen Proving Ground, Md. More than once, Army chemists have taken cans of cheap fluid from the shelf and found their contents turned to jelly. Usually this comes from traces

of moisture in the can. Your brakes, of course, are constantly exposed to moisture, so a legal fluid must now continue to flow even when wetted by water.

The Aberdeen chemists have found 26 brands of fluid that meet the very stiff federal purchasing standards, but, since many brands include various grades, the scientists won't release their approved list for fear of misleading the public. Legally, however, any fluid now shipped across state lines must meet standards almost as high as the purchasing specifications for federal use.

The experimenter who wants to probe deeper than the simple tests mentioned will need a lab, special test equipment and materials, and a set of specifications with the full details on the tests for residue and corrosion, boiling point, effect on rubber, compatibility with water, lubrication and evaporation.

For the specs, send 50 cents to the Society of Automotive Engineers, 485 Lexington Ave., New York 17. Ask for SAE J70b.

Determining Boiling Point

Boiling point, perhaps the most critical brake-fluid characteristic, may be the hardest to determine. Since some fumes may be toxic, you'll have to use a distilling flask and, preferably, a fume hood. The SAE technique, now standardized by law, is shown on page 100. With 60 cc. of fluid in the 100-cc. flask, adjust the heat so the fluid boils in 10 minutes. Over another 10 minutes, readjust until the reflux (vapor that condenses in the upright Leibig condenser) falls back into the flask at a drop or two a second. The fluid temperature then, corrected for barometric pressure, is the boiling point.

Temperature-control equipment is necessary even for approximations of the official tests. Strips of brass, copper, tinned iron, cast iron, aluminum and steel, well cleaned and fastened together, can be soaked, along with a rubber brake-fluid cup, in the fluid sample for five days at 210 degrees in a lab oven. Stains and discoloration are allowed, but visible corrosion or pitting disqualify a sample. Or if the rubber is tacky or carbon black sloughs off the surface, the fluid is below standard. By the new rules, this would make it unacceptable.

Test metal strips and brake-fluid cups are available from Chemical Specialties Manufacturers Association, 50 E. 41st St., New York 17. A kit of the strips costs \$13.50. Natural rubber cups come in boxes of 50 for \$17.50.

A complete brake-wheel cylinder assembly, rust-preventative oil or old fluid

(Please turn to page 218)

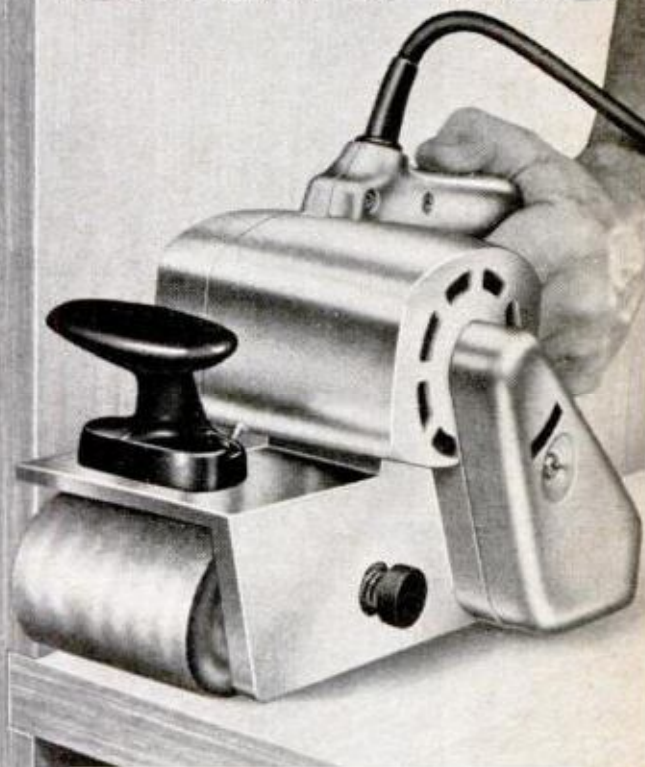


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Don't Let Brake Fluid Kill You

(Continued from page 216)

removed, should show no corrosion or hard or gummy substances after being filled with test fluid and held at 158 degrees for two weeks.

A weighed sample of fluid in an open dish, subjected for two days to a bath of dry, 210-degree air, should lose no more than 80 percent to evaporation.

Mix 3.5 parts of distilled water with 100 parts of fluid and hold the combination at 140 degrees for 24 hours. The mixture should stay clear enough for you to read this page through a filled test tube. No layers or precipitation should show up.

Not all substandard fluid comes from clip manufacturers. Congressman Roberts points out that some are simply out of date, that some unacceptable fluids were quite satisfactory until the post-war period when horsepower increased and heat dissipation was slowed down. While the new law was under consideration, the National Safety Council told Congress that honest brake fluids that were perfectly safe in 1953 may be killers by 1963. On a hot day it's possible for mere stop-and-go traffic driving to bring about the failure of the old moderate-duty fluids

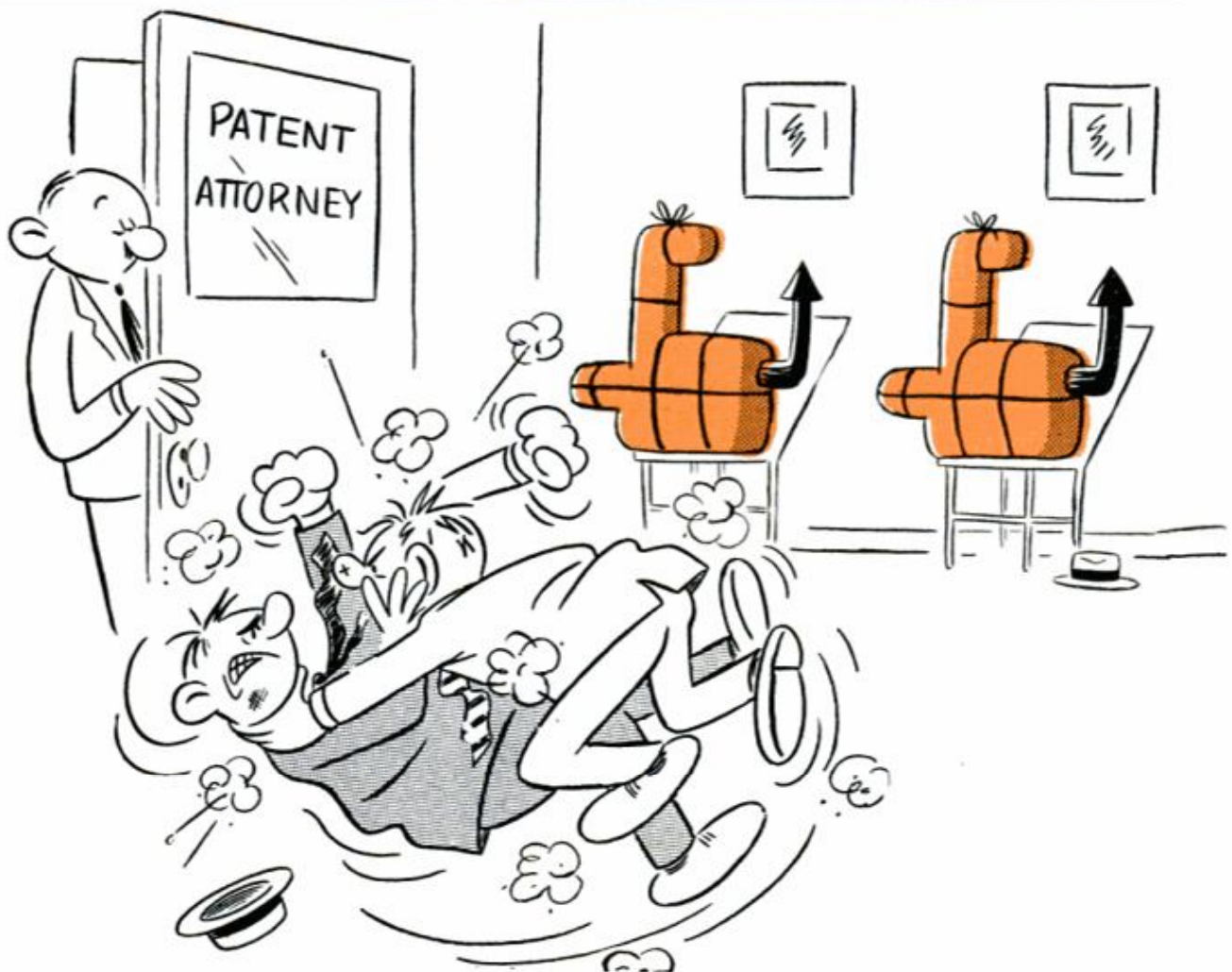
now outlawed. And high under-hood temperatures could have a similar result even on the expressway.

Granted that you now can recognize the signs of danger—what do you do when you see them? When brake fluid doesn't look right or pour well or has corroded its can, report it to the nearest U.S. Attorney's office or write to the Criminal Division, Department of Justice, Wash. 25, D.C. Some sharp operator may get a year in jail to think over the game he is playing with other peoples' lives. ★★★

Bullet Stuns Animals

A new bullet that renders an animal insensible to pain before slaughtering is said to be totally safe for nearby workers.

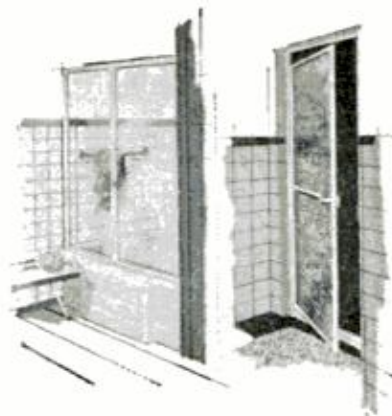
Winchester's "Num-Rite" cartridge is a compact of unbonded, powdered iron that is "caked" by a special press to form an elongated projectile. The cartridge tip is crimped. When it is fired, gases force the crimp to expand and the projectile emerges. Although it enters the animal's cranium as a solid slug, the projectile instantly reverts to its original form of thousands of tiny iron particles which blanket and numb the nerve centers in the cranial area. There is no ricochet, the manufacturer says.



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Cosmic Clinic

(Continued from page 86)

nary in appearance, arrived at the laboratory; it brought with it a major headache. The bolt, along with several others, had been installed on the launching pad to anchor the hold-down arms. These arms, during launch, pin the rocket to the pad for three to four seconds until thrust builds up to the proper point.

Several dozen of the bolts had been installed and one of them had failed. A minor matter? Not when another multimillion-dollar bird is poised on the pad. If several of the bolts sheared during blast-off, the tremendous vehicle either would topple over like an exploding firecracker, or go haywire the moment it left the pad.

Because another launch was impending, that innocuous-looking bolt put Wagner and his space coroners on a 24-hour crash program to pin down the cause of failure. From the standpoint of design, the bolt was more than adequate. From the standpoint of material, the alloy was suitable for its purpose. Why had it failed?

The coroners set up a laboratory test which simulated the stress on the bolt, enabling them to calculate the point at which it would *begin* to fail. Then they examined the crystal structure of the metal at this precise point. Photomicrographs revealed flaws that were the result of uneven stresses built into the part during the manufacturing process.

Bolt Full of Headaches

Next question: Was this the only faulty bolt, or would all the bolts shear under the incredible stress of a rocket on a three-second leash? To postpone the launch would cost thousands of dollars. To go ahead would be gambling with the fate of a multimillion-dollar bird. Wagner requested that a dozen more bolts be removed and flown to his morgue for analysis. With only hours to go, the scientists analyzed the amount and direction of stress on each of the bolts. As a result of the tests, the experts made the decision that they would hold the leash, and flashed the go-ahead to the pad. The bolts held.

In another case, an aluminum tube, part of the framework of the rocket, failed. At their inquest, Wagner and his coroners discovered that traces of moisture had been sealed inside the tube during the welding and quenching process. They calculated what would happen to this moisture in the presence of liquid oxygen (LOX) at a temperature of minus 297 degrees F., and found that this would drastically affect the strength of the tube. As a result of their revealing findings, all such tubes now

are made of solid aluminum bar material.

Occasionally, due to an explosion in the presence of liquid oxygen, there's not even a metal body to postmortem. In such a case, Wagner and his group can only pick their own brains and the brains of other scientists at Huntsville. They sit for hours, trying to pin down the total environment of the rocket at the moment it exploded, and precisely what was happening at every point inside the rocket at that instant. Their attention gradually begins to focus on a certain part that may have been LOX-sensitive; it had the deadly ability at that moment to touch off an explosion in the presence of liquid oxygen. Laboratory tests then confirm or deny their suspicions.

It Can Be Human Failure

Sometimes they find that they have a problem, not of hardware, but of humans. Stumped by the cause of a failure, they begin questioning the firing team. On one occasion an operator suddenly remembered that he momentarily had punched the wrong button. The part didn't fail; the human did.

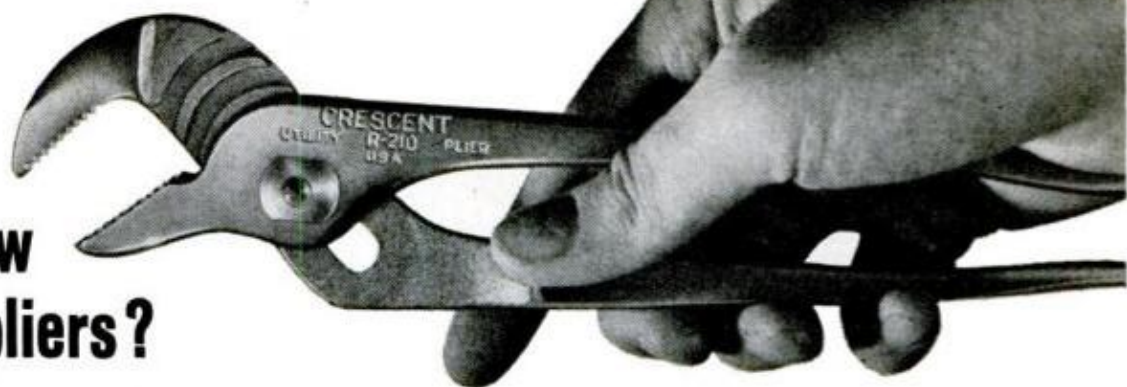
An important instrument in their analysis is photography—everything from microphotography to high-speed and stop-motion movies. The man in charge of mugging the rockets is Bob Sandlin, a 35-year-old former photographer on a B-29, and an expert at photographic innovation. Once, faced with the problem of snapping a portrait of a part buried within the guts of the rocket, he lined up a series of mirrors at precise angles to bring the image out to his camera lens. It was Sandlin who photographed the first nose cone that came back from outer space, and his photos of other nose cones melting away in the laboratory have done much to determine the shape and structure of the facial features of our future rockets.

Much of Sandlin's work is done in color. His photomicrographs of the grain structure of metals are iridescent works of art. Recently, two requests came in for framed prints of these photos. One was from a Canadian firm that wanted the splashes of color as the focal point of the decor in the board room; the other was from an art school that wanted prints as examples of fine abstract art. Sandlin is color blind.

The scientific Vic Tanny who takes the "paunch from the launch" is Conrad Hoffman. His job is to pare every ounce of fat from the rockets. For every 10 ounces of fat removed from the Saturn C-1, one extra ounce of man or machine can be hurled into orbit. Hoffman maintains a running weight-record of each vehicle from the time it is only a concept until it is

(Please turn to page 222)

What's new in utility pliers?



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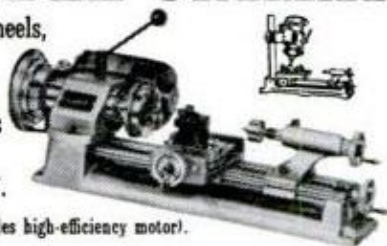


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Cosmic Clinic

(Continued from page 220)

on its way into orbit, to the moon or Mars.

As work on the vehicle progresses, each of the thousands of parts is given an estimated weight which is entered in Hoffman's log. Soon a target weight is set for the whole vehicle. The weight of some parts inevitably must be revised upward, and Hoffman must find corresponding fat to pare off others. He juggles pounds here and pounds there, shaping up the Saturn with all the care of a movie star's masseuse. About a year ago he was asked to guarantee the lift-off weight of the whole Saturn vehicle within 1½ percent. This is like predicting what your wife will weigh one year from now, and coming within a quarter of a pound. Today, that target weight is precisely the same as a year ago.

Gene Carpenter, another scientist with unique talents, actually does the weighing in, but with nothing as simple as an ordinary scale. There simply are no scales adequate to handle the huge vehicle. Working in his own world of algebraic equations, protractors 140 inches in radius, and knife-beam balances, Carpenter not only calculates the total weight of the finished vehicle, but also its center of gravity and inertia. He determined the weight of the last Saturn—which tipped the theoretical scales at 103,000-odd pounds—within 350 pounds, a phenomenal achievement. Furthermore, he may well have been right on the button, for there's no way of calibrating the "scale" used on the pad (actually a matter of calculation) with the "scale" Carpenter uses in his world of algebra and homemade instruments.

Vanishing Fuel

When the rocket is on the pad, or on its way through space, the vital problem of keeping track of its weight becomes a nightmare. The rocket, basically, is a fuel tank with a means of burning the fuel. As a rule of thumb, the fuel weighs 10 times the weight of the hardware. Computers are used to determine the amount of propellant to put aboard each stage. As the big bird stands there, a certain amount of the fuel boils off and the bird gets lighter. How much fuel can be boiled off without endangering the mission? That's the kind of hair-raising question Carpenter's team must answer all the time. And the answers have to be right on the nose.

Hoffman's weight calculations follow the big rocket as it streaks through and beyond the atmosphere. Saturn I burns fuel at the incredible rate of 6000 pounds per second. The inertial characteristics of the rocket obviously are in a state of constant

change because of this rapid alteration in weight. Furthermore, all the fuel in any stage can't be consumed. The acceleration of the rocket pressurizes the fuel, forcing it down into the thrust chamber, but as the fuel level falls and the rate of acceleration declines, the tank reaches a point where it must be pressurized. And beyond that, it reaches a point where the rocket will fail if the engine is not cut off. This leaves residual fuel aboard, still unburned when the stage is jettisoned—fuel that Hoffman had to calculate carefully at least a year before the moment of truth out in space.

The group of "surgeons" at Huntsville operate in a captive environment of filtered air, enameled walls, nylon gloves and huge hermetically sealed packages. The air in their "surgery" is completely cleaned and sterilized every three minutes, and as they work they wear hospital gowns and sterile caps.

Don't Even Want Dead Germs

Even *dead* germs aren't welcome here. One of the surgeons points out that "enough dead germs could clog a valve pore to cancel a multimillion-dollar space probe." The surgeons' "patients," for the most part, are valves that are to be fitted into the heart of the rocket. One six-inch valve, for example, weighs less than 1½ pounds, yet its 203 parts have the vital function of maintaining constant pressure on the gyro bearings. If it fails, the vehicle may well veer off to an unscheduled point on the interplanetary timetable.

Sterility is virtually absolute. The first thing that's needed is a purified purifying agent, so a batch of alcohol is filtered 32 times through special filter papers. It then serves as a bath to clean and sterilize the parts. If a subsequent inspection under a high-power microscope reveals even a fingerprint, the part is scrapped.

The vital surgery is performed inside a huge air-inflated plastic bubble. The surgeons manipulate the parts into place, wearing gloves built into the chamber walls. The completed valve then is stored in an oven to maintain its sterility until the moment it is transferred to the heart of the vehicle.

Space travel, still in its infancy, requires diapers—along with a good many other odd items. Obtaining them sometimes brings headaches to the Supply and Management Section at Huntsville. Because diapers are relatively lint-free, they are used to clean and polish lenses on the countless instruments at the space center.

Men's underwear? One type, also lint-free, is worn by technicians whenever they

(Please turn to page 223)

enter one of the dust-free enclosures to work on a rocket. They also requisition tennis shoes and bedroom slippers to prevent scratches on sensitive parts.

The supply section provides dental mirrors for examining hidden parts and castor oil to lubricate bearings. Some time ago, the space quartermaster sent out an order for several thousand empty beer cans—to be used in slosh tests of the huge fuel tanks. Once a requisition came in for air-raid sirens and a 105-mm. howitzer. The startled supply officers soon learned the items were to be used in vibration tests and promptly provided them.

Tailors on a Giant Scale

Perhaps the biggest tailor in history—as far as his job is concerned—works at Huntsville. Donald Fisher's job is to tailor protective suits for Saturn. The current version of its physique is a bit paunchy around the middle, and it has mighty narrow shoulders, but it stands 165 feet high and has a 67½-foot waistline. It takes a whopping 800 yards of nylon and vinyl fabric to cover the monster, and the finished Sunday suit weighs 400 pounds. Fisher turns out the form-fitting garment, a handsome sea-blue job complete with zippers and belts, on a commercial sewing

machine. It takes a crane and a crew of workmen to work the voluminous garment over the contours of the giant missile. It is, in effect, something like trying to tug a slinky gown over a fat lady's head.

These are just a few of the men with unique talents who have been working for years toward one specific period that lasts only 120 seconds. That's how long the engines on the Saturn booster operate. Then, spent and useless, the huge booster falls away, and the labor of thousands of these men is swallowed into the depths of the ocean.

Only a handful of the men actually see their product head for the heavens. But because of the intense mental and physical labor that goes into each booster, thousands of men form an emotional attachment for it. When the big bird finally stands on the pad at the Cape, the countdown is piped into every building in the Huntsville space center. There is a pause in the frenzied work as the rocket arcs out into space and the automatic systems take over. A good many silent prayers follow the bird into the skies.

As this is written four Saturns have actually been fired from the pad in full-scale tests.

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Owners Report—Volkswagen

(Continued from page 81)

"In winter driving, the windows fog up and the heater doesn't heat up fast enough."—Ohio teacher.

"The heater doesn't put out unless the motor is turning about 30 miles per hour."—Kansas salesman.

This heater shortcoming is inherent in air-cooled engine design. There's no water jacket to catch and hold the heat given off by combustion when engine idles. Corvair solves the problem in part by recirculating all the cool air around the engine 'till it warms up.

"It sways at high speeds with gusts of wind."—California engineer.

"Contrary to manufacturer's claim of very low wind resistance, I find steering quite troublesome when driving in winds over 10 m.p.h.—California airman.

"On windy days it has a tendency to weave."—New Jersey accountant.

We're told that VW owners commuting via San Francisco's windswept Bay Bridge put sand bags up front to curb their beetles' wanderings.

"Need a fresh-air system to demist in summer time."—Maryland salesman.

"I do not care for the defrosters in cold weather."—Montana surveyor.

We care for them even less in the summer; they'll roast peanuts before they demist. Most owners carry a clean, dry cloth—the poorman's demister.

"I would like more power, but I realize with more power I would lose on economy."—California teacher.

"Not enough power for safe passing or hill climbing."—California teacher.

"It's underpowered on long, grinding grades."—California rural mail carrier.

This is a legitimate complaint. VW management answers by pointing out that in order to have extra power on tap for occasional need they'd have to provide a larger engine (which would use more fuel), or add more gear ratios (which would mean shifting through five speeds) or soup up the present engine (which would mean shorter life).

"The rear seat isn't ventilated enough to suit me."—California builder.

"There are no roll-down windows in back seat and no ventilation for front feet."—Colorado student.

Swing out rear windows can be ordered from factory at \$26.95, as well as the sun-roof for \$90, but there's no factory solution for hot front feet.

To put the emphasis back on the affirmative, here are items six through ten that VW owners praised:

"It is built to give good, honest service, while not doing away with nice interiors and comfort."—California teacher.

"The body doesn't rust out like the Detroit models do."—Indiana technical writer.

"It's practically trouble-free compared to four previous U.S. cars I've owned."—Georgia warehouseman.

"It takes little care, and what care it does need costs very little."—California medical technologist.

"It's a car I can depend on completely—when I stop driving a VW, it'll be because we can afford a Rolls!"—California housewife.

She may still keep the VW for downtown shopping trips.

"I like VW's reliability—it's always ready to go."—South Dakota restaurant manager.

"I like its ability to perform on long trips at a steady, high-speed pace."—Indiana policeman.

VW is designed to run at wide open throttle without overspeeding or overheating, making the most efficient use of the engine.

"It runs fast enough and I can average a speed of 65 miles an hour. Performance is perfect!"—Georgia attorney.

"The changes are improvements in the mechanical engineering areas and not in style or body design."—Illinois personnel representative.

In the order of their frequency, here are numbers six through ten from the owners' lists of their complaints:

"Windshield wipers do not seem strong or large enough (when snow collects, it is deep because windshield is straight)."—New Jersey secretary.

"Wipers do not do a good job during a rainstorm."—Connecticut draftsman.

This is one of the enigmas of the VW legend; how can they make a car that's so good, yet equip it with wipers so bad?

"They should change the battery location so water can be added easier."—New York clerk.

"Battery cannot be checked without lifting rear seat and removing kick panel to loosen clamp."—Utah college professor.

VW's hidden battery play is a minor, yet eternal nuisance. But, come to think of it, where else could they put it?

"My personal relationship with numerous Volkswagen dealers over a 3-year period (I've had 3 VWs) has been very poor. They have the attitude a person is very lucky to have a Volks and should not complain if something goes wrong. I've had great difficulty in getting warranty work

(Please turn to page 226)



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Owners Report—Volkswagen

(Continued from page 224)

done on defective parts and workmanship."
 —Missouri doctor.

"Dealer service is fair when you can get it, but they have all the business they need and they know it. I went to them three times before I got a new signal flasher and then I had to put it on. It took two minutes; they said they did not have time!"—North Carolina electronics technician.

"The car is very good, but as good as the car is, it is only as good as the service, and that is rotten."—Massachusetts tool maker.

Here's the only real rotten apple in VW's barrel—some dealers who do not support the product as it deserves. Eliminating these dealers should be top priority ahead of heater and wiper improvements.

"My complaint is the very expensive authorized service and independence of dealers."—New Jersey meat packer.

"In general I like the car very much, but the service at VW dealers is often irritating."—Virginia engineer.

"Service charges for 3000-mile service are high."—California lumberman.

"The brake linings are too hard. They glaze and then squeak, which sounds terrible."—California marketing manager.

This is not a serious flaw, but it's one worth the expense of eliminating.

Our list of owner praises for the Volks is completed with numbers 11 through 16, in the order in which they were listed:

"The thing I like the most is the complete control the driver has with the direct steering. It gives the driver a feeling of driving a sports car."—Oklahoma telephone worker.

He's not just barking up a pole either. If you don't believe the sports car comparison, try driving VW's big sister Porsche.

"Driving-control qualities have improved vastly since 1961."—Maryland naval officer.

"Most of all, I like it because it is small."—Washington mechanical engineer.

"Every time we use the 'bug' for any reason we feel like we're out for fun."—Ohio housewife.

It's amazing how VW ownership affects people's driving personalities. Timid, elderly school teachers drive like frisky teenagers after they get behind the wheel of their VWs.

"A fun car—easy to drive, economical, surprisingly comfortable!"—New Jersey student.

"It's a joy to drive!"—Florida news circulation manager.

"I like that high resale value when I decide to replace it."—Illinois salesman.

"I like the fact that there's no planned obsolescence and that the car will look new next year and have high trade-in value."—Rhode Island teacher.

"I like the air-cooled engine with no worry of freezing or boiling over."—California graphic artist.

Not to mention leaking out!

To wind up owner reactions, here are numbers 11 through 16 of the complaints by Volkswagen owners:

"There's a louder sound of engine than in most conventional automobiles."—New York engineer.

"Noise at high speeds when windows are open."—Maryland insurance broker.

And in the summer they have to be open if you want fresh air—there's no fresh air inlet.

"The bumpers and hub caps rusted."—Connecticut X-ray technician.

"Bumpers not completely chromed; my right rear bumper rusted inside before it was barely two months old."—Michigan production control trainee.

It might raise cost of VW from \$1595 to \$1600 if factory added thicker chrome to bumpers, but we think practical-minded VW owners would gladly pay for the extra value received.

"Corner braces near windows make for poor visibility from the inside."—Massachusetts teacher.

VW's arched corner posts, wide rear panels around the back window, are annoying vision blockers, but to eliminate them some expensive redesign would have to be undertaken by VW.

"The directional signals are either not in a prominent enough position or bright enough. Other motorists don't seem to notice them."—Colorado dentist.

"Difficult to shift into first gear from standing position."—Maryland engineer.

"Difficult downshift into low gear and poor synchronizer."—Pennsylvania student.

He's right. The 2nd to 1st shift has been stiff on every VW we've ever driven, but at least it's synchronized and doesn't clash.

"My brakes have squeaked ever since I've had my car."—California foreman.

He's not referring to this hiss of noisy linings mentioned above; his trouble is a full-scale brake squeal.

That's it—the report by a representative group of VW owners who have rolled up a total of 2,352,944 miles on their new beetles. ★★★

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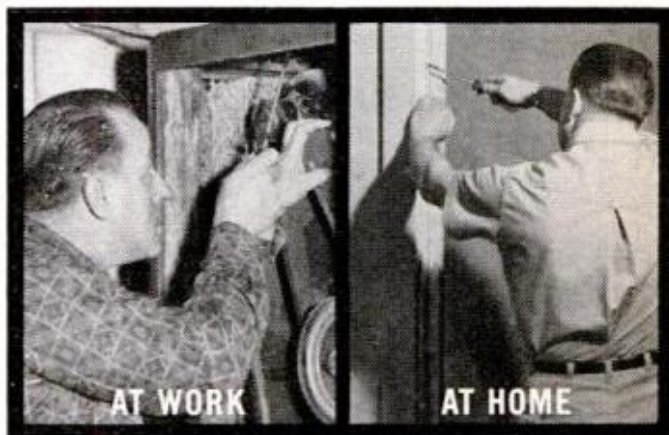


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Tiny balloons are now being used to remove clots from clogged arteries. Fastened to the tip of a long tube, a deflated balloon is inserted into the artery as far as it will go from an incision near the clot. It is then allowed to inflate and fill with blood, carrying the clot or clots with it when it is withdrawn. Local anesthesia is used for the operation which was developed at the Good Samaritan Hospital in Cincinnati.

Are We Getting Soft?

No, says a Finnish health expert. Dr. Martti J. Karvonen argues that the idea that civilization is growing soft is refuted by performances in the 1952 Olympic Games in Helsinki. Statistical studies show, he said, that athletes from the better-fed countries performed twice as well as those from countries with low-calorie diets.

Contestants from calorie-rich countries scored an average of 30.3 points in the Games, while those from calorie-poor lands averaged only 15.3 points. Athletes from primitive countries seldom win at international meets, says Dr. Karvonen. They may have suffered from several handicaps in life, including poor nutrition.

Wind-Driven Water

Wind, and not ocean currents or tides, is the prime mover of water on ocean surfaces. Nobel chemist Dr. Willard F. Libby of the University of California bases this conclusion on a study of tritium fallout from nuclear tests in the Pacific.

During the three-year moratorium on nuclear tests beginning in 1958, observations were taken on the artificial tritium that came down on ocean surfaces. Later, the tritium content of water samples revealed the movement of surface water.

"Fireproof" Carbon

Carbon, burned as fuel on earth, may turn out to be a "fireproof" structural material in space. Theoretically, carbon should burn three times faster than such space materials as tungsten and molybdenum. But at temperatures of 3000 degrees and pressures one-fortieth that at sea level, tungsten, for instance, actually burns 12 times faster than carbon.

A Westinghouse scientist explains the phenomenon by saying that carbon atoms exhibit "self control" once oxidation reaches a certain point in outer-space conditions. Other materials can't achieve similar controls and burn at speeds closer to their theoretical maximums.



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Fireproof, rotproof plastic planks are now being used to make boats and patio roofs. Radiant-heat room dividers may be next. Urethane plastic boats are said to be completely unsinkable. Read about it in October PM.

CUPRINOL

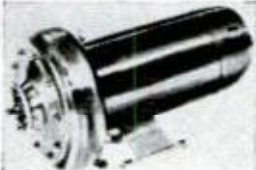
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1 3/8"	4"	1 1/4"	13"	6 lbs.	6 lbs.	\$ 4.95
2"	6 1/2"	9/16"	19"	6 1/2 lbs.	6 lbs.	\$ 7.25
2 3/8"	13"	1 1/4"	30"	11 lbs.	11 lbs.	\$14.50
3"	10 1/4"	1 1/2"	19"	15 lbs.	15 lbs.	\$12.95
3 1/4"	10"	2 1/2"	23"	29 lbs.	29 lbs.	\$15.75
3 3/4"	16 1/4"	1 3/8"	24"	30 lbs.	30 lbs.	\$26.95
4 7/8"	7 1/4"	2"	22"	30 lbs.	30 lbs.	\$24.75

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 Single Action **2000PSI** air/oil ***3000PSI**
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No. C 85

WRITE FOR FREE CATALOG

HYDE TOOLS SOUTHBRIDGE, MASS., U.S.A.

Bruise-Proofing Your Playground

(Continued from page 90)

danger and let a child take his chances, is just as wrong. No child can be helped by a severe injury.

What *can* be done is to make playgrounds as safe and attractive as possible, while keeping the equipment challenging and adventurous. Three elements of any playground must be carefully studied to ensure fun *and* safety: equipment, surfacing and—especially in public playgrounds—layout and supervision.

Most Dangerous Equipment

Which are the most dangerous pieces of playground equipment? The Hase study, which limited itself to accidents occurring in elementary school playgrounds during supervised school-activity hours, found that the apparatus with the highest accident rate was a kind of flying merry-go-round where kids hang onto ladders that swing out from a high pole. By grades, Dr. Hase discovered that kindergarten students had the highest accident rate on the slides, first grade on the seesaw, second grade, the hanging ladder and third and fourth grades the swinging ladders.

In the five-year Milwaukee survey, the swings seemed to be the chief culprit, leading the list every year. The jungle gym, horizontal ladder and horizontal bar followed in an order which varied each year.

The city which many consider to be number one in the nation when it comes to all phases of playground planning is Philadelphia. After having tested and used every kind of equipment, traditional and modern, city officials found that the jungle gym, seesaw and the old-fashioned wooden swing are most likely to cause injuries.

According to Ed Maurer, formerly Philadelphia's design and planning director, who is now in private practice as a landscape architect specializing in recreational design, "a child can lose his footing on a jungle gym, kick another youngster in the head and hurt himself at the same time.

"The major danger with seesaws," Maurer says, "is that one child may jump off unexpectedly. When this happens, the remaining child is apt to get a serious crotch or ankle injury."

Swings Can Hit Hard

"The old-style swing, with heavy durable wooden seats, can take out eyes and damage cheek bones if a corner smashes into a child's face. The new rubber belt swing, which in my opinion is the greatest safety advance in many years, will avoid this danger."

Manufacturers and designers recently

have been trying to get away from traditional equipment designs. One of the most startling developments is the so-called play sculpture, which often looks more like an abstract statue than playground equipment. These designs let children use their own fertile imaginations when they climb and explore.

Not quite so advanced, but still somewhat abstract, is such equipment as concrete turtles, spiral slides and small bridge and tunnel combinations. In place of old-fashioned jungle gyms, new playgrounds may include metal climbers designed to look like space ships or stage coaches.

In addition, the equipment is no longer painted a staid black or "playground green," but is finished in bright colors.

Manufacturers are constantly checking their designs for safety. David Aaron, president of the Playground Corporation of America, believes in constructing only stationary apparatus. "Let the children do the moving on the equipment," he says. He tries to eliminate all hazardous sharp edges and pinch spots, and makes the shapes and sizes of openings in such a way that small children can't get their heads wedged in them.

Restricting Falls

Frank Caplan, head of Creative Playthings, Inc., feels that one of the most important things to watch out for is the height from which children can fall. "If a child falls from a four-foot height," he says, "he is not likely to break anything. A six-foot fall, on the other hand, is apt to result in broken bones. We don't manufacture equipment where a child can fall more than five feet without being protected by some kind of guard or protective device.

"This is not to say that equipment should never be more than five feet high," he says. "There are nine-foot terraced sculptures, for instance, which allow a child to fall only three feet at a time. In 'play webs,' where children dangle, the important height is the distance from their feet to the ground."

Granted that the new equipment may be safer and better looking, do the kids themselves like it? There is no point in buying expensive new equipment if children ignore it as soon as the novelty wears off. And some authorities believe that much new "creative" equipment is designed mainly to please the eye of the parent.

In areas where the newer equipment has been installed, however, the kids seem to go for it in a big way.

Robert W. Crawford, Philadelphia's Commissioner of Recreation and one of the most highly respected playground ex-

(Please turn to page 232)

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NAME _____

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Bruise-Proofing Your Playground

(Continued from page 230)

perts in the country, reports that comparative records show an amazing 500 to 800 percent increase in attendance at playgrounds using the new equipment.

"Not only is the modern equipment safer in itself," Commissioner Crawford says, "but its very attractiveness gives it an extra safety value. A better looking playground draws more adults which means closer supervision of the children."

Surfacing is probably the most controversial element in playgrounds. Many still have concrete or asphalt surfacing. They are durable and inexpensive to keep up, but most authorities believe they are apt to cause injuries. As one playground man told me, "It only stands to reason that when a child falls on something hard he is likely to get hurt."

Surfacing Should "Give"

The ideal material to place under swings, climbers and other apparatus would be something with "give" to it. But what?

Many playground men, including Commissioner Crawford, are strong believers in tanbark, which is made from the bark of such woods as chestnut or hemlock.

Tanbark is attractive, resilient and fairly easy to maintain. Under proper drainage conditions, it will not become soggy. Philadelphia places tanbark six inches deep and finds that, if correctly cared for, glass and other objects will not become embedded in it.

There are some disadvantages to tanbark however. While it won't ignite into a blaze, under certain conditions it will smolder. Also, it must be picked up and turned over occasionally with a spading fork to keep it from packing down too tightly. Finally, tanbark will disintegrate after a number of years and, though it doesn't splinter, must eventually be replaced by putting more on top.

Despite this and the material's relatively high cost, many experts are convinced of tanbark's superiority. "We will try anything," Commissioner Crawford says, "but tanbark is the best surfacing we've found so far."

Other authorities, however, believe that a rubber mat type of surfacing, such as Safety Surf manufactured by Mitchell Rubber, Inc., is the best material to place under equipment. The matting is made in interlocking sections and is installed by means of recessed bolts. It is made of Butyl rubber, is one inch thick and has a life expectancy of some 10 years. Among the cities that use it is Los Angeles.

Sand is also used in some playgrounds,

as are cork and wood shavings. One of the latest materials to be tried is a compound made from ground-up tree stumps.

For back-yard playgrounds, grass is both resilient and beautiful. But it's difficult to make grass grow properly under the equipment where kids are constantly playing. Tanbark, because of its landscape qualities, may be an attractive substitute.

In the area of planning and supervision, the main thing is to keep children of different age groups apart. When older children have access to areas reserved for three- and four-year-olds, the younger children can easily be bowled over and hurt. A proper playground is fenced and laid out in such a way that the older children will not have to cross the younger tots' section in order to reach their own.

Another practical suggestion is to make preschool equipment look the part so the older group will think it is too "babyish."

There are many things that can be done to make playgrounds safer—both in the community and in your back yard. Though experts may not agree on things such as the type of surfacing to be used, there is fairly general agreement that some kind of resilient surfacing is better than concrete.

Even a small start will help. The replacing of heavy wooden swings with light-weight belt seats, for example, might save an eye, a broken cheek-bone or even a child's life. ★★

Ultrasound Diagnosis

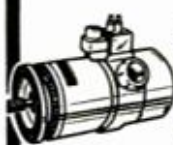
X-rays may be replaced as a diagnostic tool by a much safer ultrasound picture-taking technique. The new procedure does not cause genetic damage to the body, according to researchers at New York's Columbia Presbyterian Medical Center. Though not yet perfected for all diagnostic procedures, ultrasound pictures, called ultrasonograms, are already being used for detecting multiple births and for distinguishing between a benign ovarian cyst and ovarian cancer.

No adverse effects were observed in mice exposed to the ultrasound equivalent of high X-ray irradiation. Follow-up observations of offspring born to exposed mice, even to the seventh generation, failed to disclose any bodily damage usually expected with X-rays. The mice showed no inclination to sterility, abnormalities or decline in litters.

Improving visual clarity of the pictures will permit ultrasound to be used for other diagnostic procedures.

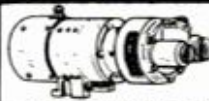
American researchers, however, aren't alone in developing ultrasound. Reports indicate that the Russians may even be ahead of us in the field.

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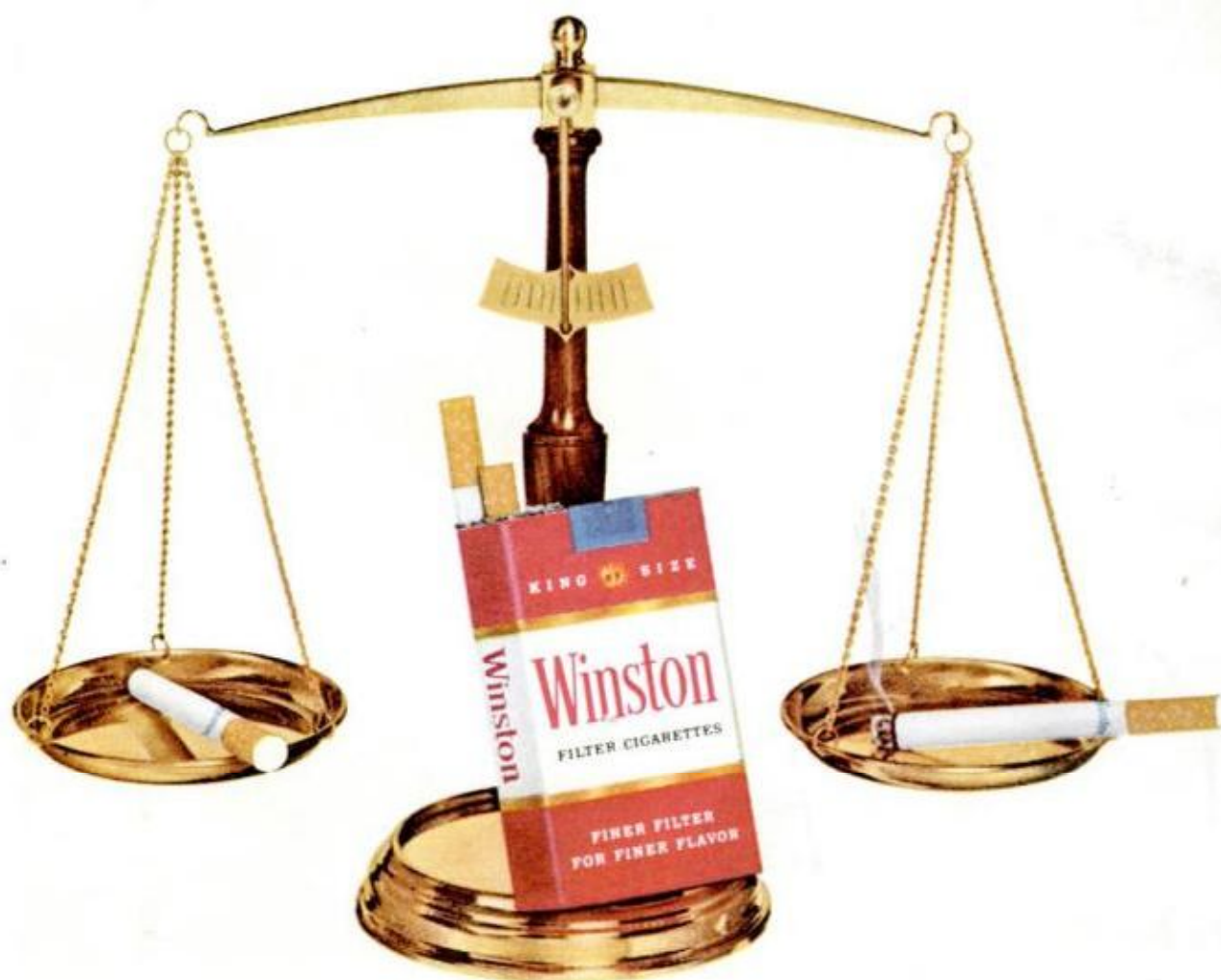
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