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Million-Mile Owner Reports: Dodge and Tempest

POPULAR MECHANICS

APRIL 1963
35 CENTS



PM
Editor
Rides New
HOT-AIR

Sports Balloon!



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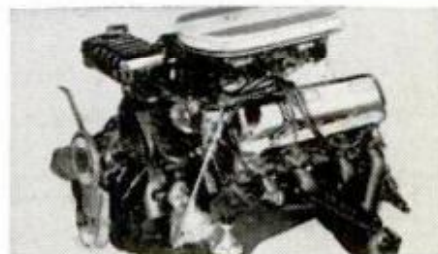
Note the sleek, racy design of Mercury's newest hardtop: the 1963½ Marauder. Aerodynamic styling cuts air resistance, takes full advantage of Mercury's brilliant new V-8's.

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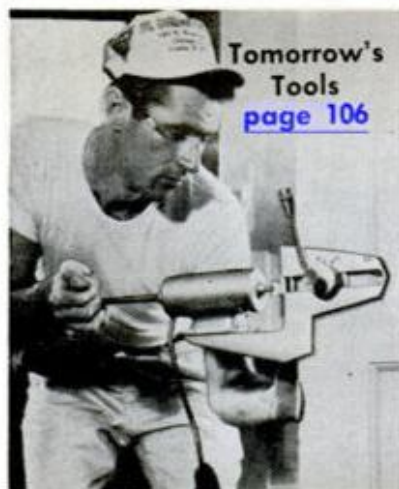
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POPULAR MECHANICS®

APRIL 1963
VOL. 119 NO. 4

INTERNATIONAL EDITIONS • SPANISH • CARIBBEAN • FRENCH • PORTUGUESE

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NEXT MONTH—Wild River Boating on white water, or into Arctic wilderness; either way it's packed with adventure. May PM also brings you owners' comments on Chryslers and Buicks, plus a sneak preview of our rendezvous-in-space project—Gemini. You'll also enjoy reading what happens when corn shows an ear for good music.

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BACKSTAGE

at PM

While the hazards of sport ballooning haven't been fully explored, this new activity (described in an article beginning on page 85) is attracting a breed that has survived hardships in other, more strenuous outdoor exercises.

Dr. Bill McGrath, who bought the first of the new hot-air balloons, is temporarily grounded, but not because of ballooning. His arm and shoulder are in a cast because of a tumble he took while bobsledding in Switzerland.

Mrs. Barbara Keith, a Connecticut grandmother who ordered another of the new balloons, had to postpone delivery until she recovers from a back sprain suffered when she landed in a tree while sky diving.

Thus far, while inexperienced pilots have had a few rough balloon landings, there have been no broken bones or even mildly sprained ankles.

After a number of readers wrote asking for information on building a tandem bicycle, PM's Wayne Leckey passed along the idea to Manly Banister, a long-time PM contributor.

The project turned out well (see page 176), but Manly wasn't able to enjoy the bike for long. Seems that, during the first trial spin, he was stopped by a bystander who wanted to buy the bike on the spot. Since the offer was too good to turn down, Manly walked all the way back to his shop—with a fistful of bills making up for any weariness of foot.

Distance-runner Jim Beatty, who tells on page 112 how he plans to beat Peter Snell's present world record for the outdoor mile, was just a spectator on February 10 when Snell suffered his first defeat in two years. The victor was Beatty's teammate, Jim Grelle, who bested Snell in the indoor mile although neither runner in the 4:04.7 race came close to Beatty's indoor 3:58.6 record.

And Snell—at this writing—still holds the 3:54.4 outdoor record that Beatty is determined to capture.

The Editors



BRAND NEW ECONOMY CAR

THIS 1914 MODEL T FORD GETS BETTER GASOLINE MILEAGE TODAY THAN WHEN IT WAS BUILT. HOW ABOUT YOUR CAR? Forty-eight years ago this Model T got 18 miles to the gallon of gas. Today, thanks to better gasoline, better ignition, it gets 19 miles to the gallon. What's the point? Just this. Almost any car can be an economy

car if you'll only give it a little help.

How? Easy. Just drive "Old Faithful" down to see the guy who sells Autolite parts. He's got a whole shelf full of nifty items that will make any moocher a miser in the miles-per-gallon marathon.

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POPULAR MECHANICS

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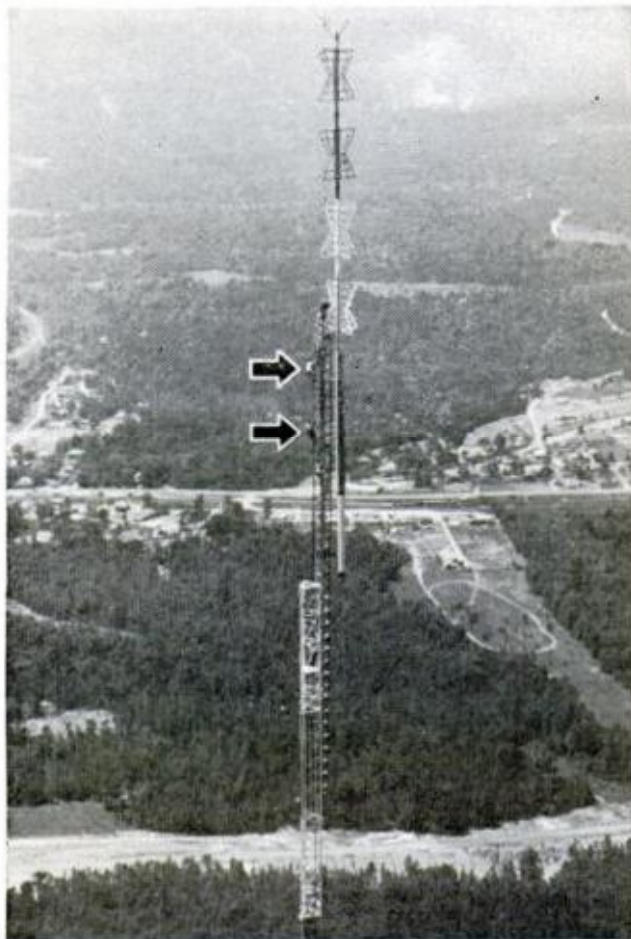
RAMBLER '63

Winner of Motor Trend Magazine Award: "CAR OF THE YEAR"

Over the editor's desk

Onward and Upward

The tower for WRBL-TV and WTVM stations of Columbus Ga., is 1749 feet high, and this is the tallest man-made structure on earth. It is 73 feet higher than the tower for KSVT-TV in Missouri (*Is This the*



World's Tallest Structure?, page 123, Dec. PM). Will the natives of Missouri bow to the natives of Georgia on this? If they "must be shown," I would be glad to accompany them to nearby Cusseta where the tower is located.

Columbus, Ga. JIM FULLER

Okay, Jim (and Joel Turner of WRBL-TV and Ted Short of WTVM and all other native and non-native Georgians who wrote), it looks as if you're on top with the tallest structure (the photo shows workers building it). And since some readers may wonder about the Empire State Building, we'll add that it's 1472 feet high.

Clean with Care

Please note the danger of using carbon tetrachloride as a cleaning liquid (page 117, Jan. PM). Being a retired engineer

from a large chemical company and knowing that we were not permitted to have even a teaspoonful of this dangerous liquid, I believe it is only fair that you advise your writer and readers.

Marion, Mich. ROBERT W. EASTMAN

As with any cleaning fluid, carbon tet should be used only in a well-ventilated room. One advantage that it has, of course, is that it's nonflammable.

Wildlife Division

I read *Coon Fever* (page 117, Feb. PM) and enjoyed it. I have been trapping for two years, have about 50 traps and have been quite successful this year.

Merrill, Wis. PHILIP SCHOTZ

Why doesn't someone organize a pack of coons to hunt down the dogs?

San Pedro, Calif. GEORGE W. RAINEY, JR.

As a coon hunter in Iowa, I surely enjoyed your story. I enjoyed every page of your February issue.

Delhi, Iowa LAWRENCE GLEW

I was shocked and disgusted to see an article dedicated to the sadists in our society.

Monte Rio, Calif. W. J. MYERS

Angles: Right and Wrong

The perspective T-square is most interesting, and one would think, "Why hasn't this been thought of before?"

Toronto, Ont. W. L. LANGRIDGE

Your article *Perspective T-Square* (page 155, Jan. PM) was most interesting. May I point out what appears to be a typographical error. The total of all angles—15, 90 and 60 degrees—shown in Fig. 4 is only 165 degrees; the total of all the angles through a straight line should be 180 degrees.

Chicago, Ill. HENRY F. OLSAK

Our crafts department blames gremlins for lettering a 30-degree angle as one of 15 degrees. You're right; the angles, in order, are 30, 90 and 60 degrees.

Too Much Exposure?

We, the members of W. W. Durbin Ring No. 71, International Brotherhood of Magicians, wish to register our formal protest of your exposure of several magical effects in *Eight Magic Tricks* (page 142, Dec. PM).

The article is exposure for exposure's sake. The effects are standard items bought from dealers. No attempt has even been made to disguise their appearance. No effort has been spent in explaining how to

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



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perform these effects properly, and very little in showing how to construct them properly. Only the basic secret of the effect is exposed!

It is inconceivable that you would repeatedly stoop to the low level of exposure of magical secrets to laymen in order to sell magazines.

Cincinnati, Ohio

WILLIAM H. BREWE,
President, Ring 71

I have had *PM* in our home for 12 years, and this month I enjoyed it more than ever. I have played with magic tricks all my life, and this is the first time I can recall where eight magic tricks were published and explained so anybody could learn how to do them. I have seen lots of books, and if a person could learn one trick out of these books, he thought he was doing good. I hope you have more of these magic tricks.

Lakeland, Fla.

HERMAN F. PHILIPP

Best Seller

The styling of the *PM-38* (page 140, Aug. *PM*) is the greatest. The lumber cost me closer to \$60 than the \$38 it cost the



author, and it took me a few more hours to build it—but it was truly worth it.

Pitman, N.J.

BARRY R. CAMPBELL

Your skill at boat-building looks great too, Barry. But look below; maybe you're not patronizing the right lumber yard.

I am 16 and the *PM-38* was my first attempt at building any type of boat. The entire boat cost me \$38.07, and took 40 hours to build. On the test run it was powered by a $7\frac{1}{2}$ -horsepower Wizard, and it hit about 15 miles per hour with three people aboard.

Washington, D.C.

GEORGE DE BOW

Well, you came mighty close to two of our 38s (cost to build and hours of construction), but—as we pointed out in the story—we had a 28-horsepower motor on it to get the 38 miles per hour. Incidentally, it's the most popular boat we've featured.

POPULAR MECHANICS

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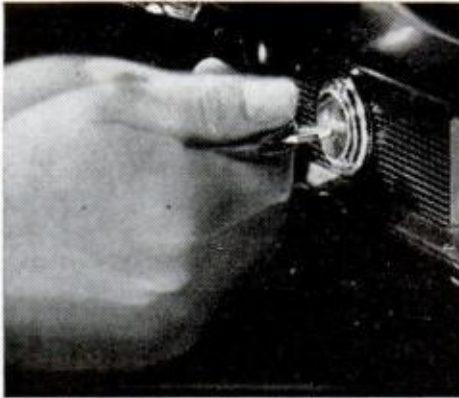
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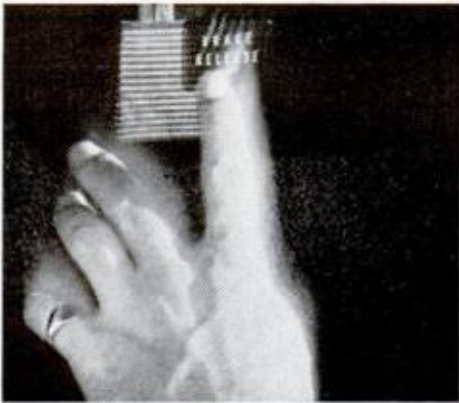
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For people who like to sit at home and knit, Tempest is not.

We could go on claiming a Tempest to be the cat's whiskers until we're blue in the face. But what's the use if you think we're just tooting our let's-sell-more-cars trumpet?



Do yourself (and your friendly car tailor—us) a favor. Amble into your Pontiac dealer's and try a Tempest. Maybe a Le Mans convertible, now that the weather's warming up.



Then reluctantly (of course) pry yourself out of its deep bucket seat and go off somewhere by yourself to do some serious thinking. Choosing the right engine (V-8 or 4?) and transmission (stick shift or automatic*?) and axle ratio and color and all that jazz isn't the work of a minute.*

When you're ready, snatch an order form from a salesman and check off what you want in your Tempest. It's the next best thing to building your own car, because we use your order as our jig, so to speak.



Unless you're one of the purl-one-drop-three brigade, strike a blow for something or other. Pack up your raveled cares (in your old knit bag?), turn on a Tempest and make off with all the fun.

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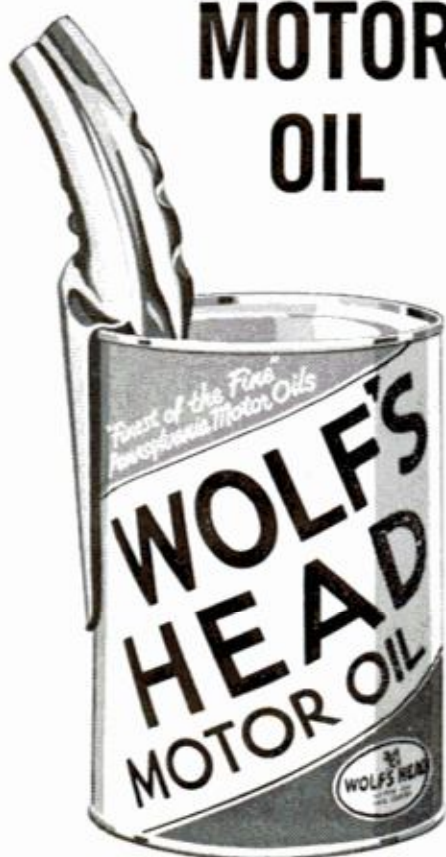
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Tune in on the inventors

World War II pilots will be interested to know that an old fighter plane designer is still in business. Willy Messerschmitt of Munich, Germany, recently received U.S. patent 3,073,552 for a new method of mounting an engine on the thin wings of an aircraft. The design is a flexible rectangle that distributes engine weight over most of the wing area.

Keep a cool head with an unusual hat that won patent 3,070,803 for Evelyn V. Slepicka, West Chicago, Ill. It has a crown and brim of double-wall construction, into which is poured a liquid coolant.

If you don't like the feel of wet beer cans, a metal beer can holder with a wide curving handle may be the answer. The can is clamped securely by the holder. John Michael Mele, East Haven, Conn., won patent 3,074,678 for it.

Come next winter, clean your own driveway with a snow clearing apparatus which attaches to your car. Snow is gathered in a scoop and thrown to one side by a rotating screw. Patent 3,074,188 went to Robert E. Etnyre, Oregon, Ill.

Coolant for outer space. A tiny cryogenic motor designed for space or electronic use, cools to temperatures more than 300 degrees below zero. The self-contained, electrically-driven motor, which operates on a modified Stirling cycle, won for Dr. Stephen F. Malaker of Mountainside, N.J., and Dr. John G. Daunt of Ohio State University patent 3,074,244.

Duck hunters can now lure their quarry to blinds with a motor-driven duck decoy. A tiny electric motor, housed in a watertight container on the underside of the decoy, is operated from the blind by remote control. Patent 3,074,195 went to Frank W. Vanderpool, Springfield, Ore.

If you want to have protection from nuclear fallout near the old swimming hole, you can build a combination shelter and swimming pool. It won patent 3,074,080 for Marte Previti, Flushing, N.Y.

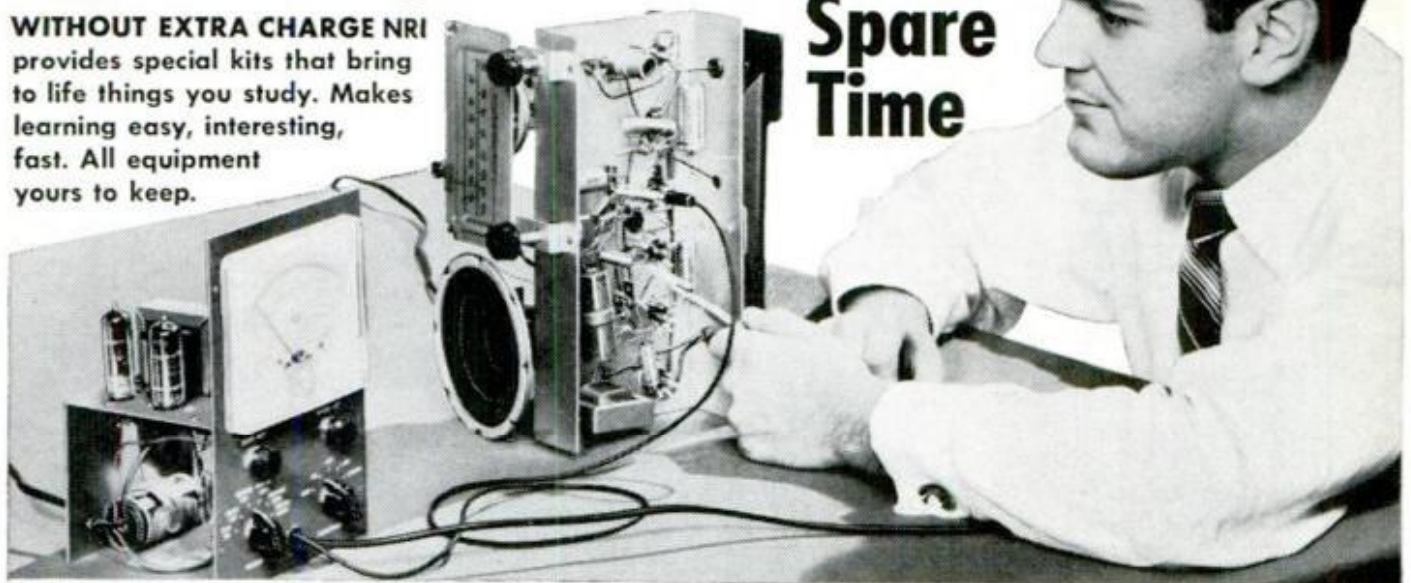
Copies of the original patents may be ordered for 25 cents each from the Commissioner of Patents, Dept. of Commerce, Washington 25, D. C.

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Sidelights on aviation

Veteran air travelers have some definite opinions about the airlines they use—or avoid using. And some of their reasons should shake up the boys in the airlines' executive suites.

A recent survey conducted among its members by the Airways Club—a sort of a motor club for airline passengers—lists Continental, American and Delta as the three most “favorite” airlines, with Mohawk, North Central and Alleghany, as “least favorite.”

Chief reasons for listing their favorites were “general services,” “courtesy” and “frequency of service.” Chief complaint, to no one's surprise, was “lack of communication,” followed by “flight delays” and poor “baggage recovery.”

The three “least favorite” airlines are all feeder lines which, unfortunately, have built-in handicaps (meeting up with flights from long-distance lines, which may cause some delays). However, three long-haul airlines, National, Eastern and Braniff,

also made the “least favorite” list.

In releasing information on the survey, the Airways Club commented that it's “interesting to note that courtesy, which costs nothing to render, was the most significant reason for choosing one airline over another. Another service which would cost little or nothing to accomplish is the simple matter of providing more and complete information to passengers about delays.”

Windless wind-tunnels—in fact, tunnel-less wind-tunnels—are now aiding scientists in making wind-tunnel observations.

A computer serves as the theoretical tunnel, and equations describing the flow of fluid are fed into its memory system. The computer then calculates what happens to the fluid when an object of known size and shape is introduced.

The technique is not designed to replace real wind tunnels, but to reduce the number of required experiments.

Scientists are studying the possibility of using synthetic fuel from coal to power future supersonic airliners. It's more economical for commercial operation.

Kevin V. Brown
Aviation Editor



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sure!
But just
an old
softy
inside.**

Here's the outside story of this rugged Ranger boot. Eight inches high. Golden tan leather. A crepe-tone cushion outsole. It'll take on anything: vegetable, mineral, or animal. The inside story? Sheer, solid comfort. Sure, solid support. There's a wedge heel, a steel shank and a Chrotan sweat-resistant insole. The smaller boot



below, in spice tan glove leather, has cushion crepe sole, no-seam back, cushion insole. Insist on Ranger, the biggest name in utility shoes. Rangers start at 8.95. For nearest dealer, write Ranger, Endicott Johnson, Endicott, N. Y.

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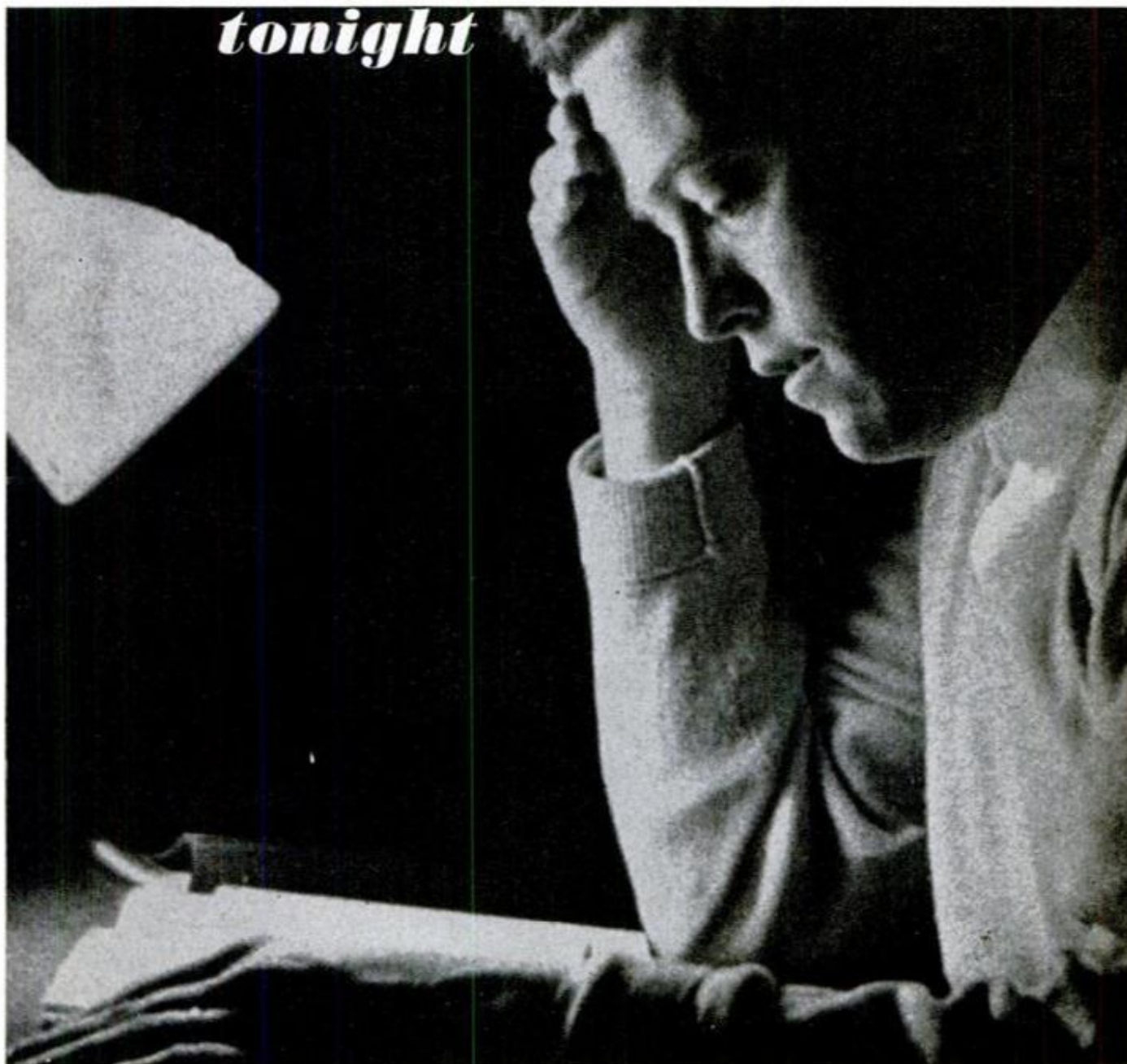
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Civilization affects your hearing. A trio of scientists recently compared the hearing ability of a group of citizens in a large British city with that of a native tribe in a remote part of the Sudan. Up to age 20, they say, there isn't much difference between the two groups. But from that age on, the Sudanese maintained almost perfect hearing while the test subjects in the noisy city showed a steady decline in hearing ability.

"Hot" bananas will keep longer. Scientists in Puerto Rico have found that exposing green bananas to just the right amount of gamma rays will delay their ripening so they can be shipped long distances.

How many inhabited worlds are there? According to a Columbia University astronomer, there may be 600 million planets with intelligent life in the Milky Way alone. Of the 100 billion stars in our galaxy, he thinks 200 million of them are similar to our sun, each capable of holding three life-supporting planets in its orbit.

An Australian meteorologist is busily collecting snowflakes at, of all places, the South Pole. In an effort to determine whether the Antarctic's seven-million-cubic-mile ice cap is increasing or decreasing, he collects specimens in homemade snow traps during high winds, then analyzes them to see if the snow is from a fresh fall or is wind-blown old snow.

Early indications are, he says, that little new snow falls in Antarctica and that much of the frozen continent's snow and ice is blowing away, evaporating and melting into the sea.

Lighter but not cheaper. A London furrier has patented a process which produces the lightest fur coats in the world. A full-length mink coat, for example, weighs but 57 ounces. Even the heavier coats, like leopardskin, can be reduced to between 3½ and 5½ pounds. The only thing not secret about the closely guarded process is its name—Souplesse.

An alligator's heart slows to the tempo of a funeral march while he's underwater. So says a Norwegian scientist who has studied the heart action of 14 of the jungle reptiles. He found that alligators can stay underwater for two hours at a time by slowing down their heartbeats to two or three a minute—drastically reducing the need for oxygen. Half the reptile's oxygen supply is used in the first 20 minutes of a dive, while the remainder may last him an hour and a half, or longer, the scientist said.

Make a pig stand on his hind legs to eat and you'll end up with more of his carcass in the choice ham and loin cuts, say researchers at the University of California. With elevated feed troughs they got five percent more ham and loin from test pigs without increasing food intake.

Being a tomboy helps a girl become "intellectually creative," says a woman psychologist at Stanford University. Boys, she says, are usually more active and independent than girls, hence develop a more detailed, analytic approach to problems. Girls, usually more passive and dependent, tend to see things as a whole, with details often blurred. She recommends letting girls develop initiative by giving them more freedom. But, she says, those who do well at analytic thinking "are not very feminine creatures."

Maybe the moon isn't a dead world after all. Russian scientists claim it is undergoing constant change; the crater Linne, they say, has decreased to half its former size, another crater has disappeared completely, and small craters have formed on the bottom of a larger one. The report also says that sometimes at sunrise greenish-gray spots appear at the bottom of some craters.

Twins are being examined before birth in a Scottish hospital. Measurements and other characteristics are being taken with ultrahigh-frequency sound equipment.

Special Science Report: Pain-Killing Aspirin Compounds

Five pain-killing (analgesic) compounds containing aspirin were tested in a recent research project carried out in Baltimore City Hospitals on a grant from the Federal Trade Commission.

Compared in the tests were Anacin, Bayer Aspirin, Bufferin, Excedrin and St. Joseph's Aspirin.

In one test series, 298 mothers in the maternity wards of Baltimore Hospitals were treated for postpartum pain with all

(Please turn to page 24)

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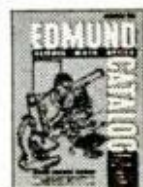
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valves, self-adjusting brakes and improved clutch and transmission controls.

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Big double doors on the right side open up to a load floor only 16" off the ground so that you can load a 4-foot crate with ease. There are wide-opening double doors at the rear and optional* double doors on the left side just as big as those on the

handiest delivery truck you can buy!



Chevrolet Greenbrier and Rampside Pickup accompany Corvan on 25,000-mile leg of endurance run in Death Valley desert country. Here, day-and-night high-speed operation showed durability of improved new air-cooled engine.

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Science Worldwide

(Continued from page 20)

five of these compounds, on a random selection basis. The percentages of post-partum patients reporting complete pain relief at selected intervals after treatment were as follows:

Drug	15 Min.	30 Min.	45 Min.	1 Hr.	2 Hr.	3 Hr.	4 Hr.
Anacin	24	38	54	67	74	73	63
Bayer							
Aspirin	31	40	48	52	55	59	58
Bufferin	28	43	61	71	64	67	52
Excedrin	37	47	51	49	69	67	59
St. Joseph's							
Aspirin	31	49	63	59	60	60	50
Placebo	16	30	32	24	39	40	41

According to the research report, "There was no striking difference among the agents so far as rapidity of onset, peak effect or duration of analgesia was concerned."

In a second phase of the study, 60 elderly patients who volunteered were tested to see which of the same drugs, if any, caused gastrointestinal disturbances. The incidence of "upset stomach" by drug type were as follows:

Drug	Doses Taken No.	Episodes of Upset Stomach		Patients Reporting One or More Episodes of Upset Stomach	
		No.	Rate %	No.	%
Anacin	799	23	2.9	11	18.3
Bayer					
Aspirin	829	9	1.1	8	13.3
Bufferin	812	5	0.6	5	8.3
Excedrin	760	34	4.5	15	25.0
St. Joseph's					
Aspirin	818	9	1.1	8	13.3
Placebo	833	7	0.8	7	11.7
Total or Average	4,851	87	1.8	54	15.0

Do plant diseases go south for the winter? Some do, says a Cornell University plant pathologist, to escape the winter temperatures. Come spring and a new growth season they climb aboard a handy air current and work their way back north. The non-migrating species hide out inside seeds, under refuse, in the roots of weeds, or even inside storage bins.

The deepest abyss in any ocean—over seven miles—was found in the Pacific recently by the British ship H.M.S. *Cook*. The Cook Depth in the Philippine Trench is 1500 feet deeper than the previous record holder, discovered in 1959 by a Russian ship in the Mariana Trench.

John P. McNeel
Science Editor

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(Please turn to page 28)



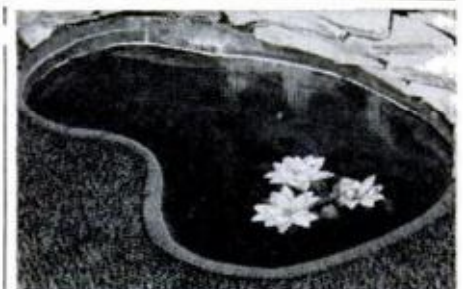
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Aluminum projects for handymen are offered in "Bright Ideas," a 14-page booklet. Directions for both functional and decorative home items such as tiered tables, utility bookshelves and wall plaques call for ordinary hand tools. Reynolds Metals Co., PRD 76, Richmond 18, Va., will send you the booklet free of charge.

Household repairs—from cracked china to leaky radiators—may be made efficiently through the help of an eight-page pamphlet, "Working with Elmer's Epoxy Glue and Compound." Seven rules for proper use of adhesives are listed, diagrammed instructions cover all projects which include modeling and casting new toys from old ones. Copies are free from Dept. H. Borden Chemical Co., 350 Madison Ave., New York 17, N.Y.

Painting small areas requires particular know-how. A "Guide to Painting Kitchens, Bathrooms and Woodwork" gives step-by-step tips for removal of old finishes, surface preparation and paint application. Liberally illustrated, the fold-out booklet also offers pointers for painting baseboards, window sashes and doors—and how to estimate the amount of paint needed for each job. Du Pont Co., Room N-2494 Wilmington 98, Del., offers it at no cost.

Boat care booklet, "Painting Handbook for Boat-owners," (PM Dec. 1962) has been updated and enlarged. Du Pont Co., Room N-2507-Y, Wilmington 98, Del., now offers it for 25 cents.

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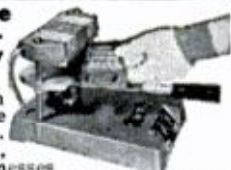
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A Career Guidance Editorial SKILLS FOR AMERICA

THE ENGINEERING TECHNICIAN . . .

Man In Demand

By A. B. Kazan

Leaders in engineering education predict that industrial payrolls in the near future will show a personnel ratio of one engineer to ten engineer technicians, and one engineer to 50 or more mechanics. This trend is already established in many industries.

Most needed are *not* the engineers, but "engineer techs", men who talk the engineers' language and can translate their ideas into action on the job. Such technical help lets the engineer stick to engineering, not supervision, laboratory experiments, drafting, basic field studies, and other assorted non-engineering (strictly speaking) chores.

For men with the equivalent of just two years of post-high-school training, a whole new set of jobs has opened up in nearly every

industry. There are enough engineers to do the real engineering, but there are not enough of them to do all the things that mechanics can't do. The chemical industry, civil engineers, electronics firms of all kinds, computer installations, metal manufacturing plants, the petroleum industry—all these and many more are finding a need for engineering techs to back up their engineers.

Engineer tech jobs are better than production jobs. Techs work *with* the engineers as well as *for* them. Engineer technicians are on the engineering team, not the production team. They can expect to be paid more than all the most highly-skilled production workers, and advancement is less hampered by existing pay scales.

The jobs are relatively easy to get, too, in any area of the country where industry exists. In a recent U. S. Department of Health, Education and Welfare survey of 5,259 graduates of two-year engineering tech programs, 3,416 had jobs and only 254 of those were in positions unrelated to the training. Out of the other 1,843, the Armed Forces had 466, and 895 were enrolled in other schools, continuing their education.

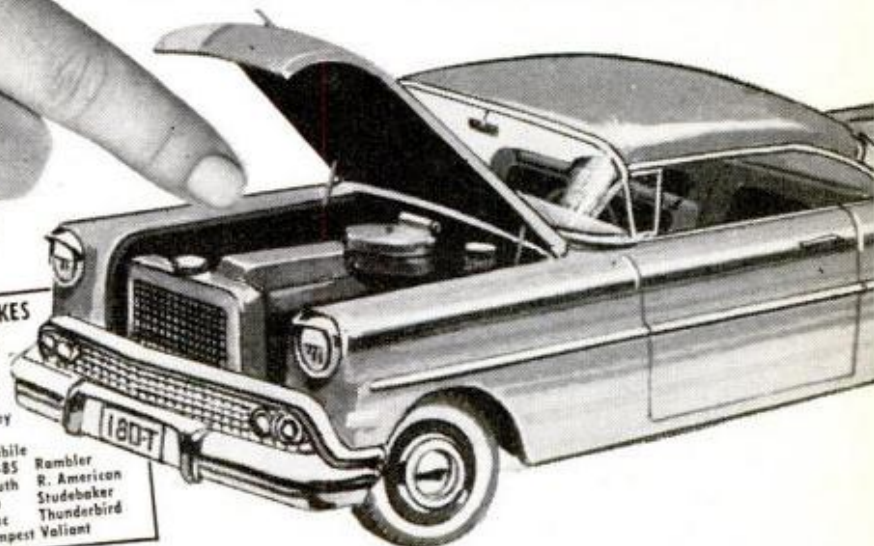
Just 92 reported as unemployed, and 308 were unreported. Even if all 400 of these were unemployed, it still shows more than 90% of the class is employed, which would be an

continued on page 32



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THE ENGINEERING TECHNICIAN...

amazing record for any class from nearly any school. This survey covered 28 states, so it is no local situation. Some of the industrial fields are very much in need—one area reported that 600 engineering tech students left for computer jobs before graduating.

The graduates of these engineering tech schools included both post-high-school (the majority) and during-high-school training. The last is being offered by some schools. The post-high-school graduates did much better than the high-schoolers in the paycheck department.

Here, obviously, is a whole new prestige field of employment where a college education may not be needed. For an engineer tech, a "degree" consists of experience and training to perform definite engineer functions, plus enough background to understand the problems engineers work on.

Just what does an engineering technician do?

In an electronics plant, he might run tests on engineer-designed new equipment. He might be responsible for testing components purchased from outside sources that go into manufactured equipment.

In a civil engineering firm, he could be running the survey team, or teams. He might also compile basic survey data from maps and plans in public engineering offices, then work with an engineer while this data is turned into an engineering study.

In a metal manufacturing plant, he might test new products. He'll also test production machinery in advance of production runs, and certainly will help engineers trouble-shoot on the production line.

Just what training is actually needed to be engineering technician? What is learned in those two years of full-time training, or during the longer period of a part-time education?

First, it is practical training that doesn't neglect theory. Courses and lessons are aimed directly at developing the skills needed in industry. Another way to put it is that the studies are designed to get jobs—good jobs—for students and give them the know-how to hold such jobs.

Second, it is general training. It is impossible to talk engineer language without knowing some of the things an engineer knows. In electronics, a student-tech learns about a TV set, but he doesn't learn to repair one; he learns radio circuitry, but not details. He does get intensive instruction in operating electronic test apparatus. He gets the kind of math he needs, and the kind of understanding of theory he needs.

Third, it is specialized training. That is, if the general subject is electronics, that is what is studied. In a two-year course, very little

continued on page 40





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Rattler with fangs bared lunges from hole as hunter pumps another shot home from a .22 gun.

Your quarry is so varied, you never know what you're going to come up with next. Poke your pistol in a hollow log and you may flush out anything from a valuable mink to a snarling bobcat. That harmless-looking hole in the ground may harbor a spitting rattler or a frightened gopher. Just use a little caution and common sense—watch that the wind doesn't blow gas in your direction.

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time is spent on anything that is not directly related to electronics engineering. There is no such thing as an all-around engineering technician—all are specialists, with a wide knowledge of their specialty.

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The electronics engineering technician, for example, would be valuable in a TV-set manufacturing plant, in a plant that made tubes or other components, any electronics defense plant, in a private engineering lab, or even in a big wholesaler's office. A civil engineer tech would find ready employment in a private firm, a state or county road or water department, or in construction departments of big private firms, or such state and Federal agencies as control road and highway systems.

The engineering tech idea is fully supported by the engineering profession itself. In fact, some professional engineers' societies are starting a movement that will eventually make it possible for engineer techs to move up the ladder—to take the regular exams that mean state licenses after proving themselves as "engineers" on the job.

Where can this kind of education be found?

Private technical institutes in such cities as New York, Chicago, Cleveland, Milwaukee, Los Angeles, San Francisco, and other large cities have long offered this kind of training, some providing it on a part-correspondence, part-residence basis. Several technical correspondence schools offer rounded-out basic training in addition to more specialized technical courses.

Publicly-owned junior colleges in most states are planning or offer technology courses as part of their regular curriculum, and most of these offer the education on a part-time basis as well as full-time. Usually, high school diplomas are not required for entrance. Many state universities offer technician training in engineering as adult education or extension courses, and often at branch campuses.

This is not the easiest extra education to get, but it may be the most worthwhile. A man in great demand today is the engineering technician.

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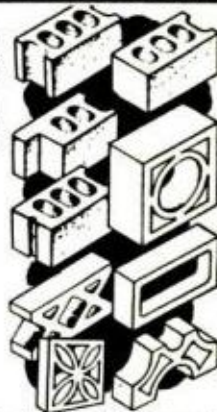
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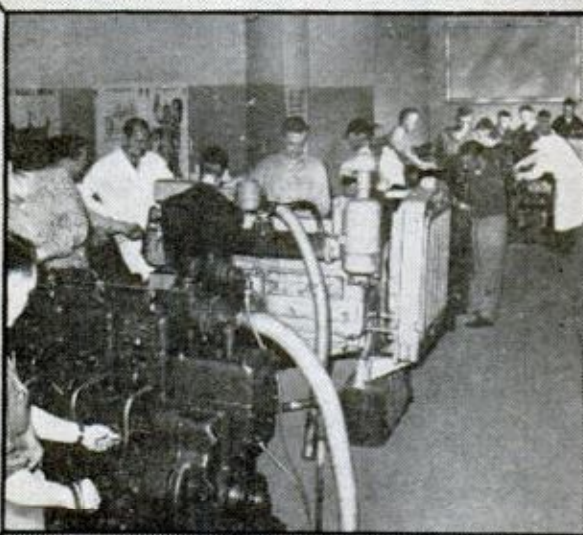
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Campers who still prefer a wood stove to the convenience of the many gas stoves on the market, will be interested in this novel



method of making a "two-burner" cook stove from three eight-inch strap hinges. Whether purchased new at a hardware store or removed from an old barn door, the three hinges are simply joined together at one end by a one-inch flathead bolt and nut. Spread out, with one side of each hinge cre-

ating the cooking area and the other each of the three legs, the stove will hold any size pot or pan. After use, the hinges are cooled and folded into a compact unit.

Outdoorsmen who insist on having all the comforts of home can take heart. Wild animals feel the same way. A park warden at Riding Mountain National Park in Manitoba reported that bears raided his garden. They stole the blankets he was using to keep the frost out of his tomatoes.

New for outdoors . . . we found a first-aid kit that measures 3½ inches by 5½ inches, fits snugly into one end of a fisherman's tackle box, and includes just about everything needed for an emergency, including a tool for removing fish hooks from fingers and insect repellent. We dropped the kit into water and left it for 10 minutes. It floated, and when removed, the interior was completely dry. Priced at \$3, it is available from Fisherman's Friend, Box 569, Glen Cove, N.Y.

STUART JAMES

Outdoors Editor

POPULAR MECHANICS

Not everyone does as well, but T. N. CODY, who started a business of his own, reports...

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By Jim Whipple



Front Drive's the Formula for Good Go in Snow. Coming Soon, Breakerless Ignition for Your Car

Detroit's back in the game but good! Although some companies are in deeper than others, four of the five U.S. auto-makers are either participating in or aiding participants in automotive competition. (Although the fifth company, American Motors, eschews performance competition, it will enter a **Rambler** in an economy run at the drop of a gear ratio.)

At the moment, Ford Division seems to be the biggest player, being involved in almost everything from the Monte Carlo Rally to Daytona speed events. Incidentally, Ford did pretty well for itself in the Monte (page 46, Mar. '62 PM) where the V8 **Falcons** finished first in their class (over 3000 cubic centimeters displacement) but finished 35th and 43rd overall.

A **blocked-off road** prevented an over-all win, but on the last, most grueling leg—90 miles over the icy switchbacks of the Alps—one of the **Falcons** driven by a persevering Swede named Bo Ljungfeldt made better time than any other car.

Over-all winner of the Monte was a car familiar to motorists on the U.S. East Coast—the Swedish **SAAB**, a three-cylinder, front-drive car with the climbing power of a mountain goat. Winning driver, Erik Carlsson, was repeating his 1962 over-all win in the same car.

An interesting fact is that eight of the first ten cars were front-wheel driven. Five of these were French **Citroens**, two were British **Morris Mini-Coopers**, and of course, the winner was Carlsson's **SAAB**. This would seem to lead to the conclusion that for fast climbing of steep, winding roads covered with snow, it's better to have your car pulled than pushed.

Recently, we had a chance to make a trial run in the Ford experimental **Mustang** with an 85-horsepower version of the **Taurus M12's** V4 driving from the rear. (see page 93, Nov. '62 PM).

Holding the engine to 4000 r.p.m. in deference to a newly installed oil pump, we reached 85 m.p.h. with ease. The car sticks to the road like a cast iron manhole cover yet maneuvers with the nimble ease of a well-trained polo pony. It has the best

remote-controlled synchromesh gearbox that we've ever tried.

The **Mustang** drives with more of the feel of a ready, willing and able competition sports car than anything currently available in the U.S. with the possible exception of **Alfa Romeo**, **Corvette Sting Ray** or **Porsche**. With the factory-made engine, and transmission axle assembly intended for a low-cost production car, we would think that such a car might be marketed at less than \$3000 in "standard," unhooped up (85 hp.) condition.

In this price bracket, the **Mustang** would have no domestic competition and a clear-cut superiority over all the under-\$3,000 imports. The big "IF" here is will Ford take the dare and tool up for a pressed steel frame and fiberglass body shell? Cost of producing the current prototype's frame of welded tubing and skin of aluminum would be far too high. We hope Ford follows the low-cost route; what this country needs is a good \$2900 sports car!

Transistors are taking over in the auto industry in no uncertain terms. With transistorized ignitions available as limited options on high-performance engines at **Ford**, **Pontiac** and **Mercury**, and kits galore, we now see the dawn of phase two in the takeover.

Holley Carburetor Company will soon make available breakerless (or contactless, if you will) ignition which will convert a conventional distributor into a pulse generator which sends a tiny surge of current to trigger the 12-volt primary after it has been amplified through two stages of transistors.

This set-up eliminates the friction, pitting, misalignment and maladjustment of conventional breaker points which remain the weak spot in present transistorized systems. Delco-Remy also has this, and Motorola is readying their version. Delco's job is available on performance **Pontiacs** now, but it differs from Holley's system in that it requires a special distributor, while Holley's can be fitted in place of points on your current distributor in a matter of minutes with no need to make any changes in the advance mechanisms.



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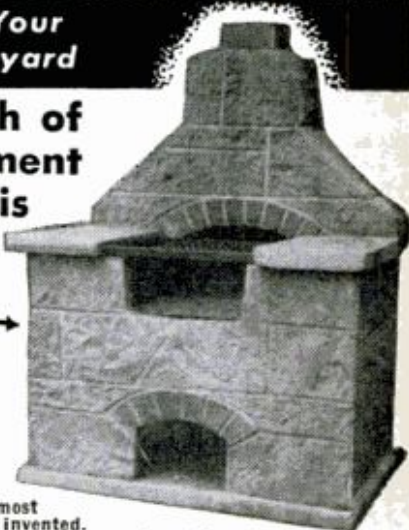
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49



Spotlight on Ford's Cortina

Newest of English Fords boasts a space-wise design but trades performance for economy

By Ed Nelson

FROM YOUR FIRST LOOK at Ford of England's new Consul Cortina, you'll recognize its Dearborn kinship. Especially if the first look includes a view of the dinner-plate-size tail lights. Although outside measurements may remind you of a baby sports car, inside it's family size.

The floor-mounted gear shift on our two-door deluxe (the standard isn't coming to the States) snapped into any of four forward positions positively although it seemed a bit "notchy." All forward gears are smoothly synchromesh. The clutch takes hold solidly—no tendency to grab.

Quick steering makes for easy parking in tight spots and the turning circle is 34 feet across; steering wheel recovery is fast, too, but don't get the idea you can slice through traffic. With 53 horsepower, acceleration isn't neck snapping. You go from 0-60 m.p.h. in about 21 seconds.

On the other hand, the economy Cortina, during a mid-winter test with liberal choking, gave *PM* 29.7 miles per gallon.

Suspension is firm in the European tradition. You may pitch some, but cornering sway and brake dive and even choppy bumps are controlled reasonably well.

With a 98-inch wheelbase, you and your front seat passenger are close to the engine. But there's little noise unless you get into a high-revving acceleration test. From about 40 m.p.h., road noise and wind roar build up, but conversation isn't impeded. The steering column transmits neither noise nor vibration inside; the stick vibrates, but doesn't rattle.

The Cortina is comfortable for most, even after several hours. Repeated S-curves set up no rhythmic sway and seat backs are well cupped for lateral stability. (A bench front seat is optional.)

The basic buckets are high, leaving good leg and thigh room in front and plenty of room underneath for rear passengers' feet. Knee room in back also is adequate.

Before trying the heater, study the directions. Once you understand the controls, you'll find the unit can roast you right out of the car, although there are several settings on the heater which will send hot air to the car's interior and cold onto the windshield.

The only gauges are for fuel and speed; oil pressure, amps and heat are on idiot lights. On two test units, the speedometer was dead accurate. A manual choke boosts faith in the car's good sense. Controls for headlights, turn signals and horn are bunched on the end of a rigid plastic arm jutting left from the steering column. Light and turn signal controls are a pair of blade-like switches set close together. Designers would have been more sensible, if less style conscious, to let the light switch project down and the turn signals up to avoid dangerous errors.

Storage space is excellent. A deep parcel shelf runs from side to side under the dash, supplementing a glove box more than a foot wide. There's a small shelf behind the rear seat and a wide-open, 20.9-cubic-foot trunk.

(Please turn to page 54)



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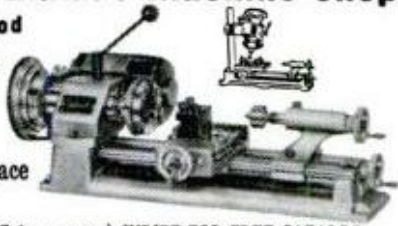
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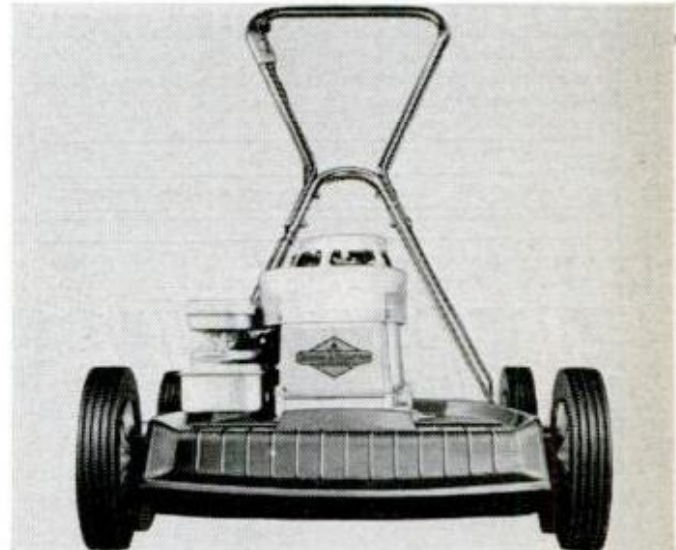
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Spotlight on Ford's Cortina

(Continued from page 50)



SPARE STANDS IN LEFT fender well, available but out of the way of luggage in generous trunk area

It's possible to get three winter-coated adults in back. The center man will have his feet on the tunnel, but won't block driver vision through the giant rear window. But the little mirror can't make full use of it. The windshield, with high, wide corners, is just as generous, and wipers clear a wide area. Rear side windows are hinged at the front and swing out about three inches.

A single key operates ignition, door and trunk lid. It works either side up.

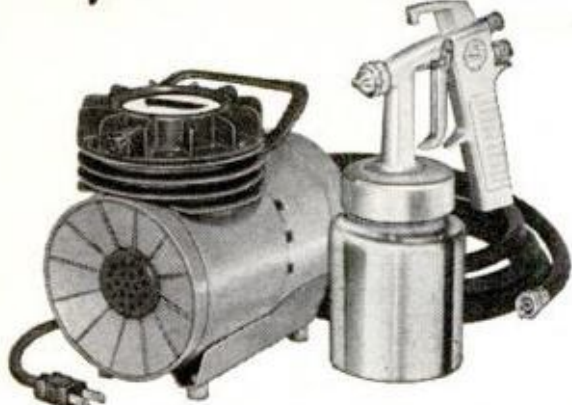
The very short hood (the car is only 168.3 inches long overall) means road vision is fine, but it doesn't mean any crowding in the engine room. Everything is accessible, from tension adjustments on the fan belt to clutch and brake fluid reservoirs high on the fire wall. No peeling up the carpet for Cortina owners.

The car has its shortcomings, but many will find they're more than set off by economy, interior room and convenient layout. The test model carried a basic East coast P.O.E. tag of \$1819.20 The heater was an extra \$45 and whitewalls on the 13-inch wheels an extra \$20.70.

Just as this report was completed, Ford of England announced the introduction to the States of a four-door version of the Cortina. It's due to become available at dealer showrooms as you read this. The new version, with a stroke about half an inch longer, has displacement increased from 73 cubic inches to 91.4 and rated horsepower boosted to 64.

Brake area is up from 81.7 square inches to 87.2. Tire cross section is slightly thicker, but diameter is unchanged. The basic East Coast P.O.E. price for the four-door is \$1963 including federal tax but excluding all local charges. ★★★

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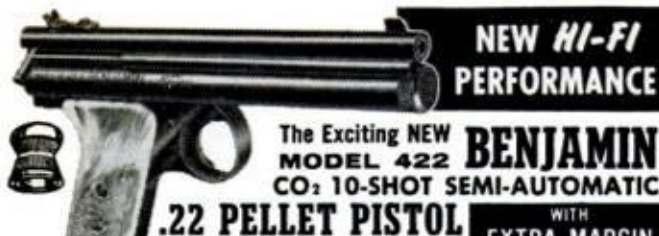


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CASH Immediately for old gold, jewelry, gold teeth, watches, diamonds, silverware, spectacles, platinum, mercury. Free information. Rose Industries, 29-A East Madison, Chicago 2.

CRACKED (Fried) marble supplies. Chains, caps, etc. Send one dollar. Satisfaction guaranteed. D. & D. Mfg., Ripley, N. Y.

HIGHEST Cash for gold, teeth, jewelry, rings, diamonds, watches, silver, platinum. Mail articles today. Free gift with information. Chicago Gold & Precious Metals, 6 E. Monroe, Dept. 4958, Chicago 3.

WANTED, Gold, silver, platinum, scrap (any form), coins. Information free. Wilmot's, 1067 Brige St., Grand Rapids 4, Michigan.

TREASURE FINDERS

NEW Coin locator! Free literature. Howe, 811-C Kansas, Atchison, Kansas.

METAL Locator kits and assembled models from \$39.90. Terms. Transistorized and underwater models available. Free catalog. Electronic Applications, Dept. M, Box 6095, Alexandria, Virginia.

TREASURE. Gold, silver, relics. Find them with new 1963 models. Free information. Raytron Box 715, North Hollywood, California.

EXPLORE Underground, years ahead transistor Metrotech locators detect gold, silver, coins, relics. Information free. Curt Fisher, Dept. A, Box 793, Menlo Park, California.

SENSITIVE Transistor treasure finders. \$19.95 up. Free catalog. Relko, Box 10563, Houston 18, Texas.

GOLD In '63! Silver, coins, treasure, relics. Important finds possible using specialized Goldak electronic locators! Established 1933. Free literature. Write: Dept. B3, The Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, California.

FUN & profit finding buried treasure, relics with Transistor M-Scope. Booklet, interesting customer comments free. Terms. Fisher Research, Dept. AZ, Palo Alto, Calif.

TREASURE. Find gold, silver, relics with super, powerful, Detectron locators. Free information. Detectron, Dept. PM-4, San Gabriel, California.

PERSONAL

"OVER 250 Legal Tax Deductions." guaranteed and explained. Send \$1.98 (includes postage) to KLB Associates, Box 6061 Hannegan Station, St. Louis 10, Mo. Act now! Get the facts! and save dollars.

BORROW \$100 to \$1000 by mail. Quick, easy, private. No co-signers. Repay in 24 small monthly payments. For the amount you want write today to Dial Finance Co., 410 Kilpatrick Bldg., Dept. 4-214, Omaha 2, Nebraska.

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NEED Money? Borrow \$100-\$1000 by mail. Confidential. repay in 24 months. Free loan application. World Finance Co., Dept. EW293, 620 Symes Bldg., Denver 2, Colo.

"PROTECT Valuable papers." Keep extra copies. Photostat your birth certificates, marriage license, school, college diplomas, military discharge etc. Send \$1.00 with original copy. Severino, 41 Vincent Street, Newark 5, New Jersey.

MONEY Problems solved quickly. It's easier than you think. B.I.C. Cash-by-mail loans easily arranged. 24-month schedule. \$100.00 to \$600.00. No co-signers or security. Write for application. B.I.C. Loans, 1003 S. Walnut, Hutchinson, Kans.

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BIBLE Questions answered free. Bible Research, 1819 La Posada, National City, Calif.

INVENTIONS Wanted. Patented: unpatented. Tremendous manufacturers lists. Global Marketing Service, 2420 77th, Oakland 5, California.

FOUR "Will" forms and "Instruction Booklet by Lawyer." \$1.00. National, Box 48313PM, Los Angeles 48, California.

SEVENTH-DAY Adventist teachings explained. Two books, \$1.00. Elder Thurber, South Lancaster, Mass.

INVESTIGATORS. Free brochure latest subminiature electronic listening devices. Ace Electronics, 11500-P NW 7th Ave., Miami 50, Fla.

BIBLE Questions answered. Stamped envelope. Bylon, 17167 Bentler, Detroit 19, Michigan.

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

DEVELOP Mind power, personality while asleep. Details free. Research Association, Box 24-N, Olympia, Washington.

REMAILING SERVICE

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

CONFIDENTIAL Address \$3.00 month. Remails 25¢. Box A-873, Ft. Lauderdale, Florida.

CONFIDENTIAL New York City mail address. Remailing, forwarding, \$3 month. Details free. G. Martin, Suite 212B, 136-04 Northern Blvd., Flushing 54, New York.

NEW ORLEANS Remails 25¢. \$3.00 monthly. Marcoll, Box 19498-P, New Orleans, Louisiana.

SECRET Mail receiving-forwarding system. Hedgpath, Box 830, Alhambra 23, California.

PERMANENT Travelers' permanent address. \$1.00 monthly. Wayne Forwarding, Clovis, California.

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

REMAILING, Forwarding, permanent address. Other services. Everett, 1613 Bradley, High Point, N. C.

MIAMI BEACH Remails 25¢; 5 for \$1.00. Monthly \$3.00. National, P.O. Box 266-A, Miami Beach 39, Florida.

SWITZERLAND, Italy. Letters mailed, \$1.00. Lovely gifts under \$10.00. Satisfaction guaranteed. Free details. Box 103, Lugano Paradiso, Switzerland.

"MONTEREY, Carmel", 25¢ letter, \$3.00 month. Armstrong, Box 1005-A, Seaside, California.

FLORIDA Confidential remailing forwarding \$3.00 monthly. Box 798, Pompano Beach, Florida.

REMAILS 25¢; Twelve for dollar. Prompt. Champ, 1319 East 26, Kansas City 8, Missouri.

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HAWAII Secret address. Receiving, forwarding 25¢. \$3.00 monthly. Postcards. Instructions for starting your remailing service \$5.00. Coe, Box 984, Kailua, Hawaii.

SAN FRANCISCO. Mt. Eden, mail address \$3.00 month. Remails 25¢; Confidential. Details free. Le Van, P.O. Box 202, Mt. Eden, California.

CONFIDENTIAL Mail address. 25¢ remails. West, 2617-PE Armacost, Los Angeles 64, California.

CAPITAL Remail 25¢. Free information. P.O. Box 5851PM, Washington 14, D. C.

SPECIAL Services, confidential. 25¢ single, \$3.00 monthly. Free literature. Kenneth Fischer, Box 426, Chatham, New Jersey.

CONFIDENTIAL Remailing \$3.00 monthly. The Sheriff's, Box 243, El Cerrito, Calif.

WANTED—MISCELLANEOUS

QUICKSILVER, Platinum, silver, gold. Ores analyzed. Wholesale Terminal, Norwood, Mass.

STAMP Collections, accumulations. Eagle Stamp Co., 2221 Romine, Pittsburgh 26, Penna.

PROMOTIONAL Items wanted for new mail order catalog. Good new names \$20.00 per 1000. P.O. 802, Balto, 3, Md.

WANTED: Old Bibles with engravings. Describe. Valley, Box 1660A, Beverly Hills, California.

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HIGHEST Prices paid for old radios. The kind using headphones or horn. Worcester, RD1, Frankfort, N. Y.

BUYING Indian-head pennies. 20¢ each. Don't write. Ship Dressel's Mart, 120 Main, Goldendale, Washington.

FOR SALE—MISCELLANEOUS

FREE Booklet "The Inside Story of Deafness." Hearing aids, and hearing aid and radio batteries wholesale. Free list. We also repair hearing aids. World-wide Company, Box 32-P, Willard, Utah.

TAPEWRITERS. New M4 Dymo instant label maker \$9.95. Extra vinyl tape 75¢ roll. Shoson Industries, Box 434A, Harper, Kansas.

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HILARIOUS Matchbooks. Comrade Hilton Hotel, Moscow; Halloff and Dye Funeral Home, etc. 24 assorted \$1.00 postpaid, 6 for \$5.00. Sylvan Studio, Box 59, Sylvan, Ohio.

HIDE-A-PACK Cigarette case (pat. pend.) fastens around ankle, prevents dropped-bent-broken smokes. Handy for police, mechanics, military. \$1.50 postpaid. Karen Kay Co., Box 28184, San Antonio, Tex.

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MISCELLANEOUS

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HEARING Aids only \$28.95. Free trial. Terms. Write Cary-B Sales, Inverness, Fla.

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

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SEND Us wool for blankets. Write Eldorado Woolens, Eldorado, Texas.

BOOKS On antiques and their prices. Free circular! P. Warman Publishers, Uniontown, Penna.

SUPER Memory overnight! Success guaranteed! Bijou, Box 1727-M, Hollywood 28, California.

"STAMMER, Stutter, No More." (Dr. Young.) Write: Gaucho, Box 9309-S7, Chicago 90.

SHEET Aluminum, zinc or iron, cut to any rectangular size. Thicknesses—.025" 1¢; .040" 1½¢; .064" 2¢ per square inch, postpaid. Double price for copper, brass, lead. Minimum 50¢ order. Glenbrook Metals, Box 2059, Glenbrook, Conn.

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REMARKABLE Hand cleaner and pre-conditioner. Apply before or after to remove grease, grime, paints, etc. Non toxic. Wholesale, postpaid, 50¢ tube, \$5.00 dozen. Distro. Inc., Box 6488, Jacksonville 5, Florida.

33 TRADE-Secrets for machinists on engine and turret lathe work (including set-up tricks) \$1.00. Hines, 59 West First St., Clifton, New Jersey.

INSTANT Spanish. Free sample lesson. Trader, Box 3488-C, Ridgecrest, Calif.

OUTDOOR Toilets, cesspools, septic tanks cleaned, sanitized, deodorized like magic. Amazing new product! Safe. Easy to use. 150,000 customers guarantee your satisfaction. Money back guarantee. Postcard brings free details. Burson Laboratories, Dept. D-65, Chicago 22, Illinois.

SO. CALIFORNIA. Save needless worry and expense. Send \$1.00 for complete information on trip and arrival. Also job and housing situations. Dixon, Box 301, Huntington Park, California.

BURGLAR Alarm devices. Complete line. Catalog \$1.00. Full details. Sootin's, 321 Northwest Third Avenue, Miami, Florida.

STRIPS Paint faster. New crystal cut abrasive, wood or metal. No clogging. Fits all ¼" electric drills. \$2.95 postage paid. Yeomans, P.O. Box 345, Holly Hill, Florida.

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SPECIAL Clip pliers \$3.50; Cage clips 50¢ lb; Mist sprayers; for ranches, sportsmen, trappers, hobbies, zoos, nurseries, pet cages, chinchilla, all type cages. Free sample clips. Pride of Petaluma, Mrs., 615 Petaluma Blvd., North, Petaluma, California.

ELIMINATES Washing! Exciting "1-step" car wax sprays on; wipes off wet. Waxes average car twice. \$2.69 postage included. Order 304 Wickham, Council Bluffs, Iowa.

FREE Folder describing sensational new patented product for sore, tired feet. Americana Shops, Reed City 3, Michigan.

MAKE Money. Have fun. Repair clocks. Complete repair manual, \$1.00. Horst Zimmermann, Box 7106, Oakland, Calif.

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LET Us tell you how to turn the reading habits of your friends into profit for you. \$10.00, \$25.00 or \$50.00 can easily and quickly be made under our Popular Mechanics subscription plan. No experience needed. Write Popular Mechanics, Room 4M, 250 West 55th St., New York 19, N. Y.

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INTEGRAPH: Read off rectangular areas on standard drawings with new pocket scale. No measuring—no multiplying. \$1 each. Breese Publishing Co., 333 Kearny, San Francisco 8.

Here's what we mean when we say the **Continental mark II** really is a new...and different muffler!

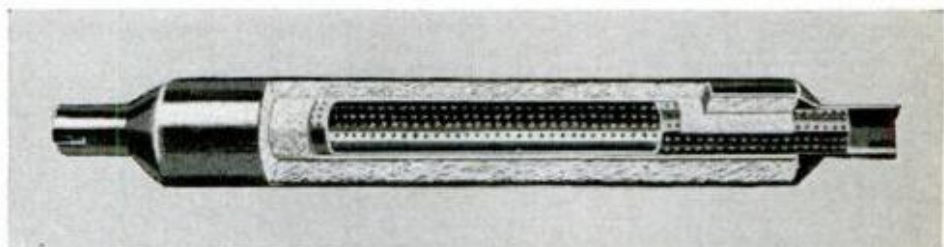
NEW OUTSIDE

Smooth, streamlined one-piece European-type muffler... with no seams to open up... no joints to blow... no connections to crack or break loose. Heavy-gauge steel, coated for extra durability and rust resistance.



NEW INSIDE

Straight-through design eliminates restrictions to free flow of exhaust gases. New sound-absorbing glass fibre insulation cuts engine noise to an authoritative purr of power!



NEW ECONOMY PRICE! You won't believe so much performance can be yours for such a modest cost! Continental Mark IIs are made for any car or small truck—late models, old family cars, sports cars, hot rods.

NEWLY ENGINEERED for top engine performance and gas economy. The Continental Mark II is made by Walker, one of the largest makers of mufflers for new cars. Walker engineers incorporated design features that prevent build-up of back pressure, and thus help engines deliver full smooth-flowing power for quick acceleration, hill climbing, real traffic flash, and maximum gas economy. You can buy a Walker Continental Mark II from your regular service station or garage.

Do you know that some mufflers waste One out of every 10 gallons of gas? Cut pick-up by as much as 47%? Account for accidents frequently listed as "cause unknown"? You'll find out why, when you read "YOUR MUFFLER, YOUR CAR, AND YOU." This new, authoritatively written booklet will be sent you without charge. Fill out and mail this coupon today. Do it now!

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 Make EVERY SHOT COUNT! Palley's new Hunter Scope has fully coated, precision ground lenses. Positive internal "click" type windage & elevation knobs. Crosshair reticle. 3/4" dia. barrel. Field of view: 29 ft. at 100 yds. Eye relief 2". O/A lgh. 11 1/2". Complete with TOP MOUNT **8.88**

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Has 11 1/2" tempered steel blade, hardwood handle and genuine leather belt sheath. Excellent for hunter, camper, etc. May also be used for clearing brush, meat cleaver or chopping blade. **2.49**



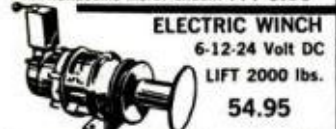
KNIFE-BAYONET U. S. ARMY
 Ideal skin divers knife, hunting knife or for the collector. Made by Camillus of the finest steel. Has 6-1/2" blade, double-edged for three inches from the point. Handle is laminated leather. Overall lgh. 11-5/8" **2.98**

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Collectors item! Has slender 19" chromed steel blade - hardwood grip. Overall is 25". Comes complete with metal bound leather sheath. **4.88**

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16" polished Solingen steel blade. Chrome handle O/A lgh. 22". Complete with handsome metal sheath **3.98**



ELECTRIC WINCH
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 LIFT 2000 lbs.
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An economy Winch for all around use. Will lift 2000lbs. Operates on 6, 8, 12, 24 or 32 V., D.C. Has manual brake. Drum will hold up to 100 ft. 1/4" cable. Motor reversible and ball bearing mounted. O/A size: 18" long x 9-1/2" W x 11" high. Net wt. 44 lbs. OTHER WINCHES available - We stock a complete line - see Catalog Below!

Signal Corps HS-19A HEADSET and CHEST MICROPHONE

Ideal for communications, divers, workers in noisy compartments, etc. Has a low impedance chest microphone with on-off switch, magnetic type headphone with headband. 6 ft. cord. An unusual surplus value at ONLY **3.95**

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50,000 RPM - motor is an integral part of balance wheel. Has double end shaft to drive precision tools or machinery at precise controlled speeds. Ball bearing mounted. High or low voltage. Ideal for experimental work, labs, hobbyist. **8.95**

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Originally part of Norden Bomb Sight. Has Solenoids which operate the precision reversing gears. Gear reduction is 165 to 1. Operates on 24 to 28 V. DC. Can be used where extreme sensitivity and instant forward & reversing operations are required or use for parts. **COST GOV'T \$1500.00**

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POWER WINDOWS on your CAR in 15 minutes
 Enjoy the comfort, luxury and safety of electric Window Lifts. Fits Gen. Motors, Chrysler and Ford cars - '56's thru '62's. Installs in 15 MINUTES! Master control on driver's door for both front windows - individual control on passengers door. Has 12 volt reversible gear head motor - 100 RPM. Motor can be used to open deck lid, as hobby motor, etc. - **SAVE 33%**
 Single unit for driver's side - **8.95 ea.** Set for both doors . . . **16.95 set**

PORTABLE 1/2 H.P. AIR COMPRESSOR
 for SKIN DIVER - GARAGE - ARTIST - etc.
 A remarkable surplus conversion - has a surplus Cornelius AC motor plus a mounting frame with built-in carrying handle. Pressure tested to 3000 PSI. Ideal for filling diving tanks, inflating struts, accumulators or to use any high pressure air use. Fills tanks to 2250 PSI. **99.50**
 Unconverted Cornelius COMPRESSORS - Air Force surplus with 1/3 HP, 27V., DC motor. Delivers 1500 PSI. In used but excellent condition. **34.95**

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 for BOAT - TRAILER - CAMPER - CABIN
 A unique Gov't Surplus Bargain! Use on Boats, Campers, Trailers, in Cabins, etc. Delivers 12 to 300 gallons per hour through use of a variable rheostat. Heavy duty, explosion proof motor operates on 12 to 24 V., DC from either battery or generator. Has 1/2" internal pipe intake and 1" hose outlet port. Comes complete with Rheostat control. **9.95**
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Sun Heats Tepee



Warmth from the sun, absorbed by black plastic panels, raises the inside temperature of a tepee-shaped shelter as much as 40 degrees.

A winter retreat, the "Wigwam" is half black and half white polyethylene. The frame is made of aluminum. Available from Edmund Scientific Co., Barrington, N.J., the shelter sells for \$29.50.

Rock Glacier Clue to Climate

Ancient climate changes in North America may be revealed by a rock glacier discovered in eastern Nevada. It is thought that the rock covers a layer of ice formed more than 70 million years ago.

The glacier appears to be moving. An expedition is planned by Fritz L. Kramer, Colorado College professor, to determine the extent of annual rock movement.

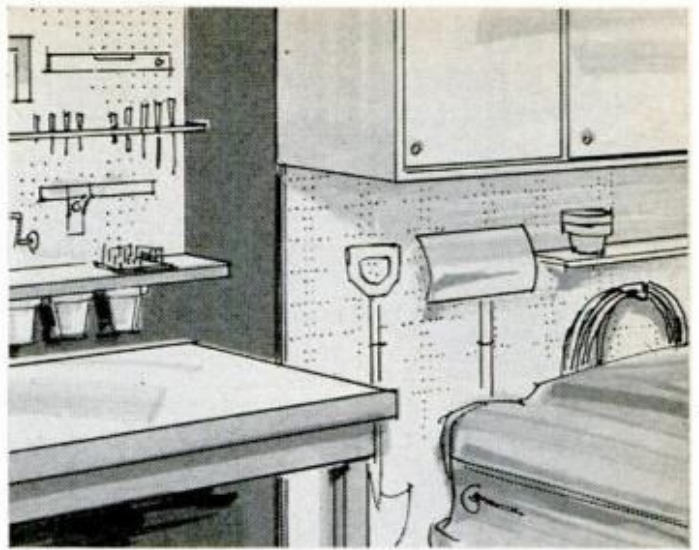
Sunspots Change Atmosphere

Two satellites, Vanguard I and Explorer IX, have revealed that the earth's outer atmosphere changes in density during different phases of the sun's 11-year cycle. When sunspot activity is at its height, the atmosphere at 400 miles increases in density, according to scientists at NASA's Langley Research Center.

As solar activity diminishes, the upper atmosphere cools and shrinks, causing a sharp drop in density. When Vanguard I was launched in 1958, sunspot activity was at its height. By 1961, when Explorer IX was sent up, scientists found that air density, calculated from changes in its orbital motion, was about a tenth of that reported earlier by Vanguard.

Organize your garage... **PRESTO!**

Use handsome new Presto Peg-Board by Masonite for quick, convenient storage space. These rugged 1/4"-thick hardboard panels come prefinished in handsome tracery design. Nail 'em up, insert hook-on fixtures, then hang everything from tools to heavy garden equipment. Cover an 8 x 12 foot wall for less than \$20.



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Weller® Heavy Duty Soldering Kit

Features a professional DUAL HEAT gun. Two trigger positions let you switch instantly to low 240-watt or high 325-watt heat to suit the job. By using high heat only when necessary, you prolong tip life. Heat and spotlight come on instantly when trigger is pulled. Included: Soldering tip. Smoothing tip. Cutting tip. Tip-changing wrench. Solder. Instructions. Plus break-proof plastic case which can be used as a lunch, fishing tackle or tool box. Model D-550PK.



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- \$2,500 TO \$4,999 — \$59.95 Benrus Wrist Watch 17-Jewel, Men's or Lady's
- \$5,000 TO \$9,999 — G. E. Transistor Radio, Electric Blanket or \$71.50 Men's or Lady's Gruen Wrist Watch
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Earn from the 1st of the Month

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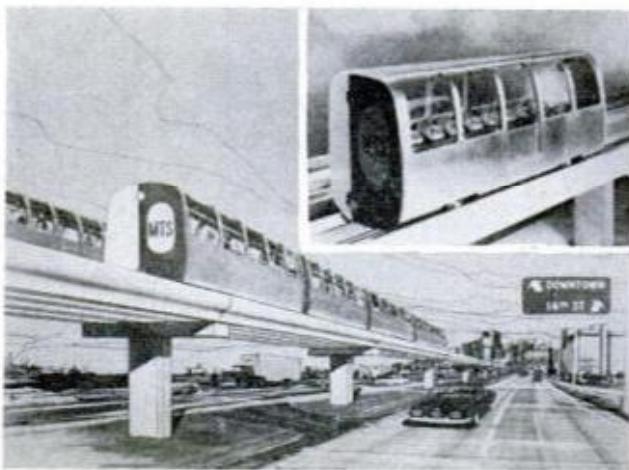
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Automated Rapid Transit

Citizens in medium-sized U.S. cities may soon be riding on a newly designed, fully automated rapid transit network. The new system, which has been developed by Westinghouse Electric as a low-cost solution to the problem of mass transportation, uses lightweight passenger cars about half as long as a streetcar, mounted on pre-fabricated concrete roadways.

A prototype of the Transit Expressway system may be erected soon in Pittsburgh.

Trains will consist of from one to 10 cars, depending on traffic loads, with automatically scheduled service every two minutes, 24 hours a day. Each car will carry 20 passengers in individual bucket seats. Electrically driven, the cars will ride on rubber-tired wheels kept in place by elevated curbs. A covered "third rail" will carry the power current.



Operating on a continuous loop, the new Transit Expressway will be primarily an elevated transit network, but it can also operate at ground level or underground. The system, including fare collecting and change making, will be controlled from a data processing center, with wayside controllers at each station. The stations would be at intervals of one-half to two miles, and trains will travel at speeds up to 50 miles an hour.

Glass on a Hot Tin Platter

Floating molten glass upon molten tin during the critical period when the glass hardens, is a method developed by an English firm to make clear, flat glass of the highest transparency without laborious grinding and polishing.

The difficulty in creating a flawless surface on plate glass previously was that it had to harden on a solid surface that always dented and scratched the surface.

The new method has been developed by Pilkington Brothers in Lancashire.

You're always in good company when you

Choose the Leader!

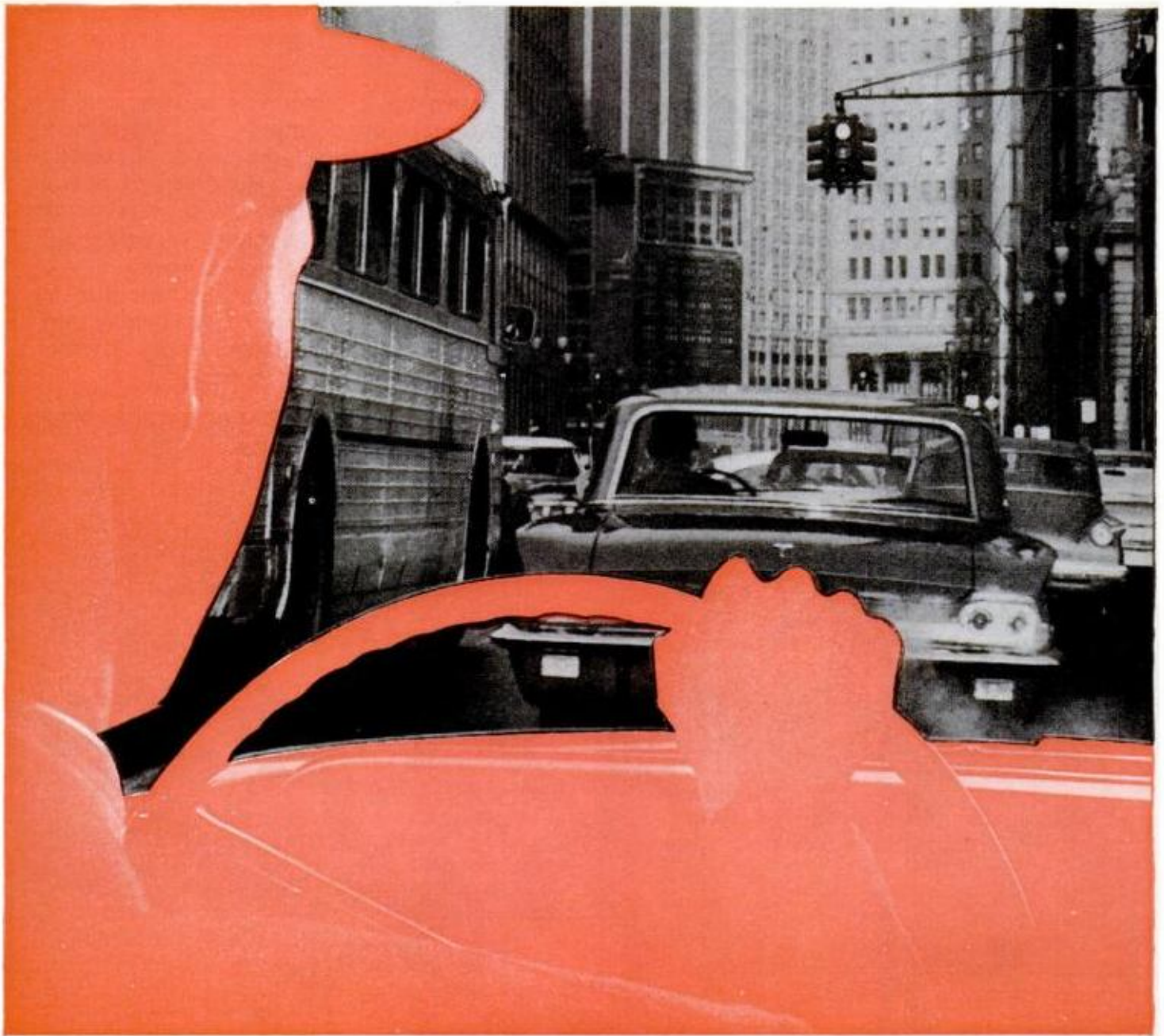
When you select *any* Harley-Davidson, you get the world's widest *choice* of models, colors, styles, accessories, clothing, and servicing products . . . all tailor-made to suit your particular riding pleasure. This exclusive combination is why Harley-Davidson continues its long-standing leadership. See your Harley-Davidson dealer. You'll be in the best of company.

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Friendly service . . . Wherever you ride, Harley-Davidson dealers help you feel at home



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Springtime Tips for

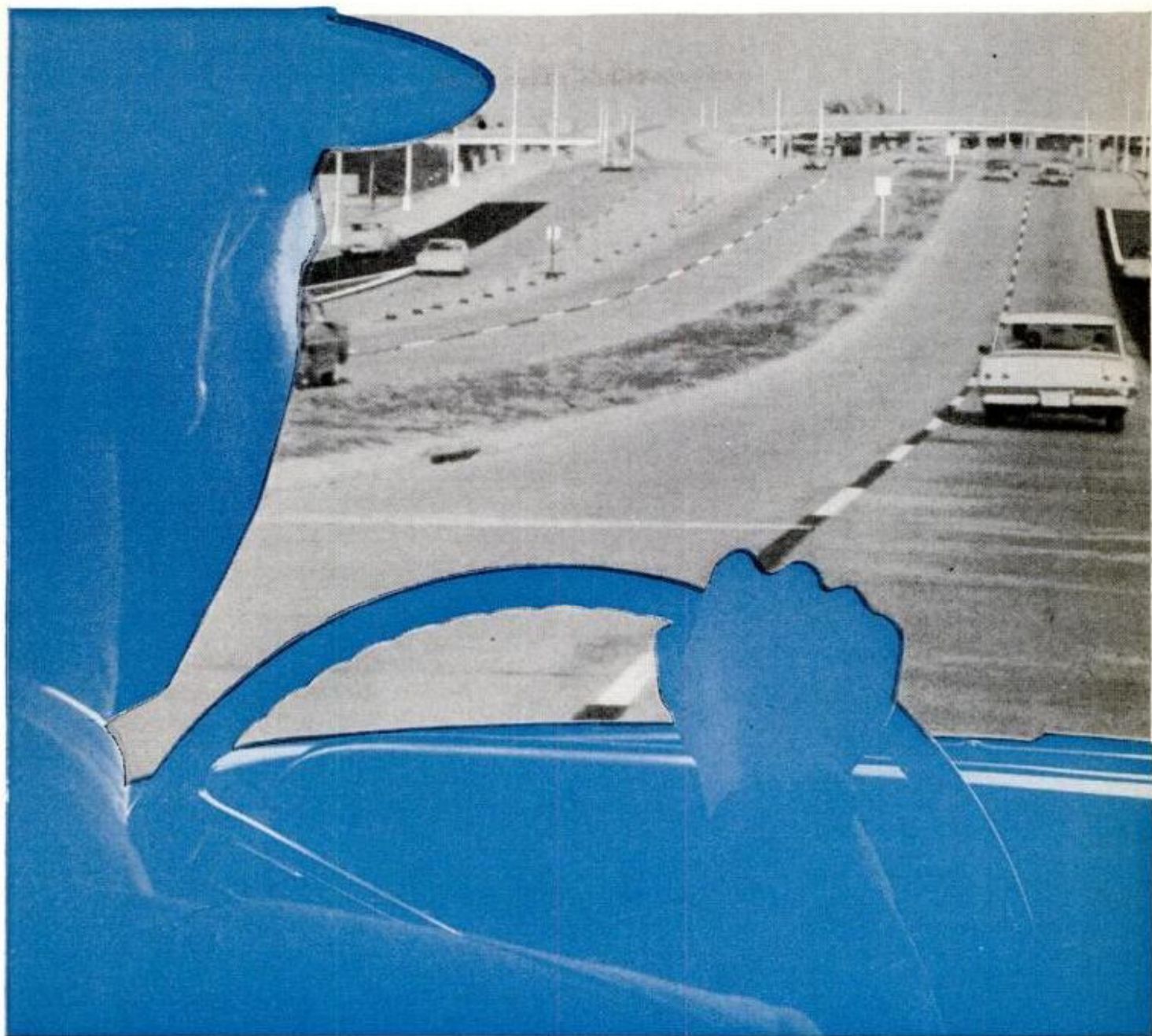


for round-the-block spins



TUNE UP WITH AC SPARK PLUGS FOR FULL POWER AND ECONOMY — Winter weather likely has taken its toll of engine vitality, especially ignition parts. That's why a spring tune-up alone is not enough. Your car needs new AC Fire-Ring Spark Plugs, too, if you are to get smoother pickup, greater economy, and peak performance this summer. Only ACs have the self-cleaning *Hot Tip* to help give more mileage and increased power by keeping power-robbing deposits from forming. For superior performance, insist on AC Fire-Ring Spark Plugs. They're best for all cars.

Carefree Summer Trips



AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

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CLIK-STOP
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Grooves in knurl mesh with teeth to hold exact openings. Spring pressure locks teeth tighter!

Compare . . . and you'll agree that the P&C Clik-Stop is no ordinary adjustable wrench. The longer jaws and square opening give a greater bearing surface and a powerful, non-slip grip on any shape of nut or bolt.

The patented "Golden Knurl" locks the movable jaw, prevents creeping or crawling, no matter how much you handle the Clik-Stop. No other wrench has this automatic locking feature. Fully guaranteed, too.

Now's the time to end needless knuckle-skipping. The Clik-Stop is sold in 5 sizes, in more than 14,000 stores.



P&C TOOL COMPANY
Portland 22, Oregon
Subsidiary of
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Set Beginning of Nile Floods

Heavy rainfalls over a long period of time, beginning 11,000 years ago, created the annual flood cycles on the Nile that paved the way for the creation of the early Egyptian civilization. So says the leader of a recent Columbia University expedition that explored the Nubian region soon to be flooded by the Aswan Dam.

Dr. Rhodes W. Fairbridge said the findings were based on radiocarbon dating of clam and snail shells recovered from Nile River silt. These silt deposits were greatest during periods of little rainfall, and revealed weather patterns as far back as 25,000 years ago.

Indications are, says Dr. Fairbridge, that Central Africa was exceptionally arid during the last Ice Age. The Nile almost dried up and was replenished only during the succeeding period of heavy rains. The river reached its present level about 5000 years ago, he estimated.

The expedition's study was part of a continuing investigation into ancient weather patterns—important in predicting long-range weather changes of the future. The study indicated that tropical rains have gradually diminished since about 1000 B.C. and that the drying tendency will continue in the sub-tropics. Temperate zones such as the North African coast, however, should get wetter and the winters colder—including those in New York.

Bar Bells Good for Athletes

Muscle flexers and weight lifters have been given academic approval by a University of California scientist.

Prof. Laurence E. Morehouse, director of UCLA'S human performance laboratory, told a conference of the American Medical Association that weight lifting and intense muscle contraction are necessary for those athletes who hope to set world records.

"The key to improvement in power," he said, "is tension. Light muscle contractions repeated a thousand times a day will not improve strength in the normal person."

Caffeine Gives Rats Ulcers

Hungry rats get stomach ulcers when fed concentrated caffeine, scientists at Southern Illinois University have discovered. In an effort to discover what possible effects alkaloids have on living tissue, the researchers fed the substance to starved rats through stomach tubes.

In addition to causing ulcers, the caffeine caused them to chase and mutilate their tails. Some excited rats even bit their own hind feet.



"You put on the coffee while I put up the Apache..."



Apache Chief, \$525 F.O.B. Lapeer, Michigan

"Coffee ready yet?"

Want to see something fast? Watch this . . .

An Apache Chief is up even before you add the chicory (takes about 8 minutes). With built-in double bed and foam mattress. Over 45 cu. feet of storage. Two big picture windows with nylon screening and zippered storm flaps. Draft-free, sewn-in flooring. Vivatex-treated Army duck tenting! . . . How's that for speed?

With an Apache in tow, you cruise at normal highway speeds (bon voyage). Lightweight aluminum makes it easy to move, hard to rust. There are off-the-ground Apaches and on-the-ground Apaches, from \$395 Scout to \$645 Eagle. They're the fastest-up, fastest-down, fastest selling camping trailers you ever saw. Your Apache dealer will help you finance one in a minute or two!

. . . Take yours black, or with cream and sugar?



World's largest-selling camping trailer

Send your name and address to Vesely Manufacturing Company, Dept. PM4, Lapeer, Michigan, for the name of your nearest Apache Camping Center and a copy of the free 1963 Apache brochure.

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THE KENDALL FAMILY
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See your Kendall dealer. He'll help you select from these four outstanding Kendall Motor Oils the one best formulated for your type of engine, your driving habits and your pocketbook.

He'll guarantee you extra protection for the money you spend. Why? Because *all* Kendall Motor Oils are refined from the choicest Pennsylvania Crude Oil.

Result? Your engine will stay younger longer. You'll save through the Economy of Kendall Quality.

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ASK YOUR DEALER FOR



Pentagon sidelights

By William R. Kreh

Cool, man! Army engineers painted the entire top of an Army automobile white, then placed two thermometers in it—one at face level and the other at knee level. Likewise, two thermometers were placed in a conventionally painted auto.

Results showed that, when the outside temperature was 96 degrees, the car without the new paint job was 99 degrees inside, while the car with the white top had a temperature of 86 degrees under the same conditions. As a result of the tests, all Army vehicles in tropical commands will now be sporting white tops.

There's a **FORD** in the Navy's future. This is a Floating Ocean Research and Development station, and the Office of Naval Research is studying the use of these 240-foot-high "Texas tower" devices to learn more about the behavior of the sea. The **FORDS** would ride on air-tight drums. Weight would push them down so the structures poke only 50 feet above the surface. This provides a practically unmoving platform in spite of high waves.

The ancient lighthouse is going atomic. The Coast Guard expects to install its first atomic-power source into some yet-to-be-announced lighthouse within the next year. The atomic reactor, called Snap-7A, is a big brother to the Snap-7B, which for some months has made light in an experimental Coast Guard buoy. Snap-7A will be able to give out 7500 candlepower and provide visibility under ideal conditions of more than 15 miles. It's powered by strontium titanate, has no moving parts, and is expected to make power for years.

An intrepid telephone operator handling a trans-Atlantic phone call in Georgia possibly saved the lives of five men and a \$1,000,000 Air Force plane circling an airfield in France recently. The plane was unable to land because of landing-gear trouble. After all attempts to fix the gear had failed, the control tower at Evereaux-Fauville Air Base put through a call to the Lockheed Aircraft Co., in Marietta, Ga., makers of the plane. For some technical reason, Lockheed engineers could hear the control tower okay, but the control tower

(Please turn to page 84)

POPULAR MECHANICS



Demolition Expert

This is a Mercury outboard test driver dressing for work at our Lake X, Florida, proving grounds. He's paid to try to demolish Mercury outboards. His weapons include speed, "stand-still" idling, corrosion, underwater obstacles the size of telephone poles, sand bars and different fuel mixtures (many of them wrong). One of his deadliest weapons is "full throttle time." The idea here is literally to run the motor to death.

That's what he's starting now. He and his cohorts will alternate continuous 8-hour shifts night and day. They'll lock open the throttles on two 1963 Merc 1000's at full speed. The boat will average about 55 mph *continuously* . . . stopping only to take on fuel and change "experts." Every 24 hours, each motor will log about 1320 miles.

And, when you're reading this same magazine next month, our experts will still be trying to run these same two Mercs to death.

We pay these Lake "X-perts" to make sure you'll get more RUN for your money with Mercury.

MERCURY

100, 85, 65, 50, 35, 20, 9.8, and 6 hp outboards



**MerCruiser Stern Drive
Power Packages • 310, 225,
190, 140, and 110 hp gasoline /
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The "professional" tool for all home projects: ceiling tile, insulation, screens, upholstery, wall plank, weather stripping, etc.

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Uses 12 different styles and sizes of staples (instantly interchanged) for every indoor and outdoor tacking job

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(Quality Tacking Tools Since 1919)

PIPED MUSIC MAKES CROPS GROW FASTER

Grow food crops faster and get more bushels per acre by serenading them with music. This Illinois farmer pipes music into his corn fields with startling results, and experiments at several universities and in India bear out his findings. What kind of music brings best results? He finds that the low notes from classical recordings did most for his corn. Your crops may like the Bossa Nova. In the

**MAY
POPULAR MECHANICS**

Pentagon Sidelights

(Continued from page 82)

couldn't hear them. So Mrs. Gloria Sanders, the telephone operator handling the call, stepped into the breach and, although she knew nothing of the technical side of airplanes and the jargon used, she relayed the information so accurately that the plane's crew managed to make temporary repairs and land without mishap.

▼ ▼ ▼
Facts about heart disease and the effects of aging on the human body are expected to be learned through an unusual "reunion" of Navy aviators. It's part of the Office of Naval Research's "Thousand Aviator" study. These thousand aviators are 1056 Navy men who, as cadets and instructors in 1940, were given a wide variety of special physical and mental tests. These same men were tested again in 1952 and 1957 by traveling medical teams. This year, for the first time, the fliers will convene over an 18-month period at Pensacola, Fla., to undergo another series of tests.

▼ ▼ ▼
Radioactive oysters are nonexistent in rivers traveled by atomic ships. Tests have confirmed this for the Navy. The oysters were hung in bags off piers in Norfolk's Elizabeth River more than a year ago, then tested in laboratories to determine their radioactivity. For the next 12 months, several nuclear-powered warships, submarines and the merchant atomic-ship *USS Savannah*, used the river and oysters were again dipped in the water during the ships' stay and after they left. The later tests showed the river's radioactivity hadn't changed since the original readings.

▼ ▼ ▼
If 350 mosquitoes could attack you in an hour's time in your area, the Army's new insect repellent might save your sanity. So say Army medics who have just finished extensive field tests in the swamps of Malaya on a new repellent called diethyl-toluamide. The substance was found highly effective providing almost solid protection to treated portions of the body for more than six hours per application.

▼ ▼ ▼
Tympanometry is being used by the Navy to see who can work best in such noisy spaces as jet test cells. Through a series of experiments, scientists believe it's possible to find out which men are more likely to be affected by high sound levels. Although tests have just started, the Navy believes it has already destroyed the old myth that persons with poor hearing should be given noisy work on grounds they have less to lose. It all depends, scientists say, on their inborn resistance.



FUN FIRST CLASS—a roomy camper body on a rugged Ford pickup! Ask your Ford Dealer!

Solid comfort-solid truck!

Slip into Ford's new Custom Cab and you'll find evidence of solid comfort everywhere. Doors open wide with no knee-knocking "dog-leg." A handy step helps you up and in. New foam seat cushioning is five inches deep; visibility is unmatched; over 23 pounds of insulation give you a quiet, relaxing ride.

But beneath this easy comfort lies solid truck . . . with big-truck toughness from axle to axle. See your Ford Dealer and see how painless buying a Ford can be . . . and how pleasant one is to drive!



BUILT LIKE THE BIG ONES. Wherever toughness counts—in axles, frame, springs—'63 Ford pickups give you extra freedom from costly breakdowns; the same kind of durable design as big trucks. Result: pickups that stay on the job and keep costs down over their long, long life!

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FORD TRUCKS

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APRIL 1963

84A

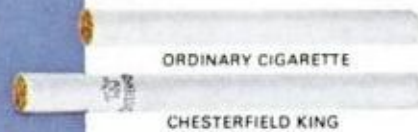
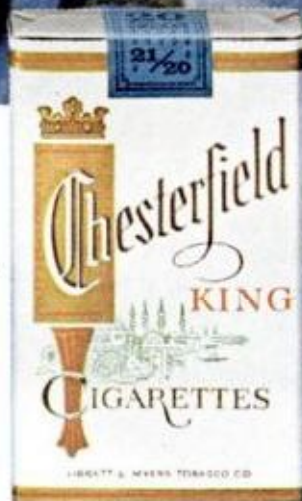
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Great
because
the
tobaccos
are!

**21 Great Tobaccos make
20 Wonderful Smokes!**

Chesterfield King tastes great, smokes mild. You get 21 vintage tobaccos grown mild, aged mild, blended mild, and made to taste even milder through longer length.

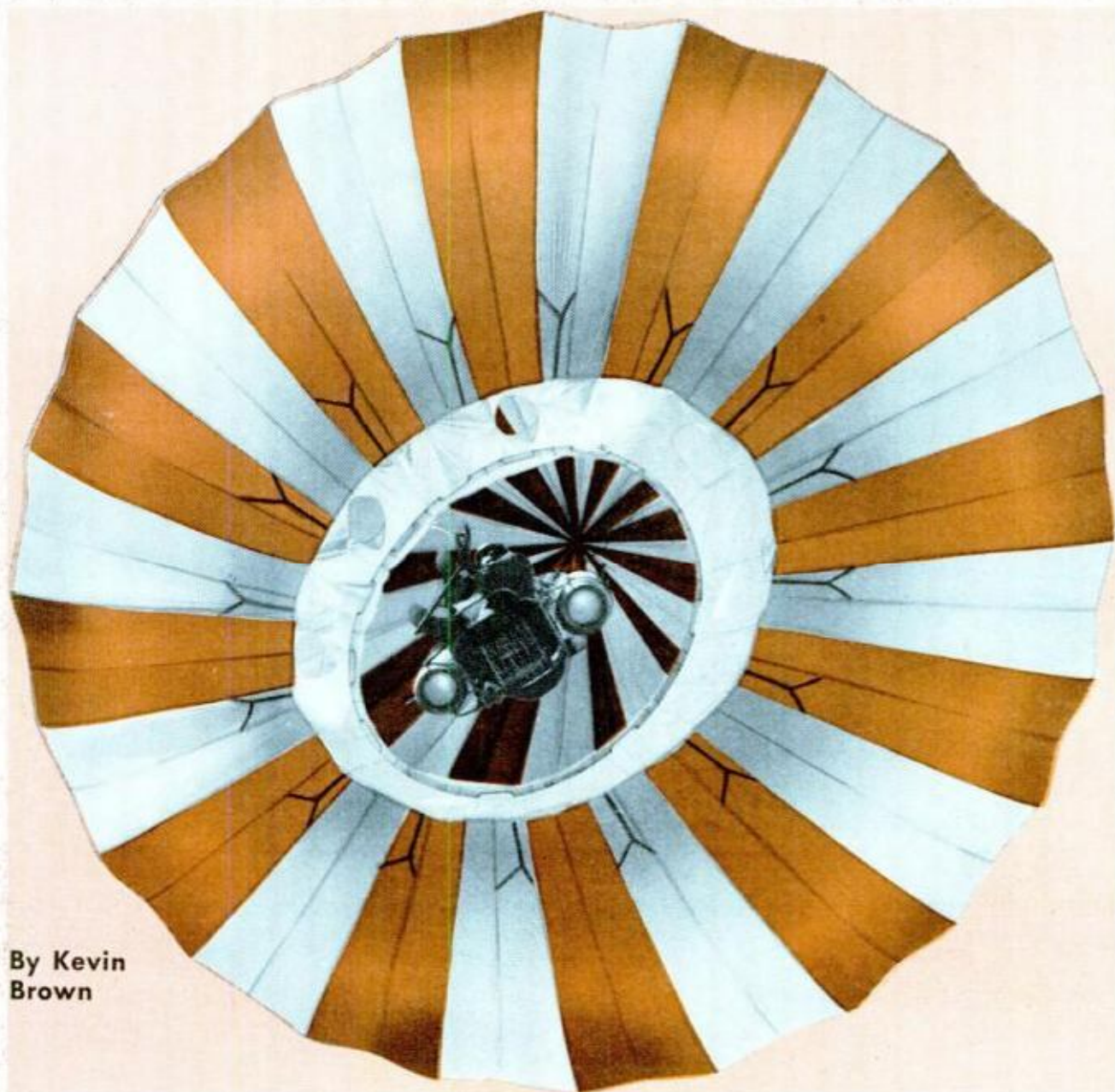
CHESTERFIELD KING



LONGER LENGTH...MILDER TASTE

Chesterfield King's smoke mellows and softens as it flows through longer length.

Ride Silent, Ride High in a New Hot-Air Sports Balloon



By Kevin Brown

Join a roving *PM* editor as he flies the new *Vulcoon*, which may soon fill the week-end skies with amateur balloonists

THE ANCIENTS DREAMED OF IT, a Frenchman did it and now, centuries later, anyone can try it. I did.

I rode the new hot-air sports balloon.

If you haven't tried it, don't knock it. It's one of the most exhilarating—and pleasant—experiences I've ever had. Quietly, ever so quietly, I just floated off the ground until I was suspended in silence in space. The open-air view from above, with no obstructions but the tips of my own toes, was almost unreal.

If you have tried it—say, in a gas-filled balloon—then, please be assured, all of

the cumbersome manual labor of getting the balloon in the air, and all of the awkward bleeding and ballasting of keeping it there, are gone. So is most of the expense. Hot air is free. All it costs is a few pennies worth of fuel to heat it.

At this writing, two of these new balloons have been sold and a third is on order. In this article, *Popular Mechanics* will describe the balloon itself and what it's like to ride in one. Also—to borrow a technique from our auto department—*PM* will bring you the world's first "owners report" from those who bought the first

of the commercial hot-air sports balloons.

To understand the significance of a hot-air balloon to ballooning, you must understand some of the history of ballooning. Roger Bacon, who died in 1294, was among the earliest to predict balloon flights, but it was not until 1783 that the Montgolfier brothers of France sent up the first balloon—an unmanned hot-air balloon heated by charcoal burned in a pan hung beneath the huge cloth bag. The air inside the bag became hotter—and lighter—than the air surrounding it, so the bag rose. A few months later François de Rozier volunteered to ride in a Montgolfier creation and became the first balloonist in history.

Hot Air Cools Off

The Montgolfiers sent many more balloons aloft—at least one large enough to carry seven passengers to a height of 3000 feet—but other men, subsequently, discovered the lifting properties of lighter-than-air gases; first hydrogen, then helium and even kitchen gas. These, too, had drawbacks, but they eventually replaced hot air as the standard lifting power for balloons. Hot-air balloons, with their awkward open fires of coals, wood or even straw, were dangerous to both the passengers and the cloth bag. Also, because the fire had to be replenished continuously, it could not sustain flight as well as the captive gases. So, while hot-air balloons didn't die, they fell into a semicomatose state.

VULCOON EQUIPMENT, envelope, seat assembly and ground blower, can all be carried handily on small trailer to launch area. Jerry Melcha unloads here



What roused this sleeping beauty was an unlikely Prince Charming—the United States Navy. A few years ago the Navy asked Raven Industries of Sioux Falls, S.D.—which builds high-altitude, gas-filled research balloons—if it could develop a small hot-air balloon that could be used for balloon-pilot training and low-altitude research. The Navy specified hot air because it needed a reusable balloon that was inexpensive and easy to operate. Gas-filled balloons are neither.

Hydrogen is the lightest of the gases in common use, but highly dangerous because it's flammable and explosive. The ill-fated *Hindenburg*, which exploded, was filled with hydrogen.

Helium is not as light but is more desirable because it's non-explosive. Also, because through an accident of geology the United States has a virtual world monopoly on the known supplies, it is used almost exclusively here for government-sponsored flights.

Natural gas—the kind used in your kitchen stove—is even heavier and less efficient, but considerably cheaper to use, and consequently it has been the favorite of the few amateur sports balloon clubs active in the United States until recently.

The clubs, necessarily, have been able to make flights only sporadically because it takes several hundred dollars for the gas—which can't be reused—and several hours of predawn work to rig the war-

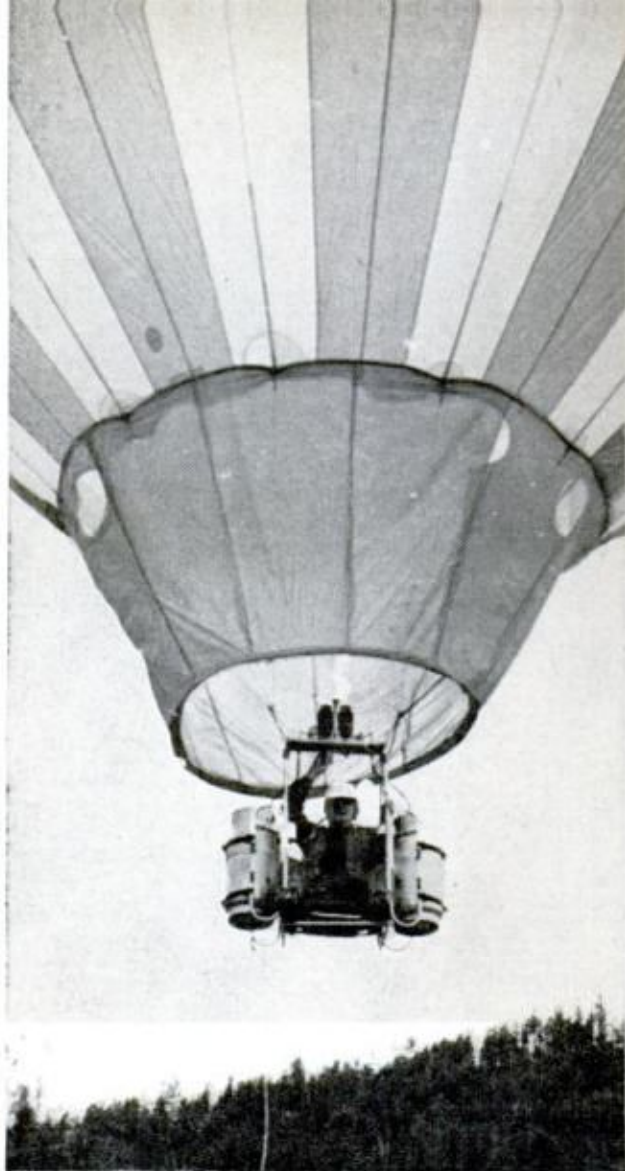
INFLATION BEGINS after envelope is stretched out, its top tied and seat attached. Blower (right) then forces hot air through asbestos sleeve into envelope





SPORTS BALLOONING has no parallel. Perspective from above while floating effortlessly through sky is like nothing else. Balloonist has only two valves to control, three instruments to watch and four hours of fuel to keep him above the world. The photos and data on Dr. Bill McGrath's balloon were supplied to *Popular Mechanics* by James Joseph

DON PICCARD (left) of famous balloon family checks author out on Vulcoon instruments. He's handling needle valve. Blast valve is alongside. Two burners and pilot light are on rack above; instruments and fuel tanks are on either side of seat



BALLOON ALOFT! Author rises slowly from floor of Stratobowl near Rapid City, S.D., his hand on needle valve and his heart in his throat. He survived "most pleasant and exhilarating" ride

BALLOON'S-EYE VIEW of world below makes groundlings look like ants. Only obstruction to unique perspective is author's boots perched precariously on foot rack. Only birds share this view



surplus balloons, many of them 20 and 30 years old, for each flight.

Also, flying a gas balloon for sport may be a misnomer. It's a frantic job—dumping sand bags to make the balloon lighter for ascent, and bleeding off some of the gas to make it heavier for descent. Ballast and bleeding, up and down—it's a gruesome amount of work.

So the Navy had a point—back to the ancient concept of riding on nothing but hot air. New materials and new techniques could take the awkwardness out of it.

Raven developed the balloon—they called it the S-40—and, in the process, saw a market for selling similar balloons to laymen for weekend sports flying. The result was the *Vulcoon* (from Vulcan, mythical god of fire, and balloon).

I flew in the first production model. And, if I can fly it, anyone can. I had never been up in a balloon before in my life. To learn what the balloon, and flying in it, is like, come along on my first flight.

We drove from the Raven plant in Sioux Falls across the state to the world-famous Stratosphere Bowl near Rapid City where, in the mid-30s, the U.S. Army Air Corps launched its record-breaking high-altitude flights. The peculiar terrain is ideal for

DEFLATION ENDS balloon flight. Explosive squib cuts cord holding top of envelope and hot air escapes. Envelope will now float to ground and be rolled up



launches. High up in the Black Hills, its deep dish shields the launching area from prevailing winds. Ideal conditions demand little or no wind, although some say if the winds are mild enough to launch in they're mild enough to fly in.

My companions included Don Piccard—son and nephew, respectively, of the late renowned Swiss balloonists, Jean and Auguste Piccard, and an internationally known balloonist in his own right—and Jerry Melcha, a part-time rodeo rider and a full-time balloon man with Raven. Piccard, who holds several world records, heads Raven's hot-air balloon program.

All across South Dakota—about 300 miles—our *Vulcoon* and its equipment rode comfortably in a small trailer behind us. At the site, before dawn next morning, the launching began. Only those who have spent from four to six hours in pre-dawn darkness trying to rig a gas balloon for flight can appreciate the ease with which the hot-air balloon is prepared. It takes less than 30 minutes.

The balloon bag or envelope—it's more like a sleeve, since it's open at both ends—is unrolled from a weatherproof carrying sack that resembles an oversize duffle bag. Stretched out, the sleeve is about 70

feet long. It consists of 24 panels, or gores, alternately white and orange (orange stands out beautifully against a blue sky). The gores are made of rip-stop nylon laminated with plastic. The nylon, laced with an interminable mixture of small threads that keep small punctures from spreading into large rips, is for strength; the plastic, which protects the nylon from the hot air, is for insulation.

Like an Onion Sack

The top end is tied off for flight—just like an onion sack—with nylon cord. The cord, however, is rigged with a small guil-lotinelike device with a small explosive charge that can cut it when triggered electrically from the seat below. That's the purpose of the open top—when landing, it can be blown open by cutting the cord. The hot air escapes, deflating the bag instantly so that it doesn't drift away or, worse, drag the balloonist with it.

The seat, made of tubular steel, is attached to the bag by Y-shaped steel cables that connect with the reinforced seams between the gores. Attached to the seat are two tanks with enough butane fuel for four hours of flight, the burners with two

[\(Please turn to page 214\)](#)

CALIFORNIA GROUP takes its *Vulcoon* to desert for weekend ballooning. Dr. McGrath is descending here from one flight; another balloonist will replace him

AND AWAY HE GOES! Pear-shaped balloon will rise to about 4000 feet, float effortlessly over desert floor, descend miles away half-hour or hour later





Brain Scientists Study Owl

With an owl named Orpheus as guinea pig, M.I.T. scientists are studying the motor and receptor mechanisms of the brain. A light is beamed into the owl's unblinking eye while a GE-225 computer records the time and degree of pupil constriction.

Sun-day Cooking

Outdoor cooking without fuel or flame can be done with a portable solar grill that uses for heat the inexhaustible energy of the sun. The "Sundiner" can be used whenever the sun shines, weighs under 13 pounds and folds into a portable case.

Sun rays are passed through two panes of glass and reflected into the oven below the grill. Manufactured by Carmer Industries, the "Sundiner" retails for \$29.95.



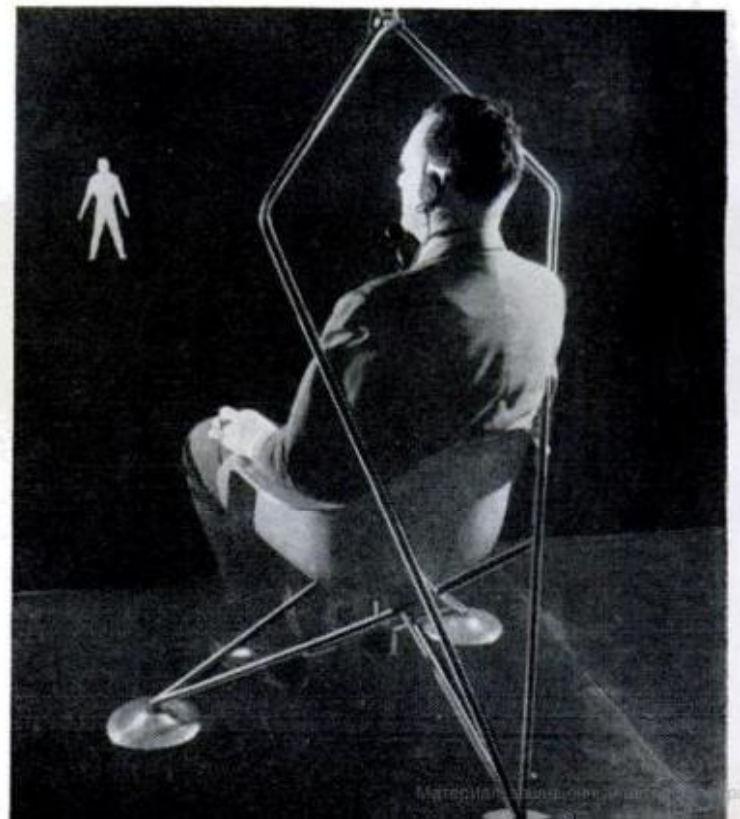
Garage Travels with Car

In Czechoslovakia, travelers don't have to leave their cars out in the rain and snow. A new plastic, inflatable car shelter can be quickly assembled—or dismantled. The "garages" come in several sizes and models. Folded, they weigh 55 to 65 pounds.

To Err Is Human—in Space

Depth perception in space may be tricky. Tests in simulated conditions show that man may err in guessing distance and angle of movement as much as 250 percent.

Researchers at Ling-Temco-Vought created a frictionless platform-chair, which rides on compressed air. They put a man in it in a pitch-black room, then moved a small luminous figure around before him. Guesses were too high and too low.





Lamp Tells the Time

Combining the advantages of lamp and clock in a single unit is a two-in-one home furnishings accessory, "Time-O-Lite."

The shade revolves on a special clock turntable which stays in motion whether the light is on or off.

Spartus Corporation is the manufacturer of the lamp clock which retails at \$12.95.

There won't be any racing in the mud at a harness racing track near Washington, Pa., with the installation of a new plastic surface called Tartan.

The new surface, made of specially compounded resin, will form a piece of plastic with an area of 6¾ acres.

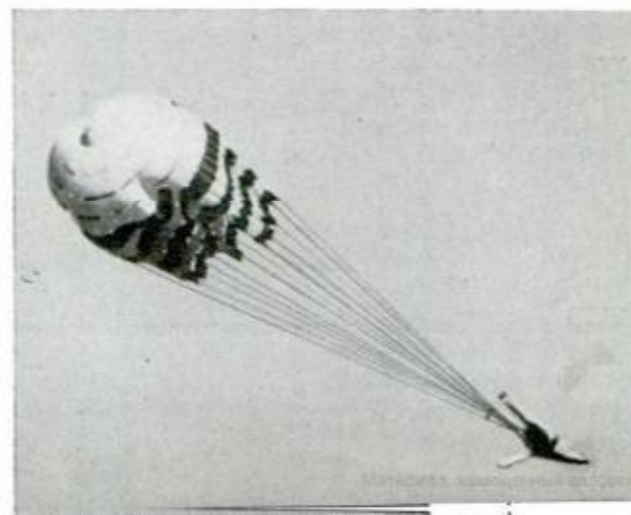
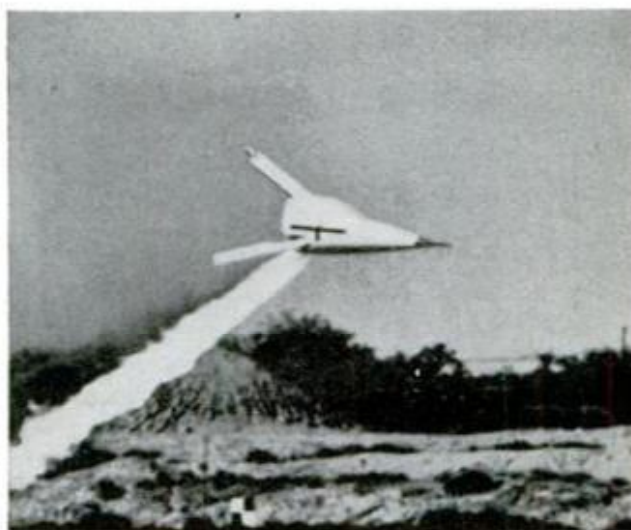
The track covering is a development of the Minnesota Mining and Manufacturing Co., St. Paul, Minnesota.

APRIL 1963

Supersonic Escape Capsule

Designed to protect pilots of future Mach 4 or 5 aircraft, a prototype escape capsule is undergoing tests at the high-speed railed track at Edwards Air Force Base in California.

The model simulates the nose section, including the cockpit, of a supersonic plane. When forced to abandon his aircraft, the pilot would separate the nose section, fins would protrude to give stability, then a small drogue parachute would pull out the large, 72-foot recovery chute and the capsule would float to a landing at less than 20 m.p.h. Eventual tests on the Edwards rail will go to 1000 m.p.h.





*A Nationwide Survey
Based on 1,095,717
Owner-Driven Miles*

Tempest's Style and Power Please, But the Transmission Noise Annoys

*Boldface and marginal comments
by Jim Whipple, PM's Auto Editor*

The percentage of V8 buyers, 32.2, is way up over the two percent who optioned the \$216-extra aluminum V8 engine in 1961 and '62 →

It looks like the Corvair Monza gold rush all over again. In fact, Corvairs were considered by 26.3 percent of all Tempest buyers →

BUYERS OF THE 1963 PONTIAC TEMPEST seem to be a bunch of individualists who have discovered a common car that they all like, but for different reasons.

Some are buying Tempest because of the compact size; in fact, 55.5 percent gave that as a primary reason for choosing the car.

With others, some 46.3 percent, economy was a first consideration. For these thrifty-minded folk the four-cylinder engine proved a strong lure, with two thirds of all buyers choosing it over the optional (\$155) 264-horsepower V8.

One thing that the Tempest *does not* seem to be this year is the first choice of those in search of a bread-and-butter family sedan. Only 20.6 percent of all buyers selected sedans while a whopping 45.1 percent chose the coupe, and the majority of these selected the sporty, bucket-seated LeMans series.

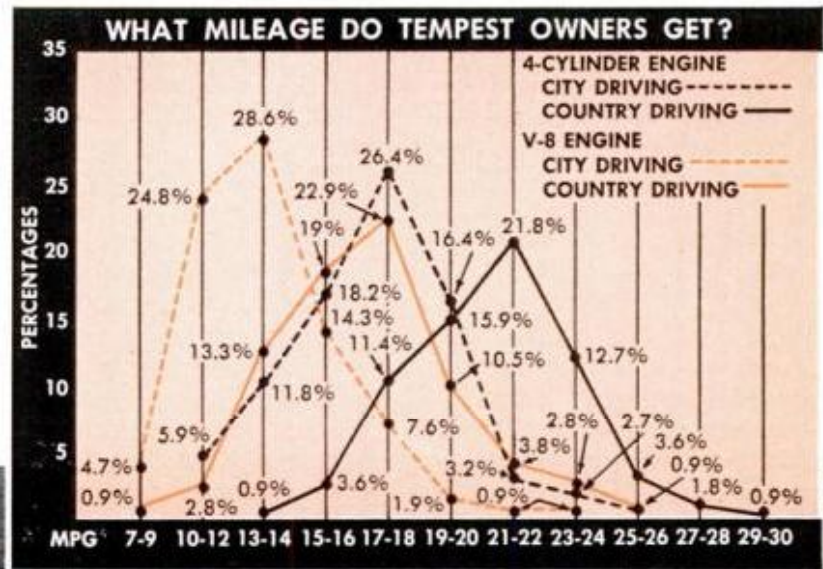
The remaining 34.3 percent of the owners reporting were split roughly two-thirds to one-third in favor of the con-

SPACIOUS TEMPEST TRUNK drew bouquets from some owners in spite of the position of the spare, which takes up considerable room. The luggage "lift distance", 27.7 inches, is almost desk height. Sign calls your attention to transaxle fluid filler



ADDITIONAL POWER of the Tempest optional V8 engine costs most owners a full four miles per gallon of gas. And while low-compression Fours take Regular, the V8 demands Premium fuel. In town most owners got 17-18 m.p.g. with Fours, 13-14 with V8s

CLEAN, UNSPANGLED STYLING got the approval of Tempest owners, but they also reported on the small bumpers' obvious shortcomings. Note the camber of the inside rear wheel as the weight shifts outward in cornering. This reduces tires' grip



Owners Like . . . and They Dislike

*Easy Handling
Snappy Performance
Comfortable Ride*

*Noisy Transmission
Unsatisfactory Paint Work
Rigid Right Bucket*

The LeMans coupe with low-power version of the four-cylinder engine → seems to have become the schoolmarm's hot rod

Almost flat curve between 40 and 60 m.p.h. is somewhat unusual but undeniable after averaging → several runs with and against wind

Excess weight in the trunk provides negative camber (that splayed-out look) to independently suspended rear wheels like Tempest's, adds stability →

vertible over the station wagon, with bucket seat LeMans trim in the lead once again.

If you could draw a picture of the average Tempest owner you might find that he (or she) is a person in search of a smallish coupe or convertible with a sporty flavor, reasonable first cost and good potential operating economy.

Now that the Tempest owners have had several months and several thousand miles (3,384 apiece on the average) of driving in their new cars, how do they like them?

Generally, the owners are pretty well satisfied as no major areas of complaint showed up.

Poor fuel mileage was the number one complaint with 11.7 percent reporting it, while the next largest group, 10.4 percent listed transmission noise as the major problem.

To provide an area of comparison, *PM* ran constant speed mileages on a Tempest sedan with four-cylinder engine, four-barrel carburetor and automatic transmission. Over 300 miles of general driving, we averaged 16.9 miles per gallon. Here are the fuel consumption figures at steady speeds:

23.7 miles per gallon at 30 m.p.h.

24.7 miles per gallon at 40 m.p.h.

24.73 miles per gallon at 50 m.p.h.

22.57 miles per gallon at 60 m.p.h.

17.65 miles per gallon at 70 m.p.h.

In the order of frequency with which owners mentioned them, here are the five things they liked best about the '63 Tempest:

"I can drive it easily in traffic."—Ohio drug salesman.

"Ease of handling makes it a fun car to drive."—Washington tugboat captain.

"Like the ease of handling when carrying a lot of excess weight in the trunk."—New York metalsmith.



TRANSMISSION RANGE SELECTOR down on the dash led the list of owners' complaints about the interior. With transmission in rear, front foot room is good



TEMPEST'S FLOOR, like so many others, is recessed to provide adequate interior height combined with the fashionably low roofline buyers seem to want

"I like the simplicity and small amount of chrome."—Michigan merchant.

"It's the best-looking compact car on the highway!"—Michigan miner.

"It has everything the T-Bird has—sports car styling, bucket seats, console shift and tasteful color arrangements."—California typist.

"The power of my V8 is fantastic!"—New York salesman.

"It (V8) has the power to go when you need it such as crossing a street through heavy traffic."—Florida grocer.

"I like the V8's tremendous pickup in passing and taking off."—Oklahoma mason.

"The 326-cubic-inch engine really has punch when needed, and the pickup is great (from 0 to 60 m.p.h. in 8.2 seconds)."—Illinois insurance man.

"Comfortable bucket seats are excellent on long drives."—Washington engineer.

"It gives you a smooth ride."—New York printer.

"It has plenty of room inside, yet it is small enough to park in crowded business district."—Wyoming rancher.

"It's a perfect size for city driving."—Massachusetts secretary.

"I really find the all-over size of the car a great convenience."—Texas teacher.

Not everything is hearts and flowers, of course. Here, listed in order of frequency, are the first five items on the owners' complaint list:

"Uses too much fuel for a four-cylinder car."—Pennsylvania teacher.

"The gas mileage is not quite as good as expected from a compact car, (I have the 326-cubic-inch V8 engine with 13 miles-per-gallon overall)."—Arkansas college instructor.

(Please turn to page 224)

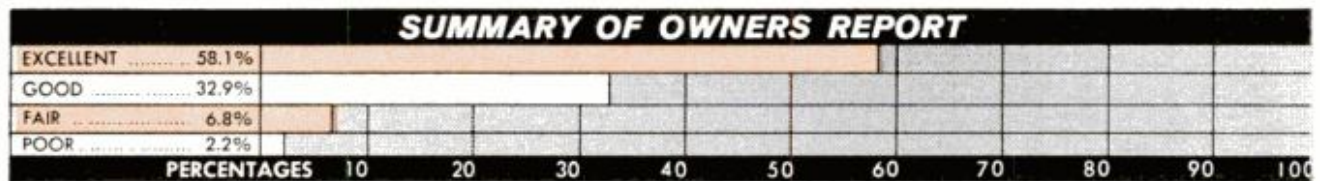
Everything, that is, but
← the same price tag!

Or when you're entering
← an expressway

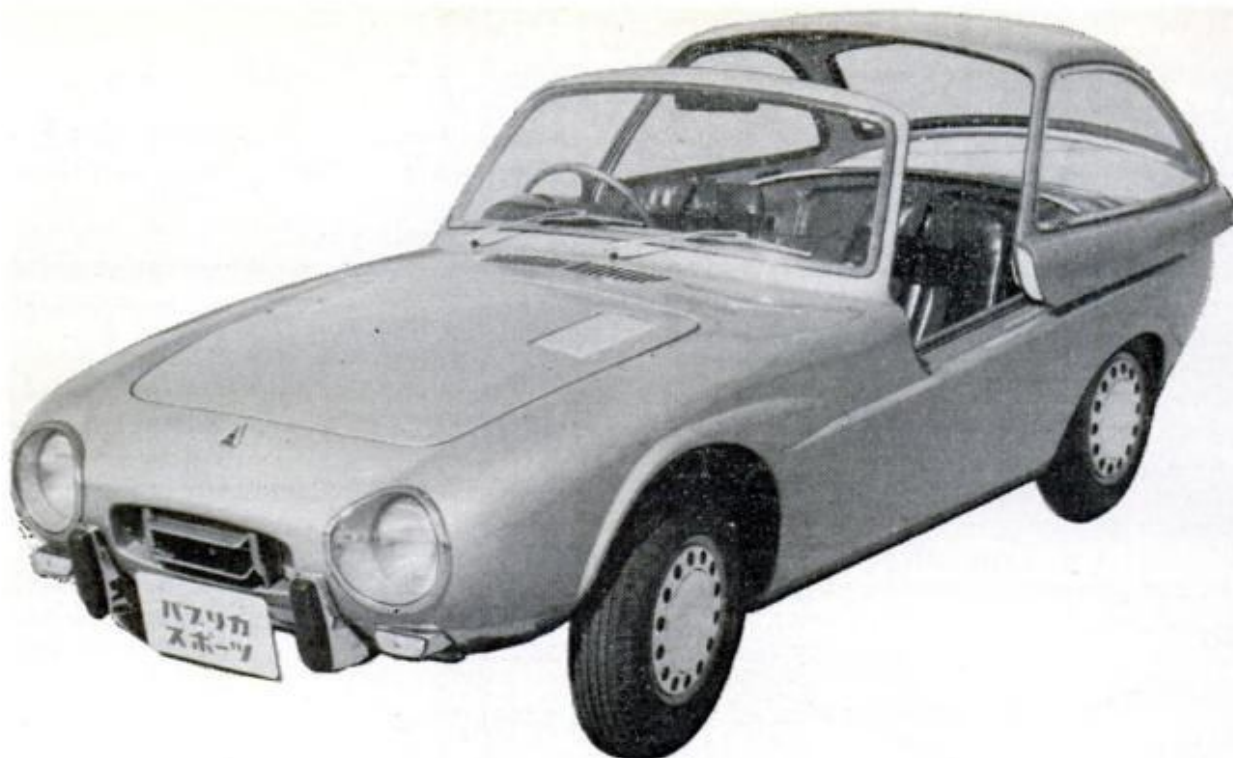
Pontiac has followed the
← hot rodders' lead, putting a big-car engine in a small car to make it GO!

Wonder where he finds
← a crowded business district in Wyoming?

That's because they're big cylinders, ma'am! In point of fact, Tempest Four's
← displacement (194.5 cubic inches) is greater than that of most of compact sixes



SUMMARY OF OWNERS REPORT		
Category	Percentage	Percentage
Fuel economy		
About as expected	42.8%	
Better	15.7	
Not as good	41.5	
Best-liked features		
Handling ease	54.9	
Styling	38.0	
Power, performance	36.5	
Riding comfort	26.7	
Size	17.8	
Roominess	15.3	
Economy	12.9	
Roadability	9.8	
Visibility	7.7	
15-inch wheel size	7.0	
Ease of parking	6.7	
Good traction in snow	5.5	
Most-frequent complaints		
Poor gasoline mileage	11.7	
Noisy transmission	10.4	
Inferior paint job	7.7	
Right bucket seat non-adjustable	7.4	
Poor workmanship	6.1	
Rattles and squeaks	4.0	
Downshifts too easily	3.7	
Unstable; rear sways or skids	3.4	
Best-liked exterior style features		
Clean, smooth, straight lines	13.8	
Uncluttered, simple design	8.6	
Front end	7.4	
Rear end	7.4	
No excess chrome	5.8	
Grille	5.5	
Big-car appearance	4.0	
Least-liked exterior style features		
Bumpers too small	10.4%	
Grille	3.1	
Tail lights	2.1	
Rear end	2.1	
Best-liked interior style features		
Bucket seats	33.7	
Upholstery	19.3	
Dashboard	15.0	
Comfortable seats	9.5	
Colors	4.3	
Carpeting	3.7	
Least-liked interior style features		
Dashboard	13.8	
Location of gear lever on dash	12.6	
Ash trays	6.1	
Idiot lights	3.7	
Lack of room in rear	3.4	
Uncomfortable seats	1.8	
Mechanical trouble, if any		
None	62.6	
Transmission	9.8	
Directional signals	5.2	
Carburetor	4.6	
Automatic transmission leak	2.8	
Windshield wiper motor	2.8	
Consider buying another compact?		
Did consider	54.9	
Did not consider	45.1	
Compact make considered		
Corvair	26.3	
Falcon	15.1	
Chevy II	14.0	
Olds F-85 Cutlass	14.0	
Buick Special	12.8	
Big car considered, if any		
Didn't consider any	65.6%	
Pontiac	16.3	
Chevrolet	11.0	
Ford	2.5	
Buick	2.5	
Oldsmobile	2.1	
Make of family's other car, if any		
Tempest is only car	49.1	
Another Tempest	1.2	
Pontiac	14.7	
Chevrolet	10.1	
Other General Motors make	4.6	
Ford	8.0	
Other Ford Motor Co. make	1.5	
Plymouth	2.8	
Other Chrysler Corp. make	2.8	
How is dealer's service?		
Excellent	52.3	
Average	39.3	
Poor	8.4	
Make of car traded in		
Tempest	10.7	
Pontiac	19.6	
Chevrolet	12.0	
Other General Motors make	11.6	
Ford	8.0	
Other Ford Motor Co. make	4.6	
Plymouth	3.1	
Other Chrysler Corp. make	2.8	
Other U.S. make	3.7	
Import make	5.2	
Would you buy another Tempest?		
Yes, would buy	80.4	
No, would not	9.5	



Sliding Hatch Is Entry for Japanese Sports Car

There are no doors on the new two-seat Publica Sports from Toyota Motors, Tokyo; entry and exit are via a sliding canopy something like a jet fighter's. A two-cylinder, air-cooled engine rated at 30 horse-

power is reported to move the 1276-pound Sports at 68 m.p.h. In Japan the price is 389,000 yen (about \$1080). A prototype is shown above but production is to start soon. U.S. import isn't yet scheduled.

V-Shaped Balloon

Like Siamese twins joined at the nose, two hulls of a V-shaped balloon fan out from the forward section at an angle of about 40 degrees.

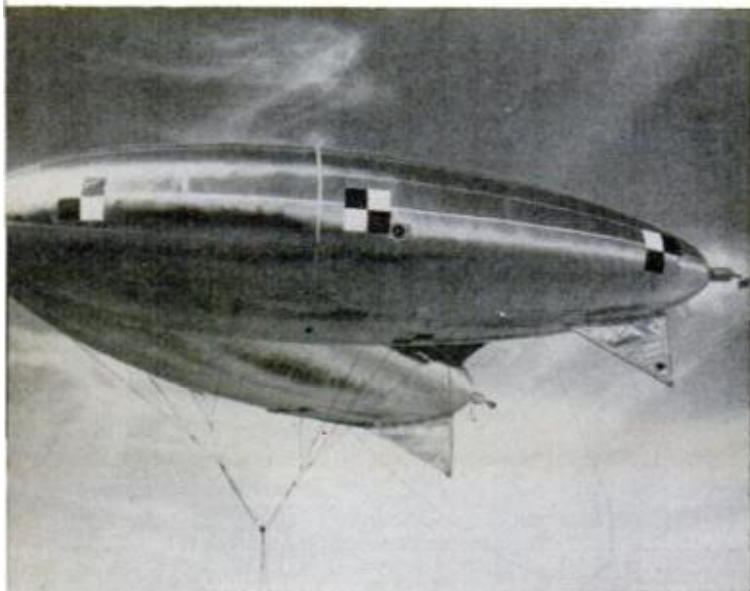
Tethered to the ground, the balloon's unique aerodynamic configuration gives it greater stability for holding aloft equipment and scientific instruments for extended periods.

Four of these 110-foot-long structures have been ordered from Goodyear Aircraft Corp. by General Electric Co.

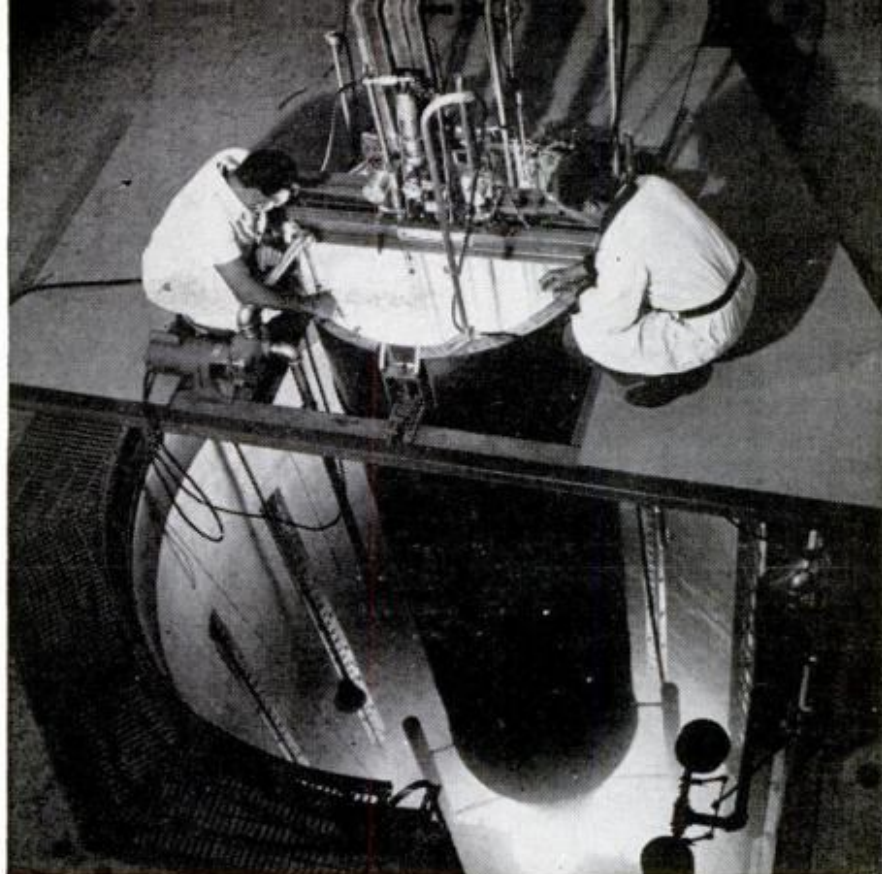
Metal Mattress

Woven from lumber and steel cable, an 1180-foot-long mattress protects the base of a guard wall at navigation locks near New Richmond, Ohio. It prevents the current from eroding the river bed and exposing the piles that support the wall.

The mattress, which was woven at the site, is shown being lowered into the river. Some 2500 tons of crushed stone, deposited by a derrickboat (shown) hold the mat in place. The project was carried out on a contract from the Army engineers.



IN NEUTRON activation analysis, a new crime detection method, clues such as hair or soil samples are bombarded in a nuclear reactor to discover tell-tale trace elements. These General Dynamics scientists are lowering clue specimens into the core of an atomic reactor



Quick, Watson... The Geiger Counter!

Criminals are up against a tough, new foe—nuclear reactors that coax evidence from microscopic clues to provide proof of crime

By Charles Remsberg

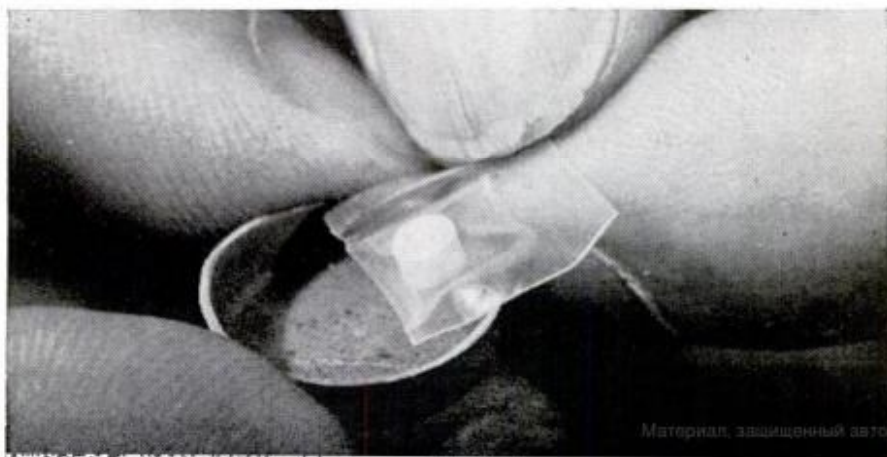
RECENTLY a man suspected of murder was shadowed by Federal Narcotics Bureau agents to a dingy hideout in New York. A search turned up an illegal cache of demerol, which the suspect denied knowing about. The agents, of course, confiscated the drug. But instead of sending it to a chemical laboratory for analysis, they shipped it to the Atomic Energy Commission's facility at Oak Ridge!

There, small amounts of the substance were put in a container, lowered by fish-line into an atomic pile and bombarded by

nuclear particles. The activated drug was then reeled in. Sub-microscopic trace elements in it were compared with similarly activated demerol samples produced by various chemical companies. A specimen from one firm matched the confiscated sample, revealing to agents where the addict's supply had come from. By tracing it from there, detectives were able to pin the drug to their suspect. The nuclear analysis saved them days of legwork.

This remarkable new method of ultra-sensitive detection, in which nuclear re-

THE TINIEST CLUE—as small as one billionth of a gram—can easily be analyzed by NAA for trace elements. Used for years in medicine, agriculture, and manufacturing, NAA is gaining recognition as a police tool





WHERE POISONING is suspected, a specimen of the victim's hair or nails is placed in a reactor. The poison is then isolated by radiochemical separation

actors match wits with criminals, is making possible the use of clues that otherwise might be worthless. The technique, says California's famed criminologist, Dr. Paul Leland Kirk, "promises to revolutionize the identification of criminal evidence."

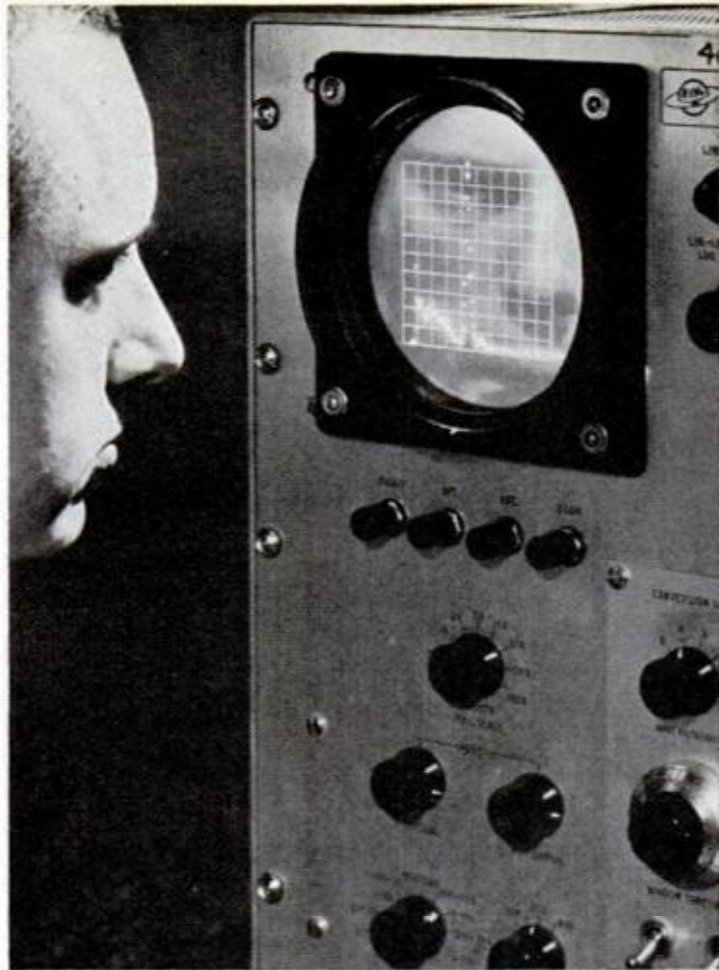
"Neutron activation analysis," or NAA, has been known and used for some years in medicine and industry. But only recently have law enforcement agencies become aware of it as a crime detection tool.

Already, NAA has helped convict a killer, traced the source of illicit narcotics, revealed poisonings and exposed a moonshiner. Any day now it will be used to trap hit-and-run drivers, burglars, counterfeiters, and other rogues' gallery regulars.

Some experts see NAA as the ultimate weapon against the so-called "perfect" crime. For it has revealed that even the cleverest lawbreaker leaves invisible traces of himself at the crime scene or carries part of the scene away with him.

Basically, NAA involves the use of artificial radioactivity to reveal the highly individualized mixture of trace elements present in any given clue or sample.

The ability of the process to identify such trace elements with sensitivity and accuracy is not affected by the size of the



AFTER BOMBARDMENT in a reactor, information on the telltale trace elements contained in clue specimens is transferred to an oscilloscope for identification

clue. Samples weighing only one-billionth of a gram have been analyzed successfully.

Also, unlike wet chemistry and some other crime lab methods, NAA often does not destroy the original specimen. Thus, it can be presented in court as evidence.

A dramatic use of NAA occurred recently in New Brunswick, Canada, after a 16-year-old girl was found stabbed to death at a gravel pit. While inking the victim's hand for fingerprints, a "Mountie" discovered a single hair clutched in her fingers, possibly yanked from her murderer's head.

Later, a man in a Maine border town was arrested because he had been in Canada when the girl was abducted; mud on his car resembled that at the murder site.

The mystery hair, along with samples from the heads of victim and suspect, were taken to Chalk River, Ontario.

There, lab workers under Dr. Robert Jervis put the specimens in plastic bottles and shot them by pneumatic tube into the core of their NRX (Nuclear Reactor, X-Rod). The samples were bombarded with neutrons, transforming certain elements in the hairs into unstable radioisotopes.

Each radioactive element then was emitting its own distinctive gamma and beta rays with unique half-life factors. By an-

alyzing the emissions Jervis was able to tell precisely what trace elements were present in each hair and in what quantity.

When the analysis was complete, the scientists found that patterns produced by the victim's hair were radically different from the other two. The sample clutched in the girl's fingers matched the suspect's.

Through earlier NAA experiments, researchers had obtained evidence that a person's hair is as distinctive as his fingerprints. Result: for the first time, nuclear science helped convict a man of murder.

Recently, U.S. alcohol tax agents used NAA to win a court case in Florida. They had raided a moonshine still and later arrested a man suspected of operating it. The suspect claimed he had never been in the vicinity of the still. Sharp-eyed agents noticed, however, that he had flecks of soot and soil on his boots. These were removed and sent to Oak Ridge National Laboratory in Tennessee, along with samples of soil and soot from the still site. NAA revealed that the samples matched—and helped police to gain a conviction.

Probably the most frequent application of NAA has been in cases of suspected poisoning. Minute traces of arsenic and other poisons are deposited in human hair, nails and skin within a day after ingestion.

Research had already established that any healthy individual has some arsenic in his hair, absorbed from normal diet and medication. Such content can run as high as 2.5 parts per million. A greater amount would indicate probable poisoning.

What's more, the arsenic needn't be fresh. NAA has been used to detect poisonings centuries old. Not long ago, Swedish scientists irradiated the exhumed remains of King Eric XIV, dead nearly 400 years. The analysis confirmed rumors that he had been murdered; it indicated extraordinary amounts of mercury poison in the remains.

Napoleon's Murder

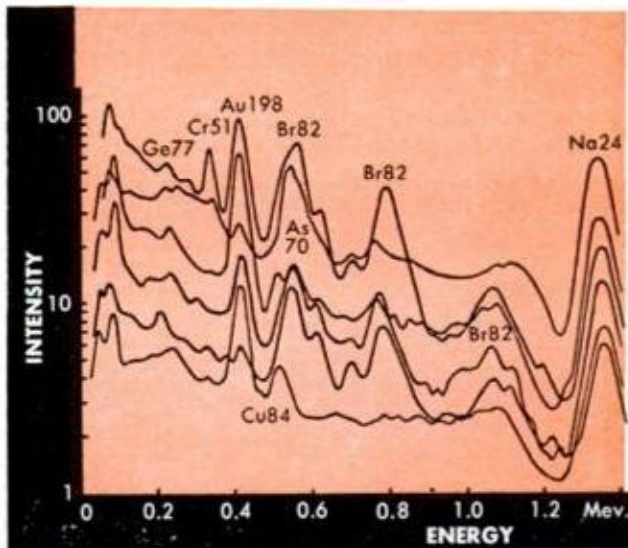
Similarly, NAA experts in Scotland recently tested hairs taken from Napoleon's head at the time the Emperor died in 1821. The hair was found to contain 10.38 parts per million of arsenic. Thus, it's probable

FISHING-POLE gear is used to remove clue specimens from the reactor core, while a second technician monitors the amount of radiation present. NAA is seen by some authorities as being the ultimate weapon against crime

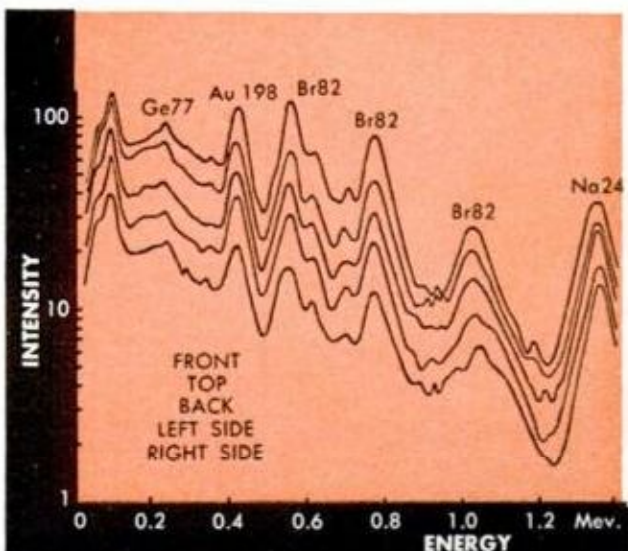




A SMEAR from the hand of a suspected gunman is prepared for NAA analysis; this may soon replace the paraffin method for detecting gunpowder residues



INDIVIDUAL HAIRS taken from the heads of six different people show, like fingerprints, clearly identifiable variations in this gamma-ray spectrograph



THE SAME spectrographic technique shows only minor differences in the trace elements in five hairs taken at random from the head of a single individual

that Napoleon's death was caused by poisoning—not by cancer or hepatitis, as some historians have suggested.

In some instances, NAA has revealed that a crime did *not* occur. In one such case described in Canada a man playing ping-pong collapsed and died. Investigators had reason to suspect arsenic poisoning. But NAA samples of the victim's hair, fingernails and toenails proved to police that their suspicions were unfounded.

Spot Gun Handlers

At San Diego, Calif., scientists at the General Atomic division of the General Dynamics Corp. are working with the Los Angeles Crime Laboratory to perfect NAA as a technique for determining if a person has recently fired a gun.

"We've been able to detect and analyze traces of powder residue as small as 10 billionths of a gram," a General Atomic scientist, Dr. Vincent Guinn, said recently.

The company is now experimenting with blood stains. Tests have shown that NAA is far more exact than conventional chemical tests in determining blood identity.

General Atomic is also finding the technique amazingly successful in identifying and matching metal additives or impurities in grease samples (such as might be found on a criminal's shoes), plastics, glass, auto paint (such as might be found on the clothing of a hit-and-run victim), soils, rubber and ink and paper (forgeries).

Other experiments are currently being conducted at Oak Ridge for the Federal Narcotics Bureau. With NAA, scientists have determined the trace elements of raw opium samples from 10 areas of the world. George Leddicotte, a Union Carbide NAA expert, told me that activated samples showed different gamma patterns because of the differences in soil, fertilizer, and other environmental factors.

"Once the sources of supply for narcotics can be definitely determined, enforcement may be easier," Leddicotte says.

At the University of North Carolina, other researchers report that with NAA they are able to detect significant differences in the trace element contents of various synthetic textile fibers. "Textiles," Dr. Kirk points out, "are among our more important forms of evidence; the ability to discriminate quickly between fibers often can result in the solution of a crime."

NAA researchers foresee the day when city police departments will have fully equipped NAA labs. Departments in smaller towns may have to farm out this kind of work to city or commercial labs.

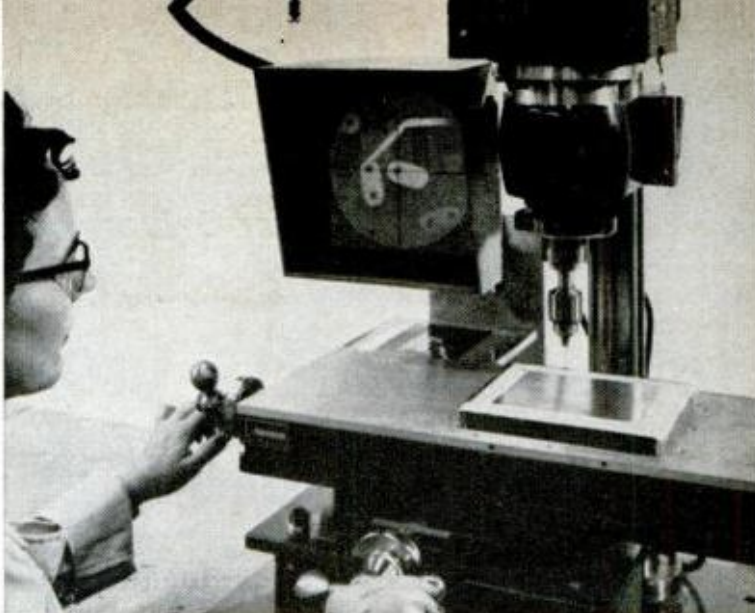
When this becomes common practice, it will mark hard times for those who live outside the law. ★ ★ ★

Drilling by Bombsight

Borrowing the principle of a World War II bombsight, an electric drill is combined with an optical viewer that zeroes the drill in on printed-circuit boards.

A photographic film of the original drawing of a printed circuit is lined up on a glass grid on the milling table and projected upward into the viewer, enlarging the image 10 times.

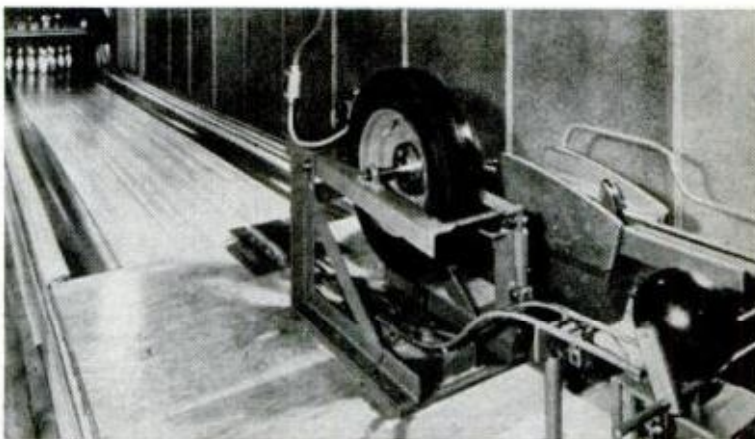
By moving the table the operator can line up in the crosshairs the precise hole to be drilled, positioning it for each hole.



Robot Bowler Tests Pins

Bowling 70 games a day, a mechanical bowler rolls a ball every 23 seconds and never scores less than 200.

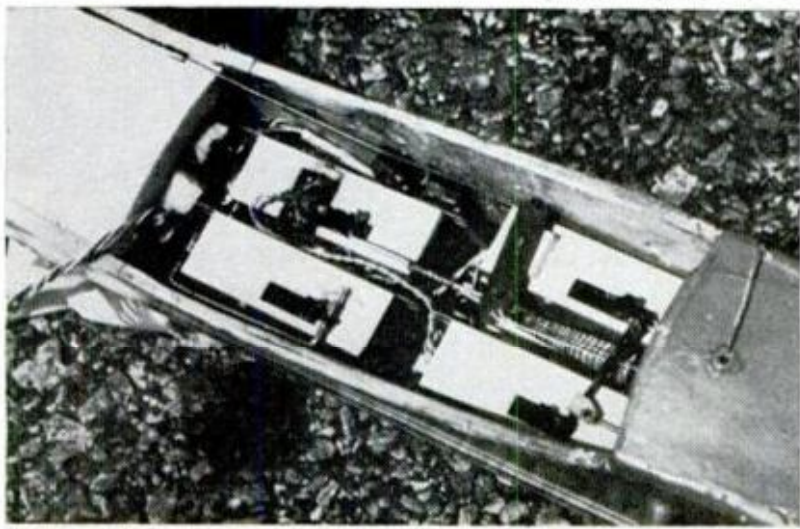
Designed by Pierce & Stevens Chemical Corp., Buffalo, N.Y., to test the protective coating on bowling pins, the bowler is a standard auto wheel and tire attached to an electric motor that keeps it spinning. The ball runs under the wheel for delivery.



10-Channel Aerobatics

A home-built airplane model carries a 10-channel radio-control system that operates four servo motors. These tiny motors control rudder, elevator, elevator trim tab, aileron and wheel brakes.

Thus the model can duplicate the actions of a real plane right down to flying upside down. Built by Everett Mathis of Hammond, Ind. the model has a 66-inch wing span and can fly 70 m.p.h.





A Nationwide Survey

Based on 1,156,591

Owner-Driven Miles

Dodge Owners Crow Over Quality, Grouse About Headroom

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

WITH ALL THE SHUFFLING of sizes and nameplates Dodge has been doing in recent years, we should note that the subject of this report is the 1963 Dodge which is available in three series: the "330," "440" and Polara.

You might call this the "Dodge" Dodge, because this is the model (rather than the Dodge 880 or the Dart) which most of the buyers seem to be getting today.

With a 119-inch wheelbase it is sized and priced to compete with full-sized Chevrolet, Ford Galaxie and Plymouth. Engine choices range from a 145-horsepower Six to the 415-horsepower Ramcharger V8 on the 1963 Dodge.

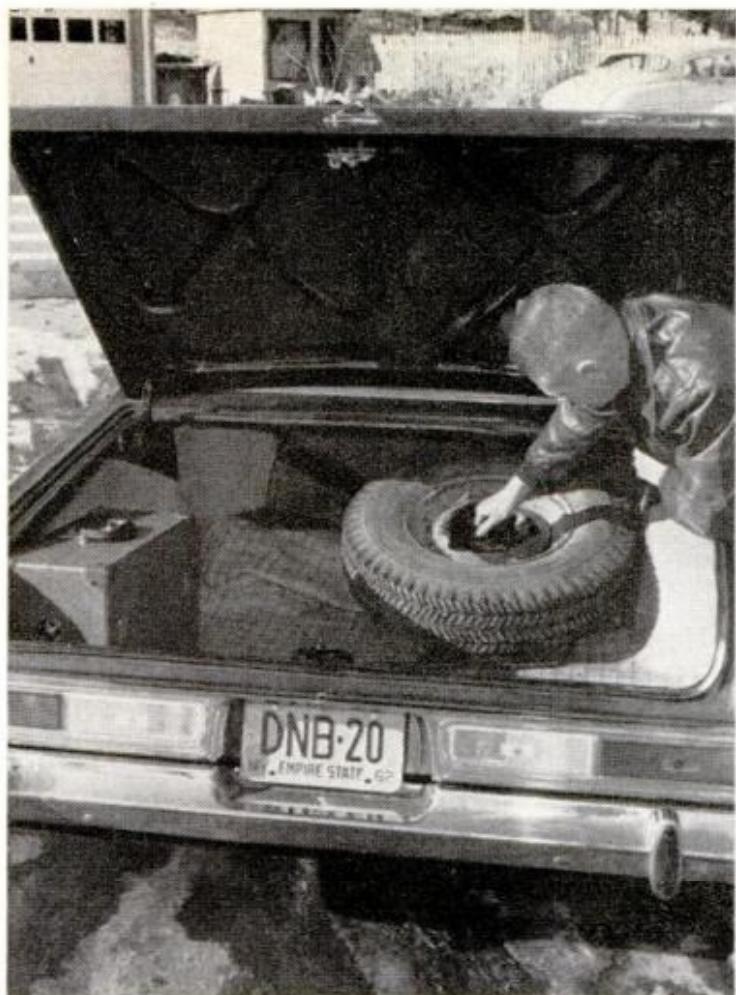
The car seems to be finding itself as a bread-and-butter

Owners Like . . . and They Dislike

Nimble handling
Power and pep
Cleaner styling

Low headroom
Difficult entry
Pushbutton location





TRUNK SPACE of test Dodge four-door drew neither praise nor complaint from owners although it seemed shallow and spare tire takes up prime space

full-sized, low-priced V8, as the majority (58 percent) of all owners buy the sedan model. Some 19.5 percent choose the station wagons while 22.2 percent go for convertibles and hardtops.

Fuel mileage economy does not seem to be the owners' first concern, as 91.8 percent of them bought the V8. With most owners getting between 13 and 20 miles per gallon, depending on their city-versus-country driving patterns, 57.8 percent felt that fuel mileage was about as expected, while some 29.8 percent felt that it was better than they had hoped for. Only 12.4 percent felt that their fuel mileage was not as good as they expected.

PM's constant speed fuel mileage runs were made on a Polara 500 four-door hardtop with automatic transmission, and 383-cubic-inch engine equipped with four-barrel carburetor. Our results were as follows:

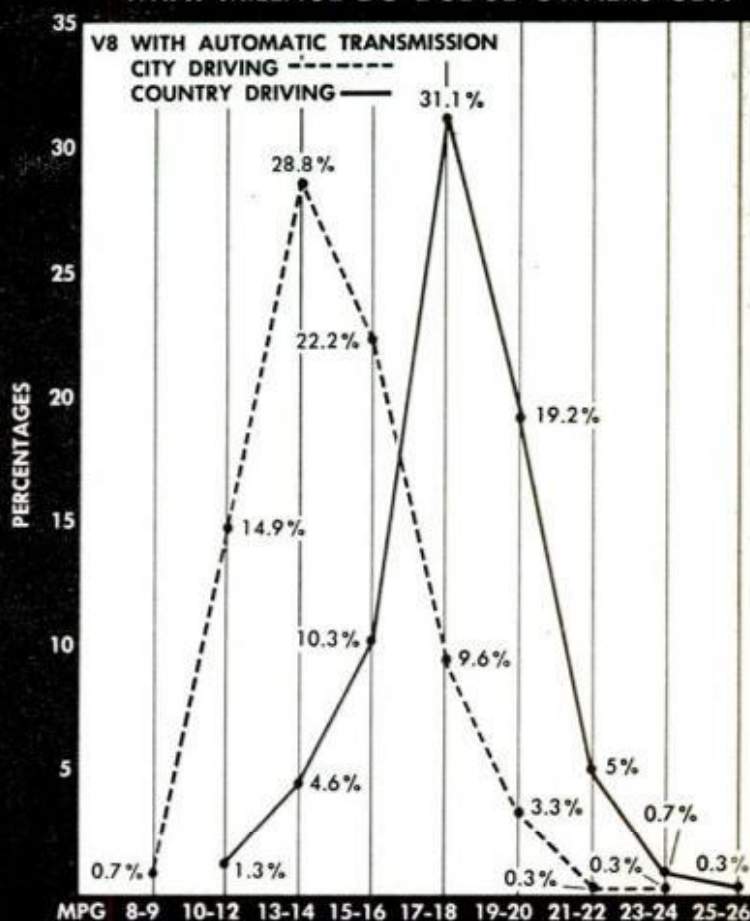
- 21.0 miles per gallon at 30 m.p.h.
- 20.1 miles per gallon at 40 m.p.h.
- 18.9 miles per gallon at 50 m.p.h.
- 16.9 miles per gallon at 60 m.p.h.
- 13.5 miles per gallon at 70 m.p.h.

Overall mileage (covering all types of driving, idling, warmups and acceleration) was 15.5 m.p.g.

The 1963 Dodge has scored a clean hit with its owners. A healthy 72.1 percent rated it Excellent, while 24.4 percent felt that it was Good. Only 2.9 percent said that it was Fair and a minute 0.6 percent rated their choice as Poor.

On the basis of several months of ownership and an average of 3,392 miles, a solid 90.4 percent reported their willing-

WHAT MILEAGE DO DODGE OWNERS GET?



MOST OWNERS of 1963 Dodges are driving automatic transmission equipped V8s, get between 12 to 15½ miles per gallon in city, 17 to 19 out on the road

← **Dodge buyers were not oversold by dealers on the car's economy potential, thus were not disillusioned**

← **This is the highest Excellent rating, and the lowest Good recording since PM instituted the four-check ratings in 1962. A genuine feather in Dodge's cap**



A VALID PROBLEM for 11.1 percent of owners reporting is the difficulty of exit or entry, illustrated here by six-foot tester, even though door opens 90 degrees



STEEPLY SLOPED windshield corner post combines with forward location of center post on four-door to make for head-bumping, according to some owners

Could this be psychological? The '58 Dodge he drove had only three inches longer wheelbase →

This suspension → **gives an outstanding combination of ride and handling whether it's on a compact Valiant or king-sized Imperial**

We'll bet that it's → **fantastic at the gas pump, too!**

ness to buy another Dodge. Some 6.7 percent remained cautiously undecided, and just 2.9 percent had made up their minds not to buy another Dodge.

In their own words, here are the five features owners liked most about their Dodges, in the order of frequency of mention:

"I like the way it handles, especially on curves."—Pennsylvania clergyman.

"After driving a larger Dodge (1958) for years it is nice to be able to park without any trouble."—Indiana supervisor.

"The handling quality is superb."—Alabama salesman.

"Let's not forget that torsion bar ride. You can ride for hours and never be overcome with fatigue. At the end of one 500-mile trip, both of us were relaxed, not beat."—Illinois policeman.

"Driving is like being on Cloud Nine!"—Iowa treasurer.

"It has the power (V8) to get up and go if necessary."—Texas farmer.

"It has the most snap for a Six of any I've ever driven."—Wisconsin crane operator.

"That Ramcharger (426 cubic-inch, 415-horsepower) engine is fantastic in the ¼-mile."—Florida teacher.

"Styling is so superior to the 1962 Dodge, and it is a good-sized car, not too large nor too small."—Nebraska university professor.

"It looks wonderful without all the fins."—Pennsylvania machinist.

"I get excellent gas mileage with my Polara sedan which

Home Workshop Tools You'll See Tomorrow ...

HOW DO YOU design a radically new or improved tool? Ask any student at Illinois Institute of Technology's Institute of Design in Chicago.

The futuristic tools shown here are not clay mock-ups. They actually work. And these are just a small sampling of hundreds developed by IIT's 19 and 20-year-old designers of tomorrow. While most aren't currently available at your local hardware store, several student-designed tools have been snapped up by manufacturers in the past.

Jay Doblin, Director of the IIT's Design

Institute, feels that tool design is an excellent assignment for kicking off a promising young designer's career. Over a period of five years, his students have proved Doblin's point well.

Perhaps the most important secret of developing a new design is a fresh approach to the problem, and this begins in the classroom. Here, the student is taught that a hand tool is "a hand at one end and some mechanical work to be done at the other."

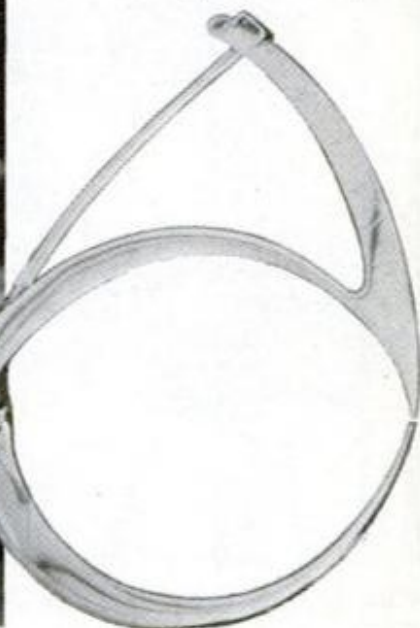
Furthermore, he learns that virtually any tool can be classified as one of five

ELECTRIC FILE utilizes the same principle as a belt sander, is adaptable for wood rasping. Upper left, socket wrench contains nested spring-mounted sockets of various sizes, automatically selects correct size when slipped over the head of a bolt. Lower left, rifle-style nail driver works like a giant stapler



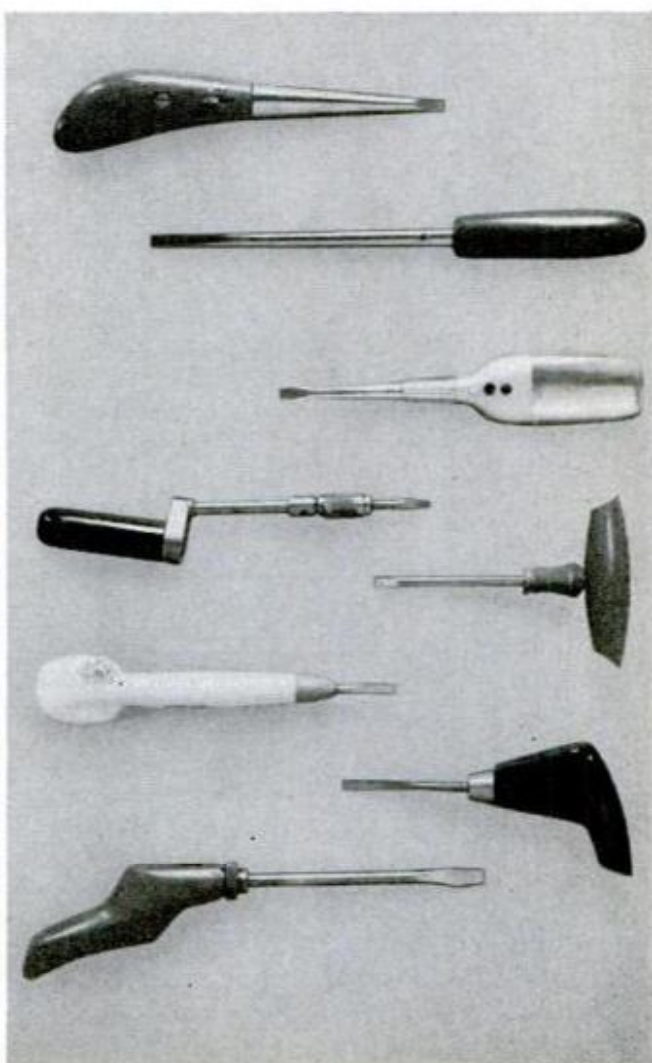
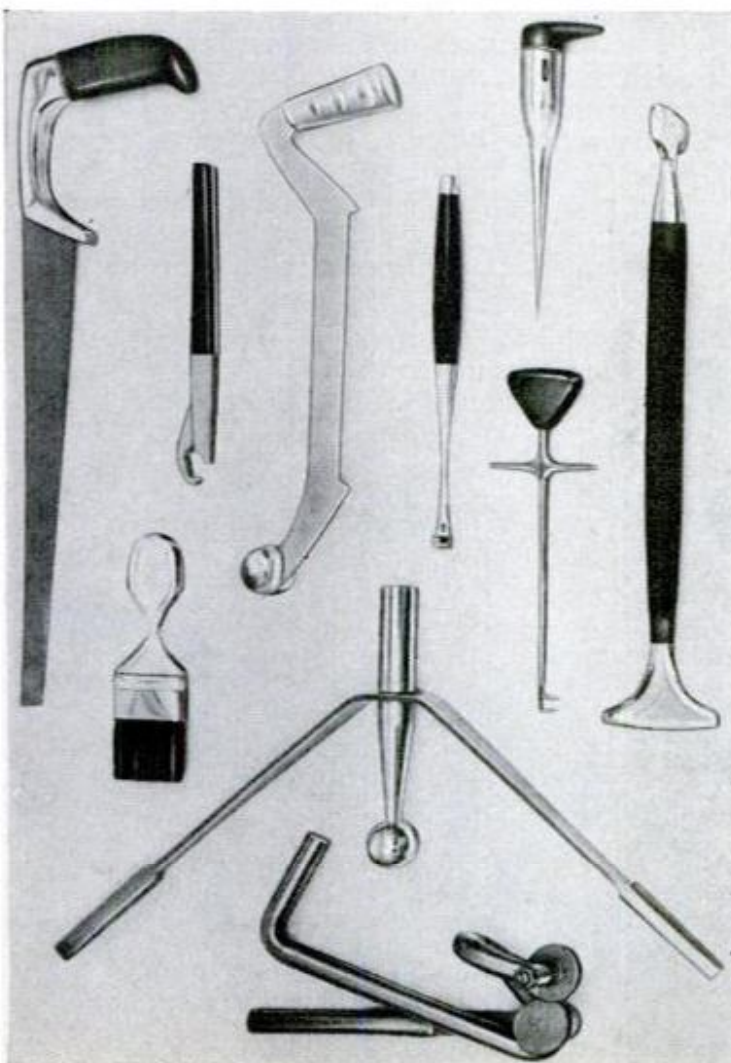


INSIDE-OUTSIDE CALIPER being made by student contains scale, reads directly as placed, thus simplifying making readings of a thin wall or inside readings taken through any small aperture



HAND TOOLS by design students include: pull saw that cuts on the up-stroke, making possible the use of narrower, thinner, faster-cutting blade; paint brush with replaceable bristles; backless hacksaw; and dental tool with tiny lamp powered by penlight cells

SCREW DRIVERS with built-in ratchet or crank drive permit the use of a variety of different handles designed to provide a firmer grip, better control and more torque. Some have fast-spin shaft which can be turned with fingers without changing grip





COMBINATION boring jig and power tool makes possible rapid installation of cylindrical locks in house doors by the builders of development houses

types (or a combination of them): the impact tool, the wedge, the lever, the connector and the scoop. Thus a hammer is simply an impact tool (the head) on the end of a lever (the handle). It becomes an extension of man's own "pounding" tool, the fist. An ax is precisely the same thing, with the addition of a wedge.

This back-to-basics approach forces a student to think of a tool in terms of its function rather than its superficial design features.

THROATLESS ELECTRIC sheet-metal shear cuts between two rollers and can follow any curve with little difficulty. It's simply steered onto sheet metal



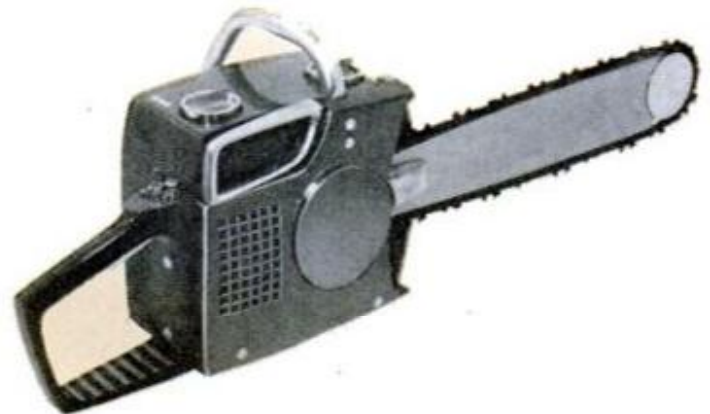
ELECTRIC MICROMETER uses tiny battery-powered motor to move anvil in and out, stalls at just the right pressure. Dial counter is spun by same drive system

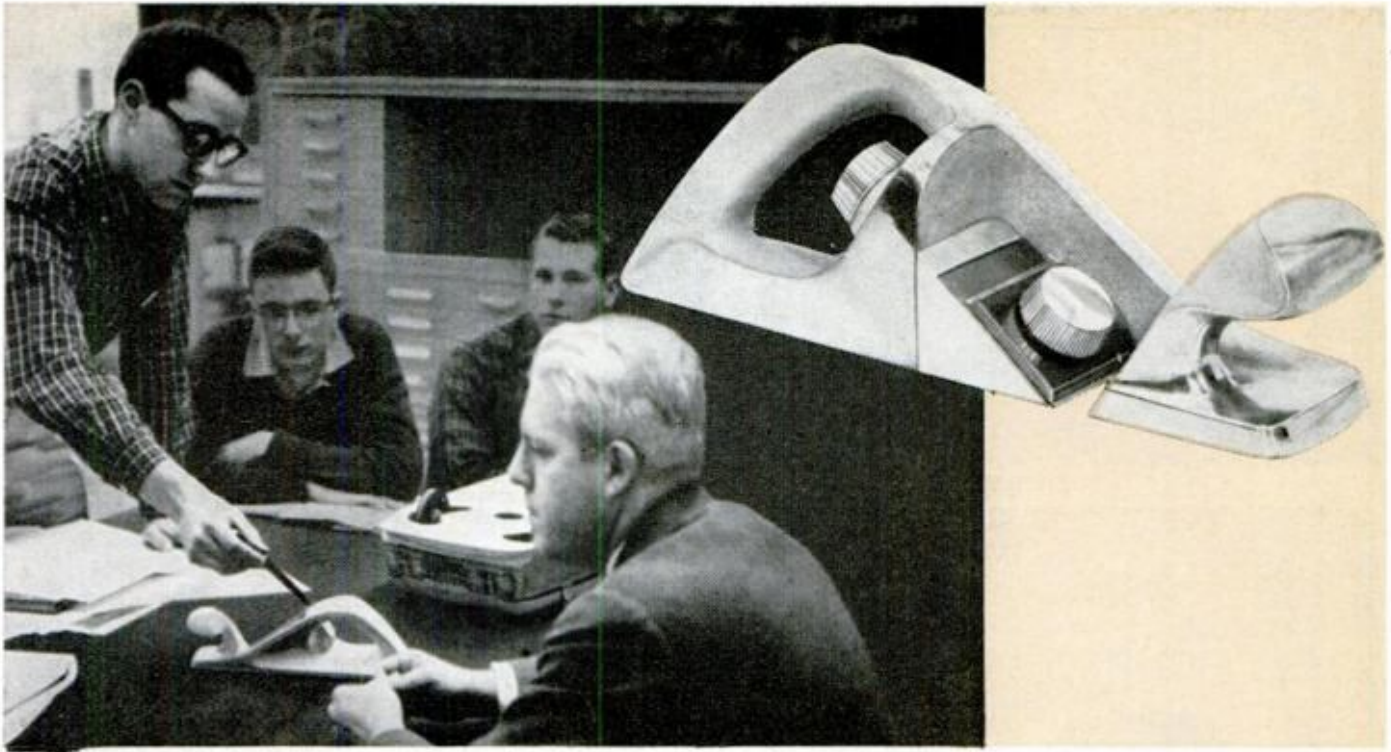
To prepare him for his project, he is first given a year-long foundation in the proper use of present-day tools, their capabilities, and the characteristics of all types of materials. For countless hours, in the school shop, he uses tools to shape all types of materials.

In his second year, he is ready to tackle his first tool project.

"We give the student as much freedom as possible," says Jim Montague, assistant professor, who teaches the class. "We tell

COMPACT CHAIN SAW is one third smaller than other models. Use of separate tanks for gas and oil makes possible continuous lubrication of all moving parts





ONE-PIECE FORGED FRAME makes this hand plane practically indestructible. Unusual four-sided blade can be rotated to a new edge when edge in use becomes dull. Blade rides on easily adjusted dial-controlled carriage

him to tackle anything he wants, as long as it is a hand tool and not a kitchen implement. On rare occasions I'll put the brakes on a project because the student is going down precisely the same road that another student has taken in the past. Otherwise, he is given complete freedom to tackle anything he wants."

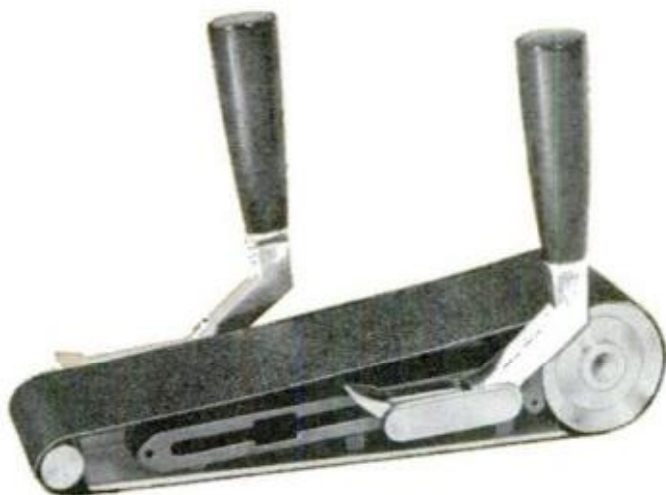
And the students tackle some surprising tools—everything from fluorescent tube removers (a similar tool now is available commercially) to a lug wrench for the car.

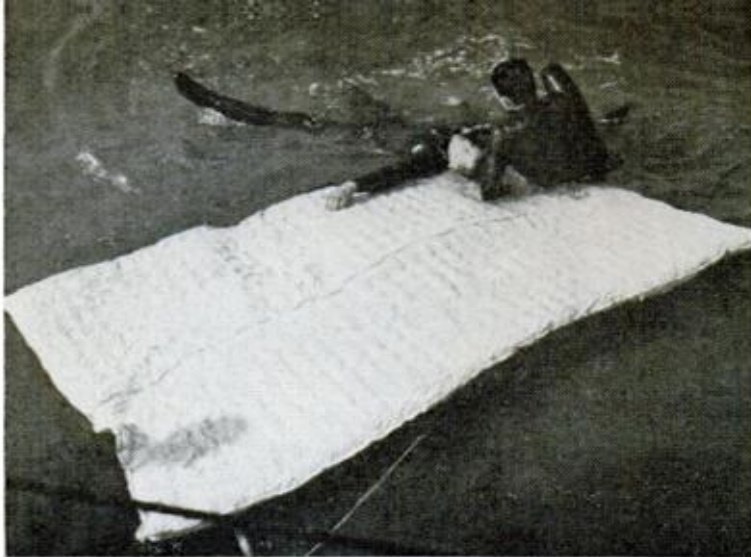
FLEXIBLE-SHAFT SANDER has platten face and free-floating face. Handles snap into different positions, and shaft attaches to either side of drive drum

In the latter case, even Montague was amazed at the results. "It's an object of beauty," he says, "yet who ever heard of a beautiful lug wrench? Furthermore, it works much faster than the conventional wrench."

After evolving an idea, the student must produce working drawings, solving all anticipated problems on paper before starting the model. He then constructs the tool in the school shop. Occasionally a student [\(Please turn to page 204\)](#)

CONDUIT CUTTER with snap-open frame fits around tube. Spring-loaded circular blades are spun against the tubing electrically, producing instantaneous cut





Plastic Rescue Platform

Coast Guard divers climb aboard a blanket of plastic foam during tests of a new life raft.

A catalyst and a resin are combined in a portable generator to form urethane foam, which, when shot into a cloth form, expands 30 times and quickly solidifies into a rigid structure. Several generators mounted on a large ship could create, in minutes, large rescue platforms in a disaster.



Domes for Dogs

Looking like a pair of bomb shelters, two new fibreglas dog houses are lightweight for easy moving, are easily cleaned, and—according to the manufacturer—they'll give any pup a feeling of status.

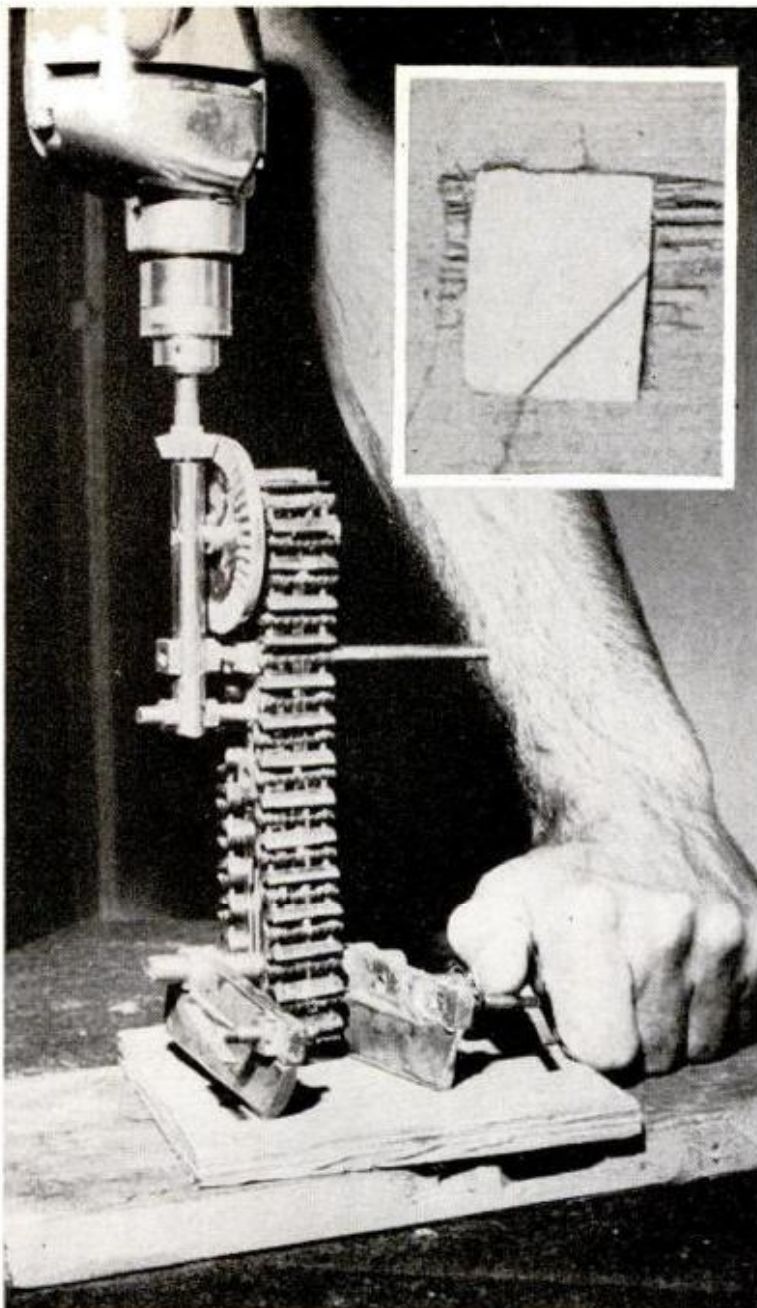
Available from Ronk Sales, 15003 Greenleaf, Sherman Oaks, Calif., Pet White House comes in two sizes. The smaller, 19 inches in diameter and 16 inches high, sells for \$19.95. The larger size, 30 inches in diameter and 33 inches high, sells for \$48.50.

Air Force Transport Modified for Rough-Field Operations

To supplement small VTOL aircraft capable of operating from unprepared fields in brushfire wars, the U.S. Air Force has rigged a 30-ton transport, the Fairchild C-123 *Provider*, so that it can land within 1400 feet even on sand 14 inches deep.

The rigging includes two jets mounted outboard of the regular piston engines, for extra boost on takeoff, a high-flotation wide-track landing gear, for extra buoyancy on rough fields, and a parachute for extra deceleration on landings.





Square Holes for Square Pegs

Making square holes for square pegs is no trouble at all with a square hole cutter invented by John Kozak of Brooklyn, N.Y.

Designed to be attached to a portable electric drill, the cutter is like a tractor tread of 40 units. Each unit contains two cutting edges, one with scoring teeth to soften the wood and the other with a sharp edge that cuts holes from one-half inch square to three inches square.

Multi-Purpose Wheelbarrow

It can be used as a wheelbarrow, or as a spreader for seeds, salt or fertilizer.

Controls on the handle operate a flow-gate at the front of the barrow which releases the material to be spread onto a rotor. The rotor, mounted against the tire, whirls—spreading the material up to five feet. It's made by Ardco, West Point, Pa.



One-Man Shelter

Sportsmen could use it, but the U.S. Marines now have it.

It's a one-man sleeping bag and tent combined. Made of water-repellent nylon with a rubberized bottom, it has a built-in foam mattress and a snap-in dacron liner for cold weather.

Tent pegs anchor it in place, three struts keep the sides erect and glass-fiber wands support the front and rear. There's also a built-in mosquito net and a zipper on the flap.

The shelter is large enough for a six-foot Marine and his gear. It weighs 6 pounds 9 ounces.



I'll Run a Record Mile

By Jim Beatty

As told to Joseph N. Bell

Even as you read this, Jim Beatty may be making his bid to set the promised record in the outdoor mile. Here's the strategy that he'll use. It's a method that paid off last year when he set an indoor mile record—the first under four minutes



BREAKING the tape is a habit for Beatty. His aim now is to run an outdoor mile faster than current record of 3:54.4

I EXPECT to set a new world record in the mile run before the 1964 Olympic Games. The present record is 3:54.4, held by Peter Snell of New Zealand. I plan to break 3:54 and I may do better.

I don't make this prediction boastfully. It's just that I think I have a fairly good idea of my capabilities, and I know that the quality of the coaching and competition I'll have in the next two years will offer me maximum opportunity to set a mile record.

I broke two world records last year—and "re-broke" one this year. In 1962 I ran the first indoor mile in history under four minutes and broke the world outdoor record in the two-mile run. In February of this year, I lowered the indoor-mile record to 3:58.6. *These record-breaking races didn't just happen.* They resulted from months of hard work and preparation—by my coach, Mihaly Igloi, my teammates at the Los Angeles Track Club and me. I got the glory, but it was a team accomplishment.

How does a runner set about deliberately to break a world record? And how can any achievement as personal and individual as a running record be chalked up as a team effort?

The answers, in my case at least, are: good coaching, good training and good competition. There may be talented runners who can set records without one or more of these elements. I'm not one of them.

Hungarian Genius

The coaching comes from Mihaly Igloi, a Hungarian genius who is probably the greatest coach of distance runners in the world. Igloi was one of the coaches of the Hungarian team in the 1956 Olympic Games in Melbourne, Australia. Igloi and his champion distance runner, Lazlo Tabori, had no stomach for Hungary after the failure of the revolution. So, instead of going home after the Melbourne Games, they came to the United States.

I first met Igloi when he trained Tabori at my college—the University of North Carolina—for several months. After watching him in action, I knew I wanted him to coach me some day. He is that rare combination of a once-great runner who can teach what he has learned.

The competition comes from my teammates at the Los Angeles Track Club, a group of runners who are anxious to put the United States back on top of the world in the distance races. All of us knew that teamwork was necessary, so—with the help of some Los Angeles businessmen who share our aims—we got together, formed the Los Angeles Track Club and hired Igloi as our coach.

The value of training with men like Tabori, Bob Seaman, Jim Grelle, Bob

Schul—and other top runners who have worked with us at the Los Angeles Track Club—is almost incalculable. Often I've seen one of these men blow his own chances to win a race in order to help a teammate who has a clear shot at the record. They've done this for me.

Training—the third essential element—is by far the toughest. But there is no substitute for it. It means an exacting schedule for a group of men who have to work for a living—as all of us at the Los Angeles Track Club do. I'm up at 5 o'clock every morning. At 5:30 I meet Igloi and the rest of my teammates at a high school track that is just a few minutes from my house. We work out until 6:30—often in the dark. Then I go home, shower and have breakfast with my wife at 7 o'clock. At 7:30, I'm off to work at the Allstate Insurance Company in Los Angeles, where I'm employed as a claims examiner.

At 4:30 P.M., when my working day ends, I drive to the track at the University of Southern California where I work out with my teammates from 5 to 7:30. I get home at 8, and I'm ready for bed by 10 o'clock. On Saturdays, I work out for three hours, and on Sundays for two.

This is rugged, but it's the price we must pay to attain the objectives we're after.

Now, what about the records? How did we go about breaking them? And how do we plan to attack the mile record presently held by Snell?

My first world record was the indoor mile, set at the Los Angeles Sports Arena on Feb. 10, 1962. I was improving steadily in the Fall of 1961, and about three months before this meet, I said to Igloi:

"I'd like to be the first man ever to run the mile under four minutes indoors. Do you think I can do it by the end of this indoor season?"

Igloi told me: "I think you can do it, but I don't know if there is time enough this season. We'll see how things go."

Instructions for Winning

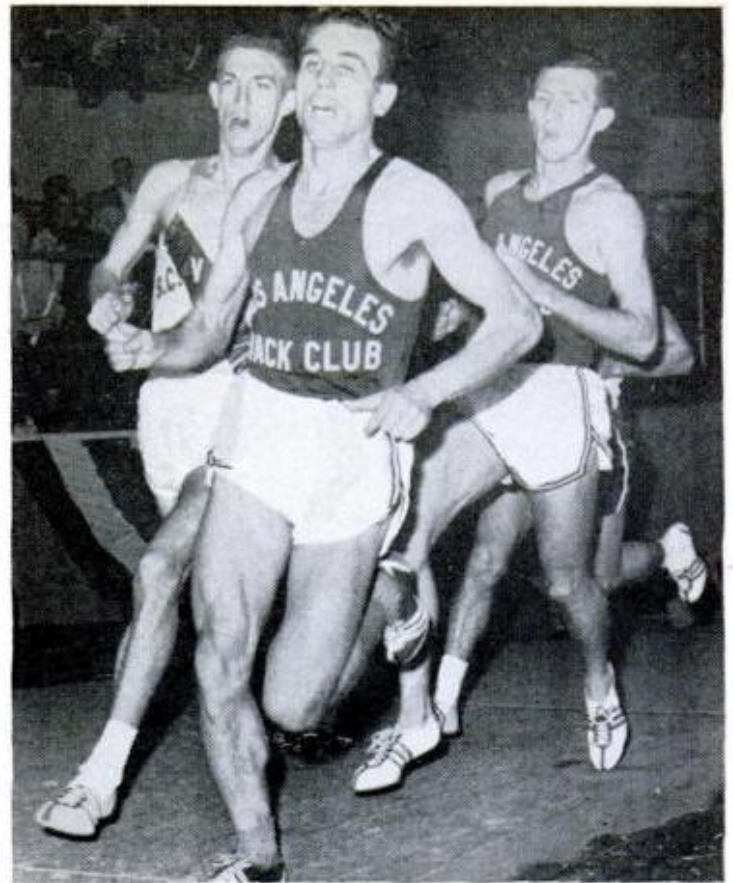
As the time for the meet approached, we all knew the training was going well and that we had a good chance. Igloi entered three of us—Tabori, Grelle and me—in the mile at the Los Angeles *Times* meet on Feb. 10. He watched us warm up, then called us off the boards and gave us our final instructions for the race.

"Tabori will lead the first quarter. Beatty leads the second. Grelle will lead the third. Jim, I want you to run your quarter in 60 seconds flat. You're on your own in the last quarter. You can break the world record. Good luck."

The race went almost exactly as Igloi had planned it. Tabori led his first quarter



GUIDING GENIUS behind the new records is Mihaly Igloi, (left) expatriate Hungarian. At a practice session he makes plans with runners Tabori and Beatty



LEADING THE PACK, Laszlo Tabori sets a blistering pace that may exhaust him before end of the race, but will pull his teammate closer to world record

in 58.5; I ran mine in 60.5; and Grelle followed with a 62 third quarter, which made us about $1\frac{1}{2}$ seconds slow at that point. As we raced into the final quarter, Tabori and Grelle fell off the pace, and I pulled away from them.

That night in Los Angeles, I was very strong. Although the last quarter was supposed to be a dog fight between Grelle and me, Grelle—like Tabori—had spent himself too much in running his assigned time. So I breezed in by about 60 yards over Grelle, crossing the finish line in 3:58.9—the fastest indoor mile in history, and the first sub-4-minute mile ever run on the boards.

The two-mile record was set at the Southern Pacific A.A.U. Championships at Occidental (Calif.) College in June of last year. It was planned about the same way as the indoor record mile—only with a slightly different cast of characters. This time, my teammates who prodded me to a record were Grelle and Bob Schul.

At Occidental, I was to lead the first half-mile (two laps) in 2:04. Then Grelle was to take over and lead for the second half-mile, closing out the mile in 4:13. I was to lead the fifth lap, then Bob Schul was to take over on the sixth lap. This was a crucial point; Schul's job was to get us through the sixth lap on time so that the rest of the run would be downhill—then he could drop out.

Again, the race went pretty much as we had it planned. There were eleven runners in the field, but we left them behind almost immediately. A 61-second first quarter in a two-mile race is certain to pull far away from the pack, and that's what happened. Grelle, Schul and I had things pretty much to ourselves from there on in.

Traffic Jams

We wanted it this way because traffic jams can cause plenty of trouble, especially when a runner is shooting for a record. Just a few weeks before—during the trials for places on the American team in its dual competition with the Russians this summer—we got fouled up twice in traffic jams in the 1500 meters. At the start, everyone broke for the pole and I got caught back in the pack. My teammate, Bob Seaman, was directly ahead of me and I shouted several times at him to let me through, but he didn't hear me. Finally, I rapped him on the back and shouted, and he heard me and let me pass inside of him.

A lap later, Jim Grelle was leading and I was supposed to take over. But I was once again caught in a pocket—with Grelle in front of me, another runner behind me and two others on the outside of me. So I had to yell to Grelle to speed up and pull over so I could get through.

We had no such problems in the record-



ON HIS WAY to a world record for the two-mile indoor run at the Los Angeles Times Meet, Jim Beatty has already been paced into the winning position by his teammates who run according to coach Mihaly Igloi's advance plans

breaking two-mile at Occidental. Both Grelle and Schul (who finished the race and came in third) performed exactly as planned, and once again I had the finishing kick that pulled me away from Grelle and brought me across the finish line in 8:29.8—more than two seconds faster than the world record set by Albert Thomas of Australia in 1958. It was also better than the 8:30 run last year by New Zealand's Murray Halberg—which hadn't yet been officially recognized as a world record.

Each time we go after Snell's mile record, we'll use the same sort of teamwork. But this project will be tougher—much tougher—because all of us will simultaneously have to produce the limit of our capabilities, and maybe just a little beyond. My best time for the mile—made in Europe last summer—is still 2.3 seconds from Snell's record. But it has been edging steadily downward in all the distance races under Igloi's coaching, and I expect this improvement to continue.

The chances are overwhelming that if we do break the mile record before the 1964 Olympics, it will be planned and executed under Igloi's direction. The possibility that it will happen unexpectedly in straight competition—even against Snell—is fairly slim. It's difficult for a runner to pace himself cold-bloodedly—in the manner he must to go after a record—in the

emotional excitement of competition.

The record-breaking mile—when we run it—will probably involve Tabori, Grelle—possibly Bob Seaman—and me in the same sort of pattern that worked so well when we broke the indoor record. The exact *modus operandi* will be up to Igloi. He'll tell us when the right time comes. But one thing is certain: the crucial point in our record-breaking mile will be at the three-quarter mark. To better Snell's record, we'll have to run a very fast three-quarter mile, and this is going to take split-second teamwork and a powerful extra measure of effort.

Record Within 18 Months

Although it's a very long limb on which I'm climbing, I predict that one of us at the Los Angeles Athletic Club will set a new world record for the mile within the next 18 months.

One other important point should be made very clear, however. Those of us who are working night-and-day to improve our running skills are not primarily out for records. We're out to put the United States back on top in the distance races in international competition. This is our first goal, the one that is always before us.

We plan to start with the outdoor mile record. Soon. ★★★



Grandstand Play

Army munitions men are now developing Big League potential by snagging artillery shells in midair. Their fielder's mitt is a cellular plastic material, Ensolite, developed by U.S. Rubber.

A supersonic rocket sled, packed with the sponge, is fired along a four-mile range. It electronically fires two 155-mm. shells and catches them (one is shown embedded in the plastic) for study.



Mauler Gets Tanked

Developed as an anti-aircraft missile system, the Army's new Mauler—a solid-fueled rocket—is mounted on a tanklike vehicle.

Entirely self-contained, the system includes a radar unit which guides each missile individually from the missile rack to the low-flying target.

Its targets will usually be tactical aircraft that bomb or strafe front-line troops.



Goose on Stilts

Successful tests in Long Island Sound by the Navy with a JRF-5 Grumman Goose have proven the feasibility of equipping amphibian aircraft with hydrofoils for safer and more efficient operation in rough water.

The Goose has a single high-speed hydrofoil under its keel, and two skis extending beyond the bow to stabilize plane during takeoff and landing.

Hydrofoils have been used successfully on boats for smoother and speedier rides. The Navy hopes to convert these advantages to use with aircraft.

VW Sedan Becomes Camper

A Volkswagen sedan converts into an overnight sleeper for two with a kit of equipment that includes a new rear seat and back rest. For sleeping, the front seat is removed and a padded cushion installed (middle photo). The cushion's foundation board attaches to the front bumper for a meal-time table (bottom).

Also included in a veneer panel is a radio receiver and a clothes closet (top), the door of which makes an interior table. The kit is available from VW dealers, or the manufacturer, the S & H Cab. & Mfg. Co., 2508 Merced Ave., El Monte, Cal., \$295.

Weatherproof Gangplank

Stealing an idea from airport terminals which now use covered, telescopic tunnels to take passengers from the terminal building directly into the aircraft on the ramp, a railway station at the Bremerhaven (Germany) boat dock has such a tunnel for its passengers.

They can step directly from the station into the tunnel and onto the docked ship without ever being exposed to weather.



HOBBIES à la carte

In these new outdoor arenas hobbyists can do everything from racing in karts to launching rockets

By John Reck



THE TROUBLE with some hobbies is that sometimes you have no place to hobby. Model airplanes need room to fly, model boats need water to float, model racers and karts need tracks and rockets need launch pads.

A New Jersey hobby-shop operator solved this problem for hobbyists—by buying 11 acres of land and laying out facilities for all of them.

The hobbyists get in free. Spectators—and as many as 1500 show up on week ends—pay admission. It helps pay the bills. So does the hot-dog stand.

Located near Parsippany, N.J., this mecca for model makers included three circular fields with 25-foot diameters for small-scale model airplanes, and two larger 90-foot and 100-foot-diameter fields for large-scale models.

Nearby is a rocket-launch pad, with all the necessary safeguards (including an adult supervisor who sets the order of firing and the allowable altitudes). Most nose cones are recovered by parachute, and some contests are run to bring the cones down within a prescribed area.

The kart track has the usual oval, plus a spur leading across a creek to winding curves through a wooded area.

The creek itself leads to the boat pond. The pond has a circular area for high-speed hydro racing, as well as room for the more placid sailing of scaled-down radio-controlled replicas of graceful yachts, tankers and midget naval craft.

Finally, there is a circular track-within-a-track for model race cars, the smaller models using the inside track.

The airplane fields, the pond and the rocket pad are sites of unusual activity. Model “pilots” dog-fight their planes, which are controlled from the end of long wires, trying to cut off paper streamers attached to the tail of each plane. Or they play “follow the leader”—a “rat race” in which several planes try to duplicate feats performed by the lead plane.

At the pond, grown men slosh around waist high in water to launch their miniature racers or replicas. The hydros are tied by wire to a center post and race in circles at speeds that come close to 100 miles per hour.



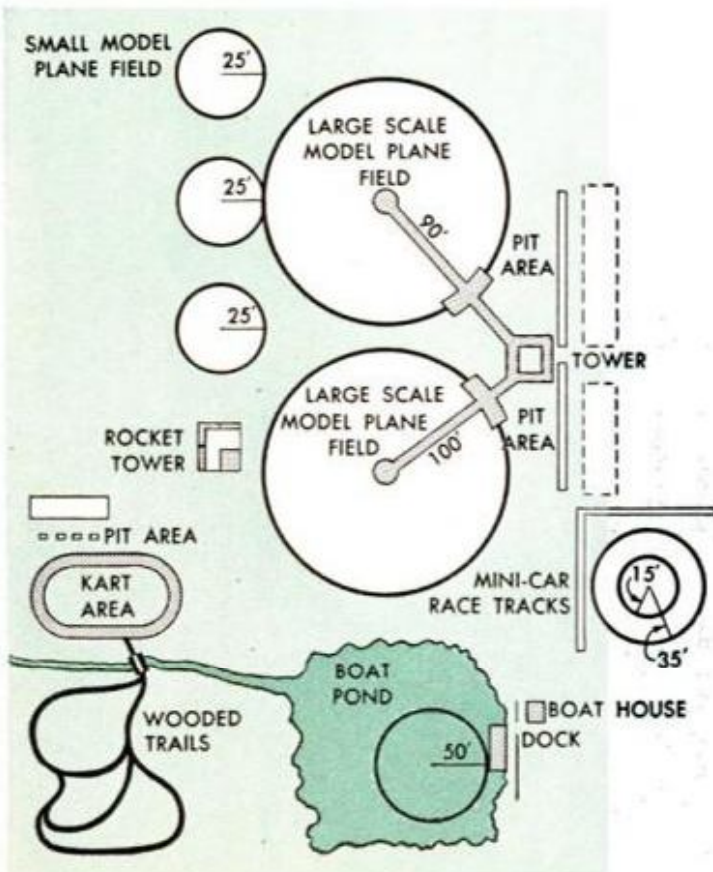
RACING HYDROS are tied by wire to center post and speed around it. No one knows why, but most model boats are built and launched by older males

LAUNCH PAD attracts younger boys, rigidly supervised by adults. Most rockets are one foot long and use solid propellants to reach up to 500-foot altitudes

KART TRACK has easy oval for beginners, plus winding obstacle course through woods, for advanced karters. Kart track usually attracts younger crowd

BOAT POND also has room for miniature replicas which are usually radio-controlled from shore. Their activities are much more sedate than racing hydros

HOBBY PARK in New Jersey may set new trend, like miniature golf courses. Hobbyists of all kinds can congregate and practice their hobbies on one site

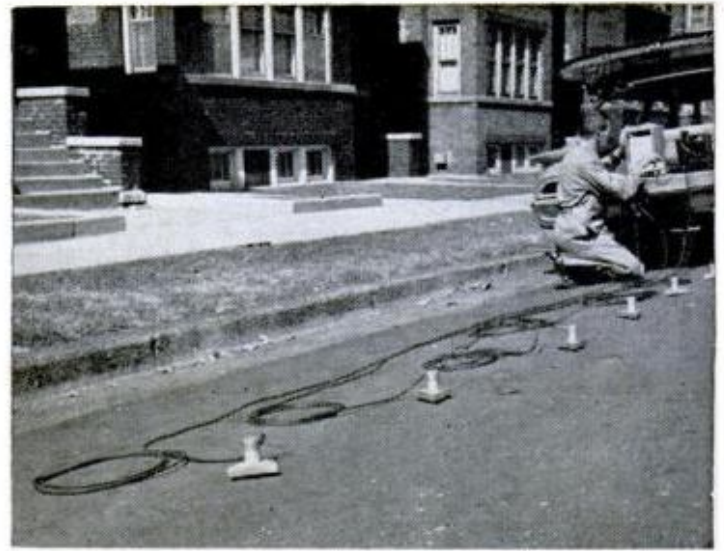




Rail-and-Road Rider

Two sets of wheels, one for railroad tracks and one for the road, are featured on a versatile towing vehicle.

The Trackmobile can switch cars in a freight yard then, on its road wheels, tow shop carts or trailers. With necessary attachments it can also be used as a snow plow on either road or rail.



Spot Gas Leaks with Sound

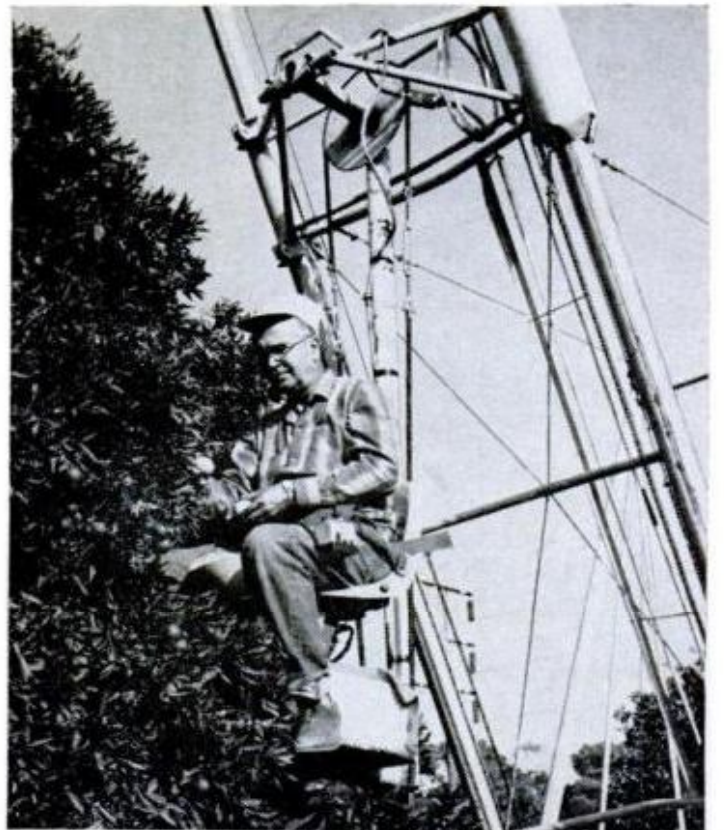
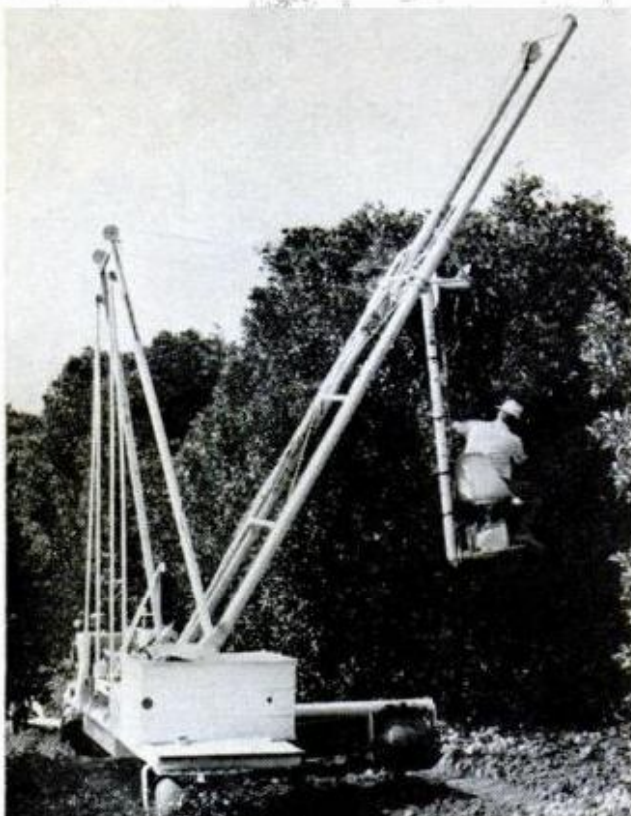
Surface detection of leaks in gas mains is possible with a sonic technique. A pure sonic tone is injected by generator into the gas in an area of suspected leakage. Then transducers strung out on the surface detect sound waves from the leak. The system is a development of the Institute of Gas Technology, Chicago, Ill.

Fruit Pickers Try Boom to Zoom to Target

Easy picking of citrus and other fruits is the aim of a "tree-working machine" now being developed by a team from the University of California and the farm equipment industry.

Essentially a moving chassis supporting a boom and hoists, the machine moves a

picker in a bucket seat in any direction, up, around, or into the tree—at the flick of any one of six buttons or even the shifting of his own weight. The three-wheeled vehicle moves in any soil, guides itself down rows by disks set in ditches and leaves the operator with two hands free for picking.





It Wouldn't Crack an Egg

Demonstrating its sensitivity of control, a 10,000-horsepower aircraft-tire testing machine holds an egg (raw) steady against one of the test tires without cracking it.

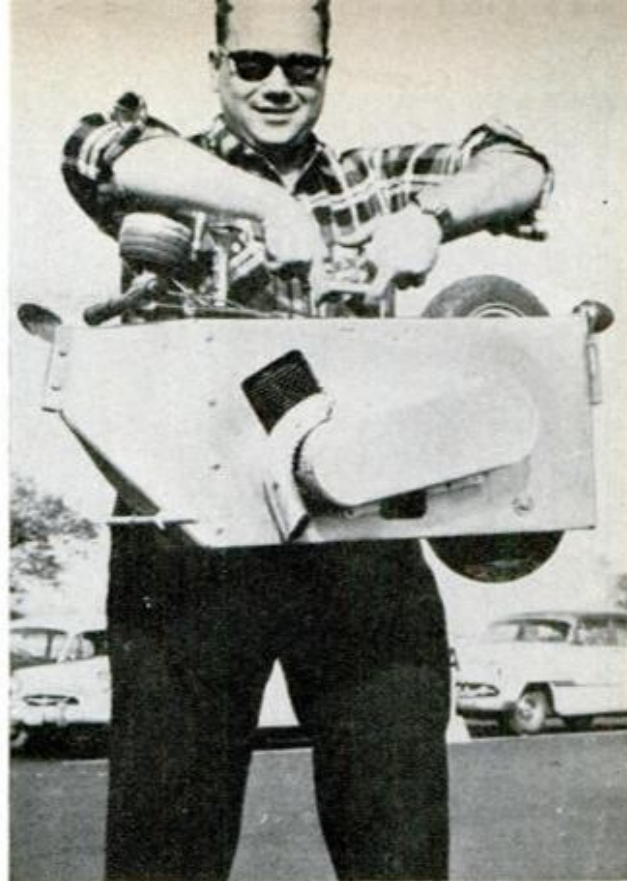
The machine is designed to submit tires to conditions more severe than any tire will experience in actual use, operating at speeds up to 400 m.p.h.

Fin Art Studio

Dead fish can be art, demonstrates Bruce Parks, a diver for Marineland of California, who makes color prints of them. Using Marineland specimens, he dries each fish, places it on a table and paints it with water-soluble ink. A piece of rice paper is pressed over the fish to make the print.



APRIL 1963



Suitcase-Size Bike

Folding to the size of a suitcase, a 45-pound homemade motor scooter is used by a private pilot to commute to and from his plane at a 25-m.p.h. clip. Dubbed the "Leap Frogger" by its inventor, Richard Baj, Hartford, Conn., the one-piece aluminum-body scooter was built in just three weeks at a cost of \$125.

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TRIUMPH'S SPITFIRE 4



A ROAD TEST REPORT

By Michael Priestley

STANDARD TRIUMPH'S new Spitfire, based on the Herald 1200's lively four-cylinder engine, backbone chassis and independent suspension all around, is as eager as its Italian (Michelotti) styling suggests. Top speed is 93 miles an hour.

I found the entry fairly easy and interior space satisfactory. Although the seats are comfortable, they're a bit short and lack thigh support. Driving position provides "straight-arm" steering and plenty of leg-room with adjustments on the steering column and seat. The gas pedal could be three or four inches farther forward. The pedals are crowded and a driver's left foot must lean on the dimmer switch. Headroom is remarkably good, however, for a car only 47½ inches high over-all. A tachometer is standard, but oil-pressure gauge and ammeter are not original equipment.

0-60 in 16 Seconds

On the open road, the TR-4's pretty little sister displays brisk performance and outstanding road holding. The 70-cubic inch, overhead-valve engine with twin SU carburetors and a 9:1 compression ratio delivers 63 horsepower at 5750 rpm. With only about 24.7 pounds of car per horsepower, you'll accelerate from 0 to 60 in about 16 seconds.

The smooth, four-speed gearbox has an almost unbeatable synchromesh on the top three. First gear's maximum, 25 m.p.h., is satisfactory but second, reaching only to 45, leaves too big a gap—up to 68—for third to cover. Front-wheel disk brakes are standard equipment.

Ride is firm but never too harsh and there's little body roll. Fast cornering is easier with a well-balanced independent suspension—coil springs, telescopic shocks, anti-roll bar in front. There's a swing axle with a transverse leaf spring and torque rods in back. First impression is a marked understeer, but as cornering stresses build up, this gives way to slight oversteer. Even so, the Spitfire is a delight to drive on twisting rural lanes (an English specialty). Light, positive rack-and-pinion steering is steady at any speed, even in heavy crosswinds. It turns, curb-to-curb, in 24 feet.

The Spitfire will be formidable competition for both MG's Midget and Austin-Healey's Sprite. Neither the Sprite nor Midget have roll-up side windows for comfort-loving Americans; the Spitfire does have them.

The test car shrugged off cold, wet weather. The soft top was easy to erect, snug, weatherproof and silent. Driven hard throughout *PM's* test, the car averaged 24.5 m.p.g.; over a year's ordinary driving, I'd expect close to 29 m.p.g. Premium gas is needed.

Luggage space—6.7 cubic feet in the trunk plus room for a large suitcase behind the seats—is good for a little sports car (wheel-base, 83 inches; over-all length, 145 inches; width, 57 inches).

For the home mechanic, working on the Spitfire will be easy. The whole hood—including fenders—is hinged at the front and lifts to expose the engine and front suspension. The price: \$2199 P.O.E. on the U.S. East Coast, \$2249 on the West.

They Won't Bury Paul Bunyan

Peavey pushers still ride the timber
In spite of a new army of clanking
Juggernauts that work our forests

JIGGER JONES," says Historian Stewart Holbrook, "was as typical a lumberjack as you would ever find. It has been said that he could walk a felled spruce, barefoot, and kick off every knot from butt to top. I don't know about that, but I know that he could hit a man's eye with a chaw of tobacco at five feet, that he could drink a full gallon of a terrible liquid he called "eagle sweat," and that he could chop a tall tree with such precision that when it fell it would drive a stake previously set into the ground."

He has been dead almost 35 years, but Jigger Jones of Holbrook's book *Holy Old Mackinaw* is still part of an American epic that spawned the likes of Mighty Jim Fisk, Roaring Jack Boyle, the folklore of Paul Bunyan and his blue ox, Babe.

Diesel fuel and steel cable have replaced the blood and guts of the old-time jack. Logging has become the lumber industry. Bulldozers, giant fork lifts, huge hydraulic shears that snip a 19-inch tree bole as though it were

HORSES and wooden sleds are still used in parts of Maine to haul cut logs out of the woods, and loggers still race over treacherous log jams to loosen the key log that will send a million tons racing downstream





HYDRAULIC SHEARS (left) have replaced the ax and saw, cutting a 19-inch tree like paper. Mounted on a tractor, one set of scissors downs the tree while another bucks it into pulpwood lengths. A fork truck (center) hurls logs around with ease. A powerful tractor (right) rumbles over a snowy road moving a load

PAUL BUNYAN would find more than a match in the huge Caterpillar fork that can scoop up a log of any size and take it anywhere. It has been the continuing development of these monster machines that has changed lumbering



already paper—modern equipment more powerful and efficient than a dozen Paul Bunyans has hastened the demise of the logger. But there are a few places where he still manages to exist.

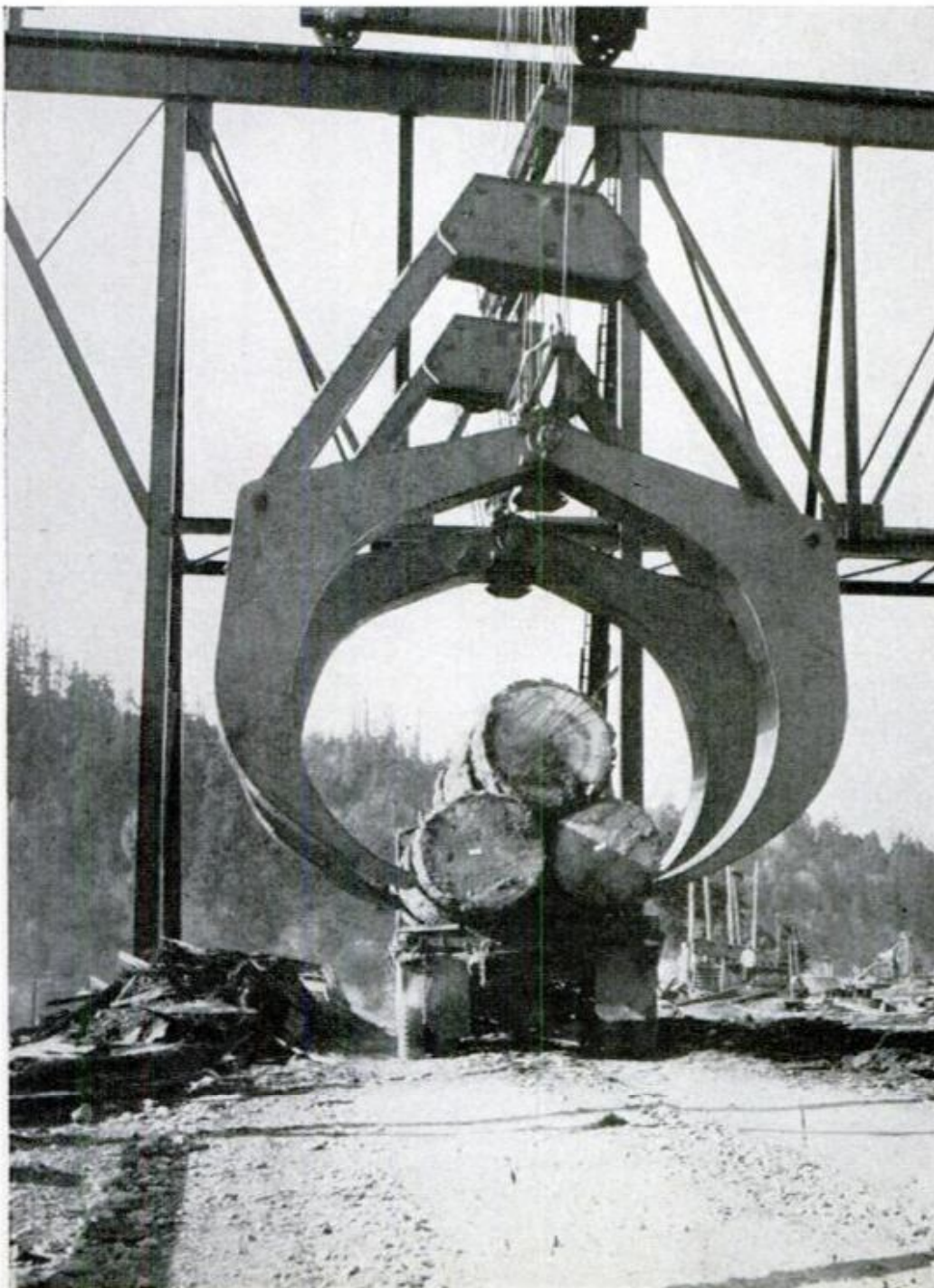
When the spring waters rise in Maine's Machias River and Idaho's Clearwater River, the river towns still hear the drumming roar of the log drive as millions of tons of timber are guided to the sawmills by those daredevils of logging—the white water men.

The Machias River drive dates back to the heyday of lumbering in Maine, the early 1800s, when the legends of the jacks were being made. In those days the jacks went into the woods in the fall and came out like wild-eyed maniacs in the spring.

They were tough, footloose men whose sole possessions were two red shirts, steel calked boots, wool trousers, a stocking cap and a two-bladed ax. It has been said that a good chopper always slept with his ax under his pillow. He worked hard, with death at his shoulder, and he fought like a lion. The scars of "logger's smallpox" were made by the steel-calked boots, and a man wasn't a man unless his body was peppered with holes.

Today's jack still reflects the ruggedness of his forerunners when the drive down river comes each spring. And good white water men still are local heroes. Logs sail downstream and the loggers follow. When there's a jam they race across floating tim-

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



RESEMBLING science fantasy, another example of modern logging is a pair of giant pincers on a movable track that come down to pluck several tons of timber from a truck bed

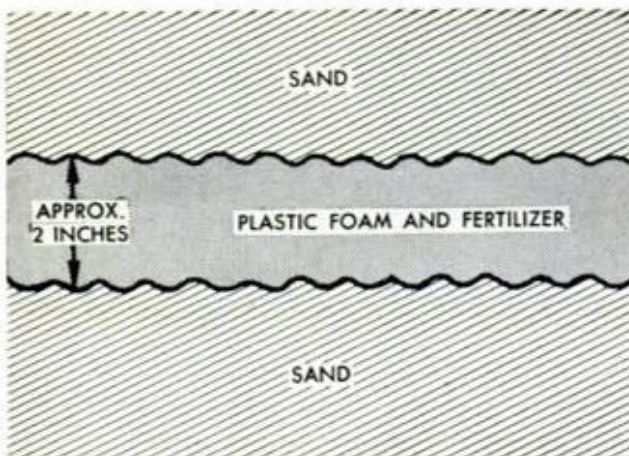
Plastic Subsoil for Deserts

Centuries ago the Mediterranean deserts were lush with vegetation, and modern plastics may make them fruitful again.

A German engineer is testing—with success—a theory that if a layer of subsoil were to keep water from seeping off and furnish nourishment to the topsoil, the desert could be cultivated.

Foamed plastic combined with liquid fertilizer is sprayed over the ground, then covered over with sand and tamped down. The test fields are then irrigated and, in the desert heat, they yield four harvests a year, chiefly orange trees.

In tests in Saudi Arabia, trees were planted in the plastic-prepared soil and more in the usual soil. These in the new soil prospered while the others died within a very short time.



Measured Thrill

It's official. City dwellers live under more strain than astronauts in orbit.

A miniature package of electronics strapped to drivers bucking traffic on expressways, riders on amusement-park roller coasters (above) and office workers who have doors slammed and paper bags popped behind them proves that their heart action, respiration rate and skin temperature exceed the stresses placed on astronauts during orbit.

The instrumentation pack was developed to measure stresses that might be placed on pilots in the Dynasoar space glider program. It was strapped to a plant engineer who drove on expressways. In ordinary traffic his heart rate was 79 beats per minute. On the expressway it rose to peaks of 111 and his respiration rose to 27 breaths per minute. John Glenn's heart rate ranged from 80 to 90 during his three orbits and respiration from 8 to 15.

During the roller-coaster ride (above) the girl's heart rate leaped to 171 beats a minute. John Glenn peaked at only 134 beats during the critical re-entry period.

Reverse English

In a one-man campaign to get dawdling drivers to speed up, a Michigan trucker painted a sign—"Get Going!"—in reverse on the hood of his truck. Now the message-in-reverse might get the slowpoke ahead to shift into high when he reads the sign in his rear-view mirror.

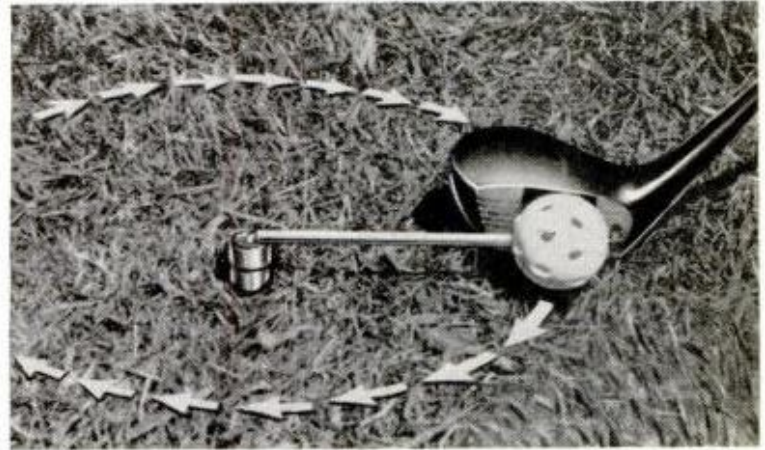


Boomerang Ball

Here's a practice golf ball that ends up where it began.

Attached by a slim rod and flexible joint to a stake that can be driven into the ground and easily removed again, the plastic ball is stroked and just swings around the stake, ready to be whacked again. No chasing.

The practice ball retails for \$1.95. It is sold by House of Ideas, 2710 Seventeenth St., Racine, Wis.



Even Non-Artist Can Dial a Sign Any Old Time

With the small-shop owner and small businessman in mind, a veteran of the printing arts has patented a dial-like device for sign painting.

It consists of a set of dials enclosed in a large, plastic housing which holds the

paint-spray gun. The dials have a series of odd-shaped openings imprinted in them. When the right combination of openings is dialed into position, the spray gun is triggered. The openings combine to form all the letters of the alphabet.



Breath of Air Steers 850-Pound Jet Cart

PFA—Pure Fluid Amplifier—beefs up the tiny air stream. PFA may also be the control for your next car's transmission or carburetor

BULKY, UNGAINLY and hard to steer. That's the Army's PFA car—and it's intended to be just that way. The jet powered cart has one purpose: Demonstrate how easily a "pure fluid amplifier" (PFA) can direct an almost unsteerable contraption of welded sheet iron and copper tubing.

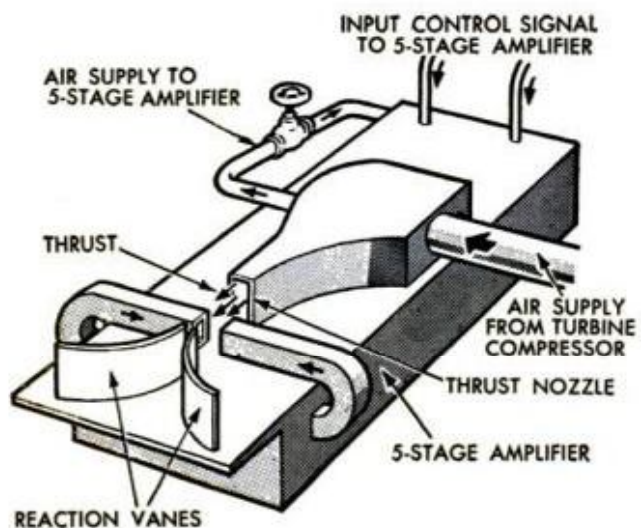
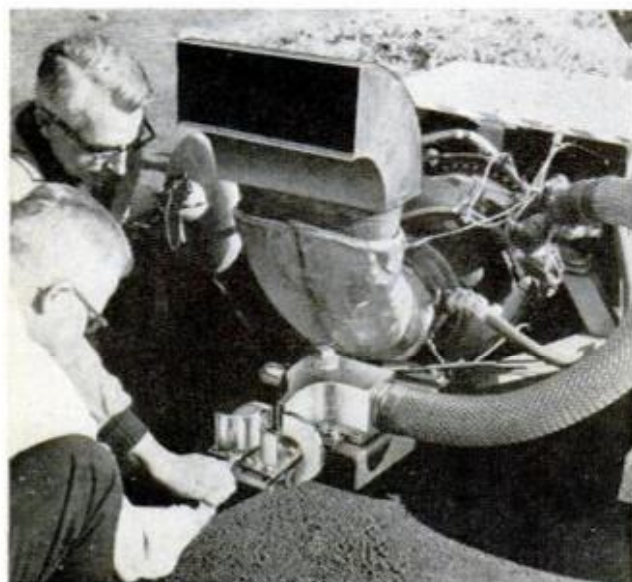
PFA can be compared to electricity. In both cases, an amplifier uses variations in small-power flow to create corresponding variations on a giant scale by letting the small one control the direction of the large one. In electricity, a vacuum tube does the job. But when the flow is liquid or gas, a fluid amplifier is the result. Without mechanically moving parts, it's a pure fluid amplifier.

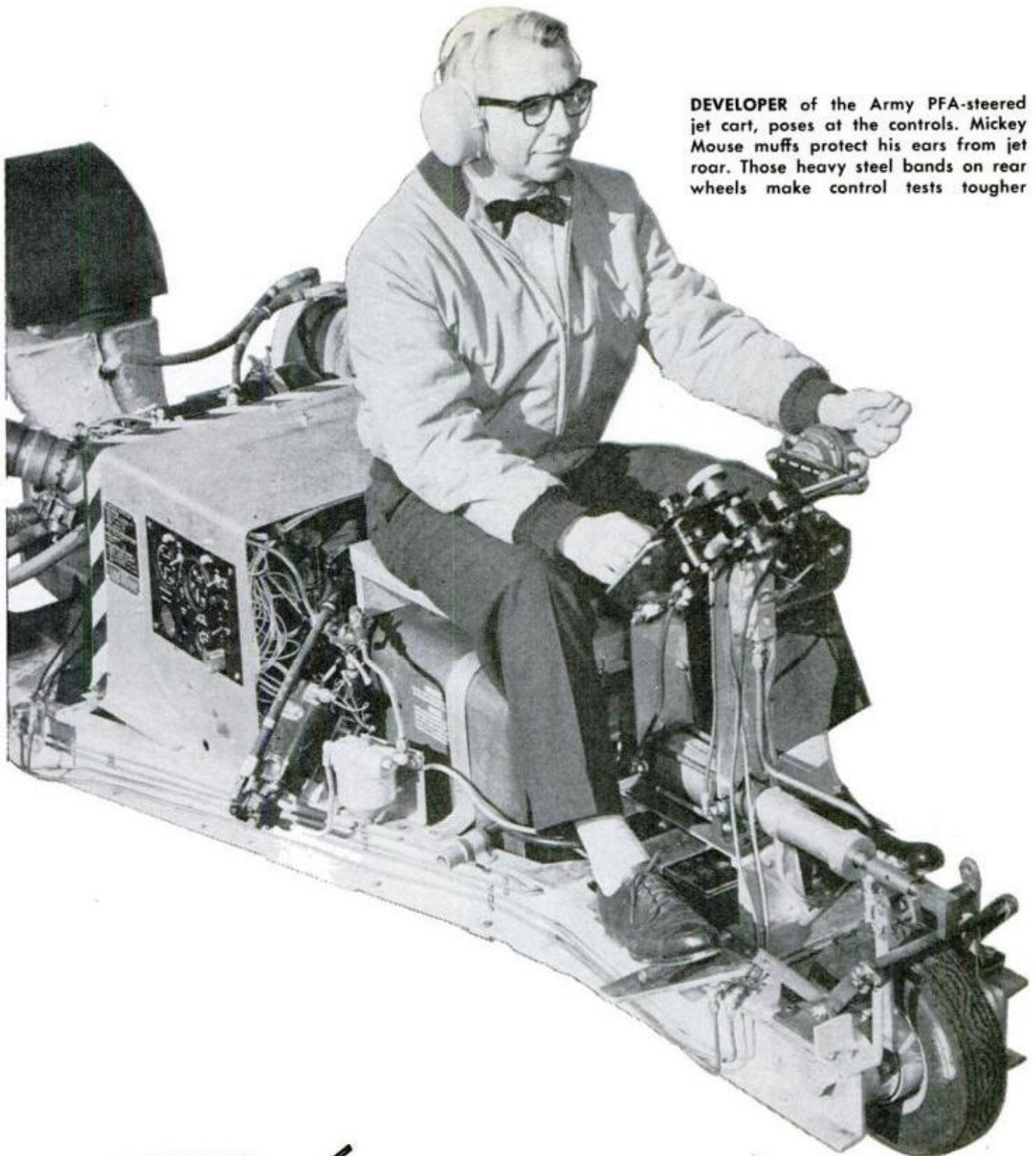
The phenomenal new system steers the lumbering, 850-pound three-wheeler with less than a sigh's worth of air power—literally. From the 40 pounds of turbine thrust that powers the PFA car, a tiny flow of 0.0045 pounds per minute is bled off and amplified several hundred thousand times to control the monster.

In each of five stages, a little jet blows from the side to deflect a much larger jet right or left. The deflected flow, in the next stage, is used to redirect still another stream of gases. At the end, the power stream itself is pushed from side to side for steering.

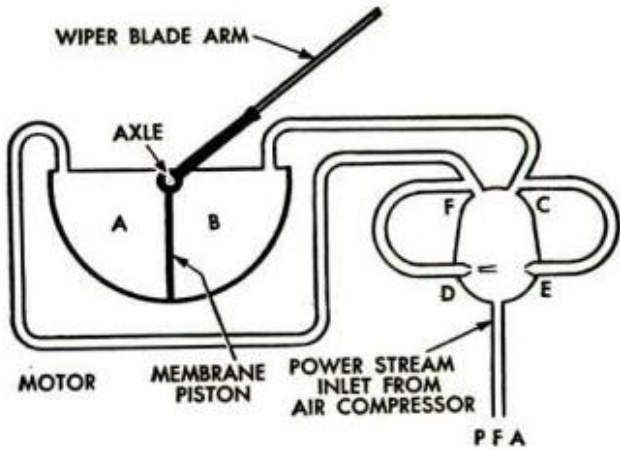
PFA's can be rigged to act as oscillators, rate-of-motion sensors, integrators, even logic circuits, all corresponding roughly to their electronic counterparts but using only fluids. Windshield wipers (below) provide a basic oscillator example. As the input starts up from the bottom, it goes largely to one side or the other. If, for example, it starts toward the left, a bit is bled off into the feedback circuit where it swings around to knock the main flow to the right. Shifting from side to side, the main flow operates the blade. Changes in geometry and loop length can vary the operation.

Non-flooding carburetors and automatic transmission controls are other automotive possibilities, all cheaper and easier to make than current versions and more reliable, say PFA partisans.





DEVELOPER of the Army PFA-steered jet cart, poses at the controls. Mickey Mouse muffs protect his ears from jet roar. Those heavy steel bands on rear wheels make control tests tougher



ARMY SCIENTISTS (far left) adjust the jet car's thrust deflectors. The small, vertical opening directs the jet's exhaust between PFA outlets so control jets can move it toward the deflectors

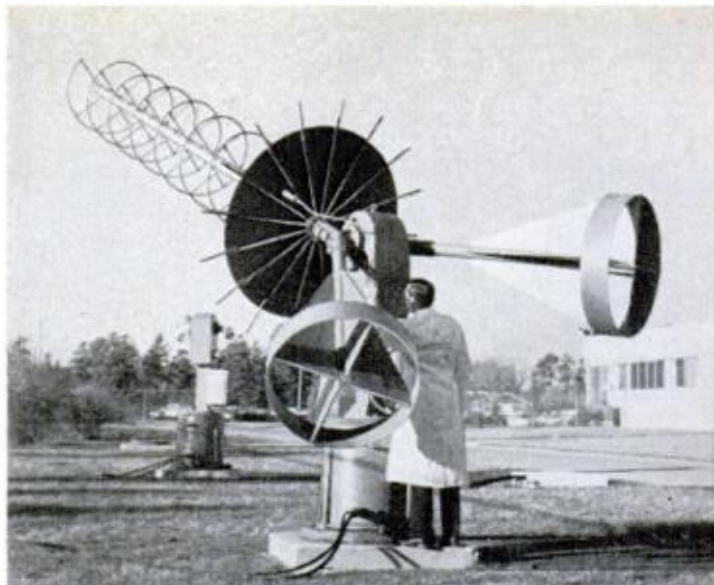
FAR DRAWING SHOWS how the 40-pound thrust of the PFA car's jet exhaust is directed between PFA outlets that shift it toward one deflector plate or the other to steer the noisy, cumbersome vehicle

SIMPLE PFA oscillator could operate wipers. If most flow starts toward chamber A, some by-passes through D to switch flow toward chamber B. Then the E by-pass quickly switches it back to A again



Tiny Craft for (Captain) Kid

For his two-year-old son, Douglas Haag of Manitowoc, Wis., designed and built a nine-foot plywood cabin cruiser. Powered by a six-volt automobile electrical system, the miniature craft is equipped with conventional steering and running lights.



Weather Reports from Space

Weathermen will soon "catch" pictures of cloud formations transmitted by orbiting weather satellites with an antenna that tracks the space vehicles. The antenna, by Fairchild Stratos, will receive reports on millions of miles of the earth's surface.



Electronic Fireworks

For an indoor spectacular, electronics will light up exhibits and product displays with simulated fireworks.

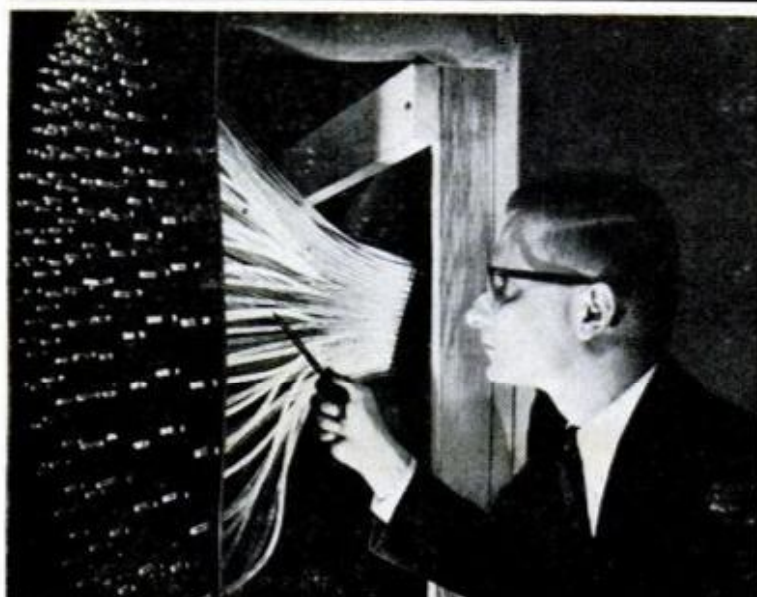
The system produces the visual effects of bursting skyrockets and showers of multicolored light (with sound effects) for about 6½ minutes without repetition.

One such display, a five-story, 36-foot-wide extravaganza of "patterned light" (top) was staged by a Philadelphia store.

Using the principle of fiber optics, the display bends and distributes light by means of thousands of tiny plastic rods (below) over the surface of the fireworks pattern.

An electronic control panel determines the sequence of color and pattern for the various firework bursts; it also synchronizes appropriate tape-recorded music and the sounds of swishes, whistles and booms accompanying fireworks displays. Various light patterns come in sizes ranging from five feet to five stories high.

Designed for indoor commercial and industrial use, the fireworks can also be used outdoors by increasing illumination levels. It is available on lease from Mobilcolor, Inc., 232 E. 53rd St., New York, N.Y.

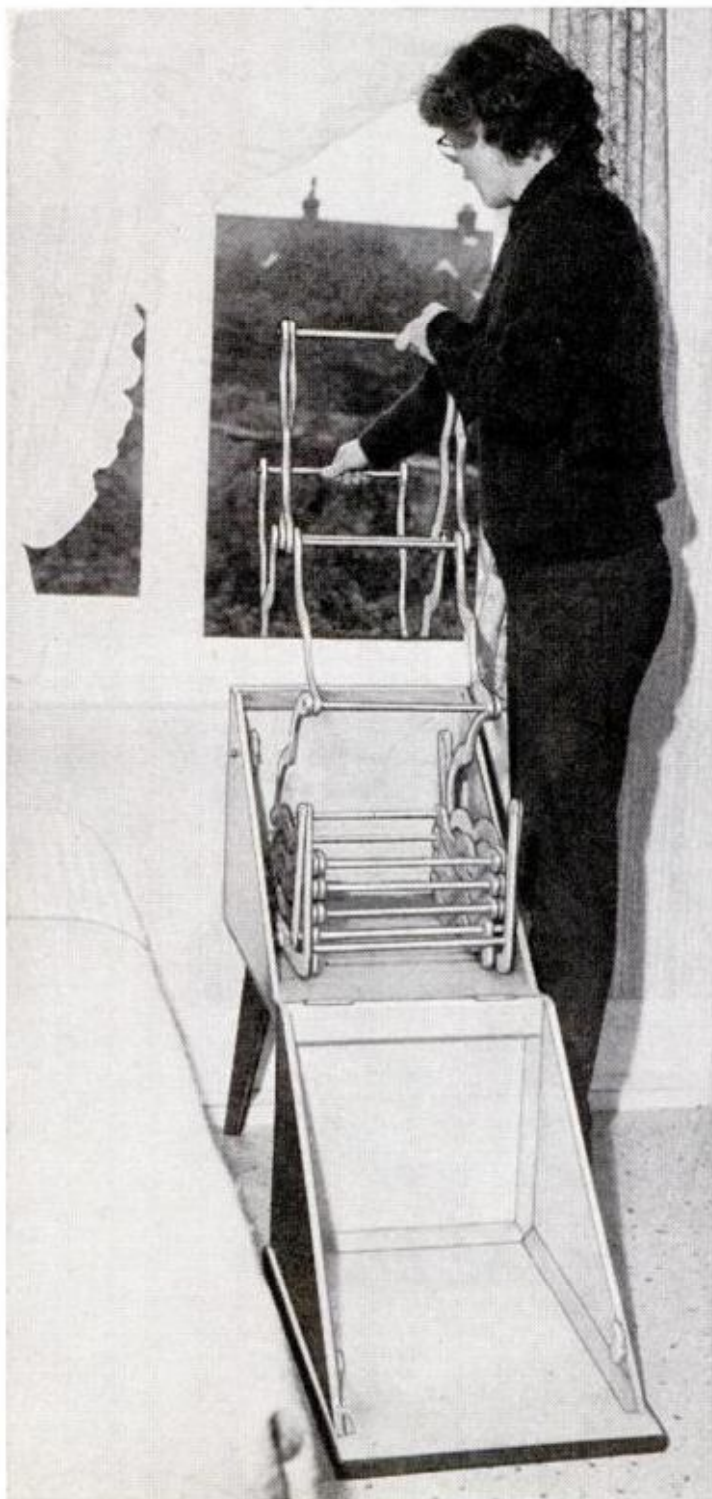


Bedside Fire Escape

Just a few seconds are needed to transform a specially designed bedside table into a fire escape ladder.

Developed by the Casting Reclamation Service of Audenshaw, Manchester, England, the "escape table" conceals a lightweight steel and aluminum ladder which extends 20 feet. The ladder collapses into the 14 by 12 by 18-inch cabinet. When closed, the cabinet looks like a decorative piece of furniture.

Weighing around 60 pounds, the ladder is designed to go over obstacles while leaving the rungs clear of a wall. It can be used by children and adults.



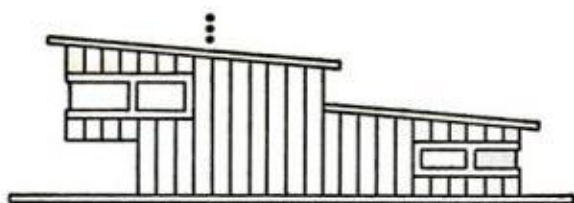
Weather Watcher on Wheels

Mobile weather units are the hottest thing in forest fire fighting west of the Rockies. Complete with barometer, humidity gauges, weather balloons, and other tools of the meteorologist, these campers will roam the back country where fire danger is extreme or where fires actually are getting started.

Weather reports from such stations have become especially important since the Forest Service has turned to aerial strategy to fight fires. The Service's methods are heavily dependent on accurate weather data.

Similar to tourist campers, the units are basic eight-foot shells made by the Coons Custom Mfg. Co. of Pomona, Calif.





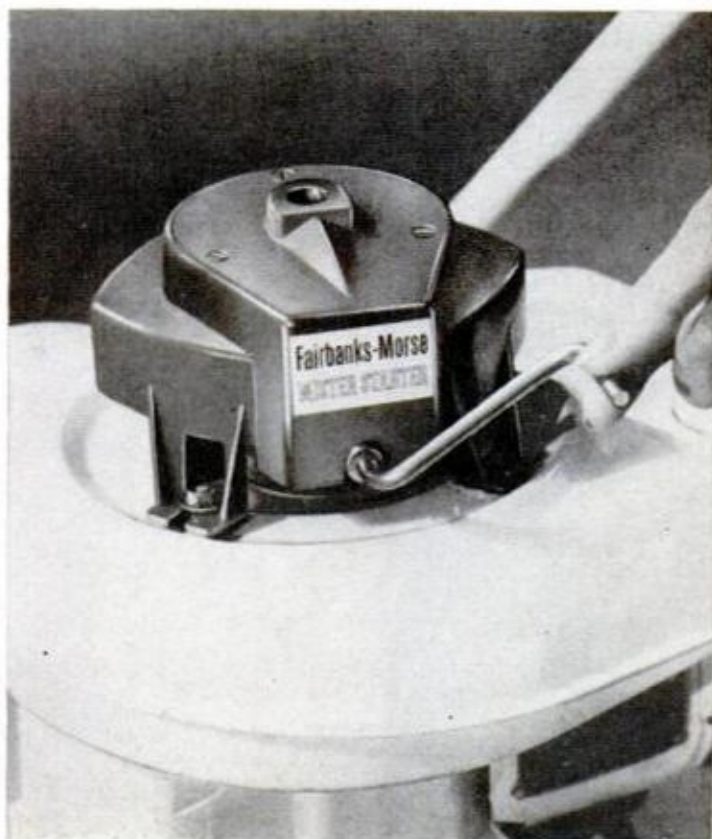
NEW FOR YOUR HOME

DOG REEL automatically retracts or extends a 15-foot nylon-covered steel cable. Compact housing swivels, letting pets rove over 700 square feet with no binding or tangling. Fits all dog collars. Cost: \$8.95; Cordomatic Corp., 1528 Walnut St., Philadelphia, Pa.



FREE-STANDING STORAGE UNIT provides over 10 cubic feet of space for toys and equipment. Nine colored fiberboard cartons rest within a steel-shelf framework, all easily assembled. Price: \$10.95; S. A. Hirsch Mfg. Co., 8051 Central Park Ave., Skokie, Ill.

AUTOMATIC STARTER for small gasoline engines re-winds itself for the next start. A power spring stays coiled until turn of side key releases energy. Adapts to horizontal or vertical engines. \$22.95; Fairbanks, Morse & Co., 100 Electra Lane, Yonkers, N.Y.





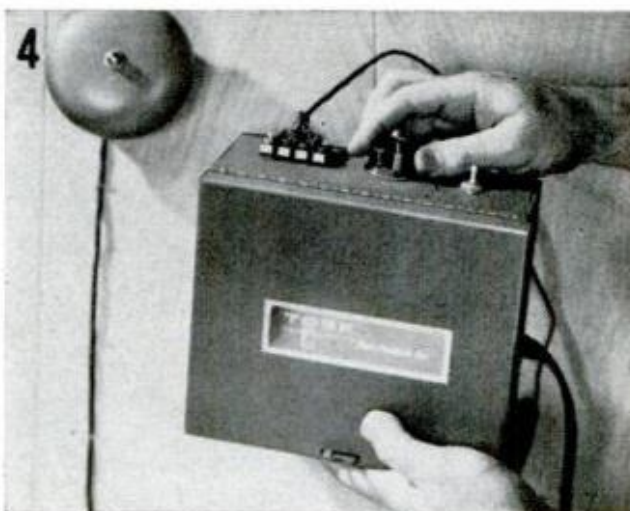
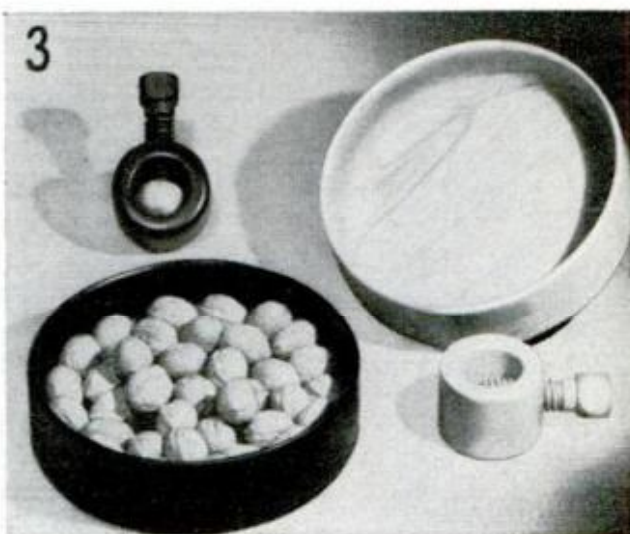
1. CURVED BACK-WASHER massages as it washes. Made of plastic with a polyfoam one-inch thick pad, its 22 inches require no stretching to reach your back. Costs \$2.98; Swanson Plastics, Inc., Windsor, Colo.

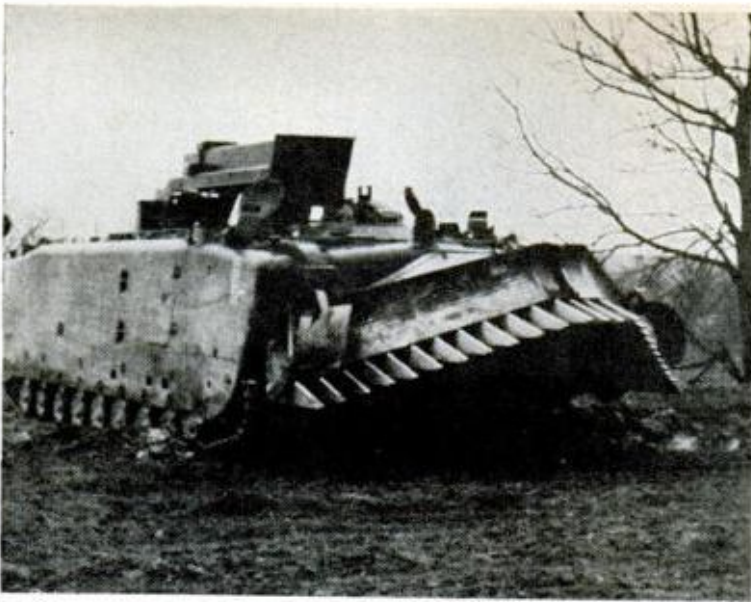
2. RUG HOOKING NEEDLE from Denmark regulates height of loops with a simple set screw, producing a sculptured effect. It goes as directed, filling patterns quickly. Price: \$6.95; A. Binstouw, Box 1, Glenview, Ill.

3. NUT CRACKER with screw-type handle cracks any nut without scattering shells; bowl is 10 inches across. Natural set costs \$12, jet black, \$15. By Te'ad, 3116 A Riverside Dr., Los Angeles 27, Calif.

4. SHIP'S CLOCK sounds the watches in the tone of a true ship's bell. Operated by a concealed electric clock mechanism, it runs on AC current. Unit is \$48.95; Tork Time Controls, Inc., Mount Vernon, N.Y.

5. DIAL TELEPHONE LOCK prevents unauthorized calls, yet doesn't stop incoming calls. Takes seconds to install or remove. Chrome finished, cost is \$2; Davises, Dept. B5, 252 E. Indian Creek, Mobile, Ala.





Saw-Toothed Mine Raker

To clear a path through a mine field during an amphibious landing, a Marine Corps landing tank first shoots across the field two charges attached to lines of plastic explosives.

The charges—including the lines—are detonated electrically from inside the tank. Then, with the plow-shaped blade in position, the tank wades through the mine field and rakes up any mines which may have remained.

The path cleared by this wide-tracked vehicle and its charges is wide enough for vehicles and men

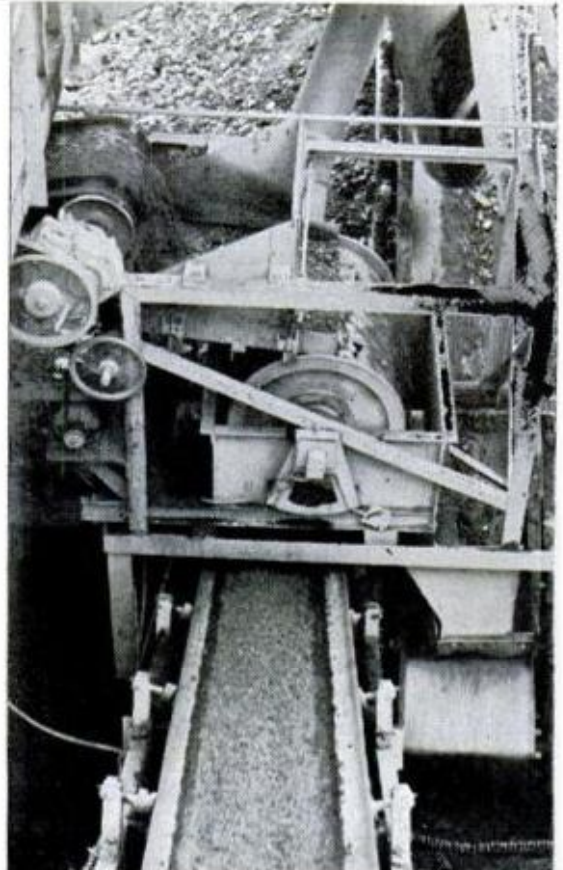


Dredges for Scrap Iron

Built specially for the job, a shallow-draft dredge "mines" the bottom of the Mahoning River near the Youngstown, Ohio, steel mills to salvage scrap metal.

Fifty years ago the river was more than 10 feet deep, but tons of silt and mill debris built up the bed so that it is only a few inches deep in spots.

A huge screw loosens the river muck, which is conveyed to screens which separate the non-metallic material from usable metal. The project also deepens the channel.





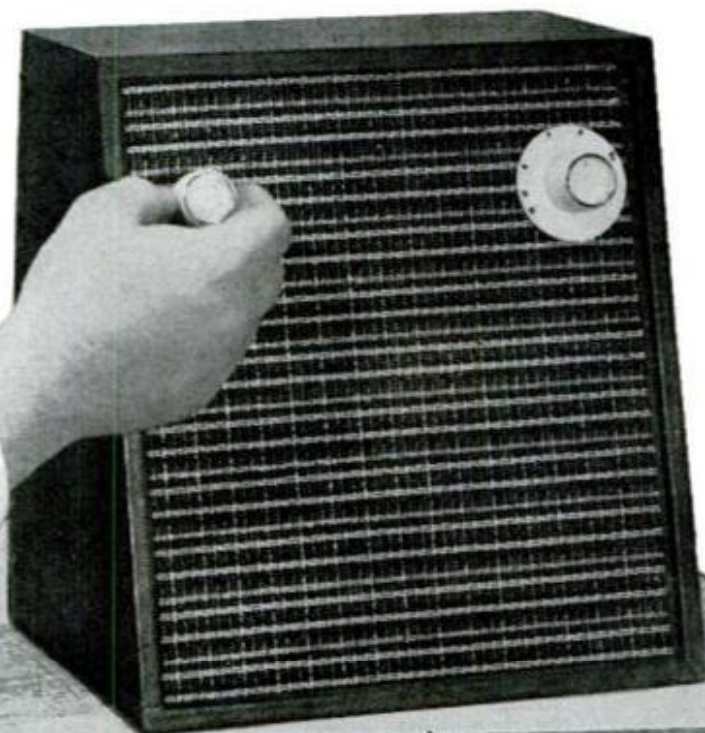
Portable Radio In 30 Minutes

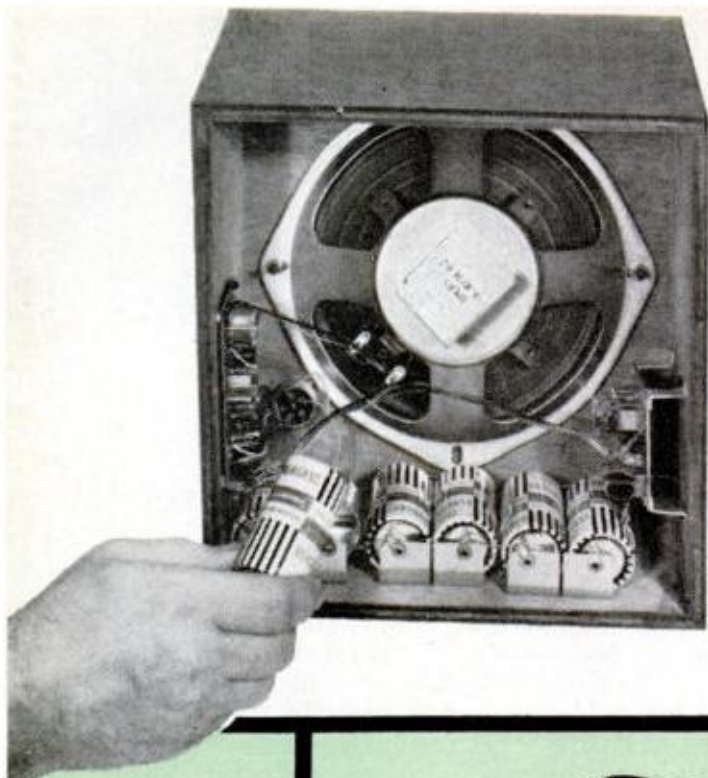
Build—and enjoy—this 8-transistor set tonight!

By Larry Steckler

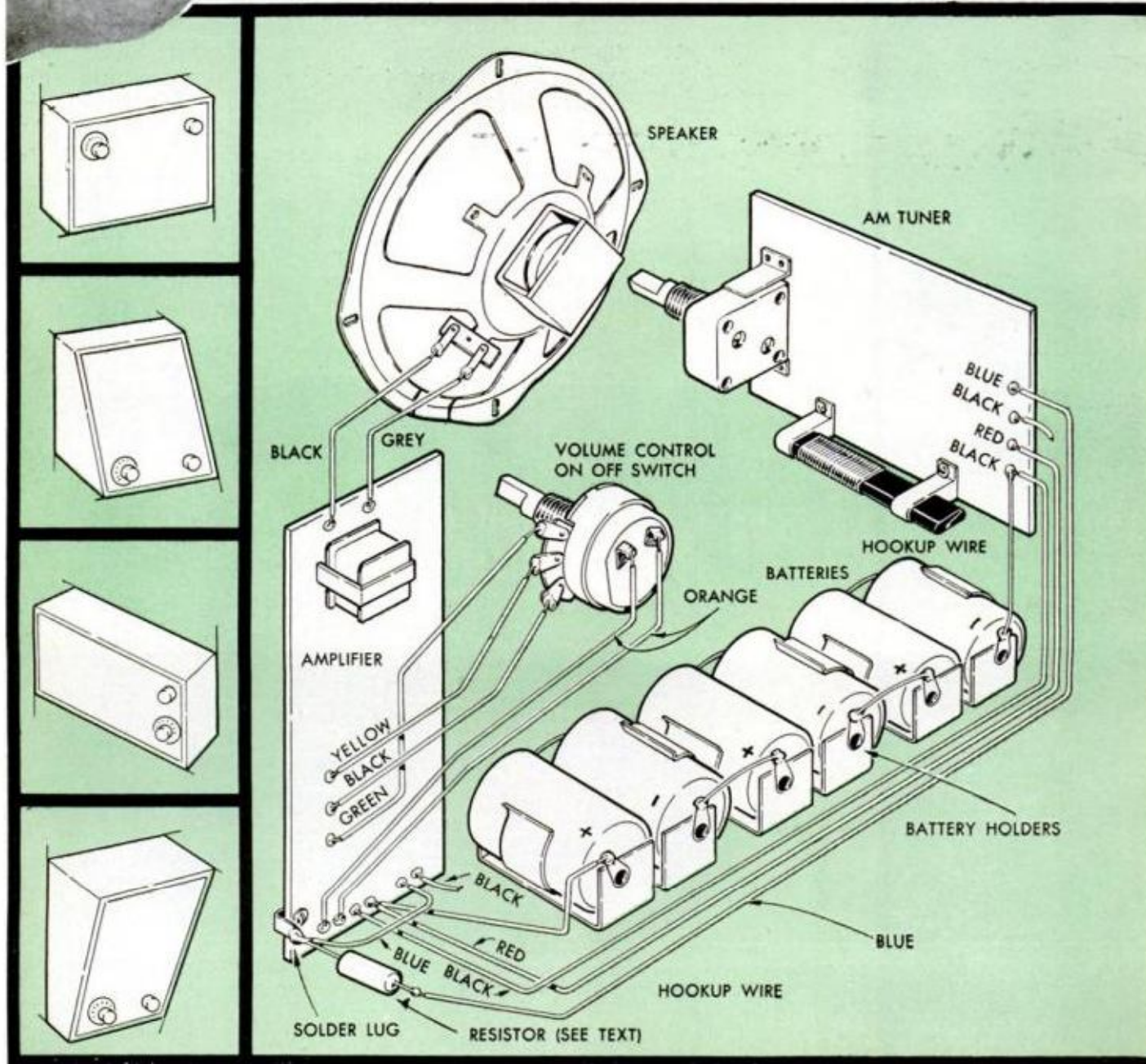
IT'S A TABLE RADIC, a hang-on-the-wall radio, a portable or all three at the same time. It has an eight-transistor circuit that delivers 350 milliwatts of audio to an eight-inch speaker. Best of all, *you* can put the whole thing together in about 30 minutes and the total cost is less than \$25. All you need are ordinary hand tools, a soldering iron and some solder.

You'll have to spend five minutes or so on preliminaries. First drill $\frac{3}{8}$ -inch holes for the volume and tuning controls. You can make them come out the front as I did, or out the sides or top, whichever you find most convenient. The choice of cabinet is also up to you. You can use the one specified—it is excellent for wall mounting, tabletop use or as a portable—or any other standard wood cabinet in an electronics catalog. For that matter, you can build your own. Just be sure to leave enough space for the two subchassis (the amplifier measures $3\frac{3}{16} \times 1\frac{5}{16}$ inches; the tuner 4 x 2 inches) and the batteries.



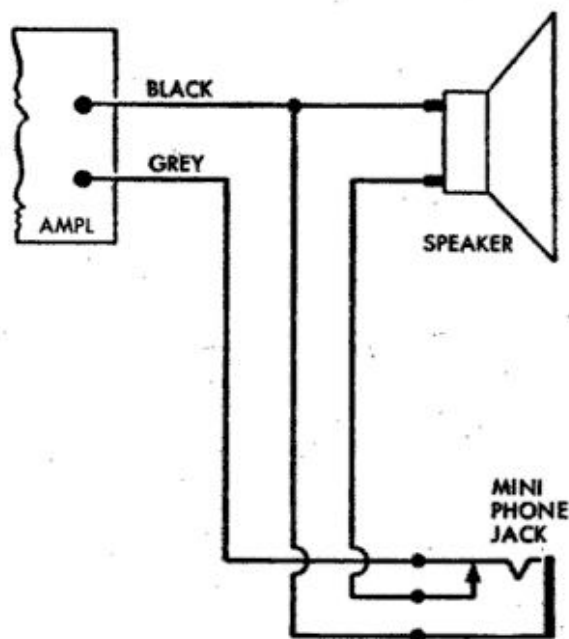


BATTERIES ARE FITTED into place as a last step before firing up the set and tuning in a station. The pictorial diagram below shows all wiring details. Follow it carefully and your radio will work the first time you turn it on. The four cabinet styles shown along the left of this page are some of the many possible arrangements the constructor can use



PARTS LIST

- AM tuner, PK-633
- Transistor amplifier, PK-544
(Lafayette Radio, 111 Jericho Turnpike, Syosset, L.I., N.Y.)
- Speaker, 8-inch (Lafayette SK-14 or equivalent)
- Speaker baffle (cabinet) for 8-inch speaker (10 x 10 x 6 $\frac{3}{4}$ inches with sloping front) (Lafayette SB-11 or equivalent)
- Volume control and SPST switch (Mallory UA14A control plus SL2500 shaft plus US41 switch; or IRC Q13-116 control plus 76-1 switch; or equivalent)
- 3 battery holders (each holder takes two D cells)
- 6 D cells (for longer life use alkaline or mercury types)
- 2 knobs, ivory, 1-inch diameter
- Plywood back cover (if needed)
- Handle (for portable unit)
- Closed-circuit miniature phone jack (if desired)
- Miniature earpiece (if desired)
- Assorted wood screws
- Hookup wire (bare)
- Solder



WANT TO USE EARPHONES? Simply change the speaker wiring to conform to this little schematic. Note that you'll have to add a miniature phone jack

Now mount the speaker, locating it so that the solder lugs are oriented toward the spot you have picked for mounting the amplifier. Fasten it securely in place.

Next mount the volume control. Like the speaker, it should be positioned so its solder lugs point toward the amplifier. You're ready for the battery holders. Mount them on the bottom of the cabinet. This takes a little care since the bottom is not always the same. Portable and table models use the wide side of the cabinet as the bottom. Wall mounted units, like the one shown here, use the narrow side of the cabinet as the bottom. To make things easier, wire the battery holders before mounting them. If you don't you may have some trouble getting at their lugs once they are inside the cabinet.

Now the amplifier can be mounted. Use $\frac{3}{8}$ -inch wood screws, one in each corner. Place small nuts or washers between the amplifier chassis and the cabinet to space the amplifier board off the cabinet itself. Once it's mounted, connect leads to the volume control, batteries and switch.

All that remains is to mount the AM tuner. Before doing so, remove the four machine screws that hold the tuning capacitor in place. Then carefully move the capacitor forward over the edge of the printed-circuit board until the rear pair of holes on its mounting bracket line up with the front pair of holes on the board (the holes closest to the edge of the board). Reinsert two of the little screws to hold the capacitor in place and tighten them

until the capacitor is firmly set. Do not overtighten or you will strip the threads in the board. This insures that the capacitor shaft will extend through the cabinet.

Remove the knob from the tuning capacitor and mount the tuner in the cabinet, using $\frac{1}{4}$ -inch wood screws. If any mounting lugs extend beyond the rear edge of the cabinet, cut off the projecting piece.

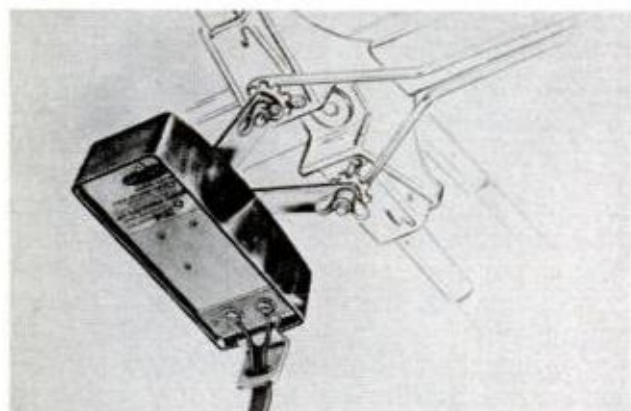
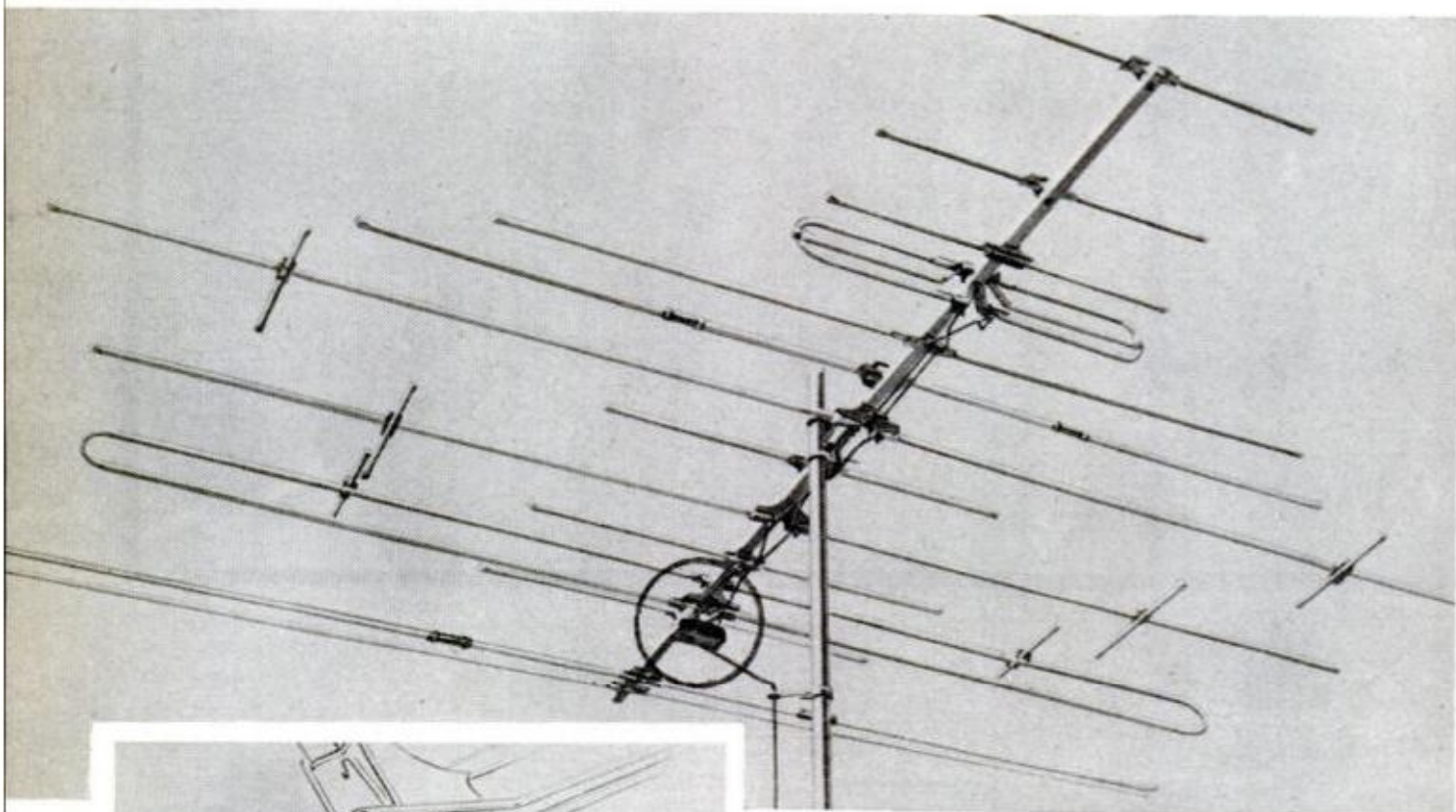
Now wire the tuner into the circuit following the illustrations carefully. Put the tuning and volume control knobs into place, insert the batteries (be sure to observe correct polarity) and you're finished.

If it's to be a portable, add a handle to the top of the cabinet. If you use the set as a portable or table model, close up the back with a sheet of $\frac{1}{4}$ -inch plywood. If you're going to hang the unit on a wall, let the wall act as the back.

You may find that the set gives you too much gain. It is extremely sensitive, especially if you live fairly close to your favorite stations. If so you'll get too much volume even with the control barely turned up. Simply add a $\frac{1}{2}$ -watt resistor between the tuner output and the amplifier input. This resistor is shown in the accompanying diagram, but don't use it unless you must. The correct value will be somewhere between 36,000 and 82,000 ohms, depending on how much you have to cut the volume. Start with the lower value and work up to the one you find satisfactory.

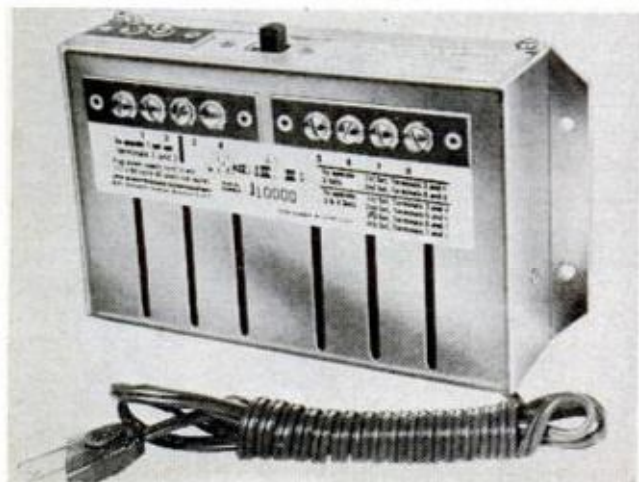
If you care to add earphones, follow the little schematic and use phones rated between 3-16 ohms impedance. ★ ★ ★

Power Antenna For Out Yonder



THE ANTENNA BOOSTER sits right up on the antenna. It is an all-transistor amplifier that has a wide bandpass so it can cover all the VHF-TV channels

POWER SUPPLY for the antenna-mounted booster is normally located behind the TV receiver. It supplies d.c. voltage to the booster through the antenna cable



IN EXTREME FRINGE AREAS the solution to good TV reception lies in the antenna. The usual procedure is to get the rig as high as you can with plenty of metal in well designed high-gain directional configurations. This gives the best results.

But you can go just so far with height, design and metal. From there, other tricks must be employed. One of the latest is a powered amplifier right on the antenna. It provides an additional stage of amplification. This amplifier is broadly tuned so it can cover the entire VHF-TV band and the FM broadcast band. These boosted signals are then fed down through the lead-in to the set.

Various types of amplifiers are available. The transistor units require d.c., either from batteries or an a.c. supply mounted behind the set. The d.c. power is sent up to the amplifier along the same lead-in that feeds signals to the TV. It does not interfere with normal reception in any way.

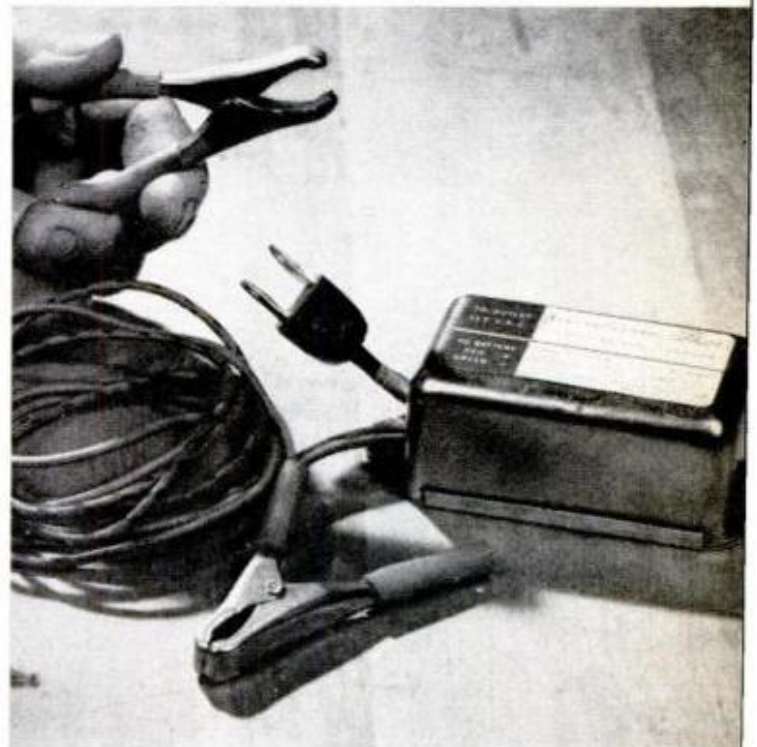
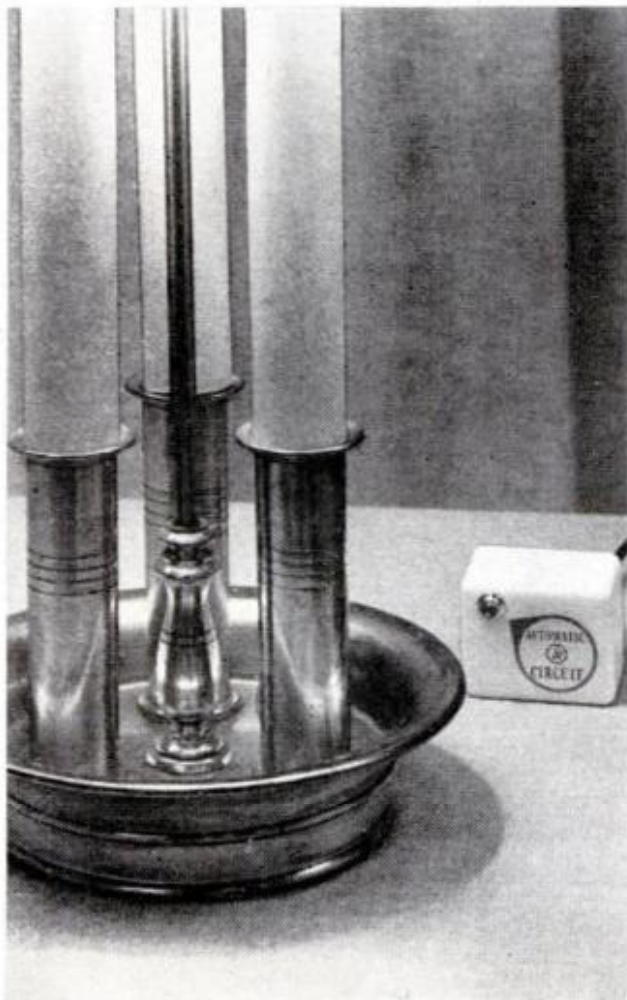
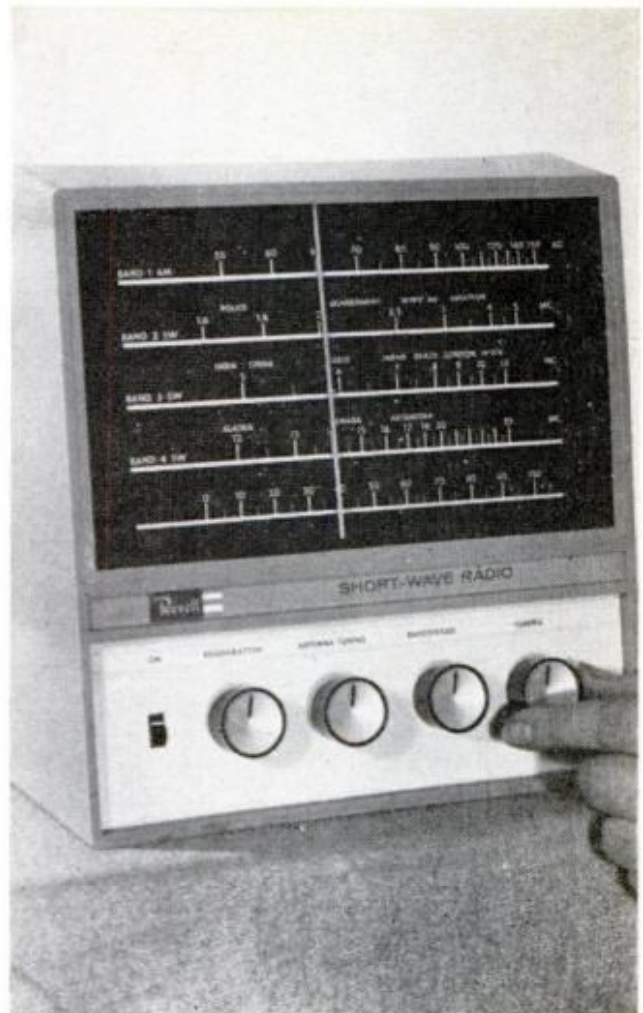
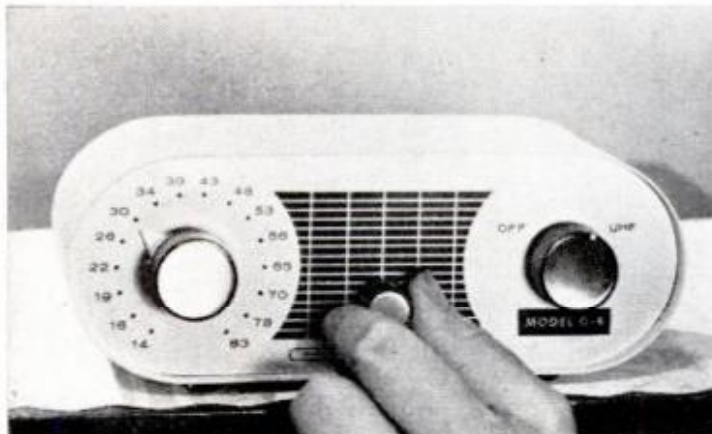
A booster offers a secondary advantage. You can operate several sets off the same antenna and get good reception on all of them. Or, even more likely, you can hook up your TV and your FM receivers to the same antenna. Without the booster, adding extra sets to the antenna would reduce the strength of the received signal, and snow would appear on the TV screen.

NEW IN

Electronics

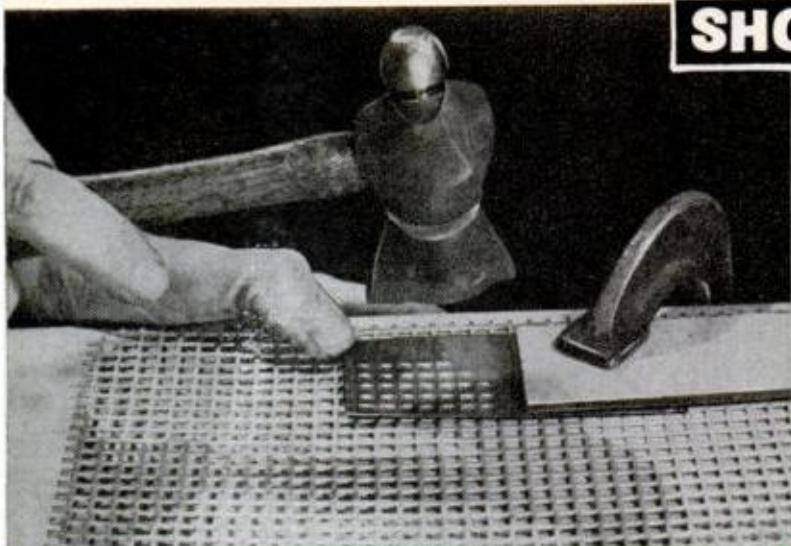
SHORT-WAVE RADIO KIT picks up ham stations, airport control towers, ships at sea, foreign broadcasts plus the standard AM broadcast band. It's made by Revell Inc., Venice, Calif. Sells for \$25

UHF TV CONVERTER sits atop your TV. Enables receiving all 70 UHF-TV channels. Model G-4 uses two high-gain nuvistor tubes, work in fringe areas. Gavin Instruments Inc., Sommerville, N. J. \$39.95



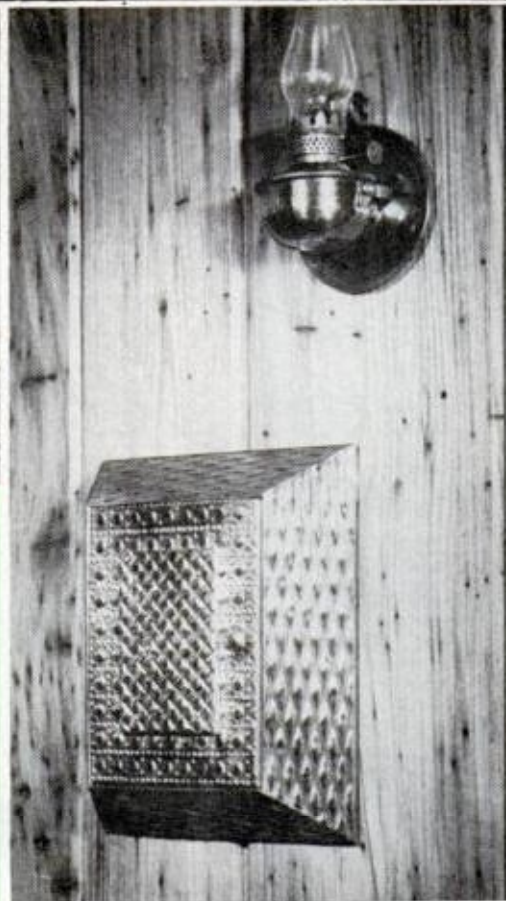
BATTERY CHARGER keeps car batteries up to snuff. Overnight charge helps prolong battery life. Two-pound Thor charger is sealed against the weather. Electrotone Laboratories Inc., Chicago, Ill. \$4.95

LIGHT SENSITIVE SWITCH turns on the lights automatically at night, protects against burglars. Plug it into any 110-volt outlet, plug lamp into switch. \$8.95. Transitex Industries, Los Angeles, California



HAMMER CRAFTING SHEET METAL

By Walter E. Burton



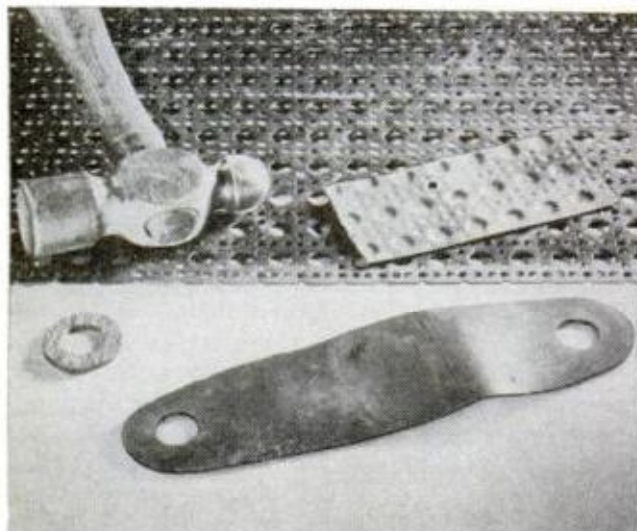
AT LEAST HALF of the work in embossing sheet metal is making the dies. Since a die is simply a metal matrix which is harder than the sheet metal being embossed, the home craftsman has available an almost limitless variety of ready-made "dies"—in the form of perforated or expanded metal, hardware cloth, even ordinary wire screening.

To try your hand at embossing all you need is a padded hammer and some of

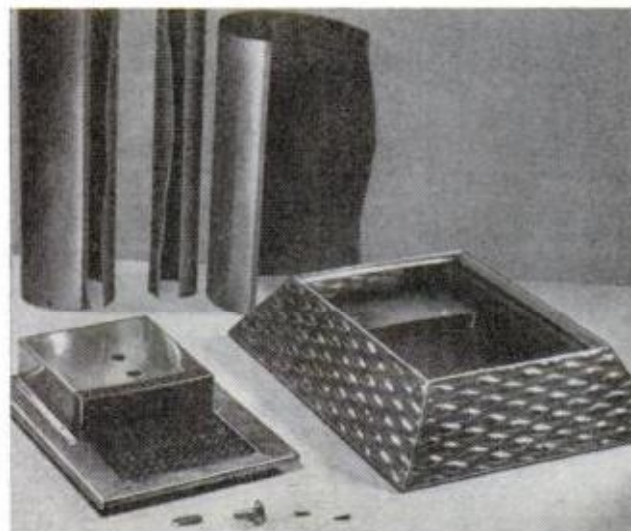
the stock "dies" mentioned, plus the conventional tools for working sheet metal. The chief raw material required is *soft* sheet metal—brass, copper or aluminum between 0.005 and 0.010 in. thick.

Note the word "soft." Normal sheet copper or brass must first be annealed before it can be embossed, so heat it until it glows red, then let it cool in air or dunk it into water. Select aluminum that is already soft (that used for pans in

ALL YOU NEED to emboss thin soft sheet metals are the tools shown here: a ball-peen hammer; pad and washer cut from inner tube; and a ready-made die



WALL CABINET was made from pieces of sheet brass salvaged from an old bedstead. Same embossing technique can be used on any sheet-metal project



which pies are sold is easy to emboss). If the project involves only creasing or bending with a hammer faced with rubber, such stock as tin-can material may be used without preliminary annealing.

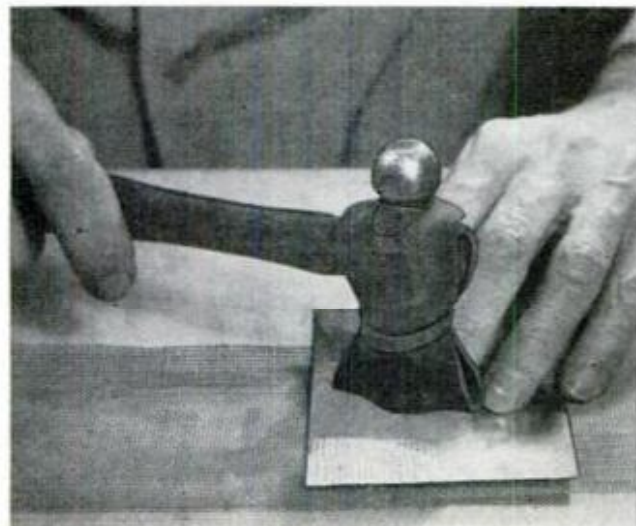
You can make an ideal pad for the hammer from a piece of automobile inner tube. Just cut a 1 $\frac{3}{4}$ x 7-in. band, punch holes near the ends and loop it over the head, as shown. To discourage the pad from creeping off the hammer face during pounding, cut a washer from the inner tube and slip this over the band. Some types of shaping will require the use of a thicker pad, and in these cases you'll need a commercial slip-on hammer head, such as the one shown at right.

The actual embossing operation is extremely easy. Simply clamp the annealed piece of sheet metal over the die and pound it with the padded hammer. This will force the metal down into the die openings and reproduce the pattern in the die. Be careful not to pound too hard or too long, for this may cause the die to cut through the sheet metal.

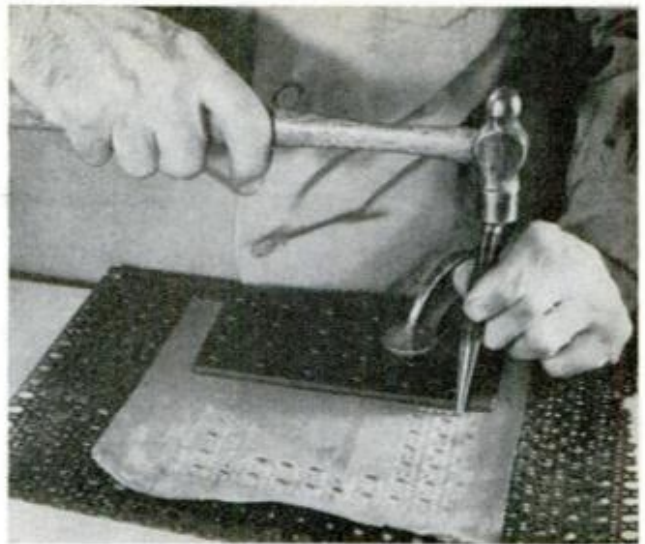
It is especially important that the work be clamped securely during the beating. To maintain the uniformity of the pattern when shifting clamps, tighten the second one before releasing the first.

Hammering usually stretches the work piece slightly, and this often causes large embossed panels to develop objectionable bulges. However, you can avoid this by making up a large panel in sections, embossing each piece separately and then soldering or riveting them together. If the die material begins to warp from hammering, this usually indicates that the metal being formed is either too hard or too thick. Annealing once or twice during the forming stage may soften it enough to

WINDOW SCREEN used as a die produces a delicate over-all pattern which makes fine background texture when combined with die having a coarse pattern



APRIL 1963

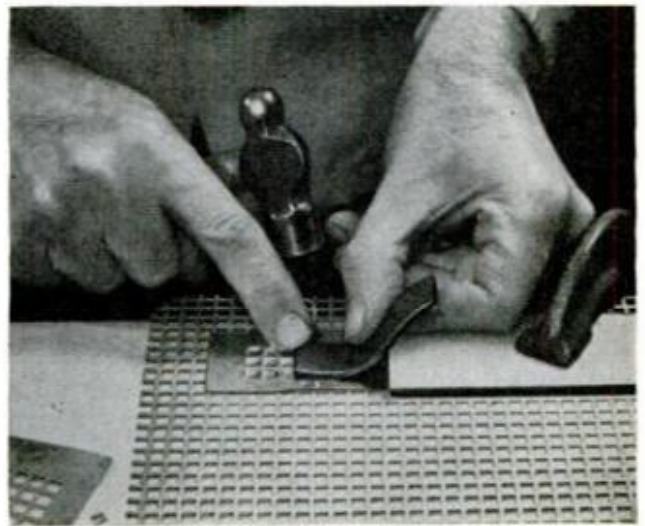


ROUND-NOSE PUNCH can be used to sharpen embossing if metal being decorated is reluctant to enter small hole in die. Be careful not to cut through metal by hitting the punch too hard. Use a light stroke



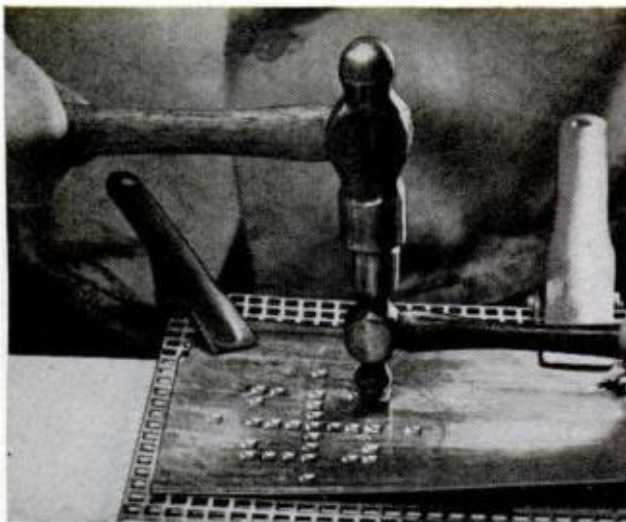
SHARP CREASING or bending sheet metal over edge of steel plate requires use of thick rubber cap for ball-peen hammer. Most hardware stores stock these rubber caps which are designed to fit over the ball

SELECTIVE EMBOSSING is possible if you remove the pad from the hammer and instead use a small square of rubber placed directly on the surface of the work



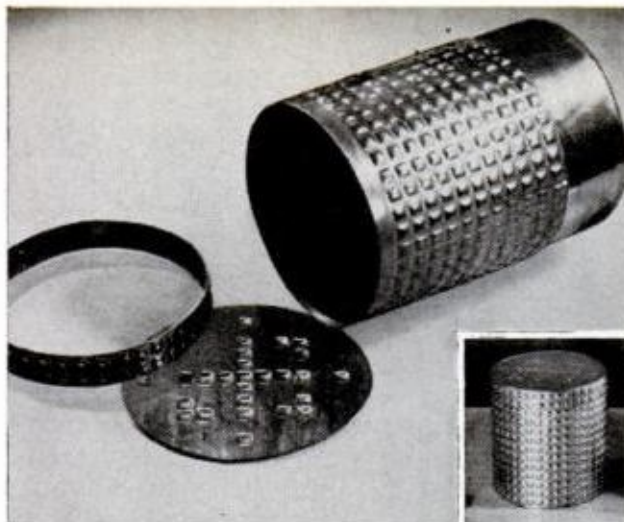
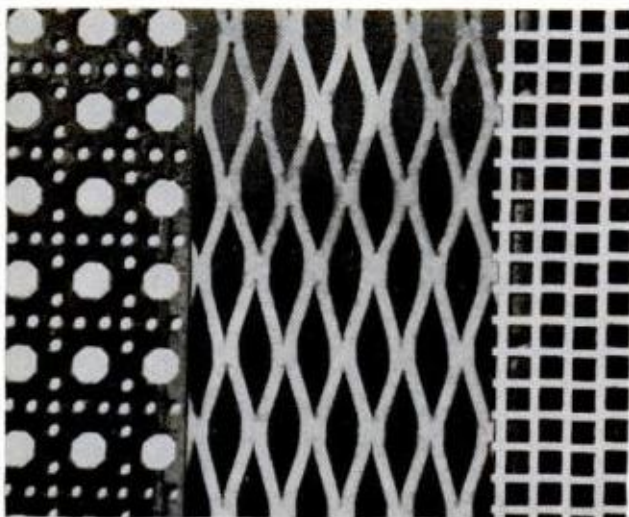
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Материал, защищенный авторским правом



ANOTHER WAY of impressing metal into only certain openings is to use a second hammer as a punch

TYPICAL DIES, two perforated and one expanded, can be used in different ways to produce many patterns



REINFORCEMENT for embossed brass shell of this container was provided by fitting it over a tin can

make it easy for you to work it.

Once the embossing is complete, clean the surface with one of the regular copperpan polishes and assemble the parts of the project. After removing any excess flux or solder that shows, round sharp points and edges with a fine-grit abrasive. Then polish the surface again, buffing to a high sheen, and apply a coat of well-thinned clear lacquer.

With a little ingenuity, you can make a number of patterns from only one or two dies. Try shifting the work on the die after pounding it and going over the whole thing again; or overlay one die pattern with another.

This embossing technique can be used to dress up any ornamental sheet-metal project made in the home workshop. ★★★

BOATING SHORT CUTS

HARD STARTING on outboard engines can most often be traced to fouled or worn out spark plugs, carburetor overchoking or improper synchronization of spark advance to the carburetor and throttle plate opening. However, it's occasionally caused by failure to disconnect the fuel line when the engine isn't in use, allowing the engine to be flooded with raw fuel mixture when it's tilted

HAVING TROUBLE getting a good carburetor adjustment on your outboard? Try closing the cover. On some models, the covers have been sealed for better control of air temperature around the carburetor. Leaving the cover open results in cooler air being taken into the carburetor, thus throwing off the calibration. So in order to reach proper r.p.m., keep that door in the front firmly closed

BOAT BATTERIES should be checked more frequently than car batteries because they encounter longer periods of idleness. Make sure that the water is at the proper level, and put the battery on a tester to check the charge. If it has run down, have it recharged. During the winter, store the battery in a dry place away from heat and check the charge at least once every couple of months

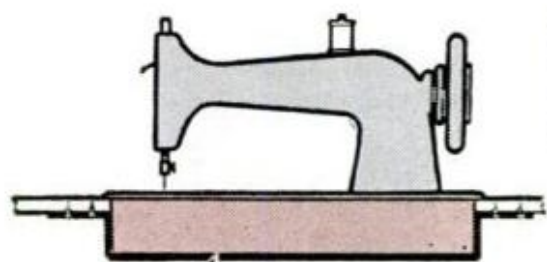
TO REPAIR A TEAR in canvas used to cover a boat deck, work a strip of press-on mending tape under the damaged area and then carefully join the torn edges over the tape. Finally, press a hot iron along the seam to bond the tape to the underside of the canvas. In cases where the edges of the seam are somewhat frayed, trim off any loose threads before you press the tape in place

SEWING CENTER

MY WIFE was tired of getting out and setting up her portable sewing machine for every little mending job. I solved her problem (and avoided buying a cabinet-type machine) with this handy sewing center, made from an old vanity.

The mounting well for the machine was easily cut with a sabre saw and finished with a rasp. However, a hand saw will do, if you start each cut by drilling three or four holes, then knocking out the wood between them. The flat-steel supporting strips for the machine can be bent in a vise.

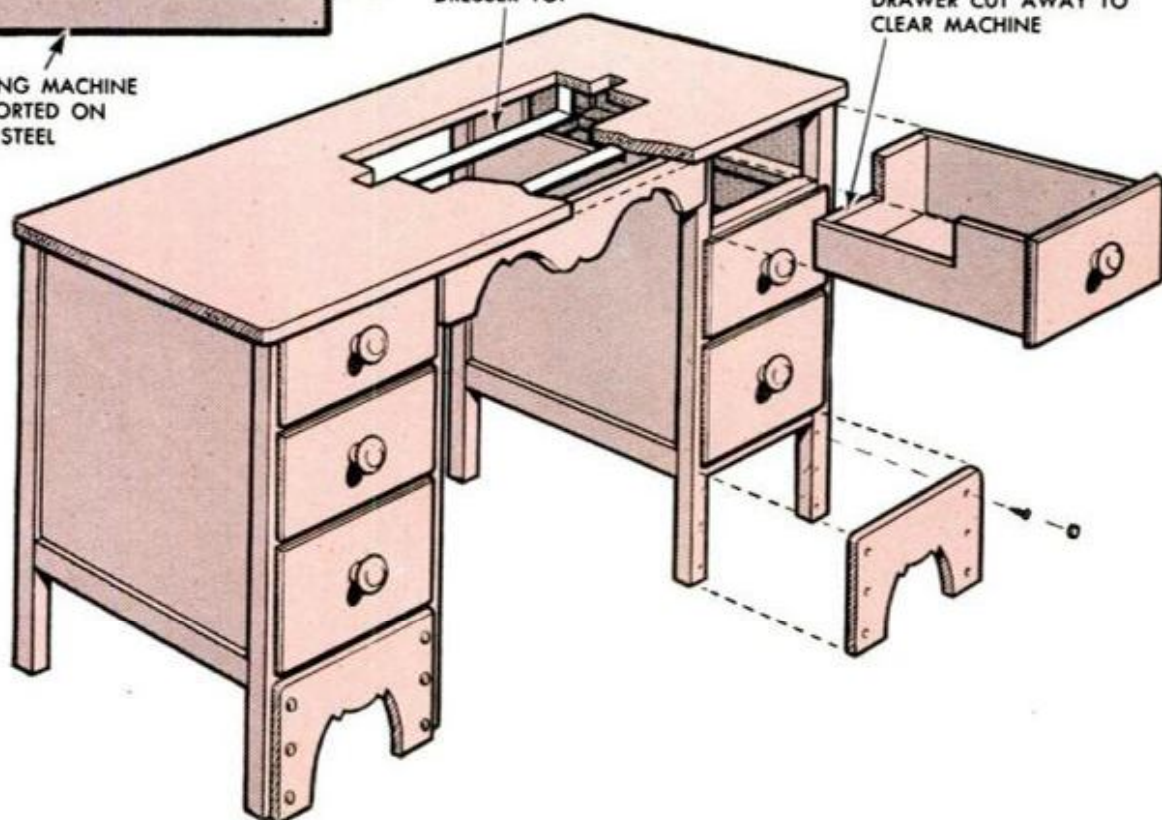
Final step, after cutting the top right-hand drawer to clear the machine, was to replace the mirror glass with a sheet of perforated hardboard. This created a rack for keeping scissors, spools of thread and other small items within easy reach.—Hi Sibley

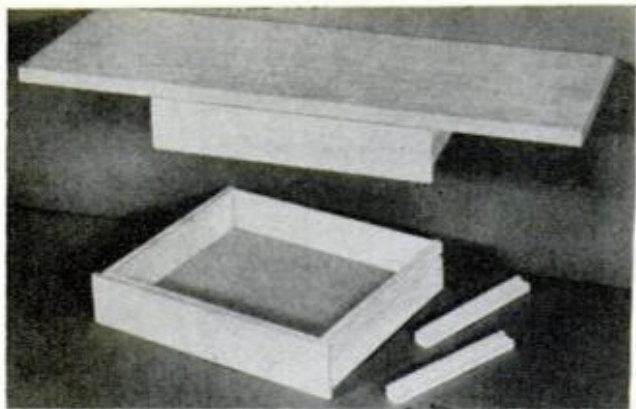


SEWING MACHINE SUPPORTED ON FLAT STEEL

CUT WELL IN DRESSER TOP

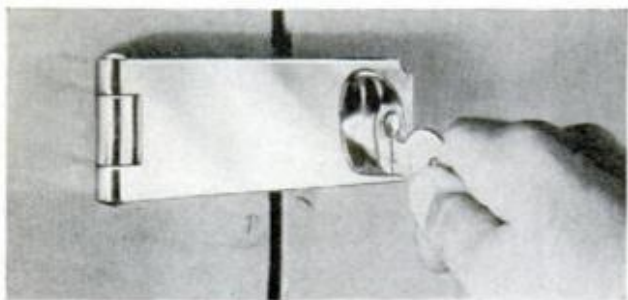
DRAWER CUT AWAY TO CLEAR MACHINE



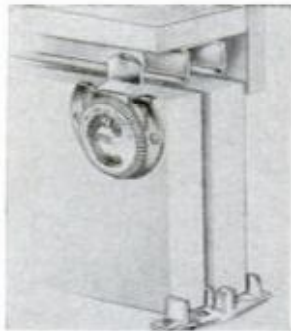


On the market

READY-MADE DRAWERS come finished or unfinished with two slides and all screws needed for quick installation under tables, workbenches, shelves, etc. Measure 2¾ in. deep, 15 in. across and 8 to 14 in. front-to-back. Prices start at \$2.50, from Jore & Co., 33/Ten Downing St., Flushing 54, N.Y.



HASP-LOK self-contained locking device eliminates need for a separate padlock. Lock unit is fastened to the door, rotates to secure the hasp when key is turned. Mechanism is said to be rust, freeze and jam-proof. Can be installed with a screwdriver. Also available in matched sets that work with a single key. Comes with lifetime guarantee. Priced at \$5.49 per unit. Curtis Industries, Eastlake, Ohio

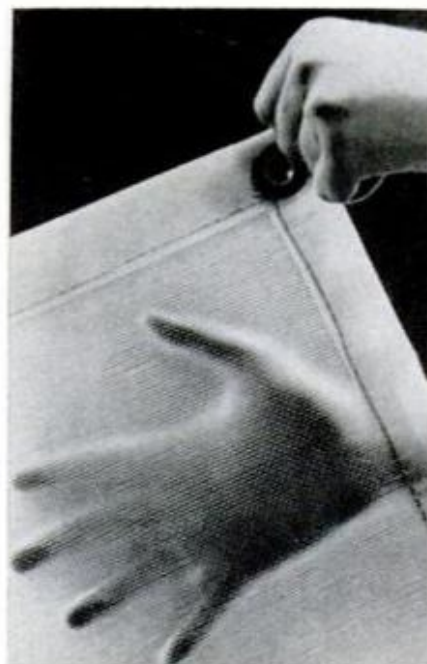


SLIDING DOOR hardware (No. 2850) for ¾ or 1⅜-in. by-passing doors features lubricated nylon roller hangers, V-shaped tracks, adjustable floor guides and fine-tuned adjustment dials. When the doors are hung on the tracks, the installer dials the adjustment required to raise or lower them for alignment with the jamb. A lockscrew maintains the adjustment. Produced by The Stanley Works, New Britain, Conn.

BUCKET BRACKET, made of ⅜-in. square rolled steel, slips onto any size ladder, on either side, at any height between rungs. Weight of bucket clamps it. Price is 30 cents, postpaid, from BMSCO, Incorporated, Box 101, Cambridge City, Indiana

EXTENSION CORD reel can be detached from its wall mounting brackets for convenient storage. Holds 100 to 150 ft. of cord, depending on wire size. Available from Central Stamping & Mfg. Co., 900 S. Division St., Polo, Ill.

C-LITE flexible plastic made of vinyl-coated nylon is said to be almost indestructible. For use as covers, bags or tarpaulins. Sold in various sizes and colors plus clear transparent. Canton Containers, Box 871, Canton 7, Ohio



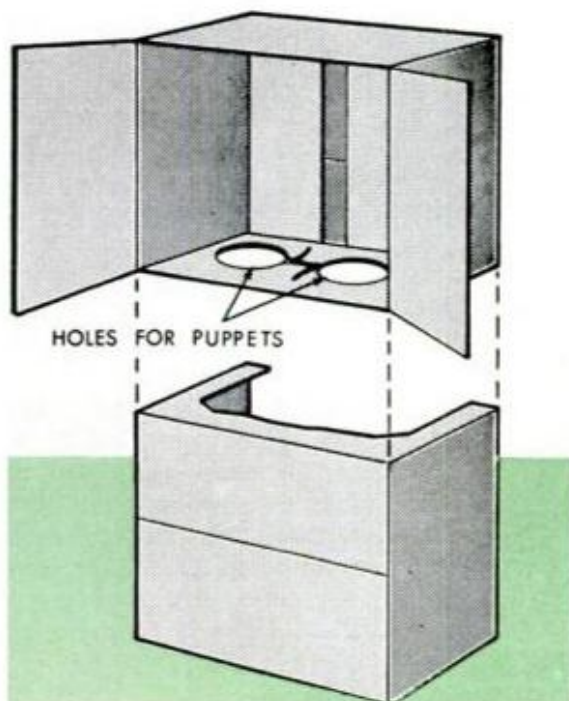


Cartons Make Rainy-Day Puppet Stage

A sharp knife, two cardboard cartons and a few scraps of cloth are practically all you need to make this puppet theater. Start by removing the top of one box and partially cutting away one side to leave a "flange" 2 in. wide along three edges. (See drawing, below). Then cut two holes about 5 in. in diameter in one side of the second box. A few slots extending from the holes will permit freer movement of the puppets. The second box

rests on top of the first and is secured with tape, staples or glue. The outside of the stage is decorated by wrapping the boxes with colored foil before adding stage curtains and skirt. Sew them in place, or use staples, which may be covered with adhesive gift tape.

The puppets are just as simple. Pencils form the bodies. Thread spools, painted or wound with tape, become the heads. Costumes are merely scraps of cloth.



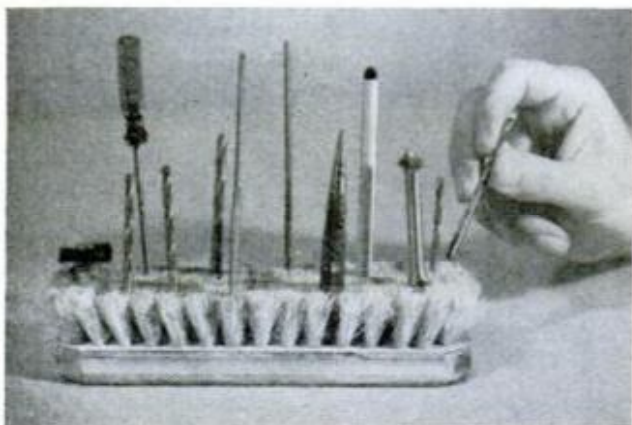


Privacy Between Rooms

Rooms connected by wide, high archways can't be put to separate uses. Yet such openings may give a spacious feeling and assist ventilation. Here's a way to divide the rooms without canceling out such benefits or risking a makeshift look. Fill in the archway with a standard flush door set in its own frame within the opening. Be sure the vertical member you add is well anchored at top and bottom. The rest of the opening can be louvered with evenly-spaced strips set square or at an angle. If you install a plant on a low platform to one side of the threshold, you can train plants up these slats.—*Basil Jackson*

Benchtop Nest for Tools

Drill bits and small tools you want to keep within ready reach won't wander away if propped upright in the bristles of a scrub brush. When the project's done, put the tools away and use the brush to whisk off sawdust and shavings from the top of your bench.—*Ken Patterson*



YEAR 'ROUND FUN FROM A SLED

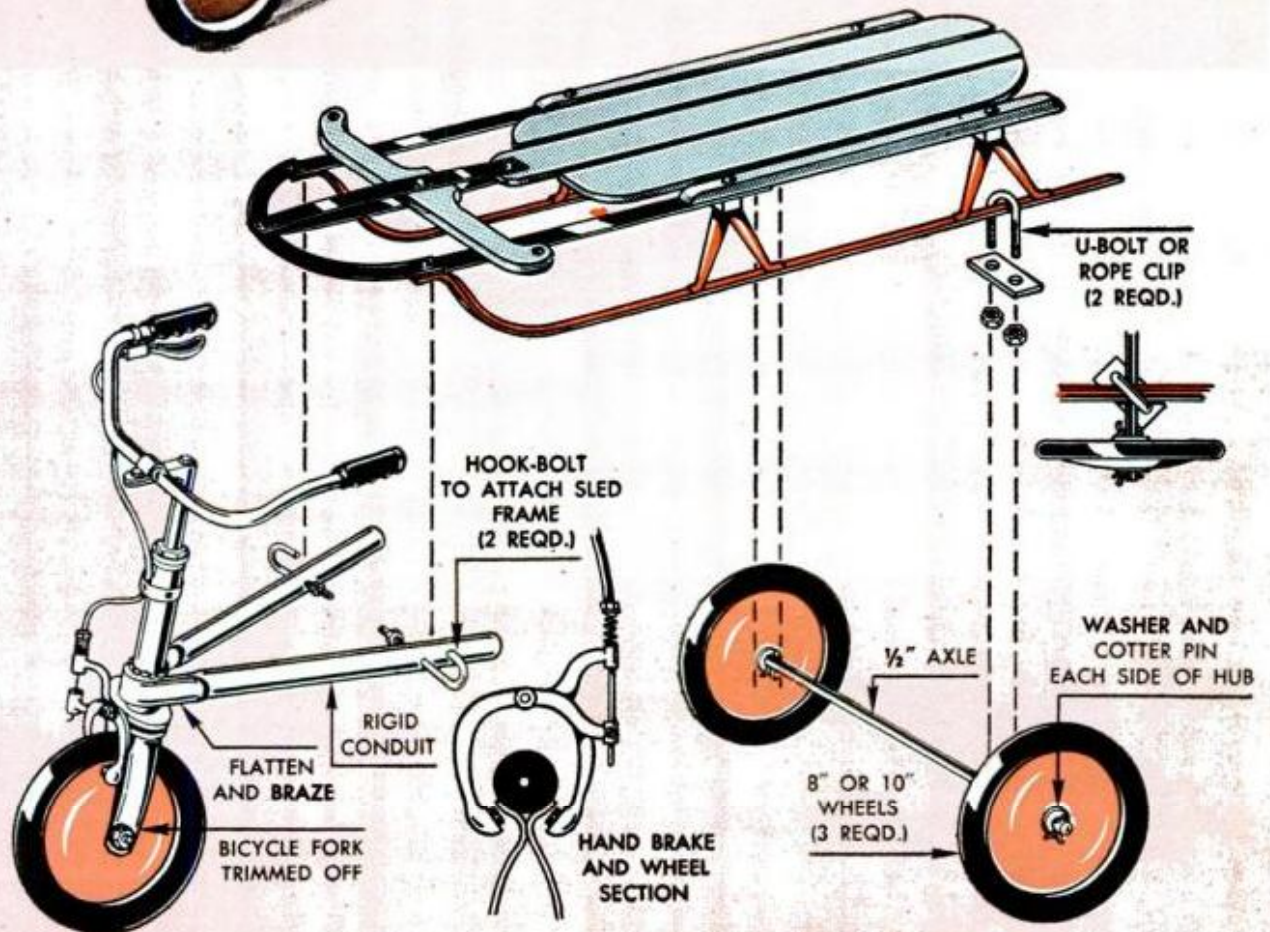
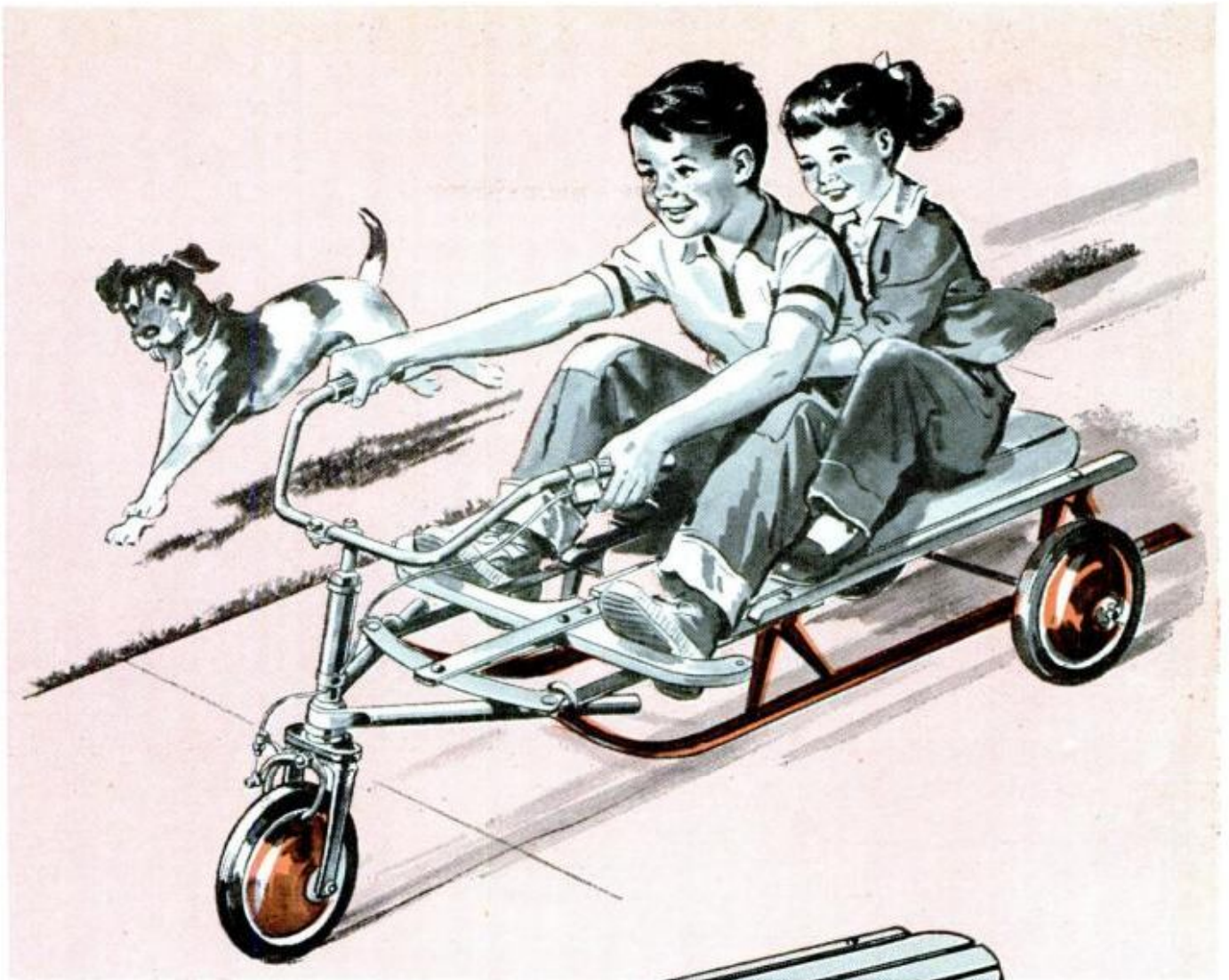
By Maxwell Price

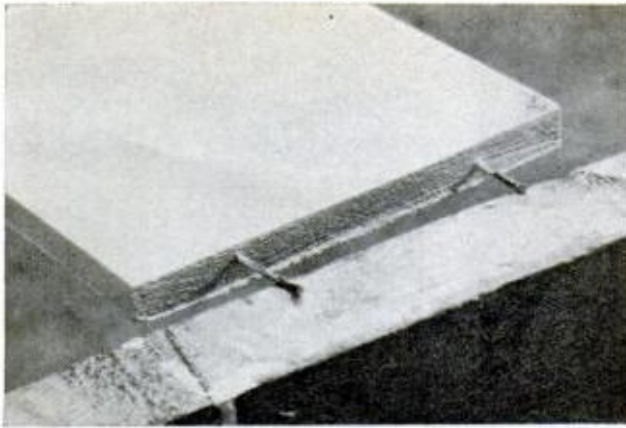
ANYBODY who's barked a shin on his youngster's sled while it's gathering dust in the garage or basement, has surely wondered if it was worth storing the cumbersome thing for the brief use it gets during the snow season. The answer is to make the sled earn its keep year 'round.

Add three 8 or 10-in. cart wheels and a steering column and you've got more than a winter-summer hybrid—it's also a cross between a wagon and a trike. The conversion is accomplished without so much as drilling a hole in the sled itself. When the air gets crisp again, you just back off six nuts and the sled lifts free, ready for ice-action.

The only thing you'll need that may take some hunting is the steering column, plus fork, from a bicycle or trike. To free this column, you'll have to hacksaw through any frame bars connected to it. The V-bracket for joining the column to the sled is a length of rigid conduit, flattened at the center and bent at an angle that permits each end to pass between the sled's runners and steering frame, as shown in the illustration on the opposite page. Heating the conduit at mid-point eases this job. Now, braze the flattened bend to the base of the column's stationary section and slip the bracket in place. To mark the conduit, seat a pencil point within the angle formed by the runner-to-frame joint at each side. Drill holes here to pass hook bolts that will clutch the sled frame bar.

Clamp on the simple rear axle assembly and set the entire unit on a flat surface to find which axle-height for the front wheel brings sled level. Drill a hole through both prongs of the fork at this point to take a short length of axle stock, threaded at each end. Trim off the prongs below this hole, install the front wheel and add a pincers-type brake to fit fork and wheel. ★ ★ ★



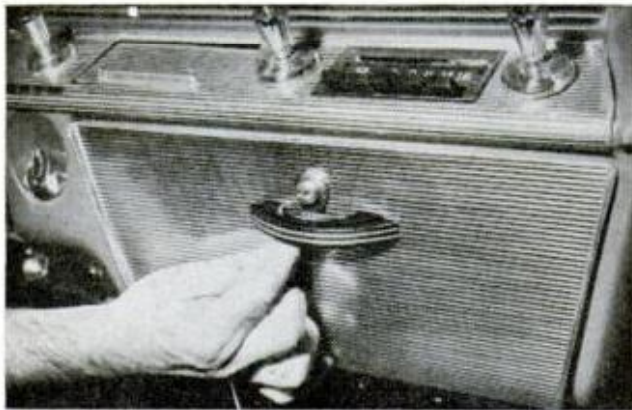


◀ No Waiting

When painting or varnishing removable shelves in a bookcase or closet, there's no need to wait for one side to dry before painting the other. Drive a couple of nails part way in both ends of each shelf. Then, at the time of painting, rest the board by the nails between two sawhorses or other supports. Paint the ends, both edges and one face. Flip the work over and complete.

Squeeze Yourself a Tread ▶

Surfacing the steps of your stepladder with closely spaced droplets of plastic rubber is a clever way of providing a non-slip footing. First be sure that the wood is dry and free of oil and then simply squeeze out a drop at a time about 1 in. apart. When dry, the nodules will provide an excellent rubber tread. You can get a tube of plastic rubber at any dime store.

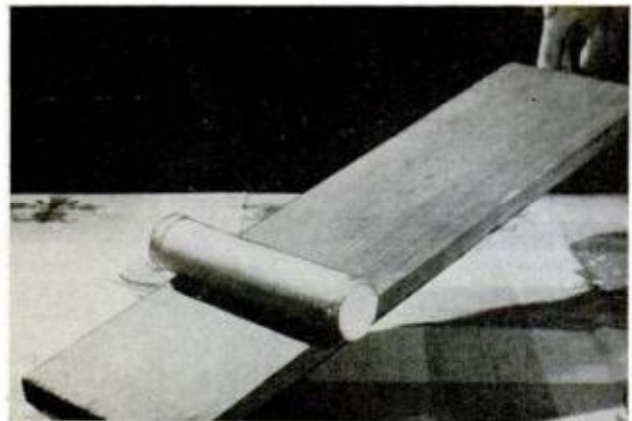
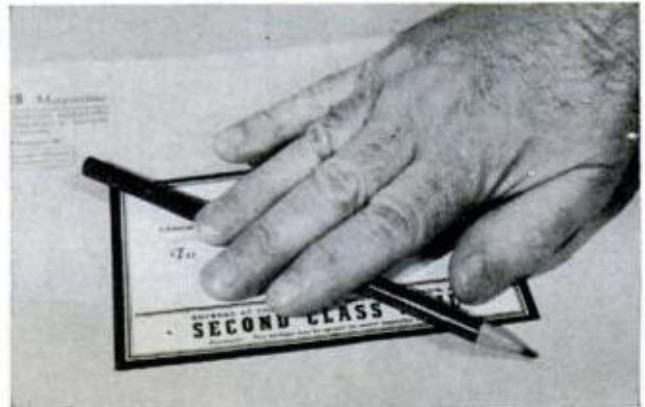


◀ Easier to Open

With a key it's not so bad, but when trying to open a glove compartment by pressing on the lock alone, there's nothing to get hold of. I made it a lot easier to open the compartment in my car by adding a handle, and by picking out a fancy cabinet pull, it looked like part of the original equipment. All I had to do was to drill two small holes through the door.

Roll It to Stick It ▶

You won't run the risk of smearing the address on a package label when sticking it down if you apply pressure by rolling rather than stroking your fingers across it. The handiest thing I found for this is a pencil and I simply roll it over the label with the palm of the hand. Pressure from the pencil will also assure a well stuck label which won't pull off.—Ken Murray



◀ Party Puzzler

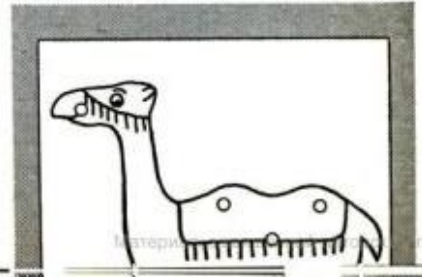
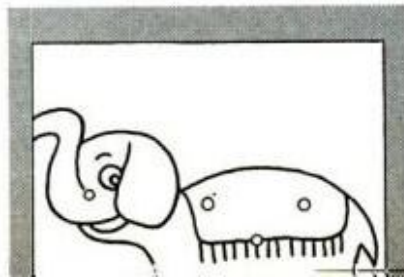
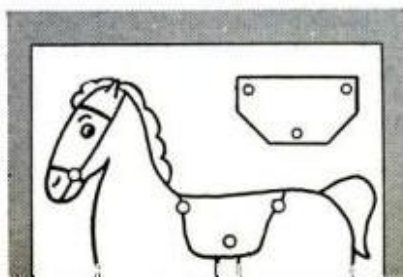
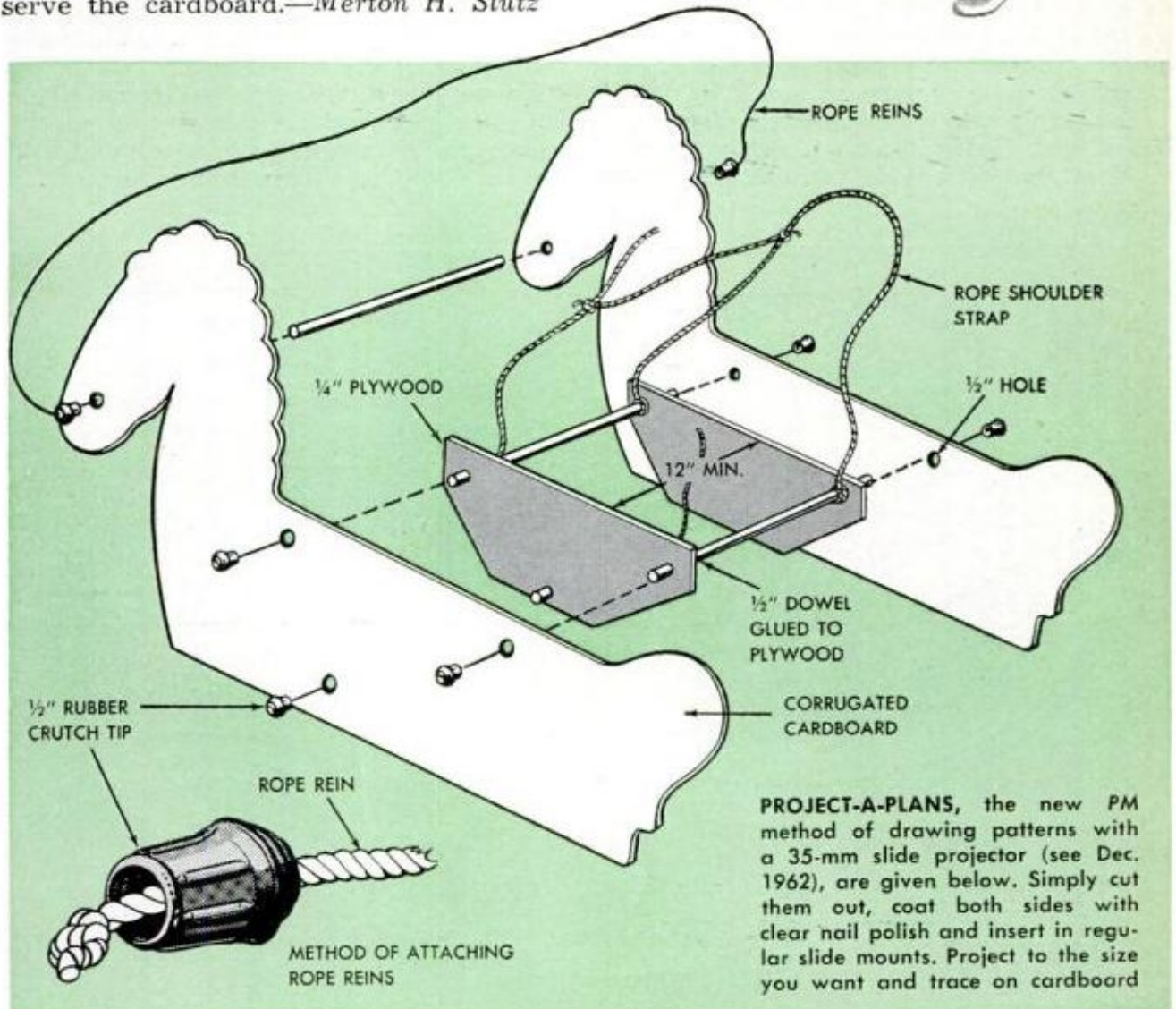
Pour an inch of sand or salt in a short length of mailing tube and cap both ends. Then stand it on end before rolling it down an inclined board. You'd expect it to roll off the end of the board, but it doesn't. It slows down, even stops dead in its tracks. How come? As long as the sand stays in the end of the tube, the tube rolls freely, but as the sand shifts and levels out, the center of gravity changes.

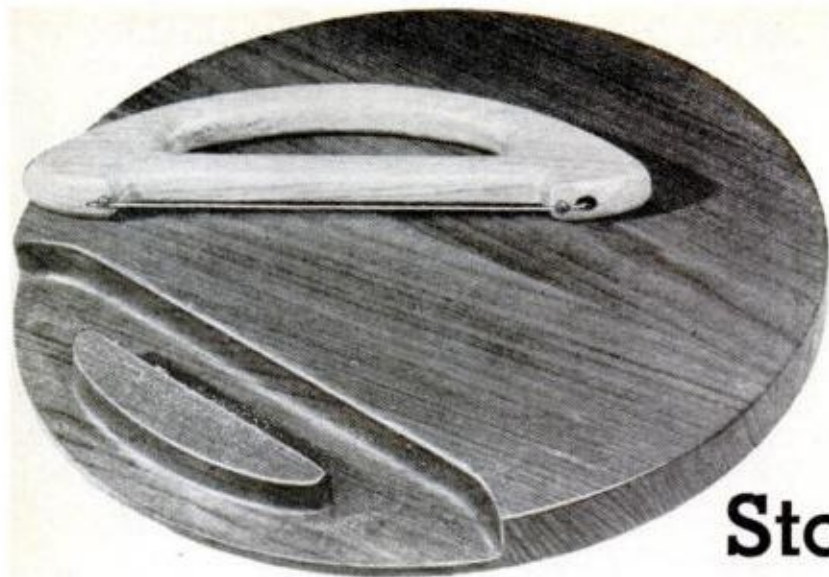
Quick-Change Cardboard Play Mounts

HERE'S A TOY that lets your youngster's imagination run wild. One minute he's a cowboy galloping over the range on his trusty pinto. A change of mood, a change of cardboard panels and he can become a tiger hunter lurching through the jungle on the back of an elephant or an Arab loping across the desert on a camel.

All three animals attach to a light plywood-and-dowel center frame with rubber crutch tips. The youngster simply slips into this frame with the rope straps over his shoulders and away he goes.

Animals for the original toy were made 42 in. long, but you may scale them and the frame to fit your child. After cutting out the panels, add the features with poster paints and finish with clear shellac to preserve the cardboard.—*Merton H. Slutz*





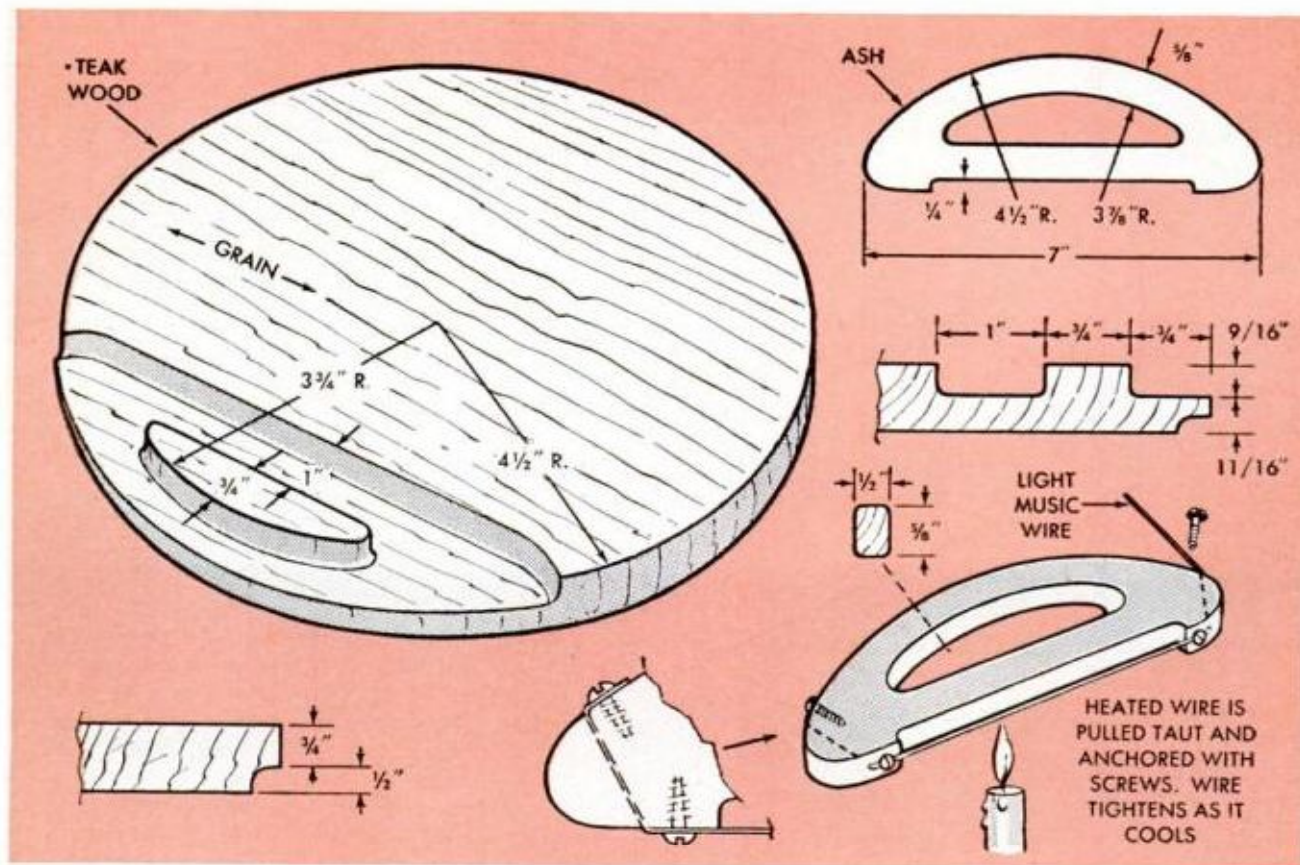
Cheese Slicing Board Has Self-Storing Cutter

DANISH INSPIRED, this modern cheese serving set looks like it came from an expensive import shop. Actually, it's a quickie project for the craftsman with a router-shaper or a somewhat challenging one if the cutter recess and cove cut around the bottom must be carved by hand.

Teak and ash were used to make the board and cutter shown here, but other hard cabinet woods of contrasting colors may be substituted. If you are unable to

find wide enough stock to make the 9-in.-dia. tray from a single board, edge-glue narrower pieces to achieve the necessary width. However, the simplicity of this project is designed to emphasize the natural beauty of the wood.

To provide a cutting edge, thread piano wire through small holes drilled in the ends of the handle and attach one end with screws. Then heat the wire and anchor the other end. It will tighten as it cools.



FAT-TIRE SCOOTER FOR SPORTSMEN



Its low speed and rugged construction are ideal for wilderness travel—and those fat tires assure a smooth ride with sure-footed traction

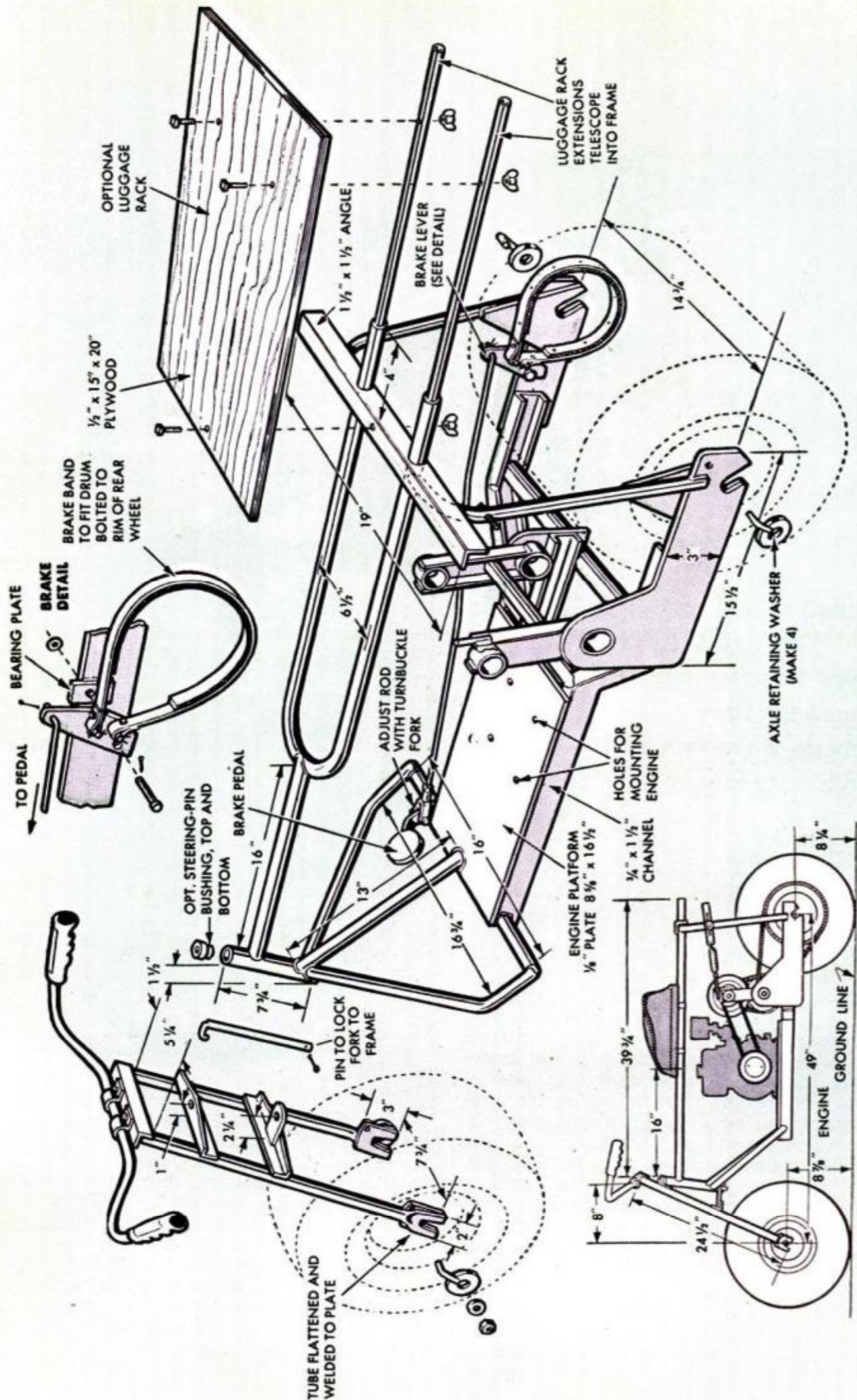
FOR TRANSPORTATION across the wilds, you can't beat this iron pack-horse. Its power-mower engine sends it over rough terrain at speeds up to 10 m.p.h.—gets you to remote hunting and fishing sites ahead of your footsore companions.

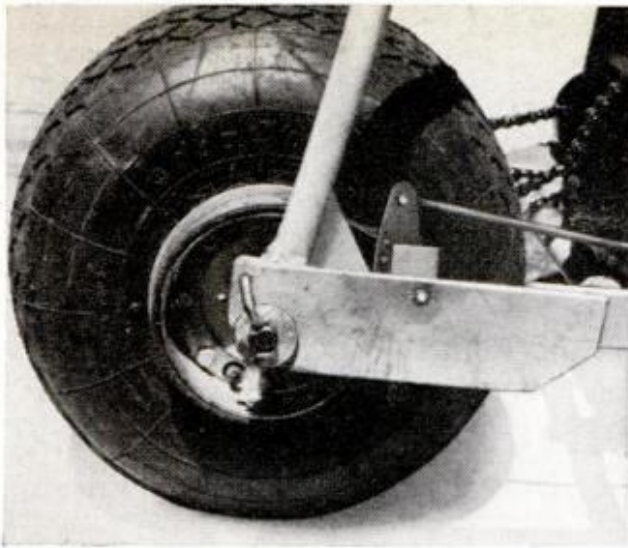
An extendable rear rack takes your equipment load off your back, and carts clumsy-to-carry game back to the campsite. When this pack rack isn't needed, you just slip out the extension pipes, or just leave them in place, capping the frame-pipe ends with crutch tips to keep the extensions from working out.

Though it's possible to up the speed by switching the transmission sprockets (putting the 6-incher on the top shaft and the small sprocket on the bottom), the scooter's not intended for public roads. You store it at your hunting cabin. Or truck it to road's end in your station wagon or the trunk of a large car. The whole front fork of the scooter detaches for easier loading.

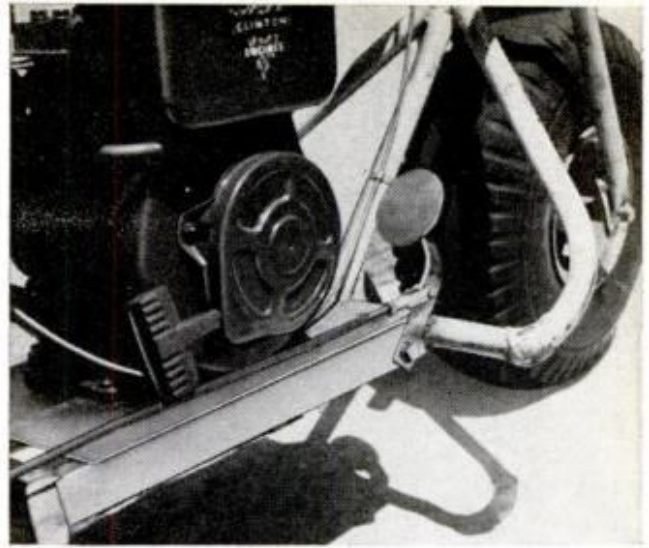
Since the over-all weight is around 150 lbs., you won't want to back-pack it very far—should you run into a stretch of country that forces you to dismount. For portage, in such cases, you just remove the fork, strap it on top of the seat, disengage the drive belt, lift the scooter by the front stirrups and "wheelbarrow" it along.

The frame design is simple but logical. Those stirrups protect your feet from jutting rocks. The side braces spread low underbrush to let the scooter pass.





BRAKE LEVER is pivoted at top of rear wheel's hub plate, with bearing plate between for clearance. Band passes around drum bolted to wheel rim. Ends loop over pins protruding from lever's rear face

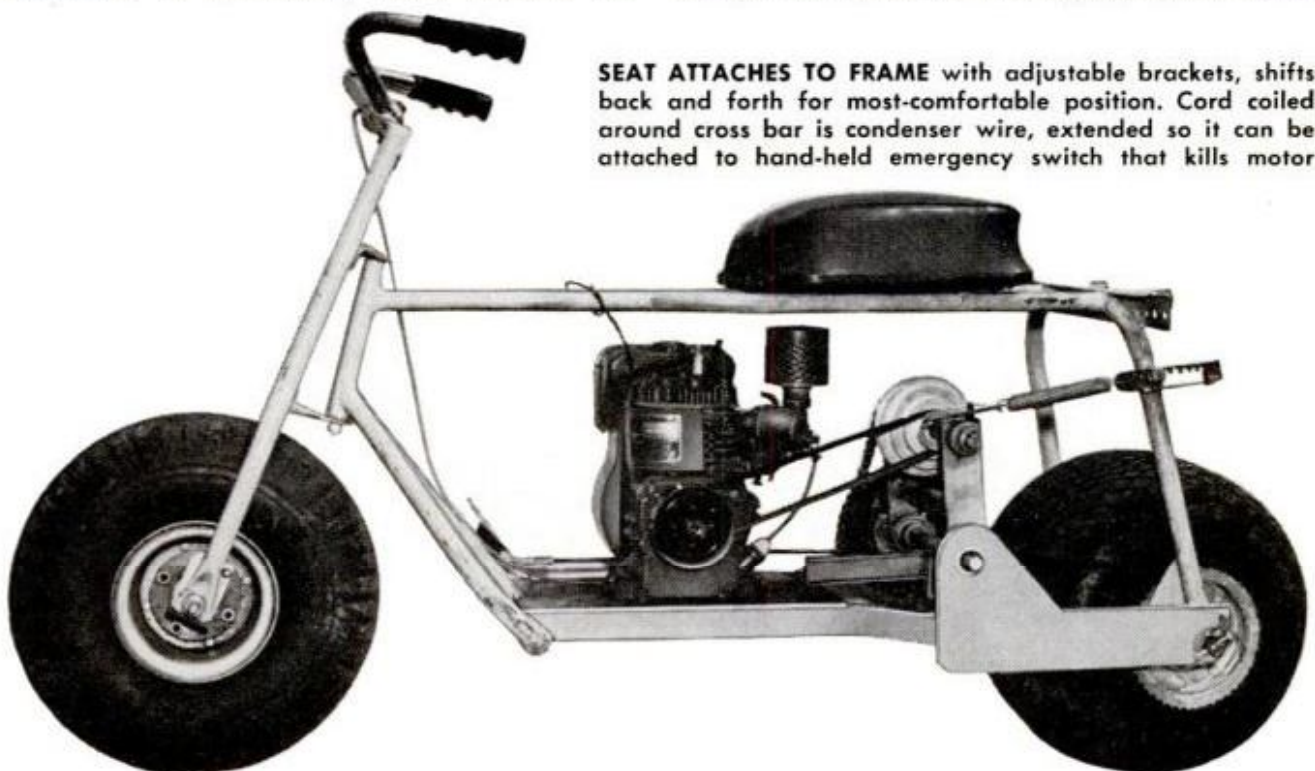


CONNECTING ROD passes forward from lever to brake pedal at right stirrup. Note how pedal angles inward for maximum foot room—and to avoid snagging on underbrush. Clevis permits rod adjustment

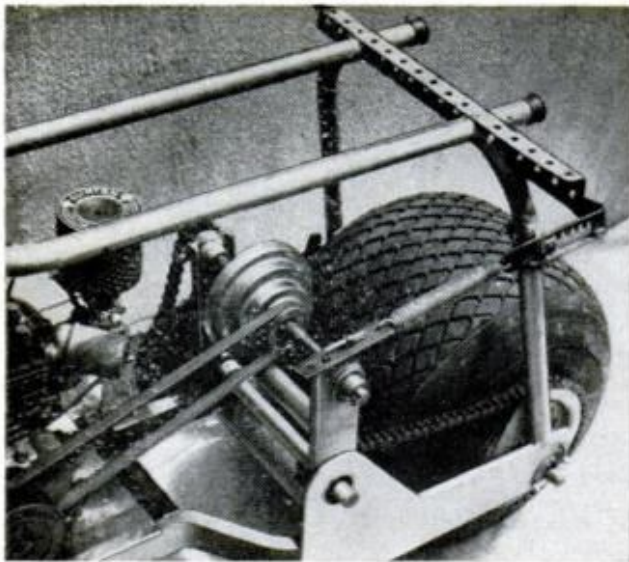
You needn't follow the dimensions exactly as given in the plans. The model shown is a basic machine, intended to demonstrate how simply a rugged scooter can be made. While the frame shown is welded up from 1-inch furniture tubing (for light weight) there's no reason why you couldn't use common $\frac{3}{4}$ -in. pipe or rigid conduit. Also, to avoid the bending, you could join straight lengths with angle iron. Such joints should, however, be reinforced with gussets, since the frame must stand up to fearful strain from jolting over rough ground. You'll also need formed channel for the frame base and transmission rack and steel plate for the engine deck. It's best if axles aren't threaded at the ends, since there's too

much chance of their being peened by scraping past stones. Rather, they should be retained with cotter pins and washers. Special pivoting retainers can be made by welding an L of $\frac{1}{4}$ -in. rod to one face of a washer large enough to slip onto the axle you've chosen. These retainers pivot on the outside of the hub plates for both wheels. The plates are notched to receive the axle. (The hub-nut shown on the front axle is an alternate treatment.)

But the main feature is that rear wheel. The 12-by-16 aircraft-type Terra-Tire has no tube and is kept at only 12 lbs. pressure. It simply cups itself around small boulders and logs in its path, smoothing your ride. (An 8-in. ground clearance keeps the frame from hanging up on these



SEAT ATTACHES TO FRAME with adjustable brackets, shifts back and forth for most-comfortable position. Cord coiled around cross bar is condenser wire, extended so it can be attached to hand-held emergency switch that kills motor



small obstructions.) It's virtually impossible to spin such a tire in loose soil or mud, or on ice. It floats along on top of sand, making this trail-blazer a practical beach buggy, as well.

The front tire's a 6-by-6 snow-and-mud tread; you keep its tube at 15-20 lbs. pressure. Both these tires can be obtained from an industrial tire dealer or (if you're lucky) at a war surplus store, where you might also find the various pulleys and sprockets. Wide-base rims are available in both pressed steel and aluminum.

The uprights of the front fork section

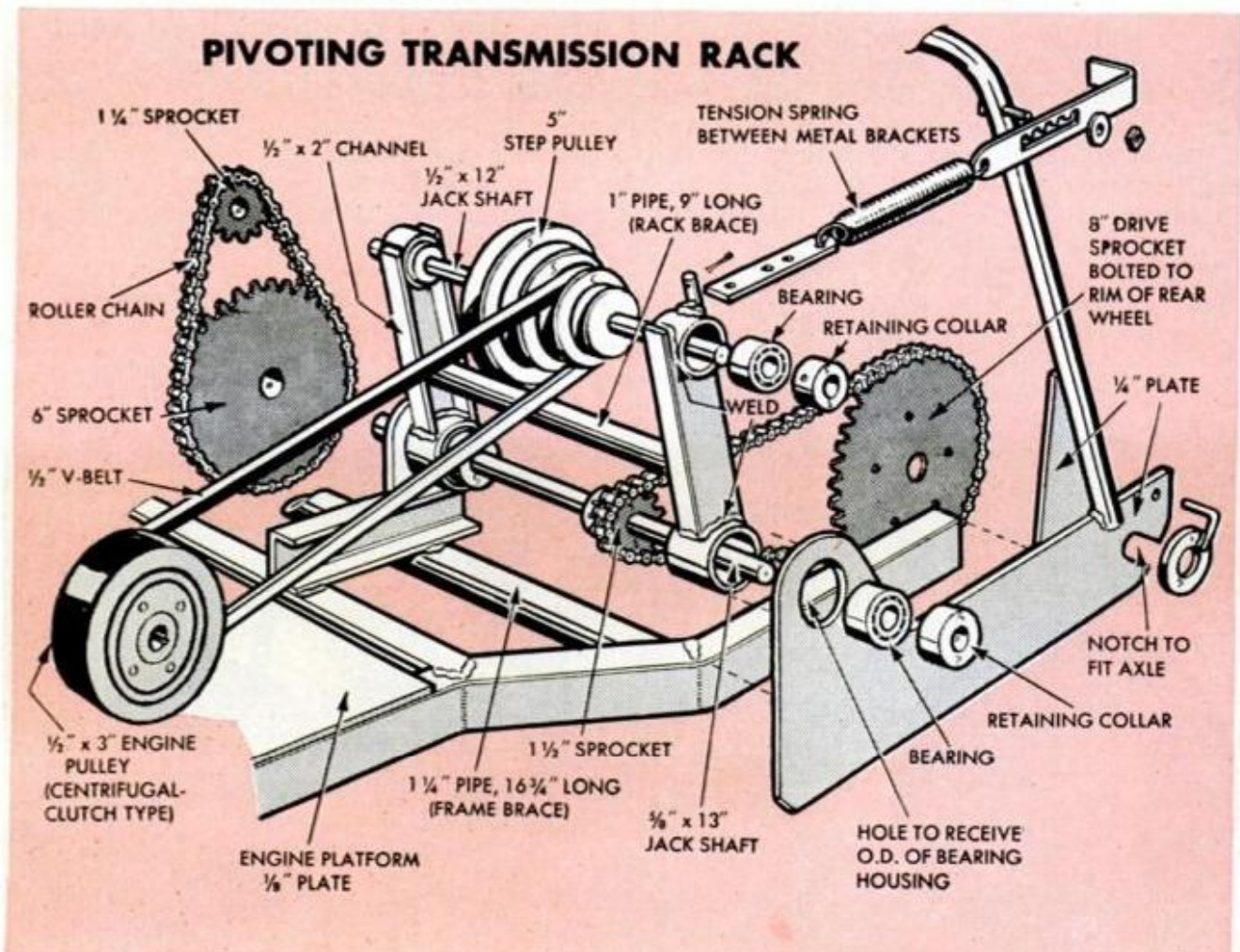
TRANSMISSION RACK is suspended between support plates, pivots forward to let you switch belt to other pulley-steps to alter speed. Pulley must then be shifted right or left to realign with engine pulley

are also 1-in. furniture tubing or $\frac{3}{4}$ -in. pipe. The cross members, including the two pivot brackets, are angle iron (or bed rails). These are spaced so that the frame's steering column will seat snugly between them. The lock pin is then dropped through. This pin is $\frac{5}{8}$ -in.-dia. rod, with an L of $\frac{1}{4}$ -in. rod welded at the top. This hooks over the upper pivot bracket to keep the pin from dropping through to the ground. It also provides a handle to facilitate withdrawal, once the cotter pin at the opposite end has been removed.

Unless you can lap this pin into the frame column for a snug fit, it should ride within bushings pressed into both ends of the column pipe. In the model shown, $\frac{5}{8}$ -in. I.D. Oilite bushings were used.

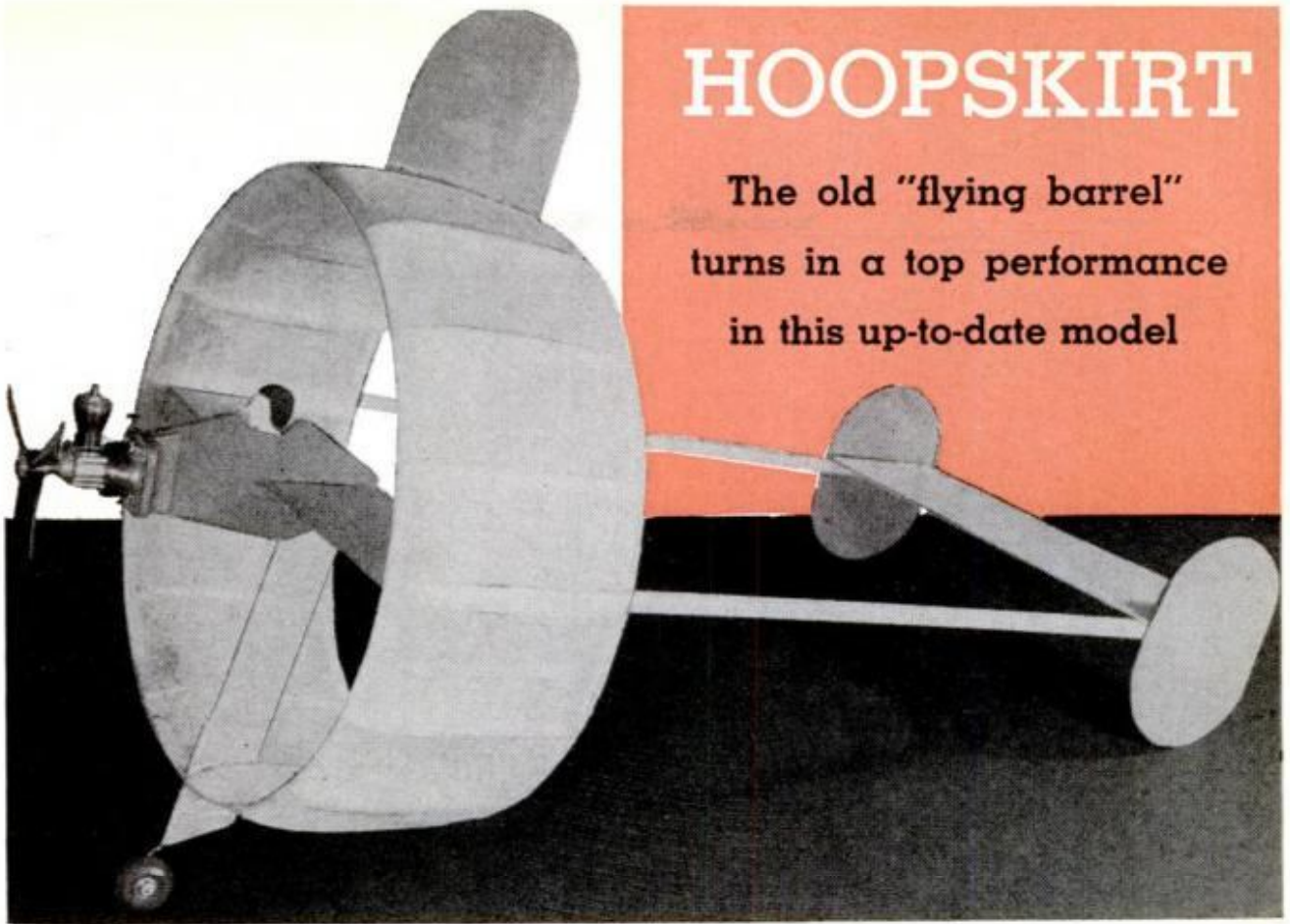
The transmission rack consists of two channel uprights with bearing housings welded at both ends. These housings are merely short lengths of pipe with an inside diameter that will provide a snug fit for the bearings you use. The two uprights are welded to opposite ends of a pipe brace, the jack shafts are slipped through

[\(Please turn to page 207\)](#)



HOOPSKIRT

The old "flying barrel"
turns in a top performance
in this up-to-date model



By Roy L. Clough, Jr.

TRROT THIS MODEL out on the field at your next meet and watch the eyes bug. If anybody snickers, put 'em in their place by reminding them that the annular wing is a very old aeronautical principle. Then launch your Hoopskirt. If its tradition hasn't impressed them, its performance is certain to!

At least a half-dozen full-scale planes (plus innumerable kites and gliders) have been built on the "flying barrel" design. One of the initial aircraft made by Ellehammer—the first Dane to fly—took this form. Louis Bleriot, the daring Frenchman who was the first to fly the English Channel, perched one on floats and tried, with indifferent success, to get it off the water. The French are still at it; their latest attempt at annular-winged aircraft is the "Coleoptere"—a tail-sitting jet.

One of the big advantages of this design is its propulsive efficiency. Efficiency in a flying system is highest when the velocity of the discharged air is almost as great as the forward speed of the plane. This means that it's better to move a lot of air relatively slowly than a small amount at high speed. (It's rather like matching impedances.) The annular wing with a propeller

ahead of it functions as an effective aspirator to increase the amount of air that is thrust backward during flight.

Such a wing has more lift than you might think. The closed-circuit nature of the airfoil eliminates wing-tip vortices. Theoretically, a hoop-wing plane shouldn't have to bank in order to turn. This model does, however, because of the vertical stabilizing fin at the top of the wing. This was added to produce an effect comparable to dihedral—necessary for stability in such an unpowered craft as this one.

The Hoopskirt is an extremely stable

(Turn page for plans)

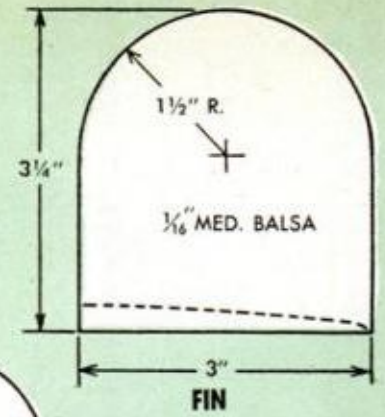


UNDER FULL POWER, the model climbs in wide, left-hand circles, glides down smoothly when power quits



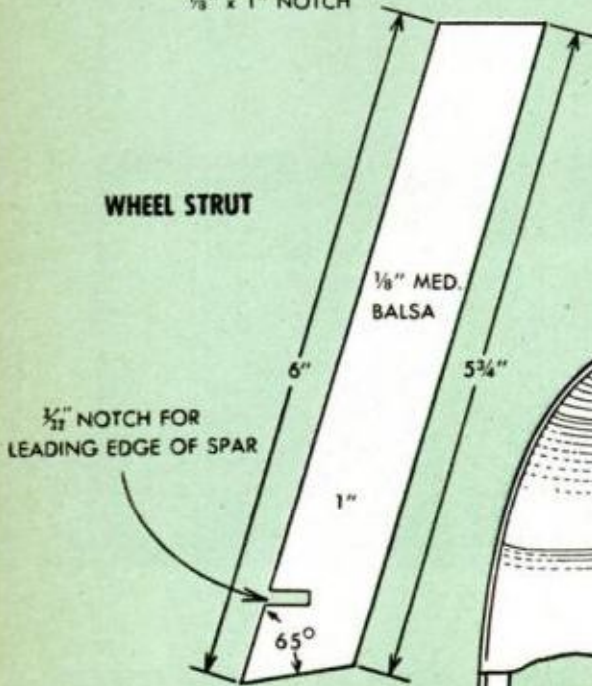
NACELLE

PILOT HEAD CAN BE SEPARATE SCRAP

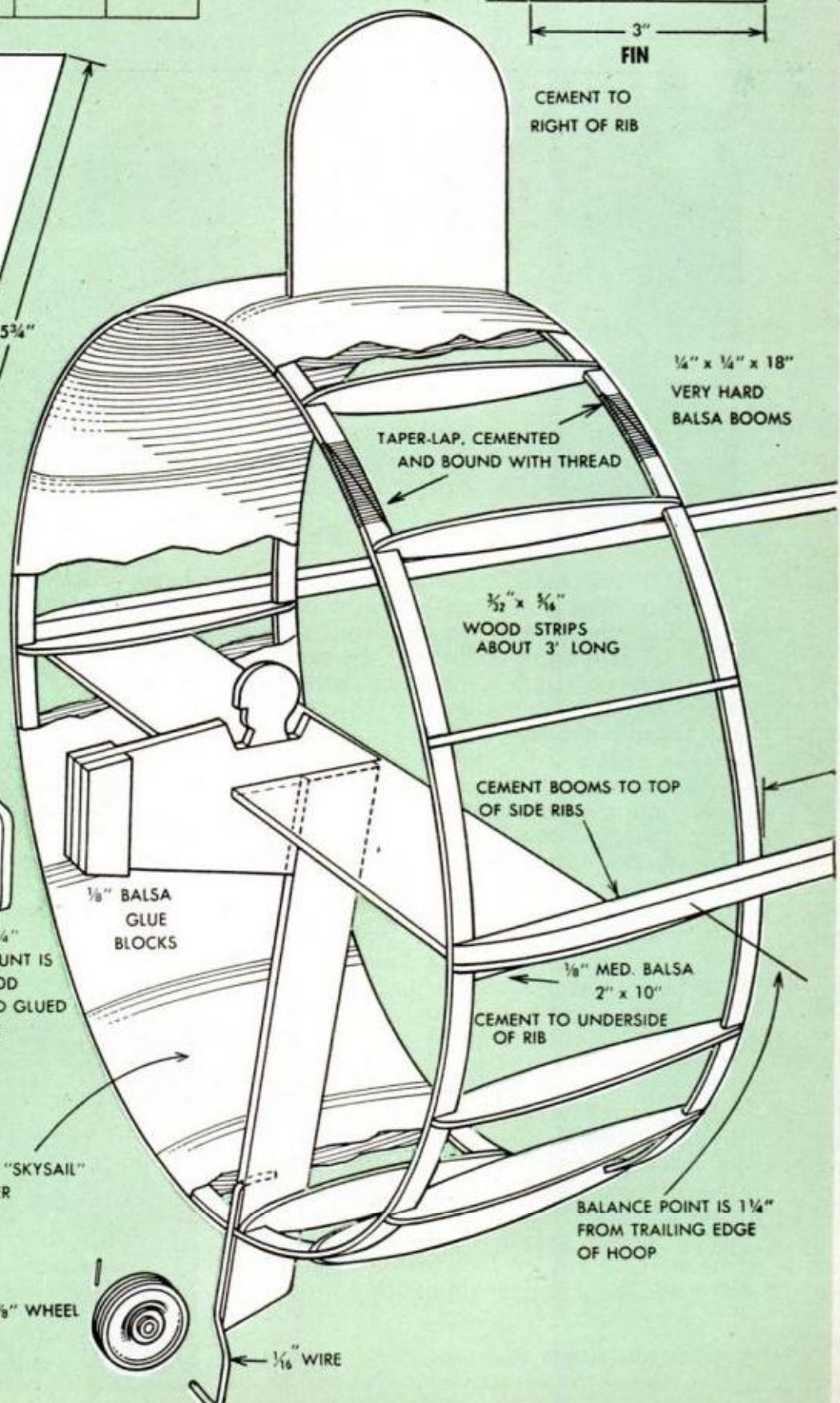
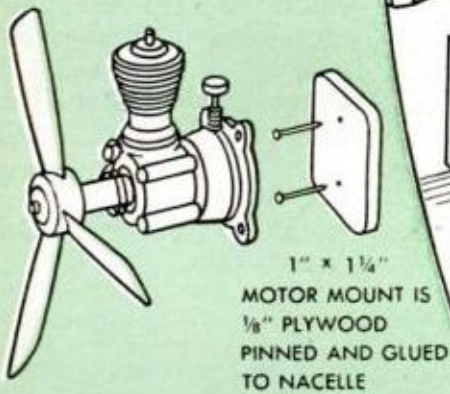


CEMENT TO RIGHT OF RIB

WHEEL STRUT



COX .020 ENGINE WITH 3-BLADE PROP (1° NEG THRUST MAX.)



LIGHTWEIGHT "SKYSAIL" COVER

$\frac{7}{8}$ " WHEEL



$\frac{1}{16}$ " WIRE

flying machine. It'll teach you a lot about this off-beat configuration. Don't let the circular wing scare you—it's quite easy to build. Any cylinder with a diameter of about 10 in. (a half inch either way won't hurt) can serve as a mold for the two spars. I used a straight-sided layer-cake pan. The spars can be of any light wood that bends easily when soaked in hot water. Bind these around the mold with a strip of rag. When dry, trim the ends in long, matching bevels to form the lap shown in the sketch; cement and bind with sewing thread.

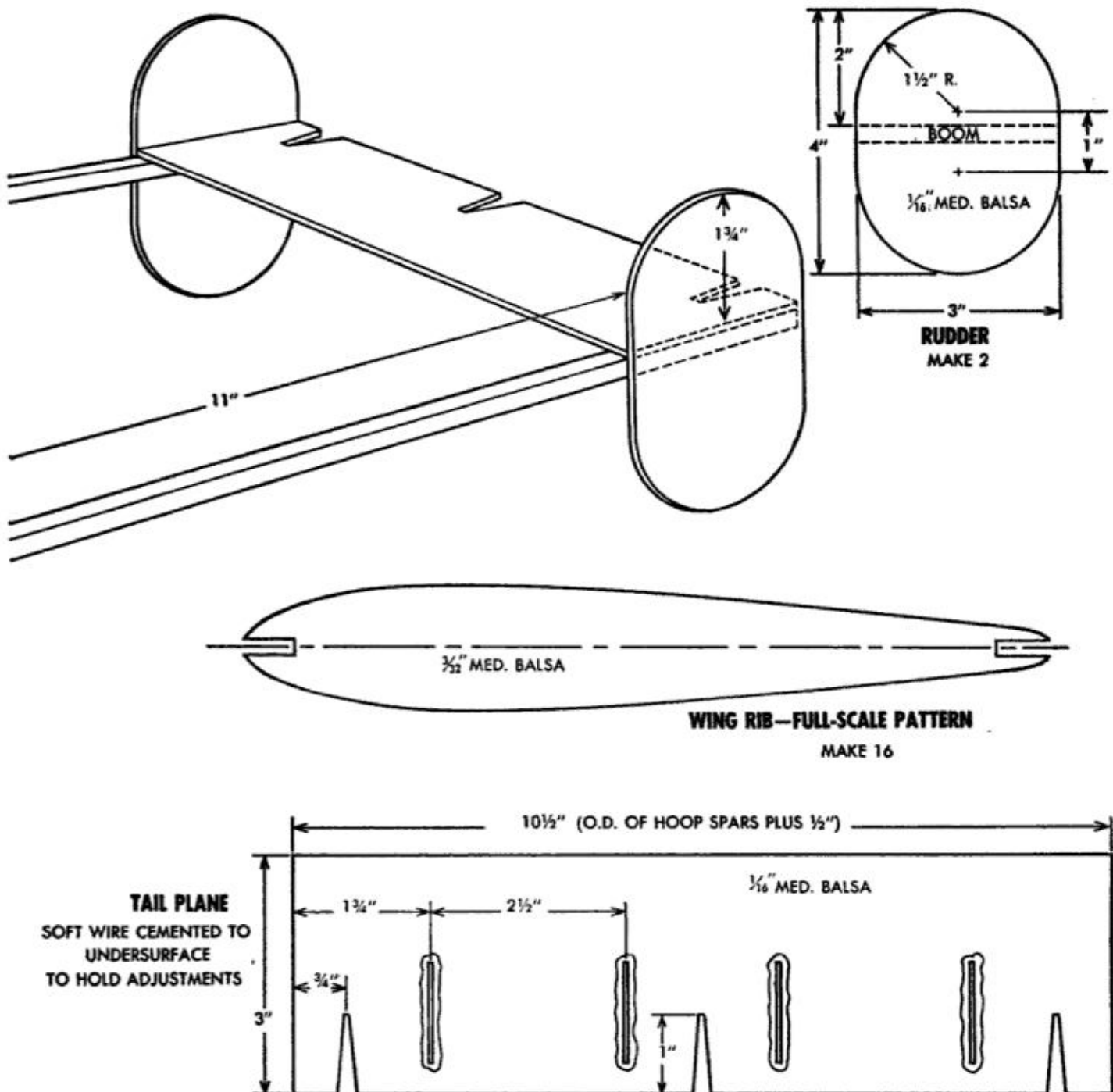
You can trace the wing-rib pattern directly onto your balsa, stacking blanks to cut as many at once as you can manage. The slots in each end are $\frac{3}{32}$ in. wide and $\frac{1}{4}$ in. deep. The width should provide a

snug fit over the spars. When these hoops are seated in the notches, their outer edges will protrude $\frac{1}{16}$ in. for rounding off.

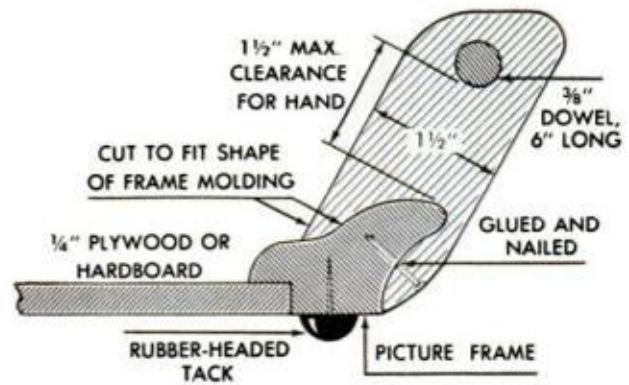
An easy way to space the ribs accurately is to set the spar-mold cylinder on a piece of cardboard and scribe around it to produce a circle the same diameter as the spars. Mark off sixteen rib positions by means of radius lines and assemble the wing vertically over this pattern.

Cover the frame one section at a time with light model-plane tissue. Sections into which the strut, fin or booms will pass can be left uncovered until assembly is completed—or you can cover the entire wing and then slit the paper of these sections when you install parts that must be cemented to the ribs. Water-shrink the

(Please turn to page 208)

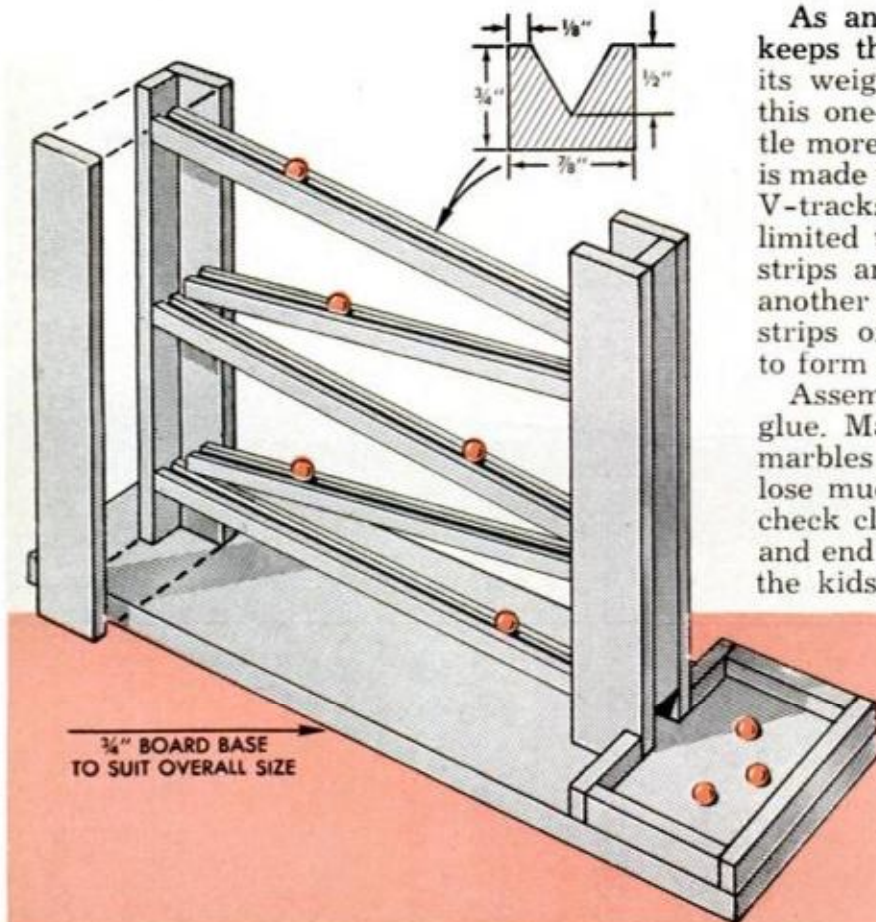


Old Picture Frame Becomes Serving Tray



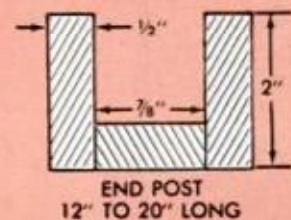
What's the quickest way to make a hostess tray? Start off with a cast-off picture frame. By replacing the glass and picture with a piece of plain or prefinished hardboard, or simply backing up the glass with the hardboard, your tray is finished with the addition of a couple of simple handles. Jigsaw the handles from $\frac{3}{4}$ -in. wood, making the four pieces exactly alike to fit the contour of the frame molding. Bore $\frac{3}{8}$ -in. holes for 6-in. dowels and glue and nail the handles to the short sides of the picture frame. After painting, drive a rubber-headed tack at each corner to prevent scratches.—D. E. Roetman

Marble Tower Toy Will Occupy Youngsters for Hours

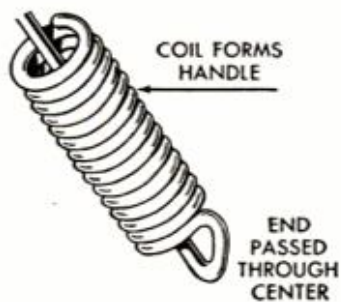


As any parent knows, a toy that keeps the youngsters busy is worth its weight in gold. Made of scraps, this one—a marble tower—costs little more than a few hours' work and is made as tall as you want. Make the V-tracks on a table saw. If you're limited to hand tools, bevel two flat strips and glue them together. Still another method would be to use two strips of cove molding, edge-glued to form a U-shaped track.

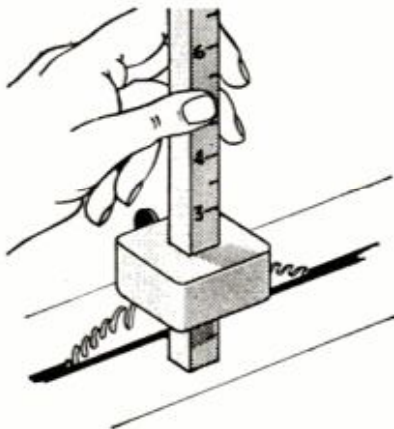
Assemble the toy with nails and glue. Make the slopes gradual (the marbles must roll slowly or they'll lose much of their fascination), and check clearances between the tracks and end posts with the same marbles the kids will use.—C. Wayne Close



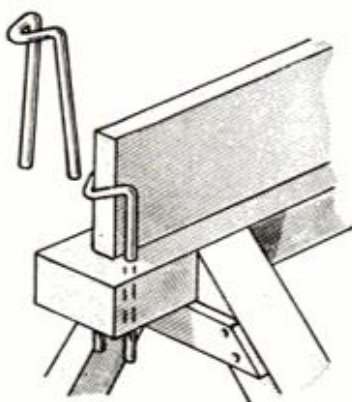
SIMPLE AS THAT



SOLDER will be easier to handle if you cut a 2-ft. length from the spool and coil this around a pencil so that it resembles a spring. Pass the loose end down through the center and feed more solder through as required

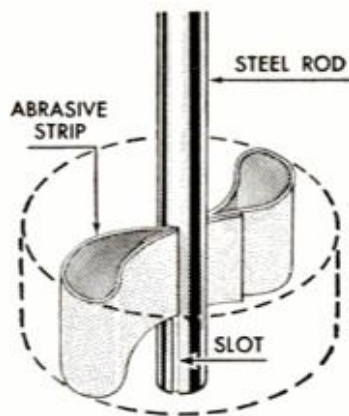


WHILE ALL circular saws are equipped with a depth scale, a lot of craftsmen will still use a rule to set the depth of cut. Here you may find a marking gauge better than a rule since the adjustable head provides a stop



HOW DO YOU edge plane short boards on a sawhorse? It's simple as can be if you make the adjustable stop shown here. Bend a length of steel rod to form the stop, then drill holes for the legs in the crossmember

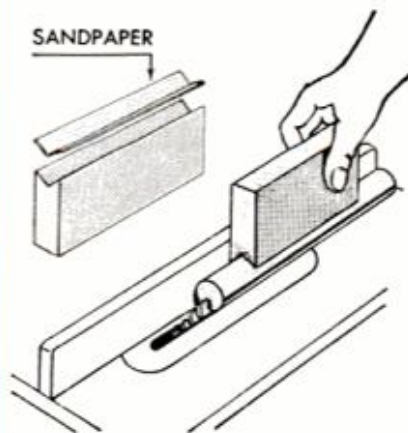
APRIL 1963



TO ENLARGE a hole slightly, fold a strip of abrasive paper or cloth so that it is a little longer than the diameter of the hole and slip this into a slot cut in the end of a steel rod. Then chuck the rod in your drill



TO CLEAN hardened cement from the edges of boards used in making forms, try using a length of angle iron. This improvised tool will glide along the edge of the board without slipping off and do the job fast



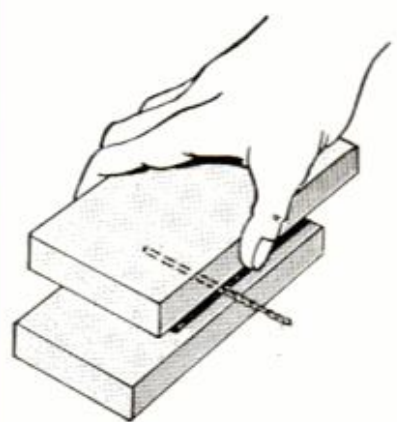
TO MAKE a hold-down block for use when grooving dowels on a bench saw, cut a V-shaped notch in one edge of a piece of 1-in. stock and line it with abrasive paper. Adjust saw fence to center dowels over the saw blade



LIFTING CAPS on hard-to-reach oil cups won't be a problem if you solder a small washer around the spout of your oil can near the tip. Hook the washer under the edge of the cap, lift and slip tip into cup



WHEN SHARPENING a saw, protect the tips of your fingers by slipping a rubber bulb from a medicine dropper over the free end of the three-cornered file. This fingertip grip can easily be removed whenever necessary



WIRE-SIZE twist drills are easily bent if you are not careful. To straighten one don't hammer it like a nail. Instead place the drill between two blocks of hardwood and roll back and forth. Drill will be straight again

159

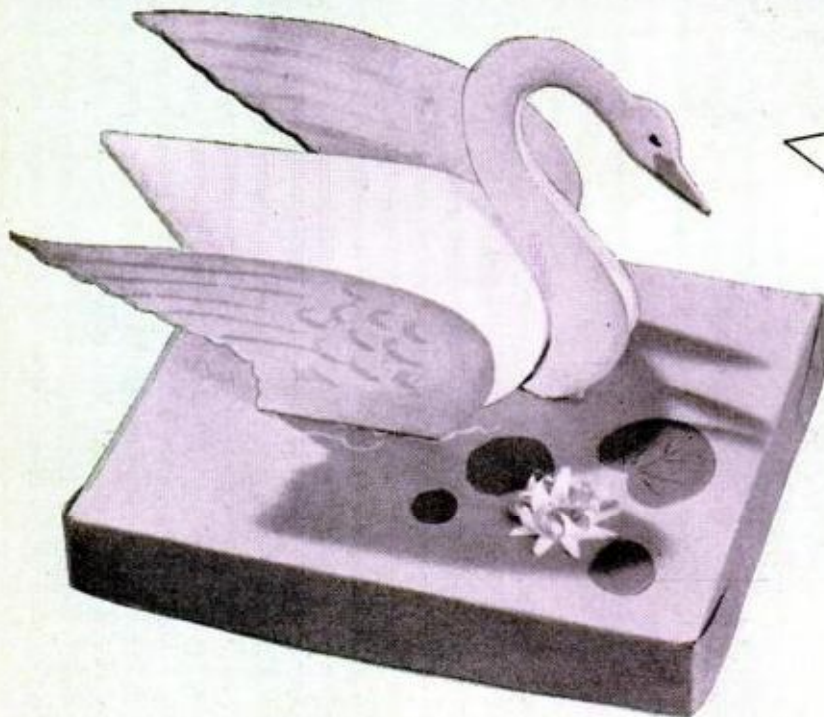
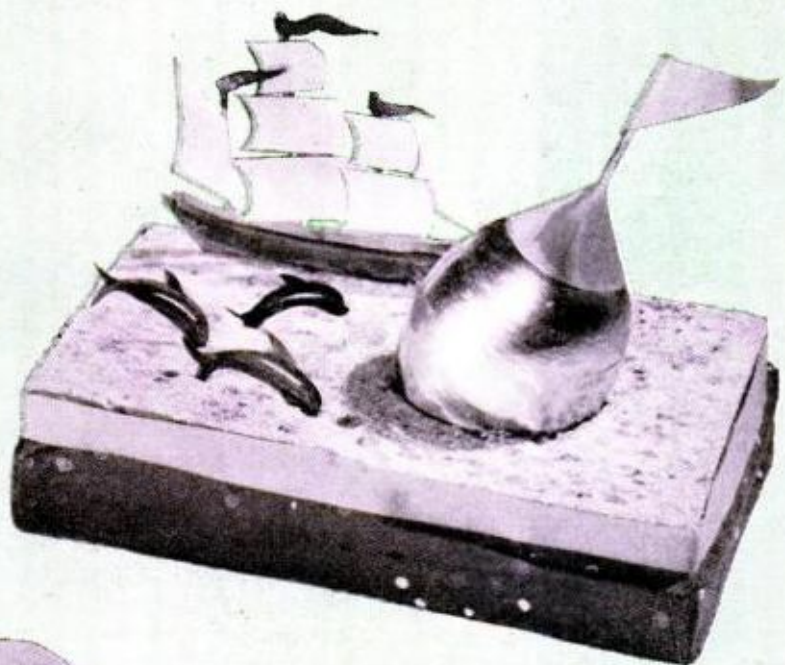
DRESS UP YOUR EGGS FOR EASTER

By Hi Sibley



WATERMELON PATCH is made from the cover of a small pasteboard box. Cut an opening in the top for the melon, then paint the cover an earthy brown. Next, add vines made by gluing paper leaves to dyed string. Paint the balsa fence a weatherworn gray and mount it as shown. To make the watermelon, dip an egg in light green dye and then add the stripes

HARBOR BUOY floats on a sea of green sponge. Cut out the depression for the egg with cuticle scissors and slip the bristol board ship and porpoises into slits cut in the sponge. Use flat toothpicks to brace the masts. The egg-buoy is topped with a paper cone which supports a toothpick mast flying a brightly colored paper pennant



WHITE SWAN has bristol-board wings with pale blue markings. Glue azure blue construction paper over the cover of a small box, then add a cutout to hold the egg and slits on either side of this for the wings. Neck is a double thickness of bristol board glued together at the head but spread apart at the bottom. A paper cone serves as a tail. Lily pads are green construction paper and lily is made from three pieces of thin white tissue

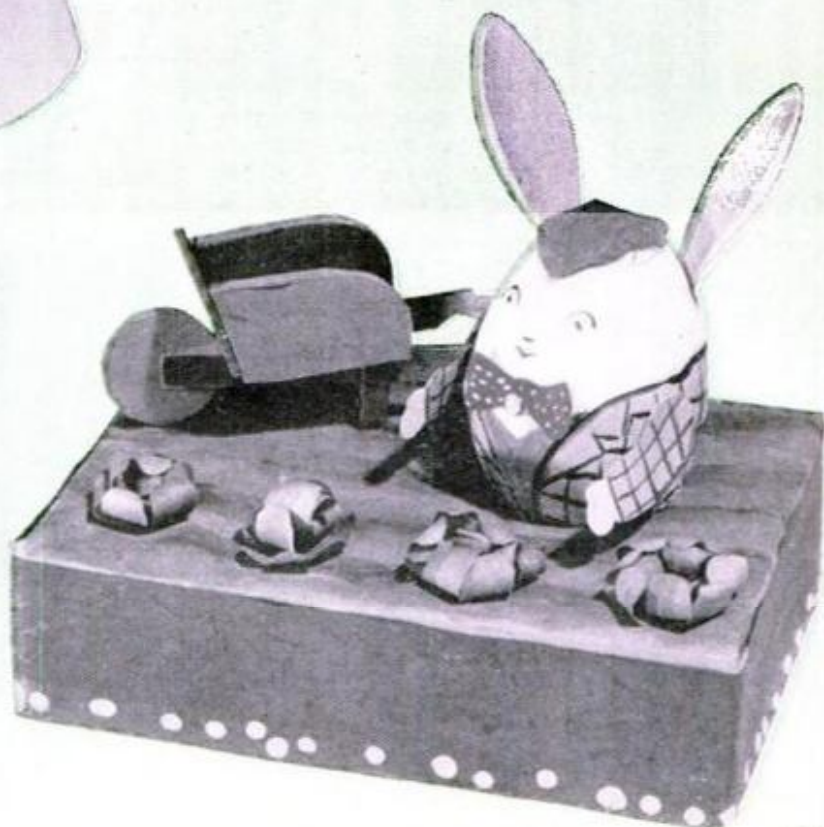
DIAMOND JIM is an egghead in a gray pasteboard suit. To make the base, ink in checks on a rectangle of gray pasteboard and bend it into a U-shape, attaching the two ends to each other with a strip of paper. Cut an oval hole in the top to hold the egg, then glue on a white paper shirt front and pasteboard lapels. Hat is a cylinder with the top wider than the base. Ribbon tie and old cuff link finish him



EASTER MAID'S pretty little head nestles in a truncated paper cone decorated with real lace. Paper hat requires more of this lace, plus cheery paper flowers, birds and pipe cleaners. That silky hair peeping out from under her hat may be a piece of wool from a floor polisher or simply painted on with watercolors



PETER RABBIT may bear a strong resemblance to Humpty Dumpty, but those tall paper ears should set any little egg-hunter straight. Paint on the jacket and vest, then add the paper arms, tie and cap. Make the wheelbarrow of balsa and the cabbages from green tissue which has been curled by pulling it over the dull edge of a table knife. Cover the cardboard box forming base with brown paper and add a decorative egg-dotted band at bottom



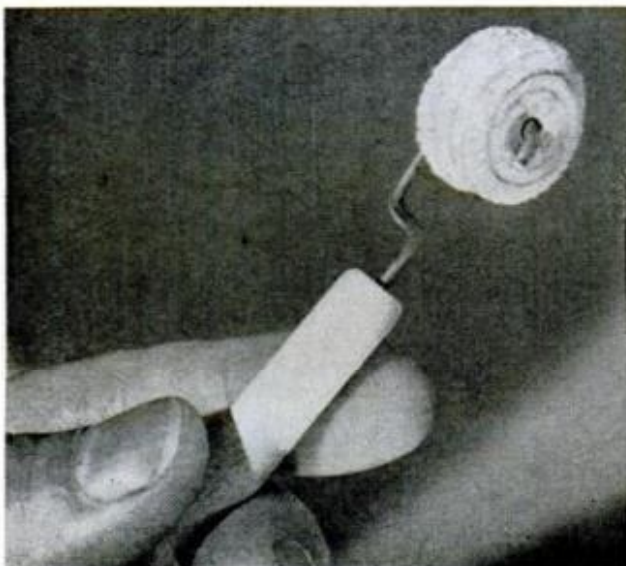


TRAVELING? One neat way to carry an extra suit in the trunk of your car is to slip it into a plastic bag and mount the whole thing on a panel of corrugated cardboard. Bend the hanger to hook over the top of the panel and tape or tie bottom of bag to the panel

Solving

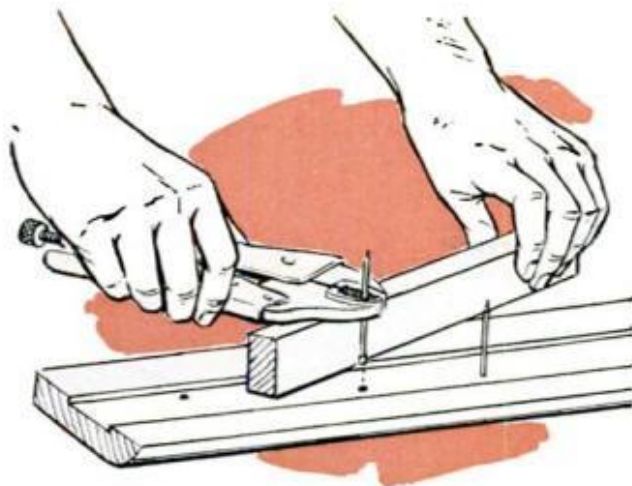
HOME PROBLEMS

PIPE CLEANER wound around spool makes a fine miniature paint roller. Drill or punch small holes to hold bent ends of pipe cleaner. Mount it in a stiff wire holder set into a length of dowel for a handle



NO MORE PRYING off the lids of small cans of paint if you store them open in screw-top glass jars. A teaspoonful of turpentine in bottom of jar will saturate air inside and protect paint in open can

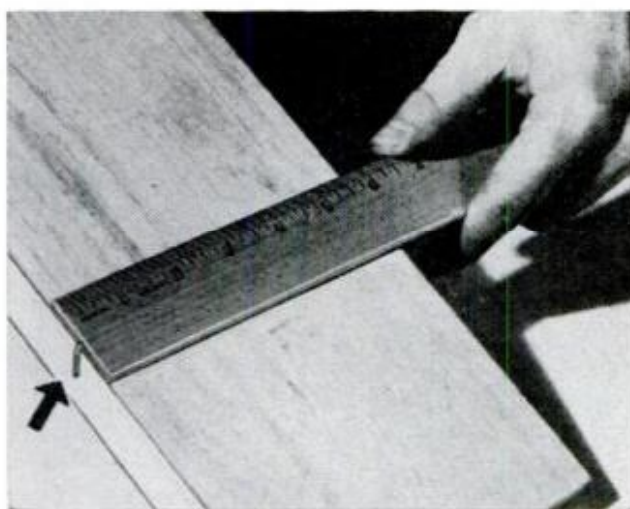




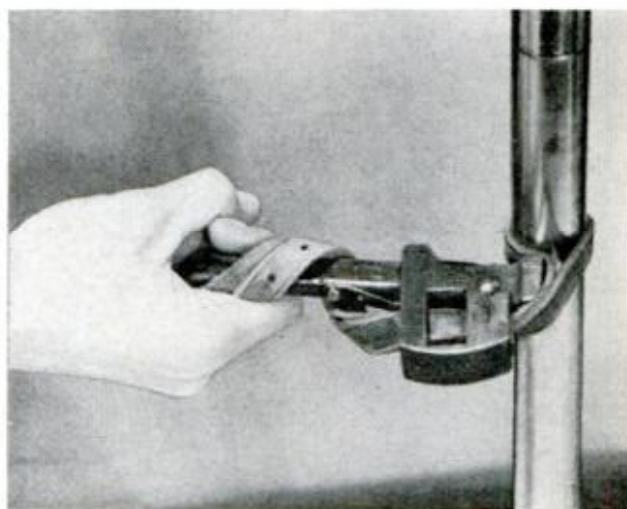
WHEN REMOVING finishing nails from trim or molding, pull them out through the back. In driving them out through the front, the nail head often causes the wood to splinter and the enamel or varnish to chip



BRIDGE TABLE is usually slid into a closet or behind a cabinet for storage, and this sliding eventually causes unsightly scratches on the edges. To protect them, glue felt bumpers near corners of the table



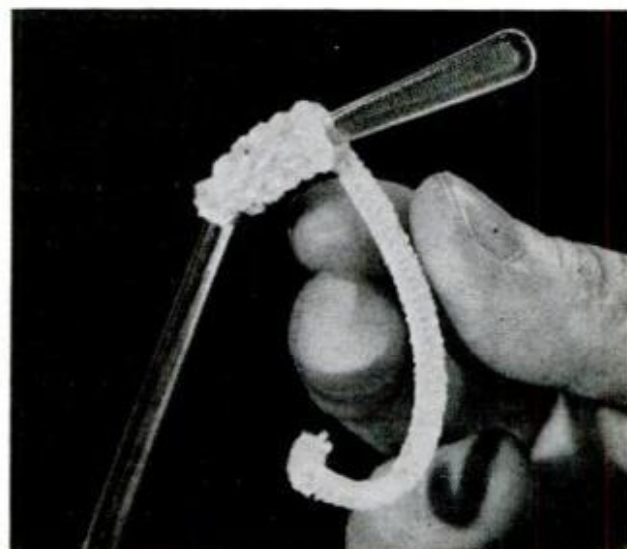
TO ASSURE ACCURATE measurements, drive a small L-hook into the end of your workshop ruler. Make sure that you drive the hook in far enough so that its inner surface lines up with the very end of the ruler



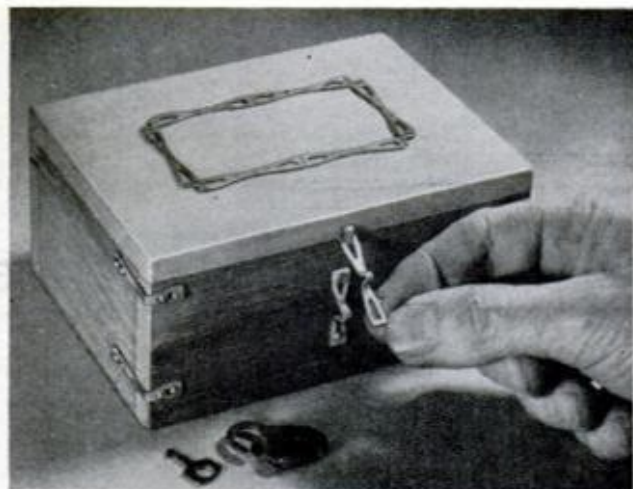
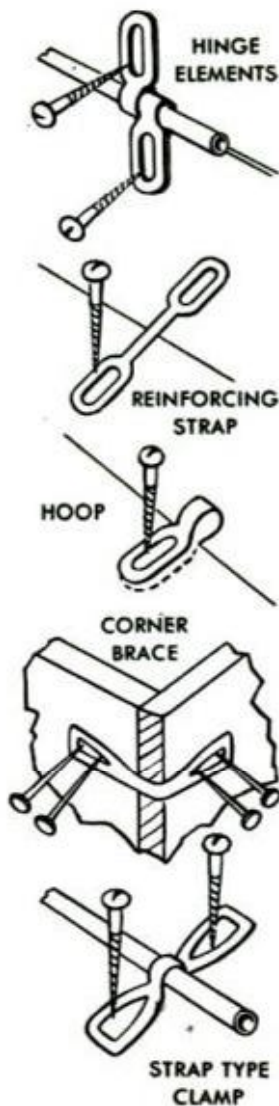
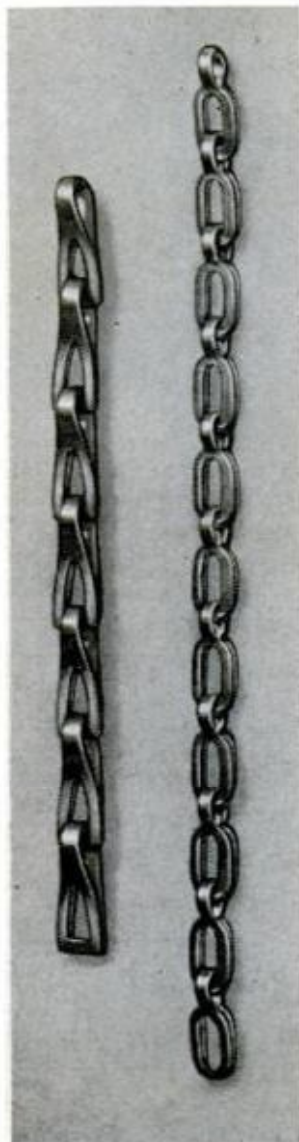
STRAP WRENCH for use on polished tubing or pipe is easily made by removing the jaw from a pipe wrench, running a leather or canvas strap through the opening, as shown, and wrapping ends around handle

UP THE CREEK without a fish scaler? Salvage the lid from a coffee can for this job. You'll find that the sharp edge lifts those scales in a hurry. However, be careful not to cut your hand on this sharp edge

EYEGLASSES that slip or slide will stay firmly in place if you wrap each bow with a piece of pipe cleaner. This will form two soft cushions that can easily be removed and replaced whenever necessary

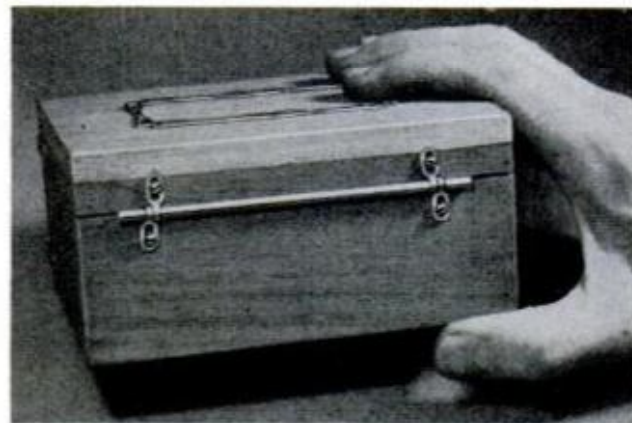


Clever New Kinks for Flat Chain Links



DECORATIVE FITTINGS for this jewelry box are all made from chain links. Upper leaf of hasp-type latch is stapled to lid with clipped link of same type

HINGE FOR THE BOX is made from four brass chain links and a length of highly polished $\frac{1}{8}$ -in. steel rod, as shown in the upper detail of the drawing at right



A **SCRAP LENGTH** of flat chain, of the type normally used to hold window sash weights or operate furnace controls, is a real gold mine for the craftsman with a little ingenuity. When separated into individual links, it becomes a stockpile of matching metal pieces which can easily be bent into various shapes to form sturdy fasteners, clips for holding cord or wire and even decorative fittings for small woodworking projects, such as the jewel-

ery box shown in the photos on this page.

To make emergency staples for use in soft woods, spread the sides of the link and straighten them so that they are parallel. Then clip the loops to make either forked or single-pronged points. Small reinforcing straps for strengthening wood joints can be made by opening the links all the way and flattening them. Such straps bent to right angles will also make good corner braces.—*Walter E. Burton*

WE ASKED IF YOU WANTED MORE

The overwhelming response from readers to our Project-a-Plan method of enlarging magazine patterns (introduced in our December 1962 Christmas Display article) has been most gratifying. Of the many, many letters we received, a number of which contained snapshots or clippings from local newspapers showing the completed projects, all were most enthusiastic about this new, easy way of "drawing" magazine patterns full size with a slide projector. You'll be happy to know that it is our intention to present Project-a-Plans for any project requiring a full-size design pattern, and you'll find these clip-out paper "transparencies" are provided for the toy featured on page 149 of this issue.—*The Editors*



NEW FOR SHUTTERBUGS NEW

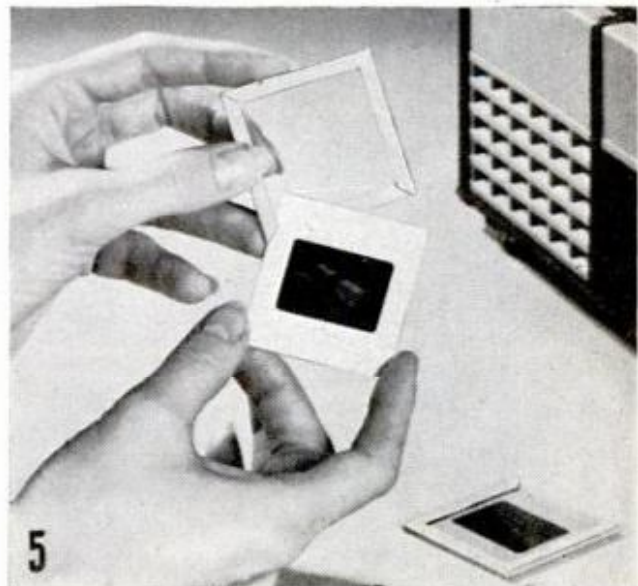
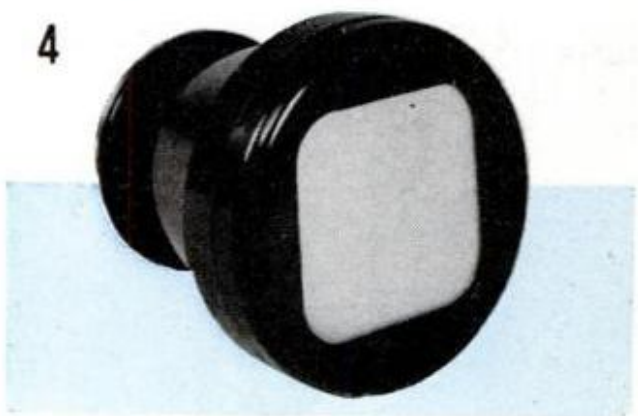
1. MOBILITE TWIN BEAM movie light features a single sealed-beam lamp that provides either floodlighting or a concentrated beam at the flick of a switch. An adjustable mounting bracket allows a lighting angle from direct to a 90-degree bounce. Price \$17.95. Flex Electric Prod., 39-08 24 St., L. I. City 1, N. Y.

2. BALOMATIC 656 projector accepts 2 X 2-in. slides mounted in cardboard, glass, metal, plastic or intermixed. Projection rate can be automatically set at one slide every 4 to 30 seconds (or more) and can be speeded up or retarded while in use. Tray holds 40 slides. Price is \$124.50. Bausch & Lomb, Rochester, N. Y.

3. TITLING SET for home movies and slides contains over 200 magnetized letters and numbers plus a metal background panel on which to arrange them. Instructions for camera placement, lighting and creative titling hints are included with the set which is available at \$7.95 from Joiner Mfg. Co., Joliet, Ill.

4. LECTRO COLOR SLIDE duplicator is available in 6 models to fit the lens of 35 mm., Polaroid and many other cameras by means of standard filter adapter rings. Color slides may be copied on either color or black and white film. Cost is \$11.95, instructions included. Electron Development Co., Bryan, Ohio

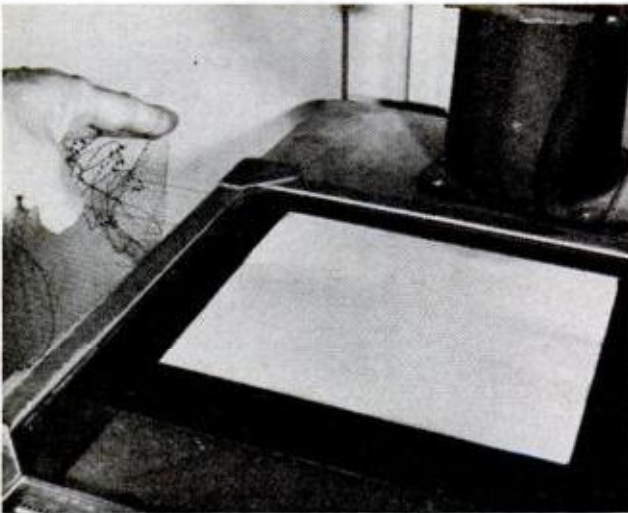
5. METAL BINDERS enable transparencies and masks to be mounted between 2 X 2-in. pieces of slide cover glass for projection in Carousel and many other magazine-type projectors. The three-piece binders hold the glass secure without fasteners. Price is \$1.95 for 50. Eastman Kodak Co., Rochester, N. Y.





Wastebasket Serves in a Pinch

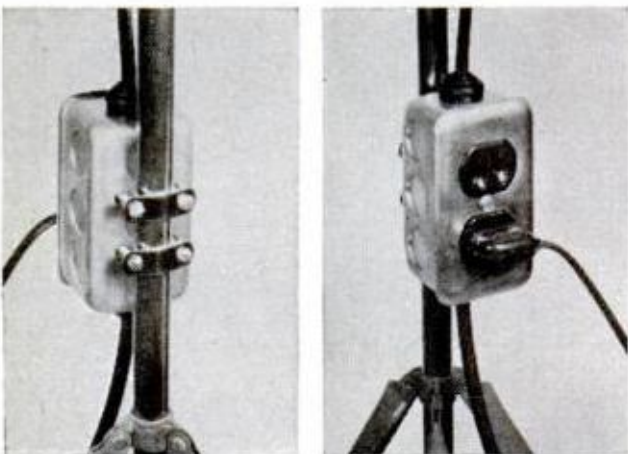
Faced with not having a large glass or other noncorrosive container for mixing stock photo solutions, I began looking about the house for something suitable, keeping in mind that it couldn't be metal. A plastic wastebasket caught my eye as being just what the doctor ordered. Being of plastic it wouldn't contaminate the developer or hypo, and having a wide mouth it would permit continuous stirring while adding the powdered chemicals. The basket, being unaffected by the chemicals, was not harmed in any way.—*Wayne Floyd*



Texture-Printing Trick

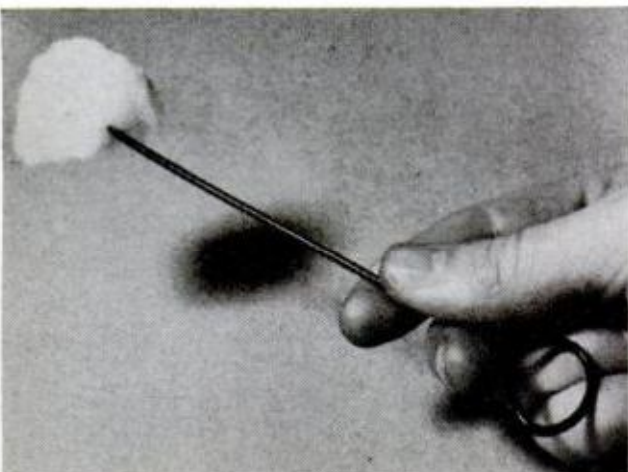
Regular texture screens often add a pleasing pictorial quality to enlargements, especially portraits, but they are somewhat expensive. A similar effect can be obtained at much less cost by printing through a piece of cheesecloth, lace, closely woven netting or veiling. Spread the material out smoothly on the easel, placing it directly on the enlarging paper and make the exposure in the regular way. Special effects can be obtained by placing the netting at a 45-degree angle across the easel and exposing through it as before.

—*Eugene M. Hanson*



Plug-in Box on Lamp Stand

A duplex receptacle box fitted with a 10-ft. heavy-duty cord and mounted on the stand of your main photolamp, will make it extra convenient to plug in your fill-in lights at one central location. Attach the surface-mounted box to the stand with clamps made from two 1½-in. brass mending plates, inserting stove bolts through the holes in the back of the box. The cord from the main photolamp is wired directly to the receptacle through a knockout hole in the top of the box which is fitted with a grommet improvised from a rubber crutch tip. The 10-ft. cord enters a hole in the bottom of the box.—*Arthur Trauffer*

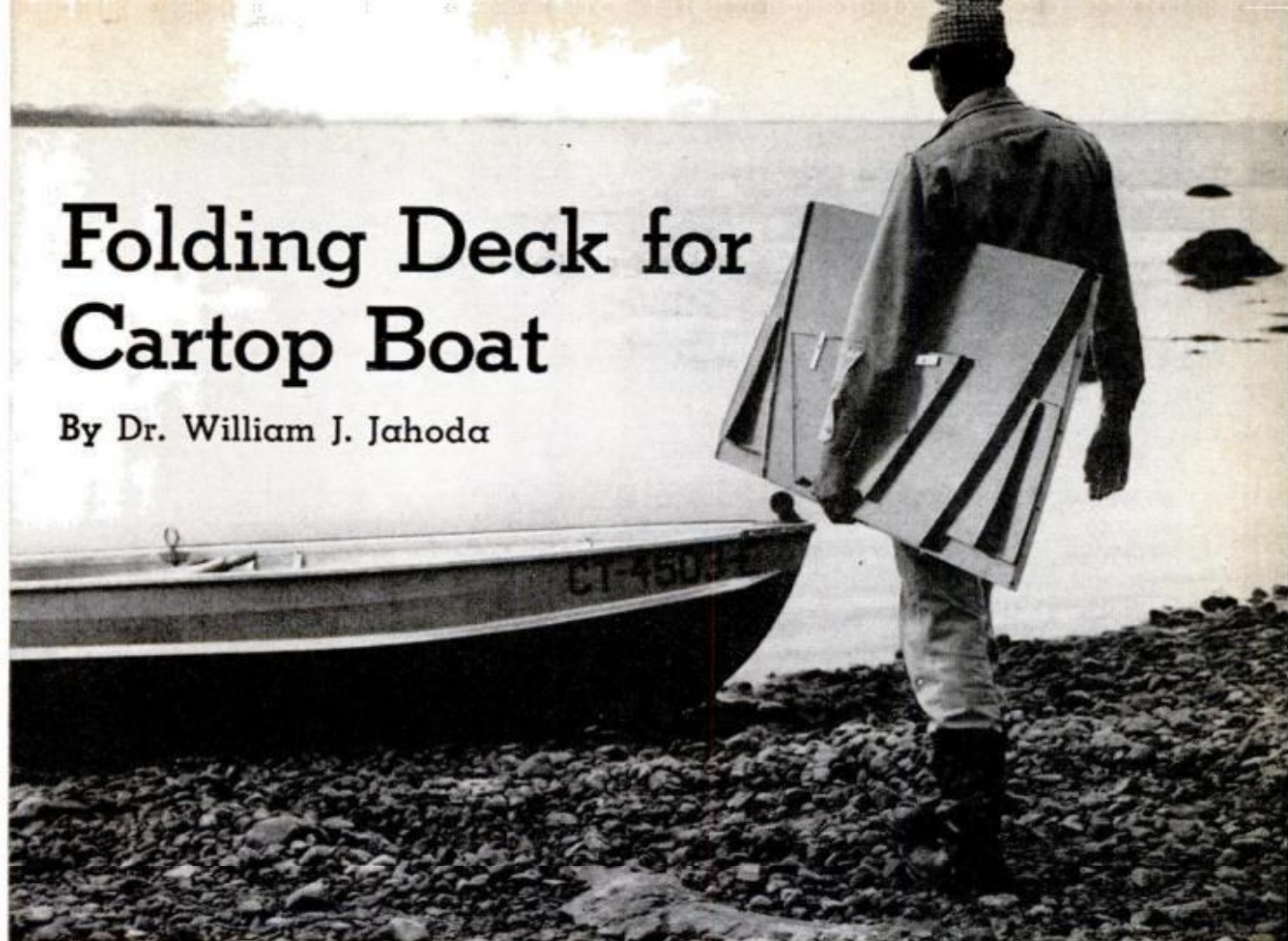


Cotton Makes Soft Dodger

Ever thought of using cotton for dodging enlargements? You'll find the fluffiness of cotton will cast a more fuzzy, less sharply defined shadow than a regular cardboard dodger and thus will diffuse the shadow better. With cotton you can quickly vary the size of the dodger needed by compressing it in a small wad or fluffing it out to cover a large area. A wire handle cut from a coathanger is all you need. The cotton is merely stuck over the end of it.

Folding Deck for Cartop Boat

By Dr. William J. Jahoda



ONE OF THE MAJOR shortcomings of a cartop boat is the lack of protection for gear and passengers in rough water. While that completely open interior is fine and practical in fair weather, it becomes most uncomfortable when running in a brisk chop with wind-driven spray. And if you've ever been caught in the middle of a lake by one of those five-minute summer showers, you know how handy it would be to have a protected compartment for tackle, lunches, etc.

The versatile bolt-on deck shown here provides dry storage space and protection from spray, yet can be quickly detached and folded into a flat compact package. Consisting of three sections, plus a fold-down spray shield, the deck can be folded in various ways while mounted on the boat to suit the weather. Buttoned up tight, with the spray shield raised, it gives the maximum protection to center-seat passengers and gear stored in the forward section of the boat.

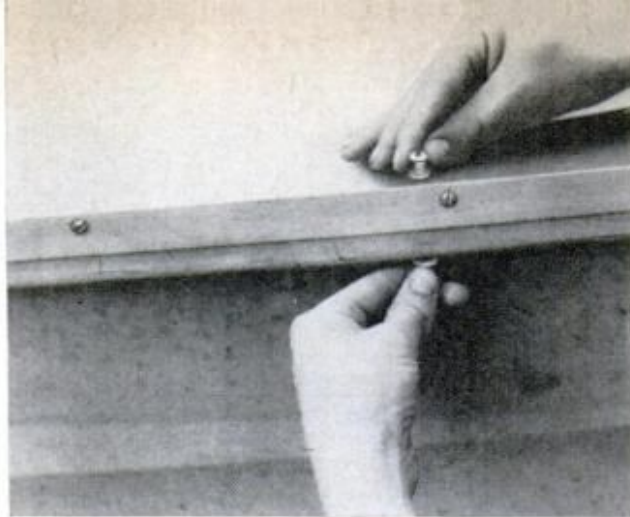
The middle section is hinged to the aft section so as to fold back on it. In clear weather, you can run the boat in a moderate chop with the spray shield flat on the aft-deck section and the middle section

folded back over it. This also makes it easier to load gear under the deck, and in calm weather, someone can ride up front in the well.

Make the deck from $\frac{3}{8}$ -in. marine plywood. Since it should cover about one third of the cockpit, the amount of plywood required will depend on the size of your boat. A 4 x 6-ft. panel was used to make the deck illustrated here, but you'll have to vary all dimensions to suit your boat. Position the aft edge of the deck far

RIGGED FOR ROUGH WATER, with the center section of the deck closed and the spray shield up, this cartop boat takes on the appearance of a rugged runabout





WHEN SUN COMES OUT, fold the spray shield flat on aft section of deck and swing middle section over on top of it so that the bow seat may be used

enough forward so that passengers in the middle seat will have freedom of movement yet be protected by the spray shield. The locations of the joints in the decking will be determined by the position of your boat's forward seat.

After positioning the plywood panel on the gunnels, mark the outline of the boat on it. Then remove the panel and cut out the deck in one piece.

Once the deck has been cut out, determine the proper locations for the joints between sections and cut the deck into three pieces. Attach section B to section C with three small brass hinges, then mount two short lengths of $\frac{1}{8}$ -in. aluminum stock near the aft edge of section A, as shown in the detail below, to act as hold-down latches for section B.

The spray shield, section D, is reinforced with two tapering uprights cut from 1-in.

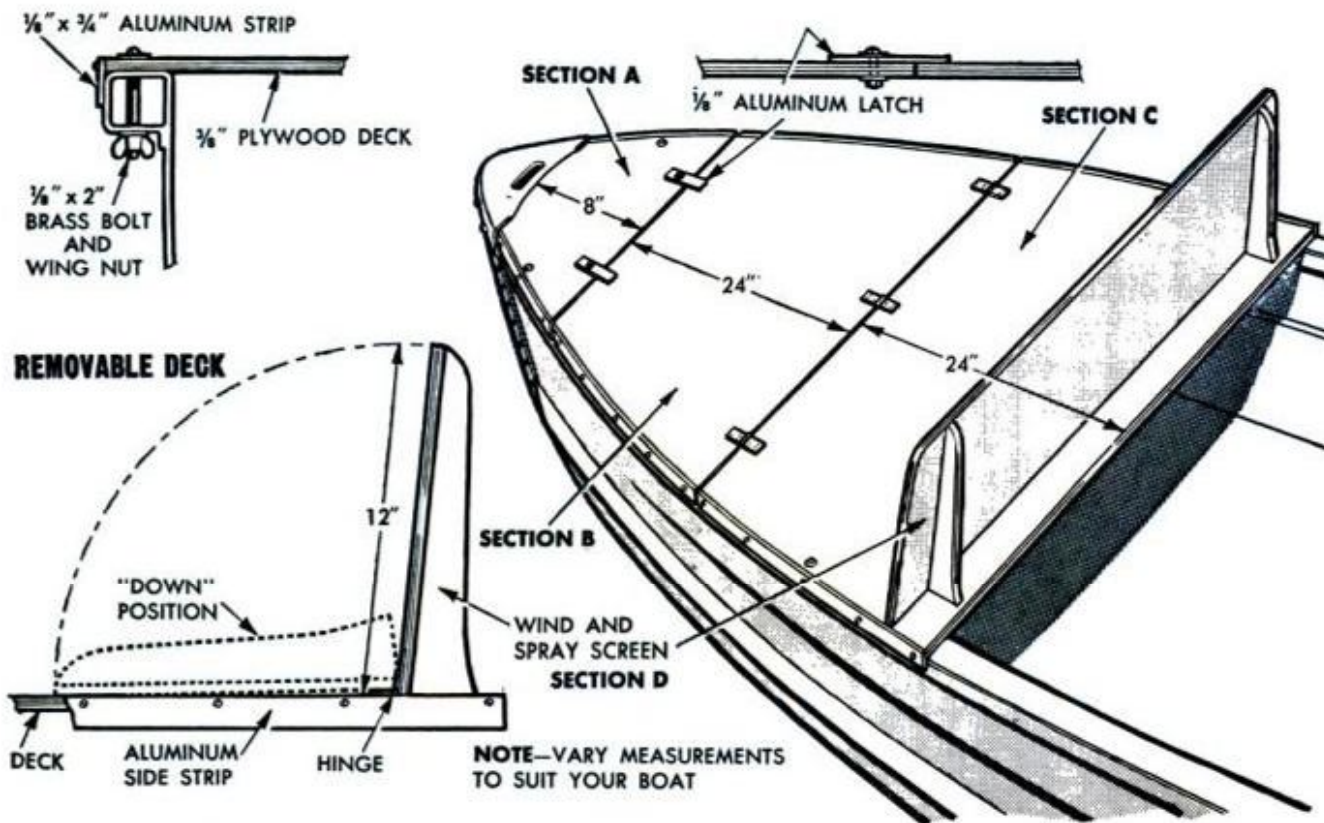
TO MOUNT THE DECK, drill four matching holes through $\frac{3}{8}$ -in. plywood and gunnels, then bolt sections A and C to the boat with brass bolts and wing nuts

stock. Mount it on section C as shown, using a length of brass piano hinge.

A $\frac{1}{8} \times \frac{3}{4}$ -in. aluminum retaining strip mounted around the outer rim of the deck not only helps to hold the sections in position but prevents water from being driven into the boat between the deck and gunnel. As an extra protection for the end grain of the plywood, you might use calking compound under this retaining strip.

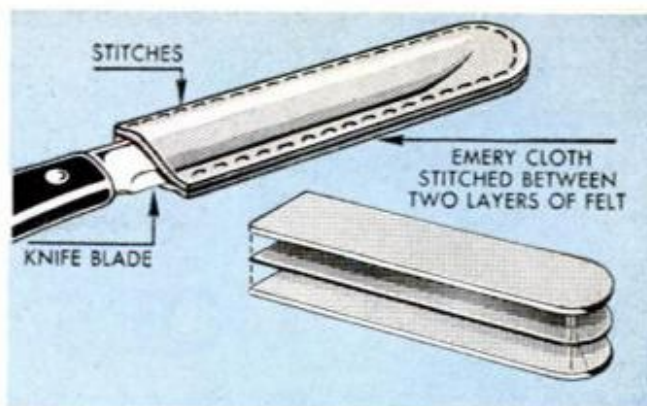
Note that the deck illustrated here features a sheet-metal bow cap with a cutout for a loading caster. If your cartop rack doesn't require the installation of such a caster, this cap may be omitted.

Sand all exposed edge grain smooth, then finish the deck with several coats of marine enamel to match the boat. Finally, tape the seams between sections B and C, and C and D, with pressure-sensitive cloth tape to prevent leaks. ★★★



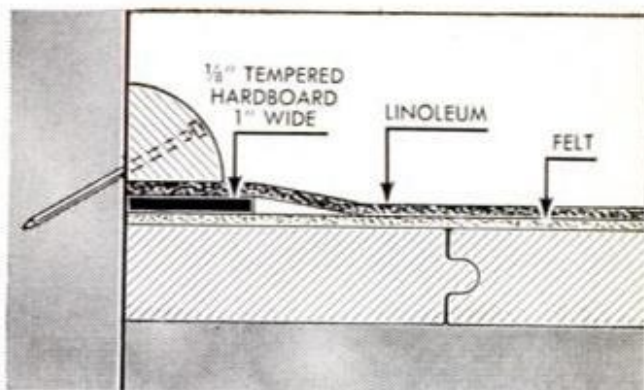
Self-Sharpener Sheath

Your shop knife, hunting knife or carver will be kept keen edged and rust free in this abrasive-lined felt sheath. To make the sheath you stitch a piece of fine abrasive cloth between two layers of $\frac{1}{8}$ -in. felt. The sheath should be sized to fit the blade rather snugly so that the abrasive will hone the cutting edge each time the blade is inserted and withdrawn. Oil on the felt will prevent rust.—*Frank Shore*



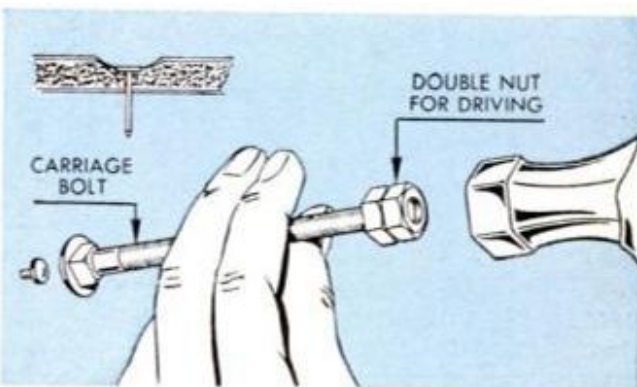
New Floor Trick

When you put down a new kitchen floor of roll linoleum, remember this reader's suggestion: Cut 1-in. wide strips from $\frac{1}{8}$ -in. tempered hardboard and tack these to the floor along the walls over the felt. Then when you lay the floor covering as detailed you'll get a raised edge all around the room. This will retain any spilled water or mop water and prevent it from seeping under the quarter-round and causing trouble.—*Roland Brandt*



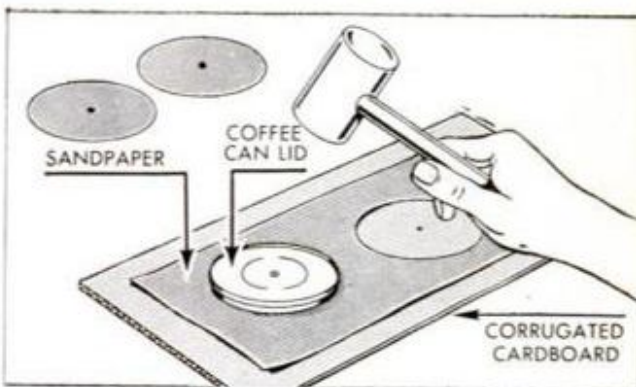
Dry-Wall Nailset

Dry wallers have a special "dimpling" hammer for setting nail heads in plaster board without breaking the paper covering. Without such a hammer, the do-it-yourselfer can do the job with a carriage-bolt nailset. Making use of the round head of the bolt to form a dimple over the nail, the bolt is held as shown and struck like a nailset. Two nuts provide a larger striking surface.—*Gordon C. Johnson*



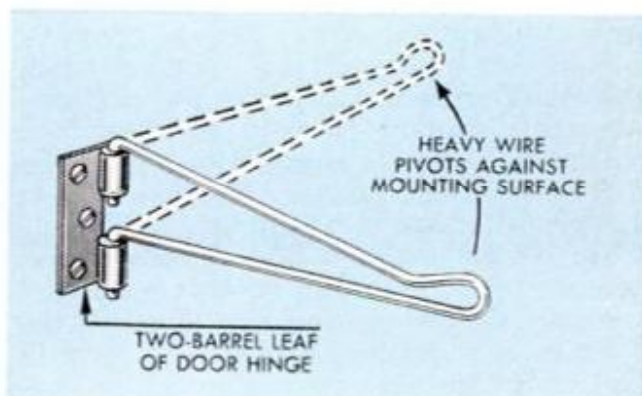
Sanding-Disk Cutter

Disks are easily cut from sheet sandpaper with a coffee-can cover. First, center a small hole through the can cover, then place the sandpaper sheet on a piece of corrugated cardboard. Place the can cover on the sandpaper sheet and tap lightly all around the edge with a mallet. Then, before you remove the cutter, insert a nail through the center hole and punch through the sandpaper disk.



Hanger Folds Flat

Need a heavy swinging hanger for garments or your shop flexible-shaft motor? It's easy to make one from one leaf of a butt hinge and a length of heavy wire. Remove the hinge pin and use the two-barrel leaf for the pivot, attaching to the back of a door or to the wall with screws. Bend a length of heavy wire to form an arm about 10 to 12 in. long. Bend the free ends at right angles and insert in the hinge-leaf barrels.—*William Goham*



WHAT GOES ON IN YOUR COOLING SYSTEM

Part 1: The Pressure Points

By Morton J. Schultz

YOUR CAR'S RADIATOR throws off enough heat to keep a six-room house comfortably warm on a near-zero winter day. With temperatures approaching 2000 deg. F at the exhaust valves, the engine would soon be destroyed if it were not for a properly functioning cooling system.

The cooling system of any automobile performs four jobs: 1. it *absorbs* heat generated by the engine; 2. it *circulates* this heat to the radiator; 3. it *radiates*, or throws off the heat to the air. 4. it *controls* coolant temperature, maintaining it at the proper level. If any of these functions are hampered in any way, your engine is in trouble—and so is your pocketbook.

How It Works

While there are some minor design variations, all cooling systems include these basic components. *Water jackets* containing coolant surround the cylinder head, valves and cylinders. A *water pump* circulates this coolant through hoses to the *radiator* where heat absorbed in the engine is thrown off to the air. The *fan* aids in this heat dissipation by drawing large volumes of air through the radiator core. Leaving the radiator, the coolant is pumped back to the water jackets. Finally, the *thermostat* regulates the degree of heat in the system, keeping the coolant at the cor-



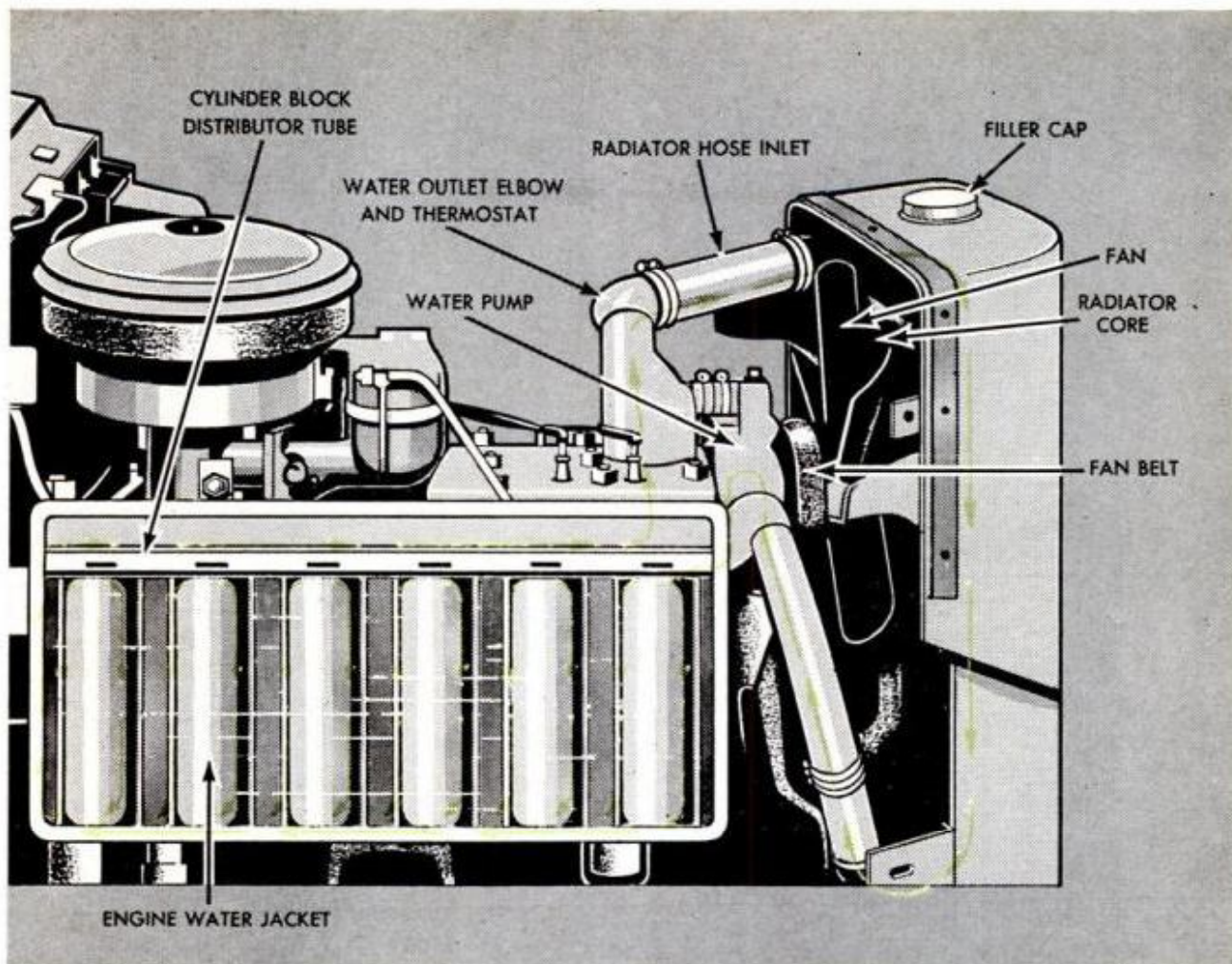
rect temperature for most efficient operation of the engine.

Within the past 10 years or so, cooling-system design has undergone a major change. In the early '50s, automotive styling began to limit radiator size, thus cutting down on the cooling capacity. Since water pumps are probably about as efficient as they can be made, automotive engineers searched for a new way to provide the cooling capacity lost through styling limitations. And this search led to the pressurized cooling system.

Before this innovation, cooling system maintenance was only a twice-a-year job—put in the antifreeze in the fall and drain it in the spring, checking each time for leaks. With a pressure system, however, such system checks must be undertaken much more often.

Why Pressurization?

What are the advantages of the maintenance-hungry pressure system? The most important is that putting coolant under pressure raises its boiling point, enabling the engine to operate at higher temperatures without fear of the coolant boiling. For every 1-lb. increase in pressure, the boiling point of the coolant is raised about 3 deg. F. As an example, coolant under 7 lb. pressure at sea level would boil at 233



deg. F., an increase of 21 deg. over the comparable boiling point without pressure.

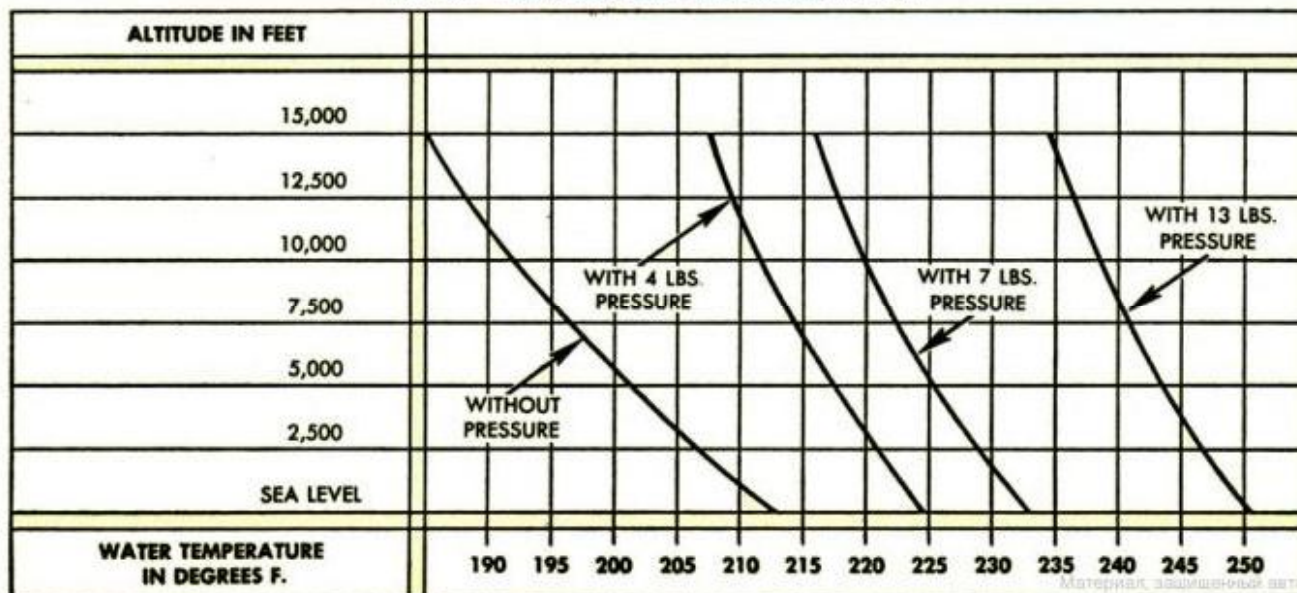
Another plus factor is that water-pump efficiency is increased if the coolant is kept under pressure during engine operation. In the old atmospheric-type cooling system, tests showed that a typical water pump was only 85 percent efficient at sea level. Under 4 lb. of pressure, however, the efficiency climbs to 91 percent, and under 14 lb. pressure it becomes almost

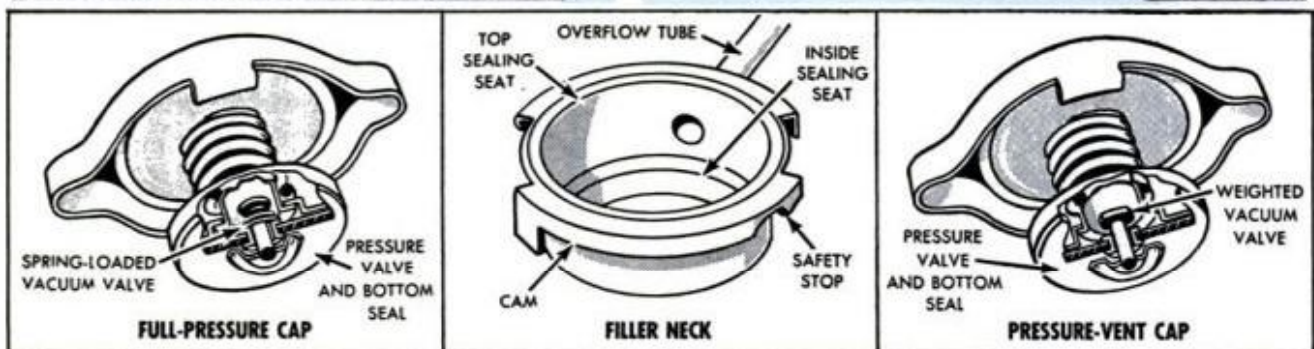
100 percent efficient. This increased pump efficiency meant that coolant would not boil under conditions of operation that would cause boiling in the older atmospheric systems.

Coolant boiling in a pressurized system is usually caused by an absolute malfunction—a badly clogged radiator core, broken fan belt, compression leak in the system or a damaged pressure cap.

In appearance, the cooling system on

WATER TEMPERATURE PRESSURE CHART





your car today probably looks no different to you than the cooling system on any of the cars you owned in the pre-pressurized era. Pressurization of a system is accomplished by the use of two units a car owner pays little attention to—a specially designed filler neck on top of the radiator and a pressure control cap.

Twin Sealing Seats

The filler neck has two sealing seats, one on top and another lower down inside.

PRESSURE TESTER check of the pressure cap is the most foolproof and accurate method of determining whether cap is doing the job it was designed for



The overflow tube leads off from a point between these two seats.

A typical pressure cap is equipped with a built-in pressure control valve which seals off the cooling system from the atmosphere. This is located near the bottom of the cap, below the overflow tube. As the system builds up heat, it also builds up pressure automatically. Thus, the greater the heat of the coolant, the more pressure and resultant cooling efficiency.

The pressure cap also acts as a safety valve to keep the pressure in the system within safe limits. When the pressure gets too high, a vacuum relief valve opens automatically, allowing excess pressure to escape through the overflow tube. Some of these valves are activated at 4 lbs. pressure, others at 7 lbs. and still others as high as 13 and 14 lbs. In cars equipped with air conditioning, the relief valve doesn't open until pressure within the system builds up to 16 lbs.

Pressure Caps

Basically, there are two types of pressure caps. The *full-pressure* cap, used as original equipment on all cars except Lincolns, Mercurys and some Chryslers and Fords, has a spring-loaded vacuum valve that keeps the cooling system closed off from the atmosphere at all times except when pressure exceeds safe limits.

This will provide pressurization under all kinds of driving conditions.

The *pressure vent cap*, on the other hand, has a weighted vacuum valve which stays open under cool driving conditions, allowing atmosphere to enter the system. However, when rapid heating or hard driving causes the coolant to start boiling, escaping vapor pops the vacuum valve shut, and from this point on until the car is stopped or the engine cools off, the cap operates the same as a full-pressure cap.

Cooling System Checks

Since pressure caps are as likely to need replacing in July or January as in April or October, it's a good idea to give the cap and filler neck a quick check every time you have the car lubricated. Look for nicks or breaks in the lower sealing seat which may prevent the pressure cap from seating itself properly.

This type of damage is rare and occurs most often when the car is involved in a collision. However, if it is present, the entire filler neck should be replaced, and this is a job for a specialist. He'll take the radiator out of the car, break the solder connection around the filler neck and solder a new neck in place. If the radiator has been repaired for any reason, be sure to check the lower sealing seat carefully for solder, and if you find any, scrape it away with a dull knife.

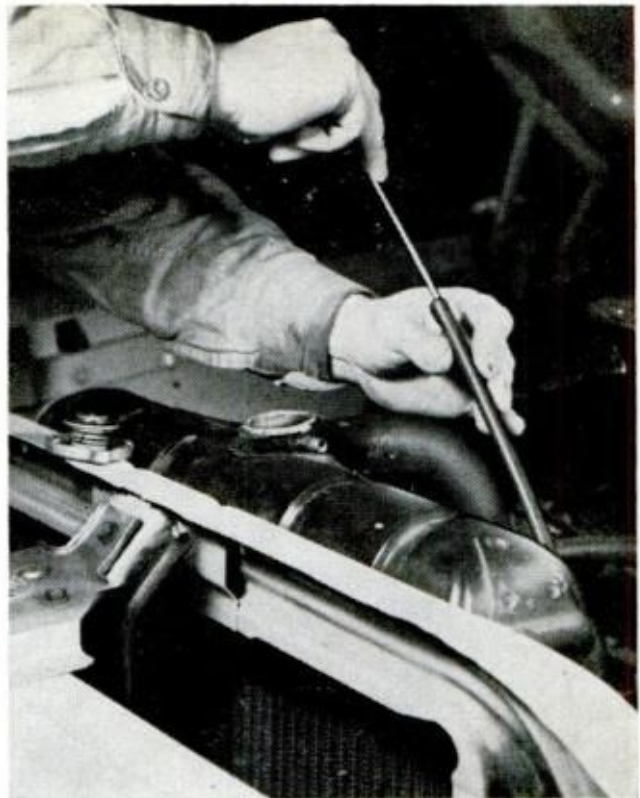
Examine the cams on the flange of the filler neck. While these are rarely damaged unless the car is involved in an accident, bent cams mean that the entire filler neck must be replaced.

The Overflow Tube

Pressure released by the pressure cap must pass out through the overflow tube unimpeded, so a dented or kinked tube should be replaced. Overflow tubes in the earliest model cars to use the pressure system were made of metal, and to remove them means breaking solder connections. Now these tubes are made of rubber and may be easily removed by simply pulling the end of the tube from the nozzle and unclipping it from the radiator.

A dirt-clogged overflow tube is just as dangerous as a dented or kinked tube. To remove dirt, run a wire down through the tube until it is clear. A piece of welding rod is ideal for this job.

Now, turn your attention to the cap. If it's a full-pressure type, press it with your



OVERFLOW TUBE on today's car is made of rubber, can be removed from filler neck easily for cleaning. Older cars are equipped with metal overflow tubes

hand to check the vacuum valve spring. There will be a great deal of resiliency if the spring is in good order.

Next, shake the cap. If the spring or other parts rattle, chances are the cap is damaged and should be replaced. However, this check doesn't apply to a pressure-vent cap, since the weight will rattle when you shake the cap.

Check the ears on the cap which engage the cams of the filler neck. These must not be bent or worn to the point where they won't hold the cap firmly on the neck. It should turn smoothly on and off the neck, but seat solidly.

Clean Sealing Points

Wash the cap in water to remove dirt from around the sealing points, then examine all gaskets. These are made of a special material designed to resist damage from antifreeze solutions, rust inhibitors and any other chemicals you're likely to put into the cooling system. A swollen or split gasket means that the cap itself is too old and should be replaced.

There are two ways of checking the cap to make sure that it is operating at the

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

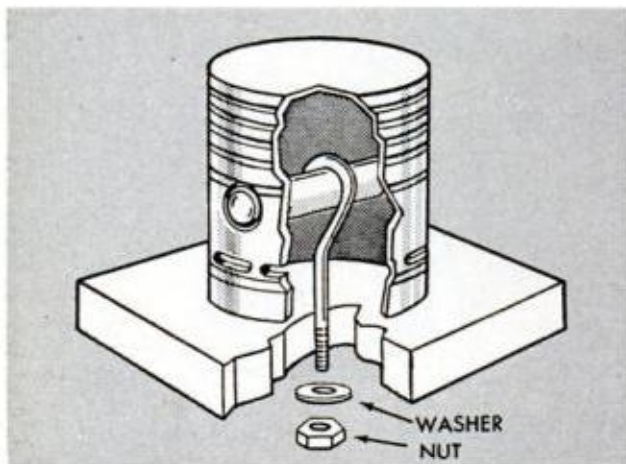
NEXT MONTH

Part II of this article will cover trouble shooting and maintenance of the rest of the modern cooling system

FOR THE MOTORIST

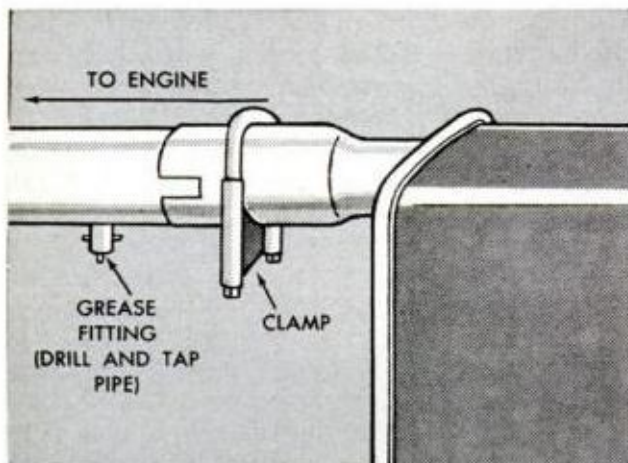
Checking Con-Rod Clearance

Want to check the clearance of your car's connecting rod against the proper clearance listed in the shop manual? Draw the two halves of the rod snug around the crankshaft, with a piece of fuse wire inserted as shown. Remove the flattened wire and check it with a micrometer.



Slip-In Flange Gaskets

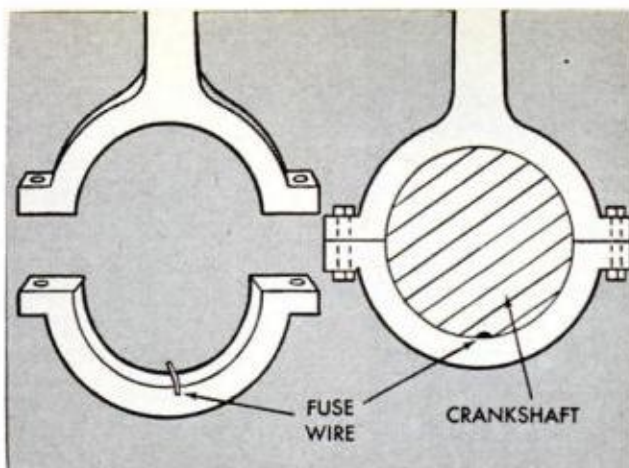
Replacing exhaust-pipe flange gaskets on some cars is difficult because the pipe will not come clear of the studs. Try pulling the pipe down as far as possible, then tear out the old gasket with pliers. To insert a new gasket, simply tin-snip it as shown, and slip it in the gap.



Emergency Road Signal

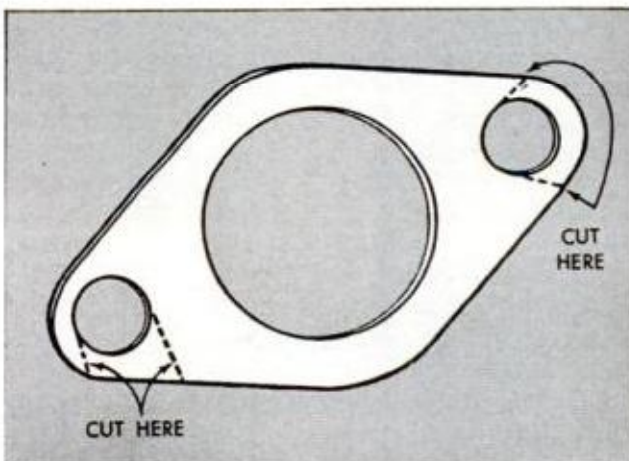
For those nighttime highway emergencies when you must draw off the road, carry a few red toy balloons in the glove compartment. Slip one over the lens of a flashlight to make an effective warning signal. And if you must work in the rain, the balloon will serve to seal the lens against leaks.—C. V. Mathis

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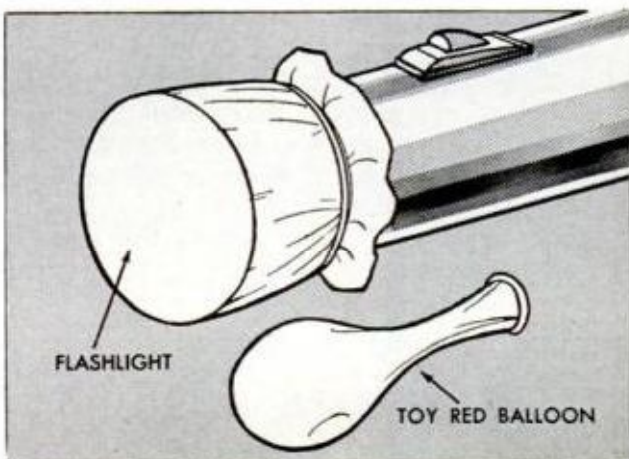
Vise Clamp For Pistons

A simple anchor block for holding a piston securely in a vise can be made with a hook bolt and a block of wood. Slip the hook over the wrist pin, pass the bolt through a hole in the block and draw the nut and washer up tightly against the bottom face.—Henry Mullen



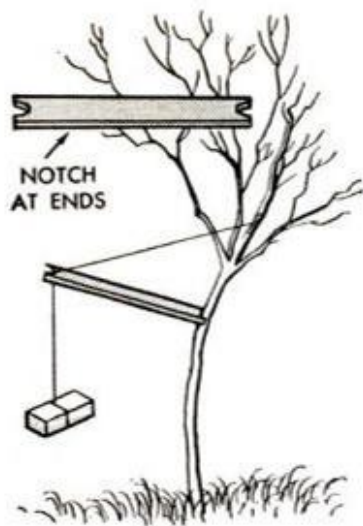
Prolonging Muffler Life

Internal corrosion of a muffler can be greatly retarded by regularly forcing a little grease into the exhaust pipe so it will vaporize and form a protective coating inside the muffler. Install a grease fitting on the pipe at a point just forward of the muffler clamp.—W. C. Wilhite



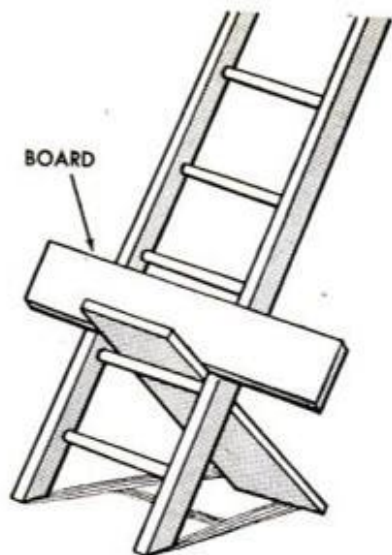
POPULAR MECHANICS

Материал, защищенный авторским правом



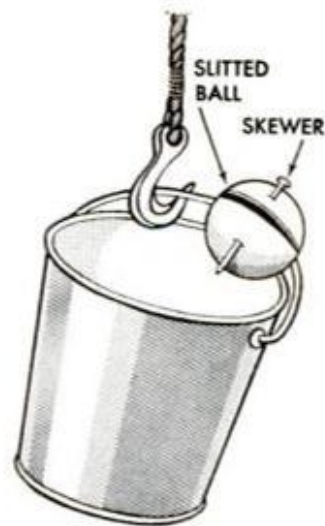
Tree Weight

A notched stick, some twine and a brick will eventually straighten a young tree that has grown at an angle. Simply hang the brick as shown, placing it opposite the bend where it will exert a constant pull. Better than staked guy wires, this off-the-ground method of bracing makes for convenient mowing around the tree. The outboard weight will often straighten a tree in a single growing season.



Quick Sawhorse

When you're working outdoors with a ladder and need a sawhorse to trim a board or two, remember this simple on-the-spot stunt: Place a scrap board on the second rung of the ladder in the manner shown so it rests at an angle to form a sawbuck. In this position, the slanting board will cradle the board to be cut when it is placed against the ladder. Saves looking around for something on which to rest the board.

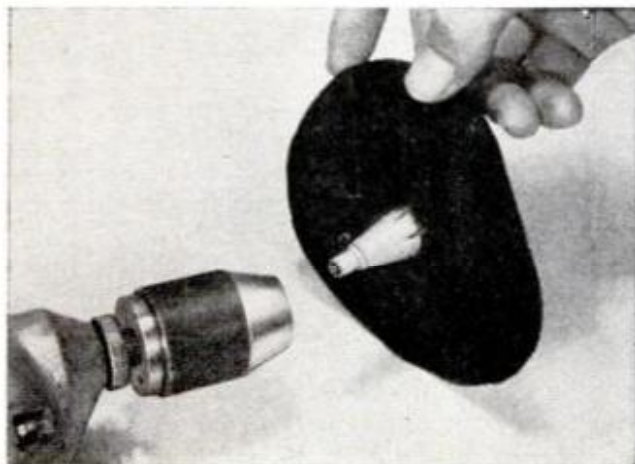


Step Saver

After making several trips up and down a tall ladder when cleaning my gutters, I began to think of a way I could lower a full bucket to the ground and then rehook the rope onto an empty one. The problem was how to keep the handle raised to engage the hook. I found that a slitted sponge-rubber ball, pressed over the handle and held with a nail skewer, worked like a charm in keeping the handle raised.—*D. Bousha*

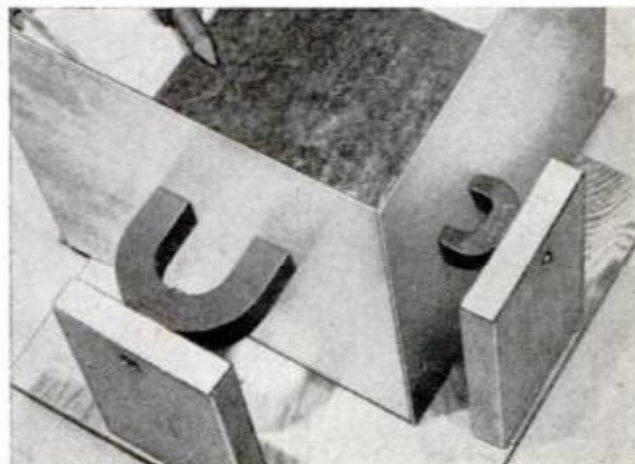
Flexible Disk for Free

You can make a dandy flexible sanding disk for use in your portable electric drill and it won't cost you a cent. Simply round up an old inner tube, cut out a disk around the valve stem, cement an abrasive disk to it and chuck it in your drill. If the stem happens to be rubber covered, cut away to the metal core so it will fit the chuck. Rubber cement is used to attach abrasive.



Magnets Do the Trick

Like having two extra hands, a pair of permanent magnets will prove most useful in holding sheet-metal parts for soldering. A good example is shown below where two magnets are being used to hold the sides of a metal box in alignment for soldering the corners. Here the magnets are attached to blocks fastened to a wooden base, which gives free access.—*Howard Levy*



BICYCLE BUILT FOR TWO

by Manly Banister



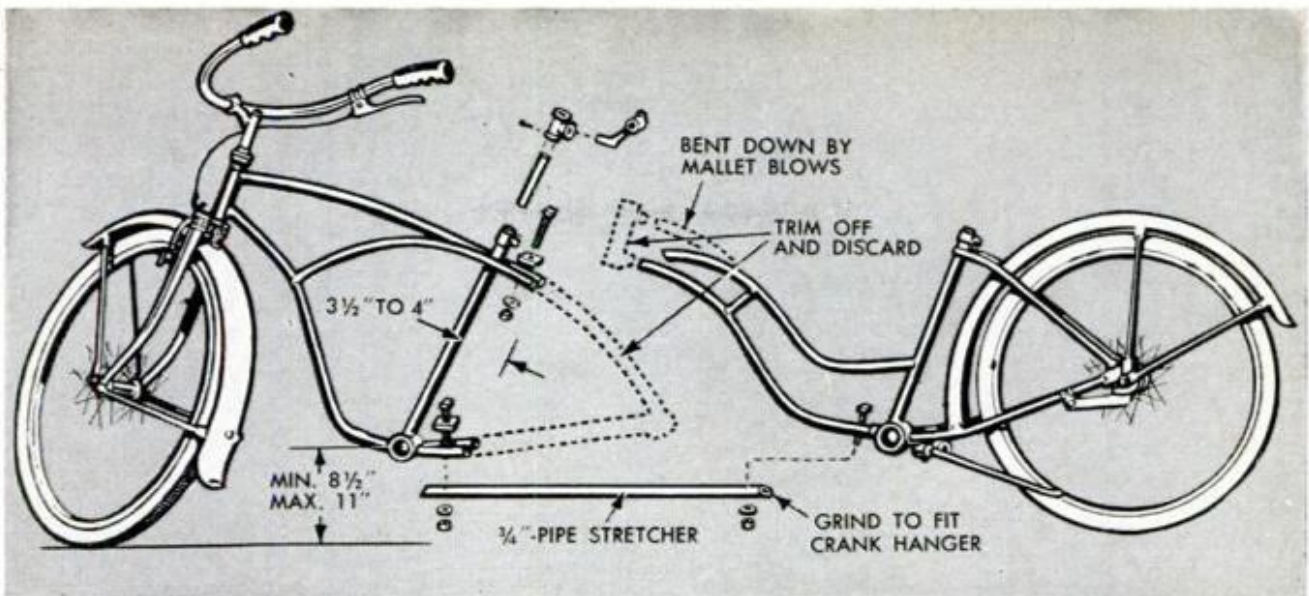
The front half's from a boy's bike, and the back half from a girl's bike. Fastened together, they give you a tandem for under \$10

EVEN IF THE LADY in your life isn't named Daisy, she'll look sweet upon the seat of this custom rig. When kids lose interest in conventional bike-riding, here's a way to get extra mileage out of a couple of stored bikes that are only a nuisance in the garage or basement. Unless the teenagers appropriate the tandem the minute you snug up the last nut, you'll discover that this type of biking is great sport for adults, as well. The co-operative propulsion takes the huff-and-puff out of cross-country pedaling—gets you out in the open air for exercise without danger of over-exertion.

Starting with two standard 26-inch bikes in good condition, you can convert them

into a tandem for less than ten dollars—including the extra sprocket, all other materials, a can of spray paint—and the cost of having necessary welding done at a local shop.

A boy's bike provides the front wheel and steering column, a girl's bike the rear wheel and seat. The first step is to measure the height of both crankshafts from the ground—which should be between 10 and 11 in. The crank hangers should be kept at this height to provide clearance for the pedals on corner-banking. Actually, in the model shown the frames were dropped somewhat to flow the lines together, so the 6½-in. cranks were replaced with 5½-in. cranks made for 24-in. bikes. But you



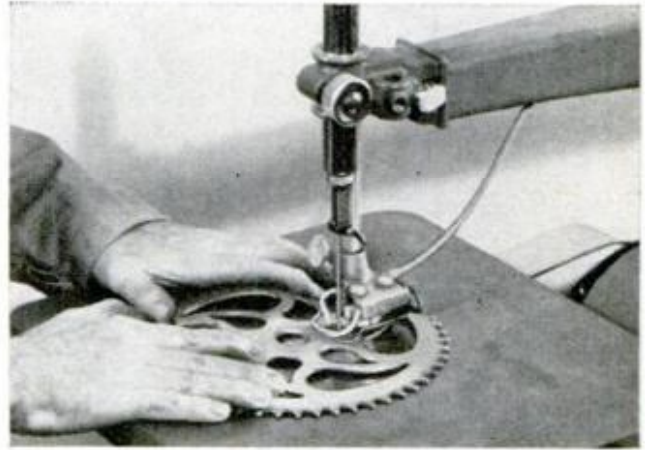
ALL YOU ADD to the two frames is a bottom stretcher. You may have to reshape the cross bars of girl's bike (right) to join it to the front frame in a good-looking design. Joints are bolted, then welded

can avoid this to keep costs at minimum.

Stand the bikes with the front wheel of the girl's beside the rear wheel of the boy's. Study them. Decide where the frames can be joined for best design and strength. The diagram above is only a suggestion, as bike models differ just as automobiles do.

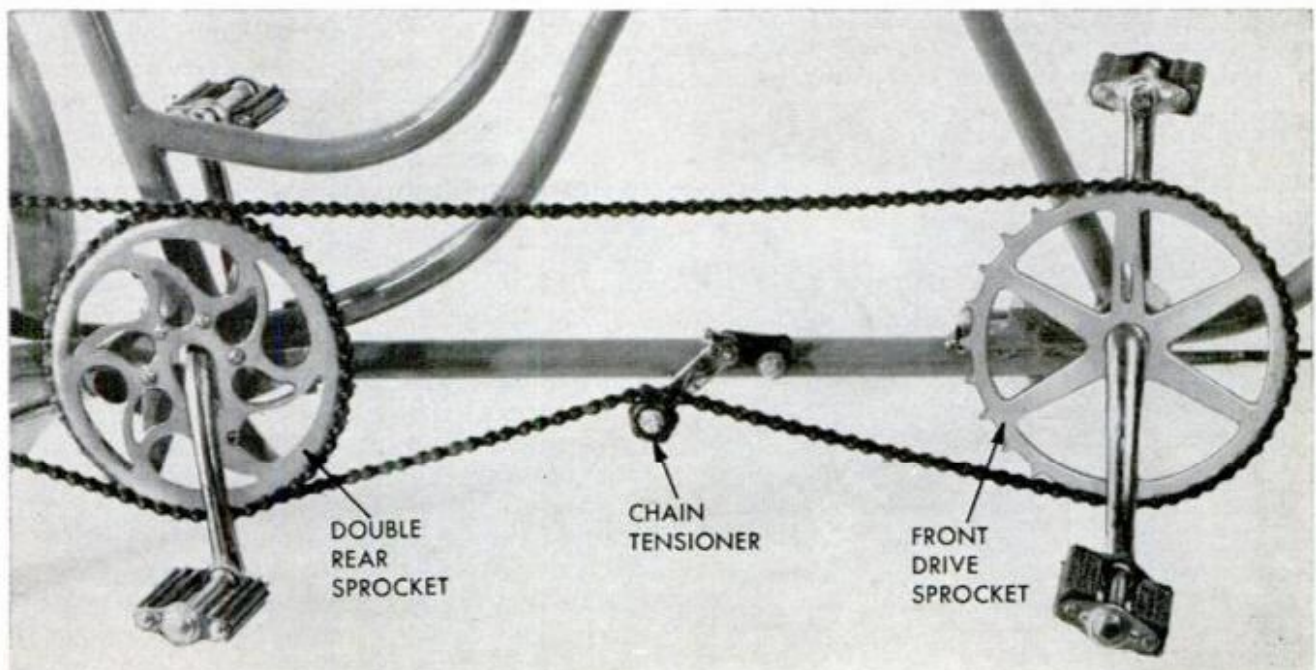
Next, strip both bikes down to their frames. Remove the handlebar and stem from the girl's bike and save them. Discard the front fork (or save it for the sled-conversion project on page 146).

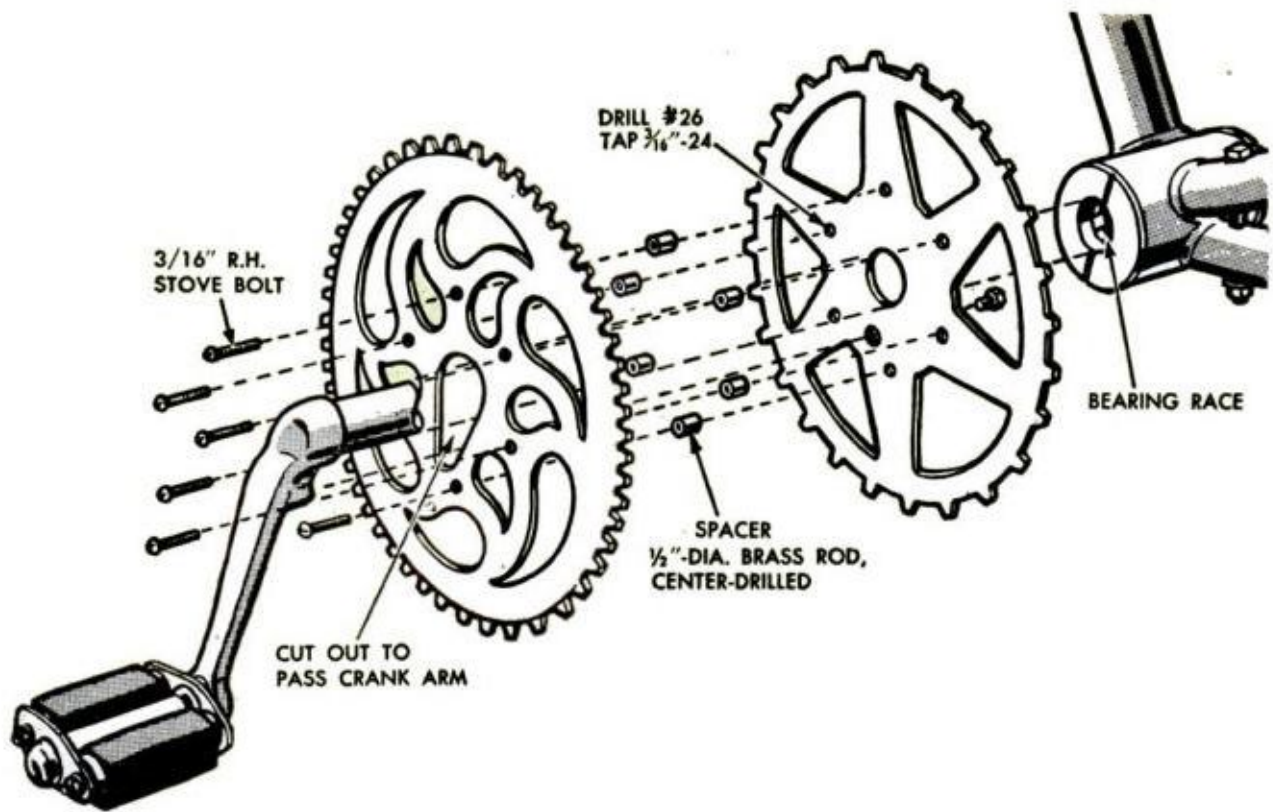
Crank assemblies differ, but most American bikes have a one-piece crankshaft that must be drawn through the hanger from the sprocket side. For this you must remove the pedal, nut and bearing race on the left side. These have lefthand threads,



OUTSIDE SPROCKET of rear drive must have hub hole enlarged to fit over pedal crank. Jigsaw with metal-cutting blade passed through sprocket does job fastest; small file in chuck does final shaping

DRIVE LINKAGE consists of one chain around front sprocket and same-size sprocket on inside of rear assembly—plus second chain from outer sprocket to rear wheel. Tensioner is needed on front chain only





REAR CRANK ASSEMBLY has two sprockets bolted together through spacers, so chains can run side-by-side without touching. Shoulder on crank arm passes through outer sprocket to seat against and bolt to inner one



TO INSTALL DUAL SPROCKET (foreground) on one-piece crank, you'll probably have to remove pedal, nut and bearing race (all left-hand threaded) from opposite side and twist crank through hanger

WORM'S-EYE VIEW of rear axle shows $\frac{3}{16}$ -in.-thick aluminum washer on far side of hub. This aligns reversed wheel sprocket with outer drive sprocket

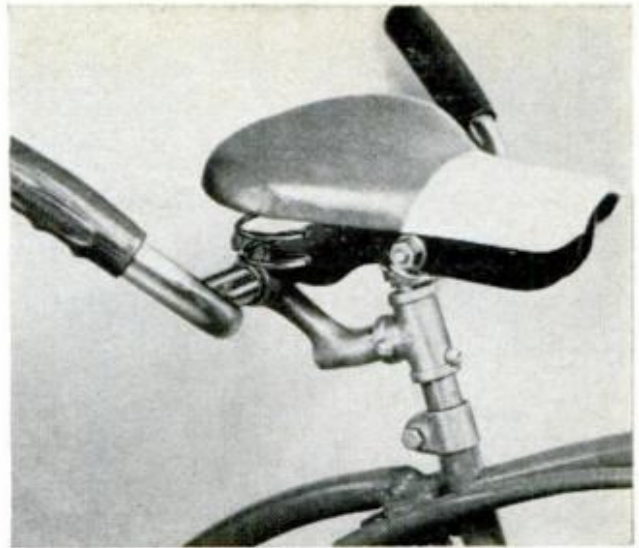


so turn them in the direction opposite to the way you normally loosen a bolt or nut. The bearing race on the sprocket side has a righthand thread. You'll have to remove this one, too, from the rear crank.

With a hacksaw, cut through the frame of the girl's bike just behind the steering column. When you saw off the rear frame of the boy's bike, leave several inches of each bar you cut through; you'll need these stubs to attach the bars of the girl's bike, and the extra stretcher. Now, select the best pair of wheels and fasten them in their respective forks.

Lay the frames on their sides on the floor with both wheels bearing against a wall. The wall represents ground line and lets you adjust the frames to each other while retaining the proper ground-to-center-of-crank-hanger distance. The $8\frac{1}{2}$ -in. minimum shown in the diagram on the previous page is for the shorter 24-in. bike cranks substituted in this particular model. To retain the present cranks (assuming you are joining 26-in. bikes), avoid dropping the frames very much.

Once the frame positions are determined, measure between the crank hangers and cut a length of $\frac{3}{4}$ -in. pipe to span this distance. File each end concave for a good fit, and drill for bolts that will secure the stretcher to the frames for welding. A third bolt joins the upper bars of the two frames. The three welds on the model shown were made by a commercial shop for \$3. It cost an extra 50¢ later on, to



REAR HANDLEBAR IS FOR GRIPPING—it has no steering function, so it's anchored by means of a ½-in. pipe tee bored out to fit the front saddle stem. Standard handlebar stem was trimmed to bring bar closer to seat

have the rear handlebar unit welded to both the seat stem and the handlebar stem. It was secured with bolts at first, so it could be adjusted during trial runs.

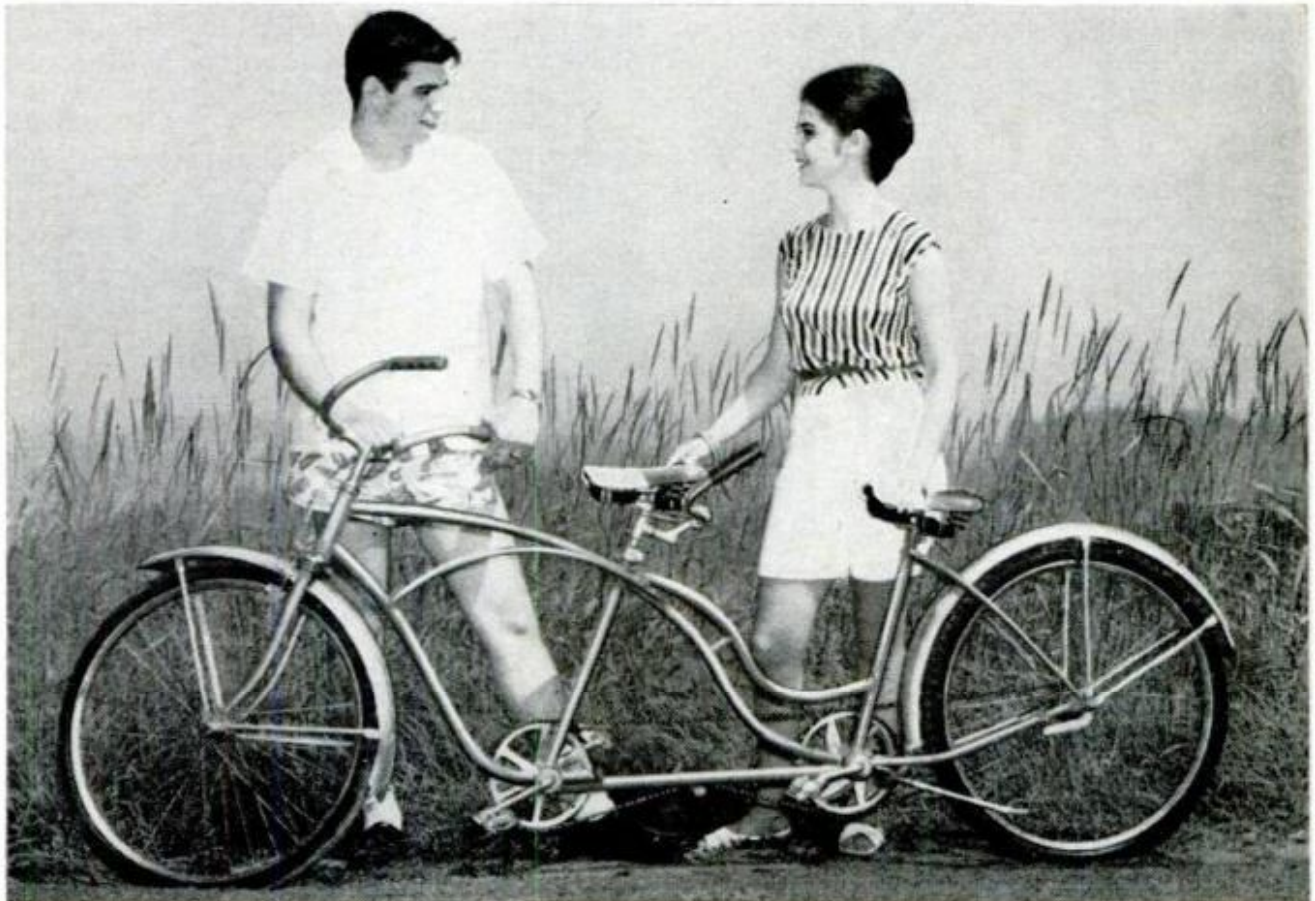
One of the bikes shown had ½-in.-pitch chain, the other 1-in.-pitch. It makes no difference as long as the extra sprocket you buy has the same diameter and pitch as the sprocket on the front frame. This extra sprocket replaces the original rear sprocket if the latter differs in pitch. The

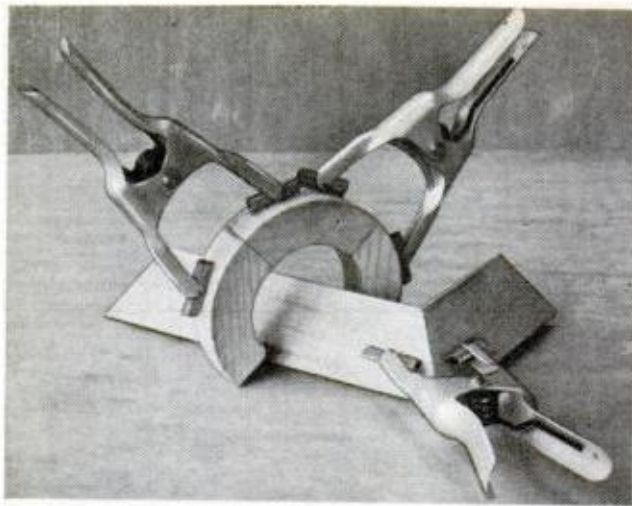
original sprocket is then attached to the replacement sprocket and chained to the sprocket on the rear wheel. These last two sprockets must have the same pitch.

The sprockets mounted on the rear crank must be separated sufficiently to let the chains pass. Wrap a length of chain around each sprocket and lay them together, back to face, separating the edges of the chains with bits of ¼-in. cardboard.

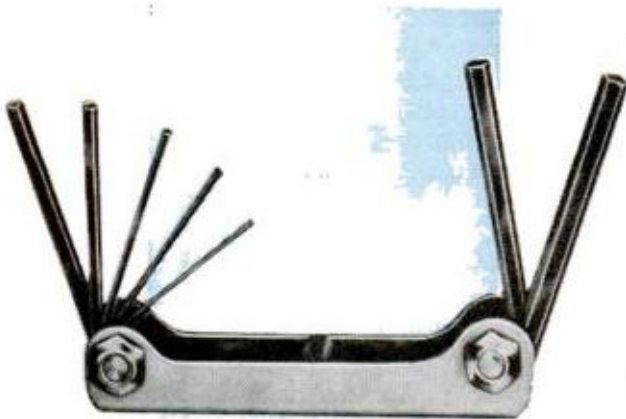
[\(Please turn to page 212\)](#)

NO PATCHWORK JOB, THIS! The two halves blend into an harmonious whole, losing their original identities. Note pedals are always in same relative positions for smooth, co-operative rhythm of riders' leg action

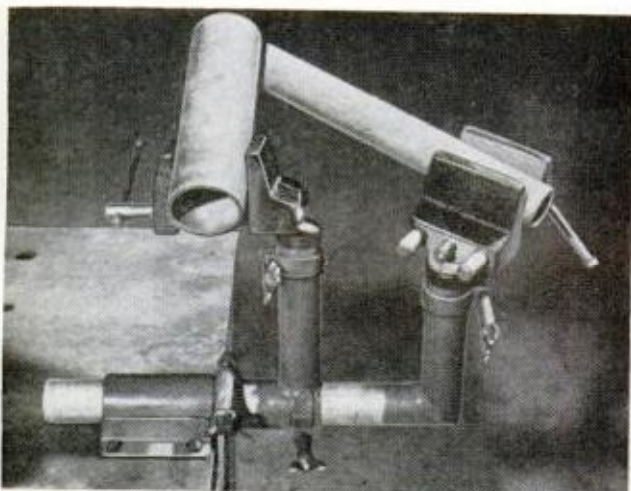




MULTI-CLAMP features pivoted jaws with double rows of serrated stainless steel teeth that grip wood, plastic and soft metal work surfaces at almost any angle without slipping. A tempered coil spring inside the handle provides the pressure. To prevent marring some types of surfaces, rubber guards are provided to slip over the toothed jaws. Marketed by Arvids Iraids, 5931 Argus Rd., Cincinnati 24, Ohio

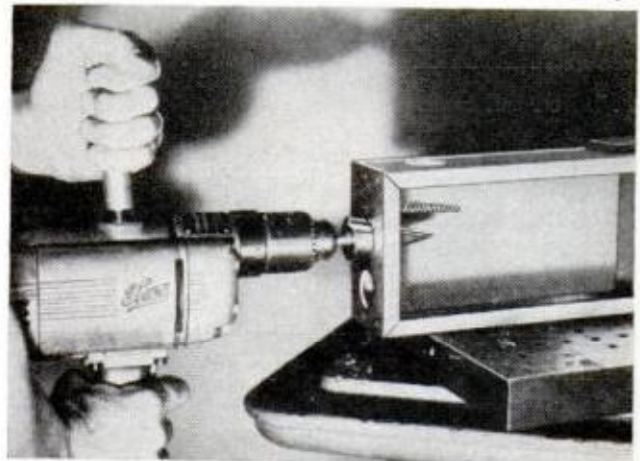


JACKKNIFE HEX-KEY SET is available in 3 models to fit hex-socket setscrews from $\frac{1}{16}$ to $\frac{3}{4}$ in. Each key may be snapped into a right-angle position for greater leverage or extended straight outward like a screwdriver. Prices for the Fold Uni Key sets range from \$1.49 to \$2.95. Produced by Eklind Tool & Mfg. Company, 2627 N. Western Avenue, Chicago 47, Ill.

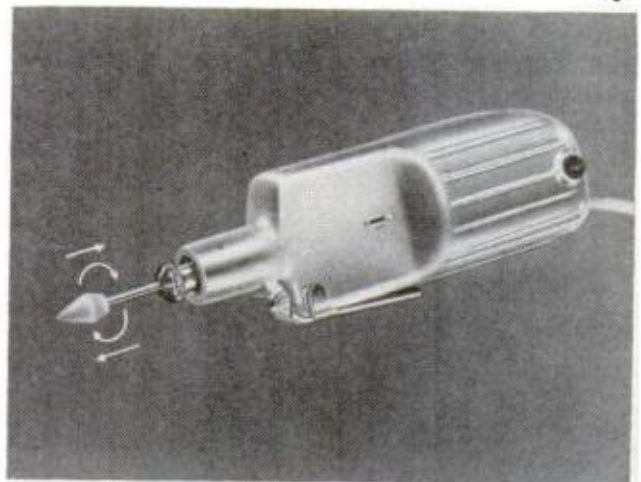


Shopping for tools

CONE DRILL, designed for use with standard power tools, cuts any size hole from $\frac{1}{4}$ to $1\frac{1}{4}$ -in. diameter in any relatively thin sheet material. Reduces the number of bits needed and the number of bit changes required for jobs involving holes of various sizes. Continuous chip action prevents burring of sheet metal. To use, operator merely drills to a prescribed hole line. Scully-Jones & Co., Chicago 8, Ill.



DUMONT TRIAX power tool gives reciprocating and rotary motion simultaneously or either action alone. Takes a wide variety of $\frac{1}{16}$ to $\frac{1}{8}$ -in. diameter accessories such as files, abrasive wheels and steel burrs. Does filing, chamfering, deburring and many other jobs. Rotates at 10,000 r.p.m. Reciprocates at 300 to 400 strokes per minute. Weighs only 1 lb. 2 oz. Dumont Electric Corp., Clearfield, Pa.

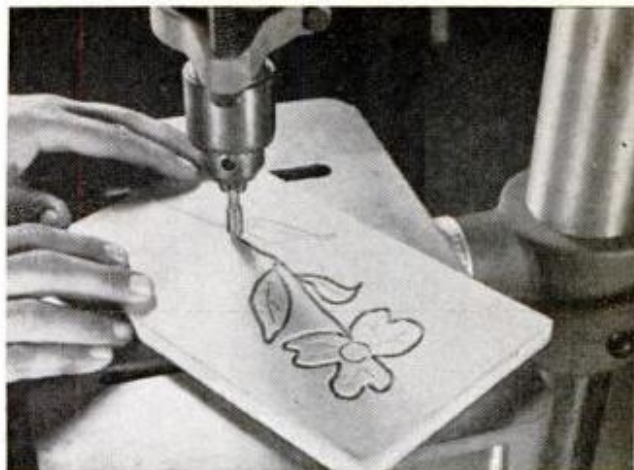


WORKBENCH WELDING JIG constructed of cast iron and steel tubing is fitted with twin vises with 4-in. jaws that open a full 3 in. They can be used at close range or up to 12 in. apart and the entire assembly rotates 360 deg. so that overhead or horizontal positioning of work parts is not required. Both vises can be easily removed for independent use. Price is \$37.50. Welders-Helper, 1346 Melrose, Modesto, Calif.

SHOP SHORT CUTS

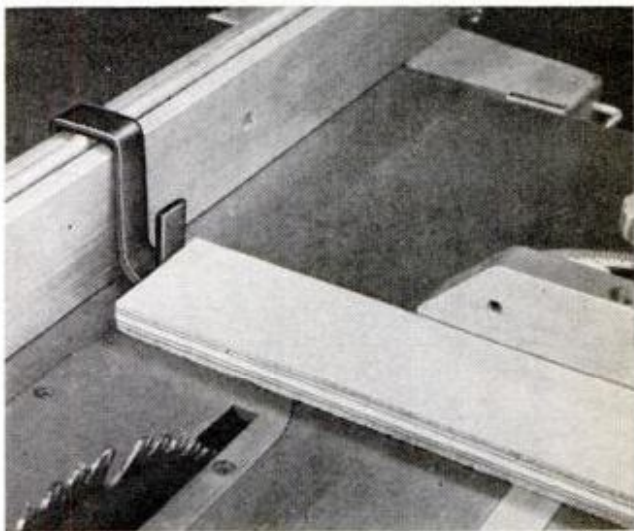
Router Bit Substitute

Just because you may not have a router don't feel you're out of luck when a project may call for the outlining of a design with a light veining cut. Chuck your countersink in your drill press, set the speed for 5000 rpm, lower the countersink $\frac{1}{8}$ -in. in the work and lock the quill. The countersink will produce a perfect V-shape veining cut, and by not forcing the cut, you can work both hardwood and hardboard.



Friction-Fit Cutoff Stop

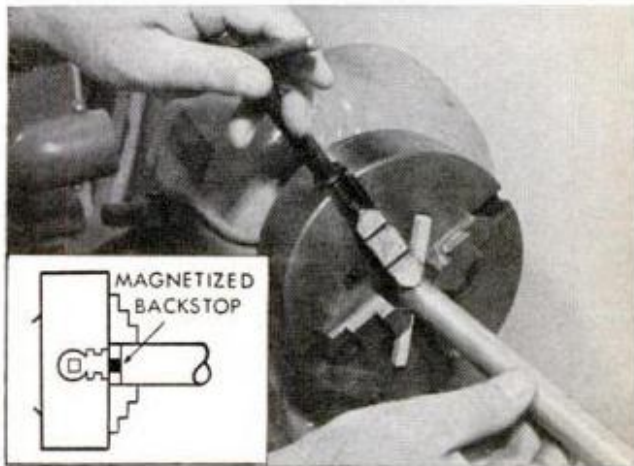
With this clever saw accessory you can forget about a clamp and wood block when you need a cutoff stop. Formed U-shape from a length of cold-rolled flat steel to fit snugly over the rip fence, the spring action of the stop makes it stay put without clamping. The upturned leg of the stop should be formed to project an exact dimension, say 1 in., so you will know how much to allow when setting the rip fence. As in using any stop block, always place it back far enough from the blade so that the work does not contact the stop when it enters the blade. The work won't bind and catch in the blade.



Magnetizing Is the Answer

Trying to hold a backstop in place while positioning the work with one hand and tightening the lathe chuck with the other is a tricky job at best and usually ends up with the backstop falling from the chuck, sometimes while the chuck is spinning. You can avoid all this by simply magnetizing the backstop so it will stay in place by itself. Placed crosswise of the chuck, the backstop prevents undersize work from being forced through the spindle hole in the chuck by pressure from the tailstock.

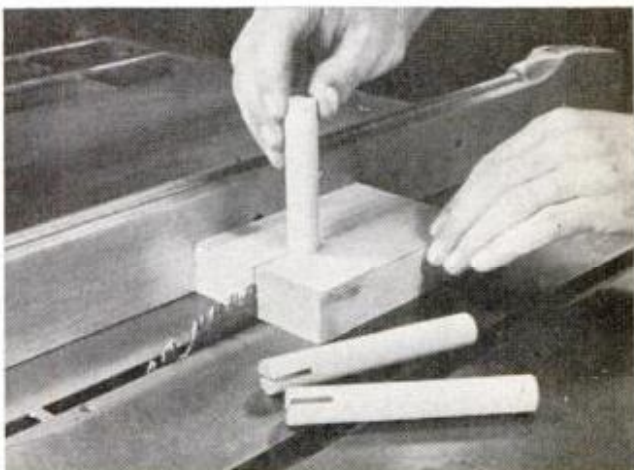
—Federico Strasser



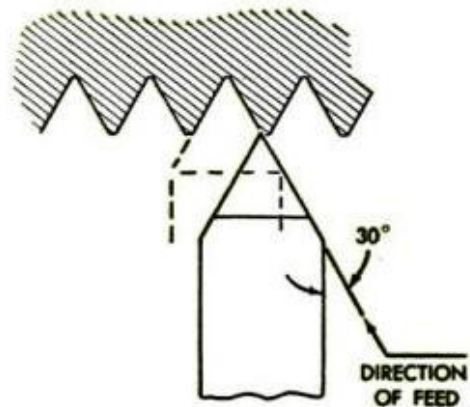
Slotting Ends of Dowels

Be it one dowel or a thousand, they'll all be slotted identically when you make use of a simple jig which is nothing more than a wood block with a hole in it. The hole should be just a bit larger than the dowel so each one can be inserted easily, and the thickness of the block should be greater than the depth of the slot. In use, the hole in the block is centered over the saw blade which is then set for height. The dowel is inserted in the hole and the block is passed along the rip fence in the manner shown.

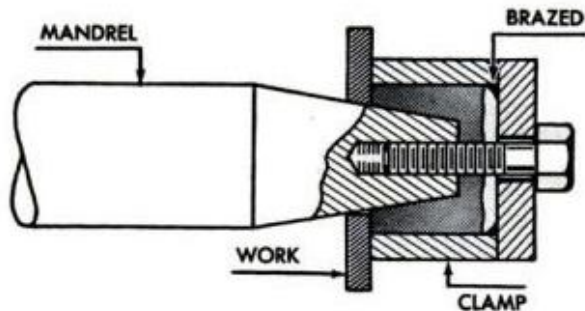
—R. J. DeCristoforo



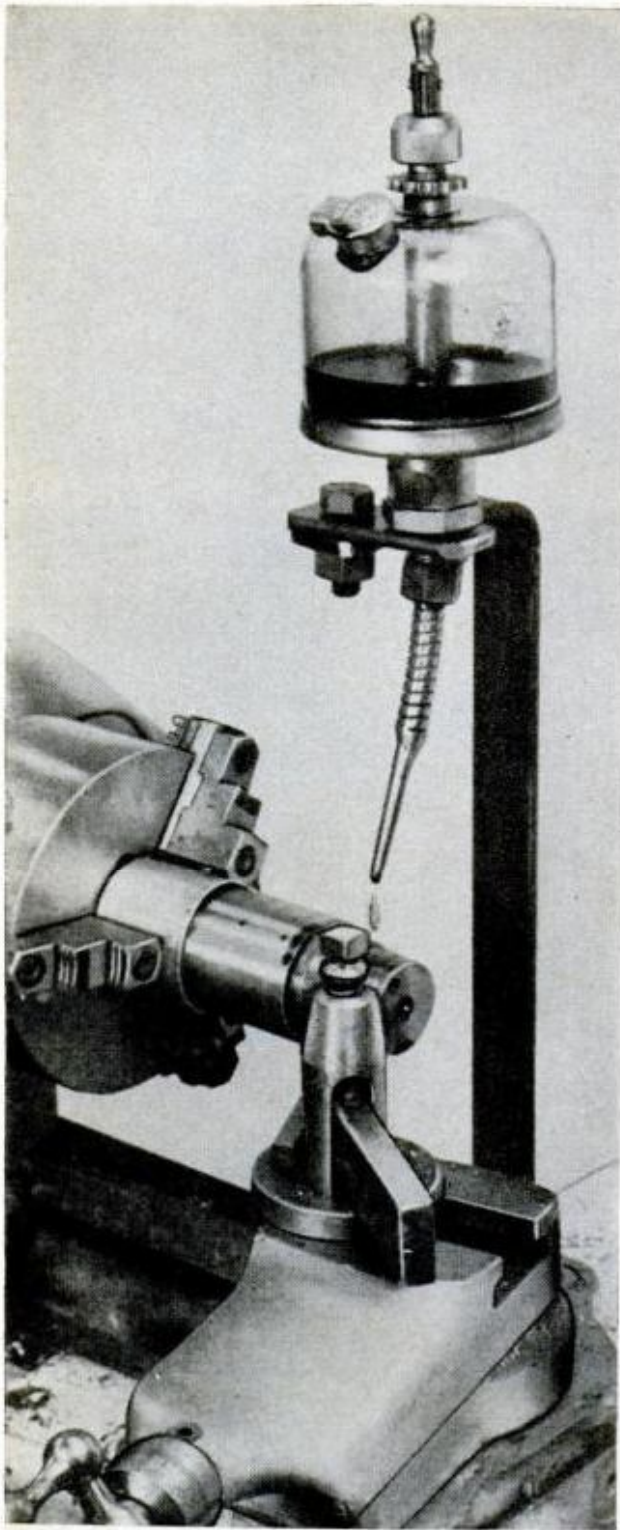
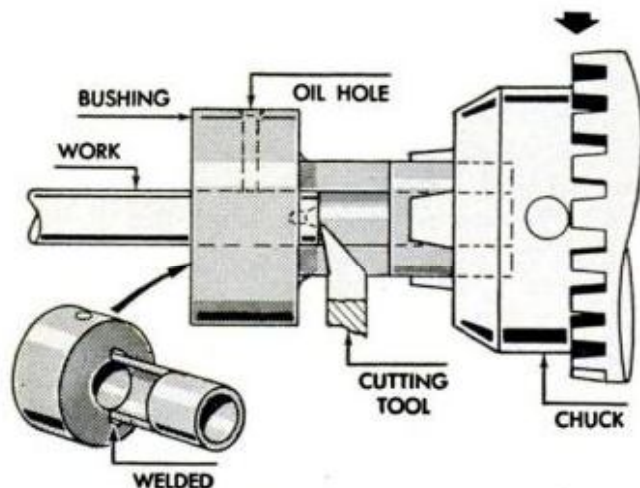
FOR THE MACHINIST



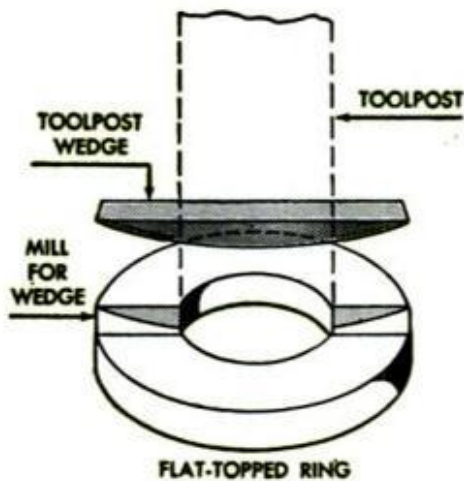
IN CUTTING THREADS in the lathe it's important that the compound be set at 30 degrees. This setting with a feed in the direction of the arrow in the detail above will give you a smooth thread provided the lathe tool has been ground to cut a 60-degree thread form. Feed per pass is determined by dividing 3 by 4 times the number of threads per inch. To cut 16 threads per inch the feed should be .047



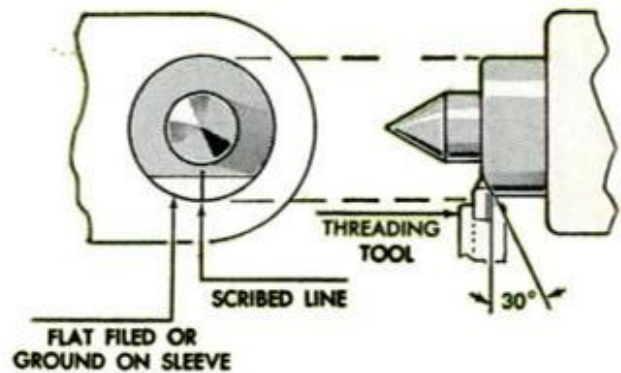
THIS BUSHING, or carrier, held in a chuck in the tail-stock, solves the problem of facing off from a center hole, chamfering and undercutting. Large member is turned, center drilled and then welded or brazed to a length of brass or bronze tubing having an inside diameter equal to that of the center hole. An opening is then milled or cut and filed in the tubing to permit the tool to enter in the manner detailed



WHEN MACHINING ferrous metals in the lathe it is essential that cutting oil be applied in a steady stream at the cutting point. Where investment in a coolant pump is not warranted this can be a problem. One good solution is to utilize a drip-type oiler mounted on a bracket that travels with the lathe carriage. The bracket is bent to an S-shape and bolted to the carriage. It carries a swiveling arm at the top end which supports the oiler and a short length of flexible spout cut from an oil can. Spout is soldered to a nipple which is turned onto threaded outlet of oiler. Adjust oiler to about one drop per second



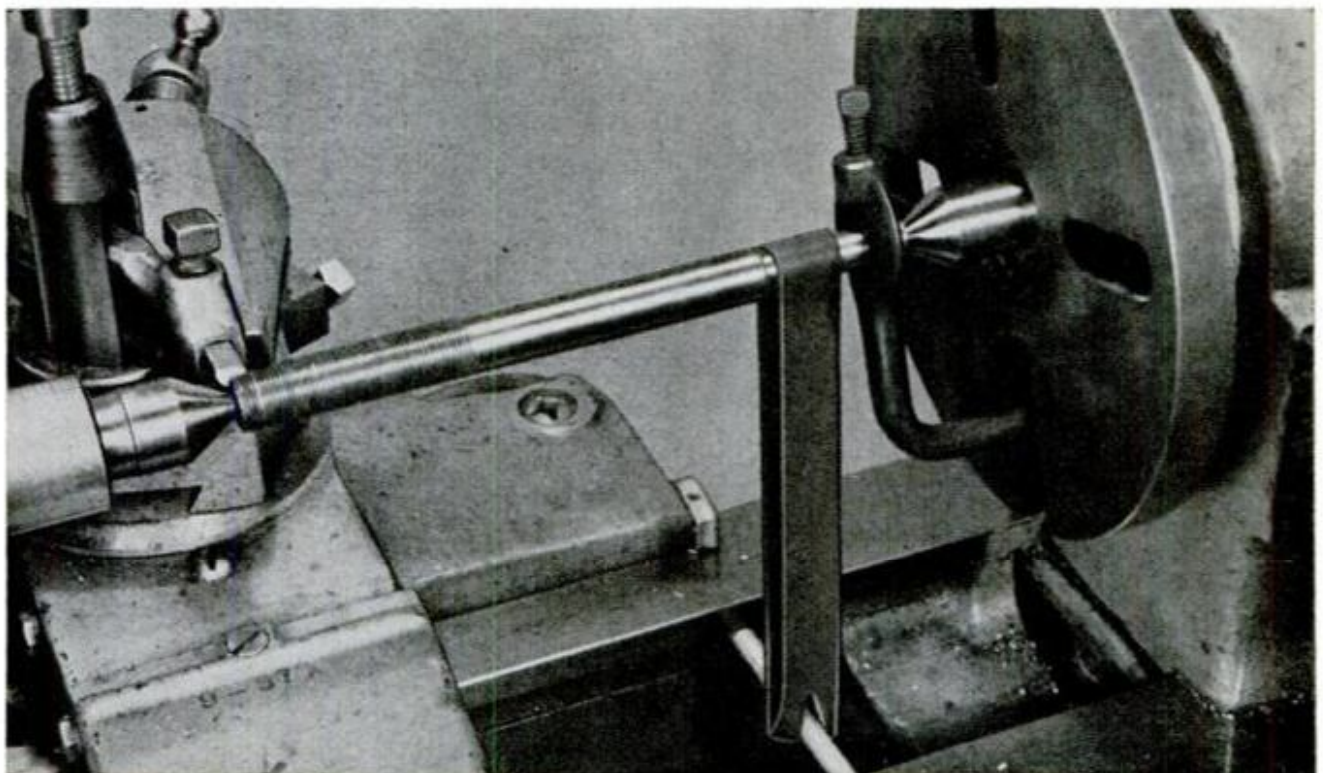
MACHINISTS in toolrooms where accurate setting of the lathe tool is essential often replace the regular concave toolpost ring with a flat ring having slots milled into one face to take the wedge. This type of ring permits the tool holder to be set without any chance of the wedge becoming misaligned with the holder and causing the tool to cant slightly sidewise. The special flat ring also tends to offset any tendency of tool to chatter



ONE REQUIREMENT in accurate thread cutting is exact alignment of the threading tool at 90 degrees with the work axis. This is difficult to accomplish by eye alone. A 30-degree flat filed or ground on the end of the tailstock sleeve makes this setting easy and certain. After filing or grinding flat, scribe a center line across face to serve as an index mark when setting tool point on center line of work. Then move tool against flat

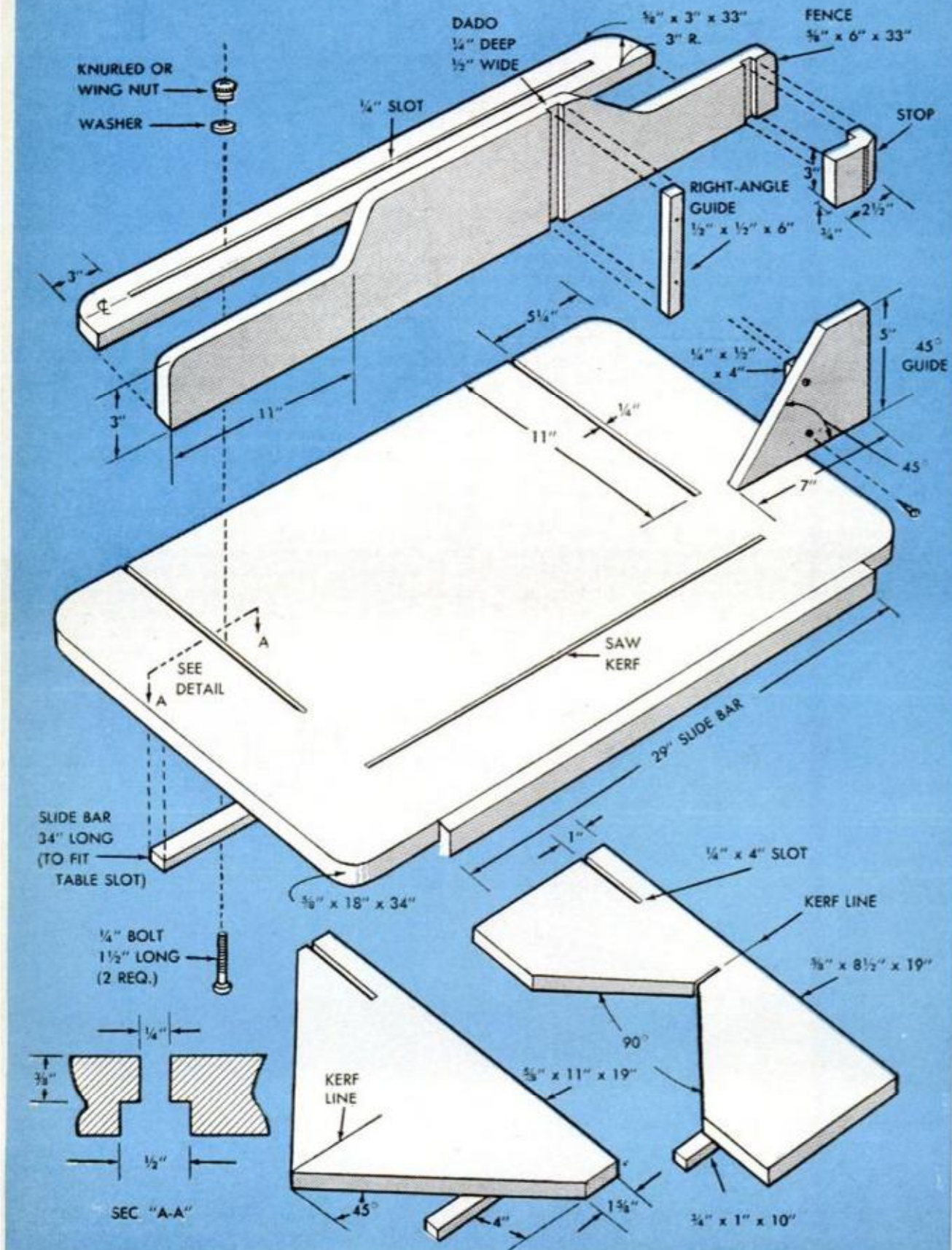
◀ **WHEN MACHINING** special precision washers or spacers, getting the edge is the problem. One machinist handles this tricky job with the special shop-made mandrel detailed. Machine a taper on a short length of stock and drill and tap a blind hole in the tapered end. Then braze a short length of tubing to a disk and machine all over to form a clamp. To use, chuck the tapered mandrel, slip the washer over the end, locate the clamp piece and tighten the screw

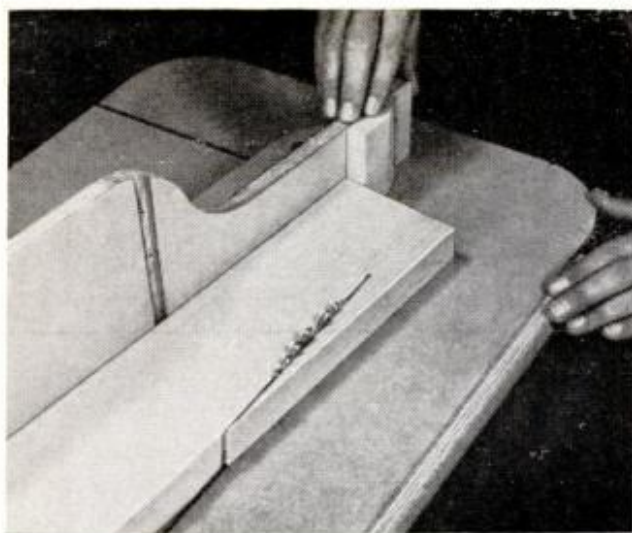
IN CUTTING FINE threads on small-diameter work the load may be insufficient to keep the tail of the dog bearing solidly against the side of the face-plate slot. Even this small amount of lash can be the cause of a rough thread. Cut a strip from inner tube about $\frac{3}{4}$ in. wide, punch a hole through the thickness and loop it over the workpiece as pictured. Pass a short length of dowel through the slots and catch the ends of the dowel under the lathe ways



SLIDING WORK HOLDER FOR YOUR TABLE SAW

By R. J. DeCristoforo





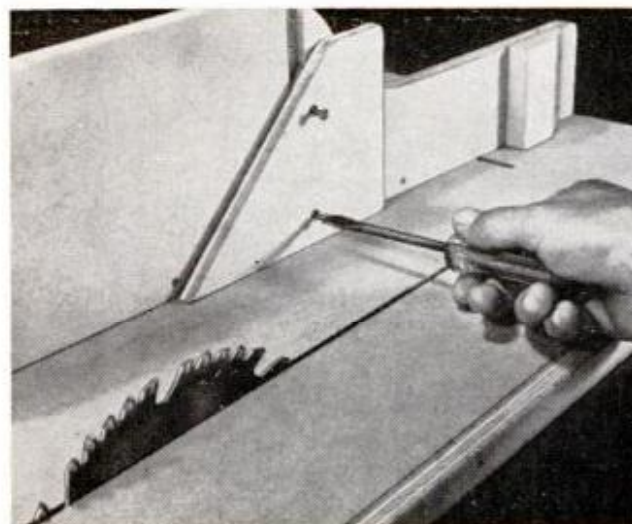
TAPER CUTS require only the stop block, and fence set at angle to jig's blade slot. Entire jig moves to make cut, with slide bar at edge and one underneath riding in miter-gauge grooves flanking arbor

SOME HOMEMADE ACCESSORIES for power tools have such limited use that it's a tossup whether they'll earn their space in your shop. Not this one: It increases the accuracy and safety of your table saw in so many ways you'll never regret the evening you invested in making it, or the small cost of the plywood.

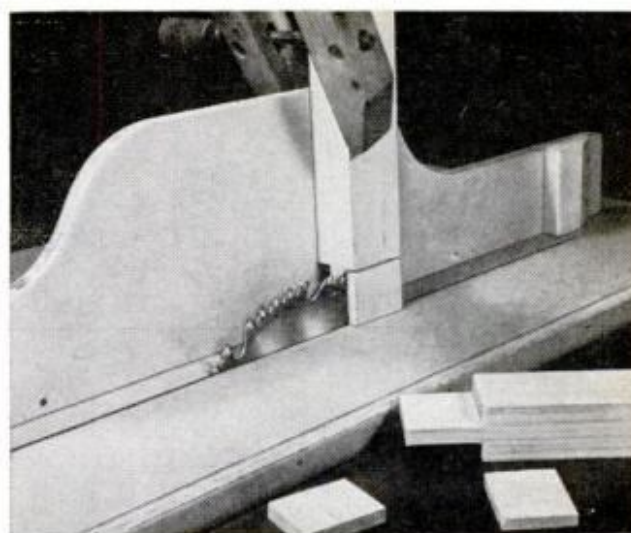
For many jobs, it's superior to the saw's miter gauge and ripping fence, since it combines the function of both in a single unit, and completely eliminates friction between the work and the machine. It's ideal for making taper cuts, straight-faced or angled tenons, kerfs for splined miter joints and grooves in small work. Fasten on a shaped, flat panel (instead of the jig's fence) and it's an accurate miter jig.

Basically, this accessory is an auxiliary table that drops over the blade and slides back and forth on top of the saw table.

45-DEGREE GUIDE has cleat that sets into same dado as right-angle guide. It creates a shoulder to rest mitered pieces against for cutting angled tenons. There's no problem of steadying work during pass



APRIL 1963

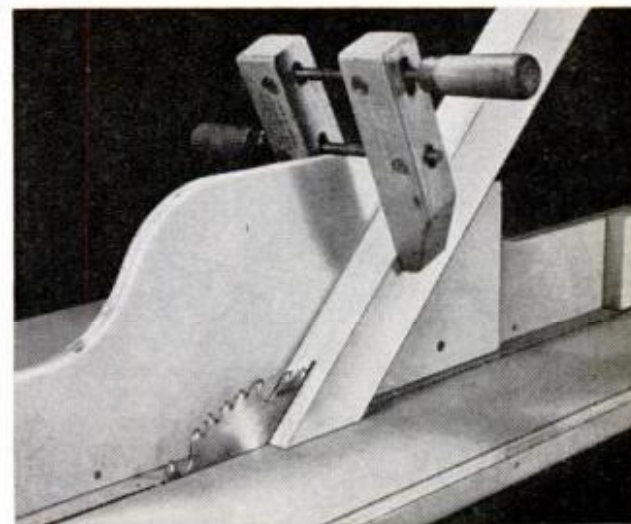


NEED A TENON? Add right-angle guide in dado provided, clamp work upright against it. What might be a dangerous cut to make free-hand against rip fence becomes safe when entire jig moves forward

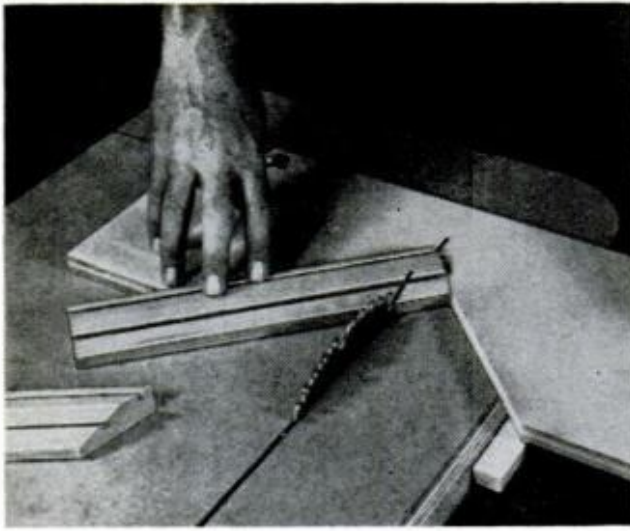
The blade projects through a long slot. Attached along one edge and to the bottom face are slide bars, spaced to match the miter-gauge grooves to the right and left of the saw blade. These keep the jig positioned as you push it forward. The jig's fence can be set parallel to, and at any desired distance from, the blade. Unlike the standard ripping fence, it may also be set at an *angle* to the blade path, for taper cuts. This means no more fussing with special tapering setups.

The jig also provides a clamping platform so you can advance small or awkwardly-shaped pieces into a blade set high for deep cuts—an action that can be dangerous, free-hand. Creep—that spoiler of miter cuts—is no longer a problem when work and table move together. In short, this jig incorporates a number of essential but usually separate jigs, and adds the ad-

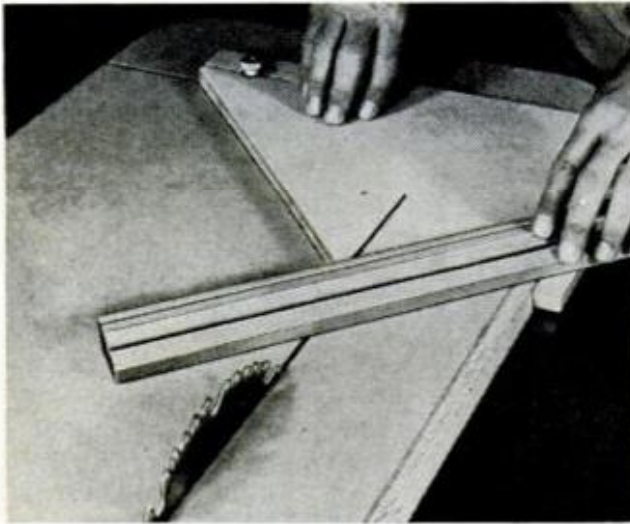
WANT TO SPLINE or feather a miter joint? The 45-degree guide positions the work. For any cut where fence and blade must be parallel, be sure that distance from blade kerf to each end of fence is equal



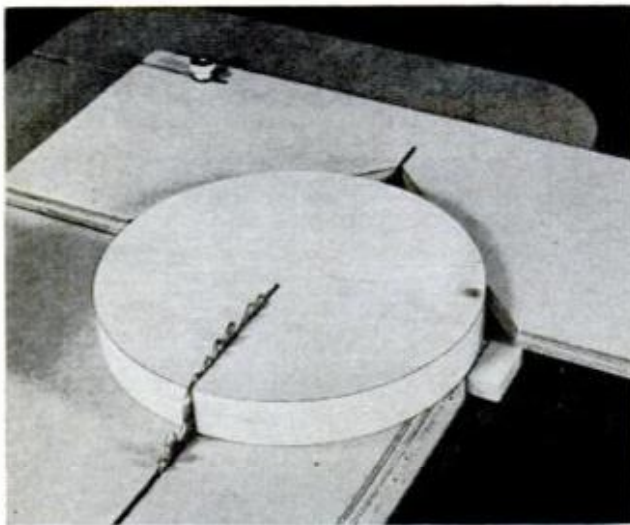
185



ACCURATE MITERS are quickly made by cutting frame pieces to overall length, then trimming in V-guide attached to sliding table. Held against this guide, work can't shift or creep. Use hollow-ground blade



ANOTHER METHOD gives you two mitered ends with one cut, without waste, when stock's edges are interchangeable. By using the reverse V guide above, you can cut at any point along a strip of any length



V-GUIDE IS USEFUL for other jobs, too—such as bisecting a disk. This is a tough cut to make on table saw without some special jig. Disk can also be quartered or cut into many pie-shaped segments

vantage of the sliding action to each one.

The jig shown is sized to fit an Atlas 10-in. circular saw, and was cut from $\frac{5}{8}$ -in. plywood. It should do, without much alteration, for any machine of similar size; exact location of slide bars and saw slot are omitted from the plans, since these must match your own machine. The jig may prove too large for smaller table saws, but a good rule is to make it as large as possible without letting it become unwieldy. Dimension the slide bars to fit snugly in the miter gauge—but not tight enough to bind. A smooth sanding and heavy waxing is essential.

After attaching the slide bars, you can cut the blade kerf by lowering the saw blade beneath the throat plate and setting the jig in place. Start the saw and raise the blade slowly to its full height, so that it slices through the jig table from beneath. Slide the jig forward and back to complete the kerf, taking care not to cut closer than 3 in. to either end of the jig table.

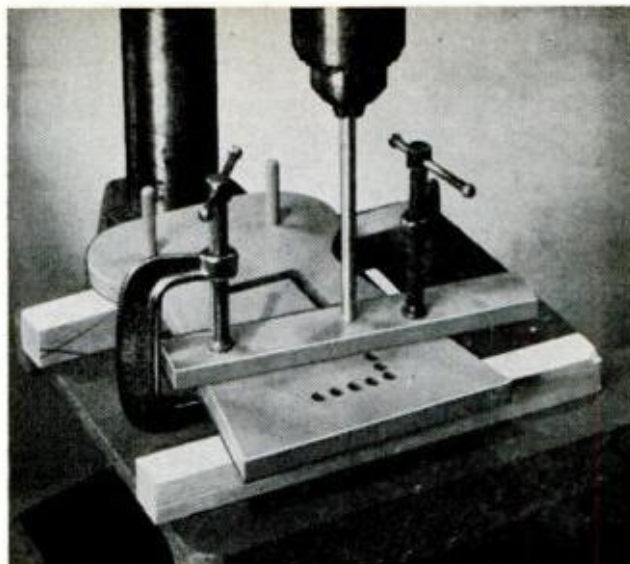
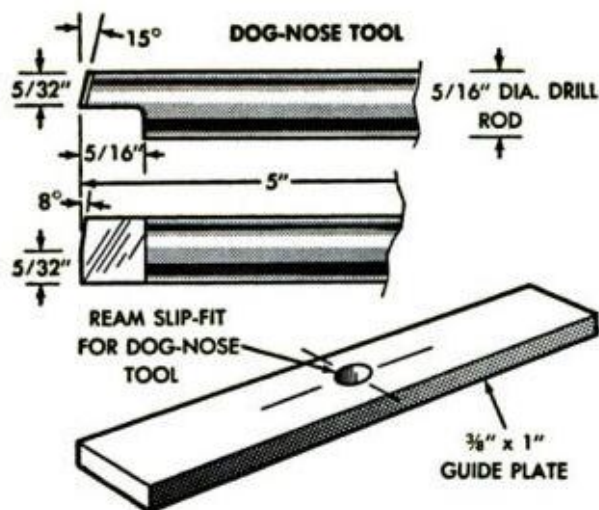
The slots for the fence lock-bolts may also be cut on the saw. Use a very high blade projection to minimize the arc at the end of the cut. To recess the bolt head, lower the blade so it projects about $\frac{1}{4}$ in. above the throat plate and enlarge the original slot by making repeat passes. This work is done with the slide bars removed, using the saw rip fence as a guide.

When making the jig's own fence, it's very important that the groove for the right-angle guide is cut accurately at 90 degrees to the base edge. Fuss a little to get this and other vital cuts exactly right—just remember the fuss you'll be saving yourself later, on individual jobs.

The $\frac{1}{4}$ -in. slot through the fence flange can be cut with a saw blade, or you may prefer to rout it out on a drill press. Assemble this flange to the fence with glue and flathead wood screws, making sure the two pieces are at right angles.

Use extra care, again, when making the two miter-cut guides. Check the angles carefully, and make several trial cuts with each guide positioned temporarily on the jig table. If the results are accurate, attach the stop strip to the undersurface. These stops clamp tight against the edge of the sliding table to line the guides up with the blade. One of the bolts which clamp the fence flange engages a slot at the right side of each guide to lock it in position.

Sand all surfaces and edges, then cover with several applications of wood sealer or wash coats of shellac. As each coat dries, smooth with fine steel wool. Finally, apply paste wax and rub to a hard polish. To further minimize friction, polish the surface of the saw table, as well. ★★★



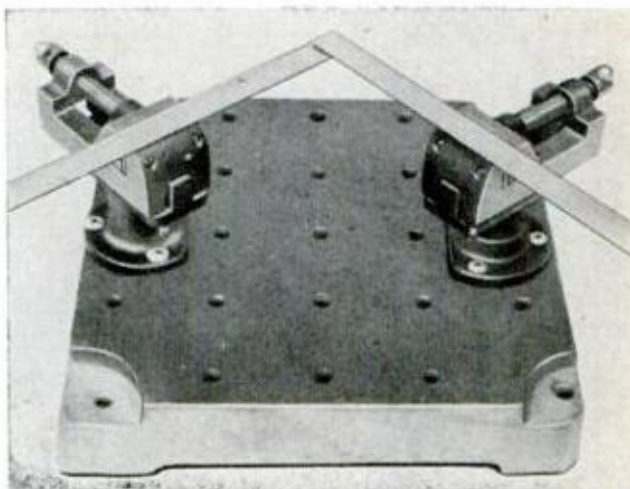
Slotting Metal with "Web-Foot" Drill Bit

Diemakers and others with the same or a similar problem often use a two-step procedure when cutting slots in steel plate. First, location of the slot is determined and a center line scribed. Then a row of holes is drilled on the center line, the diameter of the holes being just under the width of the slot required as allowance for filing. Holes are spaced to leave a web of metal between holes about $\frac{1}{16}$ to $\frac{1}{8}$ in. in thick-

ness. In a second operation the metal between the holes is removed by using a special drill bit—sometimes referred to as a dog-nosed tool, or drill—which is shop-made for the purpose. Use a short length of drill rod of the diameter required. Grind and shape the point to the clearance indicated, harden and temper it to a light straw color. Make a guide as detailed and set up the job as pictured.—*Albert T. Pippi*

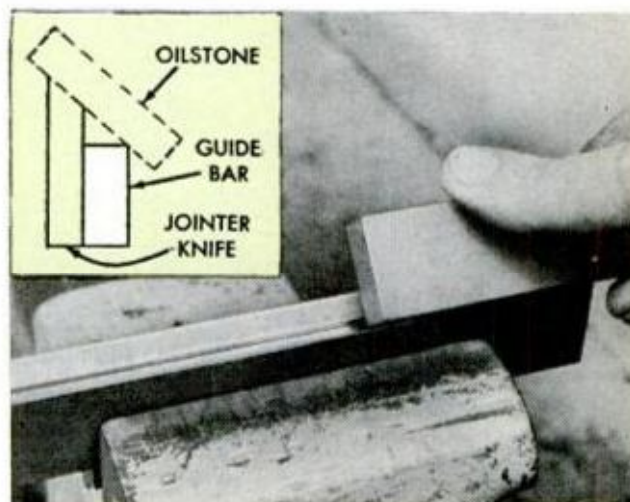
Welder's Clamp

Two swivel-base drill vises mounted on a base like that pictured or bolted to a heavy steel plate, make the ideal welder's fixture for positioning and holding work pieces in place for welding, brazing or flame soldering. A pattern of holes can be drilled in the base or plate, permitting the vises to be located in almost any required position for holding work assemblies of irregular shape as well as the more common fabrications such as square or rectangular frames. Drill vises will hold steel angles, flats, squares, tees and channels side by side, end to end, or edge to edge.

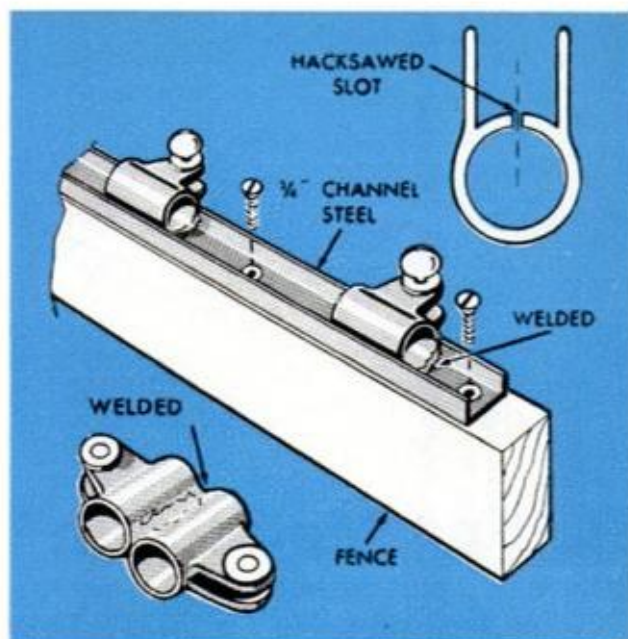
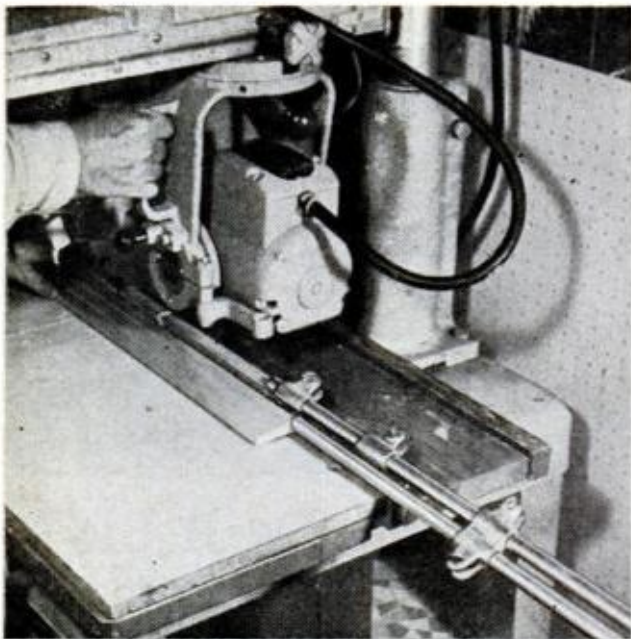


Flat Honing Assured

When honing jointer knives the trick is to avoid rounding the bevel even slightly at a point just below the cutting edge. One way to assure accuracy is to clamp the knife, edge up, in the vise with a bar of flat steel located with the top edge about $\frac{1}{8}$ in. below the lower edge, or heel, of the bevel. Then tighten the vise, making sure that the bar remains correctly located. In this position the upper edge of the bar stock serves as a guide for the oilstone. By using care and a stroke of uniform length and pressure you can hone the edge true throughout the length.—*H. J. Gerber*



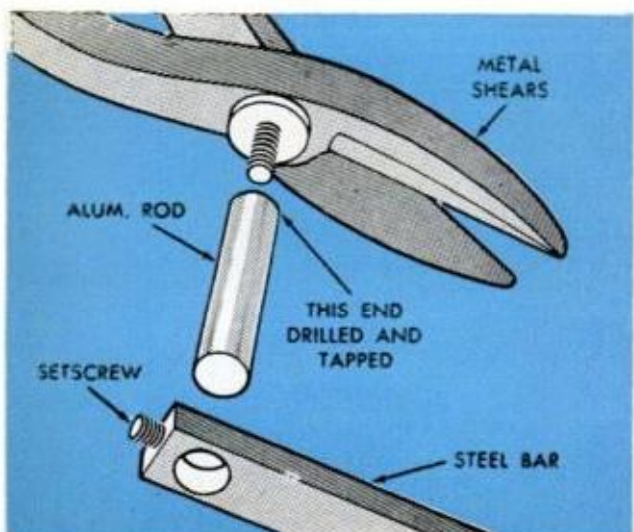
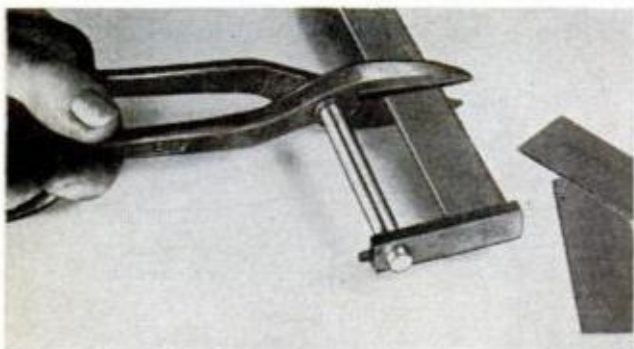
Awning Fittings Make Saw Cutoff Stop



Want to add an adjustable stop to your radial-arm saw for duplicate cutoff work? You can make a dandy one which screws to the top of the fence from four common awning fittings, a short piece of channel steel and a 10-ft. length of $\frac{1}{2}$ -in. thin-wall conduit. The four awning fittings are slit down the center with a hacksaw so they

will clamp tight around the conduit when fitted with thumbscrews. Two of the fittings are brazed together, back to back; the other two are brazed to the steel channel as shown. The conduit is cut into 7 and 3 ft. sections, the long piece being held by the two fence clamps. The 3-ft. section becomes the stop rod.—Gordon Williams

Adjustable Stop on Tin Snips Assures Identical Cuts



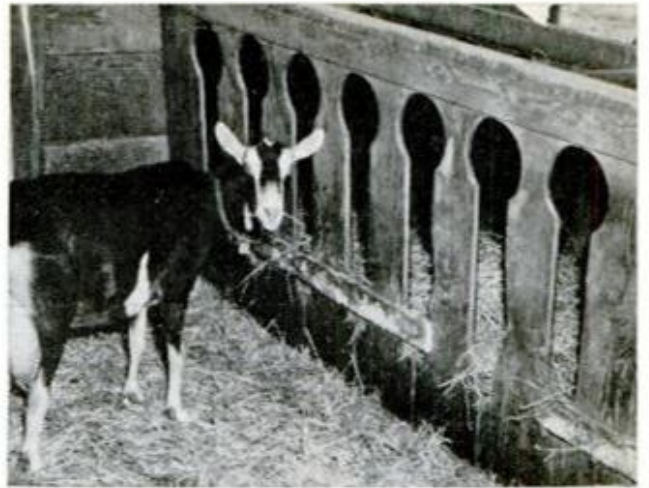
When you have to cut quantities of sheet-metal strips to identical length, this simple addition to your tin snips will save a lot of time. As you see, it consists of two simple parts; one being a short length of aluminum rod drilled and tapped to fit over the original pivot screw of the snips. The other part is a short length of bar aluminum bored to fit over the rod and drilled and tapped through the edge for a setscrew. In use, the stop is set at the desired position on the rod and locked in place with the setscrew. The strip metal to be cut is fed through the shears until it hits the stop, then snipped off. All will be the exact same length. To return the snips to their former self, simply remove the fixture and replace the original nut on the pivot screw.—H. J. Gerber

Turning plastic disks is simplified if you stick them to a faceplate which has been coated with sanding-disk adhesive. It is best to leave the protective paper on the plastic, to keep the adhesive off the plastic. However, any traces of the adhesive adhering to it can be wiped off later with a cloth which has been moistened with gasoline.—Ken Murray

FARM TIMESAVERS

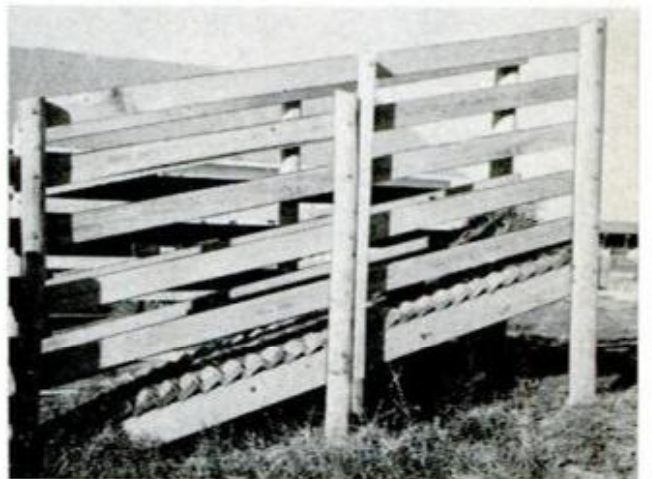
Goat Stanchions

Goats soon learn to lift their heads up in order to get into and out of these novel feeding stanchions. Once in the stanchions they can eat their fill of roughage or feed grains without waste. Although solid stock could be used in the construction, it probably is best to use $\frac{3}{4}$ -in. plywood as several stanchion openings, shaped like those pictured, can be more easily cut with a sabre saw in a single 4 x 8-ft. sheet.



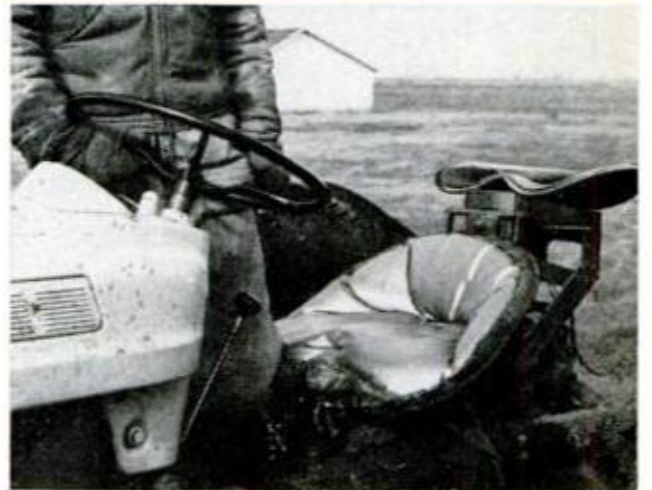
Non-Slip Chute

Cattle, horses and hogs sometimes slip on plank-and-cleat loading ramps and are seriously injured. To offset this possibility and also the loss involved, one farmer built a loading chute with a ramp made as pictured. It consists of 2 x 6s laid crosswise with the upper edge of one overlapping the edge of the piece preceding by about 1 in. Each piece is spiked to the supporting 2 x 10s at the sides and center of the chute. Although the chute pictured is a permanent installation, it also can be built on skids so that it can be moved by tractor.



Helper's Safety Seat

On some tractor jobs the pulled machine requires frequent adjustment due to uneven ground or storm-damaged crops. This combined tractor and machine operation can become an arduous if not impossible task for the driver, making a helper not only desirable but necessary. One farmer provides for the safety and comfort of the helper by fitting a second seat just back of the driver's seat. This position enables the helper to reach adjusting levers on the pulled machine easily. The added seat also provides a safe place for the second rider on farm transport jobs requiring two men.



Nurse Trailer

This nurse trailer mounting an ahydrous-ammonia tank simplifies the transport of liquids to the use point on large farms without tying up a tractor or tow truck for long periods of time. The two-axle trailer is self-balancing and the frame, of which the drawbar is a part, is made by welding steel channels to cross members supporting the saddles on which the tank is mounted. A catwalk is provided on each side of the tank from which the valves on top of the tank are easily reached.—A. M. Wettach



HOT-DIP GALVANIZING

Weatherproof those shop-made parts and fittings with a coating of zinc right in your own kitchen

IF YOU THINK OF GALVANIZING as strictly an industrial procedure, you're dead wrong. Any home craftsman can use this process. You can obtain pure zinc in bar form from any metals supply house for about 30¢ per lb. As for equipment, you'll need a plumbers' furnace and melting pot which can be purchased at almost any hardware store for about \$25.

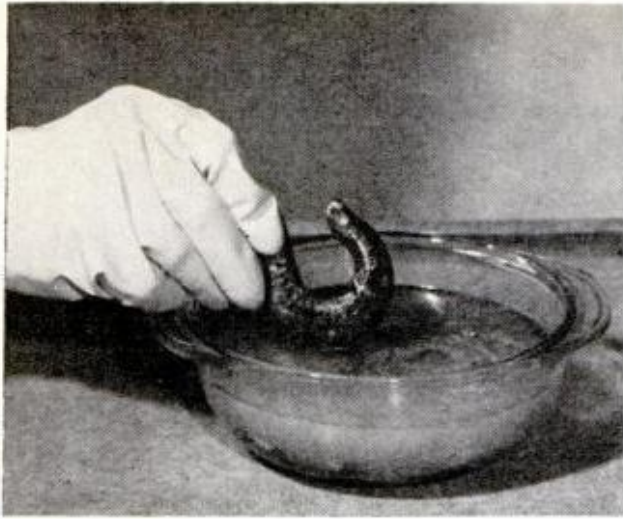
In addition to these, you'll have to stop at a drug store to pick up some sal ammoniac (ammonium chloride) and hydrochloric acid. Incidentally, the commercial grade of hydrochloric acid, usually labeled "muriatic acid," is cheaper and works just as well for pickling.

The first step in galvanizing is to clean the metal thoroughly. You can burn off paint or an old coat of zinc with a torch or the flame of the plumbers' furnace, but grease and oil should be removed by boiling the part to be galvanized in a solution of sodium carbonate. Almost any photo supply store stocks this chemical. (Don't substitute baking soda; that's sodium bicarbonate.) For average cleaning, mix about two tablespoonsful per quart of water and boil for five to ten minutes.

After boiling, rinse the part thoroughly

1. CLEANING the metal to be galvanized is the first step in the process. Old paint or previous galvanizing may be burned off, but grease and oil must be removed by boiling in a solution of sodium carbonate





2. PICKLING in acid completes the cleaning. Leave parts in acid bath until metal has a uniform gray tone, indicating that it is thoroughly clean. Be sure to wear rubber gloves when working with acid

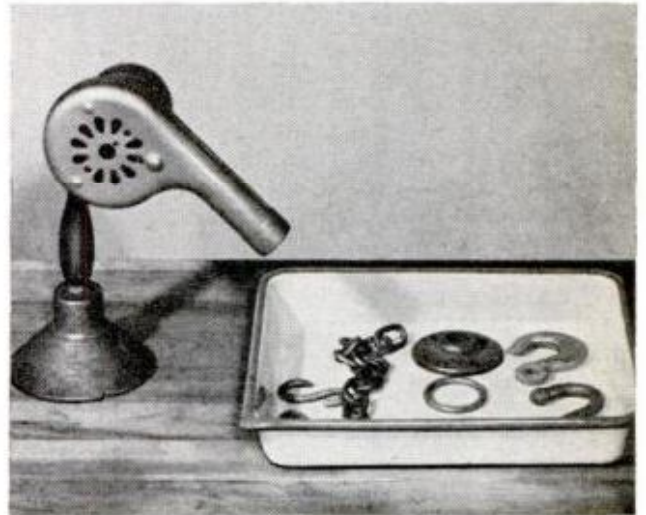


3. RINSING removes all traces of the acid. Place the parts in a shallow pan of cold water in your kitchen sink and turn on the tap. This will keep the water circulating and speed the rinsing job

in warm water to remove all traces of the solution. Then dry it with a clean towel or a stream of warm air (from your wife's hair dryer, for instance). From this point on, *do not touch the metal with your bare hand*. The invisible grease smears from your skin will inhibit the plating process.

Pickling, or bathing the part in acid, is actually a second cleaning operation which removes all oxides, leaving the metal perfectly clean and ready for the zinc. Pour enough hydrochloric acid into a glass dish to cover the part and slide the part under the surface gently to avoid splashing. Be sure to provide proper ventilation.

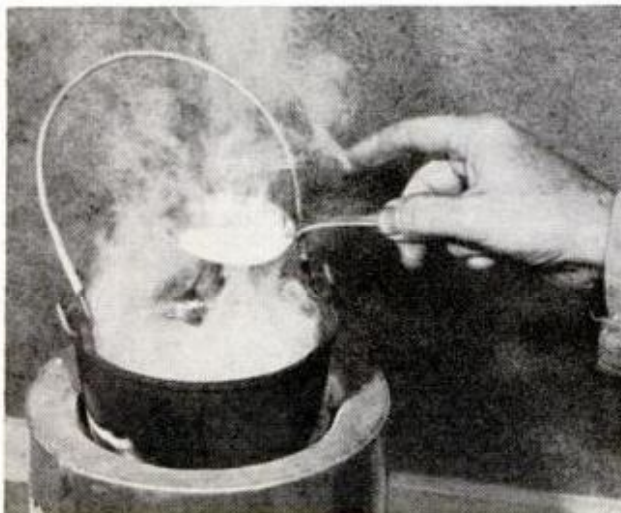
It may take an hour of soaking in the acid bath to remove every last bit of oxide. The metal will have a uniform gray tone when clean, but even though it may look clean allow an extra five or ten min-



4. DRYING after rinsing is a safety measure, since any moisture left on the metal will flash into steam on contact with the hot zinc and this may cause the molten metal to spatter. Hair dryer is fine for the job

5. BEFORE DIPPING, skim off the worst of the oxidation scum floating on the surface of the zinc and sprinkle a little sal ammoniac on the molten metal to act as a flux. Then immerse the part immediately

6. USING TONGS, lift the part out of the zinc bath and give it a quick shake to remove surplus metal. The smoke which shows in this photograph and preceding one is caused by the sal ammoniac reaction





7. **PLUNGE** the zinc-coated part into cold water immediately after withdrawing it from the zinc bath

GALVANIZING TIPS

If the zinc doesn't adhere well, your trouble can probably be traced to one of the following:

1. *Kind of steel*—Mild steel and forgings are easier to galvanize than other types.
2. *Cleanliness*—Remove all grease and oil before pickling.
3. *Poor pickling*—Leave part in acid long enough so that no spots of oxide remain.
4. *Poor quality zinc*—Happens rarely. Be sure to use "electrolytic" zinc.
5. *Temperature of zinc bath*—Keep it well above the melting point of zinc.
6. *Duration of zinc bath*—Allow part to come up to temperature of zinc.
7. *Oxide deposits*—Skim zinc bath thoroughly and sprinkle enough sal ammoniac over surface to clean it, then submerge part immediately.

utes to be absolutely sure. Then take the part out of the acid and place it in a pan of cold water under an open tap so that the running water will rinse away any acid remaining on the metal. After rinsing, dry the part thoroughly.

Acid-cleaned steel will begin to oxidize immediately upon removal from the bath, so you should have the pot of molten zinc prepared before removing the part from the pickling. Zinc melts at a temperature of 787 deg. F., but for good adhesion it should be heated to at least 820 deg. F. Be sure that the room is well-ventilated.

Molten zinc oxidizes rapidly, forming a yellowish-green scum on the surface. For a bright clean galvanizing job, avoid getting any of this oxide on the metal. Just before immersing the part, skim off the worst of this scum with an old spoon and then sprinkle a little sal ammoniac on the molten metal. When the surface is clean, thrust the part into the pot.

The part should remain in the zinc bath until its temperature comes up to that of the zinc. With the parts shown here in the photographs, a couple of minutes was sufficient. Naturally, heavier parts would require longer periods. When the part is ready to come out, reach into the pot with tongs and get a good grip on it, but don't bring it above the surface. Then use the procedure mentioned above to remove oxide from the surface of the zinc and lift the part out. Hold it over the pot for a moment to let the excess zinc flow off, then plunge it into cold water. If a heavier coating is desired, dry the piece thoroughly and repeat the zinc bath. ★★★

COMING UP NEXT . . .

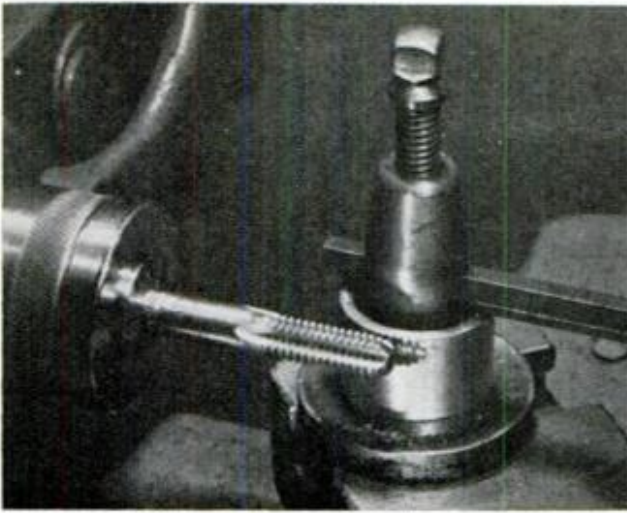
DORMITORY-DESIGN CHILDREN'S FURNITURE. College dormitory furniture packs a great deal of utility and livability into a very small space. *PM's* May issue includes plans for five coordinated pieces of bedroom furniture designed with this approach in mind. Suitable for tot or teen, the use of prefinished plywood paneling and aluminum corner posts makes each piece a one-evening project for the home craftsman.

10 POPULAR RETAINING WALLS. Want to cut back into that small mountain in your back yard to make room for a patio? In the May issue, you'll find instructions for building ten different types of retaining walls from a variety of materials. How high can you safely go? How do you anchor the wall? Which material is best for each job? It's all in the May *PM*.

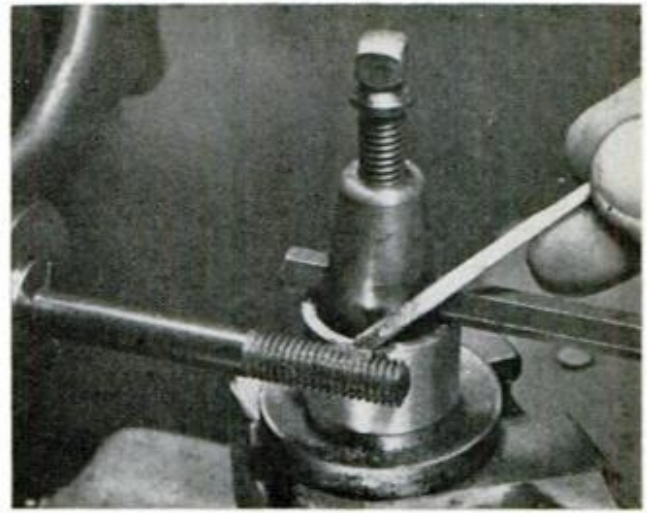
ABCs OF ANCHORING. A must for the boater who wants to get all the holding power he paid for, this article goes into the hows and whys of all those modern lightweight anchors. Learn what type to use where, how to free a snagged anchor, how to prepare for a big blow. You'll find all this and much more in the May issue.

BACK-YARD CRIME WAVE. Any gardener will agree that it's a crime the way insects can ruin the best-kept lawn and garden practically overnight. Here's your chance to get the jump on the top 20 of the insect underworld. Learn how to identify these public enemies by that first bit of damage, how to pick the best spray or powder to wipe them out. For complete mug sheets on this gang of garden vandals, be sure to read next month's *PM*.

Machinist's Trick for Lapping Threads



In certain types of assemblies where it is desirable to reduce thread lash to the minimum, machinists first cut a full depth thread and then lap it to a precise fit. One simple way of doing this where the thread is fairly short is to clamp a length of brass tubing on the tool post as in the left-hand photo above. Then a plug tap (use a precision high-speed-steel tap) is mounted in the collet chuck and the lathe set up to cut surface threads at one spot in the side of the brass tube. Lathe screw feed should be set for the same number of threads as



those in the tap. Drop in the back gears of the lathe and then hand feed so that the tap cuts to the full depth in two or three passes. This operation forms the lap.

Now the tap is removed from the chuck and replaced by the threaded workpiece. The lap is coated with a shop lapping compound or a fine valve-grinding compound and the lap is fed back and forth against the workpiece, using the same screw-cutting feed and speed. Usually two passes will be sufficient but in some cases three or more may be necessary.

Ornamental Hinge Masquerades As Drawer Pull

You don't normally think of hinges as drawer pulls, but if you like novel applications and need a flush pull, an ornamental hinge can serve the purpose nicely. Brass hinges with fixed pins and scrolled leaves usually are best on small drawers. First you polish or buff the brass to a high sheen and smooth any sharp edges or burrs. Then fill the holes on the swinging leaf with small brass screws of the size used to attach the hinge. Cut the screws off and peen the cut ends on the back face

of the loose leaf. In doing so, watch that you do not flatten the screw heads. Seat the heads in concave holes drilled in a scrap of metal. Next stand the hinge on edge on an anvil or other metal surface and peen the hinge pin lightly until the hinge opens and closes with sufficient friction to hold the loose leaf at any position. Now attach to the drawer with screws in one leaf as pictured, centering the hinge pin on the drawer front. After polishing, apply lacquer to prevent tarnishing.





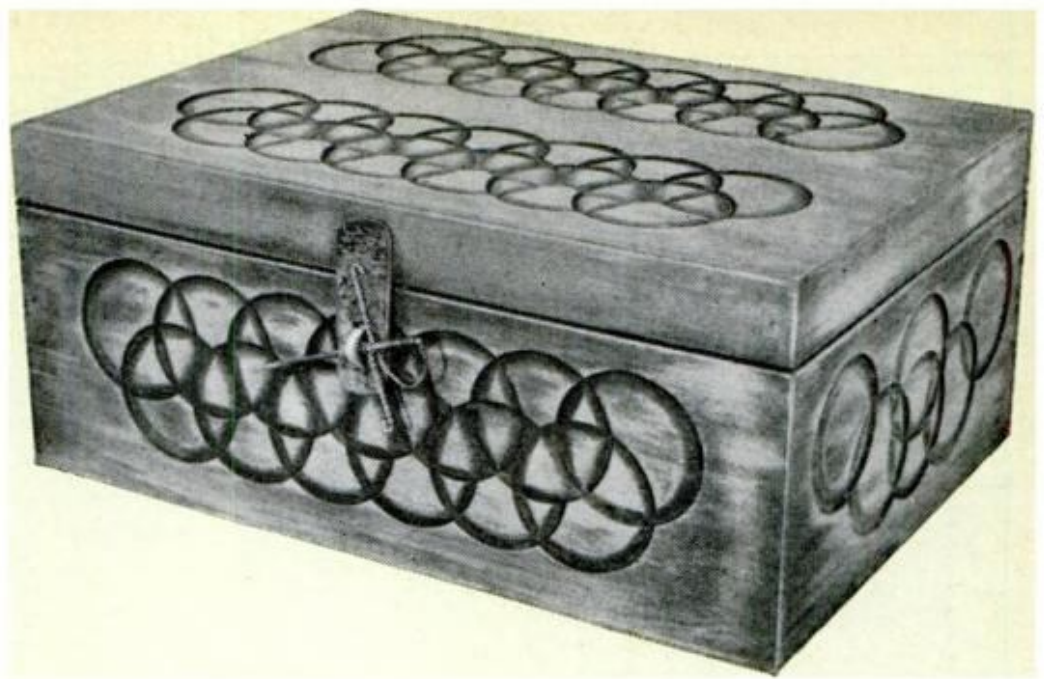
DECORATIVE CARVING MADE EASY

—with a Fly Cutter

By R. J. DeCristoforo

DOOR PANELS of the end-table chest shown above have easily-made, decorative fly-cutter carvings. Same technique can be used to edge-carve stock for making picture frames (left) or distinctive moldings





CIRCLE CUTTERS are usually used to make holes that are too large to bore with ordinary drills and bits. But the type shown here (often called a fly cutter) can also be used to create intricate geometric carvings that rival professional work in appearance.

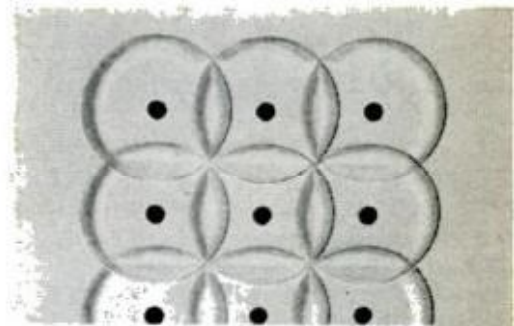
This drill-press accessory differs from the conventional circle cutter in that it employs a horizontal machine bit, locked in a central hub at a slight angle. Other cutters have a vertical bit held at the end of a horizontal shaft; such types do not make the bevel cut required for the carved effect pictured here.

All cutters have a pilot drill that passes through the hub to anchor the cutter's spindle at the center of the circle. In normal use, the hole left by this drill is in the waste stock that falls away when the bit bites through the work. In fly-cutter carving, however, you don't cut *through* the stock, so the pilot hole will remain. This can be a pleasing accent in large designs—such as the cabinet doors shown on the opposite page. If you prefer nonperforated panels, you can plug these center holes with dowels of contrasting wood. Or you can avoid the hole altogether by replacing the pilot with a stub of drill rod that won't penetrate the carved surface. You just file one end of the rod to produce a rabbet set in the same angle as the machine-bit groove in the pilot drill.

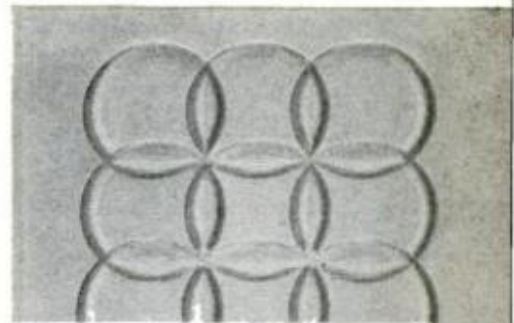
When using the pilot drill, the layout for

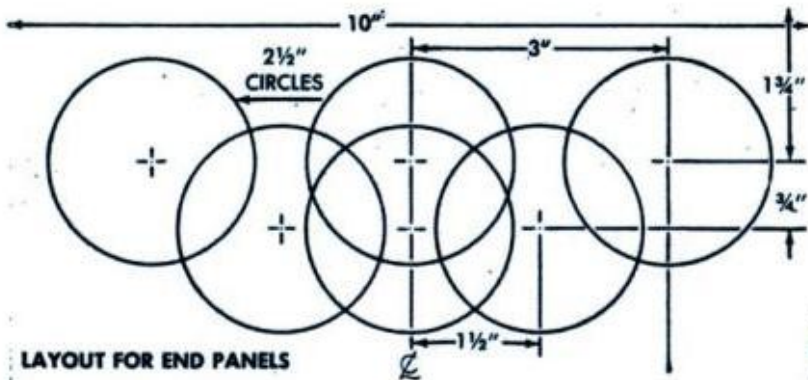
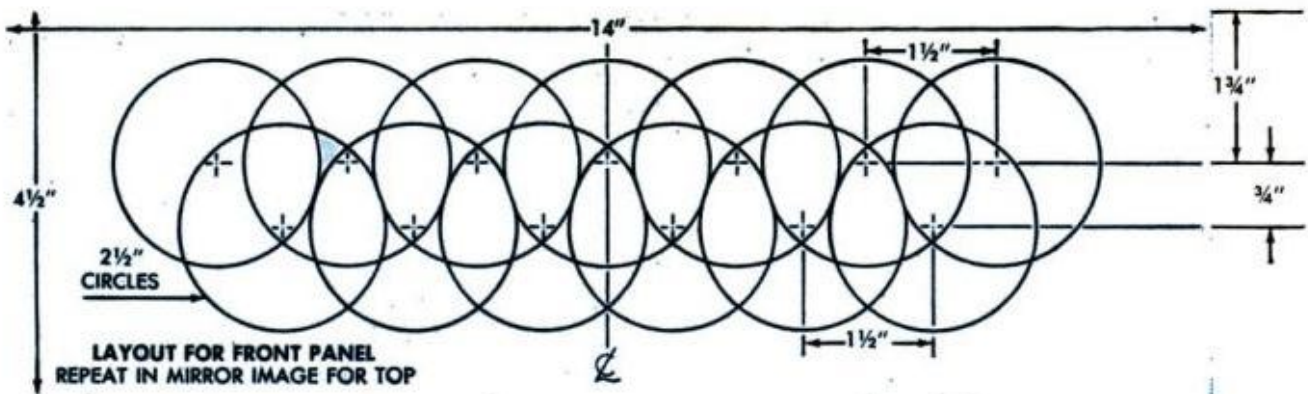
ARROW in photo at right points to slanted groove in pilot drill in which machine-bit cutter seats. Setscrew in hub bears down on cutter and drill. To modify the cutter to create carvings without a center hole, a piece of drill rod, rabbeted (arrow, lower photo) is substituted for the pilot drill. Samples of work done by different units are shown in accompanying photos

WANT HOLES?
Use the pilot drill

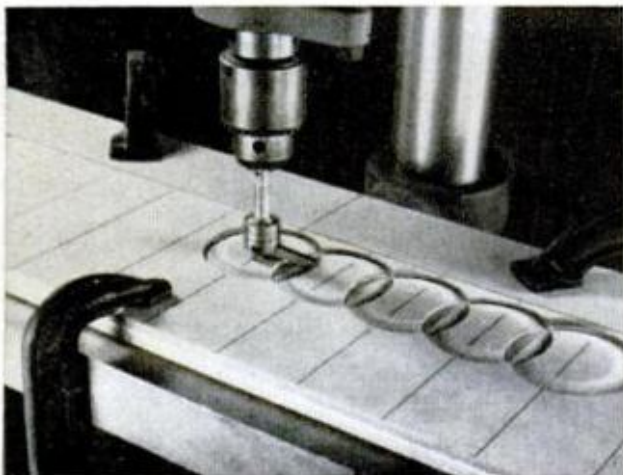


IF NOT,
replace pilot with rabbeted drill rod

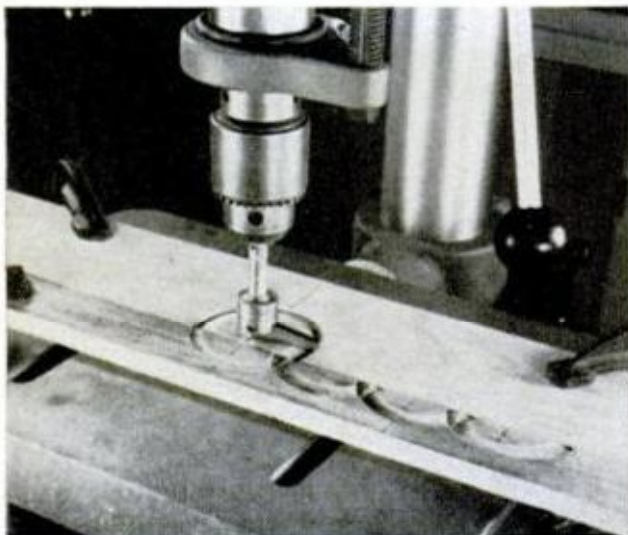




YOU NEEDN'T DRAW CIRCLES in laying out work—just mark centerlines for uniform spacing. Line these up with guide mark on clamped fence, as below



CENTERLINE SYSTEM works, too, when work receives only part of cut, as for picture-frame molding shown on page 194. Wider fence moves work to side of cutter



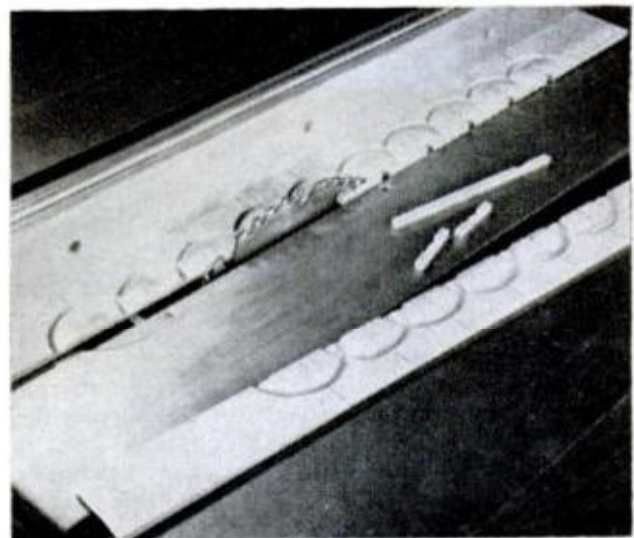
the carving pattern is simplified. Merely draw intersecting lines on the work, spacing them for the desired overlap of whatever size circle you've adjusted the bit to cut. Then drop the tip of the drill onto each intersection.


Actual layouts of the sides of the chess box are detailed above, as an example. Without the pilot, the problem of positioning these circles accurately is solved by clamping the fence or guide to the drill-press table. The fence provides uniform edge-distance, and a line scribed across it to indicate the spindle center can be lined up with the pattern marks on the work. It's a good idea to clamp the work securely before each cut.

Work at a low speed, feeding the cutter slowly into the work. Use a depth-stop to control depth of cut and a back-up block to minimize break-through damage, if you're using the pilot drill. Test each new pattern on scrap to avoid spoilage.

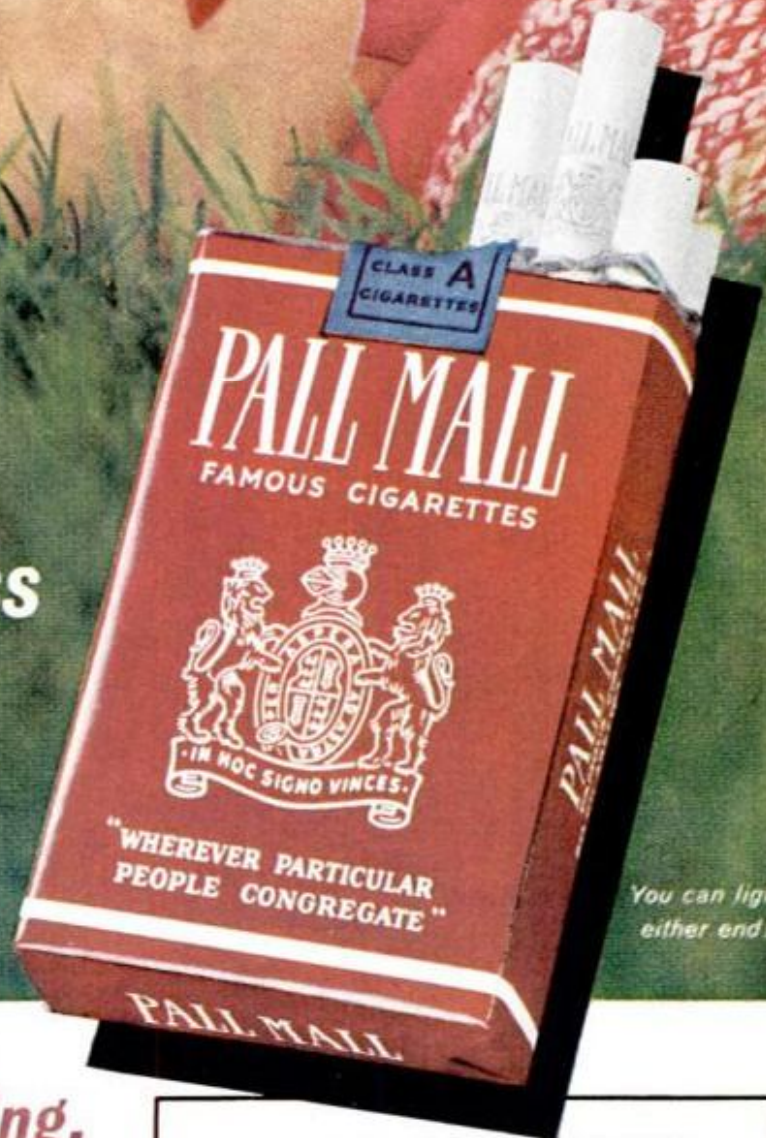
The fly cutter shown is the Adjust-A-Drill, produced in two sizes by the Jet Tool Co., Lemon Grove, California. Prices range from \$3 to \$5. ★★★

FASTER WAY TO MAKE edge-carved moldings is to cut full circles and slice them in half. Two center cuts dispose of pilot holes, give you two identical strips





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natural mildness
is so good
to your taste!**



*You can light
either end!*

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

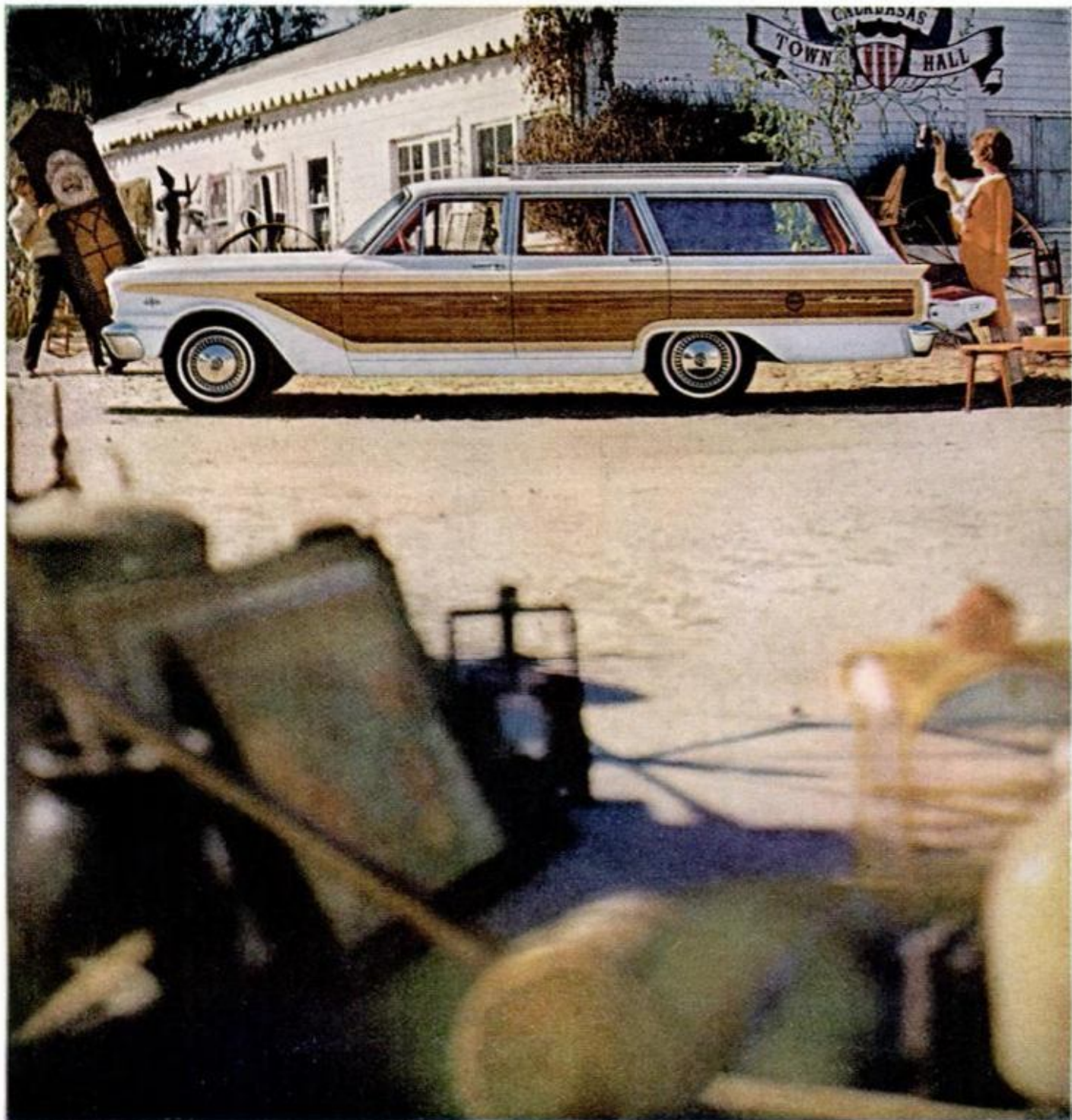
*For flavor and enjoyment you just can't beat
Pall Mall's natural mildness. It's so good
to your taste. Never too strong. Never too
weak. Always just right! Enjoy satisfying
flavor... so friendly to your taste.*

Outstanding... and they are Mild!

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 not filter
out that satisfying flavor!



Collector's Item

(New middleweight wagon that handles a full size load)

Wagon fanciers have made a great discovery: this new Fairlane wagon carries a load like the big wagons, yet is 8 inches trimmer in length, 8 inches slimmer in width (it slips through traffic almost like a compact!)

Other distinguishing features of these trim new middleweights are a remarkably smooth ride, Ford's exclusive twice-a-year (or

6000 miles) maintenance and lively V-8* (including the extra-eager Challenger 260) or thrifty Six power.

Surprisingly, the Fairlane Station Wagons are priced *below* some wagons with *less* load-space... right down with some *compact* station wagons, in fact! Whether you choose the handsome Squire, illustrated above,

or a beautiful Ranch Wagon, you'll find Fairlane Station Wagons ideal for collecting kids, cargo or compliments! See your Ford Dealer... he's America's Station Wagon Specialist.

*Optional



America's longest, liveliest line of wagons

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FALCON • FAIRLANE • FORD

Talk about wagons...your Ford Dealer has more to talk about

**"Just in case
they're biting at
the water hole!"**



New Johnson Compacts

Famous Sea-Horse dependability! Now with a 2-year warranty!

F-o-r-e! Make way for the new '63 Johnson Compacts! Above is the 5½ hp model. In action at the right is the 10. And there's also a versatile 18.

Outside: slim, trim, light. Inside: very big on quality. Corrosion-proofing and thermostatic cooling. Super silencing and cushion-hub prop. PLUS... a new 2-year warranty policy... parts and labor.

Other Sea-Horse motors at your Johnson dealer's: Electramatic 75 and 40's, a 28 hp "Convertible" and a timeless, tireless 3.

Free '63 catalog. Write Johnson Motors, 1359 Pershing Rd., Waukegan, Ill. Div. Outboard Marine Corp.



CLINIC FOR HOMEOWNERS

Sweating Chimney

Q—*My chimney goes up outside the long wall of my living room and in the summer dampness appears on the inside of the wall; the size and outline of the damp spot just about equals the size and outline of the chimney. Only during the summer months does the trouble appear. The wallpaper comes off as fast as I can put it on. What can I do to stop this?*—S.T., Minn.

A—Yours is a fairly common problem and the remedy is not simple to carry out. You do not describe the chimney, but in order for condensate to give trouble on the room side of the wall the chimney must be built into the wall, rather than outside it. If this assumption is correct, then what is happening is that moisture from the air in the rooms condenses on the surface of the plaster opposite the chimney simply because the masonry is colder than the air in the room. We think it likely that you can cure the trouble, or at least minimize it, by removing the wallpaper from the affected area and covering this with a paper-backed aluminum foil. Then nail furring strips over the foil, place glass-wool blanket-type insulation between the furring strips and finish with plasterboard. For best appearance this area should extend from floor to ceiling because of the resulting offset in the wall. Then you can size the plasterboard and paper or paint over it.

Cleaning Asbestos Shingles

Q—*My home is covered with asbestos shingles. They are only a little over two years old but they are streaked with dirt and are looking worse and worse as time goes on, appearing to have turned an unattractive gray color. I've thought of repainting them but I'm told the dirt must be removed first. But how? I've tried hosing the walls down but without much success.*—T.A., Va.

A—Cleaning asbestos shingles is, at best, a rather tedious, messy job. Hosing alone won't do it; in fact, hosing with much pressure tends to embed the dirt deeper and make it more difficult to remove. Probably the best method, although we hesitate to suggest it because as we've said it can be a tedious job, is to scrub or sponge the walls with a medium trisodium-phosphate solution, about one tablespoonful to the gallon of clean water. A large painter's sponge is probably the best to use for applying the solution, al-

though a scrubbing brush can be used. Of course, you begin at the top of the wall and work down. Clean an area, whatever is handy to reach from one or two settings of the ladder, then hose the area, including the wall directly below to remove the loosened dirt and any residues of the washing solution. Continue this procedure, an area at a time, hosing down the wall often. Don't permit loosened dirt and the solution to dry on the wall. When working with the trisodium solution it's important to wear rubber gloves and protect your eyes from splatters. The common solutions of trisodium offer no special health hazard, but can cause skin irritation.

Warped Door

Q—*How does one straighten a warped door? My front door is warped just enough to prevent it from closing tightly at the top and along the side part way down opposite the hinges. It's a framed door, not one of the newer type hollow doors. I've been told that I have only two choices—weatherstrip it or replace it, but I don't want to do either until I know whether or not the warp can be corrected.*—U.L., S.Dak.

A—Usually it is not practical to attempt to straighten a warped door, more especially a full-sized door, with such equipment as the average homeowner has at hand. It can be done, of course, by cutting spaced grooves with an electric handsaw across the affected members—in your case it's apparently the stile—the cuts made to a depth equal to at least half the thickness of the warped member. This relieves the stresses that caused the wood to warp and will permit the part to be straightened. But you have the problem of filling and concealing the saw kerfs. If the door is painted this can be done quite easily. However, your description of the warp in your front door leads us to believe that it may be possible to correct the defect, at least partially, simply by resetting, or relocating, the hinges. We can't tell you how much it may be necessary to reset the hinges, as this requires an on-the-spot check.

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.

If you could find a house paint that stayed on without cracking, scaling, or blistering, held its color with hardly any change and kept your house looking fresh and bright for years, wouldn't you use it?

Sure you would. That's why lots of shrewd homeowners are repainting with Dutch Boy Latex House Paint. Think of all the trouble it saves. To start with, it's easier to handle. Being a latex paint it brushes out smoothly, with very little effort. Goes over almost any surface—wood, stucco, brick, even galvanized iron. And Dutch Boy Latex House Paint breathes—allows moisture to escape, yet seals out the weather. That means many of the blistering and peeling problems caused by trapped interior moisture are eliminated. Another point: you don't have to wait for the weather. (Paint right after a rainstorm if you like.) You can stop when you like, start again, and stop again, without leaving lapmarks. And in two hours you have a bright, weathertight surface that stays looking that way for years. In fact, Dutch Boy Latex House Paint retains its color so well you can come back and touch it up years afterwards and not see the difference. Think what that means in maintenance. To keep your house looking fresh and bright all you do is touch up the worn spots when they need it. In short, you may never have to paint your entire house at one time again. When you're all finished, brushes, equipment, and people all clean up with soapy water. Best of all, Dutch Boy Latex House Paint costs no more than any other good paint. So, next time you're thinking of painting, why consider anything else?



A product of National Lead Company.

Owners Report—Dodge

(Continued from page 105)

"Transmission pushbuttons are poorly placed in relation to the steering wheel."
—New York supervisor.

He's right, you have to reach through the wheel—not around it—to get at buttons. Another instance of poor styling imposed on good engineering.

Back on the bright side, here is the second group—numbers six through ten—of best-liked features presented in the order of their frequency:

"Plenty of legroom in front and back."
—Illinois postal supervisor.

"This was the first new car I've ever purchased that did not require any check-up. It was completely free of defects."
—Connecticut engineer.

"I like the solid construction of the body. You can tell when you slam the door that you have a Chrysler product."
—Ohio aviation specialist.

A few years ago this statement would not have been a compliment. Chrysler Corporation's quality uplift job has been heroic.

"The driver sits up and has good vision."
—Oklahoma rural mailman.

"I like my Dodge's roadability; there's no sway or tip on curves."
—Ohio insurance man.

For our driving tastes, shock absorbers could be a bit firmer to control sway when switching lanes quickly.

"It holds the road well, especially on superhighways."
—Massachusetts accountant.

"The braking at high speeds (with power brakes) is very good."
—Louisiana methods analyst.

"I like the self-adjusting feature of the brakes."
—New York barber.

Numbers six through ten of owners' complaints demonstrate that every pro has a con. In order of frequency, they are:

"There's an air whistle on the right side around the vent window."
—West Virginia teacher.

"Excessive wind noise with wing vents open."
—California serviceman.

"I like Chrysler products very much, but I still think the gas mileage should be better (10 miles per gallon overall—V8 automatic)."
—Pennsylvania steelworker.

If he's not towing a mobile home, he sure needs a tune-up!

"I have discovered paint specks which look like rust spots on both top and body."
—Ohio government employee.

"When we left Detroit the car was full of bubbles and nicks from the factory; yet,

we cannot get any cooperation here in Seattle to have this problem attended to."
—Washington keypunch operator.

"Top of windshield is too close to my head."
—Tennessee electrical worker.

All too true. When seat is set forward the windshield's steep backslope makes it a head-knocker. That slope is great aerodynamically, though!

"Water comes in under floor mats."
—Virginia penal supervisor.

"There was water leaking around tail lights into trunk (has been repaired)."
—Washington production supervisor.

Numbers 11 through 16 complete the bouquets, listed in order of mention:

"Body is quiet, very little wind noise and no road noise."
—Nebraska farmer.

Agreed. Dodges PM drove had the hushed ride of luxury cars.

"I like the automatic transmission parking lock."
—New York engineer.

"Has very good heating system."
—Connecticut IBM operator.

"Heating system somewhat improved over 1961 Dodge, but room for improvement."
—Illinois grocer.

"I like the power steering much better."
—New Mexico teamster.

"Both the exterior and interior styling is very fine and has prompted many compliments on the car."
—Michigan design engineer.

"I like the excellent power response, and the automatic transmission which has a barely perceptible change in gear, even at low speed."
—Pennsylvania school psychologist.

If a Dodge automatic transmission doesn't behave this way on your car, it can be housebroken by correct adjustment.

Here are the last of the brickbats—numbers 11 through 16—listed according to their frequency of mention:

"The feature that I like least is the 700 X 14 size wheels."
—Massachusetts handyman.

"I don't like 700 X 14 tires; I do a lot of traveling and feel that a larger tire would give me a better ride and last longer."
—Rhode Island salesman.

His comment is particularly applicable to station wagons.

"Visibility not as good as former car. Posts at sides of windshield block view."
—Maryland pressman.

There's that stylish, streamlined slope again!

"The post at the back window makes a very bad blind spot, even with outside mirror."
—Ohio paper hanger.

In our opinion this "blind" quarter panel, which is a styling feature and makes for a stronger roof, should be eliminated in favor of greater glass area on Dodge or any other car where it is found.

"I did have mechanical trouble with the transmission torque converter hanging. The factory replaced it."—Virginia school principal.

"Poor engineering as water drips off roof when doors are opened. There's no drip molding."—Michigan traveling salesman.

We'll amend the salesman's comment. The engineers know better than to build a drippy roof, but they were over-ruled by stylists once again.

"Although the ride is comfortable, it tends to be on the stiff side."—Texas accountant.

"The driver's side mirror is not properly located for use."—Pennsylvania retiree.

There you have it: a wrap-up of likes and dislikes as expressed by owners of the 1963 Dodge after a total of 1,156,591 miles of driving.

Gas-Powered Boat Winch



Taking the heavy work out of moving his boat onto a trailer, a Florida boating enthusiast has mounted a gasoline driven mechanical winch on the trailer tongue.

Geared down to an 11:1 ratio to assure a slow, smooth pull, the motor is automatically thrown into neutral when the prow of the boat hits the trailer chock. It was built by D. E. Hunt of Miami.

OUTGRIPS

'EM ALL...

BIG



SMALL



IN TIGHT PLACES

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Easy does it on every gripping job with a Channellock Plier in your hands. Powerful parallel-jaw grip . . . tremendous leverage . . . patented, smooth-working, can't-slip adjustments. Your choice of five jaw capacities: 1/2, 7/8, 1 1/2, 2 and 2 1/4 inches. **Be sure it's a genuine Channellock.** Look for the trademark on the handle. Write for catalog showing complete line of pliers. Made Only By Champion DeArment Tool Company, Meadville, Penna.

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Designed and built for comfort and service . . . 50 different Thorogood Job-Fitted Work Shoe styles to meet the requirements of 30 basic occupations. Look for dealers displaying the Thorogood sign; or write to us for the name of the one nearest you.

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delivers high performance!
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The most popular motorcycle in the world

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Tomorrow's Shop Tools

(Continued from page 109)

who has "solved everything" on paper finds that his project suddenly falls apart on the workbench.

IIT students are fiercely proud of this work. One designed a ratcheting screwdriver of a new type. Montague gave him permission to incorporate, into the student's design, the ratchet mechanism out of an existing screwdriver.

"Nope," said Brian Skogler, "I'm building this one from scratch." And he did, spending long hours in the shop actually building his own ratchet. Worked much smoother than the commercial model, too.

Charles Dole, a graduate student, is working on a seed-tape dispenser, looking forward to the day, not far distant, when lettuce seed, for example, will be available properly spaced on a roll of paper tape. One major seed company is already producing such tape experimentally. Dole is building a gadget on two wheels that the gardener simply pushes across the ground. It opens the furrow, unrolls the seed tape, then closes the furrow.

From hand tools, the young designers turn their attention to portable power tools. Doblin defines a power tool as the insertion of a power source between the hand and the work to be done. That source can be anything from a coiled spring to electricity, gasoline or even moving air.

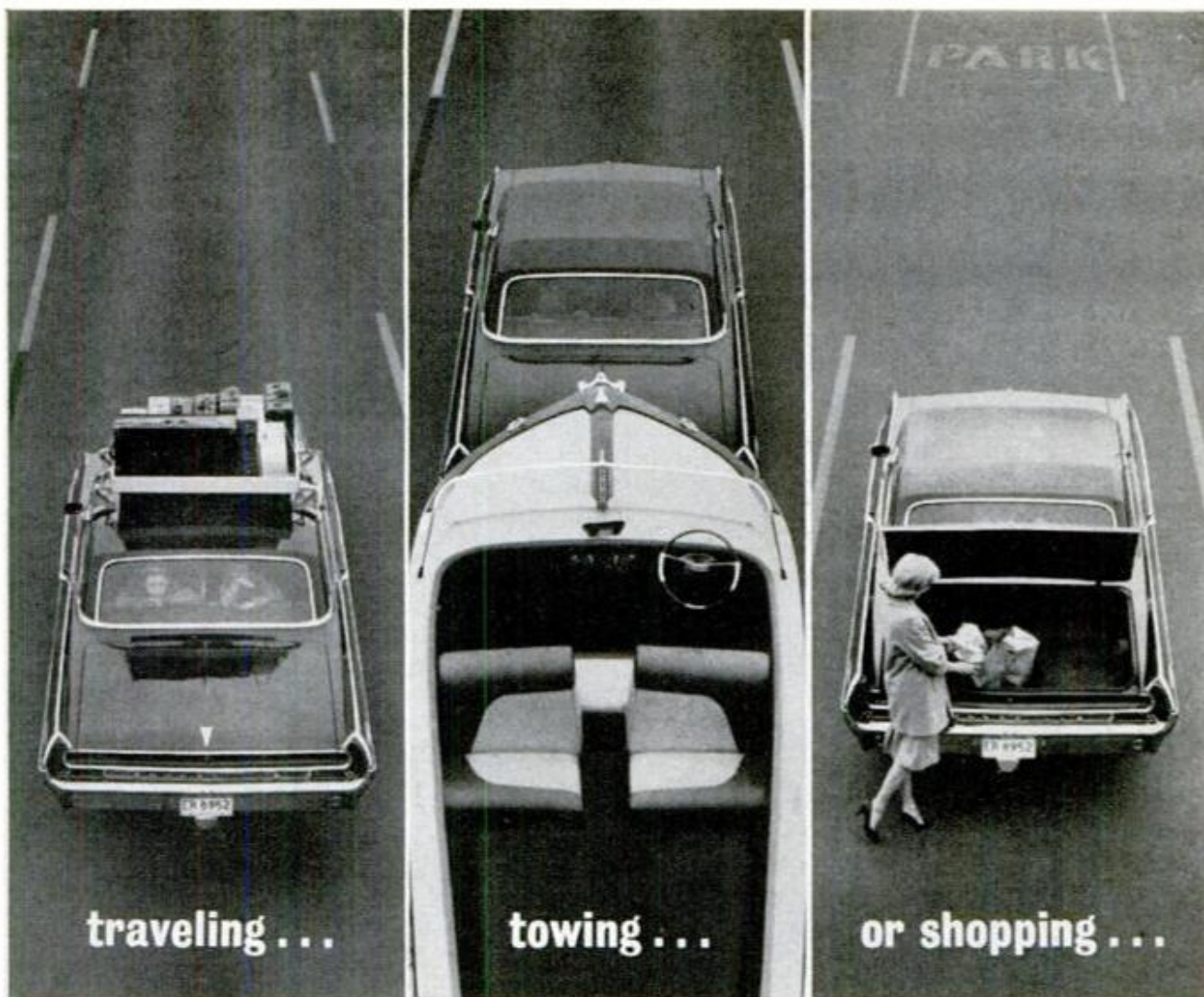
Ken Hattori is working on an electrically powered grease gun. He maintains that compressed air is fine for grease guns in big repair shops, but that many small shops, machine shops and even motorists need a powered grease gun where no compressed air is available. It makes sense.

Students at IIT later go on to more elaborate projects in other areas, such as the study of entire transportation and communication systems, but most of them, even when they are established designers, look back on their tool project as their most intense challenge.

Not only challenge, but in some cases disappointment. Joe Gruenhut worked for months on a simple electric snowblower for cleaning the sidewalk. He had completed the design, detailed it into plans, and was in the process of constructing a working model when a major manufacturer, with considerable fanfare, announced a new product—an electric snowblower. It looked remarkably like Joe's.

Joe is philosophical. "Anyway, it's solid proof I had a good idea," he says, trying to hide his disappointment.

A lot of other young tool designers at IIT have good ideas, too. Chances are, you'll see them in hardware stores soon. ★ ★ ★



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Wherever you drive . . . whatever you carry . . . you'll enjoy driving more when you're riding relaxed on new Columbus LEVELIZERS—only ride control unit **GUARANTEED FOR THE LIFE OF YOUR CAR.**

Today's cars aren't designed to carry heavy loads without help . . . LEVELIZERS provide the help you need to tow a boat, trailer or carry a heavy load. And yet, when your car is empty, you still ride smoothly . . . and on the level. □ So, if you want your car to ride like a limousine, yet work like a truck when necessary, level it—before you load it, with new Columbus LEVELIZERS and enjoy *real* comfort for a change!



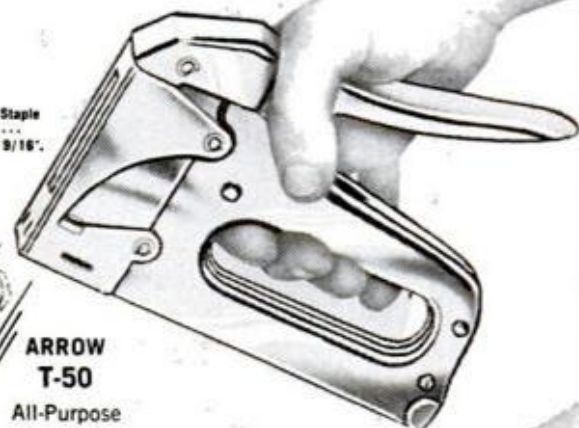
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Sizes...
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**ARROW
T-50**
All-Purpose
Heavy Duty
STAPLE GUN



**ARROW
JT-21**
Household
Light Duty
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FEATURED SPECIALS
for 1963 HARDWARE WEEK
at 22,000 hardware stores!
(April 18-27)

T-50 SPECIAL:

\$14.28 VALUE—only \$12.50

- T-50 Staple Gun..... \$12.50
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- Bonus Certificate* .78

TOTAL VALUE \$14.28

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JT-21 SPECIAL:

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- JT-21 Staple Gun..... \$4.95
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TOTAL VALUE \$6.48

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**YOU RECEIVE WITH PURCHASE OF EITHER GUN:
*EXTRA BONUS CERTIFICATE!**

Worth 78c towards additional purchase of Arrows P-66 hand stapler and 1,000 staples. Reg. \$1.78 value!

ARROW

ARROW FASTENER COMPANY, Inc.
One Junius Street • Brooklyn 12, N. Y.

They Won't Bury Paul Bunyan

(Continued from page 125)

ber to find the "key" log and pull it loose with the peavey, a steel-pointed shaft of wood with a swinging metal hook to grasp the log. Loosened, the logs break loose like wild horses. Those who can make it, run for shore, the others balance on logs and ride out the rush. It has been said of a good riverman that you can throw a bar of soap in the water and he will ride the bubbles to shore.

The toughest thing about the oldtime lumberjack, according to Holbrook, "was his stomach. Many people really believe that it was made of boilerplate." Camp cooks, boilers and sizzlers are no longer notoriously unkempt, but they are still tough. Absolute silence still is a rule in the cook shack, but is no longer enforced with a meat cleaver as it once was. A camp on the Androscoggin River in New Hampshire once had a cook who was losing his hair and it was always in the food. On his round of the table the cook noticed a logger wasn't eating his pie and he growled, "Don't you like the pie?" The logger wanted to complain without having his head parted, so he said, "It's right fine pie, but it needs a shave."

The death knell for the logger was sounded in 1876 when an "improved band-saw" was exhibited at the Philadelphia Centennial. Used as a headsaw, it could slice down more logs than an army of jacks could supply. After this came a friction device for handling logs on the heading carriage. Then steam was added to run the new machine. Then came the bull chain for moving logs in an endless procession from log pond to sawmill. These inventions were the forerunners of the mechanical monsters that now rule the woods.

It is just a matter of time before a breed of man becomes entirely extinct, when all the jacks have gone "over the hump, where white pine grows a mile high with a limb to the three-quarter mark, and where the sap of rock maple trees is 100 proof." ★★★

Space Dust Found in California

Meteoritic dust particles have been found buried in the earth layers in California. The dark, metallic particles were identified by microscopic examination of oil well drilling cores by Dr. H. Skolnick of the Spanish Gulf Oil Company.

Drilling samples from other areas of the state were also found to contain similar particles. The rocks are from the Cretaceous, Miocene and Pleistocene eras, the oldest of which is about 100 million years.

Fat-Tire Scooter

(Continued from page 154)

the bearings and held fast with retaining collars. This entire assembly is mounted in the frame by means of simple mechanical pivots. The lower bearing housings protrude into holes in the support plates at each side. The pivoting feature permits adjustment to keep the drive belt taut.

The rack is tensioned against the belt by means of a spring hooked between two flat iron brackets. The front bracket is drilled to slip over a pin projecting from the top of the rack. The rear bracket is bolted to the frame. Whether you add a screen (or shroud) around the transmission depends on the use (or abuse) you'll put the scooter to.

If you're using a power-mower engine, it may already be equipped with a centrifugal or automatic clutch. If not, you can order one from the V-Plex Clutch Co. of Hagerstown, Ind. The scooter shown uses a four-cycle engine with a self-adjusting V-Plex, and the engine-to-wheel ratio is 25-30 to 1 (depending on the clutch diameter—which in turn depends on the load at a given moment). A slightly higher ratio (around 35 to 1) is recommended for a two-cycle engine.

Bear in mind that this rig is really a two-wheel tractor. If you start it up with the throttle advanced, it'll take off instantly—with grim determination, and a mind of its own. So it's a good idea to have an emergency switch within easy reach—perhaps a hand-held, spring-loaded dead-man control which will douse the engine the moment you release your grip. You could part the condenser wire and insert a doorbell, in series, mounting it on the handlebar so you can keep your finger on the button while you steer. If the button is released, it breaks the ignition circuit. Or, you might use a hand-throttle with a sufficiently powerful return spring to starve the carburetor when released.

Engine compression supplies adequate braking, but it's a good idea to equip the rear wheel with a brake drum so you can install the pedal brake shown.

Remember, too: it's no trick to make the shafts on the idler pulleys long enough to use them as power take-offs for a water pump or generator. So if anybody shouts "Get a horse!" at you when you chug past them on the trail, you can grin smugly: What pack animal can double as a pumping station or camp-site power house? And *this* mount is cheap to feed. With the 2½-horse engine shown, a gallon of gas should scoot you through the wilds for nearly six hours. ★★★



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Hoopskirt Model Plane

(Continued from page 157)

paper; when dry, give it a coat of clear hot-fuel-proof dope (Butyrate).

Careful alignment of all balsa parts pays off in good performance. Don't diminish the strength of the rock-hard-balsa booms by sanding off the corners—it's best to leave them square.

The tail plane has a deeply-notched trailing edge, backed up with parallel pieces of soft wire cemented to the wood. These wires—which can be snipped from a paper clip—will hold any flight-adjustment bends you may give the two elevator sections after trial runs. An annular wing operates at zero incidence, so you'll have to bend the elevators up two or three degrees to get an angle of attack for climb. Bending one elevator up more than the other makes the model turn in that direction. The rudders have no adjustments, and are simply cemented to the sides of the booms after the tail plane is in place.

The engine-pilot nacelle is given a coat of pigmented dope after the motor is fastened on its plywood mount. The color scheme of the model shown is: red nacelle, rudders and fin: natural white wing; silver booms, strut and tail plane—a highly visible combination against a blue sky.

For best performance, be sure the model balances at a point about 1¼ in. ahead of the trailing edge of the wing. Hand-launch the model over tall grass until, by bending the elevators up a little at a time, you get a flat glide. As a check on these adjustments try a flight with the motor running rich, then lean it out and watch your model zoom.

If you're flying it in a limited space, it's a good idea to burn off some of the fuel before turning it loose, because the model travels at a good clip. On a full tank, it could lead you a merry chase. ★★

Breeding Sleepy Rats

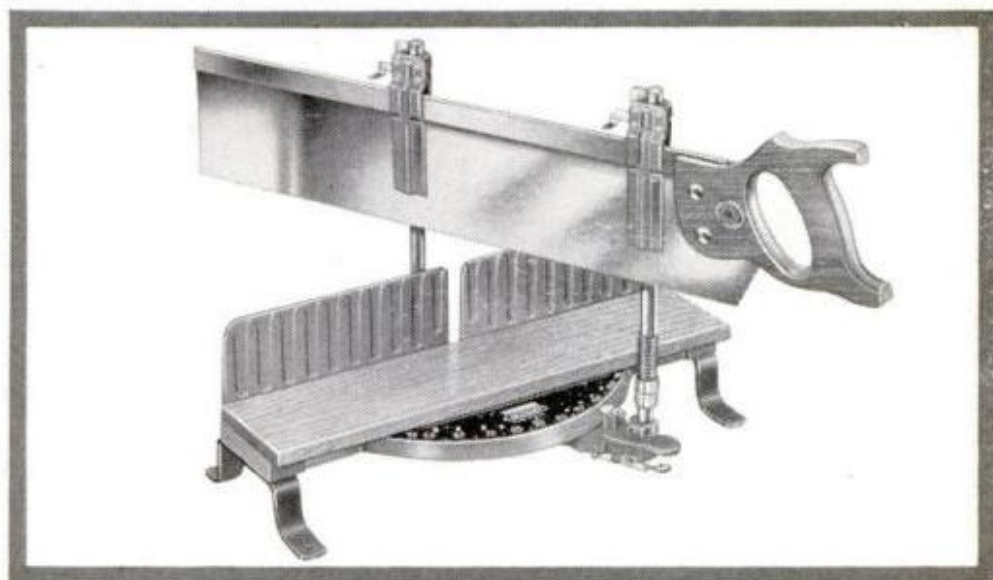
Scientists are attempting to produce a breed of sleepy rats to determine why some people wake up easily and others "hate to get up in the morning."

Development of the sleepy breed and the subsequent study of the sleep centers and their relationship to hereditary factors may answer why some people wake easier than others.

In addition to genetic factors, training and motivation may contribute to an individual's efficiency in waking according to University of Florida psychologist, Dr. Wilse B. Webb. If true, people may someday be taught to wake up without the ringing of an alarm.

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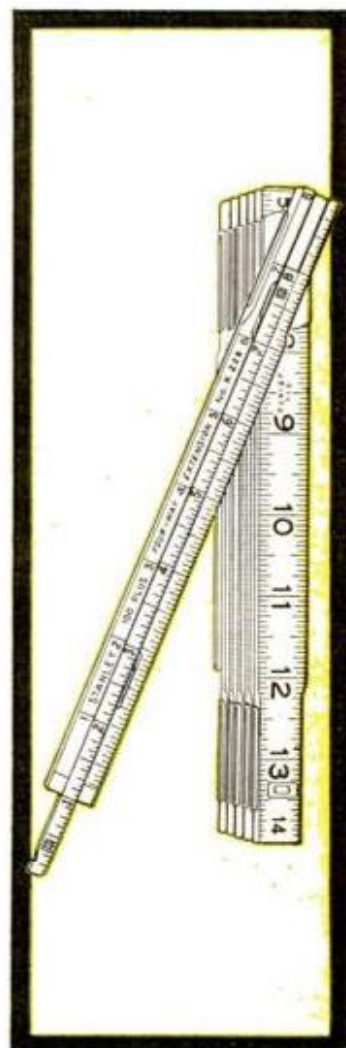
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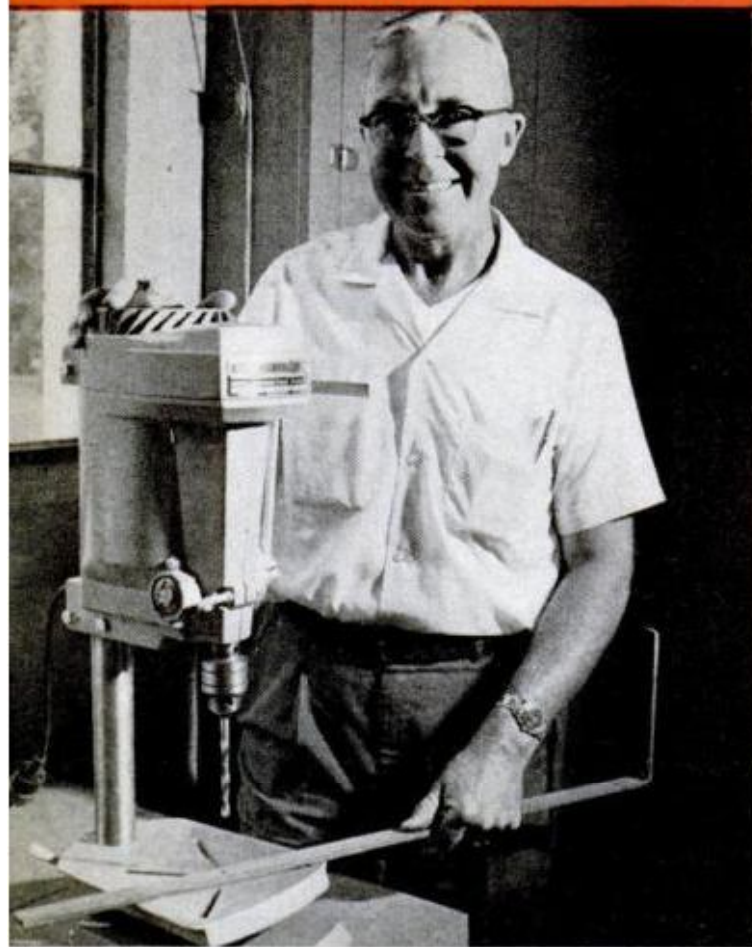
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"I bought this COMPACTOOL Drill Press for work in my sign shop. We use it mostly for drilling angle iron, $\frac{1}{4}$ " strap iron and pipe for sign hangers. When we do a store front, I take it along in my truck. We give power tools an awful beating—but this Drill Press does as well as anything three times its size—and holds up just as long."

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Know Your Cooling System

(Continued from page 173)

amount of pressure at which it is rated. The most accurate of these involves the use of a pressure tester. To use the tester in checking out a cap, simply attach the cap to the tester and build up the vacuum with the hand pump. The meter should indicate the amount of pressure at which the cap is rated. If the reading is below this amount, there is an air leak in the cap, and it should be replaced as soon as possible.

Simple Pressure Test

In the absence of a pressure tester, you can try a simple test which will give a rough indication as to whether the cap is functioning properly. With the engine cold, fill the radiator to within 1 in. of the bottom of the filler neck. Secure the cap, start the engine and run it until it reaches operating temperature. Then stop the engine and immediately loosen the pressure cap. You should hear a slight hissing sound as the pressure escapes past the loosened cap, indicating that the cap is probably holding pressure correctly when it is secured.

There is one danger in a pressurized cooling system, but it can be easily avoided. *Never* remove the cap suddenly, for the quick release of pressure may cause hot water and steam to spurt out in a small geyser and scald your hand badly.

How to Remove Cap

Before removing the cap, make sure that no steam is escaping through the overflow tube. If there is, leave the cap alone until the steam flow subsides. You can speed up this process by allowing the engine to idle for a minute or two before shutting it off so that latent heat in the engine block will be carried away by the coolant. This won't work if the car is overheated and the coolant level is low, so if this is the case, you'll just have to give the system time to cool down by itself.

After steam from the overflow tube subsides, rotate the cap slowly until you meet the resistance of the safety stops on the filler neck. At this point, the pressure valve is lifted away from its sealing seat, allowing pressure to escape through the overflow tube. When the steam flow from the tube ceases, the cap may be removed safely. ★★★

The next time your wife cleans the closets, tell her to rub a little paraffin on the hanger rod. This will provide lubrication, making it easier to remove hangers or slide them along the rod.

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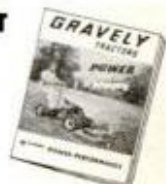
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THE TESTOR CORPORATION Rockford, Illinois

Bicycle Built for Two

(Continued from page 179)

Measure the distance between the inside faces of the sprockets and cut pieces of brass rod that length—preferably on a lathe, for uniformity. To determine how many you'll need, check the sprockets to see how many places a bolt may be driven through both. Drill through the center of each spacer to pass a $\frac{3}{16}$ -in. stove bolt. Also drill pass-holes in the outside sprocket at the points selected. Then drill and tap matching holes in the inside sprocket. Make a trial assembly with two bolts and spacers to see how the paired sprockets fit on the crank, filing out the center opening of the outside sprocket until the assembly seats squarely. Add remaining bolts, turning them tight; trim off and peen the projecting ends.

Take Up the Slack

A chain tensioner is needed to take the slack out of the front chain. The one shown at the bottom of page 177 was made from the spring, arm and one sprocket from a broken Simplex tensioner for multi-speed bikes, picked up for \$1.50 in a bike shop. But such a shop should be able to supply you a regular tensioner for tandem bikes. Commercial tensioners are for $\frac{1}{2}$ -in.-pitch chain. If your chain has a 1-in. pitch, convert the sprocket by cutting out every other tooth. You can do this with a pocket knife since the sprocket is of a composition material.

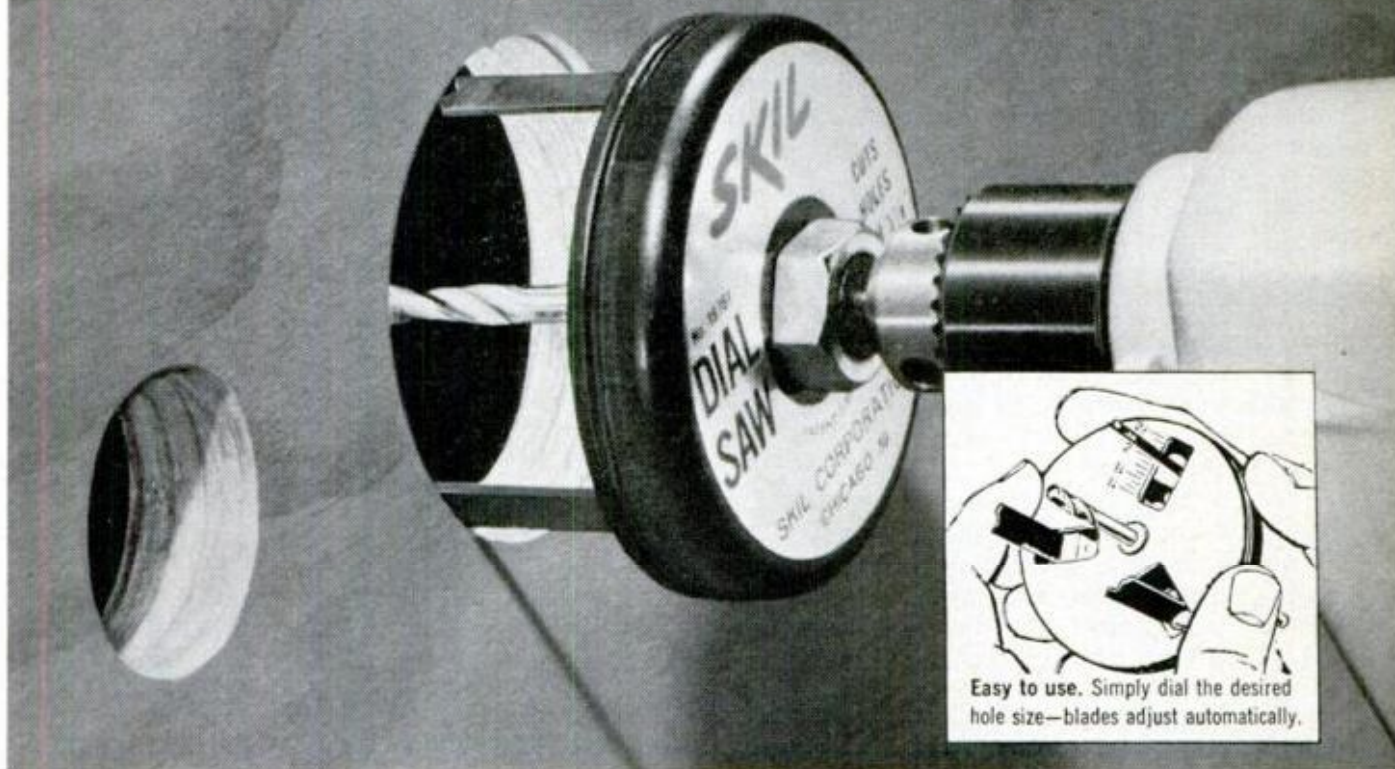
Before the tandem is ready for a trial spin, move the rear-wheel sprocket out to align with the outside crank sprocket. The girl's bike shown had an English coaster brake; the sprocket nut had a lefthand thread, with an $\frac{1}{8}$ -in. hub on the inner side. By turning the sprocket over and screwing it back on with a washer between sprocket and brake hub (see photo on page 178), the teeth were moved out enough to be in line with the drive teeth of the dual-sprocket assembly.

Should the sprocket have no hub, you might obtain a second sprocket (for its threads), turn it down to a washer, and weld it to the original sprocket, from which the threads have been machined.

For emergency stops and downhill coasting, it's a good idea to install a hand brake on the front wheel. This adds about \$4 to total costs. When you consider that a commercial tandem would set you back nearly \$100, you're still way ahead. About as far ahead as you'll be on that first hill when you show the lonely pumpers your dust. That should *really* put you out in front with sweet-sittin' Daisy! ★★★

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Model 503D 1/4" Drill has a full 2.5 amp. motor that provides power to spare for drilling in concrete, metal, brickwork, plaster, wood or wallboard. Lightweight—only 3 lbs. Priced under \$20.

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Ride Silent, Ride High

(Continued from page 89)

flame controls (one a needle valve for minute adjustments and the other a blast valve for full-on power), and three instruments, an altimeter, a rate-of-climb indicator and a pyrometer which gives the bag temperature.

That's about it. As he sits in his seat, the pilot has two valves to control, three instruments to watch and the whole world below him to enjoy.

Once the top of the envelope is tied and the seat attached, inflating the envelope takes less than 10 minutes, usually less than five. Piccard and Melcha did it in four-minutes flat.

The lower end of the envelope has a heat-resistant skirt which, spread out with a metal hoop just like on a hoop-skirt, drapes down around the burners to make sure the heat is not dissipated before it reaches the air in the envelope. Holes in the skirt ventilate it to keep heat in the immediate area from becoming too intense (see pictures).

For inflation, an asbestos sleeve from a hot-air blower is held inside this skirt. As the hot air enters, the envelope billows out until, minutes later, it is standing straight up. At this point, its own burners are turned on to maintain the heat until time for take-off.

The ground blower, the envelope and the seat assembly, plus instructions in how to operate a hot-air balloon, are all included in the price of the balloon (\$3500), which Raven is quick to point out is no more than a small cabin cruiser.

Needle and Blast Valves

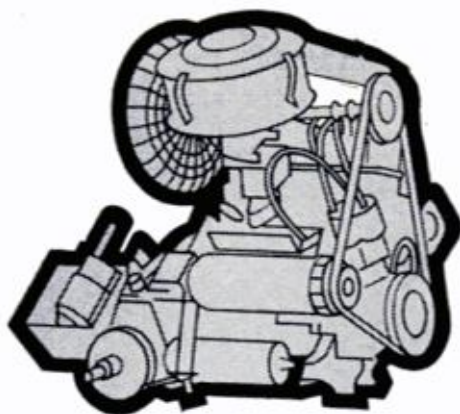
After a few preliminary instructions from Piccard, I was ready to go. The needle valve, he explained, has a range of about 20 full cranks. He set it midway—the blast valve was turned full on.

"The blast valve," he said, "bypasses the needle valve and is primarily for take-off, for gaining altitude in a hurry or for emergencies—like leapfrogging over a tree. You do most of your cruising with the needle valve."

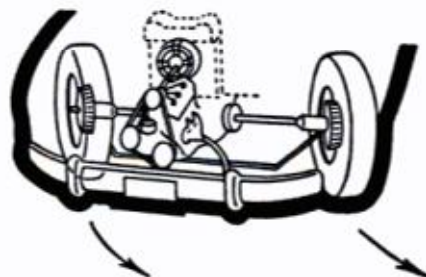
Well, they patted me on the back, smiled happily, let go of the rigging and I swallowed my heart. I needn't have, however. There was hardly any sensation at all. I just seemed to drift off the ground, and I just kept right on drifting—straight up. Except for the changing perspective as I floated above the rim of the bowl, there was hardly anything I could relate to. I was just hanging in space, with the Black Hills spread out around me. If I looked

(Please turn to page 216)

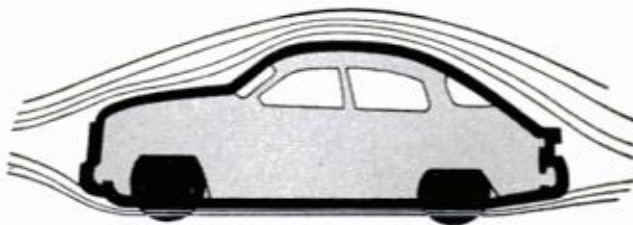
1963 SAAB... built so well



SAAB ENGINE, an economical, quiet three-cylinder, two-stroke valveless unit, employs Schnürle principle of charging through the crankcase. Simple, efficient design produces all the power of 6 cylinders with only 7 basic moving parts, eliminates 103 points of friction, wear, potential trouble. Engine proved in world-wide competition driving victories, and by the many SAABs which have delivered low maintenance performance past the 100,000-mile mark.

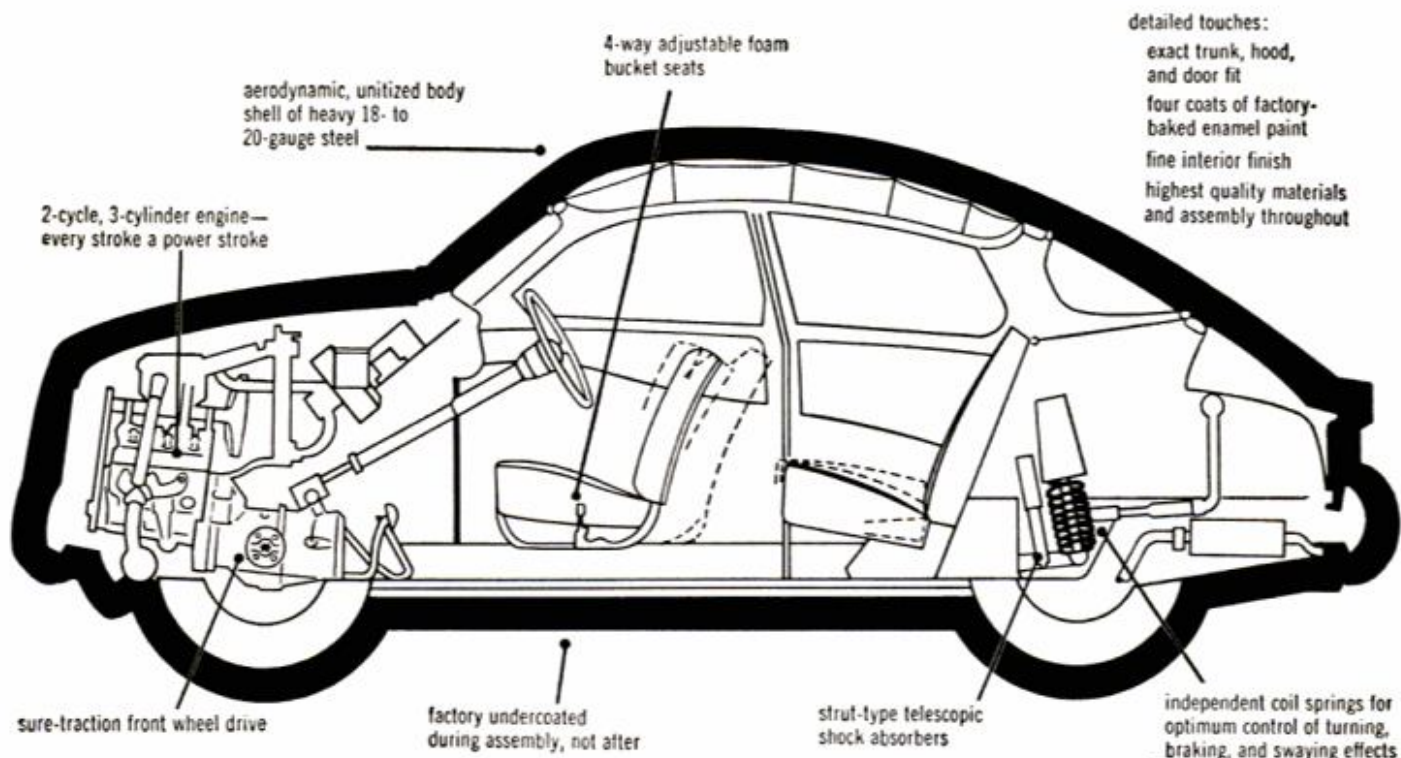


SAAB FRONT WHEEL DRIVE transmits engine torque directly to front wheels. The result is extraordinary directional stability and handling ease under all road conditions, plus outstanding traction around corners, over icy, wet, or muddy patches, and snow. Front wheel drive and carefully calculated understeering provide best possible high speed roadability and safety. Other advantages: more comfort (because there is no driveshaft hump) and more trunk and interior space.



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FOR TUB
AND TILE
...and
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the house

Set Professional
For Tub, Tile and

Ride Silent, Ride High

(Continued from page 214)

up, I wondered just what in the world was holding me up. There was nothing up there but the top of the balloon. Weird!

In playing with the valves, and checking the adjustments against the instruments, I found that there is always a considerable gap between action and reaction. If I wanted to blast up a way, it took some time for the bag air to pick up the extra heat from the burner. It's a matter of feel—you have to "lead in" to any maneuver, sensing when it is time to blast up or slack off. The Early Bird aviators, who flew "by the seat of their pants," would have loved this kind of flying. The instruments, to me, were just rough guides. You have to learn, with experience, how to handle the craft by instinct and by feel, and by knowing just what each valve will do for you.

Soft Landing

Landing was simple. I just slacked off on the heat ever so slightly, and I came down ever so slowly and lightly. Piccard and Melcha were there with their hands on the tether rope. It's about like jumping from the second or third step, although I suppose it's easy enough to come down much harder. Piccard claims, even if you lost your burners at altitude, the balloon would float to earth less roughly than if you came down by parachute. The bag volume, he says, is greater than that of a chute, making the balloon more buoyant. What you do lose is control. If you landed in a congested area, or near trees, you'd just have to go right on in.

My flight was relatively short—less than 30 minutes—so, to get a more rounded view, we contacted Dr. William McGrath, dean of students at the University of Southern California, who bought the first balloon from Raven, and John Sanders, president of a Kansas City (Mo.) balloon club which bought the second one. At this writing, McGrath and his friends had made about 40 flights, and Sanders' group six.

McGrath's group includes a doctor, a fire captain, two attorneys and some space engineers. The American Montgolfier Society of Kansas City includes, besides Sanders, six men and one woman who are all business executives. Without exception, they each had a background in outdoor sports, piloting, soaring or sky diving.

Also, without exception, their enthusiasm for the new balloon is unqualified. They cite the "romance of ballooning," the unique perspective of the scenery while floating above it, the social life surrounding a weekend of ballooning and the ease

(Please turn to page 218)



When
you ask for
a CRESCENT Wrench



make sure
it says so
on the handle

One adjustable wrench looks a lot like another. But not everybody takes 76 steps to make one adjustable wrench. The Crescent Tool Company does. It shows up in the longer useful life of the wrench. Make sure the name CRESCENT appears on the handle. Then you own the CRESCENT adjustable wrench, made only by Crescent Tool Company. Available at your hardware store.

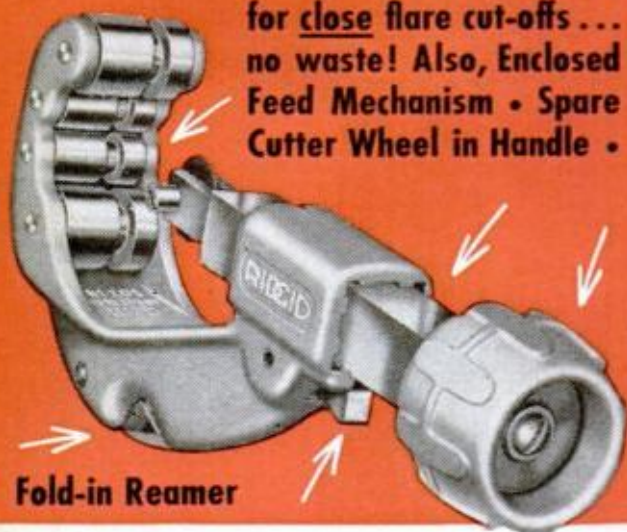
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2
New

RIGID Tubing Cutters

Give you Grooved Rollers for close flare cut-offs . . . no waste! Also, Enclosed Feed Mechanism • Spare Cutter Wheel in Handle •



Fold-in Reamer

RIGID No. 205 Tubing Cutter

Time-Saving, Slide-to-Size $\frac{1}{8}$ " to $2\frac{3}{8}$ " O. D. Capacity

Made of lightweight, high-strength cast aluminum alloy, you'll find these new RIDGID Tubing Cutters extra handy. Slight push on handle of large-size-range RIDGID No. 205 snugs cutter wheel against tubing . . . locks it in position until released. Feed screw fully protected and enclosed . . . always feeds into tube with easy handle turn . . . can't jam with chips or dirt. Wheel gives quick, clean cuts of copper, brass, aluminum tubing and thin-wall conduit . . . no burr. Grooved rollers give easy flare cut-offs without tubing waste. Tubing always turns freely on 2 of 4 Rollers. Rollers smooth tubing ready for soldering. Fold-in reamer always handy. Spare Cutter wheel in handle. Wheel for plastic and aluminum pipe available for No. 205 only.

Conform to Fed. Spec. GGG-C-771b Type II—
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RIGID No. 105 Tubing Cutter



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Screw Always
Easy-Turning
 $\frac{1}{8}$ " to $1\frac{1}{8}$ " O. D.
Capacity

Save time on home maintenance and workshop projects; get a RIDGID Tubing Cutter from your Dealer today!

RIGID

The Ridge Tool Company • Elyria, Ohio, U.S.A.

Ride Silent, Ride High

(Continued from page 216)

of handling the hot-air balloon.

It's significant that they invariably mention the balloon itself almost as an afterthought. It's the sport that whets their enthusiasm. There are, however, several things they like about the Vulcoon besides the easy handling.

Cactus Resistant

Says McGrath, "The nylon envelope is tough. We accidentally dragged ours through some cactus without damaging it."

Says Sanders, "Our fuel bill for a full day's flying averages less than \$2."

McGrath: "We've had some hard landings—through pilot error—but the seat assembly remained intact."

There is nothing they really dislike about the balloon, but there are some things they'd like to see changed. On top of the list is a stand-up basket instead of the sit-down seat.

"It's restricting," says Dr. McGrath, "to have to sit in one position on long flights. We'd like to be able to move around to get a different view, or just get the sun out of our eyes."

Sanders: "We'd feel more comfortable with a wicker basket."

The balloonists also wished for more sensitive instruments.

McGrath: "The pyrometer scale is too broad, all the way from 0 to 400 degrees. The most critical area is from 190 to 210 degrees, and a 5-degree difference here could mean the difference between lift and descent. The scale is so cramped that it's hard to read a 5-degree difference. We're changing ours."

Other comments:

McGrath: "We've had some flameouts, but we carry kitchen matches and the pilot light relights easily."

Sanders: "There's no safety belt. Raven claims it's unnecessary at altitude and could be a hazard in case of a hard landing when you have to jump clear. Our group has mixed opinions about it."

McGrath: "We put a belt on ours."

Both groups wear parachutes, and McGrath's group thinks a small oxygen supply would also be handy.

McGrath: "If the balloon gets caught in a fast-rising thermal, it could carry it well above 10,000 feet." Ten thousand is the balloon's normal ceiling, and oxygen is unnecessary below it.

They're also looking ahead.

McGrath: "We'd like to see a larger balloon that could carry two or three passengers and stay up longer."

(Please turn to page 220)

ELECTRIC WELD - BRAZE & CUT

REPAIR MOST EVERYTHING MADE OF METAL

Home, Car-Factory, Farm-garden equipment. Solder, heat, bend, with terrific heat from arc torch. Cut and weld up to 1/4" steel plate. A million uses for Home, auto, farm, inventors, factories, etc. Works from any 110 volt plug-in. Complete with dark welders facemask, arc goggles, arc torch, supply of carbon welding and brazing rods. Complete Welding Instruction Book. 1 year guarantee.

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VARNISHES

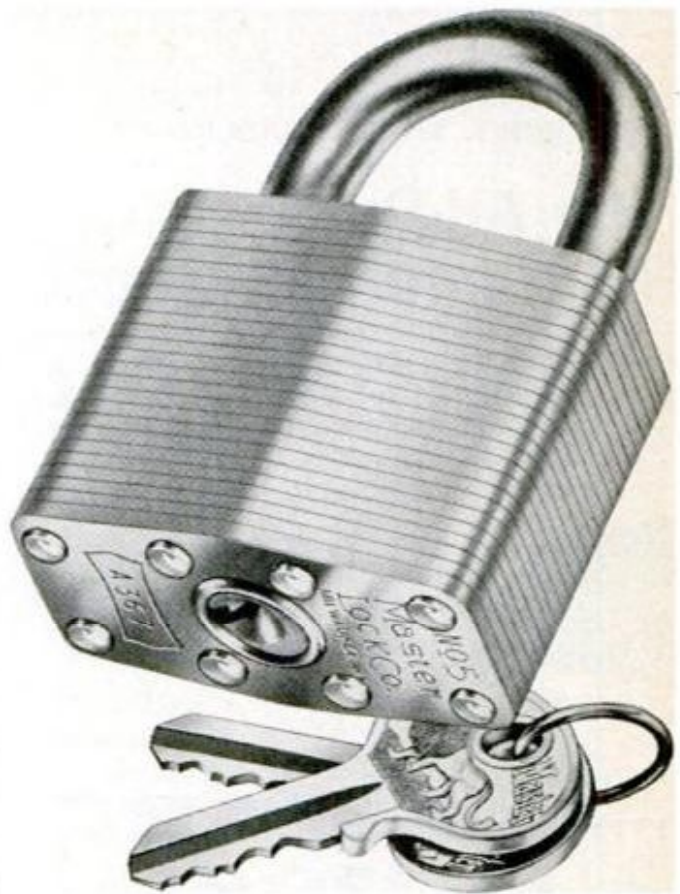
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APRIL 1963

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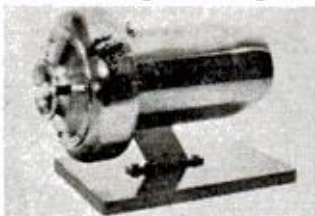
Master Lock Company

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Ride Silent, Ride High

(Continued from page 218)

Sanders: "Some of our group wants a larger balloon, but personally I wouldn't want the responsibility of a passenger. I prefer to go up alone."

In general, most of those who have used the *Vulcoon* are quite happy with it, but in case they aren't Raven is coming out with a new, larger model with an old-fashioned wicker basket that can carry two men standing up. Price tag: \$5000.

These, like the *Vulcoon*, will be inspected for airworthiness by the Federal Aviation Agency before they leave the Raven plant in Sioux Falls. The FAA also checks out each balloonist before issuing him a license. (You need a license to pilot a balloon, just as you do to drive a car.)

If you get one, a whole new way of life may open up for you.

Dr. McGrath summed it up best: "We go out to the desert for the big week-end, leaving Friday evening and returning Sunday. We set up camp the first night, and sit around the fire roasting food, drinking coffee, playing banjos and singing songs. Next morning, we start ballooning. Each man gets to ride. The flights average about 30 minutes or an hour at about 4000 feet, and we can usually follow it all the way in the chase car. We take breaks for meals, then knock off at sunset for some more socializing around the fire. Next day we do it all over again.

"The perspective, the scenery, the view from above, the socializing—it's a life none of us have experienced before."

And it's the kind of life that a lot more may be trying. ★★★

Meteorite Yields Oldest Solid

Material believed to be the oldest solid in the solar system, formed from primordial gas 4,600,000,000 years ago, was found inside a stony meteorite that fell in Canada in 1960. On pulverizing a piece of the meteorite, Craig M. Merrihue, a physicist at the University of California, discovered a number of pea-sized objects known as chondrules.

When these were heated to very high temperatures, xenon-129 gas—trapped inside when the chondrule was formed—was released. The scientist deduced that the gas was formed from the radioactive decay of iodine-129, abundant in the beginning of the solar system, and that about 100 million years elapsed from the time the solar system's gaseous elements came into existence and the formation of the chondrules—apparently the first objects in the universe to solidify.

15 TON Hydraulic PRESS KIT
Has new D.A. Cylinder 4 7/8" bore x 8" stroke hyd. hand pump 2500 PSI 4 way control valve with press relief, reservoir, filter hose & fittings \$142.50 value kit (less frame) **\$79.95**

NEW HYDRAULIC CYLINDERS 2000 PSI (plus 15% on P.P.)

Bore	Stroke	D. shaft	long	Double Action	Weight	Price
*1 1/4"	39/16"	5/8"	7"	1 lb.		\$ 4.95
1 1/2"	4 1/8"	1 1/2"	10"	3 1/2 lbs.		\$ 2.95
1 3/8"	2 5/8"	1"	38"	11 lbs.		\$10.95
2 3/8"	13"-15"	1 1/4"	30"	11 lbs.		\$14.50
1 1/2"	8 1/2"	3/4"	13"	8 lbs.		\$ 6.95
3 1/4"	10"	2 1/8"	23"	29 lbs.		\$14.75
*3 1/2"	10 1/4"	1 1/2"	19"	15 lbs.		\$12.95
*3 3/4"	2 3/4"	1 5/8"	14"	20 lbs.		\$ 8.95
4 7/8"	16 1/4"	1 3/4"	24"	30 lbs.		\$27.50
4 1/2"	8"	2"	22"	35 lbs.		\$24.50
4 1/2"	10 3/4"	1"	23"	15 lbs.		\$24.95

2000 PSI. -15% on p.p. *Single Action.
Weld cable = 1/0 22c ft. = 2/0 24c ft. (plastic insl.) = 2/0 29c (rubber insl.) in 50 or 100 ft. Hand pump 1000 PSI **\$6.95**

HYDRAULIC PUMP BARGAINS 1500 P.S.I.

Type	RPM	GPH	Reversible	Price
Pesco	.447	4500	350	\$10.95
Vickers	.410	3750	375	\$17.50

Bendix Vacuum Air pump 17C.F.M. 24"HG Press 20"HBG suction. New **\$12.95.**

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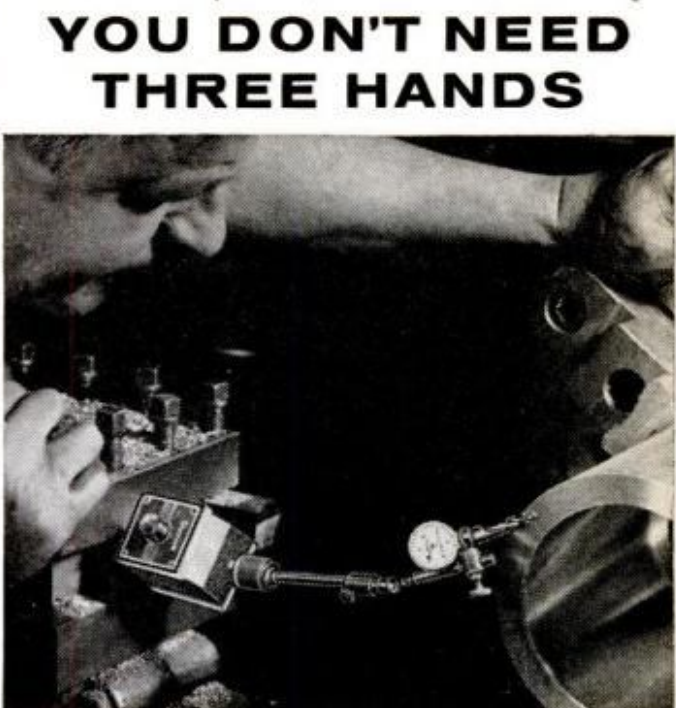
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MAGNETIC BASE INDICATOR HOLDER
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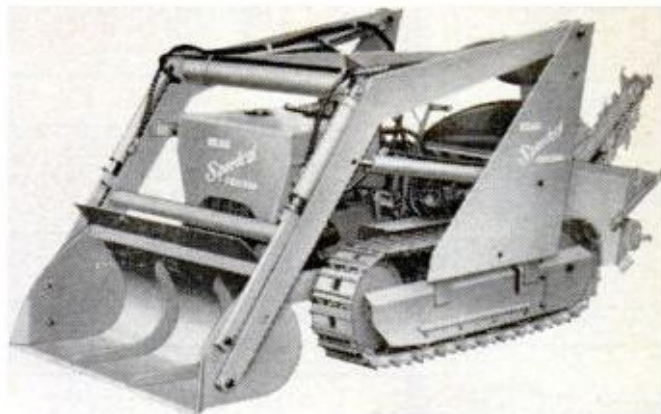
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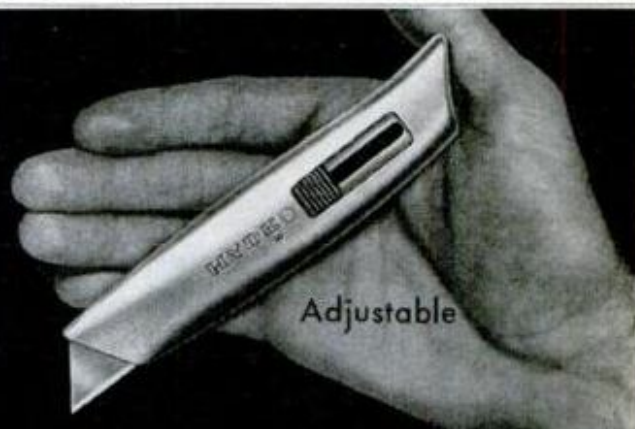
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Stops engine block and gasket leaks. Inhibits rust, scale. Protects rubber, aluminum, plastic. Lubricates water pump seal. Neutralizes acid in anti-freeze. No clogging.

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AFTER you turn it "off"! You have light to
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don't bump the basement post or miss the
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protection of light from house to garage or
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If not available, order direct

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EDCO INTERNATIONAL CORP.

19302 Grand River, Detroit 23, Mich.

Owners Report—Tempest

(Continued from page 95)

"Excessive noise in driveshaft when engine is running in neutral."—South Carolina maintenance supervisor.

"Loud whine in neutral and reverse—'natural' to this car they say."—Wisconsin housewife.

"They" are right. On automatic-transmission Tempests, driveshaft turns with engine, never rests.

"I've had a split in the transmission case."—New Jersey fireman.

"The transmission froze due to water in the line."—Ohio civil engineer.

He means in the control cable running back from the instrument panel.

"Had trouble with the transmission's losing oil."—Nebraska rancher.

"Has the poorest paint job I've ever seen."—Arizona steamfitter.

"Paint job on my car is speckled—was told that this occurs on all black cars."—Texas housewife.

"The paint on the interior is poor and thin."—Iowa housewife.

"Would like to have controllable movement of right-hand bucket seat to improve legroom."—West Virginia lab technician.

Pontiac left seat adjustment off to save money and help keep price attractive, but it seems they chose a poor place to economize.

Next, let's look over numbers six through ten on the Tempest owners' list of praiseworthy features:

"There is excellent front seat legroom and lots of width."—Michigan lumberman.

Here's a great selling point for rear-mounted transmissions like Tempest's; you gain lots of foot room up front.

"There is a sufficient amount of head and legroom."—Alabama laborer.

"My three Tempest company cars (1961-'62-'63) have been driven altogether 68,000 miles and have cost only 1¼ cents per mile for gas expense. I get 24 miles per gallon overall."—Missouri contractor.

He's doing pretty well; few owners do better than 23 m.p.g. even on trips.

"I'm getting twice the mileage out of the Tempest (19 m.p.g. overall) that I did with a 1961 Ford Galaxie."—California insurance man.

"Good control in steering, especially in windy areas."—California airman.

Tempest's front end weight bias is a help when you want to go straight, but can be sometimes less than helpful on curves.

"On the highway it has the roadability
(Please turn to page 226)



KING MIDGET "WORLD'S MOST EXCITING LOWEST PRICED CAR"

Drive it for 75c a week. Rider Agents Wanted. Send 25c for 32 page book, full details, dealer price. Or send \$1 (refunded first order) for this plus Service and Repair Manual and 16 5x7 photos of car and factory.

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TUB CAULK • TILE ADHESIVE

Pure White • Elastic
Permanent

Sticks like glue! 101 Household Uses!



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Cards, Stationery, Advertising, Circulars, labels, photo and movie titles, church work, tags, etc. Save money. Sold direct from factory only. Raised printing like engraving, too.

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Print for Others, Good Profit. Have home shop. Junior press \$15; Senior \$35 up. We supply everything. Easy rules. Pays for itself in short time. Write now for free details.
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Full line of attachments for
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2-3-4 HP TILLERS 12"-16" CUT.

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2 wheel 8



4 wheel tractors

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automatically
sets teeth
at 10° or more
\$2.95 ppd.



Works
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Seconds!



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nuts, screws, "frozen" parts!**

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BONUS USE: Add to crankcase to quiet noisy valve lifters... remove gum, sludge deposits!

THEN ADD . . .

MOTOR-MEDIC
EXTRA LUBRICATION . . .
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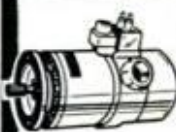
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New, improved model contains heavy-duty, 2-way drum switch. Fully reversible heavy-duty, two-speed motor, 160 to 1 gear reduction. Ball bearing construction throughout. Drum will handle 75' of 1/4" cable. Can be used on 12 V. battery. Lift cap. 200 lbs. plus. Ready to install & operate. 19" long x 9" wide x 8" high. For Jeeps, trailers, boats, trucks; etc. Complete with mounting flange, safety locking brake and leads. Shpg. Wt. 60 lbs. Approx. GOVT. COST \$400. NEW. Model E. \$52.50

DELUXE MODEL ED Same as above but with extra heavy base & outrigger support bearing. 250' 1/4" cable spool capacity. NEW. \$72.50

AIR COOLED WELDING KIT — Contains Famous P-2 generator (200 amps/30 V.D.C.) with built in fan. Also in kit — D.C. Voltmeter, Control Rheostat, Switch, 300 amp. Electrode holder, welder's gloves, adjustable welder's helmet, 30 ft. rubber covered welding cable and wiring diagram. All units pre-tested prior to shipment. A terrific value. All units guaranteed. Shpg. wt. 75 lbs. Approx. GOVT. COST \$475. Most items new — all perfect. \$47.50.



DOUBLE-ACTION HYDRAULIC CYLINDERS

Can be air or oil operated. Ideal for shop, production machinery, hydraulic steering and 100's of other uses. Steel barrel aircraft quality, precision built. 7 3/4" stroke, 5/8" shaft, 1 1/4" bore, 15" overall length. Shpg. Wt. 7 lbs. per pair. Special AIRBORNE price — 2 for \$7.



FLEXIBLE SPLINE COUPLING

— Lovejoy type. Fits all aircraft gen. with 16 tooth, 3/8" spline shafts. Excellent for direct drive on aircraft gen. New. Highest quality in 1" or 3/4" standard shaft drive. Specify when ordering. \$6.45 ea.

DC JET GENERATOR ARC WELDING KIT Complete with GE Type CM-77 Generator (30 volts D.C., 400 Amp., 3000 RPM up; ampere rating is for continuous duty, intermittent amperage is 500 to 600 amps.), also 2 rheostats, 1 voltage reg., 1 voltmeter, 1 electrode holder, 1 welder's mask, 1 toggle switch, 10 lb. vacuum packed 3/8 in. welding rods, pair welder's gloves & spline coupling. All units guaranteed pre-tested. Wt. 110 lbs. Approx. GOVT. COST \$700. All items, now only \$64.50.

*G.E. Generator noted above can be purchased separately. Makes deluxe heavy-duty welder comparable to the finest commercial welders available. Wt. 90 lbs. Approx. GOVT. COST \$600. Gen. alone — \$49.50.



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Send 25c in coin for amazing new catalog with 1,000's of surplus bargains in hydraulics, electrical, precision tools, marine items, automotive, etc. for hobbyists or industrial. Or order from this ad and receive a free copy. All prices F.O.B. Culver City, Calif. 50% dep. for C.O.D. Send check, cash or money order. Order today!

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-- scourfully!
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AT AUTO SUPPLY, FARM & HARDWARE STORES!

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serving the Mid-west and Southwest
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EVERLITE* World's **THRIFTIEST** Light Plants

(Item 869-10T)

NEW TRANSISTOR ALTERNATOR REPLACES GENERATOR



Now a Service Free Light Plant built with a transistorized alternator. Offers 30% greater efficiency—more power for less fuel. Terrific service life—no brushes to arc and burn. No more commutator to wear, no collector ring trouble. And best of all it costs no more to "go modern with Everlite." Thrifty 1000 watt, 115v. AC plant powered by a rugged easy starting 4 cycle engine—leader priced. Model 869-10T. Wt. 65 lbs. as illustrated

\$179.50

fob factory

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All sizes available—can finance. Write for catalog. Special models for public utilities—Approved for Civil Defense. Write.



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COMPARE! This is the only compressor built with a **NO RUST** stainless steel tank. Safe up to 500 lbs. (Item 209) High pressure type (4 c.f.m.) Large volume of air for heavy duty spraying, inflating truck & auto tires, greasing, sand blasting, etc. Piston type 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed.

- Safe Low factory prices, 1 1/2 hp. model 209, 85psi. Regularly \$175.00 etc. (Item 209) **\$109.50**
- 1/2 HP. heavy duty model, big pump, 3.8 cfm, heavy motor with unloader switch. (Item 209a) **\$129.50**
- Compressor only, same as on Item 209, 2.8 cfm. **\$19.25**
- Item 209co, 2x1 3/4" **\$25.50**
- Item 209aco, (2x2) same as on 209a **\$47.75**
- Item 209heo, (2 1/2 x 2 twin cyl.), 8cfm

Send 10c for big catalog. All prices fob factory.

MASTER MECHANIC MFG. CO., Dept. A-463, Burlington, Wis.
Southern Customers Write to Dept. A-463, Box 65, Sarasota, Florida

Owners Report—Tempest

(Continued from page 224)

of a much larger car."—Michigan factory worker.

We'll agree as far as cross winds go.

"Higher seating gives better vision for driving."—New Jersey housewife.

"I like the larger fifteen-inch wheels."—Minnesota laboratory worker.

Naturally, every pro has its con. Here are numbers six through ten, in order of frequency, of Tempest owner complaints:

"Doors squeak—apparently very poor factory inspection."—W. Virginia attorney.

"I think it was beautifully designed by geniuses, but assembled by idiots."—California estimator.

Wonder if he ever watched an assembly line. Sometimes the geniuses who plan it all don't give workers time to do a complete job.

"Too many defects in equipment: light switch, voltage regulator, etc."—Utah government worker.

"I've had trouble with turn signals, also courtesy lights."—Michigan salesman.

"I've had trouble with a defective carburetor."—New York nurse.

"The body of the car is too noisy; it's beginning to sound as if it's had it!"—California bookkeeper.

"I feel a bobbing sensation at 40 miles per hour."—Texas student.

What he feels, we think, is the heavy engine-driveshaft-transaxle unit responding to road vibration and vibrating within the car (on its rubber mounts) like a tuning fork. It's a unique sensation, but not dangerous.

"At slower speeds, transmission changes from high to low and vice versa for no apparent reason."—Michigan dentist.

The automatics on PM's test Tempests did seem to up and downshift frequently when moving along in thick traffic at about 15 to 20 m.p.h. But this was at less than quarter throttle and did not seem jerky. Proper adjustment is probably critical here.

"The transmission shifts when I don't want it to, especially in slow city traffic."—Maine retiree.

Listed according to the frequency with which owners mentioned them, here are the numbers 11 through 16 of the Tempest features owners liked:

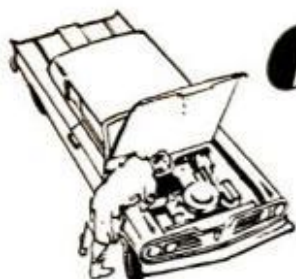
"Easy to park."—California lobbyist.

"Very good on snow and icy roads."—West Virginia teamster.

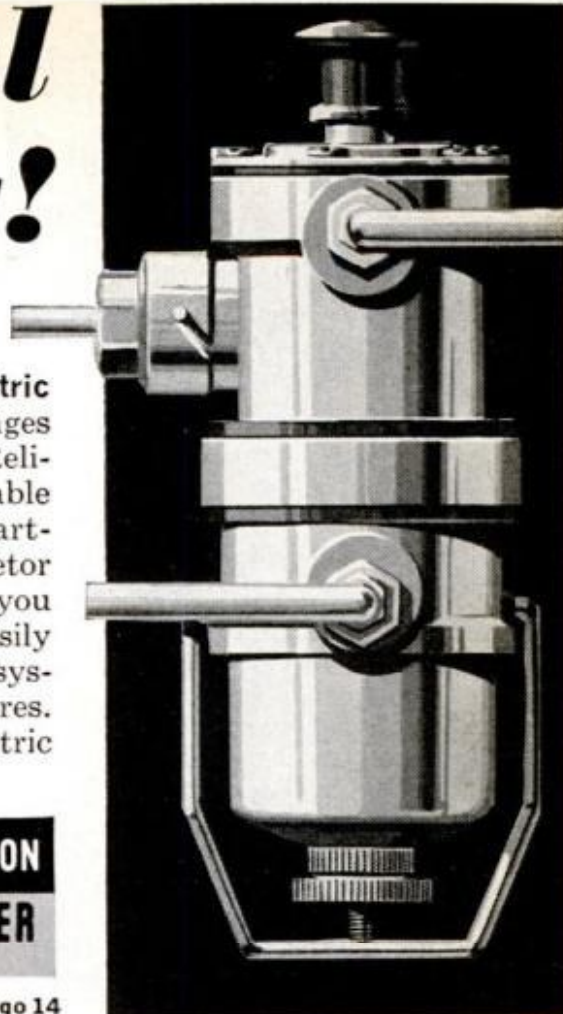
They must have stickier snow in West Virginia than in Connecticut, where PM's test sedan spun wheels until weight was added to rear seat.

(Please turn to page 228)

special delivery!



The Stewart-Warner "240" Electric Fuel Pump offers distinct advantages for anyone wanting to perfect his car's performance. Reliable and efficient under all conditions. Has adjustable automatic pressure regulator (exclusive with Stewart-Warner) that keeps fuel flowing smoothly to the carburetor ...prevents flooding, starving, "vapor lock"...helps you get instant starts in the coldest weather. You can easily install it yourself. Available for 6 or 12 volt electrical systems at leading service stations, garages and parts stores. See the difference in the Stewart-Warner "240" Electric Fuel Pump. (Also ask about the "220" series.)



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Powerful! America's big tractor value. Low price. Rugged, built-in quality. Easy to operate. 9 hp. ALL GEAR DRIVE incl. clutch, 3-spd. trans., diff., 176 to 1 reduction. Wt. 790 lb. 21 low-cost, quick-change tools for farm, lawn, snow, woodland. Write for FREE CATALOG & dealer name.

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Heat, cut, weld, braze, solder, hardface



...with this complete, ready-to-work package. There's nothing else to buy. Contains everything you need to build, rebuild or repair auto and truck bodies, fenders, frames, farm machinery, fixtures, metal furniture, tools, toys, etc. Includes the following Victor top-quality apparatus:

Acetylene and oxygen safety regulators, welding torch, cutting attachment, 3 welding torch nozzles (welds to 1/4"), cutting tip (cuts to 1"), 12 1/2' dual welding hose, spark lighter, goggles, wrench, illustrated instruction book. All for only \$99 in U.S.

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APRIL 1963

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'HAND HELD'

Tune-Up Equipment

- Over 17 professional models for precise analysis of engine troubles
- Accurate
- Rugged
- Warranted



PROTO DC TIMING LIGHT



Proto Division, Pendleton Tool Industries, Inc.
2202 Santa Fe Avenue, Los Angeles 54, California
502 Allen Street, Jamestown, New York/1702 Oxford East, London, Ontario, Canada

Owners Report—Tempest

(Continued from page 226)

"I like the handling qualities and the easy way it steers."—California actor.

"Fairly responsive steering for an American family car."—New York key punch operator.

We'll agree, you really don't miss power steering until you try to turn front wheels to get out of a parking space.

"It's small, but really feels like a big car."—Illinois student.

"I like its large trunk capacity."—New York banker.

It would be really big if they found someplace else to stow that pesky spare.

"The interior feature I like most is the minimum hump in the floor."—Connecticut realtor.

"I like those foam-rubber bucket seats."—Florida student.

To wrap up the negative side, here are numbers 11 through 16 of the features Tempest owners believe deserve brickbats:

"About the only complaint is that my Tempest does not hold the road as well as my other car."—Minnesota clerk.

"Sways on fast curves—rear end breaks out."—Illinois housewife.

This can happen when you enter a tight curve in a hurry even on dry pavement. The '63 shows much improvement in this area over the '61 and '62 Tempests, but Pontiac is still off base in naming its coupe after a sports car race.

"Very hard to manage on slippery roads."—Pennsylvania trucker.

"Too much horsepower for the light body (V8). When road is wet, car fish-tails at any speed above 20 miles per hour."—Virginia office worker.

Sad but true. Forward weight bias, slow steering and swing axle independent rear suspension make Tempest a handful when cornering under conditions of poor traction.

"I had a burned out motor on windshield wipers."—Michigan machinist.

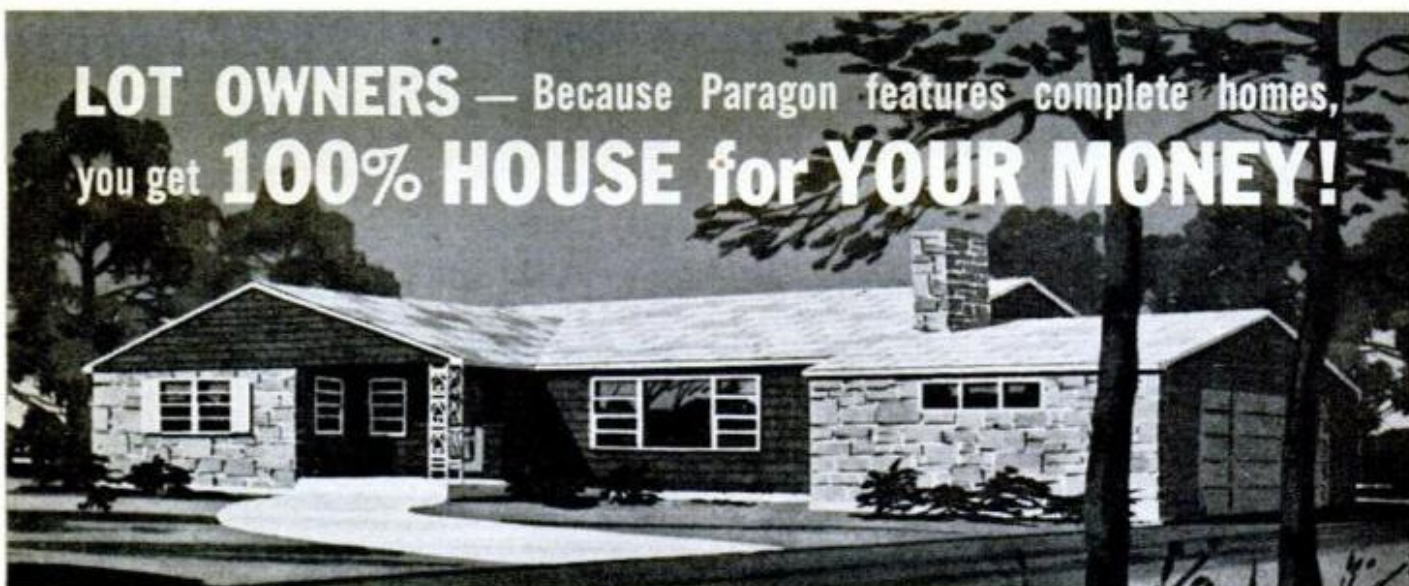
"Not enough headroom; head bumps sun-visor when wearing hat."—Pennsylvania tool and die maker.

Tempest's body, shared with Olds F-85 and Buick special, offers about average seat-to-roofline measurements which are not always adequate for those who sit tall.

"Too small dimensions between seat and wheel."—Virginia businessman.

"I had engine oil leaks at pan and valve gaskets."—California logician. ★★

LOT OWNERS — Because Paragon features complete homes, you get 100% HOUSE for YOUR MONEY!



Choose from 100 custom planned models—all styles

**Magnificent 1430 square feet
4 Bedroom 2-Bath Ranch**

Unequaled West Coast Douglas Fir Construction, can be built on slab, trench or full foundation. Customized interiors, choice of exteriors.

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Cover complete plumbing, heating and electrical systems, General Electric, American Standard or equal, Tappan Built-In Ovens, Cabinets, Oak flooring, Vinyl Tile. Cash advances to pay for construction labor.

Write today for free illustrated leaflet and dealer address, or send \$1 for 1963 magnificent color catalog showing 100 homes.

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EXCESS INVENTORY
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• Item #823. Leading make brand new latest model level-transit with tripod and case. Used by leading builders, schools, etc. 18-power scope, high accuracy, use as level or transit. Limited time offer. List over \$120. SALE... **\$96.06**



GENERATOR-3000W, 115V

• Item #633. D.C. ball bearing compound-wound Delco unit. 1" dia. shaft. 2800 RPM. Ideal for portable tools, light, etc. Will run any 115-v DC-AC tool. 100 lbs. Govt. cost over \$175. SALE... **\$54.75**



Many other Surplus Power Plants and Generators.

FARMERS-CONTRACTORS PUMPS-PIPE

• Item #204. Self priming, 1 1/2" size. Use for irrigation, pools, boats, cellar drains, etc. Wt. 32 lbs. Govt. cost \$80.50. SALE... **\$19.49**



Many other pump buys.

PORTABLE GOVT. AIR TANK

• Item #472. New ball bearing, stainless steel, 400-lb. pressure unit with hose, chuck, gauge, blow gun. • Fill tires, spray chemicals, blow dust, etc. Fill any gas station. Size 10"x18". Wt. 12 lbs. Govt. cost \$33.50. SALE... **\$16.95**



HYDRAULIC SPEED REDUCER

• Hydraulic speed reducer. Any speed from 0 to 750 rpm by throwing a lever. Handle up to 1 1/2 h.p. Use for midget cars, shop saws, etc. Instant reverse. Govt. cost \$400. SPECIAL... **\$56.71**



STORAGE BATTERY WINCHES-HOISTS

• Item #311. 12-v Govt. reversible, ball bearing 2000-lb. capacity winch. Holds 40' 1/4" cable. For trucks, docks, boats, etc. 55 lbs. Cost over \$250. SALE... **\$49.95**



Many other types battery winches-hoists.

SPECIAL OF THE MONTH!

POLICE SIREN

• Item #117. Genuine siren of type used in New York City police cars. Will work on 6 or 12-v battery. Will also work on 115-v AC thru dropping resistor (99c.) • Powerful high speed AC-DC motor with efficient siren wheel for maximum sound intensity. • Use for police and fire cars, private hot rods, as alert warning, for factory quitting time signal, for burglar and fire alarms, etc. Size 7 1/2"x5"x5 3/4". Wt. 6 lbs. Orig. cost over \$20. SALE... **\$9.65**



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- \$38 Portable Govt. Pressure Spray Tank 11.79
- \$26 Automatic Time Switch 5.94
- \$11 Fish and Worm Shocker 3.49
- \$300 AC-DC Aircraft Generator ... 15.85
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- \$100 Jeep Capstan Winch 33.95

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Cleans • Lubricates • Prevents Rust

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1,001 uses. Stainless shaft. Won't rust or clog! Use 1/6 HP motor or larger. 3/4 HP for up to 2,400 GPH; 450 GPH 80" high; or 1800 GPH from 25' well. 1" inlet; 3/4" outlet. Coupling included free. \$7.95. HEAVY DUTY BALL-BEARING PUMP. Up to 5,200 GPH; or 3,000 GPH from 25' well. 1 1/4" inlet; 1" outlet. \$12.95. Postpaid if cash with order. MONEY BACK GUARANTEE

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Powerful built-in 110 V. AC Motor

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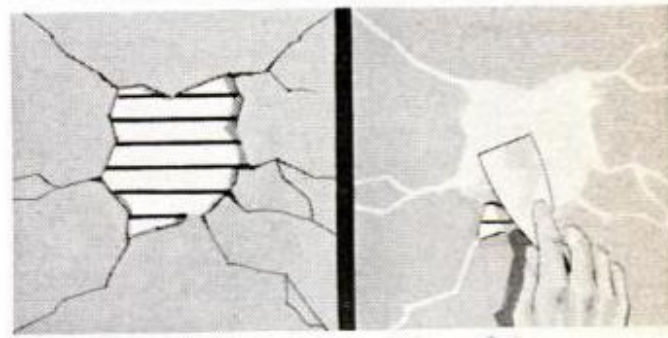
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1. Pick up an official entry blank at any hardware store. If your store doesn't have blanks, write and give us the name. Mail to Turner Treasure Contest, Box 859, Hinsdale, Ill.
2. Entries must be postmarked by June 1, 1963 and received no later than June 8, 1963. Send in as many as you want, but each must be mailed separately.
3. Winners will be drawn at random by the Donnelly company and notified by mail about July 1, 1963.

4. Entries limited to persons 18 or older, in the United States and Puerto Rico. Employees of the Turner Corporation, its advertising agency and the Donnelly company are not eligible.
5. This contest void in any locality or state where prohibited by law. Federal, state and local regulations apply. Any taxes or liabilities on any prize will be sole responsibility of winner. Only one prize to a family.

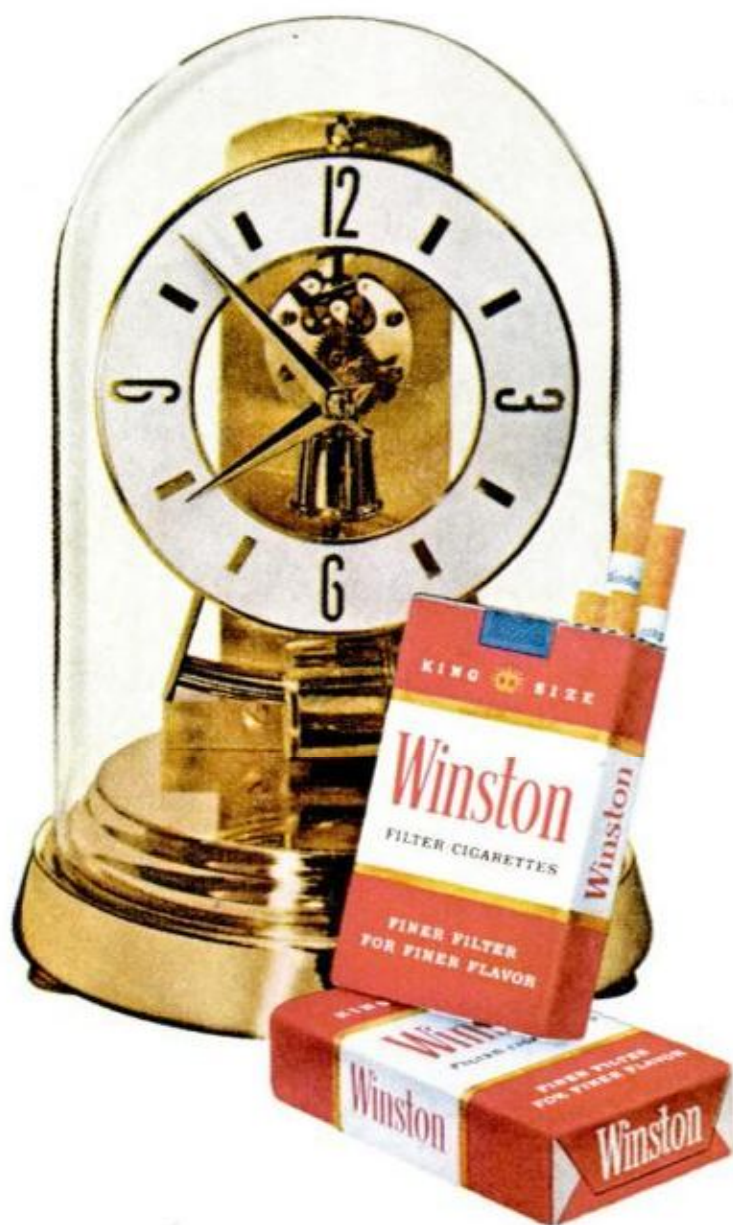
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