

Owners Report on Their 1963 Chevrolets

POPULAR MECHANICS

FEB. 1963
35 CENTS

**INSTANT
COLOR PHOTOS!**

What You Can Do with the
New Polacolor • How It Compares



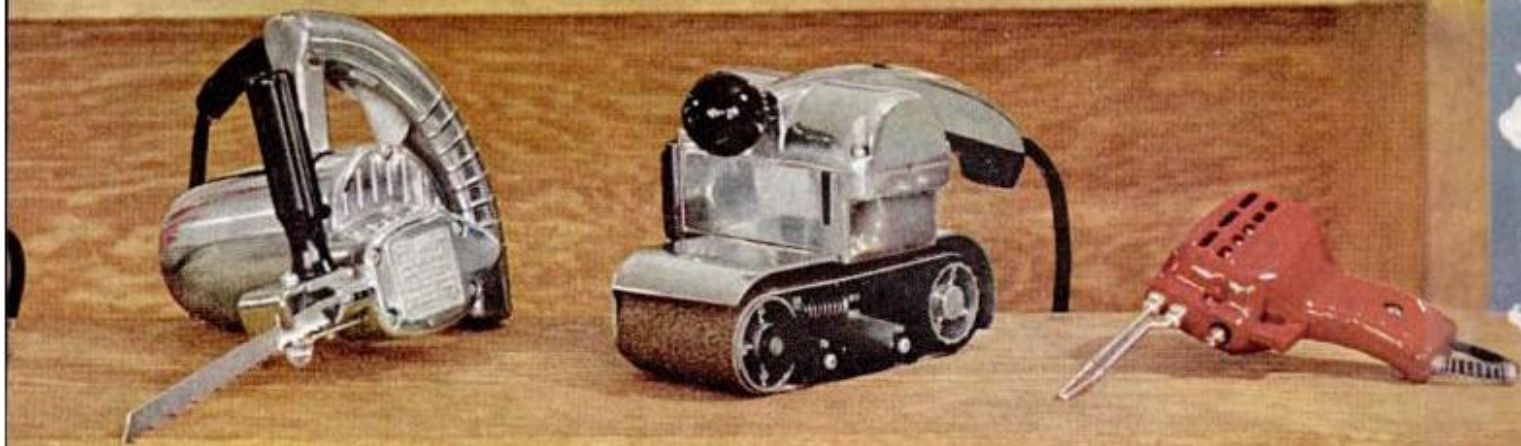
How to Stick with the Right Glue



**Fresh Flock of
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They're Tow-and-Stow Homebuilts

WEN POWER



FAST FREEHAND VERSATILE "ZIPP SAW"

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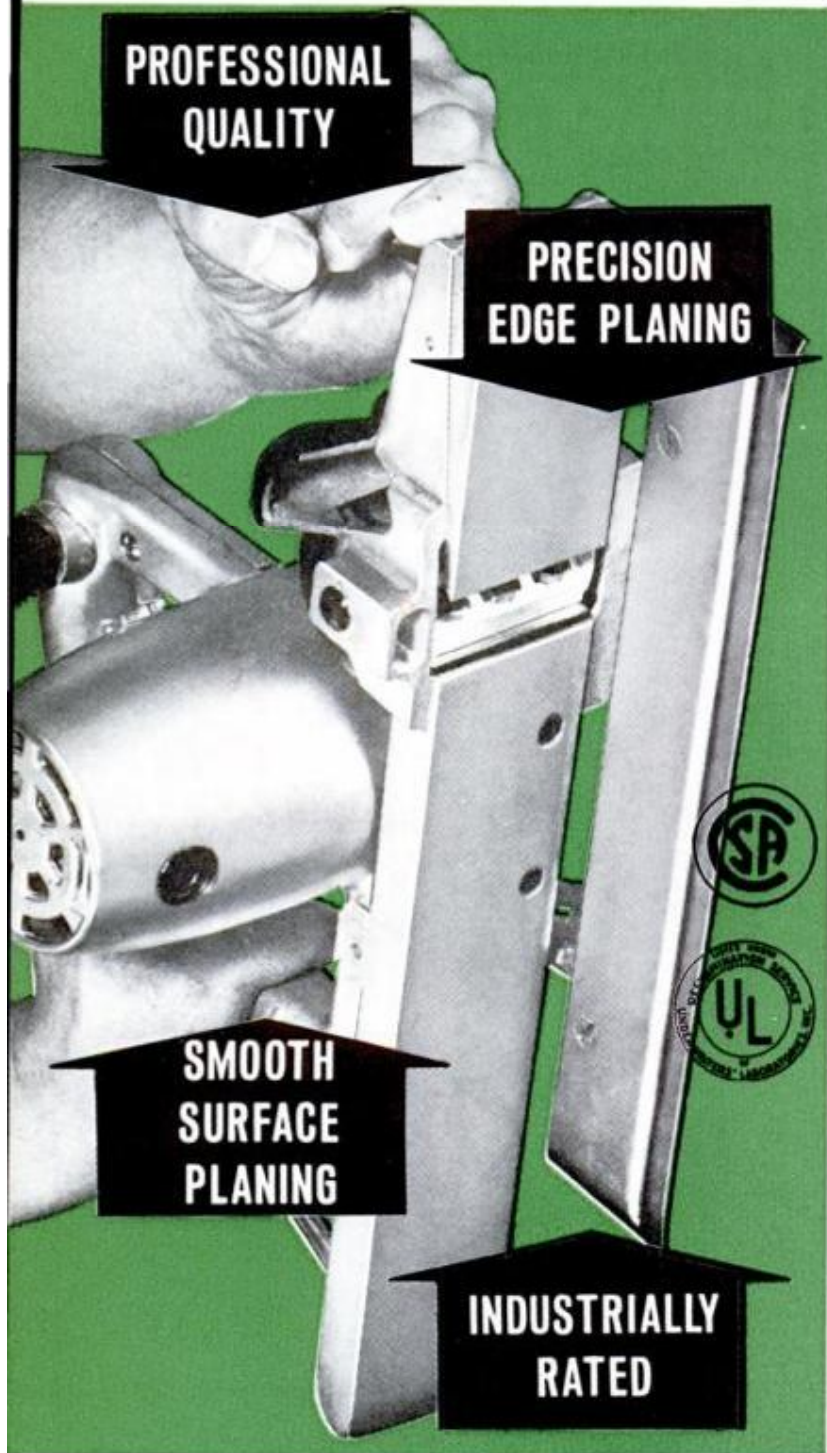
Industrially rated—does everything a pattern saw will do—more than a circular saw or chain saw—all with precision versatility. Cuts a 6" log, pipe, sheet metal . . . fine scrollwork, too. Complete with 7 blades, rip guide, circle cutter. Model 909. **\$44.95.**

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BEST BUY
WEN
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\$44.95

NEW WEN PLANE

**NOT AN ATTACHMENT BUT
A FULLY INTEGRATED TOOL**

In creating this amazing tool, Wen has filled a definite need in the industry. No comparable tool is available for less than double the price. Now the home-owner and hobbyist can include a fine electric plane in his workshop to replace the hand plane which he seldom used because it was just too tricky to adjust and to use with adequate skill. By contrast, the Wen Plane requires almost no skill and does a better job. Home-owners will find themselves able to solve problems of sticking doors and storm windows with ease . . . and able to do really fine cabinet work. Carpenters will welcome this low-cost addition to their traveling tool chest.

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The souped-up 1/2 HP motor is literally burn-out-proof and supplies plenty of muscle for the hardest woods. The conventional "saw" grip is perfect for this tool, and the forward grip handle allows the operator to exert as much or as little pressure as the job requires. The aluminum housing features an efficient air stream chip ejector which throws chips to the right—well away from the work.

The souped-up 1/2 HP motor is literally burn-out-proof and supplies plenty of muscle for the hardest woods. The conventional "saw" grip is perfect for this tool, and the forward grip handle allows the operator to exert as much or as little pressure as the job requires. The aluminum housing features an efficient air stream chip ejector which throws chips to the right—well away from the work.

A precision tool for precision work

An efficient twin-bladed cutter assembly spins at 14,500 RPM and cuts a swath 2 1/8" wide—plenty to cover any kind of edge planing and wide enough for convenient surface dressing. Depth is adjustable to 1/16". Fortunately the cutter assembly is replaceable at very little cost which saves the hobbyist (and the pro) the trouble of having to bother with precision grinding. This is handy but not vital since, with average use, the cutters are not likely to need replacement at all. The guide plate is a stabilizer in edge planing and can be angled precisely for beveling up to 45°. Available at fine stores everywhere.

OPEN THIS FLAP 

TOOLS... BEST BUY FOR YOUR MONEY

People everywhere know that dependable Wen tools offer far more for their money. More in brilliant design and engineering... new features to make doing a good job easier. Important advantages like 2-position handles on the "Double Duty" Drill and the Belt Sander to make your work more comfortable... unseen advantages like spot welded burnout proof armatures to give your Wen tool longer life and greater efficiency. You get more basic quality, too... better materials to meet exacting professional specifications—yet built so efficiently that Wen tools fall well within the budget of the hobbyist and home fixer. Next time you need a power tool, buy a Wen. You'll not find a better.

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...24 hours a day... 365 days a year
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Buick Motor Division also presents: Buick Special/Skylark/LeSabre/Electra 225/Riviera

WILDCAT BY BUICK!

How to pick the right glue for every job

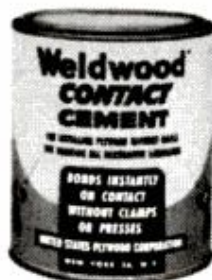
WELDWOOD ADHESIVES	APPLICATION																
	HOUSEHOLD REPAIRS china, glass, metals, plastics, porcelain		INTERIOR WOOD CABINETS, BUILT- INS, FURNITURE		INSTALLING PLYWOOD WALL PANELS		PLASTIC LAMINATES TO PLYWOOD OR PARTICLE BOARD	CONCRETE TO CONCRETE, WOOD, MASONRY	PAPER TO PAPER, FABRIC, CARDBOARD	CANYAS OR FELT TO WOOD	CORK TO WOOD	HARD- BOARD TO WOOD	BOATS (WOOD)	LEATHER TO LEATHER, WOOD	METAL TO METAL, WOOD, MASONRY	CHINA TO CHINA, GLASS	EXTERIOR WOOD OUTDOOR FURNITURE, SPORTS EQUIPMENT, WOOD TO WOOD, CORK, CANYAS
	LIGHT DUTY	HEAVY DUTY	LIGHT ASSEMBLY	HEAVY ASSEMBLY	WITH NAILS	WITH OUT NAILS											
Weldwood® EPOXY GLUE		✓					✓							✓	✓		
Weldwood® CONTACT CEMENT	✓				✓	✓							✓				
Weldwood® PRESTO-SET GLUE			✓					✓	✓	✓							
Weldwood® PLASTIC-RESIN GLUE				✓	✓							✓					
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FEBRUARY

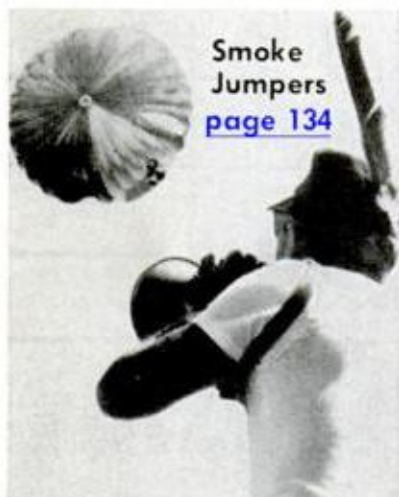
1963

VOL. 119

NO. 2

INTERNATIONAL EDITIONS • SPANISH • CARIBBEAN • FRENCH • PORTUGUESE

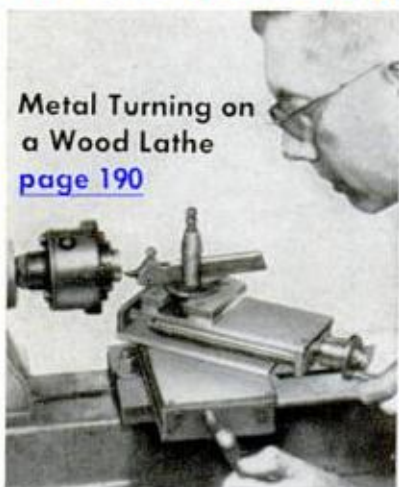
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NEXT MONTH Boats in Action: Dragboaters tell their high speed secrets; how it feels to water ski at 106 m.p.h.; plans for PM's 3-point hydro-plane. March PM also gives you inside facts on how our space detectives sleuth Red rockets; tells what owners like and dislike about their Ramblers and Ford Galaxies

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Published by Popular Mechanics Company

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ADDRESS COMMUNICATIONS TO: 575 Lexington Ave., New York 22, N.Y. For additional sources of information on the articles in this issue, or the name and address of the manufacturer of a particular product, write to Bureau of Information, Popular Mechanics for free "Where-to-Find-It-List."

SUBSCRIPTION SERVICE: Mail all subscription orders, changes of address, correspondence concerning subscriptions, and Postmaster notices of undelivered copies to Popular Mechanics, 250 West 55th St., New York 19, N.Y.

ADVERTISING OFFICES: New York: 575 Lexington Ave., MUrray Hill 8-8500; Chicago: 740 N. Rush St., WHitehall 4-0100; Detroit: General Motors Bldg., TRinity 5-8711; Cleveland: Hanna Bldg., 1422 Euclid Ave., PRospect 1-0456; Los Angeles: 3460 Wilshire Blvd., DUmkirk 2-8458; San Francisco: 111 Sutter St., YUkon 2-0823.

Published monthly by Popular Mechanics Company, 575 Lexington Ave., New York 22, N. Y. Richard E. Berlin, President; Richard E. Deems, Executive Vice-President; Fred Lewis, Vice-President and General Manager; John R. Miller, Vice-President; Joseph R. Buell, Jr., Vice-President; G. O. Markuson, Treasurer; R. F. McCauley, Secretary. Single copy in the United States and Canada, 35 cents. Subscription prices: United States and Possessions, \$4.00 for one year; \$7.00 for two years; \$9.00 for three years. Canada, add \$0.50 for each year. Pan-American Postal Union countries, add \$1.00 for each year. All other countries, add \$2.00 for each year. When changing address, give old address as well as the new, with postal-zone number, if any, and allow six weeks for change to become effective. Second-class postage paid at New York, N. Y., and at additional mailing offices. Authorized as second class mail by the Post Office Department, Ottawa, and for payment of postage in cash. Registered as Second Class matter at the Post Office at Mexico, D.F., Mexico, June 20, 1950. ©1963 by Popular Mechanics Company. All rights reserved. Printed in the United States of America.

BACKSTAGE

at PM

Those fold-wing planes featured on page 94 are sturdy—both the contest judges and the FAA have seen to that. But one contestant had to prove the sturdiness of his aircraft the hard way. A month or so before the contest, a friend who had borrowed the plane ran out of gas and crash-landed in the mountains of Washington state.

The pilot was unhurt but the plane cartwheeled, tearing the fuselage in two and ripping the fabric from the wings. The amateur builder and some friends hiked to the wreckage and carted the pieces back over mountain trails.

In less than seven weeks the amateur rebuilt the fuselage, repaired the wings, installed a new engine, repainted the exterior, and entered the contest.

It was worth it. He won first place.

Polaroid's amazing new color film, tested for a special PM report beginning on page 100, was still being improved right up to press time.

Early rolls required a minimum development of 90 seconds, then Polaroid reduced it to 60 seconds, then 50 seconds.

PM caught most of the changes, but just to make sure here's a thumbnail guide to exposure and development of Polacolor: Use 75 ASA at 50 seconds when temperatures are above 60 degrees. Below that, reduce the ASA and increase development. At extremely high temperatures, increase the ASA and decrease development.

While tramping around the hills of New Jersey in search of material for his entertaining article on Coon Fever (page 117), PM's Outdoor Editor Stu James came up with one cagey raccoon, and a headful of fascinating coon-hunting yarns, spun by 82-year-old Windy Williamson of Ringoes, N.J.

So enthusiastic was Stu about Windy's stories that he mentioned them to a director of Folkways Records. As a result, Windy's yarns are now being taped as part of Folkways' folklore library.

The Editors

NOW!



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UNTAPPED MARKET...WITH THESE
ALMOST UNIVERSALLY NEEDED**

"LIFETIME" CONCRETE INCINERATORS

**NO PREVIOUS
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NECESSARY**

**MAKE IT YOURSELF WITH 88¢ WORTH
OF SAND AND CEMENT**

**SELL IT FOR
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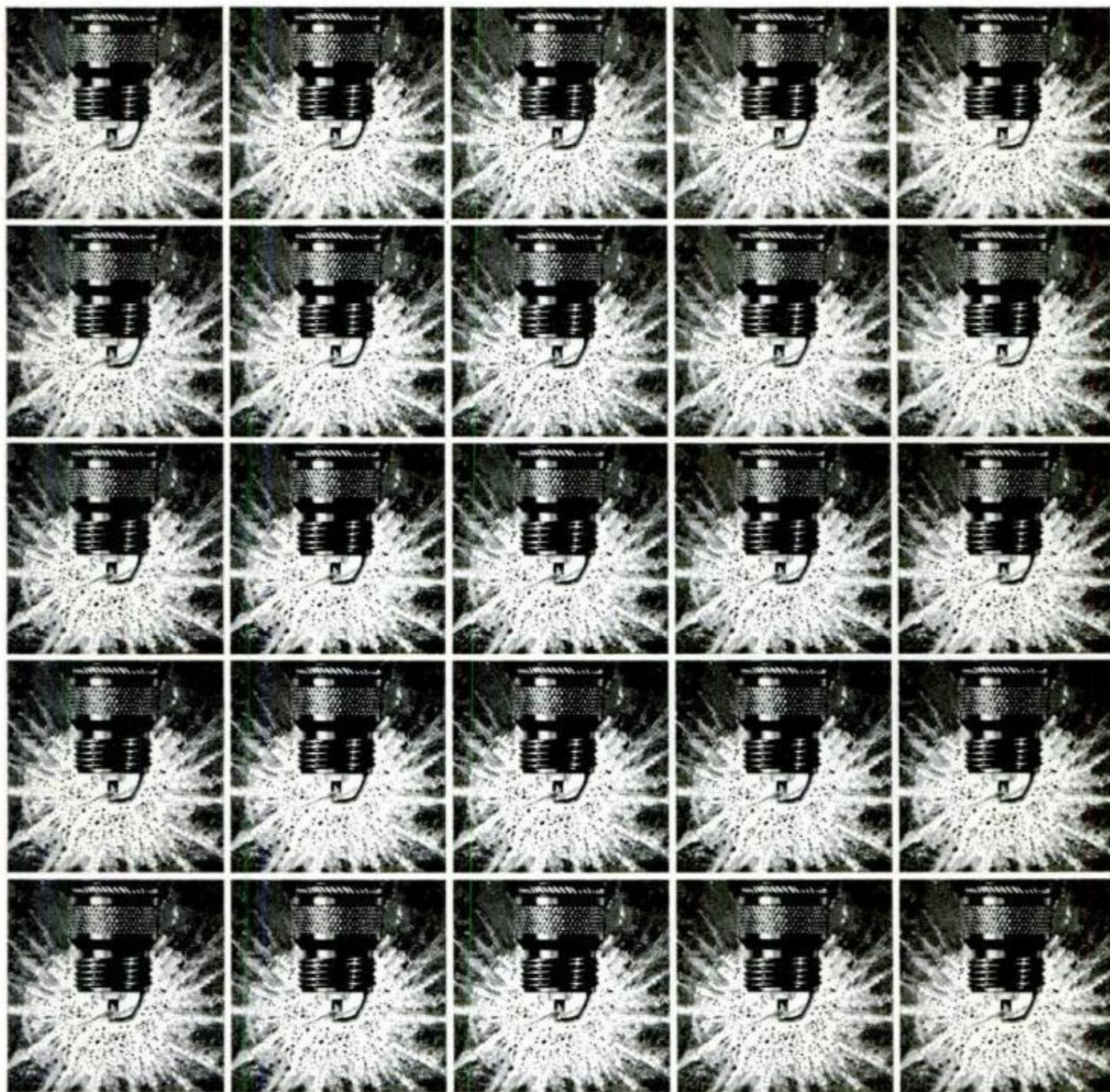
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FEBRUARY 1963

7

Over the editor's desk

He's Trying

In answer to your editor's comment on flying my GEM over the cows (*Editor's Desk*, Oct. *PM*), I have been working on it. I built an exact model of my large ground-effect machine; it is run by electricity and



flies perfectly. I could not find a cow to fly my model over so I used a horse.

Lakeside, Calif.

A. G. KLEIN

Well, okay. But if you really want to make air-cushion history, do it again with a full-size you in a full-size machine. And good luck to you and your horse.

Cards in Canada

In going back over the July 1962 issue of *PM*, I noticed in *Science Overseas* an item about punched-card shopping in France. This system can be found much closer to home than France. The Canadian Tire Corporation's main store in Toronto, Ont., has been using it for quite a few years.

Midland, Ont.

VICTOR DENISE

We didn't intend to slight our friends up North; we just didn't know about the system in Toronto.

Project-a-Plans Are the Most

Have just finished making the full-size pattern of your cover design (Dec. *PM*) using the Project-a-Plan transparency with my 35-mm. projector. You have, over the years, come out with a terrific bunch of wonderful ideas, but this time

you have topped them all! The Project-a-Plan is simply "the most." By the way, some clear vegetable oil also makes the design transparent.

Orangeburg, N.Y.

LEWIS HUBER

Have been a subscriber for many years and your Project-a-Plan is the best you have ever done. Would like to see much more done on this.

Unadilla, N.Y.

HOWARD WOOD

*Imaginative and speedier ways of doing projects have always been enthusiastically accepted by *PM*'s readers; we were pretty sure the Project-a-Plans would meet such favor. Thanks, readers Huber and Wood (and others) for agreeing with us. We'll be doing more with the plans, so keep your slide projectors handy.*

Strictly Speaking

I took the IQ test (*Does Anyone Know What IQ Means?* p. 113, Oct. *PM*) and missed one question. I defined "stringent" as "tight" instead of "strict." Afterwards, I consulted my dictionary, which mentions "strict" among the synonyms for "stringent," but also defines the word as "pressing tightly in any way; close or tight." Why not require those who make up the IQ tests to take a qualifying IQ test?

New York, N.Y.

CHARLES HAMILTON

There Will Bee Light

The article, *Let There Be Light* (p. 179, Nov. '61 *PM*), gave me an idea for my work with beeswax. I made the can-

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



POPULAR MECHANICS

**WE STARTED IN
THE SAME JOBS
...AND NOW
HE'S MY BOSS!**



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Here's how others do it:

IT HAPPENS every day. Two men start together in similar jobs. One follows instructions, performs his tasks, and hopes time and luck will bring him advancement. So he waits. And waits.

Not the other man. He does his job too, but he doesn't waste time *hoping* for something to happen. He knows he has to *help* it happen—by getting the special training that will make him *worth* a promotion.

Which of these two men will YOU be?

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This Free Book may prove of utmost importance to you. Write Today. There is no obligation.

Excelsior Medical Clinic, Dept. 86140, Excelsior Spgs., Mo.

delabra entirely from the wax and received second prize in the Harrisburg, Pa., Farm Show.

Horsham, Pa.

MRS. A. C. STORM

It's a honey of a project (if you'll allow a little bee vernacular), and we'd have been sorely stung if the judges hadn't recognized it as such. Bet it'll take a pretty special occasion to get you to light those candles, Mrs. Storm.

Ceramic Versus Magnetic

Using a magnetic cartridge in place of a ceramic unit—at a cost of two to 10 times as much plus the price of the preamp—will not improve the music-to-noise ratio. This makes the first two paragraphs of *Stereo Preamp for Magnetic Pickups* (p. 204, October PM) look naive . . . Greensboro, N. C. ROBERT G. VAUGHN

You're right, it won't improve the music-to-noise ratio. But magnetic pickups generally have better frequency response and permit lower stylus force, giving both better fidelity and longer record life. In fact, in the constant-velocity type of ceramic cartridge, output is cut down to that of magnetic pickups to improve the output quality.

Beefing Up the Bird

Since I made the Blue-Jay Weather Vane (p. 190, Sept. '57 PM) by hand except for the use of a sabre saw and electric drill, I was quite some time in completing it. How-



ever it was fun even though a 65-mile-an-hour wind sheared off the shaft inside. Plan to reconstruct, making the shaft 1/4 inch instead of 3/16 this time.

Fort Worth, Tex.

CHARLES E. FOLEY

Thanks for the tip on giving the bird a little more intestinal fortitude to weather those Texas breezes. Chances are quite a few other readers are building it, too.

To Men Who Want Big Money but Don't Know How to GET STARTED

How to Cash in on Opportunities in AIR CONDITIONING AND REFRIGERATION

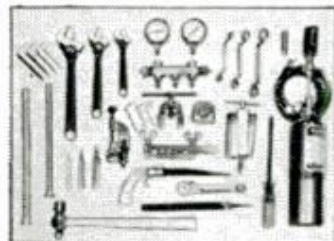
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"My wages have tripled since I entered this field."—James Weist, Minnesota.
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Radium-dial pocket watches have been banned for sale in New York City as of February 1. The City Health Department said studies indicated that such watches emit up to 75 roentgens of radiation a year, 150 times more than the amount the city considers "permissible"—0.5 roentgens. Pocket watches, one official said, are usually worn near the waistline, which over a period of years could cause genetic damage to the body. Wrist watches were not affected by the ban.

Go into a cave to cure a cold? That, in effect, is what Hungarian medical authorities prescribe after studying cases of geologists who've worked for months in chill cave air without catching colds. Medics theorize that fungi on the cave walls may be the answer. Some antibiotics are produced from fungi, and experiments showed that vapors in the cave also contain ionized calcium, which allays respiratory infections.

Eggs with man-made shells are making their appearance in England. A machine originally developed to save eggs with cracked shells can put a transparent plastic shell around as many as 3000 eggs an hour, and is now used on sound eggs as well. Each egg is vacuum sealed and sterilized with ultraviolet radiation. The eggs can withstand rough handling and stay fresh much longer. They can be boiled or poached in the container.

The lady of the house can dry her hair and heat her room with the same machine. A British firm has developed a salon-type hair dryer that easily converts into a room heater.

Fruit apparently was popular with cave-men, too. A group of Japanese archaeologists in northern Japan recently found peach seeds at an ancient dwelling site believed to be between 7000 and 8000 years old.

Scientists may soon get their first actual glimpse of an atom—and actually read the code of life as it exists in the genes. Dr. Alvar P. Wilska of the University of Arizona is now building a re-designed electron microscope which, he says, will permit scientists to see much thinner slices of matter and distinguish the atoms in a molecule. His changes, oddly enough, weaken the powerful electron beam, but increase the microscope's resolution power.

In the new design, the interior of each lens is shaped into a cone instead of a tube; as a result, slower-acting electrons are expected to give greater contrast to matter under study. To eliminate spherical aberration in the lenses, Dr. Wilska blotted out the center of each lens with a metal electrode.

'All the news that's fit to eat' is a slogan that might apply to one South African farm. A woman near Johannesburg mixes old newspapers into fodder for her livestock. She tears the papers into shreds and boils them with a touch of washing soda until they have the consistency of meal. Then she mixes them with molasses. She says horses and cattle thrive on it.

They're literally gluing houses together in Denmark. Builders there are using light-weight "foamed" concrete blocks in which a glue replaces mortar. The Danes say such "glued" walls are sturdier and actually more water repellent.

Horses no larger than dogs are being bred successfully by an Argentine rancher. The "toy" horses stand only 20 inches high—about the size of the prehistoric horses from which today's animals are descended.

An electronic method of determining the exact time of human ovulation was recently described by Dr. Alvin Singer of American Electronic Laboratories. It consists of a suppository with a tiny transmitter mounted on the rim; this will transmit precise internal temperature changes to pinpoint ovulation periods. The method would permit parents to space children at desired intervals. It can be useful in treating sterility, and it might give parents some control over the sex of their offspring, as there is some evidence of correlation between the sex of the child and the conception time.

How the ancient Etruscans got water up to their mountaintop cities is a 3000-year-

(Please turn to page 14)

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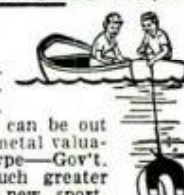


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Science Worldwide

(Continued from page 12)

old mystery being probed by two University of Michigan archaeologists. One city, Vetulonia, is still inhabited and its residents still use water from the ancient system. The question is, how does water get into the Etruscan wells? There are only two known ways ancient mountain dwellers were supplied with water: Pools inside the mountain fed by rainfall, or a system of aqueducts leading from springs in taller surrounding mountains. Only trouble is Vetulonia has no taller mountains around it and it doesn't rain there for months at a time. But the town suffers no lack of water.

Ice-water immersion was recommended as a new treatment for snake bite at a recent meeting of the American Academy of Dermatology. Calling the "cut and suction" method obsolete, a researcher said that after a tourniquet is applied, the bitten area should be immersed in a mixture of ice and water. Lowering the temperature of the area, he said, permits the body's own defenses to attack the venom.

And now it's instant butter. Australian government scientists have perfected a way of powdering butter by reducing its water content to less than one percent. Adding water won't convert the powder back to normal butter, but it can be used for cooking and baking. It needs no refrigeration and can withstand tropical climates.

In case you've wondered, the aroma of cooked oysters is caused mainly by dimethylsulphide. So say two University of Wisconsin biochemists who are tracking down the flavoring substances in various foods, including cheese and powdered milk. The odor studies may lead to improvement in the quality of foods by controlling substances that cause unpleasant odors and flavors.

Drinking water made from melted snow is on its way out at the Navy's McMurdo Sound base in the Antarctic. Strange to say, getting snow at the base is a chore. In winter, snow trucks have to operate in minus 50-degree weather; in summer, snow has to be trucked in from distant hills. A sea water distillation plant made by Aqua-Chem, Inc., is now being installed that will provide all the water needed by the 900 people at the base. It'll operate on the ice continent's first atomic plant.

John P. McNeel

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Why the Boom in Appliances Means Money in Your Pocket

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example, 4,750,000 new coffee makers, 2,000,000 new room air conditioners, 1,425,000 new clothes dryers. And now that Americans have become so absolutely dependent on these electrical aids, they are dependent on the men who can service them. As a trained Appliance Service Technician, you will be needed — respected — well paid.

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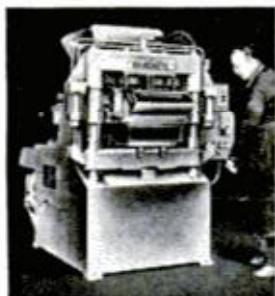
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Truly —
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Sidelights on aviation

Back in the 20s and 30s in the romantic days of aviation, it seemed that every young boy dreamed about flying. Today, while aviation has improved and pilots are shooting for the moon, interest has waned and the romance is gone.

The young pilots just aren't coming along as fast as they used to.

If no one takes over from the older men—and more than 64 percent of all pilots are now 36 years of age or older—the space ships of the future might never get off the ground because there will be no one around to man them.

A recent survey showed that of 111,000 men holding the pilot certificates, only 3200 of them were under 25. Some reasons given are the closing down of smaller airports, cost of instruction and antagonism of residents near airports who hate the noise of even the small airplanes.

Washed-out Navy pilots, among others, might be interested in the story on "knuckle-headed computers" which *PM* published in January.

Navy flight instructors now turn to computers for guidance on whether to pass or wash-out student pilots. Background information on each student became so voluminous that instructors tended to ignore it and rely on their own judgment. Now, within 15 minutes, the computer can process all data on an individual student and come back with a "success probability" on him, placing him in groups, for instance, where two out of three, or three out of four might succeed.

As the *PM* story suggests, however, some computers are knuckleheads. So the washed-out student, when bemoaning his fate, might have to curse "that chicken-hearted computer" instead of berating the instructor.

Fuel tanks for light airplanes can now be made by spraying rubber on cardboard. This revolutionary new technique, developed by the Goodyear Tire & Rubber Co., produces lighter tanks at considerably less cost and may have wide application in other fields.

Kevin V. Brown

POPULAR MECHANICS

Chevrolet has all kinds of horsepower for '63!

140

Power plant number one: A new 230-cubic-inch six-cylinder with seven main bearings for smoothness and power that'll make you think you're driving a V8. It's approximately 23% lighter, nearly three inches lower in overall height, two inches less in length.

HP

195

Power plant number two: Our old friend and yours, the 283-cubic-inch Chevrolet V8, with new cylinder heads and a higher compression ratio for better traffic performance, better highway performance, and better fuel economy in the bargain.

HP

340

Power plant number three:* A brand-new version of the Chevrolet 409. It has a moderate cam, hydraulic lifters, a compression ratio of 10 to 1, a four-barrel carburetor, and can be ordered with Powerglide.* It tailors the 409 to the pace of everyday commuting.

HP

400

Power plant number four:* Basically the same as the 409-cubic-inch V8 that delivered 380 horsepower last year, but now with a new higher lift special camshaft and free-flow manifolding that boosts volumetric efficiency and brings the horsepower up to 400.

HP

425

Power plant number five:* The King! The most powerful engine in the Chevrolet lineup. It's like the 400-horsepower 409, but it has *two* four-barrels and bags of torque. It comes with either the three- or the four-speed* stick. It could be described as stimulating.

HP



The optional 327 V8s with 250 and 300 hp, respectively, are also available, but are unchanged from 1962. . . . Chevrolet Division of General Motors, Detroit 2, Mich.

**Optional at extra cost.*

Items from all outdoors

Conservationists and hikers will be interested in plans under way to establish the Lewis and Clark Trail on the lines of the Appalachian Trail. Conceived by the late "Ding" Darling, famed editorial cartoonist for the Des Moines Register, the trail will cover 2000 miles, following the historical route of Lewis and Clark from St. Louis, Mo., to Portland, Ore. A group of Midwesterners have formed the "Ding" Darling Foundation to push the project, and officials of 10 states have offered support. For full information contact: Ries Tuttle, outdoors writer, *Register & Tribune*, Des Moines, Iowa.

Here at last is a book on fishing for the complete novice. *Fishing*, by William Moore, is for the youngster or adult who wants to fish, but does not know how to get started. Unlike most fishing books which seem to be written for experts, this book begins with simple cane pole fishing with worms or dough balls, and covers everything you need to know to go after game fish with spinning or fly tackle. G. P. Putnam's Sons is the publisher.

Backpacking a stove can be a problem, mostly because the average model is round and bulky. After searching around we found a one-burner stove that is ideal. It measures 8 inches by 6 inches by 3 inches, slips snugly into a corner of the pack and weighs only two pounds when filled. It burns denatured alcohol, which is nontoxic, and operating cost is approximately 20 cents an hour. It is easy to light, and the burner is fed by a simple gravity system. Called the "Vulcano," it is sold by Gloy's Import Co., 11 Addison St., Larchmont, N. Y. The price is \$9.95.



Antique musketry recently acquired from the Hapsburg estate in Austria lured us out to the Winchester Gun Museum in New Haven, Conn. The matchlock and wheellock muskets are beautiful pieces, but the weapon that intrigued us was an American invention called the *watermelon patch gun*. A lethal burglar alarm, this is a revolving scatter gun mounted on a

swivel base. Trip wires spread through the watermelon patch were attached to the gun, and when one was tripped by an unwary thief the gun automatically swung into position and fired.

Ice fishermen generally carry a supply of tip-ups, but in the event you need a fast improvisation, a four-foot branch trimmed of all but two limbs will do the trick. As shown, the trigger limb is cut about a foot long and whittled smooth at the end. The opposite limb is left untouched. The end of the line is tied tightly to the branch near the limbs; slack is carefully coiled near the hole, and several turns are taken around the trigger. When the fish takes the bait, the trigger sets the hook, and the extra line allows him some play. When he takes the complete line, the leafed limb is raised as a signal.



New for outdoors . . . A sleeping bag that can be tossed into an automatic washer and dryer without fear of shrinkage is new from Wenzel Tent and Duck Co., 2200 S. Hanley Rd., St. Louis, Mo. Bags are reversible and the single size is 33 inches by 75 inches. . . . The Sea/Line marine knife features a cutting blade on one side and a three-inch marlin spike on the other, which is ideal for loosening wet knots, opening beer cans and splicing. It is made of stainless steel and priced at \$2.75 by West Products, Box 707, Newark, N. J. . . . A rigid aluminum pack frame designed for extra-heavy loads features an elongated body frame and a special lever-lift action. Named the K-2 and made by Himalayan Industries, 807 Cannery Row, Monterey, Calif., it sells for \$24.95. . . . Lightweight plastic tent pegs that are as durable as metal sell for 20 cents each from Camp and Trail Outfitters, 112 Chambers St., New York, N. Y.

Fur trapping in our youth was a business and adventure: Up at 5 a.m. to run a 40-trap line; evenings spent skinning and stretching pelts; and once a month the man from Sears, Roebuck came to scowl, sniff derisively and finally buy the skins. Is this a bit of lost Americana, or are there kids still trapping in the hinterlands? If so, who buys the furs these days, and what are the prices?

Stuart James

POPULAR MECHANICS



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Here is your opportunity to BE YOUR OWN BOSS... to become financially independent... have a fast growing income... and own a Nationally Advertised business.

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You have good profits on both materials and labor after paying servicemen.

You can stay at present job while customer list grows... then switch to full time, lining up jobs for your servicemen to do.

One small job a day brings a good starting income. With full or part time servicemen your income is unlimited.

Dealers operate from a shop, office or home. Equipment is portable... the electric Foamovator converts to a carrying case.

At the start, you may want to render service yourself. This business is easy to learn... easy to start... so easy to service that women dealers often do it. We prefer you have no experience... not have to "unlearn" old scrub methods.

You may write a Duraclean dealer if you like.

A Waiting Market

New "miracle" fabrics and light colors (which soil faster) have created a growing demand for the Duraclean quality of cleaning.

All services are rendered "on location" in homes, office buildings, hotels, theaters, clubs, churches and institutions. Car dealers buy your services to revive used car upholstery... also take orders for you. Almost every building houses a potential customer. The big demand (even small towns) assures dealership growth.

These superior, safer and convenient methods resulted in Duraclean dealerships throughout North and South America, Africa, Portugal, England, Israel, Norway and other countries. Only Duraclean dealers have this prestige.

Advertising, paid by International Headquarters, explains the superior merits of your services and develops customer confidence and job leads.

We Train and Assist You

A Duraclean dealer will train and assist you. He'll reveal his successful, proven methods and sales plans. He will WORK WITH YOU.

We show you 15 quick ways to get customers. You have pre-tested newspaper and yellow page ads, commercials, and a full mailing program.

Your services are backed by Parents' Magazine Seal, McCall's "Use-tested" approval and American Research & Testing Laboratories.

Duraclean dealers find voluntary and repeat

Resale Service

If, because of illness, moving or for any other reason a dealer wants to sell, we maintain a service to locate buyers and help him sell.

Dealerships resell at up to 10 times the dealer's cost.

Find out Now! No obligation

With no obligation, we'll mail you a letter with 32 page booklet explaining these services... how and why your income grows... how we help finance you.

Then decide if this opportunity fulfills your dream of headway, independence and bigger income. Your location could be taken tomorrow... so mail coupon TODAY.



What Dealers Say

L. Broersma: "Have now completed 5 years with Duraclean. We have never had one complaint."

George Byers: "For University, bill was \$2,416. Total expenses \$814."

Ed Kramsky: "In 2 years, I now have two assistants, a nice home and real security for my family."

L. Babbit: "I average \$400 monthly part time. I'm starting full time."

Russ Day closed 19 jobs from 21 contacts.

W. C. Smith: "Earned \$650 one week. Volume keeps getting bigger."

L. Falls: "I cleaned 1,900 sq. ft. of carpet in one day. Made \$135."

Earl Davis: "Our sales increased \$17,660.00 this year."

A. Nebendahl: "Closed every sale where I used new slide projector."

N. Josseland: "Have made as high as \$200 in one day. Largest earnings for a single week, \$750."

Fabric Mills Endorse YOUR Service

Aldon Carpet Mills: "We approve this process. We are pleased with the texture restoration."

Patoraft Mills: "Fibers are not soaked by Duraclean. Best method of cleaning we have seen on tufted carpeting."

Croft Carpet Mills: "The Duraclean method is superior."

Trendline Upholstered Furniture: "We recommend Duraclean as the safest and most effective method of cleaning fine furniture."

Kingston Mills: "It is our intention to recommend Duraclean Service."

Modern Tufting Co.: "Duraclean is superior to any on-location cleaning process with which I'm familiar."

Painter Carpet Mills: "Duraclean is logical approach to carpet cleaning because the tufts are not subjected to the harsh treatment so prevalent in other methods."



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Duraclean Co., 3-162 Duraclean Bldg., Deerfield, Ill.

With no obligation, mail letter with 36 page illustrated booklet explaining how I can increase my income and family security with a Duraclean Dealership.

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Pentagon sidelights

By William R. Kreh

Mountain climbers under stress will be studied by the Navy during the first American assault on Mount Everest in May. A psychologist, under contract with the Office of Naval Research, will be in the expedition because the climbing attempt presents a unique opportunity to observe leadership and stress among small groups of men isolated for long periods such as in long submarine trips or at remote Arctic posts.

Top-blowing, a favorite pastime of some bosses, must be conducted with care in the Pentagon these days. No more desk-pounding, wall-rattling or floor-stomping. A new security system is the reason. A rash of new signs warning all, in effect, to walk and speak softly in certain areas have appeared in parts of the Pentagon. They say: "Warning: This space is protected by an electronic alarm system. Do not shake door or wall. It may trip the alarm."

The Army's bugs are being studied to see if they would make good germ-warfare detectors. Some insects, Army scientists say, have extremely sensitive receptors, especially for odors, and they might be adapted as part of a detection system for biological agents. Their receptors might be arranged to sense foreign materials and respond as transducers by creating an electrical output that could be fed into electronic computers.

Two new weather instruments—a thunderstorm locator and a cloud-height measuring device—are being tested by the Army. The locator scans a circle 300 miles in diameter by radar, searching for storms before they are visible on the horizon. The height-measuring device tells how high clouds are as they pass directly overhead. Light and compact enough to be carried to temporary airstrips by helicopters, it sends a pulse of light like a radar beam at an overhead cloud which bounces it back to the instrument. Height of the cloud is determined by the fraction of a second it takes for the light to be reflected back.

Helicopters with bamboo poles extending beneath them can serve as emergency radio relay stations, tests by the Army in Korea have shown. Should a radio relay site be put out of commission, a 'copter carrying transmitter and receiver equipment and with antennae mounted on 15-foot bamboo poles, circles the site at 2200 feet until the site is repaired. The Army says such a "bamboo relay" would be particularly useful over terrain such as in Korea where many mountains make it necessary to set up a lot of relay stations.

Clever airmen of the machine repair shop at Westover Air Force Base, Mass., have found a new way to dry typewriters completely after they've been cleaned. They built a large box and installed four heat lamps in it. By putting the typewriter inside the box, all the few hard-to-remove drops of water that remain after the machines have been cleaned are removed. Formerly, compressed air was used but this failed to remove all the dampness and often resulted in rust.

A light artillery rangefinder is under study by the Marine Corps and Army. The device, which resembles a large shotgun and weighs only 20 pounds, actually uses a beam of light to see how far away a target is. Called the Laser Rangefinder, it sends a light ray, lasting about a billionth of a second, to a target. The laser's receiver picks up its reflection. The time it takes to return is converted into range. The operation is practically instantaneous and the beam of light cannot be seen by enemy eyes.


Underwater "blackouts" kill many people rated as excellent swimmers, the Navy learned. They're caused by hyperventilation—breathing deeply and rapidly for some time before swimming underwater. This lowers the amount of carbon dioxide in the body so much that no warning is given for the need for oxygen. Swimmers black out but continue to make normal movements so that observers can't tell what has happened.

Settled stomachs and smooth sailing may be the result of a Navy experiment to see if ocean waves can be forecast just like the weather. This would permit ships to change course to avoid high waves. A one-year study now under way will feed into a high-speed computer all information we have on how winds kick up waves, size of the swells, how far they travel and the like. The study will try to find a pattern of waves in the North Atlantic Ocean. ★★

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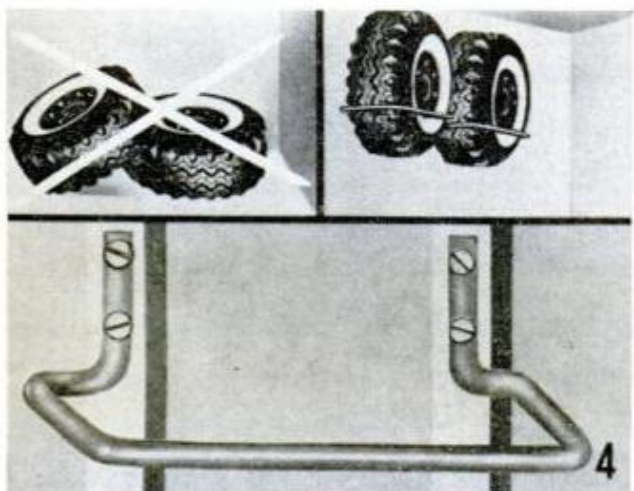
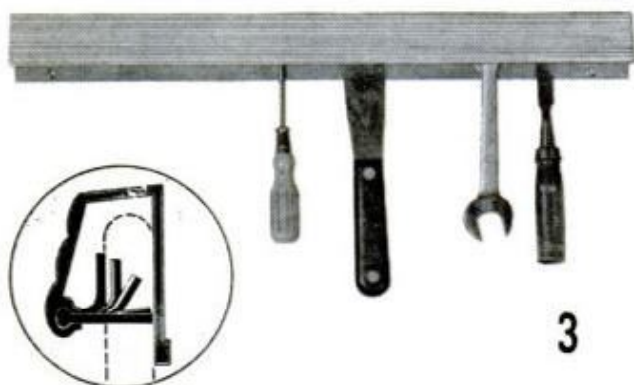
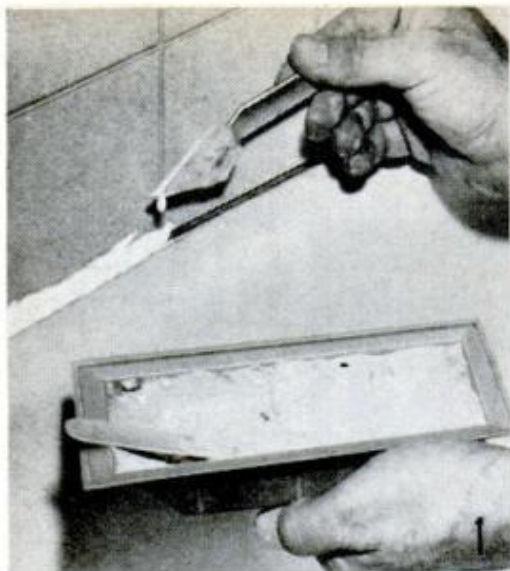
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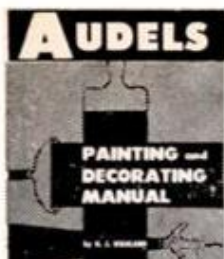
1. INSTANT CRETE, tile-and-tub patch kit, is packed in its own plastic box. Contains grout mix, a trowel and a mixer-edger. User simply adds water, mixes and then applies mix to cracks. Dries to a porcelain-like finish. Complete kit priced at \$1. Instant Crete Corp., 1134 E. St. George Ave., Linden, N. J.

2. SNOWHOUND, powered by a 4-hp. gasoline engine, has a spiral rotor that throws over a ton of snow per minute up to 20 ft. to make a 25-in.-wide path. The chute can be rotated in a 270-deg. arc to take advantage of wind and available snow-piling areas. Price is \$269.95. Toro Mfg. Co., Minneapolis, Minn.

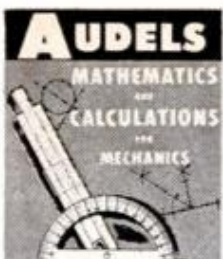
3. LITTLE WONDER wall mounted hanger has a row of rubber fingers (insert) that grasp and hold small tools or kitchen utensils pushed up into the 18-in. aluminum housing. A sideways tug releases the item. Home model costs \$1.98. Two-row workshop model for heavier tools, \$3.49. John E. Zerbey, Blue Bell, Pa.

4. TIRE STOWAWAY rack provides for storage of snow tires on a garage wall. Conserves floor space and prevents possible injury to persons who might trip over them if left on the floor or walk into them if hung on nails. Made of steel rod and painted gray. Set of 2 costs \$3.98. Crest Co., 26 Ave. B, Newark, N.J.

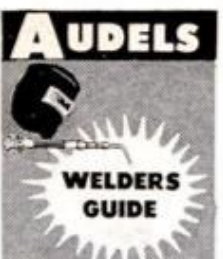
5. LEVEL STEP accessory makes it possible to use a ladder in a level position on grades or steps without danger of tipping or sliding. Attached with screws, its rubber-booted steel legs can be extended up to 7½ in. and locked at any point. By mail for \$5 from K & P Products, 1002 W. 7th St., Mishawaka, Ind.



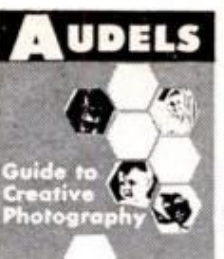
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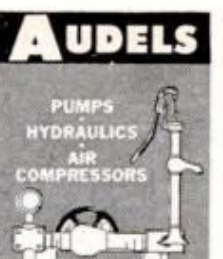
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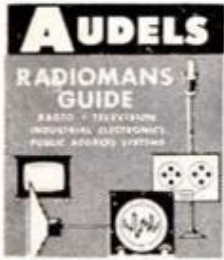
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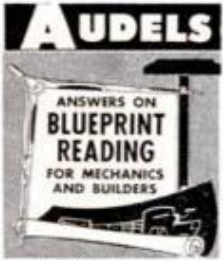
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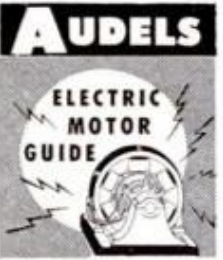
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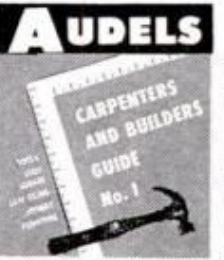
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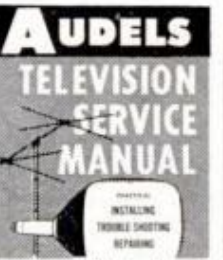
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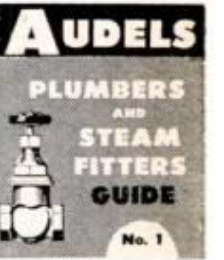
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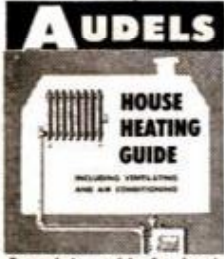
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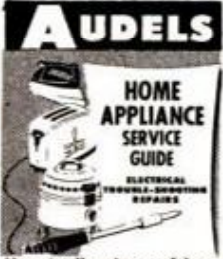
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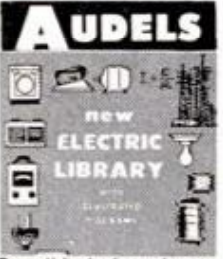
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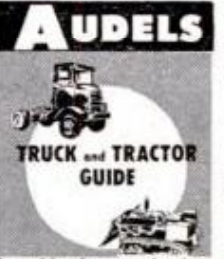
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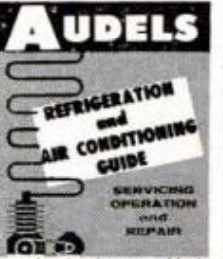
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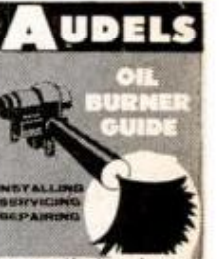
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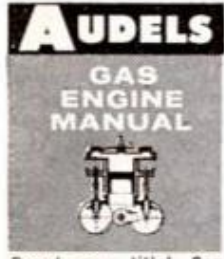
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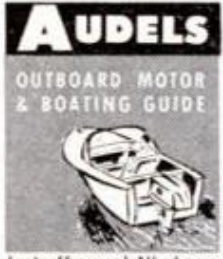
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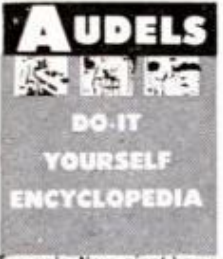
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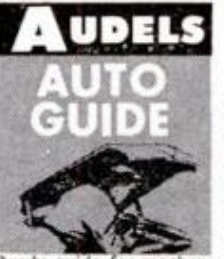
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Tune in on the inventors

A golfer's putting glove gives more accuracy by enabling a golfer to keep the proper grip during the putting stroke, according to inventor Richard E. Linnell, Minneapolis, Minn. The glove has a holder in the palm through which the putter is fitted at the correct angle to hold the face of the putter on the ball. Patent 3,065,472.

Handy for a workshop is an attachment for a radial saw that converts the saw into a router. The conversion is made by simply removing the saw blade and mounting the attachment on the motor shaft. All high-speed portable router and molding bits may be used with the attachment, says the inventor. Patent is pending for Robert Bellini, Twin Falls, Ia.

Cold, cold hands? Try a finger mitten worn over conventional gloves or mittens to give the fingers added cold protection. Patent 3,064,266 went to Henry Veghte, Jr., Stage, Rutland, Vt.

Nuclear fission to synthesize organic compounds is the method that earned patent 3,065,159. The compound is combined with fissionable uranium and then exposed to the radiation of a nuclear reactor. The uranium causes the compound to break up, and then recombine to form a different organic compound. This method is supposed to increase the output of chemical product per unit of fissionable fuel by a factor of 10, according to Willard P. Conner Jr., Chadds Ford, Pa., and William E. Davis, Wilmington, Del.

Hunters hiding in the woods will be more comfortable with a seat that can be fastened to the trunk of a tree. The seat is portable and collapsible and can be carried strapped to the hunter's back. It won patent 3,065,821 for Raymond E. Hundley, Jr., Eagle Rock, Va.

Stowing guided missiles aboard ship vertically so that they can be hoisted into position for launching or firing is the method that won patent 3,065,673 for Ralph H. Hereth, Port Orchard, Wash. He assigned rights to the Government.

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

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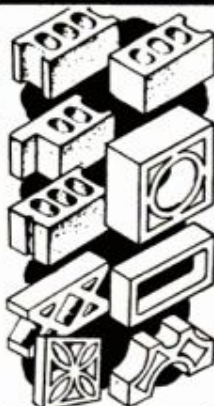
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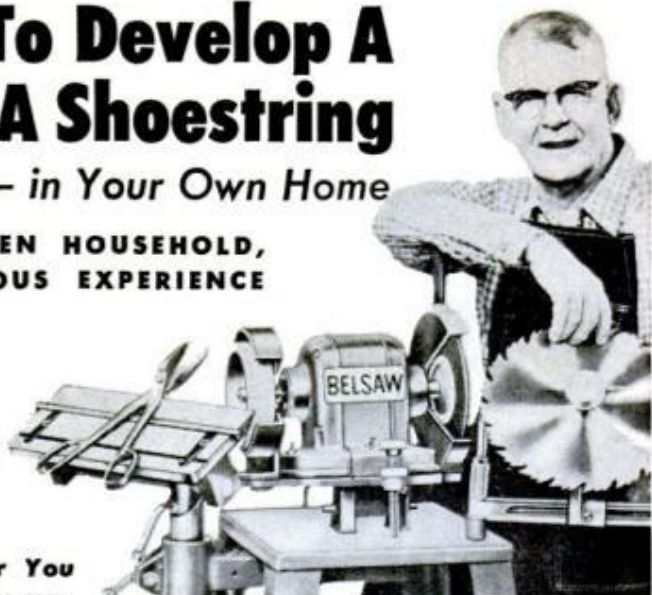
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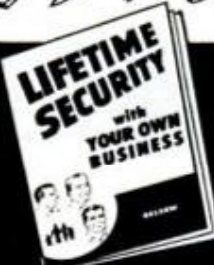
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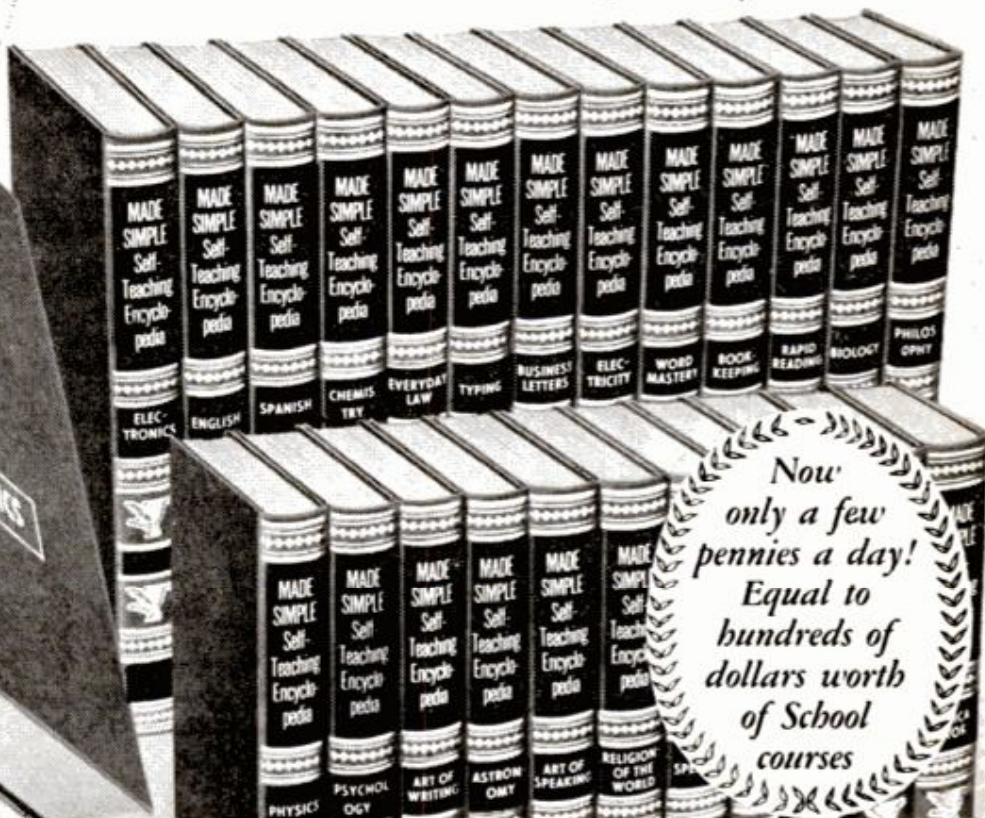
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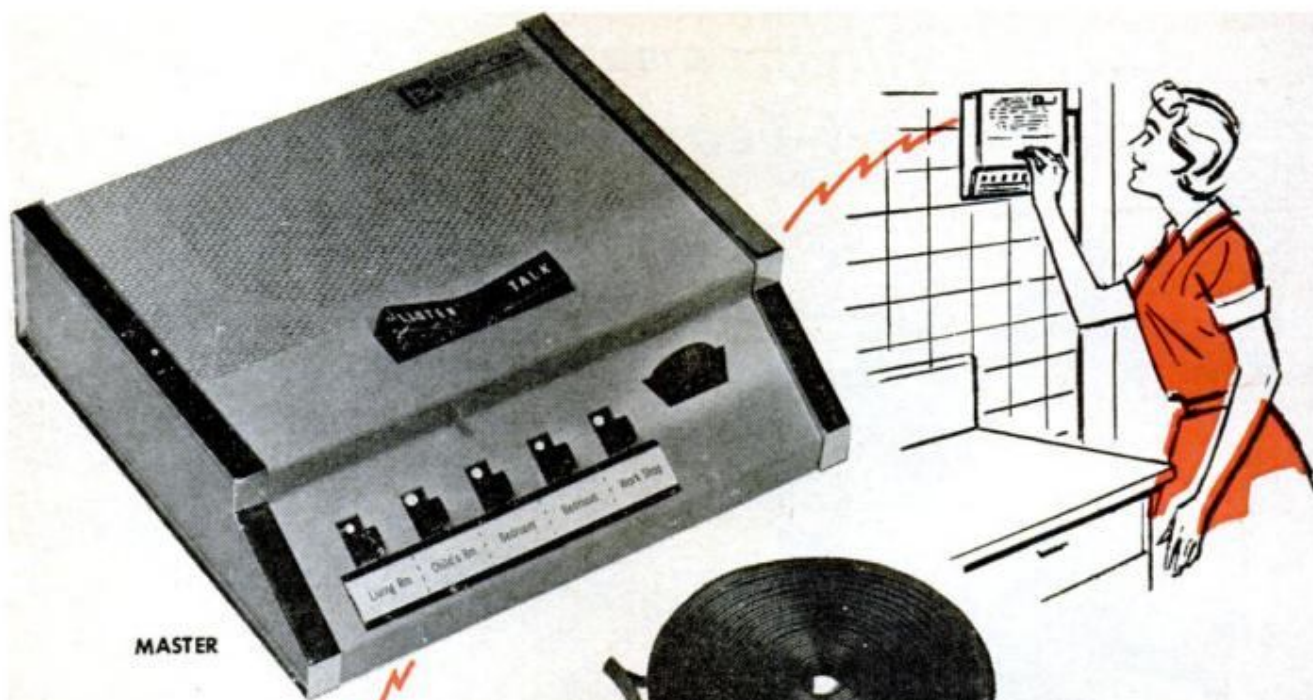
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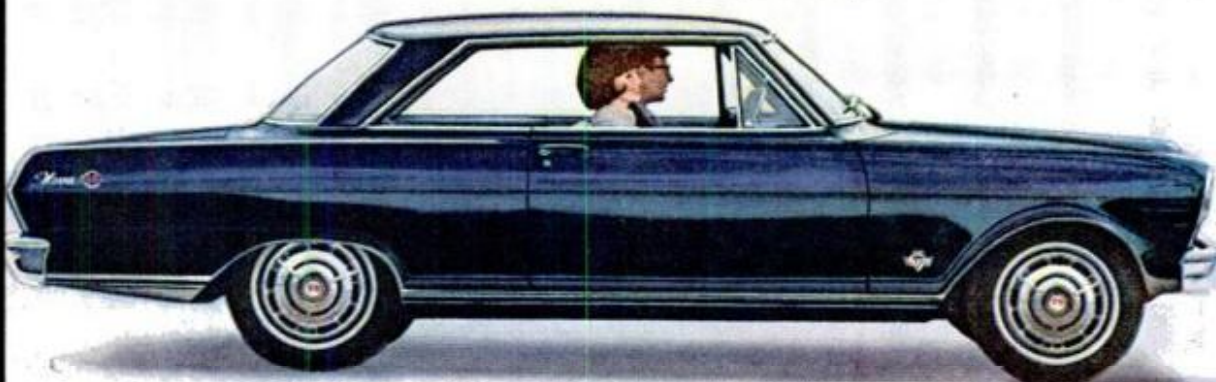
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Spotlight on the MG 1100

How well does its unique rubber-and-water suspension work?

By Ed Nelson

BRTAIN'S new, four-passenger sedan, the MG 1100, is literally jam-packed with trend-setting features. It boasts a transverse-mounted engine and front-wheel drive. Its integrated differential-transmission-crankshaft runs in a common oil bath. But the gold cup for the most important innovation goes to the car's Hydrolastic suspension—a feature that results in virtual elimination of pitch.

It is surprising how much of the discomfort of a rough ride comes from fore-and-aft pitch, rather than side roll or vertical jounce. With pitch under control, you get big-car ride on a 93½-inch wheelbase! A friend with a tendency to knock small cars as “toys” comments, “I forgot this was a toy—it feels like a real car.”

Hydrolastic's operation is fairly simple. A heavy rubber spring in the unit at each wheel acts much like a variable-rate coil spring; other parts serve as shock absorbers. Upward motion of the wheels is transferred into the Hydrolastic units (see drawing) through shafts that peel a flexible diaphragm up from the lower section and act, through non-compressible fluid,

against the conical rubber spring. That tapered shape gives the spring its variable rate: The more it's squeezed, the more it resists further squeezing.

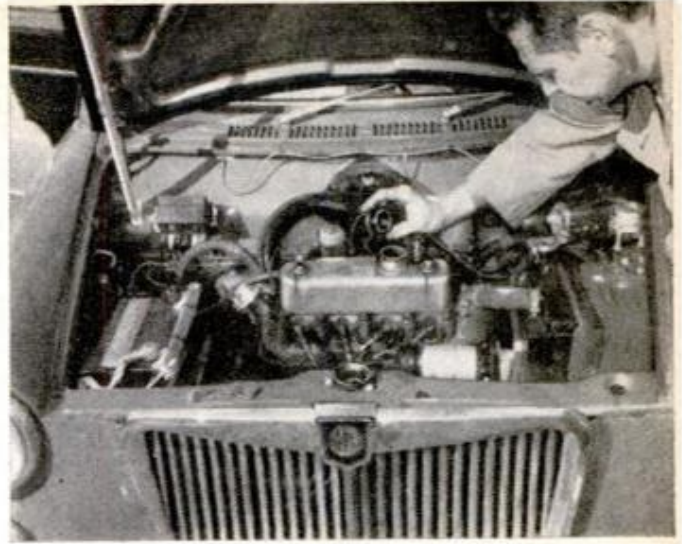
The most significant part of the sealed system is the fluid connection (via small-bore tubing and rubber damping valves) of each front-wheel unit with its corresponding rear-wheel unit. Hence, upward motion of a front wheel rams fluid to raise the rear unit. It's like holding two water-filled rubber bulbs—one in each hand—connected by a hose. Squeeze one, and pressure builds in the other. This system has a dual advantage: First, the rear Hydro unit lifts that end of the body at the same time that the front is moving up. Result: Instead of tilting one end at a time, you get a ride that is virtually level. Second, since the total displacement is split between front and rear “springs” instead of being absorbed by one end at a time, a bump is easier on individual units, the car—and its occupants.

For hydraulic fluid, British Motor Corp. engineers use water mixed with anti-

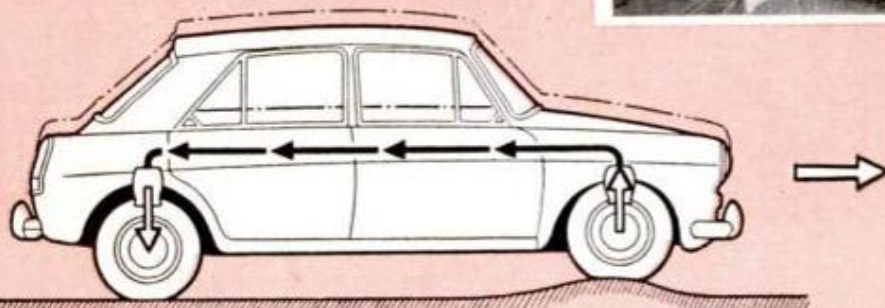
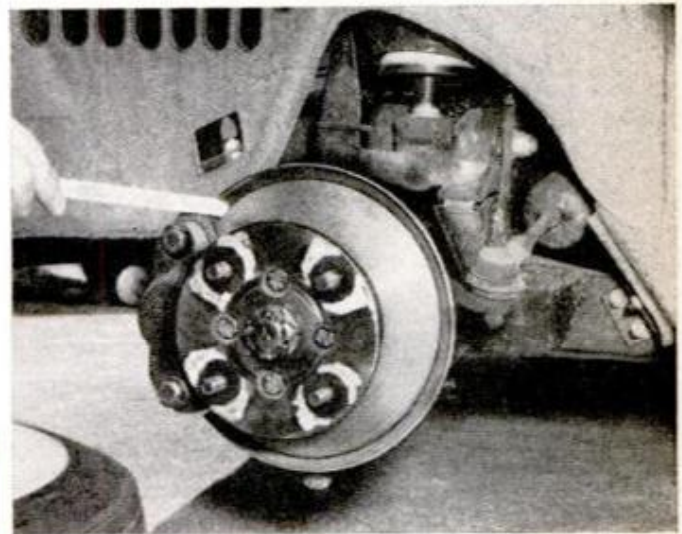
(Please turn to page 40)



ALL FOUR are in the air, left, but the 1100's suspension handles the bounce easily. Right, air intake is positioned over exhaust manifold for driving in cold-weather

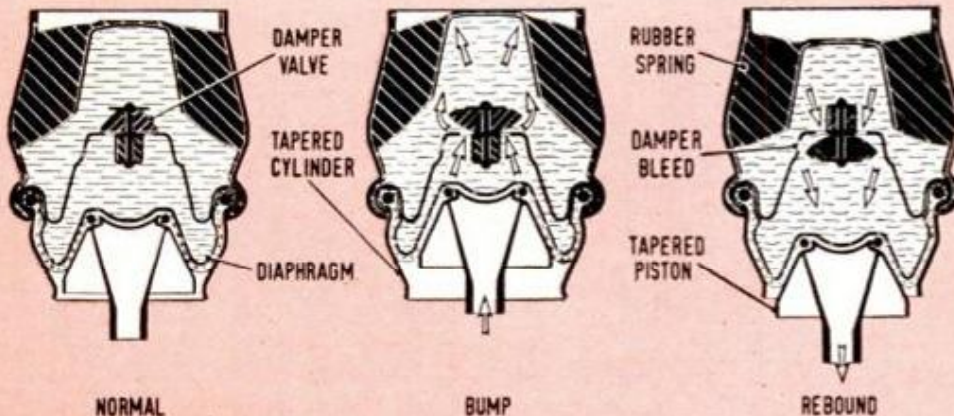


DISC BRAKES IN FRONT do most of the work in stopping the MG 1100. Behind the brake is the shaft assembly that transmits wheel motion to the Hydrolastic unit



TAIL RISES IN RESPONSE TO UPWARD MOTION OF FRONT WHEELS. = NO PITCH

PART OF THE ENERGY of a bump at the front is diverted to lift the rear of the body (upper drawing) and maintain a near level ride. Lower drawings show how the fluid transmits pressure between the rubber spring and the shaft and diaphragm during the bounce-rebound cycles



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Spotlight on the MG 1100

(Continued from page 38)

freeze. Its viscosity is nearly immune to temperature changes.

Road vision is excellent. You look out over a stubby hood made possible by mounting the little engine crossways. From the front bumper to the boxy rear end is only 146 $\frac{3}{4}$ inches—about 14 inches shorter than the Volkswagen. Yet the wheelbase is only an inch shorter than VW's. There's very generous interior room, considering overall size. Both of PM's six-foot-plus car testers found entry and exit easy through big, wide-opening doors. Leg room is ample, even without using all the seat adjustments available.

The elevated steering column angle (compared to domestic cars) gives ample thigh clearance (six inches). As in many imports, the only place to rest a big left foot is atop the dimmer switch.

Driving an MG 1100, you'll sit as straight as though you were in a kitchen chair. Your right foot, too, may be a problem on a long trip. It takes an effort to hold your toe up off the floor. But rest it on the gas pedal and you'll whirl off at top speed. On tight English roads, drivers shift that foot to the brake so often the leg can't start aching; on U.S. freeways it's a different story. But a good mechanic could easily beef up that light accelerator spring.

Thanks to the Hydrolastic system, brake dive is almost eliminated. Braking is smooth and effective, with Lockheed discs in front. And they're needed, with 62% of the curb weight on the front wheels.

The glove box is shallow, but a full 20 inches wide. There's a surprisingly roomy nine-and-a-half cubic feet of trunk space. The spare is under the trunk floor.

Cornering behavior is fine; lean is minimal. The wheel goes from lock to lock in only 3.3 spins; turning circle is under $\frac{3}{8}$ feet. But through the four forward speeds, stick action is a bit soft.

At start, PM's test car had 1600 miles on it but the wiper motor and linkage already were noisy. The trip odometer is a pleasant reminder of days when instruments told you a full story, but the 1100 still has idiot lights for oil and amperes.

Maintenance demands are few with only four grease points, two on the steering knuckles for each wheel.

Gas mileage from the 67-cubic-inch, 55-horsepower engine stays around 29 m.p.g. The MG 1100 accelerates from zero to 40 in 9.4 seconds, zero to 60 in 22.2. Top speed is an honest 78 to 79.

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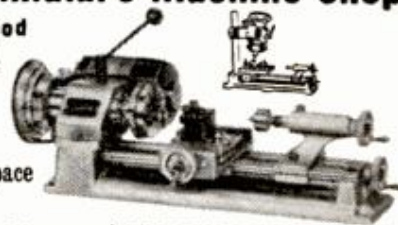
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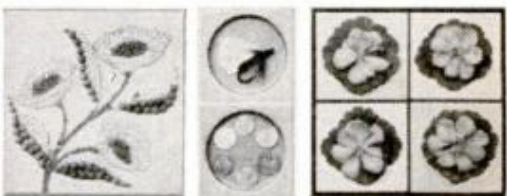


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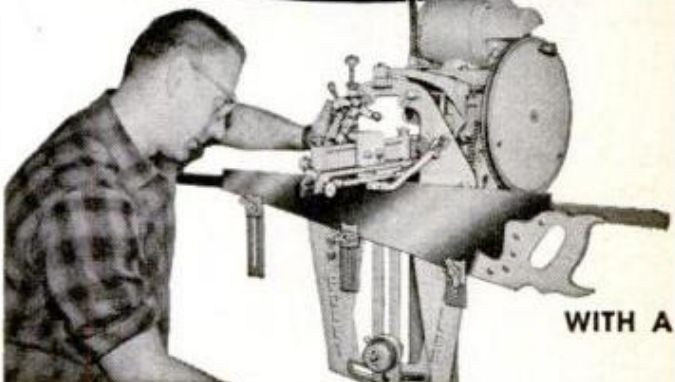
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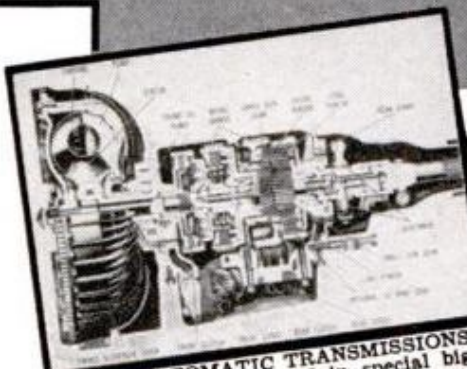
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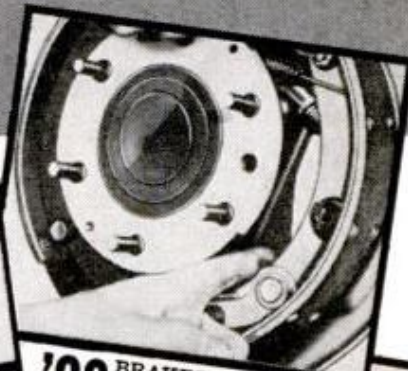
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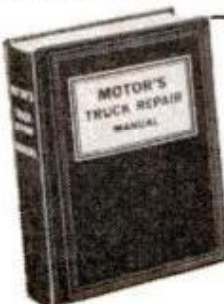
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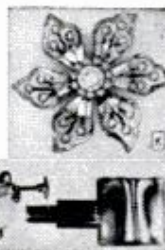
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Souping Up the Sugar Cane

A recent discovery about the hormone which induces plants to flower and bear fruit, could significantly increase the world's food supply and give man much greater control over agricultural growth and production.

Two scientists at the California Institute of Technology, Drs. James Bonner and Jan Zeevaart, have discovered that a hormone, which they named florigen, is apparently a steroid similar to sex hormones in animals.

Minute quantities of florigen are produced—during the hours of darkness—in plant leaves; it then migrates to the growing tips where it activates the genes that make flowers.

The researchers are now aiming to isolate florigen so that it can be synthesized and produced in quantity. Growers will then be able to control and increase crops with steroid and anti-steroid sprays.

"Extinct" Fish Shows Up

A specimen of a one-inch fish thought to be extinct was recently netted by four Cornell University zoology students.

Identified as the Maryland darter (*Etheostome sellare*), the fish was discovered in a small Maryland stream that empties into Chesapeake Bay.

Evolutionary placement of the Maryland darter is obscure, according to a Cornell ichthyologist, Prof. Edward C. Raney, who notes vague resemblances to some Midwestern species. Raney said the fish possibly migrated across the Appalachian Mountains ages ago.

Previous knowledge of Maryland darter is based on two specimens found in the same stream 50 years ago.

Tuna Sets Swimming Record

World freestyle swimming championship (for tuna) goes to a giant bluefin tuna that recently swam from the Bahamas to Norway—5000 miles—in a record-breaking 50 days.

The previous record was set in 1961 by a tagged tuna that made the trip in 118 days.

Frank J. Mather, research associate at Woods Hole Oceanographic Institute, tagged the fish in the Bahamas before its migratory trip. Swimming in a straight line, the tuna would have logged a minimum cruising speed of 100 miles a day. It is more likely, Mather says, that the fish swam a zigzag course.

The tagging was part of a program aimed at learning more about the migrations of various game fish.

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Old flying hands won't recognize this version of the Boeing Stratocruiser which, from the front, looks like it has an inflated balloon attached to the top. The huge plane is called the world's largest by its designers, Aero Spacelines. It has been

redesigned to transport the second stage of the Saturn space vehicle and the Apollo moon capsule from the factory to the launching sites.

The modified plane is shown making its maiden flight from Los Angeles to Mojave.

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The seat is heavily padded with foam rubber and may also be used in the home as a feeding chair, with a stand and tray—available as extras.

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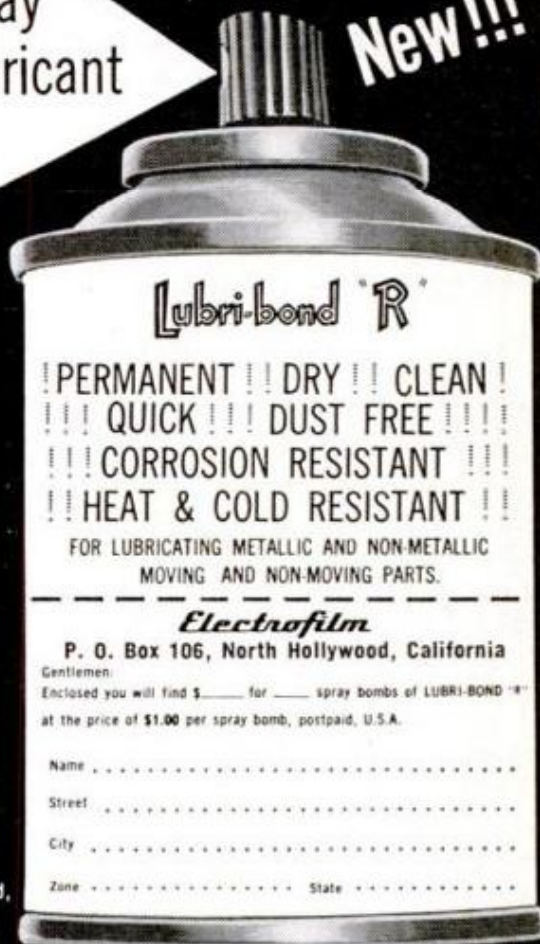
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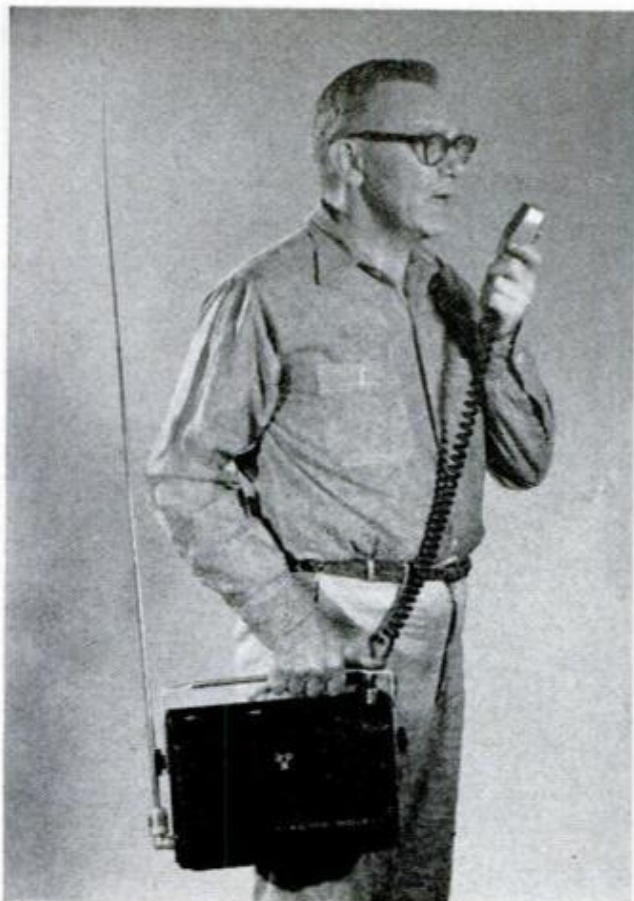
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If your power yacht conked out at sea, you could call for help on a Cadre 510 Citizens Band two-way radio—anywhere within 30 miles of home base, according to the manufacturer.

On land, the firm adds, the Cadre is effective up to a range of 20 miles. Completely transistorized, the unit operates in the 27-mc. range. It may be used in land vehicles and aircraft.

It is adaptable for field use with a portable power pack equipped with rechargeable batteries. Over-all weight is only six pounds. The 5-watt transceiver provides audio power to a full 2.5 watts. It is available for \$199.95 from Cadre Industries Corp., Endicott, N.Y.

Eternally Young Insects

Keeping insects young may be an effective way to control insect damage. Dr. Lawrence I. Gilbert of Northwestern University is studying a "juvenile" insect hormone that may be an effective insecticide.

The hormone is extracted from adult silk-moths. Injected into other insects in the larval stage, it causes them to molt into larvae once again, and thus prevents them from reaching adulthood.

Spraying insects with the juvenile hormone may prove to be a successful and safe alternative to the use of insecticides, according to Dr. Gilbert.

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The second, propionic acid, sends bees downwards away from the hive. The chemicals are harmless to bees and humans and impart no taste or odor to the honey. They permit honey to be removed from the hive without the use of a bee veil.

Antidote for Snake Bite

Heparin, a body chemical that prevents coagulation of the anti-blood, is a natural antidote for snake bite, according to Professor Robert D. Higginbotham, University of Texas Medical Branch, in Galveston.

Experiments in which mice were injected with snake venom indicates that heparin destroys its toxicity. The chemical also appears to protect body tissue from the effects of bee stings, allergic reactions, pinching and other injuries.



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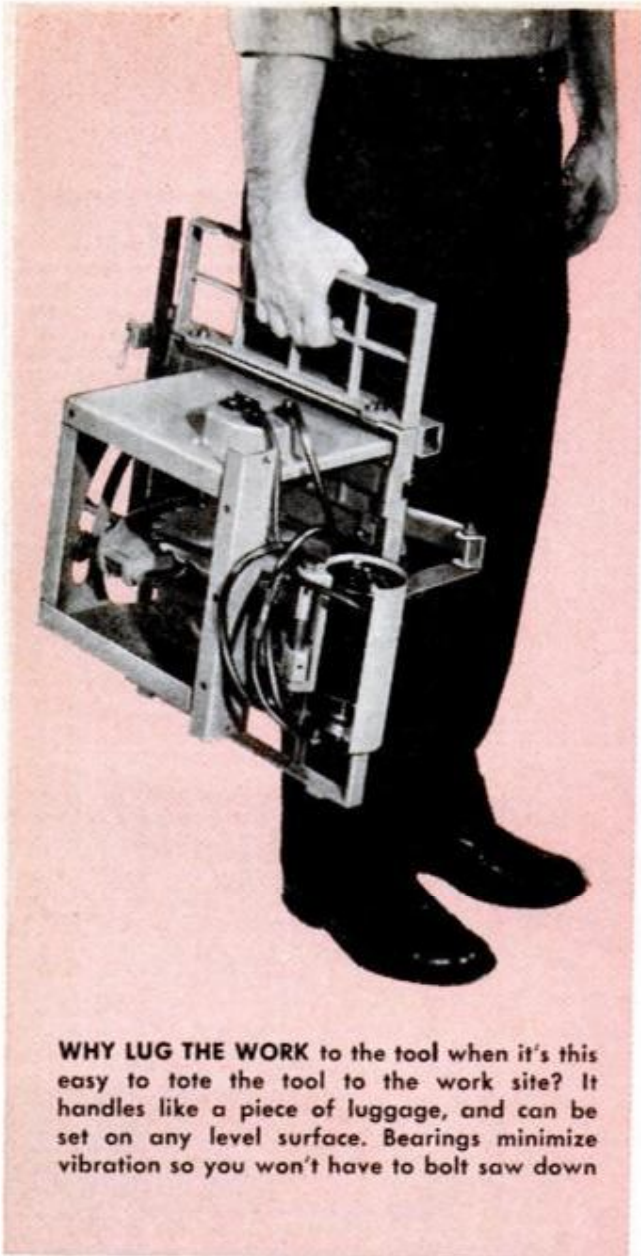
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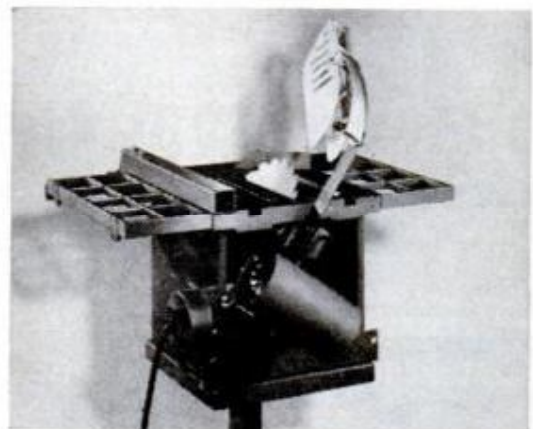
In shop testing it, the craft editors of *Popular Mechanics* found that the Model 2164 MB boasts many features of its bigger brothers: The blade can be lowered beneath the table top, or raised to a capacity of 2 1/4 in.—enough to miter a 2 x 4 at 45 deg. The tilting arbor lets you make 90 to 45-deg. cuts while the table remains level. There's "lifetime" lubrication of the bearings, a guide fence that clamps tight wherever you need it and a built-in power switch. The table insert is removable for standard dado heads and molding cutters.

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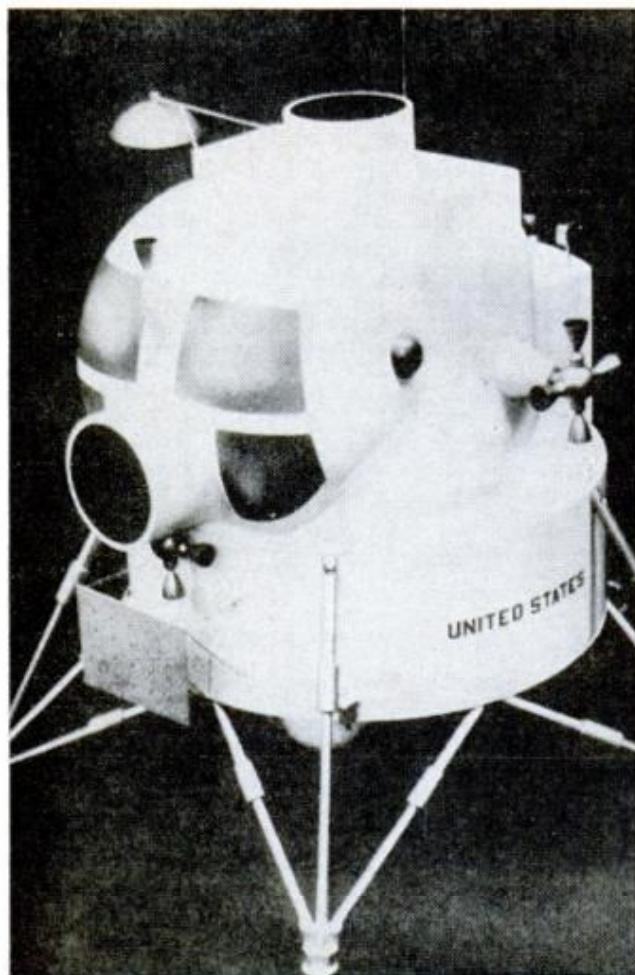
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Kilometers on Speedometers?

American speedometers should be marked in kilometers as well as miles as a start toward adopting metric measurement, urges Dr. Chauncey Leake, lecturing at Michigan State University.

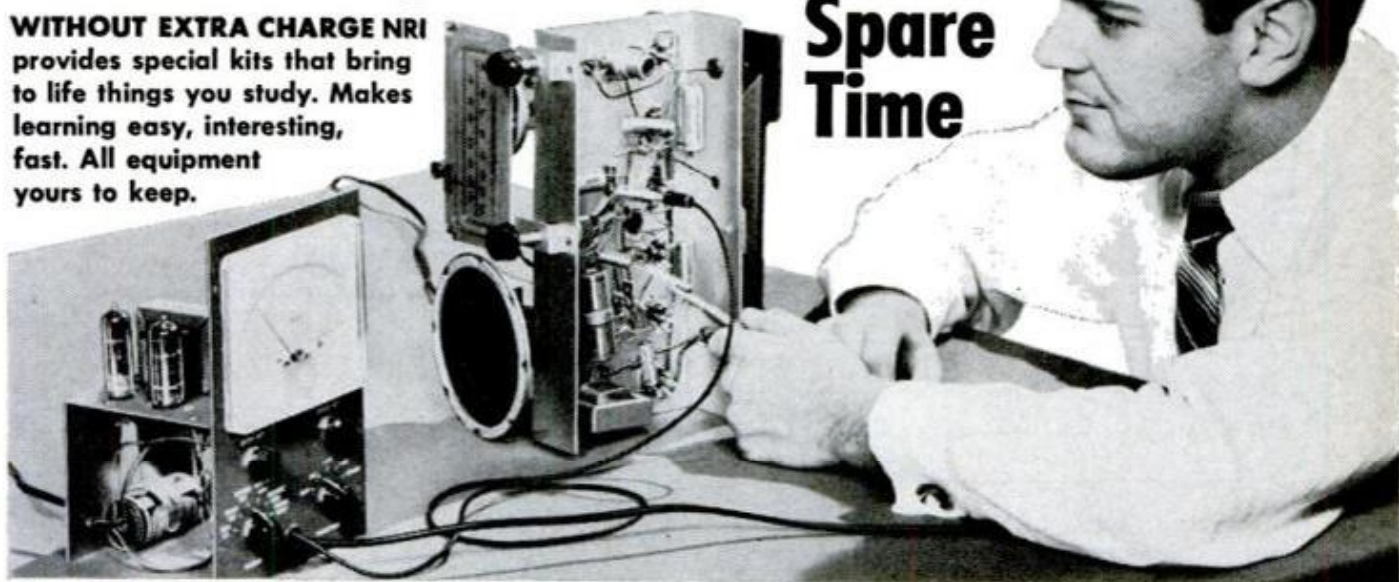
Unnecessary inconvenience—even nursery rhymes like "Jack and Jill"—come from the use of outdated, nonstandard measurement systems, he says. Today, for example, the British gallon is slightly larger than the U.S. version but the inch is slightly smaller there than here.

Explaining the nursery rhyme, Dr. Leake said that in the 17th century, Charles I made England's standard jackpot (or jack—two handfuls) a bit smaller to get more food taxes. The jill (gill) equaled two jacks. Resentfully, the people made up rhymes like "Jack and Jill" and the one about the crooked man who walked a crooked mile.

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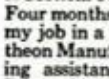
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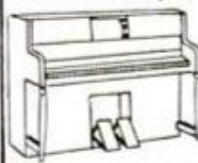


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OPERATE Home mailorder business. Vosacek Printing, 4444A1 Ute, San Diego, 17, Calif.

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

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

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

VENDING Machine catalog. Rakes, 609P Spring Garden, Philadelphia 23, Penna.

BRONZE Baby shoes. Genuine electroplating process. Equipment, mountings, instructions. Send \$1.00 for valuable book "Your Guide To Success" bronzing baby shoes, plus complete catalog. Hollywood Bronze Supply, Dept. B60, 3445 Union Pacific Avenue, Los Angeles 23, California.

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

SIMPLE. Pleasant mailorder can net \$12,000 year. Write: Rutward, 2010 Bryant, Columbia Station, Ohio.

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

STOP Throwing away boxtops! They're worth money! Some, 25¢! Inquire: Box-tops-MB, Cedar Hill, Texas.

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

COPUBLISH Mail Sale Advertiser, leading mail order paper. Details, latest copy, dime. Vanroy Shirk, Lebanon, Penna.

MAILORDER Catalogs. No inventory required. Full profits. Operate from home. Send 25¢ for 32-page sample catalog featuring 150 unusual fast-moving products and complete details. Satisfaction guaranteed. Gaylords, North Adams 6, Mass.

STRIP Furniture finishes commercially. N-K Equipment Co., Lima, N. Y.

MAKE Money from old tires. Operators clearing \$400 weekly. Equipment costs \$800. Get facts. S & S Patents, Inc., 3511 N. Lincoln, Chicago 13.

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

SELL Champlon, AC, Autolite spark plugs. Precision reconditioned, electroplated, guaranteed 10,000 miles. Up to 308% profit. Free samples. Indy 500 Spark Plug Co., Plant 3, 4620 N. Braeswood, Houston 35, Texas.

MAILORDER. Lowest-priced catalog house in U.S.A. 25¢. Holliday 914 Burnside Rd., Sharon Hill, Penna.

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

OPERATE Profitable home mail-order business. Sparetime. Get lifetime repeat orders. Write Wayne's Service, 3016-J Channing, Washington 18, D. C.

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

GOLD, Silver, platinum; refining, testing, make alloys, solders, etc. Learn wonderful business. Frank J. Herman, Metallurgist, 421 South Western, Los Angeles 5, California.

WORK At home packaging merchandise. Very profitable. No selling. Everything supplied. Details free. HBE, 1148-P West Grand, Chicago 22.

MAKE Durable building plastic easily. Waterproof. Fireproof, economical. Bays Laboratory, Cedaredge, Colorado.

DRIVING Schools needed. Profitable. Free instruction by trade association. Nothing to sell. Driving School Association, 4935 Foster, Chicago 30, Illinois.

MAILORDER Wholesale catalog of folios, manuals, wholesale directories. Dealers profit to 200%. Catalog 25¢. Refundable. Egyptian, Box 168C, Anna, Ill.

FREE Advertising for mailorder items. Branswood, 5718 Troost, North Hollywood, California.

MAILORDER Angles shrewd operators use. \$1.00. Ballard, 1834 Edgeland, Louisville 4, Ky.

IMMEDIATE Profits with no capital or experience. Take orders for all magazine subscriptions. Friends and neighbors are your prospects. Write now for complete, free kit. McGregor Magazine Agency, Dept. AB-3, Mount Morris, Illinois.

SELL Products. Mailorder. 400% profit. Work home. Catalogue free. International, 6347 Parnell, Chicago 21, Illinois.

AMAZING Manufacturing opportunity. Free list of manufacturing formulas. Presler Oil Company, Fostoria 3, Ohio.

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

PACKAGE At home for profit! We supply everything. No selling. Free home business details. HPC, 807-BF Sunset Blvd., Los Angeles 12.

MONEYMAKING OPPORTUNITIES

LEARN The secrets of repairing junk batteries, generators, starters, profitable, easy, at home. Free particulars. Batteryman, Prunedale Station, Salinas, Calif.

BIG Profits. Raising nightcrawlers, redworms. Three Oaks Ranch, Dresden, Tenn.

CASH, Making marble jewelry, flowers. Catalog 10¢. Flocraft, Farrell 34, Penna.

"MAILORDER Trade Tricks." \$1.00. Ward's, PM, Box 341, Vernal, Utah.

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

I'LL Send you full-size famous Blair home products for free trial, to help you make more money, spare time or full time. Show friends, neighbors. Take easy big orders. Make generous profits. Write Blair, Dept. 31HB, Lynchburg, Va.

PHYSICAL Culture and massage pays big profits. Learn at home. Free catalog. Write National Institute, Dept. A-1, 874 N. Wabash, Chicago 11, Ill.

START Your own business. Manuscripts show how. Free details. Shaft, 1161 Pacific, Long Beach, California.

"PROFITS In Mailorder". Complete details 25¢. William Price, R.F.D. #2, Box 68, Matthews, N.C.

START A profitable subscription business in spare time! We need men and women (young and old) as representatives for all leading national magazines. Liberal commissions on all subscriptions. Supplies free. No experience needed. Send this ad with your name and address to: Popular Mechanics, Room 11-O, 250 W. 55th St., New York 10, N. Y.

GOOD Income. Be own boss. Be independent. New fantastic system teaches in minutes. 25¢ for instructions. Variety Advertising Company, 1219 Douglas St., Dept. 142, Alton, Illinois.

MAKE Money mending. New simple method for burn, moth or snag holes. Free sample \$3.95 complete. Mend Master, 4408 Sillman Place, Dayton 40, Ohio.

HOW To sell printing by mail. Details over 100 unique plans free. P. Druillards, 210 Fifth Avenue, New York 10, N. Y.

MONEY Short? Need extra income? Get into mail order. Information 10¢. Conner, 3530 S. Atlanta Road, Smyrna, Georgia.

WE Pay cash for used sparkplugs. Details. Cisco, Box 35061-E, Houston 35, Texas.

OPPORTUNITIES Galore. Magazine-profitable, home businesses. 50¢. Vista Sales, 1230-PM Purcell, Cincinnati 5, Ohio.

LEARN Window trimming at home. No schooling. Free details. Trimming, Box 557, Whittier, California.

MAKE Dollars in car owner needs. Two items sell by mail for \$1.00. S. Houck, R-3, Hanover, Pa.

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

IT'S True. You can succeed in mail order our easy way. Details free. Worldwide, Box 4026, Station H, Columbus, Ohio.

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

RAISE Redworms. Big demand. Free literature. Hall Redworms, Hilton, Ga.

START Good pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$6.00 profit on every pair. Full particulars free. Send postcard to Warner, 1512 Jarvis, Room CM-2-A, Chicago 26, Illinois.

HOW To win prize sweepstakes, drawings, contests. Lesson 50¢. Winner, Box 304, Columbia City, Indiana.

PIANO Tuning learned at home quickly. Tremendous field! Be independent! Information free. Empire School, Dept. P, Champaign, Ill. (Founded 1935.)

EASY To start rubber stamp business at home in spare time. Make up to \$9.80 an hour without experience. Facts free. Write Roberts, 1512 Jarvis, Room CR-2-A, Chicago 26.

CASH In on booming baby market. Popular baby items ideal for mailorder, door-to-door or party plan selling. Profit-making details and sample envelope stuffers free. Rutward, 108 Bryant, Columbia Station, Ohio.

OPERATE Mailorder home folio bookshop. Ballard, 1834 Edgeland, Louisville 4, Ky.

SEASHELLS. Shellcraft and jewelry supplies. Wholesale catalog 25¢, refunded on first order. Our 29th year. Florida Supply House, Box 847M, Bradenton, Fla.

MEN - Women! Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-2-A, 1512 Jarvis, Chicago 26, Ill.

BIG Profits in figurines, lawn ornaments. World's best liquid rubber for molds. Sample and catalogue free. W. Wooley, Peoria, Illinois.

OPPORTUNITIES Galore! Details, send dime. Berthoff's, 739-PJ, Sylvania Avenue, Toledo 12, Ohio.

SELL Diamondite gems. More brilliant than diamonds. Catalog 10¢. Diamondite, 2420-M 77th, Oakland 5, California.

MAKE Big easy profits making costume jewelry at home in spare time! Quick, easy to make, easier to sell! Details free; Don-Bar, 2934 W. Fullerton, Dept. A-203, Chicago 47, Illinois.

WE Purchase items you make at home for us. Enclose stamp for details. Wolfe Specialties, Box 171, Center Line, Mich.

HOME Mailorder "manufacturing." Everything supplied. Clesno Products, 184 Oakview, Winnipeg 15, Manitoba.

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

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

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

CIGARETTES—Make 20 plain or filter- tip for 9¢. Facts free. Moberly, Box 4012, Owensboro, Kentucky.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior, E.E. Wisconsin.

EARN Money raising fishworms for us! Write: Oakhaven—59, Cedar Hill, Texas.

YOUR Own, easy-to-start, home mail-order business, sparetime. Fascinating; profitable! Information free. Alfano, 19-PM Pine, Closter, N. J.

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

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

BOOM! In babies. We furnish—finance complete shoe bronzing setup. Free booklet. Box 5036-A, Ingelwood, California.

CASH For trash! Everyday discards wanted. Particulars \$1.00 (refundable). Uniser, Box 866, San Antonio 6-D1, Texas.

EXPORT — IMPORT

JAPAN: Mail order catalogue business information, dolls, kimonoes, etc., \$1.00; Trade Directory, 3000 firms listed \$3.00; Japan Tour Guide \$1.00; Send cash. Clarence Yamagata, 814 Togin Bldg., Marunouchi, Tokyo.

MINIATURE Grandfather clock. Height 8". 36 hour spring operated. Shipped from Holland. Melco, Box 69, Edwardsville, Ill.

SCIENCE & CHEMISTRY

FREE—Pair of chemical resistant polyethylene gloves with catalog. Low priced chemicals, biologicals, and apparatus. New illustrated catalog only 35¢. Dover Chemical, 35-24 31 St., Astoria 6, New York.

BUDGET Priced chemicals, apparatus. Biology. Catalogue 25¢. Dept. PM-2, Mid-States Scientific, 7053 N. Clark, Chicago, Ill.

CATALOG Of special slide rules and calculating aids. 10¢. Dyna-Slide Inc., 600 S. Michigan, Chicago 5, Illinois.

AMAZING New book of science experiments, formulas, and catalogue of laboratory supplies. Only 35¢. National Scientific Co., 13 S. Park Avenue, Dept. PM-2, Lombard, Illinois.

ROCKETS! New illustrated catalog of rocket kits, supplies, engines, chemicals, 25¢. Central Rocket Company, Div. 89, Waupaca, Wis.

ROCKETS—Plans: construction, propellant. \$1.00. Deluxe \$2.00. Rocketry, Box 2533-A, Wilmington, Delaware.

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

EXPERIMENTER'S Handbook free with bigger catalogue, 25¢. Hagenow Laboratories, Manitowoc, Wisconsin.

FUTURE System of Mathematics. Guaranteed. \$1.00. Knowledge, 2900-9th Street, Rock Island 17, Illinois.

ROCKETS: New illustrated catalog 25¢. Single and multistage kits, cones, engines, launchers, trackers, technical information, etc. Fast service. Estes Industries, Penrose 7, Colorado.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 35¢. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 25¢. Tracey Laboratories. Evanston, Illinois.

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

MICROSCOPES, Accessories, prepared slides, supplies, etc. Free brochure. New England Science Service, P.O. Box 315, Peterborough, New Hampshire.

PLASTICS

PLASTIC Cement: ClearWeld permanently joins plexiglas and most any plastic except polyethylene. Outperforms all others you have used or money back. Trial supply 50 cents. Craft Service, 341 University Avenue, Rochester 7, N. Y.

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

COLORFUL Liquid plastic. Sample products. Details. Bryan, 1133 Barry Ave., Los Angeles 49, Cal.

NEW! Low-priced plastic laminating machines. Details. Burr, 7645 Oakland, Kalamazoo, Michigan.

EMBEDDING, Casting secrets free. Sample, 25¢. Crystal, 4350-B N. Whipple, Chicago 18.

VACUUM Form, easy. Instructions \$1.00. P. Barnes, Box 1971, San Diego 12, Calif.

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

FORMULAS, PLANS, ETC.

FORMULAS For latest money-making discoveries. New! Good! Valuable literature free! Miller, Chemist, 1517-D, Tampa, Florida.

FORMULAS—All kinds. Amazing big catalog, 10¢. Kemixal, Park Ridge, Ill.

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

10,000 MODERN Moneymaking formulas. Details free. Harvey's, 1402-PMC, Englewood, Colorado.

DELICIOUS Pancake syrup made from corn cobs. Mouth watering formula \$1.00. Albert Powers, P.O. Box 121, Royal Oak, Michigan.

LABORATORY Tested formulas. Box 81, Station B, Calgary, Alberta, Canada.

AGENTS WANTED

DIRECT From manufacturer. Lowest prices. Highest quality Exclusive deal. Hilbor Products, 650 Pierce Street, Gary, Indiana.

TERRIFIC Seller. Genuine oil portraits. Just take orders. 4 sales pay \$100.00 to \$150.00 profits. Beautiful sample makes easy sales. Amazing offer free. Nichols, Box 1054, Coral Gables 34, Fla.

SELL Greeting cards Make extra money. All occasion assortments, Easter, valentines; stationery, gifts, wrappings, toys, jewelry Experience unnecessary Salable samples on approval; Free catalog. Free gift offer Bonus plan. Write Hedenkamp, 361 Broadway, Dept. PM-84, New York.

LOVELY Invention wins fast sales. Graceful apothecary jar with exquisite flower enhances every room. Actually is effective room air freshener, deodorizer. Sells on first sight and scent. Sell to homes, stores for resale. Make up to \$25 in a day. Free money-making kit. Merlite, 114 East 32nd, Dept. W-73D, New York 16.

STRANGE Dry Window cleaner. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee, 130, Akron, Ohio.

SELL Bibles. Write for sample. Lee, Box 174, Romoland, California.

1000 Raised business cards \$2.95. L&D, 152 W. 42nd, N.Y.C. 36.

EXOTIC Earrings! Details free. Pair \$1.00. Ohga, PM-423, Sigakenkusatu, Japan.

NEW "Magic knife" slices frozen foods, even bone—pays up to 100% profit! Rush postcard for free double-your-money details, special starting assortment discount offers. Dale, Dept. K-602, 4333 N. Pulaski, Chicago 41, Ill.

SENSATIONAL Commissions, bonuses writing orders for guaranteed hosiery for entire family. Money-making outfit free. Billera, 38 Circle, Syosset, New York.

MEN! Women! 60% profit on cosmetics. Famous nationally advertised Hollywood cosmetics pay 60%. Make \$25 day up. Hire others. For free samples, details, write Studio Girl, Glendale, California, Dept. 23J32.

AGENTS—300% Profit selling genuine gold window letters; store and offices. Free samples. Metallic Sign Letter Co., 1217-D West Newport, Chicago.

MAKE Most extra cash with world's biggest line everyday greeting card assortments, gifts. Introduce friends, neighbors, to over 150 assortments, 500 big money-makers. Pocket up to 100% profit plus big cash bonus. Free giant color catalog; samples on approval. Write Arrow Greetings, 513 Fourth Ave., S., Dept. 83-A, Minneapolis, Minn.

SWISS Battery operated shaver. Sell for \$12.95. Send \$7.00 for sample prepaid. Alda, 748 Main, Poughkeepsie, N. Y.

BUSINESS Kit free! Postcard puts you in business! Complete line 230 shoe styles, jackets! New discoveries pay big commissions. No investment. Send for free kit. Mason, Chippewa Falls, K-455, Wisconsin.

EARNINGS Up to \$50 in day possible, introducing our famous guaranteed baby shoe bronzing to mothers. Make 50% profit in advance. No investment, no inventory. Free details. Sentimental, 274 East Capital, Dept. 8B, Columbus, Ohio.

SHOW Demonstrator shoes on your feet to 10, and 6 will buy on sight because of discount price, beauty, and one year unconditional guarantee. You'll see! From \$1.99 to \$5.59, none higher. Many other discount bargains. Discount clubs spreading like wildfire. You'll actually take business away from discount stores. Rush shoe size. Perfect-World Co., Dept. 212, Cincinnati 15, Ohio.

EARN Big money introducing amazing Color-V. Makes ordinary TV show in beautiful colors. Low \$2.98 price. Sells like hotcakes. Free details. Excellent Buys, (Dept. PM-3), 34 E. 12th NYC.

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

\$40.00 STARTS You in name plate business. Samples 50¢. Bonomo-PM, 54 Jefferson St., Brooklyn 6, N. Y.

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

FREE Sample. Beautiful curios! Sell on sight! Apartado 9036, Mexico City.

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

MAKE Extra money during spare time! Show colorful catalog with toys, jewelry, all-occasion cards, gifts and household gadgets. Fill orders. Work your own hours. No experience necessary. No investment necessary. Excellent for direct selling or parties. For free money-making catalog, write: Greetings Unlimited, Park Square, Room 3-701, St. Paul, Minnesota.

DIAMOND-Faceted, bluewhite, fiery gems! Gadienco, 187A Miraloma, Miraloma, California.

BUY IT WHOLESALE

BELOW Wholesale cost. Merchandise, housewares, jewelry, toys, gifts. Bargains, A14 Farr Road, Columbus 3, Georgia.

TOOL Catalog. Send 25¢. Silvo Hardware, 107-PM Walnut, Phila. 6, Penna.

REMINGTON & Norelco shavers. Discount prices. Free catalog. Parents' Bargain Shop, Box 7321-A, Birmingham 13, Alabama.

DEALERS Costs, all 1963 Cars, \$1.00. Petros, 5404-PM South Mozart, Chicago 32.

25¢ STUDIO Cards with envelopes. 20 for \$1.00. Sample 10¢. Astra Enterprises, Box 126C, Federal Way, Washington.

FREE Wholesale catalog. Small town prices. Closeouts. Write: Schaik Enterprises, 810 Calhoun St., West Liberty, Iowa.

350,000 BARGAINS! Free merchandise! Write: Goldmine, 240-PA, Planetarium Station, New York City 24.

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

AMAZING Wholesale directory available. Details free. Enterprise, 434 Temple, Fredonia, New York.

OVERHEAD Door parts. Wholesale prices. List. Door Supply, 101 County Street, Somerset, Massachusetts.

BARGAINS! Buy wholesale! Save money! Free catalog! Norris, 273-AX Merrick Road, Lynbrook, N. Y.

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

NEW Deluxe below wholesale catalog. Automobile catalog and others. Furniture, clothing, housewares, appliances, refrigerators, freezers, washers, dryers, television, radios, luggage, binoculars, hi-fi, stereo, phonographs, recorders, cameras, projectors, musical instruments, sporting goods, toys, tools, typewriters, watches, jewelry. Huge discounts on thousands of name brand items. For free specimen list of actual factory prices—postcard: Selbyco, Decatur 15, Illinois.

BUY Direct from factories! Appliances, cameras, watches! Free details! Cam Company, 436PA Bloomfield Ave., Verona, N.J.

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

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

ELECTRIC Guitars, amplifiers, wholesale. Free catalog. Carvin PMW, Covina, Calif.

SALESMEN—DISTRIBUTORS

MAKE Extra money. Big steady earnings, repeat business. Sell advertising book matches, full or part time. New 1963 line. Show glamour girls, colorama, tenorama; dozens more. All sizes. Free master outfit, sales helps, leads, no experience necessary, no investment. Write today Superior Match, Dept. M-263, 7530 Greenwood, Chicago 19, Ill.

WINDOW Sign kit used nationwide. Big profits. Signs, Box 12374, Tucson, Arizona.

MAKE Extra money selling advertising matchbooks. Free catalog and sales outfit. Matchcorp, Dept. PM-23, Chicago 32.

FREE Style display starts you in spare-time business, taking orders from firms for work uniforms that advertise, embroidered with company name, emblem. Get big-quantity orders without investment or inventory. Make up to \$78.00 in a day. Rush name, address for everything needed to make money first day. Topps, Dept. 106-B, Rochester, Indiana.

WILL You test new items in your home? Surprisingly big pay. Latest conveniences for home, car. Send no money. Just your name. Kristee, 153, Akron, Ohio.

LONG Needed invention. Men to contact service stations. Huge profits. Cyclo Mfg., 3816 Dahlia, Dept. 118, Denver 1, Colorado.

SELL Three new sports items. No competition. Easy sales. Big money! Write Dept. E, Kayven Enterprises, Oskaloosa, Iowa.

NEED A new TV set? You can easily earn enough to buy one selling friends and relatives new Beaver Shoes made of Everon. Big advanced commissions on \$2.29-\$5.59 retail price. Everything furnished. Beaver Shoes, Dept. PM263, Beaver Meadows, Pa.

BIG Profits selling world's smallest Bible. Other religious merchandise. Assorted samples, wholesale prices \$1.00. Goodwill Specialties, Box 933, Cramerton 1, North Carolina.

WANTED Distributors for new 8-MM 3-turret lens camera imported from Japan. The Robinson Co., 15468 Hiway 80, El Cajon, Calif.

TERRIFIC Vitamin product! Manpower the athletes vitamin supplement. Enjoy sales that repeat and multiply your profits. "BE a Manpower Man." Free details. Gold Seal Laboratories, Box PM-759, Coral Gables, Florida.

THREE Amazing self-sellers—liquid fabric mender, silicone eye-glass cleaner, automatic needle threader. Show, and watch sales fall into your lap! Terrific money-makers selling to users, store outlets, or your sub-agents. Facts free, or include \$1. for three samples (\$2.49 value). Unique, Dept. 1023, 216 W. Jackson, Chicago 6, Ill.

MAKE Big money taking orders for Stark dwarf fruit trees. Everybody can now grow giant size apples, peaches, pears in their yards. Also shade trees, shrubs, vines, roses, etc. Outfit free. Stark Bro's, Desk-30123, Louisiana, Missouri.

MAKE Up to \$200.00 weekly. Every business has slow accounts. Send us names. We collect. National Credit, Dept. BP-2, 903 McGee, Kansas City 6, Mo.

I'LL Send you free stocking sample newest advancement in hosiery since nylon. Patented, full-length. Stays up over-the-knee without supporters, without girdle! Nationally advertised price \$1.95. Make money introducing to friends at \$1.00 pair. American Mills, Dept. 734, Indianapolis, Indiana.

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

\$1,000.00 A Month for making dramatic 3-second demonstration of amazing light-weight Presto fire extinguisher. New chemical used by Airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free kit. Merlite, 114, E. 32nd, Dept. P-66D, New York 16.

HIGH Commission and bonus. Earn \$100 to \$300 weekly. 30 year old company has openings. List delinquent accounts for collection. Experience unnecessary. Permanent. Write Merchants Protective Agency, Dept. PM-2, 1015 Walnut, Kansas City, Mo.

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

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

IF You are calling on farmers, specialty growers, golf courses, factories or estates, we can show you how to add big money to your present income. Campbell Company, Rochelle 5, Illinois.

EMPLOYMENT INFORMATION

FOREIGN-Stateside. Employment for all occupations. Top pay, free travel, benefits. Complete information, valuable tips, plus application form and "Employers Directory Report." Satisfaction guaranteed. \$2.00 (\$2.25 airmail) (C.O.D.'s accepted). Employment Research, Box 18571-P2, Dallas 18, Texas.

MERCHANT Marine: Men and women. Top wages. Travel. Information. Hellmco, Box 397P, Odon, Indiana.

TREMENDOUS Opportunities, U.S.A. overseas. Choose jobs, locations, transportation. Free details. Occupations, International Airport, Box 100C-13, Jamaica 30, N.Y.

ALASKAN Job and wage information bulletin \$1.00 airmail. Box 4-1213, Anchorage, Alaska.

JOBS On ships. \$100 weekly for beginners. Travel. Snyder's, Box 183, Mishawaka, Ind.

LIVE In So. Calif. Find security. Send for Civil Service job information \$1.00. Box 41254, Los Angeles 41, California.

FOREIGN Employment. Construction, other work projects. Good paying overseas jobs with extras, travel expenses. Write only: Foreign Service Bureau, Dept. PM, Bradenton Beach, Florida.

WORK For the U.S. Government. Send \$1.00 for next five monthly issues containing announcements of Federal job examinations. Good pay plus fringe benefits. Civil Service Reporter, 330 Newbury Street, Boston 15, Massachusetts.

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

FOREIGN Employment information. Europe, Africa, Asia, South America. Free transportation. Up to \$1600.00 monthly. Sensational opportunities. Construction workers, clerks, truck drivers—every occupation. Complete information, application form, sent immediately by return mail. Satisfaction guaranteed. Only \$2.00 (\$2.25 airmail) (C.O.D.'s accepted) to: Jobs, P.O. Box 50512, Dept. E, New Orleans 50, Louisiana.

DIRECTORY Reports. Construction, aviation, shipping, oilfields, government, manufacturing, trucking, etc. Foreign-stateside. Helpful information plus job-getting tips on preparing application letters. Unconditional money-back guarantee of satisfaction. Act today. Only \$3.00. \$3.25 airmail. (C.O.D.'s accepted). Research Services, Meramec Building, St. Louis 5-PM, Missouri.

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Although there is slight blurring at the sides of the new lenses, this is not expected to be a problem since the viewer almost always adjusts his head position so that he can look at the object through the center of the lenses.

The manufacturer is Robinson-Houchin, Inc., Chicago, Ill.

Super-Strong Steel for Subs

Maraging steel, a new alloy now undergoing tests, may allow submarines to go to record depths, avoid detection and increase their resistance to underwater shocks from explosions.

The new alloy steel could also be used to advantage in missile cases because the cases could be welded in the field without complicated and expensive processing required by conventional steels.

Maraging steel can withstand pressures up to 300,000 pounds per square inch, almost twice the pressure capability of the conventionally processed steel.

The new alloy consists of iron and up to 25 percent nickel with up to 1/2 percent titanium as a hardening agent; conventional steel alloys use chromium, nickel or molybdenum of from two to five percent, with up to 1/2 percent of carbon as a hardening agent. About 500 tons of maraging steel have been produced for evaluation by the International Nickel Co.

Nature's Fine Balance Protects Tiny Mites

Here's an intriguing example of the delicate balance of nature:

Certain insects which are eaten by bats can also hear the radarlike signals emitted by the bat. This enables them to hear the approach of their enemy, and escape.

One of these target insects is the moth of the army worm. Colonies of mites infest the ear of the moth. However, the parasitic mites never infest *both* ears of a moth, making it deaf. This would result in the capture of the moth by a bat, and therefore the death of the mite colony.

This example of nature's delicate balance was turned up in research by Dr. Asher E. Treat of City College in New York.



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You Can Hear an Ant Talk!

Ants make sounds clearly audible to the human ear, according to Helen Forrest, a Rutgers University zoologist.

Evidence that ants can communicate across short distances prompted the study. The research project proved ants make noise by snapping their leg joints, scraping their feet, rapping their mandibles and rubbing their stridulatory organs, similar to the scraping organs of crickets and grasshoppers.

A person with good hearing can detect the sounds at very close range without any amplification, according to Miss Forrest, who has made recordings of the ant sounds.

How Does Housefly Land on Ceiling?

What's the flight pattern of a fly as it comes in for a landing on the ceiling?

It approaches the ceiling at a nearly vertical angle, and at a speed of a little more than a half-mile an hour. At about one body length from the touch-down area, it thrusts all six feet forward, and turns off its wings for a dead-stick landing. The two forefeet absorb the impact, and the fly then brings the other four feet forward for a four-point touch-down. The sticky feet keep the fly on the ceiling.

Details of the fly's landing technique were uncovered by William G. Hyzer, a consulting research engineer of Janesville, Wis. Hyzer worked out a high-speed photo system to study the problem.

Occasionally, reports Hyzer, the fly varies its landing technique, maneuvering through a half roll that ends in a sidewise hand-spring, or cartwheel.

Field Mouse Has Short Life

The common field mouse seldom lives for more than a year. Since it must devour its own weight in seeds and grass every day, it soon wears itself out in the constant hunt for food. The small mouse is also the prey of larger animals and birds.

Suturing with Glue

Surgeons may soon "sew" delicate tissues, such as eye corneas and tiny blood vessels, with a synthetic resin adhesive.

Four doctors at the University of California Medical School report the new method of "stitching" surgical cuts has been successful in operations on animals. The adhesives proved effective over periods of as long as eight weeks, long enough for natural healing to occur. No damage to tissues was apparent from using the "glue."

POPULAR MECHANICS

Submarine Built for Three



Skin divers are protected from underwater hazards in a three-man plastic submarine that permits vision in all directions. Two drive units encased in reinforced plastic on either side of the hull operate three-bladed propellers off two 12-volt batteries. The craft was introduced in London.

Machine Reads Varied Types

Automatically "reading" a variety of printed type styles and sizes, a new machine can convert printed or typewritten information into electrical signals that can be fed into a digital computer for processing. The machine recognizes printing of varied quality and alignment, including carbon copies and any size of type in English, Russian and other alphabets. At present, the maximum reading speed of the system is 50 characters per second.

Two significant characteristics of the character recognition system were cited by Dr. Edward N. Adams, Director of Engineering Science, IBM Research Center: "First, the machine determines for itself the information it requires for distinguishing one character from another. Second, by the use of stored information, the machine automatically adjusts itself to recognize different type fonts. The system thus demonstrates both adaptive behavior and self-design."

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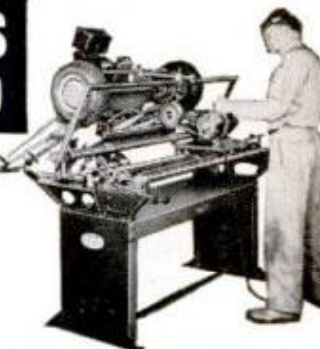
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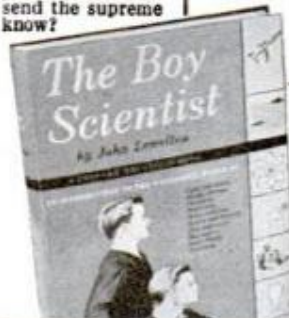
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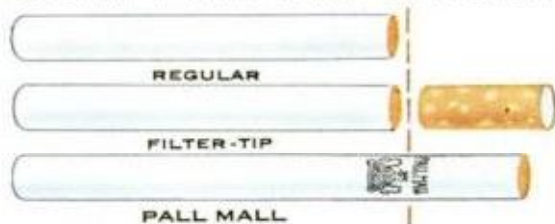
**Pall Mall's
natural mildness
is so good
to your taste!**

*You can light
either end!*

**So smooth, so satisfying,
so downright smokeable!**

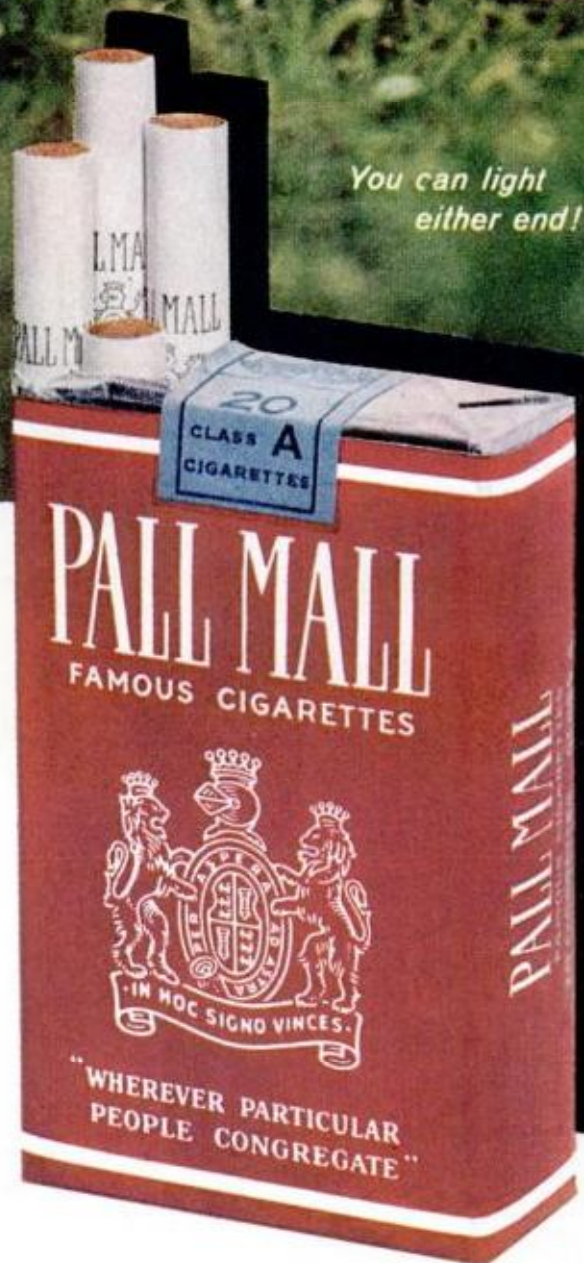
For flavor and enjoyment you just can't beat Pall Mall's natural mildness. It's so good to your taste. Never too strong. Never too weak. Always just right! Enjoy satisfying flavor... so friendly to your taste.

COMPARE ALL THREE!

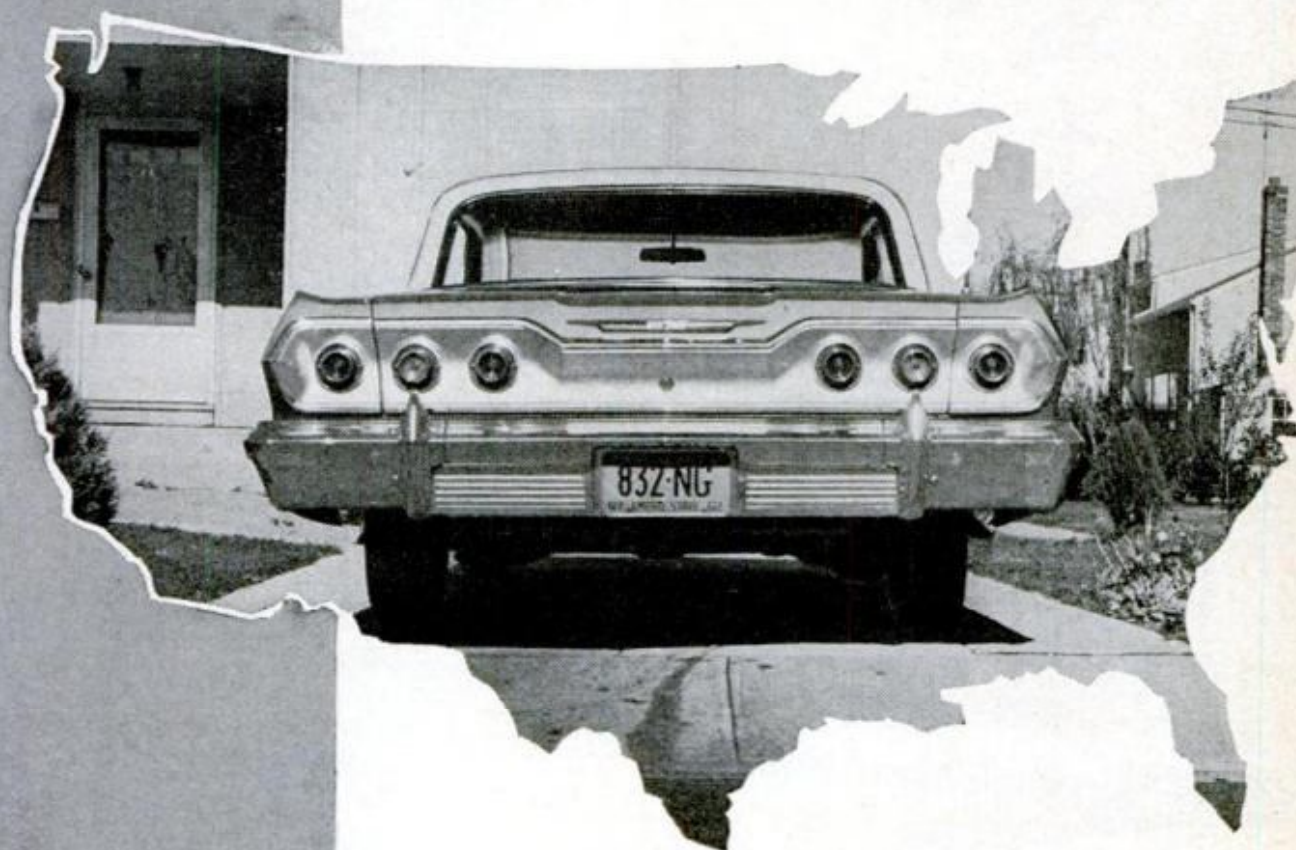


Smoke "traveled" through fine tobacco tastes best.

Pall Mall's famous length travels the smoke naturally . . . over, under, around and through the finest tobaccos money can buy. Makes it mild . . . but does not filter out that satisfying flavor!



PM OWNERS REPORT
A Nationwide Survey Based on
803,849 Owner-Driven Miles



Troubles Are Little for Owners of Big Chevrolets

Boldface comments by Jim Whipple

FROM THE VANTAGE POINT of this owners' report, the future of the big Chevrolets—Impala, Biscayne and Bel Air—appears to be pretty bullish.

A solid 89.8 percent of all owners surveyed said that they would buy another Chevrolet. This comes close to being a record high for *PM* reports in the past six years, with only the full-size 1962 Pontiac edging above this mark with 90.3 percent of their owners saying they intended to buy another.

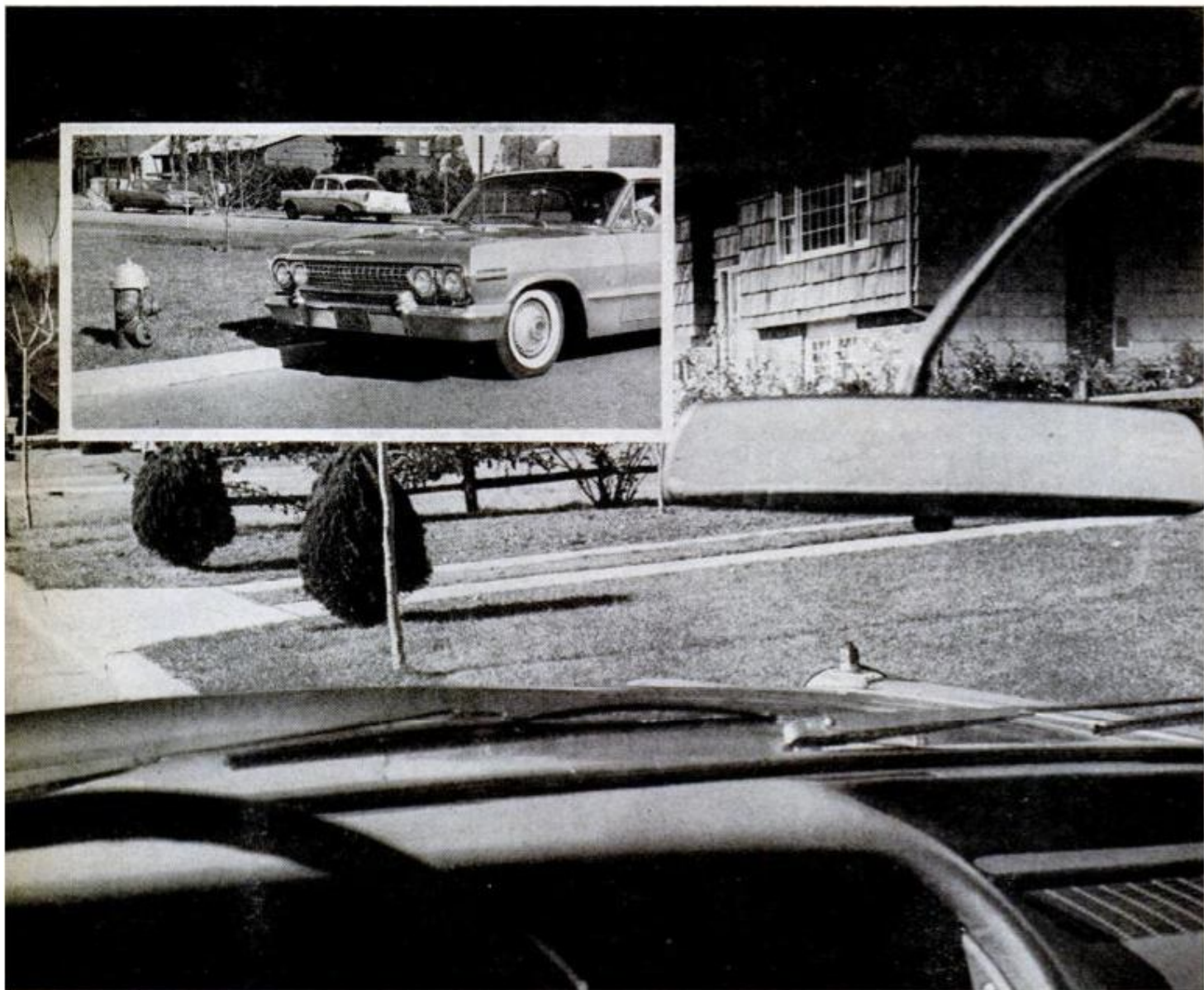
The major reason for the Chevrolet success story seems to be owner loyalty based on satisfaction with earlier Chevies. Some 62.8 percent of all owners responding to *PM's* questionnaire were simply trading in their previous Chevrolets. An additional 9.7 percent traded other General Motors makes, one-third of which were compacts.

OWNERS LIKE

*Driving, parking ease
That smooth "big car" ride
Crisp, finless styling*

OWNERS DISLIKE

*Annoying squeaks, rattles
Dust leaking into body
Problems with paint jobs.*



VISION on '63 Chevy is good until you start looking for low objects over the broad hood. Inset shows hydrant that's almost invisible to driver

Good dealer service is a real high card in Chevrolet's winning hand →

The low percentage of Poor ratings indicates a very small number of major mechanical troubles which are the things that make an owner really mad →

This new Six is pulling a hefty body through an automatic transmission →

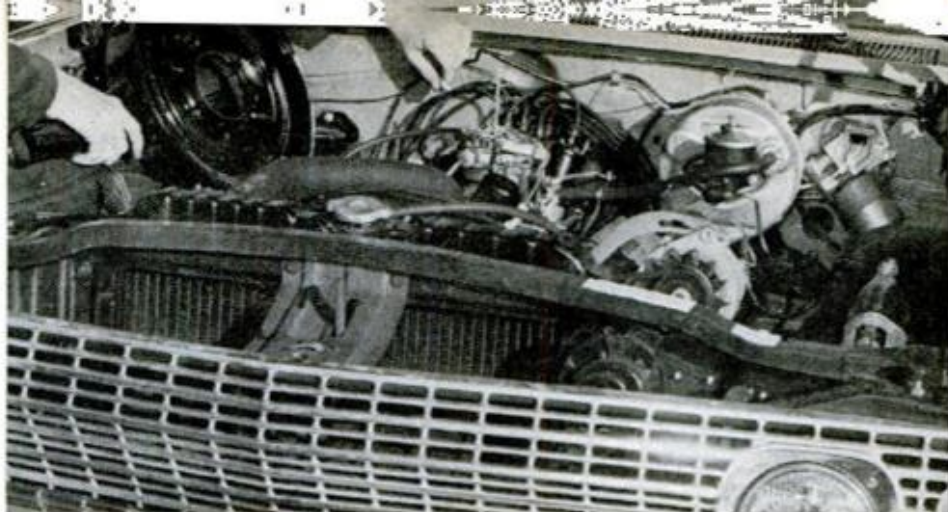
So it seems that much of Chevrolet's present success stems from good past performances, on the part of dealer as well as the product. Some 66.2 percent of the owners felt that dealer service was excellent and 74.4 percent said that they would buy from the dealer again. Only 5.3 percent had decided not to buy from the same dealer.

The over-all ratings, too, were highly favorable to Chevrolet, with 65.4 percent of the owners rating their cars an unequivocal Excellent, while a slightly less enchanted 29.2 percent rated their Chevies Good. Only 4.7 percent felt that their cars were merely Fair, while a minute 0.7 percent actually said that their Chevrolets were Poor. In recent years the "Poor" percentage of all PM survey cars has averaged well over 1.5.

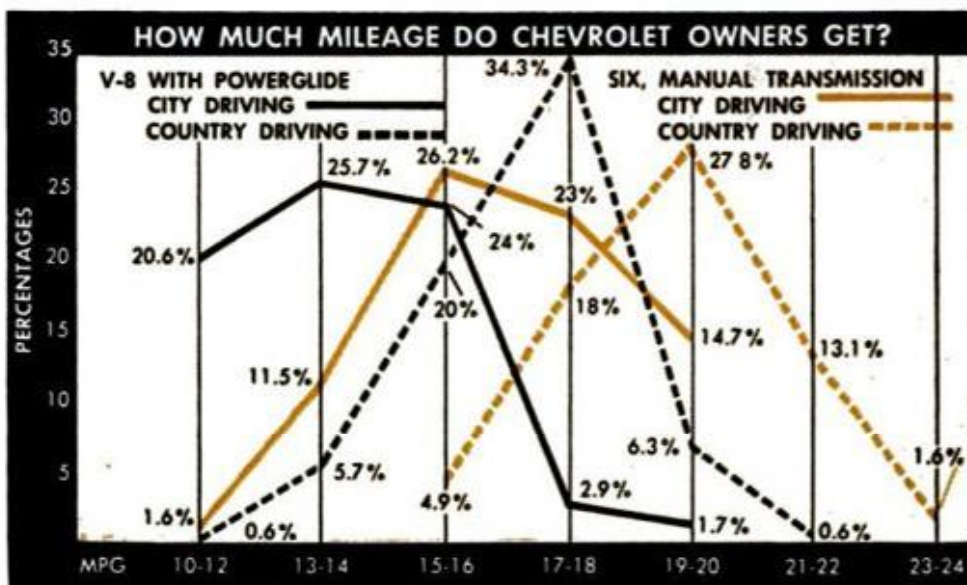
As a check on owner mileages PM took constant-speed fuel mileage readings on one of its test cars, a 140-horsepower six two-door sedan with Powerglide automatic transmission. Results were as follows.

25.01 miles per gallon at 30 m.p.h.
 23.0 miles per gallon at 40 m.p.h.
 20.32 miles per gallon at 50 m.p.h.
 18.27 miles per gallon at 60 m.p.h.
 15.38 miles per gallon at 70 m.p.h.

ACCESSIBILITY of engine components seems pretty good on 1963 Chevy except for V8's distributor which sits back close to the firewall, requires reaching



SIXES seem to be delivering about two more miles per gallon than V8s in city as well as in over-the-road driving. Most sixes had manual transmissions



PROTECTION of a sort is afforded Chevrolet owners by protruding trim strip at bottom of body (see cut of door) but door's upper bulge is still vulnerable

YAWNING LID gives easy access to a truly big trunk which won owner approval. Spare is accessible but out of way. "Well" in center can hold cold drinks



Over-all mileage including first 500 miles of break-in was done on turnpikes, city streets and country highways; average was 16.2 miles per gallon.

And now, let's see what the Chevrolet owners have to say. Here are the first five best-liked features in order of frequency mentioned.

We agree. This is especially true of the new, lighter-weight Six →

"It handles almost as easily as if it had power steering."—Georgia insurance agent.

"Like the handling ease in parking and cornering."—Ohio tire builder.

Doesn't everyone chase antelopes with Impalas? →

"I like the solid feeling, riding and handling ease. I chase antelope out West every fall and that doesn't seem to hurt it. I am very pleased with it."—Minnesota realtor.

"It drives and rides better than any Chevrolet I have had and I've had 12 or 13 since 1946. I drive them anywhere from 40,000 to 60,000 miles."—Georgia salesman.

Here's where those extra inches of wheelbase and legroom pay off →

"Much improved riding comfort."—Tennessee salesman.

"I like the comfort and ease on a long trip of about 500 or 600 miles. You are not worn out as in some other cars."—Kentucky guard.

Somehow, styling-with-a-purpose, almost always manages to be attractive →

"No 'wing-tip' fenders as in 1959-60 models. I prefer the smooth lines."—Ohio IBM operator.

"The styling feature I like most is the chrome side strip placed correctly to protect against other car doors damaging my car."—Arizona designer.

If you think that this is just a coincidence, guess again! →

"The 1963 styling is more elaborate—it looks like a small Cadillac from a distance."—Kentucky bus driver.

Actual output is almost the same, but weight reduction may boost performance →

"I like the new six-cylinder engine which has more power and less weight."—Kansas farmer.

"The large engine (250 hp. V8) gives it the 'big car' feel."—Nebraska banker.

Don't forget to steer it →

"Mine has the 327-cubic-inch engine and four-speed stick. When you press down on the accelerator, you are gone!"—Tennessee construction worker.

"It's cheap to operate for a full-sized car. Yet it rides,

ROOMY rear compartment was appreciated, but some owners complained of legroom being a bit scant

NEW INSTRUMENT cluster in shady tunnel won approval but some drivers felt seating position was low



handles and looks very good."—Ohio salesman.

"My Chevrolet's economy (Six, 19.7 m.p.h. overall) is exceeding expectations."—Kansas student.

But even the most popular car in town has problems. The first five items on the Chevy owners' gripe lists follow in order of frequency of mention.

"Rattles and squeaks are a problem. The dealer is trying to get them out. So far, he has not succeeded."—Mississippi gas distributor.

"Cars nowadays are not as solidly built as five to eight years ago, and they have more rattles."—Nebraska farmer.

"It has a rattle around the dash and we cannot find it."—Kentucky collector.

"Dirt blows in around the tailgate and also around the doors."—New Mexico engineer.

"I have had trouble keeping dust out of the inside of my car and out of the trunk."—Missouri farmer.

"Body poorly sealed and leaks dust badly."—Iowa salesman.

"Poor outside finish and not enough quality, but then you can't expect that in a production car."—Massachusetts salesman.

"Paint doesn't seem like it will hold up—chips easily."—Indiana factory worker.

"The paint job was poor. The dealer had to repaint one back fender."—Indiana draftsman.

"The only complaint I have is that the wind whistles. You just can't stop it."—Illinois foreman.

"There are air leaks around the wings of front door windows."—Indiana teacher.

"It should be more finished. There were so many little things left undone that I had to do."—Ohio secretary.

"Never serviced-out completely enough. I think paint touch-up and other minor problems should be automatic,

(Please turn to page 216)

This is about what he should be getting

The cowl and windshield is a real problem area on most separate frame cars. It should get special attention at the factory

There's little excuse for this, even early in the new model run

We expect good finish on every make, but never find it uniformly good on every car.

All too true, alas. Both PM test Chevvies howled at 50 m.p.h. and up like ship's rigging in a gale

CHEVROLET OWNERS' RATINGS

	Excellent 65.4%	Good 29.2%	Fair 4.7%	Poor 0.7%
Fuel economy				
About as expected	63.0%			
Better	21.1			
Not as good	16.0			
Best-liked features				
Handling ease	41.7			
Riding comfort	36.5			
Styling	32.7			
Power, performance	30.1			
Economy	13.9			
Roominess	9.0			
Interior design	5.6			
Heavy car, solid feel	4.5			
Large trunk	4.5			
Most-frequent complaints				
Rattles and squeaks	6.0			
Leaks (mostly dust)	4.9			
Inferior paint job	4.5			
Wind noise at doors, windows	4.5			
Poor workmanship	4.1			
Low gasoline mileage	4.1			
Best-liked interior style features				
Dashboard, instruments	37.6			
Upholstery	15.0			
Comfortable seats	6.0			
Bucket seats	4.1			
Colors	3.0			
Least-liked interior style features				
Transmission hump	6.0			
Glove compartment	6.0			
Dashboard (finish, etc.)	5.3			
Radio speaker location	3.8			
Ash trays	3.8			
Floor covering	3.4			
Step-down floor	3.0			
Best-liked exterior style features				
Straight, smooth, streamlined	9.0%			
Neat, plain, simple lines	7.9			
Front end and hood	6.8			
Chrome, stainless steel trim	6.4			
Rear end and deck	6.4			
Roof lines	5.3			
No excess chrome	4.1			
Grille	4.1			
Tail lights	4.1			
Side view	4.1			
Absence of fins	3.0			
Least-liked exterior style features				
Rear end	4.1			
Bumpers	3.0			
Rear window	2.6			
Location of side molding	2.3			
Chrome strips on side	1.9			
Too little chrome trim	1.9			
Excessive windshield exposure	1.5			
Tail lights	1.5			
Had mechanical trouble?				
No trouble	75.9			
Yes, had trouble	24.1			
What was trouble?				
Automatic transmission	3.8			
Excessive oil consumption	3.4			
Carburetor	3.0			
Stalling, missing	2.6			
Lights, directional signals	2.3			
Automatic choke	1.9			
How is dealer service?				
Excellent	66.2			
Average	29.6			
Poor	4.2			
Is Chevrolet the family's only car?				
Yes	65.4%			
No	34.6			
Make of other car				
Another Chevrolet	12.8			
Other General Motors make	10.2			
Ford	5.3			
Other Ford Motor Co. make	0.7			
Plymouth	4.5			
Other Chrysler Corp. make	1.9			
Import	2.3			
Considered another full-size car?				
No	73.3			
Yes	26.7			
Competitive car considered				
Ford	50.7			
Pontiac	25.4			
Plymouth	8.5			
Oldsmobile	8.5			
Dodge	7.0			
Considered buying a compact car?				
No	83.5			
Yes	16.5			
Compact make considered				
Chevy II	34.1			
Corvair	25.0			
Buick Special	11.4			
Tempest	6.8			
Olds F-85	6.8			
Rambler	4.5			
Volkswagen	4.5			
Would buy another Chevrolet?				
Yes	89.8			
No	3.4			
Undecided	6.8			

Fresh Flock of **FOLD-WING PLANES**

By Jack Cushman and Merle Dowd



**These tow-and-stow personal planes
can be built and flown even by beginners**

IF YOU HAVE ordinary workshop tools, about \$1000 or so you can spend on spare parts, the same number of hours you can spend on spare time, and the desire to build and fly your own airplane, then you can duplicate one of the winners in an unusual contest sponsored recently by the Experimental Aircraft Association.

These homemade flyabouts are not only easy to build and easy to fly, but they can be hitched on the back of a car and towed to the airport as easily as you tow a boat to water. And you don't have to worry about airport parking space or leaving the plane out in all kinds of weather. You can just store it in your own garage.

The reason is that this unique contest, the first of its kind, specified that the planes have folding wings!

That's a lot of airplane for the average do-it-yourselfer to build in his basement—one that is simple to construct, safe to fly and have folding wings besides. But at least 40 men tried it, six succeeded and three won prizes totaling \$4500.

And anyone can duplicate any one of

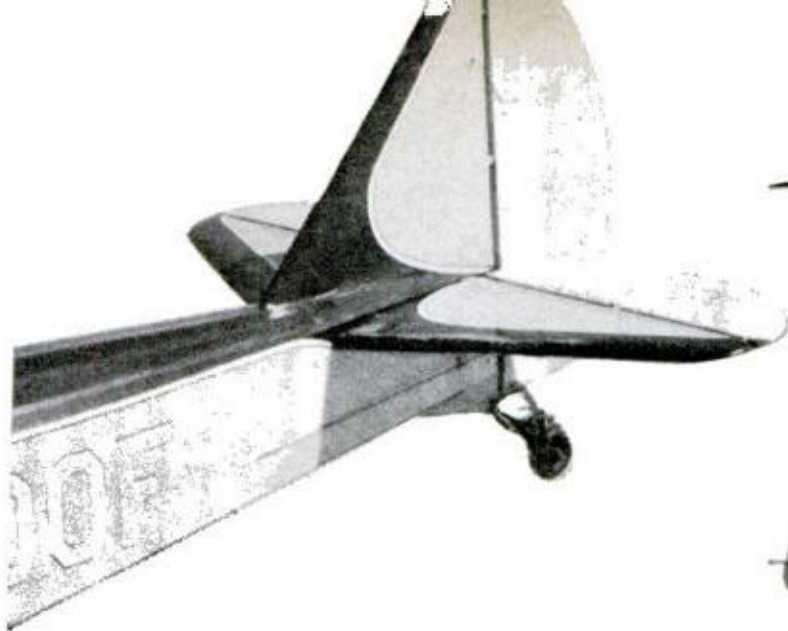
them—that was the whole point of the national build-it-yourself contest.

Top winner was *Fly Baby*, an outstandingly simple single-seater designed and built from wood and fabric by Pete Bowers of Seattle, Wash., an engineer for the Boeing Co.

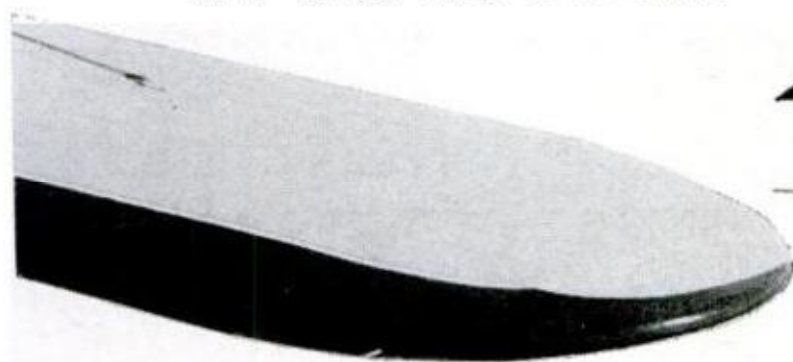
Bowers' open-cockpit monoplane 18 ft., 10½-in. long with a wingspan of 28 feet, was cited for its "structural simplicity, non-critical components and clear drawings." The judges went on to say that the beginning builder "could, within the limitations of an average home workshop and average skill, build this inexpensive sports plane from start to finish."

It flies, too. *Fly Baby's* 85-hp. engine furnishes power for a cruising speed of 115 m.p.h. and a range of 300 miles. It climbs at a peppy 1100 feet per minute, has a surprising service ceiling of 14,000 feet and stalls at a safe 45 m.p.h. Bowers says he spent close to \$1100 on it, but his first prize money of \$2500 more than covered his expenses.

Second prize of \$1250 went to E. L.



FIRST PLACE in contest for fold-wing planes went to *Fly Baby*, open-cockpit single-seater. "Bomb" between wheels is for luggage



SECOND PLACE went to speedy single-seat cabin plane, the T-40. It cruises at 130 m.p.h., maximum 145 m.p.h. Total cost to build: \$1250

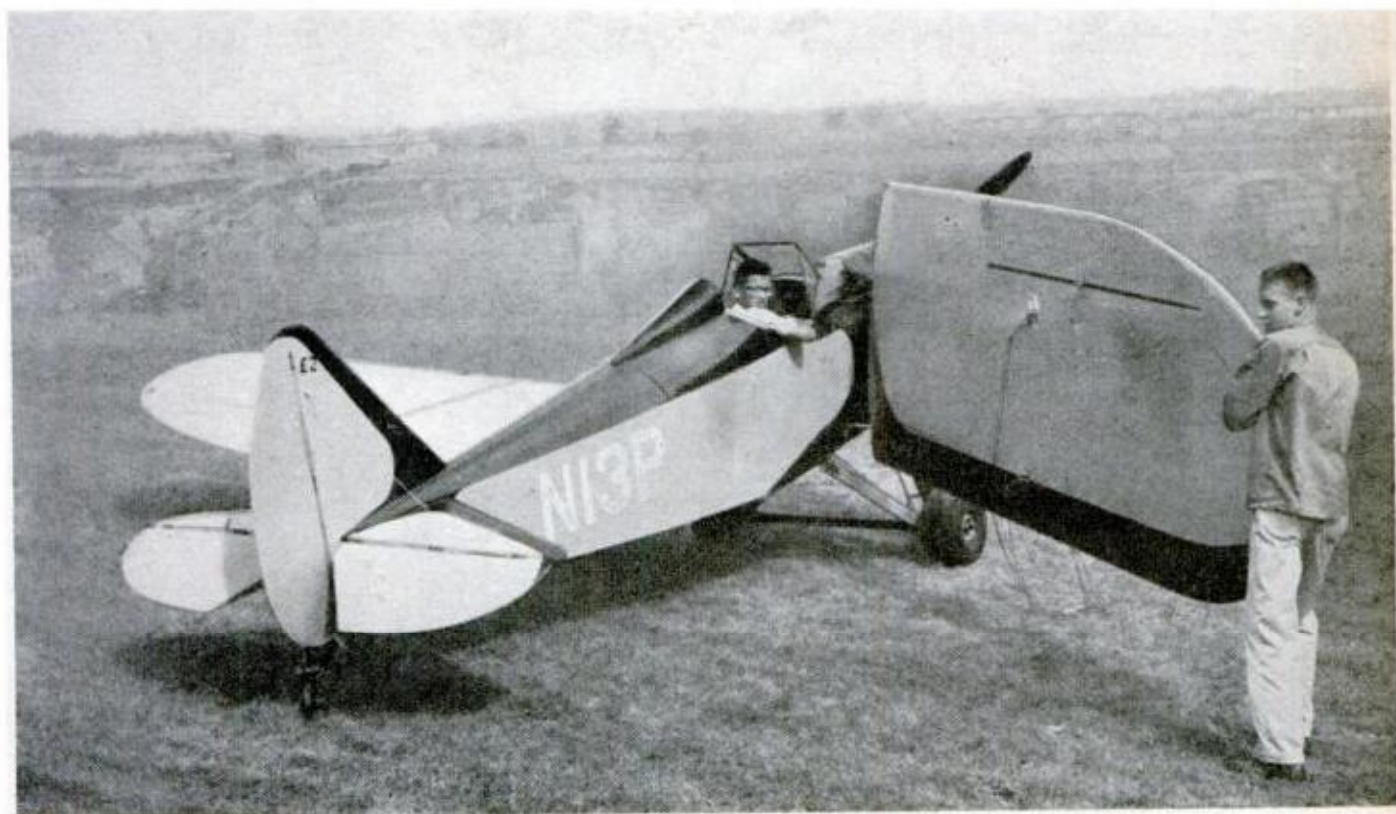


THIRD PLACE went to two-place cabin plane, *Eaves Cougar I*. It cruises at 125 m.p.h. and has range of 500 miles. It also cost \$1250



RUNNERUP was another cabin plane, *Lacey M-10*, which has unique wing that doesn't fold but pivots to lay lengthwise. Cost: \$1500

FOLDING WING on *Fly Baby* is simple enough for youngsters to operate, and several tried it at Rockford



Turner of Fort Worth, Texas, for his T-40, a sporty-looking single-place cabin plane, *Cougar I*, a two-place cabin job by Leonard and Rita Eaves of Oklahoma City, Okla., took third place money of \$750.

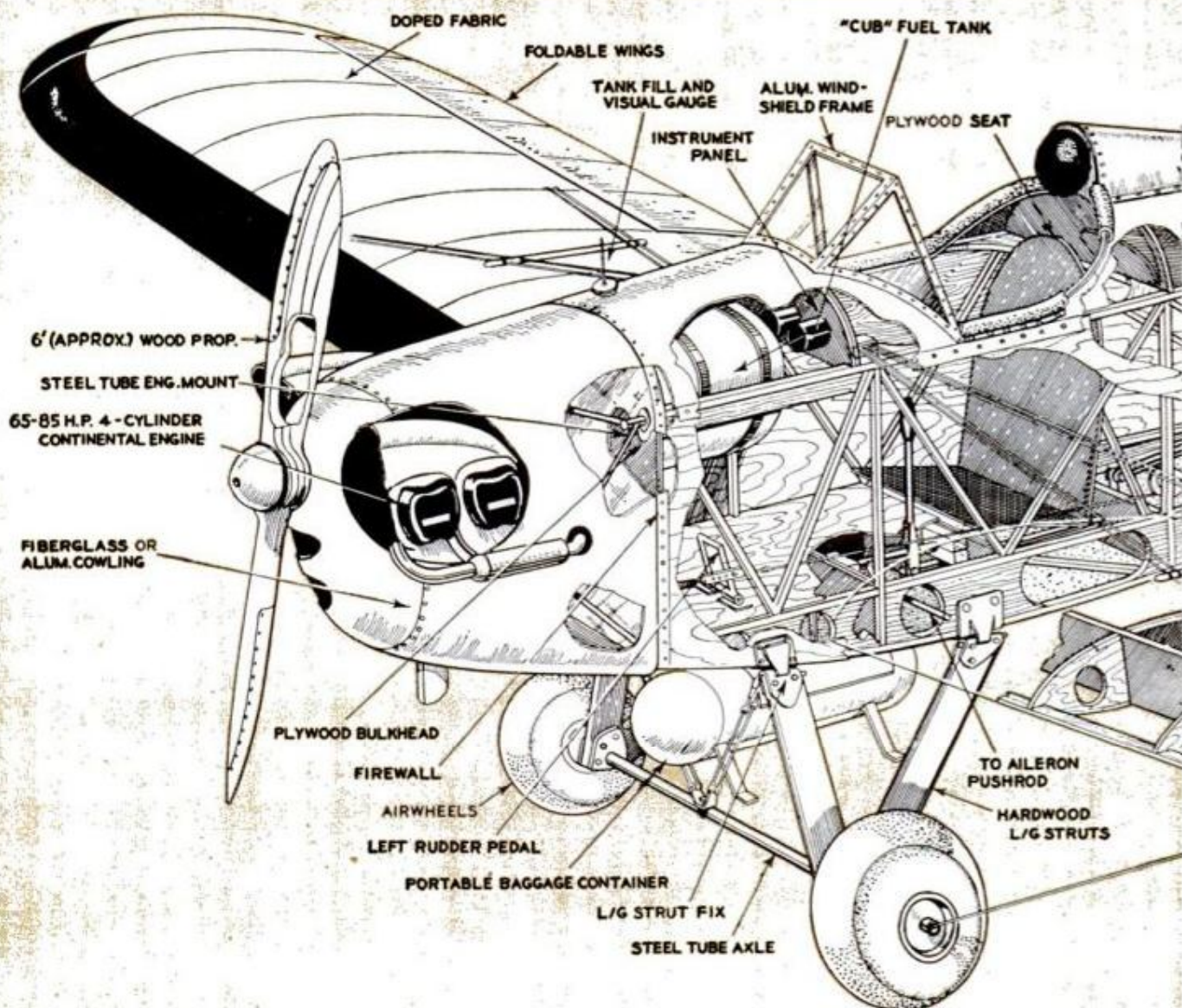
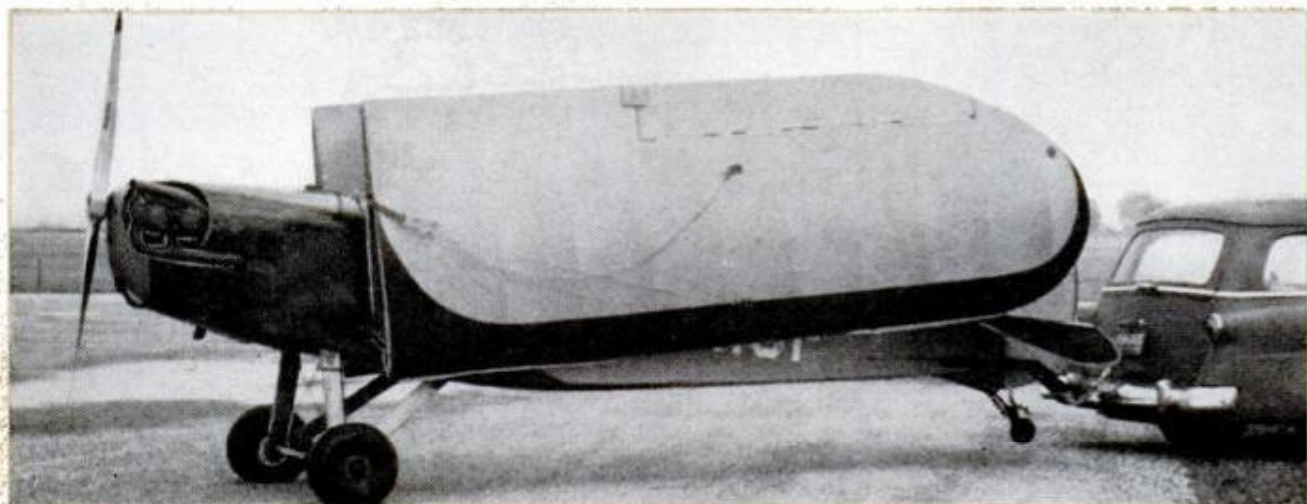
The specifications stated by the EAA were rigid but simple:

1. The airplane must be safe to fly, even by an inexperienced pilot.
2. The airplane must be suited for ama-

teur construction, even for a first effort with a modest home workshop and readily available construction materials.

3. The airplane must be capable of having its wings folded for highway travel behind the family automobile, and the folding mechanism must be safe and simple.

The six planes that ultimately competed in the contest were towed or flown to Rockford, Ill., where the EAA stages its



annual get-together. The judges—all experienced designers, builders and pilots—based their decision on simplicity of design and construction, and ease of handling in the air plus maximum safety.

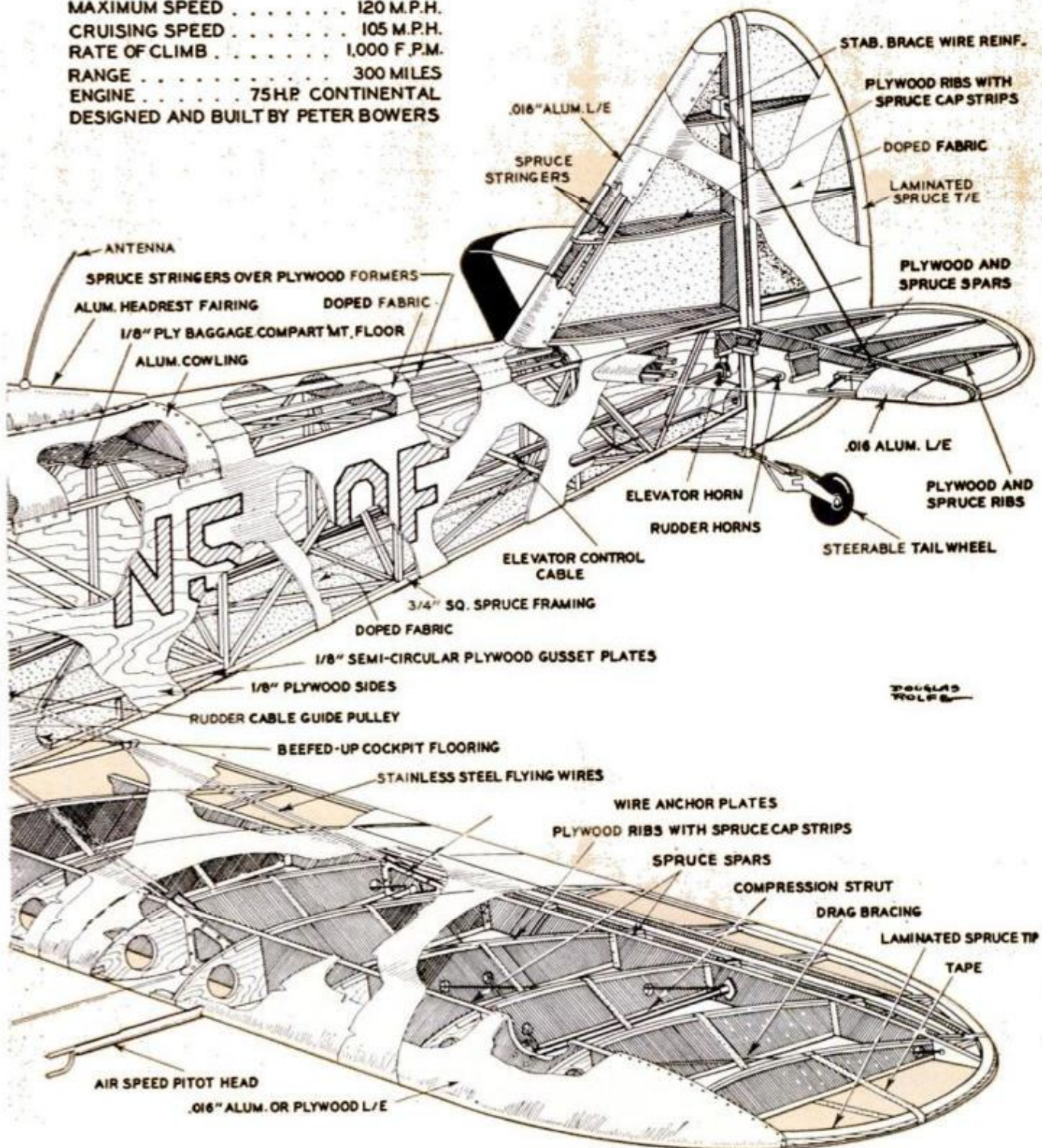
Judging of the design, in fact, began long before the Rockford show. Plans for each aircraft had to be submitted well in advance, and the designs were studied for clarity, for simplicity and for safety. Is the

airfoil the best one for the aircraft? Will the undercarriage hold up under rough landings? Is the folding mechanism safe? Can the aileron controls be disconnected and connected easily? The most important question of all, however, was whether each plane could be built by an amateur in his first attempt to build an airplane.

Prior to Rockford, each airplane had to have 50 hours of successful flight time, and

— SPECIFICATIONS —

WING SPAN	28 FEET
LENGTH	19 FEET
HEIGHT	6 FEET
WEIGHT EMPTY	605 LBS.
USEFUL LOAD	319 LBS.
MAXIMUM SPEED	120 M.P.H.
CRUISING SPEED	105 M.P.H.
RATE OF CLIMB	1,000 F.P.M.
RANGE	300 MILES
ENGINE	75 H.P. CONTINENTAL
DESIGNED AND BUILT BY PETER BOWERS	



flight records had to be kept outlining the type of tests and evaluations that were conducted by the builders.

At Rockford, these records were studied, and the planes themselves were matched against the data the judges had accumulated in studying the original plans. The builders stood by, meanwhile, to defend or explain some of the unique features covered in the plans. The wings, especially, were given careful attention. Each was folded and unfolded while the judges held stopwatches.

The Judges Flew Them

Then, the judges flew each airplane. The tests included everything from cockpit visibility to rate-of-climb and stall characteristics. At all times, the judges—all experienced pilots—weren't concerned whether they found it easy to fly, but whether an inexperienced pilot could fly it safely.

While all six aircraft drew praise from the judges, Pete Bowers' *Fly Baby* was their choice as the best overall. If one word could describe the reason for its victory, it would be simplicity. Some of the others were faster, bigger or cheaper to build, but *Fly Baby* appealed to the judges as the simplest to build and simplest to fly. Plans are available from Pete Bowers, 13826 Des Moines Way South, Seattle, Wash., at \$15 a set.

Eugene Turner's second-place T-40, for instance, impressed the judges with its high performance—130 m.p.h. cruise and

450-mile range. A smooth-looking cabin type, it should be ideal as a single-place cross-country airplane. However, in spite of top marks, the judges could not recommend it as a beginning project for the inexperienced. As a project for an advanced pilot/builder, it rates high. Plans are available from Turner at 6842 Pine Park dr., Fort Worth 18, Texas.

The third-place winner, *Eaves Cougar I*, is an old design modified to accommodate folding wings. Based on the original *Cougar* (400 of which have been built), it has proven high-quality performance and room for a passenger. The higher degree of building and flying skill required for a *Cougar* project, however, influenced the judges. The *Cougar* cruises at 125 m.p.h. and has a 500-mile range. Plans are available from the Experimental Aircraft Association, 9711 W. Forest Park dr., Hales Corners, Wis.

(The Association, incidentally, has available free copies of Civil Air Regulations relating specifically to amateur-built aircraft. Just send them a stamped, self-addressed envelope. And it is always looking for new members. It has nearly 14,000 now, and there may be a chapter in your area. Dues are \$10 a year.)

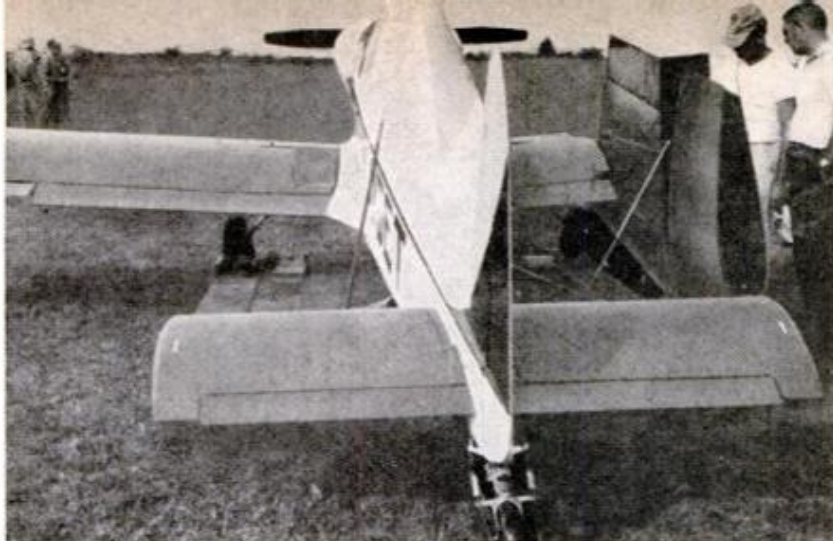
One of the runnersup at Rockford, the *Sport Tuholer*, by Tony Spezio of Bethany, Okla., was a crowd favorite. Its two-place, open-cockpit design gave it a sporty air and it had a performance to match—128

[\(Please turn to page 248\)](#)

ANOTHER RUNNERUP, *Sport Tuholer*, had raciest lines of all planes in contest, reminiscent of race planes of 1920s and 30s. *Tuholer* cost just \$800



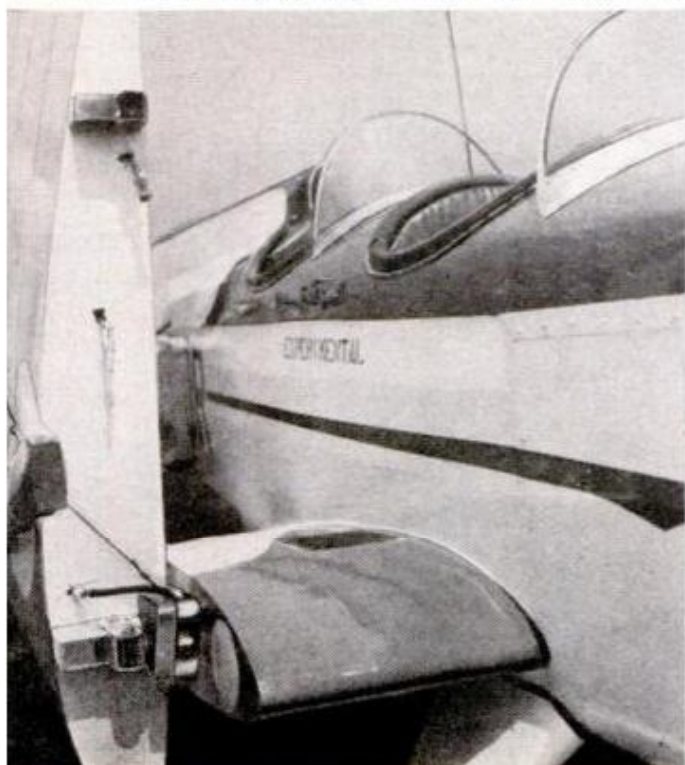
T-40's WING folds outboard of fuselage about two feet, almost even with tips of horizontal stabilizer. At 750 pounds empty weight, slim-looking plane was one of heaviest in the contest



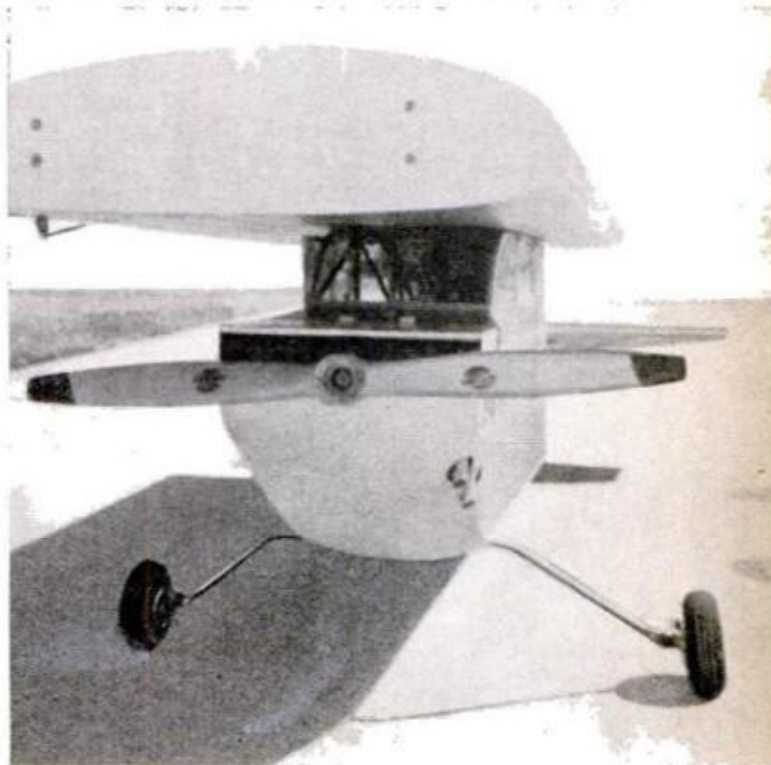
COUGAR I folds its wings snug against fuselage. Basic idea behind fold-wing contest was to encourage designs that could be built by pilot and towed to airport, eliminating parking worry



CONVENTIONAL METHOD for folding wing is shown on Tuhler, trailing edge swings up, wing folds



UNCONVENTIONAL METHOD is shown on Lacey M-10. Whole wing pivots at center, lays flat along top





Suspended Monorail

Built for the Los Angeles County Fair as a vehicle for a tourists' tour of the fairgrounds, a monorail stayed on after the fair closed for use again this year. The suspended monorail carried nearly a quarter of a million passengers during the 17-day exposition last year.



Direct-Action Laser

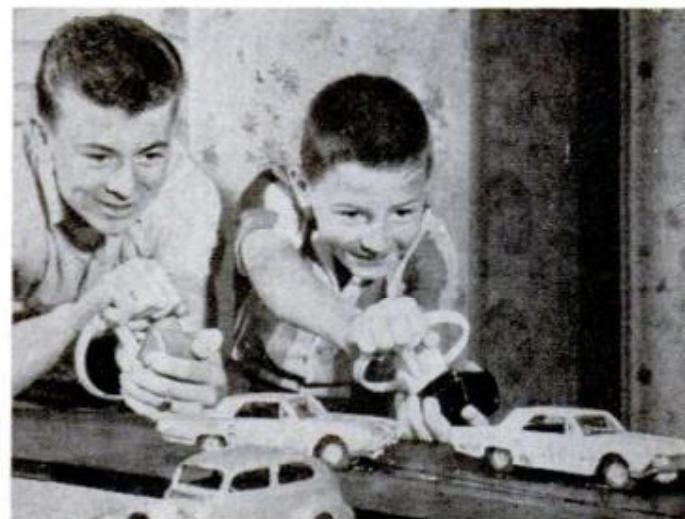
By running an electric current through a diode, new lasers generate coherent light directly, unlike gas and ruby lasers which must be "pumped" by external power sources. In General Electric's model, the gallium-arsenide diode (shown in mirror) is suspended in liquid nitrogen for cooling.

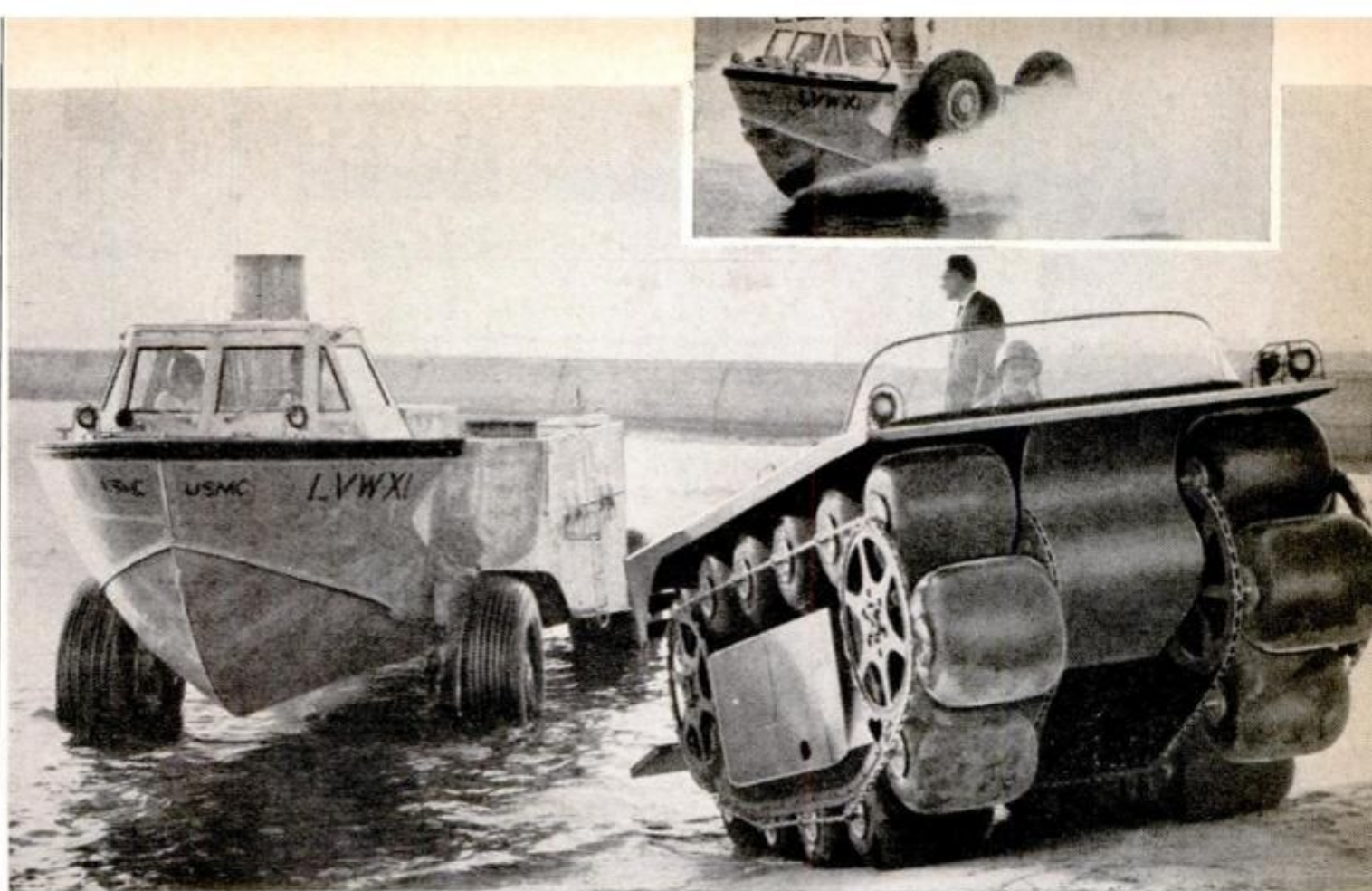
Table-Top Racers Have Steerable Front Wheels

Swerving back and forth on slotted tracks, the individually controlled cars in an electric table-top set provide the feel of stock-car racing. Guided by a steering wheel that turns the cars' wheels, the racers maneuver in and out on a pivoting front wheel assembly. They can go forward or

in reverse, pass on a special crossover, go into spins or swing wide on curves.

The cars clip onto an undercarriage (left) beneath the track. Made of plastic, the Authentic Model Turnpike measures 4 by 9½ feet. It's available for about \$50 from AMT Corp., Troy, Mich.





Marines Wheel Out Two New Floating Transports

Amphibious for travel on both land and water, two new vehicles have been unveiled by the U.S. Marine Corps.

One of them, the LVW (for landing vehicle wheeled, left above and inset), has retractable wheels and a planing hull that enable it to travel at 35 m.p.h. on both land

and water. Designed as a speedy cargo carrier, it can move tons of supplies.

The Airoll I, right, is slower but more versatile. A troop or weapons carrier, it can travel anywhere, including swamps or snow, because of its balloon-tired tank treads, a mating of the wheel and track.

Back Rest for Drivers

You can add the comfort of a bucket back to your car seat with a contour-fitted back rest that comes from West Germany. Filled with synthetic rubber fibers, the units sell for \$12.50 from Hubert Graulich, Inc., 6801 Brighton Place, Coral Gables, Fla.



Japan Gets Back in the Air

Called the first big plane designed and built in Japan since World War II, the YS-11 was developed by six Japanese aircraft companies as a Southeast Asia transport.

It seats 60 passengers, and its twin Rolls-Royce propjet engines give it a cruising speed of 300 and a range of 1488 miles.





By Jim Whipple



Renault May Get New Automatic Electric Gearbox What's Next Under The Spreading 5-50 Warranty?

Regie Renault, the French automaker, has an exciting development under wraps in the form of an electrically-operated automatic transmission. Although the unit is not yet ready for production, Renault engineers are pleased as cats who've just tipped over the cream bottle. Basically, the transmission itself is a four-speed synchromesh box coupled to the engine with a magnetic iron powder clutch, in itself not a new development.

According to the engineers, the tricky part is that the gear selection is done by a high speed electric motor working an ingenious cam which controls the shift rails. The Frenchmen claim that it's flawless, fast and foolproof and that it adds very little weight . . . thus making it an automatic transmission practical for a small car.

We are waiting with tremendous curiosity for a chance to try this new automatic, which could revolutionize the transmission business.

Over at Curtiss-Wright, development surges ahead on a shiftless automatic transmission based on the toroidal design. It will embody conical rollers which permit an infinite number of ratios and a smooth continuous shift up or down. An interesting feature of this type of transmission is that it can be used with either direct manual control or an automatic "brain box", as the engineers call it.

The rotating combustion engine, known by its inventor's name "Wankel" comes nearer to becoming a production reality every day. Rumor has it that a number of Wankel-equipped **Ramblers** are carrying on road tests using Curtiss Wright's toroidal transmission at the present time. According to our informant, there are no development problems with the blades that seal off combustion areas from each other.

Chrysler's new 5-year-50,000-mile warranty may seem to be a tremendous gamble for a company to take in guaranteeing interior engine parts, transmissions and drivelines of all owners who follow recommended service procedures.

This could be a tough (expensive) promise to keep even if there were a relatively small percentage of failures. Chrysler Corporation is no more anxious than the

next automaker to play Russian Roulette with parts and service bills on hundreds of thousands (soon millions) of cars.

So, Chrysler played it smart like a sensible automaker should, and checked out their warranted components before taking the step from which there can be no returning.

It is hardly thinkable for any company to withdraw their warranty or shorten it once they've announced it.

The automatic transmission in all its complexity was perhaps the biggest potential trouble spot, so Chrysler gave their Torqueflite a trial by fire. A number were installed in New York City taxicabs.

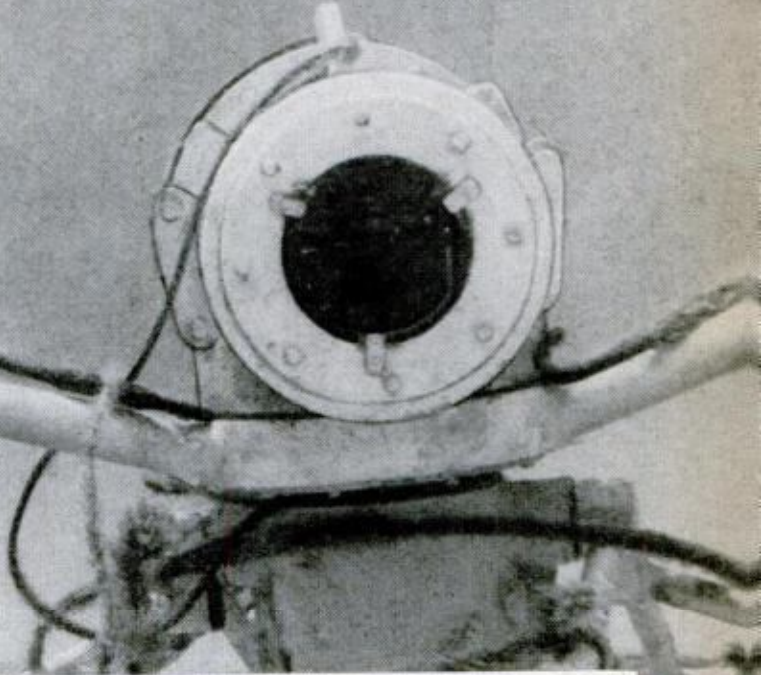
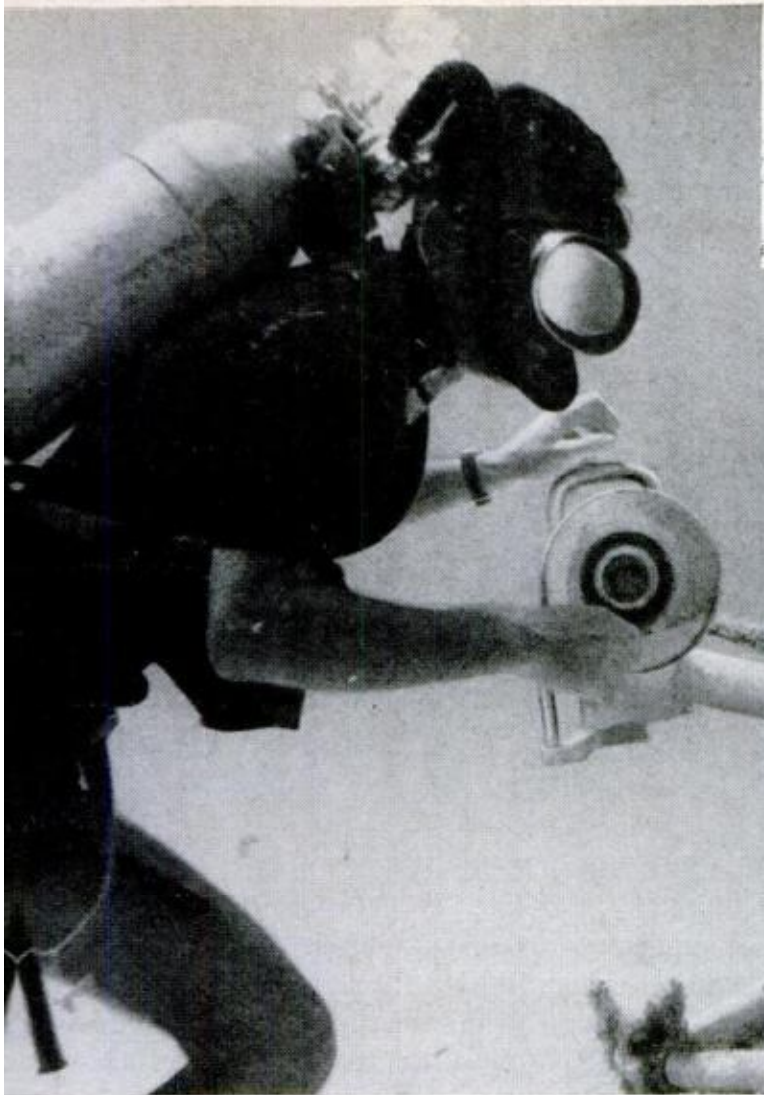
We sincerely doubt if auto engineers could devise a test to simulate the brutal full-throttle-acceleration followed by panic stop that is the standard driving pattern of many New York hackies.

After 50,000 miles (it had to be miles because cabs don't last five years, and Chrysler was in a hurry) the transmissions were pulled out of the cabs and checked over thoroughly. Not only were they still healthy but measurements showed that considerably more trouble-free life remained in these units.

Some items not yet covered under the warranty may be moved under the "5/50" umbrella in the near future. An example—the sealed-lubricant suspension and steering parts which have a failure incidence of much less than one percent in customer service.

Alternators haven't been included under the warranty because there's no satisfactory way to test the silicon diodes that rectify the AC current and turn it into direct current for the car's electrical system. Purely physical wear problems on the alternator have been licked by sealed bearing and better varnishing of windings.

Electrical systems cannot be included under 5-50 at present according to one Chrysler engineer because there are too many ways in which unskilled hands can short-circuit the wiring. In the not too distant future all electrical accessories will be sealed units with foolproof plugs on all wiring harnesses that can then only be hooked up the right way.

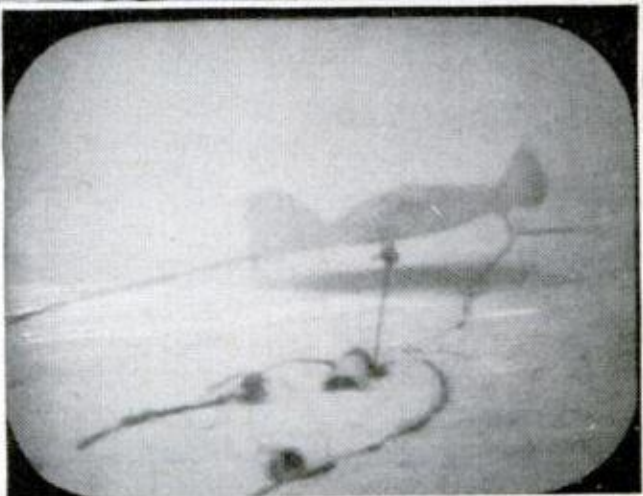


Barking Whales Star on TV

WHAT MAKES THE BARKS, whistles, grunts and other underwater noises the Navy keeps picking up on its sonar?

To answer that question, the Navy has a television camera and hydrophones 65 feet underwater near Bimini Island in the Bahamas. Scientists of Miami's Institute of Marine Science are recording the sounds and seeing what's making them by watching on a monitor at Lerner Marine Laboratory a mile away.

They've found that grunts and croaks—as might be expected—come from the croaker. A staccato noise, like a drummer hitting the rim of his instrument, comes from the margate; barking and whistling noises are produced by whales; birdlike whistling noises are the call of the sea robin. Even barnacles sound off with a staticlike noise. But still classed as mysteries are such strange noises as a clucking sound and "donkey laugh."



MANTA RAY inspecting hydrophone has voice taped
CURIIOUS GROUPE stops to stare into television lens



INSTANT COLOR PHOTOS!

Here's the word on Polaroid's revolutionary 50-second color film, what you can do with it and how it compares

By Kevin Brown

WELL, POLAROID'S INSTANT COLOR film has arrived at last.

After years of speculation about when it would get here, if it would get here, and whether it would be any good if it did, Polacolor is now on the market in selected areas in the Southern U.S. It is expected to be available nationwide by summer.

Popular Mechanics ran tests on the new film prior to its limited release in January. The verdict: When it's good, it's very good, and when it's bad, it's so-so.

Its quality, however, is probably irrelevant. Surprisingly beautiful colors are possible with it (see the next four pages), but the most fantastic thing about it is that it works at all.

Just think of it! Snap the picture, and 50 seconds later you have a permanent color print. Polacolor should succeed on this basis alone. Every time one of *PM's* photographers took a roll outdoors to test it, a crowd gathered and the "ooh's" and "aaah's" were audible.

Before giving you the results of the tests and what you can expect from this revolutionary film, here is a quick rundown on Polacolor data:

- It comes in rolls of six pictures each that fit into standard Polaroid Land cameras. Some models, notably the 80 series, need factory conversion first. Print sizes are 3¼ by 4½ inches or 2½ by 3¼ inches, depending on camera model.

- The film works the same way as Polaroid's black-and-

POLAROID COLOR, when it's good, is very, very good. And you get it 50 to 90 seconds after you take it. This sunlit photo was taken at 1/60th and f 16. The temperature was 68°F., the development time 90 seconds

ELECTRONIC FLASH created this subtle print, showing Polacolor at its best. Some photographers prefer such subdued coloring to stronger colors of conventional prints. They now have a choice: Polacolor for softer hues, conventional prints for brilliance.



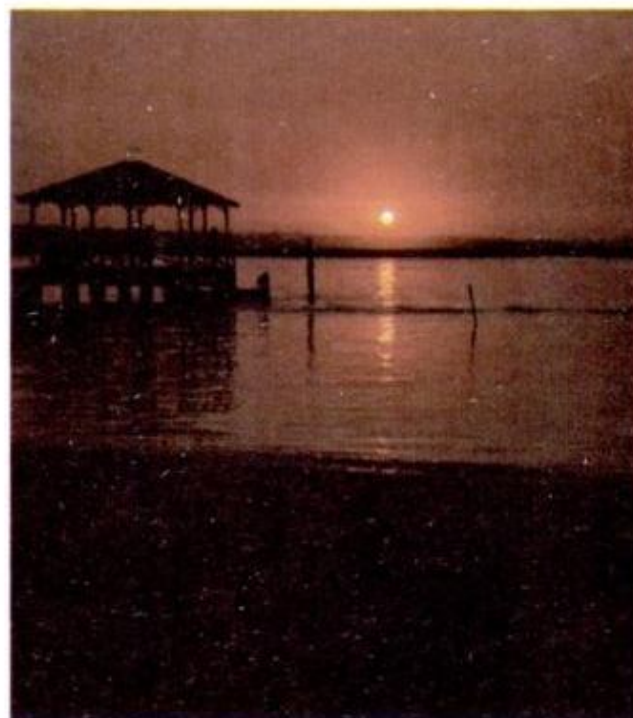
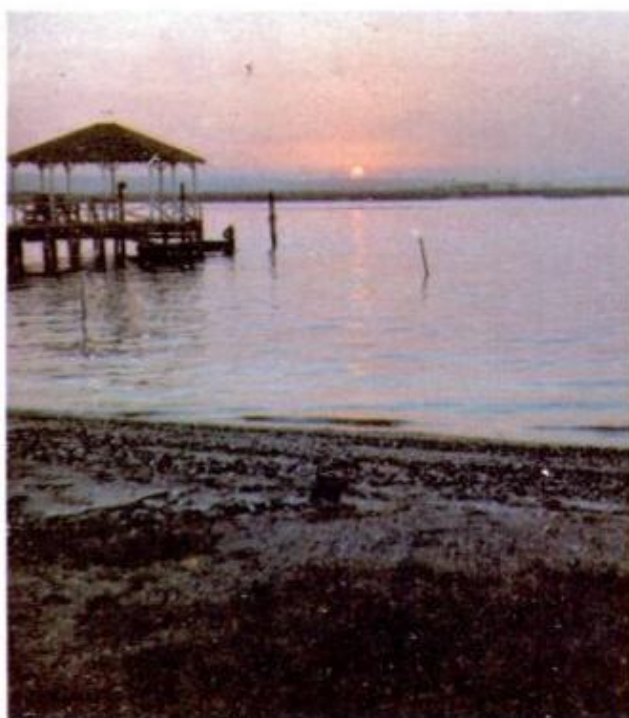
COMPARISONS between conventional color prints and Polacolor, exposed under identical conditions, illustrate consistent brilliance—even exaggerated brilliance—of conventional prints (left). Polaroid colors (right) are more subdued, less contrasty



DIFFERENCES were greatest with flash bulbs. Conventional print (left) had overall cool, bluish cast (even on white tablecloth) with stronger colors; Polacolor had warm, brownish cast and, unexplainably, turned girl's powder-blue blouse to white

More Comparisons, More Differences

DULL LIGHT, outdoors, surprisingly produced strongest Polacolor reds in PM tests, comparable to conventional print (left). Comparison tests, made under all lighting conditions, indicate that Polacolor, at its best, is excellent and a worthy competitor to conventional color prints. At its worst, it produces some pretty dull prints and is less tolerant of mistakes. Its overwhelming virtue, however, is the miracle of color prints 90 seconds after shooting, a fantastic accomplishment



SUNSET SHOTS dramatize one drawback of conventional prints. Both shots were made within seconds of each other. Conventional print (left), machine-processed at plant, came back overly light for sunset. Returned to plant with request for deeper colors, machine made an almost identical print. Polacolor, made in camera, came out like this, indicating unusual shots may be easier to "customize" with Polacolor than with prints made by automated machine at plant

white film. Snap the picture, pull the tab, wait for development, then peel off the print. An added bonus is that, unlike black-and-white Polaroid, no coating with dauber is necessary.

- Polacolor has a unique exposure-index system, varying from 50 to 100 ASA, depending on temperature. The higher the temperature, the higher the rating.

- Its development time also varies, from 60 seconds to two minutes, again depending on temperature. The lower the temperature, the longer the development.

- Its colors are balanced for daylight, blue flash bulbs, or electronic flash, but it can also be used (with proper filters) with photofloods.

- Copy prints and enlargements (up to 8 by 10 inches) are available, but only from Polaroid. The firm has announced no plans for marketing a home copy box.

- Some accessories are necessary, and others are optional. Because Polacolor is tougher to tear off, existing Polaroid cameras can use the replacement cutter bar which has serrated teeth and costs 50 cents. The J66 and J33/electric-eye cameras will need electric-eye blinds to convert the electric eyes to the speed of Polacolor, and they will also need ultraviolet filters to be attached inside the camera. Electric eye blind, UV filter and flash reflector sell together as a package for \$4.50. A two-minute timer and an exposure meter, which can both be attached to the camera, are optional. *PM* found the timers inaccurate, and would recommend, instead, the sweep-second hand on a watch. The small exposure meters were accurate enough, but for more critical exposures a good, hand-held meter is preferable. Also available is Polaroid's close-up kit, which might get more use with Polacolor for close-ups of flowers. *PM* found it practical but awkward.

Last, the price. Polacolor, let's face it, is expensive—probably twice as expensive as conventional color prints.

Polacolor Prices

At this writing, Polaroid spokesmen were still being cagey about the price, announcing only that the cost to dealers would range from \$3.50 to \$3.55 a roll, depending on production costs. They said Polaroid had not, and would not, recommend a list price.

With the usual mark-ups, however, this probably means that the price to the consumer will range from \$4 up to \$5 for a six-print roll, or as much as 83 cents a print. Conventional color prints, including the 120-size roll (\$1.15 list), development (90 cents) and prints (25 cents or more each), also cost the consumer a total of slightly

more than \$5 a roll—but for a 12-print roll, or roughly 42 cents a print.

Polacolor users, color quality aside, will be paying double for the convenience—and, if you like, the "thrill"—of seeing the print from 60 to 120 seconds after the picture is taken. And, for many, the thrill will be worth it.

PM's Color Tests

Now, for color quality. In its tests, *Popular Mechanics* assigned cameras and film to five photographers—two professionals, an advanced amateur, and two duffers, a pretty good cross-section. Their experiences with the film were remarkably similar.

In general, they found that if you aren't used to using a Polaroid camera, it would be better to practice with a few rolls of less-expensive black-and-white film to learn its intricacies. And, even with the new color film, you will probably waste a few rolls just experimenting with the rating/development variables.

However, while each of them produced their share of poor prints, they all eventually came up with something worthwhile. Luck was fine, but it was more a matter of patience and attention to detail that paid off.

The tests were conducted under all lighting conditions, outdoors in bright sunlight, overcasts and open shade, and indoors by flash bulbs, electronic flash and photofloods. In almost every case, pictures were taken side-by-side with conventional color-print film. The exposures were bracketed over, under and on the recommended ASA ratings, and Polacolor's development times were also varied systematically.

Specifically, these were the findings:

- The variable exposure ratings and development times of Polacolor are confusing at first. If the prints turned out poorly, and many did, it left the photographer wondering whether it was the exposure or the development that was off, and, if he should change something, what? Exposure? Development? Or both? Eventually, they found that a mid-range rating (75 ASA) and minimum development (90 seconds) was the best starting point, followed by varying exposure and development on succeeding prints. A half-stop more exposure (50 ASA) produced deeper color prints, and a half-stop less exposure (100 ASA) produced lighter prints. More development never seemed to make an appreciable difference in the colors, except at colder temperatures. Conversely, at warmer temperatures, maximum development only tended to muddy them up some-

(Please turn to page 206)

THE WAR

By S. David Pursglove



TEN MILES HIGH, a U-2 reconnaissance plane soared, silent and invisible to any human on the Caribbean island beneath it. At lower altitudes, several Neptunes with batteries of complex lenses bristling through belly hatches, criss-crossed the Cuban countryside.

Later, at tree-top height, fast fighter jets zipped across the same landscape at speeds approaching 600 miles per hour, appearing over one horizon and disappearing beyond the other during the blink of a human eyelid—leaving nothing behind but a maelstrom of delayed noise, and, presumably, cursing followers of one Fidel Castro.

These were our photo-reconnaissance planes which, in one master stroke last October, tipped off American authorities to the Communist buildup in Castroland.

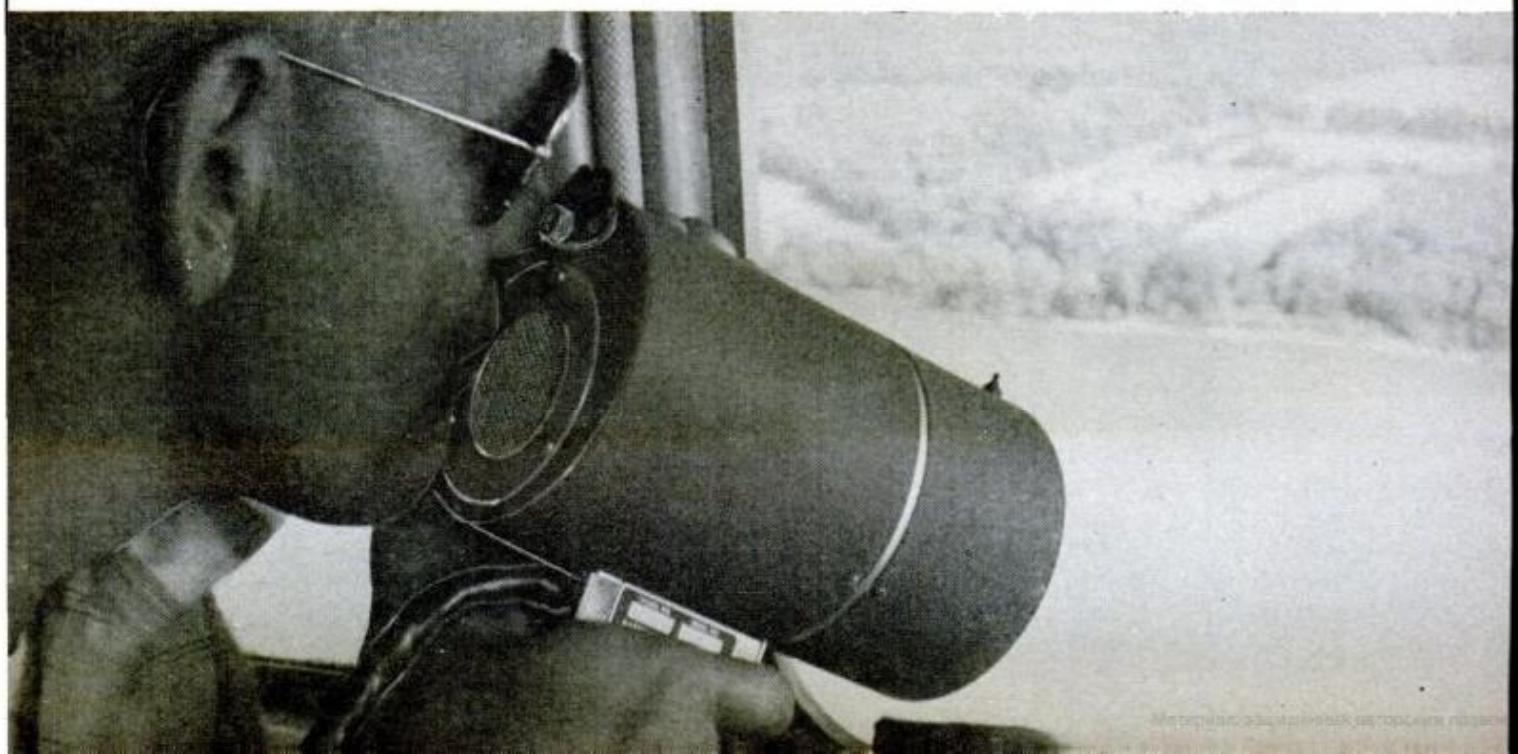
Result: Prevention of thermonuclear war or an abject American retreat—while there was still time to avert it.

There was no denying the evidence revealed by our sharp-eyed cameras. Within days, Red rockets would have been poised *inside* our warning network, leaving our cities and power centers defenseless.

Those whirring cameras gained us precious time to confront Russia with an ultimatum and a sea blockade of Cuba. The Russian retreat in the face of a swift, sure American reaction, many say, prevented war—or American surrender.

Few ordinary citizens have any concept of those cameras. Even experts are awed by the precision of the remarkable tools that exposed Khrushchev's dirty work in Cuba. "Fantastic" is the word intelligence people used to describe their reconnais-

A HEAT-SENSITIVE radiometer spots camouflaged guns, hidden factories or suspicious nighttime movements, which are then photographed with infrared film





sance cameras and photo-interpretation equipment.

One high-speed camera automatically brings together the images from seven different directions to produce a strip photograph covering ground area 100 miles wide and thousands of miles long.

Grass Blades from Six Miles Up

On that strip intelligence officers can spot military posts. They can find the commandant's house. And they can tell whether his lawn is cut with a rotary or a reel-type mower. All from a plane six miles high, flying 1200 miles per hour.

Portable, almost automatic darkrooms have been equipped with polarized light to make wet negatives look like black-and-white positive prints. They make it possible to speed information to Wash-

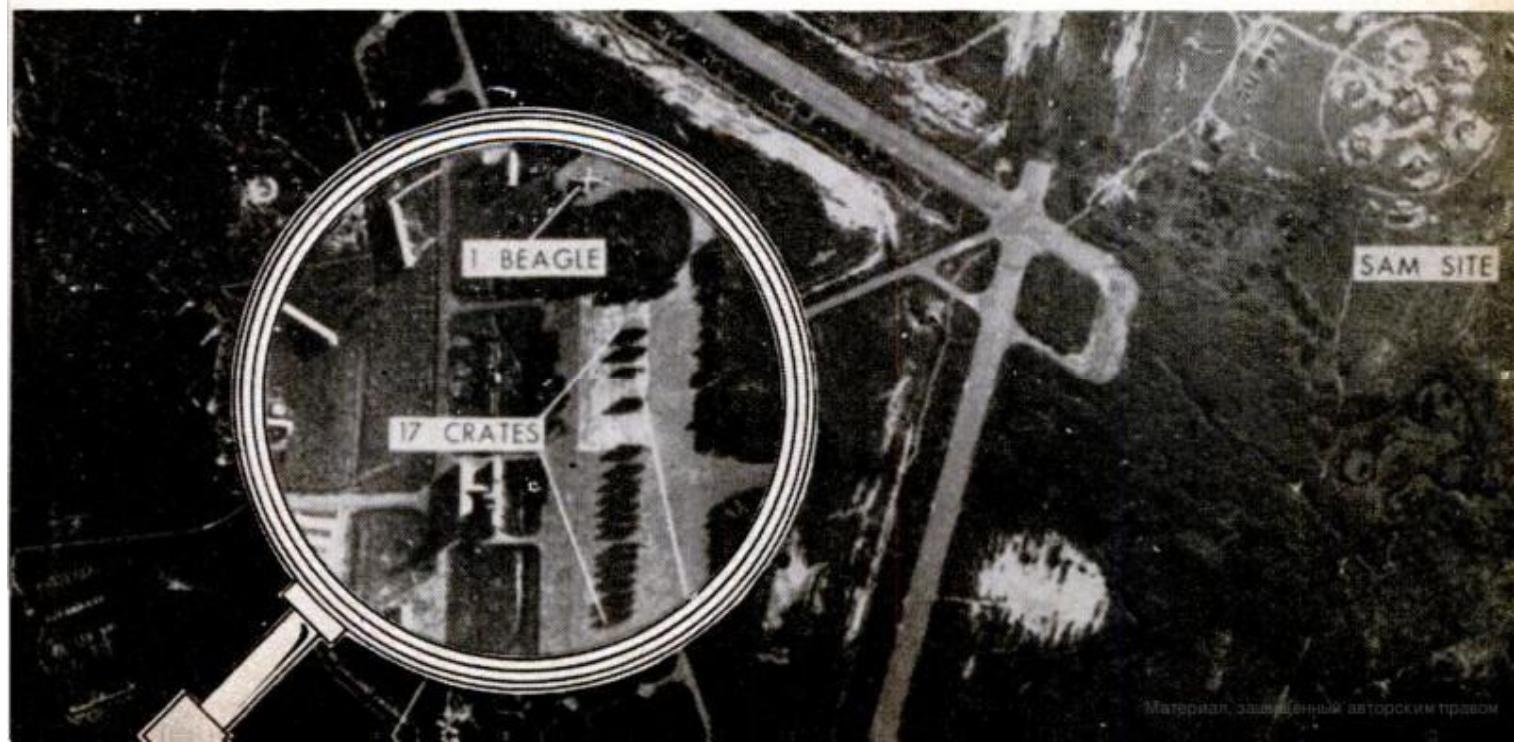
ington within seven minutes after a plane lands.

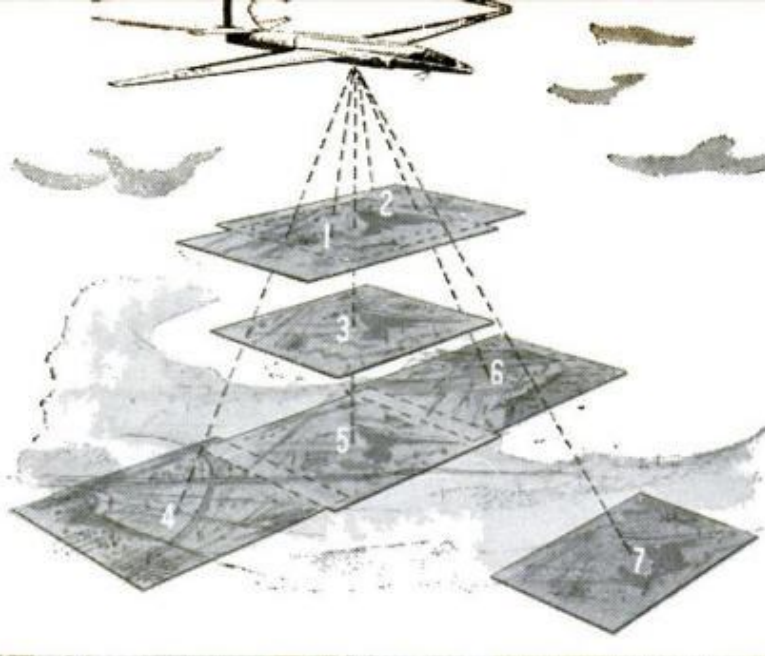
Vast catalogs of film and filter combinations help intelligence officers call their shots to make obscure detail surrender itself to sharp-eyed photo-interpreters.

Automatic machines that measure the length of a photographed runway or the height of a missile on its launching pad reduce hours of calculations to seconds for photo-interpreters who know how high the recon plane was flying and the focal length of the camera that took the picture.

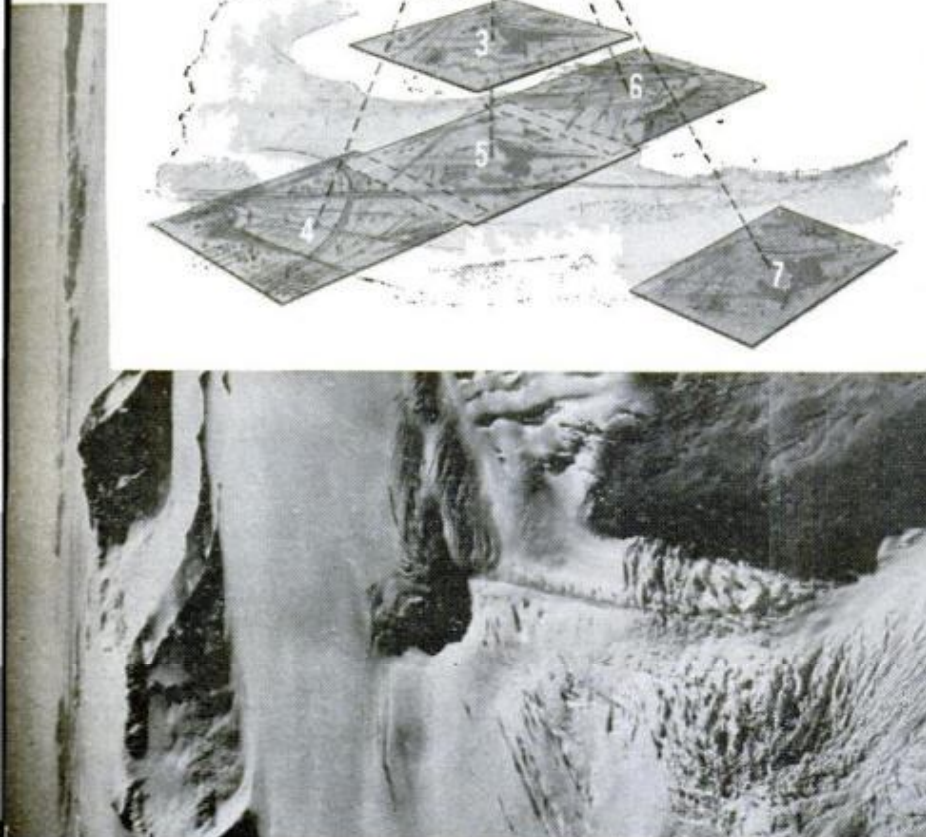
Even more fantastic equipment is under development and soon will join the surveillance designed to prevent future "Cubas" or "Pearl Harbors." Soon, completely electronic photo-reading machines will scan hundreds of photographs per minute and ring bells whenever a new photo

SOVIET BASES in Cuba were identified by enlargements of aerial photographs, which pinpointed their missile launching sites, fuel vehicles and jet bombers





INSET DRAWING illustrates four types of photos used to spot Russian missiles in Cuba: Stereo pairs (1, 2), straight verticals (3), horizon-to-horizon trimetrogons (4, 5, 6) and photo below inset, and forward obliques (7). Some recon planes use seven cameras, others only one



shows something that was not in an older shot of the same scene. Photo-sensors that are partly television sets and partly infrared cameras will make night seem like day for aerial photographers.

Many people already know that one camera will spot a golf ball on a putting green from 40,000 feet—nearly eight miles—in the air. They may not know that this camera is now considered obsolete. Its replacement will read a newspaper headline at more than 20,000 feet. One camera that compensates for apparent ground motion can zip past a newspaper only 60 feet away at 600 miles per hour and make a photo in which the larger type can be read.

This equipment is located at many points in the U.S., the British Isles, Continental Europe, Turkey, Japan, Okinawa and at other bases with communications to Washington.

The dramatic role that photo-reconnaissance played in spotting the missile build-up in Cuba underlined its value as a war preventer. A dangerous situation was revealed before it became critical.

Photo-reconnaissance has also helped us learn how closely our missile arsenal compares with Russia's (pages 110-111.)

Today, photo-interpreters can describe

the kind of weapon produced in a factory without even seeing the weapon. This is not because PIs, as they are called, have developed any magical instincts or have learned to view photographs standing on their heads. It's because they have built interpretation teams of experts in every field which might be useful to them.

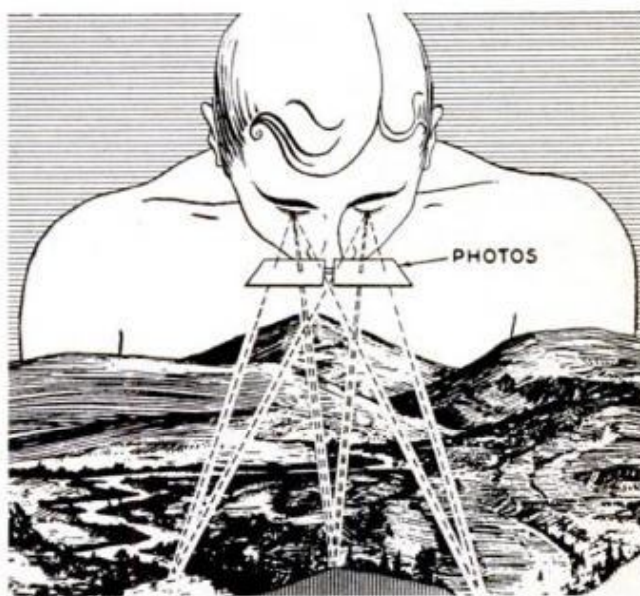
Details by the Numbers

The shape of a factory, whether it is located near a water supply, the kind and number of railroad cars that serve it, the amount of security surrounding it, the frequency and size of deliveries as learned by frequent reconnaissance—all tell a PI "industry expert" what the plant produces. This represents trained and experienced thinking processes, not a magical way of gazing at pictures.

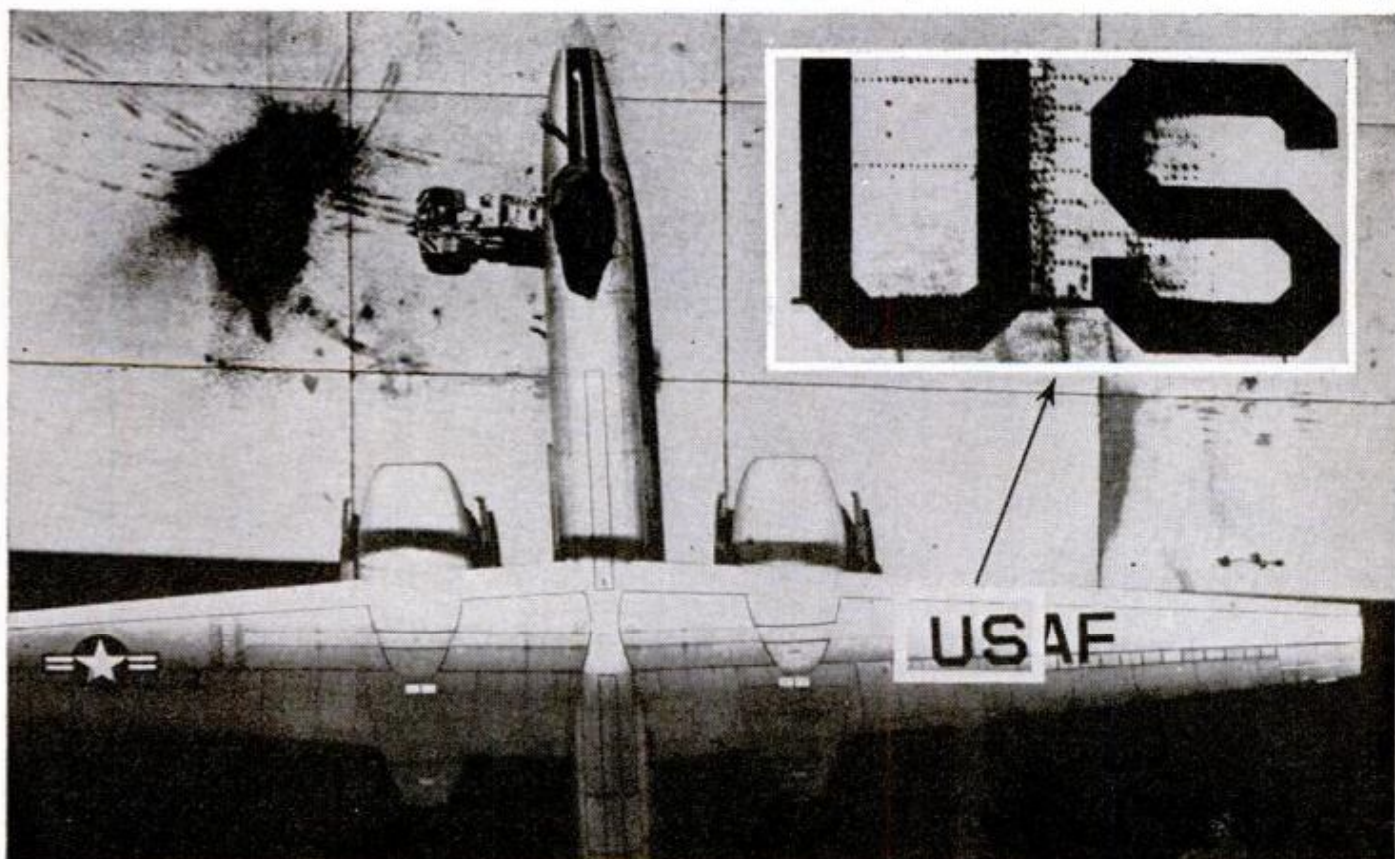
The particular technique that PIs use to view aerial photographs is older than flying itself. It dates to 1838 when Sir Charles Wheatstone invented the forerunner of the familiar stereoscope.

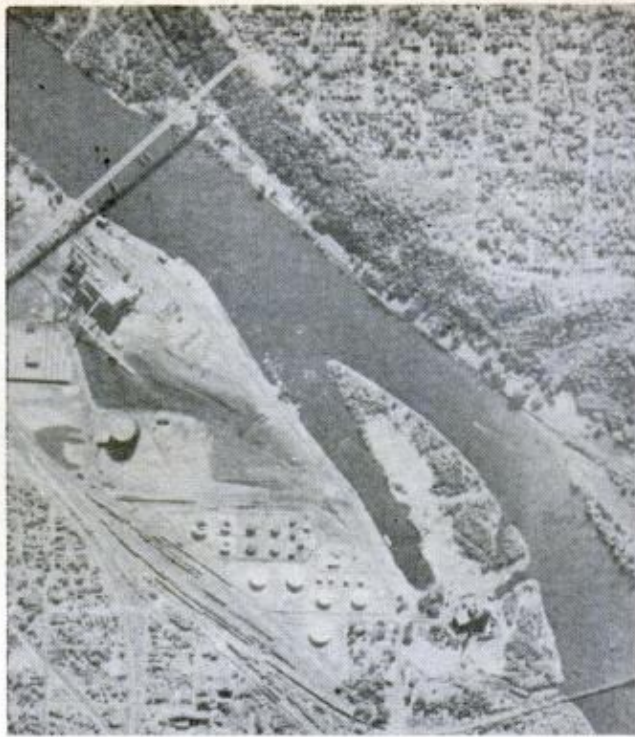
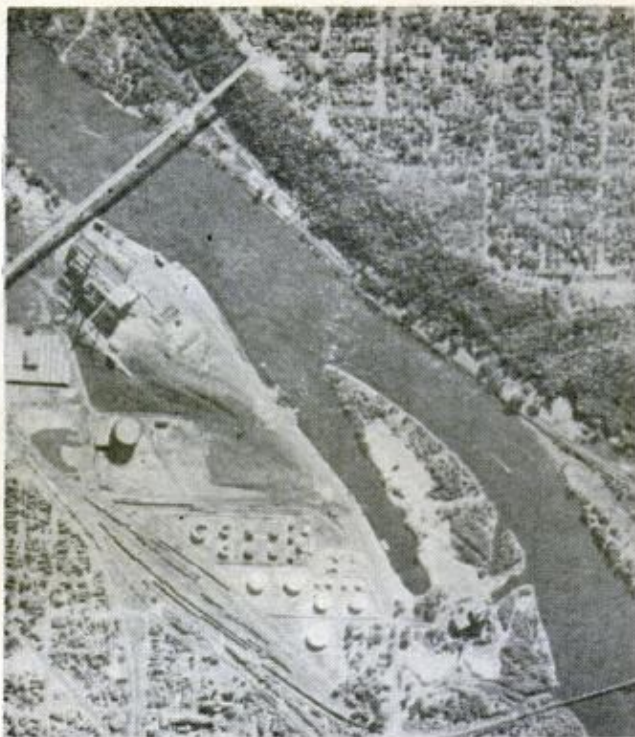
Actual landscapes seem to show more detail than do photographs because the actual scene has depth. People see all three dimensions of a hill, gully, tree or weapon because they view the object from

VIEWED THROUGH a stereoscope, pairs of photos of the same scene taken a mile or so apart bring out three dimensional objects in sharp relief. This is the equivalent of viewing the same scene through a giant's eyes—the camera lengthening the distance between normal human eyes. The same photo, in two-dimensional newsprint, looks flat and uninteresting



SPECIAL IMAGE-MOTION cameras automatically compensate for the apparent rapid movement of objects on the ground beneath low-flying planes. Enlargement of photo (inset) of grounded plane taken at 60 feet by a recon going more than 500 miles per hour clearly shows individual rivets in the fuselage



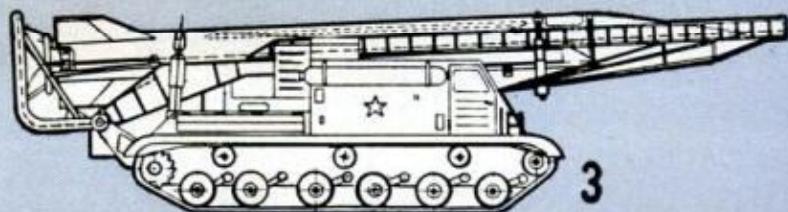
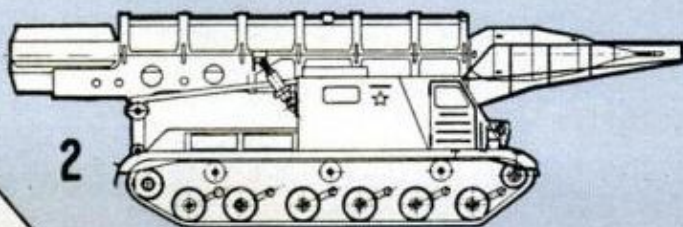
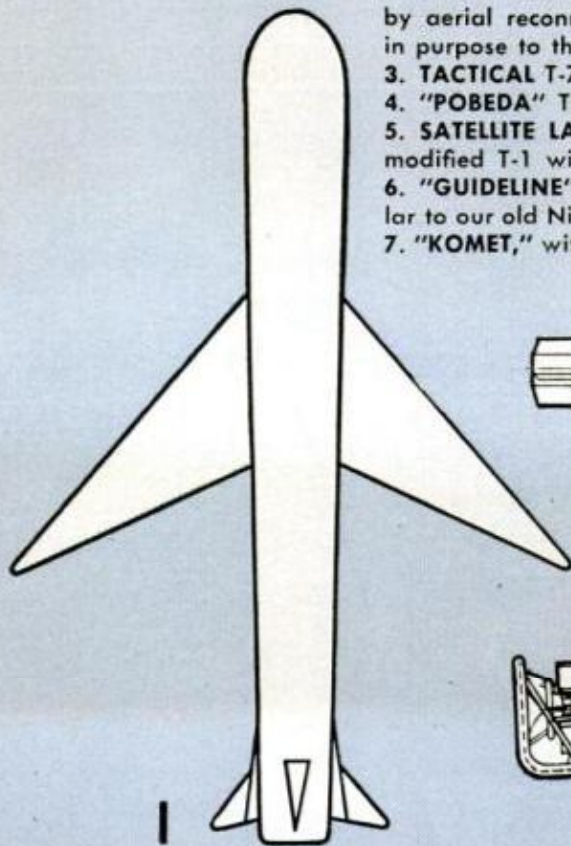


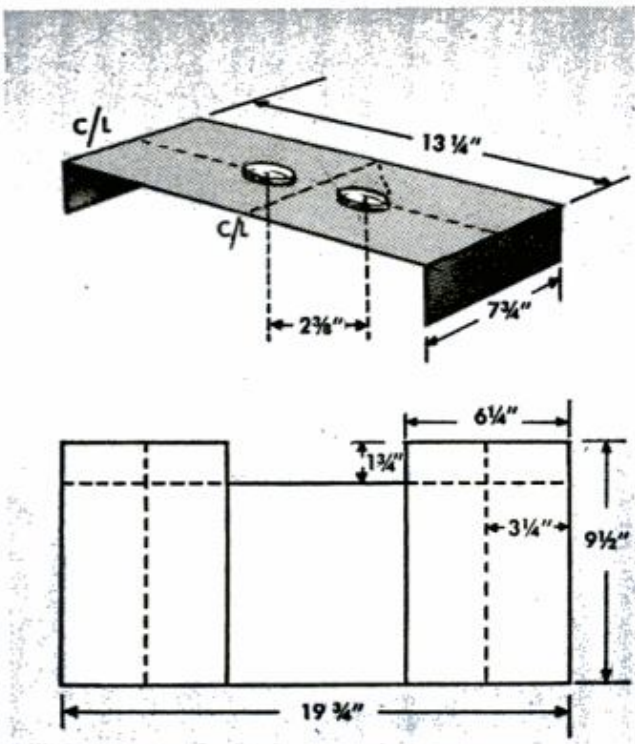
STEREO PAIR, shot a few seconds apart from a slow plane, make a dramatic three-dimensional picture when viewed under a stereoscope. Using the home made viewer shown at right, you can clip out these two photos and maneuver them beneath the lenses until they merge into a three-dimensional view.

NEW RUSSIAN MISSILES IN CUBA

SOVIET MISSILES firmly identified by our sharp-lens reconnaissance cameras as they were flown over Cuban military bases, are shown below and at the right.

1. IRBM "FITTER," with 2,200-mile range, is a drone type converted fighter similar to the obsolete U.S. Mace or Matador. Seen being carried beneath a bomber at the Tushino air show last year, it is old and not very accurate.
2. "FROG"-1, a tactical range solid propellant rocket missile and its modified Stalin tank carrier was one of several in the "Frog" series spotted in Cuba by aerial reconnaissance. These are surface-to-surface field weapons similar in purpose to the U.S. Corporal and Sergeant, though reportedly not as good.
3. TACTICAL T-7A was among the first "defensive" missiles reported in Cuba.
4. "POBEDA" T-1, good for 600 miles, is one of two types of IRBM spotted.
5. SATELLITE LAUNCHING R-10, a jazzed-up V-2, is the basis of a Russian-modified T-1 with a range of 1,100 miles that was also seen in Castroland.
6. "GUIDELINE" T-8, surface-to-air missile that got Gary Powers' U-2, is similar to our old Nike-Ajax but uses solid propellant. Many were counted in Cuba.
7. "KOMET," with solid booster and liquid sustainer, was seen on Komar boats.





STEREOSCOPE is easily made from corrugated cardboard, cut and folded as shown. A pair of magnifying glasses over eye holes serve as lenses. Adjust lenses above photos to conform to their focal length

a pair of eyes a little over two inches apart.

If a man could place his eyes in two reconnaissance planes and look at a scene from two points a mile or so apart simultaneously, he would see in much greater depth. Short fence posts that normally pass unnoticed would tower skyward. Shallow trenches would look like deep gashes.

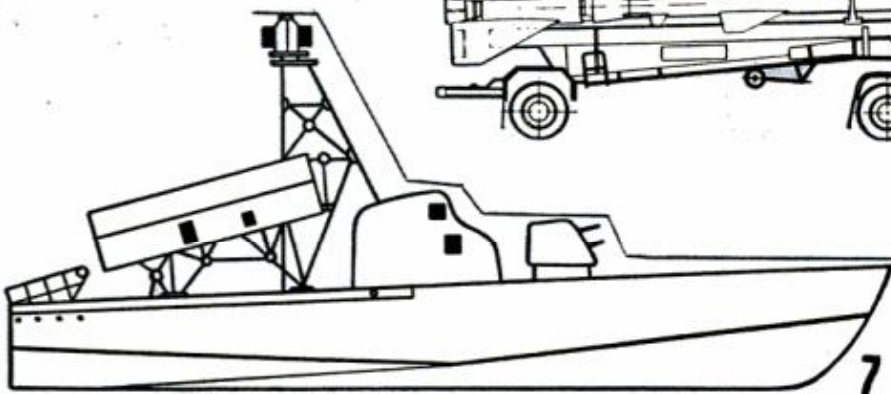
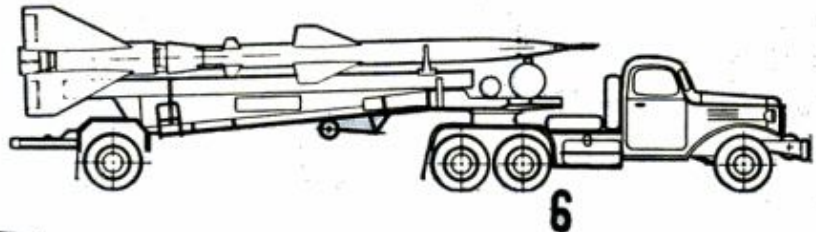
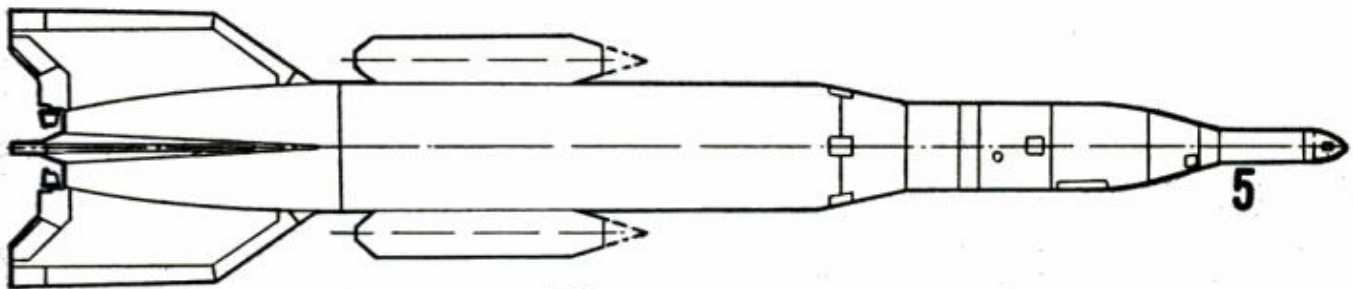
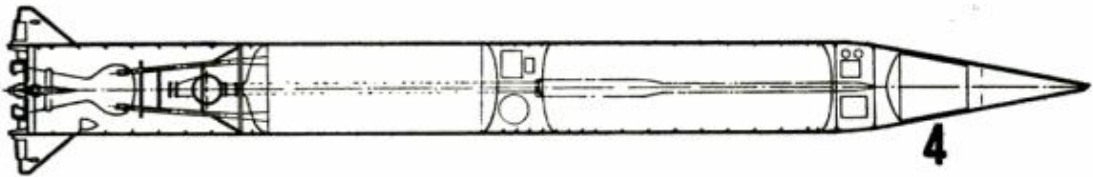
This is what a photo-reconnaissance plane does for an intelligence officer. It carries his eyes—cameras—above a scene and photographs it, then moves perhaps a mile away, and photographs the same scene.

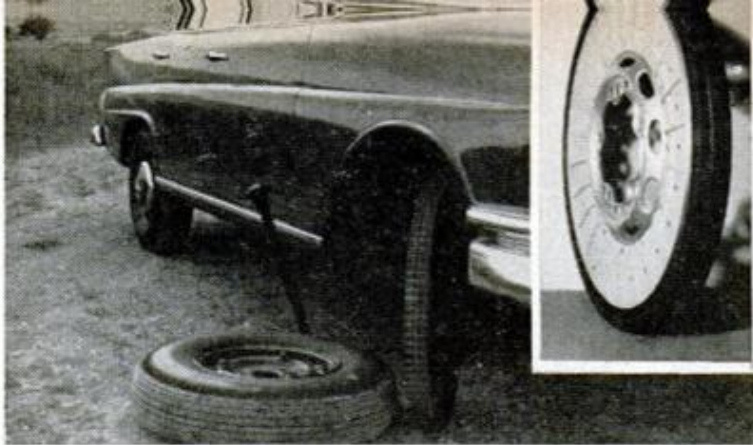
The photo-interpreter can't see depth in these two photos lying in front of him until he puts himself "several miles high" by holding two simple lenses—a stereoscope—between his eyes and the photos.

The lenses stretch the few inches between the interpreter's eyes and the photographs to several miles. When the eyes focus at a distance, the two pictures fuse into one three-dimensional scene.

It is a highly exaggerated scene. The Defense Department photos of Cuban mis-

(Please turn to page 244)

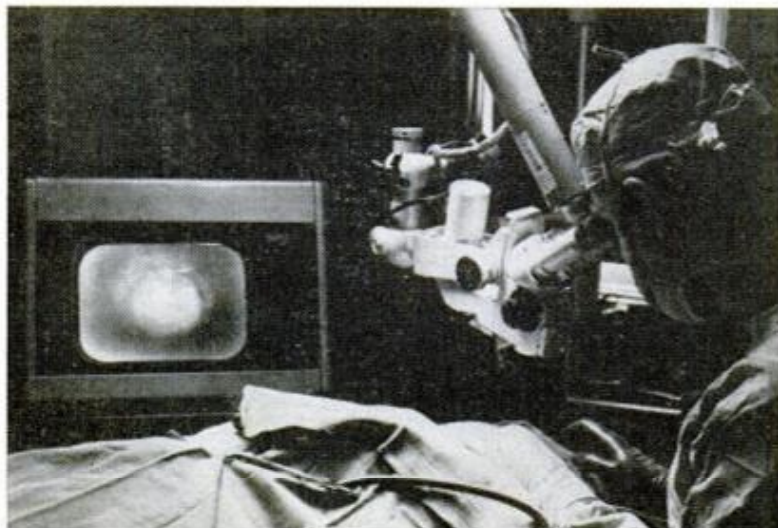




Airless Spare

Thin and lightweight for easy storage in a car, a new spare wheel is a rubber disk between two metal disks. Though intended only for emergency use, its life is estimated at 4000 miles. The wheel has been driven 110 m.p.h.

The spare is called the Schmid wheel after the designer, L. F. Schmid, Porsche's former technical-design chief.



TV Teacher

Microsurgical techniques—used in such operations as middle ear stapedectomies—can now be taught to student surgeons via closed-circuit television.

A 10-inch, 2½-pound TV camera, mounted on an operation microscope, projects a greatly enlarged picture of the delicate operation on a screen. The surgeon-instructor describes the procedure over the sound system to classes of up to 30 students. Formerly, only two students could be taught at a time. The TV unit was developed by DuMont Laboratories.

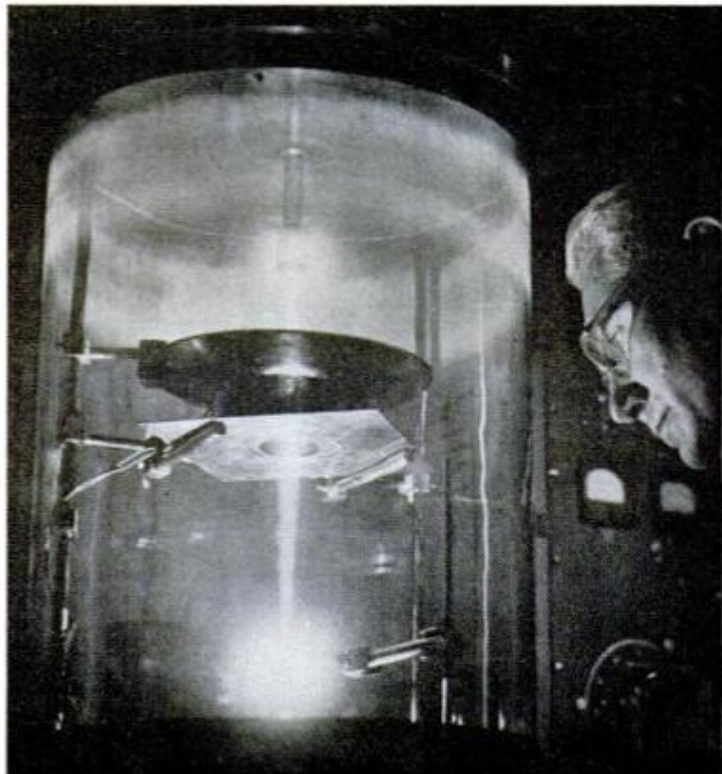
Bridge Goes Up Down Under

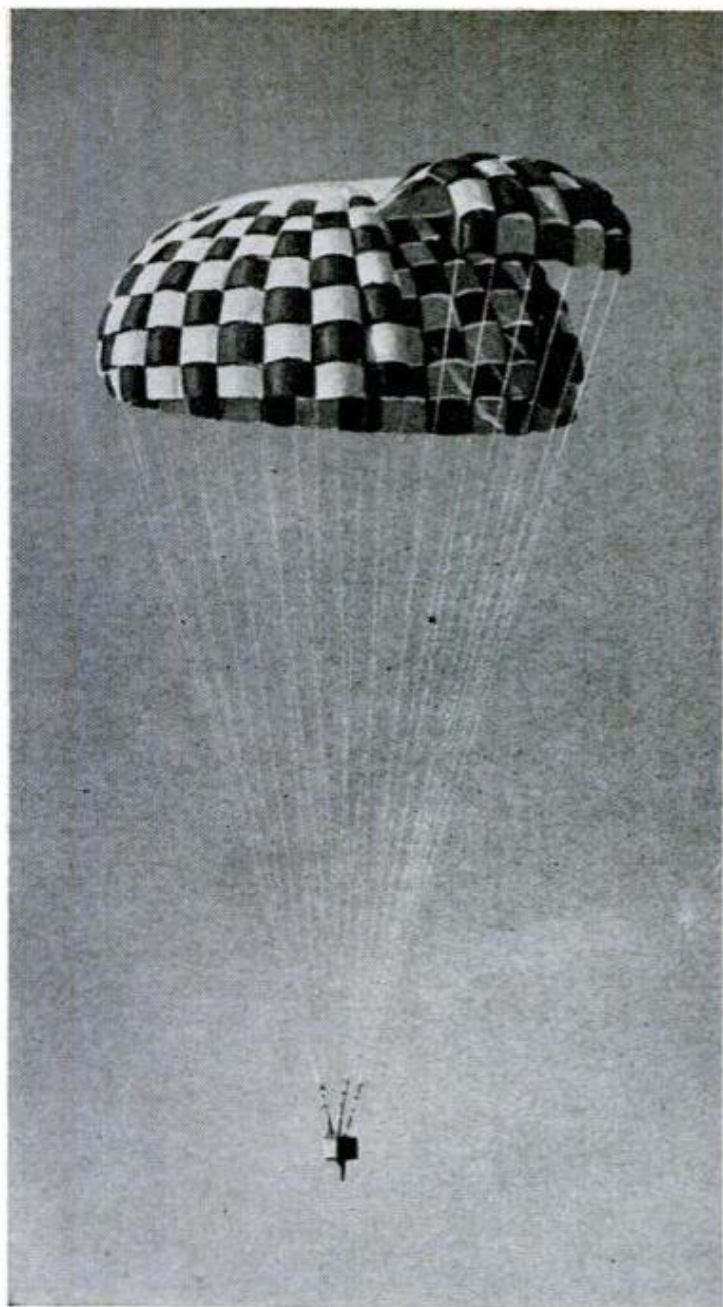
Hollow concrete blocks form the arches of a bridge being constructed across the Parramatta River in Sydney, Australia. The 50-ton blocks are joined over a steel falsework, then sealed with concrete grouting when the steel is removed. Four arches will support the 1000-foot span.



Cooler Electron Gun

A "cold cathode" electron gun that operates in a partial vacuum and at lower temperatures (100 to 1000 degrees C.) than conventional electron guns, can weld dissimilar materials and cut tungsten. The General Electric unit can melt such metals as quartz, titanium and molybdenum.





Steerable Parachute

With a flap resembling an awning on one side, a huge parachute can be controlled for direction and angle of descent.

Developed by Northrop Corp. for possible use in the return to earth of the Apollo moon vehicle, the chute has a control line to the flap. With the flap retracted, the chute drops straight down. With it open, the chute glides at an angle.

Cat on the Tiber

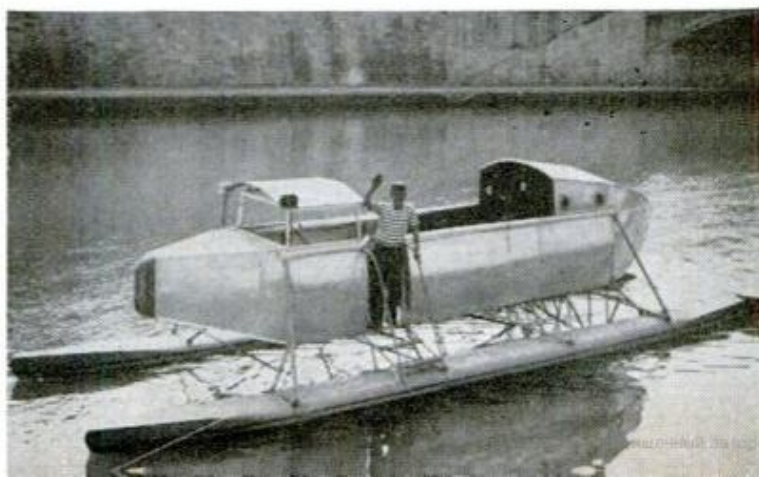
One man's answer to the traffic congestion in Rome is a catamaran called the "Idrobus," which shuttles tourists up and down the Tiber River through the center of the city. Designed and built by Antonio D'Abba, the unique pontoon craft is constructed of aluminum and is powered by an in-board diesel engine.

FEBRUARY 1963



Hot-Lunch Program

Warm lunch or hot coffee is always on hand with three portable kits. Top to bottom: a four-cup electric coffee percolator, priced at \$19.95 from Anchor Shop, 1263 Westwood Blvd., Los Angeles 24, Calif.; an electric lunch box, \$16.95, Electrolunch Co., Algonac, Mich.; and a propane gas-heated box, \$19.95, Bird Engineering, 206 S. 19th, Omaha, Nebr.



3-DIMENSIONS ON THE DOUBLE

By Dr. Lawrence W. Luce

Director of Industrial Drawing, San Diego State College

RECENTLY I watched a draftsman draw a true three-point-perspective picture of a cube with a cylinder running through it in less than 10 minutes. Such a drawing ordinarily calls for hours of tedious labor, as any draftsman will tell you, but this man was demonstrating a new pictorial system that could revolutionize the art of technical illustration.

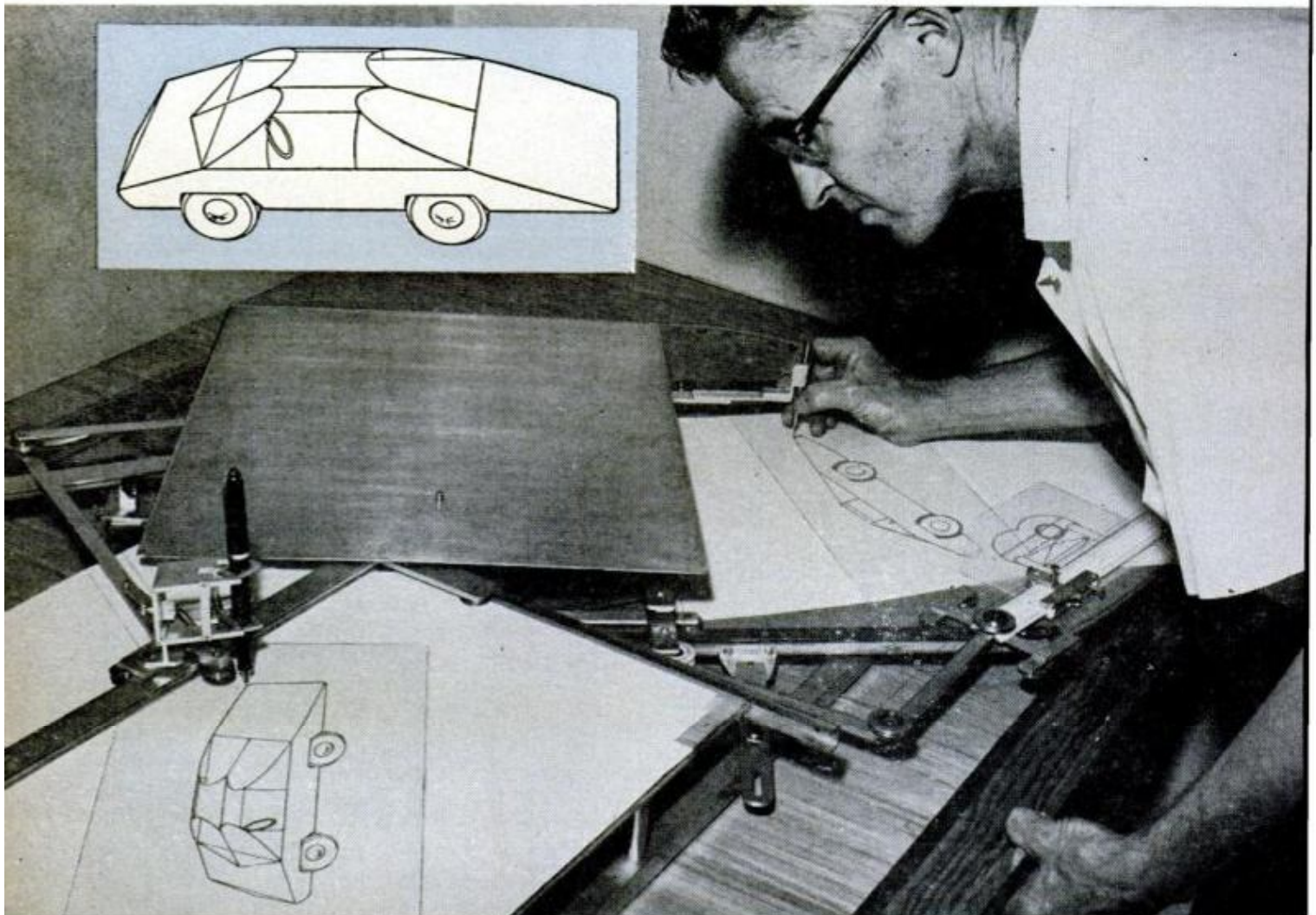
Invented by Kermit A. Bowen, a San Diego engineer, the new drafting system makes it possible to create accurate three-dimensional drawings from ordinary shop blueprints in an astonishingly short time.

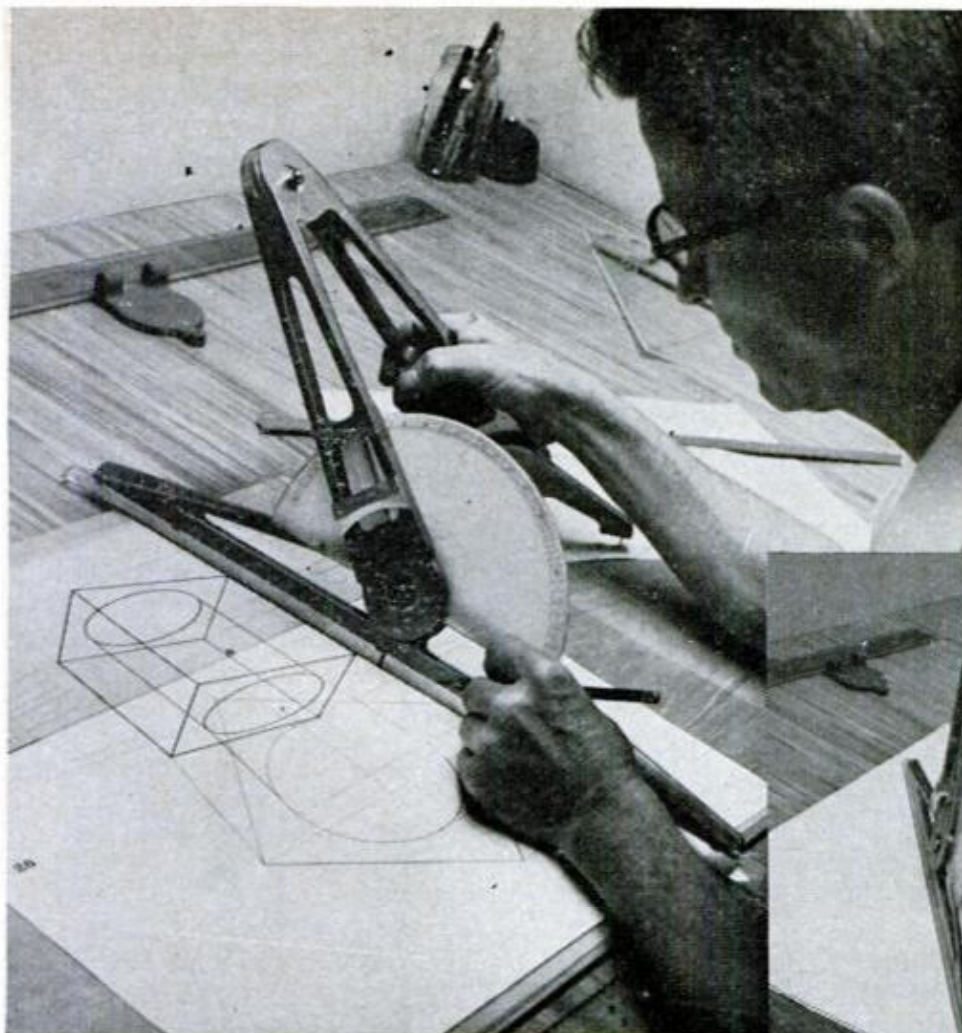
The Bowen system substitutes me-

chanics for mathematics and utilizes two new drafting instruments—a novel ellipsing compass and a perspective drafting machine. The angle of projection of an axis or plane, as well as lineal foreshortening and diametric reduction, are all determined without calculation. And it holds a “fix” on any vanishing point to infinity.

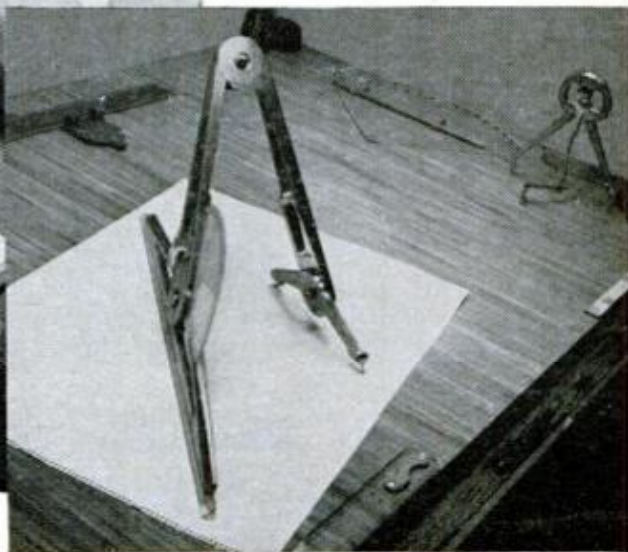
An ordinary drafting compass, basically unchanged for centuries, is simply a scribe that travels around a fixed central shaft. Bowen's new ellipsing compass, on the other hand, consists of a revolving shaft that is located between two anchored outside legs. An adjustable eccentric at the head of the shaft governs the

BY TRACING over the two-dimensional drawings with the master stylus of APT, Bowen automatically creates the three-dimensional drawing shown in inset





TWO HAND INSTRUMENTS, below, are now available. Three-point perspective drawing of accelerometer instrument, bottom, was completed in 3½ hrs. with the aid of Bowen's automatic perspective translator which will be on the market in about one year. Inking and shading of the drawing took additional time



USING HIS PDM, Bowen makes a perspective drawing of a cube with a cylinder running through it from a simple drawing of a square containing a circle

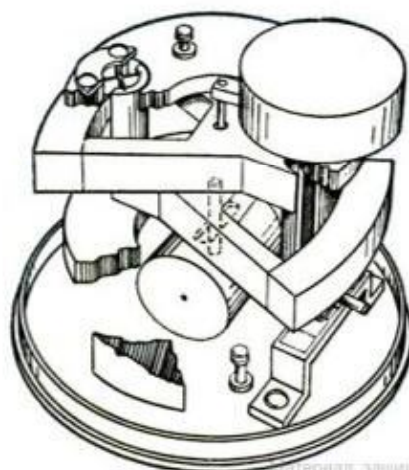
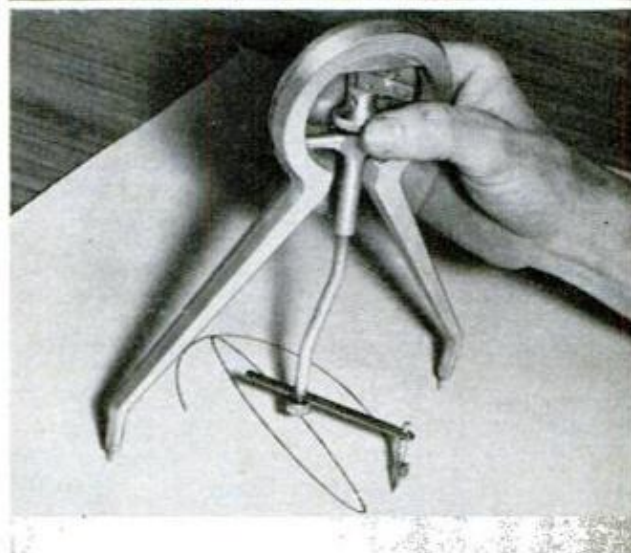
length of the major axis, and an adjustable radius that holds the scribe at the bottom of the shaft governs the minor axis.

To use this new compass, the operator merely sets the major and minor axes adjustments, places the legs in position and rotates the shaft. The ellipses thus produced are geometrically true.

The perspective drafting machine, called the PDM, looks something like two T-squares that are hinged together, with the crossbar of each T hinged to its leg. It completely eliminates the need for a draftsman to establish or even think about the location or distances to vanishing points. Once the arms are tilted to the desired setting, the PDM automatically computes and corrects itself to keep its straightedge aligned to the selected vanishing point.

Both of these hand instruments are available now, and Bowen is already working on the production model of a third and even more revolutionary drafting machine. This one will enable an op-

(Please turn to page 238)





Pick-Up Pedal Car for Adults

Not all kiddie cars are for the nursery set! A pedal car with two sets of gears for negotiating all kinds of road surfaces, even steep slopes, has been patented in France—for adult use. Made mostly of plastic, the car is light, easy to drive, and is said to be ideal for the elderly.

The car's average speed is 25 miles per hour. It is five feet long, 28 inches wide and weighs 58 pounds. Its inventor, left, who lives in Paris, uses the pedal car to commute to his job, a distance of 30 miles. Once there, he picks it up like a lady hiking her skirt, and totes it upstairs.

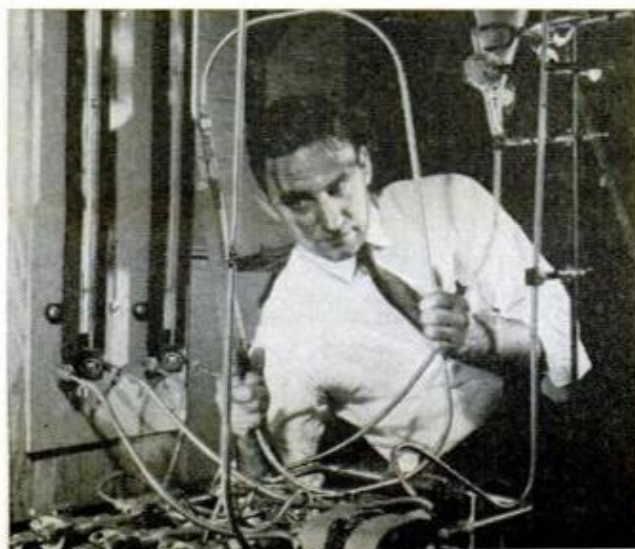
Called the Oto-Pedal, the car works much like a bicycle, with pedals attached to a chain drive. Its double gear box makes it possible, according to the inventor, for elderly people to drive it without discomfort or fatigue. It has drum brakes on the back wheels and lights for nighttime driving. Now in production in France, it costs about \$90. The inventor is Fernando Ruiz Luciarte, No. 10, Rue Antoine Boudelle, Paris 15E.



The Faithful Jeep Goes Stylish with the Wagoneer

An automatic transmission is paired with four-wheel drive for the first time in the Wagoneer, new Willys' Jeep station wagon series. The new model also is avail-

able with standard two-wheel drive and in both two- and four-door, six-passenger body styles. The torque converter transmission is offered for every model.



Stabilizing Space Vehicles

A "liquid-metal flywheel" stabilizer, designed to keep spaceships on an even keel without using expendable fuel, can correct attitude changes by circulating mercury around a closed loop of stainless steel. Such flywheels can automatically exert torque to correct pitch, roll or yaw changes in attitude—60 times faster than conventional flywheels.

Now being developed by General Electric, the system uses an electro-magnetic pump with no moving parts. Any satellite can use it for attitude control.

POPULAR MECHANICS

Материал, защищенный авторским правом



COON FEVER..

Our Favorite Epidemic

By Stuart James

IN A SMALL CALIFORNIA CITY the magistrate's court was closed for three days last year. The local newspaper reported that the judge was "indisposed," but everyone knew that the judge had bought a new Bluetick hound, and court would have to wait until he got tired of running coons.

In Council Bluffs, Iowa, a wife sued for divorce and cited four coonhounds for alienation of affection. The newspapers had a field day when the husband was reported as saying: "Judge, that woman never understood how it is. When those





BACKED INTO A CORNER, a raccoon rears up to fight. Water is the coon's best element, and the dogs are careful about closing in. Though his chances are slim against such odds, an embattled raccoon will fight like a wolverine

hounds fidget, I fidget; and when old Red cuts loose, I just gotta go."

In El Rito, N.M., a young rancher was hospitalized with multiple fractures. He was following his hounds across rough country in a jeep. They were bearing down on a big boar coon. The coon dived into an arroyo and the excited rancher was airborne before he realized his mistake.

This is coon fever, an incurable disease common to every part of the country where there is room for a hound to run and a tree for a coon to climb. The "madness" infects young, old, rich and poor.

Hunting raccoons is a truly native American sport, and it vies with fishing in the fanatic devotion of its participants. The bawl and chop of a cold-trailing hound will send a genuine "hound-dawg man" into a state of near frenzy. The high-singing sound of "treed" has been known to transform mild-mannered professors into hooting demoniacs.

As American As Baseball

Inaugurated in the South prior to the Civil War, "cooning" is the American equivalent of the English fox hunt—sans horses and scaled down to suit the down-to-earth tastes of Grassroots, U.S.A. No raccoon hunter would be caught dead in a scarlet coat, breeches and boots, but he does have a uniform. A fully equipped

"cooner" will spend \$200 on his gear: brush coat, waterproof pants, cap with "hear vents," compass, skinning knife, carbide headlight, waterproof boots, hunting horn, coon squaller, luminescent dog collar and .22 rifle with flashlight bracket.

To understand the lure of coon hunting, you must first accept as fact that a hound dog is the most beautiful and intelligent thing on earth. This isn't easy when you find yourself confronted with a sad-eyed, flop-eared, slat-sided "potlicker," but he is a major factor in motivating the coon hunter who thinks hounds, lives them, talks them.

In a history of the South during Reconstruction, there is an interview with an old slave who refused to leave his plantation. As the reason he said: "Me and the master owned shares in four hounds. I couldn't see splitting them up, and I just couldn't leave them."

The actual mechanics of coon hunting is simple. Several men take their dogs into the woods. The dogs find the trail of a raccoon and run it until it climbs a tree. The hunters come along and get the creature out of the tree. It hardly seems worth the effort. A coon skin is practically worthless. Although coons are good to eat, most people do not eat them. The real sport is in the chase, the thrill of pitting a well-trained hound—bred for the instinct



COON ON A LOG and a waterlogged dog add up to a popular sport. A wild coon is placed on the log in the water and hound must attempt to get him off



END OF CHASE, and the coon is in a tree. The hunters use a special nonglare light to reflect the animal's eyes, and then the young nimrod uses his .22 rifle



GALLOPING COON is one of the stars of the hound-dog field trials. The coon is run over a prescribed course, and the dogs follow in a test of their speed



SAFE IN A TREE, a trained coon peers down at the hounds that have completed a field trial heat. Dogs are judged for speed and ability to tree the coon



NEW TRAINING DEVICE is an electric collar operated by remote control. Developed by Bill Boatman Co., Bainbridge, Ohio, it mildly shocks errant dog



TRADITION calls for the use of a steer horn in the calling of the hounds, and when "coon fever" hits, the hills resound to the baying of the horns

to hunt—against one of the wiliest of game animals.

Ringtailed Ghost

There are thousands of stories citing the cleverness of raccoons, and typical is one from West Virginia about the "ringtailed ghost."

This old coon could not be caught, and hunters came great distances to try for him. He was big and fast and seemed to enjoy baiting the hounds and then giving them a merry chase. At the end he always ran the same trail to a wide stream, and at water's edge he disappeared. His trick was discovered when hunters finally stationed themselves at the stream and waited. They could hear the hounds on the trail, moving fast and bawling at the top of their lungs.

Suddenly they heard the coon coming hell-bent-for-election. As he broke into the open and made for the stream, he suddenly took a long, high leap and swung Tarzan-style on some vines hanging out over the water. The dogs arrived and, as usual, were thoroughly confused. The mystery solved, the hunters shook the coon into the water, and the dogs went in after him. The coon then proceeded to whip all three dogs and get away.

To offset the coon's brainy advantage, the trick is to breed and train dogs to match him. The origin of the coonhound is lost in antiquity, though it is generally agreed they are largely descended from the English foxhound. There are some who say this dog was crossed with the French

(Please turn to page 232)

SINGING "HOT TRAIL," pack of hounds races in pursuit of wily coon, a madcap dash that may go all night





Life-Saving Teacher Is a Real Doll

Mouth-to-mouth resuscitation and other life-reviving techniques can be realistically taught with lifelike Norwegian-made dummies. They may also be used in water rescue demonstrations. Called Resusci-Anne (or, as males, Resusci-Andy), they are packaged in individual kits.

The lifesize doll has a lung capacity and resistance to air similar to that of an unconscious person. The movable head weighs and feels the same as a human head. Accessories include sanitary masks for group instruction. Sells for \$163.25 from Medical Supply Co., Rockford, Ill.

"Bat Radar" for the Blind

A guiding instrument for the blind, based on the same radar principle that guides a bat in flight, has proven successful in simple field trials. Still under development, it sends out supersonic signals which bounce off objects in a person's path and reflect warnings via electronic "ears."

Lockheed Missile & Space Co. scientists say the instrument's components will be miniaturized for easier handling once a marketable model is perfected.

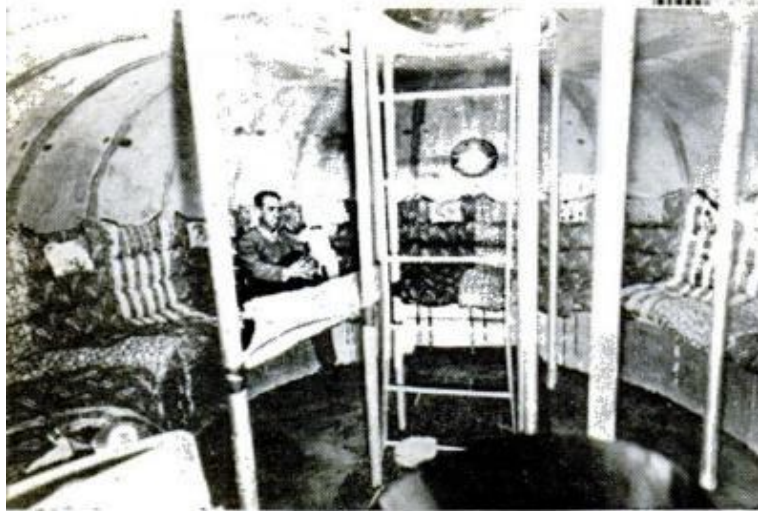
Bobbies Bring Back Shield

Like knights of English history, British bobbies are now being equipped with protective shields to help them ward off attacks by criminals.

Since Scotland Yard shuns the use of guns, the bobby has always been faced with the sticky task of disarming an assailant with his bare hands.

Padded with rubberized horsehair, the durable lightweight shield has been extensively tested and has proven to be knife-proof and bullet repellent.





Sea-Going Circle

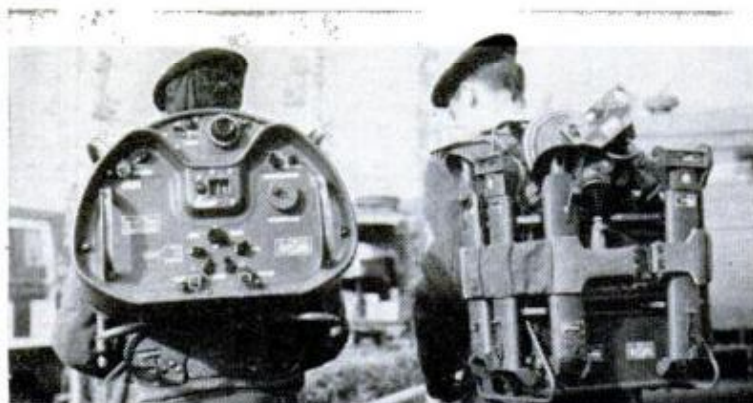
Ships can carry an unsinkable lifeboat with first-class comforts. A hollow rubber sphere with accommodations for 35 persons, the odd craft, designed by Danish inventor Anton Sorenson, bobs to surface if ship sinks.

Back-Pack Radar

Two foot soldiers can carry a portable radar unit that is capable of detecting moving vehicles more than three miles away.

Used by the French army, the unit comes in two parts and is put into operation in the field. Called *Rasura*, it covers the field in all directions.

The unit was unveiled during recent maneuvers in France.



Detects Nuclear Debris

Resembling an anti-aircraft gun, this four-barrel instrument is actually a light measuring device developed to aid in the study of nuclear debris from high-altitude explosions.

When different filters are placed over the four barrels, it is capable of observing four spectral regions simultaneously.

Much of the detail on the operation of the instrument, a "rapid-response photometer," is still classified, but by the selection of various filters, either alone or in combination, the operator can select for study various wave lengths through each barrel.

Dr. Edward Manring, manager of the physics department of the Geophysics Corporation of America which developed the photometer, is shown operating it.



Jeep Derby...

CRISIS ON WHEELS

By Thomas E. Stimson



Imagine racing with a broken crankshaft, or grabbing your copilot to keep him from pitching over the hood. That's routine in this wild test of guts and skill

"SURE I WEAR a safety belt. But my codriver can't. He's climbing all over the Jeep during a race, putting his weight where it does the most good."

Bob Wood, champion Jeep driver, says that his codriver John Sayer is one of the big reasons why the team wins. "I can take a hard right turn 10 miles an hour faster with John hanging out the right side of the vehicle. He holds on to hand and toe holds that are welded to the body.

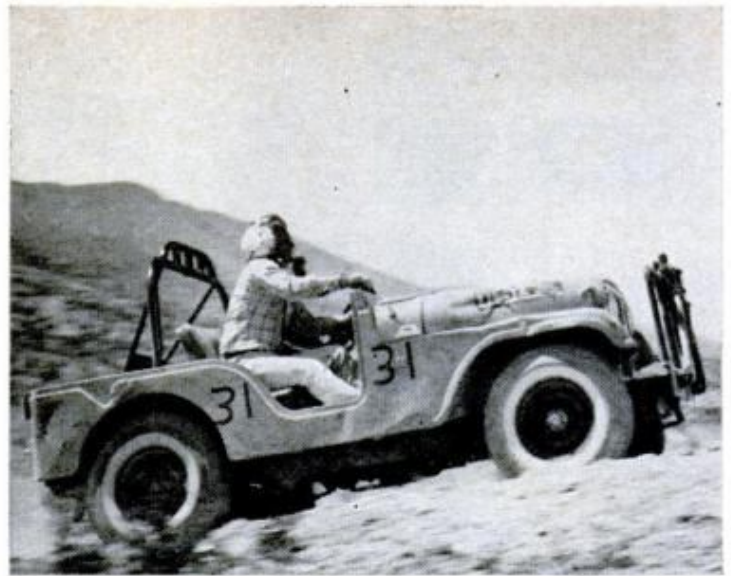
"On a steep downhill he climbs back of the rollbar to help keep the Jeep from going around sideways. At the top of a steep climb he stands up to see which way to turn and shouts the directions to me.

"I almost lost him at Truth or Consequences. We were wide open in low gear, and John stood up at the same moment I took my foot off the throttle. He pitched straight ahead over the hood, and I grabbed his pants just as he started over the radiator."

A Jeep rodeo is the world's toughest automotive sport, and the idea is to try to make the fastest time over a course that is something worse than a roller coaster designed by a madman. The full rodeo is three races, one per day, over the same course. The best total time for the three heats determines the winner. Contestants start five minutes apart. "If you don't pass the car in front of you by the halfway mark, you



FOUR WHEELS fly as two-man team negotiates the "world's toughest race course" during last year's seventh annual Jeep Derby at Truth or Consequences, N.M. Each jeep covered 18-mile course three times



DERBY WINNERS were Bob Wood of Roswell, N.M., and his copilot, John N. Sayer also of Roswell, shown here topping out on one of treacherous hills. They made three heats in 2 hours, 14 minutes

aren't going to win that heat," Wood says.

A lot of Jeep clubs hold competitions, but the best (or the worst) of the rodeos are held in the West, in badlands that any sensible driver would go out of his way to avoid.

The rodeos at Las Cruces, N.M., and the one at Denver, Colo., are rough on contestants and equipment and are possibly surpassed only by the International Championship Jeep Derby at Truth or Consequences, N.M. (A visitor at any of these towns had better be fast on the draw if he doesn't agree that the local rodeo outshines the others.)

The T-or-C course has been called the world's worst race track and that's what it's intended to be. D. L. Scott and Johnny Guthrie of the local Jeep club mapped it as a "test of man and machine" and they swear it's entirely safe. However, one thing is sure: Even at slow speed it's an automotive nightmare.

Scotty and Johnny used a bulldozer to lay out the 15-mile torture run in the hills back of town and the purpose of the bulldozer was to outline the track, not to smooth it. The men steered the machine from one obstacle to the next instead of around them.

Fortunately the rules for this bizarre race say that "Help will be allowed by anyone." This means that when a Jeep overturns, as half a dozen of them are apt to do during a race, spectators can help put it back on its wheels.

The T-or-C course is revised each year so that it's never the same, and contestants are allowed no practice on it until 48 hours ahead of time. During competition, observers are stationed at five check

points to keep track of the Jeeps. They report any wrecks or infractions of rules by radio.

Part of the course is in an eroded canyon in full view of spectators who park along the canyon's rim. From the pit area, on the far rim, the track drops almost straight down the canyon wall, then edges across a side hill that is so steep that the sure-footed Jeeps seem about to roll over on their sides. There's heavy sand in the canyon bottom that pulls down the speed in spite of four-wheel-drive, then the track climbs a ridge so narrow the wheels straddle its edges. There's a rock ledge that can't be climbed head-on and has to be taken at an angle. There are drop-offs where the driver can't see where he's going and has to rely on directions from the standing co-driver.

A team can't relax even when a level straight-away is encountered: There's a diagonal ditch at midpoint that bucks the Jeep into the air and throws it to one side at the same time.

Leaving the canyon badlands, the track twists through the sagebrush to the foot of a 7000-foot peak (2700 feet higher than the rest of the course) and climbs to its top, then plunges back down the mountainside. Part of this descent is at an angle of 60 degrees and, to the driver, it's almost like a free fall. He's in low gear and in low range and using the brakes. The codriver, meanwhile, hangs onto the rear to help prevent the vehicle from slewing sideways and crashing to the bottom out of control.

Bob Wood's hopped-up Jeep can do [\(Please turn to page 230\)](#)

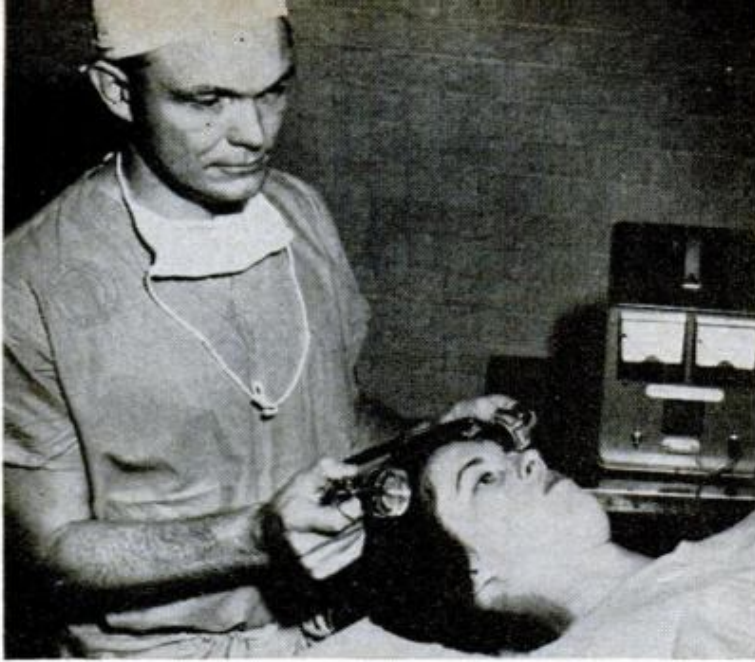
LEFT TURN lifts left front wheel off ground and sends copilot to driver's side of Jeep to keep it balanced. Small portion of rugged, rocky, twisting Truth or Consequences course is seen in background



TOPPING HILL, copilot lifts from seat to lean over hood, helping to keep front wheels on ground. Monster course was built, not over best parts of terrain, but deliberately from obstacle to obstacle



RIGHT TURN sends copilot over the side, just like on sailboat. Copilot's job is just as important as driver's. He is constantly in motion to keep Jeep on track

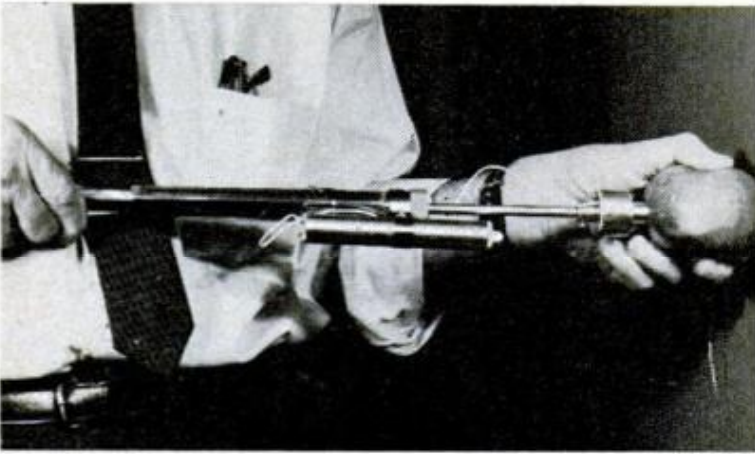


Electric Sleep

An instrument that uses an electric current to anesthetize patients has been developed at the University of Tennessee College of Medicine.

Called the "Anesthronic," it uses a headset resembling ear-phones to send about 25 volts of electricity through the brain between two electrodes.

The inventor, Dr. William H. L. Dornette, says a patient is anesthetized in two seconds and regains consciousness within 10 seconds after the current is shut off—all without discomfort. It is available from Southern Solid State Electronics, Inc., Memphis.



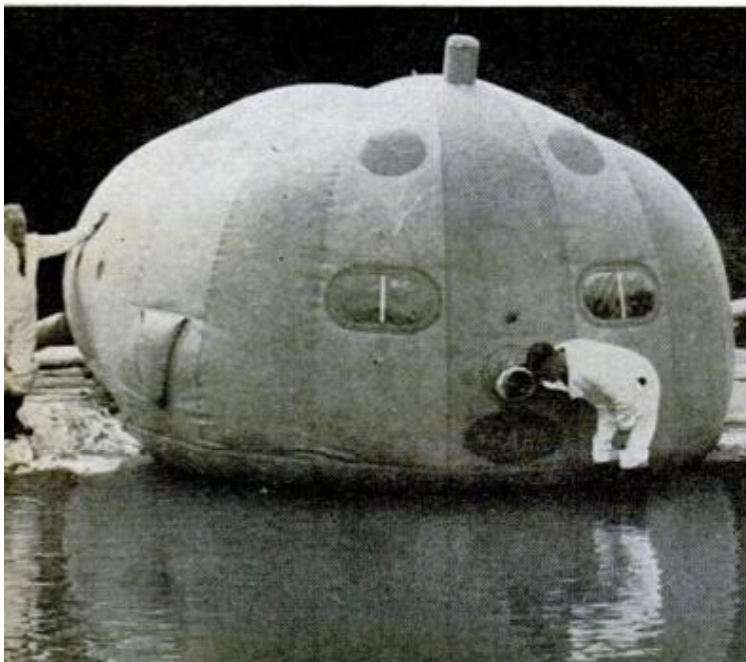
Mechanical Thumb

Squeezing fruit to test its ripeness may soon be out of date. A mechanical thumb developed by the Department of Agriculture now does the job without damage to either fruit or vegetables.

To apply, you gently touch the end of the instrument to a piece of fruit. A light on the front of the tube lights up and the approximate maturity is shown on the test.

Bloated Barge

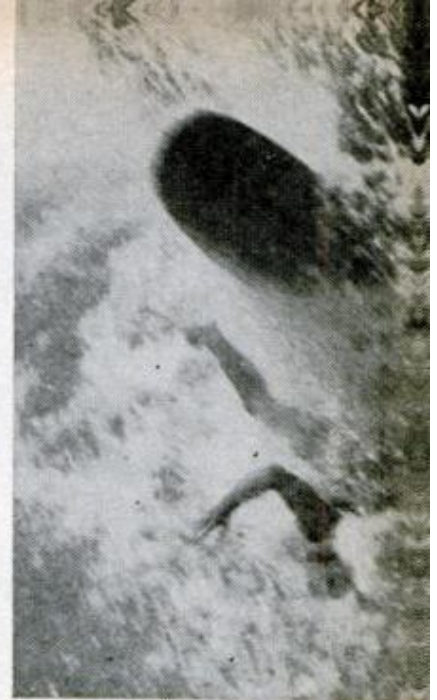
Looking like a fat Jack-O-Lantern, a pumped-up bag is actually used by the British military to transport vehicles over water. Highly buoyant, the bag has eyes for windows, a snout as a nozzle and a mouth for decorative purposes.



Piggyback Pack for Campers

Cyclists may now take along full camping equipment as well as someone to wash the dishes. A two-wheel trailer made of light aluminum tubing was introduced at an exhibition in Frankfurt, Germany. The trailer sells for \$45.





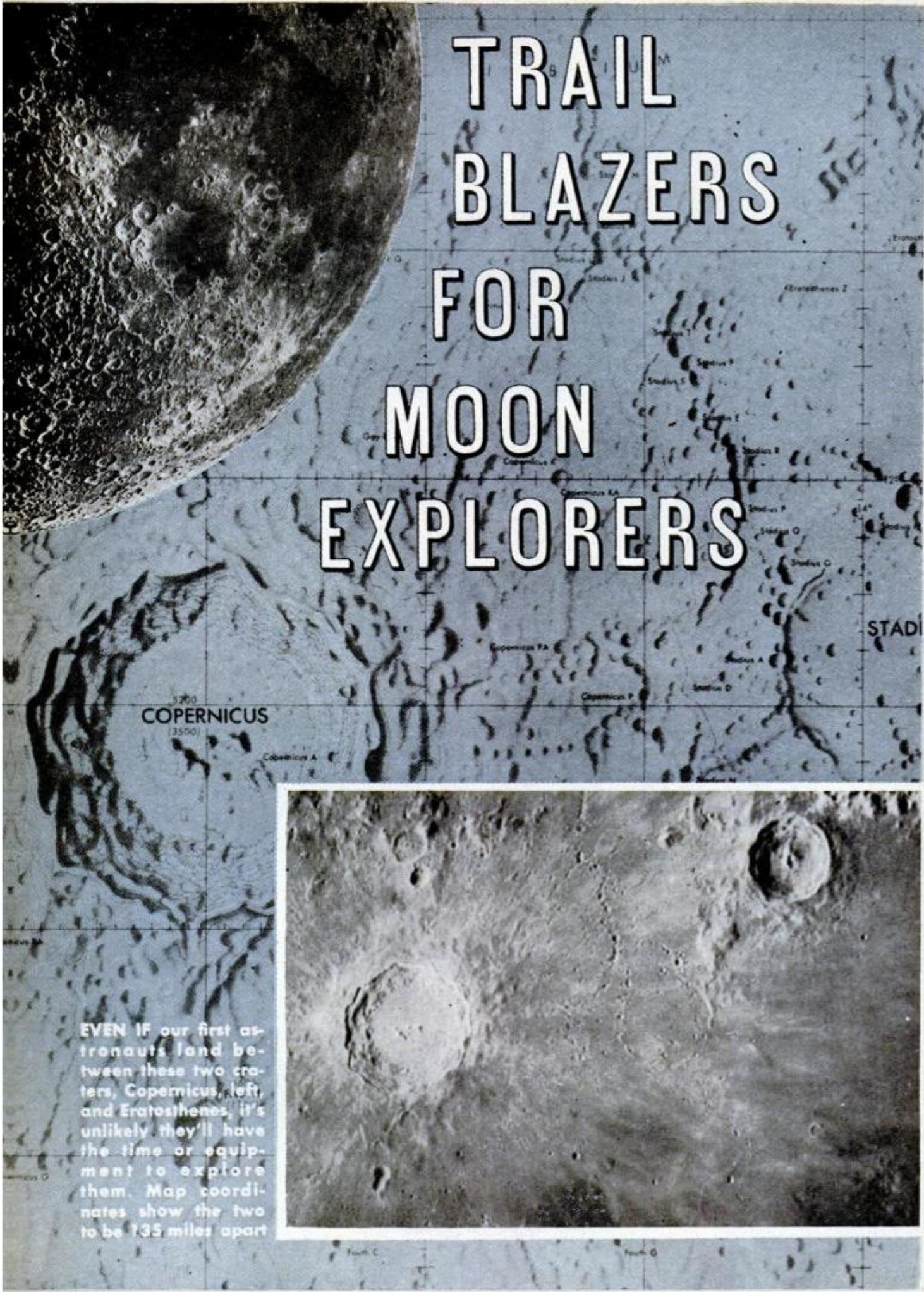
Pier Roulette—New Form of Surfboard Suicide

Californians have added a new wrinkle to surfing. Not satisfied with risking their necks on open beach, these surf riders play a game called "Pier Roulette." They shoot beneath a pier that juts out to sea, skillfully running an obstacle course of barnacle-encrusted concrete pilings. This, according to surf riders, is the supreme test of their sport.

Rocketing towards land on the crest of a huge, breaking wave, the surfer runs parallel to the pier. At a precise moment he cuts along the curl of the wave, steering the board with his feet, and shoots between the pilings and under the pier. Moving at tremendous speed through the turmoil of water breaking around the pilings, he then does his best to avoid being dashed against concrete.

The unsuccessful challenger gets his lumps. The barnacles, and mussels that cling to the pilings are razor sharp, adding to the dangers of this maddest of madcap sports. The surfer, upper right, is one who didn't judge things quite right. Center photo shows how a surfboarder can change his mind.

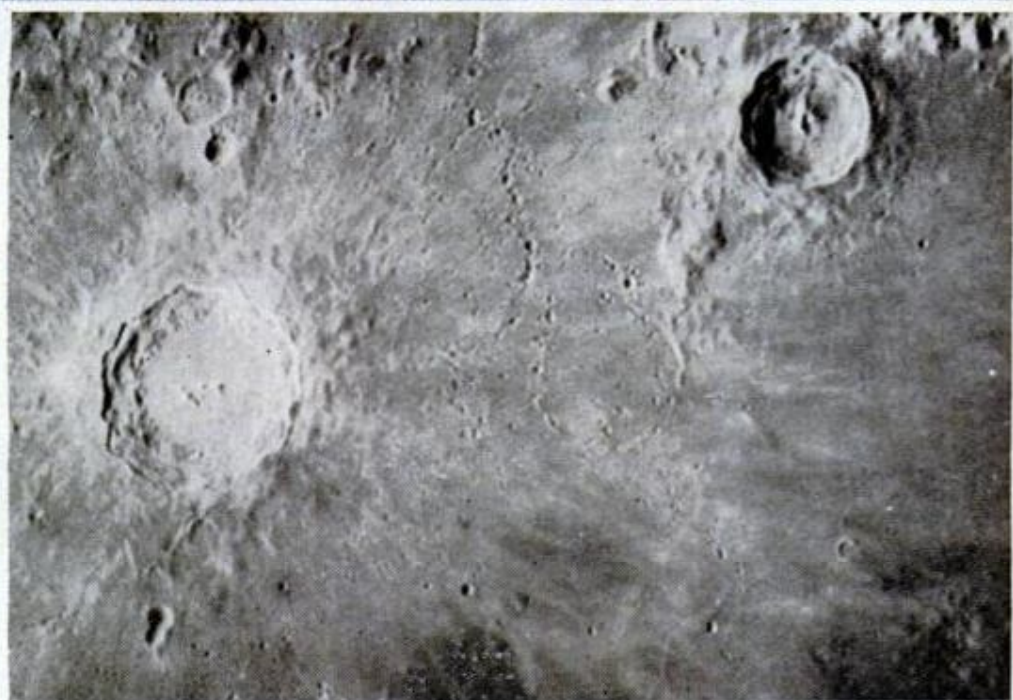




TRAIL BLAZERS FOR MOON EXPLORERS

3700
COPERNICUS
(3500)

EVEN IF our first astronauts land between these two craters, Copernicus, left, and Eratosthenes, it's unlikely they'll have the time or equipment to explore them. Map coordinates show the two to be 135 miles apart



To guide the men who will land on the moon, map makers are now drawing airline-accurate maps with lunar views no one has ever seen

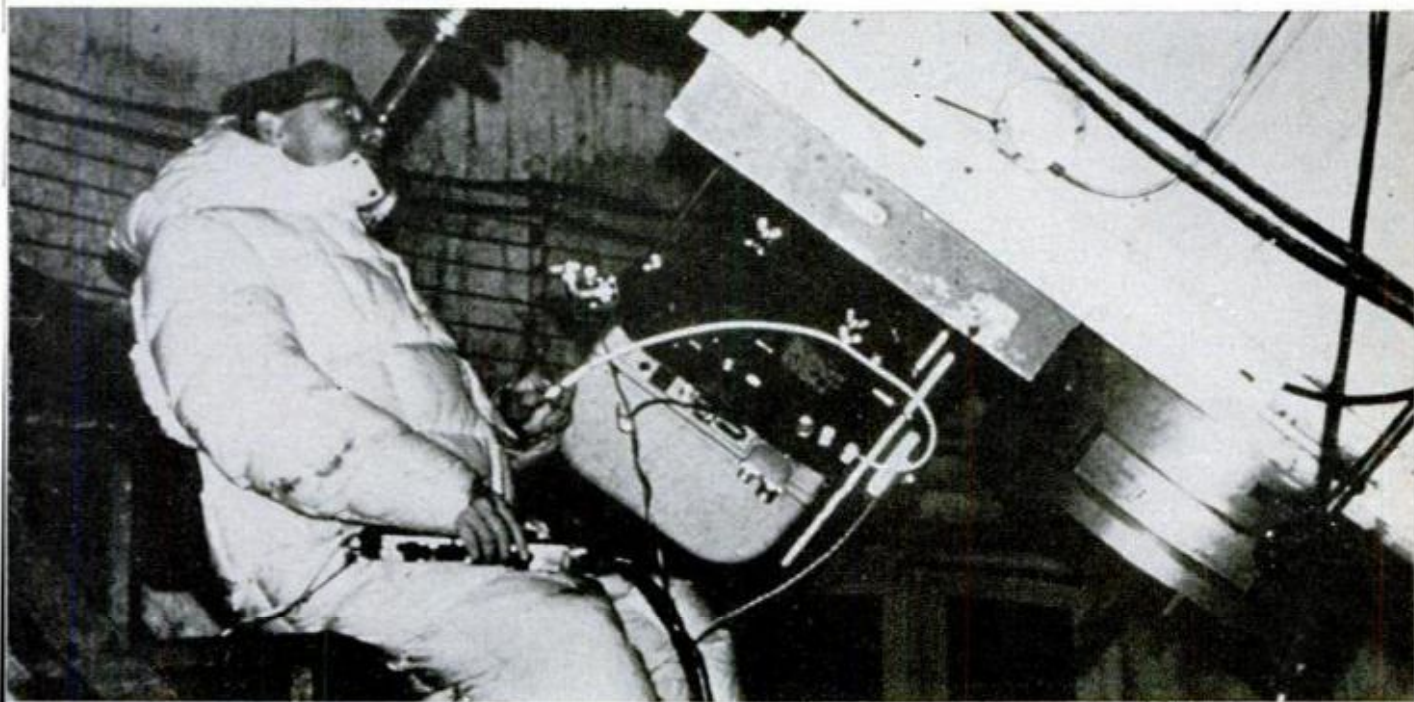
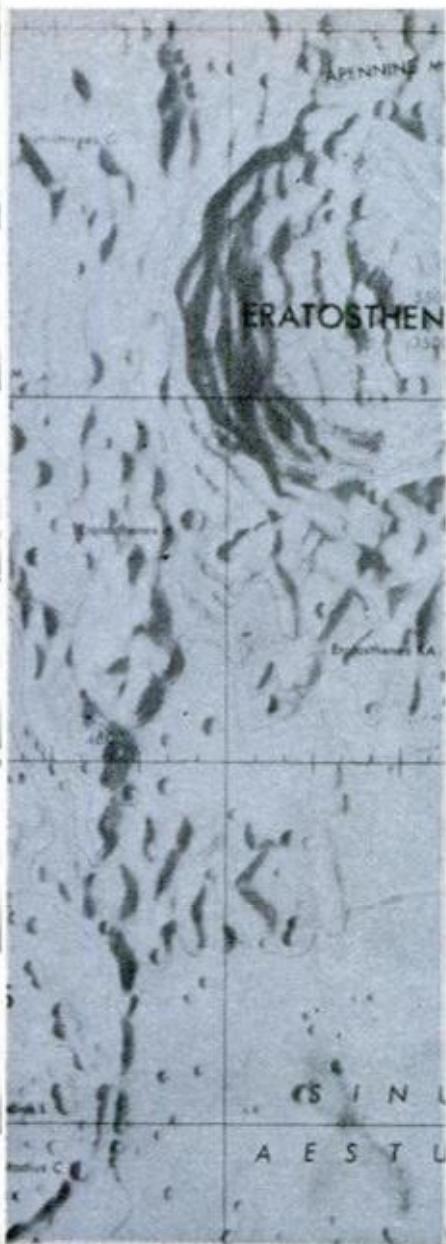
By Joseph Goodyear

ACROSS 235,000 MILES of space, the moon looks like a dead and forbidding world. It will be even more forbidding to the astronauts who will soon explore it. Its surface is dotted with craters, presumably from ancient meteor showers. Flat and mysterious plains called "seas" cover vast portions of its visible face. Mountains rivaling the size of those on earth spread over much of its landscape.

At high noon, the sky above the lunar surface is ink black. No atmosphere absorbs the deadly ultraviolet rays of the sun. By day, the temperatures reach a searing 215 degrees Fahrenheit. At night they cascade to a frigid 240 degrees below zero.

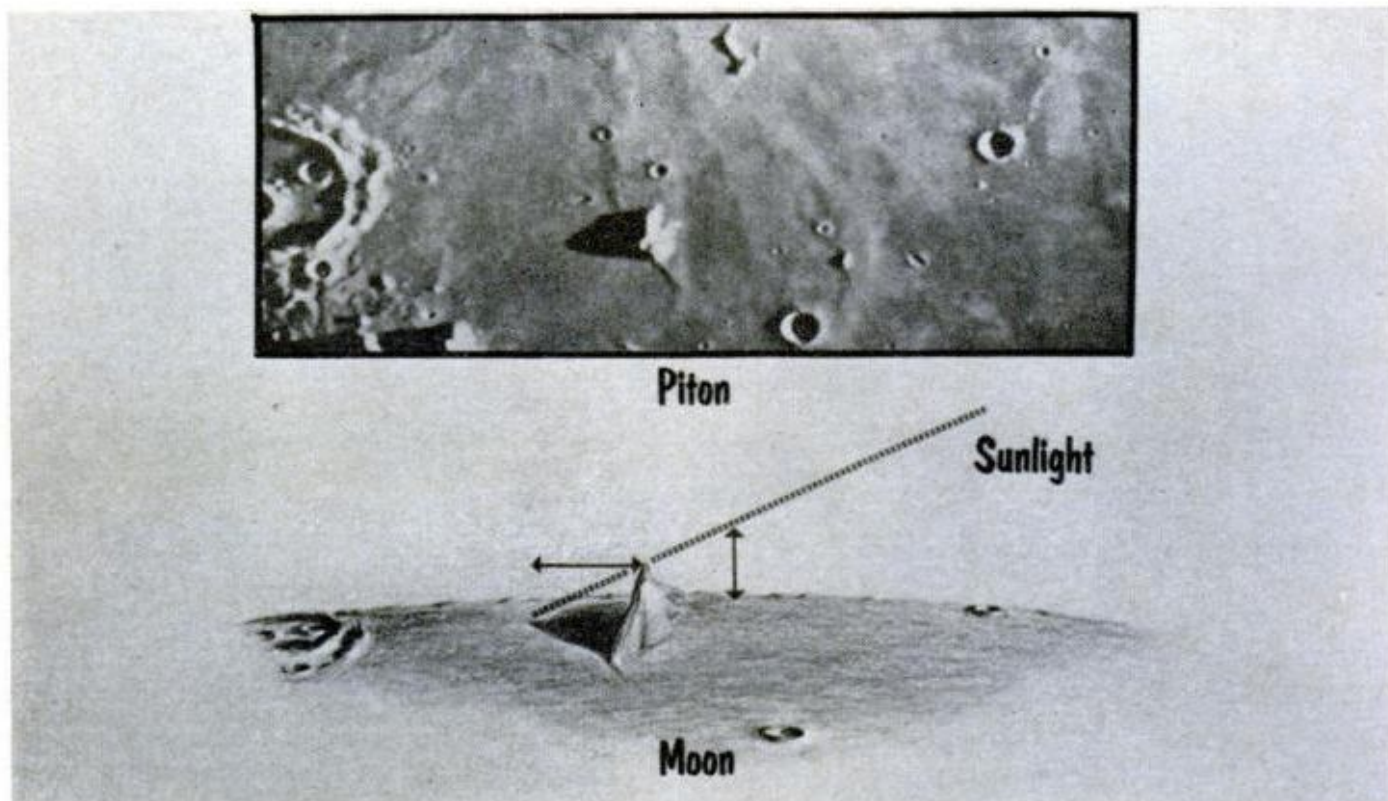
With no air currents, nothing moves across the moon's surface. All is lifeless and still. Yet this forbidding world may unlock the secrets of the universe. From the moon's geologic makeup, which has probably remained essentially unchanged since the moon was formed, we may uncover clues that will point to the origins of both earth and moon—and possibly even of life itself. The fossils of lichen spores will tell the tale, if they exist in the vastness of the lunar.

While we know much about the moon, most of its riddles remain unsolved. Even the composition of its surface is unknown. And before our spacemen can attempt a landing, that surface must be explored to the limit of our present ability to make that landing as safe as possible. We must prepare some kind of navigational guides to tell the astronauts what to look for, where to go and how to pinpoint their location once



TO MAP THE MOON, thousands of photographs were taken at Pic-du-Midi observatory in the Pyrenees and other observation points. From these, Air Force cartographers are creating lunar aeronautical charts

Determining Lunar Elevations



ASTRONOMERS determine moon elevations by simple geometry. The angle at which the sun's rays strike a mountain top forms the hypotenuse of an imaginary right triangle from which the mountain's height can be easily computed

they have actually arrived on the moon.

On the journey through space, the voyagers will operate as true astronauts, following a free-fall trajectory. But once they approach the surface of the moon, or leave the mother-ship in a landing vehicle, they'll assume the function of aeronauts, scanning the terrain for a convenient landing site.

To accomplish this, they'll need aeronautical charts such as airline pilots use, with surface features located by means of latitude and longitude grids.

Such charts of the moon's surface showing the invisible lines of a spherical grid are already being prepared.

Until recently, all lunar mapping programs were compiled for astronomers; maps were merely guides for those at the telescope. Actually, lunar cartography, or selenography as astronomers term it, is not really a new science. Galileo in the early 17th century observed the moon through his crude telescope and drew some of its features; later astronomers have extended and improved on his work.

With the realization that maps will soon be required reading for lunar navigators, selenography takes on new importance.

Three related projects for plotting the moon's features are being conducted, or

have been completed, by the Air Force and the U.S. Geological Survey. They're designed to give future moon travelers the best possible guides to topography and landing sites, plus a means of plotting their position on the moon.

Two of these projects have been completed, the third is partially complete. They are:

- A *Photographic Lunar Atlas* compiled for the Air Force Cambridge Research Laboratory;

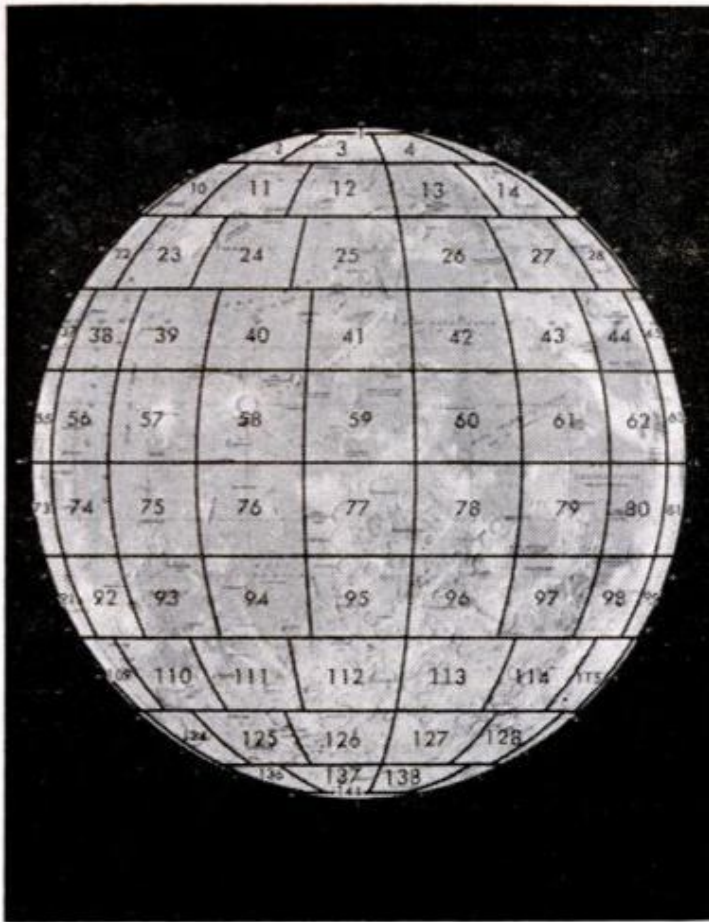
- Geological maps recently completed by the U.S. Geological Survey, and

- Aeronautical charts now being prepared by the Air Force's Aeronautical Chart and Information Center (ACIC).

The first of these projects is not, strictly speaking, a mapping program, but is a source of material for drawing up the actual charts.

Moon maps are made from photographs.

The *Photographic Lunar Atlas* is a 20-pound loose-leaf collection of the best lunar photos from five major observatories. It contains 281 photographs which show in relatively fine detail and under different conditions of illumination all the areas and landmarks on the visible side of the moon. It was compiled under the direction of expert Dr. Gerard Kuiper.



LUNAR INDEX outlines the Air Force's numbered series of aeronautical charts of the visible side of the moon. Mapping the dark side is not yet possible

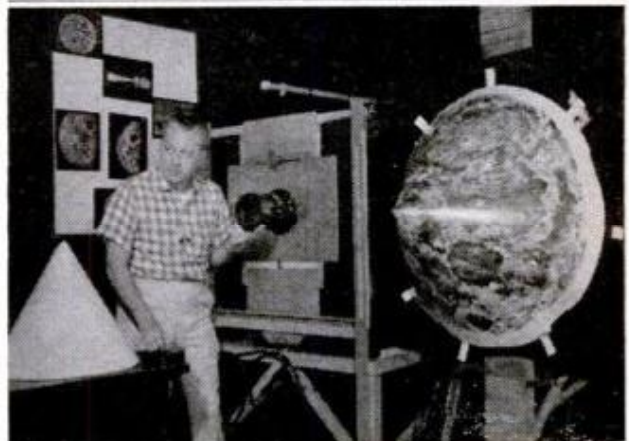
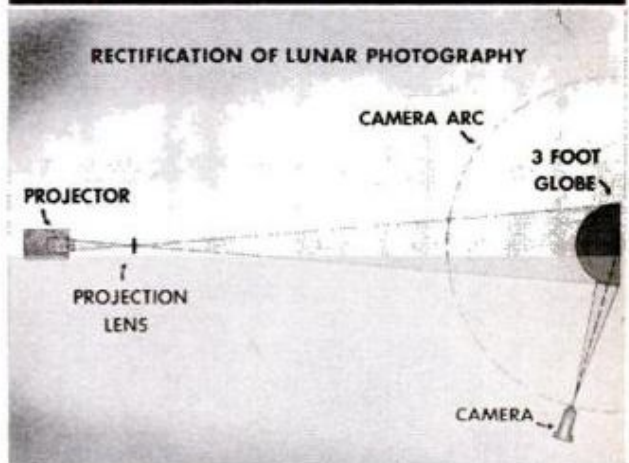
A supplement was recently added to the basic atlas, on which a grid was superimposed on 60 photographs covering the lunar surface. It is known as an "orthographic grid," with meridians and parallels at two-degree intervals. The grid lines are spaced 1/100th of the lunar radius (10.8 miles at the center). In the supplement, cartographers and astronomers had for the first time a photographic map with reference grids for accurate plotting of lunar features.

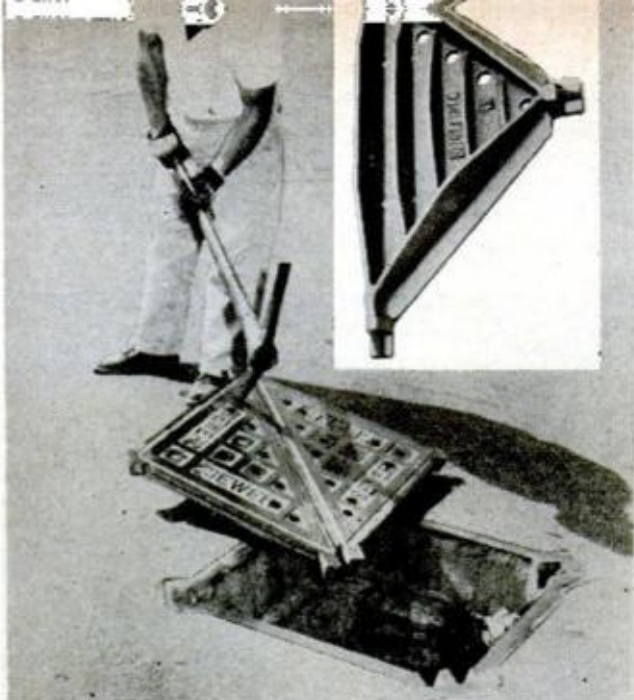
Coming soon is a second supplement to the atlas, the *Rectified Lunar Atlas*, designed to overcome one of the major problems of moon photography—distortion of objects on the edges of the moon, which makes circular shapes appear oval. By projecting normal moon photos onto a conical-shaped easel, and rephotographing this with a camera aimed at the center of the hemisphere, it's possible to get a vertical view of the surface. (See photos.) This is what an astronaut will see as he flies over it.

Geological maps will help choose a landing site. Three maps, recently completed by the Geological Survey, were compiled from a geological analysis of photographs. The map makers used stereoscopic tech-

(Please turn to page 240)

TO CORRECT DISTORTION of off-center objects in lunar photos, which makes round craters appear oval in shape (top), photos of these objects are projected onto a conical easel and rephotographed with the camera aimed at the center of the hemisphere. The rectified photo (second from top) shows the area as it would appear to an astronaut directly overhead





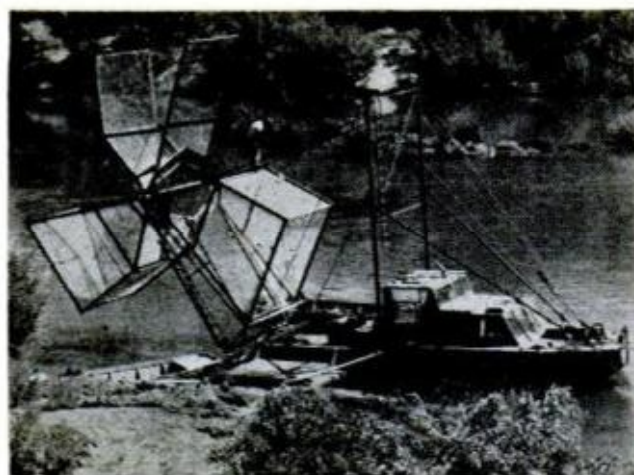
Lids Are Square and Quiet

Clunking manhole covers disturbed the sleep of William W. Taylor, Cincinnati, Ohio, once too often.

Rising to the situation, Mr. Taylor and a design engineer developed a noiseless square manhole cover that can withstand loads up to 101,400 pounds, yet is light enough to be removed or replaced by one man using a pick or hook.

The cover is bisected into two triangular sections (inset) with each section resting on a three-point support. When a tire contacts the lid, the point of impact falls within the lines of support. The lid cannot raise or rattle. Two rods make it impossible for the lid to fall into the hole.

The manhole cover is a product of Mr. Taylor's firm, the Silent Knight Co.



Ferris Wheel for Fish

Three large rotating baskets scoop up migrating salmon for counting by the California Department of Fish and Game. Attached to the stern of a barge anchored in a narrow stream, the ferris wheel is turned by the current.



Steam on the Water

Sitting in a converted 18-foot lifeboat, a wood-burning steam engine drives the pleasure craft through Ft. Lauderdale, Fla., waterways. Owner W. J. Godfrey did the remodeling. The boiler takes 20 minutes to build pressure to move the boat.

Pickup on Three Wheels

With three wheels under its tubular steel frame, Trivan handles 1000-pound loads. The load centers over the single drive wheel. A 32-horsepower, two-cylinder, air-cooled gas engine is standard, with a diesel optional. Price: about \$1600.

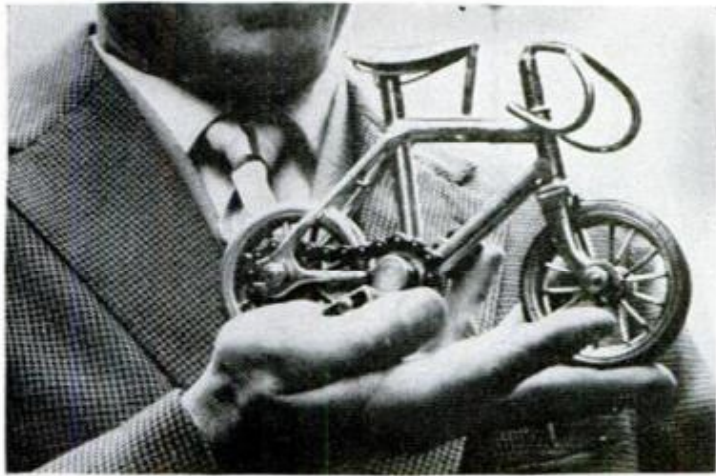


Mobile Missile Pad

Four antitank missiles can be launched from two movable arms mounted on a trucklike vehicle designed for the British army.

Operated by a crew of three, the missile launcher can move its arms in elevation and angle. Once launched, the missiles are guided by a ground-control system inside the vehicle.

Called the "Malkara Missile Launcher," the vehicle was part of a recent display of new military vehicles at the Fighting Vehicles Research and Development Establishment at Chertsey, Surrey, in England.



Bike Riding Hits An All-Time Low in Austria

So small that it can easily be held in one hand, a tiny bicycle has tires, chain, saddle and racing-style handlebars.

Trick cyclist Rih-Aruso of Vienna, Austria, captivates his audiences by riding the miniature bicycle as though it were

one of ordinary size. But Rih is looking for new angles to improve his act.

He is now trying out the hula-hoop while cycling, and has already done it on ice. For that act, he calls his machine the ice cycle.


Propelled Bicycle

Geared to the regular bicycle pedals, an oversize propeller pushes a London cyclist around his neighborhood at speeds up to 20 miles per hour.

The inventor, Ernest Winter, is using his strange craft as an experimental vehicle to test self-propelled flight. He estimates he will need another five m.p.h. (and wings) to get off the ground under his own power.

He calls his "airscrew bicycle" the "Glastonbury Zodiac." Winter and other Englishmen are competing for a prize offered to the man who can fly a self-propelled aircraft.





RUGGED PREP SCHOOL FOR SMOKE JUMPERS

By Frank A. Tinker

FIRE-SCHOOL INSTRUCTOR talks rookie jumper down to accurate landing over battery-operated bullhorn. Slotted parachute lets air slip out one side. Chutist can steer descent by controlling direction of slot. Feather is good-luck charm.

THE RUGGED LAD in the logger boots who had seemed so indifferent a moment before, had to be dragged to the open door of the DC-3.

"No!" he shouted. "I can't go! I can't—"

His voice trailed off as the two burly gents hurled him through the door of the plane, then turned and faced the other 15 passengers and asked, "Who else doesn't want to go?"

The "passengers" broke into wide-faced grins and clambered to their feet, relieved of any tensions they might have felt. And this was exactly the way it had been planned.

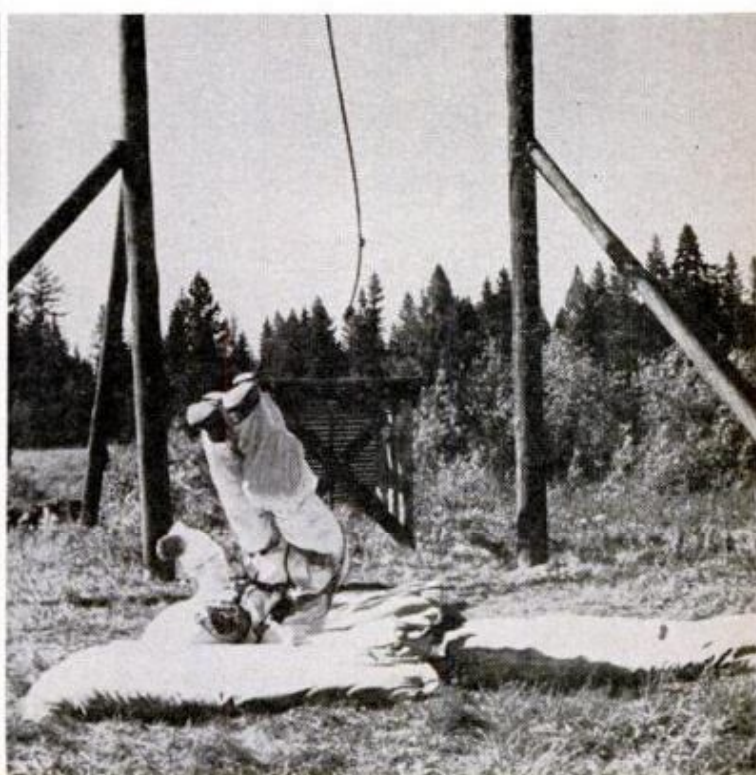
The struggling victim was actually a veteran instructor at one of the most rugged and exacting parachute jumping courses in the country—the U.S. Forest Service's Region Four smoke-jumper's school at McCall, Idaho. The passengers were his students.

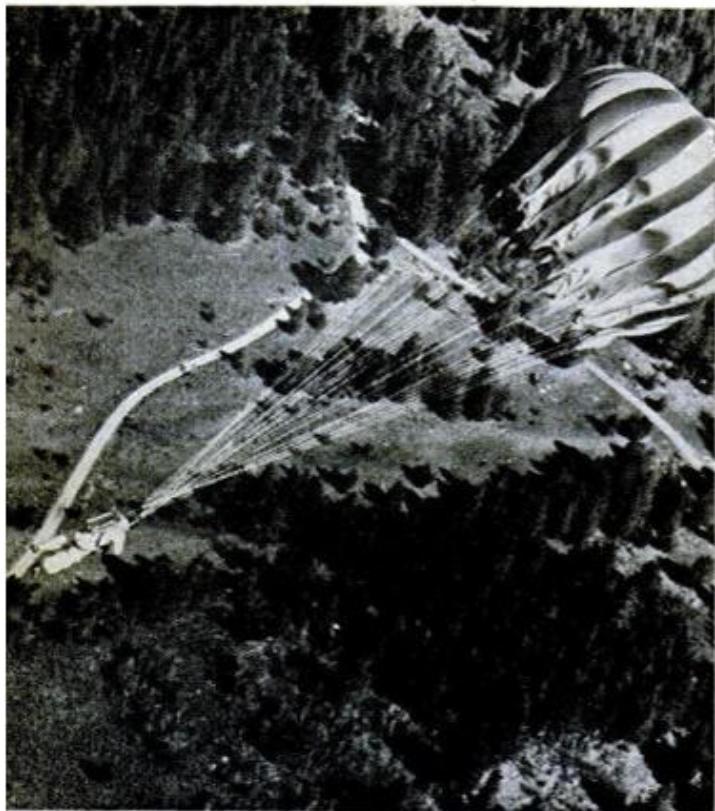
The exploits of these shock troops and their value to the country have become well known in the 20 years they have been chasing "smokes." Our annual \$100,000,000 bill from back-country fires would be much larger were it not for their dedication and skill. What is not so well known is that they are not merely employees strapped into a chute and dumped out near a blaze. Rather, they are specialists who must undergo a tough course of training in their demanding job. In the West this is done at Region One's Missoula, Mont., school, or at McCall. Once graduated, however, the smoke jumper may be sent anywhere an emergency exists.

The rigors of this training are demanding, but necessary. In fighting a raging forest fire, often alone and in remote areas, there is no room for error or frailty. The savagery of a pine-fed blaze is awesome and terrifying. In 1949, a crew of men battling a large fire in the Helena National Forest was caught by a sudden reversal of the fire's direction. Although they were experienced woodsmen, within minutes they were pinned by the blaze. Thirteen died as the heat hit them.

Nevertheless, for every vacancy in the smoke jumper corps there are 10 applicants, proving that American youth still seeks a real and worthwhile challenge. Unlike other government "volunteer" programs,

SPECIAL HARNESS is used for practice jumps from a 40-foot tower (below left), with special spring attachment to let trainee fall at regular jump speed for simulated landing. When he hits the turf, the smokie folds up, making a swivel with his body, and ending with a back somersault that will absorb the shock of landing without broken bones





SPOT JUMPER has a small target, often only a clearing 15 feet wide. He must work his way in, spilling air from his special chute to avoid the maze of trees that wait to hang him up in the air

COMING DOWN on a spot jump, the trainee must steer his chute to hit the clearing. Once on the ground he must clear his chute, secure the fire pack that is dropped after him, make contact with his partner, and begin the task of fire fighting

LEAPING INTO SPACE, the trainee leaves the plane without hesitation the moment he gets the signal from the spotter who has checked for wind drift. His partner follows a split second later. On the ground they work fire shoulder to shoulder





LANDINGS are not always smooth. This rookie has tangled with a tree at the end of his ride. He must now snake the chute free of the branches while he listens to an instructor's critical hoots of derision



LIKE THE ARMY, punishment is handed out by the tough instructors to a recruit who makes any error in his practice jump. The general rule for any mishap is 20 push-ups done at the spot of the jump

this one is accomplished without posters or recruiting. Jumpers come back summer after summer, and of the 74 men at McCall this year, only 14 were new recruits.

Most smoke jumpers are above average in education and physical condition. College students, school teachers, and men with a background in the woods plus a free summer—these are the usual veterans. Classes in the past have included ministers and school principals. Oddly enough, forestry students are not encouraged to enlist repeatedly, since this is considered too specialized a field for the broad education they require.

All applicants must have at least two seasons of experience fighting fires with state, farm or other agencies. They must also know more than the rudiments of the trade. With the short time available for training, the Forest Service reasons that it can teach a person oriented to the woods how to use a parachute, but would have little success instilling an appreciation of forestry into an otherwise acceptable, but merely jump-happy lad.

Unlike the years immediately following World War II, when over half the "smokies" were ex-paratroopers, most of the lads arriving for the first time at the school have never jumped.

Reporting in at McCall, fresh from what is usually sedentary work, the recruit is sent out for actual work on a forest project to toughen him up. After several weeks of laying telephone line in mountainous terrain, or swamping brush for a road, the class is ready for the more

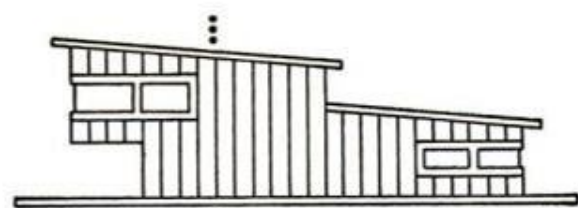
specialized training leading to the 'chutes. At the McCall grounds, veterans and recruits go through routines that prepare them for actual jumps. A 40-foot tower with apertures at the top simulating exit hatches in the various planes, gives the men practice in starting jumps correctly. In full fire dress, their harness connected to a spring that lets them down at the drop-rate of a chute (16 to 20 feet per second), they leap through the doors and smack down onto a canvas net.

Rocks In the Head

"We can usually tell when a new boy is going to freeze," says Del Catlin, Forest Service foreman at the school. "On the tower we give them a rock to pass from one hand to the other behind their backs as they come down. Those who continue thinking during the jump have little trouble; those who blank out forget the rock entirely."

A cool, clear head is vital in this business. Two smokies who jumped close together one day suddenly found themselves descending toward a fire with chutes entangled. The oscillations swung them together. To avoid colliding, each one grabbed the other's lines. Hanging together, as novices might have done, would have been disastrous, since the entangled chutes were spilling air and letting them down at a leg-busting rate. These well-trained jumpers quickly wiggled their chutes free, aimed away from each other, and sailed off to safety.

(Please turn to page 224)



NEW FOR YOUR HOME

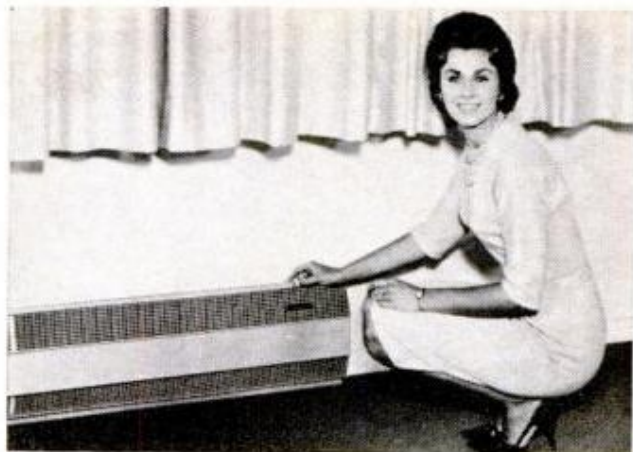
MUSICAL TELEPHONE has a Swiss music box in a plastic case to entertain caller for 3 minutes when he must wait for service. Wound by pulley cord, it's activated when handset is placed on music box's cradle. Costs \$4.95; made by J. G. Mourra, Inc., 110 Madeira Ave., Coral Gables, Fla.

ELECTRIC SEALER heat-seals food in airtight, moisture-proof pouches for storage. Food is heated before use by dropping pouch in boiling water. Costs \$24.95; by Kopak Industries, Inc., St. Paul, Minn.

TERRACE-TOP RANGE has two levels for cooking. The front units are 3 inches below standard counter height. Controls are on right side of platform rather than on rear background. The 30-inch, free-standing range (Model KLD-30) is made by Westinghouse



GAS BASEBOARD HEATER allows zone temperature control without the cost of extending existing heating system. Occupies no usable wall or floor space; connections to the gas supply are made behind wall. Unit is vented to outdoors. Samuel Stamping & Enameling Co., Manufacturers Road, Chattanooga 1, Tenn.



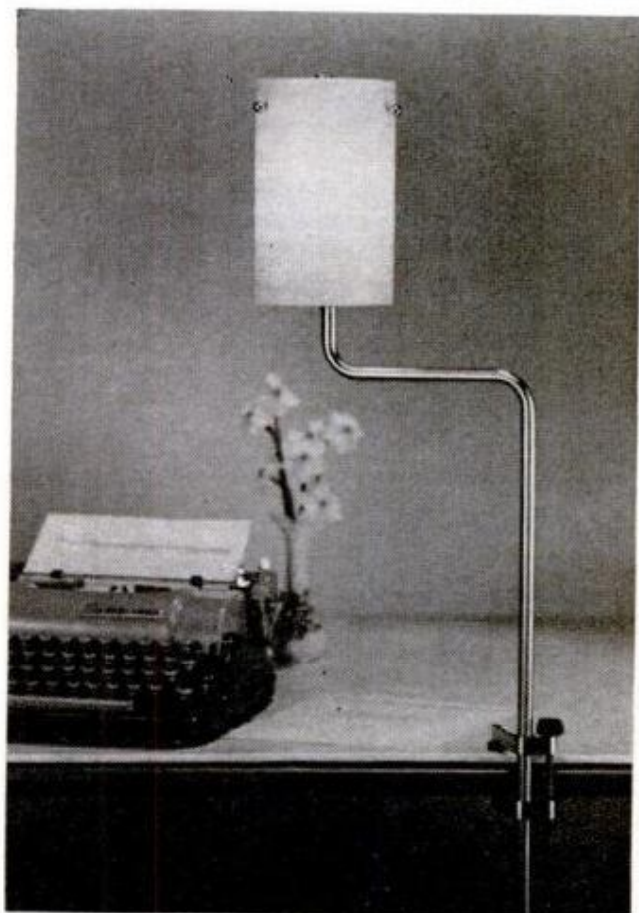
MATTRESS ADJUSTS to four degrees of firmness. Two sets of coils of a different gauge give regular or soft firmness. Inserting a sheet of vinyl into a sleeve between the coils gives two more degrees of firmness depending on which side is used. Price is \$99.50; Ther-A-Pedic Associates, Elizabeth, N. J.



ANTI-STATIC LINT BRUSH made of sponge plastic whisks off threads, dandruff, tiny particles. Will not pull nap off or shine hard-finish fabric. Made by Setwell Co., Traverse City, Mich., it costs \$1.



CLAMP LAMP REVOLVES, adjusts up and down, and attaches without marring furniture. Made of aluminum with gold anodized finish. Price is \$10; made by Handi-Lamp, 727 Delaware Ave., Youngstown 10, Ohio





For The Home . . .

FM Listening With No Amplifier

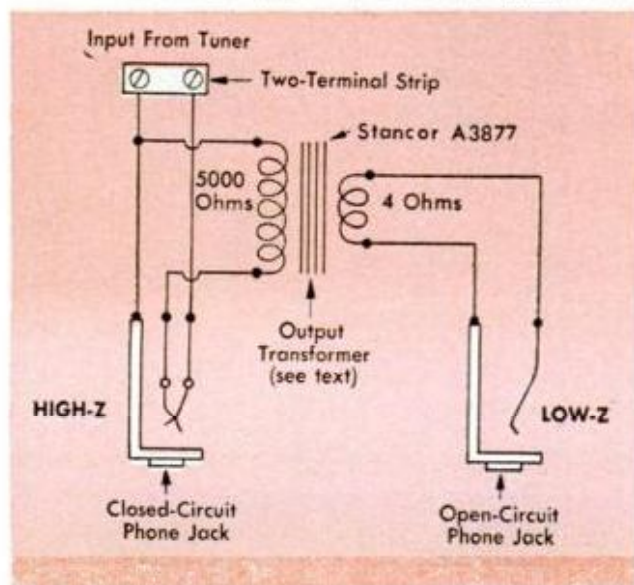
Whether you have one of the new hi-fi headsets or an old pair of army surplus "cans," here's a versatile device that neatly solves a matching problem. It allows you to hook any style earphone directly to the output of an FM tuner for private listening.

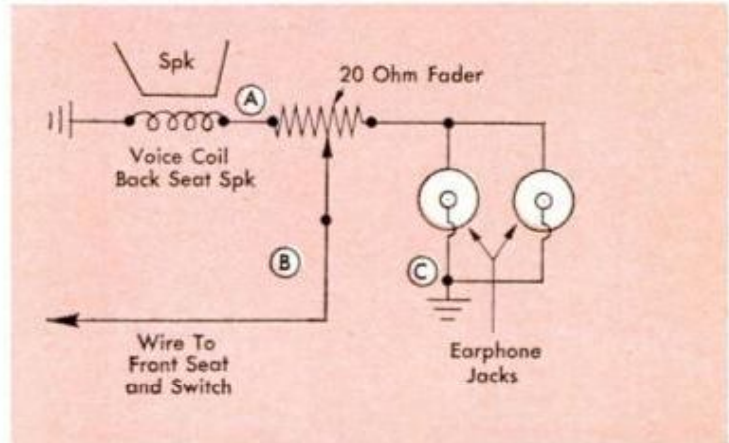
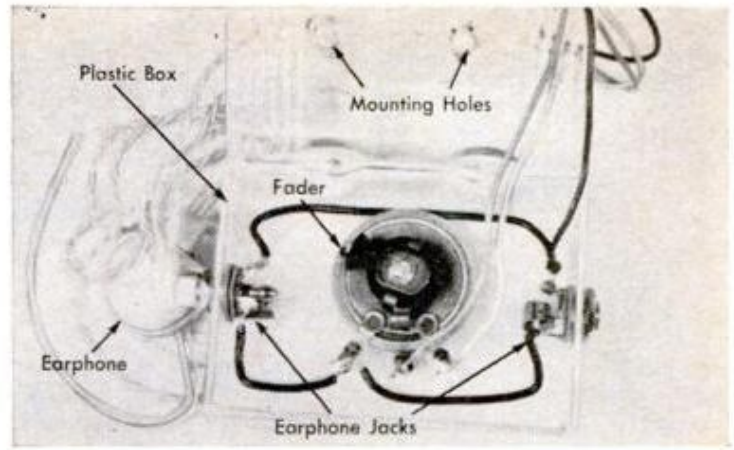
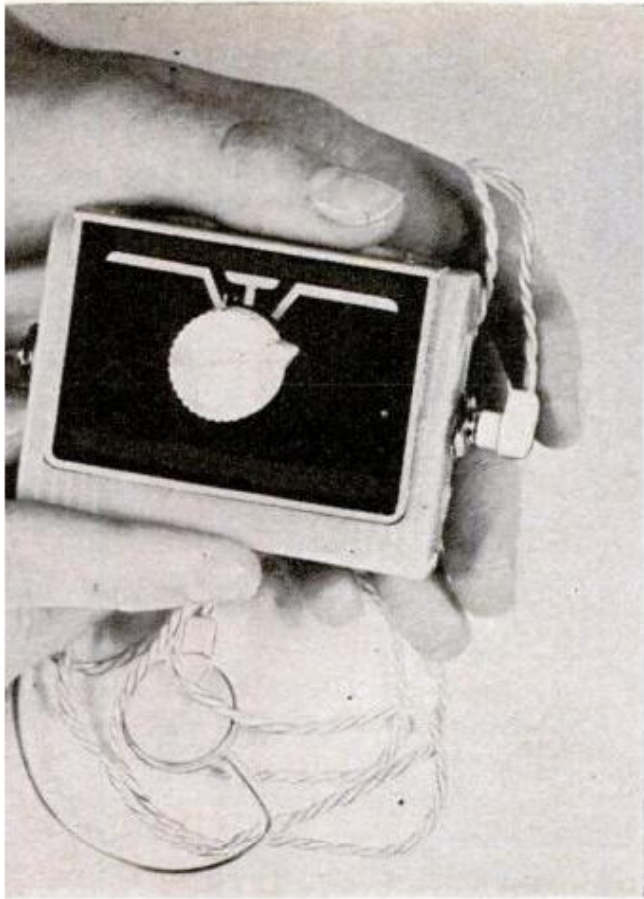
As detailed in the schematic, four components are required. These are mounted and wired in a small wood box with

lengths of hookup wire. You needn't be concerned about the polarity of the transformer leads. For example, either wire from the primary winding may be run to the terminal strip.

If you don't know whether your earphones are high or low impedance, simply try both jacks, one after the other, and use the one that provides the loudest sound.—Art Trauffer

REAR OF FM TUNER is shown atop earphone box, with two short leads connecting the two units. At lower right, listener uses FM volume to control sound.





HAND HOLDS ADAPTER for use in back seat. Knob controls volume, jacks at sides receive earphones. Top right shows internal wiring

For the Car . . .

Radio Earphones for Back Seaters

IF YOU HAVE YOUNGSTERS who insist on raucous music and clatter from the car radio throughout a long trip, here's how to keep the rest of the family happy. Build a small adapter unit that enables a couple of earphones to be operated at the back seat. Only the plugged ears need to hear the racket. There's a volume control for adjusting earphone level and to restore the speaker to normal operation at will.

The circuit is built into a plastic box large enough to accommodate the jacks and control. With care, the mounting holes for these items can be made with the tip of a hot soldering iron gently applied

PART LIST

- 1 PLASTIC BOX 2 $\frac{7}{8}$ x 2 x 1 inch OR EQUIV. MS-158
- 1 20-OHM WIREWOUND DUAL SPK. FADER CONTROL MS-187
- 2 EARPHONE JACKS MINIATURE, COMES WITH EARPHONES
- 2 EARPHONES ARGONNE AR-47 6 OHMS
- MISC. WIRE, METAL SCREWS, KNOBS, ETC.
- ALL PARTS OBTAINED FROM LAFAYETTE RADIO

to the plastic. Follow the illustrations for the internal hookup and you should end up with three leads emerging from the adapter, each about a foot long. If the car has a rear-seat speaker, these wires are run through the rear shelf into the trunk compartment. If you don't wish to drill extra holes, remove a speaker-mounting screw and use the exposed hole.

Next step is to open the trunk lid and locate the rear-seat speaker terminals. Disconnect the single wire you find there (the other is a short ground connection) and splice it to the wire marked "B" in the schematic. Now connect wire "A" from the adapter to the free speaker terminal. The remaining wire, "C," is fastened under a speaker-mounting bolt to achieve a good electrical ground.

If your car has no rear speaker, installation is a bit more lengthy. All connections are the same as shown, but you'll have to run long extensions of wires "A" and "B" underneath the car floor from the front speaker to the adapter location at the rear seat.—Homer L. Davidson

Build a Surplus Phone INTERCOM

PARTS LIST

Required for Each Station.

- 1—Handset (regular telephone type, NOT push-to-talk or sound-powered.)
 - 1—Lungen buzzer, 6 volt. Edwards #15, size 0.
 - 1—SPST push button. Edwards #620. (See text.)
 - 1—Cradle switch (in phone, or see text.)
 - 1—Tie strip (see text).
- Case, etc. and misc. hardware.

For System.

- 4—"#6" dry cells, or equivalent. (6 volts).
 - Interconnecting cable. Belden Wire Co., etc.
- (Note: Complete desk-type phones are available from Radio Shack, etc. \$2.50 to about \$4.).

RECENTLY, SURPLUS DEALERS have been advertising unusual buys in surplus phone equipment. To put it into service for a variety of household intercom jobs, use the basic wiring guide given below. It's an "all-master" system.

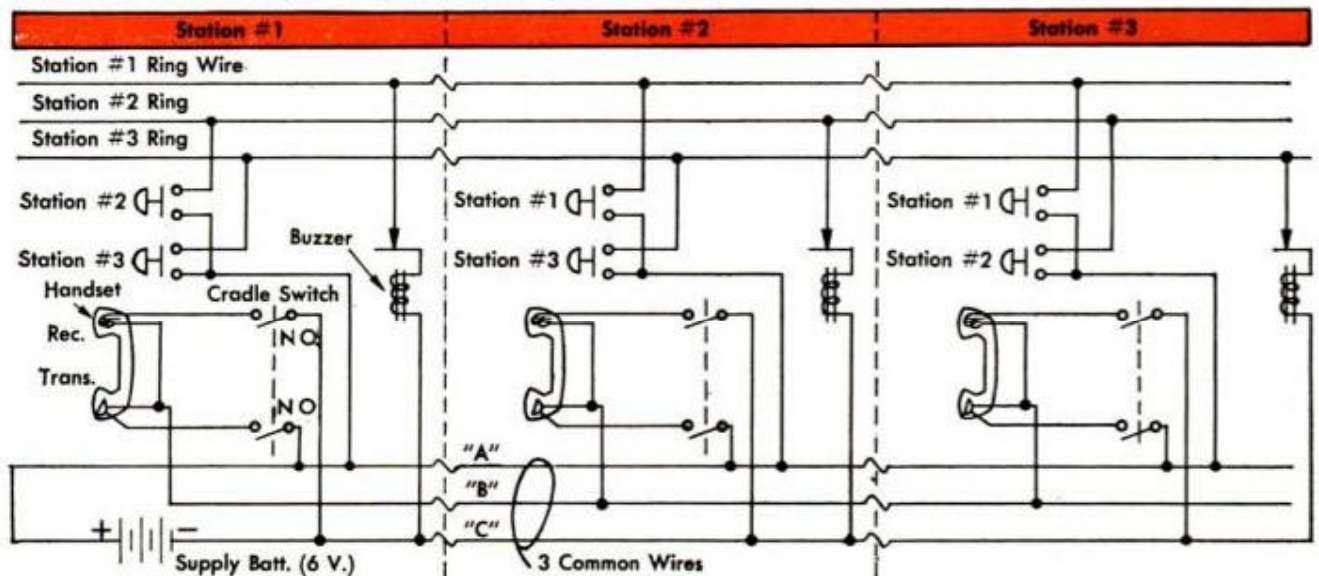
Some modifications must be made. Since the normal calling bell won't work in this set-up, small "Lungen" buzzers are added to each set, as indicated. The "ringing" of these buzzers is controlled

by small push buttons added to each phone. Every phone should have a button for each of the other stations.

Another variation occurs in the cradle switch. If it does not close when the phone is lifted, replace it with a DPST spring switch that provides this action.

Cable for the 3-phone system is a 6-conductor type. If you plan to expand the system, extra wires in the cable can save work later on.—D. D. Darling

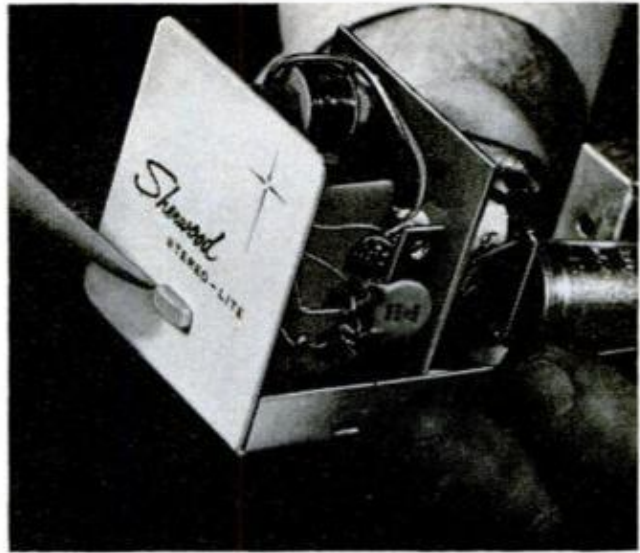
SCHEMATIC shows 3-phone system. New push buttons, visible above each handset, must be installed.



NEW IN

ELECTRONICS

FOR USE with all FM tuners, model SL-1 Stereo-Lite instantly identifies FM stations broadcasting stereo programs. Costs \$29.50 with case; made by Sherwood Electronic Labs., 4300 N. California Ave., Chicago.



SWIVEL MICROPHONE boom eliminates noise when shifting mike (American Microphone, Chicago, Ill.) from person to person while recording and frees both hands. Boom \$13; Atlas Sound Corp., Brooklyn, N.Y.

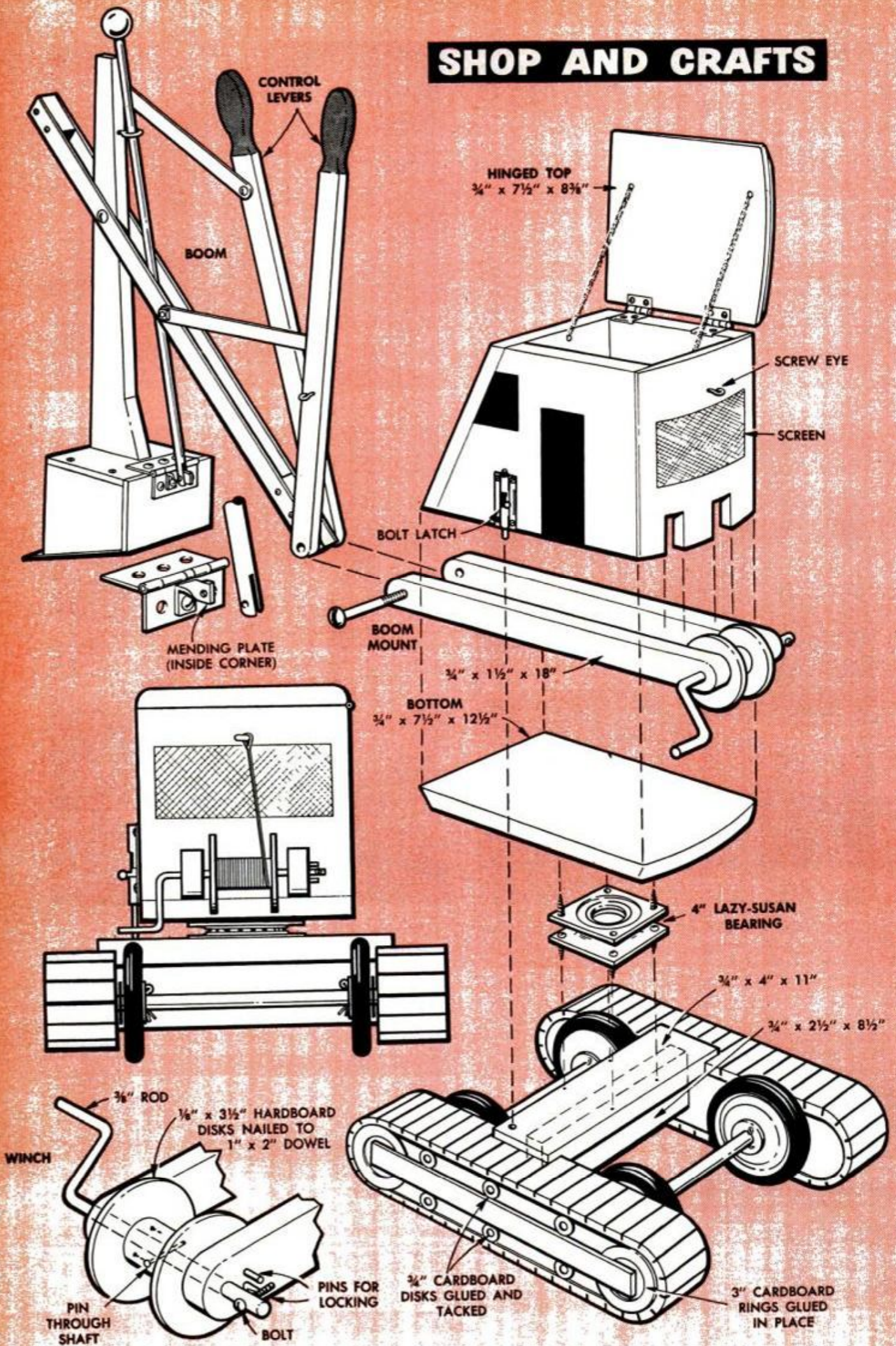


TELEPHONE BEEPER signals every 15 seconds to conform with Federal Law when interstate telephone conversations are recorded. Costs \$25; made by Robins Industries, 15-58 127th St., Flushing, N.Y.



LIGHTWEIGHT TONE ARM and cartridge tracks down to $\frac{1}{4}$ gram on moderate level recordings. Sliding adjustment moves from 0 to 3 grams. Tone arm: \$36; Cartridge: \$49.50. Maker: Pickering, Plainview, N.Y.

SHOP AND CRAFTS



LITTLE DIGGER

Junior construction engineer rides this toy power shovel that operates realistically by using hand controls and can swivel in a complete circle

By Ron Anderson



READY FOR BUSINESS, Junior holds the two control levers for easy transfer of dirt to the waiting truck

JUNIOR'S earth-moving and road-building program will be greatly simplified with this toy power shovel. Comfortably seated on the cab, he pushes himself about and can swivel in any direction. One control lever operates the boom, another the shovel position, while a push rod opens and closes the shovel. There's also a winch to use as a "stump puller", and the cab opens to store valuables.

Dummy traction treads are mounted on two pairs of holders, each pair fitted with spacers. The four pieces having rounded ends are stacked and clamped together so axle holes can be drilled in alignment. Two of these pieces are assembled to a T-shaped crosspiece with waterproof glue and screws. Then the spacers are glued and nailed on and the two outside pieces attached similarly.

The cleated treads are made from two strips of $\frac{3}{8}$ -in. white pine. Saw kerfs $\frac{5}{16}$ in. deep, and spaced $\frac{3}{4}$ in., are cut across

them. The strips are soaked with water at points where they are to be bent over the rounded ends of the tread holders. The treads are cut out to fit around the ends of the chassis crosspiece, and are attached with waterproof glue and brads, two brads to each cleat. Treads project $\frac{1}{4}$ in. beyond the outer tread holders.

Wheels and Cab Bearing

Ends of the axles come almost flush with the outer surface of the tread holders. Axles are drilled for cotter pins, then slipped through one tread holder, wheels and washers added, then slipped through the other tread holder, after which the cotter pins are installed. Use 5-in. rubber-tired wheels which will project $\frac{5}{8}$ in. below the tread holders.

Dummy drive and bearing wheels for treads can be made of cardboard (Bristol board) as shown in the lower right detail on page 144. They are glued and brad-

ded in place; later painted and then coated with spar varnish to seal out moisture. The bearing wheels also can be cut from tin cans or from polyethylene-plastic food containers. Wooden side plates projecting over the drive wheels and fitting between the bearing wheels, are nailed on.

A 4-in. standard Lazy-Suzan bearing is screwed to the chassis crosspiece. Later, after cab assembly, the upper plate of the bearing is screwed to the cab bottom, it being possible to drive the screws when the top plate is turned 45 deg. as shown in lower left detail on page 146. If you can't get such a bearing, just use two 3-in. metal disks drilled centrally and greased to reduce friction, assembling these on a bolt with large washers under head and nut.

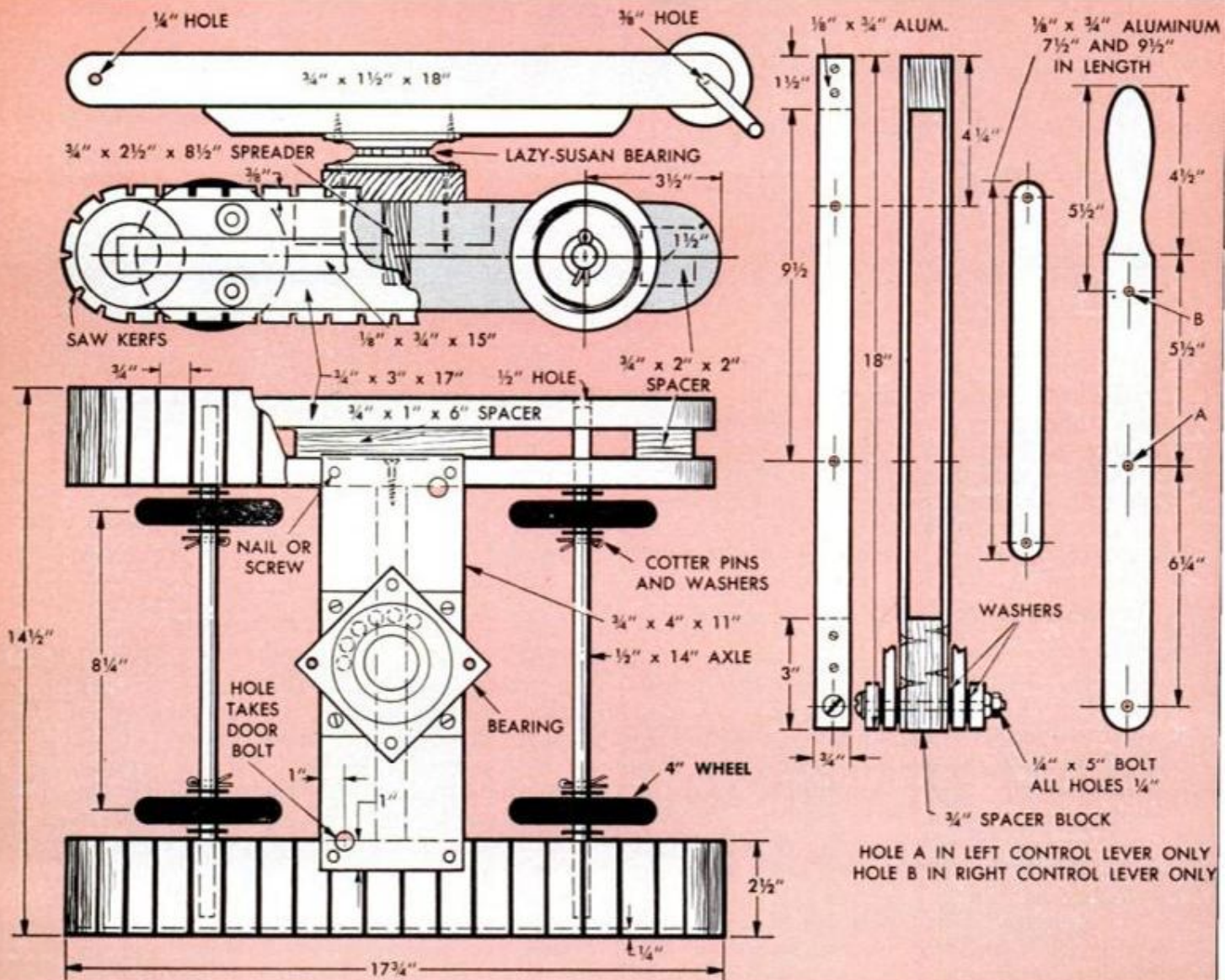
Shovel and Boom

Shovel arm, its two sides, and also the control levers, are made of $\frac{3}{4}$ -in. wood, while the back, bottom, and front are $\frac{1}{4}$ -in. stock. A 1-in. angle bracket, twisted at one end, forms the mending plate on the

hinge and connects to a push rod which opens and closes the bottom of the shovel. The push rod passes through a screw eye which is turned down far enough to provide friction on the rod and prevents the shovel from opening by itself. A ball knob is drilled to fit on the end of the push rod and is pinned to it. Control levers and boom pivot on a bolt that passes through the boom mount, washers being used between the parts.

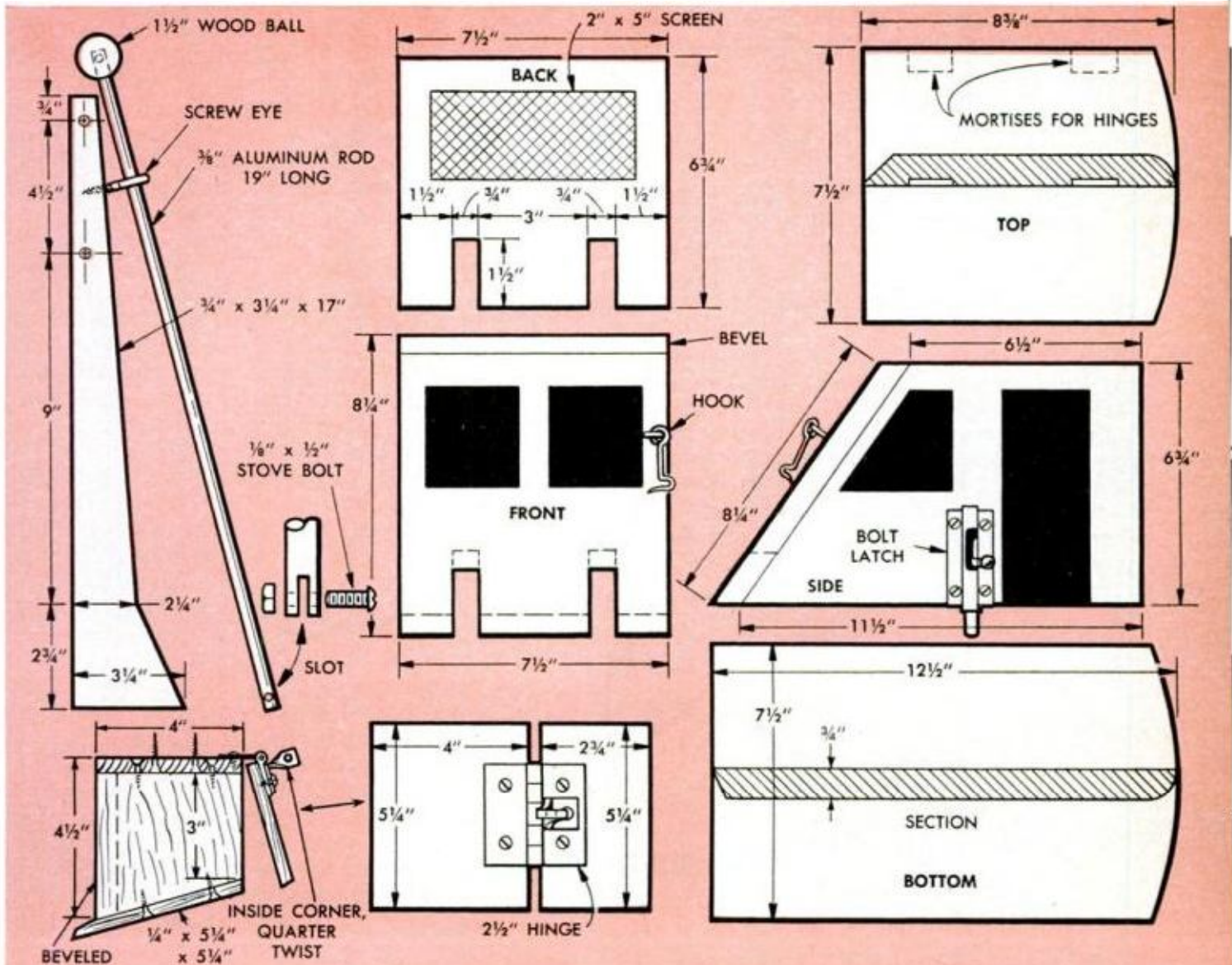
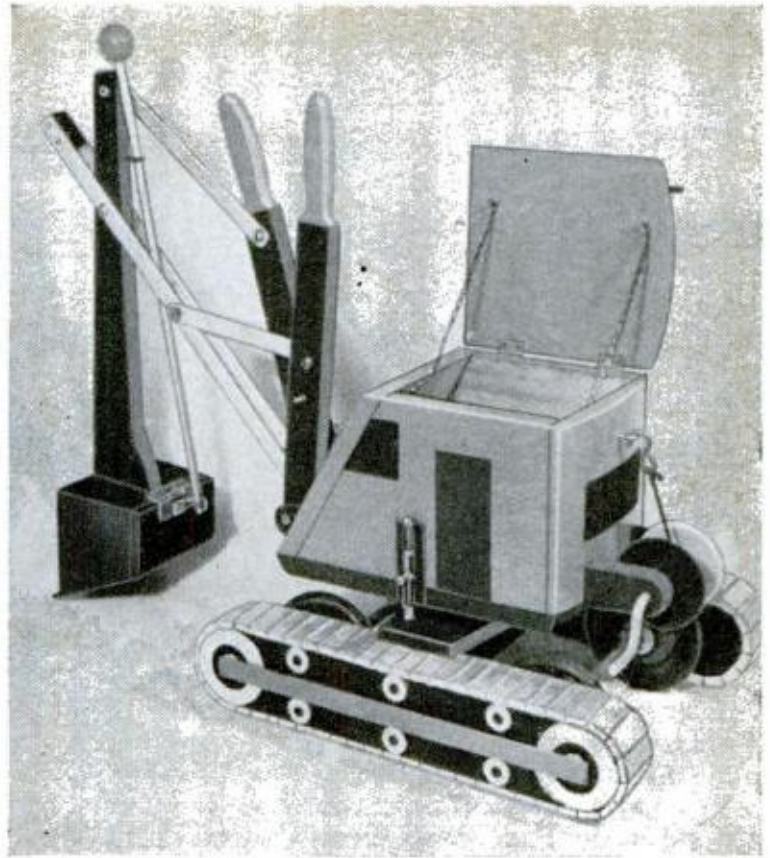
Cab Assembly and Winch

Boom mount is drilled at both ends and is fastened to the cab bottom and screws, without glue. Front and back have two slots that fit over the boom mount. After assembling the cab it is set over the boom mount and on the bottom. Wood screws then are driven through the bottom into the sides. An ordinary door bolt on the cab side locks it to the chassis crosspiece. A screw hook on the cab front engages a screw eye on the boom-control lever to hold the shovel up when it is in traveling position.



The winch is installed on the rear end of the boom mount. There should be enough clearance between the winch drum and the boom mounts so the drum can move endwise permitting a bolt at the end of the crank to slide between two pins on the boom mount to lock the winch. Nylon cord is fastened to the drum and is provided with an S-hook made of No. 11-ga. wire, for easy attachment to objects to be pulled. When not in use the cord is wound up on the drum and the S-hook is clipped in screw eye on the cab.

It is advisable to partly disassemble the unit for painting. Chassis is flat black, treads and dummy wheels are aluminum and the side plates red. The cab is red as are the handles of the control levers. The rest of the levers are black, as are the doors, windows, boom mount and the ventilating grille, which is cut from ordinary screen and is tacked in place.





See Through the Paper

You can make a tracing of any pencil drawing by wetting the paper you use for tracing with lighter fluid, lacquer thinner or turpentine. Any of these solvents will make ordinary paper transparent so that the lines underneath can be seen clearly. When wet with lighter fluid or lacquer thinner the paper will remain transparent for only a short time as the fluid evaporates in a few seconds. Use pure turpentine if the tracing is detailed as this solvent evaporates much more slowly. Remember, these liquids are highly flammable. Use with care!—*Bil Toman*

Write By the Rule

When your friends get a letter written and addressed in the manner pictured they'll wonder, now just how was that done. Of course, they'll try it, but the chances are they'll never think of using a ruler to square the bottom curves of each of the freehand letters. At first you'll have to take it slowly until you get the knack of the thing; then writing goes fairly fast. As you can see, you simply move the pen horizontally a short distance at the end of each down stroke, using the ruler as the guide. Letters "m", "n", "g" and "y" are the exceptions, of course.—*Charles Carroll*

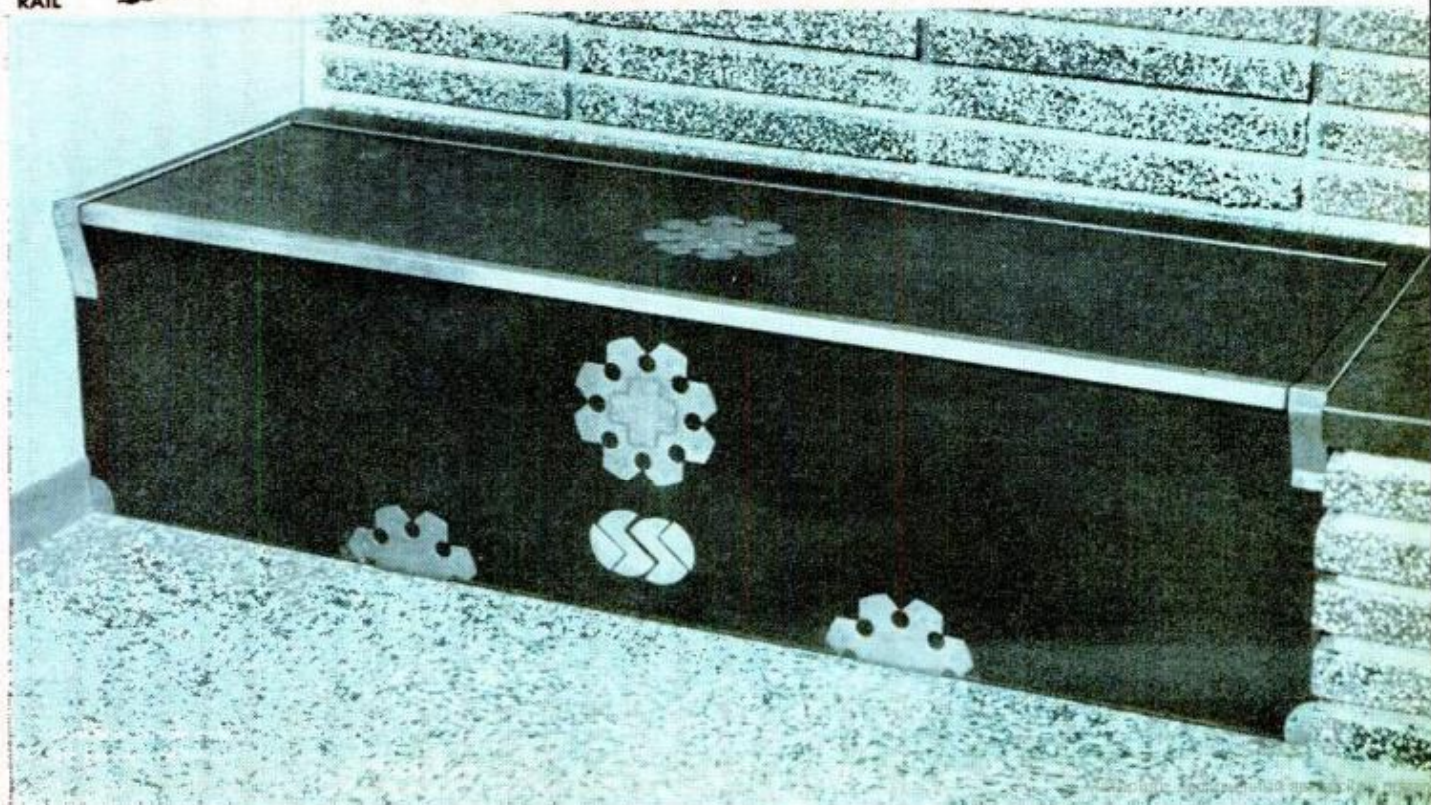
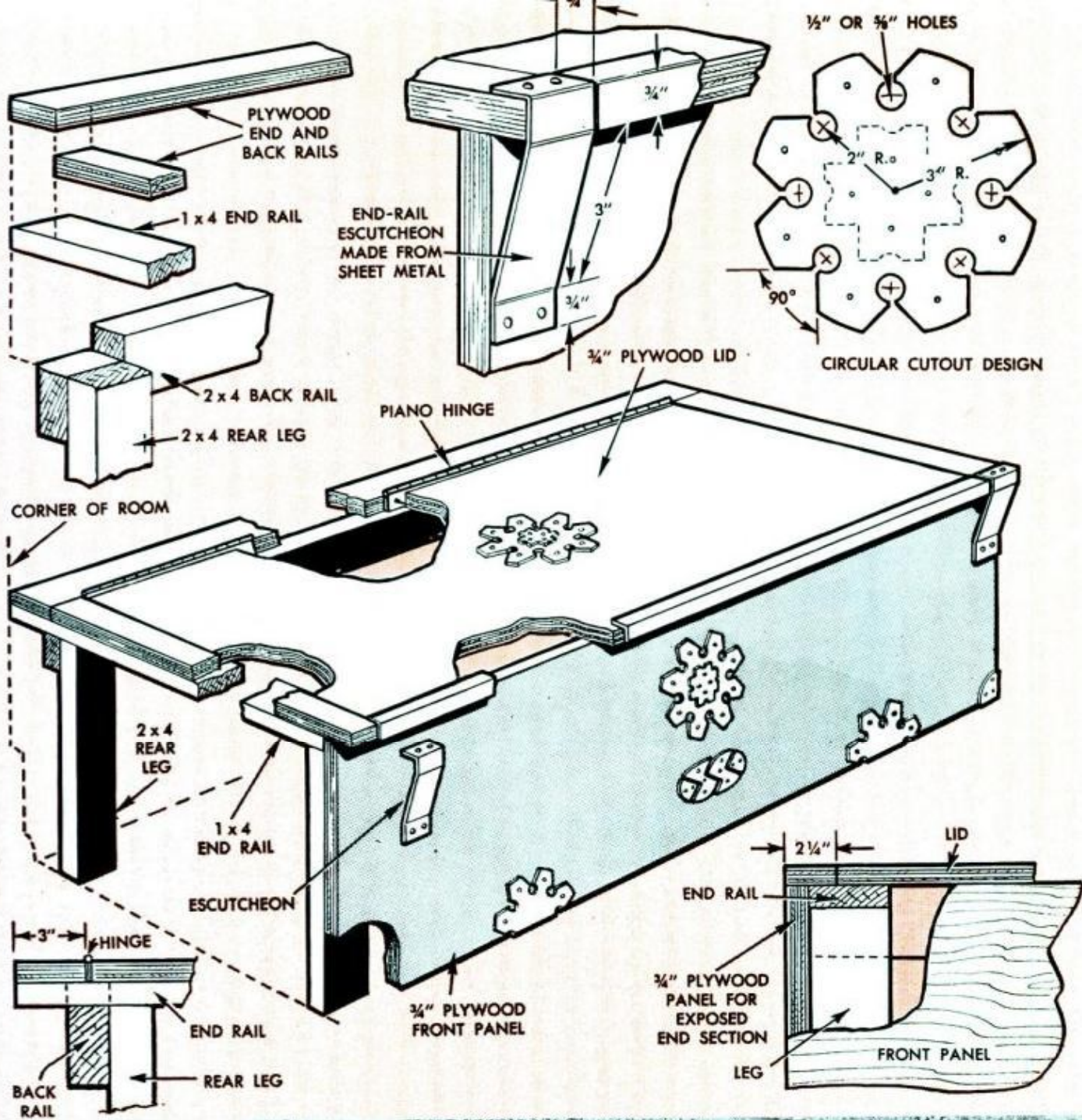


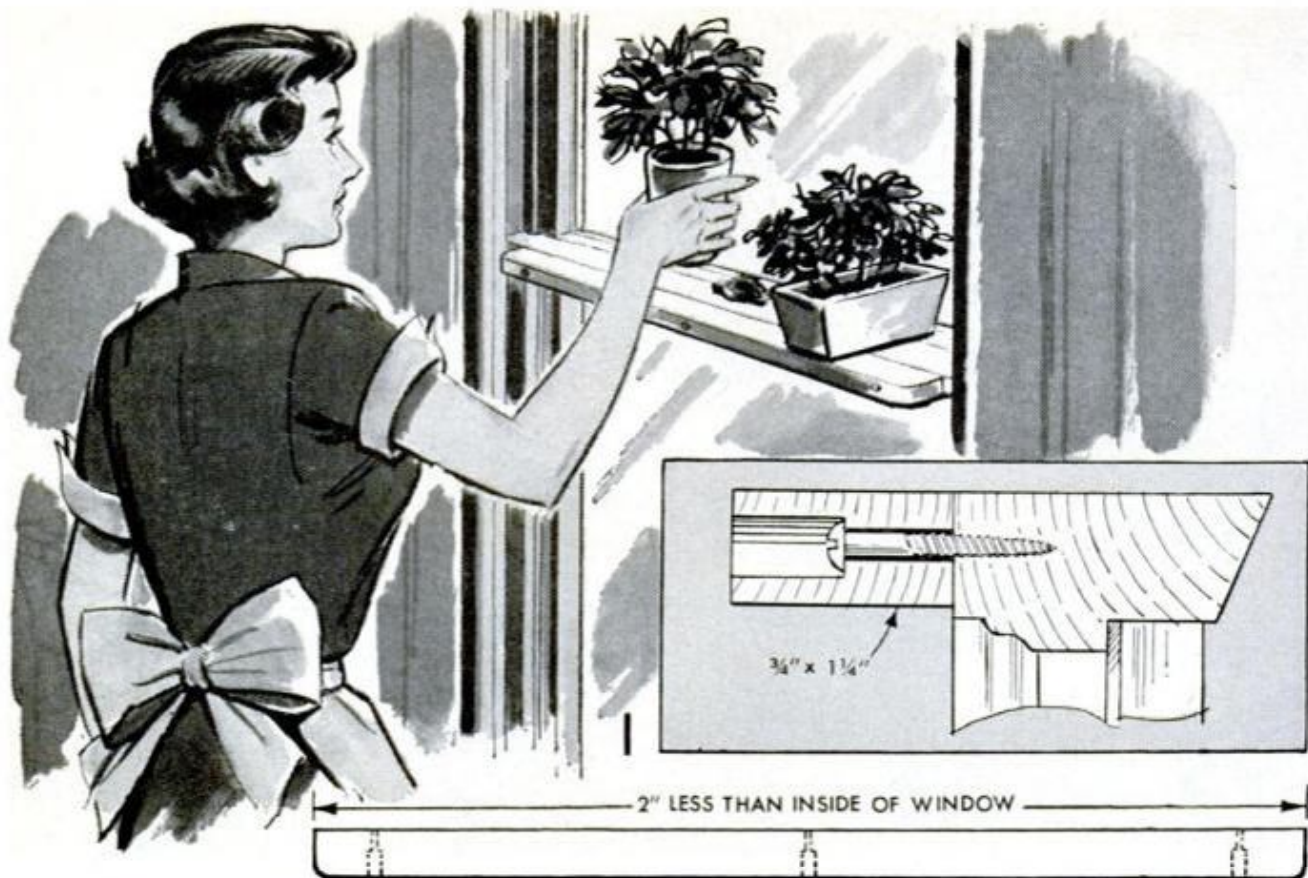
LOG-BOX BENCH

FIRELIGHT and the warmth of flickering flames go with snappy autumn days and cold winter evenings but the bits of bark, dust, splinters and other debris from the kindling and logs pose a perennial cleaning problem. This is especially true where the fireplace is of the more modern type with a raised hearth, which does not permit mere sweeping of the stuff into the fire.

Usually the traditional woodbox is the best answer to the problem. It keeps all the debris of fire tending in one place where it's out of sight and out of mind. The box can be of six-board construction, or, if the raised hearth and space permit, it can be a two-panel box like that detailed and pictured above and on the opposite page. This two-panel box was designed to fit between the wall and the end of the raised hearth and, being made with its top flush with the top of the hearth, it can serve as a comfortable bench when provided with an attached pad. Notice especially the design and placement of the metal snowflake "appliques" and the escutcheons on the top and front panel and also how the plywood-panel top is piano-hinged to a strip.

Use plywood of your choice for either the six-board box or the two-panel type. It can be fir plywood for a painted finish, or a hardwood-faced plywood for a natural wood-grain finish to match room woodwork. After applying, coat all metal decorations with clear metal lacquer to prevent tarnishing.—*Frank Stephany and Ray Buenger*





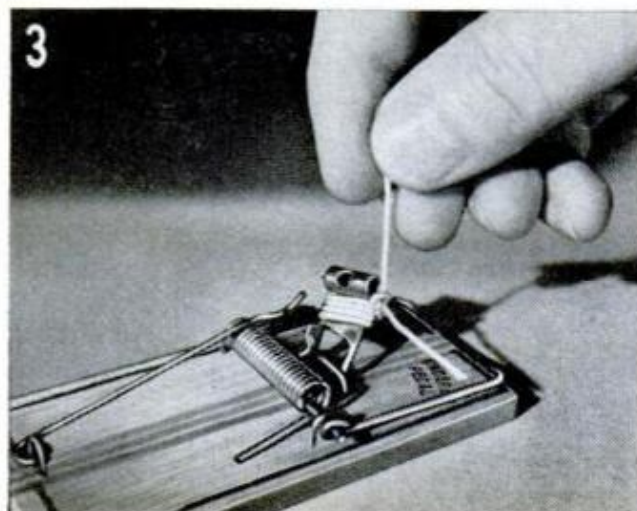
Solving HOME PROBLEMS

1. A PLACE IN THE SUN for plants during winter can be made by screwing a 1 1/4-in-wide strip to top rail of lower sash of a double-hung window. Measure width of sash and cut the strip 2 in. shorter. Attach with three screws in counterbored holes

2. USE PIPE CLEANERS instead of cord to close paper or plastic bags. Just fold top of a paper bag over pipe cleaner, two to four folds, then bend projecting ends back to lock fold. Cut cleaner in half, loop once around open end of plastic bag and twist

4. HOW MANY times have you burned your fingers trying to fish can lids out of the sterilizing water, which usually is boiling hot or nearly so. Use an ordinary magnet and you'll save time and fingers as it will lift any dome-type lid from a deep kettle

3. STRING "BAIT" catches mice every time. How? Next time you fry bacon drop an 8-in. length of cotton cord in the fat. After fat cools, wrap fat-impregnated cord several times around the trap pan and tie securely. That ends mouse-trap bait problems





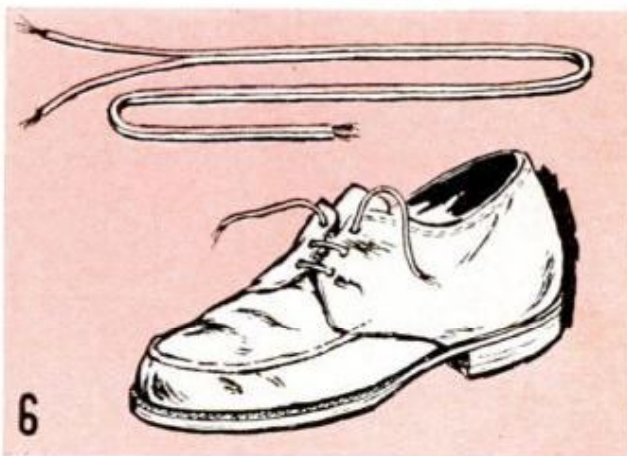
4

5. KITCHEN RECIPES are always at the ready when you hold them in a spring paper clip, or clamp, attached to a suction cup. The latter will stick to any smooth, non-porous surface such as enameled cabinet doors, anything with a porcelain finish, even crockery



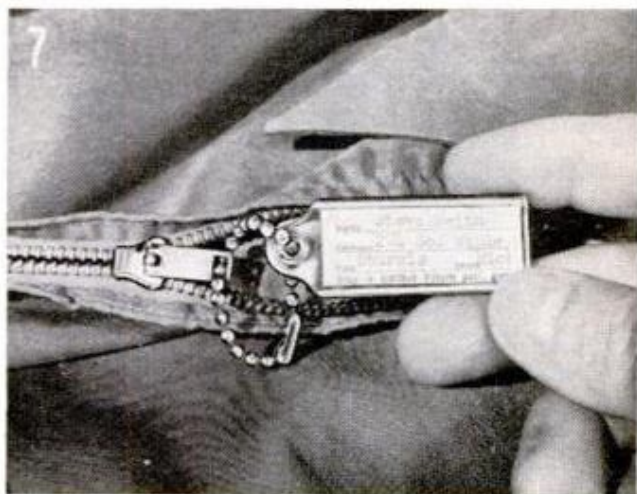
5

6. EMERGENCY SHOE LACES are easily made in a few seconds by "zipping" a length of electrical zip cord (common lamp cord) about as long as average shoe-laces. One such length makes a pair of laces that will get you to the store, or even through the day



6

7. CHAIN-TYPE key ring with identification tab attached to zipper slide makes it easier for school youngsters to grab their own garments in the 3:15 locker rush. Grownups too, can use the same idea where garment identification becomes necessary



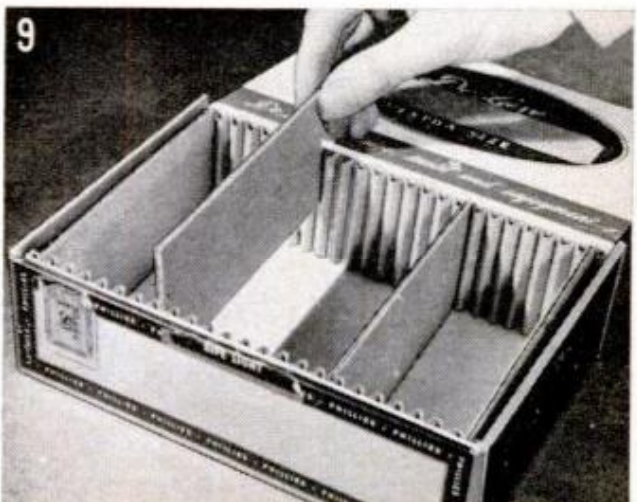
7

8. SHOE POLISHER having a lamb's-wool facing makes a good duster for that quick "lick-and-a-promise" cleaning job that must be done in minutes. It picks up the dust, it won't scratch polished surfaces, and it's easier to hold than a dust cloth

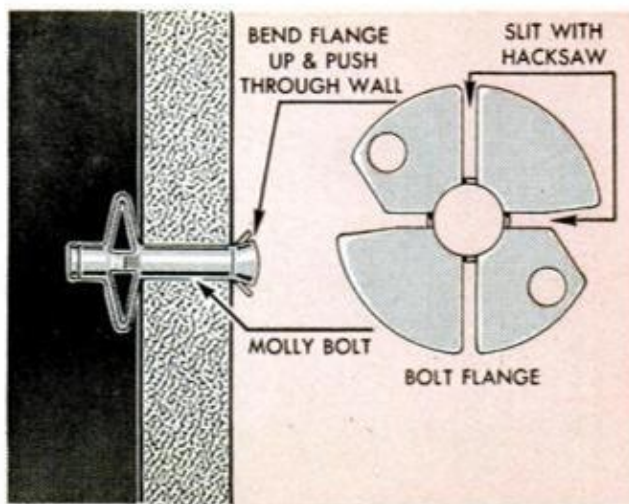
9. FITTING A SMALL BOX, such as a cigar box, with adjustable partitions, or dividers, is easy when you use cardboard for dividers and corrugated strips for adjusters. Cement latter to inside faces of sides, cut cardboard dividers to fit and there you are



8

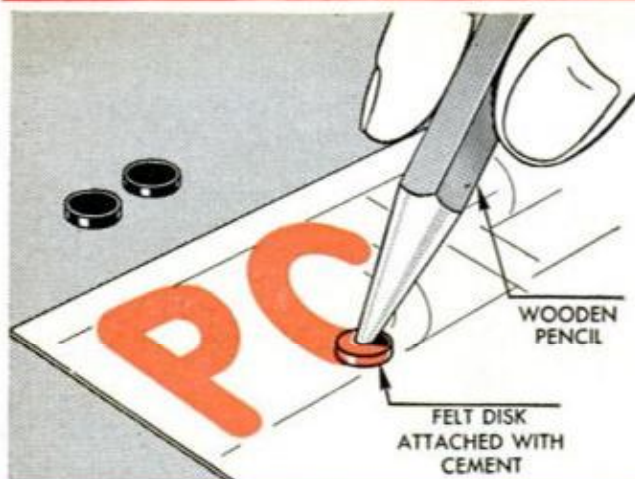


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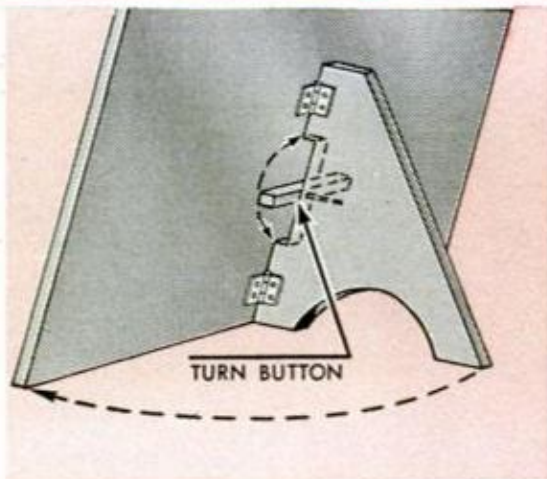
Anchor Disposal

How does one remove a wall anchor without damaging the plaster? Easy. You cross-slit the head of the insert with the blade of a hacksaw, making sure that the blade does not cut into the wall surface. The detail shows where and how to cut into the head. Then you pinch the four sections of the flange together with pliers, tap with a hammer and pin punch, or a nail, and the insert pops through its hole and down inside the wall, just like a spent razor blade. Finally, you patch the hole in the regular way, using a spackling compound.—*William B. Eagan*



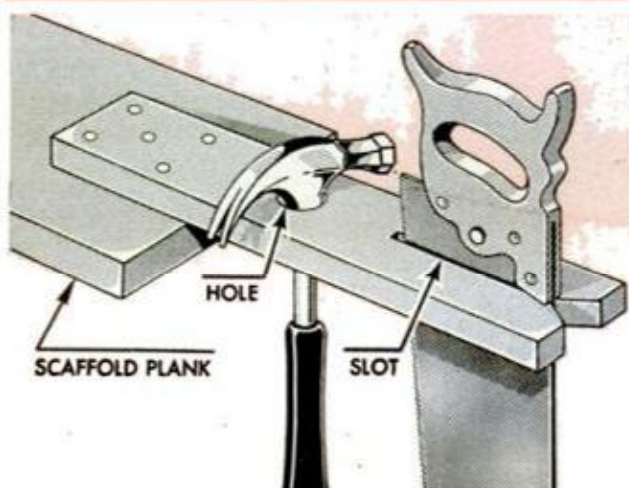
To Write Big

By cementing a round felt tip to the point of a pencil you can do a sharp job of lettering posters and addressing cartons. Sandpaper the pencil point to a slight angle, then punch disks from $\frac{1}{16}$ -in. felt with a $\frac{3}{16}$ -in. paper punch (felt from an old hat will do) and cement to the pencil point. Dip in India ink, the felt just touching the surface of the ink, and you can make neat block letters on almost any surface that will take the ink which you are using.—*Frank Shore*



Folding Easel Bracket

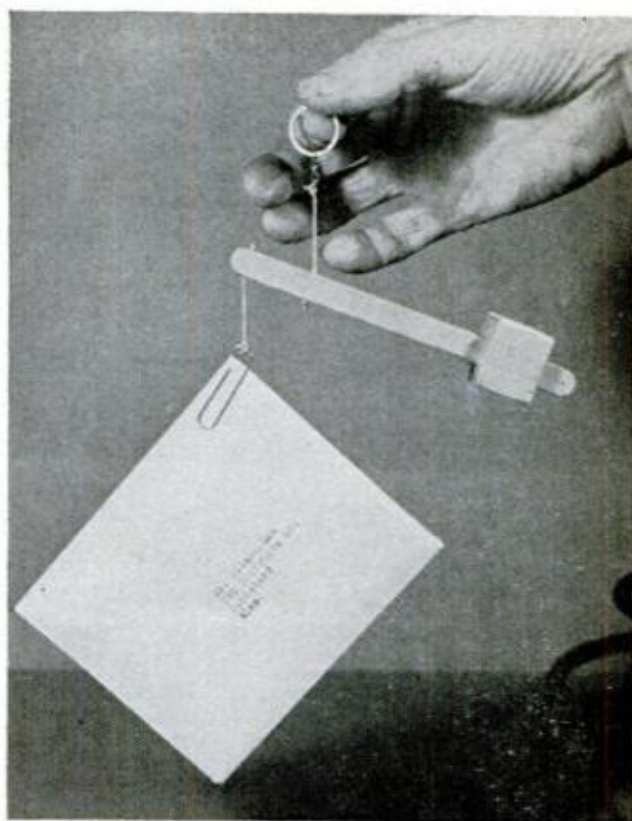
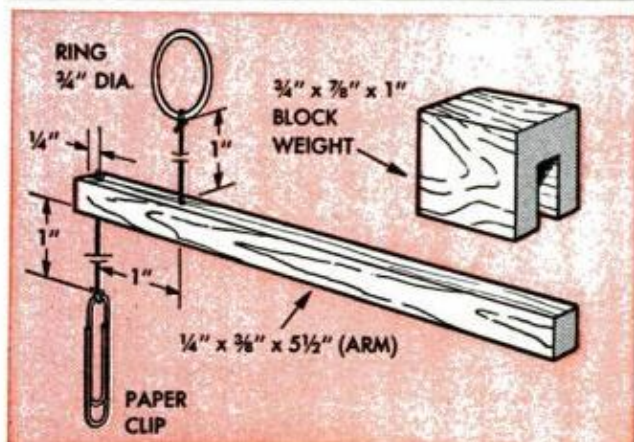
By fitting a table-top easel with a folding bracket you can store it in the minimum of space. The bracket is made of plywood, is hinged to the back of the board and supported in the open position by a long turn-button which nests in a notch in the inner edge of the bracket. When you open the bracket, the button is turned to the horizontal position as detailed. To fold the bracket you simply turn the button to the vertical position and the legs then can close.—*G. E. Hendrickson*



Scaffold Tool Rack

A hammer or saw accidentally pushed from a scaffold plank can seriously injure anyone working below. To minimize this danger one builder bores a hole and saws a slot in a short length of 1 x 4 stock and nails it to the end of the scaffold plank as indicated. When not in use either the hammer or the handsaw, or both, can be racked in a position where they cannot fall. By notching, slotting or drilling holes in the 1 x 4 in different positions, several different hand tools might be safely racked on a scaffold plank out of the way.

Stick Letter Scale Weighs To the Ounce



It works like the old-fashioned steel-yard, or huckster's balance, tells you how many stamps to put on a letter. All you need to make it are the parts shown in the detail. Use maple for wooden parts, fine fishline for the cords. Groove the block to fit snugly over the arm. To locate the block on the arm place small nails in an envelope and check combined weight to exactly one ounce. If you have no way of checking the weight accurately, take the envelope and nails to your druggist. Next, slip the envelope, with the nails, into the

paper clip, suspend by the cord and locate the block at that point where the arm balances in the horizontal position. Then spread a drop or two of glue in the groove and place the block on the arm at the pencil point. After the glue dries correct any inaccuracy by sanding off a little wood or adding a spot or two of glue to correct the balance. Once set, the scale will require no further adjustment. In weighing a letter, if the arm steadies with the block above horizontal, you'll need two stamps. If below, one stamp will do it.

Tree Planters Salvaged from Junked Washing Machines

One restaurant owner uses the tubs from junked washers to make attractive and lasting tree planters around his parking lot. After stripping of all useable parts the washer tubs are buried about half their depth, the balled specimens are planted in the tubs and the latter filled with clean soil topped with a layer of peat moss to retain moisture. The opening in the bottom provides drainage.

A clean powder puff makes a smear-proof handrest for a draftsman when working on a detailed drawing in warm weather when perspiration becomes a problem. Punch two holes through the puff at the center. Then force the loops of a short rubber band through the holes and slip loops on little finger to hold puff.



DIM YOUR



Photos courtesy Moe Light

Here's a quick review of the many ways to vary the intensity of home lighting to suit the occasion and set the mood

By Hank Stockert

COURTESY OF THE ROAD has long dictated that you dim your headlights so you won't dazzle approaching motorists. Have you ever thought of applying a similar courtesy to guests in your home? Why subject them to the blaze of light required to prepare for their arrival? Especially when it's now both easy and economical to manipulate light to create a friendlier atmosphere.

This concept applies not only to the living room serenade, demonstrated above. If you've admired the effect of gently dimming light in restaurants and theatres, you can put the same principle to work in various parts of your home. For example, if you are giving an infor-

mal dinner party, you may need bright light to set the table, but once guests are seated, you could change the glare to a candle-glow.

Likewise, when you assemble friends in the rumpus room for slides or movies, you want full illumination while you set up projector and screen, but it often seems rude to halt conversation by plunging the room into darkness for the show. With a dimmer set-up, you could prepare your audience by gradually diminishing the light. A selection of light levels is also a boon in the nursery, and for television viewing.

Dimming equipment is no longer a luxury that involves fussy installation. The

LIGHTS AT HOME, TOO

latest units will slip into your present light boxes, in place of the standard on-off switch. And most types save you money through lower power consumption and longer bulb life. You can even dim fluorescent lights with presently available equipment.

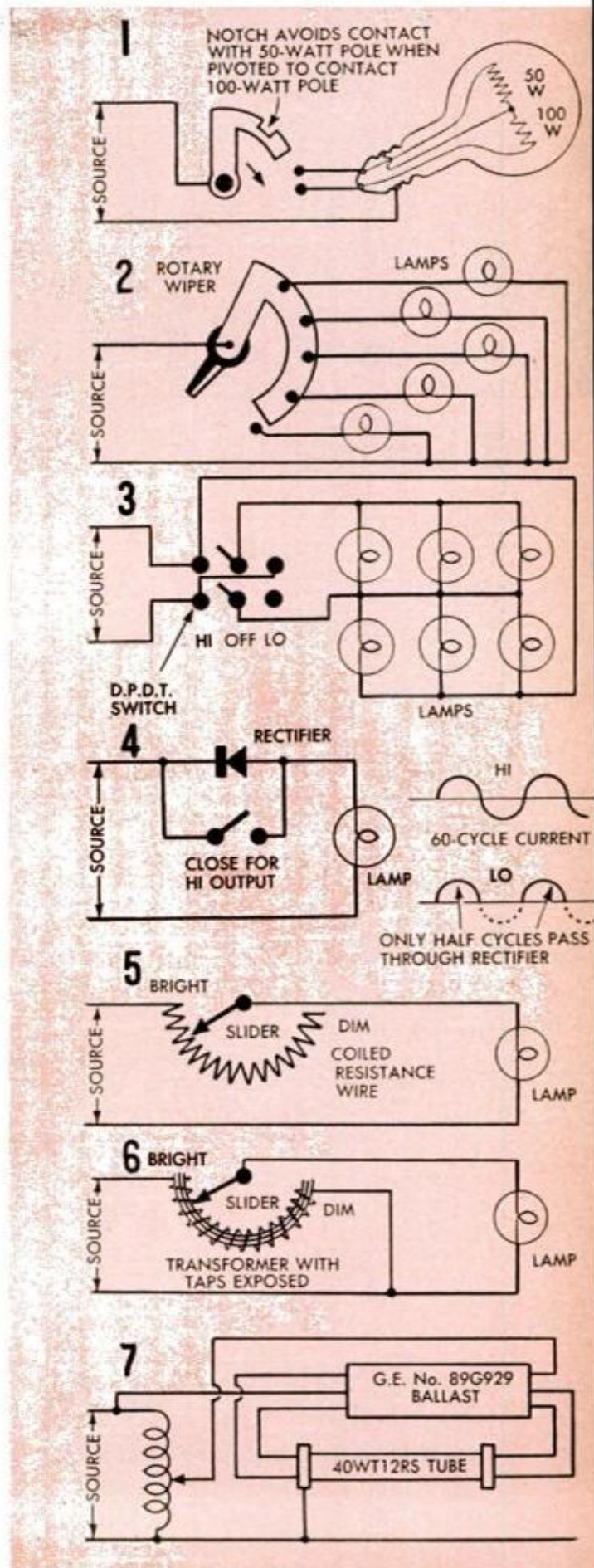
Some commercial systems are unsuited to home installations, of course. The latest types of remote-controlled, solid-state units designed for TV studios are too costly and complex. The resistance units used in theatres generate too much heat to be practical or safe for the home. But let's survey the various dimming methods you can adapt to domestic use. Numbers refer to sketches at right.

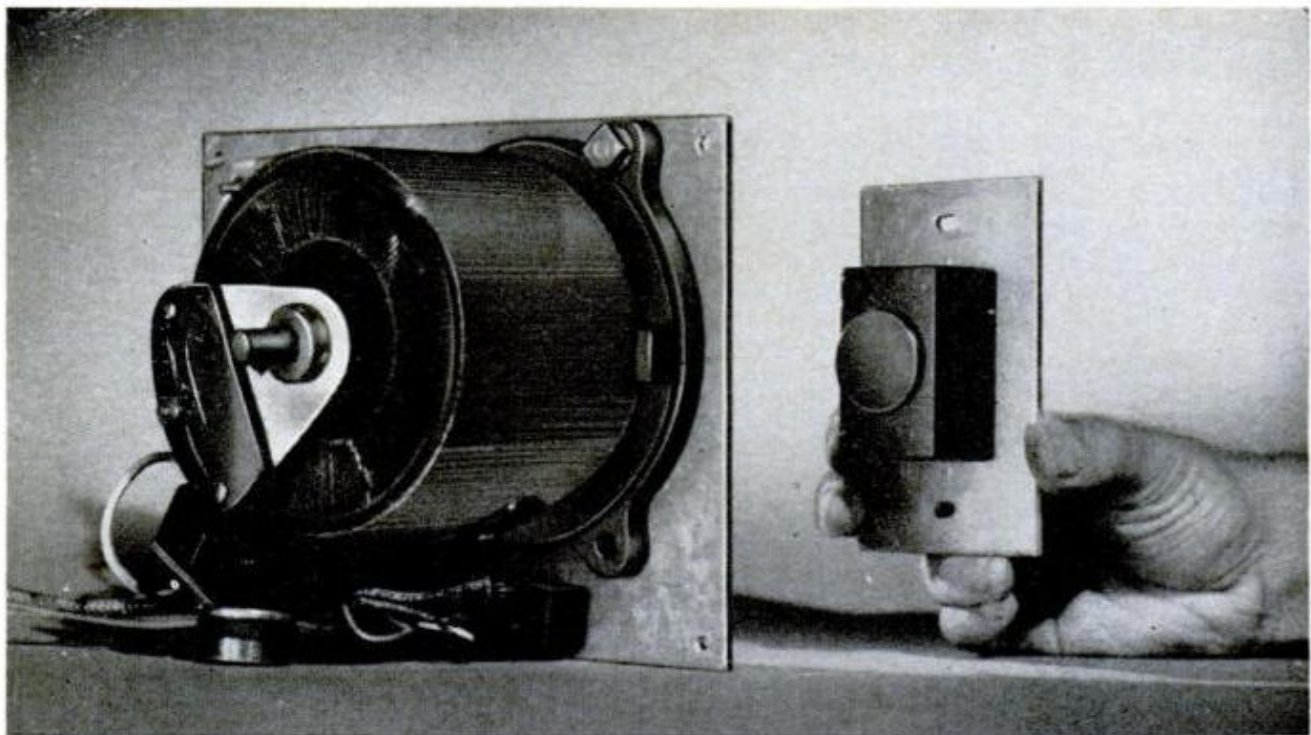
1. Your home probably already has the first type of controllable light shown—the dual-filament bulb that's found in many floor and table lamps. Three distinct levels of light are possible by providing (through a special switch and socket) electricity to either or both filaments. The bulb in the diagram offers a choice of 50, 100 or 150 watts.

2. A variation on this first system may be of more value to you. A multiple-poled rotary switch lets a special wiper progressively supply electricity to more and more small separate bulbs. The problem is to devise a practical housing for the number of bulbs you want, since each requires a separately-wired socket.

3. Amateur photographers will find that a circuit like this will extend the life of photoflood bulbs. Throwing the center off-switch one way gives you a series hookup in which each bulb burns at about one-third its normal output—providing plenty of light for set-ups and focusing. When you're ready to shoot, flip the switch to the opposite side for a parallel hookup that gives you normal output from all bulbs. This system works only when each branch has equal total wattage. If you tried to use a 7-watt night light in one branch and a 100-watt bulb in the other, you'd find that the big bulb simply went out in the "low" (series) hookup, while the other burned normally.

4. One of the newer methods of home light control is a three-position wall switch that directly replaces your current toggle switches. Containing a miniature silicon-controlled rectifier, this switch, in the low position, only passes every other half-cycle of your 60-cycle



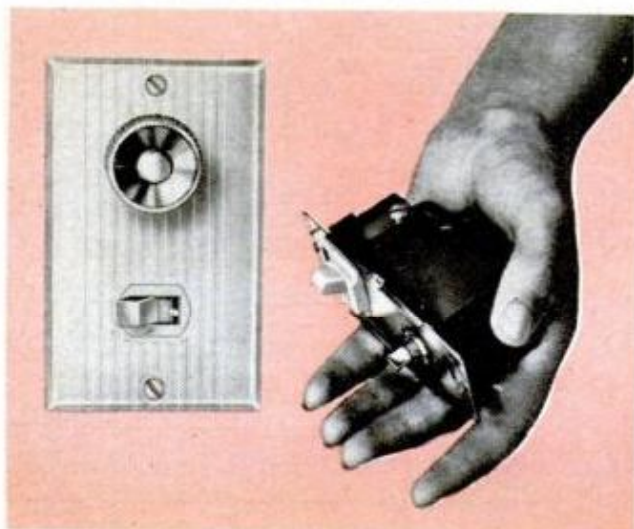


MODERN MINIATURIZATION shrinks dimmer controls to compact size. Auto-transformer at left and solid-state dimmer held at right have nearly same capacity (about 600 watts). Former, while it uses less juice, is often a problem to enclose within wall of conventional thickness. Latter slips into existing switch box

current. Since the bulb is literally "turned off" half the time, it gives only about 30 to 40 percent of its normal light. A second position of the switch disconnects the rectifier and supplies current in the normal manner. While this system offers you a choice of only two light levels, it can be used with any number or combination of incandescent bulbs up to its rated capacity. Typical units handle 300 to 500 watts.

The dimming methods discussed so far have one disadvantage in common: they only give a specific number of light levels in distinct steps. Now, let's vary light smoothly from full-bright to off.

ON-OFF SWITCH, built into this 500-watt incandescent dimmer by Thomas Industries, lets you shut light off without disturbing dial setting. This saves readjusting light level next time you switch it on



Resistance dimmers have been around a long time. Earliest types had a lot in common with a pickle barrel. They were, in fact, brine-filled wooden barrels into which two metal plates were lowered. One plate was connected to the current source, the other to the load of lights. As the plates descended, their surface areas within the brine increased, and a proportionately increasing amount of electricity could pass between them. This crude system did the job, but the shock hazard of the brine—and the fuss of maintaining the brine level—led to the adoption of "dry" resistance units. These took the form of a king-size radio volume control, with a sliding contact moving along a length of coiled resistance wire.

5. In the simplest of these units, bulbs wired to the slider can be dimmed from full output (with the slider resting on the end of the coil that's connected to the current source) to off (when the resistance in the circuit is so high it doesn't pass enough electricity to heat the bulb's filament). The following chart lists typical values of resistance and current ratings for home-sized dimmers:

LAMP WATTAGE	DIMMER RESISTANCE	DIMMER CAPACITY
7	5500 ohms	.06 amps.
25	1450 "	.23 "
60	600 "	.55 "
75	500 "	.68 "
100	360 "	.91 "
150	250 "	1.36 "
300	175 "	2.73 "
500	75 "	4.5 "

Aside from the waste of electricity suggested by these figures, such resistor units aren't very practical for the home since this waste must be carried away in the form of heat. Well-ventilated, fire-proof enclosures are a must.

6. This system evolved from the resistance dimmer. But instead of moving along a resistance bank, the slide moves along the coils of wire in a transformer. This results in a voltage that can be tapped from the transformer at any value from zero to (in most variable transformers) about 30 percent above normal line voltage. Since these transformers are designed for maximum efficiency, they draw only slightly more current than the lamps actually use. Typical units waste as little as 5 to 12 watts of current in their lowest position, allowing them to be hooked up all the time.

These variable auto-transformers are available in sizes to handle from 100

(Please turn to page 218)

A PM PREDICTION

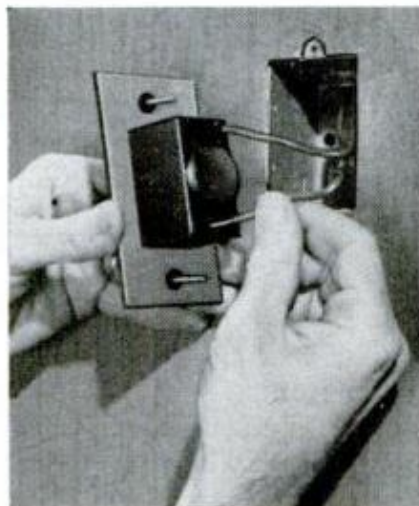
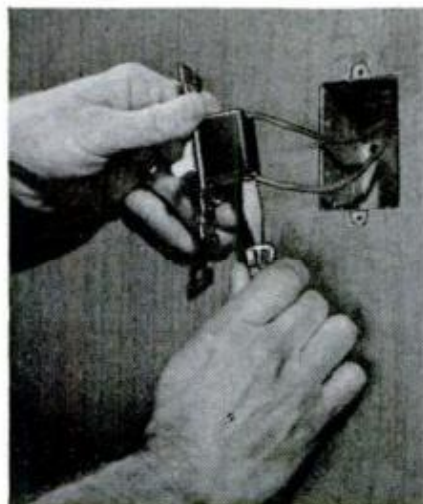
The next application of full-range household dimmers may be to make them automatic by coupling SCRs and electric eyes. As daylight faded within your home, lamps would turn on and gradually increase in brightness, maintaining any pre-set level of illumination. For Night People, lamps would dim to off as dawn made artificial light unnecessary. This would also eliminate awkward moments on overcast days when you now must keep adjusting *inside* lights to compensate for the change in *outside* light. And even when you're absent, any house lights you've pre-set will creep on at dusk, glow protectively through the night, and expire at dawn. Some electronic genius may be perfecting this now.



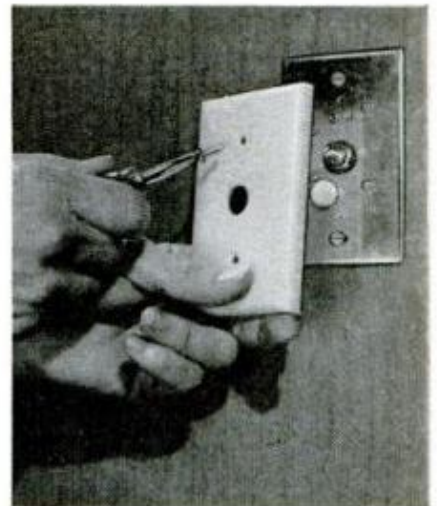
3 QUICK STEPS

from this ...

STANDARD SINGLE-POLE SWITCH above is attached with only two wires—one connected to hot side of line, the other running to light fixture. With power off, loosen terminal screws as shown below



ATTACH SAME WIRES to dimmer switch. Type shown has convenient push-in terminals. Insulation must be stripped to depth indicated by guide molded into the side of the dimmer



ADD SWITCH PLATE, press control knob in place, and the job's done. Screwdriver is only tool needed

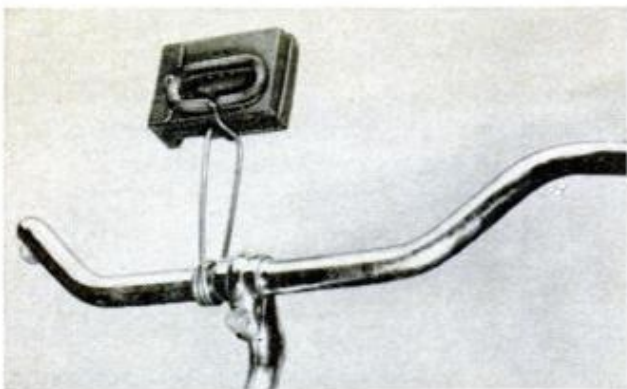
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Neat Fillet

A stick from an ice-cream bar makes the perfect tool for forming a fillet in the mastic you use for filling the opening between the bathtub and the edge of the wall tile. Run the mastic into the opening and then stroke the material with the rounded end of the stick, using uniform pressure and a steady sweep of the stick so that you get a fillet of the same contour along the length and across the width of the tub. Clean up excess mastic.—*Joseph Federico*



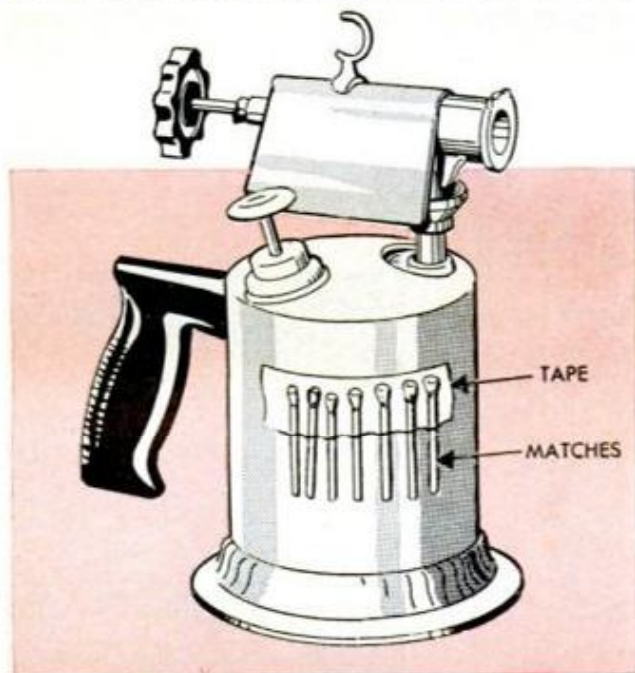
Music While You Pedal

A spring clamp from a photo reflector makes a perfect mounting bracket for carrying a pocket-size transistor radio on your bicycle. The coiled spring is just large enough to slide easily over the handlebar. However, when the radio is inserted in the clamp, this tightens the spring enough to hold it firmly in position. Also, the spring action will absorb much of the impact from bumps, thus protecting the radio from excessive vibration.



Inside-Out Flower Pot

An old auto tire, with one bead cut away and the edge notched, makes the novel flower pot pictured. First you remove one bead by cutting through the casing all the way around just back of the bead. Then you V-notch the edge, taking care to get the notches spaced uniformly and cut to a depth of about 3 in. Then turn the tire inside out, join two 1 x 10s with corrugated fasteners, saw to about 18 in. diameter and nail to the tire on the bead side to form a bottom. Drill two or three holes in the bottom for drainage.—*Harold R. Brazelton, Sr.*

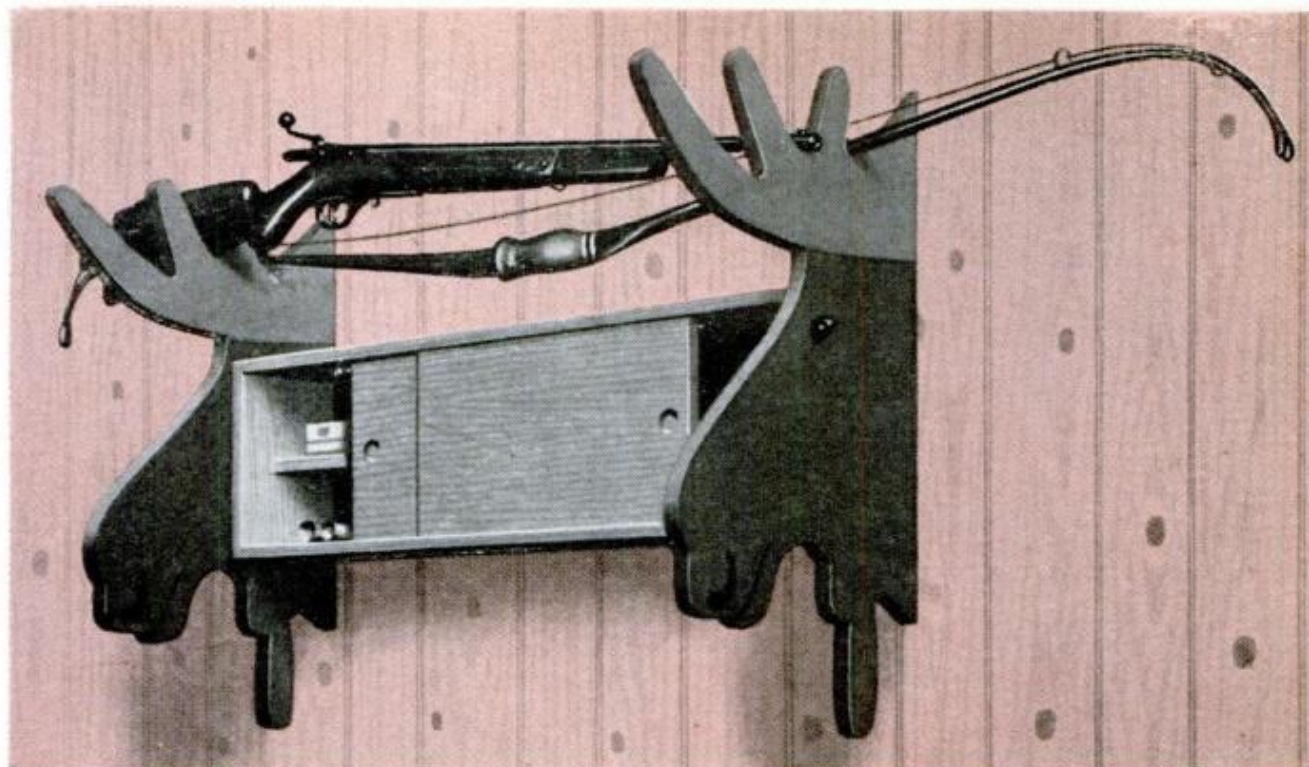


Spare Matches

You're on a new job, you don't smoke, you're ready to light your blowtorch and you discover you have no matches! That means a trip home, back to the shop, or to the nearest neighbor for a light, unless, of course, you thought beforehand to tape a half dozen or more matches to the torch.

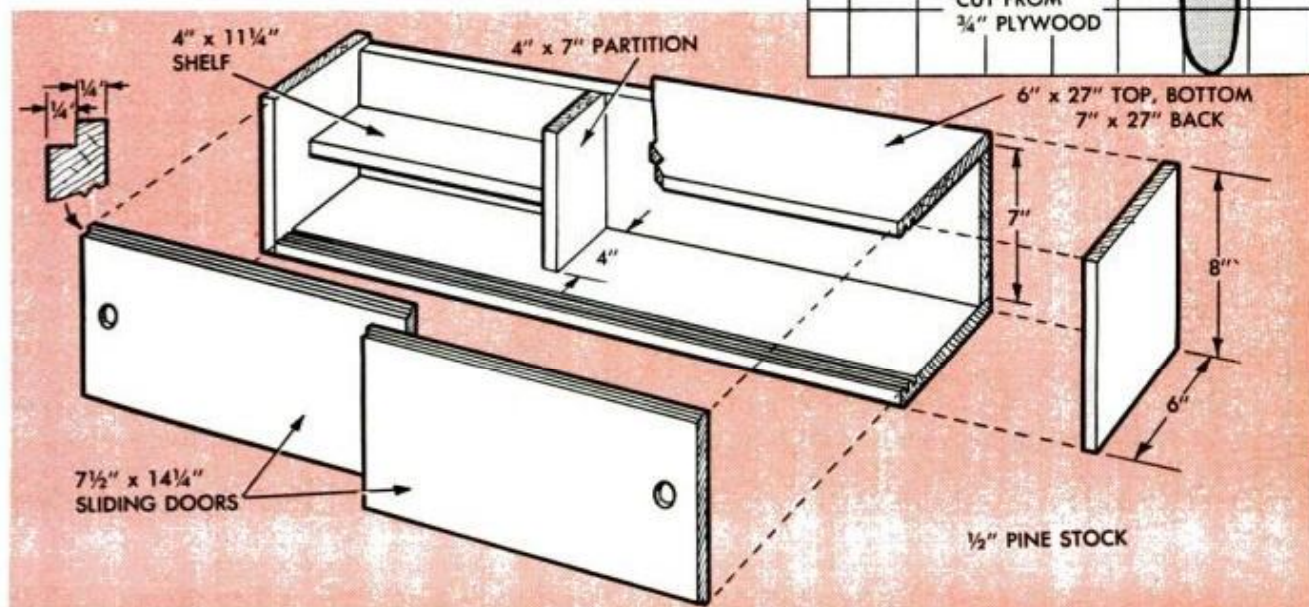
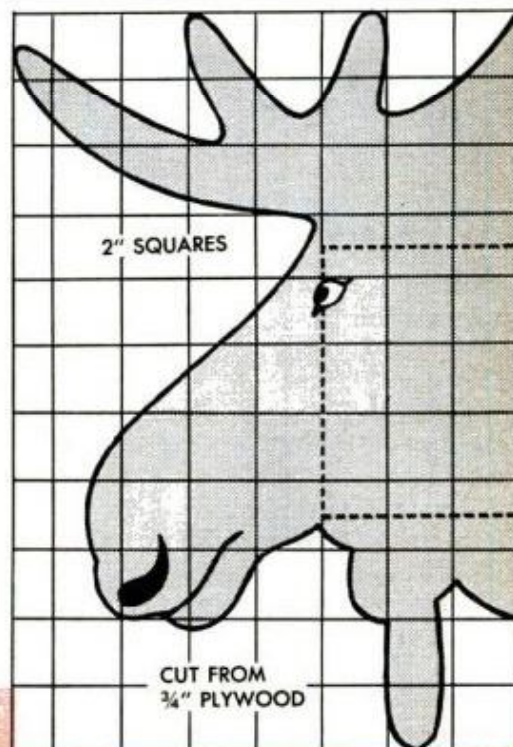
If you're heating something, a part of which hangs below the nozzle and gets pretty hot, there's a chance that the reflected heat might ignite the matches when placed in the position shown. To eliminate this possibility, tape the matches around on the back.—*G. E. Hendrickson*

If you think that only alcohol will clean your shellac brush, you'll be surprised how quickly hot water and detergent will do the trick in a pinch. You will find this a good thing to remember when you run out of alcohol.—*Arthur Shults*



GUN AND BOW RACK

An appropriate project for the hunter-craftsman, this combination cabinet-rack provides storage for a large bow, a rifle and ammunition. After cutting the pieces to size, dado two $\frac{1}{4}$ -in. grooves, $\frac{3}{8}$ in. apart, in the top and bottom pieces, running the front grooves $\frac{3}{8}$ in. in from the front edges. Cut $\frac{1}{4}$ -in. rabbets along the top and bottom edges of the doors so they'll slide easily in the grooves. Remember to install the doors before adding the second end panel. Make a full-size pattern of the moose head for tracing on your plywood. Both cutouts can be sawed out at one time with a band-saw. Assemble the cabinet with glue and screws, then sand and paint. Add the cutouts last, after painting both sides, and fasten to the cabinet with screws driven from the inside.—Dale Rudolph





ICE FLIES FOR PANFISH JIGGING

By Don Shiner

THE SIGHT OF THAT PASSEL of perch above should be more than enough to move any fisherman from the warm comfort of his fireside into the knife-sharp cold of a mid-winter day. The *really* "Compleat Angler" doesn't let the first freeze end his season. There's plenty of sport—and good eating—waiting under the ice.

You get the best of both with jigging—a technique of ice fishing that calls for a weighted fly you can easily make yourself. Dangled through a hole in the ice, this fly is irresistible to hungry panfish. Study that top picture again: those perch are all about the same age and from the same school, caught through a series of holes in the ice of a shallow lake by a fisherman jigging a homemade fly. Who wouldn't settle for such a catch on a late winter afternoon? Spread atop the ice like this, they'll freeze solid in minutes and stay fresh for days.

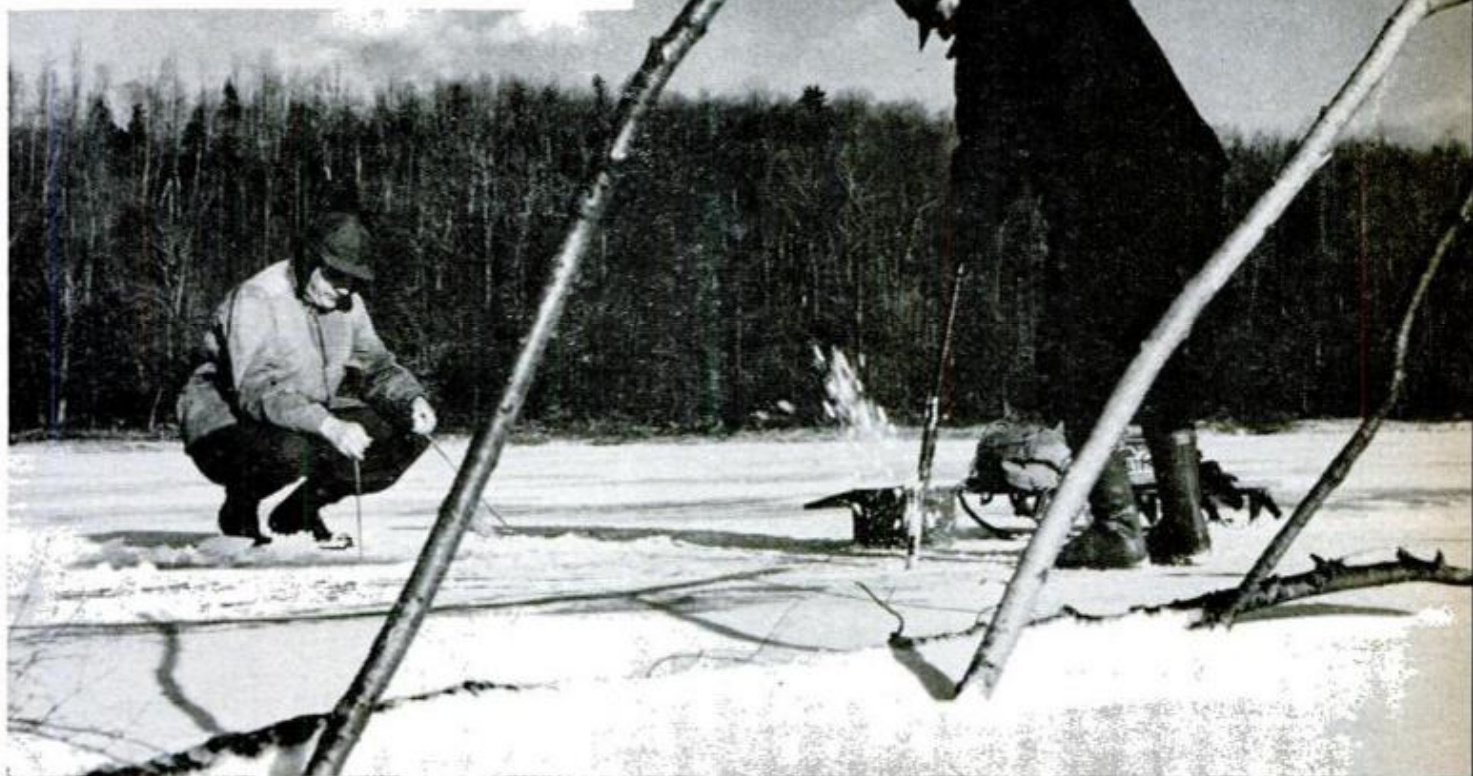
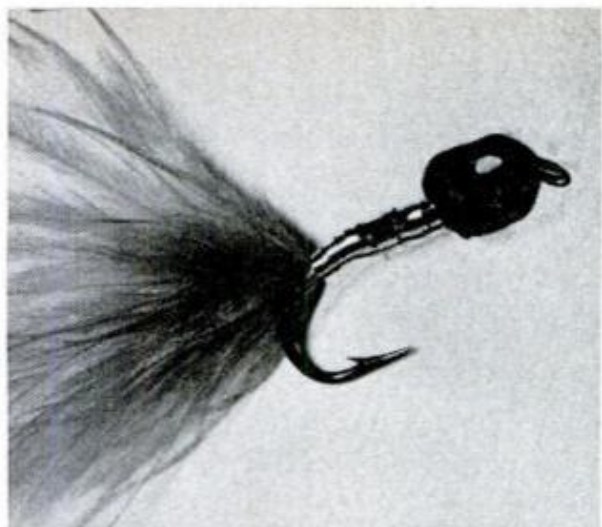
The fly on the next page is styled especially for ice jigging and is built up on a No. 8 to 10 hook for perch, a No. 12 to 14 for bluegills—or, if you like, choose your own size. A split lead shot, or sinker, sized to suit the hook, serves a twofold purpose, that of a head for the "bug" and a weight to carry the fly down to a point near the bottom of the lake. It's crimped around the windings just below the eye of the hook as you'll see in the photos on

the following pages. The body is made from bright tinsel or wool yarn and you use a gather of bucktail or long, soft marabou feathers for a tail. The latter are especially effective in attracting panfish due to the wriggly, "swimming" action in water. Soft fur can be tied in with the marabou plumage for a greater degree of realism. When tinsel is used for the body of the fly it should be coated with a clear lacquer to prevent tarnishing. The materials used to make an ice fly should be brightly colored, to show up in dark water beneath snow-covered ice.

This weighted fly can be jigged on a hand-held line but when the line is tied to a section of a fly or bait rod one can achieve somewhat better action and surer control. You can use the tip section of a fly rod but you may prefer the butt section of either a fly or bait rod, with the reel mounted. Or, use a short bait rod with reel so that you can easily adjust the line to jig the fly at varying depths. Some will prefer the rod because they like the sure feel of it and the springy rebound of the tip when a fish strikes.

A sharp spud or ice chisel is, of course, essential to any type of winter fishing. Attach a looped rope to the handle to prevent the chisel from slipping away through the hole. You'll save sweat if your chisel is razor sharp.

Where to fish a fly under the ice? You



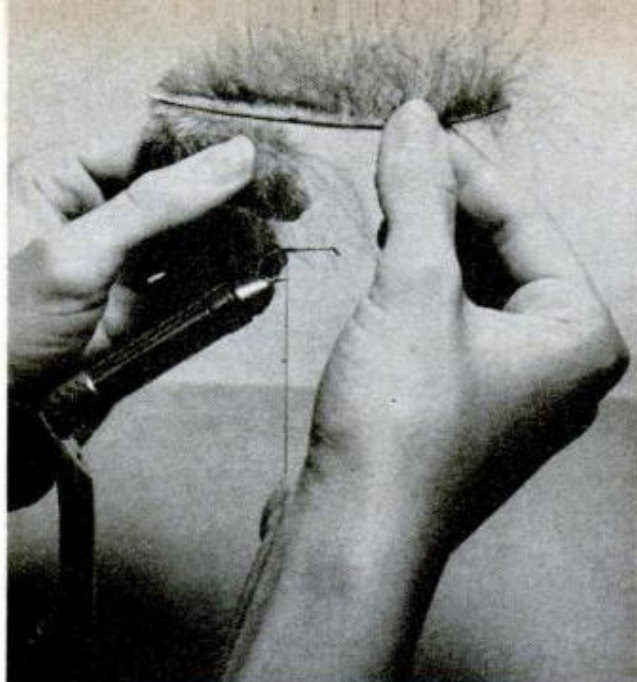
BUNDLED ANGLER on the left is jigging a special fly (inset and following pages) through a hole chopped in the ice with a chisel, as at right. Pole rig in foreground will be covered with canvas if wind comes up

are likely to know best about that, especially if you've fished the lake or pond in summer. You will know the whereabouts of the weed beds, stumps, logs, shoals and coves, the mouth of the brook or river that feeds the pond or lake.

Everything you knew about during the open-water summer fishing season is there, under the ice. And where you found the schools of panfish—the perch, sunfish, bluegills—in sunny June, there they are quite as likely to be found, fly-hungry, during a frigid February. Even so, one should keep in mind that the rules don't always hold. During the exceptional winter with thicker-than-usual ice, or shallow water due to drought conditions, the fish may light out for the deepest hole in the lake and stay there. But perch, for example, are almost always on the

move. One bright day you may pull them through the ice over a shallow, weedy cove; when you hopefully return to that same hole the next day, there's nothing to draw the slack out of the line.

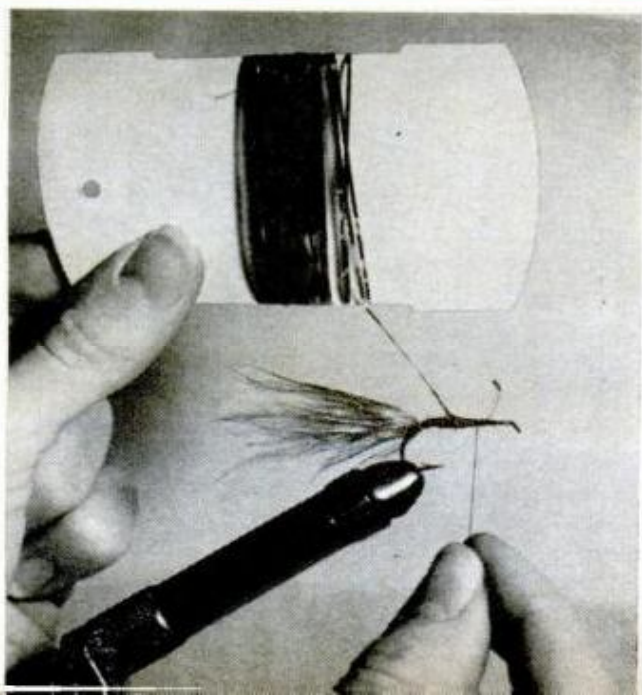
So, you bring a little strategy to bear. You chip several holes through the ice—a row of them zigzagging clear across the lake if it's a small one—and jig a snow fly in each one successively until you locate a feeding school, then work it until you have a fish fry, or the limit in your state. By chipping a number of holes, over the weed beds and the deep places, you favor luck in proportion. And you keep nearly warm enough until the wind finally cuts through your wardrobe (you should be wearing as much of it as possible). Now turn the page for more ice-fly tying—and using—tips.



HERE'S FIRST STEP in tying an ice fly. Catch hook in jaws of any small vise and tie a length of waxed thread to shank of hook. Use a length of marabou plumage (or bucktail feather) for the tail, stripping from the quill a section that will form a long, wavy plume. You can add a small gather of soft fur if you wish. Fur and plume should be light-colored for visibility, since water under heavy ice is dark

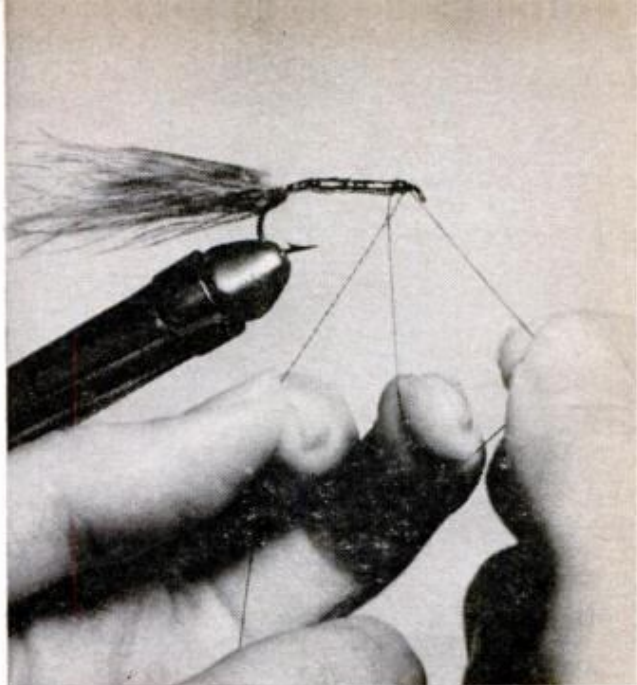


NEXT STEP is to wind the waxed thread around the feather tail, which has been gathered into single plume and placed on the shank of the hook. Don't wind turns on top of one another, but space them tightly side-by-side. A drop of shellac, placed on the hook shank and spread into a thin film, helps to hold the tail gather during the winding operation, but this is an optional matter of convenience



NOW WIND ON TINSEL strip to form body of the bug. First, tie one end to the shank and hold thread free with a downward tug, as shown. Use same care in winding the tinsel as you did when lashing the tail. Keep turns uniform—don't let them pile up. Wrap entire shank of hook. On subsequent flies, experiment with other materials for body—such as brightly-colored wool yarn or piece of chenille

END TINSEL WINDING at the eye of the hook, and lash the free end securely in place by knotting the thread to prevent unwinding. At this point, apply one or two coats of clear lacquer to preserve the glitter from tarnish. Take care not to brush any onto the plume. Keep windings at eye end very tight to provide a firm seat for the lead-sinker head so you won't shake it loose with vigorous jigging

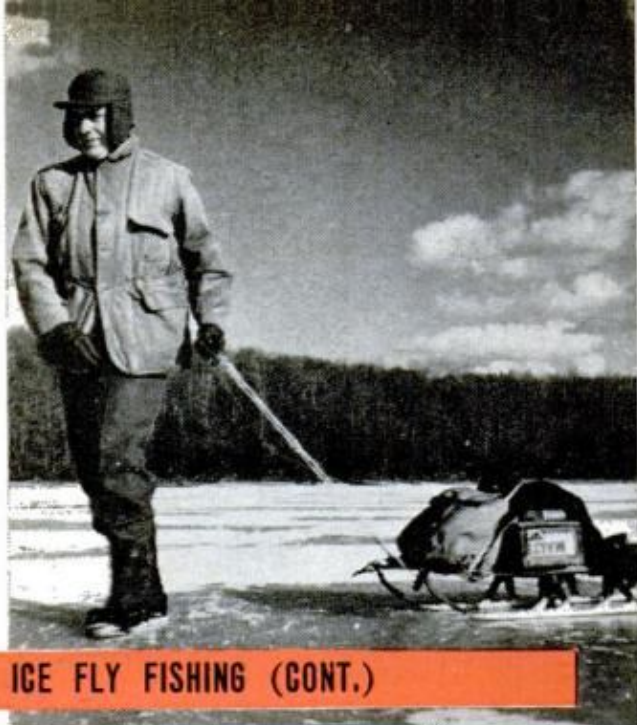


SPREAD SPLIT-SHOT SINKER and place over shank of hook just below the eye. Make sure that tinsel-wound shank is seated firmly in notch of sinker, then snip off winding thread near knot, and tuck loose end back into notch in sinker. Crimp sinker tight with pliers, but don't flatten it too much. Choice of shot size depends on size of hook, but notch must be deep enough to close around shank



LAST BUG-MAKING STEP is to paint the shot head a bright color to improve visibility. One good pattern for bluegills and perch would be yellow tail, silver body, and red head. In deep, dark waters, a white tail and head on a silver body is sure to be seen. Fingernail polish can be used for all finishing—natural (clear) to coat the body, red for the head—or use any heavy-bodied finishing lacquer





ICE FLY FISHING (CONT.)

SLED TAKES A LOAD off your back transporting gear to and from the fishing holes. Tie on boxes of flies, lines, rods, ice chisel—and your lunch. Maybe you'll need it to fetch home the day's catch as well



EVEN THIN ICE yields quickly to the sharp edge of a spud or ice chisel. Cord attached to upper end should be looped around fisherman's wrist so chisel can be retrieved if it should slip through the hole

TIPS ON JIGGING WITH FLIES

The art of jigging a fly under the ice is something only experience and the response of the fish can teach you. The fish, after all, make the rules.

Normally you drop the fly through the hole in the ice and pay out line until it comes to rest on the bottom of the weed bed. Then you raise it 4 to 8 in. and give it an easy, undulating motion by raising and lowering the line 2 to 4 in. This causes a fair imitation of the darting nymphs and playful minnows panfish feed on.

No luck? After a few minutes at one

ATTACH ICE FLY to thin leader, leader to section of rod. Drop fly through hole and jiggle it slowly. With luck, you'll soon feel sharp rap as perch or sunnie grabs fly. Set hook and haul up your prize

hole—don't wait too long or the day will be gone—move on to the next and go through the same pantomime. You know they're down there—somewhere—and it's a rare fish that's not fly-hungry in winter.

When you know you're over one of the deeps of the lake, try fishing the fly at different levels—way down at first, then at varying levels right up close to the ice where the fish are almost within grasp.

When you've fished all the holes without raising a fin, don't give up. On your next round you may hit a moving school.

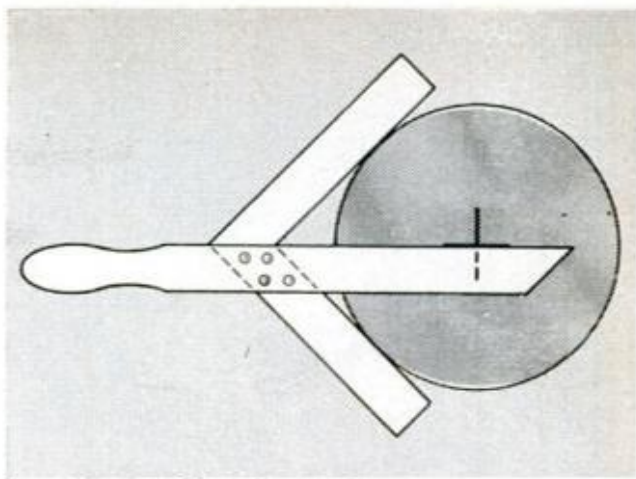
KEEP 'EM ALIVE by cutting a shallow basin in ice with small hole through at one end to let water seep up. Skimmer is used to remove slush from hole. On cold day skim ice from the hole every few minutes



SHOP SHORT CUTS

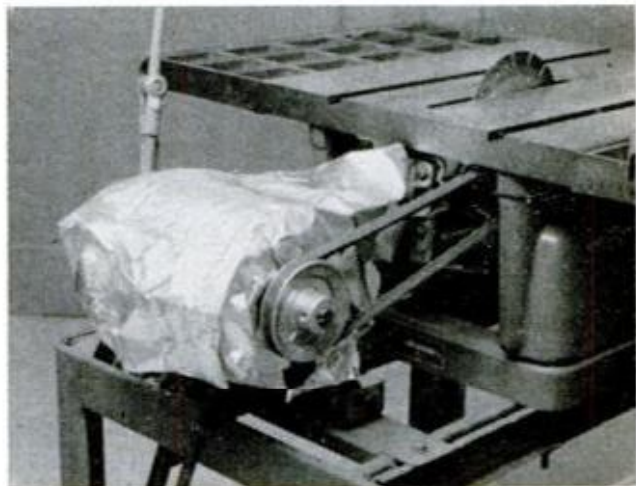
Center Square for Round Stock

You can locate the center of a disk or piece of round stock in seconds with this home-made center square. To make it, rivet a steel rule to a metal try square so that it bisects the right angle, as shown. Slip the stock into the try square and scribe a line along the rule, then rotate the square about 90 deg. and scribe another line. The intersection will be the center.—*Federico Strasser*



Protect Motors from Metal Dust

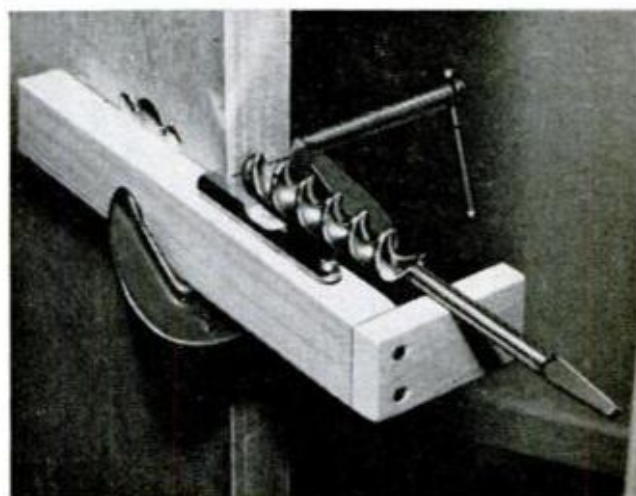
When using an abrasive cut-off wheel on your table saw, there is a danger that fine particles of metal may find their way into your motor and cause serious damage. While trying to solve this problem, one craftsman discovered that aluminum foil makes a perfect motor cover which effectively keeps out metal dust. Use the widest foil available and press it tightly around the motor. You can use the same technique to cover the ways of a lathe when grinding.—*R. J. Phillips*



Bit Cradle for Lock Boring

Drilling the latch hole accurately in the edge of a door when installing a cylinder lock can be a problem for the do-it-yourselfer inasmuch as the hole not only must be deep, but both level and parallel with the face of the door. This L-shaped jig, fitted with a bubble level, will simplify the job. Made from a scrap of 1 x 2, the short end of the jig has a 3/8-in. V-notch centered with the thickness of the door to cradle the shank of the wood bit.

In use, bore the hole for the lock cylinder first, then clamp the jig to the door with a C-clamp.—*Robert Micals*



Soldering-Gun Holster

Your soldering gun will always be ready for action if you can coax junior into parting with a toy gun holster and nail it to the end of your workbench. Use only when the gun is cool.—*James Yager*

Rattling of a door caused by a loose fit of the latch in the strike plate can be silenced by inserting two pencil erasers in the door stop. Force the erasers tightly into holes drilled in the stop and shave off the tips until the door closes properly and noiselessly.—*Ted Pankowski*

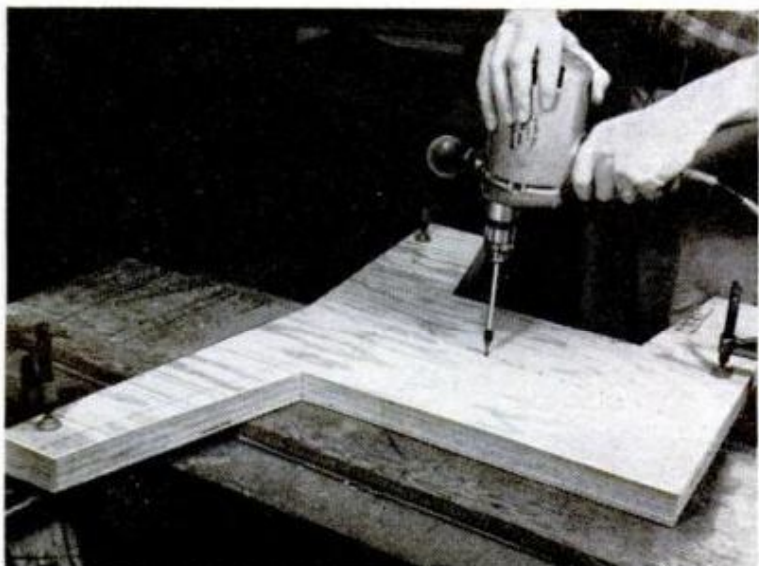




FOUR-HOUR STRING CHAIR

Sturdy, lightweight and comfortable. Seat and back are strung with easy-to-obtain plastic clothesline

By Jerry Parker



NEEED AN EXTRA CHAIR for the recreation room, TV room or the patio? Here's one that is about as simple as could be and you can easily put it together in an evening.

First, make a full-size pattern for the sides from the drawing on the opposite page. Then trace it on a 3 x 4-ft. panel of $\frac{3}{4}$ -in. fir plywood, and mark the locations of the holes for the 1-in. dowel stretchers and the cord. By inverting and nesting the pattern, both sides of the chair, as well as the arms, can be sawed from the one panel with a minimum of waste. If your shop is equipped with a bandsaw, you can probably cut both sides at once, but if you're using a portable saber saw or hand saw, cut one side at a time.

After cutting out the sides, clamp them together and drill $\frac{1}{4}$ -in. threading holes for the plastic clothesline. These holes should be countersunk slightly on both sides. Next, drill 1-in. blind holes for the five dowel stretchers, $\frac{1}{4}$ -in. deep.

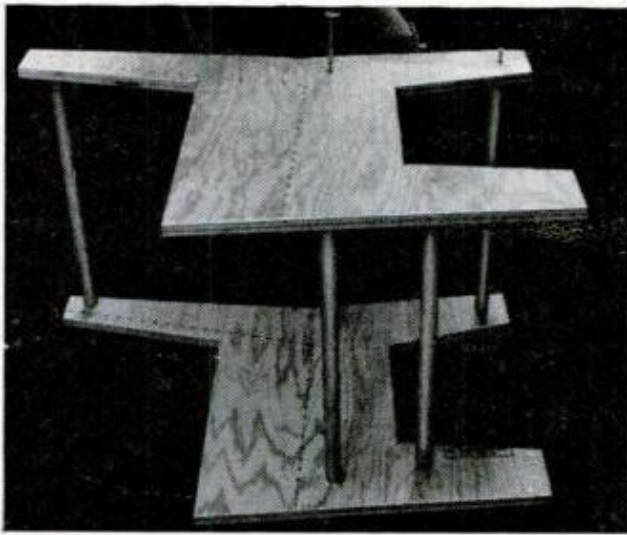
Use glue and $1\frac{1}{2}$ -in. No. 8 screws to assemble the frame of the chair. Drive the screws through the sides into the ends of the dowel stretchers, countersinking them so that the screw heads can be concealed with wood putty. The armrests are tapered at the rear as shown. The best way to mount these is to plow a $\frac{1}{4}$ x $\frac{3}{4}$ -in. dado in the underside of each so that it fits snugly over the side piece, then attach it with No. 6 finishing nails and glue. However, if you don't care to go to this much trouble, you can simply mount them with short angle steel brackets since they will hardly show when painted.

Once the frame is assembled, it should be painted before you string the seat and back. Sand all surfaces smooth, paying special attention to the edge grain of the plywood. All edges should be rounded and the edge grain of the plywood filled before you apply the finish. The use of a phenolic resin primer designed especially

CORD HOLES are identically spaced and located in each side member by clamping both together and drilling at one time

POPULAR MECHANICS

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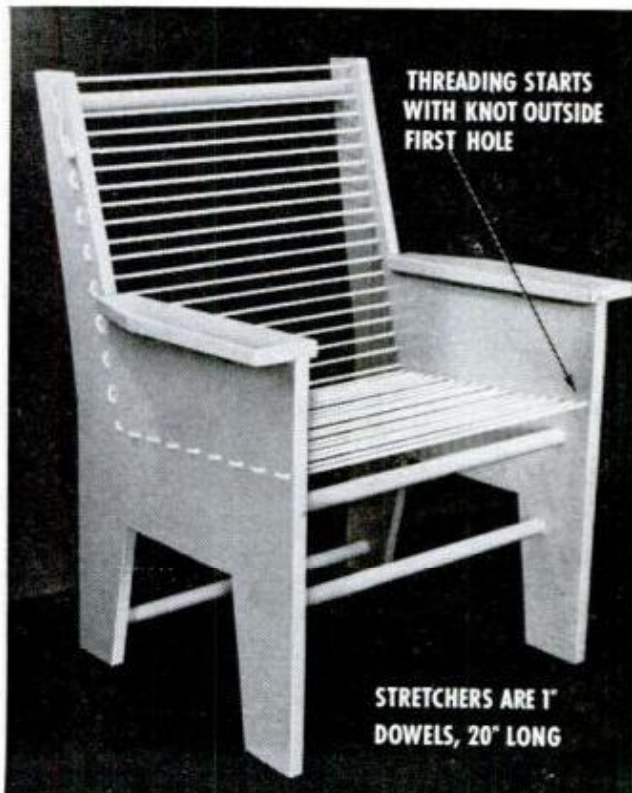
THE FIVE 20-in. dowel stretchers which join the sides are fastened in blind holes with glue and F.H. screws

for plywood (Rez, Firzite or similar) will tame the wild grain of the plywood and result in smoother, more professional looking finish.

One of the main things to consider when choosing a color for the chair (or chairs) is the color of the plastic clothes-line which will be used for the seat and back. This plastic cord is available in a number of bright colors, making possible a variety of striking color schemes. If you are building a number of these chairs, you might consider painting each a different color while using the same color cord.

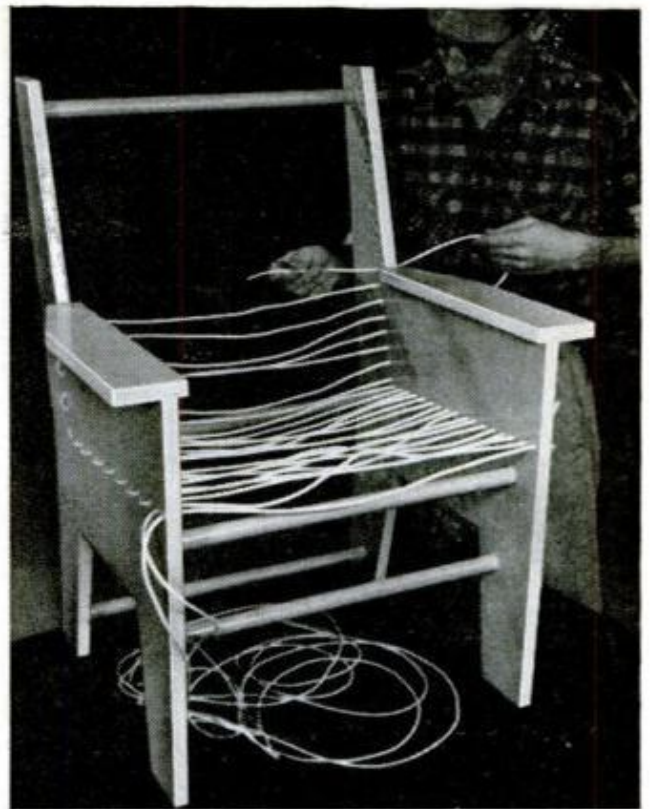
To string the chair, simply knot the cord

LACING SEAT and back is merely matter of running cord back and forth crosswise and finally anchoring



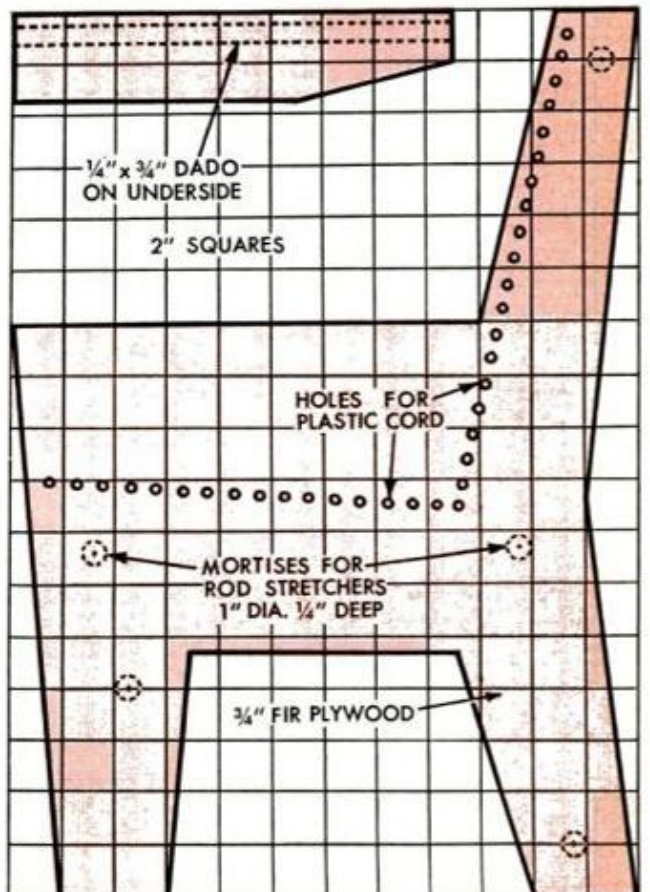
THREADING STARTS WITH KNOT OUTSIDE FIRST HOLE

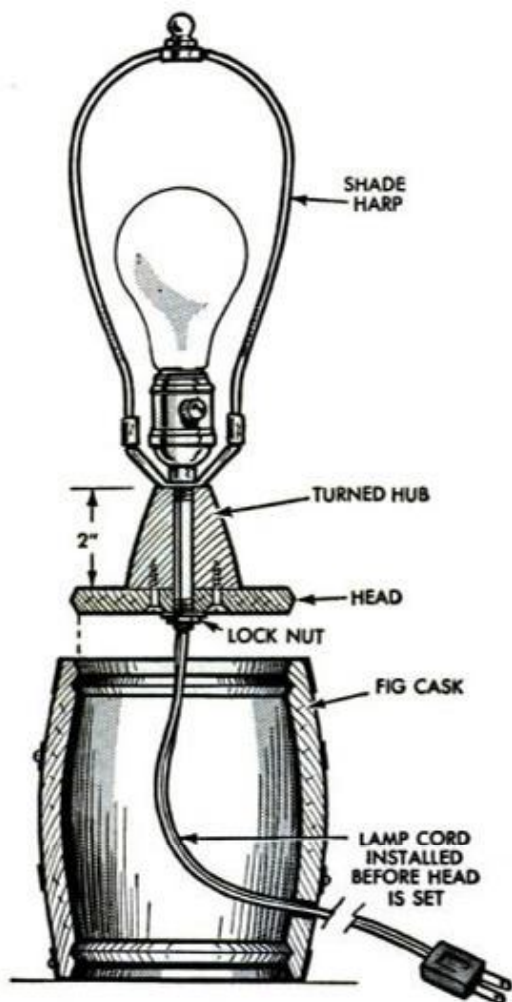
STRETCHERS ARE 1" DOWELS, 20" LONG



LACE CORD loosely through the holes first, then go back and stretch the strands as taut as you can

at one end to hold it in place, then thread it back and forth between the sides. The cord is sold in 100-ft. coils, and you will only use about 70-ft. in each chair. Before you tie the final knot, go back over the whole thing and make sure that the cord is stretched as tightly as possible.





This Cask Lamp Is Half Made Before You Start

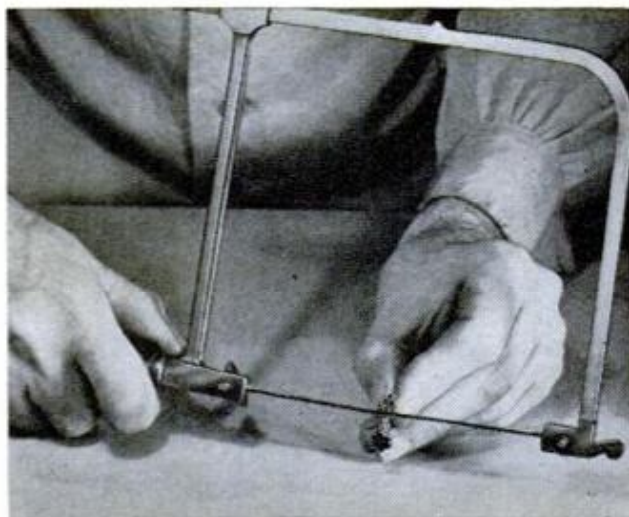
Call it a lazy-man's lamp if you will, but it's a quickie which is half made for you since the base is an empty fig cask. All you really need to make it is a turned wood hub and a new cask head; the rest of the parts are standard lamp fittings. Where do you get the cask? Go to a health-food store. Of course it will be up to you to make it empty. The sketch shows how the turned hub is attached to the cask head with screws, after which a hole

is bored down through the center for a short length of $\frac{1}{8}$ -in. electrical fixture pipe, threaded at the ends. A socket and harp are added at the top and a washer and locknut at the bottom. A hole is bored in the side of the cask and the lamp is wired with a 6-ft. lampcord before the cask head is forced back into place. Fitted with an appropriate shade, your finished lamp will fit in perfectly with the rustic decor of a den or vacation cabin.

String Polishes Jewelry

To reach difficult corners and grooves when polishing jewelry and other intricate work, try using ordinary string for the polishing cloth. Stretch it taut in a coping saw and coat the string with polishing compound. After "sawing" the hard-to-reach places with the coated string, switch to a clean string for the final polishing.

One easy way to clean a soft rubber eraser which has become soiled from use is to rub it against an ink eraser. This cleaning action works both ways, for the soft eraser will remove smudges from the harder, more abrasive ink eraser.



FOR SHUTTERBUGS

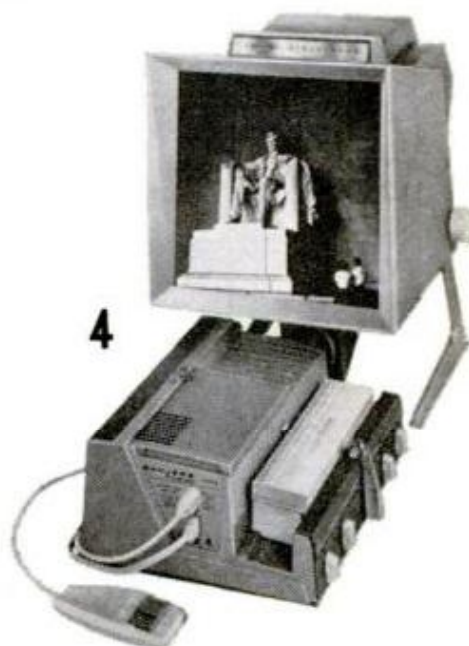
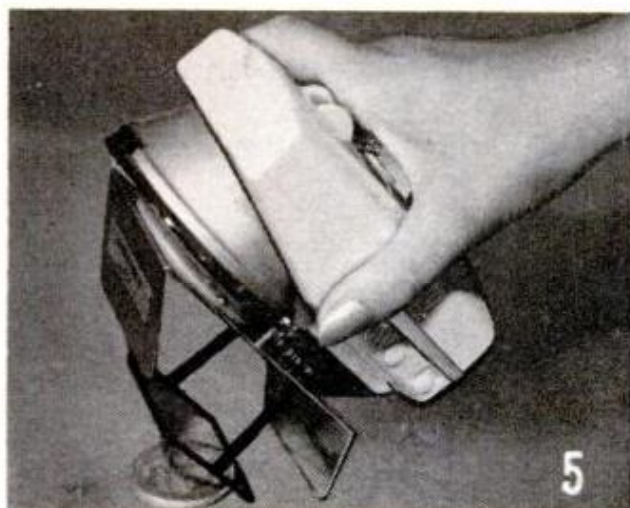
1. ROTO-PHOTO FILE holds up to 900 prints, back to back, in 450 transparent plastic pockets attached to a rotary mounting in 6-pocket binders. A flip of the knob displays any of the 3½ x 5¼-in. prints instantly and they cannot slip out accidentally. Extra binders are available. File sells for \$9.95. Roto-Photo Company, 175 West Jackson Blvd., Chicago 4, Ill.

2. PORTABLE CINEMA LIGHT has a nickel-cadmium battery which can be recharged thousands of times. A one-hour charge supplies operating power for over 6 minutes. An available accessory lamp provides light enough for telephoto shots up to 60 ft. Priced under \$125, the entire unit, including case, weighs only 8½ lb. General Electric Co., Cleveland 12, Ohio

3. EMOLUX FLASH GUN uses tiny AG-1 bulbs and weighs less than an ounce. Fitting any camera equipped with a standard accessory shoe, its retractable, bulb-ejecting reflector permits some light to be directed upward to create a semi-bounce effect. Priced at \$6.95, including a leather case and exposure guide. Barman Int'l. Co., 166 Madison Ave., N.Y.C. 16

4. MIRASCREEN CABINET with built-in mirror optics provides clear slide picture projection without darkening the room, even in bright sunlight. Placed in front of any popular-make slide projector at the proper, adjustable height it affords a wide-angle 9 x 9-in. view of the selected slide. Price: \$39.75. H. A. Bohm Company, 2814 W. Peterson Ave., Chicago 45, Ill.

5. CLOSE-UP ATTACHMENT for Kodak Startech cameras simplifies the taking of actual-size pictures of coins, stamps and other objects smaller than 1½ in. square. The components are a special close-up lens, a frame, reflector and camera-lens adapter. Priced at \$15 complete, it is available direct from Lester A. Dine Co., 102 Jericho Turnpike, Floral Park, N.Y.



DARKROOM HINTS

Easel for Copying Prints

Need a convenient method of holding a picture or drawing for copying so that it will stay flat and not be marked with tacks, pins or tape? Then place the material which you wish to copy in a photographic print frame of the type used for making contact prints. The frame may be mounted vertically in a holder made by screwing four L-type curtain hooks into the wall.—*Wayne Floyd*



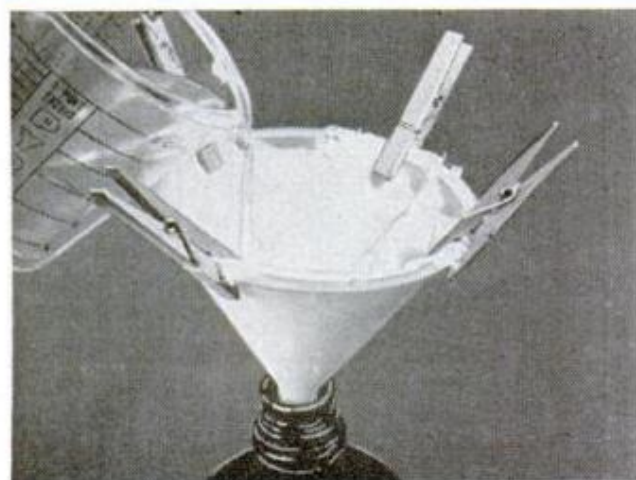
No-Mar Strap Connectors

Extension clips which prevent a camera body from being scratched by the camera strap connectors are easily made from lengths of plastic tubing and piano wire. The wire is bent in an elongated loop with the ends butted on one side as shown in the detail. With very light cameras, you may substitute a paper clip for this loop. A piece of plastic tubing is pushed over the loop of wire, locking it and protecting the camera body. A piece of adhesive tape on the camera body gives additional protection.—*Joseph R. Noonan*



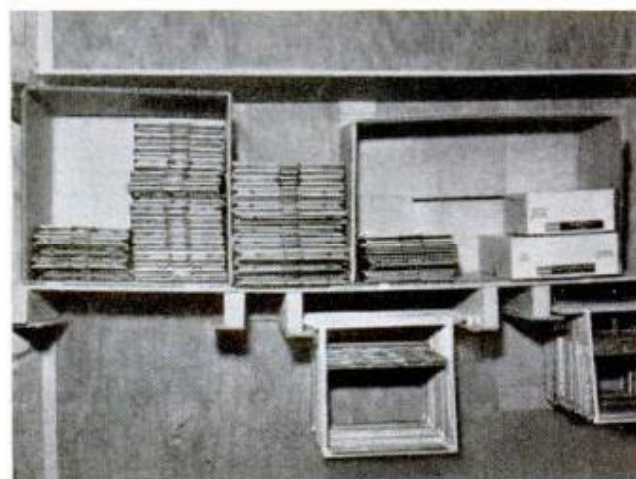
Darkroom Chemical Strainer

Improvised strainer for darkroom chemicals can be put together quickly from a funnel, four spring-type clothespins and a piece of cotton cloth. Choose the cloth according to the degree of straining you require—anything from cheesecloth to a tightly woven fabric. Cut a square of cloth on the diagonal slightly greater than the diameter of the funnel, and clip each of the corners to the funnel rim with a clothespin. More than one layer of cloth can be used for extra fine straining. The cloths may later be washed for reuse.



Darkroom Shelf Dividers

You can add as many shelf dividers to your darkroom as you need by simply cutting the tops off a few cardboard boxes and thumb-tacking the open boxes to a shelf. The pigeonholes thus formed will keep your film holders, film and paper stacked in an orderly manner. Additional shelf space can also be gained by stacking the boxes on top of each other. Under the shelf you may want to nail strips of hardboard to the supporting wooden cross-pieces, forming a rack for holding your film hangers.—*Joseph R. Noonan*





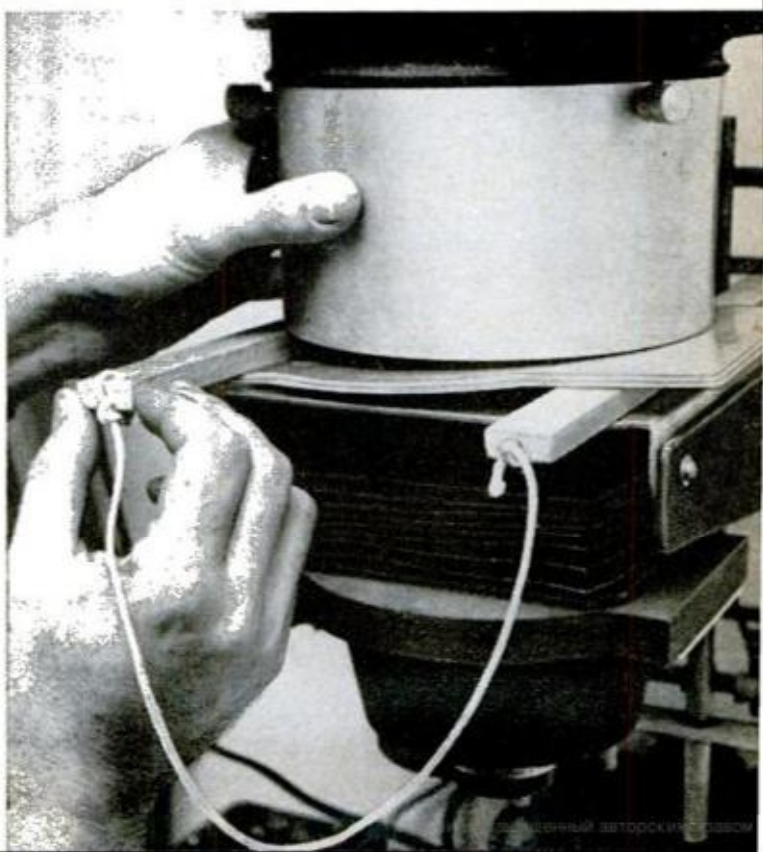
CORRECTING DISTORTION

DO YOUR PICTURES of buildings look like the leaning tower of Pisa? Don't let it worry you. Owners of miniature cameras having short focal-length lenses, can correct such distortion by an enlarger trick which straightens converging lines at the time of printing. It's done by making the exposure with both easel and negative carrier propped at an angle. Pairs of wooden strips of a like thickness are used to prop the negative carrier at a slant in the manner shown in the photo at the right. One strip is inserted *under* one end of the carrier and the other is inserted on *top* at the opposite end. Pairs of strips of different thickness, ranging from $\frac{1}{8}$ to $\frac{3}{4}$ in., let you adjust the slant of the negative carrier to coincide with the slant of the easel. The point to remember is that the negative carrier must be tilted opposite to that of the easel. The latter is propped up at an angle with a cardboard box or anything handy. Each pair of wooden strips are kept together by tying with a length of cord since it is important that only strips of a like thickness are used. With practice you'll be able to quickly select the proper pair to coincide with the degree of tilt of the enlarger easel.—*Jack Marshall*

FEBRUARY 1963



WOOD STRIPS are used to tilt negative and level enlarger head over slanted enlarger easel. Strips of equal thickness are tied together for convenience





By Morton J. Schultz

Car got the shakes? You can diagnose—and probably cure—its trouble by putting it through this step-by-step checkup

TODAY'S HIGH-COMPRESSION cars—especially those with automatic transmissions—are often plagued by the palsy of rough engine idle.

In older cars, you could usually cure this condition by adjusting the idle mixture. It's not that simple today, since improper idle mixture is only one cause of rough idle—there are others to consider.

Rough idle and misfiring aren't the same, though some of the same misadjustments cause both. A car that misfires does so under acceleration—either a slow hard pull, or when the engine's operating at high speed. With rough idle, the car gets the shakes when it's standing still. Unless both symptoms stem from the same condition, an engine that idles rough will not misfire, and vice versa.

Rough idle can lead to higher fuel consumption, wear of both carburetor and ignition parts, and damage to engine parts such as valves and pistons. The ten main

causes of this condition are listed in the color box on the facing page in the logical order for trouble shooting. Conditions easiest to pinpoint are given first, while those that require considerable work—or guesswork—are placed last.

1. Incorrect throttle and idle adjustment can usually be corrected without the equipment that a tune-up specialist would use (such as a tachometer, vacuum gauge and exhaust analyzer). But this first task *does* require care and patience.

As long as the carburetor is in good condition internally, it can be adjusted by means of the throttle and idle adjustment screws. The throttle screw, located near the bottom of the carburetor, controls engine speed; the idle adjustment screw, located in the base of the carburetor, controls the amount of fuel mixture going through the carburetor.

All carburetors have only one *throttle* adjustment screw. Two and four-barrel carburetors, however, have two *idle* adjustment screws—one for each of the idle systems—that must be adjusted separately. The procedure is the same for both:

● Warm the engine to normal operating temperature, making sure the choke plate is completely opened.

● With the engine running, remove your foot from the accelerator. If the engine stalls, turn the *throttle* screw *in* with a screwdriver until the engine runs smoothly without foot pressure on the accelerator. (Turning the screw *in*—tightening it—causes the engine to speed up; turning it *out* slows the engine down.) If the engine doesn't stall, don't touch the throttle screw.

● Turn the *idle adjustment* screw slowly inward until the engine is about to stall. (This decreases the fuel mixture going through the idle system; backing the screw off increases the mixture.) When the engine begins to cough and buck, back the screw off about one-half turn.

If the engine seems to race, turn the *throttle* screw out slowly until the engine is reduced to proper pitch. You must then find the best adjustment for the *idle* screw, as before.

If the idle screw turns all the way in without stalling the engine, the carburetor is dirty; it must be removed and cleaned.

When you think you have the proper adjustment, test it as follows:

● Put your ear close to the engine. Is it running evenly, without racing?

● Put your ear close to the exhaust pipe. Is the sound a steady one, without hesitation between firings?

TROUBLE-SHOOTING CHECK LIST

1. INCORRECT THROTTLE AND IDLE ADJUSTMENT
2. INCORRECT SPARK PLUGS OR IMPROPER PLUG GAP
3. POOR ENGINE COMPRESSION
4. LEAKY MANIFOLD GASKET
5. INOPERATIVE MANIFOLD HEAT CONTROL VALVE
6. LOOSE CARBURETOR FLANGE ON INTAKE MANIFOLD
7. HIGH FUEL-PUMP PRESSURE
8. FAULTY AUTOMATIC CHOKE
9. HIGH OR LOW FUEL LEVEL OR FLOAT SETTING
10. HIGH UNDERHOOD TEMPERATURE

● Look at the engine. Is it steady on its mountings, without excessive vibration?

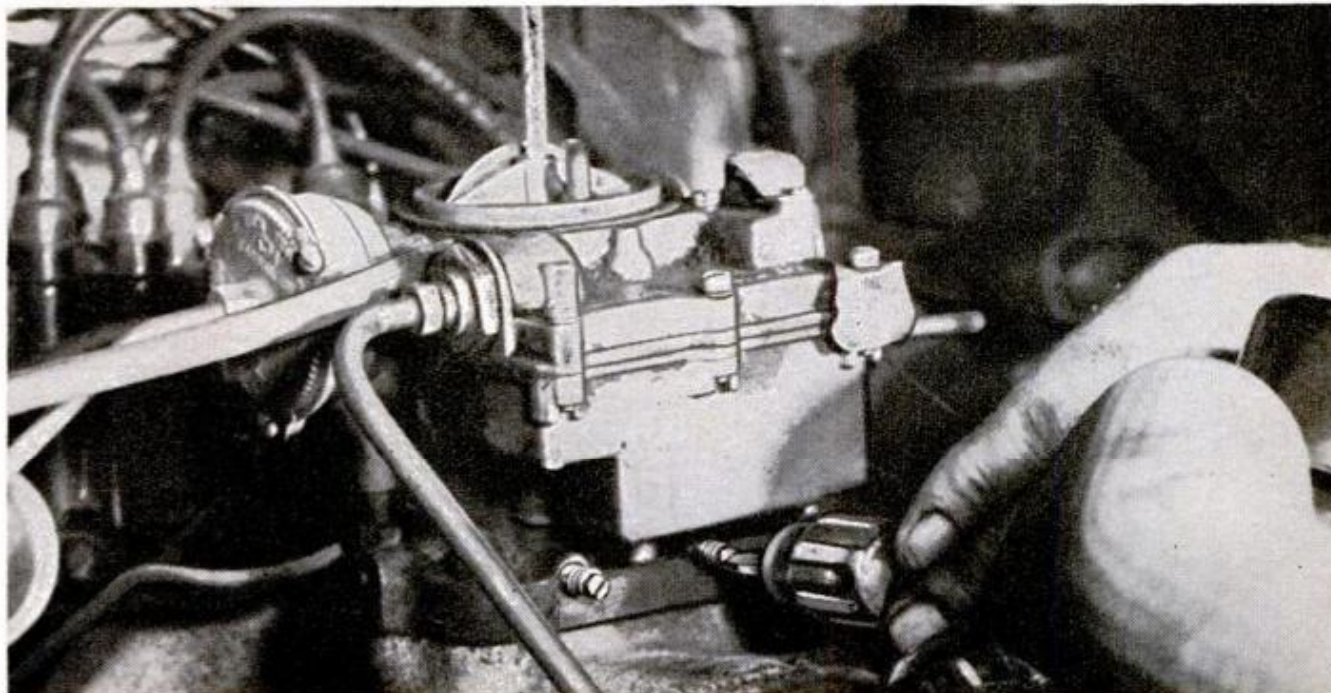
● Look at the fan. Is it rotating at a steady pitch?

● Feel the fender. Is it steady to the touch, without quiver?

If the answer's "no" to any of these questions, readjustment is in order.

If your car has automatic transmission, make sure it's in "Drive" position and the handbrake is firmly applied before you attempt any idle adjustment. The procedure's the same as explained above, but your goal should be the smoothest

DUAL-BARREL CARBURETORS have two idle-mixture screws (center) in addition to a throttle adjustment screw



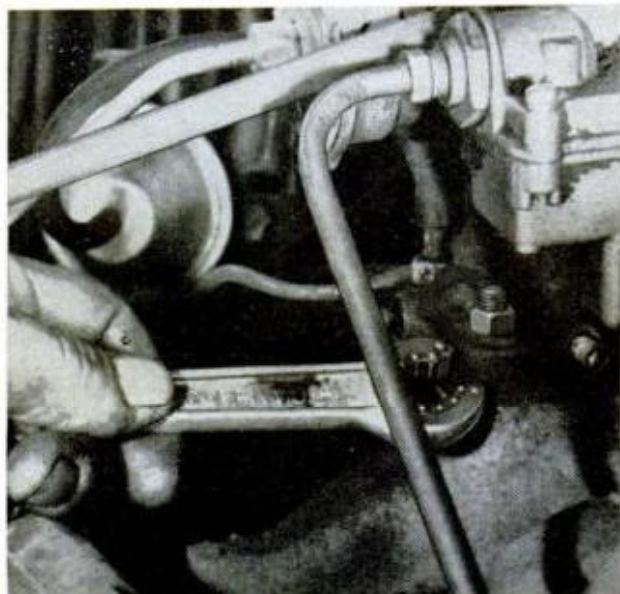


ENGINE COMPRESSION TEST determines if a burned valve is causing rough idle, but won't necessarily tell you if trouble is caused by a sticking valve



TURN COUNTERWEIGHT by hand to see whether manifold heat control valve is operating properly. It should pivot back and forth without resistance

LOOSE CARBURETOR FLANGE on intake manifold can let in enough air to dilute fuel mixture. Guard against this by tightening mounting bolts and nuts



idle possible with the least amount of pull on the engine. If you can't obtain a proper idle, or if the car "creeps", an adjustment of the transmission linkage is needed.

2. Incorrect spark plugs or improper plug gap can show up as rough idle. Your car's engine is designed to accept a specific-sized spark plug for normal driving and environmental conditions. Under special conditions, however, you may have to deviate from this recommendation for top performance. Rough idle can be a sign that a switch is needed.

Plugs are designated hot or cold, depending on the length of their insulators and their ability to dissipate heat rapidly or slowly. Hotter plugs have longer insulators that provide longer-lasting heat in the combustion chambers, to insure complete burning of the fuel mixture. Colder plugs, with shorter insulators, provide a briefer period of heat to accomplish quicker combustion. A normal plug is one that has an insulator of medium length. It provides a mid-range heating time to compensate for both slow and average-speed driving.

A hotter plug should be used if your car is consistently driven at slow speeds around town, if much stop-and-start driving is done, or if you drive in an abnormally cold climate. You may need a colder plug if the car is driven consistently at high speeds, if much hill or mountain driving is done, or if you drive in a hot climate.

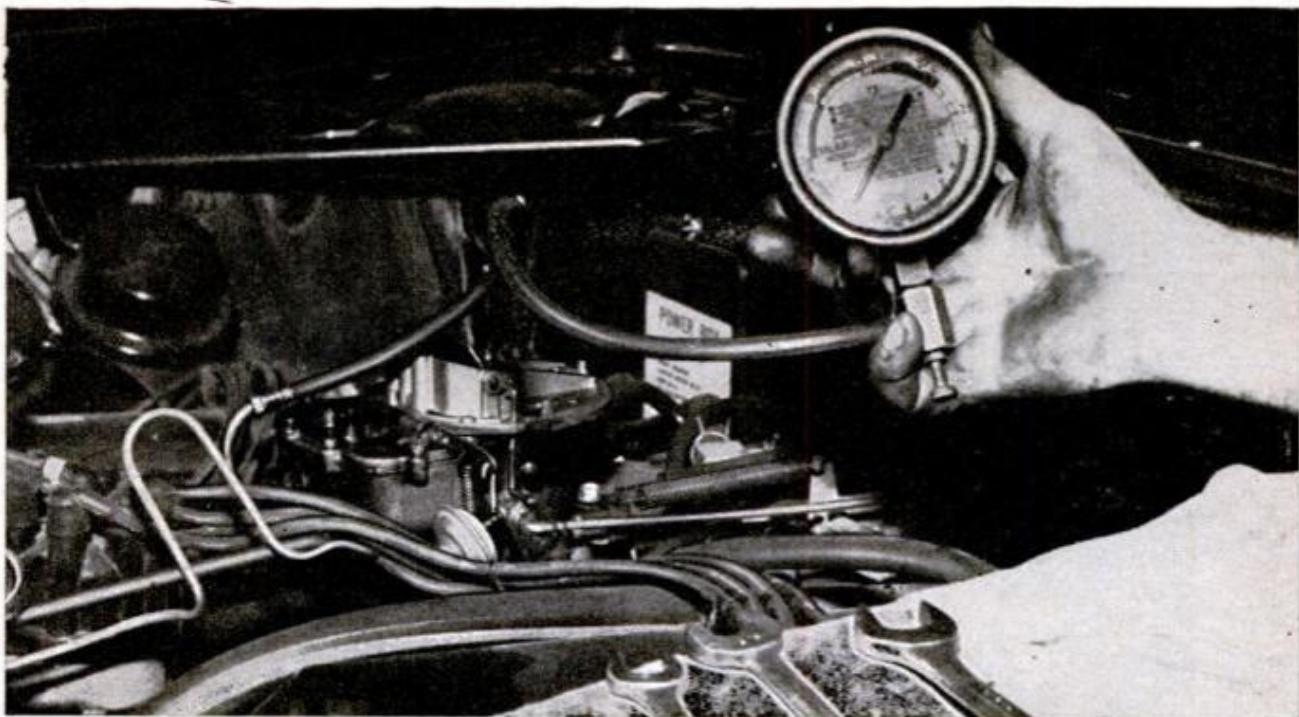
The effects of plug gap on engine idle and, for that matter, on engine performance, are well known. The correct gap insures that the plug will fire the fuel mixture at the proper time, permitting full combustion and preventing pre-ignition and engine knock. Improper plug gap is one of those conditions that causes both rough idle and misfiring.

3. Poor engine compression is next on the trouble shooting list. An engine must have normal compression pressure in each cylinder on every compression stroke.

If your engine idles rough *constantly*, the trouble may be a burned valve. To check this, perform either a cylinder balance test, with a tachometer, or a compression gauge test, as shown in the photo top left. Constant loss of pressure in any cylinder indicates a burned valve there.

If rough idle is *intermittent*, after long runs only, perform a vacuum test. A sharp drop in the needle indicates loss of compression due to a sticking valve.

Remember: if rough idle is intermittent, don't use a cylinder balance or compression-gauge test. They'll show the true condition only if the engine is at a specific temperature. Thus, the fact that they in-



FUEL PUMP ANALYZER connected at the carburetor end of the line from the fuel pump will let you know—without removing the pump—whether pump is producing too much pressure, causing the engine to flood

indicate good compression could be misleading, since a sticking valve could actually be causing rough idle without showing up.

4. A leaky manifold gasket can be checked quickly with an oil test and a tachometer. Spread oil between the manifold and carburetor and start the engine. Suction pulls oil into and temporarily seals the leak. This keeps air from seeping through to dilute the fuel mixture as it passes from carburetor to manifold. The undiluted fuel causes the engine to speed up. A tachometer records this speed up, confirming that the manifold gasket is faulty and needs replacing.

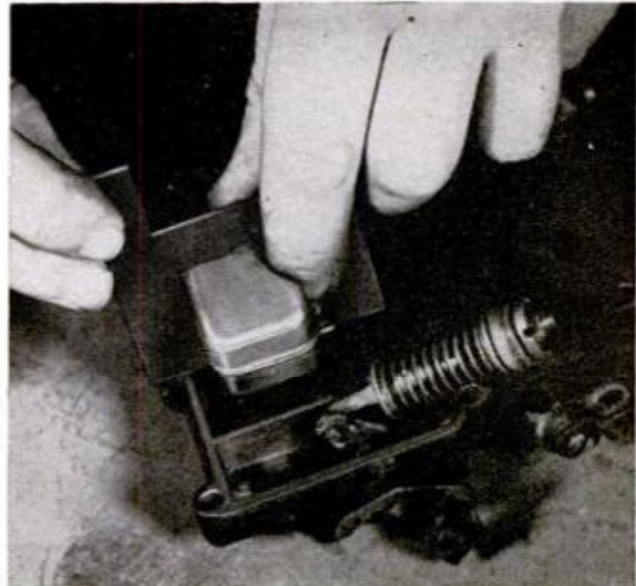
5. The manifold heat-control valve routes hot exhaust gases to the “hot

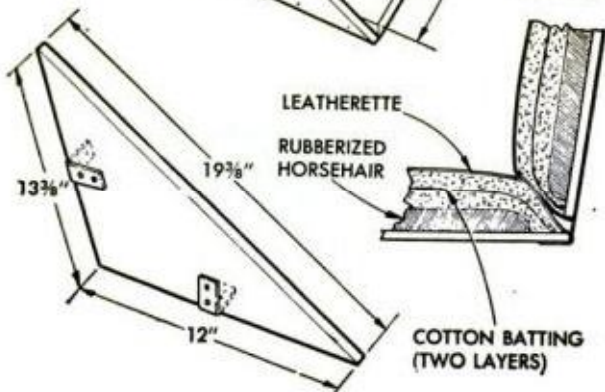
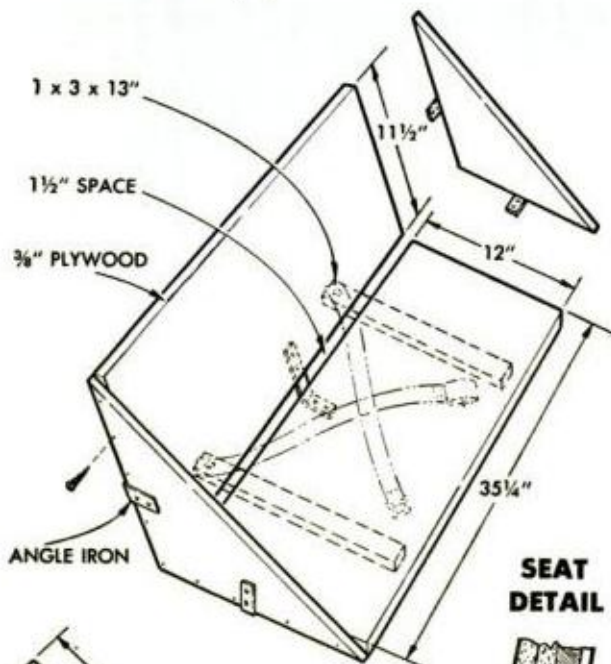
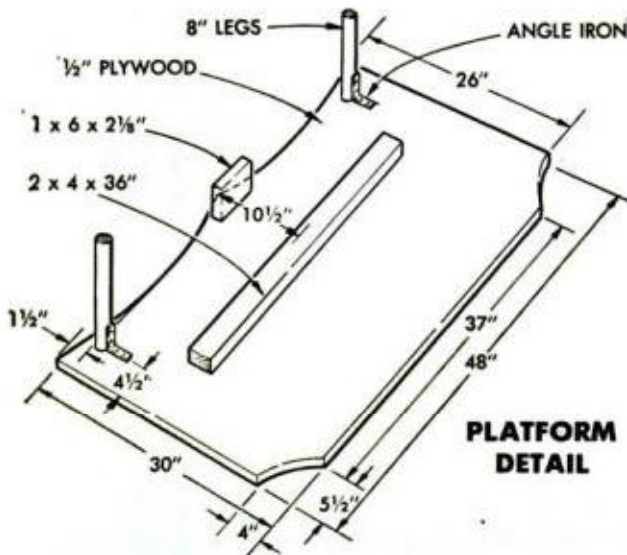
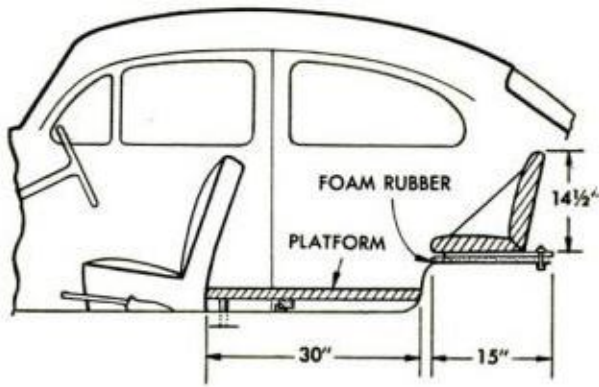
spot” in the intake manifold when the engine is cold. This enables the fuel mixture to vaporize properly during the starting period—and when the engine is idling. A stuck or sluggish valve can cause either slow warm-up or rough idle. These can be valuable warning signals, since this condition can also cause spark-plug fouling or burning, stuck or burned valves, and carburetor icing.

This heat-control valve can freeze up after only a few thousand miles of driving, so it should be tested during every lube job or tune-up. Locate the valve at the point where the exhaust manifold and intake manifold join—generally right under

[\(Please turn to page 214\)](#)

INSIDE THE CARBURETOR BOWL is a float assembly consisting of float (being disconnected at left) with a needle valve and seat beneath. In reassembling, check height with a float-adjustment tool, as at right



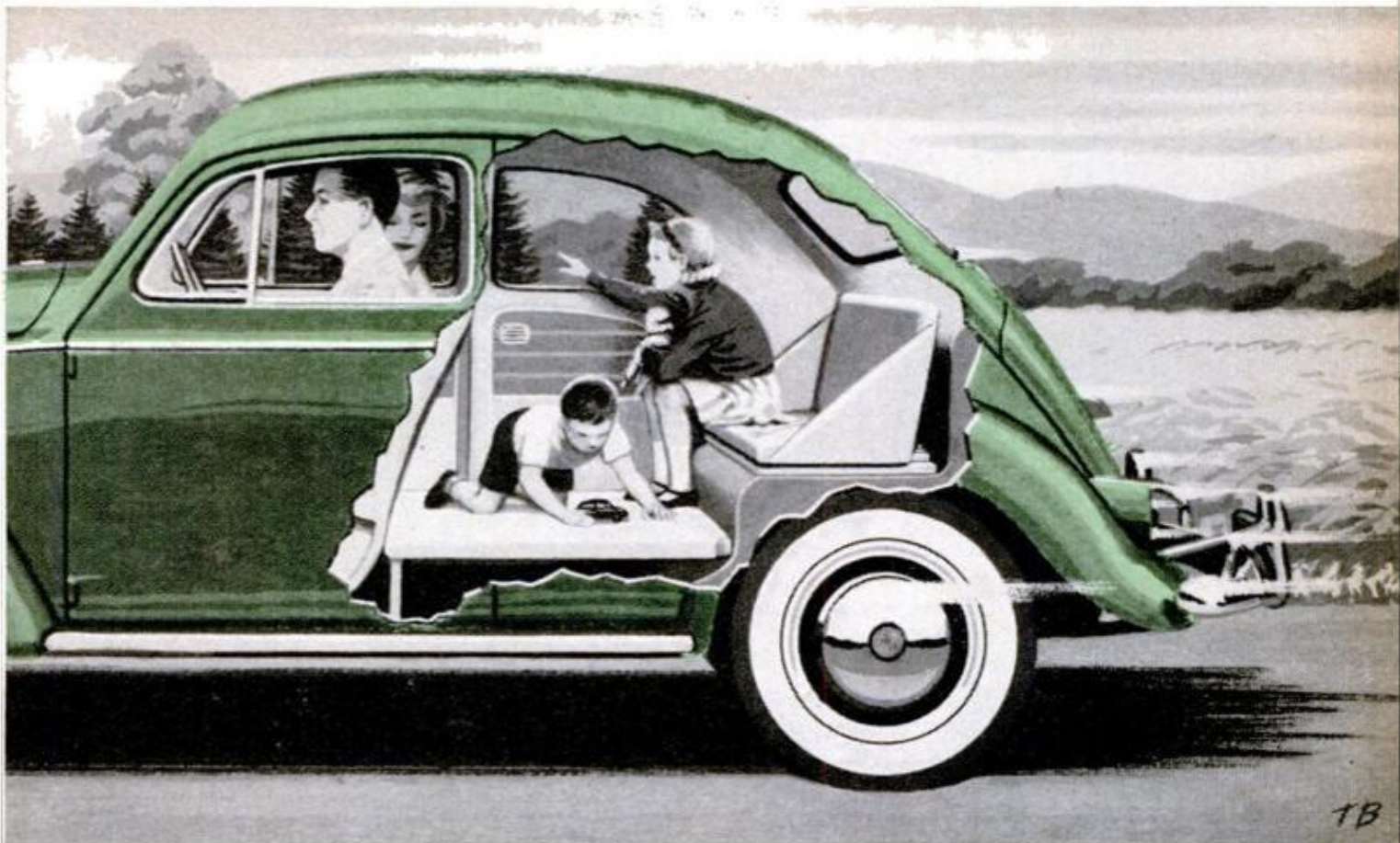


Back-Seat

S MALL CHILDREN, small cars and long trips just don't mix. No matter how roomy that back seat looks, a couple of restless youngsters will strain its capacity (and yours) on a long drive. However, for about \$20, you can turn the back seat of your Volkswagen into a station-wagon-type playroom, complete with padded floor and child-size seat in the luggage well.

After adjusting both front seats to most comfortable driving position, remove the rear seat and backrest. Next, make a cardboard pattern for the floorboard which follows the contours of the front seats and extends back level to the front edge of the carpet lining the luggage well. You'll have to trim the rear corners so that the floorboard will fit between the wheelwells. After checking for fit, transfer this pattern to a 4 x 4 panel of 1/2-in. plywood and cut it out.

You will notice that the floorboard requires support along the front edge in order to sit level. Most of this is supplied by a length of 2 x 4 which fits into the steel angle that normally supports the rear seat. To position this on the bottom of the floorboard, place the 2 x 4 in the steel angle and put the floor in place, then mark the



Playroom for Your VW

By Huc H. Hauser

location of the front edge of the cross-member on the underside of the plywood. Next, remove both pieces and attach the 2 x 4 to the floorboard by driving screws through the plywood and into the 2 x 4.

The two outer front legs which provide additional support rest on the heater-duct tunnels running just inside the doors. While dowels were used on the pilot model, these legs could just as well have been cut from scrap 1 x 3 stock and braced with steel angles, similar to the center support.

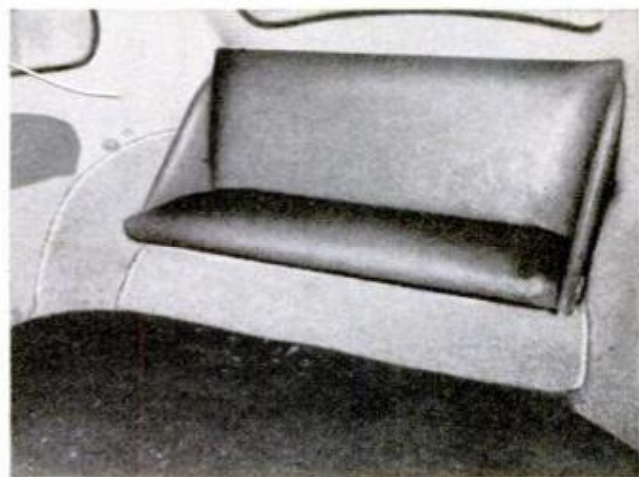
After mounting these two legs, the center support and the 2 x 4, you are ready to upholster the floor. Using the floor as a pattern, cut a 2-in.-thick pad of rubberized horsehair and two thicknesses of cotton batting (laying the first crosswise to the second). When cutting the cotton batting, allow enough overhang so that it covers the edges of the horsehair. Next, cover the cotton with a sheet of leatherette, allowing at least 6 in. overhang on all sides.

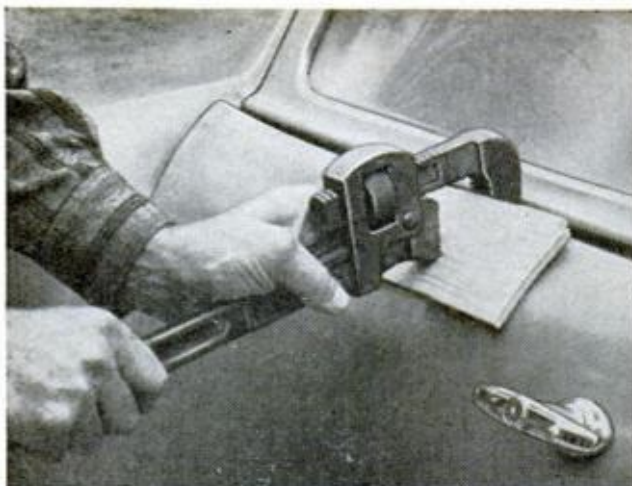
Now turn the whole thing upside down on the floor, and after making sure that there are no wrinkles in the leatherette, kneel on the plywood to compress the three layers of padding. Fold the edge of

the leatherette double so that the raw edge is underneath, then pull it taut and begin tacking. Do one side, then the other, next the back and finally the front.

To make the seat, cut out each part and upholster it separately, then assemble them as shown in the detail on the opposite page. The restraining belt, designed for very young children, is an option feature. Drill two 1/4-in. holes through the body panel over the engine and bolt the seat in place over a foam-rubber pad. ★ ★ ★

"KINDER SEAT" fits into the luggage well, allowing play floor to extend all the way back to firewall





As Good As New

Bent edges of car fenders, rear decks, hoods and doors can be pulled back into the original body fairing by careful use of a pipe wrench. The movable jaw of the wrench will reach back of nearly all common types of in-bends on fenders, decks and hoods and sometimes you can even ease out a dimple if it's near an edge. Cushion both jaws of the wrench with blocks of soft wood. Take time to get the wrench positioned correctly and work the bend out by stages. Then feather damaged paint, prime and topcoat with a matching enamel.—*Jackson Hand*

Easy On the Eyes

Driving east or west when the sun is low the glare from a shiny windshield wiper arm can blind you as completely as the upbeams of headlights coming at you at night. You do one of three things: Put up with the discomfort and danger of the glare, slide sidewise in the seat and assume an uncomfortable position until the sun sets or you change direction, or you cover the arm with black masking tape. Of course, it won't look so nice covered with tape but who cares when comfort and safety are the essentials? You can always pull off the tape before you trade in the car.



Better CARKEEPING

IF YOU HAVE trouble keeping exhaust gaskets in place, just snap a narrow rubber band around the studs and over the positioned gasket. Then reassemble the exhaust line and draw the nuts to the recommended tension. Heat will quickly destroy the rubber band, but it may be a good idea to later draw up on the nuts

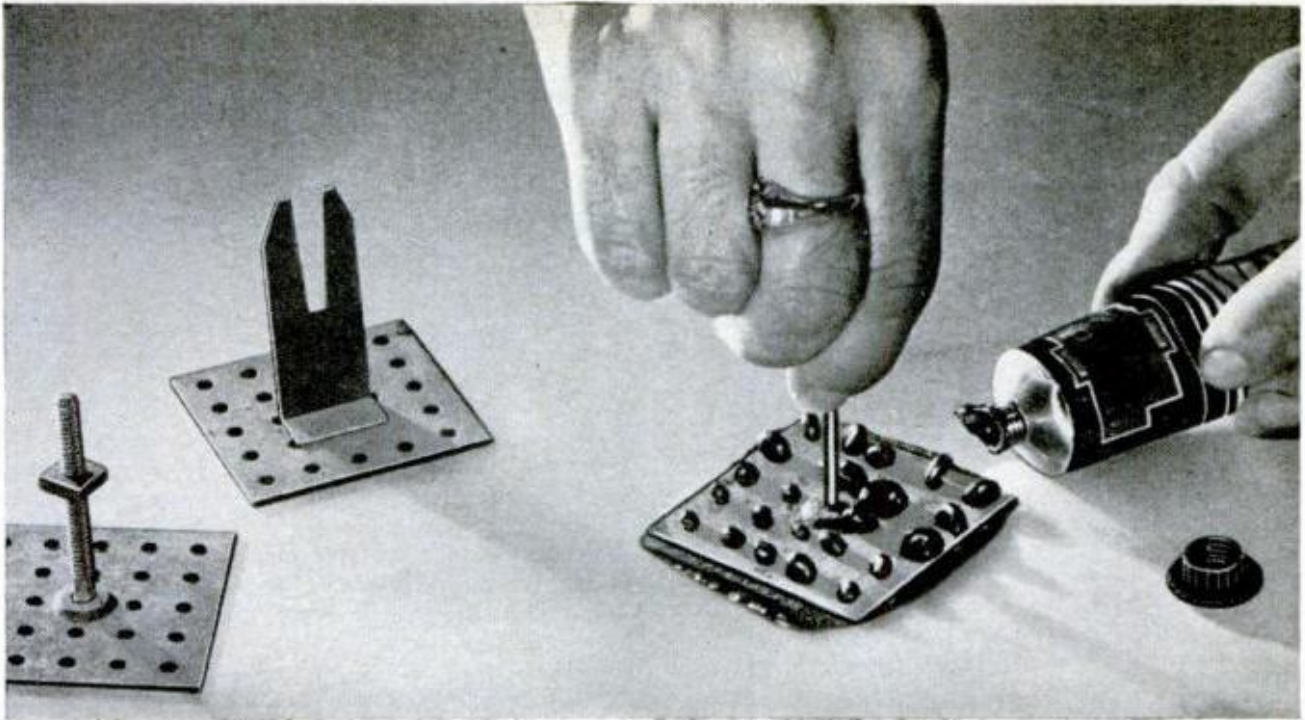
WHEN TUNING a small-car engine having opposed cylinders, a quick method of checking carbs for balance is to compare the tips of the plugs in each cylinder bank. If all plug electrodes vary from light brown to tan in color, carburetion is taken to be correct. But if plugs from one bank don't color match, carbs are out of balance

ONE QUICK WAY to clean a heavy coating of road grime from plastic rear window of a convertible is to give it a brisk once-over with a soft cloth dampened with kerosene. Follow with a dry cloth, making sure you wipe away all the kerosene, especially around the edges of the plastic window, where it may cause stains

AN EASY TRICK in laying a straight chalk line on a body paint job is to rub white or colored chalk along the edge of a length of masking tape. Place chalked edge of tape in desired position and run the tip of your finger along the edge. Result is a perfectly straight line on the new paint without the chance of scratching

THERE ARE SEVERAL ways of shimming muffler pipes that come a trifle too small, but one of the best for the purpose is a wrapping of aluminum foil. It can be wrapped tightly around the pipe and will stay in place while you ready the assembly for tightening. Joint will remain tight and won't rust-join, making removal difficult

LOCATING A NOISY hydraulic valve lifter is no easy trick even for old timers. Here's a method used by one serviceman: Idle engine and touch each valve-spring cap with tip of forefinger; just a light touch, don't bear down. When you come to the faulty lifter you'll feel a distinct, rather sharp shock when the valve returns to its seat



SPECIAL HEADS on anchor nails, bolts and clips make it possible to glue to surfaces which won't take nails

While it's right up in the top price range, epoxy glue has several definite advantages: It doesn't shrink because nothing leaves the mixture during hardening; it's thermo-setting (won't soften with heat); it won't creep under a steady load; and it works almost as well on non-porous materials as on porous ones. Use it for those difficult jobs like bonding a metal towel rack to a polished tile wall, patching a fiberglass boat where the gluing area is too slim for polyester or repairing anything from heirloom china to broken concrete. If the job's too big for the tube sizes available, check on larger container prices. On the shelf, it's good

for at least a year at room temperature.

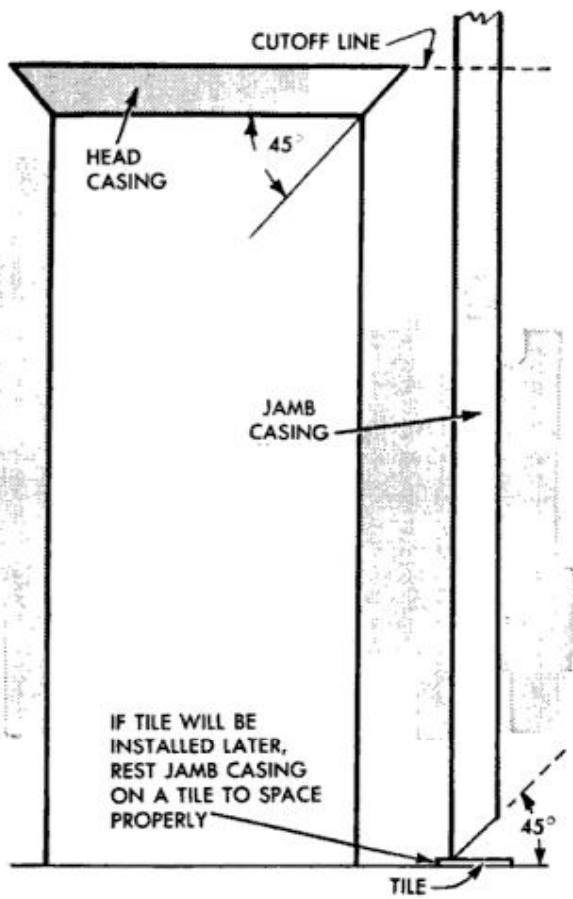
Hide glue in flake or strip form is the traditional "hot glue" of the old-time cabinetmaker. You can still buy it from cabinetmakers' suppliers at about 50¢ per lb., and in shear strength it ranks high (a ton per sq. in.). But you have to soak it, then heat it with just the right amount of water and use it quickly so it won't cool and stiffen before the parts come together. Liquid hide glue, selling for about \$1.60 per pint, is ready to use and allows plenty of working time as it sets overnight. Neither type is waterproof, but both are good for indoor cabinetwork and

(Please turn to page 208)

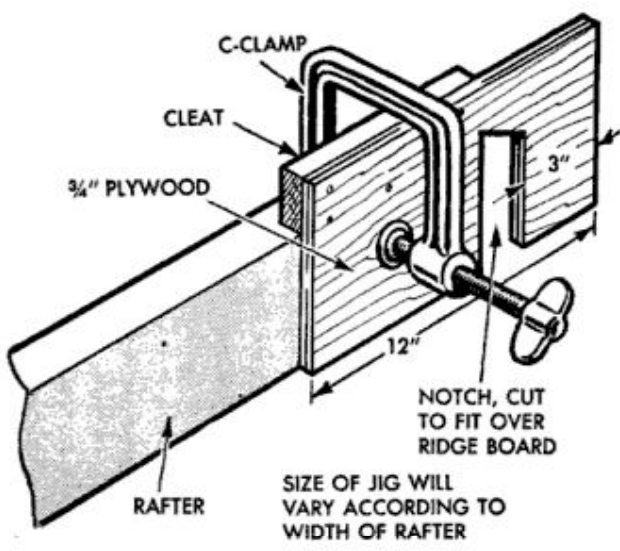
TIPS ON WORKING WITH GLUE

- Coat all contacting surfaces to assure complete surface penetration. Sanding with a medium-grit paper also encourages penetration by opening the pores of the wood.
- Use clamps or weights to press the surfaces together in over-all contact. Glue manufacturers set correct clamping pressures for a typical wood glue at 25 to 175 lbs. per sq. in., the lower figure applying to soft woods with well-fitted joints.
- Excessive clamping pressure can squeeze out too much glue and weaken the joint. A good rule of thumb for avoiding this is to tighten clamps with fingers only.
- Normal squeeze-out is an even bead all the way along the glue line. If there is no squeeze-out, this means that you either applied too little glue or there is a gap in the joint where surfaces don't meet. Excessive squeeze-out indicates the use of too much glue or clamping pressure.
- If you have to loosen a clamp before the glue dries, open the joint and recoat both surfaces.
- When using a dark glue on light-colored wood, mask both sides of the glue line as in painting.
- Squeeze-out can be removed while still wet by rubbing with a solvent-dampened cloth, but be careful not to wash glue out of the joint itself. If allowed to dry, it can be chipped off later with a sharp wood chisel.
- Where clamping is difficult or impractical, always use a filler-type glue. If the joint is a poor fit, apply a heavy coat to both surfaces and allow extra "open time" for the glue to stiffen slightly before assembly. Be sure to check the setting time of the type you're using.
- Mix all two-part glues accurately according to the manufacturer's instructions, and use different measuring cups for the two parts. (Even a minute amount of catalyst carried back to the resin can cause partial jelling.) Paper medicine cups from the drugstore are especially handy for mixing small batches, because the graduated markings printed on them help assure accuracy.

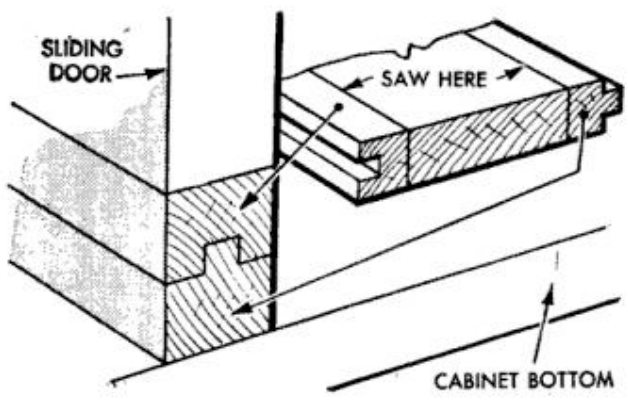
TIPS FROM BUILDERS



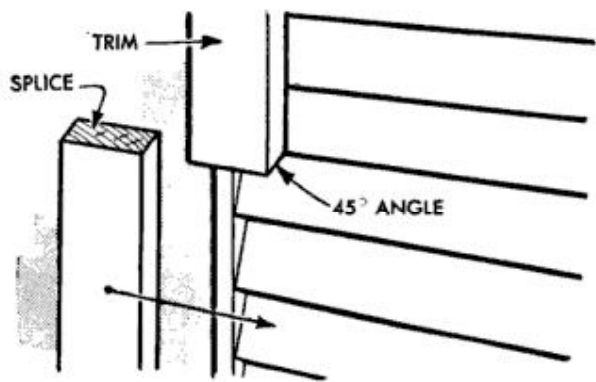
WHEN INSTALLING mitered door trim use this trick to get a perfect fit of mitered jamb (vertical) members: Miter and nail head trim piece in place. Miter end of jamb piece, place against wall with mitered end down, mark as detailed and cut off square. If the floor is to be tiled be sure to place a single tile under the mitered end of the jamb piece as shown



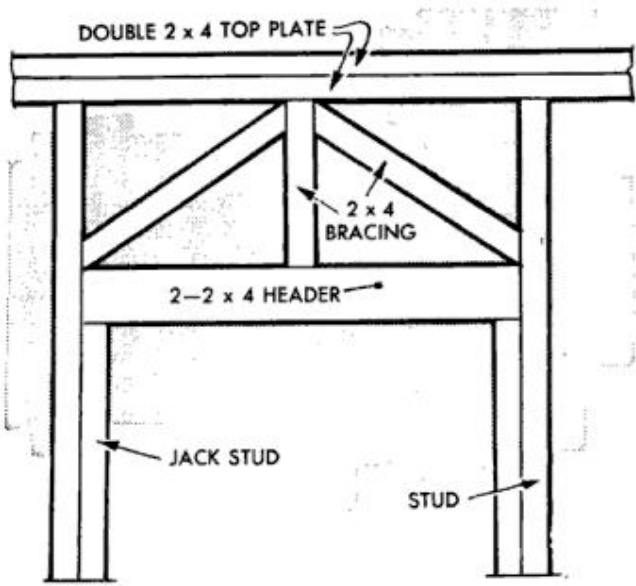
A RAFTER JIG, made by notching a piece of plywood at an angle to fit over the ridge board, enables one man to erect rafters easily. Cleated jig is clamped to upper end of the rafter, which is then lifted and the notch in jig dropped over ridge board to hold rafter securely in place for nailing



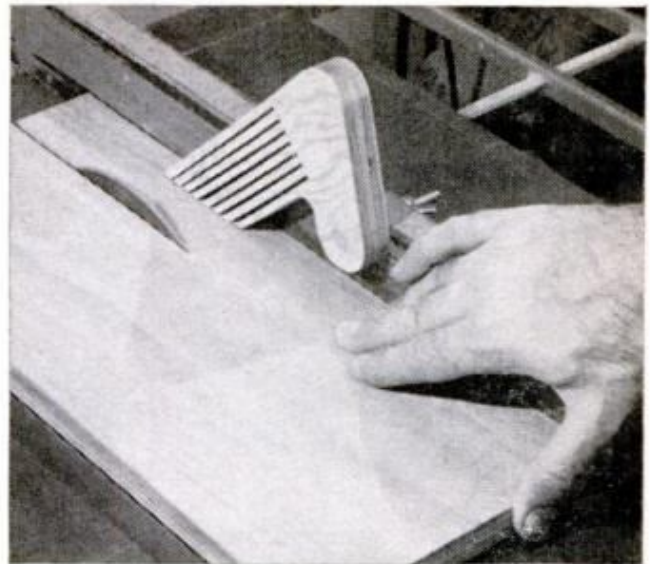
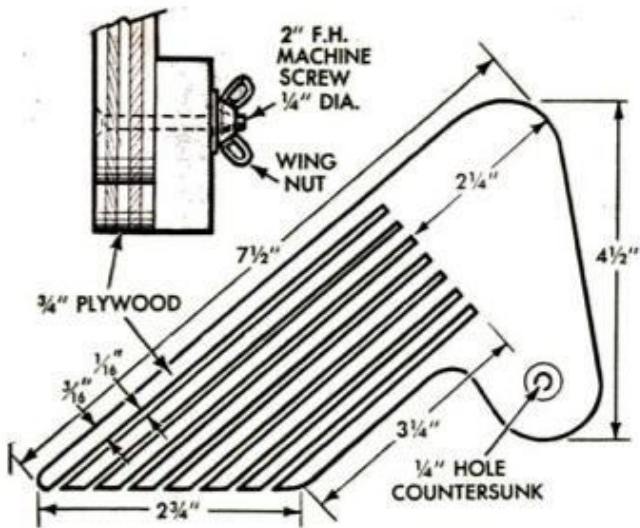
ONE WAY to install sliding cabinet doors without hardware is to rip tongue and groove edges from a length of flooring. Cut tongue into lengths to fit opening top and bottom and nail in place. Nail pieces from grooved strip to top and bottom of door. Sand flush, then apply filler to conceal joint



WHEN NECESSARY TO INSTALL corner boards in more than one piece to prevent waste, cut joining ends at a 45-degree angle, prime cut ends and join as detailed, driving nails in lower piece upward at a slight angle to draw joint tight. Such a joint sheds water readily, prevents it from entering end grain



ONE GOOD WAY to frame an opening, in either old or new work, is to install a double 2 x 4 header with the ends bearing on jack studs as detailed. Then install 2 x 4 bracing in opening over header. System prevents cracks in plaster around opening when used in a load-bearing partition or an outside wall



Feather-Board Holddown Prevents Kickback

You won't need to worry about dangerous kickback when your bench saw is equipped with a feather-board holddown. Attached to the saw rip fence to bear against narrow pieces being ripped, the spring action of the holddown permits the work to be pushed forward but not backward. Thus there's no chance of the blade throwing the piece back at the operator

should the blade and the work bind at the end of the cut. Make it from a scrap of plywood and run the series of sawcuts before jigsawing to shape. Drill a hole crosswise through the rip fence and mount it with a flat-head machine screw fitted with a wing nut so it can be tightened. Play it safe when ripping narrow strips, and use a push stick.—*Pat Sinapi*

Safe Way To Identify Liquids Found in Unmarked Bottles

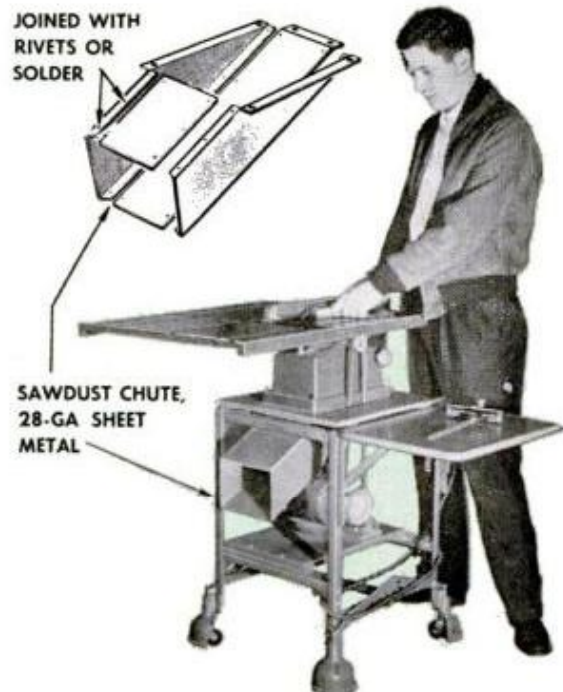
When you find an unmarked bottle of liquid around the shop or home, the natural reaction is to sniff the contents to find out what it is. This can be dangerous if the bottle holds household ammonia or some other liquid that can do harm with a healthy sniff. The proper way to

identify unknown liquids is to shake the bottle until some of the liquid wets the underside of the stopper, then remove it and sniff this tiny quantity. By doing this, you may avoid possible poisoning or the ill effects of inhaling the fumes.

—*Robert Miller*

Mobile Saw Stand

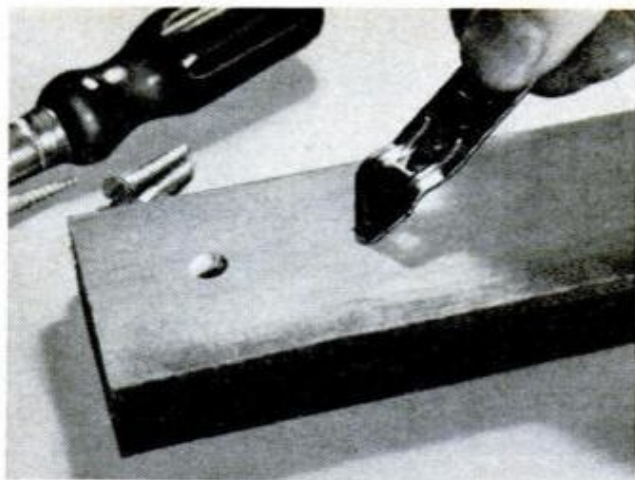
Needing a mobile stand for my circular saw which I could easily push out of the way when not in use, I decided a typewriter stand was just the thing. It has casters which can be retracted by a foot-operated lever, thereby providing a firm, stationary base when using the saw, and its folding side shelf is ideal for holding the miter guide and fence when not in use. I transformed the stand into a saw table by adding four necessary parts: an additional steel-angle brace between the legs to support the motor shelf, a mounting board for the saw, and a switch and outlet for the motor. A chute was added last.—*R. Jacobs*



SHOP SHORT CUTS

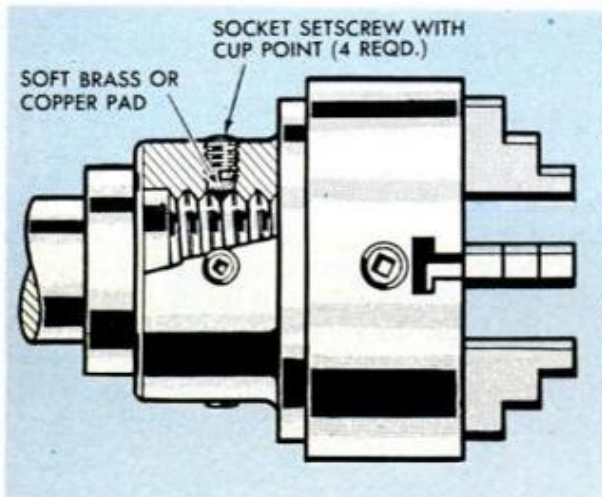
Countersink in a Pinch

How can you countersink a screw hole if you don't have a regular rosehead countersink? You can do it with the pointed end of a large twist drill, but you also can do it with a beer-can opener. After drilling the hole simply hold the opener as shown and swing it around several times. The shearing action of the pointed end will chamfer the hole nicely so it will take a screwhead flush.



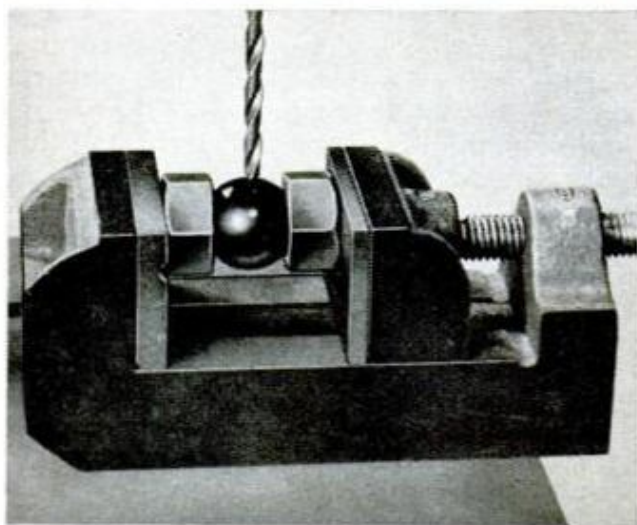
Locking a Lathe Chuck

After having a lathe chuck spin off a threaded spindle when the machine was suddenly braked at high speed, I drilled and tapped four holes around the hub of the backplate at 90-deg. intervals for socket-head setscrews. To protect the spindle threads when the setscrews were tightened, I first inserted small copper disks in each hole. Then I tightened the setscrews as evenly as possible, after the chuck was seated against the spindle shoulder. Locked in this manner, the chuck was no longer free to spin when the lathe was braked.—H. J. Gerber



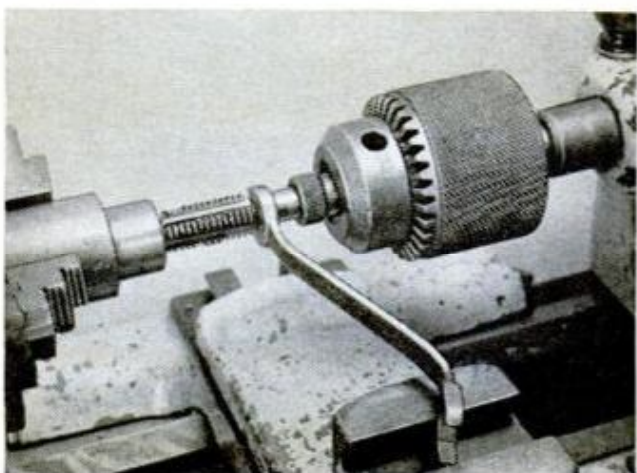
Two Nuts Cradle Steel Ball

A practical method for gripping a steel ball in a drill-press vise for drilling or machining is to clamp it between two bolt nuts as shown. The holes in the nuts should be of a size slightly smaller than the diameter of the steel ball. Pressure of the vise on the nuts is distributed evenly over the surface of the cradled ball, and the nuts provide very convenient flat surfaces for the vise jaws to grip firmly.—Daniel Bousha



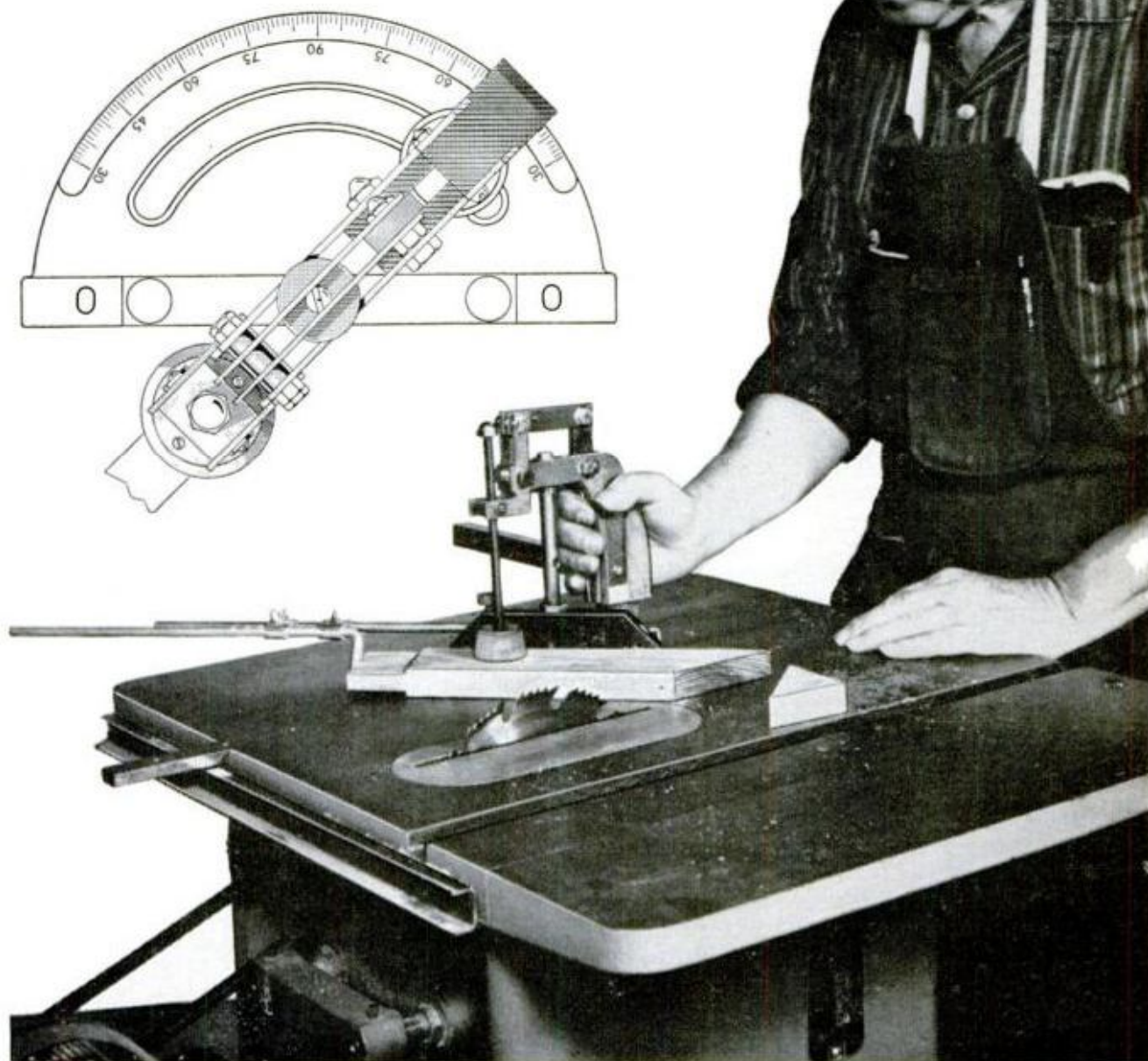
Bushing Prevents Tap Breakage

When threading a hole under power the tap is apt to break when, while supported by tail center alone, it slips off the center and catches in the work. A better way of holding the tap and preventing such a mishap is to insert it in a shouldered bushing chucked in a drill chuck. Two flats ground on the shank of the tap permit an open end wrench to be used to keep the tap from turning. Thus with the tap free to move forward in the bushing, once started, the tap will feed itself in the work without having to advance the tail spindle.



PISTOL-GRIP HOLD-DOWN

By Howard R. Clark



HOLDING STOCK FIRMLY against both saw table and miter gauge while you feed it through your bench saw can be tiring on the hands. Yet if you don't, the stock will creep enough to ruin the cut—particularly when you're cutting miters.

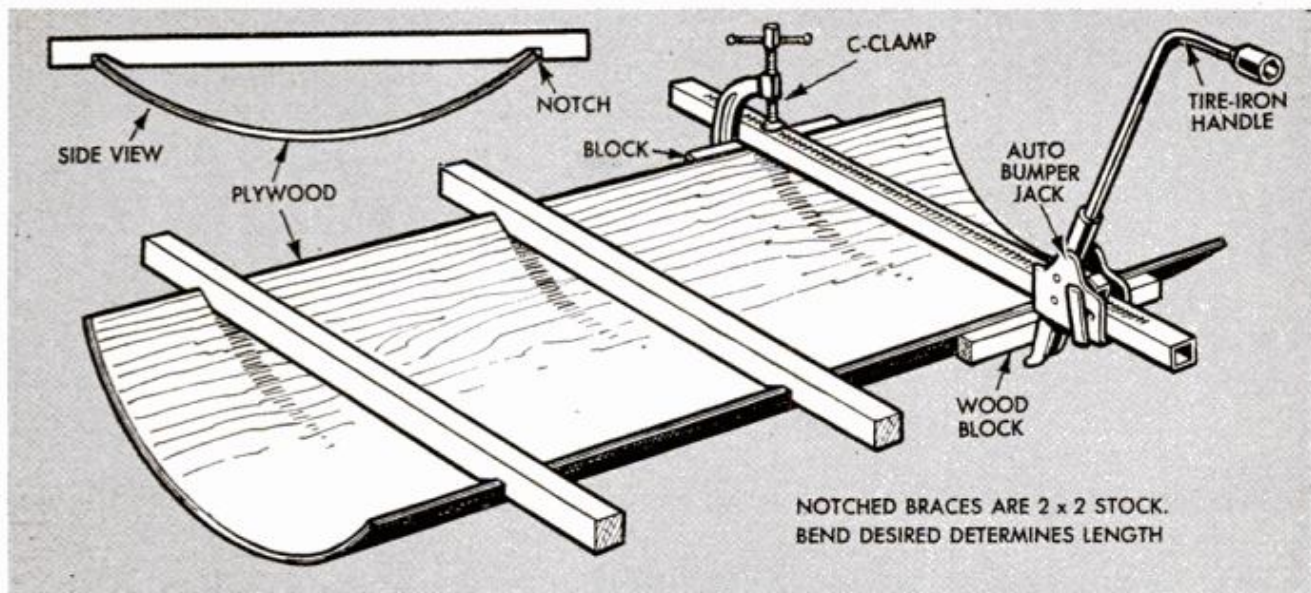
Here's a quick-acting, positive hold-down that screws on top the miter gauge. A squeeze of the pistol grip provides compound leverage that presses the hardwood pad firmly against the face of the stock. The long threaded rod lets you adjust the pad to any stock thickness. After you've

made your pass, you just release the pad with thumb pressure on the top of the lever and the work is free.

Used with a stop rod, as shown above, the hold-down makes fast work of production cutting. Identical pieces can be quickly and accurately positioned for mitering or trimming to size.

You can assemble this unit in a short time and at very small cost, from parts available at any hardware store. The two sizes of flat corners are used just as you buy them, except for trimming off un-

Bumper Jack Does the Trick in Bending Plywood



BENDING PLYWOOD without pre-forming it can pose a problem, especially if working alone. Recently I had to bend two narrow panels of $\frac{1}{4}$ -in. plywood to form curved roof sections of a camper trailer. Wetting the sheets with a sponge and warm water was no problem, but forcing the panels into a curve and holding them so until dry had me stumped. Then I thought of my car bumper jack. The jack, plus several notched braces, made bending a simple job. From a full-size drawing of the radius to be formed, I was able to determine the spacing of the hook notches in the braces and to allow for a certain amount of spring back which would take place when the braces were removed.

With a C-clamp at one end of the jack and with wood blocks at hand to prevent crushing the edges of the plywood, I started at the center and bowed the panel enough to hook the car jack over the edges. Then by working the jack, I was able to gradually bow the panel until I could hook a brace over the edges. From here I moved the jack and blocks to the end of the panel and repeated the step until another brace could be applied. When I had enough braces across the bowed panel to hold it straight from one end to the other, I left the assembly to dry overnight. After removing the braces, the bowed panels fitted the roof of my camper perfectly.—Carleton L. Hastings

COMING UP NEXT . . .

FAMILY THUNDERBOAT. Last September PM introduced you to an exciting new trend in pleasure boat design—the hydroplane runabout. If this whetted your appetite, watch for next month's issue which includes a detailed construction article on building your own four-place 50-mph funboat. With sleek sports car styling, it's a Gold Cup thrill to drive.

BARREL OF BIRDS. Ever consider putting an apartment house on top of your garage? You can make a comfortable 18-room home for martins out of a common barrel and mount it on the gable of your garage. You'll find all the details in the March PM, leaving plenty of time to complete the dwelling before the first feathered tenants arrive.

THERMOPILE. Everyone knows you can turn heat into electricity, but this mystifying demonstration still seems like a bit of magic. Next month, PM shows you how to make the simple apparatus which generates enough electricity to run a small motor from the flame of canned heat. It's a sure hit for science fairs or science classes.

LITTLE BLACK BOX. No wheels, no treads, no air jets, just a box with a smooth flat bottom. But plug-in the cable from its little red battery wagon, and away it goes, towing the power supply behind it. Place a finger behind it and the little box draws away in fright, put your finger in front and the box nuzzles against it. March PM tells you how it works.



COMPOUND SLIDE REST FOR YOUR WOOD LATHE

1. DRILL RAILS for bolts and pins, using predrilled end supports as templates

By Walter E. Burton

WHEN YOU add a compound slide rest to a wood-turning lathe, you expand the tool's abilities to include precise machining of metals, plastics, hardwoods—any turnable material.

The lathe does not need altering unless you must change pulleys or add a jack shaft to produce spindle speeds low enough for metal turning. You'll probably also want to add a chuck or two of the type used to hold metal rods, tubes and rings—say one universal jaw, and one independent four-jaw type.

The compound slide rest shown in use on the facing page was designed to be built in a shop that presently has no metal-working lathe. It's not as complicated as a quick glance at the drawings on the following pages might suggest. The

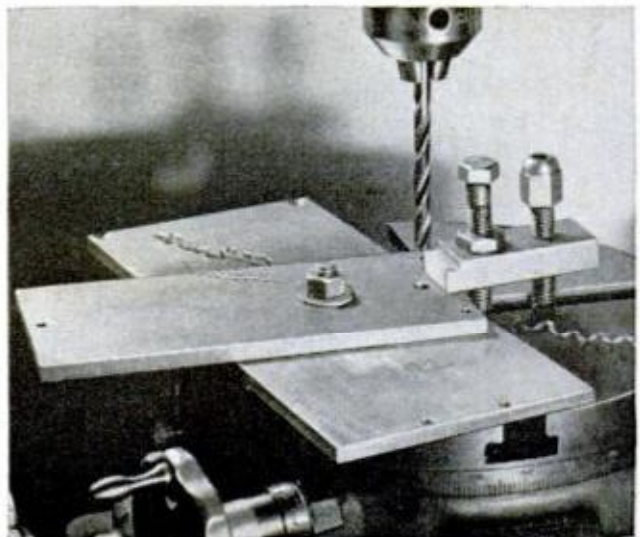
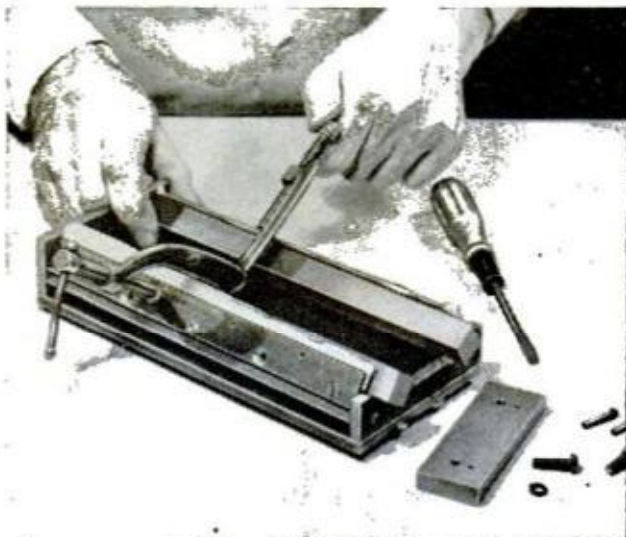
basic materials needed will include:

One plate of $\frac{3}{8}$ -in. and three plates of $\frac{1}{4}$ -in. steel (keyed A, J, K and S on the drawings); four $\frac{5}{8}$ -in.-square steel bars for the lower slide rails (E and F); four $\frac{3}{8}$ -in.-square steel bars for the upper slide rails (L and P); strips of $\frac{1}{8}$ -in.-thick metal in $\frac{3}{16}$ -in. and $\frac{3}{4}$ -in. widths, for the gibs and their retaining plates (I and O); eight end supports of $\frac{1}{4}$ -in. steel (B and C, G and H, M and N, Q and R); pieces of the same stock, to form the tool-post slot; enough $\frac{3}{8}$ -in.-16 threaded rod (the type sold in local hardware stores) to make one 6-in. and one 10-in. feed screw; and two brass blocks, each $\frac{3}{4}$ -in. to 1-in. square and about an inch long, for feed-screw nuts, which are stationary.

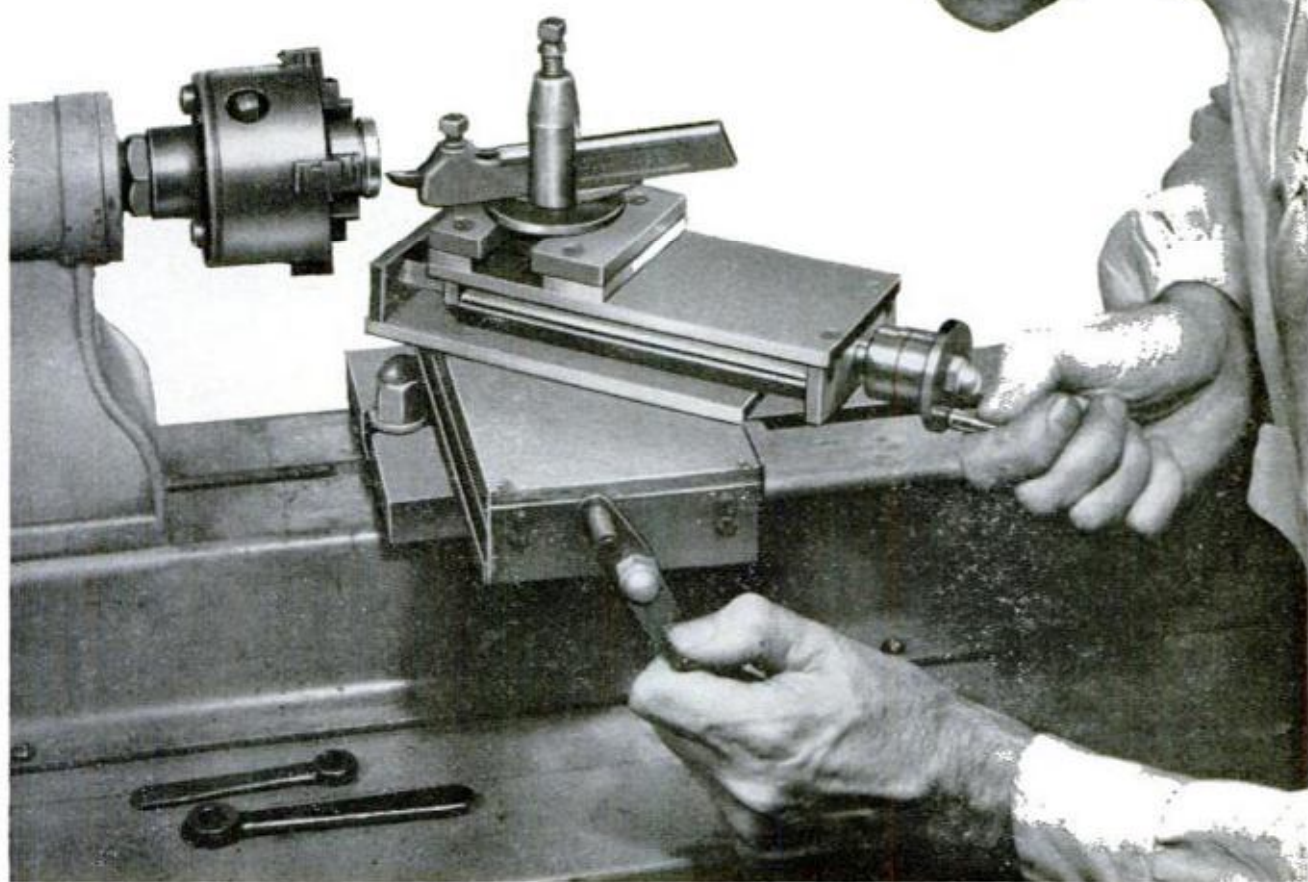
Start with the cross slide. This half

2. UPSIDE-DOWN ASSEMBLY of cross-slide sections assures accuracy. After rails F are joined to end supports and plate J, use assembly as spacing cradle for rails E. Slip paper between gib and rail before clamping to drill for bolts and pins at right

3. TO MAKE CURVED SLOT in plate J, secure plate K to it with pivot bolt and drill series of overlapping holes through locking-bolt hole, while K is pivoted about 100 deg. Then file away jagged edges and file hex nut to fit slot as shown on page 193



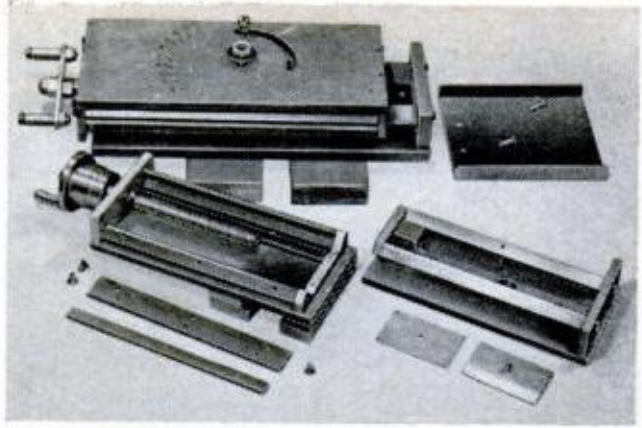
Wish you could do metal turning? This accessory lets you do it on your wood lathe—and you need no special metalworking equipment to make yourself one



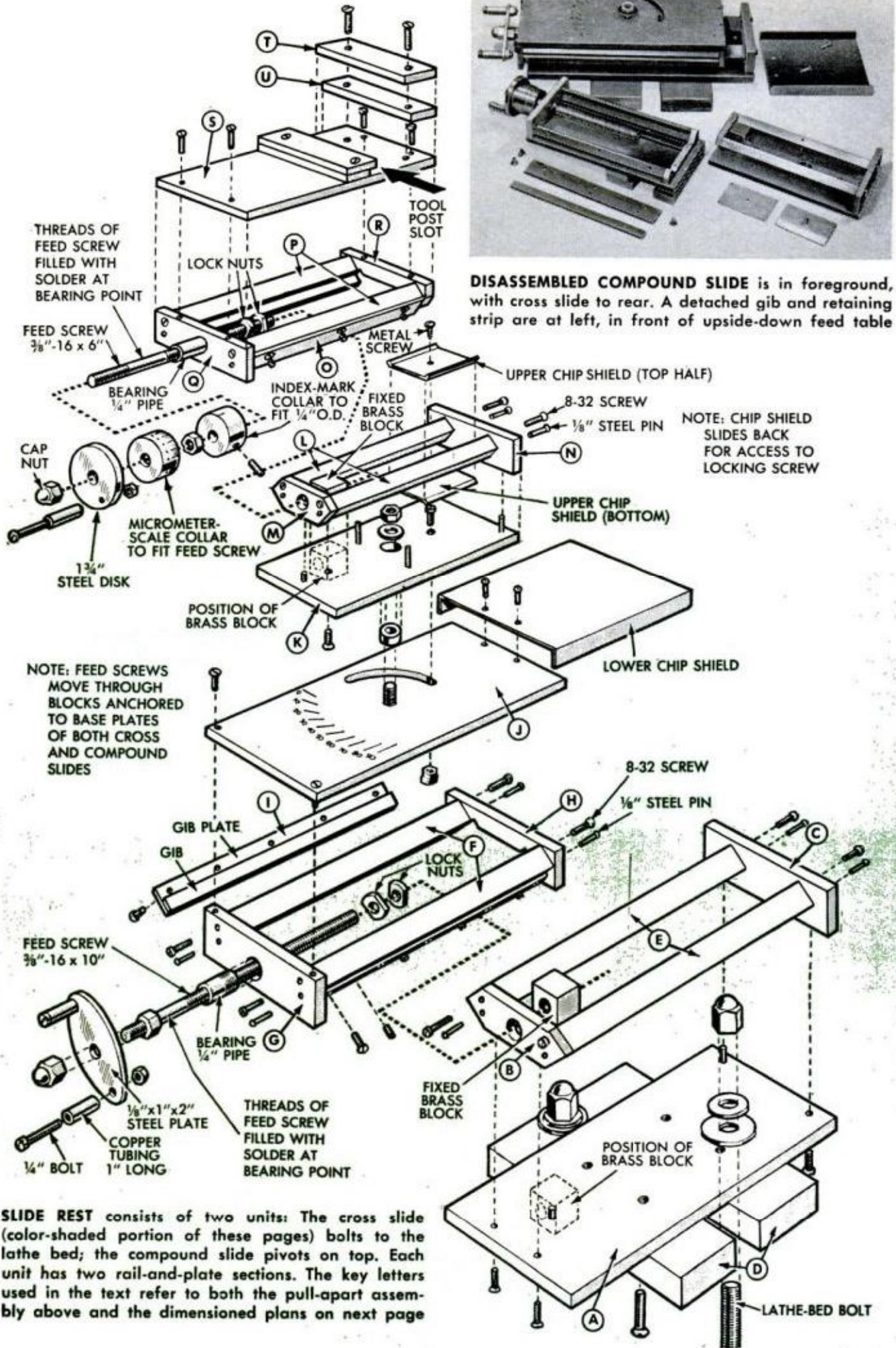
of the assembly (above) consists of two rail-and-plate sections. The bottom (fixed) section bolts to the lathe bed; the top (sliding section moves crosswise to the lathe bed—as for facing cuts—and serves as a mount for the pivoting compound slide. The gibs, attached to the rails of the sliding section, are adjustable to control any play that may develop.

It's important that rails are mounted exactly parallel to each other and to the plate on which their end supports are mounted. Assemble the top section first, clamping the rails in position and using the pre-drilled end supports for boring

templates, as in Fig. 1. Note that the gib-retaining plates are already attached to the rails. A V-block makes a good clamping support. After these rails are secured, use them as a form for clamping the lower, fixed rails while the latter are drilled for the bolts and pins that fasten them to their end supports (Fig. 2). Before applying the clamps, place a strip of fairly heavy paper—such as from a grocery bag—between each gib and its retaining strip, to provide clearance for easier assembly. Gib setscrews will take up the slack when the unit is in use. At each point where a setscrew touches a gib,



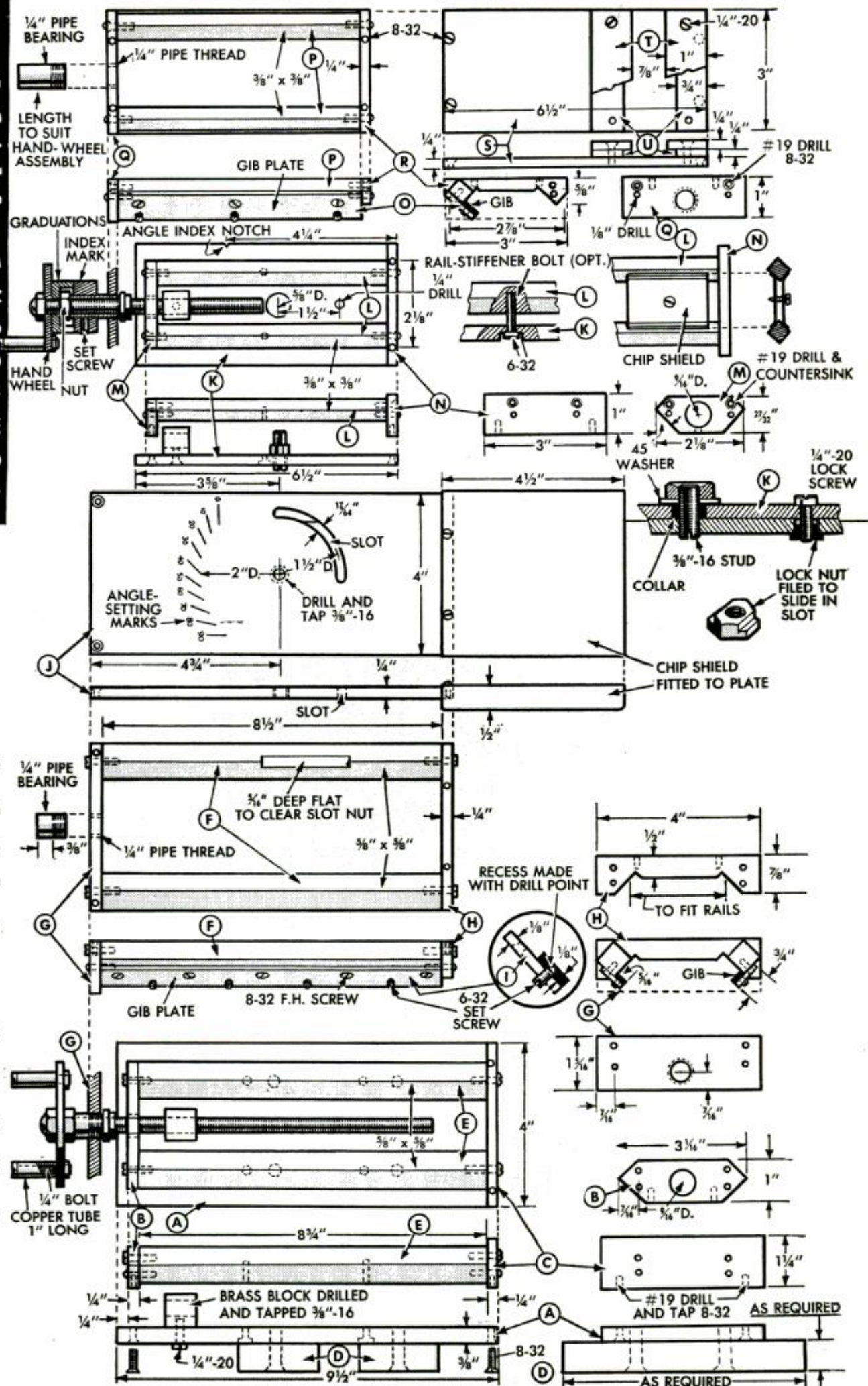
DISASSEMBLED COMPOUND SLIDE is in foreground, with cross slide to rear. A detached gib and retaining strip are at left, in front of upside-down feed table

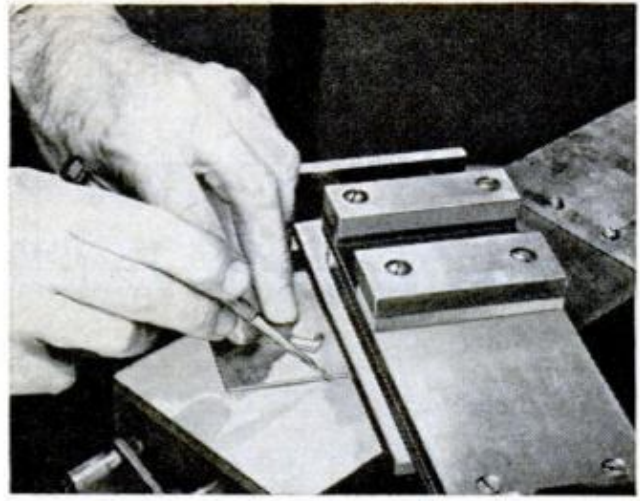
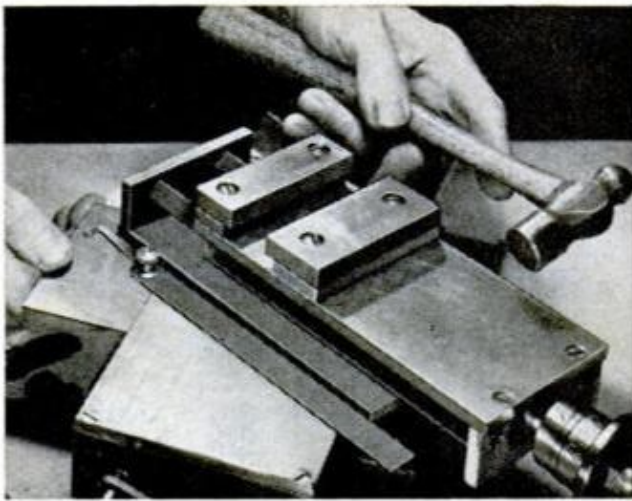


SLIDE REST consists of two units: The cross slide (color-shaded portion of these pages) bolts to the lathe bed; the compound slide pivots on top. Each unit has two rail-and-plate sections. The key letters used in the text refer to both the pull-apart assembly above and the dimensioned plans on next page

COMPOUND SLIDE

CROSS SLIDE





4. SCRIBE SCALE into face of plate J, after making index notch on edge of plate K. Set compound slide at accurate angles with protractor, tapping lightly with hammer and clamp tight. Use square edge of protractor to guide scribe. To use scale, be sure cross slide is clamped at right angles to headstock axis

drill a recess about $\frac{1}{16}$ -in. deep and not much wider than the screw tip. These prevent lateral shifting. Position the screws to provide access when the rail sections are assembled.

You can use either two 8-32 bolts, or one bolt plus a $\frac{1}{8}$ -in. steel pin, to fasten each rail to each end support. When pre-drilling the supports, use a No. 29 (tap-size) drill for the bolt hole; then, after the supports have served as boring templates, enlarge these holes with a No. 19 bit. Where clearance is close, bolt heads are countersunk.

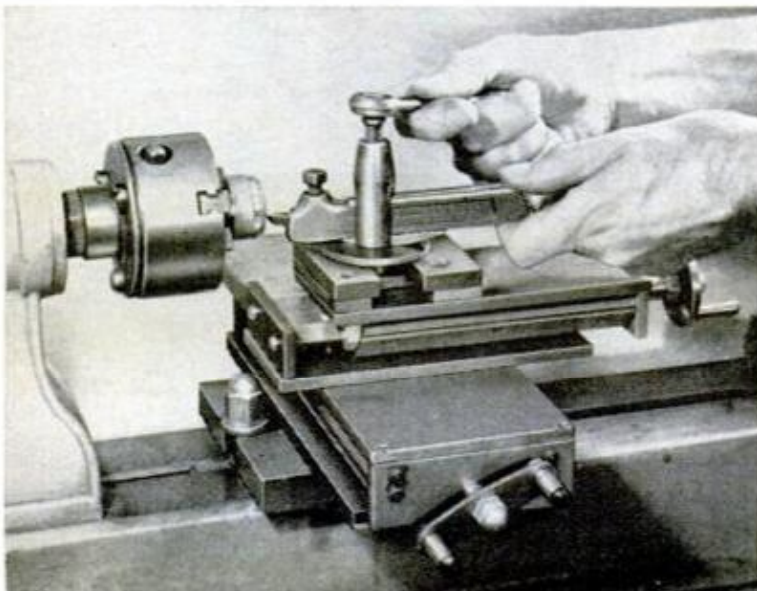
To prepare the bearing for the 10-in. feed screw, ream out a piece of $\frac{1}{4}$ -in. iron or brass pipe until it's round and smooth. Take pains that the end of this pipe is square with end support G when screwed tight. Drill and thread the brass block so the feed screw is parallel to top and bottom plates A and J. At the point when the screw rotates within the pipe bearing, coat it with solder or babbitt to fill the

threads and increase the diameter. Then file until the screw rotates snugly inside the bearing. Two thin nuts, jammed together behind this soldered section, ride against the inside end of the bearing. The central hole in end support B should be large enough for these nuts to turn inside it without binding.

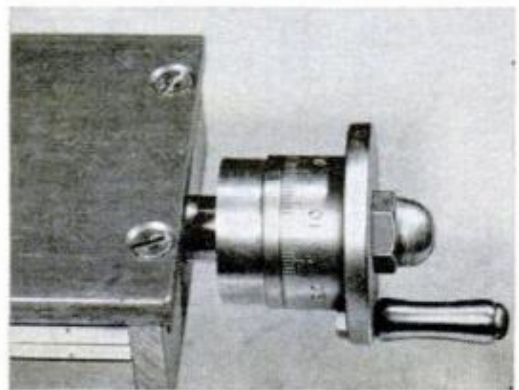
In the photos and drawings, different hand controls are shown on the two feed-screws. The choice between a two-handled crank or a handwheel is not critical, unless you plan to add micrometer scales.

Making the compound slide. This—the pivoting half of the accessory—is of the same basic construction as the cross slide, but on a smaller scale. As shown in Fig. 3, its bottom plate (K) pivots on plate J of the cross slide, for angular settings. The pivot stud is threaded into plate J and passes through a bushing press-fitted in plate K; it protrudes enough to permit the use of a washer and nut.

[\(Please turn to page 212\)](#)



5. STANDARD TOOL POST for 9-in. metal-turning lathe clamps regular tool holder. Point of bit should normally be on center-line of lathe spindle. Much work requires no micrometer collars on feed screws, but they're easily added, as shown below

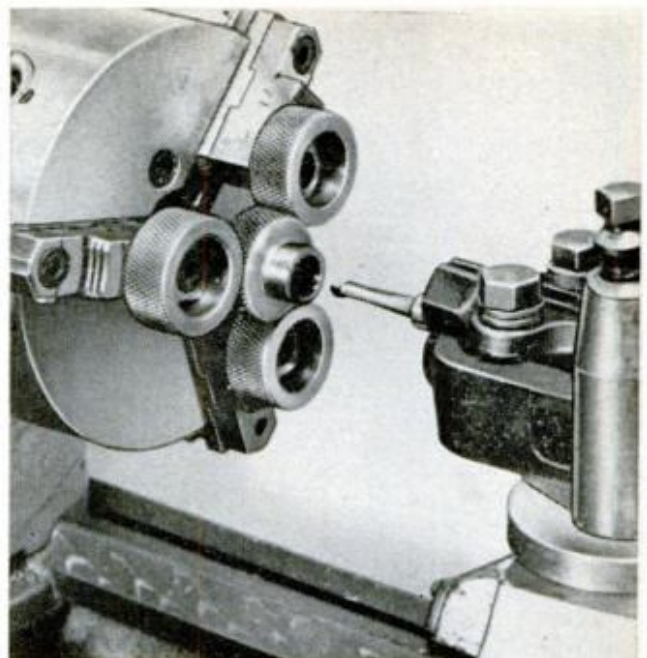


FOR THE MACHINIST

Gripping Knurled Work

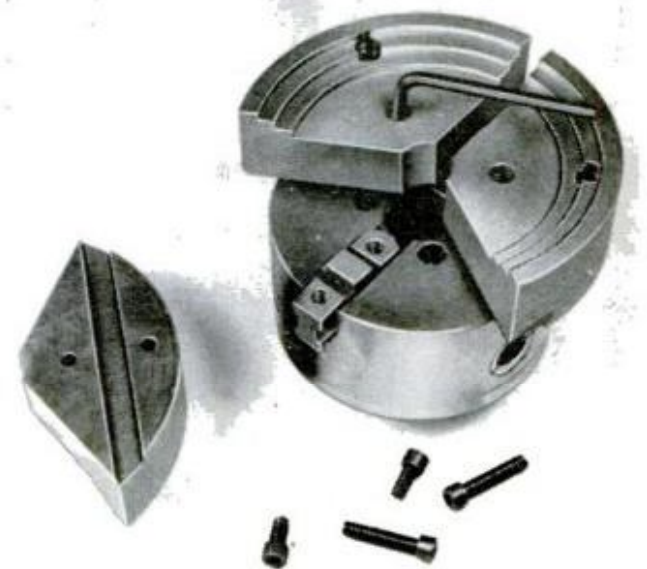
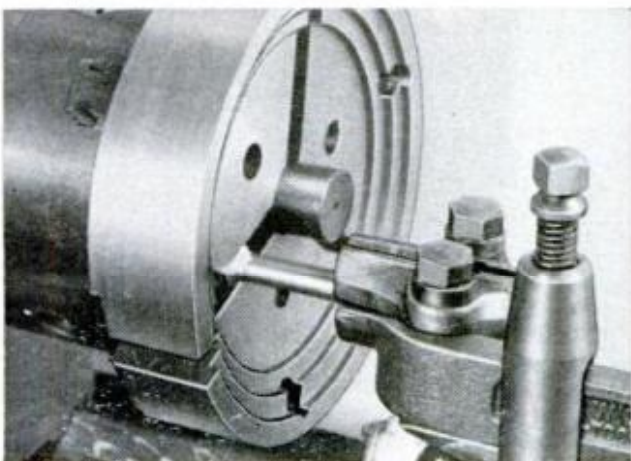
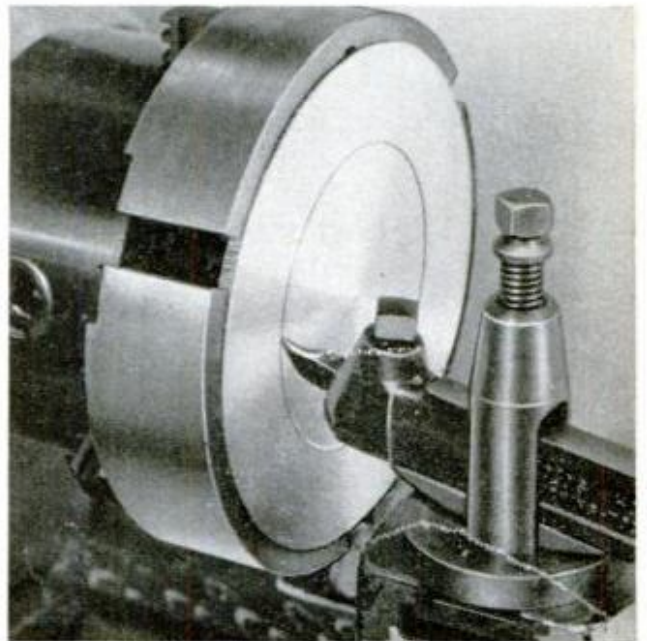
Solutions to the problem of holding knurled work in a three-jaw chuck don't come easy. Bringing the chuck jaws down directly on the knurl will almost surely damage the delicate pyramids and use of a sheet-metal wrapping may result in inaccuracy. The surest way is to machine and knurl three identical collars to slip snugly over the chuck jaws, using the same knurling tool as that used on the work. Then set up the job in the manner pictured, making sure that all the knurls mesh when the jaws are tightened. Then you have a positive drive with no chance of damaging the work and no possibility of slippage.

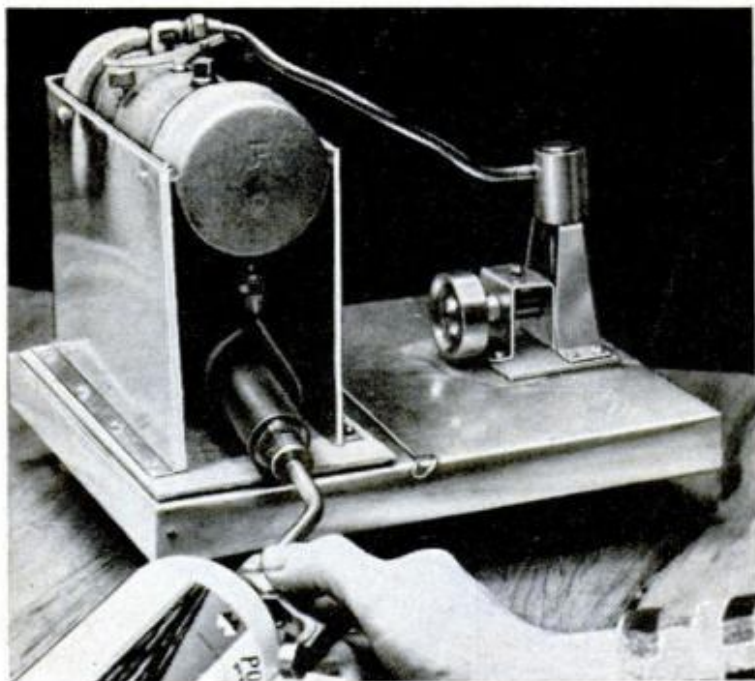
—H.J. Gerber



Stepped Pie Jaws Grip Thin Disks for Machining in Lathe Chuck

Equipping a small three-jaw universal chuck with a set of "pie" jaws—not only extends the reach of the standard chuck but enables you to grip thin metal disks of several diameters. The auxiliary jaws can be made of aluminum or mild steel by turning a circular blank and then milling into three equal segments. The back face of each segment is then milled to seat over the master chuck jaws, pictured in the lower right-hand photo, to which they are attached with socket-head screws turned into tapped holes in the jaws. Care must be taken to see that the three segments are accurately located and that the screws are tightened to a uniform tension. The step jaws can be used once for given diameters and then remachined as in the lower left-hand photo to suit other work. When machining, the jaws are put under tension by tightening down on a length of round plug as pictured. The plug is then removed and has no further function until the jaws are remachined.





Last month we detailed the simple machining of the engine itself. Now, add the blowtorch-fired boiler—literally a "pipe" to assemble

By Manly Banister

A DOUBLE-CAPPED PIPE nipple with an underslug coil of copper tubing forms the boiler for the working-model steam engine described in the January issue. This assembly, suspended within an aluminum-sheathed asbestos firebox and fired with an ordinary propane torch, produces a head of steam in about two minutes to set the midget engine whirring.

The boiler's designed to be one of the fastest things you ever built. Its parts are all plumbing supplies available at hardware stores—including standard brass compression fittings for $\frac{1}{4}$ -in. o.d. copper tubing. Before coiling the tubing, attach a fitting to one end and flare the tubing with a flaring tool. Then wrap the tubing four times around a length of $1\frac{1}{4}$ -in. dowel held in a vise, cut off the other end and attach the second flare fitting. The photo and sketch on page 199 show that when it's assembled to the boiler, one end of the coil is higher than the other; this is easily achieved by making the lead to one end shorter. This higher end is located at the rear of the firebox, as it's there that steam

is generated. Water passes into the coil at the front end, which is relatively cool compared to the end at the flame tip.

The skewer, lying on the deck next to the firebox in the photo at left, above, is used occasionally as a slice bar to knock off scale that accumulates on the coil. Formation of scale can be minimized by proper firing: Keep the flame off the coil and *never* let the coil turn red hot. Scale tends to insulate the tube from the heat, so knocking it off the coil raises the steam pressure and speeds up the engine.

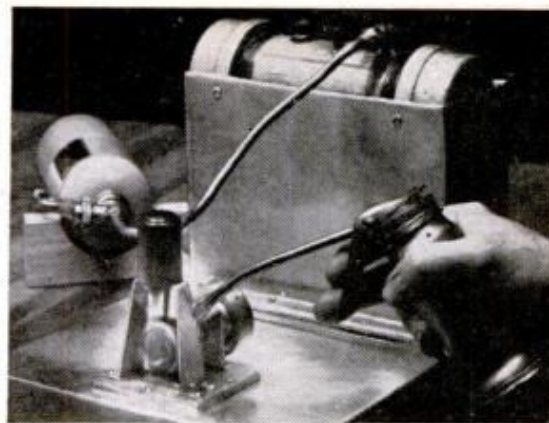
To assemble the boiler parts, put pipe-joint compound on all threads, and turn them up tight. Don't neglect to install a safety valve, as detailed on page 199. The plug is the head end of a plated wood screw, and its hole in the boiler is drilled with a numbered drill only a thousandth or two larger in diameter. File or spot-mill around the hole to make a tight seat under the screw head. The "modern Chinese" curve to the safety-valve arm in the photo (far left) isn't a decoration: When you trim off a narrow piece of thin

brass with shears, that's the shape it takes. This arm pivots on a pin through the slotted end of a $\frac{3}{16}$ -in. brass rod screwed tight in a tapped hole.

If you get careless with the blowtorch and generate too high a head of steam, this simple, positive-acting safety valve will prevent a serious accident.

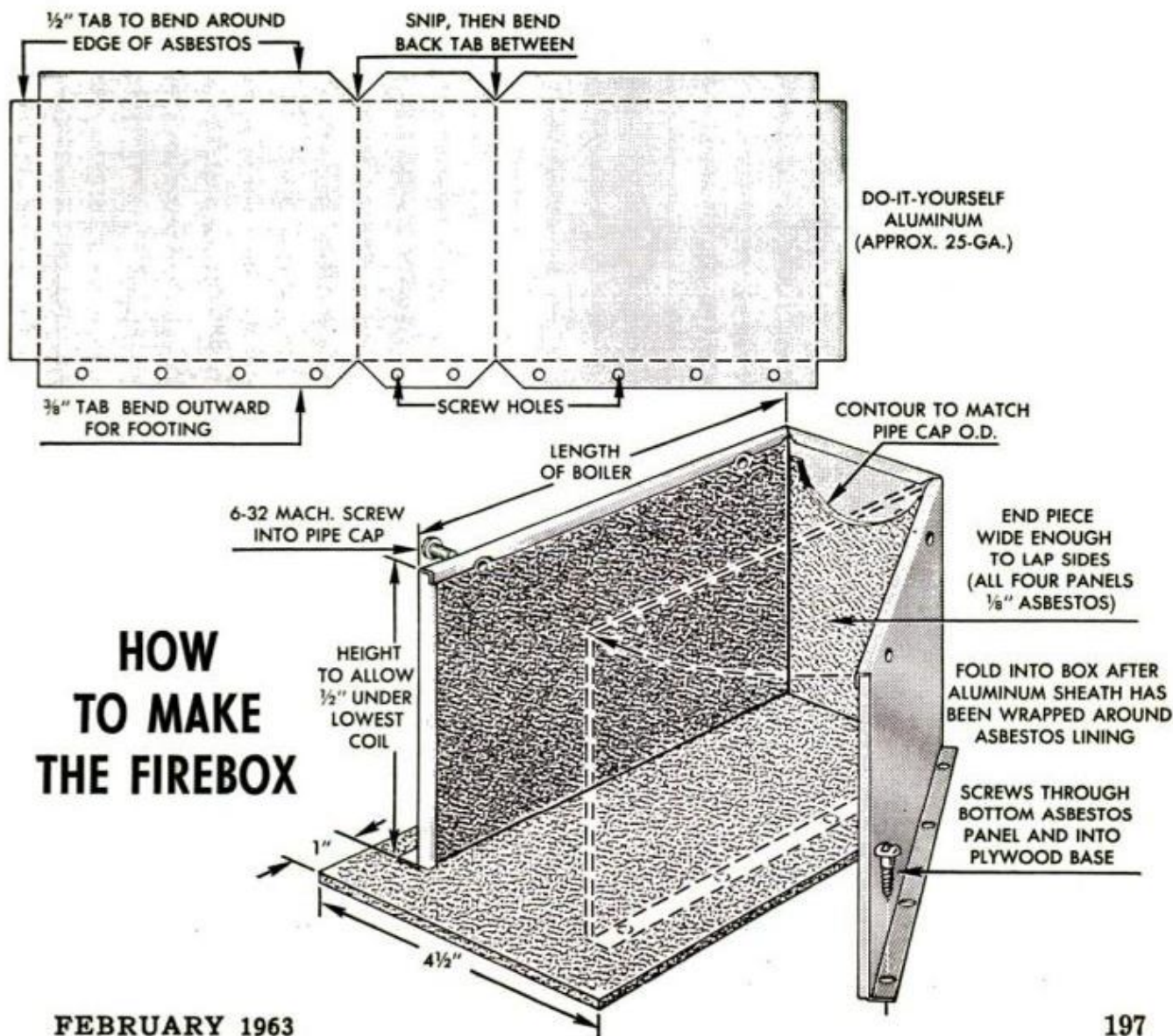
Three sheathed asbestos panels are folded to form a box, as shown below. The boiler (with coil attached) is suspended inside by means of two machine screws into each pipe cap. The inner cap is also cradled on the contoured edge of the end panel. This assembly is then set on the bottom asbestos panel, which is positioned next to the engine on a platform, as shown in the photo at left. This platform is a $9\frac{1}{2}$ -by-11-in. piece of $\frac{3}{4}$ -in. plywood, with four $\frac{3}{4}$ -in.-dia. dowels glued into holes in the underside. The platform shown has been covered with the same type of aluminum used to sheathe the firebox. This protects the plywood from flame and steam.

To fire the boiler, pour 10 to 12 ounces of water into the filler hole and screw in the plug. Attach a heavy-duty nozzle to a

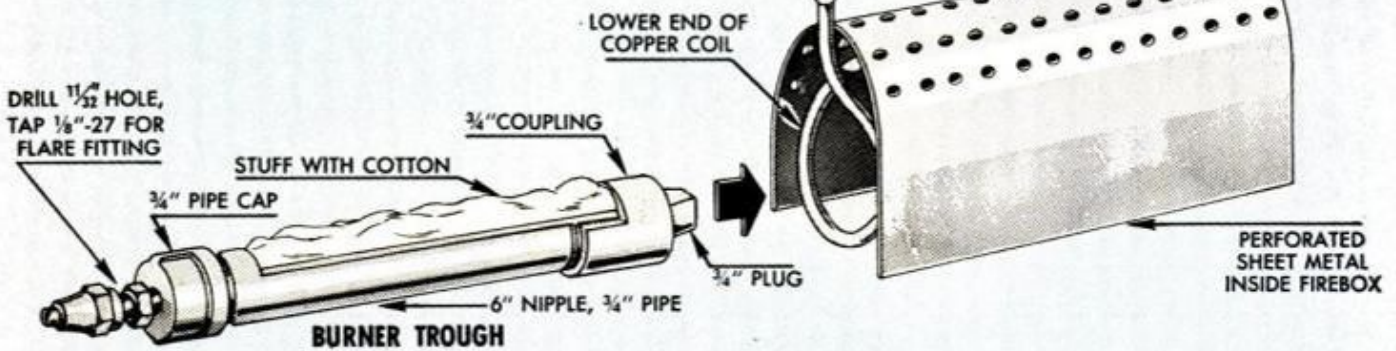


KEEP THE ENGINE OILED

Until the engine gets thoroughly hot, frequent oiling is required. With a squirt-type oil can, apply a few drops of 20-weight crankcase oil on the eccentric as shown. Also keep the bottoms of the pistons lubricated, so that oil is pumped up into the cylinders. The excess will run down the rods to lubricate the crankpin. Continue oiling every few minutes.



HERE'S AN ALTERNATE WAY TO FIRE THE BOILER

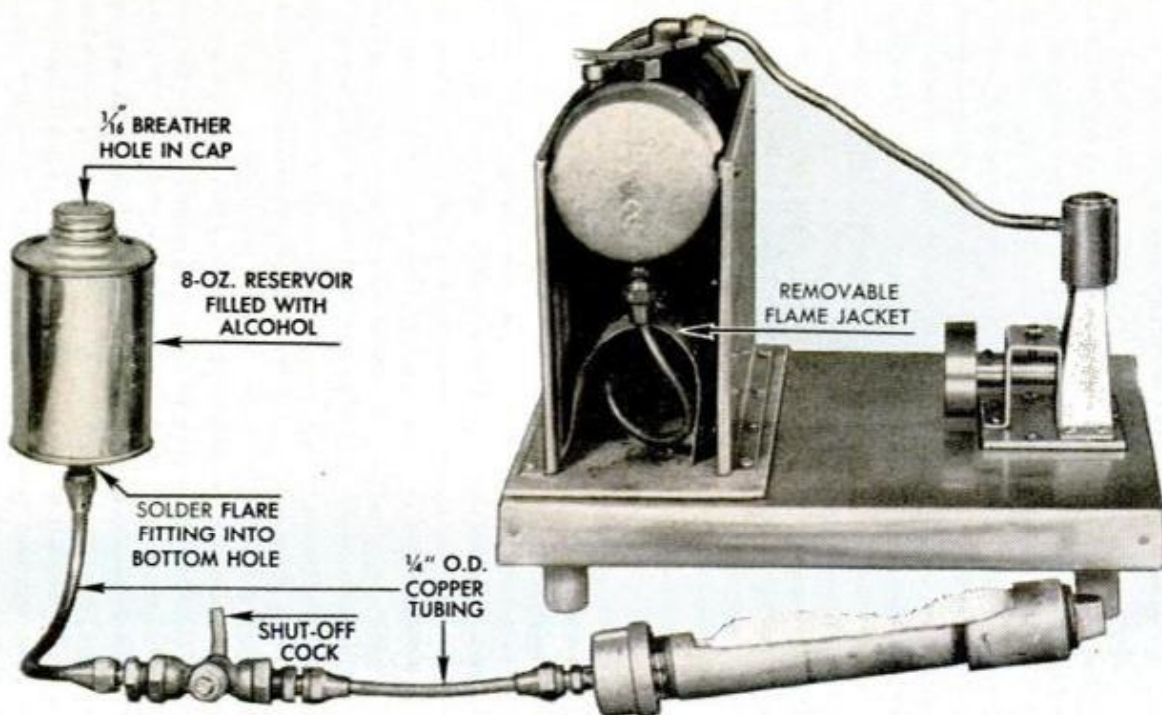


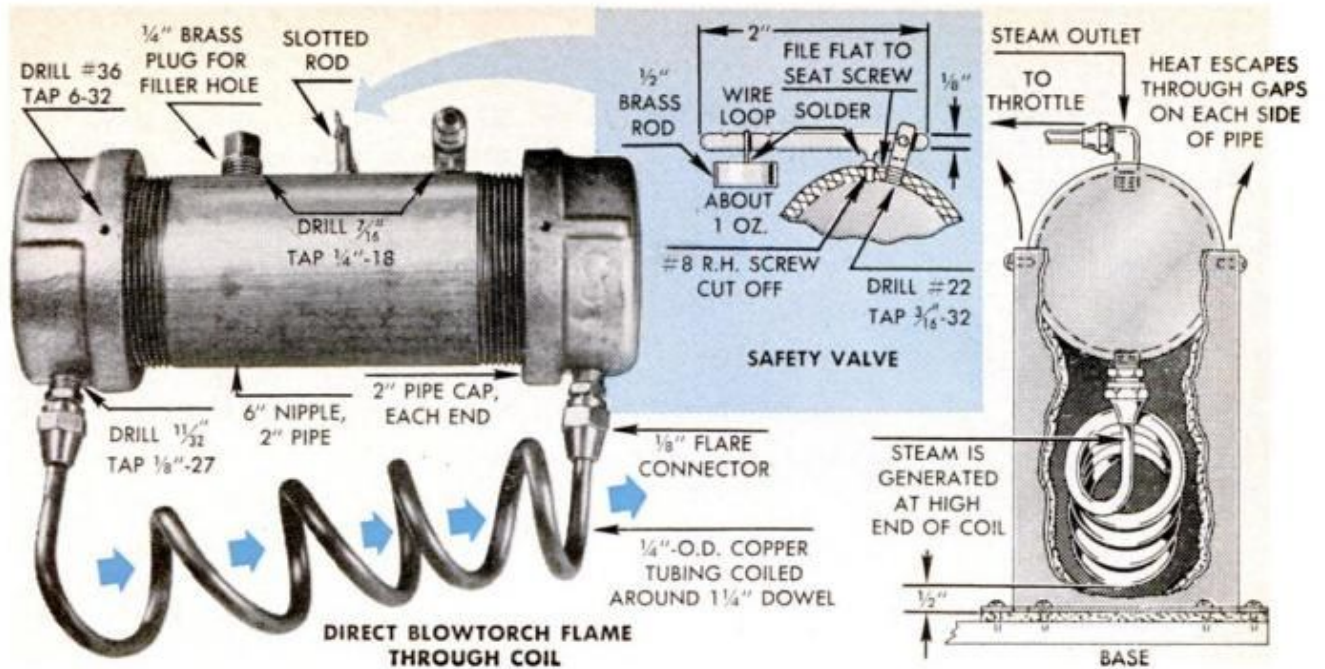
If you'd rather not use a blowtorch to heat the coils, you can make an efficient alcohol burner from another pipe nipple and a few fittings, as illustrated above and below. It'll cost you about \$3. The nipple is cut away and capped at both ends; the end that goes into the firebox is closed with a coupling and plug, since a pipe cap would be too big to pass through the coil.

Stuff this cut-away assembly with cotton—all the way to the end of the pipe cap, to make contact with the feed line. The shut-off cock provides fuel control. The perforated flame jacket, slipped over the coil before

the boiler is set in the firebox, increases the heater's efficiency nearly 100 per cent. It needn't be removed if you switch to blowtorch operation.

To operate the burner, prime the trough with about two oz. of alcohol. (The shut-off cock is left closed.) When the burner is inserted through the coil, the fit is snug enough to hold the reservoir suspended, without additional support. Whenever the fire starts to die from lack of fuel, open the shut-off cock for a second or two, then close it tightly. This avoids refilling the trough outside the firebox—which could be dangerous while the burner is hot.



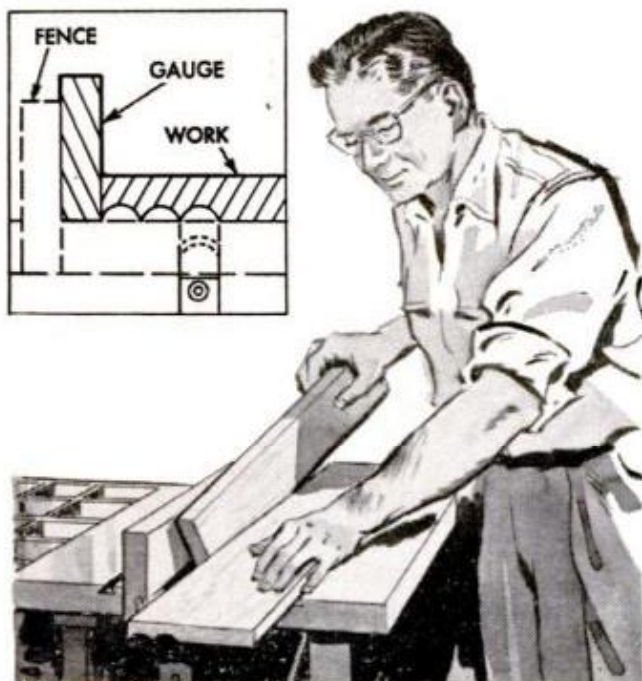


propane torch and set a medium flame. Prop the torch in a small cradle of wood so that the nozzle rests on the first ring of the coil. In about two minutes, steam should start coming out of the engine. Spin the flywheel several times to pump out the condensation and to heat the engine block. Once the engine is hot and puffing, no

throttle is needed to control its speed. Merely adjust the valve on the blowtorch. You can "pour on fuel" by opening it—then damp the fires by turning it down. For longest engine life, however, keep the flame turned down so that the engine lugs along at about 1200 r.p.m. At this rate, boiler filling lasts up to 20 minutes.

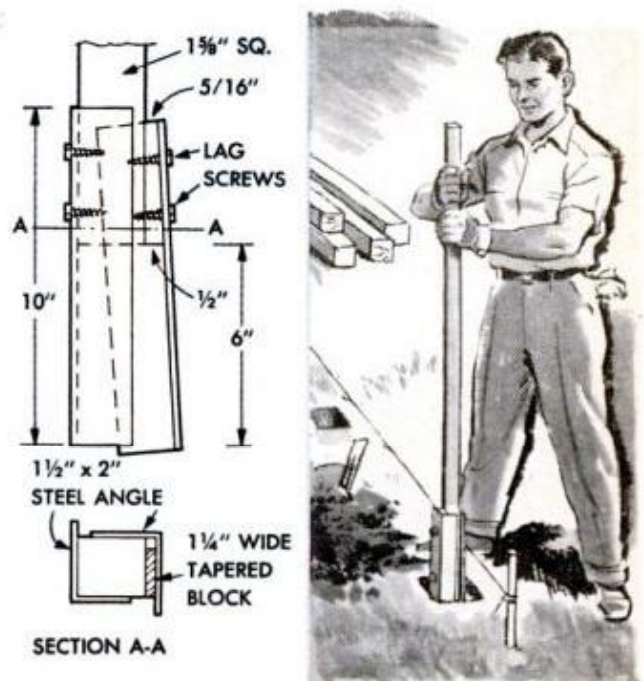
Spacing Parallel Cuts

Want to make a series of parallel cove or reed cuts with a molding head on a bench saw? After each cut, hold the work in position while you shift the fence enough to insert a block the same thickness as the width of the cut or space. Clamp the fence, remove the block, and you're set for the next cut.—*Daniel Bousha*



Post-Hole Digger

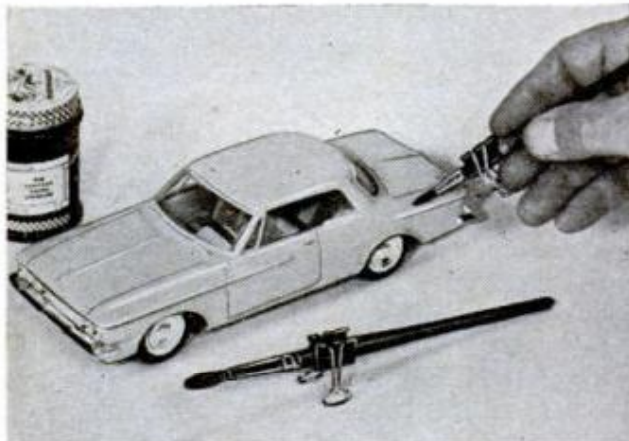
You can save yourself a lot of unnecessary digging when setting 4 x 4 fence posts if you make this rig to chop square holes only slightly oversize. Two lengths of steel angle lag-screwed to the end of a 2 x 2, with one set at an angle by means of a tapered wedge, trap the dirt in the end so it can be pulled up out of the hole.





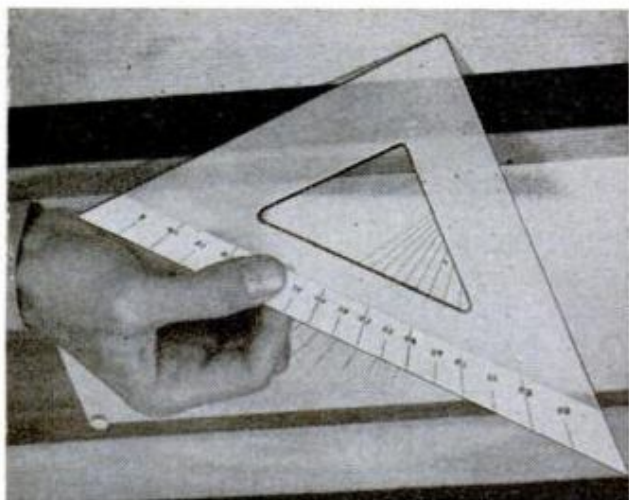
Second Look

People look twice, maybe three times, when they see this cleaner's truck go by. That's just the purpose of the two-color paint job you see in the photo—a most effective traveling billboard for a local business. The left half of the truck body (left from the driver's seat) is painted cream color. The other half is jet black. The paint line was masked straight and true, right down the middle. On the light side the firm name is in black and on the black side, in white.—*Ken Murray*



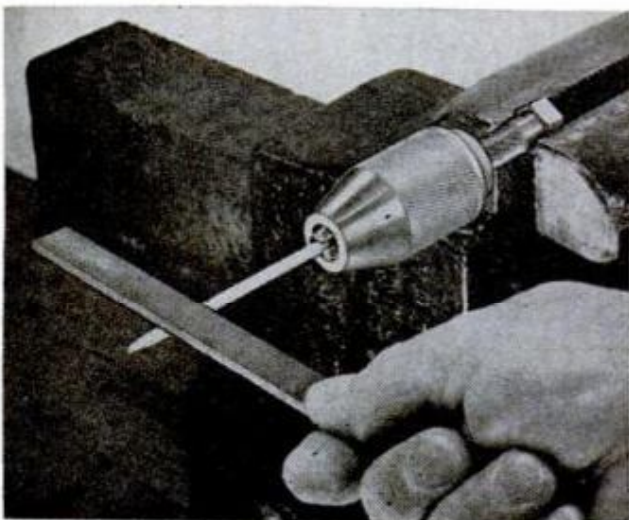
Brush Caddy

You've had this experience: You're working with two or three colors and as many brushes on a model or some other small item and you discover there's no place to put a loaded brush when you've finished with it. Of course, you can stand it, bristle end up, in any handy container but that's not too good. The paint will run down into the bristles. A better way is to provide a spring paper-clip stand for each of the brushes you are using.



Triangle Protractor

Draftsmen can save time and the bother of keeping a protractor handy simply by inking a five or ten-degree protractor scale on a 45-degree triangle. Just cement a paper strip to the long side (hypotenuse) of the triangle and then, using a protractor, ink the degree marks on the strip. The right-angle corner of the triangle is the point from which the scale lines are made to radiate. As a rule, the five and ten-degree marks are all that are needed, but, of course, the full scale, or a part of the full scale, can be included.



Improved Pin Vise

There are times when an ordinary vise, even a small one, just won't do for the job. A pin vise is the answer, but you don't have one. Then unscrew the chuck from a hand drill, turn a capscrew into the tapped end of the chuck and you've got it. The chuck will hold anything from a pin on up to a short rod $\frac{1}{4}$ -in. in diameter. The head of the screw is held in a vise.

If a single-cut file clogs when filing soft metals, you can often minimize this tendency by turning the file at a greater angle with the work to increase the shearing cut.



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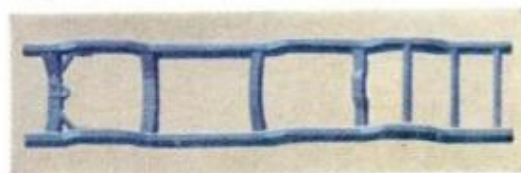
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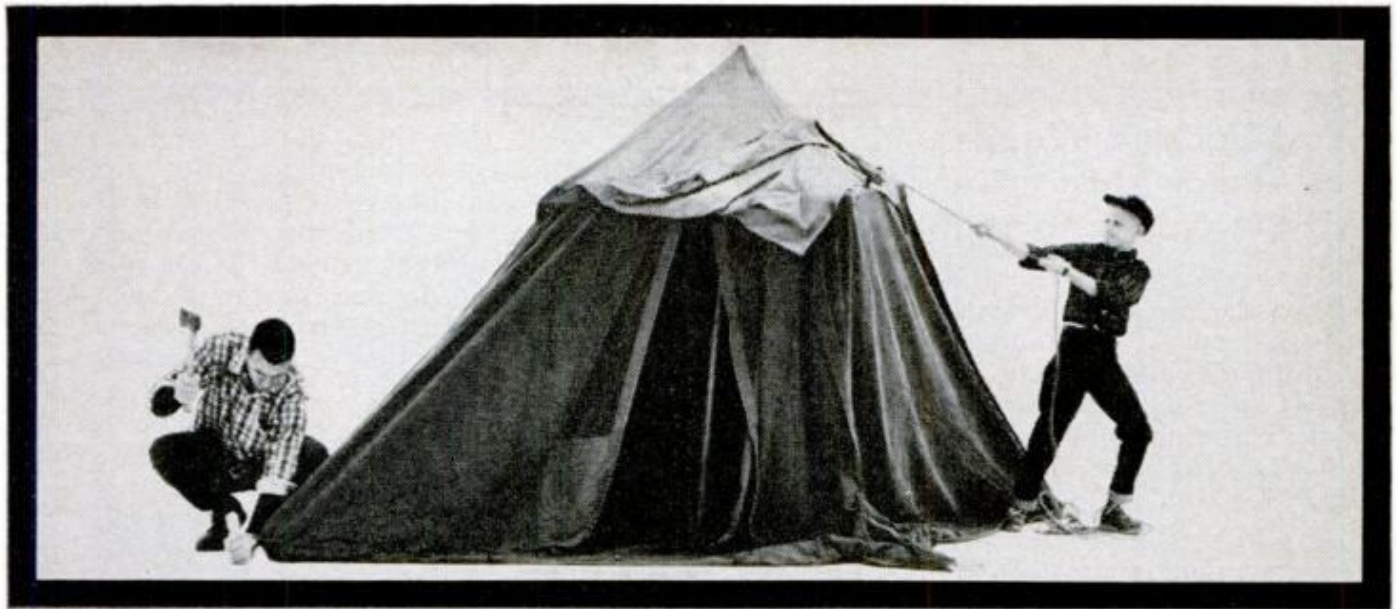
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CLINIC FOR HOMEOWNERS

Vari-Colored Woods

Q—I have acquired an old chest of drawers, an heirloom, and after taking off the old finish I find it consists of what appear to be several different kinds of woods, joined in narrow strips to make the end panels and the top. I tried to get a uniform color on one end with a dark stain. Now it looks worse than ever. The dark color darkened, but the light wood didn't darken to match. What can I do now?—I.H., Calif.

A—Many old pieces and some not so old had panels and tops built up as you describe from different woods, usually close-grained woods such as birch, poplar and gumwood. These usually were finished with a dark, uniforming stain, or toner, or a varnish stain, sprayed on. In this way a uniform color was obtained.

You can do much the same if you can rent a suitable sprayer from your local paint dealer and with this apply a couple of spray coats of a varnish stain in the shade desired. By spray application you can control the color and bring to a uniform shade on both the light and dark woods. If you have removed the old finish to the bare wood, the surfaces should be sanded smooth and a sanding sealer applied as the first coat. This will prevent uneven absorption of the new finish. Sand the sealer lightly and then follow with the spray coats of varnish stain.

If no sprayer is available, then you will have to work with a pigmented oil stain. Brush it on, allow to stand until the gloss just begins to flatten, then wipe off lightly. Make a second and even a third application, if this is necessary, to obtain the color and uniformity desired. Follow with one or two coats of clear finish after the stain is thoroughly dry.

Wood-Chip Insulation

Q—I have access to a large quantity of dry wood chips, or shavings, which can be had for the hauling. These chips are those that come from planing and boring machines in a nearby woodworking plant. I am planning to build a new home. Why wouldn't these chips make a good and lasting insulating material for walls and ceilings?—W.H., Me.

A—They would, if you could prevent them from settling into a more or less compact mass, leaving an uninsulated area between the studs just below the plate, and also prevent a six-inch layer

in the attic from settling to a compact three-inch layer between the joists.

Also one would have to find a way to prevent the chips from absorbing moisture and attracting insects. These are reasons why we do not recommend use of chips or sawdust as insulating materials, even though they may be had for the hauling, as you say, or at an attractively low price. We can only recommend that you use accepted insulating materials such as batts with a foil facing in the walls and perhaps glass-wool insulating material of the pour type in the ceilings. The latter should be poured over a vapor barrier. Or you can use a quilted glass wool, or glass fiber, in both walls and ceilings. Batt-form insulation also can be used in ceilings, but the use of a pour-type material is more common.

Moving Grapevine

Q—My back porch is practically covered with a grapevine. I have no idea how long the vine has been there, but it is a delicious white grape and I'd like to either move it or train it on an arbor alongside the porch—anything to get it off the porch and away from a lattice which is attached to the porch rail and through which the vines, or tendrils, have entwined. Looks rather hopeless but if there's any way to save the vine, I'd like to know about it, also when this should be done.—B.K., Miss.

A—Whatever is done should be carried out while the vine is dormant. Although it could no doubt be done, we doubt if you would find it practical to move it to a new location. Also, it may be advisable to cut the lattice to remove the entwining tendrils, rather than prune the vine too closely, although you can remove as much as 50 percent of the growth without injury to the vine, assuming it is healthy and has made a vigorous seasonal growth.

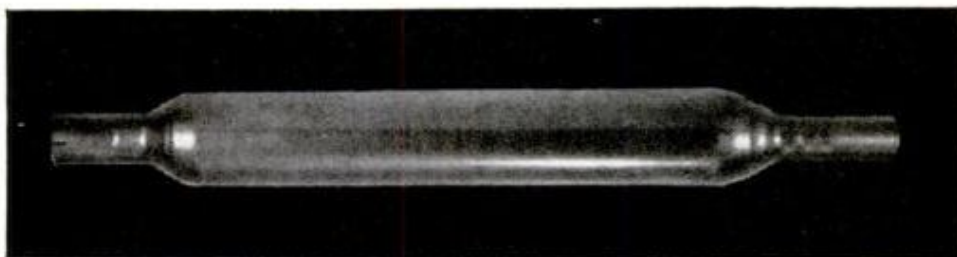
It is not possible to say at such long range and without examining the vine and its location just what to do. Perhaps it would be best to treat each tendril individually, working it loose by cutting away what is necessary to free it.

As a service to Popular Mechanics readers in solving the hundreds of problems pertaining to a home—inside or out—you are invited to present your problems to The Clinic Editor for his helpful advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 575 Lexington Ave., New York 22, N.Y.

Here's what we mean when we say the **Continental Mark II** really is a new...and different muffler!

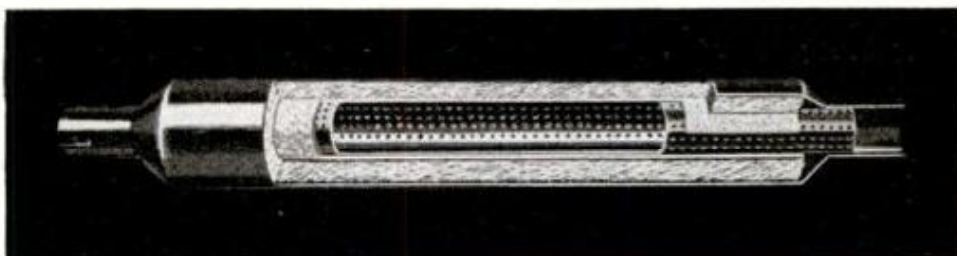
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Instant Color Photos

(Continued from page 105)

what, though not to a serious degree.

- The best pictures, the tests ultimately showed, were less a result of adjusting the variables than of choosing a colorful subject and ideal lighting conditions. Bright sunlight and the controlled conditions of studio lighting produced the most pleasing prints, and all the adjustments in the world couldn't make a colorful print from a dull subject. Photofloods, incidentally, require two filters with Polacolor (80B plus cc 20B), cutting down the rating to 12 ASA.

- Blue flash bulbs and electronic flash, which carry the additional handicap of establishing an index rating for the individual equipment, again left the photographer wondering whether the index or the development time needed adjusting when he made a poor print. As for quality, the most pleasing results unquestionably were made by electronic flash. Flash bulbs consistently created an over-all warm, yellow-brown cast. (The same brownish cast showed up in several flash pictures taken, for the benefit of a *PM* staffer, by a Polaroid photographer at Polaroid headquarters in Cambridge, Mass. So, it isn't the photographer, it's the film.) However, since flash-bulb attachments are available for Polaroid cameras, and the average amateur loves to use them for indoor snapshots of the family, the warmish Polacolor print produced by flash bulbs may be here to stay.

- Dull light produced the dullest Polacolor prints, but this is not unusual. All daylight color film is more brilliant in bright sunlight, and Polacolor is no exception. Surprisingly, however, the reddest Polacolor reds, which tended to pale to orange under other lighting conditions, showed up in prints taken on an overcast day.

- *PM*'s most extensive tests were made to compare Polacolor prints with conventional color prints, taking identical pictures under identical conditions. The results throughout were consistent. Conventional color prints are generally more brilliant, Polacolor prints are generally more subdued. It becomes a matter of taste.

Critics of conventional prints would call their colors exaggerated and unnatural, even "commercial," while admirers would say they are bright and beautiful. Critics of Polacolor would say it is often too dull and lifeless, while admirers would say it is just as often natural and subtle.

PM's tests indicate that conventional prints add color to a dull scene, or exaggerate the colors that are there, making

the scene look prettier than it really is; and they make a colorful scene more brilliant. Polacolor, on the other hand, adds nothing to a dull scene, and makes a colorful scene look natural. So you pay your money and you take your choice.

"Customizing" Polacolor

One odd result of the comparison tests was learning that you can "customize" Polacolor prints to some extent, while you lose some control over what the conventional print will look like. This comes about because Polacolor is printed in the camera, under the photographer's control, while the conventional print is usually printed by machine at the processing plant. In *PM*'s tests, each picture was bracketed, over, on and under the ASA rating. Polacolor prints showed the results, light, dark and average. But the three conventional prints, printed by an automated machine which tried to get the best possible print from each negative, came back from the processor looking almost identical. The negatives were different, but the prints were alike. This became slightly ridiculous when 12 different exposures, with 12 different settings, were taken of the standard color bar to see if the colors shifted from a light print to a dark print. The machine, bless its automated heart, didn't make a light print or a dark print, but tried its best to make 12 identical "average" prints from these 12 widely exposed negatives. We finally got what we wanted, however, by hand-carrying the negatives to a processor and explaining our problem.

Color Bar Tests

The color-bar tests showed some color differences between Polacolor and conventional color prints. Blues and reds were strongest in conventional prints, while yellows and greens were Polacolor's best. Generally, however, the conventional print produced more "definite" colors of the entire color bar, with greater separation between the colors. Polacolor, because its colors are more subdued, showed less separation between them. In fact, on those prints which were deliberately overdeveloped, the colors became a little muddy. As for accuracy of color, neither scored 100 percent in *PM*'s tests, conventional prints usually erring on the strong side and Polacolor on the weak side.

When the tests were completed, a *PM* staff member made a special trip to Cambridge to discuss the results with Dr. Edwin Land, founder and guiding genius of Polaroid, and the man for whom the Polaroid Land camera is named. He confirmed most of our findings, and explained Polaroid's approach to color.



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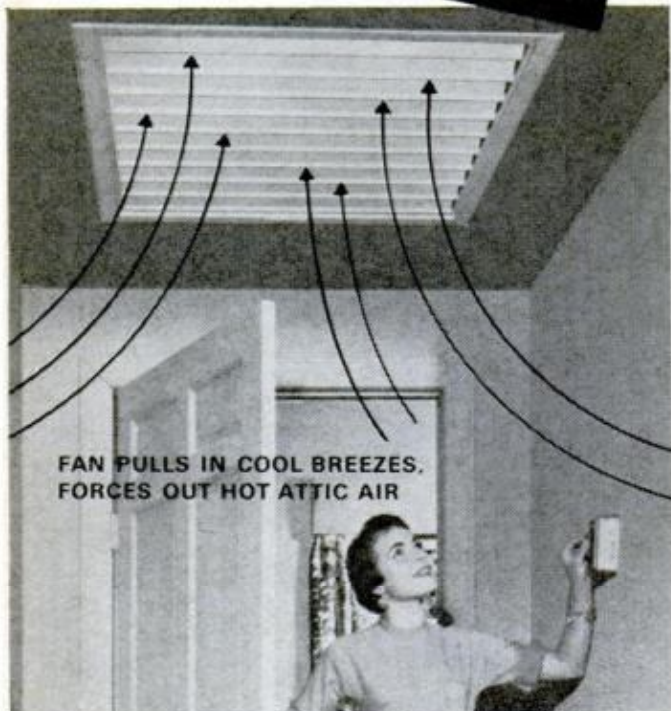
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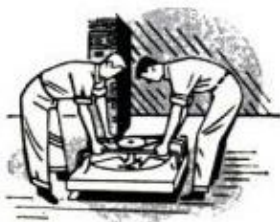
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Slide Rest for Wood Lathe

(Continued from page 194)

The completed unit shown was built for an 11-in. lathe. The top surface of the toolpost-slot strips (T) should be about 1 in. below the centerline of the lathe headstock spindle. Thus, overall height of the accessory shown is about 4½ in. from the lathe bed. The two mounting blocks (D) can be dimensioned to bring the toolpost slot to the proper height for various lathes. These blocks are simply 2-in. wide steel bars or strips bolted to the bottom of plate A; their length and spacing should be whatever is required to permit secure fastening with the lathe-bed bolts.

Test the unit by turning an easy material such as wood. Oil any moving parts, and be sure all bolts are tight. Adjust gib screws to take up excessive play in the slides. At first, the feed screws may turn hard because of slide tightness and roughness. Rails not equipped with gibs (which add stiffness) may have a tendency to spring. In the unit shown, rail-stiffening bolts were installed midpoint on the fixed rails of the compound slide. They can be seen in the photo on page 192, and are given as an optional detail.

Eliminating Play

If there's excessive chatter when turning metal, check the unit for play. Grasp the toolpost and try to rock it in various directions. If chatter persists once play has been removed, you may have to lower the spindle speed. Wood lathes often have a minimum speed that is too high for large-diameter metal turning.

You can do a lot of turning without feeling the need for the angular scale shown in Fig. 4, or for micrometer collars on each screw to gauge-feed in small fractions of an inch. These features may be added later. The collar shown (Fig. 5) is 1¼ in. diameter and ½ in. long. Its matching index ring, setscrewed to the bearing pipe, is about the same size. Each turn of the screw moves the tool 1/16 (or .0625) inch. Since the micrometer collar is divided into 125 equal spaces, each division indicates a tool movement of .0005 in.—two divisions, .001 in.

One way to graduate the collar: clamp it in the lathe chuck, wrap a strip of paper around the chuck body and trim it to exact circumference. Remove this band, divide the circumference into 125 equal parts, tape it around the chuck again, and provide a fixed pointer for the division lines. Use a pointed tool in the compound slide rest to scribe equivalent lines on the face of the collar. ★ ★ ★

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Remedies for Rough Idle

(Continued from page 175)

the carburetor. There are two ways to determine if the valve is free:

First, test the free movement of the valve's counterweight assembly with your hand, as shown in the center photo on page 174. Second, with the car's engine idling, open and close the throttle quickly. The counterweight should respond by swinging back and forth.

To free a stuck valve, unbolt the counterweight assembly, remove the thermostatic spring, and lubricate the valve shaft with graphite, penetrating oil, or a solution of baking soda in either vinegar or alcohol. *Don't* use engine oil. Now, work the shaft with your fingers until it rotates freely. Tapping the end lightly with a hammer after applying the lubricant helps to free the shaft.

6. A loose carburetor flange on the intake manifold will admit enough air below the throttle plate to upset idling. Tighten the carburetor mounting bolts and flange nuts, as shown in the bottom photo, page 174.

7. High fuel pump pressure causes flooding and, as a consequence, rough idle. More often than not, though, an oversupply of gasoline is caused by conditions other than an eager-beaver fuel pump. But if you think the pump's at fault, test it with an analyzer like that shown at the top of page 175. This instrument lets you check—without removing the pump from the engine—whether it's operating within correct pressure limits and is providing sufficient fuel. If the reading doesn't fall within the limits set by the pump's manufacturer, remove it for overhaul or replacement.

If the pump's okay, the following malfunctions can also cause rough idle through flooding: faulty automatic choke, punctured or defective carburetor float, loose fuel line connections or carburetor mounting bolts, or improper carburetor idle adjustment.

8. An automatic choke must be functioning properly and must be adjusted to specifications to assure top engine performance. Specifically, make sure the linkage and choke plate move freely, and the heat pipe (usually flexible hose joining the exhaust manifold to the choke body) is free of kinks, bends, flat spots, and pinholes. (See *PM's* December, 1961 issue, page 168, for an article on servicing automatic chokes.)

9. Improper fuel level or float setting can only be checked by removing the carburetor from the intake manifold and taking it apart. Inside the bowl, where gasoline is held before entering the carburetor throat, is the float assembly, which operates like the float and valve in a toilet flush tank. If the float causes the valve to close too soon, too little gas enters the bowl; if the valve stays open too long, too much gas passes.

Disconnect the float as shown at the bottom of page 175, and remove the needle valve and seat. This valve controls the flow from the fuel pump. Replace with a new valve and seat to insure proper fuel level in the bowl. These inexpensive parts can be purchased (in kit form) for your particular carburetor from your auto parts dealer.

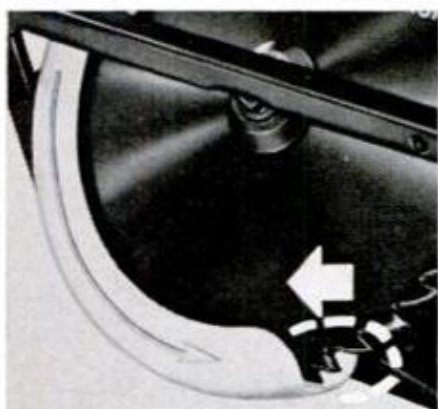
To make sure the float isn't damaged, immerse it in water, then jiggle it close to your ear. If you hear water sloshing inside, the float has a hole in it and should be replaced. A float made heavy by gas leaking into it permits the needle valve to stay open too long; this results in rough idle caused by flooding.

After the float, needle valve and seat are in place once again, make sure the float is adjusted properly to assure correct passage of gasoline. A float that's too high causes flooding; one set too low causes carburetor starvation. Invert the assembly and place a float gauge over the float. Be sure to use the correct gauge for your carburetor. It should just touch the top of the bowl and just contact the float as you hold the needle seat firmly in position. To adjust the float, bend its vertical lip toward the float to raise the level, or away from the float to lower it.

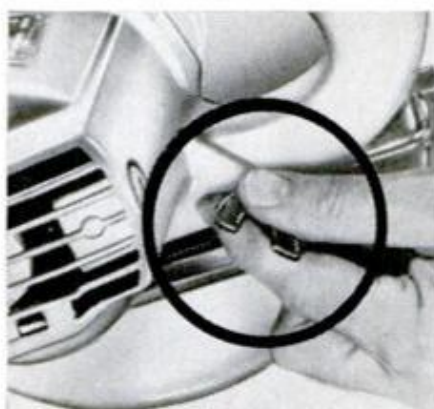
10. High underhood temperature is a problem with newer cars because of the reduced ventilation and air space caused by larger air cleaners and engine-driven accessories. Overheated air has less weight per volume than cooler air. Since fuel mixture ratio is based on weight, the result can be an over-rich mixture—and rough idle.

You can't tell if high underhood temperature is at fault unless you first check everything else; even then it's purely a guess. Most new cars compensate for this condition by use of a temperature-controlled air bleed in the carburetor. This unit insures proper mixture balance. In an older car, if you think high underhood temperature may be causing rough idle, you might want to add a similar unit to the carburetor. One such unit is made by the Rochester Division of GM. ★ ★ ★

6 REASONS WHY SKILSAW POWER SAWS OUTSELL EVERY OTHER MAKE!



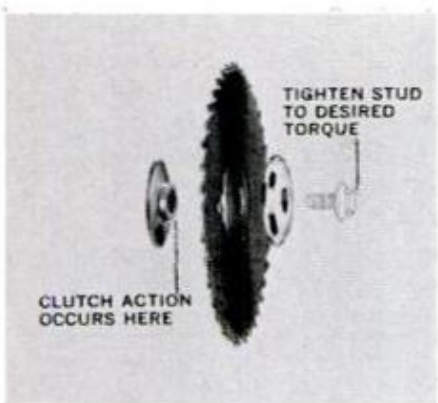
Bind-free lower guard—Retracts automatically when saw base is tilted, thus allowing bind-free starts—even on compound miter cuts.



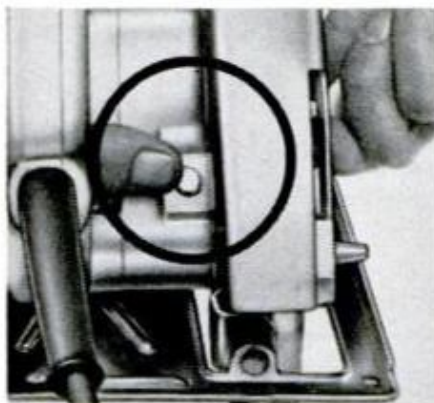
Easy-to-set depth control—Conveniently located for easy one hand adjustment. Control locks the saw firmly and quickly at any desired cutting depth.



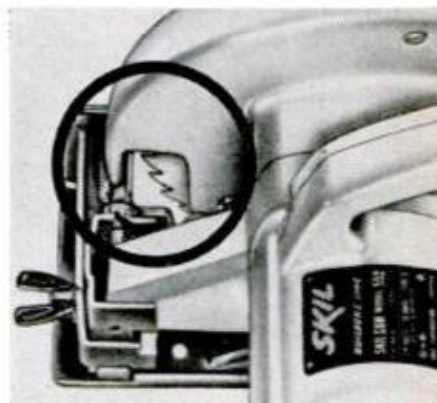
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Prices start under \$30—slightly higher in Canada.

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POWER TOOLS

* available on heavy-duty models only

Owners Report—Chevrolet

(Continued from page 89)

not optional."—Michigan technician.

His complaint's universal, like death and taxes. We hear it every year and about almost every car.

Swinging back to the upbeat items, here is the second group of "best-liked" features numbering six through ten in order of frequency mentioned.

"Plenty of headroom and sufficient storage space for hunting and fishing trips."—Michigan accountant.

"It's just as cheap as a compact and has lots more room."—Georgia millwright.

Here's the reason compacts are not going to make a clean sweep of the auto market.

"Like the recessed, easy-to-read instruments and controls are great."—Indiana purchasing expeditor.

"I sure like the green 'cold' light on the dash as this acts as a policeman for me to hold my speed down while it's on."—Ohio pressman.

He has named the first sensible reason for an idiot light!

"I vote for a heavy car. It holds the road as well as any of the five large \$4800 cars I owned before I bought my 1963 Chevrolet."—Ohio salesman.

For the record, it's good suspension design, not mere weight, that makes for good road-holding.

"Excellent idea concerning the luggage compartment under the floor of the wagon. The spare tire on one side, the gas tank on the other leaves the whole center section open for packing."—Michigan supervisor.

"I like the big trunk. It's deep enough for a farmer to put cream cans in."—North Dakota farmer.

But you'll never see this trunk testimonial in an ad.

"It runs like an expensive car such as an Olds or Cadillac."—Louisiana switcher.

"I like the quietness of the entire car at all speeds."—Ohio engineer.

PM's drivers felt that its test Chevies were well silenced except for wind noise.

Once again the "nays" have the floor with a group of complaints from sixth to tenth in order of mention.

"The gas mileage could be much better (six, 15 m.p.g. over-all)."—Michigan factory worker.

"Gasoline mileage (Biscayne Six, 17 m.p.g.) is not as good as I got from the 1962 model."—Indiana teacher.

Even with much stop and go driving, the Six should do a bit better.

"I had automatic transmission trouble, but

understand this could happen to any car."—Minnesota manager.

"The transmission made a noise on the up-shift. They took it apart and put in new parts."—Ohio highway employee.

"It uses too much oil for a new car—it has used a quart for each 1,000 miles."—Georgia drug salesman.

Most Chevies seem to use oil during break-in and "seal up" at 4-5000 miles.

"I average 1000 miles per week. This is the fifteenth Chevrolet that I have owned and it is the first one that has ever used oil."—Michigan engineer.

"It acts like it has a governor on it, once in a while. Mechanics don't know where the trouble is."—Iowa factory worker.

Wonder if it could be that new crankcase ventilation valve clogging up?

"Stalled several times when shifting to second on a steep hill."—Ohio clerk.

Now for the final listing of favorable comments, best-liked items 11 through 15.

"I liked its correct size—not too small and yet easy to park."—Ohio housewife.

"Steers easily without power steering."—Kentucky engineer.

"I feel that it's a car that I can depend on summer or winter."—Indiana inspector.

"The change in dash and windshield is very fine and leaves no image or picture on the windshield."—Maine dairyman.

"There is no distortion in the windshield."—Minnesota butcher.

From driver's-eye view the distortion problem seems to have been solved insofar as Chevy's new windshield is concerned.

"It is one car I can depend on in summer or winter."—Indiana inspector.

"I haven't had a squeak or a rattle."—Kansas mail carrier.

And now for a final volley of brickbats in the form of complaints from Chevy owners numbering 11th through 15th in order of frequency.

"Tires are too light (two-ply) for common road hazards."—North Dakota farmer.

Agreed, especially in case of a big car that can be overloaded easily.

"The turn indicator would not give a right-hand signal unless held in place."—Tennessee State highway employee.

"Would like gauges instead of lights (battery, oil, temperature)."—Kentucky Heavy Equipment Operator.

"I have had trouble with my automatic choke."—Connecticut machinist.

So did PM. The choke is new (on Sixes) this year and seems to suffer from chronic maladjustment.

"I would like a hand choke instead of an automatic choke—a real amp. meter and oil gauge."—Ohio repairman.

"The only complaint I have is the low

horsepower."—Michigan dairy farmer.
 "The car is very nearly underpowered with only 140 horsepower (Six)"—California serviceman.
 "I don't like the lack of footroom in the rear seat."—Massachusetts air freight dispatcher.

We felt the new Six coupled with Power-glide transmission and 3.08 to 1 axle ratio gave marginal performance due to lack of proper intermediate gearing. With manual transmission, overdrive and 3.70 to 1 axle, the Six should move nicely.

"Driver's seat is too low and very uncomfortable; legs have a tendency to 'go to sleep' on long (200-mile) trips."—Georgia dentist.

This may be true for some short-waisted physiques. Vertical adjustment would be a great help for a number of drivers.

There you have it, a selection of the pros and cons of the 1963 Chevrolet as seen by a group of owners who've totaled 803,849 miles on their cars already. ★★

Lights When Dunked



Lighting automatically when immersed in water, a new emergency light guides searchers to the rescue of swimmers, skin divers or boaters in distress. Operable in extreme temperatures, the unit can be worn, held or attached to a life jacket.

Several models, priced from \$3.45, are made by Resistance Products Co., 914 S. 13th St., Harrisburg, Pa.

FEBRUARY 1963

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3000 PSI HYDRAULIC PUMP *SENSATIONALLY PRICED!*
 Gov't Surplus! Delivers 3GPM at 1500 RPM or 7½ GPM at 3750 RPM (max. cont. speed). Pump is constant displacement, variable delivery type. Excellent for use on hoists, hydraulic presses, mobile equipment, lifts, etc. Has 3/4" AN intake ports 1/2" AN pressure port and 1/4" AN by-pass port. Shaft is 5/8" dia., 12 tooth spline. In excellent condition. Gov't cost, approx. \$500. Cat No. H-SP3000

2995

PUMP MOUNT — To adapt above pump to a 3/4" key slotted drive shaft. One end is splined to fit the pump, other shaft is slotted for pulley drive. Ball bearing mounted. Has foot mount, No. H-PM-2 . . .

1695



2000 PSI HYDRAULIC CYLINDER
 Made to top Gov't specs. Has bore of 2-1/4", shaft 1", stroke 4". Eye-to-eye length 13½". Ports 1/4" AN. A heavy duty cylinder at a remarkable price. No. H-66

1275

QUAD FOUR WAY HYDRAULIC VALVE
 Can be used to separately control four double action cylinders. Has 3/8" AN tube ports on inlet and outlet. Cylinder ports 1/4" tube. Cost Gov't approx. \$125. No. H-V52BSU

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NEW ARGENTINE SWORD-BAYONET
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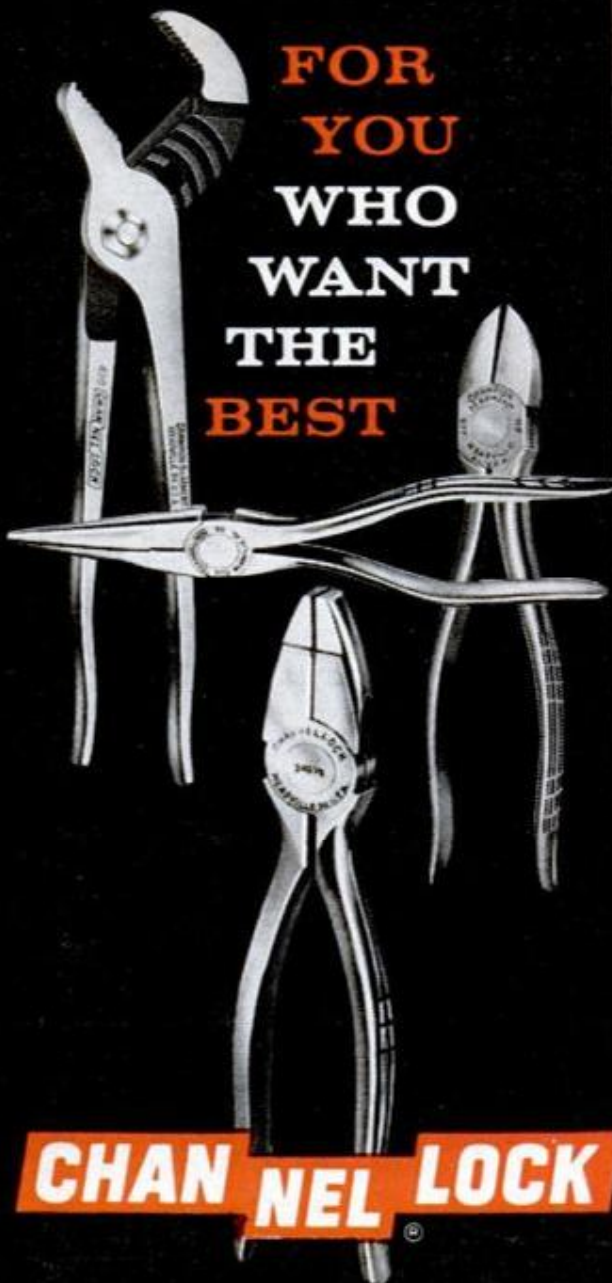
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A copy of our catalog showing the complete Channellock Plier line is yours for the asking. Write to: Champion DeArment Tool Company, Meadville, Pennsylvania.

Dim Your Lights at Home

(Continued from page 157)

watts (or less) to over 7500 watts. (A 600-watt size is shown in the photo at top of page 156.) The size you need depends on the total wattage drain on the circuit the dimmer will control. A chandelier with eight 60-watt bulbs is too big a load for a 450-watt dimmer. You can buy the units uncased, or in a portable enclosure, or mounted in a permanent enclosure accepting conduits, or in a special box—with an attached switch plate—to recess in the wall of your home. Uncased units can be mounted in large lamp bases.

Most of these units can be used with either incandescent or fluorescent bulbs—but never *both*, intermixed, on the same circuit.

7. While existing wiring from a standard on-off switch is fine for incandescent bulbs, an extra wire—as shown in the diagram—must be run from the dimmer to a fluorescent fixture. The fixture can be the conventional type, but you must add the special dimming ballast indicated. The bulbs must be the 40-watt rapid-start (not instant) type, and in this case an on-off switch is required in the input line, since the dimmer won't de-energize fluorescent filaments. You can't get extremely low levels of fluorescent light because a point is reached where the tube "cuts out."

The very latest form of full-range household dimmers use silicon controlled rectifiers in a package that will slip into a standard switch box. A dial control sets the level at which the rectifier "fires" and starts conducting current. Set it to fire only at the *peaks* of each cycle of AC current, and the rectifier lets only a small amount of electricity pass. As the voltage level at which the rectifier fires is lowered, more and more current can pass, up to the point of normal consumption of the lamp. An incandescent type SCR dimmer is shown on page 156. Another, made by Superior Electric Co., Bristol, Conn., has a continuous off-to-bright dial, eliminating the separate toggle. These dimmers range from \$20 to \$35 for 500-watt capacity.

There's also a brand-new SCR system for fluorescent lighting. Here, only the intensity selector goes into the wall. You must add a special dimming auxiliary to the fixture, besides the dimming ballast. But in the case of strip lighting, you need only one auxiliary—for the first fixture. Up to eight additional fixtures can be wired to the control fixture; all nine will dim simultaneously. ★ ★ ★

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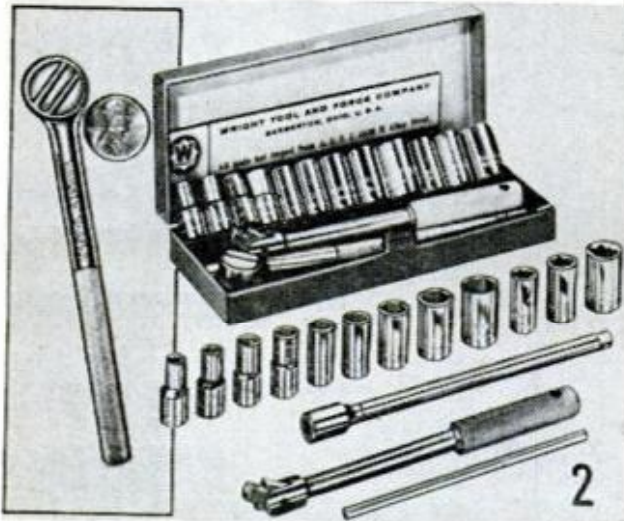
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221

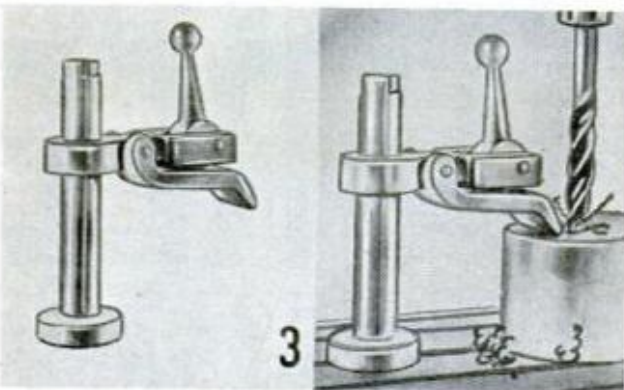
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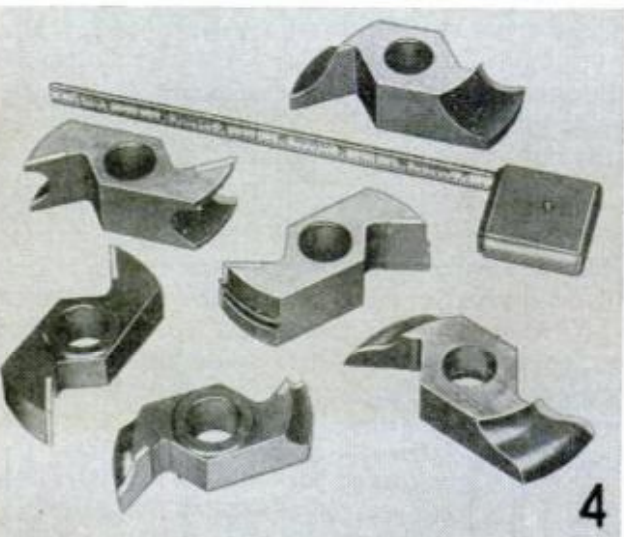
1. STEEL TAPE rule is flexible enough to be used for dressmaking purposes in addition to the usual workshop measuring jobs. Available in 6, 8 or 10-ft. lengths with black $\frac{1}{16}$ -in. graduations along the entire length and $\frac{1}{32}$ -in. marks for the first 6 in. of the yellow blade, which resists oil, acid and rust. Stanley Tools, Dept. PD, 195 Lake St., New Britain, Conn.



2. SMALLER THAN A PENNY, this $\frac{1}{4}$ -in.-drive ratchet has a handle swing of only $\frac{3}{8}$ in. Designed for radio, TV and hobby work, it is available separately or in a 17-piece set with sockets ranging from $\frac{3}{16}$ to $\frac{1}{2}$ in. The $\frac{1}{4}$ -in. model sells for \$4.36 and the 17-piece set costs \$12.88. Free catalog available. Wright Tool & Forge Co., 42 E. State St., Barberton, Ohio

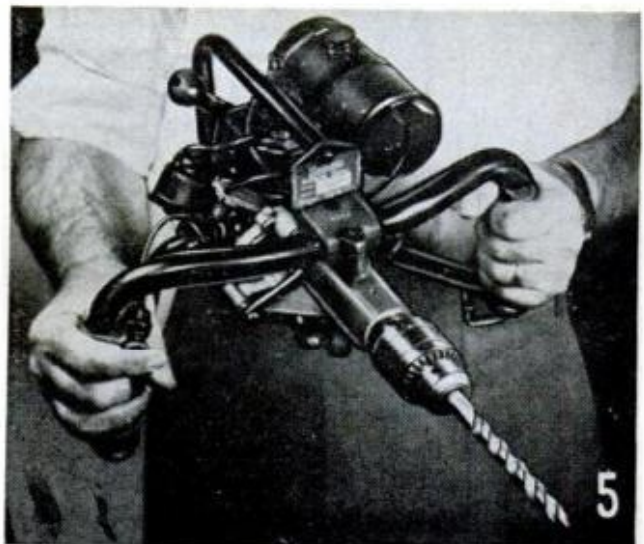


3. CAM/LOK WORK HOLDER locks material in position and holds it firm during milling, drilling and other shop operations. Mounted on a machine by a single $\frac{1}{2}$ -in. machine bolt screwed into the base of the height column, its rotatable clamp adjusts from zero to $5\frac{3}{4}$ in. in height. Priced at \$34.95. Arnold/Hall Tool Designing & Mfg. Co., Redlands, Calif.



4. TRU-FORM SHAPER CUTTERS are tipped with steel-bonded carbide and are available in a wide range of shapes. Requiring $\frac{1}{10}$ the regrinding necessary with high-speed steel cutters, they are said to clear and cut faster due to flattened-arc reliefs and do not change pattern when resharpened. Boice-Crane Company, 943 West Central Ave., Toledo 6, Ohio

5. PORTABLE DRILL is powered by a $\frac{3}{4}$ -hp. gasoline engine and can be operated in any position. Weighing 11 lb., the $\frac{1}{2}$ -in. drill is throttle-controlled, has a safety clutch and a recoil rope starter. It will drill through $1\frac{1}{2}$ -in. hardwood, $\frac{1}{2}$ -in. mild steel and up to 1-in. concrete. Priced at \$120, it is manufactured by Savidge Specialties, 529 Venezia Ave., Venice, Calif.



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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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The Model AT-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.

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Prep School for Smoke Jumpers

(Continued from page 137)

In a large leg pocket of his jump suit, each smokie carries a long nylon strap. He learns what this is for when he is hoisted off the ground by a sling, wearing a regular chute harness. He dangles in the air until he can get the strap free, fasten it to the harness, wriggle out of his gear, and lower himself to the ground. Since tree landings in some forest areas are almost unavoidable, and often preferable to jagged rocks, this method of escape must be learned well.

"Smokey" Stover, head of fire control at Idaho City and typical of the instructors at McCall, says the same thing to all recruits. "It isn't the fall that's gonna bother you, but the landing." He is a relentless taskmaster in the matter of correct landings, because past experience has taught him their importance. "A man with a broken leg or a wrenched back or one dangling in a tree isn't going to help fight a fire," he says. Stover has been with this part of the Forest Service since 1946 and has 114 jumps to his credit. Together with Wayne Webb, who came to McCall from the airborne infantry and has 212 jumps (135 on fires) to his credit, Stover hammers landing style into the recruits. Touch, swivel, roll and somersault backwards. The newcomers practice this hourly, dropping first from swinging ropes onto mats, then jumping from the rear of moving pickup trucks. This is rugged training, but nothing seems to tax the jumpers' endurance.

Pump, Pickax and Saw

After being dropped into the woods one morning, they spent the entire day felling snags with chain saw and pickax, climbing trees, and putting out practice fires with a portable suction pump. Then they shouldered their 90-pound fire packs—dropped to them after the jump—and walked the four or five miles of rough terrain back to camp—about the distance from the average fire to a helicopter.

This conditioning pays off when the real test arrives. Two smokies dropped in a remote Idaho mountain area last year fought their fire to a standstill for three days. Living on rations, sleeping at intervals when the fire permitted, they contained the fire until help arrived to relieve them. They were told that the trail out was just a mile below. It was, but the roundabout descent through clawing brush and down precipitous cliffs took them 10 hours. By the time they met the pack train on the trail, they had been through an ordeal that would

have wilted the hardest mountaineer.

The night before his first jump is a time of tension and nervousness for the trainee, but he does have the assurance of a thorough knowledge of his equipment and its use.

The chute, for instance, is a tough nylon canopy with slots to permit the escape of air, thus propelling the jumper forward and giving him considerable steering ability as well as dampening any oscillation. Each chute is packed by experts at the loft in McCall. It is thoroughly dried and inspected after every use, and any tears or holes are carefully repaired. Like most of the tools and tactics of the smoke jumpers, this canopy was developed specifically for their use. Combat paratroops used much of the foresters' experience in devising equipment.

Gear Is Crucial

The fire pack, with shovel, pickax, rations and jump gear, is the responsibility of the individual. This, along with a walkie-talkie radio and whatever special equipment is needed, follows him down on an actual fire jump. His life may depend on this equipment, and he becomes skilled in its use, both at the school and in regular practice with the veteran who will be his partner when he leaps.

For practice, as well as actual fire jumps, the Forest Service uses planes contracted from a private company. The first jump is usually made from a C-47, which can handle 16 fire fighters and their gear, each jumper carrying two chutes: a 32 or 28-footer, depending on his weight, and a 24-foot chest pack for emergency use. On the ground and in the plane he checks not only his own outfit, but that of the jumper nearest him, making sure straps and buckles are tight, and that nothing is dangling that could tear free in the fall. As his turn to jump arrives, he hooks the static line of his main chute to a cable low beside the open hatch. The overhead wire originally used was moved to a lower position when too many jumpers suffered burns from the whipping static line of the man preceding them. Poised in the doorway, he awaits the signal from the "spotter."

The spotter is what the name implies. He "spots" where the jumper will land, guides the pilot over an intercom, tells the jumper when to go. To qualify for this important job a smokie must have seven years service, and an uncanny sense of timing. From 1200 feet, despite variable winds, a good spotter will drop his man on a dime.

Before sending the first man out, the

(Please turn to page 226)



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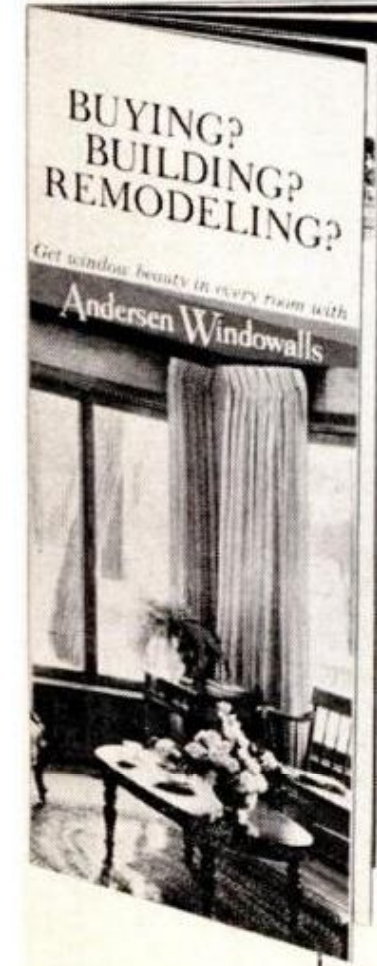
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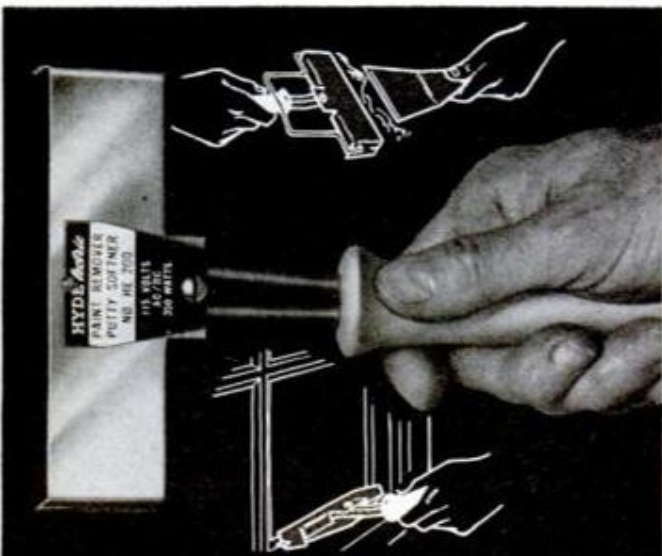
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Prep School for Smoke Jumpers

(Continued from page 224)

spotter drops weighted ribbons to judge the approximate drift. Close coordination between pilot and spotter is required to keep these ribbons in sight and properly oriented as they fall.

The plane then makes a slow circle, the spotter talking it in. The pilot reduces speed by dropping partial flaps. The moment the spotter slaps the shoe of the waiting smokie, he jumps. His partner follows a split second behind.

As a rule, only three jumpers go in a "stick," since these boys are aiming for small targets, often a clearing only 15 feet across.

This sort of accuracy demands consistent skill, and like everything about the smoke jumpers, this razor-edged ability can mean the difference between life and death. These specialists must jump anywhere at anytime. They must hit a small fire in the first hours of its life, subduing it with light tools, or at least bringing it under control until ground units can reach the site. There is little margin for error. A good lightning storm may leave a dozen fires behind it, and a pair of jumpers must descend on each immediately. Usually, they will have a half-dozen training jumps before being sent out, but during a bad fire season like that of 1961, their first blaze may occur in May, the last in October. Geared to this element of chance, the schooling is brief and straight to the point.

Smokies Don't Break Easily

Due to the fine physical condition of the recruits, and the stringent requirement of the training, there are few injuries as a result of the jumps. But a smokie never knows what he might encounter on a fire jump, and thus every trainee is given a complete course in emergency first aid.

Every precaution is taken to graduate a safe and disciplined smoke jumper. On his first jump a ground foreman broadcasts instructions to him with a portable loudspeaker. After that he is on his own, and the hapless smokie who errs is treated to hoots of derision, and for every error must contribute a dollar to a slush fund, which is spent on a graduation party. Studies are constantly under way by the Equipment and Development branch of the Forest Service, based at Missoula, to improve the smoke jumper's equipment. The paratroop boot, for instance, proved too weak for this rough

(Please turn to page 228)

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Prep School for Smoke Jumpers

(Continued from page 226)

duty, and was replaced by a logger design with steel instep and inch-high heels. The heavy suit tore too frequently; smokies now use a nylon uniform with foam rubber pads along knee, hip and other exposed joints. At present the school is helping to solve the problem of jumpers being twisted violently by the opening of the chute. Slow-motion photos are taken of jumps from a nearby plane and studied.

With such precautions, no fatality has occurred in the Forest Service from jumping, although there have been deaths from fire and ground accidents. Students at McCall have made more than 10,000 jumps—in training and on fire. In 1961 there were 50 training jumps and 550 fire jumps, and there were only 19 minor injuries actually recorded.

Plenty of Close Ones

But there have been close calls. One jumper, an Episcopal minister on an exciting sabbatical, dropped almost to tree-top level before opening his emergency chute after the main chute had failed. By some miracle he landed unhurt, and when the ground crew reached him he smiled and said, "You see? I had the Lord with me."

The ground foreman grunted and answered dryly, "Next time you better leave Him with us. The way you're jumping one of you might get hurt."

It is puzzling to understand what brings these men back year after year to spend their vacation time at one of the most rugged jobs the country has to offer. It can't be the money. The first-year jumper has a Civil Service grade of GS-5. A second year veteran is a GS-6, and a foreman is only one grade higher. This is on a scale with a typist in some comfortable office, and the smokie gets nothing extra for his jumps unless except for extra-duty time that he incurs during the course of a large forest fire.

Part of the answer is the lure of the excitement and color of his job, the personal satisfaction of doing an important, demanding service. Another reason is sheer confidence. Each smoke jumper knows that he is given the best possible equipment and training, that he is able to make any jump his foreman directs, fight his fire successfully, and return safely.

It is this feeling of confidence apparent in all the smoke jumpers that has established their reputation for daring and plenty of hair-trigger skill. ★★★

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Now zinc is married to steel and used for vital underbody parts and rocker panels of Ford-built cars. The zinc coating forms a tough barrier to corrosive moisture—and if corrosion attacks, the zinc sacrifices itself through galvanic action, saving the steel.

Other avenues explored in the fight against rust also brought results: special zinc-rich primers to protect critical lower body areas, aluminized and stainless steels to extend muffler life, quality baked-enamel finishes that are more durable (and look better).

Added rust protection marks another step forward in Ford Motor Company's quest for total quality—and brings you cars that last longer, need less care and keep their value better.

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Jeep Derby

(Continued from page 124)

well over 100 m.p.h. on pavement and yet he hardly averaged 20 miles per hour to win the T-or-C rodeo. On the first day his time was a fraction more than 44 minutes, on the second day he chopped almost a full minute from the first day's time. The third day was a Jonah and cost him 46 minutes, 37 seconds. He was lucky to finish at all.

Here's what happened: Shortly after the start there was a mysterious bang under the hood and for the rest of the race the engine wouldn't rev up to full power. (When the engine was torn down a few days after the rodeo it was found that the crankshaft had broken just forward of the rear main bearing. By a fluke of luck the break was at an angle that put pressure on the shaft and kept it turning.)

Halfway around, a front tire blew to shreds in spite of its six-ply inner liner. Wood and Sayer slammed to a stop, got the jack under the axle, yanked off the wheel and jammed on the spare with only three lugs and took off again, leaving the old tire and the jack behind.

Three Cylinder Finish

Finally, a mile from the finish, the wire vibrated loose from one of the sparkplugs and the vehicle finished the race on only three cylinders.

Wood was back in sixth place that day but his total time for the three heats was still five minutes faster than the second place winner. Of the 27 contesting vehicles, eight failed to finish. One knocked off a front wheel, one smashed its oil pan in spite of the armor. Clutches were torn up, distributors flew apart.

Most of the contestants come from New Mexico, Colorado, Wyoming, Arizona and Texas and yet one enterprising team at the last T-or-C rodeo drove all the way from Connecticut. They won ninth place and swore they would be back for the next rodeo.

Thirty-three-year old Robert E. Wood and 30-year old John N. Sayer live in Roswell, N.M., where Wood works at a missile site and Sayer at an Air Force base. They had never entered a Jeep rodeo before the last championship event at T-or-C, and a few months after winning it they competed in the Denver Jeep-O-Rama and won that one too. Hard, fast driving and good co-driving are part of the story; also important is that Wood had his Jeep reworked for maximum performance and that the team did a lot of practicing on a practice course they laid out in hills north of Roswell.

F. J. Searcy, the Roswell mechanic who put the extra horses into Wood's Jeep, estimates that he increased the original 72 hp. to around 115 hp. This is an enormous increase and Searcy is glad to outline some of the things he did but keeps the rest of his procedure a secret. "Bring your Jeep around to the shop if you want it reworked," he says. Ted Brewer of Roswell, who placed second at Denver, is another driver who relies on Searcy.

Some of his modifications on Wood's vehicle included boring the cylinders oversize and installing larger pistons, and restroking the engine for greater displacement. A semi-race cam that still gives smooth street performance is used. The original carburetor was replaced with a "97" Ford carburetor with a small venturi and with a hole drilled into the bowl to spill excess fuel. This allows the carburetor to flood without stalling, and the surplus fuel drains through a tube past the distributor and exhaust system.

To prevent the rear springs from being torn off by rocks, protective iron wedges were welded across the U-bolts.

An oversized radiator (military Jeep) was installed for better cooling, and the engine was placed on solid rubber motor mounts. The exhaust manifold was replaced with 1¼ inch exhaust headers that blow straight out under the side of the vehicle. A lube oil tank was installed behind the driver's seat to provide a 15-gallon capacity, and oil is pumped from the filter to this tank and back to the crankcase. The big reservoir provides cooler, cleaner oil. Even so, Wood changes his rod bearing inserts after every race just to be on the safe side.

Shocks Replaced Daily

Other daily maintenance includes replacing the shocks (they don't last through one race) and servicing the air cleaner to remove the quarter of an inch of dirt, gravel and cactus needles that it picks up during a run.

Wood uses four-ply nylon 9:00 x 14 tires in place of the smaller originals, with six-ply inner liners in addition to the inner tubes. The wider tread gives more cushion as well as better traction.

The several major Jeep rodeos each have somewhat different rules and, as of now, all of them allow engines to be reworked for maximum performance. Some officials are talking about rule changes that would call for strictly stock vehicles or for engines that have been only slightly modified, but it's hard to decide where the modifications should end.

What's in it for the drivers and codriv-

ers? Not a great deal, aside from the thrill of competition. First place winner gets a brand new Jeep and there are other prizes that may include sets of tires, camper tops, boats and trophies. Daily cash prizes often are awarded, too, this money coming from the \$25 entry fee each contestant pays. Counting the investment in his vehicle, the chances he takes with it and the money he spent reworking it, a driver possibly has to win to come out even.

What the contestants do get is a lot of sport. At T-or-C none of the teams would quit as long as their vehicles were still running or could be repaired. One team was clocked at 47 minutes the first day and then took two hours and 48 minutes the second day, this long delay being explained by the terse notation "Roadside repairs." Yet the team was back in competition the third day and again got around the course in 47 minutes.

One enthusiastic 56-year-old driver, afflicted with arthritis, arrived in T-or-C two weeks ahead of time to take daily treatments in the town's famed mud baths, limbering up for the rodeo.

Wood and Sayer sum it up this way for all the teams: "It's the most fun we ever had!" An understatement, that. ★★★

How Hot Is a House on Fire?

How fast does heat build up in a burning building? Plenty fast, according to a recent test in Minneapolis, where the fire department accommodatingly set fire to a condemned downtown building for engineers from Minneapolis-Honeywell.

All four stories of the structure were bugged with temperature, smoke and fire detectors linked to outside recorders. Then firemen put the torch to a gasoline-soaked woodpile on the first floor. Temperatures of over a 1000 degrees were recorded on the first floor within a minute. As the gasoline burned off, temperatures rose at a slower rate to 1400 degrees in about two minutes.

Second floor temperatures reached 300 degrees in three minutes. On the third and fourth floors, 120 degrees of heat were recorded after the same length of time.

Firemen started fighting the flames with foam after the fire had been burning seven minutes. Temperatures dropped rapidly on the first floor, going down to about 100 degrees in a minute. Recordings for the upper floors dropped at a slower rate because all windows and doors were closed.

A smoke detector, incidentally, gave the alarm first; it went off less than three seconds after the fire was lit.

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Coon Fever

(Continued from page 120)

hound, others say that it was with the Irish staghound. As the breed developed there are evidences that it was crossed with the Labrador, the setter and the otterhound. There also may be some English sheep dog, water spaniel and Newfoundland in there somewhere. As one person summed it up: "The coonhound has ancient and respectable origin—a little of everything."

Blueticks and Redbones

Whatever his lineage, the coonhound was bred with two things in mind: hunting instinct and stamina. Nowadays the breed is respected, governed by the American Hound Association, and divided into six groups: Black and Tan, Bluetick, English, Redbone, Treeing Walker and Plott. A good one sells for \$100 to \$500, and a real champion like "Oklahoma Schucks," was sold by Fred Teeter of Enid, Okla., for \$1500.

A correspondent for *Full Cry Magazine*, a monthly publication devoted to coonhounds, tells about being on hand when a wealthy Tennessee hound man tried to buy a locally renowned cold trailer from a sharecropper. The owner stoically refused to sell at any price. In exasperation the rich man waved at his Cadillac and offered a trade. "Shoot," the sharecropper said, "couldn't tree nothing with that."

Unlike his pedigreed brethren, who are judged on beauty and poise, the value of a hound is based strictly on hunting ability—intelligence, nose and speed. A dog needs all three to outwit a raccoon.

A really smart hound can become regionally famous, or in some cases legendary. It has been more than 20 years since "The Dirty Irishman" died, but New Jersey hound men still talk about him with wonder. He was owned by Windy Williamson of Ringoes, N.J., who at 82 still has the zest for an occasional coon hunt.

According to all the stories, "The Dirty Irishman" was uncanny. He could pick up a cold trail six to eight hours old. If he was hunting with other dogs, he would set them on the trail, then stop and wait, listening to the way they were running. "He was figuring," Windy explains. "He'd sashay around, thinking all the time, figuring out what mister ringtail would be doing. Suddenly he'd be off like a shot. He'd have the coon's pattern in his mind, and before you knew it, he'd cut "hot" trail and start singing for the other dogs. Old coon would be in a tree by the time they got there."

The training of the coonhound and the

resultant pride in his performance are the largest part of the sport. There are two schools of hound training; one says you should run the trainee with an older dog, the other says you shouldn't. Most books on the subject suggest the first method, but Henry Eckers of Stockton, N.J., who has trained dozens, disagrees. "Many times," he says, "an old dog will be jealous of a younger dog and he'll deliberately teach him all the wrong things. I always teach a dog myself."

Henry's first rule is to select a dog whose parents and grandparents have been good coonhounds so that you can be pretty certain he will hunt instinctively. Then he trains the dog exclusively on coon so that he won't run trash. (The coon hunter's definition of "trash" is rabbit, opossum, skunk and deer.)

When he is small you give him a coon skin to chew and play with, and you play tug-o-war with the coon skin. As he gets older you run him with a dung bag, a small canvas sack filled with coon manure, sealed and attached to a long cord. The commercial equivalent is a scent stick. The bag or stick is dragged across the ground and the dog tries to catch it. This is a game any dog would enjoy, but the coonhound is being trained on scent as he plays. The next step is to substitute a live or dead raccoon for the dung bag. If dead, the carcass is dragged through a wooded area to lay down a trail and then hung in a tree. The young dog is turned on the trail and helped to follow the scent to the tree. A live coon is led on a leash, and is better for training because his scent is "hot." During all this trailing the dog is trained to "come" on the blast of a steer horn, a traditional way of calling hounds.

Trained "Off" Trash

When the dog has passed the preliminaries, he is taken out at night for an actual hunt. It is here that he is trained "off" trash. When he runs anything but coon, the trainer calls him down with the hunting horn and scolds him, but then praises him for running coon. There are some trainers who believe in beating the dog for running trash, but experts Henry Eckers and Windy Williamson disagree violently. "Never whip a dog," Williamson says, his voice suddenly low and fierce.

A new method of training a dog off trash is to use a shocking device, an electrified collar that is operated by a remote control with a one-mile range. If the hound runs anything but coon, the trainer presses a button and the dog receives a mild shock that stops him in his tracks. This training device sells for \$250.

(Please turn to page 234)

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Coon Fever

(Continued from page 232)

Critics of coon hunting base their disdain on the assumption that a raccoon is defenseless against a pack of dogs. This is anything but true. A coon is a fighter, and when they get to 48 pounds, like the one caught by J. B. Jones of Oak Forest, Ill., they have the strength and disposition of a wolverine. If a coon can get to water, which is his best element, he is a match for any dog. One hunter tells about a 13-pound coon that drowned a 75-pound dog. Henry Eckers amplifies this by telling of the time one of his dogs was fighting a coon in the water and he had to go in to save him. The coon was on the dog's back, had him by the ears and was holding his head underwater. In Nankin, Ohio, a hound owned by Bob Brownson tangled with an 18-pound coon in a cornfield. The coon whipped the dog to a frazzle and then came after Brownson. "I whammed him with the rifle stock," Brownson said, "but he came right back. I kicked him about 10 corn rows, and he was coming back at me when I shot him."

Squalling Contests

In most states the coon hunting season runs from October to March. The rest of the year the "hound-dawg men" compete at field trials, water races, coon-squalling contests and barrel fights.

The field trials, which began on a farm seven miles north of Youngstown, Ohio, 52 years ago, test a dog for speed, nose and treeing ability. A trained coon is run over a prescribed course to lay a trail, then the hounds—eight in a heat—are turned loose and timed to the finish line. There are two prizes: "line" for the fastest dog to cross the finish line, and "tree" for the dog that reaches the treed coon first. There are hundreds of field trials every year, from small events like the one in Lumberville, Pa., which attracts a purely local crowd, to the five-day Trans-sippi Trials in Owensville, Mo., that attracts many thousands of people.

A dog can make his reputation at the big field trials, and the competition is stiff. The total purse at last year's Trans-sippi Trials was \$10,000, and there is always considerable betting on the side. Many dog owners with elaborate trailers or trucks for transporting the hounds make an annual circuit, running dogs at all major trials.

Water races are relatively new, but they are gaining in popularity all over the country. In Anderson, S.C., the sport is so popular the *Daily Independent* has begun sponsoring an Annual World Champion-

(Please turn to page 236)

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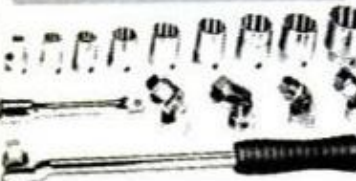


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Coon Fever

(Continued from page 234)

ship Water Race every June First.

In a water race a coon is caged and pulled across a pond or river on a small raft. The hounds are turned loose, and they hit the water. On the far side the coon is then dragged a distance and placed in safety on a platform in a tree. The first hound to reach the tree is the winner.

A sideline of the water race is a contest pitting a coon on a log in the water against a swimming dog. The dog is supposed to get the coon off the log—and it takes an awfully good dog to do it.

Barrel Fights

Barrel fighting is popular in the South. When someone has a fighting coon he will challenge a number of "hound-dawg men" to a contest. Everyone competing contributes a sum of money for the purse. The raccoon is placed inside an overturned barrel and one-by-one the dogs try to get him out. As Windy Williamson described it: "It's like sending your dog into a threshing machine." The dog that brings the coon out is the winner, but it is generally the owner of the coon who takes away the money.

Coon squalling is much like hog calling. If a coon is in trouble with a dog he squalls, and any coons within hearing distance will come to his aid. A coon squaller is a man or woman who can imitate this sound. At the National Coon Squalling Championships held at Jonesboro, Ill., they put a coon on top of a post. The squallers work from behind a barrier, and they try to bring the coon down from the post. There are two divisions, the mechanical squallers, who use a device much like a duck call, and the real artists, who make the sound with their mouth and hands. The 1962 National Champions were Bill Cates of Anna, Ill., in the mechanical division and Ed Taylor of Ava, Ill., in the mouth division.

If it all seems like a lot of fuss just to have a hound dog chase after a raccoon, you're probably right. But take a fellow like Clare Dailey of Lincoln, Neb. He quits his job every year at the start of coon season, and has been known to hunt 80 nights in a row. At the end of the season he gets another job.

Rogersville, Mo. is so coon-happy a large sign on the highway entering the town bills it as, "Raccoon Capital of the World." And in Mississippi the State Legislature made the penalty for stealing a coonhound two years imprisonment.

You have to blame it on the "fever." It's the only explanation. ★★★



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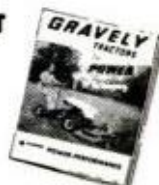
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Three Dimensions

(Continued from page 115)

erator to convert two-dimensional drawings into three-dimensional pictorial views automatically.

Called APT (automatic perspective translator), the new machine resembles a complicated pantograph and has a stylus suspended over each of two adjacent drafting boards. One of these is the master scribe that is used for tracing over the original, two-dimensional drawing; the other is the slave, but in a sense it could be considered a thinking slave.

While the design of this machine is rather complicated, it is extremely simple to operate. For instance, to create a three-dimensional view of a building from a drawing of its floor plan, Bowen first adjusts the APT for the desired height of the building, the viewpoint selected and the projection angle.

Then, after mounting the floor plan on the drawing board under the master scribe, he moves the master stylus along each line of the drawing. As he does this, a correcting mechanism automatically compensates for the angle of view, and the slave stylus dutifully draws an accurate aerial view of the structure.

When drawings of the top, front and side of an object are available, these can provide information to the slave that will guide it in drawing a three-dimensional view from a desired angle. This is particularly valuable for pictorializing a complicated mechanism.

One Week Versus Two Minutes

In still another kind of exercise, the APT can rapidly and accurately draw a picture of a spring or helix in perspective, as the eye would see it. By ordinary methods an accurate portrayal of such a spring could require a week of work, for each segment of the spring follows a different curve and must be plotted mathematically before it can be drawn. The APT does the same job in two minutes.

When the APT machine is available, possibly a year from now, it is expected to become an important tool in the fields of surveying, cartography, descriptive geometry and even in navigation.

Before then, however, the two hand instruments are expected to be in fairly wide use. The Bowen drafting system is so simple that an average student with only a semester of drafting instruction can learn to use it in two or three days.

Bowen's new system will take much of drudgery out of drafting, allowing the artist to devote his time to creative aspects of technical illustration. ★★★

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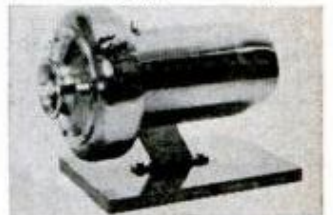


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Moon Explorers

(Continued from page 131)

niques to examine pairs of photographs taken at approximately identical lunar phases. Each map shows the visible disk of the moon.

One map divides the moon into physiographic regions, based on similarities or differences in elevation and types of probable surface material. Of two major divisions, the lunar highlands, mapped in brown, contain the great majority of craters. The lunar lowlands, in green, are known as maria—the relatively flat “seas” of the moon. The two divisions are further divided into provinces and sections.

The second map of the geological study is a photogeologic map, printed in three colors. It divides the lunar formations into the periods of time the features are believed to have been formed. The oldest division includes the *pre-maria* formations, composed of the material of which the moon was presumably formed.

The *maria* formations are those believed formed by hardened lava, which explains their relatively smooth appearance. (There is still disagreement among astronomers as to whether the smooth surfaces of the maria are due to solidified lava or to layers of dust, or to both.)

The *post-maria* formations are those believed to have been caused by explosions following meteor strikes, which most astronomers think were the causes of the moon's craters. Standard geological features, such as faults and fracture patterns, are also included.

The third geologic map depicts the lunar rays, the mysterious streaks that radiate across the surface from a few craters. Many astronomers believe the rays to be splashes of condensed vapor and fine material thrown from the craters on meteor impact.

A supplemental chart describes in detail major areas of the moon and their suitability as landing sites.

Aeronautical charts will guide the astronauts. The most ambitious moon-mapping project now under way divides the surface into 144 separate districts, each of which will be provided with a precise aeronautical chart. The maps, several of which have been completed, are drawn to a scale of 1:1,000,000 (16 miles to the inch), the map scale used by airlines.

Now being prepared by ACIC, about 80 maps will depict the visible side of the moon. (Because it wobbles on its course, about 59 percent of the lunar surface is visible from the earth, although not all at the same time.) The remainder will have to wait until the astronauts actually

survey, or photograph in detail, the far side of the moon.

The photographs taken of the dark side by Russia's Lunik III are not extensive enough or detailed enough to provide the mapping accuracy ACIC demands. Also, the descriptions given by Russian scientists of features shown in the Lunik photos have been disputed, in part at least, by American astronomers.

Shadow measurements using time-lapse photography give the ACIC series a detailed precision never before attempted in moon mapping. Elevations are plotted to an accuracy of plus or minus 40 feet near the center of the lunar disk. Approximate contour lines are given for every 300 meters (about 984 feet) of elevation.

The first chart of a moon district completed by ACIC shows the area surrounding the crater Copernicus. Part of this map is shown on pages 128-129. Terrain features have been drawn with shadows as though they were lighted by an afternoon sun.

Actually, two drawings are made and one superimposed on the other to give a three-dimensional effect. The first, air-brushed with India ink on a translucent plastic sheet, shows the shadowed features. The second shows the surface coloration of the moon and the system of rays. The two are combined and printed in four colors.

Some 10,000 photographs were received in 1961 alone from the 31-inch telescope at Pic-du-Midi observatory in the French Pyrenees for use in compiling the ACIC series. Other observatories contributing new moon photos for the geological maps and the lunar atlas were the Lick's 120-inch telescope and the 100-incher at Mt. Wilson, both in California; the 40-inch Yerkes scope in Wisconsin; the 82-inch McDonald in Texas; the 42-inch Lowell in Arizona, and the 32-inch Paris Observatory Telescope.

What's Wrong with Palomar?

Why not use the giant 200-inch Mt. Palomar reflector in California? One astronomer said it would be like using an elephant gun to shoot a squirrel. Palomar's 'scope is used principally for deep space studies of distant galaxies. Its reflector is primarily a light collector for distant specks of starlight. The smaller telescopes can gather the moon's feeble light just as efficiently.

Recently, ACIC and the Geological Survey started a joint project for the National Aeronautics and Space Administration. Using ACIC's 1:1,000,000-scale maps, the Survey is over-printing perti-

(Please turn to page 242)

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Moon Explorers

(Continued from page 240)

gent geological information, similar to that produced in their earlier maps but in much greater detail. These multi-colored maps will provide the astronauts with the latest data on the structure and composition of the lunar terrain.

Order Your Moon Mosaic

ACIC has also prepared a *Lunar Reference Mosaic* which at first glance looks like a remarkably detailed photograph of the full moon. Actually, the mosaic is a composite of the best photos of the moon's surface at a constant sun angle, over which grid lines have been superimposed. The photographs were chosen to show maximum detail; each was copied to a common scale and corrected to match adjacent areas.

All of these moon mapping programs are just a beginning. The definitive map must await the appearance of a cartographer on or near the moon. But the first visitors will have a considerably better knowledge of the unknown areas they will explore—thanks to modern selenography—than did the Spanish and Portuguese explorers who sailed into uncharted seas centuries ago.

Note: The first series of 13 Lunar Aeronautical Charts and the Lunar Reference Mosaic may be ordered, when completed, from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Cost of the series is \$7.50 by check or money order. ★★

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The War Preventers

(Continued from page 111)

sile bases published in newspapers probably frustrated most readers. Even with little blobs labelled "guideline missiles," "light AA positions," or "missiles on launchers," they still looked like blobs.

Missiles in 3-D

However, photo-interpreters were not working from the single photos. Each of those news pictures was half of a matched "stereo pair" that brought the missiles out in bold relief, raised them into position above their launchers, gave depth to the communications cable trenches, and pulled fuselages and fins out of shadows.

But even a stereoscope isn't the whole answer. How does a PI know whether a circular object is the top of a water tank, a pool or a cathedral dome? The answer is long experience. Learning the identity of objects in a vertical photograph is a matter of studying five major characteristics:

Size. In a harbor scene, for example, size quickly separates cruisers from tugboats. PIs frequently estimate size by comparison with an object of known size. Or, they measure by a simple formula:

$$\text{Length of object on ground} = \frac{\text{Length in photo} \times \text{plane's altitude}}{\text{Focal length of camera}}$$

Shape separates sleek, cigar-shaped warships from boxy merchant vessels. When weapons are dug in, the shape of the earth-works generally follows field manual instructions and is a clear give-away to the kind of weapon emplaced.

Shadows sometimes are the only clue to an object's presence as well as its identity. Try to spot an igloo on a snow-covered field without a shadow! Or look down on a field artillery piece painted in camouflage colors. Unless special filters or infrared sensors are used, the gun doesn't show. But its *shadow* reveals its exact shape. If the PI knows the time of day, latitude and season, his measurements of the shadow will reveal the size of the gun. Shadows make ridges and gullies stand out clearly, reveal factory shapes and arrangements and indicate heights of buildings. Photo-interpreters work with their light in front of and above them, and with the picture's shadows falling toward them. Otherwise ridges may look like gullies, and ponds look like mounds.

Tone, pattern and texture separate lakes from fields, highways from railroads, asphalt from concrete, and cultivated orchards from natural wooded areas.

Relationship to surrounding objects sometimes is a clue to an object's identity. The early high-altitude photographs of

Russian activity in Cuba revealed several truck beds with tall towers mounted on them. PIs were not sure what they were, but the nearby fuel tank trucks and only partly hidden missile transporters provided the clues. The objects were "cherry pickers," truck-mounted elevator towers used to service missiles raised in firing positions. If the same fuzzy tower outlines were spotted in a high-altitude view of a Havana street, far from missiles and fuel trucks, they might remain unidentified.

Evidence Comes in Shapes

Even before missiles and their transports showed themselves, PIs were able to separate the offensive bases under construction from anti-aircraft missile sites. They knew from experience (and training) that surface-to-air missiles are deployed in a ring around a central "fruit set" target-tracking radar and control center. Offensive missiles call for straight-line deployment and don't require target-acquisition radar. Even while the ground was being prepared for missiles yet uncrated, PIs knew they had spotted offensive rockets.

Identifying objects by drawing conclusions from other objects is called the "convergence of evidence" technique. Rocketry changes too fast for a PI to learn to recognize a lot of the hardware at a glance. But some fundamentals don't change. Liquid-propelled rockets need fuel and oxidizer storage tanks and trucks. Long-range missiles generally are larger than their short-range counterparts. Vertical-launch arrangements indicate high-speed ballistic missiles that rise vertically and then turn toward their targets. Launching ramps indicate slower, air-breathing cruise missiles or drone planes that take off on an incline and use wings for lift. Liquid fuel can be hauled in ordinary tanker trucks. Liquid oxygen calls for sturdier construction, bulky insulation and tell-tale pressure release valves.

Not all of the photos of Cuban missile bases were vertical views from high-flying U-2 reconnaissance. While the bases were being dismantled, most of our planes flew directly over the sites at 200 feet and recorded low oblique views from forward-pointing cameras mounted in the nose. These make it easier to identify familiar objects. The foreground is close and can be examined minutely. Although perspective in such pictures makes measuring difficult, and some objects hide behind hills, buildings and trees, oblique shots are ideal for getting more detail on a specific object previously spotted in a vertical view. They are also excellent for briefing troops who will see the ground obliquely rather than

(Please turn to page 246)



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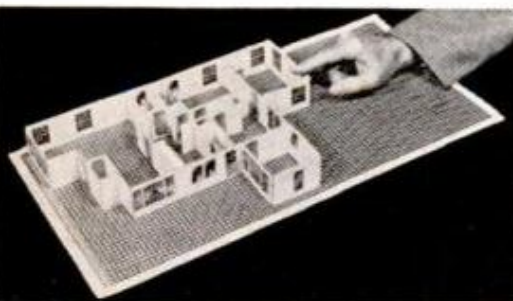
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The War Preventers

(Continued from page 244)

vertically anyway. Most U.S. reconnaissance planes today routinely shoot both vertical and oblique views on all missions.

Seven-Eyed Spies

The F-105, which has been modified to carry two aerial cameras, and most other recon craft now use a camera that shoots a negative the same size as 120-mm film used in popular reflex cameras. This camera has a focal length of 70 inches, nearly twice that of the heavy, World War II K-17—which still is used aboard the Air Force's RB-47 to produce high fidelity 9 by 9-inch negatives. The new camera takes much less space because the long telephoto lens, using prism mirrors, tucks away into a short tube much the same way prisms telescope into compact binoculars. The smaller 2¼-inch negative actually reveals more information than the old K-17 because the new films have a remarkably higher resolution.

Except for high altitude, high speed craft, most recon planes carry seven cameras. Mapping planes may carry nine. A nose-mounted camera shoots oblique views. Another points down from the belly to make vertical shots for stereo-viewing. A three-camera belly unit, known as the "trimetrogon," shoots a strip from the left horizon to the right horizon. One lens points straight down, the other two to left and right. The strip it produces shows vertical detail, and orients it with far-horizon features that overlap. Just behind the three-camera unit are two nearly vertical cameras aimed slightly left and right. They produce wider coverage than does the single true vertical, but reveal features more accurately than the trimetrogon.

A feather-light, delicately balanced U-2 can't carry all seven cameras and still fly more than 1000 miles per hour 15 miles up. The U-2 was designed around a revolutionary reconnaissance camera that combines the functions of all seven standard aerial cameras in a single compact unit.

Seven windows in the fuselage point in the seven conventional camera directions. A single lens rotating eccentrically on the front of the camera picks up an image from one window after another, covering all seven angles in a sequence timed to match the plane's speed. It produces a continuous vertical shot for innumerable stereo pairs, plus a continuous trimetrogon set on a strip of high resolution film more than nine feet wide and 50 feet long.

Smaller strips running beside the main sheet pick up a forward oblique and split vertical views. The main film covers a

swath of ground 100-125 miles wide and up to 2200 miles long. At the altitudes formerly flown over Russia, it produced photos to a 1:22,500 scale.

How much does this complicated camera cost? Intelligence officers say a \$100,000 price tag is not too high considering its value as an all-seeing eye.

Also high priced and worth the money are the new image-motion compensating cameras. In one such unit, a rotating three-sided mirror picks up the image from a viewing port and reflects it onto the film in rapid-fire sequence. As the plane flies faster the mirror rotates. No matter how fast the plane flies, only single images are reflected into the camera.

Many of our photographic recon tricks depend on highly trained—and earth-bound—photo interpreters. In their dimly lit interpreting rooms, PIs hunched over stereoscopes work either with negative or positive transparencies and from prints. Prints are cheaper and it's easier to make multiple copies. On the other hand, transparencies show greater detail because they can be lighted from behind to make objects stand out starkly. And interpretation can begin while they're still in the processing bath.

Two-Way Film

Actually, both prints and transparencies have their place. A new photo material that is both print and negative is now used widely by photo-interpreters. Called Chronapaque by the manufacturer, it is a grain-free plastic sheet. Viewed by reflected light, it appears as a print. On a light table, it acts as a transparency, or "positive" film.

Already plans are afoot to install miniaturized automatic darkrooms right aboard strike-reconnaissance planes. Film would feed from the camera into an automatic processor. From there it would run side by side with a previous film made on an identical flight path. The two would pass under a small photo-cell scanner that would instantaneously spot differences. A white gash on the new film indicating a road being cut on a hillside, for example, would trigger an electronic signal and alert the pilot to turn back for close-ups.

The film used would actually be a non-photographic type of sensitive material not camera film in the old-fashioned sense.

But then, the pilot won't be a spy in the old-fashioned sense either. Like his colleagues who discovered the Soviet rockets in Cuba, he'll be part of a highly trained team of specialists on a 24-hour alert to protect us from future Red duplicity. ★ ★ ★



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takes more lives in this country than any other type of cancer. Because so many people ignore its symptoms. Or hope they will "go away." Or expect to do something "tomorrow." In short, they avoid the one thing that will help—seeing their doctors.

For cancer of the colon and rectum can be cured in 3 out of 4 patients when discovered early and treated properly. Its danger signs—change in bowel habits or unusual bleeding—call for prompt medical examination. It may not be cancer, but only a physician will know.

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Call your local American Cancer Society Unit for more information and material on this subject.

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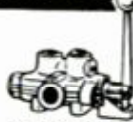
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Fold-Wing Planes

(Continued from page 94)

m.p.h. cruise, 400-mile range and an outstanding 2200 feet-per-minute climb. Because of its stalling characteristics, however, the judges did not feel it was suitable for the average inexperienced pilot. Plans are available from Spezio at 7008 N.W. 25th Pl., Bethany, Okla.

The two other runnersup, the *Lacey M-10* by Joe Lacey of Tulsa, Okla., and the *Contester* by Leon Tefft of Chicago, Ill., were unfortunately disqualified on a technicality. Complete drawings of the planes were not available by the time of the Rockford show. Both, however, drew attention. The *Lacey M-10*, for instance, has a high wing that does not fold. It pivots over the center of the fuselage, simplifying the design and eliminating some of the problems inherent in a folding wing. The *Contester* was the stubbiest of all the entries, with an 18½-foot wingspan and just 14½ feet long, and the most original-looking plane in the contest.

In fact, *Fly Baby*, the winner, was the least conspicuous of all the entries. Its generally longer wingspan, lack of fancy trim, external wire bracing and \$1.37-a-yard fabric that can be purchased from any mail-order catalog pegged it as a "plain Jane." In general, Pete Bowers' entry won because it came closest to the ideal set up by the contest rules—a simple airplane, simple to build and safe to fly. Almost anyone can do it.

Here's how Pete did it, along with a few tips on how to shop for parts to keep the cost down.

Nearly any standard aircraft engine in the 65 to 85-hp. class can be used on *Fly Baby*. The most commonly available engines are 65 or 85-hp. Continentals. A used 65-hp. Continental can be picked up for as little as \$100, but it may need some work. An 85-hp. Continental in first-class condition may be priced from \$350 to \$600, and used engines in good condition are available at all prices in between.

Engine mounts welded from aircraft-quality steel tubing can also be picked up readily from Piper Cub, Taylorcraft or other light planes using 65 to 85-hp. engines. Spare-parts suppliers and used airplane dealers are located near most big-city or suburban airports. The best source of leads for used parts of all kinds, including engines, is Trade-A-Plane Service of Crossville, Tenn., a classified-ad paper published three times a month. Parts dealers also advertise in *Sports Aviation*, the house organ of the Experimental Aircraft Association.

You'll also need aircraft wheels equipped

with hydraulic or mechanical brakes and tires. Self-contained hydraulic pedal-systems for each wheel brake include their own fluid reservoir. These, too, can be picked up used. You can either buy or build a fuel tank.

Either a 71 or 74-in. diameter prop will match the 65 or 85-hp. engines. Props are noted with two numbers: the first is the diameter in inches, the second is the pitch. High pitch numbers are best for cruising, while low pitch numbers deliver best climb performance.

Standard ⅛-in. stranded-steel wire is used all over *Fly Baby* for external and internal bracing wires. Heavy machinery or industrial suppliers stock this standard 1x19 stainless-steel flexible cable. Standard fittings are readily available at the same suppliers. A hand-operating swaging tool quickly attaches the fitting to cable ends. Only the one cable size, ⅛-in. diameter, is used on *Fly Baby* to keep construction simple. Aircraft-quality turnbuckles are sometimes available in surplus outlets, but the demand is heavy, so shop around if you can't find them in one place. Turnbuckles simplify cable stringing and provide a means for adjusting tension in cables during tuning. Once adjusted, the turnbuckles are safety-wired to maintain their position. Steel strip or bent sheet fittings are SAE 4130 steel, a readily available material that is used in many commercial airplanes. SAE 4130 is easily formed, strong and weldable.

How much your copy of "Fly Baby" will cost depends on your shopping or swapping ability. Even the \$1050 spent on the original is not a rock bottom cost but represents purchases of all new and used equipment at prevailing market prices without extensive "shopping around."

Forgiving Airfoil

Since the only critical dimensions are those that shape the wing ribs, a full-size pattern for the rib airfoil is part of the plans. Ribs are shaped to a standard NACA 4412 airfoil—a docile, all-purpose section that will forgive many minor dimensional discrepancies during building. The wing is of constant section; that is, the same-size rib is used throughout the full span of the wing except at the tips. Wing-tip shape is not critical and is simply formed in place with no jigs to shape the curve. The wing ribs are bandsawed from ⅛-in. plywood, either mahogany-faced "marine" or exterior grade.

To test whether the plywood meets Federal Aviation Agency specs, boil a small piece of it. If it holds together for half an hour, it passes. While plywood ribs carry

(Please turn to page 250)

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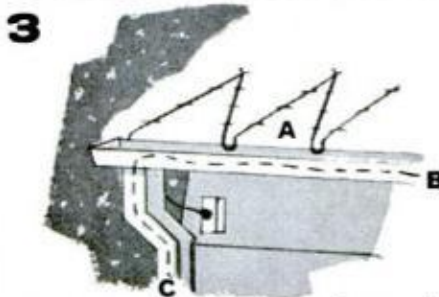
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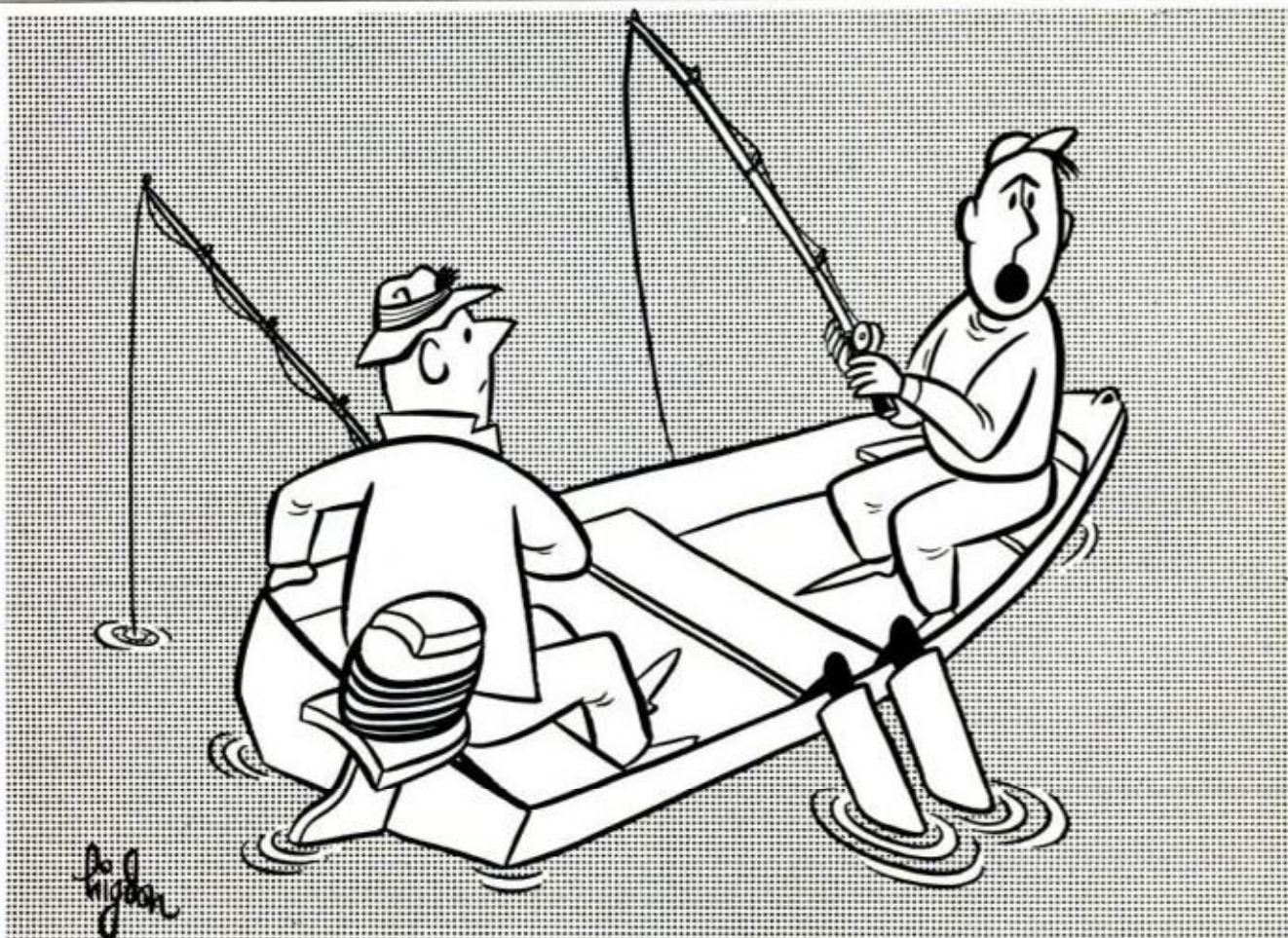


3 **A.** Easy-Heat opens channels on roof edge so water flows freely to gutter. **B.** Keeps gutters open. **C.** Assures drainage to the ground!



4 Look for Easy-Heat Roof Cable Kits in this self-service display at your hardware or department store. Or phone your electrician today!

EASY-HEAT, INC., Dept. 365, New Carlisle, Indiana



"Looks like Kirkpatrick has hooked a big one!"

Fold-Wing Planes

(Continued from page 248)

a slight weight penalty over the traditional wood-truss types, they can be sawed out in stacks. With only five pieces to each complete rib, an entire set can be assembled in a single day.

Wing spars should be built from aircraft-quality spruce. Your local lumberyard probably will not carry this special-quality lumber, but you can buy the needed few pieces by mail. Fuselage long-erons and frame parts can be cut from ladder spruce which is more generally available and costs less than certified spar spruce. Landing-gear struts are straight-grain fir. Sheet steel wrapped around each end of the landing gear struts provide a heavy-duty joint.

Dacron Taffeta Fabric

One of the major jobs on a light plane like *Fly Baby* is covering the wings, tail surfaces and fuselage with fabric. Instead of the costly mercerized cotton or Irish-linen fabric used by commercial types, *Fly Baby* and most of the other home-builts used synthetic dacron for several reasons. First, it costs less than \$1.50/yard in 44-in. widths—and is readily available under the name of “dacron polyester taffeta” in most department and dry-goods stores. Several grades are available for nurses’ uniforms and other uses, but for small planes the grade weighing three ounces per square yard is most suitable. Dacron saves time and money because most of the shrinking is done quickly with a hot iron, which also saves on expensive “dope.” Only a few coats, instead of the usual dozen, are needed to weatherproof and color the surface.

The FAA requires that the cockpit instruments be in good working order. The required instruments are an engine tachometer, oil temperature and pressure indicators, airspeed indicator, altimeter and a compass. Not required but mighty handy is a rate-of-climb indicator and a skid-ball (horizontal inclinometer). Below the lower left corner of the instrument panel is mounted the ball handle throttle control, ignition switch, carburetor heat control and a mixture control.

The mixture control is another option that’s good primarily for cruise at altitude. Without a mixture control, the fuel-air ratio becomes progressively richer as you climb due to the decreasing density of the air. With a mix control, you can manually lean out the fuel as you climb. Also a slightly lean mix for cross-country cruising increases range. Like the prop, engine and wheels, the instruments, switches and

controls are available from surplus or used-parts dealers who advertise in Sport Aviation or Trade-A-Plane Service.

How to Get a License

Licensing a plane like *Fly Baby* isn’t difficult, but certain procedures must be followed. First, when the structure is complete or nearly so, it must be inspected by an agent from the nearest FAA engineering office before covering is applied. He will approve it or recommend changes that must be made before covering. When your airplane is ready to fly, the FAA again inspects it. When the inspector is satisfied that everything works as intended and the airplane is actually ready for flight, he will issue an airworthiness certificate in the “Amateur Built” category.

This is one of six different types of aircraft carried in the over-all “Experimental” classification. Actually, amateur-built types don’t fit logically into the “Experimental” class. The FAA recognizes that “Experimental” carries an implication of hazard and is considering a change that will place amateur-built types in a “Special” category all their own.

Regulations require an initial 50-hour flight-service test restricted to a designated area not to exceed a radius of 25 miles from the base airport. This test area must be off the federal airways and away from high-density population areas and air traffic. If the plane is powered with other than an approved aircraft engine, the service test period is extended to 75 hours for further proving of the power plant. When the service test period is successfully completed, the builder applies to the FAA for a final inspection and demonstration for removal of the area restrictions. The airplane can then be flown anywhere in the United States except over densely populated areas. Amateur-built airplanes can’t be used commercially and can’t be rented out. Other flyers can borrow it as long as no commercial transaction is involved. A two-seater home-built can carry non-paying passengers after the 50 to 75-hour test is completed.

Once a year you must apply for a license renewal, and it’s up to you to keep the airplane in good, safe flyable condition. You are not required to inspect either the airframe or the engine after any set number of hours. Prudence, however, calls for a thorough check regularly to make sure all fastenings are tight and the structure is sound. You’ll want to have your engine checked regularly, but it’s good for 1000 to 1500 hours between major overhauls.

Remember, *Fly Baby* is a just-for-fun airplane. You can use it for sport flying, and it’s designed to be fun to build. ★★

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* Item #204. New Govt. Fine for boats, sump, etc. Timken bearings. 1 1/2" intake and discharge ports. 3/4" shaft. Size 12"x10"x18". Wt. 32 lbs. Cost Govt. \$97.50. **SALE**..... **\$19.49**

BATTERY REMOTE CONTROL WINCH

* Item #322. Govt. DC hoist with push-button switch, 20' control cable.

- * 35' 4000-lb. cable. High strength rating 1000-lbs. on 12-v. Fine for boats, docks, trucks, jeeps, farms, etc. Electric brake. Wt. 90 lbs. Size 12"x14"x8". Govt. cost \$395. **SALE**..... **\$68.25**



DIAL TELEPHONE

* Item #716. Std. phone, same used on all phone systems. Use as extension to main phone and on private systems. Directions furnished. Wt. 8 lbs. Govt. cost \$25. **SALE**... **\$7.95**



SPECIAL OF THE MONTH!

LABORATORY AC to DC RECTIFIER

* Item #2253. Compact Army rectifier that is excellent commercial or home laboratory unit. Converts 115-v 60-c AC 25-190-v DC or AC at 250 m.a.

- * Finest filters and components. Standard 19" rack mtg. size. Designed for Army phone and code systems. Size 19"x12"x5". Wt. 40 lbs. Govt. cost over \$100. **SALE**... **\$6.91**



HI-STRENGTH SET OF CABLES

* Item #329. Govt. surplus. New 6-piece hi-strength galvanized flexible tow and lift cables. Fine item for farmers, contractors, etc.

- * Consists of 5', 10', 20', 30', 60' and 100' 5/16" stranded cable with thimble eye and clevis. Wt. packed 55 lbs. Govt. cost over \$50. **SALE**... **\$19.95**



TACHOMETER SYSTEM

* Item #2146. Expensive mechanical-drive electric output system. Consists of G.E. precision AC generator driven by engine, motor, etc.

- * Generator connects to RPM meter with two wires, may be any distance away. Reads 0 to 1000 RPM. Fine for hot rodder, laboratory, shop, etc. Govt. cost \$50. **SALE**..... **\$19.63**



FUEL TRANSFER PUMP

* Designed for use in planes for transferring fuel from one tank to another. Makes excellent pump for contractor, farmer, etc., for refueling tractors, dozers, etc.

- * Complete with filter which takes out dirt and rust. Capacity 300 gal. per hr. Ports 1" iron pipe. Size 13"x5"x7". Wt. 10 lbs. Govt. cost over \$30. **SALE**... **\$11.95**

MISC. ELECTRONIC BARGAINS

- * \$35 Astronomical Time Switch 110-v. **\$5.98**
- * \$99 Auto Step-by-step Tel. Switch... **12.91**
- * \$95 Telephone Line Amplifier... **7.95**
- * \$5 Radio Telegraph Key... **1.39**
- * \$150 Servo Experimental Amplifier... **4.95**
- * \$9 Powerful 110-v Solenoid... **2.98**
- * \$14 Hi-Voltage (10,000-v) Spark Coil **3.91**
- * \$20 Navy Geiger Tubes... **.69**

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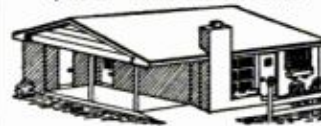
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KIT**

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Wt: 12 lbs.
If desired, for easier
work alignment: RIP
FENCE, \$3.50
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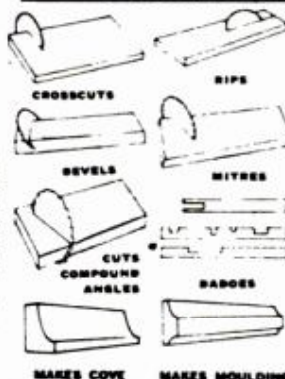


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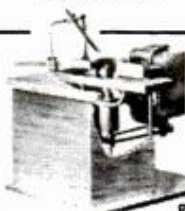
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Complete less
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Hold-down assembly
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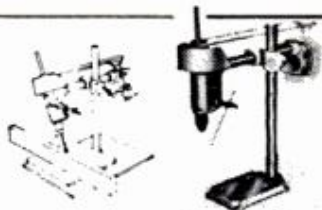
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