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NOVEMBER, 1960
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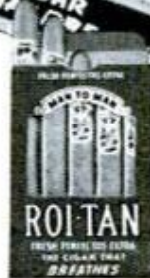
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MAN TO MAN...SMOKE ^{new}

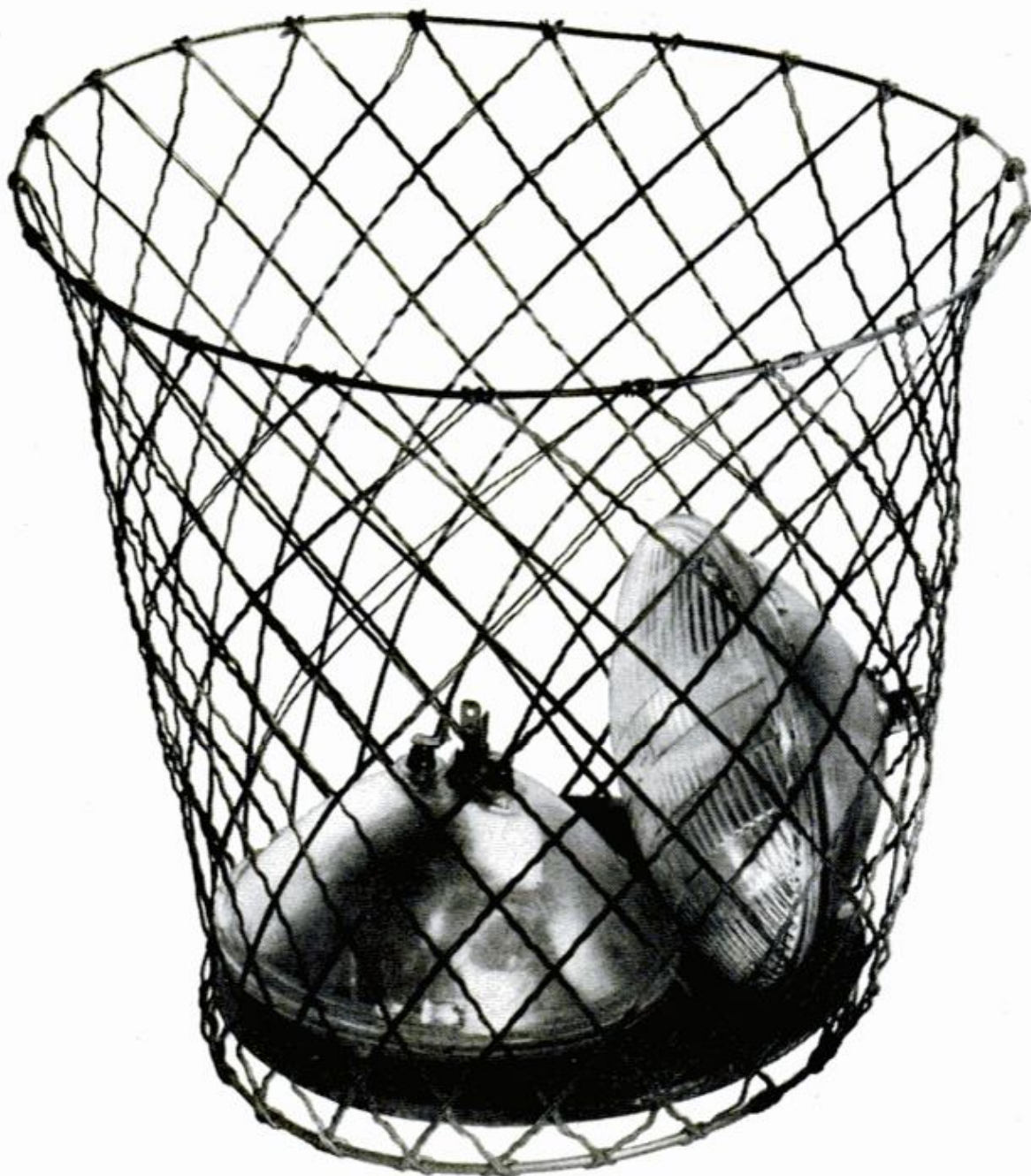
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Next Month...

WHAT'S THE NATION'S number one hobby? Stamp collecting was the champ until recently, when model building took over undisputed first place. Within the short span of two years the sale of model kits has more than doubled. Learn what put "Model-makers in a Tizzy" in December. . . . Also, there's a big 17-page section of Christmas gifts and decorations you can make yourself



What's so special about the Buick Special?

The answer? Everything! Smaller than big, yet bigger than small, this all-new Buick Special gives you the room, ride, go and pride of the costliest cars with the savings and ease of the small. Here's how Buick achieved this engineering miracle:

ENGINE: Revolutionary. The Fireball Aluminum V-8 is a water-cooled engine made almost entirely of aluminum. Its .487 horsepower per pound gives you the industry's highest horsepower to weight ratio. Performance? You can go from a standstill to expressway speed as safe and sprightly as in many a full-size car. Economy? With all its go, the Special is right up there with the compacts for gas savings.

TRANSMISSION: Exceptionally lightweight, automatic transmission* with aluminum housing and many aluminum parts. It works on a "dual path" principle. When cruising, about 70 per cent of the driving forces go through a turbine torque converter and 30 per cent through a planetary gear set. This way you get the go and gas savings of geared transmission with the smoothness of turbine drive. And for stick-shift levers there's an action-packed Synchronesh transmission that's as delightful for gas savings as it is for git.

PROPELLER SHAFT: The Special's new Hide-Away drive shaft lowers the hump, gives more flat floor space, greater foot room and softer seating for the "man in the middle." A special "constant velocity" universal joint keeps driving power flowing to the differential with perfect smoothness.

SUSPENSION: Here's a real luxury feature in new-size cars — full-coil suspension — the same type used on the full-size '61 Buicks. Front stabilizer bar and a new link-type rear mounting stabilize the ride perfectly, giving flatter cornering and a smooth "all-day" ride. The Special also uses the same hydraulic shock absorbers, front and rear, as the larger Buicks.

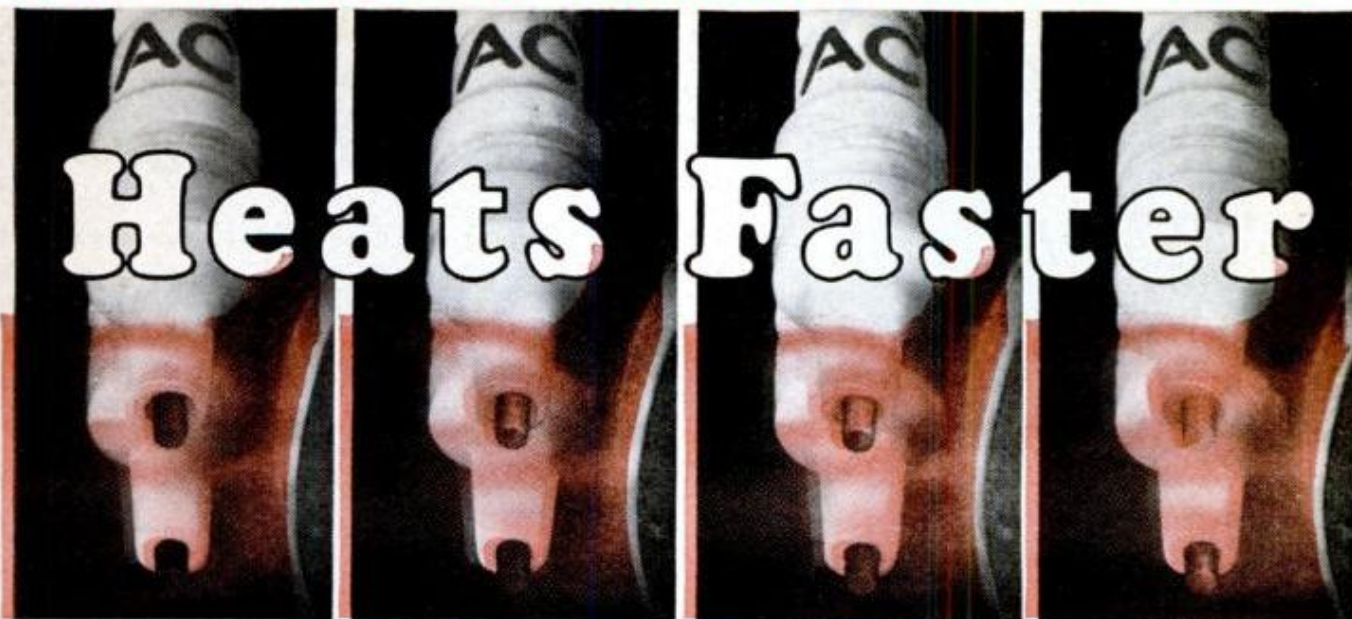
BODY: Full, unitized construction. It's tight and snug. Absence of heavy frame cuts dead weight for extra gas savings.

MODELS: A handsome four-door sedan and an amazingly roomy four-door station wagon with convenient full-height liftgate.

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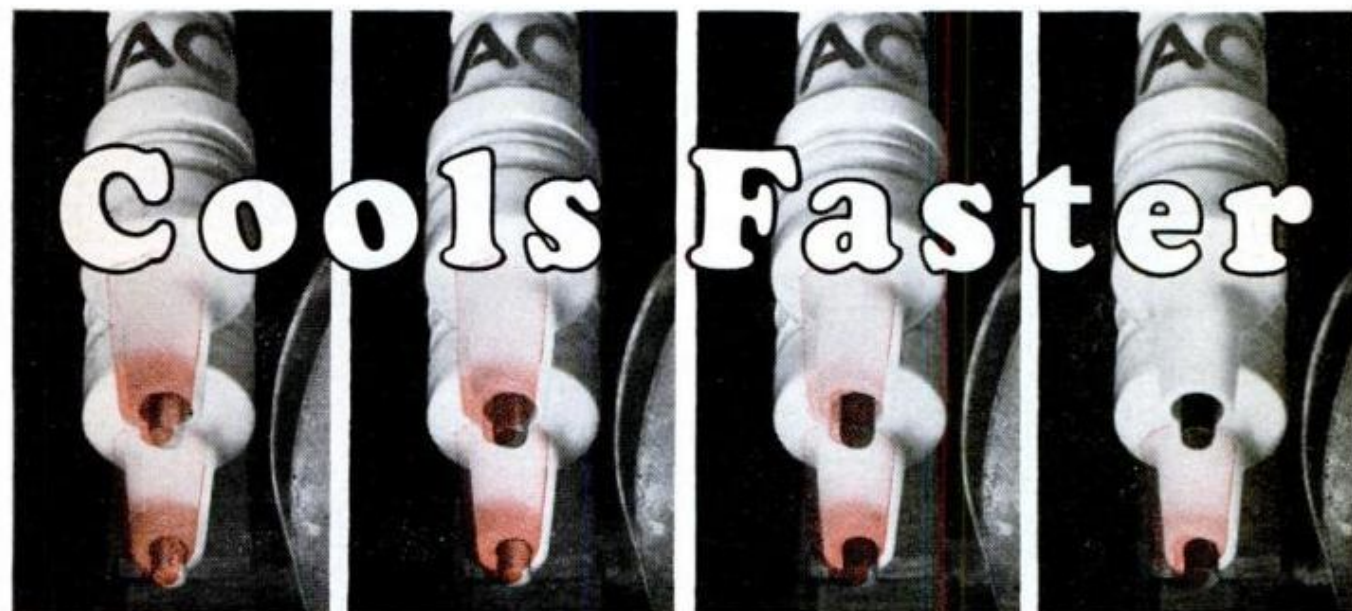


Hot Tip (at top)

Heats Rapidly

Gets Hotter

Still Hotter



Flame Removed

Tip Cools Rapidly

Gets Cooler


Still Cooler

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AC's "Hot Tip" means more miles of sure-firing operation and economy, with less cleaning and servicing. Next time you need spark plugs, ask for AC Fire-Ring Spark Plugs with the famous "Hot Tip."

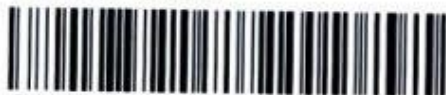
AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

AC Fire-Ring Spark Plugs

THEY MUST BE THE BEST'



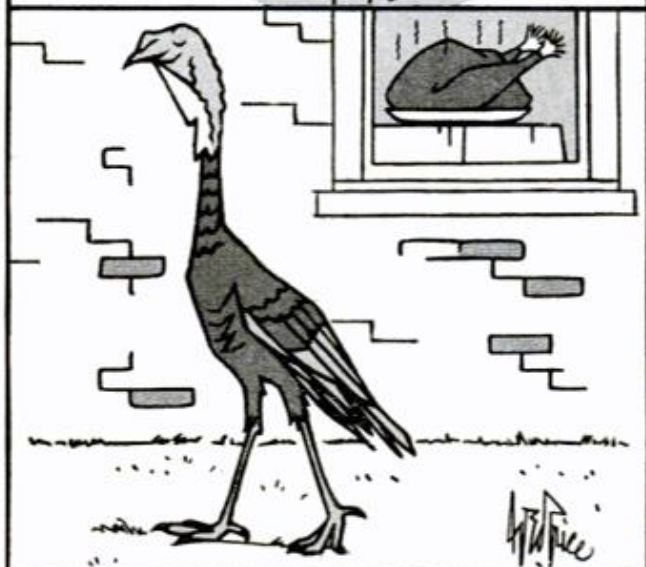
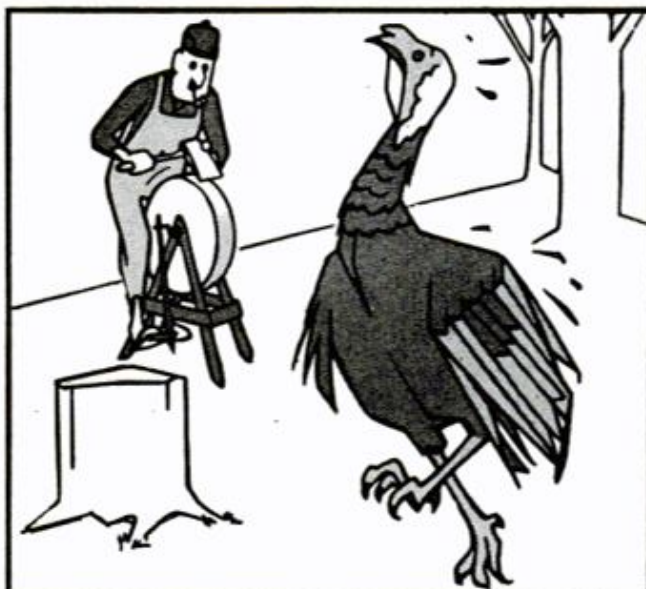
This One



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NOVEMBER 1960

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Are You "STANDING STILL" on your job?

**SAME OLD
JOB . . .
SAME LOW
PAY . . . ?**

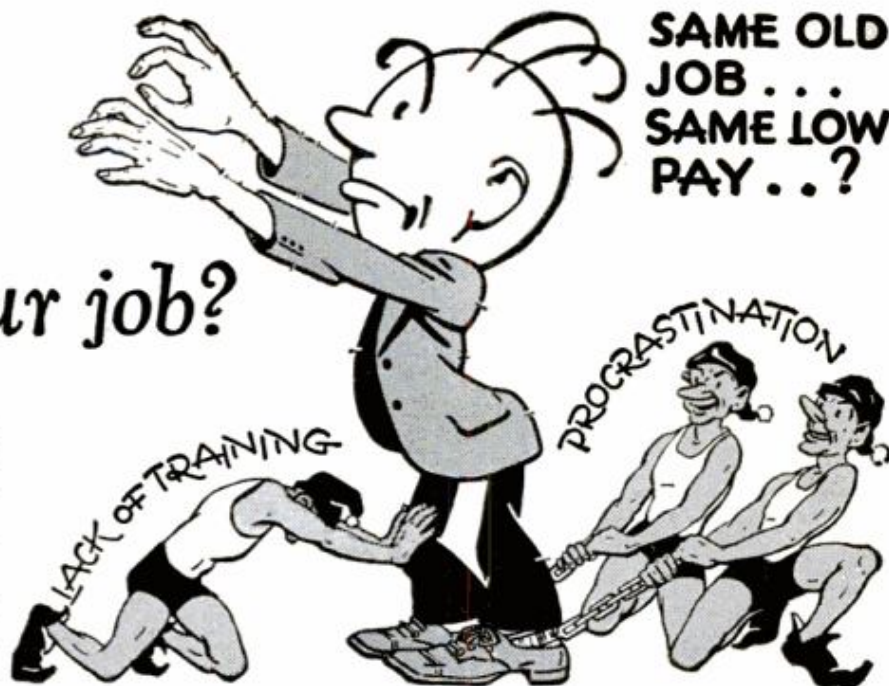
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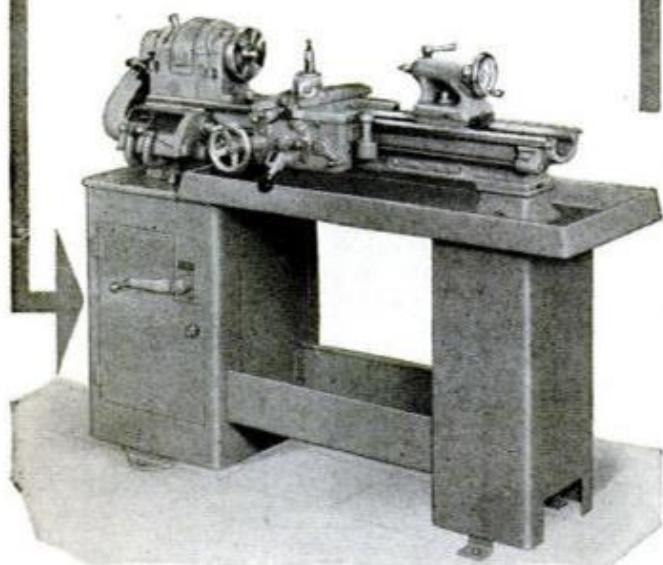
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NOTICE—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. Except where otherwise indicated, this magazine has no information as to any unexpired patents in respect of the developments reported herein. In the event that commercial use is to be made of any of the developments reported herein, it is suggested that legal counsel be consulted to avoid liability for patent infringement. It is not the purpose of this magazine to encourage patent infringement but, as indicated, it is the intention of this magazine to report on the latest developments in the mechanical arts.

X Rays of Hand and Wrist Can Identify Person

X rays of human wrists and hands can provide conclusive proof of a person's identity, reports a Stanford University scientist. Individual bones of the hand and wrist differ enough from one person to another so that if fingerprints or dental work are not available, the person can be identified. The scientist, Dr. William Walter Greulich, said that identification is based on the pattern of some 27 complete bones and parts of two others, the radius and ulna of the arm.

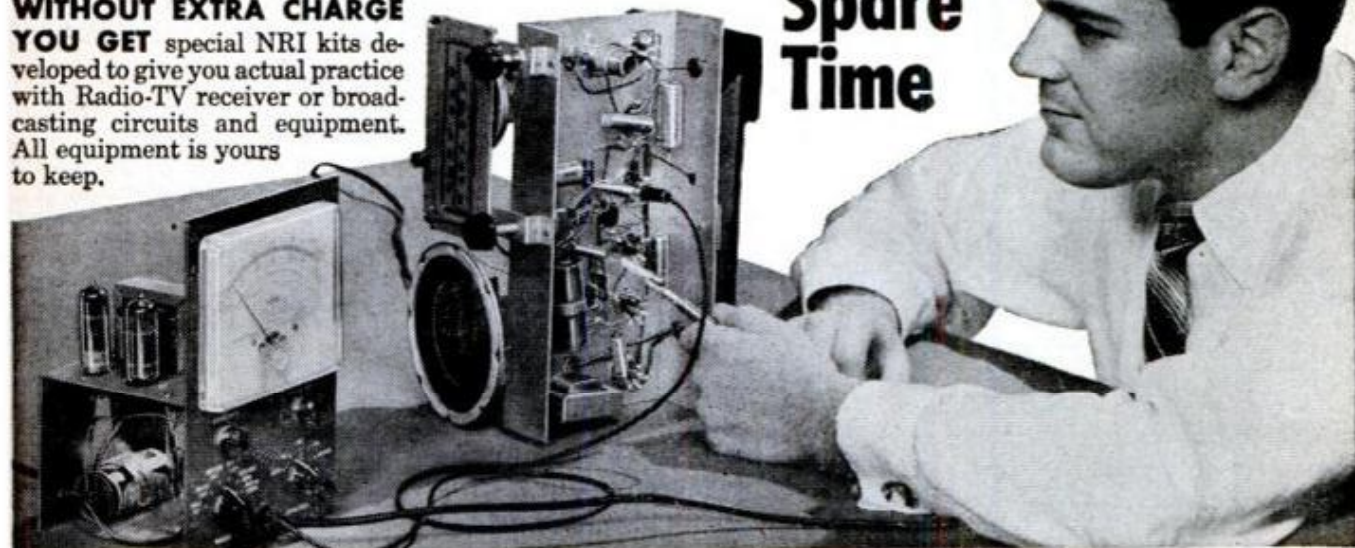
Brain's Mineral Regulator

Researchers for the U. S. Air Force have discovered that the pineal gland in the brain is part of a region controlling the amounts of minerals present in human bodies. The pineal region—once thought to be a remnant of a sense organ used by prehistoric man—helps control the output of a body chemical called aldosterone which, in turn, helps control the mineral balance in the body, say scientists who are performing research at Western Reserve University under contract to the Air Research and Development Command.

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Over the Editor's Desk



My Eye Was on Space

Popular Mechanics' readers are always alert and eager to clobber a scientist who slips up on his figures. This time I got it. I had given the distance to Pluto as 3,600,000 miles in my September article, and righteous wrath has descended upon me. The error was corrected in most issues, but a few sharp-eyed astronauts pointed out that Pluto is still 3,600,000,000 miles out there, and in no mood to approach Earth any closer. I'm not sure that we can blame it. Blame me.

Humbly, sheepishly,
Dan Q. Posin

☆☆☆

To the Editor:

I got a charge out of your article "20 Ways to 'Kidproof' Your Home," in the August 1960 issue. Wouldn't it be better for parents to discipline their children instead of spoiling them? Also it would be quite a bit cheaper.

Robert P. Graham
Holmes, New York

☆☆☆

We're Sorry

When I was reading your August issue I couldn't help wondering, when I saw the insect picture on page 68, who makes your identifications. You claim the insect is a wasp, when in fact it is a cicada. I am not enough of a taxonomic entomologist to determine from the picture whether or not this is the annual cicada, sometimes referred to as the dog day cicada or harvest fly, or the periodical cicada.

W. K. Delaplane, Jr.
General Manager
Illini Pest Control and Service, Inc.
Champaign, Ill.

Calling your attention to the photograph labeled "wasp's wings stand still" . . . As the nature counselor at this camp, I have one question: Isn't the organism a cicada (locust) rather than a wasp?

Bruce R. Bender
Crystal Lake Camp
Roscoe, N. Y.

A lot of PM's readers spotted the error. The studio that provided picture and caption made a bad guess.

(Continued to page 12)

THIS is how you train at home to become a **SERVICE ENGINEER** in the **Air Conditioning and Refrigeration industry...**



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To the Editor:



Have you noticed how much the Uher recorder on page 191 (PM, Aug. 1960) resembles a fellow that has gotten his eye blackened for talking out of turn?

John A. Marotta
Euclid 23, Ohio

☆☆☆

To the Editor:

Volkswagen, with an excellent rating of 95.8 percent, average rating 4.2 percent and poor rating of 0 still isn't the highest in PM history. The Mercedes-Benz 300SL in the January 1956 issue racked up an excellent rating of 99 percent, average of 1 percent and poor rating of 0 percent. I believe this rating is the best ever achieved.

David L. Hunt
Newport News, Va.

We stand corrected.

☆☆☆

To the Editor:

With reference to the article entitled "The Man Who Owns a Tank Corps," published in the June 1960 issue of *Popular Mechanics*, I wish to advise you that this story has aroused tremendous interest. I have received letters from South America, Southwest Africa, France, and many, many telephone calls from interested people in the United States.

I never realized that your magazine had such tremendous readership, and I think that the author of this article, Mr. Alfred Balk, should be commended very highly.

Walter Ising, President
Laube Steel Co., Chicago

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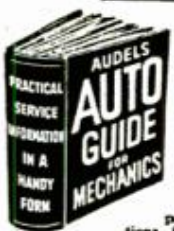


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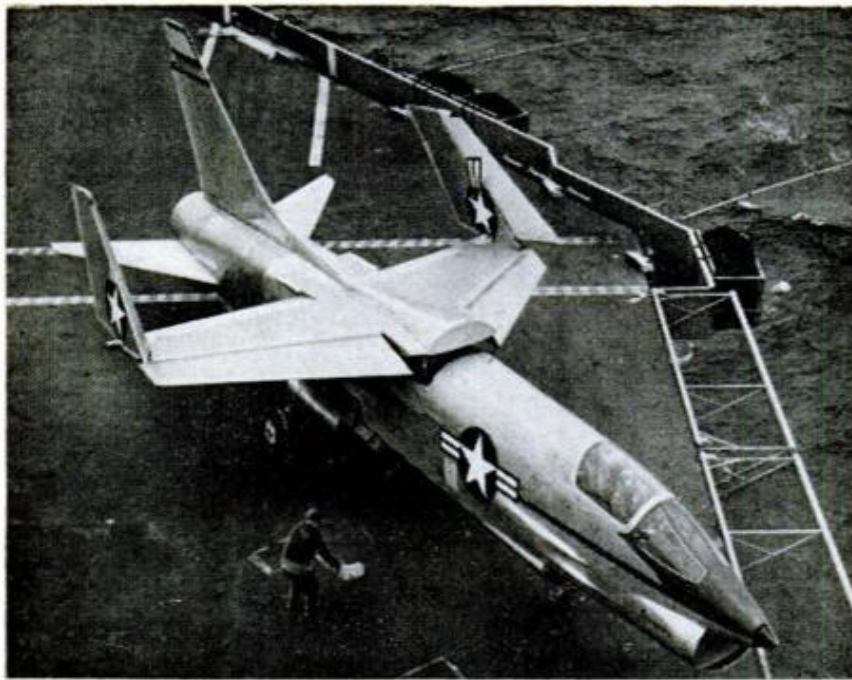
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Perched on a carrier's deck with its wing tips folded upward is an F8U Crusader. It was in this wings-up attitude that a Crusader took off from an Italian air field and amazingly stayed aloft for 24 minutes before landing without difficulty at Naples

WHO SAYS YOU NEED WINGS TO FLY?

WHEN A NAVY pilot took off from a Naples air field the other day and found himself flying with his fighter plane's wings still folded, he was, to put it mildly, startled. So was the rest of the world, which read in newspapers everywhere of the amazing achievement.

It wasn't the first time. But it was the first time a carrier plane had done it and come back in one piece.

Popular Mechanics reported a similar occurrence back in May of 1952, in an article relating weird incidents in the Korean war. The plane taking off with its wings still folded was pictured on the magazine cover.

The account of that unhappy incident read: "Everybody knows an airplane has to have wings to fly. Navy fighters and dive bombers, because they operate from the cramped flight decks of aircraft carriers, have wings that fold upward or backward like a bird's. One Navy pilot tried to take off from the runway of an air station with the wings of his

dive bomber folded upward. He not only tried to, he did! The powerful engine succeeded in getting the 20,000-pound plane 250 feet into the air before it went into a spin and crashed. The half wing extending from the fuselage to where the outer wing folded up apparently offered enough lifting surface to get the plane off the runway. Any aviator will still argue it can't be done."

The American pilot who duplicated the takeoff at Naples recently was luckier. Airborne in his F8U Crusader, he discovered the wing tips were vertical when he noticed that control required an excessive amount of forward stick. Then he kept climbing to 5000 feet, remained aloft 24 minutes while testing the plane's aerodynamic characteristics with "parked" wingtips (the folded tips are each six feet seven inches long), then dumped his fuel for safety and flew back for an uneventful landing.

The Crusader was the first aircraft to span the United States faster than the speed of sound and was first to set an official national speed record above 1,000 miles per hour. But it used its wingtips normally on those occasions.



ITEMS FROM ALL OUTDOORS

By Dick Kirkpatrick

DUCK HUNTERS can be pretty philosophical about this year's waterfowl census by the Fish and Wildlife Service. The flying biologists predict that the flights will be about like last year along the Central, Mississippi and Eastern Flyways but the number of ducks along the Pacific Flyway will be down for the second year in a row. The waterfowl population did not show the upward trend this year that many conservationists had hoped for, but on the other hand, it's holding its own. The experts did hold out some hope for 1961—improving nesting conditions should produce an increase for next year.

If you're looking for a new shotgun for the 1960 campaign, you have a chance to try something really new in Winchester's Model 59 Automatic with the Win-Lite glass-fiber barrel. It's not all glass fiber, of course, but is a .02-inch-thin steel liner wrapped with 500 miles of glass fibers bonded with chemical resins. Big advantage is its light weight—only 6½ pounds for the Model 59, a pound or so under the average autoloader. Other advantages are great durability and resistance to weather, doubled bursting strength, and cooler shooting but warmer handling; it won't stick to skin in the cold.

If you get very far off the beaten path in your hunting, and especially if you go 'way back into the big woods, there's always a chance of getting lost or of being injured and needing help. Next best thing to a radio is an aerial flare, and the March Coulter Co. of Fraser, Mich., is marketing a hunter's distress flare to fit your shotgun or rifle and fire like regular ammunition. Fired into the air, it explodes at 500 feet into a 2000-candlepower red ball that's 15 times brighter than a railroad flare, and visible for miles. The flare drifts down slowly, then burns out at about 100 feet.

If you do start a fire (a campfire, that is) you might as well make coffee. And it's available in a handy new form for the outdoorsman. Coffee Clubs, Inc., of Chicago, is packing coffee, sugar, instant cream and several soups in one-shot containers. Available in many stores. ★★ ★

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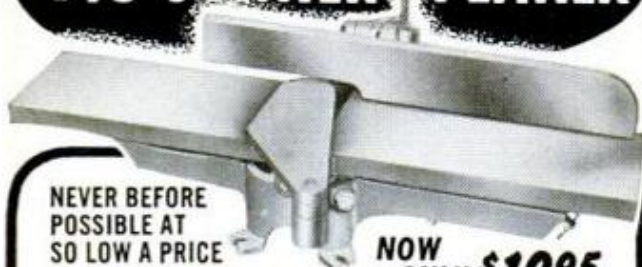
This one is really old, as you can tell by the right-hand drive; standard, left-hand drive for American cars was settled well before World War I. Although it resembles the early Ford Model-T in some ways, it is a different breed entirely.

Like the Model T, this old-timer was the product of one of the automobile industry's pioneers, one of the do-it-yourself auto tycoons who did everything from design the crankshaft to preside over the board of directors meetings.

Although its hood looks massive and the fin-and-tube radiator is impressive in size there is only one cylinder under the hood. Well, it was enough for the performance needs of the day. Seat in rear is draped with what might well be a blanket for the horse that inevitably came along in time of trouble.

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Sidelights from the PENTAGON

By **William R. Kreh**

AT LAST! A real panic button!

The Coast Guard is developing one for mariners to hit when they're in trouble at sea. The button will trigger a device that will automatically screech for help, knifing through any traffic on the marine voice-radio distress frequency.

The unit, enclosed in a little black box, is designed to plug into marine radio-telephones. It became necessary because the traditional "May Day" distress call is often lost in static or drowned out by other voices using the distress band. The frequency is used, not only by vessels in distress, but by ships wanting to contact the Coast Guard for other emergencies.

The new electronic instrument will wail into this frequency in two alternating tones, a shrill 1300 cycles per second and an even shriller 2200 cycles per second, at quarter-second intervals. It will continue wailing as long as the ship's radio works, even after the ship is abandoned, to give rescuers a longer time to get a "fix" on it.

The Army is experimenting with break-away fuel tanks for its helicopters.

Research has shown that in 'copter crashes some crews survive only to be fatally burned by fire after impact, and fuel is the greatest cause of fire.

The tanks under test are made of strong, heat-resistant Fiberglas. They're attached to the helicopter by two straps fastened by a single turnbuckle. The turnbuckle is designed to break upon impact of more than five G's when coming straight down, or at 35 miles an hour if it hits something head-on.

When it breaks, the straps release the tanks and they fall down and away from the 'copter. They're equipped with quick disconnect fittings which stop fuel flow in

(Continued to page 22)



I'd like to give this to my fellow men... while I am still able to help!

I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my Winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things; of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life, is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept

something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows". It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own". It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turn-

ing out a product that has a steady and ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

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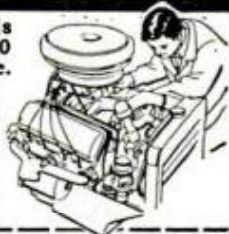
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the lines to the engine as the tanks fall away. Being oval, they roll away.

The Navy is teaching its men how to deal with radioactivity without using any atomic materials.

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The phosphor gives off light when exposed to ultraviolet rays. After it's scattered about, the Navy trainee enters the contaminated area with an invisible ultraviolet light. When it excites the phosphor, a photo-multiplier tube picks up the light and changes it into "clicks," just like a geiger counter. The number of clicks gives the amount of "radioactivity."

The Marine Corps has reorganized the bucket brigade.

When it was learned that many recruits weren't developing certain muscles that had not been used enough in civilian life, the Marines turned to weight-lifting. Calisthenics, the obstacle course and other forms of exercise weren't enough. The biceps and triceps—important muscles in rifle firing—were being neglected.



It was too expensive to issue each recruit a set of barbells, but there were lots of buckets and lots of sand. The buckets were carefully calibrated and, as the exercises progressed, more sand was added until a maximum of 60 pounds was reached.

Results showed the recruits scored an average of 20 points per man more in their physical-fitness tests than previously, and showed a gain of more than 38 percent in rifle-range tests. ★ ★ ★

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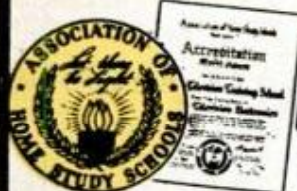
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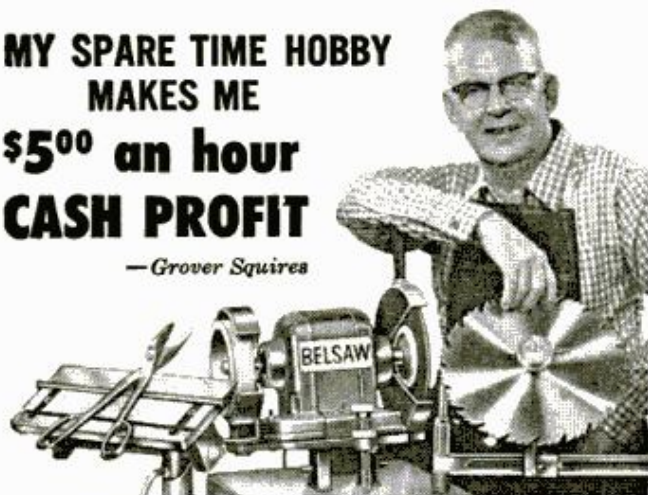
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**Keeping up
with the
ATOM**

By James Biery

THE STAGE HAS BEEN SET for the atom to go to work in the Arctic and Antarctic, and for the building of giant atom smashers that would dwarf those in existence today:

Dr. John Wolfe, a U.S. Atomic Energy Commission scientist, says a 15-month study costing \$2,000,000 disclosed that a proposed nuclear blast on the Alaskan coast 35 miles south of Point Hope would be safe from a biological standpoint. This Arctic phase of Operation Plowshare, the program dealing with peaceful uses of atomic energy, calls for an underground experimental explosion designed to demonstrate the feasibility of digging harbors and canals with nuclear energy. One 200-kiloton and four 20-kiloton devices would be detonated at the same time from depths of 400 and 800 feet. (Twenty-kiloton bombs were exploded over Hiroshima and Nagasaki in World War II.) It is estimated the detonation would blow up 30 million yards of material, some of it as high as 30,000 feet. But the report concludes that it is doubtful that "a single fish or other sea organism would be killed by radiation." Nor, it added, would there be deaths from this factor on land.

This month, the first boatloads of men and supplies will leave U.S. ports for McMurdo, principal base for American operations in Antarctica, where work will start this year on an atomic power station to provide electricity for the permanent scientific exploration of the South Polar continent. The reactor, scheduled for completion in 1962, will replace oil furnaces now used in the development of electricity.

Atomic scientists attending the 10th International Conference on High Energy Physics, at the University of Rochester, N.Y., have called for the building of high-energy atom smashers having as much as 300-billion electron volts. Such a machine, which would accelerate beams of sub-atomic particles (such as electrons) to high energies and hurl them into the nucleus of atoms to break them apart, would be 100 times more powerful than any now in existence and would cost some \$300,000,000.

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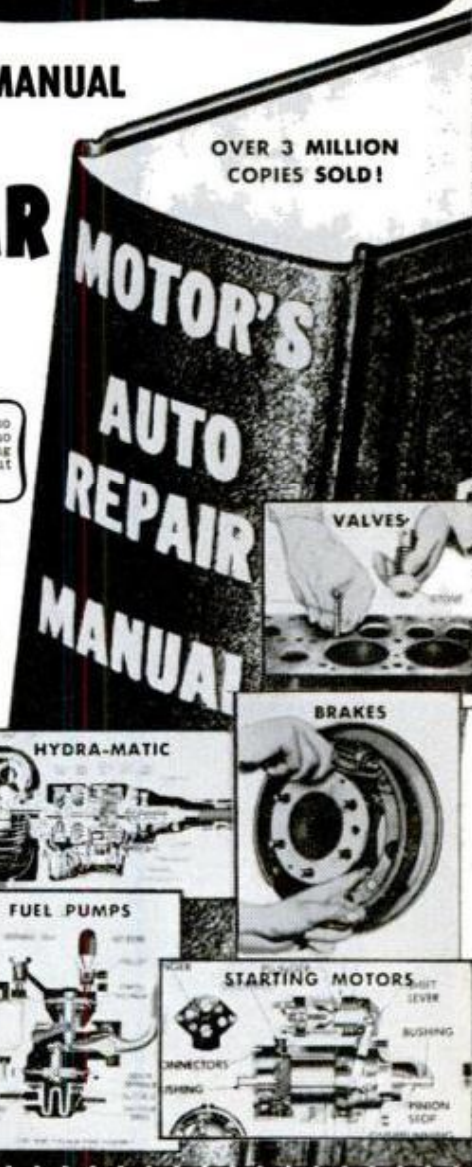
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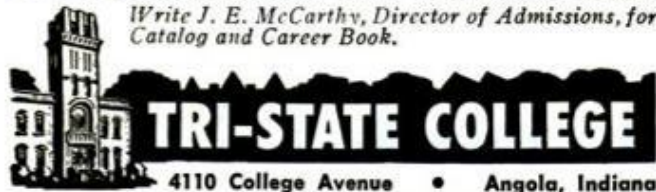
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BULLETINS from the world of **SCIENCE**

By James Biery

WHERE DO COSMIC RAYS come from? Contrary to some theories, say two Massachusetts Institute of Technology scientists, some may originate from outside the Milky Way, the galaxy that includes the solar system. Drs. John Linsely and Livio Scarsi reached this tentative conclusion after studying data gathered during possibly the largest and most powerful shower of rays to be detected bombarding Earth. Such showers are caused by subatomic particles that plunge into the upper atmosphere at nearly the speed of light and smash into atoms, causing a chain reaction that produces a rain of atomic debris. The two scientists say some 10 billion particles rained down in a period of 10 one-millionths of a second during December 3, 1959. The shower was detected by 20 fluorescent counters spread out in a six-sided pattern over an area of 600 acres at the Institute's research center near Albuquerque, N.M.

Research at a New Mexico station operated by Harvard University has tended to validate the theory that meteors—or "shooting stars"—are simply debris of comets. Using an array of camera telescopes, scientists at the station photographed some 750 meteors, gathering in this manner data on their paths, speeds, weights so their origin could be determined. It appears the meteors, as suspected, came from points in the sky lying on orbits of the major comets. Surprisingly enough, though, the Harvard researchers put the size of most meteors as being no larger than a grapefruit and their composition so fragile that most vanish at almost the instant they touch the atmosphere.

The half-way point has been reached in a census of the stars, undertaken by a dozen or so observatories located throughout the world under the auspices of the International Astronomical Union. The project began in 1955 and, when completed in the last half of this decade, it may open the way for a new understanding of the universe. The goal is a catalogue of 30,000 stars uniformly distributed over the sky. Several hundred distant galaxies have been selected as reference points so future movements of stars can be determined with accuracy. ★★★

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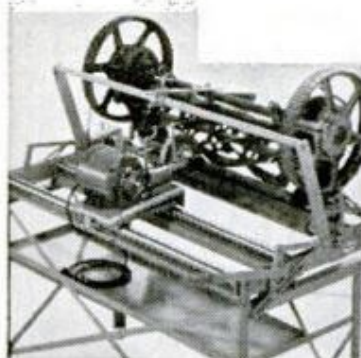
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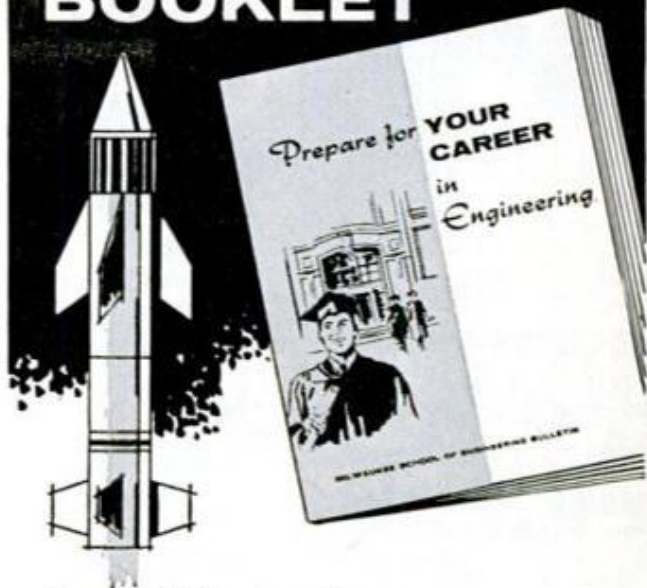
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TUNE IN ON THE INVENTORS

By John Linkletter

PULSATING BRAKES that go on and off rapidly have been designed to combat the tendency of auto wheels to slide sideways when brakes are applied on slippery surfaces. Inventor of the braking system is Burton S. Aikman of St. Petersburg, Fla. The pulsating effect is obtained by subjecting a piston to a pulsating oil pressure. The device may be connected or disconnected at will in response to road conditions. Patent number is 2,949,740.

A light-sensitive device will let you know how you're progressing with your sun tan (or burn) by popping out such warnings as "light," "medium," or "dark." It's essentially an exposure meter which has a number of areas sensitized with photographic emulsion. These areas are of different sensitivities so that they darken in the sun at different periods, allowing the words of warning (printed in reducing agent) to become visible. Invented by Stephen Fromer of Staten Island, N.Y., the meter won patent No. 2,949,880.

Automation has come to snowball fighting! R. D. Smith of Iroquois, Ont., has come up with a toy that makes and launches snowballs. Snow placed in the barrel of the gunlike launcher is packed by two cup-shaped pieces. One cup swings out of the way when the gun is cocked, and a trigger then releases a spring mechanism. Smith received patent No. 2,948,275.

An entire evening of television viewing can be programmed on a channel selector that will automatically switch the set from station to station at the right time. The selector consists of an electric clock incorporating a contact which is coupled with the hour hand and a ring of conducting rods around the rim of the clock face. Inventor is Arnold M. Steffan of Woodland Hills, Calif., and patent is No. 2,951,918.

When it's not drying the wash, Dellis Forbush's rotating clothesline can be fixed up with swing seats and turned into a merry-go-round. An electric fan acts as a propeller to turn it. Forbush, of Sandy, Utah, won patent No. 2,950,109. ★ ★ ★

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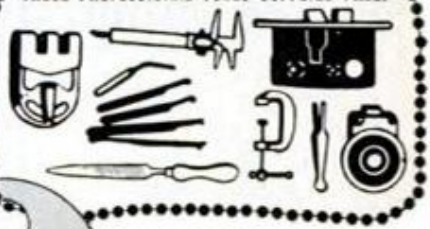


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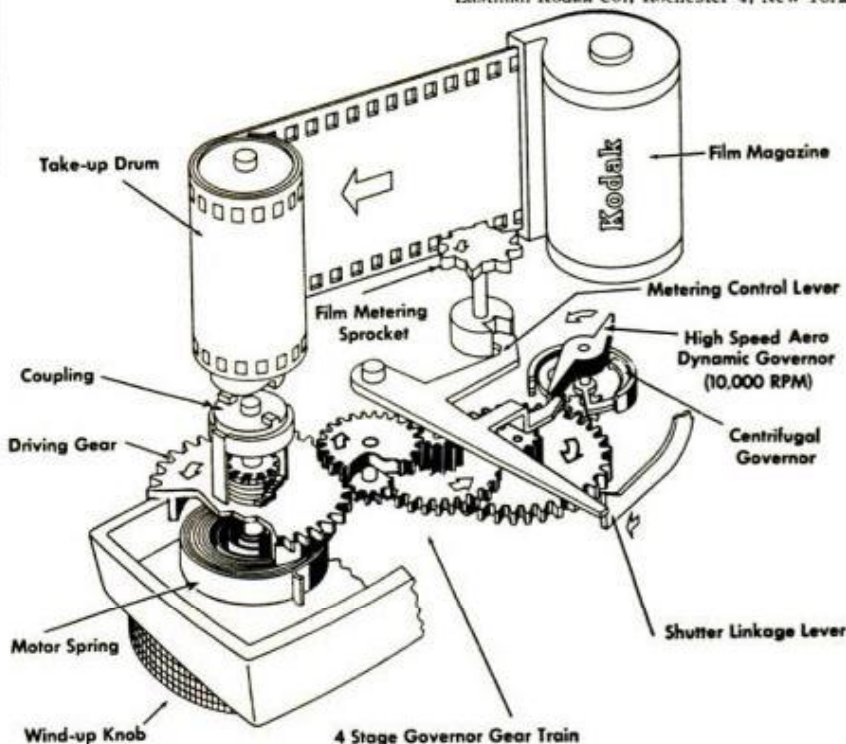
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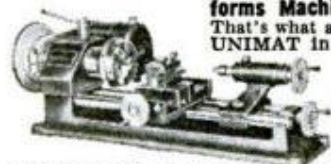


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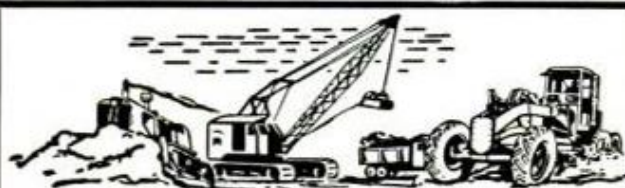
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By Kevin V. Brown

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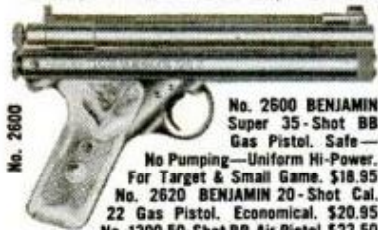
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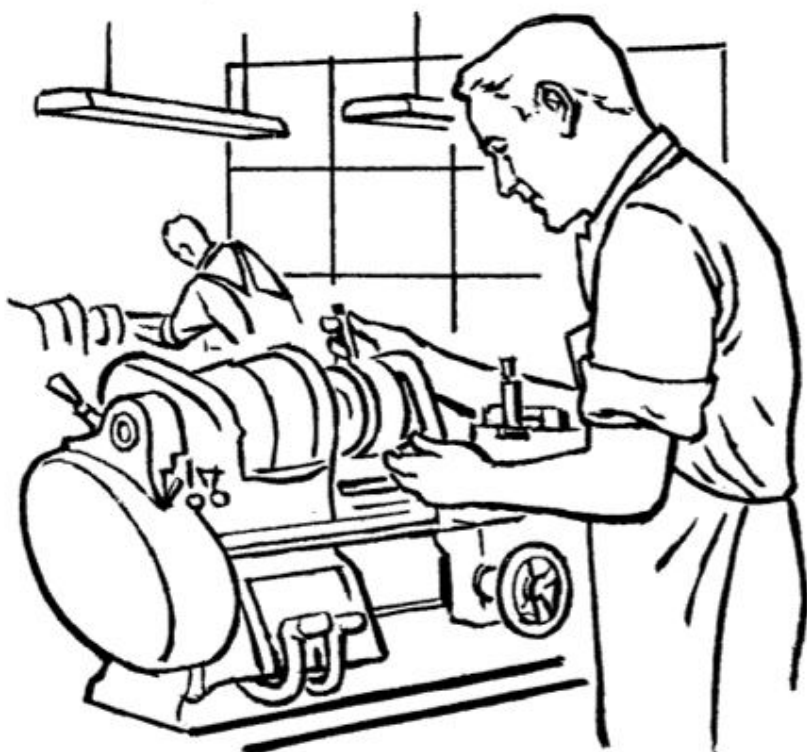
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Without machining workers, American industry would come to a virtual standstill. Machining workers make most of the metal parts contained in manufactured products; and, even more important, they make the metal parts for the machines on our modern production lines.

Machine tool operators, tool and die makers and all-round machinists shape metal parts with precision accuracy, sometimes allowing for tolerances of only one ten-thousandth of an inch, and these parts are so important to industry that machining workers have been termed the "anchor men" of America's industrial team by the National Association of Manufacturers.

In 1958, over one million workers were employed in skilled or semi-skilled machining occupations, and the United States Department of Labor predicts that there will be thousands of opportunities for new workers during the 1960's.

Our growing population is expected to bring about a continuing increase in demand for metal consumer products such as cars, refrigerators, washing machines, heating equipment, stoves, freezers, etc. In addition, American industry is expected to increase its expenditures for new equipment, new plants and industrial machinery.

All of these products contain the results of the skilled machinist's labors; and, as the demand for these products grows, the demand for machinists, the highly-trained "anchormen" of industry, will also grow.

Of the utmost importance to the strength of America is the contribution made by skilled machining workers to our national defense projects. The great use of metal in virtually all of our defensive weapons and the fact that this country will most likely be forced to expand the defense program, will increase even further employment opportunities in machining.

It is the job of a machinist to operate power-driven equipment which either cuts, shaves, grinds, or drills metal. The most common types of machine tools are lathes, grinding machines, boring mills, drilling machines, milling and broaching machines, shapers and planers.

As an example, a machine operator preparing a metal part for an automobile engine must be so accurate in his work that the parts he makes are interchangeable for fast, easy mass production. This makes the margin for error in his work very small, and he must be experienced in the use of such measuring instruments as the micrometer.

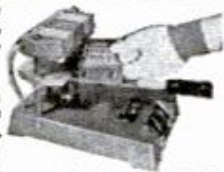
An all-round machinist is experienced in operating many different types of machine tools and is expected to plan and execute all operations required in turning out a machined product or part. A thorough knowledge of the strength and machining characteristics of metals and a complete background in the mathematics used in planning his work are required.

(Continued to page 50)

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As is the case in many skilled occupations, the machining trades require a certain formal, supervised period of training. This involves an apprenticeship during which the worker learns all the aspects of his trade while he is on the job.

Most employers prefer to select men with trade school training for their apprenticeship programs. Resident or home-study trade school courses in metal working are highly recommended for those who wish to enter into apprenticeship for the machining field.

Most experienced all-round machinists and tool and die makers have started as machinists working with only one or two metal-forming tools. Experience and know-how picked up on the job have qualified these men for their present highly skilled positions. Many have helped themselves qualify for higher-paying jobs by taking correspondence or trade school courses in blueprint reading and mathematics.

Skilled machining workers have many possibilities for advancement. Some become foremen and others become tool designers or advance to other more highly technical jobs. Many skilled machining workers have found it profitable to open their own tool and die or machine shops, and in this way these workers capitalize on the knowledge and experience they have gained through the years with larger industrial concerns.

If you like mechanical work, like to use tools, take pride in craftsmanship and want to get into a creative occupation with good pay and excellent future opportunity, you should consider the machining trades.

Machinists make an important contribution to our national economy and are needed to help keep America strong. They work in every state and in almost every city in the country.

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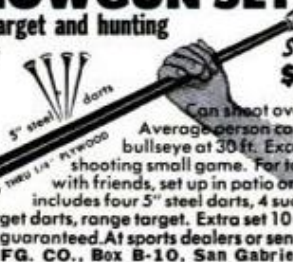
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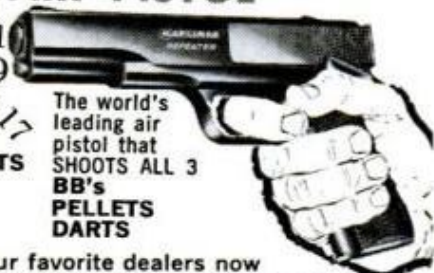
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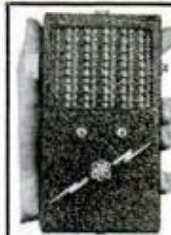
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OPERATE Profitable mail order business. Write Walter Service, 4159A East 112th, Cleveland 5, Ohio.

EARN Good money sharpening chain saws, scissors, cutters, knives. Free manual. Treyco, North Tonawanda, N. Y.

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

IF You like motorcycles and money then send for Harley-Davidson dealership book on how to become a dealer of motorcycles and a new line of motorcooters. Here's a chance to own your own business with a very modest investment. The youth market is beginning to explode and the next few years promise a chance to cash in on it. Write for free illustrated dealership book today. Harley-Davidson Motor Company, Dept. P, Milwaukee 1, Wisconsin.

\$3.00 HOUR—Home, sparetime, assembling pump lamps. Easy. Free details. Ougor, Caldwell, Arkansas.

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

\$400.00 MONTHLY Raising giant worms. Odorless soilless method. Charlie Morgan, Bushnell, Florida.

LIQUID Molding rubber, free sample. Shellcraft supplies. Chaney's, 1907-A East Road, Jacksonville 11, Fla.

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

PLATE Baby shoes, jewelry, gifts, bronze and colored pearl. We finance. Free booklet. Platex, 11029 South Vermont, Los Angeles 44

MAKE Fabulous weekly profits clipping newspaper items for publishers. Some clippings worth \$5.00 each. Particulars free. National, 81-PM, Knickerbocker Station, New York City.

RECAST Junk batteries into new. Latest achievements. Battery Laboratories, Bayou LaBatre, Alabama.

\$34.70 TWO Hours. Manufacturing concrete products. No selling. Castings #3, 2907 Dundee, Rapid City, South Dakota.

CANDIED Popcorn and potato chip equipment. Eakins, Box 933-AO, Springfield, Ohio.

BUY Direct from factories. Appliances, cameras, watches! Free details! Cam Co., 6810PM-20th Ave., Brooklyn 4, N. Y.

PROSPER By selling "The World's Most Usable Bible." Sales quick, easy and highly profitable. To start earning a better living, write today. International Book Company, Department M., Box 118, Wichita 1, Kansas.

MAIL Order, home workers, dealers, hobbyists opportunities. Part time or full. Earn extra income. Details. Sterling, Box 626-PM, Dania, Florida.

MAILORDER Beginners no cost plan. Armstrong's, 154 Darrington S.W., Washington 24, D. C.

PLASTERCRAFT Molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

SELL Books by mail. 400% profit. Royal, Box 368-X, Cleveland 27, Ohio.

EARN \$10,000 Yearly raising Angora rabbit wool for us. Information 25¢ coin. American Angora Company, Malta 77, Montana.

\$70 WEEKLY—Home, spare time. Simplified mail bookkeeping. Immediate income—easy! Auditax, 34757A, Los Angeles 34.

COLLECT Names for us, \$1.00 each. Instructions 25¢. Wilson's Specialties, Box 61-M, Mt. Pleasant, Michigan.

EVERYBODY Likes candy and popcorn specialties. Learn to make professionally home. (Our 50th year.) Ragsdale Candies, B-107, East Orange, New Jersey.

OPERATE Home mailorder business. Vosacek Distributors, 4444A Ute, San Diego 17, Calif.

EXCEPTIONALLY Profitable opportunity in tape recording! Free information. Baron's, Lynden, Washington.

MAKE Money from old tires. Operators clearing \$400 weekly. Equipment costs \$640. Get facts. S & S Patents, Inc., 1307 N. Clark, Chicago 10.

"**HOW** To make money by mail." Write: American Distributors, Box 409-P, Niles, Michigan.

MOLD Statuary, pottery, tiles, novelties. 5¢ materials makes dollar sellers! Particulars free. Marbleizing Service, Edwardsville, Illinois.

VALUABLE "Mailorder Business Franchise" absolutely free. Neil H. Tasker, Shamokin, Penna.

48 OPPORTUNITIES To make money in Florida. Copyright book \$1.00. Xotic's, Box 471, Largo, Florida.

OPPORTUNITY Of lifetime. More money Quicker advancement. Amazing information. Free. Fred Morris, 719 Mangum, Durham, N. C.

MAKE \$46 From square foot plywood; jigsaw necessary. Free details. Woodarts, Bridgewater, Mass.

MONEYMAKING OPPORTUNITIES

IN 1952 I was unemployed, broke. Today own \$18,000 home, drive Cadillac, have bank account. Anyone can do this. Write Norris Cole, 217 West 49th, Bradenton, Florida.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests, rules. Sample magazine 25¢. General Contests, 1609½ East 5th, Duluth 12, Minnesota

MAKE Fabulous weekly profits clipping newspaper items for publishers. Some clippings worth \$5.00 each. Particulars free. National, 81-PM, Knickerbocker Station, New York City.

EASY To earn extra money! Free 100 page catalog. Tandy Leather Company, Box 791-T37, Fort Worth, Texas.

100% PROFIT. No investment. Stamp brings samples, details. Miller, Box 584, Brooklyn 1, New York.

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

VENDING Machines. No selling. Operate a route of coin machines and earn amazing profits. 32-page catalogue free. Parkway Machine Corporation, Dept. #26, 715 Ensor Street, Baltimore 2, Maryland.

GROW Mushrooms. Cellar, shed and outdoors. Spare, full time, year round. We pay \$4.50 lb. dried. We have 29,000 customers. Free book. Mushrooms Dept.: 173, 2954 Admiral Way, Seattle, Wash.

CIGARETTES: Make 20 plain or filter-tips for 9¢. Facts free. Moberly, Box 821, Owensboro, Kentucky.

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

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

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

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

MAKE Big money with fast-selling line self-help manuscripts, many titles! Imprints available; drop shipments if desired! Complete details to established mailorder dealers only! Economy, Box 2580-PM, Greensboro, North Carolina.

12 SURE-FIRE Mail order business plans plus 30 fast-selling products to manufacture in your basement. Complete \$1.00. Leko Enterprises, 2968B Wilson, Campbell, Ohio.

BOOKS: Terrific profits! No investment. Lindstroms, 48 Boylston, Cambridge, Mass.

SPARETIME Homework. Typewriter required. Money-making instructions 50¢, refundable. Interstate, 37 Besch, Albany 9, N. Y.

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

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

SIZEABLE Profits, buying, selling antique items locally. Information free. O'Rourke, 201B Arlington, Jersey City 5, New Jersey.

WANT A second income? Write: Wagner, 110 Callodine, Buffalo 26, New York.

SHELLCRAFT Supplies. Highest quality. Lowest prices. Large Catalogue 25¢. Pace's, Cortez, Florida.

TERRIFIC Profits. Easy. Assemble and sell waitress name plates. All businesses. Free details. Box 182P, Maywood, Calif.

UNUSUAL Profits in pocket change. Giant, illustrated guide of wanted coins, plus amazing free offer, only 25¢. Albetco, Box 843, Union, New Jersey.

DYNAMIC Mail order plans. Everything furnished. Details 25¢. Donovan, 79-PM Greenbelt, Levittown, New York.

MONTHLY Puzzle contests. Cash prizes! Spence, Box 11569, St. Petersburg, Fla.

CASH From discarded tires, valuable information, \$1.00. Woodson & Shay, 128½ Woodland Road, Asheville, N. Car.

FREE: 40 Wholesale catalogs to 900 pages. Sources \$1.00. Dalelum, 721 Solano Ave., Los Angeles 12, Calif.

SELL Perfume. Wholesale list, sample. Geller, 2089P Matthews, New York 62, New York.

START Big-pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room CM-2-L, Chicago 26, Ill.

MAIL Order success secrets revealed by new magazine. Free details. Mail Order Business, Dept. M-102, 550 Fifth Ave., New York 36.

KEY To success in mail order. North Star Products, Box 112-P2, Cedar Grove, New Jersey.

1 PAIRS—5 Pairs \$1.00. Make 100% profit. Tested Products, Box 393, Radio City Station, New York 19.

HUSBANDS And housewives wanted! Big money. Spare or full time cake decorating and candy making. Turn your kitchen into a gold mine. No age, education limits. Complete instruction, learn and earn at home. Write for free facts: Candy and Cake, Dept. 768, Fallbrook, California.

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

JUST Out! R. C. Sellon's new manual "Poor Man's Way to Riches in Real Estate." Amazing method. Details from Author's Press, Box 265, Alameda, N. Mex.

FREE Folio! "The Facts About Plastic Laminating Business." Keller, Box 3097, New York City 17.

MEN, Women. Make money spare time and earn new car as bonus for encouragement. Amazing hosiery guaranteed to wear without holes, snags and runs, or replaced free. For example, lovely 60 gauge nylons guaranteed for as long as 1½ years, or replaced free. Write: Wilkmit, 17010 Washington, Greenfield, Ohio.

\$50 WEEKLY—Spare time, home operated. Sharpening all types scissors and pinking shears. Details free. Serr-Edge, 4469 West 160 Street, Cleveland 35, Ohio.

LEARN The secrets of repairing junk batteries, profitable, easy, at home. Free particulars. Batteryman, 3465 Forrest, Santa Clara, California.

\$600.00 PROFIT! Mailing catalogs! Sample, instructions 25¢. GPO, Box 972, New York 1.

WANT To make \$5,000 yearly or more in respectable, easily learned and operated mailorder business? Experience unnecessary. Valuable help given. Rush \$1.00 (refundable) for complete plan, details. Columbia, 45-09-PX Broadway, Long Island City 3, New York.

RAISE Nightcrawlers, redworms. Easy soilless method. Three Oaks Ranch, Dresden, Tenn.

GET Listed for life! Receive hundreds free magazines, samples, special offers. Rush 25¢, stamped, addressed envelope. Columbia, 45-09-MH Broadway, Long Island City 3, New York.

TERRIFIC Profits. Easy. Assemble and sell waitress name plates. All businesses. Free details. Ace, Box 182P, Maywood, Calif.

\$200.00 MONTHLY. Spare time. With tablesaw, bandsaw or jigsaw. Write. Holiday House, Box 1825 A, Vancouver, Washington.

ANSWER Ads effortlessly. Use personalized "Jiffy" postcards. Sample free. Rafter's, North Boston 11, N. Y.

MAKE Money in your spare time, or even go into business for yourself. Write today for free details. Zephyr Enterprises, Box 1484-D, Hartford 1, Connecticut.

MAKE \$200.00 Monthly spare time with jigsaw. Free details. Elkman, 346 N. Summit, Sioux Falls, So. Dak.

YOUR Jigsaw, bandsaw, lathe, can earn profits. Details. Majot, Michigan City, Indiana.

SEVENTEEN Dollars from square foot Balsawood. Machinery unnecessary. Instructions, sample \$1.00. Northern Crafters, PM-1, Bradford, Maine.

HOSIERY Salesmen. No canvassing. Details. George, Box 1224-p, Clarksburg, W. Va.

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

EXPORT — IMPORT

ADDRESSES, 100 Foreign firms, \$1.00. Reid, Box 481, Clinton, N. C.

FOREIGN Import Directory \$1.00. Lists 400 exporters. Tech Publications, Box 821, Logan, W. Va.

RARE, Decorative, useful imports. Free catalog! Labranche, 308 Gagne, Rouyn, Quebec, Canada.

RECEIVE Gifts from foreign countries. Catalog 15¢. Veach, 716 W. 7th, Littlefield, Texas.

IMPORT Bargains. Free gifts, catalog 25¢. Carle Distributors, 2 Empire Street, Buffalo 12, New York.

JAPAN: Direct mail-order. 26 page catalogue, kimonos, dolls, novelties, gifts, business information, manufacturers' names, addresses. Send \$1.00. Clarence Yamagata, 814 Toginbiru, Marunouchi, Tokyo.

SCIENCE & CHEMISTRY

40 MISSILES! Identify your missiles. Send 50¢ for 11x17 informative, artist's renderings, suitable for framing. Durk Advertising, 654 Sheridan, Escondido, Calif.

AMAZING New book of science experiments, formulas, and catalogue of laboratory supplies. Only 35¢. National Scientific Co., 13 S. Park Avenue, Dept. PM-11, Lombard, Illinois.

ROCKETS Model kits, parts, chemicals. Catalog, plans, instructions 25¢. Central Rocket Company, Waupaca, Wis.

CHEMISTRY Catalog, 25¢. Expendibles kit free with \$15.00 order. Laboratory Sales, Box 161-A, Brighton, Mass.

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

BARGAIN! Twelve Chemistry-Science booklets, \$1.00. Franks, 3121 South Racine, Chicago 8.

MICROSCOPE Slides, anatomical. Free list. Bay, 409 Roosevelt, San Francisco 14, California.

NEW Chemistry catalog 25¢. Winn Chemicals, 124 West 23 Street, New York 11, New York.

CHEMICALS, Apparatus, glassware. Illustrated catalog 25¢. Bio Chemical Products, Somerset, Belmont 78, Massachusetts.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25¢. Dept. M-50. Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

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

ROCKET Supplies for amateur rocketry. Catalog 25¢. Mervin Hill Company, R.D. #1, Seward, Penna.

POPULAR Mechanics book, "Science Year," illustrated survey of last year's developments in science. Covers rockets, medicine, astronomy, electronics, etc. Send \$1 to Service Bureau, Room 517E, Popular Mechanics, 200 E. Ontario, Chicago 11, Illinois.

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

EXPERIMENTERS: New! Bigger catalog and "Experiments Booklet." Only 25¢. Hagenow Laboratories, Manitowoc, Wis.

FORMULAS, PLANS, ETC.

RESILVER Mirrors—make one-way mirrors. Both \$1.00. Kem-Mir, Park Ridge, Illinois.

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

FORMULAS: All kinds, moneymakers. Three catalogs, dime. Kemixal, Park Ridge, Ill.

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

PLASTICS

PLASTIC. Vinylite, laminating supplies, machines. Solomonson, 4 Beacham, Everett 49, Mass.

PLASTIC Vacuum-forming machine. Hobby. Easy. Profitable. Details. Burr, 330 East Center, Kalamazoo, Michigan.

PLASTIC And supplies for laminating. Colamco, 12 Center, New Haven, Conn.

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

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

SEALED In plastic service. Cards, etc. Burr Laminating, 330 East Center, Kalamazoo, Mich.

PLASTICS And accessories for casting, molding, embedding and jewelry. Make unique Christmas gifts for pleasure or profit. Send 25¢ for 64 page catalog. Castacraft Corp., Dept. M-11, P.O. Box 555, Palo Alto, Calif.

AGENTS WANTED

"FOG-STOP" Windshield cloth. Instantly removes blurry mist, frost, sleet, snow. Stops windshield fogging. Samples sent on trial. Kristee 75, Akron, Ohio.

FAST-Selling specialties—Jewel Cleaner, Bouquet-Magic, many others. Excellent profits. Free catalog, special offer. Shaklee Products, 300 12th St., Oakland 7, Calif.

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

BE The Popular Mechanics representative in your neighborhood and earn big profits in your spare time. Write Popular Mechanics, Room 10-A, 250 West 55th St., New York 19, N. Y.

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

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

START Making money now. Earn top commissions taking orders for all magazine subscriptions. Friends and neighbors are your prospects. No experience needed. Write for free money-making kit. **McGregor Magazine Agency, Dept. 5A, Mount Morris, Illinois.**

MAKE Up to \$50.00 a day soliciting delinquent accounts. Terrific commissions. Write today. **National Credit, 304Y Pickwick Bldg., Kansas City 6, Mo.**

BIG Profits. Stamp social security plates, key protectors. Sample 50¢. Catalog free. **General Products, 11 No. Pearl St., Albany 7, N. Y.**

FREE! Beautiful Mexican curios! Rush 30¢ stamps mailing. **Sylvlak, Apartado 9036, Mexico City.**

MAKE Profitable men's-women's wear. Sample free. **Sunmade, Brockton 64, Mass.**

SELL Amazing glow-in-dark pictures. Big profits. Samples free. **Madison Mills, 303 Fourth Ave., New York 10, N. Y.**

YOUR Ad in this space will get some good agents for you. Yes, I'll prove it. Write for Folder "A" right now. **P. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.**

WILL You test new items in your home? Surprisingly big pay. Latest conveniences for home, car. Send no money. Just your name. **Kristee 77, Akron, Ohio.**

MAKE Big money selling famous Swami polishing cloths, treated with General Electric Silicone oil. Over one million sold. Write **Swami Kloth, Box 155, Great Neck, N. Y.**

QUICK-Change magnetic letter signboards sell themselves! Order-getting sample, details, \$1.00. **Specialties House, Cincinnati 43B, Ohio.**

MEN! Women! 60% profit on cosmetics. Famous nationally advertised Hollywood cosmetics pay 60%. Make \$25 day up. Hire others. For free samples, details, write **Studio Girl, Glendale, California, Dept. 12011J.**

DAMASCENE Earrings! Exotic orientalism. Huge profit. Ohga, PM-210, Sigakenkusatu, Japan.

TIES On consignment. \$1.00 sellers, 40¢ profit. Rush for starting assortment. **Campus Cravats, 93 South Orange Avenue, Newark 2, N. J.**

MAKE \$10-\$100 A day! Sell new 5 year light bulbs. Guaranteed. Send for sample 6 pak \$1.98. Sells for \$4.69. Free details. **Sunmaster, 366 Fifth Ave., Dept. 11PMC, New York City.**

\$3.95 AUTOMATIC Fire extinguisher. Details free. **Aut-O-Matic, 1737G East 31st Ave., Denver 5, Colorado.**

NEW Sleeping comfort means generous profits with Electro-Warmth. Beat electric blankets 10 ways, costs less. Adds no top covering you sleep on it. Best season starting. **Patented Products Corp., Dept. PM-1160, Danville, Ohio.**

NEW Product. Sells on sight. Every home prospect. Sample \$1.00 or write for free information. **Bath Aid Mfg. Co., Box 484, Mitchell, So. Dak.**

MAKE Up to 150% selling quality French perfume types at 1/2 retail! Free sales kit. Exclusive territory. **Jule, Suite 810, 530 Arlington, Chicago 14.**

REAL Diamond rings. Nationally advertised. Sell direct. Make big middleman's profit. No investment. Experience unnecessary. Free catalog, details. **Gleam-light, 111-B9 North Columbus, Mount Vernon, N. Y.**

ANSWER Ads effortlessly. Use personalized "Jiffy" postcards. Sample free. **Rafters, North Boston 11, N. Y.**

AGENTS—Dealers—Farmers—up to \$250 weekly. Represent highly rated, well established firm your area. Products nationally advertised, needed by every farmer. Proven sales plan. No investment. Free sample. Ideal proposition for seed corn and feed men. **Farm Products, 248 No. Main, Rochelle, Ill.**

BUY IT WHOLESALE

FREE! Wholesale toy catalog! Big savings on hundreds of nationally advertised toys for Christmas. **Housewares Distributors, 1216-AB West 79th St., Chicago 20, Illinois.**

NOW! Gigantic wholesale catalog \$1.00 (deductible). **Earl Johnson, Hudson, Ind.**

BOOTS. Handmade western styles. Free catalog. **Austin Boot Co., Box 5303-J, El Paso, Texas.**

FREE Catalog! General merchandise; bargains, amazing! **Cole, P. O. 793-P, Pine Bluff, Arkansas.**

WHOLESALE Catalog. You profit. Free details. **Loeber, 224-F Wyatt, Lincoln, Ill.**

7/16" RAISED. Metal letters, numerals. Black; white; gold. 150, \$3.95. **RNG Sales, Wildomar, California.**

NAME Brands at discount prices. Toys, appliances, jewelry. Catalog 25¢. (Refundable first order). Lifetime, 211 Genesee. **Auburn, New York.**

JOIN Now and save 20% to 50% on nationally advertised appliances, furniture, carpeting, photo equipment and other famous brand merchandise. Limited exclusive membership. Write for free brochure to **Mutual Buyers Club, Inc., Dept. PM-3, 1000 W. Roosevelt Road, Chicago 8, Ill.**

BARGAIN Catalog. Discounts on appliances, housewares, tools, toys. 32674 **Merritt, Garden City, Michigan.**

BULOVA. Benrus watches like new \$5.95 up. Illustrated catalog with hundreds of bargains, free. **Cosmos, New York 35, N. Y. Dept. 617.**

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

TYPEWRITERS. Cameras, watches, outboard motors, blades shavers exerciser-reducers, guitars, gold coins. **Simms, Warwick, N. Y.**

POWER Tool catalog 25¢. **B. L. Roberson, 14A Brooks Drive, Austell, Georgia.**

CAMERAS Wholesale. Catalog free. Photo Distributors, Box 4203, San Diego 4, California.

EVERYTHING In name brands merchandise sold wholesale to individual consumers. No quantity purchases necessary. Send 50¢ for large beautifully illustrated catalog. Refunded with first order. **Gary Gifts, Dept. 12-B, 672 South Alvarado Street, Los Angeles 57, California.**

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

WHOLESALE: 850,000 Items. Supply source directory 25¢. **Idealer, Park Ridge, Illinois.**

LARGEST Wholesale supply source in U.S.! Furniture, clothing, appliances, housewares, automobiles and accessories, tools, sporting goods, hobby supplies, farm equipment, imports, new products, bargain merchandise. Free details. **Associated Wholesalers, Box 2068-DD, Sioux City 4, Iowa.**

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

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

NEWLY Namebrand merchandise and toy catalog. \$1.00 for both plus postage. **Strom Sale Service, Box 141, Templeton, Mass.**

BELOW Wholesale. Clothing, appliances, etc. Catalog 10¢. **Wambaugh, 7316 Lawndale, Philadelphia 11, Penna.**

FACTORY Prices! Thousands nationally advertised products. Typewriters, housewares, jewelry, watches, appliances, television, cameras, etc. New factory buying plan saves up to 40% below wholesale. Details free. **Factory Supply Company, Bloomfield 2, New Jersey.**

BUY Direct from factories. Appliances, cameras, watches! Free details! **Cam, 116 Malden Street, Worcester, Mass.**

NEW DeLuxe Multicolor wholesale catalog, automobile catalog, and others. Nationally advertised merchandise. Housewares, appliances, refrigerators, freezers, washers, dryers, television, radios, rugs, furniture, sewing machines, clothing, luggage, binoculars, phonographs, musical instruments, recorders, cameras, projectors, typewriters, power tools, toys, notions, sporting goods, watches, jewelry, novelties, vitamins, drug sundries, cosmetics, books, school supplies, practically everything. Famous brands. Huge discounts up to 40 to 70%. Postcard: **Seibco, Decatur 5, Illinois.**

BELOW Wholesale most merchandise. Write: **Factory Buyer, 446, Jacksonville, Illinois.**

SALESMEN—DISTRIBUTORS

WILL You wear new suits and topcoats without one penny cost and agree to show them to friends? You can make up to \$30.00 in a day even in spare time, without canvassing. **Stone-Field, 532 South Throop St., Dept. N-926, Chicago 7, Ill.**

SEEKING New products? Get my outfit 47 money-making specialties. Latest conveniences for home, car. Send no money. Just your name. **Kristee 103, Akron, Ohio.**

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

MAKE Extra money—Big cash commissions plus premium for you and your customers. Sell advertising book matches. Sensational new tenoramas, glamour girls, hillbillies; dozens others. All sizes. **Quick daily sales; big repeat business. Free master kit makes selling easy. No experience necessary. Superior Match, Dept. M-1160, 7530 Greenwood, Chicago 19.**

CALENDARS. Advertising novelties, matches. All styles, including religious, varnished, 12 sheet, girls. Hundreds of advertising novelties, book matches, etc. **Fleming Calendar Co., Sales Division, 6539 Cottage Grove, Chicago 37, Ill.**

SEPTIC Tank, cesspool trouble, and expense of cleaning prevented by using nationally advertised Septo-Bac. Guaranteed. Harmless to plumbing. Flush down toilet. Send for free descriptive literature, plus details to **W. B. McGay Company, Owosso, Michigan.**

MAKE Extra money selling advertising matchbooks. Free catalog and sales outfit. **Matchcorp, Dept. PM-110, Chicago 32.**

MONEY-Making opportunity! Take big profit orders for world famous patented varieties fruit trees. Also flowering shrubs, roses, vines. Big sales outfit free. **Stark Bro's, Desk 30151, Louisiana, Missouri.**

STEADY Profits. Made - to - measure shirts. Free sales kit. **Dept. PM-11, Henlein, Cincinnati 2, Ohio.**

SALESMEN To sell transparent mirrors and novelties made on Catalina Island. **Ye Olde L.A. Press Club, 9026 So. Orchard Avenue, Los Angeles 44, Calif.**

AMAZING "Show and Sell" earns you top commission. Businesses need signs and advertising materials. **Advance Press, Addison, Ill.**

BIG Money. New sensational plan. Fleets and farmers buy huge quantities. Free details. **Conklin, Inc., 5626 Nokomis Station, Minneapolis 17, Minn.**

SENSATIONAL new longer-burning light bulb. Amazing Free replacement guarantee—never again buy light bulbs. No competition. Multi-million dollar market yours alone. Make small fortune even spare time. Incredibly quick sales. Free sales kit. **Merlite (Bulb Div.), 114 E. 32nd, Dept. C-74X, New York City 16.**

OFFPRICE Merchandise Bulletin 10¢. Liquidations, overstocks, bargains. "Close-outs." 3931 Washington, Boston 31, Mass.

GROUND Floor opportunity. Sell stores or direct. New ice grippers. Quick on and off. Fits men's, boy's shoes. Patent pending. Sample pair \$1. **Albert Bailey, Box 35, Cabanne Station, St. Louis, Mo.**

RARE Opportunity to become an exclusive dealer for America's largest producers of aluminum home and commercial additions with Honeycomb insulation. Requires \$3390 for inventory. Write or wire including phone to National Sales Division, Power-Matics, Inc., 1572 Stillwell Ave., Bronx, N. Y., TYRone 2-4400.

NEW Polish discovery. "Alumakleen" cleans, polishes, protects. Aluminum, copper, brass, chrome, stainless steel. Write Nycopro Products Co., 1803 S. Jefferson St., Chicago 16, Ill.

BIG Profits selling homes, factories 6-in-1 pocket workshop. Sample \$1.00. Gam Corporation, Lancaster, Penna.

MAKE Up to \$50.00 a day soliciting delinquent accounts. Terrific commissions. Write today. General Finance, 304V Pickwick Bldg., Kansas City 6, Mo.

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

MONEYMAKING Opportunity in fast growing market selling attractive outdoor advertising pennants. Write: Radder Products, Box 31, Colvin Station, Syracuse 5, New York.

VITAMINS! Private labels! Exclusive sales! We furnish product, plan, literature. You provide management, employ salesmen. Terrific profits. Repeats! Sample and details free. VimVite, 2908-E Beverly Boulevard, Los Angeles 57.

EMPLOYMENT INFORMATION

LIST Of names—addresses. 100 American contractors with large overseas projects. Only \$1.00. Contractor Services, Meramec Building, St. Louis 5, Missouri.

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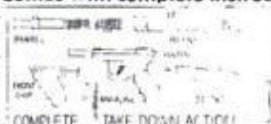
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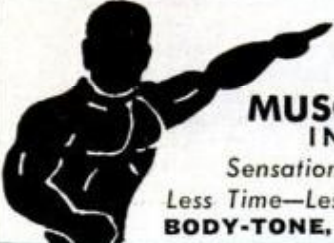


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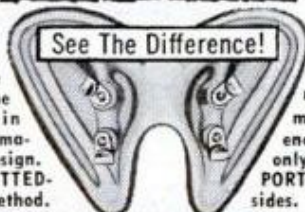
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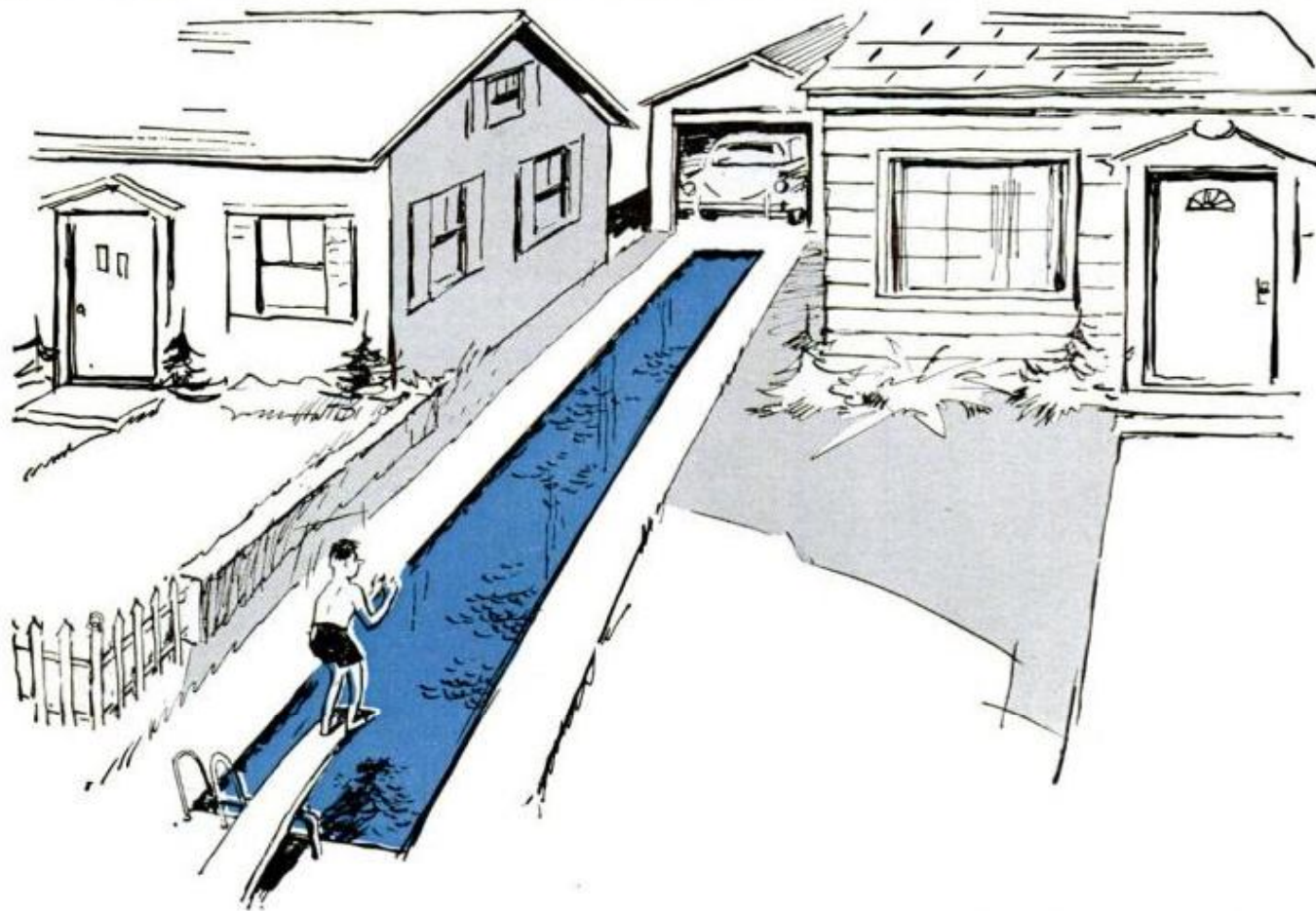
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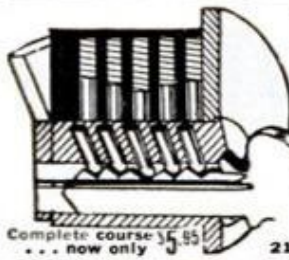
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NOVEMBER 1960

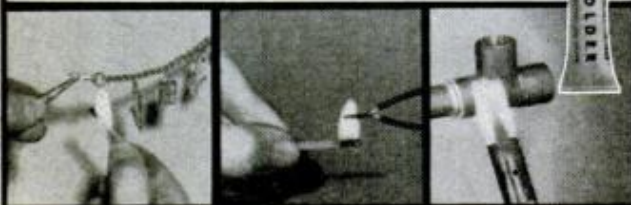
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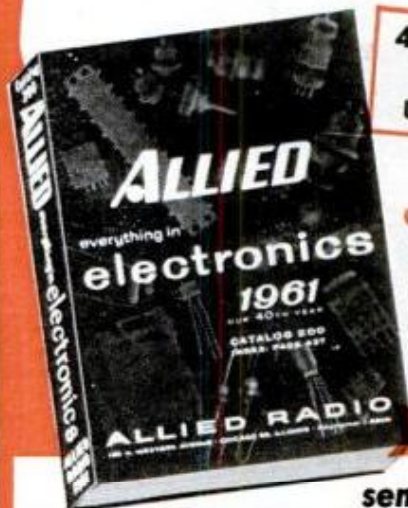
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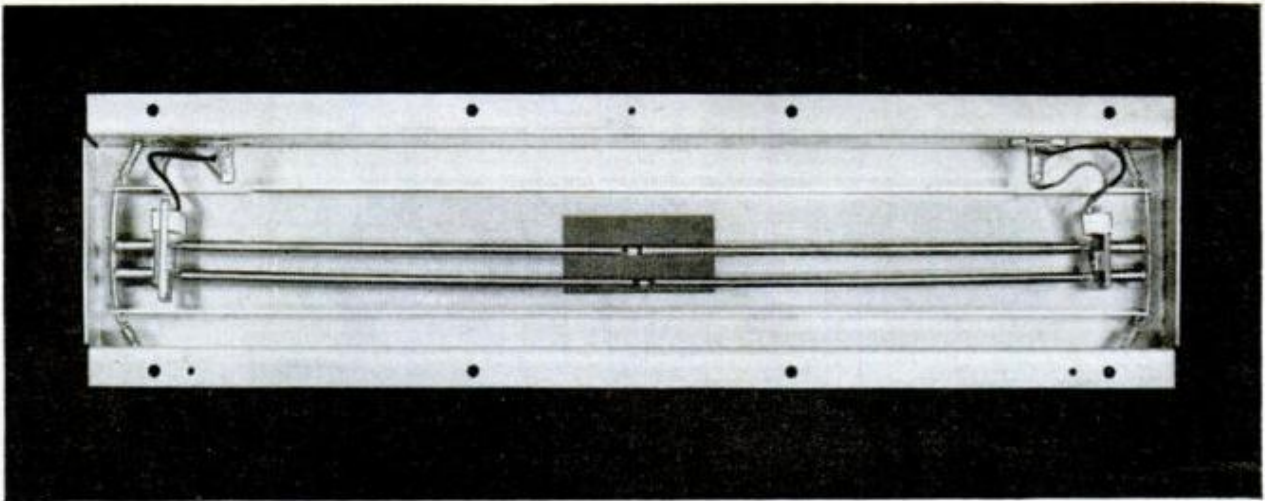
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NOW ADD REVERBERATION TO YOUR STEREO SYSTEM

By Otto Fried

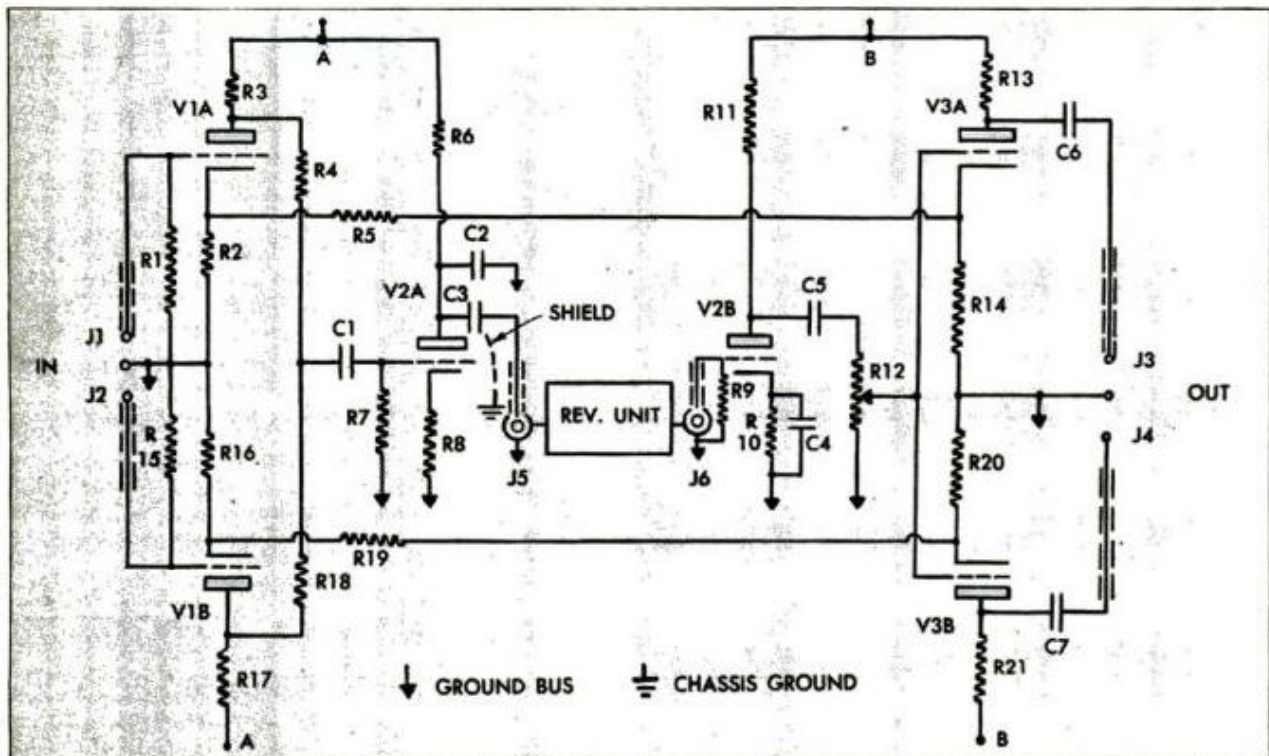
ACOUSTIC RESEARCHERS, musicians and many audio engineers appreciated the value of short echoes introduced into music recordings for many years. If we listen to an orchestra in an auditorium, our ears are subjected not only to the sounds propagated directly by the instruments, but also to the complex wave forms produced by the acoustics of the hall. The mathematical treatment of these phenomena is very difficult, and in many cases it

offers solutions that are only approximate.

We are going to concern ourselves with one important parameter of acoustics, and that is the short echo referred to as reverberation. Reverberation time is defined as that length of time required for a sound to decay 60 db. This definition can be found in any textbook dealing with the subject of acoustics, but it does not explain the effect on the listener. There is no doubt

(Continued to page 78)

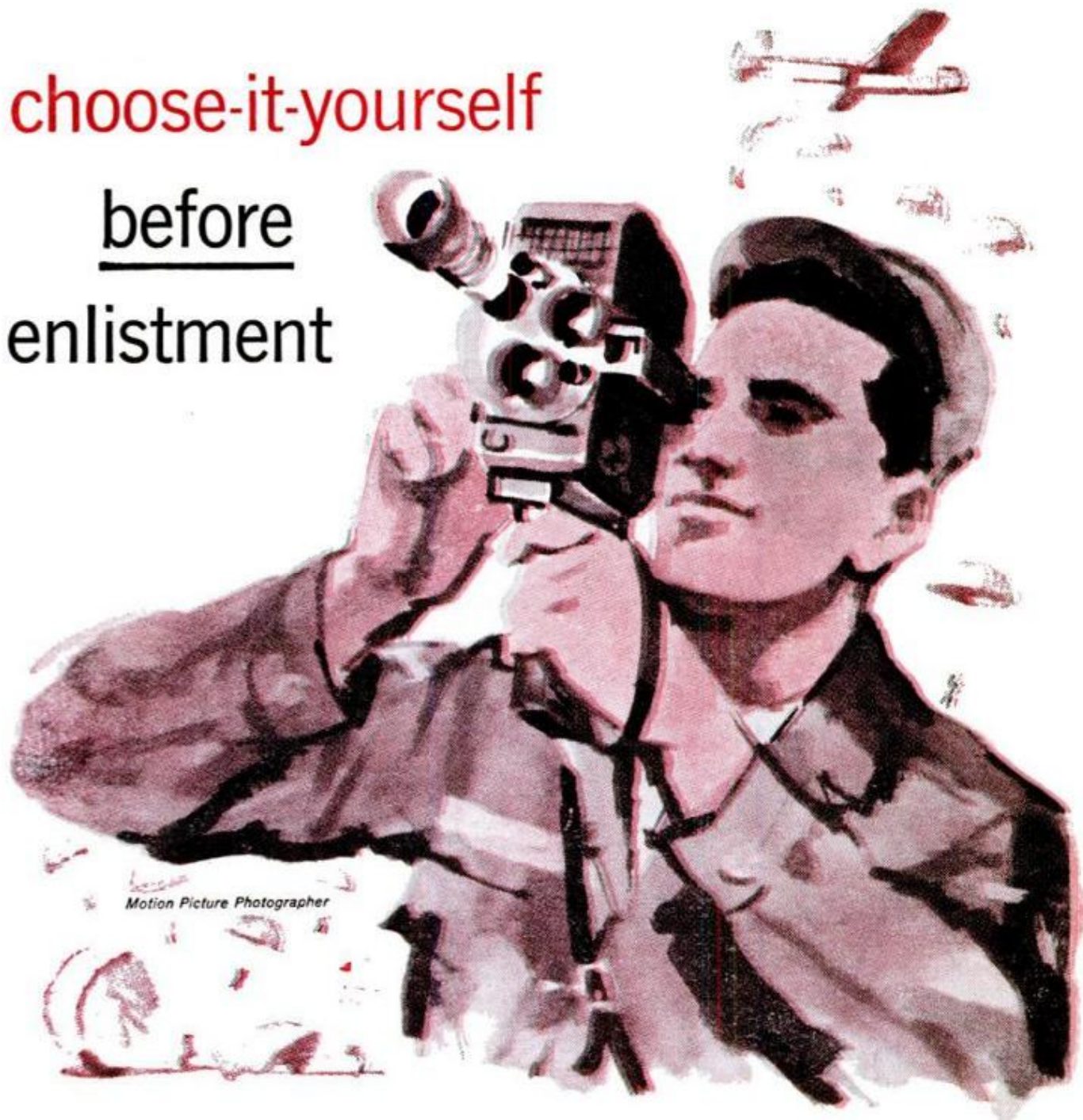
Schematic of amplifier system for reverberation unit. Above, reverberator used in many commercial systems



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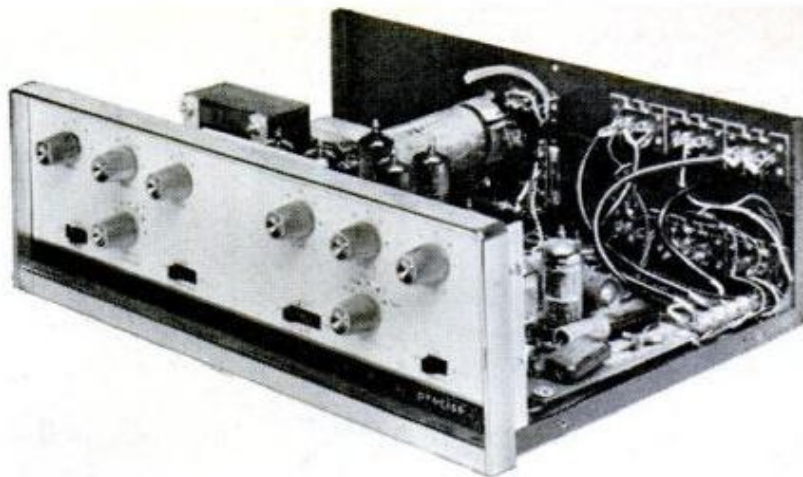
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It's up to you! The Army's new "Choose-it-Yourself" System lets you choose valuable training before you enlist. Here's how it works: **1. Choose** before enlistment. Choose your training from fields like Photography, Missiles, Communications, Construction, Automotives—and many more. **2. Qualify** before enlistment. Take aptitude and physical exams to qualify for the training you've chosen. **3. Know** before enlistment. If you qualify, you know you'll get the training you want. Your choice is written into your future Army record—guaranteed before you enlist. **Choose, qualify, know — this week!** Ask your Army recruiter to show you his complete list of available training fields.

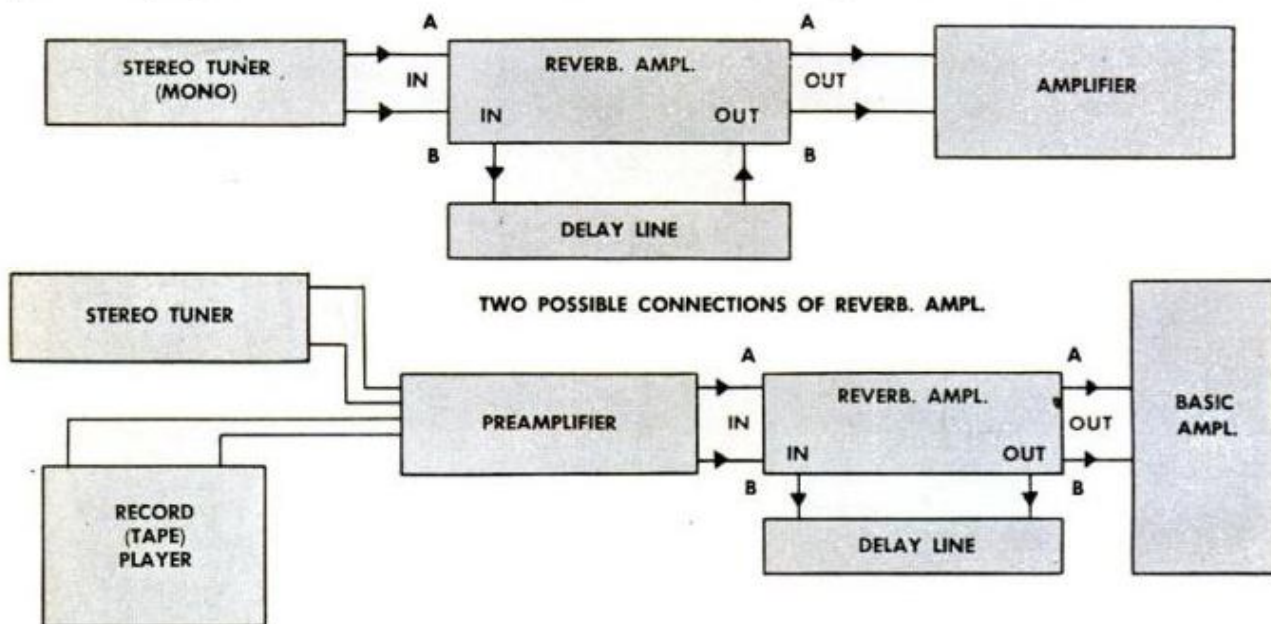
CHOOSE IT  YOURSELF VOCATIONAL TRAINING SYSTEM
US ARMY



Remove most of cone to modify speaker. Springs finish unit



Utilize unused input and output connectors on amplifier to install wiring for reverberation. Below, two possible means of installing system



that reverberation, when properly applied to your system (monophonic or stereo) will produce such realism, that many listeners will prefer the electronic reproduction to the "live" orchestra in an auditorium. Recording companies employ many different techniques to offset the effect of a "dead" studio, and there are many professional types of reverberating machines on the market. A simple method to introduce reverberation in your home recordings is to use two microphones. One of them picks up the source directly, and the other one is placed in such a way that it picks up the echoes produced by the room. Outputs of both mikes have to be properly mixed, in order to achieve the desired effect.

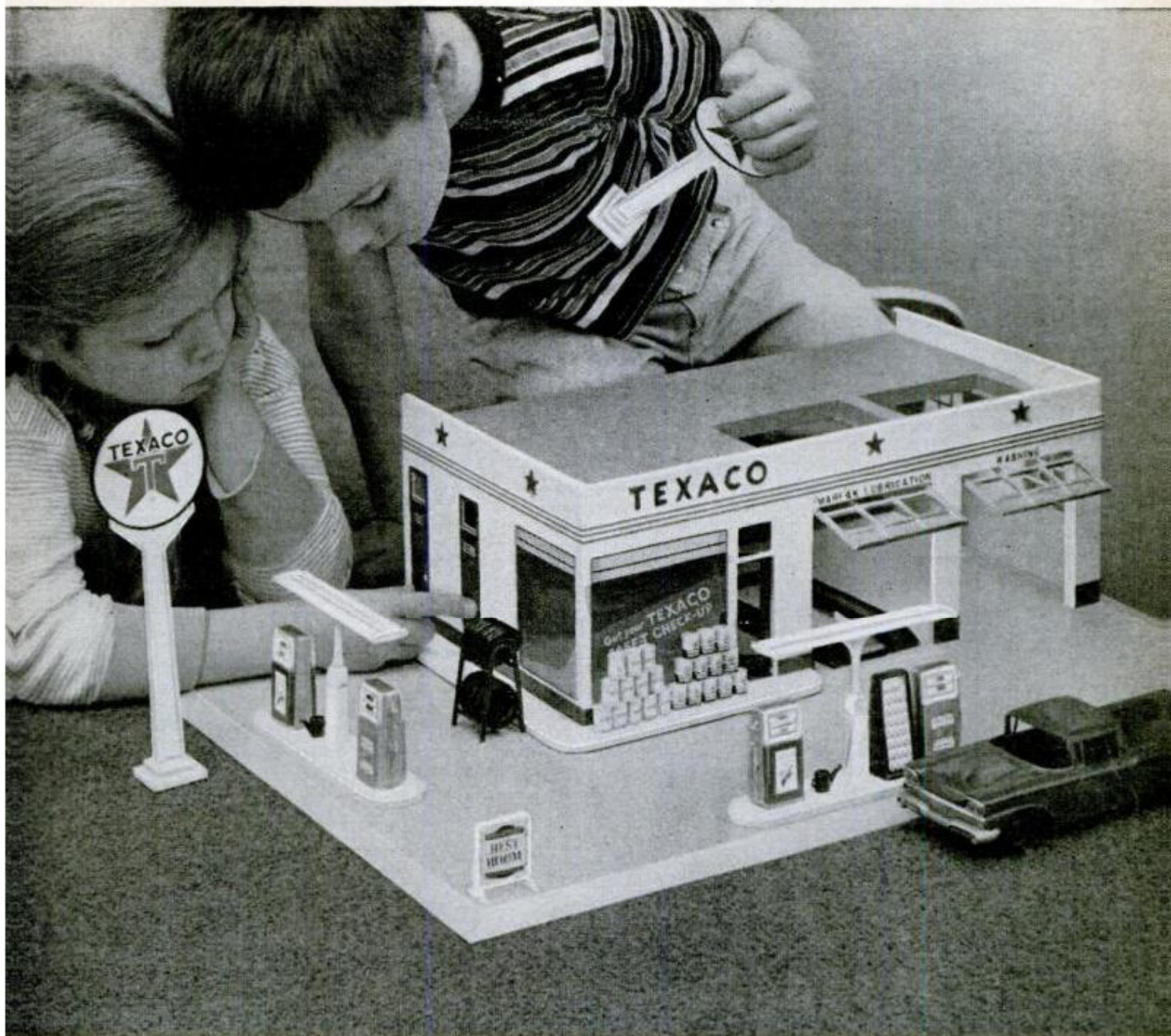
However, most of us depend on broadcasting stations or commercial recordings for a source of music enjoyment, and the following describes reverberation generators, which can be added to any hi-fi system. The first one consists of two 3-inch or 5-inch PM speakers, several ordinary springs and a small a.c.-d.c. amplifier. The

speakers with 3.2-ohm voice coils have to be modified in order to provide anchors for the springs.

Carefully cut out the cone around the speaker frame, leaving only a narrow strip of paper around the voice coil. This strip should not exceed 2 inches in length and 1 inch in width. Be sure that you do not damage the voice coil; we have found the razor blade to be an excellent tool for this operation. The next step is to prepare a small phenolic board about 1½ inches long, ¾ inch wide and 1/16 inch thick. Drill three holes along the center line, and insert #20 wire into each of them, forming a small loop on one side and flattening the loose ends of wire on the other side. The board is then glued carefully to the cone strip left around the voice coil. Be sure that none of the glue seeps between the voice coil and the magnet. The wire loops are on top of the board—the side with the loose ends is glued to the cone. Both speakers are mounted on a small metal L-shaped

(Continued to page 80)

Gift idea from Texaco—for now, for Christmas!



Big, authentic scale-model service station!

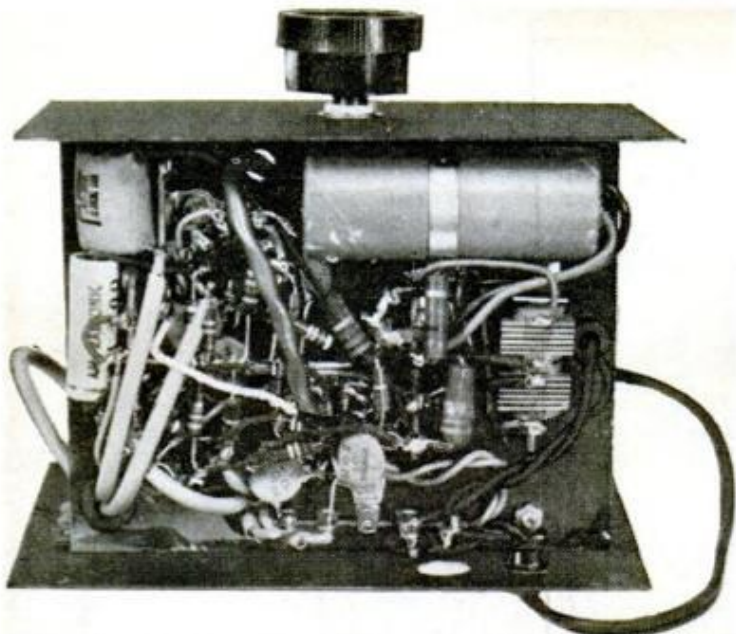
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Order now...lay away for Christmas. See your Texaco Dealer.

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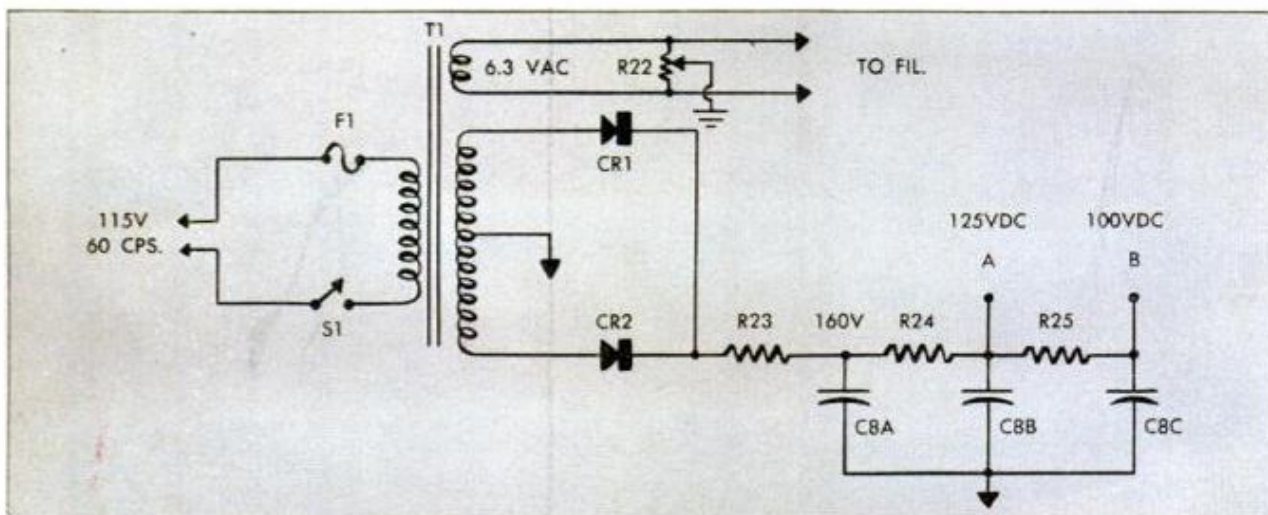


Under chassis view of amplifier unit. This will operate as well with either commercial or homemade reverberation units

PARTS LIST

R1, R15, R4, R18	1 Meg., 1/2 W
R2, R16, R10	3.3 K., 1/2 W
R3, R17, R13, R21	100K., 1/2 W
R5, R19	22K., 1/2 W
R6	6.8K., 1W
R7	82K., 1/2 W
R8	100 ohms., 1/2 W
R9	15K., 1/2 W
R11	47K., 1/2 W
R12	.5 Meg. Pot. linear taper
R14, R20	2.2K., 1/2 W
R22	100 ohms Pot. linear taper
R23	100 ohms, 1W
R24	3.3K., 2W
R25	33K., 1W
C1, C2, C5, C6, C7	.01 Mfd. disc
C3	.47 Mfd., 200V
C4	.068 Mfd., 10V or higher
C8	Electrolytic—40-20-20 mfd. at 250 V., d.c.
V1, V3	12AX7
V2	6CG7
T1	Power transformer, Stancor 8416
CR1, CR2	Selenium rectifier, 50MA.
S1	SPST switch on pot (R12) (optional—see text)
F1	Fuse, Slo-Blo, .25 amps. (optional—see text)
Chassis	Fuse, Slo-Blo, .25 amps. (optional—see text)
J1—J6	See text
Hardware, wire, etc.	Phono plug—see text

Recommended power supply diagram for reverberation amplifier. Switch S1 may be mounted on R12 or omitted entirely if unit is connected to switched convenience outlet on back of amplifier. R22 controls hum



One of many commercial reverberation devices available to add to your presently existing equipment. This unit can be connected between preamplifier and amplifier, providing complete reverberation in your home



(Continued to page 272)



PRUNES TREES



CUTS FIREWOOD



CLEARs BRUSH AND WEEDS

ONE McCULLOCH ENGINE



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This easy handling chain saw with its powerful 2-cycle gasoline engine cuts through a 9" tree in just 5 seconds . . . cuts that tree into logs just as fast. Takes Brushcutter, Weedcutter, Earth Drill and Paddle Bow attachments; straight bars up to 24". Weighs only 17 lb.

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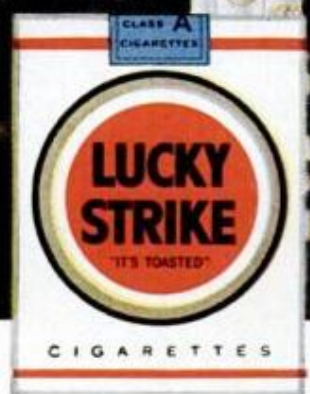
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POPULAR MECHANICS

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Four New "Medium Compacts" Join '61 Car Lineup

Aluminum engines, unit bodies, new suspensions and automatic transmissions are top new features for '61.



BUICK SPECIAL

Buick's new Special, like the other two new GM compacts, is based on the same 112-inch-wheelbase unit-construction body. Models are four-door sedan and four-door wagon. The Special is powered by a light, efficient all-aluminum V-8 of 155 horsepower, has new automatic transmission of unique "split-torque" design. Manual transmission is standard equipment.

PONTIAC TEMPEST

Beneath its crisp, conservative styling Pontiac's new compact Tempest crams the most imaginative engineering of 1961. There's the big, 130-horsepower slanted four-cylinder engine, a curved torsion bar drive shaft leading aft to independent rear suspension transaxle. A 155 horsepower aluminum V-8 is optional. Three-speed floor-shift transmission is standard.





Buick's big Le Sabre, Invicta and Electra have undergone a complete styling change as a result of a brand new body with improved seating positions, legroom and vision. Suspension is still by coil springs all around, but the torque tube has been replaced by a two-section drive shaft with four universal joints. Engines and Dynaflo are unchanged. Buick continues with its aluminum brakes.

BUICK



DODGE DART

A very thorough restyling job is the big news for 1961 from Dodge's popular Dart series. The wheelbase remains 118 inches, while width, length and height are virtually unchanged. Grille, hood, fenders, rear deck and all trim are new. Only the roof, glass area and basic Unibody and frame remain as in 1960. Basic engines are 135-horsepower slant Six and 361-cubic-inch V-8. Dart has joined other Chrysler Corporation cars in switching from generator to alternator.

Oldsmobile's version of the handsome new GM medium-priced compact, the F-85 shares its body in sedan and four-door station wagon styles with Pontiac Tempest and Buick Special. However, its 215-cubic-inch aluminum V-8 has Oldsmobile's own cylinder heads, pistons, carburetion and intake manifold as well as a light-weight version of the newly-redesigned Hydra-Matic transmission. The car is smaller than "full-sized" Olds but has room for six.

OLDSMOBILE F-85





LINCOLN- CONTINENTAL

Lincoln Division has put all its chips on just one series and two models for 1961, the Lincoln Continental four-door sedan and four-door convertible. With 123-inch wheelbase and 212-inch over-all length, (that's one inch shorter than the 1960 Ford), the Lincoln Continental is the first entry in what might grow into a "compact luxury" field. Car's performance is very high.

PLYMOUTH

Plymouth has dropped the familiar fin with a vengeance for 1961. On, and around, the unchanged shell of its unit-construction body, all-new sheet metal has given Plymouth a lower, wider look. Passenger compartment, engines and chassis are little changed. Flatter rear deck lid has permitted an enlarged trunk compartment. The standard V-8 engine has displacement of 318 cubic inches, is rated at 230 horsepower. The Six has 145 horsepower.



An all-new T-Bird, still a four-passenger two-door body in hard-top and convertible models, has been built around the big 430-cubic-inch V-8 engine of 350 horsepower. Fordomatic dual-range automatic transmission is standard. Body is now sleek, torpedolike. Windshield no longer wraps into front door opening. Front springs are mounted high in the unitized body. Steering column swings to right when car is stopped for easy exit.

THUNDERBIRD





OLDSMOBILE

Except for its big, 394-cubic-inch engine and the rear axle, the 1961 Oldsmobile is virtually a new car with a wider, box-type frame, brand new bodies and a redesigned, lighter version of Hydra-Matic transmission. Horsepower is up slightly from 240 to 250 on the Dynamic 88 and from 315 to 325 on the Super 88 and 98 models. Interiors have more room.

DODGE LANCER

Lancer is Dodge's lively and attractive new compact based on the successful unit body and chassis of Valiant. Basic engine is 101-horsepower slant six of 170-cubic-inch displacement. A 225-cubic-inch engine of 135 horsepower is optional. Two-door sedan and hardtop are available as well as four-door sedans and wagons. Buyer gets his choice of manual or automatic transmission.



PLYMOUTH VALIANT

Plymouth's Valiant has been changed slightly in appearance—just enough to let you know it's a '61. A two-door sedan and hardtop have been added to the four-door sedan and wagons. An extra-cost, high-performance version of the 170-cubic-inch slant six engine will be available. All models except the hardtop are available in "standard" or "deluxe" trim. Power steering and air conditioning are available at extra cost.

FALCON

In response to demand Falcon has been given a useful power boost for 1961 in the form of an optional 170-cubic-inch version of its current 144-cubic-inch six cylinder engine. Horsepower rating is 90 for the smaller engine, 112 for the extra-power job. Body and chassis are otherwise little changed, except for a neat new grille.





MERCURY

Mercury shares basic body and chassis with Ford for 1961 as well as its 292 and 352-cubic-inch V-8 engines, and, for the first time in Mercury's 21-year history, a six-cylinder engine. A unique variation of the coil-and-leaf-spring suspension system, exclusive with Mercury, uses movable rubber-bushed shackles to absorb ride harshness of rough roads.

PONTIAC

The senior Pontiacs for 1961 now have wider frames to match their wide tracks and mount their all-new bodies upon. As a result of this new, box-type frame, legroom is exceptionally good in both front and rear compartments. Wheelbases are now 119 and 123 inches. Seating positions, vision, entrance and exit have all been improved for 1961. The basic engine remains Pontiac's big 389-cubic-inch displacement V-8 of 215 horsepower.



LARK

There are more changes than meet the eye in the 1961 Larks. Hood and cowl have been lowered and flattened for improved driver vision. Dual headlamps are now on the Regal models. Rear quarter panels, rear deck, "C" posts and back lights have all been changed. Underneath the hood is an all-new overhead-valve six of 170-cubic-inch displacement and 112 horsepower. The 180 horsepower, 259-cubic-inch V-8 is, of course, still an option on all models.

RAMBLER

Most exciting change in the improved and facelifted 108-inch-wheelbase Rambler is the die-cast aluminum cylinder block on the 127-horsepower overhead-valve six-cylinder engine. Use of aluminum cuts 80 lb. from the engine's weight. Over-all appearance is improved by new grille, one-piece bumpers and new front-end sheet metal.





CHRYSLER

Chrysler retains the familiar fins of the Forward Look styling but takes on a different personality due to restyling of the front end including canted pairs of headlamps and a new grille. Added to the New Yorker and Windsor lines is a new, lower-priced Chrysler, the Newport, on 122-inch wheelbase with 361-cubic-inch V-8.



CORVAIR

Corvair has added a new four-door station wagon called the Lakewood to its coupe and four door sedan models. Also there's a new camper wagon, the Greenbrier, (see cover photo) and commercial vans and pickups on an entirely new 95-inch wheelbase chassis. The air-cooled rear engine is used on all models. Sedan and coupe luggage space has been greatly increased by moving spare tire to the engine compartment. Heating is by hot air.



COMET

A longer stroke, 170-cubic-inch version of the current Comet six-cylinder engine adds 20 needed horsepower to the 1961 Comet as an option for those willing to make a slight sacrifice in economy for the sake of livelier performance. This new engine should be especially welcome to station-wagon buyers. A new grille with horizontal bars and some changes in name plates and trim mark the only visible differences. Two-speed automatic transmission optional.



CHEVROLET

Bigger and better bodies with slightly smaller exterior dimensions are the big news for 1961 Chevrolets. Styling retains the "gull-wing" theme on the rear trunk area, but increases trunk's useful capacity very greatly. Frame, suspension and three basic engines; the six and 283 and 348-cubic-inch V-8s, are unchanged.

DODGE

The "big" Dodge for 1961 is one series, the 122-inch-wheelbase Polara, with five models; a four-door sedan, two and four-door hardtops, a convertible and four-door hardtop station wagon. Basic dimensions of interior and exterior of the Dodge unit construction body are unchanged. Restyling has changed the car's entire appearance making it look more compact.



RAMBLER AMERICAN

Seldom has a car been as completely restyled as the 1961 Rambler and yet retain its same engine, drive line and suspension on the same unit body and frame chassis. In addition to its two- and four-door sedans and wagons, the 100-inch-wheelbase American will offer a convertible around the first of the year. The new American is 5.2 inches shorter and three inches narrower.



FORD

The thoroughly restyled 1961 Fords are nearly four inches shorter and two inches narrower—good news for city drivers. Wheelbase remains 119 inches as do the basic dimensions of the passenger compartments. Ford has made a number of real improvements designed to ease maintenance and increase reliability. For example, chassis lubrication is needed only at 30,000-mile intervals. Brakes are self-adjusting, and lower body panels are galvanized steel.



AMBASSADOR

American Motor's Ambassador shows a considerably changed face with smaller grille and down-curved hood for 1961. Wheelbase remains at 117 inches and body shell is unchanged underneath the new front sheet metal. Powerplant is the 327-cubic-inch-displacement V-8 which develops 250 horsepower on regular grade gasoline.





CADILLAC

Cadillac has undergone a complete restyling for 1961 yet it manages to retain its typically restrained air of evolutionary change. The rear fender fins are much the same as on the 1960 models, yet the side panels from head to tail lamps have been completely changed, as has the grille. The limited-production El Dorado Brougham has been dropped, but the Sixty Special for 1961 has a "formal" rear quarter and smaller rear window. Roof lines for '61 have a new "knife-edge," somewhat continental appearance.



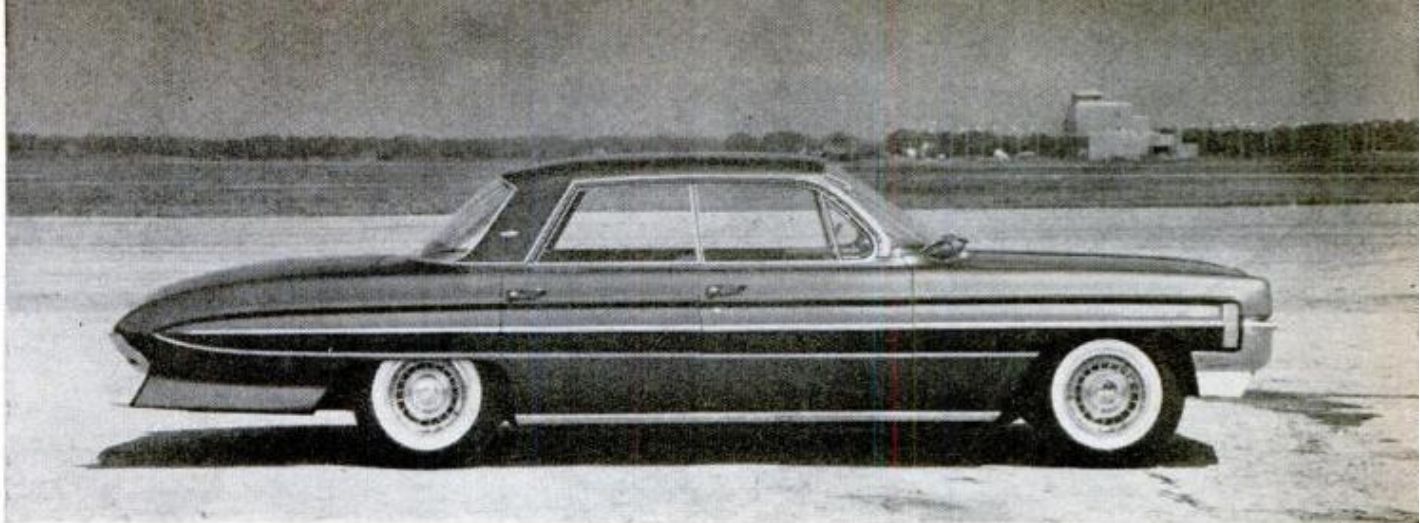
IMPERIAL

There are three model series of Imperials for 1961; Custom, Crown and LeBaron. The four-door hardtop is available in all three series; a two-door hardtop is offered in Custom or Crown and a convertible in Crown series. All models are powered by the 413-cubic-inch-displacement V-8 which develops 350 horsepower. Biggest change is in the styling of the front end with the chrome-plated, free-standing headlamps and new grille.

DESOTO

The 1961 DeSoto comes in two models, a two- and four-door hardtop, both on a 122-inch-wheelbase unit-construction body. The engine (and only one is offered) is a 361-cubic-inch V-8 with two-barrel carburetion. This engine has had its compression ratio lowered to 9.1 so that it may be operated on regular grade gasoline. Transmission is Chrysler Corporation's TorqueFlite automatic. Power brakes and power steering are optional extras.





Side view of Olds 98 four-door hardtop, above, shows entirely new lines. Note elimination of fins, wrap-around windshield and new roof and rear quarter treatment. Grille, below, is uncomplicated and attractive

New Looks for Olds in 1961

As in previous years Oldsmobile offers its three series; the Dynamic 88, Super 88 and the 98. The first two series are on 123-inch-wheelbase chassis with over-all lengths of 212 inches. Major differences between these two are interior trim and engine output. The Dynamic 88 has a 250-horsepower version of the 394-cubic-inch engine, while the Super 88 version is rated at 325 b.h.p., thanks to higher compression ratio and a four-barrel carburetor. Synchromesh manual transmission is available as an option to Hydra-Matic on the 88's. The 98, which shares the Super 88's engine is available only with automatic transmission. The 98 has a wheelbase of 126 inches and is six inches longer over-all, than the 88s. Most of this extra length has gone into the passenger compartment. All models are 3½ inches narrower than the 1960 Pontiacs and range from 3 to 5½ inches shorter over-all. At the same time interior dimensions relating to passenger comfort have been increased. Seats are higher. The tunnel is lower, headroom has been increased and the cars are much easier to enter or leave. Suspension is still by four coil springs, but linkages have been changed.



Rear treatment, above, shows down-curve of wide trunk lid on '61 Olds. Trunk has much more usable space than in previous models. Four-door station wagon, below, can be had with two or three seats





1961 Rambler Classic station wagon shows off the principal area of restyling, the front end. There's a new hood, new front fenders, newly sculptured door panels, side trim and new one-piece bumpers

No changes have been made in the window and roof area of the '61 Rambler Classic, right, yet it has a much different appearance. No change made in dimensions



Restyled Rambler Gets Aluminum Six

Biggest single change on the 1961 Rambler, now dubbed the Classic series, is its new aluminum six-cylinder engine of 195-cubic-inch displacement. This engine has the same basic design as the overhead-valve, cast-iron six that it succeeds.

The cylinder block is die cast with iron "sleeves" or cylinder liners. The cylinder head is a cast-iron alloy. Weight saving over the all cast-iron engine of 1960 is 80 pounds. Horsepower of the six remains unchanged at 127. The 200-horsepower V-8 is optional.

Ambassador V-8 Has Changed Appearance

The 117-inch-wheelbase Ambassador for 1961 continues with much the same unit construction body and chassis as used in 1960. Engine is the same 250-horsepower V-8 of 327-cubic-inch displacement. This powerplant has a compression ratio of 8.7 to 1 and is equipped with a two-barrel carburetor and single exhaust. Optional equip-

ment is a four-barrel carburetor, 9.7 to 1 compression and a dual exhaust system. With the optional "power pack" the engine develops 270 horsepower. Ambassador is equipped, as are all other American Motors cars, with new ceramic-coated mufflers that are guaranteed for the life of the car. Synchronmesh transmission is standard.



A new down-curved hood and new, forward-thrusting fenders frame the smallish grille of '61 Ambassador



Rambler American four-door station wagon, a new body type for 1961, packs a lot of space on its 100-inch-wheelbase chassis. Area of glass and size of rear opening have been much increased for '61



Five-passenger convertible, left, is brand new body for Rambler, has power-operated top, choice of 90 or 172-horsepower engines. Legroom in sedan, right, is adequate for six-footers with front seat fully back

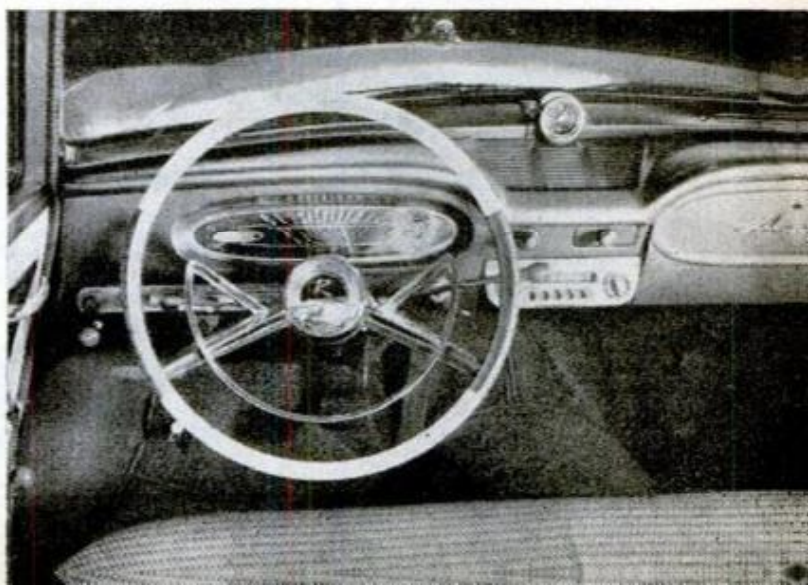
Rambler American: After 10 Years, a New Shape

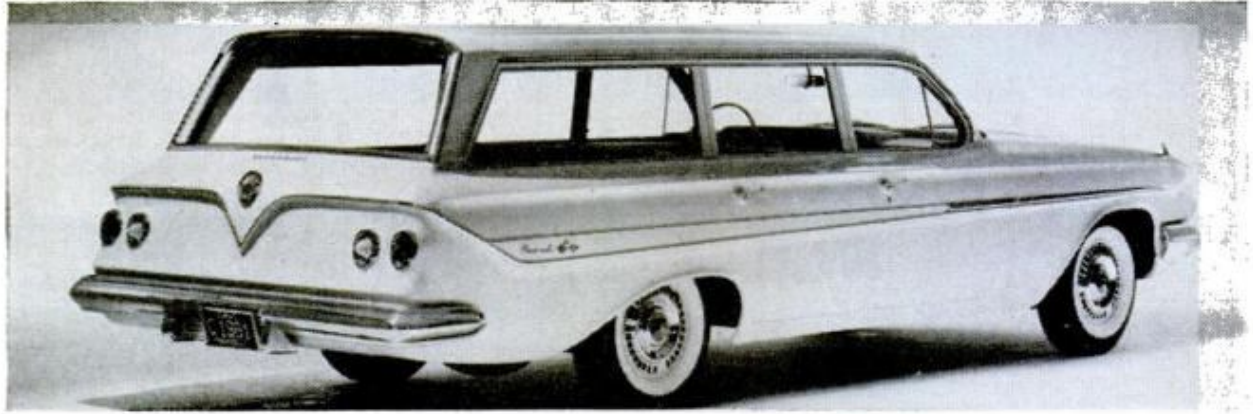
American Motors' chief Stylist has done one of the great glamorizing jobs of all time on the friendly, familiar roly-poly shape of Rambler's compact American.

The basic underframe of the unit body, those structural members that comprise the "chassis," are unchanged as are the engine, suspension and driveline parts. However, every inch of the exterior from bumper to roof pan is totally new, as is the instrument

panel on the inside. Among the improvements resulting from the new body design are a larger windshield giving much better vision over the flat hood, full width rear window in the sedans and a larger rear opening on the station wagon. The trunk, too, is larger and more accessible as a result of the redesigned rear end. Two new models, a four-door station wagon and a convertible have been added to the line.

American's trunk, below left, is larger, and much easier to load due to larger lid. New instrument panel, below right, is topped by deeper windshield, which gives much improved forward vision over hood





Impala Sport sedan, top, has newly contoured roof line. Nomad wagon, above, has rearward-facing third seat

Chevrolet Gets All-New Bodies

The 1961 Chevy has entirely new bodies on its chassis which is refined but basically unchanged from the 1960 model. The new bodies are smaller on the outside yet have approximately the same room on the inside with some gains in headroom, ease of entrance and vision.



Restyled Rear End for Corvette

Maintaining the same basic chassis used on the 1960 model, Corvette has a newly styled rear quarter and deck area. Rear deck contour has been raised to increase luggage room. Mechanically, the car remains unchanged with the 283-cubic-inch V-8 engine coupled with three or four-speed manual or automatic transmission.



The '61 Corvette, below, retains familiar front end with grille changes. Rear end, right, is higher, more integrated





Relocating tire in engine compartment was made possible by eliminating large, central air cleaner



With tire removed and gas tank reshaped, Corvair's front trunk becomes much larger and more usable

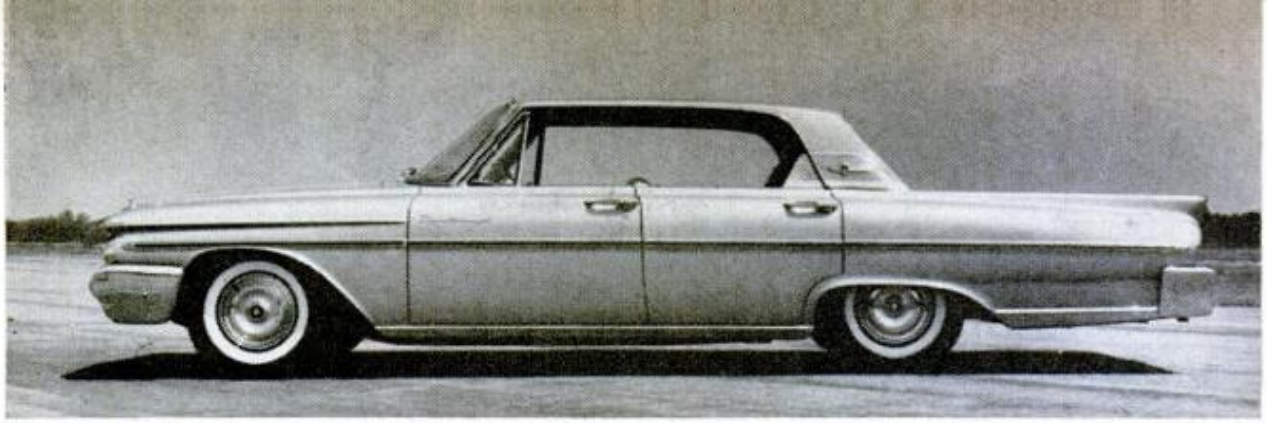
Refined Corvair

The rear-engined Corvair has received some important improvements as well as two new station wagon models. Luggage compartment on sedans and coupes has been much enlarged by moving front panel forward, changing shape of the gas tank and moving spare tire to engine compartment in the rear. To make this possible the tall, single air cleaner in center has been replaced with two lower ones. Gasoline heater has been replaced by a built-in, forced hot-air system with booster blower. Engine warmup is much improved due to new recirculation of air in engine compartment. The Lakewood, four-door station wagon has engine beneath rear cargo deck.

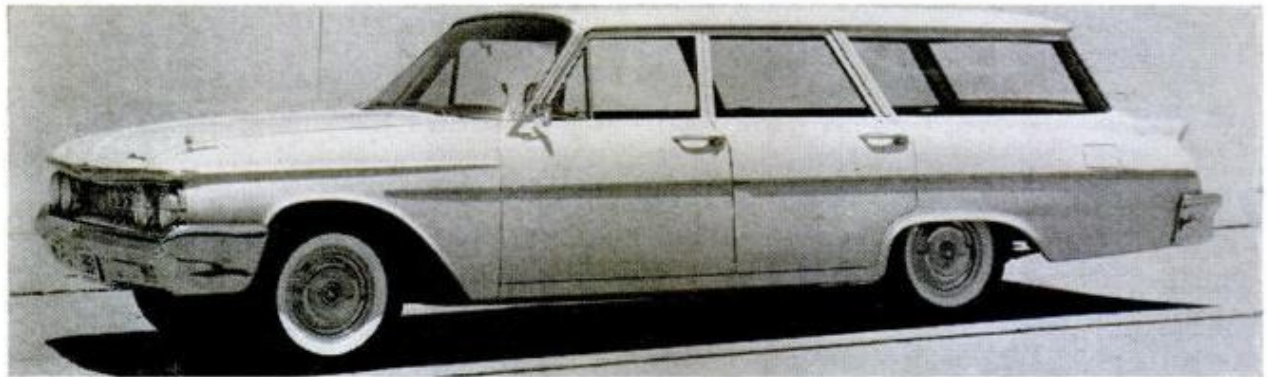


Corvair's new wagons, six-passenger Lakewood, top, and nine-passenger Greenbrier, above and below, are powered by space-saving rear engines





Mercury four-door hardtop, above, has cleaner lines than '60 model plus Ford "trade mark" roof line. Four-door wagon, below, can be ordered with optional third seat. Wagons can be had with six or V-8 engines



Smaller Mercury Has New Bodies, Many Improvements

Although its wheelbase has been reduced from 126 inches to 120 inches and over-all length from 219 to 214, the '61 Mercury has as much or more room inside than its predecessor. Entrance and exit are much improved too, due to the fact that rear door openings on four door models are wider and the new windshield no longer wraps back into the front door opening. For the first time this year Mercury will be avail-

able with a six-cylinder engine, the same 223-cubic-inch, 145-horsepower unit used by Ford. Other engines will be the standard V-8 of 292-cubic-inch displacement, the 352-cubic-inch V-8 and a special option of a 390-cubic-inch engine. The '61 Mercury's ride is improved by means of unique "cushion links" at front pivot of lower front suspension control arm and at the front of the rear springs.

Roomier, More Comfortable Bodies for Cadillac

As a result of completely new bodies for 1961, Cadillac offers easier entrance and exit and greater comfort. Wheelbase at 129½ inches is half an inch shorter, while over-all length is three inches less at 222 inches. Tops of door openings are higher, sills are narrower and "dogleg" corner of windshield has been eliminated. Rear doors are six inches wider and swing open seven inches further than on 1960 models. Head-room in the four-window sedan and the

coupe has been increased by two inches. Tunnels in front and rear compartments of all models are lower due to changes in position of engine and transmission. The Sixty Special four-door hardtop sedan is now the top of the line as the Eldorado Brougham has been dropped. Seating comfort has been improved by lowering of the front floor, giving greater "chair height." Chassis lubrication has been eliminated for 1961. Engine remains the same.

Cadillac Sixty Special, below, is leader of the '61 line, has special "formal" roof all its own





Profile of the '61 Lincoln Continental, above, shows its long hood, and deck contrasted to short roof area or "greenhouse." Rear view, below, left, has T-Bird look. Instrument panel, glove box, right, are wood



Lincoln Unwraps Compact Luxury Car

The 1961 Lincoln Continental may be the leader in a new trend toward expensive, top-quality luxury cars that are not the largest passenger cars on the highways. The new Lincoln Continental at 212 inches over-all, is 15 inches shorter than the '60 Lincoln. Wheelbase is down from 131

inches to 123. Height is down from 56 to 53 inches and width from 80 to 78 inches. In spite of these reductions which make the Lincoln actually smaller than 1960 Fords, the interior dimensions are almost unchanged. Models are four-door sedan and four-door convertible.

All-New Body for Thunderbird

The '61 Thunderbird is virtually a new car except for its 390-cubic-inch displacement V-8 engine and Cruise-O-Matic automatic transmission. Exterior dimensions of 205-inch length, 52½-inch height are unchanged, as is the 113-inch wheelbase. The new body has a rounded, "torpedo" look and is roomier inside, although the seating capacity remains limited to four adult passengers.

Thunderbird convertible, below, is smoother-lined, looks lower. Steering wheel, right, pivots for easy exit





The new Lark two-door wagon, above, is one-inch lower, looks longer due to raised side trim. Regal hard-top, below, in profile shows new, flatter hood and rear deck. Cutaway, right, shows Lark's new OHV Six



Restyled Lark Has New Engine

At first glance the familiar lines of the '61 Lark might lead one to think that it was little changed from the '60. Closer inspection reveals a new hood, flatter cowl, larger windshield, lower (by one inch) over-all height, dual headlamps (on Regal models), restyled side trim, changed rear quarter of roof, new, more attractive backlight glass and a new rear decklid. Under the hood is a brand new Six.

Bucket Seats, Floor Shift for Hawk

Studebaker's perennial favorite, the Hawk sports coupe, remains basically unchanged on its 120-inch-wheelbase chassis. Engine is Studebaker's 289-cubic-inch V-8 rated at 210 horsepower (225 with four-

barrel carburetor and dual exhaust). New for '61 is an excellent four-speed, synchromesh transmission nicely matched to the engine's power. New also, are deeply upholstered bucket-type front seats.





Pontiac's Tempest has clean, uncluttered sculptured lines, differs from other GM compacts in that it has 15-inch wheels instead of the 13-inch wheels used by Olds and Buick. Car has typical divided Pontiac grille

Tempest: Pontiac's Stylish Four-Cylinder Compact

Based on a new unit body-chassis of 112-inch wheelbase shared with GM's other new compacts, the Tempest breaks with engineering tradition with its four-cylinder engine, curved, torsion bar driveshaft and independent rear suspension-differential-transmission combination known as trans-axle. Vibration, the past enemy of four-

cylinder engine smoothness, is kept to a minimum by the extra-sturdy block and crankcase of the big four, and is isolated from the body by widely separated rubber mountings; two at the engine and two back at the transmission. The new engine develops 110 horsepower with manual transmission, 130 with automatic.

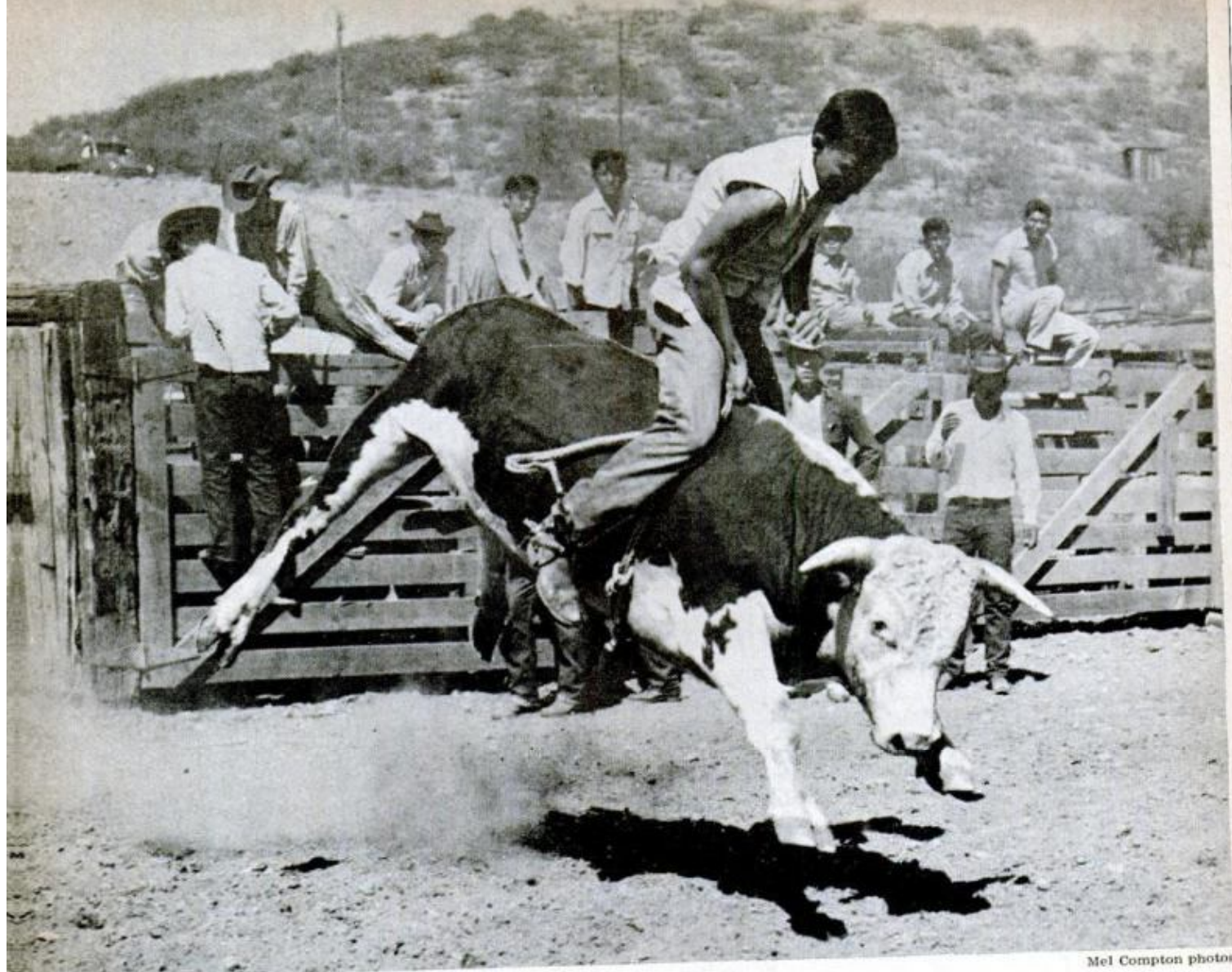
New Shape for the '61 Pontiac

The "senior" Pontiacs have new and completely restyled bodies yet manage to keep a distinctly "Pontiac" flavor to their looks. All models are four inches shorter and 2½ inches narrower. Wheelbases are 119 inches (down from 122) on Catalina and Ventura series; Star Chiefs and Bonneville are 123, (down from 124 inches). Wider frame provides lower floors for better seat height and two inches more headroom. A two-section driveshaft with double center universal joint has reduced tunnel height considerably. Front suspension is newly designed as is rear coil spring suspension with four, rubber-bushed links.



Grille on larger Pontiacs is two-section style with recessed, shadow-box grillework, above. New roof line on Bonneville, below, is crisp, knife-edged





Mel Compton photos

Kid-Size Rodeo

Grand entry parade at one of Arizona's junior rodeos—many horses come from rodeo-riding parents



STANLEY ROSSON



By Thomas E. Stimson, Jr.

Kids in the 13-17-year-old class ride full-sized steers, above left. Five-year-old's mount, above, is to scale

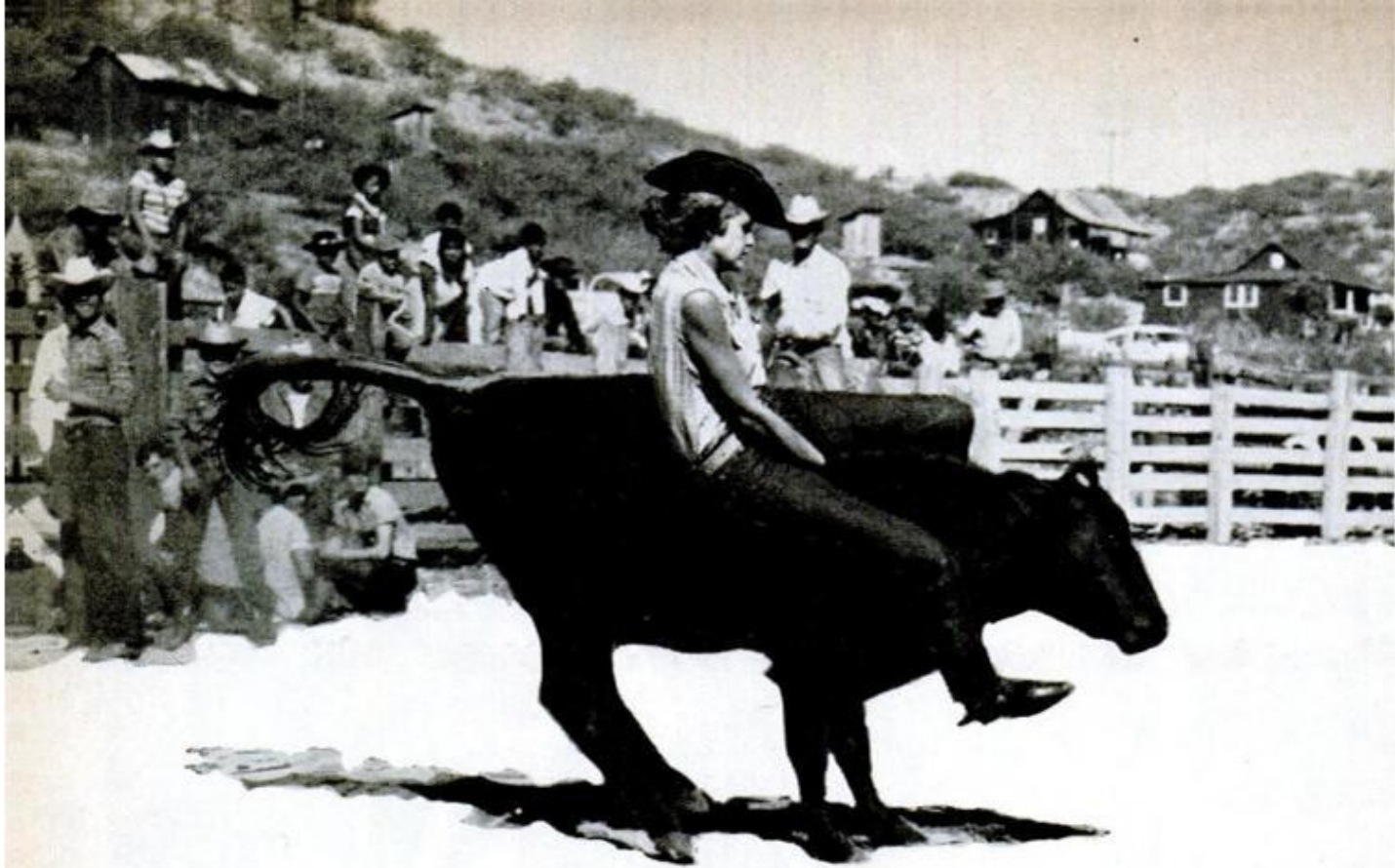
PROFESSIONAL COWBOY rules don't apply at scores of rodeos in the West these days, for kids (from five years up) are the contestants while their friends and relatives fill the seats in the grandstands.

When a seven or eight-year-old comes charging out of the chute on a white-face calf or a wild colt, with his face in a scowl and both hands clutching the surcingle strap, he's on top of the world—but the chances are he won't stay there long. In the next few seconds he's apt to be thrown or, more likely, ignominiously lose his balance and fall off. If he sticks it out for eight seconds he wins this go-round and gets to do it all over again the next day. If he's thrown and plows up dirt he'll need a bath and that's about all. The ground in the arena is soft.

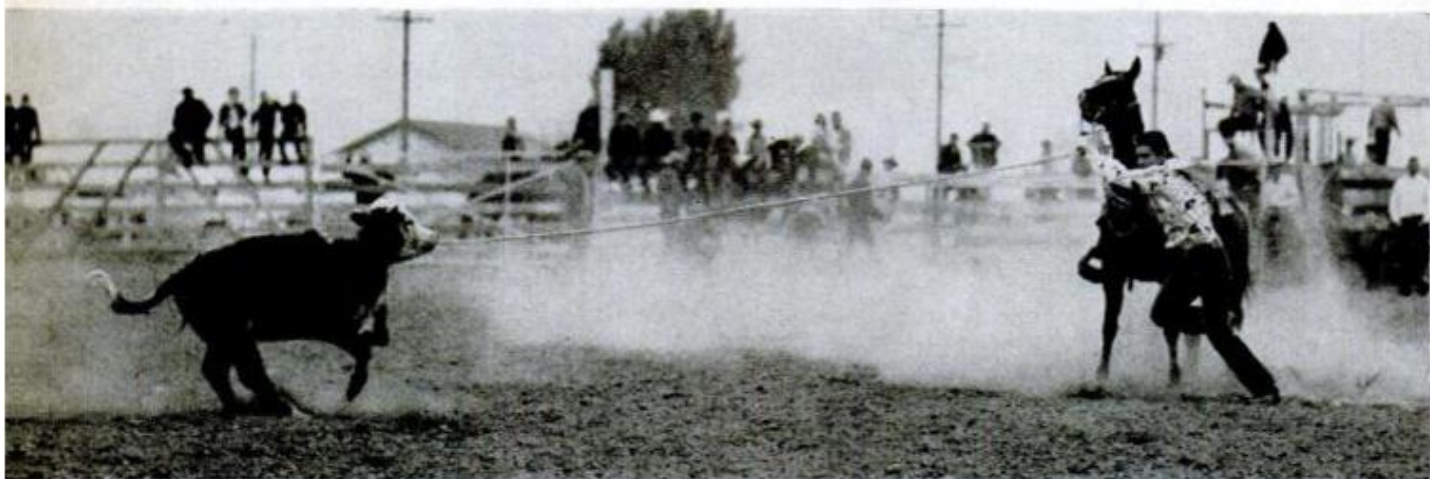
Junior rodeos got their start in 1932 when Charles A. Whitlow, Sr., Arizona cattle rancher, staged a competition for his son and several dozen school mates. The PTA milk fund in the town of Florence was running low and the rodeo was to raise money

Just like dad, a small rider spurs his steer for a better ride





Caught by a fast camera, girl steer rider comes off sideways at the end of a violent buck. Of those who manage to stay aboard for eight seconds, the rider who got the most spirited ride is selected the winner



Calf roping (above) tests boy and horse alike, for the roping horse must hold a tight rope on the calf until the boy throws him. Below, barrel racing tests the ability of horse and rider to pivot and run—fast





for it. The show was a big success and since then the Florence "Junior Parada" has been a big annual two-day event held during "Parada Weekend," the weekend after Thanksgiving Day. Charley Whitlow still acts as managing director, with the Pinal County Sheriff's Posse running the event. This year's show will be held November 26 and 27.

Ranchers and professional cowboys serve as officials. Gene Autry, the cowboy movie star, usually is on hand to award his "all around championship" belt to the junior cowpoke who wins that title. Other prizes are donated by local business men. There's a pre-rodeo parade downtown, a grand entrance into the arena, and printed programs listing the competitors and events. Two school bands and the band from the local prison keep spectators entertained between events.

Of the more than 150 contestants the majority are youngsters who live in Florence and the surrounding area. Possibly a third of them come from farm and ranching families. There's apt to be a handful of hard-riding youngsters from out of state and a scattering of tourist children. About the only formalities are the filling in of an entry blank ahead of time and possibly paying a dollar entry fee that goes for renting the rodeo stock.

Rules for junior rodeos vary in the different areas but in general there are two divisions: from 5 years through 12 years

Where'd that horse's head go? An older junior dismounts against his wishes in the bareback bronc riding event. Flanking strap, cinched around the horse just ahead of his hind legs, makes him buck

Another older junior gets a good ride coming out of the chute on a wild colt. Fresh from the range, the colt has never been ridden, and needs no flanking strap to make him want to get rid of the rider





Out of the chute on a wild brahma steer, above, youngster sticks tight. Below, rider loses a stirrup but stays aboard



and from 13 years through 16. Today there's a move to break the "junior juniors" into two classifications, from 5 to 8 and from 9 to 13, just to give the youngest kids a better break. Prizes are awarded liberally with a championship in each event.

Ranch youngsters have the edge in the roping events because they have had the most practice and because they usually can borrow a trained roping horse from a parent. Sometimes the same horse is used by several contestants in the same event. A roping horse is trained to charge after a running calf, then set all four feet and slide to a stop as soon as his rider ropes the calf. The horse then backs off to hold the rope tight while the rider dismounts and runs to the calf, throwing it and tying three legs with the pigging string he carries in his mouth. A good junior roper completes the job in 15 to 18 seconds, just about as fast as a professional.

Team roping often is performed by a father and son. Both contestants spur after a running steer and the header throws his loop over over the animal's head. The heeler ropes the steer's hind legs and then both horses separate to

(Continued to page 244)



Landing on the plowed arena floor isn't as bad as it looks — injuries are rare

Deluxe Golf Cart Is Air Conditioned

Probably the ultimate in golf-cart design, the Brannon Brrr-Buggy built by Joe Brannon, of Phoenix, Ariz., features a three-horsepower automobile air conditioning unit. The engine, transmission, and rear axle are from a Renault automobile. The cart will run Brannon to the links at 60 miles an hour, but gears down to a quiet 17 on fairway straightaways.



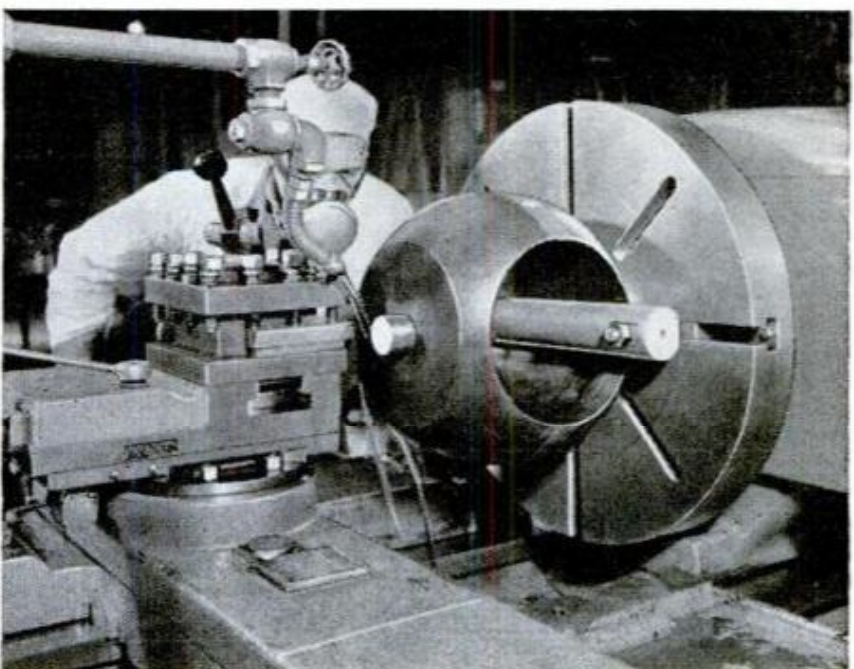
Drive-In Post Office

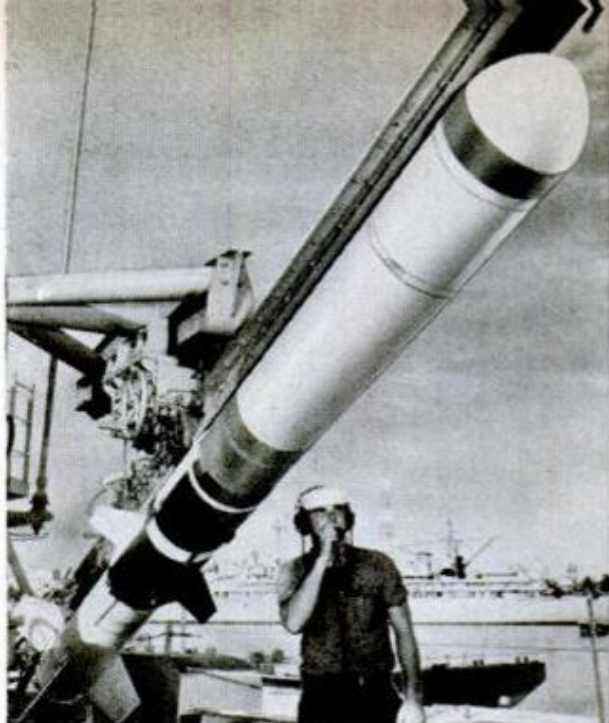
You can transact your post-office business in Luton, England, almost as fast as you can say "sports car." The first of a number of self-service, drive-in post-offices has been opened alongside a road there, attracting customers who like to do things in a hurry. Coin-operated, the machine that comprises the wayside office provides stamps, post cards and stamped envelopes. The letter box has an opening large enough to catch letters tossed toward it by drivers who are getting ready to roll.



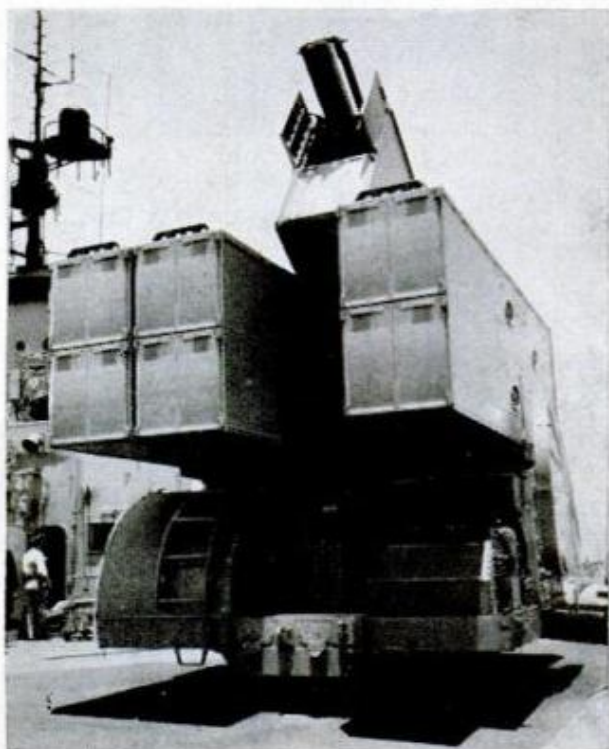
Uranium Ball For Reactor

Dressed in flame-protective caps and gowns, and wearing respirators, a team of machinists worked six days to machine a 500-pound uranium ball into a valve. The ball has a 10-inch bore to admit contaminated uranium fuel-rods from the core of a new reactor. When the rods are in the bore, the ball will be flipped over, dumping them into a wheeled cart. The ball then becomes a radiation shield. Machining was tricky as uranium has a low ignition point.





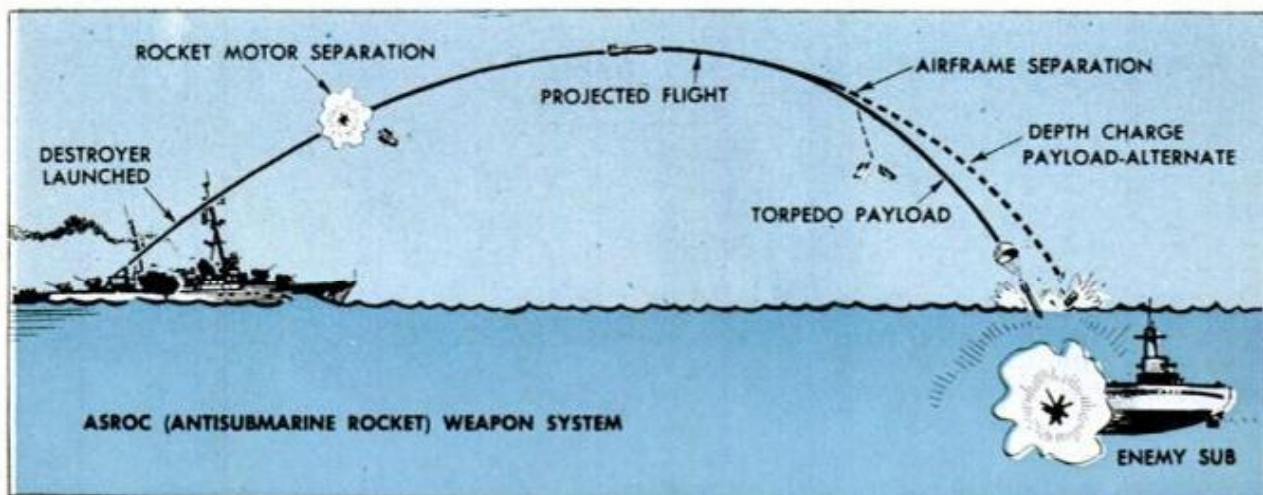
Fifteen-foot ASROC, with torpedo payload, is ready for loading into launcher aboard sub-chaser (left). At right, combination missile-torpedo is fired in tests off Florida Keys. Missile weighs 1000 pounds



Flying Torpedo

Named ASROC (for antisubmarine rocket), the Navy's newest weapon is a combination missile and torpedo or depth charge. An enemy sub is first tracked by sonar; a computer charts its course, range and speed and aims the launcher. The missile is then fired in the usual manner, following a ballistic trajectory to the target area. During flight, the rocket motor and airframe drop off. If the payload is a torpedo, it is eased into the water by parachute and locates its target with an acoustical homing device. If the payload is a depth charge, it sinks into the water and detonates at a predetermined depth. The missiles are loaded on launchers that can handle eight at a time, thus allowing combinations of torpedo and depth-charge payloads. The missiles can be launched in any direction without the ship changing course.

Launcher (left) holds eight missiles in separate compartments, fires in salvos. Chart shows sequence



Worldwide Adventure— Person to Person

By Edwin L. Chinnock

Staff Member at the Holmdel Research Laboratories of Bell Telephone Co.



ON A sweltering evening last July, in the hinterland of the new and still savage Congo Republic, a heavy-set Belgian sat down before a curious, homemade device and clamped on a pair of earphones. Pausing for a moment to wipe the perspiration from his brow, he noted that the native drums had increased their tempo. His anxiety aroused afresh, he began tapping nervously on the telegrapher's key in front of him: "This is OQ4XX. This is OQ4XX, calling someone—anyone! We are desperately in need of help. All official communication has been disrupted. We have here five women, eight children and four men, and we have been cut off for days. The situation is now critical. Two of the women have been raped and need immediate medical attention." After giving his location and signing off, the Belgian in that faraway country could only hope that his message had been heard.

It had—in Leopoldville. Within hours, Belgian paratroopers arrived at the isolated farmhouse, and two days later the anxious father was informed by other "telegraphers" in Belgium that the women and children were now home, safe and among friends!

Just six months earlier, when Fidel Castro was ranting about "perfidious American leadership," a call for help was picked up by 17-year-old Walt Murray of Long Beach, Calif. A young girl in a remote section of Cuba had been stricken with an acute case of hydrocephalus, or "water on the brain." What was needed and quickly was a special valve that could drain the excess fluid from the brain.

Walt immediately interrupted a big traffic network and passed on the emergency message. It was relayed to West Hartford, Conn., then to a Boston firm which dispatched the necessary equipment. So, at a time when Cuban-American relations were at a new low, there was at least one Cuban who felt nothing but affection for the "Yanquis."

Walt Murray and the Belgian in distress are not isolated examples. They belong to

a band of people who each day and night live the greatest person-to-person adventure in the world. They are the amateur radio operators, the dedicated "hams"—an imaginative band of 300,000 men, women and children, scattered over the globe. At the touch of a key or with a soft word spoken into a microphone these businessmen, scientists, students and housewives reach around the world, ignoring the age-old barriers of race, language and distance.

Amateur radio is the only hobby provided for by national regulations and international treaty. And few hobbies offer such a chance for adventure, for becoming a full-scale hero—and a way to help in bringing the peoples of the world a little closer together.

Anyone can become a "ham" radio operator.* A basic "rig"—receiver, transmitter and antenna—sells from \$50 in do-it-yourself kits all the way up to \$50,000. The average "rig" usually runs about \$150 in second-hand gear purchased from a mail-order house or a local radio shop. If you want to send by voice (about 50 percent of the hams do) it will cost more—\$250 is average.

To get a license, every U.S. ham must pass FCC tests. Several grades of licenses exist, each requiring a knowledge of the regulations and the ability to send and receive international Morse code. The simplest license—the novice class—requires only a five-words-per-minute code test, while the extra-class license test is so difficult that some commercial radio operators have failed it.

Whatever your proficiency, there is usually little difficulty in making yourself understood. The international "Q" signals cover a multitude of questions and answers: anything from "QTR" which in any language means "What is the correct time?" to "QTH" (What is your address?) and "QSG" (Have you a doctor on board or nearby?). In addition, hams have, over the

(Continued to page 286)

*For information on How to Become a Radio Amateur, write to the American Radio Relay League, West Hartford, Conn.



By Jim Whipple



Rambler's die-cast aluminum engine block shows the way to higher production rates, lower costs

One "wave of the future" in automotive engineering lies under the hood of the 1961 six-cylinder **Rambler Classic**. This is the die-cast aluminum engine block which weighs only 59 lb. Almost all of the rest of the engine remains unchanged from 1960, with cylinder head of cast iron alloy and other iron and steel parts.

The engine's displacement and horsepower remain the same, so why, you ask did **American Motors** go to die casting for a total weight saving of only 80 lb.? (Die casting is the method of fabrication where molten aluminum, or a similar alloy, is forced into water-cooled steel molds almost instantaneously under terrific pressures.)

With this method of production, a complete block can be cast from molten metal in mere seconds with no time out for core making or removal of casting sand. Here lies the real reason for aluminum engines; cost saving, far more important than weight saving to the manufacturer.

American Motors still uses the cast iron cylinder head and many other iron and steel parts, because the cost of tooling up for the die casting process is extreme.

Thanks to the compatibility of the aluminum block and the cast iron cylinder head **American Motors** is able to move into die-casting gradually and spread the cost of tooling over several years' production.

Newly-designed rear axles are next on the list of engineering changes to appear on Detroit cars. In search of an even better ride and surer handling, at least one of **GM's** divisions is road testing a prototype independent rear suspension in a conventional "big car," front-engined chassis. Between the differential and the engine this car uses what seems to be **GM's** solution to the drive-line problem; a two-piece drive-shaft with double universal joint in the middle.

This prototype independent rear suspension is of the coil-spring and swing-axle type similar to that used on the **Corvair** and **Pontiac Tempest**. However, there is one important difference, the big-car prototype has inboard drum brakes mounted right at the differential.

This makes for even lower unsprung

weight at the rear in proportion to total chassis weight than **Corvair** or **Tempest**, so that even less mass will be displaced by bumps, hence less thrust against the springs to compress them and, in turn, less rebound energy to toss the body. We might well see this highly sophisticated new axle in 1962.

Look for **Chrysler Corporation** to ride along with its present suspension system of torsion-bar independent up front and semi-elliptic leaf springs at the rear. This setup is still competitive in ride and handling characteristics to the new "swing-axle" cars such as **Corvair**. Compare any independent rear suspension car with a **Valiant** and you'll get the idea. There's a great deal of brilliant engineering in **Torsion Aire** suspension that isn't revealed by its conventional layout.

The excellent designs of such compacts as the highly roadable **Corvair** and the new **Pontiac Tempest** with its lively four-cylinder engine seem to beg for sports or semi-sports-car versions. **Corvair**, of course, already has one in its '61 **Monza** coupe with fully-synchronized, four-speed manual transmission and 95-horsepower engine.

It's hard to see how performance-minded **S. E. Knudsen**, **Pontiac's** General Manager, can resist putting the high-performance version of the **Tempest's** engine into a bucket-seated sports car, possibly a coupe like the **Corvair**. Rumor has it that one of these is in the works for late spring '61.

The future of U.S.-built four-passenger cars, that might be called "ultra-compacts," will depend on how competitive in cost they can be with established economy import leaders such as **Volkswagen** and **Renault**. **Ford** will be first with its four-passenger, four-cylinder economy car the **Cardinal**.

Ford plans to keep the cost of this job within limits by supplying major mechanical components such as engine transmission and drive line (front wheel drive) parts from its subsidiary, **Ford of Germany's** Cologne plant. In this way much of the expensive tooling and manufacture would be performed by German labor at lower total cost. Further cost reduction will be the result of sharing these components with the German-built **Ford Taunus**. ★ ★ ★



Tank Crews Get Infrared Binoculars for Seeing at Night

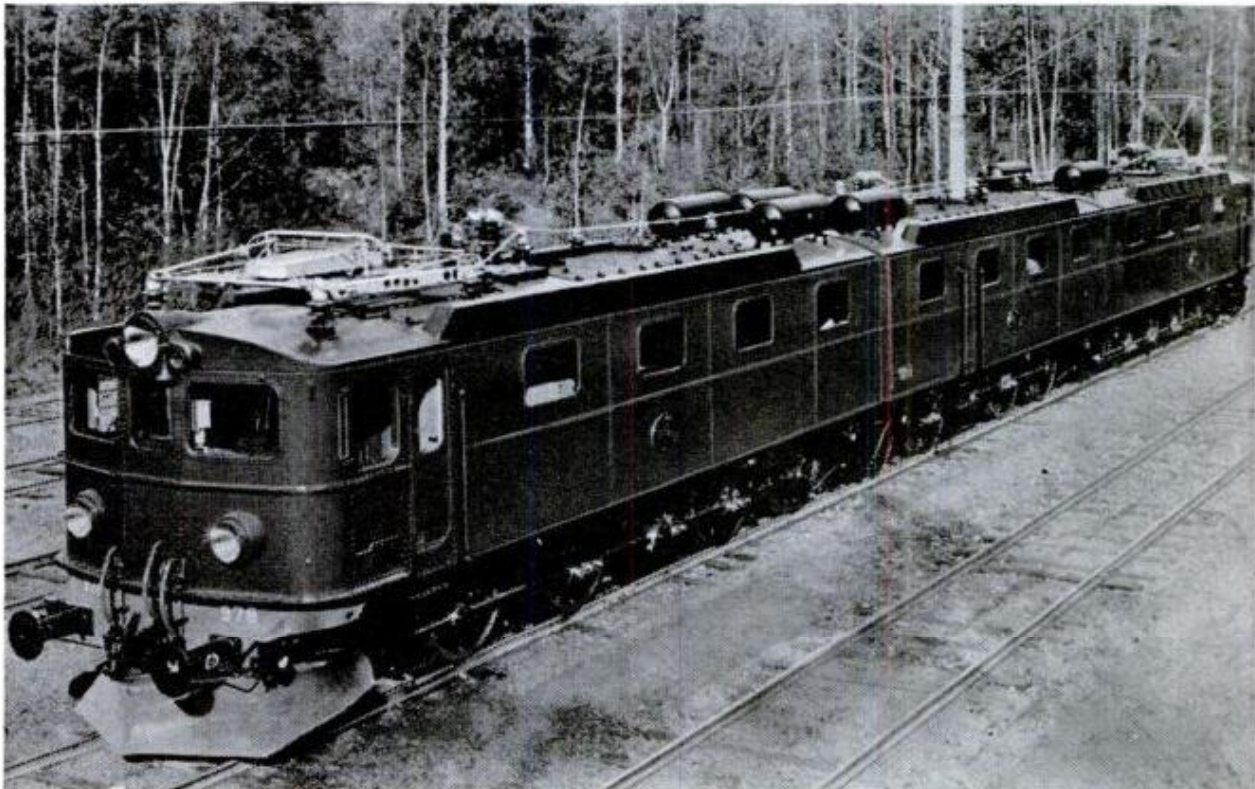
Searchlights, periscopes and binoculars which will enable tank operators to observe a possible enemy at night with either visible or infrared light are under development by the U.S. Army Engineers at Fort

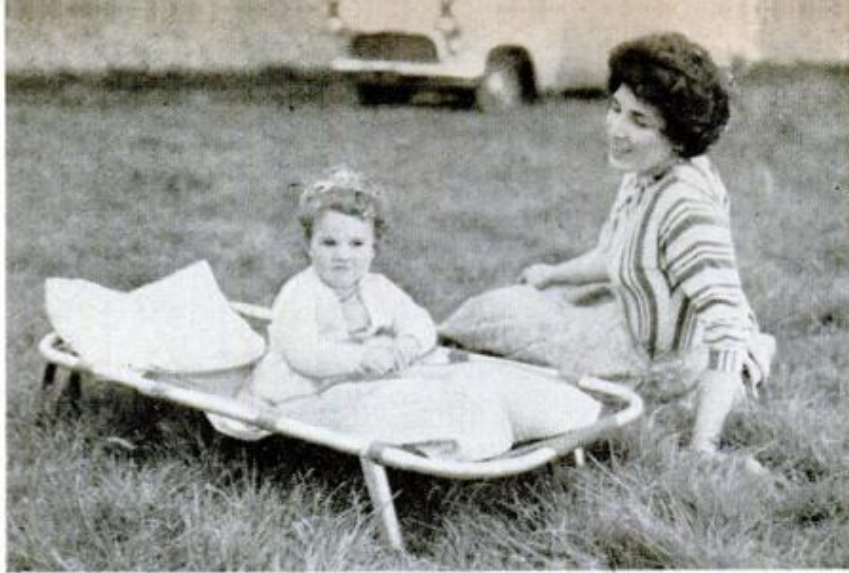
Belvoir, Va. The searchlight operates in unison with the tank gun; the periscope emerges from the tank hatch, to probe the night with infrared light. The infrared binoculars allow open-hatch viewing.

Swedish Locomotive's Six Motors Deliver 7500 Horsepower

Three permanently coupled sections make up a new electric locomotive owned by the Swedish State Railways, and thought to be the longest and most powerful in the world. Each section has two traction motors

and four driving axles; the motors will deliver a total of 7500 horsepower. The locomotive, which will be able to pull a train with a weight of 4900 metric tons is 35 meters long and weighs 260 metric tons.





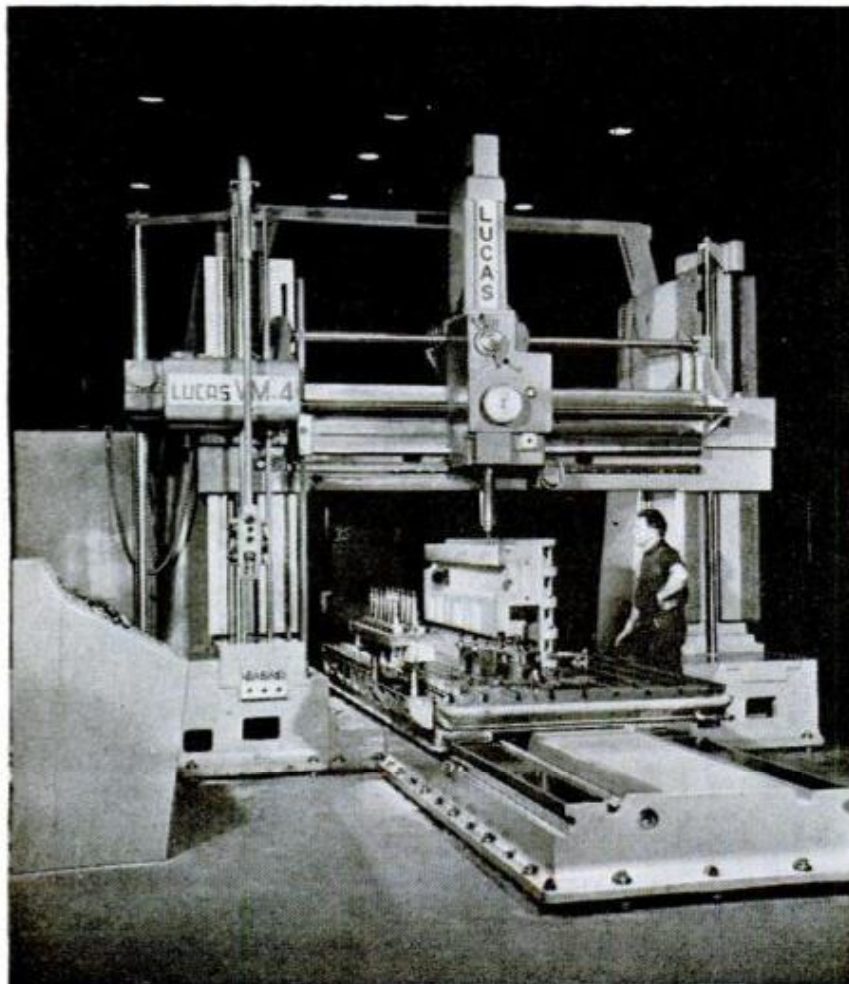
Pint-Sized Cot Keeps Baby Happy

Built to provide baby with a safe, comfortable and familiar bunk anywhere the family goes, the new British "Autocot" fits snugly between the front seat and the rear deck in any car; won't slip during turns or sudden stops. The canvas hammock is slung from an aluminum frame which expands from 40 to 48 inches in two-inch steps to adjust to cars of any length. Outside the car, aluminum legs fold down to make a bed or seat for the yard, beach, or hotel rooms. The whole cot weighs only four pounds, and collapses for carrying and storage into a flat 24-inch package. Thus a bed familiar to the baby can be carried anywhere.



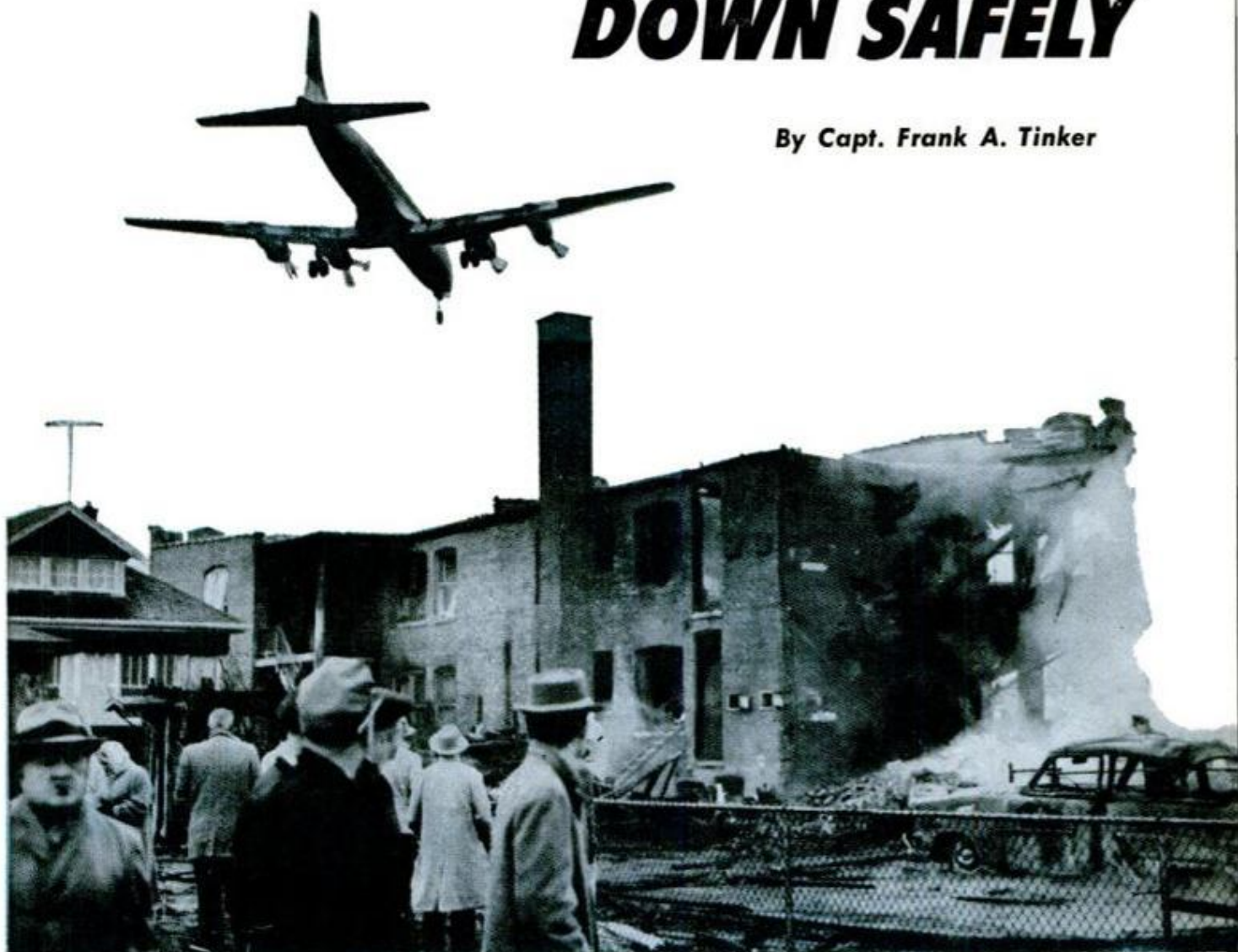
Punched Tape Instructs Machine

More than 80 percent of all machine-shop metal-working can be handled on a single automated machine that takes its instructions from a one-inch-wide strip of punched paper tape. It selects its own tools—up to 84 of them, from quarter-inch drills up to face-milling cutters 14 inches in diameter. It can hold and work on metal castings almost as big as a compact car—five feet high, six-and-a-half feet wide, and eleven feet long. Operations include drilling and boring, tapping holes and milling metal surfaces. It works to repeatable accuracies of plus or minus two ten-thousandths (.0002) of an inch, and can be operated manually from pendant station or automatically from a console (shown at left side of picture).



LET'S BRING OUR PLANES DOWN SAFELY

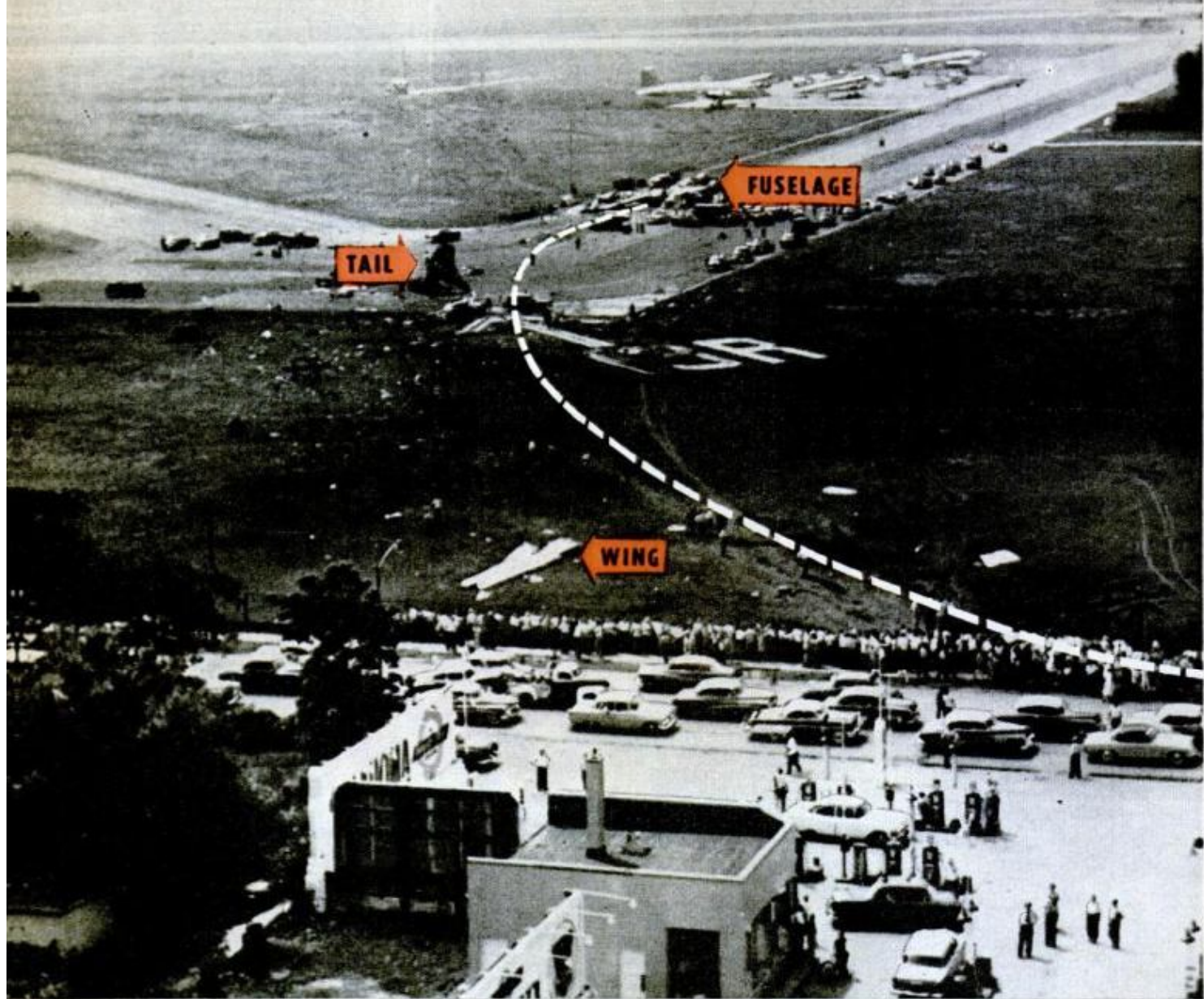
By Capt. Frank A. Tinker



Traffic can't pause for tragedy at Midway. A DC-6 makes approach as spectators gawk at the wreckage of an airliner that crashed moments before

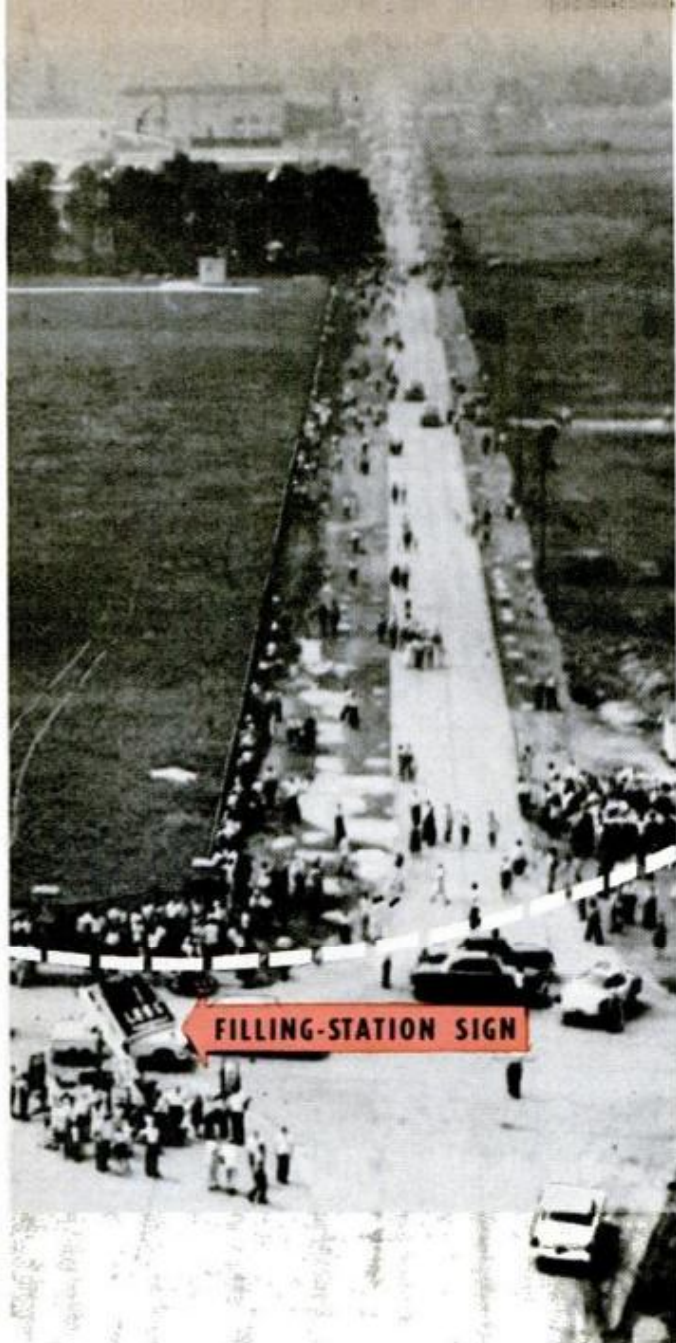
Frank Tinker (left), a veteran airline pilot, blasts today's air terminals that are endangering safety by trying to handle too many aircraft with too few facilities. He cites the world's busiest, Chicago's Midway, as the ugliest example of all.

THIS FLIGHT into Chicago-Midway had been fairly typical, both of that airport and too many others in our over-populated air traffic centers. Since cranking up the C-46 at New York three hours before, we had made and received fifty-odd transmissions with control agencies. Most of these calls had necessitated tuning and locating at least two other radio facilities, either VOR (very-high-frequency omnidirectional range) or low frequency. We had entered each pertinent call in the log, one every four minutes on the average, consulted the charts, watched our fuel consumption, kept the ice from building too deeply on wings, props, and windshield, and wondered how thick the stacks of



Twenty died in spectacular crash when incoming plane hit sign across street from Midway on foggy day, spewed wreckage along dotted line, finally coming to rest about a block away. And airport traffic went on





FILLING-STATION SIGN

As many as 100 aircraft are in traffic patterns at Chicago area's airports during peak periods. Getting them down safely demands perfection from everyone

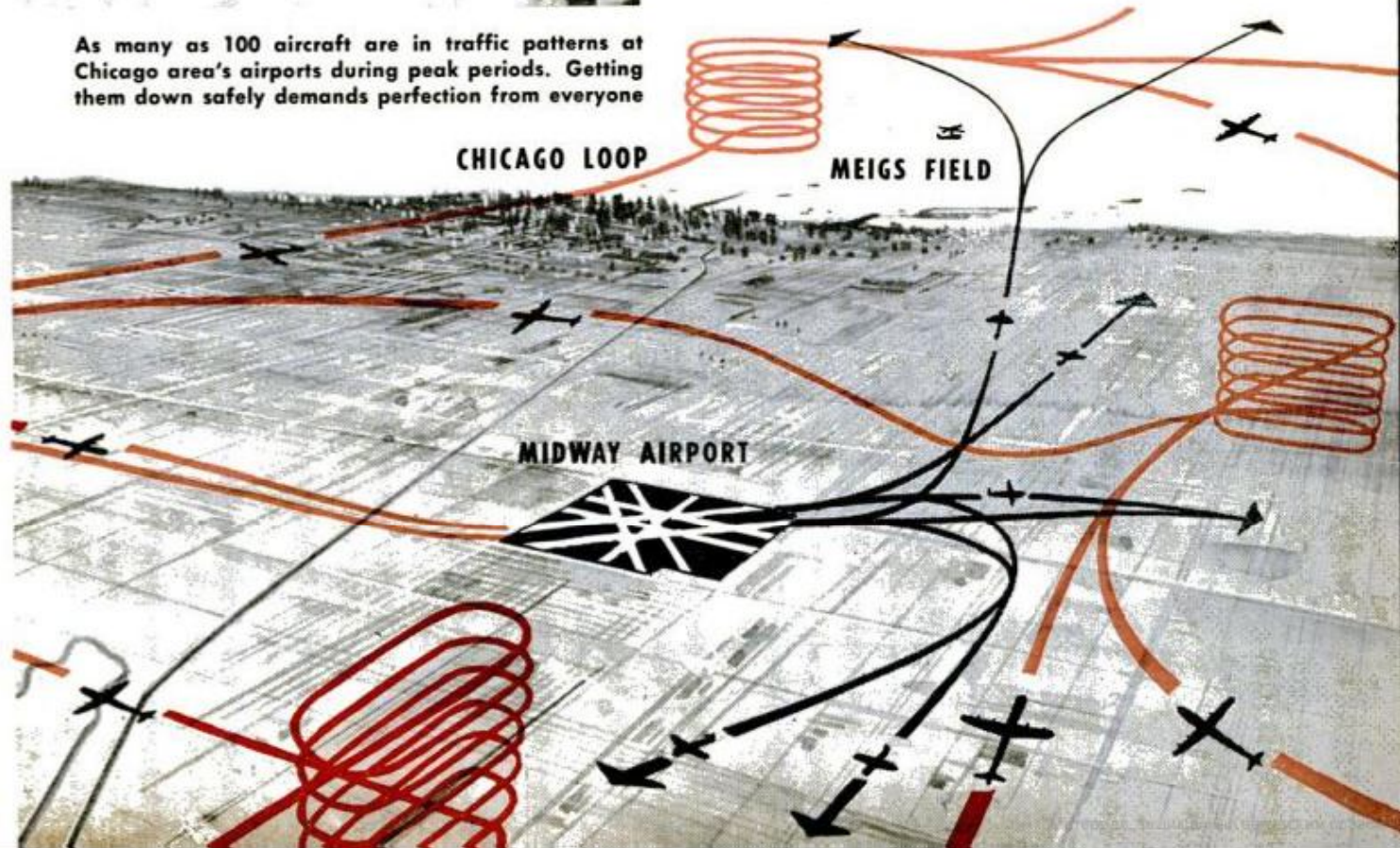
holding planes were over Midway Airport.

Chicago was reporting 300-foot ceiling and one-mile visibility, wind from the north. This meant that we would probably have to use the back door of the single instrument-landing runway, which has no glide slope to indicate how high you may be above the tenements and factories crowding in on every side of your approach. It was here that a TWA freighter crashed into the buildings while making an apparently routine three-engined return to Midway last winter. And it was while trying to approach a similarly half-equipped runway that an Electra crashed in New York only a few months before.

As we entered the area we were switched from Center to Approach Control—unfortunately to a frequency which our airline company, despite the pleas of the pilots, had not seen fit to install in this aircraft. It was embarrassing and provoking, but legal. We finally managed to break through the constant stream of chatter and obtain another frequency, one which we had aboard.

“Dig me out the approach charts for Midway,” I told the doubtful young man in the right seat. “We’re cleared to Chicago Heights.”

A few minutes and several transmissions later—during which I gave and verified our estimated time of arrival over the Chicago Heights VOR, descended a thousand feet twice, and made a rapid calculation of how long I could hold over this facility at reduced power yet still make it to Milwaukee, our alternate, with a legal 45 minutes of fuel remaining—we arrived at the assigned fix.





Midway's short runways force pilots to make perilously low approaches past signs, homes and smokestacks

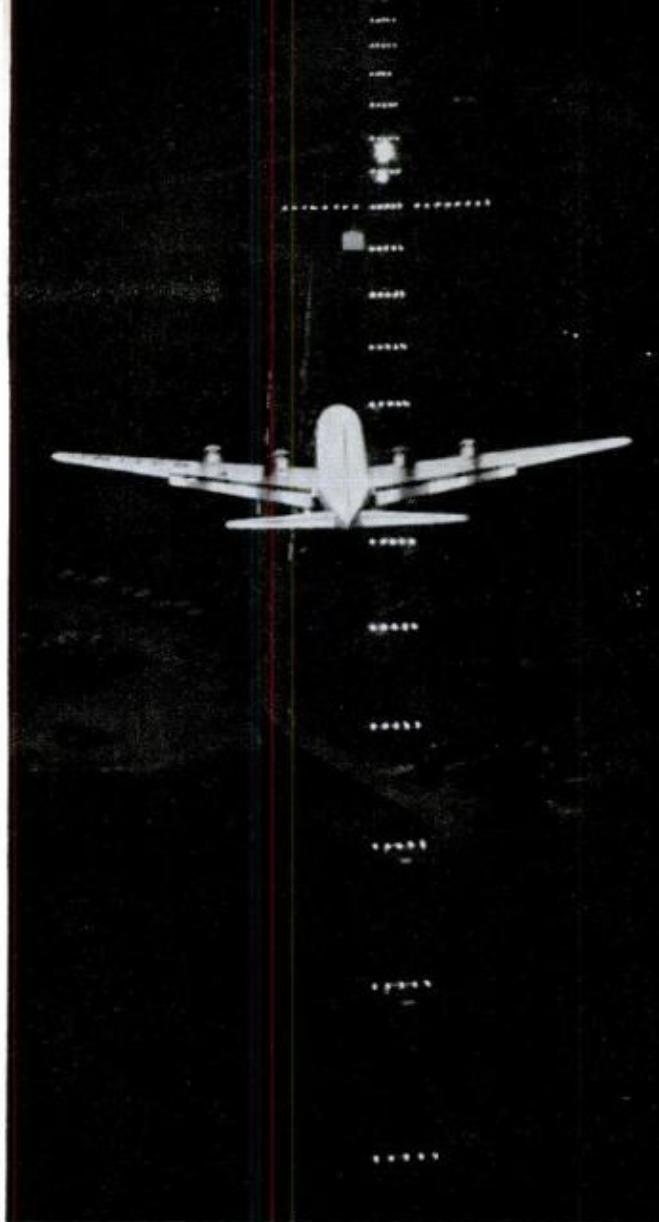
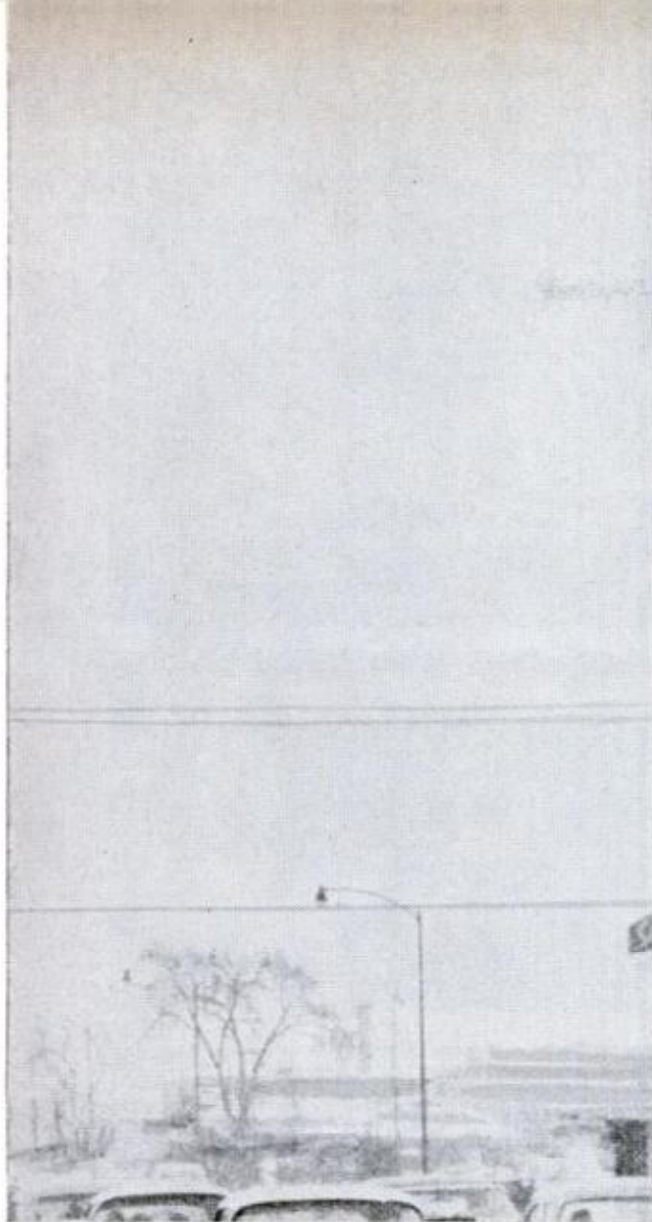
From the chatter on the single approach frequency (several are used here to avoid jamming the air completely) I estimated there were the usual 30 or 40 aircraft milling through the freezing mist and snow over Midway. We might not have to wait more than an hour for our turn. That is, if the fuel and the anti-ice alcohol lasted.

"TWO-FOUR-METRO," Approach Control rattled, "EXPECT APPROACH AT

ZERO-FOUR-ONE-FIVE." Since Two Four Metro was our bird I would have acknowledged, but there was no time to do so between this message and the next—or the next half dozen. Having visited the Midway tower I knew that they would see whether or not I had received my instructions by following on their radar scope the little blip our ship made. This may seem rather risky but, in aviation, people still

Different receptions await pilots at night at different airports. Some runways are merely outlined





Center-line light system, like this one at another airport, shows pilot path to runway on night landings

operate under the refreshing, old-fashioned idea that the other person is not a moron.

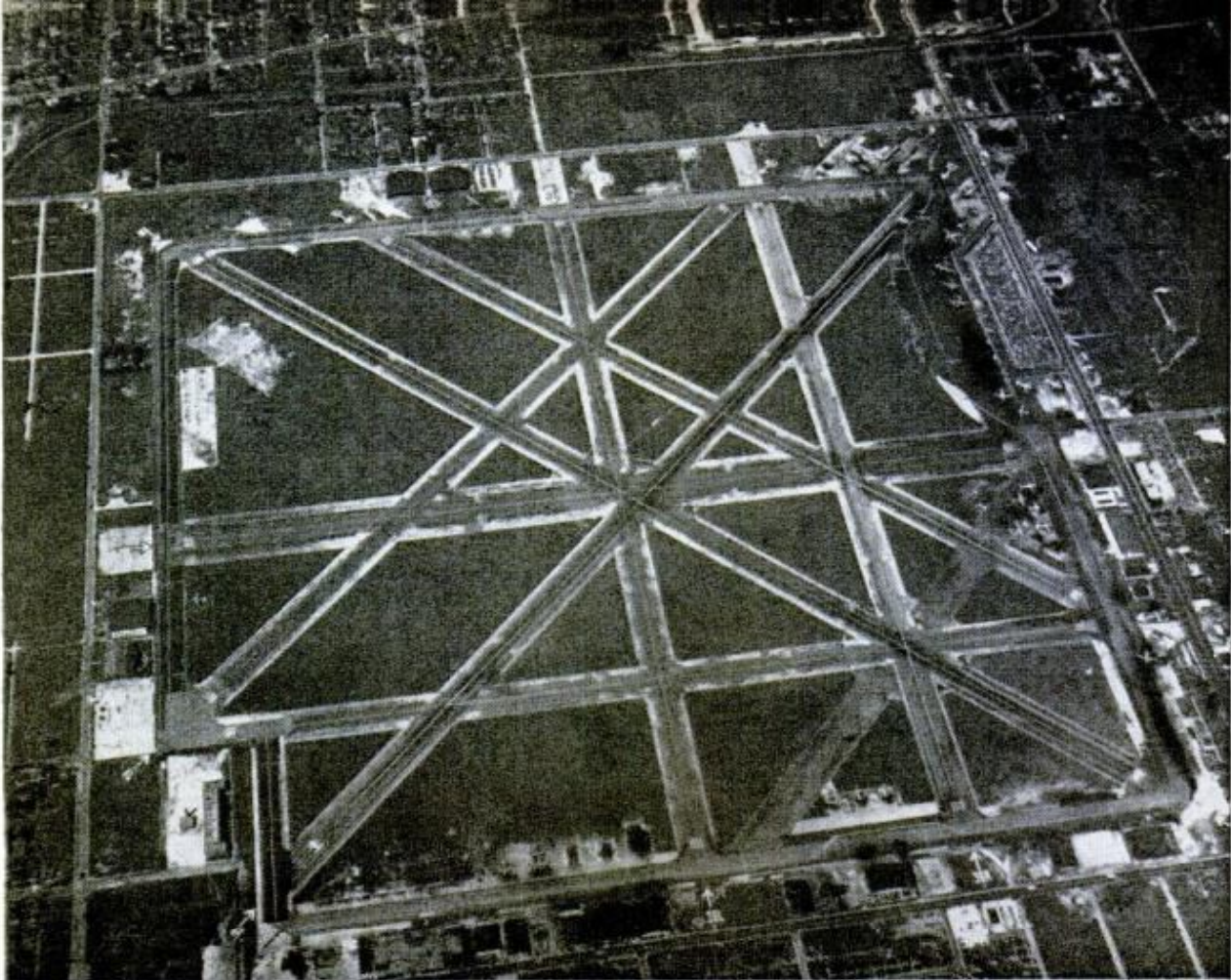
"Let's see," I thought, while toggling alcohol into the carburetors and starting my turn into a holding pattern and pulling props and throttles back to holding power, "Zero-four-one-five in Greenwich, England, means that my approach time will be quarter after ten in the evening here, an hour and a half away. However, they are

usually pessimistic about it so I'll cut that down to an even hour. I think we can make it."

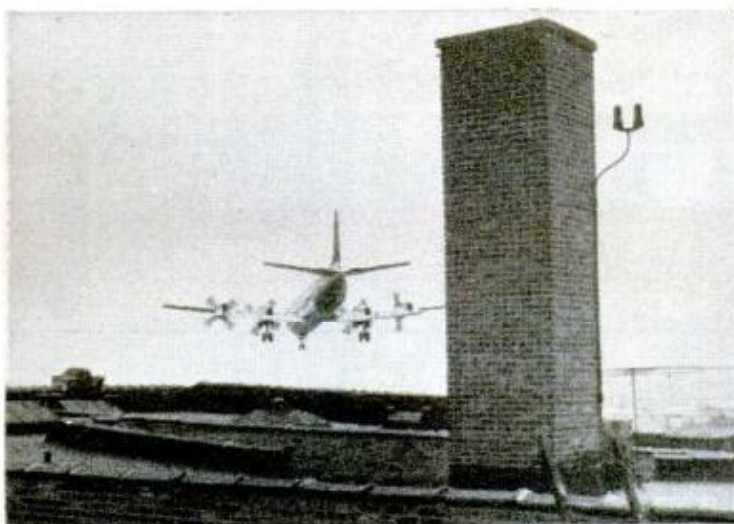
And I went back to making the turn, adjusted power because we could not hold our altitude at the settings advised for holding, studied the Jeppesen Approach Chart, asked the copilot to get on airways frequency with the other VHF (very high frequency) set and obtain the Milwaukee

Modern lighting system, installed at Washington National, gives incoming pilot well-illuminated target





Once a dream airport, because of its near-perfect symmetry, Midway is now a nightmare, giving headaches to harried traffic controllers (left) and ulcers to intrepid pilots (below) on those low, low approaches



forecast, and listened to the other member of this team down in Approach Control trying to sort out his brains. After a few hours at his job, this must have been difficult.

Just consider: This airport reached its peak capacity in 1952, which means that it handled all it theoretically could, with safety. Since that time it has increased its traffic every year, although the theoretical capacity remained the same. Some authorities maintained that the airborne traffic over Chicago had saturated the available space and facilities shortly after World War II. But then the traffic tripled and nothing more was heard about it.

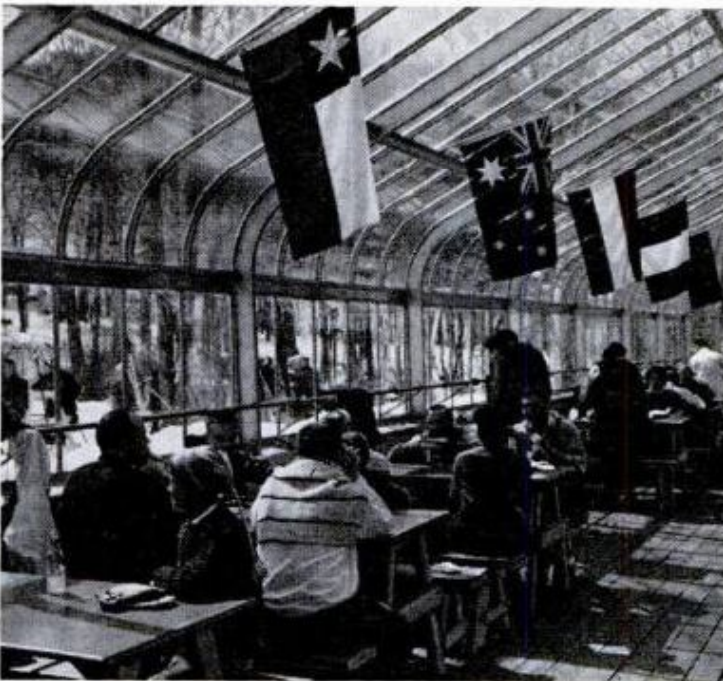
Last year, as in every year of the past decade, this ridiculously small, poorly-placed conglomeration of obscure runways led the nation's airports in almost every category of civil air operation—the most landings and takeoffs, the most passengers, the most revenue. In 1959 it handled nearly twice the

(Continued to page 242)



Greenhouse for Skiers

Skiers at Jiminy Peak, near Hancock, Mass., can eat, rest, or warm up without losing sight of the runs in a new indoor-outdoor base lodge built from modular sections designed for greenhouse construction. In cold weather, skiers can still sit in the sun; on warm days, the lower row of glass frames and one top row can be opened. The "greenhouse," above, is supplemented by an adjacent wooden building about the same size, which houses the kitchen, ski shop, offices, and other service facilities. Inside, skiers and visitors sit at picnic tables under the flags of the major skiing nations of the world. The glass part of the structure was erected by the ski area staff.



Pressure-Balancing Hose

Drivers who try to maintain equal pressure in both front and both rear tires will like a new German device which connects to two tires at once, equalizing their pressures and filling them to exactly the same pressure. The uniform tire pressure gives better control and cuts uneven tire wear. The simple attachment consists of a T fitting on the end of the usual air hose, with a pressure valve fitting on each end of the two branch hoses. The model shown is for service-station use, but another model has been designed for the car owner.

AN EYE ON SPACE

By Dr. Dan Q. Posin

PROFESSOR OF PHYSICS, DE PAUL UNIVERSITY
SCIENTIFIC CONSULTANT AND ADVISOR, COLUMBIA BROADCASTING SYSTEM

THE NIGHTMARE of any one of the first few men into space—into orbit—is that he may not be able to *come out of orbit*. After all, this event befell the Russian Sputnik that carried a dummy astronaut. Ground control sent a radio signal to have the Sputnik fire retro-rockets with the exhaust pointing in the direction of travel so that the recoil would *slow* the rocket, make it arch downward, and eventually come to Earth. However, the Sputnik happened to have turned over and was pointing the other way, so that the so-called braking rockets actually gave the Sputnik more speed, and it went into a larger orbit, never again to return to Earth.

In the shot with the dogs Belka and Strelka, however, the braking rockets operated properly. That is, the spaceship was pointing the right way when the radio signal was sent to fire the fuel for the braking shot.

What is more heartening, of course, is that one can expect a live man in orbit to see to it that the retro-rockets fire at the right time. That is to say, the orbiting spaceman himself will decide when to press the out-of-orbit button. Nevertheless, the possibility exists that the spaceman may not be competent at the right moment. Of course, in the two-way radio communication between ground and the spaceship it will become clear whether or not the spaceman is in possession of his faculties and can run the show. If not, ground will take over and fire the retro-rockets for him via radio command. And if this contact fails, a later automatic preset firing will take place. So, all together, there can be three controls to bring the spaceship out of orbit. Any cause for nightmares, then, is not evident.

There are other possible nightmares due to "minor" causes, however. "Supposing I succeed in getting out of orbit," the spaceman may say, "Is it all smooth sailing for the rest of the way?"

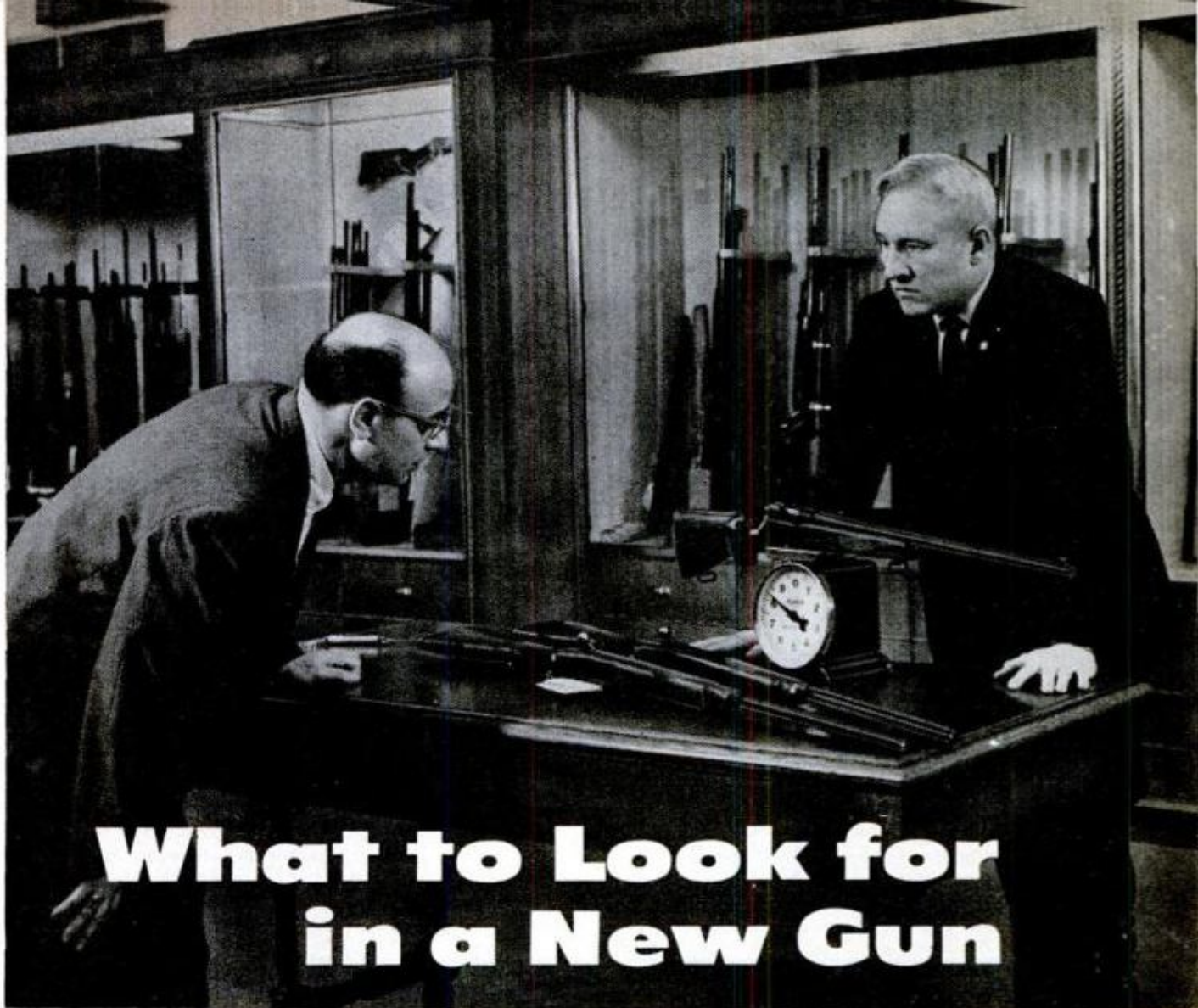
The question now raised is this: What kind of a system are we talking about? Is this the Mercury Project or a more advanced operation?

In the Mercury Project, after coming out of orbit, we have the pilot coming down in a capsule which, upon entering the atmosphere, is lowered "gently" by parachutes. The probable outcome is that the capsule lands safely in water, that it floats, is found and then is rescued by ships and aircraft at sea. Despite successful recoveries of satellites in the air, Mercury will still end up in the water—intentionally.

A certain amount of troubled sleep, naturally, is associated with this operation—insofar as the astronaut is concerned—even though all phases of this post-orbit activity have been well rehearsed. There are *several* parachutes, including those opening in emergency; the capsule is constructed to float, and *will* float (if it does not break); and it sends out radio signals and emits flickering lights to pinpoint its position for recovery.

What else might cause insomnia and bad dreams for an astronaut and his relatives? Well, we have skipped something: What about a misfire on the way up to orbit? That problem has been worked on. The capsule has an emergency rocket attached to it, and if there is trouble with the booster rockets or an explosion, the emergency rocket fires, and lifts the capsule containing the astronaut clear of the shambles to a considerable altitude

(Continued to page 254)



What to Look for in a New Gun

By Ken Warner

American-made guns, for the most part, are excellent production-line items. You might say they are all equal, but some are more equal than others.

MOST GUN BUYERS know what they want. When it comes to caliber, type of action, price and brand name, the usual shooter has his mind made up before he walks into the store. But even when he gets exactly what he wants, he can miss out on a good thing by not inspecting his choice.

Dollar for dollar—or maybe even two for one—standard American factory-made firearms are a solid value from buttplate to muzzle. They are capable of accuracy and operating efficiency better than all but a handful of shooters can use to full advantage, and even the most complicated mechanisms are almost completely reliable. But they do come off production lines, and are almost completely machine-made. Machines need tolerances, tolerances make differences, and differences can make one gun better than its apparent twin.

It is possible, of course, to buy a malfunctioning gun. It doesn't happen very

often, and no factory wants it to happen, but occasionally it does. More likely, one gun of a group of identical weapons will be a little bit better than the others. You'll get your money's worth if you buy the minimum that's passed by the inspectors, but why not check a few points and get their best?

For example, you can walk into any sporting goods store and find surprising differences between three identical factory models. They can vary as much as half a pound in weight, and three or four pounds in trigger-pull weight. Stock wood that looked fine at the factory, allowed to dry for a few months more on a dealer's rack, can undergo minor-looking changes that could seriously affect accuracy and grouping in an otherwise fine rifle.

In most cases, a little tinkering will fix things, but the time to find them is before you take the gun home.

Photographed for POPULAR MECHANICS in the Gun Room of VL&A—Abercrombie and Fitch, Chicago, Ill.



YOU WOULDN'T BE a normal gun buyer if you didn't throw the gun to your shoulder "to see how it feels." While you're at it, though, check to see if you can get the balance between your hands, and if the gun throws nicely to your shoulder and swings easily for you. Some will, some won't; here's where you decide on the size and weight you can handle best. If you hunt in a coat, bring it along or borrow one and try the gun with the coat on; it can make a big difference



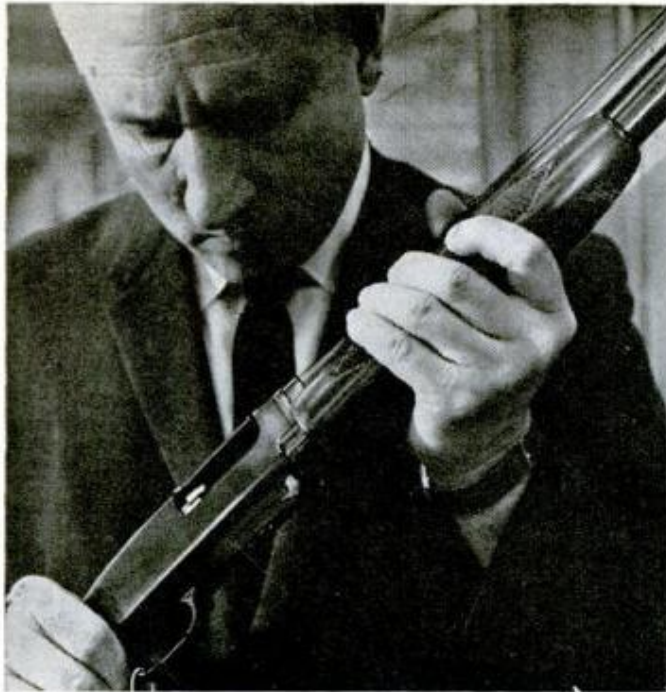
NOW YOU start looking. Take a good long look at everything (being careful with the dealer's gun, of course). First thing to do is work the action. While the slide is sliding or the lever is moving, ask yourself, "Is it cramping? Can I work the action with gloves on? How long will it take the stiff new action to limber up? How does it sound? Is everything getting into place and out again every time?" Load and eject a dummy round of ammunition if one is available



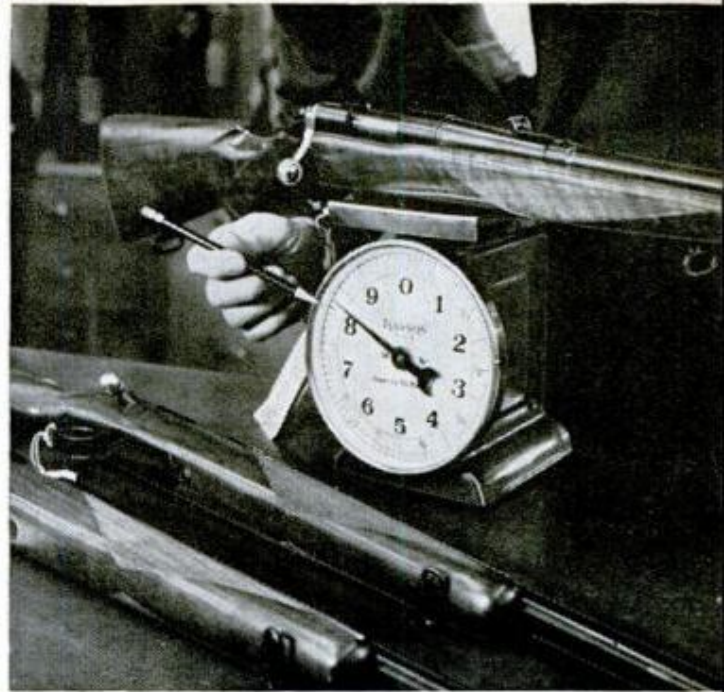
MEASURE THE weight of trigger pull with a scale, if only to demonstrate to the salesman that you're serious. If he doesn't have a scale, his fishing-tackle department does. Besides an ideal pull weight—usually three to five pounds, but whatever you prefer—the trigger mechanism should feel sharp and clean. It shouldn't "travel" much while you pull it off. If it's adjustable, find out where and how. Remember that you may want to get at it with gloves on some day



CHECK THE SAFETY. Cock the gun, put the safety in the ON position, and try to pull the trigger. It won't bend. Then release the safety and pull the trigger, feeling for differences from your trigger pull test. Do it a couple of times. While you're at it, imagine yourself in the field and see how easy (or hard) it is to get the safety off while throwing the gun to your shoulder for a fast shot. You should be able to feel whether it's on or off without stopping to look and think



NOW TAKE A LOOK INSIDE, and make it a good one. There will be bright spots and dull ones, rough spots and smooth ones. Make sure they're all where you expect them. Check the extractor and ejector, see that the firing-pin hole isn't burred, the bolt face isn't rough, and the milled parts are clean. Even on a brand-new gun there can be small faults, and you might as well avoid them or get them fixed now. If your dealer has a repair shop, small changes can be done in minutes



WEIGH YOUR CHOICE, especially for a field gun that you'll be carrying all day or toting with a pack. There was $\frac{5}{8}$ ths of a pound difference in the weights of these three identical rifles. The heaviest, shown on the scale, was the prettiest—but a mountain-climbing deer hunter would fail to see anything pretty about that extra weight. On the other hand, the heavier wood is denser, and denser wood is usually stronger if you're likely to give your gun any hard knocks



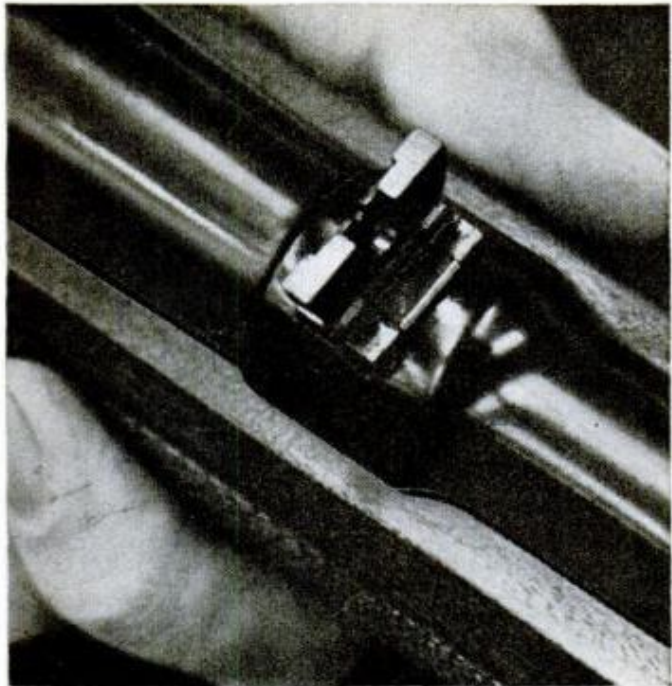
CHECK THE WOOD GRAIN in the stock, especially around the pistol grip and especially on guns with one-piece stocks. The grain should run straight, but down a little for maximum strength, as in this fine Mannlicher-Schoenauer rifle. Bad grain at this point, which is necessarily the thinnest on the stock, could produce a weakness and a nice, Z-shaped break from a good blow. Checkered surfaces should be clean-cut, with sharp points. It's more than a decoration



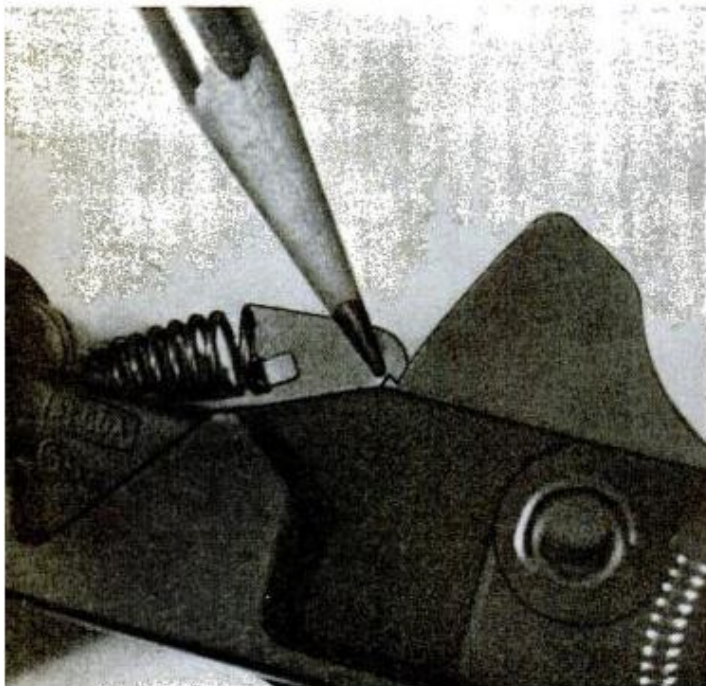
MAKE SURE the gun is solid. One easy way to check is to hold the piece at the balance point and slap the buttstock hard. Any vibrations? If you feel anything loose, find out what it is and get it fixed. Chances are it's only a loose bolt somewhere, but once in a blue moon it's something seriously wrong. On rifles with two-piece stocks, be sure the buttstock through-bolt is tight, and on one-piece stocks always be sure the guard screw is tight, but not too tight



SIZE IS A fairly standard thing in American factory guns, but the buttstock length may vary a bit even between twins. The traditional test, with the buttplate in the elbow, is still good (trigger should hit the first joint of your index finger), if an experienced salesman checks you out. It works fine for most shooters unless they're short and stout (under 5½ feet) or long and lanky (over six feet). This stock is just right; the relaxed hand falls on the grip, finger on the trigger



TAKE SPECIAL CARE looking at the inletting. Despite the importance of a good fit between wood and metal, factory prices and tolerances don't allow careful hand fitting of barrel and action, and changes sometimes occur in the wood after leaving the humidity-controlled factory. You don't want the inaccuracy that can result from one-sided pressure or strain. This gun was well fitted, but too tight on one side, near the rear sight. A few minutes with the store's gunsmith fixed it



INSIDE SURFACES on any factory gun are going to be rough. In most cases, it doesn't matter, but a rough metal-to-metal surface can produce difficult and erratic performance until it's smoothed down by wear. You can do the smoothing yourself with fine emery stones or crocus cloth, or you can have it done by a gunsmith. But a good look inside several guns will show you that the job can be a real chore on one but a pretty simple operation on another

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SCRATCHES, or rough spots, under the bluing, as on the side of this lever, are to be expected on production-line guns in some places, but overall, you're entitled to a fair polish and a good bluing job over the action and barrel. The unavoidable rough spots will turn up in the same places on every gun of a given type, but they'll be less noticeable on some. Avoid rough spots or scratches—they'll annoy you every time you clean your gun if you didn't put them there

POPULAR MECHANICS

Supersonic Cockpit Becomes Space Capsule

At Mach-4 speeds, ordinary ejection methods would kill a pilot if his plane became disabled. Tomorrow's safety device, according to Lockheed, may be a detachable forward section which would parachute safely to Earth, and even float on water. An emergency radio, parkas, fishhooks and other survival items are stored in the capsule. For escape up to 100,000 feet, the pilot presses a button. Three wedge-shaped stabilizers extend for drag; a small rocket thrusts the capsule away from the fuselage; at 15,000 feet the parachute opens.

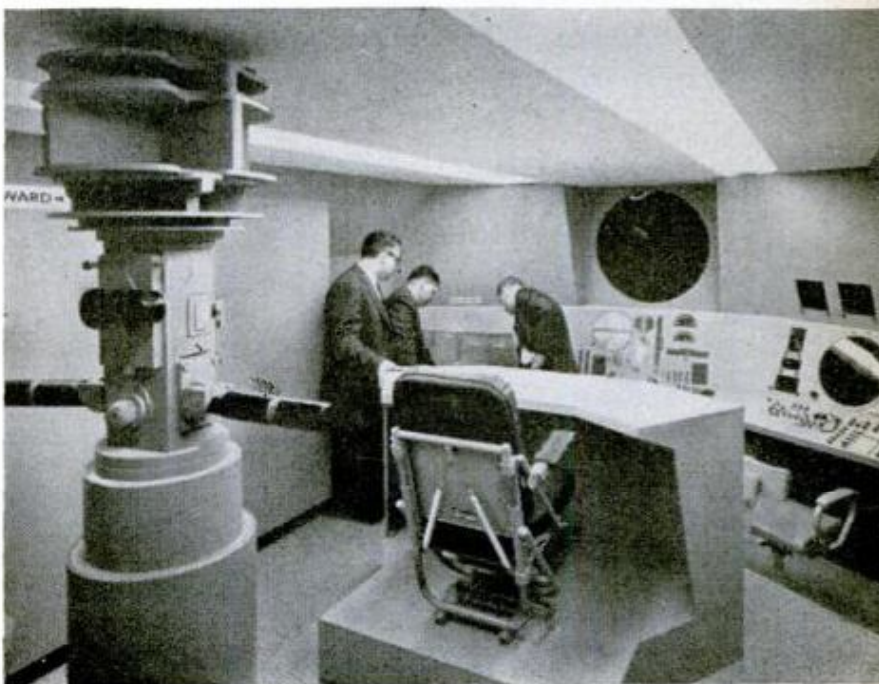
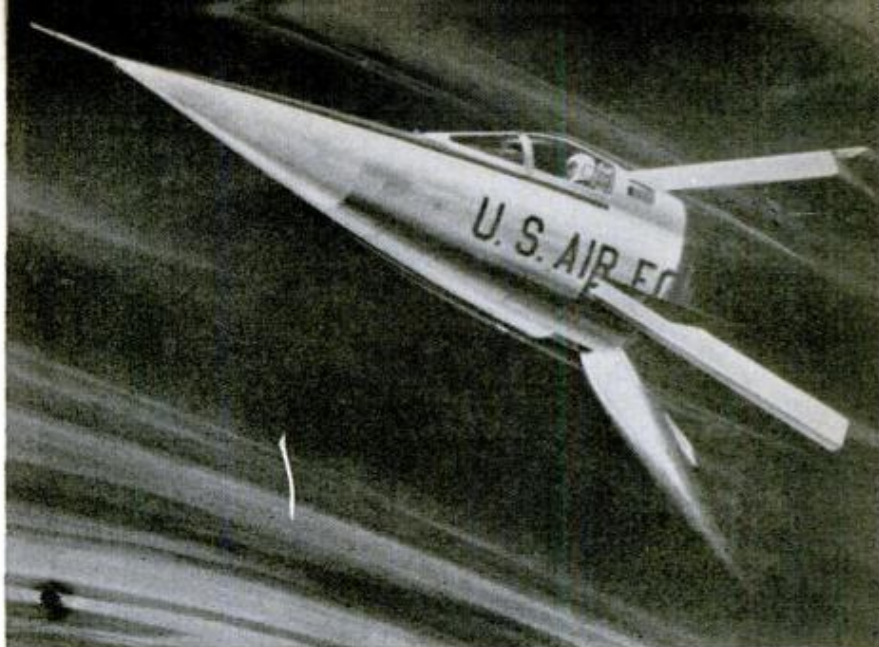
Man Bikes Dog

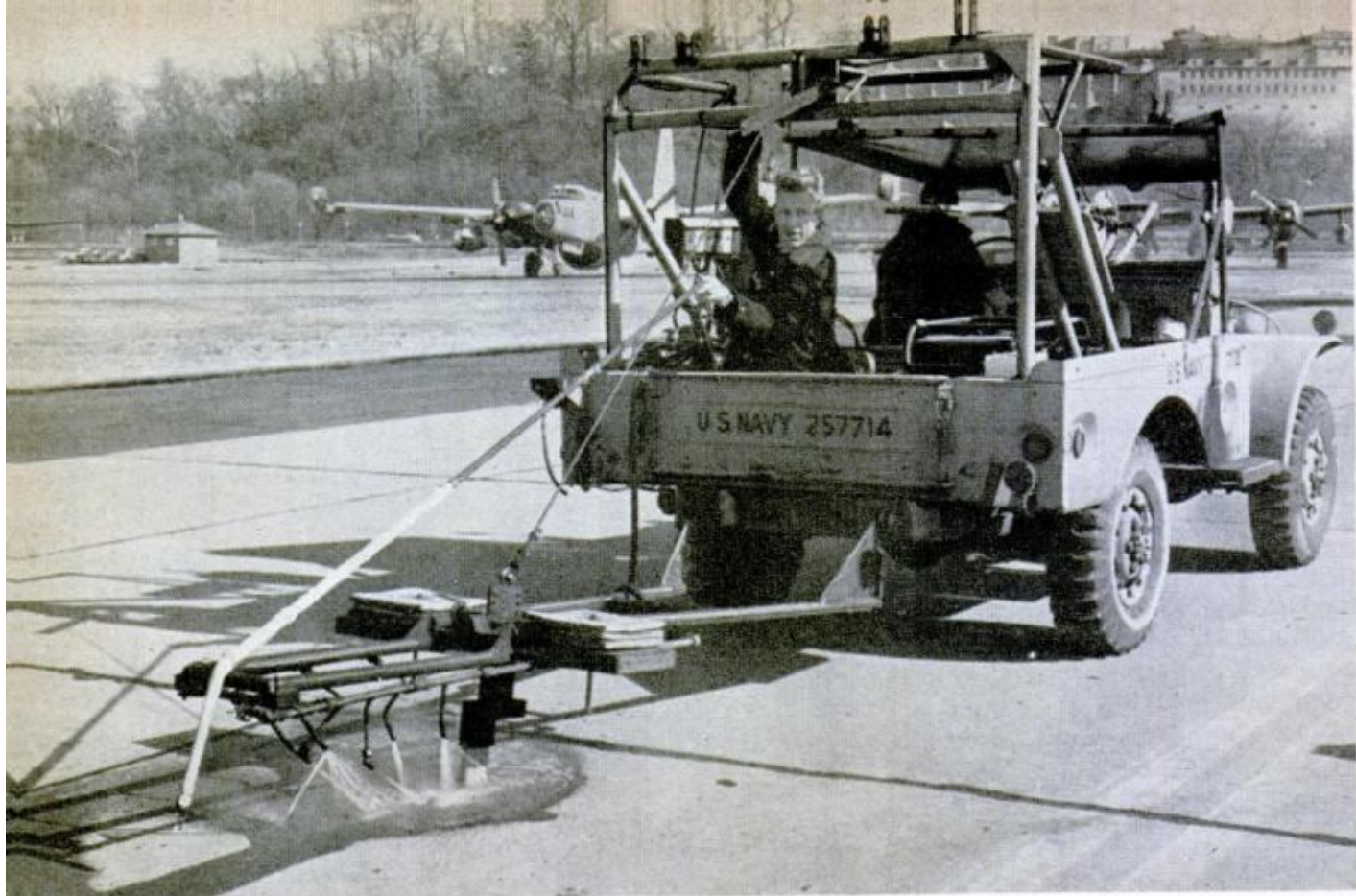
Gary Helmerick didn't build his three-wheel tandem bicycle just to take his dog Queenie for a ride, but it works nicely for that, too. The 14-year-old Cleveland newsboy taught the dog to ride along behind him on his old two-wheeler on his newspaper route, so she goes along now on the back seat when it isn't occupied by a companion. Gary built the three-wheeler by simply attaching the frame and rear wheel from one bike to the rear axle of another.

☐ The National Science Foundation estimates that total funds for the performance of basic research in the United States reached a level of \$1 billion in the last year.

Electronic Sight for Subs

Commanders of future atomic submarines will see through the murky world around them by gazing at "electronic portholes." One result could be that far fewer men will be needed to man new subs. The U. S. Navy is developing, for first installation in 1964, a control system that uses electronic sensing and data-processing equipment. Information about the sub's course, its position in relation to the ocean's surface and the depth at which it can safely operate will be shown on televisionlike screens. One screen, for example, will show various ocean depths. The course at which the sub is set to operate will stretch straight out. If the sub goes off course, the path's position will change.

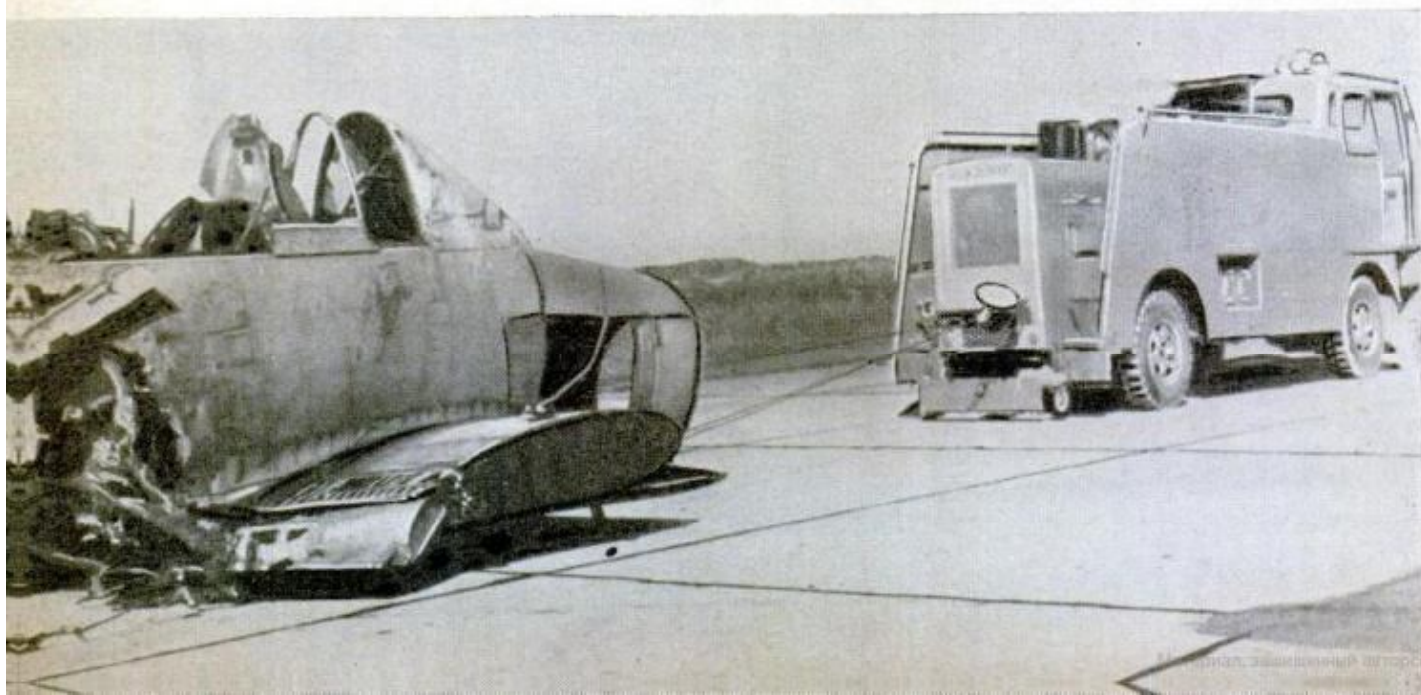




Does Foam Really Help in Belly Landings?



To test the efficiency of "greasing" airfield runways before a plane makes a wheels-up landing, the Naval Research Laboratory fitted a truck with a device (above) which dragged metal "shoes" over test runways through a spray of gasoline. A foam truck (left) prepared the runway with coatings of several depths, and the foam was allowed to "age" for varying periods. Later, the truck pulled wrecked aircraft bodies through the foam to test its lubricating qualities (below). The results were surprising—properly aged foam (10-15 minutes old) prevented fire 90 percent of the time, but the lubricating effect was almost negligible—less than five percent.



World's Biggest Yo-Yo!

Army Lt. Gene Pedrick plays with the biggest yo-yo in the world. He's a member of an Army helicopter team that travels around putting on shows to demonstrate the versatility of "choppers." As "Bozo the Clown," Pedrick hangs the 70-pound yo-yo from a landing skid and, with perfectly timed altitude changes, makes the yo-yo run up and down the giant rope.

Columbium Toughens Steel Pipe

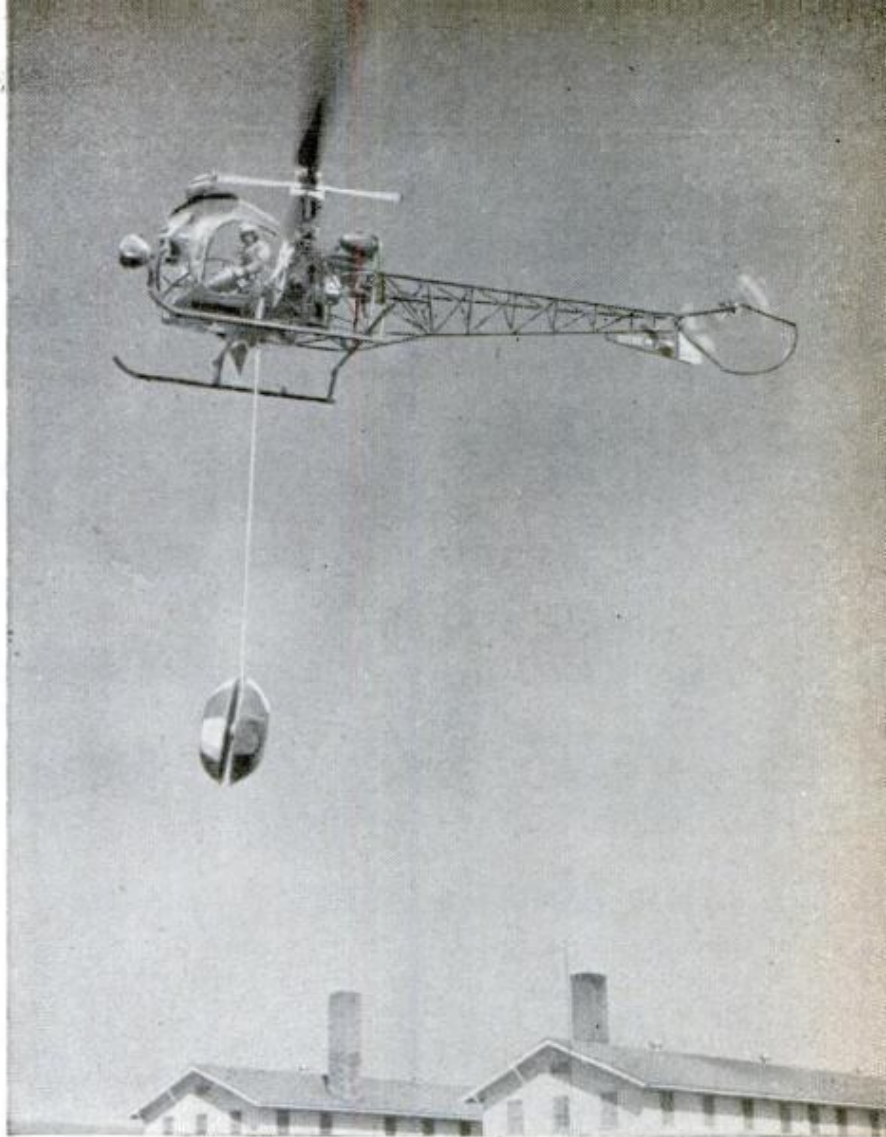
Small amounts of columbium, a metallic element, are being added to steel for gas pipelines, to add strength and make welding easier. High-carbon steels formerly used in long-distance high-pressure pipelines tend to be brittle and present welding difficulties, especially at low temperatures, but the new columbium steel has solved the problem. The steel is now being tested for possible use in truck frames, highway lamp posts and railroad equipment.

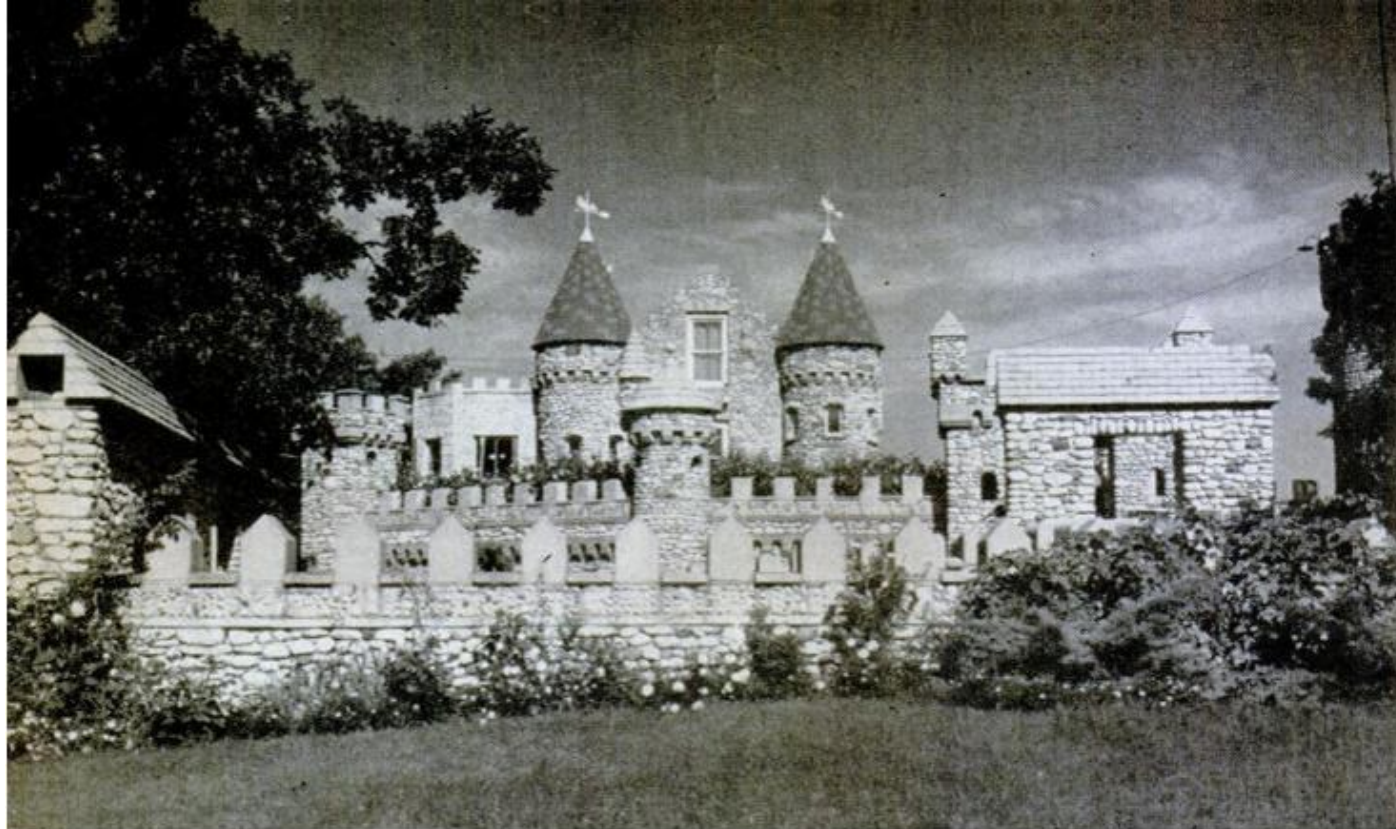
"Piggyback" Wrecker

Garage owner Joe Klosek, of Utica, N. Y., solved a lot of the problems of towing in wrecked cars when he invented a "piggyback" retrieving truck. The truck is backed to within eight feet of a wrecked car, then the flatbed platform tilts 12 degrees and slides back to the ground. A powerful hydraulic winch pulls the wreck aboard, and the platform levels itself for the trip home. The entire operation takes one man less than one minute.

Glowing Tabletop

Now the soft glow of candlelight for dinner illumination has been replaced by the soft glow of the table itself. Italian architect Giuseppe Scagliotti has designed a table with a glowing top. The light is soft enough that it does not dazzle the eyes of the diners. One interesting and strange effect is a "white shadow" that appears under each item placed on the tabletop.





This Man's Home Really Is His Castle

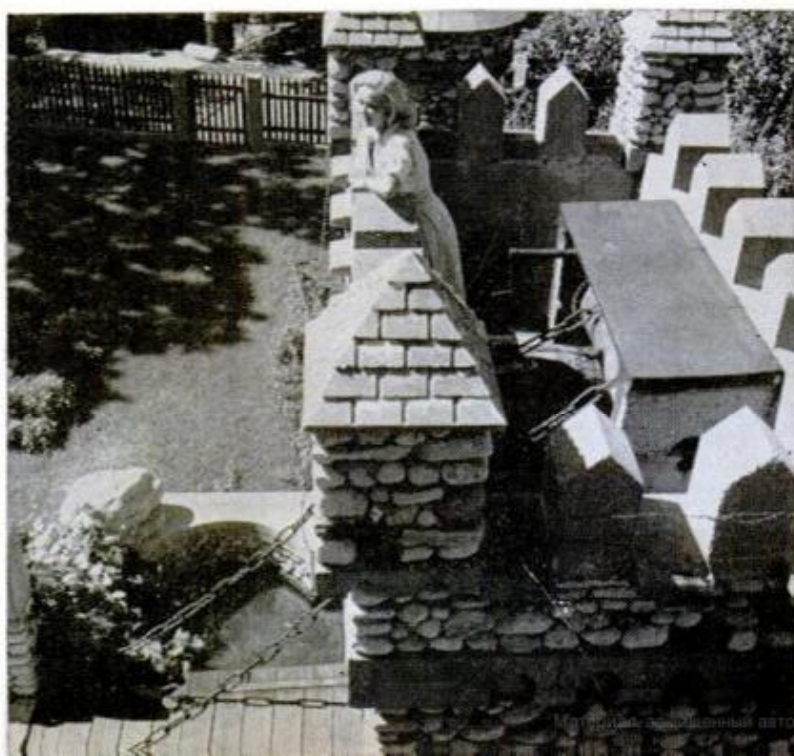
When Ted Bettendorff started putting a stone veneer over his three-room home 30 years ago, he soon realized that the beginnings of a castle were taking shape under his hands. His land, in Fox River Grove, Ill., abounds in stones and he knows how to work with them, so it was no trick to throw up four turrets to hold closets, a shower-room, washroom and stairway to the basement and attic. Liking the effect, he decided to go ahead and build a scaled-down version of Vianden Castle, a famous building in the Luxembourg town where he lived as a boy.

The reproduction of Vianden, which he

has been constructing alone over the years, today spreads its walls, guard towers, terraces, walks, moat and drawbridge across a tree-shaded section of his property. It is a favorite playground for neighborhood children who whoop along its walls in make-believe Robin Hood fashion. Its acceptance by children delights Bettendorff, a bachelor, who hopes the town eventually will take over the property for use as a park.

Now 71, Bettendorff has more plans for building and is at work on a new wing for his castle which, he says, "won't be finished as long as I can lay stone."

Using stones from his own property, Ted Bettendorff, 71, fills in a wall between two turrets in a new wing he is adding to his castle. The drawbridge tower, right, conceals a bridge-raising winch and chains



Astronomer Harlow Shapley, through his study of variable stars, revolutionized thinking about the structure of the universe. He demonstrated, among other things, that our galactic system, the Milky Way, is some 1000 times larger than had been supposed. Formerly director of the Harvard College Observatory, he is engaged in research and teaching



Harlow Shapley

By Harlow Shapley

ALL OF MY waking moments are exciting, and even some of the dream-laden hours of sleep. It is exciting when I awake to see that the Earth has turned on its tireless axis and has again produced a warming sunrise. It is exciting to feel a slight hunger and realize that as I slept the remarkable metabolic process of this animal's body has used up yesterday's fuel. And this magic has been accomplished without my direct supervision. It is exciting to contemplate that the same mechanisms that put me in motion activate the song sparrow in the maple tree, and in fact similarly operate the tree. It is made of the same elements as the bird and I, principally of nitrogen, oxygen, hydrogen and carbon. Thus in a way I am brother of the birds, cousin of the maples, and more distant kin to the hillside rocks and the atmosphere.

To be a part of a world that contains such magnificent objects as mountains, oceans, photons, stars and gravitation is a continuous excitement. The elation is reinforced when I grasp the rich idea that in the midst of the diversity there is a unifying thread that keeps me akin to atoms, stars, plants and animals; and that thread is the struggle to evolve, to participate in universal evolution. For not only do the primitives of the animal and vegetable kingdoms grow and evolve into complexity, but the atoms of which they are composed have mutated from simple hydrogen into the heavier elements, and further into molecules, and molecular aggregates of wonderful potentialities, including life.

But perhaps the most exciting moments in a world of amazement are those in which I find that I can think and write about my continuously exciting moments, and can pass on to others a taste of my elation.

Harlow Shapley



Duplicating the conditions around a burning tanker, personnel of the British Navy Damage Control School pour kerosene into the test tank. The volatile fuel produces a towering inferno below, a real trial by fire



Practicing Fire at Sea

FOR CREWMEN on an oil tanker, fire at sea is a killer that all the ocean's water can't quench. Burning oil, floating around the stricken ship, encircles the survivors in a flaming death trap. To find a way out of that trap, the British Admiralty and Ministry of Transport build man-made infernos to test lifeboats and canopies, looking for a combination that can carry crewmen through the flames to safety.

The researchers conduct their spectacular tests in a small tank at Portsmouth, England. The boat to be tested is filled with instruments to record conditions inside during the fire, then the tank is primed with a layer of kerosene and touched off. Results of the tests are being forwarded to lifeboat manufacturers with recommendations for solving the problem.



Barely visible through the smoke and flame, this aluminum lifeboat and its wet canvas cover withstood four minutes of terrible heat and emerged intact and floating with the only damage a hole in the bow





DEMONSTRATING a new "fireman's carry" technique for bringing unconscious fire victims down a ladder, a Cincinnati fireman eases a limp "victim" out of a practice tower, above left, then down the long ladder, right. The old method hung the body around the fireman's neck like a millstone, but the new way distributes the weight across the fireman's arms and shoulders, and keeps arms and legs out of the ladder rungs



Pickup Camper Goes Amphibious

Perhaps the ultimate in pick-up-truck camping bodies, a new amphibious model works like the others ashore, but also floats nicely on built-on pontoons. To launch, you simply back the truck hubcap-deep into the water, pivot the floats around until they're afloat, and push the unit off. It becomes a trim little houseboat 10 feet long and 80 inches wide, with an 11-foot beam across the pontoons, which are 12 feet long. Inside, it sleeps two, and has a portable toilet, a stove and an icebox. With a 40-horsepower outboard motor, it will top out at around 30 miles an hour, but can be powered easily with a smaller motor. It is made of marine mahogany plywood; the pontoons are built to aircraft specifications.

Infrared Viewer Keeps Night Watch

Cover of darkness is no protection from troops equipped with the Army's new Thermograph T-2 surveillance instrument. The portable scanning apparatus picks up heat radiated by men, vehicles and equipment, even at great distances, and gives the operator an accurate image of the object. It will even spot a mouse in the dark. The jeep-mounted model shown here records the infrared surveillance data on Polaroid film.



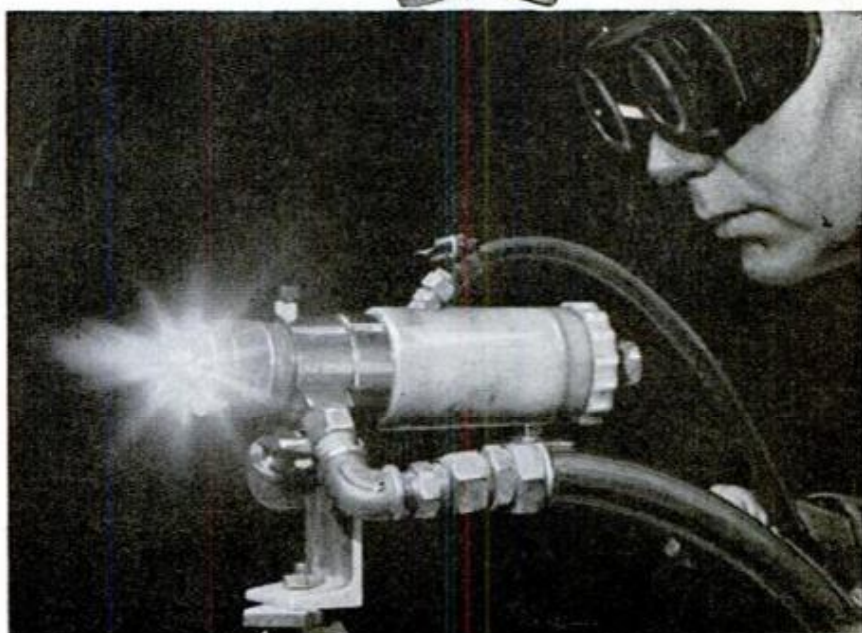
Solar Boiler On Okinawa

Latest of the instruments that soak up energy from the sun and put it to use is a "solar-heat" boiler designed to be sold at low cost to Okinawan householders. Its operation is simple. Masao Ikema, the electrical engineer who devised the boiler, set five zinc pipes in a glass-covered box. He says water placed in the pipes — they hold 12 gallons — will heat to 160 degrees F. on a sunny day. Selling price on Okinawa is \$15.



Arc-Jet Engine For Satellites

No bigger than a milk bottle, a 3½-pound, arc-jet engine has been developed by Avco Corporation to push Earth-satellites around the skies. In a two-day test, the engine produced ¾ pound of thrust which was developed by passing helium through an electric arc; the heated gas expanded supersonically through a nozzle. Such a tiny engine could provide the small amount of power needed to change the orbit of a satellite in outer space.



CONTOUR LOUNGE designed for use in the office has a hand switch which allows the person catching his "40 winks" to raise and lower head and feet independently. It comes in a variety of upholstery styles
Dura Corp., 21800 Greenfield Rd., Oak Park 37, Mich.



Christmas



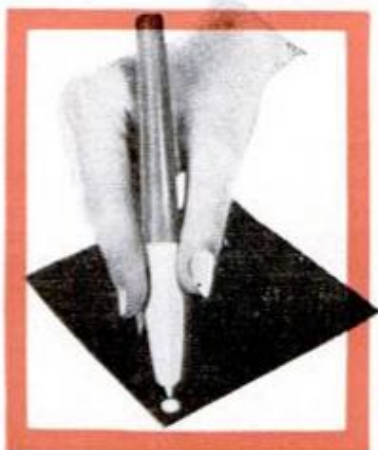
STAMPING TOY is equipped with 12 different dies so children may stamp out such things as simulated concrete blocks and noodles from modeling material
Rainbow Crafts Co., Cincinnati, Ohio



FRINGE-TOPPED SURREY holds up to 200 pounds and trundles along at five miles an hour on battery power. It has a low center of gravity, hardboard body
 Donnan Mfg. Co., 1335 Airway, Glendale 1, Calif.



Gift Ideas



GLUE PEN holds 5000 dots of glue, fits in pocket. Three dots from the pen are said to provide enough bonding strength to support the largest telephone directory. A dot does most jobs
 Twining Mfg. Co., Ann Arbor, Mich.



AIR CAR rides a fraction of an inch over any surface, including water. Made of plastic, it has a 48-inch control line and is powered by batteries
 Edmund Scientific Co., 101 E. Gloucester Pike, Barrington, N.J.





PICNIC BOX converts to a four-place dining table. Each side of the box becomes a plate setting for one person; the bottom functions as the table center. Panels are of wood. Steel legs are 14 inches high.
 Re-Ly-On Metal Products Inc., 230 Eagle St., Brooklyn 22, N.Y.



Christmas

FLUID DYNAMICS laboratory set uses water to demonstrate effects of diffusion, air pressure, water pressure, and to power many other experiments
 A. C. Gilbert Co.





DASH LIGHT plugs into lighter socket. It has a built-in magnet to hold it securely in place on any steel surface and has a one-piece plastic hood and body

Auto Lamp Mfg. Co.,
2909 S. Indiana Ave., Chicago 16

MOTOR SCOOTER has a top speed of 35 miles an hour. It features an automatic centrifugal clutch which lets the rider stop while the engine is running

The 500 Industries, Inc., Fremont, Neb.



Gift Ideas

VEGETABLE PEELER attaches to kitchen disposer. Consisting of a hopper with an abrasive disk on a driveshaft and a rubber cup on bottom, the new peeler takes power from the disposer

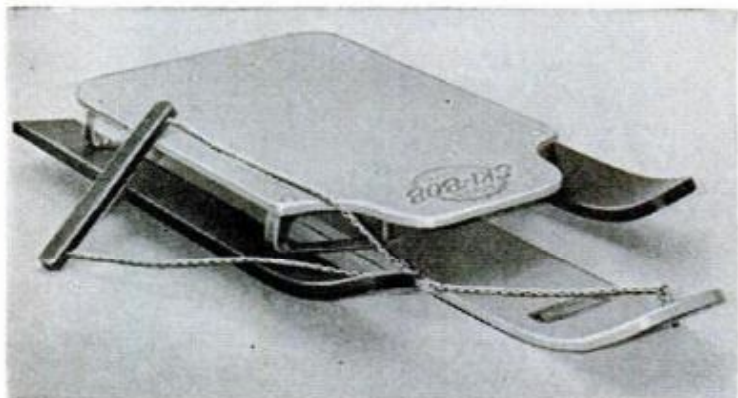
Manesco, Inc., 605 Plandome Rd.,
Manhasset, N.Y.





TOY TAPE RECORDER, operating on transistors, measures 8½ by 5½ by 2½ inches. The unit includes microphone, earphone, magnetic tape, has simple controls

Damar Co., 768 Damar Building, Elizabeth, N.J.



SKI-SLED can be used in water or on snow. Essentially a sled with skilike runners, it offers good balance for children when towed by motor boat. Suitable for adults

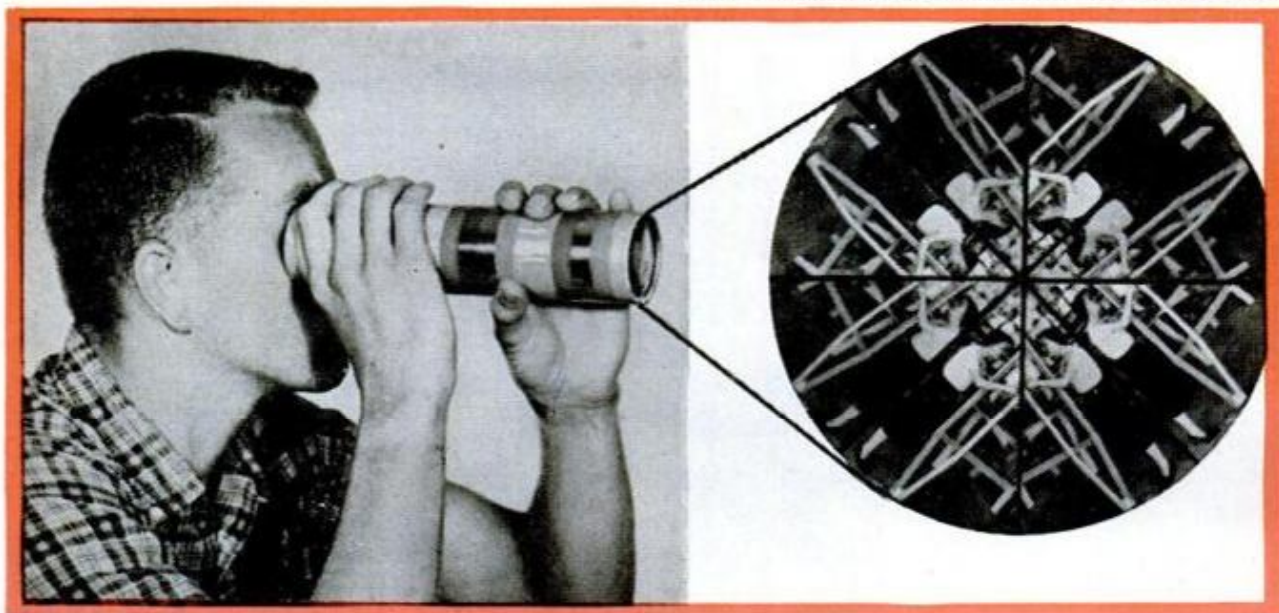
Mid-West Mfg. Co., Middlebury, Ind.



Christmas

TELESCOPE-KALEIDOSCOPE gives a new look to familiar scenes. It magnifies a view, repeating it eight times

Edmund Scientific Co., 101 E. Gloucester Pike, Barrington, N.J.





RABBIT RACK serves as a catch-all for toys, a rack for clothes, or as a toy. The frame is tubular steel, the face is plastic. It comes in two different sizes.
Hamden Specialty Products Corp.,
Eastampton, Mass.

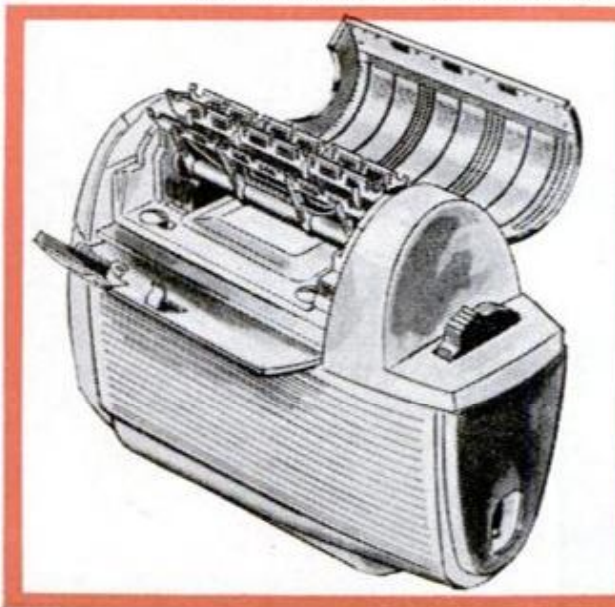


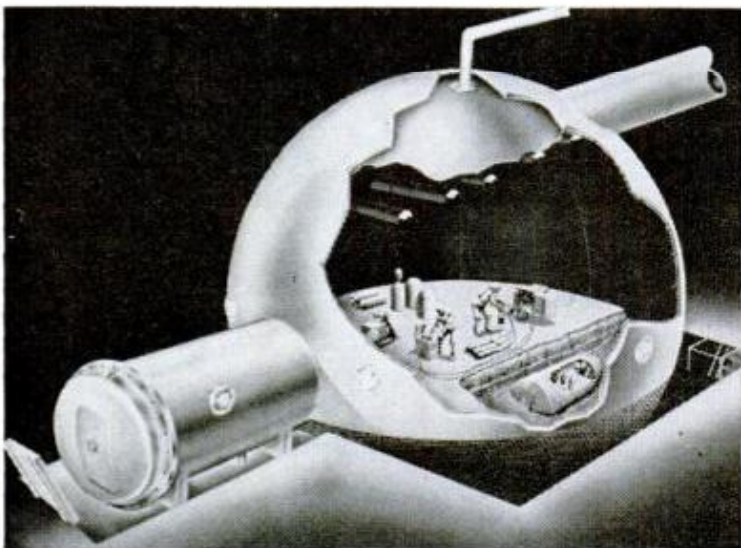
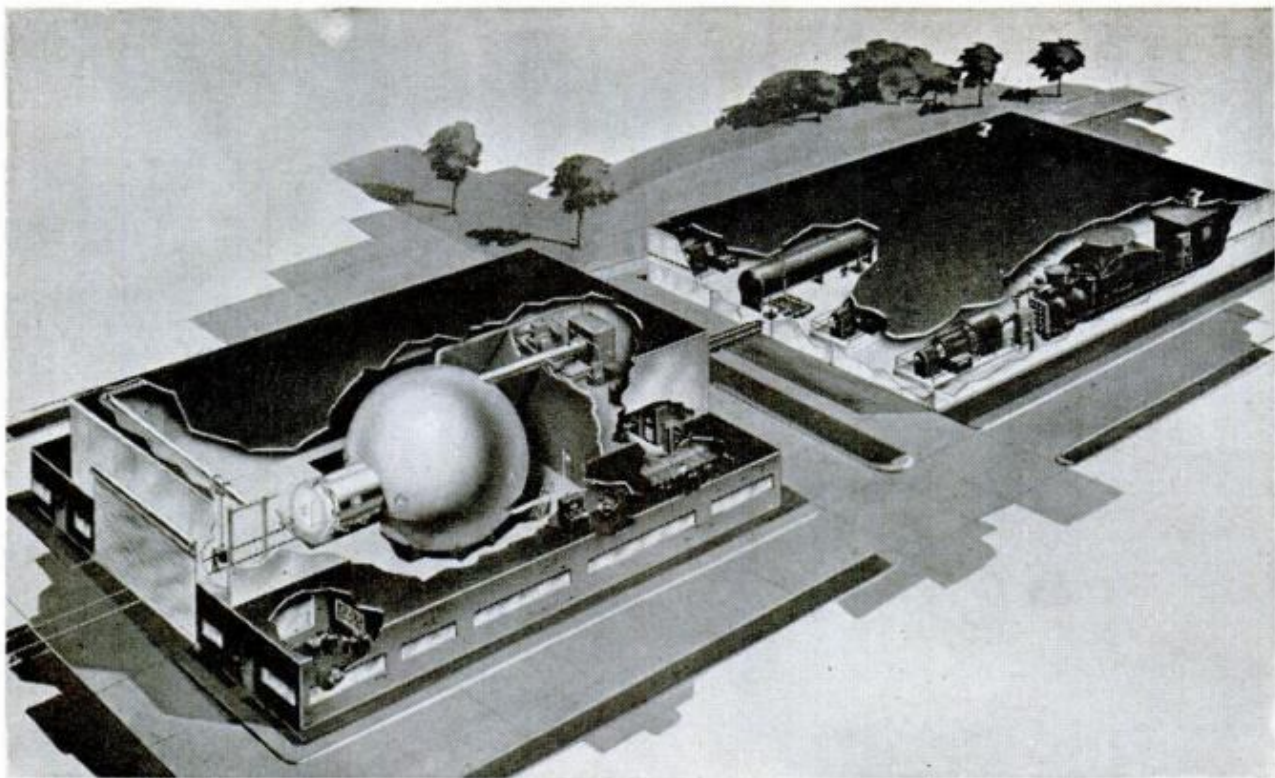
Gift Ideas



ELECTRIC SHAVER using three blades has a device for trimming sideburns, opens easily for cleaning
Sunbeam Corp., 5600 Roosevelt Bld., Chicago 50

KNIFE SHARPENER is hand held and electrically operated. It hones blades with 7200 strokes a minute
Burgess Vibrocrafters, Inc., Graylake, Ill.





Army Moon Simulator

U.S. Army engineers have designed a laboratory to simulate conditions believed to exist on the moon. Sketches of the simulator were shown congressmen by Lt. Gen. Emerson C. Itchner, Chief of Army Engineers, who said a device of this type is "a prerequisite tool for acquiring the knowledge to survive on the moon." The device would use a liquid-nitrogen refrigeration system and heat lamps to create temperatures ranging from nearly 212 degrees F. to -270 degrees F.—the range of moon temperatures.



Punchcard Data by Phone

Data processing is transmitted over telephone lines with a new IBM system that links one or more sending stations to a central receiving station by regular dial telephone. Under the system, companies of any size can transmit data from branches to one machine center, where the data is automatically punched in cards for high-speed processing by an accounting machine or computer. The operator dials the main station, then sends the keypunch information with a manual keyboard. The system also allows routine information to be transmitted automatically from prepunched data cards.



First Turbofan Jetliner Ready for Service

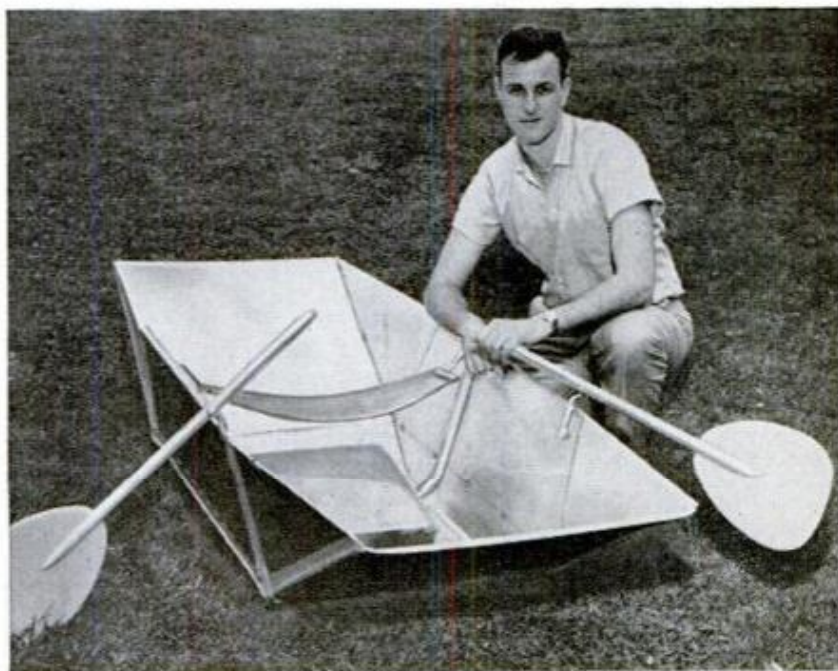
Reportedly 35 miles an hour faster than the 707, the new Boeing 707-120B features four turbofan engines. It is expected to replace many of the 707s now in service. The turbofan differs from regular turbojets in that it has a large fan, powered by

the jet engine, at the front of the engine cell. The fan, like a large many-bladed propeller, pushes air back past the engine as well as through it. The 707-120B will also feature more sweep-back to the wings than previous models.

Portable Boat Unfolds From "Suitcase"

One solution to the mooring and dock-space shortage is to fold up your boat and take it home with you. John Thomson, a senior industrial design student at the University of Illinois, manages that easily with his folding aluminum boat. It collapses—

seat, backrest, oars and all—into a neat 30-pound package no bigger than a suitcase. The hull is made of sheet-aluminum sections, with the joints hinged, then taped with flexible, waterproof plastic. The boat was Thomson's entry in a class project.





Atlantic Research Corporation builds the Arcas, a solid-propellant rocket, for low-cost experimental work

Rockets for Civilians

By S. David Pursglove

WHEN PEOPLE TODAY think about rockets, they think of military weapons and vehicles for expensive government space research. However, civilians are rapidly taking over large areas of rocketry.

Many defense missile contractors look forward to important civilian markets for their rockets in the very near future. The widely discussed probabilities of mail and cargo rockets and reliable overseas communication via satellites have prompted many rocket company officials to gear up for new civilian markets. However, there are many companies that already make rockets especially for civilian uses. They sell their products off the shelf to industry, universities and private research organizations.

Several laboratory rockets are sold to provide the heat needed to test new materials. Industry has developed a wide variety of rockets to start engines, drill

wells and hammer rivets. Rockets are even replacing wind tunnels in testing scale models of new airplanes and of other rockets. Several fire-fighting rockets already have been made and used. A close cousin of the rocket engine, the military pulse jet, operates a unique posthole digger, defrosts sidewalks and protects orchards against sudden temperature drops.

Ships and transoceanic aircraft will soon navigate by artificial "North Stars"—accurately positioned satellites. Other satellites study weather, and the Weather Bureau is gaining experience with weather rockets by observing Navy and Air Force meteorology projects. Some research institutions and universities are using rockets in weather studies and to gather information that will improve communications.

Universities are starting to follow the lead set by Prof. S. Fred Singer and his graduate students in physics at the University of Maryland. Long before anybody

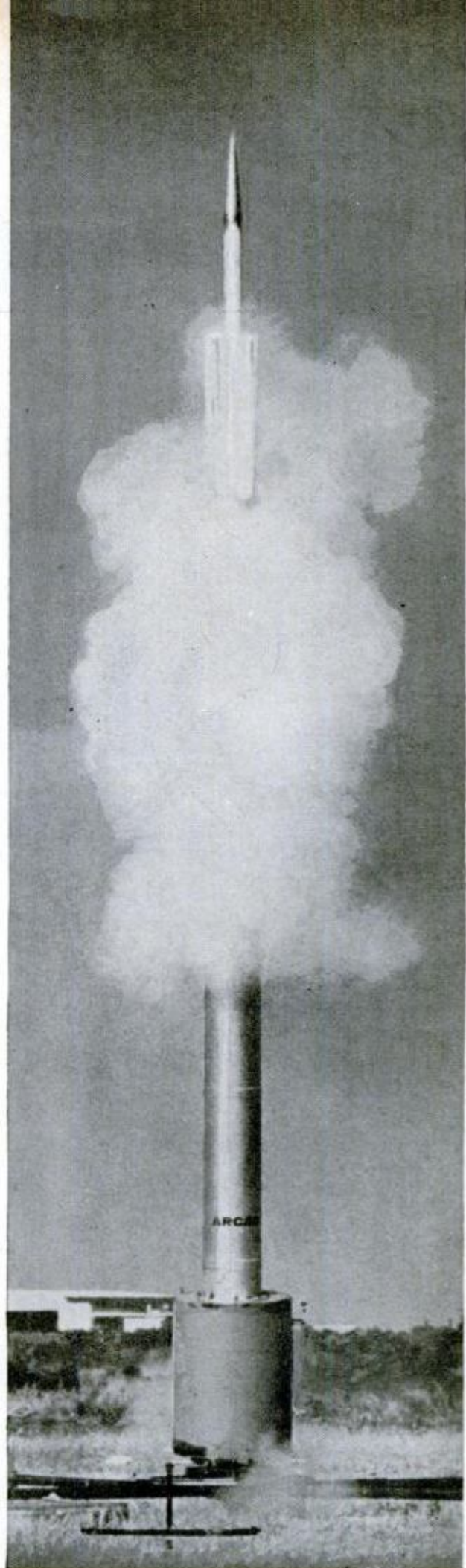


In Buck Rogers fashion, man makes a vertical jump with Thiokol's rocket-powered Jump Belt. At right, an Arcas rocket — capable of reaching a 40-mile height — leaves its unusual closed breech launcher

heard of Sputnik, Professor Singer's students built their own research rockets, using commercial solid-propellant motors, and launched them from Wallops Island, Va. Many universities have government contracts to make studies that call for rockets. Other universities are planning to expand graduate curricula to include more chemistry and physics of the upper atmosphere and other studies that require rockets.

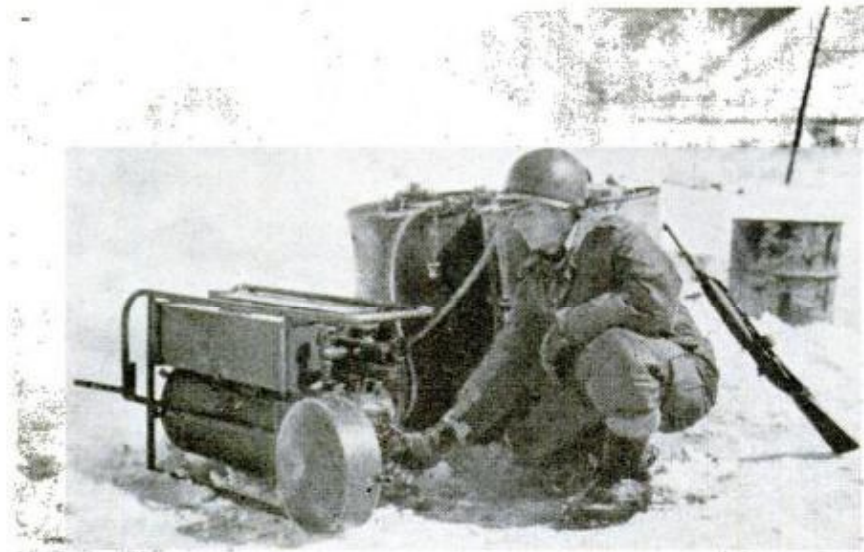
The National Aeronautics and Space Administration (NASA), when it was the National Advisory Committee for Aeronautics, routinely cooperated with aircraft manufacturers in making wind tunnels, laboratories and launching sites available for design testing. These facilities are now available to universities. The university builds the experiment and packs it into an approved rocket. NASA launch teams, working closely with the university, fire the rockets whenever government schedules permit and help collect the data.

Many companies make small, inexpen-





Two Aerojet Junior JATO units, in nacelles of Beechcraft Super 18 executive plane, yield 200 horsepower for 15 seconds



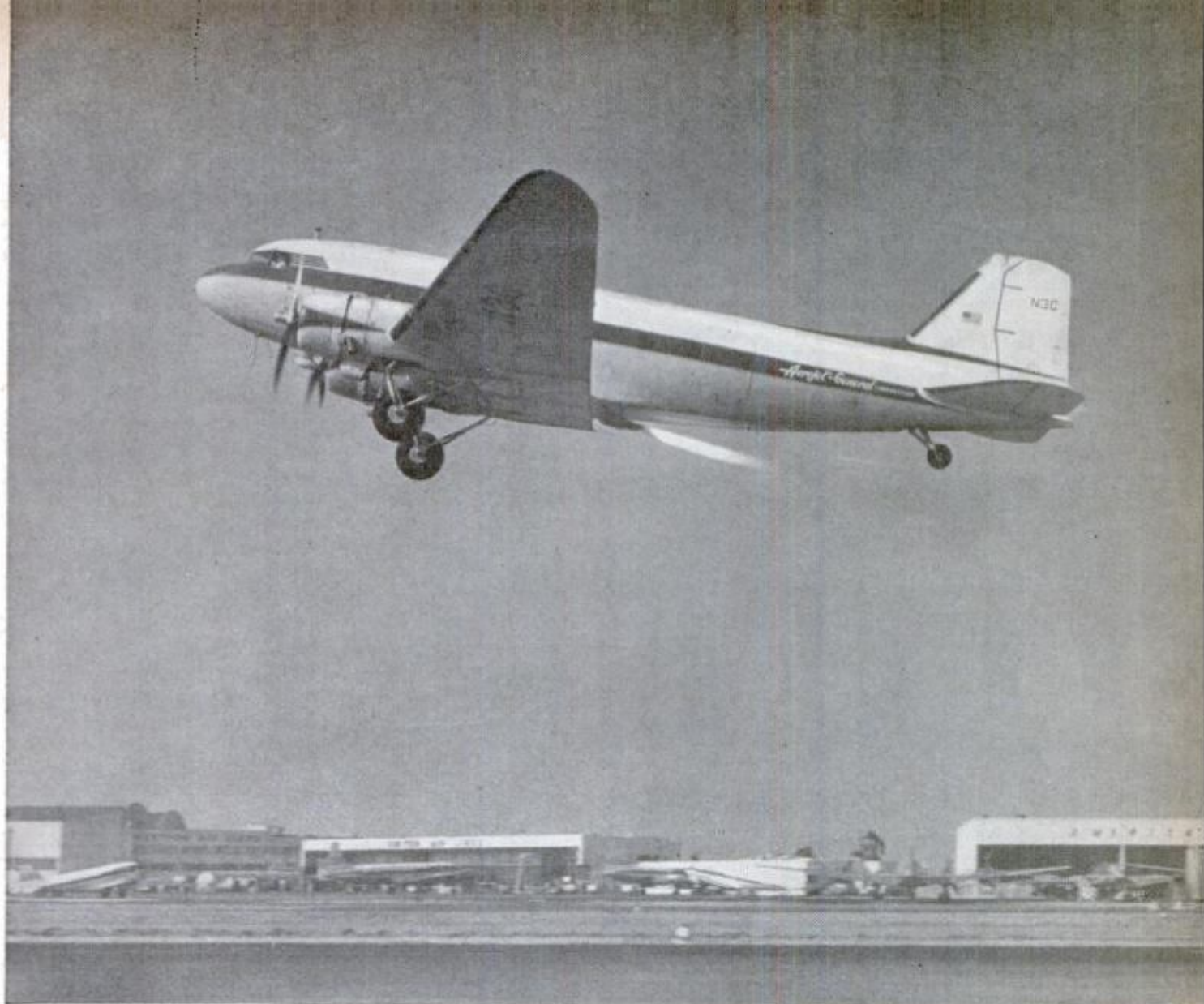
Navy's version of this Army Chemical Corps pulse-jet fog generator digs postholes, de-ices streets, protects orchards

U. S. Army photo



Two solid-propellant JATO units assist takeoff of company plane. These standby engines have wide military use also

Poised for Mach 5 rocket flight is an NASA model with nose cone similar to those planned for hypersonic manned gliders



sive rockets ideally suited to this work. Aerojet-General Corp., Atlantic Research Corp., Douglas Aircraft Co., and Thiokol Chemical Corp. are among them. Atlantic Research builds a 4½-inch diameter solid-propellant rocket, the *Arcas*, designed especially for low-cost experiments. The company makes around 100 per month at approximately \$1500 each. The price will drop considerably, company officials say, when the demand that appears to be developing justifies quantity production.

The *Arcas* will carry a five to 15-pound pay load to a 40-mile altitude. The eight-foot, 65-pound rocket develops a 350-pound thrust for 28 seconds. These are the specifications that most university experiments need. And the price is within the range of departmental budgets.

The well-known *Aerobee*, built by Aerojet-General, is a larger, more expensive rocket, but still meets the specifications and budgets of many university experiments. The company sells *Aerobees* for \$20,000 to \$30,000, depending on the modifications made especially for the buyer. The company will sell the rocket to anybody who wants it. However, the *Aerobee* booster

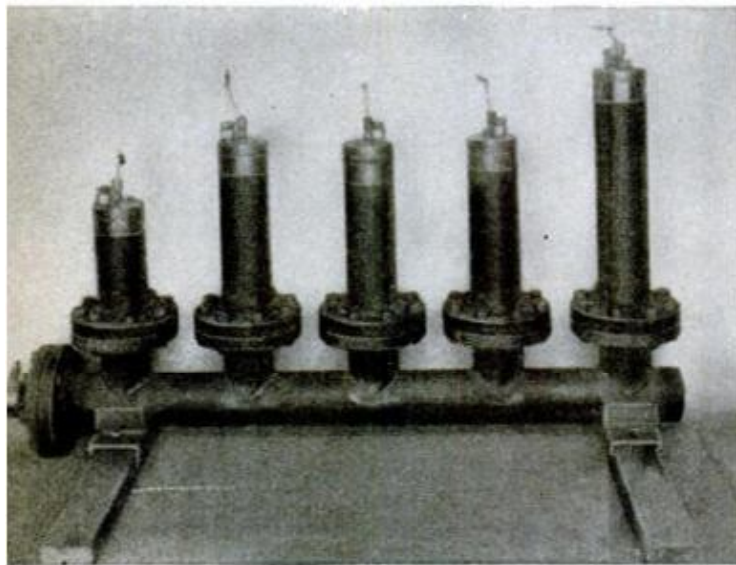
and the *Arcas* motor are classified confidential. The user must have a military clearance, which is very easy for a university to obtain on a legitimate experiment at such a low security classification. Otherwise, the user can buy several other propellants and small solid rocket motors from other firms.

Major electronic firms are using these rockets, often launched in cooperation with the government, to test radio and radar developments, and to calibrate radar. Sometimes the rocket releases metal chaff at peak altitude, and signals reflect from the falling pieces. Other times, radar is calibrated and radio devices are tested directly against the speeding rocket moving at a known velocity. The drift of falling chaff, followed by radar, is also useful in weather and geophysical studies. It describes wind direction, velocity and air density.

Atlantic Research and other companies that make small, low-cost rockets sell them to the Air Force and Navy as well as to non-federal organizations for weather studies. The U.S. Weather Bureau follows the projects closely and has participated in one series of rocket studies by providing



Rocketdyne photo



U. S. Navy photo



funds to join its National Hurricane Research Project to a military rocketry photography study. Now the Weather Bureau is weighing the advisability of instituting its own rocket program. Bureau officials are strongly impressed with the possibility of buying an adequate rocket—designed for the Bureau's purposes—at a low price. So far, most weather experiments have been hitchhikers in rockets much larger and more expensive than needed by meteorologists.

A typical weather experiment uses a balloon to carry aloft instruments that measure conditions and radio data to a weather station as the instrument package returns to earth by parachute. A rocket gets the instruments to a higher altitude, much faster, than a balloon. A rocket places the instruments precisely where they are needed; a balloon places them only approximately.

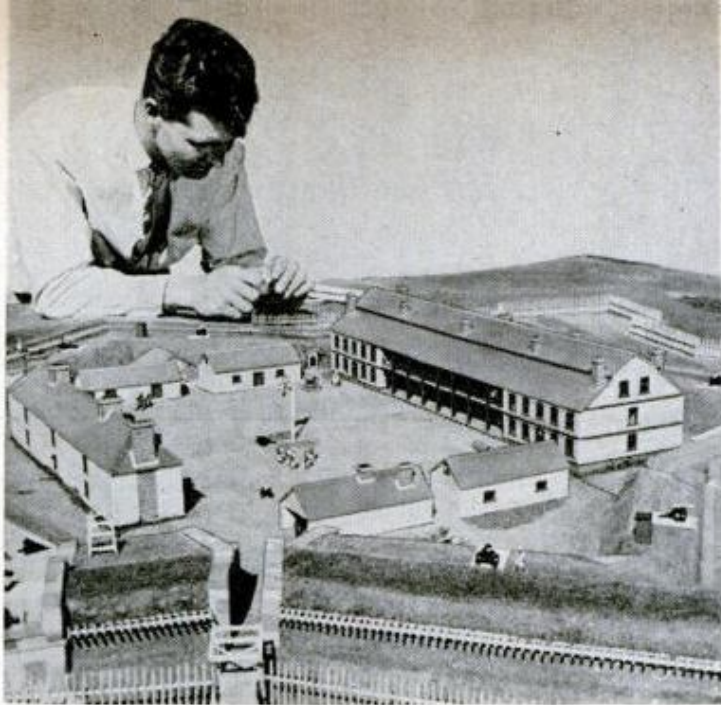
Some problems still face the Weather Bureau. People in New York and Chicago rarely are interested in weather conditions over White Sands, N.M., and off the Maryland-Virginia coast where most rocket weather information is taken. They want details about their own localities. However, short-range rockets are dangerous over cities. The firms that make the small rockets now are working on cases that will detonate at peak altitudes so they will not fall back onto populated areas.

Another use for rockets that is related to weather is cloud seeding. Most rocket firms have built rockets designed to seed sodium iodide crystals into clouds to cause rain. These often have been the same rockets they sell for weather studies or university experiments. They will sell them to reputable organizations for cloud-seeding work, but the firms do not go out of their way to encourage these sales. Although there is a definite use for cloud-seeding rockets over drouth and fire areas, many legal problems crop up. The courts must determine the rights to cause precipitation, the responsibility for causing unwanted rain, and the possible liability for damages to a person deprived of rain because a cloud was seeded early in its journey. Until these questions are solved, the rocket companies believe the market for cloud-seeding rockets will be limited to a few official government experiments.

There is another delay. Scientists must agree on whether cloud seeding really is effective. There is some doubt. On the

(Continued to page 256)

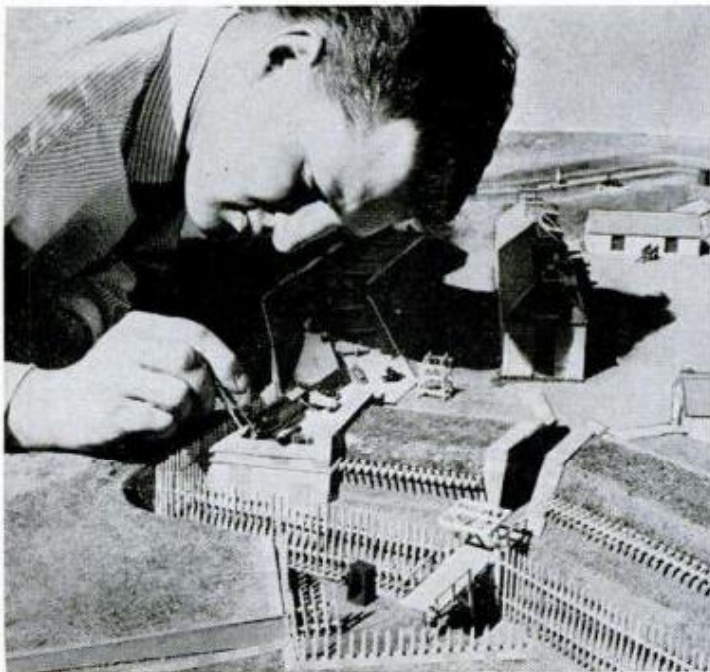
Top: Final assembly of Rocketdyne auxiliary power rocket similar to those being developed to start prop-jet engines. **Center:** Solid-propellant rockets supply pressure to operate Navy fire extinguisher. **Bottom:** Solid-propellant canisters can be fired by soldier wearing Thiokol rocket-powered Jump Belt



Model Builder—Historian

SINCE HIS ARRIVAL in St. John's, Newfoundland, from his native England, in 1955, David Webber has studied the history of his adopted country and has worked to reconstruct—in miniature—the forts that played such a big part in the history of Britain's first colony in the new world.

Working with his wife, Jennifer, he studies old maps and documents, then works by hand to duplicate the forts, buildings, earthworks, and the soldiers. Shown here are his models of The Battery, or Queen's Own Fort, above and right, Fort Townshend, below left, and Fort Frederick, below right. The Government of Newfoundland has awarded several commissions to Webber for construction of his miniatures.





Four-Place Helicopter For Businessmen

Called a "station wagon of the sky," a low-cost, four-place helicopter has been placed on the market to appeal to the business-executive field. The craft, which is nearly 30 feet long, can carry nearly 1000 pounds. It cruises at up to 96 miles per hour, and has a range of 225 miles and a ceiling of 14,600 feet.

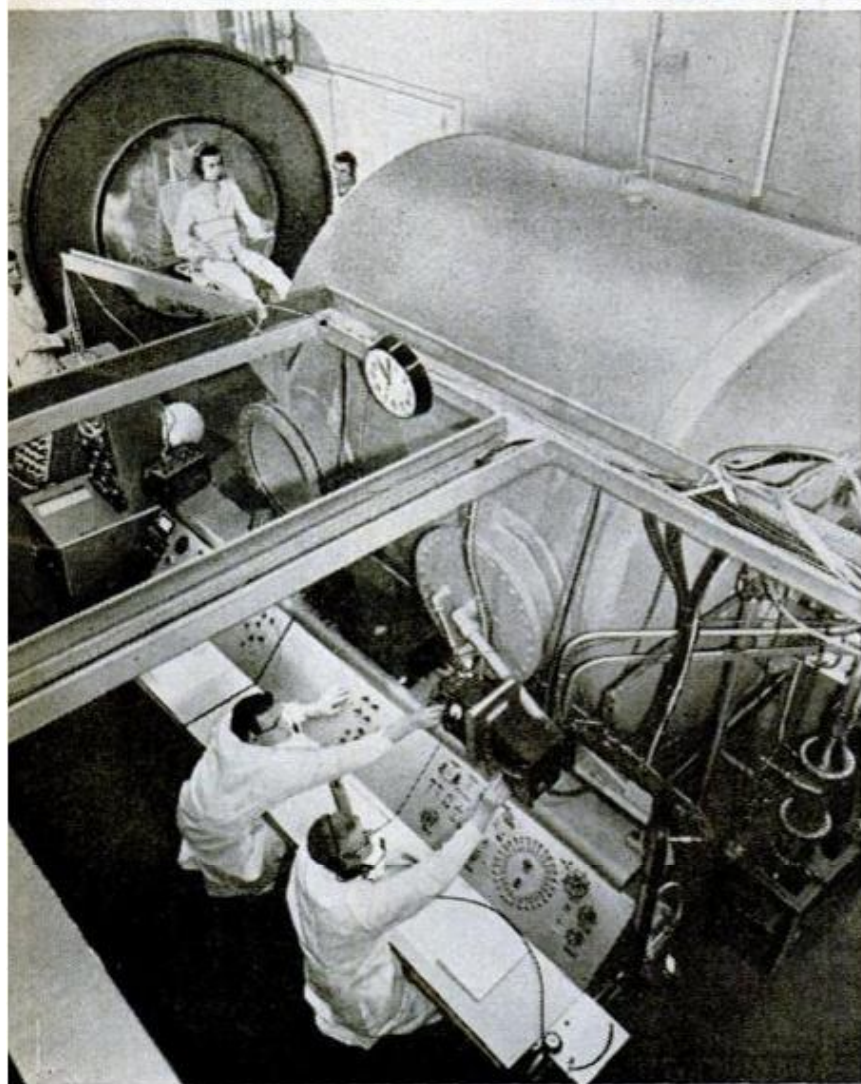
Electron Tube Amplifies Light

Making big telescopes out of little ones — and bigger telescopes out of big ones—is the job of Westinghouse Electric Corporation's new Astracon electron tube, which is so sensitive that it makes visible to the eye every individual elementary particle of light that triggers its input. It can increase the effective size, or light-gathering ability, of even the largest telescopes many times over, enabling astronomers to get photographs of the heavens never before possible.

Space-Travel Hazards Simulated in Chamber

Six hazards of space travel can be simulated in a "multistress" chamber at Boeing Aircraft Company, Seattle, Wash. Scientists seeking to learn how to condition and protect a man working in a hostile environment will be able to expose test subjects simultaneously to these conditions of space flight: noise, intense light, vibration, variations of barometric pressure, temperature and compositions of various gases.

Subjects sitting in an airtight chamber inside a larger chamber will perform such tasks as identifying targets on a radar screen and aligning rotating dials on an instrument panel while scientists alter the environment. For example, air is purified by circulating it through chemicals which remove carbon dioxide and odors. A heat exchanger condenses moisture from the pilot's breath and maintains relative humidity at the desired level. Walls of the chamber can be heated to 400 degrees F. to simulate high temperatures which might be encountered by a space vehicle re-entering Earth's atmosphere.



Let a Robot Drive the Plow



Guide disks follow furrow; if they leave furrow, an automatic ignition cutoff switch will stop tractor

By Roger Francis

DRIVING ON U.S. HIGHWAY 78, an insurance salesman saw a large farm tractor plowing with no one on it. He drove frantically to a nearby filling station to report the "accident" and find someone to stop the tractor.

"That tractor has been running two days and nights without anyone on it," calmly explained the filling-station operator. "You're the second person to tell us." It also happened that the farmer who owned the vehicle was at the station—and he invited the salesman to take a closer look.

In the field, the salesman saw two guide disks and a pivot wheel being pushed ahead of the tractor. These parts of the robot ran in the furrow and steered the tractor by a linkage to the front wheels.

This was the basis of the system that let the farmer do his plowing without a driver on the tractor, the salesman learned. And he was told that the robot he was looking

at was similar to the many others now in use.

The guide disks are mounted on an axle with each end angled about five degrees forward, and they are adjusted to push against each other. Pushing the disks, a piece of round shafting hinged from a vertical shaft permits adjustment between this horizontal shafting and the disk's axle by use of setscrew clamps.

The vertical shaft carries the pusher pipe from the tractor mounting and is supported by the pivot wheel. This pusher pipe—an old car or truck drive shaft may be used—is about six feet long. A universal joint on its mounting end permits the pipe to move up or down and crosswise. An adjustable coupling link between the pipe and the tie rod (or a guide bar on row-crop tractors) completes the basic elements.

A homemade furrow guide and purchased accessories cost from \$60 to \$125,

depending on materials used and whether it is built in the farm shop or a machine shop. Using good hubs with tapered roller or ball bearings, the guide will give excellent service for several thousands of acres without repairs.

Robot guides require several safety factors for proper self-control.

A small rope from the plow to the tractor's hand clutch, distributor coil wire, or a wire installed in the ignition circuit with clamps or pull-out couplings, stops the tractor should it become unhitched from the plow. This prevents the guide and tractor from continuing around the furrow until they run into the back of the plow.

Another safety device is an ignition switch, which is automatically turned off if the guide disks get out of the furrow. Also, a mechanical yoke across the pivot shaft uses a cord to pull the coil wire from the spark distributor or coil to stop the tractor when the guide disks are turned sharply by leaving the furrow.

If these two safety devices fail, a third is the mechanical construction which allows the guide disks to swing around only about 150 degrees on the pivot shaft until one disk hits the pusher pipe. This position of the guide disks turns the tractor in a tight circle to keep it from leaving the field.

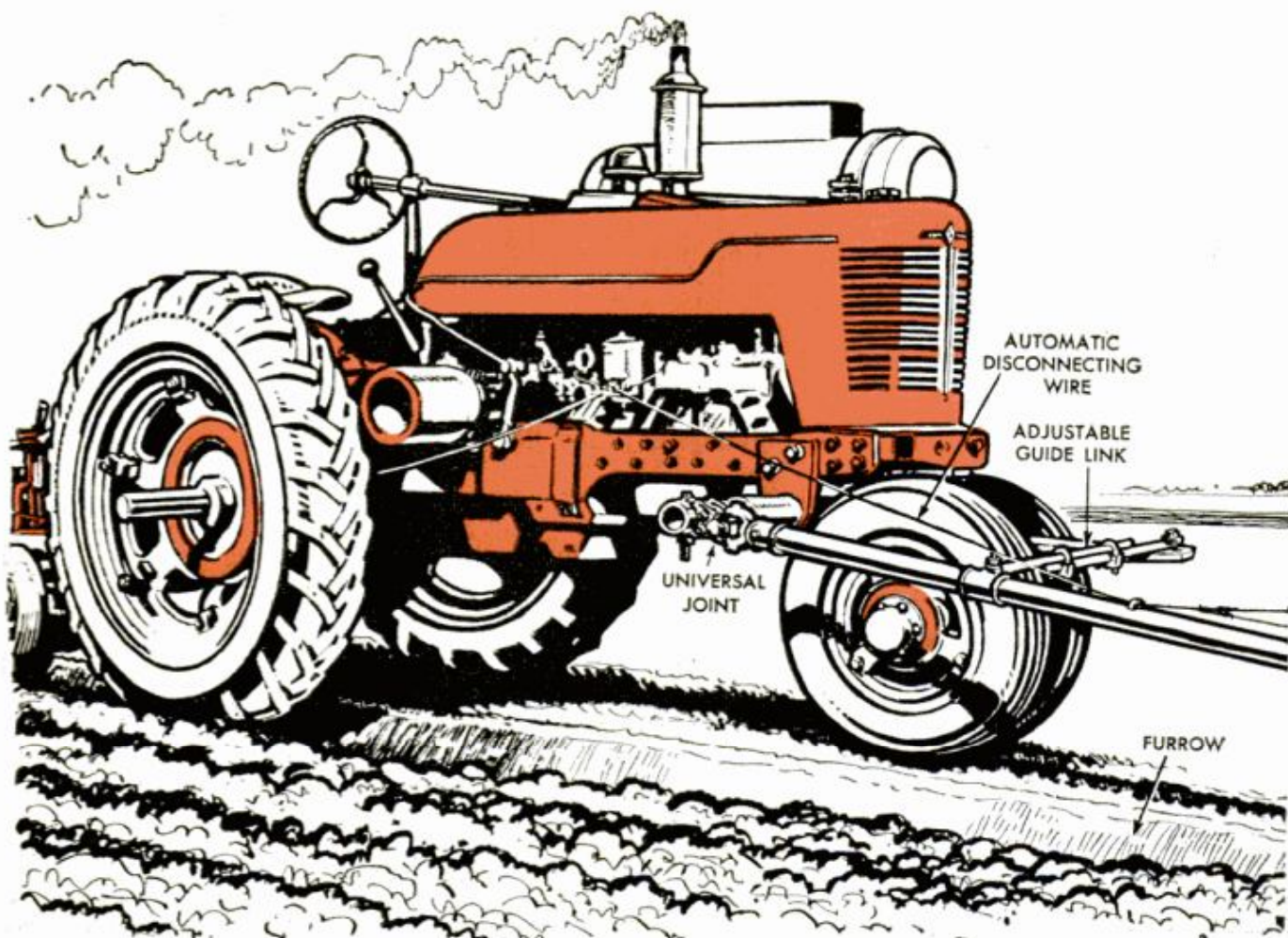
Before the yoke and cord were routinely added on the guide, a tractor might leave the furrow and run in a tight circle for some time. Other cases of tractors leaving their guiding furrows have been more dramatic.

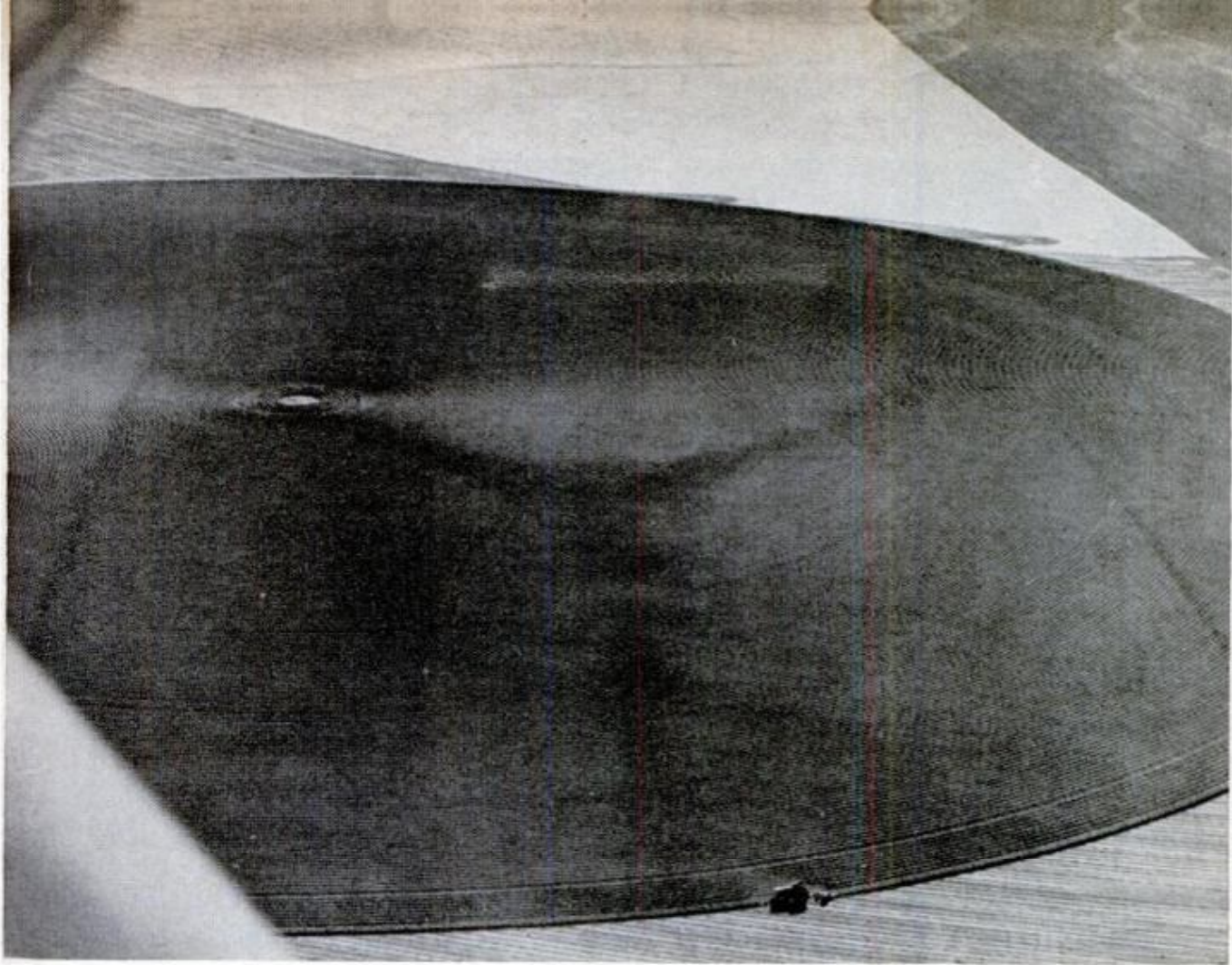
West of Plainview, Tex., a big tractor left the field pulling a disk-breaking plow. It plowed across a paved farm-to-market road twice before running into a concrete irrigation-well spillway pit. Here the tractor's differential ran on high center and the tires caught fire by continuing to rotate against the concrete.

To stop the tractors for servicing, many farmers mount their tractors from the plow side. However, this is dangerous should a man stumble. A better way is to pull the cord on the guide to remove the spark distributor wire or to throw the switch on the pivot shaft. In the latter cases, the farmer does not get in front of his tractor or plow.

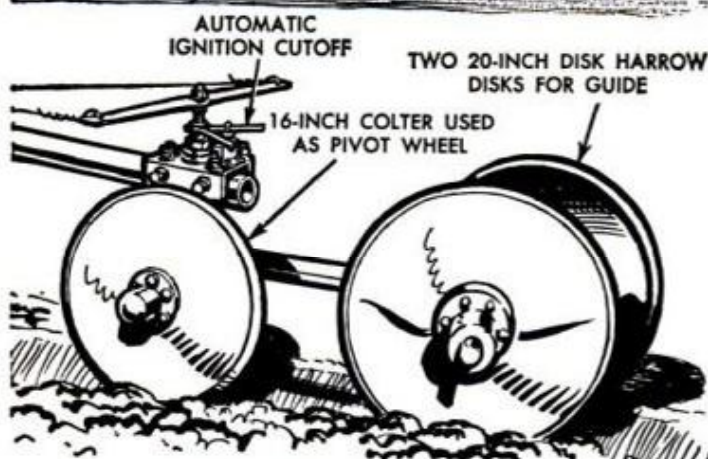
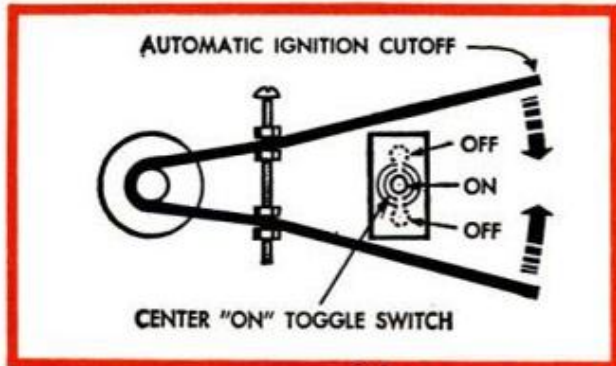
For night operations, lights on the tractor add safety and convenience. Farmers watch the lights to see if their tractors are running at night. Also, the tractors are easy to locate for servicing during the hours of darkness.

"By running my furrow-guided tractor 24 hours a day, I plowed my land in half as many days as if I had driven my tractor,"





Robot-guided tractor makes field look like giant phonograph record as it pulls plow in ever-widening circle



said a farmer living south of Dimmit, Tex.

Labor time saved by the robot amounts to about 11 out of 12 hours for conventional tractors and plows requiring service every six to eight hours. Some farmers who live in towns have extra fuel tanks on their tractors so that the furrow guide may operate their tractors for 12-hour periods without servicing.

"My guide gives me more time for tending to the business end of farming. This is important with rising cost," said one farmer. In Swisher County, Tex., a cotton and grain farmer credited his robot for helping him get his grain-sorghum ground plowed while he was still harvesting cotton.

"I can usually attend a special church meeting and visit my neighbors more while the guide is running," said a faithful church worker. A money-minded man claimed, "In plowing 600 acres 10 inches deep, the guide saved me \$400 on labor."

Fields are usually plowed from the outside to the inside using the robot guide. With a disk-breaking plow, the front disk may run in the furrow without cutting the new ground. This extra disk will pull into

(Continued to page 240)

Robot guides are made of new and scrap parts. Inset: Cutoff that's actuated when guide disks leave furrow



Bowling by Braille

Blind persons can enjoy bowling without assistance, both for recreation and exercise, with an electronic pin-reporting system which enables them to "see" which pins are down. The system was developed by Leon M. Bablouzian, above, of Arthur D. Little, Inc., Cambridge, Mass., who produced it as a public service. In use, pegs on the top of the reporting box retract as the pins fall. The bowler delivers the ball from a foot-orienting rubber mat, then touches the box to check the results.



Microwaves Speed Paychecks

Electronic computers located 30 miles apart "talk" to each other via a microwave relay that, among other things, speeds along payroll information. The computers are located at North American Aviation installations at Canoga Park and Los Angeles, Calif. Computer information is microwaved between the plants at a rate 500 times faster than that of human speech. Payroll data received in Los Angeles is processed automatically by a printer that stamps out 400 paychecks a minute.



Pipe-Organ Guitar Produces Novel Tone

Using principles of the organ, a Bavarian guitar designer has built a guitar with pipes. Arranged in assorted sizes, like a church organ, the pipes produce a distinct, resonant tone that is especially effective in solos. The pipe-guitar has been put into production, costing about 40 percent more than an ordinary high-quality guitar. It is made of maple and pinewood.

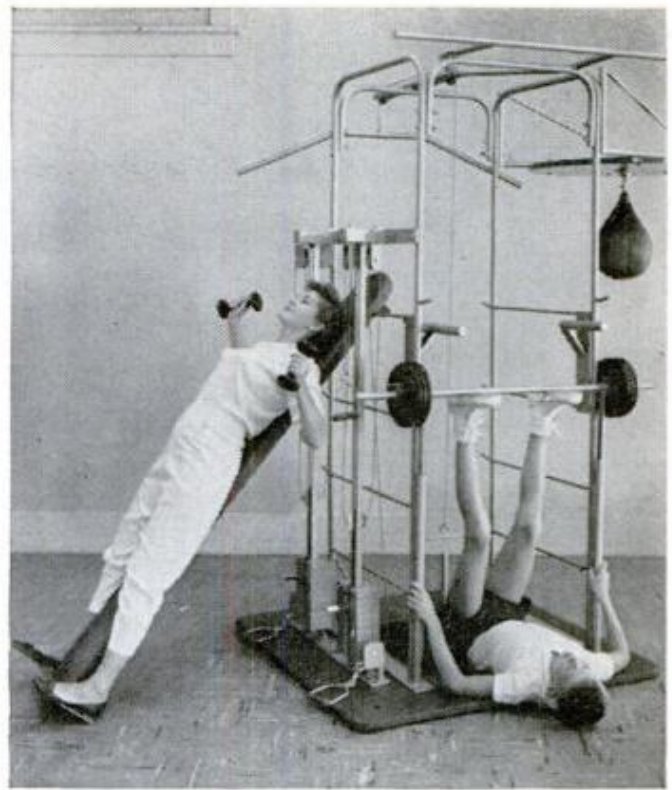
Wild Horses Are Vanishing

Vast herds of wild horses no longer roam the West's rangelands—their numbers have been reduced to a comparative handful, according to Dr. Tom L. McKnight of the University of California. The total population is down to about 17,000 head, 5000 of which are in Nevada. All of the animals are feral; that is, descendants of animals that escaped domestication; none are native.



Electronic "Side Man"

Members of a band or combo who accompany a soloist are called "side men." Now even that job is being taken over by electronic substitutes. The new Wurlitzer "Side Man" produces the effects of a rhythm section automatically, creating the sounds of 10 percussion instruments in any combination in 85 different beat patterns and at any speed from 36 to 195 beats per minute. The accompaniment is preprogrammed for automatic operation, but the "Side Man" can be "played" to produce many special effects.



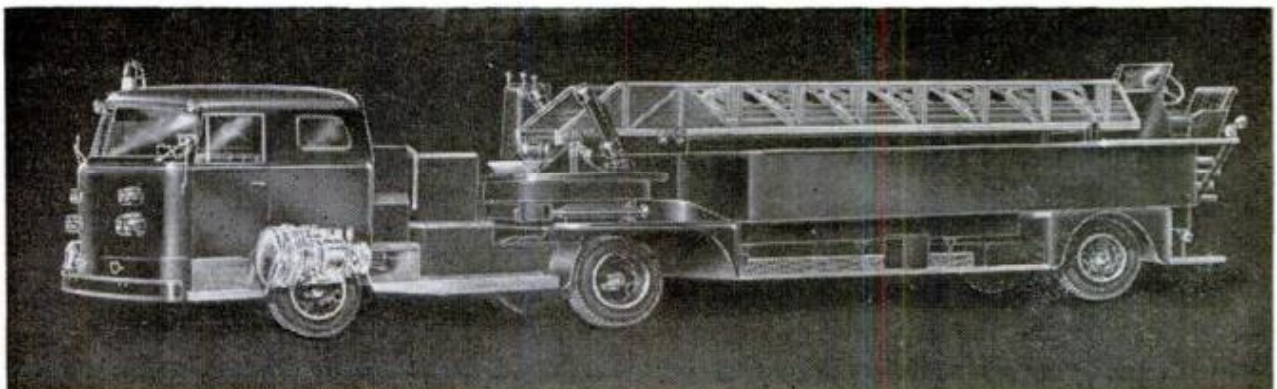
Compact Home Gymnasium

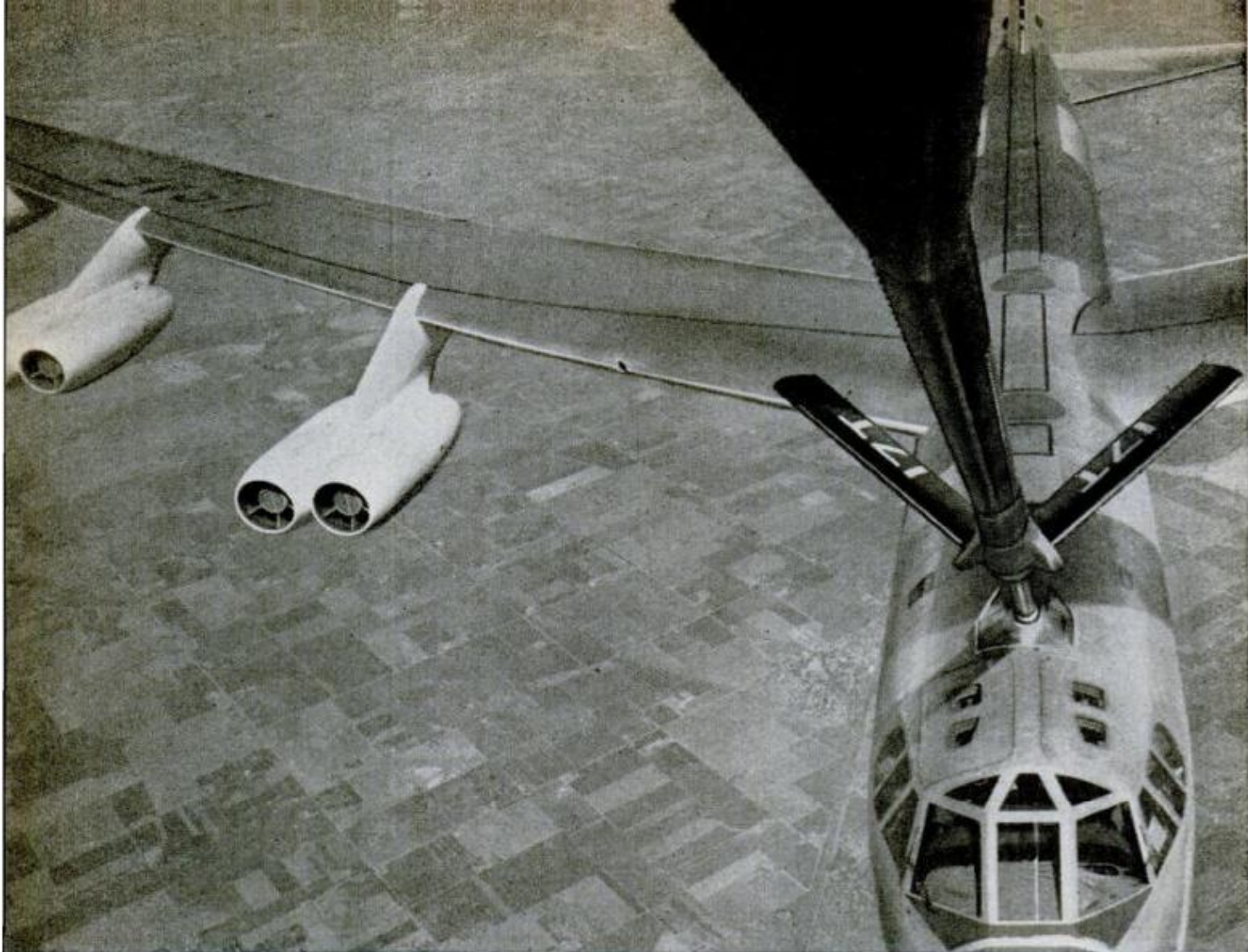
Thirteen pieces of gymnasium equipment fit on a four by four-foot platform in a new "gym," offering at least 57 different exercise combinations for home or office reducing or body-building. Besides the usual lifting and pulling exercises, it includes a punching bag, chinning bar, inclined bench, sit-up and relaxing board and a low exercise bench. To complete the set, the company offers a matching belt vibrator and exercise bicycle. The whole family gymnasium will fit nicely into 120 square feet.

Lightweight Gas Turbine Powers Fire Truck

Gas-turbine fire trucks—believed to be the world's first—have been ordered for the San Francisco and Seattle fire departments. Powered by Boeing 325-horsepower aircraft turbines, the trucks will require no warmup, can accelerate to 55 miles an hour in 34 seconds, and can perform better on hills (a problem in both cities) and in traffic

than conventionally powered trucks. The turbine engine, which uses a conventional transmission, weighs only 325 pounds, compared to 3500 pounds for a comparable piston engine, and will amount to only one percent of the total weight of the trucks. Another advantage is low maintenance—the engine can be overhauled in one day.





Refueling boom stays snugly in place if bomber pilot obeys light signals to nurse his big jet along

AIRBORNE PINBALL MACHINE GUIDES REFUELING

By Tom Sherman

THE PILOT of a jet bomber hanging on a tanker's refueling boom has his work cut out for him. His biggest problem is holding his plane in position to stay hooked up. The tanker's director lights help him solve this problem.

When the bomber is hooked up, the telescoping refueling boom is free to follow it within the area of contact, or "envelope," as it is called. If the bomber slips past the limits of the envelope, the boom will automatically disconnect to keep from getting damaged.

The pilot would be hard pressed to keep the bomber in the envelope without the director light. Ordinary formation techniques aren't precise enough, because there are only a few feet of leeway. The envelope is about 12 feet long, 14 feet high and 21 feet wide. At refueling speeds of 500 miles per hour and better, it doesn't take long to get out of position.

There are two rows of lights on the tanker's underside, just forward of the wing. The left row tells the pilot to go up or down a graduated amount, and the right row tells him to go forward or aft. The center, or safe, position on both rows is shown by green lights.

If the bomber runs too far forward, it telescopes the boom on itself. This telescoping actuates a set of electrical contacts tied into the right row of lights. Depending on how far forward the bomber is, the lights direct different amounts of correction on the "A" end of the row. The green bar plus the center green means "come back a little," the green bar alone means "come back a little more," and so forth. The red bar alone means "any further, and the boom will disconnect."

If the bomber drops behind the center position, the boom extends. This closes other contacts, which light appropriate



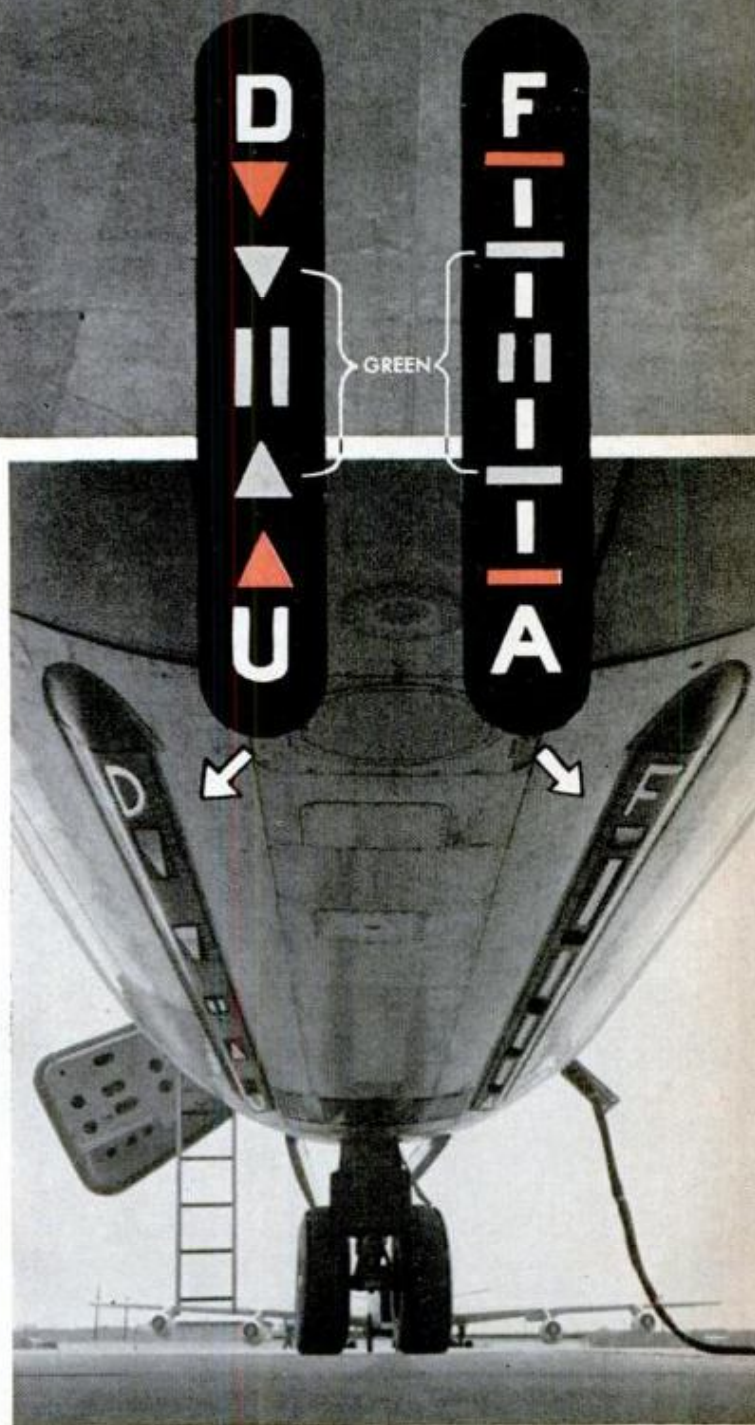
Lights are located on underside of tanker behind nosewheel. In good weather, pilot can get instructions from boom operator by radio, but in bad weather, at night or during radio silence, lights are invaluable

lights on the "F" end, telling the pilot to come forward.

The left row of lights works the same way, except that it's controlled by the angle that the boom makes below the tanker. For example, as the bomber falls below the center position, the "U" lights will light, with a green or a red arrow. Again the red means, "Go no further or the boom will disconnect."

Let's say that you're already hooked up. Maybe you're a little too high, so the left row shows a green arrow on the "D" end. Now you're drifting still higher, see, now it's a red arrow—you'd better ease the nose down or the boom will disconnect. Good, you're back in the green. Now you're sliding back too far, see that red bar on the "F" end of the right row? That's it, add some throttle and pull forward.

As you can see, air refueling isn't easy. When it gets turbulent, the lights sometimes flash back and forth like a pinball machine. It takes tremendous flying skill to make the bomber follow the lights. But without them, refueling would be a lot tougher. ★ ★ ★





Space-Medicine Instruments

Miniature electronic instruments, about the size of a pack of cigarettes, are being used to record in-flight physiological data in space-medicine research. The small size makes the instruments especially valuable, since the subjects of experiments are less restricted in their activities and movements than with larger standard equipment. They are worn on a belt around the waist with a miniature battery box, providing an integrated system. Included are miniature electrocardiographs, phonocardiographs, respirometers, electroencephalographs and equipment for measuring body temperature.



Quicker by the Dozen

Edwin Gangwer invented a stainless-steel "multi-egg fryer" that can cook 12 orders of eggs at once. It consists of 12 rings mounted in a frame, with a cup set over each ring. Eggs are broken into the cups and a lever tilts the cups, emptying the eggs into the rings and onto the grill. When the eggs are done, the multi-fryer is lifted and quickly reloaded. Using 16 of them, Gangwer fries 2304 eggs in 23 minutes each morning. Now, why would anyone want to fry 2304 eggs every morning? Well, Gangwer is food-service manager in the kitchen of the Virginia State Penitentiary.



Fiberglas Foxholes

Atomic-age soldiers now have plastic-age foxholes to help protect them from nuclear blasts and fallouts. They dig their foxholes in the usual way, then wedge a Fiberglas cover on top of it. Atop the cover they throw about 18 inches of dirt.

☐ Making electricity from noise, a phono-power element can use automobile noises to supply all of a car's electric power except for starting, according to its originator, Electronic Development Company of Tampa, Fla.



Machine Prints Music

Descended from a typewriter-like machine that prints music symbols instead of the usual characters, an "electronic punched-tape musicwriter" simultaneously prints the music and punches computer tape which can later be used to turn out additional exact copies without any further manual operation. Its inventors, two college professors, also hope the tape can be fed into a computer which will extract individual instrument parts from an orchestral score. Other uses may be transposing music to another key, transcribing old music into modern, etc.



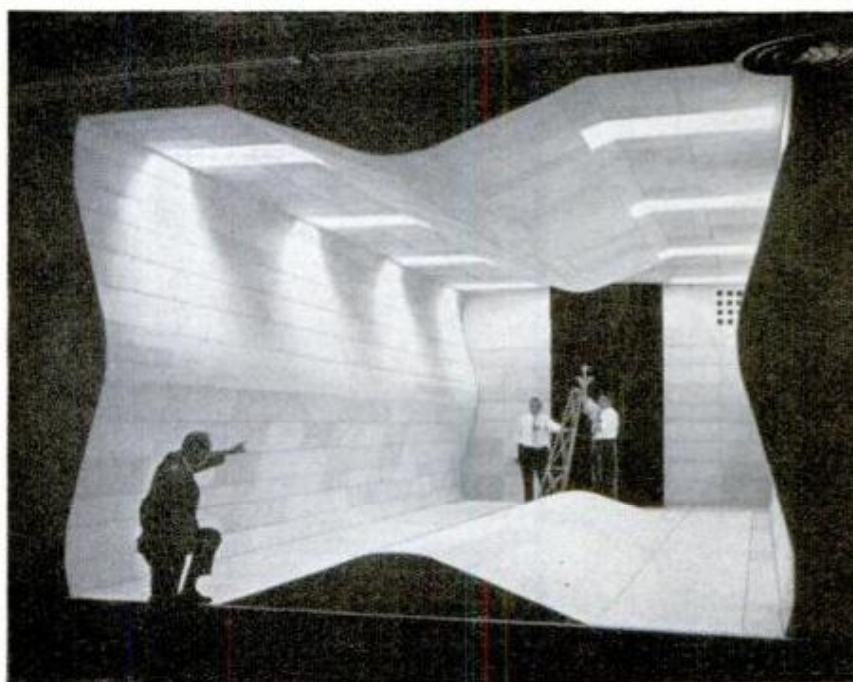
Minneapolis-Honeywell Regulator Co. photo

Radio Tracks Grouse

Six ruffed grouse are going about their daily lives in the northern Minnesota brush, unaware that they're taking part in a wildlife survey for the University of Minnesota. Each grouse carries an ultraminiaturized radio transmitter fastened to its back by a plastic harness. Movements of the grouse are being carefully tracked by two directional receiving antennas spaced a mile and a half apart on either side of the home territory. The transmitters weigh less than an ounce apiece, are powered by a tiny battery that will produce a nine-volt signal for 1000 hours.

Antenna Chamber

Odd in shape, but for a purpose, an unusual anechoic room has been built into Republic Aviation's new Farmingdale research center. To study the performance of radio antennas on space vehicles and advanced aircraft, models of the craft and their antennas are remotely turned in the 40-foot room while radio signals are beamed at them and an antenna-pattern measuring system records the results. The walls are lined with radio-wave-absorbing materials, and curved to cut reflections.



Rubber



By Dan Brogan

J. C. SCHULTZ, of Aberdeen, So. Dak., tried a dozen types of field decoys for goose hunting without finding one he liked. They were either too heavy or too bulky—he couldn't carry enough decoys when he took along a carload of friends—or they weren't natural enough to fool the real geese. So like a lot of do-it-yourselfers faced with an unsatisfactory product, he decided to try making his own.

The ideal material seemed to be rubber—inflatable decoys are light, easy to carry and handle, and don't take up much room when they aren't in use. Schultz bought some new raw rubber and started to experiment, but the price of the material made the decoys impractically expensive, so he tried using cast-off inner tubes, which he could pick up free at any service station or garage. Even new tubes, condemned because of a flaw, were available at little or no cost.

To get a pattern, he laid a freshly-killed Canadian goose on a piece of paper and outlined a two-piece pattern, but when he put the two halves together, the outline wasn't right—it bulged where it should have been flat and was flat where it should have bulged. Finally he skinned his "model," tanned the skin, and laid it out, cutting off sections and laying them out until he had a nine-piece pattern. In later experiments with mallard duck decoys, he worked out an eight-piece pattern for that size.

The first decoys, assembled with a cold-patch method and painted with decoy paint, were not a success. The seams wilted in the sun, pulling the body out of shape, and the paint, intended for wood or plastic, reflected so brightly that it frightened the geese. But vulcanized seams and rubber-base paint solved those problems, and his current decoys are so lifelike that they have been endorsed by Ducks Unlimited, a

Geese



waterfowl hunters' conservation group.

To make a decoy, Schultz first slits the tube down the center, lays it open on a flat surface, and cuts out the sections with a sharp scalpel. Then he joins the sections by vulcanizing a quarter-inch strip of raw rubber over the seams. When the decoy is assembled with the seam strips inside, the joints are all but invisible.

When all the seams are sealed, he inserts an inch-long piece of soft rubber tubing at the bottom, through which the decoy can be inflated by mouth. A cork is used to close the tube. On each side of the body he vulcanizes a one-inch length of stiff rubber tubing under a square of heavy sheet rubber, so it's open through the center. These fittings allow the decoys to be set up on shore or in shallow water by inserting foot-long sections of quarter-inch steel rod as legs, then planting the legs in the ground.

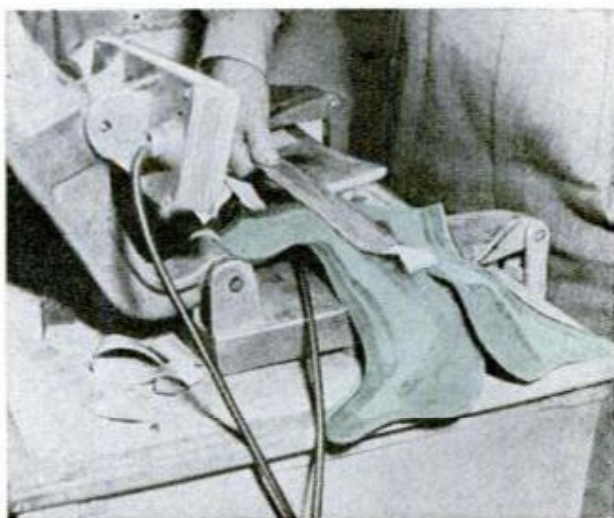
To get the different head and neck positions—feeding, resting and watching—nec-



Step one—cutting the pattern for half the neck and head section from an old rubber inner tube



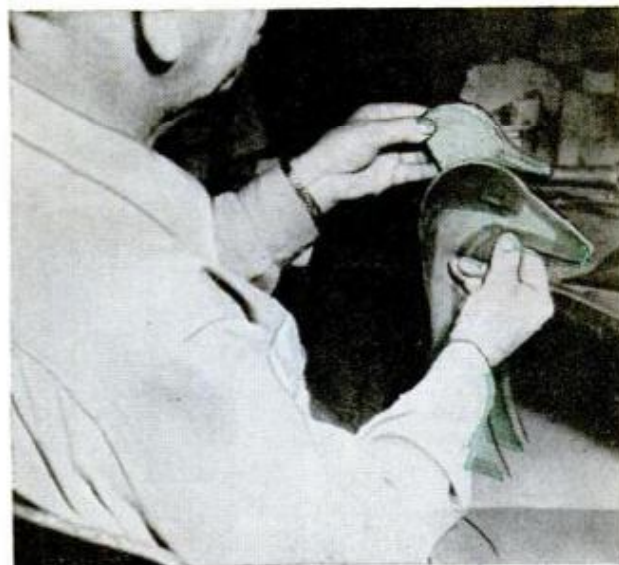
Step two—seam edges are buffed and spread with solvent, then vulcanized with thin raw rubber strips



Rubber seam strips control the shape of the seam—if it's stretched before vulcanizing in place, it pulls the seam, and the rubber, into the desired curve



Vulcanizing takes about 15 minutes, and welds the nine cut-out sections into airtight shape. A short piece of quarter-inch tubing forms a simple valve



Mallard duck head presents a forming problem, so it must be carefully vulcanized over a wooden form

Painting in the feather pattern, Schultz finishes a goose that's hard to tell from the real thing



essary for goose decoys, he uses a slightly different pattern and forms them as needed while vulcanizing the neck seams.

To get lifelike eyes, Schultz uses a pot-metal eye mold which he built for the job. He places a quarter-inch square of raw rubber in each of the 12 sections in the mold, then turns on the heat and melts the squares into the mold. The perfect eyes are then vulcanized into place on the decoy's head.

One molding problem, in making duck decoys, was to duplicate the rounded bill and flat head of a mallard drake. To match that difficult shape, Schultz assembles the mallard head and neck section over a wooden form and vulcanizes the head over the form. When cooled, it pulls off like a rubber glove.

Once assembled and tested, the rubber decoy is ready for painting. He uses ordinary black and white rubber-base tire paint, with pigments added to produce the right colors. The biggest trick is to match the purple-blue-green iridescent color of a mallard drake's head and neck, but he finally worked out a formula that produces the difficult color every time.

The Canadian goose decoys are comparatively easy, since they're all grey, black and white. He paints the body first, mixing paint as he works from the light grey body toward the darker grey and black at the tail. Then he traces in the feather pattern on the breast, back and wings with white paint, then paints the molded eyes.

The "rubber geese" proved very successful, and also very popular with Schultz' friends and other hunters, and a market was created. Before he realized it, he was making decoys as a business. Until his recent retirement, he worked his hobby interest into a business with all the orders he could handle. ★ ★ ★

Inflated, they're full-sized model game birds, but deflated, these four would fit inside a shoe box





Mercury Astronauts Test Space Capsule for Water Landing

Lt. Comdr. Walter M. Schirra, one of the Project Mercury Astronauts, climbs out of a working model of the Mercury space capsule in the Gulf of Mexico during a recent

practice for water landings. Wearing his full-pressure space suit, Schirra is assisted by Astronauts Allen Sheppard, Virgil Grissom and a Navy frogman.

"Roundhouse" in Hangar Rotates Airplane

Unlike automobiles, a small airplane can be driven in only one direction—forward. It has no reverse gear, so parking is a problem. If it's taxied into a hangar, it must be hauled out tail first. A homemade "roundtable" solved this problem for three Kansas pilots. It looks like a grease rack, but

works automatically. When the nose wheel of the plane passes over a lever, it releases a spring catch, allowing the turntable to swing free. The force of the propwash on the rudder swings the plane around. Automatic catches stop the turntable after a 180-degree turn.



Shop Projects 1961

SHOP NOTES AND CRAFTS



Have Fun CREATING NEW ART FORMS

By Frank Tehan

ALL YOU NEED are a few pieces of colorful fabric, polyester resin and imagination to fashion art forms having a refreshing newness and a flair that holds the eye. Personalized gifts you can't buy anywhere, that drape-matching lampshade you've always wanted, a planter that compliments a special floral arrangement—these creations and many others are right at your fingertips with this simple process.

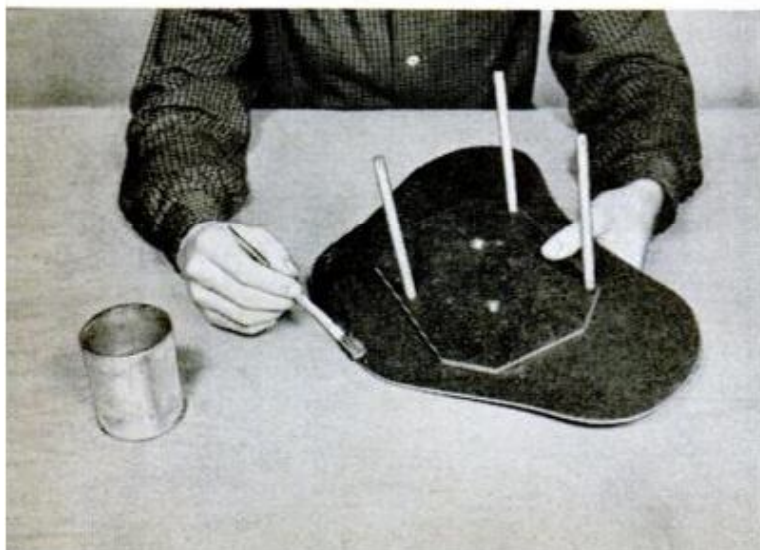
Polyester resin is usually sold for use

with Fiberglas cloth. But it's practical to combine this easy-to-work plastic resin with almost any type of cloth. Basically the resin is applied to cloth and allowed to harden. After that the cloth and resin hold their shape and retain the color and pattern of the cloth. Hardened resin is transparent and water and weatherproof.

The cloth may be scraps of clothing such as old sweaters, skirts, coats, even drapes. And by adding pigment to the resin you

MELTED PARAFFIN is brushed on all surfaces of the form which contact the resin-impregnated cloth. On this form the edges and the dowel ends are coated

POLYESTER RESIN is brushed on the cloth after it has been stretched tightly and taped to the underside of the form. Apply resin rapidly in an even coat



can change the color of the finished product. An addition of a small amount of pigment adds an interesting overtone.

The basic form is made of 1/8-in. hardboard and cut to the shape needed for a base. To this base, a slightly smaller piece of 1/4-in. perforated hardboard is bolted. The perforated hardboard makes an adjustable form in which one or more 1/4-in. dowel rods set. This completed form is reusable, and additional forms may be added to create unlimited variations.

Melted paraffin is brushed on the forms wherever resin might stick to them. On the form shown in the photo below the edges of the hardboard base and the ends of the dowels, which touch the cloth, are coated with wax. The cloth stretches over the pegs and under the edges of the hardboard to which it is taped.

Just before applying the resin, a catalyst is mixed with it in the proportion of 1/4 teaspoon of catalyst to 1/4 cup of resin. The mixing is done in a clean, disposable container that later may be thrown away. Resin should be brushed on the cloth soon after mixing. And after using the brush, rinse it immediately in acetone. Then allow the piece to harden for about thirty minutes. Once it is hard, the base is removed and all excess cloth trimmed off with a pair of scissors. Rough edges and other rough areas are sanded lightly to smooth them, and then the entire surface is wiped clean with acetone. An additional coat of resin may be applied to add more strength.

The bowl at the top of facing page is made in two sections, the form for both sections being circular and fitted with a single dowel. Cloth in the top section is black and white striped denim. For the bottom, a scrap of black wool jersey contrasts with the striped top. The two sections are held together by a wooden dowel, and resin is poured around the dowel. The simulated planter and lamp, shown at the right, is made from two forms, both using circular hardboard bases. ★ ★ ★

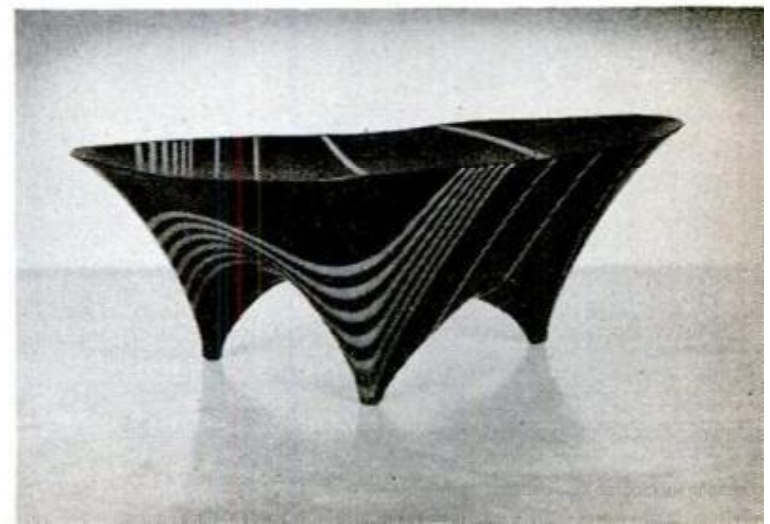
TRIM OFF the excess cloth after removing the form. The trimming should be done carefully, using a pair of ordinary scissors to form a smooth, even edge



WHITE PIGMENT is added to the resin before coating the cloth to make this three-legged, oval planter



THIS ATTRACTIVE PLANTER (below) is made by stretching black and white striped cotton jersey over a free form oblong base and three dowel rods





Removable Typewriter Shelf Fits Over Desk Drawer

My desk wasn't equipped with a pull-out shelf for a typewriter, so I cut a piece of $\frac{1}{2}$ -in. plywood to the width of the center drawer and wide enough to support my portable typewriter. Then I cut three 4-in. lengths of flat steel, bent one end of each up slightly, and attached them along the rear edge of the plywood shelf as in the detail. To use this improvised shelf I pull the center drawer of the desk out about halfway and place the shelf upon it with the projecting flat-steel lugs hooked under the rail.—Bob McPhail



Filing System for Duplicates Keeps Track of Keys in Use

Some folks have more key troubles than others, especially when it comes to keeping track of a good number of them. A good idea is to check them all over, making sure there is a duplicate for each. Now, put an identifying tag on each key and place them all on a ring in some safe place. If you hang a list of the keys you actually carry on this same ring, in the event you lose them you've only to check the list and select the corresponding duplicates.



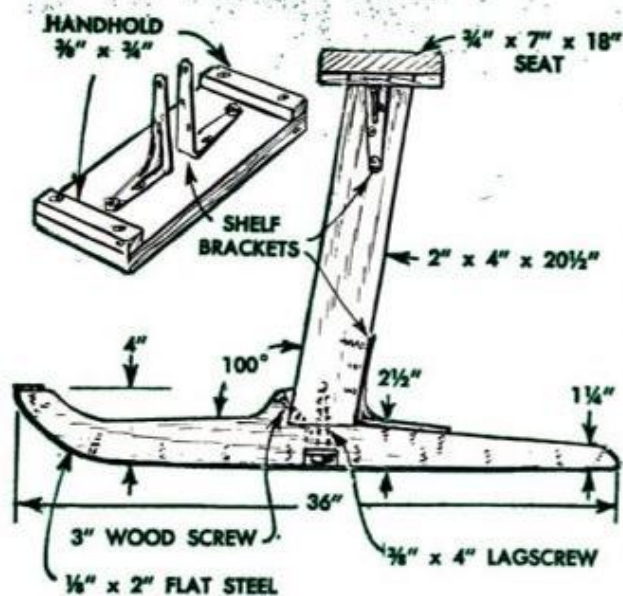
Clothespin Is Marking Gauge For Fitting New Linoleum

When laying a new piece of linoleum flush against one already in place you can solve the problem of an accurate fit by using a wooden clothespin as a marking gauge. Cut a shouldered flat on one prong, and drive a brad just through the other prong, the projecting point aligning with the shoulder. Cut the new piece of linoleum slightly oversize and slip the pin over the edge. Then slide the shoulder of the pin along the edge of the old linoleum. The brad point will score a registering line on the new piece.—Burton L. Wollenzien



Stable Soldering-Iron Stand Made From Empty Coffee Can

No doubt it has happened to you at one time or another. You're intent on the soldering job at hand and in setting the iron down you either miss the rest or tip it over and end up with a scorched bench top. But, if it has happened once it need not happen again. Just take an ordinary coffee can and bend the sides in. You'll find that the can is big enough to spot out of the corner of your eye and is almost impossible to tip over.



UNI-SLED FOR MORE WINTER FUN

If you like your snow-sledding rough, tough and fast as the wind then this jumper offers thrills that nothing else on runners can equal. The sled is designed for an adult or a teenager, but the height of the post should be cut so that the rider's feet rest on the ground when he is sitting upright.

Draw a full-size pattern of the runner

Ice Dams Along Gutters Can Cause Roof Leaks

Winter build-up of snow and ice often causes roof leaks. Ice dams form along gutters backing up trapped water which runs under shingles and drips into attic. Since the damage is caused by heat escaping through a gap in the attic insulation and melting trapped ice and snow, a thick

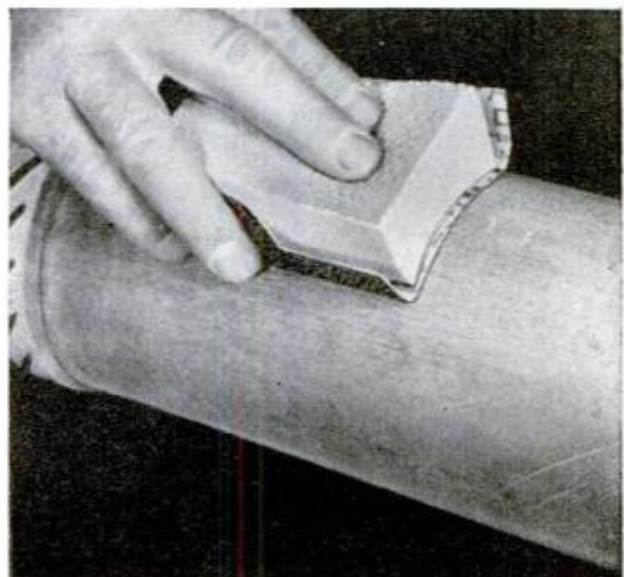
layer of insulation should be placed between roof rafters. By installing flashing along the eaves most of the water will run off. When leaks develop, cut channels in ice so trapped water can escape. Gutters can be cleared of ice by installing lengths of inexpensive heating cable.

*435 N. South Ave.
Elmira, N.Y.*

Sponge-Backed Sandpaper Fits Curved Surfaces

Contour sanding blocks make it easy to sand curved surfaces quickly and evenly. But lacking blocks that fit the curves you can always improvise by wrapping a piece of sandpaper around a common cellulose sponge. Mold the sponge in the hand to distribute pressure evenly over the curved surface. Bil Toman

¶ **Amusing toy** is improvised from transparent plastic typewriter ribbon box. Place four gummed reinforcements in empty box and replace cover. Holding box by edges, run finger rapidly around top a few seconds and then around bottom. Static electricity causes reinforcements to move and jump around.



CONCRETE TIPS FOR



Early and Late Troweling

Strength, durability and surface-wearing qualities of concrete floors are determined when the floor is laid. It's important that the dry materials be correctly proportioned and that the specified amount of water be used in every batch of concrete. The mix must have just the right amount of coarse aggregate for maximum strength. A topping mix of cement and sand trowels easily to a very smooth finish but it does not wear well. Early troweling of any poured concrete mix brings the "fines" (fine sand particles and cement) to the surface along with a portion of the water content. This will result in dusting of the cured floor. Steel troweling should never begin until water sheen has disappeared entirely from the surface. Late troweling produces an impervious and highly wear-resistant floor that will withstand hard usage.

Waterproofing Block Walls

Waterproof masonry coatings, or paints, are widely used for the dual purpose of preventing seepage through concrete blocks and poured walls and also to serve as an attractive finish on the room side of the wall. When properly applied the waterproofing qualities of such coatings are unquestioned, but it is important that instructions for application be followed in all details. Nearly all instructions call for a thorough cleaning of the walls, especially old walls, before application. As a rule you also will be directed to wet the walls before applying the coating and there will be explicit directions for mixing the dry waterproofing materials. Of course, any cracks must be filled with a mastic filler made especially for the purpose of patching concrete walls.



Cleaning Concrete Surfaces

Cleaning is important in extending the useful life of any concrete surface, particularly floors. Periodic cleaning of floors subjected to hard usage removes not only the accumulation of dirt, but also picks up the grit which acts as an abrasive to accelerate wear. As a rule warm water and soap are best for a reasonably thorough job of cleaning. After washing, the floor should be rinsed off with clean water to remove all soap residues. Always sweep the floor before washing to get up the dust and any coarse grit. A floor-sweeping compound will control dust in basements and garages while sweeping, but don't allow the compound to stand for any length of time on the floor as the oil it contains may be absorbed by the concrete. Oil and grease stains on the garage floor usually can be removed by covering the spot with dry cement or hydrated lime, which will absorb most of the oil.

CONCRETE CARE

Hardener Prevents Dusting

One fairly common defect of concrete floors is continual dusting, which usually is caused by too early troweling. In this condition fine particles continually loosen from bond and appear on the surface as a fine dust. The use of a chemical hardener offers a fairly reliable remedy for this condition. The hardener consists of materials in solution which react chemically with the lime in the concrete to form a seal and to harden the surface. After cleaning the floor the hardener is applied by flooding the surface and spreading and respreading with a broom until the concrete has absorbed all of the liquid that it will. Whenever the liquid tends to collect in puddles, it is continuously respread with the broom for a period of an hour or more. Then any excess is mopped up and the floor permitted to dry for 24 hours. The application is repeated in the same manner.



Roll on the Paint

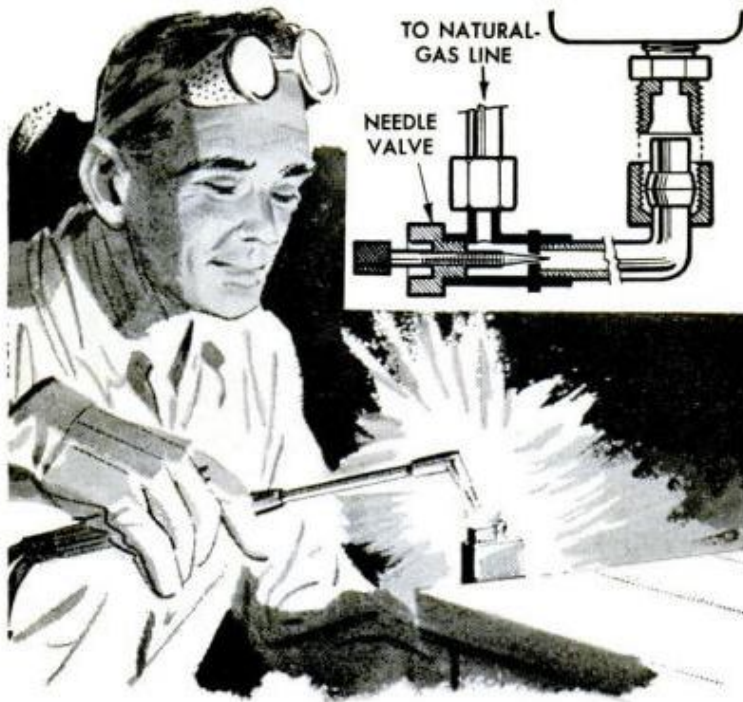
Painting makes a more attractive floor as concrete floor paints are available in a variety of colors. But it should be kept in mind that any paint will show wear much sooner than will the bare floor. Only in a recreation room or a game area, where appearance is important, is painting worth the extra effort required to apply it properly. Concrete floors should be etched before painting. This is done by applying a 10-percent solution of muriatic acid and allowing this to stand until etching action is complete. Then the residue is rinsed off thoroughly and the floor allowed to dry. Nearly all concrete floor paints can be effectively applied with an ordinary paint roller. It's much faster and far easier than applying with a brush and you get a much better job with no wearisome knee work if you use a handled roller.



Tiles Are for Plush Finish

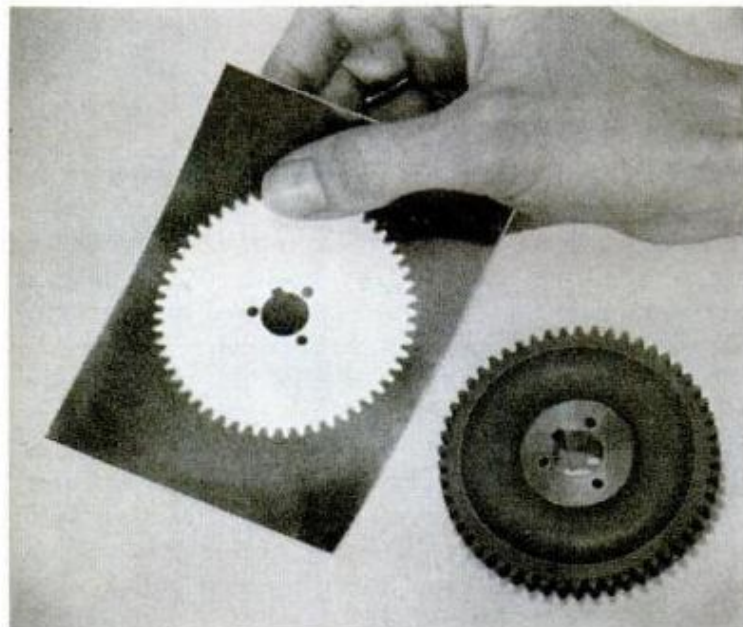
Floor tiles can be worked into any decorative scheme as they are available in a great variety of patterns and materials. If you plan on tiling the concrete floor in the recreation room in your new home or you are pouring a new floor over old, be sure to tell your contractor what you plan to do. Perhaps he can save you some money as concrete floors which are to be tiled do not require the time and care in finishing. Concrete floors can be covered with asphalt, rubber, vinyl or linoleum tile but the floor must be dry and it must be of a construction that will remain dry. And be sure that you follow the manufacturer's instructions for laying tile below grade. You can get these very complete details on procedure direct from the manufacturer of the tile or from your local dealer in floor coverings. Tile can be used to solve a floor-dusting problem.





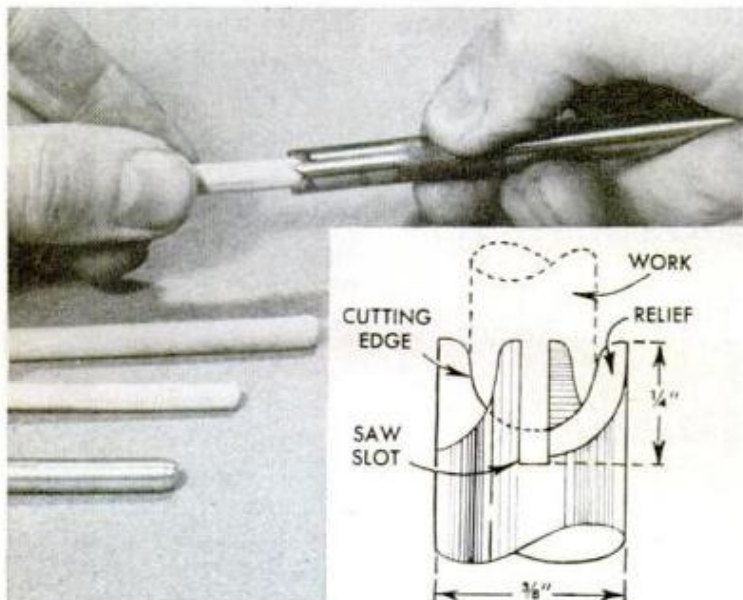
Gas-Fed Cigarette Lighter Reignites Solder Torch

Auto-repair shops specializing in radiator repair find that very often sweating parts together with a gas-oxygen torch will generate enough steam to extinguish the flame. Relighting it with matches takes time and patience especially if the repairman's hands are wet. To avoid this nuisance one shop owner fitted an outlet tube to the natural-gas line. One end of the tube is fitted with a needle valve. A cigarette lighter, minus wick and cotton, is secured to the other end with a compression fitting. When the flame-out occurs, a twist of the valve and a flick of the lighter and the torch is relit.



Red Photoproof Paper Prints Outline of Parts

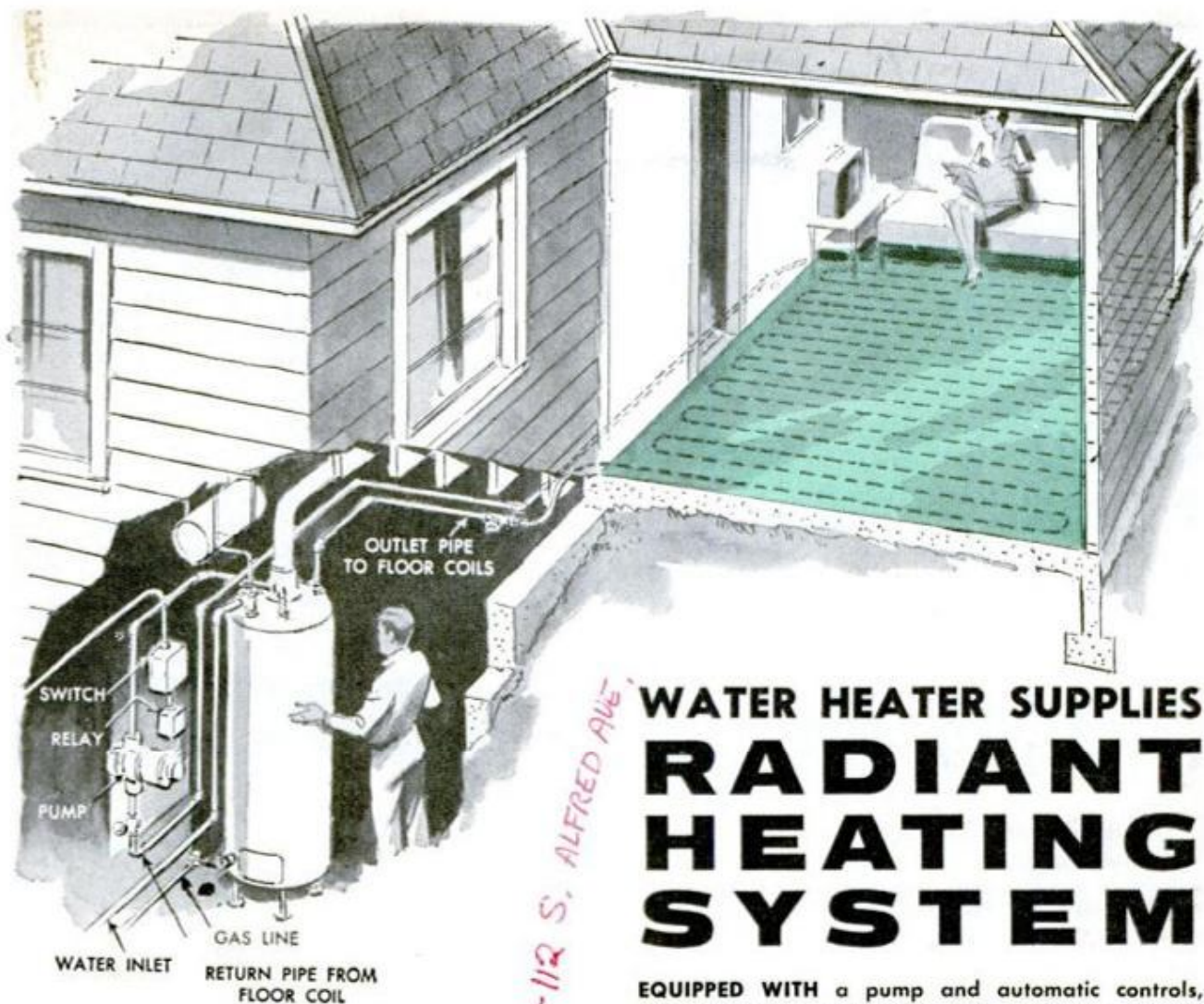
Duplicating or matching the outlines of intricate machine parts is easy to do if you use a sheet of photographic red-proof paper to do the work for you. Place the part to be copied on the paper and expose it to sunlight until the exposed part darkens. The light should be direct and contact of part to paper must be good. The resulting "print" can then be cut out and pasted to the blank to be cut. Of course, you can use regular black-and-white contact paper for the same purpose, but it will have to be fixed and developed in the usual manner.—H. Hanscom



Small Hollow Milling Center Rounds Ends of Dowels

Essentially a hollow milling center with a semi-spherical cavity, this special tool can be used as a hand tool or chucked in a lathe or drill press to round off the ends of dowels or soft metal rods. A reamer to form the concavity is first cut from tool steel and is shaped exactly like the cavity to be made in the center. Flutes are cut in it and relief is ground on each edge. The center is then cut from a length of drillrod, the cavity is reamed out and two saw cuts are made across it at right angles. The rim is then filed to form the four cutting edges.

—H. Emerson Anderson

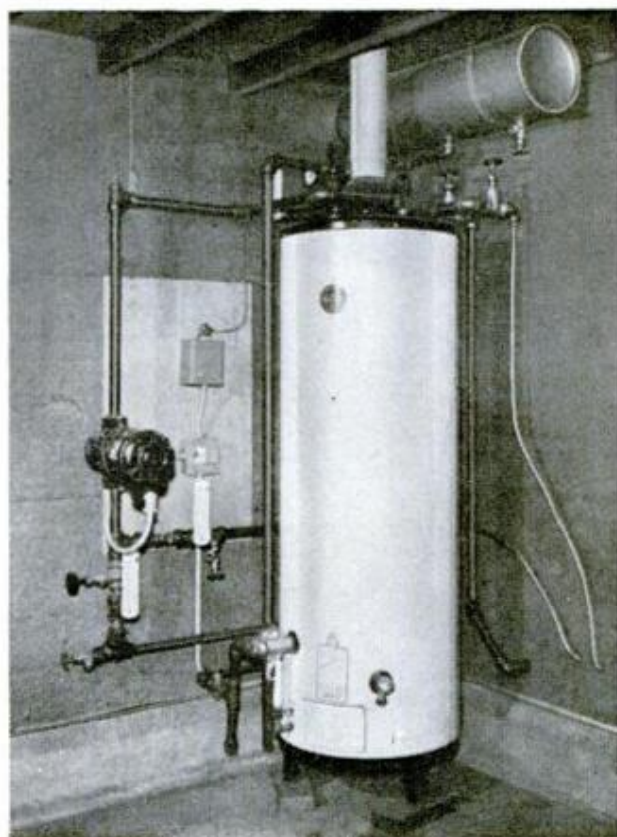


WATER HEATER SUPPLIES RADIANT HEATING SYSTEM

EQUIPPED WITH a pump and automatic controls, the system is practically self sufficient, providing inexpensive heat with a minimum of attention

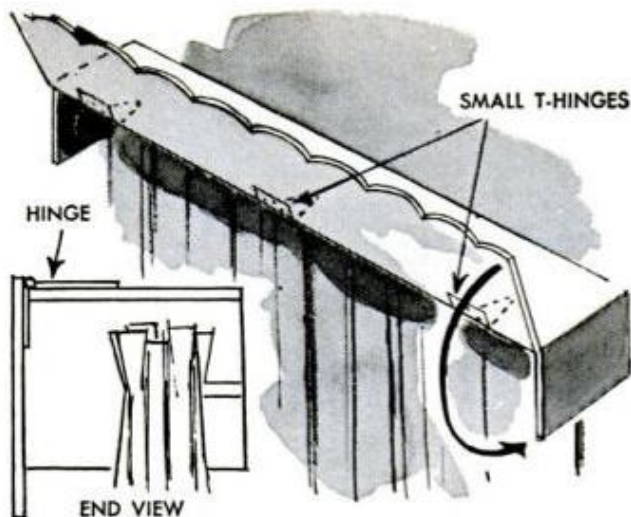
IF YOU'RE PLANNING the addition of an average size room to your home and you're confronted with the problem of heating it, it might be worthwhile for you to consider how Jack Hintt of Elgin, Illinois, solved this problem when he found that his heating system wouldn't handle the additional load. The radiant heating system pictured and diagrammed was the solution. It's simply a radiant hot-water system in which a 40-gallon gas-fired water heater is used as a boiler. The radiant coil, or field, is made up of loops of $\frac{1}{2}$ -in. copper tubing with the runs spaced 12 in. apart. The system is completed with the installation of an expansion tank and a booster pump as you will note in the diagram. Operation of both the heater and pump is automatically controlled.

Of course, complete installation data cannot be included as there are variable factors to be considered and these will vary with each installation. In a colder climate such an installation as that described might not prove adequate in severe weather, especially if the exposure of the room is direct. But in a milder climate in a well constructed, well-insulated, one-room addition, it should give clean, uniform heating throughout the entire season.





ROLL KEY FOR THE TOOTHPASTE TUBE will discourage those family members who insist on squeezing the tube in the middle. Make a saw cut in a length of 1/4-in. dowel, as shown, slip it over the bottom edge of the tube and roll up as toothpaste is needed



HINGES ON THE VALENCE will be a big help to the lady of the house when it's time to remove and rehang the drapes. Three small T-hinges at the top edge of the front panel will allow it to swing up to make it easier to hook the drapes in the rod

SOLVING HOME PROBLEMS

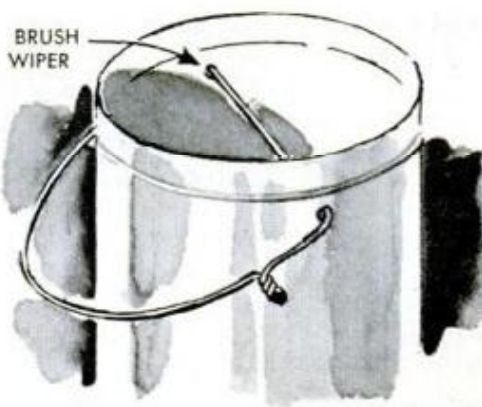
GOT A RUN IN YOUR NYLONS? Don't throw them away. A nylon stocking makes a fine polishing cloth for mirrors and windows. Unlike most cloth, nylon is lint free and won't leave particles clinging to the glass. Just dampen it, rub briskly, and watch the window or mirror come up to a high shine



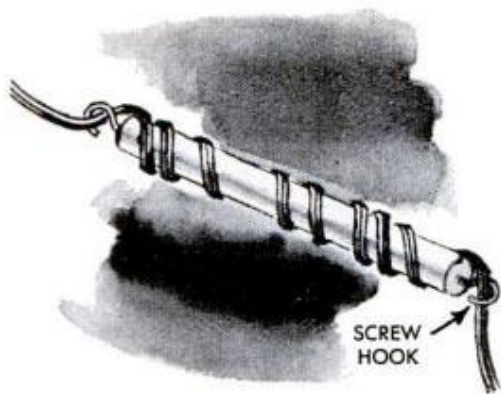
RUBBER BAND

WILD PAINTBRUSH BRISTLES can be tamed if you take this little precaution. After cleaning the brush, slip a rubber band loosely over the bristles while they dry

DANDY PAINT BUCKET CAN BE MADE for small home jobs from a 2 lb. coffee can. Run the wire handle through the can so that it serves as wiper and rest for the brush



BRUSH WIPER



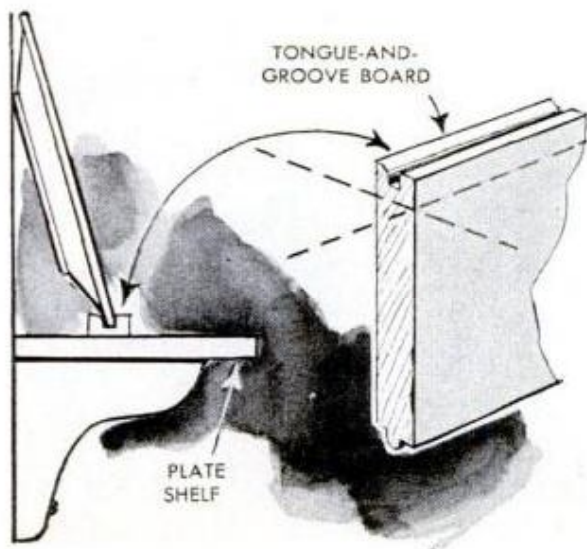
SLACK IN APPLIANCE CORD is taken up by using a section of $\frac{1}{2}$ -in. dowel and two screweyes. Wrap cord around dowel and slip it out through the screweyes on the ends

AVOID GETTING STICKY FINGERS prying open the slit of a rubber mucilage applicator. Next time you use it, slip a paper clip into the slit to keep it from drying shut

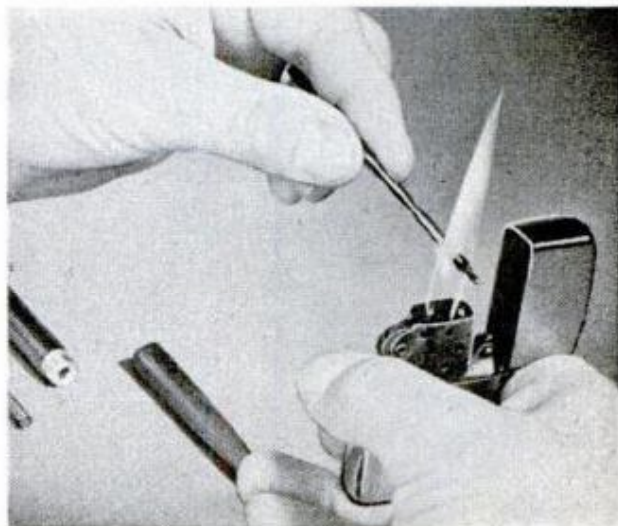


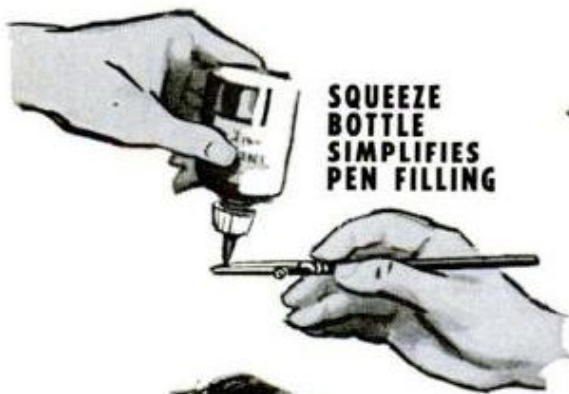
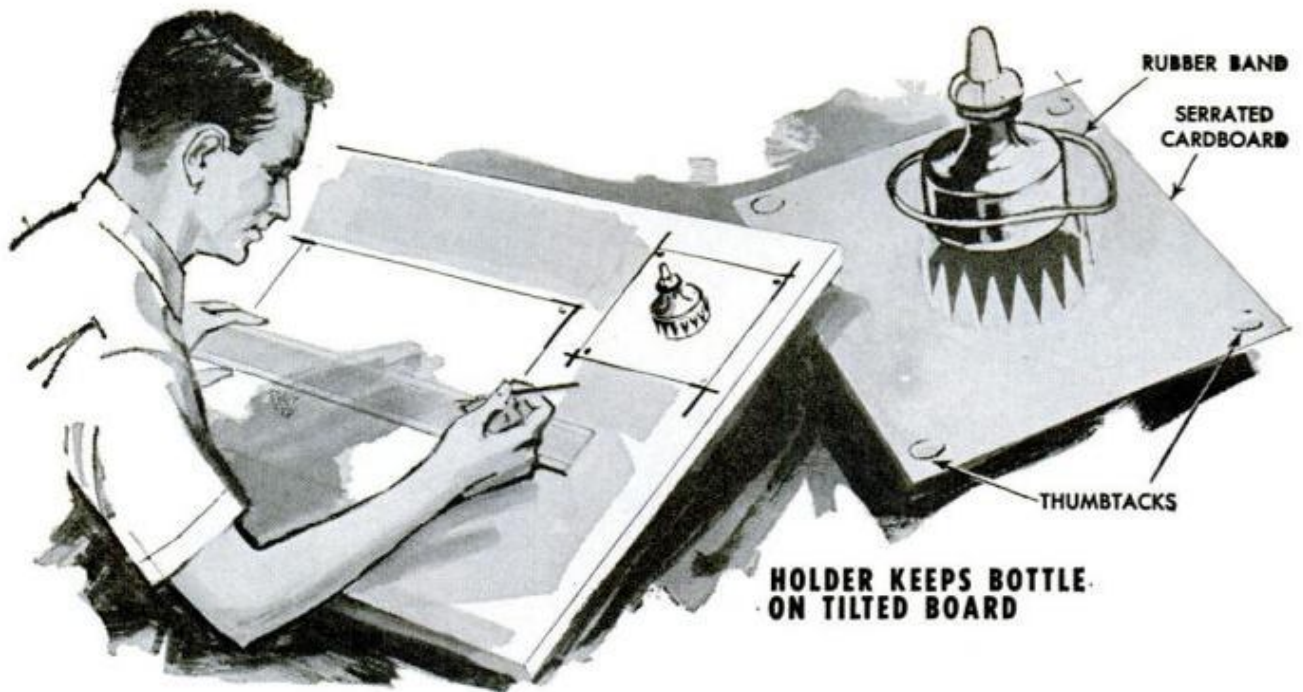
NEED A GOOD SIZED CLOTHES HAMPER? Then fetch that old radio-phonograph from the attic, remove the works and close back and bottom of cabinet. Front is dolled up by backing speaker grille with flowered wallpaper, a few holes in back will vent hamper

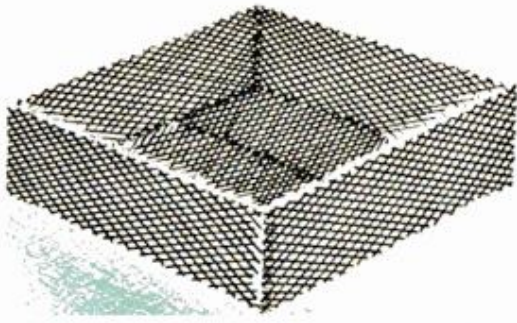
DISPLAYING MOTHER'S BEST CHINA needn't involve cutting a groove in a shelf. Rip a section from the grooved edge of a tongue-and-groove board and brad or screw it to the shelf as indicated



DON'T GET YOUR DANDER UP over a temperamental ball-point pen. If it refuses to write, run the tip of the cartridge through the flame of a cigarette lighter two or three times. Heat loosens caked ink, permitting the ball to roll and the pen to write again







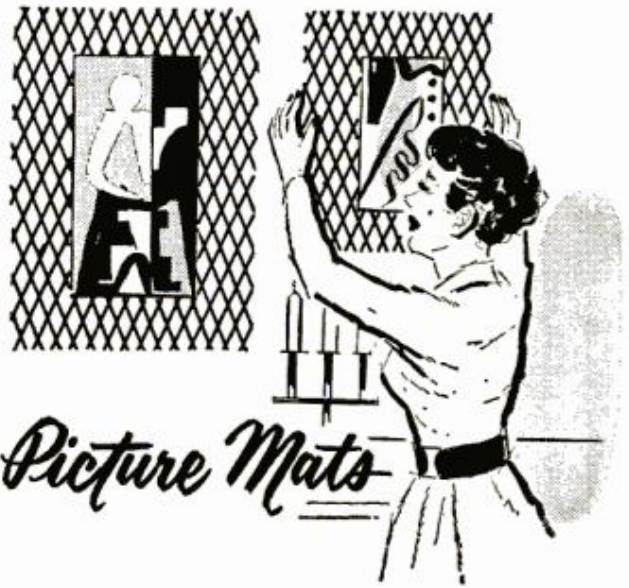
Wading Pool



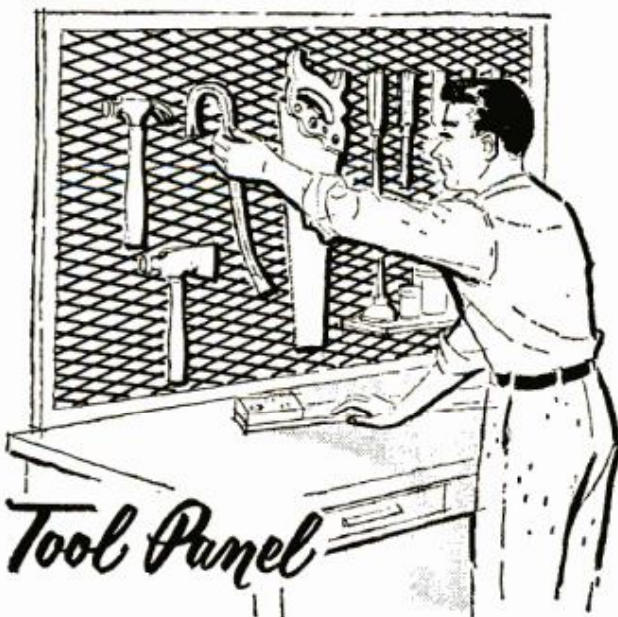
Metal Lath Mfrs. Association

EXPANDED USES FOR EXPANDED LATH

METAL LATH just for plaster? You're in for a surprise. This lowly material, long used as a quality base for plastered walls, has shaken its original shackles and taken on a more versatile existence. For example, you can use it to fabricate a form for a plastered wading pool or sandbox. Expanded metal makes smart decorator mats for frameless pictures. It makes a dandy see-through floor for the garage attic which won't collect dust when the loft is used for storage. You'll find it useful as a tool panel over a workbench. Available in both rib and diamond types, metal lath comes pre-dipped with a protective paint coating, is readily shaped, formed and cut. ★★★

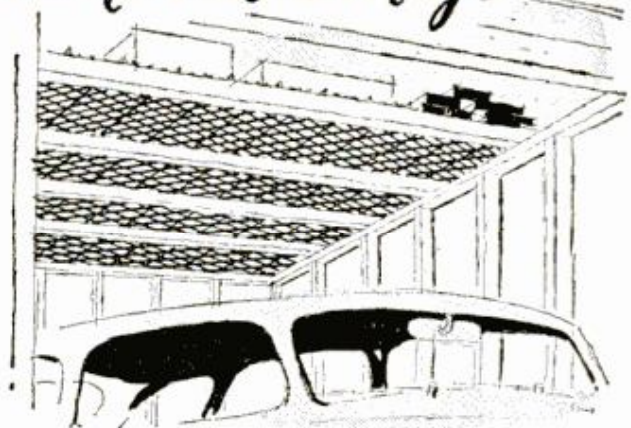


Picture Mats



Tool Panel

Overhead Storage





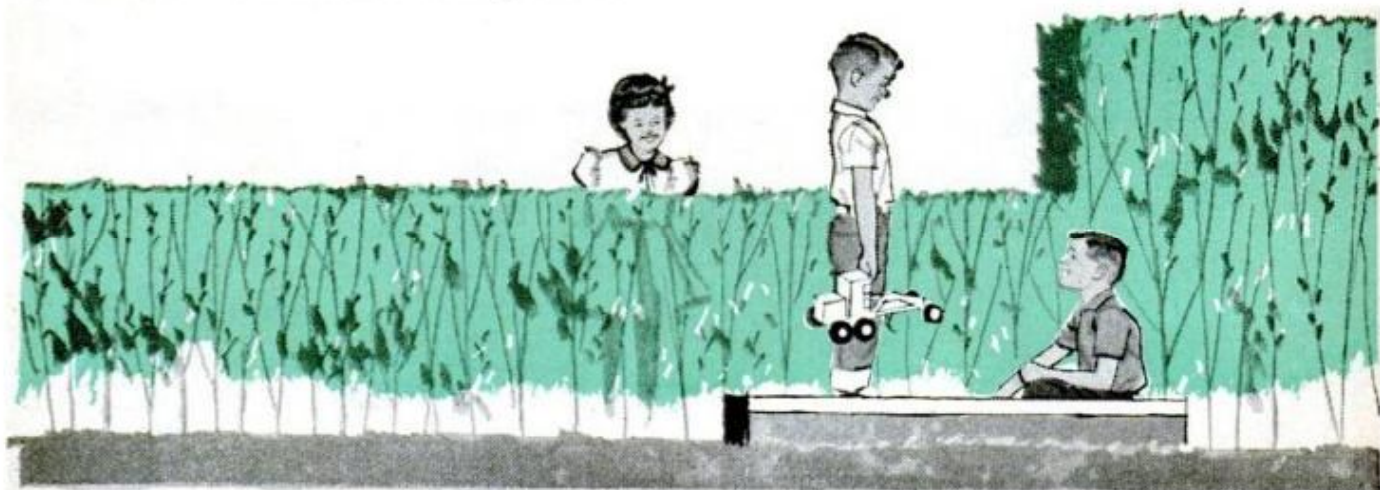
BY SELECTIVELY PRUNING a neighbor's hedge, you'll do him a favor in improving the hedge's growth and at the same time provide yourself with plenty of spring planting stock. Clippings should be taken from vigorous new shoots about as thick as a pencil and long enough to be cut into 5 or 6 sections of the proper size. These are then stored for the winter

GROW YOURSELF A

FOR THE HOMEOWNER interested in growing a fence as a part of a landscaping plan, here's a method of propagating from any existing hedge that costs next to nothing. Select one of the fast growing varieties and then, just before cold weather sets in, take cuttings from new growth on a well developed hedge. The cuttings should be about 7 to 9 in. long and $\frac{1}{4}$ in. in diameter, each shoot providing 4 or 6 cuttings. All you need now is a large bucket or tub of moist sand. Tie the planting stock in bundles, 4 to 6 in. each bundle, and bury in the sand in a horizontal position throughout the winter. Be sure the sand is kept moist

and at a temperature of between 33 and 55 deg. During this winter storage the cuttings will form "calluses" at the butt ends. Come spring, spade the hedge site to a depth of 7 to 8 in. and a width of 12 in. Use a large screwdriver to make holes for the cuttings about 12 in. apart. Be sure to plant the cuttings butt end down, leaving about 1 in. of the tip end exposed above ground. Tamp the soil firmly and keep it moist until growth starts. Waist high within two seasons, the privet grows at a tremendous rate and in 5 or 6 years will reach 12 to 15 feet, tall enough to give privacy plus.

—B. A. Roth

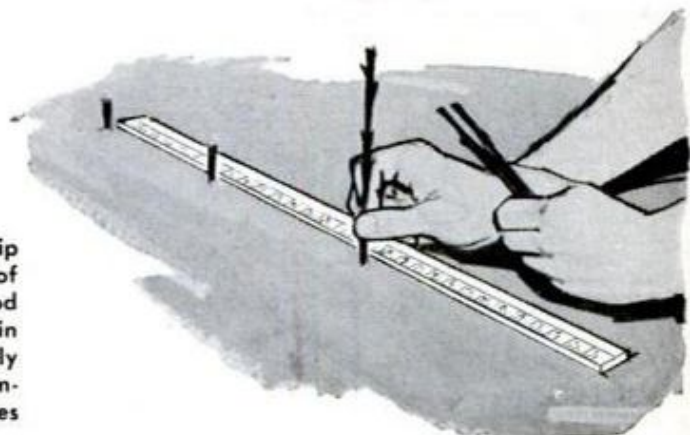


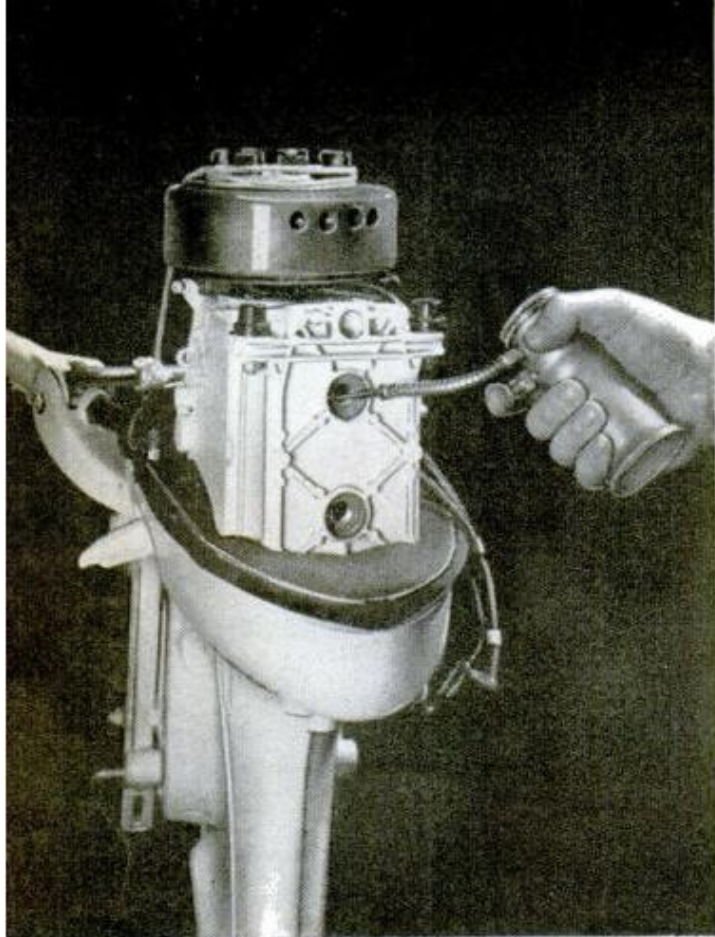
USUAL METHOD OF STORAGE is to tie the bundles of cuttings with the "butt" or rootward ends all facing one way and to place them in a tub of moist sand. Over the long winter months the ends will callous and the cuttings will be ready for planting. Be sure to keep a constant eye on the temperature to see that the dormant shoots don't freeze and die



FENCE

IN DECIDING HOW MANY shoots you'll need to clip and cut, figure on about one cutting per linear foot of hedge, and you might throw in a few extra for good measure in case some of them don't "take." Within a few seasons your "living" fence should be fairly thick and approximately waist high—ready for trimming as suits your particular needs and desires



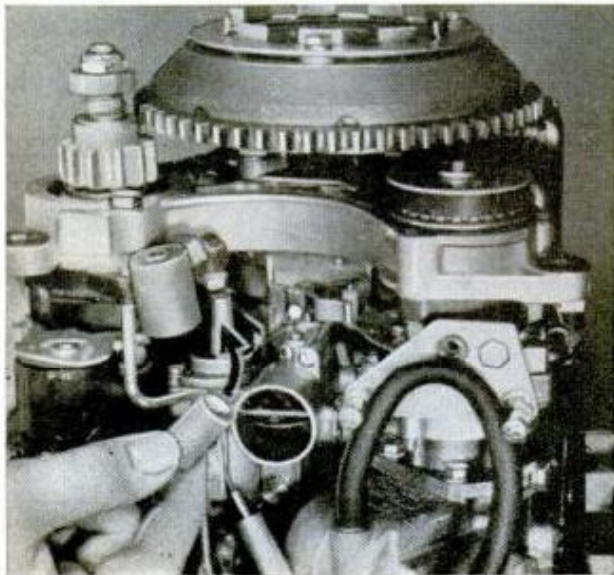


Mercury Outboard Motors photos

1. OIL SQUIRTED ONTO CYLINDERS through plug holes prevents rust formation on vital internal parts

JUST ONE HOUR of servicing at layup time will keep your outboard motor in the "pink" of condition, until warm spring breezes call you and your motor back into action again. Using the handy check list provided at the end of this story as a guide, there will be no slip-ups on important servicing and the work will be done before you know it. Clip the story and mount the list on a piece of hardboard for convenient check-off of items serviced.

2. CLEAN SEDIMENT BOWL and filter element assures constant delivery of clean fuel to carburetor



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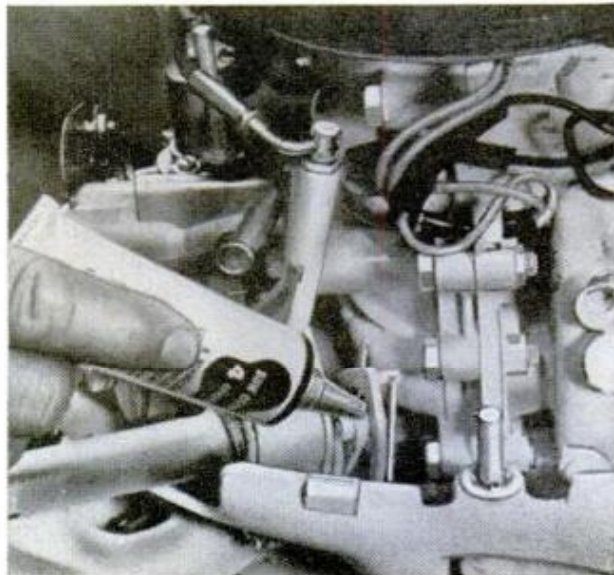
IT'S OUTBOARD LAYUP TIME

By Earl Wobeck

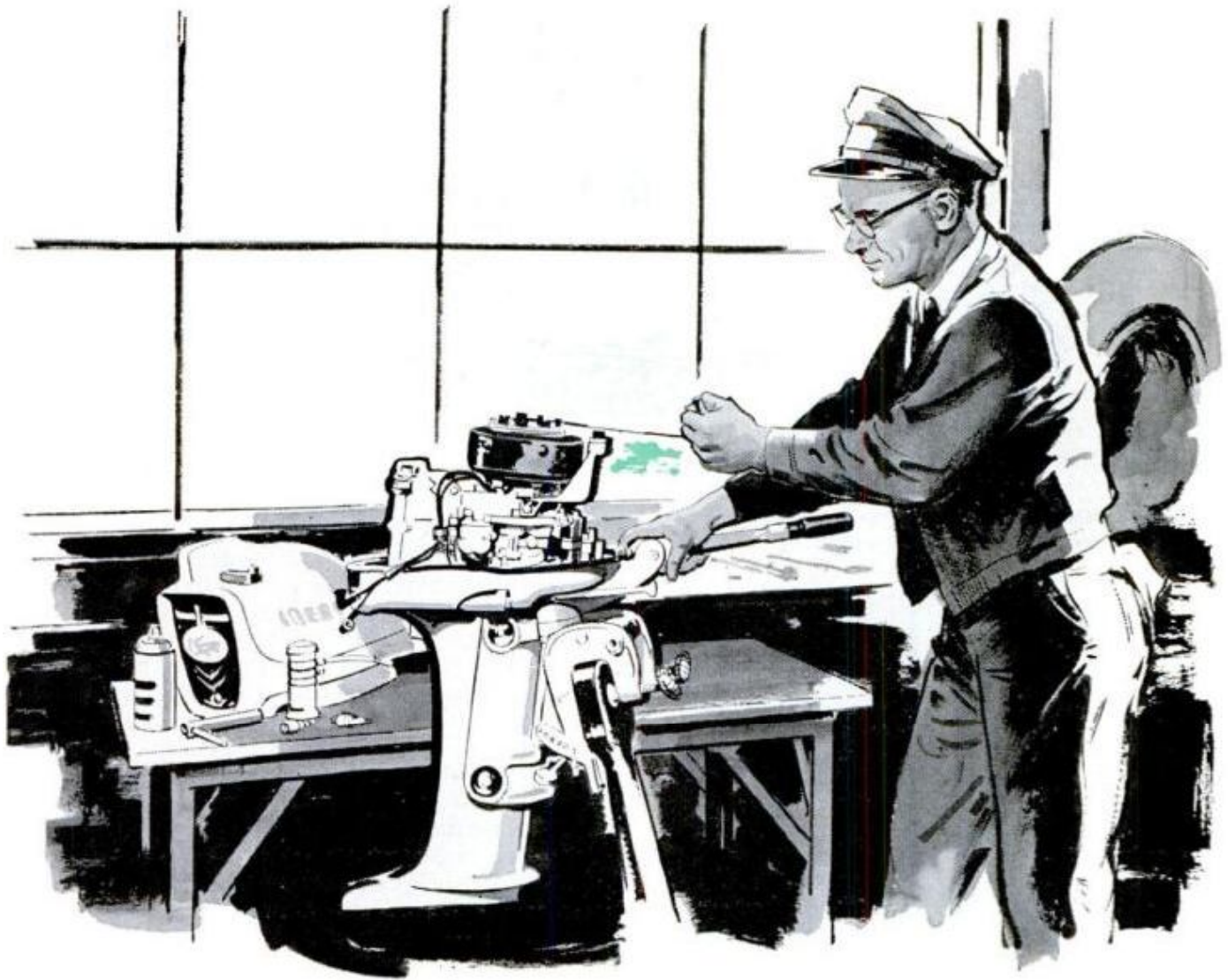
Boating Annual, 1961

Fuel that is allowed to remain in the motor forms harmful gum deposits, so this is the first item to be attended to. Disconnect the fuel line from the motor and run it while still in the water until all fuel is exhausted. Otherwise, lines and carburetor must be drained individually, entailing extra work in disconnecting them, and running the motor without coolant may overheat it. Next, flush the cooling system with clean water. Many motors of recent manu-

3. AFTER REMOVING GRIME and solidified grease from gearshift cam, lubricant is applied to joints

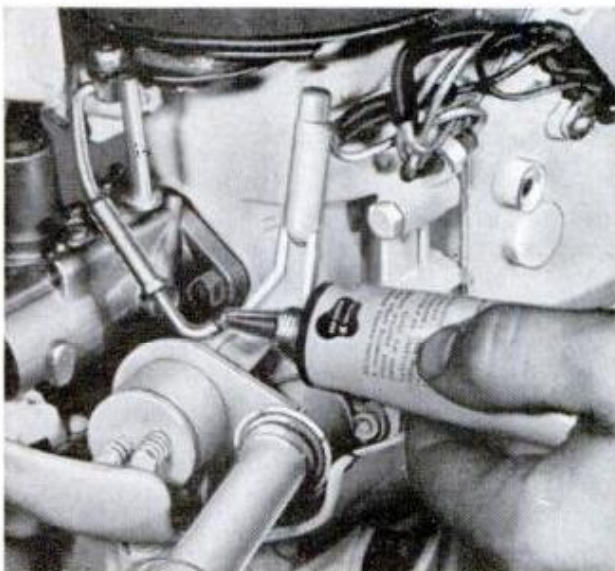


POPULAR MECHANICS



facture have a hole in the upper pump body marked, "water flush," for insertion of a hose nozzle. If your motor has no flush hole, the easiest way to do this is to tilt the lower unit into a clean garbage can filled with water, and while the motor is

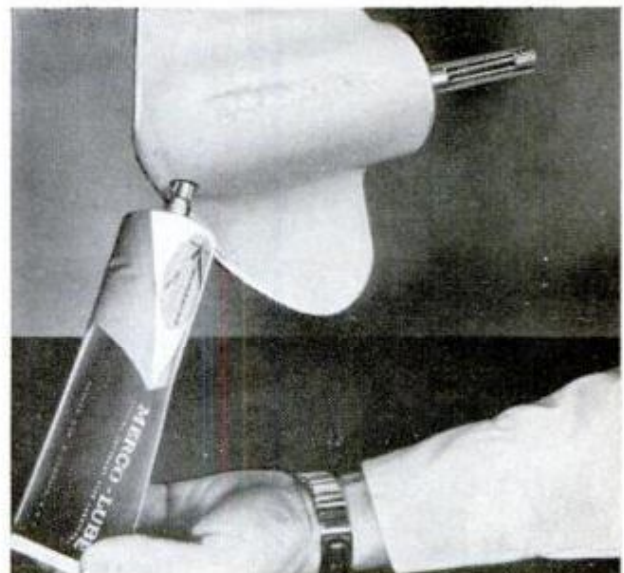
4. CONTROL LINKAGES get protective coat of lubricant, after brushing them clean with gasoline



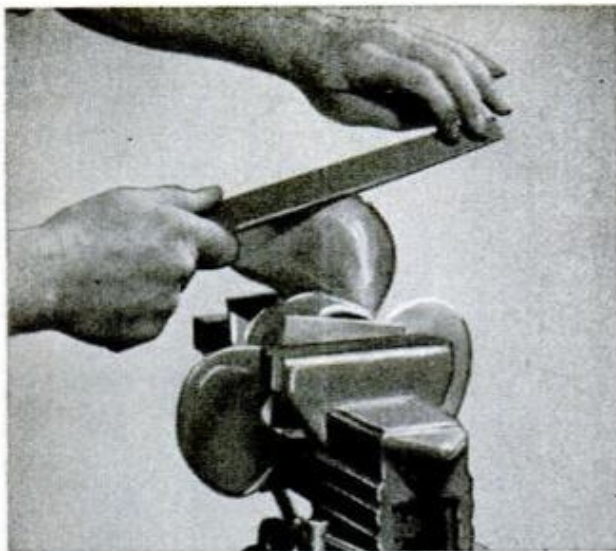
NOVEMBER 1960

still on the boat, run it for a few minutes. If the latter is done, it affords a good opportunity to exhaust the fuel supply in the motor at the same time, completing two servicing items at one time. After the motor has stopped, the water remaining in

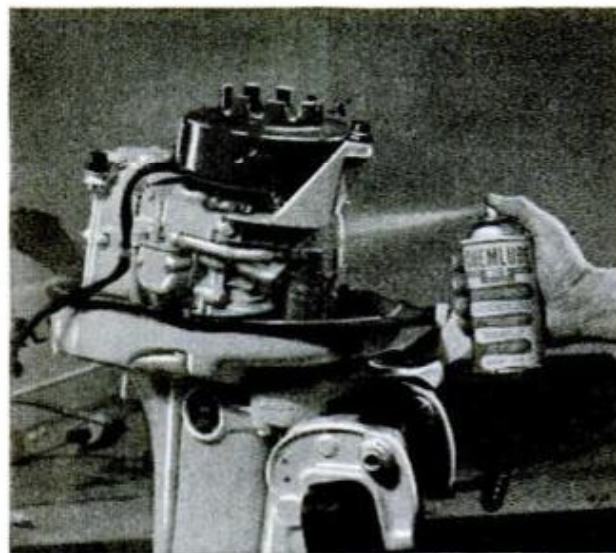
5. LOWER UNIT OF MOTOR should be drained completely, then refilled with outboard gear oil



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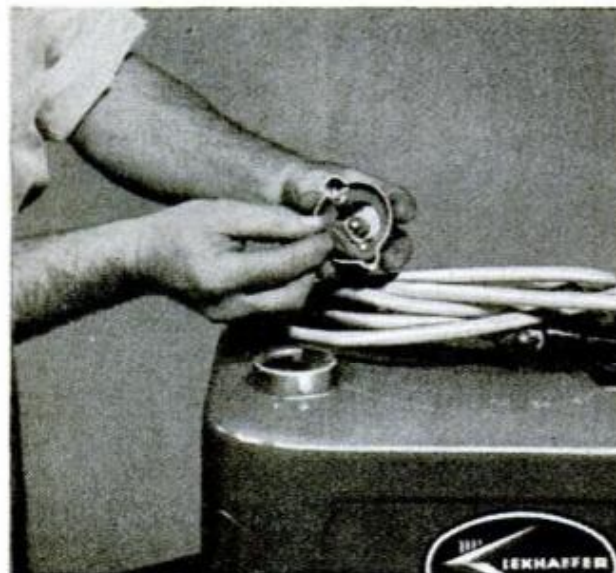


6. SMALL NICKS AND BURRS on propeller blades may be dressed down by outboarder, using metal file



7. SPRAY COAT OF SILICONE LUBRICANT on external parts shields them from moisture in atmosphere

8. WORN GASKET ON FUEL-TANK CAP lets in dirt and unwanted air, should be replaced when compacted



it is expelled by rotating the flywheel manually, with the motor in an upright position. This is an important step, as water left in the powerhead and water pump will corrode these important parts and cause irreparable damage if exposed to freezing temperatures.

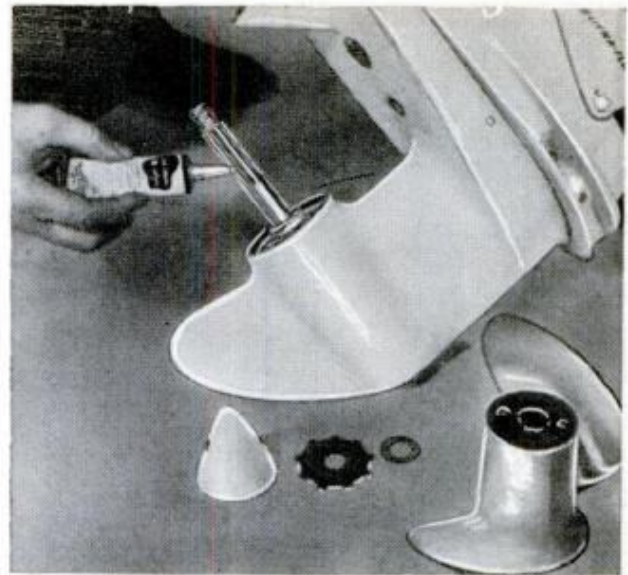
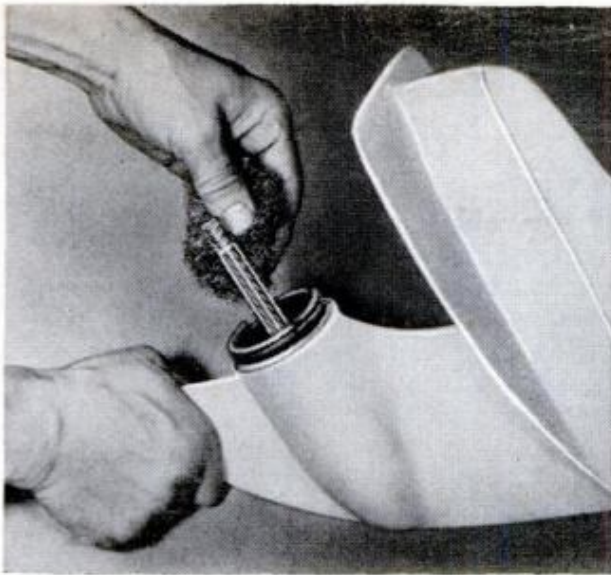
The next step is to remove the motor cover, brush and wipe accessible parts clean with a solvent. Gasoline is ideal for this, as it leaves an oily film to protect the parts from rust. Apply thin grease to remote-control linkage joints, levers, bushings and other exposed moving parts as in Figs. 3 and 4. Some motors have pressure fittings, so don't overlook this part of the grease job. Check for loose-fitting joints and bent levers, which should be replaced if they cannot be made to operate properly.

Propellers seldom get through a season's use without running afoul of some sort of underwater obstruction, resulting in nicked or bent blades. Small nicks and burrs may be dressed down with a metal file by the outboarder, Fig. 6, but the repair of bent blades and other more extensive damage should be left to the professional repairman.

It's a good idea to remove grime and hardened grease from the propeller shaft before replacing the propeller to prevent it from becoming "frozen" on the shaft. Simply rub the metal to a bright finish and apply waterproof grease as in Fig. 9. Then you'll have no trouble removing the prop when the need to do so arises.

To complete servicing of the lower unit, drain and refill it with fresh gear lubricant, Fig. 5. When doing this be sure to remove the air-vent screw located above the filler plug to prevent entrapment of air. Grease must be forced into the gear housing until it starts to flow from the vent hole, indicating the cavity is filled. Before replacing the vent screw and filler plug, make sure the gasket under each is in place, otherwise water may leak past the threads into the gear housing.

Servicing the main, upper portion of the motor is next. While this sequence need not be followed, it is arranged to expedite the work with a minimum of backtracking. The spark plugs should be removed first, cleaned and regapped if they still are in good condition. If bad, tag for replacement next spring. If the motor has performed unsatisfactorily previously and the plugs and carburetor adjustment are in order, take it to your dealer for a compression test, magneto inspection, breaker-point adjustment and possible carburetor cleaning. The trouble also may be in damaged or worn internal parts, the diagnosis of which can best be done by a factory trained mechanic having adequate equipment and facilities at his disposal. Consider money spent for



9. AFTER GRIME IS REMOVED from propeller shaft with steel wool, it is given a protective coat of water-resistant grease, making it easy to slide the propeller off the shaft the next time it must be removed

such service well worth the hours of trouble-free boating you will have next season.

With the spark plugs removed, squirt several drops of lubricating oil into the cylinders through the plug holes as in Fig. 1. At the same time, inject oil directly into the carburetor through the air silencer. Then rotate the flywheel to distribute the oil over these vital internal parts. Use #10 oil for this purpose. Next, remove the carburetor sediment bowl and wipe it clean. Agitate the filter element, Fig. 2, in a can of clean benzine and reassemble it on the carburetor.

Most motors are operated with remote fuel tanks, which also require periodic inspection. The tank should be checked for loose fittings, damaged or missing parts and worn filler-cap gasket, Fig. 8. The latter, if badly compacted, will let in dirt and allow the fuel to evaporate which causes formation of gum deposits that clog car-

buretor jets and coat the combustion chamber.

Scratches in the motor and fuel tank's finish invite rust and make them appear shabby, reducing the value of the equipment in the event resale is contemplated. Paint touch-up is an easy job if it is done at least once a year. Feather out deep scratches with fine-grit sandpaper and re-touch the finish with matching paint applied from a spray can. After the paint dries, spray all exposed surfaces of the motor with a silicone lubricant as in Fig. 7 and cover it. The motor should be clamped to a rack in a dry dust-free area.

If your motor is equipped with an electric starter, test each cell of the battery and keep it on trickle charge during the winter months. Your outboard dealer will do this for you at small cost if you don't have a charger. Having put your motor to bed well cared for you can relax and look forward to another happy boating season. ★ ★ ★

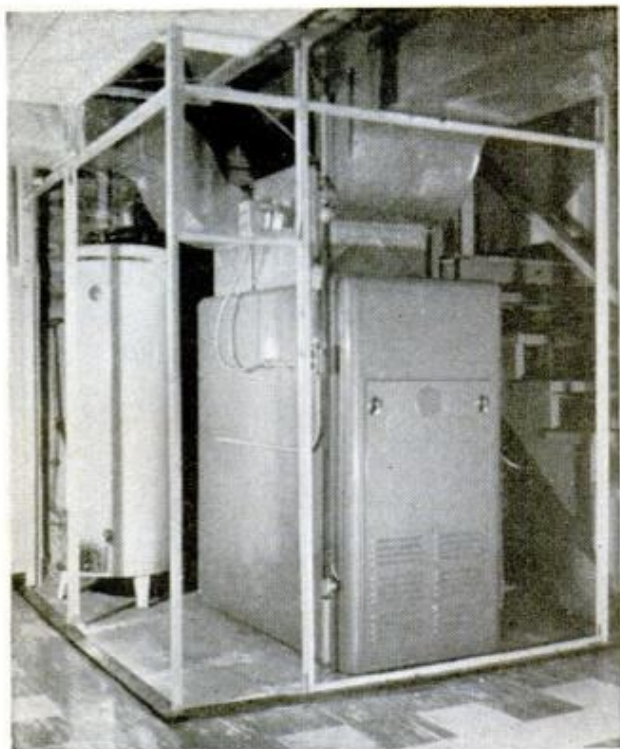
PM'S OUTBOARD MOTOR LAYUP CHECK LIST

1. () Remove fuel from tank and start motor to use all fuel in carburetor and lines.
2. () Give cooling system good flushing. Expel all remaining water from cooling system by rotating flywheel manually.
3. () Remove motor cover and clean accessible parts.
4. () Apply grease to remote control linkage joints, levers, bushings and other exposed moving parts. Check for loose-fitting joints and adjust, if possible. Replace worn parts.
5. () Remove propeller, clean and coat shaft with waterproof grease.
6. () Dress down nicks and burrs on propeller with file. If badly damaged, tag and send out for repair.
7. () Drain lower unit and refill with fresh gear lubricant.
8. () Remove plugs, clean and regap. If bad, tag for replacement next spring.

9. () If motor has given poor performance previous to layup and plugs are good, take it to dealer for carburetor cleaning, magneto inspection and breaker-point adjustment.
10. () With plugs removed, squirt several drops of oil into cylinders, also directly into carburetor through air silencer. Then rotate the flywheel to distribute the oil.
11. () Remove carburetor sediment bowl and wipe clean. Flush fuel filter element in clean benzine.
12. () Inspect remote fuel tanks for leaky gaskets, worn fittings, damaged hose.
13. () Clean all painted surfaces and re-touch scratches and nicks with matching paint from spray can.
14. () Cover motor and store it clamped to rack in area free of dust and moisture.
15. () Test battery and keep on trickle charge during layup period.

WRAP-AROUND

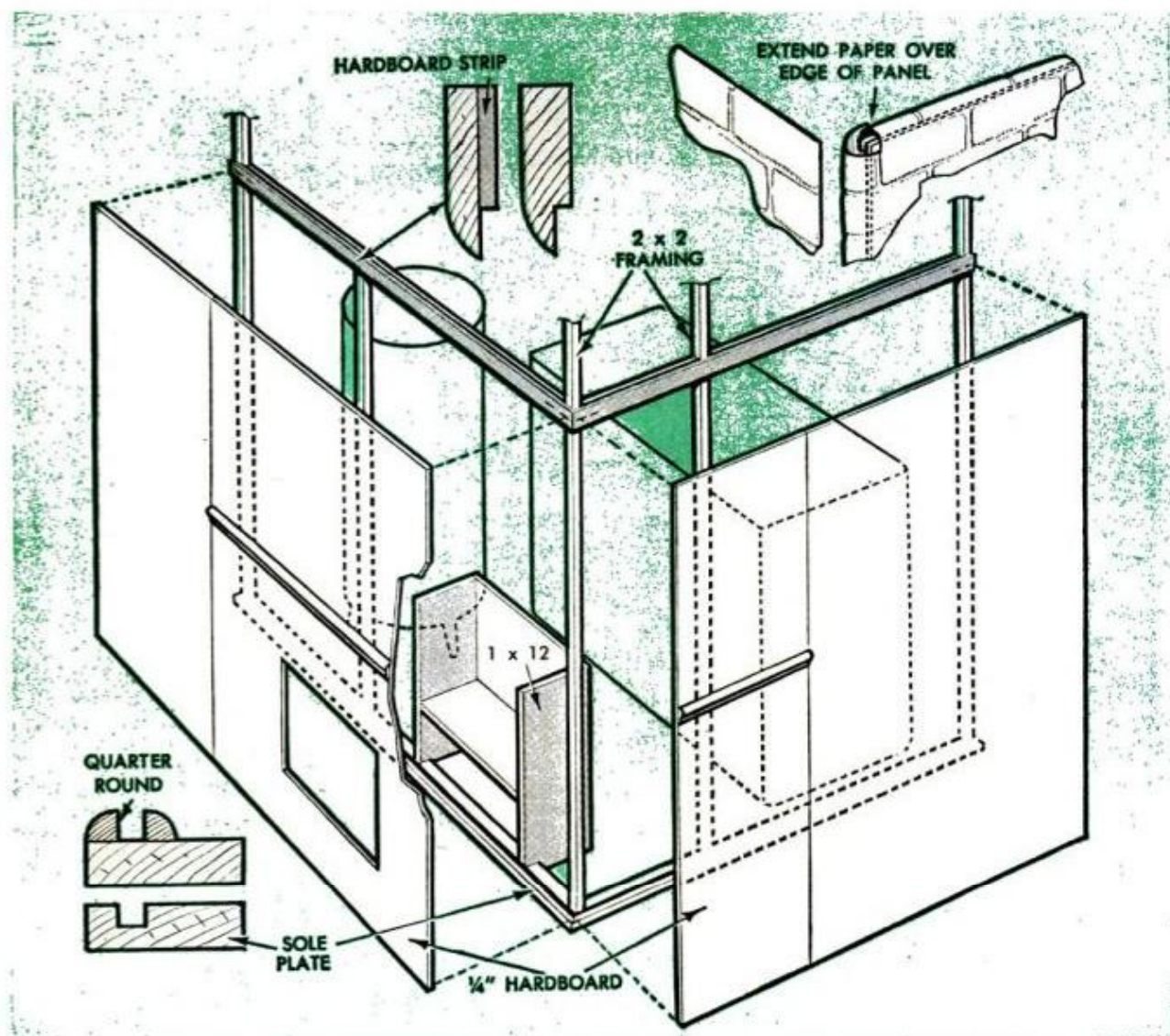
By Albert E. Helland



LIGHT FRAMEWORK of 2x2s is all that is needed to support the stone-covered panels of the fireplace wall

THERE'S ALWAYS the problem in an open basement of hiding the furnace and water heater from view when one section is used as a recreation room. The usual solution is to build a separate utility room enclosed by permanent walls. But one family solved the problem by building a false fireplace wall around the furnace and water heater which not only concealed the equipment, but added a conversation piece.

To begin a 1 x 3 or 2 x 4 sole plate is anchored to the floor. If the plate is rabbeted to hold the panels, the groove should be cut first. Otherwise quarter-round molding is nailed to the plate to form a groove. The plate can be nailed to the concrete floor with nails made especially for the purpose. If needed, a top plate should be fastened to the ceiling joists, and studs are spaced to support the edges of the panels on centers. Although the framing



WALL HIDES FURNACE IN RUMPUS ROOM



FIREPLACE WALL hides the utilities that otherwise would be an eyesore in the basement recreation room

studs can be toenailed to the plates, metal angle brackets and screws were used to hold 2 x 2 studs in the original installation, making it easy to dismantle the enclosure at some later date should the furnace or water heater need replacing or extensive repairs. For the periodic job of changing furnace filters and draining the water heater, only a single panel need be removed.

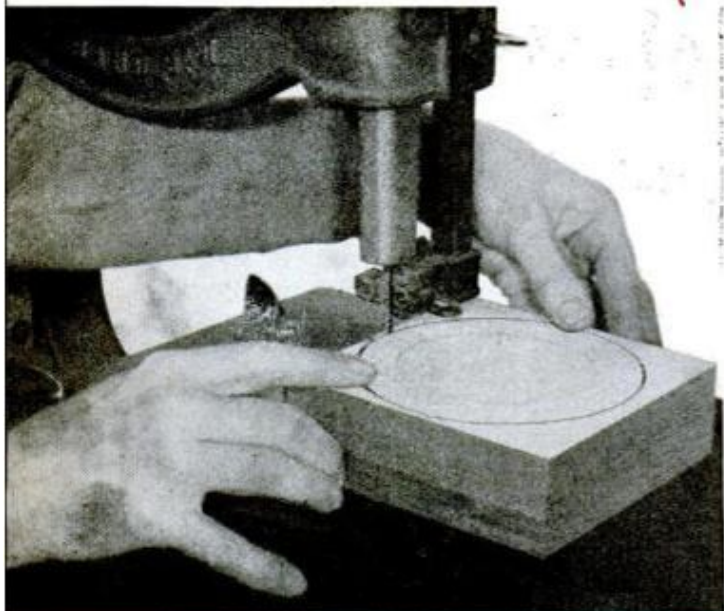
At the top, a wide molding holds the panels in place. Here you can either cut a 1/2-in. rabbet in the molding or use hardboard backing strips to form the rabbet as detailed. The molding is nailed to the top plate at the ceiling line.

Hardboard or plywood panels are cut to the correct size to form the walls. To install, the panels are inserted into the 1/2-in. groove, the molding at the top, and are then dropped into the 1/4-in. groove in the sole plate. Finger holes are drilled in the bottom of each panel to make it easy to lift it out. The fireplace opening is a rectangular opening cut in the paneling, and behind this opening is a boxed-in area forming a raised hearth. The box is open at the top to represent a fireplace flue and to supply combus-

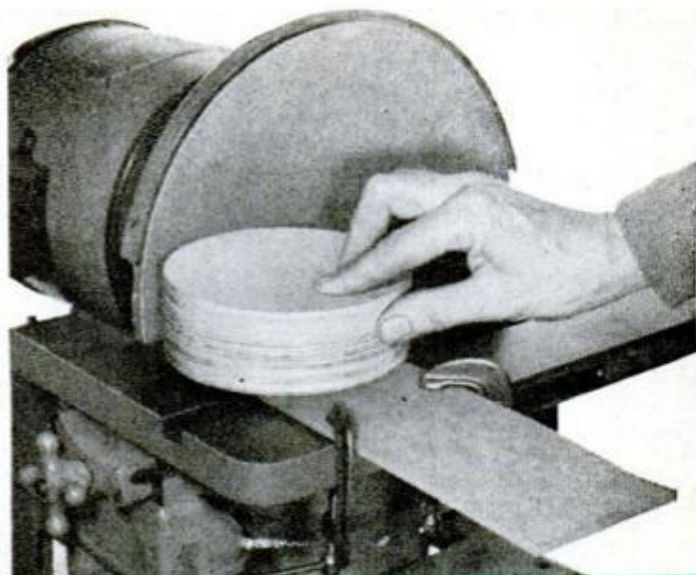
tion air for both the furnace and heater.

The wall panels and the fireplace pit were finished with a self-adhesive paper in a stone design. The paper wraps around the edges of the individual panels and the latter merely butt at the corners. A covering of a different color was used to set off the fireplace. Molding, nailed to the panels, suggests a fireplace mantel. An electrically lighted log sits in the fireplace to add a bit of realism. Then when a "fire" is desired the light is plugged into an outlet.

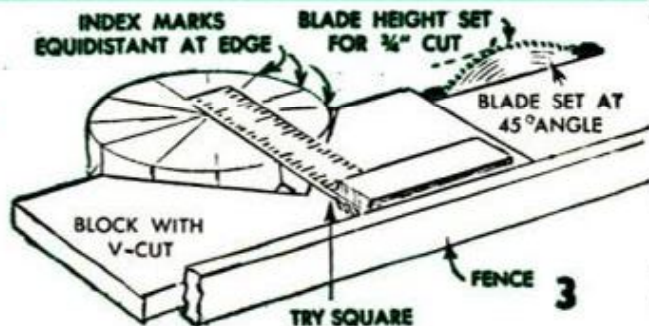
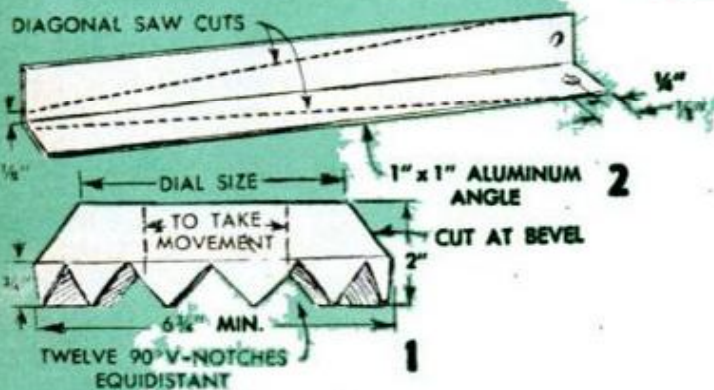
For a more realistic looking masonry wall, a brick or stonelike covering is available which is embossed to give an authentic three-dimensional appearance. Made of plastic, it is cemented in place on the panels and is exceptionally durable. It comes in different colors and in stone and brick patterns and is available in panels of about seven square feet. A special adhesive in tube form is run along the back of all simulated mortar joints, after which the plastic sheet is pressed against the wall and the mortar joints rubbed with a blunt tool to insure proper contact. The plastic is easily cut with scissors. ★ ★ ★



HOUSING FOR MOVEMENT is a glued-up plywood sandwich which is bandsawed round with circle jig



SAME IMPROVED JIG is used to sand bandsawed blank round. Nail point in hole in hardboard forms jig



HANGING DECORATOR

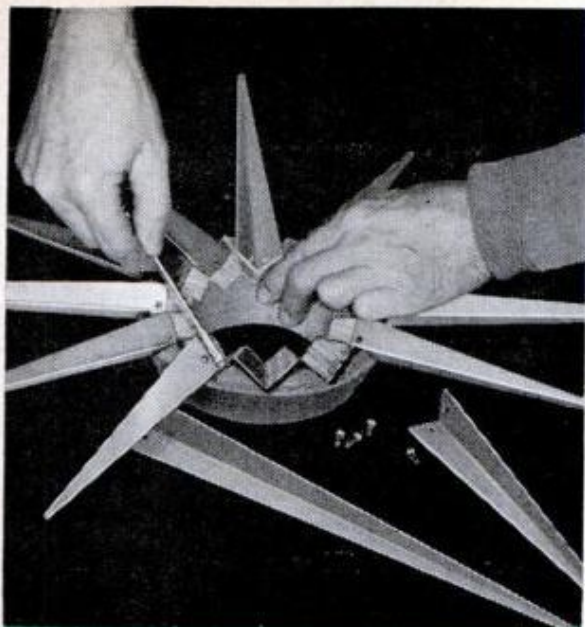
By E. R. Haan

THERE'S NO limit to the design possibilities of fascinating wall clocks that you can make at a fraction of the cost of comparable ones on the market. They can house either electric or spring-wound movements which you may have salvaged from broken or obsolete cases.

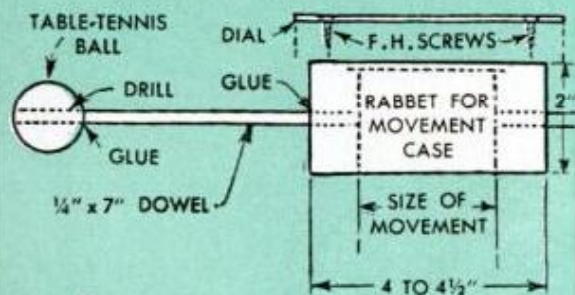
As most clock-case designs of the kind shown are circular, they are built on a plywood core or housing which encloses the movement. The size of the housing varies with the size of the movement and the kind of ornamental work to be added. The method of holding the movement in the housing also varies. These details should be worked out first. Many movements will require a housing about 2 in. thick, which can be built up by gluing together pieces of plywood. The outside circular cut of a housing can be bandsawed and the inner one scrollsawed.

Typical procedure in making a housing is as follows: First scribe both circles, prickpunch the center and drill a small hole here to take the cut-off end of a nail. The latter should project about 1/8 in. and serves as a pivot for sawing and sanding. The pivot engages a hole drilled in a piece of hardboard which you clamp to the table of the machine. The pivot hole should be on a line at right angles to the cutting blade and flush with the tooth tips. After bandsawing the outside circle, the cut edge is sanded smooth on a disk or belt sander, again using the pivot to rotate the work. The scrollsawing of the inside circle is always done last.

About the simplest novelty case to make is the spoke-and-sphere type, Fig. 6, which is especially suitable for kitchens, dens, playrooms, and children's rooms. Assembly details are given in Fig. 4. If the clock is

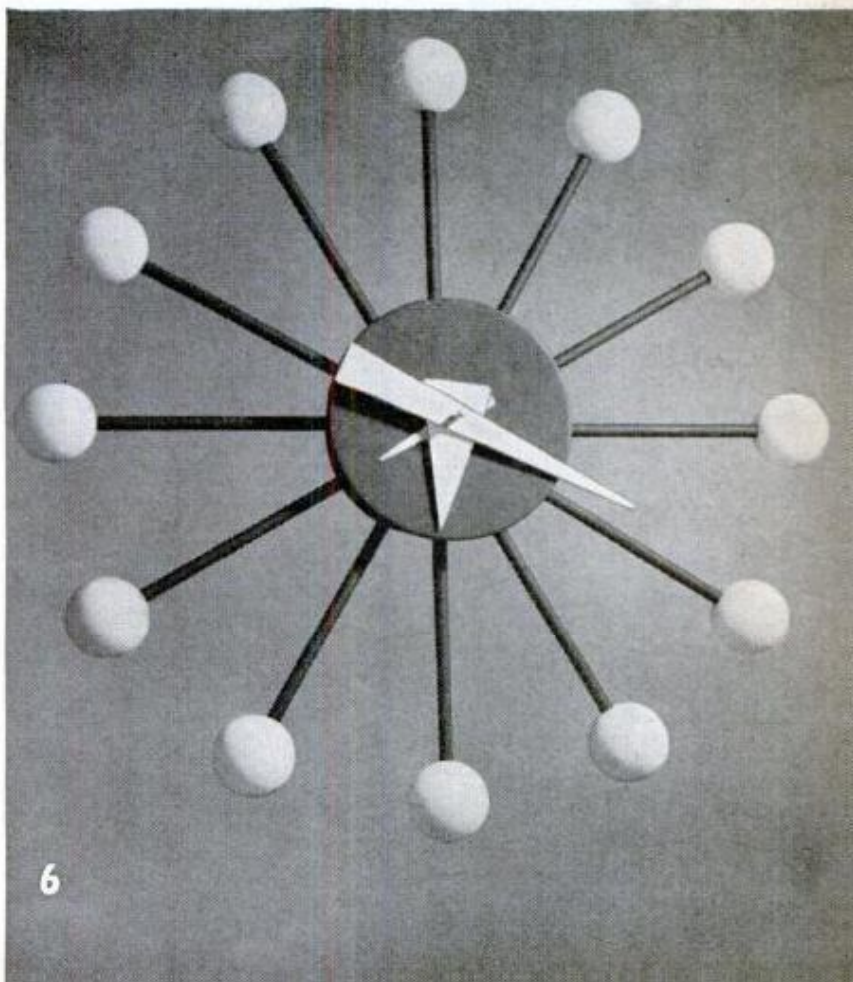


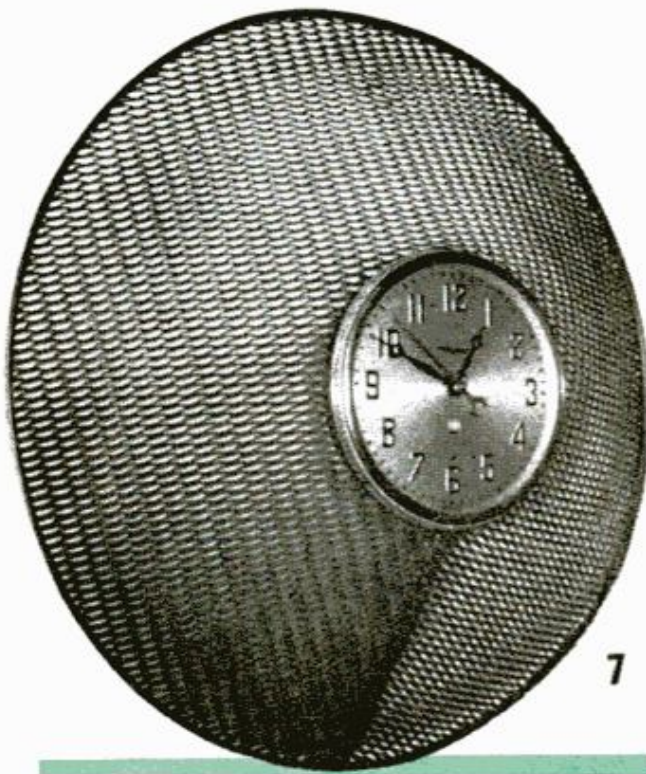
RUBBER TAPE placed around outer edge of V-cuts provides shim to tip the spokes upward



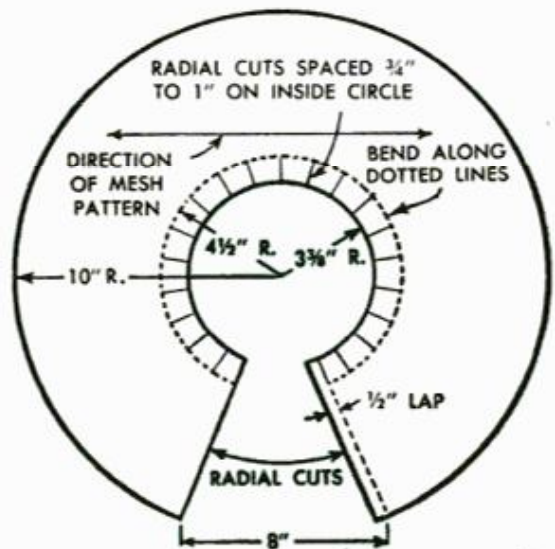
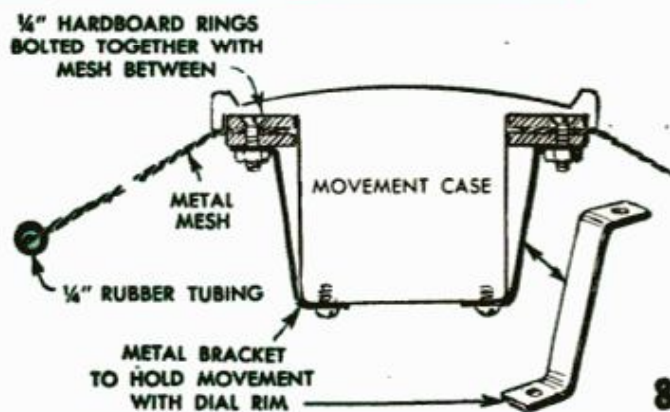
CLOCKS

used over a sunken wall outlet to dispense with a long cord, the housing should be large enough to conceal the outlet. Table-tennis balls are fitted over and glued to dowels extending from the side of the housing. Drilling one hole in each ball is done with a sharpened brass tube chucked in a drillpress, the balls being held in a blind hole almost their diameter, which permits adjusting them so that the lap at the center is parallel to the surface of the block. Markings on the balls can be eliminated with a wad of cloth moistened with lacquer thinner. Before attaching the balls, the housing, dial and dowels are painted flat black, avoiding paint on the dowel ends. Cement is applied to the dowel ends, then the balls are slipped in place. The hands should be white to match the "numerals."





7



8

Twelve slender tapered points produce the classic saber-type case shown in Fig. 5. The housing is bandsawed first to a diameter not less than $6\frac{3}{4}$ in. To hold the points to it, 90-deg. V-notches are cut in the back of the housing on a circular saw, Fig. 1. To do this you mark the edge of the housing at twelve equidistant points and carry these marks over the front of the block, crossing each other at the center. Next, set the saw to 45 deg. with the table and adjust for a cut $\frac{3}{4}$ in. deep. Adjust the fence so that when the work is resting firmly in a V-block slid along the fence, the cut to be made will reach an index mark at a point exactly $\frac{3}{4}$ in. from the bottom of the housing. When a try square is set against the fence so that its edge coincides with an index mark across the face, as shown in Fig. 3, the work is in position for a correct cut. The work must be held firmly in the V-block without shifting while sawing. All the notches are so cut.

After cutting the notches the bevel cut on the housing is made on a bandsaw, and the outside is sanded—both the straight and beveled portions. Following this the inside circle is cut on a scrollsaw. The housing is finished before attaching the points. The one shown was finished natural, using wood filler, then sanding and finally waxing.

The points are cut from 1 by 1-in. angle aluminum as indicated in Fig. 2. Four points representing the hour numerals 12, 3, 6 and 9, are 12 in. long and the others are 8 in. long. Cutting is done quickly on a bandsaw provided with a metal-cutting blade. To prevent scratching the aluminum on the bandsaw table, use a backing piece of hardboard. After sawing, the edges are filed smooth and the burr removed. The points extend into the housing about $\frac{3}{4}$ in., and are screwed in place with $\frac{1}{2}$ -in. f.h. screws.

Just before attaching the points, they are

given a satin finish with fine steel wool, the surface then cleaned and coated with clear lacquer. Rubber tape, $\frac{1}{4}$ in. wide, is cemented in the V-grooves beforehand. The tape compensates for the taper of the points and makes them fit against the wall. Otherwise, they will lean outward.

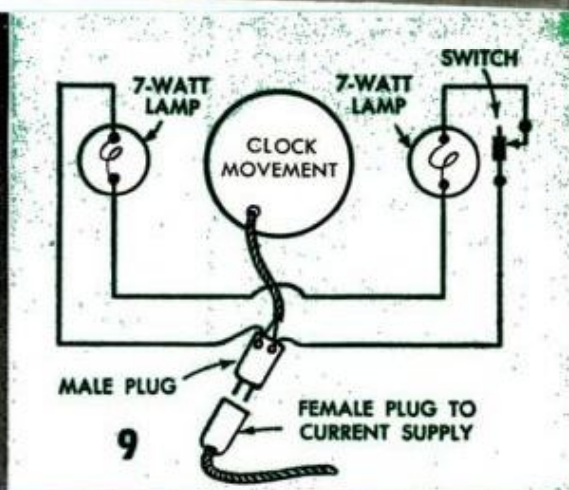
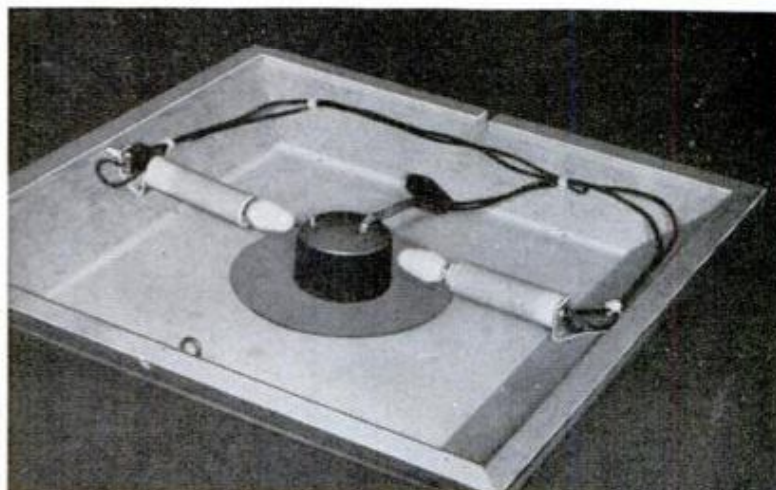
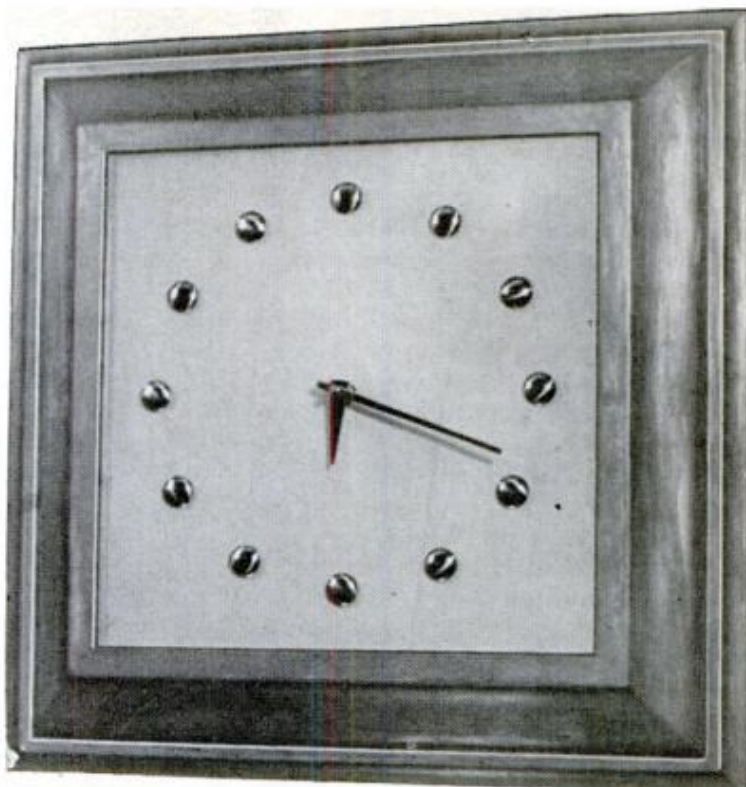
Perforated or expanded-metal mesh was used to make the shallow conical case in Fig. 7, following the pattern in Fig. 8. The base of the resulting cone will be $17\frac{3}{4}$ in. in diameter and its height about $3\frac{3}{4}$ in. To produce a 3-in. hole for the movement to fit, the inner circle of the pattern is cut $3\frac{3}{8}$ in. in diameter. For other size holes on cones of this angle, the circle on the pattern should be $\frac{1}{8}$ larger in diameter than the intended opening.

Radial cuts from the center circle permit flattening the segments so formed to fit between two rings of hardboard. The rings are bolted together with 6-32 flat-headed machine screws and nuts. The lap at one

of the straight edges is cut out of the waste portion, it being parallel to the edge. The edges are fastened with fine wire or rivets. Windshield-wiper tubing was slit lengthwise and cemented over the base edge. A wire loop tied to the mesh from the inside provides a means of hanging the case on a hook or nail.

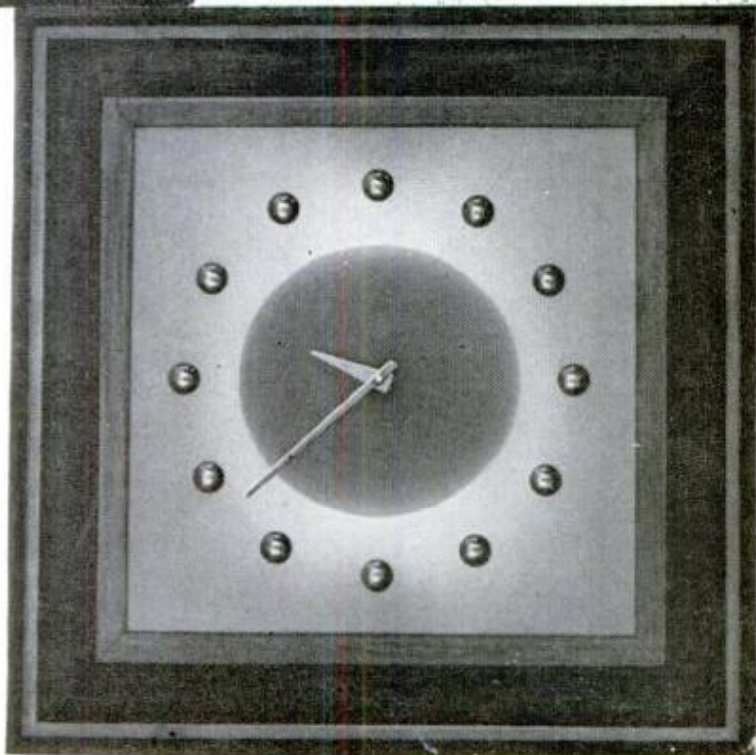
Ordinary cove molding was used to make the case shown in Fig. 9. The pieces were mitered first, then rabbeted on a circular saw set at a 45-deg. angle. The dial was opal glass, 12 by 12 in., on which lustrous brass buttons, filed smooth on the back, were cemented. Two 7-watt lamps, wired in series to reduce their brilliancy, were positioned behind a 6-in. sheet-metal disk placed against the dial. The

SOCKETS, plus turn-type fixture switch (below), are held by brackets screwed to case



sockets and a small turn-type fixture switch are held by metal brackets screwed to the case. The switch is provided with an extension tube to operate it from the outside. The cord passes through a notch in the frame so that the latter rests snugly against the wall. In the case illustrated the center of the dial was drilled for the threaded sleeve of a metal housing by which it was fastened to the dial. The frame was first painted gold and later toned with flat green partly rubbed off.

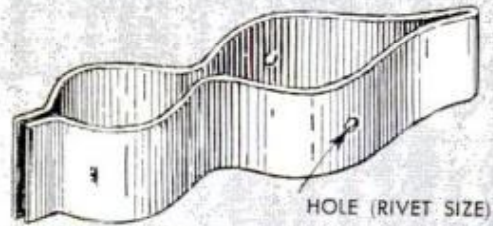
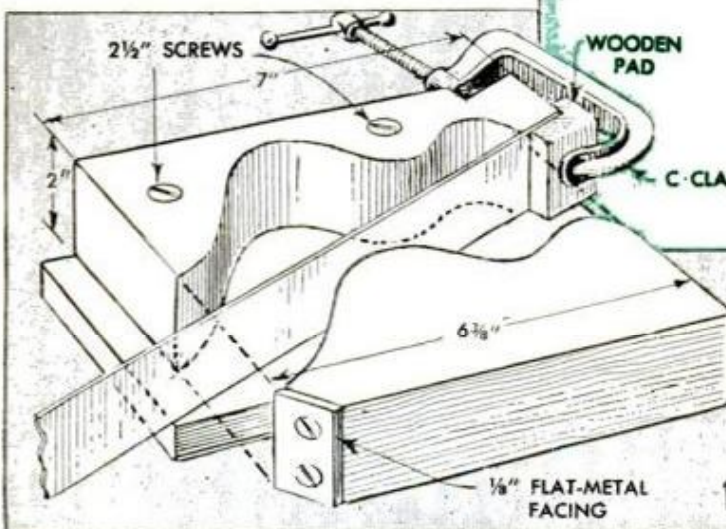
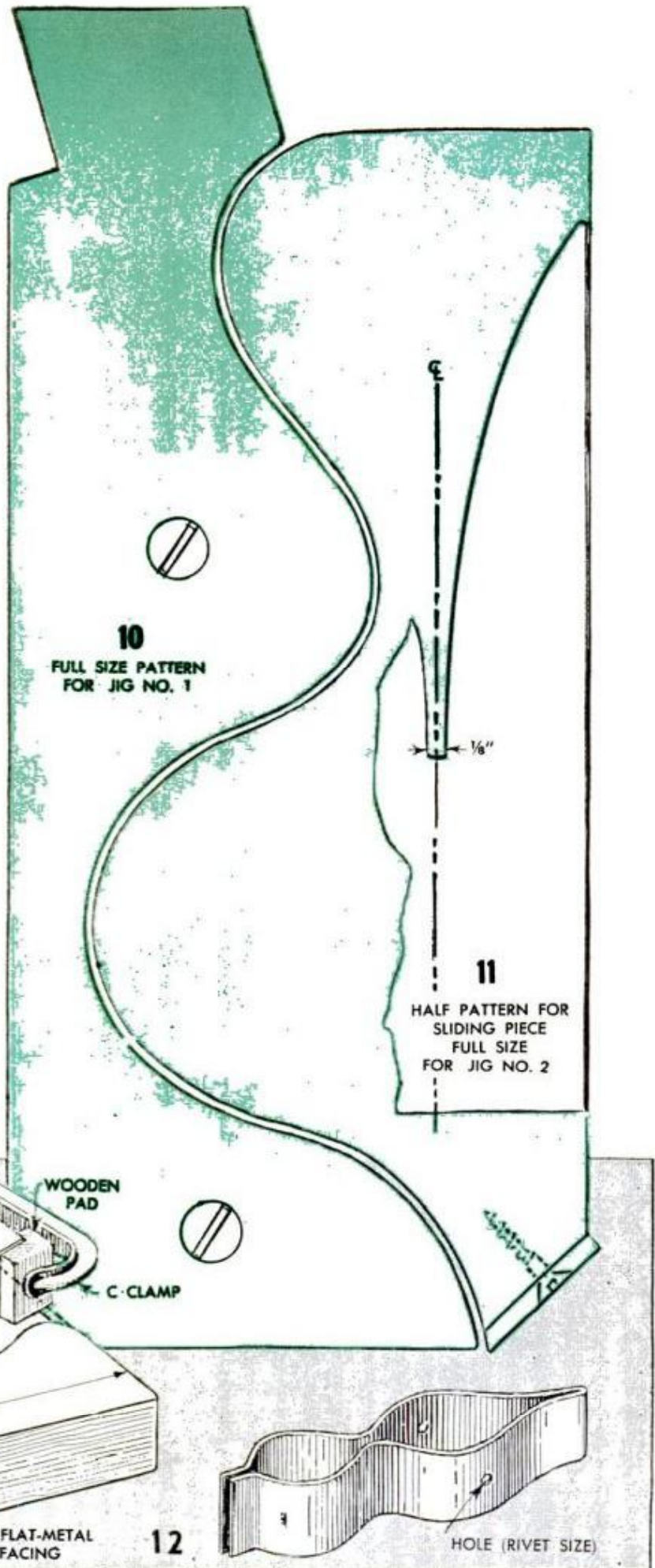
Twenty - four sheet - aluminum fins, bent to identical shape and fitted into equidistant saw kerfs in the housing, comprise the intriguing case shown in Fig. 13. Outside diameter of the housing, Fig. 14, should not be less than 5¾ in.,

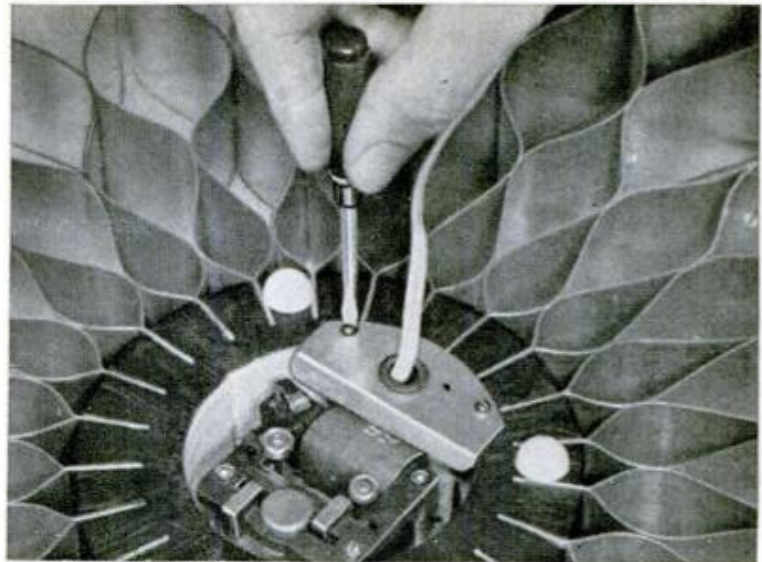
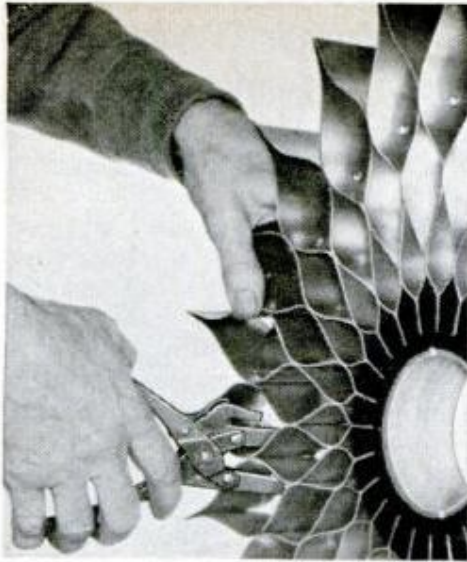


but may be larger. The cuts must be made to width accurately so that the two free ends of a fin will fit snugly. An individual fin, completely bent and drilled, is shown in Fig. 12. The fins are made from 2 by 18-in. strips of No. 24 gauge sheet aluminum available at many hardware stores. It can be bandsawed to size, which should be done on a hardboard backing to avoid scratching it on the bandsaw table. After sawing the strips their edges are filed smooth and the burr removed.

Jig No. 1, Fig. 10 is used first. Its curvature is shown full size for direct tracing. You clamp one end of a strip at the point indicated, using a wooden "pad" to avoid clamp marks on the aluminum. First form the small curve and then do the rest, feeding the stock into the jig from the free end to prevent distortion of the smaller curve. Then unclamp the strip, turn it end for end, clamp the other end and repeat the operation, but this time you bring the metal sharply around the metal corner piece. The bend so made should come at the center of the strip if bending was done properly.

After removing the strip from jig No. 1, pinch the doubled end together carefully to permit placing it into jig No. 2, detailed in Fig. 14. The two free ends slip into the slot of the fixed end block. Then the sliding piece is pushed over the doubled end of the fin to compress it symmetrically, taking care not to scratch it with the metal drill guide. The curve of the sliding piece is shown full size in Fig. 11. A dowel is pegged into the hole

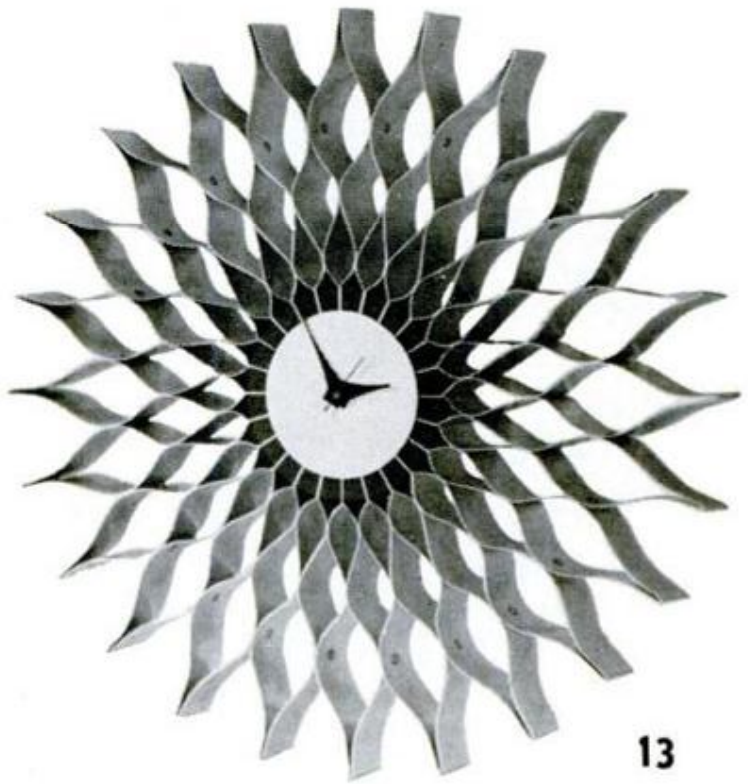




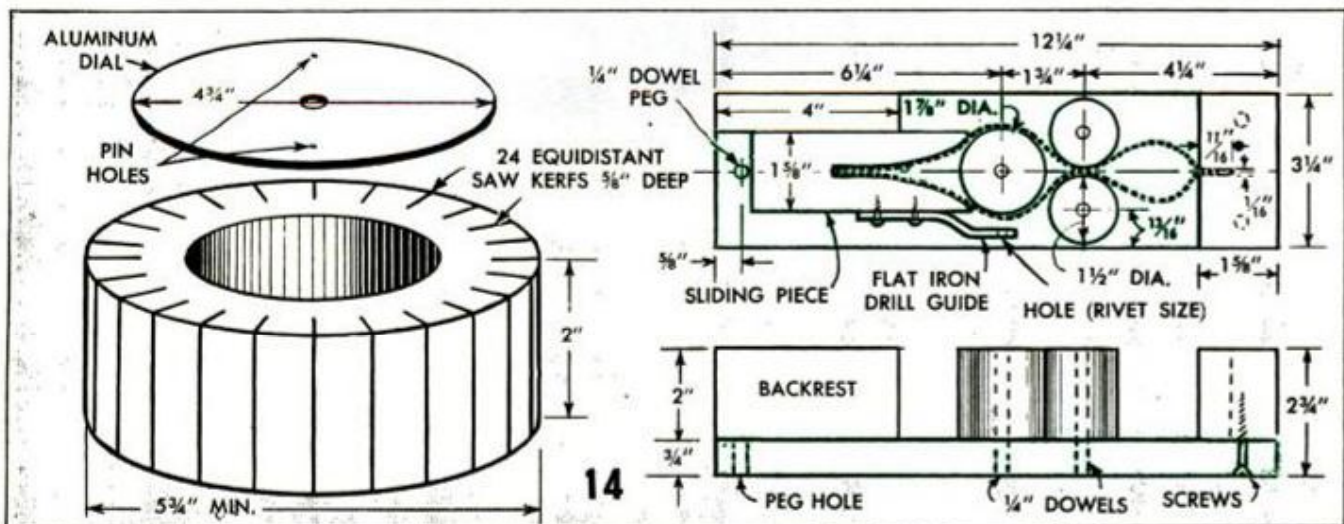
AFTER JOINING FINS to housing, fins are riveted together with hand setting tool, above. Above right, metal shield screwed to housing insulates the wiring terminals

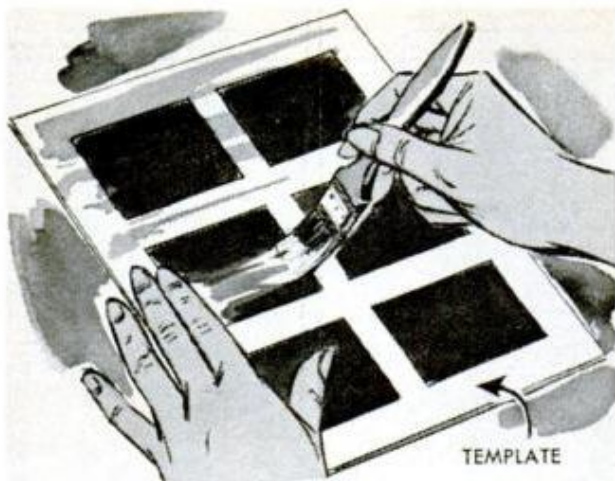
in the base to hold the sliding piece in position while drilling the rivet holes. This is done on a drill press, the jig resting with its side on the table. After drilling one side of a fin, it is reversed in the jig and the other side is drilled. This procedure assures identical locations of the rivet holes. After joining the fins to the housing, the fins are riveted together with a hand setting tool. The housing is painted before the fins are attached, being careful not to get paint in the saw kerfs. A metal shield was screwed to the housing to prevent accidental touching of the 115-volt clock terminals when setting the hands. This should be done on any electrical movement not already safely enclosed in a case.

Old conventional hands seldom
(Continued to page 282)



13

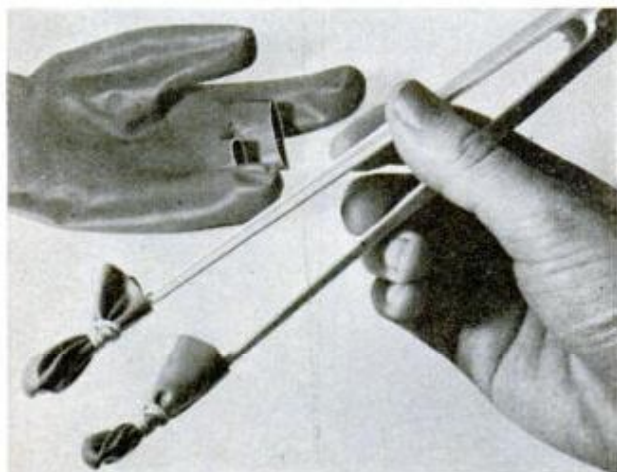




TEMPLATE

Template and Rubber Cement Speed Snapshot Mounting

Next time you mount a batch of snapshots in an album, you'll find you can do a faster, neater job and avoid a sticky mess by using a template and rubber cement. Cut the template from heavy show-card stock to album-page size with cut outs $\frac{1}{8}$ in. smaller than the size of the photos. Place the template over the album page and brush the cement within the cutouts. Remove the template and press the photos firmly in place.—P. Buzzel



Rubber Tips on Print Tongs Insure Against Scratched Prints

It's a real shame to find that all the pains you've gone through to produce a fine photo print have come to nothing because your tongs have scratched it. This is especially true with some printing paper emulsions that require more handling care than others. However, if it's happened once don't let it happen again. Cover the tips of the tongs with the finger tips from an old pair of rubber gloves. The tips, which can be held in place with rubber bands, will also insure a better grip on the prints.



RUBBER BANDS

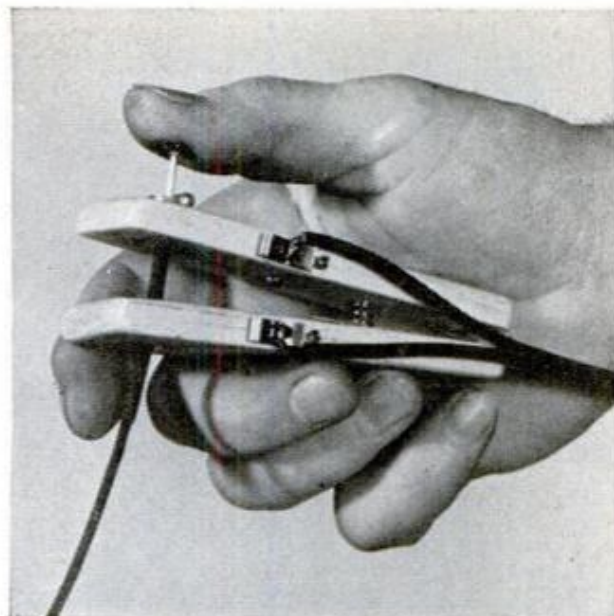
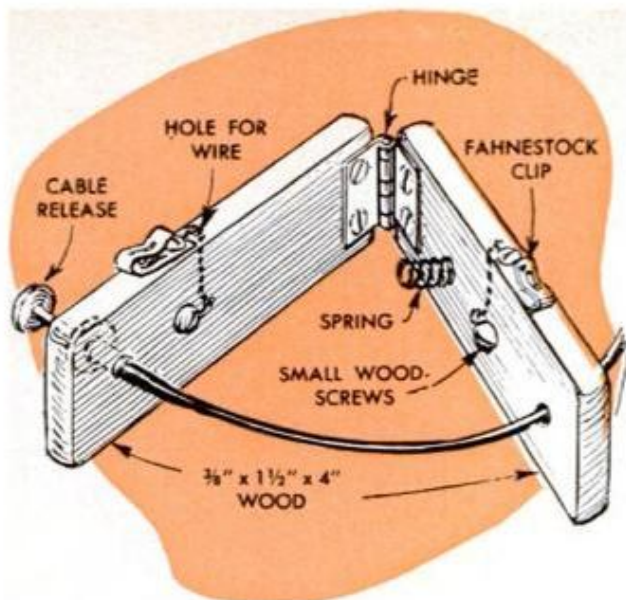
Rolled Newspaper or Magazine Takes Curl Out of Old Prints

Photo prints that have been stored for a considerable time have a way of curling up and will often refuse to lie flat for mounting. One way to take the curl out of them is to place them between the pages of a newspaper or magazine. Roll the paper or magazine up tightly against the direction of the curl and set aside for a few hours. The ends of the roll may be secured with rubber bands. In a few hours you'll find that the prints will lie flat enough to be mounted with little trouble.



Colored Edges on Slides Help Spot Choice Shots

If like some folks you are an avid collector and displayer of color slides, you most probably have several which you consider your best. Rather than sort through dozens of slides to find them try coating the top edges with nail polish to make the slides easy to spot. If there's no nail polish handy, it is also a simple matter to draw the top edge of the slides across the surface of an ink pad of the kind used with a rubber stamp. In each case, be sure to mark the "top edge."—Wayne Floyd



Open Flash Synchronizer

Operating this flash synchronizer simplifies open-flash photography for use with any shutter accepting a cable release. Two blocks of wood approximately $1\frac{1}{2} \times 4$ in. are hinged together at one end. One end of a coil spring about $\frac{3}{4}$ in. long fits tightly into a $\frac{1}{4}$ -in. blind hole drilled in one of the blocks.

Two round-headed screws form contact points. These are positioned, one in each block, so that they contact when the blocks are pressed together. Terminal clips on the edges of the blocks connect with the contact points, and wires from the flashgun attach to the clips. The circuit is closed when the two contact points touch. Holes

through the blocks accept the cable release.

The open-flash synchronizer operates by pushing down on the cable-release plunger with the thumb. The spring between the blocks holds the contacts apart until the shutter—set on bulb—opens. Then, when the plunger is depressed, a further squeeze on the blocks compresses the spring until the contacts close and fire the bulb. After the bulb fires, pressure is released on the plunger, automatically breaking the circuit and closing the shutter. The whole operation—open, fire, close—should take no longer than a second and provide foolproof control of open-flash photography.

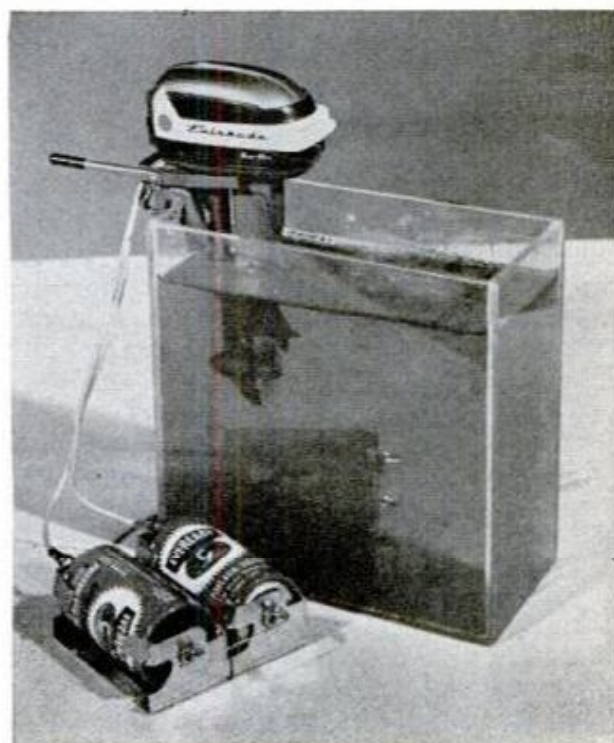
—David D. Rudd

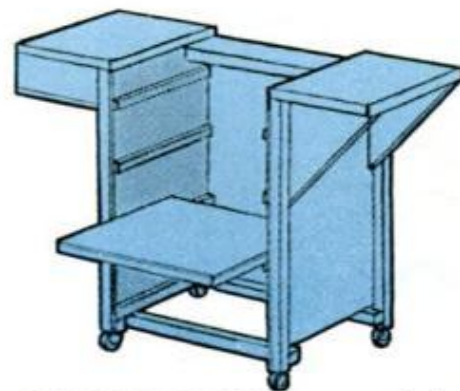
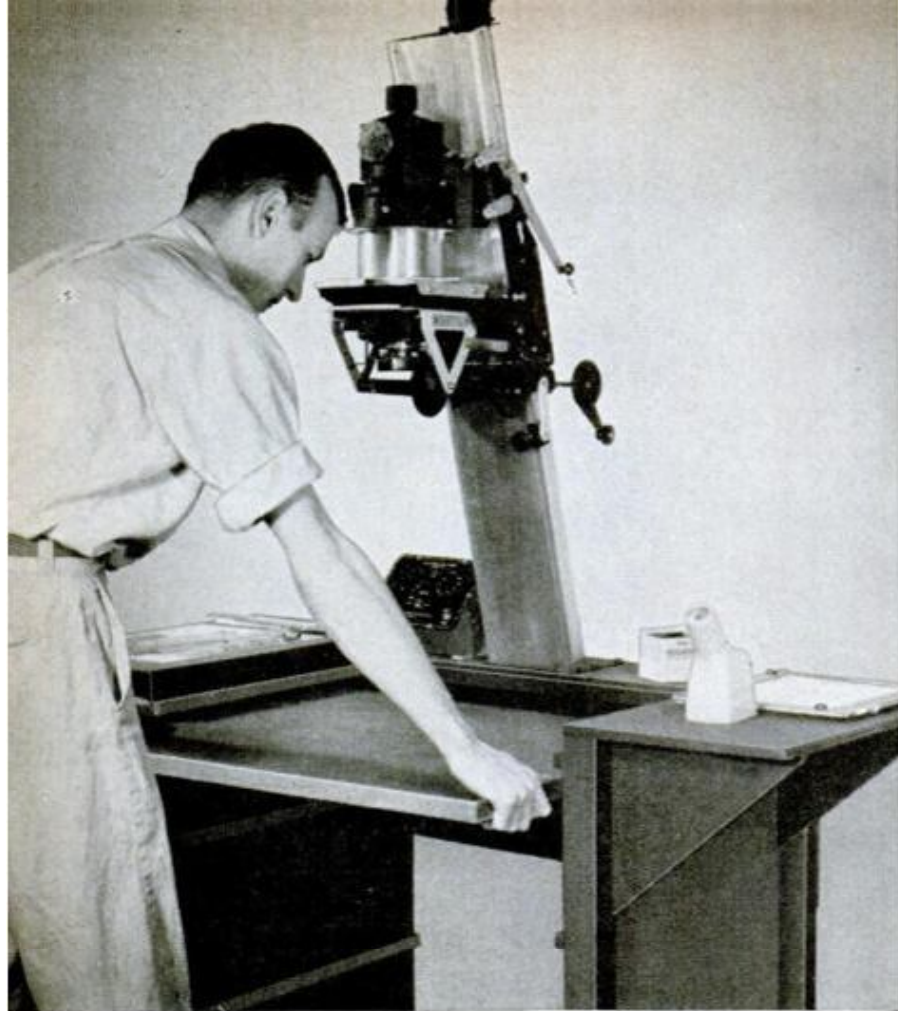
Model Outboard Motor Mixes Photo Chemicals

When Phil Slattery of the Denver Post decided he had enough of mixing photo solutions by hand he came up with a most novel power mixer. He clamps a model outboard motor to the side of his 1-gal. tank, turns it on and forgets it. Powered by two D-size cells, the little outboard churns away and does a most efficient job of mixing which sure beats stirring.

—Bernard Kelly

The wide mouth of a 1-qt. milk bottle makes it a favorite storage container for the amateur darkroom dweller. It's easy to fill and the fact that it holds 1 qt. by measure makes it doubly handy when preparing small amounts of stock developer. If you haven't thought of it, the bottles also are perfect for storing photo solutions. All you have to do to make them lightproof is to paint them black on the outside.





ENLARGING TABLE is compact unit that easily can be rolled into a closet or corner of basement when not in use. Adjustable easel may be set to height needed by merely pulling out shelf

DROP-TOP ENLARGING TABLE

EVER WISH you had more room to raise the head of your enlarger for making large blowups? Most likely you have if you work in an average basement with a low ceiling that limits making those high-ratio enlargements in the usual way. Normally there's a choice of either tilting the enlarger head 90 deg. to make a horizontal projection or swinging the head outboard and projecting the image on the floor. Both methods are time consuming and usually a nuisance.

A more satisfactory solution is to build a drop-top enlarging table, similar to those used in some of the top professional magazine and newspaper darkrooms. The adjustable shelf-like top replaces the fixed work surface with one which is easily raised or lowered. In addition, the table has a built-in viewing box.

The first step is to build two U-shaped frames of 2x2 stock, cut to dimensions shown in the detail. Drill holes for carriage bolts and casters and bolt the frames together. Cut two side panels from 1/4-in. plywood. The easel rails must be accurately located and aligned. Nail and glue the rails to each panel and check to make sure each pair align. Side panels are set flush with the edges of the uprights and glued in place. The 2-in. member to which the enlarger is anchored fits flush with the top of the

panels. Next, the back panel is attached to complete the basic table.

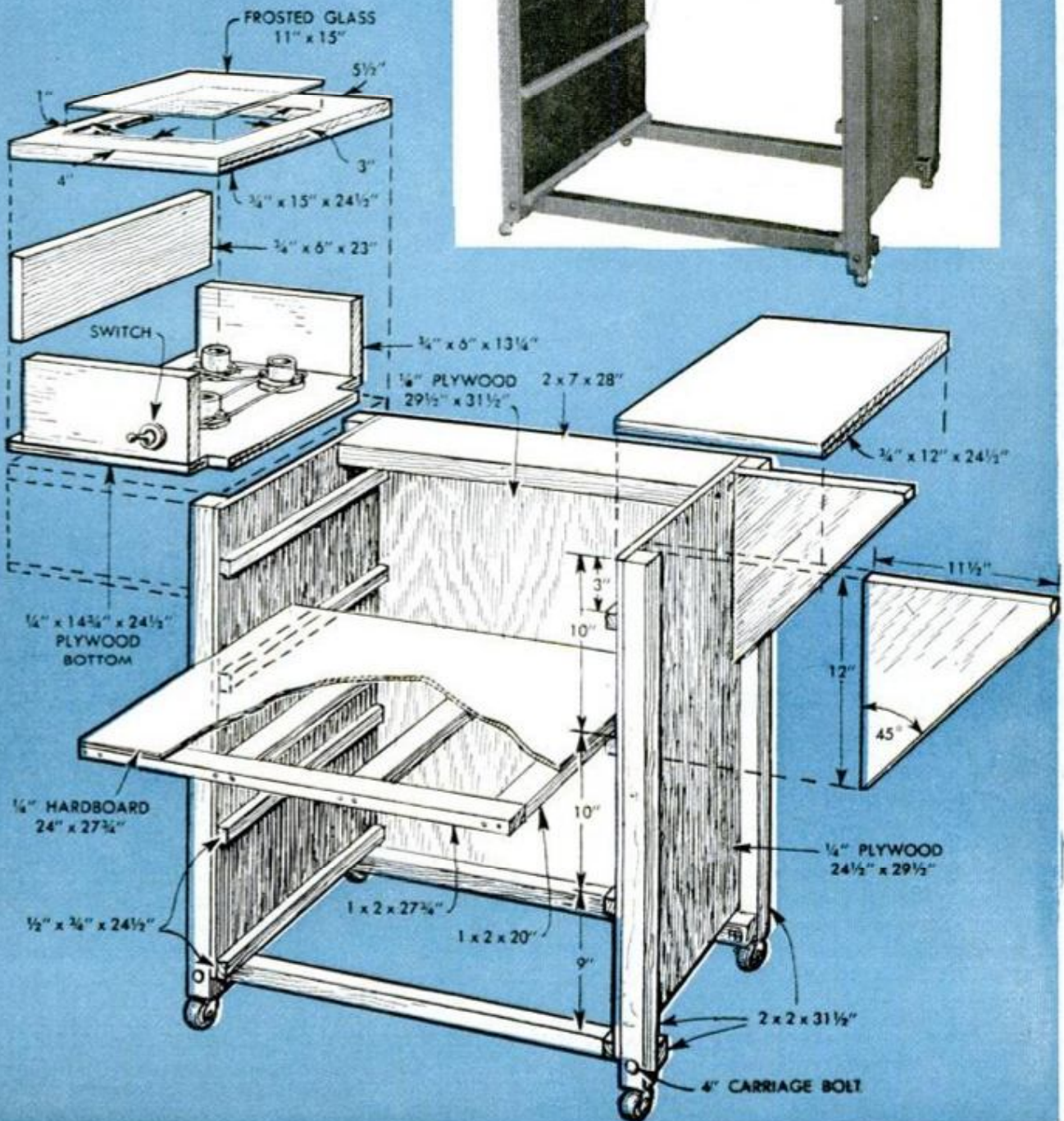
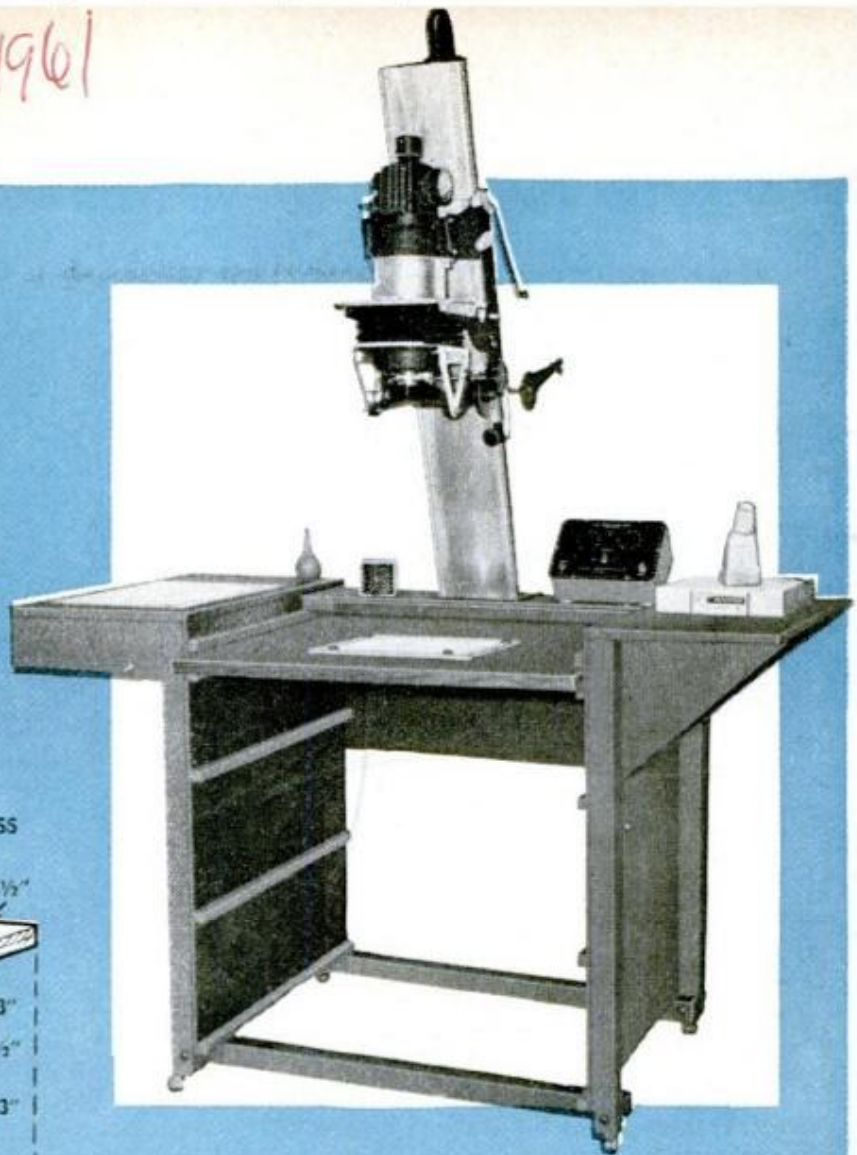
The easel may be built with a framework of 1x2s as shown in the detail, and covered with a hardboard panel glued to the frame, or, a 3/4-plywood panel may be substituted. The shelf on the right-hand side of the cabinet rests on two triangular supports.

The light box should be completed and then attached to the table. Top of the box is cut from single piece of 3/4-in. plywood. Small wood strips nailed to the inside edges of the opening to support a sheet of milk glass, which rests flush with the face of the light box. If you wish, the edge of the panel may be rabbeted to support the glass. Sides and bottom are cut as detailed.

Four receptacle sockets are spaced for even light distribution, on the base of the box. Screw the receptacles in place and wire them in parallel through a small toggle switch set in one end of the box. Assemble the box and nail it to the left-hand side of the table.

Table and light box, especially the top of the easel and the inside surfaces of the cabinet, are finished with one or two coats of flat black or dark gray paint to reduce the reflected light that may otherwise degrade the highlights of the prints. Inside surfaces of light box are white. ★ ★ ★

Shop Projects 1961



BUTTON UP YOUR HOUSE FOR WINTER



By M. Robert Beasley

AN INCREASING NUMBER of homeowners realize the dollar and sense value of buttoning up their homes for winter. In fact, homeowners reportedly buy between 40 and 50 million cartridges of caulking compound annually.

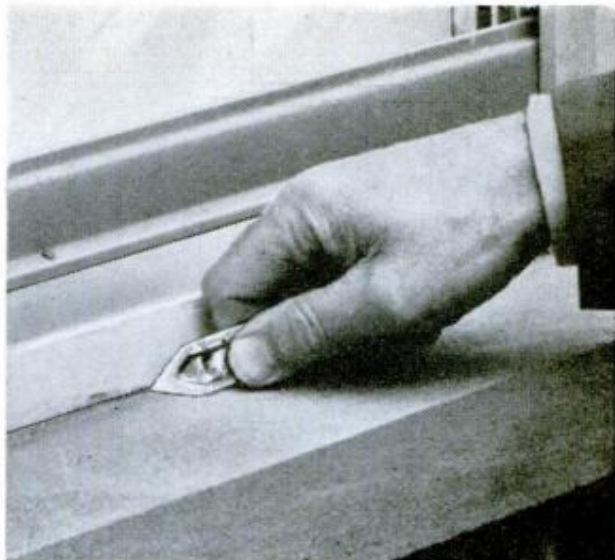
For an investment of just a few dollars and a few hours work there can be great savings by preventing moisture penetration, heat loss and peeling paint. Caulking compounds adhere to any surface that

paint does, and a professional looking job is obtained by using good material, applying it properly and then protecting oil-base compounds with paint. A good caulking material remains pliable for years. Though it may harden somewhat on the surface, the bond will remain flexible and provide an airtight, watertight seal for 10 years or more.

Just as with paint, the surface must be properly prepared. With a good base a



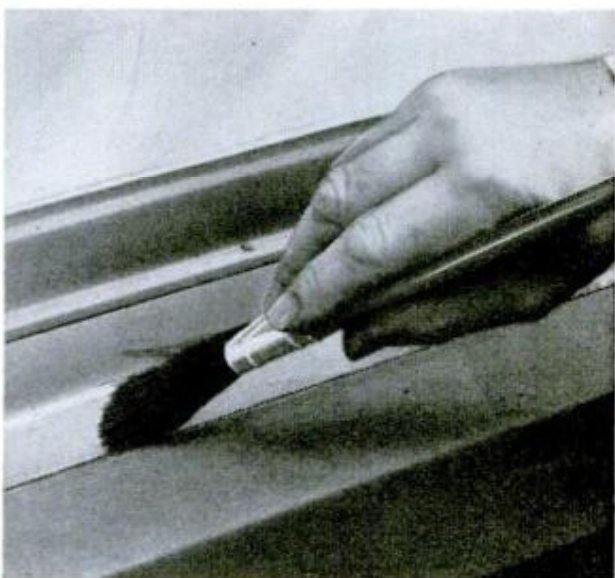
OPENINGS AROUND SILL COCKS, lead-in wires and clothes dryer vents need calking to keep out moisture



REMOVE LOOSE PAINT, other debris that prevents adhesion with V-shaped can opener and putty knife



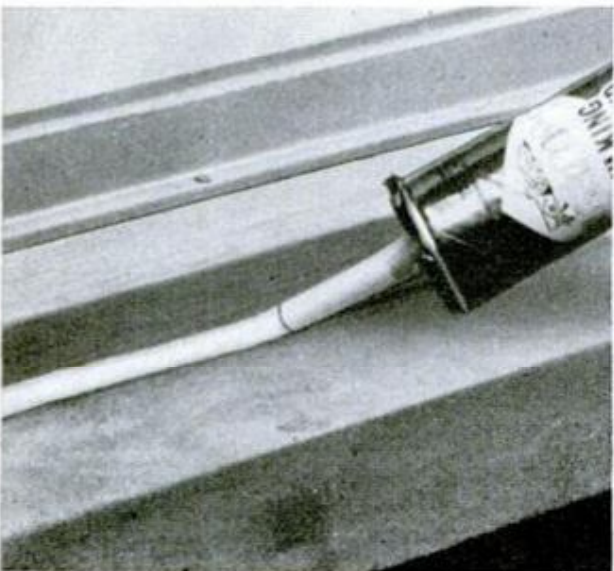
ROUGHEN SURFACES with coarse sandpaper or coarse steel wool. Rough surface promotes adhesion of calk



PRIME DRY WOOD with commercial primer or linseed oil. Then allow to dry 24 hours before applying calk

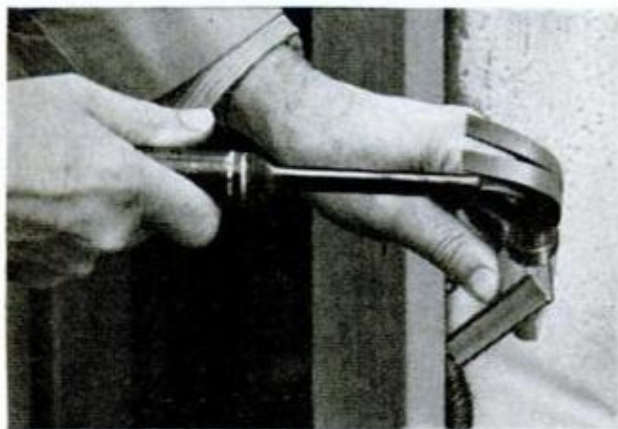
APPLICATION. Slant gun for equal distribution on both sides of crack and force compound into cracks

PAY PARTICULAR ATTENTION to metal casements, such as basement windows, where moisture is found





DON'T FORGET TO CALK where siding joins masonry foundation. Generally, calk wherever wood meets masonry. Otherwise moisture penetrates up under the siding, causing the deterioration of the wall structure



FOR LARGE CRACKS tap in oakum or mineral wool with piece of wood and hammer to provide calk base

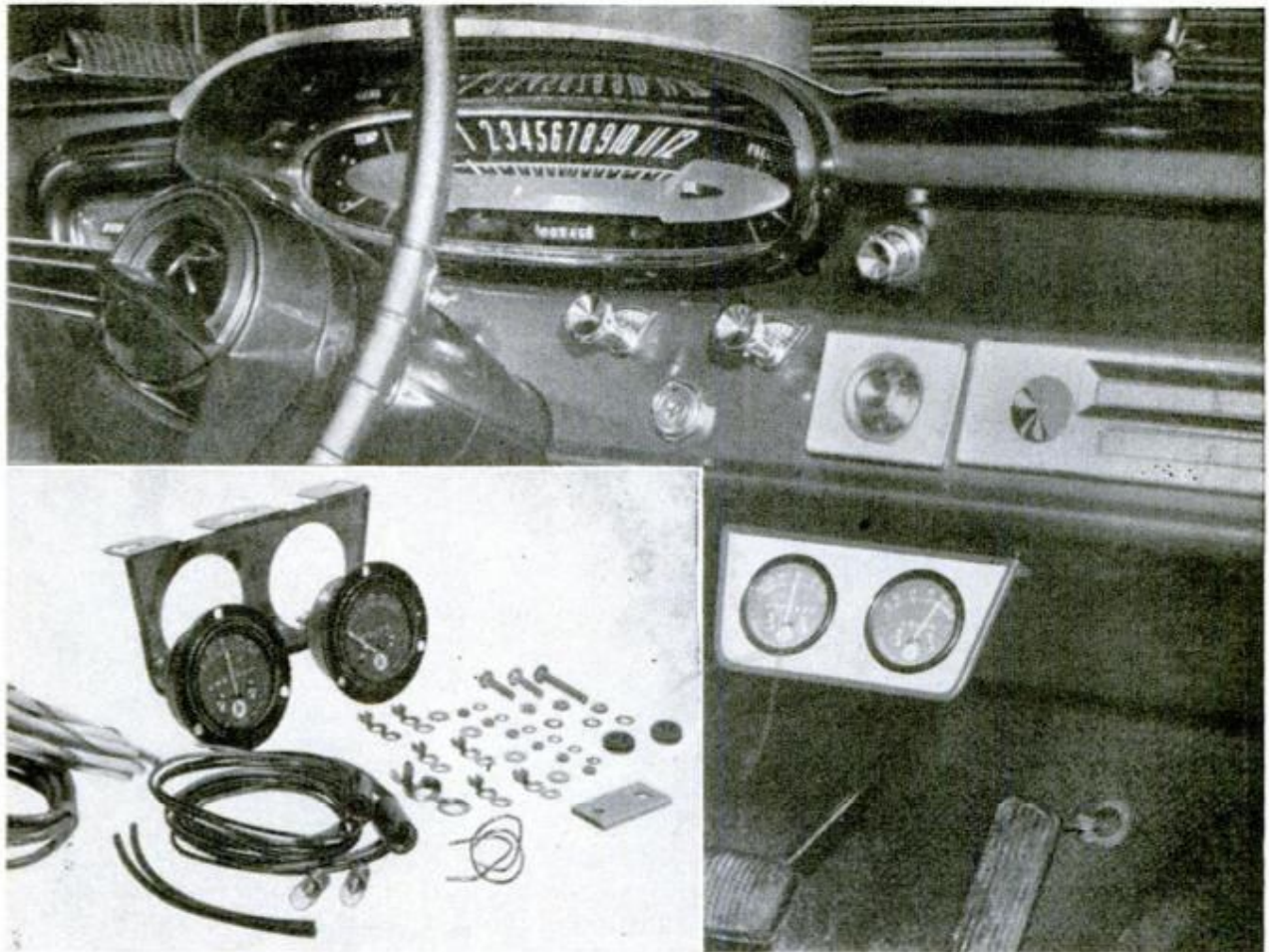
PROFESSIONAL BEAD is produced by even pressure on the trigger and an uninterrupted motion of the gun



quality compound sticks to most surfaces, such as metal-to-masonry, wood-to-concrete or whatever combinations you might encounter. Though calking does not develop galvanic action between different types of metals, galvanized surfaces should first be roughened with vinegar or solvent for maximum adhesion.

A film will form over the calk a day or two after application and it is then ready for painting. While compounds are waterproof, they require the protection of paint to give them long life and continued resilience for which they are designed. The primary purpose of calking is to seal openings. It doesn't hurt the compound to be exposed for several months, but it should be painted before freezing weather arrives. Emulsion paints require primer, but oil or elastic-base paints are applied directly over the calk. The exceptions are the black asphaltum-base compounds—these will bleed through most paints, and they should not be painted. Asphalt compounds are designed for use on roofs and gutters.

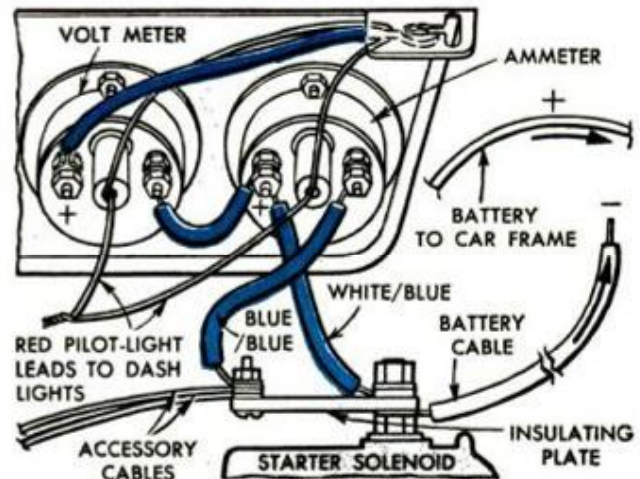
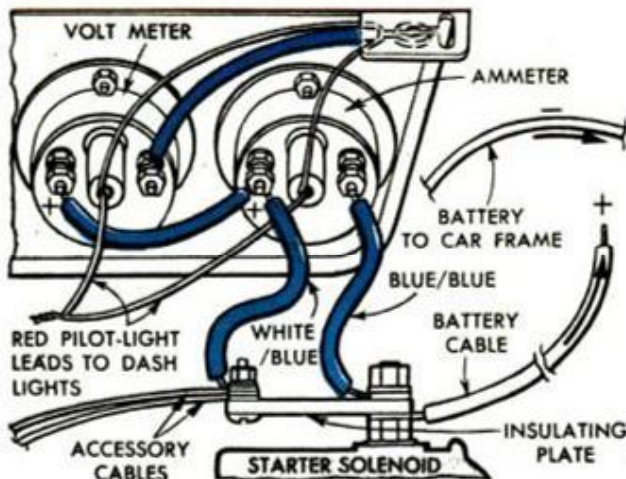
Should the material smear, just use a dry, clean rag for removing it. Solvents are not advised at this point because a dry rag is more efficient for removing the smeared compound. After the job is finished, use a paint thinner to remove miscellaneous spots and to clean gun. ★ ★ ★



Dash Meters Are Back Again

FOR THE OWNER of a late-model car equipped with "charge" and "discharge" panel lights a kit is now available consisting of a voltmeter and ammeter which enable a driver to keep close check on the precise voltage charge of his battery and to detect any excessive drain of power, as through a short. The voltmeter is especially useful in cold weather when the capacity of a battery decreases with a drop in temperature and gives ample advance warning of impending battery failure. Wiring hookups will differ, of course, depend-

ing on whether a car has a positive or a negative ground system. Illustrations for both the positive and the negative systems are shown below at the right and left respectively, and full instructions are included with the kit. Once the kit is installed and ignition and accessories are turned off, the voltmeter should read about 12.6 volts for a fully charged 12-volt battery, and the ammeter should read zero. One word of caution: Be sure to avoid shorts and shocks by disconnecting the positive cable from the car battery.





DON'T BE CAUGHT WITH A DEAD BATTERY

BUILD YOUR OWN QUICK-CHARGER

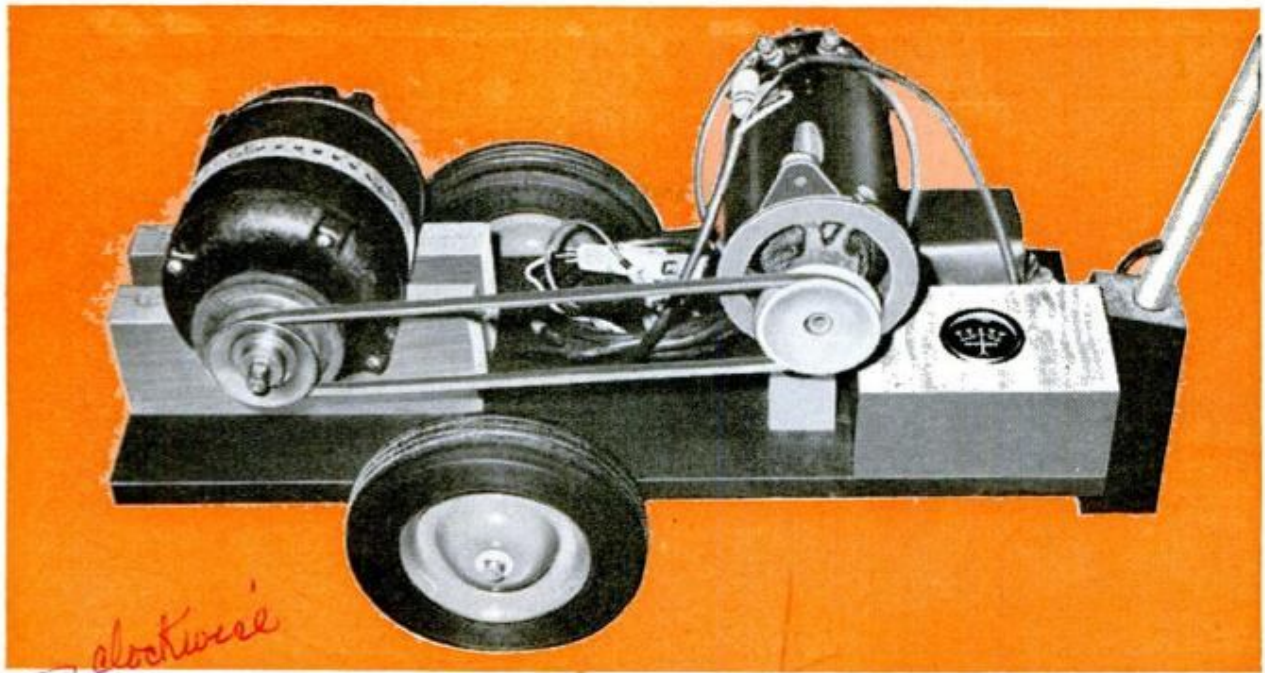
By Patrick K. Snook *2202 Catherine St
Northbrook, Ill*

FEW MOTORISTS are able to put back what they take out of a battery during winter driving. The extra drain of cold-morning starts, increased use of lights and added heater consumption takes its toll and unless you do lots of highway driving, you can't hope to keep the battery up to par by mere driving alone. The in-town driver, particularly, will do well to have his own quick-charger which he can use on occasion to keep up with the increased battery drain that comes with winter driving.

A simple quick-charger can be put together at little cost from odd parts that can be found in almost any junk yard. If possible, select a generator and voltage regulator from the same car—the generator being of the same voltage as that in your own car. You'd also better see if you can't buy, beg, or borrow the proper wiring diagram as the wiring set up is sure to vary with the type generator and regulator. The only other major items you'll need will be a 1/4-hp. motor and an ammeter and these, too, can be obtained used or rebuilt. Once

you've cleaned the generator thoroughly, make sure that the pulleys on both the generator and the motor are equal in size.

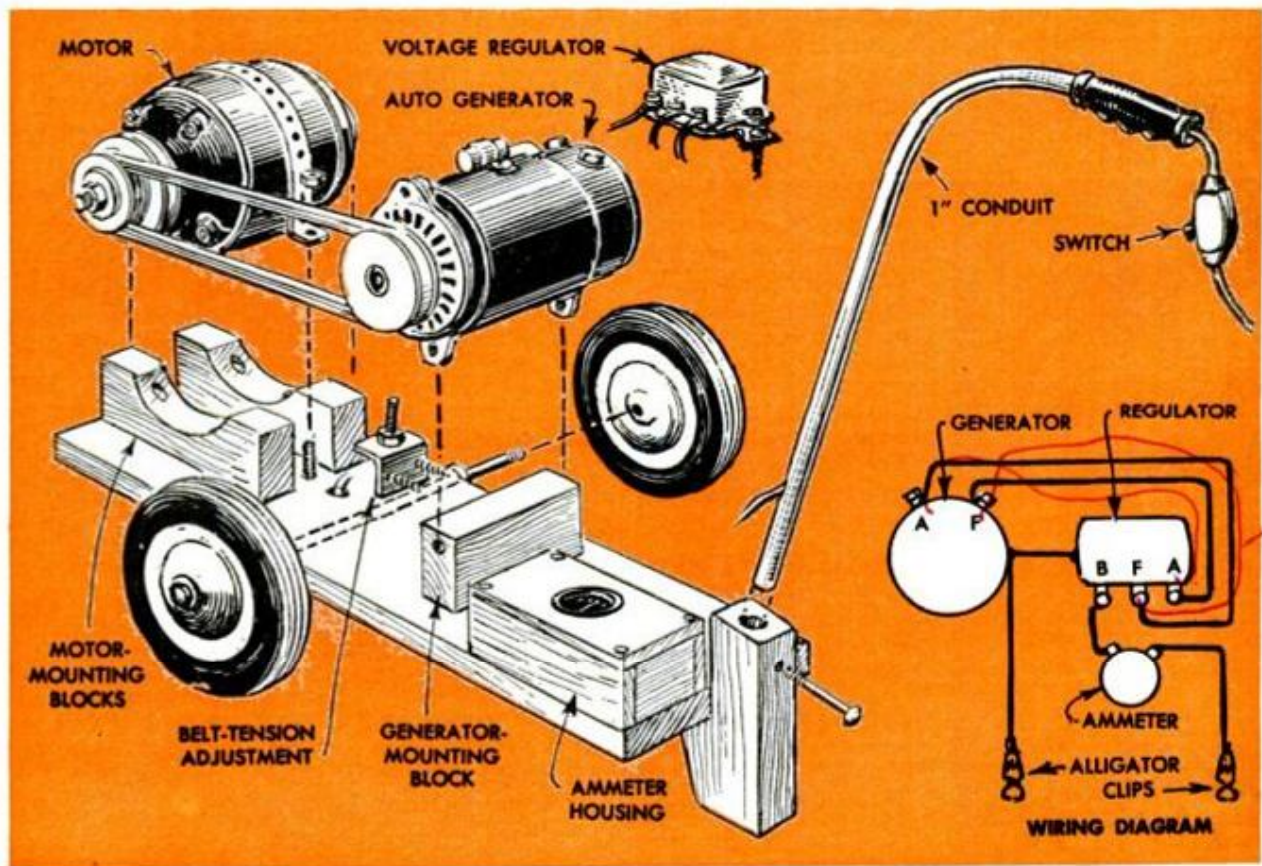
The carriage, or dolly, which makes the charger portable, consists of a 3/4-in. board measuring approximately 12 x 27 in. which is mounted on an axle and two 8-in. wheels and provided with a handle. Mount the motor on blocks of 2 x 4 cut to conform and bolt this assembly to the dolly. To find the proper position for the generator, bolt it to its single mounting block, slip the 3/8 x 36-in. V-belt over the pulleys and move the generator assembly back until the belt is snug when the generator inclines about 15 deg. toward the motor. This will enable you to mark the assembly's exact position. The generator then may be removed from its mounting block and the block bolted permanently to the dolly. At this point the box housing the ammeter may be assembled and mounted on the dolly. Leave the ammeter panel off until after wiring. The voltage regulator may be screwed to the opposite corner of the dolly. Aside from

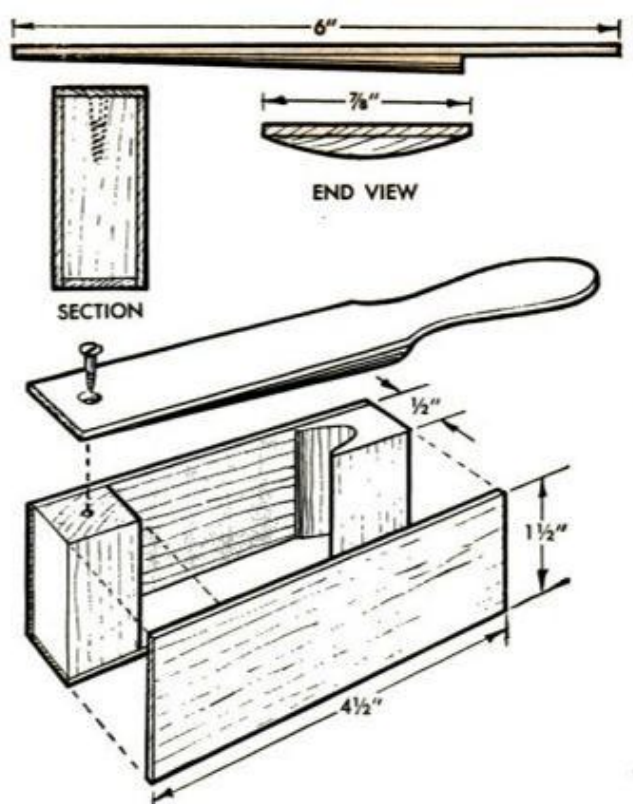


the wiring, all that remains to be done now is to fit the foot block and handle. The heavy-duty, two-wire power cable (No. 12 ga.) runs through the conduit and out of a hole drilled near the base, then under the dolly and up through a hole near the motor to which it is connected. Since most 1/4-hp. motors can be reversed make sure to connect the wiring so that the motor runs counterclockwise, viewing it from the shaft end.

There are probably half a dozen different generator-regulator wiring set ups depending on the make and vintage of the car.

One possible set up is shown in the diagram below. The generator terminals as well as those on the regulator are letter coded so that there should be no problems involved. One word of caution: On some models the field terminal is grounded by way of a resistor to the generator shell. In this case, mount the negative lead of the battery power cable to the screw that anchors the resistor, *not to the field terminal*. The direct lead from the field terminal should be attached to the F-post of the voltage regulator. ★ ★ ★





THIS BOX TALKS TURKEY

HUNTERS RATE the wild turkey as the shyest and wariest of all the game birds. Getting in shooting range of a wild turkey by any ordinary stalking method is sheer luck, they say, even when the stalker is favored by the best of cover. This is largely because the turkey relies on an incredibly sharp eye for security and also because the birds usually frequent open-timber areas where danger can be sighted at a distance.

But if you can bring yourself to sit rock-still in suitable cover in an area turkeys are known to frequent and then use a caller, or yelper, your chances of bagging a gobbler should be reasonably good. There

are many different types of callers, only two of which are pictured in use on the opposite page. The caller shown in the upper photo, opposite page, is perhaps the most popular of all the turkey callers largely because it is easily carried in a pocket and is somewhat more easily manipulated in the field. The detail above shows how it is made. Selected red cedar is used for all the parts. Note especially how the pivoted tongue is made. It consists of two pieces glued together, the top piece extending beyond the end of the box and forming a handle. The lower of the two pieces is shorter and is both rounded and

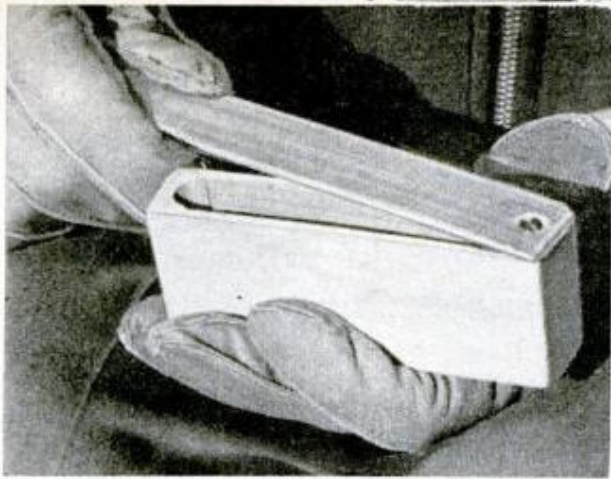
Coming
Next
Month

Take Over From Santa. Coming a month before the holidays are 17 pages packed with suggestions for Christmas gifts for your family and friends, also novel and original Christmas decorations for the home. You don't buy these anywhere. You make them.

Decor in Metal. A refreshingly new idea in hanging wall pieces, a tree branch in full autumn color. So real is the piece that you'll look at it very closely before you're fully convinced it's fashioned entirely from metal.

How to Install Drywall. Details clearly the correct methods of installation outlined by manufacturers. Tells how to nail gypsum wall board, how to score it, how to cement and tape joints and how to lay out and cut to fit without waste.

Cutting Glass Is a Snap. That's right! Just a quick, scoring stroke with the glass cutter, a snap, and you have two pieces of glass from one, with the edges line-straight. The trick is in knowing how. This article tells you in words and pictures.



tapered as indicated in the drawings. A hole is drilled near the end opposite the handle to take a flatheaded screw in a loose fit. The sides and bottom of the box are of $\frac{1}{8}$ -in. stock. Sand all surfaces smooth but do not apply any type of finishing material, inside or out.

In use, the box call just described is held in the left hand as in the photo above while the right hand moves the tongue, which has been coated with chalk, across the edges of the box in a rolling motion. No one can tell you just how to use a turkey call. You have to get the call in your hands and learn for yourself. It takes some practice to acquire the knack, but once you do learn how you can fool the wariest wild gobbler.

Another type of call which is popular in many localities where turkeys are hunted is pictured in use in the lower photo. This call consists of the top third of a coconut shell, a 2-in. length of hardwood (a $\frac{3}{8}$ -in. maple dowel often is used) and a small square of slate. The piece of hardwood, or the dowel if used, is forced into the "eye" of the coconut shell and the outer end is beveled to form a flat point. In use the flat point is rubbed across the surface of the slate, which has been coated with chalk.

When learning to use the callers, it will



help you to listen carefully to the calls of domestic turkeys and also try out the caller on them. When you can attract tame turkeys you can feel fairly sure of success in calling up the wild birds. Also, to hunt turkeys successfully you must know something of their food habits. Acorns usually are first choice, but wild grapes, wild cherries, sumac berries and beechnuts are favored foods. Wherever these are found in abundance, there you are likely to find turkeys.—Don Shiner ★ ★ ★

Shop Projects 1961

PORTABLE DRILL Powers Wood Lathe

*A Handy, Efficient Lathe for Making
Small Between-Centers Turnings*

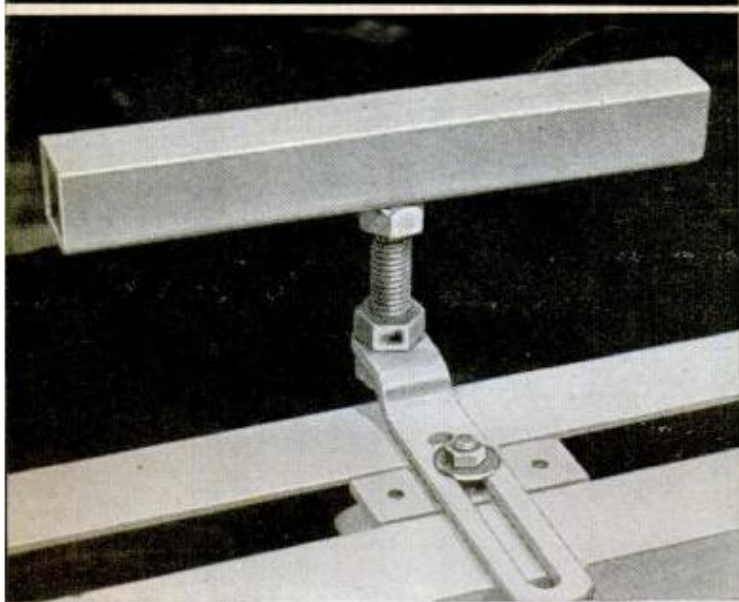
YOU HAVE a portable drill. A shop project calls for several turnings, but you don't have a wood lathe. So, what to do? There's no need to buy a wood lathe for those occasional turning jobs; make one, utilizing your portable drill as the headstock. All you need are two lengths of steel angle to make the lathe bed, an accessory stand to fit your drill (some manufacturers refer to this item as a bench stand) and a few odds and ends from which to put together a suitable tool rest and a tailstock with movable center. The details on the opposite page show you how to go about assembling the bed, tool rest and tailstock.

The first thing to do is lock the drill in its stand, place it on the level bench top and measure the distance from the surface of the bench top to the center of the chuck. This will give you the necessary height of the tailstock center above the bed. Assemble the bed as in the detail using $\frac{1}{8}$ x $1\frac{1}{2}$ x $1\frac{1}{2}$ -in. steel angles throughout. Note that in the detail the spacers give a 1-in. spacing between the bed angles. You may have to alter this spacing to properly accommodate your drill stand. The built-up tailstock base was made from a short length of channel from an auto frame, the webs being notched at a 90-degree angle. The channel was then bent at right angles and joined by means of $\frac{1}{16}$ -in. steel gussets. These can be welded on or joined by means of stove bolts as indicated. Then a $\frac{1}{2}$ -in. steel plate was joined to the vertical member and center-drilled and tapped for the dead-center screw pictured at the left.

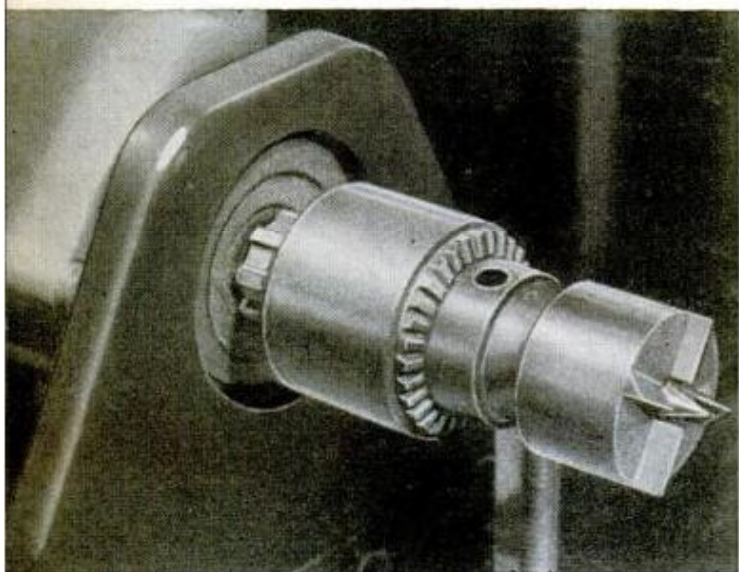
The original tool rest was made from a 6-in. length of square tubing, but if this is not available then use a $\frac{1}{2}$ -in. square of steel as detailed. Note that both the tool rest and the tailstock are fitted with guides and clamping strips. The live center, upper left-hand detail on the opposite page, is made by center-drilling and tapping a 1-in. length of steel rod for a threaded rod with a sharp point which forms a center point. The opposite end of the rod forms a spindle which is gripped by the drill chuck. Although the photo at the center, left, shows four spurs, two are sufficient as shown in the detail.

—W. Herdman Schwatka

POPULAR MECHANICS

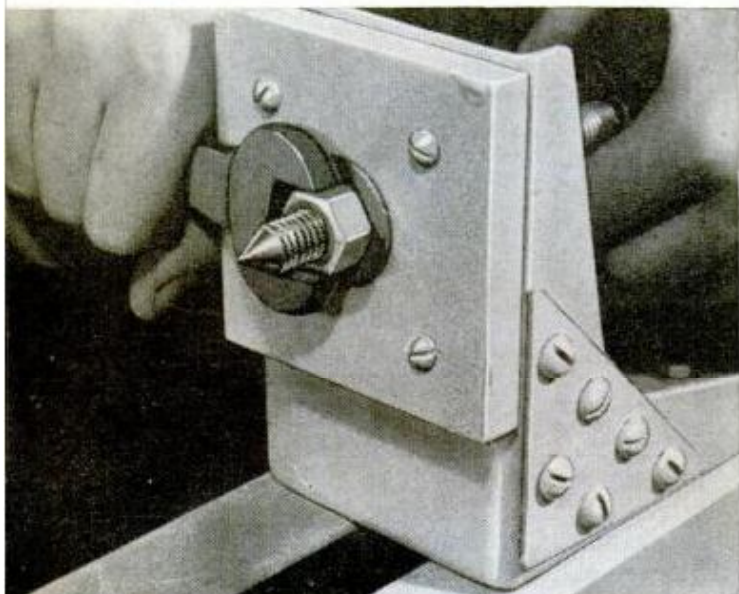


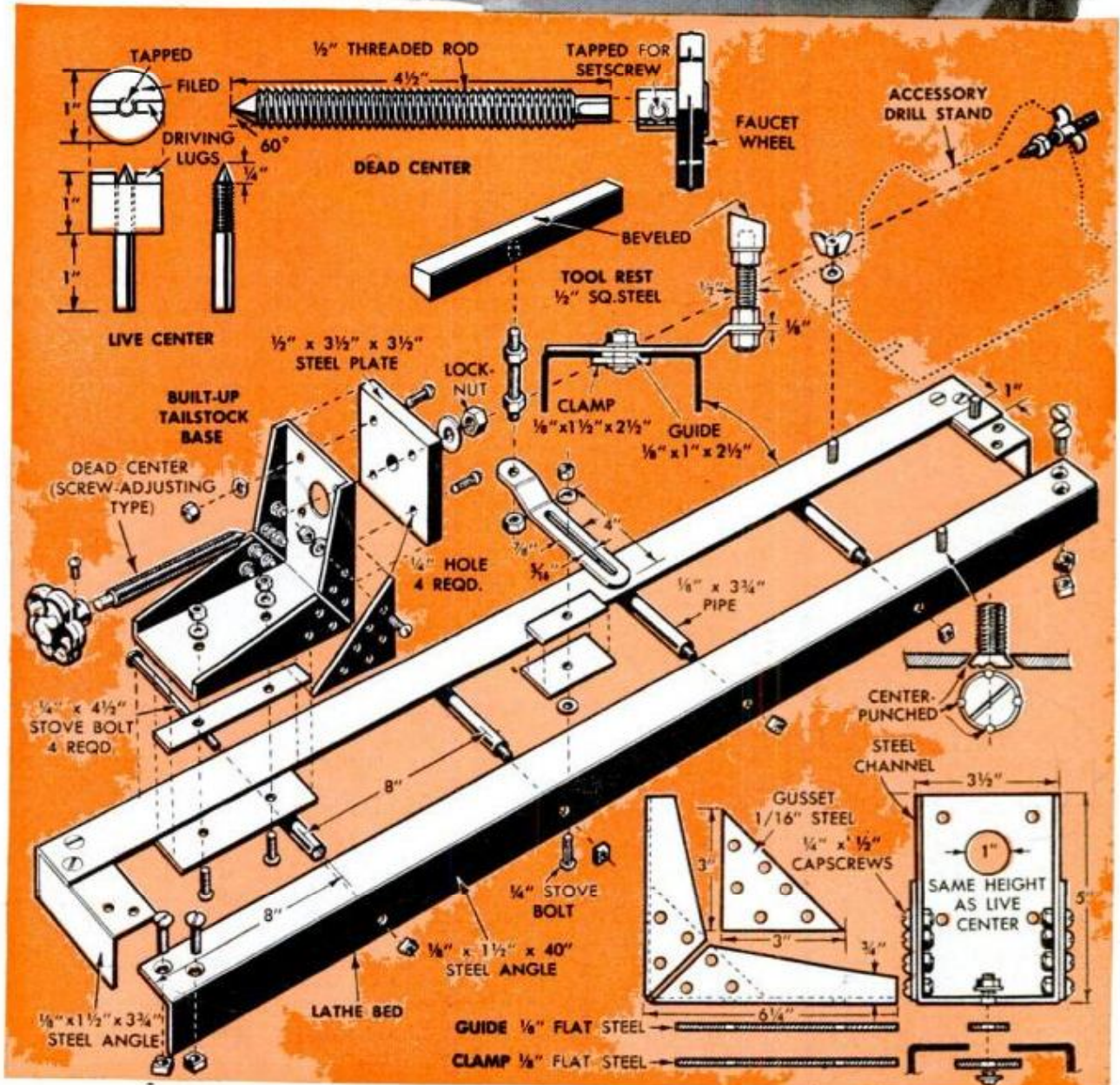
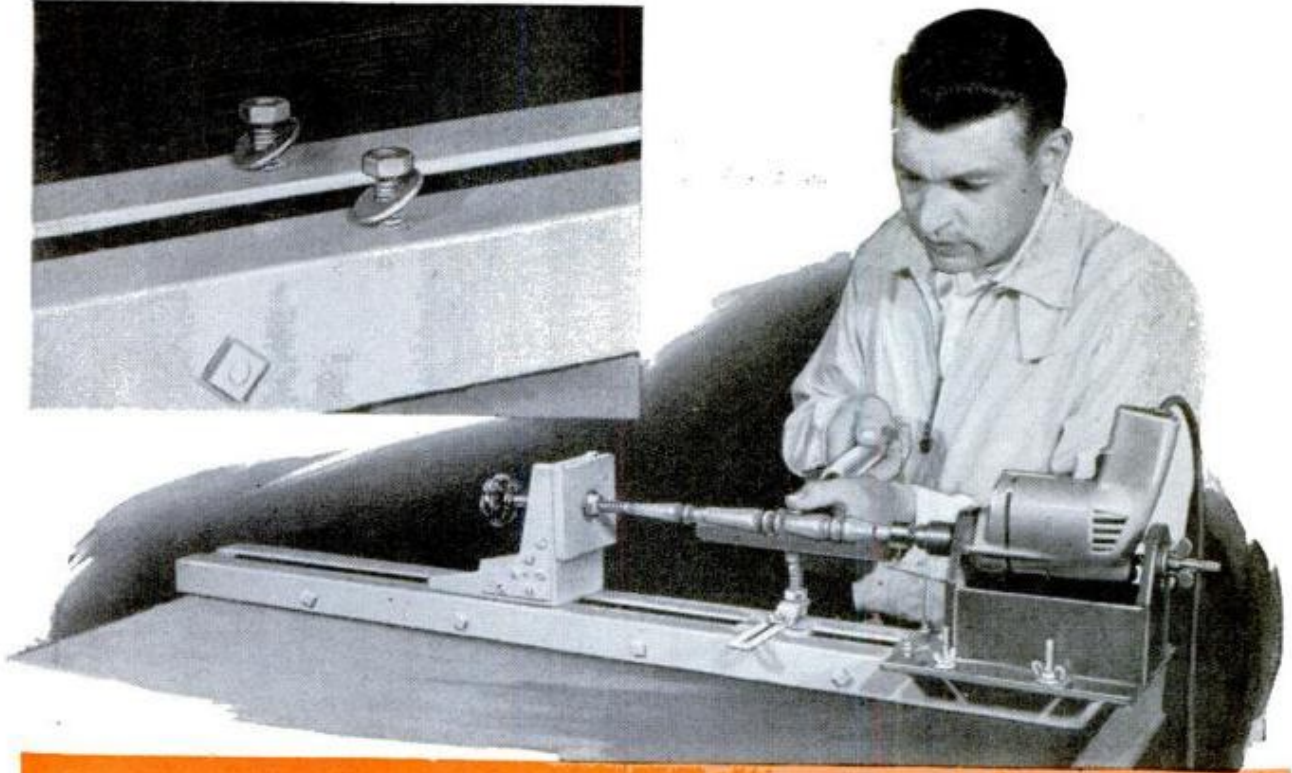
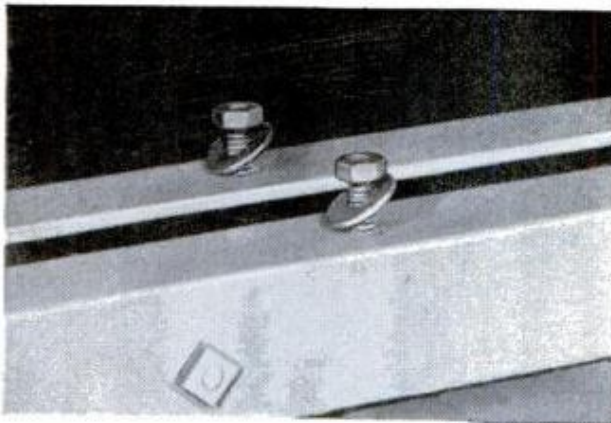
ORIGINAL TOOL REST was made from a 6-in. length of 1-in. square tubing. You also can make a suitable tool rest from $\frac{1}{2}$ -in. square steel as indicated in detail



SPUR CENTER, or live center, which drives the material being turned can be made with four spurs as shown or with two. Two spurs are easier to form by filing

TAIL CENTER is adjusted to the length of the stock to be turned and then is held in position by tightening the jam nut. End should be ground to sharp point

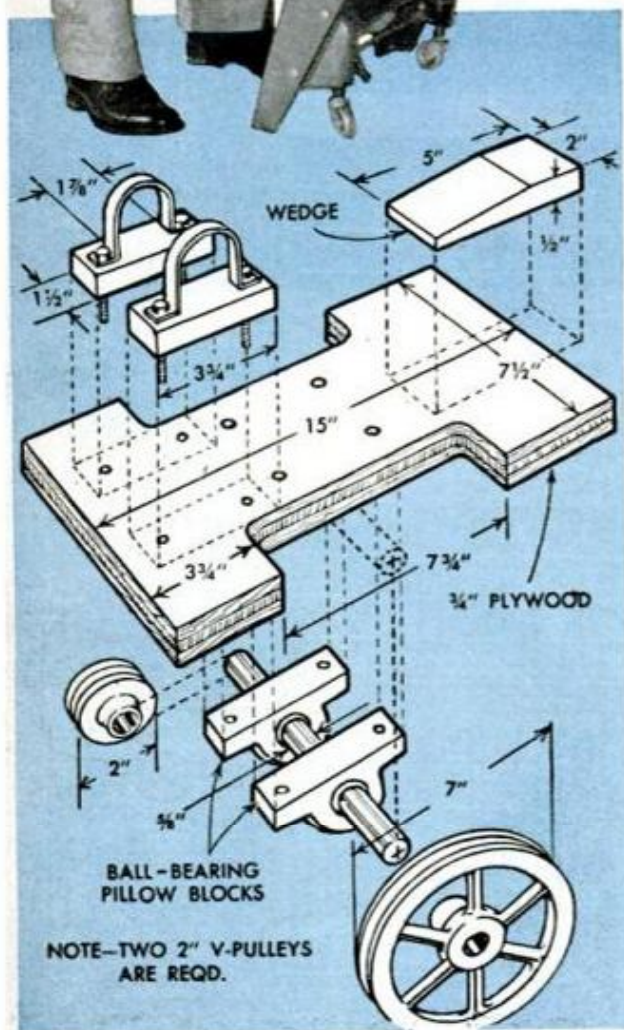
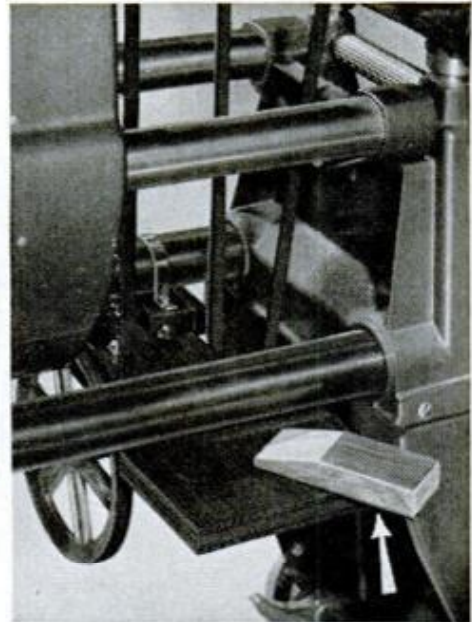




JACKSHAFT

FOR YOUR SHOPSMITH

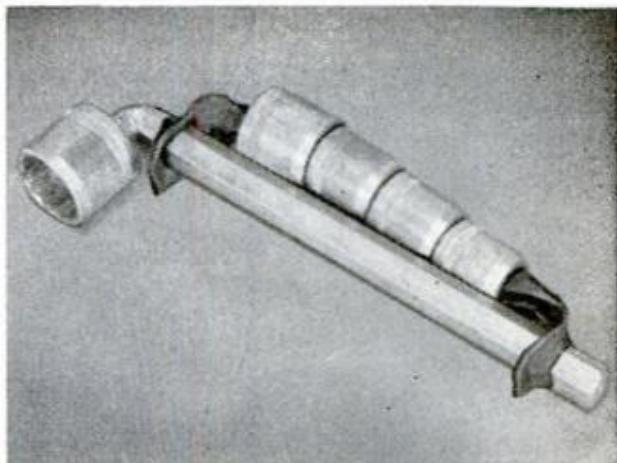
Reduces speed of accessory bandsaw
for cutting metals and plastic



MY COMBINATION machine is of the type designed only for woodworking, but I wanted to reduce the speed of the accessory bandsaw for cutting metal. So I made a jackshaft that gave me a double reduction, machine spindle to jackshaft, jackshaft to bandsaw, which did the job very nicely. It's a simple affair consisting of a piece of plywood for a base, four V-pulleys, two pillow-block bearings, a length of shafting and a wooden wedge. These parts are assembled as in the detail at the left and attached to the tubular machine bed as in the photos above. The band clamps tighten over one of the tubular frame members as in the left-hand photo and permit the assembly to pivot for removal and replacement of the V-belts. The wooden wedge you see in the photo above keeps the belts at the correct tension. When locating the pillow blocks be sure that they are in line so that the shaft does not bind and waste power. Use a metal-cutting blade with fine teeth for sawing metals, turn the speed-selector on the machine to the lowest speed and tighten the belts with the wedge. Then make sure that the saw blade is correctly aligned on the band wheels and is properly tensioned. Adjust the blade guides to support the blade both above and below the bandsaw table. Use a light, steady feed with just sufficient pressure on the work to keep the blade cutting. Forcing the work will cause heating.—Al. G. Haerberle

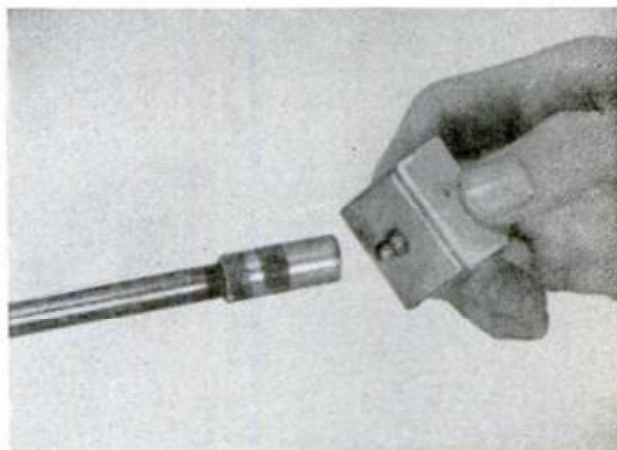
Sockets Held on Wrench Handle

When you're in a hurry nothing is more exasperating than to find the wrench, or driver, and every one of the sockets—except the one you need. That's the one usually missing from any wrench kit stored loosely in a drawer or tool chest. After an experience of this sort one mechanic cut a strip from inner tube, then made X-cuts near the ends and slipped the strip over the handle of the socket driver as pictured. When he finishes using the wrench the sockets of the kit are stored piggy-back on the handle of the driver.



Fitting Protects Grease-Gun Tip

Hand-operated grease guns carried in tool boxes on farm machinery and also on excavating machinery generally are subjected to rough use and often the tips are damaged. One sure way to protect the tips is to use a standard grease fitting with the threaded end turned into a hole in a small, square block of hardwood. Just drill an undersized hole in the center of the block and turn the fitting into the hole, forcing it to cut its own threads. Then snap the protector onto the tip of the gun before placing in the toolbox.—R. Hanscom



Where's That Chuck Key?

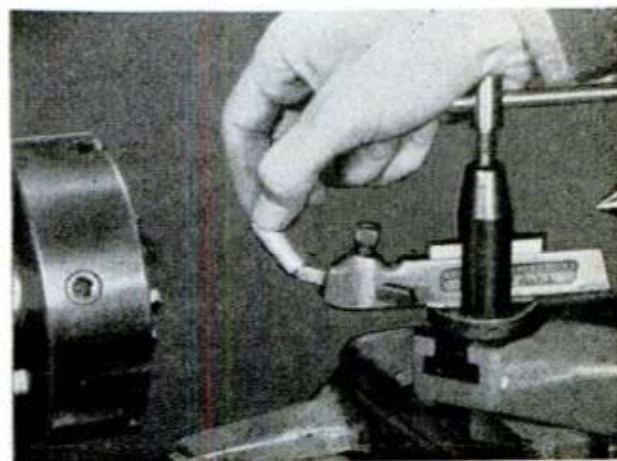
Of course, you've lost the chuck key for your portable electric drill. You were lucky if you found it again as the smaller keys are easy to lose and hard to find. I had this experience several times. Finally I went to my service station, got an old inner tube and cut a strip from it with round ends as you see in the photo. I cut a slot in the center of one of the round ends and punched a small hole in the other. I looped this flexible holder on the cord and then forced the key through the hole in the free end.

Bil Toman

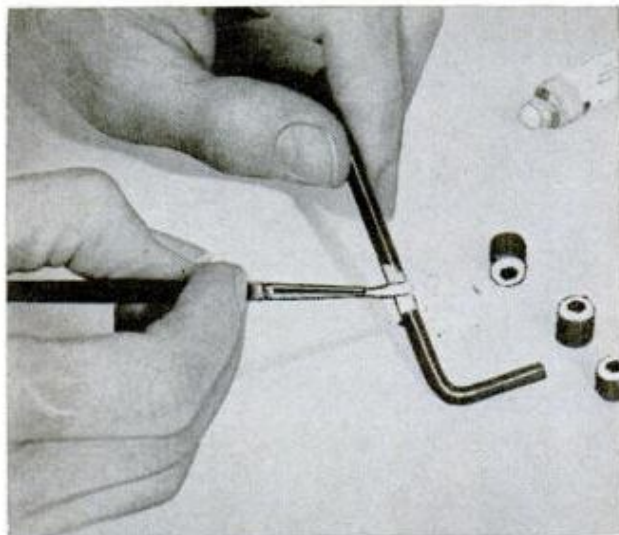


Tool Guard Prevents Hand Injury

When you're setting up work on a faceplate or in a chuck you can get a rather painful hand injury from the sharp lathe tool, even though you ran the carriage back beforehand. To offset this possibility and assure complete safety when reaching across the lathe, slip a short length of small-diameter tubing over the edge of the tool. Or, if no suitable length of tubing is at hand, simply wrap several layers of tape around the tool and pinch the open end tightly together to protect your hand from the sharp cutting edge.



Color Keys Socket Screws and Wrenches



Various sizes of socket screws and wrenches are difficult to match unless provided with a quick method of identification. This can be done by painting matching screws and wrench a single color. Just paint the end of each screw and brush a band of the same color around the wrench. The same idea can be applied to nuts and end wrenches.—R. Hanscom

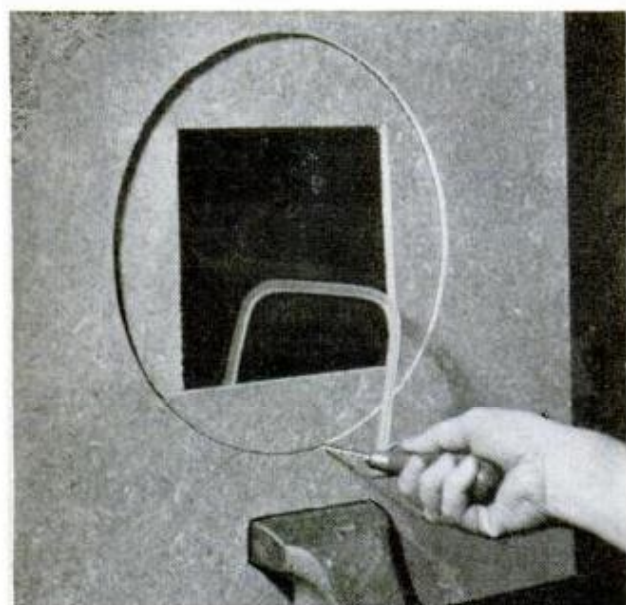
Save those old typewriter erasers! They're just the thing to keep in the tool box for cleaning small files and brushing metal particles from taps and dies. If a small screw is used to mount the ferrule on a wooden handle, the brush can be used for spreading glue.—Ken Murray



Wire Coat Hooks Make Storage Racks for Dowels

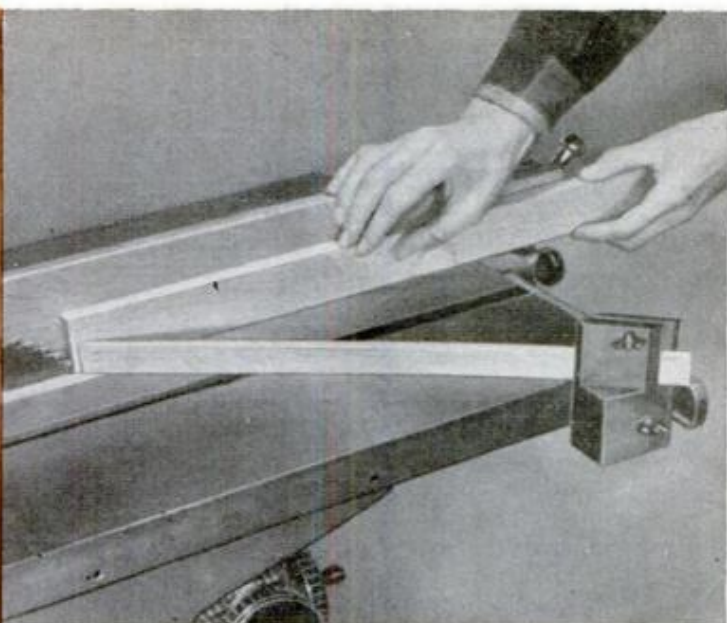
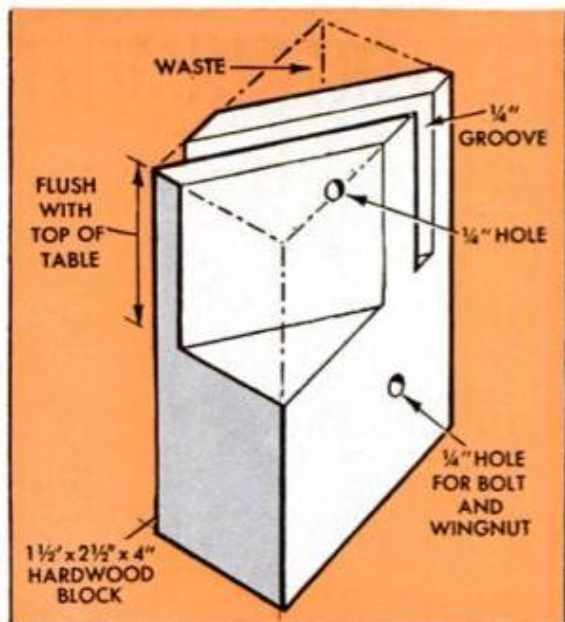
Need a good storage rack for dowels? Attach wire coat hooks to the wall of your workshop by screwing a couple into the studs or into a board nailed on the wall. The very ends of the hooks are bent upward to keep the dowels from rolling off. Several sets of hooks can provide storage space for various sizes of dowels.

To disguise a small burned spot in a carpet use a knife to scrape out the discolored pile. Then snip pile from a hidden section of the same rug. Spread the pile in the palm of one hand and dab glue over the top. Then press the pile in place in the damaged spot. Later brush the pile to make the repair unnoticeable.



Cutting Large Holes With a Coping Saw

Cutting large circular openings is easy enough with a jigsaw. But what if you have to do it by hand with a coping saw? There's a stunt that makes the job ridiculously simple and in one respect a better way than a jigsaw in that there is almost no limit to the size of the hole that can be cut. The secret is to first cut a square hole in the center of the circular opening to be cut. This provides the necessary clearance for the frame of the coping saw. Sawing the square hole can be done quickly by bringing the blade of your bench saw up through the work. In using the coping saw, the blade, of course, must be removed to insert the frame in the opening.



Hold That Board in Line—Safely

Resawing stock on edge to obtain a number of thin strips of a given length can be a tricky operation on a circular saw. The problem, of course, is to hold the stock firmly against the ripping fence as the cut is being made. This can be done in a number of ways, but without a push stick and a spring-type hold-in you risk getting a finger nipped by the blade. To make the whole operation safe and to assure accuracy take the time to make the hold-in pictured.

It consists of a holder of hardwood cut in the fashion detailed and attached to the edge of the saw table with a bolt and wing nut. The spring strip also is of hardwood and it must have lots of spring to be effective. If you can locate a piece of straight-grained hickory, that's the wood to use. Straight-grained white oak is next best for the purpose. Rip the strip to $\frac{1}{4}$ in. in

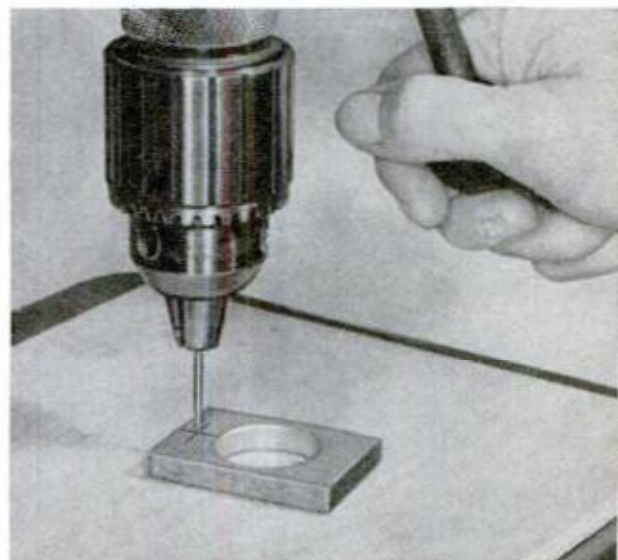
thickness and sand it smooth. Then bevel the end that is to bear against the stock. Coat the strip on both sides with paste wax and rub to a polish. Drill a $\frac{1}{4}$ -in. hole through the saw-table flange at the left-hand front corner to take the bolt which attaches the hardwood holder to the table. Be sure to drill this hole exactly at right angles to the outer face of the flange.

In use, the hold-in strip must be accurately set for different widths and thicknesses of stock to be worked. When resawing thin stock like that pictured, the end of the spring strip should be set to work as closely as possible to the blade, but be sure that when the stock is passed through, the end of the spring strip will clear the blade. In the photo a push stick has been omitted for reasons of clarity. Always use a push stick when ripping thin stock.

—R. Hanscom

On Center With a Locator

Quite often it happens that holes drilled in metal, especially those of the smaller diameters, turn up offcenter simply because the operator does not take the time to center the work under the drill chuck. Unless this is done the drill bit may be forced out of line and the result will be an oversized hole, or worse, an elongated hole and possibly a broken drill bit. To make a locator, also a prick punch suitable for center-punching soft metals, grind a sharp point on a short length of drill rod, lock this in the chuck and use as a locator in the manner pictured. Non-ferrous metals should be center punched first then centered under the chuck with the locator.



HOW TO BUILD THE ENTERTAINMENT

HERE'S PLENTY of well-organized storage space right where it is needed. This entertainment wall separates the living room from the family room in the PM House of Built-Ins, featured in the October, 1960, issue of POPULAR MECHANICS. The wall increases living space by providing compact storage and it doubles as a dividing wall. Architect Milton Schwartz designed the wall so that it integrates completely with the house.

The wall has adequate storage space for books, records, a TV set and other electronic equipment, plus a place for games, writing supplies and displays of bric-a-brac. In addition, the entertainment wall is a work saver, eliminating much of the dust problem by the use of closed storage units.

Building the wall is not confined to new houses. You'll find all the ideas shown here, suitable for remodeling a present home. Instead of using the idea dividing wall, a similar built-in could fit against one wall of a family room, and by using only a narrow slice from the room provide the compact storage space needed for the activities of a modern family. This method of construction is economical, too, since it utilizes the walls of the house for the back and ends of the storage unit.

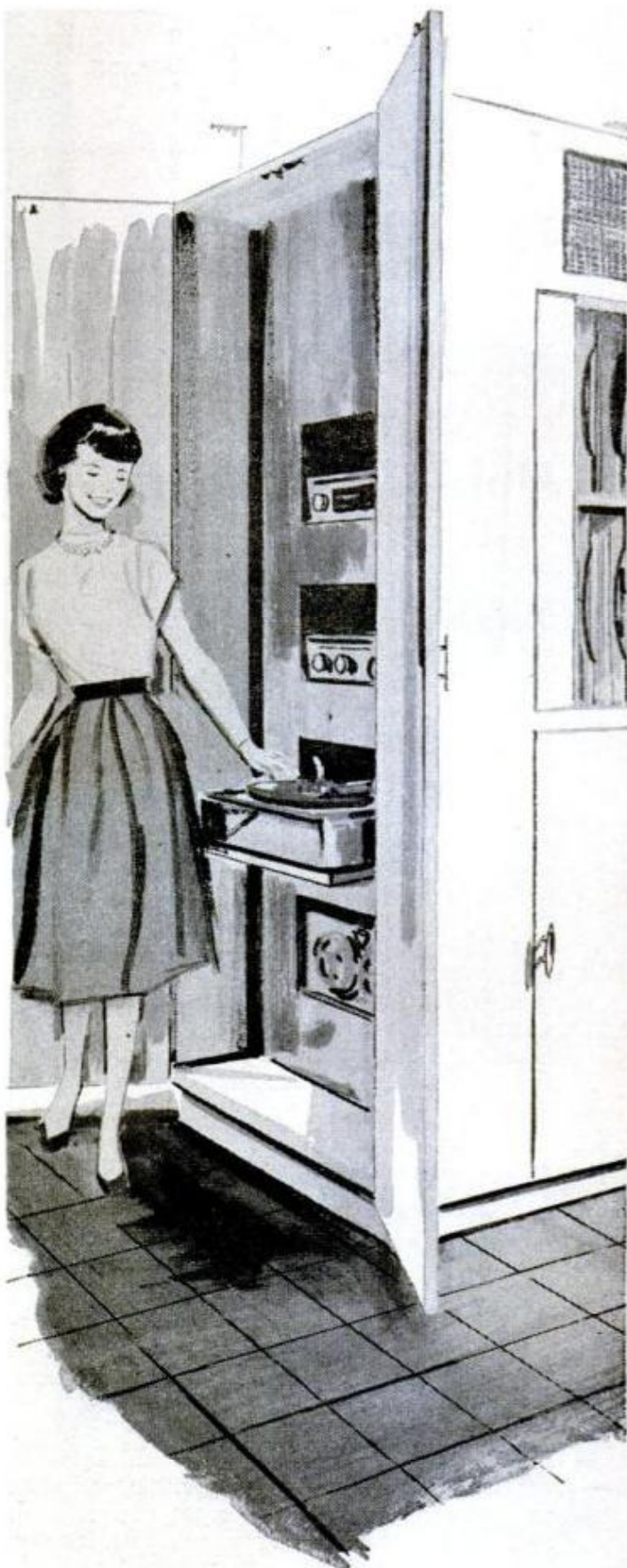
In older houses the traditional basement and attic provide enough storage room, but these usually end up as catchalls where it is inconvenient and sometimes impossible to locate things when they are needed. By adding built-ins you can keep articles near the activities they serve. And built-in storage units conserve space by replacing dressers, tables and similar pieces of furniture that often take up too much of the available floor space.

In planning your own storage space, use cabinet depths which are as shallow as practical. Then you can reach an item without disturbing all the other articles, and less storage space will be needed.

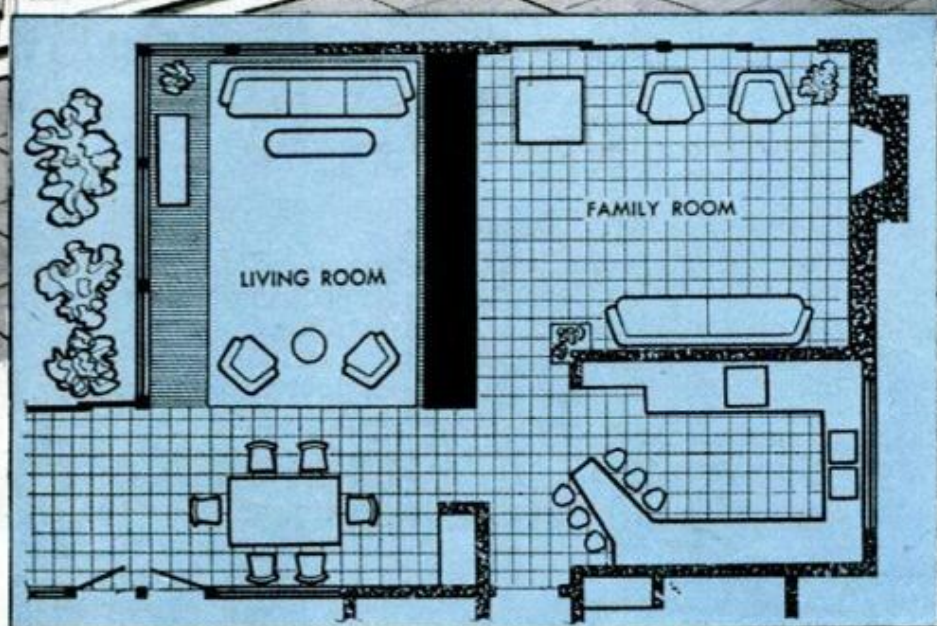
The cutaway detail on pages 206-207 shows the general construction of the entertainment wall in enough detail to supply many new ideas for your own built-ins.

The wall features a TV section that is open to both sides, and the set can be turned about for viewing from either the family room or the living room. On the living-room side, a drop panel closes off the view of the set. All the wiring for the TV is hidden inside the cabinets. The wiring is easier to install at the time framing is put up rather than waiting until the wall has been completed.

The end of the wall facing the kitchen



WALL IN THE HOUSE OF BUILT-INS



ENTERTAINMENT WALL is center of family life, dividing the two living areas and easily accessible from both kitchen and dining areas. There's a desk for writing letters and plenty of storage for books, records and all the items a family needs for entertaining



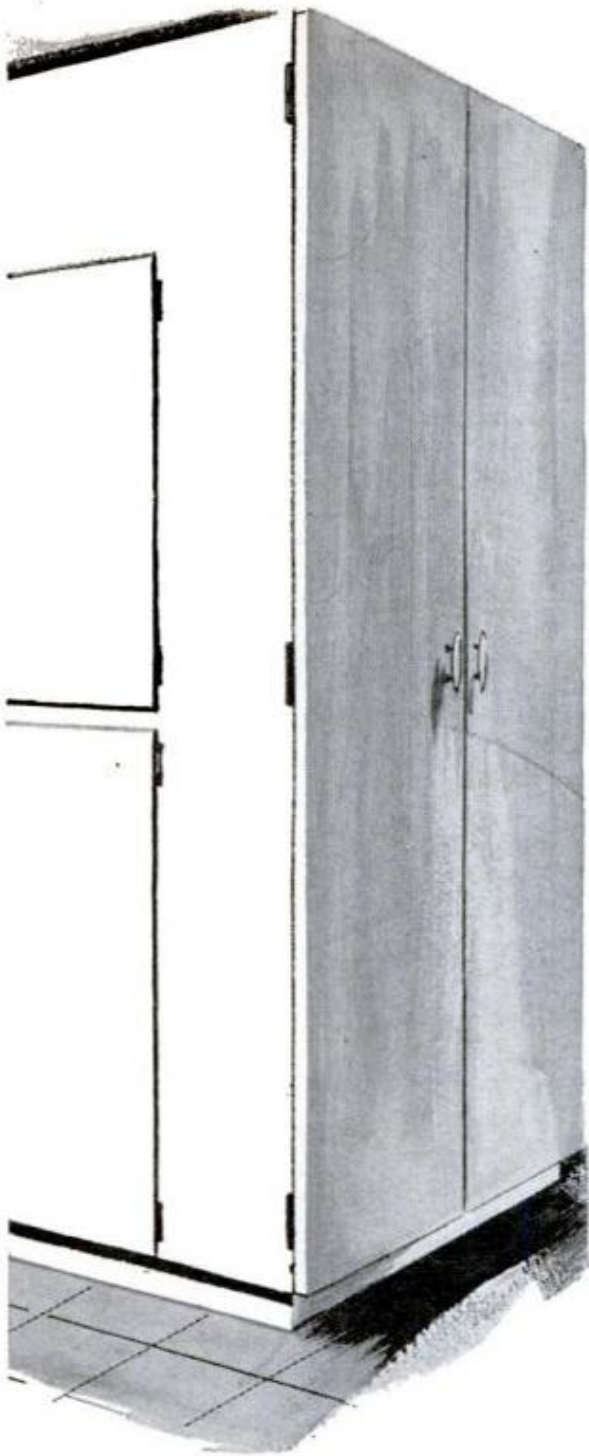
and dining areas is the center of the built-in electronics equipment. This section includes a hi-fi radio, record turntable, tape recorder and an intercom system. The two stereo speakers are built in near the top of the wall, and face towards the family room. Wiring for the system extends up from the base of the wall to the equipment mounted in the face of the recessed panel. The space required for this equipment varies, so openings should be cut for the individual units being installed. The full-length doors that enclose the electronic section may be omitted, to make the controls handier.

Next to the sound equipment is a record compartment, set into the wall facing the

family room. This section should be large enough to hold all the records the family owns and provide enough extra space to take care of several future acquisitions.

The book sections have adjustable shelves that can be rearranged quickly to accept different sizes of books and display items. Both sides of the wall include book shelves, so reference books and favorite reading material may be kept accessible for immediate use.

On the family room side there is a handy fold-down writing shelf near one end of the wall. It's a convenient place for writing letters and doing the family book work. Any clutter is quickly hidden in the wall



whenever unexpected guests arrive — simply by raising the drop-down shelf of the desk. The two drawers above the desk provide space for all of those small items that get misplaced so easily.

For the bridge-playing family who would like to store folding tables and chairs in the wall, a narrow section may be designed especially for these items. Possibly the family has an interest in home movies, or perhaps color slides are frequently shown to guests. If so, a screen can be hidden in the upper section of one cabinet and permanently mounted. Then, when movies or slides are to be shown, the screen is quickly lowered. And don't forget to include a

storage slot for those TV trays. They are always in demand at snack time.

Built-ins should be designed to insure sufficient flexibility in meeting the changing needs of the family. And it should be kept in mind that these needs are never static. The sizes and quantities of the articles stored are always changing, and space is needed that will meet these future requirements. Even an individual's own ideas about where articles are needed change from time to time. One of the best methods for achieving flexibility in the storage areas is to use adjustable shelves which can be set at any height in the cabinets to store articles of various sizes.

Building the Wall

Every large built-in installation is bound to vary according to the individual needs of the family. The entertainment wall, as shown here, is made in two 8-ft. sections, with 1x2 battens to hide the joint of the abutting sections. Once a satisfactory plan has been drawn up, start by sawing out the basic framing members. The 1x4 base provides 3 in. of toe room around the bottom of the wall. Nail the base together first and then set the floor of the cabinet on the base. Check the spacing and nail the floor and base together.

Before setting the vertical panels, mark the locations for the adjustable metal shelf strips and cut dadoes in the panels to provide recesses for the strips. The metal strips should sit flush with the surface of the panels. Also, if the sizes of the openings in the electronics section are known, cut out these openings before assembling the wall.

By laying the base on its side it is easier to nail the top and ends in place. Then the center dividing panel is added. As you proceed, make sure the pieces are square and level—check verticals and horizontals with a level. The dividing center panels, which form the back of the bookcases and cabinets, are made of 1/4-in. plywood.

Continue by fitting the rest of the shelves, backs and vertical panels into place. Some of the permanent shelves must be toenailed into the framing when it is impossible to nail straight through the vertical panel into the shelf end.

Facing strips of 1x2 lumber cover the vertical panels to form edges to which the doors are hinged. The 3/8-in. rabbets in the edges of the doors fit against the 1x2 facing strips as shown in the detail of the lipped door on page 206. All the doors have magnetic catches, though other types of catches are usable. Where doors do not close against 1x2 facing strips, the rabbeted edges are omitted.

To cover the edges of the plywood shelves, thin strips of matching solid wood are glued and nailed to the exposed edges. These strips fill the $\frac{3}{8}$ -in. space between the edge of the shelf and the lip of the door.

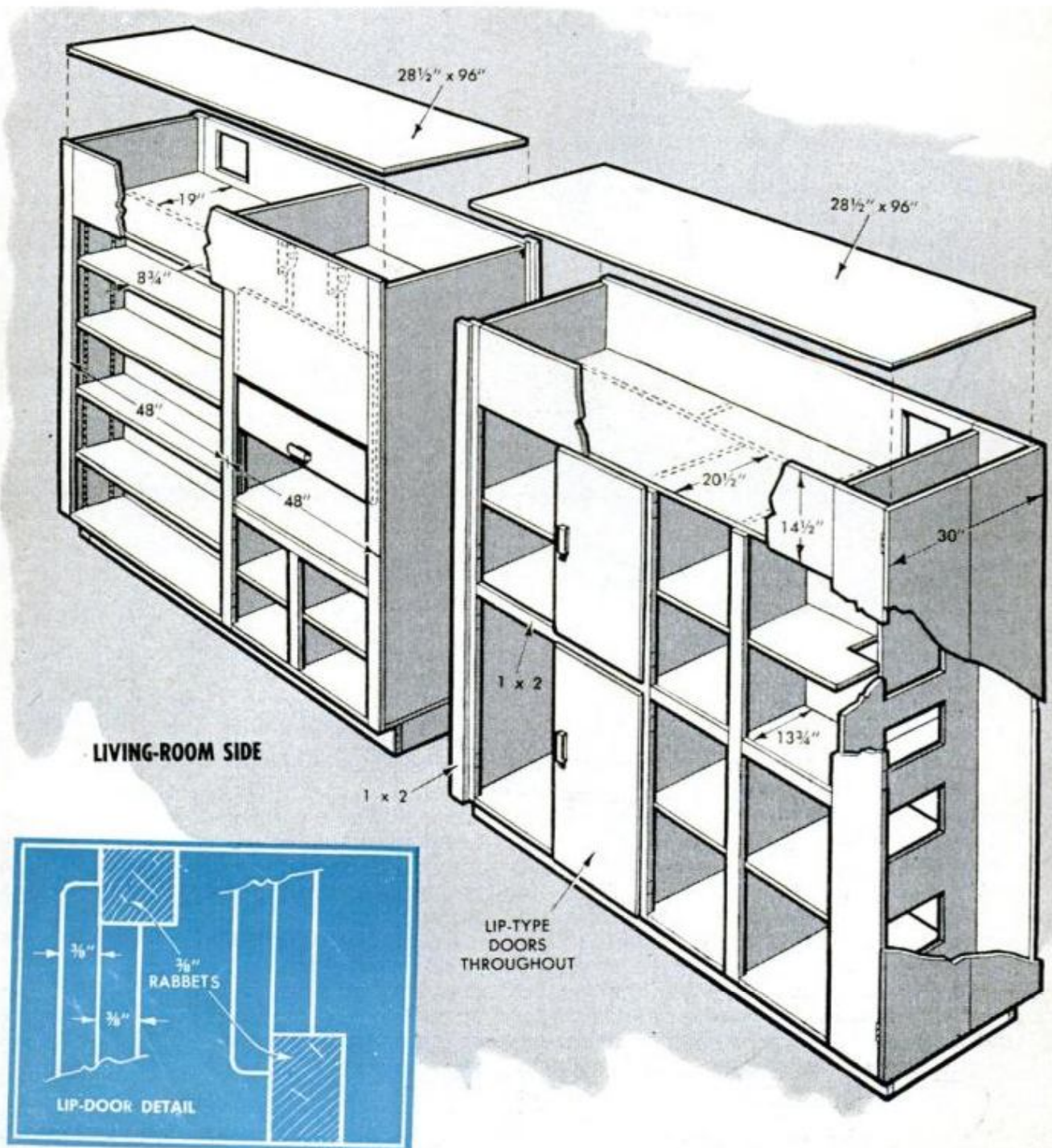
On the living room side of the wall the drop panel closes off the view of the TV set. Two spring-type sash balances facilitate raising the drop-panel in tracks formed between 1x2 facing strips and 1x1 strips added to the sides of the cabinet.

Except for the 1x4 base, 1x2 facing strips and a few other small pieces of 1-in. stock, plus hardboard spacers in the record cabinet, the wall is made of $\frac{3}{4}$ -in. and $\frac{1}{4}$ -in. interior plywood. If a natural finish is used,

all surfaces that can be seen when the cabinet doors are closed should be made of a wood having an attractive grain pattern, such as the birch built-ins featured in the PM House of Built-Ins.

The electronics end of the wall is custom built to accept whatever individual units are used. If holes are not cut before the end panel is nailed into place, they can be sawed out later with a portable electric saber saw or a keyhole saw.

The fold-down writing desk on the family-room side of the wall requires sturdy hardware to hold it in place. A continuous hinge extends the full length of the desk, and two lid-type hinges support the shelf



section when it is in the writing position. A magnetic catch holds the desk closed. The two 3-in. drawers above the desk are made according to standard drawer construction. The bottom rests in dados cut into the sides, front and back of the drawer. The back dados to the sides, and the two sides fit rabbets in the front of the drawer. Drawers overlap the 1x2 facing strips.

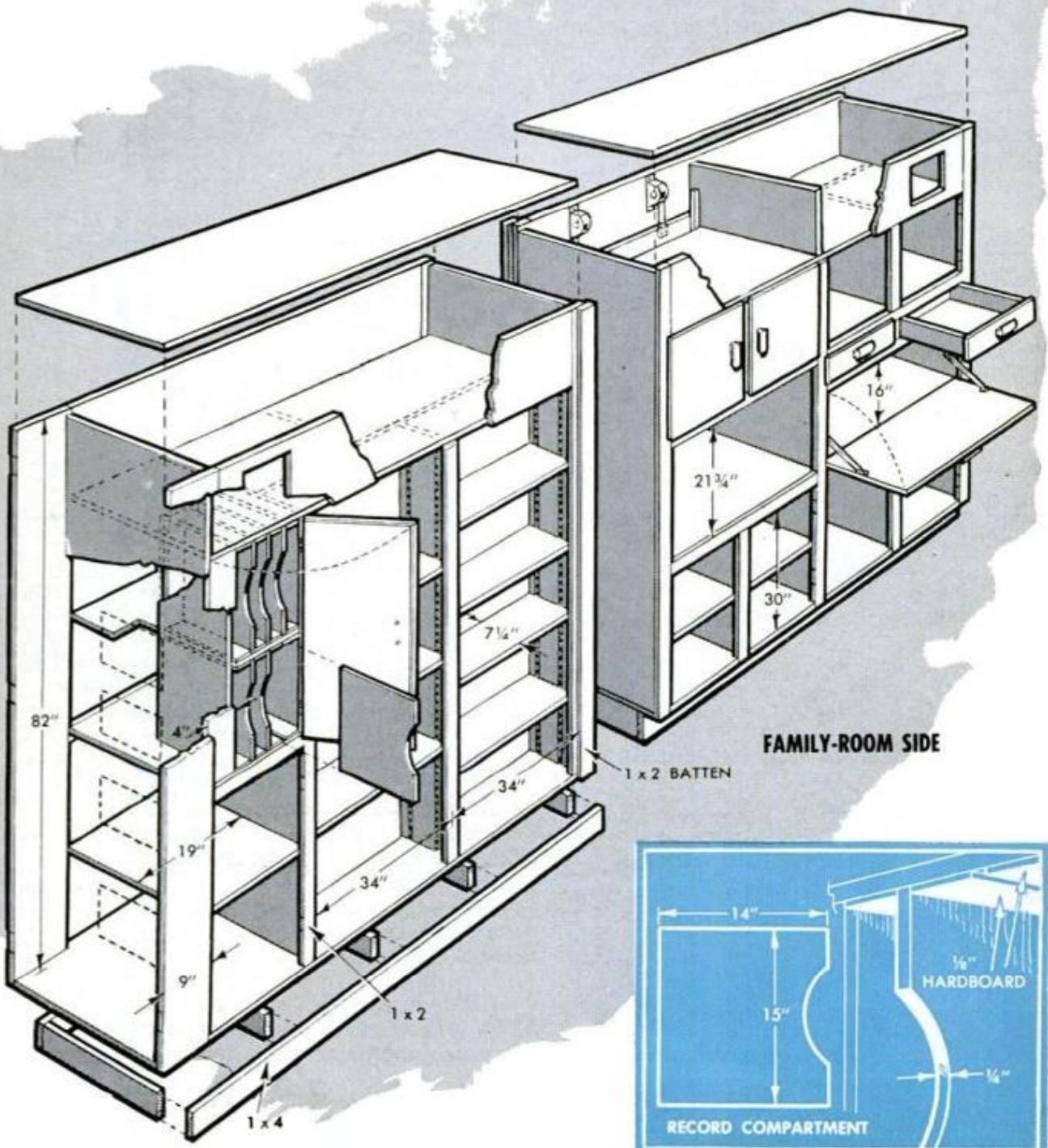
The record compartment is divided by 1/4-in. plywood panels, cut as shown in the record compartment detail on page 207. Strips of hardboard form grooves for the plywood divider panels which may be pulled out to rearrange the space.

Finishing built-ins is a matter of individ-

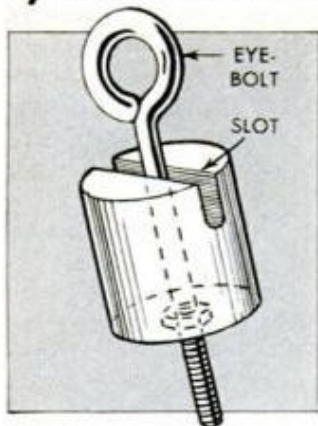
ual preference. The modern trend is towards soft, satiny finishes, both for built-ins and furniture. Most built-ins are not subjected to rough handling, so one of the penetrating resin finishes is a good choice. If you wish to retain the natural color of the wood, apply one of the water-clear finishes.

To change the color of the wood, choose from the wide selection of prepared stains or colored sealers that are available. For an important finishing job, test the combination you plan to apply by first finishing a scrap of wood or running the test in a corner of the work that will not be seen.

★ ★ ★

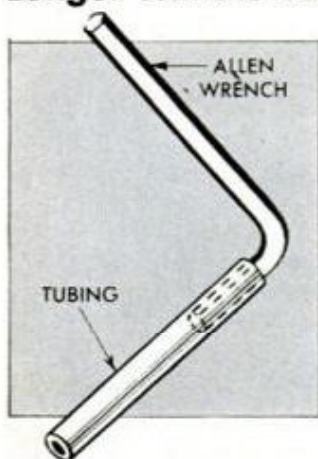


Eyebolt Chuck for Special Job



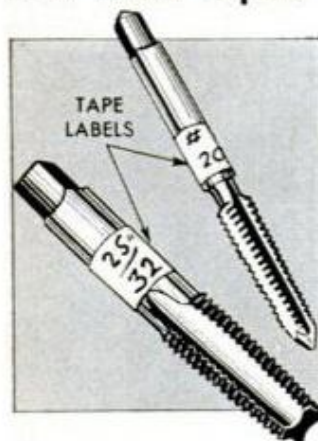
This eyebolt chuck solved a problem for one machinist. The job called for machining a shoulder on the threaded ends of a number of heavy eyebolts. The chuck is made by slotting and drilling a steel round as indicated.

Longer Handle for Allen Wrench



Often you need extra leverage on the short leg of an Allen wrench in order to work in a hard-to-reach location. Keep a piece of tubing handy for this purpose. Inside diameter of the tubing should be such that it will slip over end of wrench.

Drill Sizes Taped on Screw Taps

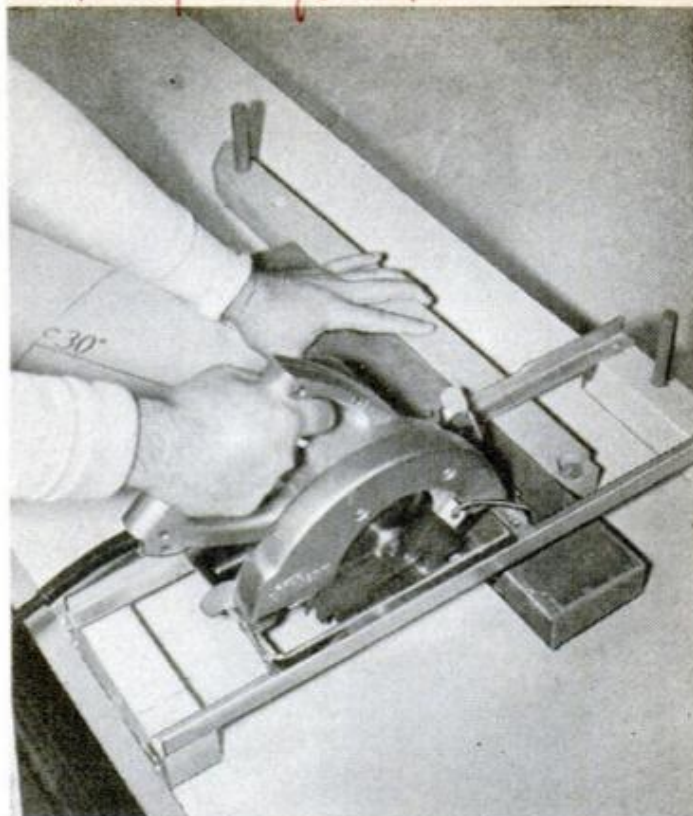


By marking the tap and body-drill sizes on screw taps the proper drills can be selected without the need for checking a chart just to make sure. Mark the sizes on tape with India ink and attach to the shank of the tap.

Cardboard Disks Protect Blades



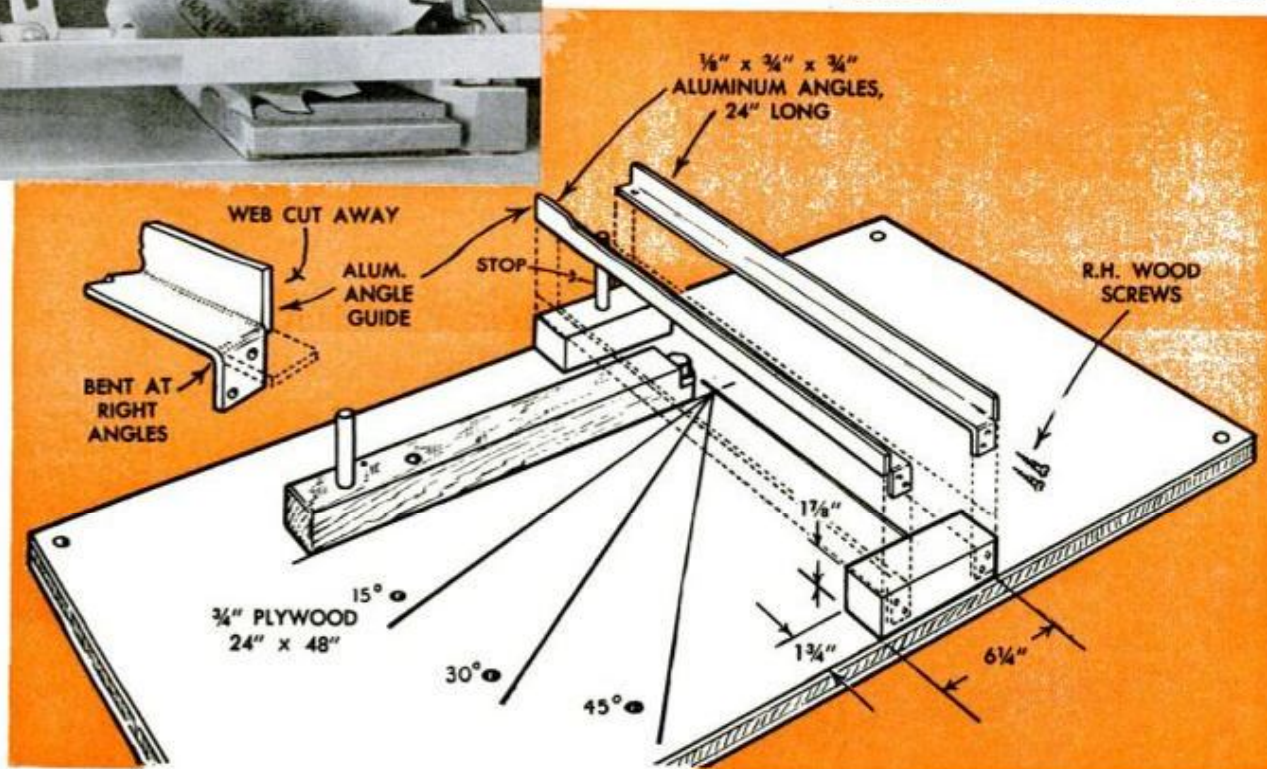
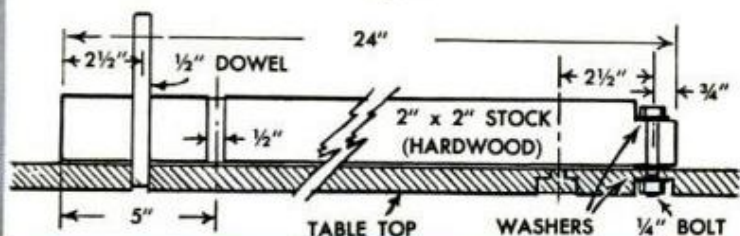
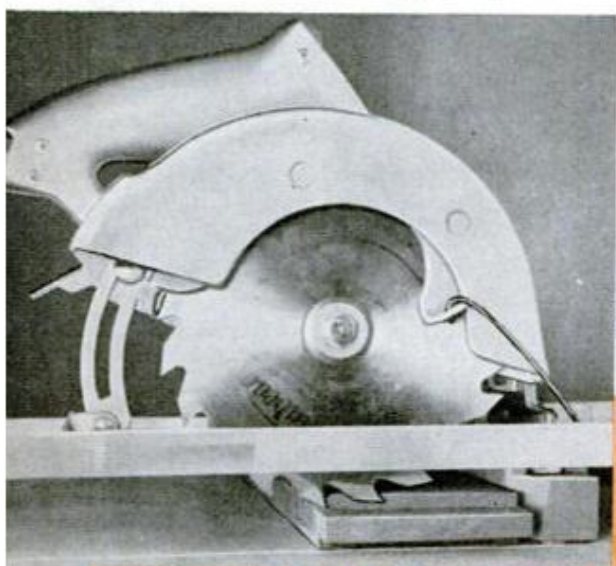
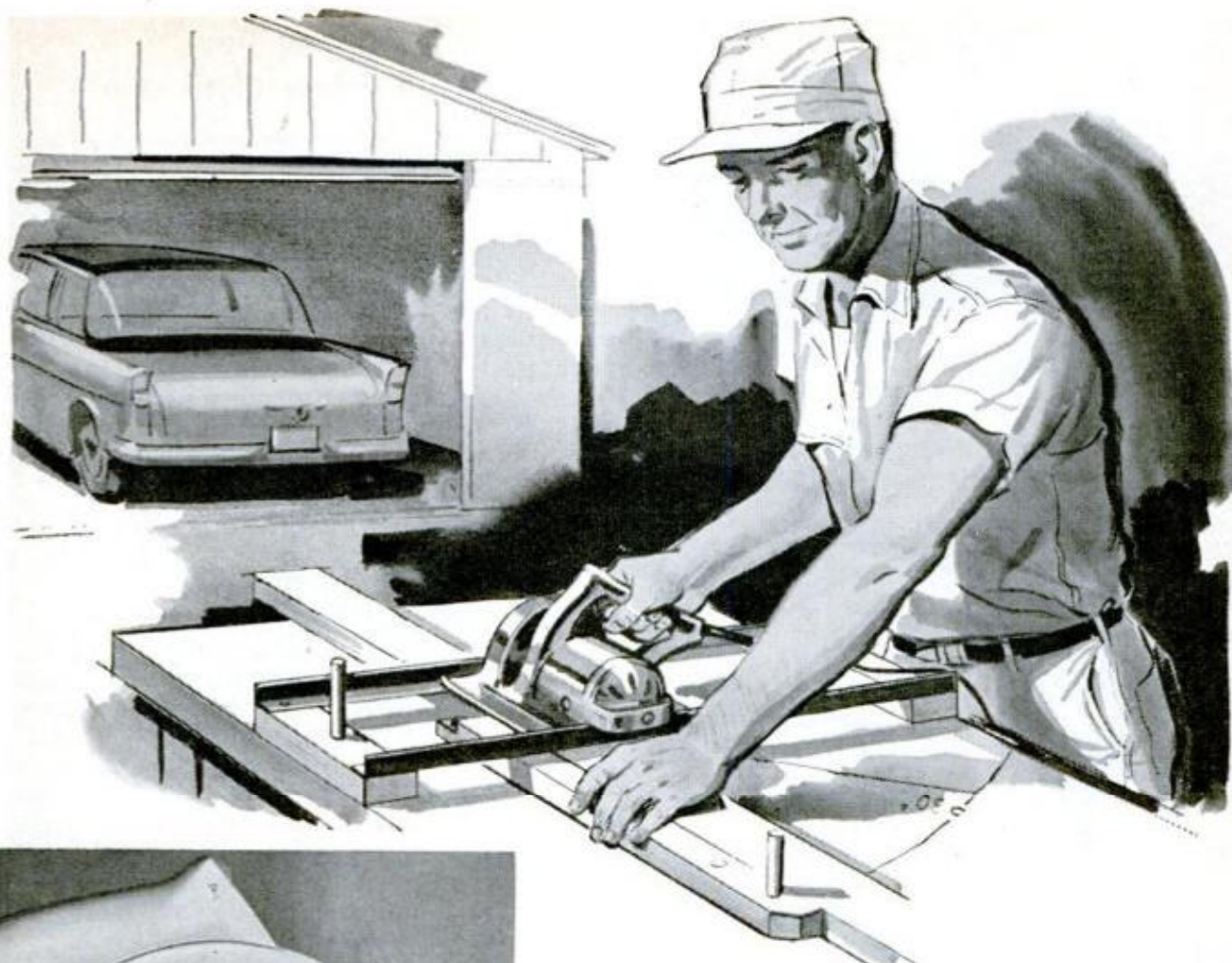
Hang one saw blade over another on a nail or peg and you'll discover what has happened to the cutting edges of the teeth only after you put the blades back in service. To prevent dulling, cut cardboard disks and place between the blades.

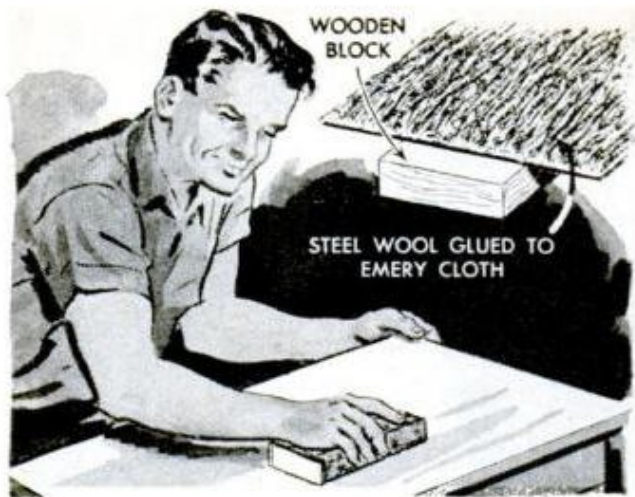


THIS PORTABLE saw guide is easy to make and can be mounted on a 24 x 48-in. plywood panel or bench top

SQUARE CUTS With Portable Saw

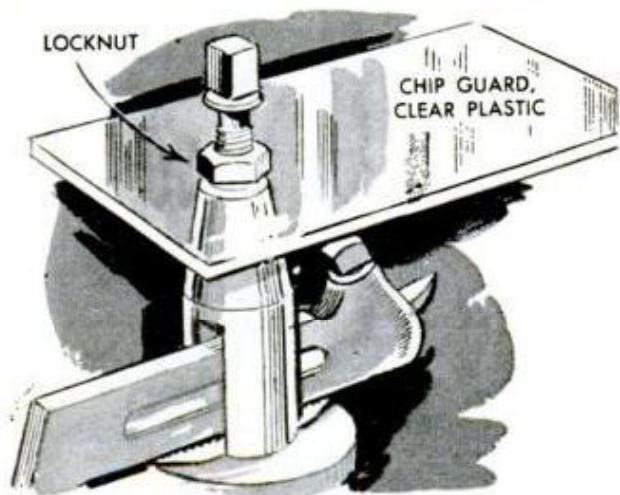
WITH A little practice you can do very accurate work freehand with your portable electric saw. But when the job calls for miter-box accuracy, then this simple guide, or jig, really pays off. A plywood panel forms the base of the unit, or a bench top can serve as the base. Then all you need to make are the swinging arm and the guide for the saw, and attach these directly to the bench top. First, make the guide for the saw. Note from the details on the opposite page that the aluminum angles which form the guide are mounted on two hardwood blocks. The length and height of the blocks suit the portable saw pictured but the dimensions may not be correct for your saw. Check the size of the sole plate of your saw before you cut stock. When you drill holes for the screws holding the guide angles, make sure that they are correctly spaced to permit the saw to slide easily throughout the length, but without any side play. Note in the detail that the angle stop has two positions. The second position makes it possible to cut a compound angle at 45 degrees. Mark 90, 15, 30 and 45-degree positions on the table. Drill holes at these positions to take the anchoring pin.—Gathel B. Weston.





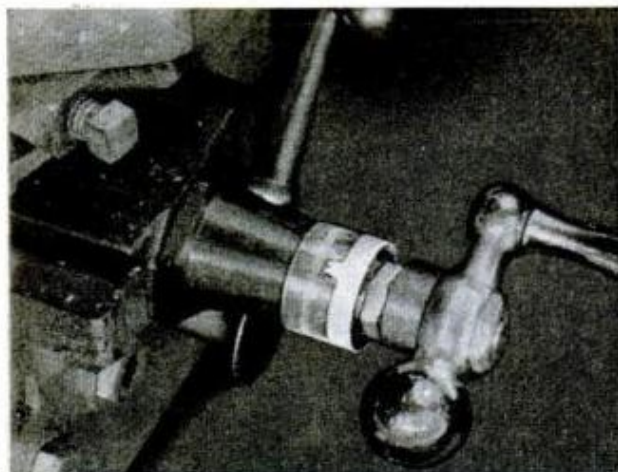
Steel-Wool Finishing Pad Backed With Emery Cloth

Next time you have occasion to use steel wool in the pad form, especially fine wool, try this stunt: Unroll a pad of the wool and glue it to a piece of fine emery cloth or any stiff, heavy fabric. When the glue has dried fold the finishing pad thus made around a wooden block or use loosely to polish metals or for rubbing down a fine cabinet finish. You'll be surprised at the increased efficiency of steel wool backed in this manner.—Sam Fleischman



Chip Guard on Tool Post Protects Lathe Operator

When metals such as gray iron and certain non-ferrous metals are machined dry chips are sometimes thrown upward with considerable force. Rather than wear a face shield constantly, one machinist installs a chip guard, or deflector, on the top end of the toolpost. This is made from clear plastic and is attached by means of the toolpost screw and a locknut as in the detail. Use of transparent plastic permits a clear view of the work.—Joseph Federico



Witness Mark "Remembers" Settings On Lathe Crossfeed Dial

Often the nature of the work requires that the crossfeed be moved and then returned to the same setting. To avoid the necessity of jotting down the original setting and not trusting to memory, one machinist made this indicator from light spring steel. It's a strip about 1/4 in. wide with a projection at one point on which a witness mark is made. Clipped to the dial and moved to the desired position it indicates the original setting clearly.

—R. Hanscom



Tap Wrench Is Ideal Holder For Grinding Lathe Tools

It's difficult to grind a lathe tool accurately without a holder, especially one that has been worn down to a short length. But if you have a tap wrench handy this problem is quickly solved for the wrench is a perfect holder for freehand grinding. You remove the sliding handle, of course, and the wrench chuck is readymade for the job as it takes the square shank of taps in a range of sizes. Just tighten the tool in the wrench chuck and you're in business.

Hardening Steel

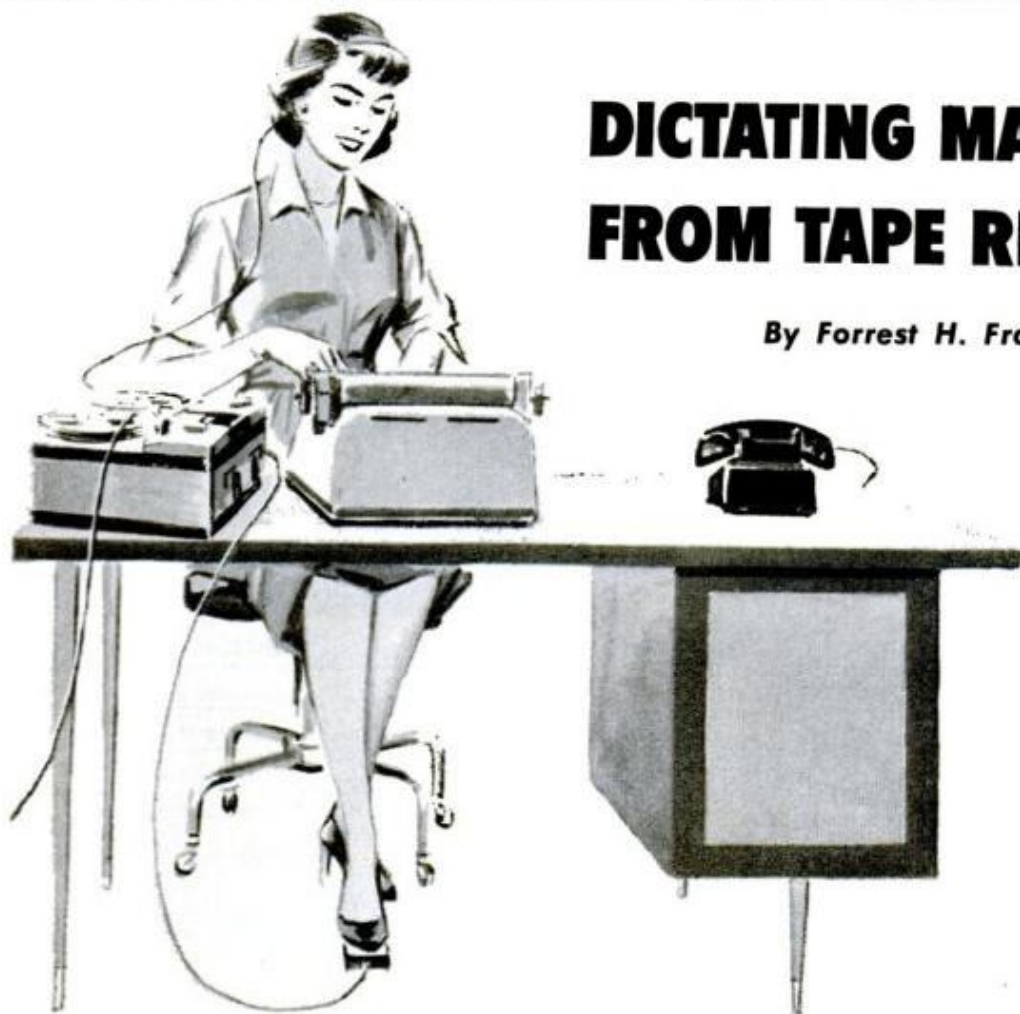
CRAFTSMEN, hobbyists and students in school shops who like to make tools need to know methods of hardening and tempering tool steels. In general, there are three steps in the process. The first is annealing to improve the physical condition of the steel and relieve stresses that may have been locked in the metal by rolling and forging processes. This usually is done by heating the metal to a dull red color and then permitting it to cool gradually. The next step is heating the steel to temperatures within the critical range where changes occur in the carbon it contains. Note from the table at the right that these temperatures vary with the carbon content of the metal. Note also the relation of temperature to color as expressed in the center table. Where a pyrometer-equipped furnace is not available one must rely on interpretation of the color of the metal to determine when to quench it in the hardening bath, which usually is cold water or oil, depending on the degree of hardness desired and other factors. The final step is tempering the steel to the desired hardness and toughness for the job it is to do. This is often referred to as drawing, and is done by reheating and quenching in oil or water by the color method.—Frank L. Rush



CARBON PERCENT	CRITICAL RANGE D.F.
.10 or less	1,290 to 1,600
.30	1,290 to 1,520
.45	1,290 to 1,430
.60	1,290 to 1,400
.90 and over	1,290 to 1,330

COLOR	TEMP.	COLOR	TEMP.
Faint Red	900 F.	Salmon	1,650 F.
Blood Red	1,050 F.	Orange	1,725 F.
Dark Cherry	1,175 F.	Lemon	1,825 F.
Medium Cherry	1,250 F.	Light Yellow	1,975 F.
Cherry or Full Red	1,375 F.	White	2,200 F.
Bright Red	1,550 F.		

COLOR	TEMP.	TYPE OF TOOL
Very Pale Yellow	430 F.	Scrapers, light-turning tools
Pale Yellow	450 F.	Razors, surgical instruments
Medium Yellow, or Light Straw	460 F.	Lathe tools, milling cutters
Full Yellow, or Straw	470 F.	Penknives, drills for iron and steel
Brown	490 F.	Taps, reamers, die for screw cutting, shears, flat drills
Brown with Purple Spots	510 F.	Axes, planes pocket knives, wood chisels
Purple	530 F.	Twist drills, cold chisels for light work, table knives
Dark Blue	550 F.	Wood saws, hammers
Full Blue	560 F.	Stone-cutting chisels, fine saws
Medium Blue	580 F.	Carving knives
Light Blue	600 F.	Drills for wood, cold chisels



DICTATING MACHINE FROM TAPE RECORDER

By Forrest H. Frantz, Sr.

PRICES for most dictating machines start at \$200 or more and dictating machines are limited to this one specific function. Tape recorders can be modified to function as a dictating machine for a few dollars. Furthermore, the tape is reusable and the entertainment value of the recorder is retained.

Dictating machines have features that are not incorporated in tape recorders. These are stop-start transport action and earphone playback for privacy. These features may be added to a tape recorder with very few parts. To provide easy stop-start operation, a foot switch is desirable. Typists can transcribe easily if their hands are not required to operate the machine. The switch is handy during recording when interruptions occur. A connector permits the use of the recorder without the switch. An earphone jack switches the speaker on for playback when the earphone plug is removed.

The switch is a Grayhill 2202 normally on, momentary contact switch. This switch

(connected in series with the recorder motor) allows the motor to run when in the normal position. The person recording or transcribing stops the motor by depressing the switch. To resume use, release pressure on the switch.

The switch is mounted on a rubber door wedge. Drill a $\frac{1}{2}$ -in. hole for the switch and two $\frac{1}{8}$ -in. holes for the mounting screws.

The wedge then mounts on a plastic case which accommodates the portion of the switch protruding from the rear of the wedge. The plastic box protects the user from the connections and provides a base for the switch. The case is $4\frac{5}{8} \times 2\frac{1}{4} \times \frac{3}{4}$ -in. (Lafayette MS-160.) The case walls flex slightly, so there's little chance of cracking. Cut a 1-in. hole with center 1-in. from an end of the larger piece of the case and on the centerline, with a heated ice pick. Place the wedge on the case. Centering the wedge, pass a heated pick held perpendicular to the top of the wedge through the mounting holes to mark them on the case.

Enlarge the case holes by passing the heated pick through. Make a 1/4-in. hole in the end of the case nearest to the switch for the cord. Start this hole with a hot pick and ream to size.

Cut out a wood block 2 1/4 x 3/4 x 3/4-in. and apply casein glue to a side. Place the block in the case near the mounting hole adjacent to the switch and fasten the wedge with a 3/4-in. screw. Fasten the slim end of the wedge with a 6-32 nut and 1/2-in. machine screw. Connect 5-ft. of lamp cord to the switch. Fasten the male plug (Amphenol 91-MPM3L) to the end of the cord.

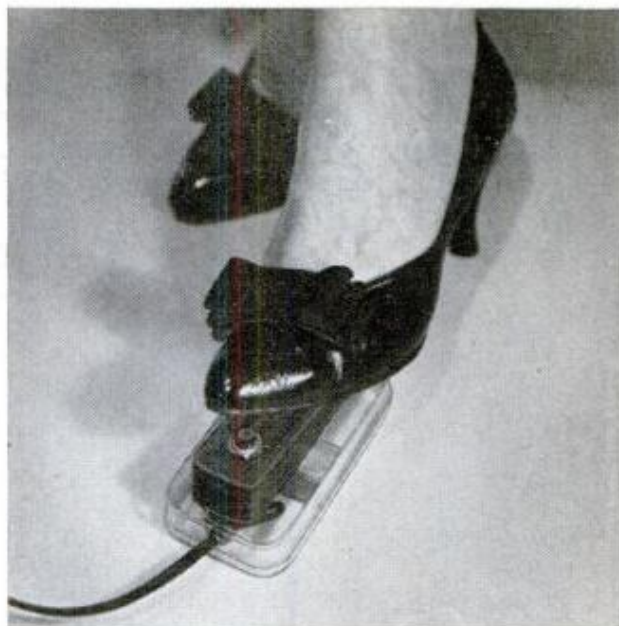
Run a bead of casein cement around the inside of the lid and spread some glue on the back of the block. Fasten the pieces together and allow to dry.

The switch is in series with one side of the motor line. A length of lamp cord to extend outside the recorder after reassembly is provided. This connects to the center and to one of the outer terminals of a SPDT switch (Carling S60B). A socket (Amphenol 91-MPF3L) connects across the outer switch terminals for the foot switch plug. The socket is mounted on the board with the shell retaining screw and a wire. The wires are bent over on the board bottom.

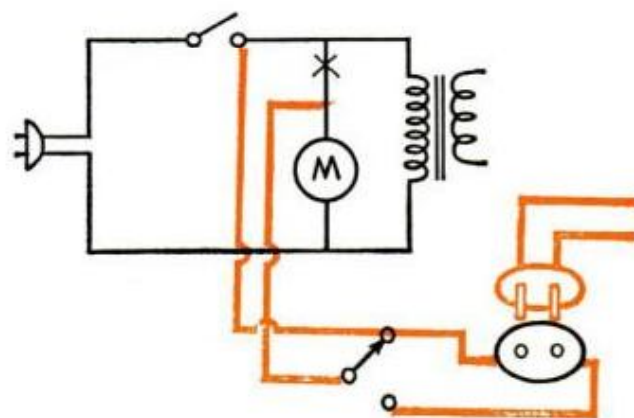
The recorder mechanism is removed from the case to make connections. The method of attachment varies with individual recorders. Place the mechanism in a position which makes the wiring accessible. Locating the motor leads, disconnect one. Turn the recorder on and check that the disconnected lead stops the motor. Usually motors have three leads (third lead grounds frame). In some recorders the motor is also the power transformer and more leads are involved, such as the Telectro 1960 in the photos. The motor lead attached to the AC switch is disconnected. Connect one lamp cord lead to the disconnected motor lead and tape. Connect the other lead to where the motor lead was disconnected.

The phone jack is connected into the loudspeaker transformer. The jack is sub-miniature (Lafayette MS-282). The loudspeaker operates as prior to modification unless the headphone plug is inserted. When the plug is inserted, the speaker is silenced due to resistance of the earphone. To connect the jack, disconnect one loudspeaker terminal. Trace the wiring back. Be sure the lead which you disconnect is ungrounded. Fasten the three jack leads to the speaker terminals and the disconnected lead. Use different wire colors to make connection easy. Replace the deck in the case, and connect the jack. Cut a mounting

(Continued to page 238)



Foot switch, mounted on door wedge, turns the tape recorder on and off so that typist can "catch up"



Red lines indicate new wiring for the foot switch. Break connection at "X," add the switch and plug

New control board is mounted to the top of tape recorder. Controls are accessible but out of the way



"Tomorrow's TV Set Today"

IT'S BEEN a long road to haul, and a tough one—but TV is finally going the transistor route and television fans the world over stand to benefit by the transition.

Transistors, of course, are no longer strangers to the electronics field. They've taken over the portable-radio field where they've virtually edged out their vacuum-tube predecessors. As a result, portable radios are now smaller, lighter and less expensive to operate. They've launched a full-scale invasion of the military and industrial electronics fields; and the resulting equipment is more reliable and infinitely more efficient. Now they've mounted a multi-pronged attack on modern, large-screen television with the promise of bringing all of their advantages to bear in this far-reaching area.

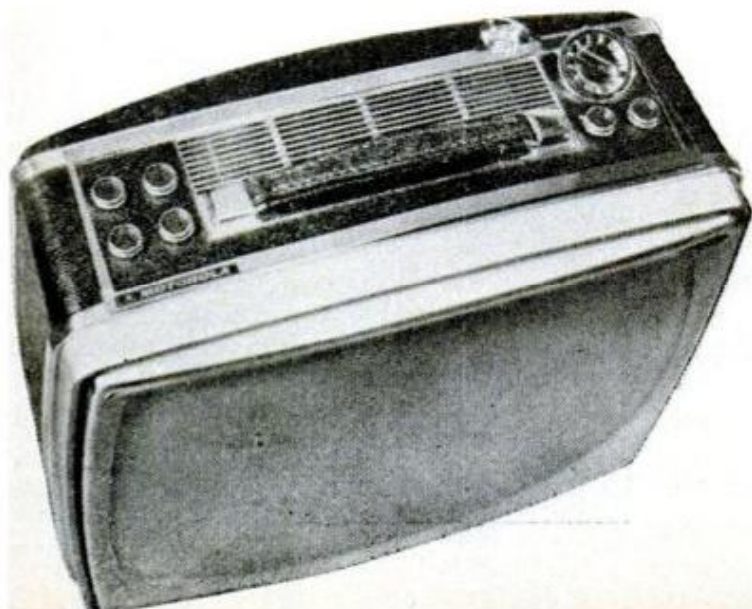
Of course, even in television, transistors are not entirely new. As far back as 1957, fully transistorized, experimental models were displayed. None of these, it was pointed out, was commercially practical at the time—owing to the high cost of prevailing transistors and a general lack of engineering background and experience with transistor circuitry.

In '59 the first commercial versions of all-transistor sets appeared on dealers' display racks. But all of these were small-screen receivers. Evidently, the problems of marrying transistors to today's large-screen picture tubes had not yet been solved.

Then came the unit shown on these pages and, with it the last obstacle to full-scale transistorization has apparently been hurdled.

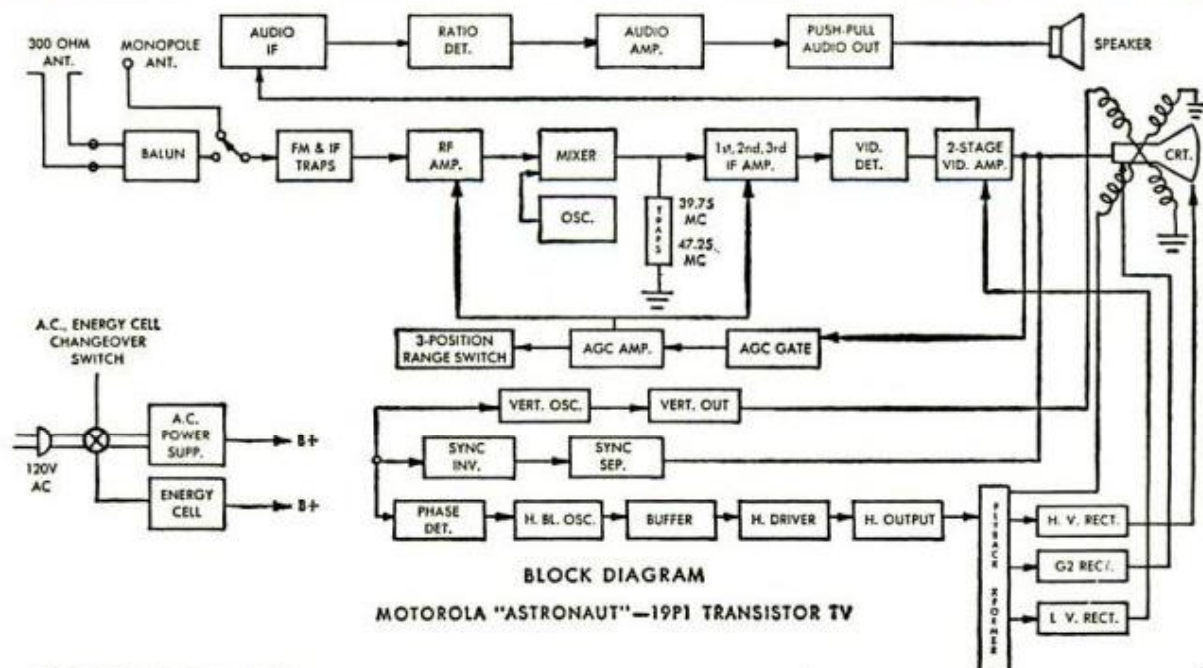
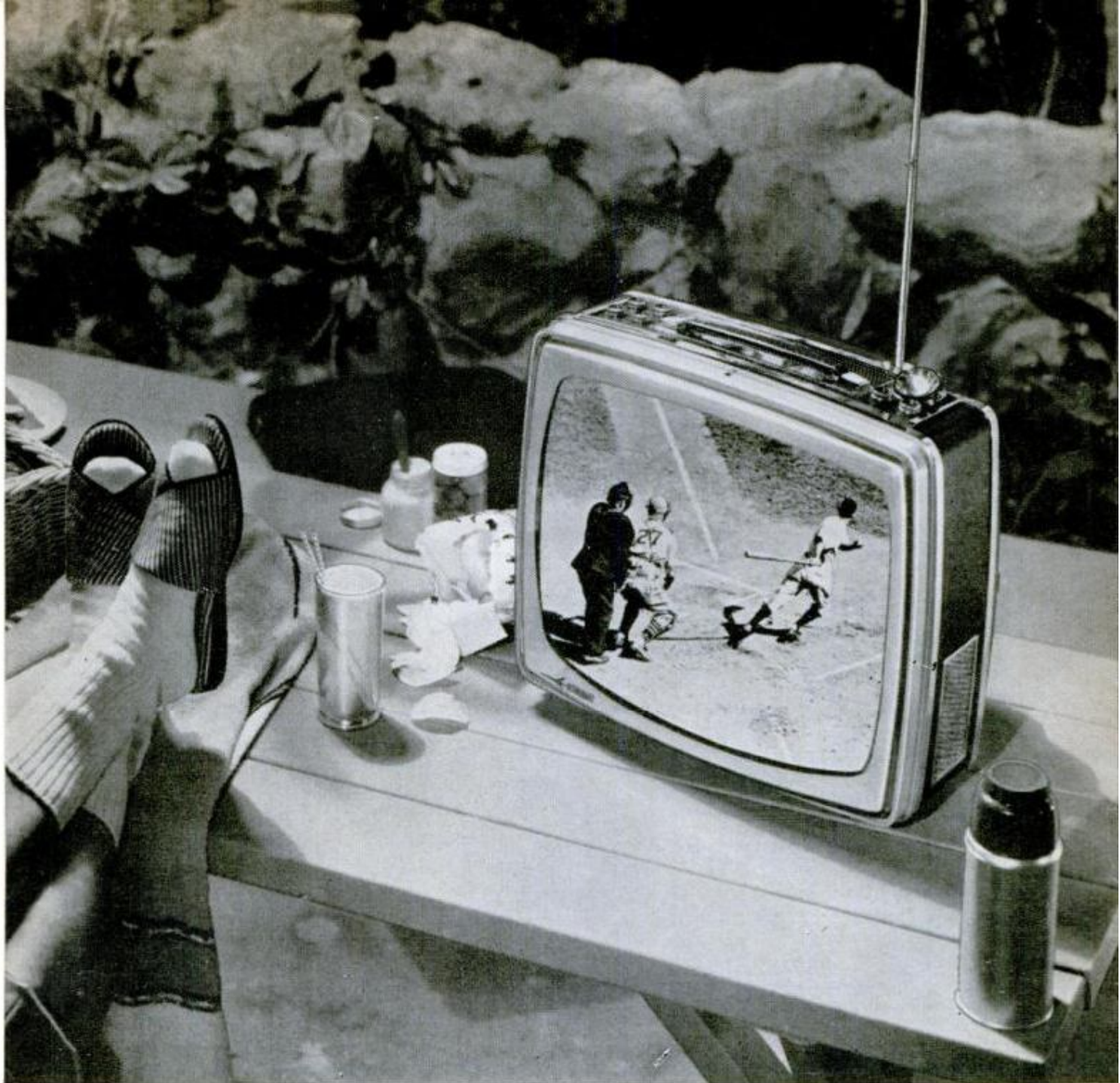
Incorporating 23 transistors and 12 diodes, it drives a full-sized, 19-inch picture tube with a 114° deflection angle which presents about the severest challenge that television has to offer. With the experience gained in its design, and with very similar circuitry, engineers triumphantly claim to be able to drive even larger tubes—21s and 23s—to the full limit of their capabilities. It has been predicted that: "the next four or five years will see an almost complete transition from tubes to transistors, in the television industry."

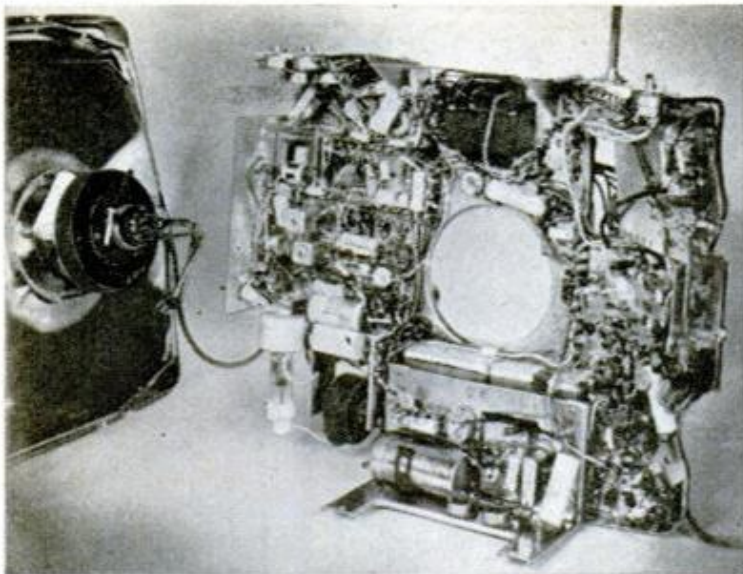
Why all the excitement over transistorized television? Perhaps the biggest single reason is the added reliability which



No line cord to plug in makes this portable, the ideal picnic companion. Monopole antenna collapses entirely into top

Block diagram shows how the unique power supply system operates. Energy cell recharges when set is used on house current

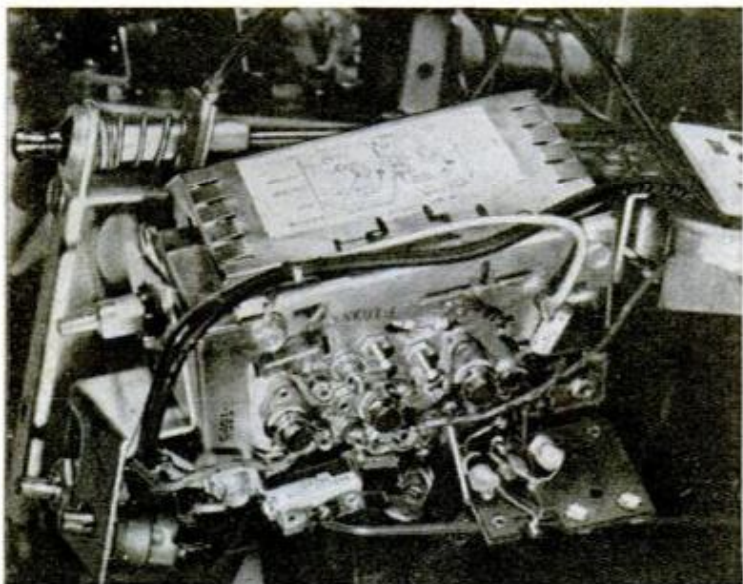




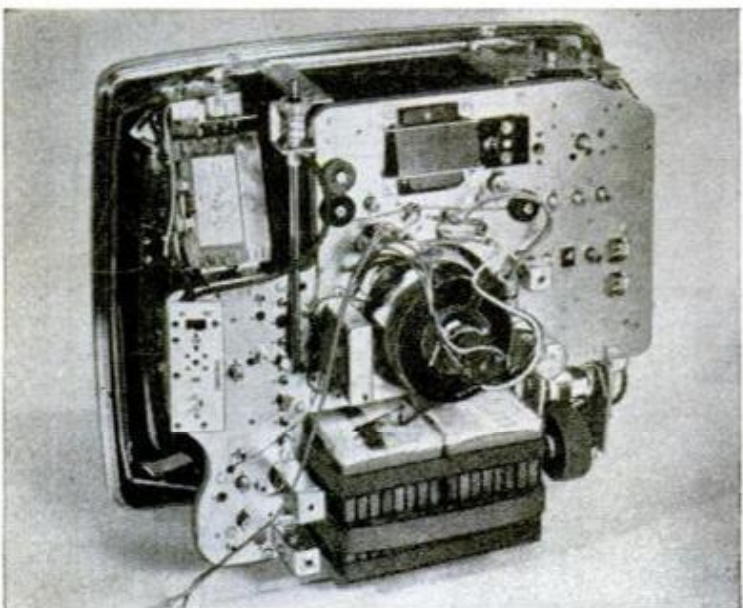
Chassis fits over neck of picture tube, keeping the size of the set to a minimum. All the wiring is easily accessible



The transistors and diodes combined use less space than the only tube in the set



Transistorized front end (above) shows compact construction. With chassis removed from cabinet (below) energy cell can be seen under yoke assembly. Transistors can be easily replaced



these amazing electronic midgets impart to the equipment in which they are used. With no filaments to burn out or deteriorate they are expected to outlast even such relatively troublefree parts as resistors and capacitors. And, because transistors produce very little heat—the arch enemy of electronic components—the life of all other parts is expected to be considerably prolonged.

The goal, apparently, is to put television on a reliability par with refrigerators, freezers and similar appliances which operate for years without any attention.

There are other advantages, however, which are no less significant. Because transistors require very little driving power, compared to vacuum tubes, they are admirably suited for battery operation. This model, in fact, performs just as well outdoors, operating from an internal energy cell, as it does indoors from the standard 120 volt a.c. power line.

In the home, only 40 watts are drawn from the power line—less than $\frac{1}{4}$ the power requirements and operating costs of an average vacuum-tube model. This model equals or betters the performance of conventional sets in every respect. This, of course, is essential in a unit costing \$275, plus an additional \$88 for the optional energy cell which permits its use outdoors where a convenient source of line power is not available.

(Continued to page 238)

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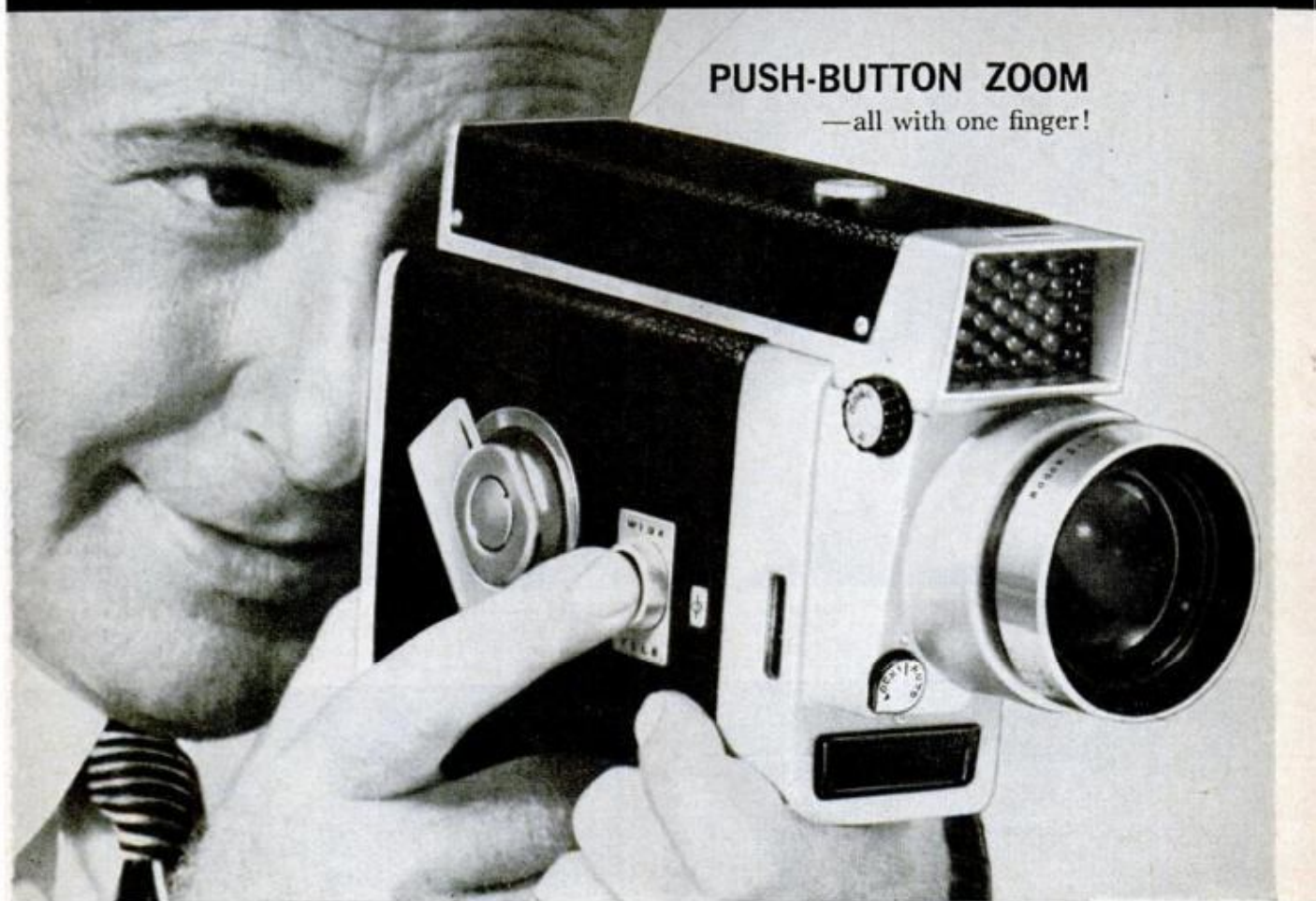
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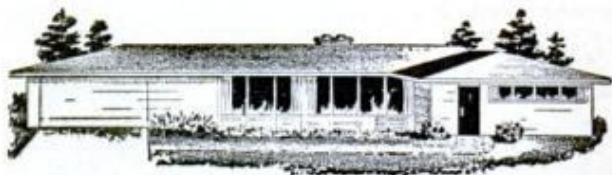
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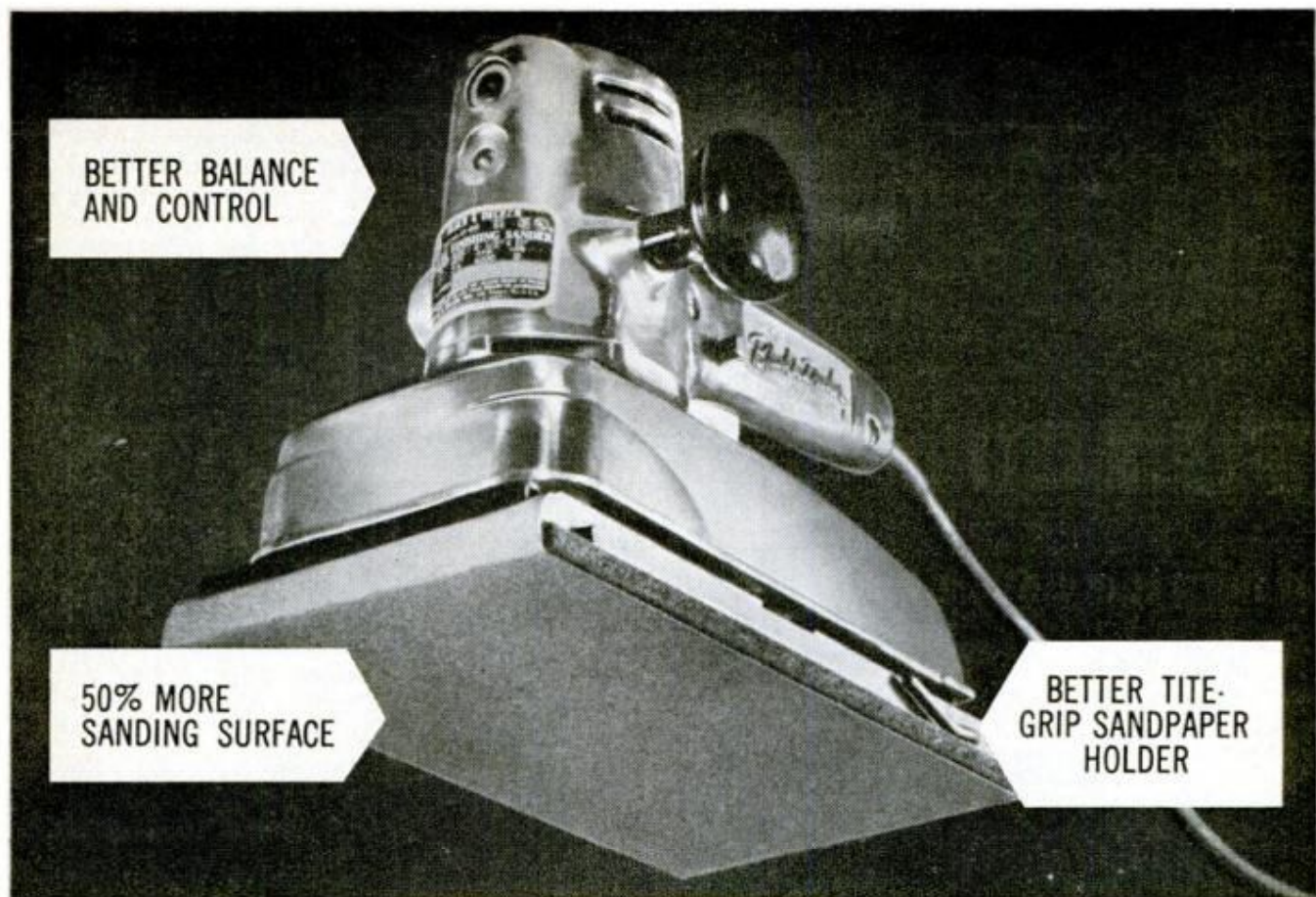
Moisture Condensation on Walls

Q—I live in an older home which I purchased two years ago. It is built of brick, with solid brick walls and I think the plaster is put on over the brick. The house is very old. I installed a modern heating system and papered the rooms upstairs. The walls sweat in winter in the upstairs rooms, so much so that the paper has been ruined in two rooms in the north end of the house. I'm at a loss as to what to do. Why do the walls sweat like this?—W. H., Vt.



A—The walls sweat, as you say, simply because they are colder than the air in the rooms. Notice the beads of moisture that form immediately on a glass tumbler full of cold water on a warm summer day and you are looking at essentially the same thing. The surface of the glass is colder than the air which contacts it. This causes the moisture in the air to condense on the cold surface. In your upstairs rooms the exposed walls (outside walls) are relatively cold. The air in the rooms is heated to a temperature of, say, 70 degrees and contains moisture in the form of vapor. The variation in temperature causes condensation of this moisture on the relatively cold walls. When brick walls are used as a plaster base, there is no "air blanket", or dead-air space, interposed between the two extremes of temperature. This

(Continued to page 234)



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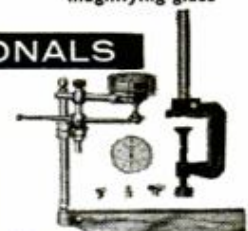


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air space tends to equalize the temperatures before the dewpoint is reached, at which point the moisture (vapor) condenses. Unfortunately, the remedy is not simple or inexpensive in homes already built. The only remedial measure that can be considered permanent is to furr the walls with wood strips, apply an insulating blanket faced with a metallic vapor barrier and cover with plasterboard finished with taped and puttied joints. Or, if you prefer, you can cover the furring strips with a plaster base and finish with conventional wet plaster. You also should ventilate the attic and insulate the attic floor with foil-faced insulating bats or with a glass-wool blanket. Also, anything you can do to reduce the moisture content of the air in the rooms will help. A humidifier on a warm-air furnace, an unvented electric or gas-fired clothes drier, the daily preparation of food, all these are sources of gallons of moisture. We hesitate to recommend that you purchase and operate an electric dehumidifier during the winter months when the trouble is likely to persist, but this might be better than going to the expense of making a permanent correction of the trouble which would involve furring and plastering the walls.

Finishing Cherry

Q—Sometime ago I completed a rather simple shop project, using cherry wood. I finished this in the natural color, that is, I used a sealer and varnish, no stain. Now I notice that the wood is turning gradually to a darker shade with some of the pieces much darker than others. When newly finished the wood was a very light brownish tan, or perhaps a sand color and the grain was quite pronounced. Now in the darker pieces the grain has almost disappeared. What does one do to make the cherry wood age more uniformly?—M. M., Ky.



A—Black cherry, from which nearly all furniture is made, has a tendency to darken with age as you describe it. In an assembly consisting of a number of exposed pieces it is difficult even for the experts to tell definitely which will darken and which will remain fairly light when finished natural. This is one reason why manufacturers of furniture in cherry usually

(Continued to page 236)

when your engine's

SICK!



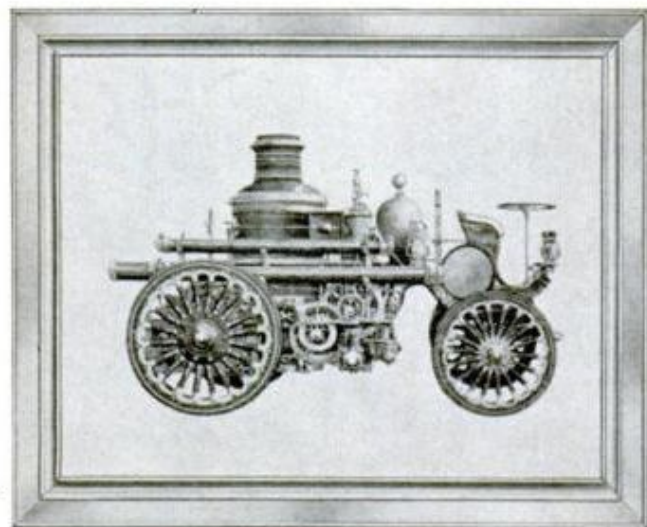
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stain the wood to a uniform color in the finishing process. Of course, it should be remembered that all furniture woods darken with age, some more uniformly than others. You can verify this by examining old pieces made of cherry and other cabinet woods. Also, there are two varieties of cherry used in cabinet work, known as the northern and the southern varieties, or types, and there is some difference in the texture of the two. Ordinarily it is best to stain the wood to a uniform color, as the stain will tend to modify the natural changes in color as the wood ages. Some manufacturers of finishing materials make stains which are especially compounded for use on cherry. We suggest that you use one of these, following the instructions for application in all details.

House Plants in Winter

Q—What kinds or varieties of plants do best in the house during the winter months? We have just moved into a new home and have a bay window in our dining room, the room being on the north side of the house. We'd like to keep plants in this window all winter long, not necessarily blooming plants but something that will stay green during the winter. Can you tell us how?—W. L., Pa.



A—Only a few plants can be expected to thrive with the proper care during winter and especially in a north window. Assuming that the window sashes are reasonably tight fitting or are weatherstripped or fitted with storm sashes it is possible to grow some types of ferns, ivies and variegated foliage plants. There are others, of course, but these seem to be the most successful. The plants should be started in large pots containing enriched soil, with a mixture of gravel and sand in the bottom of each pot to provide aeration and drainage. On severely cold nights the plants should be protected from drafts either by moving them away from the windows or by covering the lower half of each sash with cardboard held in place with tape. On bright, sunny days when the temperature is more moderate, the plants can be moved close to the window.

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Instruments have Black and White and Twin-Blue face dials. Panels are available in choice of black enameled steel, chrome plated steel, or deluxe panel of Colonial White grain finish Royalite.

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Dept. AM-110, 1840 Diversey Pky., Chgo. 14, Ill.

Dictating Machine from Tape Recorder

(Continued from page 213)

board to convenient size from a piece of 1/16-in. thick Bakelite. (Lafayette MS-305). Drill a 1/4-in. hole for the jack and mounting holes as required. The board is held in place by a recorder plate screw here. The earphone is Lafayette MS-368, and includes the jack.

Tubes will stay hot when the footswitch is off in most recorders. In recorders like the Telectro 1960 which utilize a motor winding for a transformer, heater voltage is disconnected when the switch is off. Since off periods are short, warm-ups are quick.

When recording, watch for the machine to start. A typist will operate the recorder after a sentence. A pause allowed for starting prevents loss of information.

The SPDT switch allows the recorder to be used for normal or foot operation. When in the "normal" position, the foot switch is ineffective. When in the "dictation" position, the foot controls tape operation.

★ ★ ★

"Tomorrow's TV Set Today"

(Continued from page 216)

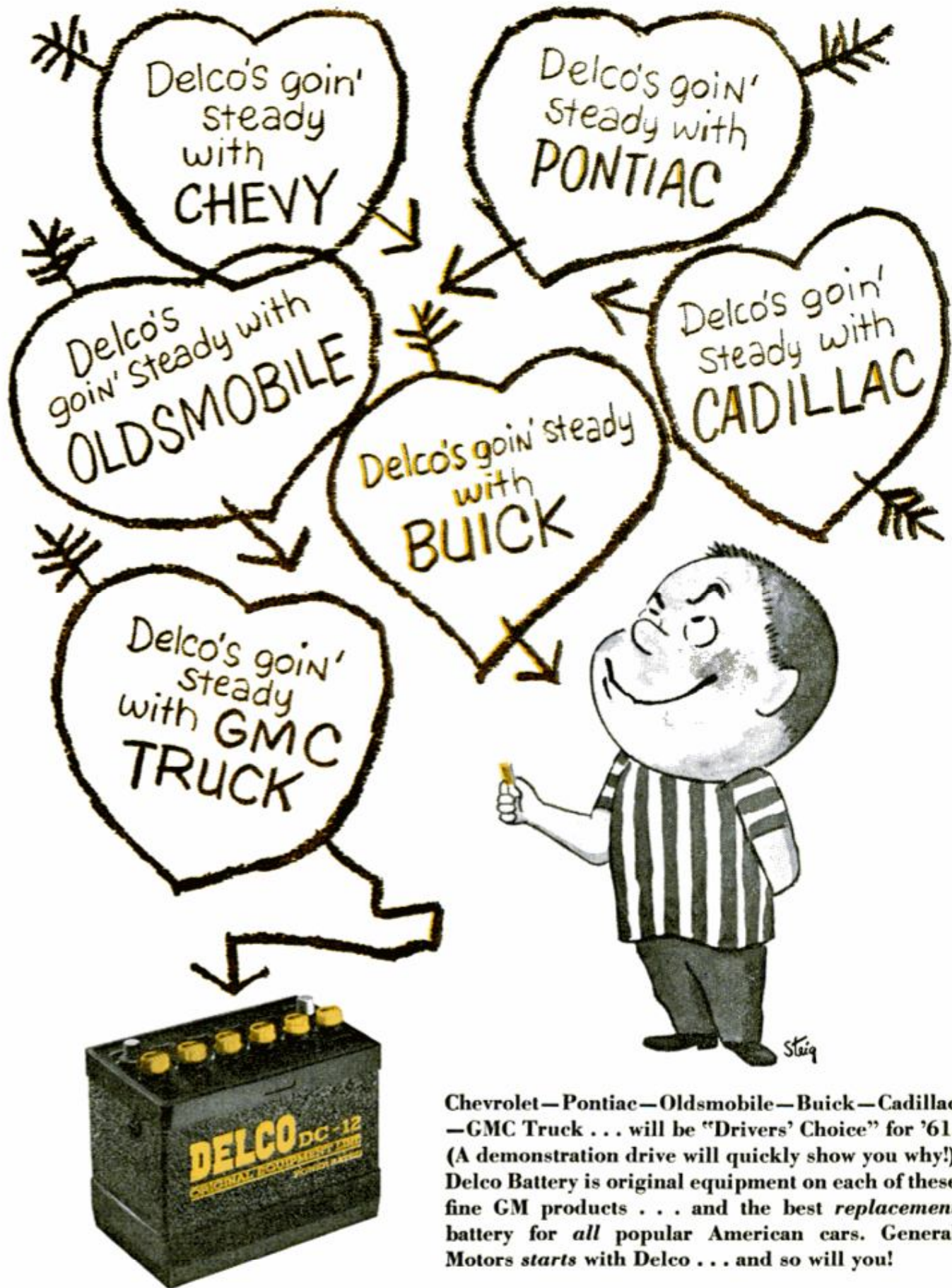
Much of the additional cost of the transistorized set (it costs about \$75 more than an equivalent tube-type receiver) is in the transistors themselves. At the moment, these cost roughly three times as much as an equivalent tube complement. The costs are almost certain to come tumbling down as more manufacturers join the switch to transistors and these units become more prevalent. When transistor receivers become the standard, rather than the exception, it is predicted that they will cost no more than the present day vacuum-tube models, while retaining all their inherent advantages. In the meantime, thanks to the engineering advances encompassed in this unit, TV fans can look forward to an even brighter future for their favorite hobby.

★ ★ ★

QUOTE:

"If a space traveler could get safely to the nearest star, record necessary information, and return for a ticker-tape reception, he might find himself 50 years older, the world three million years older and, instead of being a hero, he might end up in the zoo."

—DR. EDWARD TELLER
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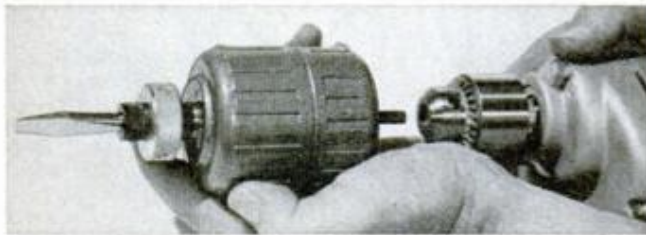
Delco Battery . . . best to START with . . . best to STAY with. /

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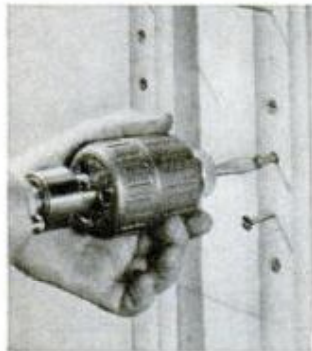


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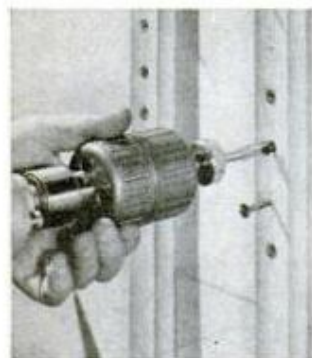


2. Place screw in hole; drive it easily with slight forward pressure . . . hold housing in fingertips.



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PRECISION  PRODUCTS

Let a Robot Drive the Plow

(Continued from page 147)

the land on 90-degree corners and plow them out completely. The disadvantage is the deep dead furrow in the middle of the field, which must be filled with the land leveler or by back plowing.

Plowing from the inside to the outside is also possible. Often an old dead furrow may be filled by this method and high fence rows turned back into the field.

A beginning plot is made in the middle of the field by plowing on each side of the center of the land before circling the corners and starting the guide. The plot plowed should be slightly longer than is proportional to the field's shape; therefore it is longer than the old dead furrow.

A furrow robot drives the tractor more accurately than a man. Once the guide is set to run in a particular place in the furrow and to steer the tractor in relation to the furrow, it will drive the tractor within an inch of this chosen position. This certainty of position aids in setting the plow to do a level and uniform job of plowing.

Accidents from these robots have been very few, considering the number of hours of work they have done.

Robot plowing shows the abilities of American farmers to meet varying needs in their ever-changing and revolutionary operations. Likely, robot plowing will spread to other areas of large obstruction-free fields. ★ ★ ★

QUOTE:

"The average consumer in the 1960's will be progressively better educated, more sophisticated and more discriminatory. He knows what he wants in a car and he will expect value for his purchase. His choice of places to spend his extra dollars has never been greater, and it will take a much better job of salesmanship to win his monetary favor. Let's face it. The customer is in the driver's seat and is likely to be there a long time. . . . The theme of the 1960's will be functionalism with thrift. Styling will be simple and unadorned. Annual model changes will not involve massive and exotic changes, but will consist generally of refinements to improve the products and give the customer greater dollar value. Cars will probably get shorter, maybe a little higher, and much lighter through use of several lightweight metals. They will be easier to get into and out of—and will have more room for passenger comfort and trunk space.

—EDWARD N. COLE
Gen. Mgr., Chevrolet Div.
General Motors

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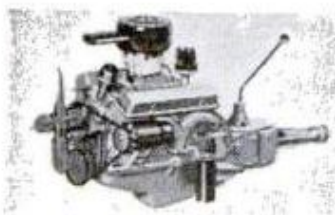
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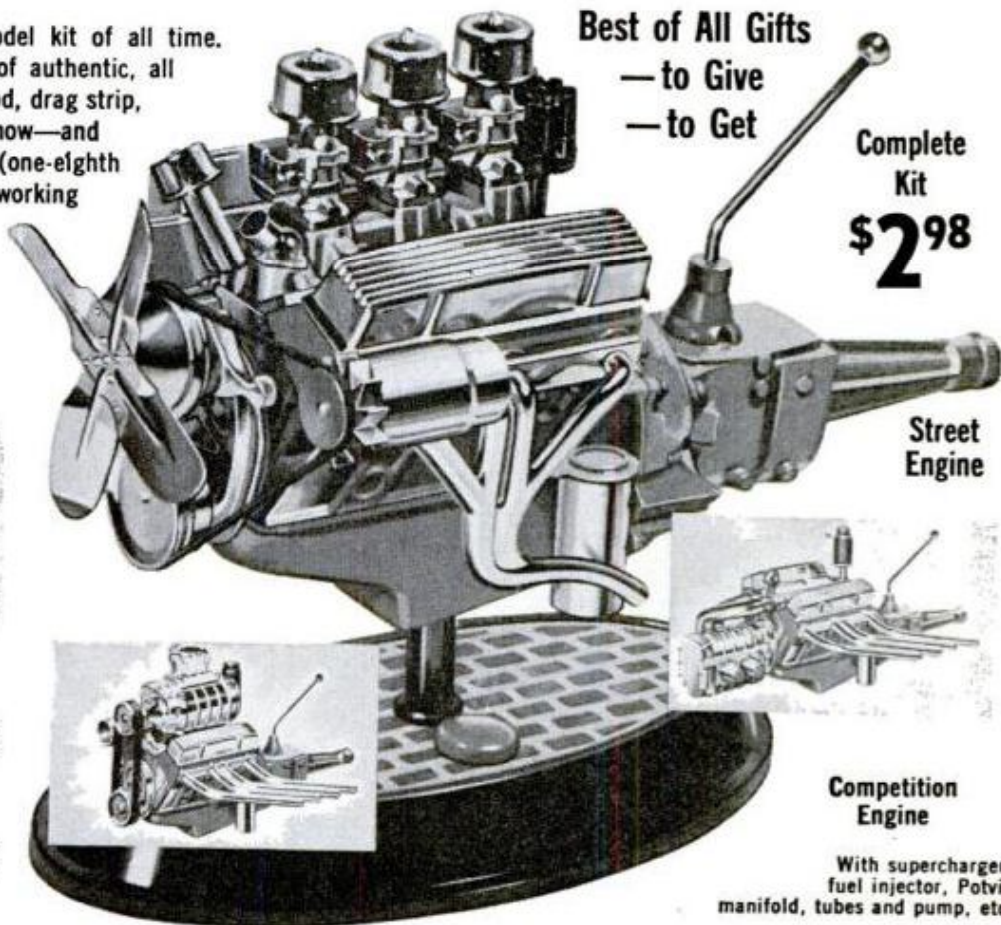


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folds—135 parts in all—in four colors and real chrome plate. No painting is required.

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MONOGRAM MODELS, INC.
CHICAGO 32

NOVEMBER 1960

241

Let's Bring Our Planes Down Safely

(Continued from page 114)

traffic of New York's Idlewild, which was recently touted as the world's busiest by a travel magazine whose editors are not pilots. During that year more than 430 thousand separate aircraft landings or takeoffs were directed by Midway's controllers, not even counting 103 daily scheduled helicopter flights. And it has increased since.

In order to space this traffic perfectly, these controllers would have to get an aircraft up or down every minute and fifteen seconds through the year. Sometimes, however, the field is closed because of weather, and rush hours occur in air travel as in any other transportation, so the traffic could not possibly be evenly spaced. The uninitiated might immediately ask the obvious—doesn't this resultant crush during peak periods exceed the capacity of the airport?

The question has long been outdated; rather, now it is simply—doesn't such traffic surpass the safe limits of pilots and controllers? For years it has far exceeded the capacity of the mechanical facilities.

This is something which a gadget-minded, somewhat propagandized public has not fully appreciated. At present and for many years to come modern aircraft must be directed by voice between individuals. Yet this voice is often received at a level of clarity well below that obtained on a ten-dollar transistor set sold at the corner drugstore, which indicates a similar lack of appreciation by aviation engineers. No gadget now operative or on the drawing boards will replace this communication method; even the most advanced of these will merely assist.

This means that the poor controller down there in his luxuriously padded cell, for whom every pilot has an abiding respect and affection, must far surpass the designed capacity of both his gadget and the regulations which cover its use. If these main terminus controllers followed strict procedures in their transmissions, using approved terms and methods and waiting for an acknowledgement of each, they would not get a third of their traffic moving.

At Midway the tower operator's duties during peak periods is so demanding on his voice and general equilibrium that his tours of duty on that microphone are limited to one hour or less. Understandably, not everyone can handle the job, nor do many operators want it. Despite the fact that this is a top-rated post in the Federal Aviation Agency setup, the experience

level is kept fairly mediocre among the personnel by the frequent turnover of controllers bidding out to less ulcerous jobs.

By using abrupt, informal commands and not bothering with acknowledgements and by putting a flattering faith in every pilot this wild-haired operator is supposed to be able to handle approximately 100 movements an hour *under perfect conditions*. One of these conditions is that the aircraft alternate evenly on the two sets of parallel runways. But most of the four-engined and turbo-prop craft *must* demand the longer runways for the little safety margin they provide. Many of these planes are overweight for a landing on the short runways if they have not burned sufficient fuel in flight. Several have suffered brake trouble and have wound up mingling with the startled commuters along adjoining streets.

With such a demand for a particular runway, the ideal maximums even with good weather prevailing are reduced to 80 movements an hour. When the ceiling lowers or the smoke and city haze can no longer be ignored, the capacity of the field drops again, to 45 aircraft an hour, which is close to the year-long actual average of flights. And this drops still further—catastrophically—when one of the many electronic aids such as a radio frequency or a radar set fails.

Then what happens to the schedules, which have supposedly been based on the reasonable capacity of the airport and the traffic control agencies? Remember that in addition to the actual takeoffs and landings, all these departing and incoming aircraft must be directed around Two-Four-Metro and the score of other waiting planes and dovetailed into the constant stream of traffic overflying the Midwest. At some periods, this instrument capacity had recently dropped to a bare 58 percent of the *scheduled* movements out of Chicago, without regard to the normal 10 transients an hour.

At times, this becomes downright ridiculous. On a Tuesday afternoon at five o'clock, as many as seven aircraft are scheduled to depart Midway simultaneously! In addition, two or three are supposed to be landing at the same instant. One might think a passenger depending on such schedules would become a little disturbed at the swindle such schedules represent. But when authorities tried to divert traffic to the new spacious O'Hare airport only 20 miles northwest, few persons would take the trouble to drive that far.

Altogether, between 4 and 6 p.m. on a typical weekday, a casual count shows 135 airline trips due in or out, which is more

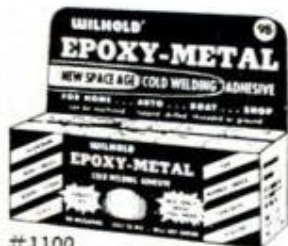
(Continued to page 246)

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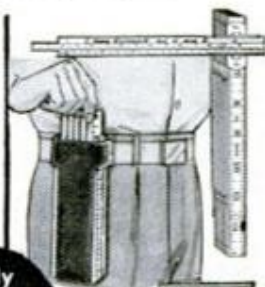
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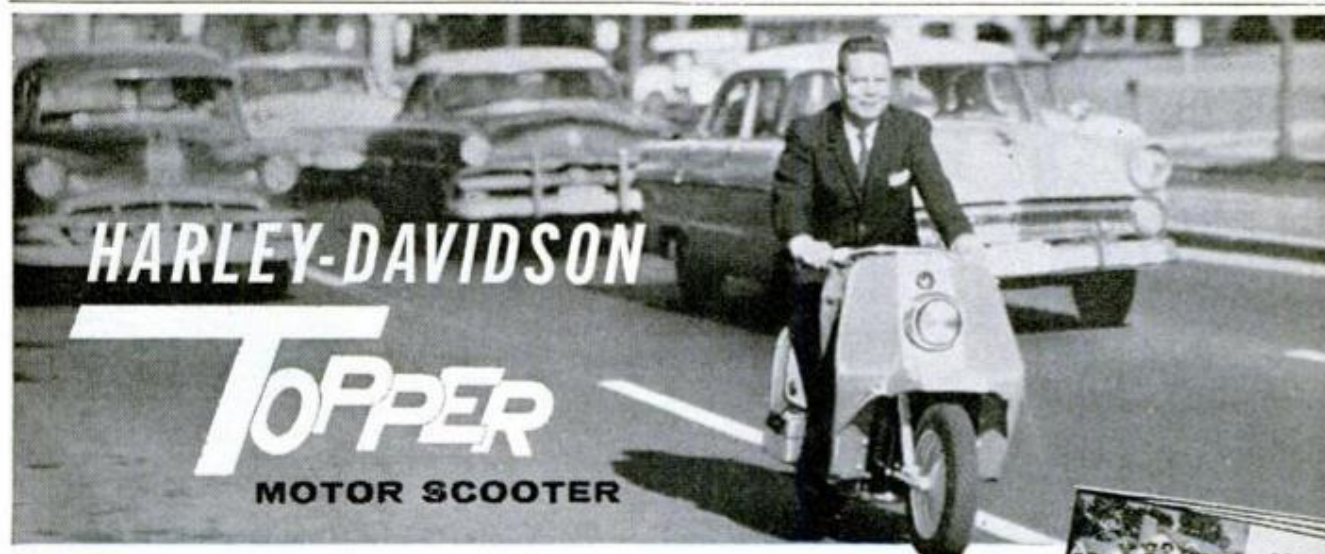
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Dept. P, Milwaukee 1, Wisconsin

Send me all the facts on the new Topper.

Name.....Age.....

Address.....

City.....State.....

Kid-Size Rodeo

(Continued from page 102)

pull in opposite directions and throw the steer to the ground. The header dismounts, ties the steer's hind legs and throws up his hands to show that they are finished. Sometimes this takes 50 seconds, sometimes as long as two minutes.

The barrel race, in which the contestants race one at a time around three barrels spaced 90 feet apart in a cloverleaf, is a test of the dodging, turning ability of a horse in cutting a desired animal out of a herd and in forcing a stray back toward the herd.

Contestant in the 5 to 12 age group get a number of breaks. When riding bareback they may use both hands to hang on to the surcingle if they wish. In the roping event they merely break a paper ribbon across the roped calf's shoulders instead of throwing it and tying its legs. Older division contestants, however, have to abide by the rules of the Professional Cowboys' Association. They hold on with one hand when riding a bronc or a Brahma steer bareback and are required to spur constantly. A bronc keeps bucking and twisting in an effort to dislodge the irritating strap that has been cinched around its flanks. If the rider lasts the required eight seconds, a pick-up

man gallops out to help him off while another rides to the far side of the animal to release the flanking strap.

The bucking horses and other stock that are used in rodeos are provided by contractors who try to collect the best animals for the purpose. Not every horse will buck even when irritated by a flanking strap, not every calf will run when released from the chute in a roping event. The contractors literally try out thousands of horses in putting together a string of bucking broncs. The worst, or "best," of these usually are wild horses that have been captured in the Northwest of Canada.

There seem to be no outstanding bucking horses today that compare with Steamboat, Midnight, Five Minutes to Midnight, Miss Klamath and other legendary horses of the past. Some rodeo contractors say it may soon be necessary to raise bucking stock just as fighting bulls are raised for the bull ring. There are few wild horses left, for one thing, and in at least some cases a bucking horse's colt tends to inherit the parent's desire to throw its rider.

Arizona calls Florence the "cowboy cradle of the great Southwest" because the Florence Junior Parada was the first of the junior rodeos. And, as far as it has been able to find out, Arizona believes it has another rodeo first. In 1938 the University



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New Safe-T-Drill

Double protection through double insulation! Here, in a first-of-its-kind drill you get a "surge-tested" MF motor PLUS the added safety of an insulated chuck and a shatterproof NYLON housing. Complete line of Quik-Change Attachments, too.

No. 1144 Drill \$24.95



IT'S SHOCKPROOF!



IT'S GREAT! THE "888"

Always a favorite. 3 tools in 1: powerful 3/8" drill, portable 6" disc sander, and 6" polisher. Also drives complete 17 tool power workshop.

No. 888 . . . \$39.95



FREE BENCH TABLE

A perfect partner for the fast-cutting Millers Falls Sabre Saw. You get both for the price of the saw alone. A real value!

No. 3660 . . . Reg. \$35.90
NOW \$29.95



\$4.55 BONUS

This big 6 1/2" circular saw sails through tough jobs in a hurry. Powerful 1 H.P. motor.

No. 626 . . . Reg. \$49.50
NOW \$44.95



A BARGAIN IN QUALITY!

The No. 1040 Power Drill now combines traditional Millers Falls quality with exceptional low price. 2.5 amp. power rating. Drives Quik-Change Attachments.

of Arizona held what may be the first college rodeo and today this is an annual university event. A couple of years later the rodeo became an intercollegiate event, with entries from five other schools. Today the National Intercollegiate Rodeo Association has member colleges all through the West and South, broken into four regions to reduce travel time. The University of Arizona, meanwhile, has instituted a new college course, rodeo physical education. Students say it's rough, but they like it.

★ ★ ★

Electronic Guard for Art Museum

Chicago Art Institute each night is filled with high-frequency sound waves to prevent thieves from stealing any of its \$170,000,000 worth of paintings and art objects. Five hundred detectors set inconspicuously throughout 200 rooms, and a central control room or guard station make up the newly installed, burglar-alarm system.

Each detector consists of two units—a sound-wave transmitter, and a receiver and motion detector. The transmitter floods the room with inaudible sound waves at a frequency of 2400 cycles per second, creating a pattern of direct and reflected waves. If this pattern, picked up by the receiver, is disturbed by someone entering the room,

a signal is tripped in the guard room. A thief's progress could thus be followed room to room.

Generally only one transmitter and one receiver are needed to protect a room. But for odd-shaped rooms or those containing large objects—statues, for example—up to four transmitter-receiver units are used. Minneapolis-Honeywell engineers, who developed the system, selected the 2400-cycle-per-second-frequency because these waves are short enough to sense even a small movement of a man, but are not so short that a buzzing fly or mosquito would set off the alarm. The sound waves completely fill the room, bouncing from every object, so there is no place an intruder can hide to escape detection.

Liquid Washes and Waxes Car

Chemists of a wax manufacturer have rendered wax water-soluble by emulsification to develop a new product that can be used to wash and wax an automobile without need for rinsing. Four ounces of the product is mixed with one gallon of water and applied to part of the car with a cloth. The surface is then wiped with another cloth, removing dirt and reconverting the wax to an insoluble state. The wax is buffed with a third cloth.

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\$5



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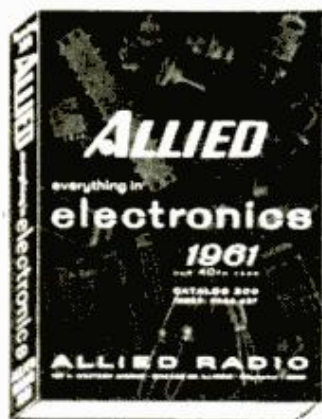
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than this same theoretical maximum under the year's average circumstance of weather, other arrivals, etc. A few years ago, under approximately the same airport conditions, six million passengers were declared the desired annual limit for Midway. The Commissioner of Public Works then declared that this generous figure "should never be exceeded." Last year over nine and a half million passengers survived Midway's crowded terminals, schedules, and airspace. The same problem, on varying scales, confounds the situation at Newark, Boston, San Francisco and the 20 other terminals from which more than two-thirds of all the air traffic in the country originates.

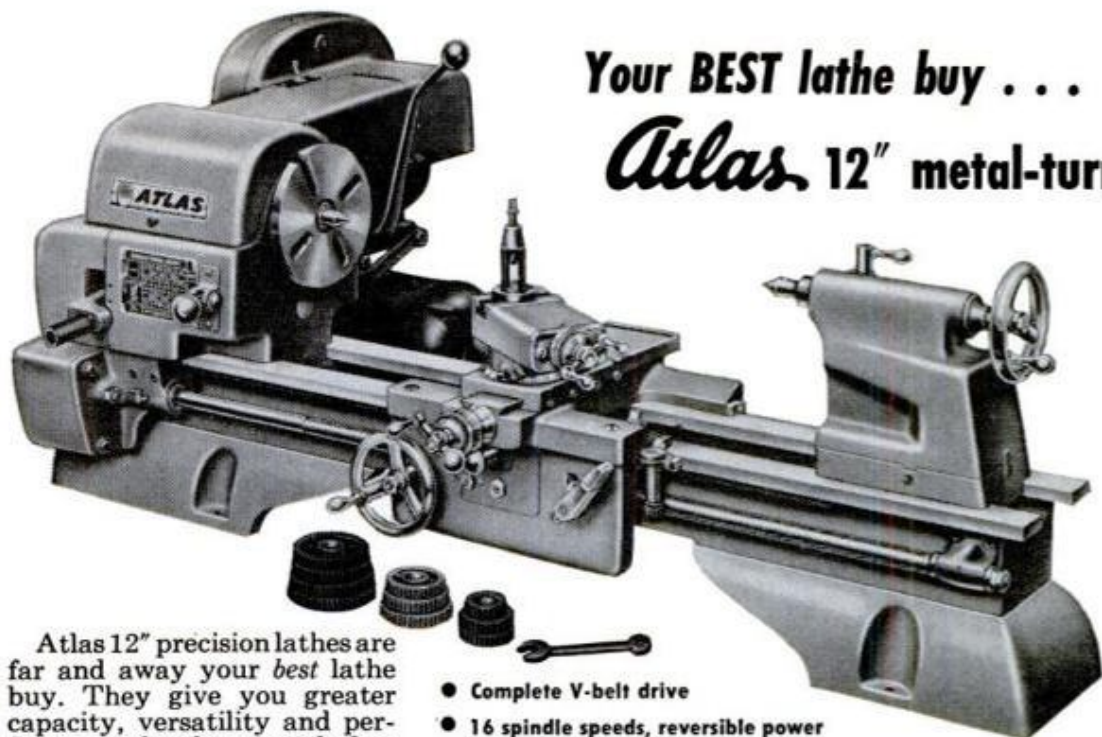
It should be understood that these terminals are what actually determines the number of planes aloft. Although there is crowding along the airways, it is above and on the airports themselves that the situation becomes critical. This is why projects such as the FAA acquisition of the multi-billion dollar, obsolescent SAGE warning system are being studied. High-speed taxiways which will permit a 60-mile-an-hour turnoff from main landing runways, and the AGACS gadget by which 250 aircraft contacts may be established every minute without blocking the others out are also in the works—for several years hence. But we live in the present.

For an admittedly egregious example, what did I have to look forward to when, some 45 minutes after starting our sluggish rectangle over Chicago Heights, I was given permission to make an approach? By taking over a golf course and some railway property in 1946, the city managed to increase Midway's dimensions to an exact square mile, set in the middle of a manufacturing, commercial and residential area. Its longest runway is 6410 feet, six of its other seven are less than 5000, which means that every heavy plane landing must shave the tops of the surrounding buildings.

It is a poor joke that this is one of several places in the country that a pilot may pick up a traffic ticket on his final approach. The patrons of restaurants and motels along Cicero Avenue duck and dive for cover as a DC-7 or Viscount appears ready to slice through the window, and even the hardened waitresses wince. This goes on continually, not occasionally.

As for lights, which I would certainly need that night, the Airline Pilots' Association and other aviation representatives have fought for a long time to have adequate approach lighting installed. Center-line lights were finally placed last year on

(Continued to page 248)



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AT LUMBER AND BUILDING SUPPLY DEALERS

the instrument runway, 13 right, and a condenser discharge light is operating on its other approach end, 31 left, which I would be using on this landing—if all went well. A similar blinker is on the approach to 4 right.

But center-line lights are effective for minimum visibility approaches *on that runway only*; as for the others, positively identifying one flashing light in the midst of an unfamiliar sparkle is difficult indeed, especially in the few seconds given to a pilot breaking through a low overcast.

Still, it was better than coming in with a marginal three-mile visibility, as it had happened before, and pretending that we were VFR (flying under visual flight rules). On any of the other runways, where three or four aircraft with their standard three-mile separation must be preceding you in order to maintain the traffic flow, simple addition shows that you are more than three miles distant as you turn on final. In brief, you are making a visual approach to a runway which theoretically, and frequently, you cannot see.

No amount of chart study will enable a pilot to make an approach by taking a bearing from Joe's All-Night Hamburger Heaven—only familiarity will do this. Would it shock the brave passengers who crowd these inadequate terminals and who apparently believe that the airport procedure is all governed by an unfailing electronic network to know that pilots have been using Joe's as a check point for years at Midway, or the factory stacks at Newark, or a brilliant gas station at Burbank?

Even with the delay, I was glad we were on instruments. The last time I had landed at Midway by visual means I was making a left base leg for 13 left, as directed, when I met a Constellation coming in the opposite direction, on a right base for 13 right, the parallel runway. These runways are separated by only a few hundred yards, which is a disturbingly short distance at a closure rate of over 300 miles per hour. The Connie and I had made our turns courteously, like two square dancers bowing in the middle of a do-si-do and had proceeded down the final approach hand in hand.

This was safe enough as long as the visibility was good, but unfortunately I had run into the cloud of smoke which usually drifts over the place from the factories to the north and west. When the lights went out, I unconsciously—and rightly—made a sharp turn away from the Connie until I broke into the clear. This is just one of those hazards which don't show up on the charts either for this airport or any other

which is squeezed into the middle of a city.

Yet in every such incident the real threat to safety lies in this single factor: the congestion of traffic necessarily assumes perfection at every hand. The fact that this has not spelled disaster many times over is not a credit to the system in operation, yet disaster is the only acceptable proof of danger to the authorities who regulate this traffic and, apparently, to the public as well. Even birds know you can get only so many birds on a wire.

We left Chicago Heights with 30 seconds of our estimated departure time, just as Approach Control asked us what the delay was, and were cleared to the tower. Then what had been startling became amazing, what had been recommended became absolutely demanded.

"Capitol-four-oh-nine cleared two-two-right after six landing has passed American-forty-three . . . Number two to land three-one-left . . . United-twenty-nine cleared immediately to cross two-two-left . . . Lake Central-six report Lake Shore to departure one-one-nine-point-nine good night . . . Continental-four get your transmitter fixed and call me again . . . TWO-FOUR-METRO REPORT KEDZIE IN-BOUND. . ."

It was only a normal transmission. You get used to it—or don't come back to Midway. By this time, of course, I had retuned my VOR from Chicago Heights to the back door ILS (instrument landing system), identified its signals, noted the deflection on my instrument's needle, calculated how far it was from Kedzie marker to runway THREE-ONE-LEFT and how many feet per minute I would have to descend in order to break out of the overcast in position to land without taking along any of the neighbors' TV antennas, had lowered the gear and quarter flaps, adjusted the low frequency homer to Kedzie, approved the landing check list recited by the copilot, and was listening carefully at the same time to the tower's Gilbert-and-Sullivan patter because there was a Viscount coming in fast behind me, according to that patter.

And sure enough! We managed to report Kedzie as we passed and were almost to the runway, if my figures and descent were correct, when I caught something else out of the stream from the tower.

". . . immediately two-two-right . . . TWO-FOUR-METRO BREAK OFF APPROACH AND LAND THREE-ONE-RIGHT . . . Braniff sixteen taxi in position and hold. . ."

At this moment several miscellaneous
(Continued to page 250)



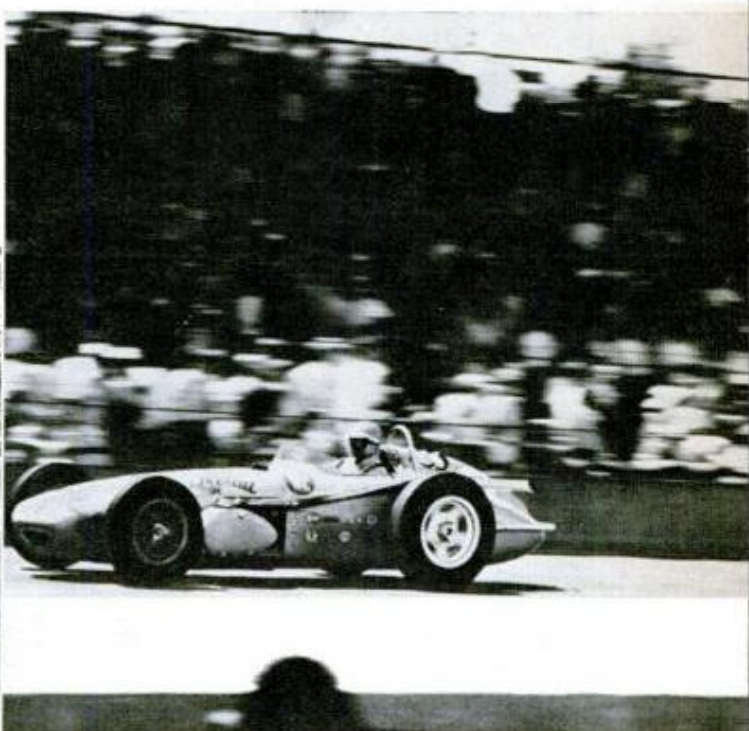
Winner at Sebring: John Bentley (above) Index of Performance winner, and 6 out of 10 class winners used Champions.



Winner at Daytona: Junior Johnson wins the 500-mile Sweepstakes. *Every* Daytona winner has used Champions.



Winner at Charlotte: Joe Lee Johnson wins the first World 600 with Champions. 8 of the first 10 to finish used Champions.



Winner at Indianapolis: Jim Rathmann sets a new record to win the "500". Like 10 of the last 11 "Indy" winners, he chose Champions.

Q. Why do winners of 9 out of 10 major races use Champion spark plugs?

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Worn spark plugs waste lots of gas—so check your plugs every 5,000 miles!



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lights showed through the murk—at about 200 feet. (Who is going to break off an approach at minimum altitude when the tower and everyone else is insisting the ceiling is 300?) I sighed, rassed the C-46 off the approach, did several vertical turns at air-show altitude above the tenement tops, chopped power and screamed for full flaps, prayed a little, and managed to hit the end of the short and slippery runway with space enough to coax the bird almost to a stop before we piled into deep snow halfway down its length. (And when would they have had time to clean it off?)

"Thank you, Two-Four Metro. . . ."

Before we stopped rolling the Viscount was alongside on the parallel runway, passing us with snow blasting the wrong way from its reversed props.

"You're quite welcome," I thought, but didn't find room to make my courtesy heard in the tower.

The copilot, for some reason, was shaking his head, this being his first trip.

"Aw, come on," I said, as we plowed through the drifts and switched to ground control. "Don't give up now. Think what it will be like in another few years. They are expecting 10 times more traffic by 1975."

"They'll never make it," he swore. "Not on these airports." ★ ★ ★

This Month's "Great Pioneer in Science"

(Page 24)



Galileo Galilei (1564-1642)

Automated Bus Garage

Buses operating from a new, \$2,000,000 garage of the New York City Transit Authority are serviced in 3½ minutes on an assembly-line basis. When a bus pulls into the heavily automated garage for its daily servicing, a series of operations start simultaneously. A hose is hooked to the fuel tank and, as submerged pumps drive diesel fuel near the full mark, a warning whistle sounds. Another hose fills the water tank. At the same time, a huge funnel swings out from a stand and glues itself against the open front door of the bus. The funnel

is part of the cleaner which sucks up air at the rate of 20,000 cubic feet a minute and drags along dust and trash which is carried into a metal compartment where it is sprayed with water to precipitate dust; moistened trash is automatically conveyed to a metal dustbin. The bus then moves a few feet and soap is applied by hand. The bus moves through an automatic washing machine which sprays water at high pressure against its sides; automatic, plastic scrub brushes buff the sides and a king-sized mop cleans the roof.



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"Thermorar-Luxus," Messrs. Maybaum, Sundern/Sauerland, West Germany

German Appliance Heats or Cools

Not a coffee table, though it serves nicely for that purpose, a new German appliance combines electric heating and forced-air circulation in three combinations for either heating or cooling. It works as a fan alone, as a two-stage heater with the fan, or as a convection heater with the fan turned off. As an incidental bonus, the large slotted top allows hot air to escape upwards from the element and keeps food or hot beverages warm.

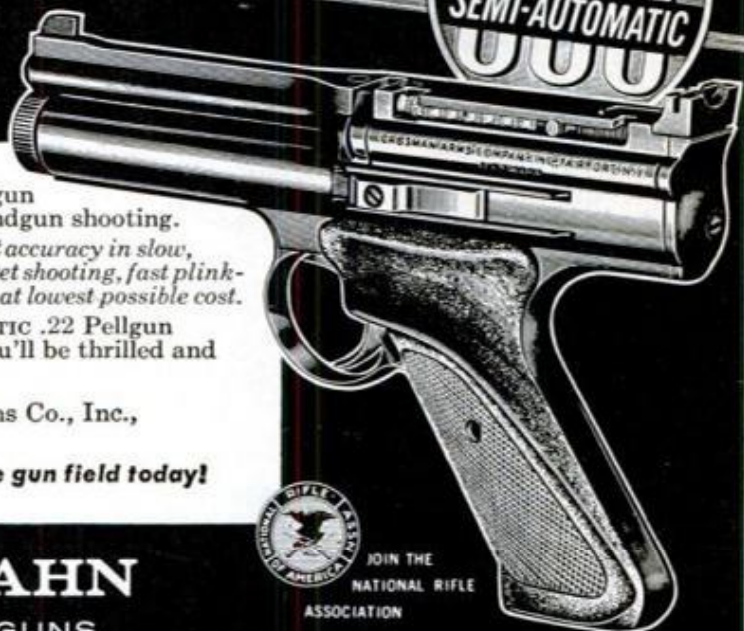


Spray Gun for Riot Control

Army riot-control units are now being equipped with a new portable irritant chemical spray for dispersing mobs. A modified flame-thrower, it can fire up to 30 seconds without reloading.

10 SHOTS IN LESS THAN 3 SECONDS!

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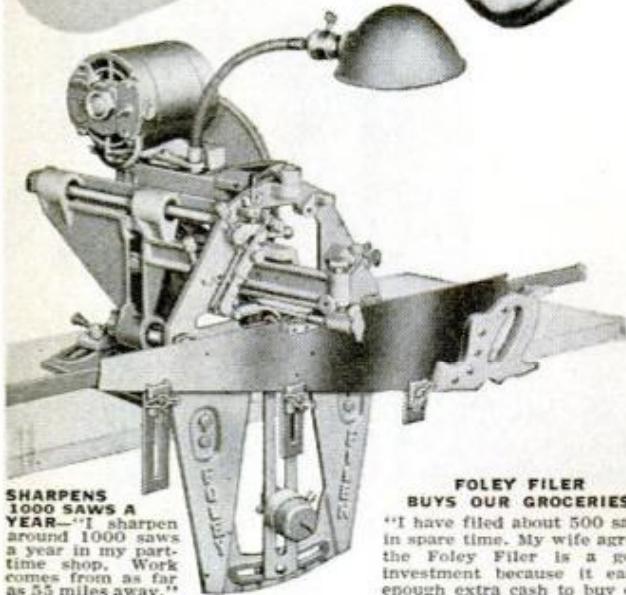
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—Joe H. Walker.

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"I have filed about 500 saws in spare time. My wife agrees the Foley Filer is a good investment because it earns enough extra cash to buy our groceries." — R. J. Kreuser.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business that pays from \$3 to \$6 an hour, and you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. J. C. Delbert wrote us: "Since I got my Foley Filer five years ago, I have averaged 4 1/4 saws each day over all this time." Howard Kuhns says: "We operate 2 Foley Filers, and our business averages about 500 saws per month. The count last year was 5,798 saws."

The new model 200 Foley Saw Filer (shown above) is the first and only machine that automatically sharpens combination (rip and cross cut) circular saws—also all hand saws, band saws and crosscut circular saws. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. Exclusive jointing action evens up irregular teeth — old saws cut like new!

"MONEY MAKING FACTS" explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think, with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Time Payments available; send coupon today for this practical money making plan. No salesman will call.



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An Eye on Space

(Continued from page 116)

where, automatically, a parachute opens on the capsule, while the spent emergency rocket falls away.

If we are talking about a more advanced system, then the worries are associated with this situation: A booster lifts a spaceship into orbit—did it go well? In orbit, the astronaut positions the spaceship (or this is done for him from ground); retro-rockets are fired (properly?); the spaceship itself, not just a capsule, comes down, enters the atmosphere, uses fuel for braking purposes, prepares to land. At this point, a decision has to be made: Should the whole spaceship land, can it do so safely or should the spaceship catapult away the capsule which will come down by parachute? The Russians did this with the two dogs; but the spaceship itself landed safely, they reported. The catapulting was a precautionary measure.

Very soon, now, everyone's dreams may be of a more peaceful variety: Spaceships will rise easily, on nonexplosive fuel, they will ease into orbit, and they will come down, all the way, intact, with the travelers, be they Ivans or Joes, Belkas or Rovers. ★★★

Pellet Insecticides Help Control Mosquitoes

Using small pellets of inert composition coated with high-powered insecticides, a University of California scientist has worked out a method of killing mosquito larvae that breed in water standing under heavily-foliaged plants where ordinary sprays can't reach. Dr. M. S. Mulla and technician Harold Axelrod discovered that granules, scattered over the plants, fell through the leaves and released their poison on the water, killing the larvae before they could mature. An application of the pellets on dry land will produce complete control after flooding, something not possible with sprays. Besides producing the desired results, the pellet method also turned out to be safer (no spray to drift on the air), easier (no big spray equipment necessary), and left no deposit of harmful chemicals on the plants. The latter advantage eliminates harm to beneficial insects and animals and prevents toxic residues in food and forage crops. By using certain organophosphates and carbamates, they found new mixtures as deadly as parathion, the most toxic of all compounds, but which were safer to use and which killed mosquitoes which had built up immunities to standard pesticides.

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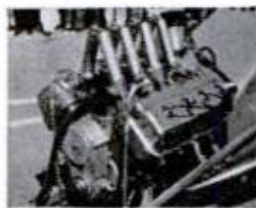
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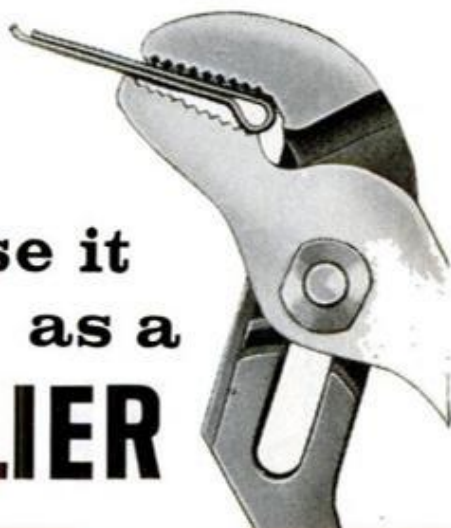
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Rockets for Civilians

(Continued from page 142)

other hand, many scientists enthusiastically claim great effectiveness. One series of California experiments using ground-based sodium iodide dispersal apparatus showed no significant difference in rainfall between seeded and unseeded clouds. However, another series of experiments in the same state showed "a significant difference" caused by seeding.

In the meantime, rocket firms continue to develop seeding rockets and techniques for the day when the market may open for them. Aerojet-General is working on rockets that can be launched either from the ground or from an airplane at 15,000 to 30,000 feet. The sodium iodide is packed in a plastic container that easily breaks into tiny pieces, and most of the rocket's parts are made of equally brittle material so there is no hazard to aircraft. Farmers in Italy have not waited for scientific proof or court rulings. They already support a wide market for very small seeding rockets developed by Angelo Patti. The rockets look very much like Fourth of July rockets—small, sharp-nosed cylinders attached to sticks that are launching guides.

Several companies that are selling small, inexpensive research rockets are also selling a line of laboratory rockets that never leave the ground. These are modifications of the tiny vernier and retro rockets that turn, stabilize or slow satellites and large rockets. Most of them fit comfortably in the palm of the hand—or in a clamp-down rig on a metallurgical lab bench. They are fired to test new alloys, ceramics and heat-resistant plastics. Their exhausts provide ultra-high temperatures and very high speed abrasion at low cost. Their thrusts range from 1½ ounces to 10 pounds.

Laboratory rockets are made in many shapes to meet different job requirements. Some look very much like their larger brothers but most of them look either like a piece of ordinary plumbing pipe, or a flat disk. Nevertheless, they are really rockets. The ones that look most like rockets or pieces of pipe usually contain a solid-propellant charge. The discs are seldom more than an exhaust-directing outlet for burning fuels piped in from separate containers.

Industry is learning that there is a double savings in using small test rockets:

(1) The cost of the rocket is much lower than the operating cost of conventional plasma jet devices and arc furnaces that have been used;

(2) The rocket can be used in an average laboratory that has been modified for safe-

(Continued to page 258)

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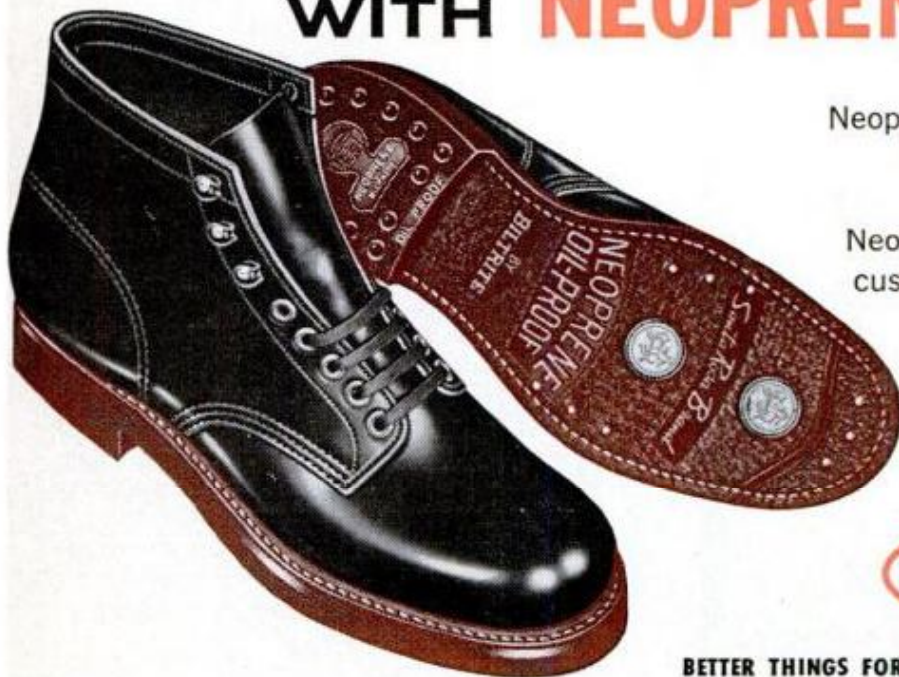
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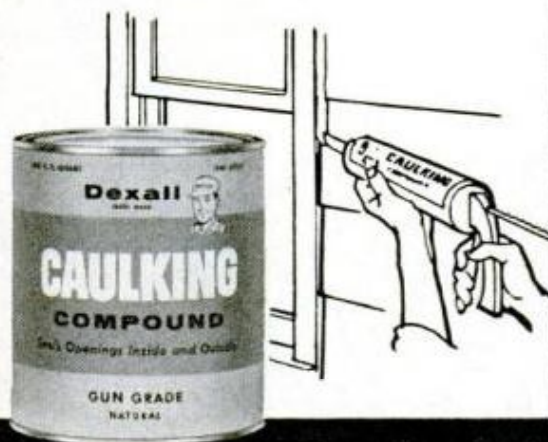


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T. Keith Glennan, head of the National Aeronautics and Space Administration, knows as well as any person in the country the importance of new materials to our missile and space effort. He has described new ceramic materials for rocket nozzles, vanes and nose cones that were made possible through repeated laboratory tests using heat and friction from small rockets.

One of the more intriguing civilian markets being considered by the rocket industry is sports. The much-publicized strap-on-the-back infantry rockets—sometimes dubbed *Buck Rogers* or *Grasshopper*—are now being developed for the Army. In less than five years, the responsible engineers say, quantity production for the Army will make a low-cost civilian modification possible.

The jump belts and flying belts will be used in sports, old and new. Alexander Bohr and Harry Burdette, engineers at Thiokol Chemical Corporation's Reaction Motors Division, first disclosed the individual troop rockets two years ago. Then as now they were enthusiastic about low-cost, lightweight rockets to propel skiers to the tops of good ski hills that have no tows. They believe this will be one of the first ways civilians will use the rockets when the price is brought under \$300 and the fuel is made cheap enough. Already, Thiokol can make them for little over \$300, light enough and reliable enough for Army evaluation. However, they have to be lighter and much more reliable for use in civilian firefighting, police and construction work. And before they can be sold to the general public for sports use, the belts must be made absolutely foolproof.

The Army and some civilian organizations are interested in two types of rocket belts. The more spectacular, but farther from reality, is the true flying belt that will lift a man and fly him for several miles at 40 to 60 miles per hour. The operator will have full control over speed and direction. So far, Thiokol and Aerojet-General are studying designs for flying belts. They have built dummy models for publicity photographs to stimulate military and Congressional interest.

The other rocket belt type is already a reality. It is a "jump belt" which assists the operator's own muscle power and eases the load on his legs. Thiokol engineers have made running broad jumps up to 25 feet with experimental models. They have made standing high jumps of 6½ feet, remaining upright the whole time. This is equivalent

(Continued to page 260)

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to a non-athlete loaded with working clothes and 40 pounds of equipment making a conventional high jump *horizontally* across a bar 10 feet high.

When these belts go into production, they will use a compact high-energy solid propellant. Right now Thiokol works with hydrogen peroxide-powered belts weighing from 11 pounds to 25 pounds. Using a 25-pound model, the average man can run 300 yards at 30 miles per hour without tiring. Men have run over 35 miles per hour for several seconds without being winded. They have jumped across gullies 20 feet wide and have made standing broad jumps of 11 feet.

Bohr and Burdette see other sports uses for their rockets besides skiing: Mountain climbing, hiking for elderly people, swimming and entirely new sports that cannot even be imagined until personal rockets are widely available.

Aerojet-General Corporation holds the Army's other study contract for personal rockets. Aerojet's engineers also have been working with belts powered by hydrogen peroxide, but believe, with Thiokol's engineers, that a cheap solid propellant will make a civilian belt practical. They also agree that the personal rockets—they call theirs "AeroPAK"—will find wide use in rescue work, fire fighting, construction, transportation and sports.

Some of the earliest types of rockets still are aiding civilians daily. They are the *JATO*—Jet-Assisted Take-Off—rockets that reduce the runway length needed for airplane take-off and allow planes to leave the ground with heavier loads.

They permit mining and prospecting companies, for example, to use airplanes in country too rugged for full-length runways. They convert farm pastures and country lawns into airstrips for craft heavier than the smaller light planes. They are especially useful on seaplanes because they greatly reduce the take-off run. This means that in choppy water they reduce the time that the plane is exposed to potential structural damage.

New uses are being reported for *JATO* units. One industry source says stunt car drivers are using them to provide bursts of power for quick starts, sudden stops and trick turns. Engineers are studying rockets similar to *JATOs* for emergency brakes on heavy trucks. The major problem is to compromise the amount of thrust and the direction so the rockets will not injure bystanders or damage property, but still will be effective emergency brakes.

Although the former National Advisory Committee for Aeronautics, now NASA,

has changed its emphasis to space interests, it is still active in research on aircraft. NASA still helps airplane manufacturers with their research, and rockets are a big part of the help. Rockets replace wind tunnels in many tests on models of new aircraft.

Scale models of airplanes, or even of other rockets, are mounted as pay loads on the noses of rockets. These range from one to six stages. Sometimes large models are used and the propelling rocket is mounted within the model.

The rocket with its test model is propelled to the top speed needed in the experiment. As the model decelerates, instruments gather various data and radio it to the launching station, usually Wallops Island, Va. During the model's free flight, accelerometers measure aerodynamic forces. Instruments measure the model's response to programmed controls, detect disturbances, instability, tendencies to flutter and buffet, and pressures and temperatures at various points. These are radioed to the ground.

In the simplest tests, a cheap rocket serves as the basic vehicle. Stabilizing fins added to the rear equip it for flight. An instrumented test model is mounted in the nose. This method is as effective as a wind tunnel for most purposes. It is also considerably cheaper. In addition, it develops free flight information that cannot be determined in most tunnels because they are too small to permit a model's free flight for more than a second or two. Free flight information can be taken for five minutes from rocket-launched models.

Sometimes a rocket is used to provide power that is not applied like ordinary rocket thrust—a rocket provides power that could be provided by a compressor, but provides it much faster. Such devices sometimes are called rockets, which they are, but more often are called "gas generators" which describes how they are used rather than what they are. When power is needed in a hurry and in a small volume, it can be provided by a stick of dynamite as an explosion. But, to be more useful, quick power in a small volume is provided by the very rapid burning—but not explosion—of a rocket propellant. Such rockets provide the power to drive gas turbines, drill oil wells, or start heavy engines. They can crack an egg gently, or bring a freight train to a screaming halt.

When such rockets are used within large missile to provide the power to operate fuel pumps or to turn nozzles, they are called auxiliary power rockets. The same rockets are being modified to meet similar power

(Continued to page 264)

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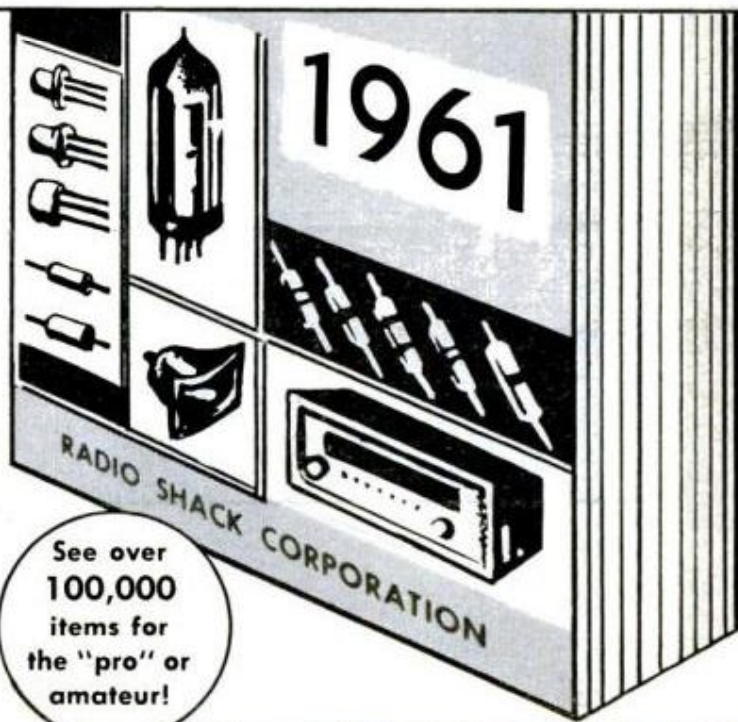


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needs, but in civilian situations. For example, the Rocketdyne Division of North American Aviation produces small rockets for auxiliary power in *Terrier* and *Tartar* missiles. They are solid-propellant gas generators that develop power to operate electrical generators. The electricity, in turn, operates the hydraulic system—drives the fuel pumps and coolant pumps. They will soon go to work for civilians.

Rocketdyne is developing, and plans to test, a number of the small solid-propellant rockets that would be used to start turbojet engines. This would eliminate much of the ground starting equipment housed now at airports for starting the turboprop, or "propjet" planes. Rocketdyne engineers say they will be about six inches long and six inches in diameter. They will weigh about eight pounds.

Other small rockets and gas generators provide the quick power for emergency cockpit ejection in military planes. The aircraft industry is now working on adaptations to civilian planes. One plan calls for rocket-actuated separation of whole sections of aircraft in an emergency. Smaller rockets will pull parachutes from their packs.

A Navy fire extinguisher sprinkler system that appeals to industry uses small solid-propellant rockets to exert pressure on a liquid extinguisher. It is a high speed system that pours out large amounts of liquid immediately on fire command. Ordinary air and gas-pressure systems would be caught by surprise and the pressure would drop almost instantly below the effective working level. The rockets build pressure almost instantaneously. The Naval Research Laboratory maintains nearly constant pressure either by using a slow, steady-burning nitroguanidine propellant, or by using a battery of rockets firing in series.

Another Naval Research laboratory development that will be going into civilian work soon uses the rocket's first cousin as a power source. Studies on pulse jets were among the most important developments that led to aircraft rockets and then to missiles. Not at all alike in appearance, rockets and pulse jets have much in common. Most important: They are compact sources of quick, cheap power based on hot gas expansion. Naval Research Laboratory uses a pulse jet to power a posthole digger designed to operate in frozen ground.

After developing the posthole digger, the Laboratory began experimenting with Army Chemical Corps fog generators. These are pulse-jet engines in which oil is added to the hot gas chamber. The oil

(Continued to page 266)

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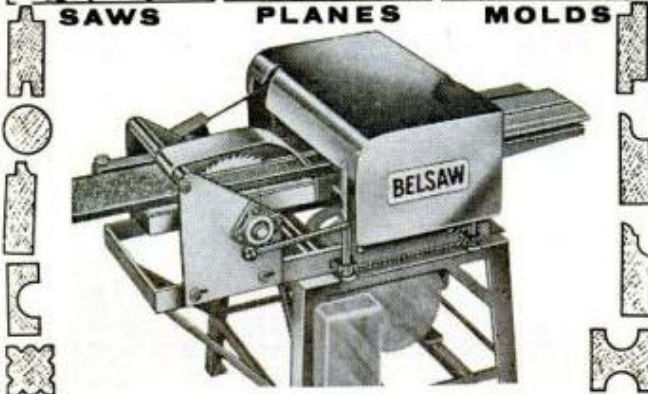
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Hughes Aircraft Company, Newport Beach, Calif.

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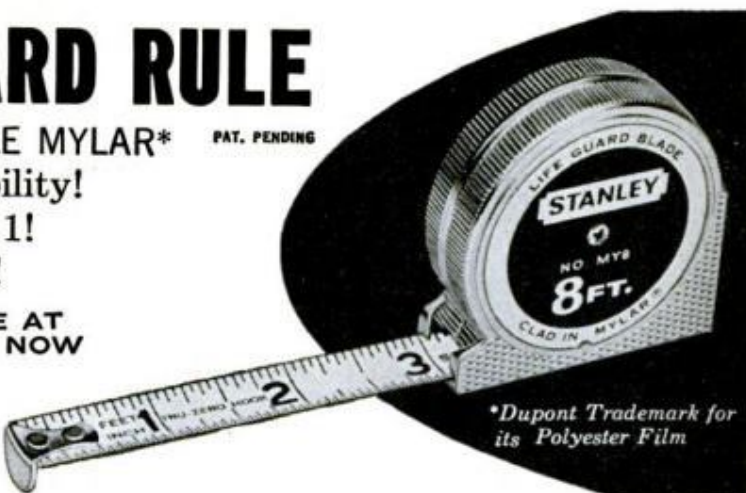
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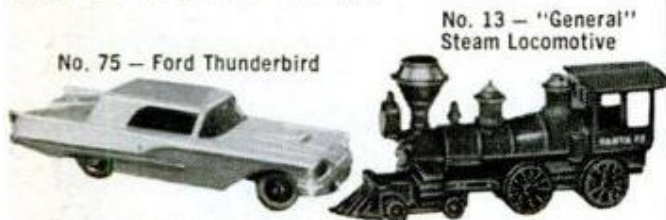
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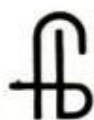
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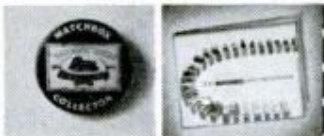
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On the **MARKET** for Do-It-Yourselfers

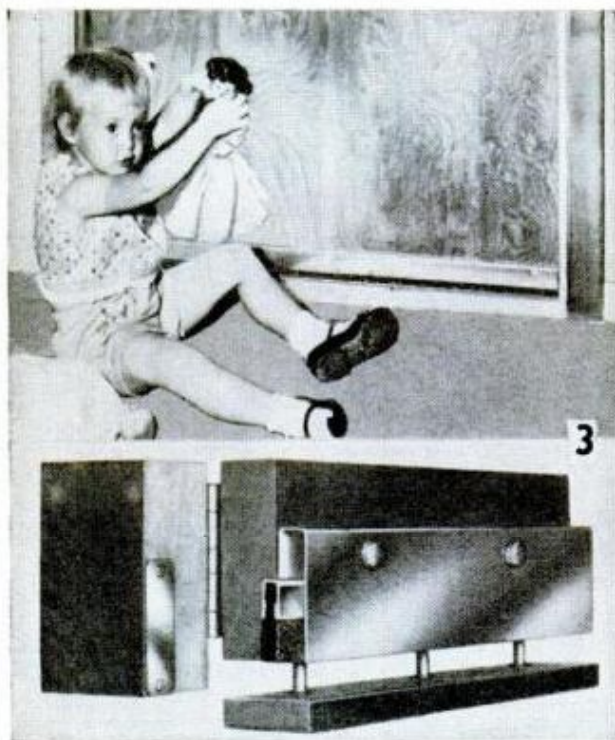
1. SNAP-IN, SNAP-OUT DIVIDERS convert any single-pane sash to a multi-pane sash in less than a minute's time. Available in a range of square pane sizes and also in diamond pane designs which simulate Swiss windows or traditional leaded-glass sashes. Dividers snap out for painting sash frame or washing glass
Zegers, Inc., 8090 S. Chicago Ave., Chicago 17, Ill.

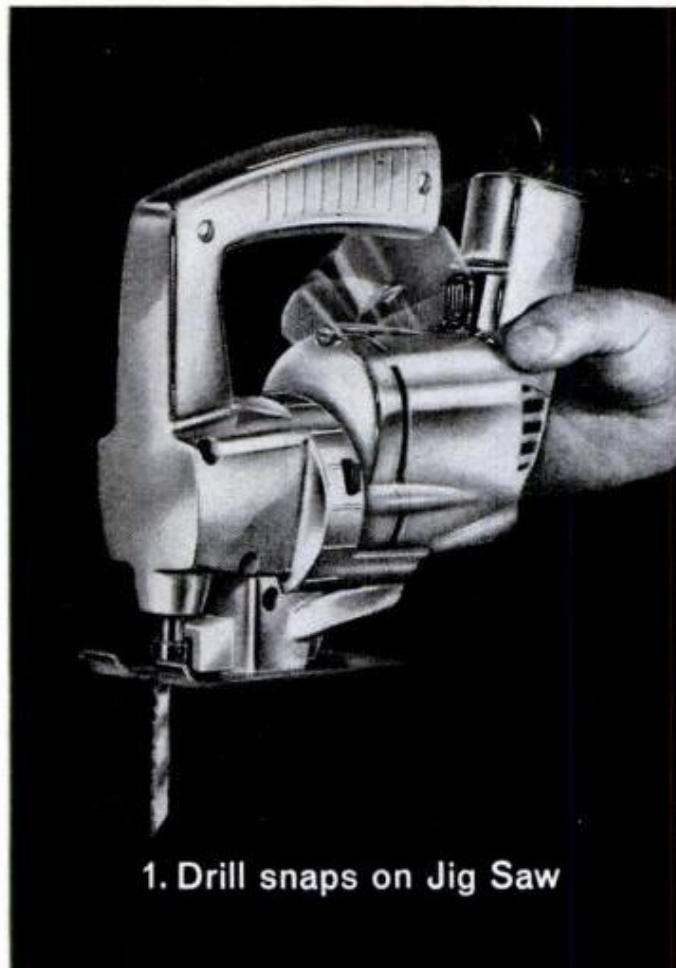
2. NATURAL OIL FINISH is a new compound of special oils and additives that penetrate and dry within the wood, not on the surface. Reduces finishing of all common cabinet woods to two basic steps—saturation and light wiping to remove surplus oil from surface. Eliminates the need for multicoat surface finishes
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Reese Metal Weatherstrip Co., 712 Park Ave., Minneapolis 15, Minn.

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Wallmaster Co., 1232 Milwaukee Ave., Chicago 22, Ill.
(Continued to page 270)





1. Drill snaps on Jig Saw



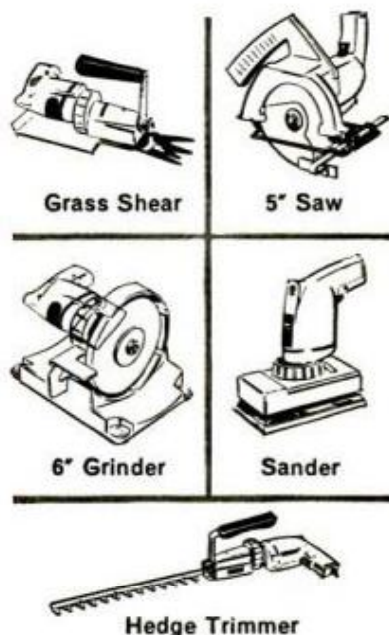
2. Drill snaps off Jig Saw

Skil 1/4" Drill converts to Jig Saw, 5 other Snap/Lock Tools...costs just \$16.95!

New Skil Snap/Lock Tools are a revolutionary development! You just snap them on or off the Skil and other 1/4" drills that power them. No complicated assembly using screwdrivers, wrenches or easy-to-lose parts as with ordinary attachments. These tools snap on the drill, lock solidly in place and *stay* that way.

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5" Saw

6" Grinder

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Skil Corp., Chicago 30, Ill. Prices higher in Canada

On the MARKET

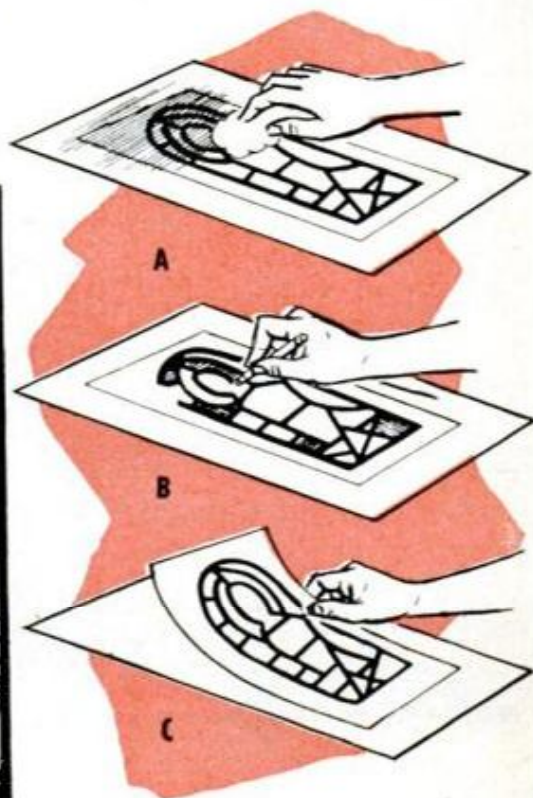
for Do-It-Yourselfers



A SIMULATED stained-glass window symbolizing the special significance of the Christmas season can be yours for the making. It's done simply by pasting a colored translucent pattern on your picture window. Religious patterns, 34 x 44-in., like those seen in many churches, are available on special paper. Individual sections, color-keyed, are first cut from a larger 16-section sheet bearing the complete design. These sections are then laid on a piece of plain paper—not newspaper—and both sides are coated with oil, rendering the design translucent. Baby oil, mineral or cooking oil will do. Both sides of the paper are colored with ordinary crayons, using heavy, bold strokes. The oil helps blend the colors but will not destroy the translucence. When colored, the individual sections are taped together in their original order and then the entire pattern is taped to the window.

Stained Glass Color Art, P. O. Box 82, Waukesha, Wis.

AS YOU CAN SEE ABOVE AND BELOW, the picture pattern is built up in sections which are color-keyed to make planning and assembly easy. The simple ABC steps detailed at the right show how the sections are prepared for placement



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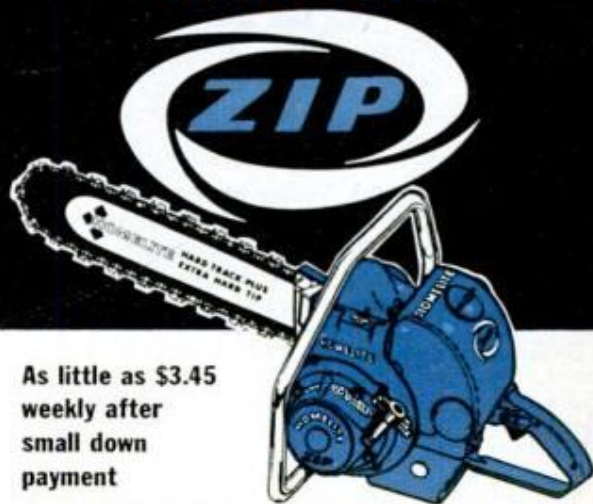
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NOVEMBER 1960

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Hurry! Contest closes Midnight Nov. 30, 1960

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Or write for address of nearest of the more than 50 branches and service stations to: THE BLACK & DECKER MFG. CO., Dept. 8011-S, Towson 4, Md.



Now Add Reverberation To Your Stereo System

(Continued from page 80)

bracket. An output transformer with a 10 K primary and 3.2-ohm secondary is also mounted on the bracket of Sp-2 with the secondary winding connected to the voice coil. Both speaker assemblies are then firmly mounted to a wooden base 18 inches long.

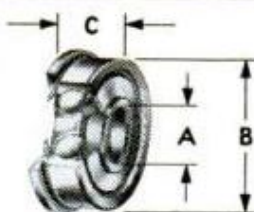
Satisfactory results can be obtained with just about any light and highly flexible spring. Springs have been used with $\frac{3}{16}$ inch to $\frac{1}{4}$ inch diameter and the lengths varied as indicated. However, before a permanent installation is made, it is recommended that you experiment not only with the springs, but also with the separation of the speakers. You may find the results most pleasing to you with one or two springs only. Do not place this reverberation unit close to the speaker in your system, because it might result in acoustic feedback, producing a squeal or howl.

The next step is to prepare the amplifier necessary to drive the modified speaker assemblies. As mentioned before, any a.c.-d.c. amplifier will do, and it is not necessary to build one, if you have an old radio on hand. Disable the RF section by shorting out the tuning capacitor, and connect the reverberation control potentiometer to the top lug of the volume control in the radio. If you decide to build a separate amplifier, either buy one of the commercially available kits (1-3 watts), or follow the schematic diagram. This amplifier has a little different twist in its circuitry: by using a pentode as a voltage amplifier, there is sufficient gain available to employ negative feedback in the output stage. This results in a much better hum level characteristic, which is always a problem in a.c.-d.c. devices.

Once all the necessary subassemblies are finished, you are ready for the final hookup. One word of caution: use a shielded cable for the connections between components and employ the braid on the cable as a ground bus. If you experience any hum in your system, reverse the a.c. plug on the reverberation amplifier. The reverberation control with the 100K isolation resistor can be mounted in any spot convenient to you. This potentiometer controls the duration of the echo effect, and its setting will vary with the type of program you are listening to. If you find that the tuner input on your preamplifier is not sensitive enough for this application, connect the cable to the microphone input jack, which always has a flat frequency response (no equalization) and sufficient gain to produce full rated power

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PETERBOROUGH, N. H.

output of your amplifier. The second reverberation unit is based on delay lines designed and produced by Hammond Organ Co. Several hi-fi set manufacturers, by the way, are adding this delay line to their new fall models with different modifications of the circuits. The Hammond unit consists of two delay lines connected between two ferrite rotors with a coil winding connected to the input and output jacks. The delay is between 30 and 40 milliseconds, and the over-all effect is excellent. Because of its nature, a special driver-amplifier and mixer stage is required, and it becomes an integral part of the monophonic or stereo system. Some purists might point out that this additional circuitry will degrade the performance of the hi-fi system, but on the other hand, one has to admit that this addition helps to create a reproduction very close to concert hall quality.

The recommended electronics are fairly simple, and the layout is not critical. We have managed to fit all the components into a 4x5x6-inch box, but the performance will be the same on a chassis twice that size. It is important that all ground connections are brought to a common ground lug, and a hum pot should be incorporated across the filaments. Both of these precautions will reward you with hum-free performance. All jacks (input and output) have to be insulated from the chassis, and you can either use the plastic type (self-insulating), or you can do as shown on the model: use the inexpensive metal jack, and insert a piece of phenolic (or friction tape) between the body of the jack and the chassis. The ground connections, of course, from all six jacks (in stereo connection) are brought to the common bus. Use shielded cable for these connections to avoid any hum and cross-talk problems.

The recommended power transformer is rated 1 amp. at 6.3 VAC and the tubes used require 1.2 amps. However, we have found that because of the low current requirement on the high voltage winding, the transformer will run very cool even though the current capacity in low voltage is exceeded by 20 percent. The larger transformer has B+ too high, which necessitates high-wattage dropping resistors with their heat problems. There does not seem to be any good reason to include an ON-OFF switch, because the circuit has to be turned on any time you wish to listen to your system. A switched a.c. receptacle on your equipment is the best choice for power source, so that one switch on your present equipment controls the power for all your components.

(Continued to page 274)

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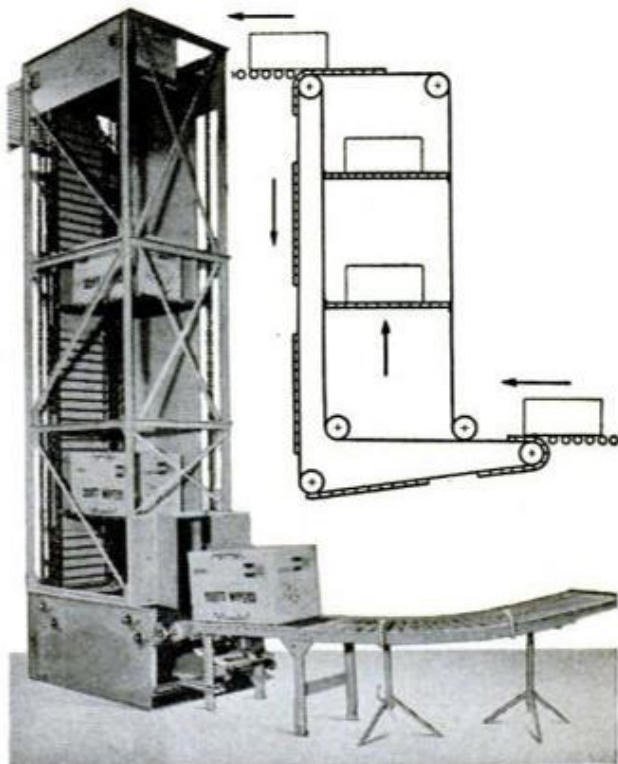
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4077 W. Pico Blvd., Los Angeles 19, Calif.

The reverberation amplifier with the delay lines can be inserted between the tuner and the amplifier, or between the preamplifier and basic amplifier. There are other possible connections, but these would require modification of your components. The potentiometer R_{12} controls the length of the delay, and when closed no echo is audible. If you wish to impress your friends with your "reverberating" system, be sure to pick out programs with soloists or small orchestras. Music passages of high levels do not produce the maximum effect, and the listeners might be disappointed. ★ ★ ★



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<p>STANDARD DIAL PHONE</p> <p>• Item #311. Powerful ball-bearing winch. Reversing switch mounted on winch. For cars, trucks, docks. Use on 6 or 12-v battery. 1000-2000 lb. pulling capacity. Will hold up to 40' cable. Wt. 54 lbs. Gov't. cost \$280.</p> <p>SALE \$46.75 FOB</p>		<p>115-W Water HEATING UNIT</p> <p>• Item #1127. Westinghouse water heating elements. Use for heating water, oil, &c. Makes ideal stock tank heater. Totally enclosed. 1 1/4" pipe threads. 3 heats—800, 400, 200 watts. Gov't cost \$17.50.</p> <p>PPD SALE \$3.95</p>
<p>EXAMPLE BARGAINS IN NEW CATALOG</p> <ul style="list-style-type: none"> \$ 43.00 Centrifugal Blower, 15" . . . \$ 29.90 FOB \$ 38.00 Air Tank s/steel . . . 10.95 FOB \$ 20.95 Sleeping Bag, deluxe . . . 16.95 FOB \$295.00 Electric Car Motor . . . 15.79 FOB \$ 66.00 Gear Reducer 80 to 1 . . . 8.98 PPD \$112.00 Level Transit Outfit . . . 92.50 PPD \$ 45.00 Hand Hyd. Pump Syst. . . 29.50 FOB \$ 4.25 Battery Booster Cables, . . . 2.75 FOB \$ 30.00 Hand Winch 1500 lb. cap. . . 15.95 FOB \$ 69.50 Hydraulic Cylinder 2-way, 2 1/2"x16 1/2" . . . 19.95 FOB \$ 27.95 Battery Charger 6 Amp., 6-12v . . . 16.95 FOB \$ 80.00 Centrifugal Pump . . . 19.49 FOB \$ 24.50 German Stop Watch . . . 14.96 PPD \$ 4.50 Telegraph Sending Key . . . 1.99 PPD <p>SURPLUS CENTER LINCOLN, NEBR DEPT 813</p>		

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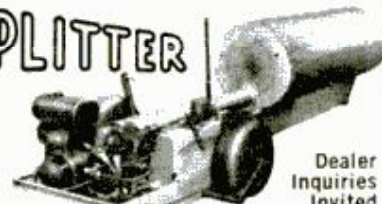
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Address _____

HOW TO TURN CONCRETE INTO GOLD

LICKITY LOG SPLITTER



Ends Wood Splitting Drudgery

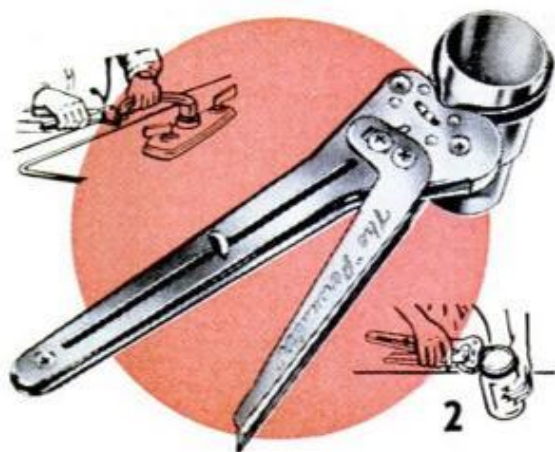
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Smooth 18 ton hydraulic power splits big profits for you from the toughest woods, including American Elm. 7 HP trailer unit squats under own power to receive large logs without "dead" lift. Has 2 speeds, auto-shift and auto-stroke. 26" ram travel splits up to 34" lengths, any diameter—or, with extended frame and adjustable wedge, splits up to 52" lengths, any diameter. Write for details.

THE WACO AIRCRAFT CO., Dept. D, Troy, Ohio



1

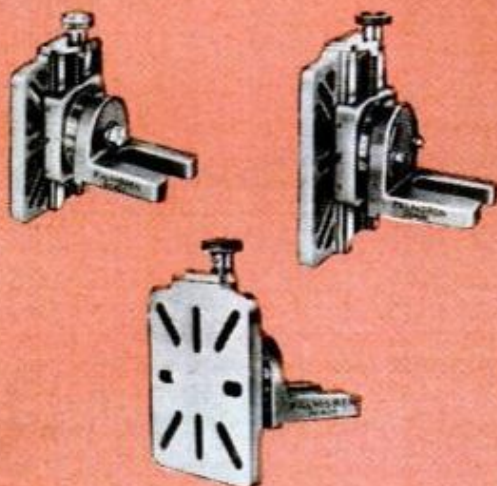


2

SHOPPING FOR TOOLS

1 MIST COOLING of cutting tools is now available for use on drill presses, metal saws, milling machines and other types of machine tools which require application of cutting oils at the point of operation. This new device features intermittent operation which eliminates waste of coolant and air as the mist, or spray, is automatically turned off during loading and unloading operations or idling cycles

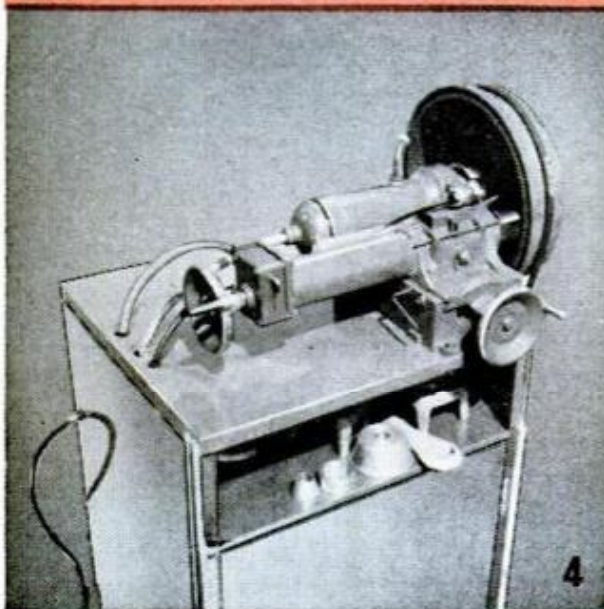
The DeVilbiss Co. Toledo, Ohio



3

2 LOOP WRENCH will grip any round object without crushing, marring or scoring the metal. Tightens or loosens chrome-plated fittings without a scratch. Will loosen or tighten metal jar caps without crushing. Material from which the loop is made is flexible yet it will not absorb oil or grease as will some types of webbing used in similar wrenches. Available in 4 and 5-in. loop sizes, closed or open loops

Long Industries, Inc., 15 N. Madison St., Chilton, Wis.



4

3. PLATE-TYPE LATHE MILLING ATTACHMENTS are designed to hold large or irregular shaped workpieces which are difficult to hold in the ordinary vise-type milling attachments. To attach to lathe, simply remove tool post ring, fit U-shaped base of the milling attachment around the tool post and tighten the tool post screw in the same manner as with any other lathe tool. Available with 6 x 6 and 9 x 9-in. plates

Chicago Tool & Engineering Co.,
8383 S. Chicago Ave., Chicago 17

4. BRAKE LATHE for the garage mechanic has been designed for servicing brake drums on passenger cars and light trucks. Spindle is carried on roller bearings. Enclosed, sliding boring bar minimizes chatter, eliminates exposed V-ways and threaded spindles which collect dirt and grit. A direct reading dial gives true tool settings, eliminates the possibility of turning the drum too large. Machine is belt driven by motor

Ateco Tool Co., 97-26 Sutphin Blvd., Jamaica, N. Y.

(Continued to page 278)

POPULAR MECHANICS

SAVE Your Heart!

America's Best Snow Plow-Tractor Value. Big 3 h.p. B. & S. engine, bigger tread, 6" x 12" tires plus heavy-duty 36" snow blade, adjustable. Both for only \$139.50. Built for lifetime use by one of oldest U. S. garden tractor mfrs., 2 year warranty. Substitute heavy-duty cultivator for snow blade if desired. Or add \$20. for cultivator also. Sold only by mail. Send check or money order now for immediate delivery, prepaid in U.S. Satisfaction Guaranteed. **WILMOR Co., Box 216, Ravenna 10, Ohio.**



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Heavy-Duty Cultivator \$20.

IDEAL CHRISTMAS GIFT FOR ANY MAN

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Acclaimed by thousands of Homeowners, Mechanics and Hobbyists as the welder of 1001 uses. Easily operated from properly wired 110 volt AC or DC line. The ideal gift with a life-long use. Order today on 10 day money back guarantee. Send only \$3.00 today. Pay postman balance C.O.D. plus charges. Literature on larger equipment on request.
FOUR-WAY WELDER CO., Dept. F2-M
1810 S. Federal St. Chicago 16, Ill.

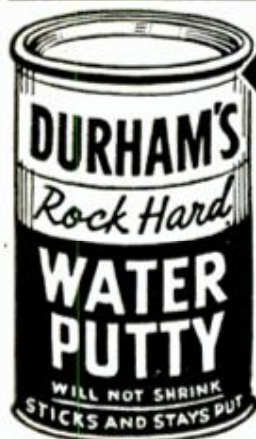
WELDER
Complete with Twin Carbon Arc Torch and accessories... to handle all metal-craft work.

NO MUSS... NO FUSS!
KRYLON SPRAY PAINT
DRY IN MINUTES!
IF YOU PRIZE IT... KRYLON-IZE IT!



GENUINE ALNICO MAGNETS

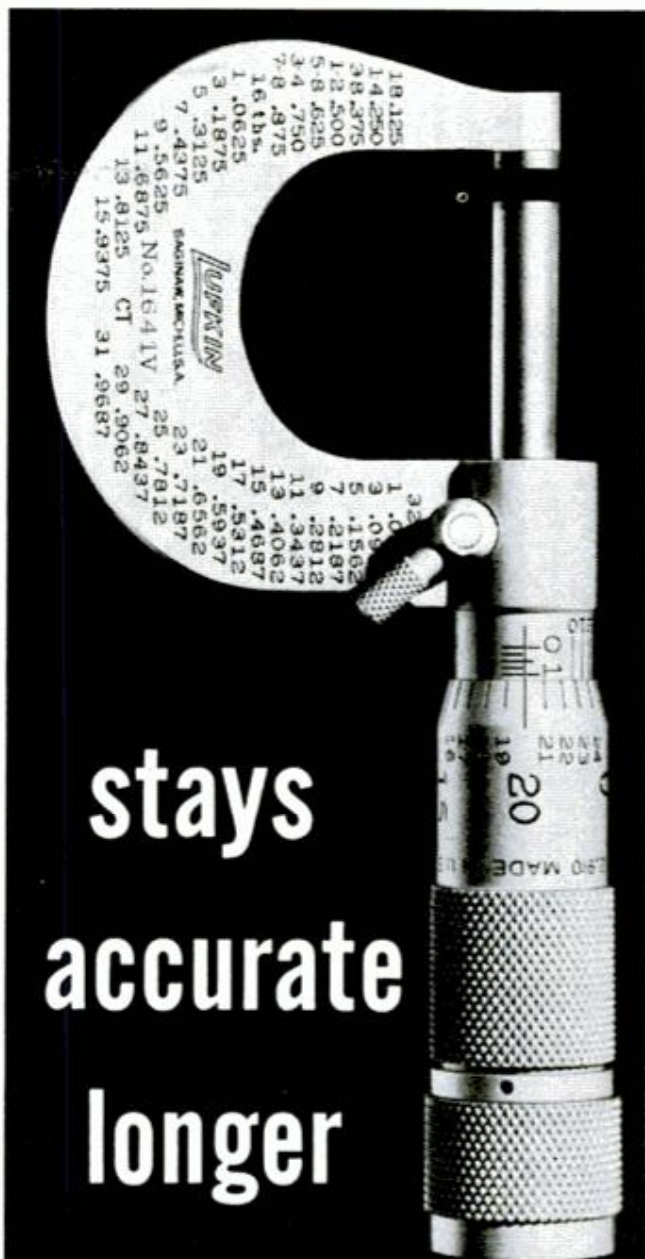
AMAZING, PERMANENT, NON-ELECTRIC, HIGHLY PRACTICAL. Conduct interesting experiments. Hundreds of uses. Retrieve valuable steel items such as pins, tackle from fresh or salt water; tools from tanks & drains. **GUARANTEED.** Try any magnet one week. Money back if you are not well-pleased.
No. M-710 (Wt. 53 oz.) Has pull of 225 lbs. on steel block... \$18.00
No. M-625 (Wt. 70 oz.) Has pull of 125 lbs. on steel block... \$10.00
No. M-575 (Wt. 18 oz.) Has pull of 75 lbs. on steel block... \$ 7.00
No. M-500 (Wt. 13 oz.) Has pull of 50 lbs. on steel block... \$ 5.00
No. M-40 (Wt. 5 oz.) Has pull of 15 lbs. on steel block... \$ 3.50
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Send M.O. or check. We pay postage. Sorry no C.O.D.'s.
MIAMI MAGNET COMPANY, 3240 N.W. 27th Ave., Miami 42, Fla.



The Modern PLASTIC for lasting Home Repairs

PERMANENTLY mends cracks or holes in wood, tile, stone or plaster. Sticks and stays put—Does not chip, shrink or fall out. Easy to use. Economical. Mold it, chisel it, polish or paint it. The big 4-lb. can is obtainable from your lumber, paint or hardware dealer at \$1.40; or will be shipped direct postpaid (in U. S.) for \$1.75. Complete satisfaction guaranteed or your money refunded.

DONALD DURHAM CO.
Box 805-T Des Moines, Iowa



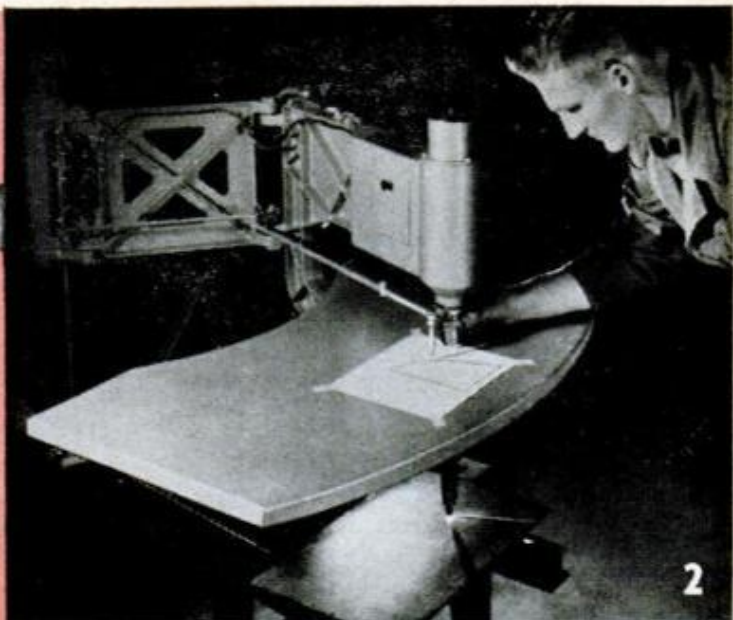
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accurate
longer

A LUFKIN EXCLUSIVE: 5 to 7 fewer parts than other micrometers... less to get out of adjustment! One-piece frame and hub simplifies wear adjustment, assures greater accuracy. Exclusive cam lock prevents reading errors. Ratchet stop top. Easy-to-read markings on nonglare *Chrome Clad*® finish.

Leading Industrial Distributors feature Lufkin—the new leader in precision tools.



LUFKIN
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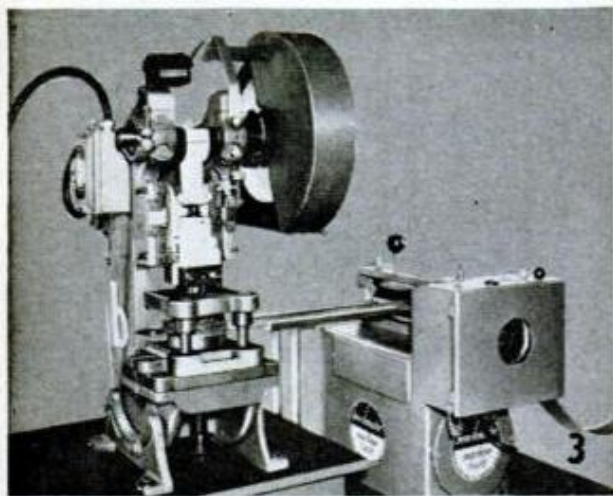
SHOPPING FOR TOOLS

1. CLAW HAMMER is a ball-peen hammer, soft hammer and nail hammer all in one kit. Hatchet is an accessory. When fitted with nail-driving bell, unit is a conventional claw hammer having a standard 16-oz. head. Interchangeable heads, or bells, are machined to a tight friction fit and are removed with a knockout pin, or drift, which is supplied with kit

The Dumas Co., Inc., 1 Jackson St., Worcester 8, Mass.

2. FLAME CUTTER offers controls which permit operator to duplicate directly from a sketch or detail drawing by means of a manually controlled tracing pencil. Also has precise magnetic control for template work, automatic right angle, straight or circular cuts. Designed especially as a versatile production tool for development and prototype work

Earth Equipment Corp., 1409 Santa Fe Ave., Los Angeles 21 Calif.



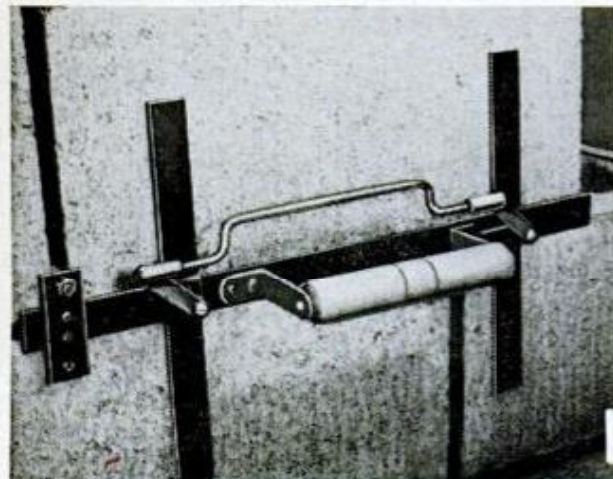
3. AUTOMATIC FEEDING UNIT for small presses feeds uniform, predetermined lengths of material and can be used to feed flat materials, coiled stock or round stock with specially contoured rolls. Standard feed speed is 50 surface feet per minute but other feed ranges and speeds can be supplied. Can be manually tripped or made to cycle with any machine motion

Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif.

4. BUILDING-BLOCK GUIDE enables even a beginner to lay concrete, cinder and composition block with the skill of a craftsman. Use of the guide assures correct alignment, uniform spacing and thickness of mortar joints. Moving a hand lever releases the guide for easy withdrawal without disturbing the block setting. Builder can work either from left or right

Viscer Associates, P. O. Box 3, Pleasantville, N. Y.

(Continued to page 280)



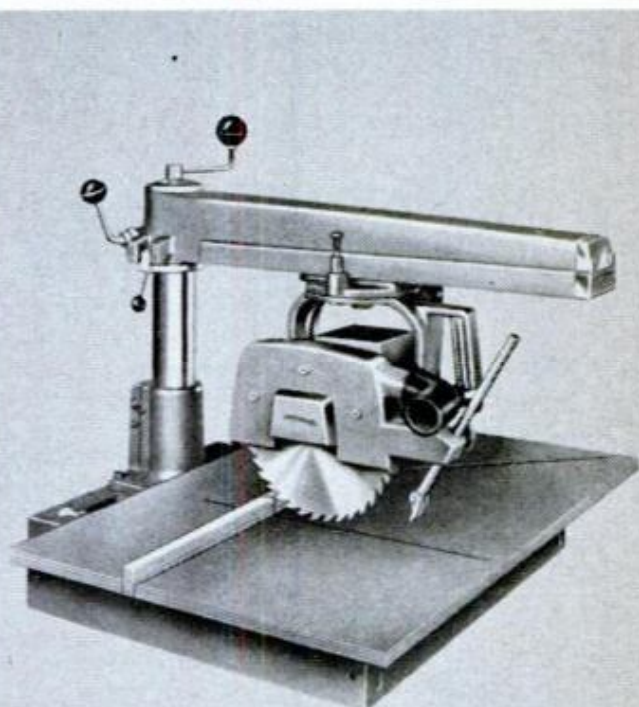
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DE LUXE 925-H, \$249

This is first choice with shopwise men! Exclusive, "years-ahead" features give you built-in motor brake, totally-enclosed 2 H.P. motor, up-front drop-leaf safety table, cut-off scale and other benefits.



THRIFTY 925-E, \$199

Introduced by popular demand for the thrifty-minded! You save \$50—and get features not found in competitive makes costing 25% more. You'll enjoy genuine DeWalt quality, safety, accuracy and versatility.

SEE BOTH...TRY BOTH!

The easiest way to make your choice is to visit your DeWalt dealer *now*. See both demonstrated! Choose yours. Buy it on easy, low-budget terms.

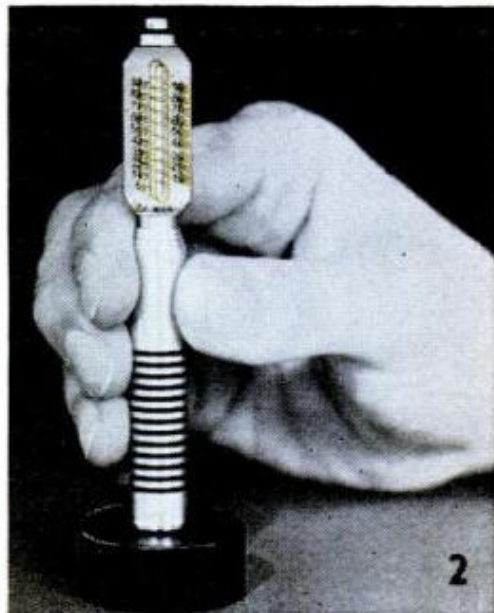
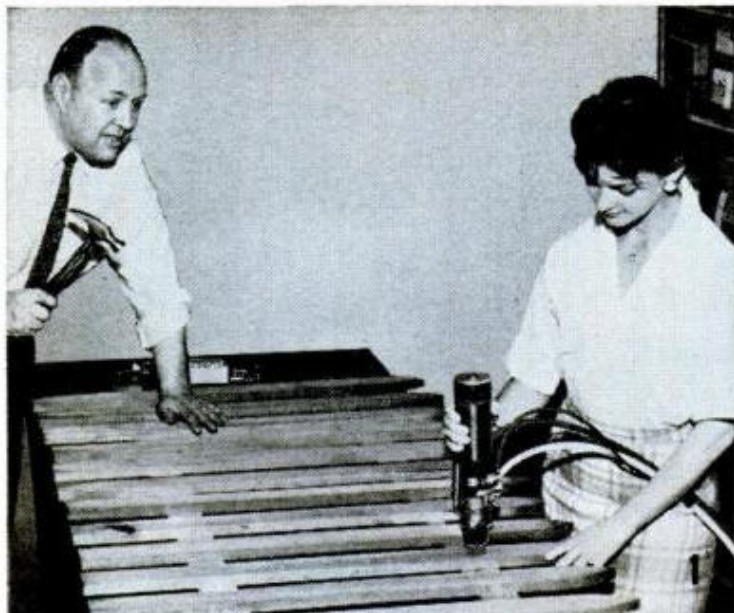
DEWALT, Inc., Dept. PM-611, Lancaster, Pa.

Please send FREE 20-PAGE DEWALT CATALOG and name of nearest dealer.

Name _____

Address _____

City _____ State _____



SHOPPING FOR TOOLS



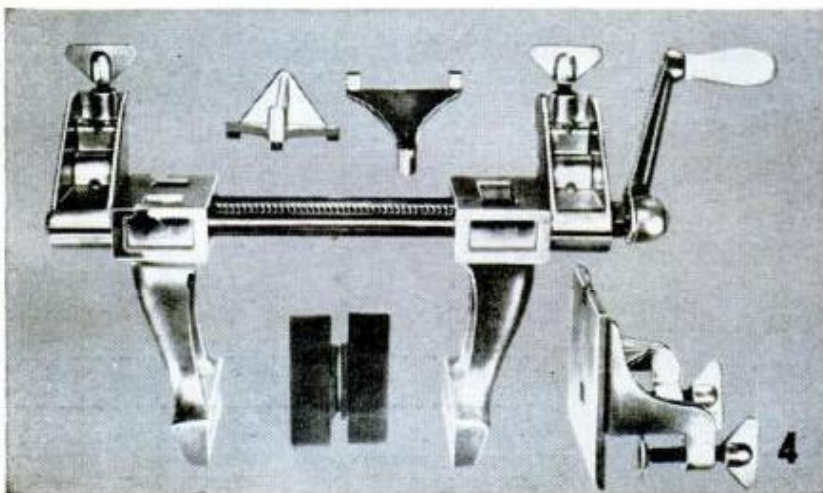
1. PNEUMATIC NAILER drives all types and sizes of nails five times faster than can be done with an ordinary hammer. Nails are fed from a hopper to the air-driven head which drives them home with a single blow. Gun is not only a nail driver; a screwdriver attachment also is available
 United Shoe Machinery Corp., Boston, Mass.

2. HARDNESS GAUGE, or tester, is used in accurately measuring the hardness of such materials as rubber in its various manufactured forms and also plastics of varying degrees of hardness. The gauge indicates in Durometer units that comply with A.S.T.M. specs for rubber hardness
 Rex Gauge Co., P. O. Box 46, Glenview, Ill.

3. SELF-LOCKING WING NUTS are made of a die cast alloy and are fitted with a nylon locking collar which prevents the nut from loosening under impact, vibration or stress reversal, whether fully seated or positioned at any point on a bolt or stud. Nuts are available in five thread sizes
 Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N. J.

4. HOBBYIST'S VISE features rotating jaws and an auxiliary clamp which will hold hexagonal, octagonal, oval or round shapes. A long screw provides a jaw opening of 8 in. By removing the auxiliary clamping attachment the vise can be used as a C-clamp. Can be set up on either end of bench top
 Little Wonder, Inc., Div. of Schiller-Pfiefer, Inc., Southampton, Pa.

5. HOT BLAST PAINT SCRAPER consists of a propane torch with a special burner and a steel scraper. The unit blisters and peels off layers of old paint in a once-over, one-hand operation. Speed of paint removal reduces fire hazards to a minimum. Leaves the surface clean and ready for repainting
 Turner Corp., Sycamore, Ill.



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Napco, leading manufacturer of highway sanders for trucks, trailers, and buses, introduces an entirely new concept in passenger car grit release devices! *Skidmaster* is controlled by a patented new vacuum release valve connected by hose to the windshield wiper line or vacuum spark advance... there are no electrical connections... no drilling or cutting into car.

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Fits any make or model car or station wagon. Simple installation kit with STEP-BY-STEP INSTALLATION INSTRUCTIONS. If you are not completely satisfied your money will be refunded. Shipped parcel post prepaid.



Flexible bracket fits into window opening, does not interfere with window operation.



Flexible plastic discharge tube slides into pre-adjusted receptacle.

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Gentlemen: Enclosed please find \$_____ for _____ set(s)
SKIDMASTER GRIT SPREADER(S) @ \$29.95 per complete
set, with instructions.

Name _____

Address _____

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Enclosed: Check Money Order Sorry, no C.O.D.'s.

Hanging Decorator Clocks

(Continued from page 183)

look well in the newer case designs and therefore you may have to make new hands. Before doing so you first ascertain which of the two or three concentric spindles are the second, minute and hour spindles. Scribe the shape of the hands on sheet metal and drill the spindle holes before cutting out the hands. The hole should be smaller than the spindle diameter by several drill sizes. Then a tapered point such as an ice pick is pushed through the hole to enlarge it to exact size. This will extrude metal along the edge of the hole thereby forming a short sleeve that will grip the spindle firmly. Another method is to sweat-solder a small piece of metal to the hand at the hole position, then drill and enlarge it to fit. Sometimes the smallest spindle is threaded, which then requires a tapped hole in the hand.

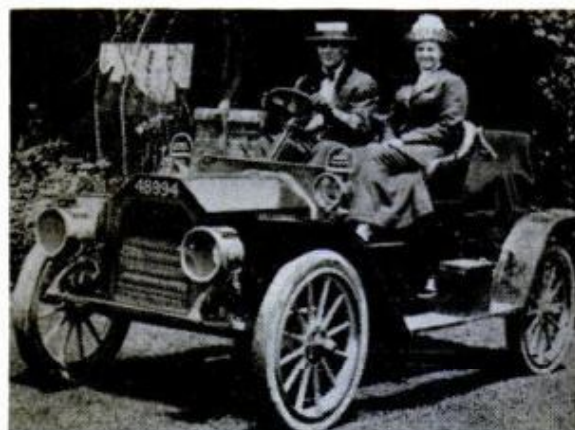
Concealing the Cord

To avoid a visible cord on an electric wall clock you can have a sunken wall outlet located directly behind the clock and concealed by it. This presupposes a permanent location for the clock. If it is to be moved from place to place, it will be better to use cords extending to the nearest base-

board outlets. A cord can be made less conspicuous by concealing a portion of it behind an appropriate piece of furniture, and then painting the visible portion to match the wall. The clocks shown were all provided with screweyes to permit secure attachment to a picture hook or nail. ★ ★ ★

Do You Know This Old-Timer?

(Answer to quiz, page 18)



1905 Reo



New from Wolverine!

WORLD'S LIGHTEST SERVICE SHOES

Most comfortable ever! Weigh a pound less than ordinary work shoes. Their exceptional lightness is so easy on the feet. Uppers are flexible elk-tanned leather . . . soles are springy, oil-resistant, neoprene cushion crepe, nearly three-quarters of an inch thick. Steel shanks, of course. And smart sports styling plus handsome Burgundy color add good looks to the comfort.

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Service Oxfords
Boots

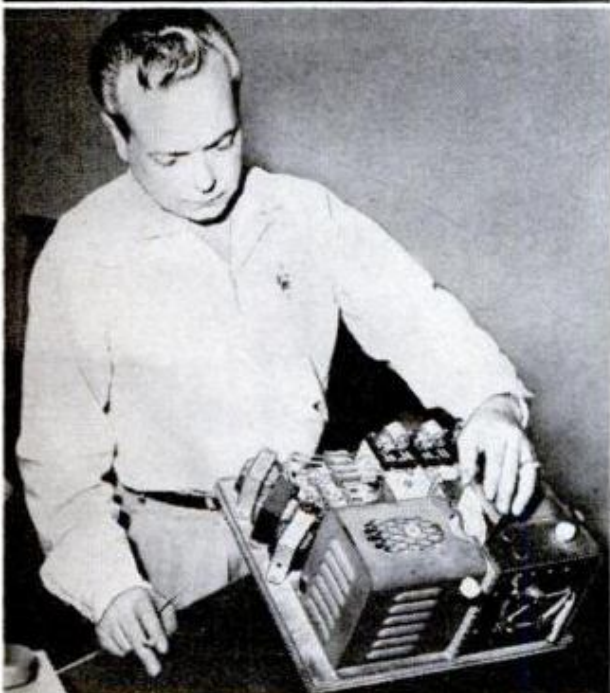
Work Shoes
Safety Shoes



West Point Products Corp., West Point, **Texas**

Battery-Powered Mower

Push-button starting and near-silent operation are two of the features of a battery-powered lawn mower which can mow more than 15,000 square feet of lawn on one battery charge. The "energy cell" plugs into any house current and recharges in about two days at a cost of two cents. It can be recharged hundreds of times.

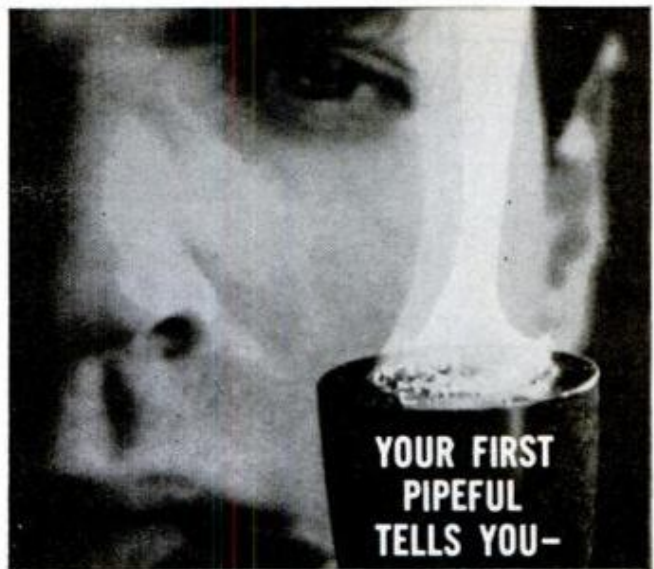


Surber Electronic Research Corp., Wichita Falls, Texas

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Designed for blind businessmen, a money-detecting machine can identify \$1, \$2, \$5, \$10 and \$20 bills. The bill is folded around a metal plate and inserted into the reading area. Each bill presents a different pattern to photoelectric cells which, in turn, cause appropriate buttons to rise.

NOVEMBER 1960



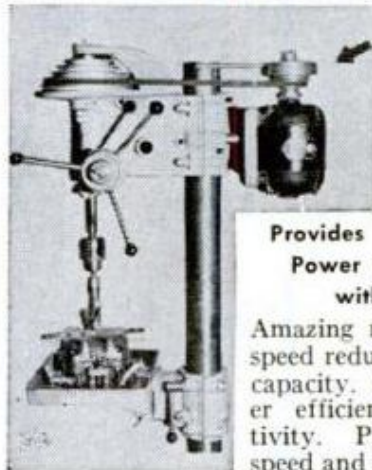
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Provides Correct Speed and Power to Drill Up to 1 3/8" with 1/2 H.P. Motor

Amazing new internally geared speed reducer doubles drill press capacity. Greater power, greater efficiency, greater productivity. Provides the correct speed and power for larger drilling, reaming, tapping and boring on light presses. Easily installed in five minutes. Adaptable to all type machines. Spindle speed range 45 to 3000 RPM. *Write for Literature.*

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Accessories Kit For Arc Welder for above generators has helmet, gloves, elect. holder, volt reg. rheostat, RC relay, voltmeter, Gr. Clamp, including switch plus splined coupling. . . . \$23.50
 & 30' cable with G-1 generator. \$36.50
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Multi-Weld (M), D.C. Arc Welding Kit Complete with G.E. R-1. 300-350 amp gen. incl. accessory kit, reactor coil w/ solenoid control \$52.50

AC-DC WELDER KIT—511 G.E. Generator. Makes 1250 Watts AC light plant and 200 amp. DC welder and battery charger. Includes all items listed in accessories kit. AC-DC generator & instr. \$38.50

Rotary Vane Vacuum pump air or fluid 15 C.F.M. 4500 RPM 10" suction. 24" HG pressure reversible. 3/4" ports. wt. 9 lbs. Gov't cost \$101.00. New \$22.50 — good C. \$14.50. Pump with 4.5 C.F.M. 26" vacuum, 3/4" ports. wt. 5 lbs. New C. \$16.50 — good C. \$12.95

400GPH water-fuel pump with 24-12VDC 8 amp motor. . . . \$8.95

NEW HYDRAULIC CYLINDERS

Bore	Stroke	Shaft C.	Length	D.A.	2000 PSI
1 1/2"	4 1/2"	1 1/8"	10"	3 1/2"	\$ 3.75
1 3/8"	2 3/4"	1"	38"	1"	\$12.95
1 1/2"	8 1/2"	3/4"	13"	8 lbs.	\$ 9.95
2 3/8"	18"	1 1/2"	26"	11 lbs.	\$19.95
2 1/2"	9"	1 1/2"	24"	12 lbs.	\$14.95
3 1/4"	9"	1 1/2"	18"	10 lbs.	\$17.95
3 1/2"	8 1/2"	1"	20 3/4"	12 lbs.	\$21.50
3 1/2"	10"	1 1/4"	27"	21 lbs.	\$24.50
3 1/2"	8 5/8"	1 1/4"	20 1/4"	12 1/2 lbs.	\$19.95
3 1/2"	2 1/8"	1 1/4"	31"	15 lbs.	\$24.50
4 7/8"	8"	2"	22"	35 lbs.	\$32.50

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 50 cu. in. 11" L x 3 1/2" D 6-lbs. . . . \$ 8.95
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 25 Volts—2.1" per second—9" travel—2700 lbs.—T-C. 1 1/2" dia. shaft—Wt. 11 lbs. \$15.50

HYDRAULIC SNOW PLOW LIFT KIT—Consists of 1 Stratopower hyd. pump 450 cu.in. 1400 PSI, drive from engine or power take-off; 1 D.A. cyl. 2 3/8" bore, 9 1/4" stroke; 4 way control valve; tank; filter; hose & fittings — \$75.40 value \$54.25 with 3"x10 1/2" cyl \$59.75

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#400 K heavy duty power driven rated 16000 lbs lift. Consists of 2 D.A. hyd cylinders 3 1/2" bore x 2 1/8" stroke ea. rated 8000 lbs with 1000 P.S.I. 1 four way hyd control valve with built in relief #821 1 Vickers hyd pump 375GPH 1000 PSI 3750 RPM filter, gauge 2000 PSI hose & fittings. Value \$169.95 save \$90.00 \$79.95 Same kit with Two D.A. Cylinders 3 bore x 10 1/4" stroke \$69.95

NEW HYDRAULIC PUMP-MOTOR SYSTEM KIT Offers fluid drive of varying power, consist of 2 new Vickers p.d.is. pumps ea. .410 cu. in. rev. 3750 RPM 1000 PSI 375 GPH where one pump is belt driven as motor, 1 four way c. valve with variable speed control, reservoir, filter, gauge, hose & fittings. Value \$98.10, \$49.95


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Worldwide Adventure

(Continued from page 105)

years, devised a shorthand understood by hams of every nationality. "NM NW OM CUL" translates as "No more now, old man; see you later." A young lady is "YL"; when she gets married she becomes "XYL" (ex-young lady); and if she's real handy with a key, she has a good "fist." Also, "73" is regards, "88" love and kisses, "HI" signifies laughter, and a really good joke rates "HI HI." BCNU, of course, is "Be seeing you."

No one seems to know exactly where the word "ham" originated, but whatever the origin, "hamdom" today is in full flower. Last year, amateurs forked out some 30-million dollars for equipment. The American Radio Relay League—amateur radio's combined country club and alma mater—lists a current world membership of 100,000 (90,000 in the United States). In addition there are some 100,000 other U.S. amateurs and 100,000 foreign hams.

The Federal Communications Commission, which monitors and regulates all U.S. frequencies and power, makes sure that no ham uses more than 1 kilowatt, or 1000 watts, of power. The average ham uses about 200 watts (the power required for a good-sized lamp), to establish contact anywhere in the world. In fact, last July 17, a

group of hams in San Carlos, Calif., talked to another group of hams in Medfield, Mass., by bouncing signals off the moon—a round trip of 478,000 miles.

Few hobbies can provide the thrills and suspense that are the hams' daily fare. With whom will he talk next—a student in Moscow,* a bearded Sikh in India, the Lord Mayor of Canterbury? Don Wherry, an Iowa boy, was idly twirling the dial on his set one night when he picked up an SOS from a Norwegian whaling ship sinking in icy seas north of the Arctic Circle. Don relayed the SOS and the ship's position to a ham in Jersey, who notified the U.S. Coast Guard. Within an hour another whaler in the vicinity, whose wireless operator had not heard the emergency signal, was speeding to the rescue. All hands were saved—and a hero's medal went to Don Wherry!

There is little formality among hams. Everything is on a first-name basis; it saves time, and, besides, who cares what you do for a living as long as you can operate a key or talk over a mike, and have something to say? Of course, there are exceptions. An enlisted man at Westover Air

(Continued to page 288)

*It has been only within the last five years that the Soviet government has permitted amateur radio communication with the outside world; before that, Soviet hams listened in to the worldwide traffic but talked only with fellow hams in Iron Curtain countries.

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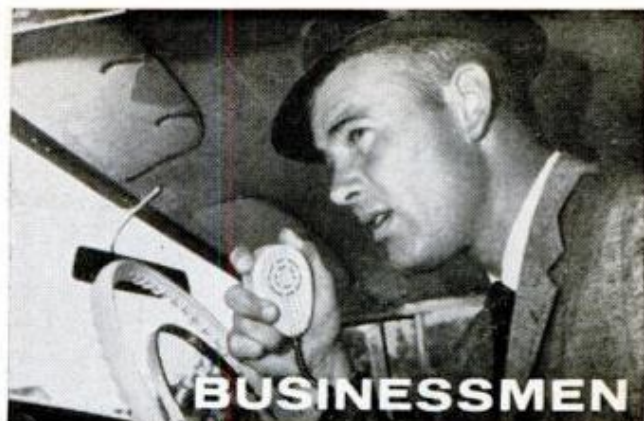
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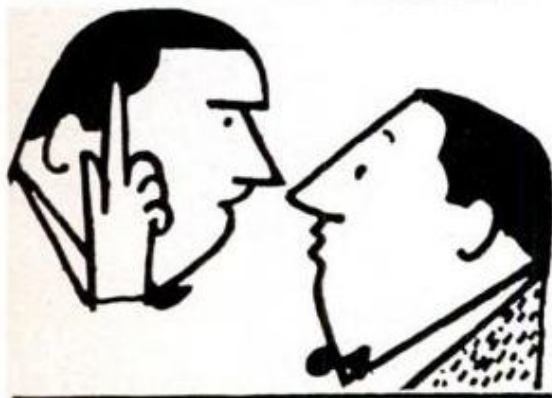
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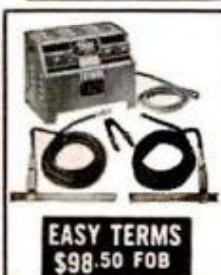


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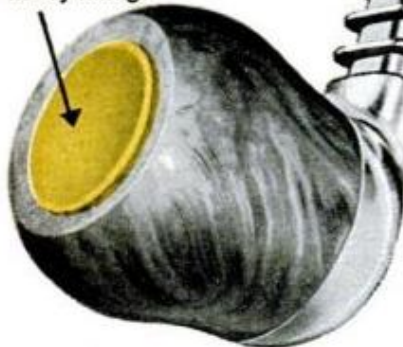
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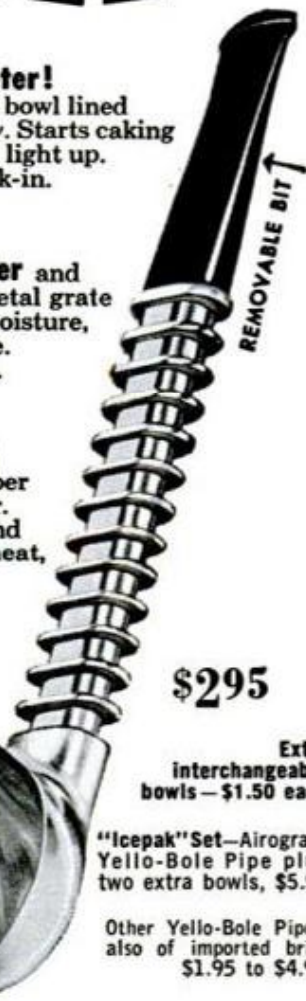


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288

Force Base reports that when he is talking to General Curtis LeMay, Vice Chief of Staff, USAF, an enthusiastic ham, he always says, "Curt . . . sir . . ." just to be on the safe side.

Clamping on the head-set is almost a sure way to be an "Earwitness" to history. A Chicago ham was once talking to an Archduke of Austria when the latter announced, "QRX (wait), I think I'm going to have a little trouble." He broke off and did not resume the conversation. It was March 12, 1938, the day Germany marched into Austria. But hams rarely close down their rigs permanently. Today the Archduke is once more on the air, this time as plain Mr. Anton Habsburg of *Am Mondsee*, Austria.

Last March, just four hours after the great earthquake struck Agadir, French Morocco, Earl Harrison of Paducah, Ky. was getting the on-the-scene story of the stricken city from a Navy man, Bill Wright. As soon as Wright, a ham at a Navy base near Agadir, heard of the disaster, he had immediately rushed his radio equipment to Agadir, knowing that the city would be without communications. Although in doing so Wright broke regulations which require all hams to notify the government when they move location, he was reassured by a message from the Crown Prince of Morocco. "Don't worry about it," said the Prince, himself a ham. "If you lose your license, you can use mine." It was largely because of Wright's reporting that help reached Agadir so quickly.

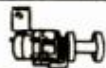
The world of ham radio belongs today as much to the "YLs" and the "XYLs" as to the men, and the ladies have proved their worth in countless instances. Some years ago, when a child was lost in the Maine woods, the late Kay Kibling won national acclaim by successfully handling radio contacts with the searching parties. In 1952, two Florida teen-age girls, by way of their small rigs, provided the only link with the outside world when a hurricane wiped out all telephone lines to their town. And in 1939, when Worcester, Mass., was hit by a tornado, the first news from the devastated city came from an alert "XYL," Gertrude Hines. Her appeals for help through the night brought immediate response from nearby towns and distant cities. Today, Gertrude Hines is teaching her daughter the intricacies of ham radio. Asked why, she replies: "Don't you think it's nice for a small girl to have her own magic carpet to take her all over the world?"

This wonderland of travel exists for all hams. Byron C. Sharpe, an attorney in Glencoe, Ill., says, "This morning before breakfast I chatted with a young man in

(Continued to page 290)

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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 regulator, 1 voltmeter, 1 electrode holder, 2 ea. 25 ft. lengths No. 0 welding cable, 1 welder's mask, 1 toggle switch, 10 lbs. vacuum packed 1/8 in. welding rods, pair welder's gloves & spline coupling. All units guaranteed pre-tested. Wt. 110 lbs. Approx. GOVT. COST \$900. 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. Approximate GOVT. COST \$700. Gen. alone—\$49.50.



"DELUXE 11" ARC WELDING KIT

Consists of 200 AMP. Gen., voltage reg., ammeter, shunt, adjustable helmet, electrode holder, pr. welder's gloves, 30' welding cable, reactor coil, toggle switch, rheostat. Approx. GOVT. COST \$650. Units guaranteed pre-tested. \$34.95 complete.



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With Deluxe accessories consisting of one 200 AMP. Gen., adjustable helmet, electrode holder, ammeter & shunt, rheostat, giant toggle switch, voltmeter, voltage reg., 1 pr. heavy-duty welder's gloves. All units guaranteed pre-tested. Approx. GOVT. COST \$500. Most items new—all perfect. \$26.00.



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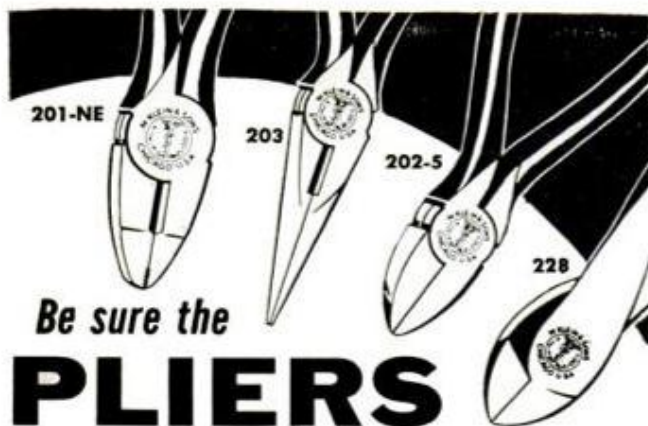
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Honduras and a Marine colonel in California, learned about life in the Arctic from a chap who lives on the edge of the Greenland ice-cap, and shared experiences with a fellow American stationed in a little Italian town. This afternoon I have an appointment with a man at the South Pole."

For the operator who specializes in distance (DX), there is the opportunity to speak with a Saudi Arabian prince, an American Embassy official in Tunis, or one of the two descendants of the "Bounty" mutineers on lonely Pitcairn Island. Or it is possible to talk with a Ukrainian worker. It has been only within the last five years that the Soviet government has permitted their version of "free" communication with "capitalistic" society though before that an operator was aware that the Soviets were listening to the outside world and talking with fellow hams in Iron Curtain countries.

Today, in the midst of the cold war, U.S. hams have a special role. In the event of a national emergency, thousands of amateurs are ready to contribute their equipment and their know-how to this country's service. Many are members of the Radio Amateurs Emergency Service (RACES), and should this nation be attacked RACES stations would be the only amateur stations permitted on the air.

This feeling of true service is one of the trademarks of hams. There's Don Mullican of Searcy, Ark., who stuck to his short-wave set for more than five days to bring emergency aid to tornado victims in his town. There's Stan Surber of Peru, Ind., called the "Arctic Mailman," who in three years handled over 18,000 messages to and from servicemen in the far North. There's Mrs. Mary Burke, of Morton, Pa., who operates eight hours a day transmitting an average of 3000 messages a month from servicemen overseas to their families.

And there's Amory (Bud) Waite of Oceanport, N. J., whose job it was to maintain contact with Adm. Byrd when he was isolated in his one-man observation post at the South Pole. Waite, at the base station in Little America, was the first to become aware of the erratic change in Byrd's sending, and, despite the Admiral's reassurances that he was all right, was able to convince his colleagues that something was wrong. This initiated the famous trek to Byrd's post to find him almost dead of monoxide poisoning. For his deed, Waite was awarded a medal.

Now, a new horizon has opened up for amateur radio operators—space! Last March, Raphael Soifer and Perry Klein, two teen-aged hams using homemade equipment established two-way communi-

(Continued to page 292)



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(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120 v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).

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12" Pipe, wt. 8 lb. **\$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E) ... **\$11.95**

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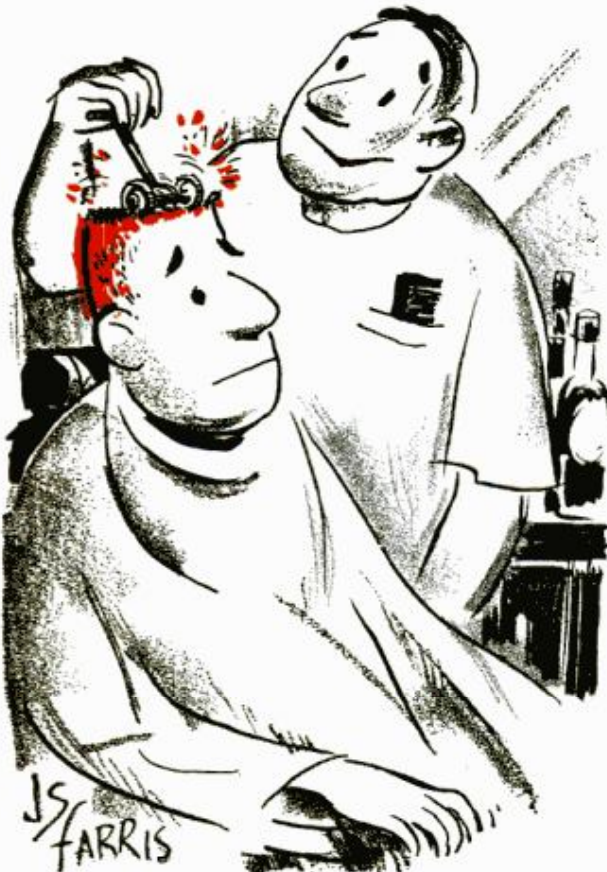
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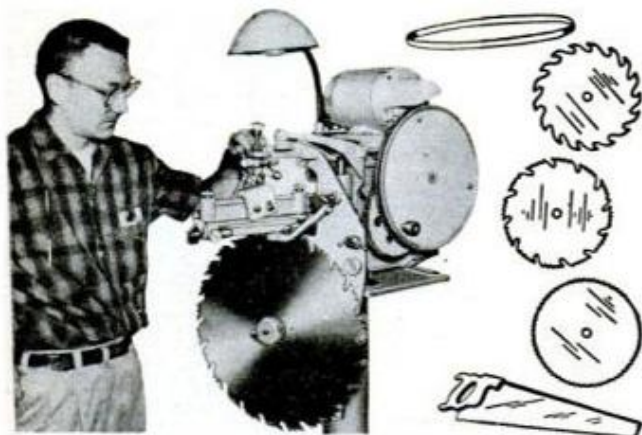
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The new model 200 Foley Saw Filer automatically sharpens combination (rip and crosscut) circular saws, hand saws, band saws and crosscut circular saws.

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cation by bouncing radio signals off a man-made satellite. "We know now," said an expert in a major radio network, "that the possibilities for communication throughout the universe are almost limitless." On August 11, an epic 2500-mile message from Goldstone, Calif., to Holmdel, N. J., was bounced off the U.S. Echo I satellite—sent into orbit for that very purpose. The technique is almost routine.

Hams are everywhere, poking out into the far and little-known corners of the world—in search of person-to-person adventure. Their password is "Calling CQ." For "Calling CQ" is the way hams have of saying: "Does anybody, anywhere, feel like talking—about anything?" ★ ★ ★



Ultraviolet Gun Kills Germs

Installed above the operating room in Mount Sinai Hospital, Los Angeles, Calif., a mammoth ultraviolet gun bathes the area with germ-killing rays. The gun has 72 chambers, each of which is 36 inches long and 7½ inches in diameter; each chamber holds a high-intensity ultraviolet lamp. The sterilizing process is 99.9 percent effective against airborne microbes. The photo shows how the ultraviolet-sterilized air is routed from the chambers. Holes have been drilled in the operating lamp so the air may "wash" germs from patients.

Inexpensive Food Supplement

Containing the protein and vitamin A content of fresh milk, an inexpensive food supplement named Incaparina promises to help prevent malnutrition among people in underdeveloped countries. A day's supply in Guatemala, where it was formulated, costs three cents, for example, compared to 15 cents for milk containing an equivalent amount of vitamin and protein.

Incaparina consists of cottonseed meal, corn, sorghum, Torula yeast, vitamin A and calcium carbonate (ordinary limestone). It takes its name from the Institute of Nutrition of Central America and Panama, in Guatemala City.

Most other countries can produce Incaparina from products grown within their borders, says Richard L. Shaw, a member of an advisory group to the Guatemalan government. Countries with rice as a main crop, for example, could substitute this for corn in the formula and thus provide protein to their citizens sooner than if they waited to develop a cattle industry.

In Guatemala, Incaparina is marketed as a powder which buyers cook with water to make a drink known throughout Central America as "atole." In tests, 80 percent of the children given Incaparina atole liked it and more than 75 percent drank two to three glasses a day. Weight gains and general health improvement "exceeded all the predictions that had been made on the basis of exhaustive laboratory studies," says Shaw.

Army Tests Throw-Away Uniforms

Clothing that can be worn once and thrown away is becoming a reality in Army Quartermaster experiments with nonwoven fabrics. Doctors and nurses at Fort Sam Houston, Tex., are wearing paper-based surgical clothing, and infantrymen are testing disposable combat uniforms made of processed paper. But nonwoven fabrics extend to other fibers as well, including cotton, nylon, Dacron, and other plastics and synthetic materials. One of man's oldest clothing materials, felt, was the first nonwoven material, and most of the modern nonwovens are made in much the same way, with fibers laid out parallel, crisscross, or in random directions, then bonded together with a binding chemical under pressure. Although the nonwoven materials account for only two percent of our textile output, new fibers and binders are improving the elasticity, drapability, and cleanability of new types, and work is continuing toward inexpensive, durable fabrics that will perform well once or a few times, then can be thrown away.

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H-70C	2-1/2"	15"	26-1/8"	1-1/2"	12.88
H-70D	2-1/2"	23-3/4"	35-1/2"	1-1/2"	18.88
H-70E	2-1/2"	30"	40-1/2"	1-1/2"	24.88
H-70F	2-1/2"	48-1/2"	64-3/8"	2"	29.88
H-70G	3-1/2"	8"	19"	2"	17.88
H-70H	3-1/2"	10-1/4"	21-1/4"	2"	19.88
H-70I	3-1/2"	15-1/8"	26-1/8"	1-3/4"	23.88
H-70J	3-1/2"	22-15/16"	34-1/4"	2"	29.88
H-70K	3-1/2"	30"	41"	1-3/4"	34.88
H-70L	3-1/2"	43-1/2"	55-1/8"	1-3/4"	44.88
H-70M	3-1/2"	47"	64-1/2"	2"	49.88
H-70N	4"	22-1/4"	34-3/8"	2"	36.88
H-70P	5"	43"	55-1/8"	2-1/4"	79.88

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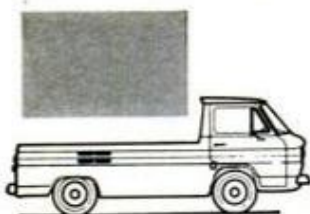
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TRUCKS

What you see here is not merely a new truck model . . . it's a new kind of truck. An ideal truck design that gives you many more feet of load space than a conventional half-tonner because of a no-hood design that's unique in the industry. A design that puts the engine in the rear, where it doesn't detract from load area. (Of a Corvair 95's short 15-foot length, almost a full 10 feet is for cargo!) Here's truck weight that's distributed evenly, front and rear, to enable a Corvair 95 to carry up to 1,900 lbs. of payload with a trim 4,600-lb. Gross Vehicle Weight. Here's a short 95-inch wheelbase that pays off in easy, nimble maneuvering. *

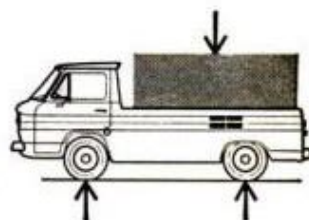
Dollar-saving performance starts with the engine—an air-cooled "pancake" 6 that never needs antifreeze or radiator repairs . . . and never stops whittling down fuel costs! And, because of its rear-end position, the Corvair 95 power plant helps provide an extra measure of surging traction for grinding through the rough spots. Ideally suited for trouble-free truck duty, also, is the tough chassis build of Corvair 95, which includes frame and body designed as a rugged one-piece unit to withstand slam-bang runs. And there's 4-wheel independent suspension (first time in a U.S. truck!) to add new stability to truck performance and take the roughness out of road surfaces.

The list of Corvair 95 design advantages is as long as your arm. There's low loading height, for example; load space so accessible that the truck practically loads and unloads itself! There's exceptional driver comfort in the roomy cab. (With no hood projecting out in front, visibility has never been better.) And that snappy Corvair 95 styling is sure to spruce up any business. It's a wing-ding of a truck idea—available in pickup and van body versions. You can see 'em at your Chevrolet dealer's right now. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



Less truck weight allows more cargo weight! Thanks to an ideal truck design, new Chevrolet Corvair 95's weigh almost $\frac{1}{2}$ ton less than corresponding conventional models. Yet they'll carry up to 1,900 lbs. of cargo!

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More load space, less road space! A Corvair 95, with 2 feet less overall length, eases into tight spots like no conventional half-tonner can. But Corvair 95's carry bigger cargoes—nearly two-thirds of the length is used for load space!

Easiest to get around in! Corvair 95 turning radius (less than 20 feet) is less than that of ordinary trucks. That means easier maneuvering and parking, faster hauls in congested areas.





Corvair 95 Rampside



Corvair 95 Corvan



Corvair 95 Loadside



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