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POPULAR MECHANICS

OCT. 1963
35 CENTS

1964 CARS IN COLOR . . .

Proving Ground Reports

New Car Specifications

Testing CHEVELLE



Dunking the 1964 Dodge

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Tool Plans**

• POWER RASP • SANDBLASTER

9 reasons why the boot that climbed Annapurna II is the best all-around boot for you

The Oneida! A boot that can take the world's toughest terrain! A light weight boot, yet warm and comfortable in sub-zero cold! This famous boot that climbed the Annapurna II can take anything you'll encounter hunting, fishing or on the job! Here are the reasons:

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9. **Durable rubber compounds.** Scientifically adapted to stand up under hard wear.



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All day walking comfort for farmers



Better traction for line-men



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NEW '64 DUO-GLIDE

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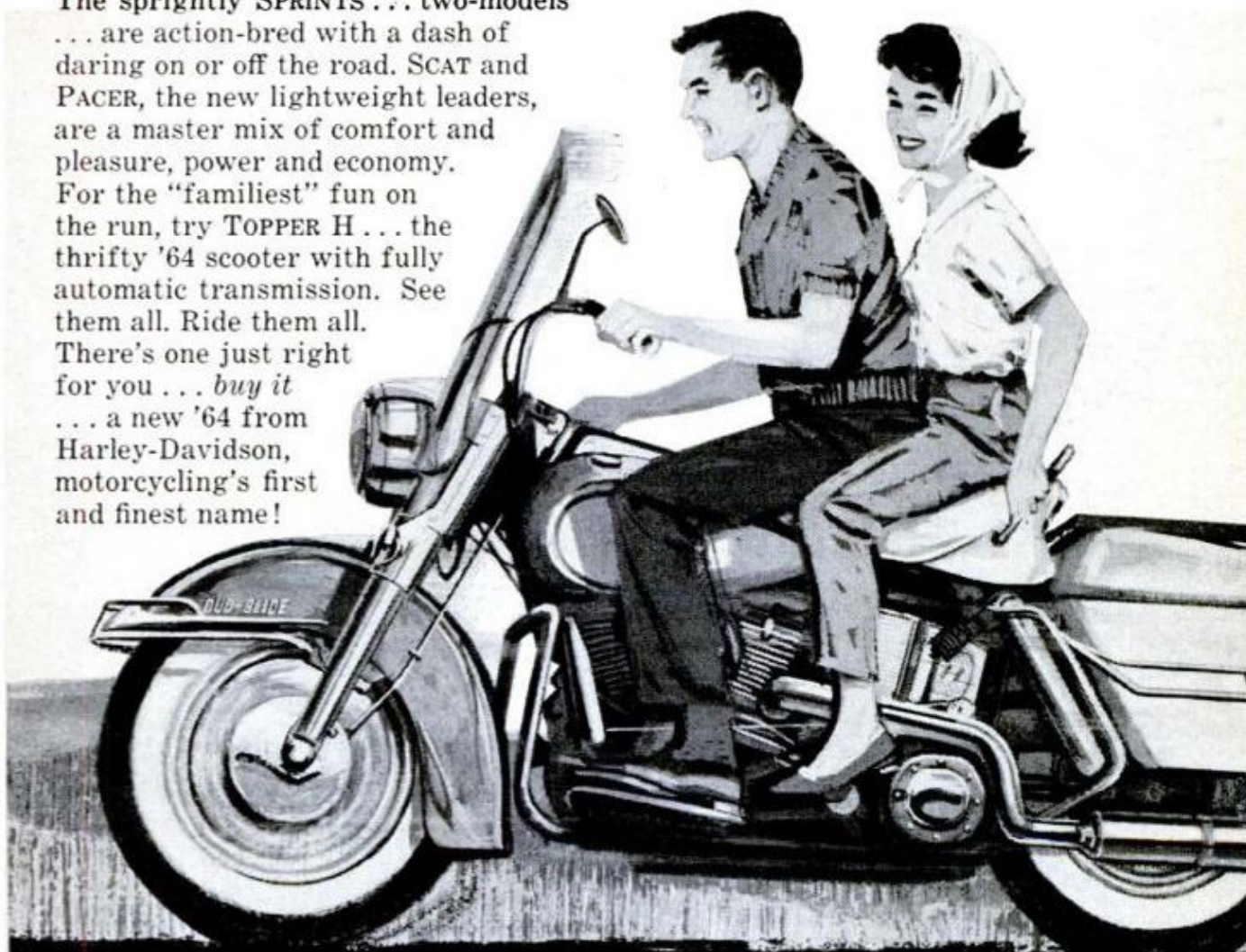
The new **SPORTSTER H**, a roadster's delight; its cross-country cousin, **SPORTSTER CH**.

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test-ride the '64 of your choice

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MOTOR CO., MILWAUKEE 1, WISCONSIN

OCTOBER 1963

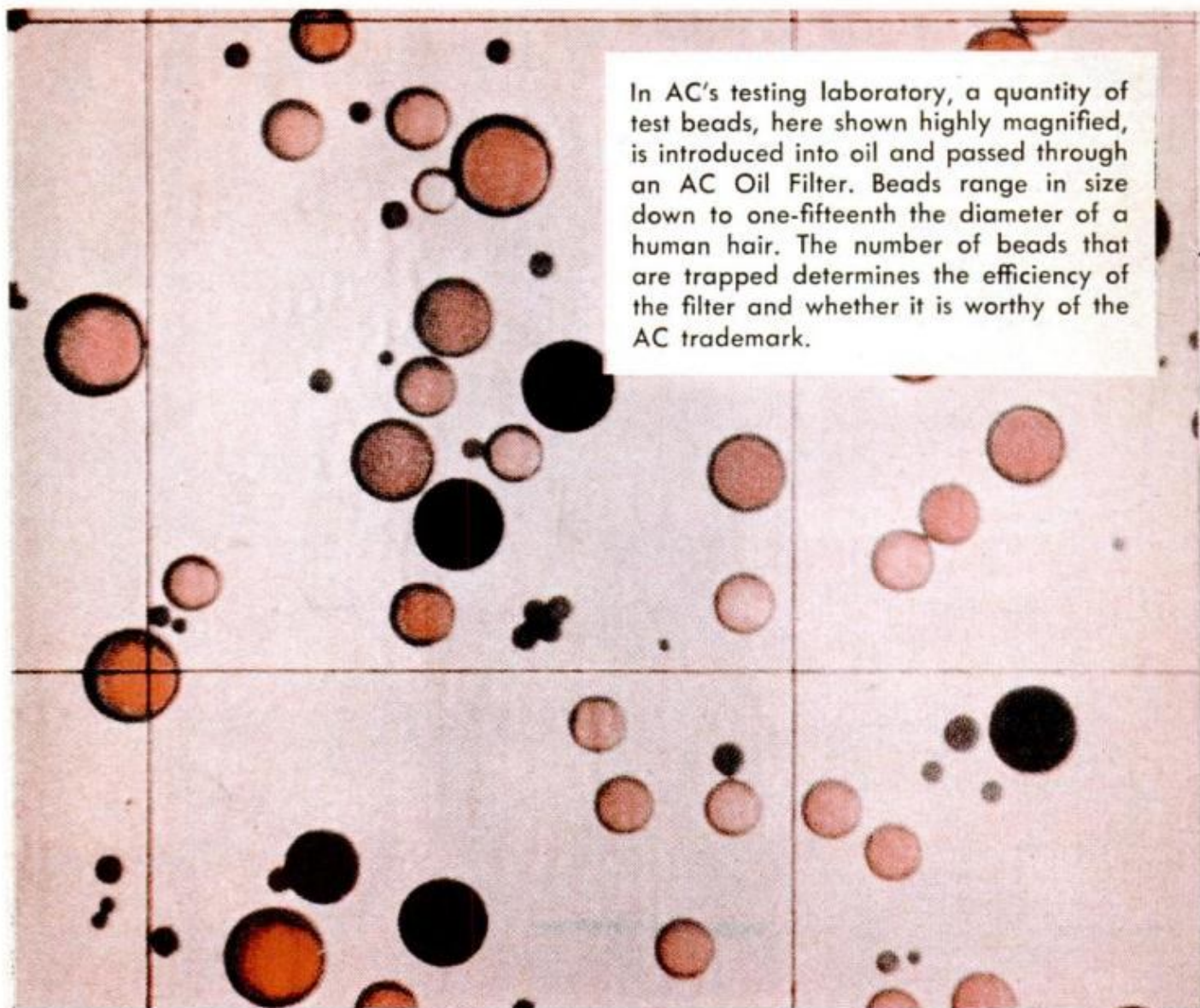
This One



24F8-2CY-J78F

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AC Oil Filters trap dirt too small to see



In AC's testing laboratory, a quantity of test beads, here shown highly magnified, is introduced into oil and passed through an AC Oil Filter. Beads range in size down to one-fifteenth the diameter of a human hair. The number of beads that are trapped determines the efficiency of the filter and whether it is worthy of the AC trademark.

Controlled porosity means better filtering action — better protection for your engine

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Shock-Fortified cord body keeps impact and moisture damage at a minimum. And Firestone Diene Rubber in the tread gives you up to 20% more miles for your truck dollar.

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VOL. 120

NO. 4

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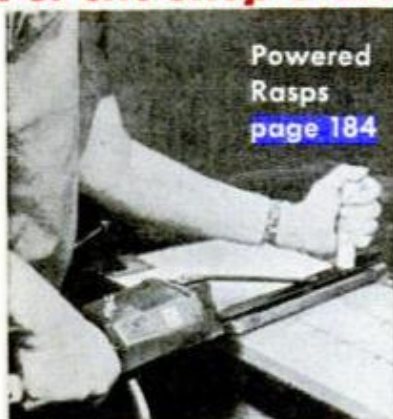
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Cover photo by Eugene A. Colangelo

NEXT MONTH—Best toy buys: A panel of outside experts put 169 toys through every test in the book to come up with PM's list of 10 best toys to buy for Christmas. You'll also find how to get more house for less money; what to look for when buying a used gun, and why astronauts might land on Mars before the moon

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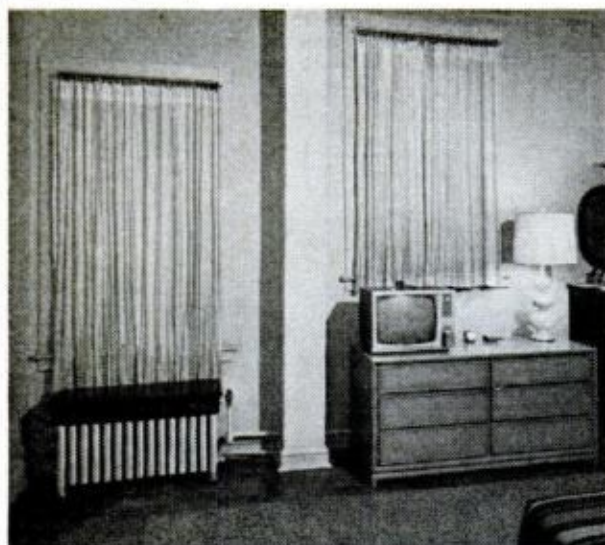
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BAD BRAKES!

Don't send your Chevy to parts unknown! With the many brands of replacement brake linings on the market, how do you know which kind to get for your Chevrolet? It's really quite easy. When it's time to replace, ask yourself what kind of lining gave your Chevy sure stops when it was new. Then replace with more of the same—Genuine Chevrolet Replacement Parts! They're engineered especially to Chevrolet specifications, to fit and work right for a long time. They're installed by people with access to more than 75,000 parts for Chevrolet cars and trucks as far back as 1938. Ask for them at leading independent garages and service stations, and at your local Chevrolet dealer's. To keep your Chevy the Chevy-est, get Genuine Chevrolet Replacement Parts. . . . Chevrolet Division of General Motors, Detroit, Michigan. It pays to keep your Chevy the Chevy-est.



Look for this sign.

Over the Editor's Desk

Let's Go Flying

I would appreciate it if you would do another article like *Fold-Wing Planes* (page 90, Feb. PM), but on how to build a fold-wing two-seat sailplane that can glide 20 miles for every mile of attained altitude. Also, I wish you'd have more articles about planes, just as you have about cars.

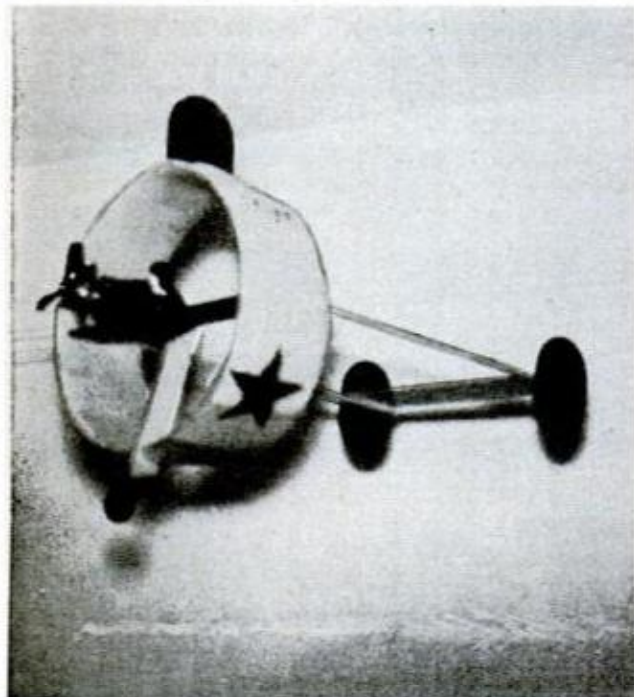
Racine, Wis.

ROBERT OSINGA

We don't have a sailplane-building story on tap yet, but our aviation editor, Kevin Brown, has been up in the wild blue to get a cockpit report on a unique new light-plane (see *Takeoff at 30*, page 94, Sept. PM) and a firsthand yarn on how it feels to fly with the Air Force's sharpest-shooting fighter pilot (see *I Flew with TAC's Top Gun*, page 118, this issue). And Kevin has plans for lots more flying and lots more reporting.

Beefed-Up Hoopskirt

The construction of *Hoopskirt* (page 155, April PM) was very easy with the detailed plans, although I found it necessary to add six wing spars. I doubled the thickness of the nacelle by using two pieces of 1/8-inch



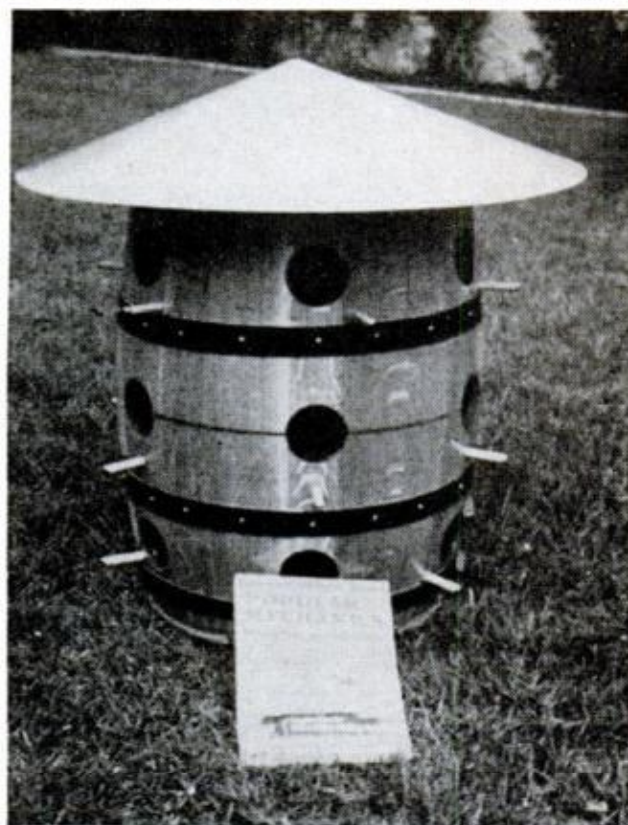
balsa with the grain running in opposite directions to give added stability. I find it a very unique airplane and a very good conversation piece.

Frazer, Mont.

MIKE A. PHILLIPS

For the Birds

I built the martin birdhouse (*Barrel Full of Birds*, page 154, March PM) and sent it to my folks in northern Wisconsin—



where I hope it's now being occupied by martins. Thank you for the plans.

Hayward, Calif.

C. A. PAKOSTA

We've heard of migrating birds before—but yours is the first migrating birdhouse.

Not Just Because It's There

I enjoyed Stuart James' article, *Mountain Climbing, Family Style* (page 86, July PM). It is one of the very few I have seen oriented toward the fun and companionship that the sport can offer, as opposed to the public's image of an almost psychotic appetite for conquest and achievement.

San Jose, Calif.

HOWARD W. LEWIS

And best of all, if you have enough kids you don't have to hire Sherpas to tote the luggage.

Of Kings and Horseshoes

I hate to complain, but the crab shown on page 138 (*3-D Frame-O-Rama*, July PM) is not a king crab but a horseshoe crab, which is a more primitive member of the family of crabs. Now, if a 12-year-old boy can see this, why can't your editors?

Tacoma, Wash.

ROLF HAGEN

Admittedly, we're generally a lot older than 12-year-old boys and don't see so well sometimes, but if you'll look in your dictionary, Rolf, you'll see that a horseshoe

(Please turn to page 10)



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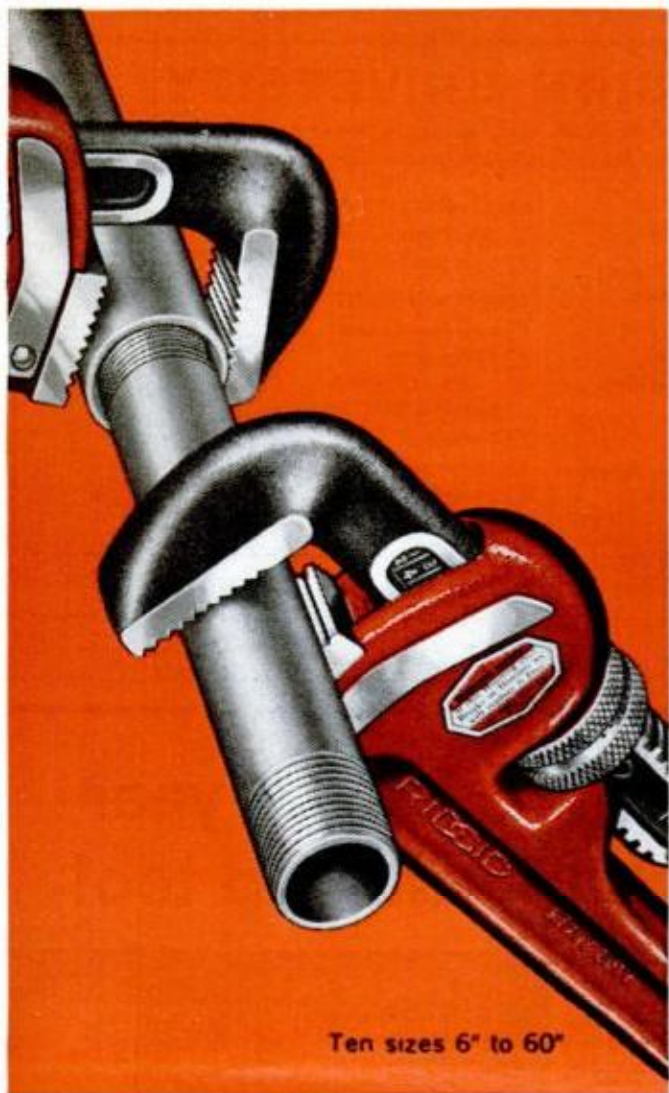


"I now earn three and a half times my former pay"

Robert Fisher, Holbrook, Ariz.

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crab and a king crab are one and the same.
(And we have 'em out here in the East.)

After the Fire

Fire Chief Frank Melo of Mount Shasta has invented a way of washing soiled fire hoses quickly and easily.

Inside a sheet-metal covering he coiled



a perforated copper tube. One end of the tube is plugged and the other end attaches to a hose coupling. As a soiled fire hose is pulled through the unit, the water spraying from the perforations washes it clean.

Mount Shasta, Calif.

J. O. McKINNEY

He Was Ready

I don't know how to thank you enough for such a fine and informative magazine.

I have been head lifeguard in Galesburg for the last several years. I had not practiced the closed-chest heart massage described in *Be Ready to Save a Life* (page 94, May 1962 PM), but it worked very well as you can read in the enclosed article.

Galesburg, Ill.

JACK W. ANDREN

The newspaper clipping tells of the recent presentation of an Illinois State Senate resolution to Mr. Andren for saving the life of an eight-year-old boy. Pulled unconscious from a lake, the lad was revived by the massage. "I had read about this new massage technique about a week before the accident, and it probably saved Kevin's life, since his pulse was too low for artificial respiration," said Andren.

We at PM are pleased we had a part in it.

The Editor

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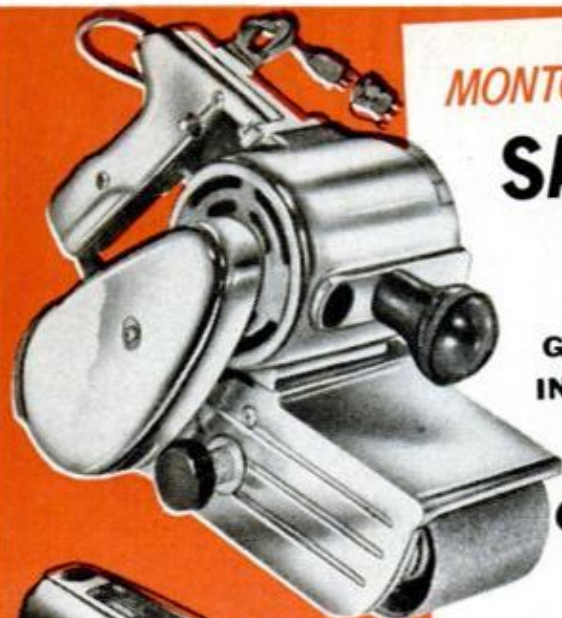
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2



3



4

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Sherlock Holmes will be on hand at the New York World's Fair. One of the puppet stages in the IBM exhibit, a company spokesman told *PM*, will show the great detective recovering a stolen subway train—without ever leaving his Baker Street address. He'll use a modern computer concept, involving binary mathematics, to solve the crime.

A drowned riverbed, the 18,000-year-old original course of the Susquehanna River, has been discovered beneath Chesapeake Bay. Scientists working with tunnelers building the Chesapeake Bay Bridge-Tunnel found the ancient watercourse just off Cape Charles, Va.

Formerly, the Susquehanna rose in the Catskill Mountains and was the main drainage basin for the continental shelf, then a well-wooded plateau. The melting of the icecap at the close of the Ice Age raised the ocean level enough to drown both the continental shelf and a good part of the Susquehanna.

Taping TV shows in the home is now possible with low-cost equipment developed by a British firm. Called Telcan, it works like a sound tape recorder, recording both sound and vision simultaneously on standard quarter-inch magnetic tape. The tapes can be erased and used again. The device will record one channel while the viewer is watching another.

Every man is Casanova—at least in his daydreams. Recent studies among college students at Texas Christian University indicate that both men and women daydream mainly about love. Men dwell on the physical aspects of the subject, while women, in their love reveries, concentrate on the need for a home and family. The study uncovered—if that's the word—the fact that man's most compelling desire is for new erotic experiences.

Alcoholism might be curable by scaring the patient half to death, Canadian re-

searchers believe. They give alcoholics a powerful drug (after a couple of slugs of whiskey) which destroys the ability to breathe for up to 90 seconds, terrifying the victim into believing he's dying. After that, most alkie swear off not only drinking but even talking about it, the Canadian scientists report.

Atom bombs may affect the weather after all. Despite official denials, indications are that high-pressure areas in the atmosphere have become more intense, probably as a result of U.S. and Russian testing at high altitudes. Dr. Irving P. Krick, president of the Water Resources Development Corp., says the Northern Hemisphere's jet stream has intensified and that a jet stream has also formed in southern latitudes. He blamed the intensity of the jet stream for Europe's unusually severe winter last year.

You're worth more these days because inflation has hit the human body, too. Once valued on the chemical market at 98 cents, the price tag has now soared to \$34.54. Part of the increase is due to the high cost of potassium. Once worth pennies, potassium now costs \$1.50 an ounce. A 150-pound man would yield four ounces of the chemical.

Air conditioning could cause your house to collapse, as one Texan discovered to his sorrow. His \$150,000 house almost disintegrated because he kept the conditioner on full blast; moisture from the hot outside air condensed in the walls, causing the wood to swell and push the stones in the outer walls apart.

He also mistakenly had a sealer of polyethylene put on the inside of the framework where it trapped the moisture within the structure. Outside, the sealer would have prevented moisture from penetrating the wall.

Home fluoridation units, for families living in communities where the water supply is not treated, are now becoming available for a small monthly rental. The units, about 14 inches long, are hooked into the home water system at the meter and feed one part per million of fluoride into the water supply. They're made by Pfaudler Permutit, Inc., Rochester, N.Y., and will be franchised to dealers.

Office secretaries may become obsolete. Or so a Cornell University electronics expert believes. Frank Rosenblatt has developed a machine that can listen to conversations and type out the remarks just like

(Please turn to page 16)

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Popular Mechanics Feature Article July 1963

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Science Worldwide

(Continued from page 14)

a stenographer. Within five years, he says, it will be possible to build a machine that will perform all the functions of a secretary-receptionist, including the ability to answer questions verbally.

It could even be made to blush and show emotion, if such accomplishments were desirable. The basis of such "thinking" machines is an electronic neuron patterned after human brain cells.

Chlorine in drinking water cuts down death from radiation, four Belgian scientists report. They studied the effects of high radiation doses on rats and mice, varying the amount of radiation. The mortality rate was 100 percent, with all rats dying within a week. However, when chlorine was added to the drinking water regularly, only 80 percent of the irradiated animals had died within 30 days.

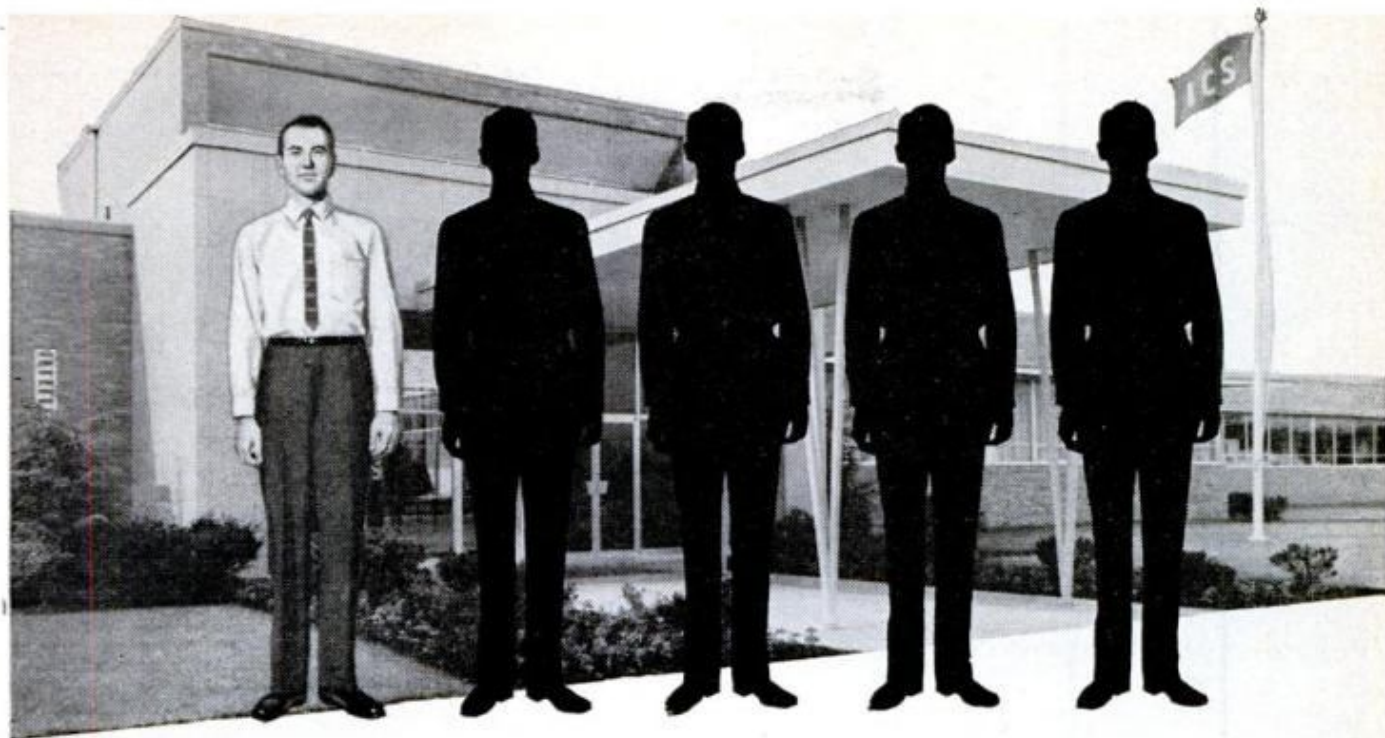
Paralytics may one day activate their immobile limbs by electricity. In a project now under way at Case Institute of Technology in Cleveland, a tape-recorder-computer will be programmed to permit patients to make simple arm movements, such as lifting a glass of water or brushing the hair.

Electric impulses will be transmitted to tiny receivers implanted inside paralyzed muscles. Patients would select the arm movement desired by directing a beam of infrared light from a mechanism in the frame of his eyeglasses to an electronic detector, which would in turn activate the tape recorder. A refinement of the technique could be applied to paralyzed legs as well.

Sterilized insects may be one answer to the poisonous insecticide problem. Department of Agriculture scientists have wiped out the melon fly on the Pacific island of Rota by sterilizing millions of male flies and releasing them to mate with local females. The resulting eggs didn't hatch. Repeated flooding of Rota with sterile males eliminated melon flies from the island in a matter of months.

"Soft" detergents which won't foam up in household taps and pollute public water supplies are on the way. At least two big chemical companies are building plants to produce the chemical base, known as alkylates, for detergents that will be easily decomposable by bacterial action in sewage disposal facilities. Continental Oil Co. and Union Carbide Corp. will have plants

(Please turn to page 20)



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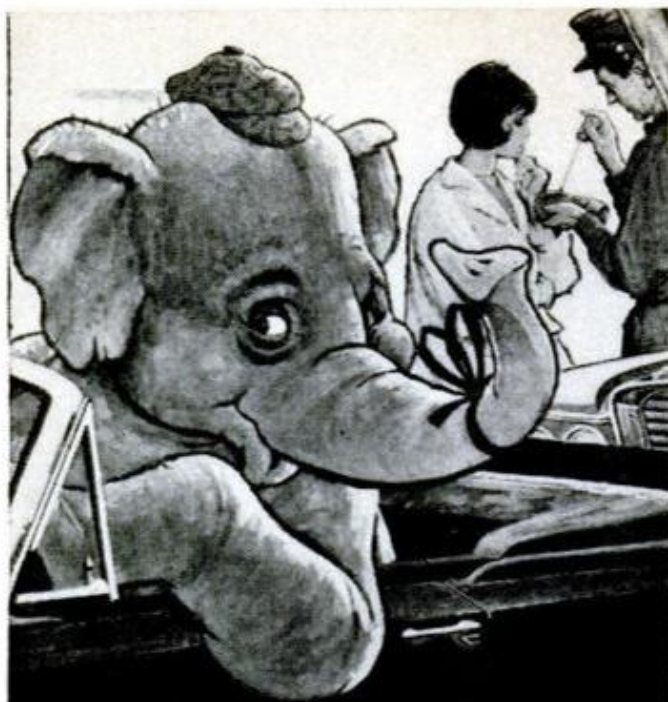
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Hear "Chet Huntley's Perspective on the News" Monday through Friday, NBC Radio Network

Science Worldwide

(Continued from page 16)

in operation producing alkylates in 1964. The Union Carbide product will work on the principle of a molecular sieve, a company spokesman told PM.

▼ ▼ ▼
Power to spare. Scientists say that if we could collect the total radio energy radiated during a one-second interval by the "Cygnus A" radio source in the constellation Cygnus, the earth's entire heat and power needs for the next trillion years could be filled.

▼ ▼ ▼
Winter came early for 20 conscientious objectors to Norwegian Army service. They're in the midst of a cold exposure project in Norway's Hardangervidda mountain plateau to try to gauge the body's ability to withstand exposure to extreme cold.

Conducted by the Institute of Occupational Physiology at Oslo, the volunteers are going through a tough and carefully controlled program while living on a special diet. The most gruelling test of the project involves having the men spending several 12-hour periods naked in a thin woolen bag at zero temperature while body changes are recorded.

▼ ▼ ▼
Recorded distress calls of nuisance birds could help farmers get rid of many bird pests, a husband-wife team of scientists at the University of Hawaii report. Hubert and Mabel Frings used tape-recorded distress calls of such birds as starlings, gulls and crows to drive them from croplands, airports and urban areas. Sonic control for mice, rats and other rodent pests is believed feasible.

▼ ▼ ▼
Talking females are replacing lighthouses in Japan. Recorded feminine voices will be used to give locations and other navigational information by means of microwave transmission. If the first two "talkhouses" work out, more will be put into operation in the future. Japan now has about 2600 lighthouses.

▼ ▼ ▼
Attention, secret agents. A Philadelphia firm has come up with a new water-soluble paper which quickly dissolves in water, making it a safe, fast and thorough means of destroying confidential information. It's as durable as regular paper and will accommodate ballpoints, ink, pencil, typewriter, rubber stamps, letterpress, offset or multilith.

John P. McNeel
Science Editor

POPULAR MECHANICS



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Grant Mauk

In the past, many men started businesses of their own—and failed. Some entered businesses that were already on the decline. They were as foredoomed to failure as a buggy-whip salesman. Some had no talent for the businesses they entered. Others had no experience in business management.

Today, all that has been changed by reputable Franchising firms. Our Franchise business is one that has been tried, and tested, and proved by the parent company. It is one that has been shown to have an enormous and a growing market. It is a business that has been brought to a high level of success by many other men. The kinks have been eliminated. The methods and plans that lead to success have been clearly charted.

We have a Franchise business that does not require a large investment. In our business you can get started for a few hundred dollars. We finance the rest of the investment for you and let you pay it in monthly payments so small that the profits on less than one day's service covers your payment. The overall investment is small—yet the potential is \$250 a week net profit. That's for a one man operation. If you have two or three or more men working for you, the potential increases accordingly.

A small dealer just starting and doing his own service should gross \$180 profit from 20 hours service in a week. If he uses 30% for advertising, etc., he nets a clear \$125. If he services 40 hours, net profit is \$250.

With only two men working for him a 35 hour week will bring the owner \$420 gross profit. Allowing 20% for advertising, etc., (since he has time to sell) he clears \$336.

What is this business? It's one of the fastest growing businesses in America today. It includes six different services that you perform for the housewife right in her home. No office or shop is needed. No investment in real estate. No problems of finding a good location. In fact, if you have a telephone at home and a car with space in the trunk—you have everything you need except the things we furnish. Your business comes to you on the telephone and in personal calls following up leads generated by National Advertising and by your own local Direct Mail Plan which we furnish. You quote your prices to the housewife, do the job, or have one of your men do it and collect the money on the spot.

GRANT MAUK, President; 3-160 Duraclean Bldg., Deerfield, Ill. 60015

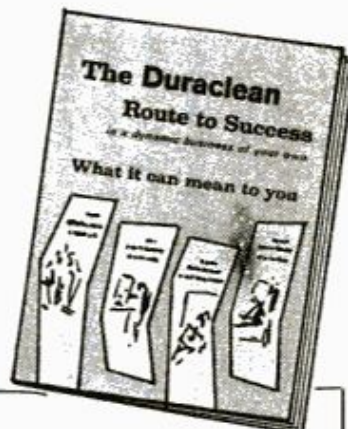
What are these services? The first and most important is the cleaning of carpets, rugs, and upholstered furniture by a revolutionary modern process known as the "Absorption Method." The work is done right in the customer's home. No scrubbing with harsh motor-driven rotary brushes. No soaking with gallons of water. An Aerated Foam loosens the greasy, atmospheric dirt and holds it in suspension until it is removed. A test conducted by an impartial laboratory showed that the new absorption method in the home removed more than twice as much dirt as was removed by the old fashioned machine scrubbing.

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 fabrics with a moth killing liquid on which you can give a company guarantee for six full years.

As owner of a business, you have the opportunity to make more money than you could hope to make working for someone else. Also, should you wish to sell, you are building a business with a cash value. 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 well above his original investment. G. F. Monroe sold his Texas Dealership after 12 months for ten times his cost. Leo Lubel, after 30 months, sold for \$7,116 over cost. When our Franchise owners want to sell, we help them find buyers.

If you are tired of working for others, tired of jumping from one proposition to another; if you have good health, energy, and ambition; if you have a real yearning for independence in a business you own, send for this book. If you have thought that starting your own business would be difficult or expensive, or risky, this book will open your eyes. With our plan it is easier than ever for you to become master of your own destiny in a business you own.

There is no obligation, no charge. No salesmen to high pressure you. Send for this book now. Read it. Then decide if you want to take the next step toward independence.



OPPORTUNITIES TO FIT YOUR OWN AMBITIONS

The Duraclean Franchise is so flexible that it can be fitted to your own ambitions. As a one man business and based on the rates in our National Price Guide you can make a net profit of \$6.00 an hour—\$250 for 40 hours of servicing.

Ward Whitbeck wrote "I have made as much as \$225 in one day." L. Lawson says: "In September, working alone, jobs totaled \$1,475." L. Canaday wrote: "\$1,571 in a single month."

If you wish, you can operate as the head of a multi-crew business with others doing the work.

This increases the profit opportunity as the owner of a business can make as much as \$6.00 an hour gross profit on every hour each employee works. Even after paying him a good hourly wage, the owner can clear \$336 a week for himself with only two men on his staff.

Ed Kramsky wrote, "In my second year I now have two assistants, a nice home, and real security for my family." And, E. Davis reported "Gross income increased \$17,660 this year."

So, no matter at what level you have set your sights, here is a Franchise that is worth careful investigation. Send your name now for the Free Book that tells all angles of the business.

Send name for FREE BOOK

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City _____ Zone _____ State _____



By Jim Whipple



Be Patient: The Vista-Dome Wagon is Coming. Are Brakes on the 1964 Cars Adequate?

Yes, Virginia, there will be a "vista-dome" type station wagon for '64 but Santa Claus can't bring it to you.

PM predicted in an advance preview (August issue) that **Buick Special** and perhaps **Olds F-85** would have the dome-type wagon for '64. Then along came the official preview time, however, and there was no sign of the rascal. That's why you won't find a picture of it in the article on the new cars which starts on page 85. The wraps are still on.

They will come off later in the 1964 model year, however. Latest word is that the **Buick Special** vista-dome wagon will debut as a 1964½ model next spring in time for the New York World's Fair.

Sometimes silence is the loudest noise and we've heard a lot of it about improvements not made in brakes on the 1964 models. Hot performance packages are popping up all over as V8 engines are shoehorned into compacts which only yesterday ran as if they were powered by a hood full of tired rubber bands.

Conspicuously absent from the '64 specifications of most 1964 cars are indications of increased brake capacity (drum size or lining area). Exceptions are GM's new intermediates, **Buick Special**, **Olds F-85**, **Pontiac Tempest**, where lining areas have increased close to 26 square inches. But this increase is primarily to keep up with the greater weight and power of the Standard '64 models of these three.

The key question, of course, is: Are 1964 brakes good enough? We've test driven a representative sample of '64s and the honest answer must be qualified according to the car. If you're driving a Six or a "standard" sized V8 and your driving patterns are in the "bread and butter" category, the answer is Yes. If you drive hard and fast and travel heavily loaded behind a 300-plus horsepower engine, the answer will sometimes be No. Repeated stops from 50 or 60 miles per hour will heat up today's drum brakes and produce fade, require greater pedal pressure and increase the stopping distance. Heavy braking will also quickly produce erratic action with brakes on one wheel grabbing and pulling the car to left or right.

Then there is also another problem cropping up on the over eager action of the self-adjusting mechanism. This operates when car is braked while in reverse, if there is enough lining wear to permit the shoes to move closer to the drums.

The trouble here is that all four brakes do not adjust themselves at exactly the same moment. Thus, a newly self-adjusted pair of shoes may give you more braking on one wheel than another and pull the car to right or left. This nasty habit is more annoying than dangerous because on hard application both loose and snug brakes apply with equal force.

The industry has several answers to the problems of conventional lined drum brakes. One is the metallic composition linings offered as production options by **Chevrolet** and others. Another is the front disc brakes that are standard on **Avanti**, optional on **Studebaker**, and special equipment on **Falcon**.

The metallic lining are fade-free but subject to grab and squealing.

What about caliper disc brakes? Because of their direct contact (piston-to-pad-to-disc) they are self-adjusting; the air-cooled disc will give you essentially the same stopping action time after time with little fade. Major disadvantage of discs is that they need power boosting.

If produced in millions of sets, discs would be no more expensive than the drum-shoe-and-lining brakes most of us have now, except for the booster.

What then is stopping the disc brake? Principally, the high cost of changeover. New production machinery to produce seven million sets of disc brakes annually would cost millions. Neither manufacturers nor suppliers will spend such money unless U.S. car buyers demand discs as standard equipment.

What will probably happen is that more and more cars will offer discs as options to meet special demand, thus gradually building production until the swing over to making them standard equipment becomes feasible.

This can't happen too soon in our opinion. Perfection in safety equipment is just good enough.

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the width of the outer ribs — doubles the rubber where tires wear most — to give up to 10,000 more safe miles than ordinary tires. Get Armstrong's Wide-Track tread design, and get extra mileage at no extra cost. See the Yellow Pages for your Armstrong dealer.

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Sidelights from the SERVICES

By William R. Kreh

"Look, Ma, no hands!" is what Navy pilots aboard the aircraft carrier USS *Midway* are shouting into their lip mikes these days. The carrier is the first to be equipped with a new automatic carrier landing system that operates the flight controls of a jet plane through signals from the ship while the pilot keeps his hands off the controls completely.

The landing system uses a precision radar which continuously determines the airplane's position. This information is fed into a computer which compares the plane's actual position with the desired position in the landing approach. The error is computed and corrections are radioed to a receiver in the plane which moves the control surfaces or throttle to put the plane into the right position. The system can land a plane within five feet of the ship's centerline and ten feet of the desired touch-down point without the pilot ever even seeing the deck.

Glowing gear for refueling-at-sea operations has been developed by the Navy. Lines, hoses and other equipment are coated with a special paint that glows for a short time after being exposed to ultraviolet light. This green glow is not bright enough to give ships away to enemy eyes, but is of great aid to refueling crews.

Cheap shooting. The Pentagon's testing a new pistol which costs only about a dollar. Called "one of the few really new developments" in the field of small arms in a hundred years, the experimental weapon is called the Gyrojet. Many details are still secret. A round for the pistol—apparently a large caliber—is said to cost about eight cents. It is said to be extremely useful at close ranges of 10 to 15 yards, but there are indications that it lacks accuracy at greater ranges.

The fastest gun in the west—or anywhere—is Navy-owned. It's called the "Hipeg" gun system and is capable of firing 12,000 rounds a minute. "Hipeg" consists of three 20-mm. gun pods which fit under the wings and fuselage of a jet fighter, doubling the firepower possible on any military aircraft in use today. Working on the revolver system, each pod contains a large single cylinder feeding two

barrels which fire 66 rounds a second at the same time. Each pod can be attached in three minutes and taken off in one minute, making it possible to put planes on observation missions quickly without armament. The system is adaptable to many military planes.

Instant maps. The Navy is testing an electronic machine that reproduces charts and maps in color aboard Navy ships at sea. The equipment, about the size of a household refrigerator, can duplicate large-sized maps and charts directly from 70-mm. film. It reproduces them in five colors at about 25 an hour. Using the machine makes possible replacement of an aircraft carrier's customary load of 15 tons of maps and charts with only five tons of blank paper, a library of film and the machine itself.

Surfside Six, U.S. Coast Guard. Houseboats are the latest thing in Coast Guard equipment. The service has started using two of them as experimental Coast Guard stations. Each houseboat is manned by a crew of 10 men who operate a fast 30-foot rescue boat with a 16-foot trailered outboard from each. Major advantages are their mobility—being easy to move them to areas where they can best serve the boating public—and their low-maintenance cost as compared with conventional stations on land with permanent building installations.

Swimmers can talk underwater with a new device just patented by a pair of Navy scientists. The new system allows scuba swimmers to freely converse at ranges comparable to those in air. Whatever sounds the human ear picks up underwater are detected by bone conduction. The Navy men's compact invention consists of a small underwater microphone which picks up sounds and an amplifier that steps them up and feeds them into special bone-conduction headphones.

Vive la difference! When aviatrix Jerrie Cobb, first woman to pass the astronaut physical tests, was at the Naval Medical School, Pensacola, Fla., scientists wanted to put her through a certain series of special tests. They sent this message to Washington: "Request authority for civilian Miss Jerrie Cobb to fly in Naval aircraft for the purpose of base-line studies to determine fundamental differences between male and female astronauts." This reply quickly came back from the Chief of Naval Operations. "If you don't know the differences already, we refuse to put money into the project."

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Air safety, a perennial problem, will always be so. As solutions are sought for the old problems, new problems arise.

Experiments are under way in New Jersey to evaluate the effect fires after air crashes have on survival. Five surplus Air Force KC-97 transports, rigged to simulate commercial airliners, will be burned, and the resulting heat and toxic fumes will be measured for what effect they would have on passengers. Fire-fighting methods, including use of helicopters to "wash down" the flames, will be used.

It's well known that, although many passengers survive the crash impact, many of them die in the subsequent fire if they don't get out in time. Other experiments in Texas are seeking a substance to turn the plane's fuel—the major source of flames—into a nonflammable jelly if a crash seems imminent.

In other problem areas, a bomb-detection device has been developed to warn when explosives have been placed aboard

airliners; arresting gear and barrier equipment, similar to those on Navy aircraft carriers but capable of preventing overrunning the runway by planes as large as the 707, have been out for some time but are getting more and more attention from safety experts; and recently announced was a collision-avoidance system, which can warn the pilot of other planes on a collision course, giving him their range and bearing and indicating the maneuver to make.

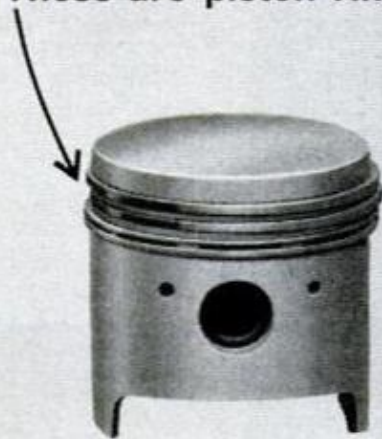
Finally, on the heels of the automatic all-weather landing system recently installed on French Caravelle jetliners came the announcement that the Federal Aviation Agency had awarded a million-dollar contract for a "second generation" system for "hands off" landings.

The new problem is the sonic boom, which will become more of a problem when the commercial supersonic transport starts flying in 1970. Not only does the boom break windows, but there is at least one case of it taking the wing off a small plane. Results of tests on sonic-boom damage are expected to be announced by the end of this year.

Kevin V. Brown

Aviation Editor

These are piston rings.



If they wear out, replacements may cost \$175.

Fifteen ounces of prevention are worth sizable savings in repair bills if a "ring job" can be avoided. One can of SDA, Quaker State's Super Detergent Additive, in your car's crankcase can make the difference. SDA prolongs engine life by removing sludge and varnish, reducing engine wear, and preventing rust

and corrosion. A clean engine gives more power on less gasoline, and extends battery life by starting fast. See your Quaker State dealer for fifteen ounces of SDA . . . and a cleaner, better-performing engine.

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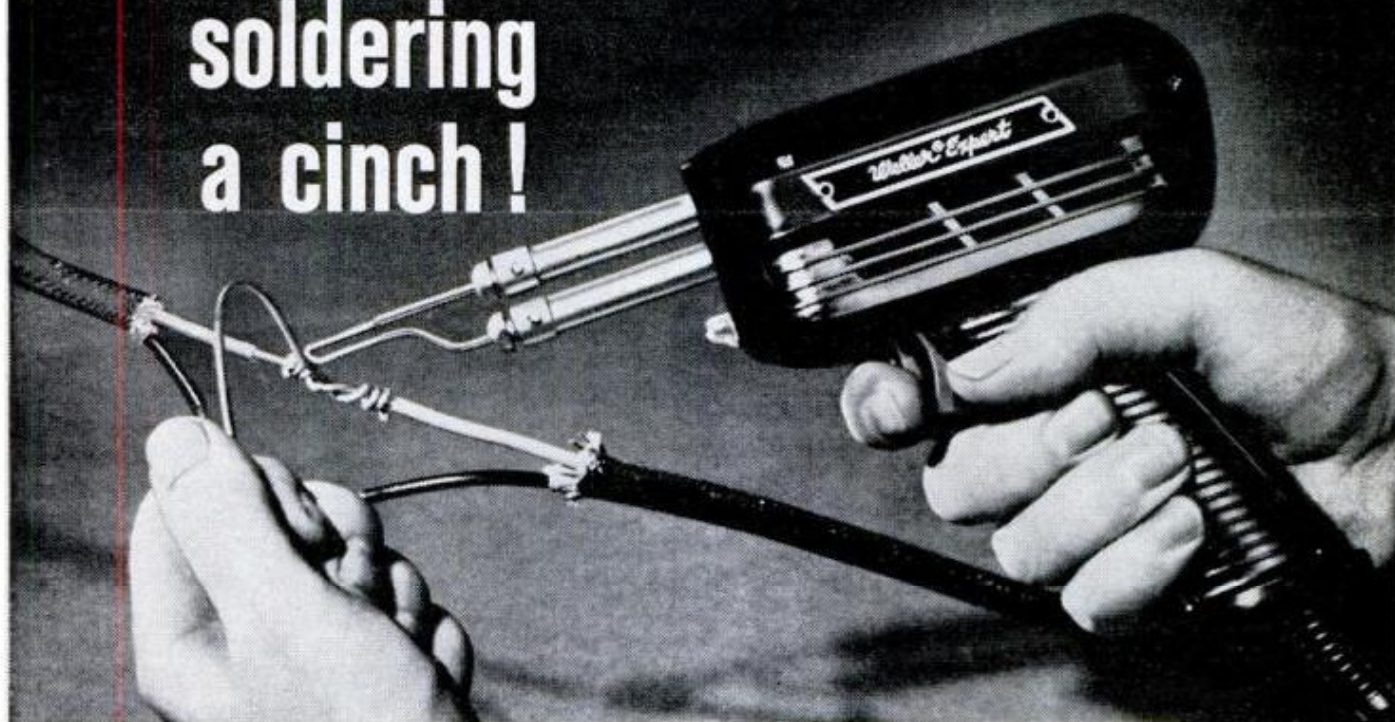
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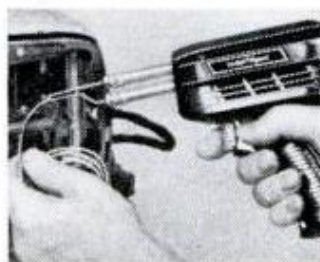
are available for heat sealing, cutting and smoothing.

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Items from All Outdoors

Single most important factor in a canoe trip is weight—the lack of it. This becomes apparent after several portages over rocks, up steep river banks and through heavy brush. We took a 50-mile trip recently on the Delaware River, using fiberglass and aluminum canoes. Both performed equally well in the water, but the lighter aluminum was easier on the back.

The second day, after a night in wet sleeping bags, we stopped and got a number of plastic garment bags. These kept everything dry the rest of the trip. We also used the bags to store firewood at the camp sites, and after a night of severe rain it was a relief to have a supply of dry wood. We carried waterproof fire starters made by coating chunks of Presto-logs with melted paraffin. Another slight innovation that proved invaluable was a pair of heavy, leather-palmed work gloves used as hot pads for cooking.

We decided against a tent to save on weight. For shelter in the rain we

stretched a poncho over three-foot stakes driven into the ground, and dug a generous trench around the perimeter. We slept dry and comfortable.

Before the downstream rush, we cut saplings and made a rack for the bottoms of the canoes to keep our gear about three inches clear. As expected, we shipped about an inch of water in the really rough spots, but the gear stayed relatively dry.

Hunters with gun or camera can improve their hearing in the same way their sight is improved by binoculars. With a second-hand hearing aid turned to full power, you can hear the beating of a hawk's wings a hundred feet in the air, or the nervous stamp of a buck a quarter mile away. One of the older, large-sized hearing aids in good condition sells for about \$5 to \$7.50, and no conversion is necessary. Simply position yourself in the woods, sit quietly for a short time, then turn on the hearing aid. By listening carefully for a time you can sort out the variety of sounds; and since the aids are directional, you can pinpoint the sound by moving your body in slow, small arcs.

STUART JAMES

Outdoors Editor

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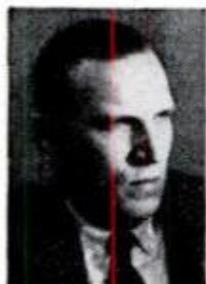
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POPULAR MECHANICS

Profits That Lie Hidden in America's Mountain of Broken Electrical Appliances

By J. M. Smith *President, National Radio Institute*



And I mean profits for you — no matter who you are, where you live, or what you are doing now. Do you realize that there are over 400 million electrical appliances in the homes of America today? So it's no wonder that men who know how to service them properly are making \$3 to \$5 an hour — in spare time or full time! I'd like to send you a Free Book telling how you can quickly and easily get into this profitable field.

THE COMING OF THE AUTO created a multi-million dollar service industry, the auto repair business. Now the same thing is happening in the electrical appliance field. But with this important difference: anybody with a few simple tools can get started in appliance repair work. No big investment or expensive equipment is needed.

The appliance repair business is booming — because the sale of appliances is booming. One thing naturally follows the other. In addition to the 400,000,000 appliances *already* sold, this year alone will see sales of 76 million *new* appliances. For example, 4,750,000 new coffee makers, almost 2,000,000 new room air conditioners, 1,425,000 new clothes dryers. A nice steady income awaits the man who can service appliances like these. And I want to tell you why that man can be *you* — even if you don't know a volt from an ampere now.

A Few Examples of What I Mean

Now here's a report from Earl Reid, of Thompson, Ohio: "In one month I took in approximately \$648 of which \$510 was clear. I work only part time." And, to take a big jump out to California, here's one from



J. G. Stinson, of Long Beach: "I have opened up a small repair shop. At present I am operating the shop on a spare time basis — but the way business is growing it will be a very short time before I will devote my full time to it."

Don't worry about how little you may now know about repair work. What John D. Pettis, of Bradley, Illinois wrote to me is this: "I had practically no knowledge of any kind of repair work. Now I am busy almost all my spare time and my day off — and have more and more repair work coming in all along. I have my shop in my basement."

We Tell You Everything You Need to Know

If you'd like to get started in this fascinating, profitable, rapidly growing field — let us give you the home training you need. Here's an excellent opportunity to build up "a business of your own" without big investment — open up an appliance repair shop, become independent. Or you may prefer to keep your present job, turn your spare time into extra money.

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on your kitchen table. No technical experience, or higher education is necessary. We'll train you at home, in your spare time, using methods proven successful for over 45 years. We start from scratch — *tell* you in plain English, and *show* you in clear pictures — everything you need to know. And, you will be glad to know, your training will cost you less than 20¢ a day.

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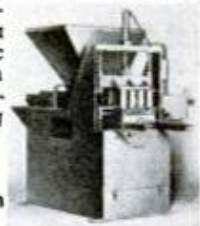
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Tune in on the Inventors

The inventors of the Rogallo Wing, the paraglider landing device which will be used by returning Gemini astronauts, have received the largest cash award ever made to inventors by the National Aeronautics and Space Administration. Francis M. and Gertrude S. Rogallo recently were presented with an award of \$35,000. Although they hold two patents on the wing, they do not collect royalties.

Ice fishermen can use a special net designed for holes in the ice no more than seven inches wide. Patent 3,099,888 went to Lawrence J. Jaster, Bellevue, Iowa.

Abstract painters could work without getting their hands messy with a new paint dispenser patented by Henry Henriksen of Minneapolis, Minn. It holds several tubes of paint and shoots either a single stream of paint or several colors simultaneously. It received patent 3,100,063.

Removing wax from the ears should be easy with a de-waxer invented by Girolama Palazzolo of Grand Rapids, Mich., patent 3,099,263. A foot-long linen tube is dipped in beeswax and inserted in the ear. The other end of the tube is lighted and the smoke melts the wax in the ear.

You can remove snow with a snowplow which attaches to automobile bumpers. John E. Koch of Minneapolis received patent 3,098,309 for the device, which automatically frees itself from rocks and other obstructions.

Twilight hunters could have a better shot at targets in the gathering darkness with a fluorescent gun sight invented by Leonard N. Plisk of Hilton, N.Y., patent 3,098,303. The luminous directional sight fits easily over gun barrels.

The government granted itself its first patent recently. Patent 3,100,294 for a multiplexer used in space-data computers was issued to Dr. Hugh L. Dryden, NASA's deputy administrator, although it was actually invented by John F. Meyer of Pasadena, Calif. The space agency is the only government branch that has the right to apply directly to the Patent Office for a patent. Government employees get automatic awards for their inventions.

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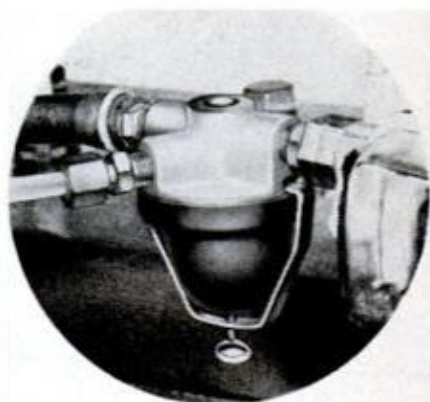
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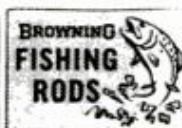
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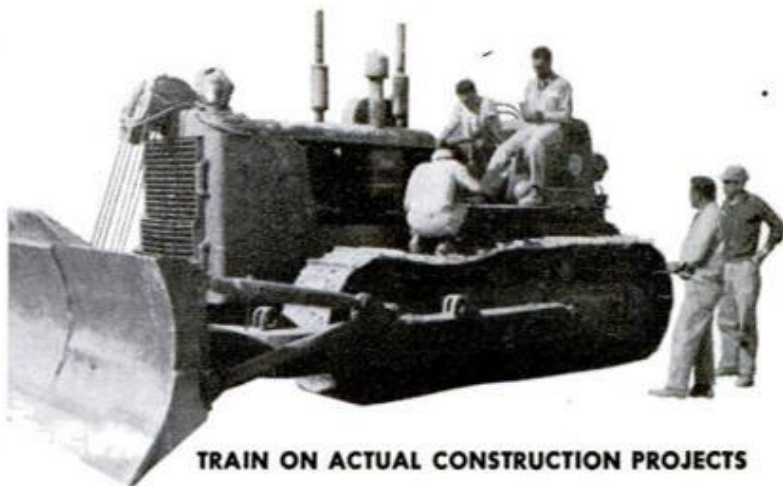
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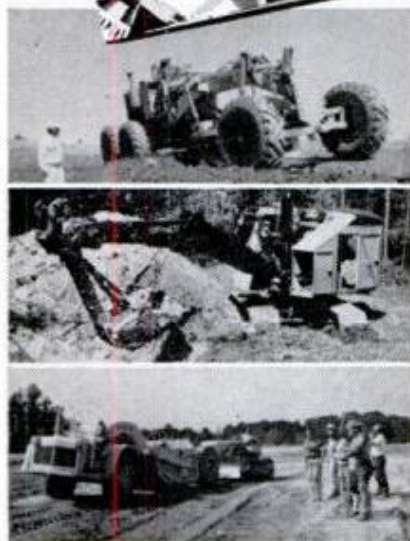
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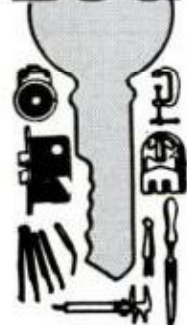
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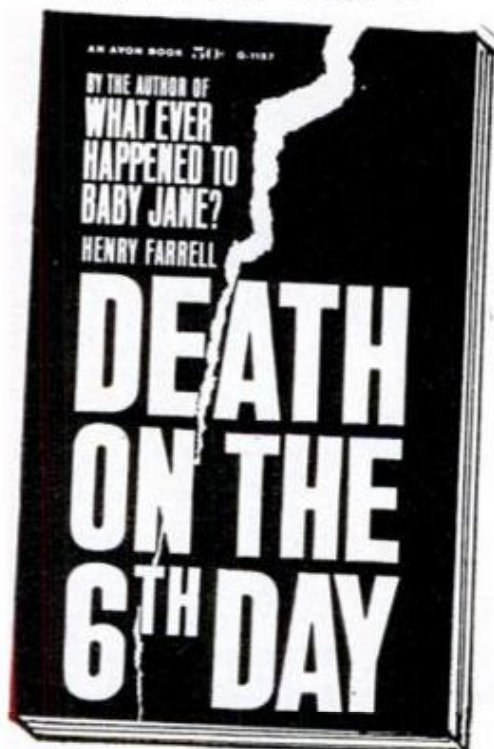
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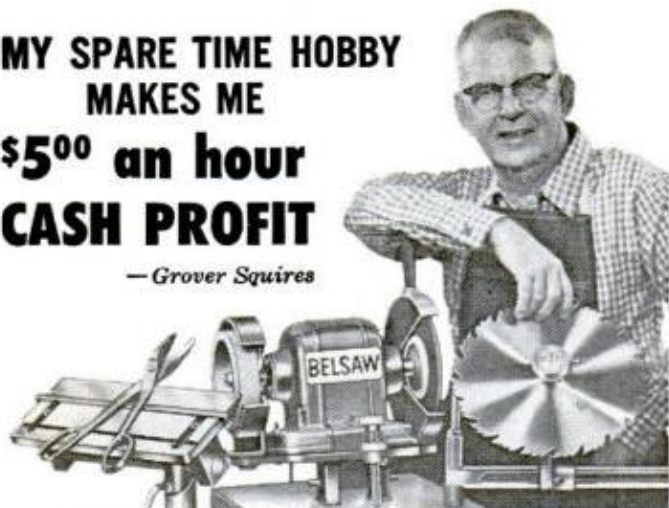
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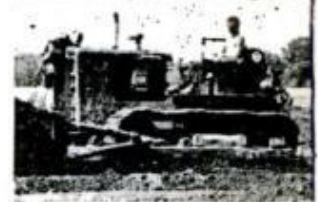


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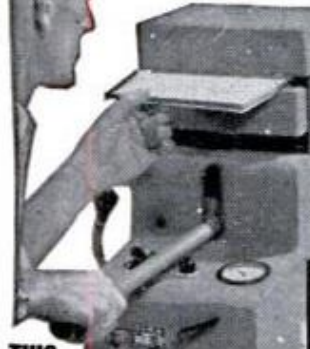


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NEW 1962-63 Illustrated printing equipment and supply catalog. This 9"x12", 336-page book is the most complete catalog of the century. Contains everything used in the graphic arts industry including thousands of offset, letterpress, binders, rubber plate and stamp, composing room, silk screen, art and engraving supplies and equipment. Includes paper cutters, folding machines, printing and proof presses, padding presses and many more. Send \$2.00 to cover mailing. Refund with first order. Also available is our latest 184 page type catalog—add \$1.00. American Printing Equipment & Supply Co., Dept. PM-42-25 Ninth Street, Long Island City 1, N.Y.

TYPE CASES. Manufacturer. Catalog. King McKay Company, 23179 Telegraph, Southfield, Michigan.

PRINTING Presses, type, supplies. Lists 5¢. Turnbaugh Service, Mechanicsburg, Penna.

MAKE Your own self-molding rubber stamps and printing cuts. Plexirubber, Argyle 1, Wisconsin.

RUBBER Stamp presses, hydraulic operated, electrically heated. Sizes 5"x8", 8"x12", 10"x15". Starting outfits, supplies. Printing presses. Custom Manufacturing, 1464-P East Commercial, Springfield, Missouri.

DO Your own printing. Save money. Simple rules. We supply everything. Print for others; good profit. Raised printing like engraving too. Have home shop. Details free. Kelsey Presses, V-11, Meriden, Connecticut.

RUBBER Stamp outfits, supplies. Kiewit, 2025 Barney Road, Kalamazoo, Mich.

ILLUSTRATED Silk Screen Printing. Instructions with Supply Sources, \$2.00. George Shine, Box 162-A, Springfield 1, Massachusetts.

MANUFACTURING

MODELS—Small lot manufacturing. Metals, plastics, etc. Milburn, Burlington, Kentucky.

MODELS—SHIPS, TRAINS, PLANES, ETC.

CASTINGS And finished steam-gas engines from simple oscillating to triple expansion. Finest materials and fittings. Catalogue \$1.00. Denison Live Steam Models, PM 1606 Denison, Cleveland 9, Ohio.

SHIP Models. Kits, fittings, plans, books, tools, engines, motors. Big illustrated catalog 50¢. James Bliss & Co., Dept. SM, 342 Atlantic Avenue, Boston 10, Massachusetts.

SHIP Model kits. Clippers, galleons, liners. Operating power boats for radio control. Send 25¢ for catalog. Ideal, 19 West 18 Street, New York 11, N. Y.

ROCKETS: New illustrated catalog 25¢. Single and multistage kits, cones, engines, launchers, trackers, technical information, etc. Fast service. Estes Industries, Penrose 2, Colorado.

SHIP Model kits and fittings: clippers, frigates, etc. Catalog paint-tool list, book list, 35¢. Model Shipways, Box 85, Bogota, N. J.

"WHITE HEAT V" radio-controlled model hydroplane featured June 1962 Popular Mechanics. Full size plans, patterns, accessories and engine available. Literature for stamped addressed envelope. Octura Models, 8144-P No. Milwaukee, Niles 48, Illinois.

MODEL Steam engines, ready to run. Sheridan air rifles. Catalogue 25¢. Gun Shop, Baker, Oregon.

SHIP and yacht model fittings; Pine construction hull kits; blueprints. Send 50¢ for illustrated catalog. A. J. Fisher, Inc., 1002 Etowah Avenue, Royal Oak, Michigan. 48067.

ROCKETS, Chemistry, plastic, electronic kits. Catalog 25¢. 21st Century Toy Corp., Box 516, Newark, New Jersey.

LIVE Steam engine castings kits, boilers, accessories. Also model maker's lathes, compact, motorized. Pictured catalog 35¢. H.P.K. Models, Box 34, Centuck Station D, Yonkers, New York.

ALL AMERICAN, steam engines, tractors, boilers, fittings, castings. Catalog manual \$1.00. Tiny Power, Junction City, Oregon.

HOME CRAFTSMEN

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WOODWORKERS—Home workshop catalog 132 pages. Save on fine woods, hardware, power tools. 25¢. Craftsman, 2719 S. Mary, Chicago 8, Ill.

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PRE-CUT Picture frames. Easy to assemble. Send self-addressed, stamped envelope for list. Sizes 4½" to 36". Voorhees Paint, 386 Remsen Ave., New Brunswick, N. J.

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DO-It-yourself bath massage! Automatic and fingertip controls. Attaches to your vacuum cleaner. Complete kit and instructions \$16.69. Butch Bath Co., 435 N. Roxbury Drive, Suite 105-F, Beverly Hills, California.

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PERSONAL

BIBLE Questions answered. Stamped envelope. Bylon, 17167 Bentler, Detroit, Michigan 48219.

"LISTEN-In-Coil" picks up any telephone conversation in vicinity. No connection to telephone necessary. Easily concealed. \$2.98 complete. Consolidated Acoustics, 1302-L Washington St., Hoboken, New Jersey.

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MIAMI Remails 20¢. Monthly \$2.00. Mikesell, P.O. Box 1266, Coral Gables, Florida.

NEW YORK CITY secret address. Remails 25¢. Monthly \$3.00. Donohue, 968 Sherman, New York 56.

CONFIDENTIAL New York City mail address \$3.00 month. Remails 25¢. Details free. Birnhan, 152 W. 42, New York City 36.

HAWAII Secret address. Receiving—forwarding 25¢, \$3.00 monthly. Postcards. Coe, Box 984, Kailua, Hawaii.

MEXICO: Reliable services. Remailing \$3.00 monthly. Ramcke, Correo Chapalita, Guadalajara, Mexico.

REMAILS 25¢. Rubber stamps. Printing. Gessel's, Box 5982, Pittsburgh, Pa. 15210.

CONFIDENTIAL. Remails 25¢ single. \$3.00 monthly. Box 4327, Tampa, Florida. 33607.

SECRET European re-airmails \$1.00. Details free. 8202 Bad Aibling, Schliessfach 146, West Germany.

LOS ANGELES. Hollywood. San Fernando Valley—25¢ single; \$3.00 monthly. Confidential, 10437P Lanark, Sun Valley 3, California.

PALM Beach, Florida prestige, confidential, efficient, reasonable. Box 1086.

NEWBURGH Remailing. 25¢ single. \$3.00 monthly. Wesley Roe, Gardnertown Rd., M.D. #27, Newburgh, N.Y.

REMAILING 25¢. Frost, P.O. Box 57181, Los Angeles, Calif.

CONFIDENTIAL New York City remailing service. G. Martin, 136-04 Northern Blvd., Flushing 54, New York.

PARIS Remailing. Letter \$1.00. Monthly rates. Earnest Mayes, 23 Rue Leon Jost, Paris, 17e France.

SECRET Mail receiving system. Hedgpath, 406-M South Second, Alhambra, California 91802.

MAKE Our Chicago office address yours. Information free. Allen, 216-PM West Jackson, Chicago 60606.

REMAIL 30¢. Monthly \$3.00. Labrie, 3364 Station C, Ottawa 3, Canada.

SPRINGFIELD, Mo. remailing 25¢. \$3.00 monthly. Brose, 2838 Missouri, Springfield, Mo.

REMAIL Through the Pacific Wonderland. Confidentially 25¢ \$5.00 monthly. Kroker, 2655 Commercial N. E., Salem, Oregon.

SWITZERLAND Letters mailed \$1.00. Confidential address \$5.00 monthly. Box 103, Lugano Paradiso, Switzerland.

CONFIDENTIAL Address, \$2 monthly. Modern, 16822 Valley Way, Veradale, Wash.

SAN FRANCISCO Confidential mail address 25¢ remailing. Kirk Enterprises, 470 27th Street, San Francisco, Calif.

SAN DIEGO Secret address. Receiving-forwarding 25¢. \$3.00 monthly. Coronado, Box 3684, San Diego 3, California.

HOUSTON-NASA Area. Prompt remails 25¢ single. \$3.00 monthly. Confidential receiving-forwarding. Tremaco, Box 5277-G, Houston 12, Texas.

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WANTED—MISCELLANEOUS

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MAGIC Good luck charms: horseshoe, four leaf clover, rabbit's foot. Send three dimes. Mermelstein, Box 344, N.Y.C. 10032.

LEKTRO-MAGIC Squelches TV commercials right from your easy chair. Complete device contained in beautiful bracelet. Simple application. \$19.95 Check or M.O. Lektro-Price Inc., Div. M, Box 1201, Clearwater, Florida. 33517.

LEG IRONS, \$7.95; Handcuffs, \$7.95. Leather restraints. Fetters. Collector's specialties. Catalog 50¢. Thomas Ferrick, Box 12M, Newburyport, Mass.

HEARING Aid batteries wholesale. Free list. Habs, Box 51, York, Penna.

TOBACCO

CIGARS. Tobaccos. Save! Free list. Tobacconist, 220 N. Clark, Chicago 60601.

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SURPRISE Gift from Orient \$1.00. NBARS, 9325-PM Menard, Oaklawn, Ill.

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NEW! Addipresto personal size (5"x5"x3 1/2") desk adding machine from Italy. Adds to 9,999,999 automatically. Saves time, work, money at home or office. Precision made, operates on same principle as costly computers. Remarkably priced: \$10.95, including cover, guarantee, postage, taxes. Check or M.O. to Allred Supply Company, Dept. 16, 605 State, Santa Barbara, California.

BURGLAR Alarm, flash light battery powered, compact, self-contained. Protects any door or window. Quantity discount. Sample \$2.00 ppd. Gil-Mar Enterprises, Inc. Box 395, Miami Shores 53, Florida.

AMAZINGLY Small Handi-Add adding machine for shoppers, students, etc., only \$1.00 postpaid. Catalog free. Sturges, Box 401-PM, Norwalk, Conn. 06852.

RECEIVE Gifts, samples, magazines, catalogs, opportunities, 25¢. "Directory," Adkins, Texas.

MOTHER And baby catalog 25¢. Sebastian Attardo, 351 Wadsworth Ave., New York 40, N. Y.

SEWER Cleaning machines. Free literature. All Clear, 3040 Matthews Ave., Bronx 67, N. Y.

LOANS By mail, \$100-\$600. Anywhere. Confidential. Write Union Finance, Dept. PM, 323 E. Camelback, Phoenix, Arizona.

LONGHORNS. Genuine Steer Horns. For mounting 4-6 foot spans. Longhorns, Laclede 10, Missouri.

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FREE Wholesale catalog! 100,000 products. Tremendous discounts! Taylor Distributors, Newton 2, New Jersey.

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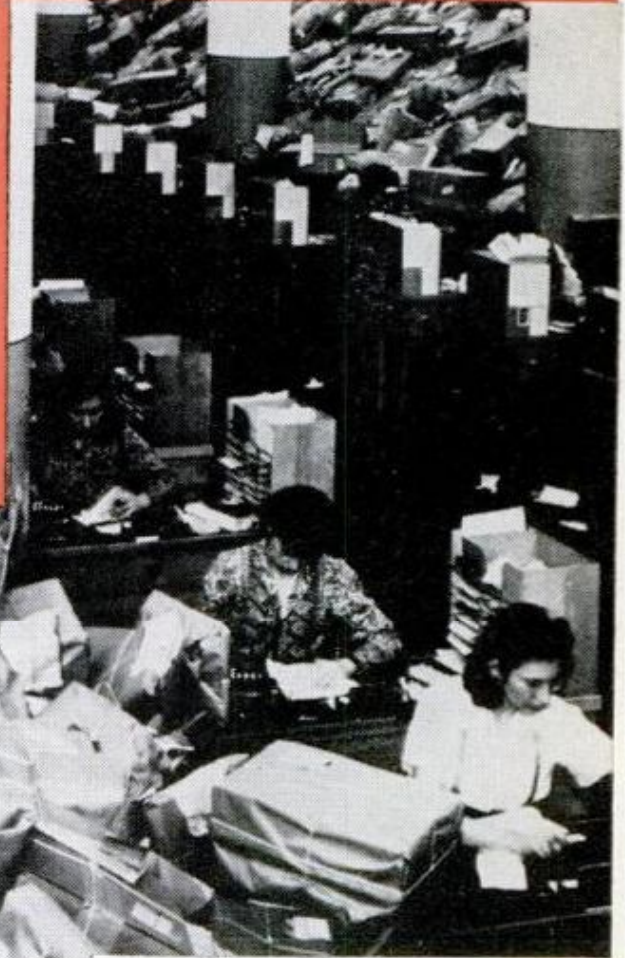
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A number of one-man mail order enterprises are paying their owners an income of \$40,000 to \$50,000.

SPECIAL OPPORTUNITIES



Mail order is big business. Annual catalog sales volume of Sears, Roebuck and Co. is over 700 million dollars!

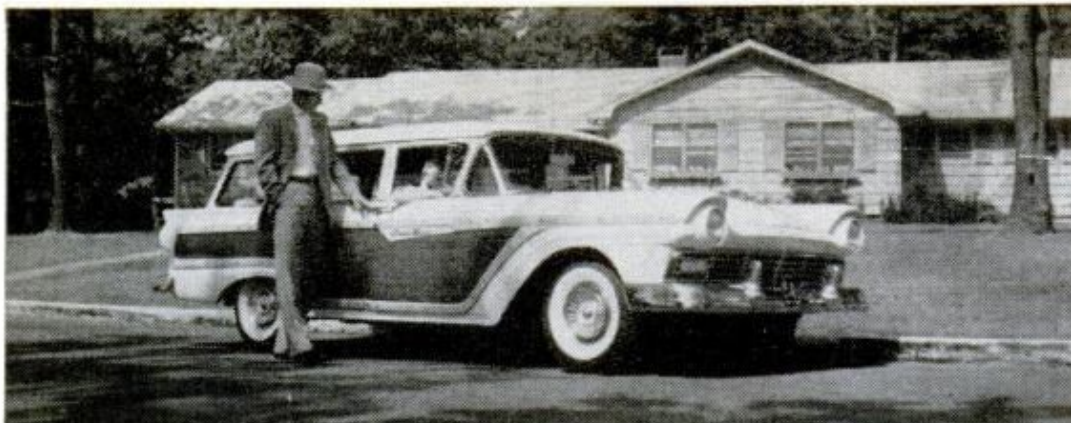
HOW TO START

Your Own Mail Order Business

You can make a fortune by mail. New firms will set you up in a fabulous mail order business of your own! They'll make up your catalogs, prepare your advertising, supply mailing lists and even ship your products for you!

By Robert Stephenson

When Anthony Sambati injured his back and was laid off from work he never dreamed it would be a blessing in disguise. Bedridden for weeks, he decided to start a small mail order business. This was something he could run right from his own home and required very little capital to begin. In fact, Sambati started with less than \$85.00.



After a short time in mail order, Sambati soon had a beautiful home with all the luxuries of a successful businessman.

He figured that a small mail order business might provide a temporary income to support his family until he got back on his feet. His first step was to obtain a franchise from a large wholesale mail order firm which supplied him with all the necessary catalogs and mailing literature. It wasn't long until his spare-time venture blossomed into a booming enterprise. Drawing a small salary and pouring the rest of the profits back into the business, he soon had others working for him! Today he owns a large retail store, his own warehouse and a beautiful home with all the luxuries of a successful businessman.

Sambati's story is typical of a number of men and women who began a small mail order business with absolutely no previous experience, and made a huge success of it. These 'little' people are quietly pocketing big profits every day—many content to keep the business small . . . spending an hour or two each day in the privacy of their own home. No bosses, time clocks or small pay envelopes. No door to door selling, in fact, you never even meet your customers face to face.

Yes, a small one-man mail order business is ideal for anyone wanting a chance to gain financial security and independence. Yet thousands try mail order each year and fail, simply because they don't learn the few simple secrets of success early in the game.

Take the case of Bud Sheer who had been working for a theatre in a small New Jersey town. With only a few hours spare-time to spend each morning, he tried mail order to supplement his regular income. Like many beginners in this field, Sheer was faced with the problem of finding good mail order items which would have a high mark-up and repeat sales potential. But the biggest obstacle was the expense of printing a catalog.

Then he heard about the A. J. Statile Co. of Hillsdale, New Jersey — an organization set up to aid the small mail order beginner.

He wrote to A. J. Statile Co. for full information, sent in his application for a franchise and within a short time the cash began rolling in. Today Bud Sheer *owns* the theatre he once worked for. Sheer attributes his success in mail order to the A. J. Statile Co. Actually, the theatre he owns has become a side investment.

He still uses the beautiful 300 page mail order catalogs supplied by A. J. Statile Co.

How does the Statile Co. help the beginner get a sound start in mail order? Very simply. Just as Henry Ford made automobiles within the reach of the general public—by mass production and large volume.

Let's take a few specific examples:

(1) All franchised dealers of A. J. Statile are offered ready to mail catalogs and sales literature. Each mailing piece has the dealer's name and address printed right on it. By printing millions of catalogs, Statile is able to offer these at a fraction of their regular cost. The artwork and layout costs for these catalogs would run into thousands of dollars for the beginner if he were starting from 'scratch'.

(2) Since all mailing material and catalogs contain your name and address, all orders come directly to you. Yet you don't have to invest one penny in inventory. All merchandise is stocked for you. In fact Statile has over \$3 million dollars worth of mail order merchandise at your disposal.

(3) All packaging and shipping is done for you. You simply send a shipping label to Statile together with the wholesale cost of the items, and the merchandise is shipped directly to your customers under your own shipping label.

(4) A consultation service is provided to answer any questions you may have. You receive a secret list of over 100 national magazines which run free ads. You'll be shown how to obtain free publicity on your own mail order items. In addition, you obtain trade names and addresses of over 150 other mail order wholesalers who drop-ship top mail order items for you. You'll also be given all the government laws and regulations pertaining to a home operated mail order business. These laws are a 'must' for all beginners.

All this valuable information is covered in the Statile Mail Order Survey which every new franchised dealer receives from Statile before they begin. Formerly sold for \$25.00, this survey has become the 'bible' of the trade. Mr. J. M. of Baltimore, Md., writes, "To tell the truth, all the information in regard to obtaining free ads is alone worth the \$25.00 I paid you . . ." J. D. of Kalamazoo, Mich.,

states, "Just a personal note to say I am most satisfied with my \$25.00 investment. Your sales plan is simple and well organized . . ." These are only a few of the many testimonials received praising the Statile Mail Order Survey.

(5) The catalogs and mailing literature offered by Statile Co. cover every conceivable mail order item. You select the field you are interested in . . . BABY ITEMS, TOYS, APPLIANCES, VITAMINS, BOOKLETS AND



The thrill of receiving money in your morning mail is one you'll never tire of.

MAIL ORDER COURSES, you name it, Statile has the catalog or mailing piece. Select your market, order your mailing literature and you're in business.

(6) You'll be told how to compile your own mailing lists—and this is the most important part of your business. Many a beginner has fallen by the wayside simply because he mails his catalogs to a poor list of names. Suppose, for example, you offered a beautiful scale model of a 40' Chris-Craft cabin cruiser by mail. You would probably make your mailings to boating enthusiasts and the chances are that nine times out of ten your mailings would show a loss instead of a profit. How would Statile help you solve this particular mailing list problem? He would show you where to get the names and addresses of *actual owners* of 40 foot Chris-Craft cabin cruisers! Surely every owner would like to have a scale model of his own boat. Strange as it may seem, such a mailing list is available to anyone. The secret is where to find it. This is just one example of how an experienced mail order expert giving you personal advice, may mean the difference between success and failure!

This same method of obtaining selective specialized mailing lists may be applied to practically any market . . . selling baby items to new mothers, selling toys to young children, etc., etc.

So much for starting your own mail order business. Now, a word of caution. **OBTAIN YOUR MAIL ORDER FRANCHISE FROM A**

REPUTABLE MAIL ORDER FIRM. Unfortunately, during the past few years a number of ads have appeared in newspapers and magazines offering to start people in mail order. The ads are grossly misleading. Many imply that you can become a millionaire over night if you use their catalogs. Beware! Particularly if they operate their own mail order business direct to the consumer. These firms compete with their own franchised dealers! They could just as well mail all the catalogs themselves. They don't need you.

Other shady firms fail to drop-ship your orders promptly, thereby losing customers for you. In mail order, prompt shipment is an absolute requirement for a successful operation.

Deal only with firms whose business is preparing catalogs and shipping merchandise. They operate on a strict wholesale basis for franchised dealers exclusively. Such a firm is the A. J. Statile Co. Letters from successful franchised mail order dealers speak for themselves. A woman from Milwaukee writes, "It has been better than my expectations." A gentleman from California states "we are quite pleased with the response we are receiving." Another man from Wisconsin writes, "To say the least, I am more than satisfied."

Yes, a small mail order business offers you an opportunity to earn a second income, or—if you work at it in earnest, a chance to strike it rich. The young housewife in St. Louis may be content to make an extra \$20.00 a week . . . the office worker in Los Angeles may be aiming for \$150.00 weekly full time business . . . and the ambitious schoolteacher in Newark may reach \$20,000.00 a year. What is your objective? Set your own goal, pick your own hours, and the sky is the limit.

Even a government report stated that a number of the most successful one-man mail order enterprises make as high as \$40,000 to



Big firms will carry all stock for you. They ship orders direct to your customers using your own shipping labels.

Your Own Catalogs of Top Mail Order Items!



A. J. Statile Co. will prepare your catalogs, write your sales letters, supply mailing lists and even ship merchandise for you, using your own shipping labels!

\$50,000 a year! But frankly, this is the exception rather than the rule. Most mail order operators are content to earn a comfortable living doing little physical work, but enjoying their work thoroughly! We don't say you'll be a mail order millionaire or another Sears & Roebuck, but if you're looking for a business of your own with financial security, the answer is mail order. If you've already tried mail order with little or no success, don't give up! Try to analyze what went wrong. Success comes only to those who keep trying and learn from their own mistakes. Again we emphasize, deal only with a reputable firm.

The A. J. Statile Co. has been in business for over twelve years.

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Firmly convinced that no other business offers the tremendous opportunities of mail order, A. J. Statile, president of the firm, is an outspoken advocate of the man or woman who wants to start in business for himself. As Statile puts it, "by all means, start your own business and start **NOW!** If you want a chance at security and financial independence make your choice mail order. There's nothing like it. Absolutely nothing!"

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Dear Mr. Statile:

Please send me complete **FREE** details telling me how I may obtain a franchised mail order dealership with your firm. I understand I am under no obligation and no salesman will call on me.

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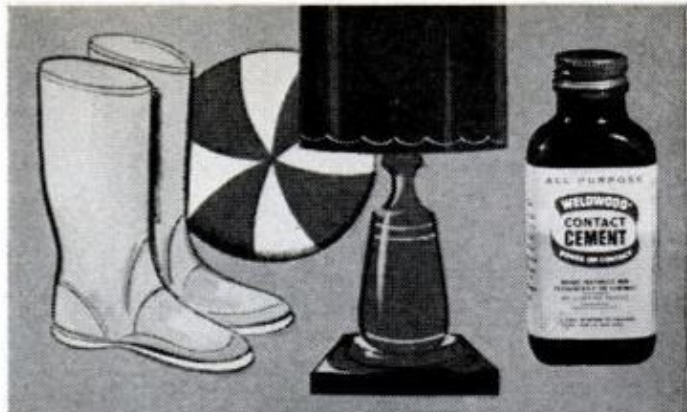
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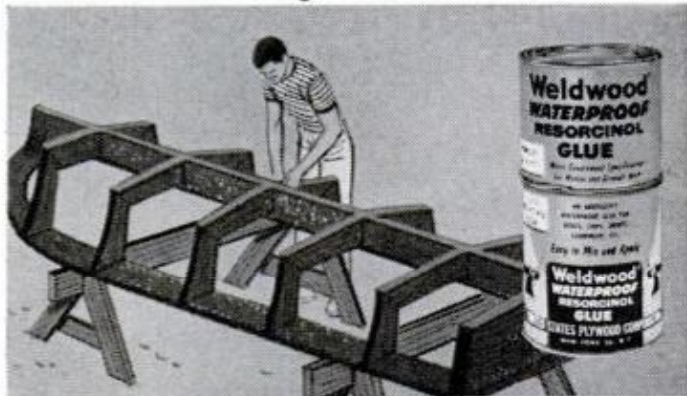
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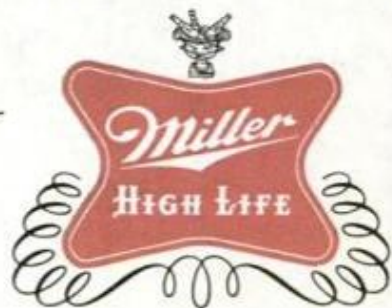


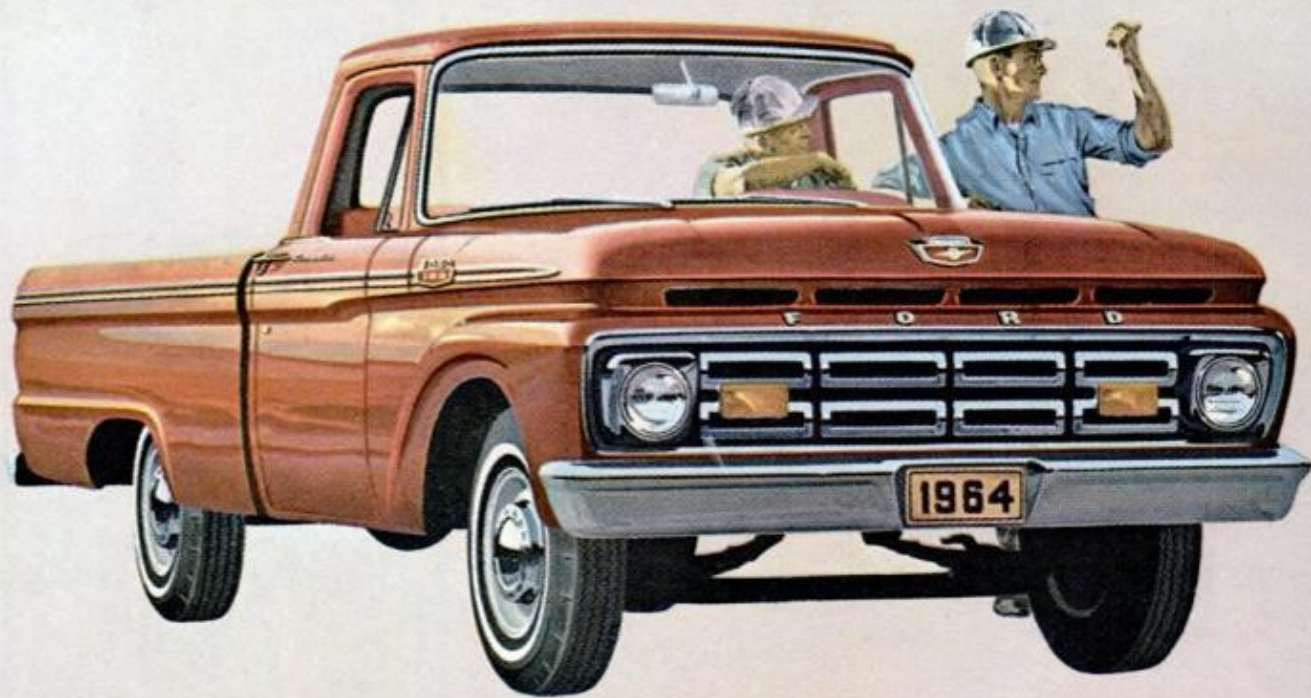


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No wonder Econoline is America's favorite delivery truck. No other one truck offers so many advantages: more load-space—up to 56% more than old-style panels; long, low flat floor and up to eight big doors for easy load handling; low price and low operating costs. And Econoline's new features give you even more advantages in '64!

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Surer stopping with new self-adjusting brakes. Brakes automatically adjust themselves, increase safety . . . cut shop time.



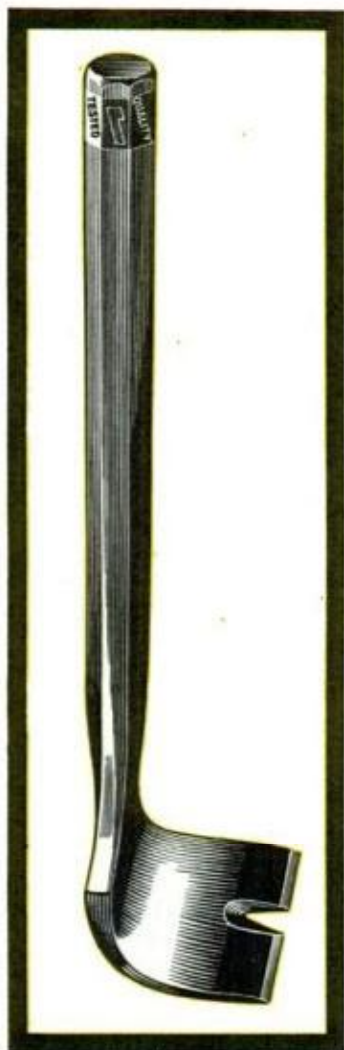
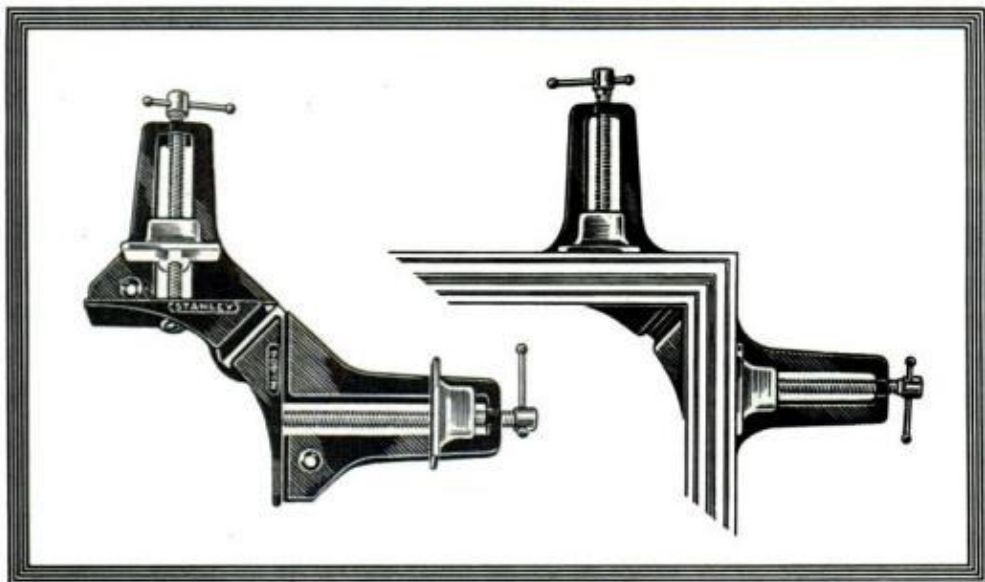
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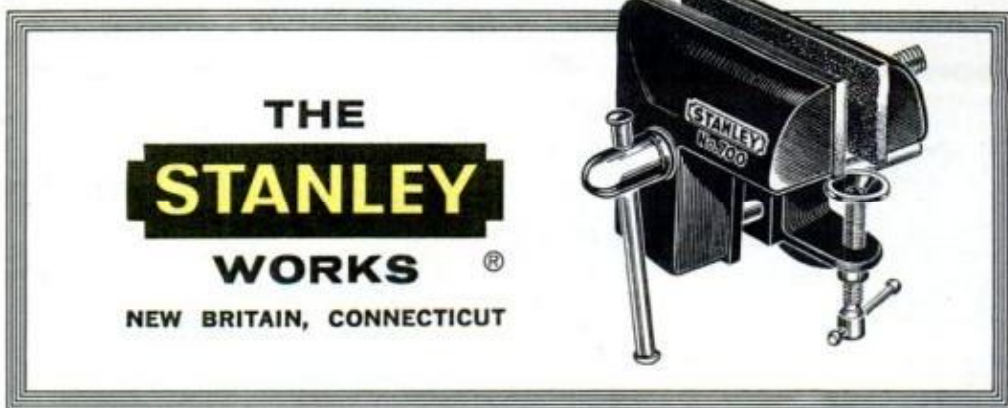
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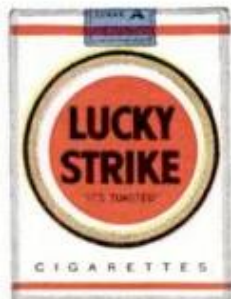
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Now—get color pictures in 50 seconds with the world's most advanced camera

Everywhere, reaction to the new Polaroid 50-second color film has been exciting. The colors are rich and clear. Skin tones are remarkably accurate.

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STEAMING around test oval is 266-horsepower 1964 Mercury with new alternator pouring out current for lights. Comparison drives show softer rubber in 1964 body mounts have mellowed the ride appreciably

Proving Ground Reports on The '64 Cars—How They Compare

For the “feel” of the 1964 cars — how they ride, steer, sound, shift and stop — join PM in a trip to the automotive proving grounds.

You’ll find, as we did, that the significant story lies beneath the gleaming new metal skins.

It shows up in a whole new line of automatic transmissions which replace the Waring blenders of previous years with more muscle and less mush.

Or in the hot engines which have made fast cats out of docile compacts, such as the 195-hp. job available for Comet, or the optional 220-hp. V8 for Chevy II and the new Chevelle.

Let’s take a closer look at such changes.



▲ **RAMBLER AMERICAN'S** 6-inch increase in wheelbase and 3-inch increase in length add moderate amount of weight but don't seem to slow down hill climbs such as this one. There's less short-wheelbase hop and new ball-joint front suspension and 7-inch longer rear leaf springs give a full-sized ride which matches roomy new 6-passenger status

▼ **COMET CALIENTE** gets brutal shakeout from boulder-studded Ford test strip. Although Comet's wheelbase remains 112 inches, the 5-inch longer rear springs and softened front suspension add serenity to highway cruising and seem able to cope with rough stuff such as this. A new 195-hp. V8 and 3-speed automatic will be available





BUICK'S NEW ELECTRA swallows a test-track torture trough without bottoming. This test really racks a convertible's frame but the Buick did not creak. New Super Turbine 400 automatic transmission for Buick adds usable low and intermediate gear ratios, improving shift performance with no power increase



▼**CHEVELLE MALIBU** has separate frame and coil springs all around. Its 115-inch wheelbase and 195-inch over-all length make its size almost identical with the 1955 Chevrolet. Four engines will be available for Chevelle: Sixes of 120 and 140 hp. and V8s of 195 and 220 hp. PM testers found V8's extra 150 pounds did not hurt cornering

▲**IMPERIAL'S BULK** is snubbed by big brakes on steep test hill at Chrysler proving ground. Frame's the same and so are torsion bars up front and long leaf springs in rear. But square-lined body is all new and convertible is far more shake-resistant than last year's model. Note "Continental" tire outline in deck lid. Gas filler is under center ornament





CHEVROLET IMPALA has wider-eyed headlight look but is mechanically almost the same. For its bulk, handling was nimble on gravel roads such as this one. Ride was thoroughly plush but, for hard cornering work, stiffer shocks and wider tread might be a welcome addition

PLYMOUTH BELVEDERE WAGON shows no distaste for hilly "countryfied" test road. Two-inch tread increase adds stability to handling. Racers will like "tweaking" refinements which should give Plymouth's super-stock 426-cu. in. engine a better high speed pickup



LEANER, CLEANER STUDEBAKER still drives like the Lark it replaces, but several trips through test water trough at South Bend showed this prototype to be remarkably water tight. Styling is considerably sleeker for '64 but the mechanical changes are relatively few



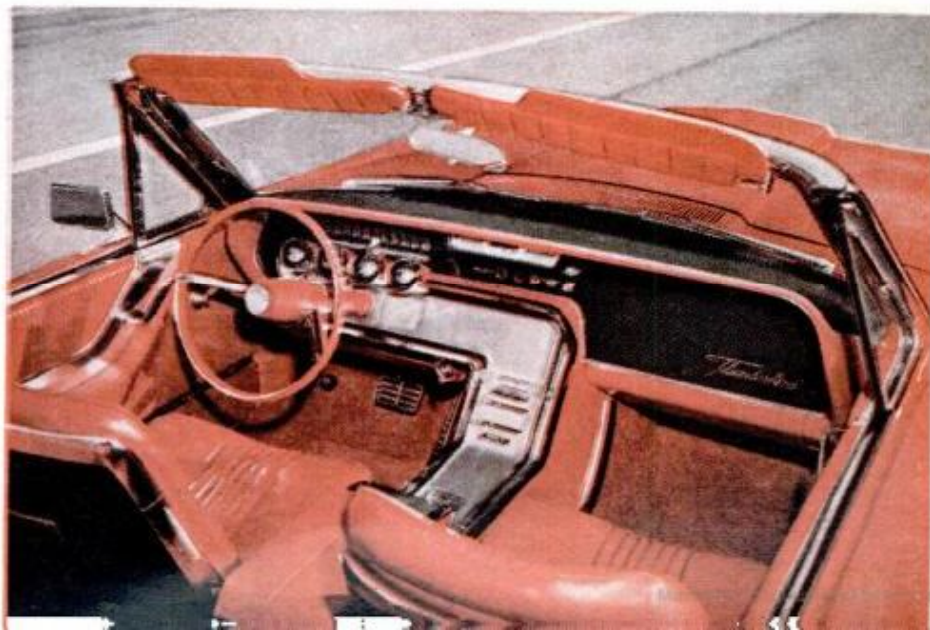


THUNDERBIRD'S MOVE back toward the less banalike contours of '58 to '60 will call for many a doubletake—and no little rejoicing. The wheels are now 15 inches, up from 14

Welcome Back, T-Bird



AFTER NEARLY a decade of style setting with round taillights, the T-Bird squares off with triple lamps behind lenses (framed by bumpers) that look like Ben Franklin's spectacles. New interior has reclining seat with movable headrest





The '64s

• Grown-up Compacts More Passing Pickup
• New Iron Engines Squeak-Damp Frames
• More Size Inside Better Shifts for All

By Jim Whipple, PM's Automotive Editor

AFTER WEEKS of driving the '64s on sunbaked proving grounds, then digging into the facts and figures behind them, we're convinced that Detroit is giving new car buyers more good sense—and less pure show—this year than it has in many a year.

And they're doing it, in large part, by going *back* to some distinctly "old hat" engineering concepts.

The nice thing about the 1964 improvements is that many of them can be seen, felt and enjoyed. Even though it is not true of all models, on many '64s you'll find a bit more room for your legs in the back seats, smaller steering wheels to scrunch under in front, more windshield glass at eye level to see out of, yet less above your noggin to let in heat and glare. Many rear windows are bigger, so you can back up with less risk.

More seats are wider so that six friends may ride in one car



◀ **TEMPEST'S ALL-NEW** station wagon, whose underbody is shared with Chevelle, Olds F-85 and Buick Special, has 87.8 cubic feet of cargo space compared to last year's 72. 1964 Tempest is almost nine inches longer

BUICK SPECIAL drops its unit body design for '64, shifting to a separate frame and body with squeak-damping body mounts. The result is fewer body-twist noises on proving-ground run such as this deep trough

CHEVELLE MALIBU COUPE shows what may be a new General Motors styling trend. Note clean, flat sides with a slight "Bunky Knudson" arch at rear quarter panel—similar to the arch you see on Pontiac. Chevelle handling was excellent



STEM-TO-STERN LINES CREASED INTO FALCON'S SHEET METAL give the impression of much greater length, although over-all measurements increased only half an inch. Basic Falcon now has optional hot V8 available



ALLOW FOR
2ND CAR-
STOP
AT END OF PAD



BRAKES ARE EFFECTIVE ON THE BIG, softly-sprung Mercury for 1964, demonstrated by this proving-ground panic stop from 30 miles an hour. If stops of this kind are common, more anti-dive geometry is needed

and remain friends. More roofs have been raised a bit so your hat stands a better chance of not being squashed. More rear door openings are broader so that you can exit without emulating a pretzel.

In some cases, added weight has gone into such things as beefier bumpers that protect your car instead of merely outlining the target zone. Power added in moderate amounts to family car Sixes and small V8s, gets you in and out of passing lanes faster. Extra ratios added to automatic transmissions let you enter speeding thruway traffic more readily, and climb mountains more economically. Inches of length added to rear springs and extra rubber in front suspensions make many compacts ride almost as well as their intermediate cousins.

What new ideas in design have accomplished these welcome improvements? Well, the *newest* of the '64 cars—the Chevelle—is, except for height, almost a twin in size to the 1955 Chevrolet. The *newest* engine is neither a lightweight aluminum V8 nor a brandy-keg cylinder Four. Instead, it's the familiar old concept—a cast-iron straight Six.

The newest automatic transmissions use time-proven three-speed gearing coupled to torque converters, and they replace the fancy split-torque jobs of recent years.

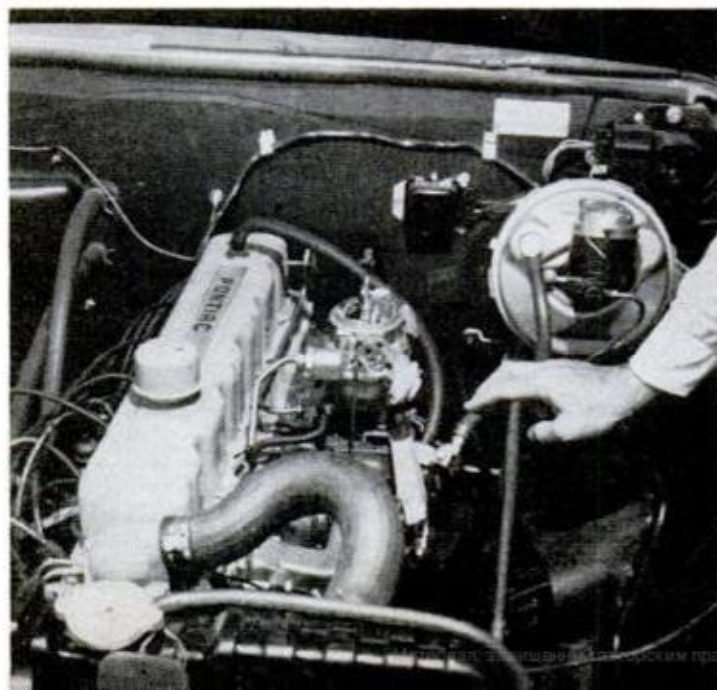
Some unit construction bodies have given way to the "old-fashioned" separate frames. A conventional axle takes the

place of Tempest's tricky transaxle, and on other cars, potentially less troublesome single driveshafts have returned, replacing the dual-shaft, multi-universal designs. Bubble-type windshields have yielded to nearly flat sheets of glass.

In short, the designers have borrowed time-tested basic ideas from the past to give you improved 1964 models that make more sense, are more comfortable, have more room inside, are easier to drive and offer better performance. You might call it a rousing return to progress.

If all this sounds too sensible to some,

ALTHOUGH A DEAD RINGER for the Chevy II Six, it's made in Pontiac's foundry and displaces 215 cubic inches. It's Tempest's new, 140-horsepower engine





DESIGN PROGRESS IS SOMETIMES GRADUAL, sometimes startling. This comparison of the 1963 (left) and 1964 Rambler American wagons shows increase across rear seat of from 42 to 57 inches—and more loading area

let's note that Detroit has not forgotten the youngster who wants warmer machinery. Or the father who wants to make like Dan Gurney as he noodles the family bus down to the drive-in.

Manual, four-on-the-floor transmissions are available on at least 18 of the 1964 models, and big-breathing engine options are plentiful even for mounting on some relatively fragile framing. We'll bring you performance reports on some of these nervous tigers as we go along.

Now let's zoom in for a sharper look at the specific changes on the 1964 models. A

logical place to begin is with the new Chevelle and its enlarged ex-compact teammates: the Tempest, Oldsmobile F-85 and Buick Special. Not only do they share many of the improvements we have mentioned, they also typify the new breed of "grown-up compacts" whose sizes parallel cars that the American family was accustomed to in the 1955-57 years.

As you may remember, that was before someone hollered "down with the gas-guzzling dinosaurs," but forgot to say how far down. Detroit, trying to oblige, turned out what it thought the public wanted—

BUICK SPECIAL'S NEW BODY is ample in all dimensions for a six-foot-three test driver. The driver position is comfortable and road vision generally good

THE DODGE ROOF LINE IS NEW, although the difference is hardly noticeable from the outside. It provides an inch and a half more rear-seat headroom





ONE OF THE FOUR GENERAL MOTORS PARTNERS in a joint new body-and-frame venture, the Olds F-85, now has its own 330-cubic-inch V8 engine and shares Buick Special's 225-cubic-inch V6. Wheel diameter is up an inch to 14

a group of six-cylinder, six-passenger Volkswagens, if you will—the first of a new breed of American compacts. They sold well, initially. But gradually the cramped seating quarters, lack of reserve passing power, lack of weight to fight crosswinds on long trips, lack of startling fuel economy—all these began to pall. And the pendulum began its swing back to more size and some of the old familiar performance power. Which brings us full circle back to the 1964 Chevelle and its sister BOP full-grown compacts.

CHEVELLE, TEMPEST, OLDS F-85, BUICK SPECIAL

All of these new GM cars share an identical 115-inch wheelbase, a frame and body which is no longer unitized and an improved suspension system. As you might suspect, the shared components make the ride, handling and driving characteristics of these cars quite similar.

Why Tempest, Olds F-85 and Buick Special abandoned unit bodies in favor of separate frames may be explained by their increase in size. As cars get larger, the weight-saving offered by the complementing strength of combined body and frame pieces is reduced. At the same time, vibration and resonance increase. Like an oil drum, the bigger it gets, the louder the "Boom!"

To keep a solid structure quiet as it gets bigger, heavier metal and more sound insulation become necessary, and these

nullify the weight savings. Then, too, different bodies (such as wagons, convertibles and hardtops) require different "tuning" of their parts, and it's easier to tune out vibrations by changing the size and softness of rubber insulators between a separate frame and body than it is to monkey with an integral body's pressed-steel welded parts.

In switching back to separate body and frame, it's interesting to note that the BOP's floor space has not been reduced in proportion and the door-sill size has not increased appreciably.

The trick is a clever trapezoidal frame design (see illustration, page 95) which engineers maintain is just as strong though it takes up less space. Air space between body sill and frame along door areas is also minimized. Both new and old bodies are step-down types, but since the new floor pan slopes up to a narrow door sill, floor space remains good. Also, door opening is wider, so entry and exit are easier.

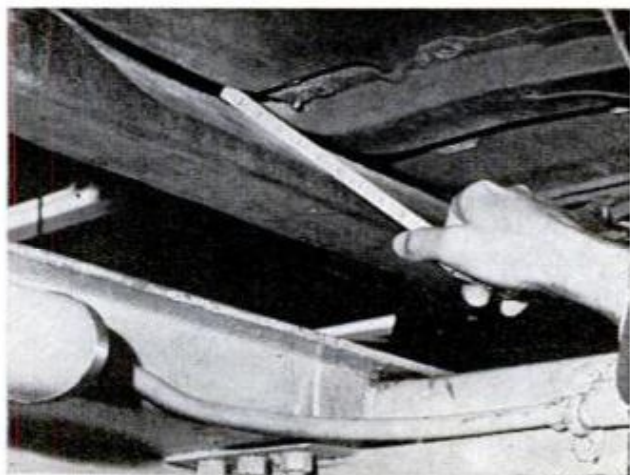
The front suspension on the Chevelle-BOP cars is a conventional and accepted design—long and short triangular control arms, coil springs and ball-joint spindles.

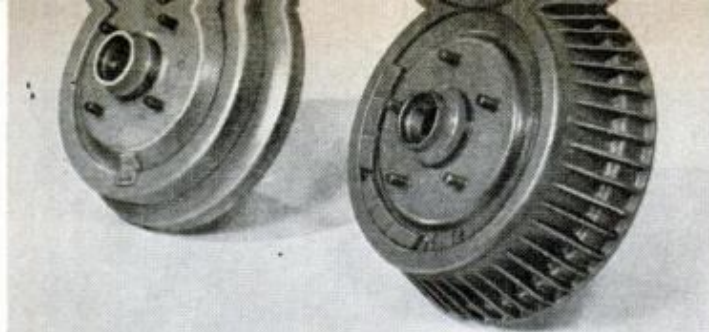
The rear suspension is a new version of the system used for the past three years on Olds F-85 and the Special. It uses coil springs and a solid axle linked to the chassis by fore-and-aft torque arms; two additional arms link the top of the differential to the frame at a 45-degree angle. These additional arms position the solid



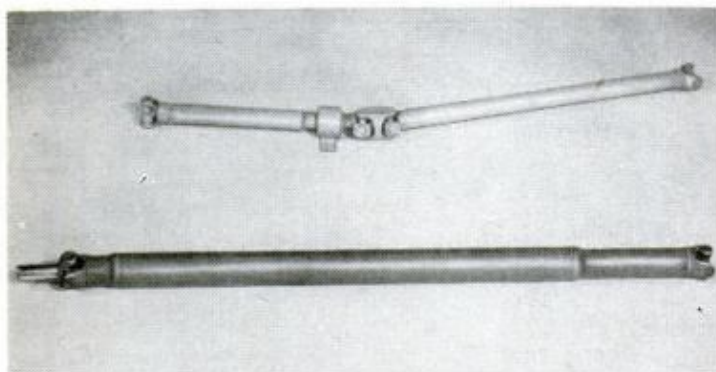
THIS ONE COULD BE A SLEEPER; Dodge's big 880 with its smooth, conservative styling has same 122-inch wheelbase body-chassis as Chryslers' with 383 cubic inch V8. The 880 has quietly replaced DeSoto in Chrysler lineup

NEW FRAME FOR CHEVELLE AND BOP COMPACTS is shown in its convertible version. The unique sloping top flange saves space and allows more footroom on the floor and a narrower door sill. The wheelbase measures 115 inches

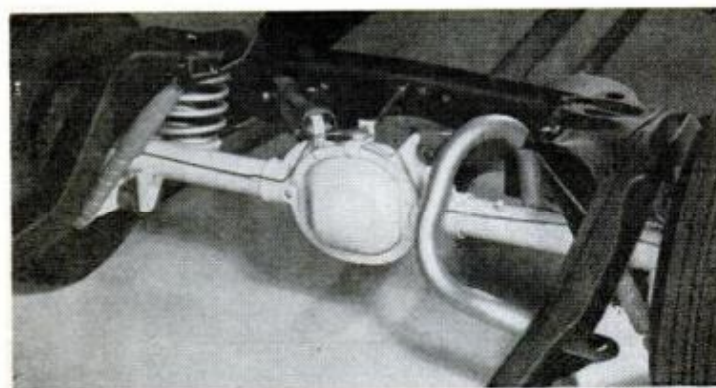




THE BUICK SPECIAL'S BIGGER and better brakes match the car's increased power and weight. Drums for the '63 Special (left) were smaller and had 123 square inches of lining area. The bigger 1964 drums (right) have 142. The car itself is 11.4 inches longer this year

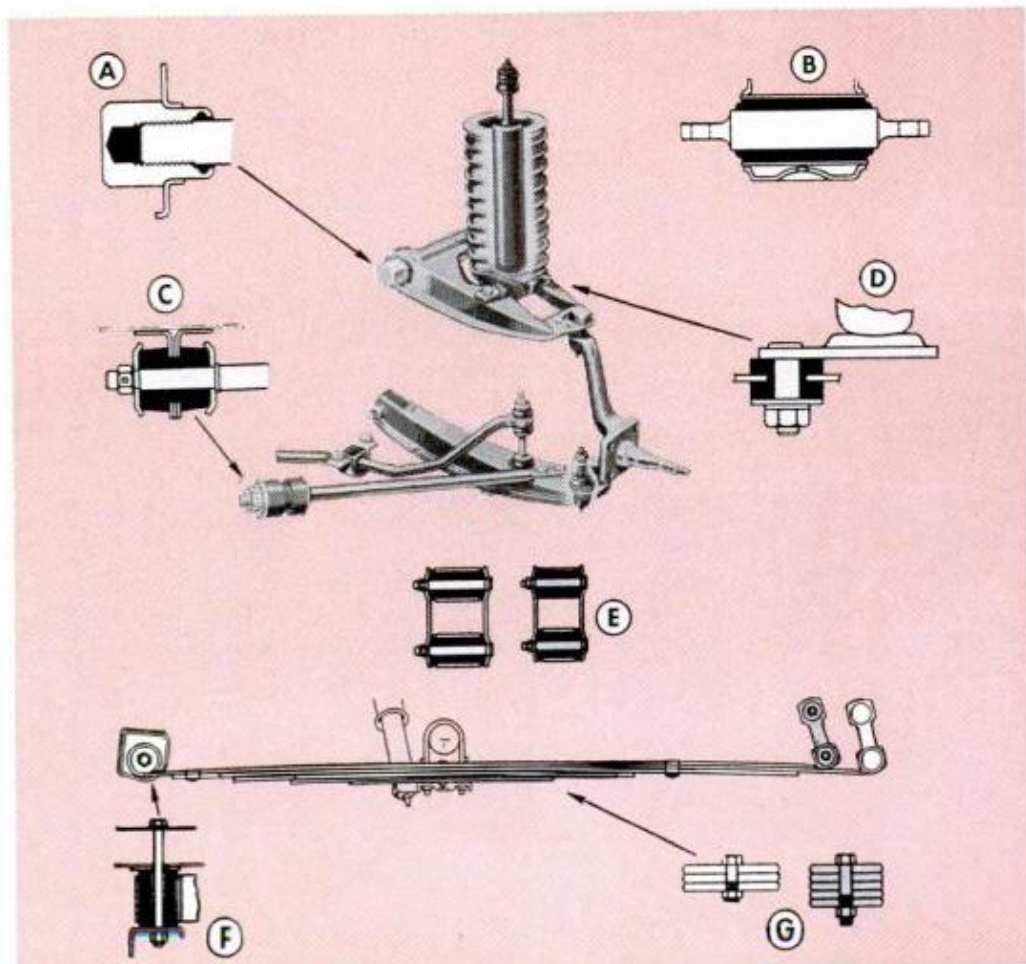


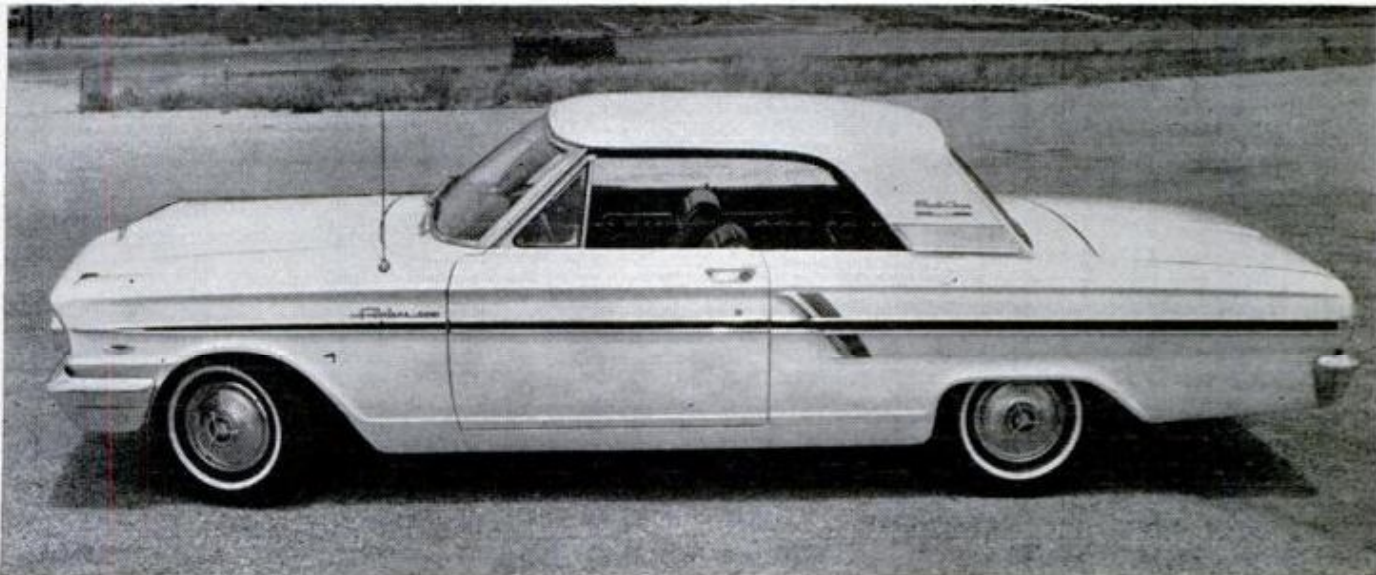
BUICK SPECIAL'S RETURN to a single-piece propeller shaft cuts universal joints to two, eliminating about half of the potential universal-joint problems and noises. It's done without increasing tunnel height, thanks to the switch to separate-frame construction for '64



REAR SUSPENSION for Tempest and Buick Special uses coil springs mounted above the axle. It allows the use of softer springs yet, says General Motors, there's no loss of handling and control. Proving-ground trial runs by PM tended to support manufacturers' claims

FALCON'S SUSPENSION for 1964 has a series of refinements that sharply reduce harshness and vibration. The upper pivot arm (A) now has lubricant sealed in. Spring-seat pivot (B), instead of metal-on-metal, is rubber bushed to reduce harshness. Front strut mounting and bushing (C) are bigger for better road shock absorption and the lower ball joint has a smaller bearing area for less friction. The thickness of the new lower shock insulators (D) is doubled. Rear spring shackles (E) are wider and more stable while bushings in spring eye (F) are wider and softer for road shock insulation. Springs themselves now have three wide leaves (G) instead of five narrow ones and are 5 inches longer than previously





TOP: VALIANT GETS A NEW GRILLE AND HOOD PANEL this year for stronger, more solid look. It shares Dodge Dart's optional four-on-the-floor stick shift

BELOW: CHANGES IN FORD FAIRLANE'S SHEET METAL doll it up for 1964, but the 115-inch wheelbase and basic underbody are continued from models of 1963

axle laterally and take care of torque.

All four of these cars share a single one-piece driveshaft which eliminates the hodge-podge of BOP shafts—Tempest's torsion bar and the two-piece job with its four universal joints that vibrated badly on many F-85s and Specials in the past.

Another exotic engineering item to disappear in 1964 is Tempest's rear-axle transmission with half-shaft "swinging" rear axles. These swing axles tended to provide some exotic steering effects when body lean on cornering forced them out of horizontal plane.

New Cast-Iron Sixes

For standard engines, Chevelle and Tempest use very similar cast-iron, lightweight, in-line, overhead-valve Sixes. They are very similar in both design and

manufacture and share such parts, as the water and fuel pumps. Tempest's Six displaces 215 cubic inches and is rated at 140 horsepower while the Chevelle buyer will get a choice of the 120-horsepower, 194-cubic-inch Chevy II Six, the 230-cubic-inch Chevrolet Six of 140 hp., or a V8.

F-85 and Buick Special will share the V6 used on the Special in '62 and '63. For '64, it's been boosted from 198 to 225 cubic inches and it is now rated at 155 horsepower.

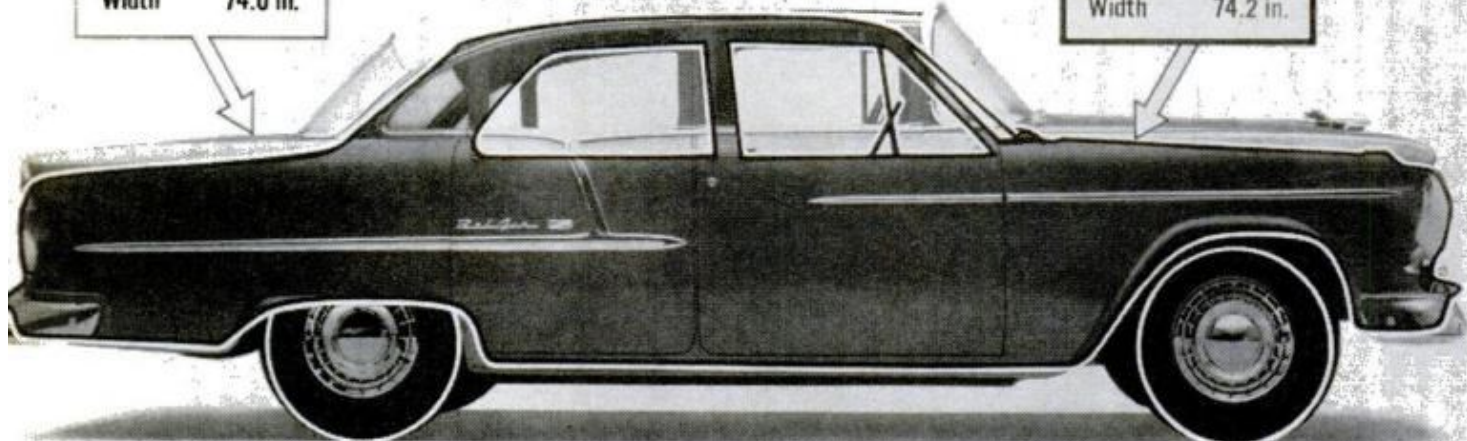
Each of these new 115-inch-wheelbase GM cars gets a different V8. Chevelle has the Chevrolet 283 engine, rated at 195 hp., Tempest's V8 is last year's 326-cubic inch version of the big Pontiac engine rated at 250 horsepower. Buick Special and Olds F-85 V8s have many common parts including the new iron cylinder block which

1955 CHEVROLET

Wheelbase 115.0 in.
Length 195.6 in.
Height 60.5 in.
Width 74.0 in.

1964 CHEVELLE

Wheelbase 115.0 in.
Length 193.9 in.
Height 54.1 in.
Width 74.2 in.



OUTLINE OF GM'S CHEVELLE IS SUPERIMPOSED on a 1955 Chevrolet sedan, showing similarities of their dimensions. The principal difference is height; Chevelle's step-down body and 14-inch wheels put height 6 inches under the '55

replaces the aluminum block used on the optional V8 engine since 1961. Heads are different and so is displacement with the Special at 300 cubic inches and F-85 at 330. Both claim 210 horsepower, which makes Buick engineers look better than Olds engineers, if economy and other factors are equal.

Because cylinder heads, intake manifolds and other parts on these V8s remain aluminum, the weight penalty of going back to a cast-iron is about 100 pounds.

Tempest's radical, slanted Four has been

dropped in favor of a new precision cast-iron thinwall, overhead-valve, six-cylinder engine very similar to Chevrolet's new 194 and 230 cubic inch Sixes. This engine weighs about 100 pounds less than the old Four.

Not only does the new Six save weight, but its seven-bearing crankshaft and 215-cubic inch displacement provide more power much more smoothly.

Olds F-85 has dropped its Jetfire turbo-supercharged option, thus eliminating a device that provided almost as much headache as it did horsepower.

ENTRY AND EXIT FROM REAR SEAT of the Rambler American is eased by use of the same doors and frames as are found on its big brother, the Classic



EQUALLY CONVENIENT ENTRY and exit are available through the rear door of the sedan body shared by Chevelle and smaller BOP cars. Tempest is shown





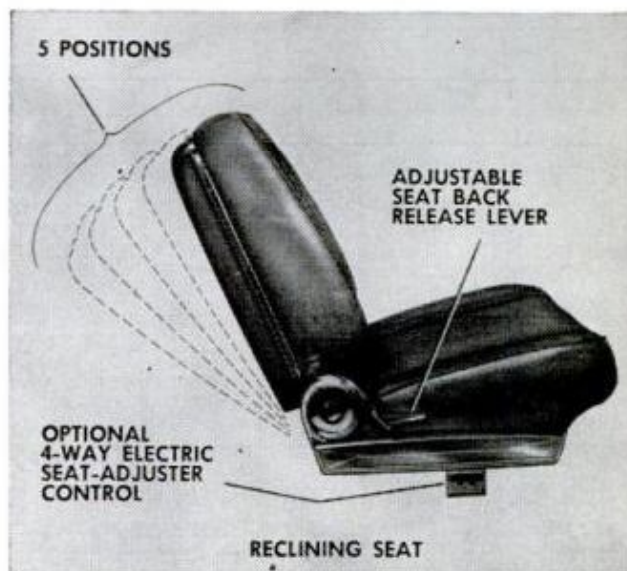
REINTRODUCTION of El Camino as a Chevelle pickup will offer lots of fun to those who like fancy, comfortable trucks. A Six or 283-inch V8 are available

All four of these cars feel solid. We drove at 60 and 70 m.p.h. over rough washboard on the proving grounds in several representative sedans, convertibles and wagons, and found what body shake they had to be very well damped and controlled. There was no front-end flapping, door judder and the like. The extra give of the rubber between frame and body on the '64s eliminates the twisting hull noises and squeaks and creaks around the windshield heard in the 1963 unit-body jobs.

Basically, these grown-up compacts are comfortable and softly sprung, yet not sloppy, willowy or mushy in feeling. They won't "float" as serenely as the bigger Pontiac Bonneville, the Olds 88 or the big Buicks because they have smaller tires, shorter wheelbases and less massive upholstery. But their ride softness and freedom from pitch is excellent. In fact, the feeling of tautness and control in these 115-inch cars will be preferred by people who really like the "feel" of driving.

Compared to the Impala, the Chevelle feels more at home on a winding road. It rolls less, corners flatter, and feels as if it were under better, firmer contact with the road. With V8 weight and power steering, though, steering feel becomes vague.

The Tempest V8, which last year was extremely nose-heavy and prone to follow a straight course, is now far less headstrong, although the engine still is heavier



WORKING RECLINING SEATS like this one of Chrysler's are indications of genuine interest—and progress—toward passenger comfort in cars introduced for '64

BUCKET SEATS GO FLIGHT STYLE on the Ford Galaxie XL hardtop where the pedestal-mounted front seats give more rear passenger foot stretch-out room





ALL-NEW SHEET METAL FOR THE CHEVROLET'S basically unchanged body and 119-inch-wheelbase frame give a new yet familiar look to the car for 1964. Mechanical changes are minor but even Biscayne now has a hot V8 option



THE SAME TREATMENT, NEW SHEET METAL ON THE SAME basic car, is given Ford's Galaxie, which gets the wider, soft-corner look and sculptured side metal reminiscent of some styling on General Motors' medium priced cars

than any of the other BOP V8s. Better weight distribution and the new, more stable suspension system make the new Tempest behave the way you want it to.

None of these four cars in stock form would be a drag stripper's delight. But none of them is sluggish. The 140-hp. Tempest sedan with automatic clicked off a true 0-60 m.p.h. acceleration in 13.6 seconds while the 195-hp. Chevelle V8, a heavier convertible, did the run in 12 seconds. A Buick Special V6, equipped with its new "switch-the-pitch" torque converter plus high and low range, reached 60 m.p.h. in 11.8 seconds.

We tried a Buick Special sedan and Tempest wagon without power steering. Both were Sixes. You can get along without power steering on a six-cylinder job, but maneuvering at near-crawl parking speeds on dry pavement will make it a borderline choice for the ladies.

These power-steered cars are not soft, touchy or over-steery, but the Tempest, with its heavy V8 comes close to being so.

Speaking of Sixes, the Chevelle and Tempest in-line Sixes with their seven bearings seemed a bit smoother than the Buick Special's V6.

Bodies of the Chevelle, Tempest, F-85 and Special are very good. The nearly flat windshield gives good vision, corner posts are narrow, seating positions are good. There's plenty of legroom for tall drivers and still good legroom in back.

There's something of a blind spot in the rear quarter of the four-door Chevelle sedan, but the rear window is straight across with no distortion. There's good entrance through the rear doors and a generous trunk. All in all, the new Chevelle seems roomy, fun to drive, and handles nicely with more than satisfactory performance using the Six in the stock sedans, but you'd need the V8 on wagons.

CHEVY II

We had an opportunity to try out a Chevy II with its new engine option for '64—the 283-inch V8. Ours was a sedan



LOOKING MORE OLDS-LIKE THAN EVER is the newest version in the line, the Jetstar, something of a poor man's Buick Riviera with basically '88' components



SMOOTHER, SLEEKER, PERENNIALY Pontiac is the Bonneville. It has grown but, after good '63 sales, Pontiac avoids rocking the boat with extreme changes



PROGRESS IS SOMETIMES MADE by going backwards, and the '64 Plymouth two-door hardtop, left, with its curved backlite much like 1960-61 Plymouth's, is a perfect example. The 1962-63 window, right, restricts rear vision at corners

and loaded for bear with air conditioning, automatic, power-steering and brakes. Frankly, it was overloaded; it had bullish tendencies to head for the fences whenever we moved into a curve briskly. Under heavy braking the wheels juddered and linings smoked profusely—there's just not enough stopping power for all that iron up front.

Chevy II's weight-saving unit body, retained for '64, is very efficient with the lighter Six. But the car wasn't designed for the extra weight of a powerful V8 up over the front axle; it shakes like a loose shutter in a gale.

Contrary to previous reports, Chevy II will retain its 90-hp. four-cylinder engine on all domestic models. It and last year's 120-hp. Six will be the standard Chevy II engines for 1964. Standard transmission will be a three-speed manual shift and the Powerglide automatic will be optional. Of course, a four-on-the-floor stick shift is optional with the hot 195-hp. Turbo-Fire 283 engine option but not with the Sixes.



A NEW SLANT ON PONTIACS' instrument housings points dial faces slightly to the left so the driver can see and read them more easily. Tach is in console

How the Specifications Change for '64

MAKE OF CAR	Wheelbase		Over-all Length		Over-all Width		Wheel Size		ADVERTISED BASIC HORSEPOWER	
	1964	Change	1964	Change	1964	Change	1964	Change	1963	1964
BUICK Special	115	+3	203.5	+11.4	73.4	+1.2	14	+1	V6 135, V8 155	V6 155, V8 210
LeSabre/Wildcat	123	—	218.8	+3.1	78	—	15	—	280/325	210/325
Electra 225	126	—	222.8	+1.1	78	—	15	—	325	325
Riviera	117	—	208	—	76.6	—	15	—	325	340
CADILLAC Sixty-two	129.5	—	235.5	+5	79.7	-.2	15	—	325	340
DeVille	129.5	—	223.5	+5	79.7	-.2	15	—	325	340
Fleetwood	129.5	—	223.5	+5	79.7	-.2	15	—	325	340
CHEVROLET	119	—	209.9	-.5	77	-2.4	14	—	Six 140	V8 195, Six 140
CHEVELLE	115	—	193.9	—	74.6	—	14	—	—	V8 195, Six 120
CHEVY II	110	—	182.9	-.1	70.8	—	13	—	Six 120, Four 90	V8 195, Six 120, Four 90, V8 195
CORVAIR	108	—	180	—	67	—	13	—	80	95
CORVETTE	98	—	175.3	—	69.6	—	15	—	250	250
CHRYSLER Newport/300	122	—	215.3	—	80	+1	14	—	265	265
New Yorker	122	—	215.3	—	80	+1	14	—	340	390
DODGE	119	—	209.8	+1.7	75	-1.5	14	—	V8 230, Six 145	V8 230, Six 145
DODGE 880	122	—	214.8	—	79	—	14	—	265	265
DODGE DART	111	—	196.3	+4	69	+3	13	—	Six 101	101
FALCON	109.5	—	181.6	+5	71.6	+1	13	—	Six 85	V8 164, Six 85
FORD FAIRLANE	115.5	—	197.6	—	72.2	+9	13	—	V8 145, Six 101	V8 164, Six 101
FORD GALAXIE	119	—	209.8	-.1	80	+1	14	—	V8 164, Six 138	V8 195, Six 138
IMPERIAL	129	—	227.8	—	80	-1.7	15	—	340	340
LINCOLN CONTINENTAL	126	+3	216.3	+3	78.6	—	15	+1	320	320
MERCURY	120	—	215.5	+5	80	—	14	—	250	250
MERCURY COMET	114	—	195.1	+3	71.4	+1	13	—	Six 85	V8 164, Six 101
OLDSMOBILE F-85	115	+3	203	+10.8	73.8	+4	14	+1	V8 155	V8 210, V6 155
88	123	—	215.3	+9	78	—	14	—	280	225
98	126	—	222.3	+8	78	—	14	—	330	330
PLYMOUTH	116	—	206.5	+1.5	75.6	—	14	—	V8 230, Six 145	V8 230, Six 145
PONTIAC Tempest	115	+3	202.7	+8.4	73.3	-.9	14	-1	V8 264, Four 115	V8 250, Six 140
Catalina	120	—	213	+1	79.2	+5	14	—	215	215
Bonneville	123	—	220	+1	79.2	+5	14	—	235	235
Grand Prix	120	—	213	+1	79.2	+5	14	—	303	306
RAMBLER American	106	+6	177.25	+4.15	68.56	-1.44	14	—	Six 90	Six 90
Classic	112	—	190	+1.2	71.32	+0.2	14	—	Six 127	Six 127, V8 198
Ambassador	112	—	190	+1.2	71.32	+0.2	14	—	250	250
STUDEBAKER Lark	113	—	194	+6	71.50	+2.5	15	—	V8 180, Six 112	V8 180, Six 112
Hawk	120.5	—	204.1	+1	71	—	15	—	180	180
Avanti	109	—	192.4	—	70.4	—	15	—	N.A.	235
THUNDERBIRD	113.2	—	205.4	+4	77.1	+6	15	+1	340	300
VALIANT	106	—	188.2	+2	70.1	+3	13	—	Six 101	Six 101

*Indicates the standard transmission for the basic car and engine or with the engine shown in parentheses.

THE 1964 CADILLAC LOOKS MUCH THE SAME as before. Careful to preserve the "Cadillac image," stylists only dropped fin height slightly, reworked the grille area and extended chrome well around fenders to stress wide feeling.



**TRANSMISSION TYPES AVAILABLE
1964**

3-speed*, 4-speed man; 2-speed auto
 3-speed man*; 2-speed auto (LeS); 3-speed auto (W)
 3-speed auto*
 3-speed auto*
 4-speed auto*
 3-speed auto*
 3-speed auto*
 3-speed man; overdrive; 2-speed auto
 3-speed man*; 4-speed man; overdrive; 2-speed auto

3-speed man*; 4-speed man (V8); 2-speed auto
 3-speed*, 4-speed man; 2-speed auto
 3-speed*, 4-speed man; 2-speed auto
 3-speed man*; 4-speed man (300 only); 3-speed auto
 3-speed auto
 3-speed*, 4-speed man (V8); 3-speed auto
 3-speed*, 4-speed man; 3-speed auto
 3-speed*, 4-speed man; 3-speed auto
 3-speed*, 4-speed man (V8); 2-speed auto
 3-speed man*; overdrive; 3-speed auto
 3-speed man*; overdrive; 3-speed auto
 3-speed auto*
 3-speed auto*
 3-speed*, 4 speed man; 3-speed auto
 3-spd man*; 4-spd man (V8); 2-spd auto, 3-spd auto (V8)
 3-speed man* (V8*); 4-speed man; 2-speed auto
 3-speed*, 4-speed man; 3-speed auto
 4-speed auto
 3-speed man*; 4-speed man (V8*); 3-speed auto
 3-speed man*; 4-speed man (V8); 2-speed auto
 3-speed*, 4-speed man; 3-speed auto
 HD 3-speed man*; 4-speed auto
 HD 3-speed*, 4-speed man; 3-speed auto
 3-speed man*; automatic clutch; overdrive; 3-speed auto
 3-speed man*; automatic clutch; overdrive; 3-speed auto
 3-speed man*; overdrive; 3-speed auto
 3-speed man*; 4-speed man (V8); 3-speed auto
 3-speed man*; 4-speed man; 3-speed auto
 3-speed*, 4-speed man; 3-speed auto
 3-speed auto*
 3-speed*, 4-speed man; 3-speed auto

**Hp. ratings, where engine type isn't shown, are for V8s.

Chevy IIs will have larger 9.5-inch self-adjusting brakes and a new composite rear-axle assembly for 1964.

CORVAIR

The happiest handling story in the industry is the improvement in the little Corvair which has had no important body style changes. Chevrolet engineers have added an anti-roll bar to the front suspension and a single leaf spring "camber compensator" under the transaxle; this keeps the rear wheels from pivoting too much on turns. Thus, they don't bend under the car and work their own special witchcraft on the steering. Past Corvairs have had a tendency to swing their rear ends around on severe cornering at the whim of centrifugal force. This suspension improvement is a particularly welcome addition on the 1964 Corvairs, whose standard engines have been upped 19 cubic inches in displacement and whose horsepower has increased from 80 to 95.

We tried both a 1963 and 1964 Corvair Monza on GM's abruptly curved handling course at 30-35 m.p.h. The new car stayed where we steered it while the uncompensated and unstabilized '63 tried to slide out from under. Incidentally, the '64 ride is also better thanks to new shock absorbers.

VALIANT AND DODGE DART

Valiant's and Dart's ride, chassis and engines are similar to '63. The Dart coupe and sedan bodies have rear windows enlarged to the full width of the body, and it's now easier to look at as well as easier to look out of.

We tried both of them with one of the new Chrysler four-speed synchromesh transmissions, and had a real ball. This is a good box with well-placed ratios. Third

[\(Please turn to page 238\)](#)

THE LINCOLN CONTINENTAL, although a look-alike of last year's model, now has wider rear doors and a roomier back seat and trunk for luxury car customers

NEW ON THE RAMBLER CLASSIC chassis is this roomy two-door hardtop. Despite austere reputation, the Classic has un-Spartan goodies like power windows

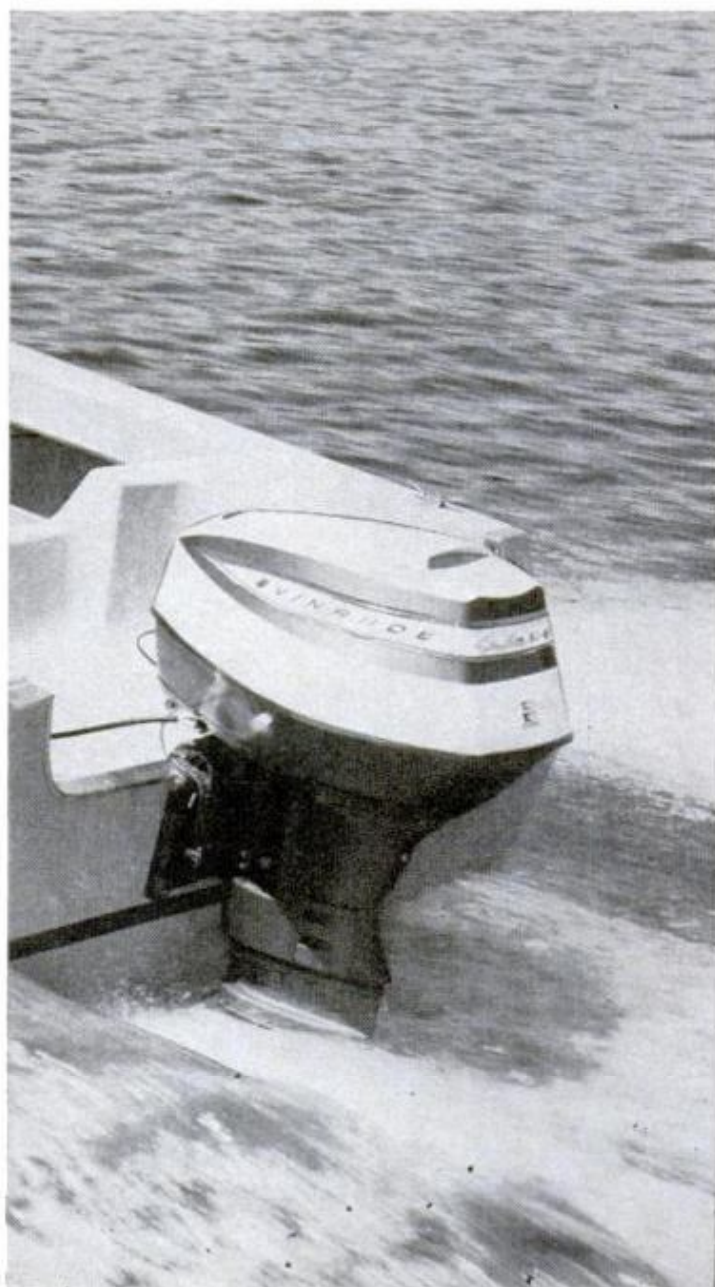




Outboards

90-HP. JOHNSON "Golden Meteor" is an 89.5-cu.-in. V4 with a bore and stroke of $3\frac{3}{8} \times 2\frac{1}{2}$ in. Designed to operate at a moderate 4500 r.p.m., it packs in extra power through improved carburetion—a four-barrel carburetor with straight-in manifold to distribute fuel equally to all cylinders. New, more efficient crankcase design with six-seal crankshaft equalizes pressures, reduces volume and eliminates drain pockets. The 90-hp. powerhead sits on same lower unit as last year's high-performance 75 model

90-HP. EVINRUDE "90-S" has the same basic specs as the big Johnson, also takes the carburetion route to greater power. It tips the scales at 242 lbs., just three pounds more than Evinrude's Starflite 75. Like the 90-hp. Johnson, the "90-S" is fed through a four-barrel carburetor, and 1964 might be remembered as "the year of the quads." (Merc's 100-hp. 1000, a 90-cu.-in. six-in-line, has three separate carburetors, one for each pair of cylinders.) A hot-air-actuated choke is standard equipment on this model



for '64

You'll find new motors in every power range, from 90-hp. giants all the way down to low-profile 9½s and a light 3.9 fisherman

PAIR OF 60s from Johnson and Evinrude are both blood brothers to these companies' 75-hp. models, but each has a 70.7-cu.-in. 60-hp. powerhead instead of the 89.5-cu.-in. 75-hp. powerhead. They're just a little weaker than the 75-hp. models, but that 15-hp. difference amounts to only 4 or 5 m.p.h. lower top speed on the same hull. Both have adjustable carburetor jets and an electric choke. Basically, these are economy versions of high-horsepower engines designed to sell at a moderate price



YOU ASKED FOR IT. Bigger top-of-the-line motors; something to bridge the gap between 45-50 and 75-hp. models; squat fishing motors that hang low on the transom—they're all on tap for next season.

Last year, most manufacturers weren't sure that there was a sizable market for century-size motors like Mercury's 1000, introduced in 1961. However, the public gave a rousing vote of confidence to this big black power package, mounting it on everything from ultra-high-speed runabouts to heavy outboard cruisers. Dealer feed-back confirmed the hunger for more horsepower, and as a result, Johnson and Evinrude will have 90-hp. models in '64.

Over the past couple of years, the same move toward a little more power, a little hotter performance, has become evident in the mid-range market. The man with a medium-to-heavy 17-ft. runabout who uses it for both water skiing and family cruising often isn't satisfied with a motor in the 40-50-hp. range, yet doesn't want to smash the piggy bank to buy a 75. Last year, Merc brought out a 65-hp. outboard for such people, and it sold like suntan lotion at a nudist camp. This year Johnson and Evinrude will both offer 60s which are actually de-tuned 75s with a lower price tag. Apparently "midrange" means more power than it did a few years ago.

Handy 9½s

The stubby 9½s answer a dual need. Viewed as high-horsepower fishing motors, they're compact, totable and hang low on the transom where they're out of the way. On lakes with a 10-hp. limitation, they serve as low-cost general recreational motors that you can toss in the trunk and drop on any small boat. McCulloch (then Scott) pioneered the shorty configuration, and it's catching on fast.

The '64 picture has changed and here (More photos, page 106; [text continues on page 236](#))

OUTBOARDS FOR '64



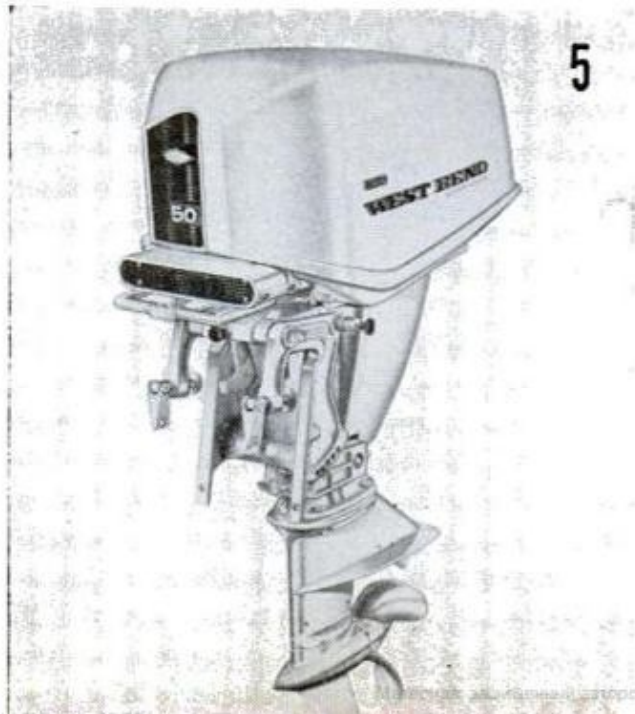
1. 9½-HP. **JOHNSON** weighs 59 lbs. and is only 34 in. long (which works out to sitting 8½ in. lower on the transom than last year's 10-hp. model). It can be tilted up for slow operation in shallow water

2. 9½-HP. **EVINRUDE** "Sportwin" is another 59-lb. 34-in. fisherman's motor that can be run in a semi-tilt position. All controls are up front, and the steering handle folds parallel with lower unit for storage

3. 9½-HP. **McCULLOCH** weighs 48 lbs. and has two spark plugs in each of its two cylinders. Each pair fires simultaneously, and if one plug fails the motor will continue to operate, allowing you to reach port

4. 3.9-HP. **MERCURY** is a single-cylinder 5.5-cu.-in. fishing motor featuring full gearshift, rubber-cushion suspension and a one-piece lower-unit housing with swept-back design. It exhausts through propeller hub

5. 50-HP. **WEST BEND**, world's first two-cylinder outboard of that rating, has a total displacement of 44.7 cu. in. It incorporates a new puddle-drain system designed to make the engine run cleaner



QUACK MEDICAL MACHINES



INVESTIGATOR Oliver Field, the J. Edgar Hoover of the AMA, exhibits some of the fraudulent devices he has helped to expose

One gadget found a corpse to be in first-rate health. Another attempts to "cure" illnesses with tap water. Here's a roundup of machines that fleece the sick

By John P. McNeel

THE WHITE-JACKETED technician snapped off the purring machine and removed two electrodes from the patient's chest. He made a few notes on a chart and handed it to the busy practitioner seated at a nearby desk.

"Our micro-dynameter indicates that you have a tuberculous condition in the left lung," he said to the slender, elderly male patient. "You're not in any immediate danger, but you will have to come in once a week for treatments."

The patient breathed a sigh of relief. He was afraid that his persistent chest pains spelled a possibly fatal lung cancer; TB was bad enough but at least it could be arrested.

"That sure is a wonderful machine, doctor," he said gratefully. "It not only tells what's wrong with me, but it'll cure me too."

The patient's future was secure, all right. But not for the reasons he



THE IDENTICAL MACHINE is often marketed in more than one model, like these two versions of the Micro-Dynameter. Eleven of them were seized recently in Brooklyn. It has been in use for at least 30 years

thought. The fact is that there was nothing wrong with him to begin with that a few days rest wouldn't have cured.

Thousands of such patients all over the country have felt similar gratitude for this little machine, which is known as the Ellis micro-dynameter. To a layman it looks like an ordinary piece of medical equipment. It has a number of impressive-looking dials; a scale with measurements in milliamperes and two electrodes, for closing an electric circuit.

The micro-dynameter is, in fact, incapable of correctly diagnosing any disease.

It is one of many bogus medical machines that annually cheat the American public out of millions of dollars. The actual bill for fake medical treatments, health and dietary nostrums is now well above \$1,000,000,000 yearly. Fraudulent diagnostic and therapeutic machines account for a sizable chunk of the total.

A few years ago the manufacturer of the micro-dynameter was held by a U.S. District Court in Chicago "to be engaged in the practice of publishing false and misleading statements to the effect that this device was of value in the diagnosis of disease," a decision that was upheld by a U.S. Court of Appeals. A review of the case was refused by the U.S. Supreme Court. But that didn't put the machine out

of profitable circulation by any means.

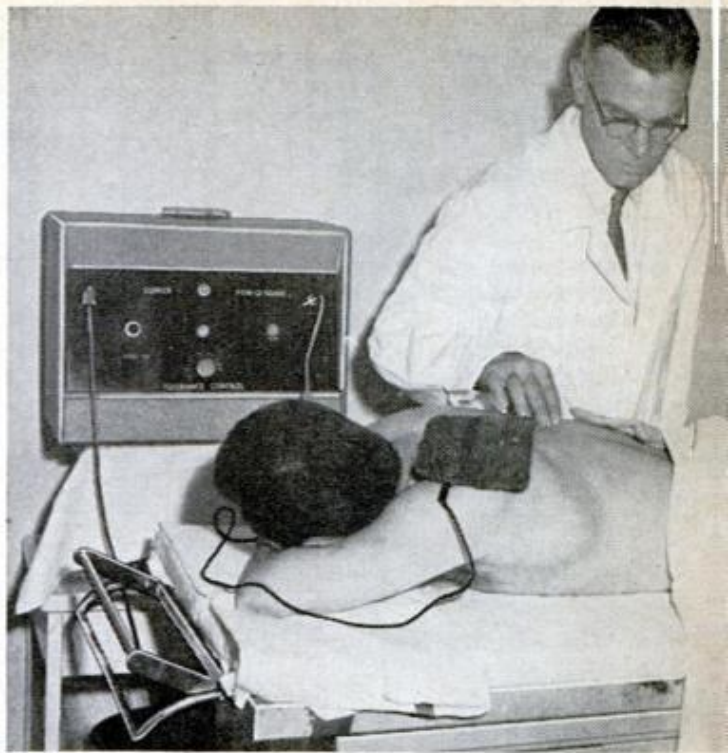
Only last fall, federal marshals swooped down on a group of widely scattered chiropractors in New York and seized 11 of these useless gadgets. The lawmen were acting on warrants issued at the request of the U.S. Food and Drug Administration.

The seizures were the opening gun of an attempt to eliminate the micro-dynameter from the American scene. It won't be an easy task. FDA Commissioner George P. Larrick has estimated that there are at least 5000 micro-dynameters in use throughout the country.

Getting fake medical machines condemned by the courts is only the first step. After that, each machine has to be tracked down and seized on local warrants. A machine can do a thriving business for years after being officially branded as worthless, because the average person rarely hears about such legal condemnations.

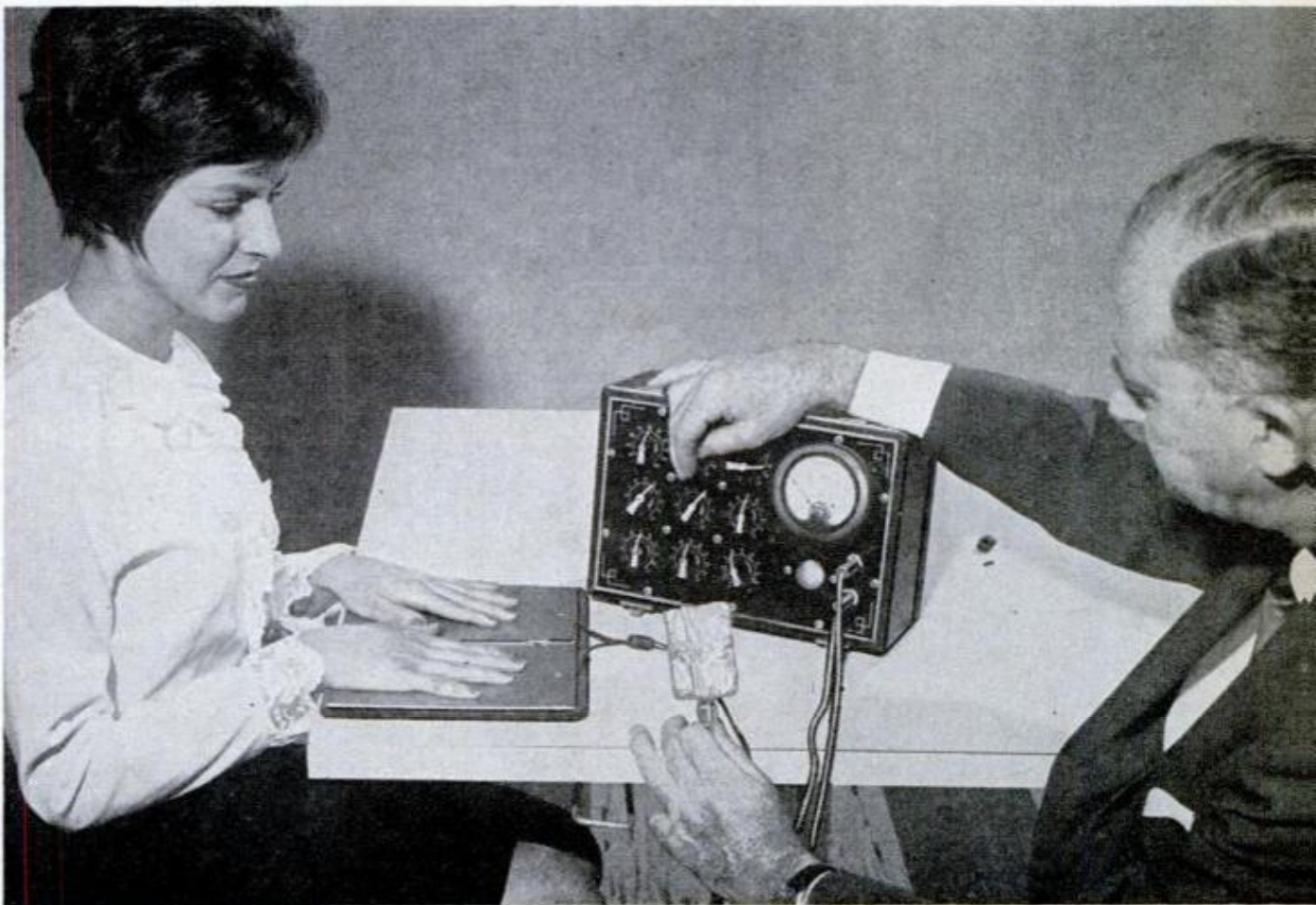
To aid the drive against fake medical devices, the FDA and the American Medical Association are holding a special two-day congress this month to map a hard-hitting campaign against the quacks who use them. Much of this effort will be directed toward educating the public to be on the lookout for "diagnostic" and "healing" machines.

Trying to track down and get court con-



THE ZERRET APPLICATOR (left) "cures" disease through an "unknown force." Chemists testified that it actually contains faucet water. The **Sonus Film-O-Sonic** (right) is claimed to treat ills with tape-recorded music

ABSENT PATIENTS get remote "treatments" on the Drown Radio Therapeutic Instrument by sending in a blood sample. The FDA once mailed in a specimen of rooster blood for analysis. Diagnosis: Dental caries



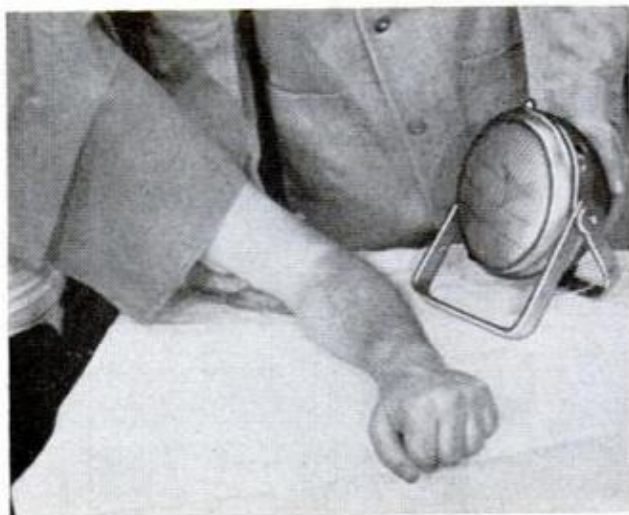
MANY BOGUS DEVICES are designed with skill and imagination. Some are patented. Demonstrated at right are the Theronoid Belt for magnetic "treatments;" the Radio Pad glove and the Electro-Galvanic bracelet, both for arthritics; the Vrillium Tube (pinned to blouse) for "non-specific" ills, and the Electreat (also known as Atomic Nu-Life), which affords patients a mild shock



THE NEUROCALOMETER (below) tagged "worthless" by AMA, has been in wide use for more than 30 years. Quacks claim it "measures" subluxations in the spine



THE DEPOLARAY never gives off healing rays, as claimed; it merely hums. Operating instructions tell users how to adjust it to get the hum they prefer



demnations of all such machines would be expensive, time consuming and probably ineffectual, anyway. In the case of one single micro-dynamometer, it took eight years to get a court ruling permitting authorities to confiscate the device—due to appeals and other legal roadblocks.

The micro-dynamometer is similar to many other bogus medical devices. Another typical machine was described recently by a Chicago reporter who called on a notorious quack while doing research on fake practitioners. The “doctor” first checked the reporter-patient’s “subluxations.” He did this by taking a sight on the reporter’s spine through the hole in the bottom half of a human skull. Then he took a “reading” of the spine with a black box called a neurocalometer. This device has been branded by a spokesman for the AMA as a “vehicle for fraud on the patient.” It is claimed to be a measurer of nerve heat. It consists of a two-pronged handle containing thermocouples which are connected to a galvanometer. In practice, the two prongs are placed astride the spinal column to register “subluxations.” (According to Webster’s big dictionary, these are “incomplete dislocations as of one of the bones in a joint.”)

The Chicago practitioner told the newspaper woman that the examination allegedly showed her neck was off center to the right, the pelvic cavity was out of true alignment and, worse, the “Atlas rotary was reversed!”

The same reporter later called on another quack who claims to effect cures with an “electro-magnetic coil.” At his

offices—dingy cubicles in the rear of a grocery store—the reporter complained of arthritic symptoms. She was told to undress and wrap herself in a sheet. Then the “doctor” wound her in a heavy rubber casing fitted with electric wiring and turned on the heat.

After “warming up” for a lengthy period, she was released. A series of such treatments, the practitioner said, would “make a new woman out of you in two months.” This crude device was said to generate electrons in the blood and to rid the body of “nitrogenous accumulations.” Being arrested and fined, as he has been on many occasions, has never hurt this quack’s reputation—or his business.

Another fake medical practitioner was nabbed recently when a woman patient became suspicious of his “iridology” treatments and alerted the authorities in the Illinois town where she lived. State and local detectives arrested him shortly after he had accepted payment from the patient in marked money. His method involved studying the patient’s eyes while she was wearing a special pair of goggles. These contained two twinkling flashlight bulbs wired to a battery. Before the police closed in, the quack had listed the patient’s ills as “soft arteries, bad kidneys and inflamed nerves.” Treatment, he said, would include “breaking down tissues to cause tiny hemorrhages to get rid of stagnant water.” Cost of the treatment was to be \$600—over a period of weeks.

Fraudulent medical devices do far more harm than appears at first glance. A ma-

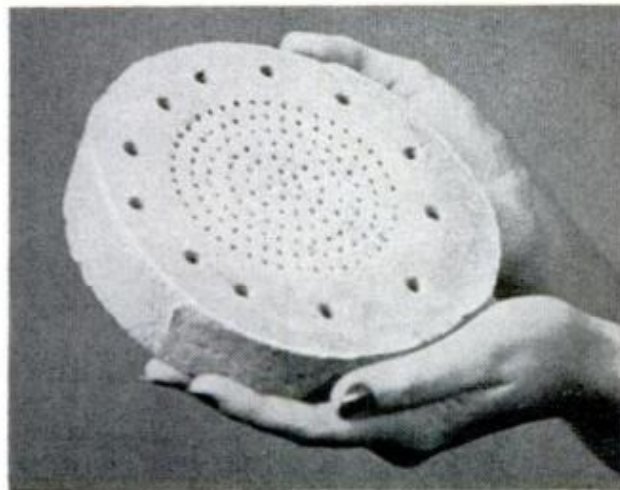
[\(Please turn to page 218\)](#)

SANCHE OXYDONOR, a metal capsule floating in water, is supposed to take oxygen from water and donate it to the patient through cotton cords



OCTOBER 1963

FARMER BROWN'S MASTER CELL, an “atomic remedy” exposed by the FDA, is claimed to “improve the human race.” Actually, it’s worthless concrete



Comparing the NEW QUICK LOADERS

HOW MANY DUFFERS and pros alike have threaded a roll of film into their 35-mm. cameras, closed the back and started wondering whether the film was really advancing when they turned the lever? And how many "instant picture" camera fans, with both hands and both knees in use, have opened the double back of the camera, dropped in the double roll of film, threaded the leader over one back and under the other, and cursed the manufacturer for ever inventing such a system?

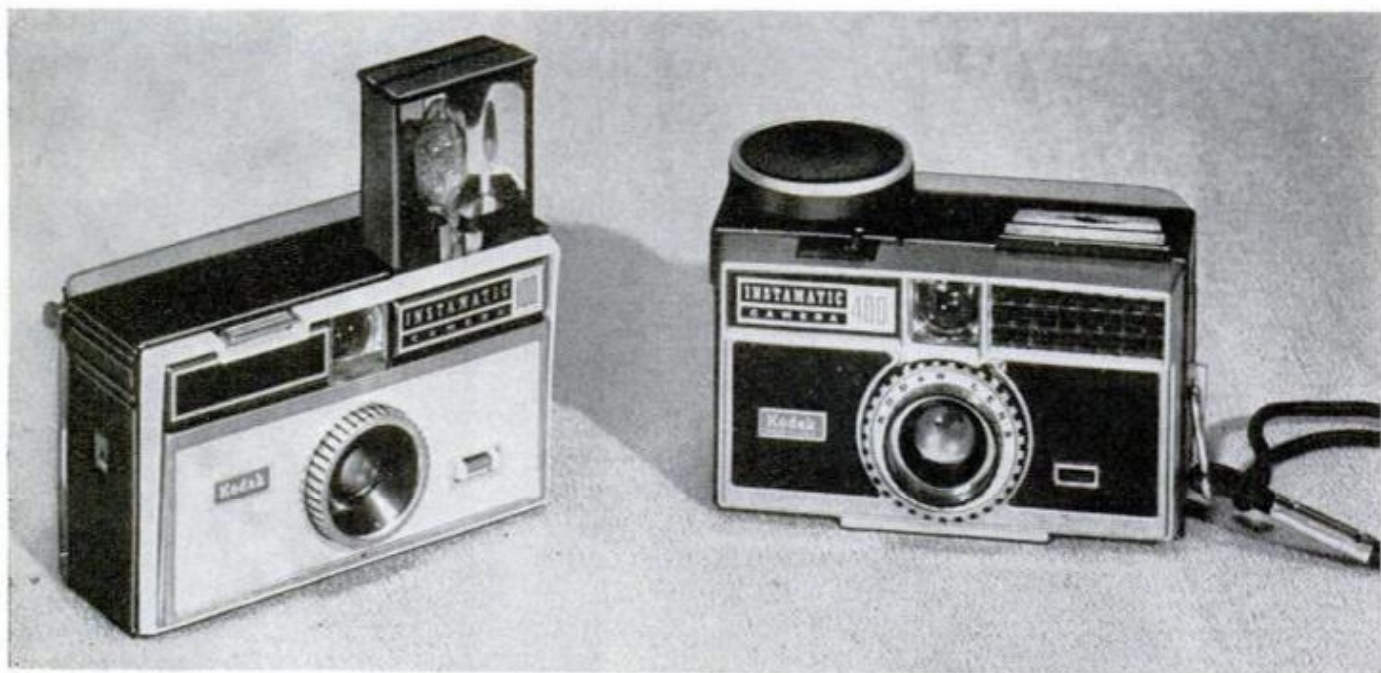
By Kevin Brown

All that may soon be obsolete. Two separate breakthroughs in camera design hit the market this year, and they invite immediate comparison.

Eastman Kodak introduced its line of Instamatic cameras, featuring plastic film cartridges that just drop in the back, ready to go. Polaroid Corp. introduced its new Automatic 100 camera, featuring easy film-pack loading plus an altogether new electric-eye design for automatic exposures.

The Kodak line has automatic-exposure control of the traditional kind on three of its four cameras, but the most obvious point of comparison between the two makes is the quick-loading technique. It takes one of the most awkward and artless drudgeries—even for

KODAK INSTAMATICS feature four cameras ranging in price from \$16 to \$110. Lowest-priced 100 (left) and spring-driven 400 models are shown. Each model has built-in pop-up flash reflector





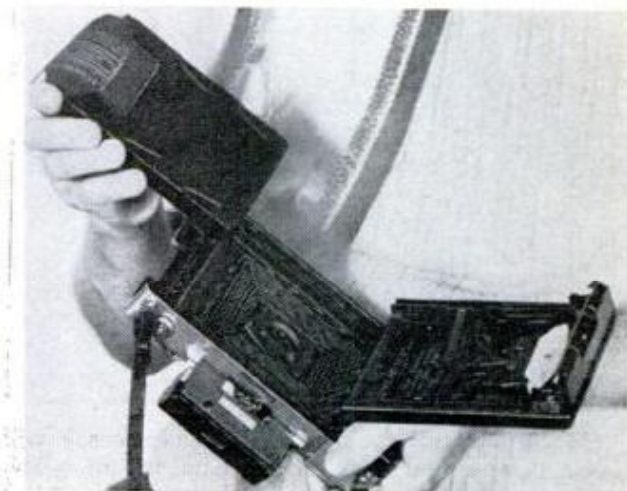
POLAROID 100 camera features automatic exposure that has considerable latitude but requires at least four manual adjustments: 1) lighting-condition knob for adjusting to bright or dull light, 2) ASA-rating dial for 3000-speed or 75-speed film, 3) lighten-darken dial for extra light or dark pictures, and 4) flash plug that must be unplugged when taking natural-light pictures

QUICK-LOADING INSTAMATIC introduces roll film in cartridge that drops into back of camera and is ready to go without cumbersome threading of 35-mm.



OCTOBER 1963

QUICK-LOADING POLAROID 100 introduces film pack that drops in back of camera and is ready to go without cumbersome threading of roll-film Polaroid



113



POLAROID 100's automatic exposure system is capable of recording even light from bounce flash. Attached reflector swivels to three positions, to give bounce light for horizontals and verticals and for straight flash

professionals—out of photography, and leaves more time for picture shooting.

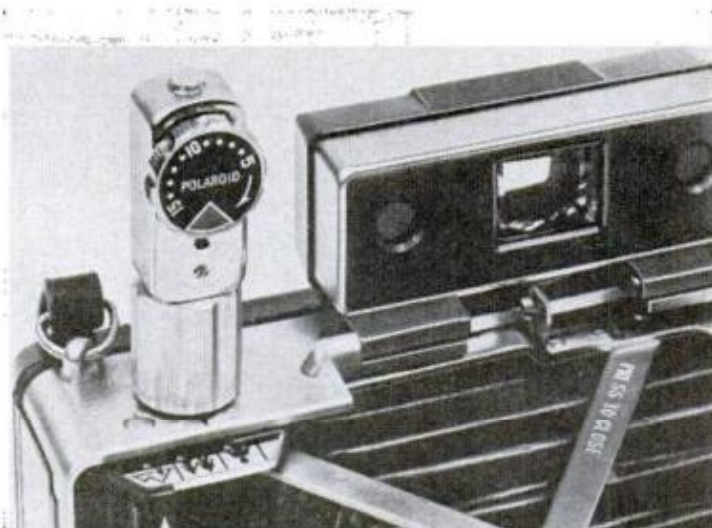
Kodak is on record as estimating that the Instamatic system eventually will account for 50 percent of its business, and Polaroid, which had at least five models on dealers' shelves early this year, has dropped its camera production down to two models, the professional top-of-the-line 110B and the new 100.

For average duffers—and both new sys-

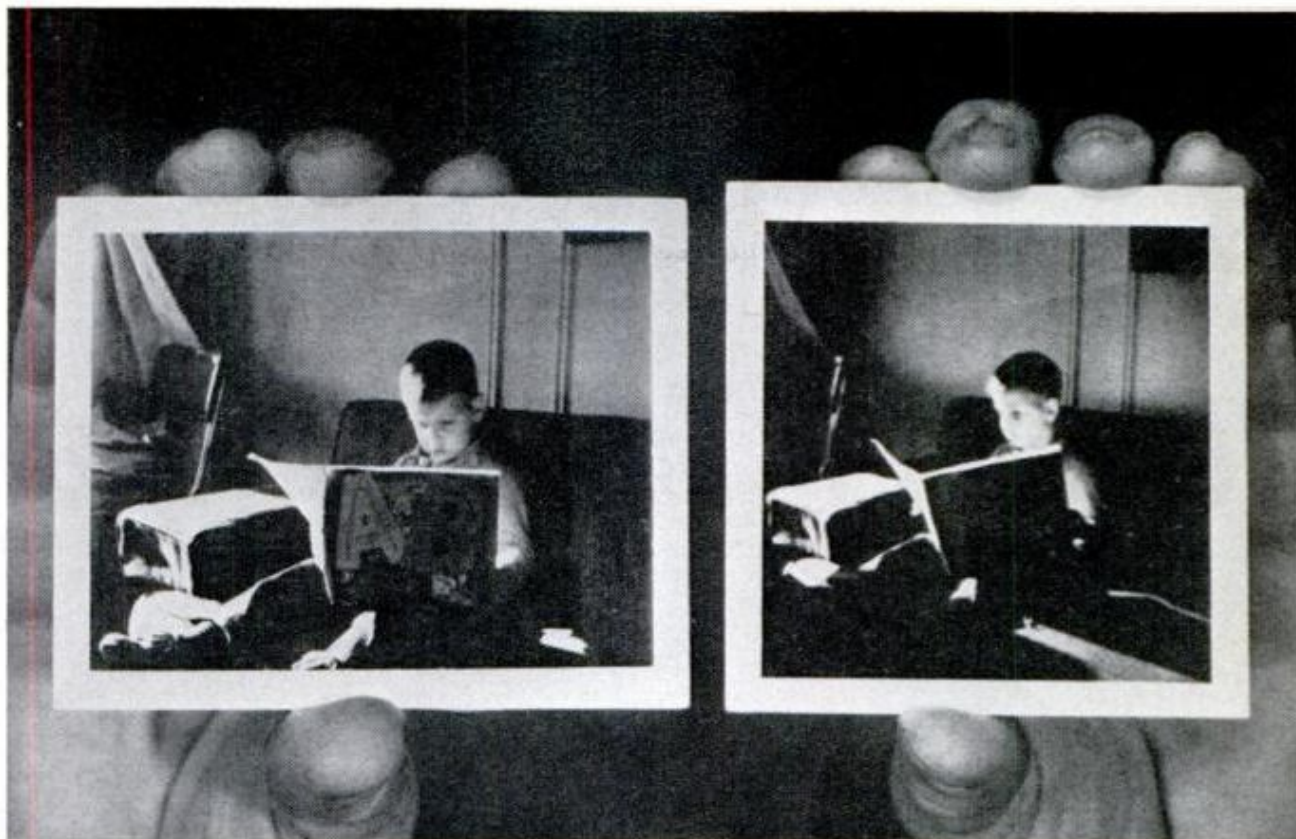
tems are definitely aimed at them—it's a windfall. They can now choose between the instant-loading, almost-all-automatic Instamatics, or the instant-loading, almost-all-automatic Polaroid 100. With either one they have a pretty firm guarantee that the pictures they take of the family on the front steps, or the snapshots they take on their yearly vacations will, as they say, "all turn out." In making their choice, however, they'll have a goodly



INSTAMATICS all feature quick film advance with lever that brings film into position for next shot and automatically cocks the shutter at same time



SPECIAL ACCESSORIES for Polaroid camera include new self-timer that pushes shutter button after delay to allow photographer to get into picture



COMPARATIVE FORMATS of Polaroid (left) and Instamatic pictures show relative shapes and areas covered by each. Instamatics take in a little more area because they use slightly wider-angle lenses than Polaroid

number of differences to choose from.

The most obvious difference, of course, involves Polaroid's on-the-spot development—10 seconds for black-and-white prints and 50 seconds for color. Kodak film still has to be developed at home or taken to the local camera store for 24-hour (or more) service. It's a little like comparing grapefruits and bananas, and it is not a new comparison. Polaroid's instant system has been around for some time and the

Kodak cartridges make no difference in the development of the film.

However, the film format on Kodak has changed, and the Polaroid film pack introduces some differences from its roll film. The Kodak Instamatics are roughly comparable to 35-mm. cameras, but the film format is square and the size is 28 x 28mm. (about 1 1/8 inches square). All four Instamatics, however, have what amount to

(Please turn to page 208)



INSTANT FILM-PACK prints, which lie pretty flat compared to Polaroid roll film, can be protected further with the cardboard backing supplied in the package



FRONT CASING of Polaroid 100 has a clip for holding prints during shooting session. Photographer must still dispose of messy negatives as before

It's Fun if You Get

STARTING POSITION for the five-minute match has the two opponents crouched, heads together, a firm grip on each other's schwinghosen



SWINGING HIS OPPONENT up with a grasp on his pants, a wrestler attempts to slam him down and touch both shoulders to the ground



SCHWINGEN CHAMPIONSHIP matches are held at Squaw Valley, Calif. The winners are rewarded with medals, cups and crowns—badges of importance in the U.S.-Swiss communities

the SCHWINGEN of It

To some folks, wrestling skill relates to seat-of-the-pants experience in a school of hard knocks

WHEN IT'S SCHWINGFEST TIME in California, a group of young men actually win laurels by the seat of their pants.

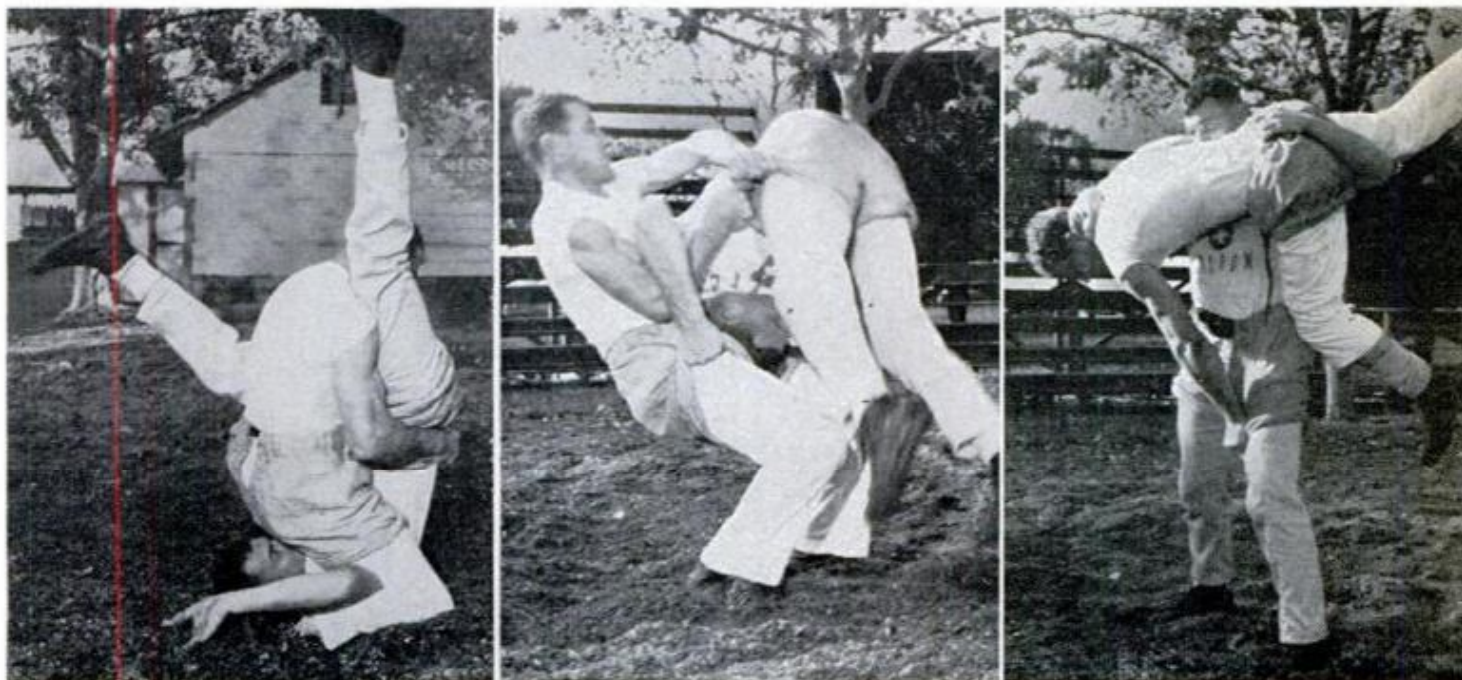
Imported from Switzerland, *Schwingen* is a form of wrestling, with two opponents trying to swing each other off balance with a grip on a pair of baggy pants known as *schwinghosen*. A match runs five minutes, starting with each wrestler getting a firm grip on the other's pants. A winner is declared when he can topple his opponent, touching both shoulders to the ground.

Schwingen was introduced to the U.S. in 1916. The championships in Squaw Valley attract hundreds of wrestlers and thousands of spectators.—Cliff Essex

DROPPING TO HIS KNEES (left below), a wrestler brings his opponent's shoulders to the ground. To win he must maintain his grip on the pants

BRUTE STRENGTH IS A VITAL FACTOR in schwingen. Off his feet and about to be thrown (middle below), a wrestler hangs onto his opponent's pants

LIFTING HIS OPPONENT off his feet and holding him shoulder-high (right below), a wrestler maneuvers into position for a fast shoulder drop



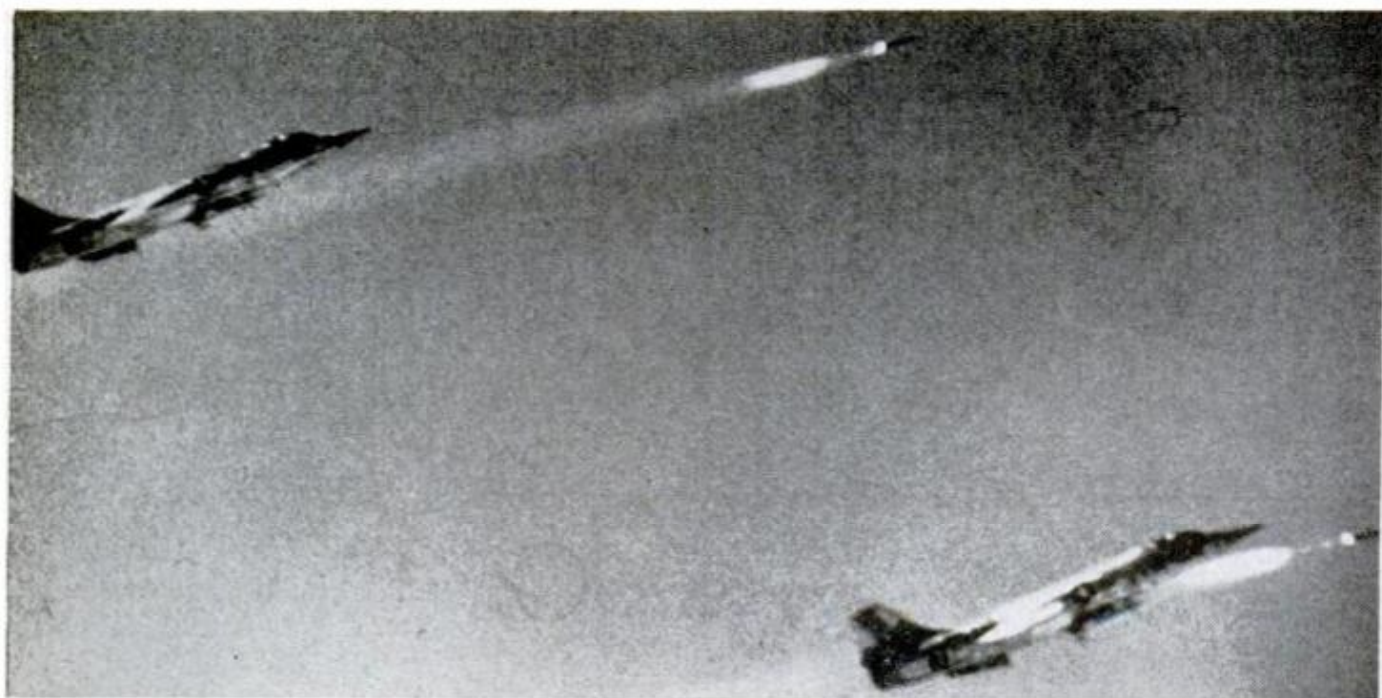


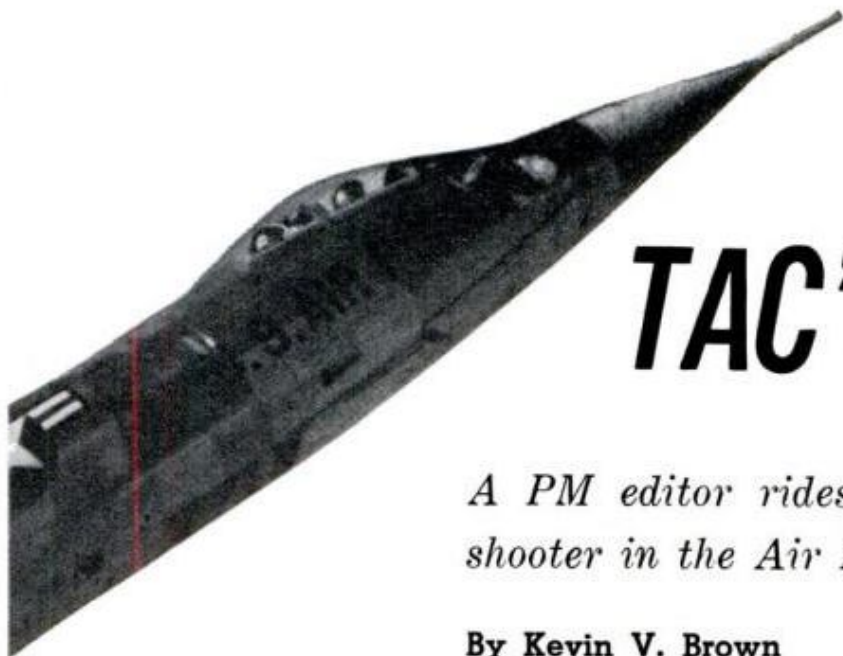
I Flew with

PM AVIATION EDITOR (left) learns intricacies of 20-mm. cannon from Capt. Charles Tofferi, Air Force's leading sharpshooter. Six-barrel gun is one of many weapons used by fighter pilots of Tactical Air Command



F-104 STARFIGHTERS, shown here firing *Sidewinder* missiles, were built originally as high-altitude fighters. Low-level versatility, however, gave them dive-bombing and strafing duties. Tofferi has more than 2000 hours in 104s





TAC's Top Gun

A PM editor rides along while the sharpest shooter in the Air Force shows how he does it

By Kevin V. Brown

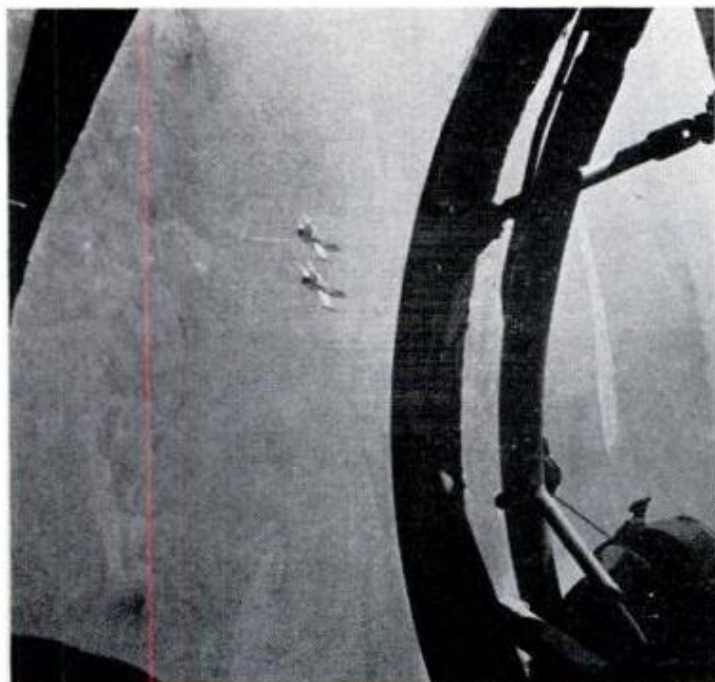
DOC HOLLIDAY started out to be a dentist, John Wesley Hardin was the son of a preacher and Charles E. Tofferi of Fitchburg, Mass., entered teachers' school, but all three ended up as gunmen.

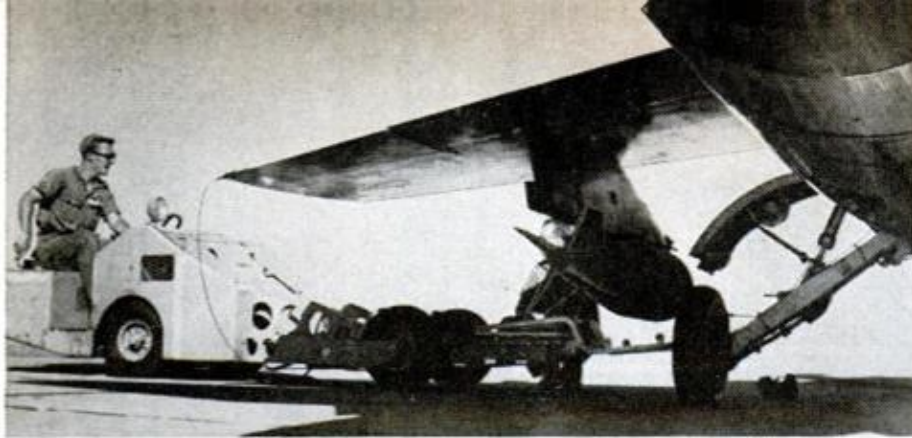
Holliday and Hardin, depending on which biography you read, were either heroes or badmen. Tofferi, who had no biographer until now, is definitely a hero, and he's on our side. What's more, his accuracy with some of the deadliest weapons ever conceived by man would make all the gunfighters who ever lived blanch with fear.

Captain Tofferi (it rhymes with BOFF-ery) is a fighter pilot in the United States Air Force—specifically, the Tactical Air Command. TAC, in time of war, fights the dirty battles, the

AERIAL ATTACK is demonstrated by Tofferi on two friendly 104s. Both this picture and one at right were taken from back seat by author during flight

GROUND ATTACK is demonstrated on targets at gunnery range in California desert. At speeds up to 700 m.p.h., author claimed they looked like fly specks





F-104 ARMAMENT includes bombs, rockets, missiles and cannon. Ground crew here hoists 750-pound bomb onto rack under one of its stubby wings

ROCKET PODS are attached to same rack. Type of mission determines type of weapon. Rockets, 19 to pod, fire split second apart to spray target



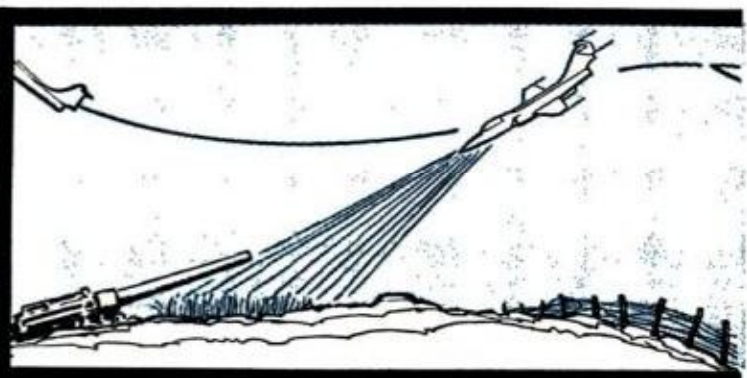
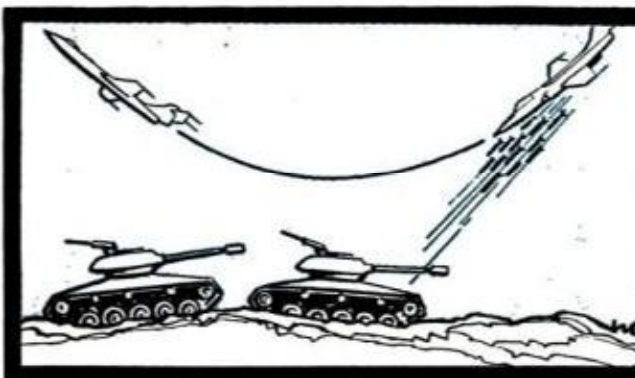
unglamorous battles, the ditch-digging battles. In short, it would be on the front lines strafing tanks and dropping bombs on bunkers from altitudes as low as 50 feet while the boys at the missile bases were pushing buttons and sending warheads to targets 5000 miles away. Not to make too fine a point, if a "little war" broke out in Cuba, TAC would fight it. And Tofferi is the best man they've got.

He proved it the hard way. TAC peri-

odically holds a so-called "fighter-weapons meet," which is really an old-fashioned Western shoot-out in which TAC units all over the world send their best men to compete against one another in strafing, dive bombing and air-to-air gunnery. Tofferi beat them all and he set a record doing it. Moreover, he did it in an F-104 *Starfighter*, a plane built originally as a high-altitude fighter. It was the only one in the meet. To add a vulgar note, the meet was held

DIVE-BOMB RUN, at 45-degree angle, starts at about 11,000 feet. Rocket pods are fired from same angle, but run usually starts from about 3000 feet

STRAFING RUN, at 15-degree angle, starts at about 2000 feet. Cannon used on strafing missions is only weapon built internally into fuselage of *Starfighter*





SIDEWINDER MISSILE is examined by Tofferi during preflight inspection. Red, transparent nose on missile covers heat-seeking device which homes in on engine exhaust of other aircraft in air-to-air combat missions

GATLING GUN, as pilots call the six-barrel cannon, is loaded with 20-mm. shells by armament crew. Gun's six barrels rotate, giving it rate of fire of 6000 rounds per minute. Each shell is explosive



at Nellis Air Force Base in Nevada, and the gamblers in nearby Las Vegas had Tofferi pegged at 14-1 in a 14-plane meet.

All of which prompted *Popular Mechanics* to request the Air Force for a ride with this sharpshooter to see how he does it, and to translate what he does into what he would do in case of a "little war." The story, which is essentially the story of all TAC fighter pilots, boils down to the man, the plane and the tactics.

SKIP-BOMB RUN, from straight-and-level approach, is used to bounce bomb into relatively inaccessible targets. Bomb has delayed-action fuse for safety



Capt. Charles Tofferi, at 29, is a nine-year veteran of the Air Force with more than 3000 hours in jets. He and his pretty wife—pretty wives are traditional in the Air Force—live in a comfortable home at George Air Force Base, Calif., with their two preschool-age daughters. I was invited to dinner while visiting the base, and it was an amusing contrast to watch a man, who could easily be rated the deadliest gunman in the world, listen to his shy little girls as they told him the troubles they had that day with their Teddy Bear, or some such playmate.

Ride to Simulate Combat

On the flight line, Tofferi is a personable and articulate spokesman for the Air Force. My request was simple, and his reaction even more so. I'd like to ride along with him while he went through all the maneuvers a tactical fighter pilot might be called on to use in a "little war."

"Sure," he said, "Want some coffee?"

So, while we sipped coffee, the erstwhile school teacher took a pencil and paper, diagrammed the techniques and pointed



NUCLEAR-BOMB RUN starts with straight-and-level approach at 50 feet. Pilot pulls up, releases bomb with parachute, rolls over and hits the deck

out the small details that mean the difference between hitting a target and missing it by an embarrassing margin. At speeds up to 700 m.p.h., missing is easy.

Tofferi and other *Starfighter* pilots are trained to drop 750-pound high-explosive bombs and napalm bombs (jellied gasoline which bursts into sticky flames on impact), and fire a 20-mm. six-barrel cannon, rockets or the heat-seeking *Sidewinder* missile. Plus—and this is a shocker—nuclear bombs starting from a level of 50 feet. (In training, of course, they can only simulate nuclear runs. The use of atomic weapons is highly restricted.) They also learn low-level navigation, finding targets 500 miles or more away while flying above the tree-tops to sneak in under the radar screen.

"The *Sidewinders* are air-to-air weapons," Tofferi explained. "The cannon is either air-to-air or air-to-ground, and the others are all air-to-ground. For air-to-ground maneuvers we have three basic passes. We come in at a 45-degree angle for dive bombing, about 15 degrees for strafing, and straight-and-level for napalm, skip bombing and nuclear weapons."

He sipped his coffee and added casually, "We do a little something extra on the nuclear pass, though."

Let's hope so, I thought.

Before going out to the plane, he helped me into a half-size G-suit. This differs from the full-size pressure suits worn by pilots who regularly fly high-altitude missions (see "I Chased a Bogie in a NORAD

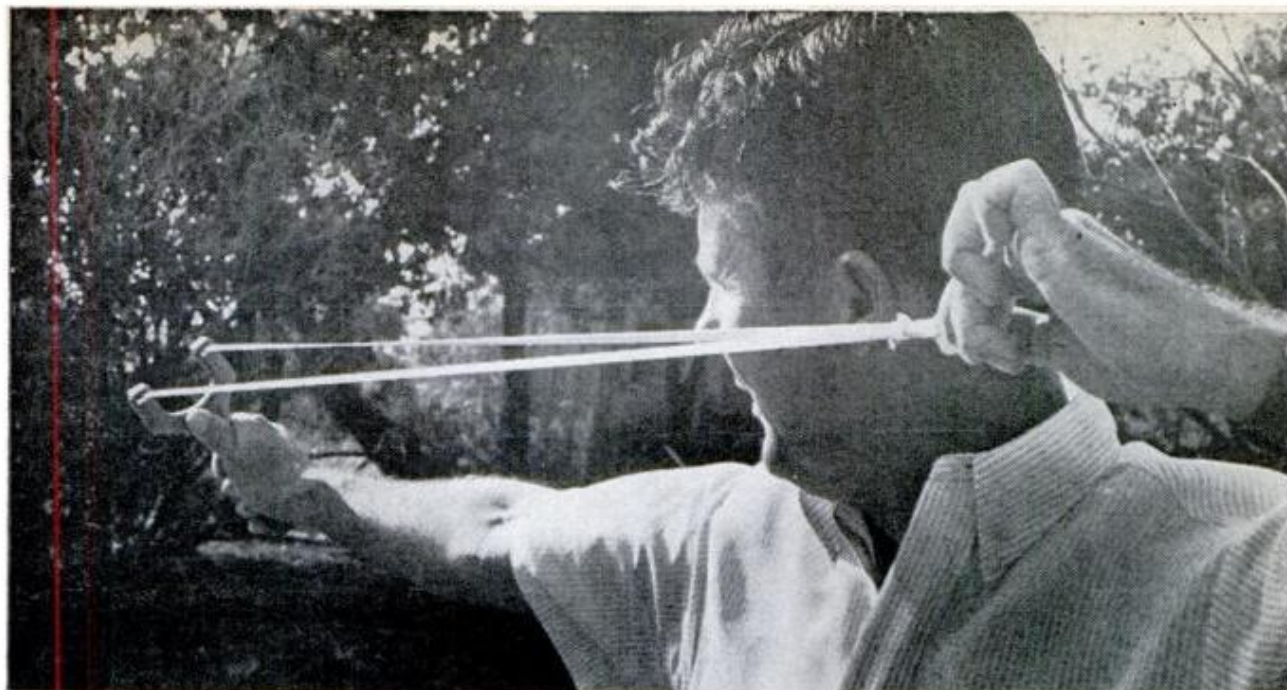
Jet," *PM*, August, 1962). The full-size suit protects the pilot in case cabin pressure fails in the thin air of high altitude. The half-size suit is strictly for G-forces encountered when racking the plane around in low-altitude maneuvers.

On the ramp, Tofferi's attitude changes slightly. No longer the patient school teacher, he becomes part cold-eyed efficiency and part little boy with the best toy he's ever owned. His preflight inspection—which involves walking around the plane and "kicking the tires"—is an important ritual required of all Air Force pilots to make sure it is ready to fly. In Tofferi's case, he gives it a few extra pats that are more affection than inspection.

The *Starfighter* is an unusual airplane, and there is an inordinate love affair going on between it and the pilots who fly it. Smallest of the Air Force fighters, its stubby wings and slim fuselage make it look more like a missile than a plane. But it's one of the most maneuverable and fastest (more than 1500 m.p.h.) jets in the sky, and probably the simplest to fly and easiest to maintain.

It is also a stray of sorts. Originally a high-altitude air-superiority fighter (it set an altitude record of better than 100,000 feet), its low-altitude capabilities were developed to give it a role in TAC's plans, and Tofferi's feat of beating out the best of the other planes, notably the F-100 and the F-105, now gives it prestige.

I got strapped into the rear seat of the
(Please turn to page 224)



PULLED TO FULL TENSION, this heavy-duty slingshot can kill moderate-sized varmints or large birds

The Sharpest Slingshooter

SHOOTING A SLINGSHOT becomes more than child's play when the weapon is capable of putting a steel ball bearing through a one-inch wooden plank.

Designed by Bill Beasley of Beesville, Tex., a high-performance slingshot does that and more. In the hands of an adept marksman, it will kill moderate-sized varmints, large snakes and birds the size of a buzzard.

Named the "Sharpshooter," Beasley's slingshot is made of a special polyethylene

plastic that has the density of oak. The sling is heavy-duty rubber with a four-foot pull, and the leather ammunition pocket is one by three inches.

Directly below the fork in the yoke, the handle has a $\frac{3}{4}$ -inch backbend that serves to stabilize the shooting platform (the yoke) against the forward pressure of the hand when the sling is pulled to full tension.

Amazingly accurate, in the hands of an expert, the slingshot can fragmentize one glass marble with another at 25 yards.

YOKE AND SLING are heavy-duty materials. Marbles and ball bearings are used for shooting small game

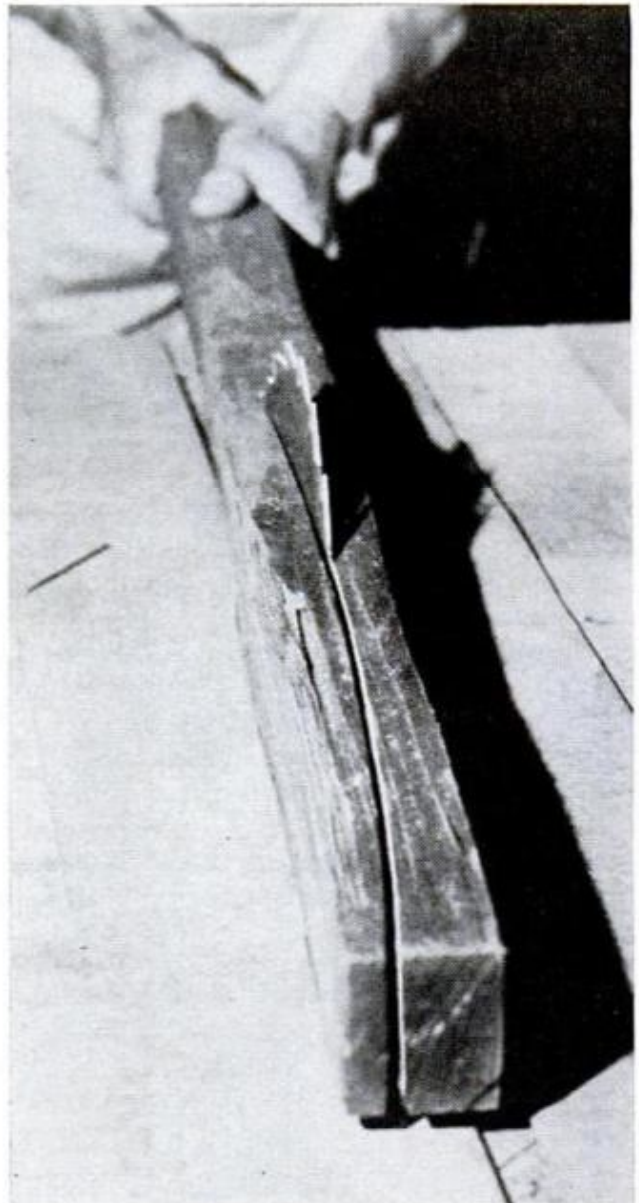
SHOOTING AT 120 FEET against a 20-mile crosswind, four pellets were placed in two-inch bull's-eye



COPPER OVERCOATS



TORTURE TEST consisted of running a 16-in. 18-ga. rip blade through a green redwood stake, deliberately twisting wood to put utmost strain on blade



POWERFUL MOTOR was required to keep the blade turning under this kind of abuse, but after repeating the operation many times, the blade was undamaged

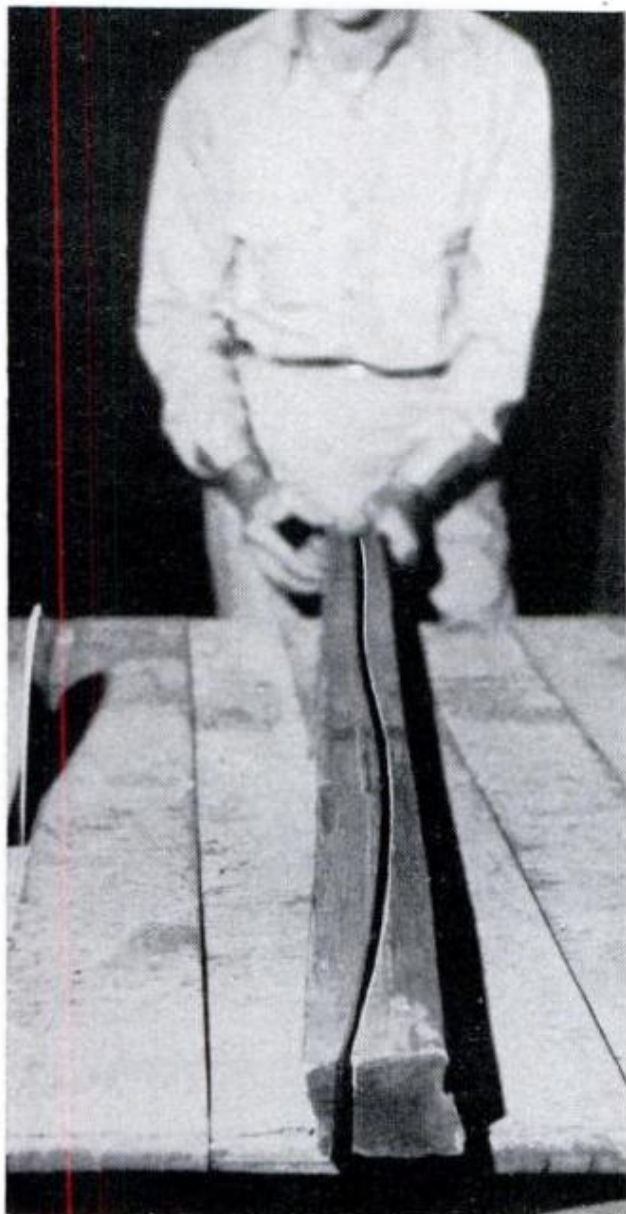
WILL FUTURE SAW BLADES be copper clad? If not, then patent 2,624,381, granted to Mr. Gordon Von Der Werth of Greenbrae, California, will have been issued in vain. The patent covers a broad use of copper, chrome and other heat dissipating agents to extend the

sharpness life and actual life of circular saw blades, and of band saws and gang saws used in the manufacture of wood products. Its aim is to minimize the traditional problems of thin saws.

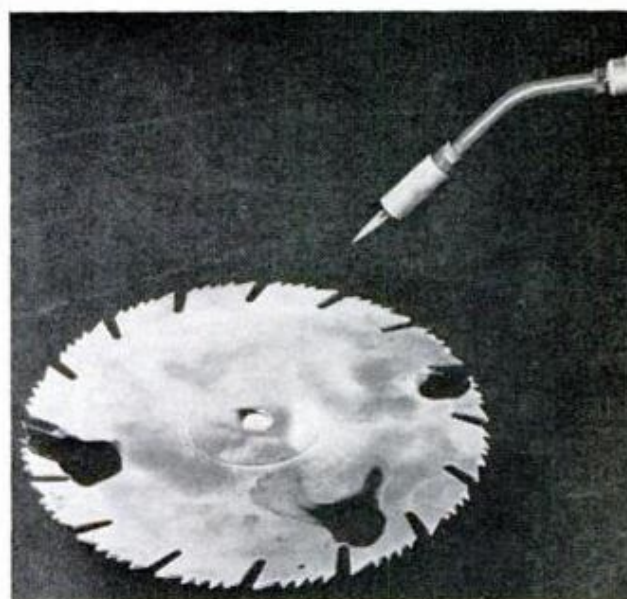
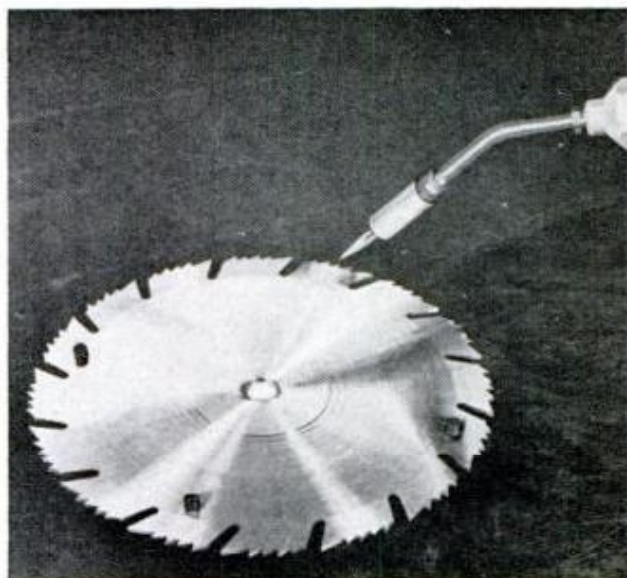
A case in point would be the molding industry where high-speed thin saws are

for SAW BLADES

By R. J. DeChristoforo



HEAVY-GAUGE BLADE couldn't have made this cut, and an untreated thin saw wouldn't have lasted through many repetitions of extreme punishment test



PIECES OF CRAYON placed on heated conventional blade melt slowly (upper photo), indicating uneven heat distribution. Those on treated blade melt quickly

used to separate moldings while leaving a fine finish. Thin saw blades are notorious for over-heating and cracking. The use of carbide teeth alleviates these problems, but increases the width of the kerf. This also brings up the physical problem of insufficient steel to support the carbide.

The biggest problem in saw-blade use is heat. You can easily build up enough heat at the cutting rim of a circular saw to anneal the metal sufficiently to cause an early loss of sharpness. Heat can also warp a blade and cause a loss of cut qual-

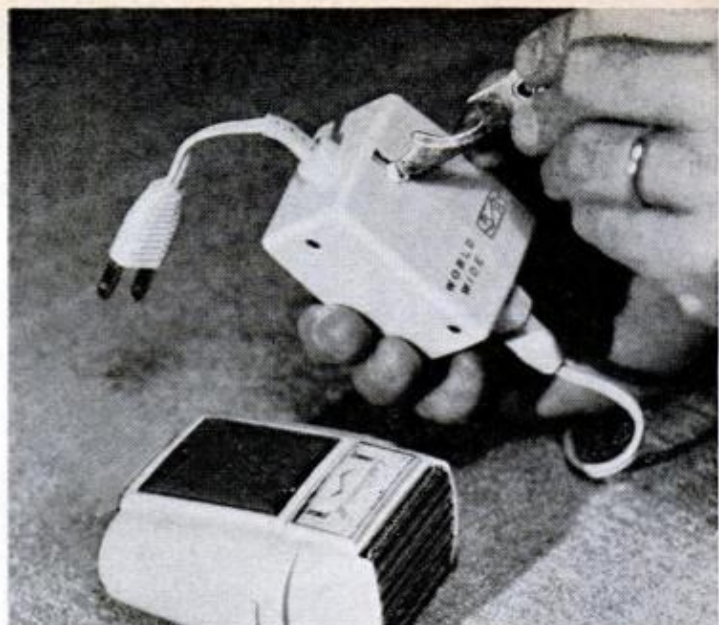
[\(Please turn to page 206\)](#)



Germany's Plastic Comtesse

The sporty looking, plastic-bodied Comtesse, based on the two-cylinder engine and chassis from the German NSU, is being sold for the equivalent of \$1450 including heater and white sidewall tires. It was developed in Munich and is reportedly the lowest-cost sports car in Germany.

The 30-horsepower engine moves the Comtesse over European highways at a top speed of about 84 miles an hour.

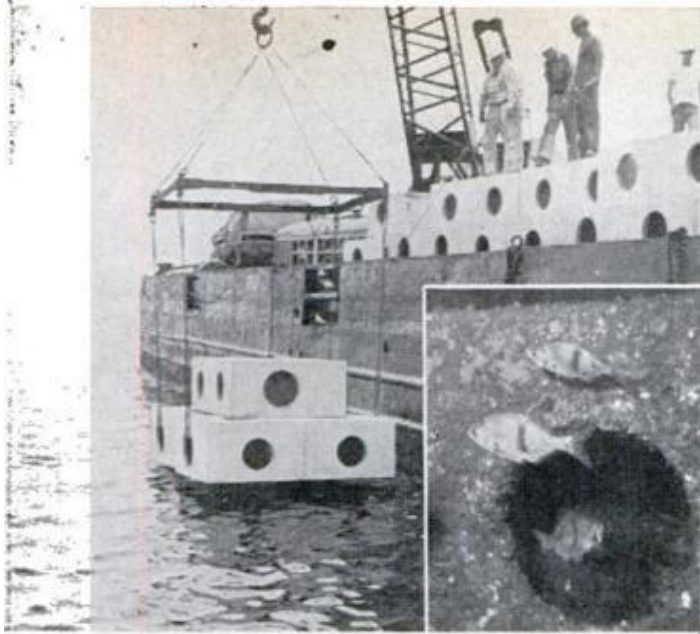


World-Wide Cordless Shaver

Rechargeable batteries power the World-Wide Lektronic II for up to 50 minutes of cordless shaving. An overnight recharge and you're ready to go again. Recharger operates on three universal voltages. Set its selector switch to 100-130 for U.S. standard, or 140-160 or 190-250, the standard voltages overseas. Adapter matches a.c. plug to European wall outlets.

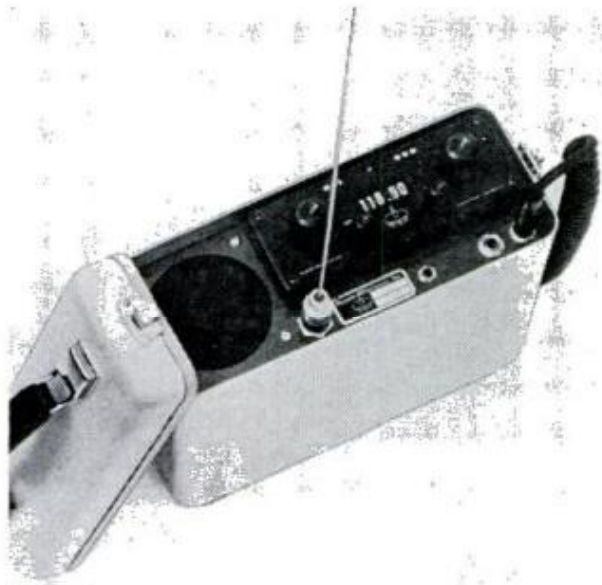
The Remington shaver sells for \$39.95.





Apartments for Fish

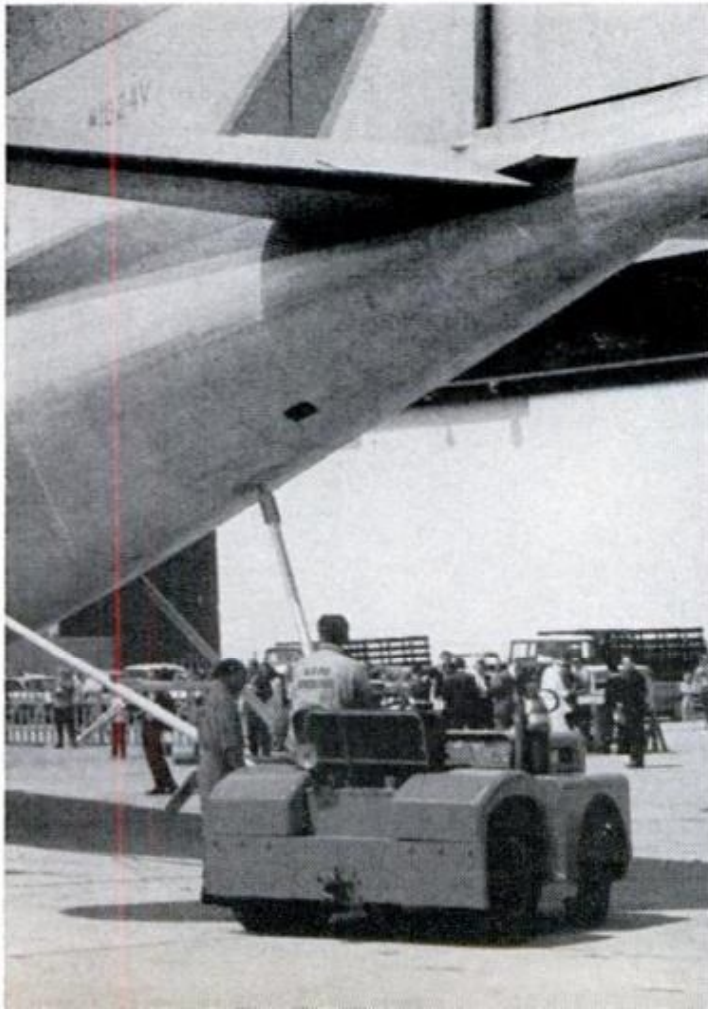
Attracting fish to barren coastal waters is the aim of man-made reefs being planted off the coast of California. Reinforced concrete blocks weighing 1500 pounds each, with circular openings on sides and top, are lowered into 60 feet of water, and positioned in a two-story rectangle. Marine biologists have observed 51 varieties of fish inhabiting one reef. Divers have placed 132 of the shelters.



Portable Aircraft Radio

First of its kind to have transistor circuitry, a miniature aircraft radio is small enough to be portable.

The 90-channel radio tunes all primary frequencies for tower, ground, approach, departure and enroute traffic control stations. \$695 for portable model, or \$595 for fixed-panel installation. Bayside Electronics, San Jose, Cal., is the manufacturer.



Two-Stage Missile Carrier

By splitting a Boeing *Stratocruiser* in two and enlarging the interior by three times its original volume, it was made roomy enough to carry missiles.

The basic airplane was lengthened 16 ft. 8 in. and its diameter expanded by 12 ft., making it the largest plane in the world in cubic capacity—29,187 cu. ft.

After the missile is loaded, the rear section is rolled into place on dollies.

School with TEACHERLESS CLASSROOMS

In University College's spanking new school, a lecturer can appear in 12 rooms at once, and conjure up slides or movies at the touch of a button while students feed back remote-control questions

By William and Ellen Hartley

IN THE WEDGE-SHAPED sloping classrooms of a curious, squatty octagonal building at the University of Miami's University College, freshmen and sophomores are exposed to the broad spectrum of knowledge through a startling array of new systems and devices. Often, the face of the teacher looks down from a TV screen located in the apex of each room, and teaching is aided by just about every known type of audio-visual equipment.

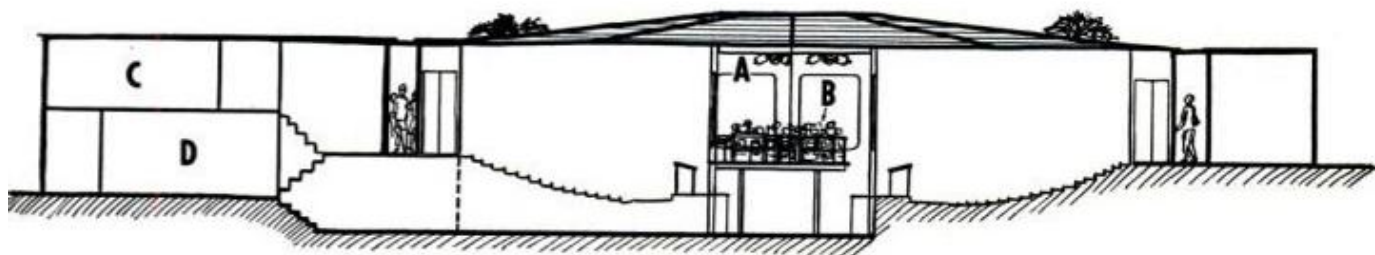
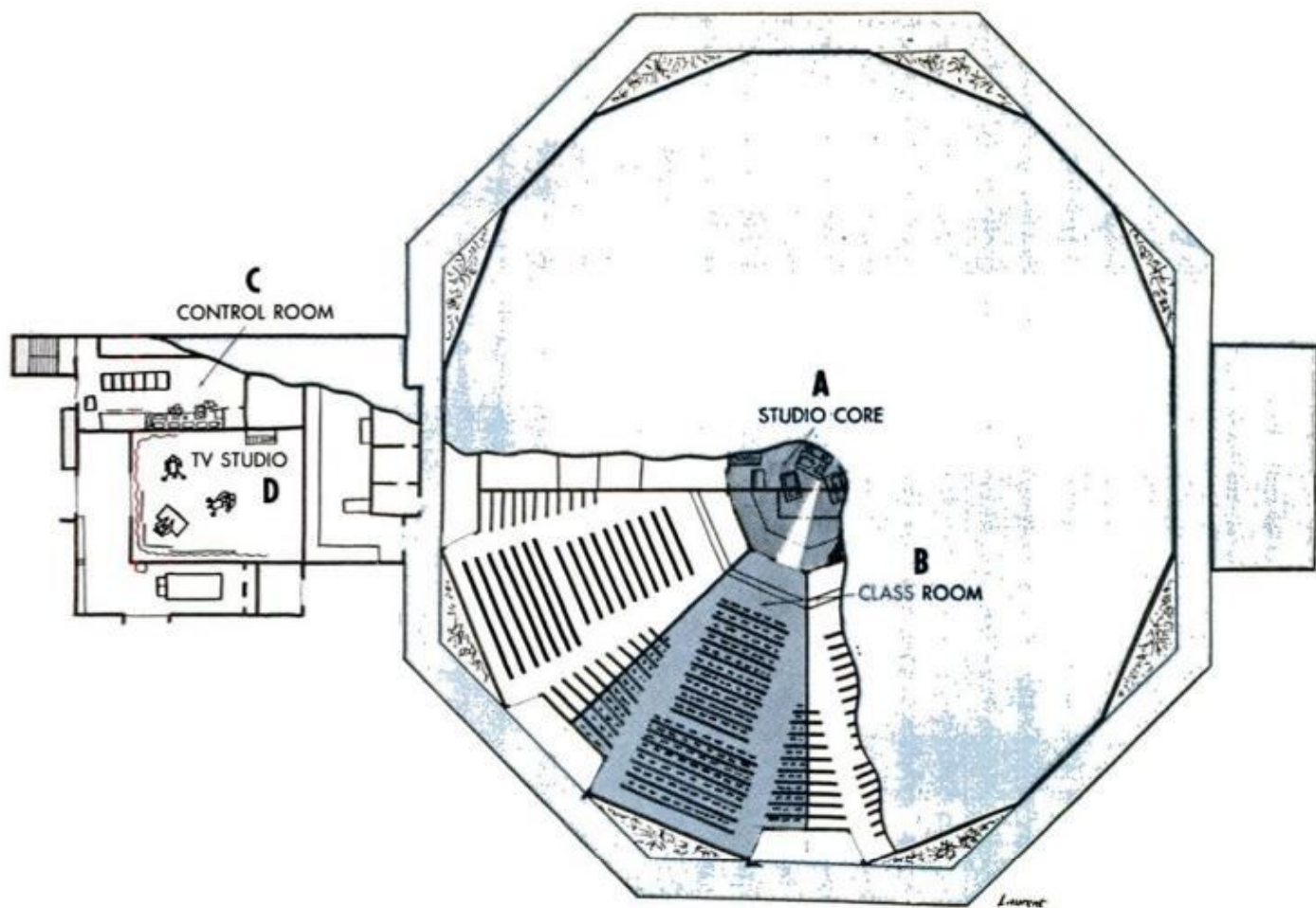
Both in function and design, University College may show the Ivy League how to remove the ivory-towered lag from teaching procedures. Educators have long been troubled about how to teach large groups of students, instruct with modern audio-visual aids, and still not lose the useful warmth of student-teacher relationship.

Structurally, University College can best be visualized as a huge angel cake

that failed to rise—but with the customary hole in the middle. The wedge-shaped slices, 12 in number, are the classrooms. The "hole" or core is a common service area, bristling with a maze of projectors for film, film strips, slides and closed-circuit television projection. By means of the TV, a lecturer may stand in front of studio cameras and project his image and message to all the classrooms simultaneously.

If he chooses to direct his remarks to a single class, however, the teacher has still another Aladdin's lamp at his disposal. In the front apex of each classroom there is a raised platform backed by a 10-foot-square screen upon which images are projected from within the core. The instructor, who stands on a podium, controls these images by pressing a variety of buttons on his podium console. In addition to his ability to "pull in" film strip, slide and

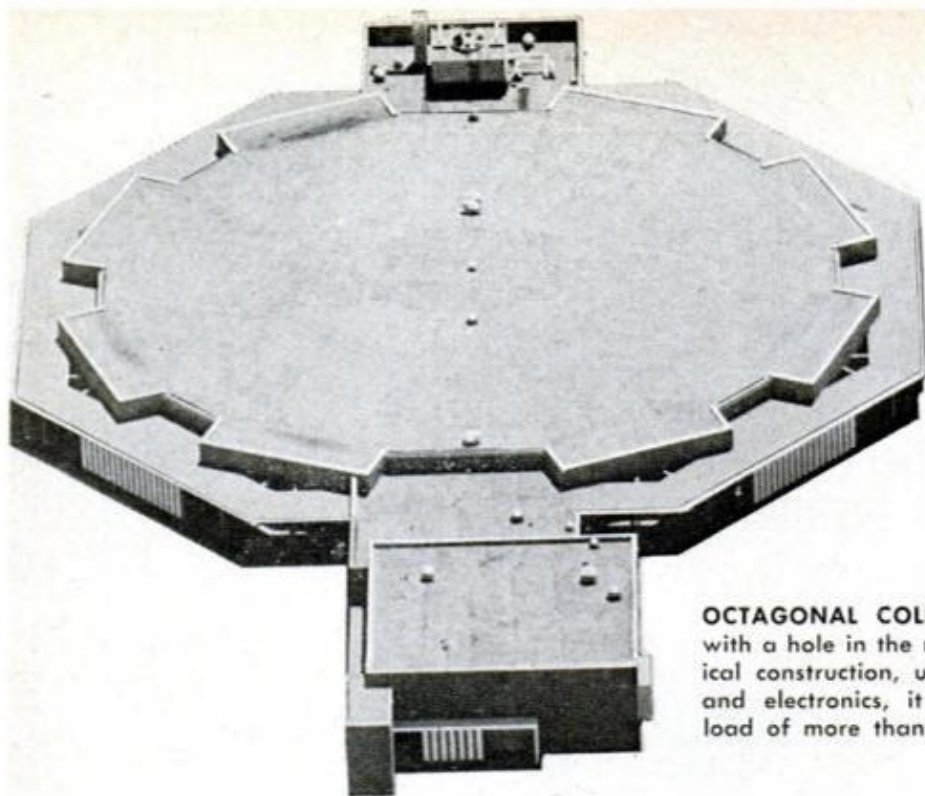




PIE-SHAPED ROOMS at University College surround a central service area core (above). From TV studio (right) in building's wing, instructor's image can be projected to all 12 classrooms, bringing lecture to 2260 students

IN CLASSROOM (left) students sit in theater seats facing screen, which may be used for common TV lecture, or for slide illustrations controlled at professor's podium console. Students use seat console (inset) for questions





OCTAGONAL COLLEGE is constructed like a pie with a hole in the middle. Through its unique physical construction, use of modern audio-visual aids and electronics, it can easily handle a teaching load of more than 50,000 student hours per week

motion picture material for use on his screen, he can control volume, classroom lighting and his own public address system in any particular room.

A blackboard can be raised beneath the screen. If classroom lighting is dim in order for screen images to be seen, the instructor uses fluorescent chalk to emphasize points on the blackboard. In one of the classrooms there is even a bank of outlets for water, butane gas, and a variety of other things for use when laboratory-type demonstrations are required.

Classrooms slant toward the platform and viewing screen; chairs are like theater seats except that they have writing arms that can be raised or lowered. Significantly—and unlike most classrooms where TV or other audio-visual aids are used—there is no distracting equipment or machinery in the lecture halls. All of this is contained in the core behind the screen platform.

In preparation for a lecture, the pit technicians are advised in advance as to what audio-visual aids the instructor wishes to use. When the teacher steps behind his lectern and notes a green light, he knows his material is ready for use.

Closed-circuit television is produced in a separate studio in a wing of the building. The control booth overlooks a 35 by 40-foot room bedecked with lights and equipped with three RCA Videcon TK-15 cameras. University of Miami educators

are quick to point out their enthusiasm for the television lecturing system, which allows a single, highly competent teacher to reach some 2260 students while, in traditional instruction, numerous dull men might be inflicted on small, sleepy classes.

University College has been accused of being too far out. "Where," the critics ask, "is the wonderful teacher-student relationship?" The fact is that "live" professors do lecture regularly in the classrooms. But even in TV lectures, seminars are conducted. Every television talk can be supported by question and answer periods within each classroom.

A "feedback" system now being installed makes this "magic" possible. Buttons in student seats can be pressed to indicate at least 31 classroom responses to the television material. By way of example, a student can depress one of his buttons and indicate to the TV lecturer, "I don't understand. Will you please repeat your statement?"

Through its unique approach to education, University College can handle a teaching load of some 50,000 student hours per week.

Is it effective as a teaching system? The Fund for the Advancement of Education was impressed enough to award \$300,000 to improve the effectiveness of the University College system. So far, cost of the building comes to \$671,850 and total investment exceeds a million. ★★



TWO-HEADED GIRL resulted from picture taken by periphery camera. It photographs 360 degrees of subject

Camera Sees All Sides at Once

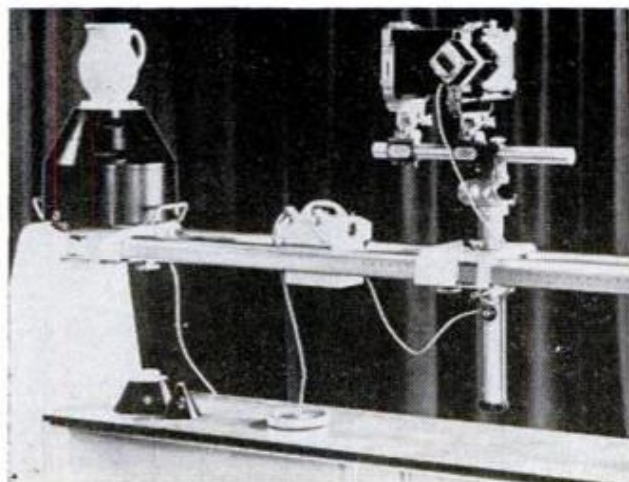
PICASSO-LIKE PHOTOGRAPHS of large objects are now possible with a camera that takes periphery pictures—photographs that record 360 degrees of any cylindrical subject, including heads of pretty girls.

Although such weird pictures are possible, the camera was designed primarily for serious scientific purposes. Developed by Shell Research, Ltd., in England, it rotates the subject on an axis while compensating for image movement by synchronizing the film to move past the lens

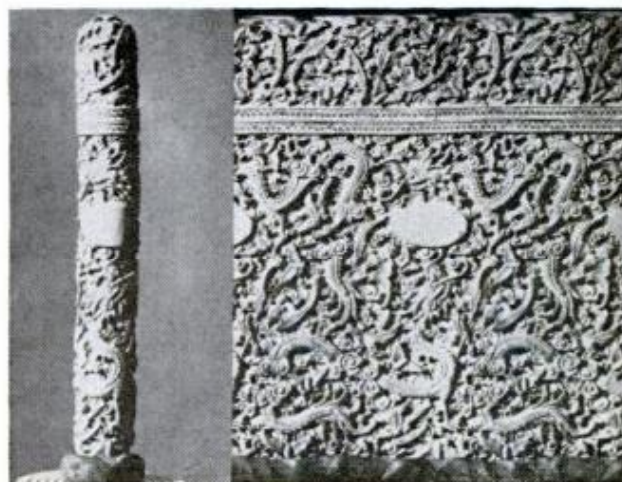
opening at the same rate. The lens opening is a vertical slit, rather than the normal round iris.

Called a periphery camera, because it takes a continuous photograph of the outer periphery of the subject, it is not an entirely new technique. Periphery pictures were reported as early as 1895. Early methods placed photographic paper in contact with the subject and passing light through it, or rotating the camera around the subject. Methods preceding the Shell camera were limited in size of subject.

CAMERA SETUP includes a revolving stand for subject, synchronized with mechanism which turns film



BEFORE AND AFTER: Chinese needle holder (left) is flattened out for study by the new periphery camera



**Boats, patio roofs and radiant-heat panels
are now being made of rotproof, fireproof**

PLASTIC PLANKS

By James Joseph

ONE DAY SOON, when you stop at your local lumberyard for a couple of 2 x 4s, the clerk may ask: "Wood or plastic?"

Why? Because now they're making "lumber" from plastic.

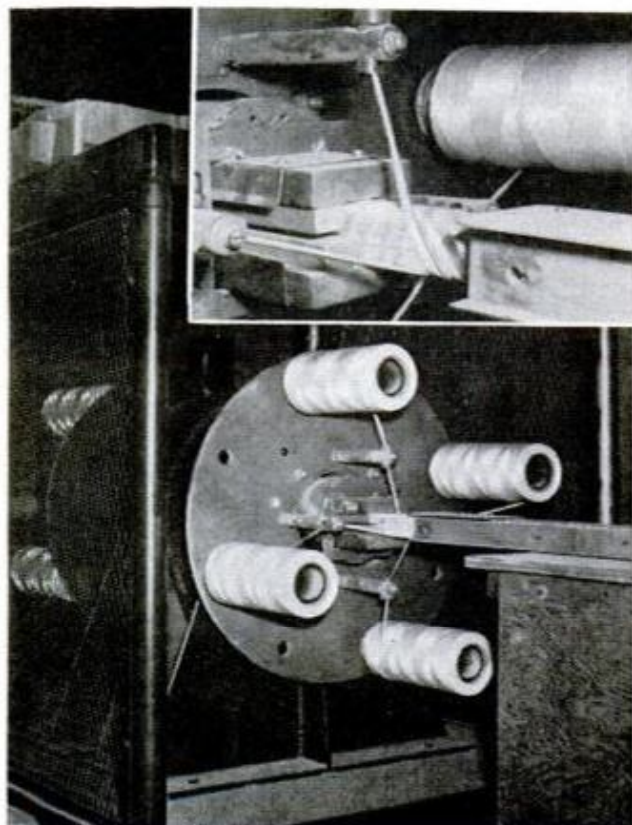
The plastic planks discussed here—just now becoming available—are the invention of plastics specialist Martin Weir. They are made by wrapping a precut polyurethane-foam core with fibreglas roving, then dunking it in polyester resin. Faced with fibreglas, the resulting "lumber" comes in most of the common construction sizes and shapes.

Pound for pound, the urethane core is more buoyant than cork, so a boat planked

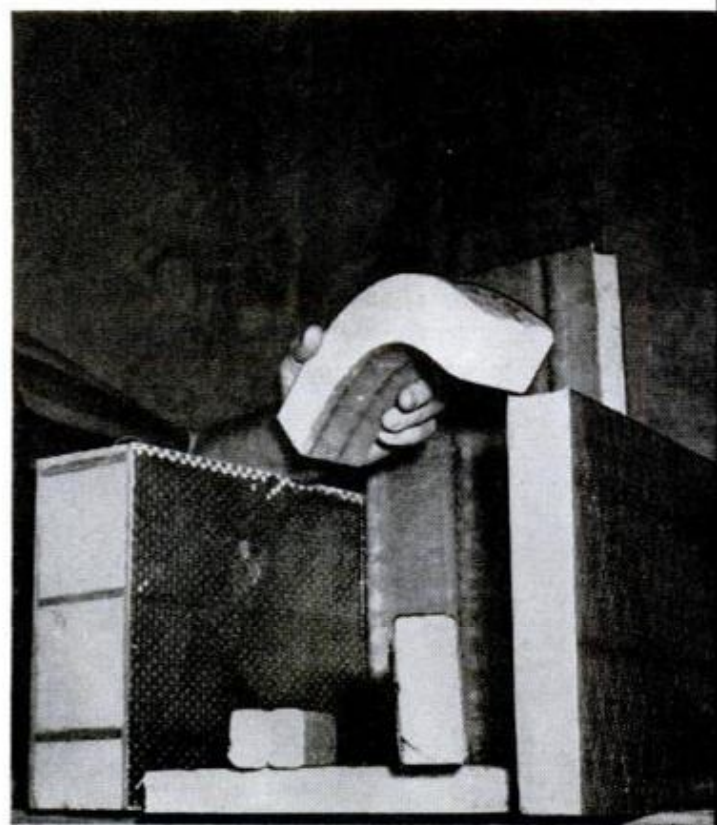
with plastic lumber is all but unsinkable. Urethane is also one of the best man-made insulating materials; an inch of this cellular foam plastic has the insulating properties of 9½ inches of solid oak. A house built of these planks will be self-insulated and, in addition, insectproof, rotproof and fireproof. Plastic lumber won't warp. If damaged, it can easily be repaired with a little resin and fibreglas.

Of course, urethane foam has long been used in plastic "sandwich" construction. Under hard use, however, it has tended to pull away from its fibreglas facings. And since urethane itself has little structural strength, such sandwich panels were easily crushed. Weir's method of jacketing the

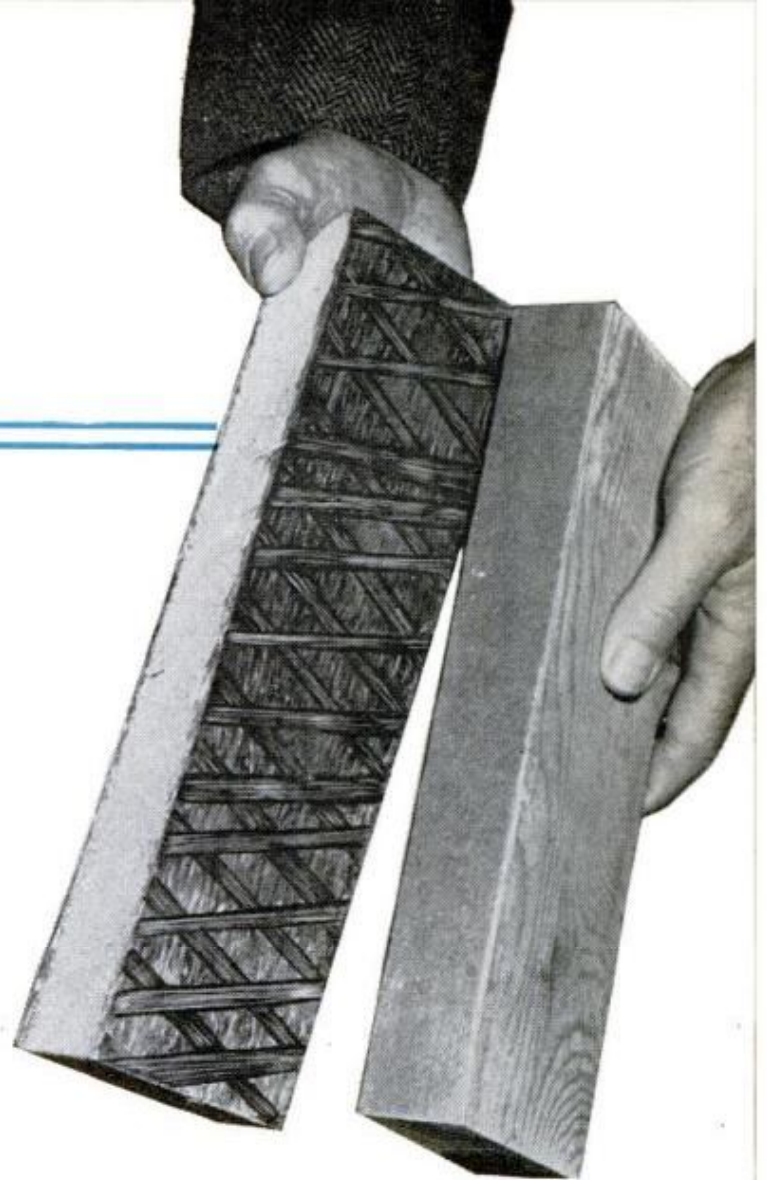
PLANK-MAKING MACHINE can lay fibreglas roving along longitudinal faces while winding roving from eight bobbins laterally around urethane foam core



CROSS SECTIONS of various planks show feather-weight-urethane core. Hand-held piece has been treated, but not faced—the "raw" plank for projects



MAN-MADE LUMBER (piece on left) weighs one third less than wood 2 x 4. The plastic 2 x 4 shown here is actually a section cut from a larger piece to illustrate the sandwich construction. Normal plastic 2 x 4 is completely jacketed with fiberglass roving which is bonded to urethane foam with polyester resin



urethane core with fiberglass can be tailored to give the plastic plank better-than-wood strength for any particular use, making it practical for almost all types of construction.

The fiberglass roving, bonded to the foam core with resins, acts as a system of tiny girders to bolster the urethane. It forms a weblike brace between the two fiberglass faces. Thus, a large panel made up of several plastic planks offers greater resistance to crushing.

Planks with thick urethane cores (4 to 6 inches) faced with a single layer of fiberglass matting or cloth weigh about a third as much as similar size boards.

[\(Please turn to page 232\)](#)

25-FT. SLOOP made from plastic planks will stay afloat at deckline even when swamped, supporting passengers and gear as well as an 1800-lb. keel



BARE HULL of plastic-plank Solar M-25 looks like common fiberglass boat from the outside, but special construction shows up when you look on the inside





STORM AND SCREEN COMBINATIONS

By
Jackson Hand

Which combination unit is best for you? Which type is most convenient, most economical? Here's the know-how you need to make the right choice

AN INTERESTING ENCOUNTER, a few years back, was the semiannual fight-for-your-life with some character in a tight suit who rang your doorbell and insisted on selling you combination storm-and-screen window units. His were the cheapest and best, his suede-shoed foot was in your door, and it took a lot of man to send him packing.

Today's home-improvement salesman has, himself, improved. In many respects, so have the combination units he sells. But there are still bad "bargains" to be had. What follows will help you recognize them.

- **Why combinations in the first place?**

Any homeowner who's gone through the annual cycle of changing from storm windows to screens and back again can answer that. They're convenient. They can turn what used to be an all-day, twice-a-year chore into an effortless 15-minute job. And they make it possible to switch back again, if necessary, almost at a moment's notice. Also, they are often easier to wash

than conventional storm windows, and they make control of winter ventilation a matter of just raising or lowering a panel.

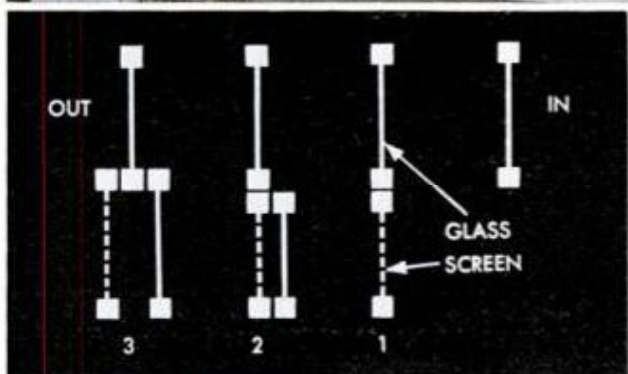
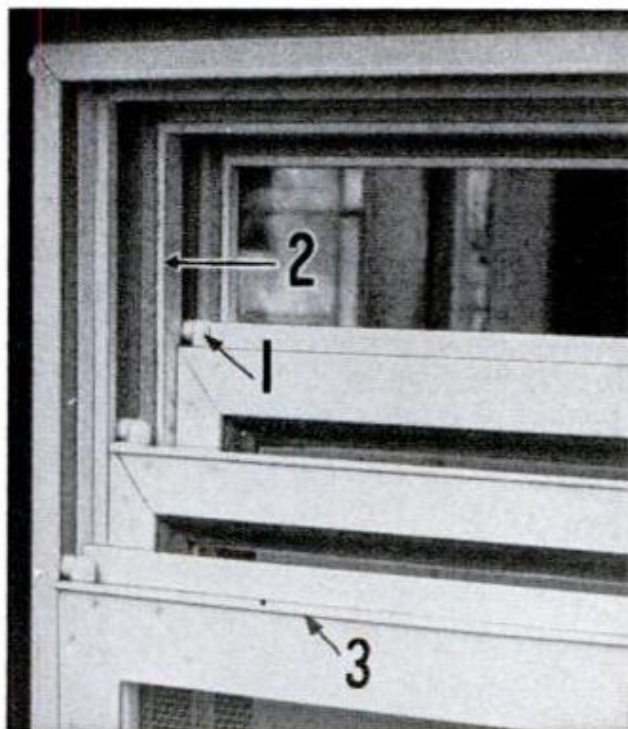
- **What are "self-storing" units?**

A typical storm-and-screen combination consists of a frame, two glass panels each equal to half the window area, and a screen panel equal to half the window area. In most cases, the panels slide vertically, but a few slide horizontally. When the two glass panels are positioned to cover the entire house window, the screen panel, although still in the frame, serves no purpose and is, in a sense, being self-stored. Conversely, when the screen panel is in use, a glass panel is self-stored.

- **Does this work with all combinations?**

With triple-track and triple-channel units, it does, since each panel (or insert, as they're sometimes called) has its own

NYLON-STUD GLIDE (1) is fairly new device found on some units. Felt weather stripping (2) prevents rattle, gives smooth operation. Extra flange (3) adds strength, indicates careful design, manufacture. Diagram at bottom of page shows arrangement of inserts in single (1), double (2) and triple (3) units



track or channel. It also works with double-track and double-channel units, because two of the inserts fit in one track or channel, while the unused insert is stored in the second.

With single-track and single-channel units, true self storage is not possible. The two inserts being used occupy the only track or channel, making it necessary to store the unused insert separately. In some single units, however, clips are provided to store the unused insert within the frame. This involves little more trouble than double and triple units.

- **Which type of unit is best?**

It is a matter of weighing cost against the convenience you're willing to settle for. Single units are less convenient than the other types, but, grade for grade, cost less. Thus, if you don't mind removing the idle screen or glass inserts for storage, you can get some real bargains in a well-made single unit. A word of caution, however. Be wary of especially low-priced "bargains." Single units are often made in inferior grades to lure the unwary.

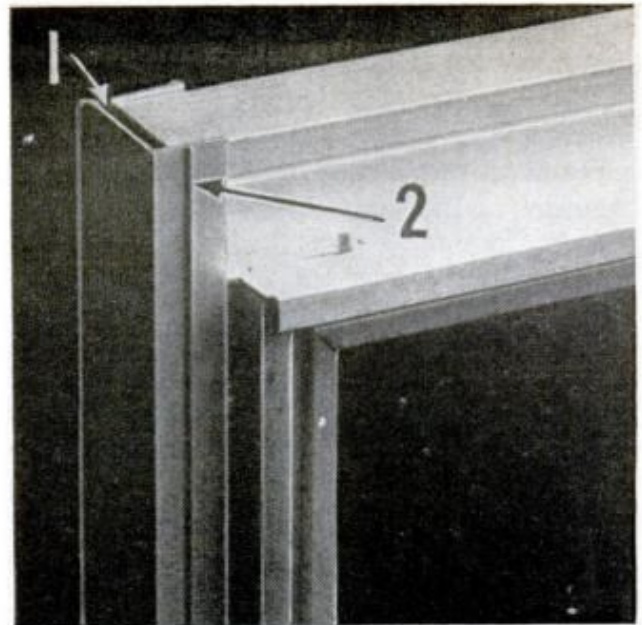
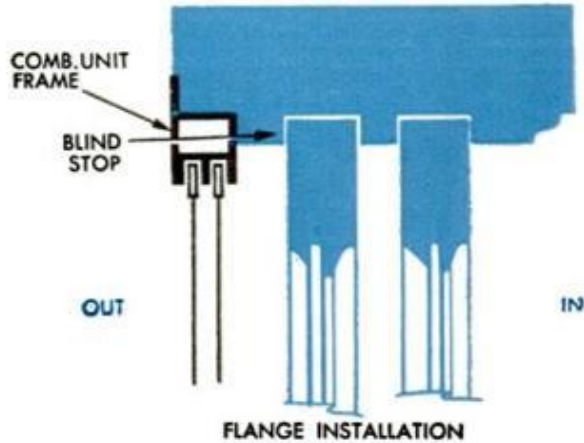
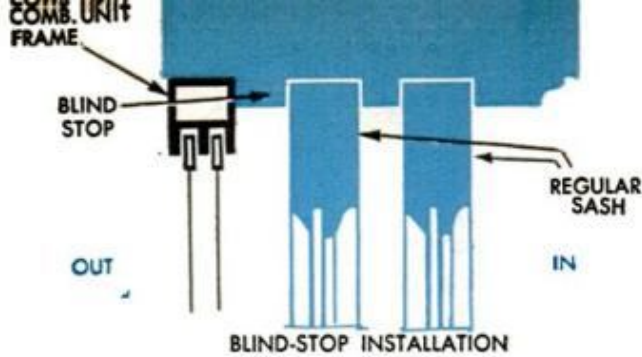
In double-track or double-channel units, it is common practice to have one glass insert and the screen in the outside track or channel, with the screen in the low position. The second glass panel rides in the inside track or channel. Thus, to "put on the screens," you just slide the inside glass panel up into storage position. A disadvantage here is that when you restore cold-weather protection by lowering the glass, the screen panel remains down, plainly visible. Costwise, double units have the edge over triple ones. They require less engineering and less material and so, dollar for dollar, can deliver more value.

In triple units the screen insert usually rides the outside track or channel, which is just as convenient as the double units. However, this arrangement lets you store the screen in the upward position—out of sight. (See drawing, bottom left.)

- **How do you recognize quality?**

Generally speaking, combination storm-and-screen units come in wood or aluminum, although at least three companies use steel. With all three types, your best insurance is close inspection. Examine samples, cross-sectional mock-ups which many dealers display, and the units themselves. Pay close attention to the following:

With units of formed sheet metal or extruded moldings, look for sufficient weight in the metal. Skimpy, lightweight frames



BACK VIEW OF WELL-DESIGNED UNIT made for blind-stop installation shows slip-joint (1) for precise fitting and extra rib (2) which provides added rigidity

mean flimsy construction. And look for strategically placed ribs that give extra strength at points of stress. (See photos, above and page 135.) If the frame is of formed sheet metal, examine the bends and seams. Bends should be sharp. Seams should be interlocking or crimped as simple butt seams are more likely to part. (See drawing, page opposite.)

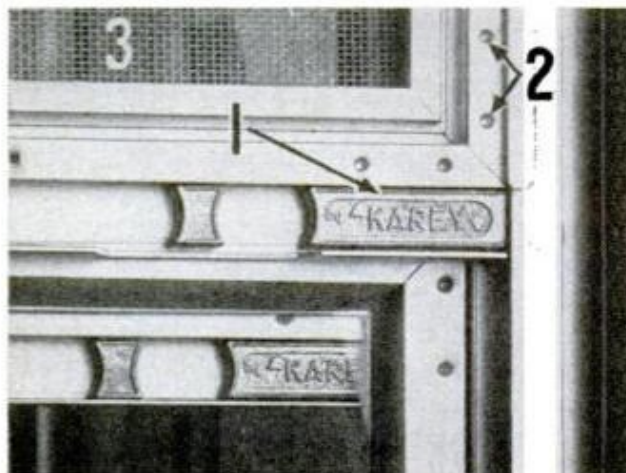
Take a good look at the corners. In good quality extruded units, they will be joined by a combination of mitering and interlocking. In formed units, good ones normally will be mitered. In either case, look for strengthening and reinforcement. A heavy right-angle insert is a good sign, and screws, dimpling or other strong

fastening should have been used to lock the joints.

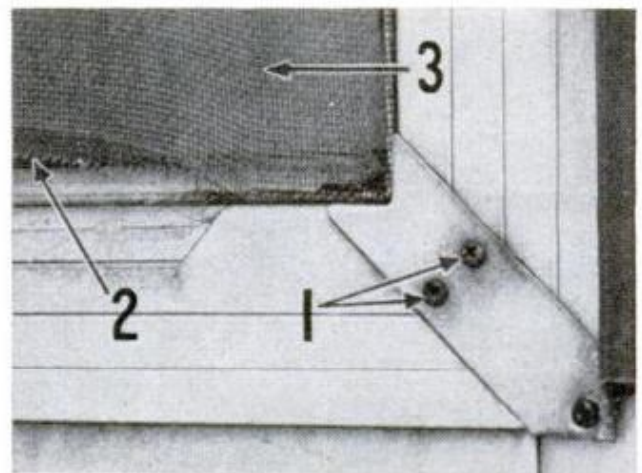
• **What about wood units?**

Many homeowners prefer wood storm-and-screen combinations because they blend well with traditional architecture. These are generally double-track, self-storing. When inspecting them, look for good workmanship—neat joinery at corners, careful finishing, etc. But don't expect all-wood construction. Inserts may be aluminum edged. Tracks might be polyvinyl, for smoothness. (Photo, page 137.)

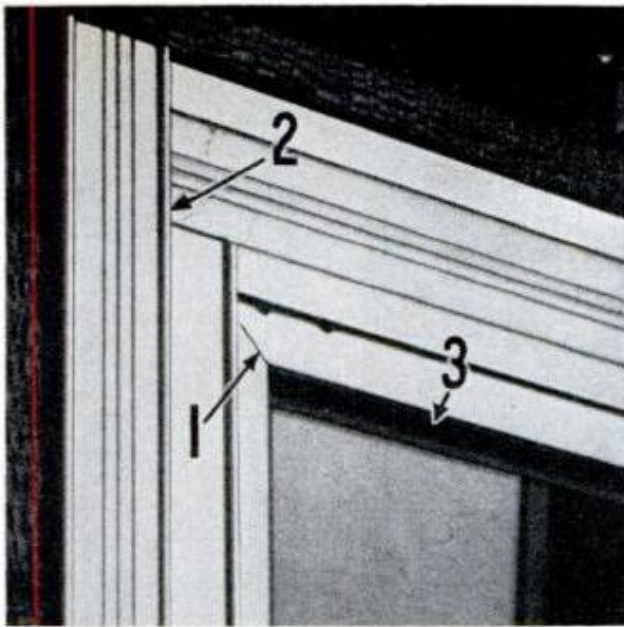
Before buying wood combinations, be sure they will fit your windows. Some manufacturers make the units to fit only their brand of standard windows. If they



RUGGED HARDWARE (1) is sign of quality. Punch marks (2) are method of locking frame to reinforcing right-angle inserts. Screen (3) should be 14 to 18 mesh



SIGNS OF POOR QUALITY: Steel screws (1) rusting, pulling out—should be stainless or aluminum. Loose screening (2) with distorted mesh (3) was overstressed



STRONG CORNERS are usually mitered on the inserts (1) but telescoped on frame (2) to simplify installation. Beveled plastic strip (3) is a good glazing technique

aren't made for your specific windows, make sure they can be trimmed to fit.

• **Can broken inserts be replaced easily?**

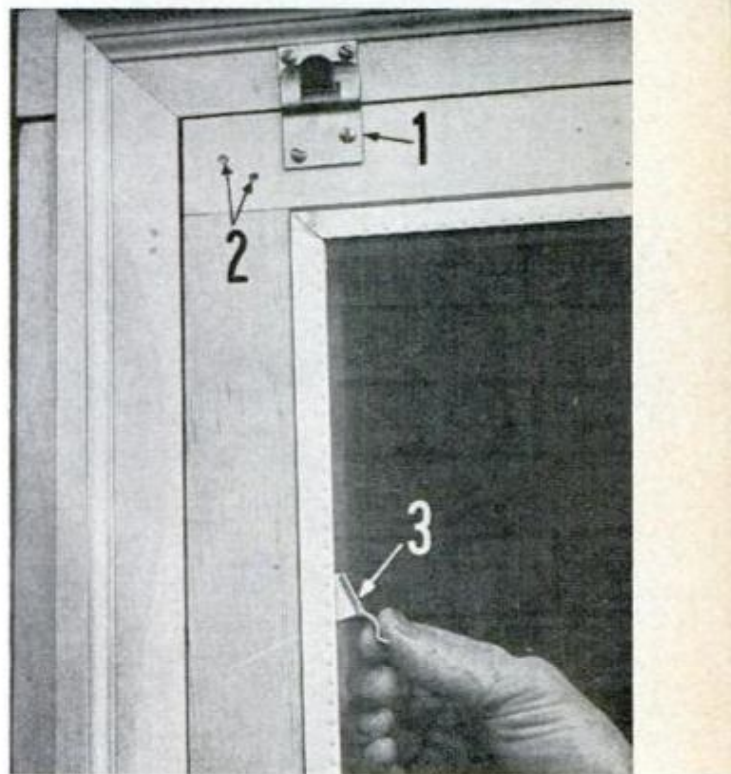
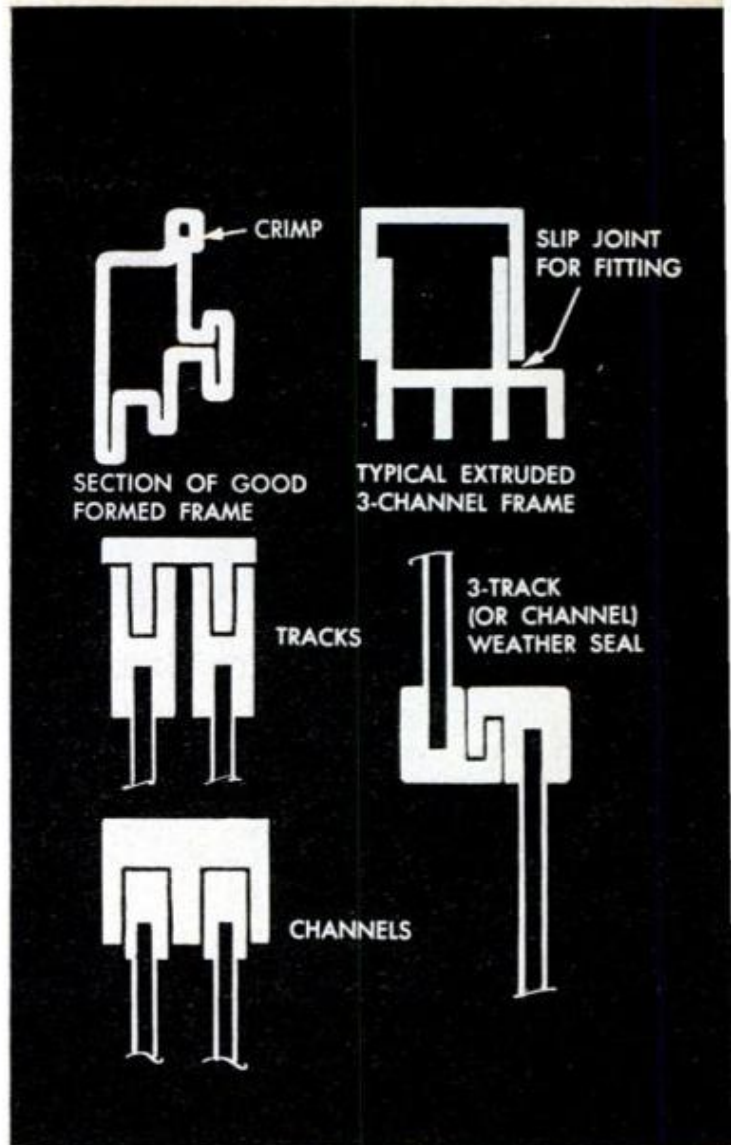
An important point. With some units, broken inserts must go back to the dealer for reglazing. Most homeowners would prefer units that can be repaired by any competent glazier. Check this out with your dealer, then examine the insert frames yourself to see if they can be disassembled with reasonable ease.

• **What about weather stripping?**

It is a fairly common misconception that storm windows must be airtight. Actually, too much tightness can cause trouble. Experts say that storm windows are just as effective against heat loss if they have the equivalent of about one square inch of air leak. Such "breathing" helps prevent condensation and accumulation of moisture.

For that reason think of weather stripping more in terms of "anti-noise-stripping" and lubrication rather than insulation value. Units well cushioned with pile, foam or similar materials do not rattle, and they are easy to open and close. Some windows of good quality have no weather stripping as such, but instead have snug-fitting plastic grooves or channels. These prevent the sticking and rasping often encountered with all-aluminum units. The most critical points for some sort of cushion-to-cushion seal is where the two glass panels or a glass and screen meet.

(Please turn to page 230)



POPULAR WOOD UNIT hangs on hooks (1) like conventional screens. Steel pins in lapped joints (2) insure strength. Clips (3) permit easy removal of screen



Rollaway Charts for Small Boats

A new navigational aid for boaters consists of a crank-operated chart case which holds strip maps up to 50 feet long. Printed on tough, plastic-coated stock, present charts cover San Francisco Bay, Puget Sound and Columbia River areas. Others will be available soon. Extra-cost options include a drafting arm and lighting system. The handy new device is made by Rollchart, Inc., 2624 S.E. Ankeny St., Portland 14, Ore.

The chart case is 21½ inches long, 12¼ inches wide and 3½ inches high. It weighs 11 pounds.



Astronauts May Eat Furniture Made of Hominy Grits

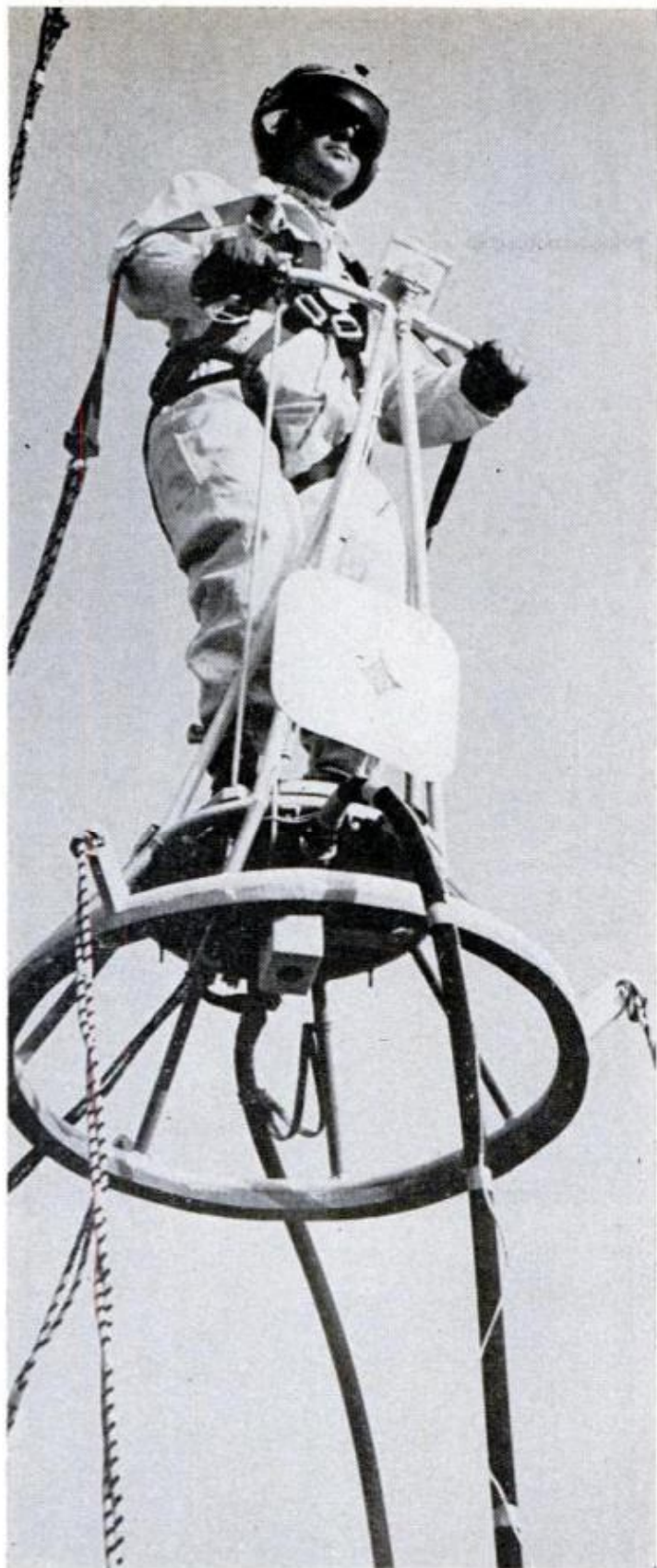
Future astronauts may eat themselves out of house and home. That is, if they use a new building material called ESM (edible structure material).

Made solely of foodstuffs, its ingredients include powdered milk, cornstarch, wheat flour, hominy grits and banana flakes. ESM looks much like fiberboard and can

be used for instrument panels, bunks, or internal walls. Developed by Grumman's Dr. Sidney Schwartz, it is machinable, drillable and can be threaded.

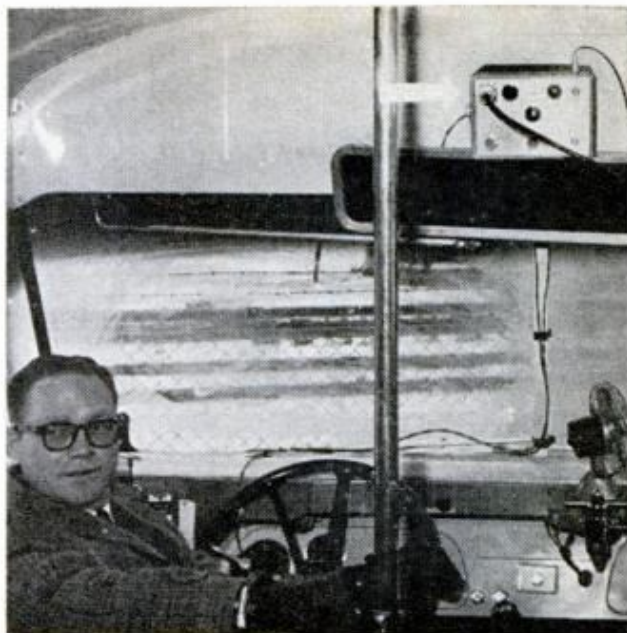
And, after use, nutritionally-rich ESM can be boiled and eaten. Its taste? Something like breakfast cereal, according to the developers of the product.





Lunar Scooter Rides on Air

How to commute from crater to crater once man gets to the moon may be solved by a one-man rocket scooter that can hover, rotate or accelerate in any direction. The tethered experimental model uses air jets instead of rocket fuel. Thrust is regulated with twist grips on the handlebar. North American Aviation is the developer.



Radio Stops Bus-Train Pile Up

Electronic signals at railroad crossings transmit warnings to bus drivers of approaching trains. Developed by Industrial Systems, the device sends out radio signals if a train is about to come through. A receiver in the bus picks up the signals and sets off an alarm, warning the driver to stop at the crossing.

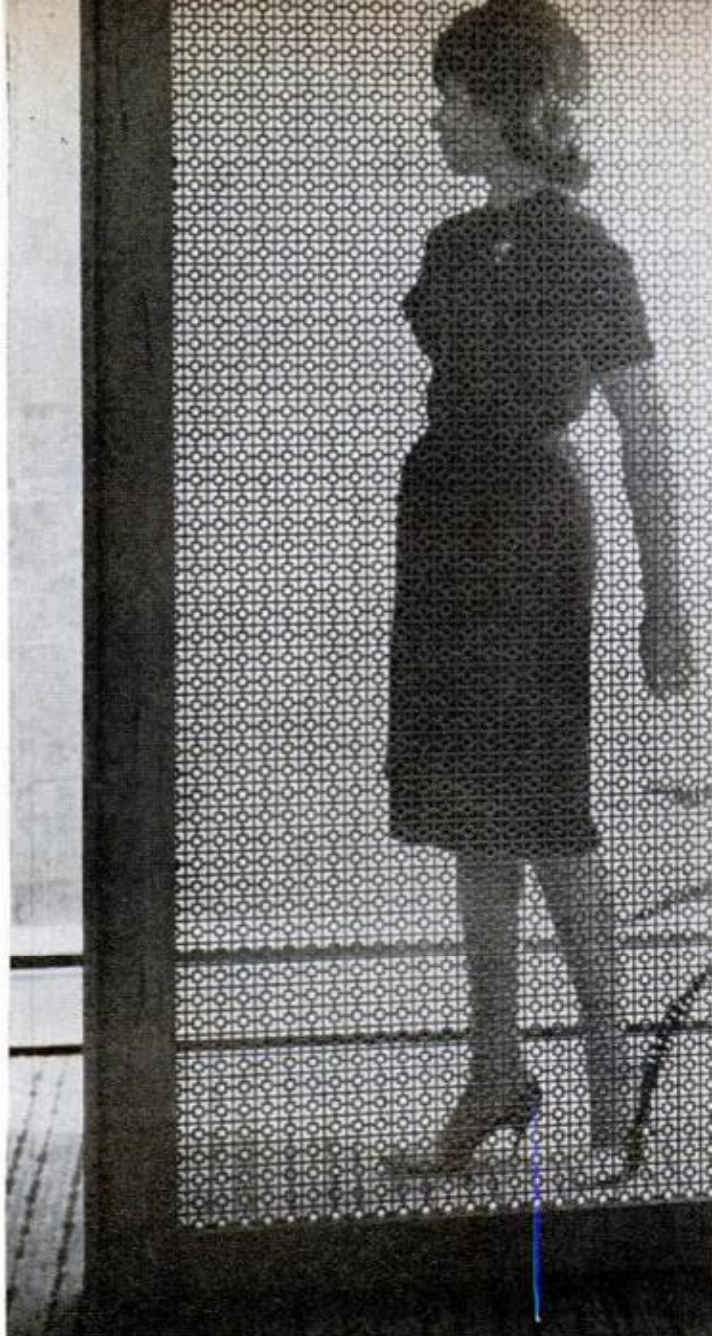


Motion-Picture Jukebox

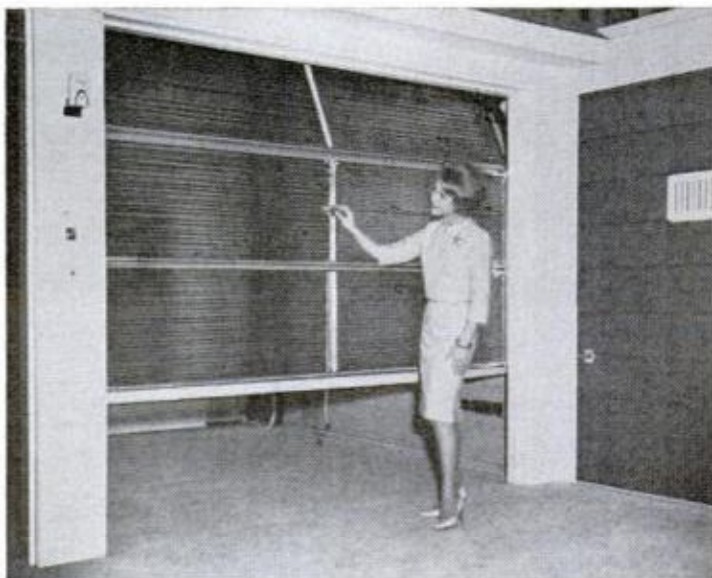
Drop a quarter down the slot and you'll watch as well as listen to your favorite music. Cinebox houses 40 three-minute full-color musical films which are selected for playing as records are chosen on a conventional jukebox. A rear-projection system displays pictures on a 23-inch screen. Cinevision Corp. is the manufacturer.

New for Your Home

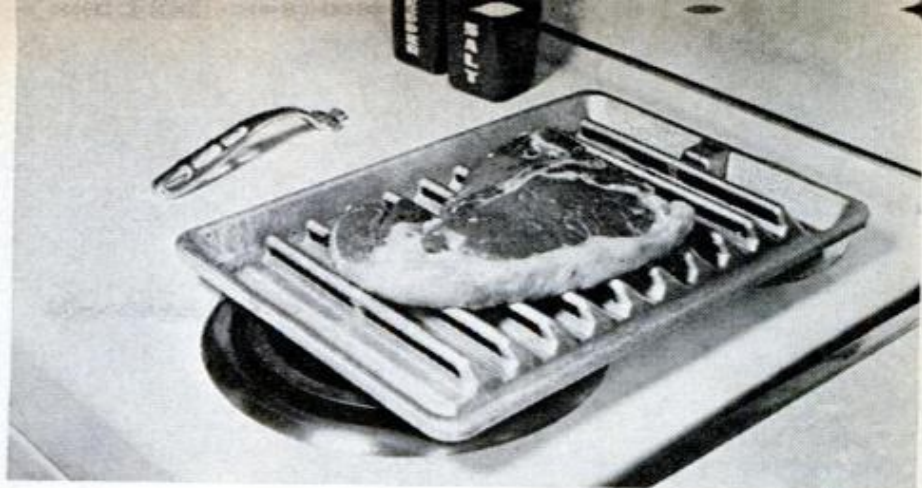
HARDBOARD FILIGREE PANELS form a decorative, secluded foyer as well as cabinet or window effects. Easy to install, "Grecianboard" comes smooth on both sides, ready to trim and use unfinished or painted. Cost: 40 cents a foot. Fabricator Corp., 70 Empire St., Newark N.J.



FACIAL MASSAGER attaches to your electric razor. To operate, snap off the cutting head of razor, slip massage head into place and massage. Made of vinyl, unit costs \$2, fits most razors. By Menne Products, Box 78281, Los Angeles, Calif.

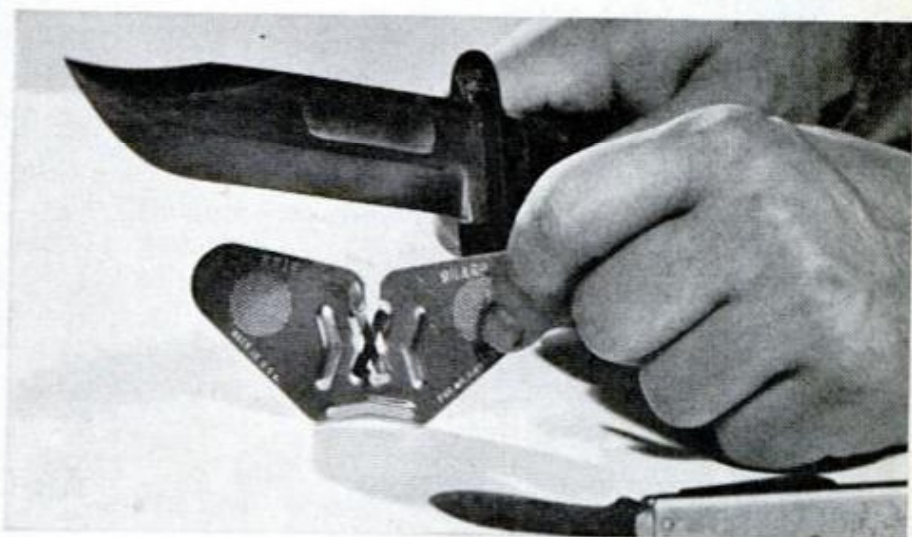


SECTIONAL GARAGE DOORS of fiberglass feature pinch-proof joints, changeable screen inserts. Lightweight, colorful doors need no painting. Single or double car sizes by Berry Ind., 2400 E. Lincoln Road, Birmingham, Mich.

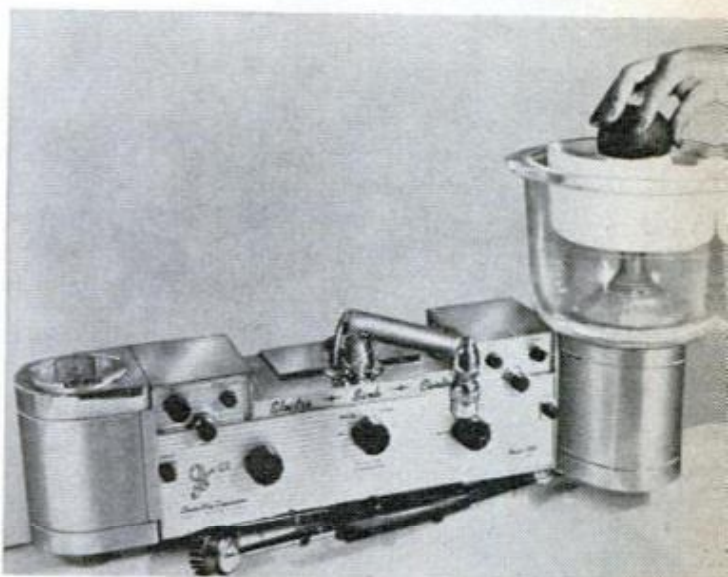


FLAMELESS GRILL cooks from direct heat outdoors or indoors. Grease is saved in grill wall for basting. Aluminum, 10½" by 15" unit is \$8.95; J-T Flameless Grill Co., 312 Wyndhurst, Baltimore, Md.

KNIFE SHARPENER puts razor edge on dull knives. Hold unit in left hand, place on cutting board, put knife in slot, draw it toward you several times. By S. and F. Sales, Box 1092, Bloomfield, N.J.



CAN OPENER makes a pouring spout as it opens any size can. Hold chrome-plated opener in hand, push down on knife button, squeeze lever to form spout. Can becomes dripless pitcher. By Keyes-Davis Co., Battle Creek, Mich.

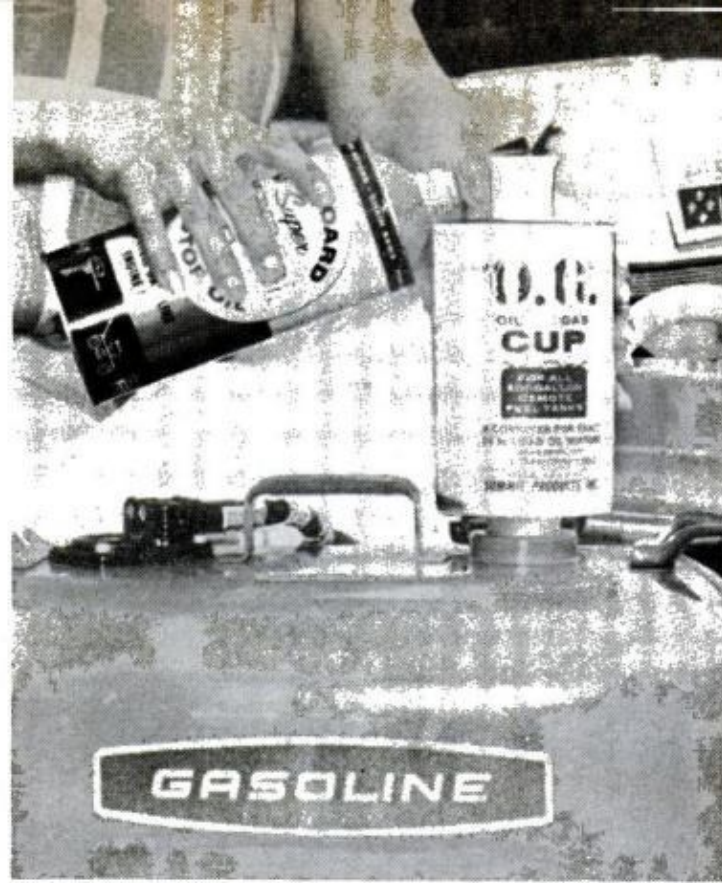


ELECTRIC SINK CENTER gives you push-button hot and cold water—blender, juicer and ice cream freezer appliances. Unit operates on 24 volts and fits any sink. Electro-Way Corp., 5711 West Adams Blvd., Los Angeles, Calif.



Merry-Go-Round Griddle

A rotating grill built by two members of the Kiwanis Club of Oconomowoc, Wis., cooks 900 pancakes an hour. Turned by a 1/20-hp. electric motor, the grill is heated by bottled gas. A movable funnel holds 1½ gallons of batter, and a trigger controls the flow onto the grill.



Balanced Diet for Outboards

A filler cup for use with six-gallon remote tanks automatically provides a 24-to-1 oil-gas mixture every time, regardless of the amount of fuel to be mixed. Called the "O-G" Cup, it's made by Summit Products Co., Akron 7, Ohio, and sells for \$2.50.



Air-Crash Transmitter

Light planes which have been forced down or have crashed may now be located with a distress transmitter.

It consists of a battery, pulser and transmitter positioned in an aluminum cylinder.

When a severe jolt is suffered, a small insulating ball is displaced from between two spring-loaded electrical contacts. When the contacts touch, the circuit is closed and an intermittent tone signal is broadcast on 121.5 megacycles, the aviation emergency frequency.

The transmitter is now being tested by the FAA and may be available by the year's end.

Soviet scientists report long survival periods for dogs whose injured nerves were replaced by thin threads of platinum.



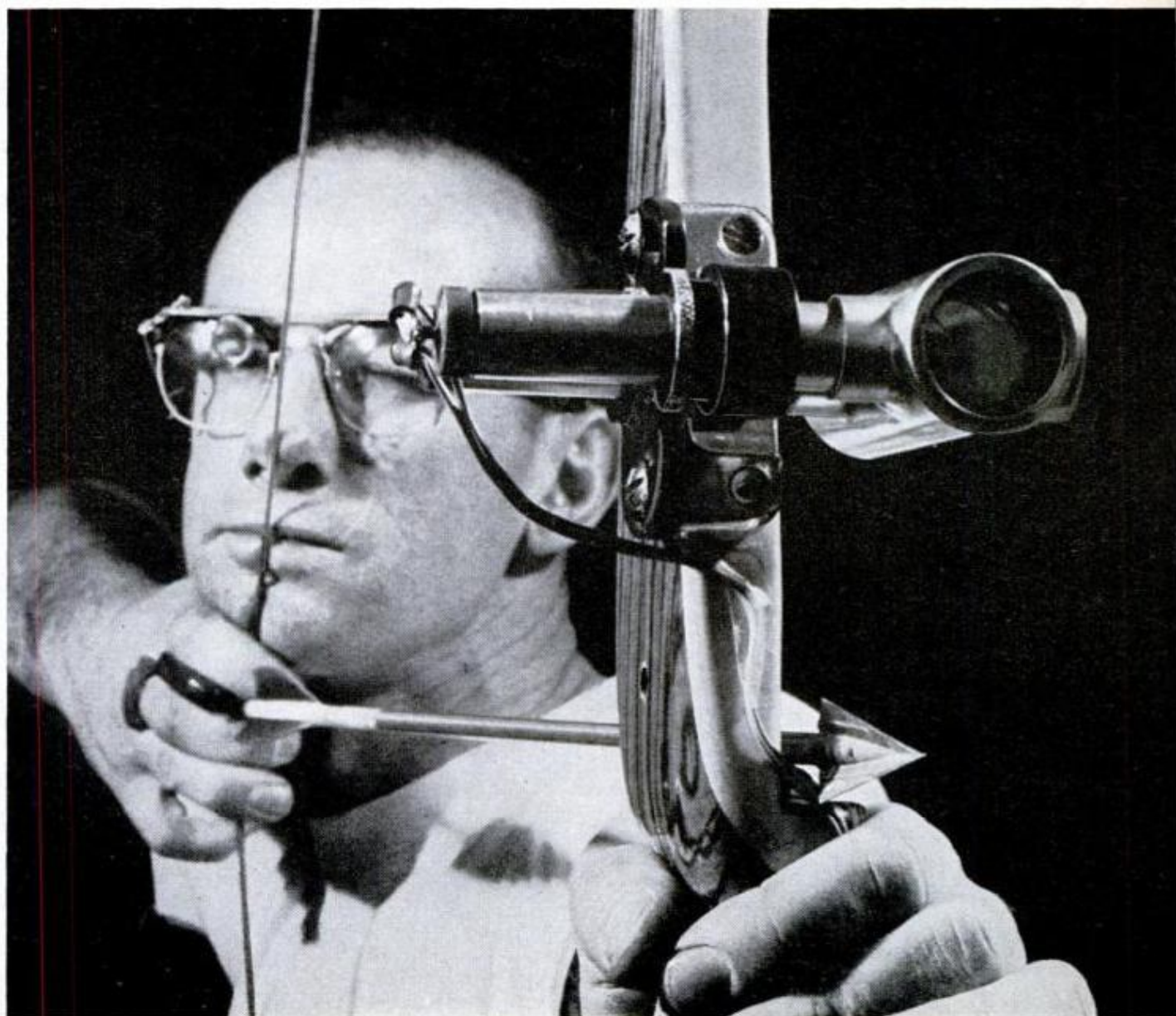
Powered Pram

The easy way to take toddlers along shopping is to stash them in a sidecar. A Pramcar chassis, made by Lambretta Scooter, holds the body of any baby carriage, which can be quickly mounted on the chassis.

Optical Arrow Aimer

Preliminary aim at low-power magnification followed by "full-draw" aim with high power is a feature of a telescopic sight for a bow. The sight has one lens attached to eyeglass frames and a convergent lens on the bow; a light-spot reticle aids sighting.

The sight, developed by Norland Associates, is made by Scientific Sports Eqpt. Co., Madison, Wis. A two-power hunting scope sells for \$79.95; four-power, \$87.95.



PROJECT-A-PLAN INSTANT

FLOWER SHOW



PROGRAMS
PROGRAMS
& PROGRAMS
PROGRAMS

DRAMA



PROGRAMS
PROGRAMS
& PROGRAMS
PROGRAMS

recital



PROGRAMS
PROGRAMS
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RUMMAGE SALE



PROGRAMS
PROGRAMS
& PROGRAMS
PROGRAMS

school picnic



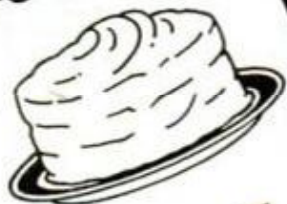
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BAKE SALE



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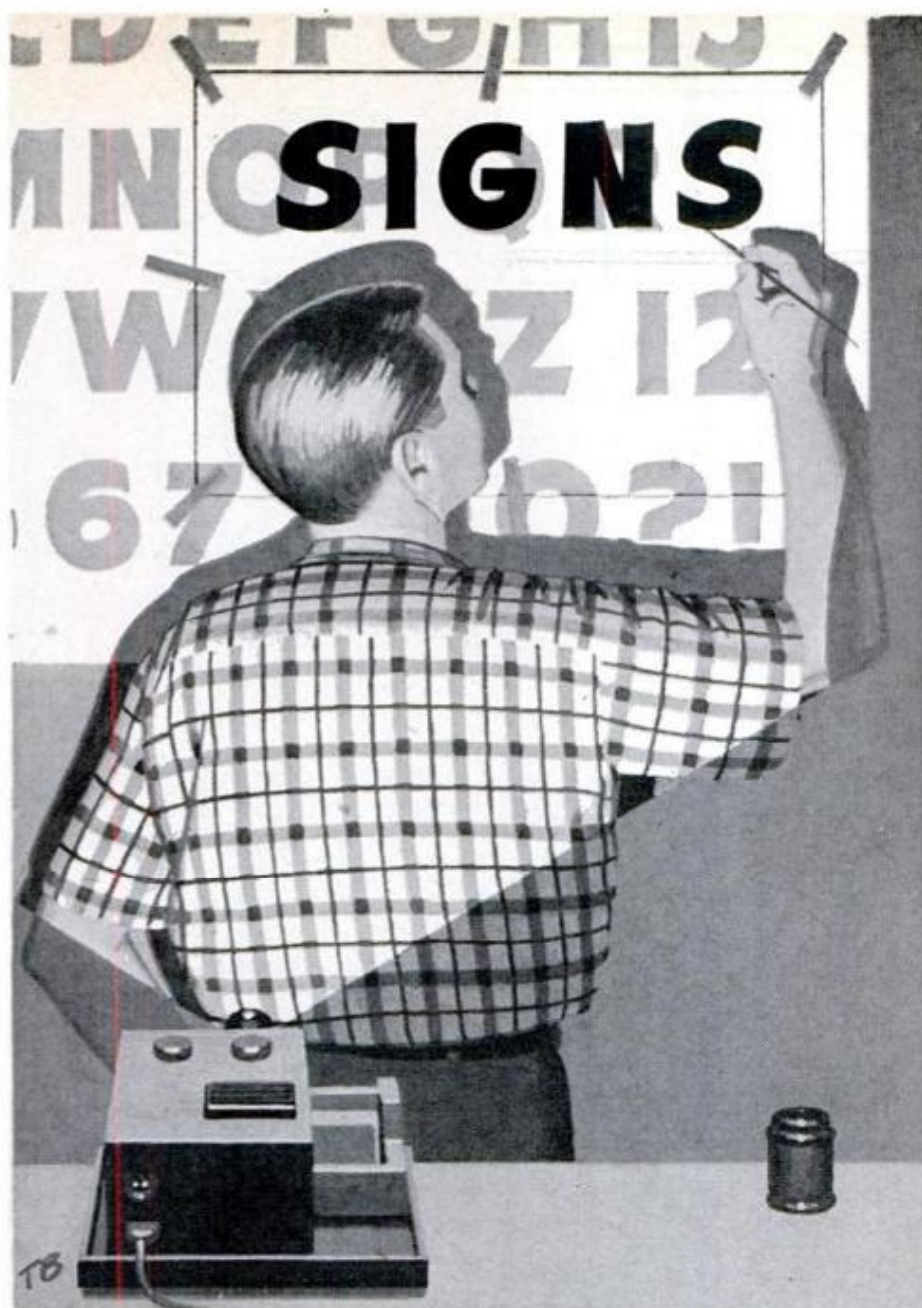
ICE CREAM SOCIAL



PROGRAMS
PROGRAMS
& PROGRAMS
PROGRAMS

ART exhibit

PROGRAMS
PROGRAMS
& PROGRAMS
PROGRAMS



By David M. Swartwout

LETTERING signs and posters requires a great deal more artistic talent than the average person has at his command. Each letter must be sketched in the right size to fit the poster and spaced the proper distance from those on either side of it; when the same letter appears a number of times each must be exactly like the others.

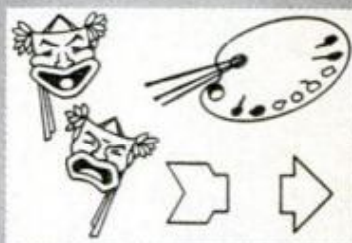
If you've attempted poster lettering and been discouraged with the results, try *PM's* foolproof method of turning out professional looking signs and posters by using Project-a-Plan alphabets.

Introduced in the December, 1962 issue, the Project-a-Plan technique is ideally suited to lettering. The three alphabets and 11 poster illustrations included here may be enough for your purposes. For additional alphabets, simply purchase sheets of lettering at an art store and photograph them to make 35-mm. slides. You can do the same thing with simple line drawings which might be

TRANSPARENCIES at right fit a standard 35-mm slide mount. If your projector isn't air-cooled, it's best to insert the paper transparencies between glass when you are mounting them



**ABCDEFGHIJ
KLMNOPQRS
TUVWXYZ I2
34567890?!'**

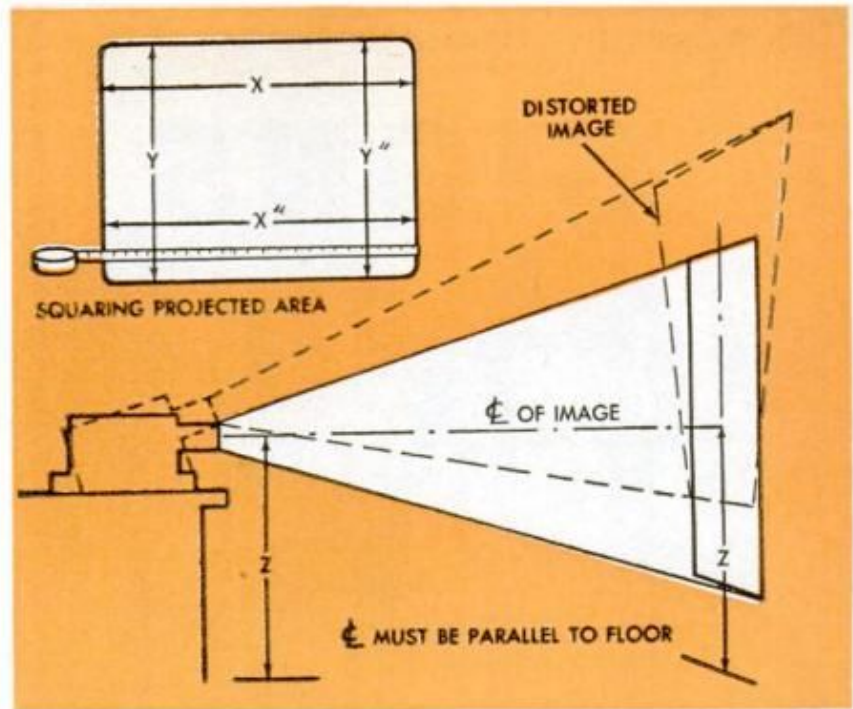


**ABCDEFGHIJKLMN
OPQRSTUVWXYZ &
S 1234567890c
abcdefghijklmnopq
rstuvwxyz.,.:;!?'''**



**ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklmnop
qrstuvwxyz3...?!-'"
1234567890\$%&**

SEE REVERSE



SIDE OF PAGE

FOR CLIP-OUT



COAT BOTH SIDES of paper with either clear nail polish or shellac

PROJECT-A-PLAN



INSERT coated paper transparency in a standard 35-mm slide mount

suitable for illustrating your signs or posters.

It is important that you set up your projector so that the line of projection is exactly perpendicular to the sign or poster being made. Otherwise, the projected image of the letter will be distorted. To check, compare the measurements referred to in the drawing above; those having the same letter designation should be equal. After deciding what size the letters should be and marking in light horizontal guide lines, tape the poster or sign cardboard to the wall in the proper position to sketch the first letter. For each succeeding letter, you simply shift the poster, align it with the row of projected letters and trace. ★ ★ ★

TRANSPARENCIES

EQUAL DISTANCE BETWEEN LETTERS

SOCIAL TONIGHT

POOR SPACING

BALANCED AREA BETWEEN LETTERS

SOCIAL TONIGHT

GOOD SPACING

POPULAR MECHANICS

Lawn-Sweeper Screen

On breezy days, the wind blew the leaves out of my lawn sweeper almost as fast as they collected in the catcher. I put an end to this by fitting the sweeper with a retractable wind screen. I used a plastic window shade having a draw bar long enough to act as a catch when the screen is pulled up over the handle. When the screen is retracted the draw bar serves as a stop. For mounting, standard window-shade roller brackets were used. To keep the screen from popping out accidentally, I bought two pairs of brackets and discarded the two slotted ones. The hole in one bracket had to be enlarged to accept the roller's rectangular peg. Small bolts and wing nuts fastened to the frame of the sweeper hold the mounting brackets in place.—*D. H. Culbertson*

Nylon fishing leaders often develop stubborn kinks. They may be straightened easily by drawing them through a piece of rubber.—*Harry J. Miller*

Homemade Marking Gauge

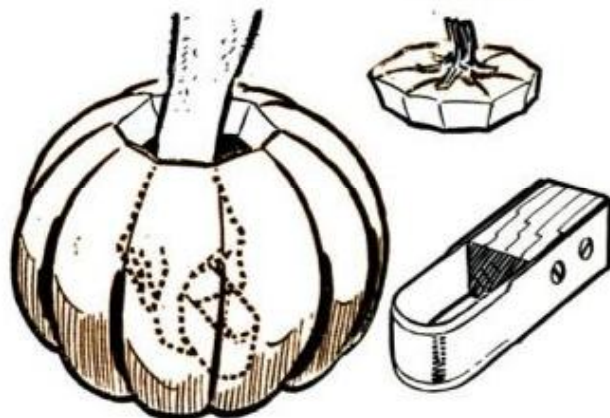
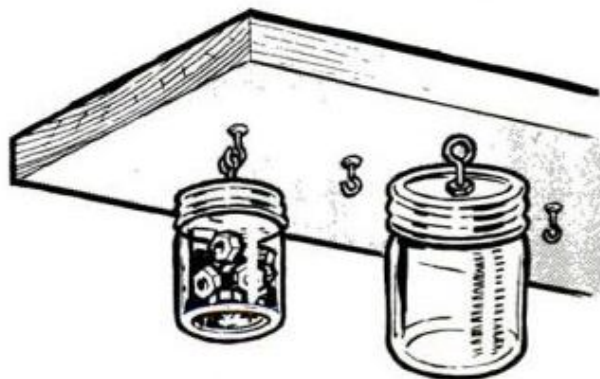
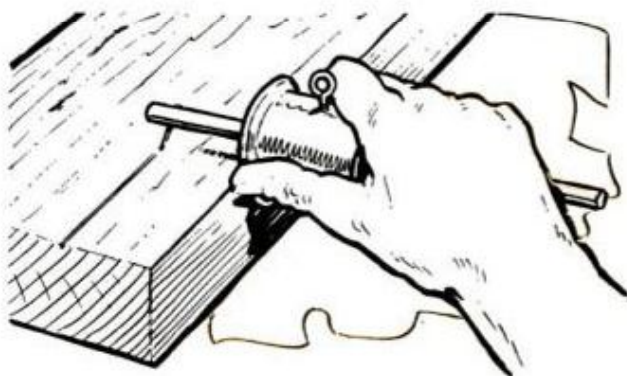
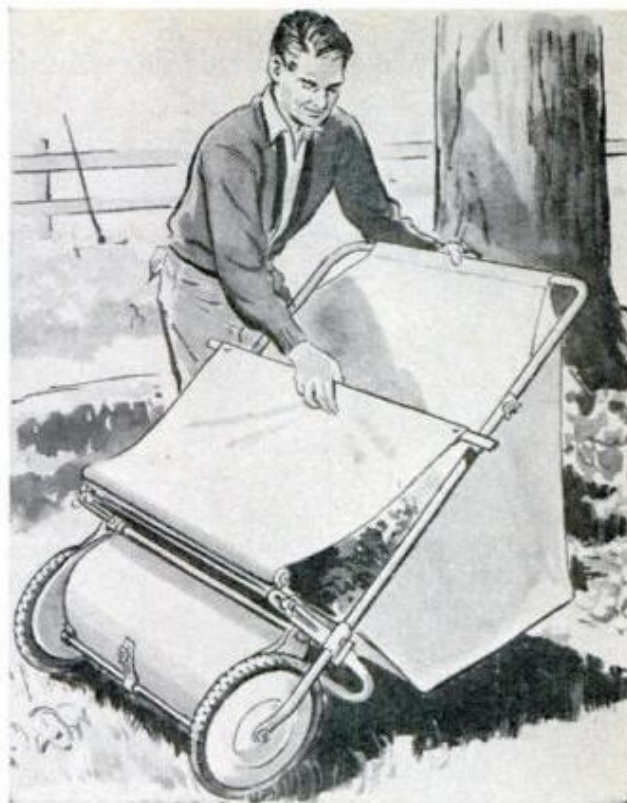
Having only occasional use for a marking gauge I decided to improvise one from a spool, dowel, brad and eye bolt. I bored a hole in the spool to meet the center hole and turned the eye bolt in it to serve as a thumbscrew to lock the dowel at the desired setting. The brad was used as the marking point.—*A. Zawistowski*

Saving Shelf Space

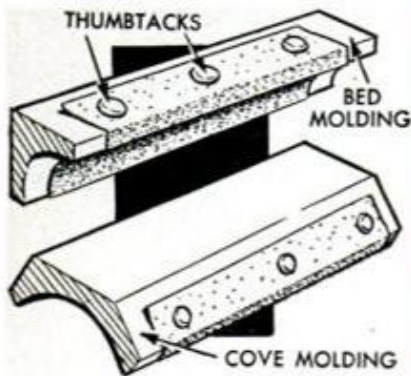
I was rapidly running out of shelf space in my workshop when I hit on the idea of putting the underside of the shelves to use. I installed cup hooks on the bottom side of each shelf and ran small eye bolts through the lids of a few jars. Now what was once perched on the shelves hangs from the underside giving me a whole extra shelf.—*Stephen Stresnic*

Scraper Better Than Spoon

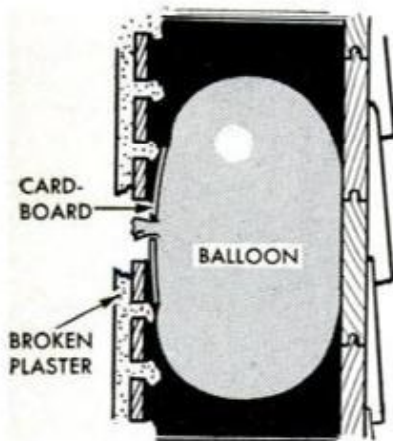
If you have ever scooped out a pumpkin to make a jack-o'-lantern, you know what a messy job it is. Cutting free the stringy insides is a slow job with a spoon mainly because the spoon is too long. I solved the problem by making a hand-size scraper from a piece of spring bronze bent U-shape and fastened to a wood block. Now I can scrape the inside of the pumpkin clean in a matter of seconds.—*Tom McCanna*



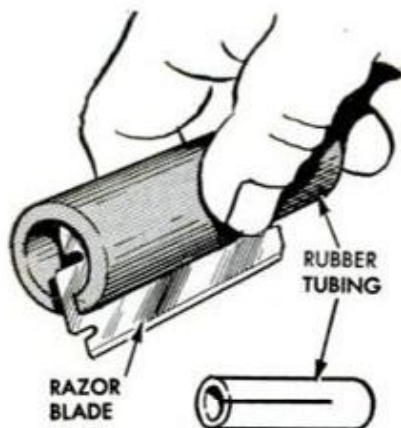
TAKE A HINT FROM READERS



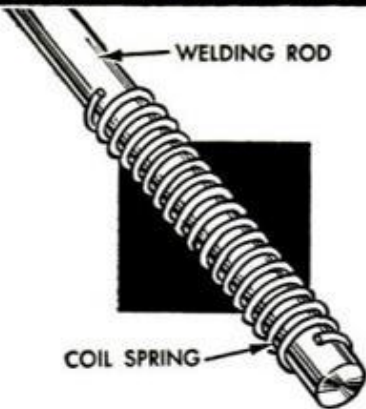
SANDING BLOCK for smoothing round edges may be made from a piece of cove or bed molding of a width that matches the work. Either glue or thumbtacks holds the sandpaper



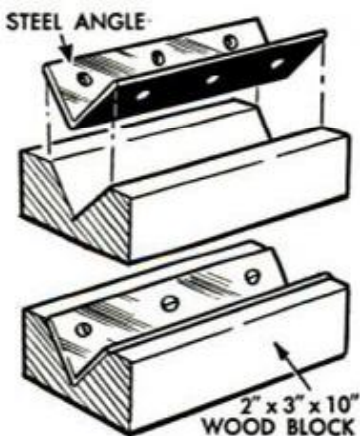
TOY BALLOON can be used to press a square of cardboard against the lath when making a plaster patch. Poke balloon through the cardboard and inflate after stuffing both in hole



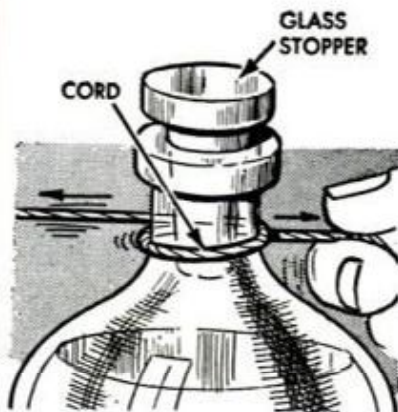
NO MORE nicked fingers if you make this holder for a double-edge razor blade. Slit a short piece of tubing and insert the blade. The blade will stay put when you squeeze the tubing



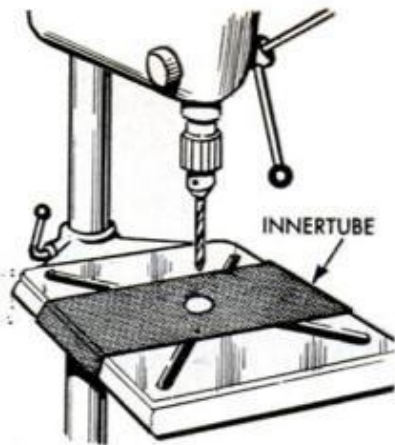
ABSENT-MINDEDLY picking up a welding rod by the hot end won't happen if you slip a coil spring over the cool end of the rod to serve as a reminder. Paint spring red for warning



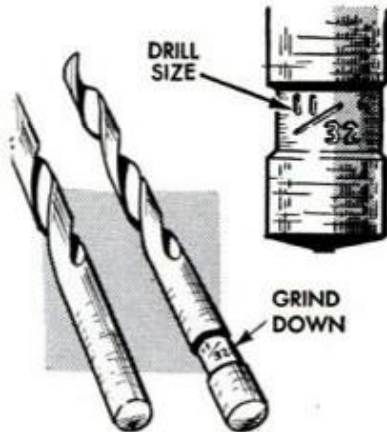
DRILLING HOLES in round stock calls for a V-block. This one is made by making right angle cuts down the center of a hardwood block. Angle iron screwed to block provides true surface



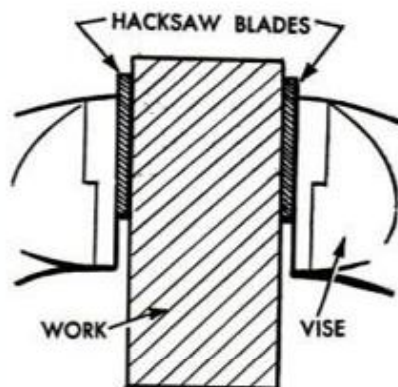
CHEMICAL BOTTLES with glass stoppers sometimes are hard to open. The solution is to expand the neck of the bottle with the heat generated by a string that is pulled rapidly back and forth



A NON-SLIP surface for your drill-press table can be made from an old inner tube. Stretch the tube over the table and cut a hole in it over the center hole in the table for the drill to pass



TWIST DRILLS often slip in a chuck and the numerals marking their size become illegible. A permanent marking can be made by machining a groove in the drill shank and stamping



FILING FLAT surfaces on small parts can be done accurately if discarded hacksaw blades are clamped along the layout lines. The part is then filed down to the blades which limit the cut



New on the Market

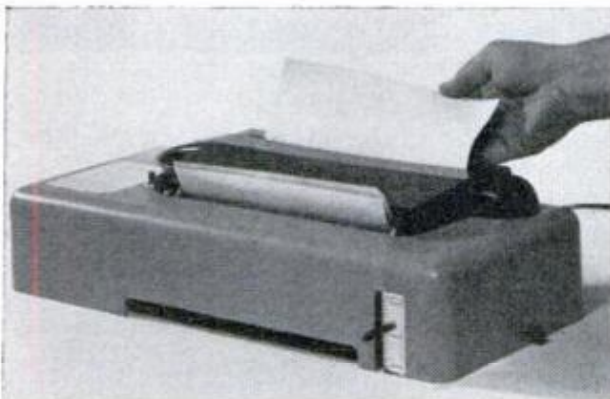
FAST WAX, a new paste wax for cars, lived up to its name when tried by PM editors. Applied with a damp cloth, it goes on with surprising ease, buffs to a high shine with little effort, leaves no overlap marks. 9-oz. can costs \$2 at garages and auto supply dealers. MALCO, 31 E. Lods St., Akron 4, Ohio



RADIANT HEATING PANEL fits into suspended-grid ceilings on the 2x4-ft. module in workshops, small factories, motels. Heating element is Pyrex-type glass. Made by Corning Glass Works, Corning, N.Y. for 120, 208 and 240-volt current. Sold only by authorized electrical dealers on installed-cost basis



LESS CHANCE OF SPILLING the paint when you hold it on your extension ladder with this gadget. Unlike a hook, it *nects* the can, lets the handle fall to one side, out of the way. Spring brackets hold spare brushes over paint to catch drips. Costs \$4.50 for 1- or 2-gal. size. Rendle, Box 2811, Phoenix, Ariz.



MAGIC TOUCH PHOTOCOPIER is the lowest cost unit of its type we've seen. Although it takes a bit more practice than higher priced models before you get consistently good results, the \$39.95 price tag makes it a good investment for small offices, clubs, etc. Magic Touch Assoc., 30 West 36 St., N.Y. 18, N.Y.



PLASTIC DOME goes over a window well to keep out leaves, trash, rain and snow while admitting daylight. Also cuts heat loss. Made of 3/16-in. Plexiglas, both clear and translucent, in many sizes. Basic model costs about \$20. Write to Greenlawn Div. of Gates Rubber Co., 1055 S. B'way, Denver 9, Col.

Trick or Treat COSTUMES

Six Scarey Outfits to Wear on Hallowe'en



Designed by Elma and Willard Waltner

WHEN THIS WITCH takes off her hat, the cat riding on top of her head lets out an angry wail. Though the effect is startling, the explanation is simple. A noisemaker that howls when turned over is glued into the top of the hat. When the witch removes her hat she tips it point downward and the cat "howls."

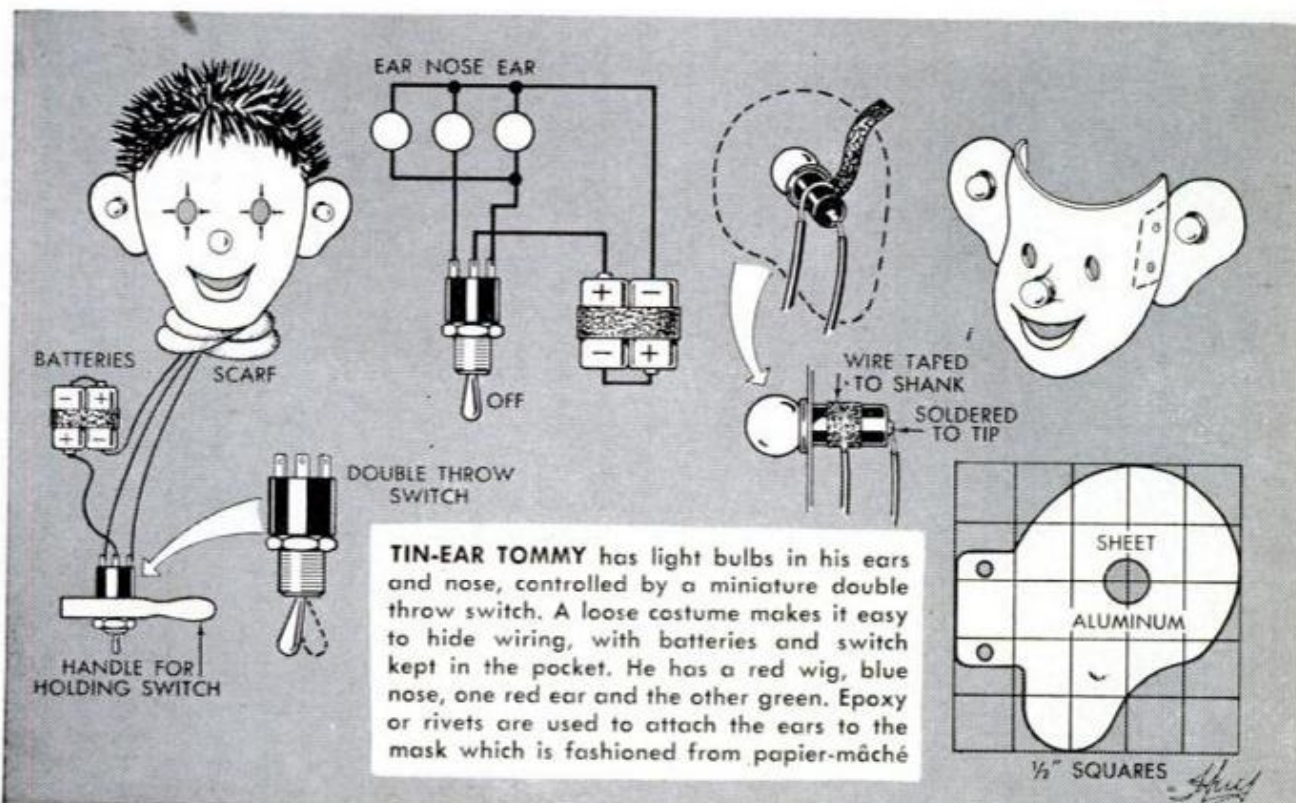
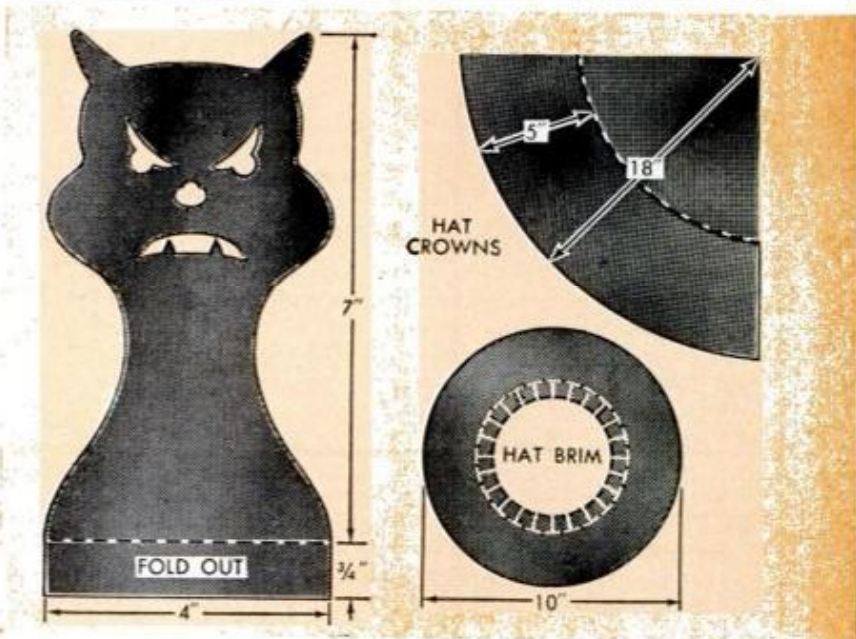
Make the hat of black posterboard, using a 90-deg. section of an 18-in. radius circle. The edges are lapped together to fit the wearer and then glued. The inner crown is an easy fit inside the hat and is made from a 5-in.-wide segment of posterboard. The platform on which the cat sits is a

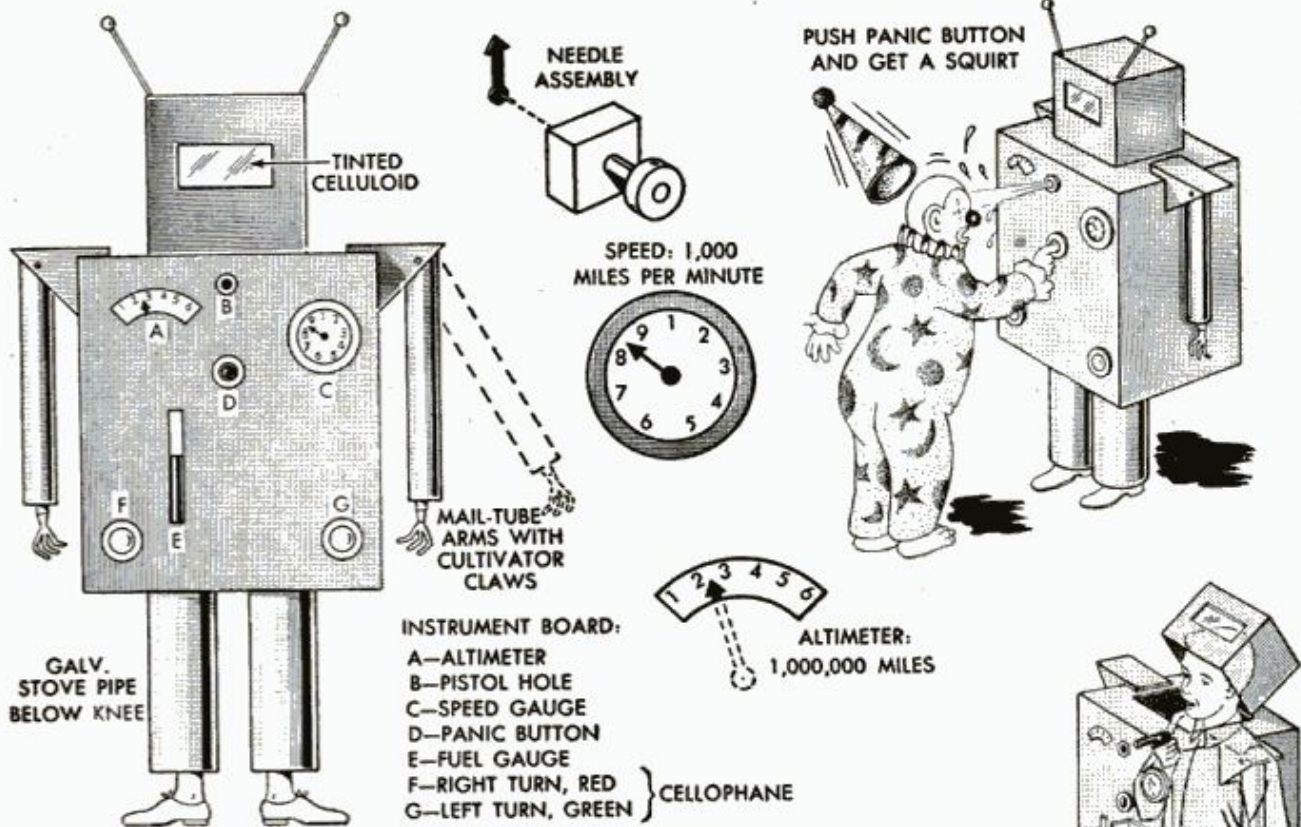
cardboard circle glued inside the inner crown about 2 in. below the top edge. Two matching pieces of posterboard are cut to form the cat. Special care is needed when cutting the eye, nose and mouth openings to make sure that the cutouts will align properly. After folding out the base as shown in the drawing, the two "cats" are glued together with a piece of white paper sandwiched between them to make the features stand out. Then the base tabs of the cat are glued to the platform inside the inner hat crown.

Two pieces of cloth, 2 x 18 in. stapled inside the bottom edge of the inner crown,



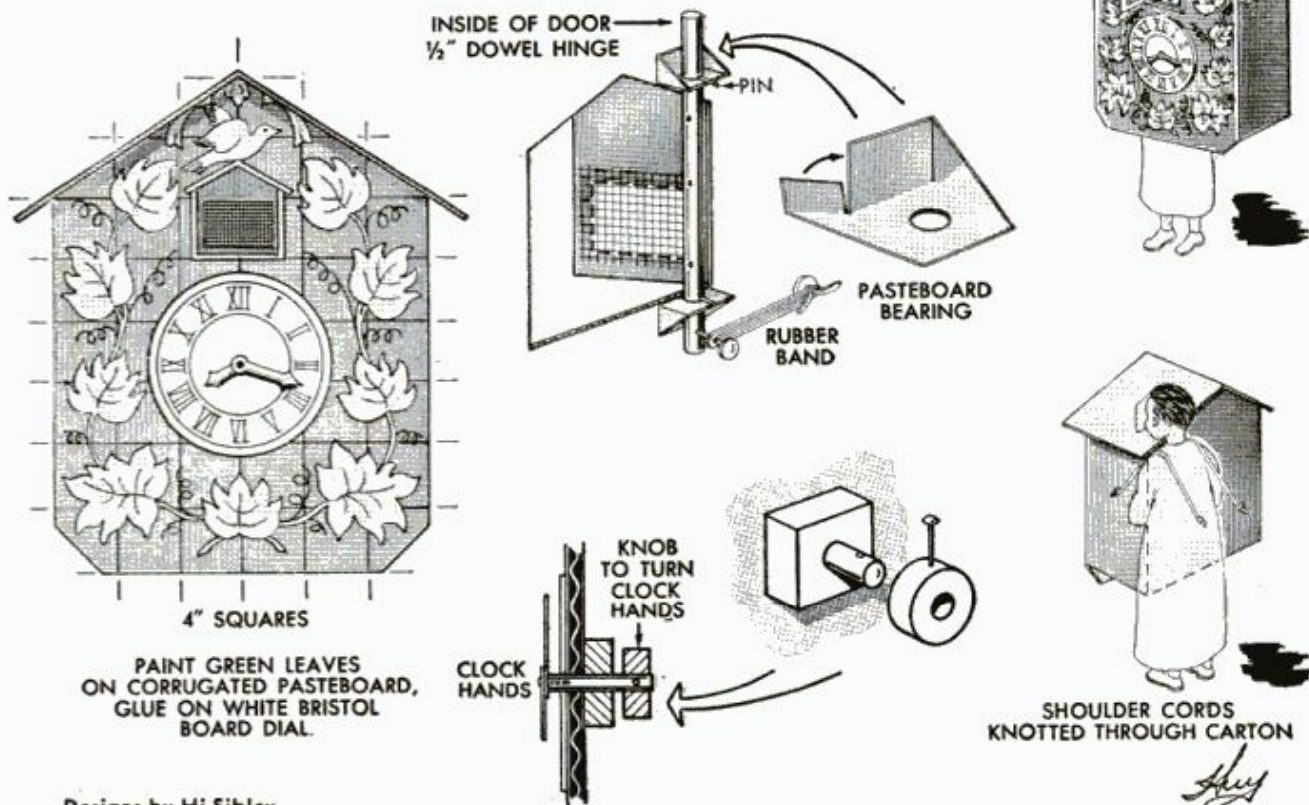
allow the wearer to tie the hat on. The hat brim is a 10-in. circle of posterboard with the inner opening cut to fit the hat. After bending up the tabs, glue them to the outside of the hat and cover them with a band of orange paper. Decorate the hat with cutouts and glue in the noisemaker. Make sure



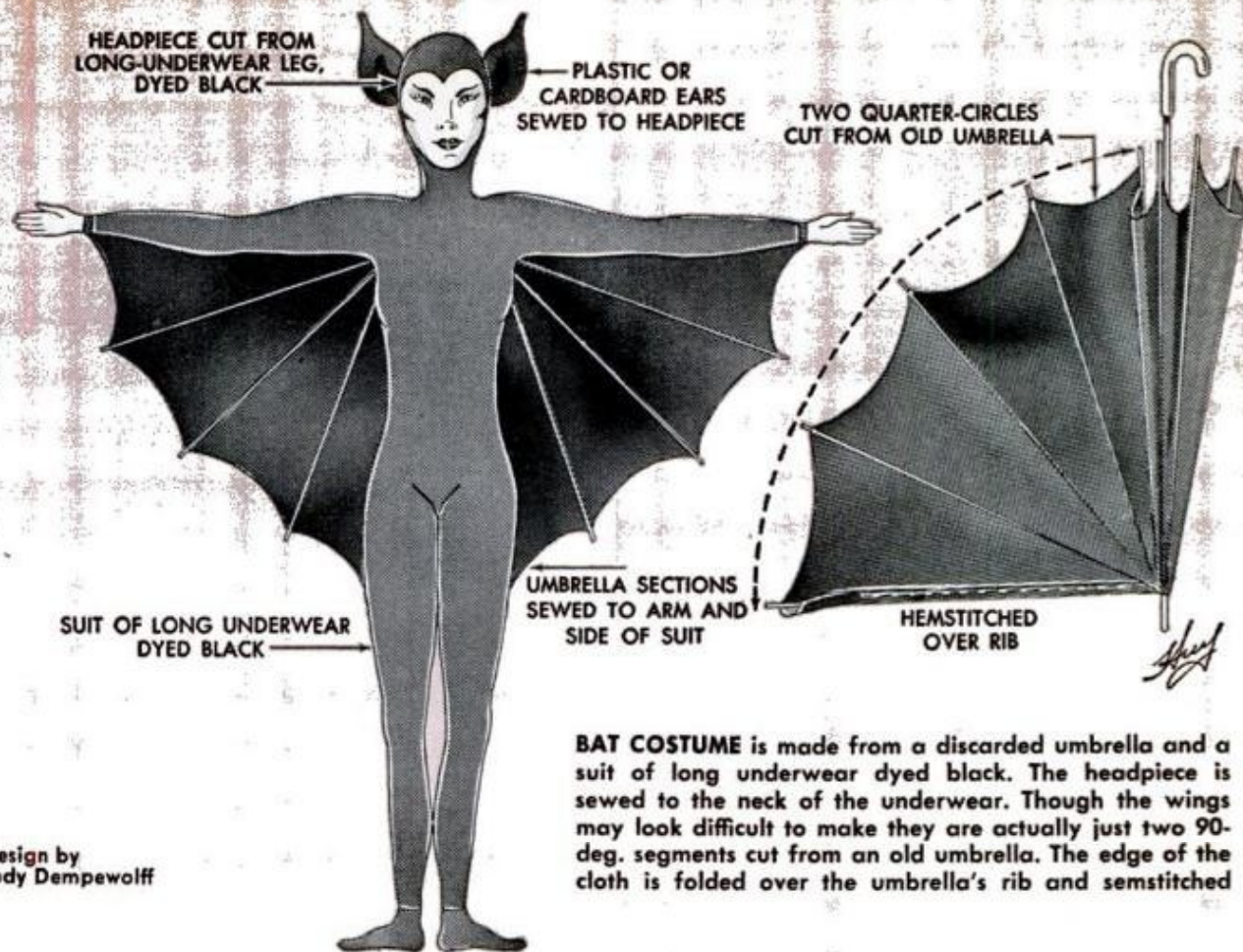


MISTER MARS is made from cartons painted aluminum. His water pistol squirts anyone who dares to push the panic button. When not in use, the pistol and flashlight that illuminates the turn signals are kept on a small shelf

CUCKOO CLOCK made from carton hangs on shoulders so that hands are free to manipulate cuckoo door and turn the clock hands. The door has a gauze or celluloid window and is retained in a closed position by a rubber band

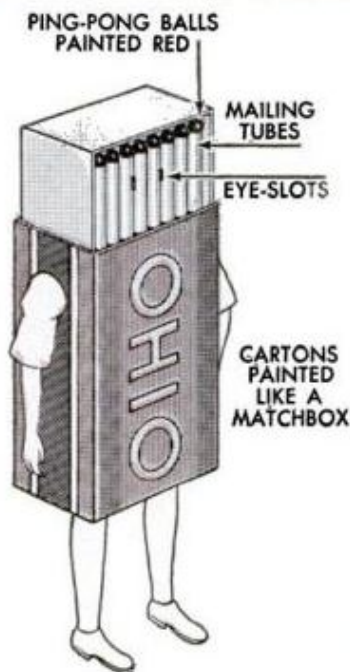


Designs by Hi Sibley



Design by
Judy Dempewolff

BAT COSTUME is made from a discarded umbrella and a suit of long underwear dyed black. The headpiece is sewed to the neck of the underwear. Though the wings may look difficult to make they are actually just two 90-deg. segments cut from an old umbrella. The edge of the cloth is folded over the umbrella's rib and semstitched



WALKING MATCHBOX is constructed from corrugated cartons painted in bright poster colors. Matches are made from mailer tubes or rolled drawing paper. Cutouts are made from the arms and two slots are cut in the matches to allow visibility

The Trick-or-Treat Tradition

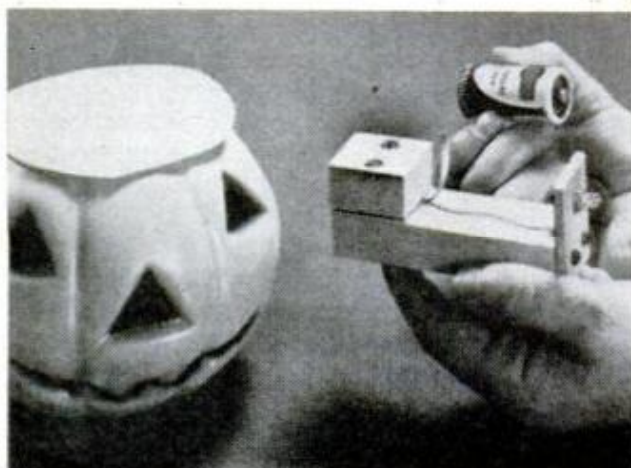
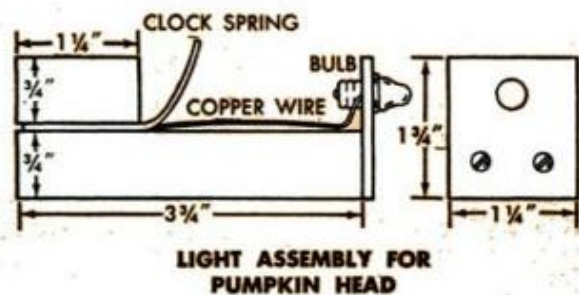
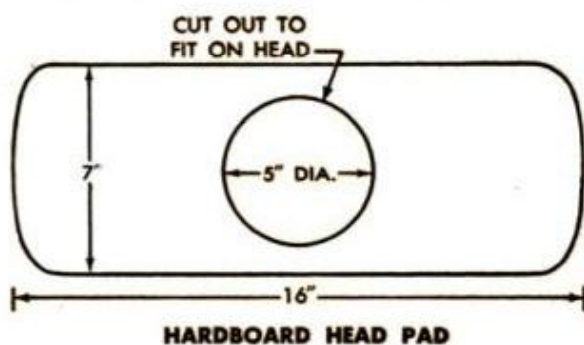
As a Christian festival, Hallowe'en goes all the way back to the 8th Century, when a Pope set Nov. 1 as All Saints' Day. How, then, did it ever become associated with ghosts and witches—and mischief? The macabre aspects are much older, stemming from ancient Druid rites in Ireland. The Celtic year ended Oct. 31, regarded as the end of summer. Spirits of the dead called at the homes of their living relatives, that night, to warm themselves against approaching winter. During the Middle Ages, pagan superstition merged with the date's sacred significance, and it was believed that witches held revels in defiance of the holy day to come.

On that same night, however, the more intrepid Irish peasants ventured from door to door to collect supplies for the Allhallows feast. Blessings were promised generous donors, but miserly ones were cursed. This custom became corrupted, later, when the village girls and boys took to switching clothes and donning masks to pester their neighbors.

To this day, in Latin countries Hallowe'en is strictly a religious holiday. So how come only the goblins and vandalism reached the U.S.? Blame *that* on the Irish, too. Hallowe'en was scarcely celebrated at all, here, until the late 1800's—soon after the great Irish migration.



Designed by Elma and Willard Waltner



that it will cry when the hat is tipped.

A large shirt is the basis of the headless-horsemann costume. A hardboard head pad that fits inside the shoulders of the shirt accounts for the headless appearance. The board is sewed into a bag of light-colored material. The bag should be loose fitting so that the cloth will "give" enough to allow the cutout opening to fit the head. Old nylon stockings stuffed with crumpled newspapers are used for the arms which may be either sewed or pinned to the head pad. A pair of gloves slipped over the stuffed feet of the stockings and sewed in place serves as the horseman's hands. After completing these steps slip the head pad into the shirt and insert the stockings in the sleeves. Bend the arms at the elbows and pin them to the front of the shirt.

The horseman carries a plastic jack-o'-lantern fitted with a light to make it glow. The light assembly is made from two pieces of 3/4-in. stock. The piece into which the bulb fits is 1/8-in. hardboard. It is necessary to make the bulb hole a tight fit so that the bulb must be "screwed" in place. If the hole is too large, the clock spring, which maintains contact between the bulb and the battery, will push the bulb out.

Twist a fine copper wire around the base of the bulb and place the clock spring on top of the wire. Then attach the small wood block with screws to clamp the spring and wire together. When the battery is installed the bulb will light. The assembly is placed inside the pumpkin which is sewed to the shirt. ★★★



Shopping for Tools

HOBBY SPRAY GUN is said to work with any liquid, can be powered by an air compressor, an ordinary vacuum cleaner or even your lungs. Ideal for small jobs like finishing model planes, touching up cars. Available for \$3.95 at hobby shops, or \$4.45 prepaid from Auto World, P.O. Box 961, Scranton, Pa.

MY-T-MITE MECHANIC'S BAG holds large number of tools of varied sizes, keeps them handy and visible at all times. Made of heavy duck fabric with molded rubber bottom. Sold by Can-Pro Corp., 19 E. McWilliams St., Fond Du Lac, Wis. Costs \$19.50, F.O.B.

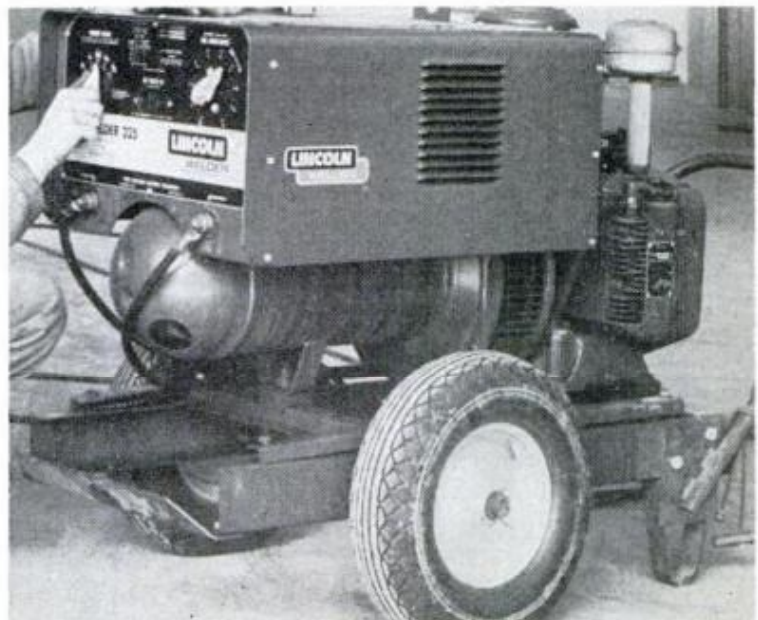
BOATING ENTHUSIASTS will like the Wonder Roller, which is said to speed application of fiberglass mat, roving or cloth to any flat or curved surface. Its grooves help eliminate bumpy air pockets. Costs \$6.95 postpaid, from A.F.C., Box 272, Mentone, Indiana

GASOLINE-POWERED DRILL is said to drive a 1-in. bit through a fir 4 x 4 in 20 seconds. Available in two models—1360 r.p.m. with $\frac{3}{8}$ -in. chuck and 620 r.p.m. with $\frac{1}{2}$ -in. chuck. Price is \$99.95. Orion Mfg. Co., 14873 E. Firestone Blvd., La Mirada, Calif.



QUICK-DRAW HOLSTER hooks over your belt on waistband, or can be threaded on the ties of a nail apron, to keep a hammer within easy reach. Can be obtained at your lumber dealer, or send 50¢ to Weyerhaeuser Co., Box 196, Tacoma 1, Wash.

LINCWELDER 225 is a compact generator unit that is especially suited for at-site maintenance. Supplies 225-amp. d.c. current for welding and 115-volt a.c. power for running electric drills, saws, grinders. Has a 15.7-hp., 2-cylinder 3000-r.p.m. engine. Price ranges from \$580 to \$595, F.O.B. Cleveland, depending on shipping zone. Lincoln Electric, 22801 St. Clair, Cleveland, O.





ROOF DORMERS PUT LAZY

Following up our wall-framing basics in last month's issue, PM now presents the facts you'll need for styling and installing a dormer to perk up your home's roof line

GOT A YEN to raise the roof? There's no more practical way than adding a dormer—and it's the easiest means of increasing usable floor space. Even a single-sash dormer adds a lot of headroom.

If properly proportioned for the existing roof, dormers can greatly improve the appearance of your home, as the sketch above demonstrates. Even if not creating rooms, they can bring light and air into that musty attic storage space.

One of the four types sketched at the far right should meet your needs. To help you decide on the style and size, try scaling these designs on tracing paper so you can position them over a sketch or photograph of your house. Choose the dormer that best complements the structural style and proportions. Then turn the page to study the framing principles of the different designs to determine whether the job's within the scope of your abilities. (No dimensions are given since these depend on area and pitch of the existing roof.)

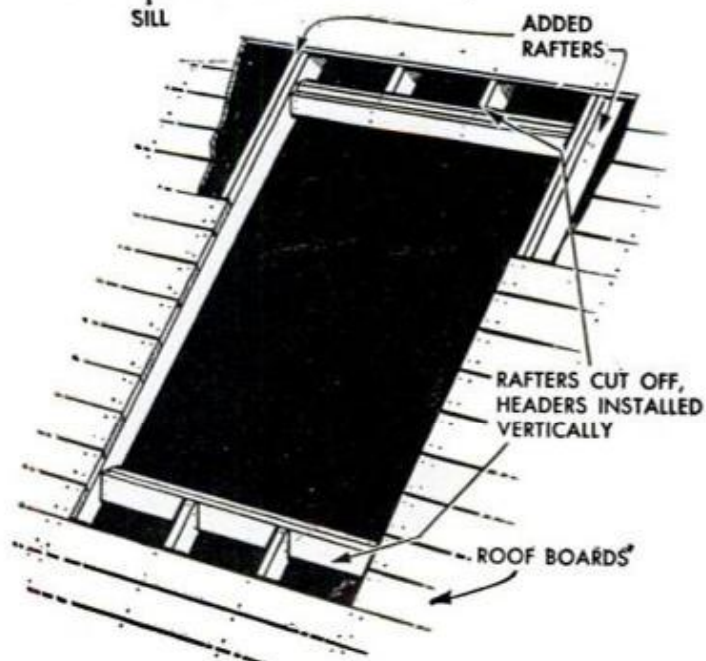
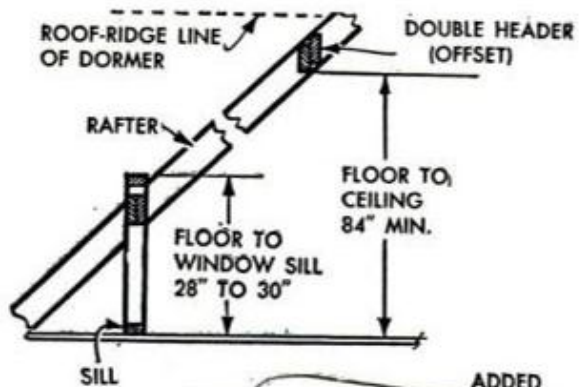
If you tackle the job alone, remember it won't be a one-day project. Before you

chop a hole in your roof, be sure you have a tent or tarp on hand that's big enough to cover the opening in case of rain. Just tack a plank or two across the hole before spreading the tarp, then anchor its edges with sandbags.

As with cutting new openings in walls (covered in September's *PM*), some re-framing is necessary to help remaining structural members carry the extra load. First, lay out the dormer location carefully and pry up the shingles within that area and about a foot beyond on all sides. Trim back the roofing paper to within a few inches of the shingle line. Before doing any cutting, double the rafters that will frame the opening, cutting the new rafters so they'll extend at least 3 or 4 ft. beyond the top and bottom of the hole. Then saw the roof boards along the inside of these doubled rafters, and across the top and bottom of the marked-out opening. The trimmed boards above and below will support the cut rafters until you can fasten in the double headers (using 20-penny nails), as shown in the sketch at the right. Note



ATTICS TO WORK



OCTOBER 1963



GABLE DORMER
SET BACK ON ROOF



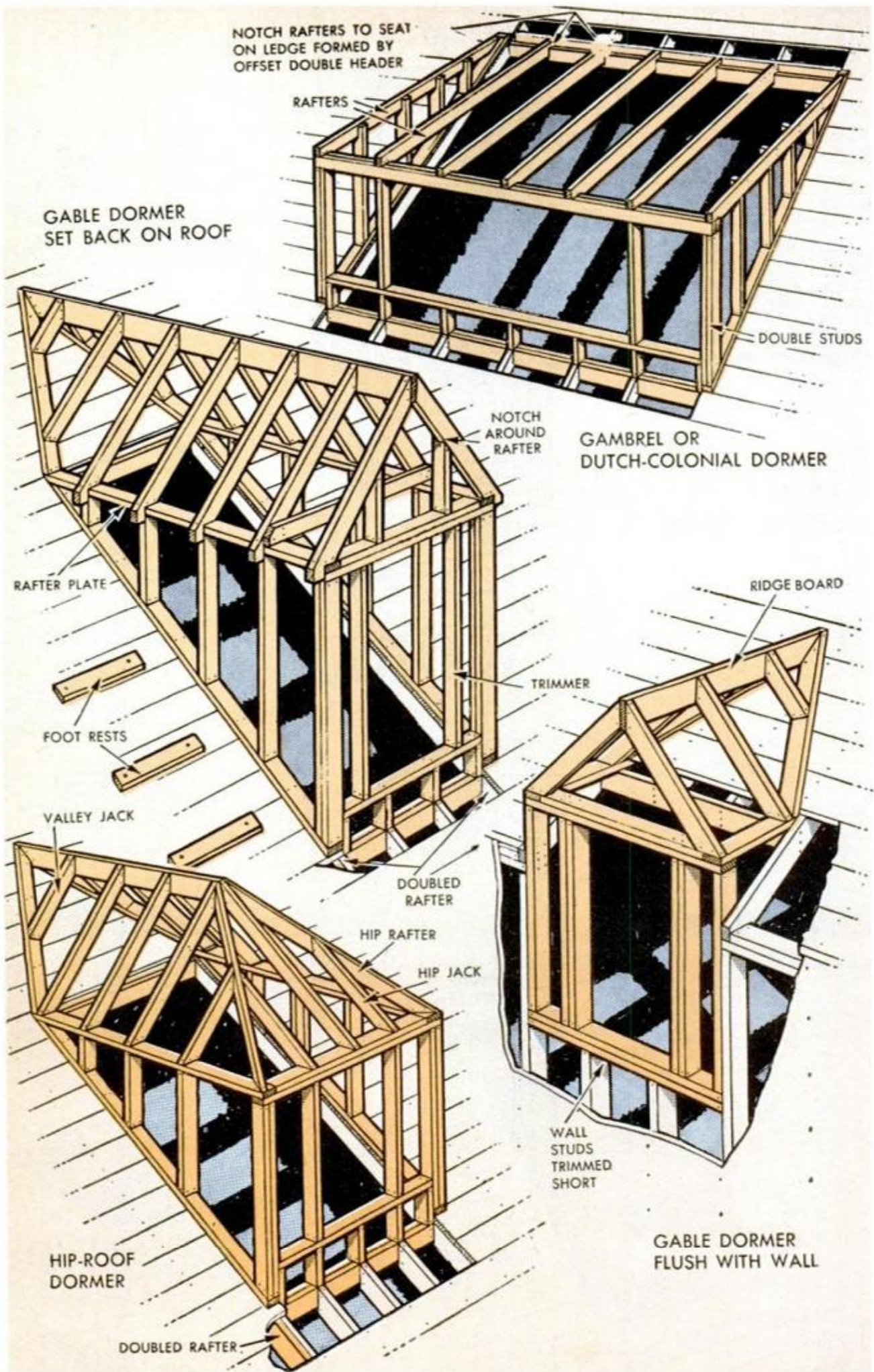
GABLE DORMER
FLUSH WITH WALL



HIP-ROOF
DORMER



GAMBREL OR
DUTCH-COLONIAL DORMER





NEW LOW-COST CdS EXPOSURE METER performed very well in PM tests, proved accurate over wide range of conditions, from very low light to bright sunlight. Scales read from 1/2000 to 30 sec., ASA 10 to 6400. Costs \$9.95 plus \$1 for case. Accura Ltd., 708 Byron Ave., Franklin Sq., Long Island, N.Y.

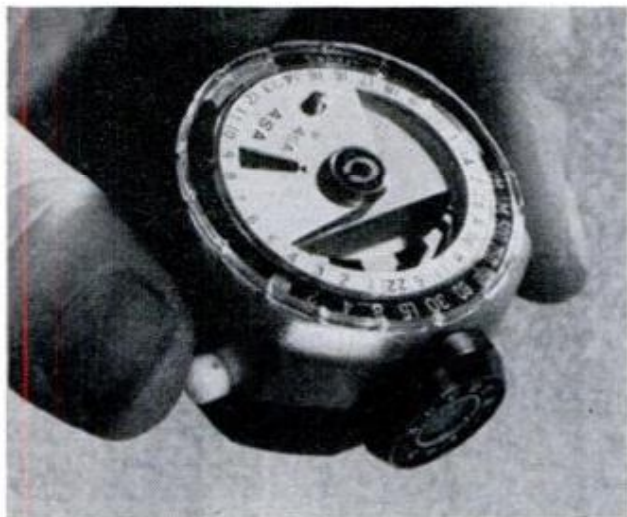


FOTO-TROL UNITS allow the photographer to vary the brightness of his photofloods or quartz lights, thus prolonging lamp life and reducing heat on the subject. Made in 500, 1000, 1500 and 3000-watt power capacities. The 3000-watt size weighs under 4 lbs. Davis Electronic, 4711 E. 5 St., Austin, Tex.



OCTOBER 1963

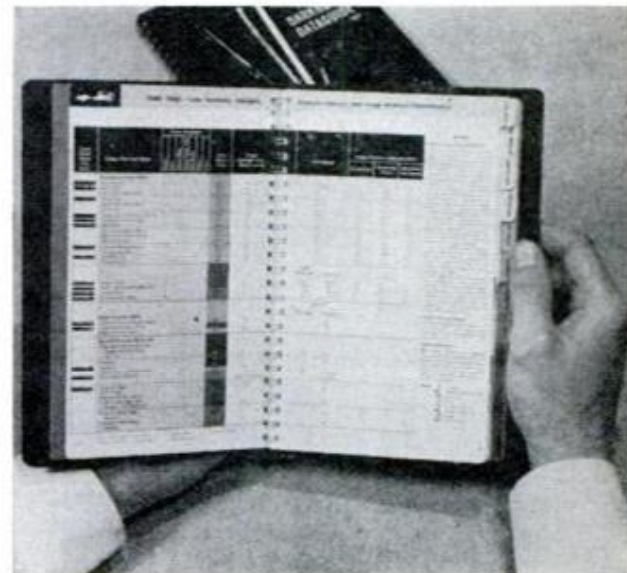
By Arthur J. Maher

PLASTIC UNDERWATER HOUSING for Miranda 35-mm single-lens reflex cameras is said to be the first of its type ever mass produced. It's been tested by manufacturer at depths up to 100 ft. All controls except shutter speed adjust from outside. Costs \$64.95. Interstate Photo Supply, 300 Park Ave. S., N.Y., N.Y.

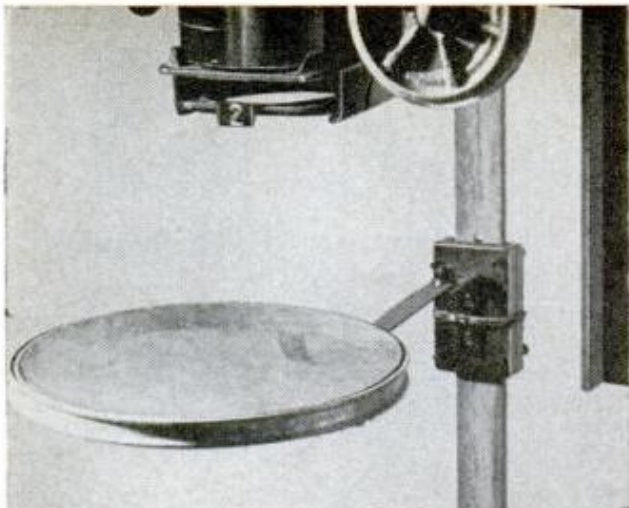
SHOOTING MOVIES is as easy as taking snapshots with the No. 18/28 8-mm camera. Has battery drive (no winding), electric eye (no shutter setting) and a fixed-focus lens (no focusing). You just point and shoot. Under \$50. Optional remote control is \$5. Vernon Audio, 144 E. Kingsbridge Rd., Mt. Vernon, N.Y.



DARKROOM HANDBOOK (No. R-20) contains the latest data on a wide variety of Kodak black-and-white materials—films, chemicals, enlarging papers. Includes a developing computer and 11 sample prints on various paper surfaces. Printed on water-resistant stock. Price: \$2.25. Eastman Kodak, Rochester, N.Y.

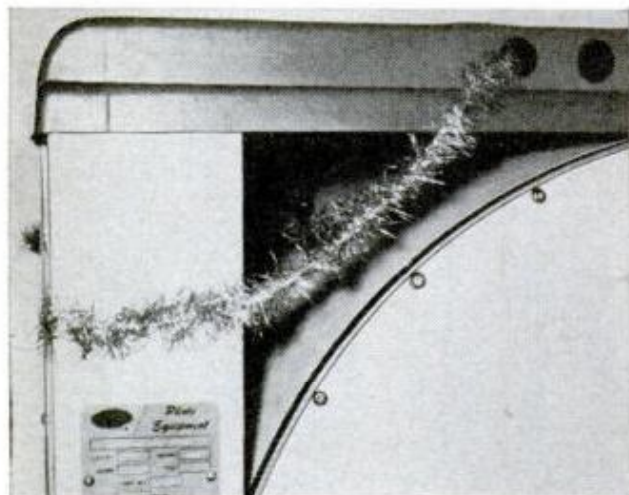


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Look—No Hands

A diffuser made from a nylon stocking mounted on an embroidery hoop can greatly improve enlargements of portrait negatives. The hoop is attached to a section of discarded hacksaw blade, which in turn is fastened to a vertical standard bolted to the enlarger bench. A light tap on the hoop before exposure keeps the diffuser in motion during the exposure and frees the hands for dodging or other print control.—Chet Chatman



Tinsel Removes Static Charge

Static electricity is a big problem for the photographer who uses a drum-type print dryer. The charge is generated by the rotary motion of the drum and the result is that prints are hard to remove after they are dry. An easy solution is to fasten a piece of Christmas tree tinsel to the dryer so that it hangs across the drum. The tinsel is attached by simply tying each end to opposite sides of the dryer frame. Though the tinsel does not contact the drum it will remove about 75 percent of the static electric charge.



View Proofs by Transmitted Light

Many photographers make contact prints of their negatives by gang printing an entire roll of film on a sheet of 8 x 10 paper. They then examine the proof sheet with a magnifying glass to select negatives for enlargement. The difficulty in this procedure is to see the proofs clearly, as the magnifier tends to shade the picture. Though illuminated magnifiers are available, a better method is to view the proofs by transmitted light. This may be done with a light box. The advantage is that tones in the darker areas of the print may be studied.



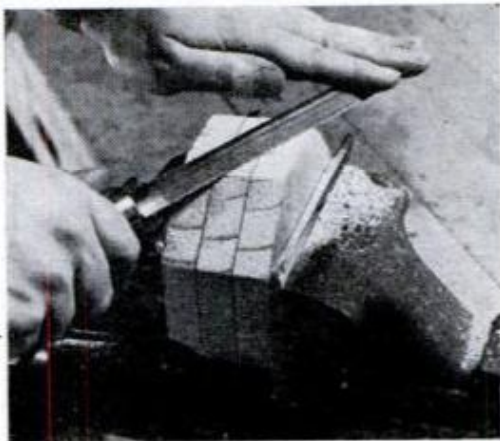
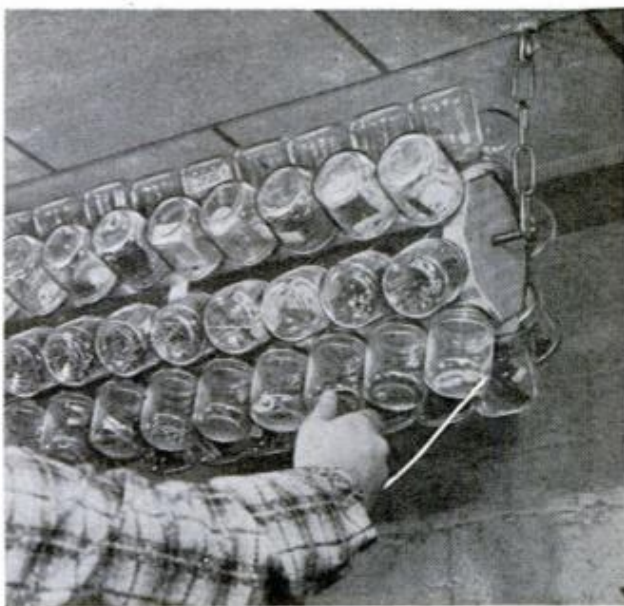
Angles Prevent Disaster

Well known to any photographer who has processed 4 x 5 sheet film is that dreadful feeling when the hangers slip to one side of the rack during agitation. Then when the rack is re-submerged there are disastrous results. Hangers fall to the bottom, negatives are gouged and you feel like junking the whole mess. You can prevent such darkroom tragedies by spot-welding stainless-steel angles to opposite sides of the rack. The angles will keep the hangers from sliding sideways and slipping off the rack during agitation.

Lazy-Susan Hardware Rack

HUNG FROM THE CEILING over your workbench this 80-jar revolving rack will keep track of every screw, nut and bolt—all within easy reach. Essentially, it's an octagonal frame to which are fastened the lids of baby-food jars. The glass jars let you see at a glance, and a half twist lets you remove them from the rack.

As shown in the drawing, the frame is made from three octagons cut from $\frac{3}{4}$ -in. pine, and eight 24-in. lengths of $\frac{1}{2}$ x $\frac{3}{4}$ -in. stock molding, called parting stop, all assembled with 1-in. No. 6 F.H. screws. The axle is a $\frac{3}{8}$ x 28-in. brass curtain rod drilled at each end for a cotter pin. It rides in $\frac{7}{16}$ -in. center holes and is suspended from two lengths of fixture chain which, in turn, are held by screw eyes anchored into the ceiling joists.—J. Canine



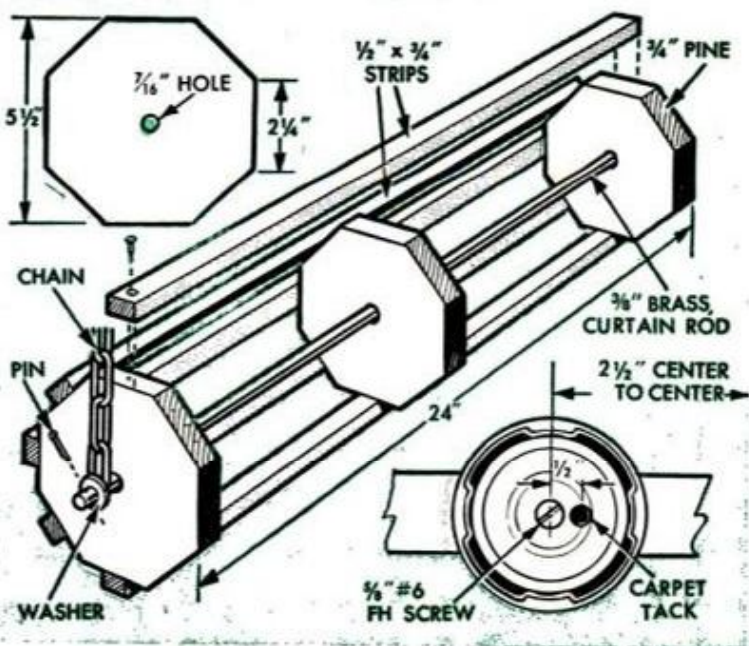
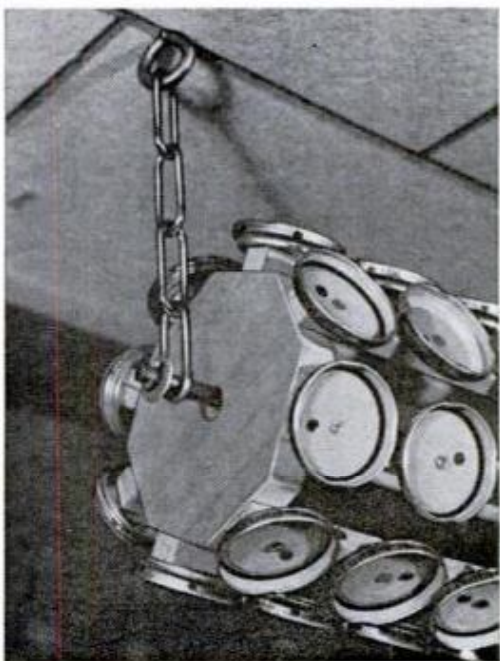
CLAMP OCTAGONAL PIECES together and finish with a rasp, to assure uniformity

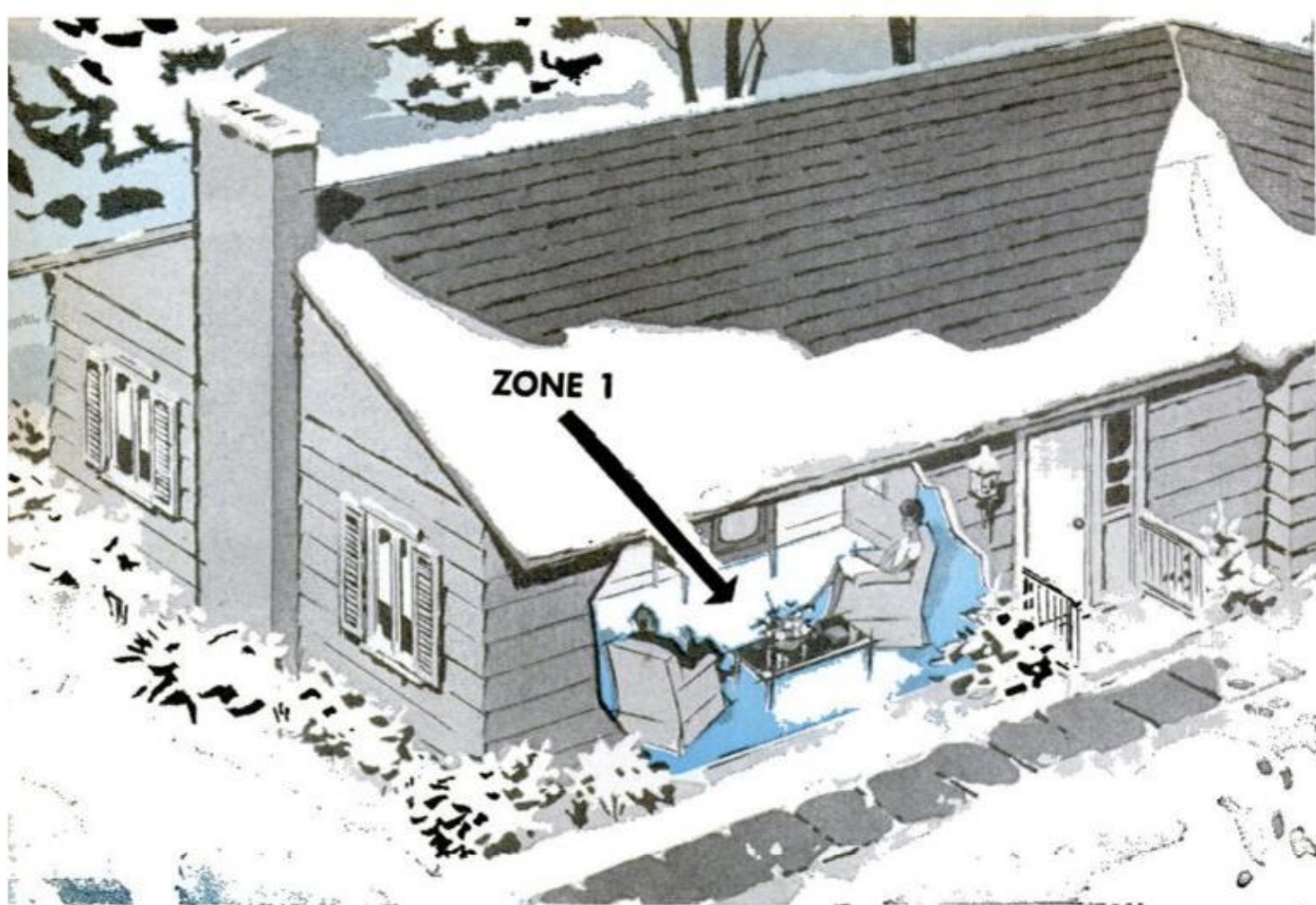


EASILY OBTAINED odds-and-ends, including 80 baby-food jars, are all you need to make a convenient small-parts storage rack

FOR CLEARANCE, fixture chain which holds the rack should be at least 6 in. long

EACH JAR LID IS FASTENED to the frame with a $\frac{5}{8}$ -in. No. 6 screw. A carpet tack $\frac{1}{2}$ -in. away will keep the lid from turning





BANISH FREEZE-AND-

*Having trouble balancing a heating system?
Try splitting the house into two different
zones by adding an extra heating-control
unit operating off a separate thermostat*

By Jordan Goldman

WHAT IS ZONE HEATING? It's a means of making more efficient use of your present heating plant, so that you are able to warm up those chilly rooms without turning the rest of the house into an oven. In essence, it's dynamic balancing.

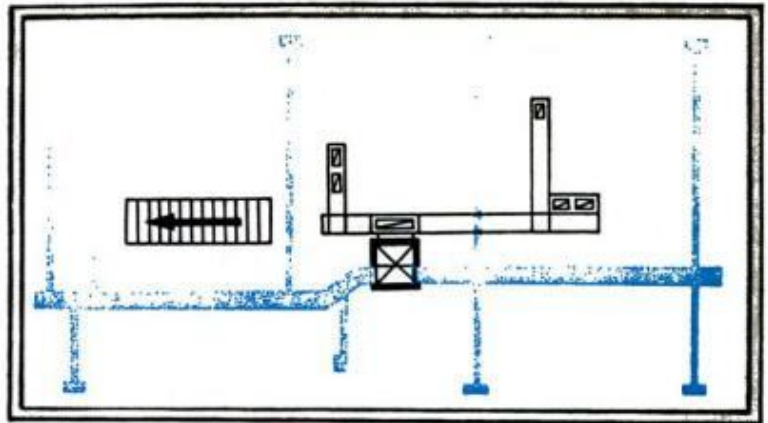
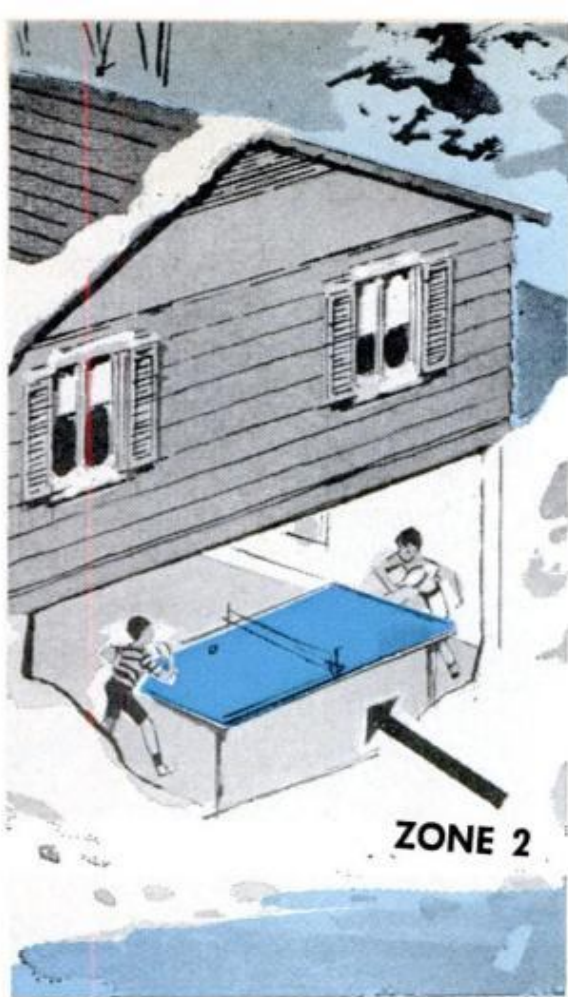
By modifying the controls of your present heat-distribution system, you can maintain whatever temperatures are desired in any part of the house, regardless of outside conditions. In some cases, this may even reduce your fuel bill.

Studies have shown that there are very few homes that would not benefit from zoning. If your house has rooms over an unheated garage; if the temperature be-

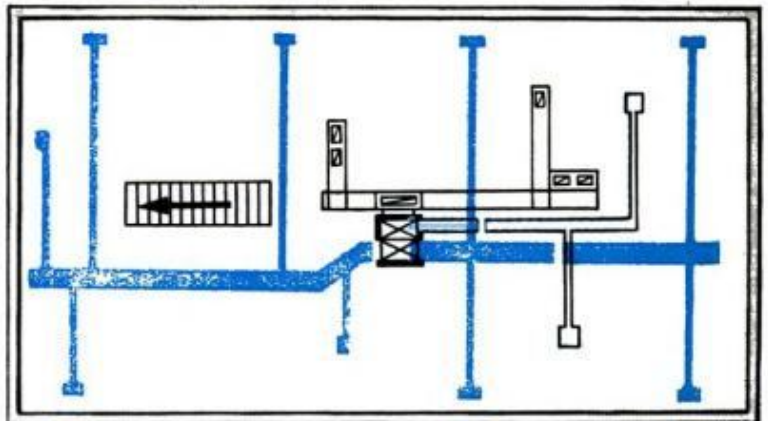
tween different rooms varies more than 3 deg.; if your home is built in the shape of a T, L or U, or is simply a long ranch type—chances are that zoning will make a big difference in comfort and livability.

While a heating system using a single thermostat may be balanced for average conditions, changes in weather can throw it so far out of balance that temperature differences between rooms may range as high as 9 deg.

For example, a bright sun on the west wall when no wind is blowing will result in very little heat loss from that side of the house. But on a cloudy day, with a 40-m.p.h. wind blowing against the same wall,

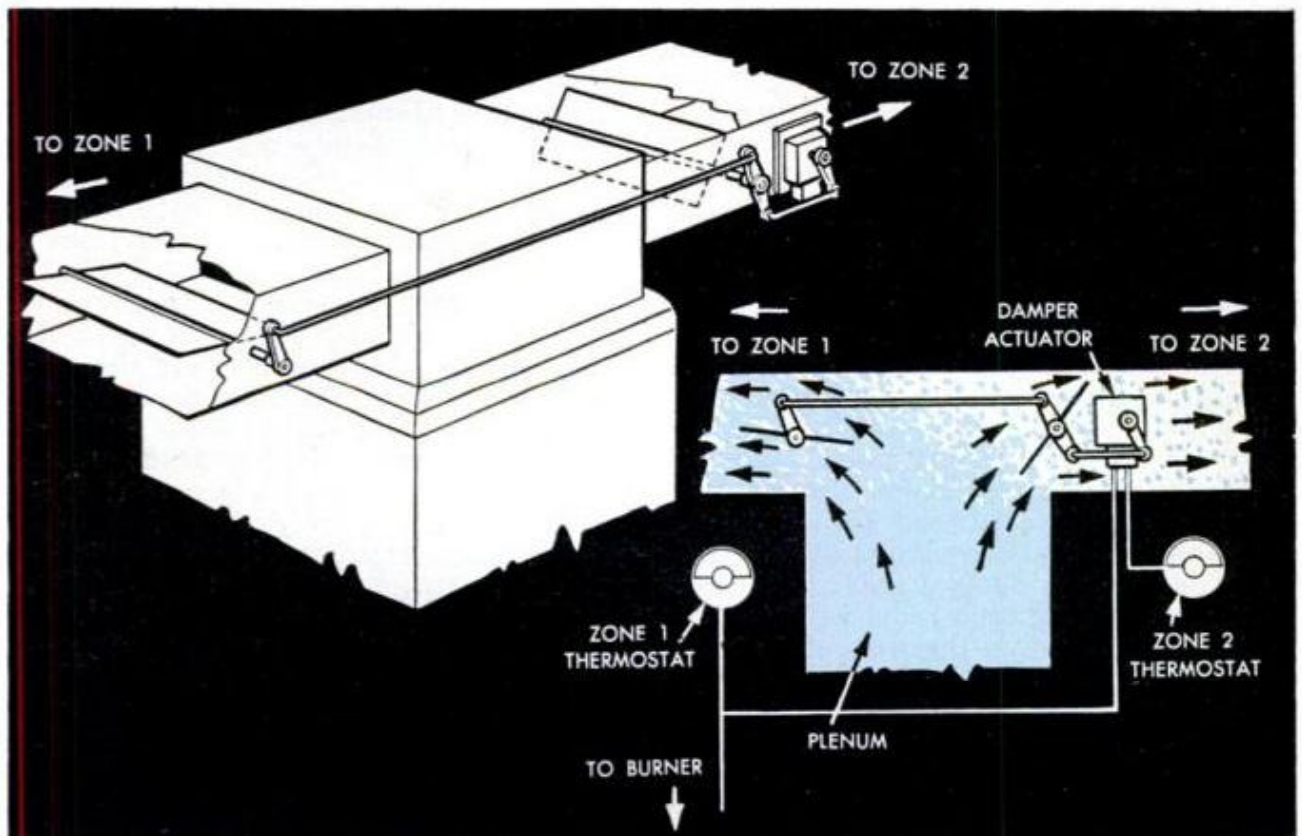


ONE-ZONE SYSTEM has only one means of controlling distribution of heat: size and location of the ducts making up system



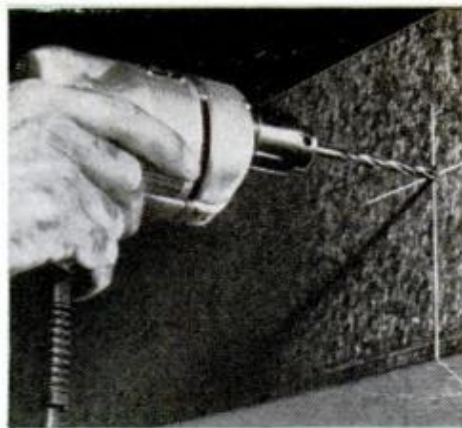
ONE WAY of converting to two-zone system would involve adding plenum splitter and ducts controlled by second thermostat

FRY HOME HEATING





1. LOCATE center of duct where zoning damper is to be installed



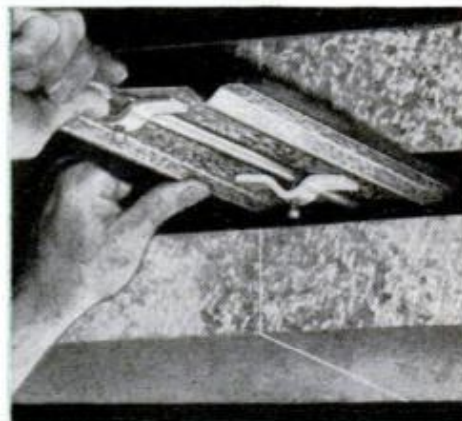
2. DRILL a $\frac{3}{8}$ -in. pilot hole at the center of duct on each side



6. CUT slot in front of duct so that damper blade may be inserted



7. TRIM blade to match duct width, allowing $\frac{1}{8}$ -in. clearance at ends



8. MOUNT blade on shaft and slip damper assembly in duct

heat loss will soar, and this will make a big difference in the temperature of the rooms on that side of the house.

Rooms with large window areas also contribute to the problem. They suffer higher than average heat loss, but are also subject to above-average solar gain when a bright sun is shining. Thus, if you mount the thermostat in such a room it will keep the house warm on cold, gray days, but when the sun comes out without an accompanying rise in temperature, it will cut off the heat supply for the entire house.

Ideally, each room should be equipped with its own thermostat, since each is a separate heating problem. In practice, however, the use of two (or sometimes three) thermostats combined with a sufficient number of ducts or radiators of the right size serving each room will maintain an even temperature throughout the average house.

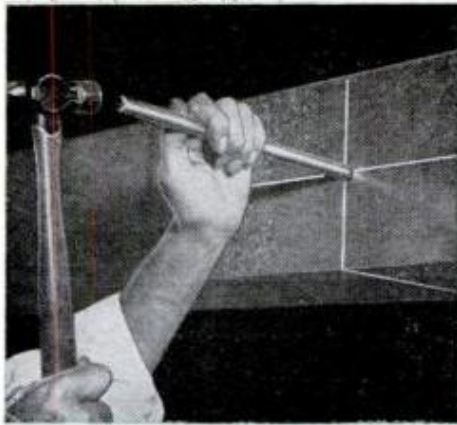
- To zone a warm-air system, you simply add a strategically placed damper in the existing duct system. This damper will be controlled by a motor which is connected to an extra thermostat located in

the zone served by this branch of ducts. You have your choice of a two-position damper which opens or closes completely in response to commands from the thermostat, or a modulating air volume system. The latter reduces the amount of warm air necessary to heat the zone by mixing returned air with warm air direct from the heating plant.

- In a hydronic system, zoning is accomplished by splicing a valve directly into the hot water supply line that heats a particular zone. As in warm-air zoning, you may use either a two-position valve or a mixing valve arrangement which allows the water temperature to be regulated automatically.

- A more extreme method of zoning is adding a second heating plant. Naturally, this is a costly solution, and it's rarely necessary. However, in cases where the size of the house has been greatly increased by the addition of a new wing, it is occasionally more economical to do this rather than replace the old heating plant with one of adequate capacity.

- There are two different approaches



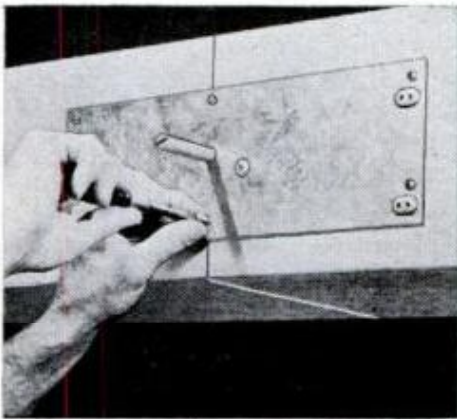
3. DRIVE shaft through holes from front side of the duct



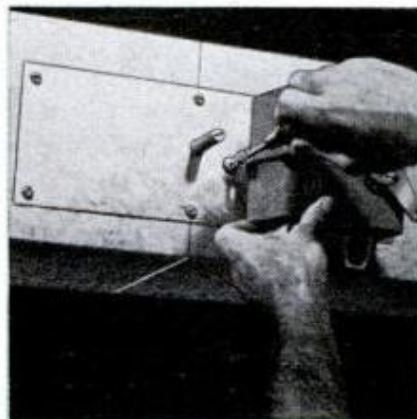
4. PUSH knurled end all the way through so shaft will rotate freely



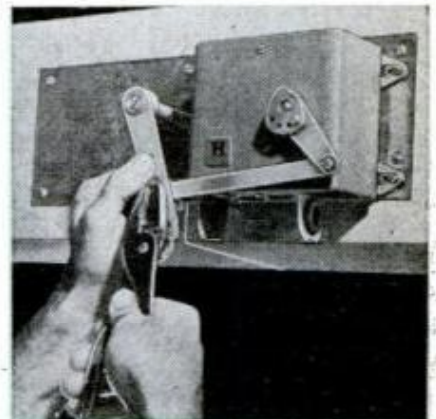
5. SLIDE template over shaft and carefully scribe around outline



9. SLIDE mounting plate over shaft and secure plate to duct



10. ATTACH damper actuator to the mounting plate with three screws



11. ADJUST the damper linkage and tighten crank on the damper shaft

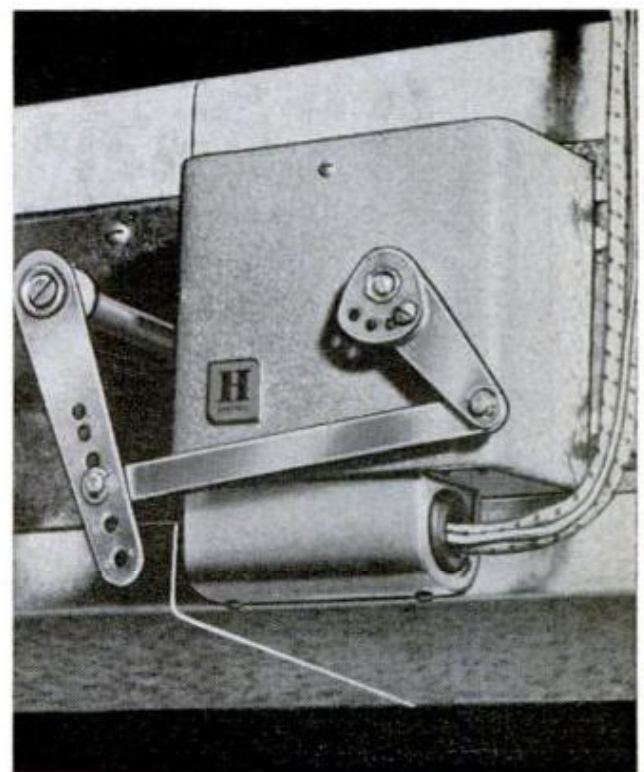
to zoning. The first is based on family habits (called "occupancy load" by heating engineers) and involves dividing the house into activity areas. Thus, the living room, dining room and kitchen would be in one zone, while all the bedrooms should be in another. (A slightly more refined system might even split the bedrooms into two zones—those on the north side of the house and those on the south side.)

The second approach glosses over occupancy load, and simply considers the relation between your rooms and the points of the compass. Generally, this means adding a separate zone for rooms with northern exposure.

● Installing zoning equipment requires a certain amount of skill, but any handyman able to hook up his own automatic garage-door opener, for instance, can certainly do the job. Manufacturers of zoning equipment provide detailed instructions covering every step of the operation.

Before going ahead with the actual installation, however, it's best to consult an expert on how to divide your home into zones, where to locate valves or dampers,

COMPLETED AUTOMATIC DAMPER wired to extra thermostat controls flow of air in the duct



ZONING HYDRONIC SYSTEMS

SINGLE RADIATOR controlled through zone valve will be shut off automatically at command from thermostat

EXTRA CIRCULATORS may be used instead of valves, but they require more power and generate noise

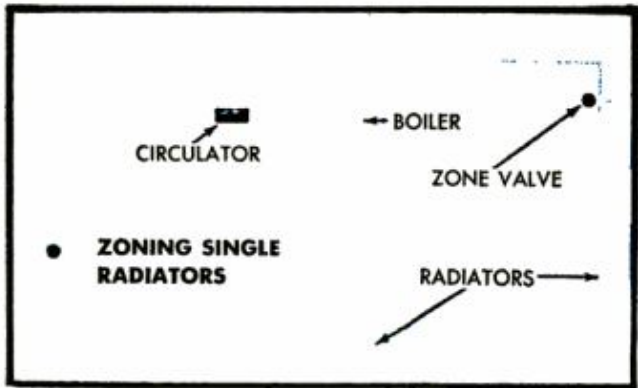
ZONE VALVES usually offer the simplest and most economical method of zoning a hydronic system

and what size ducts or radiators to use if additional ones must be added. For a small fee, most residential heating men will be more than happy to lay out your system for you. Often, they'll even sell you the materials.

To familiarize you with some of the common approaches and procedures used in zoning, here are three typical cases:

- A basementless ranch with a living room and kitchen on one side, three bedrooms on the other and the heating plant in a centrally located utility room presents few problems for zoning. Since the furnace is centrally located, with each room having its own ducts that originate at the furnace, no additional ductwork is needed. Zoning is merely a matter of installing a barrier, or "splitter," in the furnace plenum and mounting two dampers inside the plenum.

A thermostat in the living room will operate the burner and maintain the desired temperature in the living area

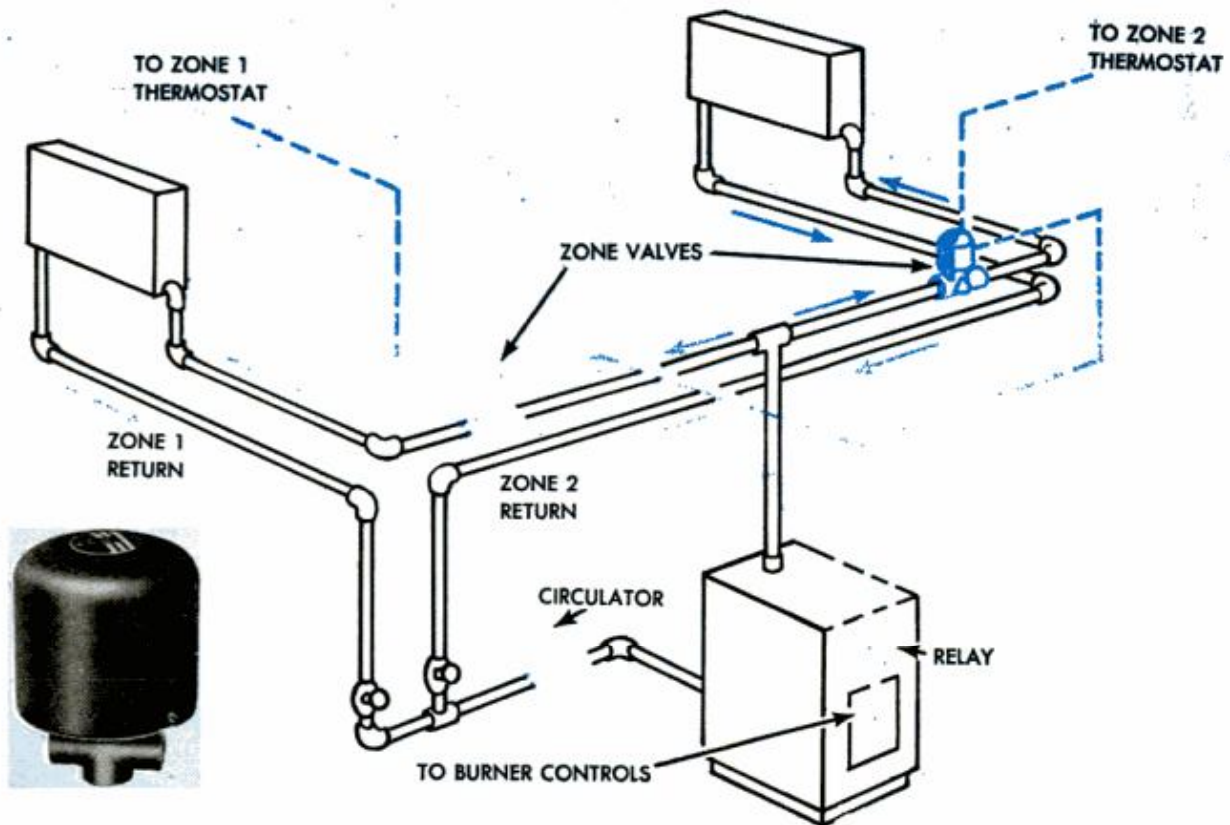


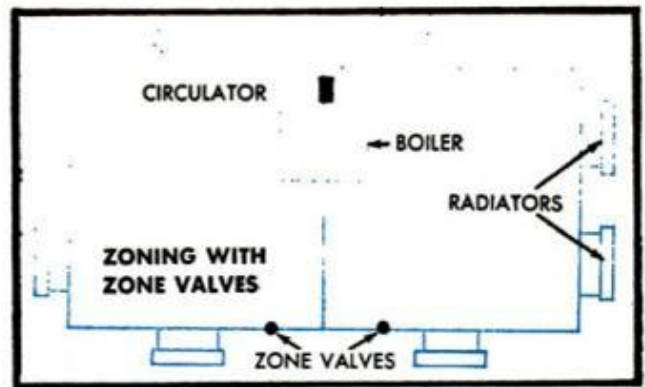
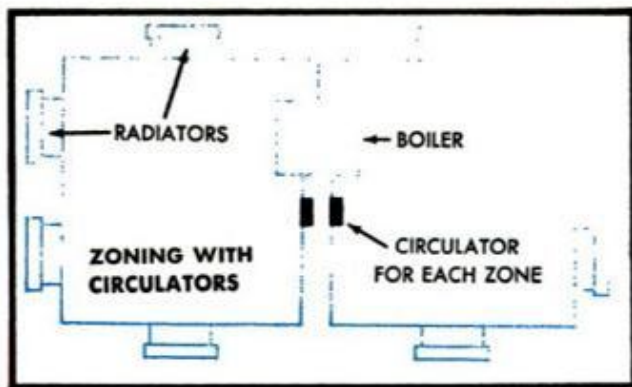
(kitchen and living room). Another thermostat in the sleeping area will control a single damper actuator which adjusts the setting of both dampers.

An alternate hook-up would be to install a damper actuator in each duct.

- A similar, but slightly more complex zoning problem is that of a typical five-room house with a recreation room in the basement that needs heating. With a centrally located furnace, this could be tackled in two ways. The least expensive would be to use a single damper actuator and a splitter in the plenum to provide a means of installing a separate take-off for the basement duct run. The living-room thermostat will operate the burner, while the basement thermostat will control the damper actuator, positioning both zone dampers so that heat is metered out to the basement as required.

An alternative would be to install motorized dampers external to the furnace, one on either side. This could split the ground





floor into two zones, with the living room and kitchen in one and the bedrooms in the other. The basement could be heated by overhead registers supplied by a duct in the basement ceiling, with the flow of heated air being controlled by a third motorized damper installed in this duct near the furnace.

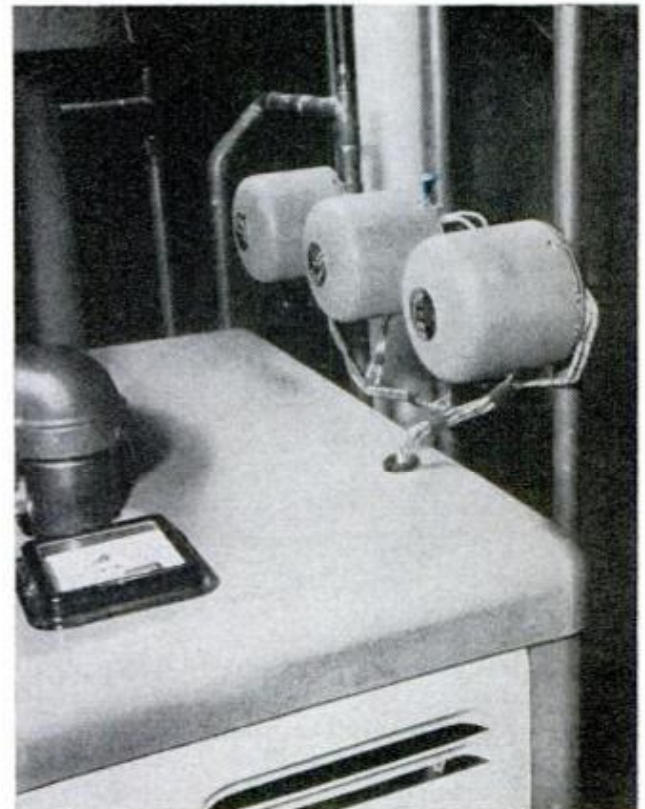
● A larger installation, which at first glance seems much more complicated than either of these two, turns out to be quite simple when warm air is supplied through separate trunk ducts to each area. In a seven-room split-level home, the living room, dining room and kitchen might be supplied by one trunk, the four bedrooms by another and the recreation room below them by a third. Zoning is simply a matter of installing zone dampers in each of the three trunks and adding two additional thermostats.

The installation will be somewhat more complicated if the zones are heated through branch ducts running off one or two trunks, and in such cases, considerable new ductwork might be needed. When the heating plant is centrally located, however, such complications usually do not arise.

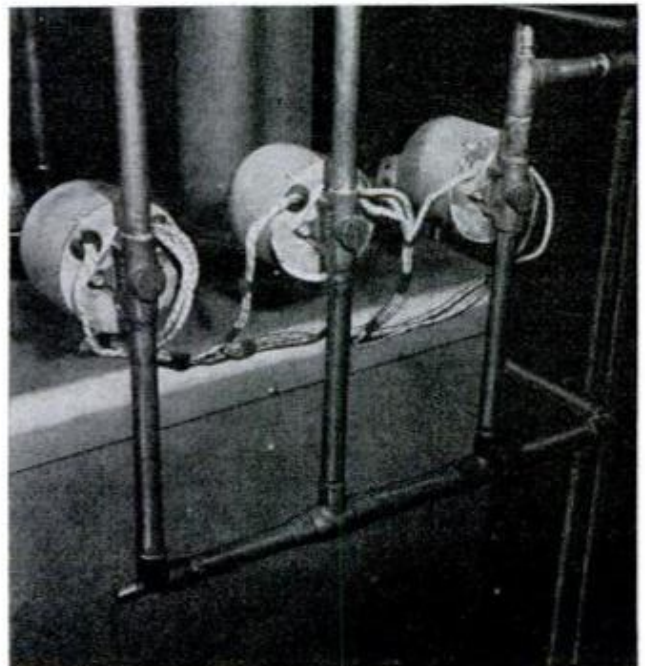
● Hydronic systems in one-story homes are simple to zone when the boiler is set near the center of the basement, with each half of the house served by a separate set of pipes. To turn this into a two-zone system, just splice in a zone valve on the boiler side of each circuit. The return line from each zone would go through a single circulator and then back to the boiler. Each thermostat would be hooked up through its zone valve to an aquastat relay at the boiler.

● A two-story house presents more problems, because both floors will probably use the same set of supply pipes. To zone such a system, you would have to install a separate set of feed and return pipes. However, you can add zone controls to one or two single radiators to shut off the hot water, provided they are connected to the supply line with diverting tees rather than inserted directly into the line.

(Please turn to page 235)



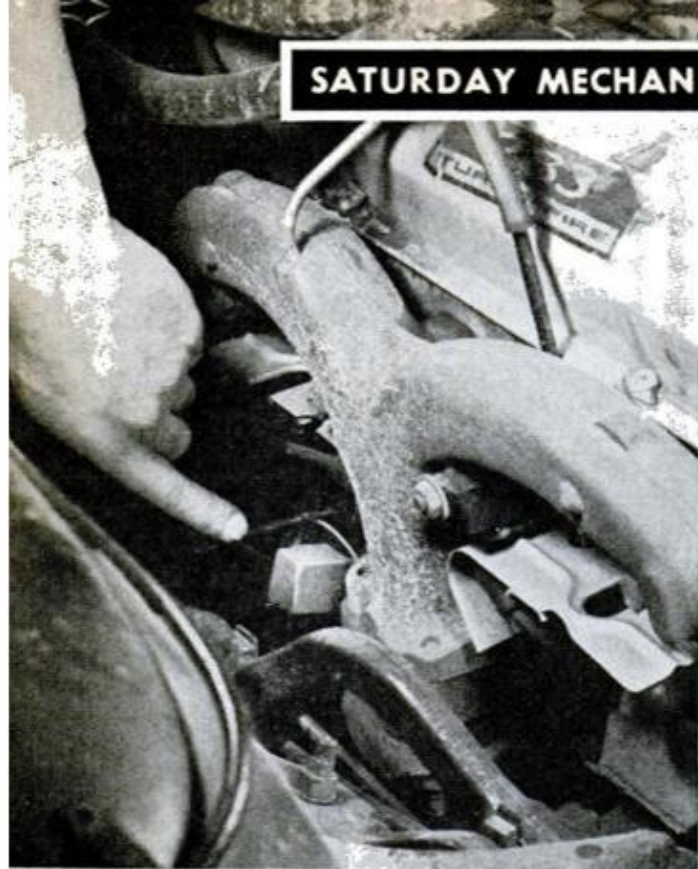
IN NEW HOMES with a heating system zoned at time of construction, zone valves are usually ganged near the boiler to simplify wiring and plumbing



THE VALVE NOBODY KNOWS

By Morton J. Schultz

HEAT CONTROL VALVE is easily overlooked on most cars since it's tucked deep in engine compartment where exhaust and intake manifolds join. Even the counterweight—pointed out here—is often hidden from view. This explains the valve's neglect by most car owners and mechanics



RUN A PENCIL down that check-list on the next page. Is your car plagued by one or more of these conditions, and you can't find the cause?

If so, you should first determine whether the car's equipped with an oft-forgotten unit called the *manifold heat control valve* or, as some term it, the *heat riser*. Though few people know much about it, most cars have such a unit, and when troubles such as those listed occur, the valve may well be responsible.

Even if you're not experiencing trouble *now*, but have a heat control valve in your car, don't feel too complacent. Unless it is checked and lubricated frequently, the valve could foul at any time, setting up a chain reaction that could spell a loss of time and money to you.

Since the manifold heat control valve is such an important unit to over-all engine performance in those cars that have it, you are probably wondering why many car owners don't even know whether there is such a unit in their cars—and why most seem to neglect it.

Could one of the reasons be that on most cars the unit is practically hidden? Is it a case of out-of-sight-out-of-mind?

Could another reason be that when trouble occurs, a driver will begin probing for a major cause, although the heat control valve is a logical place to start?

Or might it just be a lack of communication on the part of automobile manufacturers? Certainly, more stress could be given the importance of the valve in car-

owner manuals. In most manuals, it's only noted by a check on the lube chart.

Whatever the reason, surveys have shown the odds are 50-50 that if your car has a manifold heat control valve it is completely stuck in either the opened or closed position, is partially stuck, or is sluggish. In other words, *half* of the valves aren't doing their job.

If that's the case, and those cars are still running, can the valve's job be so important? Glance back at that check-list. It should be proof that *proper heat control is important to smooth engine performance*.

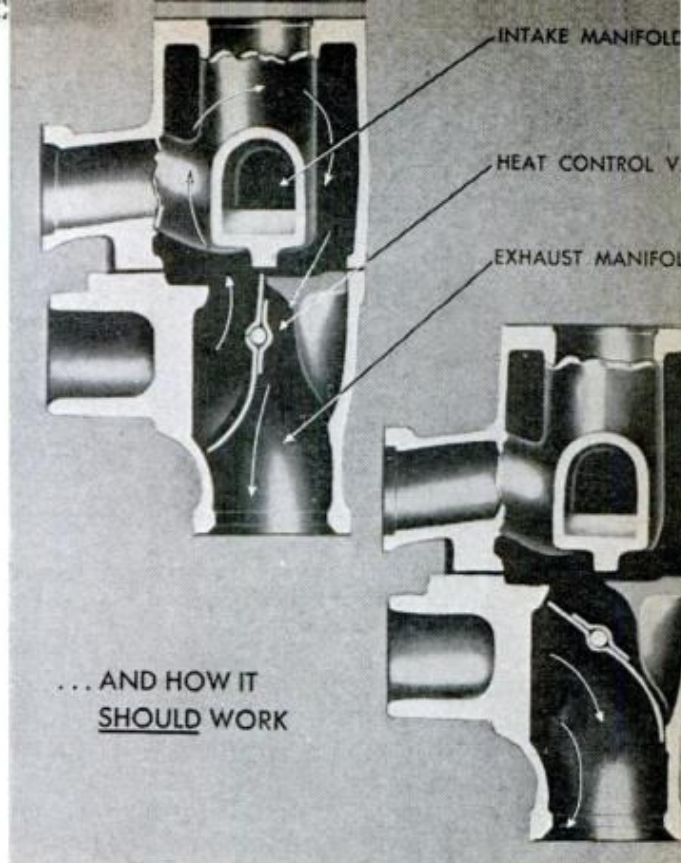
If a carburetor is clean, in good mechanical order, and properly adjusted, it will deliver the correct proportion of gasoline and air to the intake manifold. But it's another matter to get that fuel mixture *distributed* in correct amount to each cylinder so the engine will operate smoothly at any speed between 500 and 5000 revolutions per minute.

Heating the mixture as it passes through the intake manifold is one of the primary ways of obtaining the best fuel distribution to all cylinders under all conditions. Heat insures that a concentrated, fully evaporated mixture will be provided for ignition at the end of each piston's compression stroke. Regulating heat, so important to over-all engine performance, is the job of the manifold control valve. How it's *supposed* to work is shown in the diagram at the top of the next page.

● If the valve gets stuck in the opened position, exhaust gases pass right out the

The Problems It Can Cause When It Doesn't Work—

- Low gas mileage
- Sticking or burned valves
- Shortened spark plug life
- Engine "ping"
- Vapor lock
- Flat-spot acceleration
- Rough idle
- Stalling



exhaust manifold without entering the intake manifold. This deprives a cold engine of a quick warm up.

- It also means that gas mileage could drop by several miles to the gallon since raw, unvaporized gas could be blown out the exhaust or could run down past the piston rings into the crankcase, causing dilution of oil. This happens particularly during the winter when a cold engine needs more raw gasoline to start.

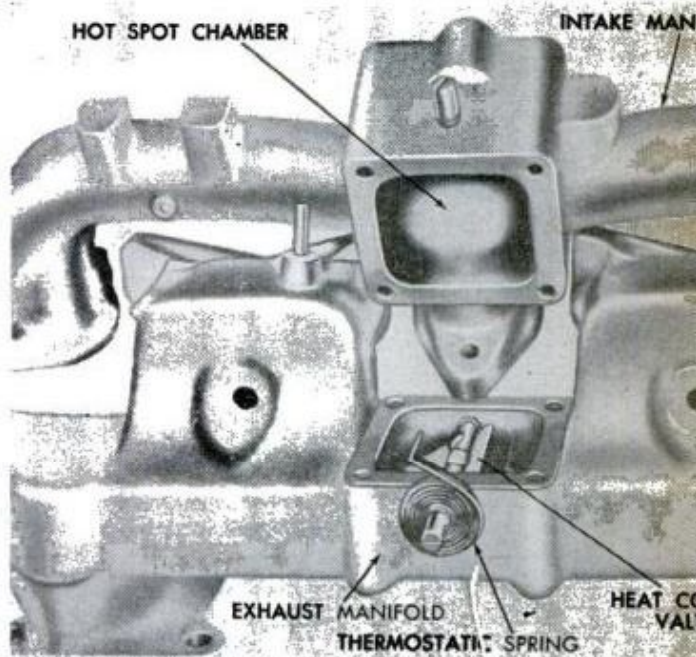
- Raw gasoline running past spark plugs could also get into and foul them.

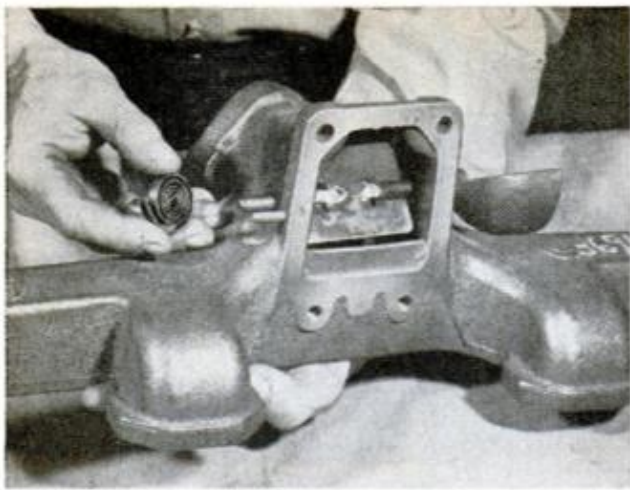
- Another consequence of a valve stuck in the opened position is so-called "flat-spot" acceleration. This is brought on by a drop in engine power resulting from the longer warm up period needed by the engine. "Flat spot" acceleration refers to a hesitancy by the engine when you tramp down on the accelerator. You may notice it when the engine is cold and you try to pass another car.

- The results of a manifold heat control valve stuck in the *closed* position are equally drastic. Under this condition, both engine heat and exhaust heat are being used to vaporize the fuel mixture. This causes too much heating of the mixture and an expansion of that fuel as it enters the combustion chambers. An expanded fuel mixture prevents a full "charge" of fuel from being packed into the cylinders for maximum engine power.

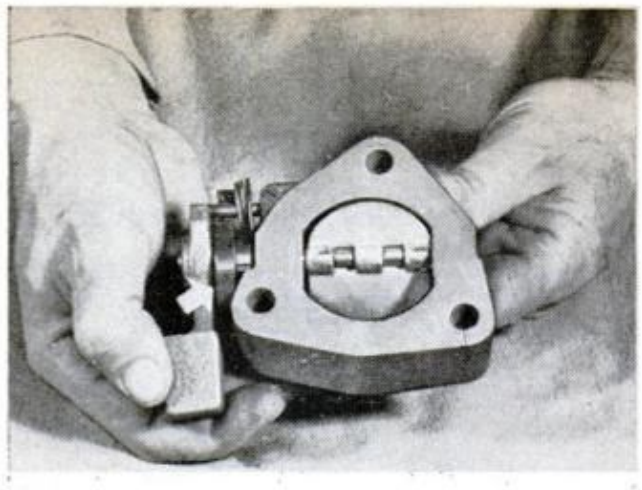
- A closed manifold heat control valve also acts as a restriction in the exhaust system, causing a build-up of back pres-

DURING COLD START, thermostatic spring keeps valve plate closed (top left). This prevents hot exhaust gases from taking direct exit, detours them instead through chamber that surrounds portion of intake manifold where vaporization of fuel mixture takes place. As engine warms up, heated spring loses its tension, permitting valve to open (right). This blocks entry to intake manifold, so gases pass directly out exhaust manifold to tailpipe while vaporizing job is taken over by engine heat. Valve housing lies between the two manifolds; access to it is gained by splitting housing at gasket, as shown below. Thermostatic spring is coiled around shaft to which valve plate is fastened; its tension opposes action of counterweight (not shown)





ON SOME CARS, thermostatic spring is on opposite end of one-unit counterweight and valve-plate shaft



IF VALVE BINDS or spring goes bad in one-piece unit like this one, entire unit must be replaced

sure that could make the engine spit back through the carburetor.

● In addition, the engine will operate below its rated compression. This could result in power loss, sticky or burned valves, hot spark plugs and detonation "ping." In some cases, gas could boil in the carburetor and cause vapor lock, rough idle and stalling.

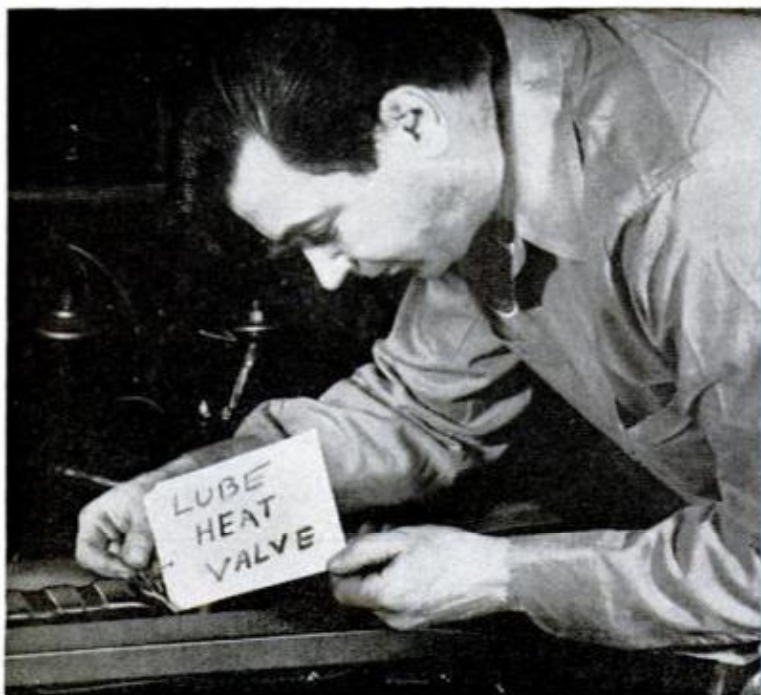
Vapor lock occurs when gas vaporizes or boils in the car's fuel system before it reaches the carburetor jets. Cars are designed to run on gasoline which remains a liquid until it passes through the carburetor jets into the incoming air. When gas becomes vaporized before reaching the jets, it upsets fuel delivery to the jets.

Naturally, most of these malfunctions could be caused by something other than an inoperative manifold heat control valve. But remember this: when any of these problems do arise, check the manifold heat

control valve *first*. It's the most logical place to start, not only because it's one of the most likely causes, but also because testing the unit takes only a few seconds and freeing it, if it's binding, takes a few minutes. The job is done with simple tools, and you don't have to be a mechanic.

To test the operation of the valve, warm the engine to operating temperature and let it idle. As you keep your eye on the counterweight, have someone accelerate and decelerate the engine quickly. If the valve is functioning properly, the sudden increase in exhaust velocity on acceleration will make the counterweight rotate. Then, as engine speed drops back to idle, the counterweight should return to its closed position.

This test establishes if the valve is stuck—either open or closed. Even if it isn't, it may be sluggish, and you can test for this by working the counterweight with your



A PROMINENT REMINDER such as this, tied somewhere under the hood, makes it hard for you or your mechanic to overlook the "valve nobody knows" when doing a general lubrication job. This simple precaution can spare you repair or replacement of a frozen valve. Such a tag will also prompt you to squirt some graphite on the shaft every thousand miles (you can jot each odometer reading on the back). Remember: you can't overlubricate this unit. Top photo, next page, shows how to apply

hand. It should move back and forth freely, without binding. If the valve seems to be frozen or sluggish, it must be freed and the thermostatic spring inspected. How this is done depends on the design of the unit:

- In some cars, older models in particular, you have to unbolt the counterweight assembly to get at the spring.

- In other cars, Chevrolet 6-cylinder models for example, the counterweight assembly and valve shaft are one piece and you cannot remove the counterweight. This type of unit is shown in the lefthand photo at the top of the opposite page.

- In still other cars, the entire manifold heat control valve is a one-piece unit like the one from an 8-cylinder Chevrolet, shown in the righthand photo. If the valve becomes fouled and cannot be freed or if the thermostatic spring goes bad, the entire unit must be replaced. This unit fits between the exhaust manifold and the exhaust pipe. To remove it, a crossover pipe has to be unbolted. The replacement part costs about \$4.50.

If possible on your car's valve, remove the thermostatic spring and inspect it carefully. This spring is set at the factory for proper tension and will usually maintain this tension for the life of the car. However, it could break or bend or become detached. If you find a broken or bent spring, replace it with a new one.

If the spring checks out, lubricating the shaft should solve the problem of a sluggish valve. A frozen valve may have to be tapped loose, as shown at right.

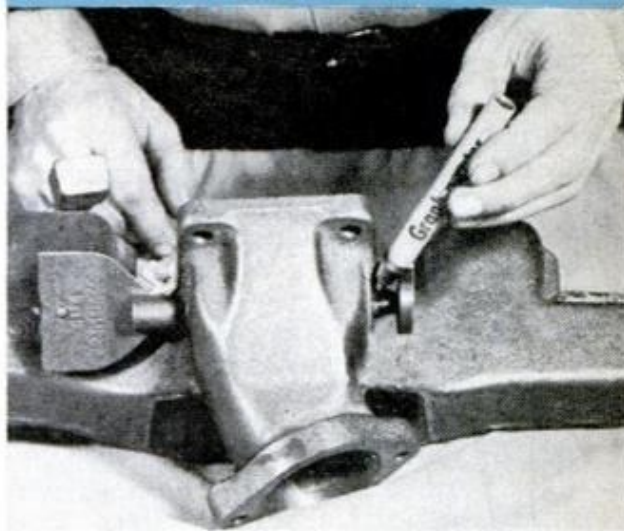
- Our study of late-model American cars shows that all but a few come equipped with manifold heat control valves. The few that *don't* have the valve are Corvair, Tempest V8, Lincoln, Falcon, 1962 and 1963 Ford Fairlanes, and all model Ramblers except the Ambassador V8 (which does have it). The most indecisive make on this question is Mercury—it drops the valve one year, may have it back the next. The only consistent Mercury models are the Comet and the Meteor: they *don't* have the valve.

- If your car dates from before 1960, you should check the manual to determine whether it has the valve. Generally, you won't find it on foreign cars.

Cars without the valve must employ an alternate means of heating gasoline in the intake manifold. In several cars—Rambler, for example—the manifold is built right into the block or into the head, and gasoline is heated directly by engine heat.

In other cars—Lincoln, for example—a water unit beneath the carburetor heats the gas as it passes into the intake manifold. Such a unit uses heated water from the car's cooling system. ★ ★ ★

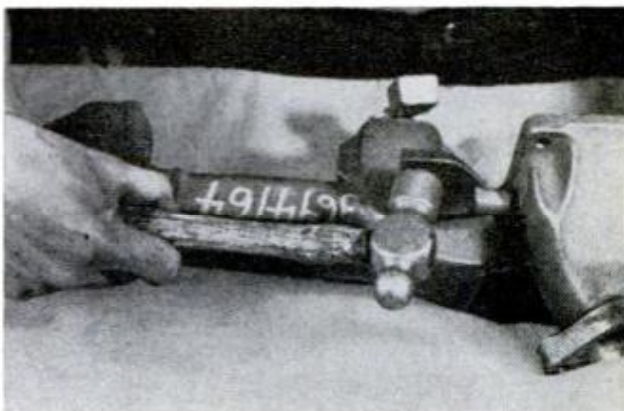
WHEN THE VALVE STICKS



BEST LUBRICATION for valve is type of graphite used for door locks. Apply at each side of housing where shaft emerges. In a pinch, you can also use penetrating oil, or solutions of baking soda and vinegar or soda and rubbing alcohol. Never use engine oil—it increases chance of shaft binding



IF SHAFT IS FROZEN and won't rotate freely by hand even after lubrication, try loosening it by tapping gently with hammer. A hard blow could cause serious damage to shaft and internal parts. First, tap end of counterweight as shown above, then turn hammer 90 degrees and tap face of weight in direction you wish shaft to turn (below). Light tapping and added lubricant will usually free the shaft; if valve remains frozen, though, it must be replaced



My 1960 Chrysler Imperial, which is equipped with an AFB four-barrel carburetor, insists on flooding. I've tried various starting procedures, but to no avail. Would you please recommend one to follow?

—H.H., Wisconsin.

One "procedure" is as good as the next: the way you start the car probably has nothing to do with the flooding condition. The 1958, '59, and '60 Chrysler Imperials, Saratogas, and New Yorkers that were equipped with this type of carburetor have been known to have foreign material lodge between the fuel inlet needle and seat, causing flooding. Recognizing the problem, Chrysler issued a new needle and seat assembly (part no. 2196207) that has the needle tipped with resilient synthetic rubber and the seat enlarged to offset the effects of foreign matter. Check with your serviceman about getting it installed in your carburetor.

I've chemically cleaned and reverse-flushed my cooling system, I've changed thermostats and fan belts, I've replaced the pressure cap, I've checked for leaks—I've done countless other things. Yet, my car insists on overheating at higher speeds. At 30 to 40 m.p.h., she's OK. Hit 50 and over, though, and the gauge needle sky-rockets. Any suggestions?

—K.D.G., Minnesota.

Your car's radiator is composed of many tiny tubes. No doubt, several of these have become blocked by rust and gunk. This prevents your engine from getting a 100-percent flow of coolant. The blocked tubes are probably allowing no more than a 60-percent circulation. At lower speeds, the engine gets just enough coolant to run at normal temperature. At higher speeds, though, the unblocked radiator tubes can't handle the increased flow of coolant needed to keep a faster-running engine at normal temperature. Chemical cleaners are probably not strong enough to cut through the embedded rust. Reverse flushing, too, often fails since it's done with cold water, and cold water won't dissolve rust. Take the car to a radiator specialist and have him use a pressure purge machine on the radiator. This emits

a hot chemical, which might clear blocked tubes if rust isn't too solidly embedded. If this doesn't solve the problem, the radiator's top and bottom tanks will have to be removed, and the tubes reamed out. The reamer rod used for this is the same shape as the tubes and will clear rust and gunk from them.

I've got a rough idling 1963 Comet. Haven't been able to put my finger on the cause. Can you?

—L.T.C., South Carolina.

Check the four bolts that secure the carburetor air horn to the carburetor bowl. They've been known to come loose on Comets and cause rough idle and engine cutout. Bet your gas economy is suffering, too. Tightening those bolts will probably clear up all your problems.

Service Tips

If your '63 Chevrolet has power steering, avoid turning the steering wheel with the engine shut off. Chevrolet has warned dealers (who often straighten the wheels of cars on display) that it's possible to force hydraulic fluid out of the power steering pump filler neck. This fluid can run onto the nearby alternator and damage it. If you **must** steer with the engine off (as when the car is being towed) it's wise to lower the hydraulic fluid level, using a bulb-type syringe or similar device, to just above the pump body. Don't forget to refill the reservoir before putting the car back in service.

Dodge has cautioned servicemen to be on the lookout for distributor part no. 1889562, which is used on all 1960 383-cu.-in. engines manufactured prior to Oct. 27, 1959. The basic timing on these was originally given as 10° before top dead center (btc). This has been changed to increase over-all efficiency and performance. The new basic timing is 12½° btc. Those cars with distributor no. 20905054, however, which were put on 1960 models made after Oct. 27, 1959, maintain the 10° btc timing.

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 questions for answering either through this column or by mail. Address Auto Clinic, Popular Mechanics Magazine, 575 Lexington Avenue, New York 22, New York.

Plastic Bag Catches Sawdust

Want to cut down on clean-up time after a big ripping job? Slip a plastic food bag over the dust deflector of your radial-arm saw and secure it with a couple of heavy rubber bands. Make sure that the bag has a few air holes; otherwise the back pressure will prevent the dust from entering the bag. A little dust will escape through these holes, but most of the chips and dust will be neatly bagged.



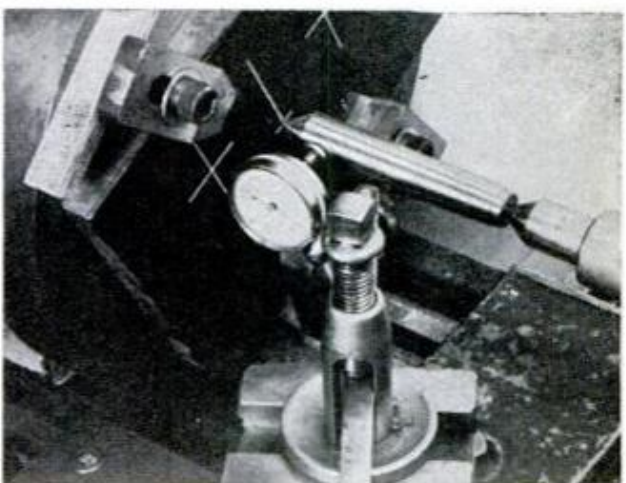
How to Shrink a Lathe Dog

One big difficulty in mounting small work in a large lathe is that the smaller dogs don't fit the driving plate slot. When you're faced with a small turning job, try this easy solution to the problem: Saw through one side of an ordinary hex nut which is large enough to hold the work, then slip the work into the split nut and tighten the nut in the large lathe dog. After the job is finished, store the split-nut adapter with your other lathe accessories. It will come in handy in the future for similar small jobs.



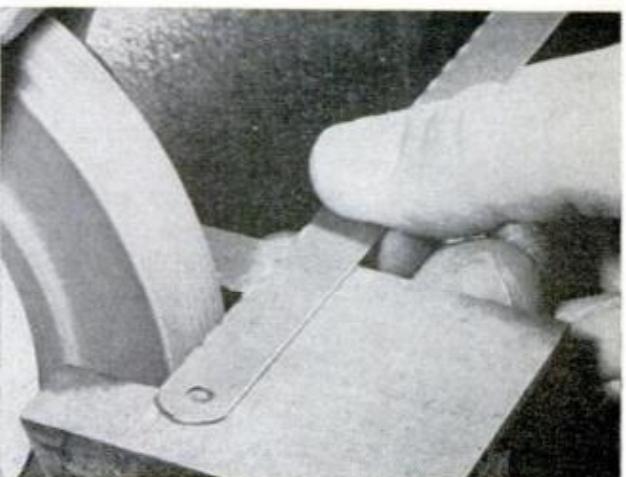
Use Lathe Center as "Wobbler"

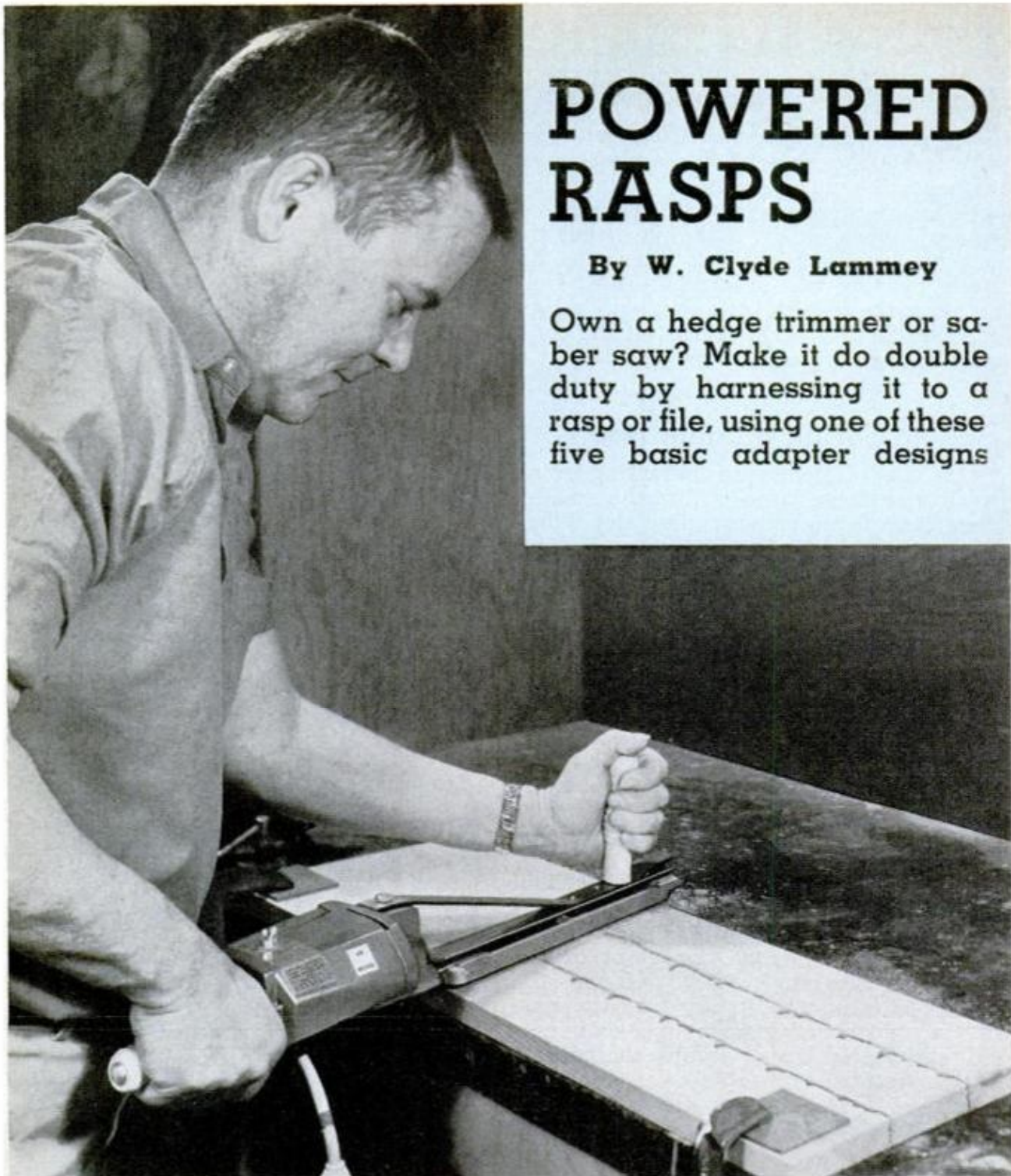
To locate the center-punched position of faceplate work dead true with the center of rotation, use the headstock center as a "wobbler." Place the point of the center in one punch mark and run the lathe tail center up tightly into the hole in the end of center. Set up a dial indicator in the tool post, seating the contact button against the shank of the free center, as close to the point as possible. Rotate the lathe spindle by hand and indicator will show runout of punch mark.



Hacksaw Wheel "Dresser"

When your grinding wheel has become loaded with soft metals such as brass, copper, aluminum, etc., it can't cut efficiently. One way to remove such metals from the wheel is to run an old hacksaw blade across the wheel while it's rotating. Repeat this operation several times and you'll find that the teeth of the saw will neatly snag the embedded particles of metal, restoring the wheel to the original condition. It's a good idea to hang an old blade near your grinder so it will be handy when the wheel starts to get loaded and fails to cut as it should.





POWERED RASPS

By W. Clyde Lammey

Own a hedge trimmer or saber saw? Make it do double duty by harnessing it to a rasp or file, using one of these five basic adapter designs

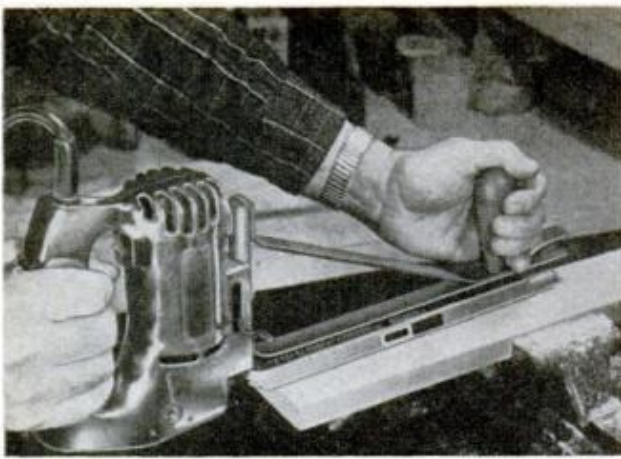
NO HEDGING INVOLVED in this nifty new use for a hedge trimmer's powerhouse—you never rasped faster! Electrifying a special rasp or file takes the tedium out of such jobs as smoothing down glue joints, above, or knocking sharp edges off panels or shelves. And it's easy to convert the tool back for hedge trimming

WITHOUT ANY ALTERATION of the tools themselves, most electric hedge trimmers and saber saws will take a simple, efficient bracket that converts them for power filing of metals or rasping of wood. The five attachments you see pictured and detailed here are adaptations from originals developed for possible industrial use by Marnie Averitt while a student at Illinois Institute of Technology.

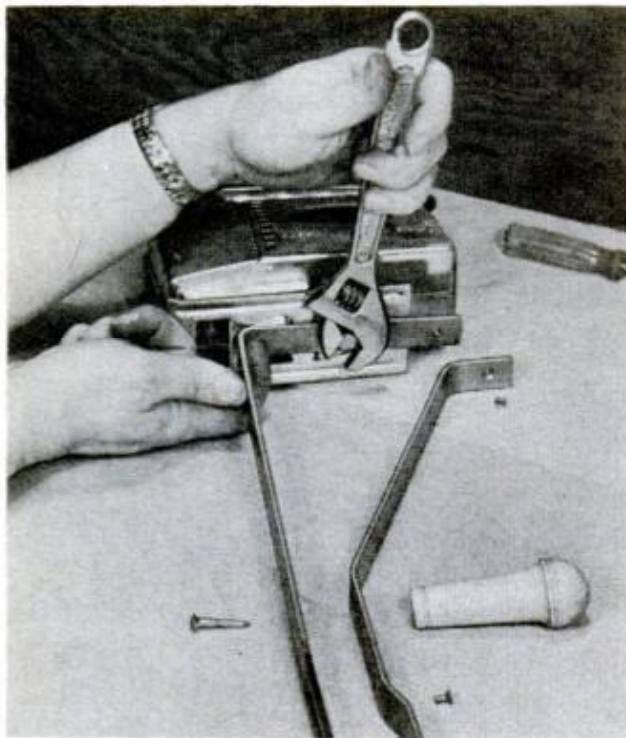
These adaptations have been simplified so that you can build any one of them to fit your own saber saw or hedge trimmer

from readily obtainable materials such as flat steel (also called strap or band iron), standard screws and a few small conversion parts easily made from scraps of brass.

The rasps and files used are the newer type consisting of a handled frame to which special blades and files are attached. The unit is sold under the name Surform. Two types of blades are available, one for working wood, the other for nonferrous metals such as aluminum, brass and copper. The blades are available in flat and convex shapes.

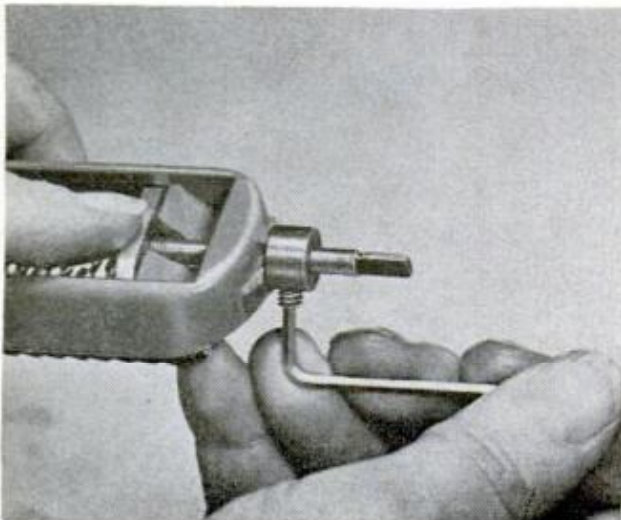


FLAT-BLADE RASP can be used as a plane. Harnessed to a saber saw, it cuts very fast. Due to overhang of saw housing, cut is made from both ends of stock



TWO BRACKETS that form carrier arm quickly attach to saber saw of model detailed at top of next page

CONNECTOR is needed to fit chuck of saber saw. It goes in end of frame where handle shank is cut off



end of the rasp frame to ride upward on the out stroke and tends to pull the rasp into the work on the in, or power, stroke. This contributes to faster cutting action and also results in smoother operation and less wear on the jigsaw plunger.

One important point in connection with fitting the brass slide, detail A, Fig. 1 (a variation of it is detailed in Fig. 3), is to file it to a free, sliding fit in the slot in the carrier. If the fit is even slightly snug, it may bind or seize in operation and cause breakage. Also, the slide must be well lubricated with a heavy oil to reduce wear.

Brass has been specified for the slide—and for wear parts in the hedge trimmer adaptations—simply because it is a more compatible metal for use where wear parts are in sliding contact. Mild (low-carbon) steel can be substituted.

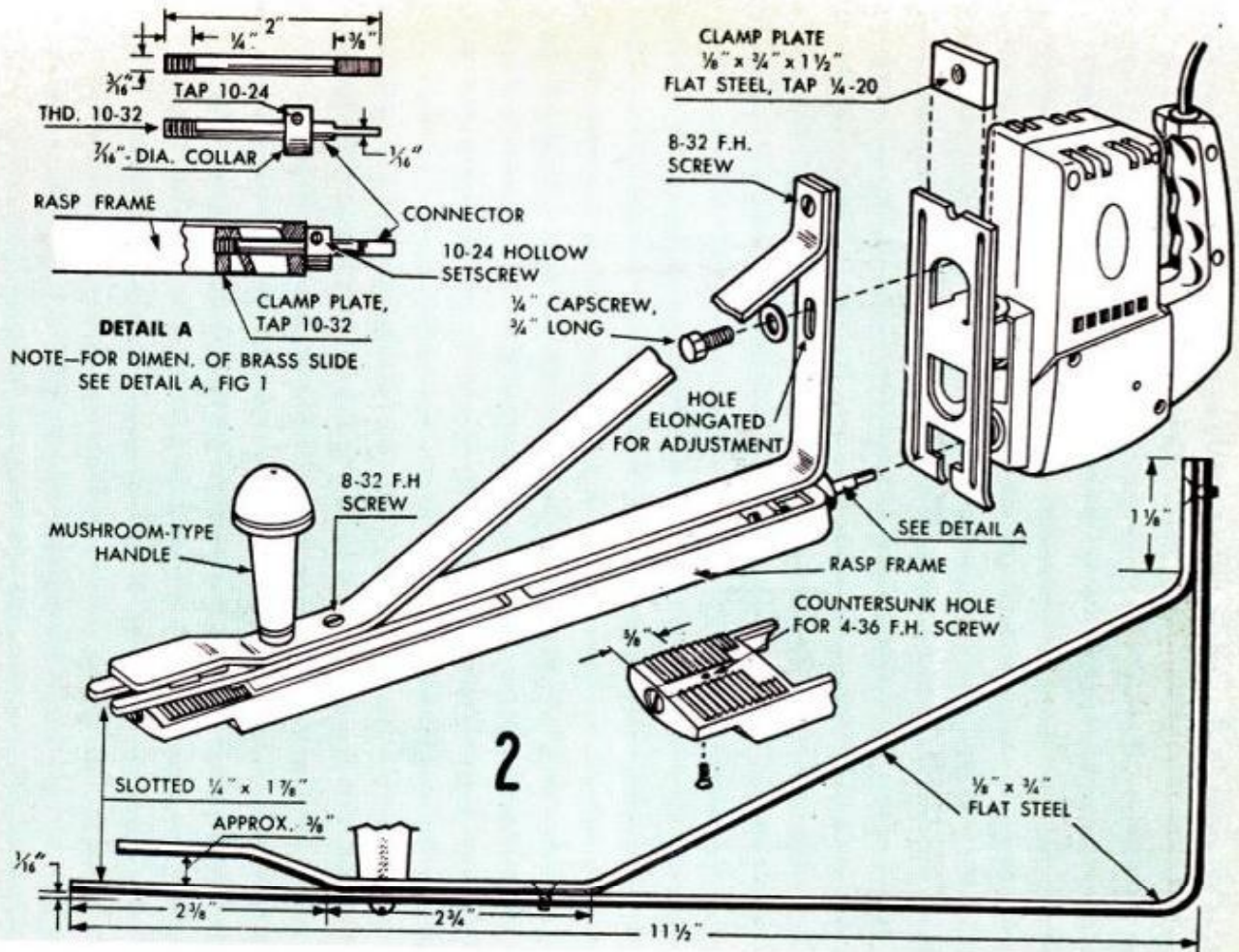
In fitting the carrier arm to the jigsaws in Figs. 1 and 3, note that in both instances the foot, or sole plate, must be removed. On the newer-type unit, Fig. 1, the sole plate tilts from 0 to 45 deg. on a trunnion. On the older type, Fig. 3, the plate is pivoted. On the third type, Fig. 2, the plate is also pivoted but need not be removed, as the openings in the plate permit attaching the carrier arm with a single screw turned into a tapped clamp plate.

In Fig. 1 the carrier arm is fitted into the trunnion by means of a hardwood shim and held by a single capscrew turned into the original clamp nut supplied with the saw. A hardwood handle is fitted to the carrier on all three units. No need to turn a handle. If you don't have a lathe, buy a large file handle, cut off the ferrule and drive a screw up into the wood.

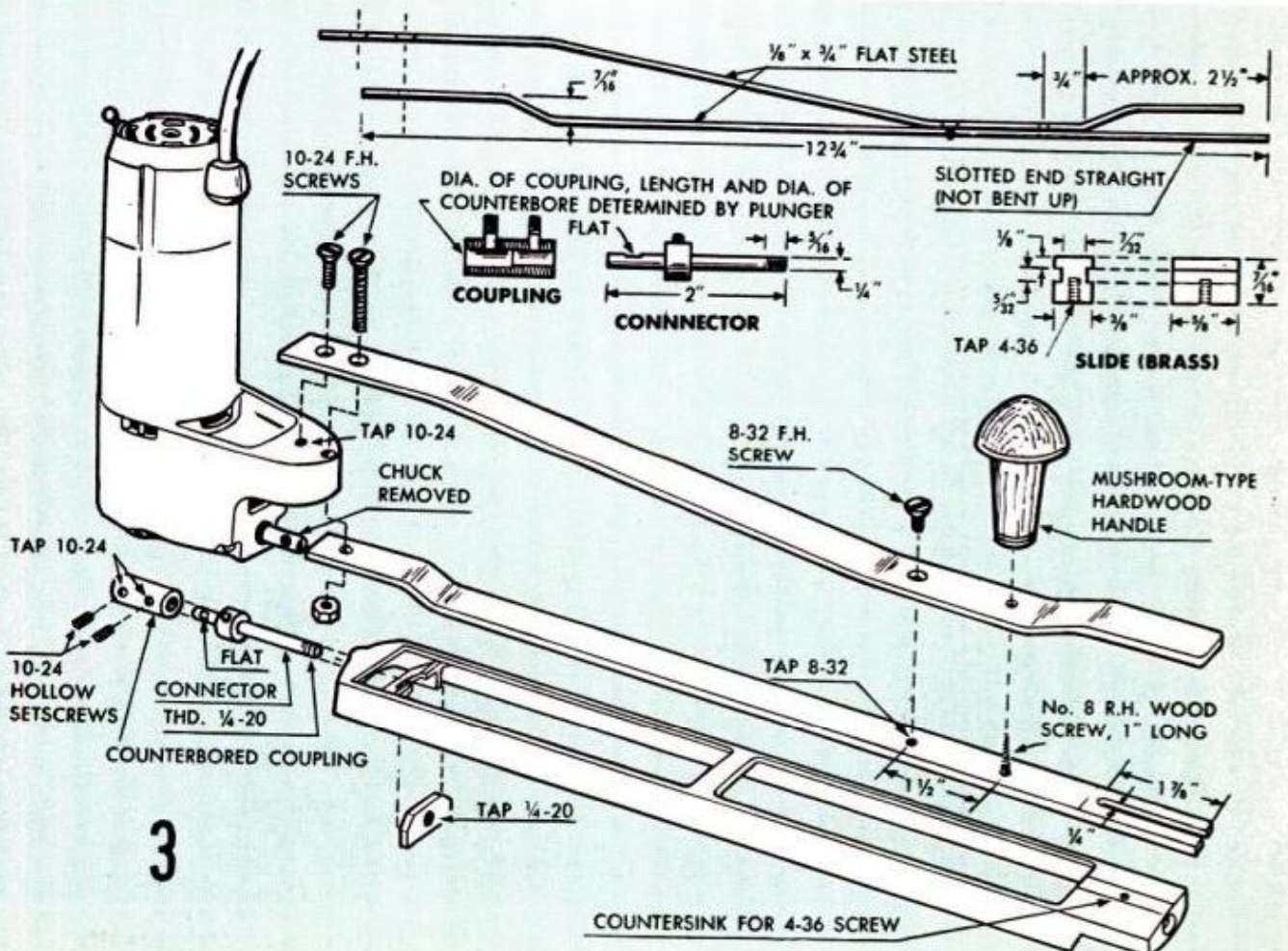
The type of connector used on each saber saw must be made to fit the original blade chuck, or, as in Fig. 3, the chuck must be removed and a counterbored coupling substituted. In all instances the connector is fitted into the end of the rasp frame by first cutting off the handle shank close to the end of the frame, drilling a hole and slotting the lug so that the threaded end of the connector can be turned into a tapped hole in a clamp plate (as in the cut-away view, Fig. 1 and the cross-section, Fig. 2).

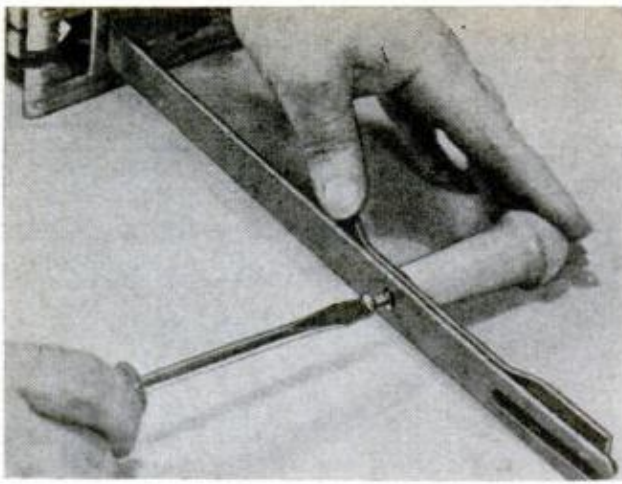
The slide is filed to fit snugly in a groove filed across the corrugated finger pad at the outer end of the rasp frame and is held in place with a 4-36 F.H. screw passing through a countersunk hole centered on the bottom of the groove as in Figs. 1 and 2.

The same general assembly is used when fitting the adaptations to the hedge trimmers, Figs. 4 and 5. The exceptions are detailed in Figs. 4 and 5 and the photos picturing the assembly of the drive hookup to the rasp frame. The conversion parts,



OTHER MAKES of saber saws require adaptations in carrier arm design. Assembly above, for use with Sunbeam model H-29 saw, is quite similar to one on page 185. Connector fits directly into blade chuck. For older type saw, below, you must replace the chuck with a specially-made coupling. Operating principles are same





TURNT HANDLE is attached near end of carrier arm with single wood screw. Note yoke at tip of arm



BRASS SLIDE that rides in yoke at outer end of carrier arm is fastened to rasp frame with small screw

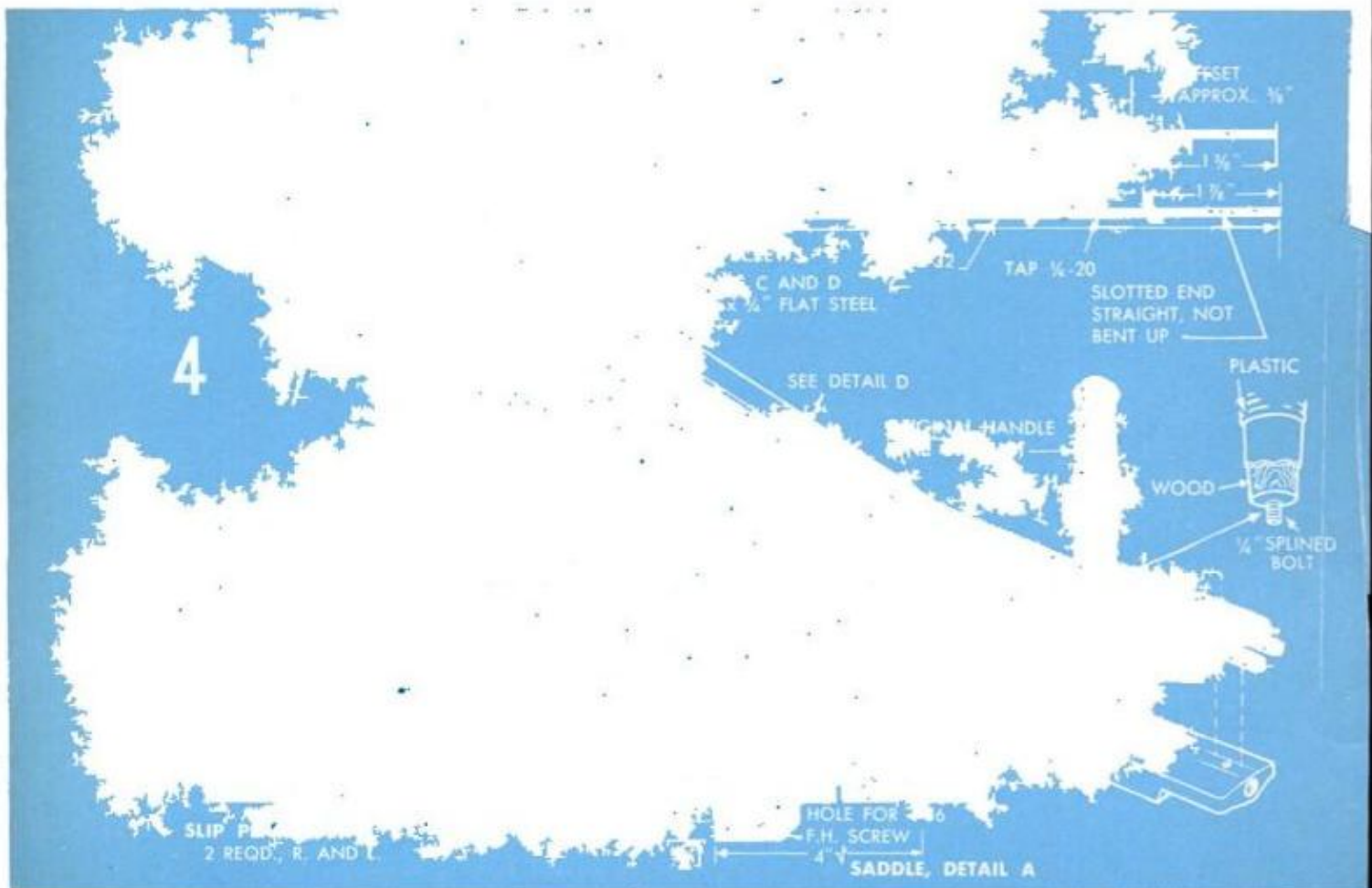
Figs. 4 and 5, substitute for the original sickle and sickle bar of the trimmer and must be made and fitted with care. Note that in one, Fig. 4, two slip plates, or wear plates, are required as substitutes for the sickle bar while in the other adaptation a single U-shaped plate is used.

On the first trimmer the drive block is round, while on the other it is square. Care must be taken when making the saddle to see that the openings for the drive blocks duplicate those in the original sickle. There must be no binding at any point in the assembly of these parts. Lubricate them at the time of assembly.

By following one of the five adaptations (with some probable variations) you should be able to convert any saber saw or trimmer now on the market. But keep in mind that manufacturers sometimes make minor changes in current models, so—even if you own one of the five machines we've chosen as representative—do some checking before you grab a hacksaw and cut materials according to the dimensions given here.

Also, remember that the dimensions of the bent parts of the carrier arms can only be close approximations due to the radius bends. The latter are much easier to make by hand than are right-angle bends, but

HEDGE TRIMMER assembly, below, is designed for Dormeyer's model HT6GR which has round drive disk

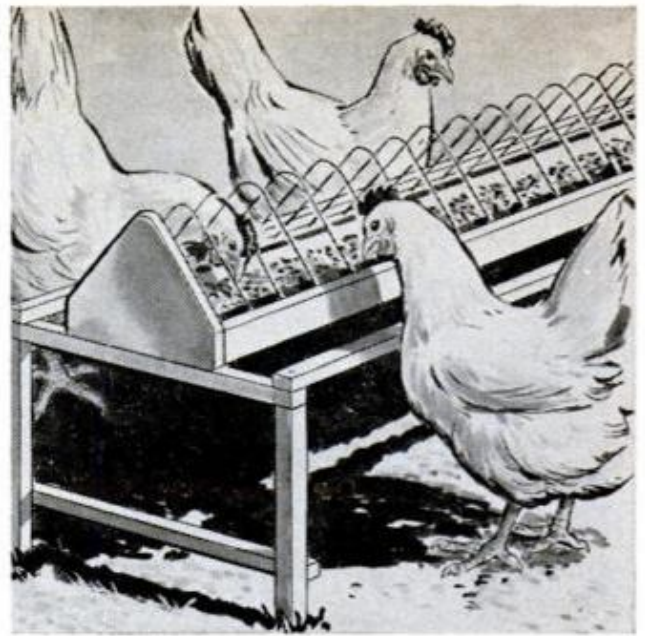


FARM TIMESAVERS



Lever Makes It Easy

The frequent job of tipping an outdoor hog trough in order to clean it is strenuous work, because of the weight of the rain water and debris accumulated in the trough. You can make this muscle-tiring job an easy one if you provide leverage by bolting a long wooden handle to one end of the trough as shown in the drawing.

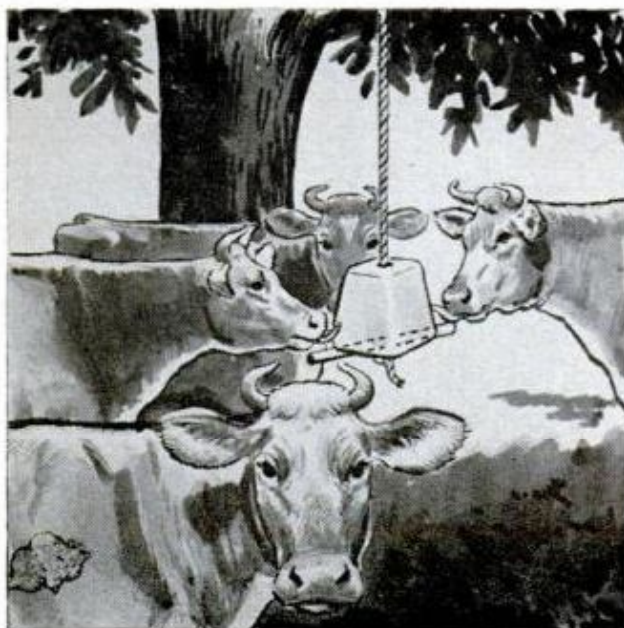


Full-Time Feeder

Poultry raisers who have idle equipment know that they are wasting money. Often this equipment is idle because it is too specialized to be used regularly. One such item is the baby-chick feeder. By simply building a wooden stand the feeder may be used for mature birds and is still suited to its original purpose.—A. Zawistowski

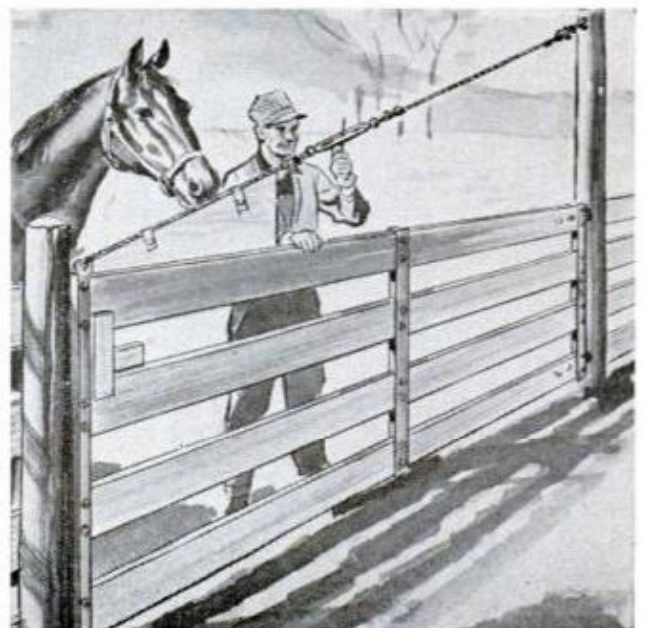
Hang It Up

Blocks of salt for pastured cattle are often placed on boards on the ground. The blocks absorb moisture which causes waste. A method which eliminates this waste is to suspend the block from a rope fastened to the limb of a tree. Pass the rope through the hole in the block and tie a stick to the end for support. This will hold the block securely.



Livestock Protector

The wire brace used to support a hinged gate poses a threat to livestock. The V-shaped notch formed by the wire and the top of the gate makes it possible for cattle or horses to catch their heads and strangle or seriously injure themselves. The hazard can be eliminated by closing off the notch with a plywood guard. The result is neat, safe and sturdy.—A. Weber





Your Home Movies



FRAGMENT OF SPLICING TAPE stuck to back of magnetic tape (shiny side) is cue point for sound tracking when it's lined up with the record head



CUE STRIP locates record grooves on which musical inserts start. For instant cue-ins hold the record while turntable spins; let go when recording starts

Whichever way you decide to record, the first caution should be to place your projector far enough from the mike to eliminate projector noise. A directional mike helps; projecting through a glass door from another room is ideal if you're fortunate enough to have such an arrangement.

There are two approaches to sound tracking: the one-pass system, in which you record all your audio simultaneously; and the sound-on-sound technique, where the first film pass is used to record music and effects, and you add the narrative on a second pass. (During the narration, the volume of the original recording is automatically lowered as you record over it.)

Sound-on-sound takes longer but simplifies the job. It is done by either turning off the erase head or physically isolating it from the tape or film. Most sound-stripe projectors have the sound-on-sound feature built into them as do many tape recorders. But a simple trick will let you do the same thing with a recorder not originally equipped for sound-on-sound.

Cut an inch-wide strip, several inches

long from an exposed piece of photographic film and double it over to form two layers. Loop the strip around your recorder's erase head and cut off the excess, leaving a bit to spare at the ends. Staple these ends together to form a permanent loop. When making sound-on-sound recordings, slip the loop over the erase head.

The most elementary sound-tracking set-up is a microphone between two self-contained phonographs. To make a musical transition, cut the volume of one phonograph and bring it up on the others. To insert narration cut back on the phonograph volume and speak into the mike.

For better results use an electronic mixer and two simple turntables or record player attachments. A regular phonograph can be used as a turntable for this system by disconnecting the pickup arm cable from the set's amplifier and plugging it right into the mixer.

Let's see how to make a sound track, using the all-at-once, electronic-mixer techniques. You can easily tailor this procedure to fit other systems.



MIXER MAKES SMOOTH BLENDING effects with two record players plus microphone. Keep cue sheet near so you'll know what's next and how to set controls

First step is to edit your film into a single story-telling reel. Avoid scenic monotony, and be careful not to introduce musical monotony. Be sure to build a change of pace into your sequencing, taking care not to break the running narrative thread in the process.

Once the film is edited, it must be sound striped if you choose sound-on-film. But footage meant for tape sync is now ready for the next production step.

This consists of screening it, timing each individual sequence and jotting down notes on subject matter, sequence changes and spots calling for commentary. Next think of the music available in your record collection. Try, mentally, to fit passages to the scenes you've run off and make a tentative list of the records they're on.

Armed with this list, rerun your film, and try each musical selection against its allotted sequence. See how scene and sound play together, and make changes where necessary. Once you've decided on the final layout, make cue strips for each record. These are strips of paper with a spindle hole at one end.

Print the name of the record on the strip, put the disk on the player and place the cue slip over the spindle. Locate the beginning of the chosen passage and stop the turntable. Move the cue strip around until it touches the stylus. Draw a straight line on the strip in front of the point of contact with a crayon pencil. If more than one selection is to be used, print the letter A, circle it, and join it to the lead-off passage's cue mark. Identify the next cue with the letter B and so on.

Prepare a cue sheet next. It labels each sequence, indicates the music selection by record name and identifying letter, if any, and notes the cue-in action to look for while screening. It cues sound effects, too. These can be made live or can be supplied from records or tapes.

The cue sheet also contains your dialogue and indicates where it should be inserted. The fewer and shorter the commentaries the better. Picture, music and sound effects should carry the story burden, leaving narration to establish settings and fill in necessary information.

Now you're ready to record. Stack your records in order of play. First play the musical sections with the loudest passages through the recording system to get proper levels. Once you find the master setting for recorder or projector, all further level juggling should be done at the mixer. Camera or recorder controls should not be varied during the recording session.

Mark the peak setting on the mixer's phono-channel controls. Then do the same thing for the mike channels. Next, using earphones, blend some music with a sample of the narration, gradually cutting back on the music till you get the right background effect. Mark this setting, too.

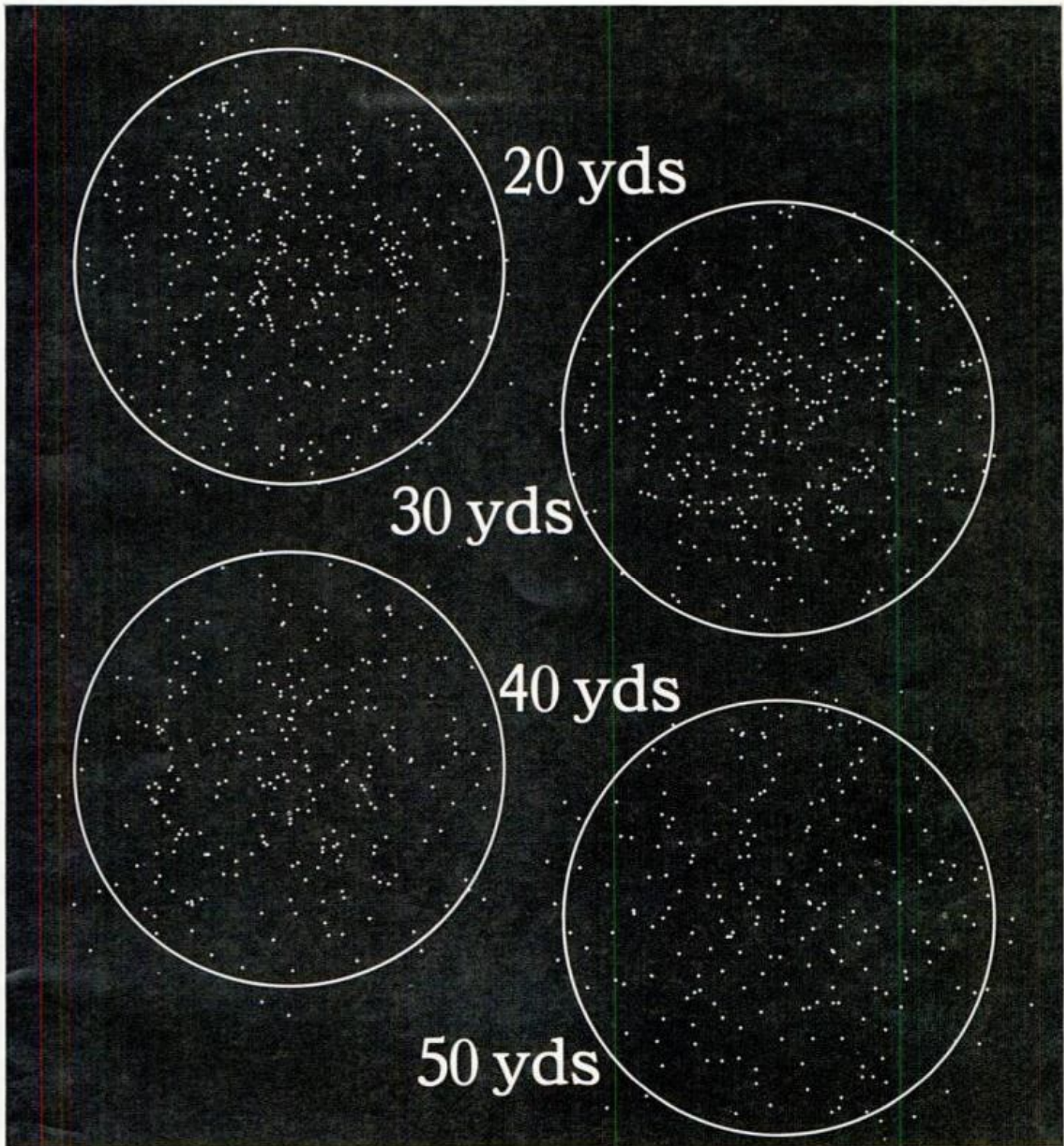
Set your first two records on the turntables and start them spinning. Hold the edge of the lead-off record to keep it from turning. Use the cue strip to locate the starting groove and set the needle on it. Then with all other mixer controls at zero, set the turntables' channel level to the play setting. Start the projection-recording system and simultaneously release the discs to get a well-synchronized start.

To insert narrative, drop the music level to the background setting and bring up your mike level. Reverse the process when narration ends. Always keep the mike dead when you're not using it to minimize pick-up of spurious noise.

Gradual fades and cross fades make the best normal transitions. But you can sometimes get dramatic effects by bringing up key passages rapidly.

In screening your creation for an audience, provide a true theatre effect by playing the sound track through an auxiliary speaker placed by or behind the screen.

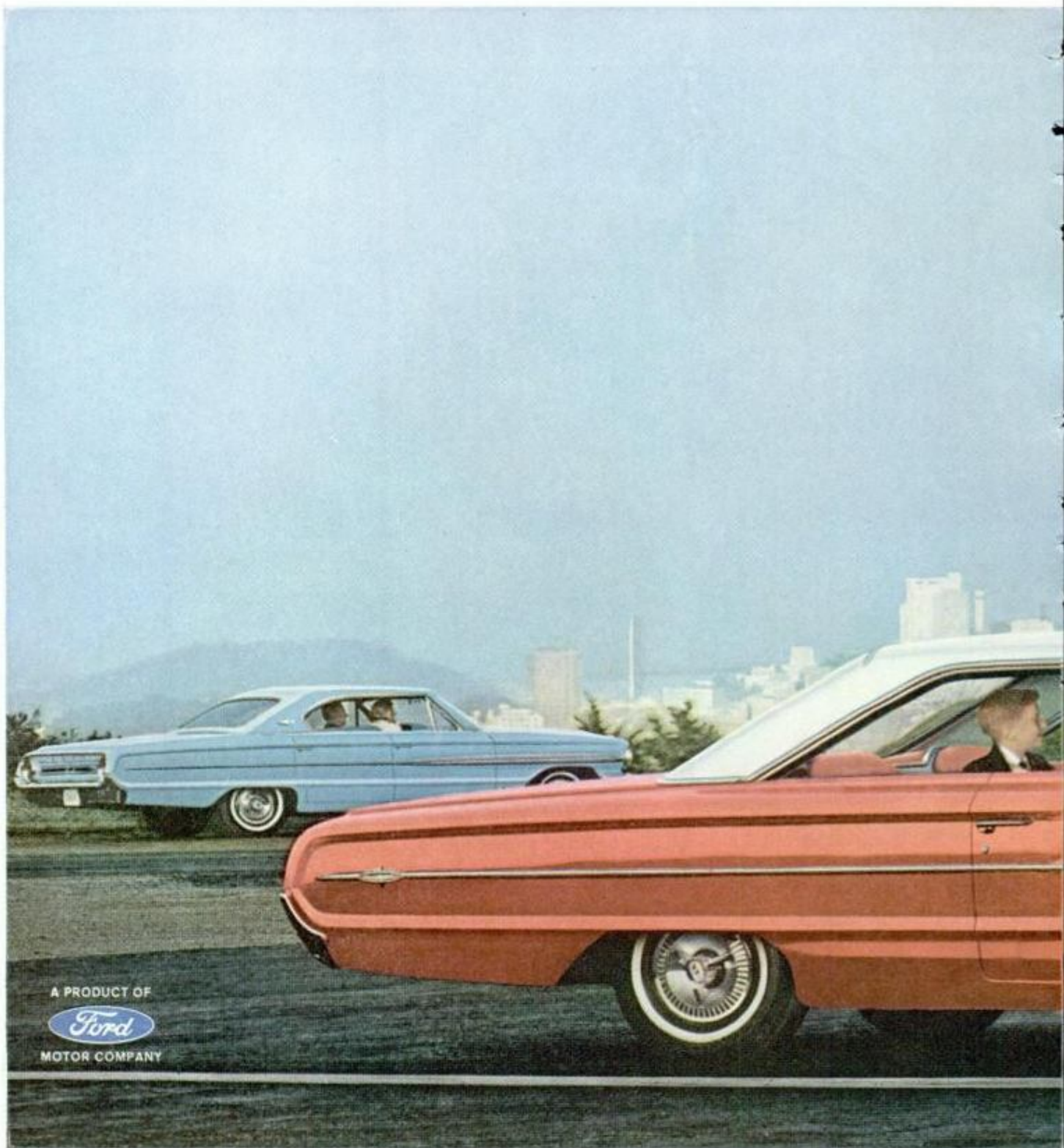
A stereo recorder used with the tape-sync system offers wonderful opportunities for extra dramatic touches. With two speakers, you can make your music and effects come from the side of the screen where attention should be focused. And remember, even the simplest of sound tracks, if produced with taste and good pacing, will keep your audience so happy that the next time around they'll beg you to pull out the old projector! ★ ★ ★



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Foreground: Ford Galaxie 500/XL 2-door Hardtop Background: Ford Galaxie 500 4-door Hardtop

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grounds alone. They're hard-muscled, fast-moving, sure-footed. Open competition helped make them that way. They're more substantial than ever, with more steel in their frames, huskier bodies, more solid road-hugging strength than anything in their field. A remarkable suspension system gives them a ride as smooth as cars costing thousands more. Did you say, "Show me"? How about this week?

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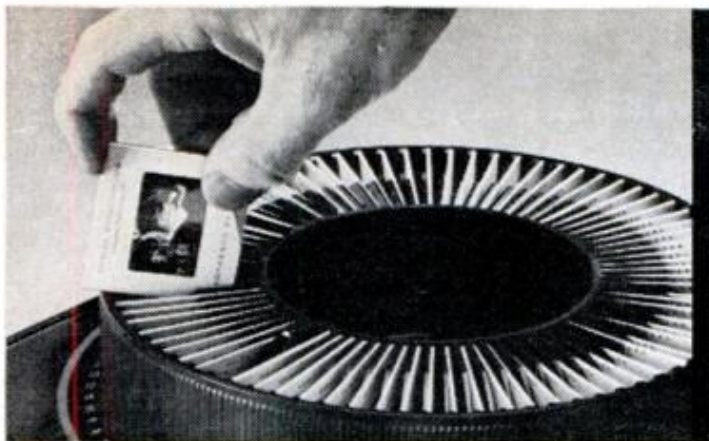
All 44 new Falcons, Fairlanes, Fords, and Thunderbirds are at your Ford Dealer's new!



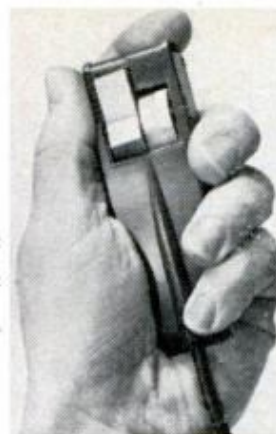
This one makes you a

KODAK CAROUSEL Projector
wins you applause for the smoothest
slide shows you've ever put on

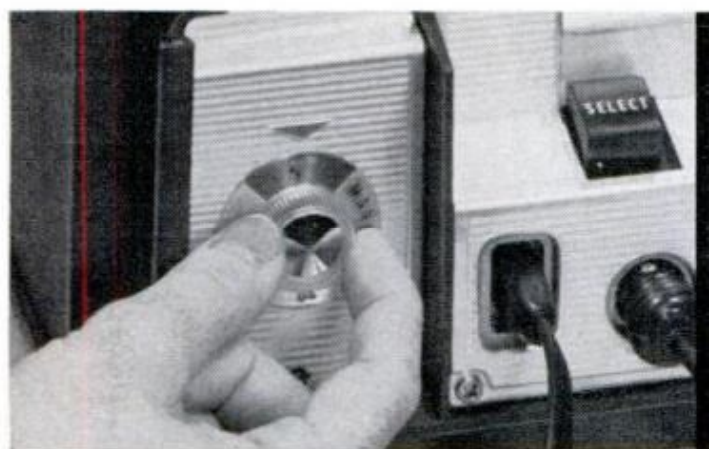
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80 SLIDES are quickly loaded and locked in the round tray—no special mounts needed. All slides are within editing reach throughout the show. Tray stores like a book on a shelf.



REMOTE CONTROL lets you sit back and run the show with one finger. A touch makes slides go forward or back, as fast or as slowly as you want. Even lets you fine-tune the focus!



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master showman automatically

Right from the first time you snap on this projector, you're putting on slide shows that are all fun and no fuss.

There's never a jam-up, for the KODAK CAROUSEL Projector is completely dependable. It works with such precision you can show a full tray of 80 slides in 75 seconds. But that's just a speed run.

This projector's real brilliance is in the relaxed, completely automatic shows it lets you put on. It's the original and still the

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Framing Roof Dormers

(Continued from page 167)

trim the ridge board flush with the outer rafters. A shed-type dormer, such as the gambrel shown, avoids all ridge-board fitting. It is used where headroom is the major concern.

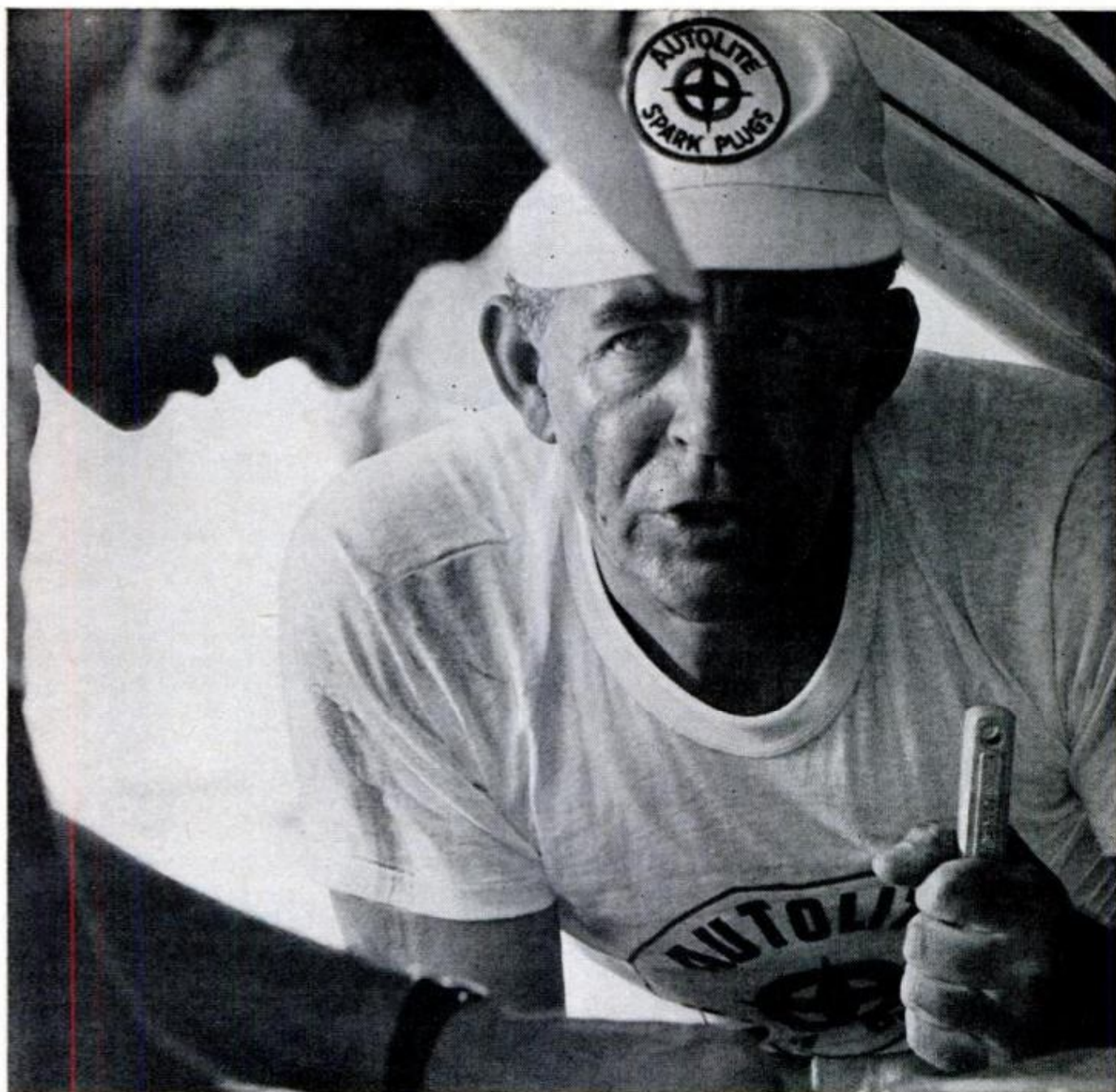
The rough window opening is centered in the front frame and should be $4\frac{1}{4}$ in. wider than the sash unit itself. Whether the trimmer studs are single or double depends on their proximity to the corner posts. When they're close, as in three of the framing details on page 166, double trimmers aren't needed. The fourth detail shows a flush-with-wall dormer where the corner posts are merely nailed to existing studs to extend a section of the wall upward; in this case, the rough framing of the window calls for double trimmers.

How a Cornice Turns Corners

The front cornice construction depends on which type of side cornice you choose (see sketches at top of page 167). In any case, the roof boards run only to the *inside* face of the front rafter, where they are nailed to a 2x2 cleat fastened along the upper inside edge of this rafter before it is put in place. A "drip board," running at right angles to the roof boards, is nailed to the edge of the rafter itself, to create the front overhang. In plain cornice construction, this overhang is braced by trim, but for the box type you extend the plancier (or soffit board) its own width beyond the front rafter so you can "turn the corner" with it, nailing the front plancier to a second cleat fastened along the *lower* front edge of the rafter. Though the sketches show the roof boards beveled flush with the side fascia or sheathing they may project an inch or so if you prefer an overhang effect.

Before shingling, lay a 14-in. sheet-metal valley where dormer and house roof meet, bending it until it lies flat against both roofs (see sketches, page 167). Snap chalk lines up the valley to indicate where shingles must be trimmed. The top corners are also snipped off, to shed water toward the valley. To avoid nailing through the valley, anchor the diagonally-cut edges of the shingles with cement.

Where the dormer walls meet the roof, use step flashing, starting with a corner piece and working back each side, as shown in the bottom sketch, page 167. The side pieces should be 6 in. long, with the vertical flange extending at least 3 in. up under the siding and the other flange 4 in. out under the shingles. Don't nail the shingles through the flashing. The front strip rides on top the shingles. ★★★



OUR MAN IN DAYTONA

It was hot at Daytona. You could fry an egg on the track. And when you feel real proud about what you've built, you send it here to find out if it's as good as you think it is. To Daytona. Or Darlington. Or to Pike's Peak. Or to Indy with its proud heritage running two bricks wide across the finish line.

If you really want to know about things like strength, durability, you lay your product on the line before 300,000 customers. Let it stand on its own.

Fireball Roberts tamed the heat and humidity in a '63 Ford at Daytona. On old

Pike's Peak, Parnelli Jones took a new Merc up in less time than any stocker in history—or sports car either, for that matter. At Darlington it was Fred Lorenzen in a Ford. And at Indianapolis, Jimmy Clark toured the brickyard in a tradition-smashing, gasoline-burning Lotus-Ford leaving behind all but one of the alcohol-fired Offies.

You could go to the track and probably never notice our crew. They're the guys in the pits with the red-and-white caps on. We make spark plugs. Autolite. We take them to the tracks to see how tough they are.

Fireball used them at Daytona. So did Parnelli at Pike's Peak. Lorenzen at Darlington. Jimmy Clark at Indy. In fact, drivers using our plugs won 8 out of 10 major stock car races (those over 250 miles long) as of July 4 this year. That's tough to beat.

So's the plug we make for the tracks. They're heat sealed to prevent compression leakage. And we build them with special electrodes, special ceramic insulators.

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Q I intend to install red-cedar paneling (boards) across one end of my basement. The walls are of concrete blocks and the width of the basement is 26 ft. I'm told that I should allow $\frac{1}{2}$ in. at each corner for expansion of the boards as otherwise the pressure may crack the walls at the corner. Is this possible?—P. G., Ind.

A Yes. If the boards are of the tongue-and-groove type and you fit each one tightly as you go along, expansion during long periods of dampness, as in summer, may cause one of two things to happen. Either the board wall will buckle or the blocks may be cracked at one or both corners. Allow at least $\frac{1}{2}$ in. at each end of the board wall as has been suggested and conceal the openings by nailing molding strips directly to the unpaneled side walls, using masonry nails. These strips mask the corner gaps but leave the boards free to expand in back of them.

Q I'm repainting my home and there are a couple of window sashes that stick so tightly I can't move them. These are the upper sashes of two windows on the first floor. Just how does one go about unsticking 'em without damaging the frames or breaking the glass?—N. E., Ga.

A Have you tried forcing a putty-knife blade between the sash frame and the stop all the way around? Usually this will break the paint "seal" and permit the sash to be raised and lowered readily. If this fails, then it usually is best to remove the stops, at least those on each side of the window frame. Begin at the bottom and pry out the stop with a chisel, working carefully so that you don't damage the groove in which the stop is fitted. Clean off all the old paint ridges and drips which caused the sash to stick, paint the sash, replace the stops (if they are still in good condition) and then slide the sash up and down at intervals until the paint sets. This will prevent it from sticking again.

Q I have an older dining table with a veneered top. There are two places where the veneer has loosened, making two small raised patches, or areas, about 3 in.

in diameter, roughly. Both areas are near the center of the top. Is there any way of making a repair?—L. H., Calif.

As a rule veneer blisters such as you describe are quite easily repaired by simply cutting through the veneer across the blister with a very sharp knife or a safety razor blade, one of the type having a single edge. Work carefully to prevent splitting or otherwise damaging the veneer. Once you get it cut through, pry it carefully apart at the cut and force glue under both halves. Then place about three thicknesses of heavy paper over the area and weight until dry. You will need a fairly heavy weight, something weighing at least 25 lbs. After the glue is dry (allow plenty of time) lift off the weight, and remove adhering portions of the paper with a damp cloth. Sand the surface smooth and refinish to match the balance of the top. Treat both blisters in the same manner.

Late last spring I made a new planting of evergreens, all balled specimens. I was told to water these sparingly. Our season has been moderately dry and only lately I've noticed that the needles of some of the larger specimens are slightly rust-colored. Could this be due to a lack of sufficient moisture?—Y. H., Va.

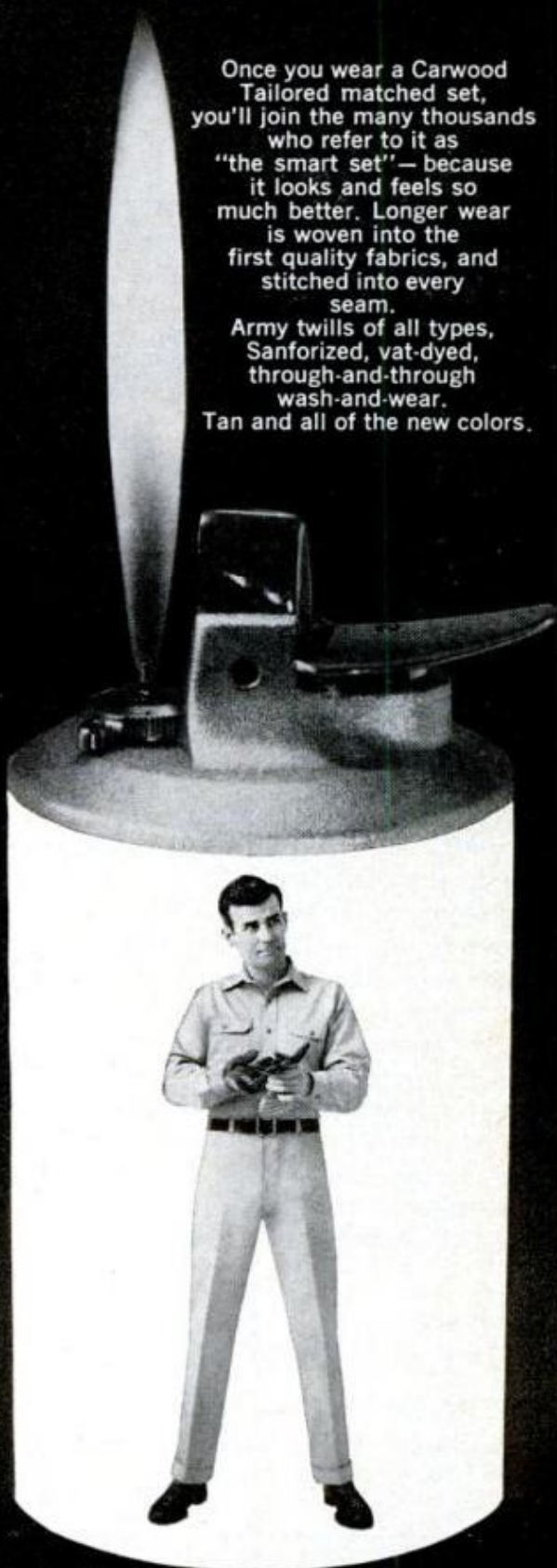
Undoubtedly. In fact, you may be too late with the hose to save your planting, but it may be worth a trial. The ground should be thoroughly soaked immediately and kept wet between rains from now on until it freezes. As we said, you may be too late to save all the planting, but it may be possible to bring through a few of the individuals, which would prove well worth while in even a planting of moderate cost. New plantings of evergreens, as well as most deciduous shrubs, require regular watering between rains during the period of establishment in a new location. Continued watering in the fall is especially important when rainfall is below normal for that particular time of the year. Even old, established plantings of evergreens will winter in better condition if watered regularly up until the time the ground freezes. A further suggestion: Why not look up the friend whose advice you followed and see how *his* plantings are doing? Maybe he prefers brown trees.

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 Clinic Editor for his helpful advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 575 Lexington Ave., New York 22, N.Y.

OCTOBER 1963

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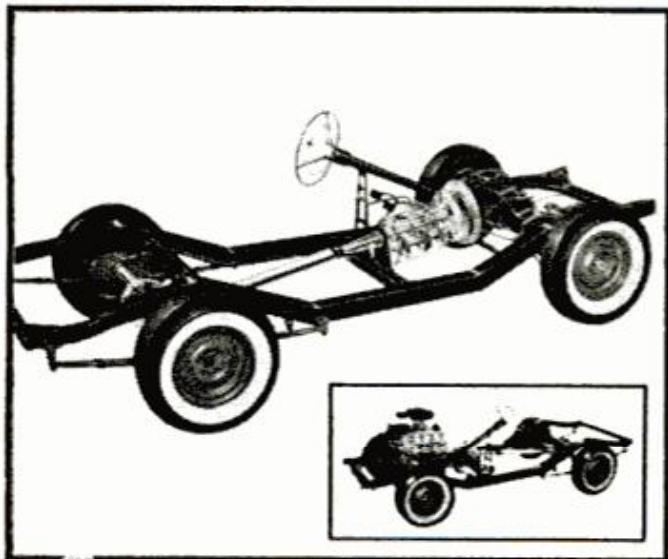


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You probably know the Renwal Visible V-8, the most accurately detailed 1/4 scale automotive engine kit ever produced. Now, Renwal introduces the VISIBLE CHASSIS, over three feet long,

with the same superb engineering that made the Visible V-8 a hobbyist's favorite. Everything works: Shift and watch the gears slide into position. Turn the wheel, and learn how the steering system and suspension operate. No detail was omitted. And thanks to Renwal's famous "Visible" construction, you see the "inside story." The Visible Chassis comes complete with battery driven motor, and parts for installation of the Visible V-8. By itself, the Visible Chassis is an amazingly realistic hobby kit. With the Visible V-8, it's a complete automotive education. **Visible Chassis \$19.95, Visible V-8 \$10.95, Chassis and V-8 Set \$29.95.**

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Copper-Clad Saw Blades

(Continued from page 125)

ity. Build up enough heat—which isn't difficult to do—and you not only harm the blade, you burn the wood.

Von Der Werth's process actually results in a laminated saw blade, one having two layers of metal of relatively high heat conductivity on each side of a conventional saw-blade steel plate. Separating these layers is a thinner heat insulator of metal which has a relatively low-heat conductivity. And finally there is a layer of hard chrome. Total plating is measured in thousandths of an inch and could consist of a layer of copper, a layer of another metal like nickel, a second layer of copper and a layer of chrome.

Torture Testing

In actual practice, Von Der Werth discovered that even a single layer of copper followed by a finish plating of chrome can reap surprising benefits. He has demonstrated this with a 16-in., 18-ga. rip saw, cutting curves in green redwood, deliberately twisting the wood to torture the blade and generally abusing it for long periods of time without any damaging heat build-up.

A conventional combination blade and a hollow-ground blade were plated for use in my shop. Both blades held up remarkably well. Performance of the hollow-ground was especially impressive for it was used on a radial-arm saw where insufficient clearance for a planer blade is always a problem.

By use of Von Der Werth's process, the thickness of circular saws could be substantially reduced, resulting in tremendous savings for lumber processors and manufacturers of wood products. In the home shop, even on blades of conventional gauge, the process would add to sharpness life and would considerably reduce the problem of wood burn. ★ ★ ★

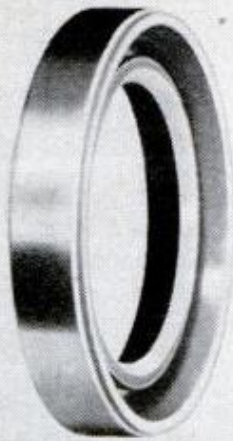
Plastic Shoes for Children

New synthetic shoes that look like leather footwear are said by the manufacturer to be more durable, require no polishing and cost one-third as much.

Molded of polyvinylchloride, the shoes have a flexible, one-piece heel and sole. The shoe uppers have a "breathing" capability but are waterproof, so there's no need for rubbers. Offered in many styles and colors, each pair retails for \$2.99.

They're a product of Arny Industries, Precision Footwear Division, 32 Industrial Ave., Little Ferry, N.J.

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New Quick Loaders

(Continued from page 115)

wide-angle lenses, from 38 mm. to 43 mm.—so they take in more area than a normal lens. The Polaroid 100 with its normal 114-mm. lens gives you a print measuring $2\frac{7}{8}$ inches by $3\frac{3}{4}$ inches. But the significance is that if an Instamatic picture and a Polaroid picture were taken from the same spot, the smaller Instamatic frame would cover a larger field within the picture.

The Instamatics offer four film choices for: Black-and-white prints; color prints; two types for color slides. Polaroid offers only black-and-white prints and color prints. So, for those who want slides, the Instamatics are the only choice. Comparing print prices, the Kodak black-and-white prints will rough out to about 20 cents per print and Polaroid's to about 28 cents per print. Kodak's color prints will cost about 45 cents per print and Polaroid's 60 cents per print. These figures may vary in some areas.

Polaroid prints from the film pack—and each pack carries eight prints—are an improvement over their roll film, if not in quality, at least in convenience. They are pulled from the camera individually, do not have to be torn off the roll and they lay much flatter. Also, each print is developed outside the camera, not inside as with roll film, so the camera is ready for the next shot immediately.

For the fastidious, however, the same messy problem of disposing of the used negatives and tabs is still with us—a problem not found with the Instamatics.

Comparing the Cameras

As for the cameras, again it's grapefruits and bananas.

What are some of the virtues and blemishes of each?

The Kodak series of Instamatics include the 100, 300, 400 and 700 models. The Instamatic 100 is a simple box camera selling for \$16 or less with a fixed lens opening and a shutter set at one speed for natural-light pictures and another for flash pictures. Popping the flash-bulb holder up or down changes the speed, so there is nothing for the photographer to adjust. Like all box cameras, however, the camera must be used under ideal sunlight conditions for best natural-light results; distances to stand for flash pictures are printed on the back of the bulb holder. The camera has a lever that advances the film precisely one frame after each shot, and automatically cocks the shutter for the next.

The Instamatic 300 is almost identical to the 100, but has an electric eye which

adjusts the lens opening for natural-light shots. It can be used under a wider variety of lighting conditions than the 100, automatically compensating for bright-light or dull-light conditions. The price, however, jumps to \$45 or less, depending on the dealer.

The Instamatic 400 is identical to the 300 except that it has a spring-driven film advance instead of a lever. In tests at PM, most of us found it a handy usage for a relatively inexpensive camera (price under \$53). It eliminates cranking the next frame into place—or allows the whole 12-frame cartridge to be shot in almost-instant sequence, each shot about a second apart.

Spring-Driven Advance

The Instamatic 700 resembles the others only in the cartridge-loading feature. It has manual shutter adjustments, 1/60, 1/125 and 1/250 seconds, and an electric eye that adjusts the shutter down as far as 1/30 second for low-light conditions. The eye also adjusts the lens opening for whatever shutter speed is being used. Then, for those photographers who care to, there is an extra provision for cheating the electric eye. By pushing a small dial one way or the other, the picture will be overexposed or underexposed up to one full stop. Shooting against the light, for instance, the photographer may wish to lighten the shadow areas slightly. Finally, the 700 is the only Instamatic that needs to be focused. It has a footage scale on the lens which revolves to focus from three feet to infinity, and an indicator in the viewfinder which marks whether it is focused for closeups, middle distance or landscapes. It is a primitive and imprecise system at best, and it remains a mystery why Kodak put it on the most expensive camera (\$110 or less) in the line.

The Polaroid 100 camera, while the lightest camera Polaroid has ever made, is much bulkier than any of the Instamatics and consequently more awkward to handle. It is also much more expensive, retailing anywhere from about \$130 to \$160, again depending on who you deal with. However, it has some features of its own.

Quick-Loading Pack

The quick-loading film-pack is the first. Open the back, drop the pack in, close the back and pull the leader through. That's it.

It has a range-finder focusing system that is easily one of the most convenient around. The two forefingers, pushing against each other, move the bellows in and out. The convenience is that the hands don't have to move after focusing, because

(Please turn to page 212)

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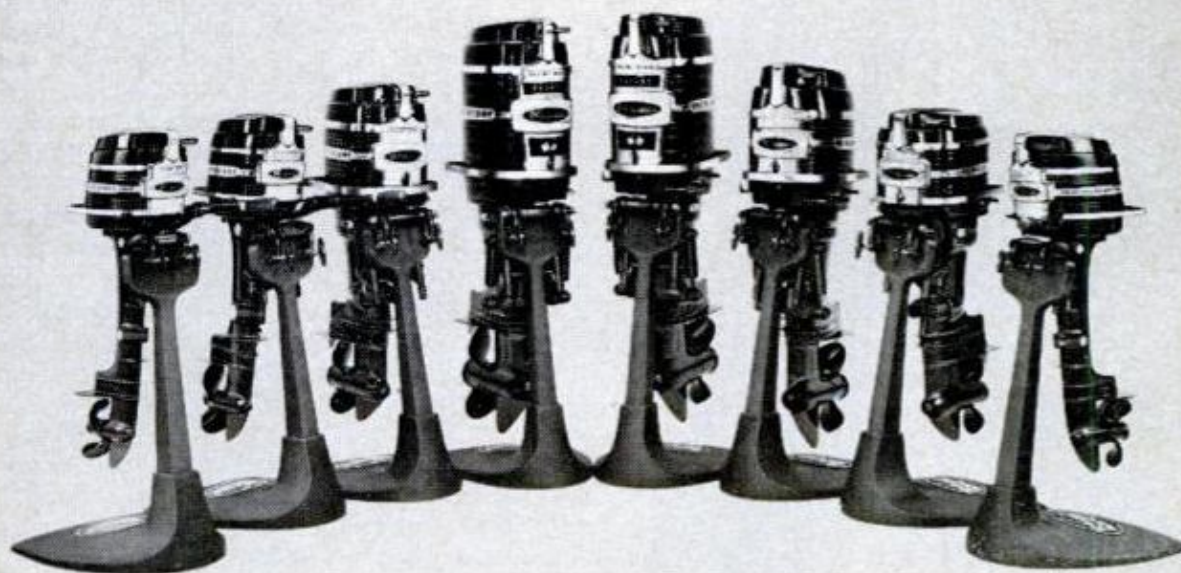
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New Quick Loaders

(Continued from page 208)

the right forefinger can reach up and push the shutter-release button from the same position.

The shutter operates from an electric-eye system which is altogether new and unique in photography. While the traditional electric-eye system usually controls only the size of the lens opening mechanically, the Polaroid electric eye controls only the shutter speed electrically. The lens opening is set manually.

Basically, the system consists of two shutter blades and two electronic circuits. When the shutter is tripped, only one blade is allowed to move, opening the lens and allowing light to reach the negative. The second blade is held back by an electromagnet, part of one of the circuits. Meanwhile, the photo cell—part of the second circuit—is monitoring the light reaching the negative and when enough has gone through, the second circuit shorts out the first circuit, cutting the energy to the electromagnet and releasing the second blade. All this can take place at speeds up to 1/1200th second or, if the light is low enough, the electromagnet can theoretically hold the second blade open for an indefinite period of time.

Candlelight Snapshots

What it means to the average snapshotter is that he can take pictures with the Polaroid 100 by candlelight, by flashlight (even bounce flash), by brilliant sunlight or by any kind of light automatically—almost.

Nearly all electric-eye cameras, are billed as automatic, but it isn't always quite so. There are at least four different ways Polaroid's 100 automatic camera requires manual adjustments to get a perfect picture or, conversely, to goof it up. There is a film-setting dial, which changes the aperture for either the ultrafast black-and-white film or for the medium-speed color film; there is a lighting-condition dial, which also changes the aperture for either bright-light or dull-light conditions; there is a lighten-darken dial which, like the dial on the Instamatic 700, either lightens or darkens a print an extra amount by passing a density filter over the photo cell; and there is the flash-gun plug which must be unplugged when not in use because it also affects the light entering the photo cell. Forget any of them, and your automatic camera will automatically give you a lousy print.

To sum up the differences, the Polaroid 100 gives you almost instant pictures on the spot, while the Instamatics do not.

POPULAR MECHANICS

Earth's Continents Came From Moon, Says Physicist

The earth's continents were once part of the moon, according to a new theory advanced by a Swedish physicist. The moon itself, he says, was then a planet of the sun, some three of four billion years ago.

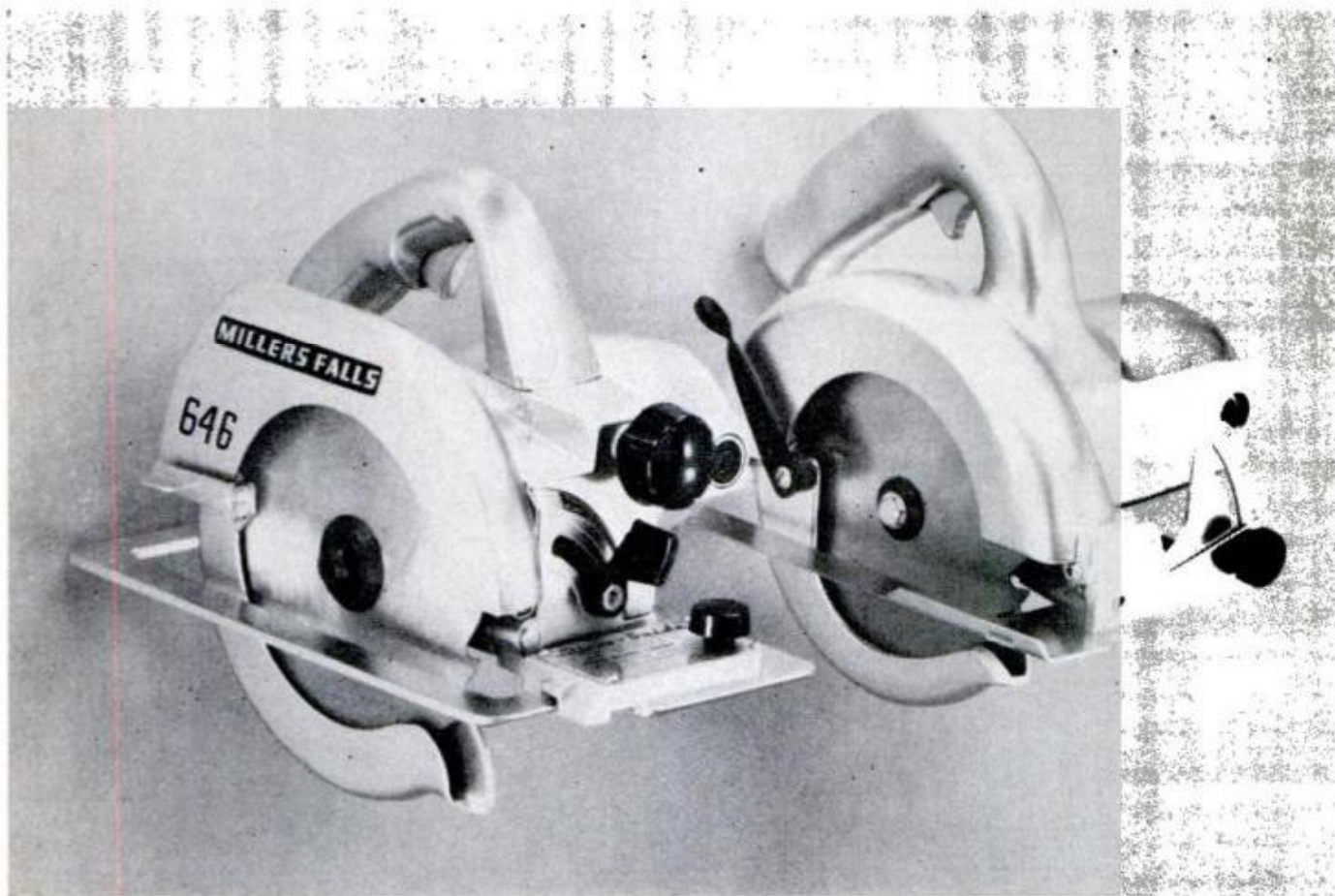
Dr. Hannes Alfvén of the Royal Institute of Technology in Stockholm says that the moon, possibly twice as large as it is now, wandered too close to the earth and was captured by our planet. The two bodies apparently rotated close together in eccentric orbits, in opposite directions to the rotation we know today.

If the theory is correct, the earth must

have been an awesome sight. Giant tidal waves five miles high, caused by the moon's gravitational pull, traveled around the globe every six hours.

But the earth exerted an even greater force on the moon. So great that finally in one cataclysmic burst, the moon broke apart and deposited half of its volume on the earth. The lunar debris ultimately formed the continents.

Before it came apart however, the lunar body was powerful enough to change the earth's movement to the same direction as the moon, Dr. Alfvén theorized.



Which one for you? Clue: one is **LIFETIME GUARANTEED**

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Quack Medical Machines

(Continued from page 111)

chine that flashes a light or gives a mild shock doesn't actually "hurt" a patient, it's true. But by fooling people into thinking they're receiving treatment for serious diseases, the machines do untold damage as the disease continues unchecked.

One woman in Chicago, whose doctors had urged her to submit to surgery for cancer of the breast, instead put her faith in the notorious Drown Radio Therapeutic Instrument and died. Complaints sent FDA agents to California to buy one of these machines for court proceedings.

In Los Angeles federal court, the Drown device didn't lack defenders. The mother of a famous movie star and the president of the Los Angeles Board of Education, whose husband is a chiropractor, both testified for the defense. Their testimony didn't help. The seller received the maximum fine of \$1000.

Machine Destroyed

In the absence of cooperative witnesses, federal officials often seize fake medical devices on such grounds as "inadequate directions for use." One such machine, the Electro-Metabograph, was seized last January in Los Angeles on the complaint of Blue Cross officials. The machine looks like a huge console with rows of knobs and switches and was described by one FDA official as "a cross between a pinball machine and a pipe organ." It sells for \$3500 and, according to the FDA, has been in use for years. Its makers claim the machine measures vibrations in blood samples. One row of knobs indicates a specific disease; another row tells which organ is affected. The machine was destroyed following a consent decree last March. But nobody knows how many more are in use.

Some bogus medical machines are manufactured for use in the home, but the fanciest are for the practitioner's office. The latter can cost a lot more money. The micro-dynamometer, for instance, sells, or did sell, for about \$800; other machines go for as much as \$4000 or more. Most look genuine enough to fool laymen. Some sport impressive rows of switches, panels of lights, control knobs and electrodes.

Often, the machines are said to give off emanations "unknown to science"; with others, quacks pretend to probe the patients' blood, saliva or urine for non-existent diseases; some contain ordinary tap water in the guise of an "unknown force" and others dispense "treatments" in the form of tape-recorded music. Some devices are said to measure electrical frequencies coming from diseased areas of the body—

frequencies that do not exist. A few "treat" patients with noxious gases.

For many years, electricity was one of the prime agents exploited by quacks. Patients were, and still are, given mild shocks by impressive-looking machines as "treatments" for an astonishing assortment of diseases.

But quacks like to keep up with the times, and they're fully in step with the Atomic Age. Bogus radiation machines, uranium mittens for arthritics and "atomic" devices are reaping a rich harvest for their inventors. Generators of magnetism, radio waves, ozone, chlorine, light rays and "unknown" waves are among the devices quacks use to fleece the innocent.

The most recent vogue among bogus practitioners are vibrator machines. In a variety of different forms, these massage, shake-up and man-handle patients for all manner of real and imaginary ailments.

The number of diseases such machines are said to diagnose and treat is not by any means limited to the number of ills that actually afflict mankind. Many diseases that exist only in a quack's imagination are regularly treated and at stiff fees.

The manufacturer of the micro-dynamometer claimed that this fraudulent machine could diagnose and treat such diseases as cancer, tuberculosis, anemia, arthritis, heart disease, insanity, rheumatism, kidney ailments, drug addiction, ulcers, infantile paralysis, tooth infections and many others.

Simple to Use

In use, the machine is simple. Two probes are placed on the pained area of the body and a weak electric current passed through from one electrode to the other. Practitioners claim to be able to record the patient's symptoms and the indicated cure from a calibrated meter on top of the machine.

"The micro-dynamometer is a peril to public health," says FDA Commissioner George P. Larrick. "Thousands of persons are being hoodwinked by its use into believing they have diseases they do not have. And they fail to get proper treatment for diseases they do have." About all the machine can actually accomplish, says Commissioner Larrick, is to measure the amount of moisture on the skin.

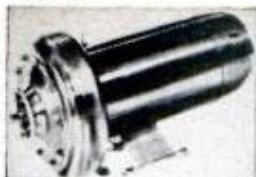
In one test conducted by the FDA, the machine indicated that a corpse was in first-rate health!

The people who are taken in by quacks are either naive, or desperate enough to grasp at any straw. "Many are ill and are in no position to maintain a healthy scepticism," says quack expert Oliver Field,

(Please turn to page 220)

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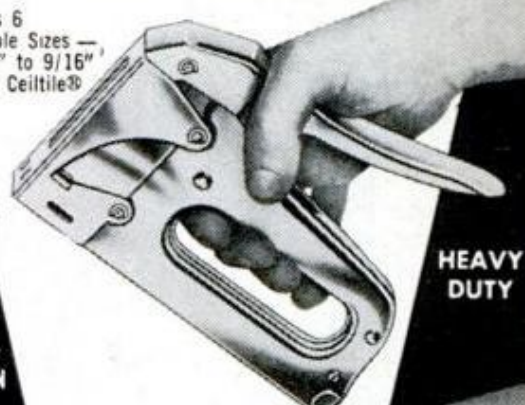


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Quack Medical Machines

(Continued from page 218)

Director of Investigations for the AMA.

Heid answers some 5000 inquiries a year about quackery and makes some 70 trips across the country each year to tell radio, television and other audiences how to spot medical fakes.

Neither the FDA or the AMA are sure just how many different kinds of quack machines are actually in use. The number is at least several dozen. Many are manufactured by the thousands.

Typical Machines

While the FDA has succeeded in getting certain devices condemned through court proceedings, the agency believes that many or all of these contraptions are still in use, some by practitioners alone, others by patients in the home. Here are the names and descriptions of typical fraudulent machines:

- **Plasmatic Therapy Device.** Housed in a metal cabinet, this machine has a control panel containing lead-in wires, a timer dial, a double-throw switch, a transformer and other electrical connections. It is used to give fake treatments for arthritis, diabetes, cardiac conditions, epilepsy, multiple sclerosis, poliomyelitis and 37 other diseases and conditions.

- **Ferguson's Zerret Applicator.** Thousands of Midwesterners have invested \$50 in this plastic dumbbell-like gadget. It contains a glass tube of "Zerret water," which is supposed to produce the "Z-ray, a force unknown to science." Buyers were told that it could expand the atoms of the body and cure all diseases. Chemists testified that Zerret water has the same composition as Chicago faucet water.

- **Oscilloclast and Oscillotron Devices.** These gadgets are short-wave transmitters said to be "beneficial" in the treatment of anthrax, coronary thrombosis, hemiplegia, infantile paralysis, nervous breakdown, tuberculosis, malignancy and 180 other diseases or conditions.

- **Theraphone.** One of the familiar vibrator instruments, this device is said to produce sound waves of various frequencies. Quacks claim it can benefit sufferers of arteriosclerosis, arthritis, rheumatism, sciatica, bursitis, all ailments of an inflammatory or circulatory nature and 22 other conditions.

- **Holder's Electronic-Oscillating Condensator.** An electronic, high-voltage oscillator with glass electrode applicators, quacks pretend it will locate toxic conditions in the body and treat anemia, arthritis, multiple sclerosis, influenza, paralysis and all other body ailments.

- **The Neuromicrometer.** An ohmmeter that measures electrical resistances, this instrument is claimed to diagnose lung ailments, cancer, circulatory disorders, spinal or pelvic conditions and 30 other diseases or ailments.

- **The Sonus Film-O-Sonic.** The electrical output from taped music in this box-type cabinet is supposed to diagnose and treat cancer, cataracts, ulcers, germ diseases and all other pathologic conditions of the body.

- **Radioclast, Model 40 and Model P.** Its users claim to diagnose and treat diseases of the brain, spinal cord, lungs, heart, bones, eyes and numerous others. One model is a console desk-type electronic instrument; the other is a similar, but portable, device.

- **Neurolinometer.** This device consists of a mono-polar electrode, a single-stage amplifier and a power supply; quacks use it to "measure nerve interferences" and thereby claim to diagnose any abnormal functions of the body.

- **Drown Radio Therapeutic Instrument.** A closed-box device, similar in appearance to a radio set, it is supposed to diagnose, prevent and treat a wide range of ills, including cancer, kidney and bladder complications, brain conditions and heart trouble; it also is said to measure body functions such as blood pressure and temperature and make blood counts and urinalyses.

Remote Treatments

Patients can even be "tuned into" this machine in their absence. This sleight-of-hand is accomplished by keeping a drop of the patient's blood on a blotter in the practitioner's office file. Whenever a treatment is needed, quacks claim, the blotter is placed in the machine and pathologic conditions are thus "treated."

Being publicly exposed as worthless doesn't seem to hurt a fake machine's standing with the public. The Drown Radio Therapeutic Instrument was conclusively shown to be fraudulent in tests at the University of Chicago more than 10 years ago. But, according to the FDA, it is still being used to cheat the sick.

The tests were described in the *Journal of the American Medical Association* in March, 1941. A group of prominent Chicago citizens, taken in by claims made for the machine, persuaded the university to set up a committee of scientists to evaluate its performance.

The operator was given blood specimens from 10 humans and 10 laboratory dogs to analyze. The tests were suspended after the first three analyses were shown to be

(Please turn to page 222)



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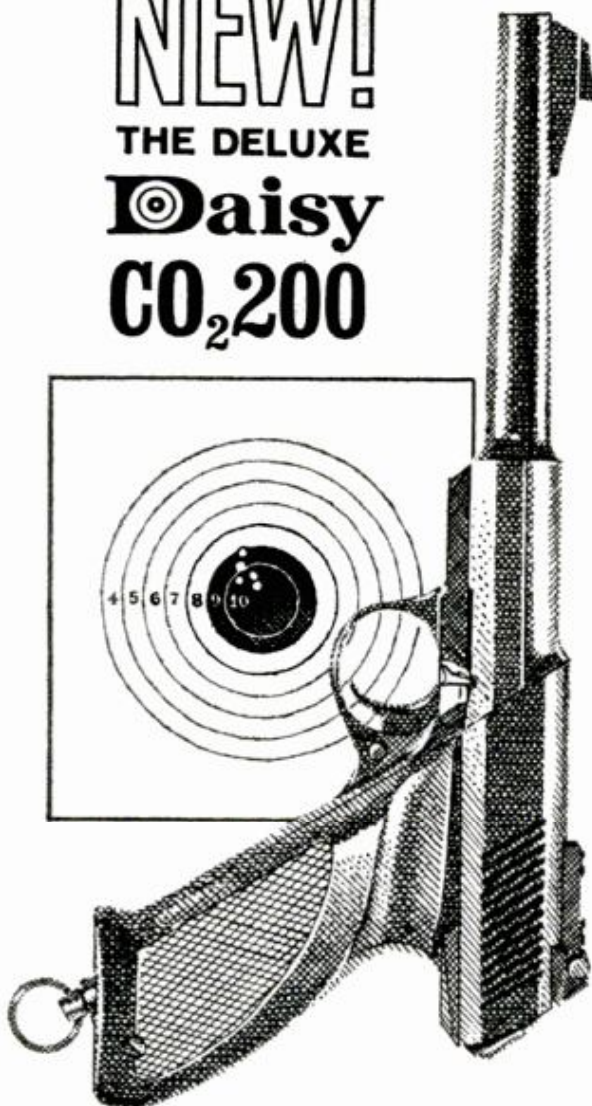
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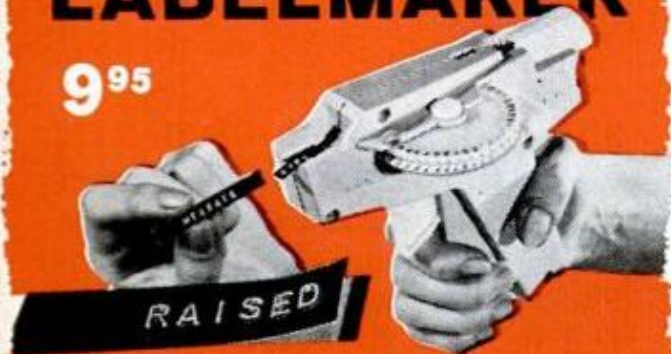
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Quack Medical Machines

(Continued from page 220)

ludicrously false. In one case, the machine indicated that the patient had "a type IV cancer of the left breast with spread to ovaries, uterus, pancreas, gall-bladder, spleen and kidney," among other things. The patient was actually suffering from tuberculosis.

In another test case, a completely healthy young man was said to have "an ischiorectal abscess, serious trouble with prostate, probably carcinoma with spread to urethra, pelvic bones, and with loss or at any rate nonfunction of the left testicle."

In the third instance, the machine really went haywire and discovered a new type of human being; the test subject was found to have "a normal function not only of the uterus but also of the prostate."

Probably the most far-fetched medical "machines" are abandoned uranium mines. Promoters charge arthritis and rheumatic patients \$2 per hour or more to sit in the mine tunnels and "absorb radiation" from the surrounding earth.

Few Check Claims

Despite the continuing efforts on the part of the medical profession, few people take the trouble to check with their local medical society or the FDA on the outrageous claims made for so called "diagnostic" and "therapeutic" machines. The really incurable malady seems to be human gullibility itself.

The battle against quacks is as old as the republic. And their appeal has never been limited to the uneducated. Even the Father of His Country once fell for a quack's promises. Washington was advised to—and did—buy a finger ring of iron for Patsy Custis, his ward, to "draw out the poisons" causing her "fits." George did observe, though, that the ring seemed a "doubtful remedy."

In 1796, a New England doctor, Elisha Perkins, introduced healing devices which he called metallic tractors. The gadgets were probably among the first to exploit a then new phenomenon, electricity. Sold in pairs, metallic tractors were three-inch-long bronze-and-iron rods which gave a mild shock when touched.

Perkins claimed that patients could extract diseases by stroking the affected parts of their bodies, first with one tractor, then the other.

The Connecticut Medical Society threw Perkins out but the public took to the tractors with enthusiasm.

Quacks have prospered in this country ever since. ★★★

I Flew with TAC's Top Gun

(Continued from page 122)

two-seat version, while Tofferi made a few appropriate and tasteless remarks about how to bail out in case the plane blew up. Soon we were taxiing out.

Takeoff in an F-104 is like accelerating a dragster, only at the end of the roll you're off the ground and climbing at a weird angle. It's hard to believe, because the wings, stubby to begin with, are far behind the cockpit and almost impossible to see. But the altimeter told me we were heading up fast. Tofferi took it to 11,000 feet within a few seconds, leveled off and headed for the California desert where the boys from George practice gunnery.

Dive-Bombing Run

"We'll try a dive-bomb run first," he said, as he launched into his lecture. "We'd normally carry two 750-lb. bombs and use them against semifixed or fixed targets such as command posts, bridges or railroad yards. We pick up enough speed in the dive, so I'll idle back, put out the speed brakes and roll over into the 45-degree bombing run. See the targets?"

He pointed out some fly specks on the ground that I assumed were bull's-eyes.

How he lines up the target can't be seen from the rear cockpit. His gun sight, a round circle (reticle) with a dot (pipper) in the middle, is projected onto his front windshield. He gave me a running account.

"I'm rolling over now and when I straighten up I'll put the reticle over the target, then try to put the pipper dead center and keep it there. When the altitude is right—bombs away! If we have to figure on wind drift, we make slight adjustments depending on wind direction."

It sounded easy, but I knew it wasn't. The plane dropped like a bullet, and kept dropping for what seemed an interminable time. Finally, too close to the ground for me, he racked it back into a climbing turn and I felt like some gorilla was jamming me through the bottom of the cockpit. My jaw sagged, my eyesight went grey and that suit bit into my intestines.

Ignoring my slight indisposition, he went on amiably, "We fire the rocket pods, either one at a time or both together, from the same kind of a run, except that we start lower—from about 3000 feet. There are 19 rockets in each pod and the individual rockets go off a millisecond apart, so we get a spray effect. The targets would be semifixed or moving—bunkers, tanks and the like. Here we go again!"

He rolled into another dive and I achieved another mild black out when he racked it back. Going at better than 600

m.p.h., even a slight nudge on the control stick jumps up the G-forces. Climbing turns are real back-breakers.

It didn't bother the school teacher, however, and he plunged into the next lesson. "Strafing's next," he said laconically.

The cannon, which I had examined before the flight, is the only armament built into the 104. Missiles are carried on the wingtips; bombs and rocket pods from beneath the wings. The cannon, which shoots 20-mm. shells that explode on impact, is therefore ready on all missions. The 104 could conceivably fire missiles from the wing tips, or drop bombs or fire rockets from beneath the wings, and still come back and strafe with the cannon—all on the same deadly mission.

The cannon has six barrels which revolve like an old-fashioned Gatling gun and fire at a rate of 6000 rounds per minute. Each barrel is slightly offset from the others, so they spray the target with shells instead of all firing at the same point.

"Targets on a strafing run are usually smaller than for rockets—small vehicles, troops, parked aircraft," Tofferi said.

He pointed out another fly speck on the ground, dipped the nose toward it and started down at a slight angle from about 2000 feet. Although the angle was much less, the ground was much closer than on bombing runs and I got the impression he was trying to ram the nose boom through the target. He swished over it at better than 500 m.p.h. at what he said was 100 feet of altitude but, looking back, I could see the cloud of dust stirred up by the jet.

At Treetop Level

On strafing runs, he explained, he keeps the pipper right on the target all the way in. But about this point I began to understand why the Air Force puts so much emphasis on depth perception for pilots. Flying down to treetop level at close to the speed of sound, and keeping his eye on the target and his finger on the trigger—and, in combat, worrying about anti-aircraft fire—a pilot must depend on instinct to tell him when to pull up. The best, like Tofferi, wait until the last split second. There are plenty of tales about World War II pilots who came back with tree branches and telephone wires in the wings because they became too absorbed in their work.

If I had thought 100 feet was low, the straight-and-level runs cut it in half.

"We come in at better than 500 m.p.h. on conventional runs," he said, "and push it up to about 700 m.p.h. for nuclear runs."

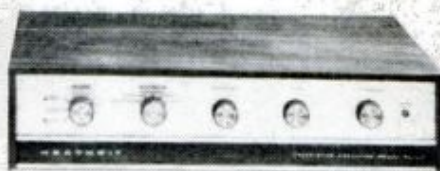
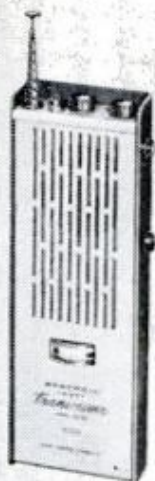
Well, as we went skimming over the desert floor at 50 cotton-pickin' feet—about the level of a theater marquee—he

(Please turn to page 228)



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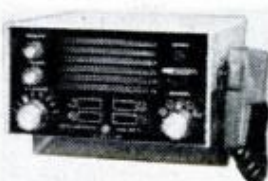


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I Flew with TAC's Top Gun

(Continued from page 224)

pointed out some more fly specks to hell and gone across the arid valley. All I saw was the shimmering heat rising from the desert floor.

"For skip-bombing," the school teacher continued, "we'd use bombs with delayed-action fuses, perhaps fragmentation bombs depending on the target. We'd try to bounce them into a tunnel or up against a bunker on a hillside.

"Straight-and-level aiming is different than on an angled attack. We have to drop ahead of the target. I'll keep the reticle below the target, and when its top hits the target I'll let go." A pause, then, "Steady, now—voom!"

I still hadn't seen the target—oops there it went! Swish!

Tofferi racked around for another go and, when I recovered from my umpteenth grey-out, I picked up his lecture.

"... with napalm, we'd drop the bomb short of the target—and the targets are usually something with motion involved, tanks or troops—and just let the goop hit and roll over them. It's real nasty stuff.

"I'll keep the reticle on a line with the target, but use the nose boom for reference. When the target hits the nose of the plane at the base of the boom, I let go. Ready, now—bombs away!"

Again, a slight delay before the target swished past below us, and this time I could imagine those sticky flames rolling over everything like high-speed lava.

Finally the Nuclear Run

Last was the nuclear run.

It came as something of a surprise when I first heard they were simulating atomic-bomb runs from 50 feet, but the techniques give it considerable accuracy.

"We come in pretty fast on these runs, about as fast as you can go without breaking the sound barrier," Tofferi explained, "but it isn't the blast we're worried about. It's radiation. We're well away from the blast by the time it hits.

"Now, the bomb is larger than a conventional bomb, but it includes a parachute. For each target—and we use these only on the biggest targets—perhaps an air base or a large railroad switching yard—we pick a geographical point some miles away. The boys in Intelligence figure these out for us. Knowing the distance, we come in at a predetermined speed and, when we hit that pre-picked point, we pull up at a specific angle. After a predetermined delay, we let the bomb go, roll over on our back, pull the nose back toward the deck, gun the engine, straighten up and get the

hell out of there. The parachute slows the bomb down and, if we've done it right, it will arch over into the center of the target and make a nice little mushroom cloud."

Again, it all sounded so simple and it even looked simple when Tofferi simulated one for me. You can't help but admire the skill of a man who can handle an instrument like the *Starfighter* with such precision, especially when he hits the top of the lift up, rolls over and starts back for the deck—at 700 m.p.h. on his back.

The F-104 is a supersonic aircraft, but the ground maneuvers are performed subsonically, because there is more precision at these speeds and no real necessity for the extra "go." The supersonic speeds are primarily for interception, and Tofferi offered to demonstrate one. He called ground control for the locations of aircraft, found two flying together and headed for them.

Would Use Sidewinders

"We'd be using *Sidewinder* missiles here," he said. "They have a heat-seeking device in the nose, and we can monitor what it sees in the cockpit. We line up the target in the reticle and, when the missile picks up the scent, we wait for its signals to reach a peak, then send it on its way. This usually happens from about one to three miles from the target. If we've done it right, it will fly right up the tailpipe."

He spotted the pair of planes we were tracking and, because they knew we were coming, turned into us, cutting down the range. Since the 104 is one of the fastest and most maneuverable aircraft, the best way to avoid it is straight ahead and hope it runs low on fuel before it catches up. Otherwise, a slower aircraft might try to outmaneuver the *Starfighter* and make it miss with its missiles, reducing the odds.

He let me fly it awhile on the way back to George, then completed the flight with a neat pattern and smooth touchdown. When I climbed out, my flight suit was soaked with perspiration, but Tofferi was still the cool gunman.

I spent another day at George, soaking up the atmosphere of the flight line, and was impressed with the computerlike precision of the activities. Every mission gets off and running with a minimum of fuss. Aborts require a good explanation.

TAC, and Tofferi is its best example, is a lean outfit. And, with "little wars" becoming more popular, the pilots seem real "gung-ho" about their role. At the coffee bar, I asked one of them whether, if a war should come, he'd want to get in on it.

"Hell, man, I'd be sick if I didn't. That's what we're here for."

TAC is here, and if Tofferi and the others are examples, it's ready. ★★

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Storm-and-Screen Combinations

(Continued from page 137)

• What is meant by "track" and "channel"?

The sketches on page 137 illustrate this, insofar as mechanics go. There are complications, however, some of which mitigate slightly in favor of one over the other. All have to do with operating the windows. Find out these things:

1. Is it easy to remove panels for washing? With some track designs this is more difficult than with some channel designs.

2. Does the window have a "tilt-out feature," that permits the top of the unit to come loose (or its whole channel may pivot forward) for washing the outside?

3. Is the design such that a panel you raise to the top must be held with one hand while you insert another with the other hand? Such engineering may result in the raised panel crashing down.

• How are storm-and-screen units installed?

Either of two ways—flanged or "blind stop." (Drawings, page 136.)

In the former, the combination unit is made slightly smaller than the window opening to permit an easy fit. A flange on the top and both sides covers the resulting gap between the unit and the window frame. In the latter, the combination fits inside the opening and sits against the blind stop—just like a conventional storm window or screen. In both installations, the units are fastened with stainless-steel or hardened-aluminum screws. Ordinary steel screws will rust out almost immediately, due to galvanic action.

Both methods work, so there's little to recommend one over the other. However, flanged units are more conspicuous.

• How much caulking is needed?

Some manufacturers recommend caulking across the top of each unit, and about six inches down both sides. Much more than that and you'll impair the breathing needed to prevent moisture accumulation.

• Can you install combination units yourself?

Of course. But it's not easy. Get an installed price first, then a price for self-installation. And be sure the difference is worth the trouble. Much of the job involves work that has to be done by the fabricator anyway.

Here's what is done for metal units:

1. Crews come to your house, measure each window, key and code them all.

2. Shop crews cut the units to accommodate the nearest size of standard inserts. (Sometimes custom-size inserts have to be made.)

3. The combinations are loose-assembled and shipped to your house.

4. Back at your house, the units are

matched to the keyed and coded windows. Adjustments are made for lack of plumb, measuring errors, etc., after which the loose assembly is locked tight.

5. Units go into place.

Installing wood windows is not simple either. They're generally made for blind-stopping. And, even if they're designed specifically for the windows on your house, trimming and fitting still might be required. If you do it, you could easily trim away some vital part.

• What about painting and maintenance?

Many homeowners like to paint aluminum combinations immediately, as they feel the exposed metal looks gauche on a house. If you're so inclined, wash off all oil and dirt smears left by the workmen, and coat with a good alkyd or zinc-chromate primer. Then finish to match the trim. If you buy one of the prepainted or preprimed units now appearing on the market, the job is simpler. Primed units (most steel units come this way) are merely washed and painted to match the trim, while painted units, if they closely match your trim, can be merely washed.

If you prefer the exposed aluminum finish, most manufacturers recommend a yearly treatment with a liquid wax.

Finishing wood units is no different from painting any other wood. They come either clear or primed and usually have been treated with a wood preservative.

• How hard are combinations to wash?

Some sort of provision for washing the outside glass easily is important, or you may find yourself up a ladder two or three times a year.

In all the better styles and brands, the inserts come out for washing or repair. Removal is achieved by means of simple sliding pins or equivalent. Some styles have the track or channel pivoted at the bottom. To wash, you release the top, tilt the window in and wash the outside.

• What is the minimum "safe" price to pay?

Responsible members of the industry say that about \$20 per average window is the lowest price at which a good window can be sold. Single-trackers may sell for less. Some doubles may. But be sure their quality has not been sacrificed, and that the installation is up to standard.

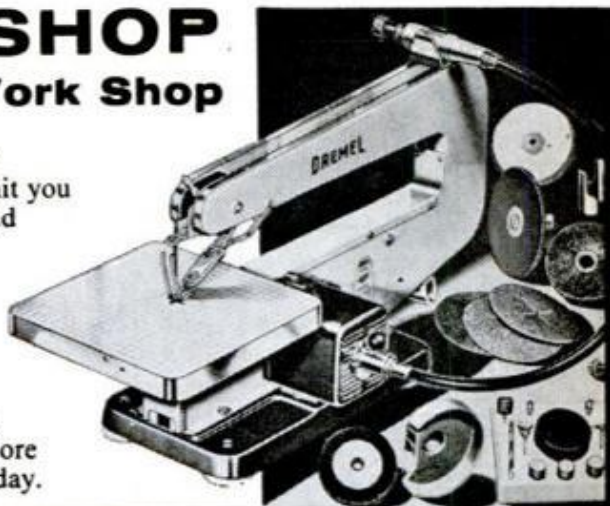
• How can you tell if the dealer is reliable?

This point no longer applies as it once did. Combination dealers are settling down to quiet respectability. One good rule of thumb, however, is to avoid "brokers" or firms who have no visible assets or permanent place of business. A five-year guarantee (about average for most brands) is worthless if the dealer who made it can't be found next spring. ★★★

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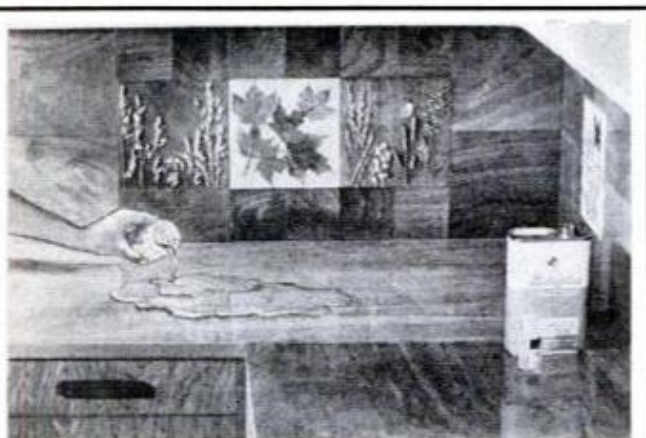
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Plastic Planks

(Continued from page 133)

Thin cores faced with many layers of fiberglass often weigh as much as pieces of lumber the same size, and in some cases, even more.

"To build a big planing cruiser designed to pack a couple of heavyweight engines," explains Weir, "you need lots of buoyancy—plastic planks with thick foam cores."

"But," he adds, "for a cabin in the mountains you need just enough insulation to keep out summer's heat and winter's cold. You can do this with thin-skinned plastic boards which aren't much thicker than ordinary clapboards."

Weir's plastic planks are now going into boats, structural beams (some spanning 18 feet and weighing only half as much as their wood equivalents), refrigerated truck bodies, patio roofs, camper tops and radiant room dividers.

Radiant Room Dividers

The room dividers have built-in resistant wiring, much like a toaster's. These fireproof panels—which retain their structural strength at temperatures well above 400 deg. F—will heat, insulate and decorate, as well. Though Weir isn't ready to market them yet, he's already built prototype panels using 2.72-ohm-per-foot Nichrome-alloy resistance wire bonded to the underside of the fiberglass facing. Plug the panel into any convenient outlet and it radiates warmth. When warm weather comes, the same panel will insulate.

Already a number of vacation cabin and house-boat builders are considering substituting Weir's plastic lumber for nature's product. They envisage plastic-walled cabins with built-in heating and year-around insulation.

As patio roofing, the panels can be made plywood-thin, yet they will protect porch or patio from solar heat.

Radar Enclosure

Jet Propulsion Laboratory, a prime space contractor, recently ordered a mobile radar enclosure made from plastic planks. The unit's dome is light enough to be retractable, yet its foam insulation keeps the air-conditioned interior cool when the roof is closed.

When built of self-insulated plastic planks, the cold compartments of refrigerated trucks or trailers need no other structural supports. This pares a quarter of a ton or more from truck weight—a saving that goes to increase the payload.

The secret of Weir's remarkable lumber is his core-making machine which wraps the panel's pre-cut urethane cores in a

kind of basket weave of fiberglass roving. The machine consists of eight or more bobbins of fiberglass twine mounted on rotating platens surrounding an orifice through which lengths of urethane feed at upwards of 40 feet per minute. The bobbins rotate, automatically wrapping the urethane with glass twine, which has a tensile strength of about 200,000 p.s.i. The spirally wound fiberglass jacket resembles the woven-wire shielding on electric cable.

Curing the Planks

When it leaves the roving machine, the fiberglass-jacketed urethane is dunked into a tank of polyester resin to bond the fiberglass to the urethane. After a few hours of air drying, the still-tacky core begins to stiffen, though it's still flexible enough to be shaped to a boat's hull mold or other curved forms. Once fully cured, however, it is less flexible than wooden planking. Ideally, plastic planks should be worked and shaped before curing.

To form plastic sheets or panels, batten-like resin-treated cores are stacked one atop the other, bonded with slow-curing polyester resin and faced with fiberglass.

To make structural shapes (arches, curved beams, etc.), the core material is bent and cut to fit over a contoured mold, then faced with fiberglass.

Unsinkable Boats

In boat building, the planks are "laid up" in a hull mold or shaped over a frame that takes most of the work out of assembly. A plastic-planked hull can be built in less than 8 hours, start to finish. From the outside it looks like conventional fiberglass, but the inside resembles a fancy job of cross-stitching.

Weir is building super-buoyant Lightning-class sailboat hulls that weigh only 205 lbs. Finished hulls are fitted out by Carl Eichenlaub, a plastic plank enthusiast and one of the world's top Lightning skippers (1960 International Lightning champion and 1962 runner-up).

Weir fabricates the hull from the outside inward. First, the fiberglass skin is laid in the female mold, which has been waxed with polyvinyl alcohol and sprayed with a 20 to 30-mil-thick gel coat. He then wheels the entire mold into a "hot room" (about 160-deg. F) to quick-cure the skin in about 30 minutes. Next, a syntactic foam is troweled on the inside surface, and the plastic planks are stacked one atop another, bedded in the resin foam. Another layer of foam and the inner skin complete the hull, after which it goes back to the hot room for final curing.

In the Lightning, Weir uses 1 x 1 3/4-inch

(Please turn to page 235)

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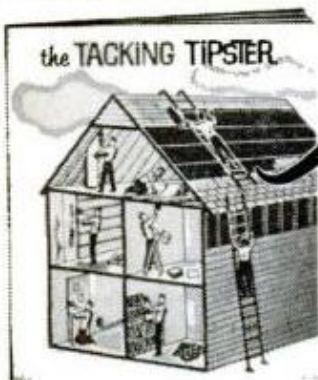


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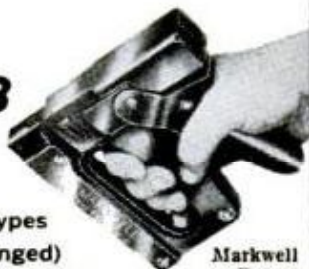
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Plastic Planks

(Continued from page 232)

glass-wrapped urethane planks, stacking them to form a 1-inch-thick core. Weir uses both polyester resin and epoxy, but prefers the polyester resin because of its longer curing time. It gives him more time to bend and form the planks to the mold.

Where to Buy It

You can buy the fibreglas-jacketed polyurethane cores, either resin-dipped or untreated, direct from the manufacturer: Martin Weir & Co., 3800 Hicock St., San Diego, Calif. Face it with fibreglas mat or cloth, bond with polyester resin or epoxy and you've got plastic lumber.

Cost is approximately the same as that of regular lumber, but depends on plank dimensions and the complexity of the glass roving. For example, you may want your planks jacketed with as many as 40 fibreglas rovings, the limit of Weir's present plank-making machine.

Also, keep in mind the one disadvantage of the product: It's difficult to saw or shape a resin-cured plank. If you want a finished 2 x 4 precisely 20½ inches long, better order that length. Otherwise, order an uncured 2x4, cut it to length and cure it. ★ ★ ★

Zone Heating for Your Home

(Continued from page 177)

There are two general methods of zoning a hydronic system. The most common uses only one circulator, with hot water being supplied by the boiler through a common pipe. The hot-water flow is then divided to supply the different zones, with the flow to each one being controlled by zone valves installed near the branching point. After flowing through the radiators, the hot water from the different zones is fed back into a common pipe.

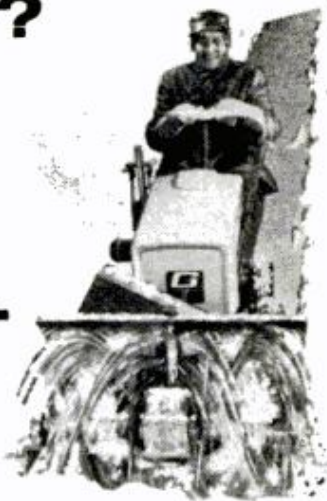
The second method substitutes circulators for zone valves, and uses a separate hot-water pipe to supply each zone. After flowing through the radiators and back through the zone circulator, the water returns to the boiler through a common pipe.

According to most heating men, the single-circulator method is preferable, since zone valves require less power and generate less noise than circulators. Prices are fairly close together. A zone valve sells for about \$30, while a circulator with accompanying flow valve to stop the flow of hot water is priced at around \$50. Thus, converting your present system to a two-zone system would require either two zone valves (\$60) or an additional circulator (\$50). Thermostats range all the way from \$10 to \$40 for the most complex type. ★ ★ ★

OCTOBER 1963

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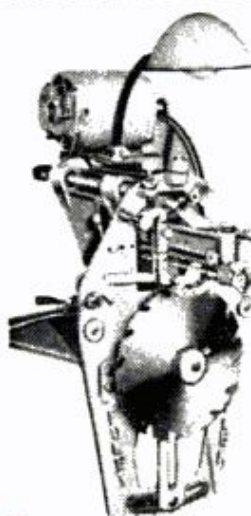
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Outboards for '64

(Continued from page 105)

are a few highlights of what's available:

EVINRUDE. Four new motors for next season—the 90, 60 and 9½ models shown here, plus a little 3-hp. Yachtwin which harnesses the old 3-hp. powerhead to a right-angle drive with lower gear ratio and three-blade power prop for extra thrust. It has an integral fuel tank and comes in three shaft lengths: standard

gines. (McCulloch also makes engines for karts, chain saws, drone target planes and portable arc welders.) In addition to the new 9½, McCulloch's '64 line of standard motors will consist of 75, 50, 28, 14, 7½ and 3½-hp. models. It will continue to offer 14 and 45-hp. work motors (larger gear box, longer shaft, power prop) and two hot competition motors based on the 75-hp. design (available on special order).

MERCURY. With 100 and 65-hp. motors in the lineup last year, Mercury was already

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The '64 Cars

(Continued from page 103)

has lots of zing and takes you up into the high sixties before the power drops off.

The heavy Hurst Campbell shift linkage takes a bit of getting used to after the short light touch of the Corvette, for example, but once you get onto it, shifting speeds up nicely.

Unfortunately, there's no V8 for the Valiant or Dart this year. Chrysler Corporation wisely resisted the temptation to ruin the handling of these compacts by putting in a heavy Plymouth V8 engine.

PLYMOUTH AND BIG DODGE

If you want real drag-strip "go," you have to move into the Dodge and Plymouth lines, where, of course, you can get the new transmission with a whole flock of V8s up to the big 426-cubic-inch jobs.

We're not sure whether or not it was the power of suggestion, but we felt that the increase of 2½ inches in the rear tread of the Dodge and Plymouth had a steadying effect in eliminating cornering roll.

Styling changes on Plymouth and Dodge are obvious—a move to the well-rounded squarishness common to GM and other cars of the past several years—call it brick ice cream beginning to melt around the edges, if you will.

But not all the 1964 changes are cosmetic. On both Dodge and Plymouth, the windshield has less slope, moving the top of its frame further from the driver's hat and keeping more glare out of his face.

To improve vision for the short-statured, the cowl has been lowered and the hood flattened out. Although you can't see it right away, roofs have been changed to provide more headroom and to clean up the sunbonnet effect around the rear window of the car.

The new two-door hardtop's roof treatment is tricky. Although it gives the illusion of a fast back, the sheet metal of the roof cantilevers out over the glass to provide more shade for the necks and more space for the heads of rear seat passengers.

RAMBLER AMERICAN AND CLASSIC

The new American is much changed in size, styling and road personality for 1964. Wheelbase has been stretched half a foot and the interior of the body has been widened and lengthened to a point where the passenger package is almost equal to the 112-inch wheelbase Classic. In fact, both the Classic and the American share the same side doors and door frames.

The '64 American's drastic styling changes have transformed it from an ugly duckling into a real rival to the Rambler

Classic as well as most other compacts.

The American now has good legroom and good entry and exit in front and rear. With all the increases in livability, the increase in over-all length is only a little over four inches and the American still remains the shortest of the domestic compact cars.

Rear springs have been lengthened and rear tread widened. The American now shares low friction ball-joint front suspension with the Rambler Classic.

With this low-friction set-up, the short wheelbase, and a weight increase of less than 100 pounds, you can snap the '64 American around short corners without too much sway or bob. Nor does it bounce much on rough surfaces.

We pushed the two-door American with 90-horsepower engine up into the 70s, and found that there was no choppiness or wallowing. The 90-horsepower engine does a good job with either manual or automatic, but, for a bit extra, the overhead 125-hp. Six should easily tempt the thriftiest.

FORDS AND MERCURYS

Like the Rambler American, Falcon has achieved better ride and road feel without a major chassis change. Falcon still has its 109-inch wheelbase, but the car feels bigger, quieter and less tinny, particularly with the standard engine. The 260-cubic inch V8-engined Falcon we tried on the track gives a totally new performance picture. It takes off like a shot, but some of these big V8s seem almost too hot for a chassis of Falcon's general design. Comet, too, now has a hot option, the 289-cubic inch V8 power plant that is the standard V8 for Ford's Galaxie.

Positive traction differential, available this year on smaller Ford products, is definitely worthwhile, particularly on V8-powered models.

The 1964 improvements reported first in *Detroit Listening Post* (p. 34, September PM) have given Falcon that softer ride and big-car stride that would have been the envy of its class when it first came out three years ago. Ford has introduced a new lightweight, three-speed automatic to go with its lightweight, smaller V8s, and eventually with the smaller Sixes where it's badly needed.

This transmission, which will be optional on Fairlanes and larger Fords, is replacing the two-speed automatic which gave you either a 1.82-low range or a 1.00-drive range. The trouble with the old two-speed automatic was that its first ratio was both weak on take-off and inadequate at 45-50 when the engine ran out of revolutions; also, drive range lacked power from there on out. Ford's new three-speed

automatic gives "kick-down" passing power up to 65 m.p.h. and a 1.00 high teamed with a more economical axle ratio.

Comet-Falcon steering wheel diameter is one inch smaller which makes it less of a knee knocker. Suspension is also vastly improved, with thicker rear springs that are half-inch wider and five inches longer, and which now use four instead of five leaves to give softer action.

Although the big Mercury boasts no major body changes for '64, it has had a complete retuning of all the rubber body mounts which determine how much or little harshness is allowed to come up from the chassis suspension into the passenger compartment. Too soft body mounts give the car a rubbery, shuddery feel. If the pucks are too hard, the small, fast vibration of a harsh road surface is drummed into the body.

Finding just the right consistency for each mount takes skill and Mercury pretty well made the grade in this area for '64. The car now has a ride and road personality comparable to the big Pontiac, Oldsmobile or Buick Wildcat, and it's a notch above the ride softness and road feel of the Ford Galaxie.

Mercury's new 40-amp. alternator and an improved choke-control system which eliminates unnecessary fuel-wasting choking are worthwhile '64 improvements.

PONTIAC, OLDSMOBILE, BUICK

The full-size Pontiac's ride for '64 is just as comfortable as that of Chevrolet Impala, just as free of judder, pitch and hop. It's also steadier on the road, more solid, with less dip, wallow and feeling of control softness. Short of total redesign on sports car principles, it would be hard to think of ways to improve the general road behavior of the larger Pontiacs, or, for that matter, of the larger Oldsmobiles.

The big Buicks still seem a little heavy in the front end, but general action in cornering at speed is good. There's understeer, of course, but the power steering isn't tender or touchy. As long as the road surface is reasonably smooth, you can move through the corner at very high speeds without feeling the car isn't giving you good roadability and full control.

The smooth shifting of the big Buick's new Super Turbine 400 automatic transmission is a delight to experience. It has three distinct gears: low, intermediate and drive—and a torque converter without variable blade switch-the-pitch stator.

Buick transmission engineers claim several distinct advantages for their version. Their "tiger" makes all of its shifts from an over-running clutch to a multiple-disc

(Please turn to page 240)

OCTOBER 1963



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239

The '64 Cars

(Continued from page 239)

clutch, instead of shifting from an over-running clutch to a band and thence to a multiple-disk clutch, as others do. Buick engineers maintain their method produces inherently smoother and more consistent shifts. This new transmission also uses an electrical system to obtain "kickdown" changes in place of mechanical rods and levers, and it contains both an altitude-compensated hydraulic system and a paper-element oil strainer.

There are no drastic body changes among GM's full-size mediums. The Buick LeSabre is 326 pounds lighter, which allows it to maintain the same performance levels with a 210-hp. engine and the new transmission as last year's LeSabre, which used a 280-hp. engine. And the lighter, less powerful '64 LeSabre is supposed to deliver 16 to 18 percent better fuel economy.

One tip for youngsters who want a quick way to tell the difference between the 1963 and 1964 Buick Riviera: the '64 model will have an ellipse letter "R" appearing on its wheel disks and in the center of each taillight.

Oldsmobile will offer a Jetstar II model for 1964. It is essentially a Dynamic 88 with different trim, but it will also have the Starfire's hotter engine.

Despite GM's reluctance to be associated with the racing image, the big Pontiac's will have engine options well up into the high-compression, multiple-carb neighborhood—and delivering well over 300 hp.

Pontiac, too, has one of the most thoughtful little styling touches we've seen for '64—off-centered dashboard dials which are canted so that their dials face the driver for easy reading.

DODGE AND CHRYSLER

Like the Dodge's and Plymouth's, the big Chrysler body shell and roofs are all new for '64. They have enlarged rear windows for better rearward visibility and the size of the panel in the blind corner has been reduced.

Chrysler Corporation serves all its models with one basic gearset and two sets of torque converters. This saves a great deal of money compared to the four or five distinct transmissions used by GM.

For '64, Chrysler does have a new four-speed box. They apparently felt that the Warner T-10 transmission used by Corvette and others just didn't have the beef to provide a safety and reliability factor when paired with the brute power of the big 426-cubic-inch V8s available on Dodge, Plymouth and Chrysler.

Chrysler's new four-speed manual is an

excellent, sturdy job which can be used on the little 170-cubic inch Sixes as well as the monster V8s, thus permitting even a cost-conscious driver a little stick-shift fun for himself. Naturally, it must be paired with the proper size clutch.

LINCOLN, CADILLAC, IMPERIAL

Actually, more body changes have been made in the luxury class—particularly Lincoln and the all new Imperial—than among the mediums.

Lincoln's greenhouse has been broadened at the top with the sides tilting in less this year to give more space around your head, but not your shoulders. Rear doors have been widened by three inches, an improvement that's very noticeable when you climb into and out of the two models in succession. Front seat hiproom is up 2.2 inches. The rear seat has been moved back farther into the body to increase rear legroom four inches without increasing the wheelbase.

Cadillac's fins are slightly lower for '64 and front-end chrome has been extended around the leading edge of the fenders. The horsepower of their standard engine has been increased from 325 to 340 and they have changed from a four-speed to a three-speed automatic transmission.

Imperial's news for '64 is primarily the drastic and attractive styling changes. An elaborate campaign to increase the car's quiet dignity includes such improvements as stronger door hinges, a flexible steering couple and triple-laminated exhaust pipes.

STUDEBAKER

Studebaker's Larks—many now named simply Daytonas or Cruisers—all are far sleeker birds with six inches more body shell on the same old chassis, still 109 inches long for two-doors and 113 for four-door models. Rear doors, once among the most convenient exits in the industry, are still good but an inch narrower. Since mid-1963, power options for the company's hottest products have been available on all the lowlier lines, too.

The Avanti does have a grille for '64, but it's not the standard above-the-bumper concept it had been rumored to be. Instead, it's a small grille covering only the under-the-bumper air scoop. The '64s are also distinguished by the squared-off trim around the headlights. A drip rail has been added over the doors. Studebaker's 304½-cubic inch "hot" engine, available with blower as the "R3" in '63, is now available without the blower and known as the "R4". Disk brakes will be continued as '64 standard equipment on Avanti and as options on Hawks and Larks. Avanti and Lark brakes have dual cylinders. ★★

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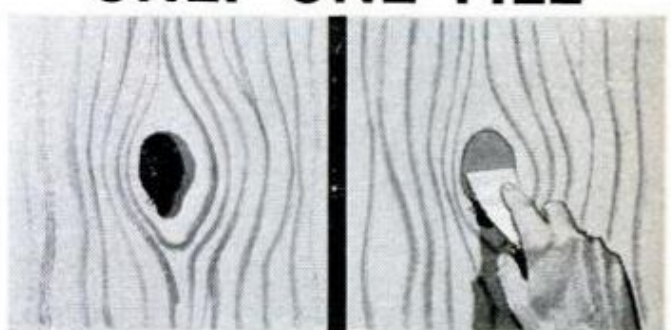
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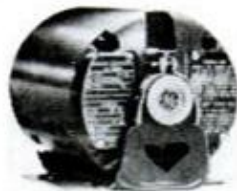
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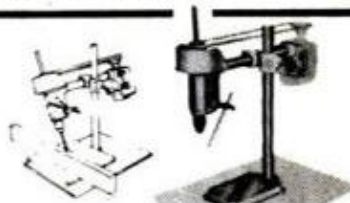
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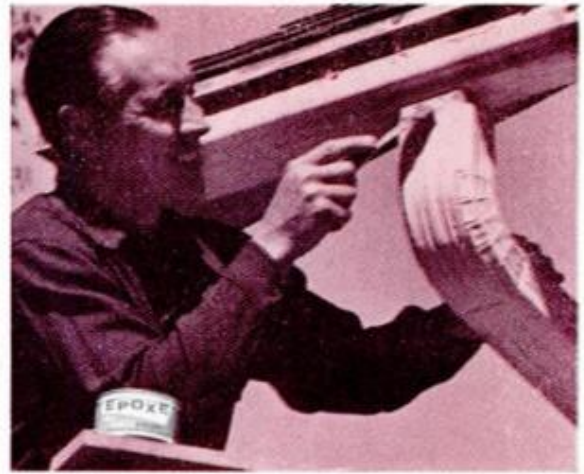
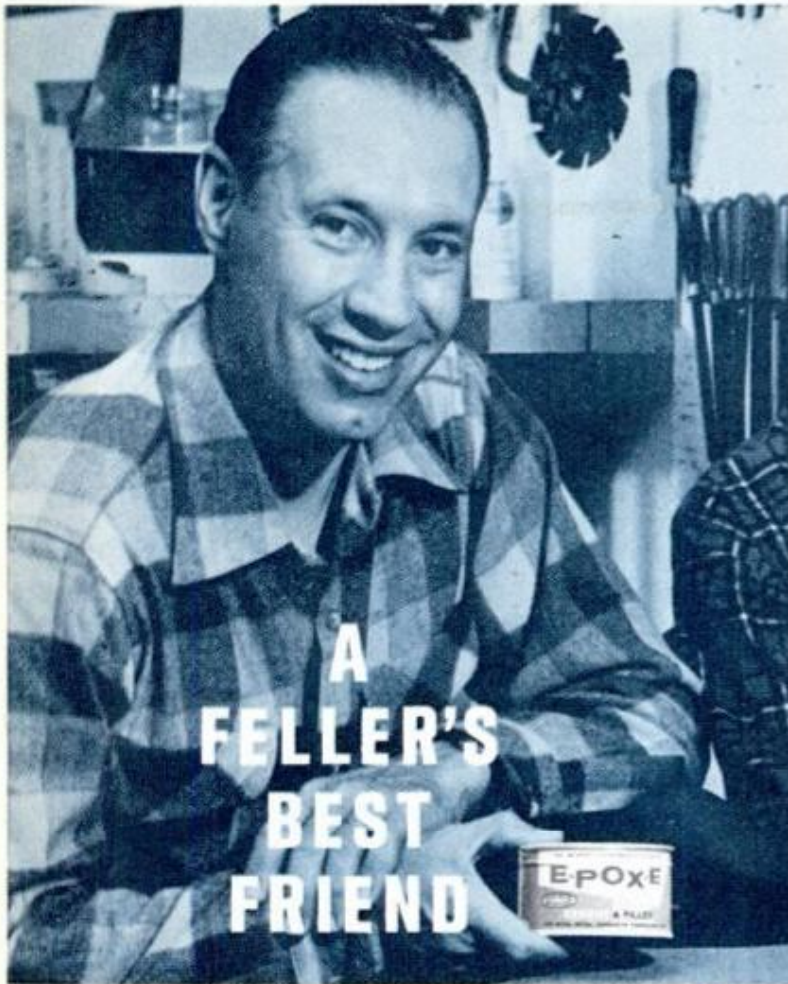
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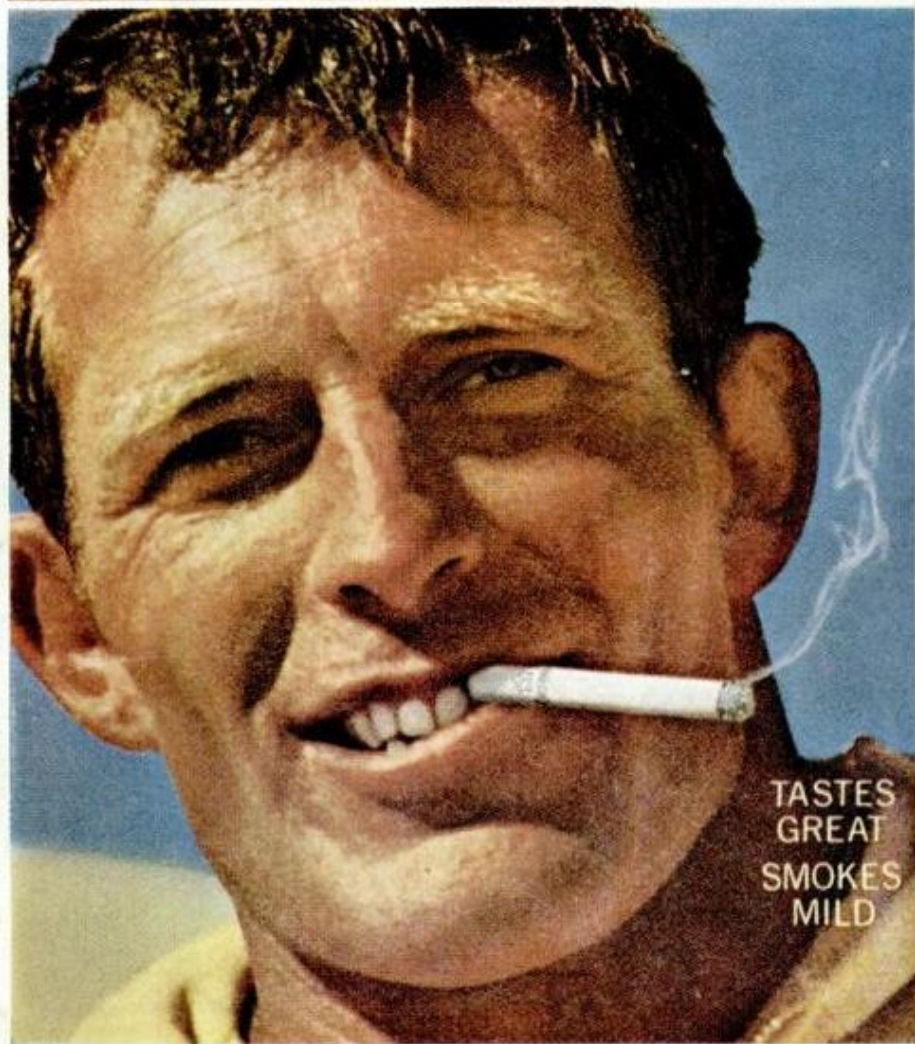


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