

Permanent Antifreeze: Safe for Your Car:

POPULAR MECHANICS

NOV. 1964
35 CENTS

Buyer's Guide to Circular Saw Blades

Could You Pass an Astronaut Physical?

Shotshell Reloading • Lost Art of Gold Leafing

**Corvair Engine
Drives NEW CORD
Over 100 MPH**





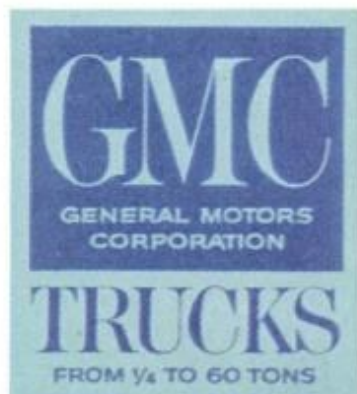
What's new?

This one's made by GMC.

Built, sold and serviced by truck people.

**But it's priced right down there
with the others.**

**So the van to get is GMC's Handi-Van.
Right?**



**GREATEST ADVANCE IN ELECTRIC DRILLS
IN 50 YEARS!**



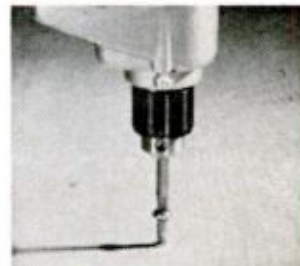
**New Skil TSC 1/4" drill lets you regulate speed
from 0 to 2000 rpm's with your "trigger finger"**

With the revolutionary Model 501K Skil *Trigger Speed Control Drill*, you have absolute speed control right at your fingertip. No buttons or dials to fool with. Just squeeze the speed you need for every conceivable job from delicate precision work to drilling in plastics, composition, wood and metal *simply by varying finger pressure*. There isn't a drilling or driving application that can't be done either faster, easier or with greater accuracy with the Skil TSC 1/4" Drill. See it today at your favorite department, hardware store or lumber dealer. Complete with handy carrying case, \$29.95. Also available in 3/8" and 1/2" sizes. Skil Corporation, 5033 Elston Avenue, Chicago, Illinois 60630

**Look for the green trigger...
it identifies Skil TSC Drills!*



HOLE IN NAIL DEMONSTRATES THE AMAZING CONTROL OF THE NEW SKIL TSC DRILL! We did it with a new Skil TSC 1/4-inch drill without center punching, to demonstrate the incredible control possible with trigger speed control.



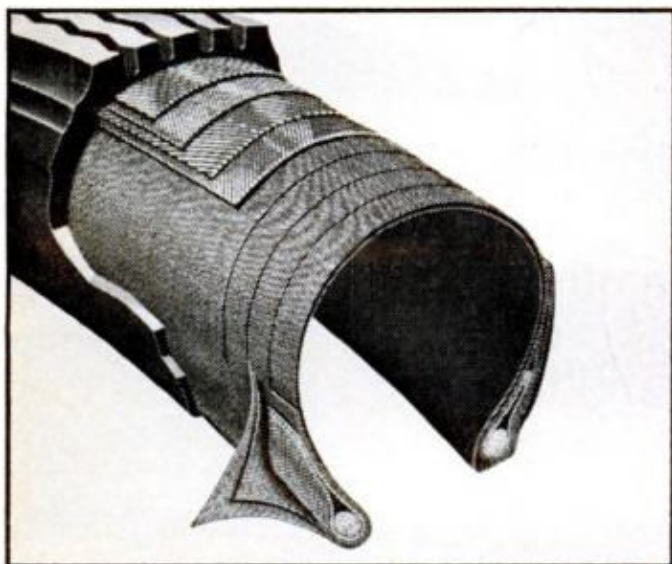
THE NEW SKIL TSC DRILL IS A PRECISION DRIVER, TOO! All you need is a driver bit. Variable speed feature lets you start screw at low speed, run it down fast at higher speed, finally set it snug by

**SKIL
POWER TOOLS**



LDKY-S8L-K5BS

A report on Goodyear's 22 billionth mile on Radial Ply truck tires



Back in 1955, our engineers recognized the great potential of truck tires with radial ply construction. In 1957 we introduced to the market a radial ply truck tire that exceeded even our own high standards. Today—7 years and more than 22 billion commercial truck miles later—we report the results:

1. Goodyear Radial Ply tires have longer life. Goodyear's right-angle construction confines flexing to the sidewalls, virtually eliminates tread squirming and scuffing. Result: Goodyear Radial Ply tires wear up to twice as long as conventional tires.

2. Goodyear Radial Ply tires increase fuel savings as much as 10%! In effect, a Goodyear Radial Ply tire's rolling action is like a caterpillar track. So rolling resistance is sharply reduced.

3. Goodyear Radial Ply tires give safer, more sure traction! Because the tread of these great tires is a "belt" . . . with movement carefully controlled . . . the thick, wide, road-

Important advances scored in longer life . . . better traction . . . greater savings . . . smoother ride by Goodyear's unique "right-angle" radial ply construction!

gripping ribs hold firm for greater, surer traction.

4. Goodyear Radial Ply tires run as much as 100° cooler! With tread flexing almost nonexistent, heat-inducing friction is greatly reduced. And whatever heat buildup does occur is dissipated by the sidewalls. The result is a safer, longer-lasting tire.

5. Goodyear Radial Ply tires' softer ride protects loads and equipment! With their buoyant, more flexible sidewall construction, Goodyear Radial Ply tires cushion against shock and pounding. So load and equipment damage and driver fatigue are reduced.

Choose Unisteel tires with radial steel cord body and steel "belt." Or Flexsteel with radial fabric body and steel "belt." Both with super-tough Tufsyn rubber. Both with the ability to shrug off cutting and puncturing objects. For more facts on Goodyear Radial Ply tires, see your Goodyear Dealer or Goodyear Service Store. Goodyear, Truck Tires, Akron, Ohio 44316.

GOODYEAR

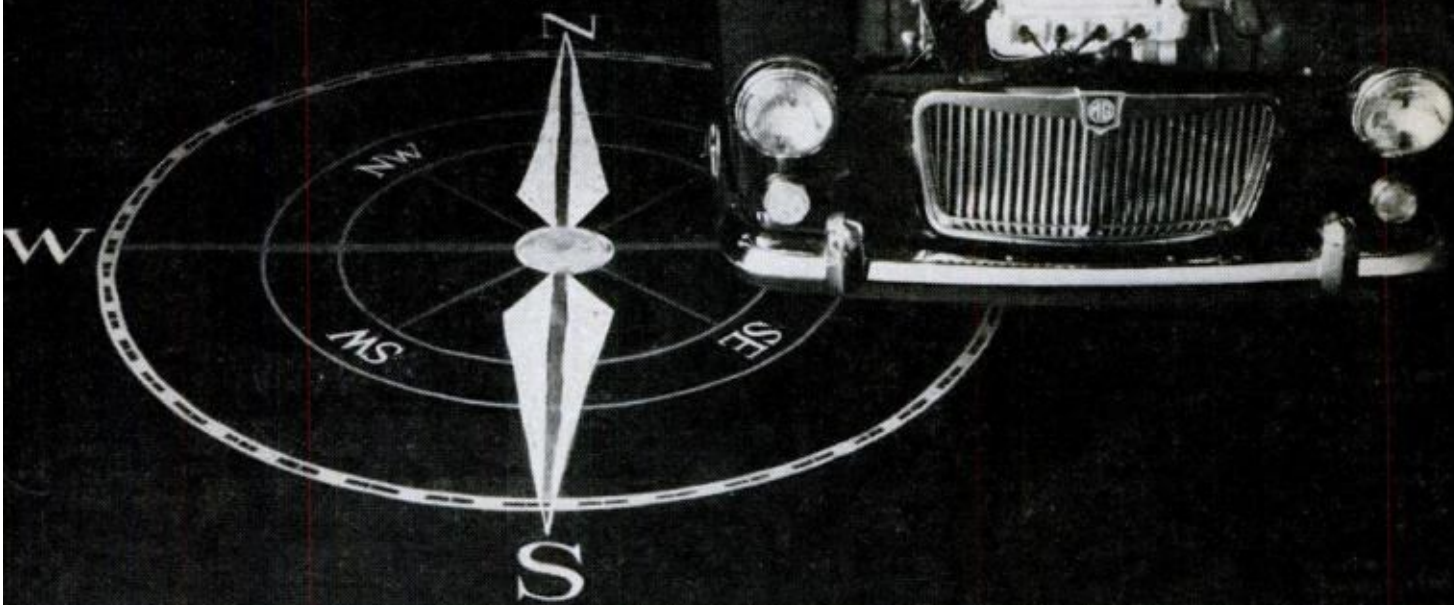
Flexsteel, Unisteel, Tufsyn—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

POPULAR MECHANICS

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RIDDLE

When an MG sports sedan is heading South... why is the engine facing East?



Good question. Easy answer. We mounted the engine crosswise, East-to-West, to give you the extra living room that's so surprising when you step into front or back. (This way, 80% of the car can be devoted to 5 passengers and their luggage.)

Revolutionary? Sure. So is the idea of combining a sports car and a family sedan. It's only logical because it works.

Take MG's radically new liquid suspension, for example. Permanently sealed-in fluid replaces metal springs and shock absorbers. Combined with front wheel drive, it enables your

MG Sports Sedan to grab the road, corner flat and handle like a polo pony. And with engine weight over the driving wheels you *pull* through mud and snow.

Even if you never race the MG Sports Sedan, it's nice to know you're master of a sportive, spirited, competition-minded car... race-tested MG engine... 4-speed stick shift... bucket seats up front.

Yet all that room... plus safe-stopping non-fade disc brakes and round-the-compass visibility make this an ideal *family* car as well. You can get 30 miles or more per gallon... and the modest

price tag is sensible, to say the least.

What's more, the MG Sports Sedan you drive home today will be the same you'll see on the road ten years from now—including that East-to-West engine. (We're not going to monkey with a good thing.)



FOR OVERSEAS DELIVERY AND OTHER INFORMATION, WRITE: THE BRITISH MOTOR CORP./HAMBRO, INC., DEPT. J-6, 734 GRAND AVENUE, RIDGEFIELD, NEW JERSEY

POPULAR MECHANICS®

NOVEMBER 1964

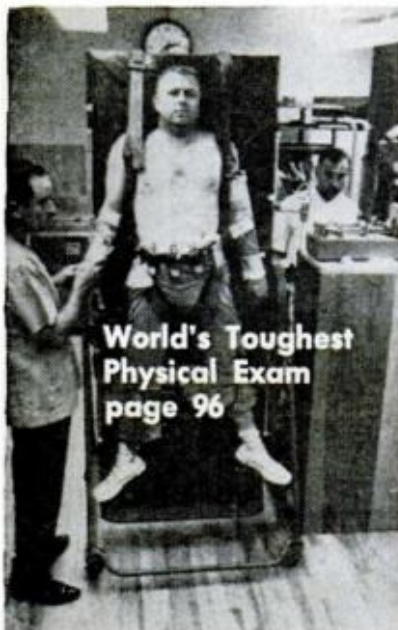
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INTERNATIONAL EDITIONS • AUSTRALIAN • SPANISH • CARIBBEAN • FRENCH • DUTCH

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NEXT MONTH: *Shadow box* Christmas gifts and decorations for your door, presented in easy-to-trace PM Project-a-Plan form. December also brings you the basics of parallel skiing, directions for building a basement sauna bath, a basic course in heat treating steel at home, and a neat method for thief-proofing your car.

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LaSalle will show you—without any obligation on your part—how you can benefit from the unique advantages offered by a career in Real Estate. LaSalle has the right training program for you—whether you wish to supplement your present salary through part-time activity; whether you are seeking a challenging new position with unlimited opportunity for self-advancement; or whether you seek a time-proven way to build a successful business of your own.

Demand for trained people now at its peak

New home construction has soared to one-and-a-half million units a year in the United States, with the number rising every year. Industrial and commercial construction is reaching new highs.

Each new transfer of property normally requires the services of a Real Estate professional—services required by buyer and seller alike, and highly rewarded. Additional qualified people to handle these Real Estate transactions are urgently needed in nearly every section of the country. With the greatest number of homes currently selling in the \$10,000 to \$20,000 range, a few sales a month can earn you a living. Just one sale a week can put you into the five-figure income bracket.



How the Real Estate Broker earns fees and commissions

Brokers are independent businessmen who not only sell Real Estate but sometimes rent and manage properties, make appraisals, arrange for loans to finance purchases, and develop new building projects. Some brokers combine Real Estate with insurance work. Many handle multimillion dollar hotels, giant office buildings, and other extremely valuable commercial properties. Still other brokers and salesmen specialize in farm properties or unimproved land.

Few fields of endeavor can equal a career in Real Estate for personal satisfaction.

Consider all these special advantages and opportunities open to both men and women:

You can start out in Real Estate earning important commissions full-time; or it can provide a convenient and lucrative income using just part of your time.

You are sought out for advice on property matters, and your position in the community is one of leadership and influence.

Little capital is required if you wish to go into business for yourself.

You deal in a commodity which has permanent value, and which continues to be actively traded in good times and bad.

You can begin building your career while continuing to hold your present job.

You can stay in Real Estate indefinitely because a high proportion of the openings are traditionally filled by men and women of mature years.

Job opportunities for the Real Estate professional are not limited to the brokerage field. People who know Real Estate are needed by loan companies, banks, insurance firms, government agencies, building contractors, investment counselors, and many other business enterprises.

LaSalle provides all you need to know

The only requisites for a successful Real Estate career are a knowledge of fundamentals and a willingness to apply yourself. LaSalle home study training gives you the necessary knowledge easily and conveniently by mail. As a LaSalle student, you learn at your own speed, in the privacy of your own home, without losing time or income from

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Your instructors start you right at the beginning—then supervise your work every step of the way—including all the preparation you need to qualify for your state license examination for Real Estate salesman or broker.

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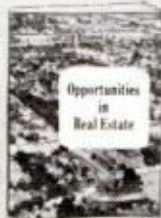
diploma (or even the simple fact that you are studying with LaSalle) will constitute proof to prospective employers that you have taken the first big step on the road to success as a reputable Real Estate professional.

Since its founding in 1908, LaSalle has been a world leader in business education. More than one million ambitious men and women have used LaSalle home study to prepare for better-paying jobs and more satisfying careers in a wide variety of business fields. More than fifty years' experience providing adults with the schooling they need to get ahead in life stands behind the LaSalle Real Estate training program.

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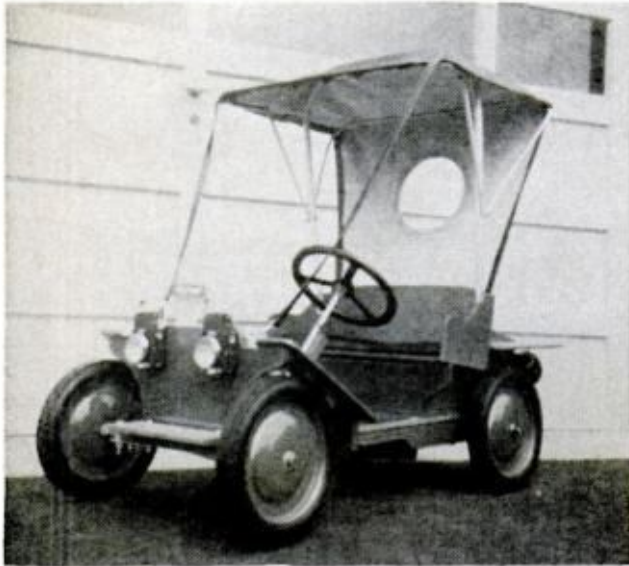
Occupation..... Working Hours..... A.M..... P.M.

450

Over the Editor's Desk

Classic Winner

I built the *Sidewalk Classic* (page 146, November 1963 *PM*) and entered it in our local firemen's parade with my three-year-



old son driving. It won first place in the children's division. My son thoroughly enjoys driving the car every day.
Westminster, Md. RAYMOND E. DELL, JR.

Fly-In Movies, Indeed!

I am sending a newspaper clipping in answer to the last line of your story *Country-Club Airports* (page 106, May *PM*).

Bettendorf, Iowa WILLIAM F. SCHURR

The last line was: "What next? Fly-in movies?" And sure enough, they have 'em.

Harlan Anderson, owner-operator of a drive-in theater at St. Ansgar, Iowa, has converted one ramp of his theater for airplanes only. The landing strip runs alongside the ramp.

Framers' Friends

I found your article *Engineered Nailing Simplifies Framing* (page 137, August *PM*) extremely informative. I had not even suspected that these building specialties existed. As I am about to build a small house, the availability of these building aids should make my efforts much more rewarding.

Nome, Alaska RALPH B. BURGESS, JR.

As usual your magazine has been very helpful supplying an answer to a problem that seemed unanswerable.

Lyndhurst, Ohio CARL H. MCKENNA

Can you please furnish me with information as to manufacturers or distributors of the building specialties. I am remodeling at present and would appreciate information as soon as possible.

Marietta, Ohio THOMAS E. McLAUGHLIN

Yes, Reader McLaughlin (and the hundreds of other active do-it-yourselfers who wrote), we are supplying that information as we promised in the article. Any other readers who want a list of manufacturers and distributors may request it from the *PM* Information Bureau.

Design for Oblivion

I agree with you wholeheartedly on the danger and immediacy of the problem stated in *The Air Around Us* (page 81, August *PM*).

I am a student at the Rhode Island School of Design, majoring in landscape architecture. This year I am beginning work on my degree project, which is directed toward a revolution in urban design. I shall try to "design into oblivion" the present-day city in its flagrant violation of nature.

Trumbull, Conn.

PAUL PETROFSKY

PM-38 in Africa

I am a road engineer in Nyasaland and built the *PM-38* (page 140, Aug. 1962 *PM*).

The boat behaves beautifully and takes rough seas very well. According to your



recommendations, I have powered the boat with a 28-horsepower outboard, which gives all the power you need for cruising and water skiing.

Zomba, Nyasaland

P. BRASK

Grand Old Game

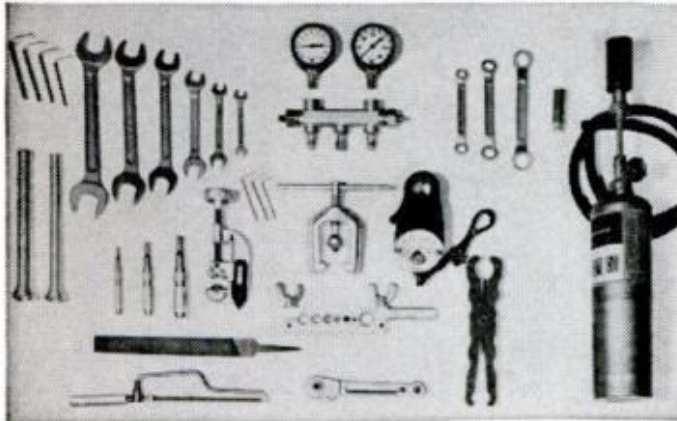
Thanks for the article *Checker Game of the Century* (page 53, August *PM*) and particularly for the diagrams and chart of the game. Although the primary concern was the computer, still this article is a great booster of our "grand old game." Checker players can seldom convince oth-

(Please turn to page 12)

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thousands of top-pay jobs waiting right now—new jobs opening every day, faster than they can be filled

It's true. In the mushrooming air conditioning, refrigeration and heating fields, *there are more top-pay, steady jobs available than there are trained men to fill them.* And still, new high-pay spots are opening every day in these challenging and rewarding fields. Check the want ads and see for yourself. You'll understand why the pay is high, the work steady, and the future so bright. *Over 20,000 men are needed each year, men who really want to get out of routine, unpromising jobs—who want to start high and move ahead quickly in one of the fastest growing fields in America today.* See how easily you can be one of these fortunate men. It's all spelled out in our FREE booklet, **SUCCESS IN AIR CONDITIONING AND REFRIGERATION.** Send for it today.

join the thousands of men who are already forging ahead in this rewarding field—and earn big money even while you learn

Nothing can tell you how secure your future can be better than the comments of men who have already started their careers in Air Conditioning, Refrigeration and Heating:

"My wages have tripled since I entered this field."—James Wiest, Minn. "During the past 5½ months, I increased my income by \$1150."—George Gulvas, Pa. "On a part-time basis, I am grossing \$440 to \$600 per month."—H. K. Wolf, Wis. "Earnings have more than doubled."—Aaron York, Ind.

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If you're earning less than \$170 a week, if you're not getting ahead as quickly as you want to, and if you're serious about wanting more pay and a secure future, a good business of your own, or important part-time earnings—you owe it to yourself to look into these exciting opportunities: Air Conditioning, Refrigeration, Heating, Auto Air Conditioning. **THE FULL OPPORTUNITY FACTS ARE YOURS—ABSOLUTELY FREE AND WITHOUT OBLIGATION—IN THE FACT-FILLED, ILLUSTRATED BOOKLET PICTURED BELOW.** Send for your copy today. There is no cost—and it can be the first step to a more secure future for you and your family. Don't put it off!



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Over the Editor's Desk

(Continued from page 8)

ers of the mathematical preciseness of the game. This story certainly illustrates the point.

Hamilton, Ont.

KEN SHOESMITH

The checker game was very interesting. However, it appears to me that the machine could have drawn the lost game, even in its late stages.

It appears to me that the computer, instead of moving 27-31 (57th move) could have moved 8-11, forcing a swap. According to my analysis, this swap leads to a drawn game.

Artesia, N.M.

RONNIE E. SHOOK

Your article does an excellent job of promoting a really great game—as the depth, precision and intricacies of checkers are known to relatively few people.

Washington, Ill.

JOHN C. TOMS

The Thing

These volunteer firemen in Churubusco liked the *Hi-Cycle* (page 169, April PM) so much that they made *two* of them—then fastened them together with pipe and installed a gas engine in the middle to propel themselves.

They dubbed it "The Thing from Churubusco," and it makes a hit in every parade it is in.

It's painted with orange and yellow glow paint, and it boasts sirens, bells,



speedometer, two-way radio, mast, flags—just about everything but the kitchen sink!

Riding it are the builders, Max Miller and Bob Shanabarger of the Fire and Rescue Squad.

Churubusco, Ind.

MORRIS G. HULTS

Bitter Is Better

I am at a loss to understand the wide price range of cultivated and wild ginseng root in *Mysterious Ginseng Root* (page 32, Aug. 1963 PM). The article noted that wild root is \$21 to \$27 per pound, while cultivated root is \$6 to \$10 per pound.

Rockford, Ill.

J. E. WHITE

We called a major exporter, the William J. Boehner Co. of New York, to find out. The wild root carries a premium price because it's in the ground longer (from 10 to 20 years versus about five years for the cultivated). The people who consume the root believe that it thus has a longer time to select the "good things" from the ground—becoming more potent. The consumers can tell the difference, too, because the cultivated root is large and sweet with a slightly bitter tang; the wild is smaller and very bitter.

Rabbit Hunt

Professional bowlers who have read your article *Is There a Rabbit in Your Bowling Pins?* (page 85, April PM) find the test results only humorous and totally misleading to the average bowler.

We claim that modern pins produce fake scores. Compare two plastic brands with wood (below) and you'll see why they're called little dancers. The result is that you cannot carry a reasonable percentage of pocket hits because the pins are flying so fast.

Tests in Los Angeles revealed the following pin velocities when hit by a 16-pound ball traveling 14 miles an hour:

Brunswick AMF

Pin Weight	Wood	Score	King	Chemweld
3 lbs. 6 oz.	16.83 mph	18.30 mph	19.10 mph	
3 lbs. 4 oz.	17.28 mph	18.90 mph	19.75 mph	
3 lbs. 2 oz.	17.55 mph	20.10 mph	20.60 mph	

High-velocity pins will ruin the game. In another two years, fake scores will relegate bowling to the level of wrestling, darts and shuffleboard.

National Committee for

Honest Bowling
Los Angeles, Calif.

BILL TAYLOR,
Secretary

As we explained in the story, PM attempted to answer a simple question: Will an average league bowler achieve higher scores with the new plastic pins? Rather than try to answer it with theories based on pin-velocity tests, we had real bowlers actually use both kinds of pins in real games. Our two league bowlers rolled five games with wood and plastic pins. And their totals showed wood pins scoring 323 more points than did plastic.

The Editor

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Sidelights from the SERVICES

By William R. Kreh

A 1200-man rocket ship that would serve as a global troop carrier may be in the nation's future military arsenal. Such a rocket ship is now on the drawing boards and has evoked the interest of the Marines.

The monster rocket would be able to hurl a full battalion or 132 tons of military equipment from the U.S. to any point on earth within 45 minutes. It would be able to land in any kind of weather and on any kind of terrain.

Dubbed *Ithacus*, the rocket would stand 21 stories high and weigh 7000 tons. It would be powered by 36 liquid-hydrogen engines generating 18 million pounds of thrust. The rocket's engines would burn for six minutes during blastoff. Then the ship would coast upward for another 7½ minutes, crest 146 miles above the earth and arc in for a landing. It would touch down, with the aid of breaking motors, on four adjustable legs similar to those being designed for America's moon ship. The rocket would be steerable, able to turn back or change course, and be reusable.

A make-believe moon has been built by the Air Force. Scientists have put into operation two "moon chambers"—large rooms in which temperature, atmospheric pressure and radiation, comparable to those found on the surface of the moon, can be simulated. The chambers are being used to study materials of the type believed to constitute the lunar surface and also to test the possibilities of human survival in the moon's environment and what special types of protection may be needed.

Wings will be sprouting on helicopters soon. Both the Army and Navy are experimenting with wings and additional engines on existing helicopters in an effort to boost their speed above 250 m.p.h.

Meanwhile, the Defense Department has given the Army an okay to develop a new type helicopter designed specifically to be armed. It will be the first 'copter developed as a fighting aircraft. Need for such a craft became apparent in Vietnam.

Submarines in trouble will literally rocket to the surface in the future. The Navy is developing a new rocket-assisted surfacing system for its nuclear subs. The device will fire small solid-propellant

rocket motors into ballast tanks. This produces high-pressure gas to expel water from the tanks much faster than the present compressed-air system. Thus any time something goes wrong while a sub is submerged, it could surface much more swiftly—and safely—than now. The rocket escape is a result of the search for safer systems after the 1963 sinking of the submarine *Thresher*.

Busy computers aboard the Navy's first Polaris submarine, the USS *George Washington*, have made an estimated 20 billion computations to keep the submarine on location and her missiles automatically zeroed-in on selected targets.

Army maps are adding all kinds of new features. Special maps now being produced for use by field commanders list expected temperatures, recommended clothing, how long a soldier can be expected to work efficiently in the climate and whether vehicle travel is possible. Military motor convoys may also obtain maps showing ethnic groups to be encountered, languages spoken, solar radiation, food storage and gasoline life. Map overlays also show timber stands, their height and density and other vehicle obstacles.

Bagging aircraft engines in a new kind of plastic container is saving thousands of dollars for the Air Force. The lightweight, zip-on plastic bags, made of polyvinyl-chloride, are designed to protect engines during shipment and storage. They're replacing the heavy steel containers which the Air Force has been using.

Alibis by the numbers have been developed by Vice Admiral Hyman G. Rickover, a demon for saving time and motion. Outside his door at the Navy Department he's posted a prepared list of excuses for helping staff members explain quickly why they failed to do something. It is headed by the request: "Please specify by number. To save time for me and yourself give your excuse by number(s)." Then follows the list in an order determined by "the current popularity rating for excuses":

- (1) I thought I told you.
- (2) That's the way we've always done it.
- (3) No one told me to go ahead.
- (4) I didn't think it was very important.
- (5) I'm so busy I just can't get around to it.
- (6) Why bother, the admiral won't buy it.
- (7) I didn't know you were in a hurry for it.
- (8) That's his job, not mine.
- (9) I forgot.
- (10) I'm waiting for an OK.
- (11) That's not in my department.
- (12) How did I know this was different?
- (13) Wait until the boss comes back and ask him.

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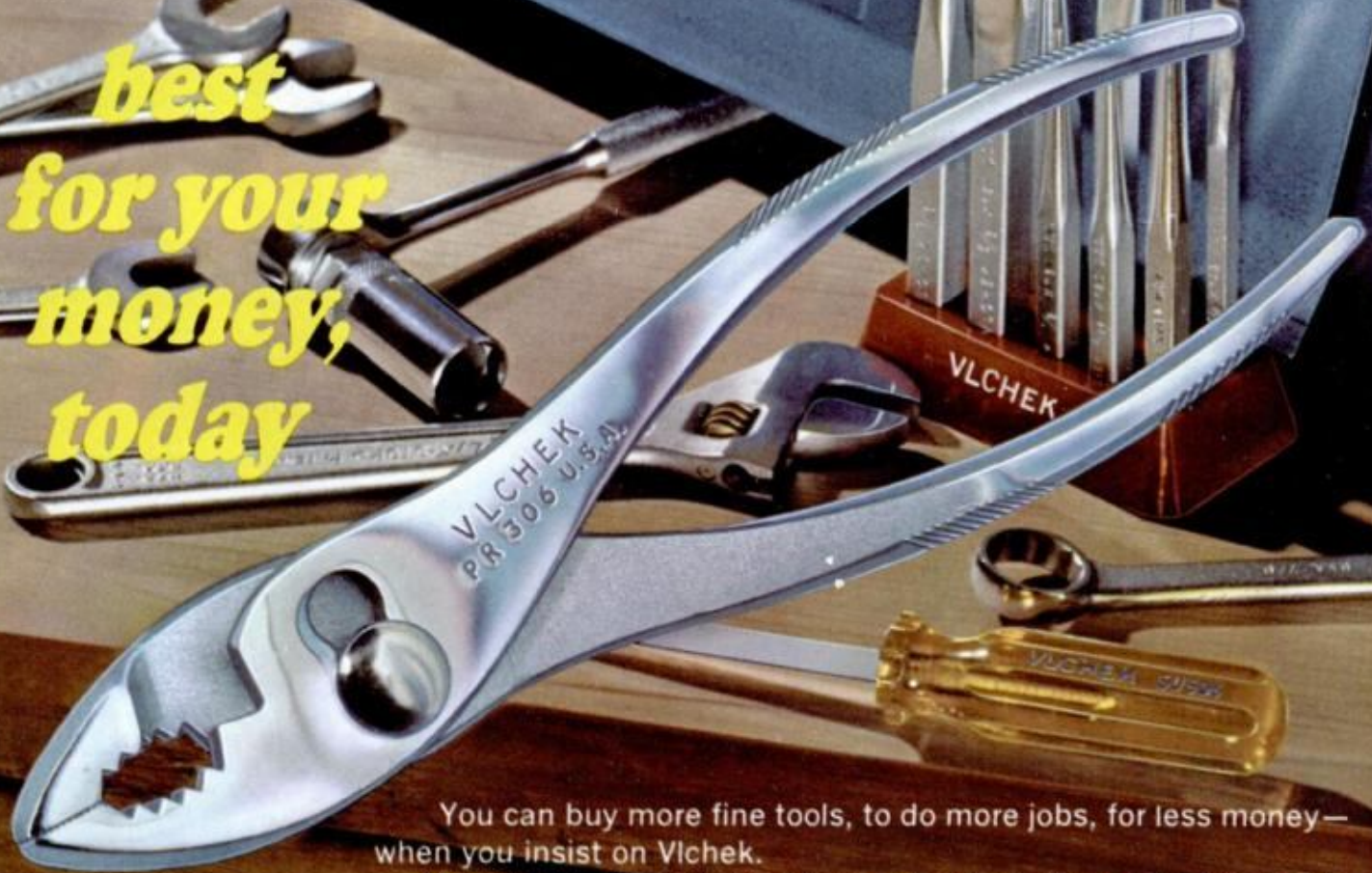


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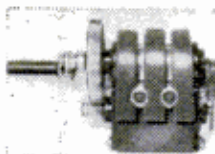
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70,005-H	8"	1 1/2"	19.50 ppd.
70,006-H	10"	1 3/4"	30.75 f.o.b.
70,007-H	12 1/2"	2 1/8"	59.95 farrington

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Case of the itchy golfer. A Philadelphia dermatologist, writing in the *Journal of the American Medical Association*, reports treating a patient who suffered a rash whenever he played golf; his right hand was always most severely affected.

The rash wasn't due to a case of nerves. Tests revealed that the patient was allergic to a fungicide used on golf courses. And the eruption was worst on his right hand because that's the one he habitually used in picking up the ball.

For that old-fashioned goodness: A company that specializes in frozen baked goods recently moved into a new Midwestern plant, where all baking operations are directed from a control room equipped with data processing machines. Computers measure all ingredients, direct the machines that mix the batter and monitor the timing of the ovens.

Got a sweet tooth? Eat "miracle fruit," a berry that grows in Africa, and then whatever you put into your mouth—be it lemon, lime or grapefruit—will taste sweet as sugar. So says a team of researchers at an Illinois chemical company who are investigating the berry. The fruit, which adds no caloric value to other foods, works its miracle by coating the taste buds. As yet, no single substance has been identified as the active ingredient.

Element No. 104 has been synthesized by Soviet scientists, according to news reports from Moscow. If true, this would be the 12th element heavier than uranium that has been created by man. The other 11, from neptunium (93) to lawrencium (103), represent the work of American scientists.

Mama and papa fish act like parents because their offspring release chemicals into the water. German scientists demonstrated this by moving adult fish into a separate tank from their spawn. They swam about unconcernedly. But when water from the tank of baby fish was pumped

into the adults' tank, mama and papa fell to fanning, hovering and acting protective over—nothing.

The random energy of the sea is put to work by means of a "gyratory motion translator" developed by the Hamilton Watch Company. It works similarly to a self-winding watch. A series of eccentric weights are so arranged that any motion will cause a weight to turn on a shaft. The rotational motion is transferred, through a one-way clutch, to an output shaft. The Hamilton people say the device can be used to generate power for buoys, to automatically wind marine chronometers or to operate sailboat instruments requiring power.

Britain's legalized betting industry is keeping up with the times. Robot bookies nicknamed "Honest Robert" now automatically collect bets and issue receipts at factories. They've replaced human "runners" who went about making collections for bookmakers.

Have fragments of the earth's original crust survived in their original state? Most geologists think not. But Dr. Robert S. Dietz of the U.S. Coast and Geodetic Survey says that pieces of the crust might be found in the dark, heavy rocks of old mountains, where they were trapped when the mountains formed billions of years ago.

When the Westinghouse time capsule is buried next year at the site of the New York World's Fair, it will contain a micro-filmed encyclopedic description of today's world plus 40-odd items, including a modern English version of the Bible and a Beatles record.

In making the announcement, Westinghouse officials said they were sure that the seven-foot torpedo-shaped capsule would "withstand the rigors of time and weather for 50 centuries." It's made of a highly alloyed stainless steel and will be coated with pitch before it is lowered into its 50-foot steel burial shaft. The contents will be sealed in an inner glass liner, in which the air will be replaced with an inert gas.

Physicians in West Berlin report that an increasing number of patients are being treated for eye injuries caused by flying champagne corks. (The force behind a cork in the neck of a champagne bottle is four atmospheres, as compared to the two atmospheres of pressure in the average auto tire.) The Germans blame the problem on the booming economy, the consumption of

(Please turn to page 24)

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Science Worldwide

(Continued from page 23)

the bubbly liquid having shot way up in recent years.

Some 15,000 young grass carp have been flown from Hong Kong to England. The hope is that the fish, heavy eaters of vegetation, will consume the weeds clogging inlets that supply water for the cooling system of a big electric power station at Barrow-in-Furness.

Better than a sun dial. Light alone powers the "solar clock" made by a Swiss watchmaker. A photoelectric cell transforms light-wave energy into electrical energy, which turns a micromotor that winds the mainspring.

If exposed four hours daily to an illumination of 200 lux—that's light intense enough to permit comfortable reading—the clock is said to be capable of running indefinitely. But before you rush out to buy one, consider the price: \$850.

Nimbus, the new weather satellite, uses heat sensors to keep itself pointed toward the earth, say engineers at General Electric, maker of the satellite. The system works because the earth is hot, relatively speaking, and space is cold.

Two Russian mathematicians say they've confirmed that the epic Greek poem, the *Iliad*, was written by only one man, presumably Homer. They put the entire text—15,693 lines—on punch cards and fed it into a computer, which produced a pattern of rhythm and sounds. The consistency of this pattern, say the Russians, indicates a single author rather than a number of them, as some scholars maintain.

German doctors report finding physical changes in people who have worked on radar equipment for about four years. Changes include disturbances in the coagulation mechanism of the blood and inner ear damage. The conditions cleared up, however, after the workers had been away from radar equipment for six months.

Heat from the armpit helps a new 10-ounce radio transmitter send signals 3000 miles. Secret of the tiny device, which is designed for emergency communications, lies in the rigid control of the frequency it transmits on; this makes possible the small size coupled with the far-reaching signal. In using the transmitter, the operator places a container of frequency controlling crystals under his armpit. Temper-

(Please turn to page 26)

EVERY MAN WHO WEARS PANTS NEEDS BIG JOE IN HIS POCKET

We call this NEW pocket knife BIG JOE. The Stainless Steel Blade is sharp enough to use as a razor. It won't become dull from rust and corrosion and can be honed to a razor edge. BIG JOE was designed for active men who want a pocket tool that fits the fist, with a 2 1/2" stainless steel cutting blade plus a sturdy can opener, pipe reamer, screw driver and bottle opener, all compactly folded into a bone-finished case. You'll find a use for BIG JOE every day in the year. Send \$1.98 and a BIG JOE pocket knife will be sent to you post-paid.

JOEY JUNIOR is a slim, exquisitely styled pocket knife, smart enough to be carried in a full dress suit, 2 blades of stainless steel only \$1.98. The EXECUTIVE'S PAL—Stainless Steel, razor sharp blade, nail file and key ring \$1.98.

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Dealers! Some territories still open — write for details.

Science Worldwide

(Continued from page 24)

closed greenhouses was reported to have increased yields and shortened the growing time of flowers and vegetables. Developed by a Midwest home-appliance maker and tested in commercial greenhouses, the system was said to have increased tomato yields up to 47 percent.



If you want your children to do well at school, arrange for them to be born in the last four months of the year. That was one of the findings in a recent survey of 1315 students in one town in England. Children born in the January-April period were second best scholastically and the summer crop came in last.



Echoes from the brain enable surgeons at George Washington University to pinpoint brain tumors. A machine fires ultrasonic sound waves at the patient's head and the echoes are picked up and electronically converted into a picture on a screen. A normal brain produces a spiked blip on the midline of the echo picture.

What causes the "midline echo" isn't known. But the presence of a tumor or cyst will push this line off center. By noting how far off center it is, and in which direction, the surgeon can calculate the exact position of the growth.



Traffic control by computer is the objective of engineers in Sydney, Australia. Five television cameras—the first of 18—have been installed above key street intersections. The pictures, showing density and direction of traffic flow, are fed into a computer that calculates from moment to moment the best possible stop-light timing for existing conditions. The system will eventually control lights at over 200 intersections.



Boon to mankind. A vaccine for the prevention and cure of pesky "cold sores" (herpes simplex infections) has been announced by a dermatologist at the Pasteur Institute Hospital in Paris. He reports that during a year of clinical trials the vaccine proved effective and harmless for children as well as adults.

John F. Pearson
Science Editor

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F. W. COX, Hollywood, Calif., averaged \$150 a month spare time while training, now has his own full time TV-Radio service business. ALLAN R. TOWNSEND, Topeka, Kan., is a missile officer at Atlas ICBM site, fixes radios and TV sets spare time. R. L. WOOD, Fargo, N. D., got his FCC license and is Master Control Engineer with KXIB-TV. J. J. JENKINS, San Diego, Calif., says his NRI training is priceless. He is Frequency Coordinator for the 11th Naval District.



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HERE'S WHY two front axles in are better than one



ONLY FORD TRUCKS HAVE IT

Completely new: a Ford pickup front suspension that's tougher than anything before it—yet gives you a smoother, more level ride! Read how this revolutionary development from Ford reduces road shocks, front-end repairs, and overall truck costs!

Some pickup trucks have one front axle. Some, those with car-type independent front suspensions, have none at all.

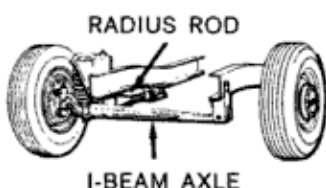
Only one pickup has two front axles: the '65 Ford with new Twin-I-Beam suspension. And only Twin-I-Beam gives you the ruggedness of big-truck construction . . . plus the easy ride of independent wheel suspension.

New engineering concept

Twin-I-Beam operates on a principle that's different from any suspension before—two front axles that work independently, one for each wheel.

Both Ford axles are forged

steel I-beams, like the I-beams used in big-truck axles. Each axle is secured to the frame by an I-beam radius rod. These radius rods, too, are borrowed from big trucks—which often use radius rods to maintain rear-axle alignment.



Axles and radius rods are pivot-mounted to the frame for free wheel movement.

The combination of forged I-beam axles and forged radius rods results in *the sturdiest, most*

reliable front-end ever built for a pickup truck. Moreover, because the radius rods keep each axle in precise position, wheel alignment, caster and camber are held as never before. And that means you save as never before; save on front-end adjustments . . . on tire wear . . . on maintenance and repairs.

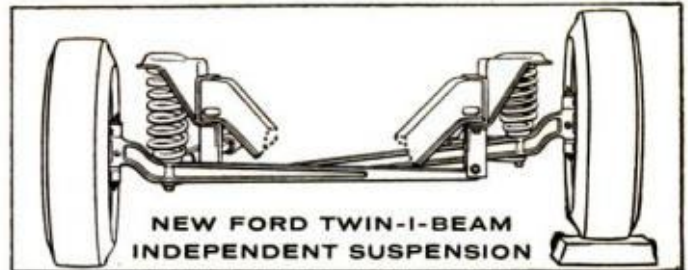
Fewer parts, stronger parts

Ford's strong new two-axle front-end weighs more than a car-type suspension does—yet has one-third less functional parts! Part by part, Twin-I-Beam is much huskier and more durable. For example, main

POPULAR MECHANICS



No front axle—wheels are suspended by short stamped “wishbones.” Similar “wishbones” were once tried on bigger trucks but soon abandoned.



Two front axles—wheels suspended on long, strong forged I-beams. Twin-I-Beam is the first independent front suspension with big-truck durability.

new Ford Pickups

...much better than none!



members are steel forgings, not sheet-metal stampings—king-pins, not ball joints.

And Twin-I-Beam suspension will quickly show you that it is just as remarkable for ride as it is for ruggedness.

Remarkable new roadability

New friction-free coil springs provide exceptional smoothness—*without mushy handling or floaty feel*. In fact, Twin-I-Beam gives a solid feel of control you've never known before.

Here's why: In the car-type systems some pickups use, the suspension arms are very short.

With Ford Twin-I-Beam,

each axle extends more than 3½ feet across the truck—and radius rods run nearly 2 feet to the rear. This broad-base mounting of the wheels stabilizes the whole front-end.

You'll find new freedom from sway, new control on curves. Even when you apply the brakes it is virtually impossible to detect any front-end dive!

Come inspect new Twin-I-Beam suspension—try Ford's smooth new pickup ride. And remember, Ford's unique front-end not only keeps shock and jar from reaching *you*; it protects your truck and your pocketbook every mile of the way!

TWO BIG NEW SIXES, NEW V-8! Ford pickups bring you completely new engines, too! Standard engine is a new 240 cu. in. economy Six. Optional are a new 300 cu. in. Big Six, the biggest Ford Six ever built, and a powerful new 352 cu. in. V-8.

'65 FORD



PICKUPS

BUILT TO LAST LONGER

Kit aircraft have always been appealing to men who haven't the time or know-how to build their own nor the money to buy a new one from the factory. Theoretically, kits should be less expensive than ready-made aircraft and less trouble to put together than homemade aircraft.

Trouble is, few ever get off the ground.

Another kit aircraft got shot down recently. A national mail-order house was informed by the Federal Aviation Agency that it would be unlawful to fly the prefabricated kit aircraft it was advertising in its catalog, specifically a one-man gyrocopter. The ad said that "you bolt the sections together like an Erector set."

Illegal, said the FAA, which governs the construction of all nonmilitary aircraft in the United States. The gyrocopters had never received a "type certificate" indicating the FAA had approved its design. Further, even if the design were approved, the FAA would have to approve the production procedures before the prefabricated kits could be offered for sale. If any of them were put together and flown without this approval, it would be like driving an automobile that didn't have a license.

The licensing of aircraft—or, in FAA language, the granting of "certificates"—is a mystery to laymen. Here, briefly, are the processes for certificating ready-made aircraft, homemade aircraft and kits.

When a factory plans a new model, the FAA inspects its blueprints and hardware before the plane is built, then follows it through the building and test-flight stages. If approved, it receives a "type certificate." Then, before it goes into production, the FAA inspects the maker's production facilities to make sure the approved prototype could be duplicated on an assembly-line basis. After that, each aircraft that conforms to the "type" certificated original receives a "standard airworthiness certificate." Finally, the FAA spot-checks the entire facility throughout production.

When an amateur plans a homemade aircraft, the FAA inspects his design and raw materials and the early construction before any of the internal workmanship is covered up. The aircraft is inspected at least once more after it is covered up and ready to fly, usually at the airport before its first flight. If approved, it gets an "experimental airworthiness certificate."

The basic difference, for FAA purposes,

between factory-built and amateur-built aircraft is that the factory is trying to make money and the amateur is not. Also, the factory is making "standard" (assembly-line) aircraft and the amateur "experimental" (one-of-a-kind) aircraft. The amateur-built category is authorized for "educational or recreational purposes," and a basic rule is that the "major portion" of the work be done by the amateur.

Obviously, the kit aircraft cannot qualify as amateur-built if it is sold (to make money) off an assembly line, and the buyer has only to "bolt the finished sections together like an Erector set." It must go through the factory-built certification program, and with one extra wrinkle. It must be inspected at the factory to qualify for its "type certificate." But before each individual kit can receive a "standard airworthiness certificate" it must be inspected again in the buyer's workshop to see that it is put together properly. So the kit aircraft is something of a mongrel. It must be inspected at the factory and in the workshop. Both are necessary.

What happened in the case of the gyrocopter kit, the FAA told *Popular Mechanics*, is that it had never received its type certificate nor had the kits been produced under FAA production surveillance.

One manufacturer who has gone through regular FAA procedures for production of kits is Schweizer Aircraft Corp. of Elmira, N.Y. The firm sells sailplanes in kit form with complete FAA approval. One model, in fact, is almost 80-percent complete. They are so designed that they can easily be put together at home, then receive their standard airworthiness certificates after FAA inspection and approval.

What all this means to the average man who is interested in kit aircraft is that 1) he had better be sure the kit being offered meets FAA regulations, and 2) if it does, he must still submit to an FAA inspection when he is putting it together.

Kits, remember, are factory-built aircraft and must submit to FAA regulations governing such aircraft. If the man wants to build his own aircraft as an amateur-built aircraft then he must do the "major portion" of the work for "educational or recreational" purposes. And just bolting pieces together is not enough.

If in doubt about any of this, contact the local FAA inspector. Meanwhile, the FAA has two advisory circulars (20-27 and 20-28) which give details on homebuilts. For copies write the Federal Aviation Agency, HQ-436, Distribution Section, 2nd and M Sts., S.E., Washington, D.C. 20553.

Kevin V. Brown
Aviation Editor

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CLINIC FOR HOMEOWNERS

Q I want to install a wooden floor in a part of my basement. It's relatively dry and I have no trouble from seepage. Can you outline a procedure?—MM., Conn.

A First step is to mop a coating of hot asphalt over the concrete, which must be clean. Lay roofing felt in the asphalt and mop on another coat over the felt. Then lay a continuous 2 x 4 along the walls and sides of the area to be covered, using pressure-treated stock. Have additional 2 x 4s cut into lengths of about 30 in. and lay these on the soft asphalt, embedding each one and laying with ends overlapping about 2 or 3 in. with an offset of about 1/2 in. at the ends to permit air circulation under the flooring. Lay pieces, called screeds, in parallel lines and space the lines about 12 in. apart. A precaution, usually worth carrying out even though some additional job time is involved, is coating the under faces of all flooring boards with a sealer. The best flooring to use for this purpose is probably white pine or edge-grain fir. Lay the tongue-and-grooved stock and nail each board to each screed, making sure that the nails are driven home and that each board is drawn tightly against the one preceding. Then finish with a sealer and a coat or two of a suitable floor finish. When laying the end lengths of 2 x 4, be sure to leave spaces at the ends of about 1 in. to permit air to circulate.

Q I have an older type dining table recently purchased which has two spots which were caused by a hot dish. The finish is still good. How can I remove or conceal the spots without removing the finish and redoing the whole top?—S.T., Tex.

A One way is to apply a stick type material, available from your paint dealer, colored to match the original finish. Usually such treatment is quite effective, but in some instances where the area involved is relatively large, other methods must be used. One that generally works quite well is to use a fine pumice stone mixed to a paste-like consistency with rubbing oil or a light mineral oil. Apply with lint-free cloth, or better, a piece of 1/16-in. felt

POPULAR MECHANICS



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cemented to a small block of wood. Don't apply too much of the abrasive at first, and rub lightly, making the strokes parallel and moving slowly back and forth over the affected area. Proceed by stages, wiping off the abrasive mixture after a few strokes and closely noting results. This precaution is necessary to prevent cutting through the finish to the wood. Continue the procedure with like caution until the spot disappears. Then polish the area to match the unaffected portions of the top. In some cases the rubbing with abrasive will tend to dull the finish. In this case go over the whole top lightly with the abrasive paste to get a matching finish over the whole area. Then polish, or wax as desired.

Q How does one patch cracks in a concrete-block foundation wall? I've tried several times. Patch looks worse than the original crack. I used a prepared cement plaster, or mortar which works into the crack nicely, but how do you get the new mortar to appear smooth and match the wall?—A.T., Kans.

A We assume, of course, that you are trying to get a matching job with a trowel. Naturally this is difficult or impossible because of the rather rough surface of the blocks. The trowel follows and reproduces these irregularities in the new mortar. One trick is to allow the new material to partially set—don't wait too long—and then brush off the excess mortar with a whisk broom. Work toward the new mortar with the brush strokes at first, then make the brush strokes roughly parallel with the crack.

Q The linoleum in my kitchen shows several small cracks; none of these is now more than 5 in. long but all are rather irregular. How can I re-stick the turned up edges temporarily pending replacement?—R.G., Ky.

A Of course, you will have to be the judge of whether the linoleum in its present condition is worth the time and labor of repairing. Probably the simplest way to repair the cracks is to cut all the way through the linoleum at each opening, following the irregularities, with a sharp knife. Then make several short cuts roughly at right angles to the first and spaced fairly uniformly. Lift each small "flap" thus formed and spread cement underneath, press the flaps down flush and weight until the cement sets. After the cement has hardened remove the weights and tap the edges lightly with a hammer to force them down flush.

NOVEMBER 1964



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New Duesenberg for Nostalgic Non-Conformists? Goodyear's Rainy-Day Tires Prove To Be Faster

Maybe the word is out—for some reason—that more of us are willing and able to pay for a distinctive car design. Whatever the reason, there seems to be a growing trend toward special, limited-production luxury cars.

There's Glenn Pray of Tulsa and his new 810 version of Cord's old '37 Sportsman (see cover). And there's a new Duesenberg organization which intends to produce "a modern classic luxury automobile in the tradition of the famous **Duesenbergs**." Chairman of the board is Fritz Duesenberg, son and nephew of the original brothers, and stylist Virgil Exner, formerly of **Chrysler**, has the design account. Alex Tremulis, former **Ford** stylist and a specialist in aerodynamics, may also act as a design consultant.

The new **Duesenberg**, by present plans, will be built in Europe, perhaps by **Ghia** of Turin, Italy, an organization Exner has worked with before.

With less fanfare than most such efforts, designer Brooks Stevens has actually produced running models of his **Excalibur SS**, a replica of a 1927 Mercedes-Benz racing model on a Studebaker frame. The SS was first knocked together as a show car, but drew such interest that production plans were undertaken. Now there's a demonstrator in San Francisco and one in New York, and a Florida distributor was to get one before the end of September. Midwestern distribution will be through Stevens' Milwaukee headquarters.

As a promotion vehicle for **Studebaker**, the SS was destined to carry a **Studey** engine, the blown **Hawk** mill that **Avanti** got. When **Studebaker**, now of Canada, decided to buy GM engines, Stevens made a similar move. The SS now carries a big 327-cubic-inch Corvette engine.

The **Avanti**, of course, is officially dead but there are some grounds for the rumors that the corpse might breathe again. Faithful of **Studebaker** dealers in the South Bend area are now thinking of building more **Avantis**, but they don't try to blow smoke in your eyes. They stress that they've only started to study possible costs and their chances in the marketplace.

The tires that Carroll Shelby's **Cobras**

wore for the Bridgehampton Double 500 were new **Goodyears**. Called the "R," they were originally developed for rain use, says **Goodyear**, but proved to be so fast they became regular racing shoes. Ken Miles, Shelby's racing manager, told us the team expected the tires to chop two or three seconds from lap times. Ronnie Bucknum, checking out the R, ran 20 consecutive laps at Riverside at or under the course record.

Oddly, the R tread compound is harder than its predecessor's, yet wears down faster. Adhesion is its big quality and, with **Cobra** power, Shelby isn't too concerned about the greater rolling resistance.

What else has the Shelby crew up its collective sleeve? As you'd expect, racing versions of both the **Ford Mustang** and the Fairlane-powered **Sunbeam Tiger**. **Hillman's Tiger** will continue with the **Fairlane V8**, we're told, in spite of **Chrysler's** new interest in the parent Rootes Group. Such are the complexities of international relations.

Which car color is most visible to oncoming drivers? Well, new studies by Indiana University's Dr. Allen (p. 114) show that a white car is most visible, thus safest. But a Swedish study completed this year boosted (so help me) pink! And a California report about a decade ago claimed two-tone orange and blue was safest.

Apparently, safety is a more colorful problem than we thought it was.

A new study by Dr. Allen on the value of daytime driving with headlights on looks interesting. A car-mounted movie camera filmed opposing traffic on a two-lane Indiana highway. Pictures compared reactions of drivers meeting the camera car with its lights on in some cases, off in others. Opposing drivers maintained a more constant distance from the center line, Dr. Allen reports, when the lights on the camera car were on. He's confident that the test shows a headlights-on campaign makes driving safer.

Automotive Editor

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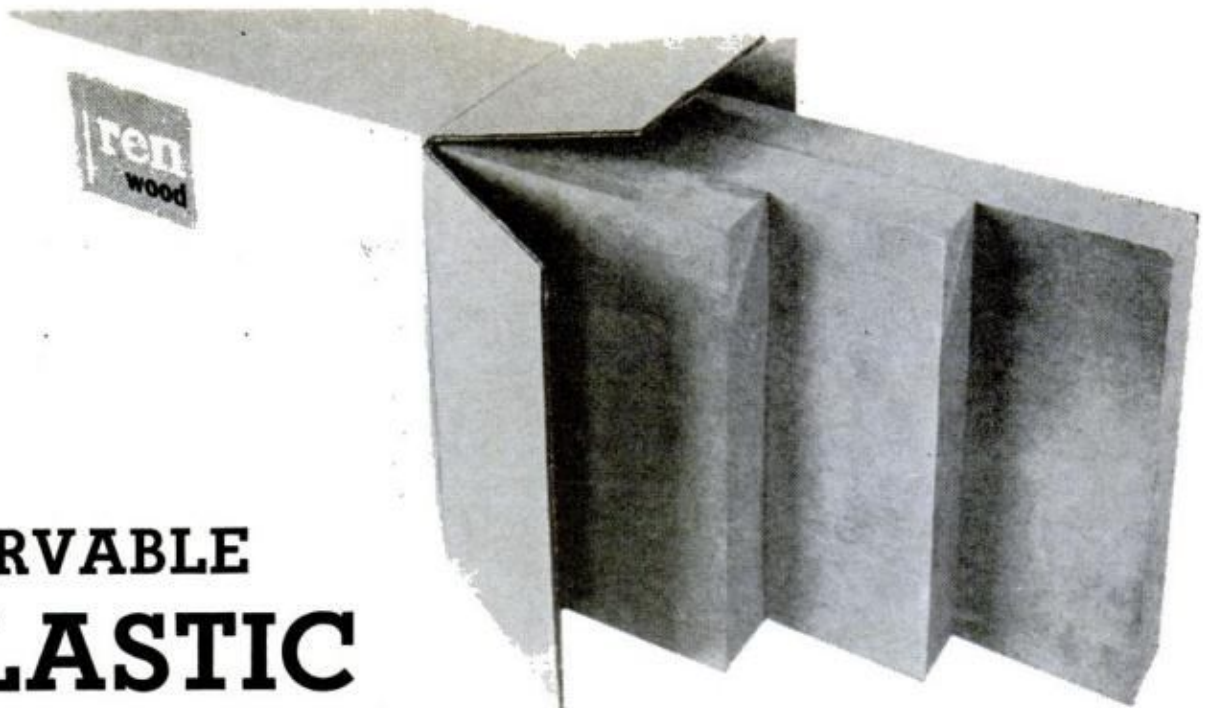
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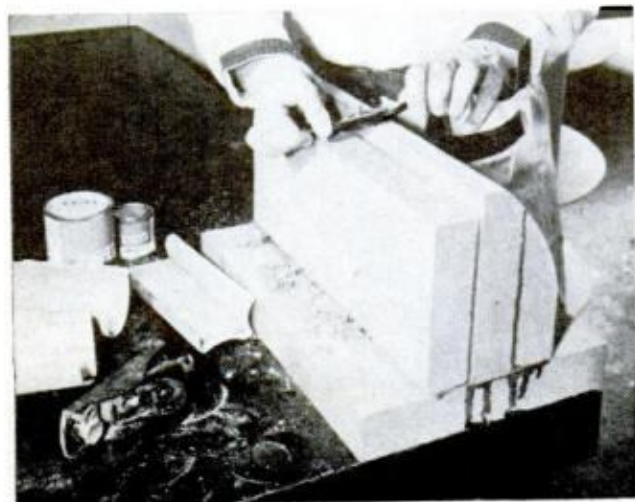
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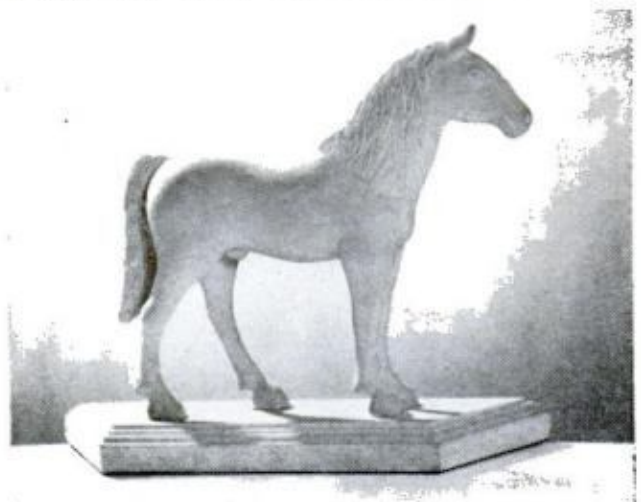


AT FIRST GLANCE it looks like mahogany; heft it and you feel the weight of hardwood. But when you look more closely you realize that it's strictly test-tube stuff.

This new man-made lumber is called **REN-Wood**, a compounded plastic material intended for patternmaking, modelwork and other industrial applications. It is free of knots and other imperfections and is resistant to chipping and splitting. Its greatest superiority over the hardwoods normally used in patternmaking is that swelling and shrinkage are predictable and can be allowed for. Unlike wood, when shrinkage or swelling occurs, the cross grain and length-grain variations are consistent.

The planks, available in 2 and 2½-in. thicknesses, 12-in. wide and 6-ft. long, are a product of Ren Plastic, Inc., of Lansing, Mich.—priced from \$3.85 to \$5.50 per bd. ft. depending on quantity.

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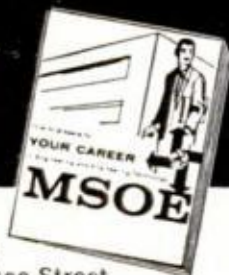
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Items from All Outdoors

Should outdoor activities such as fishing, hiking, hunting, woodcraft and conservation be a part of the physical education programs in junior and senior high schools?

Sheldon Coleman, a zealous outdoorsman who is also president of the Coleman Camping Equipment Co., has proposed the establishment of a federal grant and a commission to study the implementation of such a program on the local school level.

This is not a farfetched idea. Dartmouth College in Hanover, N.H. has had an outdoors department for 23 years. It was taught by Ross McKenney, a former Maine guide, until his retirement in 1961, and is now taught by naturalist Jim Swedlund, who has incorporated field trips in botany, biology, geology and geography with hiking, fishing and woodcraft. Both Penn State and Michigan State Universities have active programs in fishing instruction which are heavily attended by male and female students. All three are accredited physical education programs.

In Aliquippa, Pa., a high school conservation fishing and hunting club has been active for 25 years. It had eight members in 1938 and last year had 340. Although all its activities take place after school hours, the club is tremendously popular with students, and they are currently involved in a number of conservation programs sponsored by the state.

We discussed this program with a number of physical education instructors from New York to California. Without exception they liked the idea. But they also agreed that there would be resistance from educators and administrators who are generally reluctant to accept changes in the education system.

This, of course, is the reason for Mr. Coleman's suggestion of a federal study, which would serve to temper opposition, and could suggest practical application of a program.

We favor the program, not only because it would diversify physical education programs, but for the reason that the skills learned in such a program can be carried into adult life, which is generally not the case with sports like football and baseball.

STUART JAMES

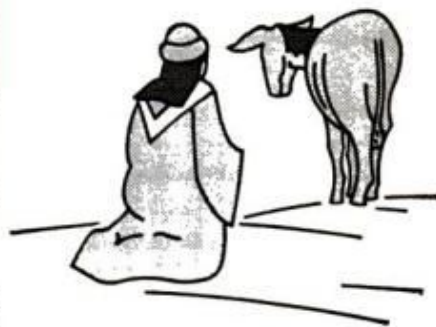
Outdoors Editor



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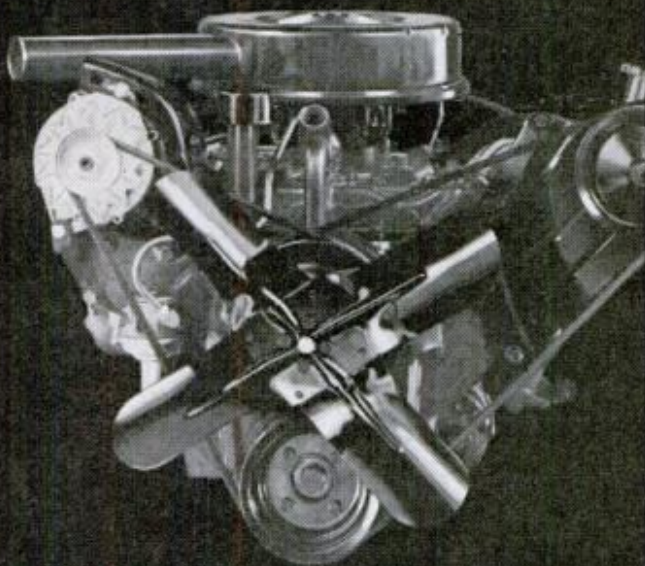
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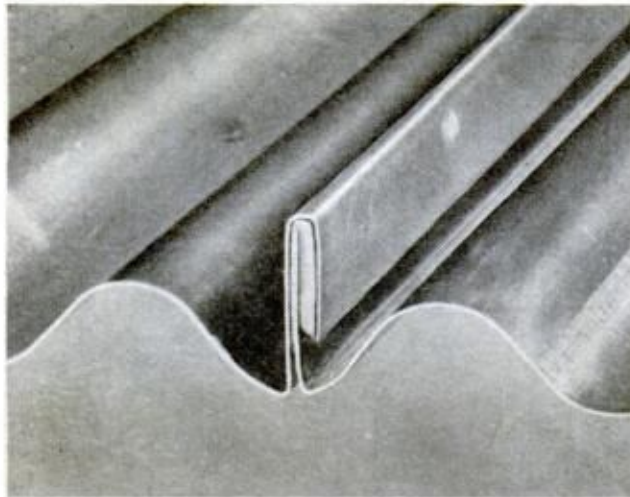
Take a '65 Dynamic 88 out on the road (the Super Rocket is standard, of course) and have yourself an exciting driving experience. Notice the incredible Rocket response. The super smoothness in city traffic. And, at turnpike speeds, the sense of security that comes from knowing you've got the reserve power you need when you need it. Make a pit stop at your Olds Dealer's soon and check out a Super Rocket! You'll find that Olds is *where the action is!* Oldsmobile Division • General Motors Corp.

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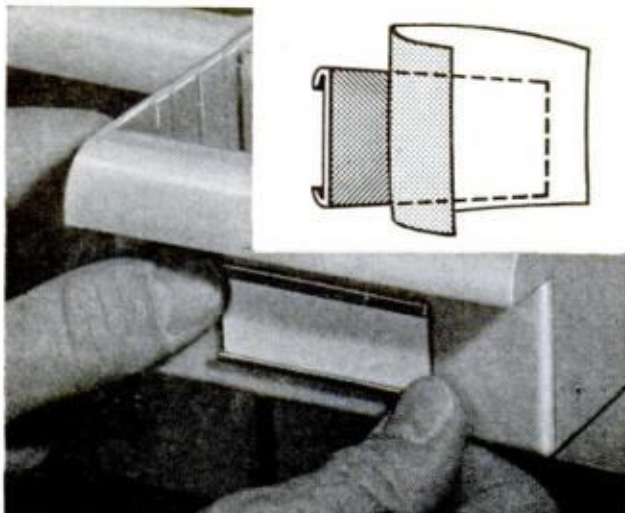
By Arthur J. Maher

LOW COST STORM WINDOWS are made of polyvinyl chloride plastic film in a rigid aluminum frame. Some sizes weigh less than a pound. Come with attaching hardware and are quickly installed from inside the house with a hammer. Vimco storm sash cost \$3 and up. Virginia Iron & Metal, Box 8664, Richmond, Va.

FACTORY-CALKED EDGES of these corrugated roof and siding panels eliminate need for overlapped joints fastened with screws or bolts. Edge of one panel slips into folded edge of adjoining panel. Tight enough to use on almost dead-level roofs. Made of steel, aluminum, stainless steel, with plastic or enamel coatings. About 23¢ a sq. ft. and up. Elwin G. Smith, Williams St., Emsworth, Pittsburgh, Pa.



ADHESIVE-BACKED LABEL HOLDERS stick on file drawers, parts bins, loose-leaf binders, ledgers, etc. You strip off paper backing, then press into place. The label is held by channel edges. \$1.50 for 50 1/2x1 1/2-in. holders, \$2 for 50 3/4x2-in. Made by Akron-Mils Cabinets, 1293 South Main Street, Akron, Ohio 44309



WASH AWAY RUST: A new preparation tried by PM actually dissolves rust from iron, steel, stainless steel, tile, concrete, brass, copper and bronze. You apply to a depth of 1/8 in., then wait a specified period, depending on amount of rust, and wash off with water. It's foul-smelling, and harmful to your skin, but it works. Manufacturer also makes a compound for dissolving rust from the insides of car radiators. Prices of both preparations run from \$9 to \$12 a gal. They're available from Sylvester V. Pointkowski, 150 B'dway, Room 914, N.Y. 7, N.Y.

NEW PIPE-THREAD SEALANT can be used for all pipes, including stainless or plastic. The Teflon-based compound is said to withstand temperatures up to 450 deg. F., and to assure easy assembly and disassembly of joints. Also recommended for bolts, nuts, gaskets. Price: \$1.95. Duriron Co., Dayton, Ohio



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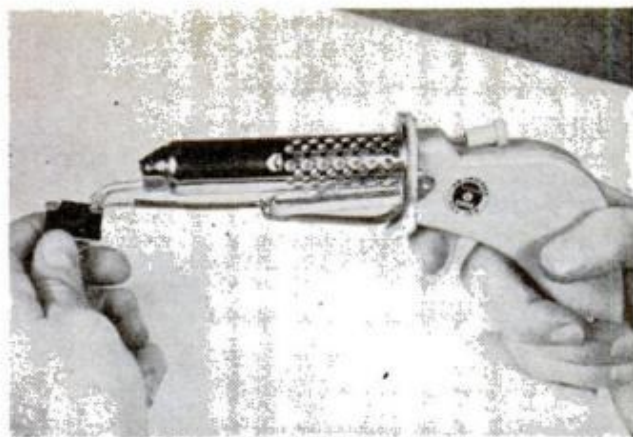
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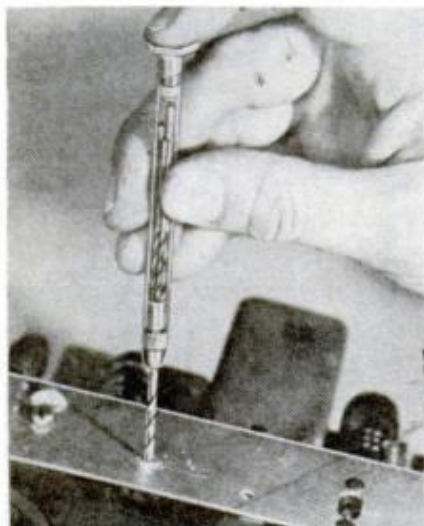


Shopping for Tools

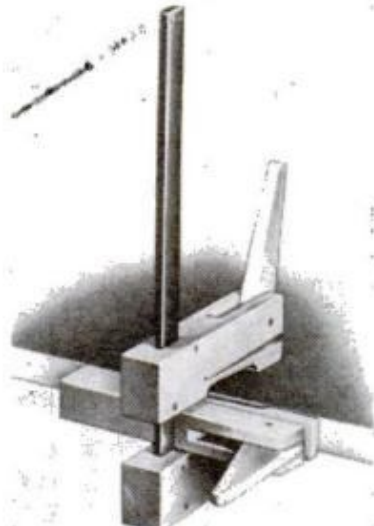
ONE-HAND SOLDERING is possible with the Blixt soldering gun. You put the wire solder inside the gun, on 16-ft. reels. Pulling the trigger feeds the solder as needed. The tool also features replaceable tips, which are removed by pushing a button. Costs \$16.95 and up. Porta-Power, 1120 N. Ball St., Owosso, Mich.



THE PIN VISE that comes with the No. 60 Tap Drill Set has a hollow handle that stores five tiny drill bits. Bit sizes are .047, .060, .070, .0785 and .089 in. These correspond to taps numbered 080, 172, 256, 348 and 440. Set costs \$3. Made by Moody Machine Prods. Co., Inc. 45 Dudley St., Providence, R.I.



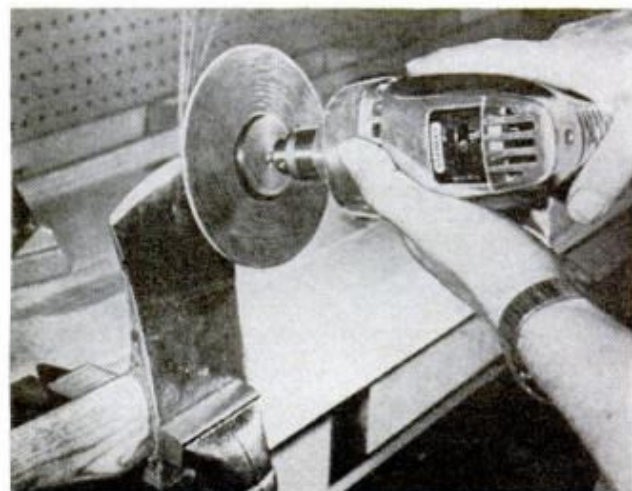
QUICK-ACTING 7 $\frac{3}{4}$ -in. clamp has wooden jaws faced with cork, to eliminate need for buffer blocks to protect work. A cam lever applies the pressure. Comes with edge clamp for gluing edging on table tops, counters. Price: \$4.25 Holly House, Box 3182, Albuquerque, N.M.



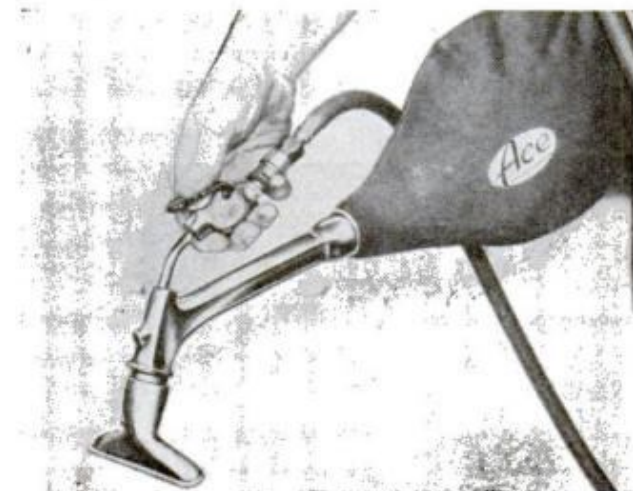
DRILL WITHOUT PRESSURE: The pilot screw on this drill bit pulls it through wood, plastic and other materials. A perimeter cutter defines the cut while a planner blade scoops out the material. In 1 $\frac{1}{4}$ to 2 $\frac{1}{16}$ -in. sizes, $\frac{3}{8}$ and $\frac{1}{2}$ -in. shanks. Priced from \$4.95. Skil Corp., 5033 Elston Ave., Chicago 30, Ill.

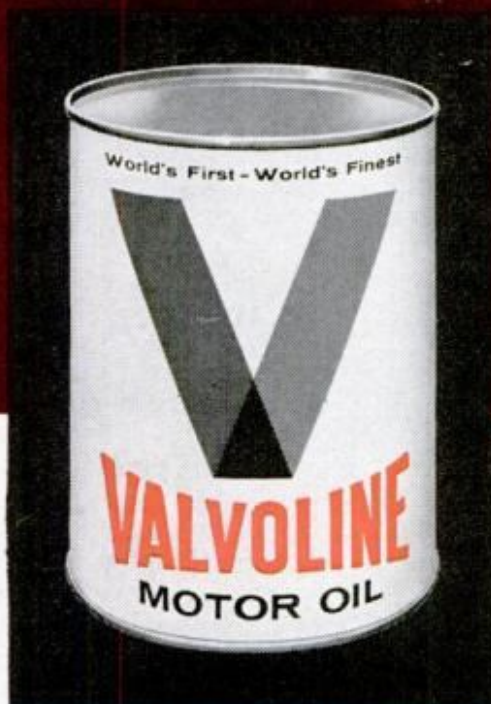
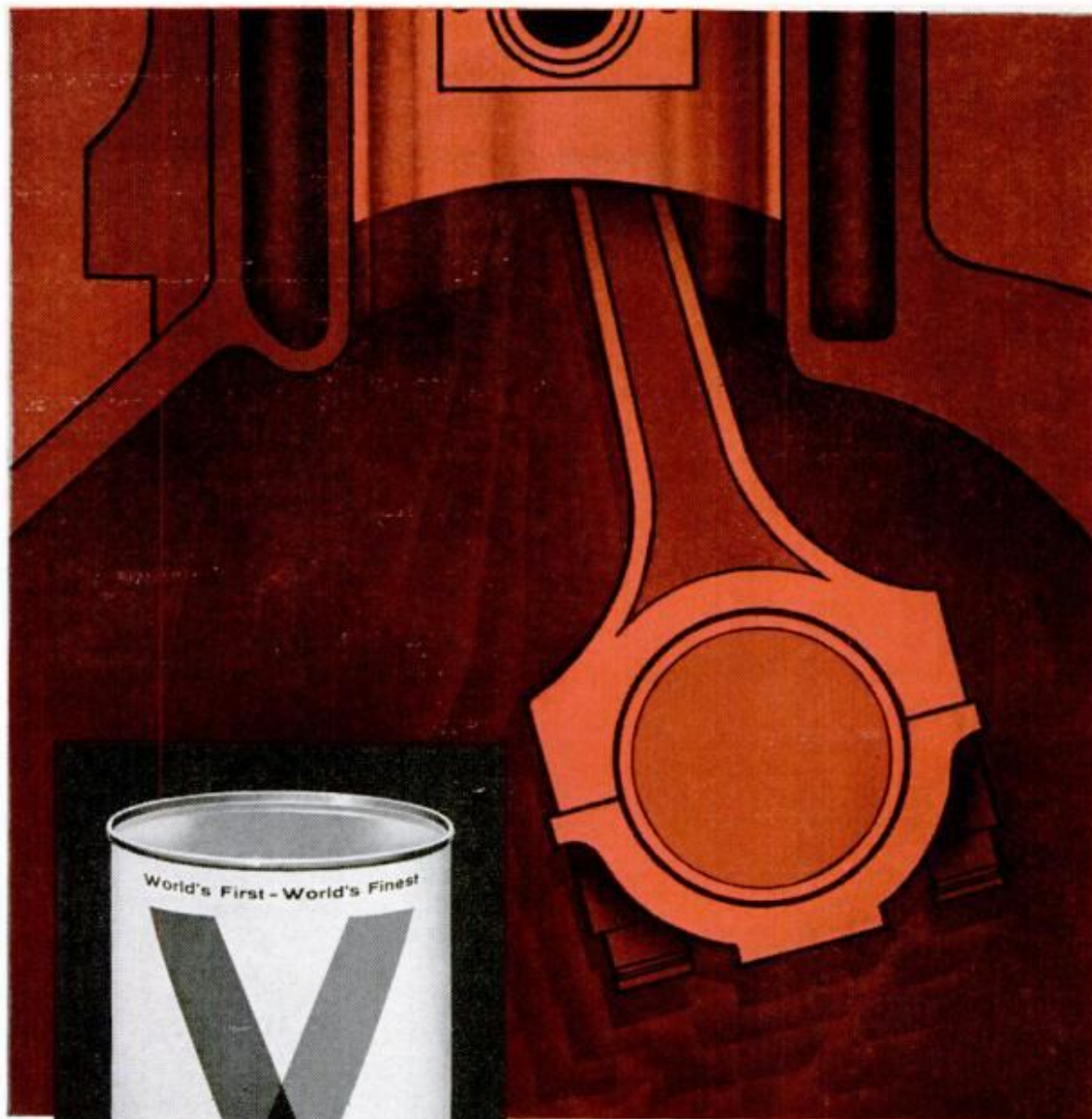


FLAT GRINDING: Abrasive disc, for use in any $\frac{1}{4}$ -in. or larger electric drill, puts new cutting edges on axes, shovels, hoes, rotary power mower blades. Unlike wheel-type grinders, it gives a flat edge. Recommended for use at 1700 to 5000 r.p.m. About \$2. The Stanley Works, 195 Lake St., New Britain, Conn.



MOTORLESS VACUUM CLEANER, the "60" Air-Vac, operates from any compressed air line of 25 to 150 lbs. pressure. Works on the Venturi principle used in spray guns and carburetors. Can also be used to siphon liquids or move bulk materials such as grain or flour. Costs \$29.95. Ace-Sycamore, Inc., Sycamore, Ill.





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Fish Like It, Crops Don't

Water that is released from a deep reservoir is good for trout but can be bad for agriculture. When Shasta Dam was completed in California, the temperature of the Sacramento River below the dam fell from an average of 61 degrees to a fairly constant 45 degrees, much too cold for good germination of rice seeds in fields irrigated with river water. Rice production fell off as far as 100 miles downstream.

The drop in temperature results from the cold water at the bottom of the reservoir being used to operate the dam's hydroelectric plant.

When the new \$390,000,000 Oroville Dam on California's Feather River is completed, the temperature of its tailwaters will be a nearly constant 42 degrees, adverse for many irrigated crops. To combat this, warm surface water will be drawn from the reservoir by "skimming towers" and will be mixed with the cold water discharged from the dam's hydroelectric plant. Engineers hope to maintain a water temperature of not less than 55 degrees downstream during the growing season.

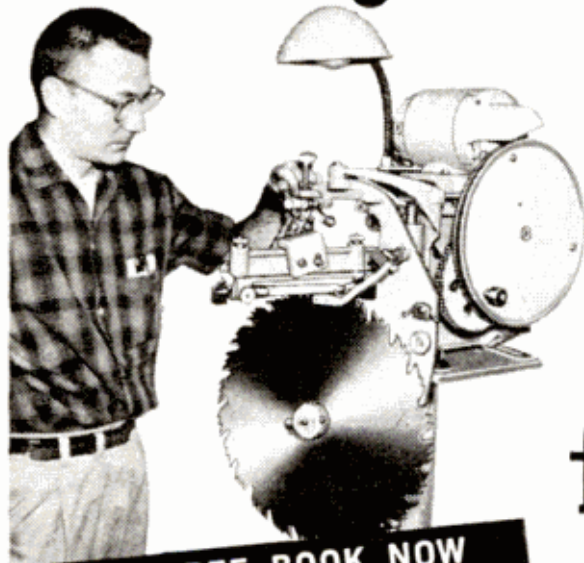
In an experiment intended to "please everybody," an intake tower is being added to Folsom Dam on California's American River, so that warm surface water can be discharged during the spring germinating season, and cold bottom water during the hot summer months to improve conditions for fish.

Microscope like TV

Using a narrow beam of electrons, a new type of electron microscope "scans" the specimen, much as a TV camera uses light. Instead of producing beams that penetrate specimens and may damage delicate tissues, as ordinary electron microscope systems do, the scanning beam causes the specimen to "glow" invisibly, giving off more electrons which permit its image to be projected by another scanner into a TV-like screen. Result: a sharper image and deeper field of view from this Westinghouse development.



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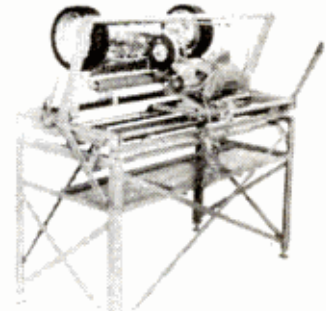


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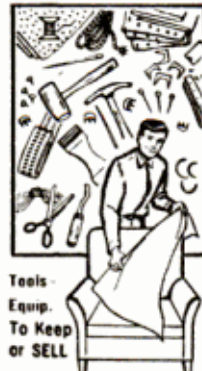
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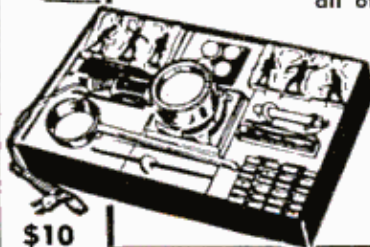
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- Insure maximum gas economy and quiet engine running. Read the exact RPM while the engine is in neutral position. Then adjust the carburetor in conformity with the car manufacturer's recommendations.
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- Cars with automatic transmissions function efficiently only if the fluid pressures are correctly maintained and since manufacturer's instructions always refer to RPM, the Model BT-162 (or an equivalent tachometer) is required to properly service automatic transmissions.

The Model BT-162 is the most complete unit in its price range ever produced. It comes absolutely complete, ready to use. Only

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Specifications

The Model BT-162 provides three dwell angle scales; 0 to 45 degrees, 0 to 60 degrees, and 0 to 90 degrees. The three dwell angle ranges specified above make this instrument suitable for making accurate dwell angle adjustments on all 4 cylinder, 6 cylinder, and 8 cylinder cars, both foreign and domestic.

The dual range tachometer is extremely versatile since it provides both a low range of 0 to 1000 RPM, necessary for making precise carburetor adjustments and the high range tachometer, 0 to 5000 RPM suitable for making all other tests at high engine speeds.

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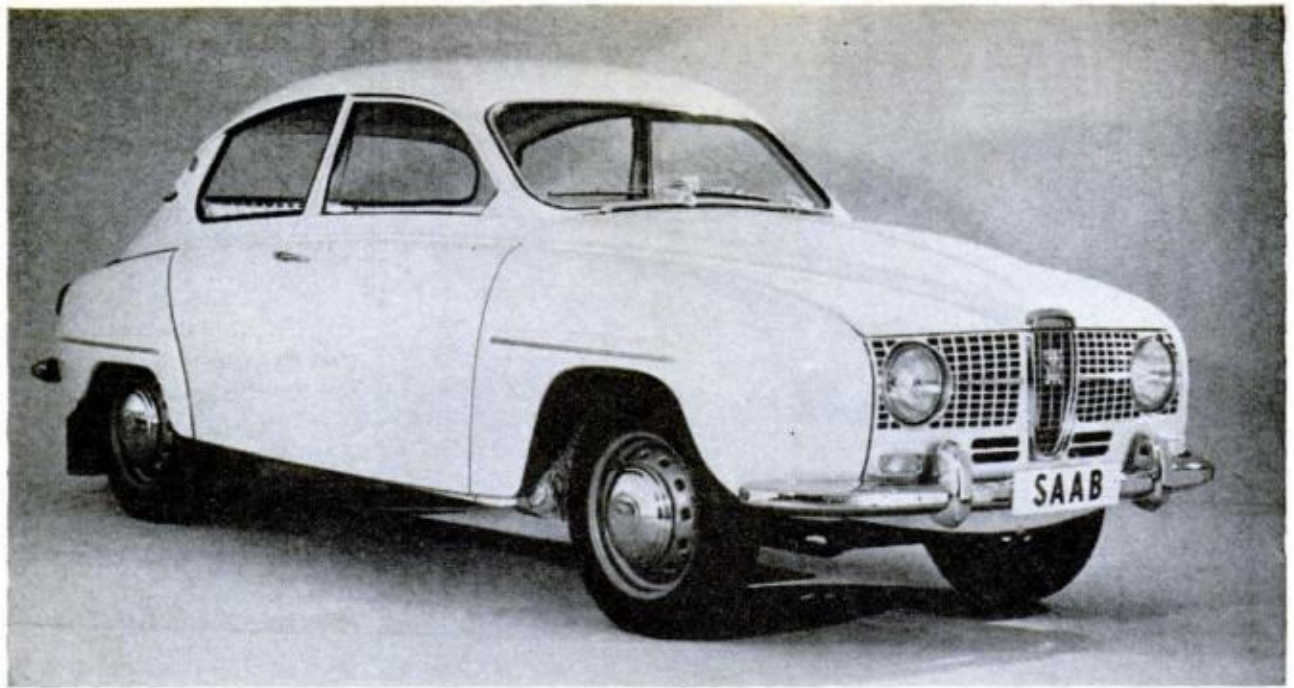
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THE SAAB IS LESS EGG-LIKE WITH ITS NEW HOOD LINE, slightly longer and a little lower, introduced for '65 models. Front overhang is increased some, too, and the wide grille is new. Its center section is stainless

New Saab Warms Up Faster, Turns Tighter

SWEDEN'S beloved Saab is losing its putt-putt sound effect (with a new exhaust system) and gaining more warmth for passengers and a 16-inch reduction in turning-circle diameter.

The radiator has been moved up in front of the engine compartment for a more orthodox arrangement that's likely to comfort U.S. buyers. One especially welcome result is the increased heater output. The manufacturers say heater air flow will now be 30° to 45° warmer than earlier Saabs. Thus, after five or six minutes at between 26 and 60 m.p.h., you'll get air at 60° or 65°. The water pump has been moved to the cylinder head, thus permitting shorter

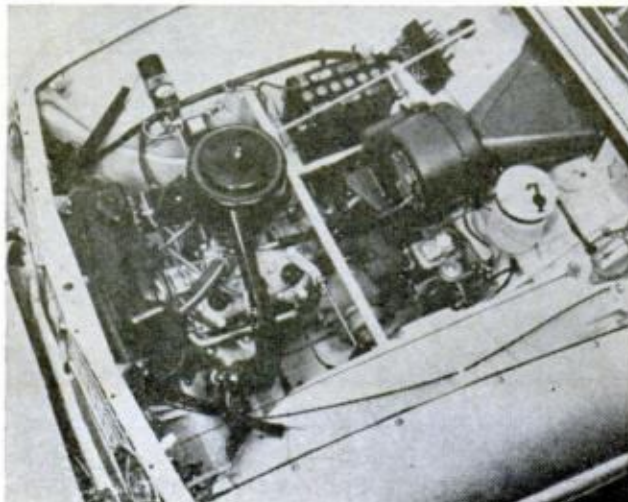
hoses and faster warm-up.

The engine's coolant capacity of Saab's engine is down nearly a quart to a little less than seven quarts.

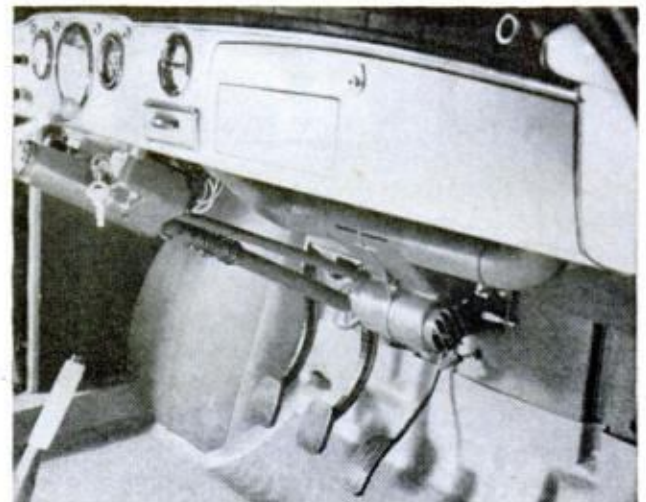
Raising the compression ratio 0.8 points from 7.3 to 8.1:1 helped Saab engineers squeeze the SAE horsepower rating up from 42 to 44 at 5000 r.p.m. Performance through the four-speed transmission was good before and should improve slightly.

The two-cycle, three-cylinder engine isn't changed, but a hydraulically operated clutch replaces the mechanical linkage. The turning circle was only 36 feet across and new front universals have cut that down another 16 inches.

RADIATOR'S NOW UP FRONT, where Americans are used to finding it. Components still are very accessible



PENDANT PEDALS on the Saab eliminate holes in the carpet to keep out moisture, thus corrosion and ice





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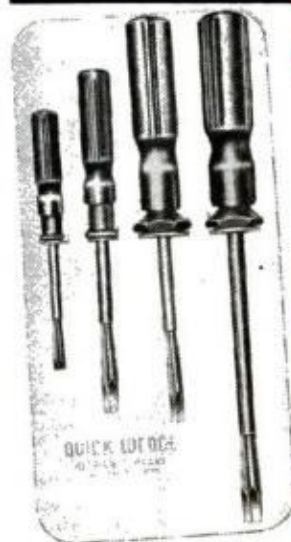
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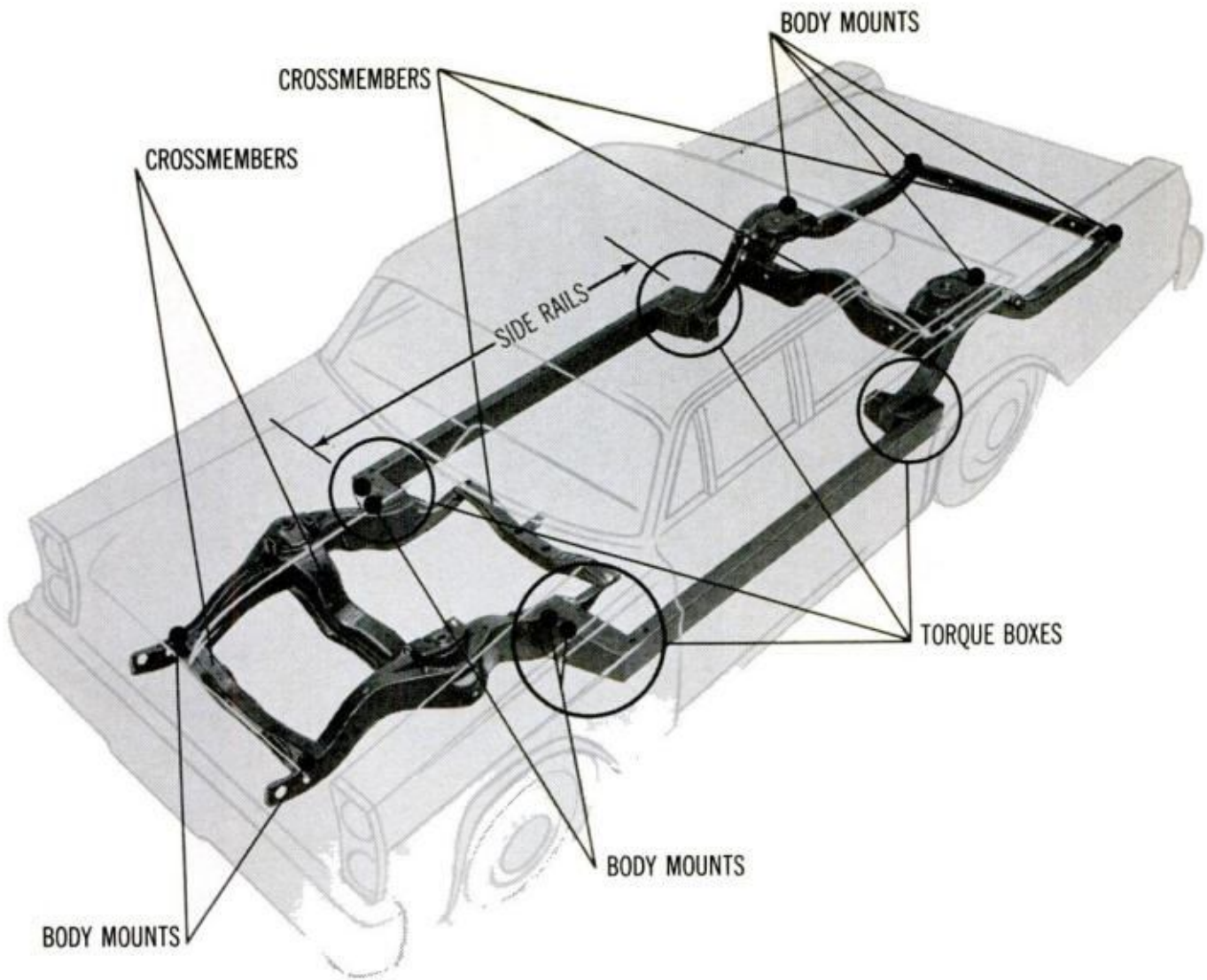
Make It a Shock-Proof Christmas



EVERY POWER CORD ON THIS PAGE ends in an ordinary two-prong plug. Only a couple of years ago, this would have been unthinkable. Three prongs were standard, to provide shock-hazard protection in case the tool shorted out. But most purchasers of portable electric tools simply bought an adapter plug and ignored the ground connection. It became apparent that the only way to guarantee safety for a careless public was to build the shock-proofing right into the tool. Millers Falls' solution, with their $\frac{3}{8}$ -in. drill, is unique in that it retains the aluminum housing for structural strength—except for a tough-plastic handle and back cap. The insulation is internal: the powerhouse is wrapped in a non-conducting liner. For holiday giving, the drill is packaged in a steel case that can be stored on the wall and lifted down for toting to the job site. Neatly fitted in the case are attachments that convert the drill to a circular saw, sabre saw and orbital sander. Since the insulated drill powers them all, this gives you a shock-proof workshop for \$119.55

ANOTHER APPROACH TO SHOCK-PROOFING is demonstrated by Rockwell's new Green Line tools, three of which are shown below. Non-conductive housings and switch triggers of unbreakable thermoplastic keep user from any metallic contact. Double protection is provided by nylon insulation around motor. The line includes a $\frac{1}{4}$ -in. drill (\$14.88), a $\frac{3}{8}$ -in. drill (not shown; \$19.88), a sabre saw and an orbital sander (\$22.95 ea.)





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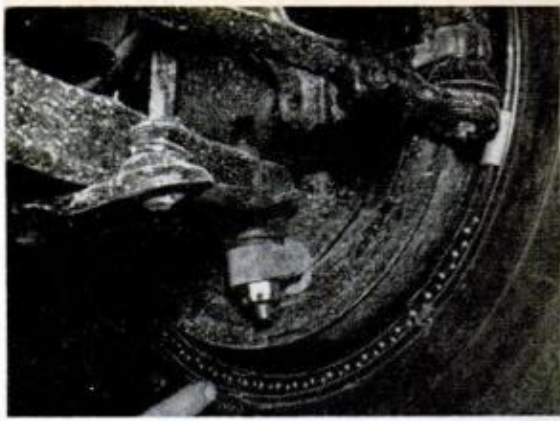
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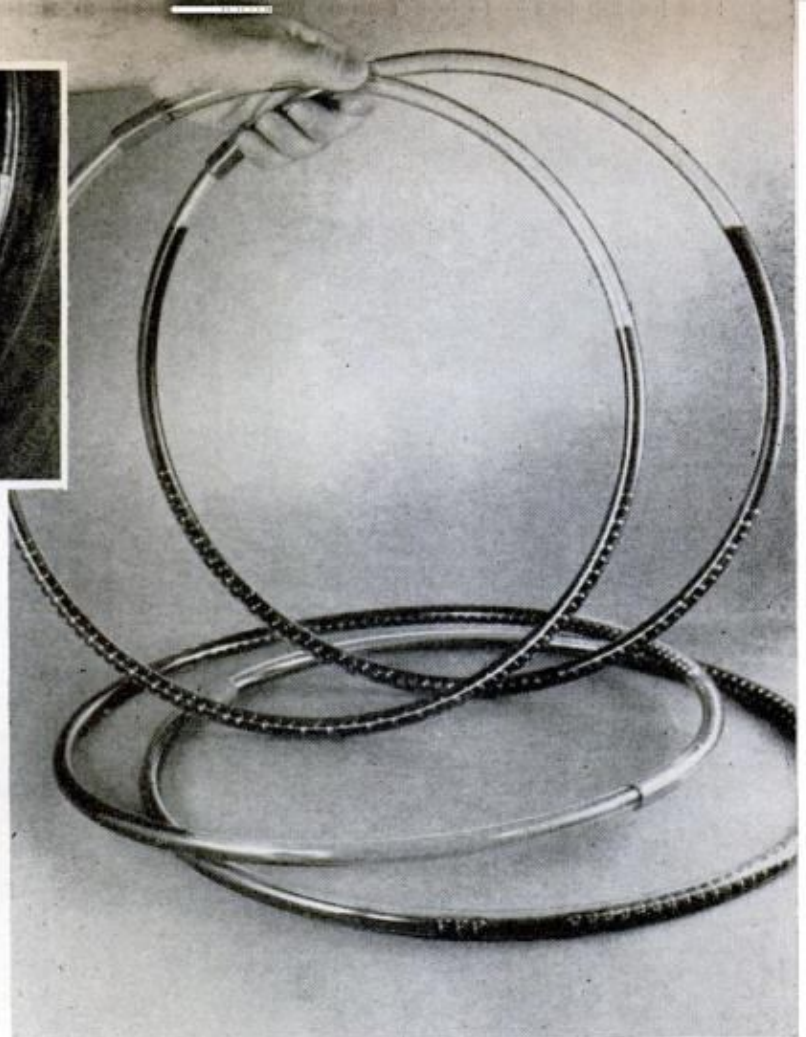
MOTOR COMPANY



Hula-Hoop Balancers

Chrome steel balls in a damping fluid are the secret of new wheel-balancing rings that automatically compensate for changes in balance.

The plastic hoops are clipped in place on a car's wheels (above). As the moving wheel changes balance, centripetal force sends some balls opposite the "heavy" side to balance it. Price is \$24.95 installed; Teco Sales Co., 2700 Stemmons Freeway, Dallas, Texas.



Kiddie-Plane

It doesn't fly, but it attracts attention—and that's the idea.

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With 85 pounds of pressure, the 48-ply tires each can support up to 80,000 pounds at speeds of five miles an hour.

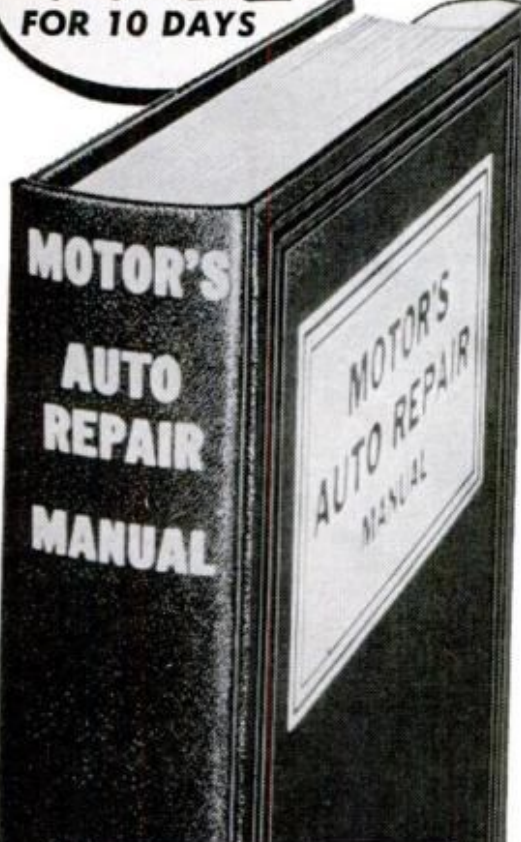
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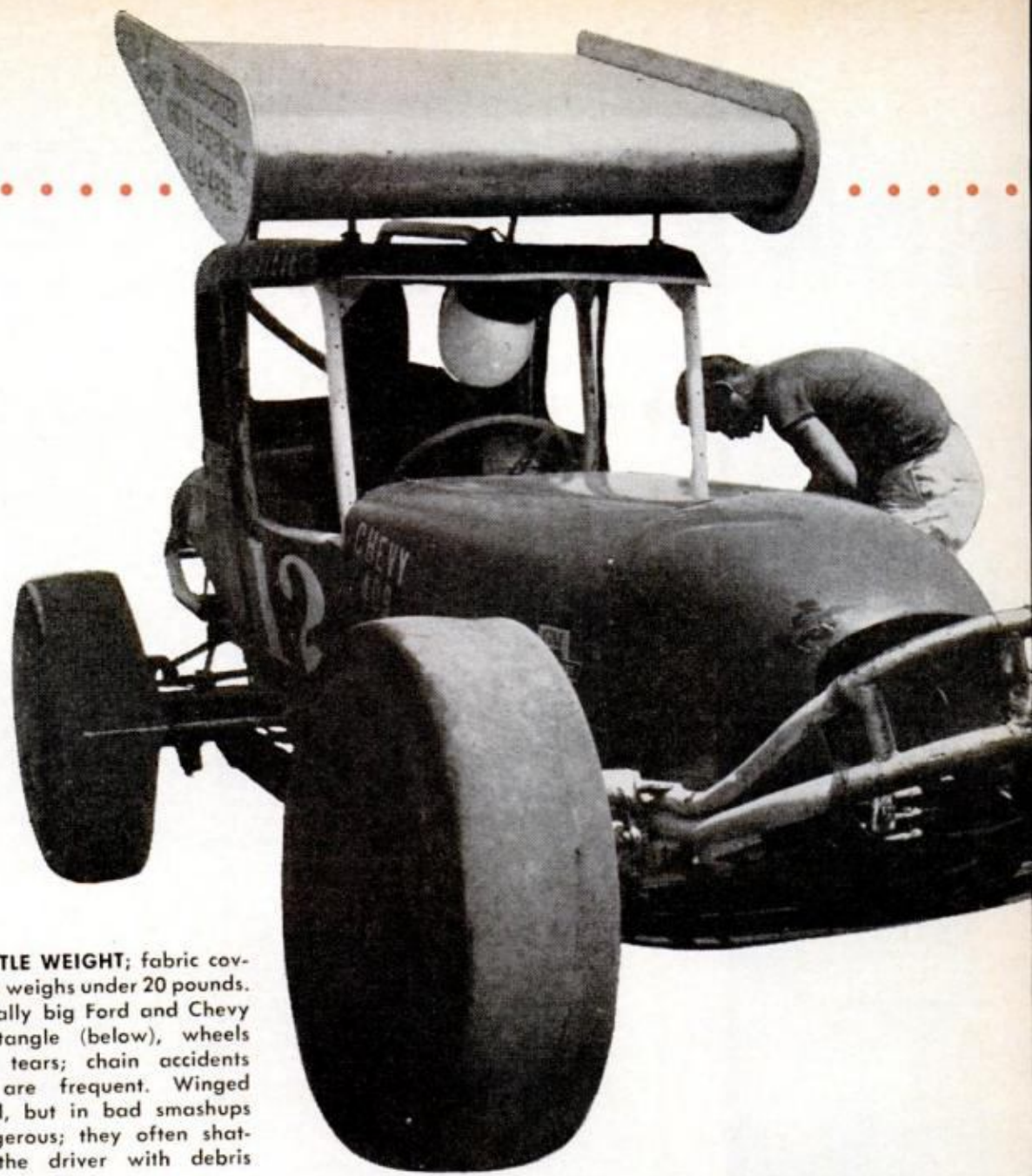
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WINGS ADD LITTLE WEIGHT; fabric covered one (above) weighs under 20 pounds. Engines are usually big Ford and Chevy V8s. In mad tangle (below), wheels fly and metal tears; chain accidents such as this are frequent. Winged cars seldom roll, but in bad smashups wings are dangerous; they often shatter and pelt the driver with debris



Wind Wings for Hot Rods

• • • • • By John E. Boykin

THE LEAD CAR, an outlandish winglike panel bolted to its roof, roared into the corner. The rest of the hot rods clustered close behind, their spinning tires spraying dirt up from the surface of the unpaved oval track.

The second-place car, a wingless rod, stormed up to within inches of the leader in the straights, but fell back again at each corner. Desperately, the young challenger finally tried to squeeze between the winged leader and the crash wall along the straight. He didn't make it. His car hooked into the wall and flipped, sending wood splinters flying. The leader sped on to take the checkered flag. The next five finishers all sported wings.

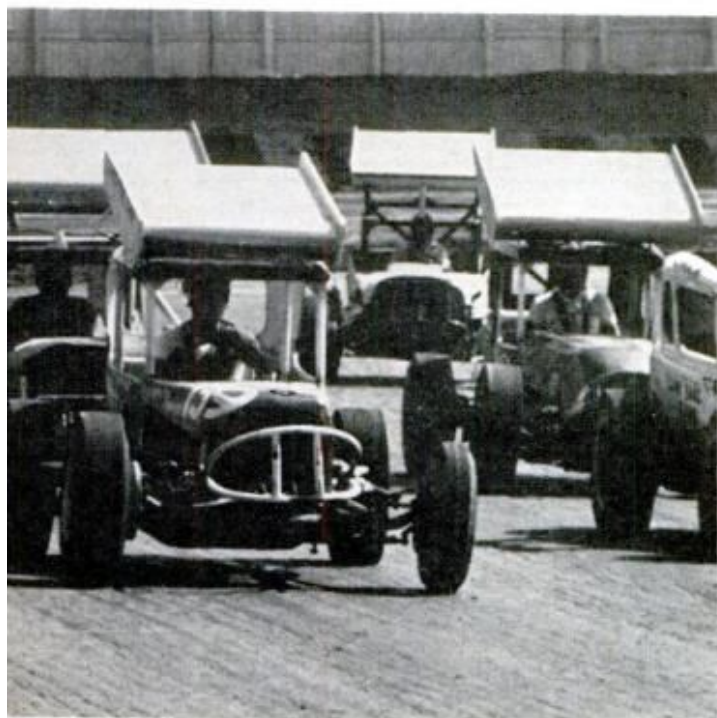
This recent race is typical of many on the West Coast today. Drivers first started using the wind wings—actually inverted airfoils—just over a year ago. The wings are usually as wide as the car and about five feet long. Their function is just opposite of an airplane's wing; air pressure pushes them down, holding the cars against the road and giving better cornering traction.

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CARS TURN ONLY LEFT in oval-track racing, so right front tire is usually a huge "slick." The other front tire and wheel are small, for banked effect

WITH LEATHER FACE MASK, goggles and helmet, driver looks like a creature from another world. His "other world" is quarter-mile hard-mud oval track





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"Gems of the World Ocean" by Dr. Gordon Melvin is about one of the most intriguing family hobbies—shell collecting. A good book for adult beginners, the 96-page text

discusses not only how to begin collecting, but also shell histories and the changing value of specific shells. Photographs (56 of them in full color) augment the how-to information on where to look for shells, clean them and name them. The paperback edition at \$2.95 is available from Naturegraph Co., Publishers, 8339 W. Dry Creek Rd., Healdsburg, Calif.

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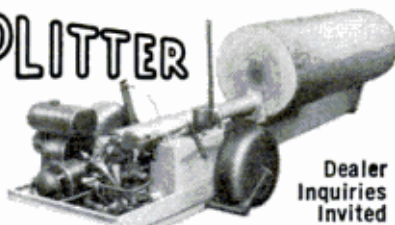
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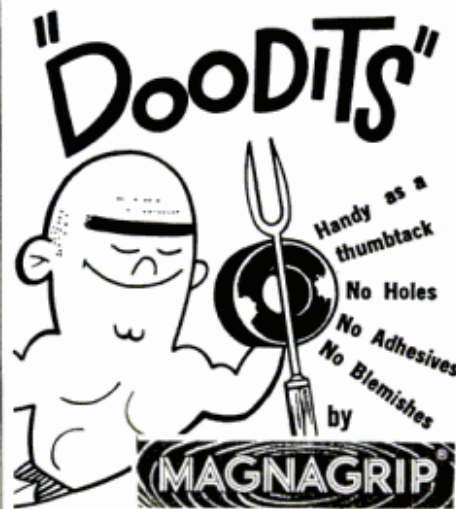
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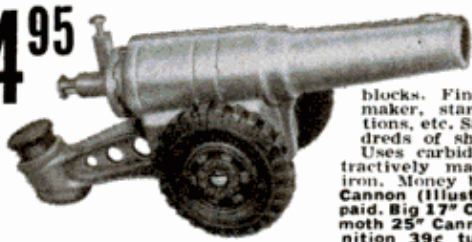
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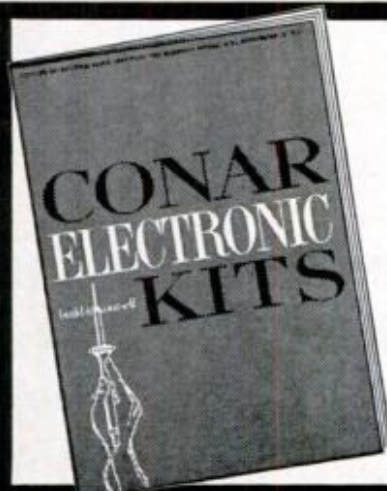
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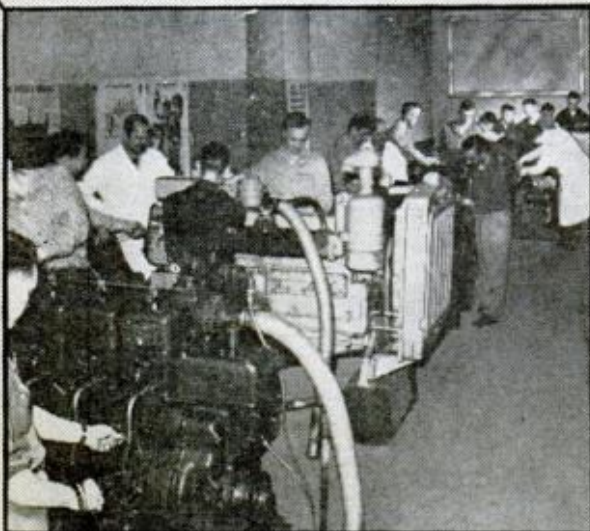


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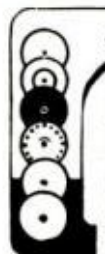


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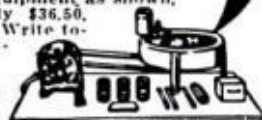
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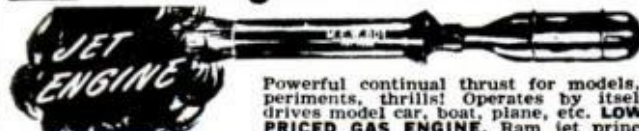
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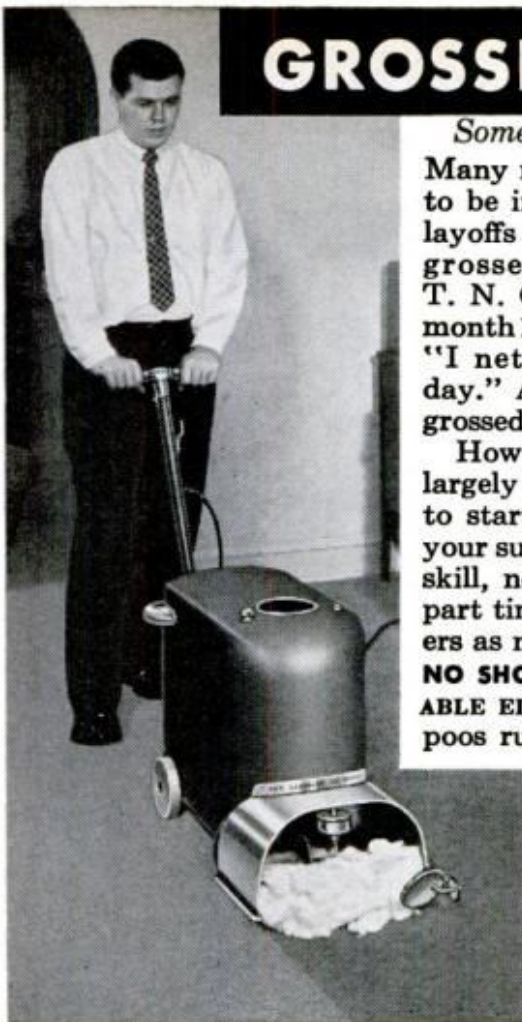
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The least active of those tested was the business executive, who scarcely moves from his desk in walking .97 during his working hours.

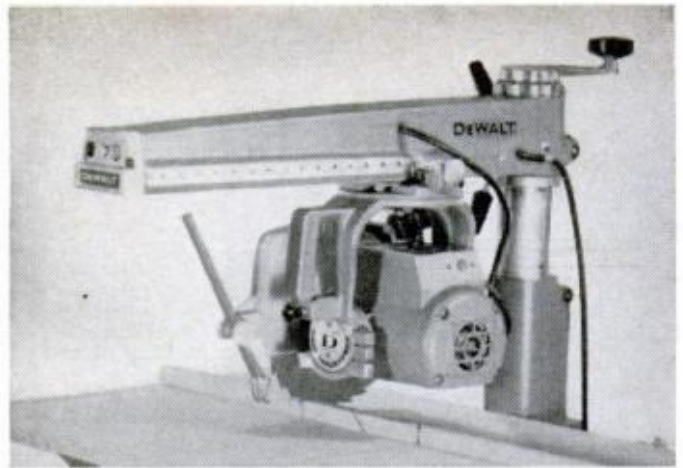
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Moon Mysteries Ranger Didn't Solve

Scientists still don't know the origin of the craters or what makes areas glow red

By John Pfeiffer

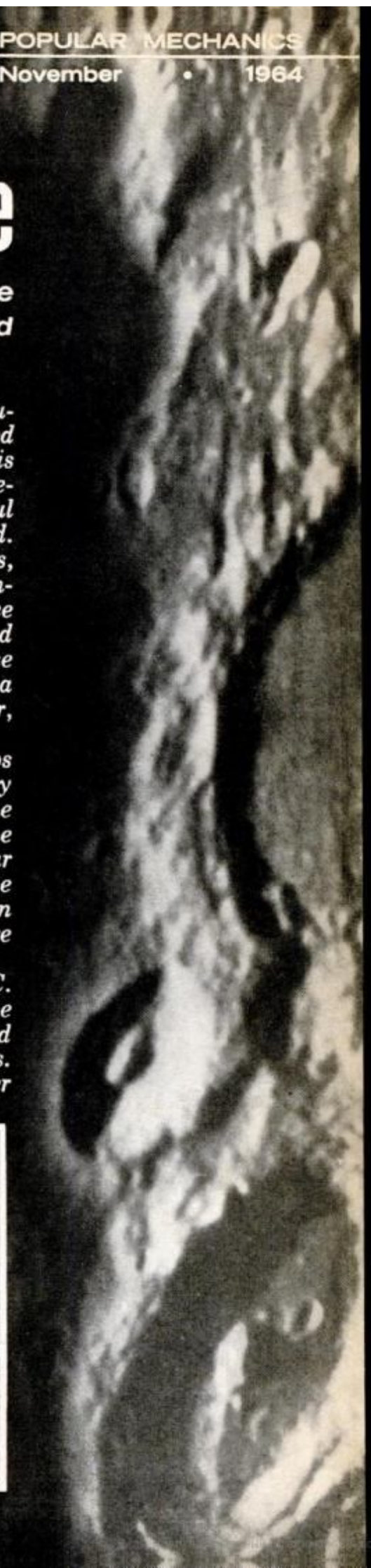
■ *Editor's Note: The dust has yet to settle in the argument over the nature of the moon's surface: Is it covered with dust deep enough to swallow a landing vehicle—or is it essentially firm and rocklike? This point was hotly debated by space scientists prior to Ranger VII's successful photo mission last summer. And it's still being debated.*

After studying a selection of the 4316 Ranger photos, Dr. Eugene Shoemaker, a member of the team of scientists assigned by the National Aeronautics and Space Administration to evaluate the pictures, said he believed that the "surface is basically hard and of fairly dense material up to within a foot, at least, and perhaps even a few inches of the surface." Astronomer Gerard P. Kuiper, head of the team, held the same opinion.

But Dr. Thomas Gold of Cornell University, perhaps the strongest proponent of the dust theory, promptly disagreed. Writing in *Science*, a professional journal, he said: "The Ranger pictures have clearly strengthened the case for dust being the main constituent of the lunar lowlands . . . Without any clear signs of firm rock, the pictures must lead to more concern about sinkage on impact or dust blowing in rocket exhausts in future operations on the lunar surface."

Another member of the NASA team, Dr. Harold C. Urey, took a mid-position: "The question of whether the lunar maria (seas) consist of lava or of finely divided material is, in my opinion, unanswered by these pictures. I have seen nothing that definitely convinces me of either

ASTRONOMER Thomas Gold argues that the many soft, rounded contours appearing in the detailed photos taken by Ranger VII indicate that the lunar lowlands are covered with layer of dust





ATMOSPHERIC distortion softens features shown in this photo made with 40-inch earth-based telescope. Part of large crater, Guericke, appears at right Yerkes Observatory Photo

point of view . . .”

In short, there is still much that we don't know about the moon. Though Ranger VII proved to be a valuable new tool, it did not — with the exception of the lunar rays — penetrate those mysteries that have long perplexed astronomers.

. . .

ONE EVENING about a year ago, James Greenacre of the Lowell Observatory in Flagstaff, Ariz., focused a 24-inch refracting telescope on an area at the upper left-hand corner of the moon's face. His field of vision included a long snake-shaped valley and Aristarchus, a crater resembling a colossal amphitheater with terraced, mile-high walls.

Greenacre was engaged in an Air Force mapping project and had no reason to expect anything unusual in this much-studied area. He was settling down for another night of routine observing when suddenly—hovering over Cobra Head, the wide southern end of the valley—he saw a shining red spot: “I had the impression that I was looking inside a large polished gem ruby. I saw another spot in the valley, then a third over the rim of Aristar-

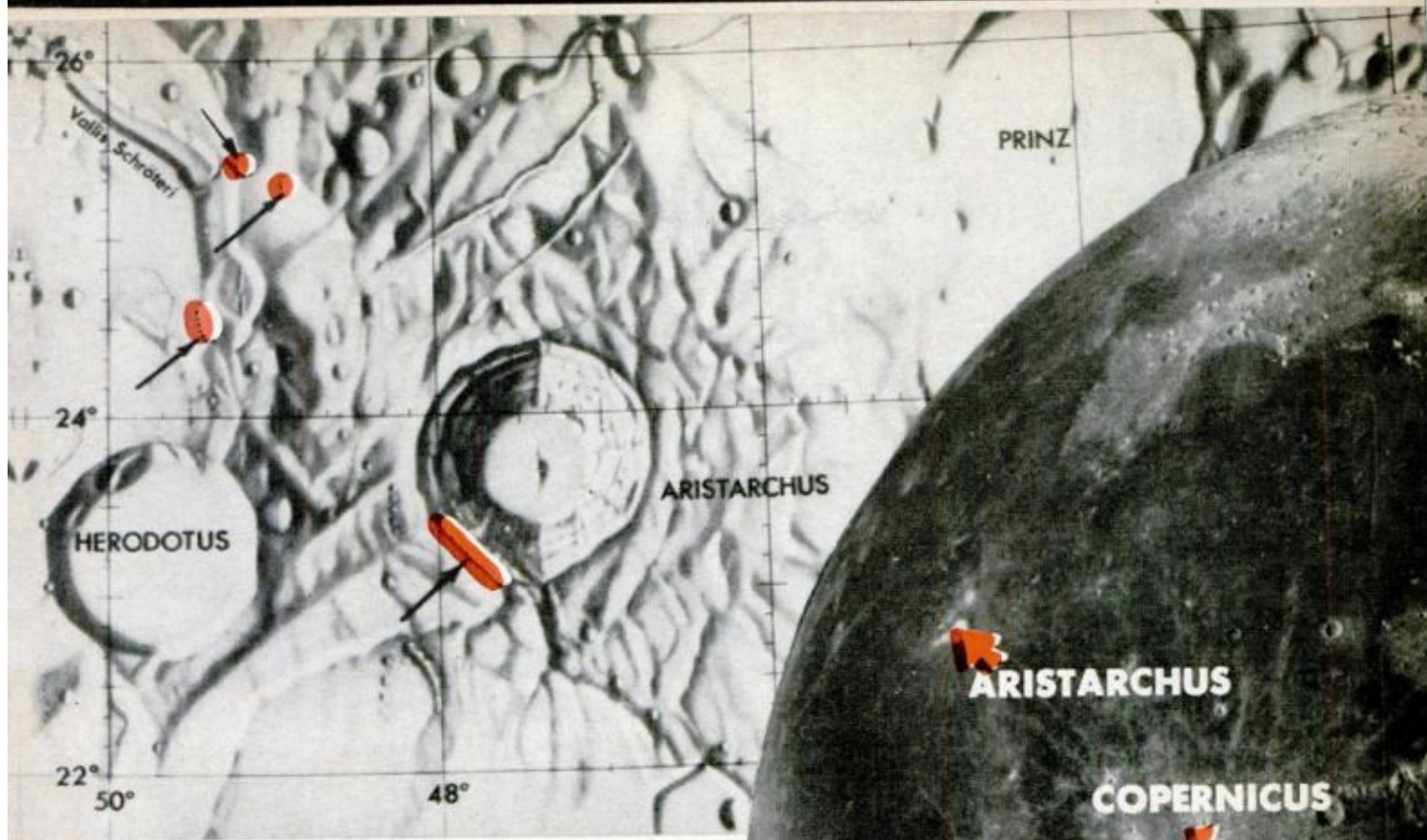


GUERICKE and surrounding area as photographed by Ranger VII from a distance of 470 miles. Smallest craters shown are approximately 800 feet across

chus. Soon the spots started to fade; they disappeared in about twenty minutes.”

Ruby moon glow is only one of the latest in a long line of lunar phenomena which continue to baffle astronomers. From one standpoint, of course, the moon is undoubtedly the best known of celestial bodies. For more than three and a half centuries observers have trained their telescopes on its rugged crater-pocked face, recording an estimated 40,000 separate features and naming about 700 of the most prominent. And Ranger VII brought craters no larger than three feet in diameter into focus.

Yet for all the observing the moon remains a place of paradox, a familiar and at the same time an alien satellite. Strange things are happening in this supposedly dead and unchanging world, and the more intently the experts look the more they find—and the more they must try to explain. For example, Greenacre kept observing and saw another spot about a month later, again over the crater's edge. This time it lasted more than an hour, long enough to permit him to notify astronomers at the nearby Perkins Observatory, who checked his report. Further-



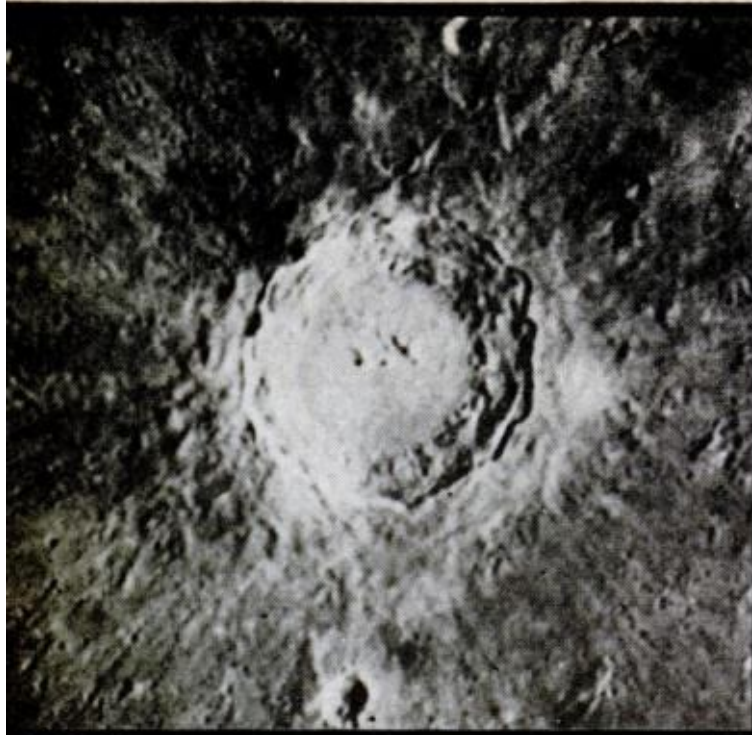
JAMES GREENACRE was mapping moon when he spotted red glows at sites shown in color on chart. It is thought the phenomena were caused by gases

more, the news aroused fresh interest in an announcement greeted with some skepticism six years ago when a Soviet scientist described similar phenomena over a crater about 1000 miles away from Aristarchus.

Astronomers are still trying to make sense of the records. Studies of the red spots indicate that they were actually clouds of dense gases, perhaps including ammonia or a form of carbon unknown on earth, colored red either by sunlight or by their own burning. (Soviet studies indicate that temperatures inside the clouds may rise as high as 2000 degrees F.) As far as the source of the gases is concerned, you can take your choice of theories. Harold Urey, University of California Nobel Prize winner, believes they may have escaped from deep fissures produced by moon quakes. Other scientists picture great clouds bursting from the mouths of active volcanoes.

In any case, the fact that things are stirring inside the moon has a number of interesting implications. The existence of sizzling red clouds calls for a second look at one of the most sensational episodes in the history of lunar observation—an episode involving an object named Linné,

RANGER VII zeroed in on site near crater Guericke and in a ray of another major crater. In area to north, rays of Copernicus can clearly be seen radiating from crater, formed when meteorite hit moon



—Mt. Wilson Photo, Courtesy Yerkes Observatory



—From "The Measure of the Moon" (Ralph B. Baldwin)

TWO IMPACT CRATERS: Telescopic photo of Copernicus (left) and aerial shot of Meteor Crater, Arizona. Characteristic rays have been worn away from the earth crater through atmospheric erosion. There's also a large difference in size, Copernicus measuring 56 miles across and Meteor Crater but 4000 feet

after the Swedish botanist Carl von Linné, and located near the center of the moon's disc.

In 1866 the veteran German astronomer Julius Schmidt was examining the area as he had many times before. Suddenly he noticed that something was missing. Linné, previously identified by three respected observers (including Schmidt himself) as a deep crater six miles in diameter, had vanished completely. The only trace of the former landmark was a small and unimpressive white patch, a feature visible today and consisting of a low dome with a pit on the top.

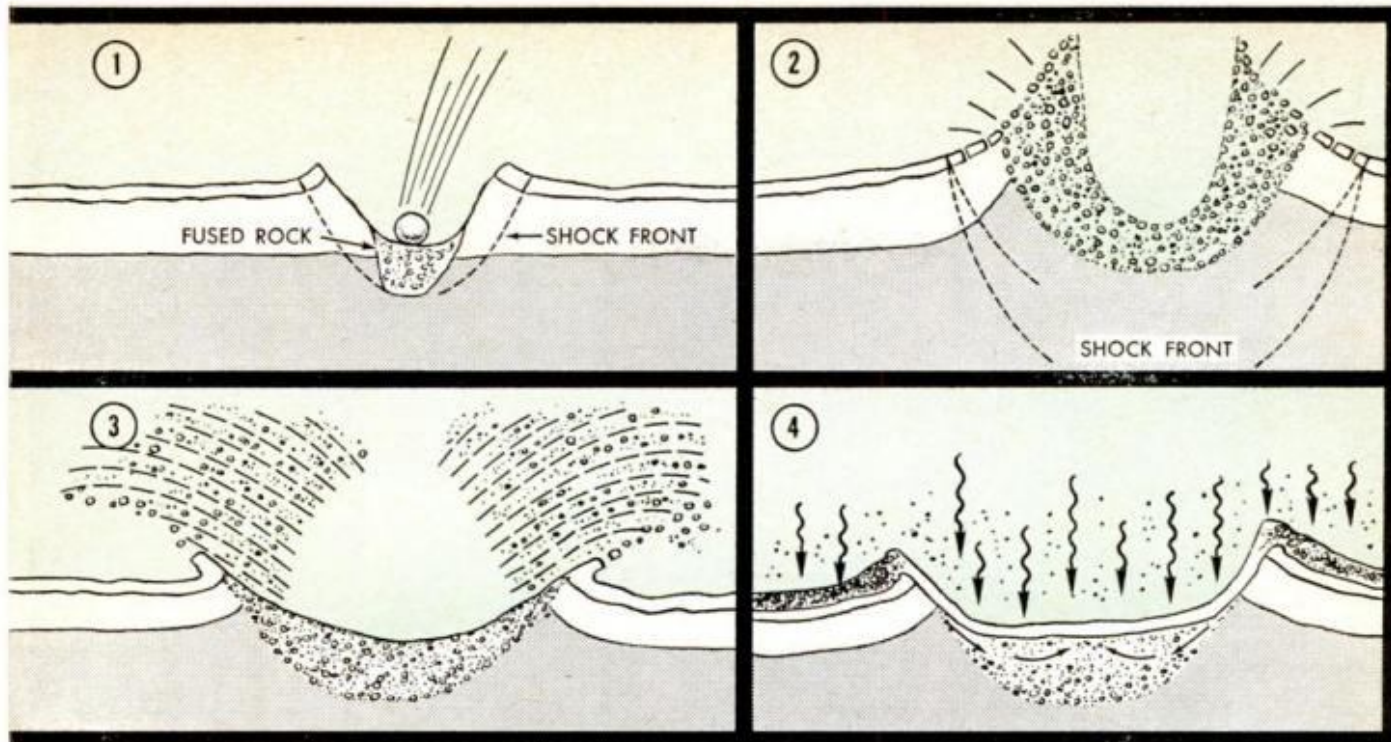
Since then no one has been able to account for the reported disappearance. So the conventional explanation has been to deny that there was a crater in the first place, to suggest that it existed only in the minds of Schmidt and his contemporaries. On the other hand, some scientists point out that three experienced observers erring in the same way and seeing the same object is a phenomenon at least as fantastic as the disappearance itself. Although we still do not know what happened to Linné, the discovery of red hotspots hints that things are, indeed, stirring inside the moon and that the old-timers may have been right after all. Perhaps the walls of the crater collapsed as its floor, forced upward

by internal pressures, formed the present blisterlike dome.

Even more significant, the recent findings bear directly on a much debated issue: the formation of the craters themselves. These striking features dominate the eerie landscapes of the moon. They are found everywhere, ranging in size from mammoth saucer-shaped depressions more than a 100 miles in diameter to "blow-holes" only a few feet across. Some are relatively shallow; others are black abysses more than four miles deep—like Newton Crater near the lunar South Pole, which has been described as "one of the most desolate spots in the whole solar system."

According to one theory, the craters were formed by meteorites which landed half a billion or more years ago, when stony traffic in interplanetary space was heavier than it is now. A meteorite moving at speeds of 10,000 m.p.h. and up would plunge deep below the surface, push rock ahead of it like a bulldozer, and vaporize the rocks into hot gases. The trapped gases would then expand in a fraction of a second, producing a shattering explosion and a crater.

Some lunar craters were probably produced in this manner; but not all, in the opinion of many astronomers, and certainly not the largest. They emphasize that a



HOW SCIENTISTS reconstruct formation of Meteor Crater: Meteorite traveling at about 10 miles per second hits ground (1), compressing and fusing rock ahead of it. Tremendous explosion results, casting debris on low and high trajectories (2, 3). Fragments shot high fall back (4) into newly formed crater

meteorite the size of a walnut is a rare giant compared with most meteorites, which are no bigger than pinheads and weigh only a few ten-thousandths of an ounce. Still rarer are supermassive missiles like the one which weighed an estimated million tons and was responsible for Arizona's Meteor Crater.

But this mammoth produced a crater only 4000 feet across, a mere scratch compared with some of the major lunar craters. It is most unlikely that the moon has encountered a large number of meteorites big enough to form craters 50 to more than 100 miles in diameter. Furthermore, the problem becomes even more formidable if many of the moon's dark plains or "seas" turn out to be craters, as is suggested by their roughly circular shape. (The Sea of Showers, for example, is 700 miles across and covers an area larger than Texas and New England combined.)

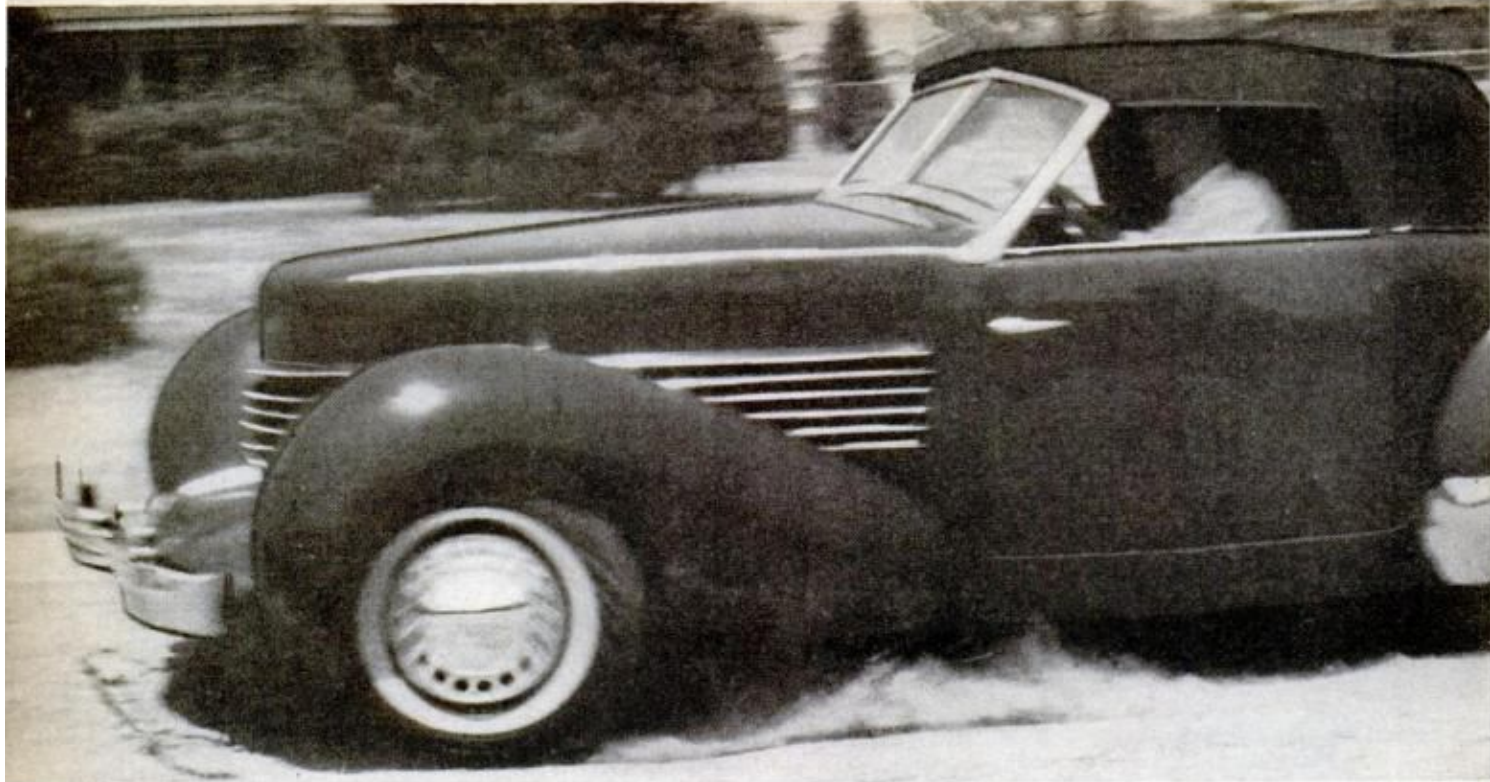
This is only one of the arguments against the meteorite theory. Unfortunately, similar arguments hold against the only other theory which the experts take seriously, the notion that the craters are the result of volcanic action. Enormous eruptions, the sort required to create major craters, may have occurred ages ago when the moon was a hotter and more turbulent place. There is no direct evidence for such catas-

trophes, however, and the moon's most studied and most striking features still represent an unsolved problem.

The nature of the surface has also puzzled astronomers for some time. Nearly 40 years ago investigators at the Mount Wilson Observatory in California made a [\(Please turn to page 244\)](#)

RANGER'S SIX EYES included three cameras with 75-mm f/2 lenses and three with 25-mm f/1 lenses. All were made up of five elements and shutters were of the focal-plane type. Two cameras were set to shoot at a speed of 1/500th, the other four at 1/200th





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Progress Report on the 1965 Cord

After a long and painful wait, the first of these reborn classics is finally on the road

By Harris Edward Dark

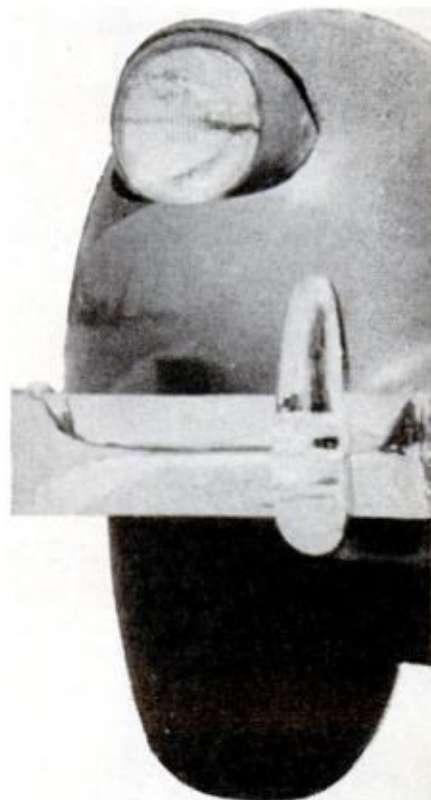
IT HAS BEEN a long and painful process, but the beloved Cord is off and running again—at least, one complete unit is. And there's reason for hope that the line of patient, would-be buyers may get their new Cords before too long.

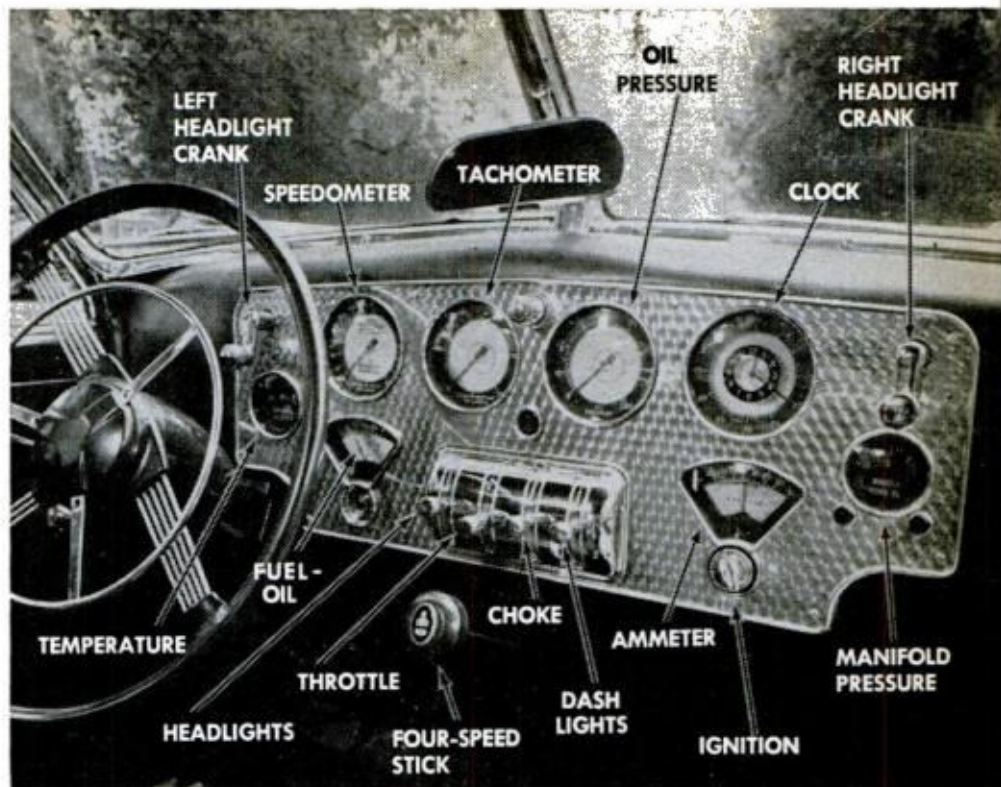
I drove the first prototype before it was half an hour old. Every minute was fun, even though a couple of minor ailments called for adjustment on "prototype one."

Trying for top acceleration and top speeds would have been meaningless on the untuned prototype. It had only the 150-hp. Corvair engine, for one thing, whereas new Cords going to customers will be powered by the new 180-hp. turbocharged Corvair engine. Even at that, after tuning and adjustment, a Cord official has reported that this same prototype was run at speeds of 110 to 120 m.p.h.

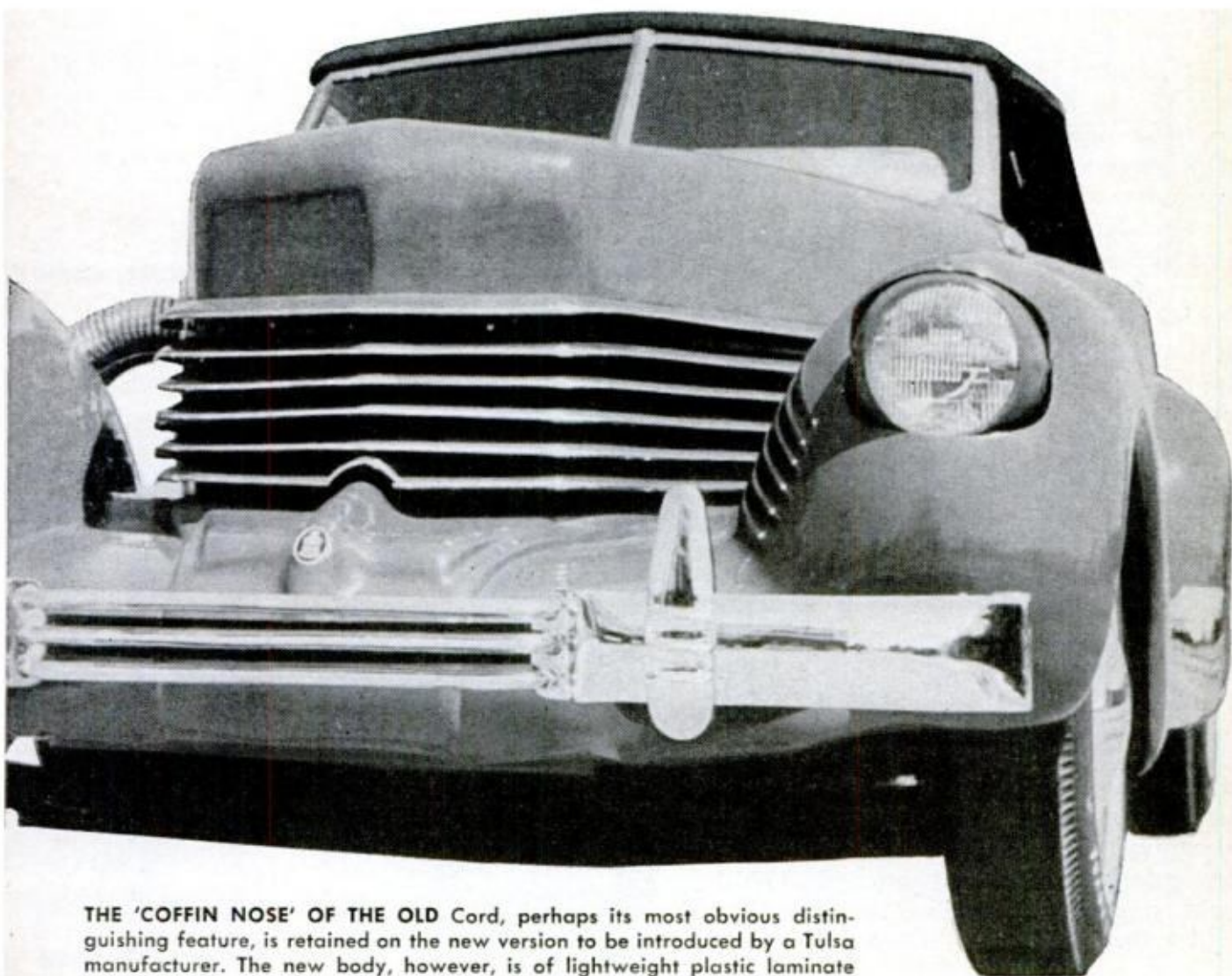
We suspect they must have had an optimistic speedometer, however, because the weights, power, gearing and wheel diameter figures for this car would indicate a possible top speed of 105 to 107 m.p.h. (A turbocharged Corvair Spyder PM tested, whose weight was close to this prototype, clocked 107.)

Even the early version had plenty of life, although frame and





CORD CONTROLS INCLUDE A PAIR of individual headlight cranks. You can fold both lights into the fenders or, if circumstances call for it, retract them one at a time in any order or sequence



THE 'COFFIN NOSE' OF THE OLD Cord, perhaps its most obvious distinguishing feature, is retained on the new version to be introduced by a Tulsa manufacturer. The new body, however, is of lightweight plastic laminate

chassis tuning had not been done on it. I used enough of the rated 150 horses to settle me hard against the seat back. It was no trick to peel rubber for the best part of a city block, although turbocharger effect doesn't mean much until you reach higher speeds.

I'd credit part of that performance to the light weight. This prototype, however, weighed in at 2540 pounds; in spite of the lightweight body, a pre-production model is almost always well above the design weight. Glenn Pray, boss of the new Cord Automobile Co., says production models will get down to around 2300 pounds, give or take 50.

It was a touchy job, drive-testing this new baby. Almost as touchy as building the car itself. Pray, a one-time Oklahoma school teacher, so dedicated to the Cord legend that he recreated it (see *PM* August, 1963, p. 82), was just as anxious as the rest of his staff when they watched me climb into this snug two-seater.

Pray insisted on giving me a driving lesson, and it was a good idea. To start with, the Cord Sportsman 8 10 (its 100-inch wheelbase is $\frac{8}{10}$ ths the length of the '37 Cord 810) has a gearshift strange to 1964 habits. It's the Corvair's standard four-on-the-floor, except that the Cord's are four-under-the-dash. The suspended stick seemed too springy, and I found it a problem to keep Low and Reverse separated. There were some embarrassing gear clashes at first. Pray's engineers later found that the whole engine-transaxle combination on the prototype was mounted too softly, making shifting particularly imprecise. The next day much harder mounts were substituted.

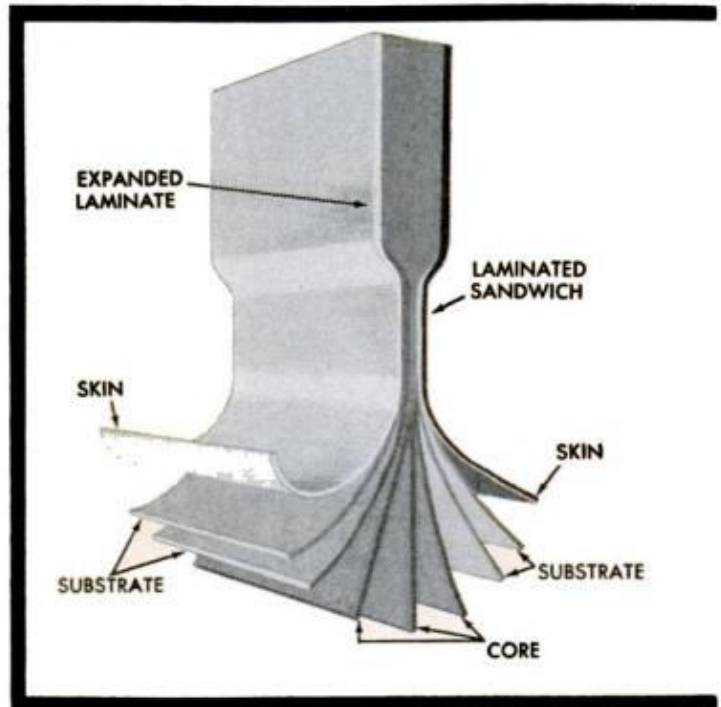
Controlling engine speed was difficult, too, on "prototype one." An accelerator pedal should move easily through the first fraction of an inch, then become progressively more firm. The Cord's worked just the wrong way: Initial pedal resistance was high but once it was overcome the pedal moved down more eagerly than I wanted. A minor repositioning in the linkage cured the trouble, I was told.

The 18:1 steering gear ratio on the prototype Sportsman 8/10 was the same as that on the '65 Corvairs. With its shorter wheelbase, the Cord's steering seemed particularly responsive, just what I'd like for a sporty little personal car. It was far lighter than you'd expect from most front-

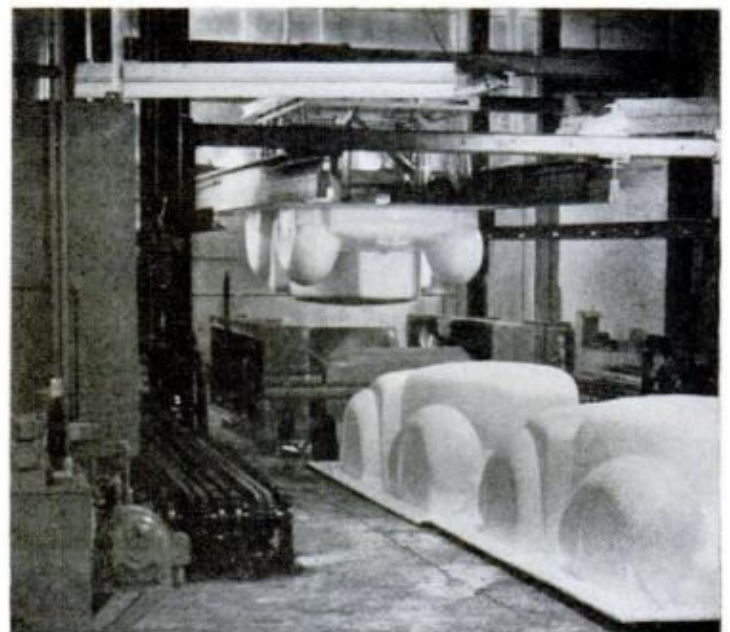
drive cars. Pray's partner, Wayne McKinley, told *PM* that the over-all ratio for production models still isn't certain. Front-wheel drive means you can chew your way easily through a gravel-strewn corner; "losing" the car in an end-for-end tailspin is almost impossible. The front wheels pull you through and the rear ones follow whether they like it or not.

On Cord number one, the rear suspension felt choppy and needed adjustment. It wasn't difficult, however; screwing some

U.S. ROYALITE MATERIAL for the new Cord has gas entrapped in the core layers. Under heat, it expands to add strength. Skin gives weatherproof surface



AUTOMOBILE BODIES COME out of forming operation after 15 to 20 minutes of cooling. They start as large sheets of loose and floppy plastic material



of the rebound out of the adjustable shocks was the only thing necessary. After it was done, Cord engineers gave me the word: While number one had leaf springs, they planned coils for the general production run. Torsion bars, originally used in the front suspension, will be retained for production cars.

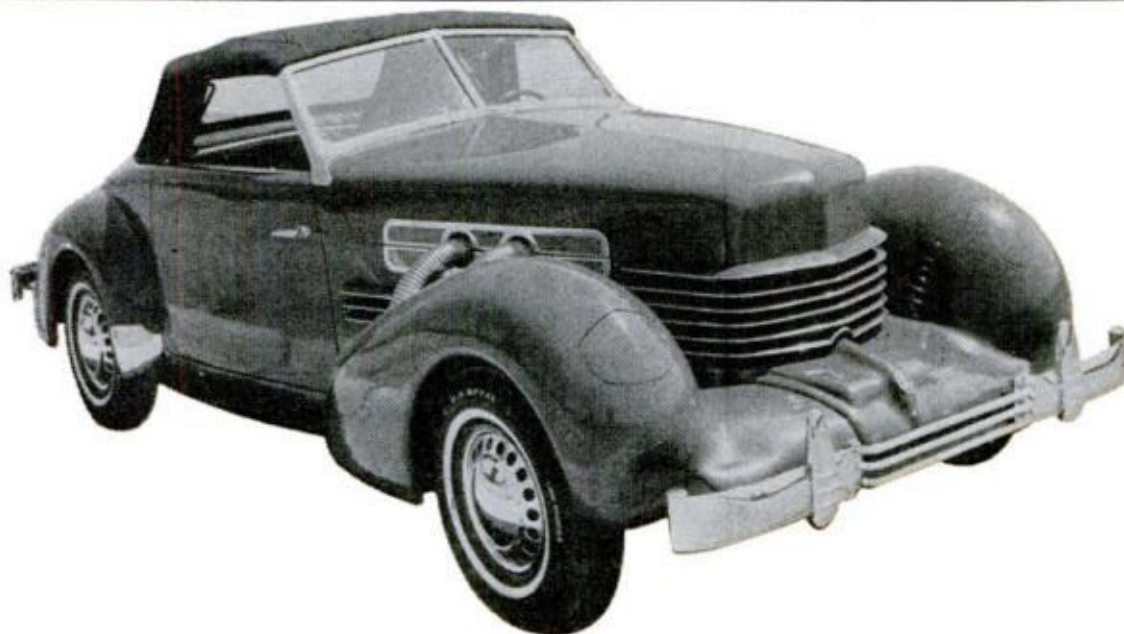
The new Cord's body is the one feature that makes such a limited production vehicle possible. The dies and tooling that would be necessary for more ordinary

construction would cost about 100 times as much as the body set-up for the expanded Royalite material that will be used.

Production will begin with the soft-top convertible exclusively. (A removable-hardtop version will be next.) The body for the convertible is made in two pieces: One includes the firewall, floor, miniature rear seat and package shelf; the other makes up the hood and cowl section, rear deck, and all four fenders. The big section

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THE LONG FORD HOOD RESULTS FROM SETTING the passenger compartment well back on the frame so the driver is located just aft of the mid-point. Ford's new little Mustang achieved instant popularity with a similar approach to style



REAR VIEW OF THE CLASSIC CORD'S NEWEST VERSION shows the flattened backlight-rear deck area. It doesn't hurt head room although it approaches the fast-back styling that's regaining popularity with stylists for Detroit builders



Could You Pass the ASTRONAUT PHYSICAL?

You might be hard-pressed to survive it. New and brutal methods are used to find super-healthy men who may some day land on the moon

By Kevin V. Brown

A VISITOR MIGHT THINK he had walked into a torture chamber.

In one room, a man's head looks like a pin cushion. Needles are stuck all over his scalp, under the skin, with wires trailing off into darkness. Metal clips, also with wires, pinch his ear lobes. A photographer's strobe light flashes directly in his face from a distance of two feet. His nose is clamped shut and he is forced to breathe through a tube held in his mouth.

In other rooms, one man lies on his back, his eyelids are spread open and a metal object is placed right on the eyeball and held there. Another man's head is held on a table, turned on its side and ice water is poured in his ear.

In still another room, a man is forced to walk on a moving platform to the point of exhaustion. He can't touch the support before him and if he walks too slowly he will fall off the platform behind him. Once a minute the platform is raised so that toward the end he is walking further and further uphill requiring greater and greater effort.

Blood is everywhere. Arms are lacerated with needle punctures, and clothing stained red. Some blood is drawn off into sinister-looking vials and some flows freely through tubes inserted in the veins. Occasionally, foreign solutions are introduced into the tubes by grim-faced men in white. The fluids flow into the man's

"CRUCIFIED" CANDIDATE had just recovered from fainting, moments before this picture was taken. He had hung suspended more than 20 minutes to test how heart would function with no physical activity to stimulate circulation

GEIGER COUNTERS track radioactive water through kidneys. Tracings on graph will show any discrepancies. Both kidneys should function identically

CLOSED-CIRCUIT FLUOROSCOPE gives medic moving picture on TV screen of candidate's digestive system. He drinks special solution to outline the tract





body on one side and out on the other.

Worst sight of all is a man strapped, arms, legs and body, to a table. The table is tilted upright and he hangs there suspended, feet off the ground, until he finally falls unconscious about 30 minutes later. It is, quite literally, a crucifixion.

All of this, the visitor is assured, is not unnecessary sadism, but very necessary testing of the human body to its ultimate. For the men being tested are candidates for our space programs, and the methods used to test them are perhaps the most brutal ever conceived. Yet, there is a definite scientific purpose to all of them.

The candidates, remember, are already pretty healthy specimens. Most of them are test pilots or operational jet pilots, and are physically fit enough to fly supersonic aircraft daily. Routine physicals on them just won't tell anyone anything.

More to the point, however, the programs these men are trying for—lunar landings, for instance—are beyond any relation to anything man has ever done before. So extraordinary missions require extraordinary men and extraordinary methods for finding them.

The tests are conducted at the School of Aerospace Medicine on Brooks Air Force Base near San Antonio, Texas. When space flights became part of our way of life, SAM was named the official agency for "evaluating," as they call it, all candidates for the space programs conducted by the National Aeronautics and Space Administration. These include Gemini and Apollo as well as the Air Force's own Space Pilots School program at Edwards Air Force Base, Calif.

The man in charge of the evaluations is Lt. Col. David Simons, who has an extraordinary mission in his own files. In 1957, the doctor-scientist spent 32 hours in a balloon, reaching a record altitude of more than 102,000 feet.

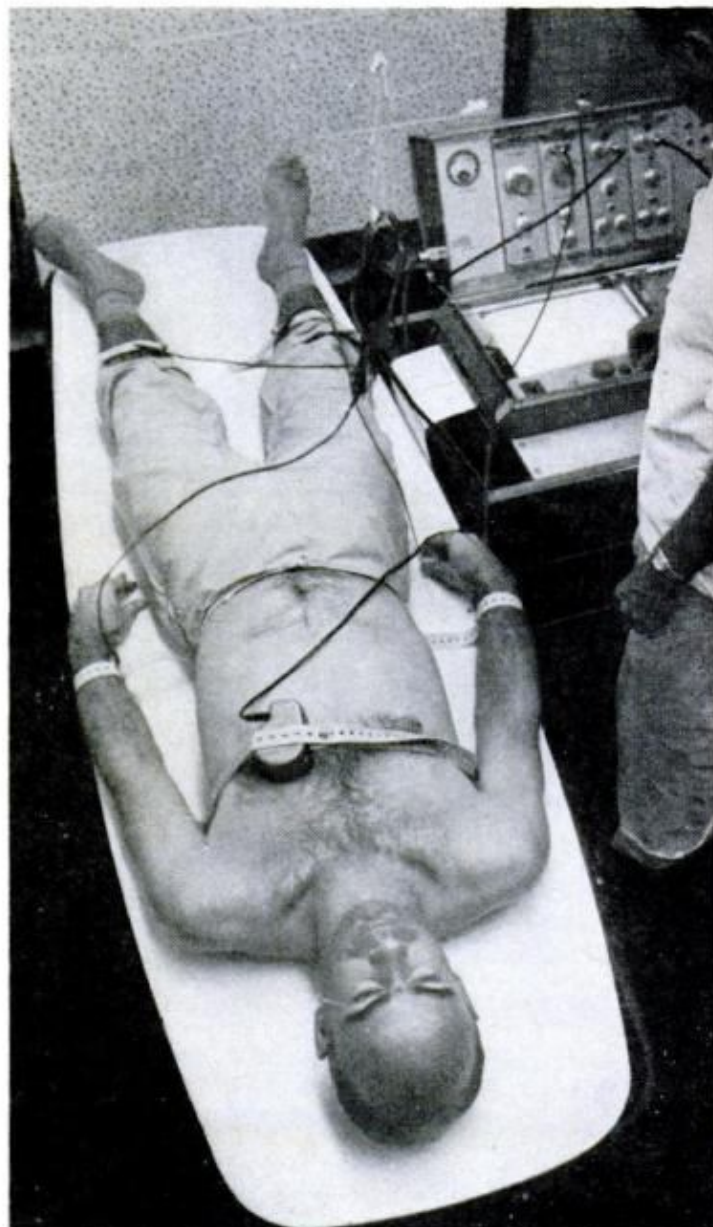
Explaining the evaluation program's basic premise, Simons said, "During World War II, we could get by with about 11 lab tests for selecting pilots. But, as high-performance jets were introduced, the physicals had to become more sophisticated. Now, as we head for space, we have to upgrade them again. We have about 44 tests today, but we're still not satisfied."

A major difference, Simons points out is that now there is more "stress testing." In the old days, routine physicals tested

the candidate at rest, either standing, sitting or lying down. At most, he might be asked to jump up and down 20 times or climb a two-step staircase, primarily to get an increased heart beat. At SAM, the candidates are "stimulated" in every conceivable, if brutal, way to find out not only how healthy they are standing still, but how healthy they are under G-forces, when exhausted, when undersupplied with oxygen, when hot or cold or under extreme mental duress. From this, they hope to diagnose how healthy the candidate might be years from now, isolated and weightless, en route to the moon.

Hence, the seeming sadism of ice water in the ears, strobe lights in the eyes, treadmills to oblivion and "crucifixions."

FLOATING TABLE, supported by air, lets body react in opposite direction from heart beat. Tracings differ from those taken with body motionless



POPULAR MECHANICS

The evaluations are generally broken down into four major areas of search, although the areas may overlap. One test can serve several purposes.

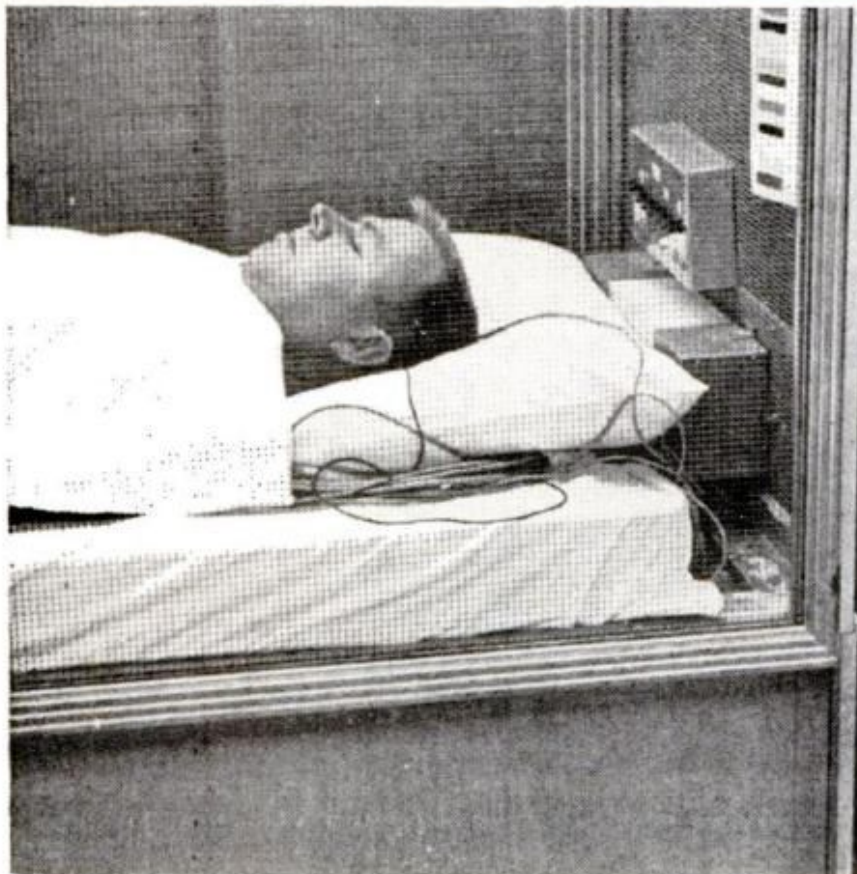
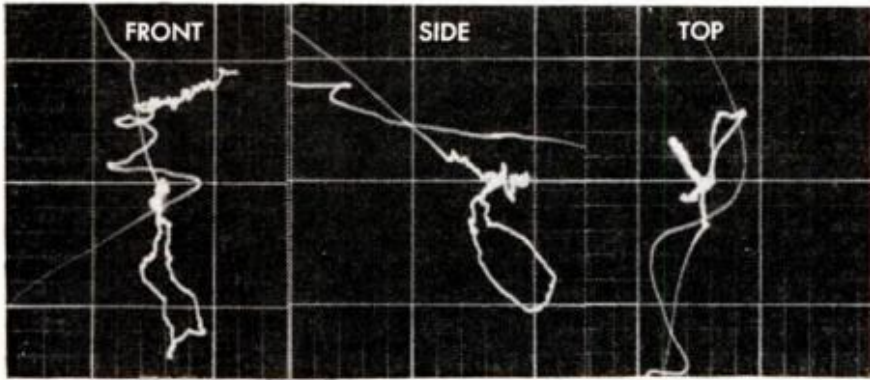
The first area is the detection of any existing disease or abnormality. While such findings are rare in space candidates, the tests are so deep-probing that at least one apparently healthy pilot not only didn't make the space team, but was taken off flying status because an unsuspected ailment was discovered. Among the minor discoveries unearthed in the testing of jet pilots is that an unusually high percentage suffer hemorrhoids, perhaps from G-forces they're subject to. But it's seldom serious enough to disqualify them.

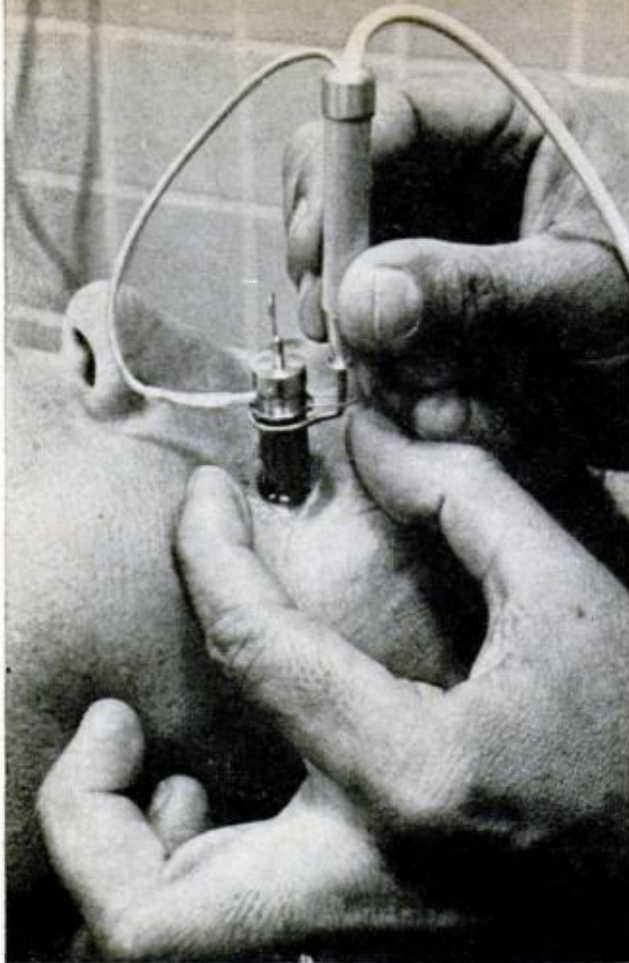
The second area of search is the de-

tection of any degenerative process that might later develop into a disqualifying problem. Overweight candidates, for instance, are more susceptible to some disease than lean types, and borderline diabetics are poor risks. The ultimate goal of the evaluations is to identify the men who are most likely to stay supremely healthy throughout their training, which may last several years, and especially during their ultimate space mission. Half way to the moon is no time for sudden medical emergencies. The theory is that there is really no such thing as a sudden emergency; that the trend or the vulnerability started years before.

Perhaps it should be pointed out here that Deke Slayton, one of the original

THREE-DIMENSIONAL VIEWS of electro-impulses in heart are taken from oscilloscope screen with Polaroid camera. Front, side and top views (see inset) give medics new tool for tracing any abnormalities in heart functions





ELECTRONIC TRONOMETER, placed directly on eyeball, measures pressure inside. Rate of drain of eye fluid foretells future problems with glaucoma



15 NEEDLES are stuck in this man's scalp, under the skin, to trace brain activity as he breathes limited amount of oxygen to simulate high altitudes

Mercury astronaut who was later disqualified after the discovery of a heart flutter, was not evaluated at Brooks. SAM became the official evaluation agency after the seven Mercury men had been chosen. But it's a case in point. If the trend leading to Slayton's heart flutter could have been identified early, it might have saved him later disappointment.

Mental health is the third area of search, and we're not talking of sanity. Most of the space candidates have generally high I.Q.'s (an average of better than 130), but it's important to select those with more emotional stability, higher motivation, stronger self-confidence and greater ability to function both as a member of a team and alone. Some of the psychiatric probing includes such off-beat queries as the attitude of the candidate's wife toward the space program. Emotional problems, entirely divorced from the mission, could interfere with the performance of even the most highly qualified man.

Stress testing is also done on the psychiatric level. The candidates are given problems to work: For instance, listening to coded signals in haphazard sequence

and identifying each time any one of them is heard for the third time. The problems go on for an hour. The idea is to find at what point a man might crack. Other problems deliberately try to confuse, to see how quickly a logical solution can be worked out before panic sets in.

The worst of the stress testing, however—the fourth area of search—is purely physical and is done in the “torture chambers” described above. Some of the routine tests are rugged enough without the stress. Here are some of the highlights of the methods used by the Air Force to check the present health, the future health and the health under stress of the men who might some day fly to the moon.

Even the preliminaries are rough. The tests last a week. For three mornings the candidates go without breakfast and eat only a light one on the fourth. They eat no dinner one night, and alcohol is forbidden throughout. The purpose in each case is to clear the body of food or drink that might interfere with certain tests.

Probably the most “horrible” sight in the “horror chambers” is a cabinet full of sets of teeth without skulls or skeletons—

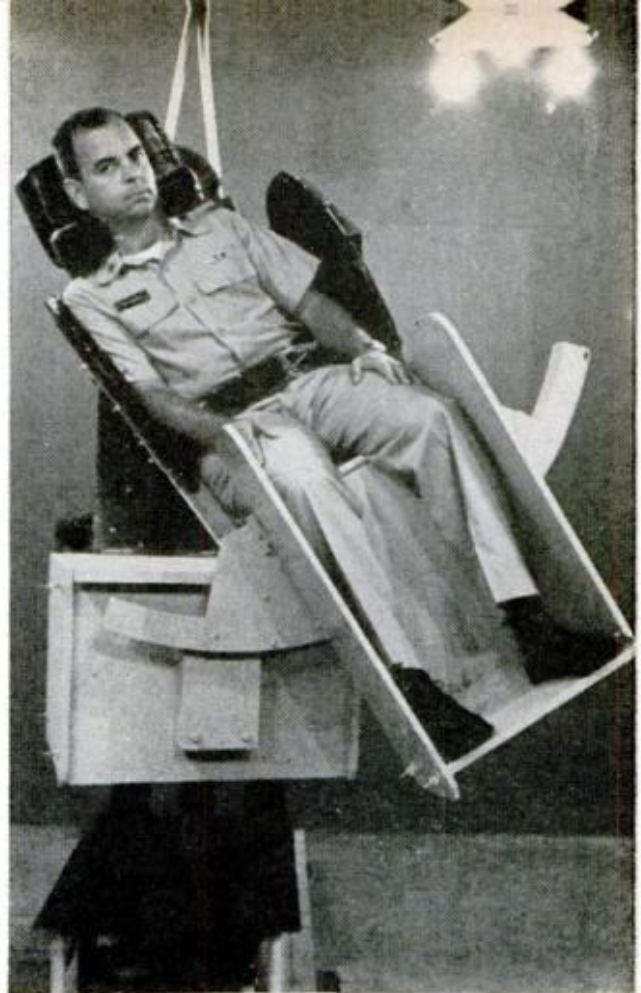


SOUND ROOM, set on springs and heavily baffled, tests hearing level through headset and also through vibrators placed on mastoid bone behind each ear

just rows and rows of teeth. The candidates all have their teeth examined and X-rayed, then plaster casts are made of both uppers and lowers. These are tagged and filed in the cabinet so that each time the candidate's mouth is re-examined in later years it can be compared to the original cast to spot any degenerative trends. It's a sample of the saturation approach to physical exams.

The candidates generally agree that the most painful 20 seconds in the week is when the ice water is poured in their ears. They say it's unbearable. Moments after the water is poured, the candidate's eyes flutter uncontrollably. Even after the water runs out and he is allowed to stand up, the man remains dizzy. What happens is that the ice water stimulates thermal circulation of water in the inner ear, which controls balance, creating a turning sensation. The object is to test the candidate's sense of balance and its reaction to stimuli.

A related test, the vestibular chair, is not painful at all but is more deadly in its disorientation. The candidate is strapped in the chair, his head locked in position in a cushioned rack, and electrodes are placed



VESTIBULAR CHAIR swings and tilts simultaneously. Picture is posed because tests are conducted in total darkness and are deadly in their disorientation

on his head and over his heart and eyes. The room lights are turned out and, in total darkness, the chair starts spinning at a constant 18 r.p.m. It also tilts up to 30 degrees either way, changing the tilt every two minutes. To make it rougher, the candidate is given problems to work through on intercom—simple arithmetic, usually—to keep his mind occupied. The electrodes show how quickly he adjusts to each tilt. The average time is about 20 seconds, but some "hot rocks" can do it in five.

After 18 minutes some candidates are close to nausea. Sweating and that "green around the gills" look are common. The relationship between the ice water and the chair is that the ice water rotates the water in the ear and the chair rotates the candidate around the water. The space man's ability to adjust quickly to spinning sensations may be imperative when he's weightless in a spinning capsule, so the vestibular chair, or some version of it, may be used for training as well as testing.

The ear is tested for hearing in an an-echoic (anti-echo) chamber, an isolated

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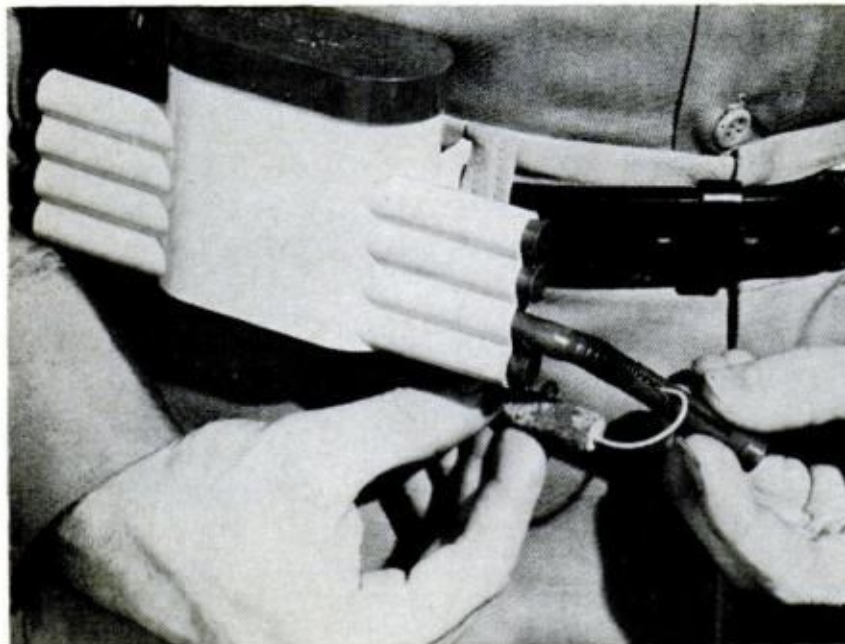


Instant Foxholes

Shaped like a small artillery shell, an explosive device loosens enough soil so that a soldier can dig a foxhole in a fraction of the time it takes manually.

The shell has two charges and two 30-second delay fuses. The first charge loosens enough dirt to insert the larger, cratering charge. The latter loosens enough soil so that the soldier can shovel it out of the hole easily.

The device was developed by the Army Engineer Research and Development laboratories at Fort Belvoir, Virginia.



Worm Dispenser

Worms—it seems—enjoy squirming into narrow tubes, and this has given fishermen a new angle on worm dispensing. Called Miracle Worm Dispenser, a plastic container of 36-worm capacity is fitted with four tubes on each side. Each opening is plugged with a slotted insert tube. When the insert is removed it holds a worm, and the hook is baited by simply pushing the hook through the slot.

The dispenser is priced at \$2 from F & F Enterprises, 1733 N. Milwaukee Ave., Chicago, Ill.



Aluminum Igloo

Igloolike dwellings in weatherproof aluminum are now available for year-round camping. Six-and-a-half feet high, nine feet in diameter, the Cosmo-Hut will sleep five adults. Assembly, without tools or bolts, takes about 35 minutes. Collapsed, the unit weighs 100 pounds and requires 1½ cubic feet of storage space. It has its own storage case.

The Cosmo-Hut costs about \$200 from Cosmo Manufacturing Co., 20201 Hoover Rd., Detroit, Mich.

SPOTLIGHT ON Harley's New Featherweight

Wringing out the new M-50, Harley-Davidson's answer to the lightweight Japanese imports

By Stuart James, PM's Outdoors Editor

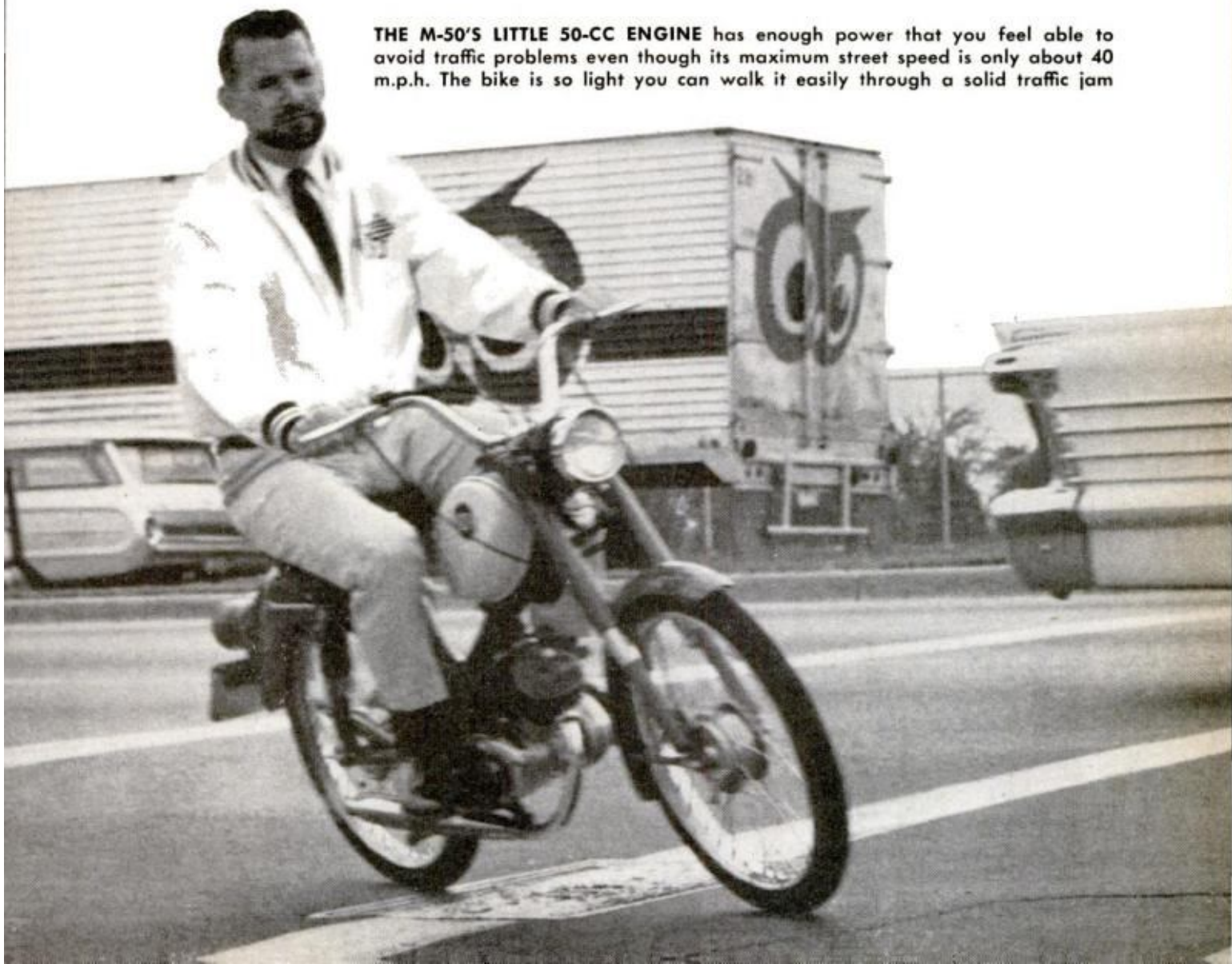
LIKE THE RELUCTANT DRAGON, Harley-Davidson has finally entered the lightweight market with a one-cylinder, 2½-hp. motorcycle dubbed the M-50.

After driving this new machine under a variety of conditions for a full day, I was impressed.

It is a beautifully designed little "wheel," and the tubular steel frame gives an appearance of sturdiness that doesn't seem to come across with the welded box frame of many of the lightweights.

It is also remarkably easy to handle. The seat is placed low enough that you can balance with both feet and walk it along with ease. I was particularly amazed at the ease of starting. Some years ago I owned a Jawa, which took considerable kicking to turn over. The M-50 on the other hand, started every time on the first kick, and can also be started easily by

THE M-50'S LITTLE 50-CC ENGINE has enough power that you feel able to avoid traffic problems even though its maximum street speed is only about 40 m.p.h. The bike is so light you can walk it easily through a solid traffic jam

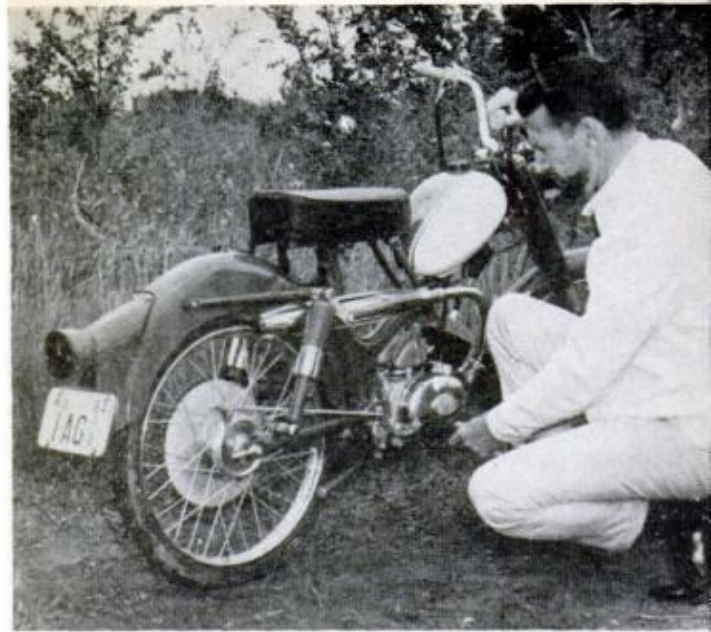


hand. This is attributed to the small piston in the 2-cycle, loop scavenged engine and the over-sized 23-watt, 6-volt flywheel magneto equipped with a high tension coil that generates plenty of spark for sudden ignition.

Gear shift, clutch, accelerator and brakes are all operated from the handle bars, adding to the simplicity. The three forward speeds are numbered, with neutral between first and second. This completely eliminates the foot clutch, which can be confusing to a novice, and the foot shift, which can really be difficult. On the M-50 everything is right at hand; a child could operate it.

The power plant in this machine is a 50-cc, Harley-Davidson-Aermacchie engine, which brings up the point that H-D is not *entirely* new to this field. For some years they have produced a diminutive "mo-ped" (motorbike) in Italy for the European market, although they staunchly refused to have it referred to as a motorcycle. They kept the same engine, as well as the Dellorto carburetor, for the M-50,

AN IMPROMPTU WHEEL-STAND takes place when, with the trail sprocket in place, Editor Stuart James pours fuel to the little Harley coming up a small bluff



FOR TRAIL USE, THE exhaust should be routed above the engine. It'll require an extra length of pipe. Big trail sprocket more than doubles gear ratios

and redesigned everything else.

Oil for the engine is mixed in the tank with the gasoline. The gas cap is actually a small cup, and you add four measures of 40-weight oil to each tank of gas.

Acceleration is slow, but steady, which is actually a safety factor in a motorcycle. You can slip the clutch and it still won't get away from you. On the other hand, in second gear you get up enough speed to make you feel you can get out of someone's way if you must. From a standing start I accelerated to the top speed of 40 m.p.h. in a little over half of a city block. This won't win speed medals, but it is enough "oomph" for security.

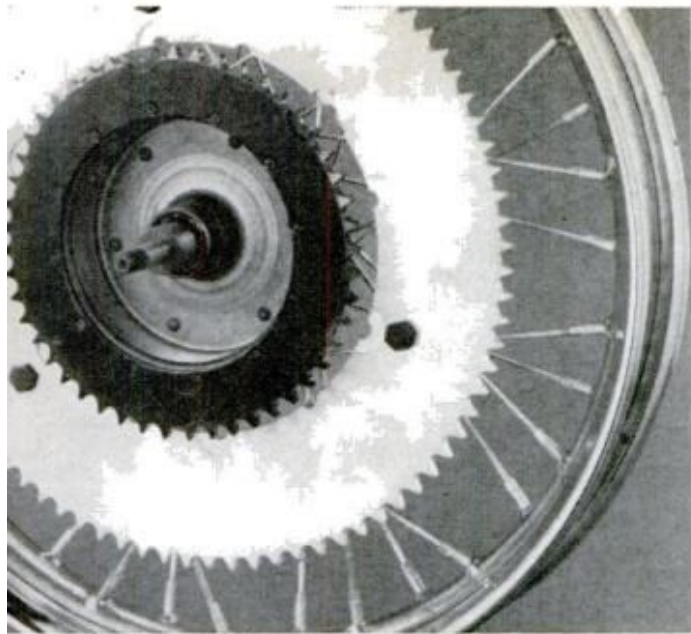
Shifting up and down is smooth, although downshifting gave me a jolt when I tried Low from top speed.

The suspension, both fore and aft, uses oil-dampened telescoping shock absorbers. I hit every rut I could find at top speed, and the jarring was very slight.

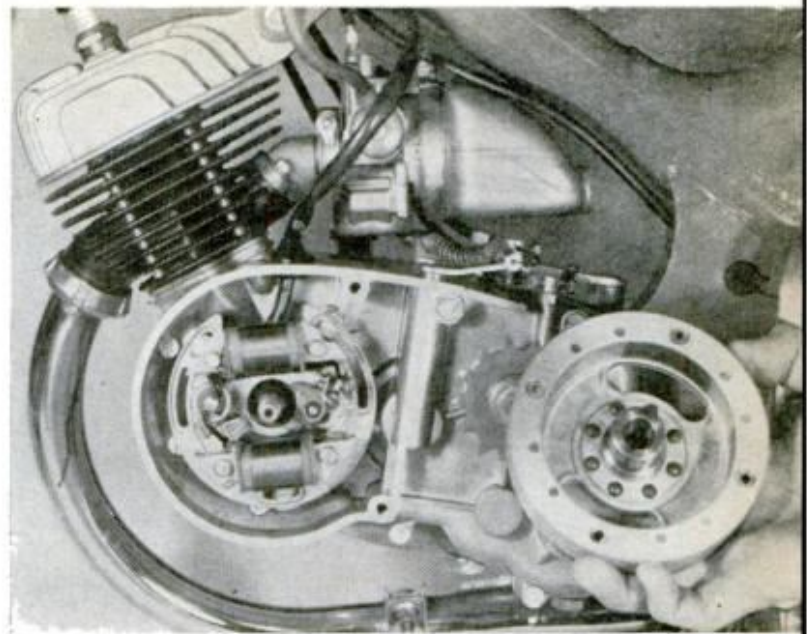
A safety factor is in the handle bar accelerator, which automatically twists back when the grip is released. To set it for cruising on open road, you have to turn a screw-lock by hand.

Braking on the M-50 is smooth and steady, a welcome feature on loose gravel when a fast grabbing brake will send you flying. From the top speed of 40 m.p.h. you can make an emergency stop within 15 feet.

After running it on the streets of Milwaukee, Wis., where it gave an excep-



SELF-STORING TRAIL SPROCKET clamps to spokes when it's not in use. The same bolts hold it around the street sprocket when you want off-the-road action



THE FLYWHEEL MAGNETO, a 23-watt, 6-volt unit, gets credit for the M-50's easy starting, along with the small piston—barely over 1½ inches in diameter

tionally stable ride and cornered smoothly at 35 m.p.h., I took it into a rough, overgrown area behind the H-D plant to see how it reacted to the wilderness.

And this brings up a unique feature of the M-50—the conversion from street bike to trail rider.

During normal street operation, the large trail sprocket, a 66-tooth affair, is out of the way, bolted to the spokes of the rear wheel. For conversion to trail bike, the large sprocket is unbolted from the wheel and bolted to the outer rim of the street sprocket. Extra linkage is inserted in the chain and a plastic roller is attached to allow the expanded chain to roll over the foot rest. Altogether, this takes about a half hour, and you're ready to take off across country.

For the rider who intends using the M-50 for open trail, the exhaust pipe should be run above the engine. That requires an extra section of pipe.

With the large trail sprocket the M-50 is a real surprise. In low gear you actually have trouble holding it down. It plows through heavy brush with the greatest of ease, maneuvers gracefully in and around rocks and trees. It bogs down in soft sand, but you just ease the weight with your feet and walk it out using the throttle. In one spot I got hung up on a log, but the M-50 weighs only 103 pounds and I lifted it off with one heave and a grunt (I weigh only 155 pounds). The big sprocket cuts the top speed, of course. It drops to about 20 m.p.h.

This machine walks up a 45 degree grade with ease, but when it gets steeper than that the front wheel kicks up.

"Boondocking" with this little work horse is exciting and fun and you come away with a feeling of great admiration.

I do have, however, a couple of criticisms. The engine is not protected by a skid plate, and although it has a 5.51-inch ground clearance, I still feel that it could be damaged if you accidentally slammed into a rock. I mentioned this to the H-D engineers. They said they did not think this would happen, but added that if there were cases of such accidents they would add the protective plate. I also complained about the lack of a luggage rack behind the seat, and it was explained that future models of the M-50 will have the seat moved forward and a luggage rack over the rear fender.

Economy is a major attraction of the M-50. With a gasoline capacity of 1.6 gallons, it averages (street use) about 180 miles per gallon. And probably the thing that is going to make it most attractive as a fun vehicle is the initial price—\$225—the lowest priced motorcycle on the market.

This is actually quite an event. Mention one of these low-power one-lungers, such as the Jawa, Honda or Yamaha, to the Harley-Davidson people just a year ago and you would have heard a derisive snort. The H-D trademark has always meant Speed and Power. The company—from

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COUNTERWEIGHTED BED lifts up (a six year old can do it) opening huge compartmented storage area underneath the bed. It cannot be closed until the safety catch releases. This is an ideal place to store spare bedlinen



CLOSEUP OF CONSOLE shows controls for television, intercom system, reading lamps, room temperature. Vertical sliding panels are counterweighted for easy closing. Bed is hand-rubbed walnut with shelves and dividers.



Meet My Remarkable

Glideaway TV, remote temperature, light and window drape controls—these are only a few goodies built into Mr. Lenz' fabulous bed

By John Lenz

I'M A TOUGH MAN to please. So, when I couldn't find just the bed I wanted, I built one for myself. It's loaded with electronic gimmicks and does just about everything but rock me to sleep at night. (I'm

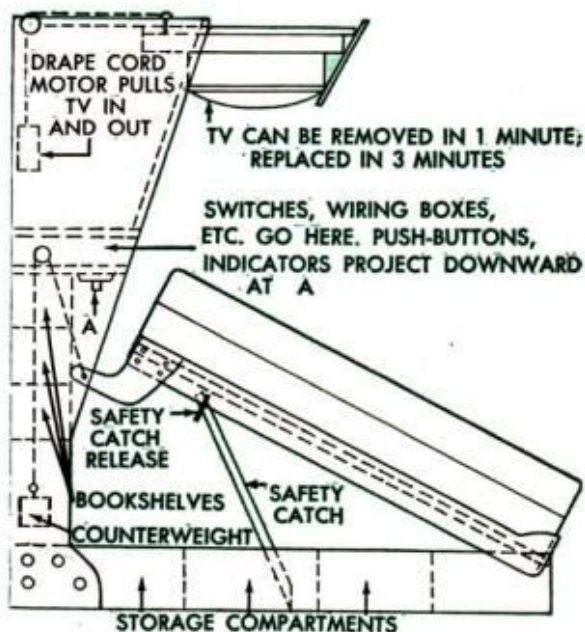
working on that feature now.)

Snug under the covers, I can reach up and turn or push switches to control an overhead TV set, open or close window drapes, order breakfast by intercom, turn bedside and overhead lamps on and off, dial a radio, control a remote stereo record player, set room temperature, answer the telephone and even set a clock timer to wake me up in the morning to soft music from a built-in radio.

Aided by the Micro Switch division of Honeywell (I'm a supervisor in Honey-



OPEN DOOR in headboard shows generous storage space. Top shelves are full 30 inches deep. Mirrored panels are angled to reflect view of creek outside



SKETCH shows details of construction of TV slide-out and bed lift mechanism, as well as location of controls and wiring. Note simplicity of arrangement

INVENTOR JOHN LENZ doesn't even have to get up to change TV channels or adjust the volume. Touch a switch—it's done automatically by remote control

Electronic Bed

well's process engineering department), I devised special circuits to handle all the electronic equipment. For example, turn a Micro CMC switch and the TV set glides out from the headboard on noiseless rollers. Turn it another notch, and the set goes on. Flick a remote-control button and the TV switches stations or adjusts the volume. There's even a timer so I can fall asleep during the late late show without having nightmares about the set burning up. And another switch position sends the set gliding back into the headboard.

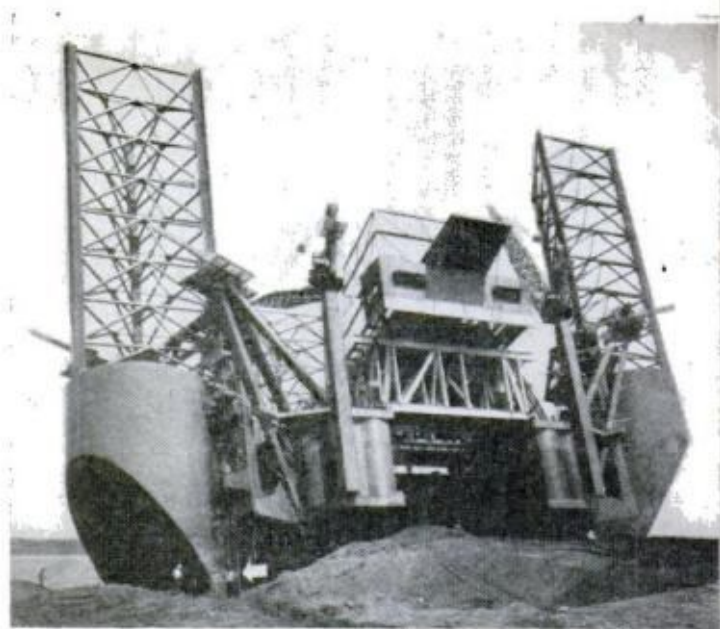
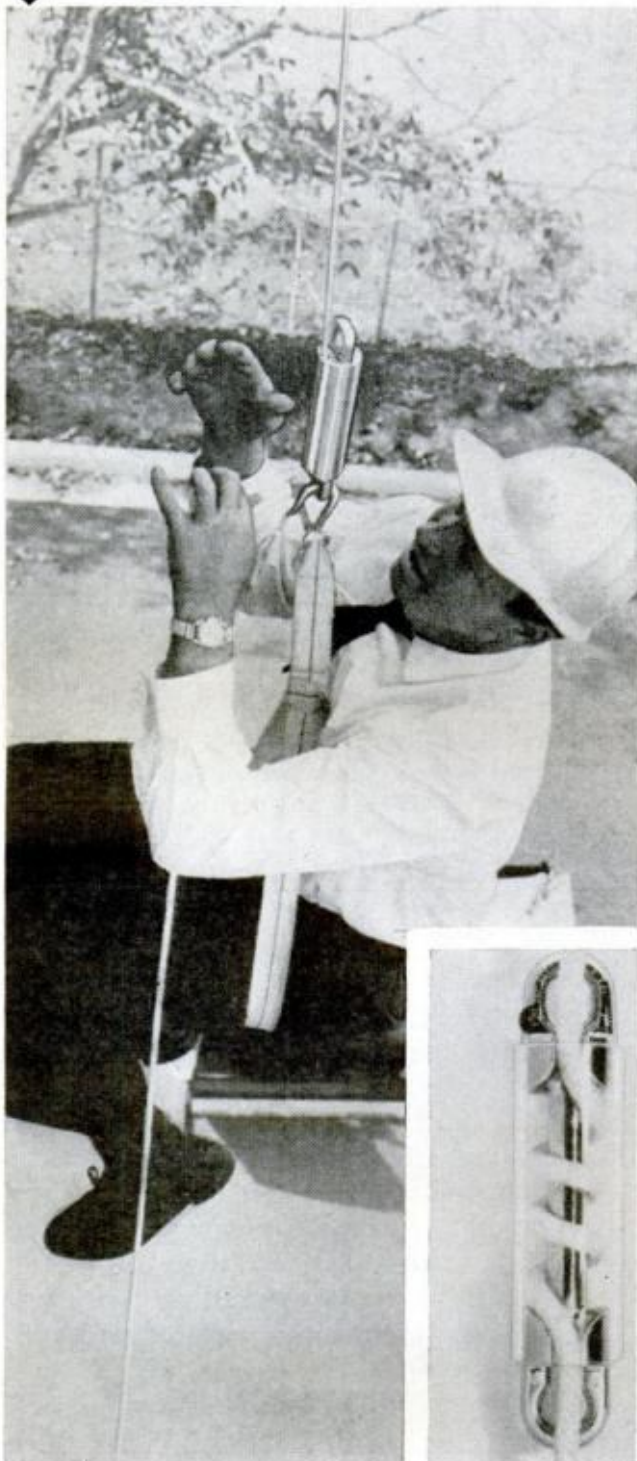
I built the bed, headboard, end table, bureau and dresser in three months spare time, at a total cost—including the radio, TV, springs and mattress—of less than \$800.

Despite all the automation I'm still a bit dissatisfied. I can't cook breakfast in bed. But if I rig up an electric grill that would swing out of the headboard, I could fry bacon and eggs without getting up. Then another pushbutton would swing out a tray with plate, cup, saucer, and silverware. And maybe I should put a small refrigerator into one end table?

"Hands Off" Controlled Descent

Based on the principle of friction, created by turning a nylon rope around an aluminum shaft, a compact descent-control device can lower men or equipment at selected speeds weighing up to 2500 pounds.

The number of turns and the weight to be lowered—roughly one turn per pounds—controls the rate of descent. Even unconscious persons can be lowered safely by their own weight without any control from others. After the proper number of turns has been made (see inset) a cover is put on the shaft and secured. Made by Descent Control, Inc., 336 E. 17th St., Costa Mesa, Calif.

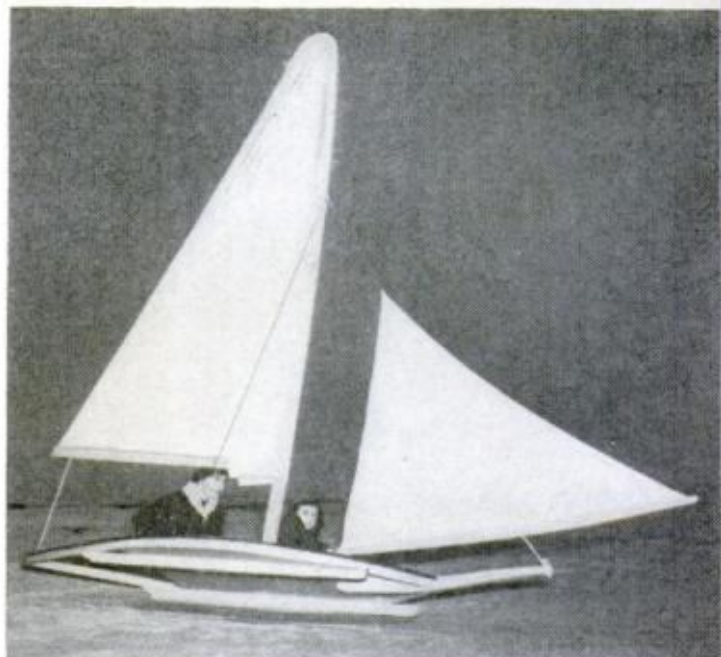


Drill Walks to Work

A 5000-ton jack-type mobile drilling rig "walked" over 180 yards of land on its way to the Gulf of Mexico. Each of its three giant legs moves backward, forward and up and down by electric motors, enabling it to move over the ground ponderously but effectively. The rig, built by Dixilyn Corp., is being used by Humble Oil Co.

Car-Top Ice Boat

One or two crewmen can sail on the Baby Scoot, an 11-foot ice boat that weighs only 70 pounds. It can be carried on a car top and assembled without bolts or cotter pins. Priced at \$395, the ice boat is available from South Bay Scooter Co., 31 Maple Ave., Bay Shore, L.I., New York.





Copter and Electronics Speed Up Land Surveying

Replacing ground crews which might take days to survey the same terrain, a helicopter rigged with electronic equipment can measure an area in minutes.

The equipment includes an electronic distance-measuring instrument (Hydro-dist), an optical device which enables the pilot to hover directly over a selected point,

a height indicator and a rotating light beam on which ground crews can focus.

Two ground bases are established and, by radio, the helicopter is directed to hover over selected areas. The ground crews then take angle measurements. Airborne antenna and reflector (arrow) transmit microwave impulses to ground crew (right).

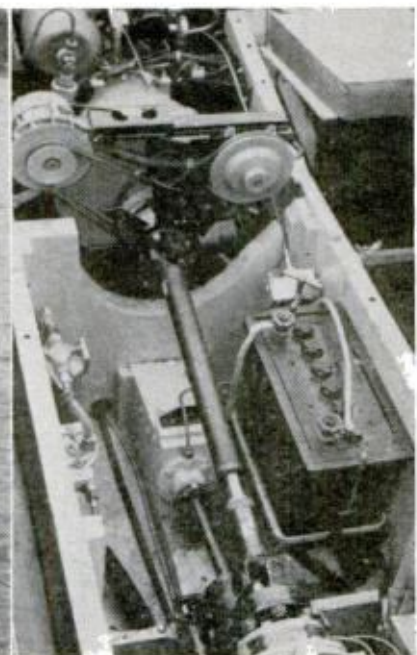
Gas Turbine Utility Engine Goes to Sea

A type of gas turbine engine previously used for driving pumps and generators now powers a 20-foot boat. It's a 90-horsepower unit made by Rover Gas Turbines Ltd.

The engine consumes 15 gallons of fuel per hour at a cruising speed of 23 m.p.h.

Since small single-shaft gas turbine en-

gines cannot start against a large inertial load, the marine use of the Rover engine was made possible by a variable-pitch propeller that matches propeller load to the engine's characteristics and eliminates the need for a gear box. Power is transmitted via a V-drive (right).



Newest fad for thrill-happy teenagers is "surfing" on wheels. I tried it on San Francisco's breathtaking Telegraph Hill, the—

By Stuart James

SKATEBOARDING, the newest fad to stir the suicidal mania of American youth, is a cross between stepping on a roller skate in a darkened hallway and riding a banana peel down a greased slide.

Originating in California as a landlocked adjunct to surfboarding, the sport has spread across the country with such speed that sporting goods dealers in the East have told *PM* that they cannot get the boards fast enough.

The object of this furor is an oak plank about the size and shape of a large steak platter. Attached to this plank, fore and aft, are a pair of fiber roller skate wheels. The skateboarder rides this device downhill, duplicating the stance and balance of the surfboarder. There is one notable difference: concrete is harder than water.

In the interest of science I journeyed to San Francisco to attempt skateboarding on the "Makaha" for landlubbers—Telegraph Hill.

I was joined by George Cooley of Manhattan Beach, Calif., 26-year-old manufacturer of the Bun Buster and Sting Ray (his trade names), and an expert practitioner of the sport who claims to have been clocked at 42 m.p.h. on Sunset Boulevard in Los Angeles. He proudly displayed a right arm that was a brown scab from thumb to shoulder blade, and announced, "I tried to go down California street and I hit the cable car tracks. Boy, I tell you, the hills in this town are great!"

On this enthusiastic note, we ascended the spiral road to historic Coit Tower to begin my instruction.

"There's really nothing to this," Cooley said, "but you have to start right or you'll break your neck."

I was most eager to start right. Unlike the athletic young mentor, I am a creaky 38 years old and not oblivious to scar tissue.

"The most important thing," he said, "is always to keep your weight forward. Remember that. Always keep your weight forward. Hey, look out!"

Makaha

MAKAHA means the big waves of Hawaii, the supreme test for surfers; the hair-raising hills of San Francisco are the same thing for avid skateboarders



for Landlubbers

IDEAL SKATEBOARD POSITION is one foot well forward, pointing ahead, the rear foot across the board to tilt the sides for turning to the right and left



HIGH-SPEED CAMERA stops my motion, but I'm rounding a curve at a good clip with the secure feeling of riding down a greased slide on a banana peel



EXPERT STANCE is called "goofy foot". Both feet are across the board, requiring excellent balance



SERIOUS ACCIDENTS can result from stepping on the rear of the board, making it shoot out from under



I had stepped on the rear of the board with my left foot. It shot out as though catapulted. But I managed to keep my feet.

"You were lucky," Cooley said. "You might have landed on your head. Now that's the next important thing. You always get on the board on the front. You saw what happens if you don't."

I practiced in the parking area at the top of the hill. Placing my right foot pointing forward on the front of the board, I gave a push as you would with a scooter, then placed my left foot sideways on the board a few inches behind the right. I leaned forward and extended my arms for balance.

"Okay," I said after 10 minutes of practice, "it seems easy enough. But just one thing. How do you stop?"

"If you want to get off you just kick back with the forward foot and run until you stop. It's real easy."

We started on the hill. I tried the kick back and running off maneuver, and it worked. Confidence restored, I followed Cooley on a long run. It was false security. A skateboard picks up speed quickly, and every crack in the roadway threatens to throw you. Standing on that speeding plank for the first time is a terrifying experience.

But then I learned that you can steer it with the back foot. The skate wheels have a swivel axle on a rubber bushing, and tilting the board to either side makes them turn. With a little practice I was able to turn the board by simply flexing my knees

to shift my weight to right or left, and then I could keep the speed in control by traversing (exactly as in skiing), and by really leaning into it I could make a full turn uphill and stop the board.

Nothing to it. With Cooley in the lead we went into one of Telegraph Hill's sweeping turns. I went to the outside, leaned my weight into my heels, and the board responded for the traverse into the curve. We were picking up speed, but it was just simply a matter of bending my knees deeply to execute the counter-traverse to slow me down. But then I stood straight up, and in that split second the board was gone, and I "wiped out." There was enough time to think, I shouldn't have done that, and gasp, and then the bone-jarring thud on the concrete.

Cooley returned to where I was still sprawled on the roadway. "You leaned back," he said. "You have to stay with the board, keep the upper part of your body a little ahead of it. It's the same with skiing or surfing; lean back and down you go. How do you feel?"

"I hurt."

"Well, anyway, it's a good thing you weren't going too fast. When I hit those cable car tracks I skidded about 50 feet. There's no doubt about it, this sport can be dangerous." He paused a moment, then asked, "How do you like it?"

"It's great," I said quickly, "really a lot of fun."

Considering that I was stretched out on the road and in some pain, that statement

[\(Please turn to page 230\)](#)

COOLEY LEADS THE WAY with perfect "goofy foot" form, body in "S" shape, head and shoulders over the board. That's me—full of confidence—in the rear



ONE MOMENT LATER I "wiped out." I straightened up for just a split second and the board was gone. Hitting that concrete jars every bone in your body



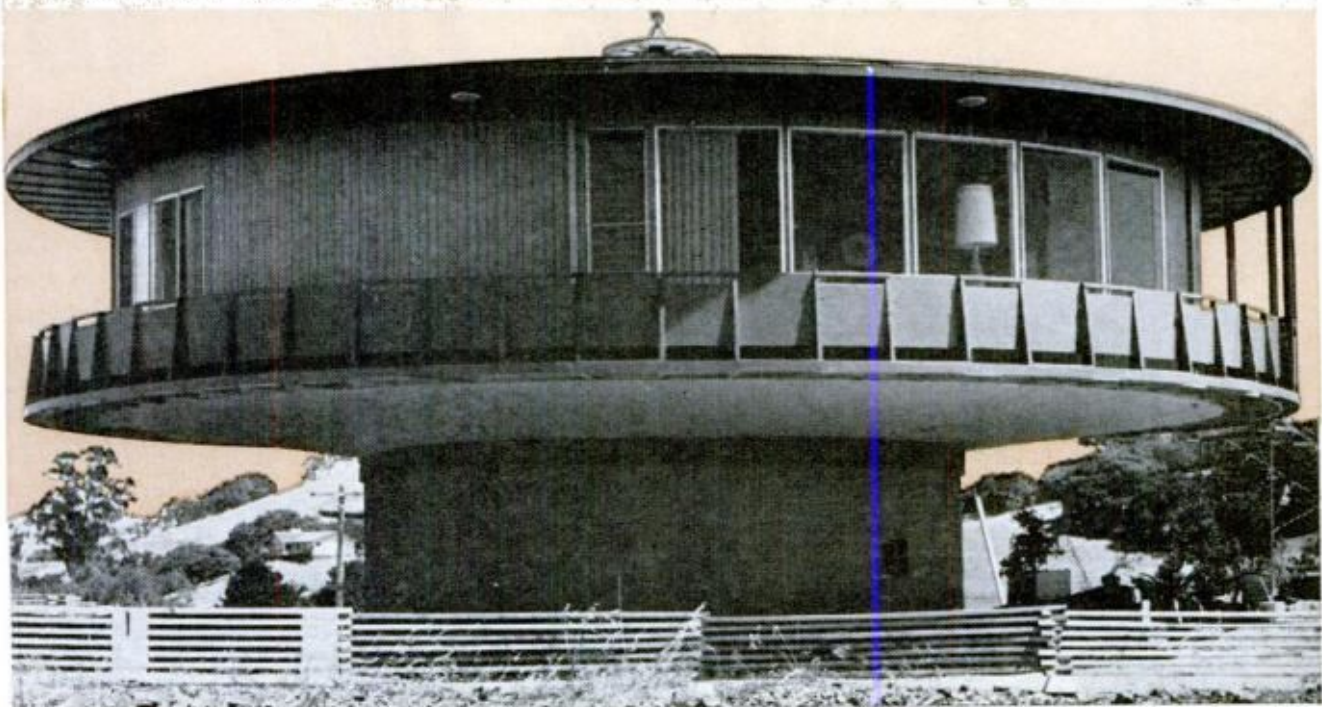
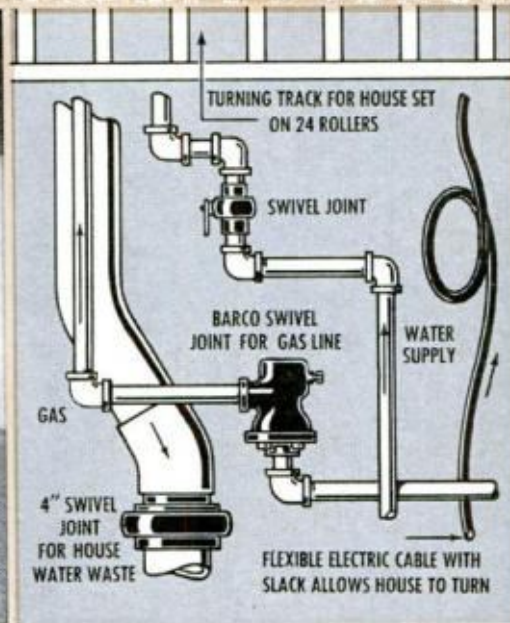
Carousel House Spins for a View

WHEN GUESTS DROP IN on Sam Harkleroad they are often treated to a spin through the surrounding countryside—without getting up from the sofa.

Harkleroad's house revolves on its concrete core by means of 24 rollers turning on an inverted railroad track. Thus, Sam, his wife and son can face the house into the early morning sun, or away from the hot late-afternoon sun. And, in winter, they can turn it to catch the sun's warmth all day. Harkleroad, a professional builder, says it cost about \$1500 extra to make the house revolve. Besides the turning mechanism, special swivels were required for water, gas and waste lines (schematic, below). These joints were stacked on the exact center axis of the house. Phone and electrical lines are flexible cables, with lots of slack.

ENTRY to revolving house is through concrete core, then up a short stairway to this entrance hall. Despite house's generous size (three bedrooms, two baths), a single electric motor provides motive power

CYLINDRICAL HOUSE (below) revolves at rate of 320 degrees in 45 minutes, to give occupants a relaxing "tour" of the rolling countryside around Novato, Calif., or to catch the fullest rays of the winter sun





● DRIVER OF THIS CAR IS PARTIALLY BLINDED by glare from the top of the dash. The situation is made even worse by dirt on the windshield, which gives a fuzzy effect. Someone could be cutting out of a sidestreet at the left

Are You an

Here's how to see and be seen on the highway. These simple safety hints can save your life

By Clifford B. Hicks

DRIVING DOWN the highway on a bright summer day, you and your car may suddenly become completely invisible! This is black magic of a potentially lethal kind, for it could involve you in a fatal accident.

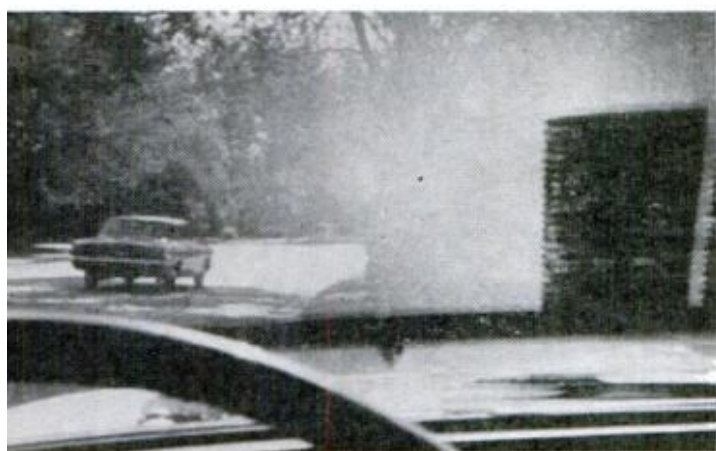
Prof. Merrill J. Allen of Indiana University has turned up the startling fact that cars often blend completely into the scenic background.

A tall, slender, soft-spoken optometrist, Dr. Allen specializes in visual problems of driving. As director of the Motorists' Vision Research Project, sponsored by the American Optometric Foundation, he has developed a substantial amount of precise—and startling—research. It shows that:

- Running lights make a car more visible, despite doubts from Detroit.
- The visually bad instrument panels on American cars can cause accidents.
- Yellow-tinted glasses shouldn't be worn at night unless specifically prescribed.
- One-third of the population has an eye condition that hampers judgment of distance from a red taillight or stop light.
- Windshield glare can completely blot



WHITE CARS ARE MUCH MORE VISIBLE against most backgrounds than black cars. Place a sheet of white onionskin or tissue paper—analagous to harsh glare from windshield reflections—over photo and black car almost disappears



RIGHT SIDE OF ROADWAY is obscured by glare from top of dashboard in photo shot through windshield of test car. Is there anything behind that glare?



YOU BET THERE IS! A pedestrian ready to step out into your car's path. Photo was taken through same windshield, but with the dash covered with velveteen

INVISIBLE DRIVER?

out pedestrians, road signs and other cars.

Dr. Allen's voice is deceptively soft, but his eyes glitter behind his spotlessly clean trifocals when he says:

"The modern automobile is jammed with visual handicaps. It almost appears that car manufacturers believe vision has nothing to do with driving."

If you're still not convinced, consider the Case of the Vanishing School-bus:

Recently a driver was charged with manslaughter for striking and killing a child. The girl was crossing a highway to board a schoolbus, which had stopped in the opposite lane. According to witnesses, the defendant, a respectable young family man with a fine driving record, even failed

to slow down. It had been a particularly bright, cloudless day, with a slight ground haze that intensified the light. Under such conditions, visibility could be no excuse for a fatal driving error. Or could it?

Dr. Allen calculated the angle of the sun at the moment of the accident. He then visited the scene when the sun was in the same position. What he saw—or didn't see—surprised even him.

"The blacktop surface of the highway bounced the sunlight straight into my eyes. In this blinding sheet of light I could barely make out, on the edge of the highway to the right, a long row of rural mailboxes. The child had stepped from between these mailboxes.



"This was no excuse, of course, for not stopping for a schoolbus that was motionless on the highway with its stop flag out and its lights blinking. It seems incredible that an object as large and well-marked as a schoolbus couldn't be recognized. However, statements from other witnesses indicated that two large trucks towing 70-foot trailers had stopped behind the bus. My subsequent tests showed that the yellow bus, due to the blinding glare, actually looked *black*, and the long line of vehicles obscured its shape."

"One other visual factor remained—the lighted stop flag on the bus. I examined the lights on the particular bus involved, and discovered that they consisted of standard bulbs that were too weak to be seen under these conditions, and that *the reflectors had been painted flat black.*"

It was a tragic chain of coincidences—that could happen again.

Dr. Allen subsequently embarked on a detailed research project to find out whether running lights—simple lamps that light when the car is in operation—can make a modern vehicle more visible in daylight.

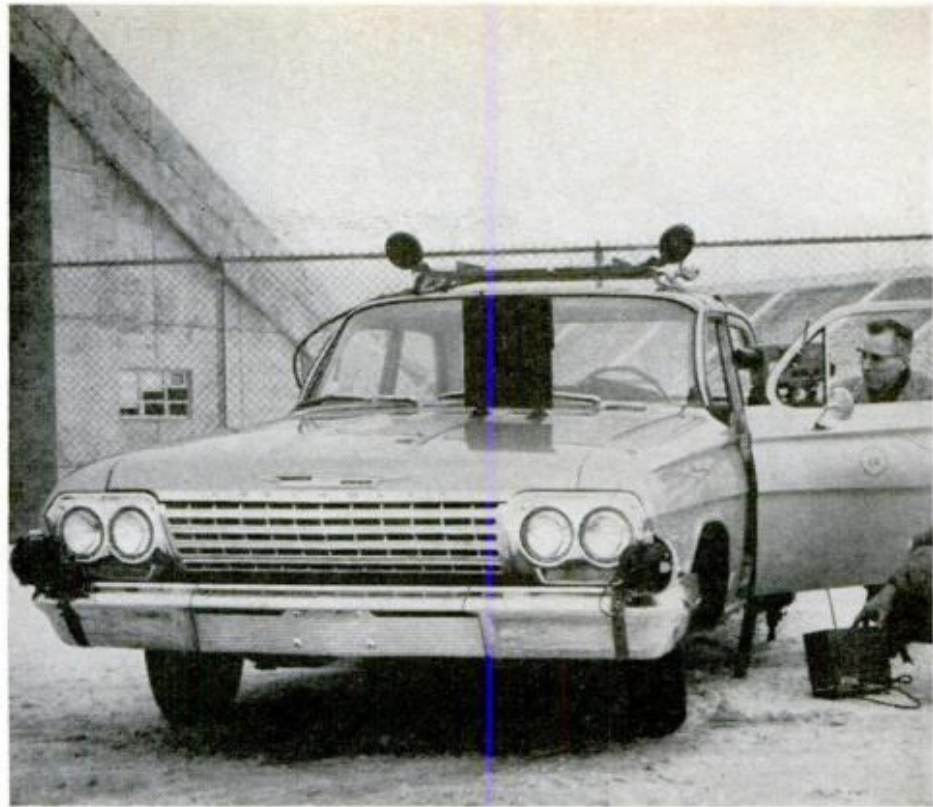
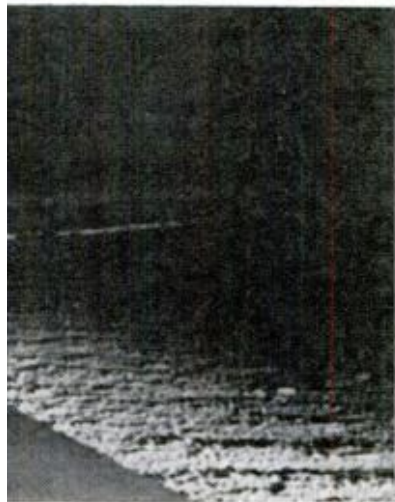
The idea probably started in Texas

where motorists, one holiday weekend, were asked by their governor to drive with headlights on—hopefully not only to make the cars more visible in daylight, but also to remind other motorists to drive safely.

In 1961, Oklahoma borrowed the idea for the Labor Day weekend with startlingly successful results. Total accidents were down 66 percent, fatalities down 75 percent and injuries down nearly 25 percent compared to the previous five-year average.

SENSITIVE PHOTOMETER operated by Dr. James Clark of Indiana University measures visibility of running light. Tests showed that the lights do help





TYPICAL NIGHT-DRIVING SCENE (upper left) shows approaching cars with headlights dimmed, as required by law. What's in that black void to their right? With bumper-mounted side lights (lower left), you can find out. Above is test car with side and roof lights wired into low passing beams. Roof lights proved impractical; they caused too much glare for following drivers. But in many highway areas the bumper-mounted side lights could do away with the need for general highway illumination on fixed posts, Dr. Allen suggests

No one knew, of course, how much credit the use of headlights deserved. However, Greyhound decided to try running its buses with headlights on all the time. Daytime accidents dropped 11 percent over a two-year period.

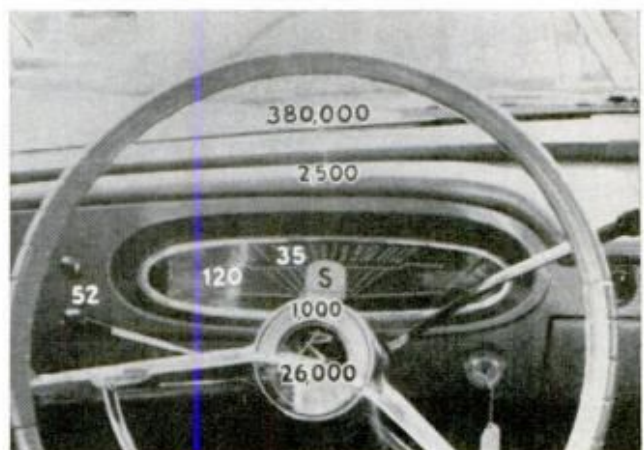
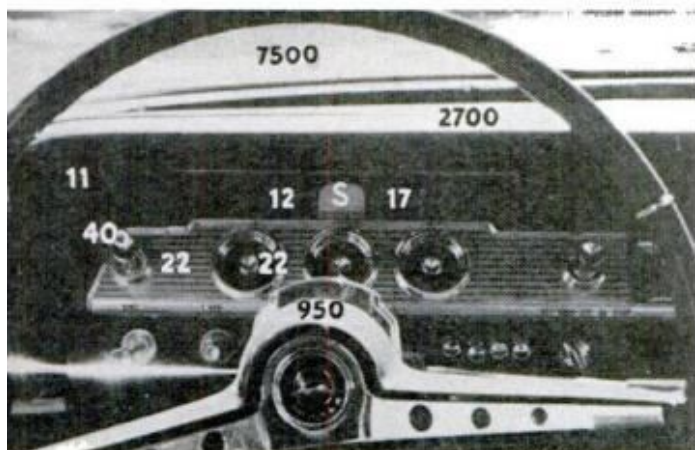
At least six manufacturers have brought out single running lights for grille mounting. Still there are doubts. Last January the Automobile Manufacturers Association decided further research is needed.

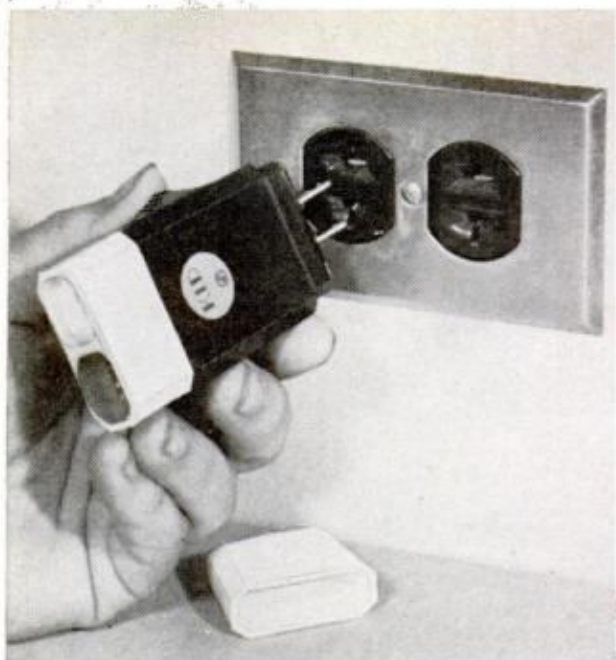
The most frequently expressed doubt is that "When everyone has one, no one will pay any attention to them."

The National Safety Council says there isn't, yet, enough proof that running lights will, in the long run, prevent accidents. And Pennsylvania and New Jersey laws on installation, testing, and use of lights rule running lights out.

Dr. Allen set up a research program with [\(Please turn to page 224\)](#)

FOR THE BEST 'SEEABILITY,' the least lighted area should be no less than a tenth as bright as the brightest. Left is Dr. Allen's shot of a '62 Chevy dash; right is '62 Rambler American. Brightness readings have been added





Two-Color Rechargeable Light

Selection of either a red or white beam of light is just a matter of flipping a fingertip switch on a new, low-cost rechargeable flashlight. The flashlight is plugged into a wall outlet for recharging. Price is \$3.95 plus 30 cents postage from C. A. Embree Co., Box 222, Dept. F, McMinnville Tenn.



Water-Winged Jeep

Buoyed by two nylon bags inflated with engine exhaust gases, a jeep can now "swim" across deep water obstacles. The vehicle can carry a capacity load at 3 m.p.h, propelling itself solely by the action of its tires in water. Goodyear Aerospace Corp. developed the system.

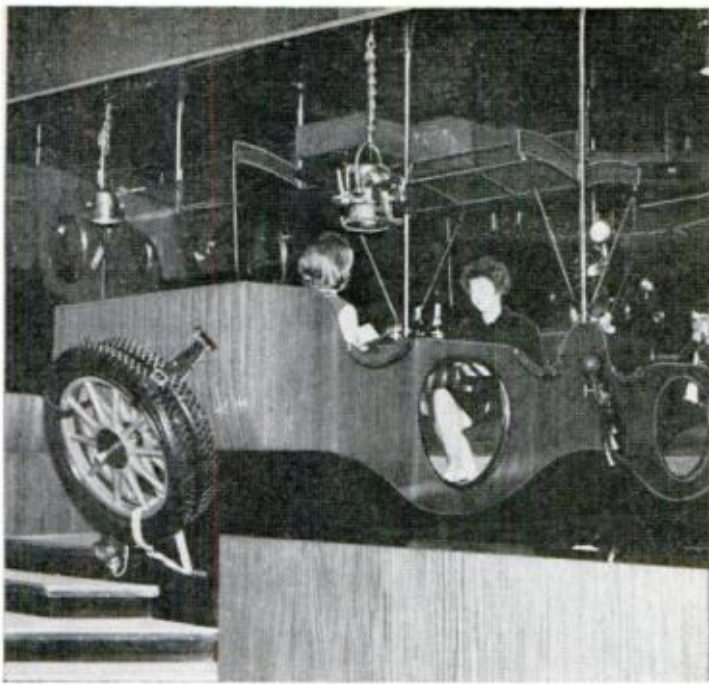


Infrared Spots Cable Breaks

Imperfect joints in power cables set up increased infrared radiation which can be spotted by a new instrument called a "bolometer."

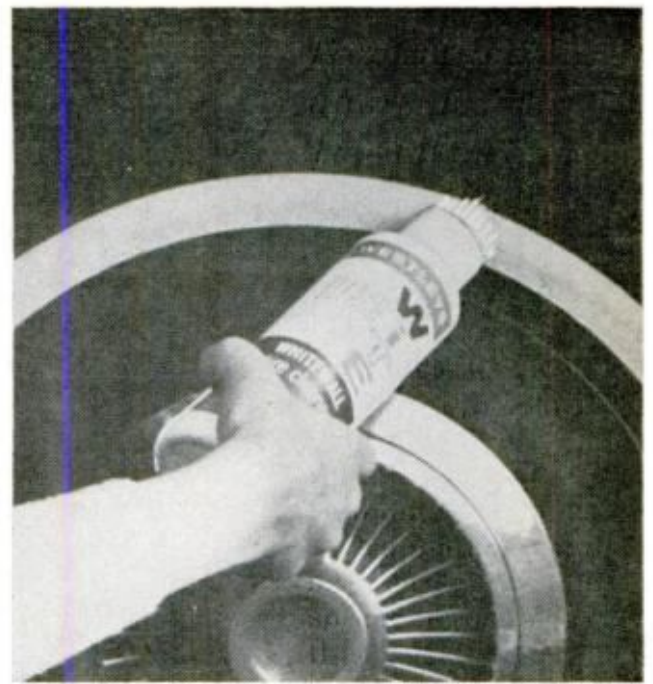
Focused on the joint, the telescopelike device is capable of taking a meter reading up to plus or minus 5 degrees F. at a distance of 120 feet.





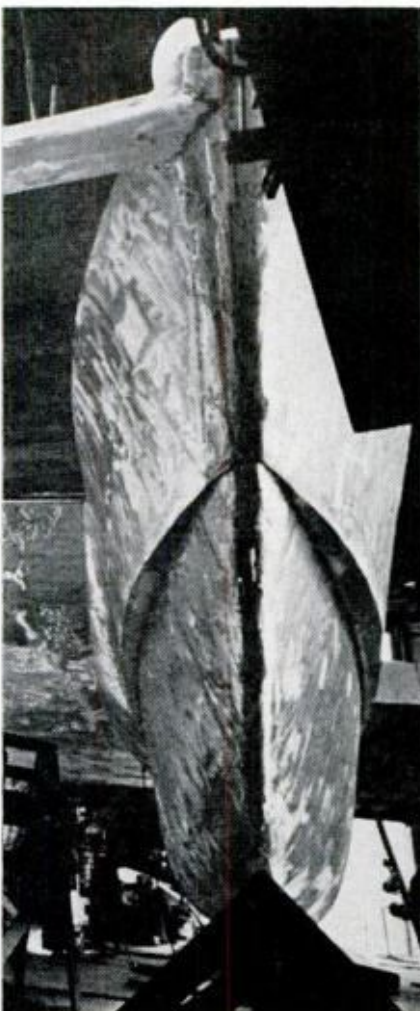
And They Even Serve Food

In Paris' new Pub Renault, one dines by the romantic glow of replica vintage headlights. Booths resemble 50-to-60-year-old autos, and tables are graced by car mirrors for mademoiselle to primp by. An old Renault flanks one entrance, and patrons leave through a showroom of cars.



Dirty Whitewalls Come Clean

A new bleach-base whitewall cleaner requires a minimum of scrubbing, *PM* found in a use-test. It's said to be harmless to rubber. The plastic bottle has a brush head for easy application. Bleach-White Tire Cleaner is sold by Westley Industries, Cleveland, Ohio, for \$1.25.



Sun Glasses Have Lenses Full of Holes

New glare-reducing glasses protect the eyes and sharpen images. "Lenses" are opaque plastic with parallel rows of pinholes. Such spectacles have also been used to correct astigmatism and other eye disorders. Stenospecs cost \$22.50 and up; Sunset Glare Guard Corp., Box 1209, Palm Springs, Calif.

◀ Cat Gobbles Up 10 Tons of Aluminum

A 52-foot auxiliary catamaran utilizing 20,000 pounds of aluminum is said to be the largest vessel of this type ever built from the light metal. Designed by MacLear & Harris, it will provide luxurious accommodations for twelve, including four private baths with showers, stereo hi-fi, sports fishing chairs, galley deep freezes and wall-to-wall carpeting.

They're Frying Weeds Out of Crops

By Jordan Goldman

FLAMES IN A CORNFIELD aren't necessarily cause for alarm nowadays. Chances are, they're just the business end of a new method of weed control called flame cultivation, or in farm lingo, "sizz-weeding."

Resembling a gigantic daddy longlegs, a flame cultivator outfit is actually just a tank of LP gas hooked up to a few pipes and nozzles—and towed by a tractor.

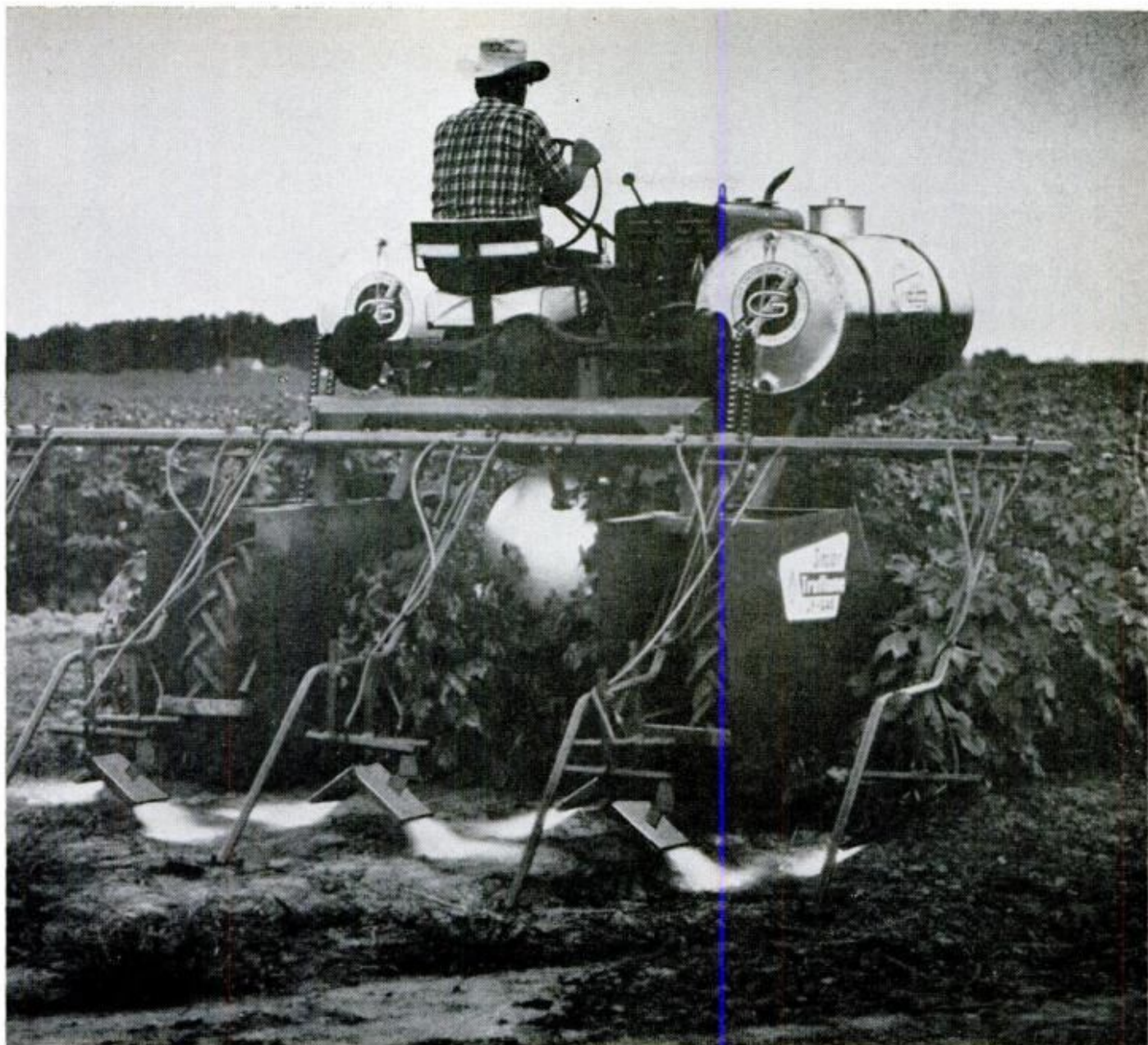
Flaming can turn a weed into a crisp, but such treatment is far too drastic. It's only necessary to hike plant cell water temperature to about 200 degrees for a tenth of a second. This causes rupturing of cell walls and eventual plant starvation.

The smart sizz-weeder bides his time. If he doesn't, he may clobber his crops as well as the weeds. As plants grow, they develop a woody exterior which has considerable heat resistance. As soon as the crops have reached this stage, but before the weeds have developed a similar protective layer, it's time to attack.

The method has proven successful in cotton, grain sorghum, soybeans, castor beans, onions, potatoes and corn against such weeds as pigweed, purslane and water grasses. High Plains Research Foundation of Texas cites such comparative costs as \$18.50 for hand hoeing an acre of onions versus \$4.55 for flaming and \$45 for hand hoeing potatoes versus \$2.10 for flaming.

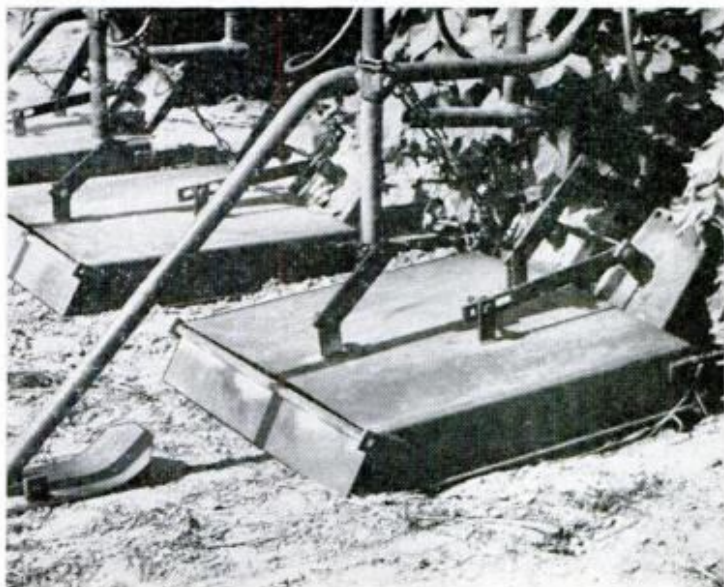


EFFECTIVENESS of flame cultivation is shown in before and after shots of cornfield. Pigweeds growing at 20-inch intervals in a row of corn can cut yield by 15 percent, or in money terms roughly \$30 an acre

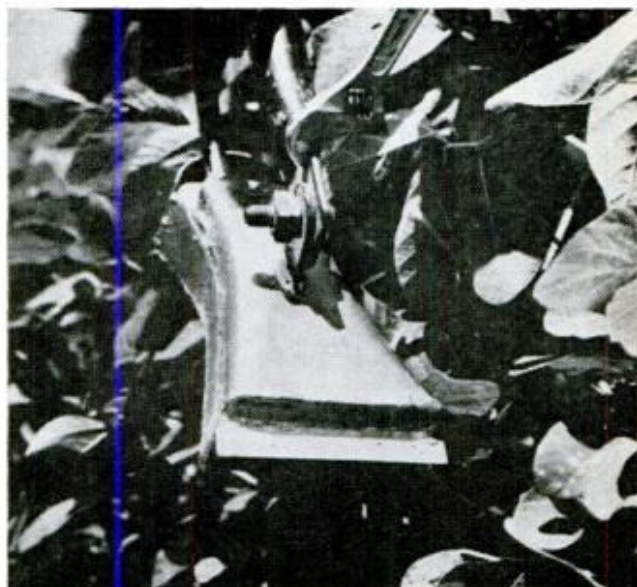


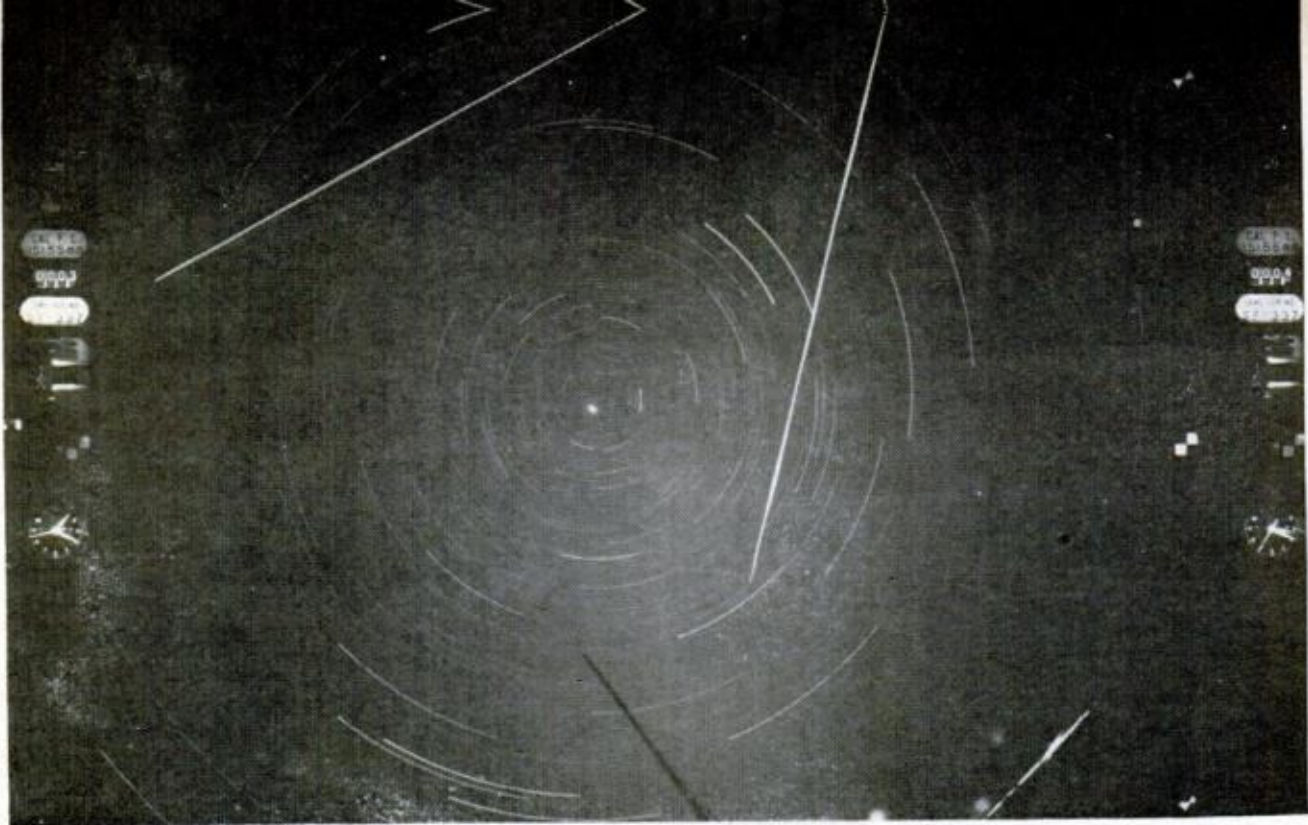
WEED KILLING with machines like this Gotcher flame cultivator has proven successful for corn, cotton, grain sorghum, soybeans, onions and potatoes

HOVER BURNER is extensively used in cotton weeding. Its ovenlike design increases heat concentration and helps protect crops from stray spurts of flame



BURNER NOZZLE, such as this Afco flamer, can be adjusted for height and angle. Additional flame control comes through regulation of the gas pressure





METEOR PICTURE (white streak, right of center) was taken by observation station last March. Although each film frame is exposed for two hours, meteor was visible for only five seconds. Other streak is Echo 1

To Catch a Falling Star

SCATTERED through seven Midwestern states are 16 observation stations spaced to scan the horizon with wide-angle lenses and record falling meteors.

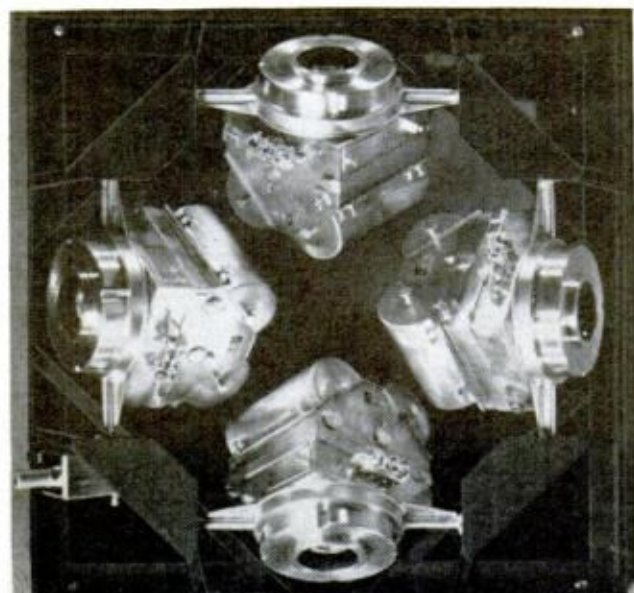
Every day more than 100 million of them flash across the sky and about 10 survive the atmosphere and crash to earth. Now the Smithsonian Astrophysical Observa-

tory and the National Aeronautics and Space Administration are following their paths to compile data impossible otherwise.

The unmanned cameras automatically turn on at sundown and off at sunrise on clear nights. A photo cell, focused on the North Star, triggers them on and off.

—Charles Remsburg

BIRD'S-EYE VIEW of unmanned station with top removed shows four wide-angle cameras covering entire sky. Photo cell (lower left) is focused on North Star



CAMERA STATION is one of 16 in Midwest "prairie network." Cameras are turned on automatically at dusk and off again at daylight by photo-electric cells



• We Don't Have to Go • Deaf on the Job

• *Ear muffs, plugs and enclosures for ma-*
• *chines can shield ears from damaging noise*

• By Jackson Hand

• **J**IM POTTER lives in a northern Wisconsin paper mill
• town, and he has the most-envied job in his plant.
• The handsome, clean-cut, 30-year-old expert operates a
• bank of corrugating machines in a paper box factory.

• Standing at a control console arrayed with buttons
• and dials, he plays the giant machines like a pipe organ,
• slowing them down to an inch-along murmur or swelling
• them into the tremendous roar of modern-age production.

• He has had his job for seven years, and he stands



CAUTION
NOISY AREA
WEAR YOUR
EAR PROTECTORS

SOUND MUFFS, one of the most promising means of protecting workmen's ears, may become as much a part of the industrial scene as hard hats are today. Muffs are effective against all but most extreme noises

there day after day confident that he will hold it for the rest of his life. He is well-liked, competent, a family man of good character and habits.

In another seven years, Jim Potter will be well on his way toward deafness. By the time his pretty young daughter presents him with a grandson, Jim will have trouble hearing the little voice that would mean so much to him.

This is inevitable. Where Jim stands all day, the noise level is so high that eventual permanent damage to the hearing nerves is certain. Ear doctors know this to be true.

But Jim doesn't think so.

I visited him last winter and I wore a pair of sound muffs. For my short visit, the noise would not have been harmful, but I wanted to see how well the muffs work. With them on, the noise of the plant in full cry was almost pleasant—just a comfortable earful, you might say. When I removed the muffs, my throat and jaw immediately tensed up in a muscular revulsion against the noise. The difference was startling.

"Why don't you wear muffs like these?" I shouted at Jim.

His eyes flickered an instant to my button-down collar and he smiled. "It's not so noisy in here."

At that moment another worker came up to Jim, tapped him on the shoulder and held up three fingers. Jim nodded and touched a button on the console. Something speeded up somewhere. The noise

got a little louder, a little more shrill.

With me on my visit to this factory was Dr. Roger Maas, one of the world's great pioneers in industrial hearing conservation. As we walked away from Jim Potter's machine, Dr. Maas said:

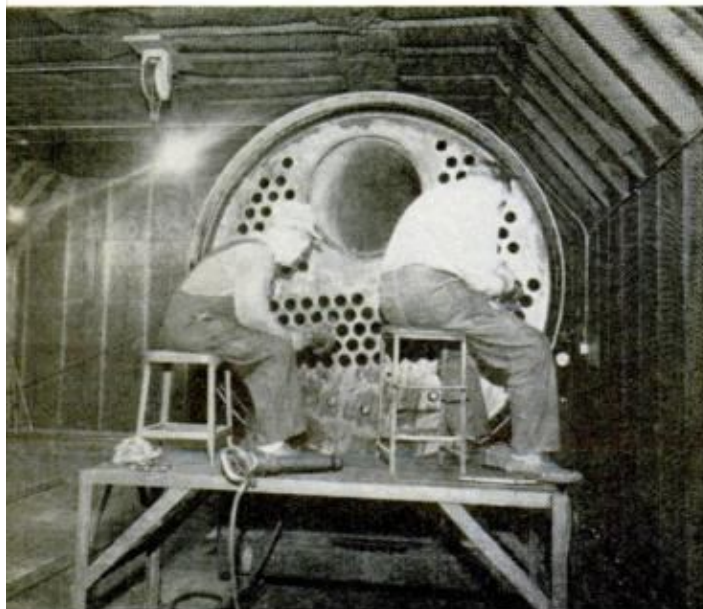
"There's your problem. So noisy the men use hand signals rather than try to shout. Over 100 decibels, when 85 is known to be damaging. But he doesn't think it's noisy."

Jim Potter is one of an estimated 16,500,000 men and women in 324,000 plants and factories in thousands of different job classifications who spend day after day in an acoustic climate known to be damaging. Protective and preventive measures that are simple and inexpensive could cut those impressive statistics *almost to zero.*

Dr. Roger Maas (his title is for a doctorate in education) is one of a relative handful of men and women who are dedicated to the job of saving all those millions of ears. He is the only industrial audiologist in the United States who is employed by—and backed 100 percent by—an insurance company, Employer's Mutual, in Wausau, Wis., Dr. Maas' home town. His co-workers are the nation's safety engineers and industrial nurses and otologists (ear doctors). Their job is difficult because Jim Potter doesn't think his plant is noisy, and refuses to be bothered.

In another factory I learned part of the reason for the apathy. There, the plant's quality control group works in a house-

BOILER FACTORY, traditional symbol of harsh noise, produces almost 130 decibels—close to the pain level. Sound is confined by housing around working area



NOISE-CONFINING PARTITIONS of hardboard and gypsumboard surround area of noisy operation. Worker in the noise area is protected by ear plugs



within-a-factory made of concrete blocks. It has a heavy door and multiple glass windows through which technicians can observe block-long, gymnasium-high machines without hearing a sound. Stepping quickly through that door, you feel the sudden blast of noise. The attack is *physical*—not merely auditory. Many observers say they must exert conscious effort to keep themselves from urinating. Dogs exposed to the noise cringed, cried in pain and terror—and fled.














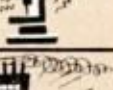






But humans are “smart” enough to force themselves to stay—and in a few minutes, the sound seems less loud. They get “used” to it. Workmen admit there is a ringing in their ears when they return to the quiet of their homes at night. By morning the ringing is gone, but a fragment of the damage is done. The man goes back to his post in the morning, not realizing that he hears a tiny bit less well than he did.

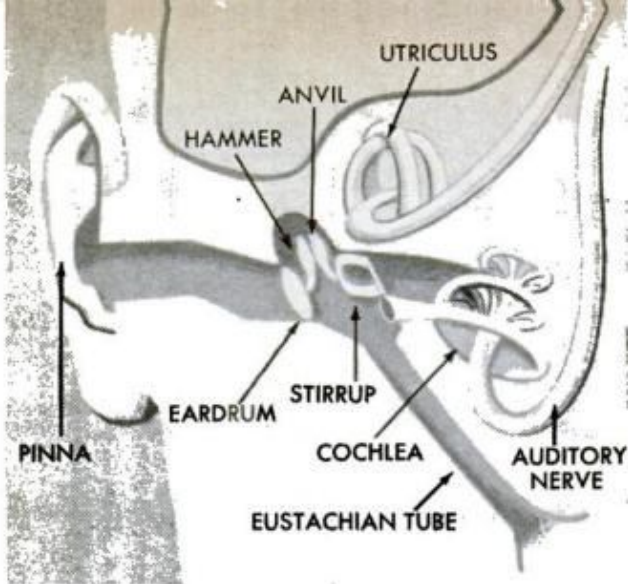
Comes the day when the ringing does not stop. He now has what the otologist calls *tinnitus*, the “tin ear” famous among boilermakers. *And only now will he believe—now that it is too late—that noise will damage his ears.*

Neither Dr. Maas nor the industrial nurse nor the safety engineer nor that otologist can explain the reason for this odd resistance to ear protection. They believe it is due in part to a man’s belief that he’d be a sissy to wear ear plugs or sound muffs. (Good evidence that this may be a vital factor is the phenomenon that

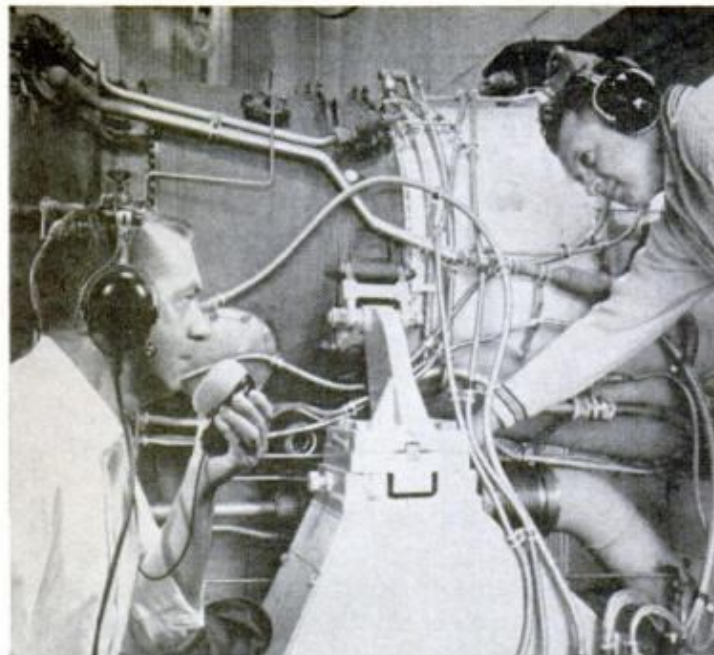
CUSTOM-FITTING EAR PLUGS makes them comfortable, effective. They’re good up to 100-plus decibels, and don’t interfere with workers’ voice communication



TYPICAL NOISE LEVELS		
Source of Sound		Decibels
Just audible level		0
Rustle of leaves in gentle breeze		10
Average whisper		25
Country residence		30-40
City residence		30-55
City office		40-70
City street		50-81
Average factory		50-90
Subway train passing through local station (express)		95
Public address system		90-96
Air drill		92-100
Loudest automobile horn - 23 ft.		100
Band Saw on sheet metal		106
Punch press		96-108
Boiler factory		105-115
Circular saw		100-116
Motor and propeller of plane - 18 ft.		120
Drop hammer		100-130
Level of painful sounds		130
Jet engine		140



THE EAR HEARS when vibrations enter through pinna, reach eardrum via canal. Eardrum vibrates anvil, hammer and stapes. Cochlea sends sounds to the brain. For clarity, the drawing exaggerates size

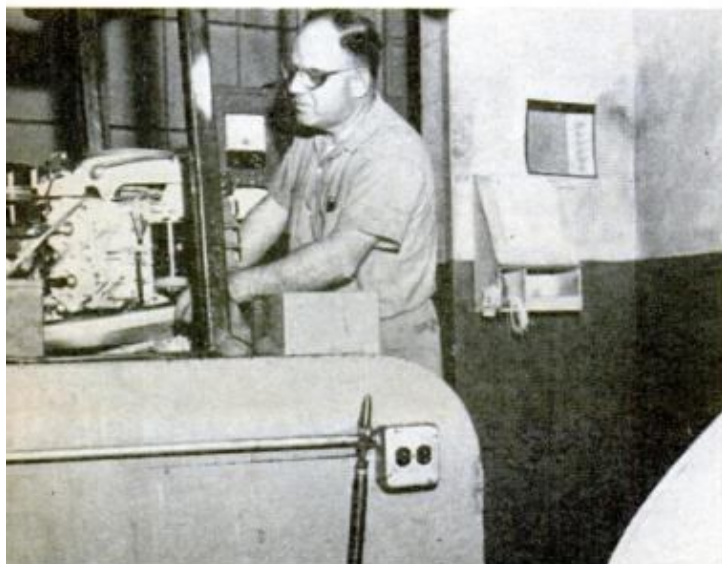


FOR EASY COMMUNICATION between workers in noise up to 130 decibels, sound muffs can be fitted with earphones. Hookups include up to 10 workers



ANECHOIC CHAMBERS facilitate precise control of sound for research on sound measuring devices. This one has 3000 wedges of sound-absorbing material

RUNNING-IN OUTBOARD MOTORS: Although operator must listen for sounds of malfunction, his co-workers are shielded from din by clay-tile walls



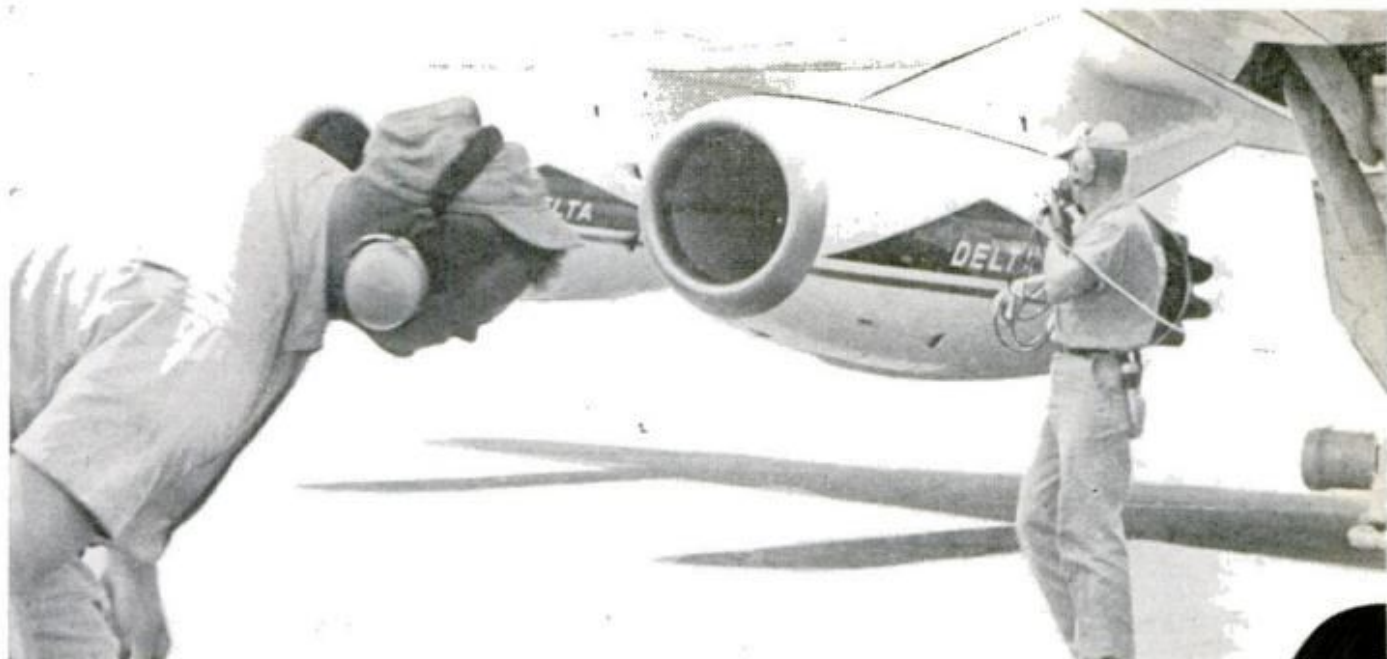
women in industry willingly and gladly wear the protection men scoff at.)

Is it the newness of hearing conservation as a science that makes the job difficult? Perhaps. Ear doctors are at a loss to explain why so wonderful an instrument as the hearing aid was so hard to sell when it was first introduced. Only in the past 10 years have large numbers of safety engineers realized that industrial noise is an occupational hazard as important as falling objects, silicosis, unguarded blades or leaking gasoline.

In the ill-kept historical annals of hearing conservation, Jack Hatton, safety engineer for Lockheed in Burbank, Calif., was the first of his profession to accept the ear as part of human fragility. In 1940, Lockheed began employing psychiatrists to check aptitudes and intelligence responses. Hatton pointed out that such tests meant little if a man happened to be a little hard of hearing—even less if he became harder of hearing on the job.

At that time the instruments for testing hearing were crude and there were no reliable methods of measuring the amount of noise a factory created. So, the idea didn't spread rapidly. On an experimental basis, Employer's Mutual held some conferences and investigated the wisdom of routine hearing checks along with routine eye, heart, lung, and other health factors of interest to employer and employee alike.

Then, in the late 1940s and early 1950s



JET ENGINE, one of man's loudest accomplishments, produces a screeching 140 decibels of sound; prop-driven plane, a formidable 120. High-pitched sounds have been found more damaging than heavy rumbling and pounding

two events focused the interest of industry on hearing. In New York, a man named Slawinsky sued the J. R. Williams Tool Company for damages to his hearing. In Green Bay, Wis., a man named Wojick sued the Green Bay Drop Forge Company on the same grounds. In both cases the workers were awarded damages.

There were cries of doom, indeed, in industry, for who was to say that the plaintiff was not just as deaf as his lawyer claimed him to be. A tremendous amount of research was focused on the field of noise—and of hearing.

The state of Wisconsin, pioneer in workmen's compensation, made the fair-to-everyone step. By law, a worker could not sue for damages to his hearing until six months after he had quit his job. This made it unprofitable to risk a phoney hearing-loss suit, and it revealed many a temporary hearing loss.

With reduction of the immediate danger of irresponsible suits, much of the big noise about noise died out. For Roger Maas, this only served to amplify the challenge. He determined to make hearing conservation his life's work, a decision no doubt encouraged greatly by the fact that his own father, retired during this period, had gone all-but-deaf working in the screech and din of a saw-mill. Frank Maas is a 70-year-old short, stocky, intense, twinkle-eyed prototype of his 37-year-old son. You feel more interested in hear-

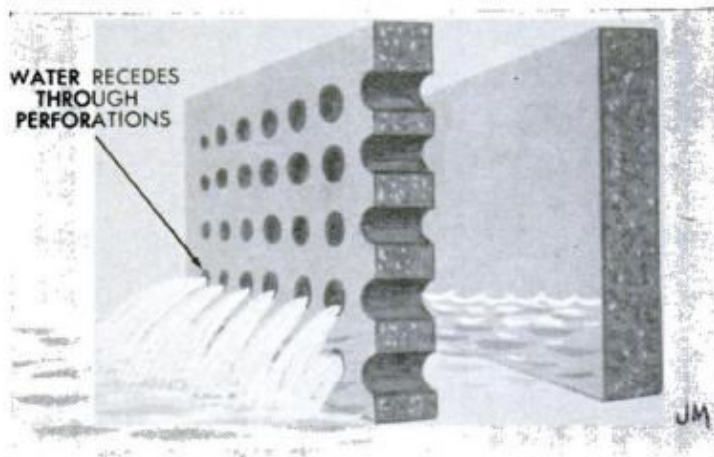
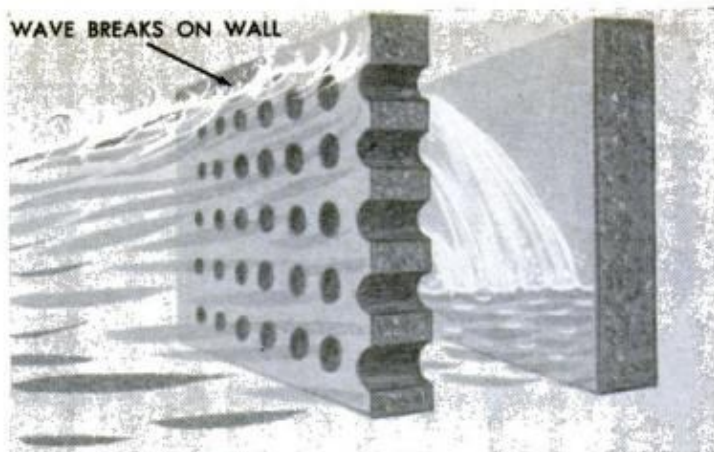
ing conservation, yourself, when you watch the affection between these two and see the older man stand on tiptoe—straining every nerve to hear his son's voice—at a distance of two feet.

The break-through in an intelligent hearing program came only about eight years ago, with the perfection of the "pure tone" audiometer, for which we are in great part indebted to the current Nobel prize winner, Dr. Georg von Békésy, of the Harvard Acoustic Research Center. This instrument produces, electronically, a single tone of controllable intensity. The tone can be changed from higher to lower pitch. With it, audiologist can measure the "threshold" of hearing for any pitch. For the first time they can accurately measure the hearing ability of human beings.

During the first few thousand tests made with the pure tone audiometer, it became apparent that men and women who had been exposed to an extremely noisy working environment were "harder of hearing" than comparable persons who worked in quiet. The audiologist discovered, further, that *noise was a greater factor than age in hearing loss.*

Most interesting, in the opinion of Dr. Maas, was that many industrial workers in seemingly less noisy jobs had hearing loss greater than those in classic "boiler factory" conditions. This phenomenon

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



Swiss Cheese Breakwater Takes Shock Out of Waves

Taming the destructive force of ocean waves battering an immovable object, a novel breakwater in Baie Comeau, Quebec, utilizes a "swiss cheese" construction to let the water spill into a 30-foot wide chamber that dissipates its energy. The

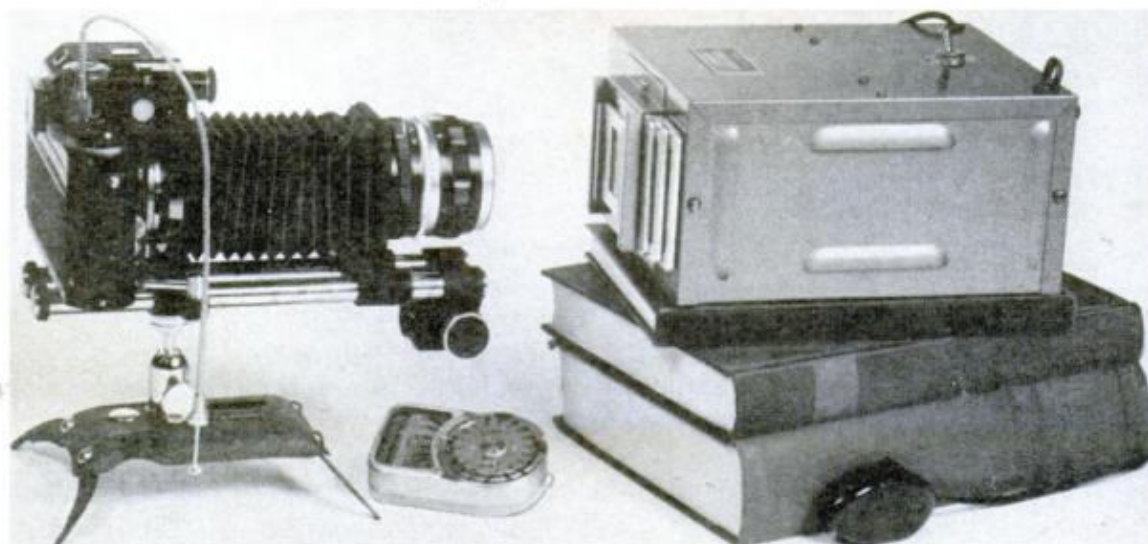
water then surges out through the perforations, creating a cushioning effect on subsequent waves. Checking the explosive power of wave energy allows the 1000-foot, reinforced-concrete breakwater to be used also as a pier for shipping.

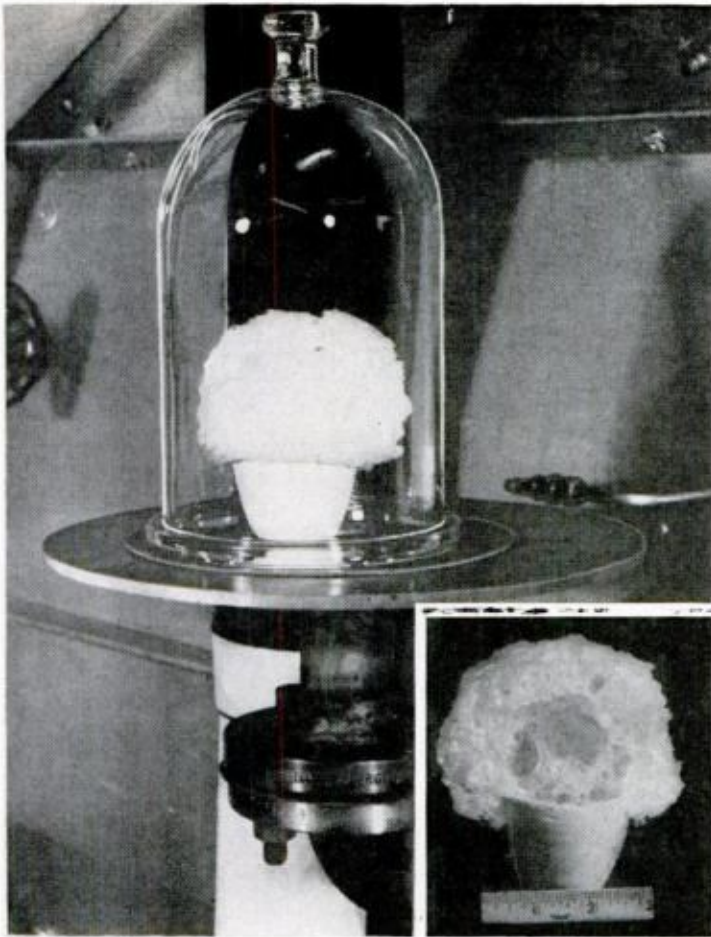
Lighted Copier Helps Duplicate Color Slides

By illuminating your color photo slides, the Kingdon Slide Copier permits you to duplicate them or make black-and-white negatives for enlargement, with your own

camera.

The copier costs \$29.95 from Kingdon Photo Accessories, Inc., 1200 Madison Ave., New York, N. Y. 10028.





Man-Made Moon Rocks

Heat sand to 1500 degrees C., put it into a vacuum—and it will foam into a glass-like substance resembling the moon's surface material. The rocks, say the Michigan State University scientists who make them, reflect light similarly to the moon.



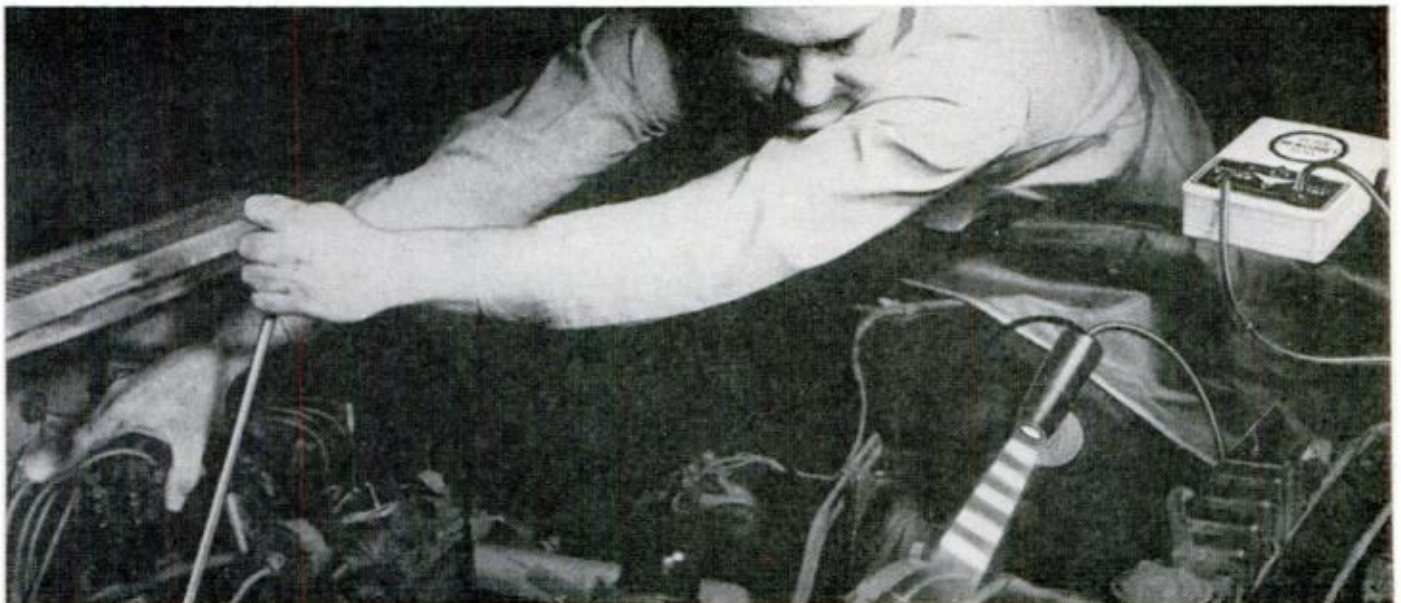
Stretcher Shrinks

Folded into a bundle, a new stretcher measures only 18 by 18 by 6 inches. Unfolded, it can carry a normal-size person. Designed by a former ambulance driver in England, the stretcher has canvas laced with wooden slats to give it rigidity.

Timing Light Sticks to Metal Panels Magnetically

This timing light has a magnet that holds it to a fender or other flat surface, leaving mechanic's hands free to adjust distributor. Flash tube is attached to

power pack by swiveling ball joint, so light can be aimed in any direction. Lincoln Engineering Co., St. Louis, sells the model 387 for \$34.95.



The Planes That NEVER WERE

FOR EVERY GREAT IDEA in aviation there are a few thousand near-great ideas that either never get off the ground—or do, just barely. For every new design that proves successful and goes into production, hundreds die in the experimental stage and thousands more are stillborn on drawing boards.

But the ideas behind some of the losers are fascinating, especially in their weird attempts to break loose from traditional molds and try some far-out configuration.

Some planes were built to take off straight up and land straight down, others to be taken off and landed by another “mother” ship. Some put two propellers on the same engine, others put the props in the tail. Some were mongrels, using two different kinds of engines in the same plane. Others were freaks, some without fuselage, some without wings. A few put the tail in the nose or out on the wings.

Some killed the men who flew them.

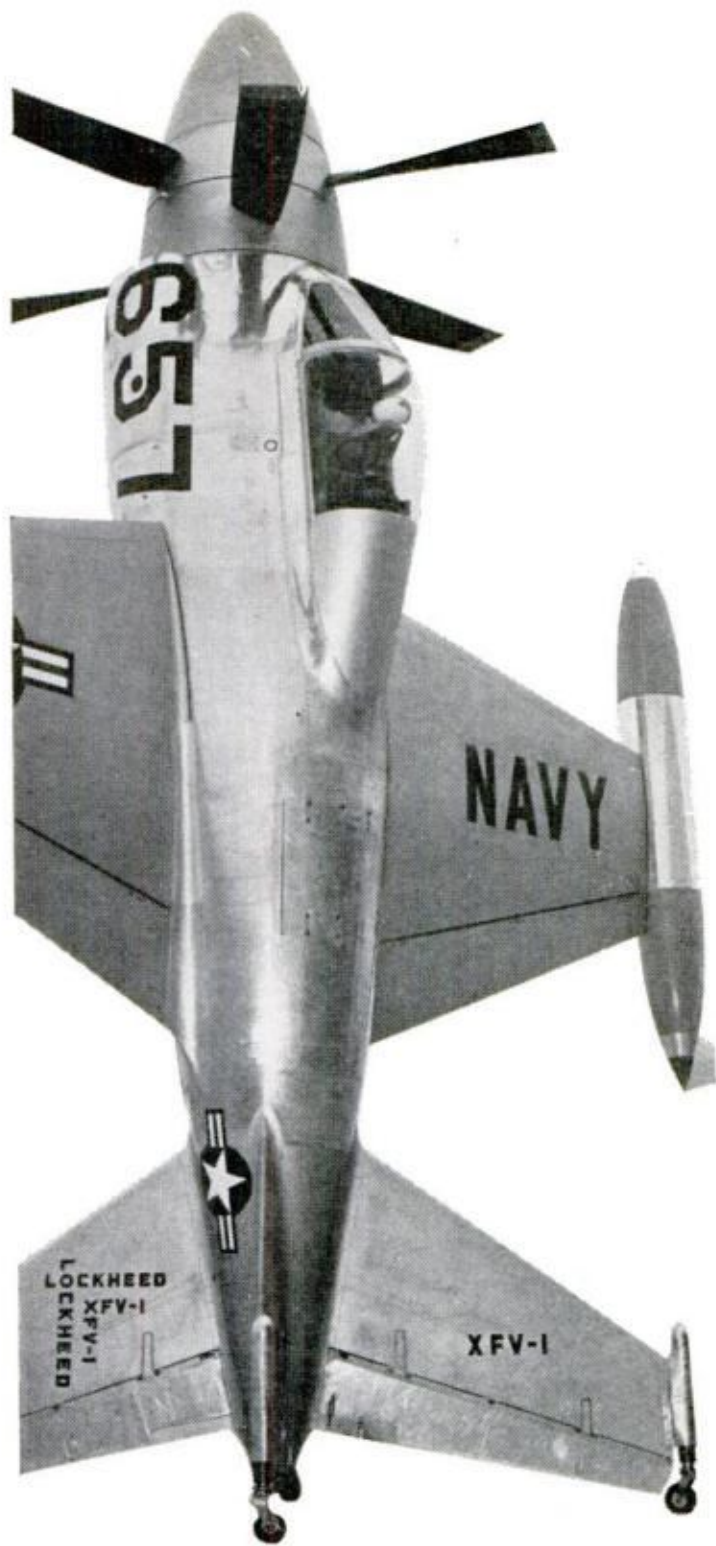
But even in failure, each made a contribution, if only to show that success was in another direction.

The air age is replete with significant failures—but, for looks, among the most grotesque were those produced during and since World War II. Ten of them are reproduced here. None ever got past the experimental stage, so they are among the planes that never were.

FLYING POGO STICK, the Lockheed XFV-1, was one of two attempts to find Navy aircraft that could take off and land vertically from destroyers or other small surface ships. Powered by turboprop engine with counter-rotating propellers, plane could hang suspended like hummingbird. Performance data, however, was never released and plane quietly died natural death

DOUGLAS MIXMASTER, the XB-42, used two engines buried in fuselage to drive two counter-rotating props in tail. It powered the plane to a remarkable 410 m.p.h., reputedly fastest ever for prop-driven bomber. Auxiliary jets added to wings later increased speed to 488 m.p.h. Mixmaster had 5400-mile range, depended primarily on speed for its defense from enemy fighter planes

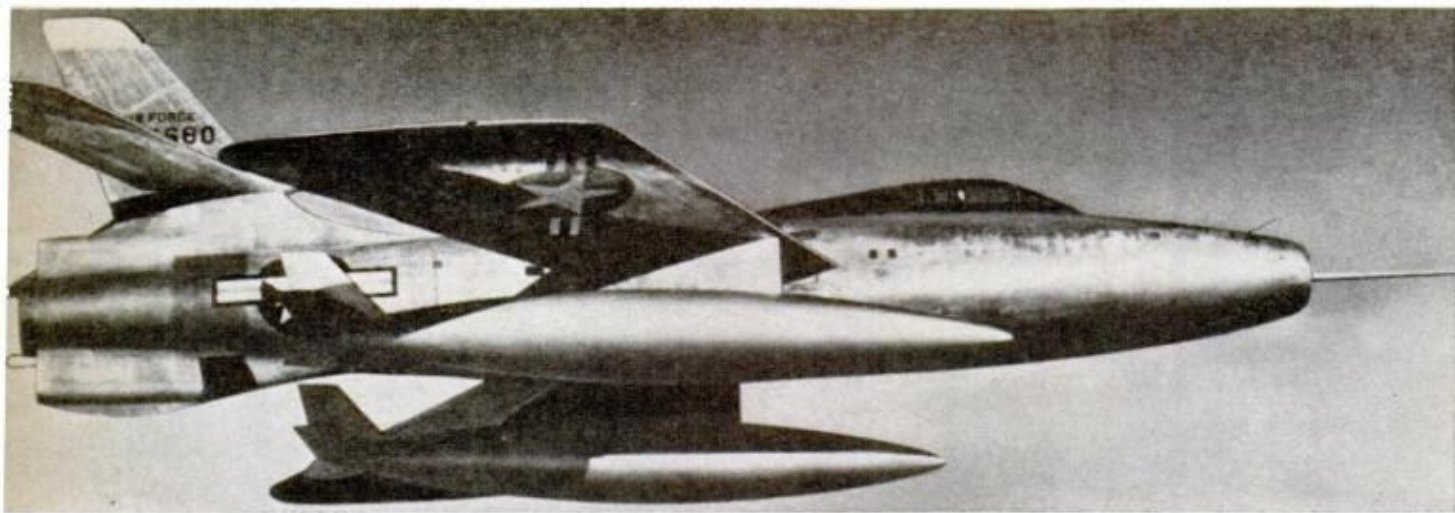




PARASITE FIGHTER, McDonnell XF-85 Goblin, (top), was loaded aboard B-36 like a bomb and released in air. It was to fly out, defend bomber, and fly back again. Troubles hooking onto mother ship doomed stubby, 664-m.p.h. jet, which had no wheels

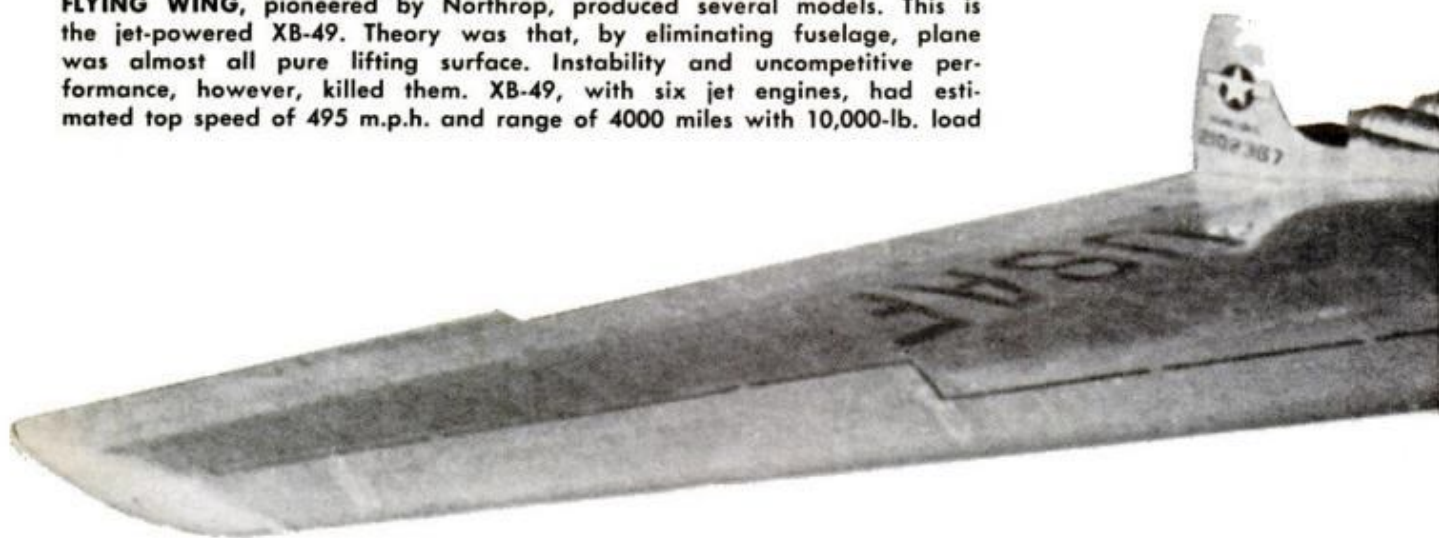
NORTH AMERICAN F-107, last of Air Force's "century series" until F-111, featured air scoop above cockpit, all-movable vertical and horizontal stabilizers, and spoilers instead of ailerons. F-107 and others are now at Air Force Museum near Dayton





MONGREL XF-91, by Republic, had both jet and rocket engines and claimed first supersonic flight by combat-type aircraft. Normal jet was supplemented by four rockets mounted in pairs above and below jet exhaust. Unusual wings were wider at tips than at fuselage fairing, for greater stability on takeoff. Wings could also change angle of attack during flight

FLYING WING, pioneered by Northrop, produced several models. This is the jet-powered XB-49. Theory was that, by eliminating fuselage, plane was almost all pure lifting surface. Instability and uncompetitive performance, however, killed them. XB-49, with six jet engines, had estimated top speed of 495 m.p.h. and range of 4000 miles with 10,000-lb. load

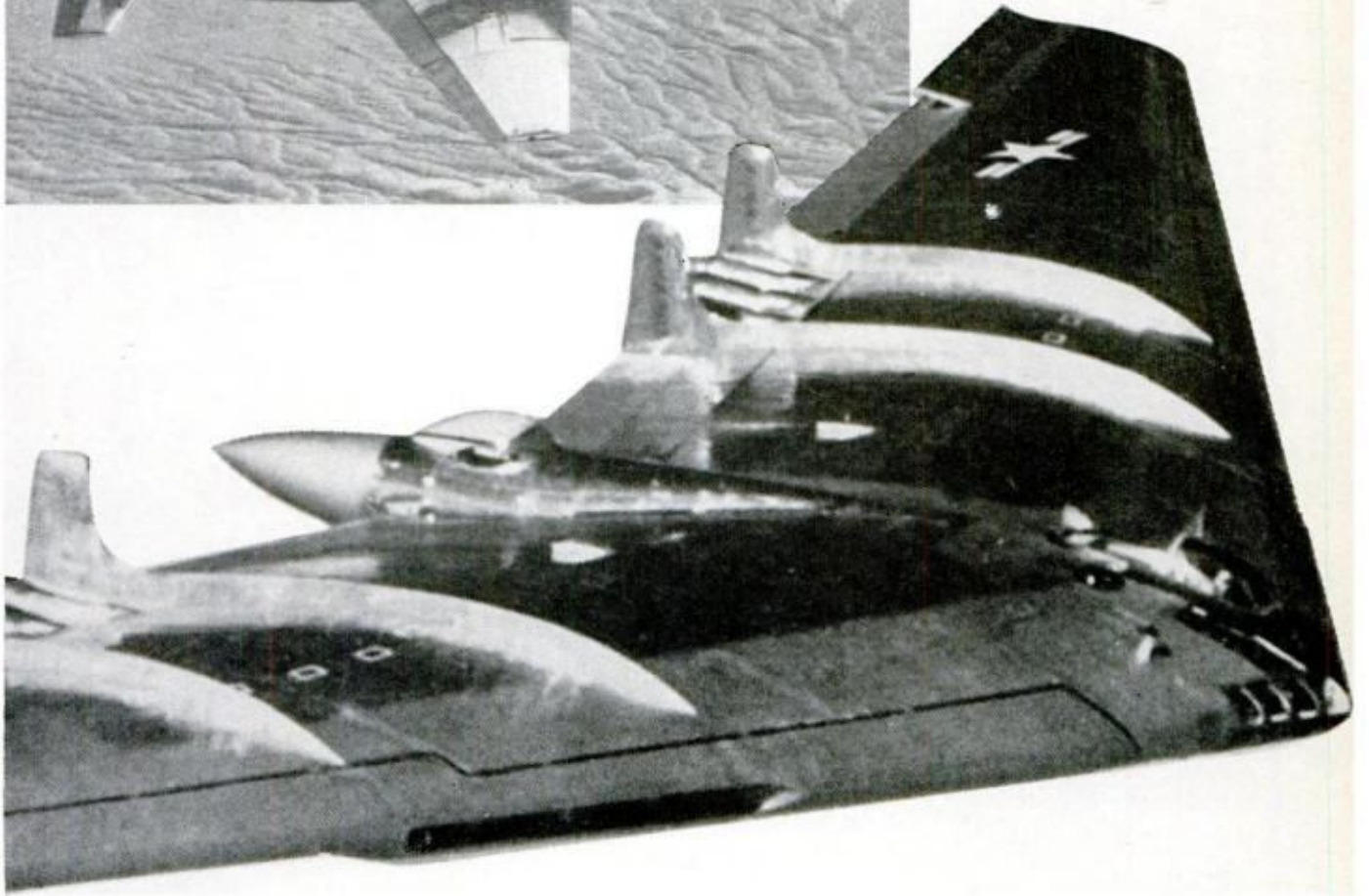


FLYING PANCAKE, the Chance Vought XF5U, was sometimes blamed for flying-saucer stories. While earlier wood-and-fabric test version flew, this circular model never did. Either all-wing or all-fuselage, depending on viewpoint, it was designed to stand on its tail and hover like helicopter, with estimated top speed of 476 m.p.h. Navy, however, lost interest, killing perhaps the weirdest airplane ever built





◀ **ANOTHER MONGREL**, the Consolidated-Vultee XP-81, was designed to overcome early jet problems of short range. It had turboprop engine in nose for cruising and pure-jet engine in tail for high speeds. With 507 m.p.h. top speed, it had respectable range of 2500 miles. Early problems with turboprop engine, first in America, doomed it

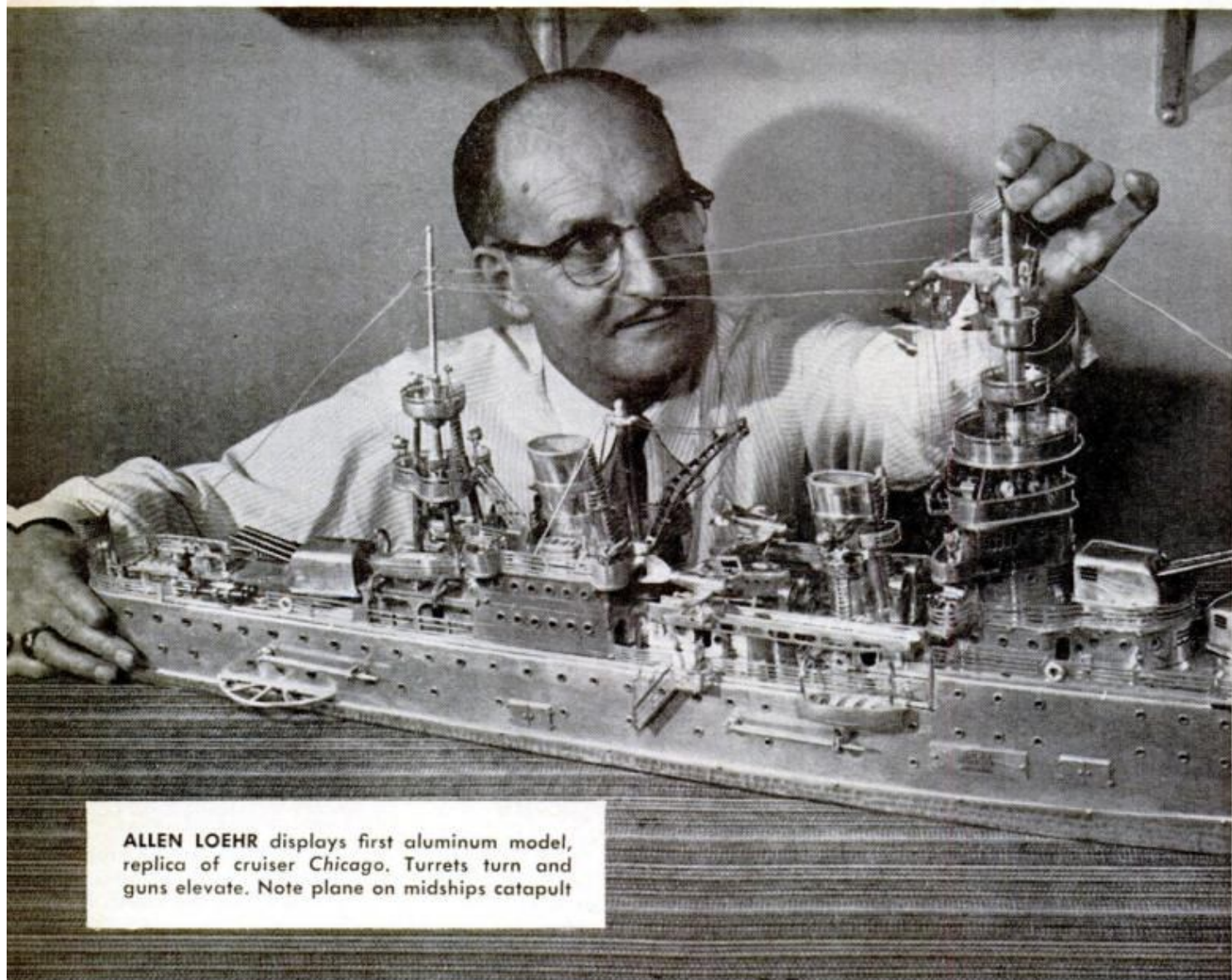


FLYING RAM, the XP-79, also by Northrop, had most macabre mission of all. Powered by twin jets, all-wing plane was built so solidly (mostly welded magnesium) it could ram enemy bombers and shear off their tails. On first flight, however, pilot who lay prone in cockpit was killed when it crashed

ANOTHER WEIRDO, the Curtiss XP-55, featured canard in nose, severely swept-back wings with rudders at wing tips. Pusher prop could be jettisoned to aid pilot's bailout. It was designed to do 507 m.p.h., but actually managed only 380 m.p.h. The XP-55, however, forecast swept-back wings of today

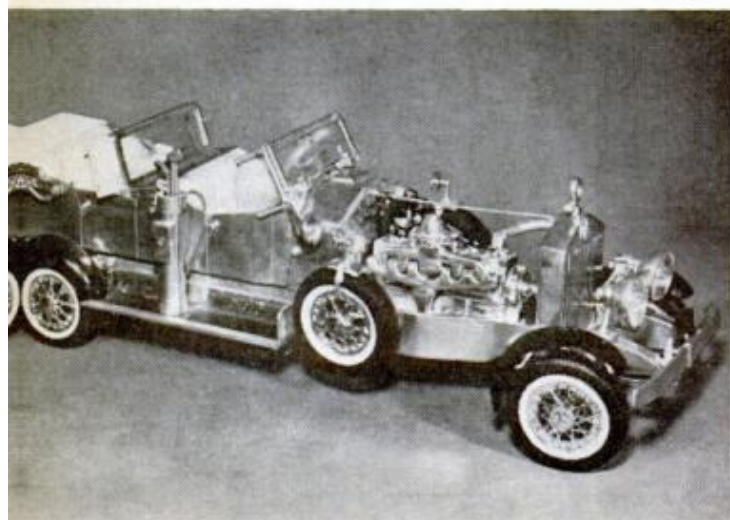


High Detail in Lowly

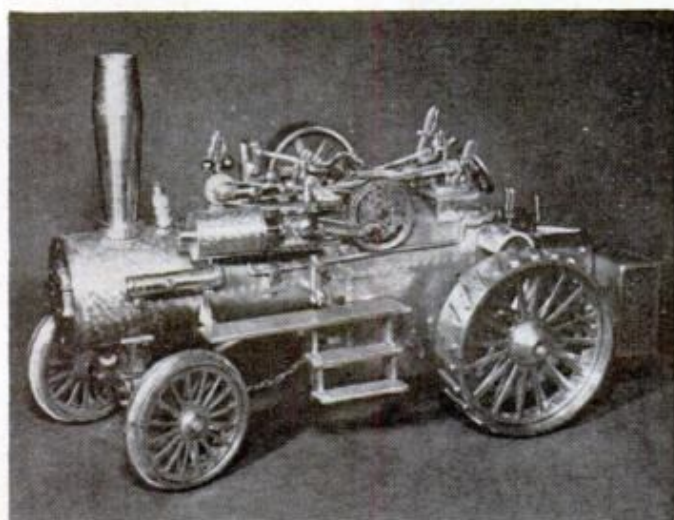


ALLEN LOEHR displays first aluminum model, replica of cruiser *Chicago*. Turrets turn and guns elevate. Note plane on midships catapult

1927 ROLLS ROYCE touring car sports aluminum golf bag to impress the ladies. Long hood was removed for picture to show intricacies of car's engine



OLD-TIME THRESHER is motorized (note switch on driver's seat) and crawls across floor, piston chugging, flywheel turning and governor whirling



Aluminum

With simple tools a master craftsman forms uncommon miniature models from a common metal

By Clifford B. Hicks

"**A**NYBODY," says Allen Loehr, "can make beautiful aluminum models. Tools? You don't need an elaborate shop. The only tools I use are a couple of files, a hacksaw and a portable drill."

Other required tools, which he neglects to mention, are those of any fine model-maker: a razor-sharp imagination and a large stock of patience.

Loehr works in an unusual medium for a modelmaker; few others have turned to aluminum as a basic model material. To this master craftsman, however, a piece of aluminum is not just a scrap of metal; it's a challenge.

"Actually," he points out, "aluminum is an ideal material for models. It's soft and easy to work. It's available in a wide variety of types and sizes. Most important, a fine aluminum model always looks good, even under a layer of dust, years after it's been completed."

Started 18 Years Ago

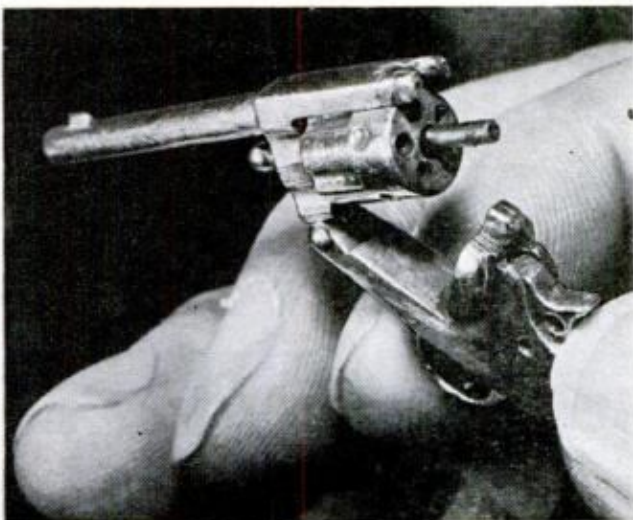
Loehr, a machine-tool inspector, started making aluminum models 18 years ago. His first was one of the most ambitious projects he ever tackled—a scaled version of the cruiser *Chicago*, complete with moving turrets, elevating guns and a reconnaissance plane on a tiny catapult. For more than a year he toiled over the intricate model. Today, it occupies a place of honor in his home in Belvidere, Ill.

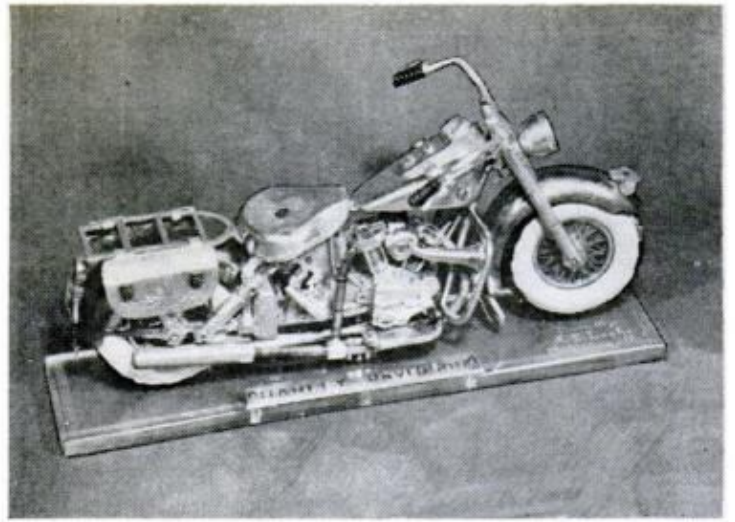
Throughout the home are other examples of his handiwork. On another wall is a glass-cased exhibit of ancient and modern arms, from bludgeons, pikes and crossbows to tommy-guns and carbines. Across the room is a framed workshop, complete with a full line of tiny hand tools, a lathe, a drill press and a bandsaw. There are miniature pianos and organs (complete with music boxes), doll furniture, tricycles, bicycles and motorcycles.

Some of his larger and more elaborate models, including locomotives and classic cars, are motorized. When he flicks the switch on an oldtime threshing engine, it crawls across the floor in search of a mini-



TINY REVOLVER is no larger than Loehr's thumb. Cylinder turns, and hammer can be pulled back and cocked. Grips are fashioned from plastic





ALUMINUM MOTORCYCLE is miniature of real motorcycle scaled down from advertising photo. Wheels are made from plastic, scored to simulate spokes. Note rear seat, bag

GRAND PIANO is finished off by Loehr. Parts are carefully planned so that each one covers fastener for last one. Fasteners are usually tiny bolts or aluminum rivets

ature wheatfield ready to be harvested.

So distinctive is the work that Loehr has sold several of his models for display in private homes. A local restaurant draws customers with 15 of his larger models permanently displayed in glass cases. For insurance purposes, his complete work—so far—has been appraised at \$5000.

The appraisal is a tribute not only to Loehr's craftsmanship, but to his remarkable knack for scaling down dimensions from a single photo or drawing. He simply looks at the photo, decides on a single dimension, and then scales the rest of the dimensions by eye. He readily admits that his models are not completely accurate in scale—but to the observer's eye they could well have been created, part by part, with the aid of a micrometer.

In working with aluminum, Loehr soon

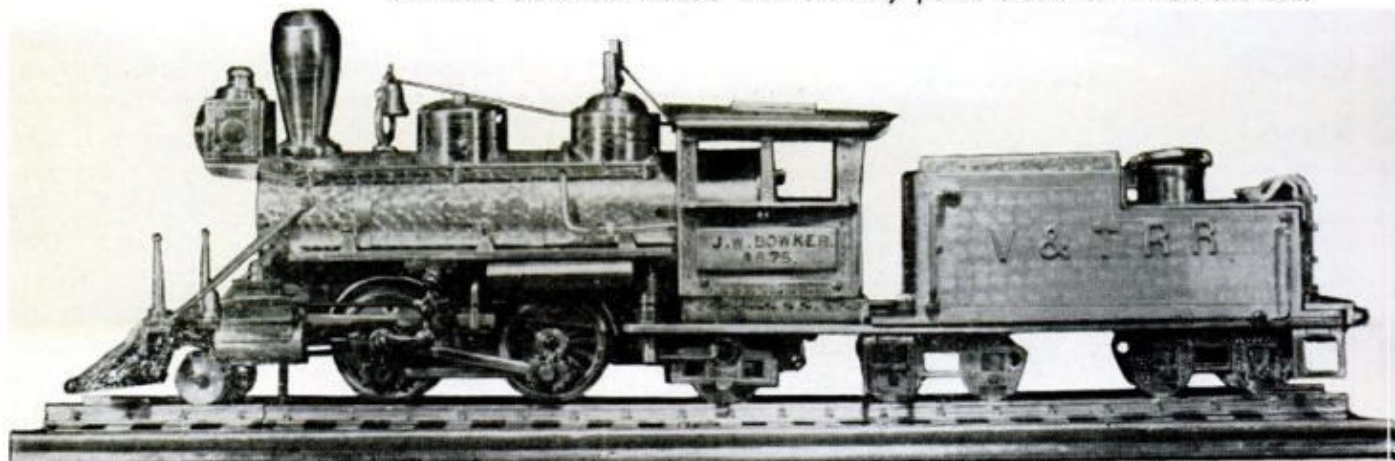
discovered that the surface finish is so soft it can readily be burnished with the eraser of an ordinary pencil. He simply chucks a pencil, point first, into an electric drill and spins it in a pattern across the surface. It produces the etched effect, sparkling like big diamonds, on many of his models.

Loehr points out only one drawback to working with aluminum—fastening. To solve that problem, he creates his model's almost like old-fashioned wooden puzzles. In effect, he starts with two pieces in the center of the model, fastening them with tiny bolts or rivets. The next piece covers these fasteners, and so on, until the completed model has only one visible fastener.

The result is an intricate masterpiece in aluminum. But not to Loehr.

"Anyone can do it," he insists. "Why not give it a try?" ★★★

J. W. BOWKER LOCOMOTIVE is scale model of famous engine, vintage 1875. Powered by motor hidden in tender, it runs on scale model tracks. Loehr burnishes aluminum models with ordinary pencil eraser set in electric drill



Space Spinner

Believed to be the world's largest rotational research device, a simulated space capsule on the end of a 150-foot-long arm will spin astronauts for periods of up to 30 days to prepare them for space missions.

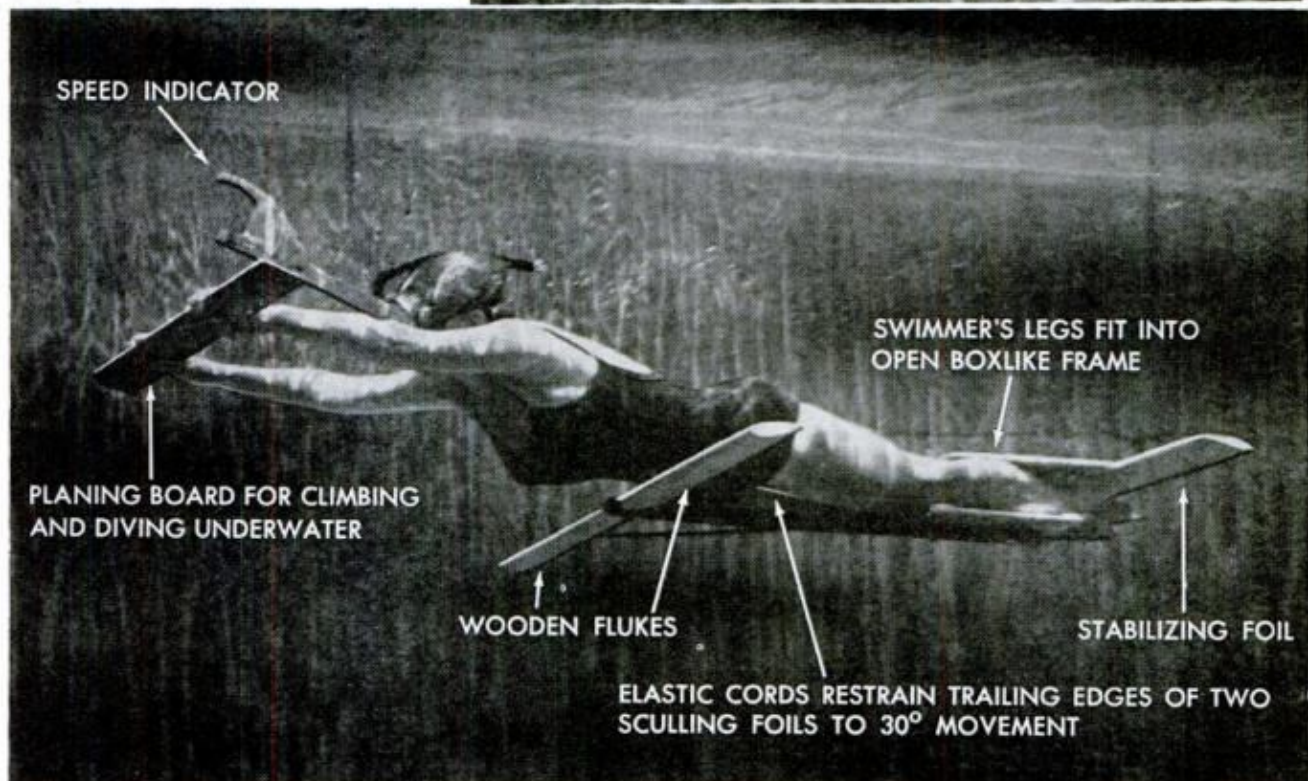
Built by North American Aviation at Downey, Calif., and resembling a carnival ride, the machine will house four astronauts at a time in its four compartments.

The spinner will get the four men accustomed to the sensations of working and living in an earth-orbiting space vehicle.

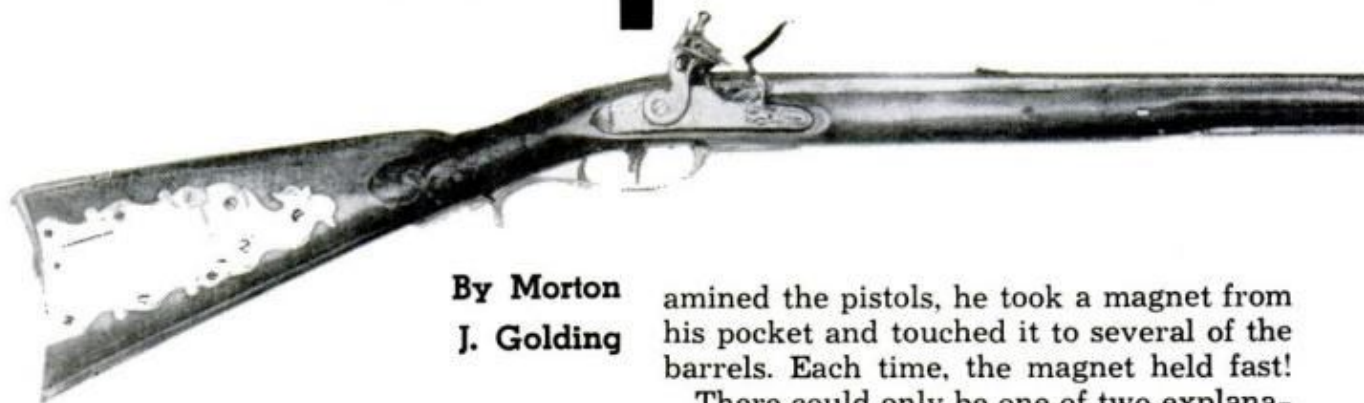


Swim Like a Fish

Porpoiselike thrust up to 4.6 m.p.h. is possible with the Aqueon, a swimming aid operated by simply flexing the knees (right) to scull a pair of foils attached to an aluminum tube, which is braced between the legs. A hand board allows for diving and surfacing. Price: \$39.50; Innerspace Corp., 455 S. Oakland Ave., Pasadena, Cal.



That Antique Gun...



By Morton
J. Golding

Famous old firearms are worth big money, but watch out for magnetic "brass," fake stamping and clever assembly jobs

A FEW YEARS AGO, a wealthy collector of antique firearms decided to specialize in pistols with solid brass barrels. Although these pieces are relatively scarce and hard to come by, a large number suddenly appeared on the market and the collector was able to buy just the ones he wanted.

One day, however, he invited a fellow collector with a suspicious nature to view his prize possessions. When the man ex-

amined the pistols, he took a magnet from his pocket and touched it to several of the barrels. Each time, the magnet held fast!

There could only be one of two explanations. Either the laws of nature had been suddenly and mysteriously suspended to allow brass to become magnetized—or the barrels were made of iron covered by a thin brass plating.

Actually, the guns were nothing more nor less than well-made forgeries. The collector was willing to pay large sums of money for old guns that were not readily available. And the gun fakers were making the most of the situation by having them brass plated locally.

A man who has been fighting the gun fakers for many years is Henry M. Stewart of Wynnewood, Pennsylvania, current president of the American Society of Arms Collectors. According to Mr. Stewart, about \$200,000 a year changes hands in the

BEAUTIFUL IN APPEARANCE, this Kentucky long rifle is a clumsy forgery. The action (right) has been aged and cleverly engraved, but it lacks the snug fitting to the stock, a characteristic of the workmanship in an original



Fortune or Forgery?

buying and selling of forged antique firearms.

Although gun fakery has a long if inglorious history, its current rise parallels the tremendous growth of gun collecting as a hobby. Since 1940, for example, the number of collectors in the United States has increased 25 times or more. And in the same period, the value of the average collector's item has risen more than 350 percent.

The first Colt Walker models once sold for as little as 50 cents. By 1911, the price had gone up to \$500. To buy a Walker in really good condition nowadays, however, you'd have to shell out at least \$5000—and many collectors would not let one go that cheaply!

Samuel Colt originally made 1100 of the heavy, long-barrelled Walkers. There are about 150 in existence today. Of that number, Henry M. Stewart estimates that some

COMMON WEAPONS are the most popular forgeries, but they are also the most easily detected. The Palmetto 1842 can be judged on a cursory examination

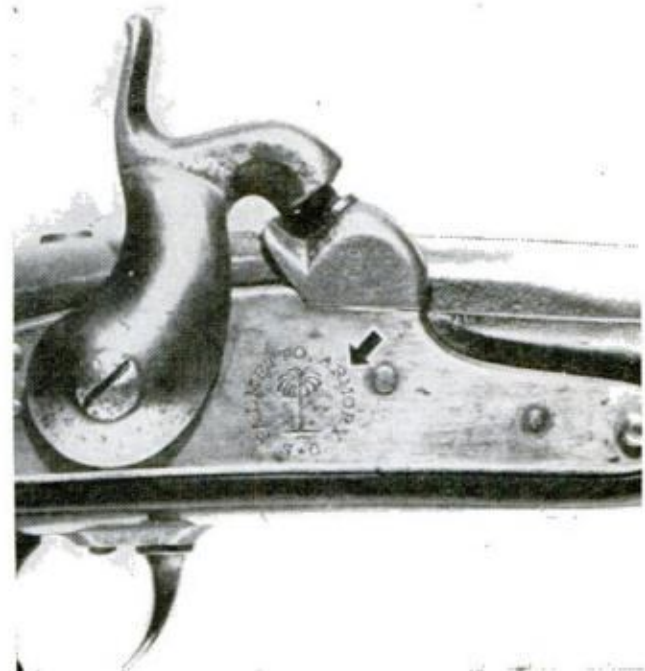
fifty are fakes in whole or in part.

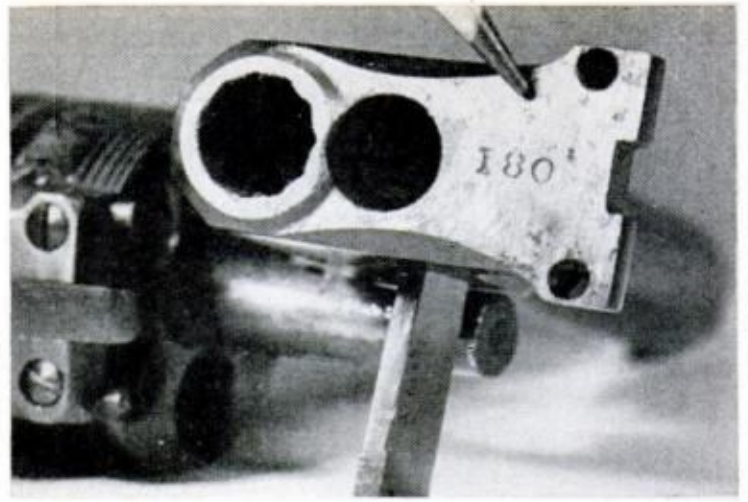
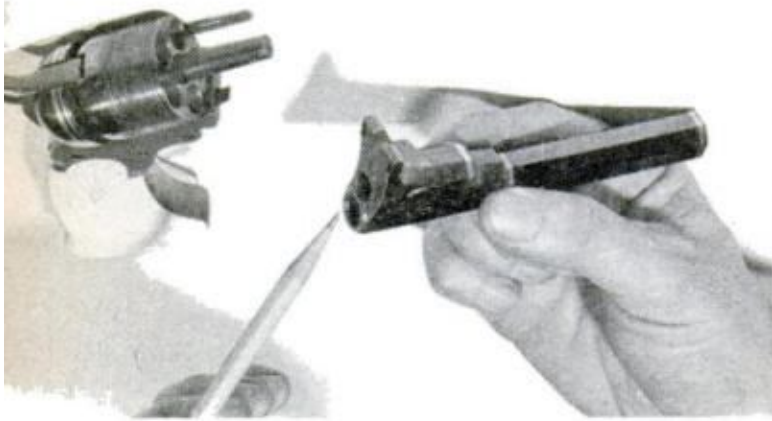
How does a faker go about forging a Walker? He may begin by purchasing a genuine frame which costs \$400 to \$500. He can then pick up some Colt replacement parts which do not have serial numbers, but which can be stamped to agree with the number on the frame. By combining these with other parts which he can make himself, and attaching a lengthened barrel of a less-rare Colt Dragoon model, the forger can realize a quick profit.

Fakery was not always directed solely to antiques. The tiny, one-shot Deringer pistol was forged almost from the beginning in order to cash in on Henry Deringer's reputation. By now, however, many of these early forgeries have found their way into the antique market.

Some of the early Deringer fakes were produced by former workmen of his, and are extremely hard to detect. One com-

CLOSEUP (below) of Palmetto 1842 being examined on left shows engraved palm tree with drooping leaves. On forgeries, tree's leaves do not match





COLT PISTOLS are best checked through their serial numbers. This genuine Paterson Colt has the number stamped on the inside base of the barrel, and its pedigree can always be found in the registry of the Colt Arms Company

pany actually hired a Philadelphia tailor named Deringer so that they would have the legal right to use the name on their gun. Others used two "r's" in the name, and the "Derringer" forgeries have become proverbial among gun collectors.

Another famous group of forgeries were of the early 19th century Forsyth pistols. Though little known outside of gun collecting circles, the Reverend Alexander Forsyth ushered in the modern era of percussion weapons. Before Forsyth, gunpowder was exploded either through friction or by fire. In the modern method, a light blow is given to certain chemical powders known as fulminates. The fulminate explodes and sets off the gunpowder.

The Forsyth system was patented in

England in 1807. The most famous of his detonators is known as a scent bottle because it roughly resembles one. These early pistols have been sought by collectors for many years. And in the 1920s, a British gunsmith decided to forge them.

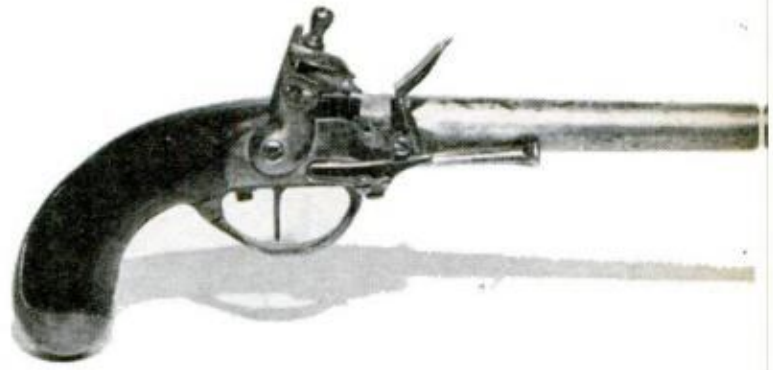
His main difficulty was in making the scent bottles, but as a skilled metal worker he was able to solve the problem. He attached the forged scent bottles to later models both of the Forsyth and other pistols, and then proceeded to sell the fakes for high prices.

The real pistols almost always have the word, "Patent," as well as a scroll engraved on the scent bottle. Since England has strong laws against the false use of this word, it has been left off most of the forgeries. In addition, the Forsyth signa-



HENRY DERINGER'S one-shot concealed weapon was so popular that forgeries began with its inception. The genuine gun has the words "Deringer Philadelphia" engraved on the action





NORTH AND CHENEY pistols were originally copied from the French military model 1777, and confusion between the American (\$3000) and the French (\$50) can be costly. French model (right) has shorter barrel and ramrod

ture on the barrel was engraved in steel on the early models, while the later ones have the signature in gold inlay.

An extremely rare American pistol which has fallen prey to the forgers is the North and Cheney 1799 model. This is the first U.S. martial pistol to be made by private contract, and its design was greatly influenced by the French military model of 1777—a much less valuable gun.

Taking advantage of this, the forgers often doctor one of the French pistols to resemble the North and Cheney.

There are several tests by which collectors determine the real North and Cheney's. For one thing, the U.S. pistols were made without belt hooks. For another, their barrels are slightly longer than the French models. But the only sure test

is a close comparison with a known, authentic North and Cheney. Without such a comparison, no matter how sharp your eye, it is possible to wind up with a French piece worth from \$50 to \$75 instead of a gun valued at from \$2500 to \$3000.

Confederate Forgeries

The Confederate field is one of the most lucrative markets for today's busy forger. One common trick is played with the Enfield rifle which was both imported from England and manufactured in the Confederacy. Since the home-made model is more valuable, forgers remove English markings from the British Enfields and replace them with phony Confederate markings.

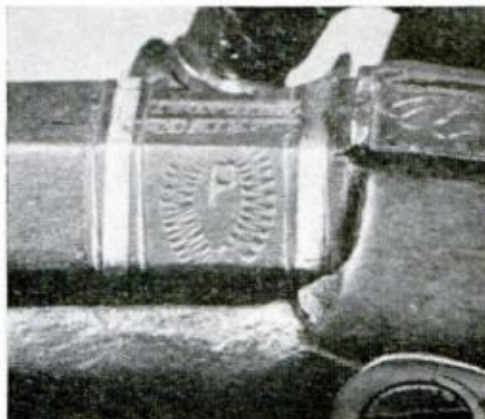
Another class of rifle which many col-

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

LEGAL FORGERIES simply duplicated the original and changed the spelling to "Deringe" (below) or added an "R." One company hired a man named Deringer and legally used his name on copies

IN AN EFFORT to distinguish his authentic weapon from the dozens of copies, Deringer engraved the base of the barrel with a registered trademark, a "P" surrounded by a sun burst pattern

MOST FORGERIES of the Deringer that are in circulation today are also engraved on the barrel (below), but they carefully avoid legal entanglement by omitting the registered "P" trademark

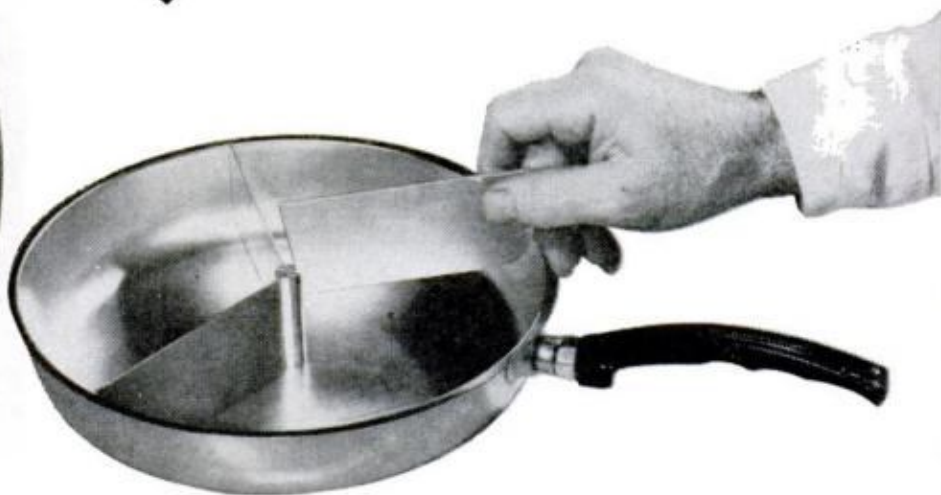


New for Your Home



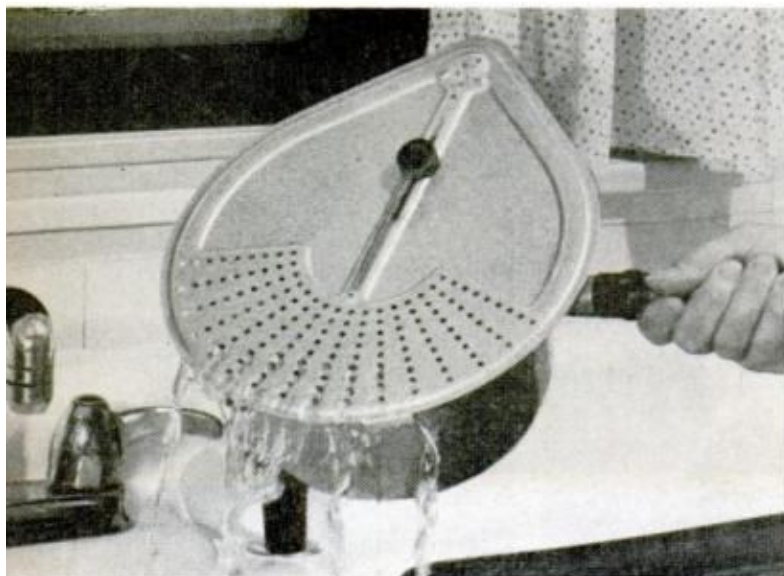
◀ **SHOE HANGER** of plastic, lined with foam rubber, lets you hang up your shoes as you do your coat; shoes dry overnight. Unit comes in yellow, blue, pink and white. Price: \$1 a pair. Available from David Wright Imports, 10912 Ringwood, Santa Fe Springs, Calif.

FRYING PAN DIVIDER adjusts to three spaces of various sizes within a ten-inch pan. Aluminum four-piece unit comes apart for cleaning, storage. Entire dinner may be cooked at one time, on one burner. Price: 79 cents. Flipper, Inc., 78 N. First St., Geneva, Ill.



ADJUSTABLE PAN STRAINER fits all sauce pans up to nine inches across (2, 3 or 4-quart containers) and snap-locks into position by pulling knob along sliding hooks on a stainless steel spring. Boiling water is poured off spaghetti, beans or what-have-you, to the last drop, with no

chance of steam burns or spilled food. This lightweight strainer eliminates a bulky colander. Made of pebble-grained aluminum which won't scratch, each unit costs one dollar. It is available from The Alfco Company, 4950 South Sepulveda Boulevard, Culver City, California





◀ **GARBAGE PAIL BOTTOM** locks in place in seconds, replaces rusted-out bottoms of 20-gal. household trash cans. Polyethylene unit is rust and corrosion-proof, extends the life of new or old cans. Cleaning is easy; odors are stopped. Price: \$1.29 from Preview House, Dept. PM, 9400 S.W. 108th Street, Miami, Florida

PORTABLE PENCIL SHARPENER fastens to any smooth, nonporous surface without screws or bolts; it has a vacuum base. Flick a lever to attach it to table or cabinet side—with no creep or slide while in use. Unit empties right at basket, stores in drawer. Cost: \$3.95. By General Slicing Machine, Walden, N.Y.



SELF-VENTILATED RANGE-OVEN mounts on standard 48-in. cabinet, needs one 220-volt setup. Hood with eye-level controls extends over entire unit, traps warm air which exhaust fan (in hood) draws out. About \$380; Nutone, Madison & Red Bank Rds., Cincinnati, Ohio

SHOWERHEAD features dispenser that can be filled with bath oil, shampoo or rinse. Fingertip control aerates water, puts liquid into the spray. Two four-ounce bottles of refreshener are included with each \$9.95 unit. Made by Vita-Shower, P.O. Box 14645, Long Beach 3, California

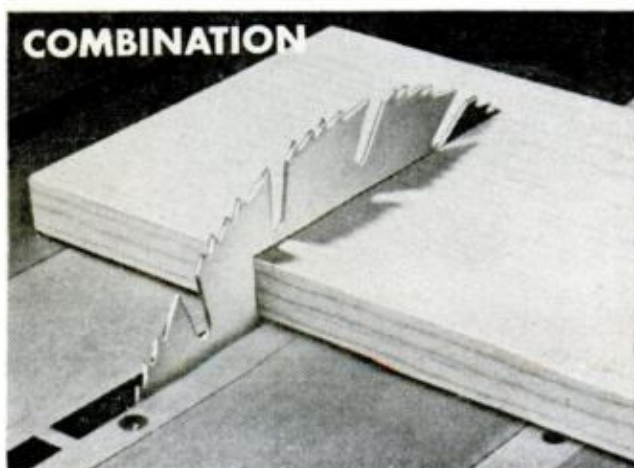




PM Shopping Guide:

HOW TO CHOOSE AND USE **CIRCULAR SAW BLADES**

How good is that combination blade that came with your saw? Sure, it does a variety of jobs—but does it do them as well as special blades would?



By R. J. DeCristoforo

IF YOU HAND-FILED teeth around the perimeter of a steel disc, you could mount it on an arbor and cut wood—but it would no more be a saw blade than a folded sheet of paper is an airplane.

High on the list of things you *can't* make better yourself would be circular saw blades. On the other hand, not every *commercial* product is a *quality* product—and even if you spend a lot, you may not be buying the best blade for the sort of cutting you do most often. It may pay you

CHOOSE THE BEST BLADE FOR EVERY JOB

MATERIAL	TYPE OF CUT	COMB.	RIP	CROSS-CUT	PLANER	PLY-WOOD	CAR-BIDE	METAL-CUTTING	FLOORING	TRIM-MER
Softwood	General	X					★			
	Rip	X	★		X		X			
	Crosscut	X		●	X		X			★
	Miter	X		●	★	X	X			X
Hardwood	General	X					★			
	Rip	X	★		X		X			
	Crosscut	X		●	X		X			★
	Miter	X			★		X			X
Occasional Nail	Flooring, old lumber, etc.							★		
Plywood		X		X	●	★	●			
Hardboard							★			
Fibrous, Porous Panels	Acoustical tile, insulation board				★	●	X	X		
	Non-ferrous							★		
Metal	Do-it-yourself aluminum	X		X				X		
	Corrugated sheet aluminum			X			X	★	●	
Plastic	Cast							★		
	Laminate						★	X		
Fiberglas	Corrugated sheets			X			★		X	

Chart information courtesy Disston Corp.

X = satisfactory blade

● = better blade

★ = best blade for the job

to invest in several different blades.

It's important to know both *what to look for* in a blade, and *what special types are available*. Here are a few shopping tips:

- Check the package to see if the manufacturer thinks enough of this product to guard it against damage on its trip from his factory to your shop.

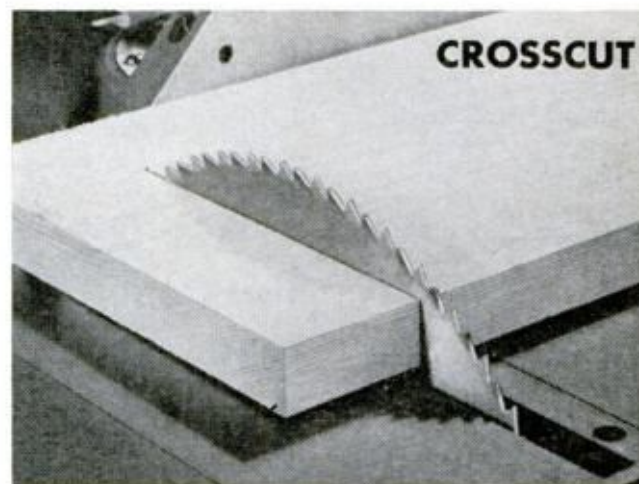
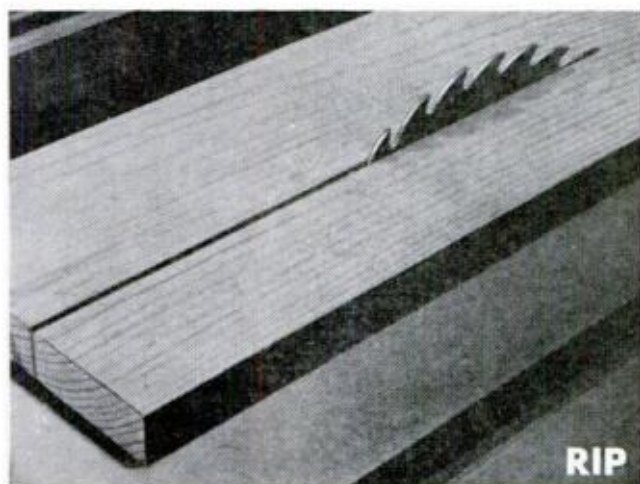
- Read the package to see if the blade is plated. A hard-chromed surface will mean that the blade will stay sharp longer, is protected against rust, won't soil easily, and will run cooler in the cut.

- Check the blade gauge, or ask about it if it's not listed. Some shop men prefer a light-gauge blade because it wastes less

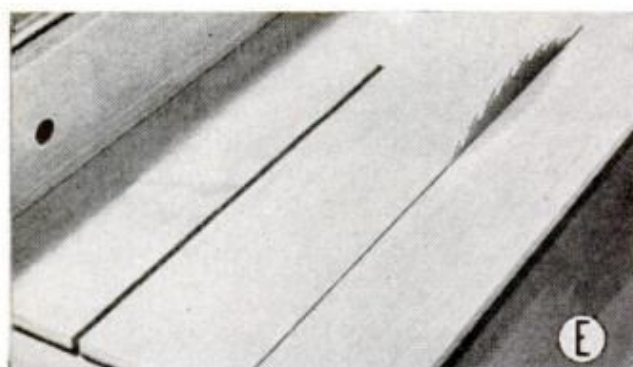
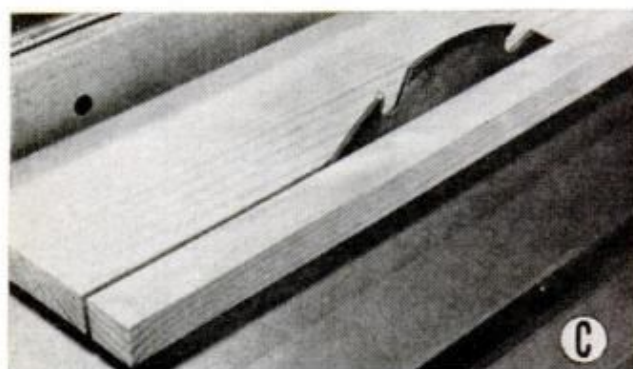
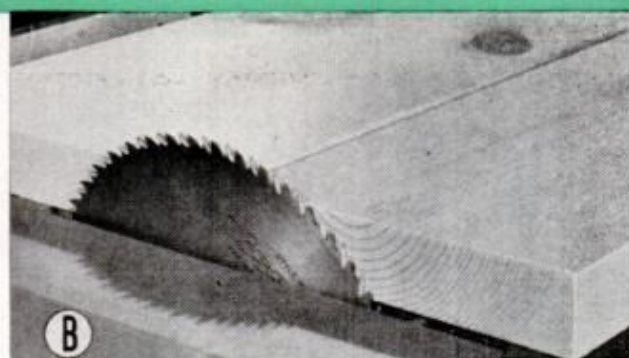
wood and requires somewhat less power; but a heavier blade is more stable in the cut and keeps down chatter and vibration.

- Slip the blade from the sleeve and examine the teeth. Are they clean and free of burrs? (Not the tiny pieces of metal which may have clung to a tooth or two and are easily flicked off, but ragged edges that indicate a poor sharpening job.)

- Check flatness with a straight-edge. The clerk should be happy to do this for you, using the blade of a small square as shown at the left. Or simply place the blade on a flat surface, such as the table of a bench saw or drill press. If the blade rocks, there may be serious warpage.



CAN YOU IDENTIFY THESE SPECIAL BLADES?



- A** Plywood blade is tempered so glue lines won't dull it; only partly hollow-ground
- B** Trimmer blade was designed to cross-cut smooth enough for a rubber lumber stamp
- C** Economy carbide has 8 or 12 teeth; it still costs more than conventional blade
- D** Carbide-tip blade with ten 5-teeth banks is a planer; it might run as high as \$80
- E** Thin-rimmed special has extra fine teeth; compare kerf with regular blade's (left)

While it's on that flat surface, you can sight along it to see if the tooth set is uniform—if you have a good eye. At best, though, this is a rough test, so don't reject the blade on this alone, unless the flaw is unmistakable.

- Examine the finish. Don't expect it to reflect your face like a mirror, but do see if it's smooth and free of pits and dark areas which may indicate that rust will be



a problem in the near future.

- Check the bottom of the gullets and the base of the teeth for cracks.

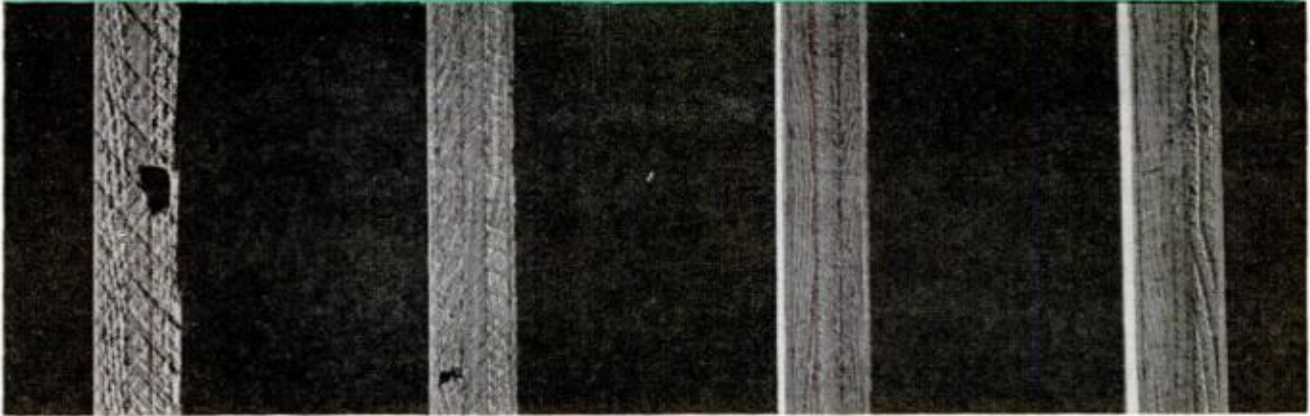
- And don't get sold a very cheap or novelty blade unless you've really looked it over and satisfied yourself it's a windfall.

Okay—you've checked out a good blade that looks just like the one you're replacing; how can you be sure it's the best blade for the type of power sawing you do most? How about those *other* teeth-patterns you've run across during your check of the store's blade stocks?

Chances are, if you're trying to duplicate the blade that came with your saw, the one you've picked is a flat-ground combination. It has points for crosscutting and deep gullets for ripping. Yet you know from hand sawing that these two operations are very different; further, lumber has cutting characteristics that differ greatly from those of hardboard, plywood

HOLLOW-GROUND BLADE shouldn't be abused with this type of rough cutting. Also note blade's projection above work is much less than it should be

DO SPECIAL BLADES MAKE BETTER CUTS?



PLYWOOD CUTS were made with (l-r) combination, crosscut, hollow-ground combination and special plywood blades. Big jump in quality starts with third (planer) blade, while special produces almost burnished edge

or particleboard.

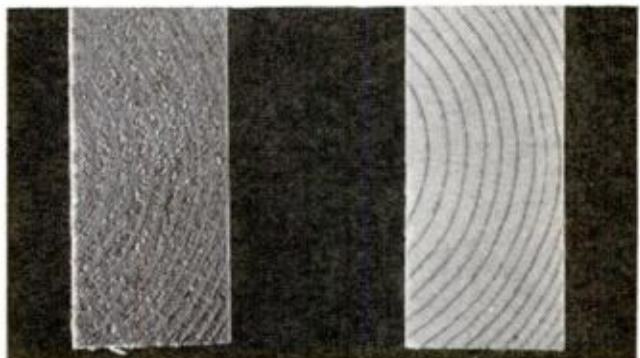
You recognize that the combination blade is a *compromise*, and thus won't make any cut as well as the blade designed specifically for that job, nor will it be tempered to stand up under the heavy abrasion involved in cutting materials like plywood and hardboard. Yet blades are expensive, and changing them is a nuisance. So what extra, "special" blades should you consider for a *minimum* set?

The chart should help you decide. Pick out the sawing jobs you do most often, then work out the best compromise with the smallest number of better-best blades recommended.

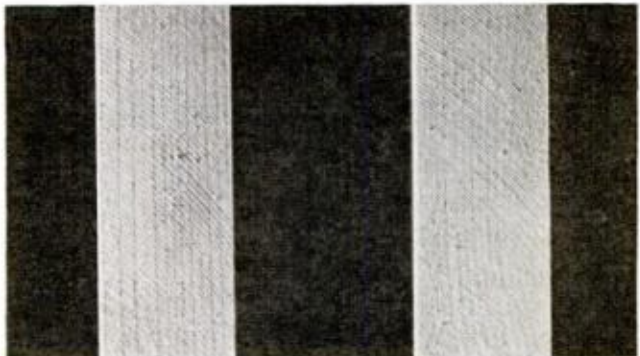
Your first impulse may be to add a rip and a crosscut, but consider: the deep gullets of a rip blade (for fast chip removal) don't adapt to other cuts, and your combination blade most likely does its best work when ripping, as the photos at right demonstrate. (All comparison cuts were made in the same piece of stock, on the same machine, with the same rate of feed.)

If you use plywood a good deal, a plywood blade should be your first "special." It stays sharp, and only the business end

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



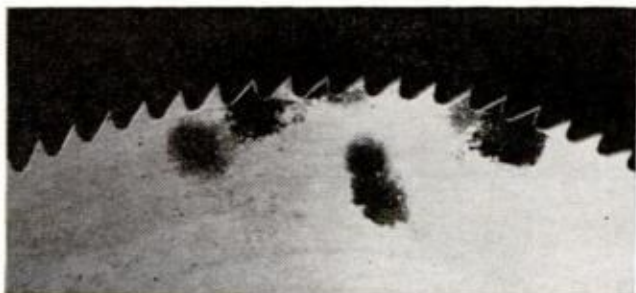
CROSSCUT BLADE made cut at right; other was done with combination blade. Smoother cut results from many small, sharp teeth that snip the wood fibers



RIP CUTS were made with combination (left) and rip blades. Small difference indicates that combination blades do better job of ripping than crosscutting



BLADE SURFACE should be free of imperfections. Dark spots needn't be as obvious as those at left to indicate beginning of rust. Check teeth for uniformity, glean gullets, burr-less cutting edges, as at right



SHOP AND CRAFTS TWO FROM ONE WITH ROOM DIVIDING BUNKS

When sisters must be separated from brothers, or when you simply need additional sleeping quarters, you can cut a room down the middle with built-in bunks that form a partition wall between the new rooms

MOST FAMILIES live in a two-bedroom or three-bedroom house that—when the family is young—seems to offer space to spare. But, all too soon, it's outgrown.

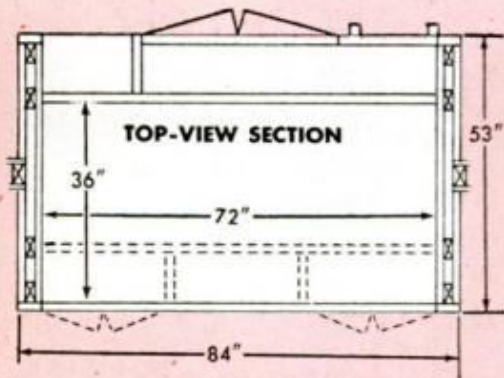
After a few short years brothers have to be separated from sisters, and the older children (who must stay up later to study) from the younger fry who "have to go to bed by day." In addition, sick children must occasionally be separated from healthy ones. And teenagers will probably want to have overnight guests.

To solve these problems, you can, of course, build extra bedrooms. Or you can

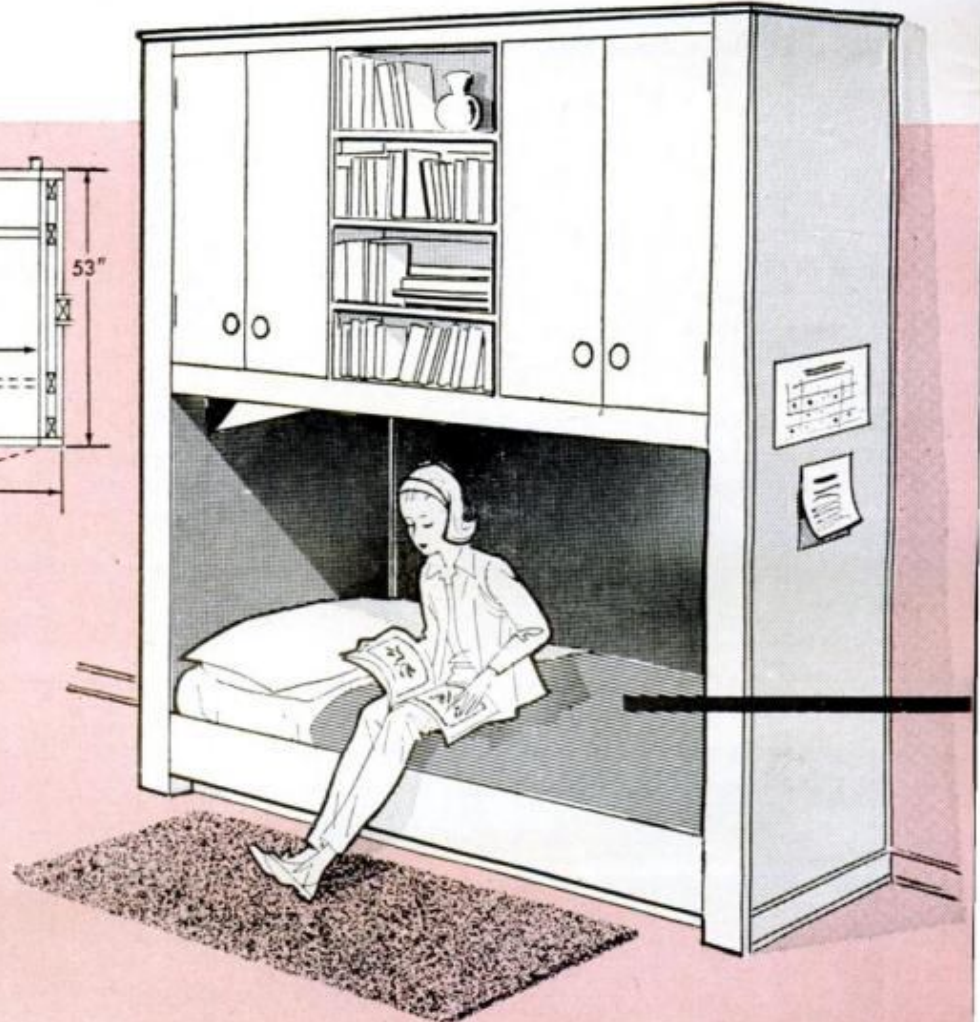
finish the attic—expensive solutions, both.

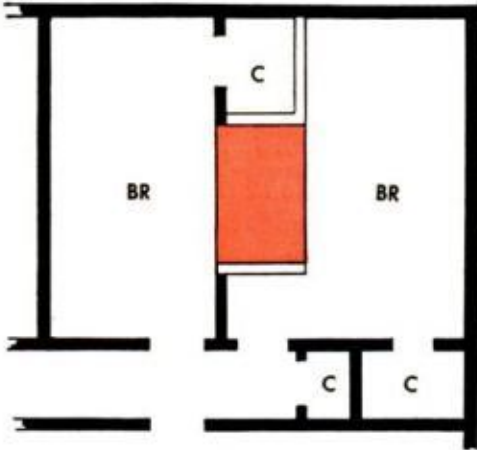
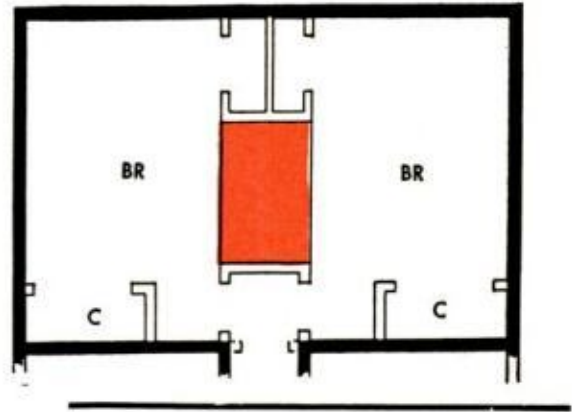
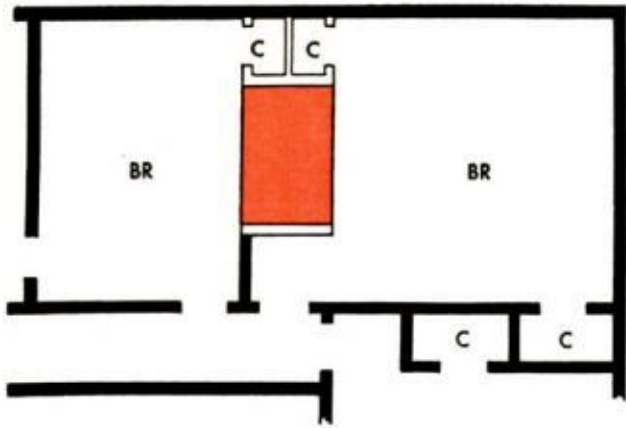
Here is a much simpler and cheaper means of solving sleeping problems—build a double bunk with the upper bunk in one bedroom and the lower bunk in the adjoining room. This is a space-saving method, too: when you stack the beds, you get two for the space of one. The floor plans at the right show just four of many ways in which the bunks can be located. Note how closets can be built at one or both ends to serve either or both rooms.

The section and plan views below show a lower bunk for older sister and an upper bunk for younger brother in separate



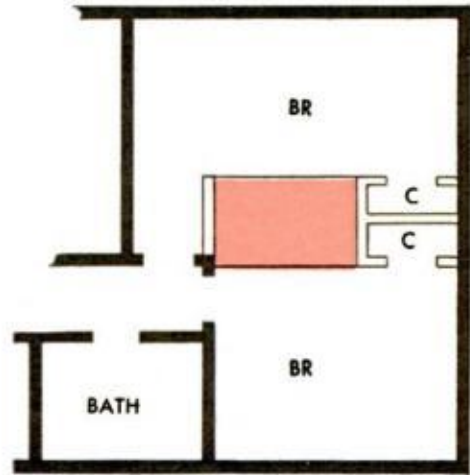
LOWER BUNK, shown at the right should be just right for a girl or the older child. Above the bunk are 12-in. deep cabinets and bookshelves meant both for storage and sound insulation. Beyond the back wall of the bunk, opening into the other room, are similar cabinets for the same purposes. The mattress shown in the section farther right is a standard 4½-in. foam rubber mattress which is less thick than an innerspring, providing more generous headroom



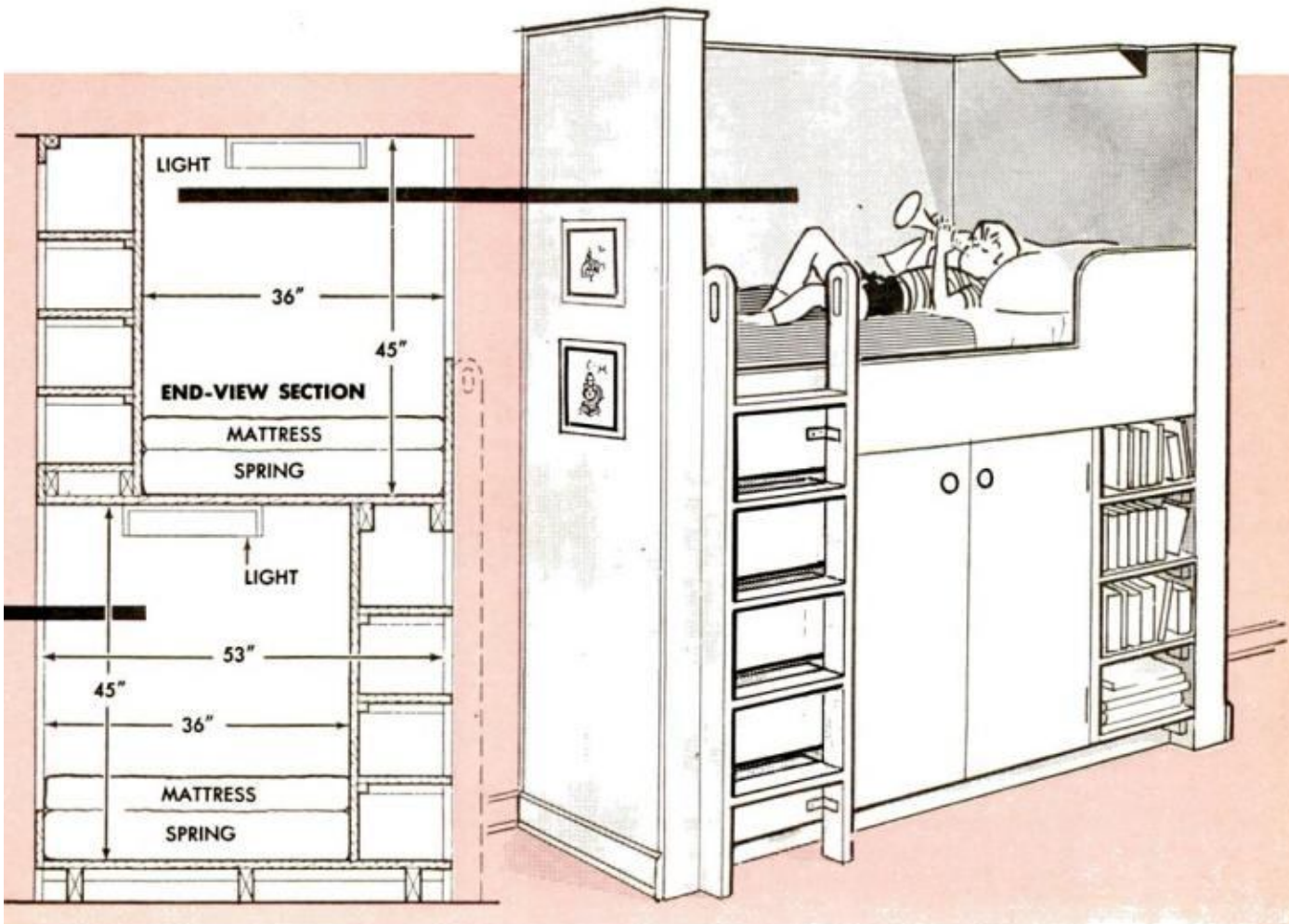


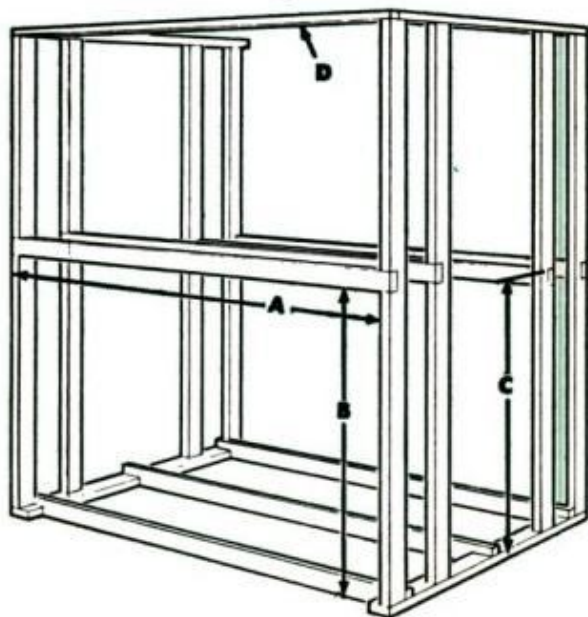
FLOOR PLAN POSSIBILITIES

UNIT ADAPTS to almost any layout you may have. Samples here show three ways to split an existing room into two useful bedrooms: two at left involve cutting new access door. One at top right has inner foyer for doors. Plan at right shows existing partition replaced with bunks to free cramped floorspace

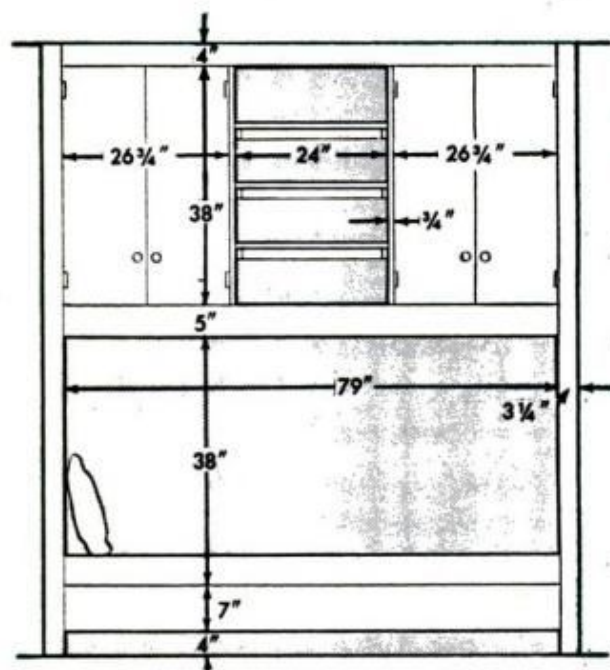


CLIMB TO TOP BUNK is adventure for younger child. Note optional toe recess behind each rung. High side-board beside pillow—and projecting ladder at foot—guard against tumbles if child should roll in his sleep

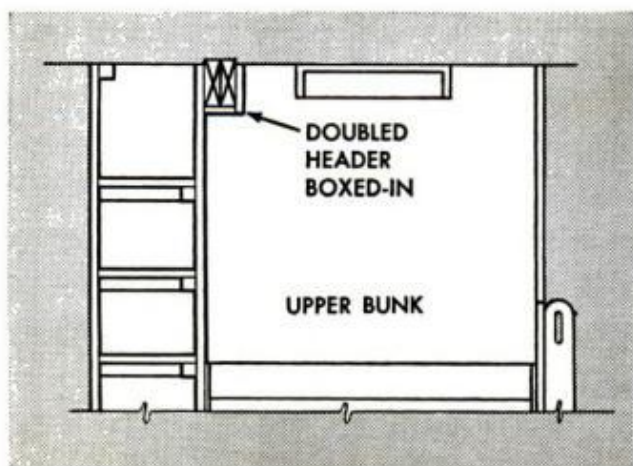




BASIC FRAMING



LEFT-HAND ELEVATION



SECTION THROUGH a bunk unit that straddles a load-bearing wall shows how new header (installed as shown next page) is located for best headroom

rooms. Shelves for books and storage are built beside each bunk to sound-insulate one bedroom from the other as well as to provide extra storage space. The mattress and spring of the upper bunk sound-insulates this bunk from the one below.

The dimensions are given only as suggestions. The controlling dimensions are the size of the spring and the height of the room. Allow at least $\frac{1}{2}$ in. all around a spring and mattress for tucking covers in place. In this case we have assumed a ceiling height of 8 ft.-0 in. If your ceiling height is less than that, the difference divided by two will have to be subtracted from 3 ft. 9 in.—our vertical dimension.

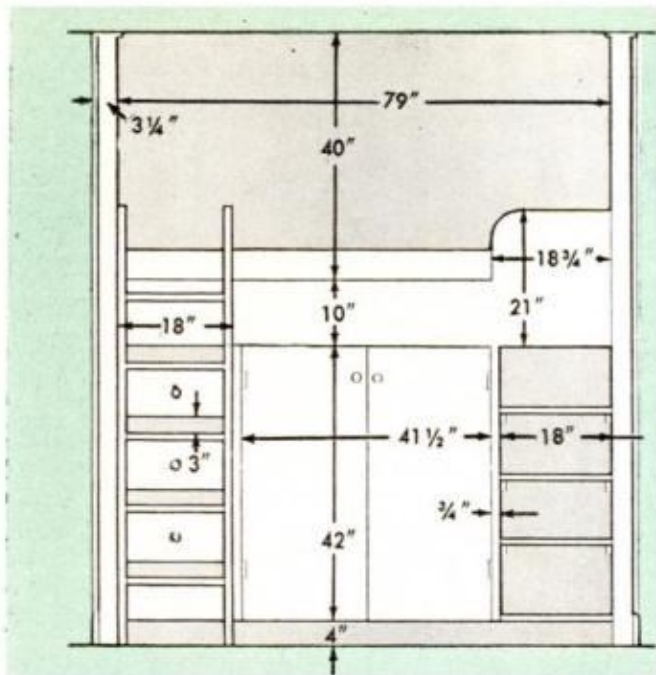
The first of the floor plans on the previous page shows how a large bedroom

can be split into two smaller rooms. The larger of these two could be, perhaps, for two sisters—one to use the lower bunk and the other sister to use a regular bed in the opposite corner. Their brother then uses the upper bunk in the smaller room.

Where the room to be split is smaller (as in the second and third floor plans) it should be divided evenly. But this may cut one of the new rooms off from existing closet space. If so, such space can be created in several ways, as shown. The partition unit itself can provide a full walk-in closet for the deprived room, or a two-foot-deep closet for each room.

Another use for the partition bunks is to free cramped floor space, as shown in the fourth sample plan. Perhaps two tiny adjacent bedrooms were perfectly adequate for your youngsters during their first years in school. But when they reach Junior High, they'll need study desks—and you can't squeeze them in because the beds take up too much room. If you knock out enough of the existing partition to accommodate this "two-faced" bunk unit, however, you can sell or store the free-standing beds and have plenty of space for the desks.

Then again, you may only need the built-in bunks as extra guest beds. Say, for example, two adjacent rooms have ample floor space for one free-standing bed and other required furniture—but none to spare for an extra guest bed that will be used only occasionally. Inserting the bunk unit into the partition between



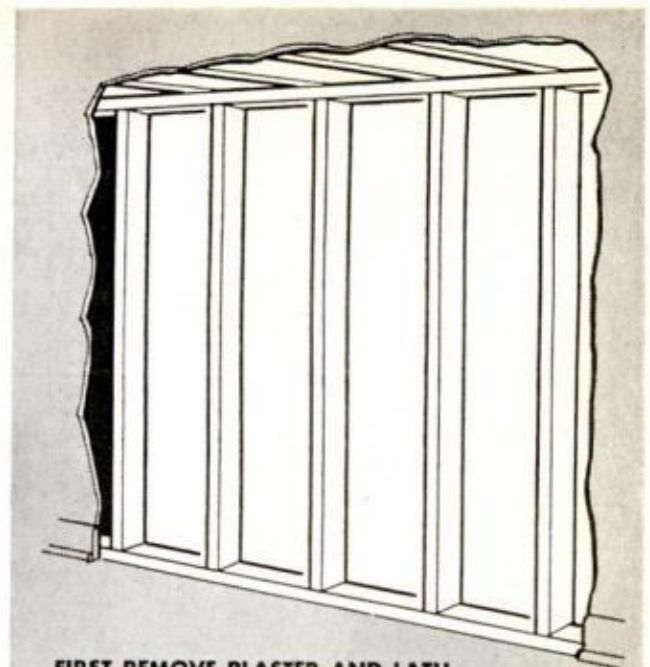
RIGHT-HAND ELEVATION

such rooms gives *each* room an extra bed.

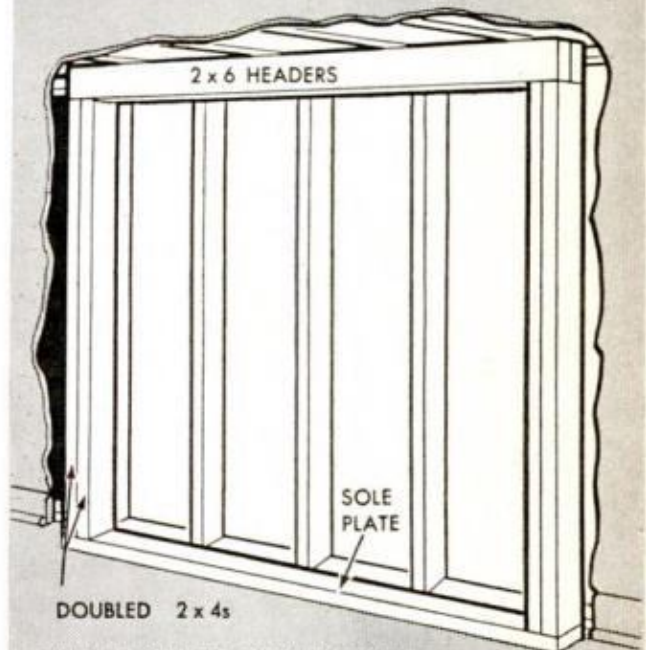
But the partition you build the bunks into needn't always be between two bedrooms. Perhaps you have a small room next to a family room or den. Insert a bunk unit into the separating wall and you've got a private bedroom on one side and a guest bed on the other. The lower bunk would, in this case, face into the family room, and would serve as a built-in sofa when not made up as a bed.

In the drawings of the two different treatments of the upper bunk (pages 149 and 152) note the toe-space beyond each tread of the ladder, to make climbing easier and safer. While not an essential feature of the construction, these little pockets will also make it more comfortable for the child's mother when she has to stand on the ladder to make his bed. The space above these recessed steps can be shelves, or drawers as seen in the elevation above. The ladder itself is made of 1x4s, and should be fastened to the bed above and the cabinet below with 1-in. steel angles.

In studying the framework drawing at upper left, remember that dimension A—the space between the end frames—is the mattress length plus 1 in., plus the thickness at both ends of the 1/2-in. plywood inner facing—a total of two inches. Dimension B, based on an 8 ft.-0 in. ceiling, should be 4 ft.-1 3/4 in. Dimension C, which is the distance from the floor to the top of the far horizontal pair of 2x4s, would be 3/4 in. less than B, or 4 ft.-1 in. You can



FIRST REMOVE PLASTER AND LATH

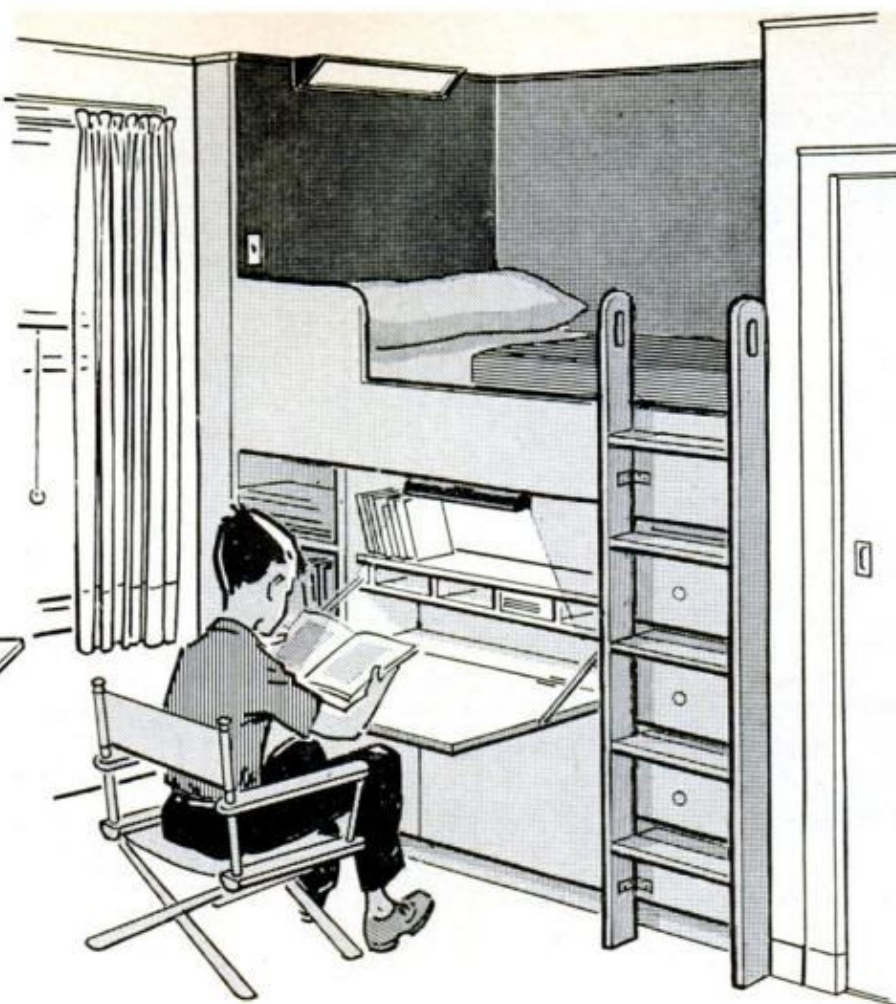
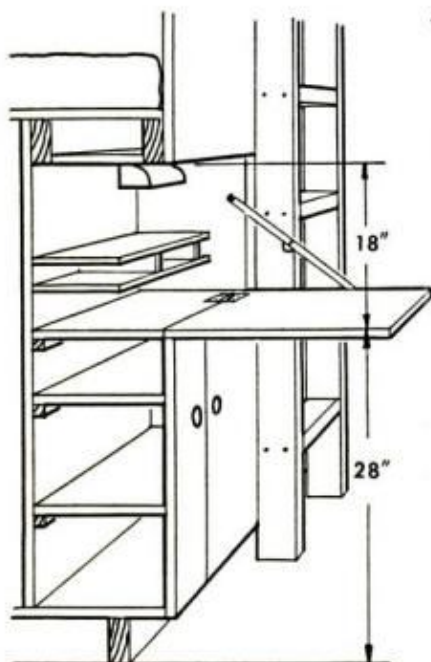


THEN ERECT SUPPORTING WALL



FINALLY REMOVE OLD PARTITION

IF THE CHILD to occupy the upper bunk is of school age, a drop-leaf desk can be built into the space below the bunk. To the left are bookcases for school books. The section below gives suggested dimensions. For teen-agers, increase desk height to 30 in. greater kneeroom



see from the section (page 149) that this framework is designed to slip pieces of $\frac{3}{4}$ in. plywood under the higher horizontal 2x4s, and over the lower ones.

Piece D is a horizontal 2x2 member fastened to the ceiling as a nailing strip for the fascia over the cabinets. It should be about $3\frac{1}{2}$ in. longer than dimension A.

Exact plywood cutting diagrams cannot be given because the bunks will vary in size with each particular installation. With judicious planning, you should get by with eight 4x8 panels. Use $\frac{3}{4}$ -in. plywood except for the inner and outer facing of the end walls. This could be $\frac{1}{2}$ -in. ply, $\frac{1}{4}$ -in. hardboard, or even plasterboard, if these panels are to be wallpapered to match the room. For economy, it is suggested that A-B or even A-C plywood be used instead of A-A grade since, with the exception of the cabinet doors, only one side of the plywood is exposed.

In removing a partition, if such is necessary, be sure that it isn't a bearing partition. Climb up in the attic to see if the joists run parallel or at right angles to the wall you are about to remove. Almost always when the joists are at right angles to the partition in question, it is a load-bearing wall. In that case, remove the plaster and lath from both sides of the section of the partition to be removed, as

shown in the sketches on the previous page. Then, right beside it, build a new partition with a 2x4 sole, double studs at both ends, and double 2x6s for the header beam. It's easier to toenail the doubled studs to this beam working flat on the floor; then raise this assembly onto the spiked-down sole plate and nail it to both the sole and the ceiling joists. This new partition must fit tight against the joists and as close to the old partition as possible. Once it's securely in place, remove the old partition. If you're working on the second floor, above a first-floor bearing partition, this new, relatively short section will be no more than 4 in. to one side of the partition below. The factor of safety being adequate, this new wall will not materially weaken the structure of the house. But before tackling this job, be sure that you are complying with all local building regulations. A sketch of what you propose to do may be required, and a building permit might have to be issued.

The new lintel with casing would extend down below the ceiling about $6\frac{1}{2}$ in., so it would be better to build these bunks in such a way that the lintel would not interfere with the child's headroom. Thus the new lintel should come in the corner formed by the bunk's rear wall and the ceiling (sketch, page 150). ★★

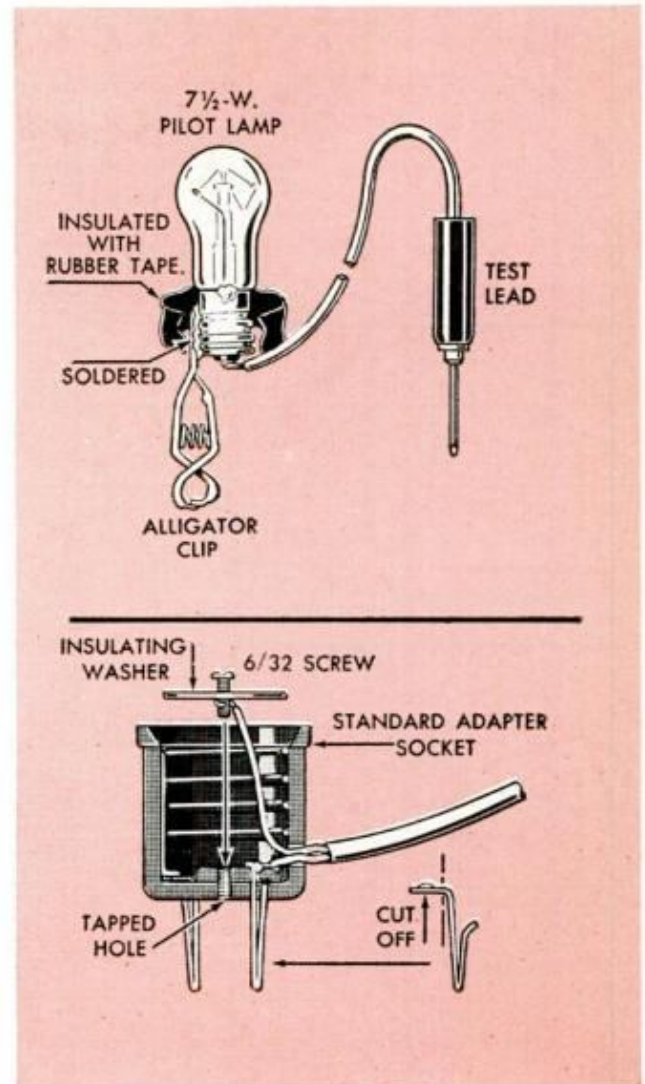
Bright Ideas for the Amateur Electrician

This circuit tester lets you spot blown fuses in your fuse box. It's made by soldering a small alligator clip to the side of a 7½-w. Christmas tree or pilot lamp. A single test lead is then soldered to the bottom of the bulb and the base of the bulb is wrapped with tape, for insulation.

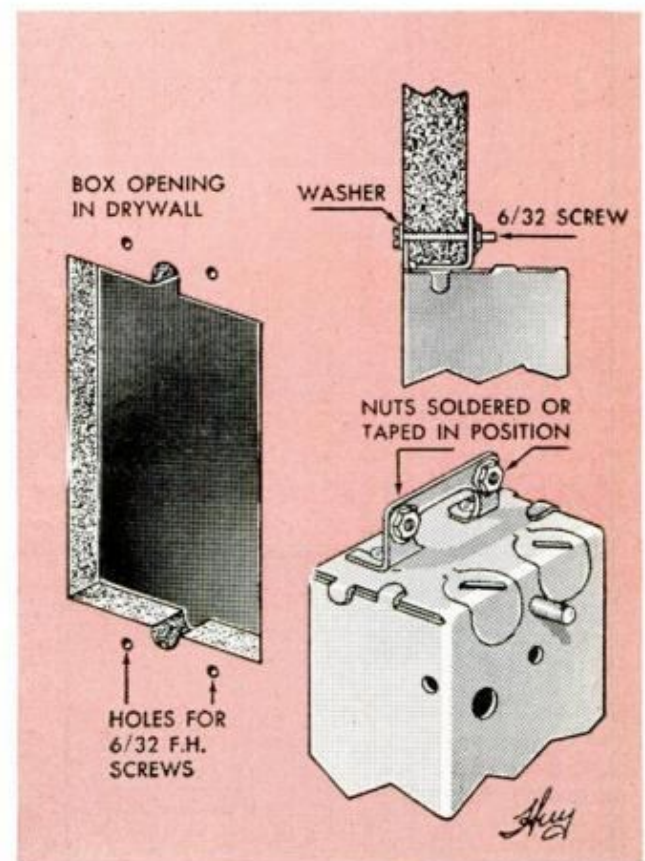
To use it, you clip the tester to the edge of the metal fuse box and you touch the fuse terminals with the test lead. When the lamp doesn't glow, you've located the blown fuse.

Continuity tester can be made from a standard adapter socket, as at right. Two holes are made in the socket, one in the side for the test leads, and a tapped one in the bottom for a 6/32 screw. The prong which normally makes contact with the bulb, is forced out of the socket, cut off at the point indicated and replaced. Then one test lead is soldered to the cut-off prong and the other lead to the 6/32 screw, which is fitted with a fiber washer.

To use the tester, you screw a bulb in the socket and plug the socket into a wall outlet. If the bulb doesn't glow with both probes applied to the appliance plug, there is a break in the circuit. If the test light glows with one probe applied to a prong of the plug and the other probe touched to the appliance, there's a short.



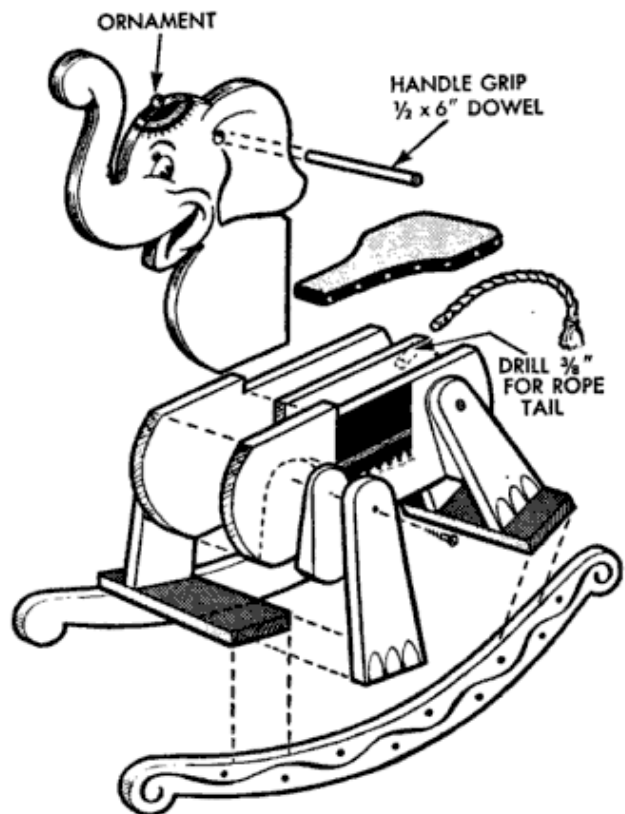
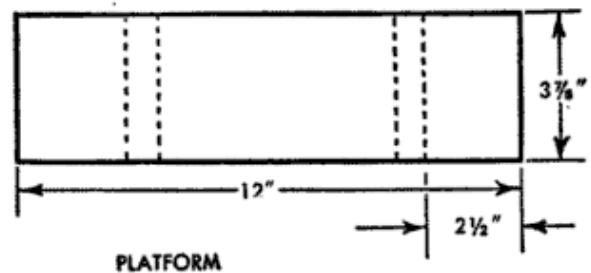
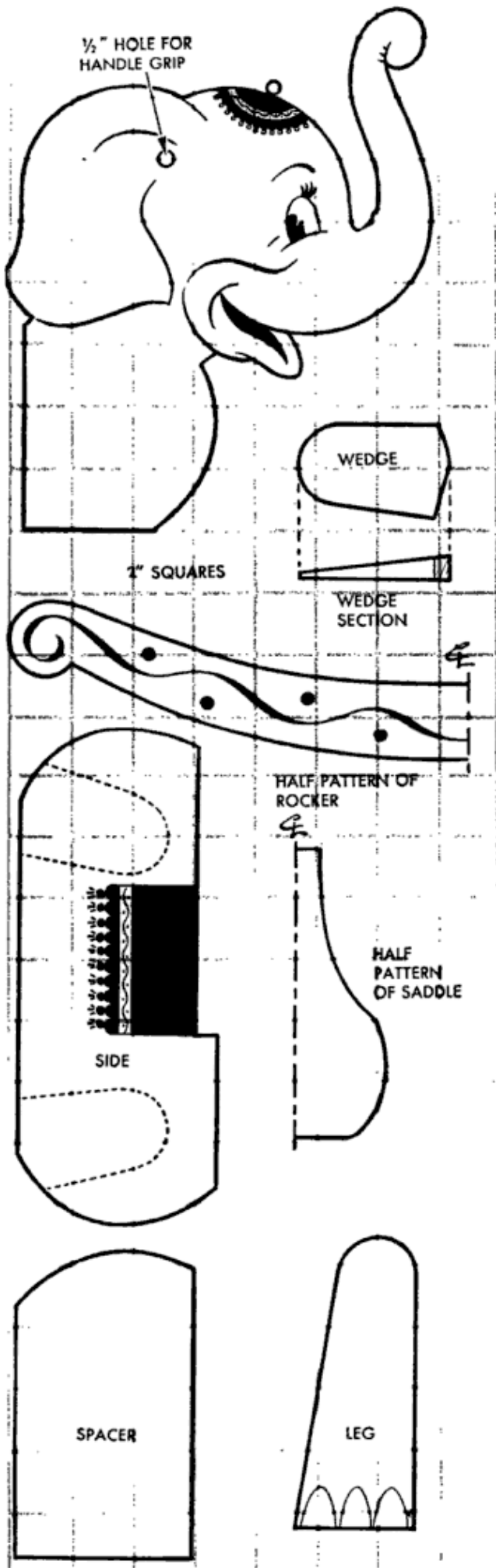
Mounting gem boxes securely in walls which have wood lath is easy enough since you can drive the anchoring screws right into the wood. But it's a different story in plasterboard walls. Here sheet-metal brackets called Holdits, must be used to anchor the boxes. But these are not always handy and they are an extra expense. However, there's another way to do it which actually anchors the box more securely. First place the box (open side against the wall) and trace around it, including the half-round ears at top and bottom. Next, cut the opening, insert the box, and mark the holes in the L-brackets. Remove the box and drill the holes through the plasterboard. Now either solder or tape the nuts of four 6/32 flat-head screws to the back of the L-brackets, centering them over the holes. With this done, attach your BX to the box, slip it and the box back into the hole, being careful not to let it drop, and pull the box forward until the L-brackets bear against the rear side of the plasterboard. Now, turn the screws until they catch hold and draw them up tight.—Joseph Braunstein



ELEPHANT ROCKER

SNEAK this cute elephant rocker under the tree Christmas morning and, like an elephant, your big-game hunter will never forget. Except for the head, the whole toy can be cut from a 1 x 12 pine board, 10 ft. long. The head is cut from an 18-in. square of $\frac{3}{4}$ -in. plywood. Duplicate parts will be an exact match (and you'll save time in the bargain) if you are able to saw two at once by tacking the blanks together.

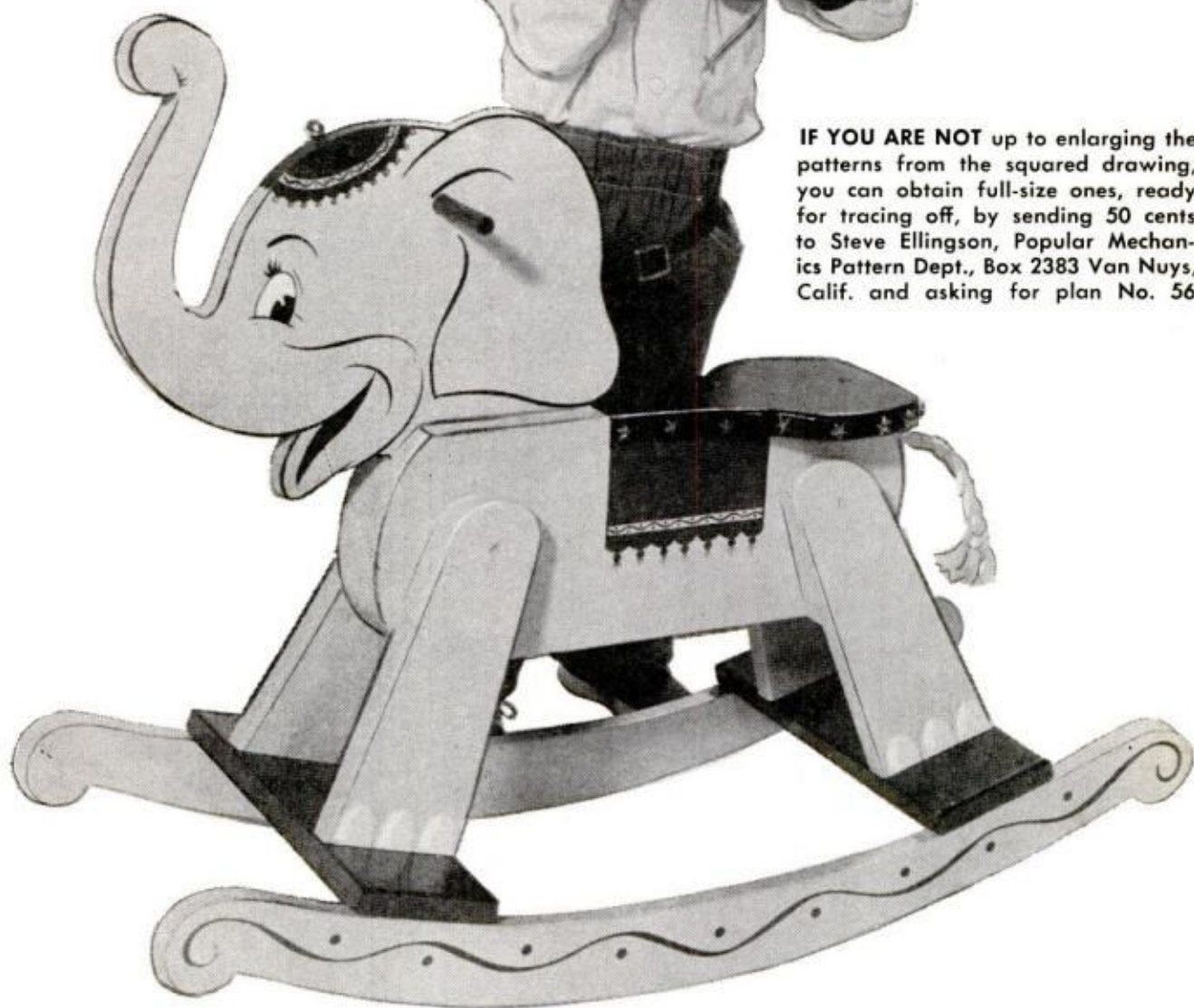
All the parts are assembled with glue and flathead wood screws. Put the rocker assembly together first so you'll be able to plant the elephant's feet squarely on the platforms when joining the legs to the body. Spray everything gray first, then come back and add the white toenails, the black outlines, the red platforms, saddle, blanket and beanie.



MATERIALS NEEDED

- 1 pc.—1 x 12 x 10' clear pine
- 1 pc.— $\frac{3}{4}$ " x 18" x 18" plywood (head)
- 1 pc.— $\frac{1}{2}$ " x 6" dowel (handle)
- 4—#10- $\frac{1}{4}$ " flathead wood screws
- 18—#10- $\frac{1}{2}$ " flathead wood screws
- 1 pc.—10" length of $\frac{1}{2}$ " rope (tail)

By Steve Ellingson



IF YOU ARE NOT up to enlarging the patterns from the squared drawing, you can obtain full-size ones, ready for tracing off, by sending 50 cents to Steve Ellingson, Popular Mechanics Pattern Dept., Box 2383 Van Nuys, Calif. and asking for plan No. 56

Enlarging Patterns by the Grid System

IF THIS IS YOUR FIRST try at enlarging magazine patterns that are presented on squares, here is how it's done: First rule off on paper the same number of squares as there are in the small pattern, drawing these the size specified. Now number the squares across the top and down one side of both the small and large grid pattern to help locate quickly corresponding squares.

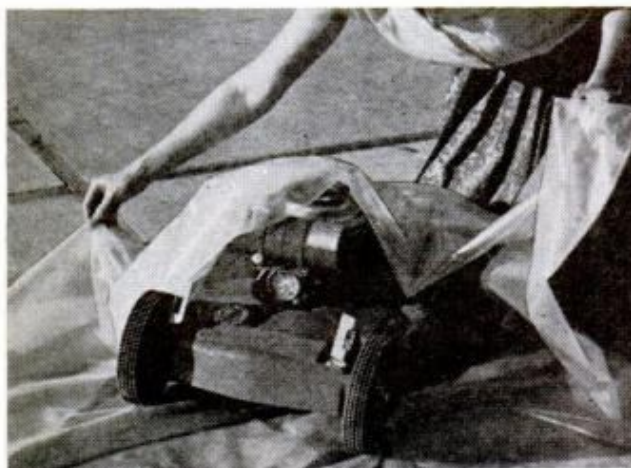
Start by drawing in on your large grid the portion of the pattern that appears in

a corresponding square of the small grid, noting the points where the pattern crosses grid lines as it progresses through adjacent squares. Dots made at these points are then connected with a solid line. Proceed from square to square and where a part of the pattern might be a sweeping curve, and your transferred outline takes on a ragged curve, you simply erase and correct it as you go. In most cases, the exact pattern of a cutout is not so critical that it cannot differ a trifle from the original.



LEFTOVER PIECE of wire fence can be turned into an efficient and durable leaf burner by wiring the ends together to form an open-bottom container, then bending bottom end of each wire inward, as shown

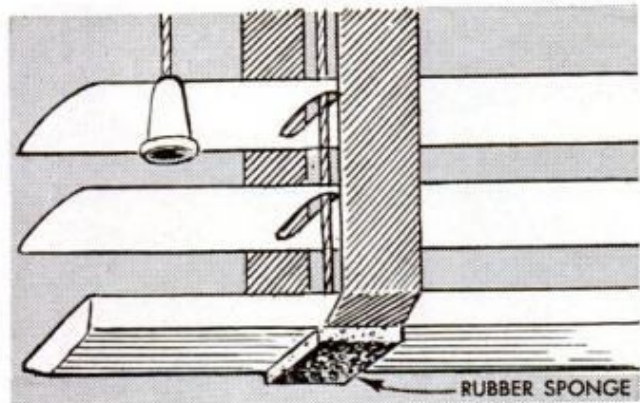
YOUR POWER MOWER will be clean and uncorroded next spring if you store it in a sealed polyethylene "bag." After cleaning it, remove the handle and spray with rustproofing oil. Seal edges with masking tape



Solving

HOME PROBLEMS

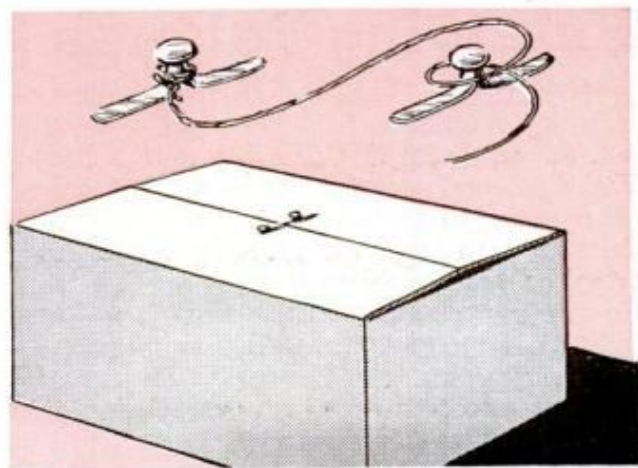
ATTACH SPONGE-RUBBER pads near each end of the base of venetian blinds and you'll silence that annoying clatter when they're lowered and hit the window sill with a bang. Also protects the sill from marring



YOU CAN STOP the cutlery tray from sliding back and forth in the kitchen drawer each time it's opened by just driving a couple of L-hooks into the drawer front and turning them down over the edge of tray



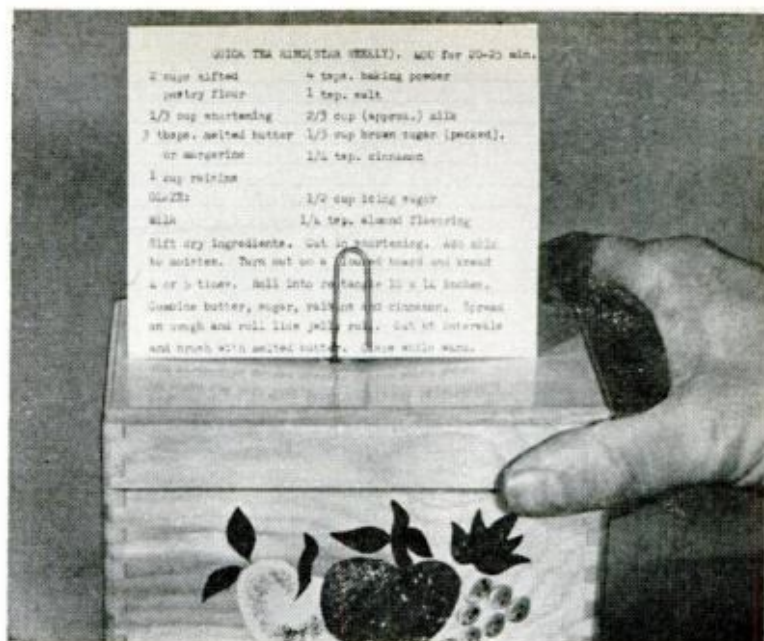
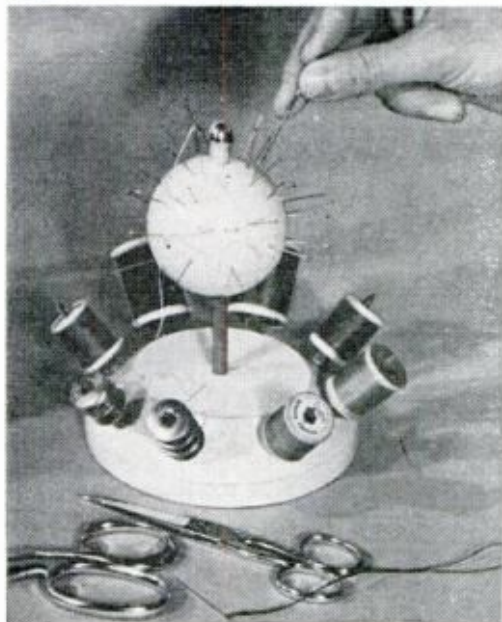
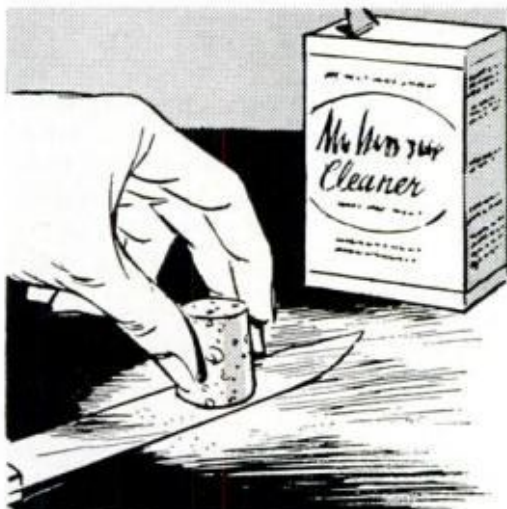
TWO PAPER FASTENERS will make a simple catch to hold cardboard storage cartons closed against dust, yet permit easy opening. To make it, insert fasteners through both flaps and tie them with cord as shown





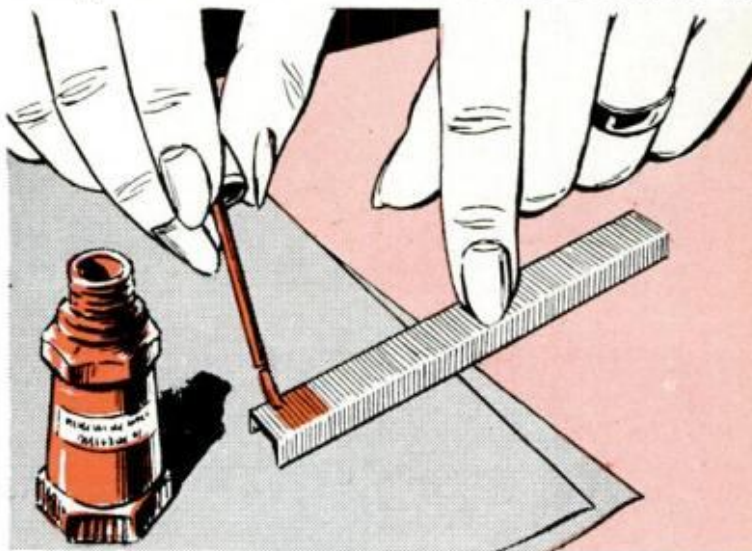
TO KEEP IT CLEAN and dry, many people remove cotton from the box in which it is sold and store it in a bottle. You can make a simple tool for removing cotton from a bottle by gluing a broken jigsaw blade in a slit cut in the cork stopper.

BEST METHOD of scouring a knife blade involves using a dampened cork instead of the customary damp cloth. It's not only safer, but also lets you apply a firm pressure over a fairly large area, thus assuring a quicker and better cleaning job.

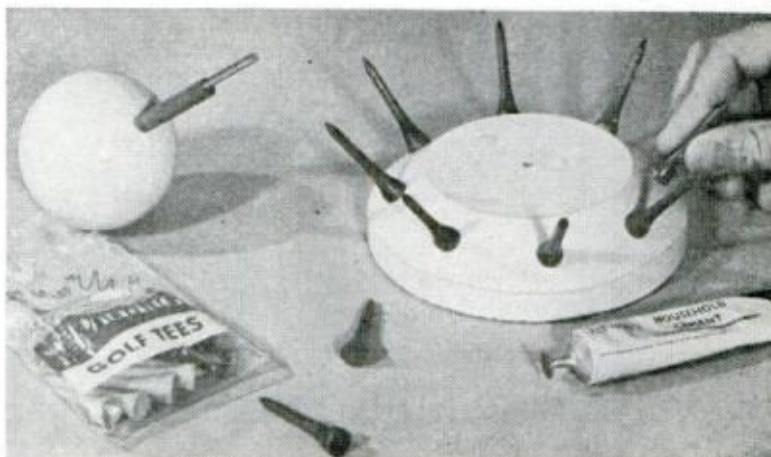


WANT TO SCORE points with your wife? Add a handy recipe card holder to the top of her recipe file box. Just bend a large paper clip slightly more than 90 deg. and mount it on top of the box with a thumbtack, cellophane tape or glue, as shown.

NEXT TIME YOU BUY a box of staples, take time out to dab the last few staples in each row with red nail polish. You can do the whole box in a couple of minutes, and these red staples make perfect reminders that it's about time to refill the gun.



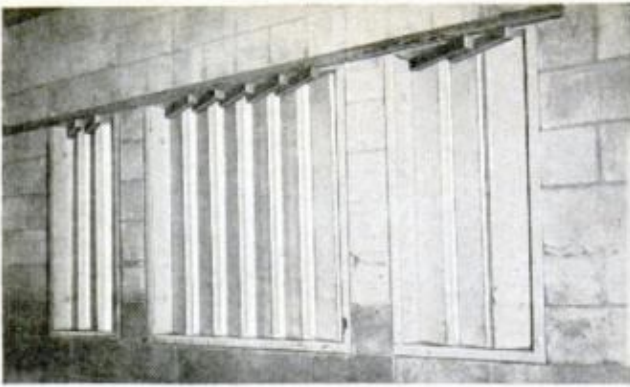
SPORTY SEWING CADDY is made by gluing golf-tee spool holders to a bevelled base, then pushing a threaded rod through a rubber ball pin cushion and slipping plastic tubing over rod. Recess a nut in base and screw a drawer pull on top.



FARM TIMESAVERS

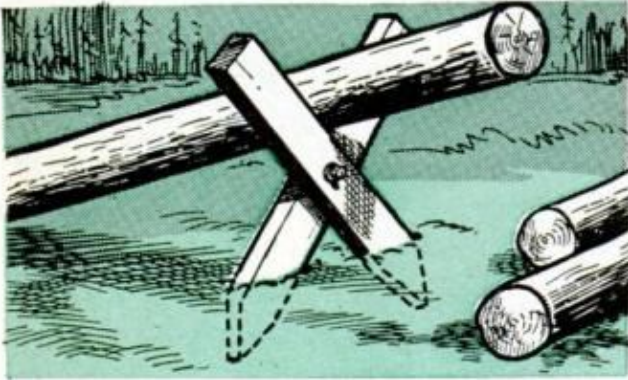
Barn Window Blinds

Plank blinds on the windows of a dairy barn may be closed in bad weather or opened for ventilation. Each blind is pivoted on spikes driven through the window frame. Short lengths of 2x2 stock nailed to the blinds are pivot-joined to an overhead strip so all blinds work at once.



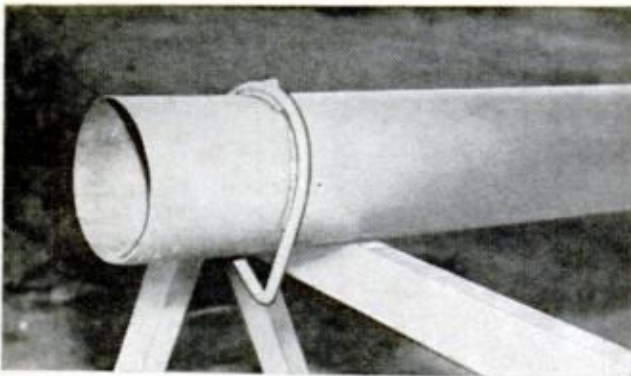
A Horse That Folds

Though it's not intended for heavy sawing, the easy portability of this folding, scissor-type sawhorse makes it an invaluable helper around the farm woodlot. It can be made from two lengths of 2x4, pointed at one end and bolted together as indicated. When opened and driven into the ground, the sawhorse will support small logs and branches at a convenient height for sawing into cordwood lengths.



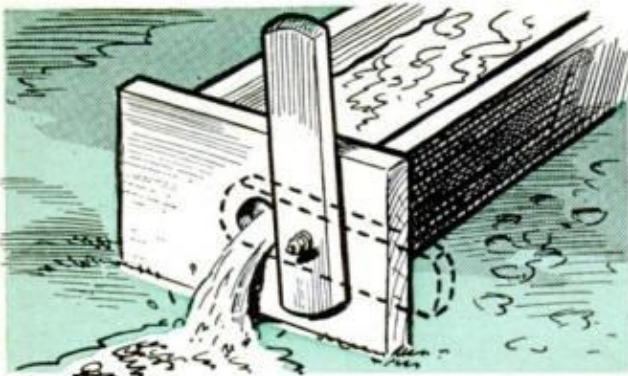
Loop Helps Lift Pipe

When you're hoisting grain or silo pipes, it's a dangerous practice to simply tie a rope directly around the pipe. It's likely that the rope will slip and perhaps be the cause of an accident. A safer technique is to weld an oval ring of iron rod near the end of each pipe. A rope doubled back through the loop formed by the rod holds securely and may be withdrawn by simply releasing the rope at the hoisting end.



No Tipping

Tipping up a heavy feed trough to empty accumulated rain water or slush is strenuous work, but fortunately there's an easier way to do the job. A large hole is drilled in one end of the trough and a strip of wood slightly wider than the diameter of the hole is bolted on so that it may be pivoted to open or close the drain hole. Feed will not seep past the strip if the bolt is tightened firmly.



Wagon Snubbing Bar

Snubbing bars bolted along the underside of this flat bed wagon permit easy attachment of hay or straw slings. When the wagon is loaded with machinery, heavy rope or cable is used to secure the load. The snubbing bar is a strip of flat or steel angle iron bolted to four pipe nipples. Each nipple is threaded as tightly as possible into a floor flange which is attached with screws to the underside of the wagon bed.

—A. M. Wettach



GILDING

WITH GOLD LEAF



ANY OBJECT can be gilded. The example shown here is a carved wooden statue. Unlike gilt paint, gold leaf won't dull, stays yellow-bright indefinitely



FAST BECOMING A LOST ART since the introduction of simulated-gold plastic coatings, gilding with gold leaf can still be a lot of fun for the hobbyist and, other than the care which must be used in handling the fragile gold leaf, there's nothing really difficult about it—it's all in knowing how.

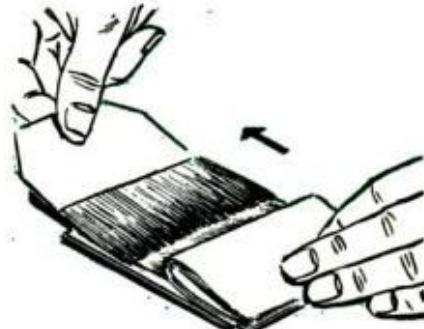
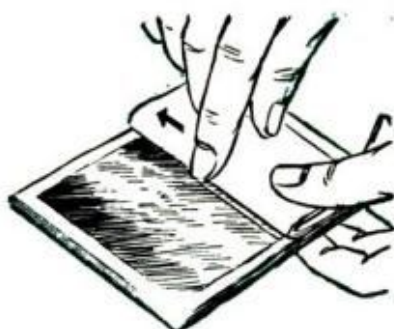
And if anyone knows how, Max Mentzel

should. He's a professional gilder who does much of the gold-leaf work at New York City's Rockefeller Center and knows all the tricks of the trade that'll help make your very first try—whether it's a statue or a picture frame—a glittering success. Unlike gilt paint, which becomes dull looking in a short time, gold leaf retains its bright yellow look indefinitely.

GOLD LEAF comes in books of 25 sheets, totaling 225 sq. in. Each 3-in.-sq. leaf is separated by tissue. Book costs about \$2.

THE FINGER NAIL is used to cut gold leaf in the manner shown below. Tissue is folded back and finger is run along fold

GILDER'S TIP is used to lift fragile leaf from page of book. Light grease on bristles makes the gold leaf cling to the brush





1. **SIZING THE SURFACE** with 4-hr. varnish is the first step. Don't skip any spots since the varnish is what bonds the gold leaf. The varnish is allowed to dry (about 2 hrs.) until it feels slightly tacky

To apply gold leaf, you need only a minimum of tools, namely, a 1-in. varnish brush, a gilder's tip, a 2-in. brush for pouncing and cotton. A gilder's tip is a special thin camel-hair brush, 4 in. wide, which—along with the gold leaf—is available in a kit from Champion Sign Co., 126 East 28th St., New York, N. Y. for \$3.00.

Gold leaf comes in books of 25 leaves, each leaf being approximately 3 in. square and separated by sheets of tissue. Being extremely thin, gold leaf cannot be touched or handled and must be applied directly from the book.

The surface to be gilded must be perfectly smooth and nonporous, since any irregularities, even brush marks, will show through the thin gold leaf. If the surface is porous it must be given several coats of flat paint or shellac.

Your first step in gilding is to "size" the work with a coat of 4-hour spar varnish, such as Valspar, making sure that no spots are missed. The varnish is what actually sticks the gold leaf and it must be allowed to dry or "condition" to just the proper tackiness. Under normal drying conditions, this will range from 2 to 2½ hours time, during which time the object should be protected from dust and lint. The drying test is made by touching the varnish with your knuckle. When it sticks to the surface very slightly, the sized surface is ready to be gilded. Determining the "ready state" is, perhaps, the most



2. **THE LEAF IS APPLIED** to the tacky surface with a gilder's tip, which is used to pick up the gold leaf directly from book without touching with hands. Tip is special thin camel-hair brush

important step in the whole process.

The gilder's tip is used to lift the gold leaf from the book without touching it with the hands. Here the pro first smears a little petroleum jelly on the back of his left hand and wipes the tip across it each time to "grease" the bristles. Then to wipe off the excess, he strokes the bristles through his hair. The slightly greasy side of the tip is placed flat on the sheet of gold leaf. The leaf clings to the tip but will pull away as soon as it touches the tacky varnished surface. The gold leaf can be

SAME BASIC STEPS



VARNISHING



3. WHEN THE SURFACE is completely gilded, the bristles of a soft brush are used to carefully crowd the fragile gold leaf into any hollows or crevices in the surface. Do this gently, with little pressure

applied to a straight surface such as a plain picture frame, without using a gilder's tip but it's somewhat tricky and requires a knack in "wrapping" the leaf and book around the tacky surface.

Using a finger nail to cut gold leaf is one of those tricks of the trade we mentioned; it's important when only a portion of a sheet is needed. With a piece of cardboard placed underneath, the book is held in the left hand and the protective tissue is folded back to expose enough of the leaf for your purpose. Then with the forefinger resting



4. FINAL STEP is polishing the gilded surface with cotton. This is called burnishing and is done with a brisk but light touch to produce luster and highlights. Avoid handling until thoroughly dry

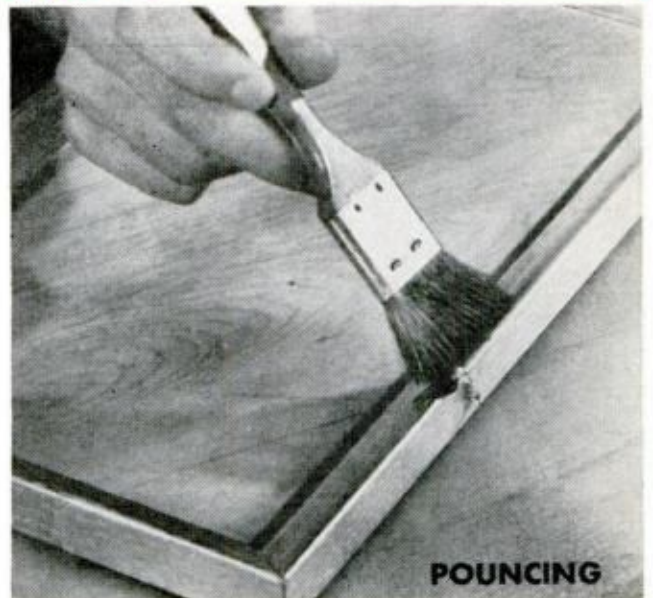
against the turned-back tissue, the nail is lightly drawn across the leaf. Each piece of gold leaf is lapped a bit as you go. Any skips can be patched with scraps of gold. Avoid crumbling the leaf.

Pounce the leaf on with a soft brush and use it to crowd the leaf into any crevices or hollows in the surface. *But do it lightly.* The gold leaf is finally burnished with cotton by rubbing it briskly without pressure. If the gilded surface will be subjected to wear, it should later be sprayed with a clear protective coating. ★ ★ ★

ARE REQUIRED TO GILD PICTURE FRAMES



GILDING



POUNCING



SHOTSHELL RELOADING

An increasingly popular hobby offers a safe, easy and enjoyable way to cut your ammunition costs by as much as 50 percent

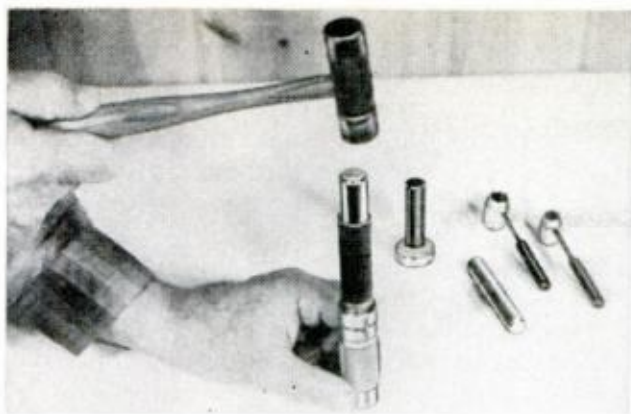
By Clyde Lamme

RELOADING your own shotshells is a fascinating way not only to save money, but to extend the pleasure of your hunting or trap and skeet shooting.

There's a wide variety of reloading equipment available, suited to the needs of the shooter who uses a box or two of shells during the bird season, and to the requirements of gun clubs, shooting preserves and individuals who fire hundreds of rounds

in a single weekend.

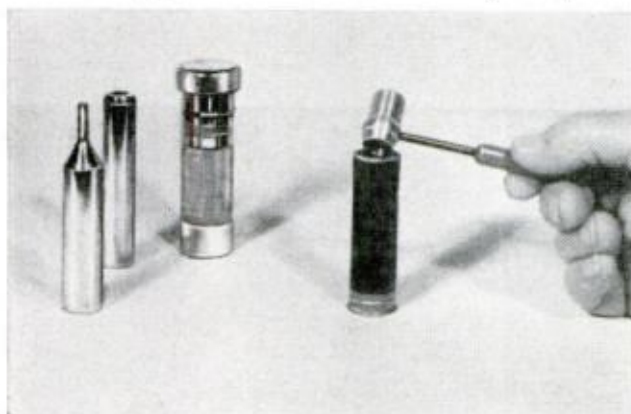
Cost of reloading equipment for all common shotgun gauges ranges from a few dollars for the simplest hand-loading kit to a hundred dollars or more for semi-automatic units that reduce shotshell reloading to a few short-reach arm movements. Capacity of the latter units can run as high as 500 reloads per hour in the hands of a skilled operator. Savings in cost



STEP 1 in operation of simple hand reloader is de-capping fired shell. With shell on top of loader, you insert decapper in shell, drive out spent primer



STEP 2: To seat a new primer, insert the rammer in the loader, place a live primer on rammer head, insert driver in shell, tap lightly with soft hammer



STEP 3: Pour in level-full measure of powder. Select type of powder from manufacturer's chart according to amount of shot you intend to use in shell



STEP 4: Insert wad column. Start over-powder wad sideways past crimp, then straighten. Insert filler wads with twisting motion. Press down with finger

per shell may range from 30 to 50 percent, the figure depending on such factors as quantity purchases of reloading components, the type of components used, and the number of reloads made per shell.

In general, shotgunners have three types of reloading equipment to choose from. The first type consists of a number of separate parts which are used manually to deprime, reprime, and resize the shell, insert wads, recharge with powder and shot, and crimp the open end. Such a kit is a good choice for the shotgunner who

reloads perhaps 25 to 100 shells for the bird season or occasional rounds of skeet. Used carefully it will produce uniform loadings in both paper and plastic shells. The operation of such a kit is shown in the photos on this page.

The single stage reloading press is similar to a small arbor press. It has a stationary stage, or platen, on which a single shell is placed at several stations for depriming, repriming, etc. This type of loader usually comes with shot and powder containers, or hoppers, and is fitted with either a man-

STEP 5: Slip shell into loader, insert rammer and place tool on bathroom scale. Seat wads to required pressure as indicated by scale, then add shot charge

FINAL STEP: Insert charged shell in loader, push all the way down to start crimp. Then insert rammer and push all the way down to finish the crimp





SINGLE STAGE RELOADING PRESS performs the same basic steps as hand loader on previous page, but is much faster. Containers on top hold powder, shot

usually or automatically operated charging bar which measures and drops given amounts of powder and shot.

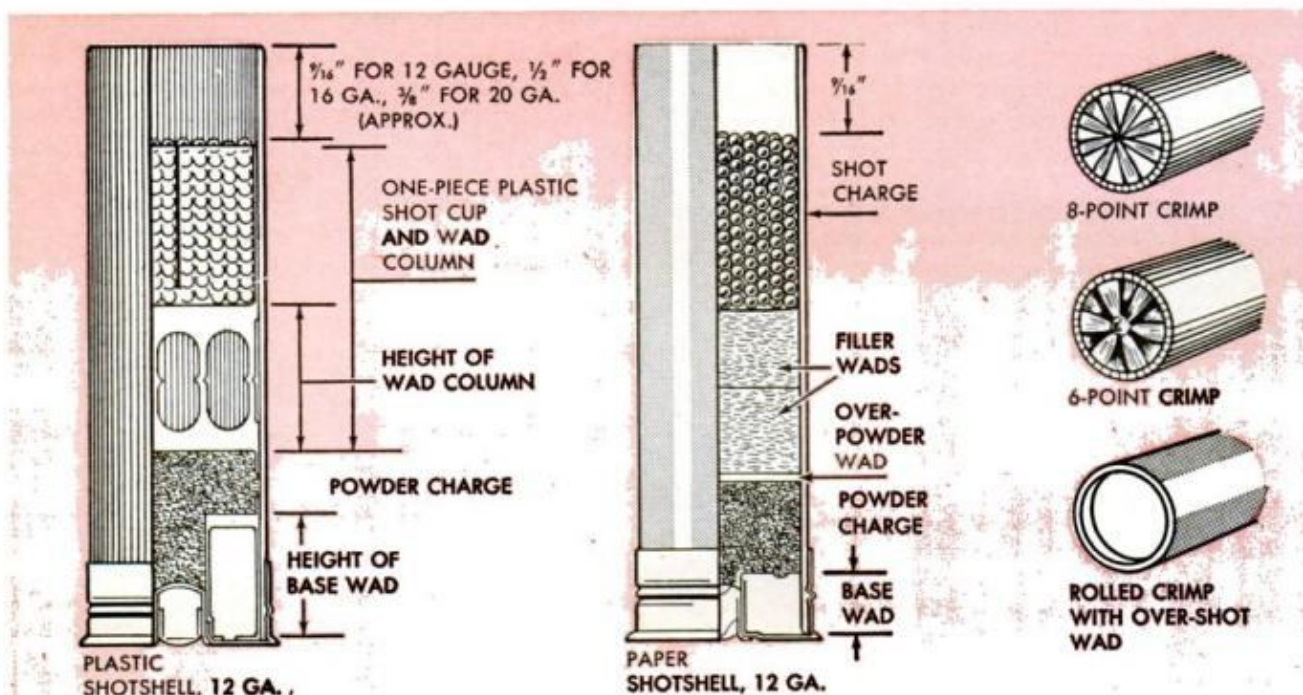
The semi-automatic reloading press automates many of the hand operations required with the two types just described, and is popular with gun clubs and many individuals who reload shotshells in quantity. Such a press requires close attention to the loading sequence as it has a carrier taking as many as six or more shells in progressive stages of loading from deprime to final crimp. On some loaders of this type the shell carrier is advanced automatically

at each stroke of the actuating lever. On others it is operated manually. Usually the charging bar is automatically shifted and on some units the live primers are fed automatically from a magazine. Some units are fitted with powder and shot dispensing drums having interchangeable measuring sleeves or bushings.

Reloading shotshells with modern equipment is a safe operation when carried out in accordance with accepted practices. Ignition and propellant components (live primers and powders) are quite stable. They withstand any ordinary handling and can be stored in suitable locations for comparatively long periods of time. There are, of course, precautions which should be observed. For example, never store live primers and powders where they can be reached by youngsters or found by those not acquainted with the possible hazards of careless handling. Always store them, even for short periods between loadings, in a relatively cool, dry place. Don't store components where they may be subjected to wide variations in temperature and humidity. Keep live primers in a sealed container except when in use. Keep powder containers tightly closed.

The paper shot shell is presently being displaced by the plastic shell having a conventional brass head. In time, all-plastic shells will probably be available. Also, conventional felt, fiber and cork filler wadding may in time be displaced by other developments in over-powder and filler waddings and separate shot sleeve or cups, or by recent innovations such as the one-piece plastic insert which combines the entire wad column and shot cup.

The primary function of the wad column in a shotgun shell is sealing in the gases



produced by ignition of the powder, and cushioning the shock of the sudden expansion of the gases to prevent deformation of the shot pellets. The secondary function of the column, of equal importance to reloaders, is in determining the total height of the components in the shell to give the correct distance from the top, or mouth, of the shell to the top of the shot column for turning a folded crimp.

Details on page 164, showing cutaway views of loaded, uncrimped shells indicate the importance of wad-column height. The left-hand detail shows a plastic shell having a high base wad, the latter an integral part of the shell, loaded with the new one-piece plastic shot cup and wad column. Note that the shot charge is encased in the plastic cup (to prevent deformation of the shot) and that this loading allows the required $\frac{9}{16}$ in. (approx.) for turning either a 6- or 8-point star crimp on a 12-gauge shell of standard $2\frac{3}{4}$ in. overall length. The center detail shows an older type loading in a $2\frac{3}{4}$ -in. paper shell having a low base wad. Here the conventional filler wads of felt or other materials are combined with an over-powder wad. An over-powder wad of plastic or other suitable material should always be used with this type of filler wadding. Note that the shot charge is not encased in a plastic cup or other type of liner or container.

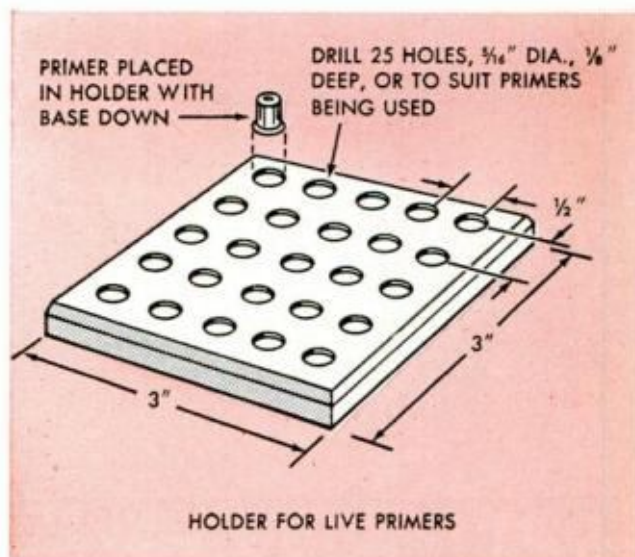
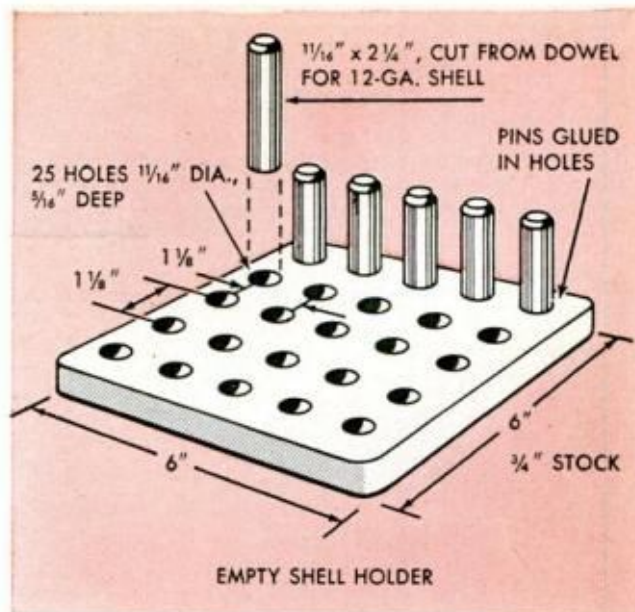
Some plastic shells require an 8-point star crimp as detailed. Some other plastics (also most paper shells) require a 6-point crimp. The older rolled crimp is no longer commonly used in the larger gauges except for some slug and magnum loadings.

When reloading plastic shells you will probably need a crimp starting die (6 or 8-point as required), since these shells do not always recrimp readily without a starter. Most starting dies have an index mark or marks to aid in locating fired plastic shells in the loader for the crimp-starting stroke. The crimp starter will also be necessary when loading new plastic cases, but is not normally required for fired paper cases.

Before reloading, examine each fired shell for defects such as pinholes (in paper cases), frayed open ends, splits, tears or dented brass. Discard any cases that show these defects, also any that are unduly oversize, bulged, or otherwise damaged. And be sure to segregate shells having high and low base wads. Have everything in order and remove any small objects other than reloading components from the bench top.

You'll save a lot of time and possible miss-fires by arranging the loading components within easy reach of both hands.

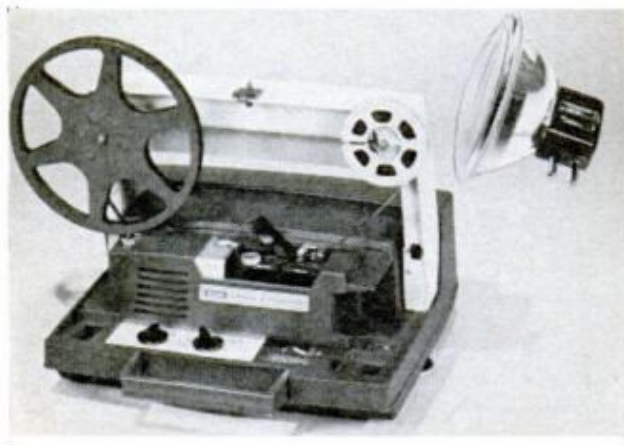
(Please turn to page 214)



SEMI-AUTOMATIC RELOADERS are fastest type available to most shooters. Shells are moved in sequence through the various steps in the reloading process



By Arthur J. Maher



CARALUX 8 PROJECTOR shows up to 400 ft. of 8-mm film at 6, 18 or 54 frames per sec., forward, reverse or still. It's self-threading and comes with 22-mm or 15-25-mm zoom lens. Uses new sealed-beam projection lamp (inset) that increases brightness, and has a special flickerless film advance. Costs under \$160 and up. Eastman Kodak, Rochester 4, N.Y.

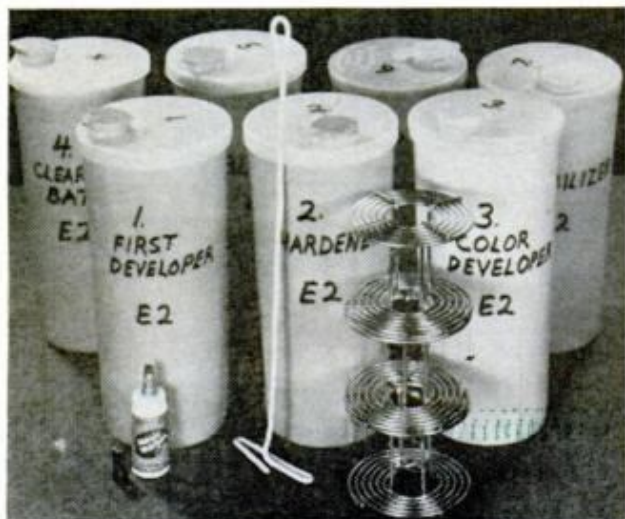


SPOT EXPOSURE METER, Model 92, has an angle of acceptance of only 4 deg., which makes it ideal for shooting with telephotos, or for any work requiring precise exposures. When you look through the eyepiece, the portion of the scene being measured appears as a black spot. \$49.95 with case. Fotomatic Corp., 3141 West 10 Street., Indianapolis 22, Indiana

DARKROOM HINTS

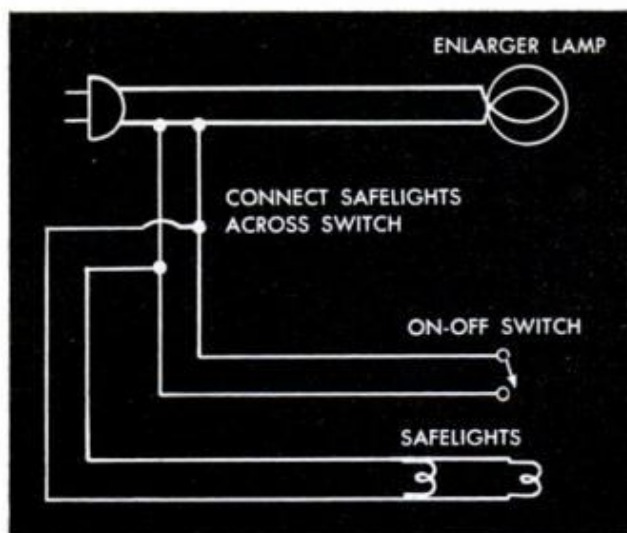
Low-Cost Developing Tanks

One-quart polyethylene juice containers make serviceable, inexpensive tanks for processing two or more reels of film simultaneously. They are particularly handy in color work, which requires a number of solutions. Identify the solutions with a felt marker and make a reel holder out of heavy copper wire.—*Rudy Schulze*

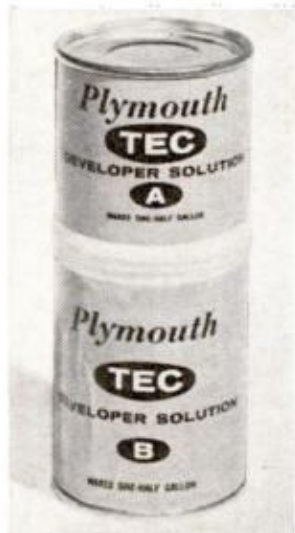


Darken Your Darkroom

When enlarging dense negatives, the glow from your safelights can interfere with the projected image, making it impossible to dodge, burn-in or focus properly. Fortunately, this is easily remedied by wiring your safelights across the enlarger switch, as in the schematic below. Then, when you turn the enlarger on, the safelights will go off automatically, but will light again as soon as the enlarger is turned off.—*Joseph Braunstein*



CONVERTIBLE 8-mm movie camera, the Nikkorex 8F, has a fixed-focus f:1.8 lens that becomes a zoom lens when you screw in an accessory attachment. Other features include electric drive and automatic exposure control. The camera sells for \$89.95, zoom attachment, \$29.95. Nikon Inc., 111 5th Ave., New York 3, New York



COMPENSATING film developer brings out maximum shadow detail while holding back excessive highlights. "A" and "B" solutions are stored individually for long shelf life. To use, you either mix the two solutions, or immerse film in each one separately. \$2.45 a gal. Plymouth Products Co., Inc., 1808 North Damen Avenue, Chicago 47, Ill.

LENS KLENS, lens-cleaning fluid, comes in an aerosol can for easy application. To prevent possible damage to the camera from excess fluid, the can is equipped with a metering spray valve that emits only a small amount of liquid each time you push the button. Sells for \$1.95 per 12-oz. can. John G. Marshall Mfg. Co., 167 North 9 St., Brooklyn 11, N.Y.

Clip Tames Film

The bothersome tendency of 120 and 620 film to curl and buckle when being started in an "outside-in" type developing reel can be controlled with a spring clip. Check the clip for clearance, and grind its ends if necessary. To use, unroll the film and cut off the paper backing to leave about an inch of film exposed. Then attach the clip to the film and use it to pull the film about 2 in. past the start of the grooves.

—F. Greenwald

Film Reel Speeds Filtering

Filtering a solution right into the processing tray, instead of an extra jug, cuts an entire step from your chemical-handling procedure. Hold the funnel upright by setting it in a 2 $\frac{1}{4}$ x3 $\frac{1}{4}$ -size steel film reel. The spout will be high enough off the bottom of the tray to permit easy flow of the liquid, and you'll have both hands free to hold the jug. A small wad of cotton in the funnel makes an effective filter.

—Wayne Floyd



THOSE MAGIC URETHANES

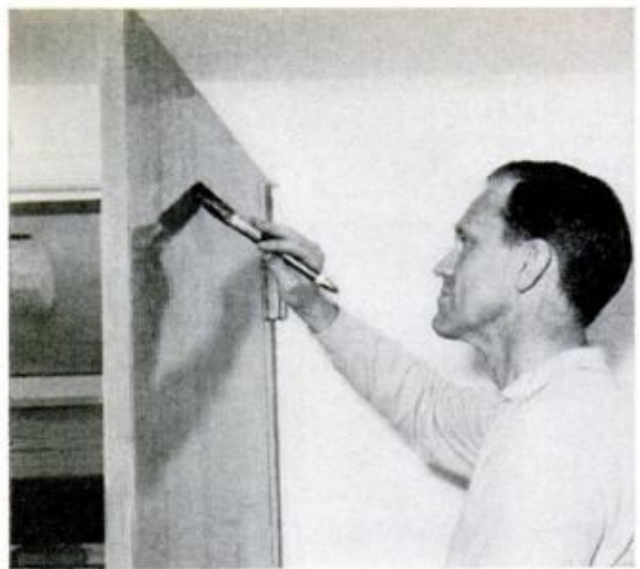
Virtually unknown five years ago, these wonder finishes can cut maintenance in half

By Merle E. Dowd

MODERN CHEMISTRY has made another giant step forward in the "do it once and forget it" school of maintenance.

Lumped under the name "urethanes," this versatile family of finishes, coatings and sealants seems almost too good to be true. They wear longer on floors, resist sun and weather on your boat, and resist chemical attack (even rust and corrosion) far better than most other coatings. Urethane finishes can be hard enough to roller skate on, or flexible enough to stretch like rubber. But these specialty finishes aren't all alike.

Some urethanes come in two parts and must be mixed before application. Others come in a single can and look like regular varnish or a high-grade enamel. Two-part urethane sealants outperform both putty



URETHANES DESIGNED for interior use have improved resistance to yellowing, a defect of early formulas

and calking and can be gunned into place.

Here's just one example of urethane "magic" from my own personal experience. A cork floor in our kitchen was driving my wife wild. She loved the cork because it was easy on the feet, and glasses didn't break nearly as often when dropped on it. But keeping the floor clean and preventing wear at high traffic spots were taking too much time. The best paste wax, dolloped on by hand and machine buffed to a high sheen, lasted about four weeks in winter and only two weeks in summer.

A three-coat application of PRC 470 polyurethane cured this maintenance headache. It's a two-part coating that's tough enough to stand up under constant wear, yet flexible enough to bond to the resilient cork tile in our kitchen.

Before application most of the old wax

AFTER CHECKING to make sure that the old finish won't lift, roughen it before applying the urethane



FLOW THE URETHANE on smoothly over the roughened surface. Apply at least two coats, preferably three





CLEAR MARINE urethane finish will last up to six times as long as most of the common spar varnishes

was washed off with a remover. A floor sander then smoothed the wear spots and removed the last remnants of wax from the cork.

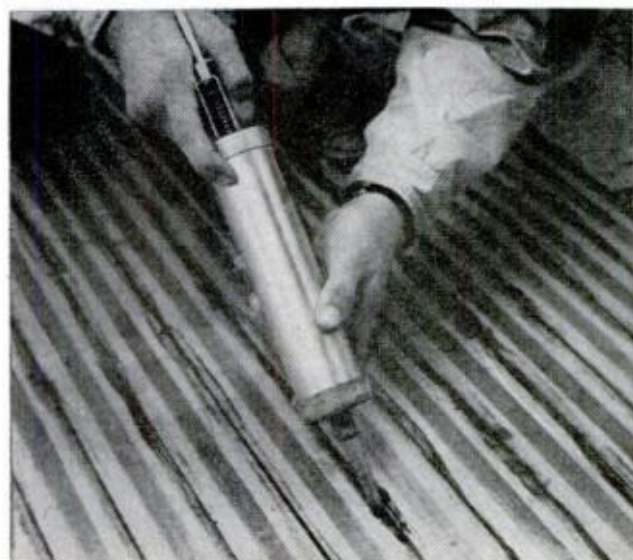
For first and second coats, a 1:1 mixture of Parts A and B was thinned with 50 percent special thinner (PRC Solvent No. 6)—that is, two parts 470 mixed to one part solvent. The first coat was brushed on with a full, flowing action and a minimum of brushing out; about half an hour later, the second coat was applied.

The thin mixture seeps down into the cork. A quick follow up with the second coat sinks more material deep into the surface before the first coat can dry. About four hours later, a third full coat of PRC 470, cut with about 25 percent solvent, was brushed out evenly. For a glossy finish, the third coat could be applied full



SPECIAL URETHANE floor finishes have extra abrasion resistance and last twice as long as varnishes

CALKING COMPOUND used on aircraft carrier decks is a urethane, a good testimonial for its toughness



NATURAL WOOD exterior finishes have become practical with development of urethanes. They last for years



strength, without thinning.

The solvent may be irritating to breathe, particularly if the thin coats are applied with a spray gun. Therefore, a brush or lambswool applicator is recommended. For large areas where a spraying is desirable, it's best to wear a mask.

During any application with brush, lambswool mop or spray, provide ventilation with a fan to prevent a build-up of solvent vapor. To avoid skin contact with uncured components of PRC 470, wear gloves during application. Clean the brush or spray gun in methyl ethyl ketone (MEK) or PRC Solvent No. 5.

PRC 470 cures in two ways, by chemical reaction between the two parts and by absorption of water from the air. Once applied, the coating cures tack-free in four hours at 75 deg. and 50 percent humidity, but it requires 72 hrs. for full curing under the same conditions; drier and/or cooler air will extend the curing time. However, the surface can be walked on as soon as it is tack-free.

Perfect Cork Sealer

Cork is only one floor covering for which urethane finishes are adapted. Since PRC 470 is clear, two coats (mixed with 25 percent solvent) will seal an unglazed ceramic tile surface. Similar seal coats can be applied to slate, porous mica or other slab-stone floors. Once such floors are sealed, regular waxing can be stopped.

One-part wood floor finishes are simpler to use, yet still keep floors new looking longer than ordinary varnishes, lacquers or penetrating finishes. Gym floors, for example, are usually hard maple and have to be refinished at least once a year. But in a Buffalo, N.Y., suburb roller skating is now permitted every Saturday afternoon in the gymnasium.

When this was first tried, the wooden wheels of the skates quickly reduced the regular varnish to a white powder and exposed the bare wood. Normally, the floors of indoor skating rinks are untreated, but in order to make the gym usable for other activities the floor had to have a good-looking protective finish. Rather than eliminate roller skating, school officials finished the floor with two coats of urethane floor varnish. The urethane varnish not only withstands the grinding abrasion of skates wheels, but retains a beautifully glossy surface finish. And refinishing is now required only once every two years.

One-Part Urethanes

One-part wood floor finishes for home use are no more difficult to use than ordi-

nary floor finishes. Since urethane finishes are oil-thinned, mineral spirits can be used to clean brushes. As might be expected, however, simple one-part finishes will not perform as well as two-part catalyzed finishes where abrasion resistant must be combined with flexibility, as on the cork floor. One-part floor finishes can also be used on concrete or stone interior floors.

Abrasion resistance tests indicate that urethane floor finishes have at least double the life of the best tung or phenolic-base varnish. A number of paint manufacturers market pigmented urethane floor finishes, as well as clear. The addition of a slight amount of pigment makes a varnish stain that both colors and protects the floor at the same time. You can either buy—or mix yourself—simulated mahogany, oak, cherry and light walnut stains.

For best results on your floor, always select a urethane finish specifically designed for floors. While many all-purpose urethane varnishes can be used for floors, added abrasion resistance is usually built into floor varnishes or porch and deck paints.

Proper Surface Preparation

Urethane finishes generally adhere to new surfaces without trouble, though previously coated surfaces may require special attention. Shellac, lacquer and some paints may prevent a good bond. Some urethane finishes will lift lacquer sealers, while others won't affect existing finishes. Waxes, particularly those containing any proportion of silicone resins, will prevent urethane finishes from bonding. Therefore, all wax coatings must be completely removed.

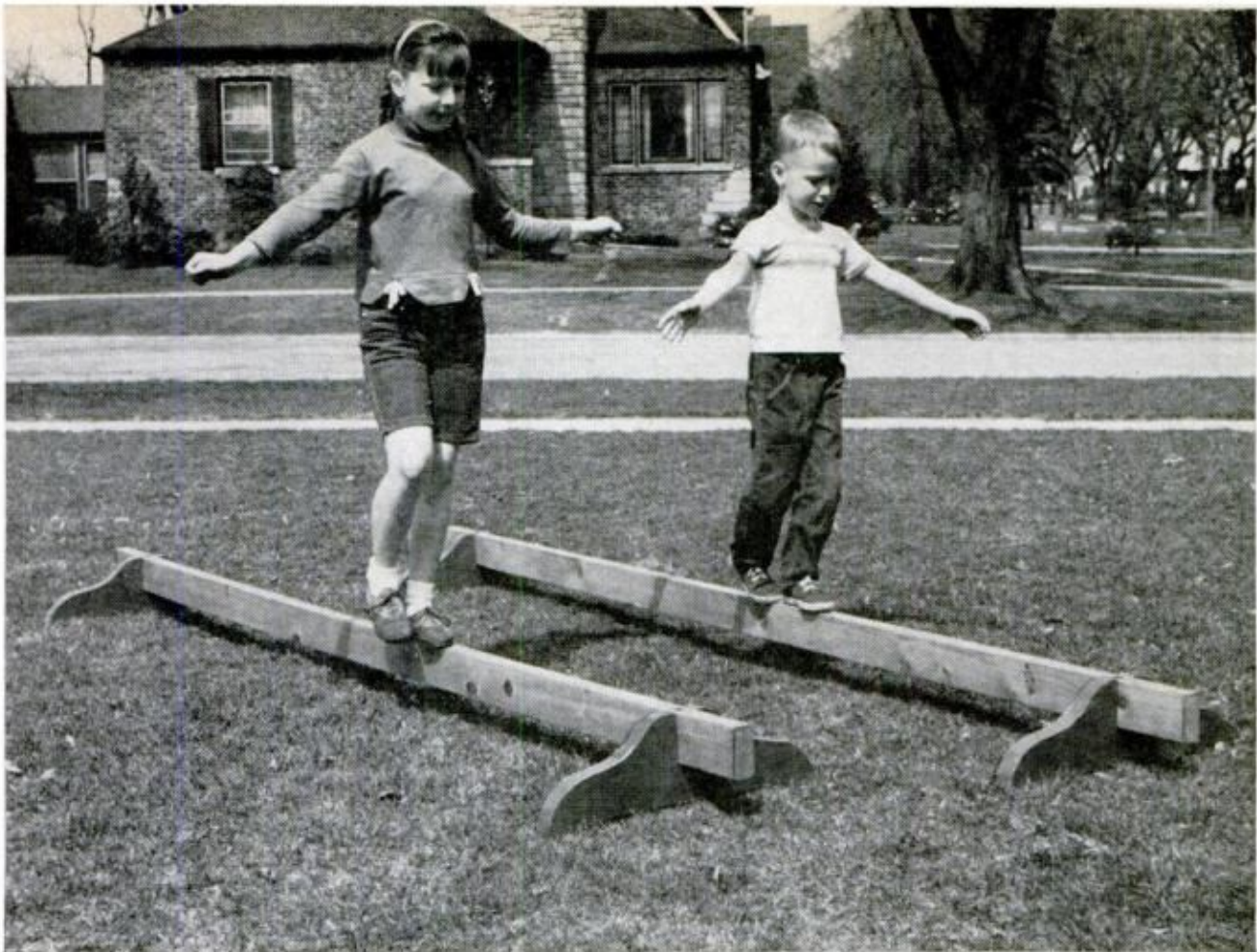
When in doubt about a previously coated surface, try a patch test in an inconspicuous corner. If the undersurface doesn't wrinkle or soften, the urethane finish will adhere. If there is any question, however, remove the old finish completely.

Any surface to be coated should be dry and free of dust. Roughen glossy undercoats by sanding before applying the first coat of urethane, then sand each coat lightly to provide "teeth" for the next coat.

Concrete floors should be etched with full-strength vinegar or a 5-percent solution of muriatic acid before applying urethane finish. Rinse the floor down well and allow it to dry before you begin applying the urethane. New concrete should be allowed to age for at least 30 days and preferably 60 days before coating.

Urethane finishes sometimes fail by "sheeting" or peeling. This usually results

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



DID YOU EVER SEE a small child who could resist the temptation to walk tight-rope along a log, a curbing or a wall? It's a natural impulse, and is helpful in developing co-ordination and a sense of balance.

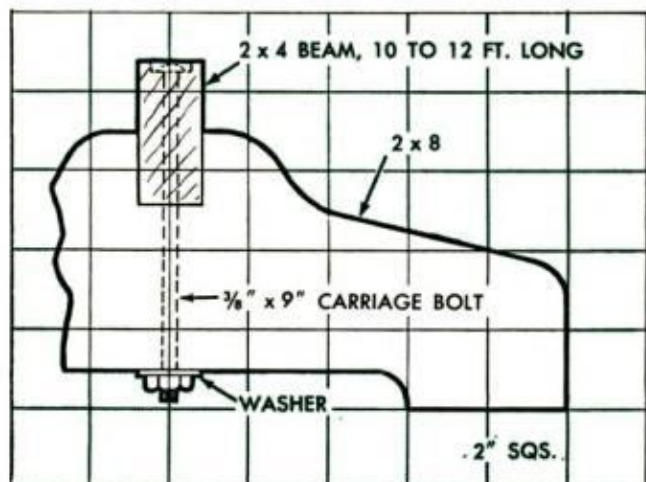
These balancing beams, developed by Theron M. Woolson of Winnetka, Ill., take advantage of a child's innate desire to walk along a narrow ledge, yet if he loses his balance, he falls only a few inches. The beams can be moved easily around the lawn, even used indoor during winter. Two balancing beams can be set up, end to end, as one long beam, or set up side by side as "railroad tracks". In addition, children find them fine for defining the walls of a "house" or a "jail".

The supports are bandsawed from 2 x 8 stock. All that remains is to set a 2 x 4, either 10 or 12 ft. long, into the noches, and fasten it in place with $\frac{3}{8}$ -in carriage bolts. If beams are set flush in supports as shown in photos, both beams and supports must be notched a depth equal to one half the width of the 2 x 4. Before assembling paint the supports bright red, and give the 2 x 4s two coats of spar varnish.

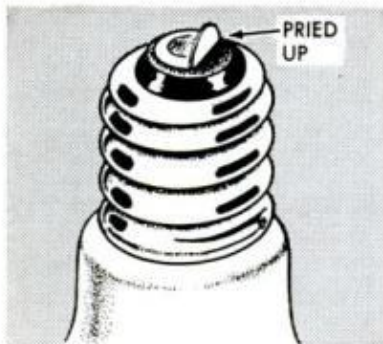
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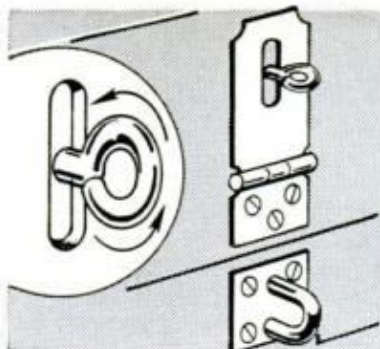
INCHING ALONG beams angled outward, it's fun seeing how far one can stretch and still keep balance



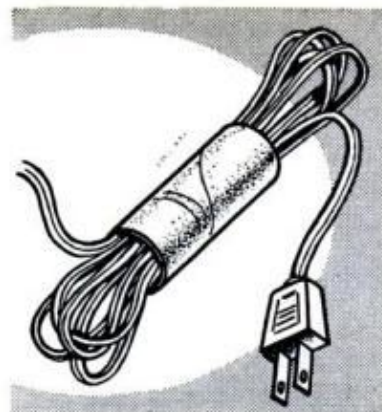
TAKE A HINT FROM READERS



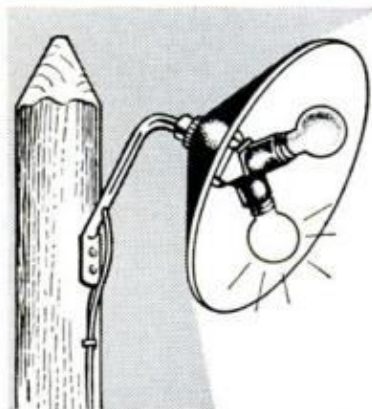
IF A BULB FAILS to make good contact, you can remedy the situation without putting your finger in the socket by curling up one edge of the contact plate on the bottom of the bulb. Particularly useful when it's a ceiling light, rather than a lamp



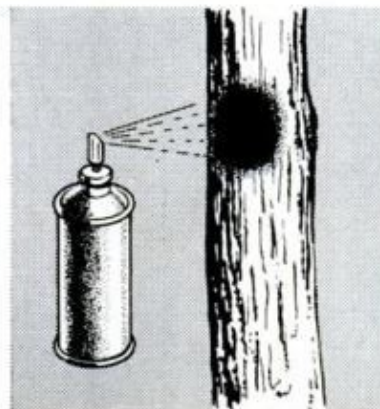
BY SETTING A SCREW EYE into the slot of a hasp on a storage chest or bin, you can prevent the hasp from falling over the staple every time you close the lid. With the hasp in the up position, turn the eye so its loop is at right angles to the slot



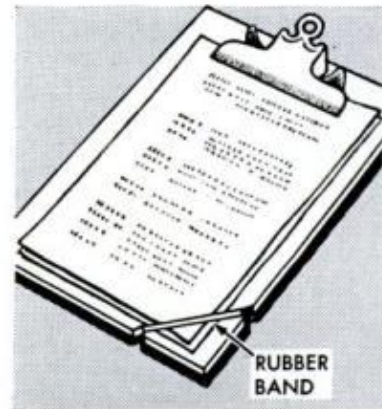
IF YOU KEEP an extension cord in a drawer, it will store neater if you coil it in a hank and slip it inside a section of cardboard tube. The tube from a roll of toilet tissue will prove just the right size for the average length of extension cord



YOU CAN AVOID the inconvenience and possible hazard of a sudden blackout of your yard light if you fit it with a double socket and a second bulb. Thus when one bulb fails, the other keeps burning since a double failure would be rare

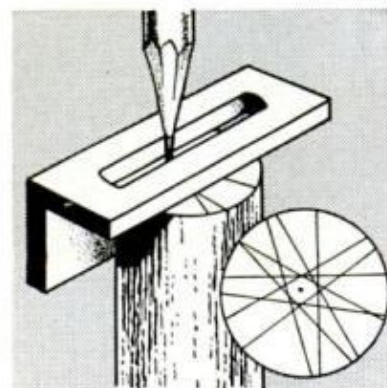


WHEN HIKING OR CAMPING, take along a spray can of white or yellow paint for marking trails. A quick press on the button leaves a vivid mark on a tree or rock. It's faster than chipping trees with a hand ax, and won't damage the trees



PAPERS ON A CLIPBOARD often curl and blow in the wind. To prevent this tendency, cut notches in one of the lower corners of the board to hold a rubber band. Snapped over the papers, the band will hold them but permits removal

TO FIND ROUGH CENTER of a rod or dowel, seat a scrap of angle with a square inside corner across the end. A slot in one side adapts the angle to various diameters. Scribe lines along edge nearest the rod's center, turning rod each time

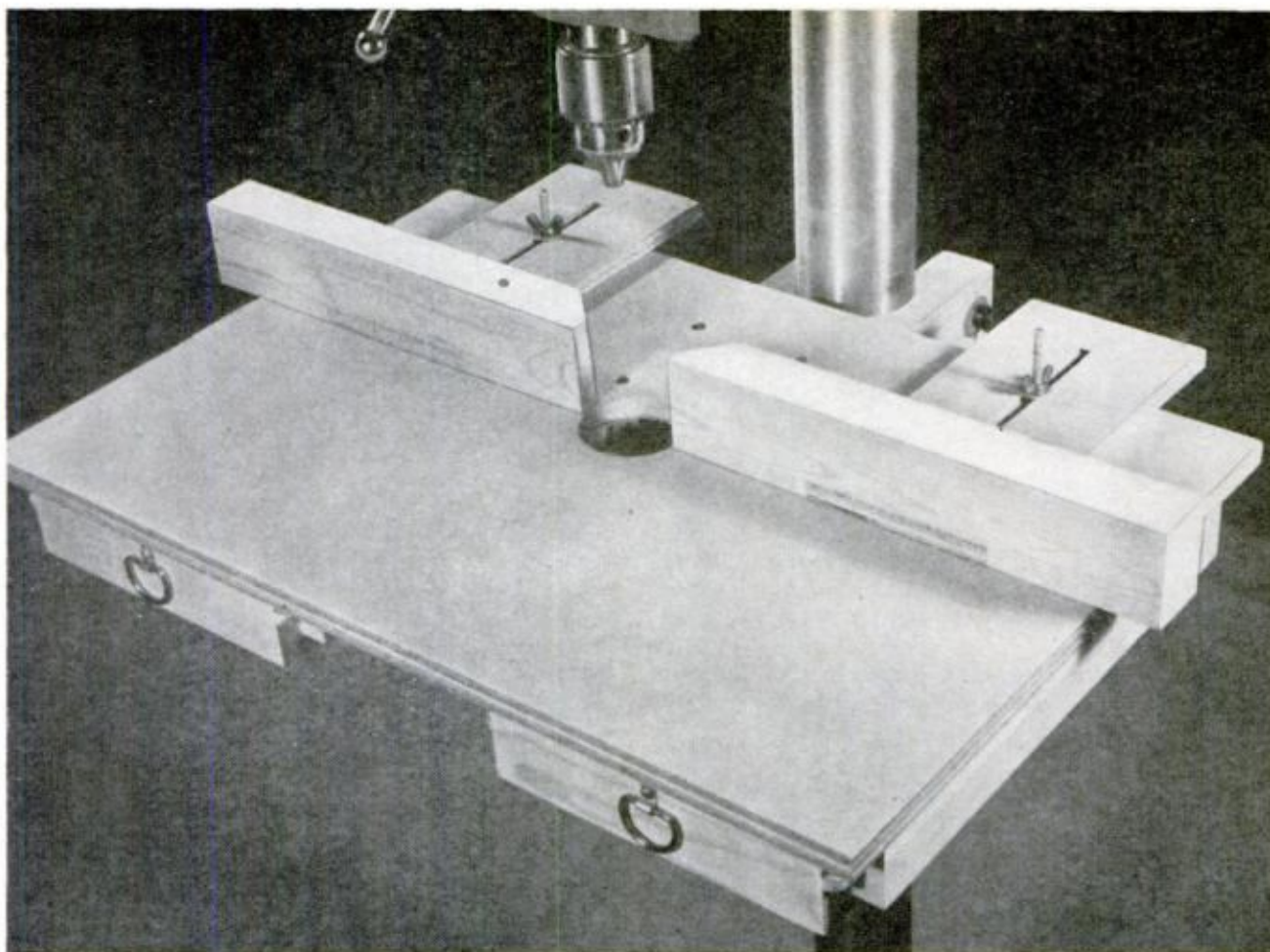


A SMALL MAGNET on the end of a length of twine will save having to fumble in the pocket of your carpenter's apron for small nails and brads. Pin free end of the twine to the apron. Then, to get nails, you pull the magnet from the pocket



KEEP AUTO SEAT CUSHIONS in place with an anchor made by threading a heavy string through two rubber balls. Make the string long enough so you can draw it across the cushions' hinge-fold and tuck both balls behind or under the seat





All-Purpose DRILL PRESS TABLE

Makes your drill press ready-and-waiting to take on a variety of woodworking jobs with no lengthy down time between special makeshift setups

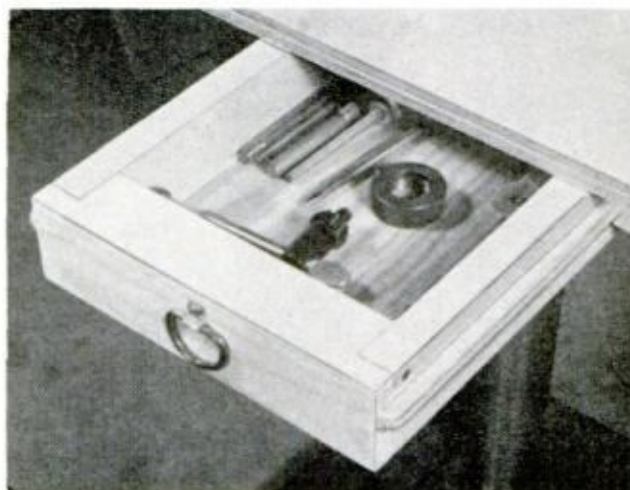
By R. J. DeCristoforo

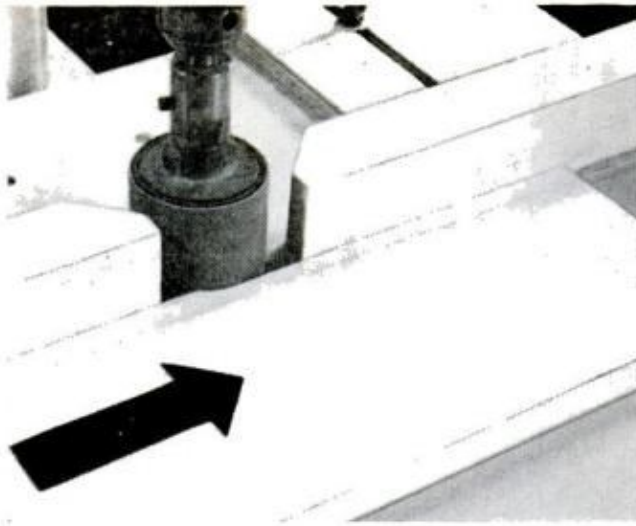
HANDLING such woodworking jobs as shaping, pattern routing and drum sanding on a drill press is made extra convenient with this auxiliary clamp-on work table. It lets you perform any of these operations, and many others, without having to stop and rig up a separate jig each time. Drill-press accessories are at your fingertips in two drawers below the table.

For straight drilling operations where you may prefer to support the work on the drill press table itself, the auxiliary table can be removed by backing off a wingnut to unclamp it from the column.

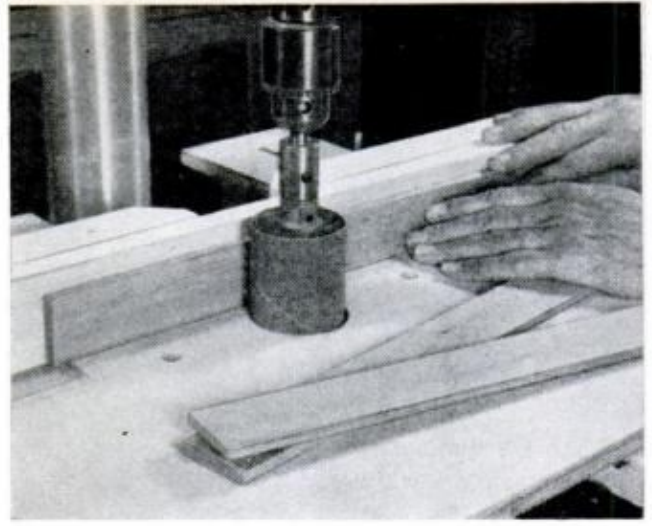
Make the table top from a smooth-surface material such as particle board or hardboard-faced plywood. The remaining parts can be most anything, although it would be best to pick a hardwood for the fences. Certain dimensions, such as the

TWO SHALLOW DRAWERS, which run in dadoed tracks on underside of table, provide convenient storage of chucks, keys, arbors and other small items. Improved pull was made from a metal belt loop

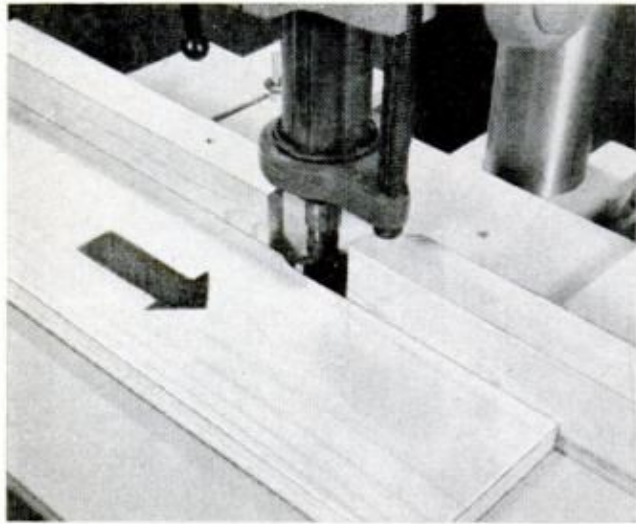




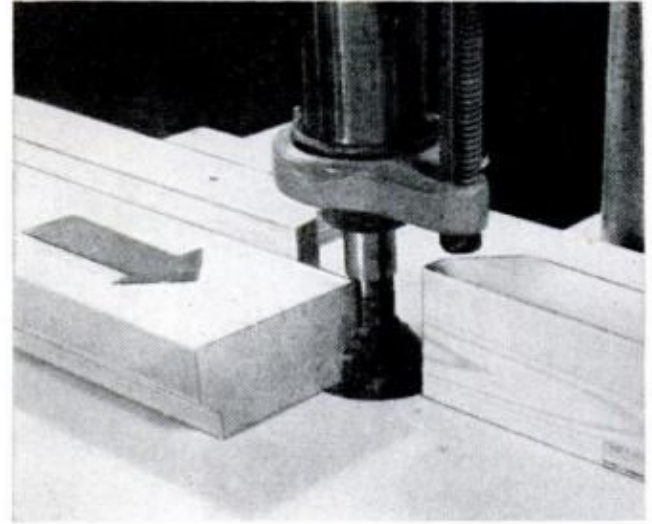
SANDING EDGES to be butt-joined is one of many operations possible with the all-purpose drill press table. Place a drum sander in the chuck and offset outfeed fence to compensate for the stock removed



DRESSING SLATS to uniform thickness is also accomplished with drum sander. Align the fences far enough behind the drum sander to permit insertion of a wood strip to span the opening between fences

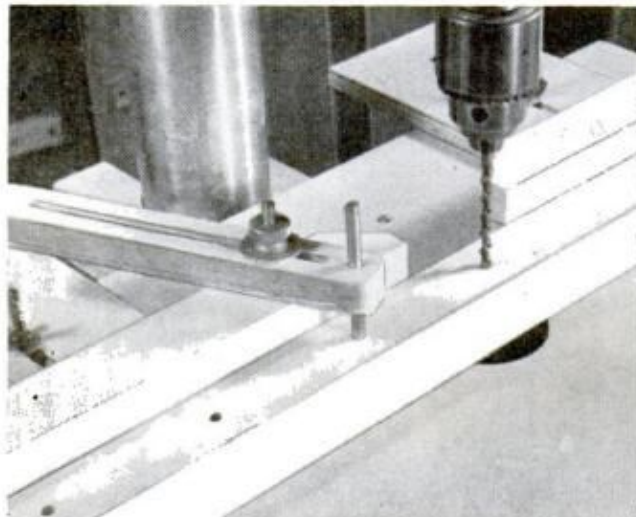


STRAIGHT-FACE CUTTER is used for light jointing cuts when entire edge of the stock is to be removed. Here, as in edge sanding (above), the outfeed fence is moved forward to support the work after the cut

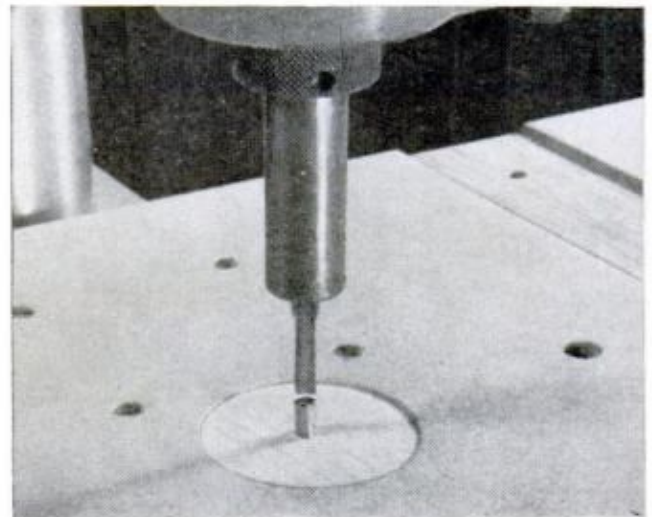


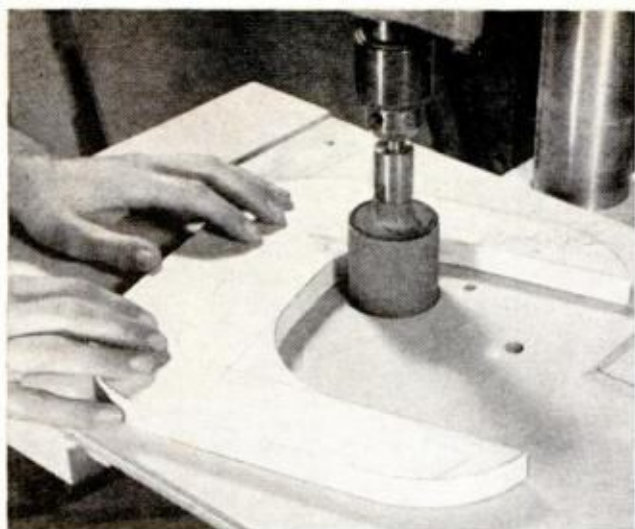
FOR SHAPING CUTS in which part of the edge is left intact, keep both fences aligned. Always feed work against direction of rotation of the blade so its action will tend to press the work against the fence

DRILL REGULARLY SPACED HOLES by means of an indexing pin. After drilling each hole, move the work until the pin engages that hole, then drill next hole. Pin is tapered to engage holes up to $\frac{1}{4}$ -in. diameter



STEP 1 IN PATTERN ROUTING is to place pattern routing guide in the table hole. To make the guide, turn wooden disc to fit the hole, then, with disc set flush with table top, drill disc to take a $\frac{1}{4}$ x1-in. rod

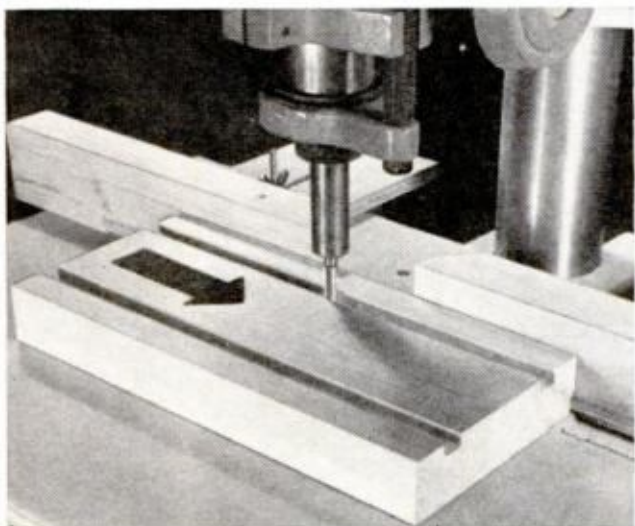




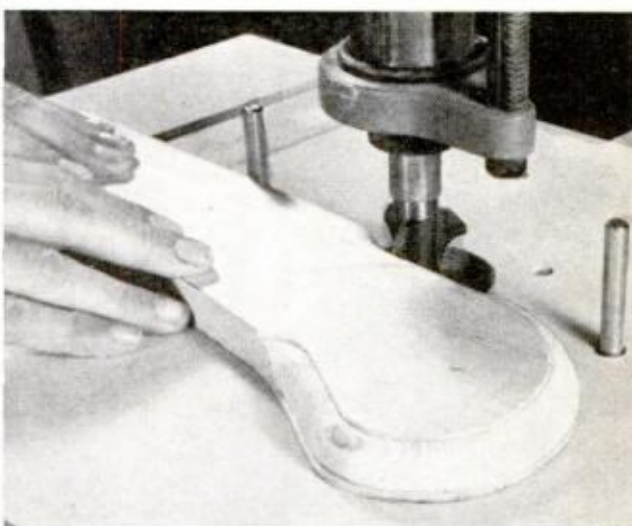
FOR CONTOUR SANDING of inside and outside edges, remove both fences and guide the work free-hand. To get maximum use out of the abrasive, raise or lower the quill as each part of the sleeve becomes worn



PATTERN SANDING is simply a matter of nailing a slightly undersized pattern of the work to the underside of the work, which has been rough-cut. The pattern rides a guide disc placed in the table hole



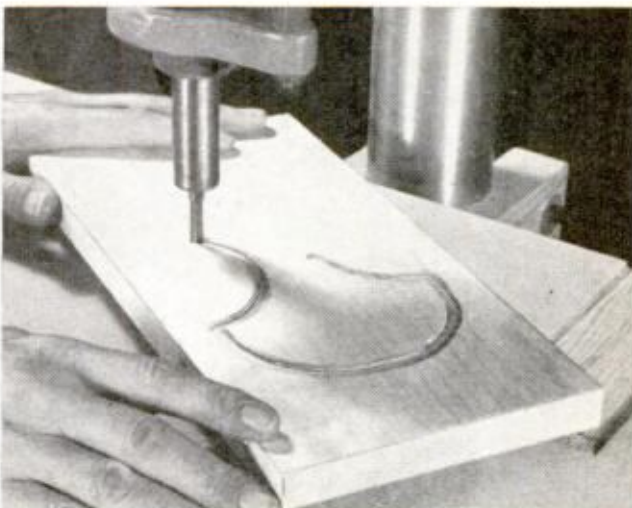
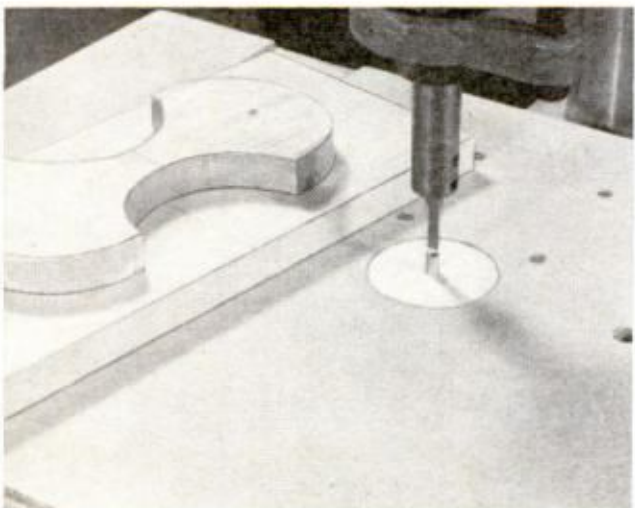
STRAIGHT-LINE ROUTING also requires use of both fences, perfectly aligned. Since drill press spins much slower than standard routers, feed the work very slowly, and make deep cuts in $\frac{1}{8}$ -in. increments

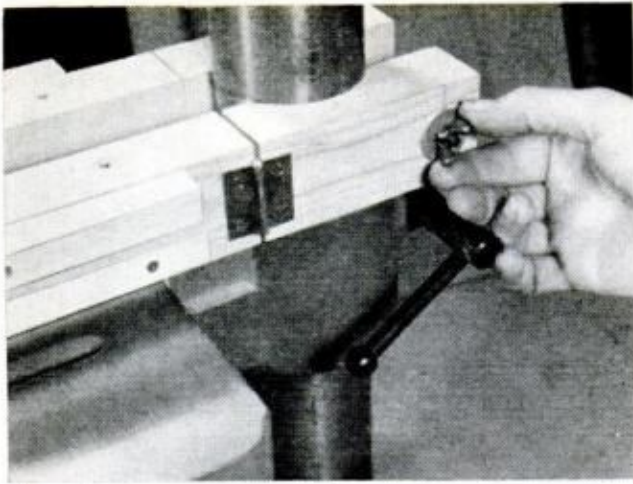


SHAPING CURVED or circular edges is facilitated by inserting fulcrum pins in Tee-Nuts installed for that purpose (see drawing, next page). Always try to rest the work against at least one pin at all times

STEP 2: Nail the master pattern to the under surface of the work. The pattern may be a fully shaped cut-out as shown here, or merely a block with a track of the desired shape routed into its bottom surface

STEP 3: While making the cut, be sure the edge of the pattern butts against the guide pin at all times. Since the router bit is aligned with the pin, the cut will duplicate exactly the shape of the pattern

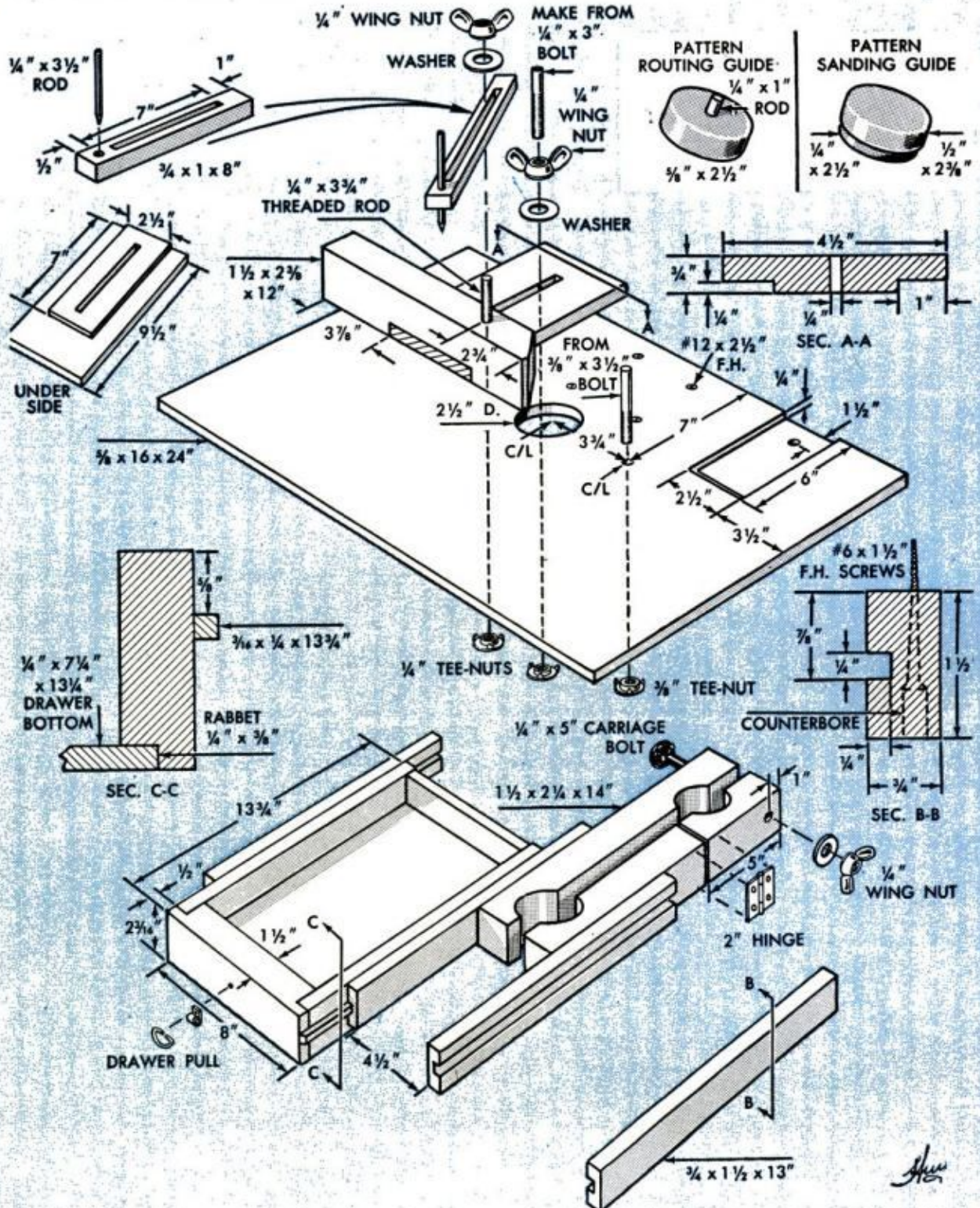




diameter of the drill-press column and the distance from the table hole to the column, must be taken from the machine itself.

In attaching the table to the clamp-on supports, make sure that the hole in the work table is positioned so it centers with the drill chuck. Also, see that there is no play in the fence guides, and use the slots in the guides to position the registering holes for the Tee Nuts which hold the fence locks. Give the work table a slick finish by applying a sealer and then waxing.

TABLE SUPPORT is hinged for quick removal. Note that support rests on the press' original steel table



HOW PERMANENT IS "PERMANENT" ANTIFREEZE?



No antifreeze lasts forever—but just how safe is the type they tell you to leave in year 'round? Here are the facts

By Morton J. Schultz

IN AUTOMOTIVE AFFAIRS, as in politics, there's often more below the surface than comforting promises might suggest. Take the situation surrounding so-called permanent antifreeze.

There's nothing truly permanent about "permanent" antifreeze of course. It doesn't last forever. In fact, in the words

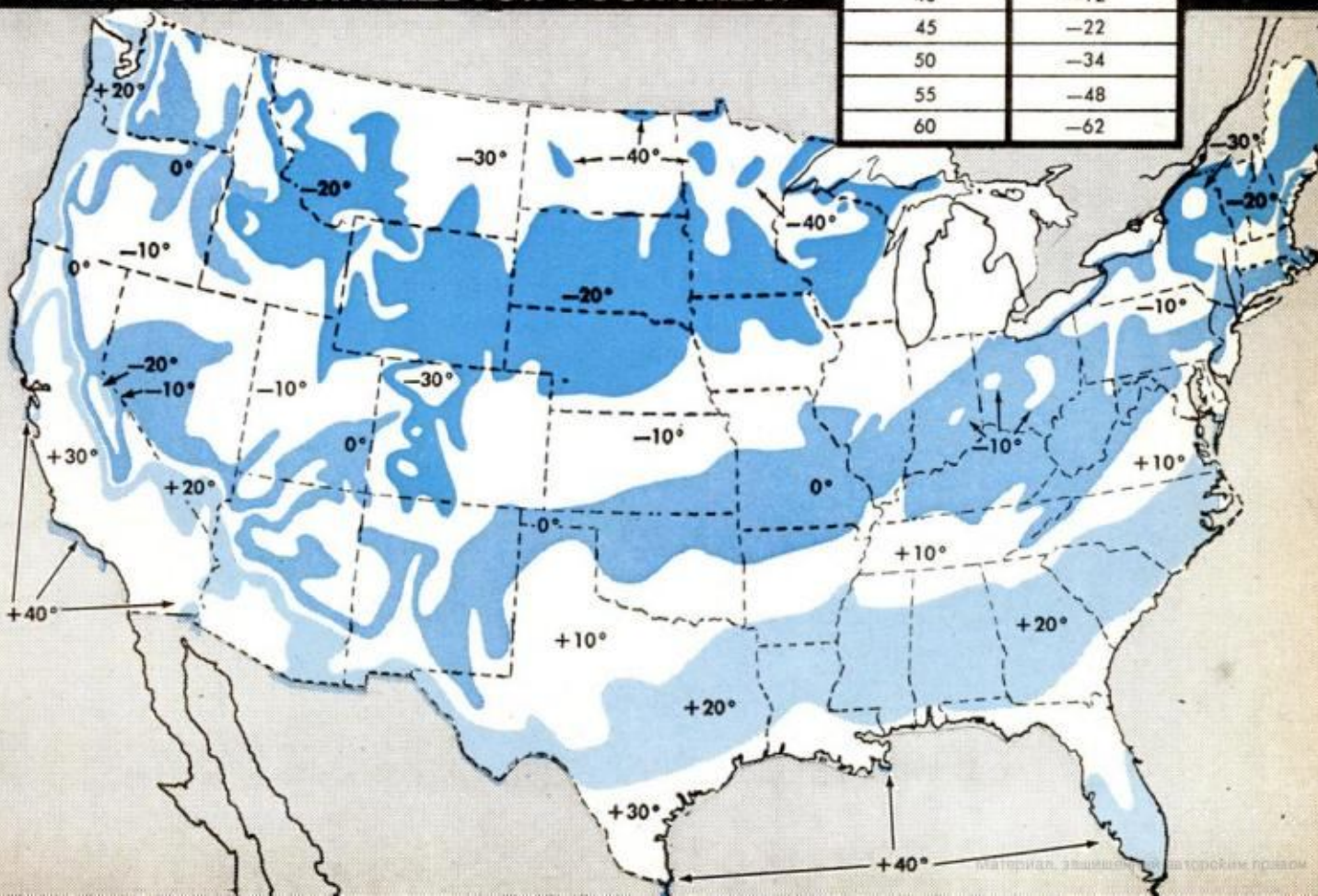
of the U.S. Bureau of Standards: "From the standpoint of inhibitor service life and corrosion protection, the term 'permanent' as applied to antifreeze is a misnomer."

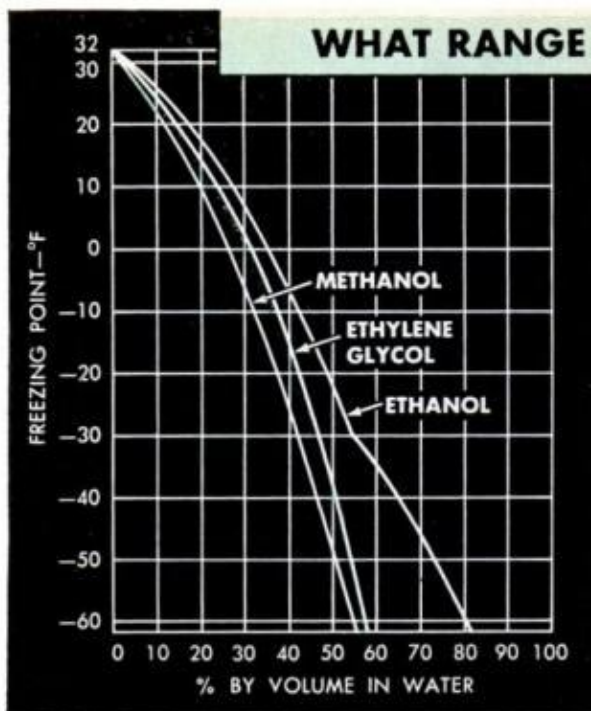
And right now there's an argument going on among antifreeze producers as to whether "permanent" antifreeze will maintain its protective qualities for as

HOW MUCH OF YOUR COOLANT should be antifreeze? Less than half? More? It depends on how low the mercury dips in your area. The white and blue bands on the map below represent average minimum temperatures. Spot your location, then consult chart at right for safe proportion of water to permanent-type antifreeze. Example: 60% water is safe for Chicago

ANTIFREEZE % BY VOLUME	PROTECTS TO °F
20	+16
25	+10
33	0
40	-12
45	-22
50	-34
55	-48
60	-62

HOW MUCH ANTIFREEZE FOR YOUR AREA?





WHAT RANGE OF PROTECTION DO YOU NEED?

CHOICE OF ANTIFREEZE depends on range of temperature your coolant must withstand. Graph at left shows non-permanent methanol is most efficient antifreeze—that is, it gives greatest freezing protection per unit volume. At 20 below, for example, less than 40% of methanol is safe, while you'd need nearly 45% "permanent" antifreeze (colored line) and a half-and-half solution of ethanol. But modern engines run hot, so the point at which an antifreeze will evaporate is also important. Chart below shows that any solution of ethylene glycol is less likely to boil than non-permanent types

TYPES OF ANTIFREEZE	BOILING POINTS OF SOLUTION RATED TO FREEZE AT.			
	+10°	0°	-10°	-20°
ETHYLENE GLYCOL	218°	220°	221°	223°
METHANOL	190°	185°	182°	179°
ETHANOL	187°	184°	182°	180°

long as *two years*. Some claim only *one season*. That's hardly "permanent" in any man's language!

Everyone does admit, however, that "permanent" antifreeze does have a few qualities (the ability to withstand evaporation by boiling is one) that makes it *more permanent* than other types of antifreeze. Thus, the word is justifiably used in this context: It is an antifreeze that's meant to stay in your cooling system year 'round, in contrast to the old type you put in, come fall, and drain out next spring.

Of the two major types of antifreeze, the "permanent" one has a base of ethylene glycol; and the alcohol type has either a methanol base or an ethanol base.

When put into a car's cooling system and mixed with water, the ethylene "permanent" glycol antifreeze provides indefinite

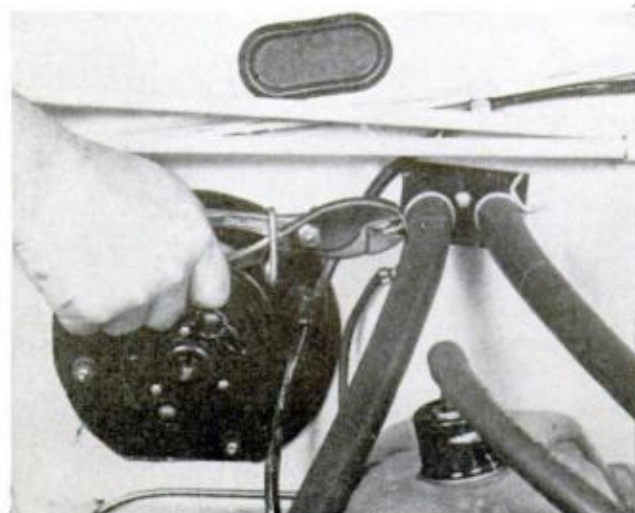
protection against freezing. In other words, as long as the antifreeze is not further diluted, the freezing protection provided by a specific amount of antifreeze when mixed with a certain amount of water lasts indefinitely.

Why, then, is it necessary to drain out "permanent" antifreeze? Why can't you leave it in your car's cooling system until it's so weakly diluted by the addition of water that it must be replaced?

The answer to these questions lies in the dual functions antifreeze is supposed to perform. It's supposed to protect against freezing, of course, but it's also supposed to protect the car's cooling system against corrosion.

Most quality antifreezes, "permanent" or otherwise, have inhibitors added to their base to retard corrosion. These inhibitors

LINES TO CAR HEATER shouldn't be overlooked when draining your car's cooling system. Detach at firewall and drain. Also, if your car's an older model, check whether it has a drain cock on engine block



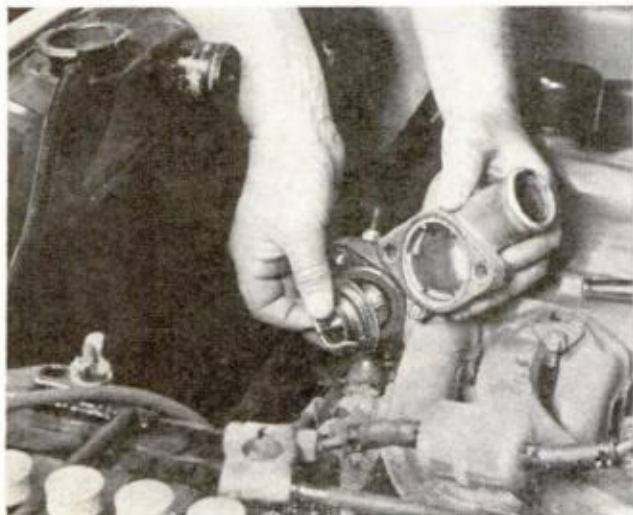
are needed to offset the natural tendency of metal to return to its organic state. Iron, for example, tends to return to its state as iron oxide which, when it appears in an automotive cooling system, is a formation that can clog the system. At first it appears black but as it absorbs more oxygen it turns a rusty brown.

Inhibitors used today take two general forms: One type of inhibitor is chemical in nature to counteract (or neutralize) the action of metal; the other type of inhibitor is the so-called polar film inhibitor that protects metal (aluminum in particular) by forming a film over it.

Various chemical inhibitors are added to antifreeze, then—each type designed to provide protection against a specific metallic corrosion problem. For many years, for example, the government specified sodium borate as the inhibitor for military vehicles equipped with cast-iron engine and cooling system parts. But this past winter, chemists at the Aberdeen Proving Ground came up with an inhibitor designed for today's higher-horsepower engines, in which aluminum components are used in conjunction with other metals. It consists of borax, disodium phosphate and something called mercaptobenzothiazole—and it's mixed right in with your radiator's water and permanent-type antifreeze. If you're a determined do-it-yourselfer, you can get a copy of the Army's report by ordering AD 433 829 from the Office of Technical Services, U. S. Dept. of Commerce, Washington, D. C. 20230, enclosing 75¢. Of course, most commercial antifreezes already contain more than one type of chemical inhibitor—one to protect iron, another for aluminum, still another for brass. You don't mix these in yourself.

The polar film inhibitor is a synthetic organic compound designed specifically to

REMOVING THERMOSTAT from system is easy, once housing is unbolted. Before flushing the system with water, replace the empty housing. See text for hot-water test to check thermostat operation



NOVEMBER 1964

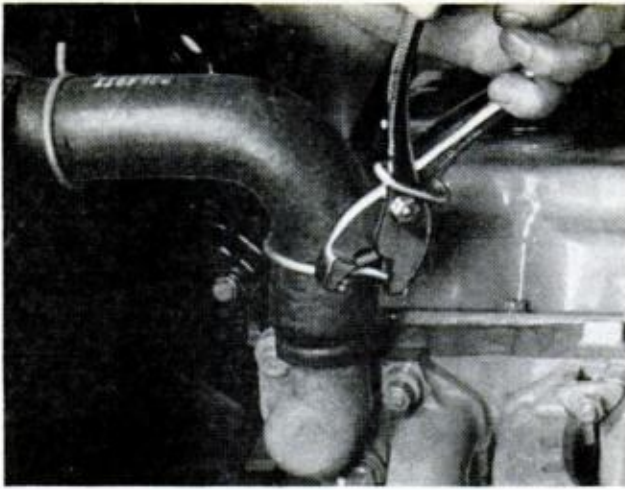


YOUR CHOICE OF ANTIFREEZE depends partly on the temperature rating of your car's thermostat, which is printed right on the unit. To this, add 20 degrees for "afterboil" and check boiling-point table on facing page. If figure is more than boiling point of methanol or ethanol, stick to "permanent" type

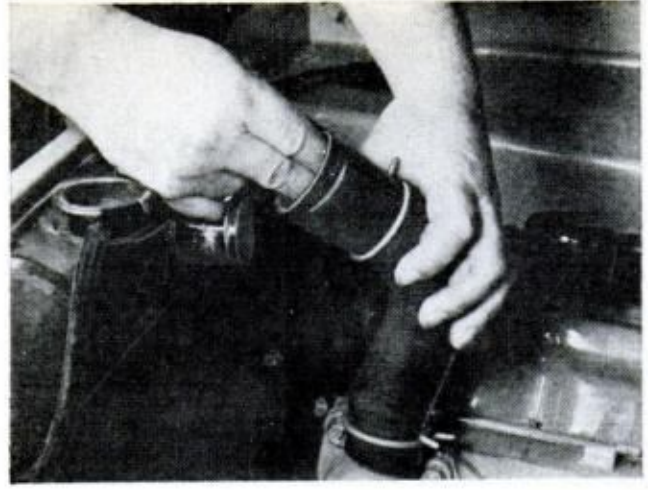
COOLANT LEVEL IS VITAL if you use other than "permanent" antifreeze; it must be checked frequently to guard against loss by "afterboil." And once you have to add water, you'd better check the solution with a hydrometer to make sure the proportion of antifreeze is enough for protection against freezing



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CHECK HOSE CLAMPS to make sure they haven't lost tension—and also that they aren't cutting into hose. Most new cars have spring-type clamps shown above; to check these, squeeze ends together with pliers



CHECK HOSE ITSELF by feeling inside and out. Reach in each end to see if hose feels rough or sheds flakes. Squeeze center part to check if it's too hard or spongy. These are signs it must be replaced

protect aluminum parts. The compound is suspended in the system as the antifreeze is added, but then forms a protective film over aluminum. Polar film inhibitors are used in combination with several chemical inhibitors to protect *all* metals.

The one specific reason why “permanent” antifreeze is *not* truly permanent involves these inhibitors. *They wear out with use. How quickly* is the question around which the present “one-year or two-year” controversy rages. Recommending “one year” usage are Union Carbide and Chrysler. Ford, General Motors, American Motors and some “permanent” antifreeze makers still recommend “two year” usage.

How quickly inhibitors wear out cannot be determined—if it could, there'd be no controversy. There are too many factors reacting against the inhibitors which make it impossible to reach a hard-and-fast rule for cars, straight across the board. Some of these factors are the mileage put on a car during a specific period, the temperature reached by the engine, the presence of an aeration condition, exhaust and fuel fumes that come into contact with the antifreeze, and the type of terrain over which the car is driven (mountainous, flat, near the ocean, or what have you).

In other words, the inhibitors in antifreeze become exhausted when used under any set of conditions, but this life expectancy also depends on how and where the car is operated, and on the car's mechanical condition.

Both sides in the argument agree that as soon as “permanent” antifreeze solution loses its original color and becomes tinged with the slightest bit of rust, it should be dumped immediately, no matter what the time factor. This must be checked when the coolant has been circulated—that is,

after the engine has been run a while.

The argument, basically then, is between a more conservative approach to time and a less conservative approach—a safer approach, if you will, and one that tries to extend the life of the solution so the customer can get maximum use from it. Both camps, naturally, have the interests of the customer in mind.

The most damaging piece of evidence against use of “permanent” antifreeze for more than one year was disclosed by Union Carbide Co.

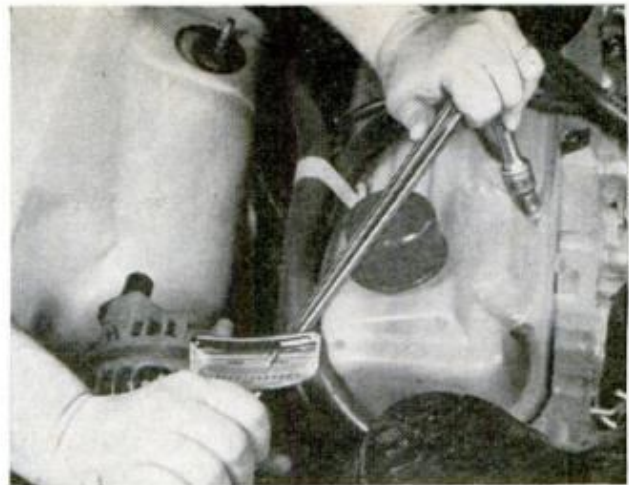
Union Carbide made a spot check of 2155 various cars filled with two-year factory coolant. It found that cooling system malfunctions were reported in one out of every 20 cars within the first year of service. Furthermore, the coolant in about 15 percent of the cars had lost 50 percent of its inhibitor protection between 8000 and 16,000 miles—and this same amount of protection was lost in about 33 percent of the cars with over 16,000 on them.

Union Carbide makes these other points to back up their position as to why “permanent” antifreeze should be discarded annually: too many car owners take the word “permanent” too literally and do not examine the coolant and, even if they did, most would not be able to recognize a weakened solution.

By an annual change of coolant, Union Carbide states that it means the antifreeze should be drained after a winter's use and new solution added in the fall, except in air conditioned cars. In these, antifreeze is required all year round to prevent freezing of coolant in the heater core. Thus, air conditioned cars, according to the Union Carbide theory, should have antifreeze changed twice a year: once in the fall, at the start of cold weather, and again in the spring when old antifreeze is dumped. (In



COOLING SYSTEM LEAKS? Small ones can be stopped by pouring a chemical sealer into the radiator. But as with any product you put into the works of your car, be sure to read the label instructions



USE A TORQUE WRENCH when you tighten cylinder head bolts, and check the specifications in your car's manual. If you overtighten—or tighten unevenly—with a regular wrench, you can cause serious damage

non-air-conditioned cars, it's assumed that a commercial inhibitor will be added to the radiator water for summer driving.)

Union Carbide, by the way, is so convinced of its stand that it refuses to designate as "permanent" its own antifreeze with an ethylene glycol base and polar film and chemical inhibitors.

If you use ethylene glycol ("permanent") antifreeze you can play it safe either by adding new antifreeze in the fall and draining it in the spring, or by checking your antifreeze color as often as you check your oil. The slightest off-color change can be a sign the solution has weakened and may need changing.

If antifreeze does become exhausted and contaminated without you knowing it, the car's cooling system can be severely damaged. And repair of that damage will cost you a lot more than the \$3 or \$4 needed to drain and replace antifreeze periodically.

What about using an alcohol-base antifreeze which costs about half what a "permanent" type will cost per quart? Will it do the job as well? Actually, the non-permanent alcohol-base antifreeze, methanol, provides *greater* freezing protection per unit volume than the "permanent" ethylene glycol type. But there's more to consider than this.

For example, today's engines run at high temperatures and every antifreeze solution has a boiling point—that is, a temperature level which, when reached, causes the antifreeze to boil and evaporate. In laboratory tests it's been proved that the "permanent" ethylene glycol type has a higher boiling point than either the alcohol-base methanol or ethanol types. A chart on page 178 gives comparisons.

When boiling of ethylene glycol solution occurs, it's not the ethylene glycol that

evaporates, unless that car reaches a temperature at which it's actually overheating. Instead, the water used in the solution evaporates. When this happens, you simply add water to bring the solution back to level, although to be safe you should always double-check the protection with a hydrometer.

When boiling occurs in cars equipped with a non-permanent alcohol-base antifreeze, the *antifreeze itself* evaporates. Thus, use of this type demands that you keep a constant eye on coolant level throughout the winter. If the level falls off and you have to add coolant, it must be in the form of new antifreeze to maintain protection against the low temperature. This additional antifreeze, then, could in the long run be more expensive for you than if you filled the cooling system with ethylene glycol to begin with.

Another factor to mull over in your consideration of what antifreeze to use is the type of heater you have in the car. Most cars produced in the 1960's have forced air heaters. These usually require a 180° or higher thermostat to operate efficiently. The addition of alcohol-type antifreezes to the cooling system demands lower temperature thermostats, usually those rated at 149° or 160°, to offset boiling.

In other words, the 180° thermostat needed for efficient heater operation doesn't permit the antifreeze to circulate and cool until it reaches 180°, which is too close to the boiling points of methanol and ethanol. Thus, on the one hand (by switching to a lower-temperature thermostat), you compromise heat output. On the other hand (by keeping the 180° thermostat), you maintain heat output but stand a good chance of boiling out the antifreeze.

There is no such problem with most cars

[\(Please turn to page 204\)](#)

AUTO CLINIC

Plastic seats may look good, but mine give me a shock when I touch metal after sliding in or out of the car, especially on dry winter days. What can I do?—D.E.F., Iowa

There are two ways to avoid this disadvantage of plastic upholstery: For one, whenever you get into and out of your car grab hold of the metal door handle before sliding across the seat and hold on until you've settled yourself or are out of the car. In doing this, you're grounding yourself to offset the effects of static electricity. A more positive cure, though, is to ground out the car by bolting a static strap to the chassis beneath the car and letting it drag on the ground. You can buy these straps in any auto supply store.

Oil has been leaking from around the valve covers of my 1961 Corvair since the car was fairly new, despite constant tightening. Is there a way of stopping it?—D.R.S., Ohio

In any car, some seepage around valve covers is normal. But Corvairs of 1960, 1961 and early 1962 vintage have all been plagued by excessive leakage. Chevrolet came out with a different type gasket and valve cover midway through 1962 that controls the leaks, although periodic tightening of the cover bolts is still needed. The gasket is a rubberized affair containing little tabs on it that block excessive oil leakage. It carries part number 3850944 and sells for 85 cents. If you wish, you can use them with the old valve covers, but the covers will have to be cut to match the shape of the gasket. Or you can buy a new valve cover made to accept the gasket for \$1.75. The new cover has part number 3813005.

The temperature and fuel gauges of my 1960 Falcon have recently started to register all the way to the right—hot and full, respectively—as soon as I turn on the ignition key. They remain in this position until I turn off the key. Any tip?—M.H.M., Calif.

Yes, and it's one all Falcon owners should keep in mind. The instrument panel of a Falcon has a constant

voltage regulator (part number B9M1080-4A). As its name implies, it sends constant voltage to the instruments to keep them at an accurate and true reading. When this regulator burns out, though, which happens after several years in use, a surge of volts is sent to the instruments that either burns them out completely or distorts them. You must now replace the regulator and the instruments. It's a pity about the instruments, but once they're hit by the voltage surge there's no way to realign them—they're ruined.

My 1963 Mercury is a gas hog. I get about 8 miles to the gallon around town and about 13 miles on the highway. Is there any information on this engine which explains why it uses so much gas?—H.A.R., Ill.

For every two complaints of a mechanical problem, we receive one letter complaining of gas mileage. While we can usually answer the former with specific information, we've become increasingly frustrated with the latter, because there is no one answer to a gas mileage complaint, no matter what kind of a car is involved. So let us take advantage of this opportunity to compose a sort of "open letter" to cover all those gas-mileage complaints:

"Generally, there are four reasons why cars seem to use an excessive amount of fuel. In the order of prevalence, these are (1) inaccurate computation by the owner, (2) the way the car is driven, (3) the nature of the beast, (4) mechanical.

"If gas consumption is being caused by a mechanical problem, no one can determine what that problem is without being able to test the car. There are just too many mechanical conditions that affect mileage, such as an inoperative or rich choke, inoperative manifold heat control valve, incorrect idle adjustment, misaligned carburetor float level, improper timing, dirty air cleaner, incorrect or damaged ignition parts, inoperative metering valve in the carburetor, high fuel pump pressure, faulty fuel gauge which leads to an erroneous assumption—to name a few. So, if you believe you're using too much gas, getting that car tuned up by the book is your first course of action.

"Most drivers compute their gas mileage to be 'about' so-and-so, but the only accurate way to compute fuel consumption is to have a garage perform a mileage test using an accurate meter. This will tell you exactly how much gas a car really uses under the expert, gas-conserving driving of

a specialist. Odds are that in every four out of five cases the consumption rate shown by the meter will be much lower than the owner computed.

"If, finally, the gas meter test shows that the car is using excessive fuel after that car is tuned, then the only conclusion can be that this is what the car uses and there's nothing to be done about it, except trade it in. If a car buyer's primary interest is in economical operation, he shouldn't buy a car with a 390 CID engine, automatic transmission, power brakes and steering, and air conditioning."

Q The other night I happened to raise the hood of my 1959 Dodge Sierra station wagon while the engine was running and saw sparks jumping from around the wires going from the distributor cap to the spark plugs. Scared me, so I changed the distributor cap, wires and even the coil, but the sparks still jump. What's causing it and what can I do about it?—L.K., Penn.

A Weak insulation on the wires could be a cause, but since you changed the wires it's almost a sure bet you have too many resistors in that ignition, which could be causing a build up of voltage and current jumping from the wires. A car may have resistor-type ignition wires, resistor-type spark plugs and even a resistor in the distributor cap. Only one is needed—not two or three—and only one should be used if you want to avoid jumping sparks.

Q Could you please advise what to do to stop my 1962 Chrysler from stalling while idling when there's the least bit of moisture in the air and the temperature is below 50 degrees?—D.S., Mich.

A This is a problem that's plagued Chrysler Corp. for several years. As soon as the temperature gets below 50 degrees and there's moisture in the air, frost forms around the carburetor throttle plates and impedes the flow of gas to the engine. This is called carburetor icing. About the only thing you can do is switch to a gasoline that advertises itself as containing a de-icer. If this doesn't work or you don't want to switch fuels, I suggest you go to your local auto supply outlet and buy some cans of so-called dri-gas. This has been known to prevent carburetor icing when used as directed.

Monthly Service Tips

★ Ford has changed its specifications on adjusting steering gear assemblies for all 1958 through 1963 cars with ball-nut-design setups. The idea is to provide closer tolerances and improve operation. Two adjustments are involved—worm bearing preload and total center mesh load. Why not make a note of the adjustment for your car and remind your mechanic of it, next time you take your car in?

Worm Bearing Preload	Total Center Mesh Load
All manual steering gears	
5-6 lb.-in.	12-13 lb.-in.
All power assist steering gears	
3-4 lb.-in.	8-9 lb.-in.
Integral power steering gear	
6-8 lb.-in.	15-17 lb.-in.

★ The Oldsmobile F-85, which has been bothered by malfunctioning lower ball joints on 1961 through 1963 models, now has a completely new package to replace the original ball joints. The package consists of the joint, lube fitting, nut and seal. It carries part number 383009, and your Olds dealer has it.

★ The 1964 V-8 Tempest with model 2GC 7024062 carburetor has experienced some engine loading problems during starting and cold-engine driving; it's been traced to the intermediate choke rod setting, which has now been revised so the choke piston is .040 in. out of bore. See your Pontiac dealer, to avoid the problem this winter.

★ Man from Cadillac just called us to say that the hub-cap click a reader complained of in our Sept. column is caused by a loose crest plate. To silence it, just crimp the tabs that hold the crest on the hub cap.

PATIENCE, PLEASE

We're sorry that the ever-increasing volume of Auto Clinic mail has swamped us, so that personal replies to readers' problems are unavoidably delayed at present. We're taking steps to speed up this service—and you can help: Inquiries accompanied by a stamped, self-addressed envelope will receive first attention.

CONCLUSION

ROLLER-ACTION SHEET-METAL BRAKE

By Manly Banister

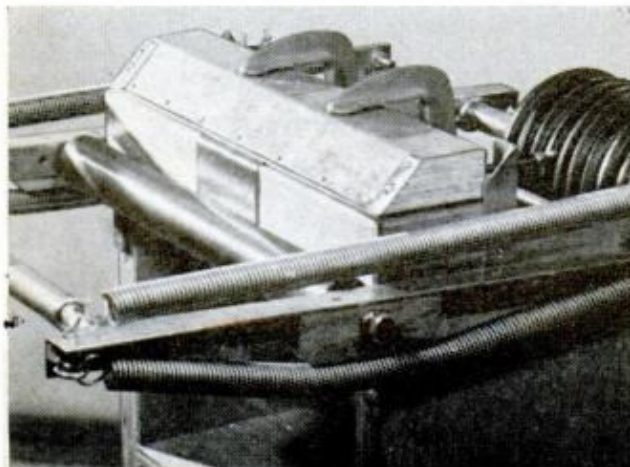
Last month we showed you how to build it. Here's how you use it.

TO ASSURE bends square with the edge of the metal, check placement of the work with a try square held against the beveled holddown block used in most bending



WITH its main beveled clamping block, plus additional bending forms of special shapes which are used either in conjunction or separately, you'll be able to make just about every bend possible with your new roller-action sheet-metal brake. It's simply a matter of selecting the proper clamp block or molding form. After you've done that, just keep in mind the golden rules of brake operation: Make

RADIUS BENDS up to $\frac{3}{8}$ in. can be made by bolting a $\frac{3}{4}$ -in. hardwood board (with top edge rounded) across front of brake and bringing roller downward



square bends by bringing the roller downward and bending the metal over the edge of the table; use a downward motion for bends over the molding forms, and finally, for bends formed with the clamping block, bring the roller upward. That, in a nutshell, is about all you'll need to know in order to be able to do basic work, but let's consider a few fine points:

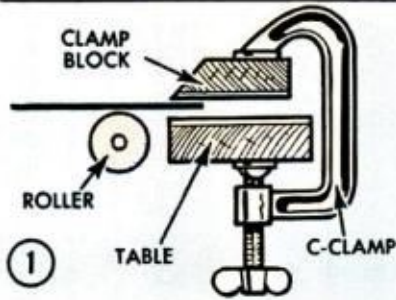
Metals, particularly in the heavier gauges, tend to spring back slightly after bending. You can compensate for this by bending the work about 5 deg. more than is desired. The easiest way to do this is to bevel the forming block an additional 5 deg. or you may prefer to increase the bend by simply tapping it with a mallet.

Large work that exceeds the capacity of the clamp blocks can be handled by using a little ingenuity. A long rectangular tube, for example, can be made in sections.

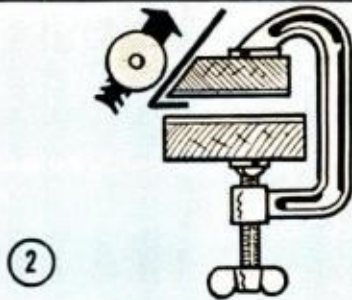
A worthwhile precaution when working with soft metals is to slip a piece of paper between the roller and the metal to prevent marring.

As is true in any shopwork, nothing can replace actual experience. In working with your brake, you'll soon work out your own setups. ★★★

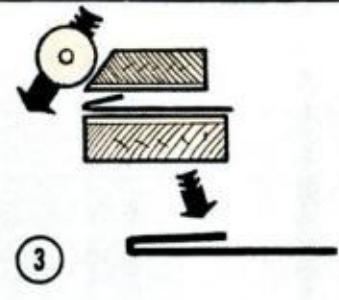
FORMING SINGLE AND DOUBLE HEMS



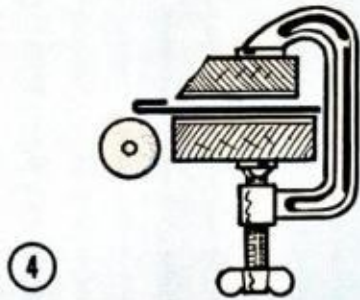
1 INSERT SHEET METAL TO DEPTH OF FOLD AND CLAMP



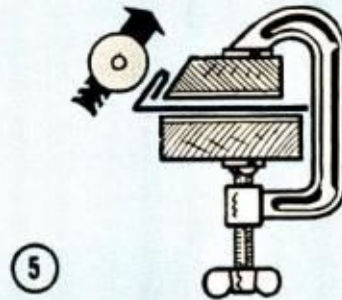
2 LIFT SWEEP TO RUN ROLLER UPWARD, FORMING THE LOCK



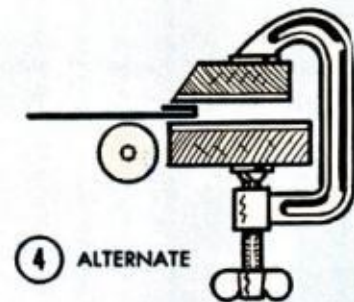
3 REMOVE CLAMPS AND RUN ROLLER DOWNWARD TO FORM SINGLE HEM



4 CLAMP METAL WITH HEM OUTSIDE

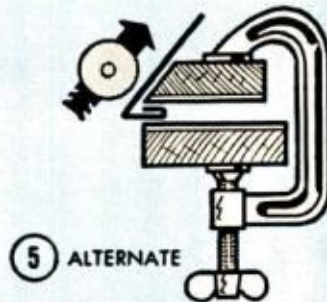


5 AND RUN ROLLER UP



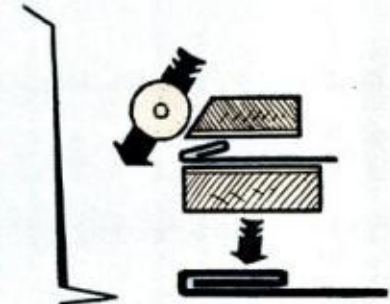
4 ALTERNATE

INSERT HEM UNDER CLAMP



5 ALTERNATE

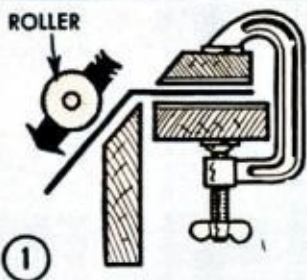
RUN ROLLER UP



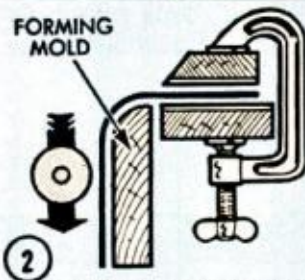
REMOVE CLAMP, THEN RUN ROLLER DOWNWARD TO FLATTEN AND FORM THE DOUBLE HEM

SINGLE HEM is made along edge when two sheets of metal are to be joined—or to eliminate a sharp edge. A double hem is made to provide additional strength and to add a finished look

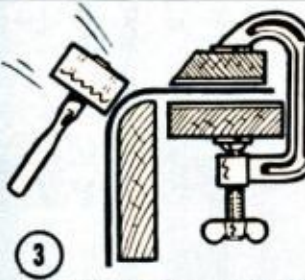
MOLDING FORMS SIMPLIFY TRICKY BENDS



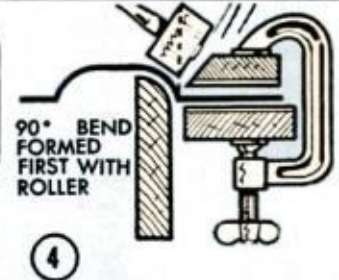
1 BENDING A LESS THAN 90° ANGLE WITH FORMING MOLD



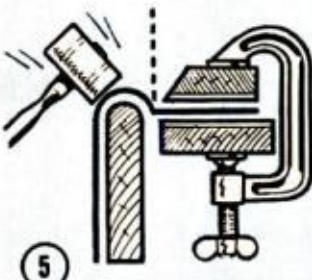
2 MAKING A RADIUS BEND WITH THE SWEEP (UP TO 3/8" RADIUS)



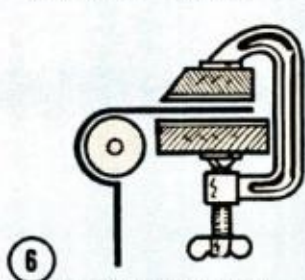
3 BENDS LARGER THAN 3/8" ARE HAND MADE USING MALLETS OR HAMMER



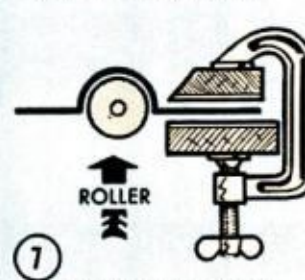
4 90° BEND FORMED FIRST WITH ROLLER
REVERSE RADIUS BEND USING MOLD AND MALLETS



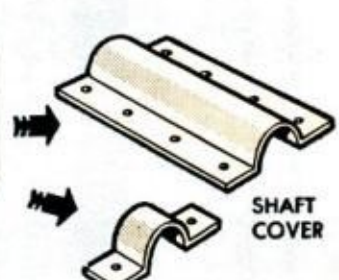
5 FORMING A COVE WITH FULL ROUND MOLD



6 ROLLER IS FORM FOR LARGE-RADIUS COVES
SUBSTITUTE PIPE FOR SMALLER ONES



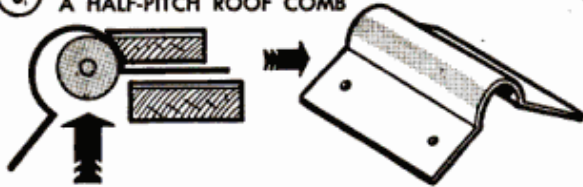
7 AFTER RADIUS BEND RAISING ROLLER (OR PIPE) COMPLETES COVE



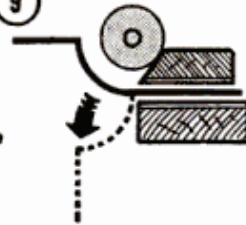
PIPE CLAMP
SHAFT COVER

CONTINUED

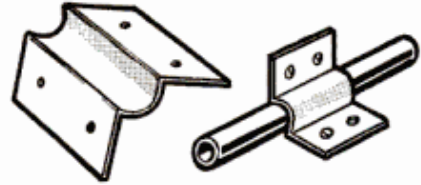
8. CLAMP BLOCK REVERSED TO MAKE A HALF-PITCH ROOF COMB



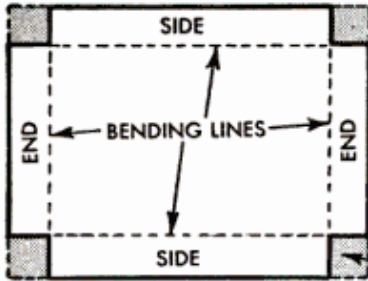
9



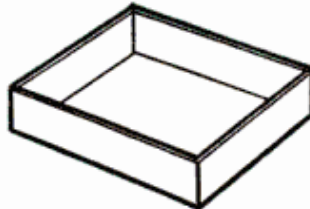
REVERSE OPERATION TO PRODUCE AN INSIDE CORNER BRACKET



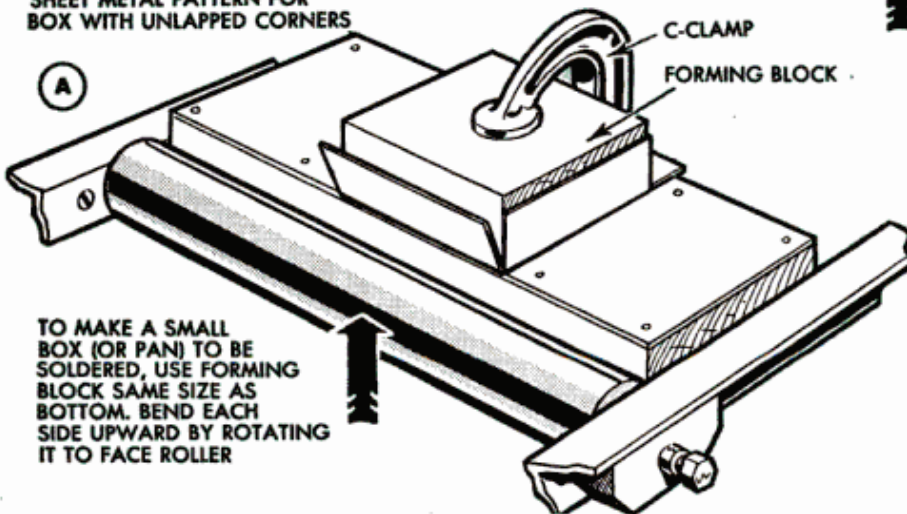
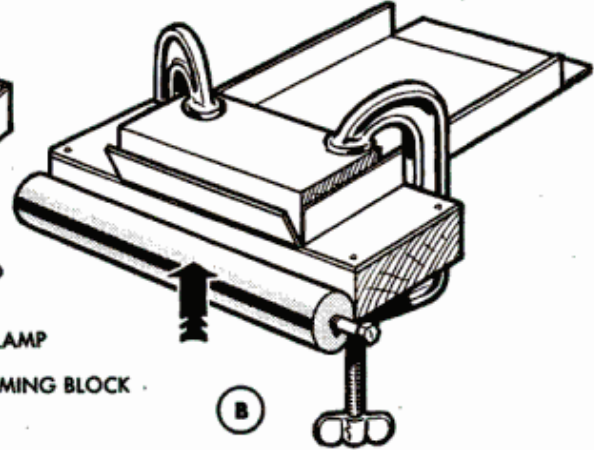
FORMING A BOX WITH SOLDERED CORNERS



SHEET METAL PATTERN FOR BOX WITH UNLAPPED CORNERS



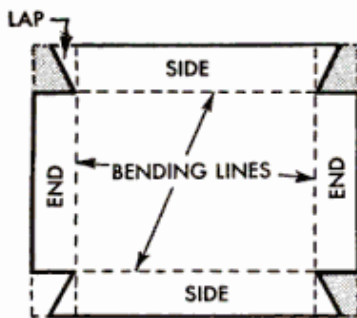
CUT OUT FINISHED BOX—CORNERS SOLDERED



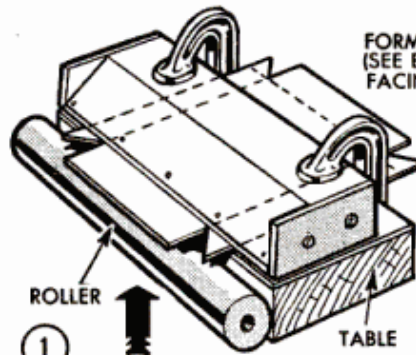
TO MAKE A SMALL BOX (OR PAN) TO BE SOLDERED, USE FORMING BLOCK SAME SIZE AS BOTTOM. BEND EACH SIDE UPWARD BY ROTATING IT TO FACE ROLLER

IF BOX IS LARGE, USE TWO FORMING BLOCKS—ONE AS LONG AS A SIDE, THE OTHER THE LENGTH OF AN END. WHERE SIZE OF BOX PERMITS, BEND EITHER PAIR OF OPPOSITE SIDES DOWN FRONT EDGE OF TABLE, USING 45° CLAMP BLOCK. BEND OTHER PAIR UPWARD, USING FORMING BLOCK AS SHOWN ABOVE

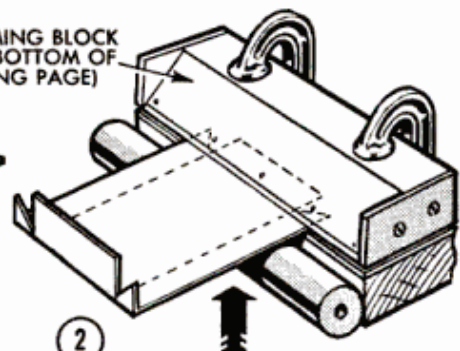
FORMING A BOX WITH RIVETED CORNERS



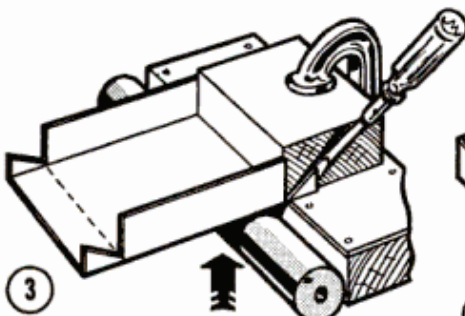
SHEET METAL PATTERN FOR BOX WITH LAPPED CORNERS



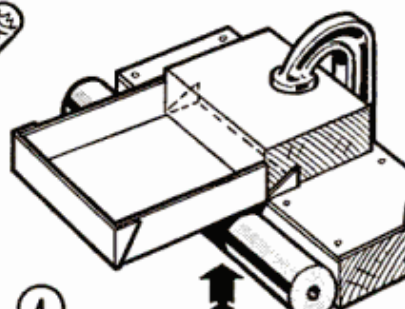
1 LIFT ROLLER, BENDING ONE END AND TWO LAPS SIMULTANEOUSLY



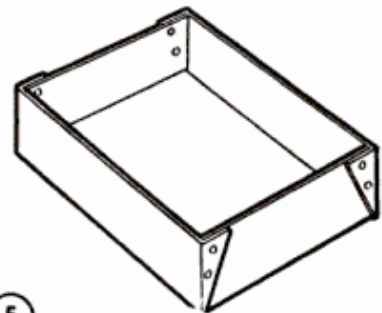
2 CLAMP SECOND END AS SHOWN, LIFT ROLLER TO BEND UP BOX



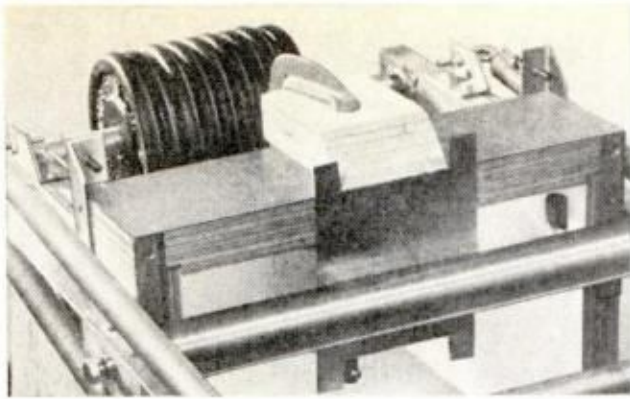
3 CLAMP SIDE UNDER SPECIAL BLOCK, LIFT ROLLER; AS ENDS FOLD DOWN, GUIDE THEM INSIDE LAPS. BEND LAPS SLIGHTLY OUTWARD.



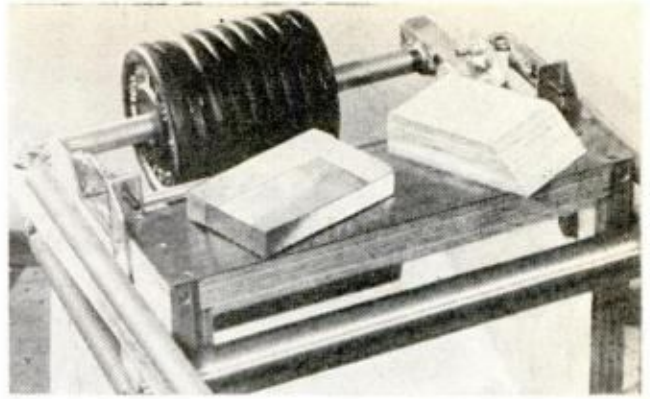
4 CLAMP OPPOSITE SIDE, REPEAT OPERATION TO COMPLETE BOX



5 FASTEN EACH LAP WITH TWO RIVETS—MORE FOR DEEPER BOX

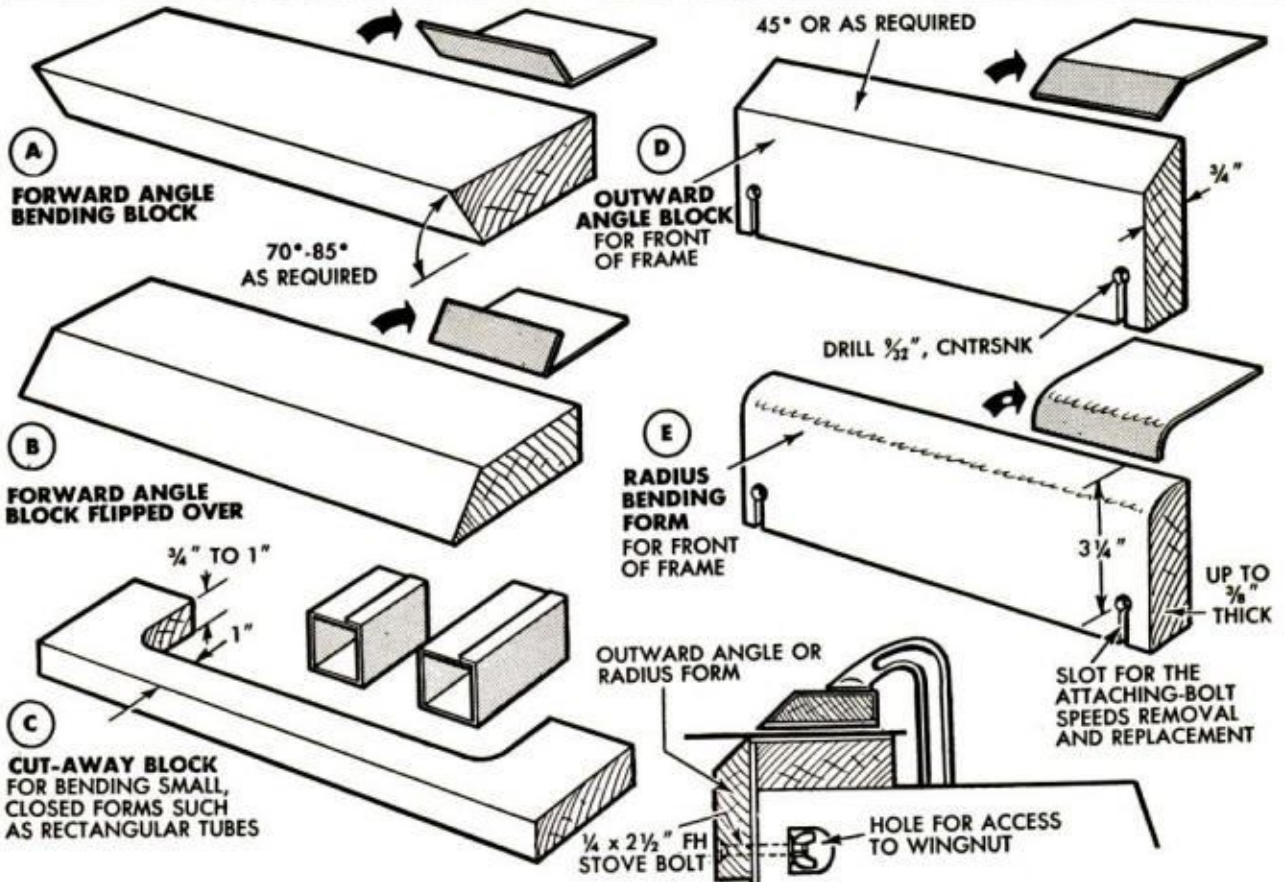


ALTERNATE METHOD of forming lap-corner box. Here ends between corner tabs are clamped first with beveled holddown block for downward roller action



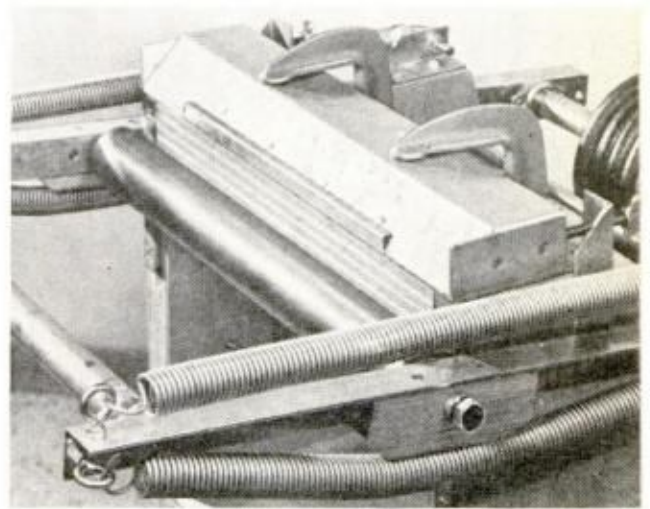
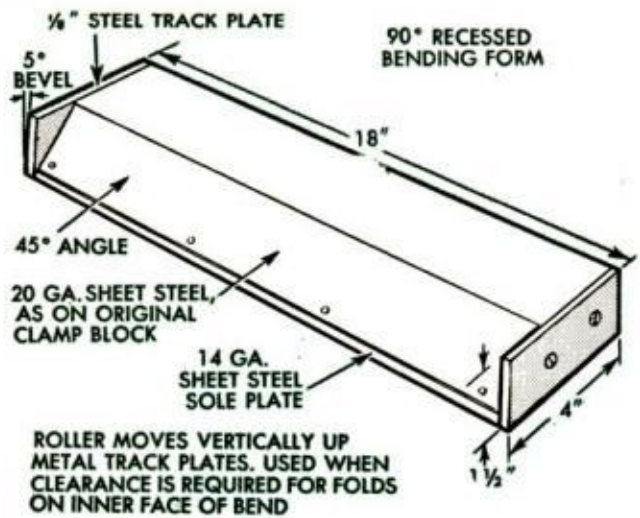
SIDES OF BOX are bent up around same holddown block with upward sweep of the roller, then corner tabs are bent over ends with mallet, for fastening

EXTRA BLOCKS — AND THE BENDS THEY MAKE

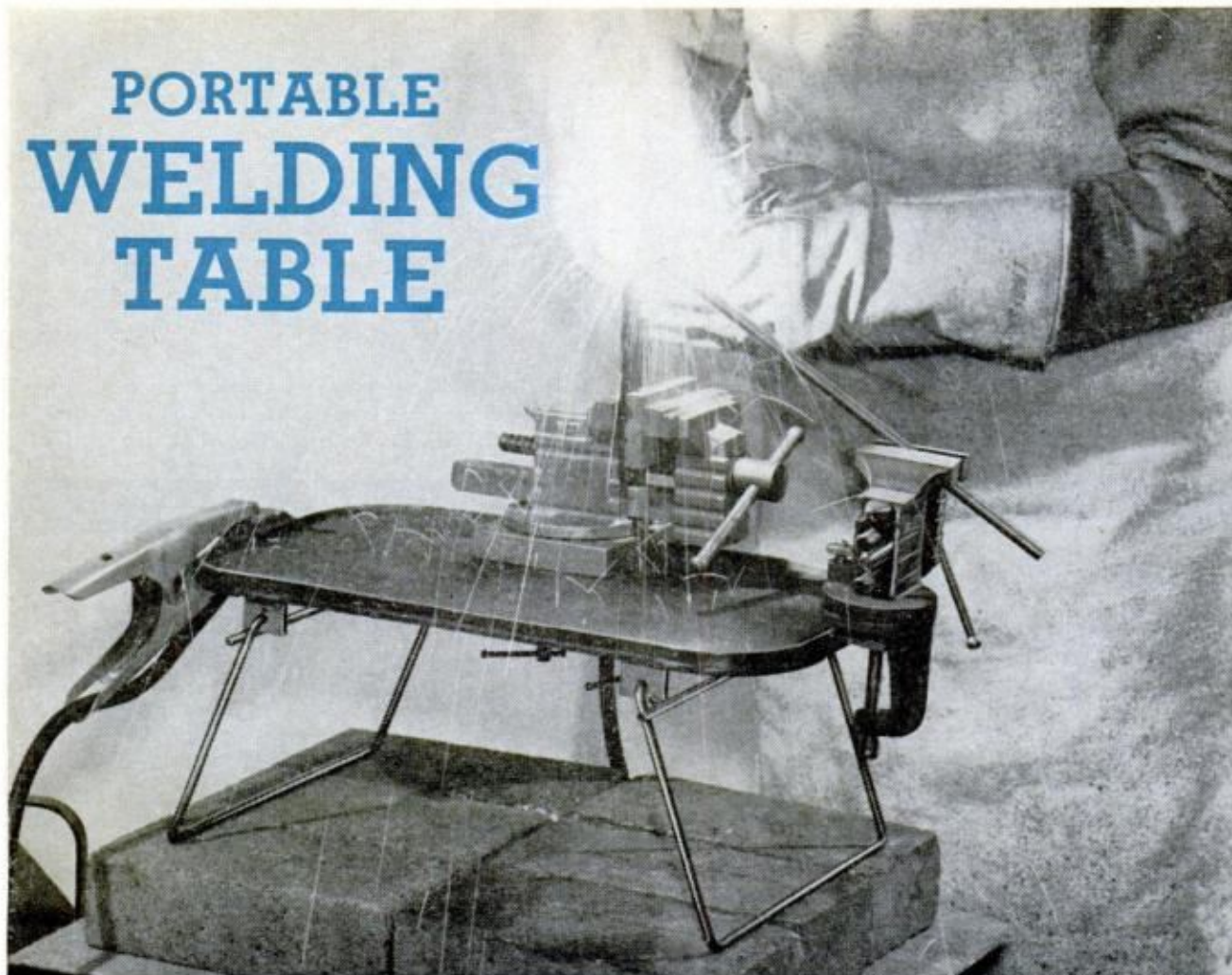


RECESSED FORM is a versatile accessory. It can be used to construct boxes and bend narrow channels

UPWARD MOVEMENT of roller combined with a 90 deg. recessed bending form produces precise channel



PORTABLE WELDING TABLE



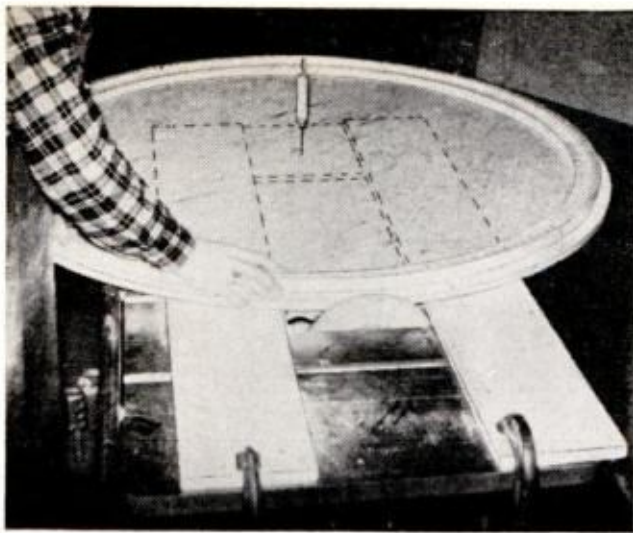
BY STARTING OUT with an old cast-iron griddle, or a new one, you have the makings of a dandy 10x17-in. portable welding table that is especially handy for work too small to permit attachment of the ground clamp of your welding equipment.

The old grease can be removed by boiling the griddle for 15 minutes in a solution of sodium carbonate and water. Use about six tablespoons in enough water to cover the griddle. The four lugs used to

attach the legs, are cut from mild steel and drilled as shown. Before welding them to the bottom of the griddle, grind the weld areas to remove the "skin." When using the table, clamp the ground clamp to the edge and hold the work in a small clamp-on bench vise.—*Manly Banister*



FOR SHELF STORAGE or easy transportation the legs may be folded. Note leg stop rods welded to lugs



Sanding a Large Disc

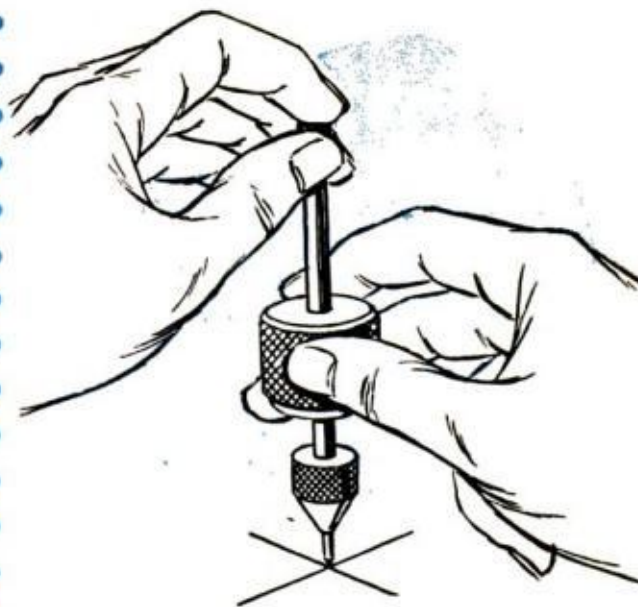
Recently I was faced with the job of truing the edge of a large wooden disc. Actually, my real problem was supporting it while I revolved it past the sanding disc. I solved the problem by using the table of my circular saw to support a U-shaped extension platform (dotted lines, above) secured at its open end with C-clamps. By mounting a sanding disc on the saw arbor in place of the blade and then drilling a hole in the exact center of the work to pass the point of an awl, I was able to anchor the disc to the extension platform by means of this central pivot, and thus sand a perfect circle.—Wayne Judy

It's Better Together

When it comes to oiling squeaks, lubricating oil alone isn't always the answer for it often dries out quickly. Graphite on the other hand is not always easy to apply in inaccessible places. The answer is a mixture of the two, adding dry graphite to the oil in your oilcan. Thus the graphite extends the life of the oil, while the oil serves as a carrier for the graphite.



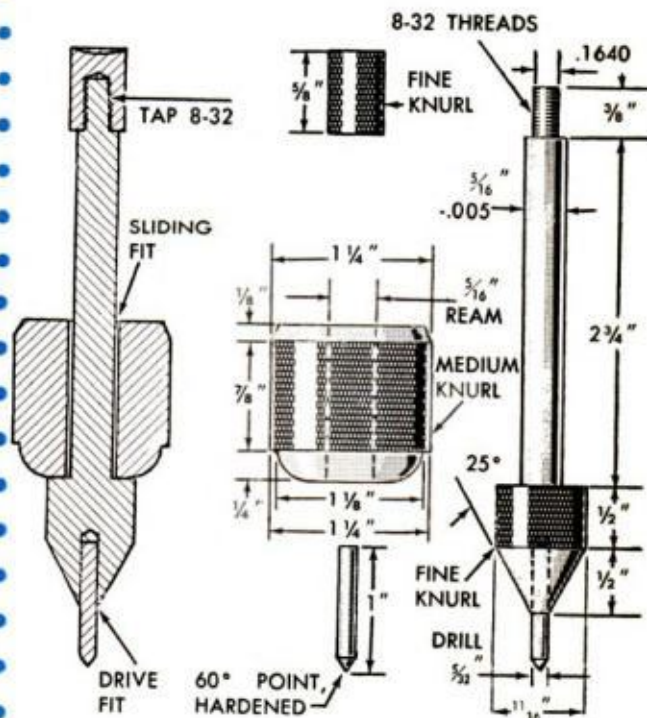
NOVEMBER 1964



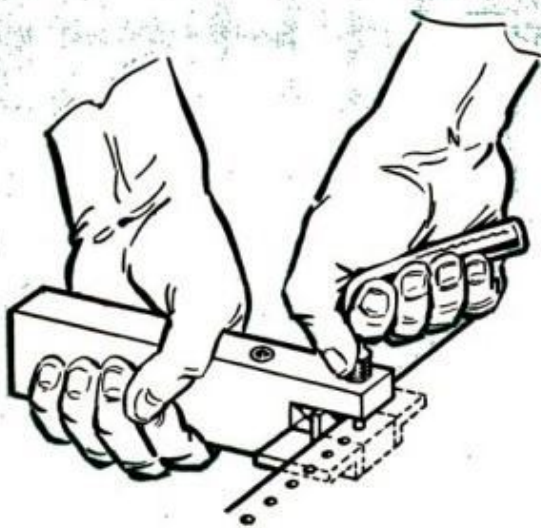
DROP PUNCH

Marking locations of holes to be drilled when you're laying out precision machine work is a quick and easy job with this drop-hammer center punch. Actually, it's a double purpose tool; by simply grinding the point to a greater degree, the tool can also be used as a prick punch. You'd want to turn another shank for the extra point, but you can use the same hammer and cap.

All parts are turned from tool steel to the dimensions shown. The hammer must be an easy sliding fit on the shank, and both parts (after being knurled) are hardened and the temper drawn. The point, made up separately, is also hardened, driven in place and then ground to a 60-deg. angle, or to a greater point if intended for use as a prick punch.—C. W. Woodson

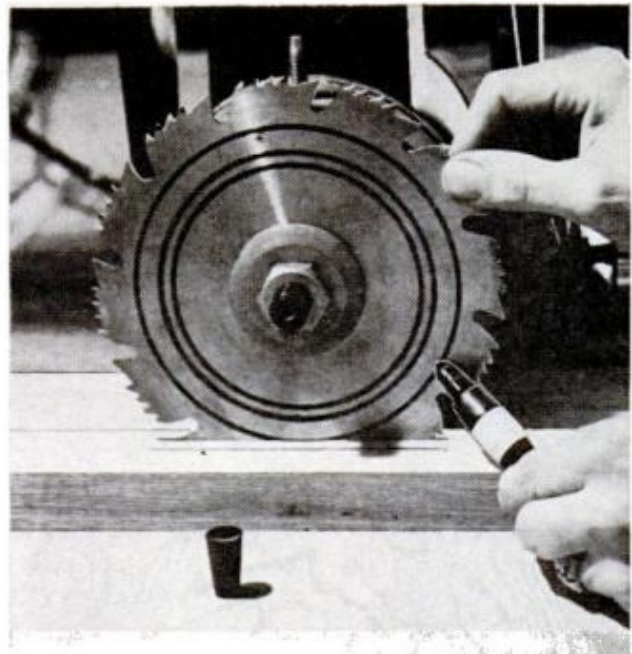
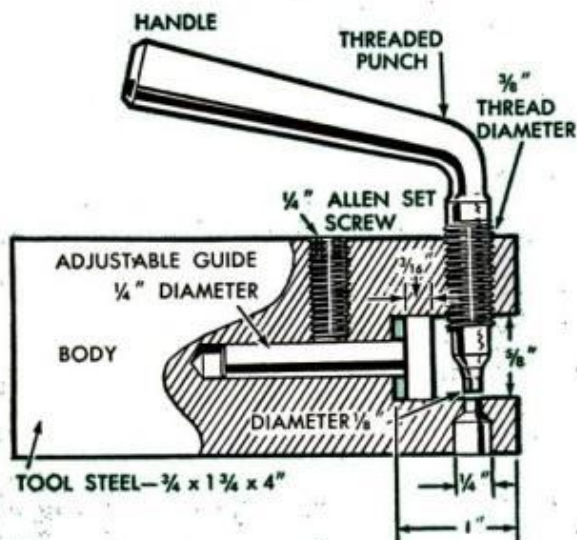


189



HOLE PUNCH

This simple, easily operated tool will punch clean rivet holes along the edges of sheet metal with a turn of a handle. It can be made for use either in a vise or hand-held. Make the body and the threaded punch from tool steel, then harden and temper. If you plan to use the tool mounted in a vise, follow the dimensions in the drawing below. For a hand-held model, add 4 in. to the length. The punch's cutting end should be turned to an easy push fit in the punch hole, which is drilled and countersunk in the lower part of the body. To operate, insert the sheet metal against the adjustable guide and turn the handle.—C. W. Woodson



Instant Dado Settings

When dadoing with a radial saw, you can speed the work by calibrating the blade for $\frac{1}{2}$ -, $\frac{3}{4}$ -, 1-in. standard depths. After determining each blade position with test cuts, touch the face of the blade with a marking pen and rotate the blade by hand to form a circle. Each circle should be located so that when its lowest segment just disappears into the cut, the blade is at the depth desired.—J. Dany

Jointer Shavings Catcher

Running even a single board through a jointer can spew shavings over most of your workshop floor. You can avoid cleaning up this litter if you cut a cardboard carton to fit against the jointer chute in such a way that it will catch and hold the shavings. Tie it to the machine with a length of clothes line—or a large elastic band.—Wayne M. Judy



"Mothballing" Your GARDEN TOOLS

BEFORE PUTTING AWAY your garden tools for a well-earned rest, take time to clean and oil them so they'll be in good condition when spring rolls 'round again.

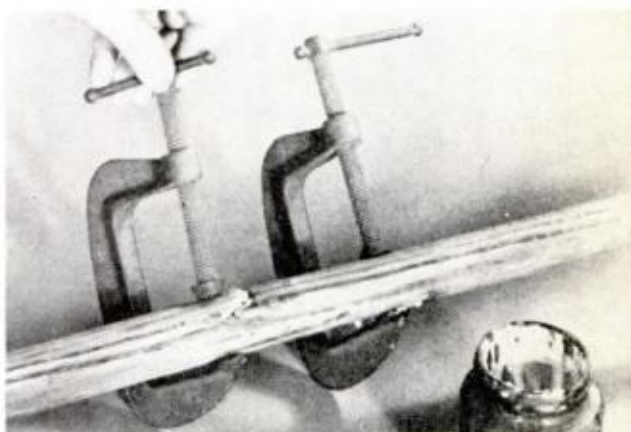
Start by removing all rust and dirt with a wire brush and emery cloth, or a mixture of sand and lubricating oil. Sharpen the blades of all spades, hoes and shovels with a file, and coat them with asphalt varnish or heavy grease to prevent rust.

Handles require close attention. Loose rivets, which cause the handles to wobble, should be tapped tight or replaced. Rough spots should be sanded smooth and sealed with linseed oil. If a handle is split, don't bind it with tape, which is a temporary measure at best. A fairly long, slanting split is easily repaired with waterproof glue. A handle with a sharp break, however, must be replaced.

To store the tools, hang them blade up on a rack, which is easily made by driving pairs of 10d nails in a board. Now sit back and relax: Your tools will be ready next spring.—Willard and Elma Waltner



WIRE BRUSH, followed by emery cloth, removes rust and caked-on dirt from spades, trowels and shovels



SPLIT HANDLES get new lease on life with waterproof glue. Work glue well into the split, then clamp



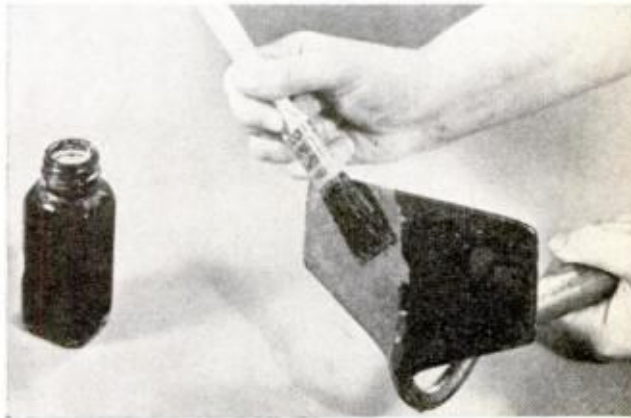
KEEP MOISTURE OUT of handles by sanding any rough spots, and applying several coats of linseed oil

AN 8-IN. MILL FILE makes fast work of sharpening blades. For curved-edge tools, use half-round file




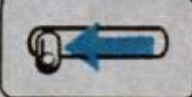


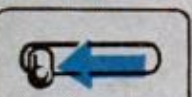







LIGHT RUST AND DIRT comes right off when you work tool in a bucket of sand mixed with machine oil

ASPHALT VARNISH thinned with turpentine, or a coat of heavy grease, will keep blades from rusting



4 - SPEED REVERSIBLE 1/2"

You shift gears to change speed mechanically,
flip a switch to choose speeds electronically.
A third switch gives all 4 speeds in reverse

TYPICAL JOB	SWITCH POSITION AND SPEED RANGE
	<p>1: LO-LO</p>   <p>300-630 RPM</p>
	<p>2: LO-HI</p>   <p>540-730 RPM</p>
	<p>3: HI-LO</p>   <p>1320-2200 RPM</p>
	<p>4: HI-HI</p>   <p>1950-2400 RPM</p>

ONE OF THE BOOTHS at New York's annual Hardware Show, last month, featured the debut of a remarkable drill that might well change your mind about not needing a 1/2-in. size around home. Though built to industrial standards for continuous use in plants, and powered by a half-horse 6-amp. motor, the Wen Model 950 boasts a new concept of speed-adjustability that makes it the closest thing we've seen to a single drill for *all* jobs with *all* accessories.

Until now, 1/2-in. drills have featured high torque for boring large holes in tough material, plus low speed so big bits wouldn't burn up. But these were bonuses the average drill-buyer needed too seldom to justify the higher cost and clumsier heft of this big brother of the portable drill family. If he wanted lower speeds, he usually settled for an adjustable-speed 1/4-in.

Speed variation in such drills is achieved by reducing the electrical input to the motor, usually by chopping off half of the current pattern, as diagramed next page. But the *torque* of these drills stays about the same at all speeds and may even be *reduced* at the lowest ones—precisely where the greatest torque is needed.

To solve this problem, the Model 950 takes its cue from the automobile and achieves its major speed reduction by shifting from one *gear ratio* to another. But the rectifier concept isn't discarded: it's used to provide a choice of two speeds in both gear ratios, for a total of four combinations without loss of torque.

Since portable circular saws operate at more than 3000 r.p.m. you need a high-speed, high-torque drill to power a saw attachment at equivalent speed and power. The same goes for portable planes, and for a sabre saw attachment when it's used to cut wood. With a metal-cutting blade in the sabre saw, however, you use the lowest speed setting. Sanding attachments call for a similar range, and the settings on the Model 950 offer full choice: for the belt type you use the LO-HI speed, for orbital sanders, the HI-LO, for disc, HI-HI.

We found the 11-in., 6 1/2-lb. body well balanced enough for one-hand horizontal drilling. The pipe handle unscrews and the top of the housing is almost flush with the chuck, permitting tight-spot drilling and the use of standard attachments. The flat rear casting lets you apply pressure with your chest for drilling tough materials.

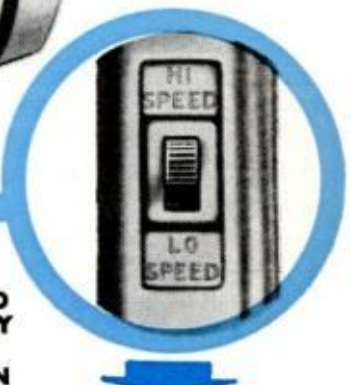
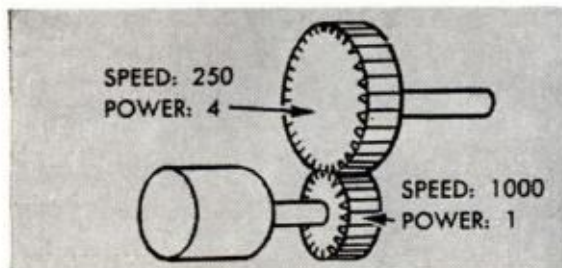
DRILL

TRIO OF SWITCHES gives drill its versatility. Stick shift (left) changes gear ratio. Further speed choice comes from rectifier switch (below right). Switch at right prevents accidental reverse

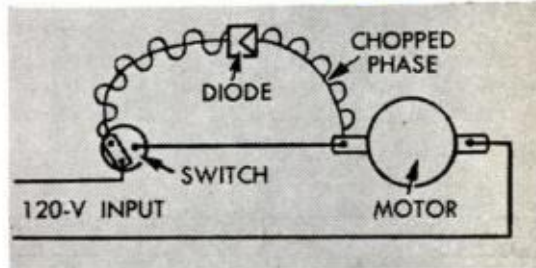
MOTOR REVERSE (DOUBLE SWITCH FOR SAFETY)



GEAR REDUCTION BOOSTS TORQUE



MOTOR SPEED REDUCTION BY HALF-WAVE RECTIFICATION



NEXT MONTH IN SHOP AND CRAFTS

CHRISTMAS DOOR DECOR. You can turn your storm door into a giant greeting card with festive 3-D inserts designed to fit into the glass opening. In the December issue, you'll find Project-A-Plans for three such inserts—traditional cherubs, a manger scene or a sprightly modern Santa Claus with a cheery red light-bulb nose. Don't miss this holiday special

HEAT TREATING IN THE HOME SHOP. If you're looking for a complete course in heat-treating steel, pick up the December *PM*. You'll find an article that takes you step-by-step through annealing, forging, hardening and tempering without the use of confusing graphs or bewildering technical jargon. There are plans for building a tempering oven and a home forge, working drawings showing you how to make your own hand tools and plenty of information on how (and where) to buy your steel, and which kinds do the best jobs

MULTI-ADJUSTABLE DRILLING JIG. Next month *PM* brings you plans for an easy-to-make jig that lets you drill true and accurate holes for dowel joints every time. It can be adjusted to take any of the common dowel sizes and guarantees that the holes on either side of the joint will align perfectly. If you're a furniture enthusiast, here's one just for you

CHRISTMAS GIFTS. *PM's* gift to you this Christmas is a bagful of plans for attractive and inexpensive gifts. The December issue contains Project-A-Plans for clever animal shapes that become trivets, bulletin boards or bookends when faced with cork or ceramic tile. From an electronic bank for Junior to a modern two-way coffee table for your wife (it converts into a smart dining table in seconds), *PM's* December gift selection is packed with ideas

Add a UHF Tuner Inside Your TV

Add 70 new channels to your TV. Takes only an hour, costs about \$20, adds hours of new viewing

By Larry Steckler

THE ULTRA HIGH FREQUENCY boom is on. Since the FCC ruling requiring all new TVs to be equipped for both the vhf and uhf channels, more and more new uhf stations are going on the air. But what about the man with a TV receiver that will only pick up the vhf channels (2—13)? He's out in the cold as far as the uhf channels go and there are 70 of them (channels 14—83).

There are two ways uhf can be added to a vhf receiver. A uhf converter can be connected to the set or a uhf tuner can be added inside the cabinet. We decided to add the tuner.

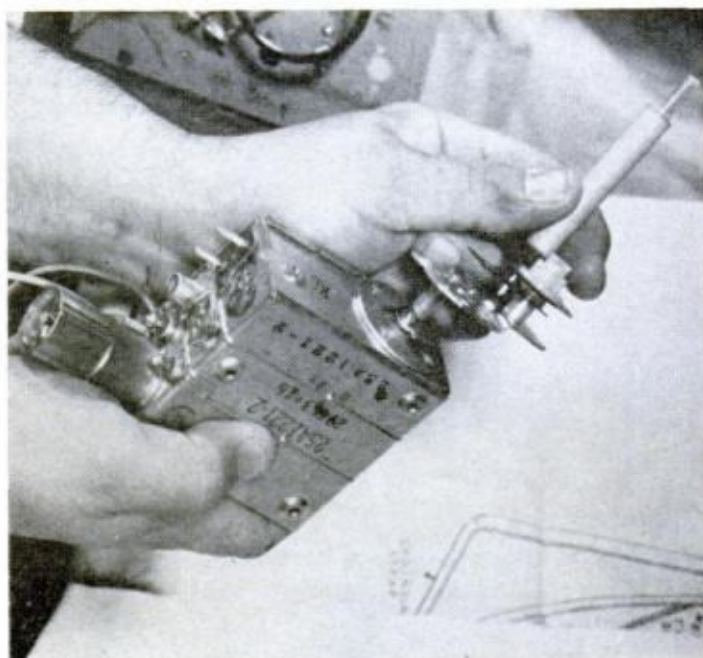
A short letter to the set manufacturer revealed that we could order a uhf conversion kit for about \$18.00. Similar kits are available from most TV manufacturers for any set made in the last 5 years. When the kit arrived it was accompanied with a rather complete set of step-by-step instructions for installing the uhf tuner in the older vhf receiver.

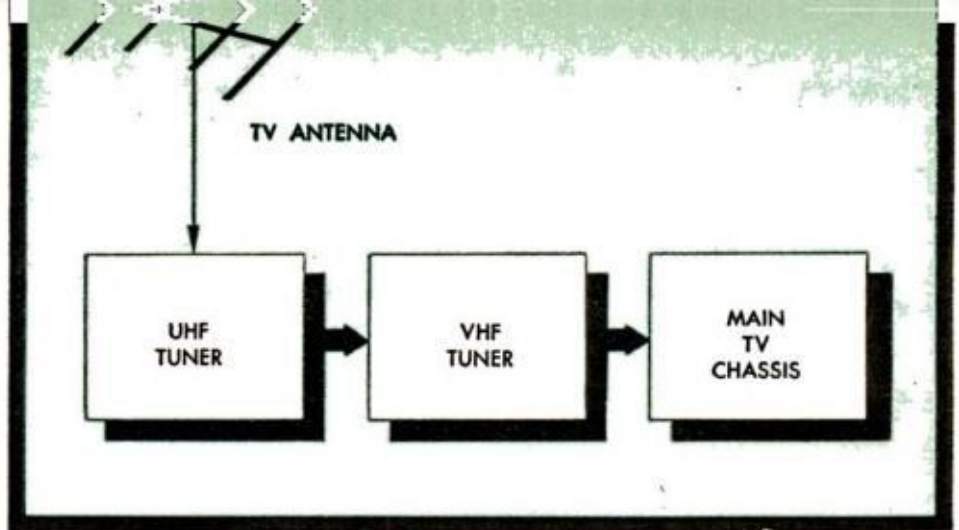
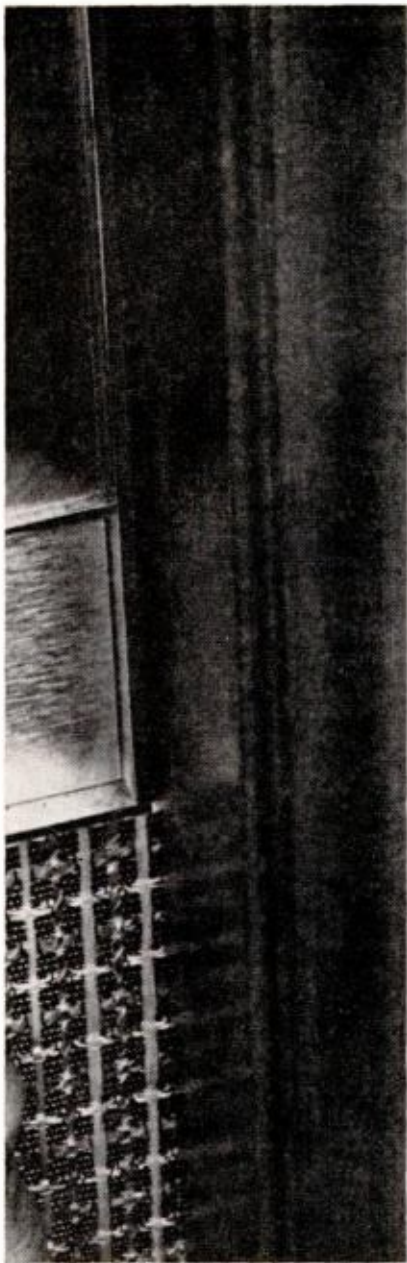
First step was to remove the back of the set, take all the knobs off the front panel and dismount the existing vhf tuner. Then came a quick subassembly of the new uhf tuner. Depending on the set model, the tuning control shaft had to be mounted in a particular position.

Next the two tuners were electrically interconnected. This was complicated by the fact that the receiver we modified has all the tube filaments connected in series. But a couple of extra filament wiring steps took care of that. Just an hour later the tuners were ready to go back into the set. We cut a new hole for the uhf tuner shaft, reassembled the set, connected the antenna and turned on the power. Result: A new channel to watch—Channel 31—New York's first uhf station.



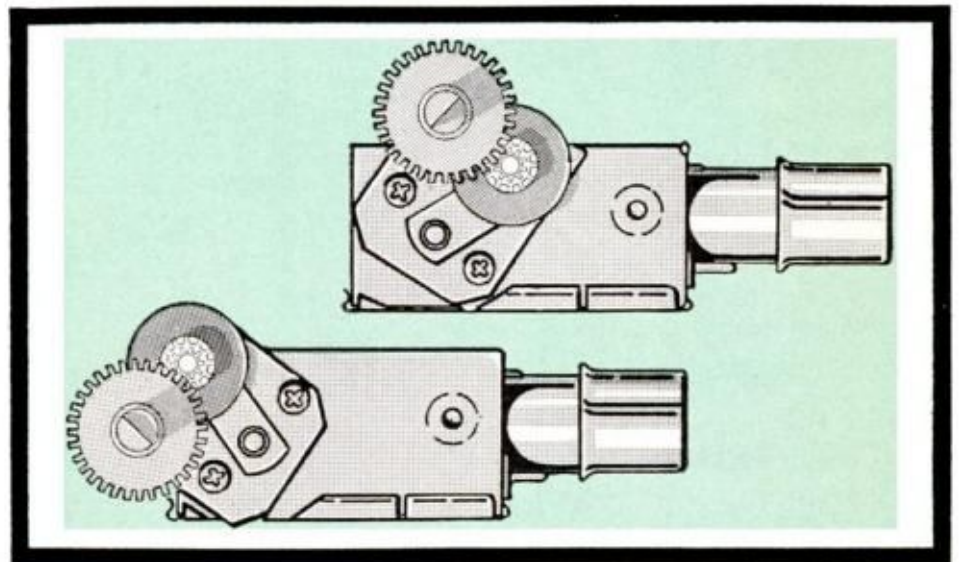
UHF TUNER SHAFT must be carefully positioned to conform to your particular model receiver. Work slowly and follow instructions to the letter





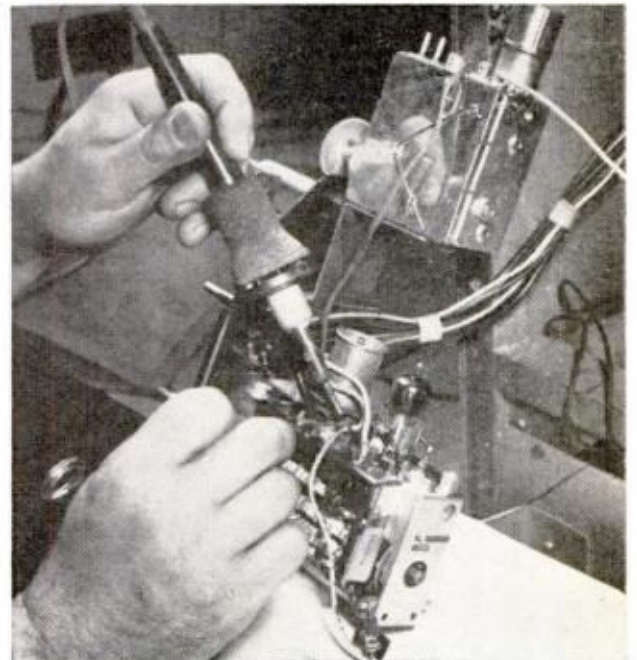
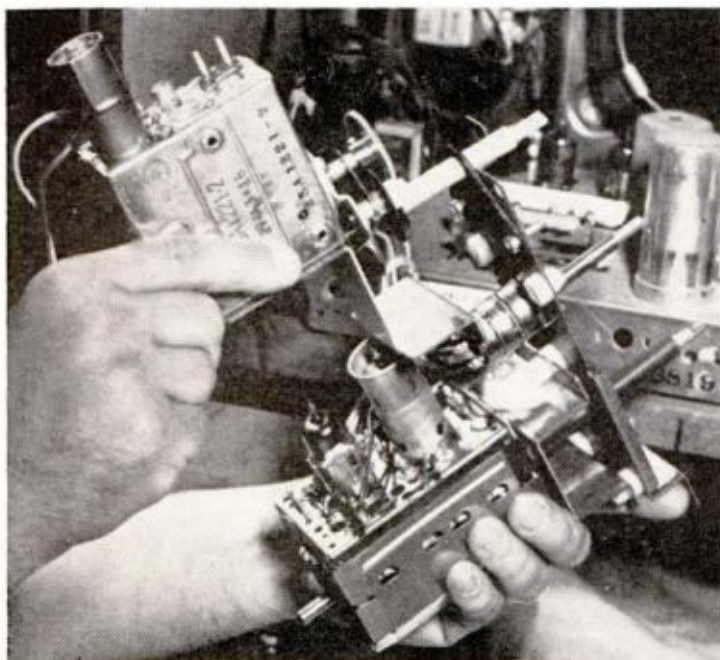
BLOCK DIAGRAM shows just how and where the uhf tuner fits into the vhf TV sets circuitry. When a uhf station is being watched, the vhf tuner acts as a preamplifier to give added strength to the received uhf TV signal!

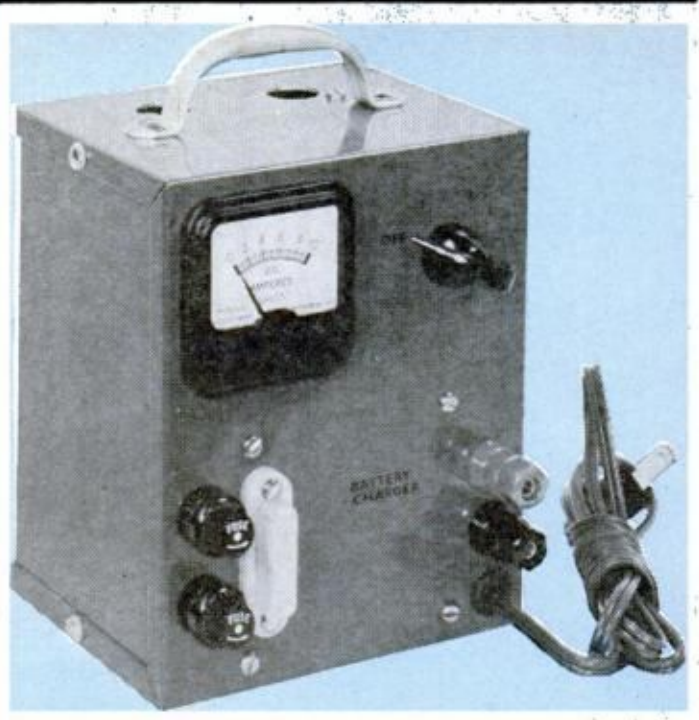
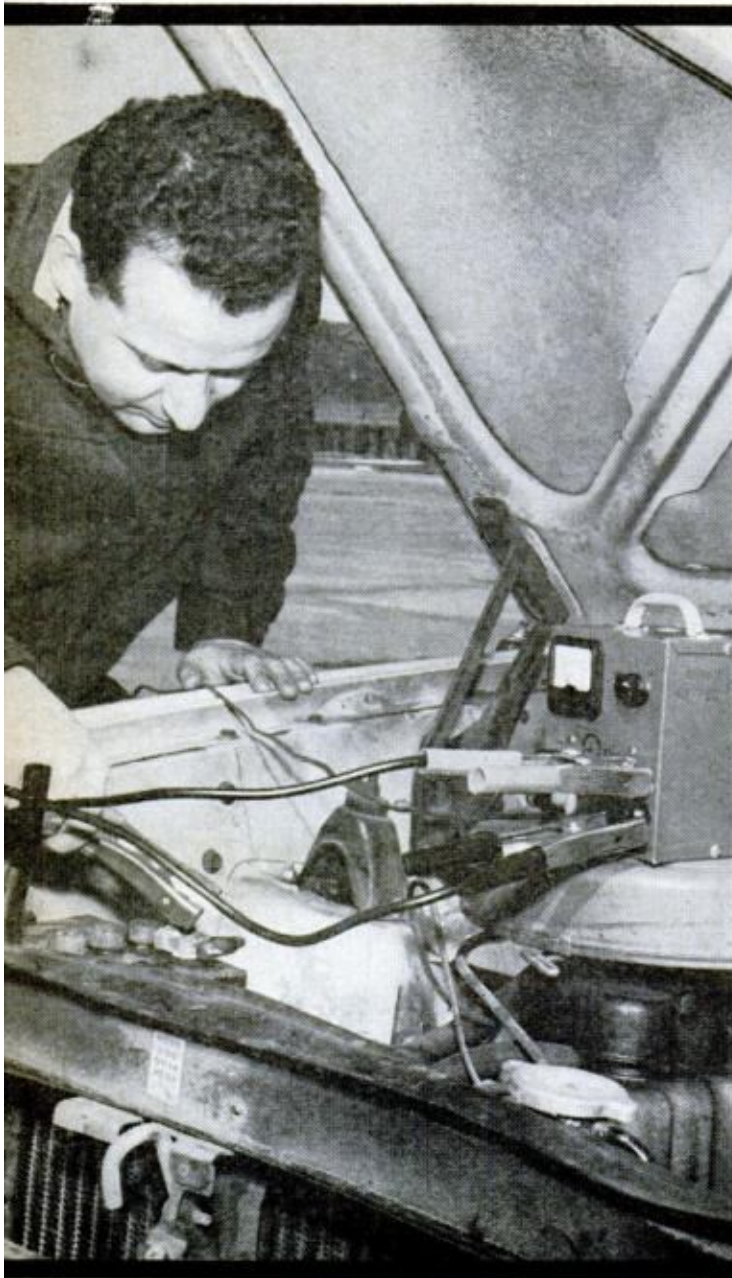
TWO VARIATIONS of the four possible uhf tuner control shaft positions are shown here. It is very important to fit the shaft into the correct mode. The instruction sheet shows which is the right mode to match your TV set



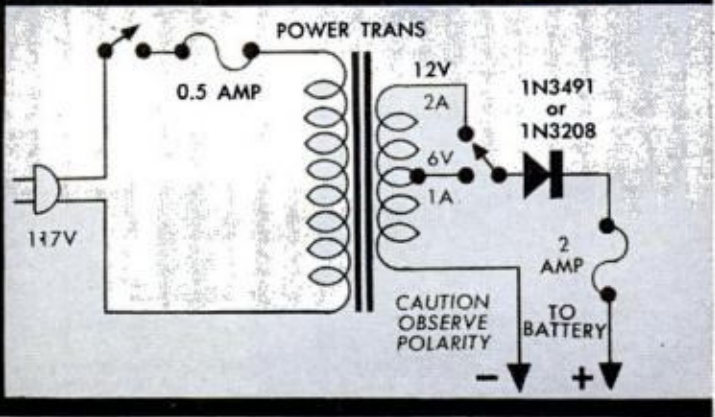
MOUNT THE TUNER on the same bracket that holds the vhf tuner. This puts both of them in a convenient operating position and makes them easy to connect

SOLDERING with a pencil iron puts the finishing touches on the tuner's installation. Now you can mount it in the receiver and turn on the set





CLOSE-UP of the completed charger. When you turn on power you select the charging rate desired



CONNECT THE BATTERY, flip on the power, and go have breakfast. In 30 minutes the battery will be completely charged and the car set to turn over

TRICKLE CHARGER circuit for a simple unit that works with 6- or 12-volt batteries. You can assemble the few parts with minimum effort in a couple of hours

Quick or Trickle Car

Beat winter starting with an all-semiconductor unit that trickle charges overnight or gives a 30-minute jolt in the morning

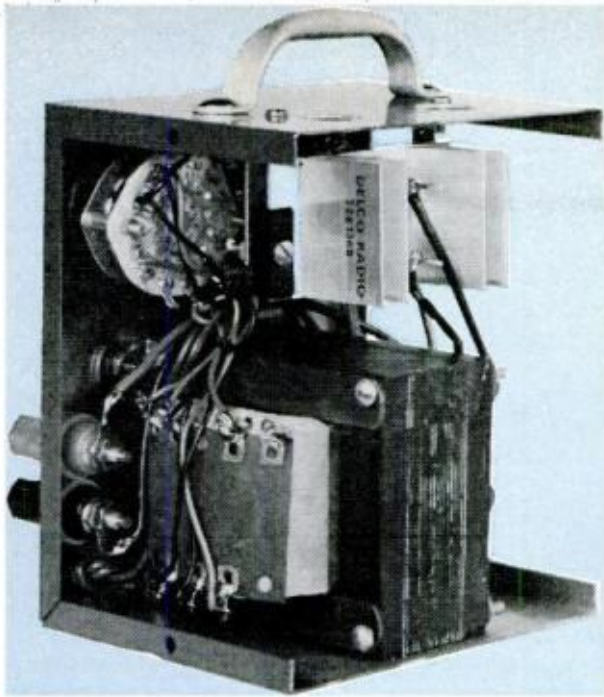
WITH COLD WEATHER here at last, car batteries once again become a problem. If the battery is weak, there won't be enough pep left to turn over a cold sluggish motor.

The best way to avoid this frustration

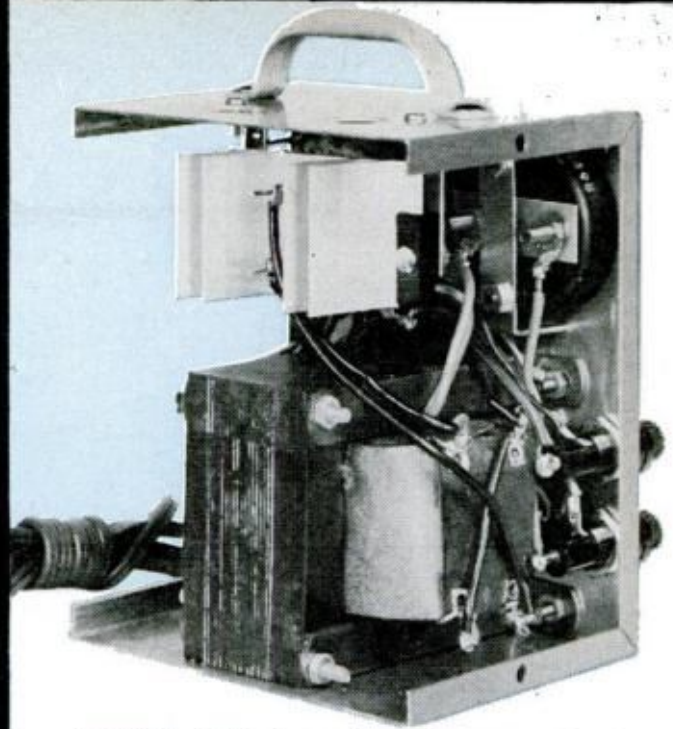
is to keep the battery fully charged at all times. You can do this by hooking up a trickle charger in the evening and disconnecting it in the morning. But should you forget, and the battery is low when you get up, you'll need a quick charger to strengthen your battery if you intend to get to work on time.

The unit described here provides four different charging rates ranging from a slow trickle charge to a rapid 8-amp half-hour jolt.

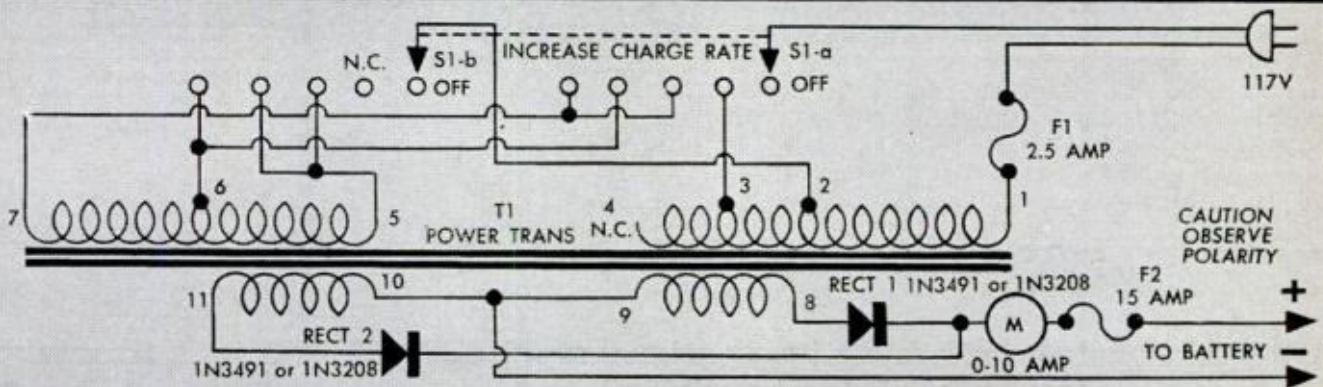
The circuit is not critical and the builder can use nearly any parts layout desired. Drill the Delco heat sink to take a IN3491



A LOOK INSIDE the case shows switch and power transformer wiring, along with parts layout



REVERSE SIDE shows how the meter, the fuses and silicon rectifiers are connected together



CIRCUIT OF THE 4-SPEED CHARGER. Its simplicity is obvious. To increase the charging rate a higher-voltage tap on the transformer is selected with the rotary switch. The charger does not turn itself off so beware of overcharging

Battery Charger

or IN3208 rectifier. Use a $31/64$ " hole with a $.01$ " x 45° chamfer for the 1N3491. The 1N3208 requires only an ordinary $1/4$ -inch mounting hole.

A few precautions should be observed: Make sure that the heat sink is completely insulated from the main chassis, and allow for as much ventilation as possible. If the heat sink is mounted inside the case, as shown here, drill several holes in the top and sides or back to allow air flow through the heat sink fins. Without proper ventilation, you can burn out the rectifier.

When using the charger connect it to the car battery with No. 12 wire not more

than eight to ten feet long.

If all you need is a trickle charger use the circuit on page 126. It is easy to build and forms a neat compact package. Overnight, it will charge a weak battery. ★★

PARTS LIST

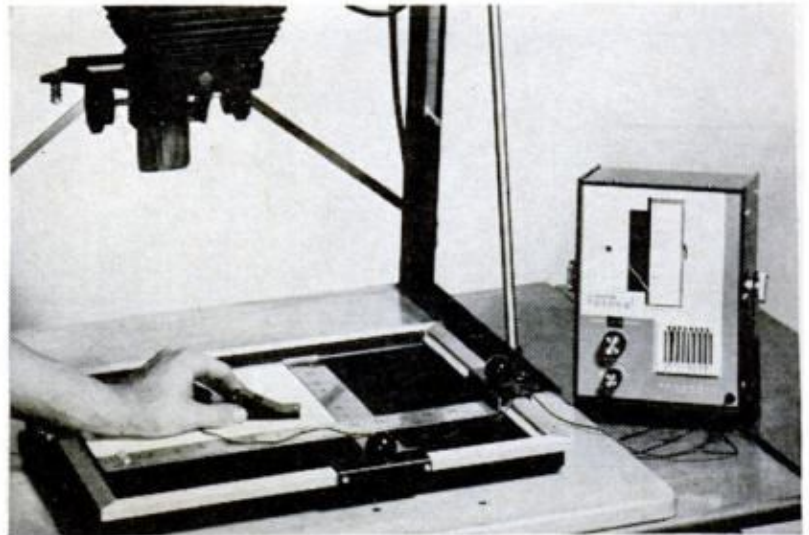
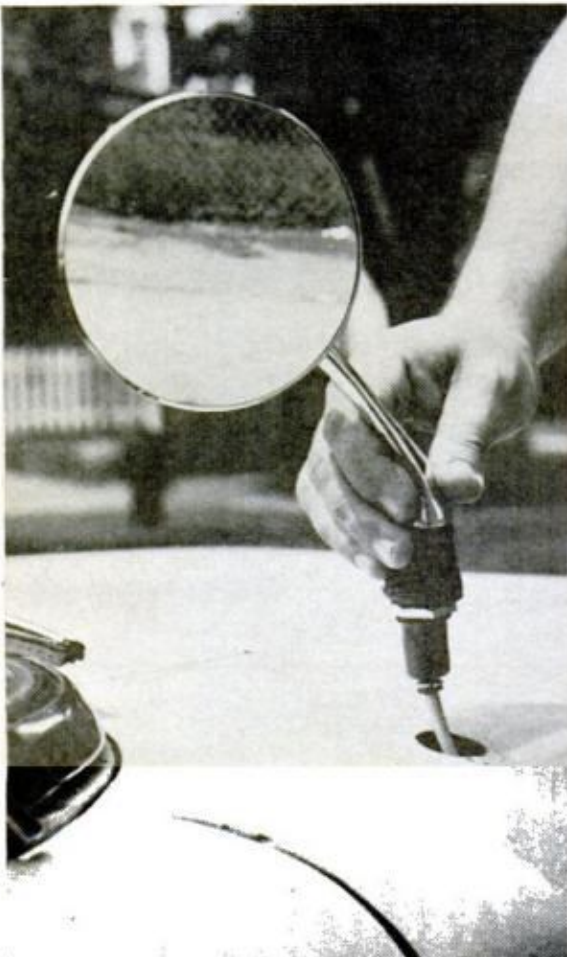
- T1—transformer, Stancor RT-204
- RECT 1, RECT 2—Delco IN3491 or IN3208
- Heat Sink—Delco 7281360
- M—Ammeter, 0-10 amps (Emico RF-2C)
- S1—2-pole 5-position rotary switch (Mallory 173C)
- F1—2.5 amp slow-blow fuse with holder
- F2—15 amp fuse with holder



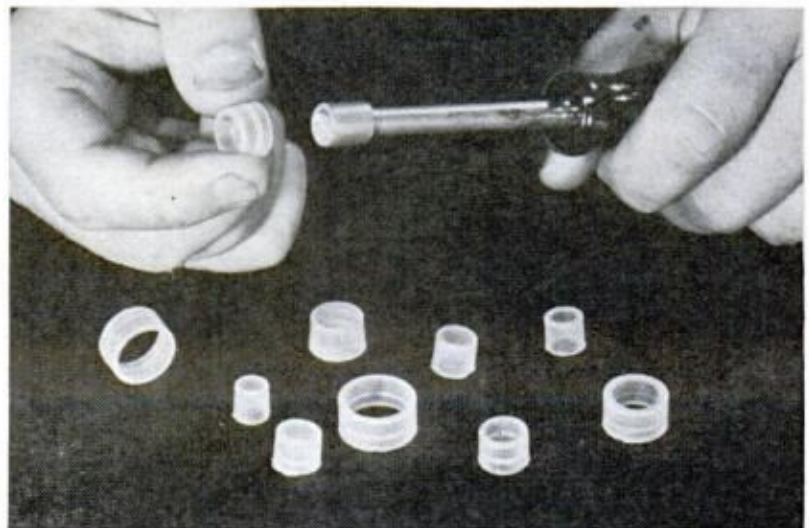
New in Electronics

TEST-TOP BATTERY tells you when it is worn out. A self-contained detector signals freshness. The top stays blue as long as the battery is good, turns pink when the battery goes bad (litmus indicator is shown in color in photo). You still have to check the color, but there's warning time on your power

AUTO MIRROR and radio antenna combination eliminates unsightly fender-mounted antennas, yet gives perfect radio reception. Consists of 4½-inch mirror head that has a built-in radio antenna. Comes with 5-foot, 9-inch shielded lead-in cable with plug-in jack and all mounting hardware. Available with flat or convex mirrors. \$3.95 from J. C. Whitney & Co., 1917 Archer Street, Chicago 16, Illinois



SCRATCHED PANELS are out when you use these Nylon protectors on the tip of spin-tight type wrenches. Protec/Tips fit snugly over working end of tools and will not fall off when the nut drivers are being used. All sizes from ⅜ to ⅝ inch. 15¢ each from MacDonald & Co., Glendale, Calif.





New 6 hp Fisherman (left)

New 5 hp Angler

New 9½ hp Sportwin (right)

Take a NEW LOOK at fishing motors

If you're satisfied with your old motor, congratulations. You've probably gotten your money's worth.

But things change.

There's a new look in fishing motors. Try one of these new Evinrudes and your old one will suddenly become a Model "T".

They're lighter, trimmer, smoother, quieter, handier.

Take the new budget-priced 5 hp Angler. It's compact. Lightweight. 43 lbs. Easy to take.

The new 6 hp Fisherman is down 10% in weight. Speed is up 18%. Power is up 9%. And it wears

a smaller "hat".

The Sportwin, introduced last year, is 8½ inches shorter and 10 pounds lighter than the old Sportwin. Weighs less than a can-and-a-half of fuel. Has 16 tilt positions.

How did the customers like it? We couldn't build enough to meet the demand.

Take a look at your old motor. Compare it with the new look in Evinrude fishing motors. Maybe it's time for a trade. And now's the best time to talk trades.

No maybe about that.

See your Evinrude dealer. Look him up in the Yellow Pages. Free motor and boat catalogs. Write Evinrude Motors, 4020 N. 27th St., Milwaukee, Wisconsin 53216.

EVINRUDE



FIRST IN OUTBOARDS

MILWAUKEE, WISCONSIN 53216

DIVISION OF OUTBOARD MARINE CORPORATION



'65 Chevrolet
Impala SS Coupe



'65 Chevelle
Malibu SS Coupe



'65 Corvair
Corsa Sport Coupe



'65 Chevy II
Nova SS Coupe

Let Chevrolet put you in beautiful shape for '65

Now, a Chevrolet that makes everything over, under and around you beautifully different. A completely new Corvair with its first big change in five years.

A Chevelle that doesn't hold back on anything but cost.

And a Chevy II that's turned into the most powerful tightwad in town!

For 1965, the big luxurious Chevrolet could almost get by on looks alone. But that's far from all that's new.

It's longer, lower, roomier, heavier, more luxurious than any Chevrolet before. Completely new from the sleek Impala Super Sport Coupe roof line all the way down to the Jet-smooth suspension.

More expensive looking outside, richer looking inside, more shoulder room, more leg room up front — all in all, we think it's the *best* Chevrolet we've ever built.

'65 Corvair

Corvair's rear engine has never had so much excitement to look forward to. Inside, there's more shoulder room. More comfort. The effortless handling only a

rear engine and new independent suspension can give.

All wrapped up in seven models, including the brand-new top-of-the-line Corsa.

New performance, too—up to 180 hp that you can order in the Corsa Series.

Wait till the ones who always wait till next year see this!

'65 Chevelle

There are enough changes in Chevelle to make it, too, feel like another whole new car from Chevrolet.

New ride, new style, and an engine that will make *you* feel young again — a 300-hp V8 that you can order in all twelve Chevelles.

And its smoother ride and extra body insulation make things as quiet as the day the kids went back to school.

And if that's too quiet, order an AM-FM Stereo radio.

'65 Chevy II

Our economy is on the upswing!

For '65, Chevy II has a dressed-up front, back, interior and a smart new roof on sedans. Plus two new V8's available: a 250-hp and a 300-hp.

Underlying it, though, are those things that have made Chevy II such a tightwad these past years.

And as your Chevrolet dealer will show you, Chevy II's now the most *exciting* tightwad in town. . . . Chevrolet Division of General Motors, Detroit, Michigan.



3 new ways to get jam-proof, quiet, long-play entertainment

COMPLETELY
AUTOMATIC
less than \$150



KODAK CAROUSEL 800 Projector

ALL 3 deliver the same brilliant, jam-proof performance ... show after show

KODAK CAROUSEL Projectors feed your slides gently by gravity; no pushing, no pulling, no shoving. So you never have to worry about embarrassing jam-ups spoiling your show. This gentle treatment can add years to the life of your slides. And each big round tray holds 80 slides—a full show in every tray!



Now there are three new 1964 KODAK CAROUSEL Projectors, each three ways better than the classic KODAK CAROUSEL Model 550—the best-selling slide projector Kodak

ever made. These new projectors are more compact, quieter, even more reliable. But the efficient, gentle, dependable, slide-handling principles are unchanged.

Loading couldn't be simpler. You drop slides into the wheel-like tray like pennies into a piggybank. No special mounts needed. You can edit any slide instantly during your show. You can even spin the circular tray to skip from one part of your show to another. Trays handle easily. They're spill-proof when loaded, and store like books when the show is over. The



KODAK CAROUSEL 800 Projector's remote control lets you quarterback the

REMOTE CONTROL

less than \$125



KODAK CAROUSEL 700 Projector

MANUAL CONTROL

less than \$90



KODAK CAROUSEL 600 Projector

whole show from your armchair—advancing, reversing, even focusing from 12 feet away. Sit near the screen yourself to point out scenic details, or move back to your favorite spot in the room. You can be as relaxed as your guests with the projector on completely automatic control. Set the automatic timer for 5-, 8-, or 15-second intervals, and the projector itself becomes the showman.



All three projectors deliver 500-watts-brilliant, jam-proof performance, show after show. The models vary only in the degree of automatic control. The completely automatic CAROUSEL 800 Projector, less than \$150; the CAROUSEL 700 with remote forward and reverse, less

than \$125; the manual-control CAROUSEL 600, less than \$90. All models come with one 80-slide tray and a choice of 3-, 4-, or 5-inch lens; or with 7-inch or zoom lens at extra cost. See them at your dealer's now.



EASTMAN KODAK COMPANY
Rochester, N.Y.

*Prices subject to change
without notice.*

Kodak
TRADEMARK

All About Antifreeze

(Continued from page 181)

produced in the 1950s, which have heaters that operate efficiently with lower-temperature thermostats.

Winter driving demands a clean cooling system. There's little sense in applying fresh, clean antifreeze to a dirty system. Dirt, rust and corrosion in a cooling system will cause the new antifreeze to wear out faster, which will lead to more rust and corrosion and, eventually, to severe damage of the cooling system. On the other hand and as we pointed out, the condition of the coolant can dictate whether you can or can't leave "permanent" antifreeze in the cooling system for another year—that is, if you decide to go along with the two-year advocates.

If you decide to condition the cooling system for winter use, there's a 13-point program to follow—

1. Drain the system completely. Don't forget that in older cars there are drain cocks on the engine as well as on the radiator, and that in all cars the heater should also be drained.

2. Clean and flush the system. Keep the drain cocks open, remove the thermostat (replacing the thermostat housing after

you do) and run water from a hose through the system until it runs clear from the drain cocks. If any rust and sediment are found, chemical cleaning of the system is called for.

3. Check the thermostat. Note the temperature at which it's rated—you'll find this somewhere on the body of the stat. Suspend it in a pan of water so it hangs free, and place a thermometer in the pan. Now, heat the water, note the rise in temperature on the thermometer and determine if the thermostat opens at the temperature at which it's rated. If it opens five degrees below or above this temperature, replace the thermostat.

4. Check all hoses and make sure all hose connections are tight. Detach each hose, including the heater hoses, and feel its outside and inside. If any hose is spongy, rotted internally or hard, replace it. Make sure hose clamps don't cut into the hose.

5. Tighten cylinder head bolts to specification. Use a torque wrench since serious damage can result from uneven tightening or overtightening.

6. Fill the system with fresh water and check for leaks. Then, drain it again.

7. Seal any leaks. There are chemical sealers on the market that do a good job

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NEW 2-Way Tool

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No. 285

THE **STANLEY** WORKS / NEW BRITAIN, CONNECTICUT
IN CANADA: HAMILTON, ONTARIO

of sealing small leaks. If they don't work, though, a more drastic repair in the form of welding or replacing the leaking part might be indicated.

8. Check the fan belt for wear and tension. Recommended slack is given in your owner's manual.

9. Clean out the radiator fins with an air pressure hose.

10. Check all drain cocks and plugs. Replace any that are rusted or corroded, have worn threads, or leaks.

11. Determine the correct antifreeze-water mixture for the protection you need, which depends on the *lowest* temperature expected in your area this winter. Remember—it's always safer to add too much antifreeze than too little. All antifreeze cans have capacity charts printed on them which tell you how much antifreeze to mix with how much water to get the desired protection.

12. Put the antifreeze in the radiator and add the right amount of water. Don't fill to the top. Remember that coolant expands when heated, so leave a little room for it. Otherwise, it'll spill out the overflow tube and be wasted. Run the engine until the thermostat opens (at normal operating temperature. This releases any air trapped in the system.

13. Finally, check your car's protection with a hydrometer. The hydrometer reading you now get won't change unless you're forced to add water to the cooling system during the winter. If this happens, check that protection level immediately with the hydrometer.

(If amplification of any of the points on checking a cooling system is needed, see the April and May, 1963, issues of *PM*.)

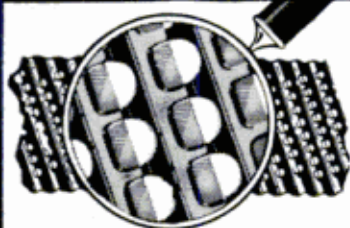
Stonehenge Counterpart Found

Britain's megalithic monument Stonehenge may have a North American counterpart. Recent excavations at "Cahokia," the site of a thriving Indian civilization about 1000 A.D., have uncovered four huge circles of spaced wooden posts.

The significance of the Indian "Woodhenge" is considered to be akin to that of Stonehenge, i.e., a solar calendar based on complicated geometry. Warren L. Wittry, assistant director of the Cranbrook Institute of Science in Bloomfield Hills, Mich., emphasized the importance of a post found just five feet east of true center. An observer at the post in approximately 1000 A.D. would have seen the sunrise on mid-summer day directly in line with one of the henge posts.

TOOLS...

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HOW THEY WORK

450 razor-sharp teeth give controlled depth of cut. Clean cutting. No clogging.



FILE TYPES — No. 295 Standard File works extra fast on all woods. New Offset Handle protects fingers and allows full stroke. No. 297 Round File is ideal for enlarging holes and forming decorative cuts.



POCKET TYPE — Compact . . . fits apron or overalls pocket. Fast and handy for trimming on the job. No. 399

PLANE TYPE — Comfortable handle and knob assure positive control. Takes same size blade as 2-way and standard file types. No. 296

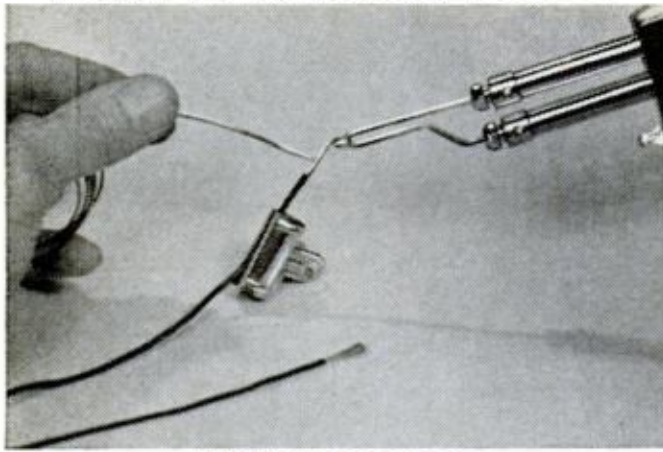
DRUM TYPE — Recommended for use in drill press. For contour, circular or straight cuts . . . shaping, cutting, forming, milling operations. No. H386



See these at better stores everywhere.

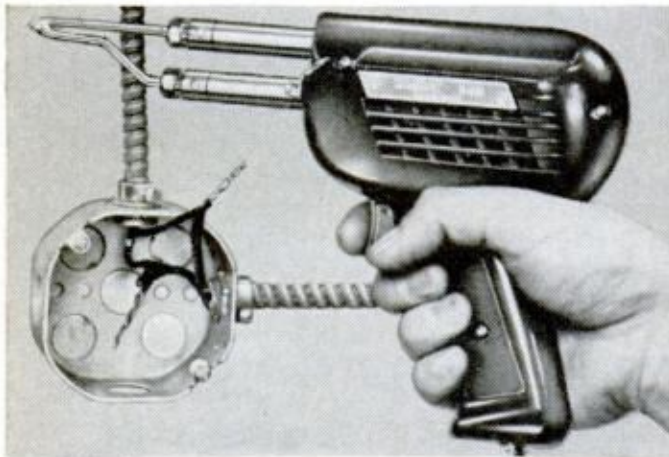
STANLEY - THE TOOL BOX OF THE WORLD

SOLDERING TIPS FOR ELECTRICAL JOBS



ALWAYS TIN WIRES

Soldered connections assure trouble-free electrical contacts. Always tin wires before soldering. When using stranded wire, twist the strands then heat and saturate with solder.



USE A PROFESSIONAL TOOL

A Weller Dual Heat Soldering Gun is used by nearly all professional electronic servicemen. They value its instant heat, two tip temperatures and ease of handling . . . just as you will.

A Heavy Duty Weller Soldering Kit pays for itself. It enables you to do a wide variety of money-saving repairs. The dual heat gun switches instantly to 240 or 325 watt heat to meet your need. Accessory tips for heat sealing, smoothing and cutting are ideal for patching plastic pools, repairing thermo-plastic toys and utensils, cutting plastic floor tile, etc. Kit also includes a tip-changing wrench and supply of solder, all in a sturdy carrying case. Model D550PK — \$12.95. Weller Electric Corp., Easton Pa.

Weller

WORLD LEADER IN SOLDERING TECHNOLOGY

Circular Saw Blades

(Continued from page 147)

is hollow-ground, leaving a large diameter of original blade-gauge as a stabilizer. But if your major material is lumber, a planer blade is a better addition. It's a versatile *hollow-ground* combination that's ideal for miters, and makes a neat plywood cut to boot. With it as your "extra," you'd use your regular combination for general cuts and rely on the planer for finer cabinetwork and special jobs.

Not all the blades listed in the chart are stocked by the average store. The trimmer blade in photo B, page 146, for example (Disston's Style-P) would probably have to be ordered for you, as would the thin-rimmed blade in photo E. The latter has its fine teeth ground thinner than the rest of the blade, minimizing waste when you work with expensive veneers.

About now, somebody's probably thinking: "True, my old combination blade's had it. But I do too many *varied* jobs for an easy decision about a replacement. If I can buy only *one* blade, which should it be?" The answer's easy—but not very heartening. Take another look at our chart: What's the only 5-star listing? The closest thing to a "universal blade" would be one from the carbide-tipped family—and we don't mean the economy blades with 8 or 12 teeth, but the real beauties with 50 or 60. What makes this choice disheartening is the price: such blades run as high as \$80 in the 10-in. size. If your shop budget can stand the jolt, it's a good buy. These blades do a super-smooth job of ripping, crosscutting, mitering, plywood cutting—and they're the only blade that'll tackle hardboard without dulling. Whatever your work, a good carbide-tipped blade will stay sharp longer than a dozen other types used alternately.

But if economy is a prime consideration, you can still have an efficient *minimum* blade collection. For general work, our recommendations would be:

- A flat-ground combination with banks of teeth (as shown on page 144) including small teeth for crosscutting plus a larger tooth with a deep gullet (raker)

- A good crosscut blade

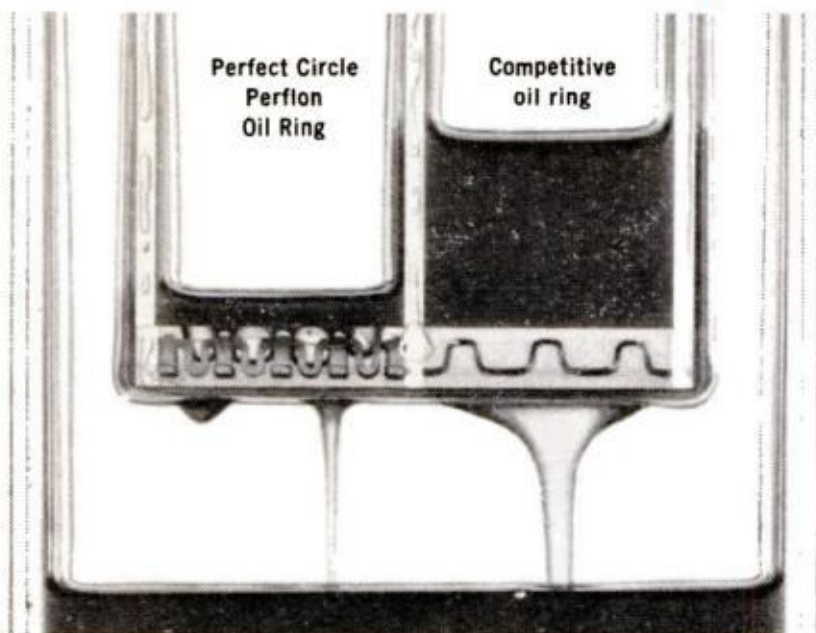
- A choice between a hollow-ground combination and a special plywood blade.

Your only problem with this trio would be keeping them sharp if you cut much hardboard. ★★★

Battery booster. Army engineers have come up with a mobile panel assembly which can simultaneously charge twenty-two 12-volt batteries or ten 24-volt battery systems.

PC Perflon OIL RINGS DRAIN UP TO 160% FASTER

Tests show how new PC Teflon^{*}-coated rings
drain faster than competitive brands!*



The un-retouched photo above was taken 2.5 seconds after the drainage test began. As you can see, the new PC Perflon oil ring drains amazingly fast—as much as 160% faster—and here is why.

The expander-spacer is coated with Teflon. This remarkable non-stick material—teamed with PC's wide-span slot design—lets oil flow faster. Perflon rings prevent carbon and sludge build-ups and eliminate

the sticking and clogging problem, even in the toughest service.

Other features of the new Perflon ring include (1) chrome-plated, tempered steel rails to assure long life, and (2) proper side seal and face seal for completely effective oil control.

New Perflon rings are made of tempered carbon steel to give them greater fatigue strength and breakage resistance than rings made of other steels, including stainless.

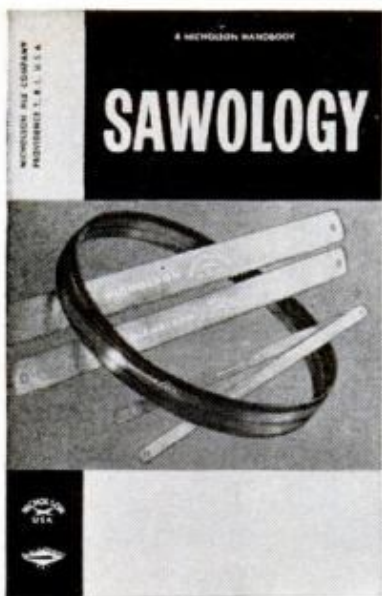
For oil control that is both better and longer lasting, specify Perfect Circle 2 in 1 sets with new Perflon oil rings.

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"Sawology" is a 34-page handbook on the manufacture, proper selection and effective use of saw blades. If you're interested in cutting metals, plastics, woods or rubber, you'll find straightforward writing that'll furnish the necessary information.

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Files • Rotary Burs • Hacksaw and Band Saw Blades
Hole Saws • Ground Flat Stock • Industrial Hammers

Magic Urethanes

(Continued from page 170)

from a lack of bonding to a previously coated surface or a tendency of urethanes to bond to themselves with such tenacity that they break the bond with other surfaces. Peeling can be prevented by properly preparing the surface—sanding or removing previous finishes that prevent a tight bond between urethane and the base material.

Natural-finish wood sidings of cedar, redwood, mahogany and cypress have required almost annual refinishing because sun, rain and temperature variations cause rapid deterioration of ordinary varnishes, penetrating sealers and wax combinations. Weathering is hastened by the naturally oily character of some woods, and the wood itself turns black or darkens with age.

Clear Exterior Finishes

The difficulty and expense of maintaining natural wood sidings have discouraged many owners from enjoying the warm beauty of natural wood siding. Urethane varnishes, however, withstand two to four years of exposure to the elements between coatings. Slightly pigmented varnish stains resist ultra violet radiation from the sun even more than clear finishes, and at least one clear exterior finish includes an ultra-violet shield that extends the recoating interval.

Urethane exterior finishes formulated as one-can coatings are just as easy to use as ordinary paint or varnish. They are oil-thinned and can be mixed with 10 to 15 percent turpentine for spraying. They're also flexible enough to move with wood as it contracts or expands due to temperature changes.

One of the primary reasons for the excellent weathering characteristics of urethane finishes is their extremely low water-vapor permeability. Since urethane finishes do not "breathe," extra care should be taken to keep water from seeping back of finished surfaces or from condensing inside walls. When interior walls are not completely protected by a built-in vapor barrier, two coats of a urethane finish will reduce water-vapor penetration through the wall. For maximum adhesion on exterior walls, roughen any glossy surfaces and sand lightly between coats. For porous new wood, use three coats. Two coats will ordinarily protect dense woods and prevent "sheeting" failures. Most exterior clear urethane finishes are formulated to produce a high gloss when dry, but some manufacturers also supply satin or rubbed-effect clear finishes.

(Please turn to page 210)

**Buick
'65
Buick**



**An almost impossible thing happened to Riviera on the way to '65.
It got even better.**

Better? Sure. Flip on the lights—you'll see. The grille over the lights automatically folds away. Inside is better also. Like a den. Wood-covered console. Wood-grained shift control knob. Wood panel on the door. Even a wood-grained steering wheel if you desire. The fireplace is up front, right under the hood, where the mighty 401 cu. in. V-8 rests. Start the engine and you fire up 325-hp. You can make your Riviera even sportier this year, with the Riviera GS packages. (One of which is a firmer suspension. A new "gyro-poise" roll control stops corkscrewing—makes for an unbelievably smooth ride.) Read all about the Gran Sport in this year's edition of the catalog, now on your Buick Dealer's newsstand.



Wouldn't you really rather have a Buick?

Here's the nicest thing anybody has ever written about the Riviera. Horsepower: 325 @ 4400. Torque: 445 @ 2800. Compression ratio: 10.25 to 1. Displacement (cu. ins.): 401. Carburetion: 4-barrel. Transmission: Super Turbine. Rear axle ratio: 3.23.

Buick Motor Division • General Motors Corporation

NOVEMBER 1964

209

A New **FREE BOOK** for

MEN PAST 40

Troubled With Getting Up Nights, Pains in Back, Hips, Legs, Nervousness, Tiredness.

This new Free Book tells that if you are a victim of the above symptoms, the trouble may be traceable to Glandular Inflammation . . . a condition that very commonly occurs in men of middle age or past and is often accompanied by despondency, emotional upset and other mental and nervous reactions.

The book explains that, although many people mistakenly think surgery is the only answer to Glandular Inflammation, there is now a non-surgical treatment available.

NON-SURGICAL TREATMENTS

This New Free Illustrated Book tells about the modern, mild, Non-Surgical treatment for Glandular Inflammation and that the treatment is backed by a Lifetime Certificate of Assurance. Many men from all over the country have taken the NON-SURGICAL treatment and have reported it has proven effective.

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REDUCIBLE HERNIA | HEMORRHOIDS

Non-Surgical treatment for both Reducible Hernia and Hemorrhoids, the book explains, can usually be taken at the same time as treatment for Glandular Inflammation.

This new Free Book is fully illustrated and deals with diseases peculiar to men and women. It tells HOW and WHY New Modern NON-SURGICAL Methods are so successful today. Fill Out Coupon.

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Gentlemen: Kindly send me at once, your New FREE Book. I am interested in full information. (Please Check Box)

- Glandular Inflammation Hernia
 Hemorrhoids

Name.....

Address.....

City..... State.....



Magic Urethanes

(Continued from page 208)

Urethane finishes are practically made to order for boats. In fact, some of the first uses of both clear and pigmented urethane finishes were pioneered on boats. The combination of humidity, sun and salt water provide the utmost test of a finish's durability. Many spar varnishes, for example, begin to turn white and chip after only six months' exposure. Ordinary marine paints need to be freshened about once a year, and every few years the accumulated coats must be stripped off down to the bare wood and the whole process started over.

Urethane clear finishes have remained in good condition and retained their bright gloss for up to three years. Pigmented urethane marine finishes, however, have not yet proved quite so successful. Urethane paints tend to lose their gloss after about six months' exposure to the weather. However, the slight chalk or haze that reduces the gloss has little effect on the durability of the finish coat. The urethane film under this haze remains practically impermeable to water, and where a continued glossy appearance is important, the chalky haze can be removed by vigorous wiping. Pigmented urethane finishes last two to three times as long as oil-base paints.

No-Mix Urethanes

Most of the readily available urethane marine finishes are packaged as one-can materials. Both clear and pigmented marine finishes are available in two-part formulations for added durability, but the added cost and more difficult application of the two-part materials doesn't usually warrant their use on pleasure boats. These are designed primarily for industrial marine application, where extremely heavy-duty service is important.

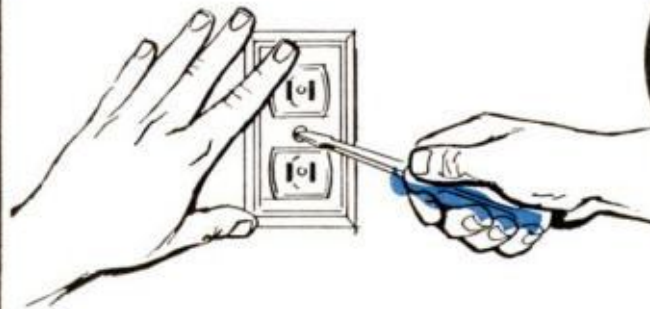
Industrial applications have demonstrated the durability of urethane paints under other extreme conditions. In one test, urethane and alkyd finishes were applied side by side on a blast furnace. After several months the alkyd coatings were completely gone. The urethane paints were still tight though they had lost much of their gloss. Highly corrosive hot fumes of hydrogen sulfide and hydrochloric acid have failed to penetrate urethane coatings in chemical plants. Urethane coatings' resistance to abrasion and corrosion was proved on steel roll-up doors where metal rubs metal as the door moves up or down. Where ordinary finishes were rubbed off in a month, urethane paint was still preventing rust after six months.

Metal surfaces subject to corrosion can

(Please turn to page 212)

The difference in screwdrivers is spelled

CHANNELLOCK®

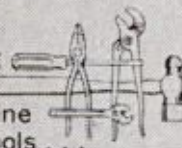


Tips are ground lengthwise for greater end strength.

You'll do the job easier and faster, year after year with CHANNELLOCK drivers. Blades are forged from tough, chrome vanadium steel . . . won't twist or snap. Tips are ground lengthwise to assure greater "end" strength and snug fit in screw slot. Opaque blue plastic (UL) handles are shockproof, breakproof and locked to the blade. Specify CHANNELLOCK drivers . . . you'll be glad you did.

SHOCKPROOF . . .
BREAKPROOF

FREE Catalog showing complete line of hand tools . . . yours for the asking.



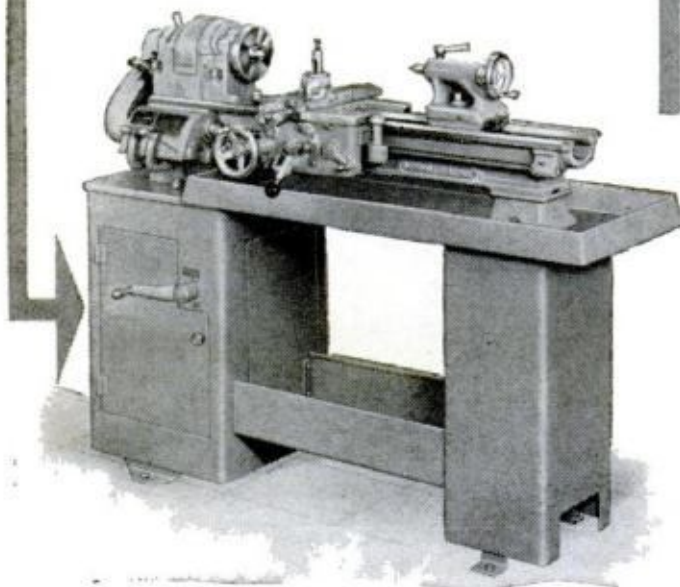
CHANNELLOCK, INC. Meadville, Pennsylvania

Formerly Champion DeArment Tool Co.

South Bend[®]

10" LATHES

*with new
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floor legs*



- New, trim floor legs . . . reinforced construction of welded, heavy gauge steel . . . maximum rigidity with minimum weight . . . no increase in price!
- Famous South Bend dependability.
- Superfinished spindles and bearings for uniform accuracy and fine finishes.
- 70 screw threads (4 to 480 per in.) . . . 70 longitudinal feeds . . . 70 cross feeds.
- Tool room and Engine Lathe models . . . prices start at \$1396 f.o.b. factory.

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SOUTH BEND LATHE, INC.

South Bend 22, Indiana

Building Better Tools Since 1906

up to 36 months to pay



Magic Urethanes

(Continued from page 210)

be protected by cleaning the surface and applying a wash primer of zinc chromate or red-lead rust sealers. This slows down any corrosion under the top coats. Apply a polyurethane primer for additional corrosion protection and aid in bonding the final coats of polyurethane. Two top coats of a polyurethane pigmented paint will keep out weather and corrosive gases. Steel, aluminum or other metals can be protected with this build-up of primer and top coats. Where a natural appearance is desired, use a clear urethane finish to keep metal bright. For applications where corrosion is less severe, pigmented urethane finishes can be used without primers.

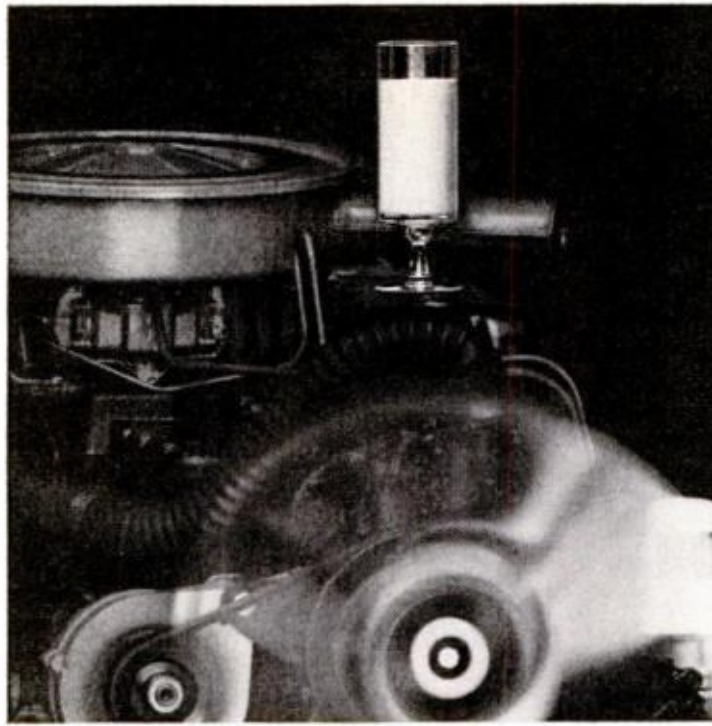
The Sealant Story

Flexible sealants made from polyurethane rubber are available for marine calking and bedding, and for sealing joints between dissimilar materials like wood and brick or concrete around your home. These sealants perform much like synthetic polysulfide sealants, but are more difficult to use since they are two-part mixtures with a limited pot life.

Once cured, polyurethane sealants are highly resistant to oils and grease. The U. S. Navy uses them for calking the joints between teak planks on aircraft carrier decks. At least two brands are available—PRC Rubber Calk 3000 and Pro-Seal 962. Both are two-part mixtures and require a primer for best performance when calking wood or porous masonry joints. Detailed instructions for surface preparation, priming and application may be obtained with the materials. Polyurethane rubber calking generally costs less than the one-part polysulfide rubber sealants.

Whenever shopping for urethane finishes, *check the label*. Some materials advertised as "urethane" or "plastic" finishes actually contain only a small percentage of a urethane, polyurethane or diisocyanate resin. If you want the best urethane finish, compare the quantity of urethane resin in one product with another—the more urethane the better. ★★

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



Is Ford's new "Big Six" smooth? Well, try this trick on your old engine!

Better yet, take a test drive. That's the quick way to discover how remarkably smooth we've made our new 240-cubic-inch "Big Six" engine.

How did we do it? Among other things, we used 7 main bearings for the crankshaft, not just 4; we developed a gear-driven camshaft, and we made the block structurally stronger. We put all this into an in-line Six (a configuration that's well balanced to begin with), added hydraulic valve lifters and came up with an engine that's almost eerie in its ability to produce smooth, quiet power.

However, we didn't settle *just* for smoothness. We wanted to improve overall performance. So


we made it the biggest Six in its field, and added 12 more horsepower. Yet, with all this added power, we managed to squeeze out a mile-per-gallon better fuel economy.

The "Big Six" is just one example from a long list of good sensible engineering features that you'll find in the '65 Ford. For instance, you ought to look into the new frame, body and suspension systems that make Ford's ride so uncannily quiet. *Listen* for it—on a test drive.

Best year yet to go Ford!
Test Drive
Total Performance '65
FORD
MUSTANG · FALCON · FAIRLANE
FORD · THUNDERBIRD

The Total Performance Ford Galaxie 500 2-Door Hardtop



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Used by thousands of businessmen, contractors, construction crews and sportsmen! Finest Citizens Radio equipment available—compact "Personal Messengers" ideal for on-the-job applications—performance-proved mobile and base station units make full use of maximum legal input. Easy installation, simplified maintenance.

Shotshell Reloading

(Continued from page 165)

For this purpose, you'll find blocks like the ones detailed on page 165 are handy for holding empty shells, wads, primers and the like. All blocks can be made to hold 50 or 100 components if desired. The empty block keeps the empty shells in order with heads up, preventing dust and small objects from dropping inside. The wad block holds separate wads conveniently stacked to column height, or the unitized plastic wad column-shot cup. The primer block holds live primers with bases down in the most convenient position for picking up one at a time and placing in the reprimer of any loader not equipped with automatic primer dispensers.

The actual reloading procedure merely requires following a few simple hand movements. Take it slowly at first to avoid missing any step, or performing any steps out of sequence. Follow implicitly the instructions furnished with your equipment. If the charging bar on your loader is manually operated, manipulate it properly, using a positive, fairly fast hand movement—not a quick, hard snap or a slow, jerky motion. Unduly slow shifting of the bar can result in slightly heavier than normal charges of both powder and shot; a quick snap may result in lighter, less uniform charging.

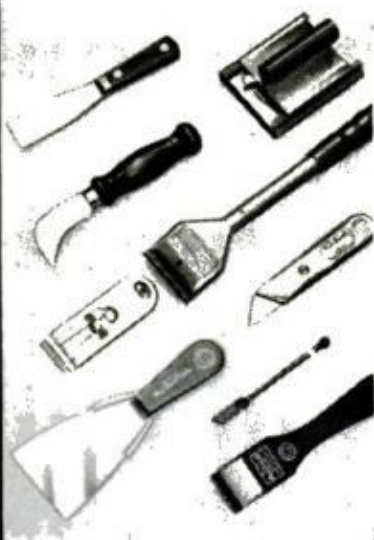
Always swing the actuating lever through the full stroke, all the way down and all the way back to the stops at both points. Don't release the lever at the end of the down stroke, then permit it to snap back to the up position. This can agitate the powder in the container excessively and may result in appreciably heavier charges being thrown by the loading bar.

If you accidentally spill or drop powder or shot when loading, some may find its way into the mechanism of press-type loaders. Stop everything and do a thorough clean-up, paying particular attention to any shot pellets that may have worked under the shell carrier or dropped into the reprimer. A shot pellet—or any other small, hard object—in the reprimer could fire a live primer. A remote possibility perhaps, but a precaution to be kept in mind. Another precaution in connection with primers: Never try to seat a live primer by any means other than that provided by the loader's reprimer. And don't for any reason punch out live primers with the loader deprimer, or with a nail, pin-punch or other tool. Don't for any reason insert your finger in the wad starter. You may have trouble removing the finger, may even suffer injury. And, finally, *don't smoke while reloading.* ★★



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Red Devil



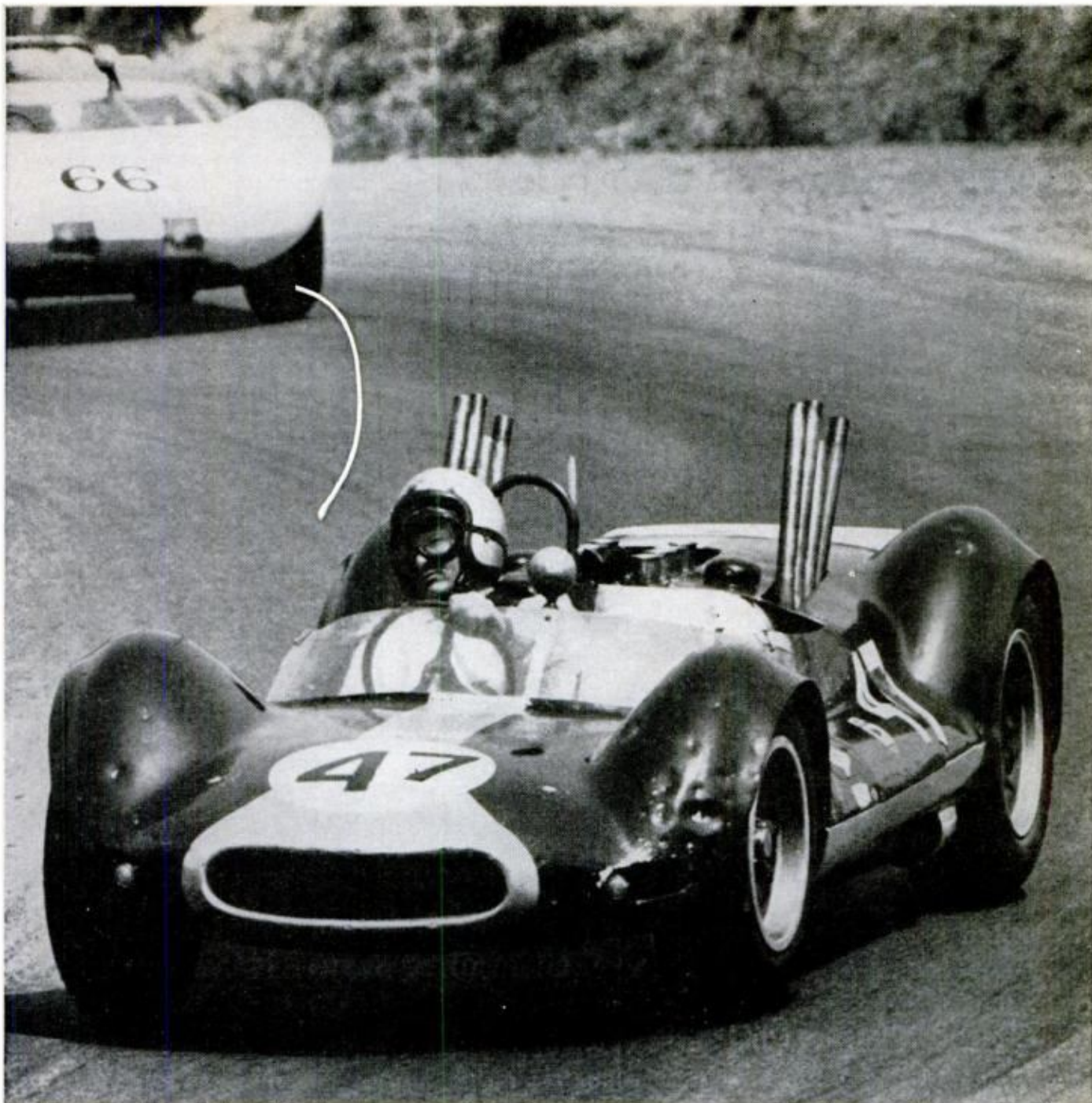
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Harley's New Featherweight

(Continued from page 105)

clerks to president—takes pride in its racing record, endurance runs like the Daytona 100, hill climbs and desert scrambles. In the lexicon of cycling Harley-Davidson means the "Big Bike," and that's the way they liked it.

"Frankly," said a top Harley-Davidson official, when I talked with him about the new M-50, "I wouldn't have one of these

SPECIFICATIONS: HARLEY-DAVIDSON M-50

Engine type	2-cycle, loop scavenged	
Bore and stroke	1.527 x 1.654 in.	
Displacement	49.66 ccs (3.03 cu. in.)	
Compression ratio	9.5:1 to 10:1	
Clutch type	Multiple plate in oil bath	
Primary drive	Helical gears	
Final drive	Single chain (1/2")	
Transmission	3-speed in unit with engine, cascaded gear arrangement, gearshift on handle bar with two cables to transmission	
Gear ratio over-all	Street	Trail
1st	31.483:1	74.203:1
2nd	17.675:1	41.662:1
3rd	11.671:1	27.511:1
Brake diameter	4.094 in. f and r	
Tire size	2.00 x 18 f and r	
Wheelbase	44.5 in.	
Saddle height	29.13 in.	
Minimum ground clearance	5.51 in.	
Weight	103 lbs.	
Fuel capacity	1.6 gal.	
Electrical equipment	Ignition: flywheel magneto 23-watt, 6-volt with high tension coil. Sealed beam headlight. Tail light, stoplight and horn.	

things as a gift. It's just a toy. A motorcycle has to be able to get out and go!"

I repeated this statement to one of H-D's engineers, and he laughed. "You've been talking to a guy who literally cut his teeth on speed trophies," he said. "Anything under 900 ccs is a toy to him. He even sneers at our Scat model, and that's a lot of motorcycle. But I'll tell you this: When we decided to bring out this 50-cc model, he nearly drove us crazy making certain we'd be putting Harley-Davidson quality in a small package. And that's what we've got."

I asked him if he thought, from the engineering point of view, that the M-50 was superior in quality and performance to other lightweights in the same class.

"I honestly don't know," he said, "but I don't think so. Some of these foreign makes are fine machines. Our major interest was to put out a machine that would be low priced, and would also be a credit to the H-D image of workmanship. We know that we've done that."

And I couldn't agree more. ★★★



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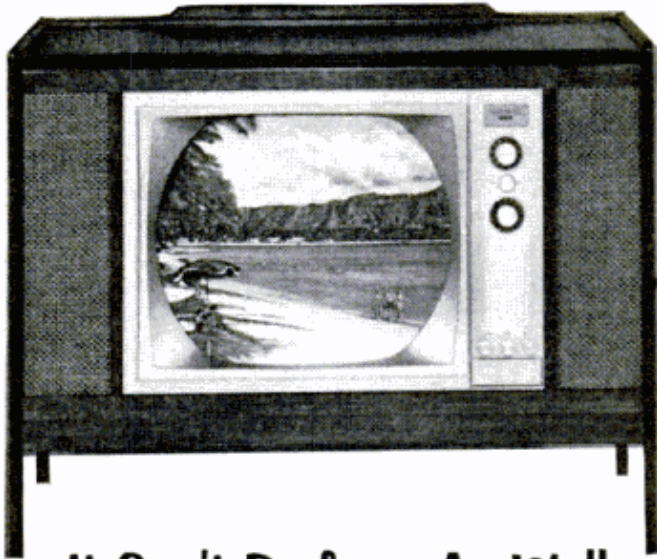
SHOCK-PROOF SAFETY. SP880 3/8" Drill and Power Unit has double insulation to prevent electric shock hazard of ordinary power tools. With inexpensive attachments, it becomes a complete shock-proof, 16-tool power workshop!



Millers Falls Company, Dept. PM-39, Greenfield, Mass.

NOVEMBER 1964

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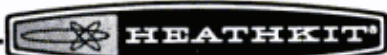
See the recent articles on the Heathkit GR-53A in *Popular Electronics*, *Radio-TV Experimenter*, *Popular Mechanics*, *Science & Mechanics*, *Radio-Electronics*, and *Popular Science*. And here's what just one Heathkit color TV owner, Mr. J. I. Newton, Chapel Hill, North Carolina says: "My friends tell me the color is better than they have seen on sets costing \$895, and I must say I agree."

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Deaf on the Job

(Continued from page 127)

could be checked as soon as the science of audiometry had worked out the "noise level indicator" and the "octave band analyzer." The former measures sound intensity. The latter takes a noise apart and reveals the myriad sound *itches* that it is composed of. In short order, it was established that the most damaging noises are those in the higher frequencies—squeals, whistles and whines—even though to the naked ear such noises may be masked by low-pitch rumblings, thuds, bumps, and booms.

By the late 1950s, The American Association of Ophthalmologists and Otolaryngologists (our leading ear-nose-throat physicians) had come to a basic conclusion, based on many employment case histories:

At a noise level of 85-87 decibels there is definite permanent damage to the human ear with continuous and prolonged exposure and the damage is greatest from noise in the higher frequencies.

Dr. Aram Glorig, the outstanding otologist in charge of the research center maintained by the Committee on Industrial Noise of the AAOO, believes that this degree and type of noise *exists in fully 50 percent of all American factories, mills, and shops.*

85-Decibel Dining

How much noise is 85 decibels? Not much, really. If you eat lunch in a busy restaurant with hard floors and without acoustical tile on the ceiling, the noise level at your table may be well over 85 decibels. Or—sit at a piano, punch middle C repeatedly as fast as you can. You'll be listening to more than 85 decibels.

In an effort to cut factory noise below 85 decibels, industry has already spent an estimated \$50,000,000—and is spending at a greater rate every day. Four methods of attack have proved most effective:

1. Make the machines quieter. This is the way Bob Blunden, safety engineer at Scott Paper Company, is going about it. Much noise, he says, is caused by machine parts rubbing together. Anti-friction bearings, therefore, can eliminate much noise.

2. Enclose noisy machines. This is tough when the machine is big, but Pete Doyle has done it at the M&M (for Marinette, Wisconsin and Menominee, Michigan) Box Company. Pete's problem was a huge screeching planer that smooths rough-sawn hardwood. He solved it with a huge plywood housing with narrow slots through which lumber is fed and removed. Watching the workers feed this machine, you

hardly hear it. But open the door, and . . .

3. Enclose the operation. The makers of Johnson outboards, in Waukegan, Ill., have perfected this technique, just as they have licked the problem of noise in outboards themselves. It is necessary, of course, to test-run every outboard before it is shipped . . . and it would be inefficient to bolt on the noise-suppressing devices before these tests. As a consequence, engines being run sound like the noisy outboards of yesteryear, only worse.

To keep this noise down, Johnson engineer Jim Mellinger installed long lines of noise-confining booths similar to the modern three-sided telephone booth. Now, only the operator hears the noise, and he can wear all the ear protection he wants in the form of plugs or muffs.

For the newest and biggest outboards, Johnson engineers have designed complete concrete-block test booths, into which the engines swing on overhead assembly-line conveyers. These engines are test run with virtually zero spill of noise into the rest of the factory.

4. Enclose the worker. This is the newest—and one of the simplest—ideas. Jim Potter, for example, might just as well handle his control panel from inside a soundproof booth.

"Even with automation, it is necessary for men to be on hand around every industrial machine, making inspections, checking lubrication, watching indicators," Dr. Maas points out. "Much of the time, these workers are not actively engaged in their assigned functions. Why shouldn't they have a room, with observation windows, in which to spend their time. Remember, it is prolonged and continuous exposure that causes ear damage. Breaking it up with periods of quiet cuts down the danger a great deal.

In Canada, Dr. Maas reports, there are many factories with "quiet rooms."

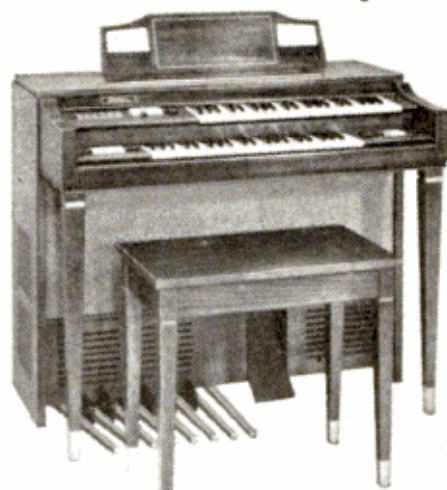
Plugs and Muffs Are Simplest

Despite the money and effort being spent to make plants quieter, safety engineers and industrial nurses still believe in ear plugs or sound muffs as the surest, simplest method of conserving hearing.

Mary Blaney, a pretty leader in the field of industrial hygiene, demonstrated ear plugs for me. They are tiny cuplike inserts made of rubber or soft plastic of about the same consistency as a baby's nursing bottle nipple. Mary fits the plugs carefully to her charges, making sure they fill the passage of the outer ear snugly but not tightly enough to cause discomfort. A flange prevents any possibility that the plug might be inserted too far.

(Please turn to page 220)

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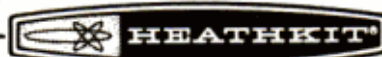
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General Electric silicone rubber sealants will bond to glass, metal, wood, ceramic, fabric, leather, most rubber and plastics. They are available in most stores.

If you can't find them please tell us the name of the store where you tried to purchase them and send \$1.95 per 3 oz. tube to Silicone Seal, P. O. Box 1300, Long Island City, N. Y. Make check or money order payable to Silicone Seal and specify the tube(s) you want by name.

GENERAL  ELECTRIC

Deaf on the Job

(Continued from page 219)

Surprisingly, these little, simple plugs, almost invisible when worn, do not interfere with normal conversation. Yet they cut as much as 30 decibels off the noise level, making 100 decibels safe.

Sound muffs of the kind loaned me by Employers Mutual for my tour with Dr. Maas, look almost exactly like the ear-phones worn by aviators, international TV correspondents, and count-down men at Cape Kennedy, except that there are no wires. Hard, dense plastic cups enclose your ears, cushioned softly against the bones of the skull. They cut down sound by as much as 50 decibels. Except for jet engine test runs and other rare situations, muffs make any industrial noise completely safe.

To review the otologist's point of view, I visited Dr. William Ford of Green Bay, a member of the American Academy of Ophthalmology and Otolaryngology who is hearing conservation consultant to many factories in East-Central Wisconsin. He ran through the entire ear-testing routine with me, pressing a tuning fork against various bones in my face and skull, asking questions, peering into my eyes, ears, throat and nose. He then sat down with me to answer questions in what he insists upon calling "medically unacceptable terms."

Age Not to Blame

"There is some case," he said, "for the belief that all hearing loss is due to acoustic insult. Even when deafness seems to be caused by old age—*presbycusis*—in many cases it is not the age that is to blame. It is the many years of sound beating at the nerve endings of the ear."

It takes time, Dr. Ford points out, for the bit-by-bit damage of excessive noise smiting the ear to become noticeable. Some otologists believe that the harm may begin with the first loud noise an infant hears. It continues throughout life. Permanent damage comes when there is too much exposure over too long a period. Reduce the amount of noise, reduce the duration of individual exposure, reduce the years of overall exposure, and you reduce the damage greatly.

To paraphrase Dr. Ford quite liberally, the ear is able to "hunch up" against loud noise. Sound is conducted from the eardrum to the auditory nerve through three tiny interconnected bones embedded in a muscle. Blast the ear with noise and this muscle tightens. Eventually, however, the muscle grows tired. It relaxes, and the

(Please turn to page 222)

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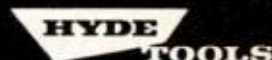


Touch-EE, the paint brush without bristles, made of polyurethane, for smooth finish. No messy hairs. No. C27-2" 29¢, No. C28-3" 39¢, No. C34-4" 69¢, No. C35-5" 79¢.

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Deaf on the Job

(Continued from page 220)

damaging sound comes through full strength, subjecting the auditory nerve to a beating it is not built to accept.

If you remove the ear from the noisy environment before the muscle loses its ability to block the sound and there will be little or no damage to nerve endings.

"Workmen assigned to seven-hour or eight-hour duty can't duck out for an 'acoustical five' every now and then," Dr. Ford agrees, "so the logical solution is ear plugs or sound muffs."

Men like Dr. Ford, Pete Doyle, Bob Blunden, Jim Mellinger, and Dr. Maas and women like Mary Blaney take great encouragement in their work on hearing conservation from a bill pending in Wisconsin, where workmen compensation laws have always been quick to meet demonstrated need. The law, Regulation 1.82 of the Wisconsin Industrial Commission, requires that . . .

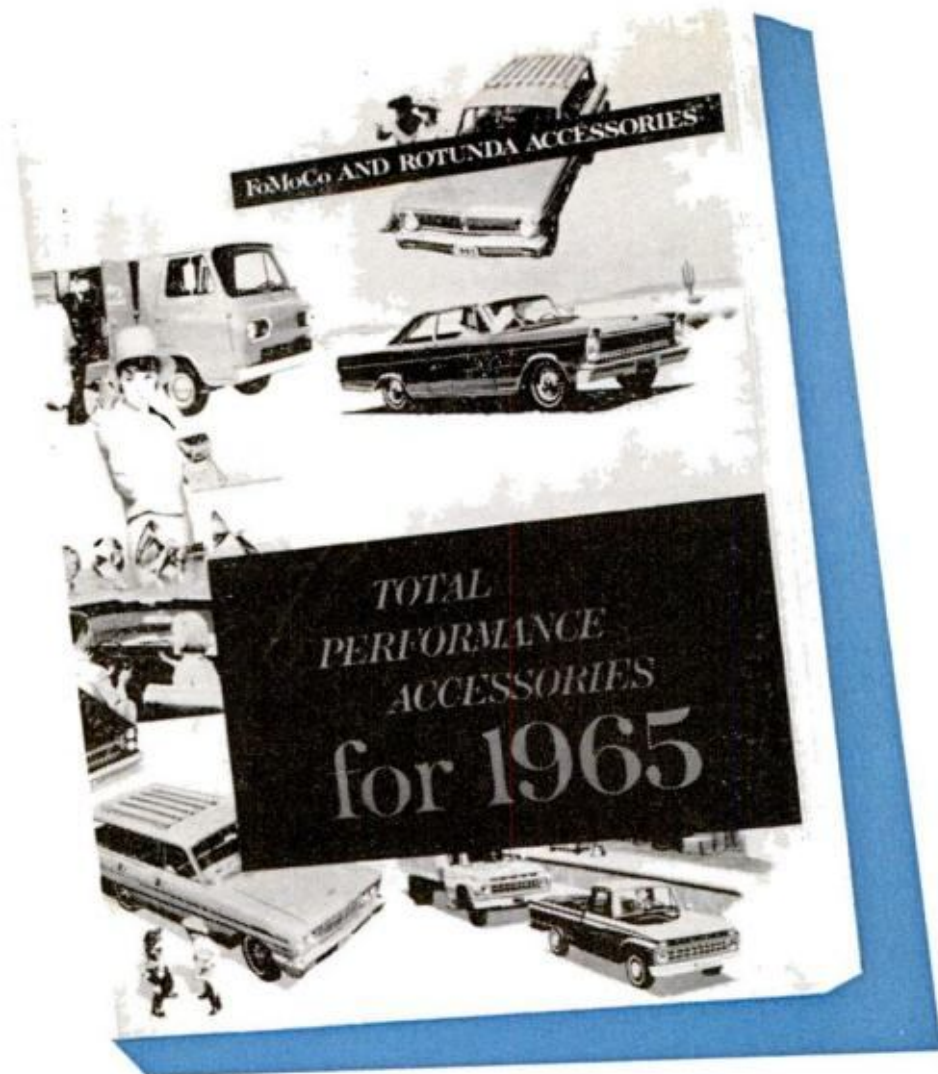
Law Requires Protection

"Properly fitted ear protectors shall be provided to persons who are exposed to sound . . . in excess of 100 decibels for a major portion of their working day. Where sound . . . exceeds 120 decibels, ear protection shall be provided regardless of the duration of each exposure."

Although this law obviously takes into account the findings of the audiologists, otologists feel the sound level is much too high. However, attempts in California to legislate the levels more precisely proved too difficult to follow and the hearing law in that state was never passed. As of now, only Missouri, New York and Wisconsin recognize hearing loss as a compensable occupational disease.

The slow, insidious damage caused by excessive noise is, sadly permanent. Nothing can be done to recover it. In the hopes of all the audiologists, however, the problem can be solved entirely on the day when workers wear ear plugs as willingly as they wear safety shoes or goggles . . . the day when a pair of sound muffs is just as much the badge of a man working at a man's job as the hard hat is, today. ★★ ★

"Auto"-matic washer. A Marine family in South Carolina has found an easy way to wash clothes during long outings in their Volkswagen Camper. A metal picnic chest is strapped on the front end of their VW, filled with dirty clothes, soap and hot water, and road action cleans the clothes as they travel.



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SEE YOUR FORD DEALER FOR ALL YOUR AUTOMOTIVE NEEDS!

Are You an Invisible Driver?

(Continued from page 117)

his assistant, Dr. James Clark. They began by determining the visibility of a random selection of cars passing a given point on an Indiana highway. Using a special visibility meter, they found that a white or cream-colored car on a bright day is about six times more visible than a dark car. The brightest car was a resounding 40 times more visible than the dullest!

Test cars then were equipped with commonly available 21-candlepower running lights, and their visibility measured again under a variety of conditions. Dr. Allen found that the running light was more visible than any other part of the car a full 1½ hours before sunset and after sunrise. On darker days and with darker cars, this period of visibility of the light was longer, extending throughout the day in some cases. Since more accidents occur late in the afternoon than at any other time, the evidence shows that a running light *does* improve the visibility of a car during the most dangerous period of the day.

When these visibility readings were made, viewing conditions were ideal. Obviously, no driving conditions are ideal, and most drivers have eye defects of one type or another. Furthermore, previous research by Dr. Allen's group showed a striking loss of driver visibility because of dirt on the windshield; glare from the dash, wipers and horn ring; and distortion from the curved windshield. These factors tend to increase the need for running lights.

Just what makes an optimum running light? Assuming a collision course of two cars, heading for each other at 60 m.p.h., each must stop within 546 feet to avoid a crash. Adding a margin of safety, Dr. Allen believes a good running light should be clearly visible for at least 600 feet. This requires a lens 4¼ inches in diameter, a bright reflector and a bulb of at least 21 candlepower. Furthermore, the lens should drastically limit the amount of light scattered upward, but should spread a significant amount 90 degrees to each side.

His tests of six currently available running lights showed that not one met all these criteria, though two came close. Ideally, he says, two running lights should be mounted high and far apart. But this improvement can be provided more practically by the car manufacturer. He therefore recommends installing at least one of the better available lights, wiring it so it goes on when the ignition is turned on.

What's the ideally visible car? Dr. Allen says it would be white, with a roof line extending down in front at least a few inches at about 45 degrees to reflect sky light toward oncoming motorists as the car

comes up over the crest of a hill. It would have little chrome in the front, because chrome either reflects light with dazzling intensity or appears black, and therefore is undependable. It would have two good running lights and—Dr. Allen's own idea—two side lights.

Early in his automotive research, he was struck by the fact that each car, at night, carries with it a built-in blind spot that affects drivers approaching from the front. Whenever you meet a car at night, the glare of its headlights, even on low beam, momentarily keeps you from seeing the road beside and beyond the car.

Every car, Dr. Allen feels, could carry its own lighting to eliminate this deadly "black spot." To test the idea, he mounted conventional sealed-beam headlights on the front bumper of a car, and aimed them backward at a 45-degree angle. The increase in visibility was amazing. This convinced Dr. Allen that such a moving light system is more practical than a fixed lighting system mounted on poles. Available road illumination would go up as traffic load increases.

His voice takes on a slight edge of anger when he discusses one appalling fact that popped up in his research.

"For one full summer we studied and photographed the interior visual characteristics of 56 different cars, representing the complete line of every manufacturer. We measured light transmission through the windshield, the luminance level of the instrument panel compared to the light level outside, and the vertical size of speedometer and odometer numerals. *Not even one car provided a suitable visual environment for daytime driving!*"

No Car Qualifies

In a well-designed car, Dr. Allen explains, the driver can see through the windshield without reduction in contrast or serious reduction in brightness; read instruments at a glance; and have no source of glare within the field of view. Not a single car passed all three basic tests.

Most instrument panels are handsome showcases that hide the merchandise inside. In many cases the panel is much brighter than the instruments themselves. Furthermore, measurements taken under a variety of light conditions on all 56 cars showed that outside illumination averaged 12 times brighter than the instruments. With such contrast, your eyes may need a second or more to read an instrument. At 65 m.p.h. you travel 95 feet per second. And there's a further moment of blindness when the eyes return to the comparatively dazzling brightness of the road.

Hot spots of light within the car make things even worse. Dr. Allen's own car

(Please turn to page 226)

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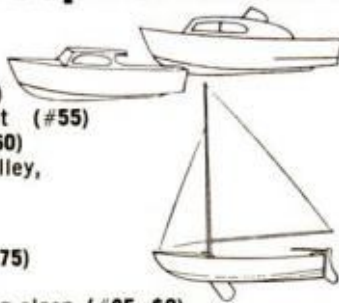
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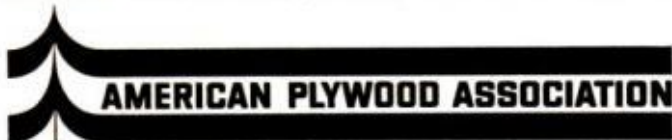
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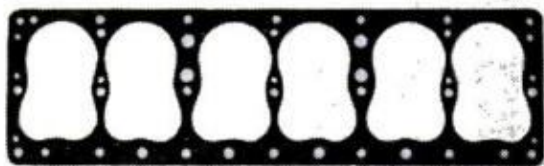
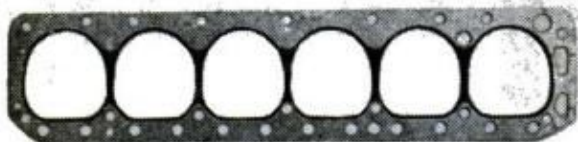
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Are You an Invisible Driver?

(Continued from page 224)

has a black velveteen cloth trimmed to fit across the top of the dash.

Many motorists wear yellow glasses as sunglasses during the day and as glare-reducing glasses at night. Any tinted lens, Dr. Allen points out, cuts down vision. His tests show that with sunglasses it takes you more than 10 percent longer to read dashboard instruments. Despite this fact, yellow glasses, used day or night, give you the feeling that everything is bright and that you can see very well—a dangerous impression. Further, a yellow filter affects the color of everything you see; you may miss color cues that help you drive.

Color perception is an important part of driving; yet about one-third of the population has faulty distance judgment of colored light. To anyone with this kind of eye, a red light appears much farther away than it really is: a taillight or a stop light may appear to be 300 feet away when it actually is only 200 feet. According to Dr. Allen, there is mounting evidence that this common eye problem may be a major factor in nighttime rear-end accidents.

How to Be Seen

What can you do to increase the visibility of your car, and your own vision out of it? Dr. Allen suggests:

- When buying your next car, choose a light color—white, cream or yellow.
- Install a running light that's about as bright as your turn signals. Two lights high and far apart are even better.
- If the top of the dash is glossy, cover it with black velveteen.
- From the driver's seat, note all chrome within your field of view. Cover it with tape, or paint it flat black.
- Remember that even good ground-and-polished-lens sunglasses reduce vision somewhat. Dust and fingerprints on glasses make matters even worse. Plastic lenses scratch so easily that they cannot be cleaned safely. If bright light really bothers you get an eye examination.

All of these points, except for the last, involve your car, rather than you as a driver. This makes Dr. Allen see red at both ends of his mental spectrum.

"In this space age," he says, "it's ridiculous that our vision is drastically reduced while we're at the wheel of a 1½-ton piece of highly sophisticated machinery. Ridiculous!" ★★★

Mossy medicine is on the way. French medical researchers foresee new types of antibiotics made from lichen cultivated for the first time in Paris greenhouses.



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Progress Report—1965 Cord

(Continued from page 95)

is cut in two at the front edge of the door after forming. Then the ends are moved apart enough to make room for the doors.

Before the idea had been tried out, an SAE committee of body engineers was told of the Cord body plan. Several members were openly skeptical that the soft-drape system being possible, let alone practicable. And you can't blame them. Here's the system that was described to the engineers:

You take three thin sheets of plastic, with nitrogen captured within it, and laminate them together with two sheets of tough "substrate" on each side. Add a sheet of weatherproof skin on each side. Now clamp the whole sandwich, measuring 10 by 18 feet, in a steel frame and hoist it up near a bank of heating elements. Flop it over again and again like a pancake for about half an hour to heat it evenly and let the temperature build to about 300° F. Don't worry when it begins to sag; it's supposed to. Eventually, like a wet, floppy piece of sailcloth, the middle of the sheet will belly down about 5 feet. (During the heat cycle, the sheet thickens as nitrogen in the core turns to bubbles.) Then quickly drop this stretchy mess into a fe-

male mold, and suck it tight against the mold with vacuum pumps. A few male helper plugs nudge the more difficult angles gently into place.

The cool mold will help the piece become rigid enough to remove in 10 to 15 minutes. It will feel warm to the touch.

Understandably, the SAE group—primarily metal-body men—took a dim view of the whole idea. U.S. Rubber, developers of Royalite, were committed to the Cord body project, however. And as far as we could determine, they succeeded.

The Royalite body has two special advantages. One is its immunity to corrosion. Winter salt (or ocean spray, for that matter) should present little problem, although the lacquer finish will be just as vulnerable on Royalite as on steel.

Then there is repairability.

If you can find a source for the material, a hot air gun is all that's necessary to repair it. I saw a body that had been peppered with spatter by a welder and looked like a shotgun's target. As I watched, a workman quickly smoothed out the holes.

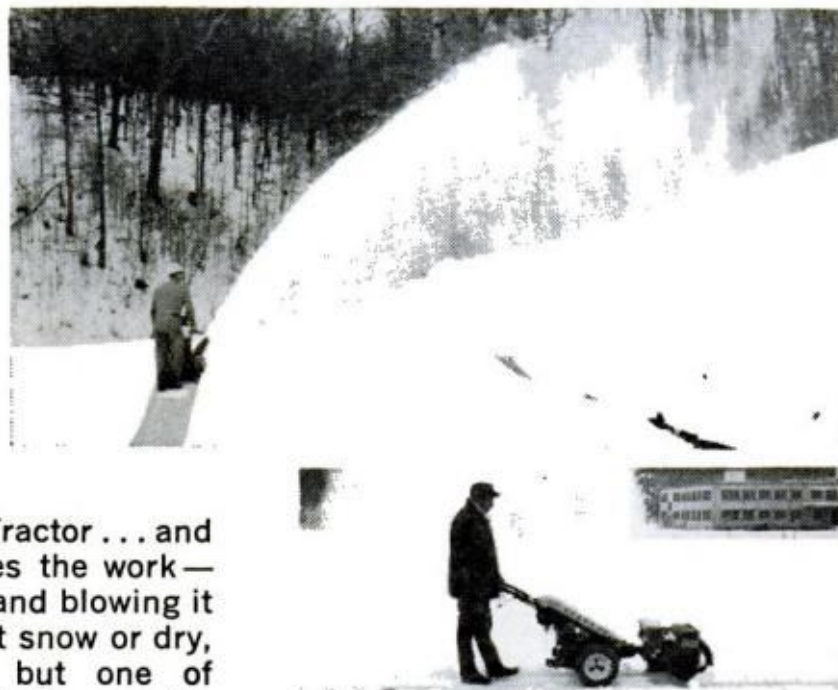
The whole molding operation is impressive. So is the car. Would-be owners who have spent their time on the waiting list—and laid \$4000-plus on the line—should be happy with it. ★★★

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Makaha for Landlubbers

(Continued from page 112)

seems ridiculous, but skateboarding is fun. The obvious danger adds to the exhilaration of shooting downhill; the mastery of the board gives the same feeling of accomplishment that comes from making a perfect parallel downhill turn in skiing or a smooth rappel down a steep cliff in rock climbing.

I was up in a few minutes and retrieved the board. And then we were off again. I stepped on the front, knees bent, leaning well forward, arms out for ballast, carefully shifting my weight to make the turns.

Essentially, that's skateboarding. If you're particularly limber-legged, however, you can practice some of the wrinkles added by the experts. You can ride the board "goofy foot," both feet in a sideways position. You can "hang ten," which means riding the board with both feet (ten toes) extended off the front; or you can try "the coffin," a daredevil maneuver in which the rider lies on the board on his back and rockets downhill feet first. There is also an acrobatic stunt wherein the skateboarder rolls toward a limbo pole held about two feet from the ground, jumps over the pole and lands back on the traveling board.

A prominent psychologist has already appeared in print to label this newest fad: "—one more manifestation of the teen-age death wish." And several California doctors have appealed to have the sport outlawed.

But despite criticism of its apparent dangers, skateboarding continues to spread. A number of adult ski clubs, for instance, have adopted the sport for off-season practice.

For the most part, however, it has been teen-agers who have spread the craze. In Walnut Creek, Calif., I watched a group of skateboarders and overheard the latest expression to join the lexicon of feminine endearment.

"Wow!" a boy said as a pretty blonde girl whizzed down the hill. "Look at that sweet old glue-foot go!" ★★★

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Antique Guns

(Continued from page 141)

lectors are interested in is the old Kentucky long rifle. Mr. Tom Hall, curator of the Winchester Museum in New Haven, Connecticut, told me of one man who bought a long rifle which looked perfectly genuine. In the manner of these old guns, the barrel was not "blued" but "browned"—a process using controlled rusting. When the gun was cleaned, however, the collector found that it was really made up of two barrels welded together to make one long one.

The value of a genuine Kentucky rifle depends partly on whether it is a flintlock or a percussion gun. Since the flintlocks are older, they are worth more than the percussion types.

Many original flintlocks were later turned into percussion guns by their owners, though, and these guns are not worth nearly as much today as they would have been if left alone. The faker's solution? Change them back into flintlocks, again. Sometimes, also, original percussions are changed into flintlocks.

It takes a sharp eye to tell when this is done. The Winchester Museum, for instance, has a changed-back flintlock with the name "John Philip Beck" on the barrel. To a casual glance, the gun appears genuine enough. But a closer look will show that the lock doesn't quite fit and the wheel was made too late for this particular gun.

Couldn't Be Fired

Another interesting fake at the Winchester Museum is that of a cavalry wheel-lock pistol supposedly made in England or Germany in about 1650. It was actually built around a few old pieces in about 1910. One way the gun proves itself a fake is by the inside of the barrel. Although the muzzle is for a large-caliber shell, the size is considerably reduced about halfway down. Also, the barrel is not bored all the way to the touchhole. The gun, in other words, could never have been fired!

Winchester's own "One of One Thousand" series of 1873 and "One of One Hundred" series of 1876 consist of guns that were selected at the factory for their shooting ability and then marked with the appropriate slogan. The forgers often take an ordinary 1873 or 1876 model and engrave "One of One Thousand" or "One of One Hundred" on the barrel. You can check these guns by sending the serial number to the factory where all of the genuine ones are on file.

Recently, a pair of carbines marked

(Please turn to page 234)

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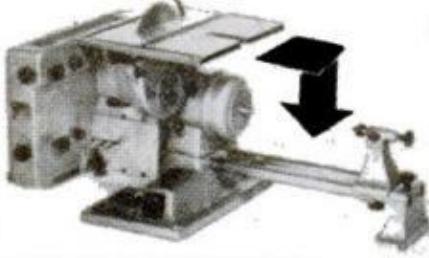


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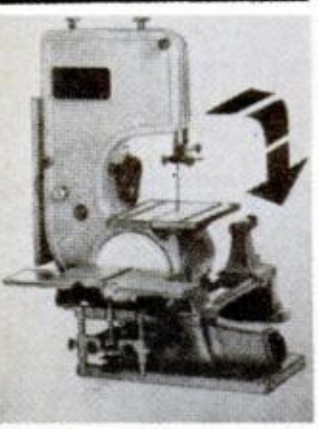
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Write today to:
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Antique Guns

(Continued from page 232)

"One of One Thousand" showed up with their serial numbers worn away. The people at Olin Mathieson, who now own Winchester, were able to bring the original numbers back with the aid of acid, and the guns turned out to be fakes.

Typical Forger

Today's typical gun forger is likely to be a small-time operator who joins a local gun club and finds his victims there. Within a club, members show off their collections, trade and buy in an atmosphere of good fellowship. A man is most likely to be off his guard there, and can often be persuaded to ignore safeguards he might otherwise demand.

One such recent victim was approached by a fellow club member and asked if he was interested in buying an 1848 Colt Dragoon pistol in first rate condition for \$600. While not as costly as some other Colts, the Dragoon model will still fetch around \$1000 on the open market. But the would-be seller said that he was in urgent need of cash and would be willing to let his gun go at the lower price if he could have the check immediately.

This is the sort of offer which will bring a gleam into the eye of any collector. The victim did feel a small twinge of suspicion. But he was quickly soothed by being assured that the pistol had been looked at and admired by several experts whom the forger proceeded to mention by name.

Investigation, however (including comparison with a genuine antique), showed that the gun was actually a modern replica which was legitimately sold as a copy but then was artificially aged by the forger.

In the aftermath of this affair, the forger was forced to return the victim's money and asked to leave the gun club.

Since the comparison method is the best way to detect fakes, probably the most difficult to catch are those of odd guns which may or not have ever existed.

At the time that Sam Colt was turning out his pistols in Paterson, New Jersey, for example, many European makers were coming on the market with variations of the Colt. These "Colt types" had a similar relationship to real Colts that "Scotch type" whiskey has to the stuff actually made in Scotland. But by now they have picked up a certain value of their own as antiques.

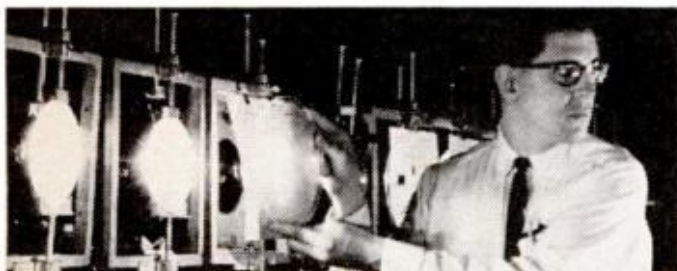
A few years ago, a New York gun dealer was offered a pistol marked "Systeme le S. Colt" which was presumably made in

(Please turn to page 236)

How General Electric headlamps help you see farther down the road at night



1. Your car headlamp has 22 precision parts. The quality of each part can affect a lamp's light and life. Only G.E. makes each of these parts—from tungsten to glass.



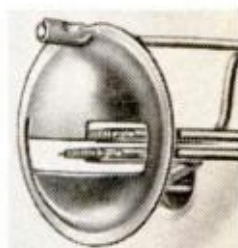
2. Your headlamp lenses have more than 100 prisms to beam light ahead of your car for maximum safety and eye comfort. G-E lenses and reflectors must pass 129 quality checks before they are assembled.

3. Even a thumb print inside the glass reflector of your headlamp would reduce reflectivity, impair your night vision. An alcohol rub cleans every G-E reflector before the mirror surface is applied.



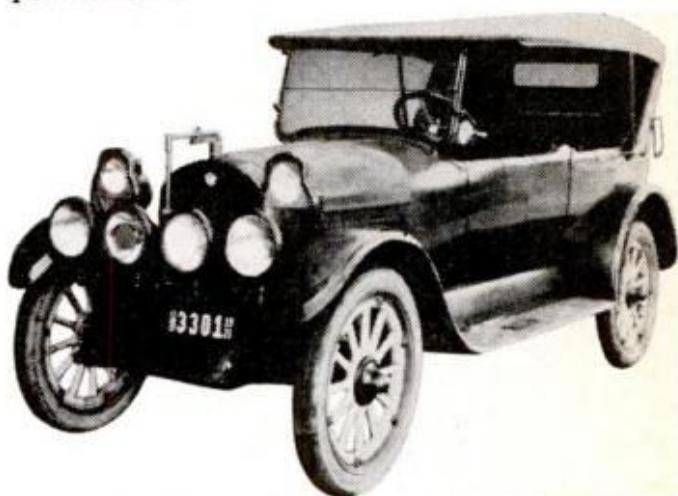
4. Reflectors in your G-E headlamps *never* tarnish. A 2000-degree "poof" transforms an aluminum hairpin into a vapor that deposits evenly over the glass and becomes a reflector. G.E. pioneered this process, as well as the sealed beam headlamp itself.

5. You see easier in rain and fog. G-E's *split-center fog shield* keeps the lower beam from bouncing upward off bumpers. Shield and filaments are independently mounted to resist vibration.



6. Your G-E headlamps are made oven-hard to shrug off impact and thermal shock from rain and snow. This is one reason G-E headlamps burn bright so long.

7. Since 1920, your car's headlamps have been constantly improved through practical research by General Electric engineers—with test cars, such as this venerable Reo, long since worn out in your service. Constant attention to minute details insures years of dependable service for pennies cost.



No wonder most drivers prefer G-E auto lamp performance. Next time you drive, push the brake, pull the switch to check your lights. Or have 'em checked where you normally have your car serviced. If you need a replacement, demand a dependable G-E lamp. General Electric Co., Miniature Lamp Dept. M4-24, Nela Park, Cleveland, Ohio 44112.

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Antique Guns

(Continued from page 234)

Belgium in about 1840. The dealer asked Henry M. Stewart to examine it for him and the gun turned out to be a recent English fake. Apparently trying to play it safe, the forger did not attempt to copy a Colt, but went after an old imitation which he knew would be harder to check.

On still another occasion, the same dealer asked Stewart to check a pair of martial Palmetto 1842 pistols. When the gun expert compared them to a pair of authentic Palmettos, he noticed a curious thing. The real pistols are stamped with small palmetto trees, the bottom branches of which curve out and back to form a sort of "O". On the ones that the dealer gave him, though, the bottom branches did not match. For this and other reasons, Stewart decided that they must be fakes and the money was returned.

Some forgers work by making relatively minor changes in genuine old guns in order to add to their value. It is they, for instance, who exchange English for American markings Confederate Enfield.

Another example of a minor change meaning major money is sometimes worked on snaphance pistols. These early pre-

cursors of the flintlock are worth about \$3000 each if made in America, but only about \$1500 if English made. To double the value of an English gun, then, a man need only file off the original name of the maker and add a presumed American one.

One probably snaphance fake now in the Winchester Museum is marked "J. Pim of Boston." It is likely that Mr. Pim never even existed.

But the most enterprising fakers of all will scorn easy tricks. They will go to any lengths to recreate a gun.

A top-flight gunsmith has prepared roller dies of cylinder engravings and a machine to apply this engraving to a cylinder. The owner of a gun can buy this service for about \$50. The value of the piece soars until the illegitimate re-engraving is detected through small errors which can be found through comparison with authentic cylinders.

The engraver, incidentally, strongly denies that *he* is a forger. He merely makes the dies, he contends. What people do with the guns afterwards is no concern of his, as he sells only a service.

Then there was the man who decided to reproduce the rare, silver-mounted Frederick Zorger single-shot pistols that were

(Please turn to page 238)

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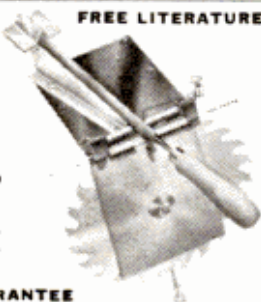
Super Filer No. 11 joints and sharpens hand and circular saws 6" to 10" with all teeth correct in height, depth, pitch, bevel. When file hits steel roller, teeth are finished. Saw runs true with no side pull. Includes 8" file. **\$9.95** PPD.



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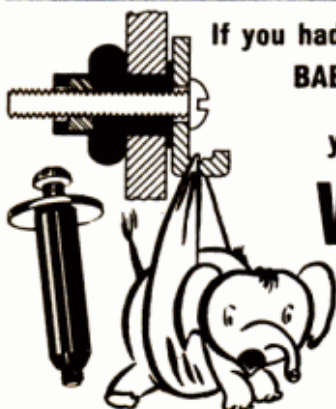
MONEY BACK GUARANTEE

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FREE LITERATURE

Polishing brass, an age-old soldier's chore, may be on the way out. The Army is experimenting with anodized aluminum for use as insignia, buttons, ornaments and belt buckles. It doesn't tarnish.



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DULUTH, MINNESOTA TORONTO, ONTARIO

EST. 1908

Antique Guns

(Continued from page 236)

made in Yorktowne, Pennsylvania, during the Revolutionary War. He created the guns from a pair of Irish Flintlock pistols, then went to the York—Lancaster area (formerly Yorktowne) and bought several old spoons with "touches" or proofs of early silversmiths. He removed the touches, silver-soldered them to the trigger guards, then silver plated around them. Examination under gamma X rays finally detected the forgery.

Is it possible to protect yourself from the gun fakes? While there may be no sure-fire single method, there are certain safeguards you can and should use.

Compare Point by Point

Whenever you can, make a point-by-point comparison of the gun you are interested in with a known authentic model of the same type. This is the first test to make and the most important. The majority of fakes can be caught right here.

In addition, you can take advantage of modern technology. Metallurgical labs, which are found in most major cities, will employ X rays and other tools in order to show up rewelding that is hidden to the naked eye.

If you do not feel you have the experience to detect a fake, yourself, you can have the gun authenticated for you. Some gun clubs have authenticating committees for their members and many dealers will authenticate guns, as well.

It's a good idea to protect yourself by buying guns from reputable dealers as opposed to private swaps and deals. If the gun you buy should later prove to be a fake, a reputable dealer will return your money.

At all times, shy away from bargain-basement prices and sucker tricks. Don't buy a gun because of its romantic history, for example, unless it is *fully* documented. It is as easy for a gun faker to put the name of a man such as Jesse James on a pistol as it is for an innkeeper to put up a sign saying, "George Washington slept here." ★★★

Bewildered skaters at a rink in Anaheim, Calif., were cleared off the ice recently while a tracked loader vehicle for the Army's *Hawk* missile was rolled out. Army engineers were making preliminary tests on a new kind of cleat that would ensure traction on icy surfaces and they needed an iced area large enough to support the 5500-pound vehicle.

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MAIL AD

Astronaut Physical

(Continued from page 101)

room mounted on springs and dampened by baffles against sound reflections or reverberations. Outside, a technician feeds both pure tones and spoken words at precisely controlled volumes into the room. The candidate's hearing threshold, from 125 cycles per second to 8000 cps, is checked by both air conduction (through a headset) and by bone conduction (vibrators placed on the mastoid bone behind the ear). Each time he hears a pure tone, the candidate punches a button in his right hand; each time he hears a spoken word, he repeats it. One-syllable words such as "hull," "fake," "wink" and "flap" are used, as well as such spondee (equal-stress) two-syllable words as "sunset," "white-wash," "doormat" and "toothbrush." And the volume gets lower and lower until the man's threshold is identified.

Which Way Is Up?

The eyes, always of paramount importance in aviation, may be even more important in space where there are no horizons or gravity clues to aid orientation. Two pieces of equipment that look deeper and deeper into the eye, especially to spot degenerative trends, are the electronic tonometer, which rests on the eyeball for four minutes to measure the rate of drain of the eye fluid (poor flow leads to glaucoma), and the slit-lamp biomicroscope which gives the examiner microscopic views of thin sections of the eyeball all the way back to the retina. He's looking for disease processes which foretell cataracts or corneal dystrophy. It's almost—but not quite—taken for granted that the space candidates have above normal vision. Most, in fact, are in the 20-15 to 20-12 brackets—all "eagle eyes."

The brain is given a good going over by the needles stuck in the scalp. Fifteen of these electrodes, precisely placed, plus two on the ear lobes, trace the patterns of the brain and central nervous system for (among other things) symmetry. Each side of the brain should produce the same pattern. The strobe light in the eye is one of the stimulants to check brain reaction. The breathing apparatus, through which the oxygen content is gradually lowered to simulate higher and higher altitudes, tests the brain's threshold of hypoxia—the point at which it ceases to function efficiently because of oxygen loss.

The glucose tests, for diabetes, are another of the candidates' "unfavorites." After fasting for 12 hours, they drink glucose (sugar) water. During the next two hours their arms are punctured four times

and vials of blood are drawn off to find their tolerance to sugar.

More unpalatable "goop," barium meal, is swallowed on another fast day for a fluoroscopic examination that checks for ulcers, hernias or other ruptures in the digestive system, all the way from the esophagus through the intestines. The fluoroscope at SAM not only takes still pictures (for leisurely study), but gives the examiner a running motion picture on a closed-circuit TV screen so he can watch for any signs of reverse flow or other abnormalities, from swallowing until the meal reaches the end of the intestines.

Water Watchers

Still more liquid—radioactive water, this time—is drunk to examine the kidneys. Two radiation detectors, one focused on each kidney, trace the water and record its activity on graphs. Any difference in function of one kidney over the other will show up, including infections or previous injuries.

The heart, more than anything, gets the greatest going over. In the ballistocardiogram test, each candidate is placed on a special oval table and electrodes are strapped on his chest, wrists and ankles. Then, driven by a compressor in the basement, the top of the table lifts up and he floats on a cushion of air. Based on the theory that every action has an opposite reaction, as the heart beats in one direction it now forces the body in the opposite direction. The graphs will show the timing and duration of the different phases of the heart cycle—in a way it never could with the body on a fixed base. Though movement is measured in fractions of millimeters, it's enough to spot variations.

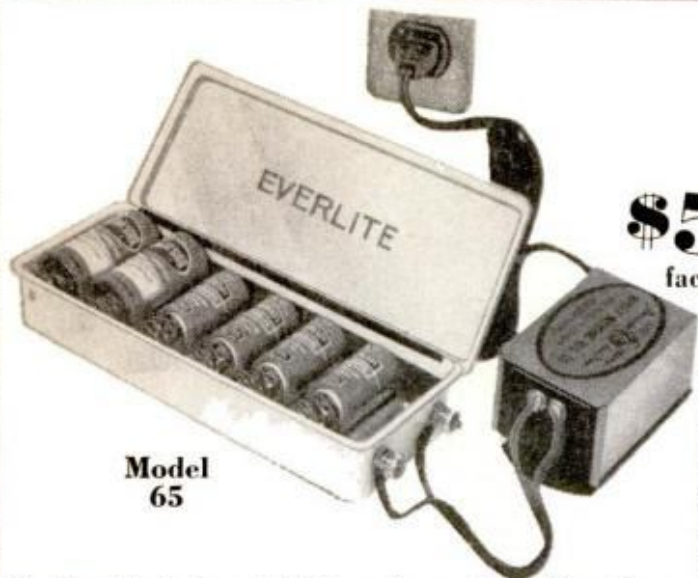
Heart Portraits

In the vectocardiogram test, three-dimensional views of the electro impulses that go through the heart are taken from an oscilloscope screen. The candidate, again with electrodes in place, lies in a wire cage (to screen out any outside electrical interference) and Polaroid pictures of the front, side and top of his heart action are taken. Again, the pictures are meaningless to a layman, but to an expert they show differences from normal heart action from three different planes.

The tilt table, by universal agreement, is the worst part of the entire week. Where else could a good, conscientious American be "crucified?" He is loaded with electrodes for the umpteenth time, and both arms are punctured. Then he is tilted upright and just hangs there. The purpose is to find how the reflexes controlling circulation will react in an abnormal situation

(Please turn to page 242)

Don't Buy Batteries Save \$—Recharge Them!



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\$5.95 • Charges 6 batteries at once
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• Charges 3 times faster

You will save real money by using the Everlite battery charger plus the convenience of always having fresh batteries when you need them. You'd have to pay \$17.85 for competitive models including all the attachments necessary to even approach Everlite performance—and then you still wouldn't have the power or ability to charge 6 batteries at one time.

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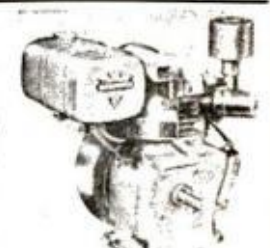
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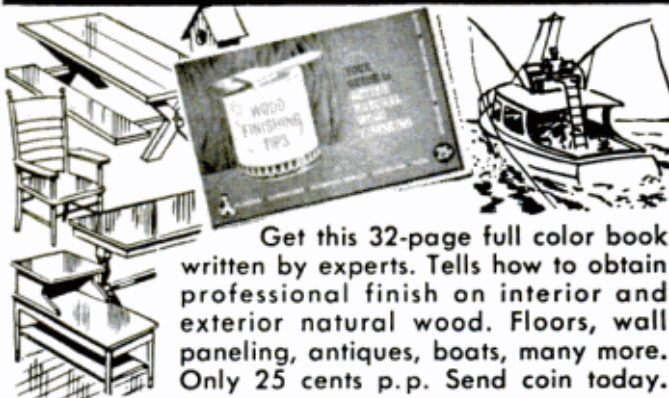
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Astronaut Physical

(Continued from page 240)

with no activity. Dyes are injected in his right arm and samples are later drawn from his left arm. The intensity of the dye sample after it has coursed through the body indicates the intensity of the cardiac output. After about 20 minutes, with most of the blood in the legs and hardly any in the head—and still no activity to stimulate the flow—the reserves of the heart system are put to the test. Some men pass out. Others survive, but pass out when they leave the table.

Long Walk Uphill

When a man leaves the table, he's still not through. He is divested of most of the electrodes and tubes, then put on a treadmill. He must now start walking uphill at better than 3 miles per hour until his heartbeat reaches 200 per minute. Normal is 80 b.p.m. The average candidate can keep it up for 12 to 17 minutes. The "hot rocks" can top 20. The record is 25.

So, from no activity on the tilt table, he is pushed to the point of exhaustion on the treadmill.

All in all, there probably isn't a more rugged physical anywhere on earth, and it's getting worse. The problem is twofold. The great bulk of medical data has, through the course of history, been gathered from the study of sick people. Healthy people, except in military services, just don't go to doctors. So a huge vacuum exists on just what medical standards to use for healthy bodies. Secondly, space medics admit that they really don't know all the problems man will meet in space—from prolonged weightlessness, for instance. Consequently, they really aren't sure just what they should be looking for.

"One of the things we're trying to do here," Colonel Simons sums up, "is to build a backlog of data for future reference. It isn't enough just to pick the best of the candidates. We have to gather as much information as we can from all of them, and we keep trying to find new ways to do it."

How do the men, who are subjected to these new and often gruesome ways, feel about it?

Just fine, thanks. They're all volunteers and, without exception, ache to get into the space program. A typical example of their attitude occurred recently. One candidate, after passing out on the tilt table, stood on wobbly legs, wiped his pale face, shook his blood-stained arms, then turned to the medic and smiled, "Okay, pal, what's next?"

What's next is the moon.

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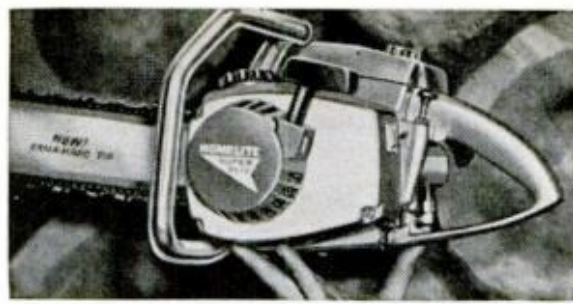
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Moon Mysteries

(Continued from page 91)

surprising discovery during a lunar eclipse. Within an hour, while all direct sunlight was cut off, the moon's surface temperature fell from plus 160 to minus 110 degrees F., a total drop of 270 degrees. Now the problem is that solid rock, supposedly the main constituent of the exposed lunar surface, would never cool off that fast.

To account for such unexpected findings, some authorities suggest the existence of a widespread blanket of moon dust. They point out that rapid heat loss is characteristic of pulverized material, and indicate that the moon dust may consist of volcanic ash or the accumulated debris of meteorite-bombarded minerals.

Hunt for Moon Rocks

New research on another old problem involves the National Aeronautics and Space Administration and a large-scale "treasure hunt" in Iowa. Scientists have long speculated about what the moon is made of and NASA astronomer John O'Keefe thinks we may be able to find out directly—by looking for pieces of the moon right here on earth. The idea is that high-speed meteorites hitting the moon's surface create splashes of material which spray off into space like shrapnel from exploding shells.

O'Keefe says that lunar fragments would be rocks "which look something like sponge rubber and may weigh a few ounces to several pounds." A good place to find them is a 3000-square-mile region in western Iowa, where terrestrial stones are unusually sparse because the bedrock lies buried deep beneath a covering of windblown soil. So last spring NASA officials launched a "Project Moon Harvest" campaign, encouraging school children, farmers and other interested parties to keep an eye out for off-beat stones in newly ploughed fields.

The harvest has produced an ample and interesting crop. Thousands of rocks have been mailed to NASA's Goddard Space Flight Center in Greenbelt, Md., and O'Keefe and his colleagues are still examining the evidence which includes some "real puzzles." Such studies may provide clues to the birth of the moon as well as to its composition, and help investigators decide whether the satellite was once a minor planet captured by the earth's gravitational field—or whether it represents a chunk thrown off a rapidly spinning earth by centrifugal forces some five billion years ago.

The list of lunar mysteries also includes luminescence in rocks around Kepler, a

(Please turn to page 246)



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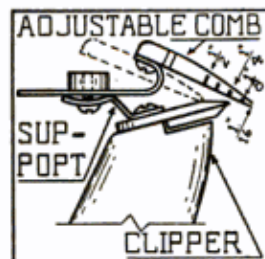


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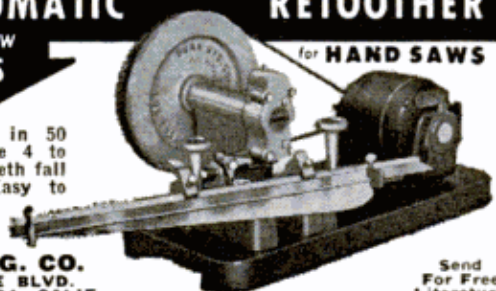
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Moon Mysteries

(Continued from page 244)

bright crater with steeply terraced walls. French astronomers detected a red glow for the first time about a year ago, and there is reason to suspect a fainter blue glow. It's thought that the phenomenon might be produced by the bombardment of high-energy protons emitted by the sun.

The so-called "grid system" is another puzzle. The system is made up of two major groups of ridges and palisades, crisscrossed and roughly at right angles to one another. They have been interpreted as signs of strain in the lunar crust, the same kind of strains that may have produced moon quakes and volcanoes.

And what is the explanation for the dark bands that run, like great tapes, across the floor and up the walls of some craters? Especially intriguing is the possibility that they may be recent features, having appeared during the past 75 years or so.

The fact that the moon is slowly spiraling away from the earth—the rate was recently estimated at about two and a half feet a century—also gives rise to speculation. The conventional explanation, that tides slow down the earth's rotation and in effect weaken its hold on the moon, does not seem to account completely for the phenomenon. Some scientists believe it may be partly a result of the expansion of the universe.

Light Cast on Rays

One mystery that was solved through the Ranger photos, according to Gerard Kuiper, chief scientific investigator of the NASA moon team, was that of the lunar rays. From earth, they appear to be whitish streaks up to 1000 miles long that extend from some of the major craters like spokes from the hub of a wheel. They were once thought to be cracks in the moon's surface.

Ranger's impact area was in a crater ray. Close-ups sent back before the vehicle crashed reveal that the ray actually is a chain of closely packed secondary and tertiary craters, formed by rocks thrown out in the explosion accompanying the formation of a primary crater.

Bit by bit, scientists chip away at the mysteries surrounding the moon. The final two probes in the Ranger series should provide more answers. But many experts are still convinced that only limited amounts can be learned using unmanned vehicles. Full and final answers, if they ever come, will have to await the landing of men on the moon. ★ ★ ★

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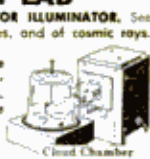


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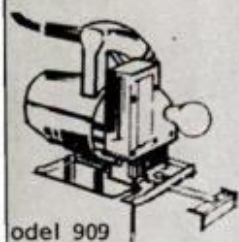
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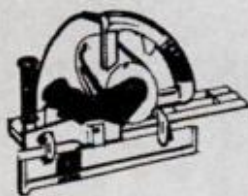


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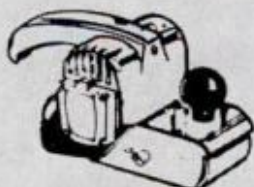
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